Technical Report Overview

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Report: Elk River Watershed Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2015-2016

Overview: This report presents the results of monitoring undertaken in 2015-2016 to support the evaluation of aquatic ecosystems, per the Regional Aquatic Effects Monitoring Program (RAEMP). The objectives of the RAEMP are to assess effects of mine operations, separately and cumulatively, on the aquatic ecosystems within the Elk River watershed, monitor change over time, and assist in understanding whether management and mitigation actions are working as predicted.

This report was prepared for Teck by Minnow Environmental Inc.

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Future studies will be made available at **teck.com/elkvalley**

Elk River Watershed Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2015-2016

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Elk River Watershed Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2015-2016

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EXECUTIVE SUMMARY

The Elk River watershed is located in the southeastern corner of British Columbia (BC). From its headwaters at Elk Lakes near the continental divide, the Elk River flows in a southwesterly direction and into Koocanusa Reservoir about 20 kilometres (km) upstream from the Canada/United States border. Teck Resources Limited (Teck) operates five mines in the Elk River watershed to extract steel-making coal. The five mines are the Fording River Operation (FRO), Greenhills Operation (GHO), Line Creek Operation (LCO), Elkview Operation (EVO), and Coal Mountain Operation (CMO). In response to concerns of increasing water quality concentrations of selenium, cadmium, nitrate and sulphate, as well as calcite formation within watercourses in the Elk Valley, the BC Minister of Environment and Climate Change Strategy (ENV) issued a Minister's Order in April 2013 (Number [No.] M113). The Order outlined a framework to develop the Elk Valley Water Quality Plan (EVWQP) to allow for continued mine development in the Elk Valley while protecting aquatic ecosystem and human health, managing bioaccumulation of contaminants in the receiving environment (including fish tissue), and protecting groundwater. Teck submitted the EVWQP to ENV in July of 2014, and in November of 2014, ENV approved the EVWQP and issued Permit 107517 under the *Environmental Management Act.* The Regional Aquatic Effects Monitoring Program (RAEMP) is one of the requirements stipulated in Permit 107517 and is the subject of this report.

In general, the objectives of the RAEMP are to assess effects of mine operations, separately and cumulatively, on the aquatic ecosystems within the Elk River watershed, monitor change over time, and assist in understanding whether management and mitigation actions are working as predicted by the EVWQP and as intended by the Site Performance Objectives (SPOs) and Compliance Limits reflected in Permit 107517. Monitoring data are presented in an interpretive report every three years.

The first comprehensive cycle of field sampling occurred in 2015, with additional sampling in 2016 at a sub-set of areas. Monitoring data from other programs have been incorporated as applicable to support the evaluation of aquatic ecosystem conditions. This report presents data for water and sediment quality and toxicity, calcite conditions and effects on biota, periphyton and benthic invertebrate productivity, community structure, and tissue selenium concentrations, longnose sucker (LSU) population characteristics, and fish tissue chemistry (particularly selenium in westslope cutthroat trout [WCT], mountain whitefish (MW), and LSU). The outcome of the analysis of each of these components is summarized below, followed by a brief summary of the integrated analysis of conditions within the watershed on a Management Unit (MU) basis.

Water Quality

Water flows in the Elk River watershed vary annually, particularly during spring freshet, after which flows gradually decline toward winter minima. Peak spring water flows in 2012 to 2014 exceeded 10-year averages, especially in 2013 when record flows were observed in mid-June. In 2015, peak freshet flows were near the average, but declined more quickly in June and July. In 2016, freshet flows began earlier and peaked at below-average levels.

Water quality variability among stations downstream of mining relates mainly to variation in concentrations of Order constituents (nitrate, total selenium, and sulphate, and to a lesser degree cadmium), as well as alkalinity, conductivity, hardness, total dissolved solids (TDS), calcium, magnesium, nitrite, sodium, and potassium; and total and dissolved antimony, boron, calcium, chloride, lithium, magnesium, molybdenum, nickel, nitrite, potassium, strontium, and uranium. Water quality variability among mine-exposed stations was also associated with concentrations of total suspended solids (TSS) and turbidity, and substances often associated with particles in the water column (e.g., aluminum, iron, manganese) as well as total organic carbon (TOC) and phosphorus (which likely reflect the mobilization of organic matter during high flows).

Monthly mean concentrations of the key mine-related constituents (nitrate, selenium, and sulphate) tend to be lowest in the upper Elk River and highest in the Fording River. Most stations show a similar seasonal pattern of lowest concentrations in winter and highest concentrations during spring freshet, although there is variability that may relate to periodic precipitation events.

Strong negative correlations with water flow ($r>|0.6|$) were observed for concentrations of alkalinity, as well as total and dissolved lithium, molybdenum, and strontium among reference station samples, but specific conductivity ($r = 0.9$) and dissolved organic carbon ($r = -0.6$) were the only constituents that correlated strongly with water flow among samples collected at mine-exposed stations. Aqueous TSS and/or turbidity correlated strongly ($r>0.6$) with water flow at most individual reference stations, but only weakly when data for reference stations were combined ($r<0.4$), indicating that relationships between flow and TSS/turbidity vary naturally among stations, even among reference stations within close proximity in the watershed. The results suggest that prior to mining, water quality along main stem streams may have varied naturally from headwaters due to differences in water quality among tributary inputs.

A single normal (reference) range was defined for each water quality variable based on combining data for all reference water quality stations monitored by Teck (2012 to 2016) within each month. The upper limit of the normal range was defined as the 97.5th percentile of the combined reference station concentrations for each month (i.e., the upper limit of “normal” was

defined for each month, thereby partially accounting for natural seasonal variations in flow and water quality). This was deemed adequate for identifying areas of the watershed that are being affected by mining because concentrations at mine-exposed areas that are above the normal range for all reference stations combined provides strong evidence of mine-related influence. For aluminum, iron, manganese, and total phosphorus, which correlated strongly with TSS and/or turbidity among reference stations, normal ranges were also defined using a covariate approach. TSS or turbidity, whichever exhibited the strongest linear regression relationship, was used as the covariate.

Normal ranges for most total and dissolved metals were exceeded in more than 10% of samples collected at more than half of the monitoring stations downstream from mining. All samples collected in 2015 at the four monitoring stations in MU5, downstream from all mining, had selenium and nitrate concentrations greater than normal ranges indicating mine-related influence on water quality extends at least to the mouth of the Elk River. In addition to elevated selenium and nitrate concentrations, total and dissolved barium, chloride, and nitrite concentrations were above normal ranges in more than 50% of samples collected at the most downstream station on the Elk River (RG_ELKMOUTH), suggesting these six constituents are the ones most strongly indicative of mine influence on water quality (i.e., conservative tracers). Comparison of aluminum, iron, and manganese concentrations at individual mine-exposed stations to covariate-adjusted normal ranges typically identified a similar or lesser frequency of normal range exceedances than comparison to monthly normal ranges. However, the covariate-adjusted normal range for phosphorus identified more normal range exceedances than the monthly normal range approach at most stations. Results will be discussed with the EMC to determine the preferred approach for future evaluations of mine-related influence on water quality relative to reference station concentrations.

Although BC water guidelines for long-term exposure are based on 30-day mean concentrations, concentrations in individual samples were compared to the guidelines to conservatively identify constituents elevated above guidelines as a result of mining. Normal reference station ranges occasionally exceeded water quality guidelines for total beryllium, total chromium, total iron, and total mercury. Aqueous concentrations measured at mine-exposed stations in 2015 exceeded site-specific benchmarks (SSBMs) or BC guidelines, as well as reference area normal ranges in one or more samples collected at one or more mine-exposed stations for nitrate, sulphate, dissolved cadmium, selenium, TDS, total and dissolved iron, dissolved aluminum, total barium, total beryllium, chloride, total chromium, total cobalt, total mercury, total nickel, nitrite, ammonia, total silver, total thallium, total uranium, and total zinc. The constituents tending to be most elevated above both normal ranges and guidelines in the Elk River watershed as a result of mining were nitrate, total and dissolved selenium, sulphate,

TDS, total (but not dissolved) iron, dissolved aluminum, and total and dissolved uranium. Highest concentrations of all constituents were observed in tributaries closest to mine sources compared to main stem areas.

Concentrations of Order constituents were also evaluated based on maximum (calendar) monthly mean concentrations. Monthly means did not exceed EVWQP Level 1 effect benchmarks for cadmium, selenium, and sulphate among main stem stations, except in the Fording River (selenium and sulphate at FR_FRCP1; selenium at GH_PC2, FR_FRABCH, LC_LC6, and LC_LC5), and in lower Michel Creek (nitrate and selenium at EV_MC2).

Statistically significant increases in nitrate concentrations were observed at six mine-exposed water monitoring stations after 2014 (GH_COUGAR 377%; GH_MC1 1,539%) or 2015 (FR_CC1 99%, LC_DC3 83%, GH_ER1 28%, EV_MC3 65%). Significant increases in selenium were observed at four stations: Kilmarnock Creek (FR_KC1 22% after 2012), upper Dry Creek stations LC_DC3 (38% after 2015) and LC_DCDS (27% after 2015), and Mickelson Creek (GH_MC1 186% after 2014). Increasing sulphate concentrations were observed in Line Creek upstream from the AWTF (LC_LCUSWLC 15% after 2012), at the GHO Elk River Order station (GH_ER1 53% between 2012 and 2016), at Mickelson Creek (GH_MC1 407% after 2014), at Leask Creek (GH_LC2, 142% after 2013), and in Michel Creek upstream from Erickson Creek (EV_MC3; 18% after 2015).

Water quality performance was evaluated for nitrate, selenium, and sulphate at the 12 Order and Compliance Stations within the Elk River watershed, and at the Compliance Station in Koocanusa Reservoir. In most cases, observed concentrations were consistent with or less than modelled concentrations. Selenium and sulphate concentrations in water samples collected at the FRO Compliance Point (FR_FRCP1; MU1) in 2016 were greater than the modelled concentrations. The data indicated that water collected at this location during the winter low flow period is predominantly discharge from Cataract Creek, which explained the high concentrations of selenium and sulphate observed in winter samples.

In MU2, aqueous nitrate concentrations at the LCO Compliance Point (LC_LCDSSLCC) in 2016 were greater than the modelled concentrations due to greater than anticipated loads from Line Creek upstream from West Line Creek. Observed concentrations were also greater than modelled concentrations for one or more constituents at each of the three Compliance Stations in MU4. In the case of EV_HC1, nitrate concentrations remained below water quality guidelines. Higher than expected concentrations at Michel Creek Compliance Stations (CM_MC2 and EV_MC2) may have been due to overestimation of water flows in the regional water quality model (RWQM; Golder 2017a). The RWQM was updated in 2017, so future comparisons of observed to modelled concentrations will be based on the updated model.

Water Toxicity

Teck routinely collects discharge water samples for acute toxicity testing, and surface water samples for chronic toxicity testing in accordance with requirements of Permit 107517. All acute tests completed in 2015 and 2016 using rainbow trout (n=176) were passes (≤50% mortality), as were most tests (169 of 179=94%) completed using *Daphnia magna*. Of the tests that failed, investigation suggested that mortality may have been due to a mineral precipitate (potentially calcite) that formed when the site water was warmed to the laboratory test temperature of 20 ± 2ºC. More than 97% of samples resulting in "passed" *D. magna* or rainbow trout tests had mortalities of 10% or less, which is within the accepted performance range for test control organisms based on the test methods.

In 2015 and 2016 a total of 70 *Ceriodaphnia dubia* (water flea), 70 *Pseudokirchneriella subcapitata* (green alga), 32 *Hyalella azteca* (amphipod), 16 *Pimephales promelas* (fathead minnow), and 36 *Oncorhynchus mykiss* (rainbow trout) chronic toxicity tests were conducted on surface water samples collected in the Elk Valley. Of tests for which a statistically significant response (relative to one or more reference waters) was identified, approximately one third showed a significant effect relative to one but not both reference waters and/or had mean responses within the typical range of test organism performance in reference waters. A review and statistical analysis of water chemistry did not identify any consistent relationships that could explain most of the significant responses, so there is uncertainty regarding whether the results represent an adverse response to toxicants in the test water or variance in test organism performance related to background water quality. Evaluation of whether temporal variation in test organism performance (batch sensitivity) was a potential confounding factor did not result in major differences in the data interpretation (i.e., most responses indicative of toxicity would be classified similarly either with or without control normalization). In 2016, eight tests exhibited a response that was significantly different from responses in reference water samples, below the reference envelope, and potentially attributable to water quality constituents in test waters. Effects to organisms observed in tests with first-quarter samples collected at the Fording River Compliance Point (FR_FRCP1) were attributed to water flowing from Cataract Creek, because the reach of the Fording River upstream of FR_FRCP1 goes dry during the winter low flow period. Additional investigations are underway to evaluate potential causes of the toxicity observed in a subset of the quarterly and semi-annual tests.

Calcite

In 2013, Teck initiated a regional calcite monitoring program to document calcite deposition in tributary and main stem areas of the Elk River watershed. Regional calcite monitoring results from 2015 and 2016 were generally similar to those reported in 2013 and 2014. All reference

streams assessed had calcite index (CI) values of 0.5 or less. Most of the mine-exposed stream kilometres that were assessed (in MUs 1-4 and a portion of MU5) also had a CI of 0.5 or less (≥75% of tributaries and ≥81% of main stem Fording and Elk Rivers). CI of 0.5 is a long-term (Year 2029) SPO specified in Permit 107517 for streams that provide or flow directly into fish habitat.

Analysis of temporal changes in calcite (using data collected from 2013 to 2016, as part of the regional calcite monitoring program) resulted in approximately half of all mine-exposed study areas (52 of 101) showing a significant increase or decrease over time, after accounting for mean trends among reference areas. More specifically, significant increasing trends in CI were identified in 27 reaches and significant decreasing trends were observed in 19 reaches, with most reaches showing significant temporal changes being in tributaries. Significant increases were only observed at two locations in the main stem Fording River: FORD4 (upstream from Line Creek) and FORD5 (vicinity of LCO Dry Creek). In both cases, the increase was due to a step change from 2014 to 2015. When temporal trends in CI were analyzed for main stem mine-exposed stations by MU, increasing average trends were only observed in MU1 (step from 2013 to 2014) and MU2 (step from 2015 to 2016). A decreasing trend was observed in MU5 after 2013, and no changes were identified in MU3 or MU4.

Calcite measurements made among the 40 reference areas sampled as part of the RAEMP in 2015 defined the upper limit (97.5th percentile) of the normal range for reference areas as CI = 1.0. Most (91%) of the mine-exposed areas sampled in the 2015 RAEMP cycle had CI>0.5 but 62% had CI within the upper limit of the normal range (i.e., ≤ 1.0). Areas that were sampled in some tributaries (Kilmarnock, Swift, Cataract, Greenhills, Wolfram, Thompson, and Corbin) and a portion of two areas in the upper Fording River (FOBSC and FOBCP) had CI greater than the upper normal range limit of 1.0. RAEMP data for calcite are based on proportions (%) of areas sampled whereas data for the regional program are based on stream kilometres. To guide interpretation of the regional monitoring results with respect to potential effects on aquatic biota, a separate supporting study was begun in 2014, focusing initially on assessing potential relationships between calcite deposition and both benthic invertebrate community structure and periphyton productivity. The study reported that periphyton chlorophyll-a and ash-free dry mass (AFDM) concentrations were weakly (i.e., r < 0.5) positively correlated with CI values among areas. The results suggested that calcite deposits may provide a surface favourable for periphyton growth, that periphyton growth alters water quality near the periphyton surface in a manner that favours calcite formation, and/or bioavailable nutrient concentrations may be elevated in areas with more calcite. The scientific literature also indicates that calcite formation is the product of complex interaction of abiotic habitat and periphyton community characteristics.

The supporting study did not indicate a specific CI value above which periphyton productivity would be expected to deviate from the normal range.

The same supporting study showed that benthic invertebrate community structure, and especially the proportion of Ephemeroptera, deviated from the reference area normal range when CI was greater than 1.0. However, the analysis also showed that there was strong correlation between CI and the concentrations of mine-related constituents in water among areas such that the effects of calcite could not be conclusively distinguished from potential effects associated with water quality.

Sediment

Sediment chemistry was evaluated at a total of 31 areas in 2013 and/or 2015, including 10 reference areas. Most of the areas chosen for sediment sampling have little or no surface water connection to the main channel flow for at least part of the year. Consequently, sediment samples collected among the 31 study areas were dominated by fine particles (silt and clay). These areas were expected to have the highest sediment accumulations of mine-related substances compared to lotic habitats that are regularly affected by seasonal high flows and associated scouring.

Mining influence on sediment chemistry was most evident as elevated concentrations of selenium and PAHs. Highest concentrations of selenium in sediment were observed at R5-1 (wetland adjacent to the Fording River, near GHO) and GO13 (Goddard Marsh). Highest PAH concentrations were observed in a sample collected at STPD (Stanford Pond near Fernie), but the pattern of PAHs suggested a source other than, or in addition to, coal mining. At areas closer to mining, 2-methylnaphthalene was the PAH found at highest concentrations relative to guidelines, particularly at OTTO (Otto Creek ponds), GO13, and reference area LOLA (Lost Lake). The upper limit of the reference area normal range exceeded the upper sediment quality guideline for selenium, fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene.

Goddard Marsh (GO13) was the only mine-exposed area in which the change in sediment quality in 2015 compared to 2013 was significantly different from the change in reference area mean and each of the three reference areas sampled in both 2013 and 2015, individually. Concentrations of both selenium and PAHs (based on 2-methylnaphthalene) at GO13 were greater than the upper sediment quality guidelines (SQGs) in both years and increased significantly in 2015 relative to the reference areas.

The sediment toxicity supporting study completed in 2016 evaluated a variety of test species, test durations, and biological endpoints to decide which tests were the most appropriate for evaluating sediment toxicity in the Elk Valley. A subset of five mine-exposed areas was chosen

for the study based on having the highest concentrations of mine-related constituents of interest (e.g., selenium, cadmium, and PAHs). Three reference areas were also selected based on having a similar range of physical substrate characteristics (particle size distribution, sediment texture, and TOC content) to the sediments from mine-exposed areas, as well as a natural range of metal and PAH concentrations. The study found that toxicity was observed in samples having highest concentrations of selenium and/or PAHs. The 21-day *Hexagenia* survival and growth test and the 14-day *Hyalella* survival and growth test were recommended for future testing of potential mine-related sediment toxicity.

Periphyton

Periphyton represents an important component of aquatic food webs in the streams within the Elk River watershed and consists of a complex matrix of organisms that can include algae, fungi, bacteria, and protozoa. These organisms take up inorganic nutrients such as nitrogen (e.g., nitrate, nitrite) and phosphorus (e.g., ortho-phosphate), as well as other substances dissolved in water (e.g., selenate), to serve physiological functions and which thereby become available via dietary pathways to consumer organisms at higher trophic levels.

In the RAEMP and associated supporting studies, periphyton were used to evaluate primary productivity (based on chlorophyll-a and AFDM) in mine-exposed areas relative to reference and the BC guideline for chlorophyll-a, tissue selenium concentrations relative to the upper limit of the reference normal range, and differences in community characteristics among mine-exposed and reference areas.

Periphyton AFDM and chlorophyll-a concentrations were within the reference area normal range at ≥ 75% of 58 mine-exposed areas sampled in 2015. Chlorophyll-a concentrations were less than the guideline at 48 of 58 (83%) mine-exposed areas. There was no direct relationship between periphyton chlorophyll-a concentrations and aqueous total phosphorus or orthophosphate concentrations, even though phosphorus is the limiting nutrient within the watershed. Data from the literature suggest there is a threshold (P > 0.030 mg/L) above which periphyton growth may be related to nutrient concentrations, but concentrations in the Elk River watershed are typically less than this value. Instead, primary productivity in the Elk River watershed appears to be mostly related to other habitat factors. The strongest relationship between periphyton productivity endpoints and more than 50 habitat variables evaluated in this study was with calcite index ($p<0.001$, $r=0.55$). As noted above, periphyton potentially provides nucleation sites for calcite formation and/or calcite deposits serve as a suitable substrate for growth of some periphyton species.

Two supporting studies that evaluated periphyton communities in mine-exposed areas compared to reference areas concluded that periphyton communities in the Elk Valley are

sensitive to a variety of habitat factors that likely cannot be measured or effectively controlled in sampling designs or data analysis, and confound detection of mine-related effects.

Benthic Invertebrates

Benthic invertebrate communities were sampled in September 2015 at 40 reference and 59 mine-exposed lotic areas using the Canadian Aquatic Biomonitoring Network (CABIN) kick sampling method for evaluation of community structure (lowest practical level of taxonomy). Additional community samples were collected in 2016 to support the LCO Dry Creek, Line Creek and FRO local aquatic effects monitoring programs (LAEMPs), and to satisfy other data needs by Teck (total of 7 reference and 32 mine-exposed areas). Samples for tissue selenium analysis were also collected at all mine-exposed areas and a subset of reference areas in 2015. Additional tissue selenium samples were collected at a sub-set of areas in 2016.

Benthic invertebrate communities sampled in reference areas were composed mainly of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), collectively referred to as EPT. Of the 59 mine-exposed areas sampled in 2015, almost half (27 of 59) had proportions (%) of EPT and/or Ephemeroptera that were less than the reference area normal ranges for those endpoints. % EPT and % Ephemeroptera were inversely related to increasing gradients of mine-related influence on water quality and calcite.

More significant temporal changes were observed for % Ephemeroptera than the other benthic invertebrate community endpoints. Declines were observed in 2015 and 2016 relative to 2012 at main stem areas of the upper Fording River upstream from Ewin Creek (FOUKI, FOBKS, FOBCP, FODPO, and FOUEW) and at the Elk River mouth (ELH93). The other areas (Fording downstream from Greenhills [FODGH] and upstream [FRUL] and downstream [FO23] from Line Creek, as well as mid [MI3] and lower [MI2] Michel Creek) showed a pattern of decreased (lowest) % Ephemeroptera in 2013 compared to 2012, followed by increases in 2015 and 2016, with 2016 values being near the reference mean.

The pattern of lower % Ephemeroptera over a distance of about 12 km in the upper Fording River was identified in the FRO LAEMP report submitted in May 2017. The response appears to be chiefly attributable to declines in abundances of the mayfly families Ephemerellidae and Heptigeniidae. Several factors (e.g., elevated nitrate concentrations, increased temperature, variation in annual flow regimes, seasonal dewatering, and/or calcite deposition) may be influencing benthic invertebrate communities. In consideration of these findings, the FRO LAEMP design was adjusted to allow for further investigation of the cause(s) of benthic invertebrate community changes in September 2017.

Benthic invertebrate tissue selenium concentrations observed in lotic monitoring areas in 2015 and 2016 were compared to predictions that were derived from water modelling and tissue bioaccumulation models developed for the EVWQP. Tissue selenium concentrations were less than the upper prediction interval (i.e., within the range of model uncertainty for individual observations) at all areas except at Bodie Creek (BOCK), although additional areas reflected tissue selenium concentrations that were more than 20% greater than predicted mean concentrations in 2015 and/or 2016. Tissue selenium concentrations measured among mine-exposed areas in 2015 and 2016 were generally at the upper end of, or greater than, the normal range for reference areas (51 of 58 areas = 88%).

Benthic invertebrate tissue selenium concentrations measured in lotic habitats of the watershed since 2006 have typically been less than the EVWQP Level 1 benchmark for effects to invertebrates (13 mg/kg dw), as well as benchmarks for dietary effects to juvenile fish (11 mg/kg dw) and birds (15 mg/kg dw). Most (89%) of the areas sampled in 2015 had invertebrate tissue selenium concentrations less than the lowest benchmark. HQs > 1 occurred mainly in tributaries (e.g., Swift, Greenhills, Line, Wolfram, Thompson, and Bodie), as well as the most downstream Elk River area (ELH93). In 2016, 6 of 32 (19%) benthic invertebrate tissue samples collected in mine-exposed areas had concentrations greater than the benchmark of 11 mg/kg dw. By comparison, benthic invertebrate tissue selenium concentrations in lentic areas have frequently been greater than Level 1 benchmarks, and in 2015, at least one replicate sample exceeded the benchmark in 13 of 18 (72%) mine-exposed areas and one of five (20%) reference areas.

Potential changes in benthic invertebrate tissue selenium concentrations over time were evaluated for all areas having at least two years of data. Significant increases were identified at LILC3 (Line Creek downstream from the AWTF) and at BOCK (Bodie Creek) in 2015 and 2016 compared to 2012. The elevated tissue selenium concentration at LILC3 in 2016 was associated with discharge of selenium from the AWTF that was in a chemical form (i.e., predominantly selenite) that is more readily accumulated by aquatic organisms than the form that is normally found in other parts of the watershed (i.e., selenate). Teck is currently pilot testing an active oxidation process to convert most of the selenium discharged by the AWTF into selenate, which is expected to result in less tissue selenium accumulation in Line Creek after it becomes operational at full-scale. Increases at BOCK compared to predictions and past observations may be related to altered invertebrate communities due to exposure to mine-influenced water downstream of the sediment ponds, exposure to pit dewatering, or some other factor related to proximity to the point of discharge.

Decreasing step changes in benthic invertebrate tissue selenium concentration were observed at EL19 (Elk River downstream from Fording River) and MI2 (lower Michel Creek) after 2006. At all other areas, concentrations observed in 2015 were similar to those observed in one or more previous years.

Among lentic monitoring areas, a decreasing trend in tissue selenium was observed at the former Fording River Oxbow (FO10) in 2015 compared to previous years which is consistent with the transformation of that area from a stagnant lentic habitat to a flowing side-channel after the record storm event in June 2013. The invertebrate tissue selenium concentration at this area in 2015 was less than EVWQP Level 1 benchmarks.

A decreasing trend in invertebrate tissue selenium concentrations was also observed at Otto Ponds (OTTO), where the concentrations measured in 2015 ranged from less than the upper limit of the normal reference area range to greater than Level 1 benchmarks for effects to invertebrates and juvenile fish among the three replicate samples. This trend was supported by a decreasing trend for selenium in water at the Otto Creek monitoring station (EV_OC1). An increasing trend was observed for the Michel Creek wetland (MI16) downstream from CMO; however, no trends were found for aqueous selenium downstream from CMO (CM_MC2).

Longnose Sucker

Longnose sucker (LSU) populations are widespread in the Elk River watershed, being most abundant in small, cool, lentic water bodies that contain vegetative cover and few other fish species. Two reference and ten mine-exposed areas were sampled in May 2015 for evaluation of LSU density, population size, morphometrics, and tissue selenium concentrations. Although not stipulated in the study design, selected areas were revisited in September 2015, to determine if the timing of sampling affects catch success and population estimates.

LSU population estimates varied widely among the twelve study areas in May 2015. Largest population sizes were estimated for Goddard Marsh (GO13), Otto Ponds (OTTO) and Stanford Pond (STPD), where populations were greater than at the reference area. Confidence limits for the LSU population estimates were wide, especially in May.

Mean fork length and body weight were significantly lower for LSU captured at OTTO and STPD than at the reference areas. Based on input from the EMC, evaluation of potential changes over time focused on LSU condition. Increases in condition were observed at three of six areas in 2015 compared to earlier years but the changes were small (<10%) and comparable in magnitude between the reference area and the two mine-exposed areas where the increases were observed.

All LSU captured in six of eight mine-exposed areas where tissues were collected had tissue selenium concentrations greater than the tissue-specific reference normal ranges. The exceptions were the most northerly mine-exposed area, Elk River upper ponds (ERUP) and the unnamed wetland near Morrissey (UNWNMO), where ovary selenium concentrations (2 of 2 at ERUP and 1 of 1 at UNWNMO) and one muscle selenium concentration (of 3 at ERUP and 4 at UNWNMO) exceeded the normal range in each area, but not whole body selenium concentrations (n=5 in both areas). Ovary and muscle selenium concentrations were also above site-specific Level 1 benchmarks for all LSU captured at Goddard Marsh (GO13) and for some of the LSU captured at the Elk River wetland downstream from Grave Creek (ELWDGC) and at Stanford Pond (STPD).

Westslope Cutthroat Trout

Westslope cutthroat trout (WCT) are widely distributed throughout the Elk River watershed and are the only fish present in the Fording River upstream of Josephine Falls. A four-year study (2012 - 2015, inclusive) by Cope et al. (2016) characterized the fluvial population of WCT and their habitat within the upper Fording River watershed. The use of telemetric methods confirmed both resident and migratory life history forms of WCT within the upper Fording River population. The study concluded that the upper Fording River population metrics of sub-adult and adult abundance (2,552 to 3,874 fish > 200 mm fork length), habitat availability (57.5 km of main stem river plus approximately 59 km of tributary habitat), and genetic integrity (pure strain) represent a viable WCT population. Population characteristics such as condition factor (weight to length relationships), growth rates, von Bertalanffy growth model estimates, and population age structure indicate the population appears to be in good condition and robust compared to similar upper Kootenay River populations.

WCT muscle samples were collected non-lethally from main stem areas of the watershed in May and August 2015 to evaluate tissue selenium concentrations relative to predictions, normal ranges, and site-specific effect benchmarks developed in the EVWQP. Although all 90 fish had concentrations near or above the normal range for reference area fish, only one muscle sample (from one of the 10 fish collected in Henretta Lake), exceeded the Level 1 benchmark for reproductive effects. Tissue selenium concentrations were also within prediction intervals derived from water quality and tissue selenium bioaccumulation models developed in the EVWQP.

Mountain Whitefish

Mountain whitefish is a species native to the Elk River basin, where it is found mainly along the main stem of the Elk River and in lower reaches of larger tributaries such as the Fording River, Line Creek, Alexander Creek, and Michel Creek. Selenium concentrations in mountain

whitefish samples collected in 2015 were greater than the reference area normal range for 12 of 20 (60%) of muscle samples and 2 of 20 (15%) ovary samples collected in mine-exposed areas of the Elk River, lower Fording River, and lower Michel Creek. Ovary selenium concentrations were greater than the BC ovary selenium guideline among most reference and mine-exposed mountain whitefish, and 6 of the 20 (30%) individual mine-exposed whitefish captured (from lower Michel Creek and the lower Elk River) had ovary selenium concentrations greater than the estimated lower bound of the effect threshold (29.3 mg/kg dw).

Mountain whitefish have unusually high egg/ovary selenium concentrations relative to muscle compared to other fish species. On average, mountain whitefish ovary selenium concentrations are about 7 times those in muscle, whereas in most other fish species, ovary selenium concentrations are 1 to 2 times those in muscle. Monitoring data since 2006 show that whitefish ovary selenium concentrations tend to be higher in late August or early September than in October, closer to spawning. Therefore, the timing of monitoring was shifted from August-September (2006, 2009) to October (2012, 2015). Ovary samples collected in October 2015 had similar selenium concentrations to those collected in October 2012.

Management Unit 1 (Upper Fording River) Integrated Summary

MU1 includes areas along the main stem Fording River, as well as numerous tributaries as far downstream as Josephine Falls.

Conditions in MU1 in 2015-2016 were largely as expected based on the long history of mining, projections from the EVWQP and monitoring results. Most tributaries in MU1 have been both physically and chemically altered by mining (Minnow 2016e). The upper Fording River WCT population study (Cope et al. 2016) indicated that the fish are in good condition and the population is viable. This is an important finding because it suggests that mine-related effects on WCT are unlikely in lotic habitats of other MUs where main stem concentrations of mine-related stressors are lower, and there is greater access to main stem and tributary habitats with minimal or no disturbance from mining. Teck continues to work with the Regional Fish and Fish Habitat Committee to identify, prioritize, and implement aquatic habitat improvements, with particular focus on MU1 where historical mining has had more effect on the amount and quality of tributary habitat than in other MUs. A Tributary Management Plan is also under development to protect or rehabilitate aquatic ecosystems in tributaries that flow into the Fording River, Michel Creek, and the Elk River.

The main, unexpected observation for MU1 was a reduction in the proportion of Ephemeroptera relative to normal reference area values over a distance of about 12 km of the Fording River main stem since 2012. Several factors were identified as potential causes (e.g., elevated nitrate concentrations increased temperature, variation in annual flow regimes, seasonal dewatering,

and/or calcite deposition) and the FRO LAEMP design was adjusted to allow for further investigation of the cause(s) of benthic invertebrate community changes in September 2017.

Reduced % EPT at lower Swift Creek (GH_SC1 and GH_SC2), and reduced invertebrate abundance at lower Cataract Creek (GH_CC1) have no long-term ecological consequence, because water from these streams will be directed to the future FRO AWTF. Increasing selenium concentrations at Kilmarnock Creek (FR_KC1) will also be addressed by directing a portion of the flow to the future AWTF. Increasing concentrations of nitrate at Clode Ponds decant [FR_CC1] warrant on-going monitoring since concentrations of nitrate already exceed Level 1 benchmarks in much of the Fording River.

Twenty two of 25 mine-exposed tributary and main stem monitoring areas in MU had benthic invertebrate community total abundance and taxa richness within normal reference area ranges. Of 19 and 10 WCT muscle samples collected in lotic and lentic areas of MU1 in 2015, only one fish from the lentic area (Henretta Lake) had a tissue selenium concentration slightly over the EVWQP Level 1 benchmark (HQ > 1) (=3%).

Increasing nitrate and selenium concentrations in upper LCO Dry Creek [LC_DCDS, LC_DC3]) are the expected consequence of advancement of mining into that catchment based on the approved plan for LCOII. The concentrations of mine-related constituents in LCO Dry Creek remain well below levels of concern at the present time.

Management Unit 2 (Lower Fording River) Integrated Summary

MU2 includes areas on the main stem Fording River downstream from Josephine Falls and in two tributaries to the Fording River (Grace Creek [reference] and Line Creek [reference and mine-exposed portions]).

Concentrations of mine-related constituents in water and tissues in MU2 were generally consistent with expectations based on models developed in support of the EVWQP. Exceptions included higher than anticipated aqueous nitrate concentrations due to greater loading than anticipated from Line Creek upstream from West Line Creek, which will be taken into account in the next update of the RWQM. Also, despite significant reductions in total aqueous selenium concentrations, tissue selenium concentrations were elevated in Line Creek immediately downstream from the AWTF in 2016 (compared to predictions and values observed in 2015). This was the result of discharge of selenium from the AWTF that was in a chemical form (i.e., predominantly selenite) that is more readily accumulated by aquatic organisms than the form that is normally found in other parts of the watershed (i.e., selenate). Teck is currently pilot testing an active oxidation process to convert most of the selenium discharged by the AWTF

back to selenate, which is expected to result in less tissue selenium accumulation in Line Creek after it becomes operational at full-scale.

All six mine-exposed tributary and main stem monitoring areas in MU2 had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges. All 10 WCT captured in MU2 in 2015 had muscle selenium concentrations less than the Level 1 benchmark for reproductive effects.

A significant temporal reduction of % Ephemeroptera in the lower Fording River (FO23) occurred after 2012 and then showed consecutive increases in 2013, 2015, and 2016. The 2016 value was within the reference area normal range.

Management Unit 3 (Upper Elk River) Integrated Summary

MU 3 includes the main stem Elk River and its east-side tributaries located to the west of GHO, extending downstream to the mouth of the Fording River. Conditions in MU3 in 2015 to 2016 were generally consistent with expectations based on comparisons of observed conditions to EVWQP predictions and past monitoring results. The exceptions were reduced % EPT and % Ephemeroptera at the monitoring area on the Elk River upstream from the Fording River (ELUFO). No benthic invertebrate community effects were observed at EL20, ELDEL, and ELUEL, closer to GHO sources and HQs for mine-related stressors were also less than one at all four Elk River areas downstream from GHO, suggesting the cause of effects at ELUFO was not mine-related.

Cougar Creek (GH_COUGAR), for which an increasing trend in nitrate concentrations was observed, flows only intermittently. As it is dry much of the year, it has low habitat value within the broader spatial context of MU3.

Step increases in concentrations of nitrate, selenium, and sulphate were observed at Mickelson Creek (GH_ MC1) in all years after 2012, but especially after 2014. Maximum monthly mean concentrations of both nitrate and sulphate were greater than EVWQP Level 1 benchmarks in 2015. Calcite deposition also increased over time, particularly after 2015. It is not considered to be fish bearing, but western toads have been observed within the catchment (Minnow 2016e). The area around Mickelson Creek has been extensively deforested in recent years. This information bears consideration in future cycles of RAEMP or GHO LAEMP study design development.

Sulphate concentrations increased at Leask Creek (GH_LC2) in all years, particularly after 2013 and were above the Level 1 benchmark in 2013. The stream is considered to be non-fish-bearing and the catchment has also been disturbed by logging.

All six mine-exposed tributary and main stem monitoring areas in MU3 had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges. All 10 WCT captured in MU3 in 2015 had muscle selenium concentrations less than the Level 1 benchmark for reproductive effects.

MU3 is very large and includes the Elk River up to its headwaters. The mine-disturbed tributaries have small catchments relative to other mine-disturbed and undisturbed tributaries in MU1-MU4. Therefore the mine-disturbed tributaries represent a small proportion of the total tributary habitat in MU3 and in the watershed as a whole.

Management Unit 4 (Michel Creek and Middle Elk River) Integrated Summary

MU4 is large and encompasses Michel Creek and its tributaries as well as the middle portion of the Elk River and its tributaries. Aqueous concentrations of selenium, nitrate, and sulphate agreed with predictions from EVWQP models at the Order Station in the Elk River downstream from the Fording River (EV_ER1) in 2016. At the CMO Michel Creek Compliance Point (CM_MC2), observed values corresponded reasonably well to modelled values for sulphate; however, selenium and nitrate concentrations were greater than modelled concentrations, which also occurred during the EVWQP model calibration period and may relate to overestimation of flows at that location. Future adjustments to the RWQM are expected to address the few discrepancies noted between observed and modelled concentrations of nitrate, selenium, or sulphate at some water monitoring stations in MU4.

Tissue selenium concentrations in benthic invertebrates were consistent with predicted values, except at Bodie Creek, where observed values were outside of the predicted range in both 2015 and 2016. Increases in tissue selenium concentrations compared to predictions and past observations (2012) may be related to one or more of a number of factors, such as altered invertebrate communities due to exposure to mine-influenced water downstream of the sediment ponds, exposure to pit dewatering, or some other factor related to proximity to the point of discharge.

The reduction in % Ephemeroptera observed in Michel Creek upstream from EVO occurred after 2012 and was followed by consecutive increases in 2015 and 2016, with all values being within the reference area normal range. In spite of significant increases observed after 2015, concentrations of nitrate and sulphate in water remain near or within normal ranges for reference areas (depending on the month) and well below Level 1 benchmarks. Therefore, no further action is warranted other than on-going monitoring.

Another concern that has emerged from the monitoring data for MU4 is elevated concentrations of selenium and PAHs in sediment at Goddard Marsh (GO13) and Otto Creek ponds (OTTO),

and the toxicity response that was observed in laboratory tests of sediment samples from these areas that used standard invertebrate species. There were no significant differences in condition of LSU from GO13 relative to reference, and only a minor increase in condition of LSU from OTTO (6%) but, based on very large differences in area size, habitat characteristics, and LSU population sizes among reference and mine-exposed areas, the relative health of the populations in Goddard Marsh and Otto Ponds is uncertain.

The other monitoring observations for MU4 were consistent with expectations based on past monitoring results. All 15 mine-exposed tributary and main stem monitoring areas in MU4 had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges.

Management Unit 5 – Lower Elk River

MU5 represents the portion of the Elk River downstream from Michel Creek to its mouth at Koocanusa Reservoir. There are no tributaries affected by mining within this MU. Aqueous concentrations of selenium, nitrate, and sulphate agreed with EVWQP model predictions at the Order stations in the Elk River downstream from Michel Creek (EV_ER1) and at the Elko Reservoir (EV_ELKORES) in 2016. Three reference tributaries had water quality, calcite, and benthic invertebrate tissue selenium concentrations within normal ranges, except for elevated sulphate at McCool Creek. Water quality in the Elk River reflected the influence of mining based on NRQs > 1 for nitrate, selenium, and sulphate. Benthic invertebrates collected between Sparwood and ELDFE (Elk River immediately downstream from Fernie) had selenium concentrations within normal ranges, but selenium concentrations were greater than the normal range in invertebrates collected farther downstream near Elko (ELELKO) and near the mouth of the Elk River (ELH93). The most notable finding was temporal reduction in % EPT and % Ephemeroptera immediately upstream the Elk River mouth (ELH93), where values of these endpoints were well below reference area normal ranges. There were no significant changes detected for mine-related stressors, so the cause of the benthic invertebrate community changes is uncertain. Additional samples were collected in 2017 to further investigate conditions at this location. All monitoring areas in MU5 had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges.

Management Unit 6 – Koocanusa Reservoir

Management Unit 6 (MU6) consists of the Canadian portion of Koocanusa Reservoir, which was created when the Libby Dam (Montana) was constructed in 1972. As required under Permit 107517, a three-year study characterizing and comparing chemical and biological conditions downstream from the Elk River relative to upstream was implemented from 2014 to 2016.

Most of the water column within the reservoir was oxygenated with slightly alkaline pH. In situ water quality profiles showed only limited gradients in temperature, oxygen, pH, and conductivity with depth. Findings were consistent with a study completed by Hamilton et al. (1990) which concluded that waters in the Canadian portion of the reservoir remain relatively well-mixed, even during periods of maximum water elevation (May-November), as a result of basin morphometry, continual movement of water from river inputs and reservoir operations, and exposure to strong prevailing winds.

The evaluation of water quality focused on key substances associated with coal mining: nitrate, selenium, and sulphate. Concentrations of these substances were generally similar in water samples collected at middle and bottom depths at all sample locations downstream of the Elk River, but were higher than concentrations measured in samples collected at the surface. Differences between upstream and downstream concentrations were greater in 2016 than 2015 for both nitrate and selenium, but mean concentrations at the downstream areas in 2016 were similar to or less than those observed in 2015. Sulphate concentrations did not differ significantly between downstream and upstream. Site performance objectives for nitrate, selenium, sulphate, and dissolved cadmium were consistently met at the Order station (RG_DSELK).

Sediment samples collected in the reservoir both downstream and upstream from the Elk River were mostly silt (≥60%), with sand and clay comprising smaller fractions. Sediments collected upstream from the Elk River (T2/TN) were significantly sandier (annual means of 2-10%) with less clay (means of 17-19%) than those collected downstream (T4; means of <1% for sand and 26-30% for clay). This may be related to the shallower depths and more fluvial nature of the reservoir upstream of the Elk River (i.e., greater seasonal scour resulting in finer particles accumulating in sediments farther downstream). Total organic carbon content was similar at both areas, ranging from 0.9 to 1.7%.

Concentrations of most metals and polycyclic aromatic hydrocarbons (PAHs) in sediment were higher in sediments collected downstream from the Elk River compared to upstream, but did not increase over the three year study. Concentrations of some metals (upstream and downstream) and PAHs (downstream only) in sediments were above the lower provincial sediment quality guidelines, but none exceeded the higher guidelines. The general pattern of higher concentrations in sediment downstream from the Elk River compared to upstream may be related to a greater proportion of fine sediment particles in the downstream area, providing more surface area for adsorption than larger particles.

The reservoir is considered to be phosphorus limited. Low concentrations of phosphorus and chlorophyll-a, along with low seston and zooplankton biomass, all indicated that the reservoir is

oligotrophic. Phytoplankton communities in the reservoir were numerically dominated by diatoms, and to a lesser extent with Chrysophytes. There were no significant differences in overall phytoplankton density, biomass, or richness between downstream and upstream areas over the three years. Community structure was similar between upstream and downstream areas, except for greater Cyanophyte (biomass at the downstream area, which was considered to have low ecological significance because this group represented <1% of the community.

The zooplankton community was numerically dominated by rotifers and copepods, with relatively low numbers of cladocerans. With the exception of abundance and biomass of cladocerans (tended to be lower downstream from the Elk River compared to upstream), no consistent differences were observed between downstream and upstream areas in overall zooplankton community structure (i.e., density, biomass, richness, and absolute or relative density or biomass of copepods or rotifers), over the three year study. Selenium concentrations in zooplankton were also similar between downstream and upstream areas in all three years.

Benthic invertebrate communities upstream (T2/TN) and downstream (T4) from the Elk River were primarily composed of oligochaetes (mostly immature Tubificinae), insects (various species of chironomids), and ostracods in all three study years. Overall community density and richness did not differ significantly between upstream and downstream areas in any of the three study years. However, the densities of ostracods and oligochaetes were higher at the downstream area compared to upstream. Greater abundance of these organisms may be associated with preference for greater depths and finer sediment texture present at the downstream area, and/or avoidance of coarser, compacted sediments that may dry out during low pool in the upstream area.

Mean benthic invertebrate tissue selenium concentrations were significantly higher at the downstream area (6.9 µg/g dw) than the upstream area (5.0 µg/g dw), and were greater than the BC interim chronic dietary guideline of 4 µg/g dw, but were consistently less than the Level 1 EVWQP benchmarks (based on <10% effect) for growth and reproductive effects to benthic invertebrates (13 mg/kg dw) and for dietary effects to fish (11 mg/kg dw).

Largescale sucker, northern pikeminnow, peamouth chub, redside shiner, and yellow perch were consistently captured in highest numbers at all three fish study areas (i.e., areas within the reservoir in the vicinity of the mouths of Sand Creek, Elk River, and Gold Creek). Other species that were captured included bull trout, burbot, kokanee, longnose sucker, mountain whitefish, pumpkinseed, rainbow trout, slimy sculpin, and westslope cutthroat trout.

Following technical guidance developed by Environment Canada, fish surveys were conducted in April of each study year at each of the three study areas, to assess endpoints indicative of

fish survival (mean age), growth (body size-at-age), reproduction (relative gonad weight) and energy storage (relative liver weight and overall condition). Peamouth chub were targeted in 2014 but additional species (northern pikeminnow, redside shiner, yellow perch, and largescale sucker) were also evaluated in subsequent years. Results were statistically compared between the downstream areas (Elk River and Gold Creek) and the upstream area (Sand Creek). No consistent patterns were observed among fish species, sexes, or sampling years that were indicative of influence from the Elk River.

Tissue samples were collected for analysis of metals from all fish species collected over the three-year study. Some fish had concentrations of selenium in muscle or whole body that were greater than the BC guidelines of 4 µg/g dw for both tissue types. All muscle and whole body samples were less than the USEPA criterion of 11.3 µg/g dw in muscle and 8.5 µg/g dw in whole bodies, except for a single yellow perch with a muscle selenium concentration of 15.0 µg/g dw. Similarly, ovary selenium concentrations were frequently greater than the BC chronic guideline of 11 µg/g dw (particularly in peamouth chub, redside shiner, and northern pikeminnow). All species except redside shiner and northern pikeminnow had mean ovary selenium concentrations less than the EVWQP Level 1 benchmark for reproductive effects to fish (18 mg/kg dw), and the 2016 USEPA guideline of 15.1 µg/g dw. Northern pikeminnow had mean ovary selenium concentrations above the Level 1 benchmark at the Elk River area in only one of the three years they were sampled (2014), when ovaries were relatively undeveloped. Mean redside shiner ovary selenium concentrations were above the Level 1 benchmark at both the Elk River and the Sand Creek areas in both years sampled.

Data obtained during the 2014 to 2016 sampling program are being used to design the next phase (2018 to 2020) of chemical and biological monitoring in the Canadian portion of Koocanusa reservoir. Results of all monitoring will be considered in the weight of evidence evaluation of MU6, which is currently under development in consultation with the EMC.

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ACRONYMS AND ABBREVIATIONS

ABMP – Area-based management plan (refers to Elk Valley Water Quality Plan)

AFDM – Ash-free dry mass (in this project, refers to periphyton)

AMP – Adaptive Management Plan

ANOVA – Analysis of Variance

ANCOVA – Analysis of Covariance

APHA – American Public Health Association

AWTF – Active Water Treatment Facility

BACI – Before-After Control-Impact

CABIN – Canadian Aquatic Biomonitoring Network (Environment Canada 2012a,b).

CI – Calcite Index

CIp – Calcite Presence Score (Number of particles with calcite)/(Number of particles counted)

CIc – Calcite Concretion Score (Sum of particle concretion score)/(Number of particles counted)

CMO – Coal Mountain Operation

CSM – Conceptual Site Model

CV – Coefficients of Variation

CPUE – Catch-per-unit-effort

CRC ICP-MS – Collision Reaction Cell Inductively Coupled Plasma-Mass Spectrophotometry

CRFD – Cumulative Relative Frequency Distributions

CVAFS – Cold Vapour Atomic Fluorescence Spectrophotometry

CV – Coefficient of Variation

DO – Dissolved Oxygen

DOC – Dissolved Organic Carbon

DQA – Data Quality Assessment

DQO – Data Quality Objective

dw – Dry Weight

EA – Environmental Assessment

EF – Enrichment Function

EMC – Environmental Monitoring Committee

ENV – British Columbia Ministry of Environment and Climate Change Strategy (formerly BCMOE)

EPA – Environmental Protection Agency

EPT – Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies)

EVO – Elkview Operation

EVWQP – Elk Valley Water Quality Plan

FRO – Fording River Operation

GIS – Geographic Information System

GHO – Greenhills Operation

GPS – Global Positioning System

HR – High Resolution

HQ – Hazard Quotient, computed by dividing an measured value by a value that represents a threshold for potential effects

HSD – Honestly Significant Differences

ICP-MS – Inductively Coupled Plasma Mass Spectrometry

IQR – Interquartile Range

KNC – Ktunaxa Nation Council

KS – Kolmogorov-Smirnov statistical test

km – Kilometres

LAEMP – Local Aquatic Effects Monitoring Program

LCO – Line Creek Operation

LPL – Lowest Practical Level, referring to taxonomic identification of benthic invertebrates

LRL – Laboratory Reporting Limit

LSU – Longnose Sucker

m – Metres

MW – Mountain Whitefish

MU – Management Unit

MURR – University if Missouri's Research Reactor Center

NAA – Neutron Activation Analysis

NMDS – Nonmetric Multidimensional Scaling Ordination

N:P – Total Nitrogen to Total Phosphorus

NRQ – Normal Range Quotient. Computed by dividing a measured value by the upper limit of the normal reference area range (97.5th percentile) for a given sample type and measurement endpoint

PAH – Polycyclic Aromatic Hydrocarbon

PCA – Principal Components Analysis

PC-x – (as in PC-1) referring to one of the summary variables resulting from a Principal Components Analysis

Qx – referring to calendar quarters

QA/QC – Quality Assurance / Quality Control

r – Correlation Coefficient

RAEMP – Regional Aquatic Effects Monitoring Program

RM – Repeated Measures

SPO – Site Performance Objective

SQG - Sediment Quality Guideline

SRC – Saskatchewan Research Council

SSBM – Site-Specific Benchmarks

TDS – Total Dissolved Solids

TIE – Toxicity Identification Evaluation

TKN – Total Kjeldahl Nitrogen

TOC – Total Organic Carbon

TSS – Total Suspended Solids

TTF – Trophic Transfer Factors or Functions

USEPA – U.S. Environmental Protection Agency

UTM – Universal Transverse Mercator system

VIE – Visible Implant Elastomer

WCT – Westslope Cutthroat Trout

DEFINITIONS

algae – simple rootless, unicellular plants containing chlorophyll that grow in sunlit waters in proportion to the amount of available nutrients.

allochthonous – material that is imported into an ecosystem (in this report referring to organic material and nutrients in the aquatic ecosystem that have terrestrial origin)

ANOVA – analysis of variance

autochthonous – native to or produced within an ecosystem (e.g., algae are autochthonous sources of energy in the aquatic ecosystem)

bacteria – single-celled microorganisms that lack chlorophyll.

basin – the area drained by a river and its tributaries.

benthic – pertaining to the bottom substrates of aquatic environments.

benthic invertebrates – animals (without backbones) living in or on the bottom of a water body. Also referred to as benthic macroinvertebrates, infauna, or macrobenthos.

bioaccumulation – the accumulation of substances in an organism, which occurs when the rate of absorption exceeds the rate of loss by catabolism or excretion.

bioavailable – when a substance is in a form that can be absorbed into the body/tissues of an organism.

biota – referring to plant or animal life

calcite – a precipitate created by the reaction of dissolved calcium (Ca2+) and carbonate (CO_3^2) ions under conditions of saturated carbonate and/or increasing water pH or calcium concentrations.

community – an assemblage of populations of different species living together in space and time.

conceptual site model – a picture and/or written description used to describe sources of environmental stressors and the physical-chemical processes that control fate and exposure pathways relevant to evaluating environmental conditions and potential effects to receptors

consumer – any organism which consumes other organisms (living or dead) to satisfy its energy needs.

detritus – suspended or deposited organic matter resulting from the decomposition of plants and animal tissues or waste products.

emergent vegetation – aquatic plants (macrophytes), the greater part of which, including the leaves, protrudes from the surface of the water, although its roots are under water (e.g., cattails, bulrushes).

enrichment – in ecology, enrichment usually refers to the addition of nitrogen, phosphorus and carbon compounds or other nutrients into a lake or other waterway that greatly increases the growth potential for algae and other aquatic plants. In contaminant ecology, it can refer to the relative concentrations of a contaminant in organisms relative to their environment (e.g., water or sediment concentrations).

Ephemeroptera – mayflies

family – Biological classification between genus and order.

food chain – series of organisms, each eating or decomposing the preceding one (with the exception of food producers, which obtain their food by assimilation of inorganic nutrients). The succession of trophic levels through which energy flows.

food web – complex network of many interconnected food chains and feeding interactions.

genus – biological classification between family and species

habitat – a place where the physical and biological elements of ecosystems provide a suitable environment including the food, cover, and space resources needed for plant and animal livelihood.

in situ – in the natural or original place

lentic – traditionally refers to standing or still water bodies. In this study, the definition has been broadened to include relatively slow-flowing habitats (see also lotic).

lotic – traditionally refers to any flowing aquatic system, such as streams or rivers. In this study, the definition has been more narrowly applied to relatively fast-flowing habitats typical of much of the Elk River watershed (see also lentic).

macrophyte – large, rooted or floating aquatic plants that may bear flowers and seeds. Some plants, like duckweed and coontail, are free-floating and are not attached to the bottom.

macroinvertebrate – organisms without backbones that are visible to the eye without the aid of a microscope.

nutrient – materials that are considered essential to the support of biological life; in freshwater systems, nitrogen and phosphorus are particularly important for supporting plant life at the base of the food web

organic matter – the components of live or dead plant or animal matter possessing a carbon-hydrogen structure.

Order – biological classification between class and family

otolith – An ear stone (or calcareous concretion) in the inner ear of a bony fish. Each year, a new concretion (layer of bone) is added, which can be used to measure age.

periphyton – the aggregation of algae and other organisms that form on stones and other substrates on streambeds and the lake bottom (see also epilithon and epipelon).

Plecoptera – stoneflies

post hoc – in this study referring to statistical procedures to test for differences in sample values between or among sample means following ANOVA

receiving environment/water – the waterbody inhabited by aquatic biota (receptors) into which an anthropogenically-affected discharge (e.g., effluent) flows

receptor – an organism that could be adversely affected by environmental stressors

RM ANOVA – repeated measures analysis of variance

stressor – a chemical or biological agent, environmental condition, external stimulus or an event that causes stress to an organism.

substrate – "supporting surface" on which an organism grows. The substrate may simply provide structural support, or may provide water and nutrients. A substrate may be inorganic, such as rock or soil, or it may be organic, such as wood.

taxa – Plural of taxon, representing any group or rank in a biological classification into which related organisms are classified.

Trichoptera – caddisflies

taxonomy – the classification of organisms into groups on the basis of shared characteristics.

trophic level – the position occupied by an organism within a food web.

trophic transfer – transfer of food energy through levels of a food web; dietary uptake.

watershed – the natural geographic region drained by one or more watercourses and their tributaries.

wetland – areas of vegetation that are transitional between land and water bodies and range from being permanently wet to intermittently water covered.

1 INTRODUCTION

1.1 Background

1.1.1 Setting

The Elk River watershed is located in the southeastern corner of British Columbia (BC) in the rugged terrain of the Front and Border Ranges of the Rocky Mountains, with peaks up to 3,300 metres (m) in the north and 2,200 m in the south. From its headwaters at Elk Lakes near the continental divide, the Elk River flows in a southwesterly direction and into Koocanusa Reservoir about 20 kilometres (km) upstream from the Canada/United States (U.S.) border (Swain 2007; Kennedy et al. 2000). Koocanusa Reservoir was created by the damming of the Kootenay[1] River at Libby, Montana, U.S., in 1972 (HydroQual 1990).

The Ktunaxa First Nation has occupied lands in the region for more than 10,000 years (KNC 2005). Rivers and streams of the region provide culturally important sources of fish and plants. The Ktunaxa Territory is divided into traditional land districts historically associated with key actors in the Ktunaxa creation story, but also with specific key resources and with specific Ktunaxa individuals or lineages that held particular authority and responsibility for stewardship of resources in those areas (Robertson 2010).

Teck Coal Limited (Teck) operates five mines in the Elk River watershed to extract steel-making coal. The five mines are the Fording River Operation (FRO), Greenhills Operation (GHO), Line Creek Operation (LCO), Elkview Operation (EVO), and Coal Mountain Operation (CMO; Figure 1.1).

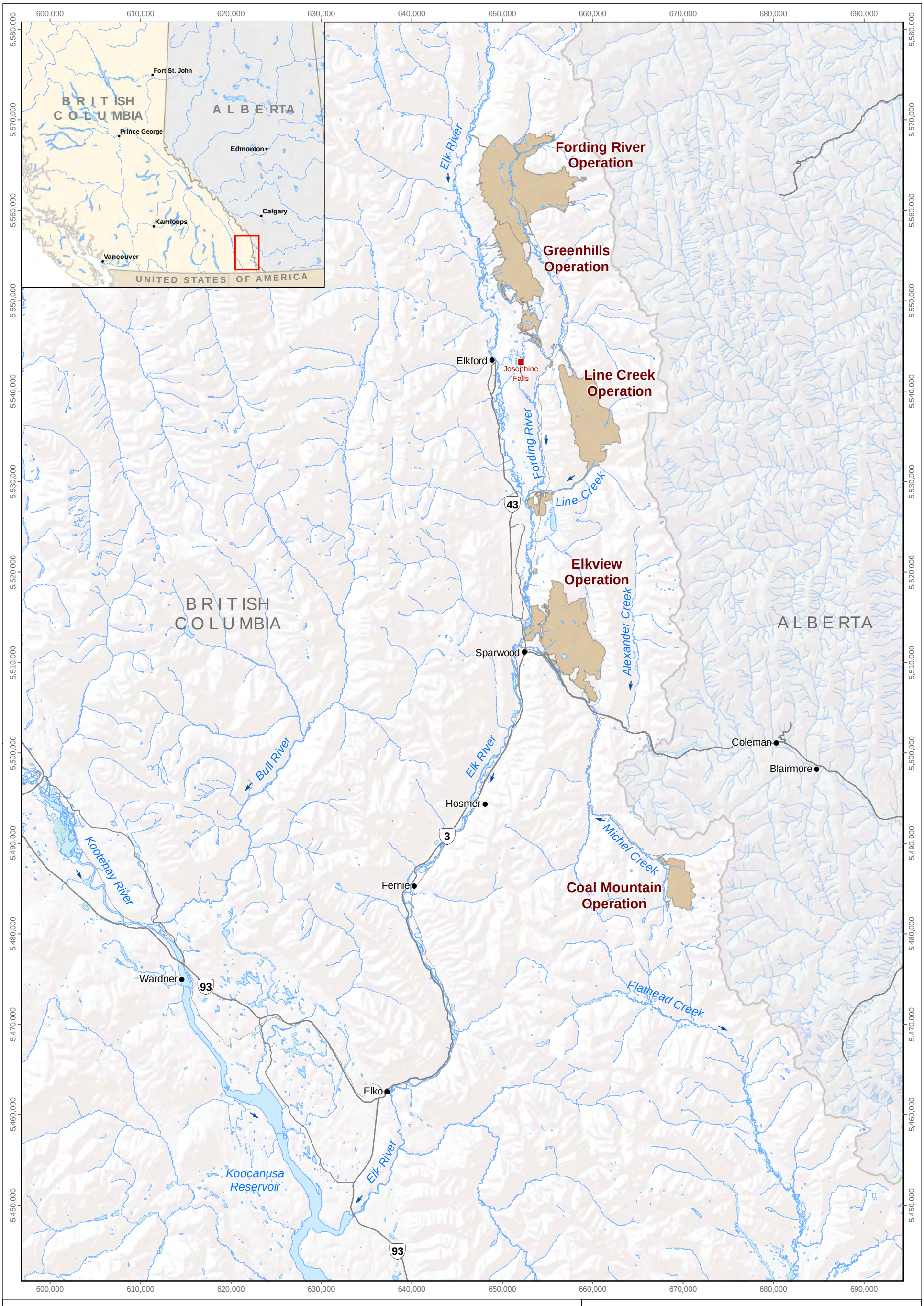
1.1.2 Elk Valley Water Quality Plan and Permit 107517

In response to concerns of increasing water quality concentrations of selenium, cadmium, nitrate and sulphate[2], as well as calcite formation within watercourses in the Elk Valley, the BC Minister of Environment and Climate Change Strategy (ENV) issued a Minister's Order in April 2013 (Number [No.] M113). The Order outlined a framework to develop an area-based management plan (ABMP), the Elk Valley Water Quality Plan (EVWQP), to allow for continued mining development in the Elk Valley while achieving the following outcomes:

- protection of aquatic ecosystem health;

[1] Spelled "Kootenai" in U.S.

[2] Collectively referred to as "Order constituents" because they are specifically named in Provincial Order M113.



LEGEND

Teck Coal Mine Operation

Teck's Coal Mine Operations within the Elk River Valley, Southeast British Columbia

0 5 10 20
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
Project 2561

minnow environmental inc.

Figure 1.1

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- management of bioaccumulation of contaminants in the receiving environment (including fish tissue);
- protection of human health; and
- protection of groundwater.

In 2013 and 2014, Teck worked with First Nations, governments, other stakeholders and scientists to develop the EVWQP (Teck 2014). The EVWQP was designed for the Elk River watershed and the Canadian portion of Koocanusa Reservoir, which represents the Designated Area referred to in Order M113. The EVWQP divided the Designated Area into six management units (MUs) based on geographic features, major tributaries and hydrodynamic characteristics (Figure 1.2), five of which are in the Elk River watershed, while the Canadian portion of Koocanusa Reservoir represents the sixth MU[3].

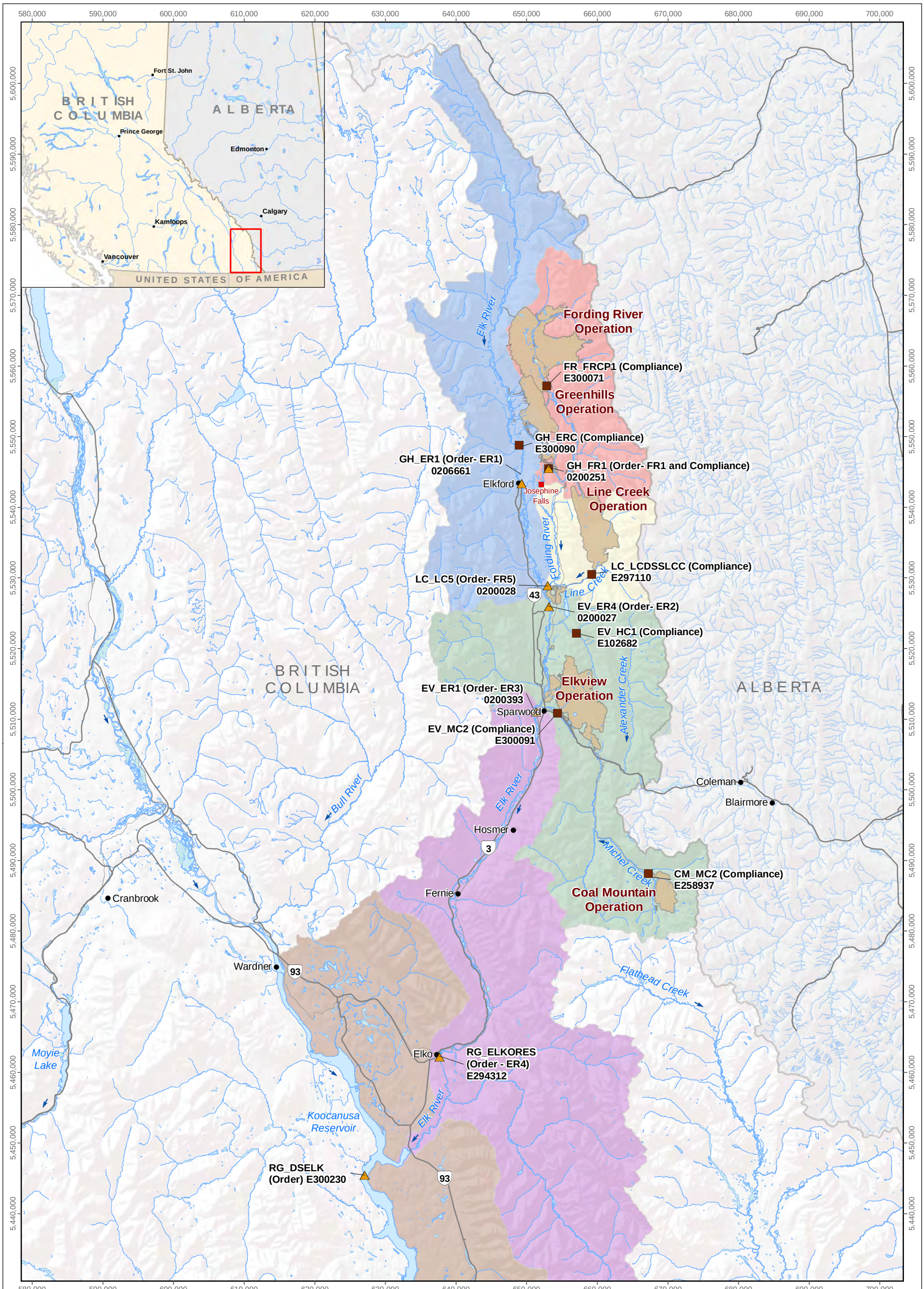
The process of developing the EVWQP incorporated water, sediment, and biological monitoring data to characterize baseline conditions, assess current conditions with respect to aquatic ecosystem and human health, and project future water quality. The water quality assessment identified that selenium and nitrate concentrations in the Elk River were routinely greater than water quality guidelines, and were increasing in many areas (Windward et al. 2014, Teck 2014). Selenium bioaccumulation was evident in fish and other biota, and localized effects on biota were observed near some mine sources. Results from Teck's research and technology development program revealed that active water treatment was the most effective option for stabilizing selenium and nitrate concentrations in the near-term (Teck 2014).

Short-, medium-, and long-term targets were derived for specific ("Order") stations in the EVWQP to protect aquatic ecosystem health at an MU scale (Teck 2014). The EVWQP also outlined the initial implementation plan for achieving targets including phased commissioning of active water treatment facilities in relevant areas of the watershed.

Teck submitted the EVWQP to ENV in July of 2014. In November of 2014, ENV approved the EVWQP and issued Permit 107517[4] under the *Environmental Management Act.* Permit 107517 regulates discharges from Teck's five Elk Valley mine operations in a manner consistent with the EVWQP, and is periodically amended in response to new learnings. The Permit specifies water quality limits and site performance objectives (SPOs) for monitoring stations downstream from the mines, and outlines requirements for commissioning and operating active water

[3] Conditions in Koocanusa Reservoir have been studied separately (Minnow 2018) and results of that monitoring program are summarized in this report.

[4] Permit 107517 was most recently amended in March 1, 2017.



LEGEND

- Order Stations
- Compliance Stations
- Teck Coal Mine Operation

Management Units

- MU-1
- MU-2
- MU-3
- MU-4
- MU-5
- MU-6

Management Units in the Elk River Watershed

0 5 10 20
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

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Figure 1.2

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treatment facilities (AWTFs), tributary evaluation and management, calcite management, toxicity testing, monitoring of water quality, flow and aquatic effects, and adaptive management and reporting.

Teck's Regional Aquatic Effects Monitoring Program (RAEMP) is also one of the requirements stipulated in Permit 107517 and is the subject of this report. The requirement for RAEMP reporting and submission is as follows:

> *(Section 10.6) "The RAEMP report for the first approved cycle under the ABMP must be submitted to the Director by September 30, 2017 and by September 30 of the final year of each subsequent three year monitoring cycle. The Permittee shall submit a report that contains a detailed rationalization of the overall RAEMP including reasons why specific monitoring areas are/are not being monitored in a given year. The report may include a discussion and analysis of the results of the previous cycle of monitoring of the following components:*
>
> 1. *Water quality*
> 2. *Sediment quality and calcite*
> 3. *Water and sediment toxicity testing*
> 4. *Periphyton productivity and community structure*
> 5. *Benthic invertebrate community structure and tissue contaminants*
> 6. *Fish population metrics and tissue contaminants*
> 7. *Amphibian and bird egg tissue contaminants*
> 8. *QA/QC*
>
> *Each report will also discuss cumulative effects by providing an integrated interpretation of conditions in the Elk River Watershed. Each report will, on a three year cycle, verify and calibrate the selenium bioaccumulation model using the most recent three years of water quality, aquatic effects and other data from any special studies undertaken."*

1.2 Regional Aquatic Effects Monitoring

1.2.1 Overview

The RAEMP provides spatially comprehensive monitoring and assessment of potential mine-related effects on the aquatic environment downstream from Teck's coal mines in the Elk Valley. Although implementation of the RAEMP is the responsibility of Teck, the program was designed with input and advice from ENV and the Ktunaxa Nation Council (KNC). The RAEMP study

design was submitted to ENV by Teck in November, 2014, updated in response to approval conditions from ENV (BCMOE 2014), re-submitted in March 2015 (Minnow 2015a), and approved by ENV in October 2015 (BCMOE 2015). The RAEMP involves completion of a sampling program and interpretive report every three years, as well as annual sampling for selected components. The first comprehensive cycle of field sampling occurred in 2015, with additional sampling in 2016 at a sub-set of areas in accordance with the approved study design. This report presents the results of the 2015-2016 monitoring cycle.

Permit 107517 also required Teck to develop local aquatic effects monitoring programs (LAEMPs) at LCO, FRO, and GHO to assess localized concerns on a more frequent and/or spatially intensive basis. A LAEMP is also in place for LCO Dry Creek under a separate permit. LAEMPs are required at specific areas until sufficient data have been collected, concerns no longer exist, or relevant monitoring can be incorporated into the RAEMP. Data from these programs have been included, as applicable, in this report.

Teck conducts a variety of additional programs to monitor, evaluate, and/or manage the aquatic effects of mining operations within the Elk Valley at local and regional scales:

- Water Quality Monitoring Program
- Flow Monitoring Plan
- Calcite Monitoring Program
- Chronic Toxicity Testing Program
- Fish and Fish Habitat Management Program
- Tributary Evaluation and Management Plan

Some of these programs are still under development. Relevant data from these programs are summarized in this report to describe and support assessment of conditions in the aquatic habitats of the Elk River watershed downstream from Teck's mines.

After the RAEMP design was approved and implemented in 2015, Teck established an Environmental Monitoring Committee (EMC), consisting of representatives from Teck, ENV, the Ministry of Energy and Mines, the KNC, Interior Health Authority, and an Independent Scientist[5]. The EMC reviews submissions and provides technical advice and input to Teck and the ENV Director, as stipulated in Section 12.2 of Permit 107517. Throughout 2016 and early 2017, draft

[5] Environment Canada has also agreed to provide its perspectives on matters related to Permit 107517 and the Committee's activities, on a case-by-case basis when requested by the Committee. To-date, the Committee has not called on Environment Canada to participate.

results from the 2015 to 2016 RAEMP cycle (and LAEMPs) were presented to, and discussed with the EMC. The input provided by the EMC was incorporated into this report.

The RAEMP report was submitted September 30, 2017, in draft, for EMC review and has been updated for submission January 31, 2018, based on input received.

1.2.2 Conceptual Site Models

A conceptual site model (CSM) provides the framework to summarize and illustrate the chemical, physical, and biological processes and interactions relevant to evaluating potential effects on environmental receptors. Chemical and physical CSMs (Figures 1.3 and 1.4) were developed and ultimately integrated (Figure 1.5) to assist with understanding and evaluating potential cumulative effects associated with coal mining, and were the basis on which the study design for the RAEMP was developed (Minnow 2015a).

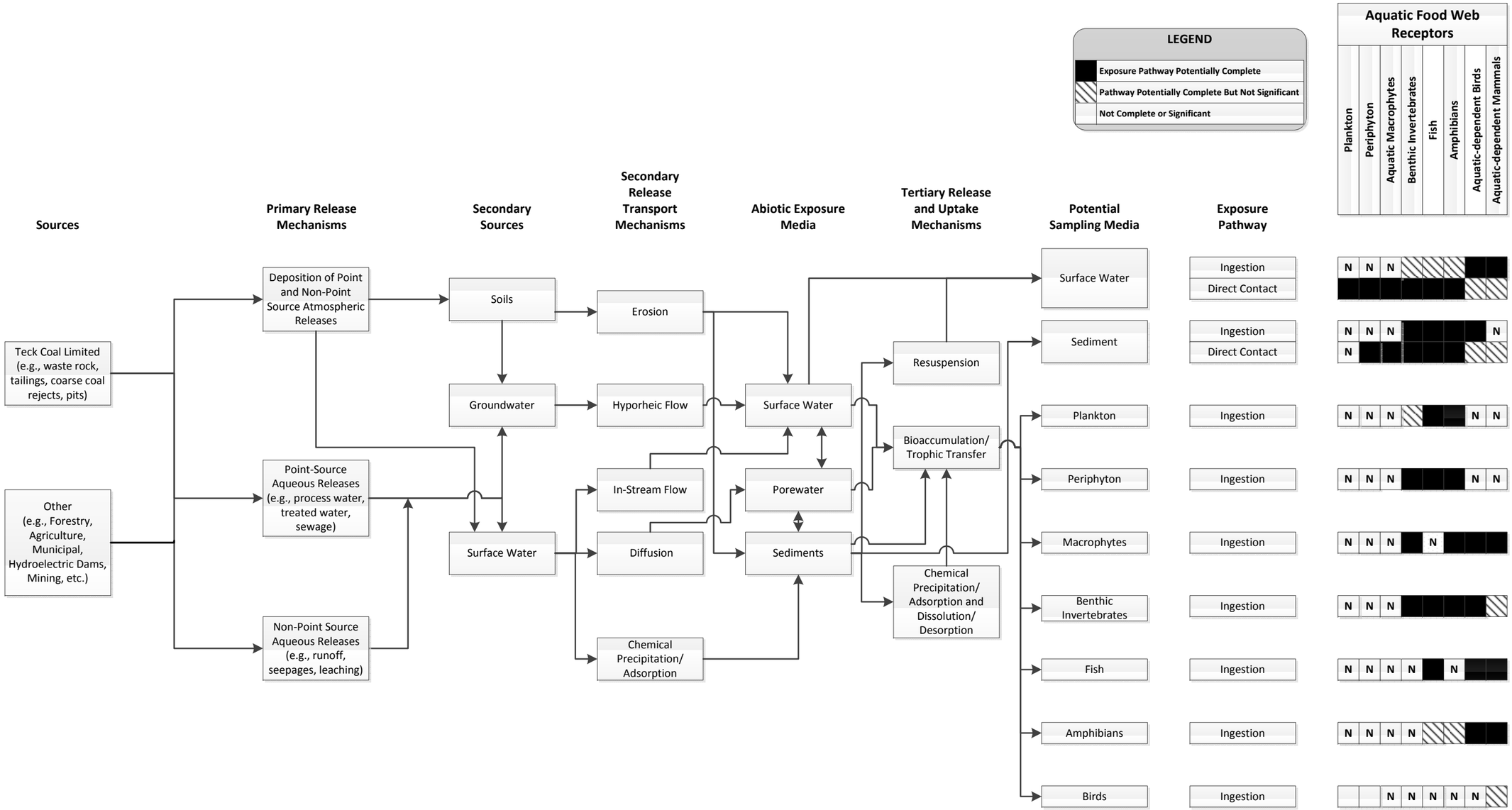
1.2.3 Objectives

The general objectives of the RAEMP are to:

- Assess effects of mine operations on the aquatic ecosystem of the Elk River watershed, and monitor changes over time, relative to expectations established in approved plans for mine development and in Permit 107517; and
- Assist in understanding whether management and mitigation actions are working as predicted by the EVWQP (Teck 2014) and as intended by the Site Performance Objectives (SPOs) and Compliance Limits reflected in Permit 107517.

Specific objectives of the RAEMP cycle were framed as questions to guide data analysis and interpretation, and were developed collaboratively among Teck, ENV, and KNC representatives (Minnow 2015a):

1. What are the mine-related chemical and physical changes to aquatic ecosystems and where do they occur?
2. Are mine-related chemical and physical changes to the aquatic environment resulting in unacceptable biological effects and where do they occur?
3. What are the specific mine-related sources of any unacceptable changes to chemical, physical, or biological conditions?
4. How are chemical, physical, and biological conditions changing over time?
5. What are the consequences of observed biological effects to the aquatic ecosystem?



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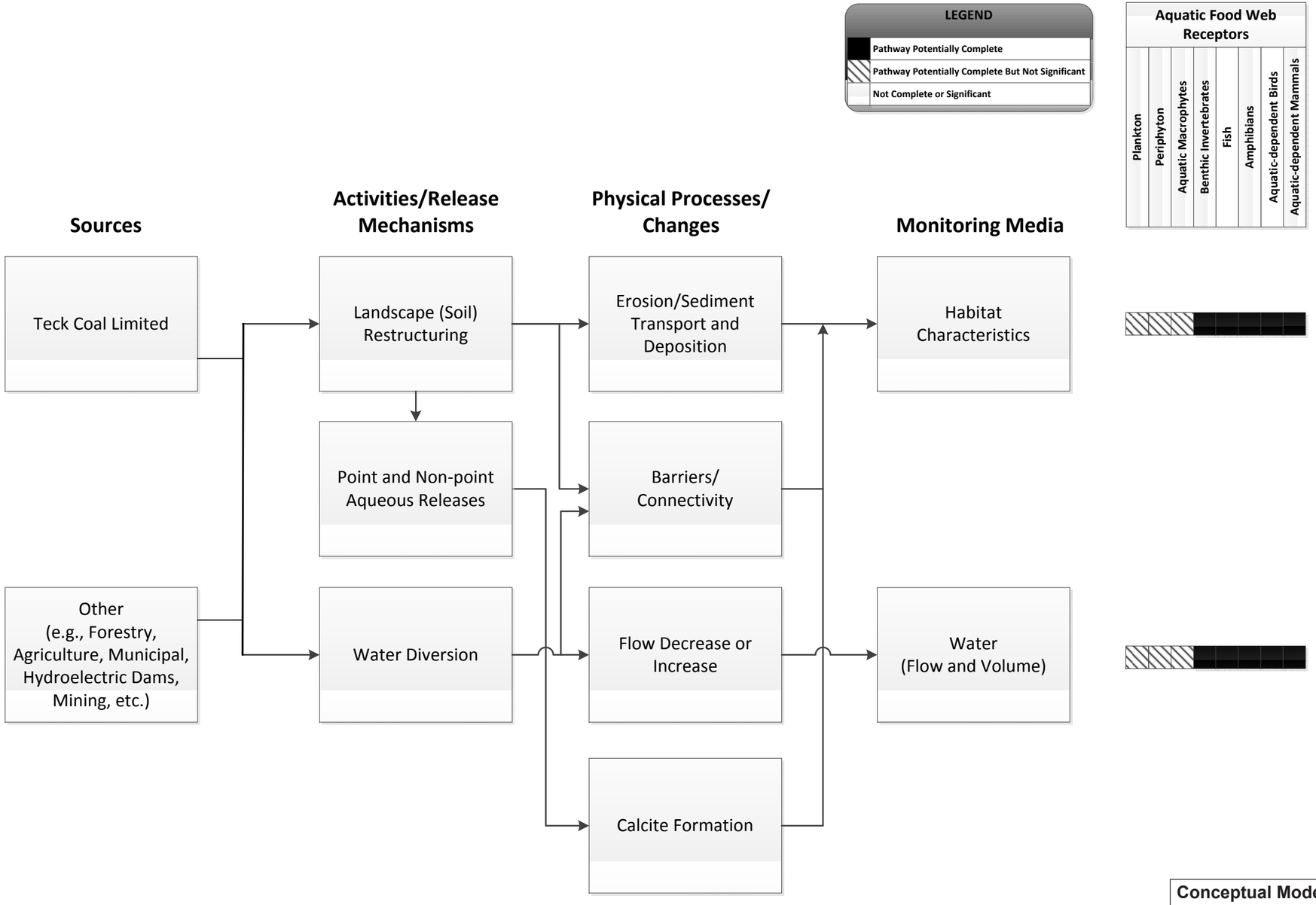

Conceptual Model for Physical Stressors in the Elk River Watershed

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Figure 1.4

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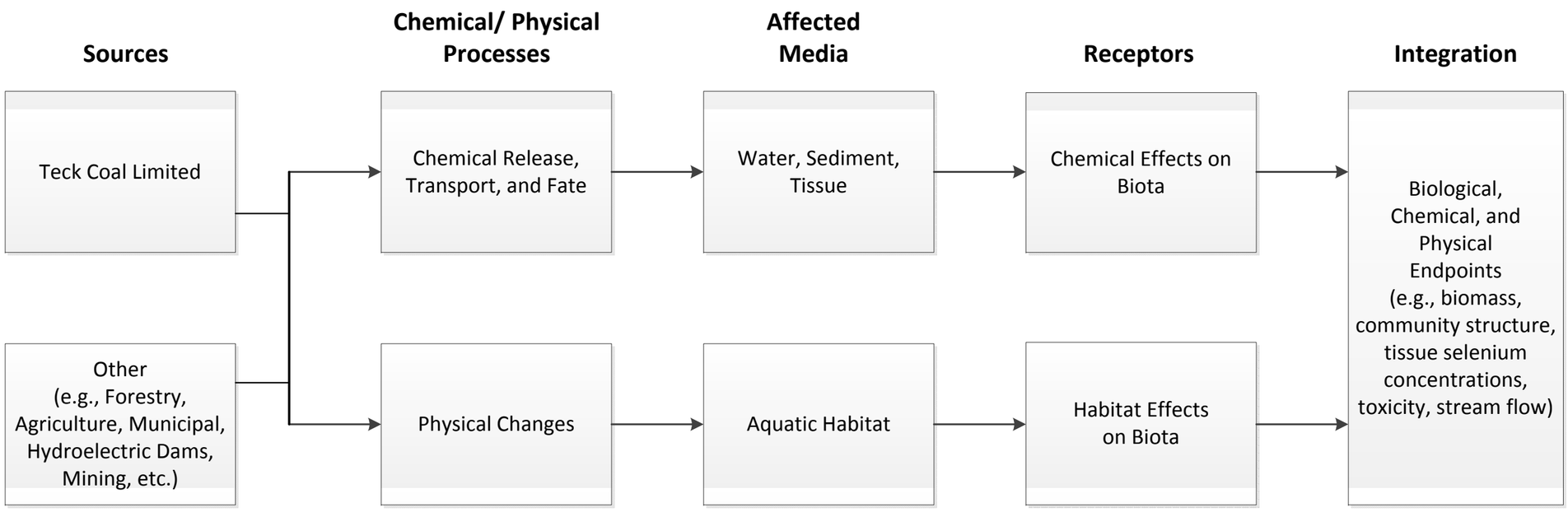

Cumulative Effects Model for Chemical and Physical Stressors in the Elk River Watershed and Koocanusa Reservoir

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Figure 1.5

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6. Are the mine-related chemical and physical changes and/or biological effects impacting water and aquatic ecosystem uses?

The monitoring results presented in this report have been evaluated relative to the questions presented above; however, the questions are being updated for the 2018-2020 cycle of the RAEMP, so that data analysis and interpretation will lead to improved understanding of the influences of mining on the aquatic ecosystem of the Elk River watershed and Koocanusa Reservoir and feed more clearly and directly into Teck's Adaptive Management Plan (AMP).

1.3 Linkages to Teck's Adaptive Management Plan

As required by Section 11 of Permit 107517, Teck has also developed an AMP to support implementation of the EVWQP, achieve water quality and calcite targets, ensure human health and the environment are protected (and where necessary, restored), and facilitate continuous improvement of water quality in the Elk Valley (Teck 2016b). The AMP is structured around a set of six overarching environmental Management Questions that collectively address the environmental management objectives of the AMP and the EVWQP. In addition, the AMP identifies Key Uncertainties underlying each Management Question, which if reduced, either help confirm that Teck's current management actions are appropriate, or lead to refinements or changes that would better achievement of the EVWQP objectives. Monitoring data and evaluations conducted within the RAEMP are designed to support answering AMP Management Question #5, (currently worded as "Does monitoring for mine-related effects indicate that the aquatic ecosystem is healthy?") and Key Uncertainty 5.1 (currently worded as "How will monitoring data be used to identify potentially important mine-related effects on aquatic ecosystem health at a management unit scale?"). The RAEMP evaluates data to address these AMP questions. Should management response be required associated with findings from this analysis, additional investigations or adjustments would likely occur within the AMP itself.

Data, and to a lesser extent, analysis conducted under the RAEMP, will also contribute to answering AMP Management Question #2 (currently worded as "Will aquatic ecosystem health be protected by meeting the long-term site performance objectives?"), by assessing the aquatic ecosystem under a range of current conditions and identifying areas where biological effects may be occurring due to one or more mine-related constituents. The RAEMP will also contribute information to help reduce Key Uncertainty 2.1 (currently worded as "How will the science-based benchmarks be validated and updated?") and Key Uncertainty 2.2 (currently worded as "How will the integrated assessment methodology used to derive area-based SPOs be validated and updated?"). Assessments associated with these AMP components will primarily be conducted separately from the RAEMP.

Specific information collected under the RAEMP will also be used to help reduce Key Uncertainty 4.1 (currently worded as “Are the calcite SPOs ecologically relevant and protective of fish and aquatic life?”) and provide data required for Management Question 6 (currently worded as “Is water quality being managed to be protective of human health?”). Assessments associated with these AMP components will be conducted outside the RAEMP.

The above context related to Teck’s AMP also guides the evaluation of monitoring data presented in this report.

The AMP was submitted to ENV on February 29, 2016, as required by the Permit. Following this, the EMC reviewed the AMP and provided substantial technical advice. Teck considered this advice and submitted a revised AMP to the EMC on July 31, 2016. The EMC reviewed the revised submission and provided additional technical advice, concluding in September 2016. Teck then re-submitted the revised AMP to ENV. In October 2016, after review of the resubmitted AMP, KNC wrote a letter that outlined key concerns with the submission. KNC, Teck, and ENV continue to work towards addressing the concerns about the AMP identified by the KNC.

1.4 Aquatic Ecosystem Health

As noted above in Section 1.1.2, one of the environmental management goals of the EVWQP is to protect aquatic ecosystem health, from which arose Management Question #5 in the AMP: “Does monitoring for mine-related effects indicate that the aquatic ecosystem is healthy?” Permit 107517 also refers to ecosystem health (Sections 5 and 11). However, the term “health” is not defined in the EVWQP or in Permit 107517. Teck received input from the EMC on the definition of the term “aquatic ecosystem health” to facilitate development of a framework for analyzing and interpreting monitoring data to decide if the aquatic ecosystem is healthy or if further management action is needed.

Following discussions with the EMC, Teck proposed the following definition for aquatic ecosystem health, which is similar to that used by Environment Canada (Kilgour et al. 2005, 2007),

> “A healthy aquatic ecosystem is one in which the chemical and physical conditions support a biological community that is diverse and functioning, with normal assemblages and abundances of organisms.”

There was support but not complete consensus for this definition within the EMC. In part, this is because the term “health” originated as a property of organisms and is an unsuitable metaphor for ecosystems (Suter 1993). Most importantly, ecosystem health is not an objective scientific concept and instead is defined by specific societal values and goals (Costanza 1992,

Suter 1993, Lancaster 2000, Lu et al. 2015), which are not necessarily shared equally among stakeholders. Although it is relatively straightforward to measure aquatic ecosystem properties, integrated interpretation of data to judge overall "health" or "quality" of the ecosystem necessitates human value judgements (Costanza 1992, Rapport et al. 1998, Pollard and Huxam 1998).

The tentative definition of ecosystem health presented above is consistent with the approach and values underlying the EVWQP and the need for interpreting monitoring data at spatial scales relevant to the home ranges of relevant indigenous biota (e.g., fish). However, Teck will continue to work with the EMC to determine if a more suitable, consensus term or description can be developed for future reports to articulate aquatic ecosystem conditions in a manner that is consistent with the objectives of the EVWQP.

2 METHODS

2.1 Overview

The RAEMP was implemented according to the design described by Minnow (2015a), which was approved by ENV in October, 2015 (BCMOE 2015). As outlined by the design, sampling was comprehensive in 2015, and repeated for a subset of areas, sample types, and endpoints in 2016. Deviations from the approved design were few, and are discussed in the following sections where applicable.

Sampling areas are shown on maps in each section where data are presented.

2.2 Water

2.2.1 Routine Water Monitoring by Teck

Data from Teck's water quality monitoring program are stored in Teck's EQuIS™ database. Data for the 2012-2016 monitoring period were downloaded and provided to Minnow in an Excel workbook for data analyses.

2.2.2 Water Sampling Associated with the RAEMP

Water samples were collected at areas sampled for periphyton productivity and tissue selenium analysis, benthic invertebrate community assessment and tissue selenium analysis, and longnose sucker population monitoring areas in 2015.

In lotic areas, water samples were collected by wading into mid-channel (or as far into the channel as was practical and safe to do so), moving from downstream to upstream, to avoid collecting water downstream of disturbed substrates. In lentic areas, water samples were collected by wading from downstream to upstream in an area where some flow was present, from shore or from a boat. All samples were collected at arm's length below the water surface or, in shallower waters, at mid-depth. Sample bottles were not pre-rinsed.

Samples requiring preservatives were preserved on shore. Bottles were filled to minimize the amount of air in the container. Once re-capped, bottles were inverted two or three times to mix the preservative with the water sample. Water samples being analyzed for dissolved organic carbon (DOC) and dissolved metals were filtered in the field using a clean syringe affixed with a 0.45 µm membrane. Following filtering, the samples were preserved immediately as specified by the analytical laboratory. Water samples were stored in a cooler with ice or freezer packs during the day and then transferred to a refrigerator at the end of the day. Water samples were re-packed in coolers with ice and/or freezer packs for shipment to the analytical laboratory each

day or every other day. Samples were shipped to ALS Environmental in Calgary, Alberta, for analysis.

At the laboratory, samples were analyzed for the following analytes using the methods indicated in parentheses:

- total organic carbon (TOC) and DOC (combustion method; American Public Health Association [APHA] 5310 for TOC);
- total suspended solids (TSS) and total dissolved solids (TDS) (gravimetric method; APHA 2540 D and C for TSS and TDS, respectively);
- alkalinity (potentiometric titration; APHA 2320);
- turbidity (nephelometric method; APHA 2130 Turbidity);
- hardness, as $CaCO_3$ (by calculation; APHA 2340 B);
- total and dissolved metals[6], (collision cell inductively coupled plasma - mass spectrometry and inductively coupled plasma - optical emission spectrophotometry; APHA 3030 B&E / Environmental Protection Agency (EPA) SW-846 6020A, and EPA 3005A/6010B, respectively);
- bromide, chloride, fluoride, and sulphate (ion chromatography; APHA 4110 B);
- ammonia, as N (fluorescence; J. Env. Monit., 2005, 7:37-42);
- nitrate and nitrite, as N (ion chromatography; EPA 300.0);
- total Kjeldahl nitrogen (TKN) (fluorescence; APHA 4500-NORG D.); and
- orthophosphate and total phosphorus (colourimetric method; APHA 4500-P Phosphorus).

Temperature, dissolved oxygen (DO), pH, and specific conductance/conductivity were measured in each sampling area using a YSI ProPlus meter (or equivalent) that was calibrated daily (or multiple times per day for DO, if moving among high- and low-elevation areas). Water velocity was measured at all lotic benthic invertebrate sampling areas using a Marsh-McBirney Flowmate. Sampling area locations were marked using a hand-held global positioning system (GPS) unit. All field measurements were recorded on standardized field data collection forms copied on waterproof paper.

[6] Here and elsewhere in this document, “metals” includes metalloids, such as selenium.

2.2.3 Data Analysis

To support evaluation of potential mine-related effects on productivity, ratios of aqueous total nitrogen to total phosphorus (N:P mass/volume) for reference and mine-exposed stations were plotted using a boxplot for samples collected in September 2015. The boxplots were defined using the minimum, first quartile (Q1), median, third quartile (Q3), and maximum values. When extreme values were present [values above Q3 + 1.5(IQR) or below Q1 – 1.5(IQR); IQR = Q3 – Q1] then the extreme values were plotted as individual points and the whiskers of the plot were truncated to the next value in the data set (Figure 2.1). N:P ratios of < 7 were used to indicate nitrogen limitation and N:P ratios > 15 were used to indicate phosphorus limitation (McDowell et al. 2009).

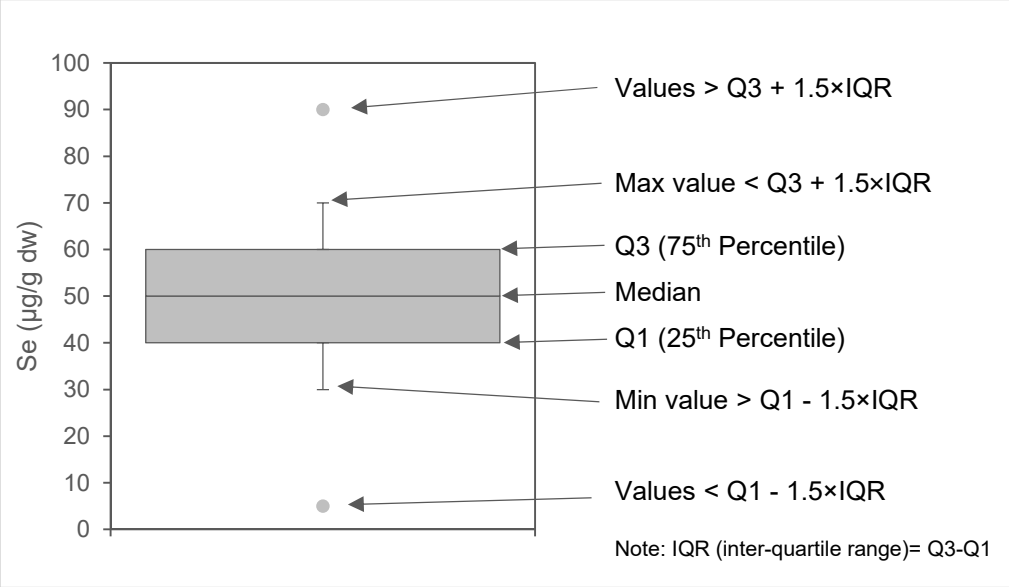


Figure 2.1: Description of Boxplot

Reference station normal ranges were defined for all analytes separately by month to account for seasonal variability in concentrations of constituents in water. The normal ranges were defined as the 2.5th and 97.5th percentiles of monthly mean concentrations for each reference station for each year between 2012 and 2016. The percentiles were estimated using the *quantile* function in R (R Core Team, 2017) using the default Type 7 method. The percentiles were estimated based on a survival curve for censored data generated using the *survfit* function in R (*survival* package; Therneau 2017) to accommodate values below the laboratory reporting limit (LRL) (i.e., the Kaplan-Meier method). Outliers in the reference station datasets were defined as values that exceeded Q3 + 1.5(IQR) on the untransformed and $\log_{10}$-transformed scales and were removed from estimation of the normal ranges. In additional to the 2.5th and

97.5th percentiles, the following summary statistics were calculated for each reference station data set by month: sample size, minimum value, 25th percentile, median, 75th percentile, maximum value, mean, and standard deviation.

Spearman rank correlations were conducted to evaluate monotonic trends between all parameters and potential covariates known to influence water quality: flow rates, total suspended solids, and turbidity. Correlations were performed using the Hmisc package (version 4.1-1; Harrell 2017) in R. Instantaneous flow rates were converted to daily flow rates and used for the correlations. Flow rates reported as zero were not included in the correlation analyses. Data reported as below the LRL were substituted with the LRL for the correlation analysis. For total phosphorus, samples at the poor LRL (i.e., reported as <0.3 mg/L) were excluded. Correlations were performed separately for the reference (2012-2016) and mine-exposed (2015) stations. Spearman rank correlations were also conducted between total suspended solids, turbidity, and flow rates for individual reference stations for data collected in all years. Correlations with a correlation coefficient (r) with magnitude greater than 0.6 were considered strong (Milton and Arnold 2002), and significance was tested at $\alpha = 0.05$.

For parameters with strong monotonic correlations with turbidity or total suspended solids (total aluminum, iron, manganese, and phosphorus), covariate adjusted normal ranges were defined to account for the influence of suspended particles on water quality. The relationships were approximately linear, so linear regression models were developed for these parameters with data for all reference stations (2012 to 2016) using turbidity and total suspended solids as predictor variables. Outliers were defined as observations with residuals beyond Q3 + 1.5 (IQR) or Q1 - 1.5 (IQR) and were removed from the regression. The predictor variable with the highest r^2 was chosen as the covariate for the adjusted normal ranges. The 97.5th percentile of the residuals of the regression model was added to the regression model equation to produce an equation for the upper limit of the normal range. For individual samples, concurrent predictor variable concentrations (i.e., total suspended solids or turbidity) and the adjusted model equation were used to define a sample-specific covariate-adjusted normal range. Since mine-exposure could cause elevated covariate concentrations, data for individual samples were screened against the covariate-adjusted normal range using either the individual sample covariate concentration or the upper limit of the monthly normal range for the covariate, whichever was smaller.

In order to evaluate the potential proximity to mine-exposure, individual sample data at all mine-exposed stations (2015) were screened against upper monthly normal ranges (e.g., parameters for a sample collected in January would be screened against the upper normal range determined for January). In addition, data collected at reference stations in 2015 were screened

against monthly normal ranges in order to assess how frequently reference stations sampled in 2015 naturally exceeded the normal range determined for 2012 to 2016. Only stations with data collected in at least 8 months in 2015 were included in the analysis in ensure sufficient annual coverage. One exception with 7 months was included, LC_LC1, in order to include more reference stations in the analysis.

Normal range quotients (NRQs) for individual samples for all reference and all mine-exposed stations sampled in 2015 were calculated as the ratio of the sample concentration to the upper limit of the normal range for a given month. For analytes with covariate-adjusted normal ranges, the NRQ was determined using either the individual sample covariate-adjusted normal range or monthly normal range, whichever was smaller. Exceedances of normal ranges by individual samples was determined as a percent. An exception was dissolved oxygen, for which impacts to aquatic life occur at low, not high concentrations, and NRQs were calculated by dividing the monthly lower normal range by the concentration of individual samples.

Individual samples were screened against British Columbia guidelines for the protection of aquatic life (Table 2.1; BCMOE 2017a,b). For analytes with site-specific benchmarks (SSBMs) – nitrate, sulphate, dissolved cadmium, total selenium, and total dissolved solids – individual samples were screened against SSBMs (Teck 2014). Conservative guideline screening was undertaken, whereby chronic guidelines were used when available, and otherwise acute guidelines were used. For analyte-dependent guidelines (e.g., hardness- and pH-dependent guidelines), guidelines were calculated using analytes measured concurrently with individual samples, and these were used to screen individual samples. The frequency of guideline or SSBM exceedances was determined for each analyte and station with sufficient data, and those analytes with exceedances were reported. In order to characterize the frequency of mine-exposure related exceedances of guidelines, the frequency of individual samples in excess of both the upper limit of the normal range and guideline or SSBM were reported. In addition, monthly means used to define the normal range were screened against water quality guidelines and SSBMs in order to determine how often these values were naturally in exceedance of guidelines. For analyte-dependent guidelines, individual monthly means were screened against guidelines calculated using concurrent analyte values. The frequency of guideline exceedance was determined for each month (e.g., January for all years) for all reference stations.

Hazard quotients (HQ) were calculated for individual samples using individual sample guidelines (when applicable) by dividing the concentration by the guideline. Dissolved oxygen was an exception, since the guideline is a minimum, and the HQ was calculated by dividing the guideline by the concentration. For each station and analyte with guideline exceedances, the maximum HQ for all individual samples was reported, as well as for the subset of samples in

Table 2.1: British Columbia Water Quality Guidelines for Parameters Potentially Relevant to Teck Coal

Variable		Units	British Columbia Water Quality Guidelines [1]		Year	Status	Site Specific Benchmark [2]
			Long-term Average	Short-term Maximum			
Non-Metals	Total Alkalinity	mg/L	For dissolved calcium = < 4mg/L, WQG = <10 For dissolved calcium = 4 to 8 mg/L, WQG = 10 to 20 For dissolved calcuim = > 8 mg/L, WQG = > 20	-	2015	Working	-
	Unionized Ammonia [3]	mg/L	0.102 to 2.09	0.752 to 28.7	2009	Approved	-
	Chloride	mg/L	150	600	2003	Approved	-
	Fluoride (dissolved)	mg/L	-	For hardness ≤ 10 mg/L, WQG = 0.4 For hardness > 10 mg/L, WQG = [-51.73 + 92.57 × $\log_{10}$(hardness)]×0.01	1990	Approved	-
	Nitrate-N	mg/L	3	33	2009	Approved	MU1 & MU2: $10^{1.0003[\log(\text{hardness})]-1.52}$ Maximum applicable hardness = 500 mg/L MU3 to MU6: 3
	Nitrite-N [4]	mg/L	0.02 to 0.20	0.06 to 0.60	2009	Approved	-
	Dissolved oxygen [5]	mg/L	For buried embryo/alevin life stages, WQG (water column) = 11 WQG (interstitial) = 8 For other life stages, WQG (water column) = 8	For buried embryo/alevin life stages, WQG (water column) = 9 WQG (interstitial) = 6 For other life stages, WQG (water column) = 5	1997	Approved	-
	pH [6]	pH units	6.5 - 9.0		1991	Approved	-
	Sulphate [7]	mg/L	128 to 429 Maximum applicable hardness = 250 mg/L	-	2013	Approved	MU1 to MU5, WQG = 429 MU6, WQG = 308
	Total Dissolved Solids	mg/L	1,000 to 3,000	-	1987	Working	1,000
Metals and Metalloids	Antimony (III)	mg/L	0.009	-	2015	Working	-
	Arsenic	mg/L	-	0.005	2002	Approved	-
	Barium	mg/L	1	-	2015	Working	-
	Beryllium	mg/L	0.00013	-	2015	Working	-
	Boron	mg/L	1.2	-	2003	Approved	-
	Chromium [8]	mg/L	For Cr(VI), WQG = 0.001 For Cr(III), WQG = 0.0089	-	2015	Working	-
	Cobalt	mg/L	0.004	0.11	2004	Approved	-
	Copper [7]	mg/L	For hardness ≤ 50 mg/L, WQG = 0.002 For hardness 50 to 250 mg/L, WQG = 0.04 × mean hardness × 0.001 For hardness > 250 mg/L, WQG = 0.01	For hardness 13 to 400 mg/L, WQG = (0.094 × hardness + 2) × 0.001 no criteria specified for other hardnesses. Maximum Applicable Hardness = 400 mg/L	1987	Approved	-
	Iron	mg/L	-	1	2008	Approved	-
Total	Lead [7]	mg/L	For hardness ≤ 8 mg/L, none proposed For hardness 8 to 360 mg/L, WQG = 0.001×{3.31+ exp[1.273 × ln(hardness) - 4.704]} No more than 20% of samples in a 30-d period should be >1.5X the guideline. Maximum applicable hardness = 360 mg/L	For hardness ≤ 8 mg/L, WQG ≤ 0.003 For hardness 8 to 360 mg/L, WQG = 0.001×{exp[1.273 × ln(hardness) - 1.460]} Maximum applicable hardness = 360 mg/L	1987	Approved	-
	Manganese [7]	mg/L	For hardness 37 to 450 mg/L, WQG ≤ 0.004 × hardness + 0.605 Maximum applicable hardness = 450 mg/L	For hardness 25 to 259 mg/L, WQG ≤ 0.01102 × hardness + 0.54 Maximum applicable hardness = 259 mg/L	2001	Approved	-
	Mercury [9]	mg/L	MeHg ≤ 0.5% of THg, WQG = 0.00002 Else, WQG = [0.0001/(MeHg/THg)] OR When MeHg = 0.5% of THg, WQG= 0.00002 When MeHg = 1.0% of THg, WQG = 0.00001 When MeHg = 8.0% of THg, WQG= 0.00000125	-	2001	Approved	-
	Molybdenum	mg/L	1	2	1986	Approved	-
	Nickel [7]	mg/L	For hardness <60, WQG = 0.025 For hardness 60 to 180, WQG = exp{0.76[ln(hardness)]+1.06}×0.001 For hardness ≥180, WQG = 0.15	-	1987	Working	-
	Selenium	mg/L	0.002	-	2014	Approved	MU1, WQG = 0.07 MU2 to MU6, WQG = 0.019
	Silver [6]	mg/L	For hardness ≤ 100 mg/L, WQG = 0.00005 For hardness > 100 mg/L, WQG = 0.0015	For hardness ≤ 100 mg/L, WQG = 0.0001 For hardness > 100 mg/L, WQG = 0.003	1996	Approved	-
	Thallium	mg/L	0.0008	-	1997	Working	-
	Uranium	mg/L	0.0085	-	2011	Working	-
	Zinc [7]	mg/L	For hardness ≤ 90 mg/L, WQG = 0.0075 For hardness 90 to 330 mg/L, WQG = [7.5 + 0.75 (hardness - 90)]×0.001; Maximum applicable hardness = 330 mg/L	For hardness ≤ 90 mg/L, WQG = 0.033 For hardness 90 to 500 mg/L, WQG = [33 + 0.75 (hardness - 90)]×0.001; Maximum applicable hardness = 500 mg/L	1999	Approved	-
Dissolved	Aluminum	mg/L	When pH ≥ 6.5, WQG = 0.05 When pH < 6.5, WQG = exp[1.6 - 3.327(median pH)+ 0.402(median pH)^2]	When pH ≥ 6.5, WQG = 0.1 When pH < 6.5, WQG = exp[1.209 - 2.426(pH)+ 0.286 (pH)^2]	2001	Approved	-
	Cadmium [7]	mg/L	For hardness = 3.4 to 285 mg/L, WQG = {exp[0.736×ln(hardness) - 4.943]}×0.001 Maximum applicable hardness = 285 mg/L	For hardness = 7 to 455 mg/L, WQG = {exp[1.03×ln(hardness)-5.274]}×0.001 Maximum applicable hardness = 455 mg/L	2015	Approved	MU1 to MU6, WQG = $0.001\times10^{0.83(\log(\text{hardness}))-2.53}$ Maximum applicable hardness = 285 mg/L
	Iron	mg/L	-	WQG = 0.35 mg/L	2008	Approved	-

[1] British Columbia Working (BCMOE 2017a) or Accepted (BCMOE 2017b) Water Quality Guidelines for the Protection of Aquatic Life. For guidelines dependent on other analytes (e.g., hardness), guidelines were screened using concurrent values.

[2] When appropriate, site specific benchmarks were applied instead of BC water quality guidelines (Teck 2014)

[3] Temperature and pH dependent; range of minimum and maximum values.

[4] Dependent on concurrent chloride, range of values reported (BCMOE 2017a)

[5] Dissolved oxygen guidelines represent a minimum value, and so exceedances were quantified below this guideline.

[6] Unrestricted change permitted within this pH range.

[7] For hardness-based guidelines, concurrent hardness values were used for calculating guidelines. If hardness values exceeding the maximum applicable hardness, then guidelines were determined using the maximum applicable hardness.

[8] Chromium(VI) is the dominant oxidation state in oxygenated environments, and so its guideline was applied.

[9] The most conservative guideline (0.00000125 mg/L) was applied.

exceedance of the normal range. In addition, for individual samples in exceedance of both the normal range and guideline, the minimum of the NRQ and HQ ratios was determined for each individual sample, and the maximum of these ratios was reported for each station.

Normal range quotients (NRQs) were calculated for the order constituents for all reference and all mine-exposed stations sampled in 2015 for each month, as the ratio of the monthly mean concentration to the upper limit of the normal range for the given month. Monthly mean hazard quotients (HQs) were calculated for all reference and all mine-exposed stations sampled in 2015 for each month, as the mean of the ratios of concentration to the site-specific benchmarks (Table 2.2) for each month.

Table 2.2: Level 1 (10%) Water Effect Benchmarks Identified in the Elk Valley Water Quality Plan

Constituent	Management Unit	Concentration	Units
Total Selenium	1	70	µg/L
	2 to 6	19	µg/L
Dissolved Cadmium	1 to 6	$10^{0.83(\log(\text{hardness}))-2.53}$ [a]	µg/L
Nitrate-N	1, 2	$10^{1.0003[\log(\text{hardness})]-1.52}$ [b]	mg/L
	3 to 6	3	mg/L
Sulphate	1 to 5	429	mg/L
	6	308	mg/L

[a] Maximum guideline at hardness = 285 mg/L
[b] Maximum guideline at hardness = 500 mg/L

A principal component analysis (PCA) was conducted on all water quality samples collected as part of Teck's routine water monitoring. The PCA is a multivariate analysis which transforms a group of n variables into a smaller new set of uncorrelated variables (the principal components; PCs). The principal components are defined to be linear combinations of the original n variables. The method was used to identify PCs that explained the most variability in water quality among areas. The PCA was conducted on $\log_{10}$-transformed data using the correlation matrix. Analytes with 50% or more values below the detection limit were excluded from the analysis.

A PCA was also conducted using the water quality data collected from lotic habitats from sampling associated with the RAEMP (i.e., concurrent with benthic invertebrate samples in September, 2015). A PCA was conducted five different ways based on input from the EMC:

- using concentrations of all water quality variables (log_{10}-transformed) and the correlation matrix;
- using hazard quotients of all water quality variables (log_{10}-transformed) and the covariance matrix;
- using hazard quotients of all water quality variables and calcite index (CI) (log_{10}-transformed) and the covariance matrix;
- using concentrations of key water quality variables and calcite index (log_{10}-transformed) and the covariance matrix; and
- using hazard quotients of key water quality variables and calcite index (log_{10}-transformed) and the covariance matrix.

A PCA was also conducted using the water quality data collected from lentic habitats from sampling associated with the RAEMP in May, August, and September, 2015.

The primary objectives of the PCAs were to identify the PC that explains the difference between mine-exposed and reference stations and identify the water quality constituents associated with that PC. Correlations among the first two PCs and each water quality variable were evaluated using Pearson correlation coefficients.

Temporal changes in key constituent concentrations (i.e., nitrate, total selenium, and sulphate) were evaluated in mine-exposed stations relative to the mean change in reference stations from 2012 to 2016. The analysis was conducted as an analysis of variance (ANOVA) on the difference in monthly mean concentrations (log_{10}-transformed) between the mine-exposed station and the monthly mean reference station with Year as a factor, with up to 12 differences calculated per year for a complete data set. The monthly means for the reference stations were based on six stations (CM_MC1, FR_UFR1, RG_CH1, GH_ER2, LC_GRCK, and LC_SLC) that were consistently sampled from 2012 - 2016. If the overall ANOVA was significant ($\alpha = 0.05$) then *post hoc* contrasts were conducted to test for linear and step changes according to the following hypotheses (for a mine-exposed station sampled in all five years):

- A linear change from 2012 to 2016;
- A step change after 2012 (i.e., a comparison of the mean in 2012 to the mean of 2013-2016);
- A step change after 2013 (i.e., a comparison of the mean of 2012-2013 to the mean of 2014-2016);

- A step change after 2014 (i.e., a comparison of the mean of 2012-2014 to the mean of 2015-2016); and
- A step change after 2015 (i.e., a comparison of the mean of 2012-2015 to the mean in 2016).

The contrasts were conducted in Microsoft Excel, following the methods described in Oehlert (2010). When more than one contrast hypothesis was identified as statistically significant ($\alpha = 0.05$), then the contrast with the best fit was used for interpretation. The contrast with the best fit was defined to be the contrast with the largest difference in the numerator of the test statistic (equivalent to selecting the contrast with the smallest p-value). The magnitude of difference for linear contrasts was calculated as:

$$\frac{10^{\bar{x}_{OBS2016exp}} - 10^{\bar{x}_{PRED2016exp}}}{10^{\bar{x}_{PRED2016exp}}} \times 100\%$$

where $\bar{x}_{OBS2016exp}$ is the observed mean for the mine-exposed station in 2016 and $\bar{x}_{PRED2016exp}$ is the predicted mean for the mine exposed station in 2016, assuming that the relative difference between reference and mine-exposed stations in 2016 is the same as the difference observed in 2012 (i.e., $\bar{x}_{PRED2016exp} = \bar{x}_{OBS2016ref} + \bar{x}_{OBS2012exp} - \bar{x}_{OBS2012ref}$). The means $\bar{x}_{OBS2016exp}$ and $\bar{x}_{PRED2016exp}$ were anti-logged prior to calculating the percent difference in order to put the concentrations in the original data units. The magnitude of difference for step change contrasts was calculated similarly as:

$$\frac{10^{\bar{x}_{OBS(Post\ Step)exp}} - 10^{\bar{x}_{PRED(Post\ Step)exp}}}{10^{\bar{x}_{PRED(Post\ Step)exp}}} \times 100\%$$

where $\bar{x}_{OBS(Post\ Step)exp}$is the observed mean for the mine-exposed station after the step change and $\bar{x}_{PRED(Post\ Step)exp}$ is the predicted mean for the mine-exposed station in 2016, assuming that the relative difference between reference and mine-exposed stations after the step change is the same as the difference observed prior to the step change (i.e., $\bar{x}_{PRED(Post\ Step)exp} = \bar{x}_{OBS(Post\ Step)ref} + \bar{x}_{OBS(Pre\ Step)exp} - \bar{x}_{OBS(Pre\ Step)ref}$).

The contrasts and magnitude of difference calculations were modified as appropriate when a mine-exposed station was not sampled in all five years to accommodate the available data.

Temporal trends for main stem stations by management unit were evaluated using the same methods described above, but the differences were calculated as the difference in the mean concentration for main stem mine-exposed stations and the mean reference stations. The temporal analyses at the station scale and the management unit scale were also conducted for mine-exposed stations without the adjustment to control for changes in the reference stations.

2.3 Toxicity Testing

2.3.1 Acute Testing

Acute toxicity tests are routinely conducted on discharge and receiving water samples collected by Teck in accordance with requirements of Sections 7.2, 10.2.2, 10.2.4, 10.3, and Appendix 2 of Permit 107517. The test organisms are *Oncorhynchus mykiss* (rainbow trout; 96-hour exposures; Environment Canada 1990b) and *Daphnia magna* (48-hour exposures; Environment Canada 1990a). Tests with no more than 50% mortality are considered acceptable (a "pass"). The results are presented in annual water quality reports (Teck 2016a, 2017a) and are summarized in this report.

2.3.2 Chronic Testing

Requirements for chronic toxicity testing are specified in Section 9.8 of Permit 107517 and a letter from the MOE to Teck, dated November 14, 2014, which approved the RAEMP study design (BCMOE 2014). Requirements include bioassays every three years, beginning in 2015, to evaluate the survival and development of wild, fertilized westslope cutthroat trout eggs incubated in a laboratory. The Permit also requires semi-annual laboratory tests using rainbow trout (survival, hatch, growth, deformity, behavior in 30-day exposures beginning with eggs that are <24 hours post-fertilization; Environment Canada 1998), quarterly tests (at all compliance points) of the water flea *Ceriodaphnia dubia* (7-day survival and reproduction; Environment Canada 2007b) and the alga *Pseudokirchneriella subcapitata* (72-hour growth; Environment Canada 2007a), and quarterly testing (at FRO and GHO Compliance Points in the Fording River and the CMO Compliance Point in Michel Creek) using the amphipod *Hyalella azteca* (28-day survival and growth; adapted from USEPA 2000) and fathead minnow (*Pimephales promelas*; survival, hatch, growth, and deformities in 30-day exposures beginning with eggs that are <24 hours post-fertilization; USEPA 1996). Annual reports of results have been prepared by Golder (2016, 2017b) and results are summarized in this report.

2.4 Calcite

2.4.1 Regional Calcite Monitoring

2.4.1.1 Approach

In 2013, Teck initiated a regional calcite monitoring program to document calcite deposition in tributary and main stem areas of the Elk River watershed (Lotic et al. 2013). Annual reports were prepared by Lotic Environmental for monitoring completed in 2013 to 2016 (Lotic 2014a, 2015-2017) and results are summarized in this report.

The regional program measures calcite deposits at one to three 100-m-long areas (depending on the reach size) in numerous reaches defined throughout the watershed. At each 100-m-long area showing any evidence of calcite, a modified Wolman (1954) pebble count procedure was applied involving random selection and measurement of 100 substrate particles throughout each 100-m-long area (and distributed in proportion to the habitat types present). Calcite deposition was characterized by recording the presence (score = 1) or absence (score = 0) of calcite on each substrate particle, and the degree of concretion was assessed by determining if the particle was removed with negligible resistance (not concreted; score = 0), noticeable resistance but removable (partially concreted; score = 1), or immovable (fully concreted; score = 2). Substrate that was too fine to be retrieved (e.g., sand, silt) and to visually discern calcite presence/absence was assigned presence and concretion scores of "0".

The results for each area were then expressed as a CI based on the following equation:

CI = CIp + CIc

Where:

CI = Calcite Index
CIp = Calcite Presence Score = (Number of particles with calcite)/(Number of particles counted)
CIc = Calcite Concretion Score = (Sum of particle concretion score)/(Number of particles counted)

This results in CI values ranging from 0 (no calcite present) to 3.0 (calcite present on all particles and fully concreted). Up to three 100 m areas were surveyed within each stream reach and the averaged calcite index value was considered representative of the linear stream distance of each reach.

2.4.2 Calcite Measurements at Biological Sampling Areas

2.4.2.1 Approach

To guide interpretation of the regional monitoring results with respect to potential effects on aquatic biota, a separate supporting study was initiated by Teck in September 2014[7] (Minnow 2015d). The study of biological effects of calcite focused initially on assessing potential relationships between calcite deposition and both benthic invertebrate community

[7] Study requirements were subsequently stipulated in the MOE's approval of the RAEMP (i.e., letter to Teck dated November 14, 2014), which stated: "Teck shall complete the assessment to determine the potential relationships between calcite and benthic invertebrate community structure, periphyton productivity, and fish spawning and incubation success. Teck shall work in collaboration with the Ministry and Ktunaxa Nation representatives ideally in a monitoring committee forum to prepare study designs for work proposed in 2015 and 2016."

structure and periphyton productivity (Minnow 2016b). Calcite deposition was evaluated at all biological sampling areas in the supporting study, using methods applied in the regional monitoring program, except for the following modifications:

- Calcite was measured only in riffle habitats in the immediate vicinity of where invertebrate samples were collected (e.g., ~10 m distance), whereas the 100-m-long areas sampled in the regional program may include glide and cascade habitats;
- No calcite score was assigned in the biological monitoring programs when fine sediments (sand, silt, clay) were encountered; instead the sampler noted the presences of fines and moved to the next rock where calcite presence or absence could be visibly ascertained; and
- Calcite measured in association with biological sampling areas was done in the first half of September, whereas regional calcite monitoring was typically completed in late September to early December, depending on the year.

The areas sampled in the supporting study in 2015 included all of the areas associated with the RAEMP, the LCO Dry Creek LAEMP (Minnow 2016a) and the LCO Line Creek LAEMP (Minnow 2016c) and additional areas specific to that study. The same approach was used for calcite measurement in 2016 for annual RAEMP sampling (this report), in the LCO LAEMPs (Minnow 2017b,c) and the first year of the FRO LAEMP (Minnow 2017a).

In 2015, the supporting study of calcite effects on biota was expanded to investigate potential effects on fish spawning and incubation success (Minnow 2016b; Ecofish 2016, 2017; Ecofish and Westslope 2017). Evaluation of potential effects on fish is on-going but the results of studies completed to date are summarized in this report.

2.4.2.2 Data Analysis

The normal range for calcite index was defined as the 2.5th and 97.5th percentiles of the distribution of calcite index values observed in reference areas sampled concurrently with the RAEMP benthic invertebrate sampling in September, 2015. Outliers were evaluated using the methods described in Section 2.2.3. NRQs for 2015 and 2016 reference and mine-exposed areas were calculated as the ratio of the CI to the upper limit of the normal range for calcite index.

The temporal analysis for calcite index was conducted using the regional calcite monitoring data collected from 2013 to 2016 (Lotic 2014a, 2015-2017). The analysis was conducted using a repeated measures (RM) ANOVA followed by *post hoc* contrasts to test for differences relative to the mean change at the reference stations. The RM ANOVA model was fit using all data as:

$$CI = Year + Steam + Station(Stream) + Stream \times Year + \varepsilon$$

where *CI* is calcite index, *Year* is a categorical factor for year, *Stream* is a fixed factor, *Station* is a fixed factor for the station and nested in *Stream* because each station is fixed within a particular stream, *Stream*×*Year* represents the interaction between stream and year, and is the ε error term. *Post hoc* contrasts were then conducted to determine which mine-exposed streams are "trending" differently from the mean reference "trend" by testing for linear and step changes (Section 2.2.3). Table 2.3 provides example contrast coefficients for a comparison of a mine-exposed stream with three stations, assuming three reference streams with two stations sampled in each reference stream.

Table 2.3: Example Contrast Coefficients for Testing for a Linear Change and A Step Change after 2013, with 4 Years of Data

Stream	Station	Contrast Coefficients (Linear)				Contrast Coefficients (Step Change After 2013)			
		2013	2014	2015	2016	2013	2014	2015	2016
Exp1	1	-1/3	-1/9	1/9	1/3	-1/3	1/9	1/9	1/9
Exp1	2	-1/3	-1/9	1/9	1/3	-1/3	1/9	1/9	1/9
Exp1	3	-1/3	-1/9	1/9	1/3	-1/3	1/9	1/9	1/9
Ref1	1	1/6	1/18	-1/18	-1/6	1/6	-1/18	-1/18	-1/18
Ref1	2	1/6	1/18	-1/18	-1/6	1/6	-1/18	-1/18	-1/18
Ref2	1	1/6	1/18	-1/18	-1/6	1/6	-1/18	-1/18	-1/18
Ref2	2	1/6	1/18	-1/18	-1/6	1/6	-1/18	-1/18	-1/18
Ref3	1	1/6	1/18	-1/18	-1/6	1/6	-1/18	-1/18	-1/18
Ref3	2	1/6	1/18	-1/18	-1/6	1/6	-1/18	-1/18	-1/18

The contrasts were conducted in Microsoft Excel, following the methods described in Oehlert (2010). When more than one contrast hypothesis was identified as statistically significant ($\alpha = 0.05$), then the contrast with the best fit was used for interpretation. The contrast with the best fit was defined to be the contrast with the largest difference in the numerator of the test statistic (equivalent to selecting the contrast with the smallest p-value). The magnitude of difference (in units of CI) for linear contrasts was calculated as:

$$\bar{x}_{OBS2016exp} - \bar{x}_{PRED2016exp}$$

where $\bar{x}_{OBS2016exp}$ is the observed mean for the mine-exposed stream in 2016 and $\bar{x}_{PRED2016exp}$ is the predicted mean for the mine exposed stream in 2016, assuming that the relative difference between reference and mine-exposed streams in 2016 is the same as the difference observed in 2012 (i.e., $\bar{x}_{PRED2016exp} = \bar{x}_{OBS2016ref} + \bar{x}_{OBS2012exp} - \bar{x}_{OBS2012ref}$). The magnitude of difference for step change contrasts was calculated similarly as:

$$\bar{x}_{OBS(Post\ Step)exp} - \bar{x}_{PRED(Post\ Step)exp}$$

where $\bar{x}_{OBS(Post\ Step)exp}$is the observed mean for the mine-exposed stream after the step change and $\bar{x}_{PRED(Post\ Step)exp}$ is the predicted mean for the mine-exposed stream in 2016, assuming that the relative difference between reference and mine-exposed streams after the step change is the same as the difference observed prior to the step change (i.e., $\bar{x}_{PRED(Post\ Step)exp} = \bar{x}_{OBS(Post\ Step)ref} + \bar{x}_{OBS(Pre\ Step)exp} - \bar{x}_{OBS(Pre\ Step)ref}$).

The contrasts and magnitude of difference calculations were modified as appropriate when a mine-exposed station was not sampled in all five years to accommodate the available data.

Temporal trends for main stem mine-exposed stations by stream and management unit were evaluated using the same methods described above, but the differences were calculated as the difference in the mean CI value for main stem mine-exposed stations and the mean CI value for reference stations.

2.5 Sediment

2.5.1 Sampling

Sampling methods in 2015 were similar to 2013 except that replicates were increased from three stations per area in 2013 to five stations per area in 2015. All samples were collected using a 10.2 cm (4 inch) inside diameter corer, stainless steel Petite Ponar grab sampler (0.023 m^2 sampling area), or stainless steel spoon, depending on the sampling conditions in each area. For example, if the corer was unable to adequately penetrate the sediments to allow for retrieval of the sample without slippage and loss of sample from the core tube (particularly in deeper areas), a Petite Ponar grab was used instead. Coring was attempted in all areas prior to using a Ponar. A spoon was only used in areas where heavy *Chara* spp. coverage and rocky substrate prevented collection of sediments using a corer or ponar. Depending on the depth of the overlying water, the sampling device was deployed from a boat or by individuals on foot. In either case, the sampling area was approached in such a way as to avoid disturbance of sediments before sampling.

Upon selection of each sediment sampling station, the location was recorded using a handheld GPS, and *in situ* water quality measurements (i.e., DO, pH, temperature and specific conductance) were taken using a field meter (i.e., YSI 650 MDS or YSI ProPlus). Water quality measurements were taken approximately 0.5 m above the sediment-water interface in areas deeper than 0.5 m, and mid-column between the water surface and sediment in areas shallower than 0.5 m.

When conditions were conducive to coring and the corer was being deployed from a boat, care was taken to control the rate of descent and to maintain the corer in a vertical position during ascent. When the corer was deployed on foot, care was taken to ensure the area being sampled was not influenced by individuals collecting the sample. After the core penetrated the sediment, it was carefully retrieved and an extruder inserted into the bottom of the core tube. The core extruder was used to push sediments upwards towards the top of the core tube in a controlled fashion to minimize suspension of fine particles. In the event of suspension, momentum was stopped to allow the solids to re-settle. Once the sediment was near the top of the tube, an extrusion collar marked in 1 cm intervals was aligned on the top of the tube and the sediment was extruded upwards to a depth of 2 cm. A core slicer was carefully inserted between the tube and the collar, the collar/slicer removed, and the sample transferred from the slicer to a clean plastic tub. Core samples were rejected if there was evidence of slippage, disturbance of the sediment-water interface, or inadequate penetration of the substrate. A photograph was taken of each core, and the total number of core attempts, penetration depths, and visible sediment characteristics (i.e., the presence of epibenthic organisms or stratification) were recorded on field sheets. This process was completed five more times (for a total of six cores), to ensure sufficient sample amount for all required analyses. The six sub-samples collected at each station were homogenized using a stainless steel spoon. The homogenized sediment was split amongst a glass jar (for analysis of polycyclic aromatic hydrocarbons [PAHs]) and a large Ziploc® bag (all other analyses – see Section 2.5.2).

In areas sampled by Petite Ponar (Appendix Table E.1), a total of six grabs were collected to form a single composite sample. Each grab sample was gently opened and lifted to release the collected sediment into a clean plastic tub. If the sample was not complete to each edge of the Ponar or lacked an intact sediment-water surface layer it was discarded and a new sample collected. The 10.2 cm core collar utilized for obtaining the surface sediments during coring was placed into the top of the sediment to a depth of 2 cm. The core slicer was inserted into the sediment immediately under the core collar and retrieved with the core collar. Excess sediment surrounding the core collar was removed and the sediment within the core collar (top 2 cm) placed into a separate tub. Collection of sediment was repeated in this manner five more times. The six sub-samples collected at each station were then homogenized using a stainless steel spoon and split amongst a glass jar and a large labelled Ziploc® bag.

The single area (STPD) that could not be effectively sampled by core or ponar was sampled using a stainless steel spoon (Appendix Table E.1). The spoon was carefully inserted approximately 2 cm into the substrate and retrieved as slow as possible through the water column to ensure minimal loss of fines. Each spoonful of sediment was then transferred to a

clean plastic tub, and after sufficient volume was obtained, the sediments were mixed using a stainless steel spoon, and split amongst a glass jar and a large labelled Ziploc® bag.

All samples were subsequently placed in a cooler with ice and transferred to a refrigerator later in the day.

2.5.2 Laboratory Analysis

Sediment samples for chemical analysis were sent to ALS Environmental in Calgary, AB for analysis. The laboratory was instructed to thoroughly homogenize each sediment sample before analysis (according to standard laboratory protocols), to ensure sub-samples were representative and comparable. Separate sub-samples were taken for analysis of moisture content, particle size, pH, TOC, and metals (<1 mm fraction[8]) from samples submitted in Ziploc® bags. Samples submitted in glass jars were used for analysis of PAHs. With respect to metals analysis, the <1 mm fraction is considered representative of whole sediments because samples were only collected from depositional areas dominated by fine-grained sediments. Laboratory screening at 1 mm ensures that the small sub-sample that is analyzed does not contain any large particles that would not be considered representative of the sample as a whole and could bias results.

Sediment samples were analyzed using the following methods: metals by Collision Reaction Cell Inductively Coupled Plasma-Mass Spectrophotometry (CRC ICP-MS; EPA 200.2/6020A), mercury by Cold Vapour Atomic Fluorescence Spectrophotometry (CVAFS; EPA 200.2/245.7), TOC by combustion method (Bartels and Sparks 2009), and PAHs by rotary extraction using hexane/acetone (EPA 3570/8270) followed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Particle size distribution was determined by dry sieving (coarse particles), wet sieving (sand) and the pipette sedimentation method (fines) (SSIR-51 Method 3.2.1).

2.5.3 Data Analysis

Normal ranges and summary statistics for sediment chemistry constituents were calculated using reference area data from 2013 and 2015, following the same methods and outlier identification as for water quality (Section 2.2.3). NRQs were calculated as the ratio of the concentration of each parameter in sediment to the upper limit of the normal range. The

[8] The laboratory normally sieves out particles large than 2 mm, but a 1 mm sieve was used in 2013 and 2015 to be consistent with sampling previously completed by Teck in 2011 (Lotic 2013). In the end, data from 2011 were excluded from this report due to quality control concerns. Future sediment sampling should revert to standard 2 mm sieving prior to analysis.

maximum NRQs among replicate stations within an area for selenium and the PAH with the highest NRQ were reported in summary tables and figures.

Concentrations in sediment were compared to BC Working Sediment Quality Guidelines (SQGs) (Table 2.4). HQs were calculated as the ratio of the concentration of each parameter in sediment to the upper SQG (or the single guideline, in the case of selenium). The maximum HQs among replicate stations within an area for selenium and the PAH with the highest HQ were reported in summary tables and figures.

A PCA was conducted on the covariance matrix for HQs (HQs were $\log_{10}$-transformed) of constituents measured in samples collected at reference and mine-exposed areas in 2013 and 2015. The methods used to complete the PCA follow those described in Section 2.2.3.

Temporal changes in selenium, 2-methylnaphthalene, and PC-1 between 2013 and 2015 were evaluated using RM ANOVA followed by *post hoc* contrasts to test for differences relative to reference. The RM ANOVA model was fit using all areas as:

$$Y = Year + CI + Area(CI) + Year \times CI + Area(CI) \times Year + \varepsilon$$

where *Y* is the chemical parameter, *Year* is a categorical factor for year, *CI* is a control-impact factor (C = control or reference and I = impact or mine-exposed), *Area* is a factor for area and nested in *CI* because each area is either a reference or a mine-exposed area, *Year*×*CI* represents the interaction between *Year* and *CI, Area*(*CI*)×*Year* represents the interaction between area and year, and is the *ε* error term. When the *Area*(*CI*)×*Year* interaction is significant then there is a difference in the relative difference between the mine-exposed areas and reference areas that depends on the areas being compared. *Post hoc* contrasts are then conducted to determine which mine-exposed areas are "trending" differently from reference. The following contrast hypothesis was tested:

$$EXP_{2015} - REF_{2015} = EXP_{2013} - REF_{2013}$$

Where EXP_X and REF_X are the means for the mine-exposed and reference areas in year X, respectively. Contrasts were conducted relative to the overall reference mean, and to each of the three reference areas with data in 2013 and 2015 (LCHO, LML, and REFF). A magnitude of difference was calculated using similar methods to those described in Section 2.2.3. The 2015 mean for the mine-exposed area was compared relative to the predicted 2015 mean for the mine-exposed area, where the predicted mean was calculated as the 2015 reference mean plus the difference between mine-exposed and reference means in 2013.

Table 2.4: BC Working Sediment Quality Guidelines (SQGs)

Analytes		Guideline (mg/kg)	
		Lower SQG [a]	Upper SQG [b]
Metals	Aluminum (Al)	-	-
	Antimony (Sb)	-	-
	Arsenic (As)	5.9	17
	Barium (Ba)	-	-
	Beryllium (Be)	-	-
	Bismuth (Bi)	-	-
	Boron (B)	-	-
	Cadmium (Cd)	0.6	3.5
	Calcium (Ca)	-	-
	Chromium (Cr)	37.3	90
	Cobalt (Co)	-	-
	Copper (Cu)	35.7	197
	Iron (Fe)	21,200	43,766
	Lead (Pb)	35	91
	Lithium (Li)	-	-
	Magnesium (Mg)	-	-
	Manganese (Mn)	460	1,100
	Mercury (Hg)	0.17	0.486
	Molybdenum (Mo)	-	-
	Nickel (Ni)	16	75
	Phosphorus (P)	-	-
	Potassium (K)	-	-
	Selenium (Se)	2 [c]	
	Silver (Ag)	-	-
	Sodium (Na)	-	-
	Strontium (Sr)	-	-
	Thallium (Tl)	-	-
	Tin (Sn)	-	-
	Titanium (Ti)	-	-
	Uranium (U)	-	-
	Vanadium (V)	-	-
	Zinc (Zn)	123	315
	Zirconium (Zr)	-	-
Polycyclic Aromatic Hydrocarbons	Acenaphthene	0.00671	0.0889
	Acenaphthylene	0.00587	0.128
	Anthracene	0.0469	0.245
	Benz(a)anthracene	0.0317	0.385
	Benzo(a)pyrene	0.0319	0.782
	Benzo(b)fluoranthene	-	-
	Benzo(b+j+k)fluoranthene	-	-
	Benzo(g,h,i)perylene	0.17	3.2
	Benzo(k)fluoranthene	0.24	13.4
	Chrysene	0.0571	0.862
	Dibenz(a,h)anthracene	0.00622	0.135
	Fluoranthene	0.111	2.355
	Fluorene	0.021	0.144
	Indeno(1,2,3-c,d)pyrene	0.2	3.2
	2-Methylnaphthalene	0.0202	0.201
	Naphthalene	0.0346	0.391
	Phenanthrene	0.0419	0.515
	Pyrene	0.053	0.875

[a] A concentration that will protect aquatic life from adverse effects of toxic substances in most situations.

[b] A concentration that if exceeded will likely cause severe effects on aquatic life.

[c] Only a single guideline has been defined.

'- No guideline.

2.6 Periphyton

2.6.1 Sampling for Productivity Assessment

Periphyton productivity was evaluated at 58 mine-exposed and 40 reference areas in September 2015, including areas sampled in the Line Creek LAEMP (Appendix Tables F.1 and F.2). Additional samples were collected at sub-set of 21 areas throughout the watershed in September 2016 as part of the RAEMP and Line Creek LAEMP (Minnow 2017b). Samples were analyzed for chlorophyll-a and ash-free dry mass (AFDM). Periphyton chlorophyll-a is an indicator of the amount of chlorophyll-producing algae within the periphyton community. Periphyton AFDM measures the total dried biomass of organisms comprising the periphyton community (e.g., algae, fungi, bacteria, protozoa).

Periphyton samples for chlorophyll-a and AFDM analysis were collected from riffle habitat with water depth of at least 5 cm, near-bottom water velocity of about 0.1-0.4 m/s, and uniform substrate characteristics, including relatively flat rocks with a diameter of at least 12 cm. When a sampling area with such characteristics was identified, five rocks were selected (excluding those that were too small, highly angular, or uncharacteristic in surface texture) and taken to shore. A thin acetate template with a 4 cm^2 opening in the middle, was placed firmly on each rock and the periphyton within the opening was scraped off using a scalpel. Scrapings from each of the five rocks were placed on a wetted Whatman GF/F glass fibre filter (e.g., 90 mm diameter, 0.7 µm pore size) to provide a single, composite sample per station for chlorophyll-a analysis. The filter paper containing the composite sample was folded in half twice and then tightly wrapped with aluminum foil. The foil-wrapped sample was placed in a labelled Whirl-Pak® bag and stored in a cooler with freezer packs (in the field) until transfer later in the day to a freezer for storage. Samples can be stored frozen for up to 30 days as long as they are not exposed to light (APHA et al. 1998).

The same five rocks sampled for chlorophyll-a analysis were used to collect separate scrapings for analysis of AFDM. The material on the scalpel from each scraping was rinsed into a small pre-labelled plastic jar with additional water added, as necessary, to cover the tissue. Each composite sample for AFDM analysis was placed in a cooler until transfer to a freezer later in the day.

With the exception of the seven locations being monitored as part of the Line Creek LAEMP, where 10 replicate stations were sampled per area in 2015 (each spaced a minimum of 5 m apart), all periphyton chlorophyll-a and AFDM monitoring consisted of collection of a single composite sample per area (each composite sample consisting of scrapings from 5 different rocks).

2.6.2 Sampling for Tissue Chemistry

Samples were collected for periphyton tissue selenium analysis in both lotic and lentic areas. Lotic tissue samples were collected in both September 2015 and September 2016 from the same 21 areas as annual periphyton productivity samples. Lentic periphyton tissue samples were collected in August 2015 from the same areas where sediment samples were collected for chemical analysis (Appendix Tables F.14 and F.15).

Periphyton samples collected in lotic areas for selenium analysis (n = 1 composite per area) were scraped from the same rocks as those sampled for evaluation of productivity, plus additional rocks (as necessary) to obtain the required sample weight. Scrapings were transferred directly into a pre-labelled cryovial (without rinsing) to minimize the amount of water in each sample. Scrapings were collected until approximately 2 g wet weight of tissue per sample was attained.

Periphyton samples collected for selenium analysis from lentic areas (n = 3 composite samples per area, corresponding to locations near the inlet, middle and outlet of each area) were suctioned from the surface of perennially submerged sediment using a wide-bore syringe. Care was taken to ensure the area being sampled was not influenced by individuals collecting the sample, and that inclusion of sediment particles in the periphyton samples was minimized (i.e., by controlling the depth of the tip of the syringe and the rate at which suction was applied). If the sediment-water interface was easily discernable from the water surface, samples were collected *in situ*. If the sediment-water interface was not visible, a 10.2 cm (4 inch) inside diameter corer was used to collect the sample. Samples were transferred directly into pre-labelled cryovials from the syringe.

All periphyton tissue samples were kept on ice in a cooler during the day and then stored in a freezer until they were shipped to the laboratory.

2.6.3 Sampling for Evaluation of Communities

Samples were collected in September 2015 for a supporting study to the RAEMP to determine if periphyton community endpoints can be used to sensitively and reliably detect mine-related effects on aquatic communities in the Elk Valley (Minnow and Larratt 2016). A total of 40 reference and 58 mine-exposed areas were sampled, corresponding to areas where benthic invertebrate communities were also sampled as part of the RAEMP (this study). Details of sampling and analysis were reported by Minnow and Larratt (2016) and results are summarized in this report.

2.6.4 Laboratory Analyses

Samples for AFDM and chlorophyll-a analysis were shipped frozen to ALS Environmental in Calgary, AB for analysis. Analysis of AFDM followed procedures modified from APHA Method 10300 C. Total AFDM was calculated as the difference between the dried sample weight and the ash weight, both of which were determined gravimetrically. Dry weight was determined by drying the sample at 105°C, and the ash weight was subsequently determined by ashing the dried sample at 500°C.

Analysis of chlorophyll-a was completed using procedures adapted from EPA Method 445.0. Chlorophyll-a was determined by routine acetone extraction followed by fluorescence detection using a non-acidification procedure (a method that is not subject to interferences from chlorophyll-b).

All periphyton samples collected for selenium analysis in 2015 and 2016, were sent to the University of Missouri's Research Reactor Center (MURR) in Columbia, Missouri, except samples collected for the Line Creek LAEMP in 2016. At MURR, the samples were freeze-dried and analyzed for selenium using Neutron Activation Analysis (NAA). Samples collected for the Line Creek LAEMP in 2016 were sent to the Saskatchewan Research Council (SRC) Laboratory in Saskatoon, SK for freeze-drying and then sent to ALS in Burnaby, BC for selenium analysis by high resolution (HR) ICP-MS. Results were reported on a dry-weight (dw) basis.

2.6.5 Data Analysis

Area-based AFDM and chlorophyll-a concentrations were calculated by dividing the total AFDM and chlorophyll-a concentrations reported by the laboratory by the surface area sampled (20 cm^2) at each station.

Normal ranges for AFDM and chlorophyll-a were calculated as the 2.5^{th} and 97.5^{th} percentiles of the distribution of values observed in reference areas sampled in September, 2015. The outlier evaluation followed the same methods as for water quality (Section 2.2.3) and also consisted of an evaluation of the percentile rank of values within each watershed to identify whether reference areas in a particular watershed were unusually high or low relative to the other reference areas. NRQs were calculated for AFDM and chlorophyll-a as the ratio of the concentration to the upper limit of the normal range. HQs were calculated for chlorophyll-a as the ratio of the concentration to the BC Ministry of Environment (BCMOE) guideline for the protection of aquatic life (100 mg/m^2) (BCMOE 2001). Water samples collected at the same time as periphyton samples during the 2015 RAEMP cycle included measurement of nutrient concentrations (e.g., nitrate, phosphorus) and those data were included in the evaluation of mine-related effects on productivity.

Periphyton tissue selenium concentrations measured in a variety of historical monitoring and baseline studies were previously summarized by Windward (2014) and Windward et al. (2014). The data pertaining to reference areas were added to data collected in the RAEMP in 2015-2016 to characterize the normal range for tissue selenium concentrations. The normal range for periphyton tissue selenium concentrations was calculated as the 2.5th and 97.5th percentiles of this distribution, with identification of outliers following the same methods as described in Section 2.2.3. NRQs were calculated for all reference and mine-exposed areas sampled in 2015 and 2016.

The evaluation of the periphyton community endpoints for the RAEMP focused on the key endpoints identified in the 2015 Periphyton Special Investigation (Minnow and Larratt 2016): Green density, *Achnanthidum* density, Fragilariacae density, and two non-metric multi-dimensional scaling axes (NMDS axis 1 and NMDS axis 3). NMDS is a method to visualize the level of similarity of samples based on the rank of the similarities (Clarke and Ainsworth 1993). The NMDS takes the n-dimensional (here N = number of taxa) coordinates of each sample (i.e., area) and defines a set of new n-dimensional coordinates that reflect the locations (rank distances) among samples. The NMDS was used to reduce the complete periphyton taxonomic data matrix to fewer dimensions. The NMDS axes retained for the evaluation of the RAEMP data were axis 1 and axis 3 (significantly correlated with PC-1 for water quality which separates reference and mine-exposed areas) from an NMDS 3-D ordination at the genus level of taxonomy using fourth-root transformed relative abundance. Further details on the NMDS analysis for the periphyton community can be found in Minnow and Larratt (2016). Normal ranges were then calculated for the community endpoints as described above for AFDM and chlorophyll-a, and also included an evaluation of the percentile rank of values within each watershed to identify whether reference areas in a particular watershed were unusually high or low relative to the other reference areas.

Mine-exposed areas sampled in 2015 were compared to the normal ranges for the key periphyton community endpoints. A correlation analysis was conducted among key periphyton community endpoints and PC-1 for water quality (Section 2.2.3) to assess whether periphyton community endpoints were responding to differences in water quality between reference and mine-exposed areas.

2.7 Benthic Invertebrates

2.7.1 Kick Sampling

Benthic invertebrate communities were sampled in September 2015 at 40 reference and 60 mine-exposed lotic areas using the Canadian Biomonitoring Network (CABIN) method

(Environment Canada 2012a) for evaluation of community structure (lowest practical level of taxonomy) (Appendix Tables G.32 to G.35). Additional community samples were collected in 2016 to support the Dry Creek, Line Creek and FRO LAEMPs (Minnow 2017a-c) and to satisfy other data needs by Teck (total of 7 reference and 32 mine-exposed areas; Appendix Tables G.36 to G.39).

The CABIN method involves 3-minutes of travelling kick sampling, with collection of disturbed organisms using a net with a triangular aperture measuring 36 cm per side and mesh having 400 µm openings (Environment Canada 2012a). During sampling, the field technician moved across the stream channel (from bank to bank, depending on stream depth and width) in an upstream direction. With the net being held immediately downstream of the technician's feet; the detritus and invertebrates disturbed from the substrate were passively collected in the kick-net by the stream current. After three minutes of sampling time, the sampler returned to the stream bank with the sample. The kick-net was rinsed with water to move all debris and invertebrates into the collection cup at the bottom of the net. The collection cup was then removed and the contents poured into a labelled plastic jar and preserved in a 10% buffered formalin solution. A single sample was collected in each area, with an additional two samples (i.e., three in total) collected at 5% of areas to assess within-area variability in community composition. Consistent with the requirements of the CABIN sampling protocol, supporting information including stream habitat characteristics was collected concurrent with benthic invertebrate samples (Environment Canada 2012a).

2.7.2 Hess Sampling

Benthic invertebrates have also been collected in the Line Creek LAEMP (annually since 2014) and in the FRO LAEMP (beginning in 2016) for analysis of tissue biomass and community composition (family level of taxonomy) (Minnow 2015c, 2016c, 2017a,b). For these samples, benthic invertebrates were collected using a Hess sampler with 500 µm mesh, for measurement of biomass and community endpoints relative to the area sampled. Stations were located a minimum of 5 m apart to ensure they were representative of the overall area (10 stations per area). A single sample was collected at each station by carefully inserting the base of the Hess sampler into the substrate to a depth of approximately 5 to 10 cm. Any gravel or cobble enclosed within the Hess sampler was carefully washed while allowing the current to carry dislodged organisms into the mesh collection net. All organisms collected into the net were rinsed into the end of the net, and then into a labelled wide-mouth plastic jar. Samples were preserved to a level of 10% buffered formalin in ambient water within approximately 6 hours of collection to ensure that biomass was not lost through predation or decomposition of tissues before the samples were sorted at the laboratory.

2.7.3 Tissue Sample Collection

Between the RAEMP and LAEMPs, benthic invertebrates were collected with kick nets for analysis of tissue selenium concentrations at 7 reference areas and 59 mine-exposed lotic areas in September 2015, as well as 5 reference and 23 mine-exposed lotic areas in September 2016 (Appendix Table G.43). Samples were a composite of representative taxa present in each area (a minimum of one sample in each lotic area, more in some areas in accordance with the respective LAEMP designs). In addition, samples of one or more common and readily identifiable taxa (i.e., Ephemeroptera, Plecoptera, or Rhyacophilidae) were also collected at areas that are monitored on an annual basis for the RAEMP and LAEMPs.

Tissue samples were also collected in 5 reference and 18 mine-exposed lentic areas in August 2015 (Appendix Table G.47). In lentic areas, three composite samples of benthic invertebrates were collected by sweeping the substrate and/or vegetation along the shoreline with a kick net. Tissue samples were taken near the inlet, middle, and outlet of each lentic area.

Invertebrates from both lotic and lentic areas were picked free of debris in the field, placed into labelled cryovials and stored in a cooler with ice packs until transferred to a freezer later in the day.

2.7.4 Laboratory Analyses

2.7.4.1 Kick Samples for Community Analysis

Benthic invertebrate community samples collected by kick net were sent to Cordillera Consulting (lead taxonomist Sue Salter), in Summerland BC, for sorting and taxonomic identification. Taxonomists at Cordillera have achieved certification for Group 1 (general Arthropods West), 2 (EPT East and West), and 3 (Chironomids West) benthic organisms in the Taxonomic Certification Program (http://nabstcp.atlanticwebfitters.ca/) of the Society for Freshwater Science (formerly the North American Benthological Society). Organisms were identified to the lowest practical level (LPL) (typically genus or species) using up-to-date taxonomic keys.

At the beginning of the sorting process, each sample was examined to estimate total invertebrate numbers. If the total number was estimated to be greater than 600, then the sub-sampling protocol was followed, otherwise the sample was sorted in its entirety. In cases where samples cannot be analyzed in their entirety, CABIN requires that a sufficient number of sub-samples be analyzed to result in the sorting of at least 300 organisms and at least 5% of the sample (Environment Canada 2014). Sorting efficiency and sub-sampling accuracy and precision were quantified using methods specified by Environment Canada (2012b).

2.7.4.2 Hess Samples for Biomass and Community Analysis

Benthic invertebrate biomass samples were sent to ZEAS Inc. (lead taxonomist Danuta Zaranko) in Nobleton, ON, for sorting and taxonomic identification. All preserved organisms in each sample were sorted from the sample debris into groups separated at the family-level of taxonomy for weighing. Each family group of organisms was placed onto a fine cloth to drain excess surface moisture (preservative) before being weighed to the nearest 0.0001 g. Total and family-level biomass were reported for each sample (preserved wet weight).

2.7.4.3 Tissue Selenium Analysis

All invertebrate samples collected for selenium analysis in 2015 and 2016, were sent to the MURR in Columbia, Missouri, except samples collected for the Line Creek LAEMP in 2016. At MURR, the samples were freeze-dried and analyzed for selenium using NAA. Samples collected for the Line Creek LAEMP in 2016 were sent to SRC in Saskatoon, SK for freeze-drying and then sent to ALS in Burnaby, BC for selenium analysis by HR ICP-MS. Results were reported on a dry-weight (dw) basis.

2.7.5 Data Analysis

2.7.5.1 Tissue Selenium Relative to Predictions, Normal Ranges and Benchmarks

Composite-taxa benthic invertebrate tissue selenium concentrations measured in 2015 and 2016 were compared to predictions that were derived from water modelling (Golder 2014a,b) and tissue bioaccumulation models developed for the EVWQP (Teck 2014).

Benthic invertebrate tissue selenium concentrations measured in a variety of historical monitoring and baseline studies were previously summarized by Windward (2014) and Windward et al. (2014). Reference area data used in those studies were obtained, along with benthic invertebrate tissue data measured in the 2015-2016 RAEMP cycle (this study), the Dry Creek LAEMP (Minnow 2016a), and the 2016 LAEMPs for Line Creek and FRO (Minnow 2017a,b), to characterize the normal range for tissue selenium concentrations. Tissue selenium concentrations observed in mine-exposed areas in 2015 and 2016 were compared to the upper limit of the reference normal range and to site-specific benchmarks developed in the EVWQP (Table 2.3). The 95% confidence interval for the 97.5th percentile [calculated following methods in Kilgour et al. (2017)] for tissue selenium in lotic habitats overlapped with the 95% confidence interval for the 97.5th percentile for tissue selenium in lentic habits, indicating no significant (α = 0.05) difference in the upper limit of the normal range for the two habitats. Thus, normal ranges were calculated as the 2.5th and 97.5th percentiles of the reference area distribution for both lotic and lentic areas combined. An outlier evaluation was conducted for the

reference area data set as described in Section 2.2.3. NRQs and HQs were calculated as the ratio of concentrations to the upper limit of the normal range and site-specific benchmarks, respectively.

2.7.5.2 Communities Relative to Normal Ranges

NMDS was used to reduce the complete family level and LPL taxonomic data matrices to fewer dimensions. The analysis used the Bray-Curtis distance as the measure of relative community similarity or dissimilarity, as recommended by McCune and Grace (2002), using PC-ORD© (McCune and Mefford 2011). Rare taxa (i.e., those occurring in less than 5% of areas) were removed from the dataset as their exclusion from multivariate statistics reduces 'noise' (Bailey et al. 2004) and improves the ecological interpretability of the resulting community ordination. The 'slow and through' option, which uses the following settings, was applied: maximum iterations = 400, instability criterion = 0.00001, number of real runs = 40, and number of randomized runs = 50 (McCune and Grace 2002). All NMDS ordinations were evaluated for solution stability, final stress <0.20, and Monte Carlo randomization determination of interpretable axes of $p<0.05$ (McCune and Grace 2002).

NMDS is a method to visualise the level of similarity of samples based on the rank (e.g. sample A is more similar to Sample B than to Sample C) of the similarities (Clarke 1993). The NMDS takes the N-dimensional (here N = number of taxa) coordinates of each sample (i.e. area) and defines a set of new n-dimensional coordinates that reflect the locations (rank distances) among samples. NMDS results of non-transformed data often leads "to shallow interpretation in which only the pattern of a few, very common species is represented" (Clarke 1993). A suite of transformations were applied (log_{10}, square root, fourth root, power 2, and power 4) and the resultant data matrix was assessed for normality based on the average skewness and kurtosis. The transformation with the lowest average skewness and kurtosis was deemed the preferred transformation as it reduced the influence of dominant taxa. Axis 1 of the NMDS was retained for the evaluation of the RAEMP data because it was significantly correlated with PC-1 for water quality which separates reference and mine-exposed areas.

Community data for samples collected in 2015 were used to investigate a total of 107 benthic invertebrate community endpoints as potential indicators of mine-related influence (Appendix Tables G.3 and G.5). Univariate endpoints having values less than the lower limit of the reference normal range at more than 10% of mine-exposed areas, or greater than the upper limit of the normal range at more than 10% of areas were included in correlations (Appendix Table G.6) with the first principal component (PC-1) of several variations of the PCA for water quality described in Section 2.2.3. Significant ($\alpha=0.05$) correlations were observed for most benthic invertebrate community endpoints and PC-1 (Appendix Table G.6) suggesting

redundancy among benthic invertebrate community endpoints as indicators of potential mine-related effects. Redundancy among endpoints was also indicated by a correlation analysis of benthic invertebrate community endpoints alone (Appendix Table G.7). Strongest correlations ($r > 0.6$ or $r < -0.6$) with PC-1 were observed for percent (%) Ephemeroptera and Ephemeroptera richness, % Ephemeroptera, Plecoptera, and Trichoptera (EPT), % Diptera, and with overall community structure as indicated by NMDS (Appendix Table G.6). These results suggested that these endpoints are the ones most sensitive to influences from coal mining. As expected, these endpoints also tended to identify the same areas as being different from reference area communities (Appendix Table G.8). Following discussion of draft results with the EMC, four univariate endpoints were selected as key community endpoints: total benthic invertebrate abundance and LPL richness (as overall indicators of the number and diversity of organisms present), as well as % Ephemeroptera and % EPT (as endpoints most sensitive to mine-related influence). NMDS Axis 1 (family-level of taxonomy; 3-D ordination on fourth rout relative abundance) was also retained as a multivariate indicator of overall community structure.

After identification of the key community endpoints, normal ranges were updated with the pooled 2012 and 2015 reference area data distribution. The normal ranges were further refined for these key community endpoints by removing outliers (Appendix Table G.10; Appendix Figure G.2). The outlier evaluation followed the same methods as described in Section 2.2.3 and also consisted of an evaluation of the percentile rank of values within each watershed to identify whether reference areas in a particular watershed were unusually high or low relative to the other reference areas. This evaluation resulted in reference areas in the upper Kootenay River watershed being excluded from the normal range for benthic invertebrate abundance based on low abundance relative to reference areas in the other watersheds (Appendix Table G.10).

Correlation analysis indicated that a variety of habitat variables were significantly correlated with benthic invertebrate community endpoints, but correlation coefficients were low in most cases (Appendix Table G.11), indicating that the habitat variables explained little of the community variability. However, based on input from the EMC, additional analyses were undertaken to determine if normal ranges for key endpoints should be further refined by taking into account community variability associated with other habitat factors (Appendix I). After discussion of results with the EMC, it was decided that the ability to detect communities deviating from normal ranges was not sufficiently enhanced to warrant the added complexity of the analysis. Therefore, reference area normal ranges were defined without covariates, as shown in Appendix Table G.10.

Key community characteristics for benthic invertebrates sampled in mine-exposed areas in 2015 and 2016 for the RAEMP and LAEMPs were compared to the respective reference normal ranges. NRQs and HQs were not calculated; comparisons were made between the observed value for each endpoint and the normal range.

2.7.5.3 Temporal Changes

Temporal changes in benthic invertebrate selenium concentrations and benthic community endpoints were evaluated using RM ANOVA followed by *post hoc* contrasts to test for differences relative to reference (similar to methods described in Section 2.5.3). The RM ANOVA model was fit using all areas as:

$$Y = Year + CI + Area(CI) + Year \times CI + \varepsilon$$

where *Y* is the endpoint, *Year* is a categorical factor for year, *CI* is a control-impact factor (C = control or reference and I = impact or mine-exposed), *Area* is a factor for area and nested in *CI* because each area is either a reference or a mine-exposed area, *Year*×*CI* represents the interaction between *Year* and *CI.* An interaction term for *Area*(*CI*)×*Year* could not be included because there was no replication in samples within an area and year. Data were transformed (log_{10}, square root, or fourth root) as required to meet assumptions of normality and homogeneity of variances in the model residuals. *Post hoc* contrasts were conducted for all mine-exposed areas to assess whether the mine-exposed areas were "trending" different from reference. The RM ANOVA requires reference area data to be collected at the same time as mine-exposed data. Due to differences in sampling schedules for the different mine-exposed areas (e.g., some areas sampled in the LAEMPs have additional data), the analysis was conducted separately for subsets of mine-exposed areas and reference areas with data collected in the same year. The contrasts consisted of tests for linear changes and tests for step changes in the relative difference between mine-exposed and mean reference across years. A magnitude of difference was calculated as described in Section 2.2.3.

Temporal trends for main stem mine-exposed areas by management unit were evaluated using the same methods described above, but the differences were calculated as the difference in the mean endpoint value for main stem mine-exposed areas and the mean endpoint value for reference areas.

2.8 Longnose Sucker

2.8.1 Sampling

All longnose sucker work was completed under fish collection permit CB15-167864, issued by the BC Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO). Nine mine-

exposed and three reference study areas were targeted for LSU monitoring (Appendix Table HLSU.1). Monitoring was initially conducted at all areas in spring (i.e., mid-May), with four areas (ERUP, GO13, OTTO, and STPD) repeated in September to evaluate the effect of seasonality on catch success and population size estimates.

Fish abundance (density) was assessed using mark-recapture sampling based on an adaptation of the Schnabel method (Schnabel 1938, Krebs 1999). Lentic habitats were sampled using standard, galvanized-mesh, cylindrical minnow traps (42 cm length, 0.6 cm mesh, 2.5 cm diameter opening) deployed singly as overnight, bottom sets baited with a suitable attractant. At each study area, minnow trap locations were randomized to meet assumptions of the Schnabel method. Accordingly, each lentic water body was separated into 12 to 24 approximately equal-sized sampling zones, with a greater number of zones being defined in larger versus smaller waterbodies. Locations for each of the overnight minnow traps set at each study area were determined *a priori* using a random numbers table, with some adjustments made to ensure that only a single minnow trap was set in a sampling zone at one time and that the same set location within a sampling zone was not used sequentially. For each minnow trap set, supporting information including duration of sampling effort (i.e., “soak time”), mean sampling depth, GPS coordinates and habitat descriptions were recorded. Minnow trap sampling was conducted until a minimum of 10% of marked fish were recaptured, or for a maximum of four nights of minnow trapping effort at each study area.

All minnow traps were checked daily, with all captured fish identified to species and enumerated. Captured LSU were temporarily retained for physical measurement and marking, with any re-captures (i.e., marked LSU) and incidental captures (i.e., other species) released immediately following the recording of pertinent details. All LSU were measured for fork and total length to the nearest millimetre using a standard measuring board, and for fresh body weight to the nearest 0.001 g using an electronic balance. Each captured LSU was marked to allow identification during subsequent, within-year capture. Suitable markers included a fin clip, or a visible implant elastomer (VIE) tag. Fish captured on each successive night of fishing received a different identification mark (e.g., anal fin clip, right pectoral fin clip, left pectoral fin clip) to account for any repeated recaptures in the population estimate calculations. No marking occurred on the final day of trap checking. If high numbers of LSU (e.g., >100) were captured at any of the study areas, a sub-set of individuals (i.e., 5% of captures, up to a maximum of 10 fish) were sacrificed for otolith and/or pectoral fin ray removal to allow assessment of age. Liver and gonad weights were also recorded for these individuals, along with the ten adults being collected for selenium analysis (Section 2.9.2) Additional observations on individual fish included assessment of general condition (e.g., emaciated appearance), presence of any lesions, tumours and/or fin erosion, presence or evidence of parasites, and any other

abnormalities. Photographs were taken of fish exhibiting abnormalities or poor body condition, along with photographs of representative healthy LSU. Once LSU were measured, marked, assessed for abnormalities, and photographed, each was released near its location of capture.

2.8.2 Data Analysis

Fish community data were summarized by species presence and total number of fish captured per area. Catch-per-unit-effort (CPUE) was calculated as the number of fish captured per 24 hours per minnow trap. The LSU population of each mine-exposed and reference area was then estimated using total catch numbers and the following equation:

$$N = \sum (C_t * M_t) / (\sum R_t) + 1$$

Where N = the estimate of the number of individuals in the population;

C_t = the number of fish caught;
M_t = the number of marked fish at large; and,
R_t = the number of recaptures.

The 95% confidence intervals were calculated as follows:

$$95\% \text{ Confidence Limit} = \sum (C_t * M_t) / \sum R \text{ (Poisson)}$$

LSU density estimates (i.e., number of LSU per 100 m^2) were calculated for each water body based on the total area of the water body and the corresponding population estimate. An estimate of the LSU biomass per unit area was determined for each water body by multiplying the density estimate by the mean mass of the LSU sampled at the water body. The total area of each water body was determined using Geographical Information Systems (GIS) and/or direct field measures. The LSU population, density, and biomass estimates were compared among the mine-exposed and reference areas and can be used as a basis for tracking relative population changes over time.

Fish health for mine-exposed areas sampled in May, 2015 was evaluated relative to the reference area (FLA1) using the following endpoints and statistical methods:

- Length frequency distributions (indicator of survival/recruitment)
- Fork length (indicator of body size)
- Body weight (indicator of body size)
- Condition (indicator of energy storage)

Length frequency distributions were analyzed for each mine-exposed area relative to the reference area using the two-sample Kolmogorov-Smirnov (KS) test. A magnitude of difference

was reported as the maximum difference in the cumulative relative frequency distributions (CRFD; see Appendix Figure HLSU.4) between areas. A negative difference implied that the mine-exposed area had more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implied that the mine-exposed area had fewer fish less than the length where the maximum difference in CRFDs was observed.

Fork length and body weight were analysed using ANOVA or the non-parametric Kruskal-Wallis test when the assumptions of normality and homogeneity of variance could not be met after a $\log_{10}$-transformation. Condition was analyzed using analysis of covariance (ANCOVA) with $\log_{10}$(body weight) as the response variable and $\log_{10}$(fork length) as the covariate. Regression slopes for the ANCOVA were considered parallel when the interaction term of the model was not significant ($\alpha = 0.05$) or when the slopes are considered practically significant (i.e., the coefficient of determination [R^2] of the parallel slope model was within 2% of the R^2 of the interaction model). *Post hoc* contrasts were conducted using Dunnett's method (comparison of each mine0exposed area to reference) for ANOVA and ANCOVA or Dunn's tests with a Bonferroni adjustment for Kruskal-Wallis. A significance level of 0.1 was used for testing area differences. Outliers with a Studentized residual magnitude greater than four were removed from the analysis. A magnitude of effect was calculated for each mine-exposed area relative to reference based on means (ANOVA), covariate adjusted means (ANCOVA), or medians (Kruskal-Wallis).

Length frequency distributions plotted using histograms and the cumulative relative frequency distributions of each mine-exposed area vs. the reference area were provided to support the two-sample KS tests.

Fork length, body weight, and condition factor (K= body weight [g] / total length^3 [mm] x 10^5) were plotted using boxplots.

Temporal Comparisons

Comparisons of fish condition (analyzed using ANCOVA) for longnose sucker collected from STPD, OTTO, GO13, and ERUP in May and August 2015 were initially conducted using ANCOVA (Appendix Table HLSU.12). Since no differences were observed, the May and August 2015 data were pooled for comparison to previous years. The temporal analysis consisted of comparisons of reference area FLA1 and mine-exposed areas GO13, OTTO, and STPD to 2013 data collected by Lotic (2014b) and comparisons of mine-exposed data from ERUP and EROL to 2005 data collected by LePage (2014). Temporal analyses were not conducted for fish morphometric endpoints in WCT and MW because sample sizes were small, males and females were not separated, and samples were collected at different times of the year resulting in fish being in different stages of reproductive development.

2.9 Fish Tissue Selenium Monitoring

2.9.1 Overview

All fish tissue sampling was completed under fish collection permit CB15-167864, issued by MFLNRO.

2.9.2 Longnose Sucker

Mature LSU were sampled in early-mid May in an effort to collect females with developed eggs/ovaries. A total of five mature females (for ovary analysis) and five additional adults (for whole body analysis) were targeted for tissue sampling in each area.

Mature adult LSUs retained for sampling were lethally euthanized using clove oil dissolved in ethanol. External fish condition, including the presence of any deformities, lesions, or parasites, was documented. Body mass (in grams) and fork and total length (in millimetres) were measured using a digital balance (accuracy to ± 0.1 g) and a small measuring board (± 1 mm). Otoliths were extracted and stored in small, labelled paper envelopes for age analysis. The body cavity of each LSU was opened using round-nosed scissors. Gonads and livers were removed and weighed using a digital balance. If the fish was female and not spent, both ovaries were placed into a sterile, labelled, Whirl-Pak® bag. If the female was spent, a muscle sample was collected instead of an ovary sample. The muscle was collected from the dorsal side of the fish, and all skin and bones were removed, and the filet placed in a labelled, Whirl-Pak® bag. The remaining fish carcass was then placed in a separate Whirl-Pak® bag for archive purposes. Individuals retained for whole-body analysis were placed in a Whirl-Pak® bag with all internal organs and labelled with a unique sample identification code. All fish tissues were stored on ice until transfer to a freezer (-20 ºC) later in the day.

2.9.3 Westslope Cutthroat Trout

Westslope cutthroat trout were sampled in early May (prior to spawning) and late August (during the period of more intense recreational angling) from main stem mine-exposed areas only, in accordance with the study design[9] (Minnow 2015a). For the purposes of this report, all data (May and August) were compared to site-specific benchmarks for protection of aquatic life (Table 2.5). The data were also included in a separate human health risk assessment (Ramboll Environ 2016).

[9] An adequate database of historical reference tissue data were available to characterize the reference area normal range.

Table 2.5: Selenium Benchmarks for Periphyton, Benthic Invertebrates, and Fish Tissue in the Elk Valley

Endpoint	Tissue Type	Benchmark			Source
		Value (µg/g dw)	Type	Description	
Benthic Invertebrates	Whole body	13	Site-specific benchmark	Level 1 (~10% effect) benchmark for growth, reproduction and survival of invertebrates	Table 3-1 (Golder 2014c)
	Whole body	11	Site-specific benchmark	Level 1 (~10% effect) benchmark for dietary effects to juvenile fish (growth)	Table 3-1 (Golder 2014c)
	Whole body	15	Site-specific benchmark	Level 1 (~10% effect) benchmark for dietary effects to juvenile birds	Table 3-1 (Golder 2014c)
Westslope cutthroat trout	Egg/ovary	25	Site-specific benchmark	Level 1 (~10% effect) benchmark for westslope cuttroat trout reproduction	Table 3-1 (Golder 2014c)
	Muscle/ muscle plug	15.5	Site-specific benchmark	Muscle equivalent to the 25 mg/kg dw ovary benchmark, based on the relationship observed between selenium in muscle and ovary in westslope cutthroat trout	Nautilus and Environmental and Interior Reforestation (2011)
Mountain whitefish	Egg/ovary	29.3	Site-specific benchmark	Conservative estimate of lower bound for potential effects	Nautilus (2017)
Other Fish	Egg/ovary	18	Site-specific benchmark	Level 1 (~10% effect) benchmark for reproduction effects to other species than westslope cutthroat trout	Table 3-1 (Golder 2014c)
	Muscle	18	Site-specific benchmark	Muscle equivalent to the 18 mg/kg dw ovary benchmark, based on the relationship observed between selenium in muscle and ovary in longnose sucker[a]	This report (Data in Figure 9.2)
	Egg/ovary	11	BC guideline	Combination of weight of evidence and mean of published effects data with an uncertainty factor of 2 applied	BCMOE (2014)
	Whole body	4	BC guideline	Combination of weight of evidence and mean of published effects data with an uncertainty factor of 2 applied	BCMOE (2014)
	Muscle/ muscle plug	4	BC guideline	Whole-body translation to derive muscle benchmark with no additional uncertainty factor	BCMOE (2014)

References:

British Columbia Ministry of Environment (BCMOE). 2014. Ambient Water Quality Guidelines for Selenium Technical Report Update. April 2014.

Golder. 2014c. Benchmark Derivation Report for Selenium. Elk Valley Water Quality Plan. Report Number 13-1349-0006. July 2014.

Nautilus and Environmental and Interior Reforestation. 2011. Evaluation of the Effects of Selenium on Early Life Stage Development of Westslope Cutthroat Trout from the Elk Valley, BC. Submitted to Elk Valley Selenium task Force. November, 2011.

Nautilus Environmental. 2017. Evaluation of the Effects of Selenium on Early Lifestage Development of Mountain Whitefish from the Elk Valley, BC (Draft Report). Submitted to Golder Associates, Burnaby, BC. July.

[a] The benchmark of 18 mg/kg dw ovary was estimated from the regression of log(muscle Se) on log (ovary Se): muscle BM = $10^{1.20*\log(\text{ovary BM})-0.251}$

Each captured WCT was assigned a unique identification code. Body weight was measured using an appropriately-sized spring scale (e.g., 100 g, 500 g, 1,000 g). Total and fork length were determined using a measuring board equipped with a metre stick (± 1 mm). External fish condition, including the presence of any deformities, lesions, or parasites, was documented. To the extent possible, WCT gender was determined using secondary sexual characteristics (i.e., shape of jaw, colour, and condition of vent/ovipositor). A biopsy punch (4 mm acu-punch) was inserted into the dorsal musculature, ensuring the penetration was perpendicular to the fish skin surface. Light pressure was applied while turning (twisting) the punch into the dorsal musculature (about 5 to 7 mm). The punch was then angled slightly and removed, while still turning, to separate the sample from the surrounding musculature. Skin was removed from the sample with a scalpel and the remaining muscle sample was placed into a sterile microcentrifuge tube. Following sampling, the fish was released back into the water body where it was captured. Samples were stored on ice until transfer to a freezer later in the day.

While collection of WCT was intended to be non-lethal, there was one incidental mortality of a female WCT from Henretta Lake in May 2015. The body cavity of this fish was opened using round-nosed scissors and the ovaries were extracted, weighed to the nearest 0.1 g using a top-loading digital scale, and placed into a sterile, labelled, Whirl-Pak® bag. A muscle sample (approximately 5 g) was taken from behind the dorsal fin on the dorsal side of the fish using a clean fillet knife. The muscle was filleted from the bones and the skin removed so that the sample was composed of only muscle. The muscle sample was then packaged in a sterile, labelled, Whirl-Pak® bag and frozen.

2.9.4 Mountain Whitefish

Mountain whitefish samples were collected in early October (pre-spawning). Female fish (n=5 per area) were targeted for measurement of selenium concentrations in ovaries and muscle.

Mature MWF were euthanized using clove oil dissolved in ethanol mixed in ambient water. Body weight was measured using appropriately-sized spring scales (e.g., 100 g, 500 g, 1,000 g). Total and fork length were determined using a measuring board equipped with a metre stick (± 1 mm). Otoliths and pectoral fin rays were collected, wrapped in wax paper, and stored in small paper envelopes labelled with the fish identification code. The body cavity of each fish was then opened using round-nosed scissors. If the fish was female, both ovaries were extracted, weighed to the nearest gram using a top-loading digital scale, and placed into a sterile, labelled, Whirl-Pak® bag. A muscle sample (approximately 5 g) was taken from behind the dorsal fin on the dorsal side of the fish using a clean fillet knife. The muscle was then filleted from the bones and the skin removed so that the sample was composed of only muscle.

If the fish was male (i.e., three of the five fish collected from the St. Mary's River reference area), a muscle sample (approximately 5 g) was collected as described above.

2.9.5 Laboratory Analysis

Tissue samples were sent to MURR in Columbia, Missouri for analysis. Cutthroat trout and mountain whitefish tissues were freeze dried and analyzed for total metals using ICP-MS. Tissues from longnose sucker were similarly freeze dried, and analyzed for selenium using NAA. Results were reported on a dw basis, along with moisture content (based on the difference between wet and freeze-dried sample weights) to allow conversion to wet-weight values.

2.9.6 Data Analysis

Fish tissue selenium concentrations measured in a variety of historical monitoring and baseline studies were previously summarized by Windward (2014) and Windward et al. (2014). Reference area data used in those reports were obtained, along with reference area data measured in the 2015-2016 RAEMP cycle (this study) to define reference area normal ranges. The normal ranges were calculated as the 2.5th and 97.5th percentiles of the reference area distribution after the outlier evaluation, as described in Section 2.2.3. Concentrations of selenium in fish tissues were compared to normal ranges and to applicable site-specific benchmarks developed in the EVWQP (Table 2.3). NRQs and HQs were computed by dividing observed concentrations by the upper normal range limit and site-specific benchmark, respectively. The maximum NRQ and HQ among replicate fish in a sampling area were reported in summary tables and figures.

The 97.5th percentiles of WCT muscle selenium were compared between lentic and lotic reference areas sampled between 1998 and 2012. The 95% confidence intervals were determined for the 97.5th percentile of lentic and lotic areas, and any overlap of the confidence intervals indicated that the upper normal ranges are not significantly different ($\alpha = 0.05$).

WCT muscle selenium concentrations measured in 2015 were also compared to WCT ovary selenium predictions derived from water modelling (Golder 2014a,b) and tissue selenium bioaccumulation models developed for the EVWQP (Teck 2014). The ovary selenium predictions were converted into predicted muscle selenium concentrations based on the muscle-to-ovary selenium relationship identified by Nautilus and Interior Reforestation (2011):

Muscle Se = (Egg Se/1.6862)^1.0199

A temporal analysis of fish tissue selenium concentrations was conducted for each species using ANOVA or a Kruskal-Wallis test. Due to differences in sampling months and a limited

reference data set, linear contrasts and comparisons to reference temporal changes were not conducted. The *post hoc* tests for the ANOVA and Kruskal-Wallis test comparisons were conducted among all sampling periods using Tukey's HSD method (ANOVA) or Dunn's tests (Kruskal-Wallis) using $\alpha = 0.05$.

2.10 Integrated Data Evaluation

2.10.1 Addressing Key Questions within the RAEMP

Monitoring results for the various types of samples described in Sections 2.2 to 2.9 were compiled into summary tables to support integrated evaluation of results within each MU relative to the key questions specified in the RAEMP study design (Minnow 2015a):

1. What are the mine-related chemical and physical changes to aquatic ecosystems and where do they occur?
2. Are mine-related chemical and physical changes to the aquatic environment resulting in unacceptable biological effects and where do they occur?
3. What are the specific mine-related sources of any unacceptable changes to chemical, physical, or biological conditions?
4. How are chemical, physical, and biological conditions changing over time?
5. What are the consequences of observed biological effects to the aquatic ecosystem?
6. Are the mine-related chemical and physical changes and/or biological effects impacting water and aquatic ecosystem uses?

To facilitate evaluation of the data matrix, results were tabulated and colour-coded to represent categories of "good", "marginal", and "poor" environmental quality as defined in Tables 2.6 to 2.8. These categories are reflected in data tables presented throughout this report.

Key Question #1 (mine-related chemical and physical changes) was addressed by computing normal range quotients (NRQs) for:

- water quality, calcite, and tissue selenium concentrations in lotic areas, and
- water quality, sediment quality, and tissue selenium concentrations in lentic areas.

Data for local and regional reference areas were used to approximate pre-mining conditions. NRQs greater than 1.0 indicated monitoring areas having physical or chemical conditions outside of the normal range for reference areas, providing evidence of mine-related changes.

Table 2.6: Categories for Classifying Physical and Chemical Data Relative to Normal Ranges (NR)

Habitat Type	Sample Type	Measurement Endpoints	Data Source	Statistic Used to Compare to NR	Normal Range Values		Good (Well Within NR)	Marginal (Upper End of NR in direction of adverse effect)	Poor (Outside NR in direction of adverse effect)
Lotic	**Water**	Nitrate, Sulphate, Selenium	Samples collected concurrently with biological samples in 2015	Single concentration	See Appendix Tables C.14 - C.17		<0.7	0.7 to 1.0	>1.0
			Teck routine monitoring data for 2015	Monthly mean concentration			<0.7	0.7 to 1.0	>1.0
	Calcite	Calcite Index	Calcite measured at invertebrate community sampling areas of the RAEMP in 2015	Single value	1.0		<0.5 (80th percentile of reference areas)	0.5 to 1.0	>1.0
	Benthic Invertebrates	Abundance	Benthic Invertebrate sampling areas of the RAEMP in 2015	Single value	$P_{2.5}$ = 471	P_{20} = 832	>20th percentile of reference distribution	2.5th to 20th percentile of reference distribution	<2.5th percentile of reference distribution
		Total Richness (LPL)		Single value	$P_{2.5}$ = 21	P_{20} = 24			
		% EPT		Single value	$P_{2.5}$ = 38	P_{20} = 68			
		% Ephemeroptera		Single value	$P_{2.5}$ = 21	P_{20} = 37			
	Tissue	Selenium concentration in specific tissue type	Invertebrate and fish tissue selenium concentrations measured in the RAEMP in 2015	Maximum concentration	Benthic Invertebrates: 7.82 mg/kg dw		<0.7	0.7 to 1.0	>1.0
					Westslope cutthroat trout muscle: 5.98 mg/kg dw				
					Mountain whitefish muscle: 4.97 mg/kg dw				
					Mountain whitefish ovary: 34.7 mg/kg dw				
Lentic	**Water**	Nitrate, Sulphate, Selenium	Samples collected concurrently with biological samples in 2015	Single concentration	See Appendix Tables C.27		<0.7	0.7 to 1.0	>1.0
	Sediment	Selenium, PAH (PAH with highest quotient)	Sediment samples collected in the RAEMP in 2015 (or 2013 if not sampled in 2015)	Maximum concentration	See Appendix Tables E.8 and E.10, E.12		<0.7	0.7 to 1.0	>1.0
	Tissue	Concentration in specific tissue type	Invertebrate and fish tissue selenium concentrations measured in the RAEMP in 2015	Maximum concentration	Benthic Invertebrates: 7.82 mg/kg dw		<0.7	0.7 to 1.0	>1.0
					Longnose sucker muscle: 6.09 mg/kg dw		<0.7	0.7 to 1.0	>1.0
					Longnose sucker ovary: 6.41 mg/kg dw		<0.7	0.7 to 1.0	>1.0

Table 2.7: Categories for Classifying Data used as Direct or Indirect Indicators of Effects

Habitat Type	Sample Type	Measurement Endpoints	Data Source	Statistic Used to Compare to Benchmark	Benchmark	Good	Marginal	Poor
Lotic	**Water**	Nitrate, Sulphate, Selenium	Samples collected concurrently with biological samples in 2015	Single concentration	See Appendix Tables C.23 - C.26	<0.7	0.7 to 1.0	>1.0
			Teck routine monitoring data for 2015	Monthly mean concentration		<0.7	0.7 to 1.0	>1.0
	Acute Toxicity	Rainbow trout and *Daphnia magna* % Mortality	Teck routine monitoring data for 2015	Maximum percent mortality observed for all tests conducted in 2015	Percent Mortality > 20%	0% to 10%	10% to 20%	>20%
	Chronic Toxicity	Rainbow trout embryo viability, *C. dubia* reproduction, *P. subcapitata* Cell Yield, *Hyalella azteca* dry weight	Teck data from chronic toxicity testing program	Lowest quarterly mean that is (in order of priority): significantly different from both reference area samples, different from one reference area sample, or did not differ from the reference area(s).	Fording River Reference and Elk River Reference	Not significantly different from both reference areas	Significantly different from one reference area	Significantly different from both reference areas
	Calcite	Calcite Index	Calcite measured at invertebrate community sampling areas of the RAEMP in 2015	HQ Single value	1.0	<0.5 (80th percentile of reference areas)	0.5 to 1.0	>1.0
	Benthic Invertebrates	Abundance	Benthic Invertebrate sampling areas of the RAEMP in 2015	Single value	$P_{2.5}$ = 1,005 / P_{20} = 3,510	>20th percentile of reference distribution	2.5th to 20th percentile of reference distribution	<2.5th percentile of reference distribution
		Total Richness (LPL)		Single value	$P_{2.5}$ = 20 / P_{20} = 25			
		%EPT		Single value	$P_{2.5}$ = 63.0 / P_{20} = 76.6			
		%Ephemeroptera		Single value	$P_{2.5}$ = 21.3 / P_{20} = 36.9			
	Tissue	Selenium concentration in specific tissue type	Invertebrate and fish tissue selenium concentrations measured in the RAEMP in 2015	HQ Maximum concentration	Benthic Invertebrates: 13 mg/kg dw	<0.7	0.7 to 1.0	>1.0
					Westslope cutthroat trout muscle: 15.5 mg/kg dw[a]			
					Mountain whitefish ovary: 29.3 mg/kg dw			
Lentic	**Water**	Nitrate, Sulphate, Selenium	Samples collected concurrently with biological samples in 2015	HQ Single concentration	See Appendix Tables C.27	<0.7	0.7 to 1.0	>1.0
	Sediment	Selenium, PAH (PAH with highest quotient)	Sediment samples collected in the RAEMP in 2015 (or 2013 if not sampled in 2015)	HQ Maximum concentration	See Appendix Tables E.9 and E.11, E.12	<0.7	0.7 to 1.0	>1.0
	Sediment Toxicity	Survival, weight, and biomass for *Hexagenia* spp. 21-day test and *Hyalella azteca* 14-day test	2015 sediment toxicity data	Mean relative to reference	FLA1, LCHO, and LML reference sediments	No toxicity observed = none of the six endpoints show a significant difference from any two reference sediments	-	Toxicity observed = at least two of the six endpoints show a significant difference from at least two reference sediments
	Tissue	Selenium Concentration in specific tissue type	Invertebrate and fish tissue selenium concentrations measured in the RAEMP in 2015	HQ Maximum concentration	Benthic Invertebrates: 13 mg/kg dw	<0.7	0.7 to 1.0	>1.0
					Longnose sucker ovary: 18 mg/kg dw			
	Longnose Sucker	Condition	Fish health survey conducted in May 2015 for the RAEMP	Adjusted mean[c] compared to adjusted means for two reference areas[b] Magnitude expressed as a percentage relative to reference	5.57 and 6.11 g	p-value > 0.1 or p-value < 0.1 and magnitude < 7%	p-value < 0.1 and magnitude of 7-10%	p-value < 0.1 and magnitude >10%

Note: 'NA' - not applicable; BI = benthic invertebrate; WCT = westslope cutthroat trout; MW = mountain whitefish; LSU = longnose sucker

[a] muscle equivalent benchmark based on ovary EC10

[b] the percentage with the smallest magnitude was carried forward to the summary table

[c] adjusted to a fork length of 8.19 cm

Table 2.8: Categories for Classifying Temporal Changes for RAEMP Data

Habitat Type	Data Type	Endpoints	Data Source	Approach	Good (no change or change in favorable direction)	Marginal	Poor (statistically significant change in unfavorable direction)
Lotic	**Water**	Nitrate, Sulphate, Selenium	Teck's routine monitoring data 2012 to 2016	Seasonal Kendall test on monthly means	negative slope	NA	p-value < 0.1 and positive slope
	Benthic Invertebrates	Abundance	Benthic invertebrate sampling areas 2012 -2015	Paired t-test between 2012 and 2015 within a MU	2015 mean > 2012 mean	NA	p-value < 0.1 and 2015 mean < 2012 mean
		Total Richness (LPL)					
		%EPT		Linear regression on year by sampling area	positive slope	NA	p-value < 0.1 and negative slope
		%Ephemeroptera					
	Tissue	Selenium concentration in specific species and tissue type	Benthic invertebrate and fish tissue selenium from regional monitoring 2006 - 2015	Linear regression of selenium concentration on year	negative slope	NA	p-value < 0.1 and positive slope
Lentic	**Sediment**	Selenium, PAH (PAH with highest quotient)	Sediment samples collected in the RAEMP in 2013 and 2015	Paired t-test by station	2015 mean > 2012 mean	NA	p-value < 0.1 and 2015 mean < 2013 mean
	Tissue	Selenium concentration in specific tissue type	Invertebrate and fish tissue selenium from regional monitoring 2006 - 2015	Linear regression of selenium concentration on year	negative slope	NA	p-value < 0.1 and positive slope
	Longnose Sucker	Condition	2015 RAEMP data compared to 2005 or 2013 data	Analysis of covariance on adjusted body weight relative to fork length	increasing or no significant change	NA	significant (p-value <0.1) decrease

Note: 'NA' - not applicable

These areas were highlighted in pink ("poor") in summary tables presented in Section 12. The "marginal" (yellow) category was generally defined as values near the outer limit of the normal range (e.g., NRQs of 0.7 to 1.0), except in the case of calcite for which the "marginal" category was defined as a calcite index of 0.5 (the calcite target specified in the EVWQP and Permit 107517) to 1.0 (Table 2.4). Areas with chemical or physical values well within the reference area normal range were highlighted in green ("good") (e.g., NRQs < 0.7), except in the case of calcite for which the "good" category was defined as calcite index of < 0.5. Concentrations were also discussed relative to predictions made in the EVWQP to identify any locations where conditions were outside of the expected range (i.e., for water quality and for selenium concentrations in benthic invertebrates and cutthroat trout).

Biological effects referred to in Key Question #2 were identified primarily through evaluation of benthic invertebrate community endpoints for lotic main stem and tributary areas were evaluated relative to normal reference area ranges for each endpoint. This was supported by other lines of evidence, such as HQs water quality, calcite index, and tissue selenium concentrations in a weight of evidence approach to assess if benthic invertebrate responses were potentially mine-related (e.g., Are areas with evidence of effects to benthic invertebrate communities associated with aqueous nitrate, aqueous or tissue selenium, or aqueous sulphate concentrations above site-specific effect benchmarks?). Periphyton productivity and community data were not included in the integrated evaluation because the evaluation presented in Section 7 concluded that results for these endpoints are strongly confounded by influences other than mining, and that mining has not affected productivity through increases of the limiting nutrient, phosphorus. Results of the upper Fording River WCT study (Cope et al. 2016) were also considered in the interpretation of mine-related effects. Longnose sucker condition was included as an indicator of potential mine-related effects in lentic areas within applicable MUs, along with evaluation of water and sediment quality and tissue selenium data in the same areas.

Key Question #3 (identification of mine sources) was addressed, to the extent possible based on existing information, as part of the evaluation associated with Key Questions #1 and #2 (locations of chemical and physical changes and observed or potential biological effects, respectively). This occurred by identifying and interpreting spatial patterns for data within each MU as part of the weight of evidence for determining if observed effects may be mine-related. For example, a large increase in NRQs and HQs for mine-related substances between two water monitoring stations on a main stem receiver would corroborate a conclusion that observed biological effects at the downstream area may be mine-related and would also suggest that mining activities or discharges located between the two main stem stations are likely sources. Historical evaluations of mine-related constituent loads were referenced to, where applicable, as further evidence of the locations of key sources of mine-related stressors.

The concept of whether or not mine-related effects or changes are “unacceptable”, which is a component of Key Questions #2 and #3, relates to societal judgements about aquatic ecosystem health, which are discussed in Section 2.10.2.

Temporal analyses were completed for abiotic endpoints to identify how conditions have been changing over time (Key Question #4). Results were expressed as percent magnitude of change per unit of time.

Key Question #5 (aquatic ecosystem consequences) considers the spatial scale of mine-related effects to contribute to the weight of evidence in evaluating if observed biological effects are of potential concern for aquatic ecosystem health at a management unit scale. However, like the portion of Key Question #2 that refers to “unacceptable” biological effects, Key Question #5 cannot be addressed solely by science and will involve societal value judgements about the type, spatial scale, and rate of mine-related changes that are considered important enough to warrant management action. This is the point at which the RAEMP and other monitoring programs link to the AMP, which is discussed further in Section 2.10.2.

The RAEMP also gathers information that contributes to addressing Key Question #6 (Effects on Water or Ecosystem Uses). Guidelines have been developed in BC pertaining to a variety of potential water uses including source drinking water, aquatic life, agriculture, recreation and aesthetics, and industrial water supply (BCMOE 2017a,b). The RAEMP focuses mainly on evaluation of potential mine-related effects on aquatic life. Other monitoring programs by Teck evaluate potential effects of mining on human uses of water. For example, Teck monitors, evaluates, and reports on groundwater quality related to potable water use and screens groundwater against the various receptor/use guidelines (Permit 107517, Sections 7.8 and 9.2). Teck has also conducted a human health risk assessment (Permit 107517, Section 9.9), which incorporated fish tissue data collected in the RAEMP to evaluate potential risks to human consumers.

Based on the above, the integrated interpretation for each MU (in Section 12) was first organized into three sections:

- identifying where mine-related chemical and physical changes have occurred, as well as mine-related sources (Key Question #1 and #3);
- identifying where biological effects have occurred and assessing if they are mine-related (Key Questions #2, #3, and #5); and
- identifying changes over time (Key Question #4).

Once each MU was organized into the three section above, further integrated evaluation of the RAEMP results for each MU was completed as summarized in Section 2.10.2 below.

2.10.2 Data Evaluation Steps

The overarching purpose of data from the RAEMP is to evaluate the state of the aquatic ecosystem from a biological, water quality and physical habitat perspective, to help determine if the goal of the EVWQP to protect aquatic ecosystem health is being met, and to identify areas of concern and uncertainty. Through evaluation of the status, changes, and uncertainties in chemical, physical, and biological conditions, the RAEMP also plays an important role in supporting adaptive management.

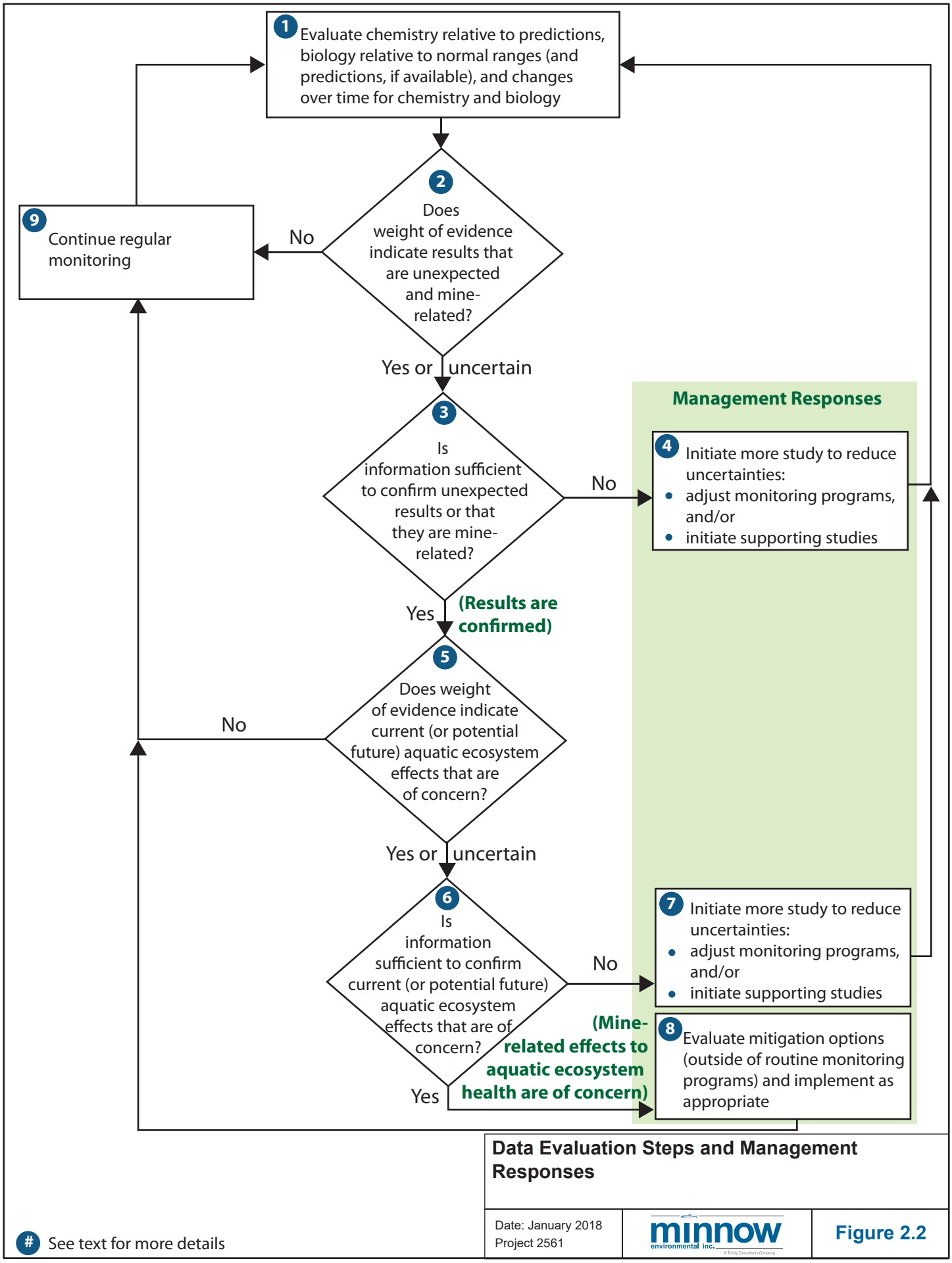
As noted in Section 1.4, ecosystem health is not an objective scientific concept and instead is defined by societal values and goals. The implication of this is that the RAEMP, and other monitoring programs managed by Teck, measure and report on the condition of various ecosystem attributes to the extent supportable by current scientific methods and understanding, but final determination of acceptability of existing conditions or the need for mitigation is based on judgements made by Teck with input from the EMC as part of the adaptive management process, with the final decision resting with the ENV. Thus, the monitoring program reports will identify the magnitude and spatial extent of mine-related effects, and identify the source(s) of mine-related stressor(s) to the degree possible based on available information. Based on the results, Teck will work through the Adaptive Management Plan response framework (Teck 2016b) to investigate and confirm results, and based on that investigation, determine if adjustments to mitigation, monitoring, or evaluation required. Teck is currently working with the EMC to develop triggers for management responses based on biological monitoring data.

Within the context described above, the general steps for evaluation of data within the RAEMP, including links to management responses, are outlined in Figure 2.2. Data evaluation steps corresponding with the numbers in blue circles in Figure 2.2, are described in more detail below.

Step 1 in Figure 2.2 refers to the evaluation steps described in Section 2.10.1 (addressing key RAEMP questions), which are a routine part of RAEMP (and LAEMP) reporting. In particular, this will include:

- Comparing water and tissue chemistry results to predictions made in the EVWQP[10] and/or Environmental Assessments (EAs) for mine expansion;

[10] Evaluation of observed to predicted water quality is done by Teck as a reporting requirement to the Ministry of Energy and Mines separate from Permit 107517 (e.g., Golder 2017a). RAEMP reports will include a summary of results, as applicable. The RAEMP will also compare observed tissue selenium concentrations to predictions made in the EVWQP.



Data Evaluation Steps and Management Responses

See text for more details

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Figure 2.2

- identifying zones within the watershed where mining influence is evident by comparing water and sediment chemical concentrations, and calcite index values to reference area normal ranges and past observations for the same area;
- comparing biological endpoints to reference area normal ranges (and predictions, if available) and comparing chemistry data to relevant effect benchmark, to identify potential mine-related effects; and
- comparing recent monitoring results to historical data to evaluate changes over time.

Step 2 in the data evaluation process is to identify unexpected results or data patterns. The word "unexpected" is used to highlight that different expectations exist in different parts of the watershed depending on the stage of mine development, trends that were predicted in the EVWQP or approved EAs, and/or the stage of local or upstream mitigation or habitat enhancement actions. For example, streams that have been permanently altered by historical mining are not expected to reflect conditions associated with undisturbed reference areas. In other areas, particularly in main stems, biological communities are expected to have characteristics typical of reference areas. Expectations for temporal patterns also differ. For example, changes in a positive (good) direction may be expected in areas near or downstream from locations where remediation is implemented[11] Generally, changes in a negative (bad) direction are not expected unless articulated in the EVWQP (e.g., temporary increase in concentrations of nitrate or selenium in water until treatment can be implemented) or an approved EA (concentrations of mine-related constituents in water may be expected to increase in certain tributaries as mining progresses). Other unexpected patterns would include water or tissue selenium concentrations that are outside of predicted ranges, or degrading trends in benthic invertebrate community endpoints even if values are still within normal reference area ranges.

Step #3 in Figure 2.2 involves investigation of unexpected results to determine if they are mine-related. This considers factors such as whether there has been a change to mine operations over a relevant time frame that could explain the response. The evaluation also explores potential relationships (e.g., temporal and/or spatial correlations) between specific mine-related stressors and biological responses to investigate if mine-related stressors are at levels that could explain the unexpected biological response (e.g., above guidelines or benchmarks for effects to aquatic life). This evaluation step is also a standard part of RAEMP or LAEMP

[11] For example, commissioning of active water treatment to meet commitments in the EVWQP, fish habitat creation, or enhancement as part of the Regional Fish and Fish Habitat Program, and/or rehabilitation under the Tributary Management Program.

reporting, to the extent supportable, based on existing information. Typically the draft results are presented to and discussed with the EMC before the report is completed, so the EMC has input the data assessment, as well as the scope and timing of follow up actions.

It may be decided that more study is needed to confirm unexpected results or verify if they are mine-related. This may occur because multiple potential factors may explain or contribute to the observed response, because certain information is lacking, or because available data are ambiguous (e.g., weak signal of effect, conflicting lines of evidence). This will require a management response aimed at addressing the uncertainties by adjusting the scope, sampling frequency, sampling intensity, or timing of sampling within regular monitoring programs, or by initiating a targeted one-time supporting study (Step #4 in Figure 2.2). As with regular monitoring, the study design and draft results, along with any management responses that have already been planned or undertaken by Teck, would be discussed with the EMC.

Step #5 in Figure 2.2 occurs when mine-related effects have been (at least largely) confirmed and the evaluation begins to incorporate judgements by Teck and the EMC about the implications to aquatic ecosystem health. Step #6 reflects that some questions or uncertainties may still remain, which would necessitate further study (Step #7). The design and results of new studies will continue to be promptly discussed with the EMC and input will be incorporated into reports. In reality, Steps #3-6 are not distinct steps but instead represent a continuum of increasing evidence that unexpected effects are occurring that are mine-related and warrant investigation or mitigation. As uncertainties are resolved, and if evidence continues to push towards Step #6, efforts related to evaluation of mitigation options will escalate (Step #8).

Regular monitoring or supporting studies may provide evidence to conclude that effects are not occurring, are not mine-related, or are not of sufficient concern to warrant further management responses (i.e., “No” answer at question Steps #2 or #5). In such cases, and also while other management responses are triggered (Steps #4, #7, or #8), Teck will continue with regular monitoring.

Thus the intention of each RAEMP (and LAEMP) reporting cycle is to identify if conditions are consistent with expectations and, if not, to determine if unexpected changes are mine-related (to the extent supportable by existing information). It may take several cycles of RAEMP (or LAEMP) monitoring to move through the steps summarized in Figure 2.2 and resolve uncertainties about specific observations that have warranted more study, whereas other observations will not trigger additional investigation and will continue to be monitored according to the scope and schedule of the approved study design. Through Teck’s internal adaptive management plan process, and through discussion with the EMC, management responses will be initiated as appropriate.

The type, degree, and spatial extent of observed effects in LAEMPs and the RAEMP will be presented and discussed as described above within the existing regulatory process. In some cases, further discussion may be required with the EMC, outside of the RAEMP and within the context of Teck's AMP, about the acceptability of the observed effects and potential need for mitigation. In other words, this RAEMP report aims to present and assess all of the relevant available monitoring data to determine if expected and unexpected mine-related effects are occurring in the watershed. This information will allow Teck, in consultation with the EMC to decide if observed type(s), degree(s), and spatial extent(s) of effects are "acceptable" or warrant mitigation. Teck will continue to work with the EMC to develop a more formalized approach for evaluating monitoring data using a weight of evidence approach and to develop triggers for management responses based on biological monitoring data.

3 WATER QUALITY

3.1 Overview

Water quality is routinely monitored by Teck at stations distributed throughout the watershed, as required by Permit 107517 and to support management decisions. The data are reported annually (e.g., Teck 2016a, 2017a). Water quality samples were also collected in September 2015 as part of the RAEMP at all lotic areas where periphyton and benthic invertebrate community samples were collected, which included some areas that are not routinely monitored by Teck. In addition, water samples were collected in lentic areas in August 2015, which are not routinely monitored by Teck, where sediment or biological samples were collected.

Figures 3.1 and 3.2 show Teck's water monitoring locations. Maps of areas where water samples were collected for the RAEMP are presented in subsequent sections of this report.

In addition to regular monitoring and reporting of water quality data, Teck has been working with the EMC to evaluate the water quality data for the purpose of identifying values to serve as early warning of potential future, undesirable trends or conditions (i.e., "early warning triggers"). The analysis of water quality data for this purpose has taken place in parallel with the water quality data evaluation presented in this report. Potential differences in methods and/or conclusions that emerge from these parallel processes will be evaluated and discussed with the EMC.

3.2 Flows

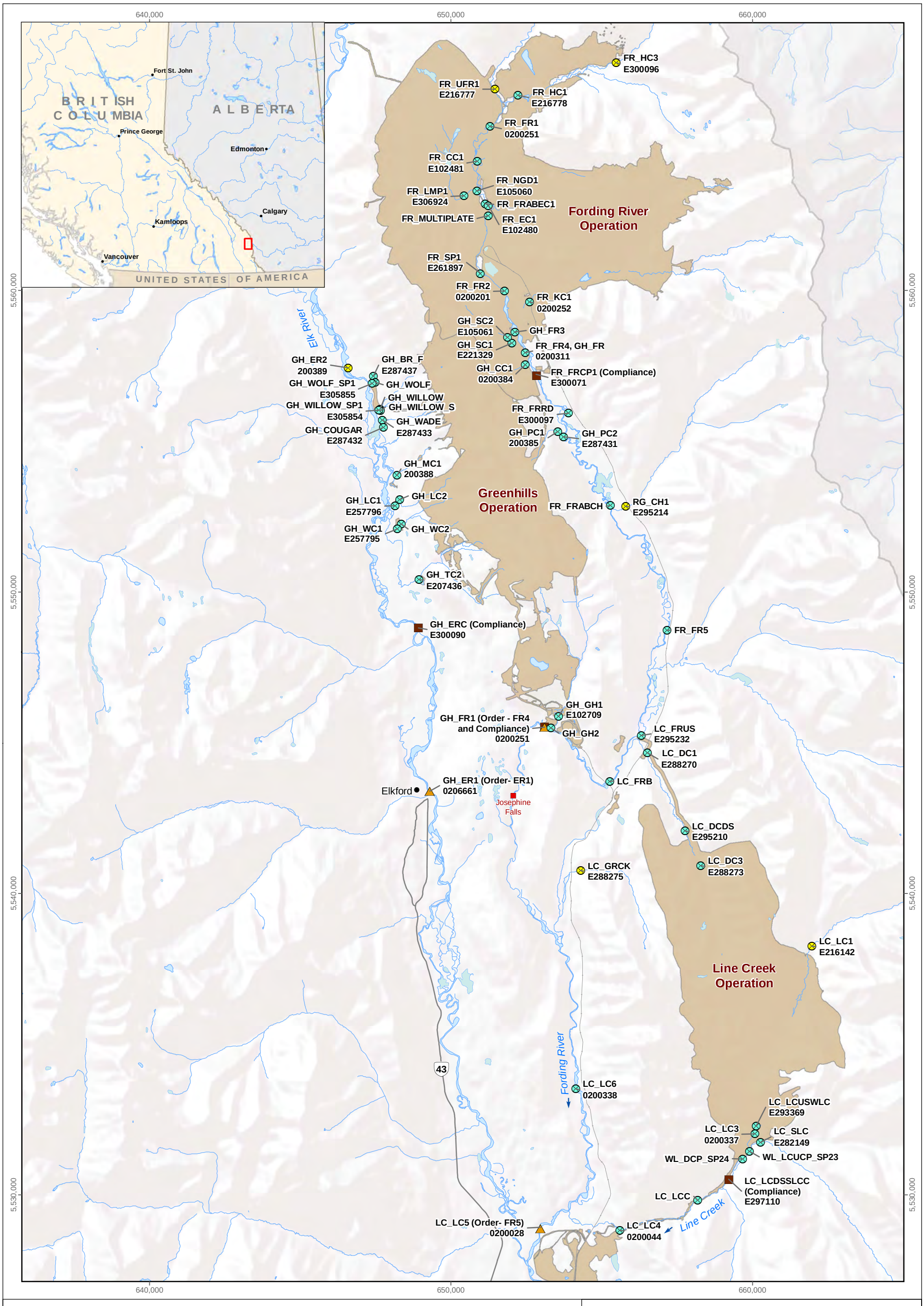
Water flows in the Elk River watershed vary annually, particularly during spring freshet, which typically begins in April and peaks in late June (Figure 3.3). After the freshet peak, flows gradually decline toward winter minima. Peak spring water flows in 2012 to 2014 exceeded 10-year averages, especially in 2013 when record flows were observed in mid-June. In 2015, peak freshet flows were near the average, but declined more quickly in June and July. In 2016, freshet flows began earlier and peaked at below-average levels.

3.3 General Water Quality Characteristics

3.3.1 Seasonal Patterns

Monthly mean concentrations of general water quality variables were plotted for representative stations in the Elk River, Fording River, and Michel Creek[12] to illustrate patterns in water quality.

[12] Two Order or Compliance stations were selected on each main stem stream that represented different elevations, stream sizes, and mining influences.



LEGEND

- Order Stations
- Compliance Stations

Teck Water Quality Station

- Mine-exposed
- Reference
- Teck Coal Mine Operation

Water Monitoring Stations in the Upper Elk River Watershed

0 2 4 8
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: February 2018
Project 2561

minnow environmental inc.

Figure 3.1

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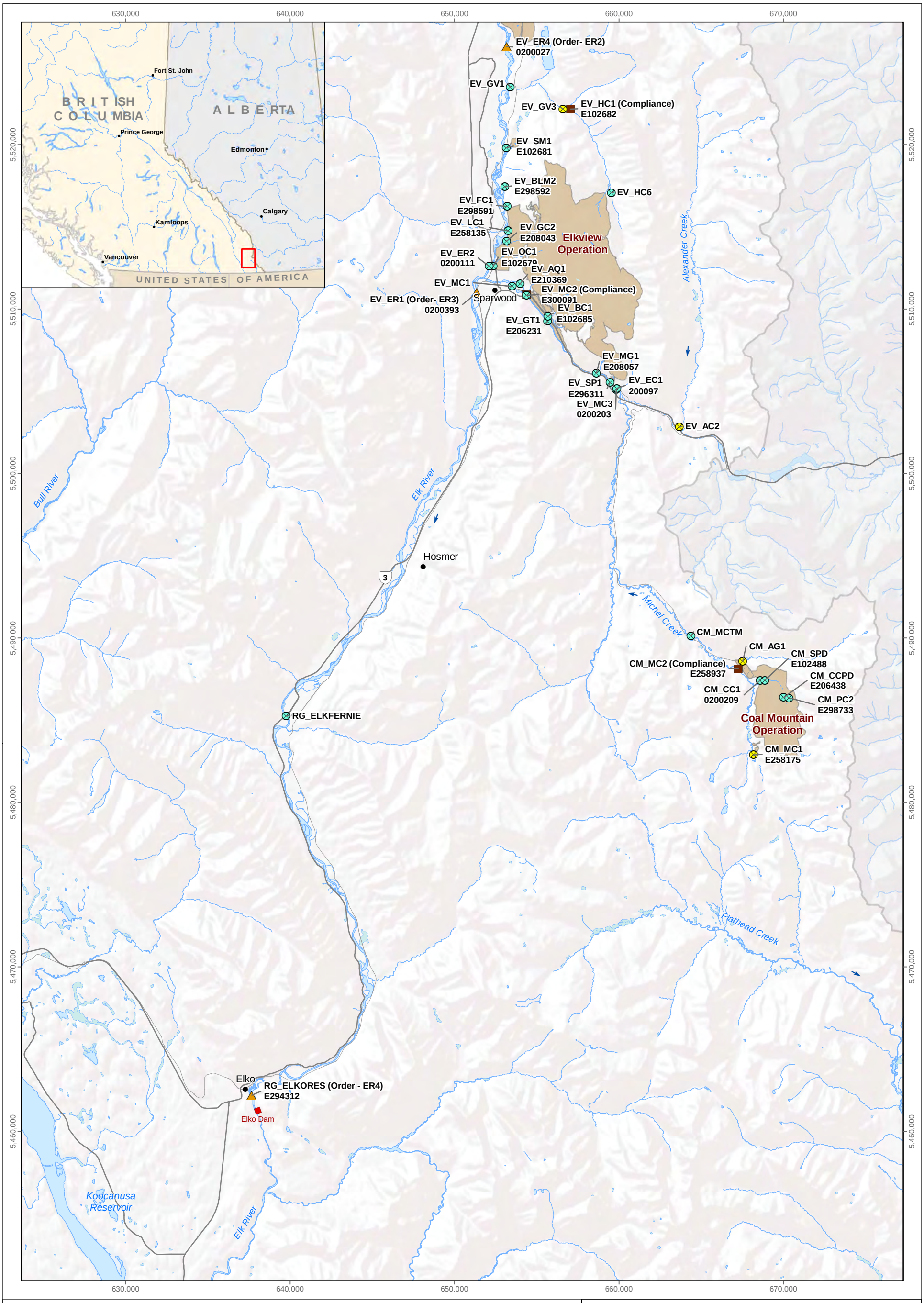

LEGEND

- Order Stations
- Compliance Stations

Teck Water Quality Station

- Mine-exposed
- Reference
- Teck Coal Mine Operation

Water Monitoring Stations in the Lower Elk River Watershed

0 3.5 7 14
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
Project 2561

minnow environmental inc.

Figure 3.2

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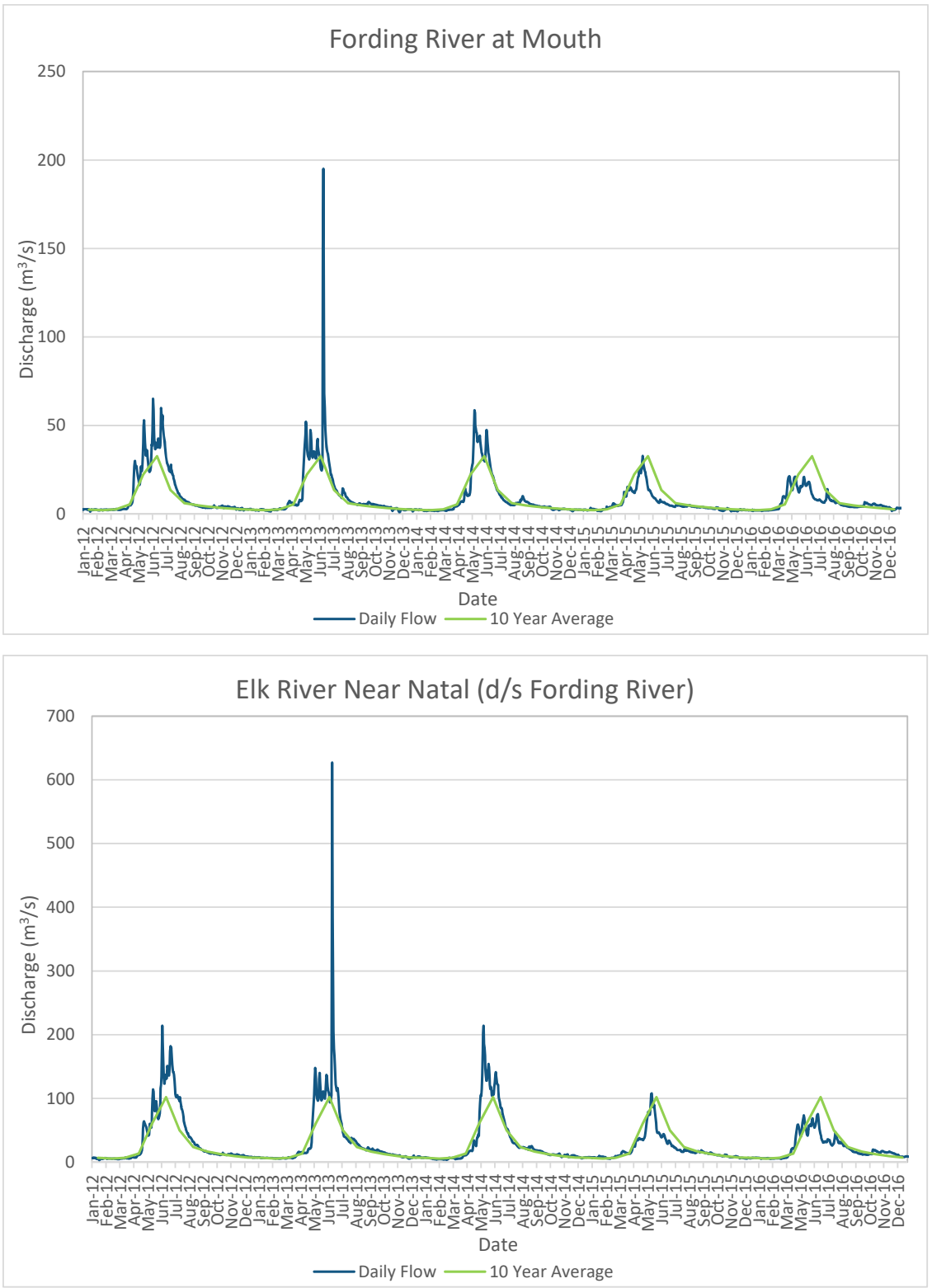


Figure 3.3: Flow Measurements at the Fording River (08NK018) and Elk River Near Natal (08NK016) Water Survey of Canada Stations from 2012 to 2016

Note: 10 year average calculated from 2006-2015 average monthly flows.

Aqueous pH is typically around eight and the water is well oxygenated (Figure 3.4). Water temperatures vary from winter lows near zero to summer highs of about 10 to 15 ºC. Total suspended solids (TSS) and turbidity concentrations are typically highest during spring freshet, but precipitation/melt events also cause periodic spikes in concentration.

Monthly mean concentrations of key mine-related constituents nitrate, selenium, and sulphate tend to be lowest in the upper Elk River and highest in the Fording River (Figure 3.5). Most stations show a similar seasonal pattern of lowest concentrations in winter and highest concentrations during spring freshet, although there is variability that may relate to periodic precipitation events.

3.3.2 Relationships Among Water Quality Variables

PCA was used to summarize water quality characteristics for reference and mine-exposed stations monitored in 2015 (n=1,395 samples). The first two Prinicipal Components explained 61.3% of the variability in the data set (Figure 3.6; Appendix Table C.3). Water quality characteristics were relatively similar among reference stations, as indicated by the tight cluster of green symbols in the upper left of the first panel in Figure 3.6. The spread of water quality data for samples from mine-exposed stations along PC-1 was associated with increasing concentrations of Order constituents (cadmium[13], nitrate, total selenium[14], and sulphate), as well as many other correlating analytes (bottom panel in Figure 3.6). The other variables correlating strongly with PC-1 (r>|0.6|) were substances that are also relatively soluble: total calcium, magnesium, nitrite, sodium, and potassium, as well as total and dissolved antimony, boron, calcium, chloride, lithium, magnesium, molybdenum, nickel, nitrite, potassium, strontium, and uranium (Appendix Table C.3). Alkalinity, conductivity, hardness, and total dissolved solids (TDS) concentrations were also strongly correlated with PC-1, and reflect concentrations of soluble constituents in water.

Separation of water sample results along PC-2 in the negative direction was associated with higher concentrations of TSS and turbidity (Figure 3.6), likely reflecting samples collected during high flow events such as spring freshet. Other variables associated with negative scores on PC-2 (aluminum, arsenic, iron, lead; Appendix Table C.3) tend to be related to particulates in the water column. Total organic carbon (TOC) and phosphorus were also associated with negative scores on PC-2 and likely reflect the mobilization of organic matter (e.g., microorganisms dislodged from periphyton, terrestrial plant detritus) during high flows.

[13] Correlation with PC-1 was stronger for total cadmium (r=0.62) than for dissolved cadmium (r=0.46).

[14] Also dissolved selenium.

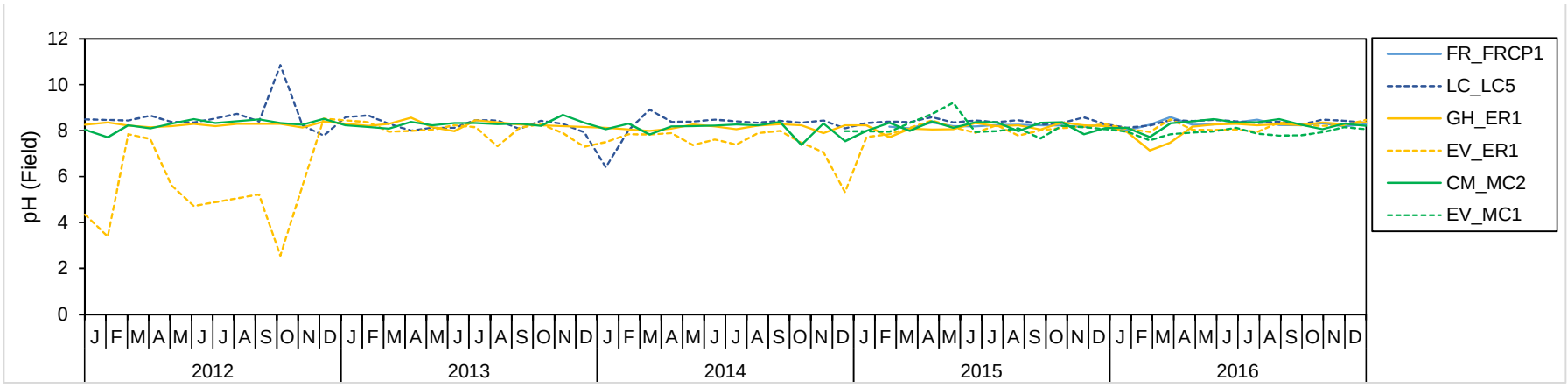


Figure 3.4: Time Series Plots for Monthly Mean Concentrations of General Water Quality Characteristics at Representative Mine-exposed Monitoring Stations on Main Stem Streams

Note: Blue = Fording River stations, Orange = Elk River stations, Green = Michel Creek stations. Values below the laboratory reporting limit (LRL) were substituted with the LRL.

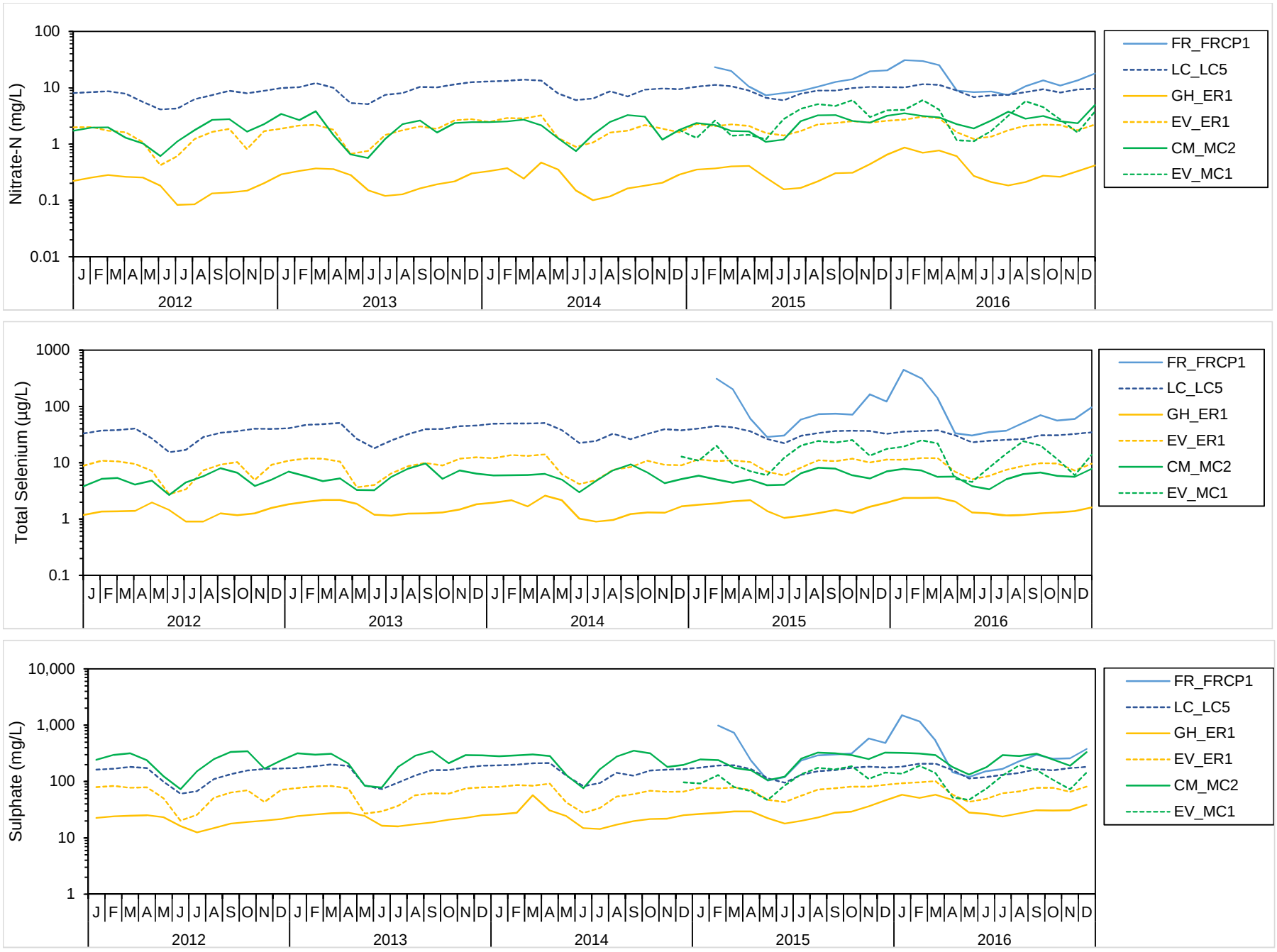


Figure 3.5: Time Series Plots for Monthly Mean Concentrations of Key Mine-related Constituents at Representative Mine-exposed Monitoring Stations on Main Stem Streams

Note: Blue = Fording River stations, Orange = Elk River stations, Green = Michel Creek stations. Values below the laboratory reporting limit (LRL) were substituted with the LRL.

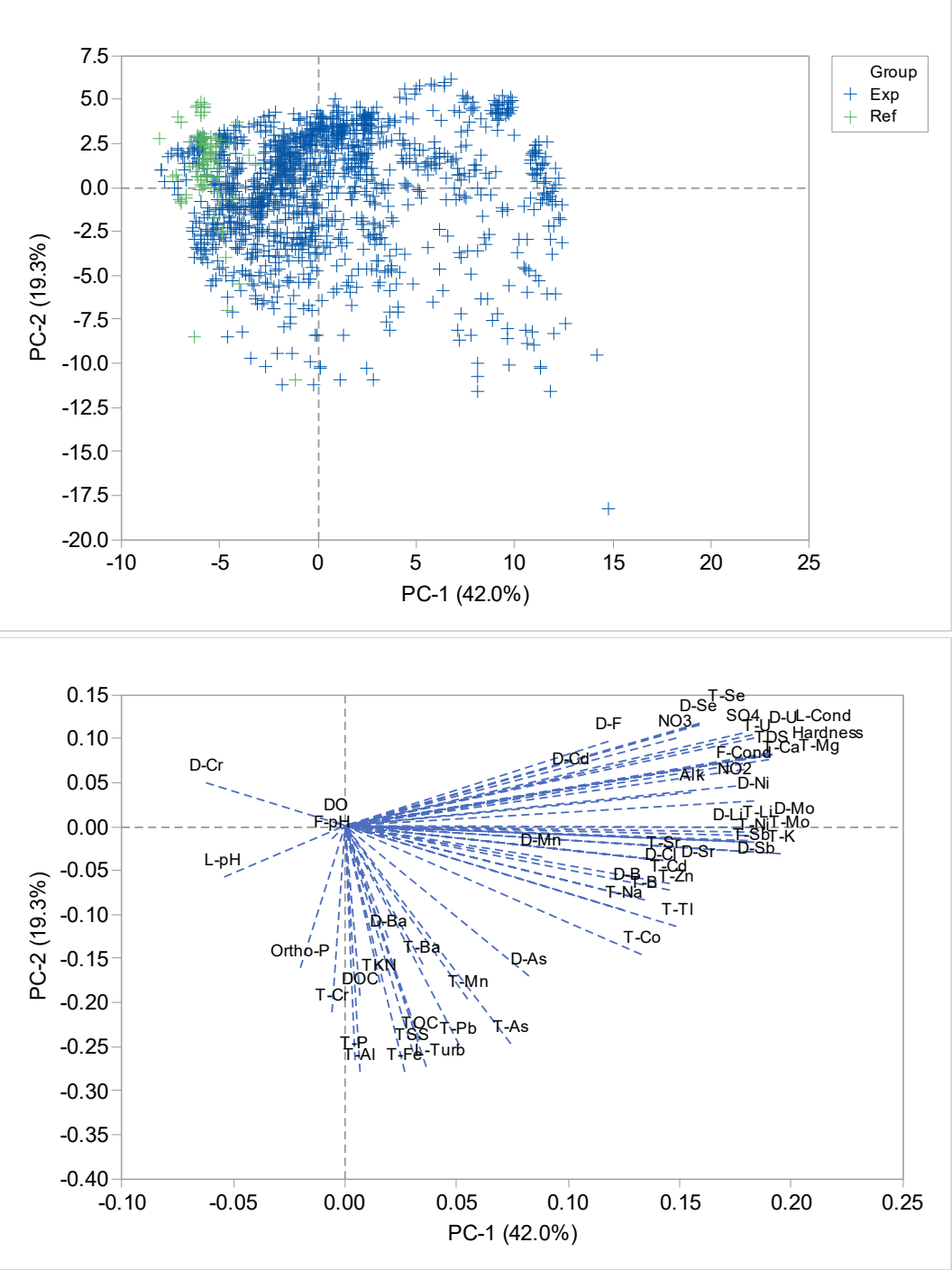


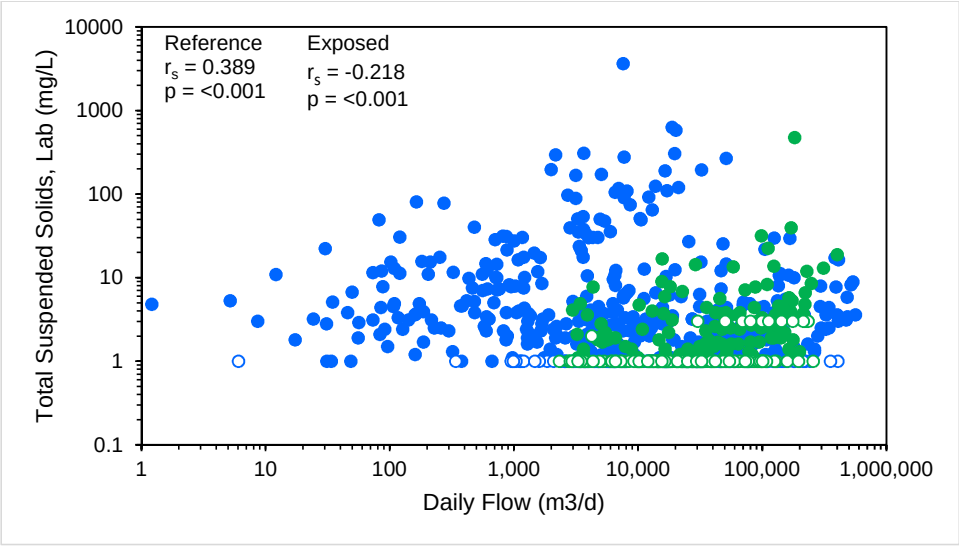
Figure 3.6: Scatterplot of PC-2 versus PC-1 from a PCA of Concentrations (log10-transformed) of Water Quality Constituents (Top Panel) and a Scatterplot of Weightings of each Water Quality Parameter to PC-2 and PC-1 (Bottom Panel) for 1,395 Samples Collected from Reference and Mine-exposed Stations in 2015

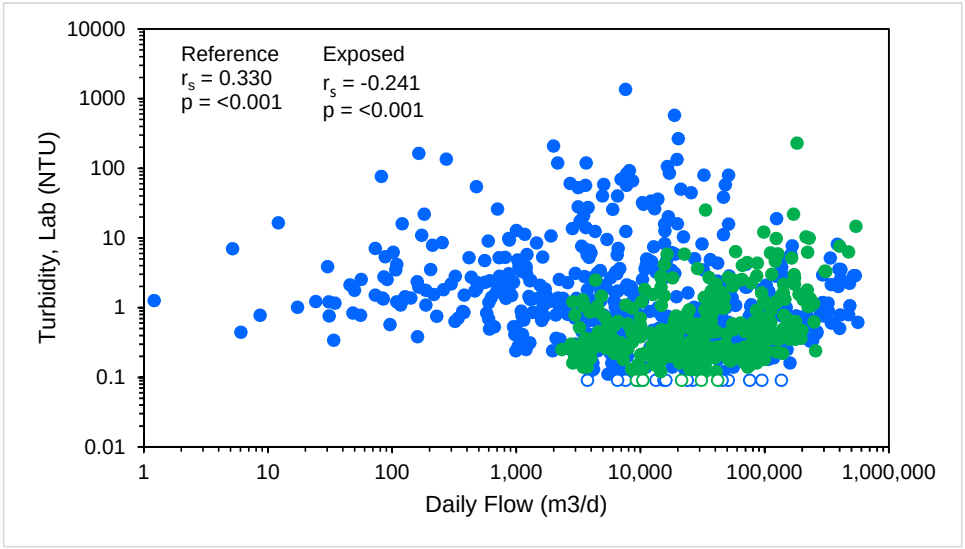
Notes: "L-" = lab measured; "F-" = field measured, "T-" = total; "D-" = dissolved

Further general evaluation of water quality data involved correlation analysis performed separately on data sets for reference versus mine-exposed stations monitored by Teck in 2015. Among mine-exposed stations, aqueous concentrations of key mine-related variables nitrate, selenium, and sulphate correlated strongly with each other, and with the other variables associated with PC-1 described above (conductivity, hardness, TDS, total calcium, magnesium, and potassium, dissolved antimony, and total and dissolved lithium, molybdenum, nickel, and uranium; Appendix Table C.4). Dissolved cadmium concentrations did not correlate strongly ($r<|0.5|$) with any water quality constituents other than total cadmium ($r=0.898$). Interestingly, a similar sub-set of analytes correlated amongst each other when only the reference stations were considered (e.g., conductivity, total and dissolved selenium, sulphate, total and dissolved uranium; Appendix Table C.5). This latter list of correlates may have been shorter than that for mine-exposed monitoring stations because at least 50% of reference station values for many of the other analytes associated with PC-1 were below detection and not included in the correlation. Turbidity, which correlated with PC-2 in Figure 3.6, was also correlated with total aluminum, iron, and manganese concentrations among reference stations. Therefore, the correlation analysis for separate reference and mine-exposed water quality data sets suggested that many of the water quality relationships observed among analytes in mine-exposed stations also occur naturally among reference stations, although concentrations are lower, on average, among reference stations.

PCAs for water samples collected in lotic and lentic areas concurrent with other RAEMP samples, each showed a similar water quality pattern to that described above for lotic stations monitored by Teck, with PC-1 predominantly reflecting soluble mine-related variables and PC-2 reflecting TSS, organic material, and metals that tend to adsorb to particulates (Appendix Figures C.1 and C.2 and Appendix Tables C.6 and C.7).

Data presented above indicated there is natural variation in concentrations associated with variations in water flows and particulate concentrations in water. These relationships were explored further using correlation analysis and data plots. Aqueous TSS and turbidity correlated only weakly with water flow ($p<0.001$, $r<|0.4|$), but correlated strongly with each other ($p<0.001$; $r>0.6$) when data were combined for reference versus mine-exposed monitoring stations in 2015 (Figure 3.7; Appendix Tables C.8 and C.9). Strong negative correlations with water flow ($p<0.001$; $r>|0.6|$) were observed for concentrations of alkalinity, as well as total and dissolved lithium, molybdenum, and strontium among reference station samples (Appendix Table C.8), but specific conductivity and dissolved organic carbon were the only constituents that correlated strongly with water flow ($p<0.001$; $r>|0.6|$) among samples collected at mine-exposed stations (Appendix Table C.9).





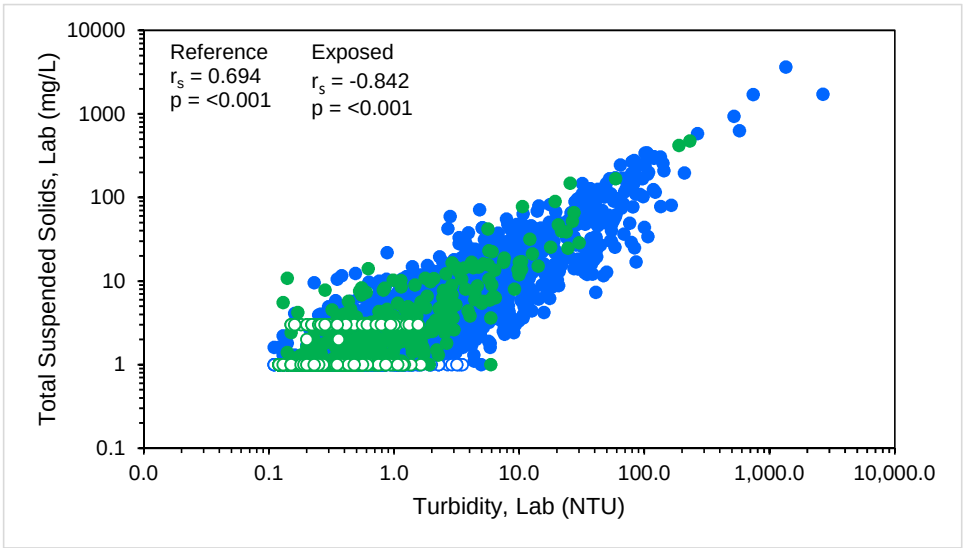


Figure 3.7: Relationships between Total Suspended Solids, Turbidity, and Flow Rates Among Samples Collected at Reference and Mine-exposed Stations in 2015

Stronger relationships between water quality and flow were observed when data were evaluated for individual reference stations (Figure 3.8). However, the relationships differed among reference stations, even those in close proximity (e.g., FR_HC3 [Upstream Henretta] versus FR_UFR1 [Upstream Fording]) or in the same sub-watershed (e.g., first five sets of panels in Figure 3.8 are all tributaries to the Fording River; note differences in x- and y-axis scales among stations). These natural differences among tributaries account for the relatively weaker correlations between flow and TSS or turbidity when data for multiple reference areas were combined (Appendix Table C.8). Natural differences in the relationships between water quality and flow among reference tributaries, even those in close proximity, suggest that prior to mining, water quality along each main stem stream (Elk River, Fording River, or Michel Creek) may have varied naturally from the respective upstream headwaters due to tributary inputs. This makes it challenging to define the water quality that may have existed at any given place in the watershed prior to mining.

3.4 Defining Upper Limit of the Normal Range

Results of the water quality evaluation in Section 3.3 indicated that concentrations of some water quality variables are related to water flow (Appendix Tables C.8 and C.9). The EMC had suggested potential use of flow as a covariate to adjust normal ranges for water quality. Although flow is measured in all mine-exposed tributaries, it is monitored at only a few reference tributaries and some mine-exposed main stem stations, which hampers development and application of flow-adjusted normal ranges for water quality evaluation. Also, there were weak or no relationships between water flow and the concentrations of most constituents among mine-exposed stations (Appendix Table C.9). Therefore, normal ranges for water quality constituents were not directly adjusted for flows. However, normal ranges for each constituent were defined for each month, as described below, which indirectly adjusted for natural seasonal variations in flow.

Results in Section 3.3 suggested that pre-mining water quality along main stem streams may have differed from water quality in the headwaters of the same stream because of variation in natural inputs from tributaries situated in between. This means that water quality at a single upstream reference station is not necessarily a better indicator of “expected” (i.e., normal, non-mine-influenced) concentrations farther downstream than is the water quality at other reference streams in the watershed. Also, multiple reference tributaries are monitored in some portions of the watershed (e.g., upstream Fording, Henretta, Chauncey, Line, South Line, and Grace Creek associated with the Fording River in MUs 1 and 2), whereas only a single main stem reference area is measured in MU3 (upstream Elk River). This also makes it challenging to define “normal” water quality for any given mine-exposed monitoring station in the watershed. Based

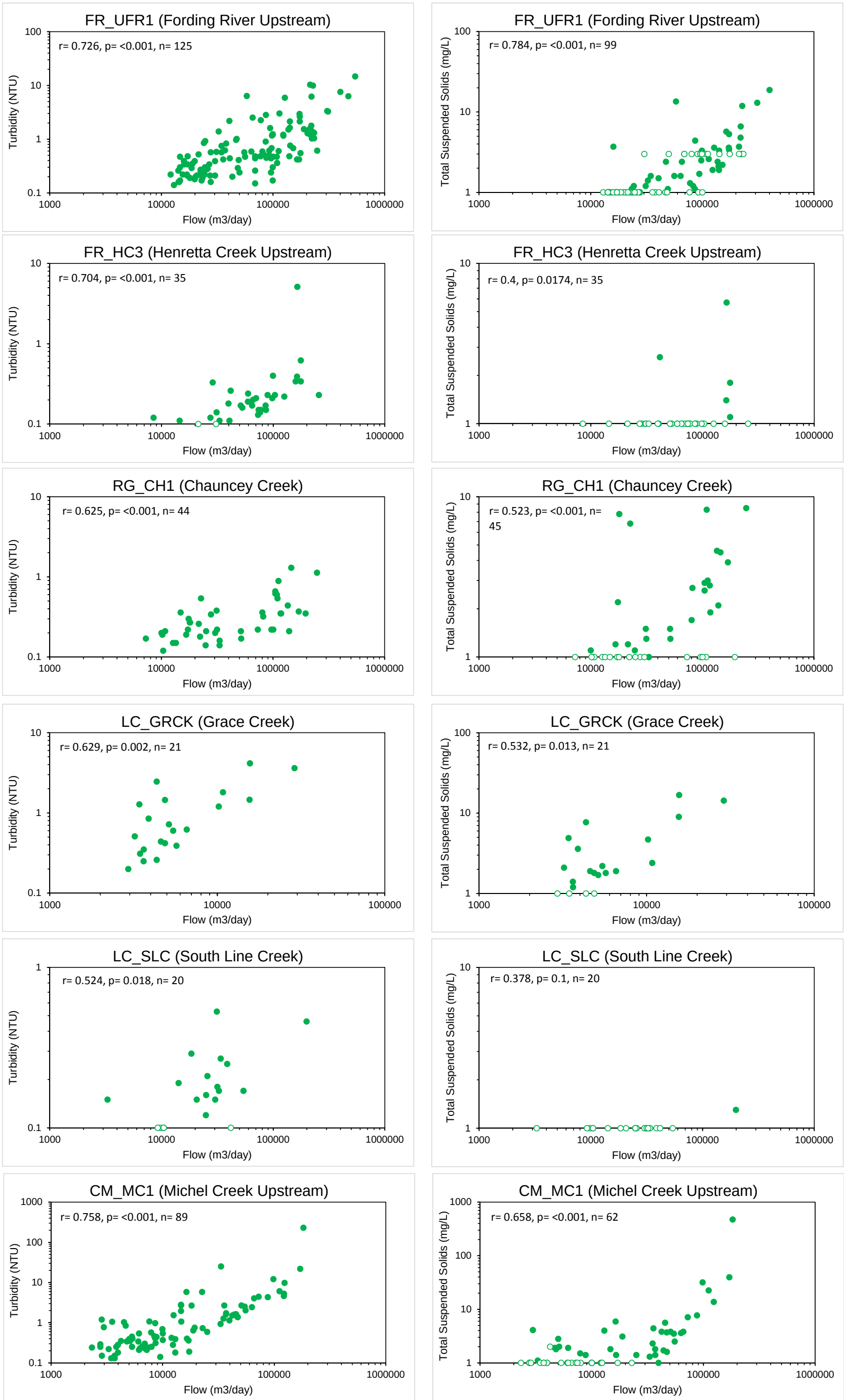


Figure 3.8: Flow versus Total Suspended Solids or Turbidity at Reference Stations where Significant Spearman Correlations ($p < 0.05$) were Observed

Notes: Axis scales vary among panels. Open symbols indicate data below the laboratory reporting limit (LRL).

on discussions with the EMC about this evaluation, it was decided that a single normal range would be defined for all water quality variables based on combining data for all reference water quality stations monitored by Teck. This was deemed adequate for identifying areas of the watershed that are being affected by mining because concentrations at mine-exposed areas that are above the normal range for all reference stations combined provides strong evidence of mine-related influence. Subtle differences in water quality associated with areas being newly affected by mine development (i.e., where comparison to a regional reference normal range might "miss" a small change in water quality in early stages of mining) will be detected through station-specific trend analysis that incorporates pre-mining water quality data.

Upper normal range limits were defined for each water quality constituent by pooling data for 2012 to 2016 across reference stations within each month and computing the reference 97.5th percentile for each constituent in each month (Appendix Figure C.3; Appendix Table C.10). Reference station normal ranges for the Order constituents were well below site-specific benchmarks in all months (Figure 3.9). Concentrations of all other constituents at reference stations were also below BC guidelines for protection of aquatic life, except for total beryllium, total chromium, total iron, and total mercury concentrations (Appendix Figure C.3).

Total aqueous concentrations of metals such as aluminum, arsenic, iron, lead, and manganese, as well as total phosphorus and TOC, correlated strongly and positively ($p<0.001$, $r>0.6$) with TSS and/or turbidity, especially among mine-exposed stations, whereas correlations were weaker for dissolved fractions of those constituents (Appendix Tables C.8 and C.9). For aluminum, iron, manganese, and total phosphorus, which correlated strongly with TSS and/or turbidity among reference stations (Appendix Table C.8), normal ranges were also defined using a covariate approach[15]. TSS or turbidity, whichever exhibited the strongest linear regression relationship, was used as the covariate (Appendix Figure C.4; Appendix Table C.12). The normal range applicable to a given sample was defined as the 97.5th percentile of the residuals up to a maximum value corresponding to the maximum monthly covariate value for the same month.

Although concentrations of other variables (e.g., total arsenic, total lead, and TOC) at mine-exposed areas were also strongly associated with elevated TSS and/or turbidity levels ($r>0.6$ Appendix Table C.9), correlations were not as strong ($r<0.6$) for samples collected at reference areas (Appendix Table C.8). Therefore, covariate-adjusted normal ranges were not developed

[15] i.e., The covariate-adjusted approach was a second way of defining the upper limit of reference station normal ranges that was applied to aluminum, iron, manganese, and phosphorus, in addition to the monthly 97.5th percentiles computed for all constituents.

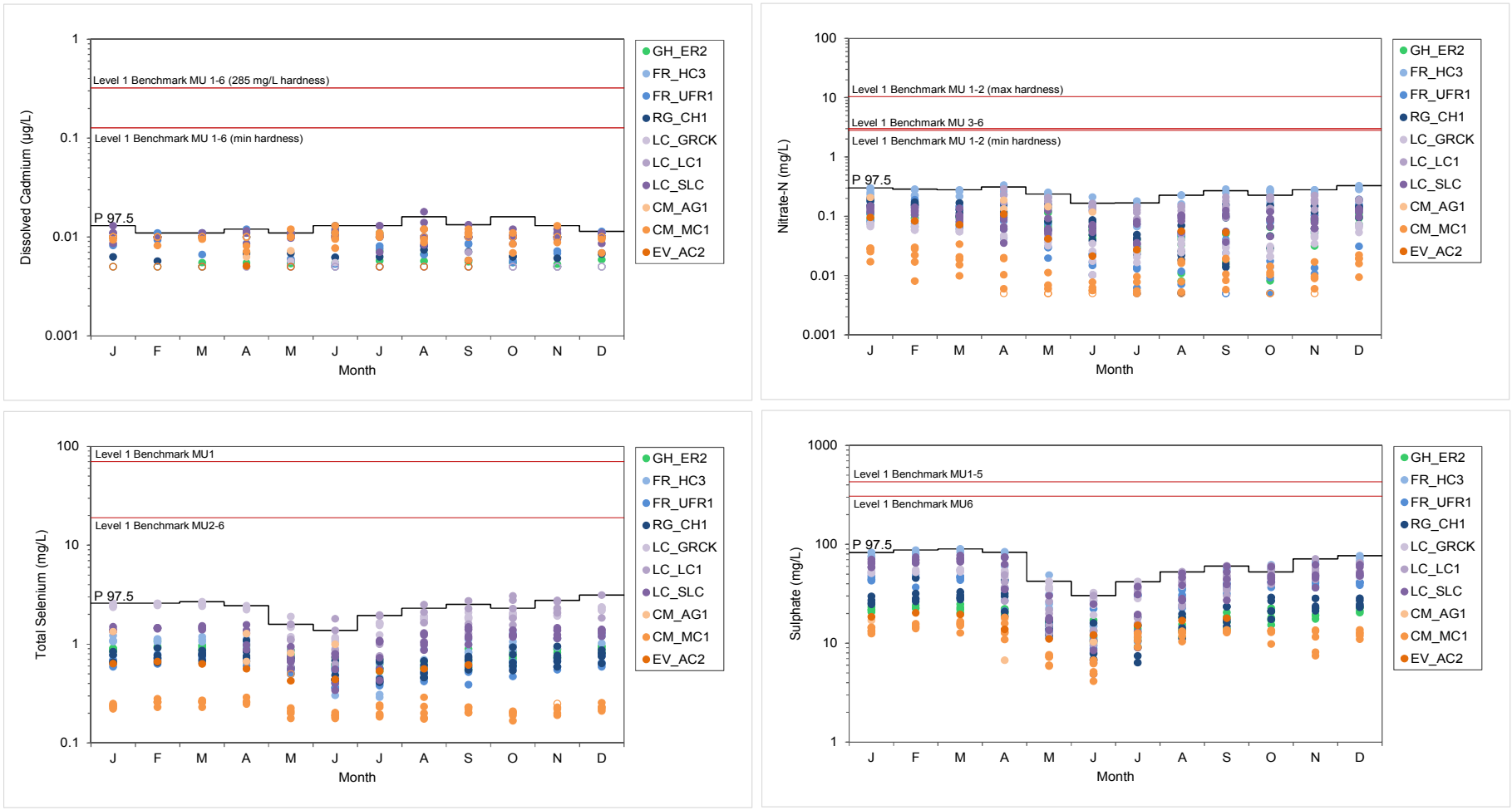


Figure 3.9: Normal Ranges Computed by Month for Dissolved Cadmium, Nitrate-N, Total Selenium, and Sulphate

for these constituents. Nevertheless, strong positive correlations of these variables with TSS and/or turbidity among mine-exposed stations indicate strong association with elevated particulate levels for these constituents (Appendix Figure C.5).

3.5 Concentrations at Mine-Exposed Stations Relative to Normal Ranges

3.5.1 Lotic Monitoring Stations

A low percentage (e.g., ~2.5%) of all samples could be expected to naturally exceed normal ranges that are based on the 97.5th percentile of reference station values. Differences in flow regimes from year to year may increase the frequency of samples naturally exceeding normal ranges. For example, normal ranges for total cadmium and total chromium (that were based on reference station data from 2012 to 2016 combined) were exceeded in a high percentage of reference station samples collected in 2015 (Appendix Table C.13). Elevated concentrations of both of these metals tend to be associated with high TSS/turbidity events (Appendix Figure C.5). Similarly, variation in sampling frequency among months may contribute to a higher frequency of individual samples exceeding normal ranges (i.e., >2.5% of samples). For example, higher sampling frequency during freshet months is likely to increase the percentage of samples exceeding normal ranges for any constituents for which concentrations are positively correlated with flow, TSS, or turbidity. To identify substances having a high probability of being elevated as a result of mining, subsequent evaluation of water quality data relative to normal ranges for mine-exposed stations focused mainly on constituents that were elevated above normal ranges in at least 10% of samples collected in 2015.

Normal ranges for most total and dissolved metals were exceeded in more than 10% of samples collected at more than half of the monitoring stations downstream from mining (Appendix Tables C.13 and C.14). Exceptions included total and dissolved beryllium, bismuth, mercury, silver, and tin, as well as dissolved chromium, iron, lead, and vanadium, which exceeded normal ranges in more than 10% of samples at only a small number of tributary monitoring stations (i.e., ≤7 of 62 mine-exposed stations). Of non-metal constituents, bromide and fluoride also rarely exceeded normal ranges among mine-exposed stations, and dissolved oxygen was usually above the lower limit of the normal range, indicating little or no influence of mining on these constituents. All samples collected in 2015 at the four monitoring stations in MU5, downstream from all mining, had selenium and nitrate concentrations greater than normal ranges. In addition to elevated total selenium and nitrate concentrations, total and dissolved barium, chloride, and nitrite concentrations were above normal ranges in more than 50% of samples collected at the same four stations, suggesting these eight constituents are the ones most strongly indicative of mine influence (i.e., conservative tracers).

Comparison of aluminum, iron, and manganese concentrations at individual mine-exposed stations to covariate (TSS- or turbidity-) adjusted normal ranges typically identified a similar or lesser frequency of normal range exceedances than comparison to monthly (97.5th percentile) normal ranges (Appendix Table C.13). However, the covariate-adjusted normal range for phosphorus identified more normal range exceedances than the monthly normal range approach at most stations (Appendix Table C.15). These results will be discussed with the EMC to determine the best approach for future evaluation of concentrations of constituents having strong relationship to flow, TSS, and/or turbidity levels.

The frequency of normal range exceedances among all samples collected at each station did not necessarily reflect the proportion of the year over which concentrations were elevated, because weekly samples are collected in some months and a single sample in other months based on Permit 107517 requirements[16] (i.e., weekly sampling during months when concentrations are elevated inflates the proportion of samples exceeding normal ranges compared to when the sampling frequency is the same for all months). As requested by the EMC, the monthly mean aqueous concentration of each Order constituent observed at each mine-exposed station in 2015 was divided by the upper normal range limit for the same month to derive normal range quotients (NRQs) (Appendix Tables C.17 to C.20). There were no consistent patterns with respect to the month in which maximum NRQs were observed among stations for the Order constituents although, generally, more maximum NRQs were observed between March and August than in other months of the year. Maximum monthly mean NRQs for the key[17] mine-related constituents nitrate, selenium, and sulphate were greater than one at most mine-exposed lotic stations in 2015. Consistent with the evaluation of frequency of normal range exceedances (above), the NRQs indicated a general pattern of mine influence on water quality throughout the watershed downstream from mining activities (Appendix Table C.21). Highest NRQs in Appendix Table C.21 indicate stations where concentrations were highest.

NRQs computed for water samples collected concurrent with other RAEMP samples in September 2015 agreed well with September results from Teck's water monitoring program, except with respect to some cadmium values (Appendix Figure C.6). Detection limits for Teck samples hovered around the upper limit of the normal range, which increases uncertainty for cadmium NRQs near one. Lower detection limits were achieved with RAEMP water samples

[16] Analysis by Minnow and PLA (2012) concluded monthly sampling was sufficient to monitor mine-related contaminant concentrations and loads over time.

[17] Cadmium concentrations tend to be relatively less elevated above EVWQP Level 1 benchmarks (see Section 3.6) than nitrate, sulphate, or selenium concentrations. Also, total and dissolved cadmium concentrations did not correlate strongly with any other water quality variables. Therefore, of the four Order constituents, the latter three are considered key mine-related variables.

and resulted in lower NRQs for some areas than those based on Teck data for the same areas in September. Good agreement between programs for September water data, especially for the key mine-related variables (Appendix Figure C.6) justified the use of either data set in analyses in later sections of this report.

3.5.2 Lentic Sampling Areas

NRQs greater than one were observed at 12 of 17 lentic areas (Appendix Table C.22). NRQs < 1 were observed at some of the lentic areas associated with the Elk River (EROU, ERUP, UNWNMO), Fording River (FOXL, FWDEC), and Michel Creek (MIWW) indicating that mine-related influence is minimal in these areas (i.e., limited connectively to mine-influenced surface or groundwater) or occurs only seasonally (i.e.., during high flow periods).

The Fording Meadow Upstream of Chauncey Creek (FMUCK) is where the Fording River deepens, flow is slower, and the substrate is finer than other areas of the river. This main stem area was sampled because of its semi-lentic qualities and because it provides over-winter habitat for westslope cutthroat trout (Cope et al. 2016). A water sample was collected here concurrent with collection of sediment and benthic invertebrate tissues for the RAEMP (see Sections 6 and 8), which explains why data for this area are included in Appendix Table C.22.

Area FO10 was formerly a lentic habitat and referred to as the Fording River Oxbow. It was altered to a flowing side-channel in the record storm event of June 2013 (Figure 3.3) and therefore is now a lotic rather than lentic habitat. A water sample was collected here concurrent with collection of sediment and benthic invertebrate tissues to evaluate the change of flow regime on tissue selenium accumulation (see Section 8).

3.6 Concentrations at Mine-Exposed Stations Relative to Benchmarks and Guidelines

3.6.1 Lotic Habitats

Although BC water guidelines for long-term exposure are based on 30-day mean concentrations, concentrations in individual samples were compared to site-specific benchmarks (SSBMs) or BC guidelines (Table 2.1) to conservatively identify constituents being elevated above guidelines as a result of mining. Normal reference station ranges occasionally exceeded water quality guidelines for total beryllium, total iron, total chromium, and total mercury (Appendix Figure C.3). Aqueous concentrations measured at mine-exposed stations in 2015 exceeded SSBMs or sample-specific guidelines, as well as reference area normal ranges[18], for nitrate, sulphate, dissolved cadmium, selenium, total dissolved solids, total and

[18] Occasionally, normal ranges also exceeded SSBMs/guidelines. Discussion focuses on samples from monitoring stations that exceeded both normal ranges and SSBMs/guidelines to reflect the mine-related influence on guideline

dissolved iron, dissolved aluminum, total barium, total beryllium, chloride, total chromium, total cobalt, total mercury, total nickel, nitrite, ammonia, total silver, total thallium, total uranium, and total zinc in one or more samples at one or more monitoring stations (Table 3.1). However, the highest frequencies of exceedances (i.e., >20% of samples at more than three monitoring stations) were observed for nitrate, sulphate, dissolved cadmium, total selenium, total dissolved solids, and total uranium.

Concentrations of constituents observed in individual samples were divided by corresponding SSBMs or generic water quality guidelines for BC to compute HQs reflecting the magnitudes of exceedances. Highest HQs (HQ > 2) were observed at multiple (> 3) stations for nitrate, sulphate, total selenium, total dissolved solids, total iron, dissolved aluminum, total beryllium, total chromium, total mercury, nitrite, and total uranium (Appendix Table C.24). Of those constituents, guideline exceedances for iron, aluminum, beryllium, chromium, and mercury were relatively few (<~20% of samples at most [≥ 94% of] stations; Table 3.1) and, when they occurred, were associated with elevated TSS/turbidity events (Appendix Figure C.5). Guidelines for iron and aluminum are based on dissolved fractions, but dissolved concentrations also tended to be elevated when TSS/turbidity were elevated (Appendix Figure C.5). As suggested by the EMC, dissolved metal concentrations were compared to total metal guidelines to reduce the confounding effect of elevated TSS/turbidity events on guideline exceedances for metals with strong affinity for particulates. This resulted in no exceedances for most metals, and relatively few exceedances (<20% of samples at all stations) for chromium, cobalt, and mercury. Concentrations of dissolved selenium and uranium were frequently elevated above SSBMs/guidelines for the total fraction (Appendix Table C.27a), consistent with these constituents being highly water soluble (Section 3.3.2).

Overall, the evaluation of water quality data for 2015 relative to SSBMs/guidelines and reference area normal ranges indicated that the constituents tending to be most elevated above normal ranges and guidelines in the Elk River watershed as a result of mining were nitrate, total and dissolved selenium, sulphate, total dissolved solids, total (but not dissolved) iron, dissolved aluminum, and total and dissolved uranium.

Frequencies of exceedances described above may overestimate the proportion of the year when concentrations were elevated, if exceedances occurred in months when sampling frequency was weekly instead of monthly. Also, the evaluation of concentrations relative to a 30-day rolling average is challenging to implement and interpret in routine monitoring because

exceedances. Frequency of exceedances of SSBMs/guidelines and associated maximum HQs, irrespective of normal ranges, are presented in Appendix Tables C.25 and C.26.

Table 3.1: Frequency (%) of Individual Samples Exceeding Both the Sample Specific SSBM/ Guideline and the Monthly Normal Range at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Number of Parameters Exceeding a Guideline	% Parameters HQ and NRQ > 1	Maximum % of Samples with HQ and NRQ > 1		SSBM					Acute			Chronic	
									%	Parameters Exceeding HQ and NR	Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total) [2]	Aluminum (Dissolved)	Barium (Total)
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	FR_UFR1	Fording River	E216777	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC1	Line Creek	E216142	1	4.3%	14%	Zn(T)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_SLC	South Line Creek	E282149	5	22%	8.3%	Cd(D), Fe(D), Al(D), Cr(T), Hg(T)	0%	0%	8.3%	0%	0%	0%	8.3%	0%	8.3%	0%
	3	Elk	M	GH_ER2	Elk River	200389	2	8.7%	2.9%	Al(D), Cr(T)	0%	0%	0%	0%	0%	0%	0%	0%	2.9%	0%
	4	Michel	M	CM_MC1	Michel Creek	E258175	1	4.3%	8.3%	Al(D)	0%	0%	0%	0%	0%	0%	0%	0%	8.3%	0%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_CC1	Clode Creek	E102481	6	26%	100%	NO3, Cd(D), Se(T), TDS, NO2, NH3	100%	0%	7.1%	93%	7.1%	0%	0%	0%	0%	0%
				FR_NGD1	Lake Mountain Creek	E105060	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_KC1	Kilmarnock Creek	0200252	6	26%	100%	NO3, SO4, Cd(D), Se(T), TDS, U(T)	100%	42%	75%	100%	83%	0%	0%	0%	0%	0%
				GH_SC2	Swift Creek	E105061	7	30%	100%	NO3, SO4, Cd(D), Se(T), TDS, NO2, U(T)	72%	90%	89%	100%	84%	0%	0%	0%	0%	0%
				GH_CC1	Cataract Creek	0200384	8	35%	100%	NO3, SO4, Cd(D), Se(T), TDS, Be(T), U(T)	100%	100%	42%	100%	100%	0%	0%	0%	0%	0%
				GH_PC1	Porter Creek	200385	2	8.7%	42%	SO4, Se(T)	0%	21%	0%	42%	0%	0%	0%	0%	0%	0%
				LC_DCDS	LCO Dry Creek	E295210	4	17%	14%	Fe(T), Al(D), Cr(T), Hg(T)	0%	0%	0%	0%	0%	0%	0%	3.4%	14%	0%
				LC_DC3	LCO Dry Creek	E288273	5	22%	7.1%	Fe(T), Al(D), Cr(T), Cu(T), Hg(T)	0%	0%	0%	0%	0%	0%	0%	3.6%	7.1%	0%
				LC_DC1	LCO Dry Creek	E288270	2	8.7%	3.7%	Hg(T), NO2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_GH1	Greenhills Creek	E102709	5	22%	55%	SO4, Se(T), TDS, NO2, U(T)	0%	55%	0%	50%	50%	0%	0%	0%	0%	0%
			M	FR_FR1	Fording River	0200251	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR2	Fording River	0200201	1	4.3%	12%	NO3	12%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR	Fording River	-	1	4.3%	5.9%	Se(T)	0%	0%	0%	5.9%	0%	0%	0%	0%	0%	0%
				FR_FR4	Fording River	-	1	4.3%	5.0%	NO3	5.0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR3	Fording River	-	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FRCP1	Fording River	E300071	5	22%	51%	NO3, SO4, Se(T), TDS, U(T)	30%	21%	0%	51%	19%	0%	0%	0%	0%	0%
				GH_PC2	Fording River	E287431	2	8.7%	85%	NO3, Se(T)	85%	0%	0%	53%	0%	0%	0%	0%	0%	0%
				FR_FRABCH	Fording River	-	2	8.7%	92%	NO3, Se(T)	92%	0%	0%	31%	0%	0%	0%	0%	0%	0%
				FR_FR5	Fording River	-	1	4.3%	81%	NO3	81%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_FRUS	Fording River	E295232	1	4.3%	33%	NO3	33%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_FRB	Fording River	-	1	4.3%	18%	NO3	18%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR1	Fording River	0200251	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	3	13%	92%	NO3, Cd(D), Se(T)	58%	0%	58%	92%	0%	0%	0%	0%	0%	0%
				LC_LC3	Line Creek	0200337	3	13%	100%	NO3, Cd(D), Se(T)	47%	0%	68%	100%	0%	0%	0%	0%	0%	0%
				LC_LCDSSLCC	Line Creek	E297110	3	13%	91%	NO3, Se(T), Cr(T)	6.5%	0%	0%	91%	0%	0%	0%	0%	0%	0%
				LC_LC4	Line Creek	0200044	5	22%	90%	Se(T), Fe(T), Be(T), Cr(T), Hg(T)	0%	0%	0%	90%	0%	0%	0%	3.4%	0%	0%
			M	LC_LC6	Fording River	0200338	1	4.3%	100%	Se(T)	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
				LC_LC5	Fording River	0200028	2	8.7%	94%	Se(T), Hg(T)	0%	0%	0%	94%	0%	0%	0%	0%	0%	0%
	3	Elk	T	GH_WILLOW	Willow Creek	-	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_WADE	Wade Creek	E287433	5	22%	11%	Fe(T), Al(D), Be(T), Cr(T), Hg(T)	0%	0%	0%	0%	0%	0%	0%	7.1%	3.6%	0%
				GH_MC1	Mickelson Creek	200388	10	43%	63%	NO3, SO4, Se(T), TDS, Fe(T), Be(T), Cr(T), Co(T), Hg(T), U(T)	63%	63%	0%	3.8%	52%	0%	0%	15%	0%	0%
				GH_LC2	Leask Creek	-	18	78%	100%	NO3, SO4, Se(T), TDS, As(T), Fe(T), Al(D), Ba(T), Be(T), Cr(T), Co(T), Cu(T), Hg(T), Ni(T), NO2, Tl(T), U(T), Zn(T)	100%	86%	0%	100%	89%	3.6%	0%	54%	3.6%	3.6%
				GH_WC2	Wolfram Creek	-	11	48%	100%	NO3, SO4, Se(T), TDS, Fe(T), Al(D), Be(T), Cr(T), Co(T), Hg(T), U(T)	100%	69%	0%	100%	56%	0%	0%	33%	5.6%	0%
				GH_TC2	Thompson Creek	E207436	4	17%	100%	NO3, SO4, Se(T), TDS	96%	54%	0%	100%	45%	0%	0%	0%	0%	0%

Shading indicates frequency exceeded 0%.

[1] Only stations with data for at least 8 months were included. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM/Guideling. Only constituents that had at least one guideline exceedance are reported.

[2] For total iron, normal ranges were adjusted for total suspended solids for each month. Refer to methods for details.

[3] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table 3.1: Frequency (%) of Individual Samples Exceeding Both the Sample Specific SSBM/ Guideline and the Monthly Normal Range at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Number of Parameters Exceeding a Guideline	% Parameters HQ and NRQ > 1	Maximum % of Samples with HQ and NRQ > 1		SSBM					Acute			Chronic	
									%	Parameters Exceeding HQ and NR	Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total) [2]	Aluminum (Dissolved)	Barium (Total)
Mine-exposed	3	Elk	M	GH_ERC	Elk River	E300090	1	4.3%	3.1%	Cr(T)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_ER1	Elk River	0206661	2	8.7%	3.6%	Al(D), Cr(T)	0%	0%	0%	0%	0%	0%	0%	0%	3.6%	0%
	4	Elk	T	EV_HC6	Harmer Creek	-	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_HC1	Harmer Creek	E102682	1	4.3%	97%	Se(T)	0%	0%	0%	97%	0%	0%	0%	0%	0%	0%
				EV_GV1	Grave Creek	-	5	22%	65%	Se(T), Fe(T), Be(T), Cr(T), Hg(T)	0%	0%	0%	65%	0%	0%	0%	5.0%	0%	0%
				EV_SM1	Six Mile Creek	E102681	0	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_BLM2	Balmer Creek	E298592	3	13%	55%	Be(T), Cr(T), Hg(T)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_FC1	Fennelon Creek	E298591	4	17%	21%	Fe(T), Be(T), Cr(T), Hg(T)	0%	0%	0%	0%	0%	0%	0%	5.3%	0%	0%
				EV_GC2	Goddard Creek	E208043	3	13.0%	64%	Se(T), Cr(T)	0%	0%	0%	64%	0%	0%	0%	0%	0%	0%
				EV_OC1	Otto Creek	E102679	2	8.7%	9.1%	Fe(T), Cr(T)	0%	0%	0%	0%	0%	0%	0%	9.1%	0%	0%
			M	EV_ER4	Elk River	0200027	2	8.7%	53%	NO3, Cr(T)	53%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_ER2	Elk River	0200111	2	8.7%	9.1%	NO3, Cr(T)	9.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Michel	T	CM_CC1	Corbin Creek	0200209	5	22%	96%	NO3, SO4, Se(T), TDS, NO2	96%	61%	0%	3.6%	46%	0%	0%	0%	0%	0%
				EV_EC1	Erickson Creek	200097	5	22%	100%	NO3, SO4, Se(T), TDS, Cr(T)	100%	100%	0%	100%	100%	0%	0%	0%	0%	0%
				EV_SP1	South Pit Creek	E296311	6	26%	100%	NO3, SO4, Cd(D), Se(T), TDS, U(T)	100%	100%	27%	100%	100%	0%	0%	0%	0%	0%
				EV_MG1	Milligan Pond	E208057	3	13%	100%	SO4, Se(T), TDS	0%	55%	0%	100%	18%	0%	0%	0%	0%	0%
				EV_GT1	Gate Creek	E206231	8	35%	100%	NO3, SO4, Cd(D), Se(T), TDS, Cr(T), NO2, U(T)	100%	100%	18%	100%	100%	0%	0%	0%	0%	0%
				EV_BC1	Bodie Creek	E102685	7	30%	100%	NO3, SO4, Se(T), TDS, Cr(T), NO2, U(T)	100%	100%	0%	100%	100%	0%	0%	0%	0%	0%
				EV_AQ1	Aqueduct Creek	E210369	5	22%	17%	Fe(T), Be(T), Cl, Cr(T), Hg(T)	0%	0%	0%	0%	0%	0%	0%	5.6%	0%	0%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	6	26%	15%	NO3, Fe(T), Be(T), Cr(T), Hg(T), NO2	15%	0%	0%	0%	0%	0%	0%	2.5%	0%	0%
				CM_MCTM	Michel Creek	-	3	13%	9.1%	Al(D), Be(T), Cr(T)	0%	0%	0%	0%	0%	0%	0%	0%	9.1%	0%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	5	22%	6.7%	Al(D), Cr(T), Hg(T), Ag(T), Zn(T)	0%	0%	0%	0%	0%	0%	0%	0%	3.3%	0%
				EV_MC2	Michel Creek	E300091	7	30%	31%	NO3, Se(T), Fe(T), Be(T), Cr(T), Cu(T), Hg(T)	31%	0%	0%	21%	0%	0%	0%	4.1%	0%	0%
	5	Elk	M	EV_ER1	Elk River	0200393	4	17%	10%	Fe(T), Be(T), Cr(T), Hg(T)	0%	0%	0%	0%	0%	0%	0%	2.0%	0%	0%
				RG_ELKFERNIE	Elk River	-	2	8.7%	3.6%	Be(T), Cr(T)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				RG_ELKORES	Elk River	E294312	2	8.7%	7.1%	Al(D), Cr(T)	0%	0%	0%	0%	0%	0%	0%	0%	3.6%	0%
				RG_ELKMOUTH	Elk River	-	2	8.7%	7.1%	Al(D), Cr(T)	0%	0%	0%	0%	0%	0%	0%	0%	3.6%	0%

Shading indicates frequency exceeded 0%.

[1] Only stations with data for at least 8 months were included. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM/Guideling. Only constituents that had at least one guideline exceedance are reported.

[2] For total iron, normal ranges were adjusted for total suspended solids for each month. Refer to methods for details.

[3] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table 3.1: Frequency (%) of Individual Samples Exceeding Both the Sample Specific SSBM/ Guideline and the Monthly Normal Range at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Number of Parameters Exceeding a Guideline	Chronic												
								Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [3]	Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	FR_UFR1	Fording River	E216777	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC1	Line Creek	E216142	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	14%
				LC_SLC	South Line Creek	E282149	5	0%	0%	8.3%	0%	0%	8.3%	0%	0%	0%	0%	0%	0%	0%
	3	Elk	M	GH_ER2	Elk River	200389	2	0%	0%	2.9%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	4	Michel	M	CM_MC1	Michel Creek	E258175	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_CC1	Clode Creek	E102481	6	0%	0%	0%	0%	0%	0%	0%	100%	64%	0%	0%	0%	0%
				FR_NGD1	Lake Mountain Creek	E105060	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_KC1	Kilmarnock Creek	0200252	6	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	0%
				GH_SC2	Swift Creek	E105061	7	0%	0%	0%	0%	0%	0%	0%	3.4%	0%	0%	0%	79%	0%
				GH_CC1	Cataract Creek	0200384	8	4.2%	0%	0%	0%	0%	4%	0%	0%	0%	0%	0%	100%	0%
				GH_PC1	Porter Creek	200385	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_DCDS	LCO Dry Creek	E295210	4	0%	0%	6.9%	0%	0%	10.3%	0%	0%	0%	0%	0%	0%	0%
				LC_DC3	LCO Dry Creek	E288273	5	0%	0%	7.1%	0%	3.6%	7.1%	0%	0%	0%	0%	0%	0%	0%
				LC_DC1	LCO Dry Creek	E288270	2	0%	0%	0%	0%	0%	3.7%	0%	3.7%	0%	0%	0%	0%	0%
				GH_GH1	Greenhills Creek	E102709	5	0%	0%	0%	0%	0%	0%	0%	6.9%	0%	0%	0%	5.0%	0%
			M	FR_FR1	Fording River	0200251	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR2	Fording River	0200201	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR4	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR3	Fording River	-	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FRCP1	Fording River	E300071	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	12%	0%
				GH_PC2	Fording River	E287431	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FRABCH	Fording River	-	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR5	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_FRUS	Fording River	E295232	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_FRB	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR1	Fording River	0200251	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC3	Line Creek	0200337	3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LCDSSLCC	Line Creek	E297110	3	0%	0%	3.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC4	Line Creek	0200044	5	3.4%	0%	6.9%	0%	0%	3.4%	0%	0%	0%	0%	0%	0%	0%
			M	LC_LC6	Fording River	0200338	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC5	Fording River	0200028	2	0%	0%	0%	0%	0%	3.3%	0%	0%	0%	0%	0%	0%	0%
	3	Elk	T	GH_WILLOW	Willow Creek	-	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_WADE	Wade Creek	E287433	5	7.1%	0%	11%	0%	0%	11%	0%	0%	0%	0%	0%	0%	0%
				GH_MC1	Mickelson Creek	200388	10	12%	0%	19%	15%	0%	12%	0%	0%	0%	0%	0%	35%	0%
				GH_LC2	Leask Creek	-	18	29%	0%	68%	36%	11%	43%	3.6%	18%	0%	0%	3.6%	75%	3.6%
				GH_WC2	Wolfram Creek	-	11	11%	0%	39%	22%	0%	22%	0%	0%	0%	0%	0%	39%	0%
				GH_TC2	Thompson Creek	E207436	4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Shading indicates frequency exceeded 0%.

[1] Only stations with data for at least 8 months were included. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM/Guideling. Only constituents that had at least one guideline exceedance are reported.

[2] For total iron, normal ranges were adjusted for total suspended solids for each month. Refer to methods for details.

[3] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table 3.1: Frequency (%) of Individual Samples Exceeding Both the Sample Specific SSBM/ Guideline and the Monthly Normal Range at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Number of Parameters Exceeding a Guideline	Chronic												
								Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [3]	Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Mine-exposed	3	Elk	M	GH_ERC	Elk River	E300090	1	0%	0%	3.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_ER1	Elk River	0206661	2	0%	0%	3.6%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	4	Elk	T	EV_HC6	Harmer Creek	-	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_HC1	Harmer Creek	E102682	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_GV1	Grave Creek	-	5	5.0%	0%	10%	0%	0%	10%	0%	0%	0%	0%	0%	0%	0%
				EV_SM1	Six Mile Creek	E102681	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_BLM2	Balmer Creek	E298592	3	9.1%	0%	9.1%	0%	0%	55%	0%	0%	0%	0%	0%	0%	0%
				EV_FC1	Fennelon Creek	E298591	4	5.3%	0%	5.3%	0%	0%	21%	0%	0%	0%	0%	0%	0%	0%
				EV_GC2	Goddard Creek	E208043	3	0%	0%	9.1%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%
				EV_OC1	Otto Creek	E102679	2	0%	0%	4.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	EV_ER4	Elk River	0200027	2	0%	0%	3.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_ER2	Elk River	0200111	2	0%	0%	9.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Michel	T	CM_CC1	Corbin Creek	0200209	5	0%	0%	0%	0%	0%	0%	0%	18%	0%	0%	0%	0%	0%
				EV_EC1	Erickson Creek	200097	5	0%	0%	4.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_SP1	South Pit Creek	E296311	6	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	92%	0%
				EV_MG1	Milligan Pond	E208057	3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_GT1	Gate Creek	E206231	8	0%	0%	6.8%	0%	0%	0%	0%	19%	0%	0%	0%	73%	0%
				EV_BC1	Bodie Creek	E102685	7	0%	0%	2.6%	0%	0%	0%	0%	38%	0%	0%	0%	100%	0%
				EV_AQ1	Aqueduct Creek	E210369	5	5.6%	17%	11%	0%	0%	17%	0%	0%	0%	0%	0%	0%	0%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	6	2.5%	0%	2.5%	0%	0%	10%	0%	2.5%	0%	0%	0%	0%	0%
				CM_MCTM	Michel Creek	-	3	9.1%	0%	9.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	5	0%	0%	6.7%	0%	0%	3.3%	0%	0%	0%	3.3%	0%	0%	6.7%
				EV_MC2	Michel Creek	E300091	7	4.4%	0%	10%	0%	2.2%	4.7%	0%	0%	0%	0%	0%	0%	0%
	5	Elk	M	EV_ER1	Elk River	0200393	4	2.2%	0%	10%	0%	0%	2.3%	0%	0%	0%	0%	0%	0%	0%
				RG_ELKFERNIE	Elk River	-	2	3.6%	0%	3.6%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				RG_ELKORES	Elk River	E294312	2	0%	0%	7.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				RG_ELKMOUTH	Elk River	-	2	0%	0%	7.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Shading indicates frequency exceeded 0%.

[1] Only stations with data for at least 8 months were included. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM/Guideling. Only constituents that had at least one guideline exceedance are reported.

[2] For total iron, normal ranges were adjusted for total suspended solids for each month. Refer to methods for details.

[3] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

multiple exceedances can occur if a single sample had a sufficiently elevated concentration to elevate means for each 30-day period that included that particular sample value (i.e., during weekly monitoring, multiple 30-day means may exceed the guideline based on elevated concentrations in only a single sample).

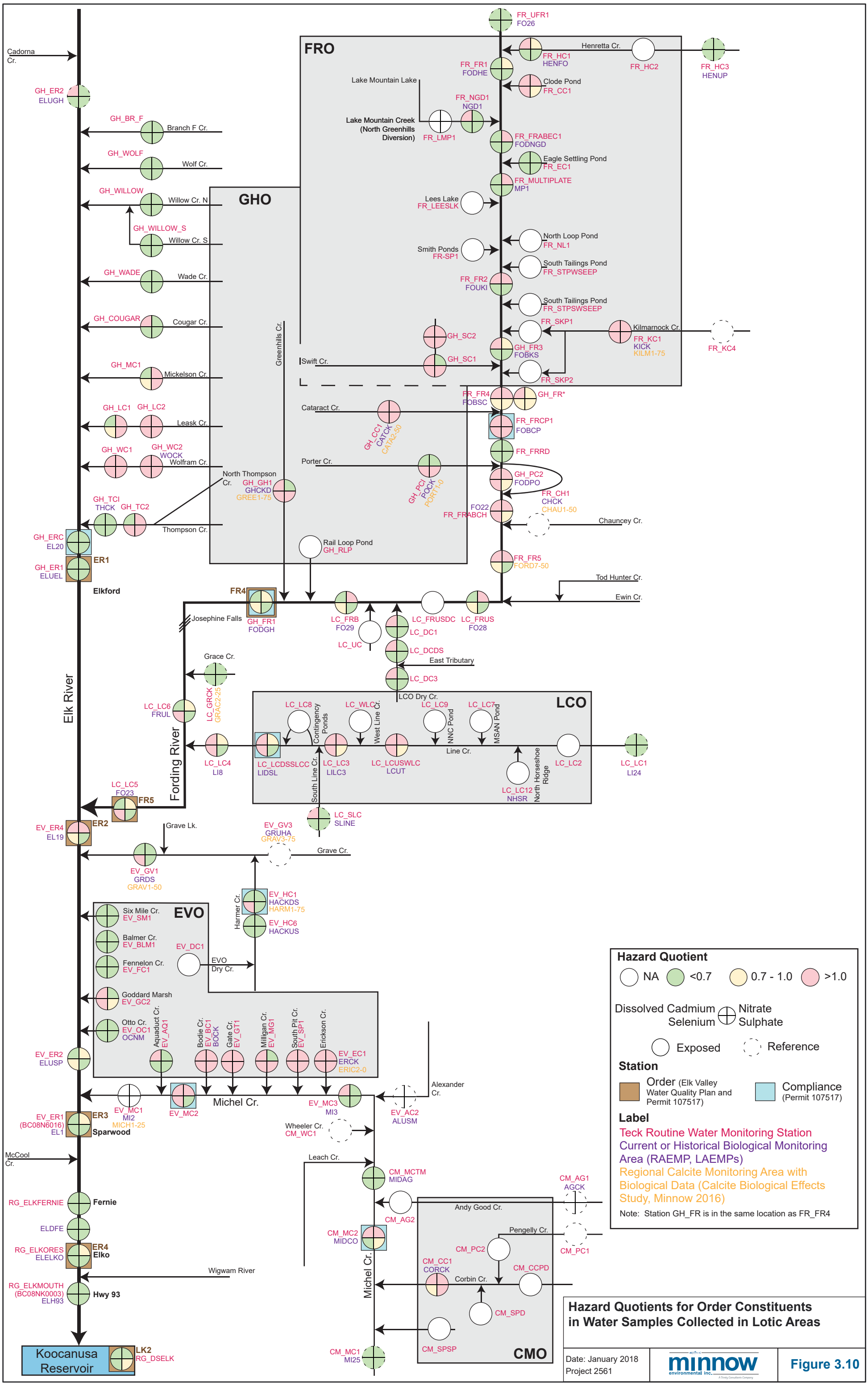
As requested by the EMC, mean monthly[19] concentrations of Order constituents observed in routine monitoring by Teck in 2015 were divided by corresponding EVWQP Level 1 benchmarks (Table 2.2) to compute an HQ for each month (Appendix Tables C.28 to C.31).

Maximum monthly HQs were less than one for cadmium, selenium, and sulphate in all main stem areas except in the Fording River (selenium and sulphate at FR_FRCP1; selenium at GH_PC2, FR_FRABCH, LC_LC6, and LC_LC5), and in lower Michel Creek (selenium at EV_MC2) (Appendix Table C.21). Maximum monthly HQs were near or greater than one for nitrate at most stations in the Fording River downstream from mining, in the Elk River downstream from the Fording River (EV_ER4 and EV_ER2), and at two stations in Michel Creek (CM_MC2, EV_MC2).

Maximum monthly HQs greater than one were observed for nitrate, selenium, and/or sulphate in numerous tributaries of MU1 to MU4 (there are no mine-exposed tributaries in MU5). In MU1, highest HQs for nitrate and selenium were observed at Clode Settling Pond decant (FR_CC1), Kilmarnock Creek (FR_KC1), Swift Creek Sediment Pond decant and bypass (GH_SC1 and GH_SC2, respectively), and Cataract Creek Sediment Pond decant (GH_CC1) (Figure 3.10; Appendix Tables C.21 and C.28 to C.31). Kilmarnock Creek is the single largest source of mine-related constituents in MU1 (Zajdlik and Minnow 2013). Water from Kilmarnock, Swift, and Cataract will be directed to an active water treatment facility (AWTF) that is expected to reduce aqueous concentrations of nitrate and selenium in the Fording River.

In MU2, highest HQs for aqueous mine-related constituents were observed among the mine-exposed stations in Line Creek, which are located downstream from the LCO rock drain (Figure 3.8). Line Creek was formerly identify as a major source of mine-related constituents to the Fording River (Zajdlik and Minnow 2013), and an AWTF was commissioned in late 2015 (commencing full scale operation in early 2016) to reduce concentrations of selenium and nitrate discharging from West Line Creek into Line Creek. The results summarized for 2015 (Appendix Table C.21 and Figure 3.8) precede changes in water quality associated with operation of the AWTF. There is further discussion about changes observed in 2016 associated with the West Line Creek AWTF in subsequent sections of this report.

[19] Based on calendar months, not rolling 30-day periods.


FRO
GHO
LCO
CMO
EVO
Cadorna Cr.
GH_ER2 ELUGH
GH_BR_F
Branch F Cr.
GH_WOLF
Wolf Cr.
GH_WILLOW
Willow Cr. N
GH_WILLOW_S
Willow Cr. S
GH_WADE
Wade Cr.
GH_COUGAR
Cougar Cr.
GH_MC1
Mickelson Cr.
GH_LC1
GH_LC2
Leask Cr.
GH_WC1
GH_WC2
WOCK
Wolfram Cr.
GH_TC1
THCK
GH_TC2
Thompson Cr.
GH_ERC
EL20
ER1
GH_ER1
ELUEL
Elkford
Elk River
Fording River
LC_LC5
FO23
FR5
EV_ER4
EL19
ER2
Grave Lk.
EV_GV1
GRDS
GRAV1-50
EV_GV3
GRUHA
GRAV3-75
Grave Cr.
EV_HC1
HACKDS
HARM1-75
Harmer Cr.
EV_HC6
HACKUS
Six Mile Cr.
EV_SM1
Balmer Cr.
EV_BLM1
Fennelon Cr.
EV_FC1
EV_DC1
EVO Dry Cr.
Goddard Marsh
EV_GC2
Otto Cr.
EV_OC1
OCNM
Aquaduct Cr.
EV_AQ1
Bodie Cr.
EV_BC1
BOCK
Gate Cr.
EV_GT1
Milligan Cr.
EV_MG1
South Pit Cr.
EV_SP1
Erickson Cr.
EV_EC1
ERCK
ERIC2-0
EV_ER2
ELUSP
EV_MC1
MI2
MICH1-25
EV_MC2
Michel Cr.
EV_MC3
MI3
EV_AC2
ALUSM
Alexander Cr.
Wheeler Cr.
CM_WC1
EV_ER1
(BC08N6016)
EL1
ER3
Sparwood
McCool Cr.
RG_ELKFERNIE
Fernie
ELDFE
RG_ELKORES
ELELKO
ER4
Elko
Wigwam River
RG_ELKMOUTH
(BC08NK0003)
ELH93
Hwy 93
Koocanusa Reservoir
LK2
RG_DSELK
Leach Cr.
CM_MCTM
MIDAG
CM_AG2
CM_MC2
MIDCO
CM_MC1
MI25
CM_AG1
AGCK
Andy Good Cr.
Pengelly Cr.
CM_PC1
CM_PC2
CM_CC1
CORCK
Corbin Cr.
CM_CCPD
CM_SPD
CM_SPSP
Greenhills Cr.
Swift Cr.
GH_SC2
GH_SC1
Cataract Cr.
GH_CC1
CATCK
CATA2-50
Porter Cr.
GH_PC1
POCK
PORT1-0
North Thompson Cr.
GH_GH1
GHCKD
GREE1-75
Rail Loop Pond
GH_RLP
Josephine Falls
FR4
GH_FR1
FODGH
Grace Cr.
LC_GRCK
GRAC2-25
LC_LC6
FRUL
LC_LC4
LI8
LC_LC8
Contingency Ponds
LC_WLC
West Line Cr.
LC_LC9
NNC Pond
LC_LC7
MSAN Pond
LC_LCDSSLCC
LIDSL
LC_LC3
LILC3
LC_LCUSWLC
LCUT
South Line Cr.
Line Cr.
LC_LC12
NHSR
North Horseshoe Ridge
LC_LC2
LC_LC1
LI24
LC_SLC
SLINE
LC_FRB
FO29
LC_UC
LC_DC1
LC_DCDS
LC_DC3
LC_FRUSDC
LC_FRUS
FO28
LCO Dry Cr.
East Tributary
FR_UFR1
FO26
FR_HC1
HENFO
Henretta Cr.
FR_HC2
FR_HC3
HENUP
FR_FR1
FODHE
Lake Mountain Lake
Clode Pond
FR_CC1
FR_NGD1
NGD1
Lake Mountain Creek
(North Greenhills Diversion)
FR_LMP1
FR_FRABEC1
FODNGD
Eagle Settling Pond
FR_EC1
FR_MULTIPLATE
MP1
Lees Lake
FR_LEESLK
Smith Ponds
FR-SP1
North Loop Pond
FR_NL1
South Tailings Pond
FR_STPWSEEP
FR_FR2
FOUKI
South Tailings Pond
FR_STPSWSEEP
FR_SKP1
Kilmarnock Cr.
FR_KC1
KICK
KILM1-75
FR_KC4
GH_FR3
FOBKS
FR_SKP2
FR_FR4
FOBSC
GH_FR*
FR_FRCP1
FOBCP
FR_FRRD
GH_PC2
FODPO
FR_CH1
CHCK
CHAU1-50
FO22
FR_FRABCH
Chauncey Cr.
FR_FR5
FORD7-50
Tod Hunter Cr.
Ewin Cr.
Hazard Quotient
NA
<0.7
0.7 - 1.0
>1.0
Dissolved Cadmium
Selenium
Nitrate
Sulphate
Exposed
Reference
Station
Order (Elk Valley Water Quality Plan and Permit 107517)
Compliance (Permit 107517)
Label
Teck Routine Water Monitoring Station
Current or Historical Biological Monitoring Area (RAEMP, LAEMPs)
Regional Calcite Monitoring Area with Biological Data (Calcite Biological Effects Study, Minnow 2016)
Note: Station GH_FR is in the same location as FR_FR4
Hazard Quotients for Order Constituents in Water Samples Collected in Lotic Areas
Date: January 2018
Project 2561
minnow environmental inc.
Figure 3.10

Maximum monthly HQs for main stem Elk River monitoring stations were less than one, indicating low potential for mine-related effects. HQs in MU3 were highest in GHO west-side tributaries Leask (GH_LC1, GH_LC2), Wolfram (GH_WC1, GH_WC2), and Thompson (GH_TC2; Appendix Table C.21), which have had longer historical exposure to mining than the tributaries farther north. The GHO LAEMP was initiated in fall 2017 to characterize conditions in the valley bottom and Elk River side channel into which these tributaries discharge (Minnow and Lotic 2017). Data from the GHO LAEMP will be used to inform future RAEMP reports.

As with other MUs, highest HQs for mine-related variables in MU4 were observed in tributaries draining to upper Michel Creek near CMO (Corbin Creek [CM_CC1]) and into lower Michel Creek near EVO (Erickson [EV_EC1], South Pit [EV_SP1], Gate [EV-GT1], and Bodie [EV_BC1]). No EVWQP Level 1 benchmarks were exceeded for stations in the lower Elk River (MU5).

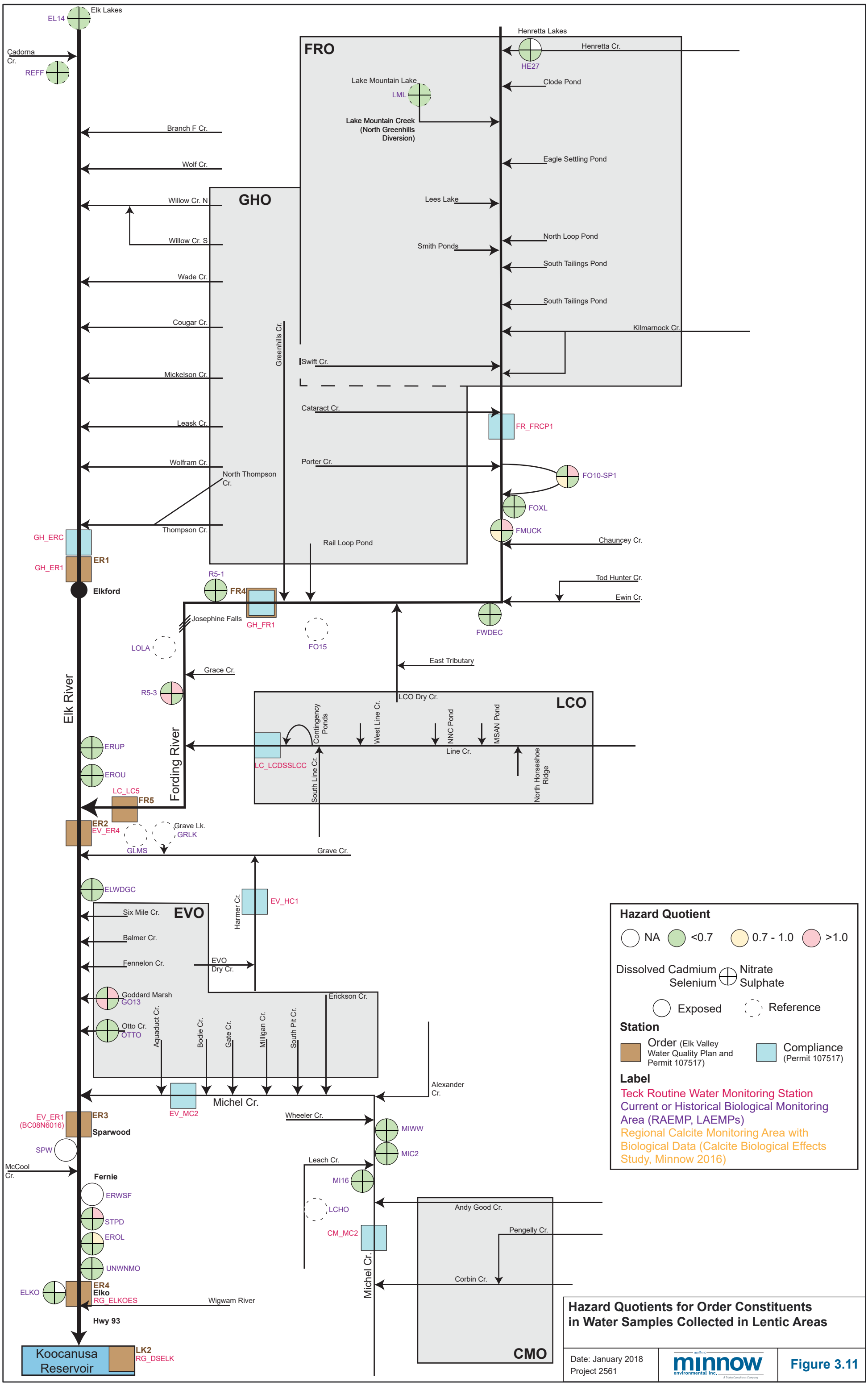
3.6.2 Lentic Habitats

HQs > 1 were observed for nitrate and/or selenium at FMUCK (MU1), R5-3 (MU2), GO13 (MU4), and Stanford Pond (MU5) (Figure 3.11; Appendix Table C.22).

3.7 Comparison to Predictions

Golder (2017a) evaluated water quality in the Elk River watershed in 2016 relative to concentrations predicted by Teck's Regional Water Quality Model (RWQM) that was developed in support of the EVWQP. Water quality performance was evaluated for nitrate, selenium, and sulphate at the 12 Order and Compliance Stations within the Elk River watershed, and at the Compliance Station in Koocanusa Reservoir (Table 3.2). In most cases, concentrations were consistent with or less than modelled. Selenium and sulphate concentrations in water were greater than the modelled concentrations at the FRO Compliance Point (FR_FRCP1; MU1) in 2016 (Golder 2017a). Compliance Points are intended to monitor fully mixed conditions in the receiving environment (i.e., main stem river) of all or most of the direct or indirect discharges from one mine operation. Water quality and quantity monitoring data have indicated that surface water flow at FR_FRCP1 is predominantly discharge water from the mine-impacted Cataract Creek during winter low flows.

In MU2, aqueous nitrate concentrations at the LCO Compliance Point (LC_LCDSSLCC) in 2016 were greater than the modelled concentrations due to greater than anticipated loads from Line Creek upstream from West Line Creek (Golder 2017a). Observed concentrations were also greater than modelled concentrations for one or more constituents at each of the three Compliance Stations in MU4 (Table 3.2). In the case of EV_HC1, nitrate concentrations remained below water quality guidelines. Higher than expected concentrations at Michel Creek



Hazard Quotients for Order Constituents in Water Samples Collected in Lentic Areas

Date: January 2018
Project 2561

minnow environmental inc.

Figure 3.11

Table 3.2: Comparison of Monitoring Observations to Model Predictions for Order and Compliance Stations in the Elk Valley

Management Unit	Stream Name	Teck Water Station Code	Station Description	MOE EMS Number	Observed Concentrations Relative to Predictions			Potential Explanation(s) for Observed Concentrations Being Greater than Predictions
					Nitrate	Selenium	Sulphate	
1	Fording River	FR_FRCP1 (Compliance)	d/s Cataract, u/s Porter	E300071	✓	↑	↑	Water collected at this location during the winter low flow period is predominantly discharge from Cataract Creek so concentrations are not representative of combined and fully mixed contributions from FRO discharages within the Fording River.
	Fording River	GH_FR1 (Order - FR4 and Compliance)	d/s GHO and Greenhills Cr.	200251	↓	↓	✓	-
2	Fording River	LC_LC5 (Order - FR5)	d/s Line Creek	200028	↓	↓	✓	-
	Line Creek	LC_LCDSSLCC (Compliance)	immediately d/s of South Line Cr. confluence	E297110	↑	✓	✓	Source loadings of nitrate were greater than anticipated.
3	Elk River	GH_ERC (Compliance)	220 m d/s of Thompson Cr. and d/s all GHO	E300090	↓	↓	✓	-
	Elk River	GH_ER1 (Order - ER1)	d/s GHO, u/s Fording R. and u/s Boivin Cr.	206661	↓	↓	✓	-
4	Elk River	EV_ER4 (Order - ER2)	d/s Fording R., u/s Grave Cr.	200027	✓	✓	✓	-
	Harmer Creek	EV_HC1 (Compliance)	dam/spillway at d/s end of Harmer Pond	E102682	↑	✓	✓	Although the model has been underestimating nitrate concentrations, concentrations are less than water quality guidelines and not a significant contributor to regional loads.
	Michel Creek	CM_MC2 (Compliance)	d/s Corbin Creek and CMO, 50 m u/s Andy Good Cr.	E258937	↑	↑	✓	The model also underestimated observed concentrations during the model calibration period and may be because the model overestimated flows at this location.
	Michel Creek	EV_MC2 (Compliance)	lower Michel Compliance; between Bodie Cr. and Aqueduct Cr., d/s HWY #3 bridge (Shell Plant)	E300091	↑	✓	↑	Higher than predicted nitrate and sulphate values may relate to overestimation of flows or lack of integration of pumping data at this location.
5	Elk River	EV_ER1 (Order - ER3)	d/s Sparwood & Michel Creek, d/s EV_ER1	200393	✓	✓	✓	-
	Elk River	RG_ELKORES (Order - ER4)	at Elk Reservior	E294312	✓	✓	✓	-
6	Koocanusa Reservoir	RG_DSELK (Order)	Lake Koocanusa - South of Elk River	E300230	✓	↓	↓	-

✓ Observed concentrations were consistent with predictions.
↑ Observed concentrations were higher than predictions.
↓ Observed concentrations were lower than predictions.
Shade indicates stations where model underestimated concentrations

Compliance Stations (CM_MC2 and EV_MC2) may have been due to overestimation of water flows in the RWQM (Golder 2017a). The RWQM was updated in 2017, so future comparisons of observed to modelled concentrations will be based on the updated model.

3.8 Temporal Changes

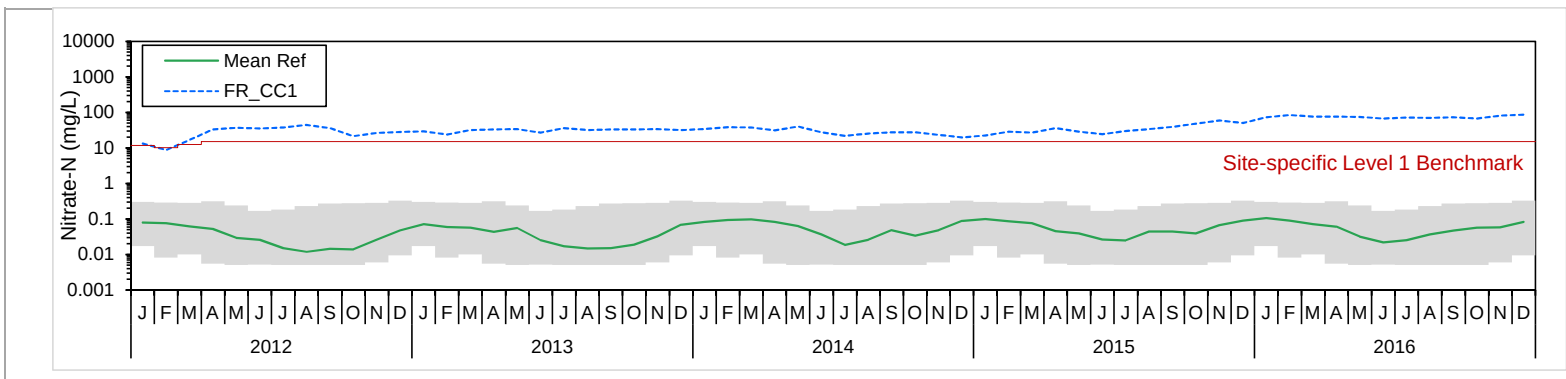
Temporal trends were evaluated for monthly mean nitrate, selenium, and sulphate concentrations using RM ANOVA, followed by *post hoc* contrasts to test for linear and step changes relative to mean reference area temporal changes. Step change decreases, particularly for nitrate, were observed at many areas (Appendix Tables C.32 to C.35). This was contrary to expectations, and was found to be at least partially attributable to temporal increases in concentrations of nitrate among reference areas, and not necessarily decreases among mine-exposed areas (Appendix Figure C.8).

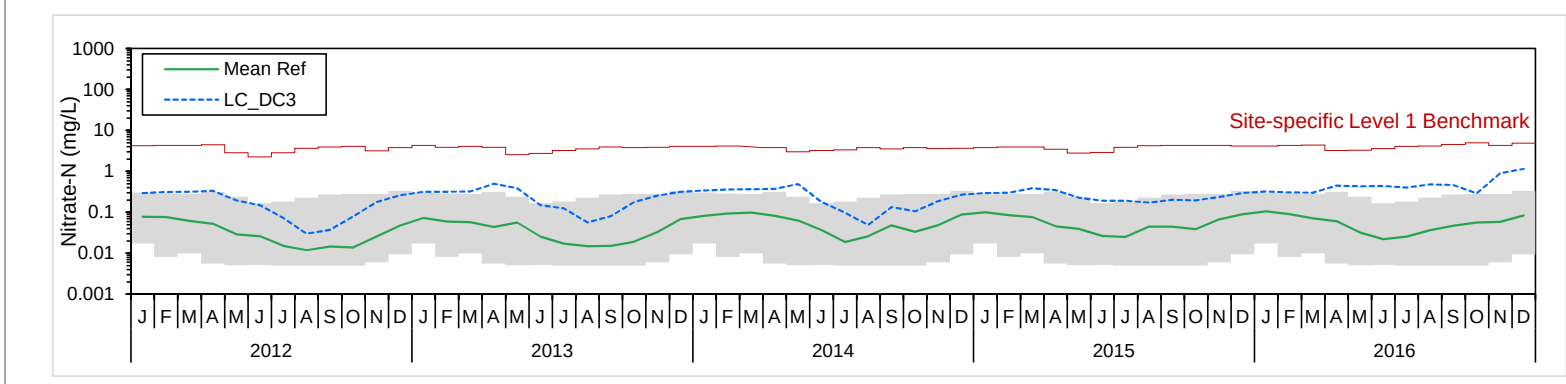
The hypothesis that reference area temporal changes were dominating temporal changes reported for mine-exposed areas was evaluated further. Instead of assessing changes in concentrations at each of the mine-exposed areas relative to the reference mean (as reflected in Appendix Tables C.32 to C.34), the analyses were repeated to evaluate absolute changes over time for each water station (Appendix Tables C.36 to C.38). Very few decreases remained, with more stations showing no change or increases in concentrations when reference area trends were not taken into account (Appendix Table C.36 to C.38). Although not all changes in concentrations over time were statistically significant, there was a pattern of increasing concentrations at most reference areas (6 of 8 reference stations for selenium; 7 of 8 reference stations for nitrate and sulphate) year-over-year (Appendix Tables C.36 to C.38). Therefore, the data indicate that decreases that were reported among mine-exposed areas in Appendix Tables C.32 to C.34 were largely attributable to increases among reference areas. The reason for observed increases among reference areas is currently unknown.

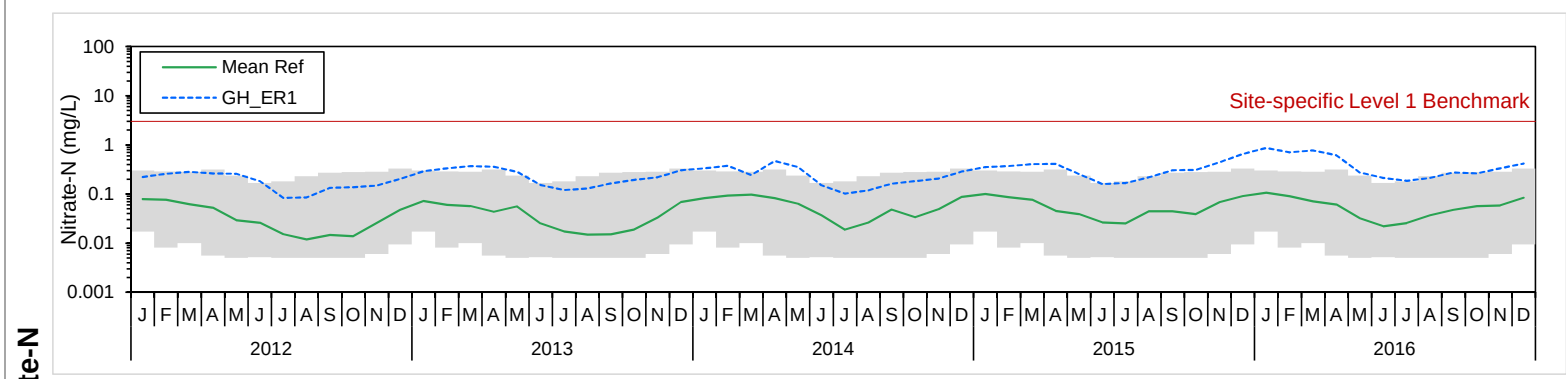
Step decreases in aqueous concentrations observed among mine-exposed areas after 2013 may also be related to effects of the record flood in June 2013 (Figure 3.3).

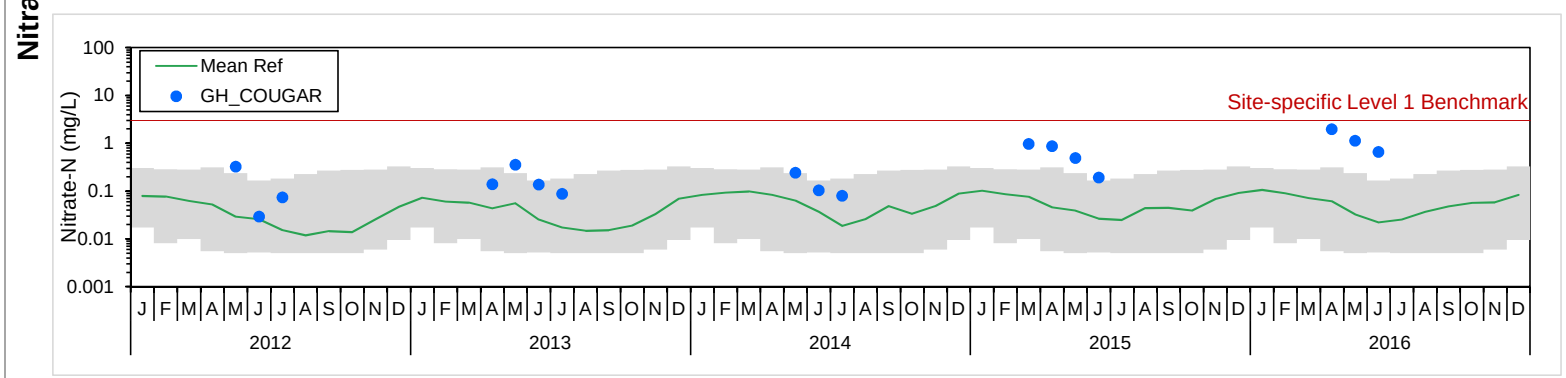
Statistically significant increases in nitrate concentrations were observed at six mine-exposed water monitoring stations after 2014 (GH_COUGAR 377%; GH_MC1 1,539%) or 2015 (FR_CC1 99%, LC_DC3 83%, GH_ER1 28%, EV_MC3 65%) (Figure 3.12; Appendix Table C.32). Significant increases in selenium were observed at four stations: Kilmarnock Creek (FR_KC1 22% after 2012), upper Dry Creek stations LC_DC3 (38% after 2015) and LC_DCDS (27% after 2015), and Mickelson Creek (GH_MC1 186% after 2014) (Figure 3.12; Appendix Table C.33). Increasing sulphate concentrations were observed in Line Creek upstream from the AWTF (LC_LCUSWLC 15% after 2012), at the GHO Elk River Order station

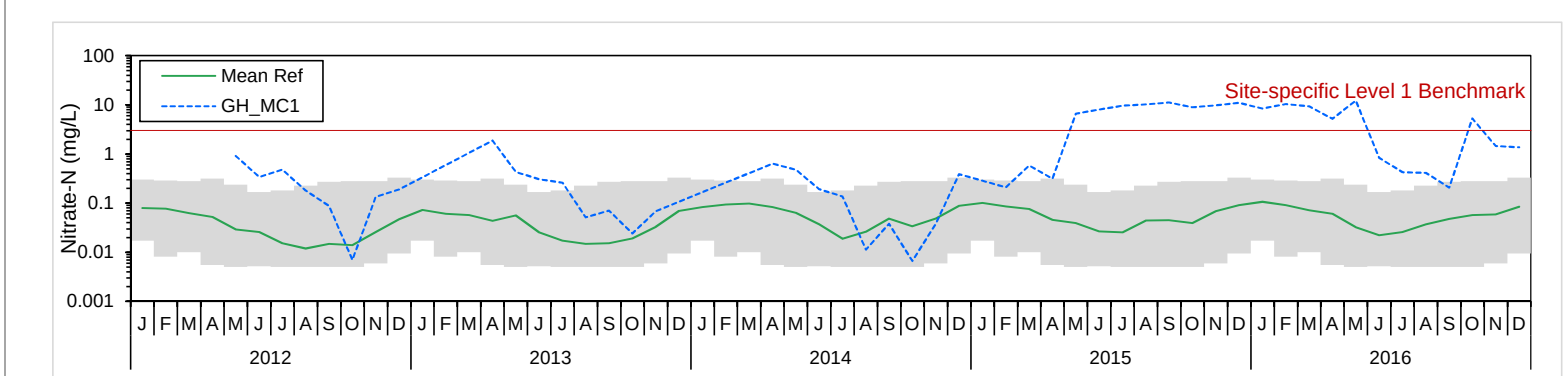
Nitrate-N











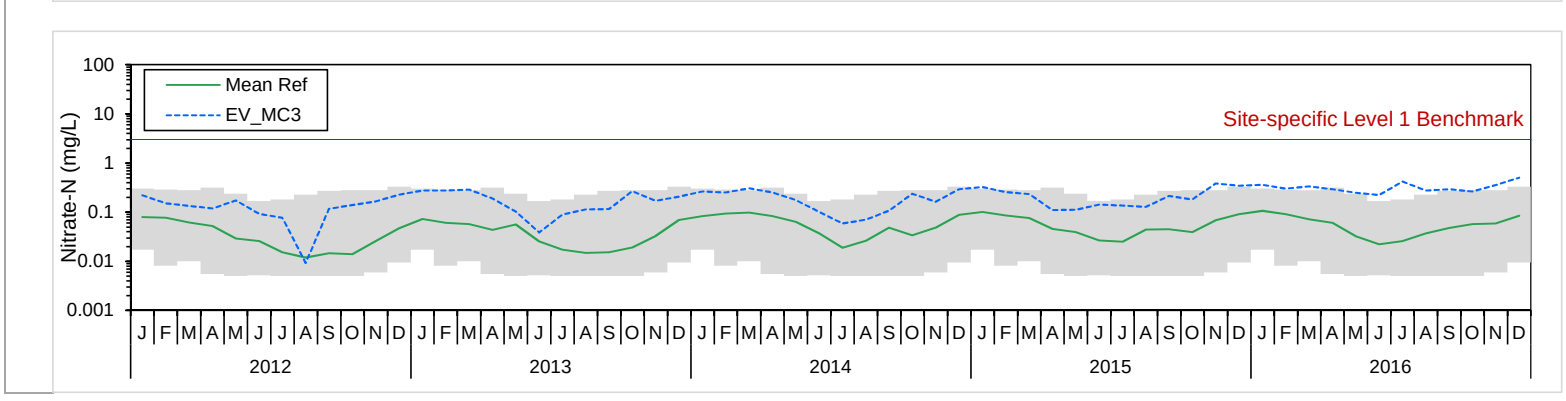
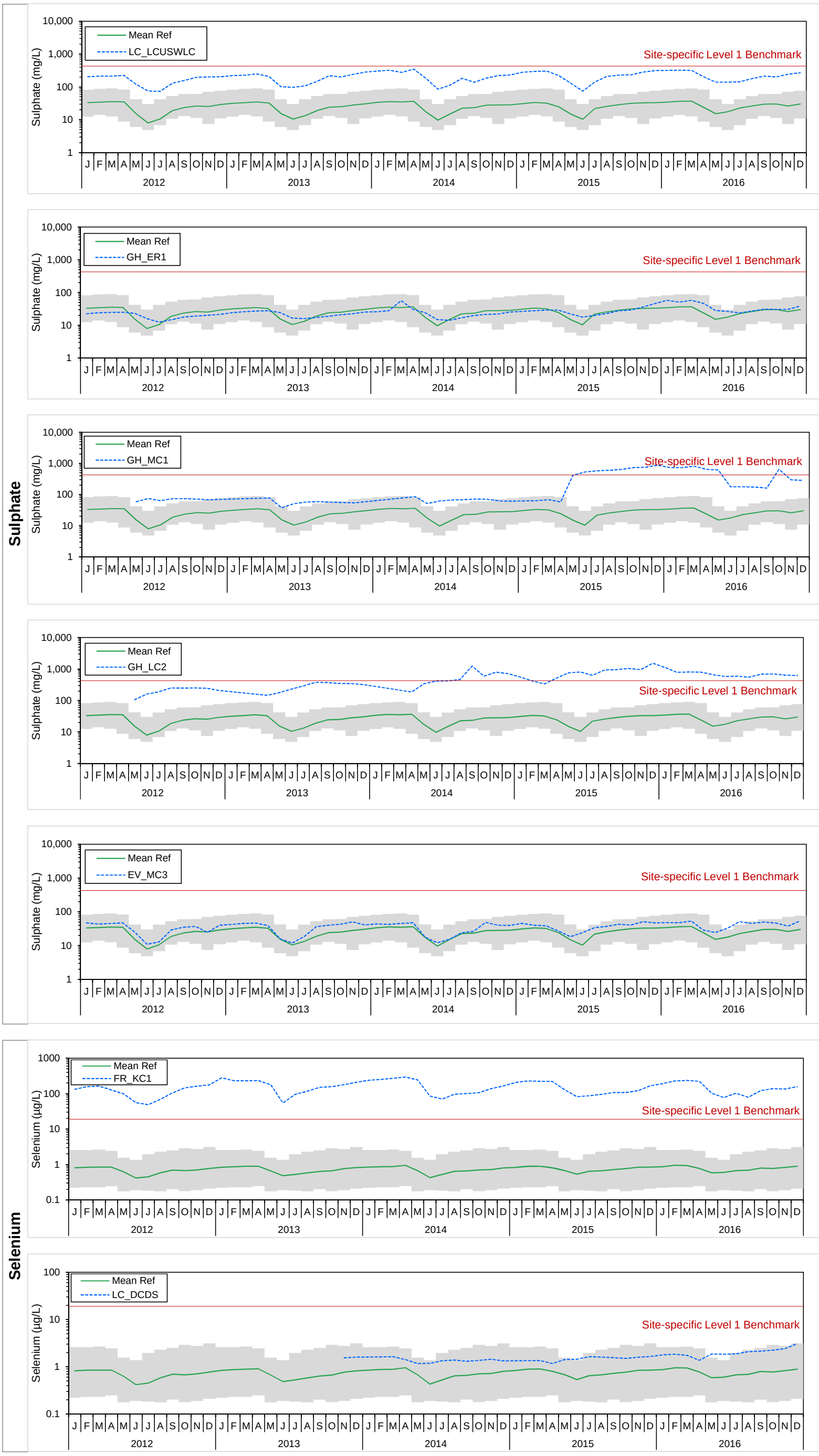


Figure 3.12: Significant Increasing Temporal Changes for Nitrate-N, Total Selenium, and Sulphate Relative to Mean Reference Concentrations, 2012 - 2016

Notes: Grey shading represents the reference area normal range (2.5th and 97.5th percentiles for the 2012-2016 reference area data).



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Notes: Grey shading represents the reference area normal range (2.5th and 97.5th percentiles for the 2012-2016 reference area data).

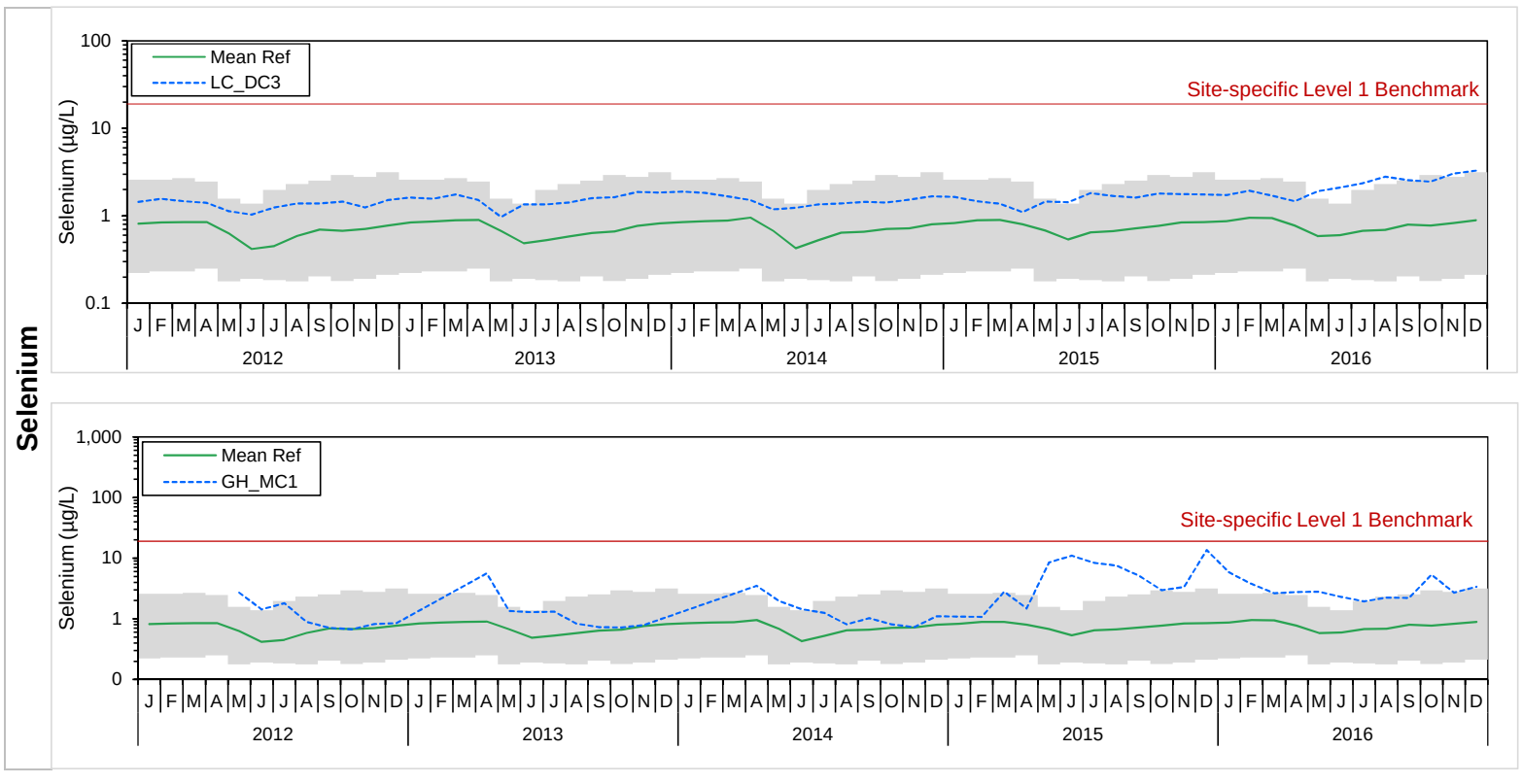


Figure 3.12: Significant Increasing Temporal Changes for Nitrate-N, Total Selenium, and Sulphate Relative to Mean Reference Concentrations, 2012 - 2016

Notes: Grey shading represents the reference area normal range (2.5th and 97.5th percentiles for the 2012-2016 reference area data).

(GH_ER1 53% between 2012 and 2016), at Mickelson Creek (GH_MC1 407% after 2014), at Leask Creek (GH_LC2, 142% after 2013), and in Michel Creek upstream from Erickson Creek (EV_MC3; 18% after 2015) (Figure 3.12; Appendix Table C.34).

Although decreases in nitrate concentrations were detected in Line Creek downstream from the AWTF (LC_LC3; Figure 3.13; Appendix Table C.32), decreases of similar magnitude were observed in previous years (i.e., after 2013 and 2014) and were also observed widely among mine-exposed areas (i.e., related to reference area increases not decreases at mine-exposed areas).

Potential temporal changes were also evaluated for the overall main stem receiver within each MU relative to reference areas. Significant increases in nitrate and sulphate concentrations were identified for the Elk River in MU3 (Appendix Table C.35), but concentrations remained below EVWQP Level 1 benchmarks (Table 3.1). Average concentrations of nitrate, selenium, and sulphate decreased or remained unchanged in the other main stem receivers (Appendix Table C.35).

3.9 Summary

Water flows in the Elk River watershed vary annually, particularly during spring freshet, after which flows gradually decline toward winter minima. Peak spring water flows in 2012 to 2014 exceeded 10-year averages, especially in 2013 when record flows were observed in mid-June. In 2015, peak freshet flows were near the average, but declined more quickly in June and July. In 2016, freshet flows began earlier and peaked at below-average levels.

Water quality variability among stations downstream of mining relates mainly to variation in concentrations of Order constituents (nitrate, total selenium, and sulphate, and to a lesser degree cadmium), as well as alkalinity, conductivity, hardness, TDS, calcium, magnesium, nitrite, sodium, and potassium; and total and dissolved antimony, boron, calcium, chloride, lithium, magnesium, molybdenum, nickel, nitrite, potassium, strontium, and uranium. Water quality variability among mine-exposed stations was also associated with variation in concentrations of TSS and turbidity, and substances often associated with particles in the water column (e.g., aluminum, iron, manganese) as well as TOC and phosphorus (which likely reflect the mobilization of organic matter during high flows).

Monthly mean concentrations of the key mine-related constituents (nitrate, selenium, and sulphate) tend to be lowest in the upper Elk River and highest in the Fording River. Most stations show a similar seasonal pattern of lowest concentrations in winter and highest concentrations during spring freshet, although there is variability that may relate to periodic precipitation events.

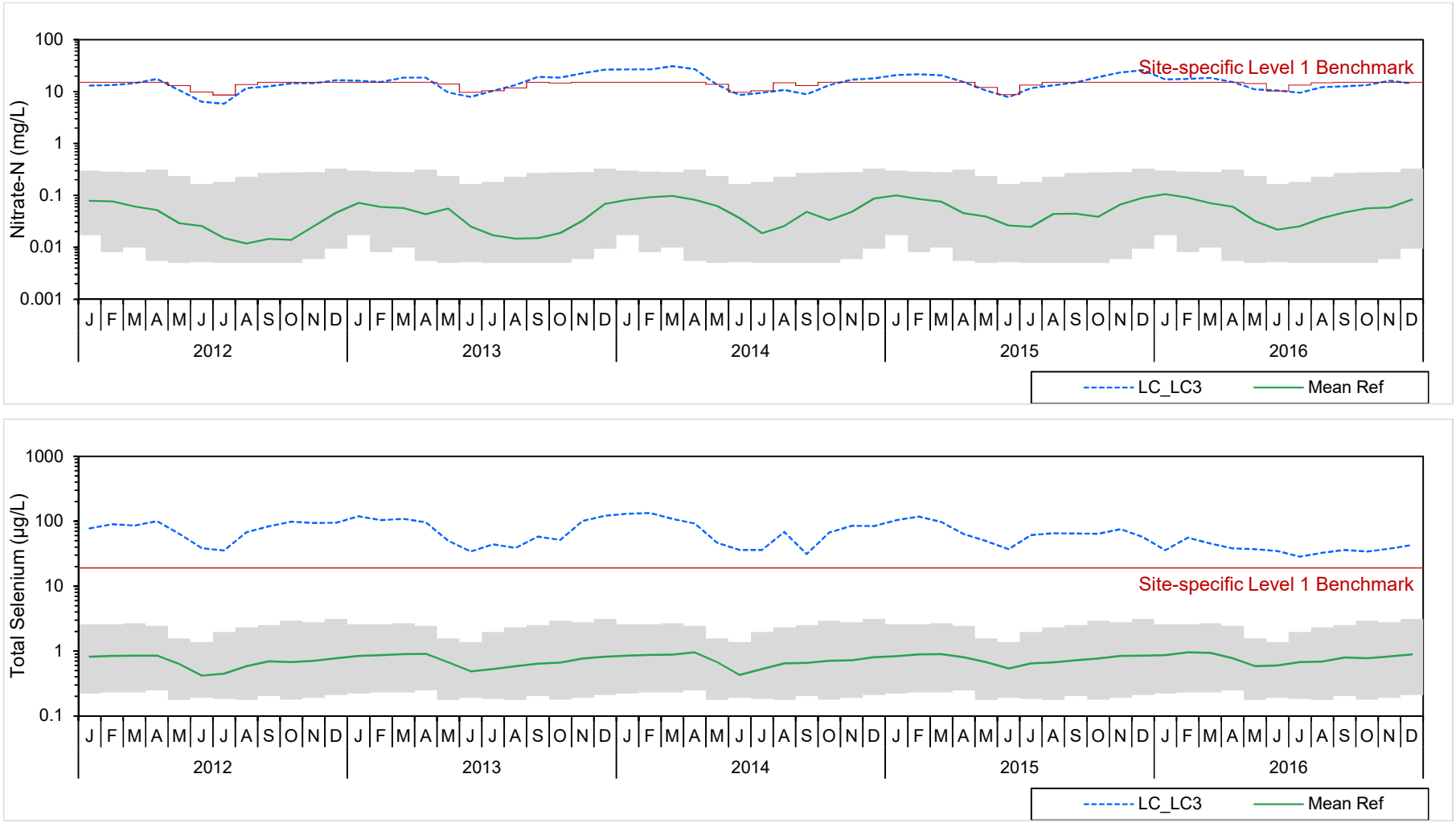


Figure 3.13: Time Series Plots for Monthly Mean Nitrate and Total Selenium Concentrations at LC_LC3 and for the Mean of the Reference Areas, 2012 - 2016

Notes: Grey shading represents the reference area normal range (2.5 th and 97.5th percentiles for the 2012-2016 reference area data).

Strong negative correlations with water flow (r>|0.6|) were observed for concentrations of alkalinity, as well as total and dissolved lithium, molybdenum, and strontium among reference station samples, but specific conductivity (r = 0.9) and dissolved organic carbon (r = -0.6) were the only constituents that correlated strongly with water flow among samples collected at mine-exposed stations. Aqueous TSS and/or turbidity correlated strongly (r>0.6) with water flow at most individual reference stations, but only weakly when data for reference stations were combined (r<0.4), indicating that relationships between flow and TSS/turbidity vary naturally among stations, even among reference stations within close proximity in the watershed. The results suggest that prior to mining, water quality along main stem streams may have varied naturally from headwaters due to differences in water quality among tributary inputs.

A single normal (reference) range was defined for each water quality variable based on combining data for all reference water quality stations monitored by Teck (2012 to 2016) within each month. The upper limit of the normal range was defined as the 97.5th percentile of the combined reference station concentrations for each month (i.e., the upper limit of "normal" was defined for each month, thereby partially accounting for natural seasonal varations in flow and water quality). This was deemed adequate for identifying areas of the watershed that are being affected by mining because concentrations at mine-exposed areas that are above the normal range for all reference stations combined provides strong evidence of mine-related influence. For aluminum, iron, manganese, and total phosphorus, which correlated strongly with TSS and/or turbidity among reference stations, normal ranges were also defined using a covariate approach. TSS or turbidity, whichever exhibited the strongest linear regression relationship, was used as the covariate.

Normal ranges for most total and dissolved metals were exceeded in more than 10% of samples collected at more than half of the monitoring stations downstream from mining. All samples collected in 2015 at the four monitoring stations in MU5, downstream from all mining, had selenium and nitrate concentrations greater than normal ranges indicating mine-related influence on water quality extends at least to the mouth of the Elk River. In addition to elevated selenium and nitrate concentrations, total and dissolved barium, chloride, and nitrite concentrations were above normal ranges in more than 50% of samples collected at the most downstream station on the Elk River (RG_ELKMOUTH), suggesting these eight constituents are the ones most strongly indicative of mine influence (i.e., conservative tracers). Comparison of aluminum, iron, and manganese concentrations at individual mine-exposed stations to covariate-adjusted normal ranges typically identified a similar or lesser frequency of normal range exceedances than comparison to monthly normal ranges. However, the covariate-adjusted normal range for phosphorus identified more normal range exceedances than the monthly normal range approach at most stations. Results will be discussed with the EMC to

determine the preferred approach for future evaluations of mine-related influence on water quality relative to reference station concentrations.

Although BC water guidelines for long-term exposure are based on 30-day mean concentrations, concentrations in individual samples were compared to the guidelines to conservatively identify constituents being elevated above guidelines as a result of mining. Normal reference station ranges occasionally exceeded water quality guidelines for total iron, total chromium, and total mercury. Aqueous concentrations measured at mine-exposed stations in 2015 exceeded SSBMs or BC guidelines, as well as reference area normal ranges in one or more sample(s) collected at one or more mine-exposed station(s) for nitrate, sulphate, dissolved cadmium, selenium, total dissolved solids, total and dissolved iron, dissolved aluminum, total barium, total beryllium, chloride, total chromium, total cobalt, total mercury, total nickel, nitrite, ammonia, total silver, total thallium, total uranium, and total zinc. The constituents tending to be most elevated above normal ranges and guidelines in the Elk River watershed as a result of mining were nitrate, total and dissolved selenium, sulphate, total dissolved solids, total (but not dissolved) iron, dissolved aluminum, and total and dissolved uranium. Highest concentrations of all constituents were observed in tributaries closest to mine sources compared to main stem areas. An analysis of water quality data for development of early warning triggers has taken place in parallel with the water quality data evaluation presented in this report. Potential differences in methods and/or conclusions that emerge from these parallel processes will be evaluated and discussed with the EMC.

Concentrations of Order constituents were also evaluated based on maximum (calendar) monthly mean concentrations. Monthly means did not exceed EVWQP Level 1 effect benchmarks for cadmium, selenium, and sulphate among main stem stations, except in the Fording River (selenium and sulphate at FR_FRCP1; selenium at GH_PC2, FR_FRABCH, LC_LC6, and LC_LC5), and in lower Michel Creek (nitrate and selenium at EV_MC2).

Statistically significant increases in nitrate concentrations were observed at six mine-exposed water monitoring stations after 2014 (GH_COUGAR 377%; GH_MC1 1,539%) or 2015 (FR_CC1 99%, LC_DC3 83%, GH_ER1 28%, EV_MC3 65%). Significant increases in selenium were observed at four stations: Kilmarnock Creek (FR_KC1 22% after 2012), upper Dry Creek stations LC_DC3 (38% after 2015) and LC_DCDS (27% after 2015), and Mickelson Creek (GH_MC1 186% after 2014). Increasing sulphate concentrations were observed in Line Creek upstream from the AWTF (LC_LCUSWLC 15% after 2012), at the GHO Elk River Order station (GH_ER1 53% between 2012 and 2016), at Mickelson Creek (GH_MC1 407% after 2014), at Leask Creek (GH_LC2, 142% after 2013), and in Michel Creek upstream from Erickson Creek (EV_MC3; 18% after 2015).

Water quality performance was evaluated for nitrate, selenium, and sulphate at the 12 Order and Compliance Stations within the Elk River watershed, and at the Compliance Station in Koocanusa Reservoir (Golder 2017a). In most cases, observed concentrations were consistent with or less than modelled concentrations. Selenium and sulphate concentrations in water samples collected at the FRO Compliance Point (FR_FRCP1; MU1) in 2016 were greater than the modelled concentrations. The data indicated that surface water flow at FR_FRCP1 is predominantly discharge water from the mine-impacted Cataract Creek during winter low flow months, which explained the high concentrations of selenium and sulphate observed in winter samples.

In MU2, aqueous nitrate concentrations at the LCO Compliance Point (LC_LCDSSLCC) in 2016 were greater than the modelled concentrations due to greater than anticipated loads from Line Creek upstream from West Line Creek (Golder 2017a). Observed concentrations were also greater than modelled concentrations for one or more constituents at each of the three Compliance Stations in MU4. In the case of EV_HC1, nitrate concentrations remained below water quality guidelines. Higher than expected concentrations at Michel Creek Compliance Stations (CM_MC2 and EV_MC2) may have been due to overestimation of water flows in the RWQM (Golder 2017a). The RWQM was updated in 2017, so future comparisons of observed to modelled concentrations will be based on the updated model.

4 TOXICITY TESTING

4.1 Overview

Laboratory toxicity tests can contribute to the understanding of conditions observed in the field by testing samples collected in the field using standard test species in a controlled laboratory environment. Teck routinely collects discharge water samples for acute toxicity testing in accordance with requirements of Permit 107517. The results are presented in annual water quality reports (Teck 2016a, 2017a). Chronic toxicity testing of surface water samples is also undertaken and reported in accordance with Permit 107517 (Golder 2016, 2017c). A summary of acute and chronic toxicity test results related to surface water monitoring stations[20] sampled in 2015 to 2016 is presented below and details can be found in the reports cited above.

4.2 Acute Toxicity

Acute toxicity tests with rainbow trout and *D. magna* are considered a "pass" if at least 50% of the test organisms exposed to each sample survive. All tests except one completed in 2015 and 2016 using rainbow trout (n = 225) were considered passes, as were most tests completed using *D. magna* (218 of 229 = 95%) (Table 4.1; Appendix Table C.33). Samples with more than 50% mortality were collected at Smith Pond (MU1; one sample in 2016), Swift Creek (MU1; one sample in 2015), Cataract Creek (MU1; seven samples in 2015 and 2016), Wade Creek (MU3, one sample in 2015), Pengelly Channel (MU4; one sample in 2015), and EVO Dry Creek (MU4, one sample in 2016) (Appendix Table C.33).

Further investigation of the failed *D. magna* tests suggested that the standard laboratory procedure of warming water samples to 20 ± 2°C (i.e., above field water temperatures) may have enhanced formation of a mineral precipitate that affected *D. magna* survival (Teck 2017a). Although it was not confirmed if the mineral precipitate was calcite or another form of carbonate mineral, calcite formation is known to be greater at higher than lower water temperatures (Langmuir 1997). When samples were split for duplicate testing at the standard test temperature of 20ºC and at a lower temperature of 10ºC, consistently fewer mortalities were observed in the same sample adjusted to the lower temperature (Teck 2017a).

Bogart et al. (2016) tested the effects to *D. magna* of rapid and extreme shifts in water hardness (38–600 mg/L as $CaCO_3$) and alkalinity (30–420 mg/L as $CaCO_3$) both independently and in combination. Within these ranges, if no calcite precipitate formed, shifts in water hardness

[20] Teck (2016, 2017) included acute toxicity test results for samples collected at discharge stations LC_LC7, LC_WTF_OUT, and WL_BRWB_OUT. As this report focuses on aquatic health in tributaries and receiving environments of the Elk River watershed, toxicity data for those stations were not included in this report.

Table 4.1: Summary[a] of Acute Toxicity Results, 2015 - 2016

Management Unit	Teck Water Station Code	Stream Name	Area Description	Rainbow Trout			*Daphnia magna*		
				# Tests Completed (2015-2016)	# Tests with 0-10% Mortality (no acute toxicity[b])	Maximum % Mortality in a Single Test	# Tests Completed (2015-2016)	# Tests with 0-10% Mortality (no acute toxicity[b])	Maximum % Mortality in a Single Test
1	FR_CC1	Clode Creek	Decant from Clode sediment pond	8	8	0	8	8	3.3
	FR_EC1	Eagle Creek	Sedimentation pond decant	8	8	0	8	8	0
	FR_LMP1	Lake Mountain Creek	Lake Mountain sediment pond decant (initiated 2017)	1	1	0	1	1	0
	FR_SP1	Smith Pond	sediment pond decant	9	9	0	8	5	63
	FR_FRABEC1	Fording River	u/s Eagle Pond discharge (EC1)	1	1	0	1	1	0
	FR_MULTIPLATE	Fording River	Multiplate Culvert on Greenhills Access Road	1	1	0	1	1	3
	FR_SKP1	Kilmarnock Creek	Kilmarnock outflow from settling pond	2	2	0	2	2	0
	FR_SKP2	Kilmarnock Creek	Kilmarnock outflow from settling pond	1	1	0	1	1	0
	GH_SC1	Swift Creek	sediment pond decant	3	3	0	3	3	0
	GH_SC2	Swift Creek	sediment pond bypass	2	2	0	2	1	100
	GH_CC1	Cataract Creek	sediment pond decant	8	8	10	9	1	100
	GH_PC1	Porter Creek	sediment pond decant	8	8	0	8	7	17
	GH_FR1	Fording River	d/s GHO and Greenhills Cr.	2	2	0	2	2	0
	GH_GH1	Greenhills Creek	sediment pond decant	1	1	0	1	1	0
2	LC_LCUSWLC	Line Creek	d/s rock drain, u/s West Line Cr. and AWTF outfall	2	2	0	2	2	0
	LC_LC3	Line Creek	d/s West Line Cr. and AWTF outfall	4	4	0	4	4	0
	LC_LCDSSLC	Line Creek	immediately d/s of South Line Cr. Confluence	2	2	0	2	2	0
	LC_LC5	Fording River	d/s Line Cr.	7	7	0	7	7	3.3
3	GH_WADE	Wade Creek	at LRP Road culvert	6	6	0	7	6	73
	GH_COUGAR	Cougar Creek	at LRP Road culvert	2	2	0	2	2	0
	GH_MC1	Michelson Creek	at LRP Road culvert	6	6	0	6	6	0
	GH_LC1	Leask Creek	sediment pond decant (goes to ground)	2	2	0	2	2	0
	GH_WC1	Wolfram Creek	sediment pond decant (goes to ground)	4	4	0	4	4	0
	GH_TC1	Thompson Creek	sediment pond decant	8	8	0	8	7	13.3
	GH_TC2	Thompson Creek	sediment pond decant	8	8	0	8	8	3.3
	GH_ERC	Elk River	220 m d/s of Thompson Cr. and d/s all GHO	2	2	0	2	2	0
4	EV_HC1	Harmer Creek	dam/spillway at d/s end of Harmer Pond	1	1	0	1	1	3
	EV_SM1	Six Mile Creek	sediment pond decant	8	8	0	8	8	0
	EV_LC1	Lindsay Creek	Lindsay Creek infiltration basin discharge	6	6	10	7	7	0
	EV_GC2	Goddard Creek	sediment pond decant	8	8	0	8	8	3
	EV_OC1	Otto Creek	near mouth (~80m upstream of Elk R.)	8	8	0	8	8	0
	CM_CC1	Corbin Creek	near mouth and d/s CMO	4	3	20	4	4	0
	CM_CCPD	Corbin Sediment Pond	Decant discharge from Corbin Sediment Pond	10	9	20	11	10	46.7
	CM_PC2	Pengelly Channel	Pengelly channel decant	4	2	70	4	4	3
	CM_SPD	Main Pond	Main pond decant	12	10	30	12	11	13.3
	CM_MC2	Michel Creek	d/s Corbin Cr. and CMO, 50 m u/s Andy Good Cr.	1	1	0	1	1	0
	EV_EC1	Erickson Creek	at CPR main line near mouth	8	8	0	8	8	0
	EV_BC1	Bodie Creek	sediment pond decant	8	8	0	8	8	0
	EV_AQ1	Michel Creek	at Great Northern Road	7	7	0	7	7	3
	EV_GT1	Gate Creek	sediment pond decant	8	8	10	8	8	0
	EV_MC2	Michel Creek	between Bodie Cr. and Aqueduct Cr., d/s HWY #3 bridge (Shell Plant)	1	1	0	1	1	0
	EV_MG1	Milligan Pond	sediment pond decant	8	8	0	8	8	0
	EV_DC1	EVO Dry Creek	EVO Dry Creek	7	7	0	8	7	100
	EV_SP1	South Pit Creek	sediment pond decant	8	8	0	8	7	33.3
			Totals	**225**	**219**	**-**	**229**	**210**	**-**

[a] See detailed results in Appendix Table C.31.

[b] Up to 10% mortality is considered acceptable test performance for control organisms (Environment Canada 1990a,b)

and/or alkalinity were not toxic to *D. magna*. By comparison, water with high hardness (600 mg/L as $CaCO_3$) and alkalinity (420 mg/L $CaCO_3$) formed a calcite precipitate that was ingested by and coated the *D. magna*, resulting in 98-100% mortality within 96 h of exposure. Thus, the literature (e.g., Langmuir 1997 and Bogart et al. 2016) provides support for the hypothesis that *D. magna* mortalities observed in some water samples collected in the Elk River watershed may have been associated with the effects of calcite precipitate formation within the laboratory test vessels. The degree to which the observed mortalities reflects a degree of calcite precipitation that would occur under field conditions is unknown, although the rate observed in the laboratory is expected to exceed that of field conditions given the temperature-dependence of the mortalities (Teck 2017a).

More than 97% of samples that were "passes" (<50% mortality) had mortalities of less than 10% (Appendix Table C.34), which is within the accepted performance range for test control organisms based on the test methods (Environment Canada 1990a,b). Mortalities between 10% and 50% were observed among *D. magna* exposed to only four samples collected at Cataract (GH_CC1; MU1), Porter (GH_PC1; MU1), Thompson (GH_TC1; MU3), and South Pit (EV_SP1; MU4) creeks and among rainbow trout exposed to one sample from Corbin Creek (CM_CC1; MU4).

4.3 Chronic Toxicity

Interpretive reports were prepared by Golder (2016, 2017c) to present the results of quarterly and semi-annual chronic toxicity tests undertaken in 2015 and 2016 for Teck's coal mining operations in the Elk Valley. In 2015 and 2016, a total of 70 *Ceriodaphnia dubia* (water flea), 70 *Pseudokirchneriella subcapitata* (green alga), 32 *Hyalella azteca* (amphipod), 16 *Pimephales promelas* (fathead minnow), and 36 *Oncorhynchus mykiss* (rainbow trout) chronic toxicity tests were conducted on surface water samples collected in the Elk Valley (Table 4.2). The following conclusions were summarized from Golder (2017c):

- In 2015, there was no evidence of statistically significant adverse effects in the majority of quarterly and semi-annual toxicity tests relative to one or more reference waters. In 2016, there was no evidence of statistically significant adverse effects in the majority of tests conducted with *P. subcapitata* and *P. promelas*, but significant effects were observed in half of the tests conducted with *C. dubia* and the majority of tests conducted with *H. azteca* and *O. mykiss* relative to one or more reference waters.
- Of tests for which a statistically significant response (relative to one or more reference waters) was identified, approximately one third showed a significant effect relative to one but not both reference waters and/or had mean responses within the typical range of test

Table 4.2: Results of Quarterly and Semi-Annual Chronic Toxicity Tests [a,b] (from Golder 2016, 2017b)

Quarter	Location	Management Unit	Stream Name	Location Description	*C. dubia* Reproduction (% control-normalized)		*P. subcapitata* Cell Yield [× 10^4 cells/mL]		*H. azteca* Dry weight (% control-normalized)		*P. promelas* (copper treated) % Hatch [c]	*O. mykiss* Viability (% control-normalized)	
					2015	2016	2015	2016	2015	2016	2016	2015	2016
Q1	Fording River reference	1	Fording River	Fording River reference	103 ± 17	114 ± 11	108.3 + 6.1	134.6 ± 8.1	82 ± 25	95 ± 4	100 ± 0.0	-	
	FR_FRCP1	1	Fording River	d/s Cataract, u/s Porter	47 ± 18	60 ± 21	64 + 8.9	93.5 ± 7.0	81 ± 6	58 ± 14	93.3 ± 9.4		
	GH_FR1	1	Fording River	d/s Henretta Cr.	99 ± 11	92 ± 45	96.5 + 5.9	119.5 ± 4.7	91 ± 11	88 ± 7	98.3 ± 3.3		
	GH_ERC	3	Elk River	d/s Thompson Cr. and GHO	96 ± 37	101 ± 36	107.5 + 12.1	129.5 ± 9.3	-		-		
	CM_MC2	4	Michel Creek	d/s Corbin Creek, u/s Andy Good Creek	87 ± 14	97 ± 16	101 + 11.9	121.8 ± 2.2	73 ± 22	58 ± 6	98.3 ± 3.3		
	LC_LCDSSLCC	2	Line Creek	d/s South Line	98 ± 14	109 ± 16	117 + 2.2	129.5 ± 5.3	-		-		
	Fording River reference	1	Fording River	Fording River reference	93 ± 14	-	110.6 + 6.8	-	-				
	EV_MC2	4	Michel Creek	between Bodie Cr. and Aqueduct Cr., d/s HWY #3 bridge (Shell Plant)	96 ± 24	109 ± 14	140.8 + 19.5	130.3 ± 12.4	-		-		
	Fording River reference	1	Fording River	Fording River reference	102 ± 9	-	106 + 6.8	-	-				
	EV_HC1	4	Harmer Creek	dam/spillway at d/s end of Harmer Pond	97 ± 8	113 ± 13	27.2 + 3.9	120.3 ± 6.4	-		-		
Q2	Fording River reference	1	Fording River	Fording River reference	92 ± 19	98 ± 14	121.8 + 5.9	107.9 ± 4.9	91 ± 6	104 ± 9	100 ± 0.0	89 ± 14	81 ± 15
	Elk River reference	3	Elk River	Elk River reference	93 ± 10	74 ± 31	102.4 + 5.7	98.8 ± 5.3	-		-	62 ± 22	101 ± 8
	FR_FRCP1	1	Fording River	d/s Cataract, u/s Porter	94 ± 11	80 ± 16	140.3 + 8.4	78.8 ± 1.9	72 ± 10	51 ± 13	98.3 ± 3.3	83 ± 19	79 ± 8
	GH_FR1	1	Fording River	d/s Henretta Cr.	103 ± 7	74 ± 27	125 + 7.4	100.0 ± 5.9	78 ± 25	60 ± 21	96.7 ± 6.7	92 ± 13	77 ± 14
	GH_ERC	3	Elk River	d/s Thompson Cr. and GHO	91 ± 21	77 ± 15	131 + 6.7	103.8 ± 8.5	-		-	68 ± 16	77 ± 9
	EV_MC2	4	Michel Creek	d/s Corbin Creek, u/s Andy Good Creek	90 ± 15	77 ± 17	102 + 5.2	111.5 ± 8.1	-		-	102 ± 10	66 ± 4
	EV_HC1	4	Harmer Creek	dam/spillway at d/s end of Harmer Pond	97 ± 6	79 ± 16	139.8 + 13.6	113.5 ± 1.3	-		-	75 ± 18	81 ± 11
	CM_MC2	4	Michel Creek	d/s Corbin Creek, u/s Andy Good Creek	55 ± 14	43 ± 21	107.5 + 8.8	94.0 ± 4.2	86 ± 8	30 ± 7	100 ± 0.0	82 ± 8	73 ± 8
	LC_LCDSSLCC	2	Line Creek	d/s South Line	82 ± 12	67 ± 39	69.2 ± 5.7	91.0 ± 4.8	-		-	101 ± 6	78 ± 6
Q3	Fording River reference	1	Fording River	Fording River reference	106 ± 25	99 ± 6	125.9 + 9.4	121.1 ± 6.5	70 ± 18	110 ± 3	98.3 ± 3.3	-	
	FR_FRCP1	1	Fording River	d/s Cataract, u/s Porter	119 ± 39	67 ± 28	126.8 + 7	124.5 ± 4.8	77 ± 10	93 ± 13	96.7 ± 6.7		
	GH_FR1	1	Fording River	d/s Henretta Cr.	114 ± 27	100 ± 12	107 + 5.8	118.0 ± 9.2	48 ± 35	97 ± 7	98.3 ± 3.3		
	GH_ERC	3	Elk River	d/s Thompson Cr. and GHO	100 ± 21	95 ± 9	129.3 + 7.2	121.3 ± 6.6	-		-		
	EV_MC2	4	Michel Creek	d/s Corbin Creek, u/s Andy Good Creek	114 ± 20	96 ± 9	110.3 + 5.2	120.0 ± 5.7	-		-		
	EV_HC1	4	Harmer Creek	dam/spillway at d/s end of Harmer Pond	123 ± 9	89 ± 30	133.8 + 5.5	120.5 ± 6.6	-		-		
	CM_MC2	4	Michel Creek	d/s Corbin Creek, u/s Andy Good Creek	104 ± 16	73 ± 18	109.3 + 4.8	107.5 ± 2.1	35 ± 25	113 ± 6	86.7 ± 10.9		
	LC_LCDSSLCC	2	Line Creek	d/s South Line	107 ± 20	83 ± 21	101.3 + 4.3	119.5 ± 5.5	-		-		
Q4	Fording River reference	1	Fording River	Fording River reference	100 ± 16	92 ± 11	121.8 + 7.9	154.3 ± 9.5	104 ± 29	113 ± 11	100 ± 0.0	90 ± 8	91 ± 2
	Elk River reference	3	Elk River	Elk River reference	98 ± 28	95 ± 17	132.1 + 4.5	152.0 ± 8.1	-		-	94 ± 3	97 ± 7
	FR_FRCP1	1	Fording River	d/s Cataract, u/s Porter	51 ± 27	63 ± 20	96.2 + 2.2	141.0 ± 2.9	92 ± 4	95 ± 13	96.7 ± 3.8	72 ± 3	55 ± 6
	GH_FR1	1	Fording River	d/s Henretta Cr.	111 ± 24	83 ± 12	153 + 5	158.5 ± 1.9	97 ± 7	92 ± 37	98.3 ± 3.3	79 ± 4	46 ± 20
	GH_ERC	3	Elk River	d/s Thompson Cr. and GHO	107 ± 30	84 ± 18	146.5 + 3.1	156.8 ± 10.4	-		-	74 ± 22	102 ± 6
	EV_MC2	4	Michel Creek	d/s Corbin Creek, u/s Andy Good Creek	99 ± 22	66 ± 24	136 + 4.1	166.3 ± 2.2	-		-	86 ± 15	88 ± 7
	EV_HC1	4	Harmer Creek	dam/spillway at d/s end of Harmer Pond	106 ± 19	88 ± 13	129 + 3.9	157.8 ± 2.2	-		-	81 ± 3	59 ± 14
	CM_MC2	4	Michel Creek	d/s Corbin Creek, u/s Andy Good Creek	62 ± 18	68 ± 20	115.3 + 3.5	156.0 ± 10.1	80 ± 8	112 ± 8	100 ± 0.0	81 ± 6	84 ± 15
	LC_LCDSSLCC	2	Line Creek	d/s South Line	80 ± 24	94 ± 18	112.0 ± 8.4	156.0 ± 4.5	-		-	87 ± 9	70 ± 10

Notes:
result significantly lower than Fording River reference only.
result significantly lower than Elk River reference only.
result significantly lower than both Fording River reference and Elk River reference.

- = not tested; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; ± = plus or minus.

[a] Results presented as endpoint mean ± standard deviation.

[b] Results provided for most sensitive endpoint.

[c] Copper-treated tests were not conducted in 2015.

organism performance in reference waters (characterized as a 'reference envelope'). Statistical analysis of water chemistry did not identify any consistent relationships that could explain the statistically significant responses, so there is uncertainty regarding whether the results represent an adverse response to toxicants in the test water or variance in test organism performance related to background water quality.

- To evaluate whether temporal variation in test organism performance (batch sensitivity) was a potential confounding factor, mean responses in reference waters in 2016 were compared to the paired batch-specific laboratory control for each test species and endpoint. Most chronic toxicity endpoints (i.e., all response data for that endpoint including reference waters and test waters) were control-normalized before performing subsequent data analyses. This procedure did not result in major differences in the data interpretation (i.e., most responses indicative of toxicity would be classified similarly either with or without control normalization).
- In 2015, two tests exhibited a response that was statistically significantly different from reference, outside the normal range of variability of test organism performance and that were potentially attributable to water quality constituents in test waters. Statistically significant adverse responses in Q1 tests with C. dubia and P. subcapitata were observed at the Fording River Compliance Point (FR_FRCP1) that were associated with nitrate and sulphate concentrations above chronic BC WQG and/or effects concentrations determined in previous toxicity testing with Elk Valley waters.
- In 2016, there were eight tests that exhibited responses that were statistically significantly different from reference, below the reference envelope, and that were potentially attributable to water quality constituents in test waters. Statistically significant adverse responses were observed in the Q1 FR_FRCP1 tests with C. dubia, P. subcapitata, and H. azteca. Nitrate may have contributed to observed responses in these tests, although the magnitude of responses observed is greater than indicated by other site-specific testing. In 2016, nitrate concentrations in five other C. dubia tests (FR_FRCP1 [Q2, Q3, Q4], GH_FR1 [Q2], LC_LCDSSLCC [Q2]) may have contributed to the observed response, although the evidence for nitrate toxicity as the primary explanatory factor in these experiments was weak based on comparison to C. dubia responses in other quarterly tests.

Overall, no water quality parameter was identified as a potential cause of most statistically significant test results observed in 2015 and 2016. The Q1 FR_FRCP1 tests resulted in adverse effects attributed to water quality in both 2015 (*C. dubia* and *P. subcapitata*) and 2016 (*C. dubia*, *P. subcapitata,* and *H. azteca*). Other statistically significant adverse test responses

did not align with the concentration-response patterns for mine-related constituents determined in previous toxicity testing with Elk Valley waters, indicating that some other source of variance was affecting the results.

4.4 Summary

All acute tests completed in 2015 and 2016 using rainbow trout (n = 176) were passes (≤50% mortality), as were most tests (169 of 179 = 94%) completed using *D. magna*. Further investigation of the failed *D. magna* tests suggested that the laboratory procedure of warming water samples from the ambient field temperature to the laboratory test temperature of 20 ± 2°C may have affected survival due to formation of a mineral precipitate (potentially calcite). More than 97% of samples resulting in "passed" *D. magna* or rainbow trout tests had mortalities of 10% or less, which is within the accepted performance range for test control organisms based on the test methods.

In 2015 and 2016 a total of 70 *C. dubia* (water flea), 70 *P. subcapitata* (green alga), 32 *H. azteca* (amphipod), 16 *P. promelas* (fathead minnow), and 36 *O. mykiss* (rainbow trout) chronic toxicity tests were conducted on surface water samples collected in the Elk Valley. Of tests for which a statistically significant response (relative to one or more reference waters) was identified, approximately one third showed a significant effect relative to one but not both reference waters and/or had mean responses within the typical range of test organism performance in reference waters. A review and statistical analysis of water chemistry did not identify any consistent relationships that could explain most of the statistically significant responses, so there is uncertainty regarding whether the results represent an adverse response to toxicants in the test water or variance in test organism performance related to background water quality. In 2016, eight tests exhibited a response that was statistically significantly different from responses in reference water samples, below the reference envelope, and potentially attributable to water quality constituents in test waters. Effects to organisms observed in tests with first-quarter samples collected at the Fording River Compliance Point (FR_FRCP1) were attributed to water flowing from Cataract Creek, because the reach of the Fording River upstream of FR_FRCP1 goes dry during the winter low flow period.

4.5 Additional On-going Work

Additional investigations are underway to evaluate potential causes of the toxicity observed in a subset of the quarterly and semi-annual tests. From the annual reporting conducted separately for 2015 and 2016, it is apparent that concentrations of nitrate and sulphate do not, on their own, explain the patterns of toxicity observed in the quarterly and semi-annual chronic toxicity tests. However, the frequency of statistically significant responses warrants further investigation

to confirm patterns over time and/or spatial location, and to identify causes where possible. The following work is being conducted under the Chronic Toxicity testing program to assist evaluation of toxicity data:

- Additional representation of toxicity endpoint patterns - as multiple rounds of toxicity test response data are accumulated, the results will be integrated and summarized in future interpretive report. Based on discussions with EMC, these reports will organize toxicity responses by sampling location, and will explicitly evaluate whether statistically significant responses are confirmed in successive sampling events. These evaluations will also incorporate EMC input regarding the treatment of data (e.g., control-normalization, use of reference comparisons) for evaluating magnitude.
- Additional statistical analysis of contaminant mixtures - from the concentration-response evaluations of 2015 and 2016 test data, most water quality parameters evaluated in the concentration-response analysis exhibit concentrations below water quality guidelines or orders of magnitude below effect concentrations. Based on the different mechanisms of action and low exposure concentrations relative to toxicological benchmarks, there is a low potential for additive effects of multiple constituents. It is unlikely that combined effects among the parameters would occur; nevertheless the EMC has identified some additional approaches to statistical evaluation of the water chemistry data (e.g., summation of “toxic units” relative to site-specific benchmarks or water quality guidelines) to assess potential for mixture responses. There procedures will be applied in the next cycle of annual interpretative reporting.
- Validation of sulphate and nitrate benchmarks - as part of Permit 107517 testing and the associated RAEMP approvals, Teck has conducted additional testing of site waters amended with supplemental sulphate and nitrate concentrations across a wide range of concentrations and multiple site waters (Golder 2017c). Overall, results of these supplemental tests in fall 2016 confirmed that benchmark levels derived in support of the EVWQP, and the associated Site Performance Objective values, remain protective of aquatic life.
- Toxicity identification evaluations - when the magnitude of toxicity in an individual test is large, a toxicity identification evaluation (TIE) can provide information regarding causation. A TIE consists of multiple supplemental treatments based on adjusting the original sample characteristics to discern which adjustments increase of decrease the magnitude of response. Future potential TIE tests will contribute to evidence regarding causes of toxicity.

- Additional test refinements - in some cases, investigations of root causes have identified information sufficient to determine that adjustments to toxicity test methods are required. For example, the testing with fathead minnows in 2015 identified that amendment of water samples with copper was necessary to control for microbial responses. Other refinements, such as supplementing test waters for *H. azteca* with halides, have also been necessary to meet test performance criteria and isolate potential chemical responses from confounding factors unrelated to mine-influence. Teck has conducted multiple stages of supplemental testing to help reduce uncertainty in the results of Permit-mandated tests, and have obtained EMC approvals where protocol modifications are required..

5 CALCITE

5.1 Overview

Calcite is created by the reaction of dissolved calcium (Ca^{2+}) and carbonate (CO_3^{2-}) ions under conditions of supersaturated carbonate and/or increasing water pH or calcium concentrations (Rupp and Adams 1981). Although calcite deposits can occur naturally in streams, calcite build-up can increase if water passes through mine waste rock, which elevates aqueous concentrations of both calcium and carbonate. Over time, as calcite particles collect on the substrate, they can cement together (Photos 5.1 to 5.4).

Stream calcite formation is not strictly governed by the laws of chemical thermodynamics and instead is the product of complex interplay among factors such as angle of slope, water temperature and discharge rate, and plant and microbial community abundance and composition (Pedley 1990; Pedley and Rogerson 2010). Periphyton photosynthesis may be almost as important as chemical solubility in mediating calcite precipitation, depending on water temperature and velocity (Rupp and Adams 1981).

Photo 5.1: Rocks Affected by Calcite (Lower Greenhills Creek)

Photo 5.2: Substrate with No Calcite (CI=0; Wigwam River)

Photo 5.3: Substrate Covered in Calcite but No Concretion (CI=1; Thompson Creek)

Note: Substrate is uniform in colour.

Photo 5.4: Substrate Covered in Concreted Calcite (CI=3; Cataract Creek)

In 2013, Teck initiated a regional calcite monitoring program to document calcite deposition in tributary and main stem areas of the Elk River watershed (Robinson et al. 2013). To guide interpretation of the regional monitoring results with respect to potential effects on aquatic biota, a separate supporting study was initiated by Teck in September 2014 (Minnow 2015d). The study of calcite effects on biota focused initially on assessing potential relationships between calcite deposition and both benthic invertebrate community structure and periphyton productivity (Minnow 2016b). In 2015, the study was expanded to investigate potential effects on fish spawning and incubation success (Minnow 2016b; Ecofish 2016, 2017; Ecofish and Westslope 2017). The results of the supporting biological effects studies completed to date are summarized below. Calcite deposition associated with biological monitoring in the RAEMP and LAEMPs is also discussed in later sections of this report, where applicable.

5.2 Regional Calcite Monitoring Program

5.2.1 Results in 2015 and 2016

Monitoring results in 2015 and 2016 were similar to those reported in 2013 and 2014 (Lotic 2016, 2017). All (100% of) reference streams assessed had CI of 0.5 or less. Most of the mine-exposed stream kilometres that were assessed (in MUs 1-4 and a portion of MU5) also had a CI of 0.5 or less (≥75% of tributaries and ≥81% of main stem Fording and Elk Rivers).

5.2.2 Temporal Changes

Of the 124 stream reaches sampled in the 2015 regional calcite monitoring program, 119 were sampled in all three years (2013 to 2015; Lotic 2017). Regression analysis was used by Lotic (2017) to identify any stream reaches showing an increasing or decreasing trend in mean CI over the three-year period. An increase was reported for one reach in Erickson Creek (ERIC3; MU4; 2.36 to 3.00 = 0.32 CI/year), and decreasing trends were reported for one reach each at Eagle Pond Outlet (EPOU1; MU1; 1.90 to 0.58 = -0.66 CI/year), Grace Creek (GRAC1; MU2; 0.31 to 0.05 = -0.13 CI/year), and Otto Creek (OTTO1; MU4; 0.30 to 0.10 = -0.10 CI/year). No trends were reported for the other 115 reaches that were sampled in all three years (Lotic 2016).

The study design was modified in 2016 to sample at 85 “indicator” reaches throughout the valley. The purpose of the indicator reach sampling on an annual basis is to detect large scale changes. In addition to the annual surveillance monitoring, long-term trend monitoring will take place at a three-year interval (Lotic and Teck 2016). Of the 85 indicator reaches sampled in 2016, 10 showed a significant change in CI from 2013 to 2016 (Lotic 2017; Table 5.1). After inclusion of data for 2016, EPOU1 and GRAC1 continued to show decreasing trends, while trends previously suggested for ERIC3 and OTTO1 were not apparent. Decreasing trends were indicated in a total of six reaches, while increasing trends were indicated in four reaches (Table 5.1).

Now that a sufficient number of years of data are available, temporal trends in the regional calcite monitoring program were re-evaluated for the purposes of this report using statistical methods recommended by the EMC for data evaluation within the RAEMP (RM ANOVA, followed by post-hoc contrasts to test for linear and step changes relative to reference areas). The RM ANOVA contrasts differ from the regression approach previously used in the 2016 Calcite Monitoring Annual Report (Lotic 2017) because multiple hypotheses for a temporal change (i.e., a linear trend as well as a potential step change after each year), are tested and temporal changes are assessed relative to the mean reference temporal change.

The RM ANOVA contrasts, which accounted for the mean trends among reference areas, and detected step changes in addition to linear trends, identified substantially more temporal changes in CI among mine-exposed reaches than were detected by trend analysis using linear regression. Significant increasing trends in CI were identified in 27 reaches (27% of a total of 101 mine-exposed areas having at least three years of data) over the 2013 to 2016 regional

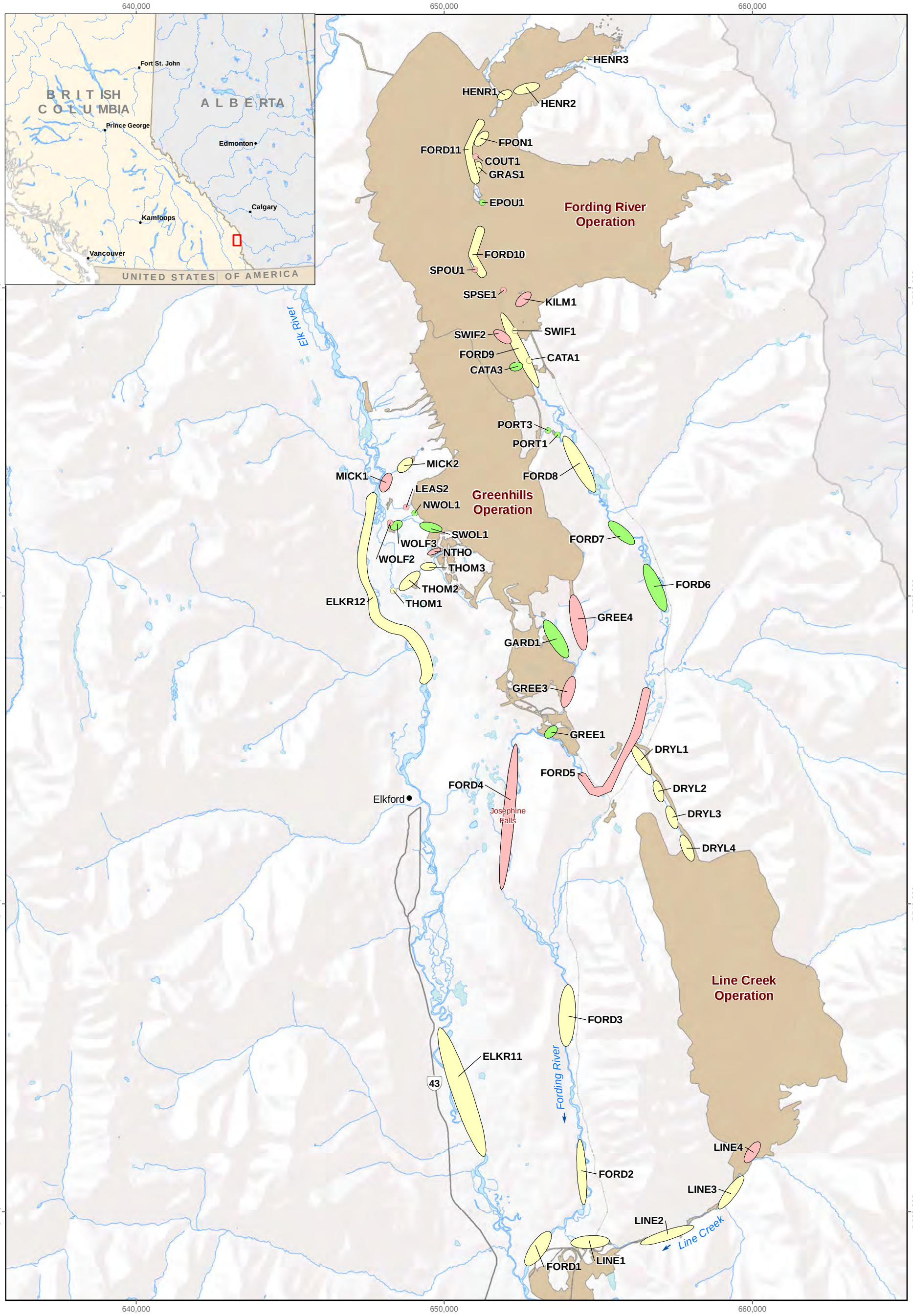
Table 5.1: Temporal Changes in Calcite Index Reported in Regional Calcite Monitoring Program, 2013 - 2016 (Adapted from Lotic 2017)

Management Unit	Main Watershed	Stream Name	Reach	Regression P-value	Slope (ΔCI/year)	Change
1	Fording River	Eagle Pond Outlet	EPOU1	0.01	-0.58	Decrease
		Porter Creek	PORT3	0.06	-0.40	Decrease
			PORT1	0.08	-0.05	Decrease
2	Fording River	Grace Creek	GRAC1	0.09	-0.08	Decrease
3	Elk River	North Wolfram Creek	NWOL1	0.02	-0.55	Decrease
		Wolfram Creek	WOLF2	0.06	0.15	Increase
4	Michel Creek	Pengally Creek	PENG1	0.09	-0.03	Decrease
		South Pit Creek	SPIT1	0.06	0.55	Increase
		Gate Creek	GATE2	0.09	0.47	Increase
	Elk River	CCR Seep	CSEE1	0.05	0.50	Increase

calcite monitoring period (Appendix Table D.1). Significant decreasing trends were observed in 19 reaches (19%). Results plotted in Figures 5.1 and 5.2 reflect the direction of trends/step changes that best fit the contrast model (shown in bold text in Appendix Table D.1). Approximately half (49%) of the reaches showed no significant linear trend or annual step change over the 2013 to 2016 monitoring period (Appendix Table D.1).

Most reaches showing significant temporal changes were in tributaries. However, significant increases were observed after 2014 for Fording River reaches FORD4 (upstream from Line Creek) and FORD5 (vicinity of LCO Dry Creek; Figure 5.1; Appendix Table D.1; Appendix Figure D.1).

When temporal trends in CI were analyzed for main stem mine-exposed stations by MU, increasing average trends were only observed in MU1 (step from 2013 to 2014) and MU2 (step from 2015 to 2016) (Appendix Table D.2; Appendix Figure D.2). A decreasing trend was observed in MU5 after 2013, and no changes were identified in MU3 or MU4.



Calcite Trend

- Decrease based on temporal contrast of best fit (selected from step change/linear contrasts; see methods)
- Increase based on temporal contrast of best fit (selected from step change/linear contrasts; see methods)
- No significant temporal changes identified (from step change/linear contrasts; see methods)
- Teck Coal Mine Operation

Trends Identified from Regional Calcite Monitoring, 2013 - 2016 - North Watershed

0 2 4 8
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
Project 2561

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Figure 5.1

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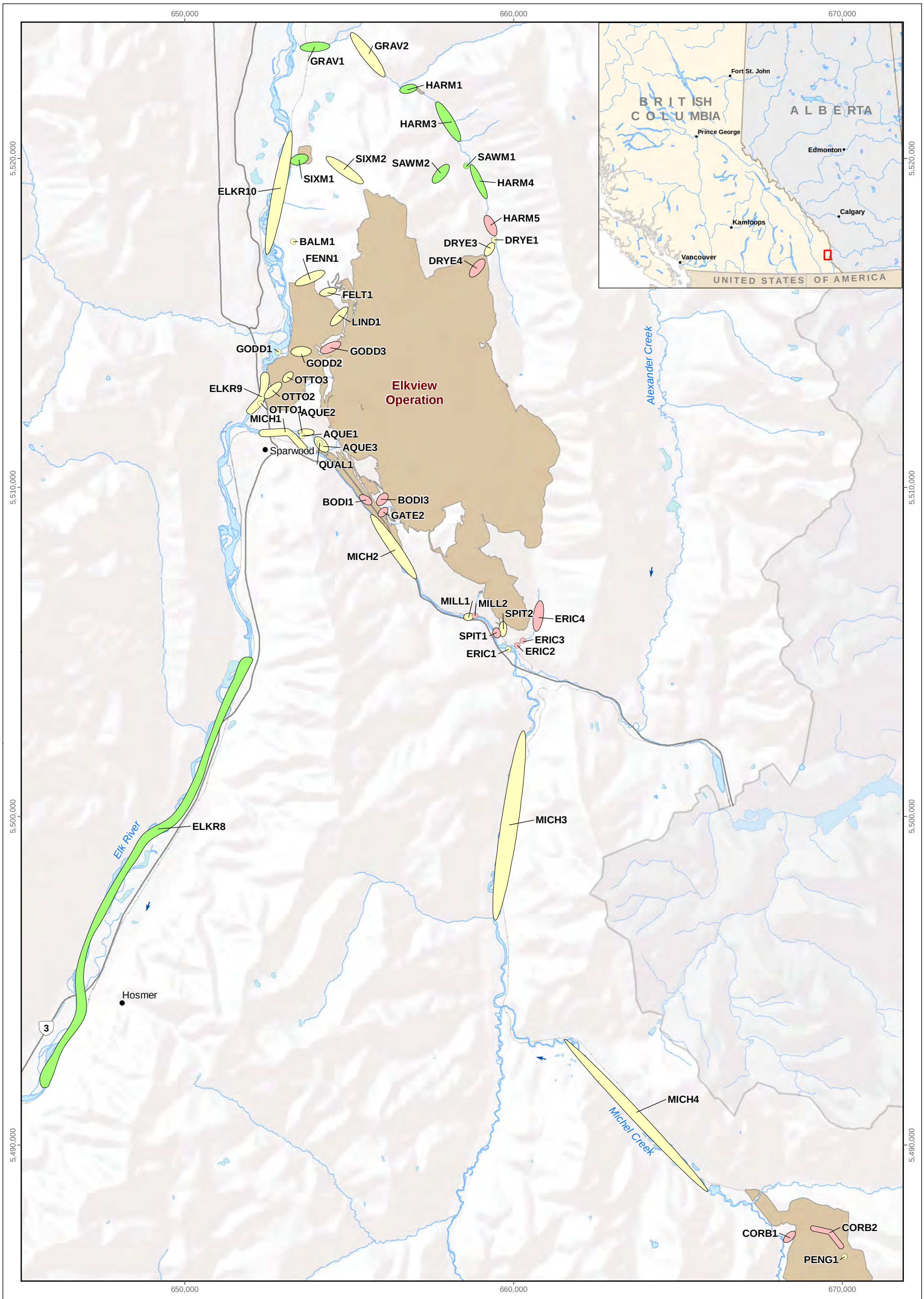

Calcite Trend

- Decrease based on temporal contrast of best fit (selected from step change/linear contrasts; see methods)
- Increase based on temporal contrast of best fit (selected from step change/linear contrasts; see methods)
- No significant temporal changes identified (from step change/linear contrasts; see methods)
- Teck Coal Mine Operation

Trends Identified from Regional Calcite Monitoring, 2013 - 2016 - South Watershed

0 1.75 3.5 7
km

N W E S

Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
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Figure 5.2

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5.3 Calcite Measurements within the RAEMP

5.3.1 Calcite Reference Normal Range

Calcite has been measured concurrently with collection of benthic invertebrate community samples in the RAEMP and in LAEMPs. Calcite measurements made among 40 reference areas sampled in 2015 were used to characterize the normal range, and the upper limit (97.5th percentile) was defined as CI = 1.0 (Appendix Table D.3 and Appendix Figure D.3). Eighty percent of reference areas had CI<0.50[21], which is a long-term (Year 2029) Site Performance Objective specified in Permit 107517 for streams that provide or flow directly into fish habitat.

5.3.2 Evaluation of Calcite in Mine-Exposed Areas

Most (91%) of the mine-exposed areas sampled in the 2015 RAEMP cycle had CI>0.5 but 62% of areas sampled had CI within the upper limit of the normal range (i.e., ≤ 1.0; values highlighted in yellow on Figure 5.3; Appendix Table D.4). Areas sampled in some tributaries (Kilmarnock, Swift, Cataract, Greenhills, Wolfram, Thompson, and Corbin) and two areas in the upper Fording River (FOBSC and FOBCP) had CI greater than the upper normal range limit of 1.0. Greenhills Creek has been identified as a priority stream for calcite treatment, which began in October 2017 in accordance with requirements of Permit 107517.

Teck is aware that calcite measurements at biological sampling areas have, in some cases, varied from those reported by the regional calcite monitoring program for the same stream. This may be due to the differences between programs in the approach, as well as timing for calcite measurement (described in Section 2.5). Teck audited field sampling programs in the fall of 2017 to achieve better standardization among programs for characterizing calcite deposition and will continue to have discussions with the EMC regarding this topic.

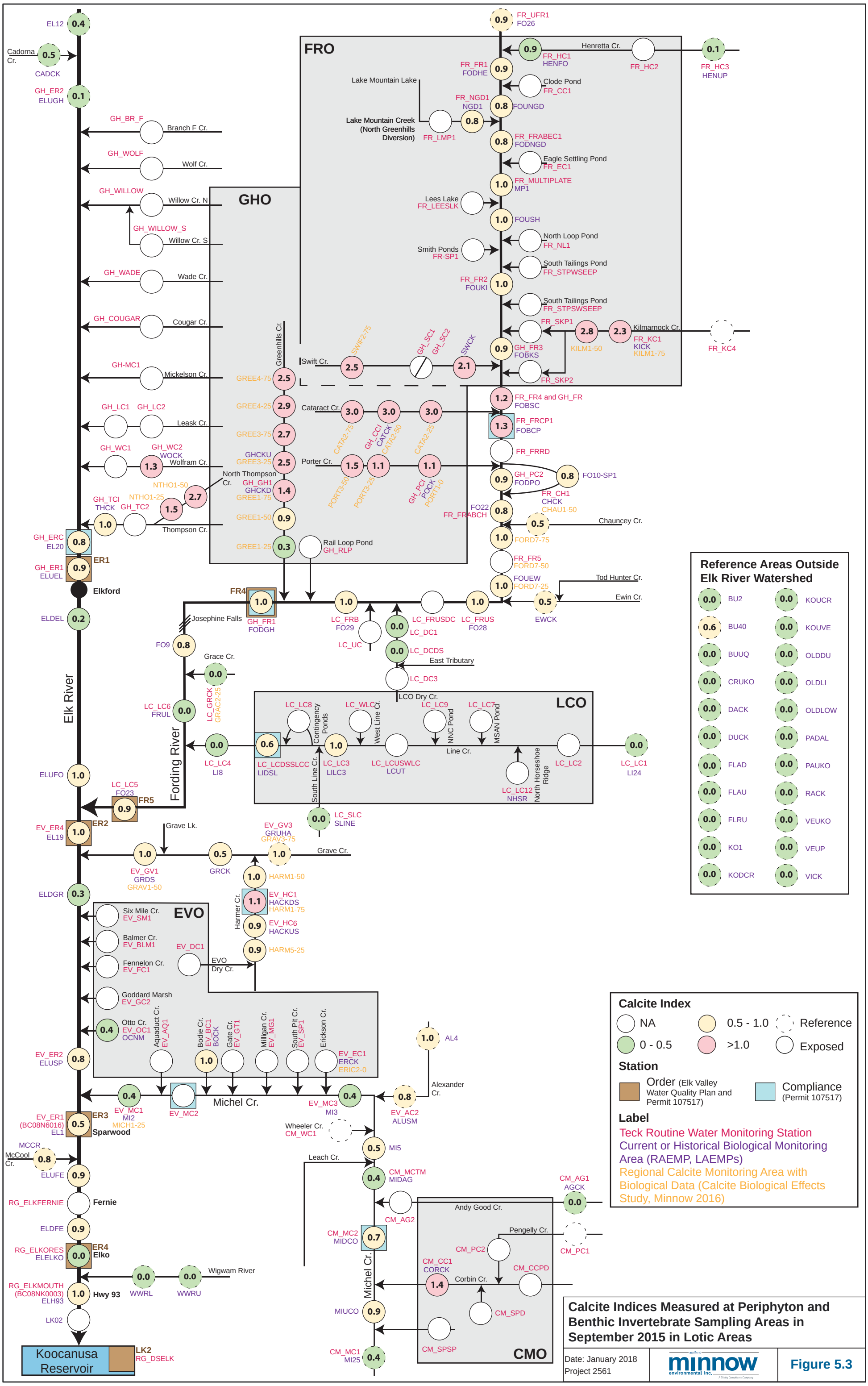
Relationships between biological monitoring endpoints and calcite are also discussed in Sections 7 to 10, where potentially relevant in explaining biological responses observed downstream from mining.

5.4 Calcite Relationships with Biota

5.4.1 Relationships with Periphyton Productivity and Benthic Invertebrates

The effects of calcite on biota are being studied in phases, with initial focus on assessment of potential relationships between calcite deposition and both benthic invertebrate community

[21] Results differ slightly from the regional monitoring data, which are expressed relative to stream km monitored in the regional program, while the RAEMP data are expressed relative to the total number of RAEMP monitoring areas.


FRO
GHO
LCO
CMO
EVO
Elk River
Fording River
Elkford
Sparwood
Fernie
Elko
Hwy 93
Koocanusa Reservoir
Michel Cr.
Swift Cr.
Cataract Cr.
Porter Cr.
Leask Cr.
Wolfram Cr.
Thompson Cr.
Rail Loop Pond
GH_RLP
Josephine Falls
Grace Cr.
East Tributary
LCO Dry Cr.
Line Cr.
Grave Cr.
Grave Lk.
Harmer Cr.
Wheeler Cr.
Leach Cr.
Andy Good Cr.
Pengelly Cr.
Corbin Cr.
Wigwam River
Lake Mountain Lake
Lake Mountain Creek (North Greenhills Diversion)
Clode Pond
Eagle Settling Pond
Lees Lake
Smith Ponds
North Loop Pond
South Tailings Pond
Henretta Cr.
Kilmarnock Cr.
Chauncey Cr.
Tod Hunter Cr.
Ewin Cr.
Alexander Cr.
Cadorna Cr.
Branch F Cr.
Wolf Cr.
Willow Cr. N
Willow Cr. S
Wade Cr.
Cougar Cr.
Mickelson Cr.
Greenhills Cr.
Six Mile Cr.
Balmer Cr.
Fennelon Cr.
Goddard Marsh
Otto Cr.
Aquaduct Cr.
Bodie Cr.
Gate Cr.
Milligan Cr.
South Pit Cr.
Erickson Cr.
Contingency Ponds
West Line Cr.
NNC Pond
MSAN Pond
South Line Cr.
North Horseshoe Ridge
Reference Areas Outside Elk River Watershed
Calcite Index
NA
0 - 0.5
0.5 - 1.0
>1.0
Reference
Exposed
Station
Order (Elk Valley Water Quality Plan and Permit 107517)
Compliance (Permit 107517)
Label
Teck Routine Water Monitoring Station
Current or Historical Biological Monitoring Area (RAEMP, LAEMPs)
Regional Calcite Monitoring Area with Biological Data (Calcite Biological Effects Study, Minnow 2016)
Calcite Indices Measured at Periphyton and Benthic Invertebrate Sampling Areas in September 2015 in Lotic Areas
Date: January 2018
Project 2561
minnow environmental inc.
Figure 5.3

structure and periphyton productivity (Minnow 2016b). In the first year of study (2014), field activities included collection of water samples, benthic invertebrate community samples (using the CABIN 3-minute travelling kick approach), and periphyton productivity samples (i.e., chlorophyll-a and AFDM), along with *in situ* water quality measurements and field documentation of substrate characteristics, aquatic habitat, and calcite at 31 areas within the Elk River watershed. In 2015, 114 areas (74 mine-exposed and 40 reference) situated throughout the Elk River watershed and in adjacent watersheds within the region, including all RAEMP monitoring areas, were sampled using methods similar to those in 2014.

Periphyton chlorophyll-a and AFDM values were weakly positively correlated (i.e., $r < 0.5$) with CI values among areas (Minnow 2016b). The results suggested that calcite deposits may provide a surface favourable for periphyton growth, that periphyton growth alters water quality near the periphyton surface in a manner that favours calcite formation, and/or bioavailable nutrient concentrations may be elevated in areas with more calcite (Minnow 2016b). Hypothesized relationships between periphyton and calcite are supported by the scientific literature, which indicates calcite formation is the product of complex interactions of abiotic habitat and periphyton community characteristics (e.g., Pedley 1990, Pedley and Rogerson 2010, Rupp and Adams 1981), as mentioned in Section 5.1. The study did not indicate a specific CI value above which periphyton productivity would be expected to deviate from the reference normal range (defined as the range bounded by the 2.5th and 97.5th percentiles of reference area calcite observations) (Minnow 2016b).

A total of 82 benthic invertebrate community endpoints were evaluated as potential indicators of calcite effects on biota using data collected in 2015 (Minnow 2016b). Seven of the 82 endpoints were selected as the strongest univariate indicator endpoints because they identified at least 10% of mine-exposed areas as having community characteristics outside of the normal range and they also correlated with CI values ($r > 0.6$). In addition to the univariate endpoints, 11 multivariate indicators were examined, including six that represented overall community structure based on NMDS. The multivariate endpoints showed strong agreement among each other and relative to the univariate endpoints in identifying areas with community characteristics that differed from the normal range observed among reference areas. The results also indicated that the selected univariate community endpoints were effective in identifying areas that were unusual based on overall community structure.

Overall, the data indicated that benthic invertebrate community structure, and especially the proportion of Ephemeroptera, tended to deviate from the normal range when CI was greater than 1.0 (Minnow 2016b). However, the analysis also showed that there was strong correlation between CI and the concentrations of mine-related constituents in water among areas. Areas

having CI greater than 1.0 also tended to have concentrations of selenium, nitrate, and/or sulphate that were greater than the Level 1 invertebrate benchmarks identified in the EVWQP, indicating potential for water quality effects. Therefore, the effects of calcite could not be distinguished from those associated with water quality (i.e., in areas where effects were observed, the effects may be due to calcite or water quality, or both, depending on relative constituent concentrations in each area).

5.4.2 Relationships with Fish Spawning and Incubation Success

In 2015, the study was expanded to include initial evaluation of potential effects on fish spawning and incubation success. Minnow (2016b) reported that, of 10 spawning areas in the upper Fording River watershed where calcite was assessed in both in the spring and fall of 2015, CI was greater in the fall than in the spring at 8 areas. CI was less than one at all but one redd location in the spring and two locations in the fall, potentially indicating preferential utilization of areas with relatively low CI. It was hypothesized that this is because spawning trout preferentially select areas with moveable gravels, and avoid areas where calcite concretion makes substrates immovable.

Evaluation of potential effects of calcite on fish spawning and incubation success continued in 2016 (Ecofish 2016). Calcite is hypothesized to affect spawning success through several mechanisms including access to useable spawning gravels, egg incubation conditions, rearing conditions for juveniles, and food availability (e.g., production of invertebrate prey) (Ecofish and Westslope 2017). Potential linkages between calcite and incubation conditions were investigated in 2016, and focused specifically on testing if observed calcite conditions on stream substrates affect hyporheic flow and dissolved oxygen concentrations. Representative spawning areas used by westslope cutthroat trout within the upper Fording River watershed (upper Fording River main stem, Clode Creek outlet, lower Greenhills Creek) were selected as study areas. Spawning was visually confirmed (redds, spawning fish) in late June and areas were revisited in late August and early September 2016 to measure CI, hyporheic conditions of DO and flow with depth, and other naturally varying factors (e.g., fish habitat variables, hyporheic water quality, substrate composition, and surface hydrology). Flow and DO were measured with a piezometer standpipe. Both a hydraulic head method and a temperature method were used to measure hyporheic flow. Results were used to model relationships between hyporheic conditions and CI, taking into consideration site characteristics and covariates (e.g., % fines) (Ecofish and Westslope 2017). Response variables were DO concentrations and hyporheic flow measured by either of the two methods. Predictor variables included in the model were CI, habitat, and sampling variables suspected to affect hyporheic

conditions (e.g., depth in substrate, water temperature, water quality, water depth, flow, substrate composition, season, sampling area).

The CI measured near the piezometers showed good agreement with CI measured at the mesohabitat scale, suggesting that the CI values for mesohabitat scale are representative of conditions at the scale of WCT redds (Ecofish and Westslope 2017). There was little variation in CI score by season (June versus August/September). CI score was an important predictor of DO in the substrate but not of hyporheic flow as measured by either the hydraulic head or temperature methods. The model for DO predicted that average instantaneous DO would decrease to less than 8 mg/L at a depth of 30 cm and CI of about 2.3. At a depth of 50 cm, average instantaneous DO was predicted to decrease below 6 mg/L at CI near 3. The average redd depth for WCT is 10-30 cm, so model predictions suggested average DO concentrations would be above the BC guideline for protection of aquatic life instantaneous minimum threshold for buried embryos/alevins of 6 mg/L. However, variability around the modelled relationships resulted in a conclusion that areas with high calcite levels would likely experience some reduction in incubation conditions. The authors cautioned that the data set was small and the effect of calcite on DO was most apparent at depths deeper than those typical of WCT redds, to guide prioritization of on-going work.

Continued study in 2017 investigated the extent to which calcite influences incubation conditions in the shallow hyporheic zone, and the data will be evaluated to characterize the relationship between calcite and spawning habitat suitability and use among mine-exposed tributaries in the Elk River watershed (Ecofish 2017).

5.5 Summary

Monitoring results in 2015 and 2016 were similar to those reported in 2013 and 2014 (Lotic 2016, 2017). All (100% of) reference streams assessed had CI of 0.5 or less. Most of the mine-exposed stream kilometres that were assessed (in MUs 1-4 and a portion of MU5) also had a CI of 0.5 or less (≥75% of tributaries and ≥81% of main stem Fording and Elk Rivers).

Calcite has been measured concurrently with collection of benthic invertebrate community samples in the RAEMP and in LAEMPs. Calcite measurements made among 40 reference areas sampled in 2015 defined the upper limit (97.5th percentile) of the normal range for reference areas as CI = 1.0. Eighty percent of reference areas sampled had CI<0.50, which is a long-term (Year 2029) Site Performance Objective specified in Permit 107517 for streams that provide or flow directly into fish habitat. Most (91%) of the mine-exposed areas sampled in the 2015 RAEMP cycle had CI>0.5 but 62% of areas had CI within the upper limit of the normal range (i.e., ≤ 1.0). Areas that were sampled in some tributaries (Kilmarnock, Swift, Cataract,

Greenhills, Wolfram, Thompson, and Corbin) and a portion of two areas in the upper Fording River (FOBSC and FOBCP) had CI greater than the upper normal range limit of 1.0.

Analysis of temporal changes in calcite (using data collected from 2013 to 2016, as part of the regional calcite monitoring program) resulted in approximately half of all mine-exposed study areas (52 of 101) showing a significant increase or decrease over time, after accounting for mean trends among reference areas. More specifically, significant increasing trends in CI were identified in 27 reaches and significant decreasing trends were observed in 19 reaches, with most reaches showing significant temporal changes being in tributaries. Significant increases were only observed at two locations in the main stem Fording River: FORD4 (upstream from Line Creek) and FORD5 (vicinity of LCO Dry Creek). In both cases, the increase was due to a step change from 2014 to 2015. When temporal trends in CI were analyzed for main stem mine-exposed stations by MU, increasing average trends were only observed in MU1 (step from 2013 to 2014) and MU2 (step from 2015 to 2016). A decreasing trend was observed in MU5 after 2013, and no changes were identified in MU3 or MU4.

A supporting study observed that periphyton chlorophyll-a and AFDM concentrations were weakly (i.e., $r < 0.5$) positively correlated with CI values among areas (Minnow 2016b). The results suggested that calcite deposits may provide a surface favourable for periphyton growth, that periphyton growth alters water quality near the periphyton surface in a manner that favours calcite formation, and/or bioavailable nutrient concentrations may be elevated in areas with more calcite. Hypothesized relationships between periphyton and calcite are supported by the scientific literature, which indicates calcite formation is the product of complex interaction of abiotic habitat and periphyton community characteristics (e.g., Pedley 1990; Pedley and Rogerson 2010, Rupp and Adams 1981). The study did not indicate a specific CI value above which periphyton productivity would be expected to deviate from the normal range for reference areas (Minnow 2016b).

The same supporting study showed that benthic invertebrate community structure, and especially the proportion of Ephemeroptera, deviated from the reference area normal range when CI was greater than 1.0 (Minnow 2016b). However, the analysis also showed that there was strong correlation between CI and the concentrations of mine-related constituents in water among areas such that the effects of calcite could not be conclusively distinguished from potential effects associated with water quality.

Calcite is also hypothesized to potentially affect spawning success through several mechanisms, including access to useable spawning gravels, egg incubation conditions, rearing conditions for juveniles, and food (e.g., production of invertebrate prey) (Ecofish and Westslope 2017). A study conducted in 2016 evaluated potential calcite effects on hyporheic

flow and dissolved oxygen concentrations within substrates of cutthroat trout spawning redds in areas of the upper Fording River watershed. CI score was inversely related to DO in the substrate at some depths, but was not related to hyporheic flow. The resulting model predicted that average DO concentrations at substrate depths relevant for cutthroat trout redds would be above the BC guideline for protection of aquatic life instantaneous minimum threshold for buried embryos/alevins of 6 mg/L. However, the data set was limited and it was concluded that variability around the modelled relationships may mean that areas with high calcite levels would experience some reduction in incubation conditions. Further study continued in 2017 to investigate the extent to which calcite influences incubation conditions in the shallow hyporheic zone, and to characterize the relationship between calcite and spawning habitat suitability and use among mine-exposed tributaries in the Elk River watershed (Ecofish 2017).

6 SEDIMENT

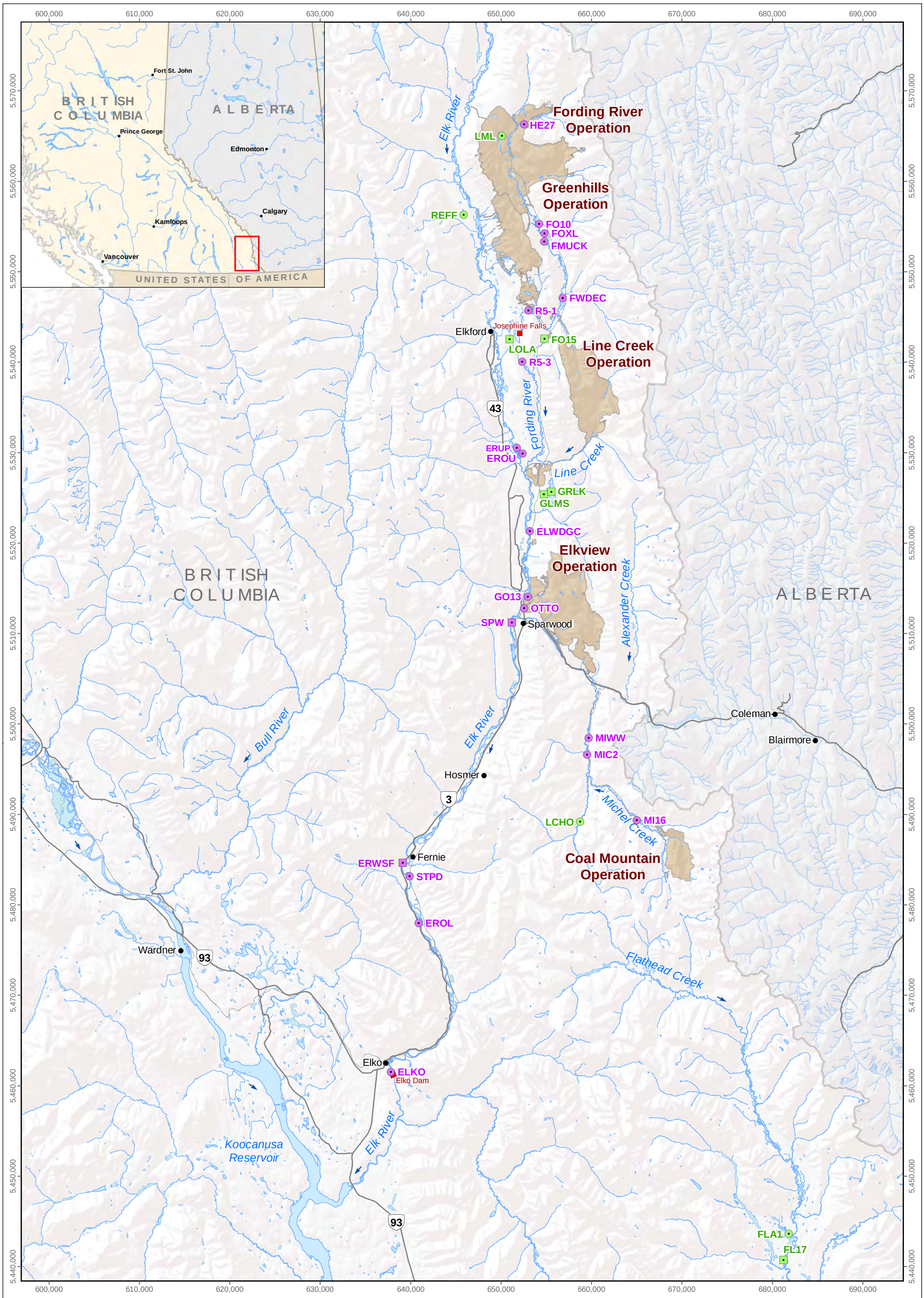
6.1 Overview

Suspended and bed sediments can play an important role in the transport and fate of chemicals in aquatic systems, particularly with respect to hydrophobic chemicals that adsorb to particle surfaces (Jain and Ram 1997). Settling of particles from the water column to substrates is inversely related to particle size and water velocities (Chin 2006), such that streams that are continuously or seasonally fast flowing tend to be dominated by coarse particles. Chemicals that have a tendency to adsorb to particles are typically found at highest concentrations in areas with fine compared to coarse bed sediments because fine particles offer greater surface area for adsorption (Chin 2006, Horowitz and Elrick 1987, Blanton et al. 1995). TOC content also tends to be higher in sediments with fine rather than coarse particles (Blanton et al. 1995, Dinakaran and Krishnayya 2011).

Lentic areas of the Elk River watershed were sampled for the RAEMP because these areas were expected to have highest sediment accumulations of mine-related substances compared to lotic habitats that are more directly affected by scouring associated with spring freshet and seasonal storm events. Lentic areas sheltered from seasonal scour also allow for sediment to accumulate year over year, which makes them more physically stable and amenable to tracking changes over time compared to lotic habitats in which fine substrates are routinely re-suspended and transported downstream.

Sediment chemistry was evaluated at a total of 31 areas in 2013 (Minnow 2014b) and/or 2015 (this study), including 10 reference areas (Figure 6.1; Appendix Table E.1). Some of the areas sampled in 2013 were not re-sampled in 2015 to re-distribute the sampling effort in 2015 among additional reference and mine-exposed areas, including areas targeted for evaluation of longnose sucker populations and health (Section 9). Observed concentrations were compared to BC sediment quality guidelines for protection of aquatic life. Potential temporal changes were assessed for all areas that were sampled in both years. Results of a supporting study of sediment toxicity (Minnow 2016d), which was completed in response to ENV's conditions related to approval of the RAEMP study design (BCMOE 2014)[22], are also summarized below. Photos of each lentic area sampled in the RAEMP are presented in Appendix A.

[22] The condition was: "Teck shall develop, in consultation with the Ministry and Ktunaxa Nation representatives ideally in a monitoring committee forum, the sediment toxicity study as discussed in Section 4.3.2 of the RAEMP study design..."



LEGEND

Sediment Chemistry Sampling Locations

- Reference
- Mine-Exposed
- Sampled in 2015
- Sampled in 2013 only

Teck Coal Mine Operation

Sediment Sampling Areas, 2013 and/or 2015

0 5 10 20
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

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Figure 6.1

Document Path: S:\Projects\2500 Projects\2561 - Teck RAEMP Implementation\GIS Mapping\RAEMP -\Report\2561 F 6.1 Sediment Chemistry Sampling.mxd

Photo 6.1: Sediment Sampling at Lentic Areas

6.2 Chemistry

6.2.1 General Characteristics

Most of the areas chosen for sediment sampling in the Elk Valley have little or no surface water connection to the main channel flow for at least part of the year. Consequently sediment samples collected among the 31 study areas were dominated by fine particles (silt and clay; Figure 6.2). Sand content was highest at FO10 (the former Fording River Oxbow, which became a flowing side channel of the Fording River after the record flood in 2013) and FMUCK (main stem Fording River upstream from Chauncey Creek), which are areas experiencing continuous water flow throughout the year.

Sediment TOC content was 10% or less in more than 70% of samples, but ranged from 2% (one sample at Grave Lake) to 36% (one sample at Otto Ponds) (Figure 6.2; Appendix Tables E.2 to E.5). Concentrations of constituents in sediment such as PAHs and many metals are usually positively related to TOC content and the proportion of fine particles in sediment (Blanton et al. 1995, Wang et al. 2001, Chin 2006).

HQs[23] for sediment variables are discussed in more detail in Section 6.2.3, but are mentioned here because they were used in a preliminary principal components analysis (PCA) to illustrate variability in sediment quality among areas. The first two principal components explained 83.3% of the variability in HQs among areas. Mine-exposed areas separated in the direction from the bottom left quadrant to the top right quadrant of Figure 6.3, corresponding to differences in HQs for selenium and PAHs, indicating that these are the mine-related variables of potential concern. Concentrations of selenium and PAHs are discussed in subsequent sections relative to reference area normal ranges and sediment quality guidelines.

[23] Ratio of concentration to sediment quality guideline.

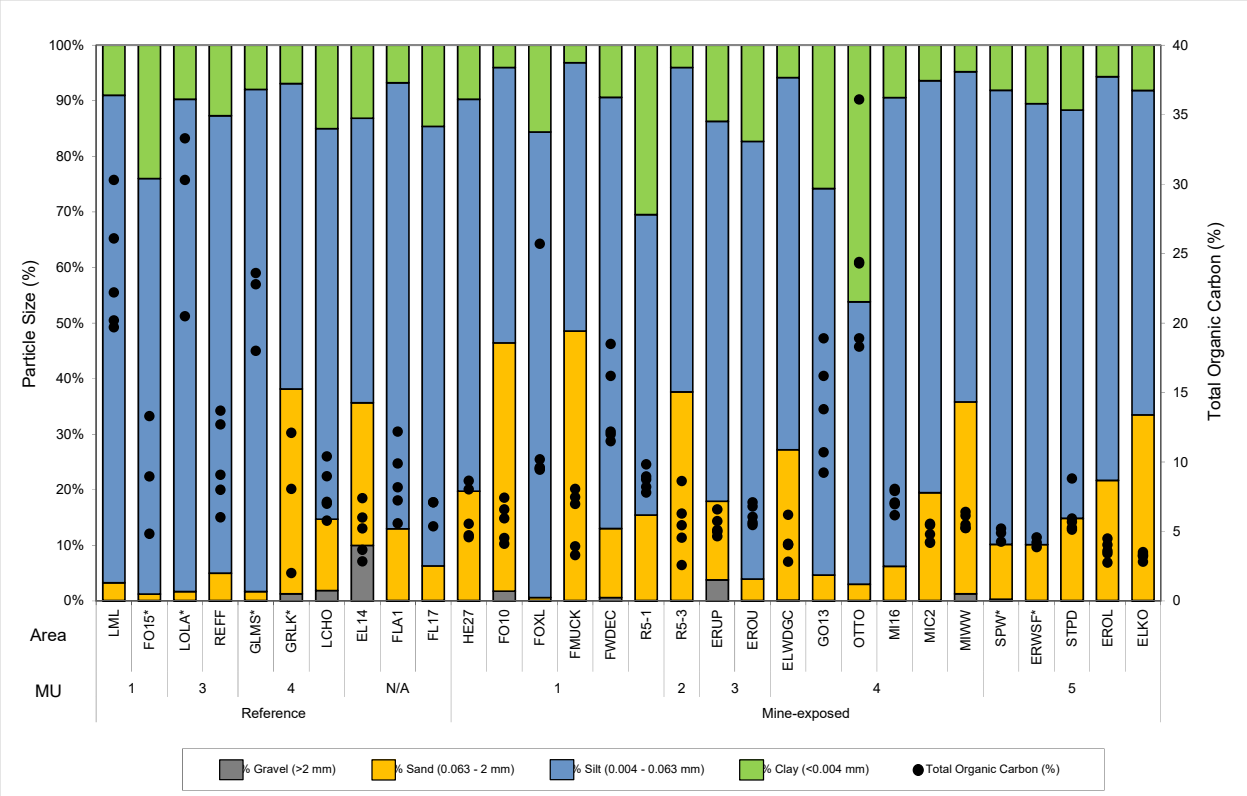


Figure 6.2: Mean Particle Size (%) and Total Organic Carbon Content (%) in Sediments, August 2015 Except for Areas Sampled Only in 2013 (asterisk)

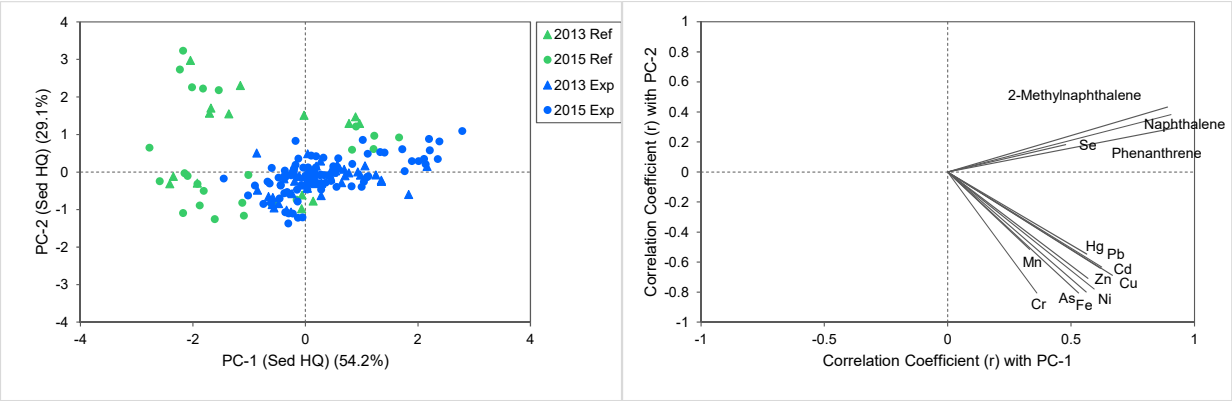


Figure 6.3: PCA of Hazard Quotients for Sediment Quality Variables

Notes: PCA was conducted on the covariance matrix for hazard quotients (hazard quotients were log_{10}-transformed). Scatterplot of Pearson correlation coefficients for PC-1 and PC-2 for each variable (Right Panel) show the correlation of each variable to the PCs. Data are for samples collected in reference (n = 15) and mine-exposed (n = 51) stations in 2013 and reference (n = 25) and mine-exposed (n = 90) stations in 2015 (n = 3 or 5 stations per sampling area). Correlation coefficients and p-values are shown in Appendix Table E.13.

6.2.2 Comparisons to Normal Reference Ranges

A total of 49 samples were collected among 10 reference areas in 2013 and 2015 (Appendix Table E.6), and the data were used to derive reference normal ranges for sediment metals and PAHs (i.e., 2.5th and 97.5th percentiles; Appendix Table E.7; Appendix Figures E.1 and E.2). More than 92% of almost 7,000 concentrations reported for 52 constituents measured among 22 lentic areas in 2013 or 2015 were within the normal range for reference areas.

Concentrations observed among mine-exposed areas were divided by the upper limit of the normal range for each parameter to derive NRQs (Figure 6.4). The largest NRQs were observed for numerous PAHs measured in one of the samples collected from Stanford Pond (STPD), near Fernie (Appendix Tables E.8 and E.9). In samples collected closer to mine sources, anthracene was the PAH that was most often observed at concentrations above background levels. Anthracene and other PAHs were also elevated in sediment samples from reference area Lake Mountain Lake (LML, in MU1), indicating that sediment PAH concentrations are naturally elevated in some areas of the watershed. Concentrations of many PAHs were elevated above the reference normal range in the sediment samples from Otto Ponds and Goddard Marsh (Appendix Table E.8). Of all the metals/metalloids, selenium was most often elevated above the reference normal range in sediment collected among mine-exposed areas.

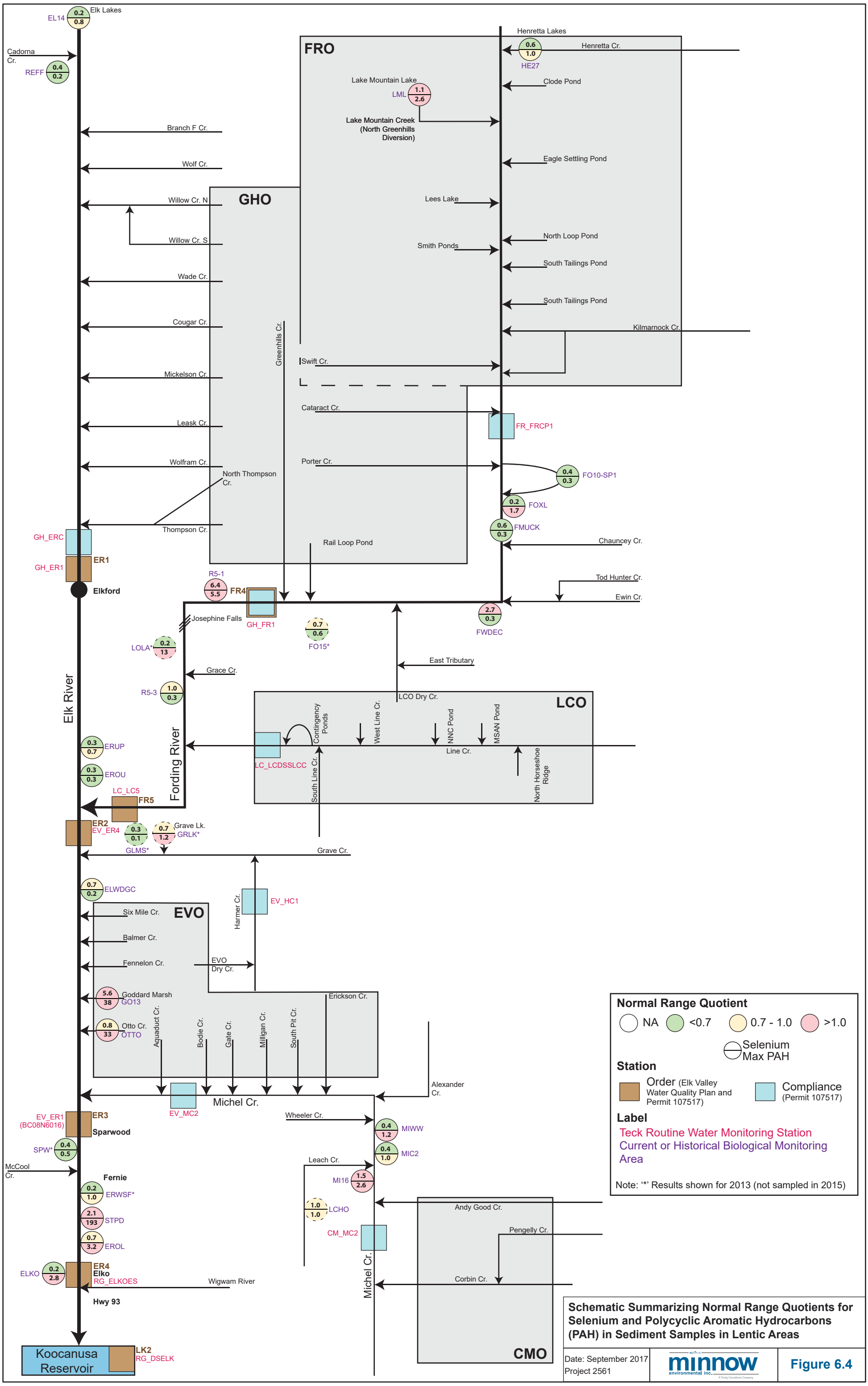
Areas of the Elk River watershed that were monitored in 2013 and/or 2015 and had sediment PAH and/or selenium concentrations above the reference area normal range, are indicated by pink symbols in Figure 6.4. NRQ values for selenium and the PAH with highest NRQ in each area are also shown in the figure. The specific PAH corresponding to the NRQ values in Figure 6.4 are listed in Appendix Table E.12.

6.2.3 Comparisons to Guidelines

Selenium was the metal[24] most often observed at concentrations above the working sediment quality guideline (SQG) (Figure 6.5; Appendix Tables E.2 to E.5). Highest concentrations of selenium in sediment were observed at R5-1 (wetland adjacent to the Fording River, near GHO) and GO13 (Goddard Marsh) (Figure 6.5).

Of the metals having both a high and low SQG, cadmium was reported at a concentration greater than the upper guideline in one sample from one reference area (LCHO – Leach Creek Oxbow) and one mine-exposed area (MI16 – Michel Creek wetland), and manganese was

[24] Selenium is a metalloid, but is included in metal scan results reported by analytical laboratories. It is referred to as a metal in subsequent sections of this report for brevity and ease of reading.



Schematic Summarizing Normal Range Quotients for Selenium and Polycyclic Aromatic Hydrocarbons (PAH) in Sediment Samples in Lentic Areas

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Figure 6.4

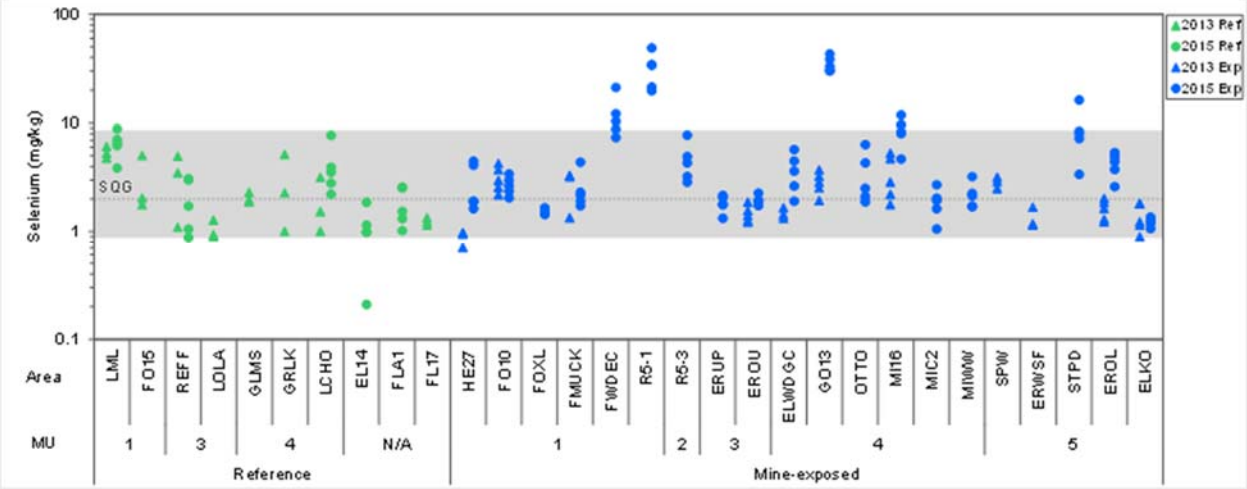


Figure 6.5: Selenium Concentrations Measured in Sediment Samples Relative to the Guideline

Notes: Sampling areas are shown in Figure 6.1. Concentrations below the LRL are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).

found at concentrations above the upper guideline at three areas (HE27 [Henretta Lake], R5-3 [lentic area adjacent to the Fording River downstream from Josephine Falls], and EROU [upper Elk River oxbow]; Figure 6.6; Appendix Figure E.3; Appendix Tables E.2 to E.5).

BC has SQGs for 16 of the 18 routine PAHs and none of the alkylated PAHs. Of the 16 routine PAHs, 12 were observed at concentrations greater than the upper SQG in one or more of the study areas (Appendix Figure E.4). 2-Methylnapthalene was the PAH most frequently exceeding the upper guideline in sediment samples (Figure 6.7). HQs were computed by dividing the concentrations observed in sediment samples by the upper SQG for each parameter. The upper normal range for 2-methylnaphthalene exceeded the upper SQG (Appendix Figure E.1), so HQs were typically higher, but NRQs were lower for this PAH than for other PAHs (Appendix Tables E.8 to E.12). Concentrations of PAHs were highest in sediments collected at Stanford Pond (STPD) and Otto Ponds (OTTO), with concentrations of many routine PAHs being highest at STPD and concentrations of most alkylated PAHs being highest at OTTO (Figure 6.8; Appendix Figure E.4). These data suggest STPD may be influenced by factors in addition to mining (e.g., municipal stormwater).

The upper limit of the normal range for reference area concentrations (97.5th percentile) exceeded the lower SQG for numerous metals and PAHs (arsenic, cadmium, nickel, selenium, zinc, benz(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, fluorine, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene)

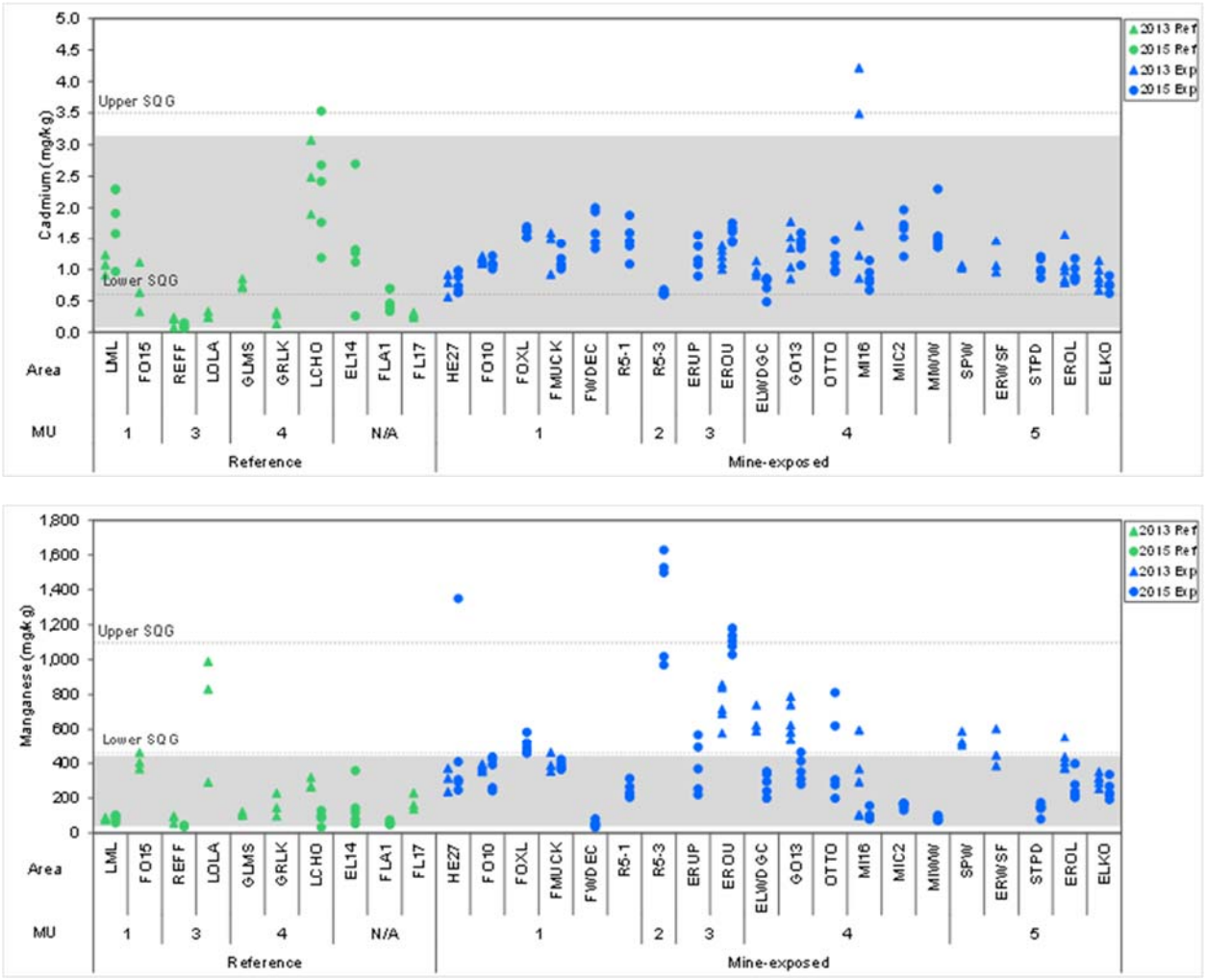


Figure 6.6: Cadmium and Manganese Concentrations in Sediment Samples Relative to Guidelines

Notes: Sampling areas are shown in Figure 6.1. Concentrations below the LRL are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).

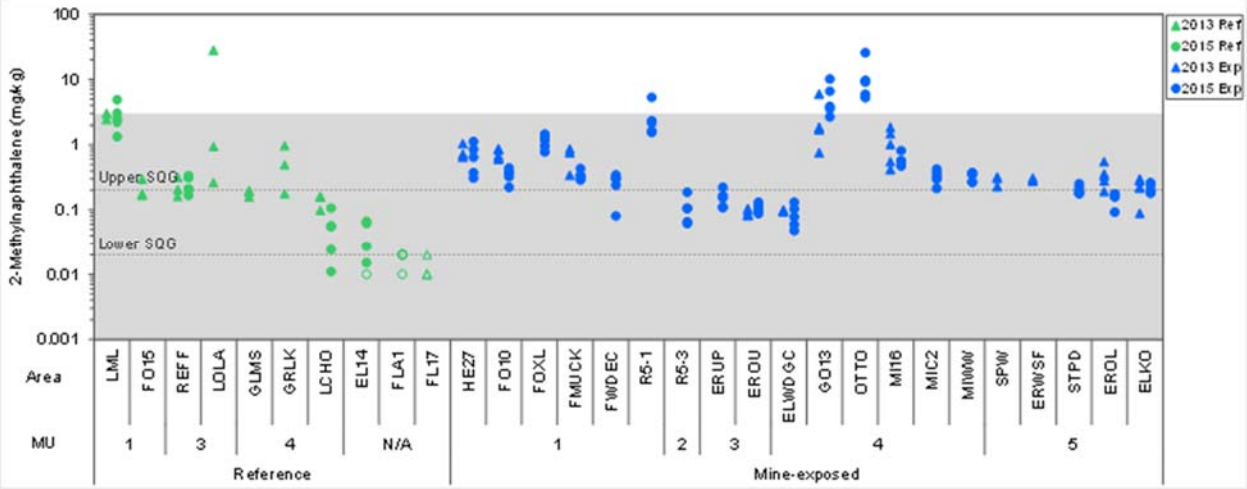


Figure 6.7: Concentrations of 2-Methylnapthalene in Sediment Samples Relative to Guidelines

Notes: Sampling areas are shown in Figure 6.1. Concentrations below the LRL are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).

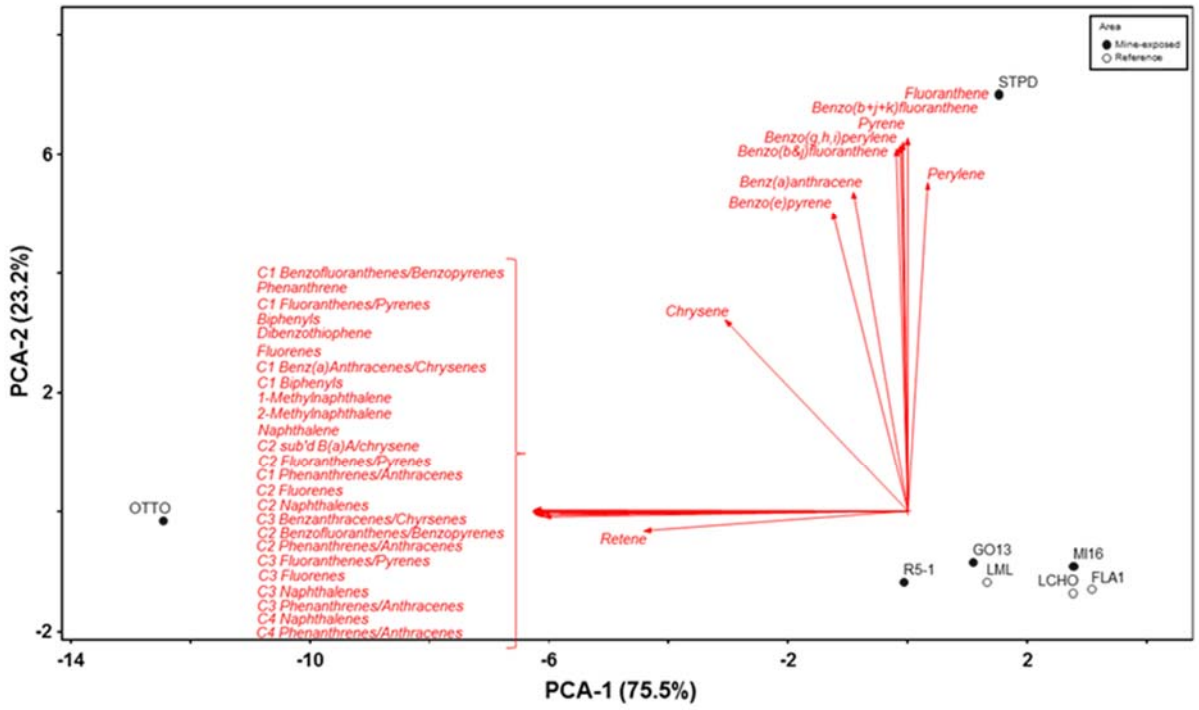


Figure 6.8: PCA of PAHs measured in sediment samples collected in 2015

(Appendix Figure E.1). The upper limit of the normal range also exceeded the upper SQG for selenium[25], fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene.

Of PAHs, the highest HQs were associated with 2-methylnaphthalene in sediment samples collected at OTTO (HQs of 26 to 128 in samples collected in 2015) (Appendix Tables E.10 and E.11). HQs greater than 20 were also observed for 2-methylnaphthalene in one or more sediment samples collected at R5-1 (Fording River wetland downstream from GHO), GO13 (Goddard Marsh) and reference area LML (Lake Mountain Lake) (Figure 6.9; Appendix Table E.10). HQs greater than 20 were also observed for fluorene (OTTO), phenanthrene (OTTO), and selenium (R5-1 and GO13) (Appendix Table E.10). All of these (2-methylnaphthalene, fluorene, phenanthrene, and selenium) are substances for which reference area normal ranges also exceeded the upper SQG. For these substances, NRQs were less than one-third the corresponding HQ (Appendix Tables E.8 and E.9).

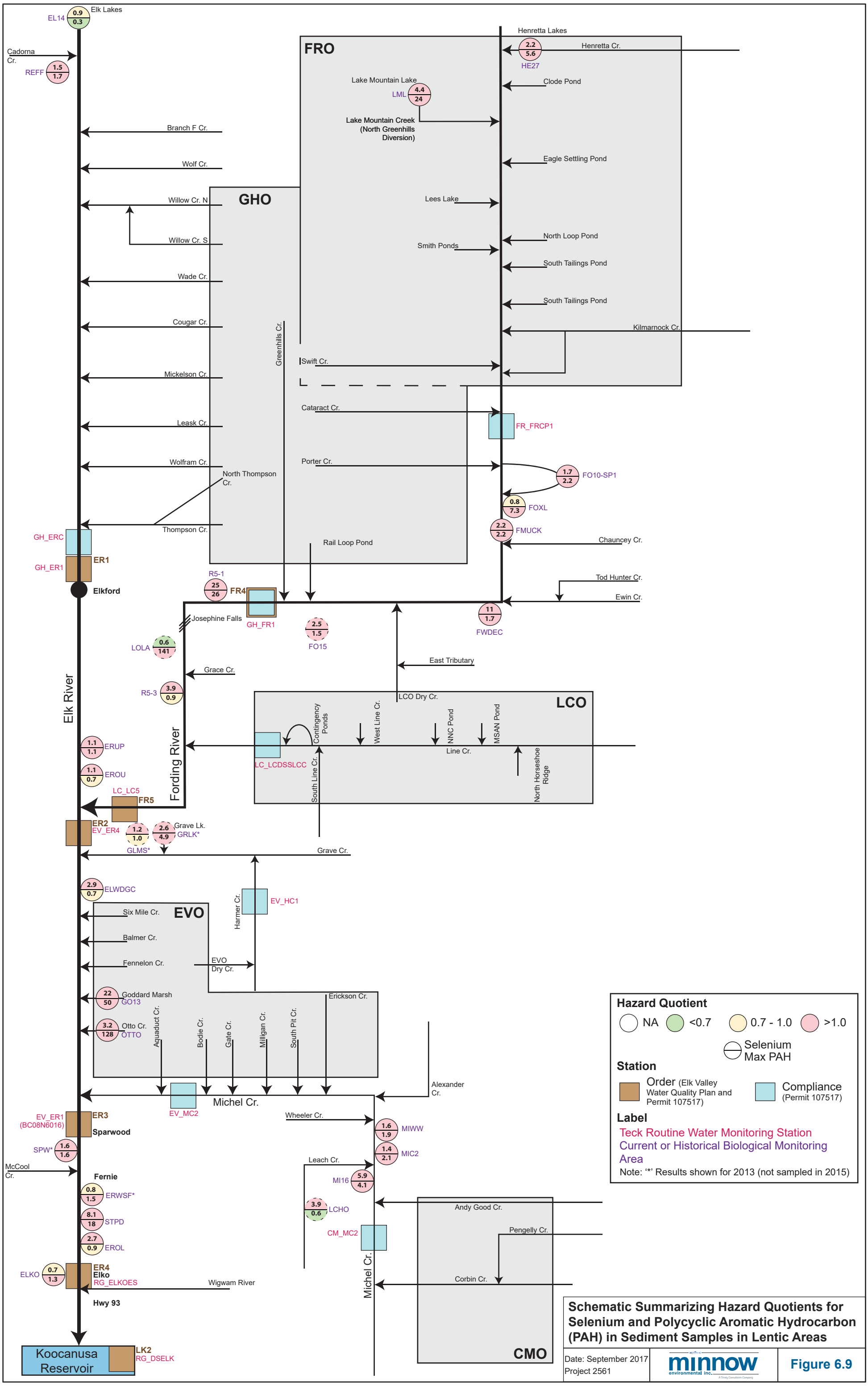
6.2.4 Temporal Changes

Potential temporal changes in sediment quality were tested for all areas that were sampled in both 2013 and 2015 using a RM ANOVA (three reference areas and nine mine-exposed areas; Appendix Tables E.14 to E.16). Contrasts after the ANOVA tested the relative difference in sediment quality between each mine-exposed area and both the mean of reference areas and each individual reference area between 2013 and 2015. Goddard Marsh (GO13) was the only area in which the change in sediment quality in 2015 compared to 2013 was significantly different from the change in reference area mean and the change for each of the three individual reference areas. Concentrations of both selenium and PAHs (based on 2-methylnaphthalene) at GO13 were above SQGs in both years and increased significantly in 2015 (Figure 6.10). The magnitude of temporal change for 2-methylnaphthalene was partially attributable to a decrease in mean reference area concentrations in 2015 (Figure 6.10).

6.3 Toxicity

A sediment toxicity supporting study was previously undertaken to evaluate a variety of test species, test durations, and biological endpoints to decide which test(s) is (are) the most appropriate for evaluating sediment toxicity in the Elk Valley (Minnow 2016d). To support selection of sampling areas for the toxicity study, sediment chemistry data (Section 6.2) were evaluated for the 19 mine-exposed and 5 reference areas sampled in August 2015. Based on input from the EMC, Teck selected a subset of mine-exposed areas for evaluation of sediment toxicity based on having the highest concentrations of mine-related constituents of interest (e.g.,

[25] Selenium has only a single guideline, which is why it is listed here as well as in the previous sentence.



Schematic Summarizing Hazard Quotients for Selenium and Polycyclic Aromatic Hydrocarbon (PAH) in Sediment Samples in Lentic Areas

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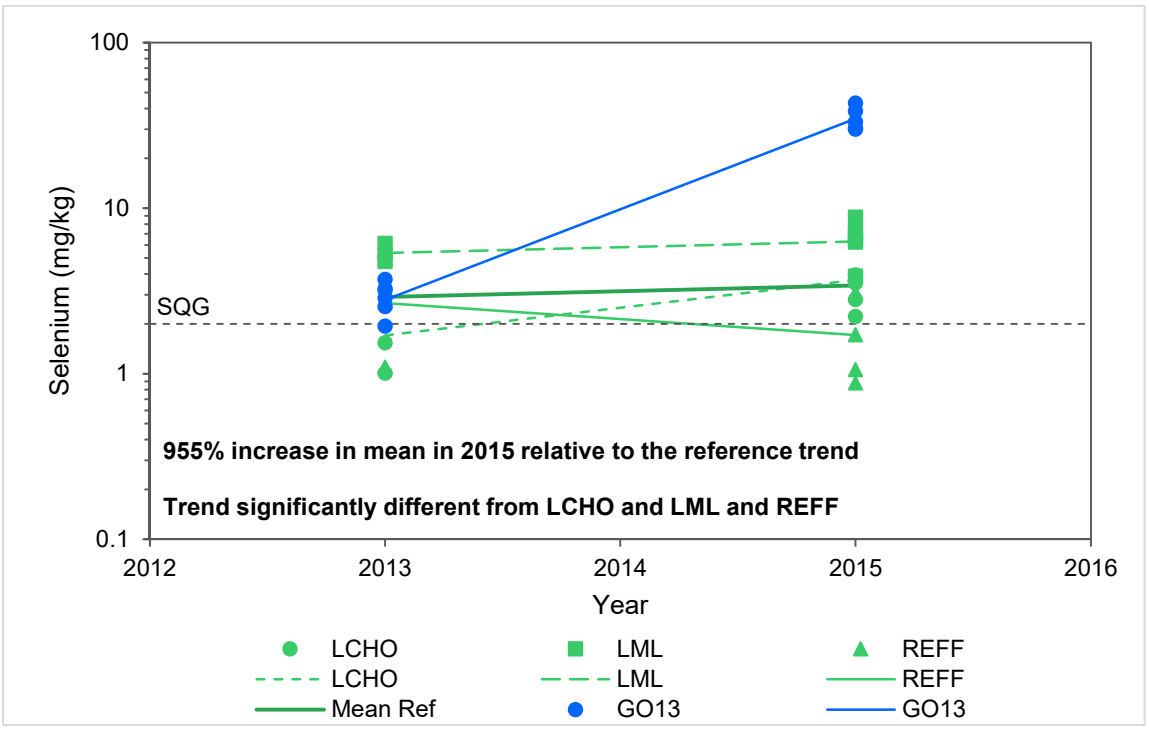
Figure 6.9



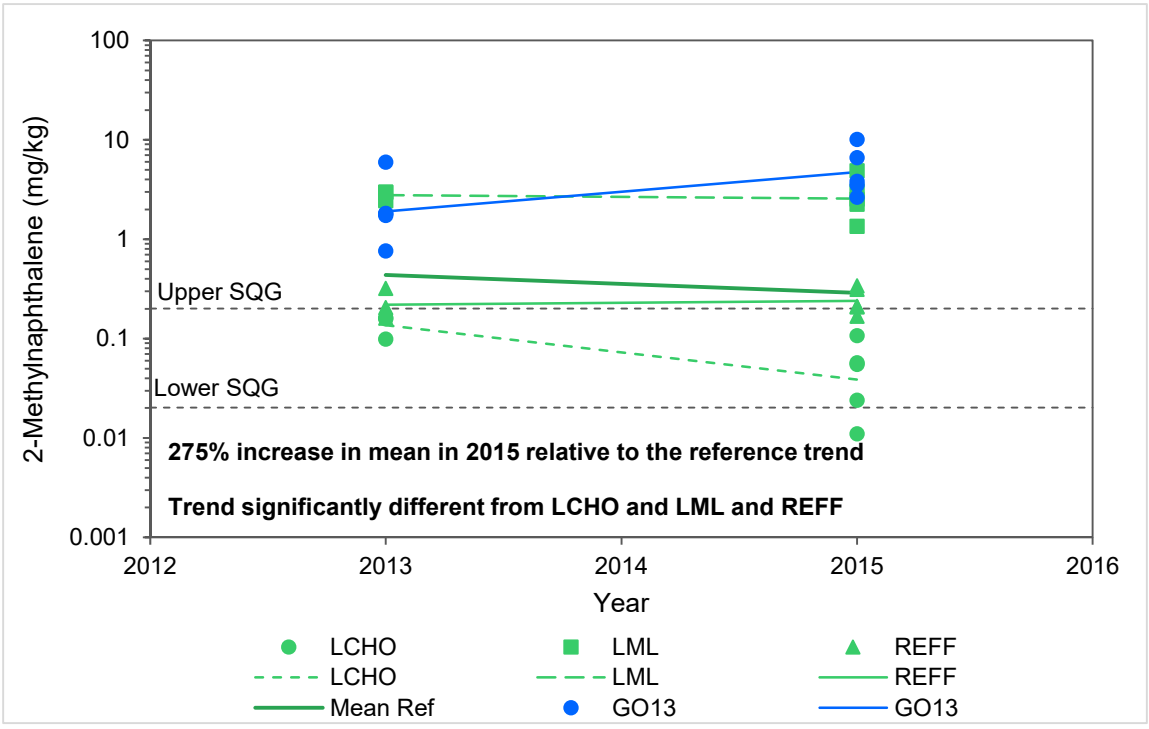


Figure 6.10: Temporal Changes in Concentrations of Selenium and 2-methylnaphthalene in Sediment (2015 compared to 2013) at Goddard Marsh (GO13) Relative to Reference Areas

selenium, cadmium, and PAHs). This was done to maximize the probability of detecting sediment toxicity (if present). Reference areas were also selected based on having a similar range of physical substrate characteristics (particle size distribution, sediment texture, and TOC content) to the sediments from mine-exposed areas, as well as a natural range of metal and PAH concentrations. This approach facilitated the comparison of test endpoint sensitivity by increasing the range of responses that might be expected among the tests, and helped to distinguish biological responses from underlying test variance. In total, five mine-exposed (R5-1, OTTO, GO13, STPD, MI16) and three reference areas (LML, LCHO, FLA1) were sampled for evaluation of three test species and a variety of test durations and endpoints:

- *Hexagenia* 21-day survival, growth, and biomass;
- *Hyalella* 14-day and 28-day survival, growth, and biomass;
- *Hyalella* life-cycle survival, growth, biomass, and reproduction;
- *Chironomus* 10-day and 20-day survival, growth, and biomass; and
- *Chironomus* life-cycle emergence and reproduction.

The results were evaluated based on a variety of factors, including test:

- representativeness - the degree of ecological and taxonomic representation to organisms that reside in Elk Valley aquatic habitats.
- sensitivity - the ability of a candidate test endpoint to detect biological impairment when the impairment exists.
- specificity - the ability of a candidate test endpoint to correctly conclude lack of impairment when no impairment exists.
- reliability - the ability of a test to consistently meet test performance criteria using a standard test method, such that results can be interpreted with confidence.
- variability - the tendency for a test to yield high variance when testing is repeated across laboratory or field replicates. Such variance affects the statistical power to detect biological changes relative to control or reference conditions.
- practicality - the ability to implement tests at reasonable cost and effort within the constraints of laboratory space, sample volume, sample holding times, and other practical considerations.
- The results are summarized in Table 6.1 and key findings were reported as follows (Minnow 2016e):

Table 6.1: Sediment Toxicity Test Results

		Hexagenia spp. 21-day test		
Sample ID		**Survival ± SD (%)**	**Average Wet Wt. ± SD (mg)**	**Biomass ± SD (mg)**
Laboratory Control Sediment		98 ± 4	15.5 ± 2.1	15.1 ± 1.8
Reference	FLA1-TOX-1	88 ± 22	17.4 ± 4.9	16.2 ± 6.9
	LCHO-TOX-1	80 ± 23[a]	18.5 ± 7.0	15.0 ± 6.1
	LML-TOX-1	78 ± 38[a]	19.6 ± 13.1	17.6 ± 12.8
Mine-exposed	OTTO-TOX-1	88 ± 13	3.2 ± 0.5[abcd]	2.8 ± 0.6[acd]
	GO13-TOX-1	32 ± 40[abcd]	10.1 ± 7.7	4.2 ± 5.8[abcd]
	STPD-TOX-1	92 ± 4	7.0 ± 1.2[acd]	6.4 ± 1.0[a]
	R5-1-TOX-1	20 ± 31[abcd]	16.6 ± 6.7	2.9 ± 4.1[abcd]
	MI16-TOX-1	78 ± 33	15.5 ± 3.8	12.9 ± 6.2

		Hyalella azteca 14-day test			*Hyalella azteca* life-cycle test (28-day endpoints)			*Hyalella azteca* life-cycle test (42-day endpoints)			
Sample ID		**Survival ± SD (%)**	**Average Dry Wt. ± SD (mg)**	**Biomass ± SD (mg)**	**Survival ± SD (%)**	**Average Dry Wt. ± SD (mg)**	**Biomass ± SD (mg)**	**Survival ± SD (%)**	**Average Dry Wt. ± SD (mg)**	**Average Young/female ± SD**	**Biomass ± SD (mg)**
Laboratory Control Sediment		98.0 ± 4.5	0.32 ± 0.07	0.31 ± 0.07	95.0 ± 5.8	0.39 ± 0.08	0.37 ± 0.07	87.5 ± 8.9	0.92 ± 0.13	7.74 ± 5.65	0.81 ± 0.13
Reference	FLA1-TOX-1	92.0 ± 8.4	0.29 ± 0.02[b]	0.26 ± 0.02[b]	97.5 ± 5.0	0.59 ± 0.08[bd]	0.57 ± 0.06[d]	95.0 ± 7.6	1.03 ± 0.09[bd]	5.26 ± 2.84[bd]	0.98 ± 0.13
	LCHO-TOX-1	94.0 ± 8.9	0.32 ± 0.04	0.30 ± 0.04	97.5 ± 5.0	0.81 ± 0.06	0.79 ± 0.07	90.0 ± 10.7	1.22 ± 0.11	10.82 ± 5.06	1.10 ± 0.15
	LML-TOX-1	98.0 ± 4.5	0.37 ± 0.03	0.36 ± 0.04	92.5 ± 15.0	0.82 ± 0.05	0.76 ± 0.13	86.2 ± 7.4	1.34 ± 0.12	14.42 ± 2.84	1.16 ± 0.13
Mine-exposed	OTTO-TOX-1	94.0 ± 5.5	0.24 ± 0.03[abd]	0.23 ± 0.03[ab]	72.5 ± 5[cd]	0.45 ± 0.09[bcd]	0.33 ± 0.07[bcd]	90.0 ± 16.9	0.97 ± 0.10[bd]	4.81 ± 3.35[b]	0.86 ± 0.15[bd]
	GO13-TOX-1	90.0 ± 10.0	0.37 ± 0.05	0.34 ± 0.07	97.5 ± 5.0	0.86 ± 0.04	0.84 ± 0.04	85.0 ± 14.1	1.26 ± 0.20	11.13 ± 7.65	1.08 ± 0.23
	STPD-TOX-1	94.0 ± 5.5	0.19 ± 0.03[abcd]	0.18 ± 0.02[abcd]	90.0 ± 8.2	0.30 ± 0.15[bcd]	0.28 ± 0.15[bcd]	86.2 ± 9.2	0.87 ± 0.17[bd]	3.35 ± 3.08[bd]	0.75 ± 0.19[bcd]
	R5-1-TOX-1	88.0 ± 11.0	0.41 ± 0.06	0.36 ± 0.09	92.5 ± 15.0	0.83 ± 0.07	0.77 ± 0.17	93.8 ± 9.2	1.25 ± 0.17	8.22 ± 5.34	1.17 ± 0.14
	MI16-TOX-1	100.0 ± 0.0	0.45 ± 0.04	0.45 ± 0.04	95.0 ± 10.0	0.85 ± 0.04	0.81 ± 0.11	97.5 ± 4.6	1.34 ± 0.08	15.17 ± 5.66	1.29 ± 0.10

		Chironomus dilutus 10-day test			*Chironomus dilutus* life-cycle test (20-day endpoints)			*Chironomus dilutus* life-cycle test (final endpoints[e])	
Sample ID		**Survival ± SD (%)**	**Average Dry Wt. ± SD (mg)**	**Biomass ± SD (mg)**	**Survival ± SD (%)**	**Average Dry Wt. ± SD (mg)**	**Biomass ± SD (mg)**	**Emergence ± SD (%)**	**Reproduction ± SD (per mated female)**
Laboratory Control Sediment		94.0 ± 5.5	1.78 ± 0.22	1.51 ± 0.10	89.6 ± 4.2	2.09 ± 0.16	1.53 ± 0.28	72.9 ± 13.9	1,177 ± 220
Reference	FLA1-TOX-1	94.0 ± 5.5	2.68 ± 0.34	2.53 ± 0.43	68.8 ± 23.9	3.03 ± 0.66	1.79 ± 0.63	56.2 ± 15.3[a]	1,249 ± 166[b]
	LCHO-TOX-1	84.0 ± 19.5	2.40 ± 0.37	1.82 ± 0.55	77.1 ± 23.0	2.77 ± 0.66	1.88 ± 0.25	53.1 ± 35.3[a]	1,231 ± 254
	LML-TOX-1	84.0 ± 8.9	2.57 ± 0.15	2.10 ± 0.17	68.8 ± 14.2	2.52 ± 0.22	1.71 ± 0.25	43.8 ± 20.8[a]	1,454 ± 248
Mine-exposed	OTTO-TOX-1	80.0 ± 7.1	1.93 ± 0.36[bc]	1.50 ± 0.33[c]	79.2 ± 14.4	2.21 ± 0.29	1.69 ± 0.33	65.6 ± 10.4	1,292 ± 225
	GO13-TOX-1	88.0 ± 13.0	2.89 ± 0.55	2.46 ± 0.38	56.2 ± 8[a]	2.98 ± 0.57	1.48 ± 0.71	63.5 ± 18.9	1,253 ± 223[b]
	STPD-TOX-1	78.0 ± 11.0	2.52 ± 0.23	1.84 ± 0.59[c]	70.8 ± 21.0	1.34 ± 0.52[bcd]	0.89 ± 0.38	37.5 ± 18.4[ac]	1,280 ± 406
	R5-1-TOX-1	60.0 ± 20.0[abcd]	3.40 ± 1.08	1.65 ± 0.53[c]	43.8 ± 41.6[ad]	3.24 ± 0.83	1.38 ± 1.15	49.0 ± 19.6[a]	1,595 ± 264
	MI16-TOX-1	90.0 ± 7.1	2.74 ± 0.13	2.40 ± 0.16	93.8 ± 8.0	2.51 ± 0.24	2.23 ± 0.19	55.2 ± 16.6[a]	1,417 ± 312

[a] Sample was significantly different from laboratory control sediment.

[b] Sample was significantly different from reference area LML-TOX-1.

[c] Sample was significantly different from reference area FLA1-TOX-1.

[d] Sample was significantly different from reference area LCHO-TOX-1.

[e] 41 to 58 days, depending on the sample.

Significant relative to one reference area.

Significant relative to two reference areas.

Significant relative to three reference areas.

- Survival, growth, and, where applicable, reproduction of tests organisms in field reference samples were usually similar to or greater than those of laboratory control samples. Physical characteristics of the reference samples were also more comparable to the mine-exposed samples than the (sandy) laboratory control sample.
- Toxicity to *Hexagenia* was observed for four of five mine-exposed sediments based on significant differences from at least two reference sediment samples. By comparison, only two samples caused toxicity to *Hyalella*. Results for *Chironomus* were variable, depending on the test duration and endpoint considered, and which reference areas results were compared.
- There were significant correlations among results for species exposed for multiple test durations, and effects were not observed in longer term tests with *Hyalella* or *Chironomus* that were not observed for the standard short-term tests using the same species (e.g., 14-days and 10-days, respectively) or using *Hexagenia*.
- There were significant correlations among endpoints for different test organisms, suggesting similarity in biological responses and redundancy among tests.
- Growth of all three species was most reduced at the two areas having highest concentrations of PAHs relative to SQGs. Similarly, survival of the three test species tended to be reduced at the areas with highest selenium concentrations. These results provided evidence of cause-effect relationships for mine-related constituents, and thus provided evidence that these test species are relevant for evaluating mine-related effects on sediment quality.
- Tests for all organisms were reliable based on achieving method-specific Quality Assurance/Quality Control (QA/QC) criteria.
- *Hexagenia* tests showed the largest absolute magnitude of effect and highest ratio of the magnitude of difference to the minimum statistically detectable difference. The *Hexagenia* test also showed the highest test sensitivity and specificity

Based on the conclusions presented above, the following recommendations were provided (Minnow 2016e):

- Although laboratory control samples are an important component of within-laboratory quality control for test systems, they often have different physical characteristics from mine-exposed sediments. Therefore, sediment toxicity testing programs should include collection of at least one, and preferably more, reference-area sediment samples having similar physical characteristics to sediments from mine-exposed areas being tested.

The field reference samples should be used in statistical evaluations to identify and interpret effects associated with mine-exposed sediments.

- The 21-day *Hexagenia* test is recommended based on highest ratio of magnitude of effect to minimum detectable biological response, as well as greatest overall test sensitivity and specificity compared to the other test species, durations, and endpoints. However, reliable methods for laboratory culturing are lacking and the test method has not been developed or used to the same degree as for other sediment species. Therefore, it is recommended to be used in conjunction with another test species.
- Based on the availability of standard methods for laboratory culturing and testing, it is recommended that the *Hyalella* 14-day test also be applied for sediment toxicity testing to corroborate results obtained for *Hexagenia* tests. Longer-term tests with *Hyalella* are not recommended because they did not indicate toxicity for samples that was not evident in the 21-day *Hexagenia* and 14-day *Hyalella* tests.
- None of the *Chironomus* test durations or endpoints identified effects that were not observed in the *Hexagenia* 21-day or *Hyalella* 14-day tests, so testing with this species is not recommended.

Concentrations of Se and five PAHs (2-methylnaphthalene, pyrene, phenanthrene, naphthalene and fluorene) in sediment samples collected from reference and mine-exposed areas from August, 2015 were depicted in a histogram showing the frequency of concentrations for each constituent (Appendix Figure E.8). The concentrations of each constituent in the areas that showed no toxicity are marked on the plots, with the highest non-toxic concentration highlighted with a circle. The majority of the concentrations for each constituent fall under the highest non-toxic concentration.

6.4 Summary

Sediment chemistry was evaluated at a total of 31 areas in 2013 and/or 2015, including 10 reference areas. Most of the areas chosen for sediment sampling have little or no surface water connection to the main channel flow for at least part of the year. Consequently sediment samples collected among the 31 study areas were dominated by fine particles (silt and clay). These areas were expected to have the highest sediment accumulations of mine-related substances compared to lotic habitats that are regularly affected by seasonal high flows and associated scouring.

Mining influence on sediment chemistry was most evident as elevated concentrations of selenium and PAHs. Highest concentrations of selenium in sediment were observed at R5-1 (wetland adjacent to the Fording River, near GHO) and GO13 (Goddard Marsh). Highest PAH

concentrations were observed in a sample collected at STPD (Stanford Pond near Fernie), but the pattern of PAHs suggested a source other than, or in addition to, coal mining. At areas closer to mining, 2-methylnaphthalene was the PAH found at highest concentrations relative to guidelines, particularly at OTTO (Otto Creek ponds), GO13, and reference area LOLA (Lost Lake). The upper limit of the reference area normal range exceeded the upper sediment quality guideline for selenium, fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene.

Goddard Marsh (GO13) was the only mine-exposed area in which the change in sediment quality in 2015 compared to 2013 was significantly different from the change in reference area mean and the change for each of the three reference areas sampled in both 2013 and 2015. Concentrations of both selenium and PAHs (based on 2-methylnaphthalene) at GO13 were greater than the upper SQGs in both years and increased significantly in 2015 relative to the reference areas.

A sediment toxicity supporting study evaluated a variety of test species, test durations, and biological endpoints to decide which test(s) is (are) the most appropriate for evaluating sediment toxicity in the Elk Valley. A subset of five mine-exposed areas was chosen for the study based on having the highest concentrations of mine-related constituents of interest (e.g., selenium, cadmium, and PAHs). Three reference areas were also selected based on having a similar range of physical substrate characteristics (particle size distribution, sediment texture, and TOC content) to the sediments from mine-exposed areas as well as a natural range of metal and PAH concentrations. The study found that toxicity was observed in samples having highest concentrations of selenium and/or PAHs. The 21-day *Hexagenia* survival and growth test and the 14-day *Hyalella* survival and growth test were recommended for future testing of potential mine-related sediment toxicity.

7 PERIPHYTON

7.1 Overview

Periphyton represents an important component of aquatic food webs in the streams within the Elk River watershed and consists of a complex matrix of organisms that can include algae, fungi, bacteria, and protozoa. These organisms take up inorganic nutrients such as nitrogen (e.g., nitrate, nitrite) and phosphorus (e.g., ortho-phosphate), as well as other substances dissolved in water (e.g., selenate), to serve physiological functions and which thereby become available via dietary pathways to consumer organisms at higher trophic levels.

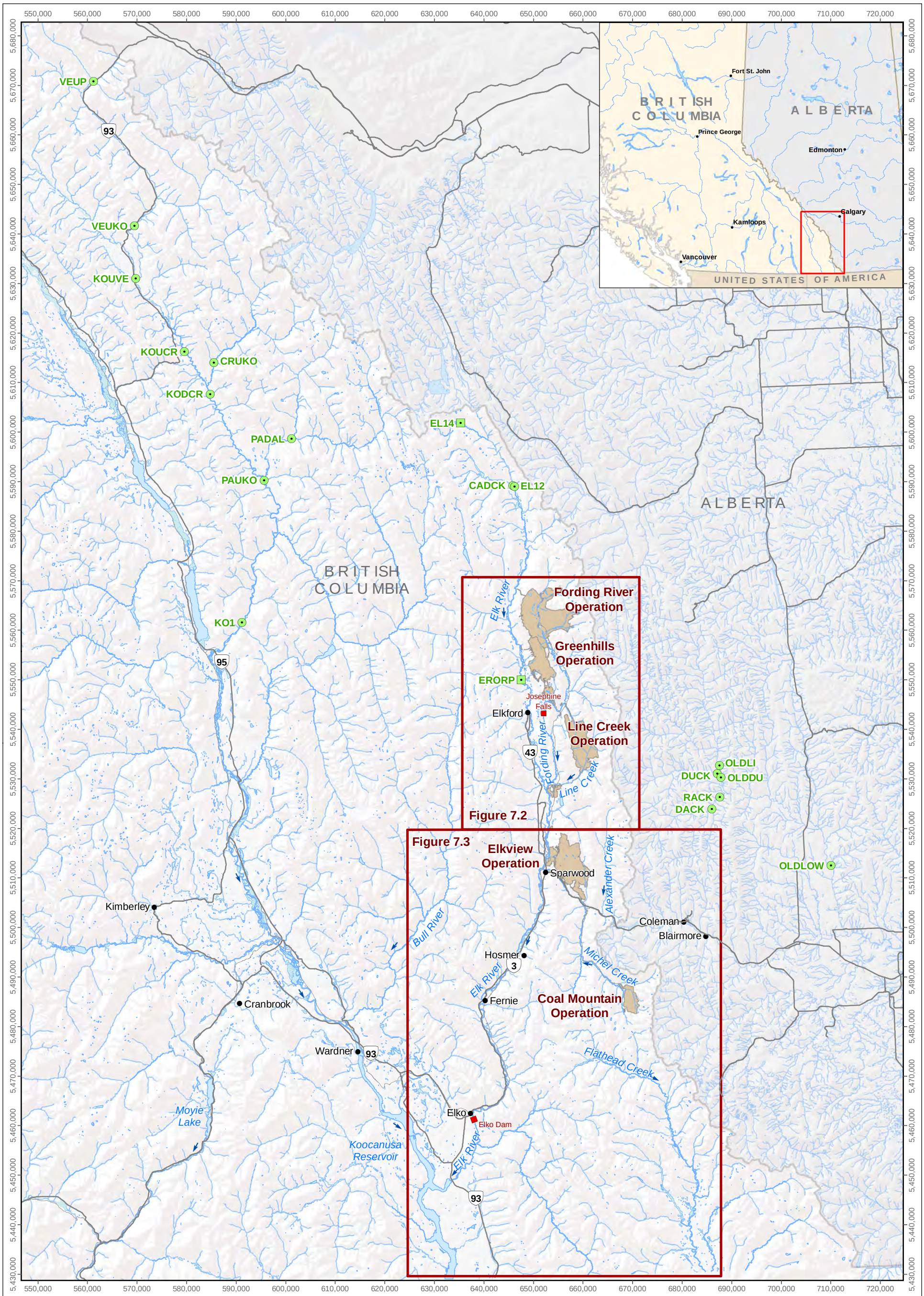
Periphyton productivity was evaluated as part of the RAEMP (2015-2016), in the supporting study to evaluate the effects of calcite on biota (Minnow 2016b), and in the Line Creek and FRO LAEMPs (Minnow 2015c, 2016c, 2017a,c). Periphyton chlorophyll-a and ash-free dry mass (AFDM) were the endpoints used to evaluate primary productivity in comparison to reference normal ranges. Periphyton chlorophyll-a concentrations were also compared to the provincial guideline of 100 mg/m^2.

Periphyton tissue selenium concentrations measured in mine-exposed areas in the 2015-2016 RAEMP cycles, the Line Creek LAEMP (Minnow 2016c), and the 2016 LAEMPs for Line Creek and FRO (Minnow 2017a,c) were compared to the upper limit of the reference normal range.

Evaluations of potential mine-related effects on community characteristics were completed in supporting studies to the RAEMP (Minnow 2014c, Minnow and Larratt 2016) and the results are summarized in this report.

Figures 7.1 to 7.3 show the sampling locations discussed in this section.

Photo 7.1: Periphyton Sampling



LEGEND

Lentic Sampling Areas

- Reference

Lotic Sampling Areas

- Reference
- Teck Coal Mine Operation

Regional Reference Areas Sampled for Periphyton Productivity, Community and/or Tissue Selenium

0 10 20 40
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
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Figure 7.1

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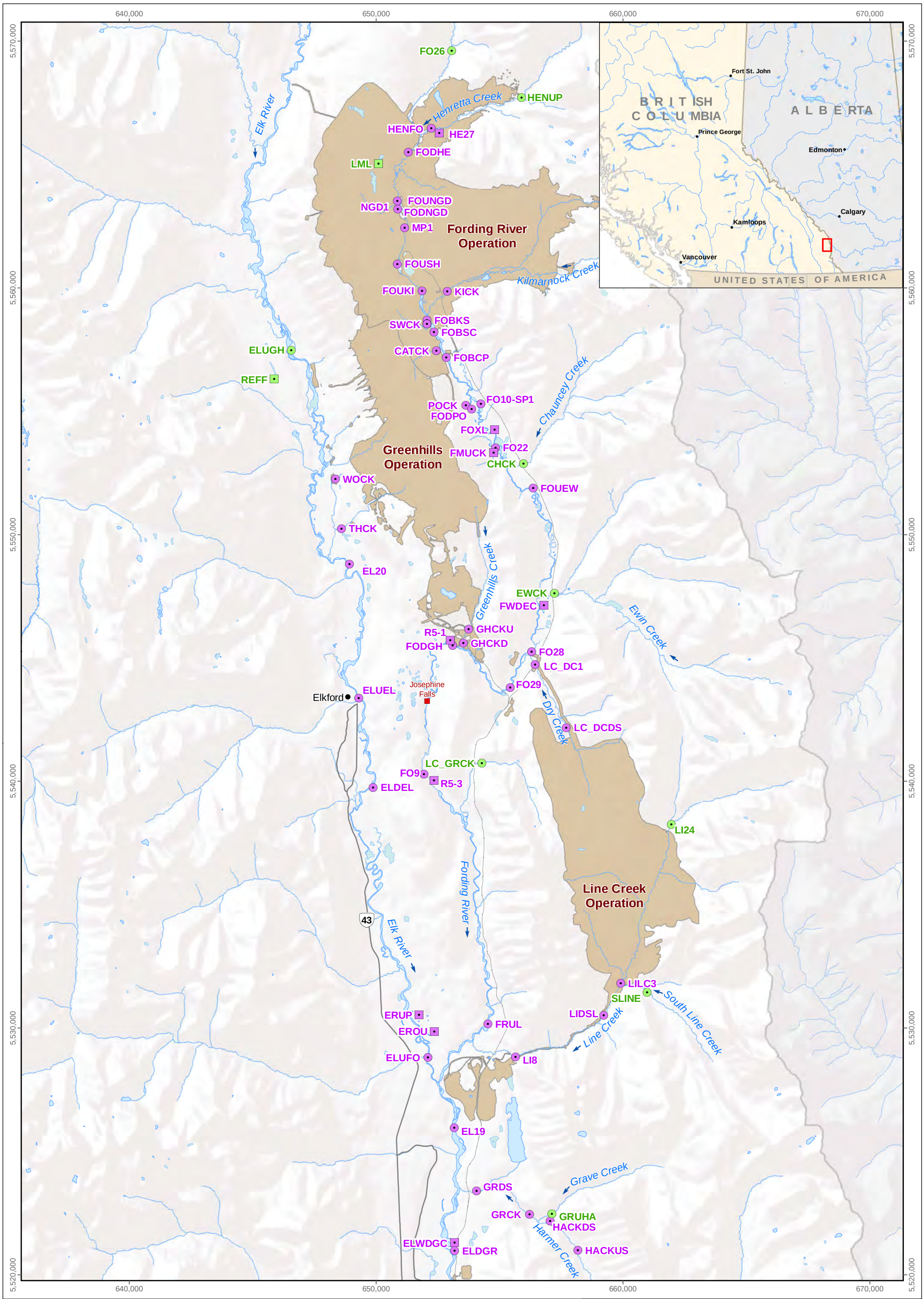

LEGEND

Lentic Sampling Areas

- Reference
- Mine-Exposed

Lotic Sampling Areas

- Reference
- Mine-Exposed
- Teck Coal Mine Operation

Areas in Upper Elk River Watershed Sampled for Periphyton Productivity, Community, and/or Tissue Selenium

0 2.5 5 10
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

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Figure 7.2

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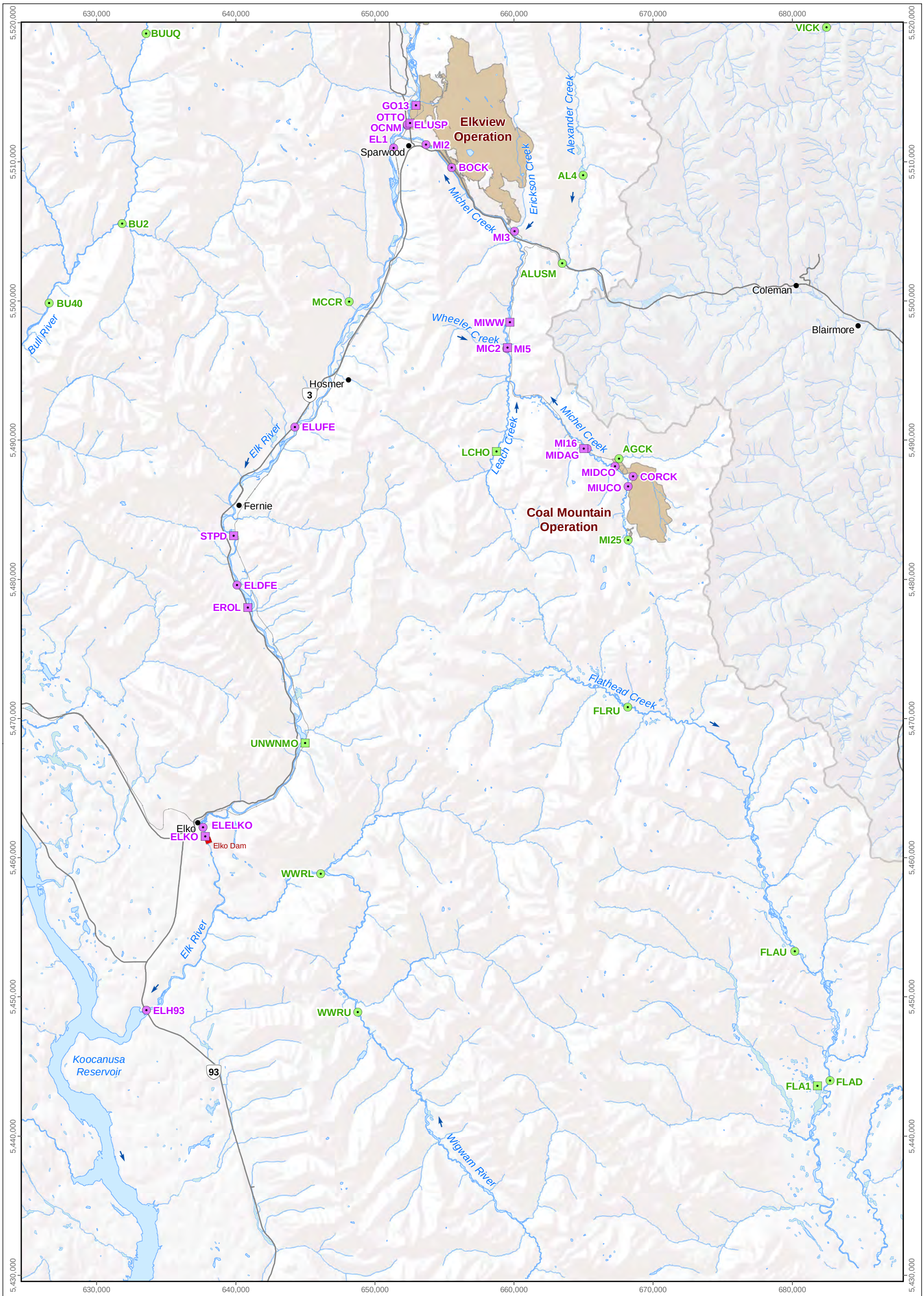

LEGEND

Lentic Sampling Areas

- Reference
- Mine-Exposed

Sampling Locations

- Reference
- Mine-Exposed
- Teck Coal Mine Operation

Areas in Lower Elk River Watershed Sampled for Periphyton Productivity, Community, and/or Tissue Selenium

0 4.25 8.5 17
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

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Figure 7.3

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7.2 Productivity

7.2.1 Nutrient Levels

Most reference and mine-exposed areas sampled in September 2015 had ratios of aqueous total nitrogen to total phosphorus concentrations (N:P) greater than 15 (Figure 7.4), indicating that phosphorus is the limiting nutrient based on categories defined by McDowell et al. (2009) for mass concentrations:

N:P < 7	Nitrogen-limited
7 < N:P < 15	Co-limited (nitrogen and phosphorus)
N:P > 15	Phosphorus-limited

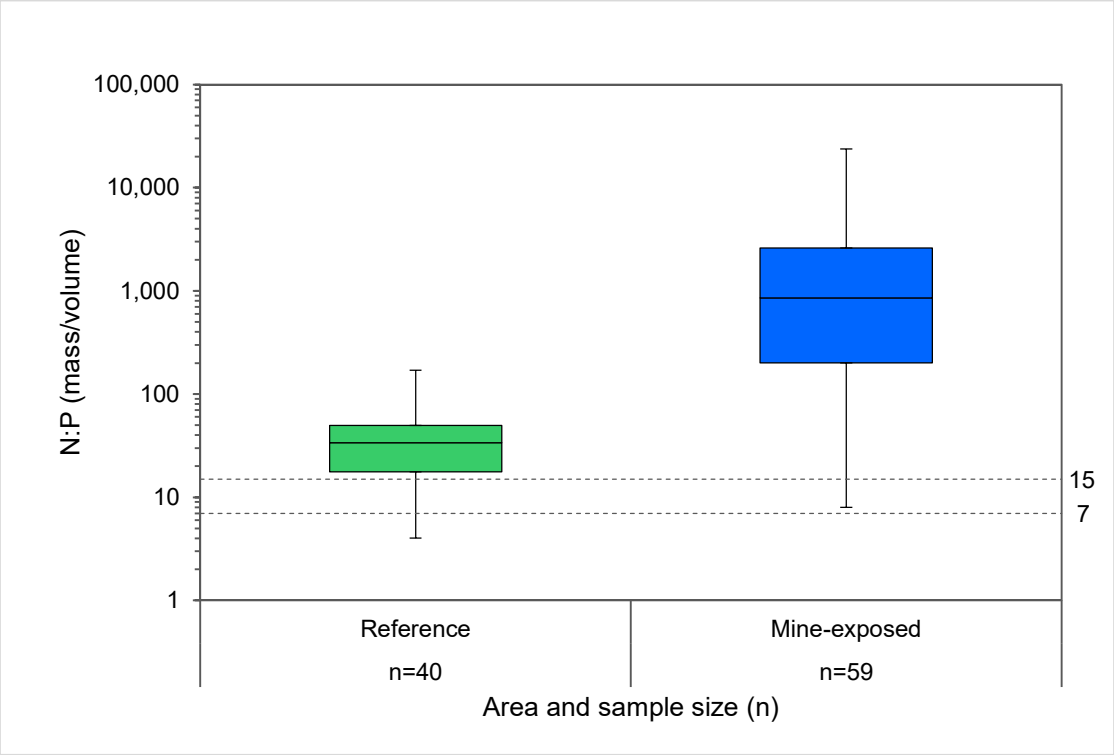


Figure 7.4: Boxplot of Ratio of Total Nitrogen to Total Phosphorus (Concentrations Expressed as Mass/Volume) Based on Samples Collected for the RAEMP, September 2015

Notes: The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values. Ratio <7 indicates nitrogen limitation, Ratio >15 indicates phosphorus limitation (McDowell et al. 2009)

Of the 59 mine-exposed areas sampled in 2015, 56 would be considered phosphorus-limited, while three would be considered co-limited (Figure 7.5). This means that aquatic productivity is

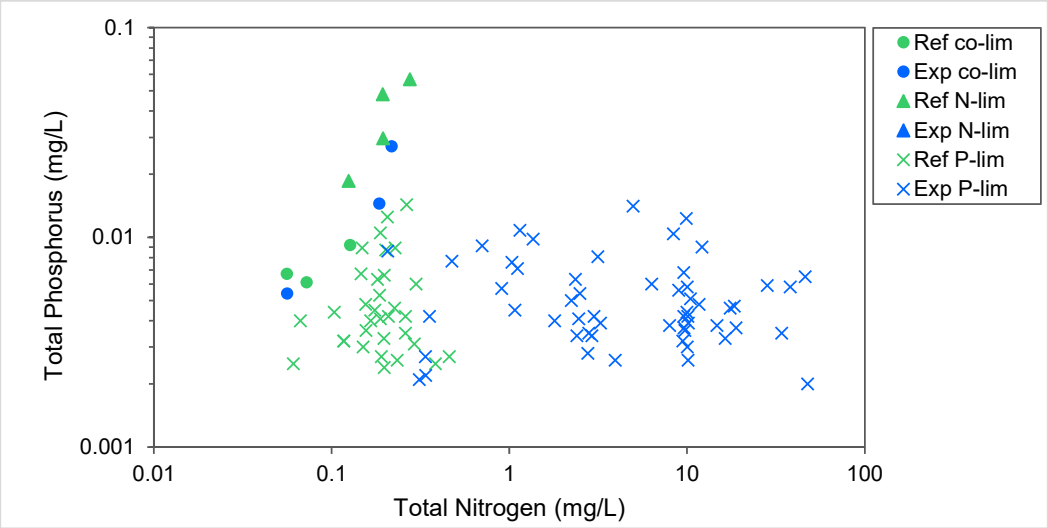


Figure 7.5: Scatterplot of Concentrations of Total Phosphorus versus Total Nitrogen for Reference (n = 40) and Mine-exposed Areas (n = 59) Grouped by N:P Ratios for Stations Sampled for the RAEMP, September 2015

not likely sensitive to changes in nitrogen concentrations, but productivity would likely increase at any locations where phosphorus concentrations increased.

7.2.2 Comparisons to Normal Reference Ranges

Periphyton AFDM and chlorophyll-a were measured at 40 reference and 58 mine-exposed areas in 2015 as part of the RAEMP, and were measured at a sub-set of areas in 2013, 2014, and 2016 for various other purposes (Figures 7.6 and 7.7; Appendix Tables F.1 and F.2). Normal ranges were defined for periphyton chlorophyll-a and AFDM based on the samples collected at 40 reference areas in 2015 (Appendix Table F.3; Appendix Figure F.1). Chlorophyll-a and AFDM levels in 2015 were within respective reference normal ranges at 76% (44 of 58 areas) and 78% (45 of 58 areas) of mine-exposed areas, respectively (Appendix Table F.4). The sub-set of areas sampled in 2016 had similar or higher periphyton AFDM and chlorophyll-a values compared to 2015, including reference area FO26 on the Fording River upstream from FRO, where levels of both endpoints were within normal ranges in 2015 and greater than the normal range in 2016 (Appendix Table F.5).

Periphyton AFDM and chlorophyll-a were elevated above the reference area normal range at 14 and 10 areas, respectively, of 58 mine-exposed areas sampled in 2015 (Figures 7.6 and 7.7; Appendix Table F.4). There was no direct relationship between periphyton chlorophyll-a concentrations and aqueous total phosphorus or orthophosphate concentrations, even though phosphorus is the limiting nutrient (Figure 7.8). Dodds et al. (2002) concluded that, although

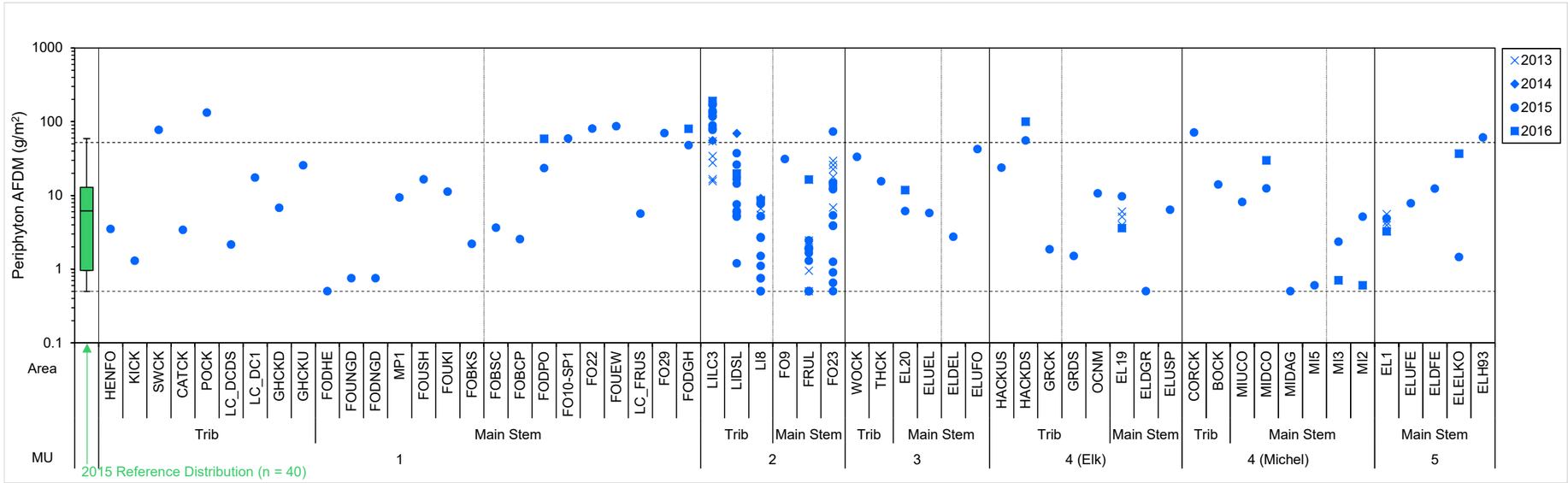


Figure 7.6: Periphyton Ash-free Dry Mass (AFDM) Concentrations in Samples Collected in Lotic Habitats, 2013 - 2015

Note: Dashed horiztonal lines represent the limits of the reference area normal range

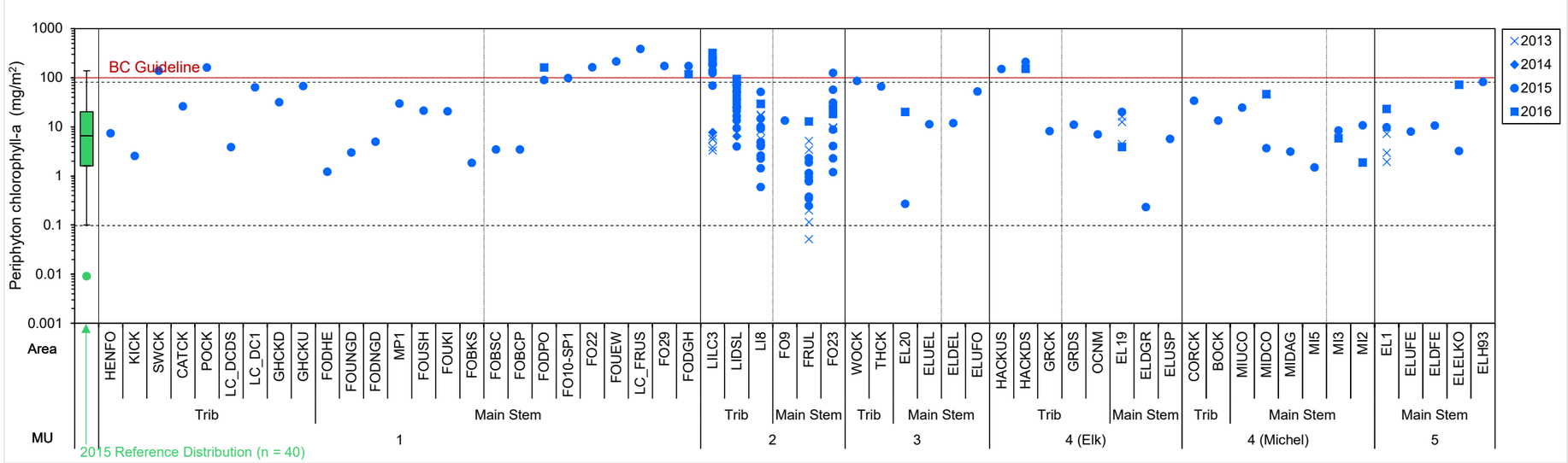


Figure 7.7: Periphyton Chlorophyll-a Concentrations in Samples Collected in Lotic Habitats, 2013 - 2015

Note: Dashed horiztonal lines represent the limits of the reference area normal range

nutrient availability can explain as much as 40% of the variability in periphyton biomass among areas, multiple factors affect primary productivity. Much of the scientific literature shows inconsistent to no statistical linkages between nutrient and chlorophyll-a concentrations, especially in aquatic habitats with low nutrient concentrations (see meta-analysis: Francoeur 2001). There appears to be a threshold (P > 0.030 mg/L, N > 0.040 mg/L) above which periphyton growth is more closely associated with nutrient concentrations, and below which primary productivity is mostly related to other habitat factors (Lewis and McCutchan 2010). The phosphorus threshold of 0.03 mg/L is most relevant to the Elk River watershed, because it is the limiting nutrient.

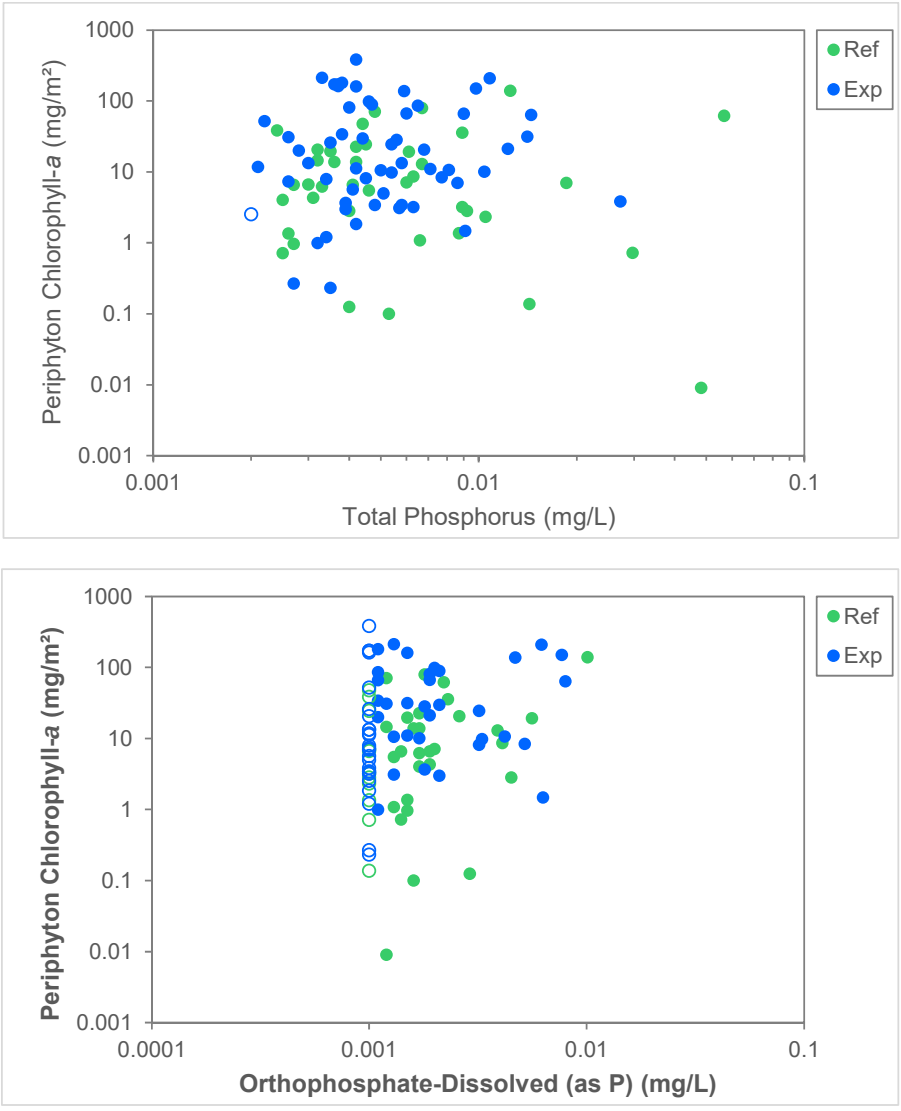


Figure 7.8: Periphyton Chlorophyll-a Compared to Orthophosphate Concentrations in Reference (n=40) and Mine-exposed (n=57) Areas

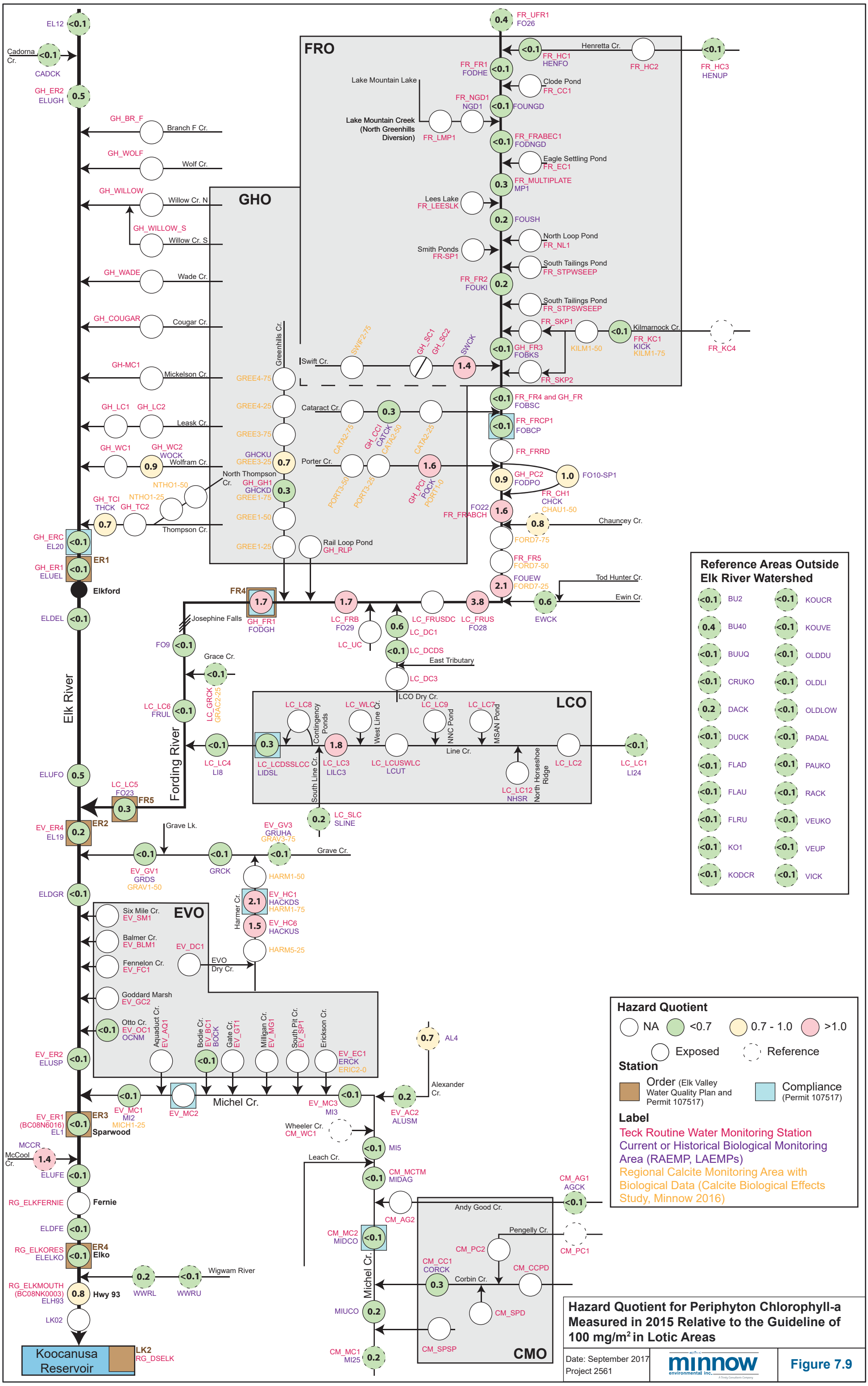
Note: Open circles indicate values less than laboratory reporting limit.

Of other habitat factors, Lewis and McCutchan (2010) identified water temperature and the length of growing season as primary factors contributing to periphyton biomass in streams of the Colorado Mountains and foothills. Periphyton productivity, as indicated by chlorophyll-a concentrations, may also be influenced by stream gradient and light intensity (Dudgeon and Chan 1992, Dodds et al. 2002, Death and Zimmerman 2005, Lewis and McCutchan 2010). In addition, substrate disturbance associated with variation in discharge regimes appears to positively correlate with producer richness and net production of biomass (Cardinale et al. 2005). The abundance of grazing benthic macroinvertebrates does not seem to consistently explain low periphyton biomass, as several studies have shown a strong positive correlation between primary productivity and invertebrate abundance and richness (Death and Zimmerman 2005, Dudgeon and Chan 1992, Kiffney and Richardson 2001, Lewis and McCutchan 2010, Quinn et al. 1997). Studies reporting a negative relationship between invertebrate grazers and periphyton biomass were typically laboratory experiments in which grazer abundance was controlled; such relationships were much less evident in short-term experiments conducted in the field (reviewed in Feminella and Hawkins 1995).

In the Elk Valley, the strongest relationship between periphyton productivity endpoints and habitat variables was with calcite index when considering reference areas alone or reference and mine-exposed areas together ($p<0.001$, $r=0.55$; Appendix Tables F.6 and F.7; Appendix Figure F.3). Periphyton potentially provides nucleation sites for calcite formation and/or calcite deposits serve as a suitable substrate for growth of some periphyton species (Section 5.4.1). Absolute correlation coefficients (r) for all other variables were less than 0.5, indicating they explained little of the variation in productivity endpoints among areas. Also, some significant relationships were in a direction opposite to those expected (e.g., chlorophyll-a concentrations were inversely related to variables related to stream size and agricultural activity; Appendix Tables F.6 and F.7).

7.2.3 Comparisons to Guidelines

Periphyton chlorophyll-a concentrations were greater than the BC guideline of 100 mg/m^2 at some reference and mine-exposed areas sampled since 2013 (Figures 7.7 and 7.9; Appendix Tables F.1 and F.2) Chlorophyll-a concentrations were less than the guideline at 48 of 58 (83%) mine-exposed areas sampled in September 2015 as indicated by HQs less than 1.0 (Figure 7.9; Appendix Table F.5). HQs greater than 1.0 were mainly associated with some tributary or main stem areas of the Fording River, but were also observed in Harmer Creek.



Hazard Quotient for Periphyton Chlorophyll-a Measured in 2015 Relative to the Guideline of 100 mg/m² in Lotic Areas

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Figure 7.9

7.2.4 Temporal Changes

Temporal trends were not evaluated for periphyton productivity endpoints because a recent evaluation that used data from both the Line Creek LAEMP and the RAEMP, showed that benthic invertebrate abundance (kick samples), density, and biomass (Hess samples) correlated with periphyton productivity endpoints, and this finding was consistent with results from a variety of studies in the scientific literature (Minnow 2017d). Within-area variability was less for invertebrate than for periphyton productivity endpoints, indicating that changes in biological productivity over time are more likely to be statistically detected with invertebrate than periphyton endpoints for a given sample size, α and β (Minnow 2017d).

7.3 Community Characteristics

7.3.1 2013 Supporting Study

In 2013, Teck completed a study to investigate the utility and the relative sensitivity of periphyton community endpoints for evaluating mine-related effects compared to benthic invertebrate community monitoring (Minnow 2014c). Periphyton and benthic invertebrates were collected at 13 reference areas and 13 mine-exposed areas of the Elk Valley. The reference condition was defined as the range capturing 95% of reference area values for each endpoint (similar to the approach used in this report). Significant reductions in proportions of the invertebrate group EPT (Ephemeroptera, Plecoptera, Trichoptera) with concurrent increases in chironomid proportions at some mine-exposed areas (Line Creek-LILC3, Michel Creek-MI2, Fording River-MP1, Thompson Creek-THCK) suggested adverse effects that were not observed or only weakly evident in periphyton community analyses for the same areas. None of the mine-exposed areas were significantly different from the reference condition for the dominant periphyton taxa *Hydrurus* sp. or *Achnanthes* sp. (now identified as *Achnanthidium*), nor for NMDS axis scores of overall community composition, likely owing to the large variation among reference areas for these endpoints. For example, the coefficients of variation (CV, i.e., standard deviation/mean * 100) for proportions of the periphyton genera *Hydrurus* and *Achnanthes* among reference areas were 68% and 168%, whereas CVs for proportions of the benthic invertebrate groups EPT and Ephemeroptera were 12% and 36%, respectively. This suggested that only major shifts in periphyton community composition among mine-exposed areas were likely to be statistically detectable, compared to relatively smaller changes in benthic invertebrate community composition. It was concluded that periphyton community assessment is less sensitive for statistical detection of potential mine-related effects on aquatic ecosystems than benthic invertebrate community assessment, based on high natural variability of periphyton community composition among areas (Minnow 2014c).

7.3.2 2015 Supporting Study

7.3.2.1 Comparisons to Normal Ranges

As a condition of ENV's approval of the RAEMP study design, Teck was required to undertake an additional supporting study "to evaluate the effects of mine-related discharges on periphyton community structure" (BCMOE 2014). The study design was submitted on December 19, 2014, and sampling was undertaken in 2015. The detailed results were reported by Minnow and Larratt (2016) and are summarized below.

A total of 40 reference and 58 mine-exposed areas were sampled for analysis of periphyton community structure. The majority of periphyton communities in reference and mine-exposed areas were dominated by diatoms, however, both reference and mine-exposed areas showed large variation in community composition even at a major group level (Figures 7.10 and 7.11).

A total of 50 periphyton community endpoints were investigated as potential indicators of mine-related influence (Appendix Table F.8). Ten univariate endpoints identified the most areas outside of the reference normal range and significantly correlated with a mine-related gradient in

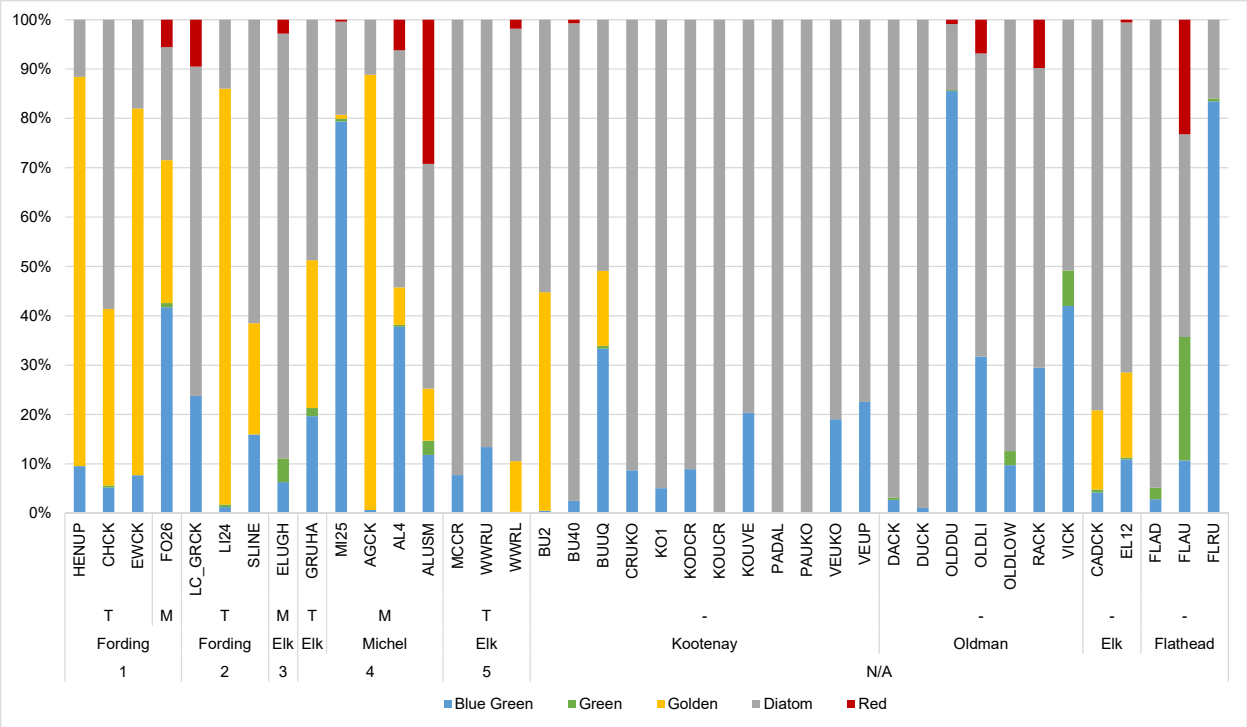

Figure 7.10: Proportions of Major Periphyton Groups among Reference Areas (n = 40), September 2015

Note: Stream Type: 'M' = Main Stem, 'T' = Tributary

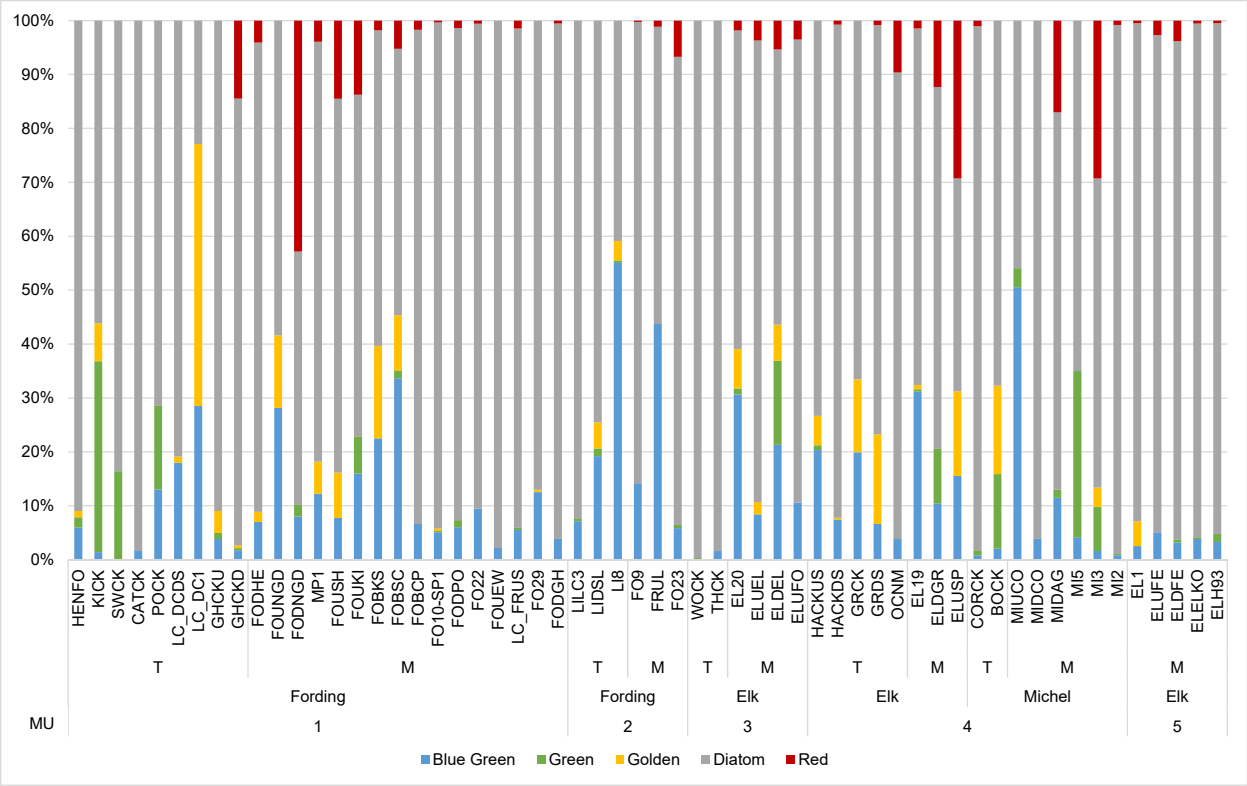

Figure 7.11: Proportions of Major Periphyton Groups among Mine-exposed Areas (n = 58), September 2015

Note: Stream Type: 'M' = Main Stem, 'T' = Tributary

water quality indicated by the first axis in a PCA of water quality data (Appendix Table F.9). There was strong correlation among the ten endpoints and three were selected (green algal density, *Achnanthidium* density, Fragilariaceae density) for evaluation of communities in mine-exposed areas to those in reference areas (see Minnow and Larratt 2016 for further details). For the purposes of this report, overall periphyton community structure, as summarized by NMDS Axes 1 and 3[26] has also been evaluated.

Normal ranges were derived for each of the five periphyton community endpoints (Appendix Table F.10). Of the 58 mine-exposed areas, 38 had at least one of the final five community endpoints outside of the reference area normal range (2.5th and 97.5th percentiles) (Table 7.1; Appendix Figures F.5 to F.7). Only four areas were identified as having overall community structure that was different from reference areas based on NMDS Axis 1 (which explained 35%

[26] Community structure summarized by NMDS Axes 1 and 3, but not Axis 2, correlated with variations of PC-1 for water quality (with and without calcite), and expressed as either concentrations or hazard quotients (Appendix Table F.9). These NMDS results were derived from the raw data presented by Minnow and Larratt (2016) but the results were not presented in that report.

Table 7.1: Periphyton Community Endpoints for Mine-exposed Areas (n = 58) Sampled in September 2015 Compared to the Respective Normal Ranges

Area				Periphyton				
Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Area Code / Normal Range	Green Density (# cells/cm^2)	Achnanthidium Density (# cells/cm^2)	Fragilariaceae Density (# cells/cm^2)	NMDS 3-D Ordination (Genus-Level/ Relative Abundance/ Fourth Root Transformed)	
							Axis 1	Axis 3
			$P_{2.5}$	0	3,328	550	-1.13	-0.891
			$P_{97.5}$	25,098	667,156	140,549	1.01	0.548
1	Fording	T	HENFO	14,664	500,832	23,688	-0.06	-0.41
			KICK	42,300	25,380	18,612	-0.21	0.40
			SWCK	106,032	261,696	126,336	-1.1	0.02
			CATCK	0	111,108	182,172	-1.0	-0.42
			POCK	408,336	1,191,168	406,080	-0.23	-0.88
			LC_DCDS	0	36,096	45,120	0.46	-1.1
			LC_DC1	0	68,808	16,920	0.80	-0.69
			GHCKD	4,512	611,376	313,584	-0.23	0.28
			GHCKU	20,304	1,371,648	137,616	0.10	0.05
		M	FODHE	0	81,216	2,256	0.40	0.50
			FOUNGD	0	41,172	3,948	0.96	-0.23
			FODNGD	13,536	231,804	9,588	0.27	0.39
			MP1	0	596,712	84,600	0.35	0.09
			FOUSH	0	544,824	3,384	0.94	0.21
			FOUKI	5,076	38,352	6,768	0.88	0.96
			FOBKS	0	85,728	1,128	1.1	0.21
			FOBSC	10,152	300,048	7,896	1.3	0.02
			FOBCP	0	159,048	253,236	0.28	0.86
			FODPO	27,072	1,628,832	94,752	0.06	0.48
			FO10-SP1	4,512	1,459,632	189,504	-0.02	0.00
			FO22	0	772,680	101,520	-0.07	0.59
			FOUEW	0	8,040,384	631,680	0.03	-0.41
			LC_FRUS	9,024	1,604,016	198,528	0.16	0.18
			FO29	2,256	2,616,960	110,544	0.42	-0.69
			FODGH	2,256	6,436,368	90,240	0.69	0.36
2	Fording	T	LILC3	36,096	5,333,184	225,600	0.03	-0.31
			LIDSL	15,792	730,944	13,536	0.61	-0.43
			LI8	1,692	37,788	7,332	1.3	-0.76
		M	FO9	0	703,872	31,584	0.39	0.90
			FRUL	0	82,908	12,972	0.68	-0.18
			FO23	3,384	285,948	118,440	-0.01	0.13
3	Elk	T	WOCK	9,024	1,064,832	415,104	-1.1	-0.02
			THCK	0	6,768	656,496	-0.85	0.49
		M	EL20	1,692	67,680	8,460	0.62	-0.13
			ELUEL	564	519,444	1,692	0.73	0.56
			ELDEL	44,556	96,444	13,536	0.52	-0.15
			ELUFO	0	408,336	27,072	-0.12	0.09
4	Michel	T	CORCK	31,584	767,040	1,597,248	-0.63	0.54
			BOCK	30,456	80,088	29,328	-0.37	-0.48
		M	MIUCO	9,588	18,612	29,892	-0.66	-0.99
			MIDCO	0	230,676	45,684	-0.40	-0.13
			MIDAG	1,692	50,760	3,384	0.44	-0.39
			MI5	20,868	32,148	564	-0.26	-0.73
			MI3	11,280	63,732	2,256	0.49	0.95
			MI2	1,692	537,492	23,688	-0.28	0.56
	Elk	T	HACKUS	13,536	957,672	41,736	0.36	-0.36
			HACKDS	0	671,160	164,688	0.11	0.24
			GRCK	0	459,096	21,432	0.36	-0.07
			GRDS	0	236,316	78,960	0.13	0.37
			OCNM	0	7,896	7,332	-0.76	0.74
		M	EL19	2,256	252,672	31,584	-0.15	0.61
			ELDGR	15,228	70,500	3,948	0.25	0.04
			ELUSP	0	87,984	16,920	0.89	0.63
5	Elk	M	EL1	0	1,073,856	19,176	0.27	0.44
			ELUFE	0	565,128	99,264	0.24	0.30
			ELDFE	4,512	532,416	74,448	-0.60	0.39
			ELELKO	1,128	177,660	59,220	-0.64	0.47
			ELH93	27,072	1,398,720	124,080	-0.35	0.43

value > upper limit ($P_{97.5}$) of the normal range

value < lower limit ($P_{2.5}$) of the normal range

of overall community variance). More differences in community structure between mine-exposed and reference areas were identified by NMDS Axis 3 (18% of overall community variance). There was no consistent pattern among endpoints with respect to identifying areas that had communities differing from reference areas.

Weak correlations ($r < |0.45|$) between periphyton community endpoints and PC-1 for water quality indicated that a gradient of mine-related influence on water quality and calcite explained little of the community variability among areas (Appendix Table F.9). There was also high natural variability in periphyton community composition even among reference areas (Appendix Table F.10). Also, for data sets of reference areas only, and reference plus mine-exposed areas, only a small amount of the variability in community composition among areas was explained by more than 50 GIS- and field-derived natural and anthropogenically-influenced habitat variables measured in the study (Appendix Table F.11). Potential detection of mine-related effects was not improved by further analyses completed for this report involving adjustment of normal ranges for periphyton community endpoints to account for habitat covariates (Appendix I). It is concluded that periphyton communities in the Elk Valley are sensitive to a variety of habitat factors that likely cannot be measured or effectively controlled in sampling designs or through data analysis, and confound detection of mine-related effects[27].

The periphyton community results are compared to the benthic invertebrate community results in Section 8.

7.3.2.2 Data Reliability and QA/QC

The study by Minnow and Larratt (2016) also reported the following conclusions:

- Only a small proportion of each periphyton sample (e.g., <0.01%) can be practicably sub-sampled in the laboratory for organism enumeration, which makes it difficult to accurately enumerate taxa, especially non-dominant ones.
- Counts for the most dominant taxon in within-laboratory sub-samples were within 20% of each other for all but one of 14 samples and no sub-samples differed by more than 50%, which is considered indicative of good sub-sampling precision.
- The proportion of all genera that were identified by two laboratories for a given (split) sample averaged 52% (ranging from 38 to 80% among 11 samples).

[27] The study also concluded that artificial substrate samplers may be useful in some applications, however, they may not be sufficiently reflective of natural conditions to be used to evaluate and manage mine-related effects on the aquatic environment within the Elk Valley.

- Counts for the three key community endpoints identified as strongest indicators of mine-related influence (green algae density, *Achnanthidium* density, and Fragilariaceae density) differed by more than 50% between laboratories for six, eight and nine samples, respectively, of the eleven split samples.
- Clumped distributions, if encountered during enumeration, confound density estimates, and may contribute to both within and between laboratory differences.

The above results reflect the inherent challenges associated with periphyton community analyses, rather than poor laboratory performance. Nevertheless, they affect the confidence with which periphyton community data can be used as a reliable indicator of mine-related aquatic effects.

7.3.2.3 Temporal Changes

Periphyton communities sampled in 2015 were compared to those sampled in 2013 (Minnow and Larratt 2016). The three endpoints used as indicators of mine-exposure on periphyton communities showed large variation between years, including at reference areas. Such shifts in community structure are commonly observed and are thought to reflect habitat factors, such weather and flow (Schleppe et al. 2013, Azim et al. 2005). These results corroborate conclusions from the evaluation of periphyton productivity, that periphyton communities are naturally sensitive to changes in a variety of environmental factors that confound detection of mine-related effects.

7.4 Tissue Selenium

7.4.1 Comparisons to Concentrations in Water

Selenium accumulation in aquatic biota begins with uptake from water at the base of the food web where algae, bacteria and other microorganisms typically concentrate selenium in tissues by at least two orders of magnitude relative to concentrations in water (Stewart et al. 2010). The ratio of the selenium concentration in tissues of algae and microorganisms to the concentration in water is described as an enrichment factor or enrichment function (EF) or as a distribution coefficient (K_d) (Young et al. 2010). Almost all of the selenium accumulated by organisms at higher levels of the food web is acquired through dietary exposure rather than direct uptake from water (Stewart et al. 2010). Selenate is the oxidized form of selenium that makes up most (~98%) of the total aqueous selenium in the Elk River watershed. Accumulation and toxicity of selenate are reduced by sulphate (Williams et al. 1994, Ogle and Knight 1996, Brix et al. 2001, Fournier et al. 2010, Eastham 2015), which is also elevated in streams downstream from coal mining in the watershed. Studies have also shown that accumulation in the food web tends to be greater in lentic than lotic systems with similar concentrations of

selenium in water (Hillwalker et al. 2006, Orr et al. 2012, USEPA 2016, Deforest et al. 2017). Such pattern was not obvious for periphyton samples collected in the Elk Valley in 2012 and 2015, with overlap in periphyton tissue selenium concentrations in lotic and lentic areas over a wide range of aqueous selenium concentrations (Figure 7.12). The tissue data collected since 2013 are being incorporated into an update of the Elk Valley selenium bioaccumulation model.

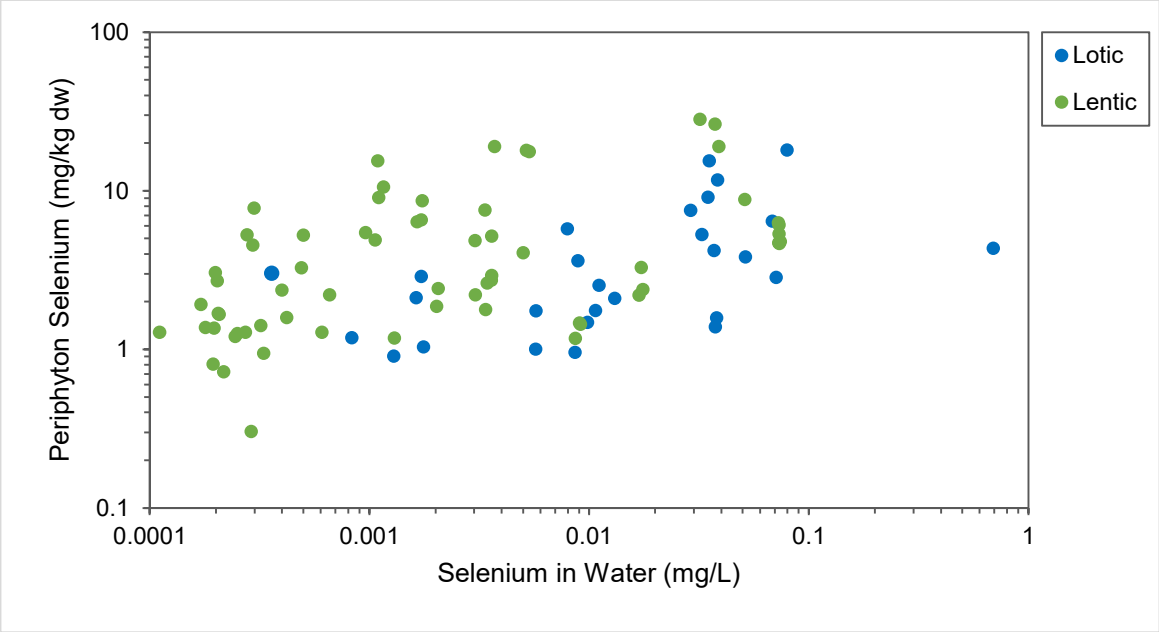

Figure 7.12: Scatterplot of Selenium Concentrations in Periphyton versus Selenium Concentrations in Water in the Elk Valley for Lotic and Lentic Habitats, 2012 and 2015

7.4.2 Comparisons to Normal Reference Range

The distributions of reference area periphyton selenium concentrations were similar between lotic and lentic areas and resulted in 97.5th percentiles that were not significantly different (Appendix Table F.12). Therefore periphyton tissue selenium concentrations measured at both lotic and lentic reference areas sampled since 1996 were combined (n=102 samples) to characterize the reference normal range (Appendix Table F.13; Appendix Figure F.8). The upper limit of the normal range was defined as 5.35 mg/kg dw of selenium in tissue.

Of samples collected among 15 mine-exposed lotic areas in 2015 and 2016[28], three and five, respectively, had concentrations greater than the upper limit of the normal range, resulting in

[28] Periphyton tissue samples were collected at only a sub-set of RAEMP monitoring areas, consistent with the RAEMP study design (Minnow 2015a). This was because food web accumulation is considered better reflected by benthic invertebrate tissue selenium concentrations (e.g., periphyton samples can be confounded by selenium

NRQs >1.0 (Figures 7.13 and 7.14; Appendix Tables F.14 and F.16; Appendix Figure F.9). Among lentic areas (sampled in 2015 only), mean periphyton selenium concentrations were greater than the upper normal range limit at one (of five) reference area(s) and at six (of 16) mine-exposed areas (Appendix Tables F.15 and F.17).

7.4.3 Temporal Changes

Temporal changes in tissue selenium concentrations were not completed for periphyton because there is a larger data set (more areas and more years of data) for benthic invertebrate tissue selenium concentrations, which will better identify trends in food web selenium concentrations among areas.

7.5 Summary

Periphyton AFDM and chlorophyll-a concentrations were within the reference area normal range at ≥ 75% of 58 mine-exposed areas sampled in 2015. Chlorophyll-a concentrations were less than the guideline at 48 of 58 (83%) mine-exposed areas. There was no direct relationship between periphyton chlorophyll-a concentrations and aqueous total phosphorus or orthophosphate concentrations, even though phosphorus is the limiting nutrient within the watershed. Data from the literature suggest there is a threshold ($p > 0.030$ mg/L) above which periphyton growth may be related to nutrient concentrations, but concentrations in the Elk River watershed are typically less than this value. Instead, primary productivity in the Elk River watershed appears to be mostly related to other habitat factors. The strongest relationship between periphyton productivity endpoints and more than 50 habitat variables evaluated in this study was with calcite index ($p<0.001$, $r=0.55$). Periphyton potentially provides nucleation sites for calcite formation and/or calcite deposits serve as a suitable substrate for growth of some periphyton species.

Two supporting studies that evaluated periphyton communities in mine-exposed areas compared to reference areas concluded that periphyton communities in the Elk Valley are sensitive to a variety of habitat factors that likely cannot be measured or effectively controlled in sampling designs or data analysis, and confound detection of mine-related effects.

Of periphyton tissue selenium samples collected among 15 mine-exposed lotic areas in 2015 and 2016, three and five, respectively, had concentrations greater than the upper limit of the normal range, resulting in NRQs >1.0. Among lentic areas (sampled in 2015 only), mean periphyton selenium concentrations were greater than the upper normal range limit at one (of

contributions from abiotic particles – see Minnow 2017b). Samples were collected at a sub-set of areas to potentially support the re-evaluation of site-specific bioaccumulation models.

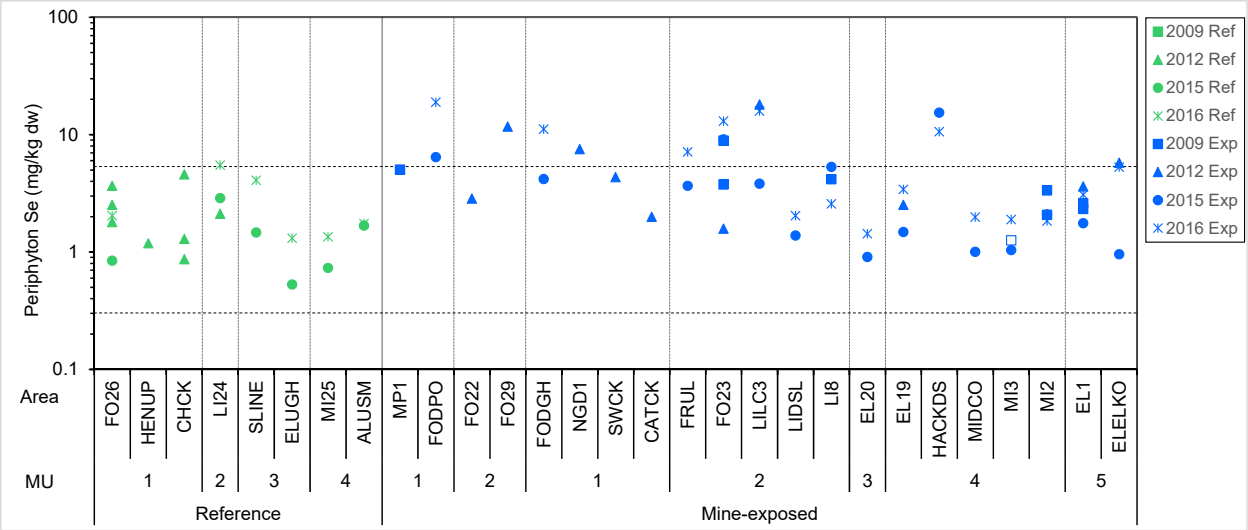

Figure 7.13: Periphyton Selenium Concentrations Measured in Lotic Areas Relative to the Normal Range

Note: Concentrations less than the LRL are plotted as open symbols at the LRL. Dashed horizontal lines represent the limits of the reference area normal range.

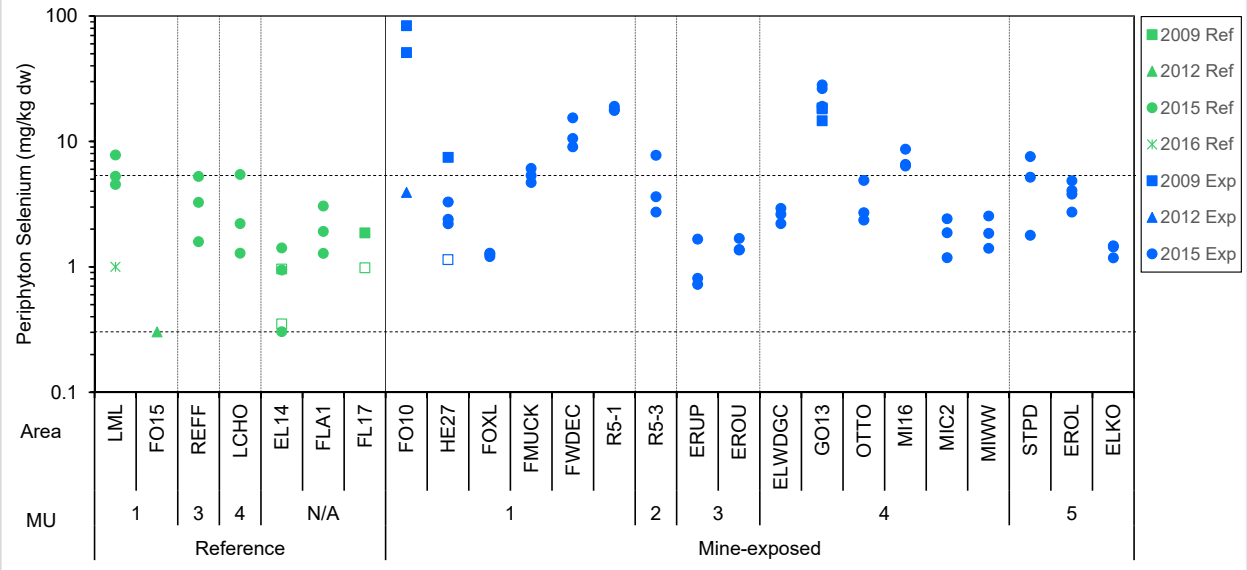

Figure 7.14: Periphyton Selenium Concentrations Measured in Lentic Areas Relative to the Normal Reference Area Range

Note: Concentrations less than the LRL are plotted as open symbols at the LRL. Dashed horizontal lines represent the limits of the reference area normal range. FO10 was lentic only for 2009 and 2012

five) reference area(s) and at six (of 16) mine-exposed areas. Temporal analyses were not completed for periphyton tissue selenium concentrations because there is a larger data set (more areas and more years of data) for benthic invertebrate tissue selenium concentrations, for evaluating spatial patterns and temporal trends in food web selenium concentrations.

8 BENTHIC INVERTEBRATES

8.1 Overview

Benthic invertebrates are excellent biomonitors for assessing potential effects of physical and chemical habitat changes in aquatic systems (Barbour et al. 1999, Feltmate and Fraser 1999, Beatty et al. 2006). This is because

- they are relatively sessile and are therefore good indicators of localized conditions;
- they reflect the community level of organization, including a range of trophic levels and chemical tolerances, providing numerous useful assessment endpoints;
- they are relatively easy to sample, identify and quantify; with minimal detrimental effect on the resident community;
- there is technical guidance for standardization of sample collection, laboratory sample processing, and laboratory QA/QC (Environment Canada 2012a,b, 2014) and
- they serve as an important direct or indirect food source for fish and aquatic dependent wildlife (e.g., amphibians, birds).

Potential mine-related effects on benthic invertebrate communities were identified by comparing community characteristics in mine-exposed areas to normal ranges defined based on data collected at 40 reference areas in 2012 and 2015. Reference areas were selected to match the range of habitat characteristics observed among mine-exposed areas (see Minnow 2015a and Appendix A). Water samples collected at the same time as benthic invertebrate samples during the 2015 RAEMP cycle, as well as calcite measurements made in the vicinity of invertebrate samples, were used in the evaluation of mine-related effects on benthic invertebrate communities.

Benthic invertebrate tissue selenium concentrations measured in 2015 and 2016 as part of the RAEMP and LAEMPs were compared to the upper limit of the reference normal range, and to predictions and site-specific tissue selenium benchmarks in the EVWQP (Teck 2014). Benthic invertebrate tissue selenium and community characteristics observed in 2015 and 2016 were compared to historical data to evaluate changes over time.

Figures 8.1 to 8.3 show the sampling locations discussed in this section (Appendix Tables G.1 and G.2). Photo 8.1 presents representative photographs of benthic invertebrate sampling.

VEUP
VEUKO
KOUVE
KOUCR
CRUKO
KODCR
PADAL
PAUKO
EL14
CADCK
EL12
KO1
Kimberley
Cranbrook
Wardner
Moyie Lake
Koocanusa Reservoir
Elkford
Josephine Falls
Sparwood
Fernie
Hosmer
Coleman
Blairmore
Elkview Operation
Fording River Operation
Greenhills Operation
Line Creek Operation
Coal Mountain Operation
Elk River
Fording River
Line Creek
Alexander Creek
Bull River
Michel Creek
Flathead Creek
Elko
Elko Dam
OLDLI
OLDDU
DUCK
RACK
DACK
OLDLOW
Figure 8.2
Figure 8.3
BRITISH COLUMBIA
ALBERTA
UNITED STATES OF AMERICA
Fort St. John
Prince George
Edmonton
Calgary
Kamloops
Vancouver
93
95
43
3

LEGEND

Lotic Sampling Locations

- Reference

Lentic Sampling Areas

- Reference
- Teck Coal Mine Operation

Regional Reference Areas Sampled for Benthic Invertebrates, Community, and/or Tissue Selenium

0 10 20 40
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
Project 2561

minnow environmental inc.

Figure 8.1

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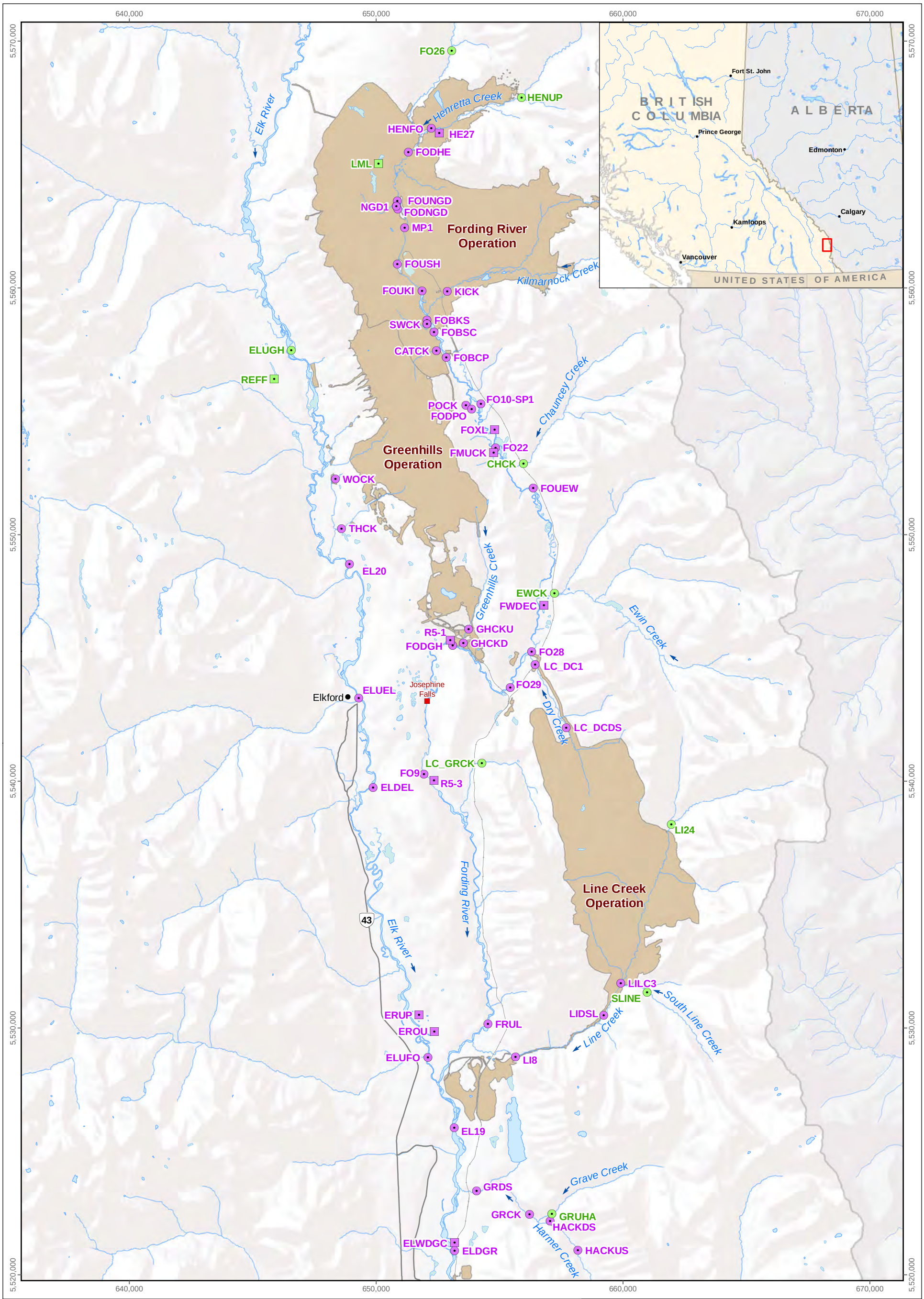

LEGEND

Lentic Sampling Areas

- Reference
- Mine-Exposed

Lotic Sampling Locations

- Reference
- Mine-exposed
- Teck Coal Mine Operation

Areas in Upper Elk River Watershed Sampled for Benthic Invertebrates, Community and/or Tissue Selenium

0 2.5 5 10
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: February 2018
Project 2561

minnow environmental inc.

Figure 8.2

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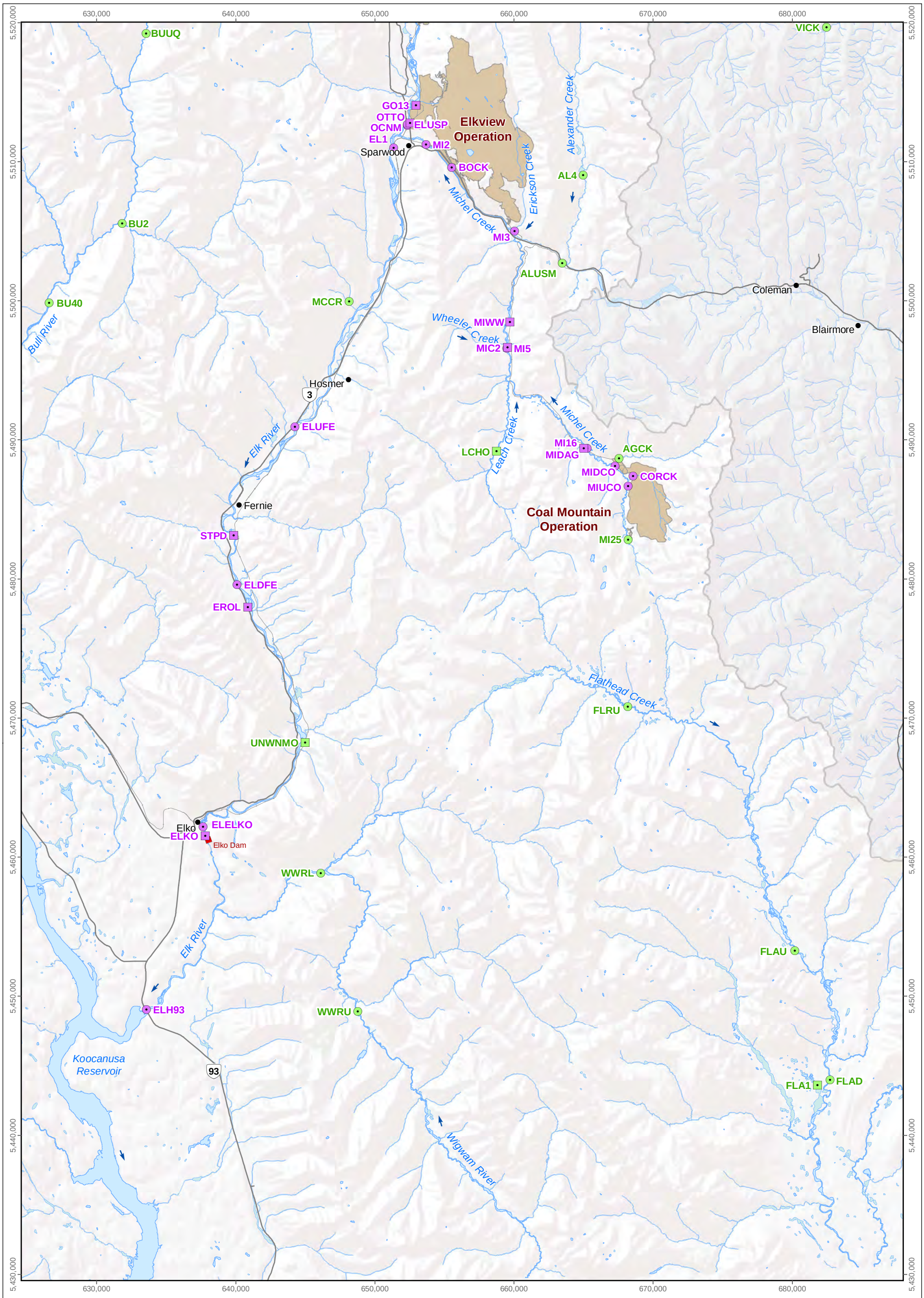

LEGEND

Lentic Sampling Areas

- Reference
- Mine-Exposed

Lotic Sampling Locations

- Reference
- Mine-Exposed
- Teck Coal Mine Operation

Areas in Lower Elk River Watershed Sampled for Benthic Invertebrates, Community and/or Tissue Selenium

0 4.25 8.5 17
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: February 2018
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Figure 8.3

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Photo 8.1: Benthic Invertebrate Sampling (field crew, Hess sampler, representative organisms)

8.2 Community Characteristics (Kick Samples)

8.2.1 Dominant Taxa

A total of 40 reference and 59 mine-exposed areas were sampled for analysis of benthic invertebrate community composition in 2015, and a sub-set of 7 reference and 32 mine-exposed areas were sampled in 2016. Benthic invertebrate communities sampled in reference areas were composed mainly of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), collectively referred to as EPT (Figure 8.4). Many mine-exposed areas also had communities dominated by EPT (Figure 8.5), but others reflected a shift in community structure to organisms such as chironomids (part of the Diptera Order) that are more tolerant of degraded conditions (Barbour et al. 1999, Taylor and Bailey 1997), and this was evaluated as potential indication of a mine-related effect (Section 8.2.3).

8.2.2 Evaluation of Kick Sampling Method

The CABIN kick sampling method (Environment Canada 2012a) is standardized based on the length of time sampled (3 minutes) instead of the area sampled. At a subset of 15 areas sampled in 2015, benthic invertebrates were collected using the standard 3-minute approach and by kick-sampling three separate 1 m^2 areas[29] (Minnow 2016b). The total abundance of benthic invertebrates present in 3-minute kick samples was a strong predictor ($p < 0.001$; $r^2 = 0.867$) of the number of invertebrates measured in the density-based kick samples (Figure 8.6). The total abundances for dominant taxa based on 3-minute kick samples were also strong

[29] The three samples from the 1 m^2 areas were pooled into a single composite sample for taxonomic identification and enumeration.

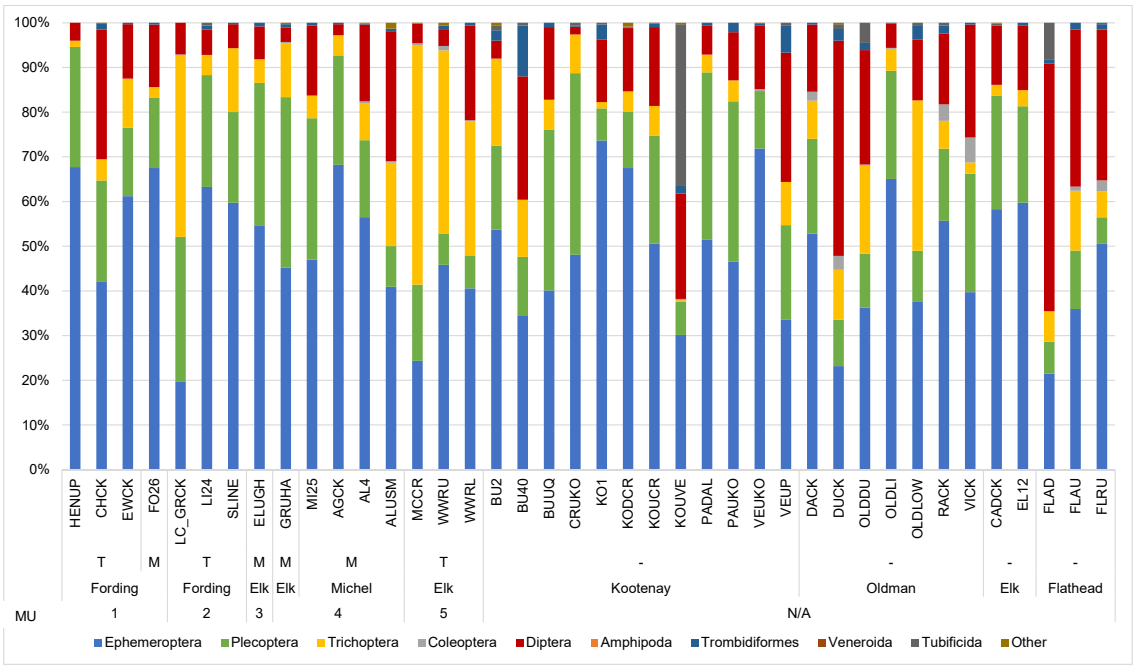


Figure 8.4: Proportions of Major Benthic Invertebrate Groups among Reference Areas (n = 40), September 2015

Notes: Other includes Orders Hemiptera, Lepidoptera, Megaloptera, Odonata, Basommatophora, Oribatei, Lumbriculida and an unknown Order in Class Gastropoda. Stream Type: 'M' = Main Stem, 'T' = Tributary.

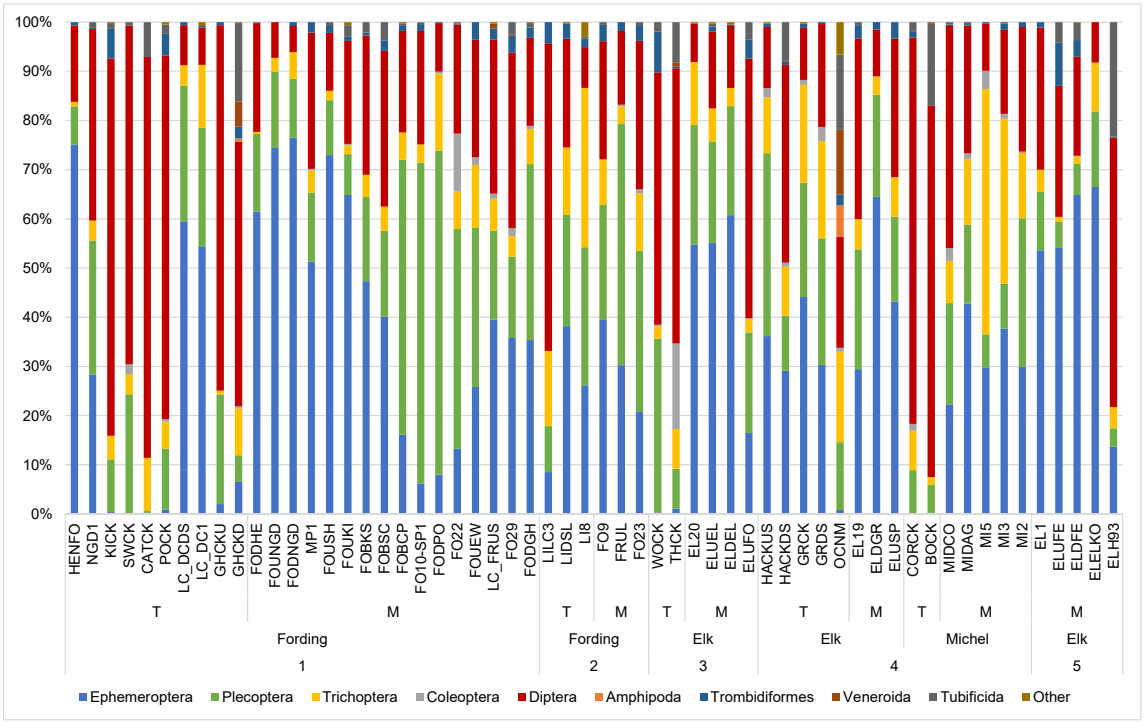


Figure 8.5: Proportions of Major Benthic Invertebrate Groups among Mine-exposed Areas (n = 59), September 2015

Notes: Other includes Orders Hemiptera, Lepidoptera, Megaloptera, Odonata, Basommatophora, Oribatei, Lumbriculida and an unknown Order in Class Gastropoda. Stream Type: 'M' = Main Stem, 'T' = Tributary.

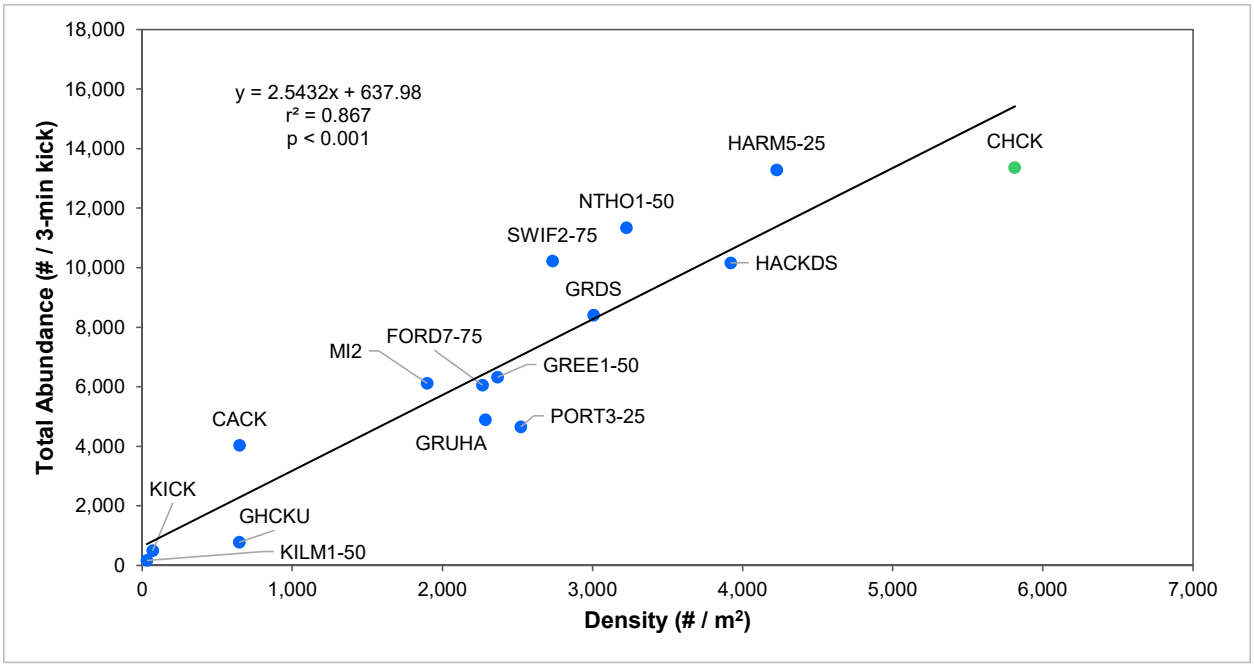


Figure 8.6: Benthic Invertebrate Density (# / m^2) Based on Kick Sampling Over Three 1 m^2 Areas Versus Total Sample Abundance for 3-minute Travelling Kick Samples

predictors of densities of those taxa (Minnow 2016b). These results indicate that the abundance of organisms in 3-minute travelling kick samples can be interpreted as reasonable approximations of benthic invertebrate density.

Replicate 3-minute kick samples were used to evaluate within-area variability of the CABIN method for characterizing benthic invertebrate communities. Coefficients of variation (CV) for abundance ranged up to 53%, but were 21% on average (Table 8.1). CVs for the other key community characteristics were low (consistently ≤25% and averaging ≤12%). These results indicate that individual kick samples reasonably approximate community characteristics in a given area. Further analysis comparing community results for kick versus Hess sampling methods is presented in Minnow (2017f).

8.2.3 Comparisons to Normal Reference Ranges

Of the 59 mine-exposed areas sampled in 2015, almost half (27 of 59=46%) had % EPT and/or % Ephemeroptera less than the reference area normal range (Table 8.2). Most of the areas with reduced % EPT and/or % Ephemeroptera were associated with NMDS scores above the normal range for reference areas, indicating differences in community structure were mainly

Table 8.1: Within-area Variability for Replicate Kick Samples Collected for the RAEMP, 2012 - 2015

Exposure Type	Year	Biological Area Code	n	Total Abundance			LPL Richness			% EPT			% Ephemeroptera		
				Mean	SD	COV[a] (%)	Mean	SD	COV (%)	Mean	SD	COV (%)	Mean	SD	COV (%)
Reference	2012	BU40	3	3,748	1,535	41	25	1.2	4.6	84	3.0	3.6	44	0.22	0.5
	2015	KO1	3	774	85	11	19	3.6	19	90	6.5	7.2	80	5.7	7.1
	2015	MI25	3	6,993	307	4.4	28	2.5	8.9	78	7.5	9.6	47	3.5	7.5
Mine-exposed	2012	EL1	3	8,800	2,219	25	35	4.7	14	75	6.0	7.9	49	5.0	10
	2012	ELUFE	3	3,645	459	13	24	3.8	16	80	7.7	9.6	59	10	17
	2012	FO23	3	8,207	1,312	16	32	3.1	9.6	77	1.4	1.8	30	4.0	13
	2012	FOUSH	3	12,340	2,631	21	25	3.0	12	73	5.9	8.2	64	5.3	8.3
	2015	FO23	3	3,770	365	10	34	7.0	21	63	2.8	4.5	20	3.3	16
	2015	FO29	3	7,329	1,246	17	30	5.8	19	69	12	17	47	12	25
	2015	M12	3	4,566	1,453	32	32	1.0	3.1	72	2.0	2.8	29	1.2	4.0
	2014	ELKR8-75	3	2,013	1,072	53	29	2.0	6.9	87	4.1	4.7	59	7.0	12
	2014	HARM-50	3	18,387	1,013	5.5	32	3.2	9.9	77	4.0	5.3	44	3.1	7.0
Mean COV				-		**21**	-		**12**	-		**6.8**	-		**11**

[a] COV-coefficient of variation

Highest COV for each endpoint

Table 8.2: Comparison of Key Benthic Invertebrate Community Endpoints for Mine-exposed Areas (n = 59) Sampled September, 2015 in the Elk Valley to the Normal Ranges Calculated as the 2.5th and 97.5th Percentiles for the Pooled 2012 and 2015 Reference Area Distribution

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	2015					2016				
				Univariate Indicators				Axis 1 Scores from Family-Level NMDS Ordinations	Univariate Indicators				Axis 1 Scores from NMDS Ordinations
				Total Abundance (org/3-min kick)	LPL Richness	% EPT	% Ephemeroptera	Relative Abundance (fourth root transformation) (3D-Ordination)	Total Abundance (org/3-min kick)	LPL Richness	% EPT	% Ephemeroptera	Relative Abundance (fourth root transformation) (3D-Ordination)
			$P_{2.5}$	**1,005**	**20**	**63.0**	**21.3**	**-0.560**	**1,005**	**20**	**63.0**	**21.3**	**-0.316** [a]
			$P_{97.5}$	**13,221**	**38**	**97.2**	**71.8**	**0.210**	**13,221**	**38**	**97.2**	**71.8**	**0.280** [a]
1	Fording	T	HENFO	13,820	29	84	75	-0.141	-	-	-	-	-
			NGD1	9,760	27	60	28	0.412	-	-	-	-	-
			KICK	497	22	16	0.4	0.042	-	-	-	-	-
			SWCK	6,214	24	29	0	0.763	-	-	-	-	-
			CATCK	4,030	18	12	0	0.886	-	-	-	-	-
			POCK	22,160	30	19	0.9	0.580	-	-	-	-	-
			LC_DCDS	7,640	27	91	60	-0.084	6,116	21	65	49	-0.212
			LC_DC1	7,140	25	91	54	0.025	4,423	27	85	48	0.034
			GHCKD	10,560	40	21	6.4	0.640	-	-	-	-	-
			GHCKU	774	24	25	1.9	-0.032	-	-	-	-	-
		M	FODHE	17,060	27	78	61	0.100	9,800	23	88	77	-0.012
			FOUNGD	7,260	23	93	75	-0.069	-	-	-	-	-
			FODNGD	7,840	23	94	77	0.102	-	-	-	-	-
			MP1	5,470	32	70	51	0.044	-	-	-	-	-
			FOUSH	7,320	28	86	73	0.083	-	-	-	-	-
			FOUKI	3,490	30	75	65	0.080	1,440	34	51	36	0.188
			FOBKS	4,161	25	69	47	0.007	4,323	26	65	39	0.179
			FOBSC	2,923	26	62	40	0.021	2,083	30	50	22	0.212
			FOBCP	4,260	27	78	16	0.125	2,210	29	67	19	0.223
			FODPO	10,340	22	90	7.9	0.282	11,620	31	76	14	0.168
			FO10-SP1	13,800	29	75	6.2	0.264	-	-	-	-	-
			FO22	21,140	30	65	13	0.375	-	-	-	-	-
			FOUEW	7,720	25	71	26	0.229	6,760	28	60	17	0.312
			LC_FRUS	2,065	30	64	39	-0.033	9,700	38	60	36	0.282
			FO29	8,580	37	56	36	0.174	-	-	-	-	-
			FODGH	10,980	28	78	35	0.237	18,740	37	72	42	0.138
2	Fording	T	LILC3	19,360	26	33	8.5	0.205	38,320	29	6.5	2.4	0.038
			LIDSL	6,980	30	74	38	0.047	4,630	30	68	40	-0.010
			LI8	3,390	29	87	26	-0.056	14,360	24	83	22	-0.420
		M	FO9	6,720	24	72	40	-0.006	-	-	-	-	-
			FRUL	3,006	25	83	30	0.130	2,708	26	89	57	0.056
			FO23	3,780	39	65	21	0.088	6,620	36	66	33	0.174
3	Elk	T	WOCK	1,244	30	38	0.3	0.233	-	-	-	-	-
			THCK	2,412	25	17	1.1	0.531	-	-	-	-	-
		M	EL20	6,218	29	92	55	-0.019	7,740	30	86	59	0.031
			ELUEL	5,135	27	82	55	0.012	-	-	-	-	-
			ELDEL	7,740	28	87	61	0.050	-	-	-	-	-
			ELUFO	8,980	34	40	17	0.280	-	-	-	-	-
4	Michel	T	CORCK	29,180	34	17	0	0.826	16,180	35	29	0.5	0.605
			BOCK	8,140	26	7.6	0	0.960	5,127	38	18	0.3	0.643
		M	MIUCO	7,820	31	72	53	0.061	4,187	32	80	46	0.156
			MIDCO	12,360	32	51	22	0.256	7,500	40	50	5.9	0.329
			MIDAG	14,520	31	72	43	0.222	-	-	-	-	-
			MI5	7,120	22	87	30	0.030	-	-	-	-	-
			MI3	7,660	26	80	38	0.132	7,700	31	84	49	0.366
			MI2	6,119	33	73	30	0.132	6,186	33	82	46	0.175
	Elk	T	HACKUS	15,540	35	85	36	0.203	18,320	36	86	46	0.032
			HACKDS	10,160	32	50	29	0.169	7,280	29	45	28	0.308
			GRCK	7,740	33	87	44	0.066	-	-	-	-	-
			GRDS	8,400	30	76	30	0.112	-	-	-	-	-
			OCNM	1,373	40	34	2.1	0.163	-	-	-	-	-
		M	EL19	3,240	32	60	29	0.062	1,347	31	69	53	0.157
			ELDGR	1,288	30	89	64	-0.154	-	-	-	-	-
			ELUSP	6,460	25	68	43	0.040	-	-	-	-	-
5	Elk	M	EL1	7,720	32	70	54	0.035	4,273	21	72	64	-0.065
			ELDFE	17,160	33	73	65	0.053	-	-	-	-	-
			ELUFE	11,000	32	61	54	0.059	17,340	43	44	38	0.259
			ELELKO	7,880	22	92	67	-0.321	24,540	38	58	32	0.014
			ELH93	2,858	23	22	14	-0.506	11,060	33	18	8.1	0.129

[a] Normal range estimates are the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data (from an ordination of 2012 and 2015 reference area data and all areas in 2016)

value > upper limit ($P_{97.5}$) of the normal range

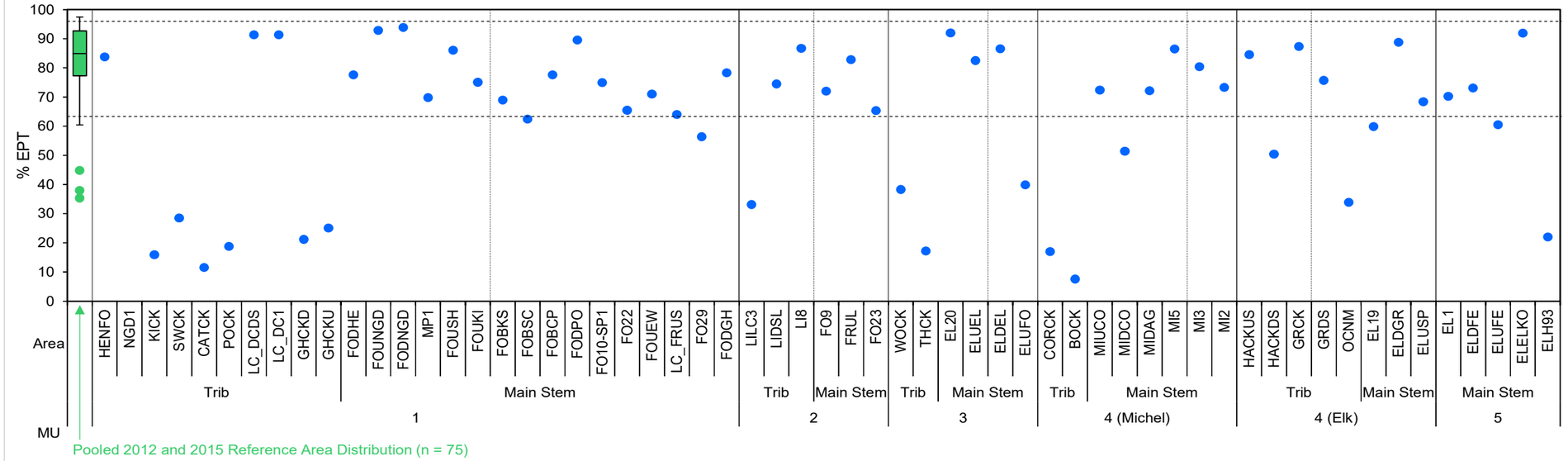
value < lower limit ($P_{2.5}$) of the normal range

associated with proportional reductions in these taxa[30]. All three endpoints correlated significantly ($p<0.001$) with PC-1 for water quality, yielding r-values > 0.6 (Appendix Table G.6). This is evidence that community changes associated with mining are related to decreases in % EPT and % Ephemeroptera. Where they occurred, reductions in relative abundance of EPT and Ephemeroptera were due to decreases in absolute abundance of these taxa (particularly Ephemeroptera), rather than increases in abundance of other taxa (e.g., Diptera).

Benthic invertebrate community abundance was greater than the normal range at 10 mine-exposed areas throughout the watershed. Higher abundances suggests potentially increased productivity in those areas, although the evaluation in Section 7.2 indicated that differences in productivity among areas was not associated with mine-related effects on aqueous nitrogen or phosphorus concentrations. Although productivity evaluations in aquatic ecology tend to focus on major nutrients in water like nitrogen and phosphorus, aquatic biota also require other elements for normal physiological function (e.g., selenium). Greater invertebrate abundance among reference areas in the Elk River watershed than among reference areas in the upper Kootenay River watershed and some of the areas in the Oldman River watershed (Appendix Table G.10) suggests that that the Elk River watershed may be naturally more productive than some other watersheds in the region.

Reductions in % EPT were mainly associated with tributaries (Figure 8.7). However, data from 2015 identified a pattern of lower % Ephemeroptera in the Fording River, particular downstream from Cataract Creek (FOBCP) to upstream from Ewin Creek (FOUEW) (Figure 8.7). This pattern was also evident in data collected in 2016 for the FRO LAEMP (Minnow 2017a). Temporal evaluation of the data in the FRO LAEMP report also suggested a potential pattern of decreasing total organism abundance, % EPT, and % Ephemeroptera among the same areas of the Fording River over time (also see Section 8.2.5 below). Minnow (2017a) concluded that elevated nitrate concentrations (but not likely selenium or sulphate concentrations) may have contributed to the spatial pattern of decreasing % Ephemeroptera with distance downstream, but did not explain the apparent change in benthic invertebrate community structure over time. Conversely, increased temperature trends (and/or associated variation in annual flow regimes) may partially explain the temporal changes in community structure, but did not fully explain the spatial pattern of benthic invertebrate community change observed in the Fording River in 2016. As well, temperature variations in the Elk River are based on 'spot' measures, which vary diurnally, and may reflect only the time of day the temperature was recorded). Seasonal

[30] Detailed NMDS results are presented in Appendix G based on LPL abundance (Appendix Tables G.20 to G.22), LPL proportional abundance (Appendix Tables G.23 to G.25), family-level abundance (Appendix Tables G.26 to G.28) and family-level proportional abundance (Appendix Tables G.29 to G.31) data matrices.



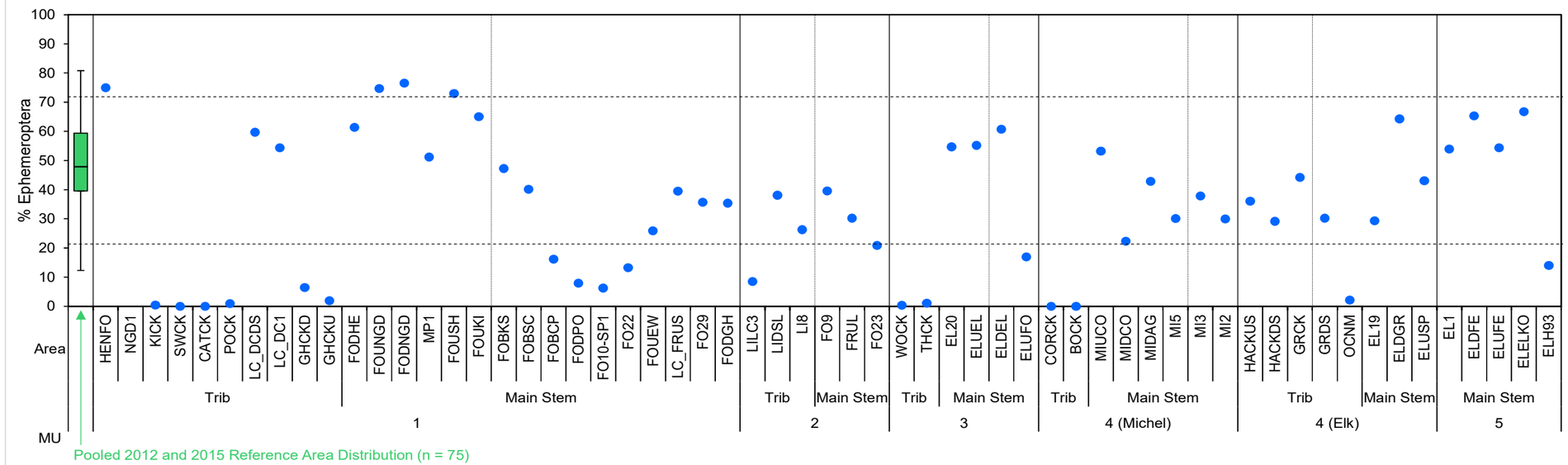


Figure 8.7: % EPT and % Ephemeroptera from 3-minute Kick Samples Collected in Lotic Habitats, 2015

Note: Dashed horizontal lines represent the limits of the reference area normal range. The reference area distribution that is plotted in the boxplot includes all reference areas prior to the removal of outliers.

dewatering and/or calcite deposition in portions of the Fording River are additional factors potentially influencing benthic invertebrate communities.

Further examination of the temporal data for Ephemeroptera (Appendix Figure G.7) showed that the major changes from 2012 to 2016 in the upper Fording were due to decreases in total abundance of Ephemerellidae and Heptageniidae, but not Baetidae (Table 8.3; Ameletidae was the only other Ephemeroptera family found in the upper Fording, which typically represented between 0 and 2% of organisms in this taxonomic Order). Over the same time period, total abundance of the same families appeared to increase in reference areas (particularly at FO26; Table 8.3).

Table 8.3: Total Abundance of Key Ephemeroptera Families in the Upper Fording River, 2012, 2012, and 2016

Organism Identification		Baetidae			Ephemerellidae			Heptageniidae		
		2012	2015	2016	2012	2015	2016	2012	2015	2016
Reference	FO26	120	1,280	640	1,540	1,320	3,760	2,780	3,660	5,100
	HENUP	43	80	0	657	460	820	2,028	4,500	2,950
Mine-Exposed	FODHE	40	1,340	580	3,000	3,700	2,140	9,700	5,340	4,680
	FOUKI	340	540	96	280	190	88	8,220	1,480	320
	FOBKS	345	801	326	155	126	376	2,267	1,038	976
	FOBSC	260	391	237	660	127	119	2,180	609	112
	FOBCP	40	163	133	2,360	138	134	2,860	388	160
	FODPO	1,060	0	960	2,700	140	160	1,660	680	540
	FOUEW	300	40	420	667	580	120	1,984	1,380	580

Baetis are found in erosional and depositional areas of streams where they cling to stones, aquatic vegetation, and detritus, and where they function trophically as collector-gatherers of organic matter and scrapers of the periphyton community (Merritt et al. 2008). *Drunella* mayflies, which were the most common genus in the family Ephemerellidae, have similar habitat requirements to that of *Baetis*, but function both as scrapers and as facultative engulfing predators, as well as collector-gatherers. *Epeorus* and *Rhithrogena*, the most commonly identified genera in the family Heptageniidae, are restricted to cold, swift-moving waters in erosional areas of streams, where they cling onto rocks and function as scrapers of periphyton and collector-gatherers of organic materials (Merritt et al. 2008). These two genera have requirements of meso-to-stenothermal cold waters of neutral to alkaline pH, and are considered intolerant of organic enrichment (Hubbard and Peters 1978).

It is possible that factors such as competition among taxa could impact densities of certain organisms. For example, the grazing *Glossosoma* caddisflies could impact densities of

scraping-grazer mayflies such as *Baetis* (e.g., Baetidae abundance dropped from 1,060 to 0 at FODPO from 2012 to 2015, when *Glossosoma* increased from 0 to 1,200; Appendix Tables G.40 and G.41; Minnow 2014a). Habitat-related factors may also contribute to differences over time. For instance, accumulation of loose calcite may provide additional habitat for species that can burrow in this type of matrix, such as *Rhyacophila* and elmid beetles, whereas concretion of calcite over time may lead to reduced habitat availability. There is insufficient information in the literature to determine if the mayfly families that appear to be most affected (Ephemerellidae, Heptageniidae) are relatively more sensitive to mine-related consitutents in water such as nitrate, selenium, or sulphate, or to calcite formation.

Consistent with adaptive management, the FRO LAEMP design was adjusted to support further investigation of the cause(s) of benthic invertebrate community changes in September 2017 (Minnow 2017e).

Some tributaries also had communities that differed from reference area communities (i.e., endpoints outside of normal ranges), but those observations were expected based on the legacy of upstream mining activities and observed concentrations of mine-related substances. Community effects that were unexpected are being investigated further to determine the cause, as discussed in Section 12.

8.2.4 Comparison to Periphyton Community Results

Benthic invertebrate community results for 2015 were compared to periphyton community results from the same year (Section 7.3.2). There was high natural variability in periphyton community composition even among reference areas, resulting in large reference area normal ranges (Appendix Table G.13), even after adjustment to account for habitat covariates (Appendix I). Consequently, fewer community differences were detected between mine-exposed and reference areas based on periphyton endpoints (54 of 295 endpoints among areas = 18%) than benthic invertebrate endpoints (78 of 295 endpoints = 26%). More importantly, there was less consistency among periphyton endpoints in terms of identifying areas outside of reference area normal ranges than among benthic invertebrate endpoints. For example, overall benthic invertebrate community structure, as summarized by NMDS Axis 1 scores, was frequently outside of the normal range at the same areas where % EPT and/or % Ephemeroptera values were outside of normal ranges. These three benthic community endpoints correlated more strongly ($r>|0.6|$) with a mine-related gradient of water quality (as summarized by PC-1, Appendix Table G.6), than did any of the periphyton community endpoints ($(r < |0.45|$; Appendix Table F.9). These results indicate that periphyton communities in the Elk Valley are sensitive to a variety of habitat factors that confound detection of mine-related

effects, whereas mine-related effects to the aquatic ecosystem can be detected using benthic invertebrate community endpoints, particularly % EPT and % Ephemeroptera.

8.2.5 Temporal Changes

Temporal trends in benthic invertebrate community characteristics were evaluated using RM ANOVA, followed by *post hoc* contrasts to test for linear and step changes relative to reference areas. Linear trends were evaluated for all areas having data in at least 2012 and 2015, and potential step changes were evaluated for areas with data in one or more additional years. Areas where a significant change was detected are summarized in Figure 8.8.

Changes in invertebrate abundance were detected for four areas, but only two years of data were available for two of the areas (CATCK, GHCKU), so results for those areas should be interpreted with caution. Both areas had lower abundance in 2015, but abundance at CATCK was near the reference mean in 2015, whereas GHCKU had abundance less than the normal range in 2015 (Figure 8.8; Appendix Table G.18). Invertebrate abundance in lower Corbin Creek (CORCK) increased from a value near the lower limit of the normal range in 2012 to greater than the normal range in 2015 and 2016. Abundance at Harmer Creek upstream from the settling pond (HACKUS) decreased in 2015-2016 compared to 2012, but was greater than the normal range in all three years of sampling. Values less than, rather than above, the normal range (e.g., GHCKU) are of greatest concern with respect to mine-related effects (see Section 8.2.3 regarding productivity in the Elk Valley).

Similarly, of four areas showing significant change in LPL richness, two had data for only 2012 and 2015 (Porter Creek [POCK] and lower Greenhills Creek [GHCKD]). Both areas had greater LPL richness in 2015 than 2012 (Figure 8.8). Richness at EL1 (Elk River downstream from Michel Creek) was lower in 2016 compared to previous years and the reference mean, but still within the normal range, whereas richness increased farther downstream at ELUFE (Elk River upstream from Fernie) in 2016 compared to reference areas and previous years.

Changes in % EPT were observed at five areas, of which four had at least three years of data (Figure 8.8). Values of % EPT less than the reference area normal range were evident in 2015 (and 2016, if sampled) at four of the areas (Swift Creek [SWCK], Elk River upstream of Fording River [ELUFO], Thompson Creek [THCK], and Elk River near the mouth [ELH93]), whereas all four areas had values within the normal range in 2012. At lower Michel Creek (MI2), % EPT values were in the normal range in 2015 and 2016, representing an increase over values below the normal range in 2012 and 2013.

More significant temporal changes were observed for % Ephemeroptera than the other benthic invertebrate community endpoints. Lower values were observed in 2015 and 2016 relative to

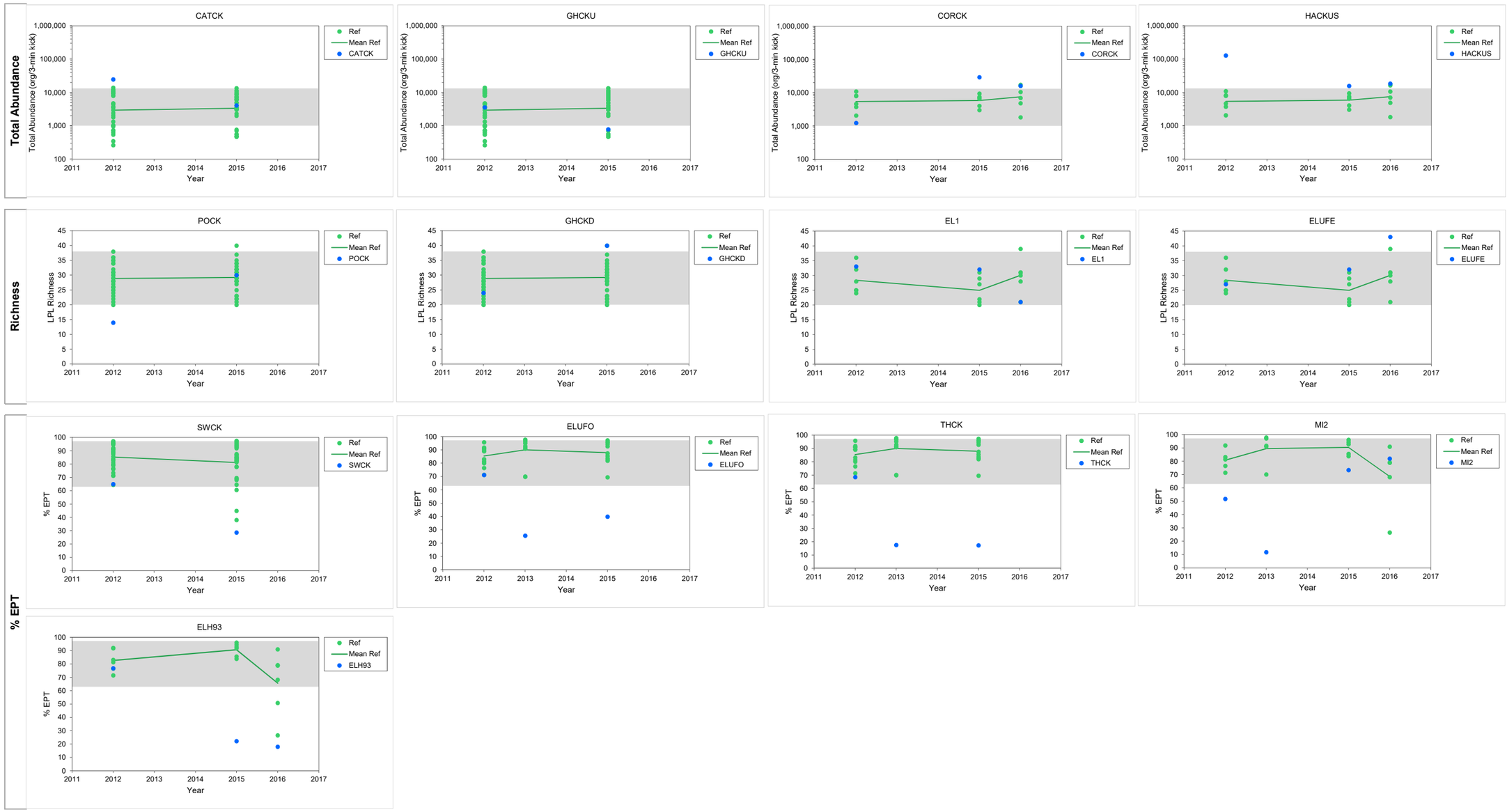


Figure 8.8: Scatterplot of Abundance, Richness, % EPT, and % Ephemeroptera versus Year for Mine-exposed Areas with a Significant Temporal Change Relative to the Mean Reference Area Temporal Change

Notes: Shaded region represents the normal range (2.5th and 97.5th percentiles for the pooled 2012 and 2015 reference area distribution). Reference area data in each plot represent the reference data used in that specific contrast

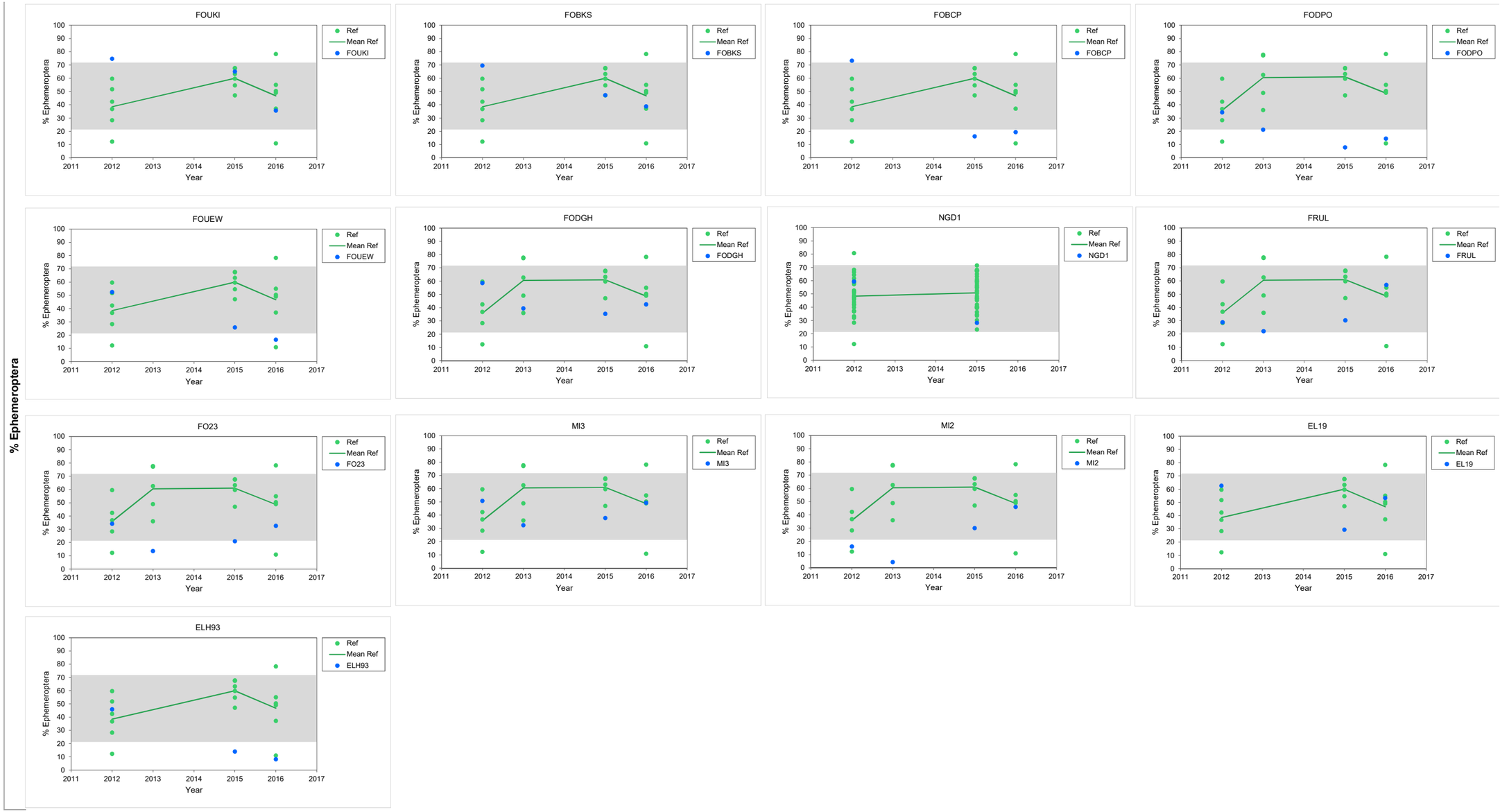


Figure 8.8: Scatterplot of Abundance, Richness, % EPT, and % Ephemeroptera versus Year for Mine-exposed Areas with a Significant Temporal Change Relative to the Mean Reference Area Temporal Change

Notes: Shaded region represents the normal range (2.5th and 97.5th percentiles for the pooled 2012 and 2015 reference area distribution). Reference area data in each plot represent the reference data used in that specific contrast

2012 at main stem areas of the upper Fording River upstream from Ewin Creek (FOUKI, FOBKS, FOBCP, FODPO, and FOUEW) and at the Elk River mouth (ELH93; Figure 8.8). The other areas (Fording River downstream from Greenhills Creek [FODGH] and upstream [FRUL] and downstream [FO23] from Line Creek, as well as mid [MI3] and lower [MI2] Michel Creek showed a pattern of lower % Ephemeroptera in 2013 compared to 2012, followed by increases in 2015[31] and 2016, with 2016 values being near the reference mean.

When temporal changes were analyzed by MU, decreasing trends in % Ephemeroptera were apparent in the upper Fording River (MU1) and the lower Elk River (MU4, MU5), with a step change after 2012 in all locations (Appendix Table G.19, Appendix Figure G.12). A decreasing trend in % EPT was detected after 2012 in MU5, while % EPT appears to be increasing in the Michel Creek portion of MU4 (Appendix Table G.19, Appendix Figure G.12).

The observed changes are discussed further in Section 12 as part of the integrated evaluation of data for each monitoring area within each MU. Management responses that have been planned or initiated in response to findings are also discussed.

8.3 Biomass and Density (Hess Samples)

Invertebrate biomass and density have been monitored in the Line Creek LAEMP since 2014 to evaluate potential changes in productivity associated with operation of the AWTF (e.g., Minnow 2017b). Invertebrate biomass was greater downstream from the AWTF (LILC3 and the LIDSL) than at reference area SLINE, but this difference was apparent prior to AWTF operation and did not increase after the AWTF became fully operational in 2016 (based on before-after control-impact [BACI] analysis) (Figure 8.9). Biomass is also being monitored in the FRO LAEMP beginning in 2017 (Minnow 2017a) to evaluate baseline conditions prior to commissioning of the future upper Fording River AWTF, which is planned to treat water from Swift, Cataract, and Kilmarnock creeks. In addition, biomass monitoring began in the GHO LAEMP in 2017 (Minnow and Lotic 2017) and these data will be used to inform future RAEMP reports.

8.4 Tissue Selenium

8.4.1 Comparisons to Concentrations in Water

As noted in Section 7.4.1, selenium is taken up from water by organisms at the base of aquatic food webs (Stewart et al. 2010). Once incorporated into the base of the food web, selenium is transferred to higher levels of the food web through dietary pathways. In the Elk Valley, benthic

[31] The exception was FODGH, where % Ephemeroptera in 2015 was similar to that observed in 2013.

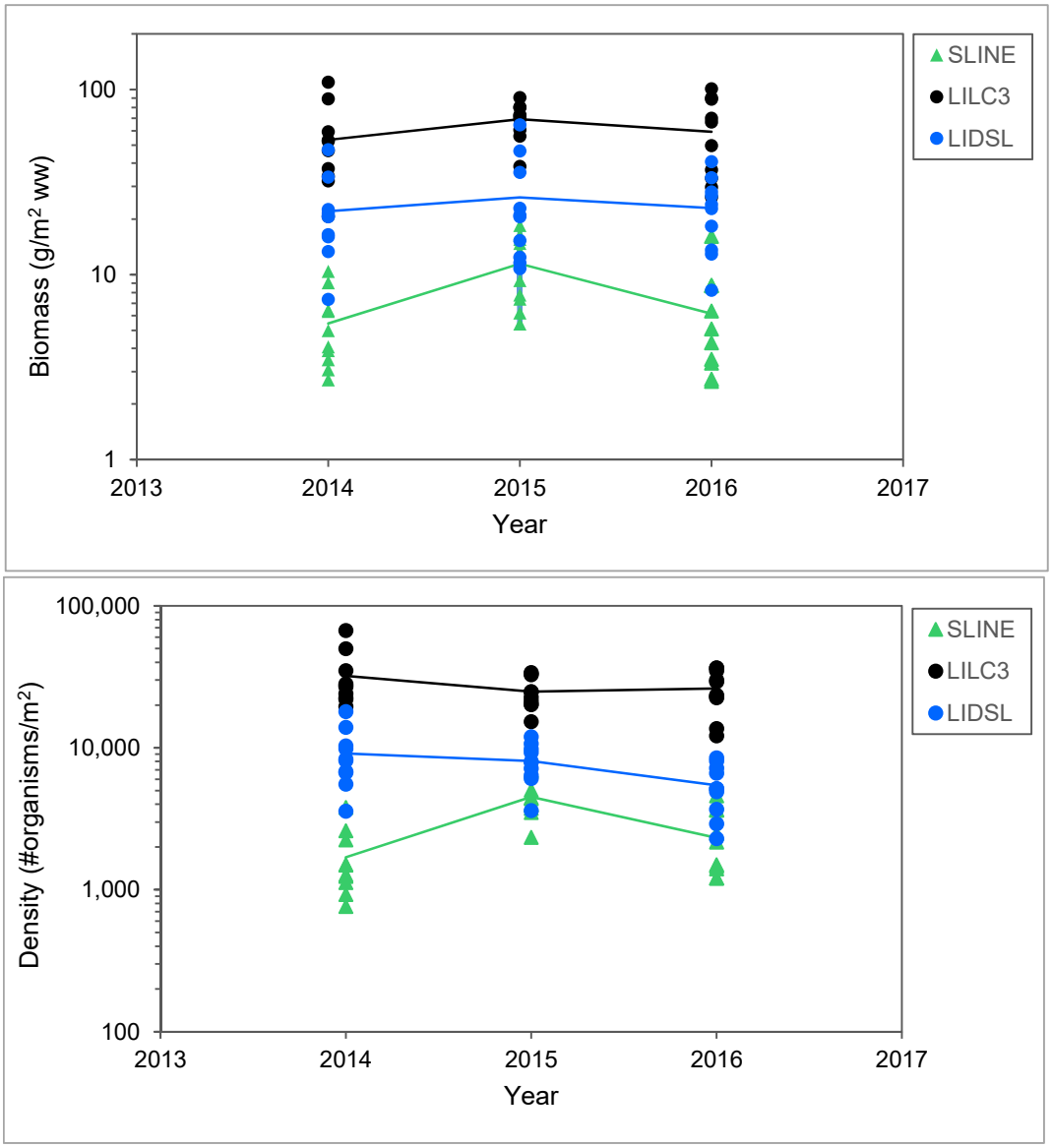


Figure 8.9: BACI Plots for Benthic Invertebrate Biomass and Density in Line Creek from 2014 - 2016

Note: Y-axes are on a log scale

invertebrates represent the first level of consumers and a key food source for aquatic and aquatic-dependent vertebrates (e.g., fish, amphibians, birds).

Dietary uptake steps in the food web are characterized by trophic transfer factors or functions (TTF) that describe the relationship between tissue selenium concentrations in consumers and their prey. TTFs from the base of the food web to invertebrates are typically in the range of 1 to 3 (Presser and Luoma 2010), meaning concentrations in invertebrates are usually 1 to 3 times

higher than those in the algae and other microorganisms they consume. However, TTFs up to about 10 have been observed in the Elk Valley, chiefly in areas with lowest aqueous selenium concentrations (Orr et al. 2012) where organisms actively take up selenium to maintain internal concentrations to support physiological functions (Stewart et al. 2010). Selenium accumulation in food webs tends to be greater in lentic than lotic or semi-lentic systems with similar concentrations of selenium in water (Hillwalker et al. 2006, Orr et al. 2012, USEPA 2016, Deforest et al. 2017). Although such a pattern was not strongly evident for periphyton samples collected in the Elk Valley in 2012 and 2015 (Figure 7.12), differences in accumulation between lotic and lentic areas are indicated by selenium concentrations in benthic invertebrate samples collected in the same areas and years (Figure 8.10). The tissue data collected since 2013 are being incorporated into an update of the Elk Valley bioaccumulation model.

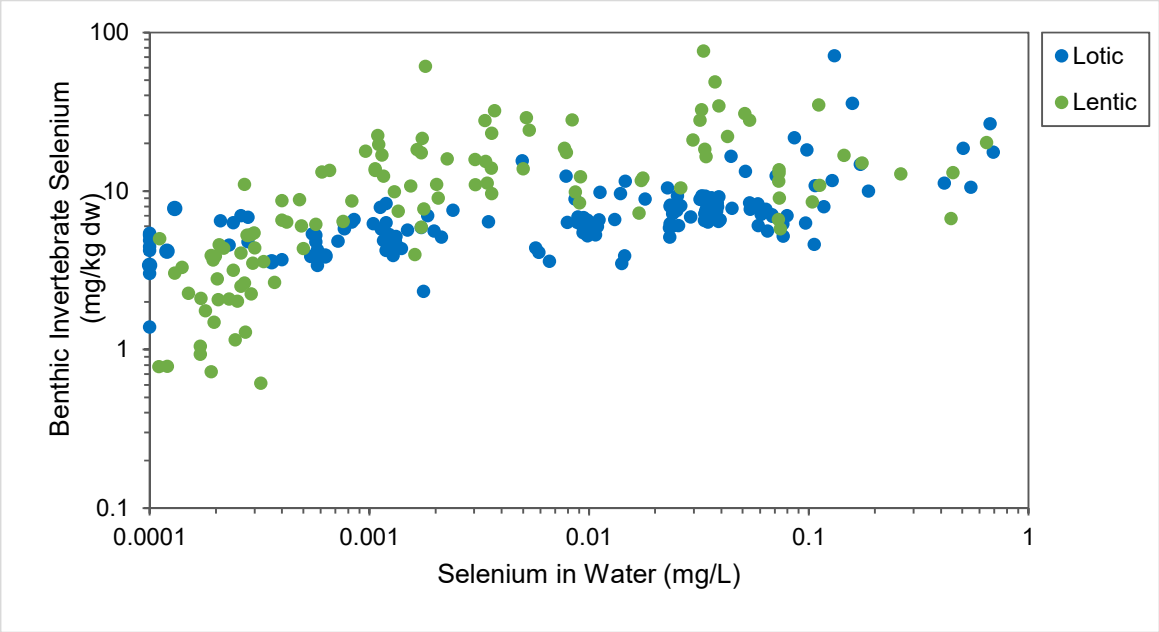


Figure 8.10: Scatterplot of Selenium Concentrations in Benthic Invertebrate Tissue versus Selenium Concentrations in Water in the Elk Valley for Lotic and Lentic Habitats, 2012 and 2015

8.4.2 Comparison to Predictions

Benthic invertebrate tissue selenium concentrations measured in 2015 and 2016 were compared to predictions that were derived from water modelling (Golder 2014a,b) and tissue bioaccumulation models developed for the EVWQP (Teck 2014) (Table 8.4). Observed concentrations were similar to or lower than predicted mean concentrations for 2013 and 2017, except at Swift Creek (SWCK; 2015); LCO Dry Creek (LC_DC1; 2016), lower

Table 8.4: Predicted Benthic Invertebrate Tissue Selenium Concentrations for 2013 and 2017 Compared to Observed Concentrations in Lotic, Composite-Taxa Samples Collected in 2015 and 2016

Manage-ment Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Location Code for Predictions	Area Description	Biological Sampling Area Code	Tissue Selenium (mg/kg dw)		2013 Prediction Interval (mg/kg dw)[a]			2017 Prediction Interval (mg/kg dw)[a]		
						2015	2016	Lower	Mean	Upper	Lower	Mean	Upper
1	Fording	T	HC1	Henretta Creek at the mouth	HENFO	9.62	-	3.38	9.30	25.61	3.34	9.20	25.34
			-	-	NGD1	11.54	-	-	-	-	-	-	-
			KC1	Kilmarnock Creek at the mouth	KICK	0.4[b]	-	4.68	12.90	35.53	4.83	13.30	36.63
			SC_CA	Swift/Cataract	SWCK	18.54	-	5.85	16.10	44.34	5.56	15.30	42.14
					CATCK	10.54	-						
			PC1	Porter Creek at the mouth	POCK	5.59	-	3.96	10.90	30.02	4.14	11.40	31.40
			-	-	LC_DCDS	5.68	7.53	-	-	-	-	-	-
			DC1	LCO Dry Creek at the mouth	LC_DC1	5.17	7.72	2.03	5.60	15.42	2.03	5.60	15.42
			GH1	Greenhills Creek at the mouth	GHCKD	**21.67**	-	4.36	12.00	33.05	4.39	12.10	33.33
			-	-	GHCKU	10.81	-	-	-	-	-	-	-
		M	FR1	Fording River downstream of Henretta Creek	FODHE	6.55	-	3.05	8.40	23.14	3.16	8.70	23.96
			FR2	Fording River downstream of Clode Creek	FODNGD	6.21	-	3.38	9.30	25.61	3.56	9.80	26.99
					FOUNGD	7.19	-						
			-	-	MP1	5.85	-	-	-	-	-	-	-
					FOUSH	**6.04**	-						
					FOUKI	**5.13**	**5.24**						
					FOBKS	**6.00**	-						
			FR3	Fording River between Swift and Cataract Creeks	FOBSC	7.51	-	3.78	10.40	28.64	4.03	11.10	30.57
			-	-	FOBCP	7.68	9.72	-	-	-	-	-	-
			FR3b	Fording River downstream of Porter Creek	FODPO	6.92	3.80	3.96	10.90	30.02	4.03	11.10	30.57
					FODPO-RYAC-1	8.48	-						
			-	-	FO10-SP1	7.13	-	-	-	-	-	-	-
					FO22	**7.08**	-						
					FOUEW	**6.05**	**5.84**						
					LC_FRUS	**7.01**	**9.14**						
					FO29	**7.54**	**8.52**						
			FR4	Fording River downstream of Greenhills Creek	FODGH	8.36	7.25	3.63	10.00	27.54	3.67	10.10	27.82
					FODGH-MF-1	8.15	-						
2		T	WLC1	West Line Creek at the mouth	LILC3	13.31	**35.20**	5.56	15.30	42.14	5.56	15.30	42.14
			-	-	LIDSL	8.89	16.00	-	-	-	-	-	-
			LC1	Line Creek at the mouth	LI8	9.31	11.80	3.56	9.80	26.99	3.12	8.60	23.69
		M	-	-	FO9	7.19	-	-	-	-	-	-	-
					FRUL	**7.29**	-						
			FR5	Fording River at the mouth	FO23	6.37	6.73	3.59	9.90	27.27	3.49	9.60	26.44
3	Elk	T	WC1	Wolfram Creek at the mouth	WOCK	11.63	-	3.67	10.10	27.82	4.07	11.20	30.85
			TC1	Thompson Creek at the mouth	THCK	**18.14**	-	4.32	11.90	32.78	4.61	12.70	34.98
		M	-	-	EL20	4.98	5.13	-	-	-	-	-	-
			ER1	Elk River downstream of GHO and upstream of FRO	ELDEL	4.64	-	2.03	5.60	15.42	2.32	6.40	17.63
					ELUEL	4.33	-						
					ELUFO	5.31	-						
4	Elk	T	-	-	HACKUS	6.57	9.89[c]	-	-	-	-	-	-
			HM1	Harmer Creek at the mouth	HACKDS	8.04	**15.25**[c]	3.41	9.40	25.89	3.49	9.60	26.44
					HACKDS-MF-1	8.08	-						
			-	-	GRCK	7.53	-	-	-	-	-	-	-
					GRDS	**10.46**	-						
					OCNM	**6.83**	-						
		M	ER2	Elk River downstream of Fording River	EL19	5.22	7.58	2.94	8.10	22.31	2.90	8.00	22.03
					EL19-MF-1	6.59	-						
			-	-	ELDGR	6.06	-	-	-	-	-	-	-
					ELUSP	5.47	-	-	-	-	-	-	-
	Michel	T	-	-	CORCK	3.48	2.72	-	-	-	-	-	-
			BC1	Bodie Creek at the mouth	BOCK	**71.20**	**50.47**	5.37	14.80	40.76	4.94	13.60	37.46
		M	-	-	MIUCO	4.78	4.06[c]	-	-	-	-	-	-
					MIDCO	**4.38**	4.18[c]						
					MIDAG	**7.55**	-						
					MI5	**5.11**	-						
					MI3	**2.33**	-						
			MC1	Michel Creek at the mouth	MI2	6.61	7.79	2.80	7.70	21.21	3.05	8.40	23.14
					MI2-MF-1	6.62	-						
5	Elk	M	ER3	Elk River downstream of Michel	EL1	5.29	5.72	2.76	7.60	20.93	2.80	7.70	21.21
			-	-	ELDFE	6.35	-	-	-	-	-	-	-
					ELUFE	**5.79**	**7.36**						
			ER4	Elko Reservoir	ELELKO	8.88	9.50	2.65	7.30	20.11	2.69	7.40	20.38
			ER5	Elk River at the mouth	ELH93	**12.40**	**12.14**	2.51	6.90	19.00	2.58	7.10	19.56

[a] Approximate 95% prediction interval for invertebrate tissue selenium concentrations (mg/kg dw) (±2 RMSD) of 2-step, water to invertebrate, bioaccumulation model that used predictions from regional water quality model.

[b] Result was verified with the laboratory, but is suspect.

[c] Maximum concentration reported from replicate samples

Bold values are >50% higher than the mean of predicted means for 2013 and 2017

observed value is greater than upper limit of the prediction interval

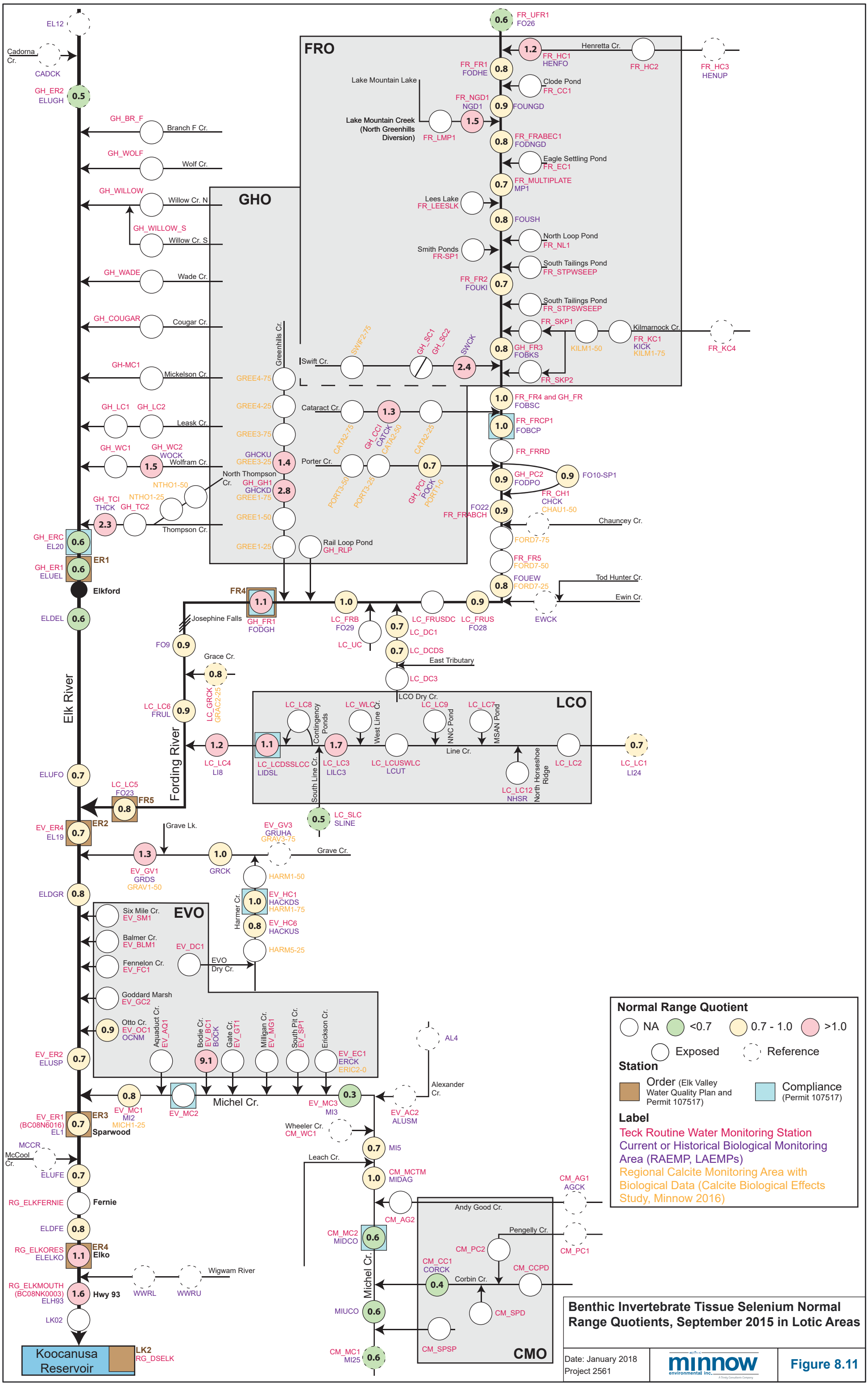
Greenhills Creek (GHCKD; 2015), Line Creek immediately downstream from the AWTF (LILC3; 2016), Thompson Creek (THCK), Harmer Creek (HACKDS; 2016), Bodie Creek (BOCK; 2015 and 2016) and the lower Elk River (ELEKO and ELH93; 2015 and 2016), where tissue selenium concentrations were more than 20% higher than the mean predictions for 2013 and 2017 (Table 8.4). However, all observed concentrations except those at Bodie Creek (BOCK) were less than the upper prediction interval (i.e., within the range of model uncertainty). The benthic invertebrate community in Bodie Creek has been affected by mining, so the taxa collected for tissue selenium analysis at Bodie Creek (mainly aquatic worms) differ from those comprising tissue samples at most other areas (EPT).

The elevated tissue selenium concentration at LILC3 in 2016 was associated with discharge of selenium from the AWTF that was in a chemical form (i.e., predominantly selenite) that is more readily accumulated by aquatic organisms than the form that is normally found in other parts of the watershed (i.e., selenate) (Minnow 2017b). Teck is currently pilot testing an active oxidation process to convert most of the selenium discharged by the AWTF back to selenate, which is expected to result in less tissue selenium accumulation in Line Creek after it becomes operational at full-scale.

8.4.3 Comparisons to Normal Reference Ranges

The distributions of reference area benthic invertebrate selenium concentrations were similar for lotic and lentic areas and resulted in 97.5th percentiles that were not significantly different (Appendix Tables G.48 and G.49). Therefore benthic invertebrate tissue selenium concentrations measured at both lotic and lentic reference areas sampled since 1996 were combined (n=176 samples) to characterize the reference normal range (Appendix Table G.49; Appendix Figure G.13). The upper limit of the normal range was defined as 7.82 mg/kg dw of selenium in tissue.

Of samples collected among 59 mine-exposed lotic areas in September 2015, 16 (27%) had selenium concentrations greater than the upper limit of the normal range, resulting in NRQs >1.0 (Figure 8.11; Appendix Table G.43). Highest NRQs were found in tributaries, but NRQs greater than 1.0 were also observed in the Fording River downstream from GHO (FODGH) and in the lower Elk River (ELELKO, ELH93; Figure 8.11; Appendix Table G.50). Of mine-exposed lotic areas having benthic invertebrate selenium concentrations within the normal range, all but eight had NRQs of 0.7 or more, indicating concentrations near the upper limit of the reference area normal range (Figure 8.11). Samples collected from a sub-set of areas in 2016 produced similar results with NRQs of 0.7 or more at 23 of 27 (85%) mine-exposed areas (Appendix Table G.50).


FRO
GHO
LCO
EVO
CMO
EL12
Cadorna Cr.
CADCK
GH_ER2 ELUGH 0.5
GH_BR_F
Branch F Cr.
GH_WOLF
Wolf Cr.
GH_WILLOW
Willow Cr. N
GH_WILLOW_S
Willow Cr. S
GH_WADE
Wade Cr.
GH_COUGAR
Cougar Cr.
GH-MC1
Mickelson Cr.
GH_LC1
GH_LC2
Leask Cr.
GH_WC1
GH_WC2 WOCK
1.5 Wolfram Cr.
NTHO1-50
North Thompson Cr.
GH_TCI THCK
NTHO1-25
GH_TC2
2.3 Thompson Cr.
GH_ERC EL20 0.6
GH_ER1 ELUEL 0.6
ER1
Elkford
ELDEL 0.6
Elk River
ELUFO 0.7
LC_LC5 FO23
0.8 FR5
Fording River
EV_ER4 EL19 0.7
ER2
Grave Lk.
1.3 EV_GV1 GRDS GRAV1-50
1.0 GRCK
EV_GV3 GRUHA GRAV3-75
Grave Cr.
HARM1-50
ELDGR 0.8
Harmer Cr.
1.0 EV_HC1 HACKDS HARM1-75
0.8 EV_HC6 HACKUS
HARM5-25
Six Mile Cr. EV_SM1
Balmer Cr. EV_BLM1
Fennelon Cr. EV_FC1
EV_DC1
EVO Dry Cr.
Goddard Marsh EV_GC2
0.9 Otto Cr. EV_OC1 OCNM
EV_ER2 ELUSP 0.7
Aquaduct Cr. EV_AQ1
Bodie Cr. EV_BC1 BOCK
9.1
Gate Cr. EV_GT1
Milligan Cr. EV_MG1
South Pit Cr. EV_SP1
Erickson Cr.
EV_EC1 ERCK ERIC2-0
AL4
Alexander Cr.
EV_AC2 ALUSM
0.8 EV_MC1 MI2 MICH1-25
EV_MC2
Michel Cr.
EV_MC3 MI3 0.3
EV_ER1 (BC08N6016) EL1 0.7
ER3
Sparwood
Wheeler Cr. CM_WC1
0.7 MI5
Leach Cr.
1.0 CM_MCTM MIDAG
CM_AG1 AGCK
CM_AG2
Andy Good Cr.
Pengelly Cr.
CM_PC1
CM_PC2
CM_CC1 CORCK
CM_CCPD
Corbin Cr.
0.4
CM_SPD
CM_SPSP
CM_MC2 MIDCO 0.6
Michel Cr.
MIUCO 0.6
CM_MC1 MI25 0.6
MCCR McCool Cr.
ELUFE 0.7
RG_ELKFERNIE
Fernie
ELDFE 0.8
RG_ELKORES ELELKO 1.1
ER4
Elko
RG_ELKMOUTH (BC08NK0003) ELH93 1.6
Hwy 93
WWRL
WWRU
Wigwam River
LK02
Koocanusa Reservoir
LK2 RG_DSELK
0.6 FR_UFR1 FO26
1.2 FR_HC1 HENFO
Henretta Cr.
FR_HC2
FR_HC3 HENUP
FR_FR1 FODHE 0.8
Lake Mountain Lake
Clode Pond FR_CC1
FR_NGD1 NGD1 0.9 FOUNGD
Lake Mountain Creek (North Greenhills Diversion)
1.5 FR_LMP1
0.8 FR_FRABEC1 FODNGD
Eagle Settling Pond FR_EC1
0.7 FR_MULTIPLATE MP1
Lees Lake FR_LEESLK
0.8 FOUSH
North Loop Pond FR_NL1
Smith Ponds FR-SP1
South Tailings Pond FR_STPWSEEP
FR_FR2 FOUKI 0.7
South Tailings Pond FR_STPSWSEEP
FR_SKP1
Kilmarnock Cr.
FR_KC1 KICK KILM1-75
KILM1-50
FR_KC4
0.8 GH_FR3 FOBKS
FR_SKP2
Greenhills Cr.
Swift Cr.
SWIF2-75
GH_SC1
GH_SC2
SWCK
2.4
GREE4-75
GREE4-25
GREE3-75
GHCKU GREE3-25 1.4
GHCKD GREE1-75 2.8
GREE1-50
GREE1-25
Rail Loop Pond GH_RLP
Cataract Cr.
1.3
CATA2-75
GH_CCI CATCK CATA2-50
CATA2-25
Porter Cr.
PORT3-50
PORT3-25
0.7
GH_PCI POCK PORT1-0
1.0 FR_FR4 and GH_FR FOBSC
1.0 FR_FRCP1 FOBCP
FR_FRRD
0.9 GH_PC2 FODPO
0.9 FO10-SP1
FR_CH1 CHCK CHAU1-50
FO22 FR_FRABCH 0.9
Chauncey Cr.
FORD7-75
FR_FR5 FORD7-75
0.8 FOUEW FORD7-25
Tod Hunter Cr.
Ewin Cr.
EWCK
FR4
1.1 GH_FR1 FODGH
Josephine Falls
1.0 LC_FRB FO29
LC_UC
0.7 LC_DC1
0.7 LC_DCDS
East Tributary
LC_DC3
LC_FRUSDC
0.9 LC_FRUS FO28
LCO Dry Cr.
FO9 0.9
Grace Cr.
0.8 LC_GRCK GRAC2-25
LC_LC6 FRUL 0.9
1.2 LC_LC4 LI8
1.1 LC_LCDSSLCC LIDSL
LC_LC8
Contingency Ponds
1.7 LC_LC3 LILC3
LC_WLC
West Line Cr.
LC_LCUSWLC LCUT
LC_LC9
NNC Pond
LC_LC7
MSAN Pond
Line Cr.
LC_LC2
0.7 LC_LC1 LI24
LC_LC12 NHSR
North Horseshoe Ridge
South Line Cr.
0.5 LC_SLC SLINE
Normal Range Quotient
NA
<0.7
0.7 - 1.0
>1.0
Exposed
Reference
Station
Order (Elk Valley Water Quality Plan and Permit 107517)
Compliance (Permit 107517)
Label
Teck Routine Water Monitoring Station
Current or Historical Biological Monitoring Area (RAEMP, LAEMPs)
Regional Calcite Monitoring Area with Biological Data (Calcite Biological Effects Study, Minnow 2016)
Benthic Invertebrate Tissue Selenium Normal Range Quotients, September 2015 in Lotic Areas
Date: January 2018
Project 2561
minnow environmental inc.
Figure 8.11

Mean invertebrate tissue selenium concentrations among lentic areas were greater than the reference normal range in 14 of 18 areas, resulting NRQs up to 4.1 (at R5-1, a side channel of the Fording River downstream from Greenhills Creek; Appendix Table G.51).

8.4.4 Comparisons to Site-Specific Benchmarks

Benthic invertebrate tissue selenium concentrations measured in lotic habitats of the watershed since 2006 have typically been less than the EVWQP Level 1 benchmark for effects to invertebrates (13 mg/kg dw), as well as benchmarks for dietary effects to juvenile fish (11 mg/kg dw) and birds (15 mg/kg dw; Figure 8.12). Figure 8.13 expresses the concentrations observed in 2015 as HQs based on the most sensitive EVWQP benchmark of 11 mg/kg dw for dietary effects to fish. Most (7 of 58 = 88%) areas sampled in 2015 had invertebrate tissue selenium concentrations less than the lowest benchmark. HQs > 1 occurred mainly in tributaries (e.g., Swift, Greenhills, Line, Wolfram, Thompson, and Bodie), as well as the most downstream Elk River area (ELH93). In 2016, 6 of 32 (19%) benthic invertebrate tissue samples collected in mine-exposed areas had concentrations greater than the benchmark of 11 mg/kg dw (Appendix Table G.43).

Benthic invertebrate tissue selenium concentrations in lentic areas have frequently been greater than Level 1 benchmarks (Figure 8.12). In 2015, at least one sample exceeded the benchmark in 13 of 18 (72%) mine-exposed areas and one of five (20%) reference areas (Appendix Table G.47). Maximum invertebrate tissue selenium concentrations (of replicate values among areas) exceeded the Level 1 benchmark for potential dietary effects to fish (i.e., HQ > 1) in 11 of 18 mine-exposed lentic areas (Appendix Table G.44).

8.4.5 Temporal Changes

Potential changes in benthic invertebrate tissue selenium concentrations over time were evaluated for all areas having at least two years of data. Significant increases were identified at LILC3 (Line Creek downstream from the AWTF) after 2015 and at BOCK (Bodie Creek) after 2012 (Figure 8.14; Appendix Table G.42a,b). The increase at LILC3 was due to discharge of selenium from the AWTF in a chemical form (i.e., predominantly selenite) that is more readily accumulated by aquatic organisms than the form that predominates in other parts of the watershed (i.e., selenate) (Minnow 2017b). Teck is currently pilot testing an active oxidation process to convert most of the selenium discharged by the AWTF back to selenate, which is expected to result in less tissue selenium accumulation in Line Creek after it becomes operational at full-scale

The cause of elevated tissue selenium concentrations at BOCK in 2015 and 2016 relative to 2012 and predicted values is uncertain. These samples could reflect altered invertebrate

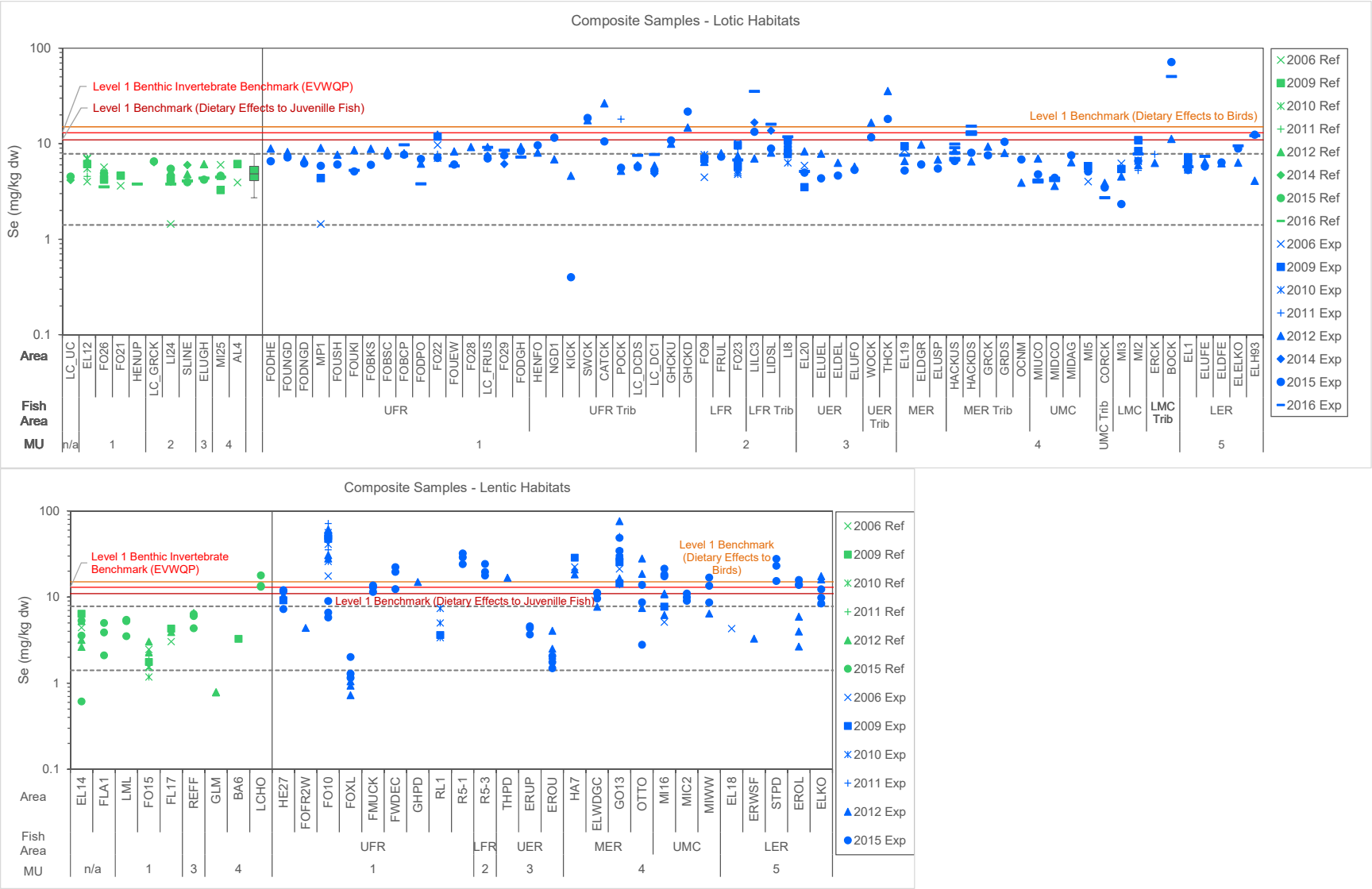
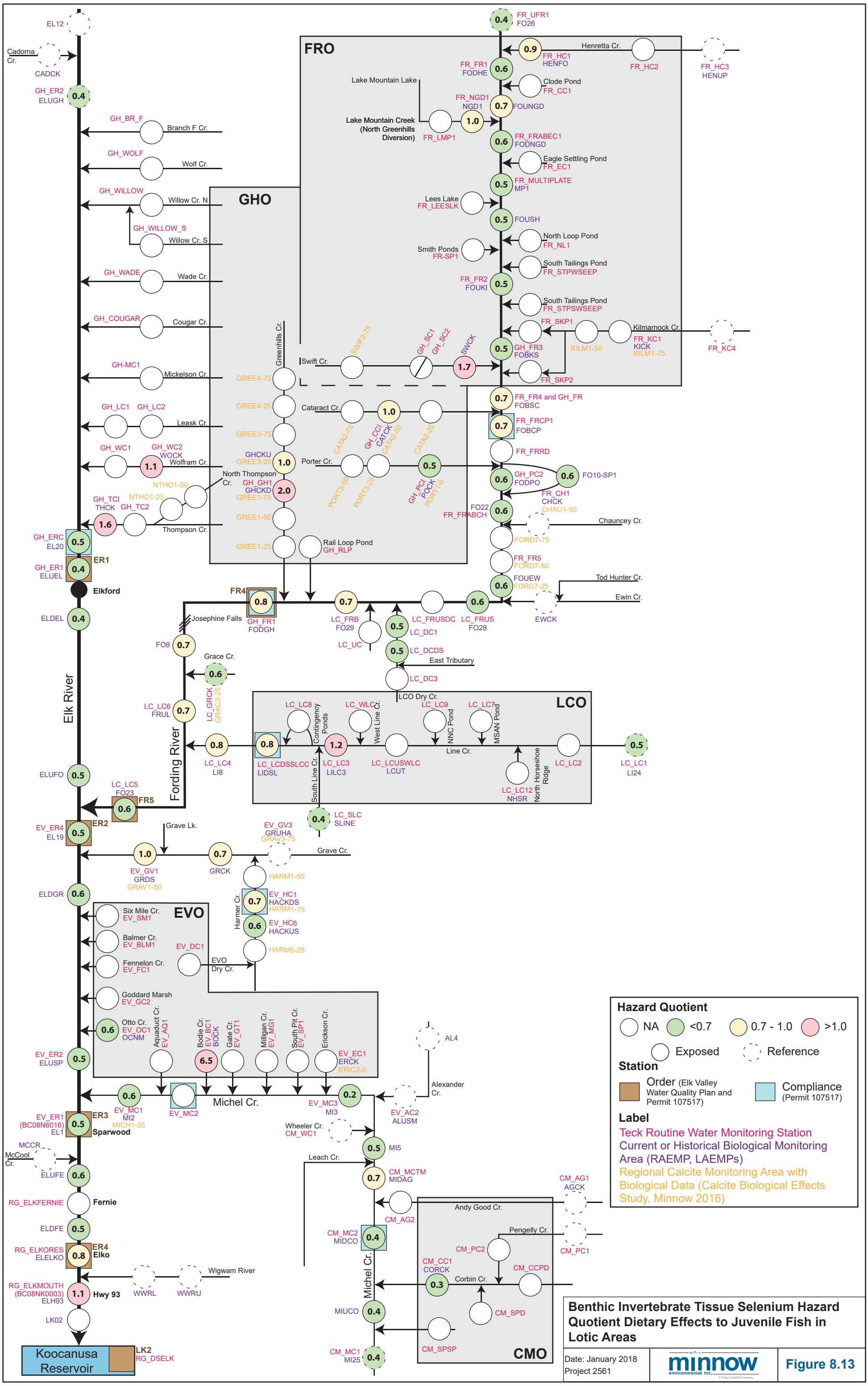


Figure 8.12: Selenium Concentrations in Benthic Invertebrate Samples Collected in Lotic and Lentic Habitats, 2006 - 2016

Notes: UFR = Upper Fording River; LFR = Lower Fording River; UER = Upper Elk River; MER = Middle Elk River; UMC = Upper Michel Creek; LMC = Lower Michel Creek; LER = Lower Elk River; Trib = Tributaries. Normal Range limits are displayed by grey dashed lines. Samples were not collected in 2016 in lentic areas.



Benthic Invertebrate Tissue Selenium Hazard Quotient Dietary Effects to Juvenile Fish in Lotic Areas

Date: January 2018
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Figure 8.13

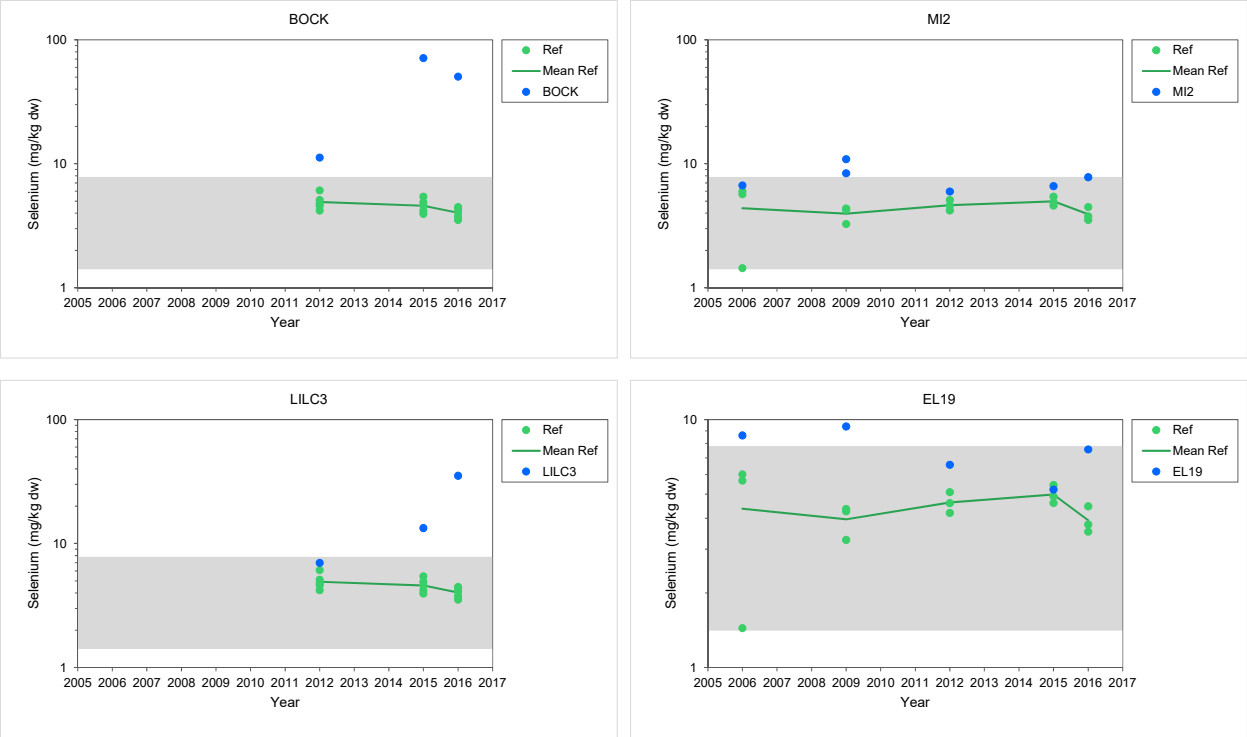


Figure 8.14: Scatterplot of Selenium Concentration in Benthic Invertebrate Tissue versus Year for Lotic Mine-exposed Areas with a Significant Temporal Change Relative to the Mean Reference Area Temporal Change

Notes: Shaded region represents the reference area normal range. The reference area data in each plot represent the reference data used in that specific contrast. Reference data sets included any reference areas having data for the same years as the mine-exposed area.

communities due to exposure to mine-influenced water downstream of the sediment ponds, or some other factor related to proximity to the point of discharge. Locations close to sediment ponds also have a greater potential influence of mine water management practices (e.g., pit dewatering) that could expose these locations to mine-influenced water from a range of sources.

Decreasing step changes were observed at EL19 (Elk River downstream from Fording River) and MI2 (lower Michel Creek after 2006 (Figure 8.14). At all other areas, concentrations observed in 2015 were similar to those observed in one or more previous years (Appendix Table G.42a,b).

Among lentic monitoring areas, a decreasing trend in tissue selenium was observed at the former Fording River Oxbow (FO10) in 2015 compared to previous years (Figure 8.15; Appendix Table G.42c). The record flood in 2013 altered this area from a lentic oxbow habitat to a flow-through side-channel. Tissue selenium concentrations were reduced in a manner consistent with the relative differences in food web accumulation of selenium between lotic and

lentic habitats (Figure 8.10). The tissue selenium concentrations in 2015 were less than EVWQP Level 1 benchmarks (Appendix Table G.51).

A decreasing trend in invertebrate tissue selenium concentrations was also observed at Otto Ponds (OTTO), where the concentrations in 2015 ranged from less than the upper limit of the normal reference area range to greater than Level 1 benchmarks for effects to invertebrates and juvenile fish among the three replicate samples (Appendix Tables G.47 and G.51). This was supported by a decreasing trend for selenium in water at the Otto Creek monitoring station (EV_OC1).

Increasing trends for invertebrate tissue selenium concentrations were evident for the Michel Creek wetland (MI16) downstream from CMO. However, concentrations in water were low at the time of sampling (i.e., < 2 µg/L) and no trends were found for aqueous selenium concentrations downstream from CMO (CM_MC2; Appendix Table C.29). An increase was also observed for the lower Elk River Oxbow (EROL), but this result was based on only two years of data and should be interpreted with caution (Figure 8.15).

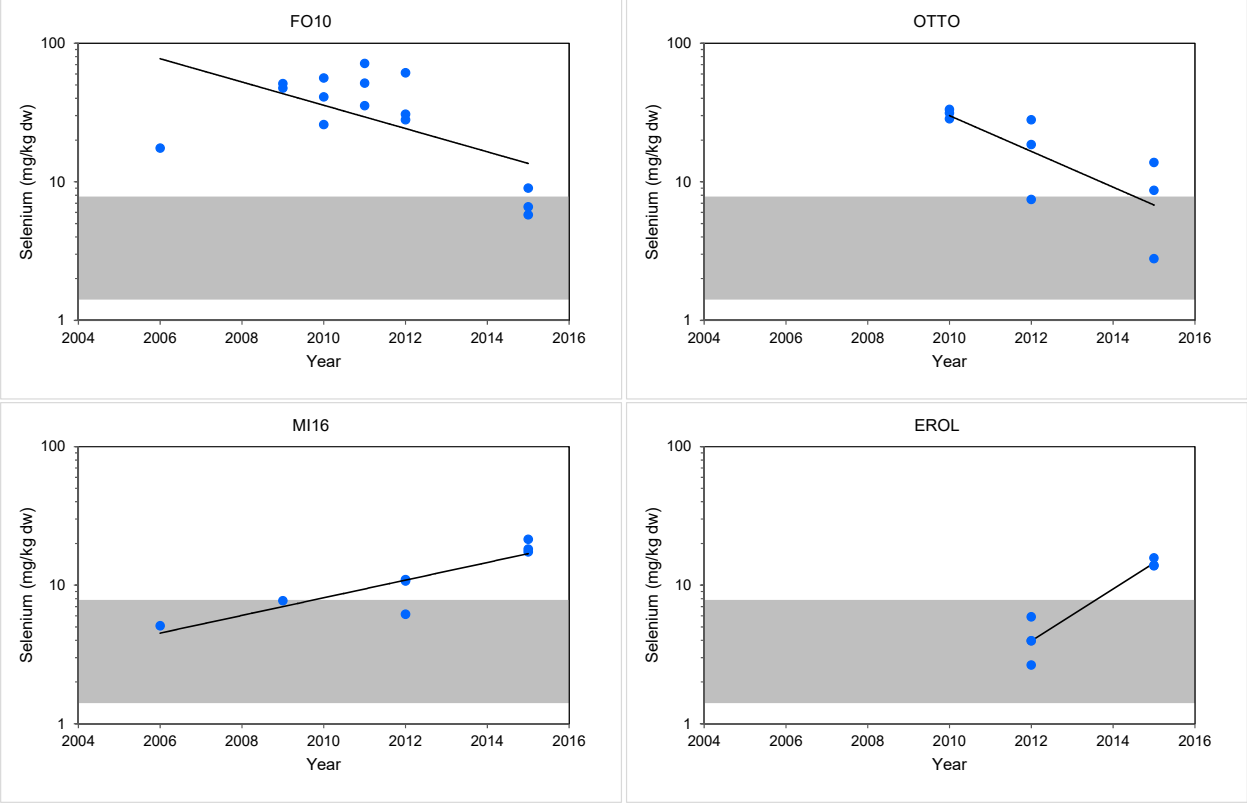


Figure 8.15: Scatterplots and Linear Regression of Benthic Invertebrate Tissue Selenium for Lentic Areas with a Significant Linear Trend over Time, 2006 – 2015

Notes: Shaded region represents the reference area normal range.

8.5 Meta-Analysis

PCA was used to evaluate relationships between benthic invertebrate community endpoints, natural habitat variation, and mine-related constituents (e.g., water quality and calcite) (Figure 8.16; Appendix Tables G.52 to G.54[32]). As noted above, differences in benthic invertebrate community structure (as summarized by NMDS) were directly related to %EPT, particularly %Ephemeroptera, and these community endpoints were inversely related to the summary variables for water quality (expressed as either concentrations [PC1] or HQs for key constituents nitrate, selenium, sulphate) and calcite index). Natural habitat variables explained little of the variation in conditions among areas ($r < 0.5$ for habitat PC1 and PC2; Appendix Table G.51). Benthic invertebrate richness was not related to any of the measured habitat or mine-related variables (Figure 8.16).

8.6 Summary

Benthic invertebrate communities sampled in reference areas were composed mainly of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), collectively referred to as EPT. Of the 59 mine-exposed areas sampled in 2015, almost half (27 of 59) had proportions (%) of EPT and/or Ephemeroptera that were less than the reference area normal ranges for those endpoints. % EPT and % Ephemeroptera were inversely related to increasing gradients of mine-related influence on water quality and calcite.

More significant temporal changes were observed for % Ephemeroptera than the other benthic invertebrate community endpoints. Declines were observed in 2015 and 2016 relative to 2012 at main stem areas of the upper Fording River upstream from Ewin Creek (FOUKI, FOBKS, FOBCP, FODPO, and FOUEW) and at the Elk River mouth (ELH93). The other areas (Fording downstream from Greenhills [FODGH] and upstream [FRUL] and downstream [FO23] from Line Creek, as well as mid [MI3] and lower [MI2] Michel Creek showed a pattern of decreased (lowest) % Ephemeroptera in 2013 compared to 2012, followed by increases in 2015 and 2016, with 2016 values being near the reference mean.

The pattern of lower % Ephemeroptera over a distance of about 12 km in the upper Fording River was identified in the FRO LAEMP report submitted in May 2017 (Minnow 2017a). The response appears to be chiefly attributable to declines in abundances of the mayfly families

[32] A second PCA was completed that included benthic invertebrate tissue selenium concentrations, but it depicts results only 5 reference areas. This is because tissue selenium concentrations were not measured at all reference areas in 2015 based on a large existing data set for reference tissue selenium concentrations. The results were similar to those depicted in Figure 8.8 with tissue selenium concentrations correlating strongly with other abiotic mine-related variables (Appendix Figure G.15: Tables G.55 to G.57).

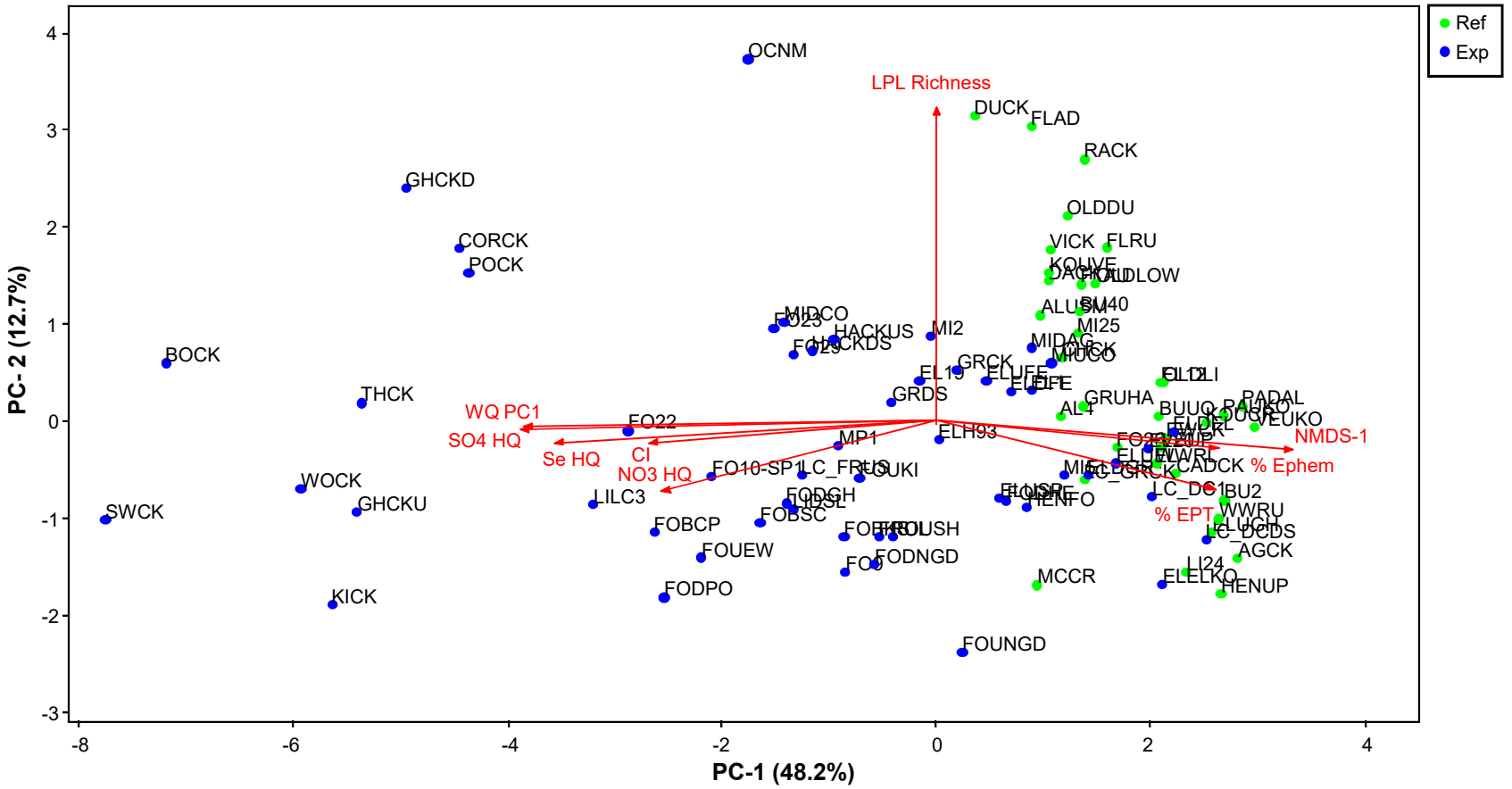


Figure 8.16: Overall Principal Components Analysis Biplot of Biological and Abiotic Summary Variables Based on Data from 36 Reference and 54 Mine-exposed Areas, September 2015, Elk Valley

Note: Direct correlation vectors are displayed for variables having an absolute Pearson's correlation coefficient (r) greater than 0.6 with PCA axis scores. Vector length is proportional to correlation strength. Note that PC-2 is not a significant axis (Monte carlo simulation p > 0.05).

Ephemerellidae and Heptigeniidae. Several factors (e.g., elevated nitrate concentrations increased temperature, variation in annual flow regimes, seasonal dewatering, and/or calcite deposition) may be influencing benthic invertebrate communities. In consideration of these findings, the FRO LAEMP design was adjusted to allow for further investigation of the cause(s) of benthic invertebrate community changes in September 2017 (Minnow 2017e).

Benthic invertebrate tissue selenium concentrations observed in lotic monitoring areas in 2015 and 2016 were compared to predictions that were derived from water modelling and tissue bioaccumulation models developed for the EVWQP. Tissue selenium concentrations were less than the upper prediction interval (i.e., within the range of model uncertainty for individual observations) at all areas except at Bodie Creek (BOCK), although additional areas reflected tissue selenium concentrations that were more than 20% greater than predicted mean concentrations in 2015 and/or 2016. Tissue selenium concentrations measured among mine-exposed areas in 2015 and 2016 were generally at the upper end of, or greater than, the normal range for reference areas (51 of 58 areas = 88%).

Benthic invertebrate tissue selenium concentrations measured in lotic habitats of the watershed since 2006 have typically been less than the EVWQP Level 1 benchmark for effects to invertebrates (13 mg/kg dw), as well as benchmarks for dietary effects to juvenile fish (11 mg/kg dw) and birds (15 mg/kg dw). Most (89%) of the areas sampled in 2015 had invertebrate tissue selenium concentrations less than the lowest benchmark. HQs > 1 occurred mainly in tributaries (e.g., Swift, Greenhills, Line, Wolfram, Thompson, and Bodie), as well as the most downstream Elk River area (ELH93). In 2016, 6 of 32 (19%) benthic invertebrate tissue samples collected in mine-exposed areas had concentrations greater than the benchmark of 11 mg/kg dw. By comparison, benthic invertebrate tissue selenium concentrations in lentic areas have frequently been greater than Level 1 benchmarks, and in 2015, at least one replicate sample exceeded the benchmark in 13 of 18 (72%) mine-exposed areas and one of five (20%) reference areas.

Potential changes in benthic invertebrate tissue selenium concentrations over time were evaluated for all areas having at least two years of data. Significant increases were identified at LILC3 (Line Creek downstream from the AWTF) and at BOCK (Bodie Creek) in 2015 and 2016 compared to 2012. The elevated tissue selenium concentration at LILC3 in 2016 was associated with discharge of selenium from the AWTF that was in a chemical form (i.e., predominantly selenite) that is more readily accumulated by aquatic organisms than the form that is normally found in other parts of the watershed (i.e., selenate). Teck is currently pilot testing an active oxidation process to convert most of the selenium discharged by the AWTF into selenate, which is expected to result in less tissue selenium accumulation in Line Creek

after it becomes operational at full-scale. Increases at BOCK compared to predictions and past observations may be related to altered invertebrate communities due to exposure to mine-influenced water downstream of the sediment ponds, exposure to pit dewatering, or some other factor related to proximity to the point of discharge.

Decreasing step changes in benthic invertebrate tissue selenium concentration were observed at EL19 (Elk River downstream from Fording River) and MI2 (lower Michel Creek) after 2006. At all other areas, concentrations observed in 2015 were similar to those observed in one or more previous years.

Among lentic monitoring areas, a decreasing trend in tissue selenium was observed at the former Fording River Oxbow (FO10) in 2015 compared to previous years which is consistent with the transformation of that area from a stagnant lentic habitat to a flowing side-channel after the record storm event in June 2013. The invertebrate tissue selenium concentration at this area in 2015 was less than EVWQP Level 1 benchmarks.

A decreasing trend in invertebrate tissue selenium concentrations was also observed at Otto Ponds (OTTO), where the concentrations measured in 2015 ranged from less than the upper limit of the normal reference area range to greater than Level 1 benchmarks for effects to invertebrates and juvenile fish among the three replicate samples. This trend was supported by a decreasing trend for selenium in water at the Otto Creek monitoring station (EV_OC1). An increasing trend was observed for the Michel Creek wetland (MI16) downstream from CMO; however, no trends were found for aqueous selenium downstream from CMO (CM_MC2).

The observed spatial and temporal effects on benthic invertebrates are discussed further in Section 12, which compiles and integratively evaluates all the monitoring data for each area within each MU. Teck is working with the EMC to develop a formalized approach for evaluating monitoring data on a weight of evidence basis, as well as triggers for management responses based on biological data, and these approaches will be implemented in future cycles of the RAEMP.

9 LONGNOSE SUCKER

9.1 Overview

In 2004, a dwarf form of longnose suckers (LSU; Photo 9.1) was reported to be inhabiting lentic areas of the Elk River watershed (Minnow 2005). Further study indicated that dwarf LSU populations are widespread in the Elk River watershed, being most abundant in small, cool, lentic water bodies that contain vegetative cover and few other fish species (LePage 2014). The normal-sized phenotype is also found in larger, deeper water bodies in the region (e.g., Grave Lake, Koocanusa Reservoir; LePage 2014). LePage (2014) concluded that, in addition to having smaller body size and different habitat preferences from the normal form, dwarf adults have a shorter head length and snout, larger mouth and eyes, and a more slender body than the normal form, suggesting that the adult dwarf sucker have retained some of the morphological characteristics of juveniles. The dwarf form also shows smaller home range size, younger age-at-maturity, lower maximum age, slower growth rate, lower fecundity, and smaller but proportionally larger egg size compared to normal sucker (LePage 2014). Slight, but significant, genetic differences were indicated between Elk River watershed dwarf and normal longnose sucker forms, and compared to the endangered Salish sucker. The study concluded that the dwarf form may have evolved to opportunistically expand into lentic areas subjected to seasonal flow disturbances and reduced oxygen levels, especially where predators and other interspecific competitors are few or lacking (LePage 2014).

Photo 9.1: Longnose Sucker Collection in Lentic Areas

Although the distribution of LSU is patchy and limited to lower elevations of the Elk River watershed (LePage 2014; Lotic 2014b), this species is an important biological component of some lentic areas. Therefore, it was chosen to serve as one of two "sentinel fish species"[33] in the RAEMP to support assessment of the aquatic ecosystem in the Elk River watershed downstream from Teck's coal mines (Minnow 2015a). Two reference and ten mine-exposed areas were sampled[34] in May 2015[35] (Figure 9.1; Appendix Table HLSU.1) for evaluation of LSU density, population size, health indicators, and tissue selenium concentrations. Although not stipulated in the study design (Minnow 2015a), mine-exposed areas with the most abundant LSU were revisited in September 2015, to determine if the timing of sampling affected LSU catch success and population estimates.

9.2 Fish Catches and LSU Population Estimates

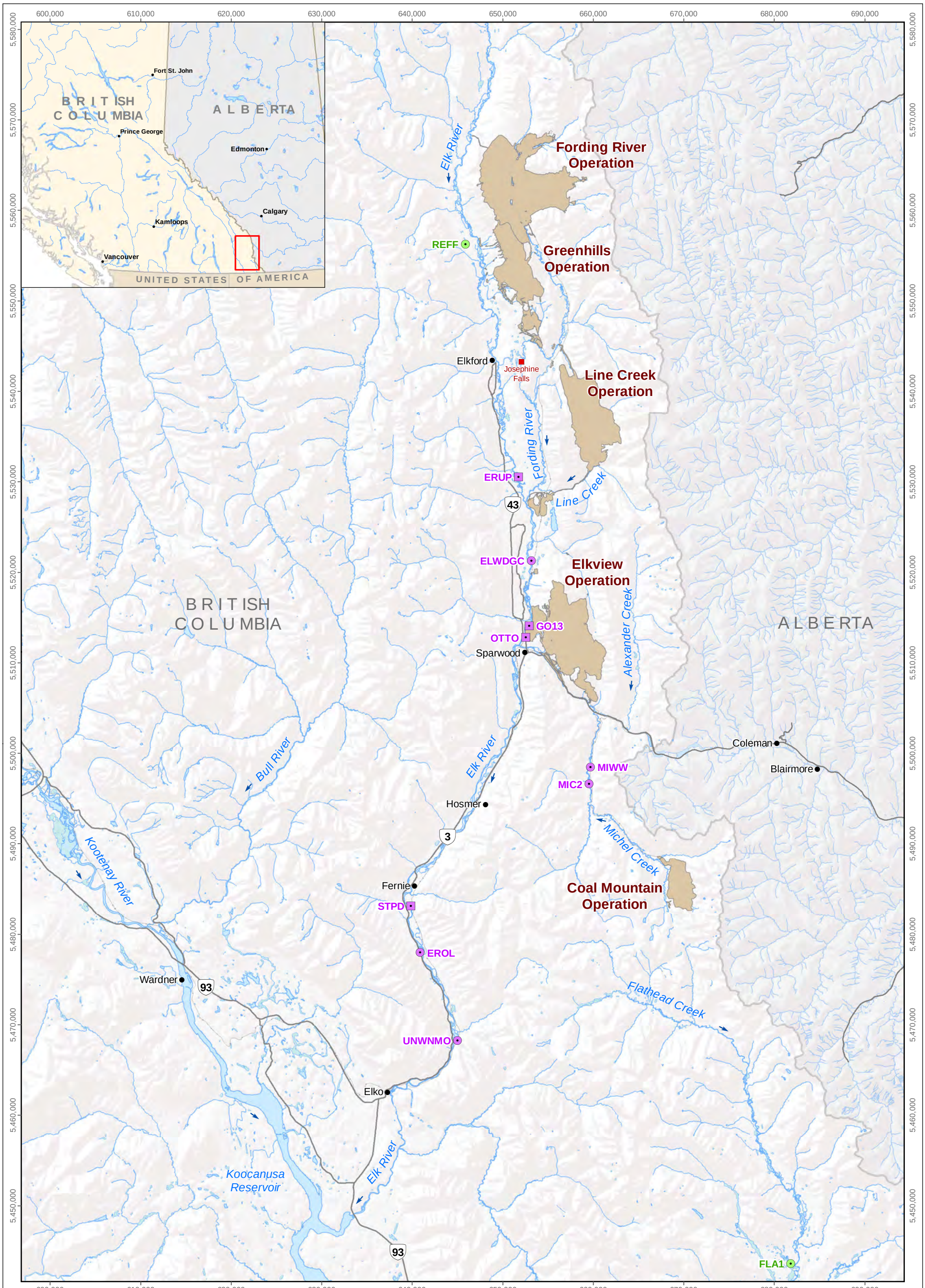
Among the areas targeted for LSU population monitoring, LSU was the dominant species captured in minnow traps in both May and September, 2015 (Table 9.1). Low numbers of redside shiner, longnose dace, juvenile cutthroat trout, and/or juvenile mountain whitefish were also captured at seven of the ten mine-exposed areas in May and/or September, but were not found at either of the two reference areas in minnow traps (Table 9.1). No LSU were captured at the REFF reference area or at the MI16 mine-exposed area, and only low numbers (<10) were captured at ELWDGC, MIC2, MIWW, and EROL mine-exposed areas sampled in May (Table 9.1). Greater numbers of LSU were captured in September than May at each of the four mine-exposed areas that were re-sampled using comparable fishing effort (i.e., consecutive nights until a minimum of 10% of marked fish were recaptured or a maximum of four nights).

LSU population estimates varied widely among the twelve study areas in May 2015. Largest population sizes were estimated for mine-exposed areas Goddard Marsh (GO13), Otto Ponds (OTTO) and Stanford Pond (STPD), where populations were greater than at the reference areas (Table 9.2). The LSU population at the mine-exposed Elk River Upper Ponds (ERUP) was comparable to the FLA1 reference population, whereas relatively small LSU populations were estimated for ELWDGC, MIC2, MIWW, and EROL mine-exposed areas during the May sampling event (Table 9.2). Confidence limits for the LSU population estimates were wide, especially in May. Longnose sucker population estimates did not show consistent numbers

[33] The use of this term is consistent with Gray et al. (2002) and Environment Canada (2012a). The other sentinel species chosen was westslope cutthroat trout, which is discussed in Section 10.

[34] The study design indicated two reference areas and seven mine exposed areas would be targeted from a list of three reference and 10 mine-exposed candidate areas.

[35] Limited information indicates that dwarf longnose sucker spawn in late May or early June, but the timing likely varies among years based on water flows and/or temperature.



LEGEND

Longnose Sucker Sampling Location

- Reference
- Mine Exposed
- Sampled in Spring (2015)
- Sampled in Spring and Fall (2015)
- Teck Coal Mine Operation

Longnose Sucker Sampling Areas

0 5 10 20
km

N
W E
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Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
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Figure 9.1

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Table 9.1: Total Catch and CPUE of All Species by Minnow Trap, May, and September 2015

Biological Area Code		Longnose Sucker				Cutthroat Trout				Redside Shiner				Mountain Whitefish				Longnose Dace			
		May		September		May		September		May		September		May		September		May		September	
		Catch	CPUE[a]	Catch	CPUE[a]	Catch	CPUE[a]	Catch	CPUE[a]	Catch	CPUE[a]	Catch	CPUE[a]	Catch	CPUE[a]	Catch	CPUE[a]	Catch	CPUE[a]	Catch	CPUE[a]
Reference	REFF	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
	FLA1	66	3.09	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
Mine-exposed	ERUP	32	0.98	42	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.03
	ELWDGC	6	0.29	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
	GO13	79	2.63	243	7.88	6	0.20	0	0	6	0.20	2	0.06	1	0.03	15	0.48	2	0.07	12	0.38
	OTTO	85	2.15	187	4.81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16	0	0	-	-	4	0.24	-	-	0	0	-	-	0	0	-	-	0	0	-	-
	MIC2	2	0.11	-	-	1	0.05	-	-	1	0.05	-	-	0	0	-	-	0	0	-	-
	MIWW	2	0	-	-	1	0.04	-	-	0	0	-	-	0	0	-	-	0	0	-	-
	STPD	123	5.41	395	15.41	0	0	0	0	4	0.18	2	0.08	0	0	1	0.04	0	0	0	0
	EROL	9	0.24	-	-	0	0	-	-	20	0.54	-	-	0	0	-	-	1	0.03	-	-
	UNWNMO	35	1.82	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch / minnow trap / day (24 hours)

within each of the four individual study areas, nor relative to one another, between May and September 2015 (Table 9.2). However, narrower confidence limits were obtained using the September catch data.

Table 9.2: Longnose Sucker Population Estimates Based on Minnow Trap Catch-release Sampling in May and September 2015

Biological Area Code		May Population Estimate[a]	September Population Estimate[a]	May Fish Density (No. fish/ha)
Reference	REFF	0	-[c]	0
	FLA1	364 (152 - 1,066)	-[c]	10.9
Mine-exposed	ERUP	357 (109 - incalculable[b])	183 (55 - 1,028)	5.8
	ELWDGC	9 (3 - incalculable[b])	-[c]	0.9
	GO13	1,069 (402 - 41,922)	4,357 (2,151 - 21,303)	17.2
	OTTO	689 (309 - 5,820)	1,304 (814 - 2,695)	10.5
	MI16	0	-[c]	0
	MIC2	>5 (incalculable[b])	-[c]	>0.18
	MIWW	>3 (incalculable[b])	-[c]	>0.13
	STPD	5,417 (1,649 - incalculable[b])	2,996 (1,944 - 4,824)	170
	EROL	25 (8 - incalculable[b])	-c	0
	UNWNMO	274 (83 - incalculable[b])	-c	3.7

[a] Population estimate (95% confidence limits for a Poisson Frequency Distribution).
[b] Upper population range could not be calculated due to few fish recaptures.
[c] Area was not re-sampled in September.

In 2013, a study of LSU presence/absence, abundance (density) and health was implemented at a variety of lentic areas to inform the design of the RAEMP (Lotic Environmental 2014b). Similar to this study, low densities were reported at a number of oxbows on the Elk River and Michel Creek, although the study was potentially confounded by reduced catch success associated with lower temperatures (mid-September to early October).

9.3 LSU Health Indicators

9.3.1 Comparisons to Reference Area

Potential differences in LSU fork length, body weight, and condition between mine-exposed and reference areas were tested for areas sampled in 2015 using ANOVA followed by *post hoc* comparisons. Mean fork length and body weight were significantly lower for LSU captured at OTTO and STPD compared to the reference area (Figure 9.2; Appendix Table HLSU.8). A significant increase in mean fork length was observed at ERUP, and significant increases in body weight were observed at ERUP and GO13, compared to the reference area.

Potential differences among areas were tested for LSU length-frequency distributions using two-sample KS tests, which compare the cumulative relative frequency distributions between areas (Appendix Table HLSU.8; Appendix Figures HLSU.3 and HLSU.4). The K-S test compares the maximum vertical distance (displayed as a percentage in Appendix Figure HLSU.4) between two cumulative relative frequency distributions to a critical value (based on α and sample size). These plots help demonstrate the size at which differences in length frequency distributions are observed and the magnitude of the differences. For example, 71% of fish at FLA1 were < 10 cm in length and 47% of fish at UNWNMO were < 10 cm in length (a difference of 25% between these two areas). The length frequency distributions were compared between mine-exposed areas and the FLA1 reference area. Differences of 39% and 32% at ERUP and GO13, respectively, indicated significantly fewer small fish were captured at these areas compared to the reference area, whereas differences of -34% and -46% for OTTO and STPD, respectively, indicated a greater proportion of small fish captured at these areas compared to the reference area. The differences in cumulative frequency distribution detected for OTTO and STPD support the test results shown in Figure 9.2 of shorter mean length at those areas compared to the reference areas. The reason for fewer small fish at ERUP and GO13 has not yet been determined, but could be linked to reduced recruitment. This will be investigated in future studies associated with the RAEMP.

9.3.2 Temporal Changes

Based on input from the EMC, evaluation of potential changes over time focused on LSU condition. No differences in LSU condition were found between fish captured in May versus September 2015 among four mine-exposed areas, so fish from both months were used in comparisons among years (Appendix Table HLSU.9). Increases in condition were observed at three of six areas in 2015 compared to earlier years (Appendix Table HLSU.10). Condition was increased by 6.8% at the Elk River upper ponds (ERUP) in 2015 compared to 2005. Increases of 5.4% and 6.2% were also observed for the Flathead reference area (FLA1) and mine-

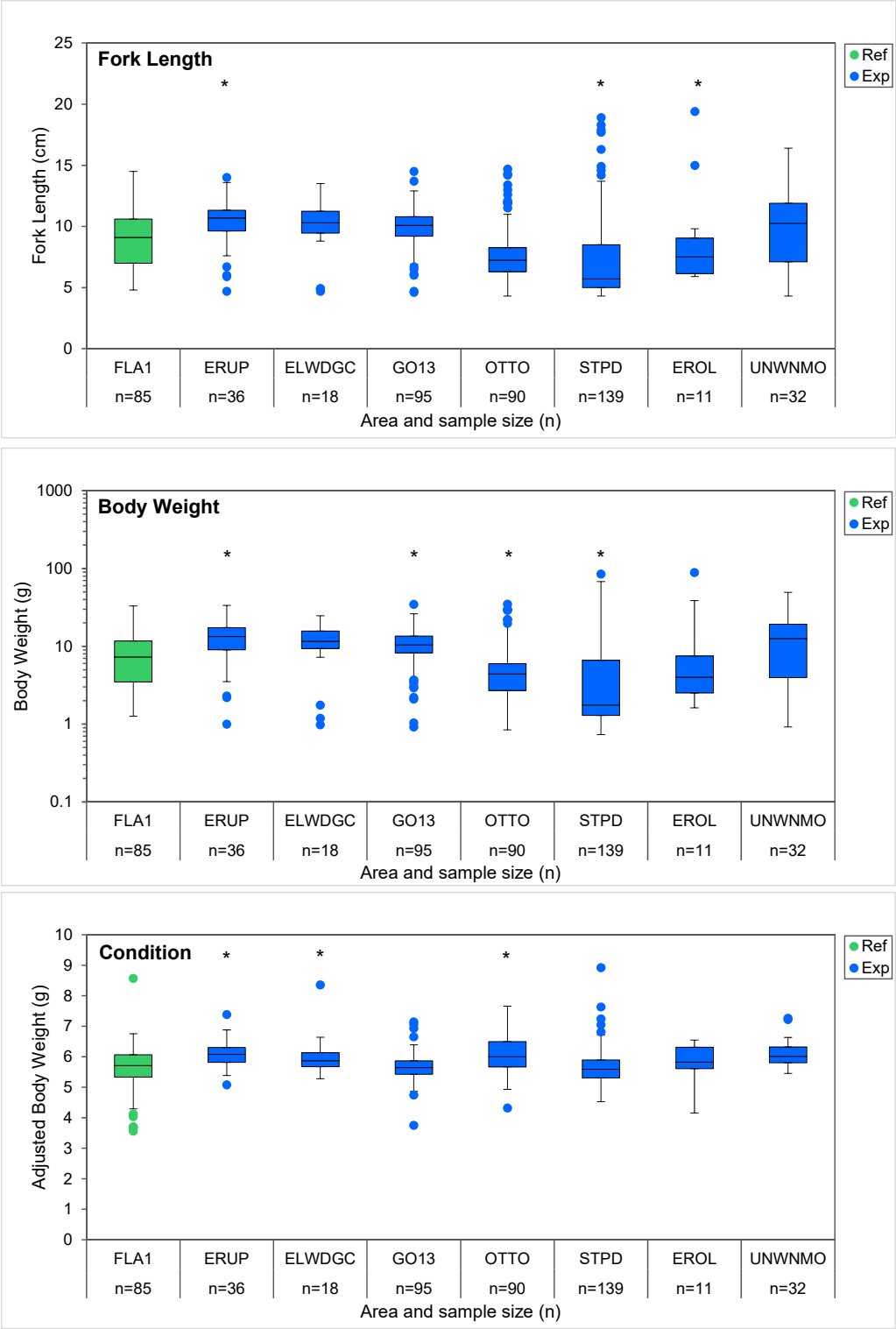


Figure 9.2: Boxplots of Fork Length, Body Weight, and Condition for Longnose Sucker Among Reference and Mine-exposed Areas, May 2015

Notes: * = significantly different from FLA1 (Dunn's Test for Fork Length and Body Weight; Dunnett's test for Condition; α = 0.1). For condition, body weight was adjusted to a fork length of 8.19 cm based on the parallel slope ANCOVA model.

exposed Otto Ponds (OTTO), respectively. These changes are less than what Environment Canada (2012b) defines as a "critical effect size" of 10% for fish condition and the observation of similar magnitude change between reference and mine-exposed areas also suggests the observed differences are not ecologically meaningful.

9.4 Tissue Selenium

9.4.1 Overview

Tissue sampling in May 2015 targeted ovaries and whole bodies of LSU, consistent with the RAEMP study design (Minnow 2015a). However, sampling revealed that the females at some areas had already spawned, possibly because limited winter snow pack and warm weather caused the freshet to be small and earlier than normal. Longnose sucker ovary selenium concentrations tend to be similar to muscle selenium concentrations in the pre-spawning period (Figure 9.3); therefore, muscle samples were collected from spent females to serve as a surrogate for ovary selenium concentration evaluation. A muscle selenium benchmark for LSU was estimated by converting the EVWQP Level 1 benchmark for fish ovary selenium (18 mg/kg dw) to a muscle benchmark (18 mg/kg dw) based on the aforementioned relationship (Figure 9.3).

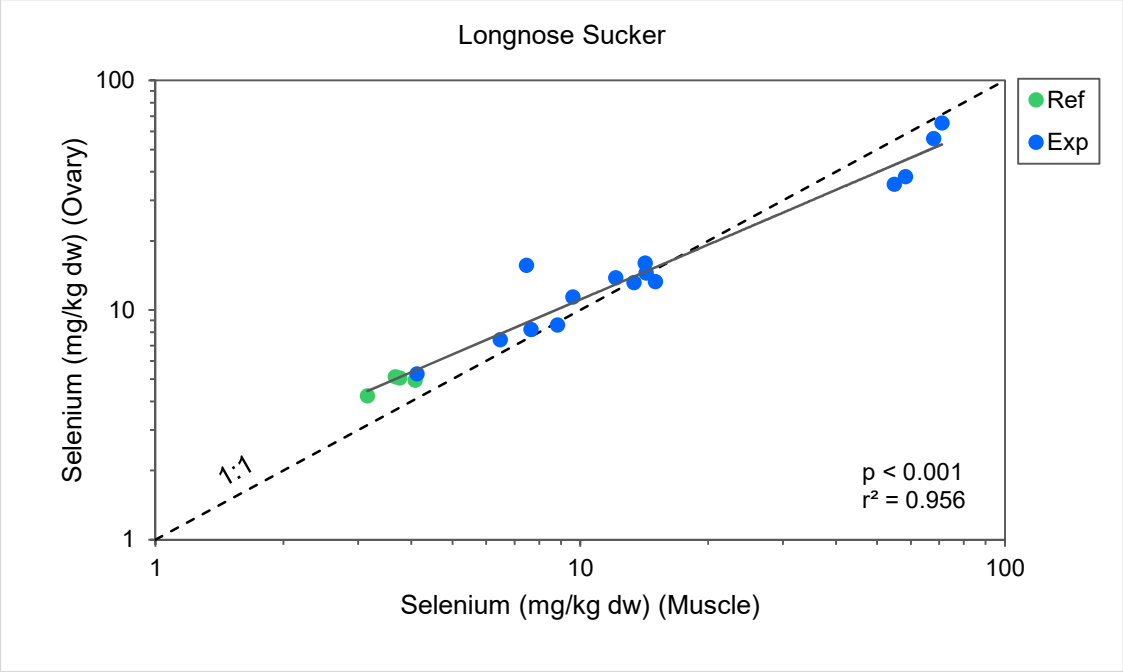


Figure 9.3: Linear Regression of Selenium Concentrations in Ovary Versus Selenium Concentrations in Muscle for Longnose Sucker

9.4.2 Comparisons to Normal Reference Range

LSU tissue samples collected at reference areas from 2002 to 2015 were used to characterize normal ranges for muscle, ovary, and whole body selenium concentrations (Appendix Tables HLSU.14 to HLSU.16; Appendix Figure HLSU.10). Upper normal range limits were defined as 5.71, 6.09, and 6.64 mg/kg dw for ovary, muscle, and whole body selenium concentrations, respectively, based on these data. All LSU captured in mine-exposed areas in 2015 had tissue selenium concentrations greater than the normal reference ranges, except at the Elk River Upper Ponds (ERUP), where ovary selenium concentrations, and one muscle selenium concentration exceeded the normal range, but not whole body selenium concentrations (Figure 9.4; Appendix Table HLSU.17). One fish each had ovary and muscle selenium concentrations greater than the normal range at UNWNMO in 2015. NRQs were calculated by dividing the maximum concentrations observed for each LSU tissue in each area by the respective upper normal range limit (Appendix Table HLSU.18). NRQs were near or above one for muscle and whole body samples at the reference area and at all seven mine-exposed areas. However, ovary selenium concentrations were within the normal range at the reference area and at ERUP and UNWNMO, near the upper end of the normal range at ELWDGC and MIWW, and greater than the normal range at GO13 and STPD.

The LSU tissue selenium concentrations observed in 2015 were generally consistent with those observed in previous years in terms of being greater than the reference area normal ranges in most mine-exposed areas (Figure 9.4).

A Spearman correlation between LSU health endpoints and tissue selenium concentrations identified significant correlations between whole body selenium concentrations and both fish length and body weight, but correlation coefficients were low ($r \leq |0.32|$), indicating that selenium explained little of the variance in fish size (Appendix Table HLSU.20; Appendix Figure HLSU.12). No relationships were found between ovary or muscle selenium concentrations and the various fish health measurements. No significant correlations were detected between tissue selenium concentrations and condition factor, gonadosomatic index or liversomatic index.

9.4.3 Comparisons to Site-Specific Benchmarks

Ovary and muscle selenium concentrations were above site-specific Level 1 benchmarks for all LSU captured at Goddard Marsh (GO13), for some LSU captured at the Elk River wetland downstream from Grave Creek (ELWDGC), and at Stanford Pond (STPD) in 2015 (Figure 9.4; Appendix Table HLSU.17). Whole body selenium concentrations exceeded the BC guideline of 4 µg/g dw for all LSU captured at UNWNMO, ELWDGC, OTTO, MIWW, and STPD even though most or all muscle and ovary selenium concentrations were less than respective site-specific

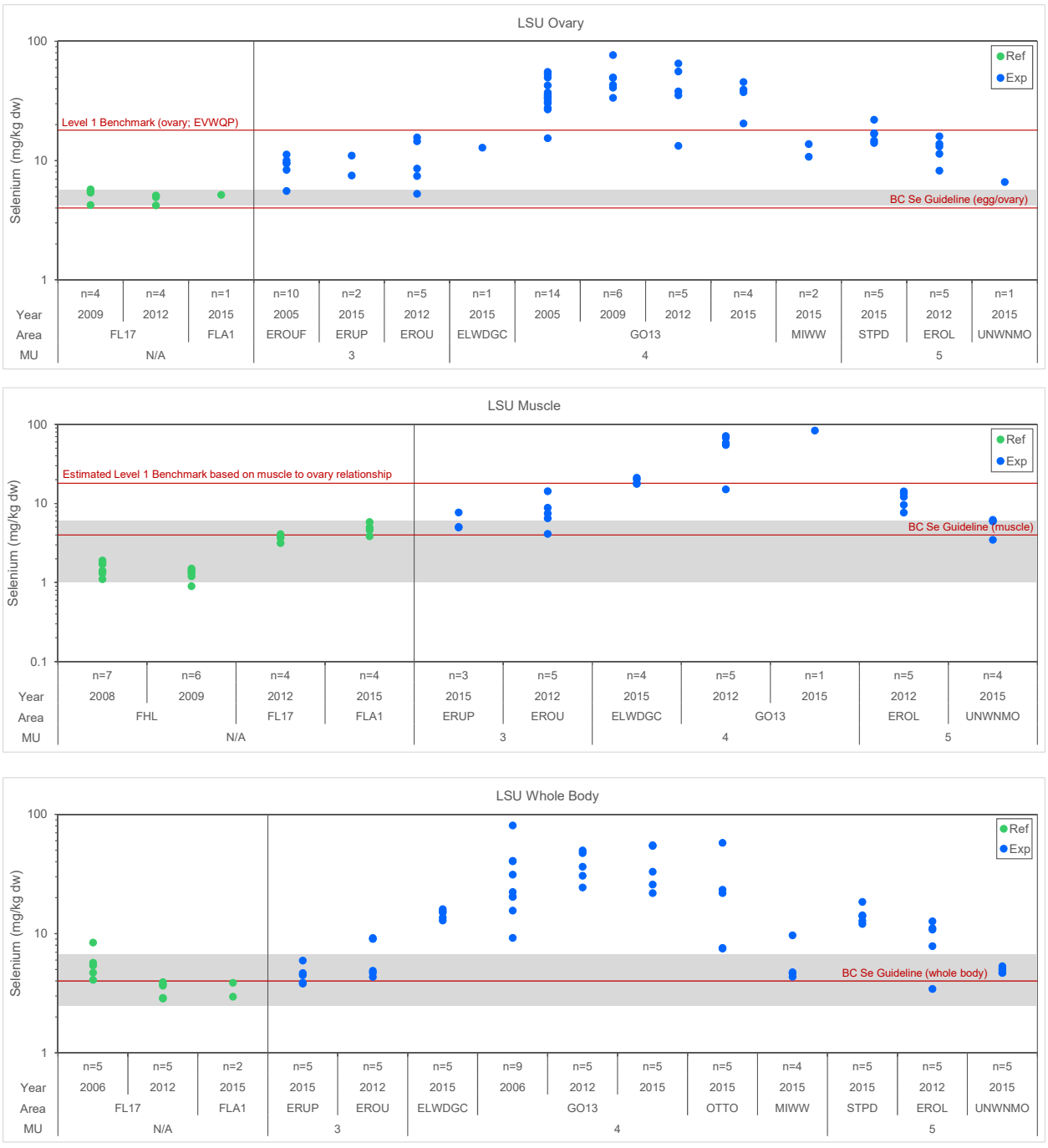


Figure 9.4: Selenium Concentrations in Longnose Sucker Ovary, Muscle, and Whole Body Samples Collected 2005 – 2015

Notes: Shaded region represents the reference area normal range

benchmarks in the areas where muscle and ovary selenium concentrations were also measured in 2015 (Appendix Table HLSU.17). Eggs/ovaries are considered the most relevant tissue type for evaluating the potential for reproductive effects (USEPA 2012).

The LSU tissue selenium concentrations observed in 2015 were generally consistent with those observed in previous years in terms of concentrations being most elevated compared to the Level 1 tissue benchmarks at GO13. Elevated whole body selenium concentrations were also observed at OTTO in 2015, but ovary or muscle selenium data, which would provide a better estimation of potential risk for reproductive effects, are currently lacking for this area (Figure 9.4).

9.4.4 Temporal Changes

Potential changes over time were evaluated for areas having at least three years of LSU tissue data using ANOVA or Kruskal-Wallis tests followed by *post hoc* pairwise comparisons (Appendix Table HLSU.19; Appendix Figure HLSU.11). The only significant difference detected was for the Flathead wetland reference area, where the mean whole body selenium concentration was slightly lower in both 2012 and 2015 (3-4 mg/kg dw) than in 2006 (5 mg/kg dw). There were no differences among years for mine-exposed areas.

9.5 Summary

Two reference and ten mine-exposed areas were sampled in May 2015 for evaluation of density, population size, morphometrics, and tissue selenium concentrations. Although not stipulated in the study design (Minnow 2015a), selected areas were revisited in September 2015, to determine if the timing of sampling affects catch success and population estimates.

LSU population estimates varied widely among the twelve study areas in May 2015. Largest population sizes were estimated for Goddard Marsh (GO13), Otto Ponds (OTTO) and Stanford Pond (STPD), where populations were greater than at the reference area. Confidence limits for the LSU population estimates were wide, especially in May. LSU population estimates were not consistent between May and September 2015; however, narrower confidence limits were obtained using September data.

Mean fork length and body weight were significantly lower for LSU captured at OTTO and STPD than at the reference area. Based on input from the EMC, evaluation of potential changes over time focused on LSU condition. Increases in condition were observed at three of six areas in 2015 compared to earlier years but the changes were small (<10%) and comparable in magnitude between the reference area and the two mine-exposed areas where the increases were observed.

All LSU captured in six of eight mine-exposed areas where tissues were collected had tissue selenium concentrations greater than the tissue-specific reference normal ranges. The exceptions were the most northerly mine-exposed area, Elk River upper ponds (ERUP) and the unnamed wetland near Morrissey (UNWNMO), where ovary selenium concentrations (2 of 2 at

ERUP and 1 of 1 at UNWNMO) and one muscle selenium concentration (of 3 at ERUP and 4 at UNWNMO) exceeded the normal range in each area, but not whole body selenium concentrations (n=5 in both areas). Ovary and muscle selenium concentrations were also above site-specific Level 1 benchmarks for all LSU captured at Goddard Marsh (GO13) and for some of the LSU captured at the Elk River wetland downstream from Grave Creek (ELWDGC) and at Stanford Pond (STPD).

10 WESTSLOPE CUTTHROAT TROUT

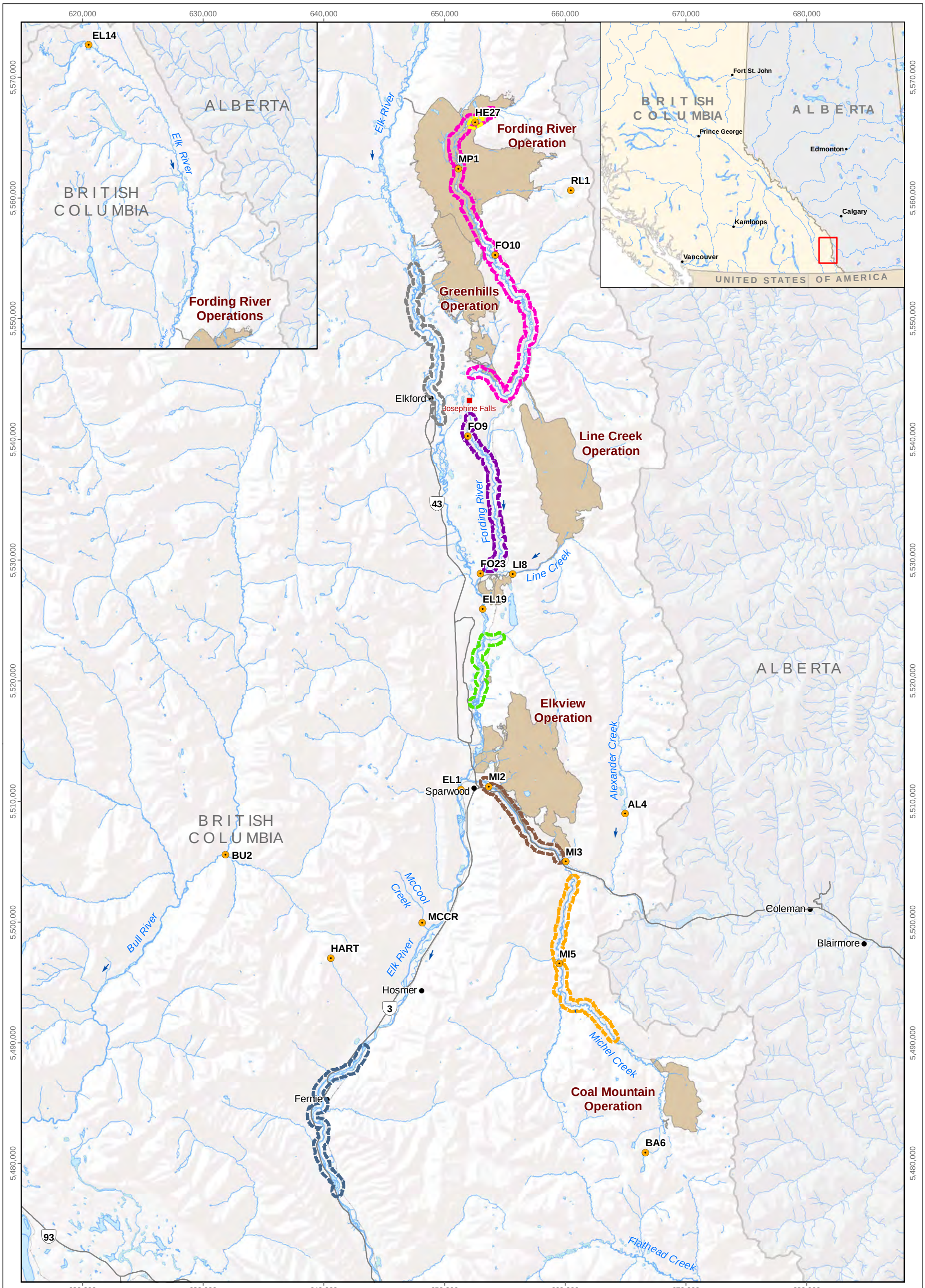
10.1 Overview

Westslope cutthroat trout (WCT) are widely distributed throughout the watershed and are the only fish present in the Fording River upstream of Josephine Falls. Josephine Falls has prevented upstream movement of fish, which has protected the population upstream from the falls from hybridization with non-native rainbow trout (and competition with non-native species in general). Consequently, the upper Fording River population is considered to be one of a limited number of populations that remains genetically pure, thus making it important in the context of WCT conservation (Cope et al. 2016). In 2010, the Province of British Columbia closed the upper Fording River to angling due to uncertainty regarding the WCT population status.

Fish population monitoring requires multiple years of study to understand and quantify basic population characteristics sufficiently to then monitor potential changes over time relative to stressors (e.g., mining, angling, extreme weather events, water chemistry, and habitat fragmentation). A three-year study (40 months of 2012 - 2015) was recently completed to determine if the upper Fording watershed WCT population is healthy, robust and sustainable, and to assess movement and critical habitat to help inform fish habitat management decisions (Cope et al. 2016). Results of the study are summarized in Section 10.2.

WCT muscle samples were collected non-lethally from main stem areas of the watershed in 2015 as part of the RAEMP to evaluate tissue selenium concentrations relative to predictions, normal ranges, and site-specific effect benchmarks developed in the EVWQP (Teck 2014). Representative photographs of WCT sampling in the Elk River watershed are shown in Photo 10.1. Sampling areas are shown in Figure 10.1.

Photo 10.1: Westslope Cutthroat Trout Sampling



LEGEND

- Areas Sampled in 2006, 2009, and/or 2012
- Upper Elk River (2015)
- Henretta Lake (HE27, 2015)
- Middle Elk River (2015)
- Lower Elk River (2015)
- Upper Fording River (2015)
- Lower Fording River (2015)
- Upper Michel Creek (2015)
- Lower Michel Creek (2015)
- Teck Coal Mine Operation

Westslope Cutthroat Trout Tissue Sampling Areas in 2006, 2009, 2012 and/or 2015

0 5 10 20
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Projection: North American Datum 1983 UTM Zone 11

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Figure 10.1

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10.2 Upper Fording River WCT

A 40-month study by Cope et al. (2016), completed in 2012 to 2015, employed a review of previous studies within the upper Fording River in combination with field methods that included telemetric methods, snorkel mark-recapture, Floy and PIT (Passive Integrated transponder) tag mark-recapture, juvenile density estimates (representative closed-station removal-depletion locations), and habitat mapping (review of high resolution [10 cm] aerial photography and ground-truthing). These methods characterized the fluvial population of WCT and their habitat within the upper Fording River watershed in terms of abundance, genetic differentiation, mortality rates, condition factors, age class structure, growth rates, life history strategies (home ranges, movement patterns and seasonal distribution by life stage), and habitat (available and critical [e.g., over-wintering, rearing, spawning and migration corridors]).

The use of telemetric methods confirmed both resident and migratory life history forms of WCT within the upper Fording River population. The study concluded that the upper Fording River population metrics of sub-adult and adult abundance (2,552 to 3,874 fish > 200 mm fork length), habitat availability (57.5 km of main stem river plus approximately 59 km of tributary habitat), and genetic integrity (pure strain) represent a viable WCT population. Population characteristics such as condition factor (weight to length relationships), growth rates, von Bertalanffy growth model estimates and population age structure indicate the population appears to be in good condition and robust, compared to similar upper Kootenay River populations.

Continued monitoring and evaluation were recommended to address outstanding statistical uncertainties and perceived threats to population resilience and sustainability. Plans to address some of the identified threats are being developed by Teck in collaboration with the Elk Valley Fish and Fish Habitat Committee and the EMC (i.e., Regional Fish Habitat Management Plan, Regional Offsetting Strategy, EVWQP, Tributary Evaluation, and Management Plan). In 2016, habitat rehabilitation (offsetting) measures were constructed to address some of the identified threats and additional offsetting measures are planned to be constructed over the next five years. Snorkel surveys of sub-adults and adults, as well as 3-pass closed-station electrofishing removal-depletion of fry and juveniles will occur in 2017, 2019, and 2021 to monitor trends in population characteristics.

10.3 Tissue Selenium

10.3.1 Comparison to Predictions

WCT tissue selenium concentrations measured in 2015 were compared to predictions derived from water modelling (Golder 2014a,b) and tissue bioaccumulation models developed for the EVWQP (Teck 2014). All observed concentrations were less than predicted mean concentrations (Table 10.1).

10.3.2 Comparisons to Normal Reference Ranges

WCT muscle samples collected in reference areas since 1996 were combined (n=210 samples) to characterize the reference normal range (Appendix Table HWCT.4; Appendix Figure HWCT.1). The upper limit of the normal range was defined as 5.98 mg/kg dw. All 90 WCT muscle samples collected in 2015 had selenium concentrations near or exceeding the upper normal range limit as reflected by NRQs of 0.7 or more (Table 10.2). Spearman correlations between WCT health endpoints and tissue Se concentrations did not identify any significant correlations (Appendix Table HWCT.7).

10.3.3 Comparisons to Site-Specific Benchmarks

All WCT muscle samples collected from lotic main stem areas in May or August 2015 (i.e., total of 80 samples) were less than the Level 1 benchmark for reproductive effects, as were most samples (98%) collected in three-year monitoring cycles beginning in 2006 (Figure 10.2). The results indicate low potential for reproductive effects of selenium to WCT.

The only lentic area where WCT muscle samples were collected in 2015 was Henretta Lake (MU1), where one of five fish had a muscle selenium concentration slightly greater than the Level 1 benchmark. WCT samples collected historically in lentic areas typically had concentrations less than the Level 1 benchmark, except at the Fording River Oxbow (FO10), where fish have not been sampled since 2009 and which was transformed from a lentic habitat to a lotic habitat during the record flood in June 2013. Selenium concentrations in benthic invertebrates collected at FO10 have been much lower since the flood (e.g., 7.1 mg/kg dw in 2015 compared to ≥ 28 mg/kg dw in 2006 to 2012; Minnow et al. 2011, Minnow 2014a), which is consistent with the expected behaviour of selenium in lotic versus lentic habitats (Figure 8.10).

10.3.4 Temporal Changes

Potential changes in WCT tissue selenium concentrations over time were evaluated using ANOVA followed by *post hoc* pairwise comparisons among years (Appendix Tables HWCT.8 and HWCT.9). Of all the areas sampled in 2015, differences among years were evident only for

Table 10.1: Lower (L) and Upper (U) Predicted Westslope Cutthroat Trout Muscle Selenium Concentrations for 2013 and 2017 Compared to the Observed Maximum Concentration of Samples Collected in 2015

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Location Code for Predictions	Area Description	Biological Sampling Area Code	Observed Maximum Muscle Selenium Concentration (µg/g dw)		2013 Prediction Interval (mg/kg dw)[a,b]			2017 Prediction Interval (mg/kg dw)[a,b]		
						2015							
						May	August	L	Mean	U	L	Mean	U
1	Fording	M	FR1	Fording River downstream of Henretta Creek	UFR - Upper Fording River - u/s Josephine Falls	13.7	11.5	3.8	13.9	19.3	4.0	14.5	20.1
			FR2	Fording River downstream of Clode Creek				4.3	15.7	21.8	4.6	16.5	23.0
			FR3	Fording River between Swift and Cataract Creeks				4.9	17.6	24.5	5.3	19.0	26.5
			FR3b	Fording River downstream of Porter Creek				5.2	18.6	26.0	5.2	18.9	26.4
			FR4	Fording River downstream of Greenhills Creek				4.6	16.8	23.4	4.7	17.1	23.8
2	Fording	M	FR5	Fording River at the mouth	LFR - Lower Fording River - d/s Josephine Falls	11.5	10.9	4.6	16.6	23.1	4.5	16.2	22.5
3	Elk	M	ER1	Elk River downstream of GHO and upstream of FRO	UER - Upper Elk River - downstream from GHO, upstream from Fording River	6.16	5.88	3.0	11.0	15.2	3.0	11.0	15.2
4	Elk	M	ER2	Elk River downstream of Fording River	MER - Middle Elk River - between Fording River and Michel Creek	8.74	8.41	3.7	13.3	18.4	3.6	13.1	18.2
			MC1	Michel Creek at the mouth	UMC - Upper Michel Creek - upstream from Alexander Creek	7.78	6.68	3.5	-	17.6	3.8	-	19.3
					LMC - Lower Michel Creek - downstream from Alexander Creek	7.56	8.79		12.7			13.9	
5	Elk	M	ER3	Elk River downstream of Michel Creek	LER - Lower Elk River - d/s from Sparwood (near Fernie)	8.1	8.6	3.4	12.4	17.2	3.5	12.7	17.6
			ER4	Elko Reservoir				3.3	11.9	16.5	3.4	12.2	16.9
			ER5	Elk River at the mouth				3.1	11.2	15.5	3.2	11.6	16.0
-	-	-	LK2	Elk River at Lake Koocanusa	-	-	-	3.0	10.9	15.0	3.0	11.0	15.2

[a] Approximate 95% prediction interval for Westslope Cutthroat Trout Muscle selenium concentrations (mg/kg dw) (±2 RMSD) of 2-step, water to invertebrate, bioaccumulation model that used predictions from regional water quality model.
[b] Muscle selenium concentrations were converted from predicted ovary selenium concentrations using the equation Muscle Se = $(\text{Egg Se}/1.6862)^{1.0199}$ (Nautilus and Interior Reforestation 2011)

Bold values are >20% higher than the mean of predicted means for 2013 and 2017

observed value is greater than upper limit of the prediction interval

Table 10.2: Normal Range Quotients and Hazard Quotients for Selenium in Westslope Cutthroat Trout Muscle Collected in the Elk River Valley in May and August 2015

Area		Date	Sample ID	Moisture (%)	Selenium (mg/kg dry wt)	Selenium (NR Quotient)[a]	Selenium Hazard Quotient[b]
			Benchmark	-	-	5.98	15.5
Lentic	Henretta Lake	6-May-15	HE27-WCT-01	81%	8.6	1.4	0.6
		11-May-15	HE27-WCT-03	75%	13	2.1	0.8
		11-May-15	HE27-WCT-04	75%	14	2.3	0.9
		11-May-15	HE27-WCT-06	74%	14	2.3	0.9
		11-May-15	HE27-WCT-09	76%	17	2.8	1.1
Lotic	Upper Fording River	11-May-15	UFR-WCT-01	73%	13	2.2	0.8
		11-May-15	UFR-WCT-02	73%	11	1.8	0.7
		11-May-15	UFR-WCT-03	74%	7.9	1.3	0.5
		11-May-15	UFR-WCT-04	73%	11	1.8	0.7
		11-May-15	UFR-WCT-05	71%	9.6	1.6	0.6
		12-May-15	UFR-WCT-06	75%	14	2.3	0.9
		12-May-15	UFR-WCT-07	69%	11	1.8	0.7
		12-May-15	UFR-WCT-08	75%	11	1.8	0.7
		12-May-15	UFR-WCT-09	74%	10	1.7	0.7
		12-May-15	UFR-WCT-10	71%	9.3	1.5	0.6
	Lower Fording River	8-May-15	LFR-WCT-01	75%	11	1.8	0.7
		8-May-15	LFR-WCT-02	77%	10	1.7	0.7
		9-May-15	LFR-WCT-03	74%	12	1.9	0.7
		10-May-15	LFR-WCT-04	78%	7.3	1.2	0.5
		12-May-15	LFR-WCT-05	79%	6.7	1.1	0.4
	Upper Michel Creek	12-May-15	MCU-WCT-01	75%	4.5	0.8	0.3
		13-May-15	MCU-WCT-02	80%	5.5	0.9	0.4
		13-May-15	MCU-WCT-03	76%	5.6	0.9	0.4
		13-May-15	MCU-WCT-04	77%	5.4	0.9	0.3
		13-May-15	MCU-WCT-05	75%	7.8	1.3	0.5
	Lower Michel Creek	5-May-15	MCL-WCT-01	72%	6.0	1.0	0.4
		5-May-15	MCL-WCT-02	64%	6.6	1.1	0.4
		5-May-15	MCL-WCT-03	82%	6.4	1.1	0.4
		5-May-15	MCL-WCT-04	51%	7.5	1.3	0.5
		7-May-15	MCL-WCT-05	71%	7.6	1.3	0.5
		7-May-15	MCL-WCT-06	66%	4.9	0.8	0.3
		7-May-15	MCL-WCT-07	76%	5.1	0.9	0.3
	Upper Elk River	9-May-15	UER-WCT-01	83%	6.2	1.0	0.4
		9-May-15	UER-WCT-02	79%	4.1	0.7	0.3
		10-May-15	UER-WCT-03	75%	6.0	1.0	0.4
		10-May-15	UER-WCT-04	77%	5.0	0.8	0.3
		10-May-15	UER-WCT-05	73%	5.2	0.9	0.3
	Middle Elk River	8-May-15	MER-WCT-1	75%	8.7	1.5	0.6
		8-May-15	MER-WCT-2	76%	7.9	1.3	0.5
		8-May-15	MER-WCT-3	75%	8.1	1.4	0.5
		10-May-15	MER-WCT-4	75%	7.6	1.3	0.5
		10-May-15	MER-WCT-5	69%	5.7	0.9	0.4
	Lower Elk River[c]	7-May-15	LER-WCT-01	75%	8.0	1.3	0.5
		7-May-15	LER-WCT-02	79%	8.1	1.4	0.5
		7-May-15	LER-WCT-03	72%	6.3	1.0	0.4
		7-May-15	LER-WCT-04	75%	4.5	0.7	0.3
		7-May-15	LER-WCT-05[c]	-	-	-	-

Area		Date	Sample ID	Moisture (%)	Selenium (mg/kg dry wt)	Selenium (NR Quotient)[a]	Selenium Hazard Quotient[b]
			Benchmark	-	-	5.98	15.5
Lentic	Henretta Lake	20-Aug-15	HE27-WCT-A1	71%	8.41	1.4	0.5
		25-Aug-15	HE27-WCT-A2	77%	7.58	1.3	0.5
		25-Aug-15	HE27-WCT-A3	70%	13.8	2.3	0.9
		25-Aug-15	HE27-WCT-A4	68%	12.6	2.1	0.8
		25-Aug-15	HE27-WCT-A5	64%	10.3	1.7	0.7
Lotic	Upper Fording River	20-Aug-15	UFR-WCT-A2	74%	10.8	1.8	0.7
		20-Aug-15	UFR-WCT-A7	60%	8.68	1.5	0.6
		20-Aug-15	UFR-WCT-A8	77%	9.26	1.5	0.6
		23-Aug-15	UFR-WCT-A9	80%	8.27	1.4	0.5
		23-Aug-15	UFR-WCT-A10	78%	10.8	1.8	0.7
		23-Aug-15	UFR-WCT-A12	78%	11.5	1.9	0.7
		23-Aug-15	UFR-WCT-A13	80%	6.93	1.2	0.4
		23-Aug-15	UFR-WCT-A14	75%	9.02	1.5	0.6
		23-Aug-15	UFR-WCT-A15	85%	8.87	1.5	0.6
		-	-	-	-	-	-
	Lower Fording River	22-Aug-15	LFR-WCT-A1	75%	7.36	1.2	0.5
		22-Aug-15	LFR-WCT-A2	77%	8.19	1.4	0.5
		22-Aug-15	LFR-WCT-A3	75%	9.6	1.6	0.6
		23-Aug-15	LFR-WCT-A4	76%	10.9	1.8	0.7
		23-Aug-15	LFR-WCT-A5	74%	9.62	1.6	0.6
	Upper Michel Creek	21-Aug-15	MCU-WCT-A2	78%	6.19	1.0	0.4
		21-Aug-15	MCU-WCT-A3	69%	6.05	1.0	0.4
		21-Aug-15	MCU-WCT-A4	70%	4.81	0.8	0.3
		21-Aug-15	MCU-WCT-A5	73%	5.09	0.9	0.3
		25-Aug-15	MCU-WCT-A6	73%	6.68	1.1	0.4
	Lower Michel Creek	21-Aug-15	MCL-WCT-A1	76%	6.72	1.1	0.4
		21-Aug-15	MCL-WCT-A2	71%	7.06	1.2	0.5
		21-Aug-15	MCL-WCT-A4	76%	6.8	1.1	0.4
		25-Aug-15	MCL-WCT-A5	75%	8.08	1.4	0.5
		25-Aug-15	MCL-WCT-A6	77%	8.79	1.5	0.6
		-	-	-	-	-	-
		-	-	-	-	-	-
	Upper Elk River	22-Aug-15	UER-WCT-A1	72%	4.78	0.8	0.3
		22-Aug-15	UER-WCT-A2	75%	5.03	0.8	0.3
		23-Aug-15	UER-WCT-A3	82%	4.95	0.8	0.3
		23-Aug-15	UER-WCT-A4	77%	5.88	1.0	0.4
		23-Aug-15	UER-WCT-A6	82%	5.52	0.9	0.4
	Middle Elk River	25-Aug-15	MER-WCT-A1	74%	8.41	1.4	0.5
		25-Aug-15	MER-WCT-A2	76%	7.04	1.2	0.5
		25-Aug-15	MER-WCT-A3	74%	6.18	1.0	0.4
		25-Aug-15	MER-WCT-A4	73%	6.26	1.0	0.4
		25-Aug-15	MER-WCT-A5	74%	5.84	1.0	0.4
	Lower Elk River	24-Aug-15	LER-WCT-A2	75%	8.6	1.4	0.6
		24-Aug-15	LER-WCT-A3	77%	7.45	1.2	0.5
		24-Aug-15	LER-WCT-A4	67%	6.47	1.1	0.4
		24-Aug-15	LER-WCT-A5	75%	8.53	1.4	0.6
		24-Aug-15	LER-WCT-A6	71%	6.69	1.1	0.4

Good (Quotient < 0.7)
Marginal (Quotient between 0.7 and 1.0)
Poor (Quotient > 1.0)

[a] Quotient was calculated as the tissue selenium concentration divided by the upper limit of the normal range (97.5th percentile of reference area selenium concentrations)

[b] Hazard quotient was caclulated as ovary selenium concentration divided by 15.5 mg/kg, derived from Level 1 egg/ovary benchmark (Golder 2014c) and converting to muscle equivalent value based on ovary-muscle relationship (Nautilus and Interior Reforestation, 2011)

[c] LER-WCT-05 lost during freeze drying.

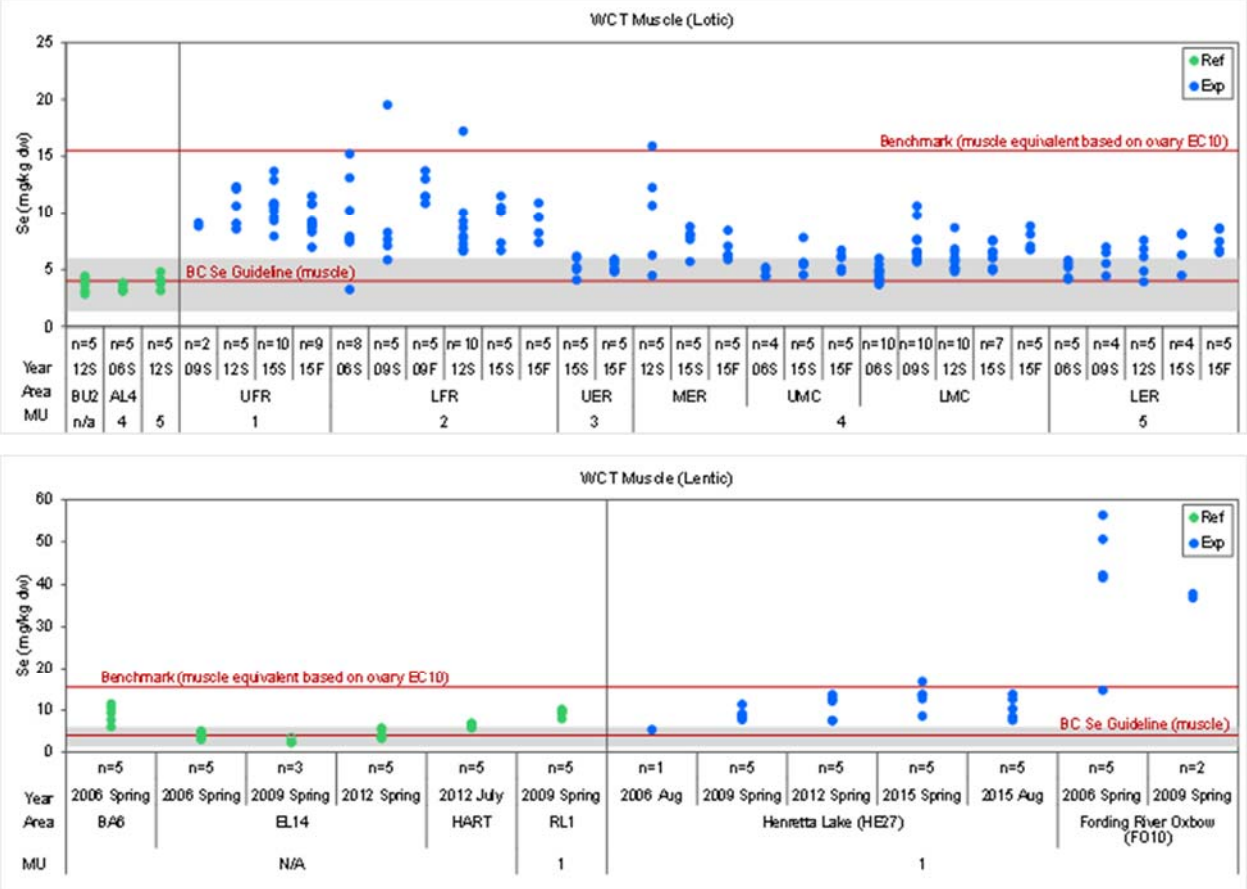


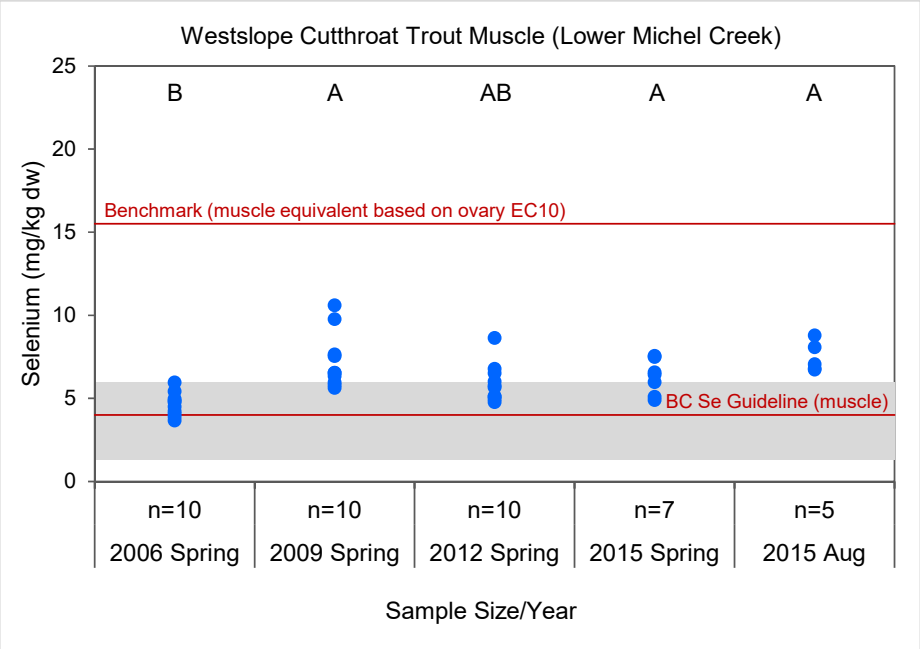
Figure 10.2: Selenium Concentrations in Westslope Cutthroat Trout Muscle Samples Collected in Lotic and Lentic Habitats, 2006 - 2015

Notes: Shading represents Normal Range. The first two digits of the year were truncated for plotting purposes; S = Spring (i.e. April – June) and F = Fall (August and September); UFR = Upper Fording River; LFR = Lower Fording River; UER = Upper Elk River; MER = Middle Elk River; UMC = Upper Michel Creek; LMC = Lower Michel Creek; LER = Lower Elk River. Concentrations reported below the LRL are plotted as open symbols at the LRL.

lower Michel Creek and the lower Elk River (Figure 10.3; Appendix Figure HWCT.2). Muscle selenium concentrations in lower Michel Creek were variable over time, and did not indicate a trend. Concentrations in WCT from the lower Elk River suggest a potential increasing trend that warrants further investigation.

10.4 Summary

A four-year study (2012 - 2015, inclusive) by Cope et al. (2016) characterized the fluvial population of WCT and their habitat within the upper Fording River watershed. The use of telemetric methods confirmed both resident and migratory life history forms of WCT within the



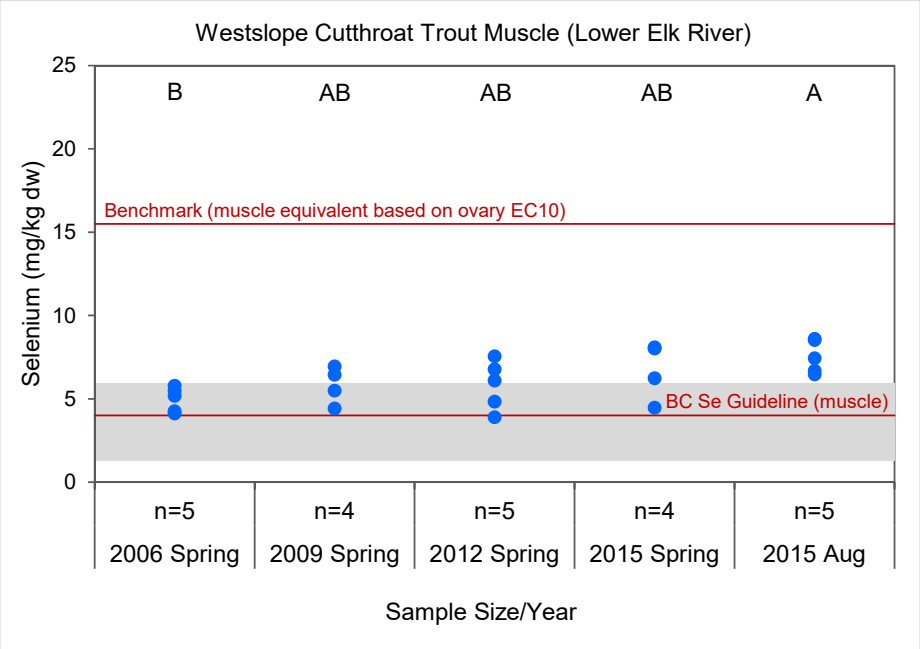


Figure 10.3: Areas with Significant Changes in Westslope Cutthroat Trout Muscle Selenium Concentration Over Time

Notes: time periods that do not share a letter are significantly different (p-value < 0.1)

upper Fording River population. The study concluded that the upper Fording River population metrics of sub-adult and adult abundance (2,552 to 3,874 fish > 200 mm fork length), habitat availability (57.5 km of main stem river plus approximately 59 km of tributary habitat), and

genetic integrity (pure strain) represent a viable WCT population. Population characteristics such as condition factor (weight to length relationships), growth rates, von Bertalanffy growth model estimates, and population age structure indicate the population appears to be in good condition and robust compared to similar upper Kootenay River populations.

WCT muscle samples were collected non-lethally from main stem areas of the watershed in May and August 2015 to evaluate tissue selenium concentrations relative to predictions, normal ranges, and site-specific effect benchmarks developed in the EVWQP. Although all 90 fish had concentrations near or above the normal range for reference area fish, only one muscle sample (from one of the 10 fish collected in Henretta Lake), exceeded the Level 1 benchmark for reproductive effects. Tissue selenium concentrations were also within prediction intervals derived from water quality and tissue selenium bioaccumulation models developed in the EVWQP.

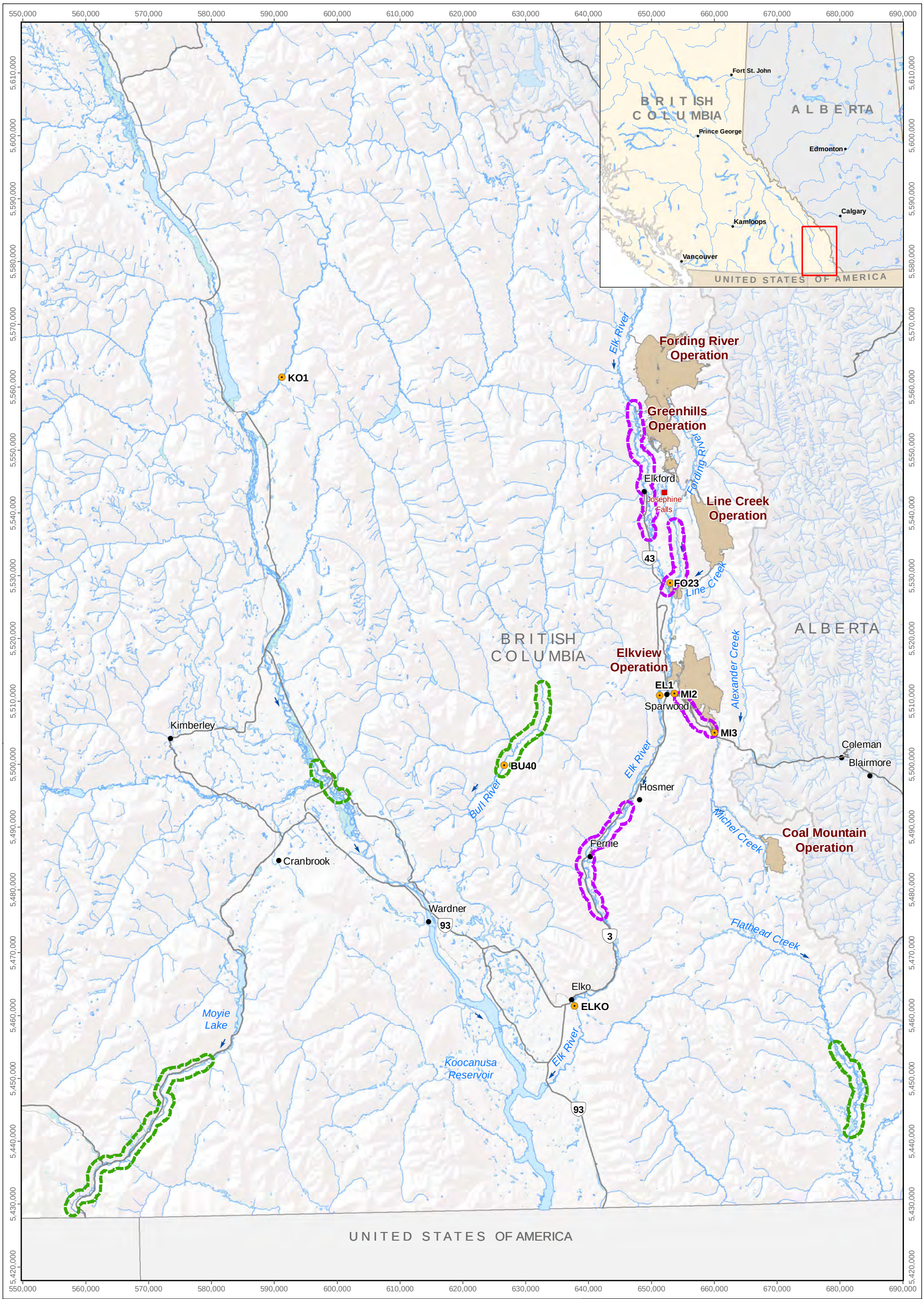
11 MOUNTAIN WHITEFISH TISSUE SELENIUM

11.1 Overview

Mountain whitefish (*Prosopium williamsoni)* is a species native to the Elk River basin, where it is found mainly along the main stem of the Elk River and in lower reaches of larger tributaries such as the Fording River, Line Creek, Alexander Creek, and Michel Creek (Photo 11.1; Wilkinson 2009, Interior Reforestation 2011). Mountain whitefish is an important species to recreational and subsistence fishers in the Elk River valley. As such, whitefish were sampled as part of the RAEMP mainly to support evaluation of human health risks related to whitefish consumption (evaluated outside of the RAEMP; Ramboll Environ 2016). Tissue selenium concentrations were also evaluated relative to normal ranges and Level 1 benchmarks from the EVWQP.

A photograph of a mountain whitefish collected in the Elk River watershed is shown in Photo 11.1. Figure 11.1 depicts the sampling areas for mountain whitefish in 2015.

Photo 11.1: Mountain Whitefish



LEGEND

- Areas Sampled in 2006, 2009, and/or 2012
- Mine-Exposed (2015)
- Reference (2015)
- Teck Coal Mine Operation

Mountain Whitefish Tissue Sampling Areas in 2006, 2009, 2012 and/or 2015

0 5 10 20
km

N
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Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
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Figure 11.1

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11.2 Comparisons to Normal Reference Ranges

Tissue samples collected in reference areas since 2008 were combined to characterize the reference normal ranges for muscle (n=72) and ovary (n=31) selenium concentrations (Appendix Tables HMW.2 and HMW.3; Appendix Figure HMW.1). Selenium concentrations were greater than the reference area normal range for 12 of 20 (60%) muscle samples and 2 of 20 (15%) ovary samples collected in mine-exposed areas of the Elk River, lower Fording River, and lower Michel Creek in 2015 (Figure 11.2; Appendix Table HMW.4 and HMW.5).

Compared to most other fish species, mountain whitefish collected throughout the Elk River watershed have unusually high selenium concentrations in eggs/ovaries relative to muscle concentrations (Table 11.1). On average, selenium concentrations in MW ovaries are about 7 times those in muscle, although there is considerable variability in the relationship (Figure 11.3). In most other fish species, ovary selenium concentrations are 1 to 2 times those in muscle.

Spearman correlations between MW health endpoints and tissue selenium concentrations identified a number of significant correlations (Appendix Table HMW.6; Appendix Figure HMW.2 and HMW.3). Ovary and muscle selenium concentrations both correlated with mountain whitefish length and body weight, but not condition factor or gonadosomatic index (Appendix Table HMW.6). Muscle selenium concentrations also correlated with liversomatic index. This may be because whitefish captured in mine-exposed areas, where selenium exposure was higher, were also slightly longer and heavier, on average (Appendix Figures HMW.2 and HMW.3).

11.3 Comparisons to Site-Specific Benchmarks

A site-specific study of selenium effects to mountain whitefish estimated the effect threshold for selenium to be 29.3 mg/kg dw or higher in eggs/ovaries (Nautilus 2017). Ovary selenium concentrations were greater than the BC ovary selenium guideline among most reference and mine-exposed mountain whitefish, and 6 of the 20 (30%) individual mine-exposed whitefish (from lower Michel Creek and the lower Elk River in 2015) had ovary selenium concentrations greater than the lower bound of the estimated effect threshold for this species (Figure 11.2; Table 11.2; Appendix Table HMW.4). Highest whitefish ovary selenium concentrations were observed in 2006 and 2009 when sampling was completed in late August or early September, instead of in October (2012, 2015). The effects of sample timing on tissue selenium concentrations are discussed further in Section 11.4.

For LSU and WCT, ovary selenium benchmarks could be converted to an equivalent benchmark for muscle samples based on strong relationships between muscle and ovary selenium concentrations, but this was not done for whitefish due to the high variability in the relationship

Table 11.1: Ovary to Muscle Selenium Relationships for Different Fish Species in the Elk Valley and Various Locations in the Literature

Location	Source	Common Name	Scientific Name	Ovary to Muscle Concentration Ratios[a]			Regression[b]	
				Minimum	Maximum	Average	P-value	r^2
Elk Valley	This report	Longnose sucker	*Catostomus catostomus*	0.64	2.1	1.1	<0.001	0.96
		Mountain whitefish	*Prosopium williamsoni*	1.8	16.4	7.0	<0.001	0.52
	Nautilus and IR (2011)	Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	0.5[c]	6[c]	2[c]	<0.001	0.82
Various	USEPA (2016)	Black bullhead	*Ameiurus melas*	3.4	18.9	6.84	0.25	-
		Bluegill	*Lepomis macrochirus*	0.5	2.4	1.38	<0.001	0.65
		Bluehead sucker	*Catostomus discobolus*	0.94	1.8	1.48	<0.001	0.91
		Brook trout	*Salvelinus fontinalis*	0.5	2.3	1.09	<0.001	0.91
		Brown trout	*Salmo trutta*	0.4	10.5	7.00	0.71	-
		Channel catfish	*ictaluris punctatus*	3.7	8.7	5.80	0.67	-
		Common carp	*Cyprinus carpio*	0.4	1.5	1.14	0.007	0.84
		Cutthroat trout	*Oncorhynchus clarkii*	1.0	3.1	1.81	<0.001	0.82
		Dolly varden	*Salvelinus malma*	0.9	3.6	1.26	<0.001	0.90
		Flannelmouth sucker	*Catostomus latipinnis*	0.9	1.4	1.08	0.036	0.58
		Green sunfish	*Lepomis cyanellus*	0.9	1.8	1.21	<0.001	0.89
		Largemouth bass	*Micropterus salmoides*	0.8	1.8	1.09	0.22	-
		Mountain whitefish	*Prosopium williamsoni*	3.5	8.2	5.80	<0.001	0.33
		Northern pike	*Esox lucius*	1.0	3.4	1.88	<0.001	0.83
		Rainbow trout	*Oncorhynchus mykiss*	0.6	4.4	1.92	<0.001	0.96
		Razorback sucker	*Xyrauchen texanus*	1.1	5.2	2.31	<0.001	0.8
		Roundtail chub	*Gila robusta*	1.5	2.4	2.04	0.026	0.62
		Smallmouth bass	*Micropterus dolomieu*	1.0	1.6	1.19	0.006	0.85
		White sturgeon	*Acipenser transmontanus*	1.6	20.5	1.33	0.006	0.86
		White sucker	*Catostomus commersonii*	0.5	2.1	1.00	<0.001	0.59

[a] Ratio of ovary to muscle for individual fish as listed by USEPA (2016)

[b] r^2 presented for significant relationships ($p<0.05$)

[c] Estimated from a figure in Nautilus (2011)

Notes: Fish reproductive effects were reported at selenium concentrations ranging from 15 to 56 mg/kg dw in eggs or ovaries, depending on the fish species. No effects to mountain whitefish were observed at the highest tested egg selenium concentration of 33 mg/kg dw (Nautilus 2013).

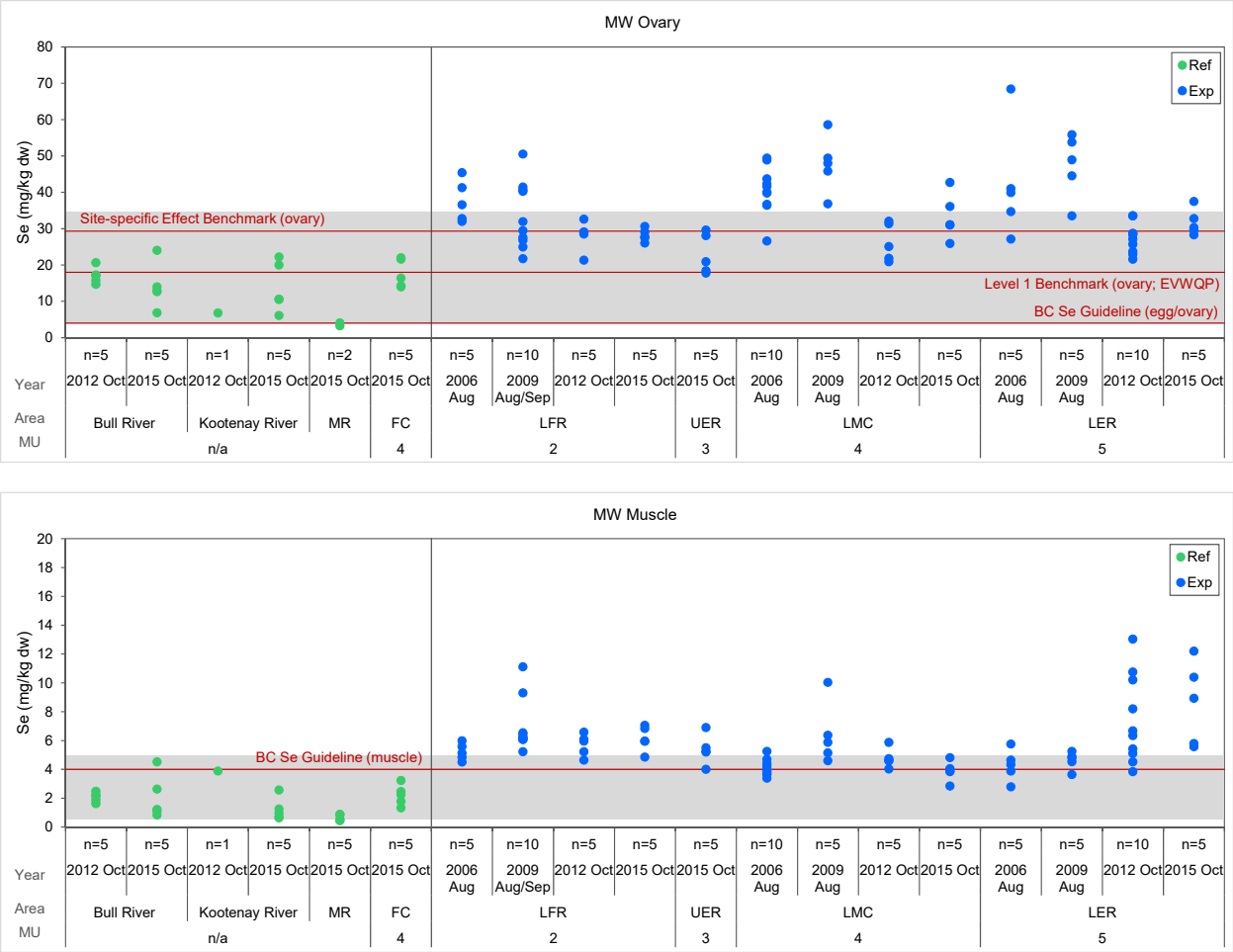


Figure 11.2: Selenium Concentrations in Mountain Whitefish Ovary and Muscle Samples Collected 2006 - 2015

Notes: LFR = Lower Fording River; UER = Upper Elk River; LMC = Lower Michel Creek; LER = Lower Elk River. Normal Range is represented by shaded area.

Table 11.2: Normal Range Quotients and Hazard Quotients for Selenium in Mountain Whitefish Muscle and Ovaries, October 2015

Exposure Type	Area	Sample ID	Date	Muscle			Ovary			
				Moisture (%)	Selenium (mg/kg dw)	Selenium (NR Quotient)[a]	Moisture (%)	Selenium (mg/kg dw)	Selenium (NR Quotient)[a]	Hazard Quotient[b]
			Benchmark	-	-	4.97	-	-	34.7	29.3
Reference	Bull River	BR-MW-03	05-Oct-15	79%	4.52	0.9	66%	24.0	0.7	0.8
		BR-MW-04	05-Oct-15	78%	1.23	0.2	65%	12.7	0.4	0.4
		BR-MW-05	05-Oct-15	77%	2.64	0.5	64%	12.9	0.4	0.4
		BR-MW-06	05-Oct-15	78%	0.841	0.2	64%	6.82	0.2	0.2
		BR-MW-07	05-Oct-15	79%	1.12	0.2	64%	14.0	0.4	0.5
	Kootenay River	KR-MW-08	05-Oct-15	79%	0.648	0.1	64%	10.6	0.3	0.4
		KR-MW-09	05-Oct-15	78%	0.701	0.1	64%	6.10	0.2	0.2
		KR-MW-10	05-Oct-15	77%	1.26	0.3	62%	20.0	0.6	0.7
		KR-MW-11	05-Oct-15	79%	2.58	0.5	63%	22.2	0.6	0.8
		KR-MW-12	05-Oct-15	79%	0.961	0.2	63%	10.5	0.3	0.4
	Flathead Creek	FC-MW-05	09-Oct-15	77%	1.78	0.4	64%	14.0	0.4	0.5
		FC-MW-06	09-Oct-15	78%	2.25	0.5	63%	16.4	0.5	0.6
		FC-MW-07	09-Oct-15	77%	2.47	0.5	63%	21.6	0.6	0.7
		FC-MW-08	09-Oct-15	78%	3.24	0.7	63%	14.3	0.4	0.5
		FC-MW-09	09-Oct-15	76%	1.34	0.3	63%	22.0	0.6	0.8
	St. Mary's River	MR-MW-01	11-Oct-15	77%	0.457	0.1	63%	3.24	0.1	0.1
		MR-MW-02	11-Oct-15	78%	0.474	0.1	64%	4.07	0.1	0.1
		MR-MW-03	11-Oct-15	76%	0.881	0.2	-	-	-	-
		MR-MW-04	11-Oct-15	77%	0.543	0.1	-	-	-	-
		MR-MW-05	11-Oct-15	77%	0.865	0.2	-	-	-	-
Mine-exposed	Lower Fording River	LFR-MW-02	06-Oct-15	77%	7.06	1.4	64%	30.6	0.9	1.0
		LFR-MW-03	06-Oct-15	78%	5.96	1.2	63%	27.8	0.8	0.9
		LFR-MW-04	08-Oct-15	79%	6.84	1.4	63%	27.5	0.8	0.9
		LFR-MW-05	08-Oct-15	79%	5.96	1.2	64%	26.0	0.7	0.9
		LFR-MW-06	10-Oct-15	77%	4.86	1.0	64%	29.1	0.8	1.0
	Upper Elk River	UER-MW-06	07-Oct-15	79%	5.26	1.1	62%	20.9	0.6	0.7
		UER-MW-07	07-Oct-15	77%	6.90	1.4	61%	28.1	0.8	1.0
		UER-MW-08	09-Oct-15	80%	4.00	0.8	62%	18.4	0.5	0.6
		UER-MW-09	10-Oct-15	78%	5.51	1.1	64%	29.6	0.9	1.0
		UER-MW-10	10-Oct-15	77%	5.20	1.0	64%	17.8	0.5	0.6
	Michel Creek	MC-MW-02	06-Oct-15	77%	3.84	0.8	63%	31.1	0.9	1.1
		MC-MW-03	06-Oct-15	77%	2.85	0.6	64%	36.1	1.0	1.2
		MC-MW-04	06-Oct-15	77%	4.06	0.8	63%	25.9	0.7	0.9
		MC-MW-05	06-Oct-15	77%	3.88	0.8	64%	31.0	0.9	1.1
		MC-MW-06	06-Oct-15	77%	4.82	1.0	62%	42.7	1.2	1.5
	Lower Elk River	LER-MW-02	07-Oct-15	79%	8.94	1.8	64%	30.3	0.9	1.0
		LER-MW-03	07-Oct-15	80%	5.57	1.1	63%	32.8	0.9	1.1
		LER-MW-04	07-Oct-15	80%	12.2	2.5	64%	37.5	1.1	1.3
		LER-MW-05	07-Oct-15	79%	5.80	1.2	63%	29.6	0.9	1.0
		LER-MW-06	08-Oct-15	78%	10.4	2.1	64%	28.3	0.8	1.0

Good (Quotient < 0.7)
Marginal (Quotient between 0.7 and 1.0)
Poor (Quotient > 1.0)

[a] Quotient was calculated as the tissue selenium concentration divided by the upper limit of the normal range (97.5 th percentile of reference area concentrations)
[b] Hazard quotient was calculated as the tissue selenium concentration divided the site-specific benchmark of 29.3 mg/kg, a conservative estimate of lower bound for potential effects (Nautilus 2017)

shown in Figure 11.3. Therefore, mountain whitefish muscle values were compared only to the BC guideline for selenium in fish muscle. Most mountain whitefish captured in mine-exposed areas (20 of 26 = 77%) had muscle selenium concentrations greater than the BC guideline of 4 mg/kg dw, whereas most whitefish collected in reference areas (21 of 22 = 95%) had muscle selenium concentrations below the guideline (Figure 11.2; Table 11.2). Ovary selenium concentrations measured in pre-spawning fish are more relevant for interpreting potential reproductive effects than muscle, when data for both tissue types are available.

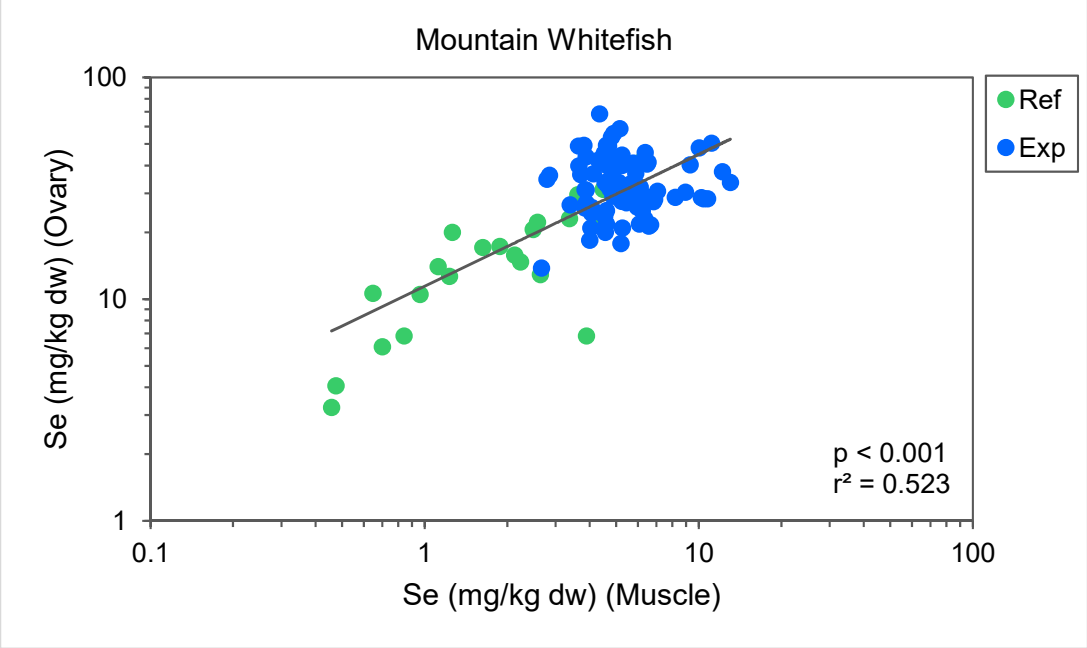


Figure 11.3: Scatterplot and Linear Regressions of Selenium Concentrations in Ovary Versus Selenium Concentrations in Muscle for Mountain Whitefish (2006 - 2015)

11.4 Temporal Changes

Monitoring of mountain whitefish in 2006 and 2009 was completed in August/September (pre-spawning) and yielded numerous female whitefish with egg/ovary selenium concentrations more than the site-specific effect threshold of 29.3 mg/kg dw, with a maximum egg/ovary selenium concentration of 68.4 mg/kg dw (Minnow et al. 2007, 2011) (Figure 11.4). In the site-specific study in which the reproductive effects of selenium to mountain whitefish were evaluated, the fish were sampled in late October and early November (2010, 2011, and 2013), closer to spawning, yielding a maximum egg/ovary selenium concentration of 33.2 mg/kg dw (Nautilus 2017). This suggests a potential shift in whitefish diet or selenium metabolism in the months approaching spawning that affects ovary selenium concentrations. To ensure

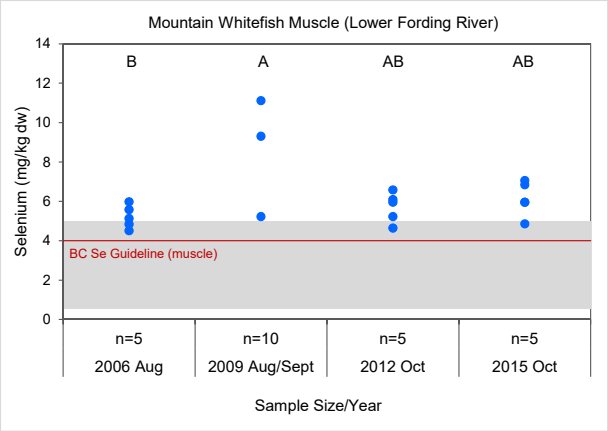
monitoring data were more representative of potential reproductive effects associated with selenium, mountain whitefish samples were collected in October for the 2012 and 2015 regional monitoring cycles. The concentrations observed in October sampling (2012, 2015) were significantly lower than those collected in August/September in earlier study years (2006, 2009; Appendix Figure HMW.4).

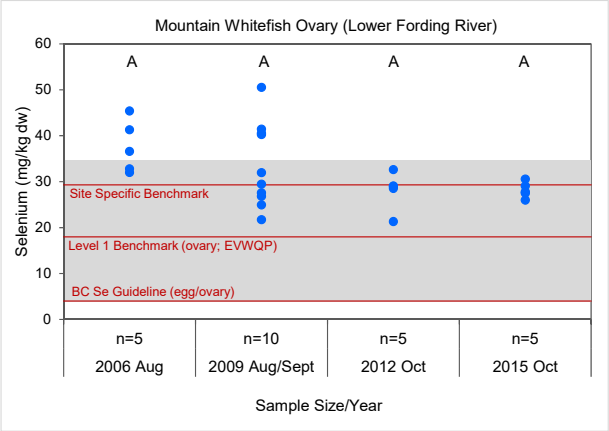
Muscle and ovary samples from mountain whitefish captured in the lower Fording River in 2015 did not differ from previous years (Figure 11.4). Whitefish collected in lower Michel Creek have had variable tissue selenium concentrations over time, with levels observed in 2015 being similar to those in 2012 and 2006. Mountain whitefish captured in the lower Elk River in 2015 also had similar selenium concentrations to those observed in 2012, but muscle selenium concentrations in 2015 were higher, and ovary selenium concentrations were lower, than those observed in 2006. At all areas, ovary selenium concentrations were significantly lower in 2012 and/or 2015 compared to 2006 and/or 2009, which is likely related to samples being collected later in the year in 2012 and 2015, as described above.

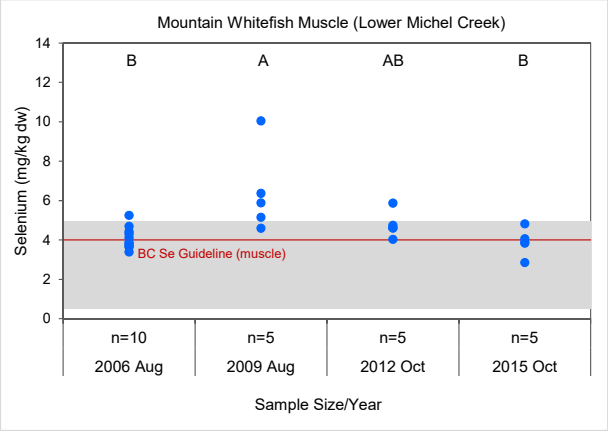
11.5 Summary

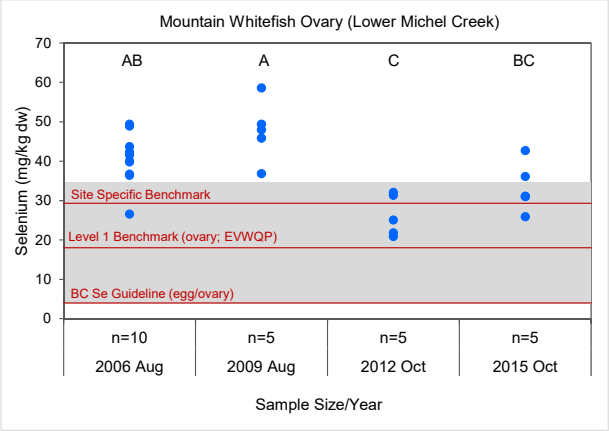
Selenium concentrations in mountain whitefish were greater than the reference area normal range for 12 of 20 (60%) of muscle samples and 2 of 20 (15%) ovary samples collected in mine-exposed areas of the Elk River, lower Fording River, and lower Michel Creek in 2015. Ovary selenium concentrations were greater than the BC ovary selenium guideline among most reference and mine-exposed mountain whitefish, and 6 of the 20 (30%) individual mine-exposed whitefish captured (from lower Michel Creek and the lower Elk River) had ovary selenium concentrations greater than the estimated lower bound of the effect threshold for this species (29.3 mg/kg dw).

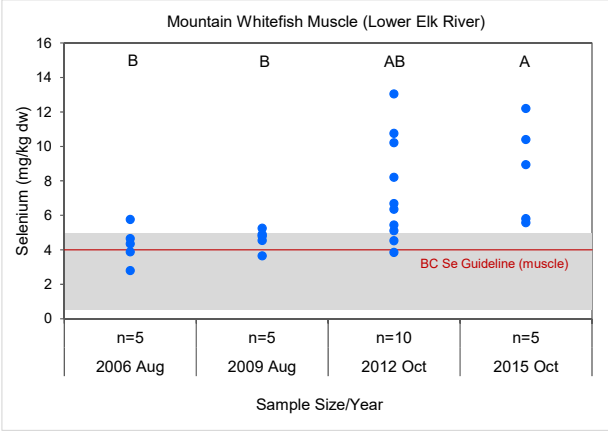
Mountain whitefish have unusually high egg/ovary selenium concentrations relative to muscle compared to other fish species. On average, mountain whitefish ovary selenium concentrations are about 7 times those in muscle, whereas in most other fish species, ovary selenium concentrations are 1 to 2 times those in muscle. Monitoring data since 2006 show that whitefish ovary selenium concentrations tend to be higher in late August or early September than in October, closer to spawning. Therefore, the timing of monitoring was shifted from August-September (2006, 2009) to October (2012, 2015). Ovary samples collected in October 2015 had similar selenium concentrations to those collected in October 2012.











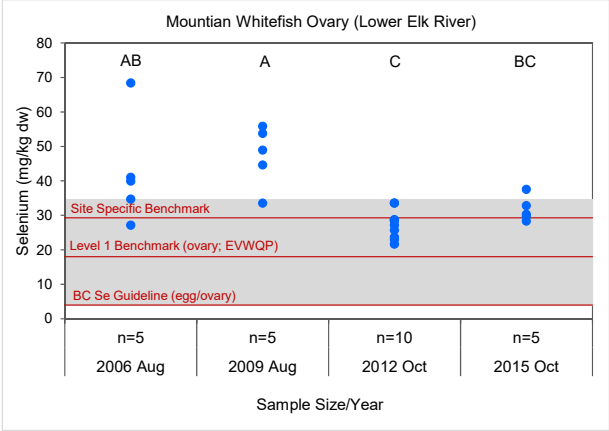


Figure 11.4: Boxplot/Individual Value Plot for Selenium Concentrations in Muscle and Ovary of Mountain Whitefish Over Time

Notes: time periods that do not share a letter are significantly different (p-value < 0.1). Results of statistical comparisons are in Appendix Table HMW.5.

12 MANAGEMENT UNIT EVALUATIONS

12.1 Overview

This section summarizes and evaluates the data to address the original questions posed in the RAEMP study design (Minnow 2015a), and presented in Section 1.3.2, above. The evaluation focuses mainly on the questions related to identifying the portions of the watershed that have been influenced by mining, where effects have occurred, and how conditions have been changing over time. The questions were addressed separately for each of MU1 through MU5. MU6 consists of the Canadian portion of Koocanusa Reservoir, which was evaluated as part of a separate program (Minnow 2018; Appendix J). The main objective of the first cycle (2014 to 2016) of monitoring in Koocanusa Reservoir was to assess conditions near and downstream from the Elk River compared to upstream, to identify differences that may be attributable to influences from the Elk River. Results from the 2014 to 2016 study will also serve as baseline relative to which future changes can be measured. Since the program was not designed to answer the same questions as the RAEMP, the evaluation of data for MU6 within this section simply provides a summary of the findings from the 2014 to 2016 study.

The integrated interpretation presented for each MU (below) compiles the information used to answer the original RAEMP study design questions, to present an overview of the conditions within each MU. The future approach to integrated evaluation of data is currently being discussed with the EMC. It is anticipated that a systematic weight of evidence (WOE) approach will be implemented to provide a clearer link between results, triggers for biological monitoring (currently under development) and adaptive management. The WOE approach will be structured to answer the following revised RAEMP study design questions:

1. Has there been a change in condition since previous monitoring cycle(s), or over time, with respect to fish and benthic invertebrate population/community indicators, water quality, sediment quality, calcite, and/or tissue selenium concentrations?
2. Were the changes identified in Question 1 unexpected (i.e., inconsistent with model predictions or general expectations[36])?
3. Does the weight of evidence indicate the unexpected changes are mine-related?

[36] "General expectations" may include predictions that were presented in approved plans in a narrative or semi-quantitative form. General expectations also include biological characteristics that are considered to be consistent with expectations based on observed chemical concentrations and calcite conditions relative to site-specific effect benchmarks.

4. Does the weight of evidence indicate current or future[37] mine-related effects to the aquatic ecosystem that are of concern, considering the observed type, magnitude, spatial extent, and rate of change?

It is anticipated that the WOE approach to integrated evaluation will be finalized prior to completion of the next cycle of the RAEMP (i.e., before September 2020), such that results/findings can be presented accordingly.

This section has numerous large figures (maps) and tables relative to the amount of text. To minimize disruption for readers, the maps showing lotic and lentic sampling areas within each MU, and data tables summarizing monitoring results for each MU, are all presented at the end of Section 12. Data included in the summary tables are mainly from 2015[38], except in temporal evaluations which included historical data and data from 2016, if available, as presented in previous sections of this report.

12.2 Management Unit 1 – Upper Fording River

12.2.1 Mine-Related Chemical and Physical Changes in Comparison to Normal Reference Ranges

12.2.1.1 Lotic Habitats

Monitoring in MU1 includes areas along the main stem Fording River, as well as numerous tributaries (Figure 12.1). Aqueous concentrations of one or more of the key mine-related constituents were elevated above the normal reference area ranges in all lotic, mine-exposed, main stem and tributary areas of MU1 (i.e., NRQs > 1; Table 12.1). Of all mine-exposed main stem and tributary areas, LCO Dry Creek had the lowest NRQs, consistent with the relatively early stages of mine development in the upper portion of that watershed. Nitrate concentrations at the upper Henretta Creek (FR_HC3) reference area were at or slightly greater than the upper normal range limit in all months of 2015 with the highest monthly mean concentration being observed in June (NRQ of 1.3) (Appendix Table C.18). By definition, 2.5% of values among reference areas will exceed the upper limit of the reference normal range (97.5th percentile) in each month.

Highest NRQs for water quality were in tributaries, especially Kilmarnock, Swift, and Cataract creeks. Calcite index values greater than the normal range were observed in the same three tributaries, as well as Porter and Greenhills creeks, and in the Fording River between Swift and

[37] Although the monitoring data reflect existing conditions, evaluation of trends may indicate a pattern of unexpected degradation indicative of potential future concern.

[38] Some exceptions are noted on the tables.

Porter creeks. No calcite was observed in LCO Dry Creek. Tissue selenium concentrations were close to or exceeded the normal range limits for benthic invertebrates and westslope cutthroat trout muscle at all mine-exposed areas.

Overall, the data showed widespread chemical and physical changes in the aquatic ecosystem of MU1 relative to reference conditions (the latter being presumed to approximate pre-mining conditions).

12.2.1.2 Lentic Habitats

Two reference and five mine-exposed lentic areas were sampled in MU1 (Figure 12.1; Table 12.2). Varying degrees of mine-related disturbance were observed among the mine-exposed lentic areas (Table 12.2). NRQs greater than one for selenium and PAHs in sediment collected at reference area Lake Mountain Lake (LML) indicated that concentrations of these substances in sediment are naturally high in some areas of the watershed[39]. Slightly elevated PAHs in sediment at FOXL may also be natural, because all other data collected in that area resulted in NRQs < 1 (i.e., FOXL is located downstream from mining but appears not to be hydrologically connected to the Fording River). However, mine-related influence was evident at lentic areas FWDEC (downstream from Ewin Creek) and R5-1 (downstream from Greenhills Creek), based on NRQs > 1 for selenium in both sediment and benthic invertebrate samples and concentrations greater than those observed at LML. NRQs greater than one for selenium and sulphate in water and for selenium in benthic invertebrate tissues (Table 12.2) and WCT tissue at Henretta Lake (HE27; Table 10.2), also reflect mine influence.

FMUCK is an area of the main stem Fording River upstream from Chauncey Creek that is slower flowing, deeper, and has finer sediments than other areas of the Fording River, so data from this location were tabulated with lentic areas. FMUCK had NRQs > 1 for aqueous nitrate, selenium, and sulphate, consistent with other lotic habitats of the Fording River (indicating concentrations above normal reference ranges). Benthic invertebrate tissue selenium was also greater than the reference area normal range, but NRQs for sediment were less than one.

12.2.2 Comparisons to Predictions

Selenium and sulphate concentrations in water were greater than the modelled concentrations at the FRO Compliance Point (FR_FRCP1) in the Fording River in 2016 (Golder 2017a). The data indicated that water collected at this location during the winter low flow period is predominantly discharge from Cataract Creek, which explained the high concentrations of

[39] Lake Mountain Lake is on mine property upstream from mining. The lake is not accessible by road so it is not influenced by public use (i.e., motorized vehicles).

selenium and sulphate observed in winter samples. Nitrate concentrations at the FRO Compliance Point, as well as nitrate and sulphate concentrations at the GHO Fording River Compliance Point (GH_FR1) were considered to match the model predictions reasonably well. Selenium concentrations observed at the GHO Fording River Compliance Point were less than those estimated by the model (Golder 2017a). Tissue selenium concentrations in invertebrates and WCT were within predicted ranges (Tables 8.1 and 10.1). Therefore, concentrations of mine-related constituents in water and tissues in MU1 are generally consistent with expectations based on models developed in support of the EVWQP and based on SPOs and compliance limits established in Permit 107517.

12.2.3 Mine-Related Biological Effects

12.2.3.1 Lotic

Benthic invertebrate communities sampled in main stem areas of the Fording River in 2015 generally had characteristics within normal reference area ranges, except % Ephemeroptera (mayflies), which was reduced at sampling areas from Cataract Creek (FOBCP) to downstream from Chauncey Creek (FOUEW; Table 12.3; Figure 8.7). In the same portion of the Fording River, maximum monthly average HQs for water quality variables were greater than one for nitrate (with selenium and sulphate also exceeding HQs at one or more locations), and calcite index HQs were also near or greater than one, indicating potential for mine-related effects. Chronic toxicity tests completed on samples collected at the two Fording River Compliance Points in MU1 also provided some evidence of effects, although the results shown in Table 12.3 for *C. dubia* and *P. subcapitata* at FR_FRCP1 were from samples collected in the first quarter of 2015 when surface water at that location comes mainly from Cataract Creek (Golder 2016, 2017c).

A similar pattern of reduced % Ephemeroptera between Cataract Creek and Chauncey Creek was identified in the first (2016) cycle of the FRO LAEMP (Minnow 2017a). The LAEMP report also identified a potential pattern of decreasing benthic invertebrate abundance and % EPT over time among areas in the same section of the Fording River downstream from Kilmarnock Creek. The study concluded that elevated nitrate concentrations (but not as likely selenium or sulphate concentrations) may have contributed to the spatial pattern of decreasing % Ephemeroptera with distance downstream, but did not explain the apparent change in benthic invertebrate community structure over time. Conversely, increased temperature trends (and/or associated variation in annual flow regimes) were identified as potentially contributing to the temporal changes in community structure, but did not fully explain the spatial pattern of reduced % Ephemeroptera observed in the Fording River in 2016. Seasonal dewatering and/or calcite deposition in portions of the Fording River are additional factors potentially influencing benthic

invertebrate communities. In consideration of these findings, the FRO LAEMP design was adjusted to allow for further investigation of the cause(s) of benthic invertebrate community changes in September 2017 (Minnow 2017e).

Of tributaries in MU1, Kilmarnock (KICK), Swift (SWCK), Cataract (CATCK), Porter (POCK), and Greenhills Creek (GHCKU, GHCKD) were each associated with benthic invertebrate communities having % EPT and % Ephemeroptera less than reference area normal ranges in 2015. These areas also had HQs > 1 for two or more of the following: aqueous nitrate, selenium, and sulphate concentrations, calcite, and/or tissue selenium concentrations. Benthic invertebrate community data were not available for Clode Creek, which also had aqueous nitrate and selenium concentrations greater than the respective benchmarks in most months in 2015. These tributaries have been heavily influenced by historical mining, and at least 30% of each creek has been permanently altered or destroyed (Minnow 2016e).

Of all four reference and 25 mine-exposed tributary and main stem areas in MU1, a total of three (10%; mine-exposed) areas had benthic invertebrate community total abundance and taxa richness outside of normal reference area ranges. Two areas, Kilmarnock and Greenhills Creek, had abundance less than the normal range and Cataract Creek had taxa richness less than normal range.

At least one sample each from Swift and Cataract creeks resulted in acute toxicity to *Daphnia magna* in 2015 (Table 4.1; Appendix Table C.18), which may have been due to effects of precipitate formation within the laboratory test vessels (see Section 4). Henretta Creek, Kilmarnock Creek, Swift Creek, and Cataract Creek each contribute 5% or more of the nitrate, selenium, or sulphate loads to the watershed, with Kilmarnock being the single largest load source for all three constituents (Zajdlik and Minnow 2013). All water from Swift and Cataract, as well as a portion of the water from Kilmarnock, will be directed to a future AWTF that is expected to reduce concentrations of nitrate and selenium in the Fording River downstream from Kilmarnock Creek.

Of 19 and 10 WCT muscle samples collected in lotic and lentic areas of MU1 in 2015, only one fish from the lentic area (Henretta Lake) had a tissue selenium concentration slightly over the EVWQP Level 1 benchmark (HQ > 1) (=3% of all fish).

A four-year study (2012 - 2015, inclusive) by Cope et al. (2016) characterized the fluvial population of WCT and their habitat within the upper Fording River watershed. The use of telemetric methods confirmed both resident and migratory life history forms of WCT within the upper Fording River population. The study concluded that the upper Fording River population metrics of sub-adult and adult abundance (2,552 to 3,874 fish > 200 mm fork length), habitat availability (57.5 km of main stem river plus approximately 59 km of tributary habitat), and

genetic integrity (pure strain) represent a viable WCT population. Population characteristics such as condition factor (weight to length relationships), growth rates, von Bertalanffy growth model estimates, and population age structure indicate the population appears to be in good condition and robust compared to similar upper Kootenay River populations.

12.2.3.2 Lentic

Most lentic areas in MU1 had HQs < 1 for nitrate, sulphate, and selenium in water samples collected concurrently with other RAEMP samples in 2015 (Table 12.4). The exception was FMUCK on the main stem Fording River, where nitrate concentrations were consistent with other lotic habitats of the Fording River. HQs > 1 were also observed for sediment selenium and PAHs at FMUCK, even though NRQs were within normal reference area ranges (i.e., normal ranges exceed SQGs). Benthic invertebrate tissue selenium concentrations at FMUCK were at the Level 1 benchmark for effects to invertebrates, but slightly greater than the benchmark for effects to juvenile fish (Table 12.4).

Mine influence was also evident at lentic areas FWDEC (downstream from Ewin Creek), R5-1 (downstream from Greenhills Creek), and HE27 (Henretta Lake) based on elevated selenium concentrations in both sediment and benthic invertebrate samples. Sediment from R5-1, which had the highest concentrations of selenium and PAHs of lentic areas in MU1, had a toxic response in laboratory tests (Section 6.3). Sediment from reference area LML also had PAH concentrations greater than normal ranges and sediment quality guidelines, but was not toxic in laboratory tests. One of five WCT captured in Henretta Lake (HE27) in May 2015 had HQs > 1 for muscle and ovary selenium concentrations, but all other samples (n=5 muscle samples in both May and August) had concentrations less than Level 1 effect benchmarks (Table 10.2).

12.2.4 Changes over Time

There were many decreasing step changes or linear trends for nitrate and selenium among water monitoring stations in MU1 (Table 12.5). However, as noted in Section 3, this is usually the result of increasing trends in reference areas rather than decreases at mine-exposed areas. When temporal changes were evaluated without accounting for reference areas changes, most areas showed either no change over time or increasing concentrations. Only Swift Creek (GH_SC1 and GH_SC2) still showed decreases for nitrate and lower Lake Mountain Creek (FR_NGD1) and lower Greenhills Creek (GH_GH1) showed decreases for selenium (Appendix Tables C.36 and C.37).

Statistically significant increases in nitrate concentrations were observed at Clode Ponds decant (FR_CC1 99% after 2015) and upper LCO Dry Creek (LC-DC3 83% after 2015), whereas increases in selenium were observed at Kilmarnock Creek (FR_KC1 22% after 2012) and upper

Dry Creek stations LC_DC3 (38% after 2015) and LC_DCDS (27% after 2015). No significant increases in sulphate concentrations were observed over the period 2012 to 2016 (Table 12.5).

Significant increases in calcite deposition were observed at two locations in the main stem Fording River (FORD5 and SPSE1) and four tributaries (Clode, Kilmarnock, Swift, and Greenhills upstream of the settling pond; Table 12.5). The two main stem locations showing increasing temporal trends were separated by four other monitoring locations showing either no change over time, or a significant decrease (Table 12.5). All of the significant increases were due to step changes after 2013 or 2014, which may have been related to accumulation after the record flood event in 2013.

Significant reductions in % Ephemeroptera occurred relative to reference areas between 2012 and 2015 at main stem areas of the Fording River. This pattern extended about 12 km from downstream of Cataract Creek (FOBCP) to downstream from Chauncey Creek (FOUEW; Table 12.5; Figure 8.7) and was evaluated as part of the FRO LAEMP report (Minnow 2017a; results also summarized in the previous section). This change was not corroborated by increases in mine-related stressors over the same time period. As noted above, investigation will continue as part of the 2017 FRO LAEMP (Minnow 2017e).

A reduction in % Ephemeroptera was also identified in the Fording River downstream from Greenhills Creek after 2012 (FODGH; Table 12.5). However, the proportion of Ephemeroptera at FODGH in all study years was still within the reference normal range (Figure 8.7). Mine-related stressors at FODGH were less than site-specific benchmarks for water quality and tissue selenium concentrations and no temporal trends were detected that would account for the observed change since 2012.

A decrease in % EPT was evident in lower Swift Creek (SWCK; Table 12.5), but the analysis was based on only two years of data (2012 and 2015) which is not sufficient to confidently identify a temporal trend. This creek has been heavily influenced historically by mining (Minnow 2016e) and water from Swift Creek will be directed to an AWTF in the future.

No temporal changes were found for tissue selenium concentrations in benthic invertebrates. Most tributary and main stem locations within MU1 did not have any significant changes for benthic invertebrate total abundance or taxa richness.

Significant decreases in invertebrate abundance were identified for lower Cataract Creek (CATCK) and for Greenhills Creek upstream from the sediment pond (GHCKU), but the analysis was based on only two years of data (2012 and 2015) for both areas, which is not sufficient to confidently identify temporal trends. Both creeks have also been heavily influenced historically

by mining (Minnow 2016e). Water from Cataract Creek will also be directed to the future FRO AWTF.

Historical data were limited for evaluating temporal changes in lentic areas of MU1 (Table 12.6). Sediment chemistry at HE27 and FMUCK did not change between 2013 and 2015.

12.2.5 Integrated Interpretation

Conditions in MU1 in 2015-2016 were largely as expected based on the long history of mining, projections from the EVWQP and monitoring results. Most tributaries in MU1 have been both physically and chemically altered by mining (Minnow 2016e). The upper Fording River WCT population study (Cope et al. 2016) indicated that the fish are in good condition and the population is viable. This is an important finding because it suggests that mine-related effects on WCT are unlikely in other MUs where main stem concentrations of mine-related stressors are lower, and there is greater access to main stem and tributary habitats with minimal or no disturbance from mining. Teck continues to work with the Regional Fish and Fish Habitat Committee to identify, prioritize, and implement aquatic habitat improvements, with particular focus on MU1 where historical mining has had more effect on the amount and quality of tributary habitat than in other MUs. A Tributary Management Plan is also under development to protect or rehabilitate aquatic ecosystems in tributaries that flow into the Fording River, Michel Creek, and the Elk River (Teck 2017b).

The main, unexpected observation for MU1 was a reduction in the proportion of Ephemeroptera relative to normal reference area values over a distance of about 12 km of the Fording River main stem since 2012. Minnow (2017a) concluded that several factors (e.g., elevated nitrate concentrations increased temperature, variation in annual flow regimes, seasonal dewatering, and/or calcite deposition) may be influencing benthic invertebrate communities. In consideration of these findings, the FRO LAEMP design was adjusted to allow for further investigation of the cause(s) of benthic invertebrate community changes in September 2017 (Minnow 2017e).

Reduced % EPT at lower Swift Creek (GH_SC1 and GH_SC2), and reduced invertebrate abundance at lower Cataract Creek (GH_CC1) have no long-term ecological consequence, because water from these streams will be directed to the future FRO AWTF. Increasing selenium concentrations at Kilmarnock Creek (FR_KC1) will also be addressed by directing a portion of the flow to the future AWTF. Increasing concentrations of nitrate at Clode Ponds decant [FR_CC1] warrant on-going monitoring since concentrations of nitrate already exceed Level 1 benchmarks in much of the Fording River.

Twenty two of 25 mine-exposed tributary and main stem monitoring areas in MU had benthic invertebrate community total abundance and taxa richness within normal reference area ranges. Of 19 and 10 WCT muscle samples collected in lotic and lentic areas of MU1 in 2015, only one fish from the lentic area (Henretta Lake) had a tissue selenium concentration slightly over the EVWQP Level 1 benchmark (HQ > 1) (=3%).

Increasing nitrate and selenium concentrations in upper LCO Dry Creek [LC_DCDS, LC_DC3]) are the expected consequence of advancement of mining into that catchment based on the approved plan for LCOII. The concentrations of mine-related constituents in LCO Dry Creek remain well below levels of concern at the present time (Table 12.3, Minnow 2017c).

12.3 Management Unit 2 – Lower Fording River

12.3.1 Mine-Related Chemical and Physical Changes in Comparison to Normal Reference Ranges

12.3.1.1 Lotic

Monitoring in MU2 includes areas on the main stem Fording River and in two tributaries to the Fording River (Grace Creek [reference] and Line Creek [reference and mine-exposed]) (Figure 12.2). Aqueous concentrations of one or more of the key mine-related constituents were elevated above the normal reference area ranges in all lotic, mine-exposed, main stem and tributary areas of MU2 resulting in NRQs > 1 (Table 12.1). The maximum monthly mean for aqueous sulphate was also greater than the normal range at the upper Line Creek reference area (LI24). By definition, 2.5% of monthly means among reference areas will exceed reference normal ranges in each month. Tissue selenium concentrations were also above normal ranges in the lower Fording River (WCT and MW muscle) and in mine-exposed areas of Line Creek (benthic invertebrates). Calcite index values were within normal ranges at all areas. Overall, the data for MU2 indicated mine-related chemical changes in mine-exposed areas of Line Creek and the lower Fording River.

12.3.1.2 Lentic

A single mine-exposed lentic area was sampled in MU2, situated adjacent the Fording River downstream from Josephine Falls (R5-3; Figure 12.2). NRQs > 1 for aqueous nitrate, sulphate, and selenium were indicative of mine influence on water quality, as was the benthic invertebrate tissue selenium NRQ of 2.5 (Table 12.2). Selenium and PAH concentrations in sediment were within normal ranges (i.e., NRQs ≤ 1).

12.3.2 Comparisons to Predictions

Aqueous nitrate concentrations at the LCO Compliance Point in 2016 were greater than the modelled concentrations due to greater than anticipated loads from Line Creek upstream from West Line Creek (Golder 2017a). Observed aqueous selenium and sulphate concentrations at the LCO Compliance Point (LC_LCDSSLCC) corresponded reasonably well to model predictions, as did selenium, nitrate, and sulphate concentrations at the Order station in the lower Fording River (LC_LC5; Golder 2017a). Tissue selenium concentrations in invertebrates at LILC3 (LC_LC3) were near the predicted mean in 2015, but were well (130%) above the predicted mean in 2016 (Table 8.1). While the results were within the uncertainty bounds of the model in both years, the large increase in 2016 was unexpected. Tissue selenium predictions for invertebrates and WCT in the Fording River were consistent with model predictions (Tables 8.4 and 10.1). Overall, concentrations of mine-related constituents in water and tissues in MU2 were generally consistent with expectations based on models developed in support of the EVWQP, except for higher than anticipated aqueous nitrate and tissue selenium concentrations in Line Creek in 2016, the latter of which was due to the change in form of aqueous selenium (due to AWTF effluent) in Line Creek immediately downstream of the AWTF (more discussion below).

12.3.3 Mine-Related Biological Effects

12.3.3.1 Lotic

No effects to benthic invertebrates were evident at 6 of 9 monitoring areas in MU2 having invertebrate community data (Table 12.3). Strongest evidence of effects was at LILC3, located downstream from the Line Creek rock drain and the discharge from the West Line Creek AWTF, where proportions of EPT and Ephemeroptera were reduced relative to normal ranges. At this area, maximum monthly HQs for nitrate and selenium were greater than one, and values for both the invertebrate tissue selenium HQ and the calcite HQ were one (i.e., on the verge for potential effects). Water samples collected a bit farther downstream at the LCO Compliance Point provided some evidence of effects in laboratory toxicity tests with *C. dubia* and *P. subcapitata*, but based on evaluation of supporting data, it remained uncertain if these results indicated an adverse response or variance in test organism performance related to background water quality (Golder 2016). Benthic invertebrate community characteristics were within normal ranges at the LCO Compliance Point and in lower Line Creek (LI8), and invertebrate tissue selenium concentrations were within normal ranges in spite of a maximum monthly HQ > 1 for selenium in water (2015, prior to AWTF operation).

Of the three reference and six tributary and main stem monitoring areas in MU2, all had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges. All 10 WCT captured in MU2 in 2015 had muscle selenium concentrations less than the Level 1 benchmark for reproductive effects.

12.3.3.2 Lentic

At R5-3, HQs > 1 for nitrate and selenium in water, as well as selenium in sediment and benthic invertebrate tissues suggested potential for mine-related effects (Table 12.4). At reference area LCHO and mine-exposed area MI16 (in MU4; Table 12.4), HQs for selenium and PAHs in sediment were comparable or greater than those observed at R5-3 and did not cause toxicity in laboratory tests with standard invertebrate test species, suggesting sediment toxicity would not likely be observed at R5-3.

12.3.4 Changes over Time

A significant decrease in % Ephemeroptera occurred at the Fording River monitoring area downstream from Line Creek (FO23) after 2012 (perhaps associated with the record flood in 2013), but consecutive increases in 2015 and 2016, resulted in % Ephemeroptera being within the normal range in 2016 (Table 12.5).

Increasing temporal trends for calcite were observed at one location in Line Creek (in the vicinity of the AWTF discharge; LINE4), and one location in the Fording River (upstream of Line Creek; FORD4) (Table 12.5). Both were related to a significant step change after 2014, which may have been due accumulation after the record flood event in 2013. A slight increase in sulphate (15%) was also observed on Line Creek upstream of the AWTF outfall (Table 12.5), but concentrations remained below the site specific benchmark (Appendix Figure C.9).

Line Creek, including the discharge from West Line Creek, was previously identified as a major load source of mine-related constituents to the Fording River and the Elk River watershed overall (Zajdlik and Minnow 2013). The West Line Creek AWTF was commissioned in late 2015 (commencing full scale operation in early 2016) to reduce loads of selenium and nitrate. Although decreases in nitrate concentrations were detected in Line Creek downstream from the AWTF, decreases of similar magnitude were observed in previous years (i.e., after 2013 and 2014) and were also observed widely among mine-exposed areas (i.e., related to reference area increases, not decreases at mine-exposed areas). However, monthly mean total selenium concentrations decreased at LC_LC3, particularly in 2016. A significant increase in benthic invertebrate tissue selenium concentrations was observed at LILC3 (LC_LC3), immediately downstream from the West Line Creek AWTF, for the period 2012 to 2016 (Table 12.5). As noted above, the benthic invertebrate tissue selenium concentration observed at LILC3 in 2016

was greater than that observed in 2015 and substantially greater than the predicted mean concentration for Line Creek (Table 8.4). This increase was a result of discharge of selenium from the AWTF that was in a chemical form (i.e., predominantly selenite) that is more readily accumulated by aquatic organisms than the form that is normally found in other parts of the watershed (i.e., selenate) (Minnow 2017b). Teck is currently pilot testing an active oxidation process to convert most of the selenium discharged by the AWTF into selenate, which is expected to result in less tissue selenium accumulation in Line Creek after it becomes operational at full-scale. No temporal changes in invertebrate tissue selenium concentrations were found at monitoring areas farther downstream in Line Creek (LIDSL, LI8), or in the lower Fording River. Also no changes were found for benthic invertebrate abundance, richness, or % ETP among the 10 monitoring areas in MU2.

Potential temporal changes could not be evaluated for MU2 lentic area R5-3 due to lack of historical data (Table 12.6).

12.3.5 Integrated Interpretation

Concentrations of mine-related constituents in water and tissues in MU2 were generally consistent with expectations based on models developed in support of the EVWQP. Exceptions included higher than anticipated aqueous nitrate concentrations due to greater loading than anticipated from Line Creek upstream from West Line Creek, which will be taken into account in the next update of the Regional Water Quality Model (Golder 2016a). Also, despite significant reductions in total aqueous selenium concentrations, tissue selenium concentrations were elevated in Line Creek immediately downstream from the AWTF in 2016 (compared to predictions and values observed in 2015). This was the result of discharge of selenium from the AWTF that was in a chemical form (i.e., predominantly selenite) that is more readily accumulated by aquatic organisms than the form that is normally found in other parts of the watershed (i.e., selenate) (Minnow 2017b). Teck is currently pilot testing an active oxidation process to convert most of the selenium discharged by the AWTF back to selenate, which is expected to result in less tissue selenium accumulation in Line Creek after it becomes operational at full-scale.

All six mine-exposed tributary and main stem monitoring areas in MU2 had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges. All 10 WCT captured in MU2 in 2015 had muscle selenium concentrations less than the Level 1 benchmark for reproductive effects.

A significant temporal reduction of % Ephemeroptera in the lower Fording River (FO23) occurred after 2012 and then showed consecutive increases in 2013, 2015, and 2016. The 2016 value was within the reference area normal range.

12.4 Management Unit 3 – Upper Elk River

12.4.1 Mine-Related Chemical and Physical Changes in Comparison to Normal Reference Range

12.4.1.1 Lotic

Management Unit 3 includes the main stem Elk River and its tributaries to the west of GHO and downstream to the mouth of the Fording River (Figure 12.3). Nitrate concentrations were elevated in water at two of four mine-exposed stations in the Elk River downstream from GHO in 2015, resulting in maximum monthly NRQs of 2.2 and 2.5, and selenium concentrations in mountain whitefish muscle exceeded the normal range (NRQ = 1.4), but all other samples types had values within reference area normal ranges (Table 12.1). Mine influence was evident in all mine-exposed tributaries in MU3, except the south branch of Willow Creek, based on NRQs > 1. Highest NRQs were associated with tributaries to the south (i.e., Mickelson, Leask, Wolfram, and Thompson) which drain the areas where mining activities have historically been most intense, compared to the tributaries to the north (e.g., Branch F, Wolf, Willow).

12.4.1.2 Lentic

Lentic areas sampled in MU3 included two reference areas (REFF and LOLA) and two mine-exposed areas (ERUP and EROU; Figure 12.3). Water constituents, sediment selenium, and benthic invertebrate selenium concentrations resulted in NRQs less than 1, indicating conditions within normal reference area ranges. The high NRQ for sediment PAHs at the Lost Lake (LOLA) reference area provides further evidence (along with LML in MU1) that PAH concentrations in sediments are naturally elevated in some parts of the watershed (Table 12.2). Longnose sucker from the upper Elk River ponds (ERUP) had muscle and ovary selenium concentrations above reference area normal ranges (i.e., NRQs >1), providing some evidence of mining influence even though selenium concentrations in water and sediment were within normal ranges.

12.4.2 Comparisons to Predictions

Water quality models developed for the EVWQP overestimated selenium concentrations observed at the GHO Elk River Compliance Point (GH_ERC), as well as selenium and nitrate concentrations observed at the Elk River Order Station upstream of the Fording River in 2016 (Golder 2017a). Observed values corresponded reasonably well to modelled values for nitrate and sulphate at the GHO Elk River Compliance Point and for sulphate at the Elk River Order station upstream of the Fording River (GH_ER1). Benthic invertebrate and WCT tissue selenium concentrations in MU3 were consistent with model predictions.

12.4.3 Mine-Related Biological Effects

12.4.3.1 Lotic

HQs were less than one for samples collected in MU3 from the main stem Elk River in 2015 (Table 12.3). A chronic toxicity test with rainbow trout performed on a sample from the GHO Compliance Point in 2015 (GH_ERC) resulted in significant reduction in fish survival and length, but thorough evaluation of supporting data resulted in a conclusion that evidence for adverse mine-related effects was equivocal (Golder 2016). Reduced % EPT and % Ephemeroptera at the monitoring area on the Elk River upstream from the Fording River (ELUFO) was contrary to low HQs for water quality and tissue selenium concentrations at that location, but calcite index was at the estimated threshold for effects to invertebrates in these taxonomic orders (Section 5). However, no effects were observed at EL20, ELDEL, and ELUEL, farther upstream closer to GHO, where HQs were similarly less than one for mine-related stressors. These results suggest benthic invertebrate community effects at ELUFO are not mine-related.

Of the seven tributary and main stem monitoring areas in MU3, including one reference area, all had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges. All 10 WCT captured in MU3 in 2015 had muscle selenium concentrations less than the Level 1 benchmark for reproductive effects.

HQs for water quality were less than one for the most northerly tributaries (Branch F to Cougar) to the Elk River in MU3 (Table 12.3), but greater than one for the more southerly tributaries (Mickelson to Thompson). Benthic invertebrate communities have only been sampled at two of the southern tributaries in MU3 (Wolfram and Thompson), and in both cases, effects were evident as reductions in both % EPT and % Ephemeroptera relative to normal ranges. HQs for calcite and tissue selenium effects to invertebrates were also close to or greater than one for both creeks. Therefore, the observed reductions in % EPT and % Ephemeroptera at Thompson and Wolfram creeks may be associated with one or more mine-related stressors. Many of the tributaries in MU3, especially the northern ones, are steep-gradient and ephemeral, and only Thompson Creek is fish bearing (Minnow 2016e). There has also been active deforestation along the GHO west-side tributaries in recent years.

12.4.3.2 Lentic

HQs for selenium and PAHs in sediment were greater than one at both reference and mine-exposed lentic areas in MU3, but only the concentrations of PAHs at reference area Lost Lake (LOLA) were above normal ranges (i.e., the upper limit of the distribution of reference area concentrations exceeds the upper guideline for several PAHs; Table 12.4). Mine-related constituents in water, as well as tissue selenium concentrations in invertebrates and longnose

sucker resulted in HQs less than one. Also, longnose sucker at ERUP had condition that differed from reference longnose sucker by less than 10%, which is not likely ecological relevant (Environment Canada 2012b) and the direction of change (7.3% increase) was opposite to expectations for an adverse response. Therefore, the data do not suggest potential mine-related effects have occurred in the lentic areas that were sampled downstream from mining in MU3.

12.4.4 Changes over Time

Significant increases in aqueous nitrate (28% after 2015) and sulphate (53% from 2012 to 2016) were observed at the GHO Elk River Order station (GH_ER1) but no changes to benthic invertebrate communities were observed. No significant changes to benthic invertebrate communities were observed for the other main stem monitoring areas in MU3 or in the two tributaries having biological monitoring data.

Increases in aqueous concentrations of mine-related constituents were observed at 3 of 12 tributaries where no biological monitoring occurred[40]: Cougar Creek (GH_COUGAR, 377% for nitrate after 2014), Mickelson Creek (GH_ MC1, 1,539%, 186%, and 407% for nitrate, selenium, and sulphate after 2014), and Leask Creek (GH_LC2, 142% for sulphate after 2013; Table 12.5). The maximum monthly mean concentrations were greater than EVWQP Level 1 benchmarks at GH_MC1 and GH_LC2, but not at GH_COUGAR. A significant temporal increase in calcite was also observed in Mickelson Creek, primarily due to a step change after 2015 (Table 12.5).

No temporal changes in invertebrate tissue selenium concentrations or benthic invertebrate community endpoints were found.

Historical data were limited for evaluating temporal changes in lentic areas of MU3. There was no change in sediment chemistry at EROU in 2015 compared to 2013, and only a slight increase (6.8%) in longnose sucker condition at ERUP in 2015 compared to 2005 (Table 12.6).

12.4.5 Integrated Interpretation

Conditions in MU3 in 2015 to 2016 were generally consistent with expectations based on comparisons of observed conditions to EVWQP predictions and past monitoring results. The exceptions were reduced % EPT and % Ephemeroptera at the monitoring area on the Elk River

[40] Temporal changes were evaluated in mine-exposed stations relative to the mean change in reference stations from 2012 to 2016. The analysis was conducted using ANOVA on the difference in monthly mean concentrations (log_{10}-transformed) between the mine-exposed station and the monthly mean reference station, with Year as a factor (see Section 2.2.3 for further details).

upstream from the Fording River (ELUFO). No benthic invertebrate community effects were observed at EL20, ELDEL, and ELUEL, closer to GHO sources and HQs for mine-related stressors were also less than one at all four Elk River areas downstream from GHO, suggesting the cause of effects at ELUFO was not mine-related.

Cougar Creek (GH_COUGAR), for which an increasing trend in nitrate concentrations was observed, flows only intermittently which accounts for the limited data set depicted in Figure 3.11. As it is dry much of the year it has low habitat value within the broader spatial context of MU3.

Step increases in concentrations of nitrate, selenium, and sulphate were observed at Mickelson Creek (GH_ MC1) in all years after 2012, but especially after 2014 (Table 12.5; Figure 3.12; Appendix Tables C.36 to C.38). Maximum monthly mean concentrations of both nitrate and sulphate were greater than EVWQP Level 1 benchmarks in 2015. Calcite deposition also increased over time, particularly after 2015. It is not considered to be fish bearing, but western toads have been observed within the catchment (Minnow 2016e). The area around Mickelson Creek has been extensively deforested in recent years. This information bears consideration in future cycles of RAEMP or GHO LAEMP study design development.

Sulphate concentrations increased at Leask Creek (GH_LC2) in all years, particularly after 2013 (Figure 3.12) and were above the Level 1 benchmark in 2013. The stream is considered to be non-fish-bearing and the catchment has also been disturbed by logging.

All six mine-exposed tributary and main stem monitoring areas in MU3 had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges. All 10 WCT captured in MU3 in 2015 had muscle selenium concentrations less than the Level 1 benchmark for reproductive effects.

MU3 is very large and includes the Elk River up to its headwaters (Figure 1.2). The mine-disturbed tributaries have small catchments relative to other mine-disturbed and undisturbed tributaries in MU1-MU4 (Minnow 2016e). Therefore the mine-disturbed tributaries represent a small proportion of the total tributary habitat in MU3 and in the watershed as a whole.

12.5 Management Unit 4 – Michel Creek and Middle Elk River

12.5.1 Mine-Related Chemical and Physical Changes in Comparison to Normal Reference Range

12.5.1.1 Lotic

Management Unit 4 is large and encompasses Michel Creek and its tributaries as well as the middle portion of the Elk River and its tributaries (Figure 12.4). Reference areas in MU4 had

NRQs < 1 for all samples, except for slightly elevated nitrate in water at Andy Good Creek (Table 12.1). Mine-exposed areas in Michel Creek, the MU4 portion of the Elk River, as well as mine-exposed tributaries all had NRQs > 1 for nitrate, selenium and/or sulphate, except Harmer Creek upstream from Harmer Pond (EV_HC6). Calcite index values and benthic invertebrate tissue selenium concentrations were within normal ranges at all areas except at Corbin Creek (for calcite) and Bodie and Grave creeks (for tissue) (Table 12.1). The maximum NRQ for WCT muscle (of n=5 replicate fish per area) was greater than one in the Elk River and both upper and lower Michel Creek, but some individual fish (11 of 32 = 34%) had selenium concentrations within normal ranges (Appendix Table HWCT.6). The maximum selenium concentration in mountain whitefish ovaries also exceeded the normal range in lower Michel Creek (Table 12.1).

12.5.1.2 Lentic

Lentic areas in MU4 included three reference areas and six mine-exposed areas (Table 12.2). NRQs > 1 for aqueous sulphate at five of six mine-exposed lentic areas provided evidence of mine-related influence, as did NRQs > 1 for benthic invertebrate tissue selenium at all six mine-exposed lentic areas, and NRQs > 1 for longnose sucker tissues, where sampled (Table 12.2). Influence from mining was greatest at Goddard Marsh (GO13) based on highest NRQs for selenium in water (30), sediment (5.6), and tissues (3.6 for invertebrates and 8.0 for LSU ovaries, respectively), as well as for PAHs in sediment (38; Table 12.2). PAH concentrations were also above the reference normal range in sediment at Otto Ponds (OTTO; NRQ = 33), Michel Creek Wetland (MI16; NRQ = 2.6), and Lower Michel Wetland (MIWW; NRQ = 1.2).

12.5.2 Comparisons to Predictions

Aqueous concentrations of selenium, nitrate, and sulphate agreed with predictions from EVWQP models at the Order Station in the Elk River downstream from the Fording River (EV_ER1) in 2016 (Golder 2017a). At the CMO Michel Creek Compliance Point (CM_MC2), observed values corresponded reasonably well to modelled values for sulphate; however, selenium and nitrate concentrations were greater than modelled concentrations, which also occurred during the EVWQP model calibration period and may relate to overestimation of flows at that location.

Observed values also corresponded reasonably well to modelled values for selenium at the EVO Michel Creek Compliance Point (EV_MC2). However, monitored selenium and nitrate concentrations at the CMO Compliance Point were greater than modelled concentrations, which also occurred during the EVWQP model calibration period and may relate to overestimation of flows or lack of integration of pumping data at that location.

Nitrate concentrations were greater than the modelled concentrations at the EVO Harmer Creek Compliance Point (EV_HC1), but both monitored and modelled concentrations were less than water quality guidelines. Aqueous selenium and sulphate concentrations were consistent with predictions for EVO Harmer Creek (Golder 2017a).

Tissue selenium concentrations in benthic invertebrates were consistent with predicted values, except at Bodie Creek, where observed values were outside of the predicted range in both 2015 and 2016.

12.5.3 Mine-Related Biological Effects

12.5.3.1 Lotic

Of the Elk River portion of MU4, effects to benthic invertebrate communities were suggested by reduced % EPT at EL19 (Elk River downstream from Fording River), Harmer Creek downstream from the settling pond (HACKDS), and at Otto Creek (OTTO; Table 12.3). HQs greater than one were indicated for nitrate at EL19 and selenium at HACKDS, which may account for the response observed for % EPT. HQs for the other water quality constituents, calcite, and tissue selenium concentrations were less than one, except for an HQ of 1.4 for selenium in water at Grave Creek (GRDS) where the benthic invertebrate community had characteristics within normal reference area ranges, an HQ of 2.5 for selenium in Goddard Creek. Low HQs for mine-related stressors in Otto Creek suggest that low proportions of EPT and Ephemeroptera are due to factors other than mining. For example, the habitat in Otto Creek is slower-flowing and more depositional than the habitats preferred by those taxonomic orders.

In the Michel Creek portion of MU4, effects to benthic invertebrates were evident downstream from Corbin Creek (MIDCO), although HQs for mine-related stressors were less than one, except for aqueous nitrate (HQ of 1.1). A toxicity test with *C. dubia* completed on a water sample from the same area (CM_MC2 Compliance Point) resulted in a significant adverse response but, after evaluation of supporting data, it remained uncertain if this indicated an adverse response or normal variability in test organism performance (Golder 2016). Therefore, the cause of benthic invertebrate effects at MIDCO is uncertain. Sampling areas farther downstream on main stem Michel Creek (MIDAG, MI5, MI3, MI2) had benthic invertebrate communities with characteristics in the normal range for reference areas and HQs < 1 for mine-related stressors. Water samples at the EVO Michel Creek Compliance Point (EV_MC2), located between RAEMP sampling areas MI3 and MI2 had maximum HQs for nitrate and selenium above 1, but chronic toxicity tests did not provide compelling evidence of mine-related effects. The maximum HQ for WCT muscle selenium concentrations was less than one, but the

maximum HQ for mountain whitefish ovaries was greater than one, suggesting potential for effects.

HQs were greater than one for at least two of the three key mine-related constituents in all mine-influenced tributaries, except Aqueduct Creek (Table 12.3). Effects to benthic invertebrate communities were indicated for the two tributaries that were sampled in 2015 (Corbin [CORCK] and Bodie [BOCK]) based on reduced % EPT and % Ephemeroptera. Tissue selenium concentrations also resulted in an HQ of 5.5 for effects to invertebrates at BOCK. Calcite index values were also at or above the threshold for effects to these taxonomic orders at both CORCK and BOCK. Therefore, mine-related stressors may account for the observed biological effects at CORCK and BOCK.

Of the 6 reference and 15 mine-exposed tributary and main stem monitoring areas in MU4, all had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges. All 22 WCT captured in MU4 in 2015 had muscle selenium concentrations less than the Level 1 benchmark for reproductive effects (Table 10.2).

12.5.3.2 Lentic

Water samples had HQs < 1 for nitrate, sulphate, and selenium except at Goddard Marsh (GO13). HQs for tissue selenium concentrations were greater than one at four of six mine-exposed areas and at one reference area in MU4. HQs were also greater than one for selenium and/or PAHs in sediment at all reference and mine-exposed lentic areas in MU4 (Table 12.4), but at four of the areas both selenium and PAHs were within normal ranges (Table 12.2). The normal range for 2-methylnaphthalene exceeds both the lower and upper SQG (Appendix Figure E.1), so HQs were typically higher, but NRQs were lower for this PAH than those for other PAHs (Appendix Tables E.8 to E.11). Sediment samples collected at Goddard Marsh (GO13) and Otto Ponds (OTTO) caused significant effects to survival and/or growth of invertebrates in laboratory toxicity tests (see Section 6.3), consistent with these areas having highest HQs for selenium and PAHs. However, GO13 and OTTO continue to support two of the largest populations of LSU identified to date in the Elk River watershed (Table 12.4). Longnose sucker condition did not differ from reference (GO13), or differed from reference by less than 10% (OTTO, ELWDGC), suggesting low ecological relevance. On the other hand, based on very large differences in area size, habitat characteristics, and longnose sucker population sizes among reference and mine-exposed areas, the relative health of the populations in Goddard Marsh and Otto ponds is uncertain.

Sediment samples collected at MI16 and at reference area LCHO were not toxic in spite of HQs ≥ 4 for selenium (and for PAHs in the case of MI16), suggesting that the sediment quality guidelines may overestimate site-specific effects of these substances. HQs for the other mine-

exposed areas (ELWDGC, MIC2, MIWW) were less than HQs observed at reference areas in MU4.

Overall, the existing information suggests potential for mine-related effects at GO13 and OTTO where highest HQs for mine-related variables, as well as sediment toxicity, were observed.

12.5.4 Changes over Time

There were many decreasing step changes or linear trends for nitrate and selenium among water monitoring stations in MU4 (Table 12.5). However, as noted in Section 3, this was usually the result of increasing trends in reference areas rather than decreases at mine-exposed areas. When temporal changes were evaluated without accounting for reference area increases, decreases were still evident for nitrate at EV_OC1, EV_SP1, EV_MG1, and EV_BC1; for selenium at EV_OC1, EV_GT1, and EV_BC1, and for sulphate EV_BC1 (Appendix Tables C.36 to C.38). In analyses that accounted for increased concentrations at reference areas, increasing concentrations of mine-related constituents (specifically nitrate and sulphate) were observed only in Michel Creek upstream from EVO (EV_MC3).

Significant increases in calcite index were observed at both Corbin Creek and Bodie Creek (Table 12.5). The observed increases may be contributing to effects observed on the benthic invertebrate communities in both tributaries.

Benthic invertebrate abundance decreased at the Harmer Creek monitoring area upstream from the settling pond (HACKUS) after 2012, but abundances in all three years were greater than the reference area normal range (Table 12.5). There were also no significant temporal changes in mine-related stressors, so the change in community abundance is not interpreted as an adverse mining effect.

A significant step change decrease in % Ephemeroptera occurred after 2012 at Michel Creek monitoring area MI3 (Table 12.5), which is far downstream from CMO and upstream from tributaries influenced by EVO (Figure 12.4). However, % Ephemeroptera remained within normal ranges in all four years and the value observed in 2016 was near the reference area mean and the value observed at MI3 in 2012. Also, significant increases were observed for nitrate (65%) and sulphate (18%) in water at MI3 (EV_MC3) after 2015 (Table 12.5; Figure 3.12). However, concentrations in 2016 remained near or within normal ranges for reference areas (depending on the month) and below Level 1 benchmarks.

Thirteen of the 17 monitoring areas showed no change in benthic invertebrate community characteristics since 2012. Fifteen of the sixteen monitoring areas evaluated for potential changes in tissue selenium concentration, showed no change or a significant decrease. A significant increase in benthic invertebrate selenium concentrations occurred after 2012 in Bodie

Creek. This did not result in a significant change in benthic invertebrate community characteristics, but the mining-sensitive endpoints of % EPT and % Ephemeroptera were already less than reference area normal ranges in 2012 and continued to be in 2016.

The only statistically significant changes observed for lentic areas in MU4 were increased concentrations of selenium and PAHs in sediment samples collected at GO13 in 2015 compared to 2013, increased selenium concentrations in benthic invertebrate tissues from MI16, and increased condition of LSU in OTTO in 2015 relative to 2013 (Table 12.6). A significant temporal decrease in benthic invertebrate tissue selenium was also noted at OTTO.

12.5.5 Integrated Interpretation

Future adjustments to the Regional Water Quality Model are expected to address the few discrepancies noted between observed and modelled concentrations of nitrate, selenium, or sulphate at some water monitoring stations in MU4.

Tissue selenium concentrations in benthic invertebrates were consistent with predicted values, except at Bodie Creek, where observed values were outside of the predicted range in both 2015 and 2016. Increases in tissue selenium concentrations compared to predictions and past observations (2012) may be related to one or more of a number of factors, such as drift of invertebrates from lentic conditions in the sediment ponds, altered invertebrate communities due to exposure to mine-influenced water downstream of the sediment ponds, exposure to pit dewatering, or some other factor related to proximity to the point of discharge.

The reduction in % Ephemeroptera observed in Michel Creek upstream from EVO occurred after 2012 and was followed by consecutive increases in 2015 and 2016, with all values being within the reference area normal range. In spite of significant increases observed after 2015, concentrations of nitrate and sulphate in water remain near or within normal ranges for reference areas (depending on the month) and well below Level 1 benchmarks. Therefore, no further action is warranted other than on-going monitoring.

Another concern that has emerged from the monitoring data for MU4 is elevated concentrations of selenium and PAHs in sediment at Goddard Marsh (GO13) and Otto Creek ponds (OTTO), and the toxicity response that was observed in laboratory tests of sediment samples from these areas that used standard invertebrate species. There were no significant differences in condition of LSU from GO13 relative to reference, and only a minor increase in condition of LSU from OTTO (6%) but, based on very large differences in area size, habitat characteristics, and LSU population sizes among reference and mine-exposed areas, the relative health of the populations in Goddard Marsh and Otto Ponds is uncertain.

The other monitoring observations for MU4 were consistent with expectations based on past monitoring results. All 15 mine-exposed tributary and main stem monitoring areas in MU4 had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges.

12.6 Management Unit 5 – Lower Elk River

12.6.1 Mine-Related Chemical and Physical Changes in Comparison to Normal Reference Range

12.6.1.1 Lotic

MU5 represents the portion of the Elk River downstream from Michel Creek to its mouth at Koocanusa Reservoir (Figure 12.5). There are no tributaries affected by mining within this MU, but three reference tributaries had water quality, calcite, and benthic invertebrate tissue selenium concentrations within normal ranges, except for elevated sulphate at McCool Creek (Table 12.1). Water quality in the Elk River downstream from mining reflected the influence of mining based on NRQs > 1 for nitrate, selenium, and sulphate. Benthic invertebrates collected between Sparwood and ELDFE (Elk River immediately downstream from Fernie) had selenium concentrations within normal ranges, but selenium concentrations were greater than the normal range in invertebrates collected farther downstream near Elko (ELELKO) and near the Elk River mouth (ELH93). WCT and MW collected in the lower Elk River also had elevated tissue selenium concentrations. Overall, the data show that mine influence continues to be measurable throughout the lower Elk River.

12.6.1.2 Lentic

NRQs > 1 were observed for most of the mine-related constituents in water and sediment samples, as well as benthic invertebrate tissue selenium samples, collected in mine-exposed areas Stanford Pond (STPD), the lower Elk River oxbow (EROL), and Elko Reservoir (ELKO) (Table 12.2). Sediment samples collected in 2013 at wetlands near Sparwood (SPW) and downstream of Fernie (ERWSF), had selenium and PAH concentrations within normal reference area ranges. Water and tissue selenium data are not available for these areas.

12.6.2 Comparisons to Predictions

Aqueous concentrations of selenium, nitrate, and sulphate agreed with EVWQP model predictions at the Order stations in the Elk River downstream from Michel Creek (EV_ER1) and at the Elko Reservoir (EV_ELKORES) in 2016 (Golder 2017a).

12.6.3 Mine-Related Biological Effects

12.6.3.1 Lotic

Sampling areas in the lower Elk River generally had benthic invertebrate communities with characteristics in normal ranges and HQs < 1, with a few exceptions. % EPT was slightly reduced (61%) relative to the lower limit of the normal range (63%) at the sampling area upstream from Fernie (ELUFE; Table 12.3). Mine-related stressors produced HQs less than one, so the cause of reduced % EPT at ELUFE is uncertain. Strongest evidence of effects was near the mouth of the Elk River at ELH93, where both % EPT and % Ephemeroptera were less than normal ranges, and both calcite and tissue selenium concentrations were at their respective thresholds for potential effects (HQ=1). Selenium concentrations in ovaries of mountain whitefish were also above the estimated effect threshold in the lower Elk River.

Of the three reference and five mine-exposed tributary and main stem monitoring areas in MU5, all but one had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges. The exception was the upper Wigwam reference area (WWRU; Table 12.3). All 10 WCT captured in MU5 in 2015 had muscle selenium concentrations less than the Level 1 benchmark for reproductive effects.

12.6.3.2 Lentic

Sediment collected at Stanford Pond (STPD) had the highest HQs for selenium and PAHs of samples collected among lentic areas in MU5, and resulted in effects on growth and/or survival of standard invertebrate species in laboratory toxicity testing (Table 12.4). The pattern of PAH concentrations in sediment at STPD suggested contributions from a source other than, or in addition to, mining. This pond appears to have been constructed for storm water management. HQs for tissue selenium at STPD were also greater than one, suggesting potential for effects. However, of the areas sampled in the RAEMP, STPD supports the largest population of dwarf LSU, and condition of the LSU at STPD did not differ from reference fish. On the other hand, as noted for GO13 and OTTO in MU3, there are large differences in area size, habitat characteristics, and LSU population sizes among reference and mine-exposed areas in the watershed which confound determination of the relative health of the populations in individual areas.

LSU condition at EROL was similar to that of reference LSU in spite of HQs > 1 for selenium in sediment and tissues. Also, HQs for selenium and PAHs in sediment at EROL (and also SPW) were less than those observed among reference areas and concentrations associated with toxicity to invertebrates in laboratory testing.

12.6.4 Changes over Time

A decrease in invertebrate taxa richness was observed at the Elk River Order station (EV_ER1) after 2015 (Table 12.5). The 2016 value was still within the normal range but less than observed in 2015 or 2012 (Figure 8.8). No temporal changes were observed for mine-related stressors and aqueous concentrations were less than Level 1 benchmarks. Also, % EPT and % Ephemeroptera, which appear to be the community endpoints most sensitive to mining influences, were in normal ranges and did not change significantly over time. Therefore, the results appear to reflect normal variability or an influence that is not mine-related.

The low values for % EPT and % Ephemeroptera reported in 2015 and 2016 at ELH93, mentioned in the previous section, represent a significant decrease since 2012 and the cause is currently uncertain.

No temporal changes in benthic invertebrate tissue selenium concentrations were found.

Historical data were limited for evaluating temporal changes in lentic areas of MU5 (Table 12.6). The only significant difference was an increase in benthic invertebrate tissue selenium at EROL from 2012 to 2015, but this trend was based on only two years of data, which is not sufficient to confidently identify a temporal trend. No changes in sediment chemistry were evident at EROL or ELKO in 2015 compared to 2013. Longnose sucker condition was similar to historical observations for both STPD and EROL.

12.6.5 Integrated Interpretation

MU5, aqueous concentrations of selenium, nitrate, and sulphate agreed with EVWQP model predictions at the Order stations in the Elk River downstream from Michel Creek (EV_ER1) and at the Elko Reservoir (EV_ELKORES) in 2016. No tributaries in this MU have been affected by Teck's coal mines. Three reference tributaries had water quality, calcite, and benthic invertebrate tissue selenium concentrations within normal ranges, except for elevated sulphate at McCool Creek. Water quality in the Elk River reflected the influence of mining based on NRQs > 1 for nitrate, selenium, and sulphate. Benthic invertebrates collected between Sparwood and ELDFE (Elk River immediately downstream from Fernie) had selenium concentrations within normal ranges, but selenium concentrations were greater than the normal range in invertebrates collected farther downstream near Elko (ELELKO) and near the mouth of the Elk River (ELH93). The most notable finding was temporal reduction in % EPT and % Ephemeroptera immediately upstream the Elk River mouth (ELH93), where values of these endpoints were well below reference area normal ranges. There were no significant changes detected for mine-related stressors, so the cause of the benthic invertebrate community changes is uncertain. Additional samples were collected in 2017 to further investigate

conditions at this location. All monitoring areas in MU5 had benthic invertebrate community total abundance and taxa richness values within normal reference area ranges.

12.7 Management Unit 6 – Koocanusa Reservoir

Management Unit 6 (MU6) consists of the Canadian portion of Koocanusa Reservoir, which was created when the Libby Dam (Montana) was constructed in 1972. As required under Permit 107517, a three-year study characterizing and comparing chemical and biological conditions downstream from the Elk River relative to upstream was implemented from 2014 to 2016. This section provides a brief summary of the findings from the three-year study (reported in Minnow 2018; Appendix J).

Most of the water column within the reservoir was oxygenated with slightly alkaline pH. *In situ* water quality profiles showed only limited gradients in temperature, oxygen, pH, and conductivity with depth. Findings were consistent with a study completed by Hamilton et al. (1990) which concluded that waters in the Canadian portion of the reservoir remain relatively well-mixed, even during periods of maximum water elevation (May-November), as a result of basin morphometry, continual movement of water from river inputs and reservoir operations, and exposure to strong prevailing winds.

The evaluation of water quality focused on key substances associated with coal mining: nitrate, selenium, and sulphate. Concentrations of these substances were generally similar in water samples collected at middle and bottom depths at all sample locations downstream of the Elk River, but were higher than concentrations measured in samples collected at the surface. Differences between upstream and downstream concentrations were greater in 2016 than 2015 for both nitrate and selenium, but mean concentrations at the downstream areas in 2016 were similar to or less than those observed in 2015. Sulphate concentrations did not differ significantly between downstream and upstream. Site performance objectives for nitrate, selenium, sulphate, and dissolved cadmium were consistently met at the Order station (RG_DSELK).

Sediment samples collected in the reservoir both downstream and upstream from the Elk River were mostly silt (≥60%), with sand and clay comprising smaller fractions. Sediments collected upstream from the Elk River (T2/TN) were significantly sandier (annual means of 2-10%) with less clay (means of 17-19%) than those collected downstream (T4; means of <1% for sand and 26-30% for clay). This may be related to the shallower depths and more fluvial nature of the reservoir upstream of the Elk River (i.e., greater seasonal scour resulting in finer particles accumulating in sediments farther downstream). Total organic carbon content was similar at both areas, ranging from 0.9 to 1.7%.

Concentrations of most metals and polycyclic aromatic hydrocarbons (PAHs) in sediment were higher in sediments collected downstream from the Elk River compared to upstream, but did not increase over the three year study. Concentrations of some metals (upstream and downstream) and PAHs (downstream only) in sediments were above the lower provincial sediment quality guidelines, but none exceeded the higher guidelines. The general pattern of higher concentrations in sediment downstream from the Elk River compared to upstream may be related to a greater proportion of fine sediment particles in the downstream area, providing more surface area for adsorption than larger particles.

The reservoir is considered to be phosphorus limited. Low concentrations of phosphorus and chlorophyll-a, along with low seston and zooplankton biomass, all indicated that the reservoir is oligotrophic. Phytoplankton communities in the reservoir were numerically dominated by diatoms, and to a lesser extent with Chrysophytes. There were no significant differences in overall phytoplankton density, biomass, or richness between downstream and upstream areas over the three years. Community structure was similar between upstream and downstream areas, except for greater Cyanophyte (biomass at the downstream area, which was considered to have low ecological significance because this group represented <1% of the community.

The zooplankton community was numerically dominated by rotifers and copepods, with relatively low numbers of cladocerans. With the exception of abundance and biomass of cladocerans (tended to be lower downstream from the Elk River compared to upstream), no consistent differences were observed between downstream and upstream areas in overall zooplankton community structure (i.e., density, biomass, richness, and absolute or relative density or biomass of copepods or rotifers), over the three year study. Selenium concentrations in zooplankton were also similar between downstream and upstream areas in all three years.

Benthic invertebrate communities upstream (T2/TN) and downstream (T4) from the Elk River were primarily composed of oligochaetes (mostly immature Tubificinae), insects (various species of chironomids), and ostracods in all three study years. Overall community density and richness did not differ significantly between upstream and downstream areas in any of the three study years. However, the densities of ostracods and oligochaetes were higher at the downstream area compared to upstream. Greater abundance of these organisms may be associated with preference for greater depths and finer sediment texture present at the downstream area, and/or avoidance of coarser, compacted sediments that may dry out during low pool in the upstream area.

Mean benthic invertebrate tissue selenium concentrations were significantly higher at the downstream area (6.9 µg/g dw) than the upstream area (5.0 µg/g dw), and were greater than

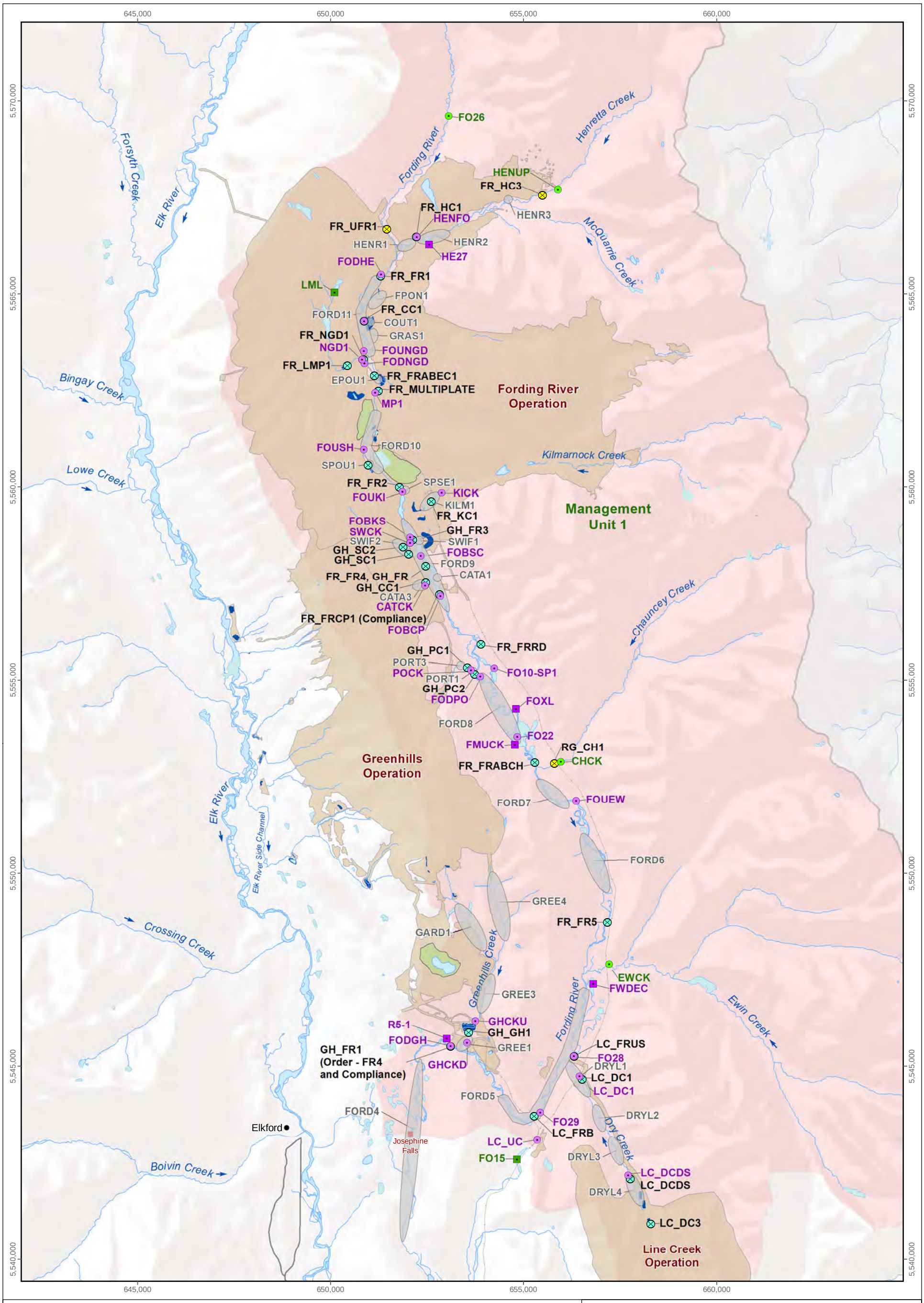
the BC interim chronic dietary guideline of 4 µg/g dw, but were consistently less than the Level 1 EVWQP benchmarks (based on <10% effect) for growth and reproductive effects to benthic invertebrates (13 mg/kg dw) and for dietary effects to fish (11 mg/kg dw).

Largescale sucker, northern pikeminnow, peamouth chub, redside shiner, and yellow perch were consistently captured in highest numbers at all three fish study areas (i.e., areas within the reservoir in the vicinity of the mouths of Sand Creek, Elk River, and Gold Creek). Other species that were captured included bull trout, burbot, kokanee, longnose sucker, mountain whitefish, pumpkinseed, rainbow trout, slimy sculpin, and westslope cutthroat trout.

Following technical guidance developed by Environment Canada, fish surveys were conducted in April of each study year at each of the three study areas, to assess endpoints indicative of fish survival (mean age), growth (body size-at-age), reproduction (relative gonad weight) and energy storage (relative liver weight and overall condition). Peamouth chub were targeted in 2014 but additional species (northern pikeminnow, redside shiner, yellow perch, and largescale sucker) were also evaluated in subsequent years. Results were statistically compared between the downstream areas (Elk River and Gold Creek) and the upstream area (Sand Creek). No consistent patterns were observed among fish species, sexes, or sampling years that were indicative of influence from the Elk River.

Tissue samples were collected for analysis of metals from all fish species collected over the three-year study. Some fish had concentrations of selenium in muscle or whole body that were greater than the BC guidelines of 4 µg/g dw for both tissue types. All muscle and whole body samples were less than the USEPA criterion of 11.3 µg/g dw in muscle and 8.5 µg/g dw in whole bodies, except for a single yellow perch with a muscle selenium concentration of 15.0 µg/g dw. Similarly, ovary selenium concentrations were frequently greater than the BC chronic guideline of 11 µg/g dw (particularly in peamouth chub, redside shiner, and northern pikeminnow). All species except redside shiner and northern pikeminnow had mean ovary selenium concentrations less than the EVWQP Level 1 benchmark for reproductive effects to fish (18 mg/kg dw), and the 2016 USEPA guideline of 15.1 µg/g dw. Northern pikeminnow had mean ovary selenium concentrations above the Level 1 benchmark at the Elk River area in only one of the three years they were sampled (2014), when ovaries were relatively undeveloped. Mean redside shiner ovary selenium concentrations were above the Level 1 benchmark at both the Elk River and the Sand Creek areas in both years sampled.

Data obtained during the 2014 to 2016 sampling program are being used to design the next phase (2018 to 2020) of chemical and biological monitoring in the Canadian portion of Koocanusa reservoir. Results of all monitoring will be considered in the weight of evidence evaluation of MU6, which is currently under development in consultation with the EMC.



LEGEND

Lentic Monitoring Area
- Mine-exposed
- Reference

Lotic Monitoring Area
- Mine-exposed
- Reference

Teck Water Quality Station
- Mine-exposed
- Reference

- Regional Calcite Monitoring Areas
- Settling Pond
- Tailings Pond
- Teck Coal Mine Operation

Monitoring Locations in Management Unit 1

0 1.5 3 6
km

N W E S

Projection: North American Datum 1983 UTM Zone 11

Date: February 2018
Project 2561

minnow environmental inc.

Figure 12.1

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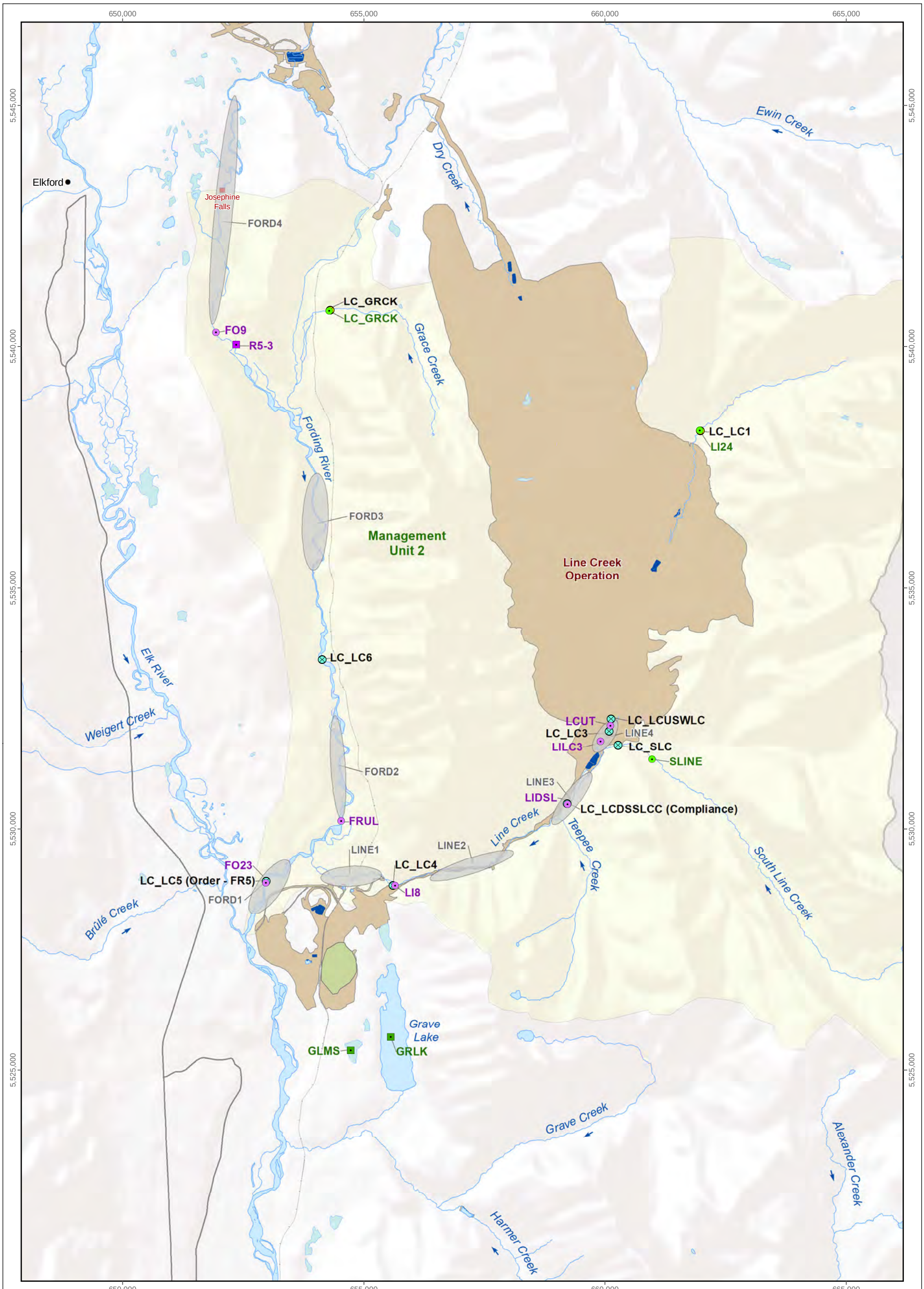

LEGEND

Lentic Monitoring Area
- Mine-exposed
- Reference

Lotic Biological Monitoring Area
- Mine-exposed
- Reference

Teck Water Quality Station
- Mine-exposed
- Reference

- Regional Calcite Monitoring Areas
- Settling Pond
- Tailings Pond
- Teck Coal Mine Operation

Monitoring Locations in Management Unit 2

0 1.25 2.5 5
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: February 2018
Project 2561

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Figure 12.2

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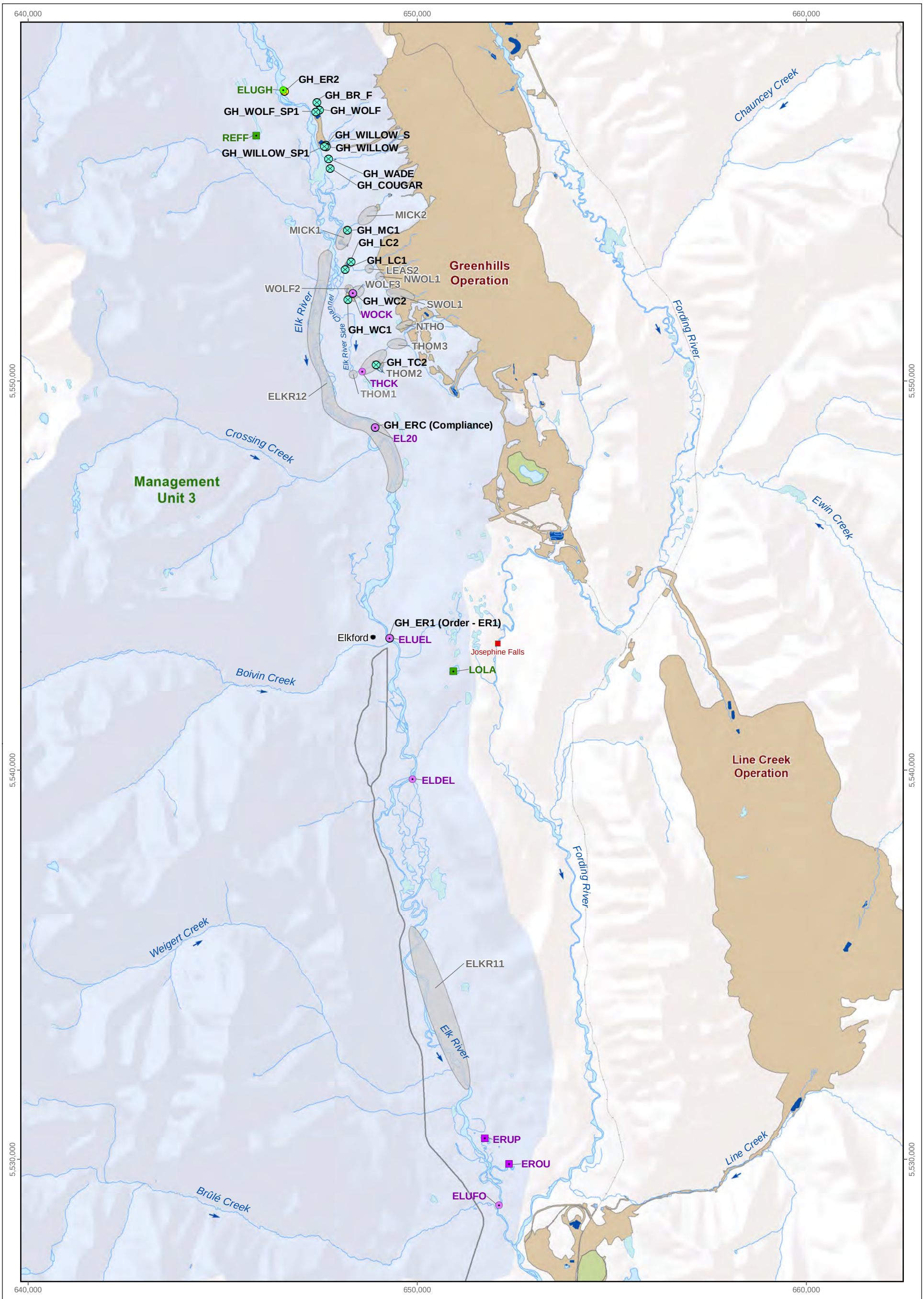

LEGEND

Lentic Monitoring Area
- Mine-exposed
- Reference

Lotic Monitoring Area
- Mine-exposed
- Reference

Teck Water Quality Station
- Mine-exposed
- Reference

- Regional Calcite Monitoring Areas
- Settling Pond
- Tailings Pond
- Teck Coal Mine Operation

Monitoring Locations in Management Unit 3

0 1.5 3 6
km

N W E S

Projection: North American Datum 1983 UTM Zone 11

Date: February 2018
Project 2561

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Figure 12.3

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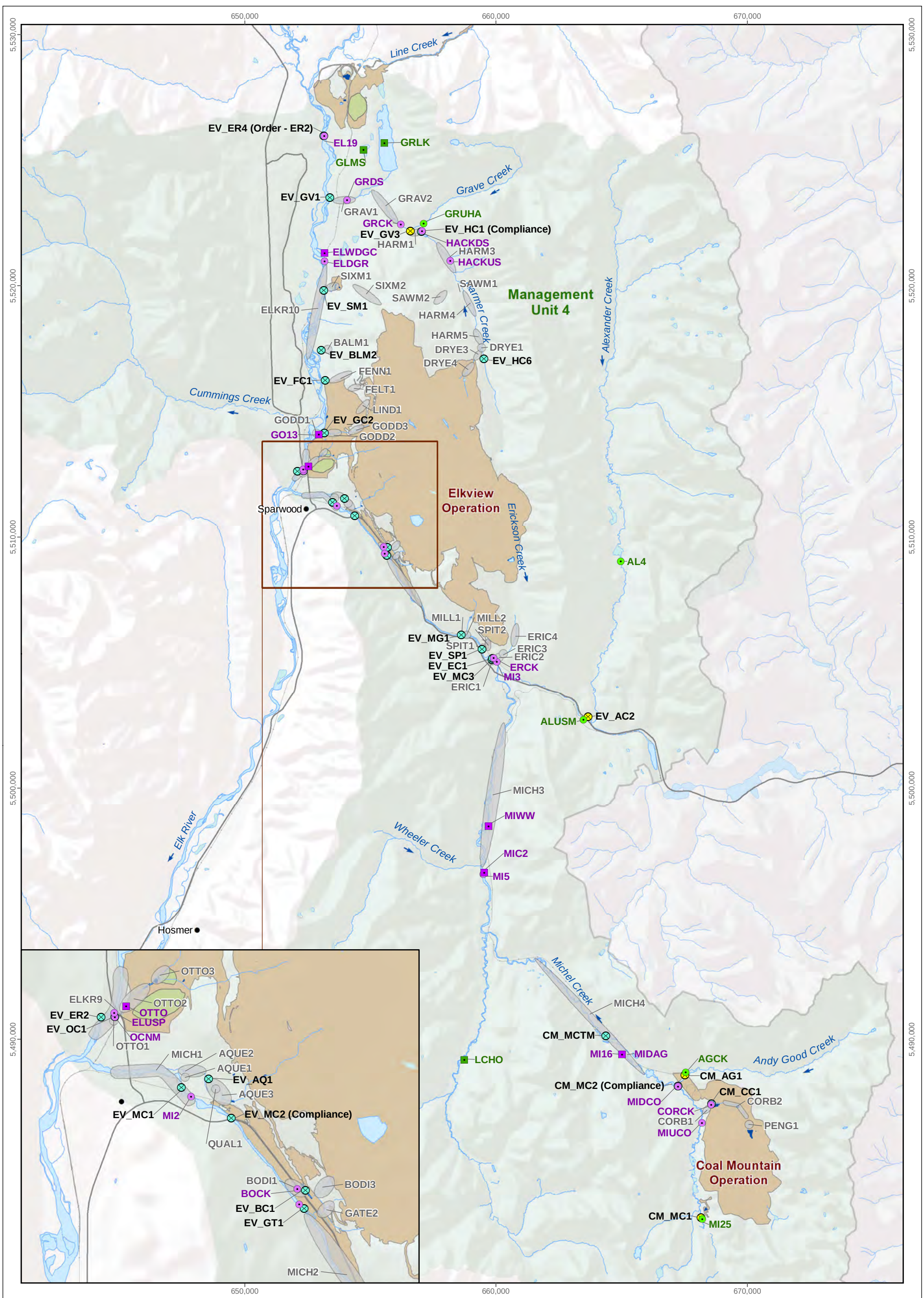

LEGEND

Lentic Monitoring Area
- Mine-exposed
- Reference

Lotic Monitoring Area
- Mine-exposed
- Reference

Teck Water Quality Station
- Mine-exposed
- Reference

- Regional Calcite Monitoring Areas
- Settling Pond
- Tailings Pond
- Teck Coal Mine Operation

Monitoring Locations in Management Unit 4

0 2.25 4.5 9
km

N W E S

Projection: North American Datum 1983 UTM Zone 11

Date: February 2018
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Figure 12.4

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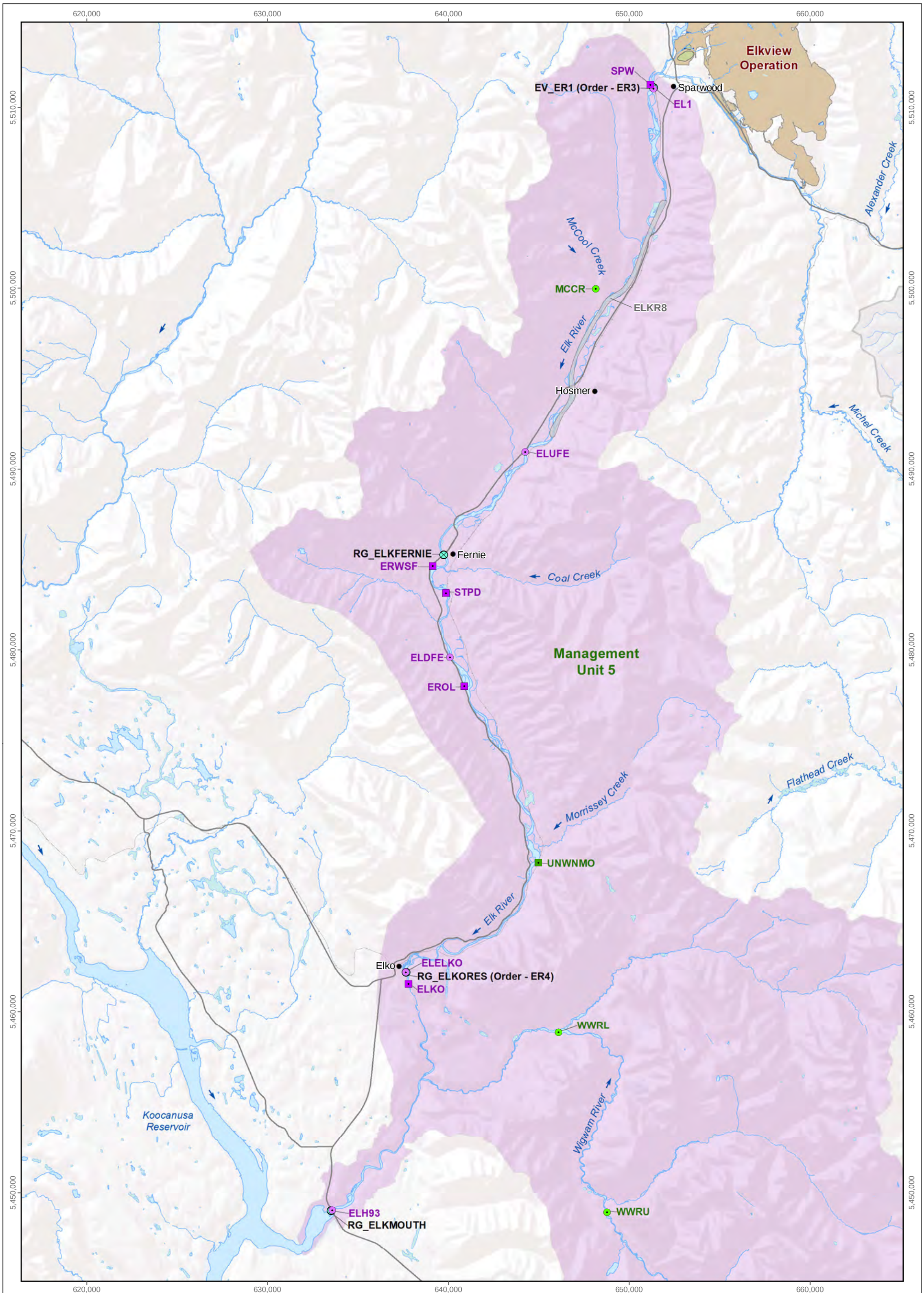

LEGEND

Lentic Monitoring Area
- Mine-exposed
- Reference

Lotic Monitoring Area
- Mine-exposed
- Reference

Teck Water Quality Station
- Mine-exposed
- Reference

- Regional Calcite Monitoring Areas
- Settling Pond
- Tailings Pond
- Teck Coal Mine Operation

Monitoring Locations in Management Unit 5

0 3.25 6.5 13
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: February 2018
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Figure 12.5

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Table 12.1: All Management Units, Lotic, Key Question #1 and #3

Locations of Chemical and Physical Changes and Mine Sources (comparison to normal ranges)

Management Unit	Main Watershed	Exposure Type	Stream Type (M-main stem; T-tributary)	Stream Name	Biological Area Code	Calcite Reach	Teck Water Station Code	Description (Biological. Water Stn Description included if no Biological) For RAEMP summary tables	ENV EMS Number	Water Quality, Routine Monitoring 2012 - 2016, Relative to NR (maximum monthly average NRQ in 2015)			Calcite Index (NRQ)	Maximum Tissue Selenium Concentrations Relative to Normal Ranges (NRQ)			
										Nitrate	Selenium	Sulphate	Concurrent with Benthic Invertebrate Community Samples	Invertebrates (n=1)	Westslope Cutthroat Trout Muscle	Mountain Whitefish Muscle	Mountain Whitefish Ovary
1	Fording	Reference	T	Henretta Creek	HENUP	HENR3	FR_HC3	upper creek, u/s FRO	E300096	1.3	0.5	1.0	0.1	-	-	-	-
			T	Chauncey Creek	CHCK	-	FR_CH1[a]	near mouth	E295214	0.4	0.3	0.4	0.5	-			
			T	Ewin Creek	EWCK	-	-[a]	near mouth	-	0.7	0.7	0.8	0.5	-			
			M	Fording River	FO26	-	FR_UFR1	u/s Henretta Cr. and FRO	E216777	0.6	0.4	0.8	0.9	0.6			
		Mine-exposed	T	Henretta Creek	HENFO	HENR2	FR_HC1	u/s Fording R.	E216778	34	13	2.2	0.9	1.2	-	-	-
						HENR1											
				Clode Creek	-	COUT1	FR_CC1	Decant from Clode sediment pond	E102481	212	65	8.1	-	-			
				Lake Mountain Creek	NGD1	-	FR_NGD1	Lower Lake Mountain Creek/ North Greenhills Diversion	E105060	7.8	8.5	1.8	0.8	1.5			
				Kilmarnock Creek	KICK	KILM1	FR_KC1	mouth (d/s of rock drain)	0200252	370	91	7.4	2.3	-			
				Swift Creek	SWCK	SWIF2	GH_SC1	lower creek	E221329	38	118	15	2.1	2.4			
							GH_SC2	lower creek	E105061	158	317	29	-	-			
				Cataract Creek	CATCK	CATA3	GH_CC1	Cataract Creek near mouth	0200384	198	394	59	3.0	1.3			
				Porter Creek	POCK	PORT1	GH_PC1	lower creek	200385	20	51	13	1.1	0.7			
				Fording River side channel	FO10-SP1	-	-[a]	former Fording River Oxbow, now side channel	-	69	26	1.3	0.8	0.9			
				LCO Dry Creek	LC_DCDS	DRYL4	LC_DCDS	d/s sedimentation ponds	E295210	1.1	1.0	0.3	0.0	0.7			
				LCO Dry Creek	-	-	LC_DC3	u/s of East Tributary Cr.	E288273	1.4	1.0	0.3	-	-			
				LCO Dry Creek	LC_DC1	DRYL1	LC_DC1	Dry Creek near mouth	E288270	0.6	1.1	0.2	0.0	0.7			
				Greenhills Creek	GHCKU	GREE3	-[a]	u/s of sediment pond	-	24	46	12	2.5	1.4			
				Greenhills Creek	GHCKD	GREE1	GH_GH1	d/s sediment pond	E102709	23	47	14	1.4	2.8			
			M	Fording River	FODHE	FORD11	FR_FR1	d/s Henretta Cr.	0200251	25	10	1.7	0.9	0.8	2.3	-	-
				Fording River	FOUNGD		-[a]	u/s North Greenhills Diversion	-	40	10	1.9	0.8	0.9			
				Fording River	FODNGD	-	FR_FRABEC1	d/s Lake Mountain Creek/ North Greenhills Diversion	-	47	15	2.1	0.8	0.8			
				Fording River	MP1	EPOU1	FR_MULTIPLATE	Multiplate Culvert on Greenhills Access Road	-	47	15	2.2	1.0	0.7			
				Fording River	FOUSH	FORD10	-[a]	u/s Shandley Cr.	-	39	11	2.1	1.0	0.8			
				Fording River	FOUKI	SPSE1	FR_FR2	u/s Kilmarnock Cr.	0200201	62	15	3.1	1.0	0.7			
				Fording River	FOBKS	FORD9	GH_FR3	at Fording R. bridge, d/s Kilmarnock & u/s Swift Cr.	-	46	14	2.9	0.9	0.8			
				Fording River	FOBSC		FR_FR4, GH_FR	d/s Swift Cr., u/s Cataract Cr.	0200311	63	24	4.3	1.2	1.0			
				Fording River	FOBCP		FR_FRCP1 (Compliance)	d/s Cataract, u/s Porter	E300071	83	120	11	1.3	1.0			
				Fording River	FODPO	FORD8	GH_PC2	d/s Porter Cr., u/s Chauncey Cr. (discontinued sampling in 2015)	E287431	125	36	5.7	0.9	0.9			
				Fording River	FO22		FR_FRABCH	Fording River Above Chauncey Creek		132	37	6.0	0.8	0.9			
				Fording River	FOUEW	FORD7	FR_FR5	d/s Chauncey Cr., u/s Ewin Cr.	-	100	27	4.7	1.0	0.8			
						FORD6											
				Fording River	FO28/LC-FRUS	FORD5	LC_FRUS	Fording River u/s Dry Creek	E295232	62	21	3.4	-	-			
				Fording River	FO29		LC_FRB	d/s Dry Cr., u/s GHO at Fording R. Bridge	-	60	20	3.2	1.0	1.0			
				Fording River	FODGH	-	GH_FR1 (Order - FR4 and Compliance)	d/s GHO and Greenhills Cr.	0200251	59	19	3.6	1.0	1.1			
2	Fording	Reference	T	Grace Creek	LC_GRCK	-	LC_GRCK	lower creek	E288275	0.3	1.0	1.0	0.0	0.8	-	-	-
				Line Creek	LI24	-	LC_LC1	u/s LCO	E216142	1.0	1.0	1.1	0.0	0.7			
				South Line Creek	SLINE	-	LC_SLC	u/s Line Creek and LCO	E282149	0.5	0.6	1.0	0.0	0.5			
		Mine-exposed	T	Line Creek	LCUT	LINE4	LC_LCUSWLC	d/s rock drain, u/s West Line Cr. and AWTF outfall	E293369	102	22	4.3	-	-	-	-	-
				Line Creek	LILC3		LC_LC3	d/s West Line Cr. and AWTF outfall	0200337	87	46	5.5	1.0	1.7			
				Line Creek	LIDSL	LINE3	LC_LCDSSLCC (Compliance)	d/s South Line	E297110	52	28	3.8	0.6	1.1			
				Line Creek	LI8	LINE1	LC_LC4	Line Creek canyon	0200044	44	20	3.3	0.0	1.2			
						LINE2											
			M	Fording River	FO9	FORD4	-[a]	d/s Josephine falls, u/s Grace Cr. and Line Cr.	-	39	15	2.7	0.8	0.9	1.9	1.4	0.9
				Fording River	FRUL	FORD2	LC_LC6	d/s Grace Cr., u/s Line Cr.	0200338	56	19	3.2	0.0	0.9			
				Fording River	FO23	FORD1	LC_LC5 (Order - FR5)	d/s Line Creek	0200028	50	17	3.1	0.9	0.8			
3	Elk	Reference	M	Elk River	ELUGH	-	GH_ER2	u/s Branch Cr. and GHO	200389	0.4	0.5	0.4	0.1	0.5	-	-	-
		Mine-exposed	T	Branch F Creek	-	-	GH_BR_F	at LRP Road culvert	E287437	1.6	0.4	0.2	-	-	-	-	-
				Wolf Creek	-	-	GH_WOLF	at LRP Road culvert (until end 2016)	-	3.0	0.5	0.5	-	-			
				Willow Creek	-	-	GH_WILLOW	at LRP Road culvert; Willow_S was diverted to this location Dec 2016	-	1.5	2.2	1.0	-	-			
				Willow Creek	-	-	GH_WILLOW_S	Willow Creek South at LRP Road (as of 2017)	-	0.4	0.4	0.3	-	-			
				Wade Creek	-	-	GH_WADE	at LRP Road culvert	E287433	4.4	1.0	0.8	-	-			
				Cougar Creek	-	-	GH_COUGAR	at LRP Road culvert	E287432	3.6	0.3	0.4	-	-			
				Mickelson Creek	-	MICK1	GH_MC1	at LRP Road culvert	200388	61	8.0	18	-	-			
				Leask Creek	-	-	GH_LC2	u/s pond inflow at LRP Road culvert	-	177	61	27	-	-			
				Leask Creek	-	-	GH_LC1	sediment pond decant (goes to ground)	E257796	52	8.1	12	-	-			
				Wolfram Creek	WOCK	WOLF3	GH_WC2	lower creek	-	243	47	15	1.3	1.5			
				Wolfram Creek	-	-	GH_WC1	sediment pond decant (goes to ground)	E257795	62	12	12	-	-			
				Thompson Creek	THCK	THOM2	GH_TC2	lower creek	E207436	53	48	15	1.0	2.3			
			M	Elk River	EL20	ELKR12	GH_ERC (Compliance)	d/s Thompson Cr. and GHO	E300090	2.5	0.9	0.7	0.8	0.6	1.0	1.4	0.9
				Elk River	ELUEL	-	GH_ER1 (Order - ER1)	d/s GHO, u/s Fording R. and u/s Boivin Cr.	0206661	2.2	0.9	0.6	0.9	0.6			
				Elk River	ELDEL	-	-[a]	d/s Elkford sewage ponds	-	1.0	0.6	0.5	0.2	0.6			
				Elk River	ELUFO	-	-[a]	u/s Fording R.	-	0.9	0.5	0.5	1.0	0.7			
4	Elk	Reference	T	Grave Creek	GRUHA	-	EV_GV3[a]	u/s Harmer Cr.	-	0.3	0.5	0.4	1.0	-	-	-	-
	Michel			Andy Good Creek	AGCK	-	CM_AG1[a]	u/s CMO	-	1.2	0.7	0.3	0	-			
				Alexander Creek	AL4	-	-[a]	mid creek upstream ALUSM	-	0.3	0.3	0.3	1.0	-			
				Alexander Creek	ALUSM	-	EV_AC2[a]	near bend to west	-	0.2	0.3	0.3	0.8	-			
			M	Michel Creek	MI25	-	CM_MC1	u/s CMO	E258175	0.1	0.1	0.3	0.4	0.6			
				Michel Creek	MIUCO	-	-[a]	u/s Corbin Cr.	-	0.0	0.1	0.3	0.9	0.6			
	Elk	Mine-exposed	T	Harmer Creek	HACKUS	HARM3	EV_HC6	u/s from Harmer Pond	-	0.7	0.3	0.3	0.9	0.8	-	-	-
				Harmer Creek	HACKDS	HARM1	EV_HC1 (Compliance)	dam/spillway at d/s end of Harmer Pond	E102682	5.3	18	4.0	1.1	1.0			
				Grave Creek	GRCK	GRAV2	-[a]	d/s Harmer Cr.	-	3.0	11	2.6	0.5	1.0			
				Grave Creek	GRDS	GRAV1	EV_GV1	near mouth at Elk River	-	3.3	11	2.7	1.0	1.3			
				Six Mile Creek	-	-	EV_SM1	sediment pond decant	E102681	0.4	2.5	1.4	-	-			
				Balmer Creek	-	-	EV_BLM2	at CFI Road	E298592	3.2	5.5	1.1	-	-			
				Fennelon Creek	-	-	EV_FC1	at CFI Road	E298591	1.8	4.5	1.9	-	-			
				Goddard Creek	-	-	EV_GC2	sediment pond decant	E208043	11	35	10	-	-			
				Otto Creek	OCNM	OTTO1	EV_OC1	near mouth	E102679	0.8	0.7	2.1	0.4	0.9			

[a] No routine monitoring data available. Data presented are for water samples collected concurrently with other RAEMP samples, September 2015.

"-" = no data; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; "±" = plus or minus; "<" = less than; "0" = no significant trend at α = 0.1; NRQ = normal range quotient; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

Good
Marginal
Poor

Table 12.1: All Management Units, Lotic, Key Question #1 and #3

Locations of Chemical and Physical Changes and Mine Sources (comparison to normal ranges)

Management Unit	Main Watershed	Exposure Type	Stream Type (M-main stem; T-tributary)	Stream Name	Biological Area Code	Calcite Reach	Teck Water Station Code	Description (Biological. Water Stn Description included if no Biological) For RAEMP summary tables	ENV EMS Number	Water Quality, Routine Monitoring 2012 - 2016, Relative to NR (maximum monthly average NRQ in 2015)			Calcite Index (NRQ)	Maximum Tissue Selenium Concentrations Relative to Normal Ranges (NRQ)			
										Nitrate	Selenium	Sulphate	Concurrent with Benthic Invertebrate Community Samples	Invertebrates (n=1)	Westslope Cutthroat Trout Muscle	Mountain Whitefish Muscle	Mountain Whitefish Ovary
4	Elk	Mine-exposed	M	Elk River	EL19	-	EV_ER4 (Order - ER2)	d/s Fording R., u/s Grave Cr.	0200027	14	6.3	1.3	1.0	0.7	1.5	-	-
				Elk River	ELDGR	ELKR10	-[a]	d/s Grave Creek	-	11	4.3	1.2	0.3	0.8			
				Elk River	ELUSP	ELKR9	EV_ER2	d/s Otto Cr., u/s Sparwood & Michel Cr.	0200111	11	7.0	1.5	0.8	0.7			
	Michel		T	Corbin Creek	CORCK	CORB1	CM_CC1	near mouth and d/s CMO	0200209	42	10	14	1.4	0.4	-	-	-
				Erickson Creek	ERCK	ERIC1	EV_EC1	near mouth	200097	73	87	21	-	-			
				South Pit Creek	-	-	EV_SP1	sediment pond decant	E296311	32	128	24	-	-			
				Milligan Pond	-	-	EV_MG1	sediment pond decant	E208057	2.6	48	11	-	-			
				Gate Creek	-	-	EV_GT1	sediment pond decant	E206231	230	85	22	-	-			
				Bodie Creek	BOCK	BODI1	EV_BC1	d/s Bodie Pond	E102685	227	104	21	1.0	9.1			
				Aqueduct Creek	-	-	EV_AQ1	at Great Northern Road	E210369	2.6	5.8	1.6	-	-			
	Upper Michel		M	Michel Creek	MIDCO	-	CM_MC2 (Compliance)	d/s Corbin Creek, u/s Andy Good Creek	E258937	16	3.9	6.2	0.7	0.6	1.3	-	-
				Michel Creek	MIDAG	MICH4	CM_MCTM	d/s Andy Good Creek	-	4.6	1.5	2.4	0.4	1.0			
				Michel Creek	MI5	MICH3	-[a]	u/s Wheeler Creek	-	2.1	0.9	1.1	0.5	0.7			
	Lower Michel		M	Michel Creek	MI3	-	EV_MC3	u/s Erickson Creek	0200203	1.4	0.8	0.8	0.4	0.3	1.5	0.97	1.23
				Michel Creek	-	-	EV_MC2 (Compliance)	between Bodie Cr. and Aqueduct Cr., d/s HWY #3 bridge (Shell Plant)	E300091	27	12	3.4	-	-			
				Michel Creek	MI2	MICH1	EV_MC1[a]	d/s EVO and Aqueduct Creek	-	12	5.7	2.0	0.4	0.8			
5	Elk	Reference	T	McCool Creek	MCCR	-	-[a]	u/s Elk River	-	0.5	0.4	1.2	0.8	-	-	-	-
				Upper Wigwam River	WWRU	-	-[a]	upper	-	0.1	0.1	0.1	0.0	-			
				Lower Wigwam River	WWRL	-	-[a]	lower	-	0.2	0.1	0.1	0.0	-			
		Mine-exposed	M	Elk River	EL1	-	EV_ER1 (Order - ER3)	d/s Sparwood & Michel Creek, d/s EV_ER1	0200393	11	5.3	1.4	0.5	0.7	1.4	2.5	1.1
				Elk River	ELUFE	ELKR8	RG_ELKFERNIE	u/s Fernie	-	8.9	4.2	1.3	0.9	0.7			
				Elk River	ELDFE	-	-[a]	d/s Fernie	-	8.3	3.8	1.2	0.9	0.8			
				Elk River	ELELKO	-	RG_ELKORES (Order - ER4)	u/s Elko	E294312	9.3	3.9	1.3	0.0	1.1			
				Elk River	ELH93	-	RG_ELKMOUTH	u/s Hwy 93 bridge and Elk R. mouth at Koocanusa	-	8.1	3.2	1.1	1.0	1.6			

[a] No routine monitoring data available. Data presented are for water samples collected concurrently with other RAEMP samples, September 2015.

"-" = no data; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; "±" = plus or minus; "<" = less than; "0" = no significant trend at α = 0.1; NRQ = normal range quotient; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

Good
Marginal
Poor

Table 12.2: All Management Units, Lentic, Key Question #1

Locations of Chemical and Physical Changes (comparison to normal ranges)

Management Unit	Main Watershed	Exposure Type	Biological Area Description	Biological Area Code	Water Quality for Samples Collected Concurrently with Other Samples Relative to Normal Ranges (NRQ)			Sediment Chemistry Relative to Normal Ranges (NRQ)			Selenium Concentration in Invertebrates or Fish Relative to Normal Ranges (NRQ)		
												Longnose Sucker	
					Nitrate	Sulphate	Selenium	Selenium	PAH (PAH with highest quotient)	Applicable PAH (previous column)	Benthic Invertebrates	Muscle	Ovary
1	Fording	Reference	Lake Mountain Lake	LML	<0.1	<0.1	0.1	1.1	2.6	Dibenz(a,h)anthracene	0.7	-	-
			Fording River Wetland	FO15 (2013)	-	-	-	0.7	0.6	Benzo(b&j)fluoranthene	-	-	-
		Mine-exposed	Henretta Lake	HE27	-	2.0	8.2	0.6	1.0	Anthracene	1.5	-	-
			Lower Fording River Oxbow	FOXL	<0.1	<0.1	0.1	0.2	1.7	Anthracene	0.1	-	-
			Meadow area u/s Chauncey Creek	FMUCK	94	4.9	35	0.6	0.3	Chrysene	1.7	-	-
			Fording River wetland d/s Ewin Creek	FWDEC	0.4	0.6	0.5	2.7	0.3	Chrysene	1.6	-	-
			Off channel area of Fording River d/s Greenhills	R5-1	0.2	7.6	2.2	6.4	5.5	Anthracene	4.1	-	-
2	Elk	Mine-exposed	Lentic area off Fording River d/s Josephine Falls	R5-3	34	2.5	13	1.0	0.3	Chrysene	2.5	-	-
3	Elk	Reference	Unnamed Wetland near Elk River north of Elkford	REFF	<0.1	0.2	0.2	0.4	0.2	Chrysene	0.6	-	-
			Lost Lake	LOLA (2013)	-	-	-	0.2	13	Phenanthrene	-	-	-
		Mine-exposed	Elk River Upper Ponds	ERUP	<0.1	0.5	0.2	0.3	0.7	Anthracene	0.6	1.3	1.9
			Upper Elk River Oxbow	EROU	<0.1	<0.1	<0.1	0.3	0.3	Benzo(b&j)fluoranthene	0.2	-	-
4	Elk	Reference	Grave Lake Marsh	GLMS (2013)	-	-	-	0.3	0.1	2-Methylnaphthalene	-	-	-
			Grave Lake	GRLK (2013)	-	-	-	0.7	1.2	Fluoranthene	-	-	-
			Leach Creek Oxbow	LCHO	<0.1	<0.1	0.4	1.0	1.0	Anthracene	2.3	-	-
		Mine-exposed	Elk River Wetland Downstream of Grave Creek	ELWDGC	0.9	1.3	1.6	0.7	0.2	Chrysene	1.2	3.5	2.2
			Goddard Marsh (and lower Goddard Pond decant)	GO13	8.3	7.0	30	5.6	38	Anthracene	3.6	14	8.0
			Otto Creek wetlands	OTTO	0.1	2.6	0.9	0.8	33	Anthracene	1.8	-	-
			Michel Creek Wetland	MI16	1.4	2.0	0.8	1.5	2.6	Anthracene	2.3	-	-
			Michel Oxbow #2	MIC2	0.8	1.4	0.8	0.4	1.0	Anthracene	1.2	-	-
			Lower Michel Wetland	MIWW	0.2	0.9	0.6	0.4	1.2	Anthracene	2.2	-	2.4
5	Elk	Mine-exposed	Sparwood Wetland	SPW (2013)	-	-	-	0.4	0.5	Fluoranthene	-	-	-
			Elk River Wetland Downstream of Fernie	ERWSF (2013)	-	-	-	0.2	1.0	Fluoranthene	-	-	-
			Stanford Pond	STPD	3.4	0.9	3.4	2.1	193	Fluoranthene	3.6	-	3.9
			Lower Elk River Oxbow (d/s Fernie)	EROL	3.0	0.7	1.8	0.7	3.2	Anthracene	1.8	-	-
			Unnamed Wetland near Morrissey	UNWNMO	0.3	0.9	0.4	-	-	-	-	1.0	1.2
			Elko Resevoir	ELKO	-	1.3	4.2	0.2	2.8	Anthracene	1.3	-	-

Notes: "-" = no data; "<" = less than; ">" = greater than; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

[a] A survey was conducted but no fish were captured

[b] Upper limit of population estimate could not be calculated due to few fish recaptures

Good

Marginal

Poor

Table 12.3: All Management Units, Lotic, Key Question #2 and #3

Locations of Biological Effects and Mine Sources (comparison to normal ranges [biological] and effect benchmarks [physical, chemical])

Management Unit	Main Watershed	Exposure Type	Stream Type (M-main stem; T-tributary)	Stream Name	Biological Area Code	Calcite Reach	Teck Water Station Code	Description (Biological. Water Stn Description included if no Biological) For RAEMP summary tables	ENV EMS Number	Water Quality, Routine Monitoring 2012 - 2016, Relative to Level 1 Benchmarks (maximum monthly average HQ in 2015)			Water Quality Temporal Analysis (% Change Relative to Reference Trend)[b]	Acute Toxicity (maximum percent mortality among monthly tests in 2015)		Maximum Chronic Toxicity Among Quarterly Samples in 2015 (mean ± standard deviation for most sensitive test endpoint)				Calcite Index (NRQ)	Maximum Tissue Selenium Concentration Relative to Level 1 Benchmarks (HQ)						Benthic Invertebrate Community Endpoints Relative to the 2.5th and 97.5th Percentiles of the Reference Area Distribution			
										Nitrate	Selenium	Sulphate	Years included in Analysis	Rainbow trout	Daphnia magna	Rainbow trout embryo viability (% control-normalized)	*C. dubia* reproduction (% control-normalized)	*P. subcapitata* Cell Yield (x 10^4 cells/mL)	*Hyallela azteca* dry weight (% control-normalized)	Concurrent with Benthic Invertebrate Community Samples	Effects to Invertebrate Growth, Reproduction, Survival	Effects to Juvenile Fish based on Dietary Exposure to Invertebrates	Effects to Juvenile Birds Based on Dietary Exposure to Invertebrates	Effects to Westslope Cutthroat Trout Reproduction (egg/ovary)	Effects to Mountain Whitefish Reproduction (egg/ovary)	Total Abundance (# organisms / 3-min kick sample)	Total Richness (lowest practical level of taxonomy)	% Ephemeroptera, Plecoptera, and Trichoptera (EPT)	% Ephemeroptera
																										1,005	20	63.0	21.3
																										13,221	38	97.2	71.8
1	Fording	Reference	T	Henretta Creek	HENUP	HENR3	FR_HC3	upper creek, u/s FRO	E300096	0.1	<0.1	0.2	-	-	-	-	-	-	-	0.1	-	-	-	-	-	7,500	20	96	68
			T	Chauncey Creek	CHCK	-	FR_CH1[a]	near mouth	E295214	<0.1	<0.1	0.1	-	-	-	-	-	-	-	0.5	-	-	-	-	-	13,360	32	69	42
			T	Ewin Creek	EWCK	-	-[a]	near mouth	-	<0.1	<0.1	0.1	-	-	-	-	-	-	-	0.5	-	-	-	-	-	6,060	31	87	61
			M	Fording River	FO26	-	FR_UFR1	u/s Henretta Cr. and FRO	E216777	<0.1	<0.1	0.1	-	-	-	-	-	-	-	0.9	0.4	0.4	0.3			9,400	29	86	67
		Mine-exposed	T	Henretta Creek	HENFO	HENR2	FR_HC1	u/s Fording R.	E216778	0.8	0.5	0.5	12,13,14,15,16	-	-	-	-	-	-	0.9	0.7	0.9	0.6			13,820	29	84	75
						HENR1																							
				Clode Creek	-	COUT1	FR_CC1	Decant from Clode sediment pond	E102481	3.9	1.8	0.8	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-			-	-	-	-
				Lake Mountain Creek	NGD1	-	FR_NGD1	Lower Lake Mountain Creek/ North Greenhills Diversion	E105060	0.3	0.3	0.3	12,13,14,15,16	-	-	-	-	-	-	0.8	0.9	1.0	0.8			9,760	27	60	28
				Kilmarnock Creek	KICK	KILM1	FR_KC1	mouth (d/s of rock drain)	0200252	6.6	3.3	1.5	12,13,14,15,16	-	-	-	-	-	-	2.3	0.0	0.0	0.0			497	22	16	0.4
				Swift Creek	SWCK	SWIF2	GH_SC1	lower creek	E221329	0.6	2.7	1.5	12,13,14,15	-	-	-	-	-	-	2.1	1.4	1.7	1.2			6,214	24	29	0.0
							GH_SC2	lower creek	E105061	2.9	11	4.2	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-			-	-	-	-
				Cataract Creek	CATCK	CATA3	GH_CC1	Cataract Creek near mouth	0200384	2.4	10	4.5	12,13,14,15,16	10	90	-	-	-	-	3.0	0.8	1.0	0.7			4,030	18	12	0.0
				Porter Creek	POCK	PORT1	GH_PC1	lower creek	200385	0.2	1.2	1.1	12,13,14,15,16	0	0	-	-	-	-	1.1	0.4	0.5	0.4			22,160	30	19	0.9
				Fording River side channel	FO10-SP1	-	-[a]	former Fording River Oxbow, now side channel	-	1.2	0.6	0.2	-	-	-	-	-	-	-	0.8	0.5	0.6	0.5			13,800	29	75	6.2
				LCO Dry Creek	LC_DCDS	DRYL4	LC_DCDS	d/s sedimentation ponds	E295210	0.1	<0.1	<0.1	13,14,15,16	-	-	-	-	-	-	0.0	0.4	0.5	0.4			7,640	27	91	60
				LCO Dry Creek	-	-	LC_DC3	u/s of East Tributary Cr.	E288273	0.1	<0.1	<0.1	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-			-	-	-	-
				LCO Dry Creek	LC_DC1	DRYL1	LC_DC1	Dry Creek near mouth	E288270	<0.1	<0.1	<0.1	12,13,14,15,16	-	-	-	-	-	-	0.0	0.4	0.5	0.3			7,140	25	91	54
				Greenhills Creek	GHCKU	GREE3	-[a]	u/s of sediment pond	-	0.4	1.0	1.7	-	-	-	-	-	-	-	2.5	0.8	1.0	0.7			774	24	25	1.9
				Greenhills Creek	GHCKD	GREE1	GH_GH1	d/s sediment pond	E102709	0.3	1.5	1.6	12,13,14,15,16	0	0	-	-	-	-	1.4	1.7	2.0	1.4			10,560	40	21	6.4
			M	Fording River	FODHE	FORD11	FR_FR1	d/s Henretta Cr.	0200251	0.7	0.4	0.4	12,13,14,15,16	-	-	-	-	-	-	0.9	0.5	0.6	0.4			17,060	27	78	61
				Fording River	FOUNGD		-[a]	u/s North Greenhills Diversion	-	1.1	0.2	0.3	-	-	-	-	-	-	-	0.8	0.6	0.7	0.5			7,260	23	93	75
				Fording River	FODNGD	-	FR_FRABEC1	d/s Lake Mountain Creek/ North Greenhills Diversion	-	1.2	0.5	0.3	12,15	0	0	-	-	-	-	0.8	0.5	0.6	0.4			7,840	23	94	77
				Fording River	MP1	EPOU1	FR_MULTIPLATE	Multiplate Culvert on Greenhills Access Road	-	1.1	0.5	0.3	12,13,15,16	0	3.0	-	-	-	-	1.0	0.5	0.5	0.4			5,470	32	70	51
				Fording River	FOUSH	FORD10	-[a]	u/s Shandley Cr.	-	1.0	0.2	0.3	-	-	-	-	-	-	-	1.0	0.5	0.5	0.4			7,320	28	86	73
				Fording River	FOUKI	SPSE1	FR_FR2	u/s Kilmarnock Cr.	0200201	1.2	0.6	0.6	12,13,14,15,16	-	-	-	-	-	-	1.0	0.4	0.5	0.3			3,490	30	75	65
				Fording River	FOBKS	FORD9	GH_FR3	at Fording R. bridge, d/s Kilmarnock & u/s Swift Cr.	-	0.9	0.5	0.5	12,13,14,15	-	-	-	-	-	-	0.9	0.5	0.5	0.4			4,161	25	69	47
				Fording River	FOBSC		FR_FR4, GH_FR	d/s Swift Cr., u/s Cataract Cr.	0200311	1.2	0.9	0.7	12,13,14,15,16	-	-	-	-	-	-	1.2	0.6	0.7	0.5			2,923	26	62	40
				Fording River	FOBCP		FR_FRCP1 (Compliance)	d/s Cataract, u/s Porter	E300071	1.5	4.4	2.3	15,16	-	-	72 (±3)	47 (±18)	96.2 (+2.2)	72 (±10)	1.3	0.6	0.7	0.5	0.9	-	4,260	27	78	16
				Fording River	FODPO	FORD8	GH_PC2	d/s Porter Cr., u/s Chauncey Cr. (discontinued sampling in 2015)	E287431	1.5	1.3	0.8	12,13,14,15	-	-	-	-	-	-	0.9	0.5	0.6	0.5			10,340	22	90	7.9
				Fording River	FO22		FR_FRABCH	Fording River Above Chauncey Creek		1.4	1.1	0.7	13,15,16	-	-	-	-	-	-	0.8	0.5	0.6	0.5			21,140	30	65	13
				Fording River	FOUEW	FORD7	FR_FR5	d/s Chauncey Cr., u/s Ewin Cr.	-	1.3	1.0	0.6	12,13,14,15,16	-	-	-	-	-	-	1.0	0.5	0.6	0.4			7,720	25	71	26
						FORD6																							
				Fording River	FO28/LC-FRUS	FORD5	LC_FRUS	Fording River u/s Dry Creek	E295232	1.1	0.7	0.5	13,14,15	-	-	-	-	-	-	-	-	-	-			-	-	-	-
				Fording River	FO29		LC_FRB	d/s Dry Cr., u/s GHO at Fording R. Bridge	-	1.1	0.7	0.5	12,13,14,15,16	-	-	-	-	-	-	1.0	0.6	0.7	0.5			8,580	37	56	36
				Fording River	FODGH	-	GH_FR1 (Order - FR4 and Compliance)	d/s GHO and Greenhills Cr.	0200251	0.9	0.7	0.6	12,13,14,15,16	0	0	79 (±4)	99 (±11)	107 (+5.8)	48 (±35)	1.0	0.6	0.8	0.6			10,980	28	78	35
2	Fording	Reference	T	Grace Creek	LC_GRCK	-	LC_GRCK	lower creek	E288275	<0.1	0.1	0.1	-	-	-	-	-	-	-	0.0	0.5	0.6	0.4	-	-	6,760	26	93	20
				Line Creek	LI24	-	LC_LC1	u/s LCO	E216142	0.1	0.1	0.2	-	-	-	-	-	-	-	0.0	0.4	0.5	0.4			3,008	21	93	63
				South Line Creek	SLINE	-	LC_SLC	u/s Line Creek and LCO	E282149	<0.1	0.1	0.2	-	-	-	-	-	-	-	0.0	0.3	0.4	0.3			6,505	27	94	60
		Mine-exposed	T	Line Creek	LCUT	LINE4	LC_LCUSWLC	d/s rock drain, u/s West Line Cr. and AWTF outfall	E293369	2.0	3.1	0.7	12,13,14,15,16	0	0	-	-	-	-	-	-	-	-			-	-	-	-
				Line Creek	LILC3		LC_LC3	d/s West Line Cr. and AWTF outfall	0200337	1.7	6.2	0.9	12,13,14,15,16	0	0	-	-	-	-	1.0	1.0	1.2	0.9			19,360	26	33	8.5
				Line Creek	LIDSL	LINE3	LC_LCDSSLCC (Compliance)	d/s South Line	E297110	1.0	3.8	0.6	14,15,16	-	-	87 (±9)	82 (±12)	69.2 (±5.7)	-	0.6	0.7	0.8	0.6	-	-	6,980	30	74	38
				Line Creek	LI8	LINE1	LC_LC4	Line Creek canyon	0200044	1.0	2.7	0.5	12,13,14,15,16	-	-	-	-	-	-	0.0	0.7	0.8	0.6			3,390	29	87	26
						LINE2																							

[a] No routine monitoring data available. Data presented are for water samples collected concurrently with other RAEMP samples, September 2015.

[b] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

"-" = no data; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; "±" = plus or minus; "<" = less than; "0" = no significant trend at α = 0.1; NRQ = normal range quotient; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

Good Marginal Poor

Table 12.3: All Management Units, Lotic, Key Question #2 and #3

Locations of Biological Effects and Mine Sources (comparison to normal ranges [biological] and effect benchmarks [physical, chemical])

Management Unit	Main Watershed	Exposure Type	Stream Type (M-main stem; T-tributary)	Stream Name	Biological Area Code	Calcite Reach	Teck Water Station Code	Description (Biological. Water Stn Description included if no Biological) For RAEMP summary tables	ENV EMS Number	Water Quality, Routine Monitoring 2012 - 2016, Relative to Level 1 Benchmarks (maximum monthly average HQ in 2015)			Water Quality Temporal Analysis (% Change Relative to Reference Trend)[b]	Acute Toxicity (maximum percent mortality among monthly tests in 2015)		Maximum Chronic Toxicity Among Quarterly Samples in 2015 (mean ± standard deviation for most sensitive test endpoint)				Calcite Index (NRQ)	Maximum Tissue Selenium Concentration Relative to Level 1 Benchmarks (HQ)						Benthic Invertebrate Community Endpoints Relative to the 2.5th and 97.5th Percentiles of the Reference Area Distribution			
										Nitrate	Selenium	Sulphate	Years included in Analysis	Rainbow trout	Daphnia magna	Rainbow trout embryo viability (% control-normalized)	*C. dubia* reproduction (% control-normalized)	*P. subcapitata* Cell Yield (x 10^4 cells/mL)	*Hyallela azteca* dry weight (% control-normalized)	Concurrent with Benthic Invertebrate Community Samples	Effects to Invertebrate Growth, Reproduction, Survival	Effects to Juvenile Fish based on Dietary Exposure to Invertebrates	Effects to Juvenile Birds Based on Dietary Exposure to Invertebrates	Effects to Westslope Cutthroat Trout Reproduction (egg/ovary)	Effects to Mountain Whitefish Reproduction (egg/ovary)	Total Abundance (# organisms / 3-min kick sample)	Total Richness (lowest practical level of taxonomy)	% Ephemeroptera, Plecoptera, and Trichoptera (EPT)	% Ephemeroptera
																											1,005	20	63.0	21.3
																											13,221	38	97.2	71.8
2	Fording	Mine-exposed	M	Fording River	FO9	FORD4	-[a]	d/s Josephine falls, u/s Grace Cr. and Line Cr.	-	0.9	0.3	0.4	-	-	-	-	-	-	-	0.8	0.6	0.7	0.5	0.7	1.0	6,720	24	72	40
				Fording River	FRUL	FORD2	LC_LC6	d/s Grace Cr., u/s Line Cr.	0200338	0.9	2.5	0.5	12,13,14,15,16	-	-	-	-	-	-	0.0	0.6	0.7	0.5			3,006	25	83	30
				Fording River	FO23	FORD1	LC_LC5 (Order - FR5)	d/s Line Creek	0200028	0.9	2.4	0.5	12,13,14,15,16	-	-	-	-	-	-	0.9	0.5	0.6	0.4			3,780	39	65	21
3	Elk	Reference	M	Elk River	ELUGH	-	GH_ER2	u/s Branch Cr. and GHO	200389	<0.1	0.1	0.1	-	-	-	-	-	-	-	0.1	0.3	0.4	0.3	-	-	4,044	22	92	55
		Mine-exposed	T	Branch F Creek	-	-	GH_BR_F	at LRP Road culvert	E287437	0.1	<0.1	<0.1	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Wolf Creek	-	-	GH_WOLF	at LRP Road culvert (until end 2016)	-	0.3	<0.1	<0.1	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Willow Creek	-	-	GH_WILLOW	at LRP Road culvert; Willow_S was diverted to this location Dec 2016	-	0.1	0.2	0.1	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Willow Creek	-	-	GH_WILLOW_S	Willow Creek South at LRP Road (as of 2017)	-	<0.1	0.1	<0.1	13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Wade Creek	-	-	GH_WADE	at LRP Road culvert	E287433	0.4	0.1	0.1	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Cougar Creek	-	-	GH_COUGAR	at LRP Road culvert	E287432	0.3	<0.1	<0.1	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Mickelson Creek	-	MICK1	GH_MC1	at LRP Road culvert	200388	3.7	0.7	2.1	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Leask Creek	-	-	GH_LC2	u/s pond inflow at LRP Road culvert	-	17	7.7	3.6	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Leask Creek	-	-	GH_LC1	sediment pond decant (goes to ground)	E257796	4.3	1.0	1.6	15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Wolfram Creek	WOCK	WOLF3	GH_WC2	lower creek	-	13	4.5	2.0	12,13,14,15,16	-	-	-	-	-	-	1.3	0.9	1.1	0.8			1,244	30	38	0.3
				Wolfram Creek	-	-	GH_WC1	sediment pond decant (goes to ground)	E257795	5.6	1.8	2.0	12,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Thompson Creek	THCK	THOM2	GH_TC2	lower creek	E207436	4.9	6.3	1.7	12,13,14,15,16	0	0	-	-	-	-	1.0	1.4	1.6	1.2			2,412	25	17	1.1
			M	Elk River	EL20	ELKR12	GH_ERC (Compliance)	d/s Thompson Cr. and GHO	E300090	0.3	0.1	0.1	15,16	0	0	74 (±22)	91 (±21)	107.5 (+12.1)	-	0.8	0.4	0.5	0.3	0.4	1.0	6,218	29	92	55
				Elk River	ELUEL	-	GH_ER1 (Order - ER1)	d/s GHO, u/s Fording R. and u/s Boivin Cr.	0206661	0.2	0.1	0.1	12,13,14,15,16	-	-	-	-	-	-	0.9	0.3	0.4	0.3			5,135	27	82	55
				Elk River	ELDEL	-	-[a]	d/s Elkford sewage ponds	-	0.1	<0.1	0.1	-	-	-	-	-	-	-	0.2	0.4	0.4	0.3			7,740	28	87	61
				Elk River	ELUFO	-	-[a]	u/s Fording R.	-	<0.1	<0.1	0.1	-	-	-	-	-	-	-	1.0	0.4	0.5	0.4			8,980	34	40	17
4	Elk	Reference	T	Grave Creek	GRUHA	-	EV_GV3[a]	u/s Harmer Cr.	-	<0.1	<0.1	0.1	-	-	-	-	-	-	-	1.0	-	-	-	-	-	4,891	32	96	45
	Michel			Andy Good Creek	AGCK	-	CM_AG1[a]	u/s CMO	-	0.1	<0.1	<0.1	-	-	-	-	-	-	-	0	-	-	-	-	-	7,180	22	97	68
				Alexander Creek	AL4	-	-[a]	mid creek upstream ALUSM	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	1.0	-	-	-	-	-	10,960	28	82	57
				Alexander Creek	ALUSM	-	EV_AC2[a]	near bend to west	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	0.8	-	-	-	-	-	8,900	34	69	41
			M	Michel Creek	MI25	-	CM_MC1	u/s CMO	E258175	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	0.4	0.4	0.4	0.3			7,140	31	84	47
				Michel Creek	MIUCO	-	-[a]	u/s Corbin Cr.	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	0.9	0.4	0.4	0.3			7,820	31	72	53
	Elk	Mine-exposed	T	Harmer Creek	HACKUS	HARM3	EV_HC6	u/s from Harmer Pond	-	<0.1	<0.1	<0.1	13,14,15,16	-	-	-	-	-	-	0.9	0.5	0.6	0.4			15,540	35	85	36
				Harmer Creek	HACKDS	HARM1	EV_HC1 (Compliance)	dam/spillway at d/s end of Harmer Pond	E102682	0.5	2.1	0.5	12,13,14,15,16	0	3.0	81 (±3)	97 (±6)	27.2 (+3.9)	-	1.1	0.6	0.7	0.5			10,160	32	50	29
				Grave Creek	GRCK	GRAV2	-[a]	d/s Harmer Cr.	-	0.1	0.2	0.4	-	-	-	-	-	-	-	0.5	0.6	0.7	0.5			7,740	33	87	44
				Grave Creek	GRDS	GRAV1	EV_GV1	near mouth at Elk River	-	0.3	1.4	0.4	13,14,15,16	-	-	-	-	-	-	1.0	0.8	1.0	0.7			8,400	30	76	30
				Six Mile Creek	-	-	EV_SM1	sediment pond decant	E102681	<0.1	0.2	0.2	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Balmer Creek	-	-	EV_BLM2	at CFI Road	E298592	0.2	0.5	0.1	13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Fennelon Creek	-	-	EV_FC1	at CFI Road	E298591	0.1	0.5	0.3	13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Goddard Creek	-	-	EV_GC2	sediment pond decant	E208043	0.6	2.5	0.8	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Otto Creek	OCNM	OTTO1	EV_OC1	near mouth	E102679	0.1	0.1	0.2	12,13,14,15,16	0	0	-	-	-	-	0.4	0.5	0.6	0.5			1,373	40	34	2.1
			M	Elk River	EL19	-	EV_ER4 (Order - ER2)	d/s Fording R., u/s Grave Cr.	0200027	1.3	0.8	0.2	12,13,14,15,16	-	-	-	-	-	-	1.0	0.4	0.5	0.3	0.6	-	3,240	32	60	29
				Elk River	ELDGR	ELKR10	-[a]	d/s Grave Creek	-	0.4	0.1	0.2	-	-	-	-	-	-	-	0.3	0.5	0.6	0.4			1,288	30	89	64
				Elk River	ELUSP	ELKR9	EV_ER2	d/s Otto Cr., u/s Sparwood & Michel Cr.	0200111	1.0	0.7	0.2	12,13,14,15,16	-	-	-	-	-	-	0.8	0.4	0.5	0.4			6,460	25	68	43
	Michel		T	Corbin Creek	CORCK	CORB1	CM_CC1	near mouth and d/s CMO	0200209	2.5	1.0	1.6	12,13,14,15,16	-	-	-	-	-	-	1.4	0.3	0.3	0.2			29,180	34	17	0.0
				Erickson Creek	ERCK	ERIC1	EV_EC1	near mouth	200097	4.5	7.0	1.7	12,13,14,15,16	0	0	-	-	-	-	-	-	-	-			-	-	-	-
				South Pit Creek	-	-	EV_SP1	sediment pond decant	E296311	2.1	10	1.9	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-			-	-	-	-
				Milligan Pond	-	-	EV_MG1	sediment pond decant	E208057	0.2	3.8	1.3	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Gate Creek	-	-	EV_GT1	sediment pond decant	E206231	12	9.4	2.2	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-			-	-	-	-
				Bodie Creek	BOCK	BODI1	EV_BC1	d/s Bodie Pond	E102685	16	12	2.2	12,13,14,15,16	0	0	-	-	-	-	1.0	5.5	6.5	4.7			8,140	26	7.6	0.0
				Aqueduct Creek	-	-	EV_AQ1	at Great Northern Road	E210369	0.2	0.6	0.2	12,13,14,15,16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] No routine monitoring data available. Data presented are for water samples collected concurrently with other RAEMP samples, September 2015.

[b] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

"-" = no data; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; "±" = plus or minus; "<" = less than; "0" = no significant trend at α = 0.1; NRQ = normal range quotient; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

Good Marginal Poor

Table 12.3: All Management Units, Lotic, Key Question #2 and #3

Locations of Biological Effects and Mine Sources (comparison to normal ranges [biological] and effect benchmarks [physical, chemical])

Management Unit	Main Watershed	Exposure Type	Stream Type (M-main stem; T-tributary)	Stream Name	Biological Area Code	Calcite Reach	Teck Water Station Code	Description (Biological. Water Stn Description included if no Biological) For RAEMP summary tables	ENV EMS Number	Water Quality, Routine Monitoring 2012 - 2016, Relative to Level 1 Benchmarks (maximum monthly average HQ in 2015)			Water Quality Temporal Analysis (% Change Relative to Reference Trend)[b]	Acute Toxicity (maximum percent mortality among monthly tests in 2015)		Maximum Chronic Toxicity Among Quarterly Samples in 2015 (mean ± standard deviation for most sensitive test endpoint)				Calcite Index (NRQ)	Maximum Tissue Selenium Concentration Relative to Level 1 Benchmarks (HQ)						Benthic Invertebrate Community Endpoints Relative to the 2.5th and 97.5th Percentiles of the Reference Area Distribution			
										Nitrate	Selenium	Sulphate	Years included in Analysis	Rainbow trout	Daphnia magna	Rainbow trout embryo viability (% control-normalized)	*C. dubia* reproduction (% control-normalized)	*P. subcapitata* Cell Yield (x 10^4 cells/mL)	*Hyallela azteca* dry weight (% control-normalized)	Concurrent with Benthic Invertebrate Community Samples	Effects to Invertebrate Growth, Reproduction, Survival	Effects to Juvenile Fish based on Dietary Exposure to Invertebrates	Effects to Juvenile Birds Based on Dietary Exposure to Invertebrates	Effects to Westslope Cutthroat Trout Reproduction (egg/ovary)	Effects to Mountain Whitefish Reproduction (egg/ovary)	Total Abundance (# organisms / 3-min kick sample)	Total Richness (lowest practical level of taxonomy)	% Ephemeroptera, Plecoptera, and Trichoptera (EPT)	% Ephemeroptera
																										1,005	20	63.0	21.3
																										13,221	38	97.2	71.8
4	Upper Michel	Mine-exposed	M	Michel Creek	MIDCO	-	CM_MC2 (Compliance)	d/s Corbin Creek, u/s Andy Good Creek	E258937	1.1	0.4	0.8	12,13,14,15,16	0	0	81 (±6)	55 (±14)	107.5 (+8.8)	35 (±25)	0.7	0.3	0.4	0.3	0.5	1.5	12,360	32	51	22
				Michel Creek	MIDAG	MICH4	CM_MCTM	d/s Andy Good Creek	-	0.4	0.2	0.3	12,13,14,15,16	-	-	-	-	-	-	0.4	0.6	0.7	0.5			14,520	31	72	43
				Michel Creek	MI5	MICH3	-[a]	u/s Wheeler Creek	-	0.1	<0.1	0.1	-	-	-	-	-	-	-	0.5	0.4	0.5	0.3			7,120	22	87	30
	Lower Michel		M	Michel Creek	MI3	-	EV_MC3	u/s Erickson Creek	0200203	0.1	0.1	0.1	12,13,14,15,16	-	-	-	-	-	-	0.4	0.2	0.2	0.2	0.6	-	7,660	26	80	38
				Michel Creek	-	-	EV_MC2 (Compliance)	between Bodie Cr. and Aqueduct Cr., d/s HWY #3 bridge (Shell Plant)	E300091	2.0	1.3	0.4	14,15,16	-	-	86 (±15)	90 (±15)	102 (+5.2)	-	-	-	-	-			-	-	-	-
				Michel Creek	MI2	MICH1	EV_MC1[a]	d/s EVO and Aqueduct Creek	-	0.3	0.1	0.3	12,13,14	-	-	-	-	-	-	0.4	0.5	0.6	0.4			6,119	33	73	30
5	Elk	Reference	T	McCool Creek	MCCR	-	-[a]	u/s Elk River	-	<0.1	<0.1	0.2	-	-	-	-	-	-	-	0.8	-	-	-	-	-	11,620	24	95	24
				Upper Wigwam River	WWRU	-	-[a]	upper	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	0.0	-	-	-	-	-	777	23	94	46
				Lower Wigwam River	WWRL	-	-[a]	lower	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	0.0	-	-	-			4,856	23	78	41
		Mine-exposed	M	Elk River	EL1	-	EV_ER1 (Order - ER3)	d/s Sparwood & Michel Creek, d/s EV_ER1	0200393	0.9	0.6	0.2	12,13,14,15,16	-	-	-	-	-	-	0.5	0.4	0.5	0.4	0.6	1.3	7,720	32	70	54
				Elk River	ELUFE	ELKR8	RG_ELKFERNIE	u/s Fernie	-	0.6	0.4	0.1	13,14,15,16	-	-	-	-	-	-	0.9	0.4	0.5	0.4			11,000	32	61	54
				Elk River	ELDFE	-	-[a]	d/s Fernie	-	0.3	0.1	0.2	-	-	-	-	-	-	-	0.9	0.5	0.6	0.4			17,160	33	73	65
				Elk River	ELELKO	-	RG_ELKORES (Order - ER4)	u/s Elko	E294312	0.7	0.5	0.2	12,13,14,15,16	-	-	-	-	-	-	0.0	0.7	0.8	0.6			7,880	22	92	67
				Elk River	ELH93	-	RG_ELKMOUTH	u/s Hwy 93 bridge and Elk R. mouth at Koocanusa	-	0.6	0.4	0.1	12,13,14,15,16	-	-	-	-	-	-	1.0	1.0	1.1	0.8			2,858	23	22	14

[a] No routine monitoring data available. Data presented are for water samples collected concurrently with other RAEMP samples, September 2015.

[b] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

"-" = no data; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; "±" = plus or minus; "<" = less than; "0" = no significant trend at α = 0.1; NRQ = normal range quotient; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

Good Marginal Poor

Table 12.4: All Management Units, Lentic, Key Question #2

Locations of Biological Effects (comparison to normal ranges [biological] and effect benchmarks [physical, chemical])

Management Unit	Main Watershed	Exposure Type	Biological Area Description	Biological Area Code	Water Quality for Samples Collected Concurrently with Other Samples Relative to Level 1 Benchmarks (HQ)			Sediment Chemistry Relative to Upper Sediment Quality Guideline (HQ)			Sediment Toxicity (Y = toxicity observed; N = no toxicity)	Tissue Selenium Concentration Relative to Level 1 Benchmarks (HQ)				Fish (Longnose Sucker)			
					Nitrate	Sulphate	Selenium	Selenium	PAH (PAH with highest quotient)	Applicable PAH (previous column)		Effects to Invertebrates	Effects to Juvenile Fish Based on Dietary Exposure to Invertebrates	Effects to Juvenile Birds Based on Dietary Exposure to Invertebrates	Effects to Longnose Sucker Reproduction (egg/ovary)	Population Estimate, May (95% confidence interval)	Population Estimate, September (95% confidence interval)	Density Estimate May (No. fish/ha)	% Difference Relative to Reference: Condition
1	Fording	Reference	Lake Mountain Lake	LML	<0.1	<0.1	<0.1	4.4	24	2-Methylnaphthalene	N	0.4	0.5	0.4	-	-	-	-	-
			Fording River Wetland	FO15 (2013)	-	-	-	2.5	1.5	2-Methylnaphthalene	-	-	-	-	-	-	-	-	-
		Mine-exposed	Henretta Lake	HE27	-	<0.1	0.2	2.2	5.6	2-Methylnaphthalene	-	0.9	1.1	0.8	-	-	-	-	-
			Lower Fording River Oxbow	FOXL	<0.1	<0.1	<0.1	0.8	7.3	2-Methylnaphthalene	-	0.1	0.1	0.1	-	-	-	-	-
			Meadow area u/s Chauncey Creek	FMUCK	6.2	<0.1	1.0	2.2	2.2	2-Methylnaphthalene	-	1.0	1.2	0.9	-	-	-	-	-
			Fording River wetland d/s Ewin Creek	FWDEC	<0.1	<0.1	<0.1	11	1.7	2-Methylnaphthalene	-	1.0	1.1	0.8	-	-	-	-	-
			Off channel area of Fording River d/s Greenhills	R5-1	<0.1	<0.1	<0.1	25	26	2-Methylnaphthalene	Y	2.5	2.9	2.1	-	-	-	-	-
2	Elk	Mine-exposed	Lentic area off Fording River d/s Josephine Falls	R5-3	3.3	<0.1	1.5	3.9	0.9	2-Methylnaphthalene	-	1.5	1.8	1.3	-	-	-	-	-
3	Elk	Reference	Unnamed Wetland near Elk River north of Elkford	REFF	<0.1	<0.1	<0.1	1.5	1.7	2-Methylnaphthalene	-	0.3	0.4	0.3	-	0[a]	-	0[a]	-
			Lost Lake	LOLA (2013)	-	-	-	0.6	141	2-Methylnaphthalene	-	-	-	-	-	-	-	-	-
		Mine-exposed	Elk River Upper Ponds	ERUP	<0.1	<0.1	<0.1	1.1	1.1	2-Methylnaphthalene	-	0.4	0.4	0.3	0.6	357 (109 - incalculable[b])	183 (55 - 1,028)	5.8	7.3
			Upper Elk River Oxbow	EROU	<0.1	<0.1	<0.1	1.1	0.7	2-Methylnaphthalene	-	0.1	0.1	0.1	-	-	-	-	-
4	Elk	Reference	Grave Lake Marsh	GLMS (2013)	-	-	-	1.2	1.0	2-Methylnaphthalene	-	-	-	-	-	-	-	-	-
			Grave Lake	GRLK (2013)	-	-	-	2.6	4.9	2-Methylnaphthalene	-	-	-	-	-	-	-	-	-
			Leach Creek Oxbow	LCHO	<0.1	<0.1	<0.1	3.9	0.6	Phenanthrene	N	1.4	1.6	1.2	-	-	-	-	-
		Mine-exposed	Elk River Wetland Downstream of Grave Creek	ELWDGC	0.3	<0.1	0.2	2.9	0.7	2-Methylnaphthalene	-	0.7	0.9	0.6	0.7	9 (3 - incalculable[b])	-	0.9	6.0
			Goddard Marsh (and lower Goddard Pond decant)	GO13	2.8	<0.1	2.5	22	50	2-Methylnaphthalene	Y	2.1	2.5	1.9	2.5	1,069 (402 - 41,922)	4,357 (2,151 - 21,303)	17.2	NS
			Otto Creek wetlands	OTTO	<0.1	<0.1	<0.1	3.2	128	2-Methylnaphthalene	Y	1.1	1.3	0.9	-	689 (309 - 5,820)	1,304 (814 - 2,695)	10.5	7.0
			Michel Creek Wetland	MI16	0.5	<0.1	<0.1	5.9	4.1	2-Methylnaphthalene	N	1.4	1.7	1.2	-	-	-	-	-
			Michel Oxbow #2	MIC2	0.3	<0.1	<0.1	1.4	2.1	2-Methylnaphthalene	-	0.7	0.8	0.6	-	>5 (incalculable[b])	-	>0.18	-
			Lower Michel Wetland	MIWW	<0.1	<0.1	<0.1	1.6	1.9	2-Methylnaphthalene	-	1.3	1.5	1.1	0.8	>3 (incalculable[b])	-	>0.13	-
5	Elk	Mine-exposed	Sparwood Wetland	SPW (2013)	-	-	-	1.6	1.6	2-Methylnaphthalene	-	-	-	-	-	-	-	-	-
			Elk River Wetland Downstream of Fernie	ERWSF (2013)	-	-	-	0.8	1.5	2-Methylnaphthalene	-	-	-	-	-	-	-	-	-
			Stanford Pond	STPD	1.1	<0.1	0.3	8.1	18	Pyrene	Y	2.1	2.5	1.9	1.2	5,417 (1,649 - incalculable[b])	2,996 (1,944 - 4,824)	170	NS
			Lower Elk River Oxbow (d/s Fernie)	EROL	1.0	<0.1	0.2	2.7	0.9	2-Methylnaphthalene	-	1.1	1.3	0.9	-	25 (8 - incalculable[b])	-	0.4	NS
			Unnamed Wetland near Morrissey	UNWNMO	0.1	<0.1	<0.1	-	-	-	-	-	-	-	0.4	274 (83 - incalculable[b])	-	3.7	8.0
			Elko Resevoir	ELKO	-	<0.1	0.5	0.7	1.3	2-Methylnaphthalene	-	0.8	0.9	0.7	-	-	-	-	-

Notes: "-" = no data; "<" = less than; ">" = greater than; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

[a] A survey was conducted but no fish were captured

[b] Upper limit of population estimate could not be calculated due to few fish recaptures

Good

Marginal

Poor

Table 12.5: All Management Units, Lotic, Key Question #4
Changes Over Time

Management Unit	Main Watershed	Exposure Type	Stream Type (M-main stem; T-tributary)	Stream Name	Biological Area Code	Calcite Reach	Teck Water Station Code	Description (Biological. Water Stn Description included if no Biological) For RAEMP summary tables	ENV EMS Number	Water Quality Temporal Analysis (% Change Relative to Reference Trend) [b]						Calcite Index Temporal Analysis (Change in Calcite Index Relative to Reference Trend) [c]			Tissue Selenium Concentration Temporal Analysis			Benthic Invertebrate Community Temporal Analysis (% Change Relative to Reference Trend) [b]									
										Nitrate		Selenium		Sulphate		Years included in Analysis	Calcite Index		Years included in Analysis	Benthic Invertebrates 2006 - 2015		Years included in Analysis	Total abundance (# organisms per sample)		Total Richness (lowest practical level of taxonomy)		% Ephemeroptera, Plecoptera, and Trichoptera (EPT)		% Ephemeroptera	
										Magnitude	Type	Magnitude	Type	Magnitude	Type		Magnitude	Type		Magnitude	Type		Magnitude	Type	Magnitude	Type	Magnitude	Type	Magnitude	Type
1	Fording	Reference	T	Henretta Creek	HENUP	HENR3	FR_HC3	upper creek, u/s FRO	E300096	-	-	-	-	-	-	13,14,15	NS	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Chauncey Creek	CHCK	-	FR_CH1[a]	near mouth	E295214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Ewin Creek	EWCK	-	-[a]	near mouth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			M	Fording River	FO26	-	FR_UFR1	u/s Henretta Cr. and FRO	E216777	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Mine-exposed	T	Henretta Creek	HENFO	HENR2	FR_HC1	u/s Fording R.	E216778	-49	Step 13	-28	Step 14	NS	-	13,14,15	NS	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
						HENR1										13,14,15,16	NS	-												
				Clode Creek	-	COUT1	FR_CC1	Decant from Clode sediment pond	E102481	99	Step 15	NS	-	NS	-	13,14,15,16	0.87	Step 13	-	-	-	-	-	-	-	-	-	-	-	-	-
				Lake Mountain Creek	NGD1	-	FR_NGD1	Lower Lake Mountain Creek/ North Greenhills Diversion	E105060	-41	Step 13	-36	Step 13	-42	Linear	-	-	-	12, 15	NS	-	-	-	-	-	-	-	-	-	-	-
				Kilmarnock Creek	KICK	KILM1	FR_KC1	mouth (d/s of rock drain)	0200252	-42	Step 13	22	Step 12	NS	-	13,14,15,16	0.50	Step 14	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
				Swift Creek	SWCK	SWIF2	GH_SC1	lower creek	E221329	-94	Linear	-77	Step 14	NS	-	13,14,15	1.30	Step 13	12, 15	NS	-	12,15	NS	-	NS	-	-53	Linear	NS	-
							GH_SC2	lower creek	E105061	-58	Step 13	NS	-	NS	-				-	-	-	-	-	-	-	-	-	-	-	-
				Cataract Creek	CATCK	CATA3	GH_CC1	Cataract Creek near mouth	0200384	-36	Step 13	NS	-	NS	-	13,14,15	-0.37	Step 13	12, 15	NS	-	12,15	-83	Step 12	NS	-	NS	-	NS	-
				Porter Creek	POCK	PORT1	GH_PC1	lower creek	200385	NS	-	NS	-	NS	-	13,15,16	-0.15	Step 15	12, 15	NS	-	12,15	NS	-	125	Step 12	NS	-	NS	-
				Fording River side channel	FO10-SP1	-	-[a]	former Fording River Oxbow, now side channel	-	-	-	-	-	-	-	-	-	-	06, 09, 12	NS	-	-	-	-	-	-	-	-	-	-	-
				LCO Dry Creek	LC_DCDS	DRYL4	LC_DCDS	d/s sedimentation ponds	E295210	NS	-	27	Step 15	NS	-	13,15,16	NS	-	14, 15, 16	NS	-	15,16	NS	-	NS	-	NS	-	NS	-
				LCO Dry Creek	-	-	LC_DC3	u/s of East Tributary Cr.	E288273	83	Step 15	38	Step 15	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				LCO Dry Creek	LC_DC1	DRYL1	LC_DC1	Dry Creek near mouth	E288270	NS	-	NS	-	NS	-	13,14,15,16	NS	-	12, 15, 16	NS	-	15,16	NS	-	NS	-	NS	-	NS	-
				Greenhills Creek	GHCKU	GREE3	-[a]	u/s of sediment pond	-	-	-	-	-	-	-	13,14,15,16	0.61	Step 14	12, 15	NS	-	12,15	-78	Step 12	NS	-	NS	-	NS	-
				Greenhills Creek	GHCKD	GREE1	GH_GH1	d/s sediment pond	E102709	-39	Step 13	-38	Step 14	NS	-	13,14,15,16	-0.04	Step 14	12, 15	NS	-	12,15	NS	-	72	Step 12	NS	-	NS	-
			M	Fording River	FODHE	FORD11	FR_FR1	d/s Henretta Cr.	0200251	-51	Step 13	NS	-	NS	-	13,14,15	NS	-	12, 15	NS	-	12,15,16	NS	-	NS	-	NS	-	NS	-
				Fording River	FOUNGD		-[a]	u/s North Greenhills Diversion	-	-	-	-	-	-	-				12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
				Fording River	FODNGD	-	FR_FRABEC1	d/s Lake Mountain Creek/ North Greenhills Diversion	-	NS	-	NS	-	NS	-	-	-	-	12, 15	NS	-	-	-	-	-	-	-	-	-	-
				Fording River	MP1	EPOU1	FR_MULTIPLATE	Multiplate Culvert on Greenhills Access Road	-	NS	-	NS	-	NS	-	13,14,15,16	-1.69	Linear	06, 09, 12, 15	NS	-	12,13,15	NS	-	NS	-	NS	-	NS	-
				Fording River	FOUSH	FORD10	-[a]	u/s Shandley Cr.	-	-	-	-	-	-	-	13,14,15	NS	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
				Fording River	FOUKI	SPSE1	FR_FR2	u/s Kilmarnock Cr.	0200201	NS	-	NS	-	-14	Step 13	13,14,15	0.83	Step 13	12, 15, 16	NS	-	12,15,16	NS	-	NS	-	NS	-	-57	Linear
				Fording River	FOBKS	FORD9	GH_FR3	at Fording R. bridge, d/s Kilmarnock & u/s Swift Cr.	-	-44	Step 13	-27	Step 13	-24	Step 13	13,14,15,16	NS	-	12, 15	NS	-	12,15,16	NS	-	NS	-	NS	-	-54	Step 12
				Fording River	FOBSC		FR_FR4, GH_FR	d/s Swift Cr., u/s Cataract Cr.	0200311	-34	Step 13	-25	Step 14	-12	Step 13				12, 15	NS	-	12,15,16	NS	-	NS	-	NS	-	NS	-
			M	Fording River	FOBCP		FR_FRCP1 (Compliance)	d/s Cataract, u/s Porter	E300071	NS	-	NS	-	NS	-				12, 15, 16	NS	-	12,15,16	NS	-	NS	-	NS	-	-78	Step 12
				Fording River	FODPO	FORD8	GH_PC2	d/s Porter Cr., u/s Chauncey Cr. (discontinued sampling in 2015)	E287431	NS	-	-12	Step 14	NS	-	13,14,15	NS	-	12, 15, 16	NS	-	12,13,15,16	NS	-	NS	-	NS	-	-74	Step 12
				Fording River	FO22		FR_FRABCH	Fording River Above Chauncey Creek		NS	-	NS	-	NS	-				06, 09, 12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
				Fording River	FOUEW	FORD7	FR_FR5	d/s Chauncey Cr., u/s Ewin Cr.	-	-34	Step 13	-10	Step 14	NS	-	13,14,15,16	-0.10	Step 14	12, 15, 16	NS	-	12,15,16	NS	-	NS	-	NS	-	-75	Step 12
						FORD6										13,14,15,16	-0.18	Linear												
				Fording River	FO28/LC-FRUS	FORD5	LC_FRUS	Fording River u/s Dry Creek	E295232	NS	-	NS	-	NS	-	13,14,15,16	0.26	Step 14	-	-	-	-	-	-	-	-	-	-	-	-	-
				Fording River	FO29		LC_FRB	d/s Dry Cr., u/s GHO at Fording R. Bridge	-	-24	Step 13	-3	Step 14	NS	-				12, 15, 16	NS	-	12,13,15	NS	-	NS	-	NS	-	NS	-
				Fording River	FODGH	-	GH_FR1 (Order - FR4 and Compliance)	d/s GHO and Greenhills Cr.	0200251	NS	-	-14	Step 14	NS	-	-	-	-	12, 15, 16	NS	-	12,13,15,16	NS	-	NS	-	NS	-	-51	Step 12
2	Fording	Reference	T	Grace Creek	LC_GRCK	-	LC_GRCK	lower creek	E288275	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Line Creek	LI24	-	LC_LC1	u/s LCO	E216142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				South Line Creek	SLINE	-	LC_SLC	u/s Line Creek and LCO	E282149	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Mine-exposed	T	Line Creek	LCUT	LINE4	LC_LCUSWLC	d/s rock drain, u/s West Line Cr. and AWTF outfall	E293369	NS	-	NS	-	15	Step 12	13,14,15,16	0.34	Step 14	-	-	-	-	-	-	-	-	-	-	-	-
				Line Creek	LILC3		LC_LC3	d/s West Line Cr. and AWTF outfall	0200337	-31	Step 13	-51	Step 15	NS	-				12, 15, 16	516	Linear	12,13,15,16	NS	-	NS	-	NS	-	NS	-
				Line Creek	LIDSL	LINE3	LC_LCDSSLCC (Compliance)	d/s South Line	E297110	NS	-	-31	Step 15	NS	-	13,14,15	NS	-	12, 15, 16	NS	-	12,13,15,16	NS	-	NS	-	NS	-	NS	-
				Line Creek	LI8	LINE1	LC_LC4	Line Creek canyon	0200044	NS	-	-40	Step 15	NS	-	13,14,15,16	NS	-	06, 09, 12, 15, 16	NS	-	12,13,15,16	NS	-	NS	-	NS	-	NS	-
						LINE2										13,14,15	NS	-												
			M	Fording River	FO9	FORD4	-[a]	d/s Josephine falls, u/s Grace Cr. and Line Cr.	-	-	-	-	-	-	-	14,15,16	0.56	Step 14	06, 09, 12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
				Fording River	FRUL	FORD2	LC_LC6	d/s Grace Cr., u/s Line Cr.	0200338	-28	Step 13	-7	Step 15	NS	-	13,14,15,16	NS	-	12, 15	NS	-	12,13,15,16	NS	-	NS	-	NS	-	144	Step 15
				Fording River	FO23	FORD1	LC_LC5 (Order - FR5)	d/s Line Creek	0200028	NS	-	-19	Step 15	NS	-	13,14,15,16	NS	-	06, 09, 12, 15, 16	NS	-	12,13,15,16	NS	-	NS	-	NS	-	-59	Step 12
3	Elk	Reference	M	Elk River	ELUGH	-	GH_ER2	u/s Branch Cr. and GHO	200389	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Mine-exposed	T	Branch F Creek	-	-	GH_BR_F	at LRP Road culvert	E287437	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Wolf Creek	-	-	GH_WOLF	at LRP Road culvert (until end 2016)	-	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Willow Creek	-	-	GH_WILLOW	at LRP Road culvert; Willow_S was diverted to this location Dec 2016	-	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Willow Creek	-	-	GH_WILLOW_S	Willow Creek South at LRP Road (as of 2017)	-	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Wade Creek	-	-	GH_WADE	at LRP Road culvert	E287433	-77	Linear	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Cougar Creek	-	-	GH_COUGAR	at LRP Road culvert	E287432	377	Step 14	-34	Linear	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Mickelson Creek	-	MICK1	GH_MC1	at LRP Road culvert	200388	1539	Step 14	186	Step 14	407	Step 14	13,14,15,16	2.16	Step 15	-	-	-	-	-	-	-	-	-	-	-	-	-
				Leask Creek	-	-	GH_LC2	u/s pond inflow at LRP Road culvert	-	-49	Linear	NS	-	142	Step 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Leask Creek	-	-	GH_LC1	sediment pond decant (goes to ground)	E257796	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Wolfram Creek	WOCK	WOLF3	GH_WC2	lower creek	-	NS	-	NS	-	NS	-	13,14,15,16	-0.39	Step 14	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
				Wolfram Creek	-	-	GH_WC1	sediment pond decant (goes to ground)	E257795	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Thompson Creek	THCK	THOM2	GH_TC2	lower creek	E207436	-51	Step 13	NS	-	NS	-	13,14,15	NS	-	12, 15	NS	-	12,13,15	NS	-	NS	-	NS	-	NS	-

[b] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

[c] Absolute change in Calcite Index = (observed - expected); For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

[a] No routine monitoring data available. Data presented are for water samples collected concurrently with other RAEMP samples, September 2015.

"-" = no data; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; "±" = plus or minus; "<" = less than; "0" = no significant trend at α = 0.1; NRQ = normal range quotient; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

Good Poor

Table 12.5: All Management Units, Lotic, Key Question #4
Changes Over Time

Management Unit	Main Watershed	Exposure Type	Stream Type (M-main stem; T-tributary)	Stream Name	Biological Area Code	Calcite Reach	Teck Water Station Code	Description (Biological. Water Stn Description included if no Biological) For RAEMP summary tables	ENV EMS Number	Water Quality Temporal Analysis (% Change Relative to Reference Trend) [b]						Calcite Index Temporal Analysis (Change in Calcite Index Relative to Reference Trend) [c]			Tissue Selenium Concentration Temporal Analysis			Benthic Invertebrate Community Temporal Analysis (% Change Relative to Reference Trend) [b]									
										Nitrate		Selenium		Sulphate		Years included in Analysis	Calcite Index		Years included in Analysis	Benthic Invertebrates 2006 - 2015		Years included in Analysis	Total abundance (# organisms per sample)		Total Richness (lowest practical level of taxonomy)		% Ephemeroptera, Plecoptera, and Trichoptera (EPT)		% Ephemeroptera	
										Magnitude	Type	Magnitude	Type	Magnitude	Type		Magnitude	Type		Magnitude	Type		Magnitude	Type	Magnitude	Type	Magnitude	Type	Magnitude	Type
3	Elk	Mine-exposed	M	Elk River	EL20	ELKR12	GH_ERC (Compliance)	d/s Thompson Cr. and GHO	E300090	NS	-	NS	-	NS	-	13,14,15,16	NS	-	06, 09, 12, 15, 16	NS	-	12,15,16	NS	-	NS	-	NS	-	NS	-
				Elk River	ELUEL	-	GH_ER1 (Order - ER1)	d/s GHO, u/s Fording R. and u/s Boivin Cr.	0206661	28	Step 15	NS	-	53	Linear	-	-	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
				Elk River	ELDEL	-	-[a]	d/s Elkford sewage ponds	-	-	-	-	-	-	-	-	-	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
				Elk River	ELUFO	-	-[a]	u/s Fording R.	-	-	-	-	-	-	-	-	-	-	12, 15	NS	-	12,13,15	NS	-	NS	-	NS	-	NS	-
4	Elk	Reference	T	Grave Creek	GRUHA	-	EV_GV3[a]	u/s Harmer Cr.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Michel		T	Andy Good Creek	AGCK	-	CM_AG1[a]	u/s CMO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Alexander Creek	AL4	-	-[a]	mid creek upstream ALUSM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Alexander Creek	ALUSM	-	EV_AC2[a]	near bend to west	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			M	Michel Creek	MI25	-	CM_MC1	u/s CMO	E258175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			M	Michel Creek	MIUCO	-	-[a]	u/s Corbin Cr.	-	-	-	-	-	-	-	-	-	-	12, 15, 16	NS	-	12,15,16	NS	-	NS	-	NS	-	NS	-
	Elk	Mine-exposed	T	Harmer Creek	HACKUS	HARM3	EV_HC6	u/s from Harmer Pond	-	NS	-	NS	-	NS	-	13,14,15,16	-0.14	Step 14	12, 15, 16	NS	-	12,15,16	-88	Step 12	NS	-	NS	-	NS	-
			T	Harmer Creek	HACKDS	HARM1	EV_HC1 (Compliance)	dam/spillway at d/s end of Harmer Pond	E102682	-42	Step 13	NS	-	NS	-	13,14,15,16	-0.46	Step 14	12, 15, 16	NS	-	12,15,16	NS	-	NS	-	NS	-	NS	-
			T	Grave Creek	GRCK	GRAV2	-[a]	d/s Harmer Cr.	-	-	-	-	-	-	-	13,14,15	NS	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
			T	Grave Creek	GRDS	GRAV1	EV_GV1	near mouth at Elk River	-	-38	Step 13	NS	-	NS	-	13,14,15,16	-0.54	Step 14	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
			T	Six Mile Creek	-	-	EV_SM1	sediment pond decant	E102681	-66	Step 13	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Balmer Creek	-	-	EV_BLM2	at CFI Road	E298592	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Fennelon Creek	-	-	EV_FC1	at CFI Road	E298591	-67	Linear	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Goddard Creek	-	-	EV_GC2	sediment pond decant	E208043	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Otto Creek	OCNM	OTTO1	EV_OC1	near mouth	E102679	-85	Linear	-76	Linear	NS	-	13,14,15,16	NS	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
			M	Elk River	EL19	-	EV_ER4 (Order - ER2)	d/s Fording R., u/s Grave Cr.	0200027	-35	Step 13	-17	Step 14	NS	-	-	-	-	06, 09, 12, 15, 16	-69	Linear	12,15,16	NS	-	NS	-	NS	-	NS	-
			M	Elk River	ELDGR	ELKR10	-[a]	d/s Grave Creek	-	-	-	-	-	-	-	13,14,15	NS	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
			M	Elk River	ELUSP	ELKR9	EV_ER2	d/s Otto Cr., u/s Sparwood & Michel Cr.	0200111	NS	-	-13	Step 14	NS	-	13,14,15,16	NS	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
	Michel		T	Corbin Creek	CORCK	CORB1	CM_CC1	near mouth and d/s CMO	0200209	NS	-	NS	-	NS	-	13,14,15,16	0.64	Step 14	12, 15, 16	NS	-	12,15,16	968	Step 12	NS	-	NS	-	NS	-
			T	Erickson Creek	ERCK	ERIC1	EV_EC1	near mouth	200097	NS	-	NS	-	NS	-	13,14,15,16	NS	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	South Pit Creek	-	-	EV_SP1	sediment pond decant	E296311	-50	Step 14	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Milligan Pond	-	-	EV_MG1	sediment pond decant	E208057	-83	Linear	-33	Linear	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Gate Creek	-	-	EV_GT1	sediment pond decant	E206231	-19	Step 13	-39	Linear	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Bodie Creek	BOCK	BODI1	EV_BC1	d/s Bodie Pond	E102685	-66	Linear	-71	Step 14	NS	-	13,14,15,16	0.78	Step 15	12, 15, 16	512	Step 12	12,15,16	NS	-	NS	-	NS	-	NS	-
			T	Aqueduct Creek	-	-	EV_AQ1	at Great Northern Road	E210369	-80	Step 13	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Upper Michel		M	Michel Creek	MIDCO	-	CM_MC2 (Compliance)	d/s Corbin Creek, u/s Andy Good Creek	E258937	NS	-	NS	-	NS	-	-	-	-	12, 15, 16	NS	-	12,15,16	NS	-	NS	-	NS	-	NS	-
			M	Michel Creek	MIDAG	MICH4	CM_MCTM	d/s Andy Good Creek	-	NS	-	NS	-	NS	-	13,14,15,16	NS	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
			M	Michel Creek	MI5	MICH3	-[a]	u/s Wheeler Creek	-	-	-	-	-	-	-	13,14,15	NS	-	06, 09, 12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
	Lower Michel		M	Michel Creek	MI3	-	EV_MC3	u/s Erickson Creek	0200203	65	Step 15	NS	-	18	Step 15	-	-	-	06, 09, 12, 15	NS	-	12,13,15,16	NS	-	NS	-	NS	-	-44	Step 12
			M	Michel Creek	-	-	EV_MC2 (Compliance)	between Bodie Cr. and Aqueduct Cr., d/s HWY #3 bridge (Shell Plant)	E300091	NS	-	NS	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			M	Michel Creek	MI2	MICH1	EV_MC1[a]	d/s EVO and Aqueduct Creek	-	NS	-	NS	-	NS	-	13,14,15,16	NS	-	06, 09, 12, 15, 16	-35	Step 06	12,13,15,16	NS	-	NS	-	197	Step 13	253	Step 15
5	Elk	Reference	T	McCool Creek	MCCR	-	-[a]	u/s Elk River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Upper Wigwam River	WWRU	-	-[a]	upper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			T	Lower Wigwam River	WWRL	-	-[a]	lower	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Mine-exposed	M	Elk River	EL1	-	EV_ER1 (Order - ER3)	d/s Sparwood & Michel Creek, d/s EV_ER1	0200393	NS	-	NS	-	NS	-	-	-	-	06, 09, 12, 15, 16	NS	-	12,15,16	NS	-	-41	Step 15	NS	-	NS	-
			M	Elk River	ELUFE	ELKR8	RG_ELKFERNIE	u/s Fernie	-	-40	Step 13	-30	Linear	NS	-	-	-	-	12, 15, 16	NS	-	12,15,16	NS	-	50	Linear	NS	-	NS	-
			M	Elk River	ELDFE	-	-[a]	d/s Fernie	-	-	-	-	-	-	-	-	-	-	12, 15	NS	-	12,15	NS	-	NS	-	NS	-	NS	-
			M	Elk River	ELELKO	-	RG_ELKORES (Order - ER4)	u/s Elko	E294312	NS	-	NS	-	NS	-	-	-	-	12, 15, 16	NS	-	12,15,16	NS	-	NS	-	NS	-	NS	-
			M	Elk River	ELH93	-	RG_ELKMOUTH	u/s Hwy 93 bridge and Elk R. mouth at Koocanusa	-	NS	-	-27	Step 15	NS	-	-	-	-	12, 15, 16	NS	-	12,15,16	NS	-	NS	-	-75	Step 12	-87	Step 12

[b] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

[c] Absolute change in Calcite Index = (observed - expected); For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

[a] No routine monitoring data available. Data presented are for water samples collected concurrently with other RAEMP samples, September 2015.

"-" = no data; mg = milligrams; mL = millilitre; mm = millimetres; % = percent; "±" = plus or minus; "<" = less than; "0" = no significant trend at α = 0.1; NRQ = normal range quotient; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient

Good Poor

Table 12.6: All Management Units, Lentic, Key Question #4
Changes Over Time

Management Unit	Main Watershed	Exposure Type	Biological Area Description	Biological Area Code	Sediment Chemistry 2015 vs. 2013 (% change relative to reference trend)		Fish (Longnose Sucker)		Benthic Invertebrate Tissue Selenium Temporal Analysis (Linear Regression)	
							Condition			
					Selenium	2-Methylnaphthalene	% Difference (2015 relative to 2005)	% Difference (2015 relative to 2013)	Years included in Analysis	Magnitude Change (%) [c]
1	Fording	Reference	Lake Mountain Lake	LML	-	-	-	-	-	-
			Fording River Wetland	FO15 (2013)	-	-	-	-	06,09,12	NS
		Mine-exposed	Henretta Lake	HE27	NS	NS	-	-	09,12,15	NS
			Lower Fording River Oxbow	FOXL	-	-	-	-	12,15	NS
			Meadow area u/s Chauncey Creek	FMUCK	NS	NS	-	-	-	-
			Fording River wetland d/s Ewin Creek	FWDEC	-	-	-	-	-	-
			Off channel area of Fording River d/s Greenhills	R5-1	-	-	-	-	-	-
2	Elk	Mine-exposed	Lentic area off Fording River d/s Josephine Falls	R5-3	-	-	-	-	-	-
3	Elk	Reference	Unnamed Wetland near Elk River north of Elkford	REFF	-	-	-	-	12,15	NS
			Lost Lake	LOLA (2013)	-	-	-	-	-	-
		Mine-exposed	Elk River Upper Ponds	ERUP	-	-	6.8	-	-	-
			Upper Elk River Oxbow	EROU	NS	NS	-	-	12,15	NS
4	Elk	Reference	Grave Lake Marsh	GLMS (2013)	-	-	-	-	-	-
			Grave Lake	GRLK (2013)	-	-	-	-	-	-
			Leach Creek Oxbow	LCHO	-	-	-	-	-	-
		Mine-exposed	Elk River Wetland Downstream of Grave Creek	ELWDGC	NS	NS	-	-	12,15	NS
			Goddard Marsh (and lower Goddard Pond decant)	GO13	955	275	-	NS	06,09,11,12,15	NS
			Otto Creek wetlands	OTTO	-	-	-	6.2	10,12,15	-78
			Michel Creek Wetland	MI16	NS	NS	-	-	06,09,12,15	271
			Michel Oxbow #2	MIC2	-	-	-	-	-	-
			Lower Michel Wetland	MIWW	-	-	-	-	12,15	NS
5	Elk	Mine-exposed	Sparwood Wetland	SPW (2013)	-	-	-	-	-	-
			Elk River Wetland Downstream of Fernie	ERWSF (2013)	-	-	-	-	-	-
			Stanford Pond	STPD	-	-	-	NS	-	-
			Lower Elk River Oxbow (d/s Fernie)	EROL	NS	NS	NS	-	12,15	265
			Unnamed Wetland near Morrissey	UNWNMO	-	-	-	-	-	-
			Elko Resevoir	ELKO	NS	NS	-	-	12,15	NS

Notes: "-" = no data; "<" = less than; ">" = greater than; NA = not available; NS = not significant; NRQ = normal range quotient; HQ = hazard quotient
[a] A survey was conducted but no fish were captured
[b] Upper limit of population estimate could not be calculated due to few fish recaptures
Good
Poor

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Elk River Watershed Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2015-2016

Appendices

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January 2018

APPENDIX A
HABITAT INFORMATION

Lotic Areas

Lentic Areas

Lentic Habitat Photos

HABITAT INFORMATION

Lotic Areas

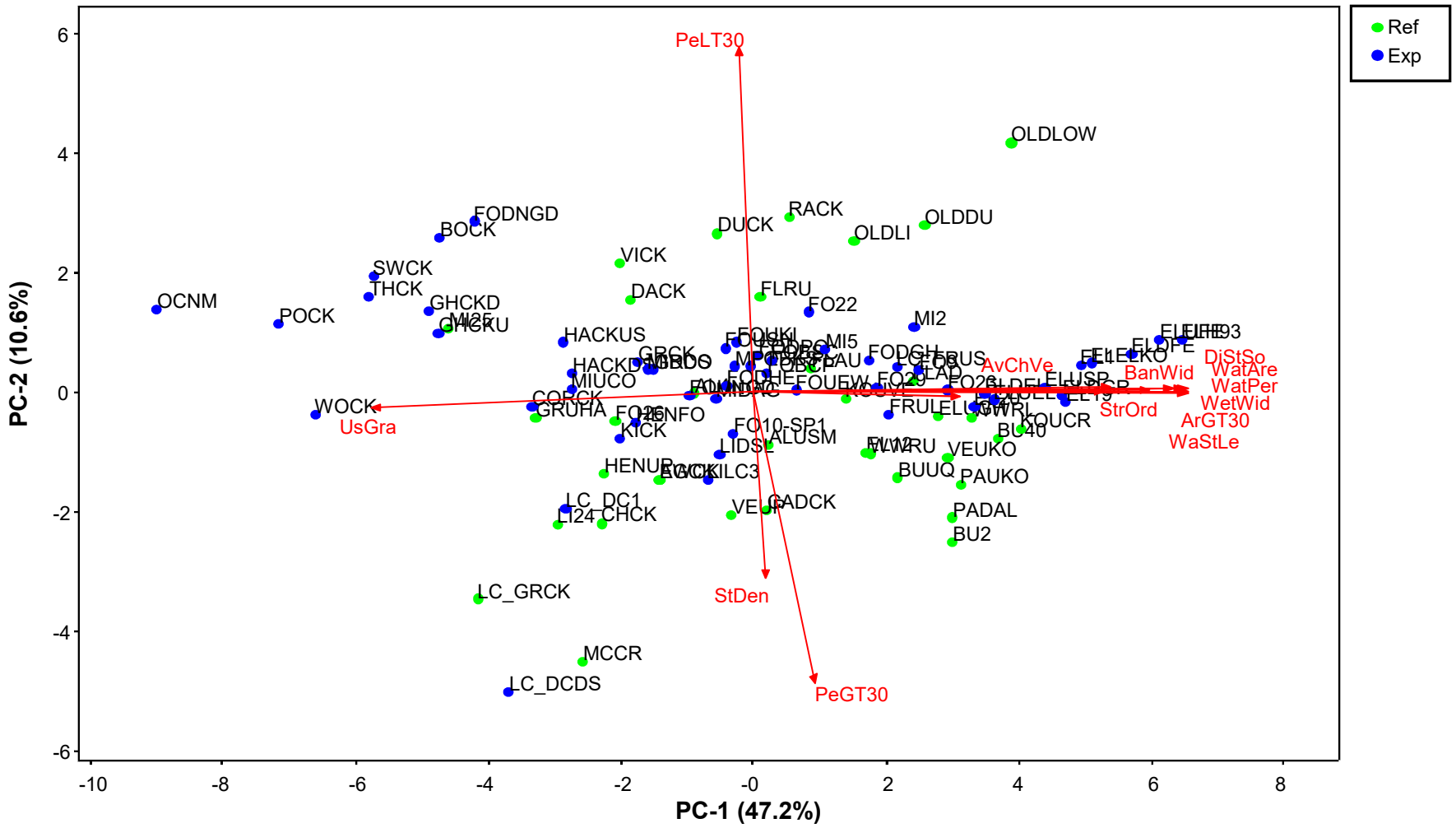


Figure A.1: Principcpal Components Analysis Biplots of Field and GIS-Derived Environmental Variables for 36 Reference and 54 Mine-exposed Areas, Elk Valley, 2015

Note: direct correlation vectors are displayed for variables having an absolute Pearson's correlation coefficient (r) greater than 0.6 with NMDS area axis scores. Vector length is proportional to correlation strength.

Table A.1: Habitat Information Associated with Lotic Reference Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**AGCK**	**AL4**	**ALUSM**	**BU2**	**BU40**	**BUUQ**	**CADCK**	**CHCK**
Waterbody		Andy Good Creek	Alexander Creek	Alexander Creek	Bull River	Bull River	Bull River	Cadorna Creek	Chauncey Creek
Date Sampled		12-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	12-Sep-15
UTM (NAD83, 11U)	Easting	667551	664974	663482	631852	626589	633561	645826	655349
	Northing	5488669	5509024	5502718	5505579	5499846	5519210	5589227	5552776
Samplers' Initials		KB, HC	KB, HC, MR	KB, HC, MR	OB, JG, TW	TW, OB	OB, JG, TW	JW, DB	SW, LB, KH
Habitat Characteristics									
Surrounding Land Use		forest, mining, railbridge downstream	forest, logging, bridge downstream of sites, road adjacent to creek	forest	forest, logging, road/bridge infrastructure	forest, logging, livestock	forest	forest, logging	forest, hunting camps
Length of Reach Assessed (m)		50	50	50	100	100	100	100	50
% Riffle		95	95	85	70	50	70	100	100
% Run		0	0	0	0	50	30	0	0
% Rapids		5	5	15	20	0	0	0	0
% Pool/Back Eddy		0	0	0	10	0	0	0	0
Streamside Vegetation (most dominant first)		coniferous trees and shrubs, deciduous trees,	coniferous trees, fern/grass, shrubs	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, shrubs, deciduous trees	shrubs, coniferous trees, ferns/grass, deciduous trees	coniferous trees, shrubs, deciduous trees, ferns/grass	coniferous trees, ferns/grass, shrubs	ferns/grass, shrubs, coniferous trees, deciduous trees
% Bedrock		0	0	0	0	0	0	0	0
% Boulder		2	0	5	45	20	20	25	0
% Cobble		90	90	75	25	60	65	60	75
% Pebble		5	5	10	10	5	10	10	10
% Gravel		2	5	5	10	5	2.5	5	0
% Sand/Finer		1	0	5	10	10	2.5	0	5
% Organic		0	0	0	0	0	0	0	0
Canopy Coverage (%)		0	18	18	9.5	0	0	21	0
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0
Periphyton Coverage		3	3	2	2	2	2	2	3
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	4/<0.5/olive	4/<0.5/green,olive, brown, black	4/0.5-1/green, olive, brown	2/<0.5/green, olive	2/-/green	2/<0.5/olive	3/<0.5/olive	4/0.5-1/olive
	Filamentous Algae	0	3/1-5/green	3/1-5/green	1/0.5-1/green	0	0	0	2/<0.5/olive
	Slimes/Streamers	0	4/1-5/clear, green, brown	3/1-5/clear, green, brown	0	2/-/clear, green, olive	2/-/olive, brown	1/-/olive, brown	1/<0.5/clear
	Macrophytes	0	0	0	0	0	0	0	0
	Moss	0	0	0	0	0	0	3 (bryophyte)	0
Bank Stability		moderate	moderate (slightly undercut banks)	unstable, substantial erosion	stable, no erosion	stable, no erosion	moderate	moderate	moderate
Water Colour & Clarity		clear / clear to bottom	clear / clear to bottom	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		13.7	11	13.85	28	39	20	15	8
Wetted Width (m)		10.5	10.3	9.85	20	34	17	13.4	4.4
Bankfull-Wetted Depth (cm)		28	22	26	40	1	30	70	40
Gradient (%)		1	2	2	2	1	2	0.50 - 2	2
Mean Transect Depth (cm)		24.0	19.1	26.5	42.8	53.9	37.3	26.7	13.8
Mean Transect Velocity (m/s)		0.41	0.40	0.56	0.66	0.45	0.50	0.54	0.30
Comments/Notes		Banks with some visible erosion, no visible calcite on rocks and rocks covered in yellowish periphyton. Rocks quite slippery. Fishy smell to periphyton	Calcite evident at site and rocks were difficult to overturn during 3 minute kick and sweep. Periphyton has a pungent cheese smell. Periphyton sampling involved scraping/chiseling the thick calcite off rocks	Calcite present and rocks slightly difficult to overturn for 3 minute kick and sweep. Periphyton had a turnip smell. Calcite and periphyton integrated together, difficult find periphyton separate from the calcite.	-	Calcite present	-	Some calcite on rocks on edge of creek	Moved station downstream to more open canopy area relative to 2012.
Benthic Invertebrate Sampling									
Total Kick Distance (m)		12	8	8	20	25	40	28	25
# of Transects (if complete)		4	2	3	3	4	2	2	5
Dominant Taxa in Tissue Sample		-	-	-	-	-	-	-	-

Table A.1: Habitat Information Associated with Lotic Reference Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**CRUKO**	**DACK**	**DUCK**	**EL12**	**ELUGH**	**EWCK**	**FLAD**	**FLAU**
Waterbody		Cross River	Daisy Creek	Dutch Creek	Elk River	Elk River	Ewin Creek	Flathead River	Flathead River
Date Sampled		11-Sep-15	12-Sep-15	11-Sep-15	13-Sep-15	17-Sep-15	12-Sep-15	14-Sep-15	14-Sep-15
UTM (NAD83, 11U)	Easting	585502	685988	687139	646175	646477	657208	682705	680187
	Northing	5614058	5523955	5531110	5589009	5557523	5547645	5443985	5453294
Samplers' Initials		JT, SM	OB, TW	OB, TW	JW, DB	LB, KH	SW, LB, KH	JT, SM	JT, SM
Habitat Characteristics									
Surrounding Land Use		forest, logging	forest, livestock	forest, livestock, logging, road/bridge crosses d/s of sampling area	forest, logging, provincial park	forest	forest	forest, logging, bridge d/s	forest, logging, road adjacent
Length of Reach Assessed (m)		100	30	50	100	100	50	100	50
% Riffle		60	85	50	100	95	100	35	50
% Run		40	10	30	0	0	0	65	50
% Rapids		0	0	10	0	0	0	0	0
% Pool/Back Eddy		0	5	10	0	5	0	0	0
Streamside Vegetation (most dominant first)		coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, fern/grass, shrubs, deciduous trees	deciduous trees, coniferous trees, ferns/grass, shrubs	coniferous trees, ferns/grass, shrubs	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs, deciduous trees	shrubs, deciduous trees, coniferous trees, ferns/grass	shrubs, deciduous trees, coniferous trees, ferns/grass
% Bedrock		0	5	0	0	0	0	0	0
% Boulder		10	10	10	10	0	5	10	5
% Cobble		55	70	70	60	80	75	70	55
% Pebble		15	5	10	10	10	15	10	15
% Gravel		15	5	5	10	5	5	5	15
% Sand/Finer		5	5	5	10	5	0	0	5
% Organic		0	0	0	0	0	0	5	5
Canopy Coverage (%)		12	28	0	14	76-100	5	6.8	5
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0
Periphyton Coverage		1	3	2	2	2	4	4	3
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	1/<0.5/brown	3/0.5-1/green, brown	2/0.5-1/olive	4/<0.5/olive	2/<0.5/olive	4/0.5-1/brown	3/<0.5/green, brown	2/<0.5/brown
	Filamentous Algae	0	0	-	0	1/<0.5/olive	3/0.5-1/brown	0	0
	Slimes/Streamers	0	0	-	1/0.5-1/brown	0	4/1-5/clear, olive	2/1-5/olive	3/1-5/green
	Macrophytes	0	0	-	0	0	0	0	0
	Moss	0	1	-	3 (bryophytes - brown streamers)	0	0	0	0
Bank Stability		moderate	stable, no erosion	moderate	unstable, substantial erosion	stable, no erosion	moderate - unstable, substantial erosion	stable, no erosion	stable, no erosion
Water Colour & Clarity		turquoise, clear some glacial till turbidity	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		35	9	14.7	44	20	7.6	30	9.12
Wetted Width (m)		25	7	12.4	24	18	7	20.92	5.73
Bankfull-Wetted Depth (cm)		55	30	15	4.5	70	58	70	61
Gradient (%)		-	1	2	1.5 - 2.0	1.5	2	1.5	1
Mean Transect Depth (cm)		26.1	19.0	17.6	33.0	55.1	22.3	11.1	2.8
Mean Transect Velocity (m/s)		0.55	0.24	0.28	0.59	0.79	0.43	0.41	0.10
Comments/Notes		-	Periphyton had a fishy smell	Silt layer on much of periphtyon	Green specks of calcite present on some rocks, very little amounts	Banks are stable but area was blown out during 2013 flooding/storm.	-	-	-
Benthic Invertebrate Sampling									
Total Kick Distance (m)		15	28	30	48	7.5	20	15	20
# of Transects (if complete)		4	1	1	2	5	4	1	5
Dominant Taxa in Tissue Sample		-	-	-	-	Plecoptera Ephemeroptera	-	-	-

Table A.1: Habitat Information Associated with Lotic Reference Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**FLRU**	**FO26**	**GRUHA**	**HENUP**	**KO1**	**KODCR**	**KOUCR**	**KOUVE**
Waterbody		Flathead River	Fording River	Grave Creek	Henretta Creek	Kootenay River	Kootenay River	Kootenay River	Kootenay River
Date Sampled		19-Sep-15	14-Sep-15	11-Sep-15	15-Sep-15	13-Sep-15	12-Sep-15	12-Sep-15	10-Sep-15
UTM (NAD83, 11U)	Easting	668175	653064	659422	655887	591185	584744	579591	569766
	Northing	5470823	5569601	5523781	5567716	5561577	5607649	5616187	5630957
Samplers' Initials		JW, JG	JW, DB, KC	JW, DB, MR	JW, DB, KC	JT, SM	JT, SM	JT, SM	JT, SM
Habitat Characteristics									
Surrounding Land Use		forest, logging	forest, logging, mining	forest, logging, mining	forest, logging, mining	forest, livestock, logging	forest, logging, recreational (fishing, rafting)	forest, logging	logging, recreational hiking trail
Length of Reach Assessed (m)		50	30	30	30	100	100	100	100
% Riffle		100	100	100	100	60	80	70	55
% Run		0	0	0	0	40	20	30	15
% Rapids		0	0	0	0	0	0	0	0
% Pool/Back Eddy		0	0	0	0	0	0	0	30
Streamside Vegetation (most dominant first)		coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs	coniferous trees, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs, deciduous trees
% Bedrock		0	0	0	0	0	0	0	0
% Boulder		10	20	50	20	30	15	15	5
% Cobble		60	35	30	60	50	70	60	60
% Pebble		10	20	5	10	10	10	20	15
% Gravel		10	20	5	10	10	5	5	5
% Sand/Finer		10	5	10	0	0	0	0	10
% Organic		0	0	0	0	0	0	0	5
Canopy Coverage (%)		19	12	91	0.5	3.5	1	8.5	22
Macrophyte Coverage (%)		0	0	0	0	-	0	0	0
Periphyton Coverage		2	2/3	2	2	1	1	1	2
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	4/<0.5/olive, brown	4/-/-	4/<0.5/olive	4/<0.5/-	2/<0.5/brown	2/-/-	2/<0.5/green, brown	3/<0.5/brown (green/grey matrix with silt)
	Filamentous Algae	0	0	0	0	0	0	0	0
	Slimes/Streamers	1/1-5/green	3/1-5/green, olive, brown	0	1/0.5-1/brown	0	1/-/green	1/1-5/green	2/1-5/green
	Macrophytes	0	-	0	1	0	0	0	0
	Moss	2 (bryophytes)	0	1 (a few bryophytes)	0	0	0	0	1 (unknown)
Bank Stability		moderate	moderate	moderate	moderate	stable, no erosion	stable, no erosion	stable, no erosion	moderate
Water Colour & Clarity		colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / turbid (turquoise glacial till)	colourless / turbid (turquoise glacial till)	colourless / turbid	colourless / clear
Bankfull Width (m)		22	38	8.6	21	99	54	46	20.51
Wetted Width (m)		13	5.83	6.5	5.2	67	49	55	13.45
Bankfull-Wetted Depth (cm)		87	53	60	91.5	> 100	-	100	63
Gradient (%)		1	1.5	2 - 2.5	2.5 - 3.0	1	1	1	1
Mean Transect Depth (cm)		11.3	7.8	14.8	22.1	25.2	15.3	24.3	15.0
Mean Transect Velocity (m/s)		0.20	0.36	0.29	0.52	0.55	0.65	0.54	0.35
Comments/Notes		Rocks had black algae pucks, some heavily coated. Periphyton very thin but rocks slippery, no calcite	No to slight organic smell, calcite was slight green dots or orange patches	Very fine periphyton, very smooth on rocks, just see a yellowing but rocks are slippery. Calcite, some speckling black calite on most rocks/ quite thin.	Approx. 20 m from 2012 coordinates, but relocated because original coodinates were on a small trib that is created by groundwater flow and a stream entering from the mountains. Rocky shoreline but some slumping on rocky shoreline and where there is grass. Small amount of calcite, orange, flat and patchy on rocks.	Station moved from the confluence with the Wildhorse River, no riffle habitat. This station is u/s from sawmill in the Canal Flats and u/s from pulp mill in Skookumchuck.	-	-	-
Benthic Invertebrate Sampling									
Total Kick Distance (m)		26	18	20	25	13	20	13	13
# of Transects (if complete)		2	3	5	5	2	1	1	1
Dominant Taxa in Tissue Sample		Plecoptera Ephemeroptera Trichoptera	Ephemeroptera Trichoptera Plecoptera Oligochaeta	-	-	-	-	-	-

Table A.1: Habitat Information Associated with Lotic Reference Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**LC_GRCK**	**LI24**	**MCCR**	**MI25**	**OLDDU**	**OLDLI**	**OLDLOW**	**PADAL**
Waterbody		Grace Creek	Line Creek	McCool Creek	Michel Creek	Oldman River	Oldman River	Oldman River	Palliser River
Date Sampled		18-Sep-15	10-Sep-15	11-Sep-15	10-Sep-15	12-Sep-15	11-Sep-15	10-Sep-15	11-Sep-15
UTM (NAD83, 11U)	Easting	654283	662214	648151	668226	687855	687526	710028	601173
	Northing	5540738	5538393	5499951	5482795	5530302	5532685	5512469	5598667
Samplers' Initials		KB, HC, SW	JI, MW	SW, LB	HC, KB	OB, TW	TW, OB	OB, TW	JT, SM
Habitat Characteristics									
Surrounding Land Use		forest, road just d/s of site	forest	forest, recreational ATV use in area	forest, livestock, mining, off roading trail crossing creek channel	logging, livestock, hwy 40 beside station, about 50 m	forest, livestock	field crops, livestock, residential, rarm/ranching	forest, logging, recreational camping
Length of Reach Assessed (m)		15	50	30	18-20	100	100	100	100
% Riffle		95	70	100	100	70	100	85	60
% Run		0	10	0	0	30	0	0	40
% Rapids		5	20	0	0	0	0	10	0
% Pool/Back Eddy		0	0	0	0	0	0	5	0
Streamside Vegetation (most dominant first)		deciduous trees, shrubs	coniferous trees, ferns/grass, shrubs	coniferous trees, deciduous trees, fern/grass, shrubs	coniferous trees, fern/grass, shrubs, deciduous trees	coniferous trees, fern/grass, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs	shrubs, farns/grass, deciduous trees	coniferous trees, ferns/grass, shrubs, deciduous trees
% Bedrock		0	0	0	0	0	0	0	0
% Boulder		0	30	20	0	30	0	25	20
% Cobble		10	50	70	80	50	90	55	60
% Pebble		60	20	0	0	10	5	5	10
% Gravel		20	0	10	15	5	5	10	5
% Sand/Finer		10	0	0	5	5	0	5	5
% Organic		0	0	0	0	0	0	0	0
Canopy Coverage (%)		98	1 - 25	59	6.8	0	1	0	13
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0
Periphyton Coverage		2	2	2	2	1	2	3	1
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	3/<0.5/olive	4/-/brown	2/<0.5/black	2/<0.5/olive	1/<0.5/olive	4/<0.5/olive	3/-/brown	1/<0.5/green, brown
	Filamentous Algae	0	0	0	1/0.5-1/olive	1/1-5/green	0	2/-/green, olive	0
	Slimes/Streamers	0	0	0	2/0.5-1/green	0	1/0.5-1/brown	0	0
	Macrophytes	0	0	0	0	0	0	-	0
	Moss	1	0	0	-	0	0	-	0
Bank Stability		stable, no erosion	moderate	moderate/unstable, substantial erosion	moderate	moderate	moderate	moderate	moderate
Water Colour & Clarity		colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	brown / turbid
Bankfull Width (m)		1.98	8.8	5.6	14.4	98	30	63	43
Wetted Width (m)		1.75	4.8	4.1	2.8	24	17	31	41
Bankfull-Wetted Depth (cm)		24	50	40	65	100	35	45	60
Gradient (%)		3	2	2.0 - 3.0	4	1	2	1	1.5
Mean Transect Depth (cm)		10.0	15.3	16.2	7.8	34.8	34.8	30.5	21.7
Mean Transect Velocity (m/s)		0.34	0.26	0.41	0.09	0.38	0.47	0.65	0.69
Comments/Notes		Samples for periphyton (rocks) were gathered near d/s end of reach in fairly open canopy area (about 40%) cover, whereas kick was completed further u/s	-	Lots of calcite on rocks. Creek braids through forest upstream of sampling location.	Site is upstream of obvious off road crossing in riffle area. Calcite on rocks. Small curled vegetation on most rocks at site, possibly a type of bryophyte.	Hard to judge bankfull width as 2013 flood heavily scoured banks. Slightly fishy, no obvious odor	-	Slight "fishy" smell	More boulders towards the middle of the channel, so CABIN kick was along the edge of the river.
Benthic Invertebrate Sampling									
Total Kick Distance (m)		12	13	26	7, 10, 10	25	-	40	10
# of Transects (if complete)		7	3	4-5	5	1	4	1	3
Dominant Taxa in Tissue Sample		Trichoptera Ephemeroptera	Ephemeroptera Plecoptera	-	Trichoptera Plecoptera Ephemeroptera	-	-	-	-

Table A.1: Habitat Information Associated with Lotic Reference Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**PAUKO**	**RACK**	**SLINE**	**VEUKO**	**VEUP**	**VICK**	**WWRL**	**WWRU**
Waterbody		Palliser River	Racehorse Creek	South Line Creek	Vermillion River	Vermillion River	Vicary Creek	Wigwam River	Wigwam River
Date Sampled		11-Sep-15	11-Sep-15	15-Sep-15	10-Sep-15	10-Sep-15	10-Sep-15	11-Sep-15	19-Sep-15
UTM (NAD83, 11U)	Easting	595626	687621	661122	569465	561227	682461	646099	648769
	Northing	5590338	5526336	5531374	5641604	5670806	5519665	5458836	5448916
Samplers' Initials		JT, SM	TW, OB	JI, MW	JT, SM	JT, SM	TW, OB	SW, LB	JW, JG
Habitat Characteristics									
Surrounding Land Use		forest, logging	forest, livestock, campsite	forest	forest, highway	forest, tourism, highway adjacent, small concrete wall u/s	logging	forest, park	forest, logging
Length of Reach Assessed (m)		100	100	30	100	100	30	100	100
% Riffle		50	100	50	40	85	100	100	100
% Run		50	0	10	60	5	0	0	0
% Rapids		0	0	40	0	10	0	0	0
% Pool/Back Eddy		0	0	0	0	0	0	0	0
Streamside Vegetation (most dominant first)		coniferous trees, ferns/grass, shrubs, deciduous trees	deciduous trees, ferns/grass, shrubs, coniferous trees	coniferous trees, ferns/grass, shrubs	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, fern/grass, shrubs	deciduous trees, shrubs, ferns/grass	coniferous trees, shrubs, moss, deciduous trees
% Bedrock		0	0	0	0	0	0	0	0
% Boulder		30	20	20	5	30	25	5	40
% Cobble		30	60	50	70	55	60	75	50
% Pebble		15	10	22	5	5	15	10	5
% Gravel		15	10	10	5	5	5	15	5
% Sand/Finer		10	0	0	15 (glacial till)	0	5	5	0
% Organic		0	0	0	0	5	0	0	0
Canopy Coverage (%)		14	0	1-25	8.5	15	13	0	29
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0
Periphyton Coverage		1	2	-	1	2	3	2	2
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	1/<0.5/brown	2/<0.5/green, brown	-	2/<0.5/brown (grey in silt matrix)	2/<0.5/green, olive (grey/orange in spots)	1, 2/<0.5/olive, brown	1/-/brown	4/<0.5/green, olive
	Filamentous Algae	0	2/1-5/green	-	0	0	0	0	0
	Slimes/Streamers	0	0	-	0	2/1-5/green	0	1/-/brown	0
	Macrophytes	0	0	-	0	0	0	0	0
	Moss	0	0	-	0	1 (on margins, just out of water)	0	0	0
Bank Stability		unstable, substantial erosion	moderate	moderate	stable, no erosion	moderate	moderate	unstable, substantial erosion	moderate
Water Colour & Clarity		brown / turbid	colourless / clear	colourless / clear	turquoise / glacial till cloudy	blue, clear / clear, glacial till Turquoise colour	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		52	27	7.9	36	15	11.2	69	37
Wetted Width (m)		36	18	5.3	30	13	7.2	25 (at sampling point) 42 (total)	13.6
Bankfull-Wetted Depth (cm)		70	70	60	50	0.5	12	100	80
Gradient (%)		1.5	1.5	2	1	2	2	1	1.5
Mean Transect Depth (cm)		15.9	23.1	15.4	17.7	26.2	14.6	37.4	38.1
Mean Transect Velocity (m/s)		0.61	0.31	0.47	0.26	0.65	0.29	0.65	0.46
Comments/Notes		Site from 2012 has changed - channel is now a deep swift run, site has been moved upstream. Still sampling u/s of the trib.	More periphyton on shaded part of rocks, often green. Scummy, earthy	-	Moved station upstream to riffle for access	-	-	-	-
Benthic Invertebrate Sampling									
Total Kick Distance (m)		10	40	13	18	5	18	30	28
# of Transects (if complete)		2	2	2.5	2	river too swift, kicked perpendicular to shore	1	4	2
Dominant Taxa in Tissue Sample		-	-	Ephemeroptera Trichoptera	-	-	-	-	-

Table A.2: Habitat Information Associated with Lotic Mine-exposed Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**BOCK**	**CATCK**	**CORCK**	**EL1**	**EL19**	**EL20**	**ELDEL**	**ELDFE**
Waterbody		Bodie Creek	Cataract Creek	Corbin Creek	Elk River	Elk River	Elk River	Elk River	Elk River
Date Sampled		14-Sep-15	11-Sep-15	11-Sep-15	16-Sep-15	17-Sep-15	17-Sep-15	17-Sep-15	16-Sep-15
UTM (NAD83, 11U)	Easting	655536	652429	668563	651655	653157	649186	649968	640103
	Northing	5509605	5557517	5487395	5508624	5525801	5548524	5540252	5479658
Samplers' Initials		KB, HC, HL	KM, KH	KB, HC	KB, HC, SW	JT, HL, MW	JI, HL, MW	KB, HG, JG	KB, HC, SW
Habitat Characteristics									
Surrounding Land Use		commercial, teck maintenance yard adjacent to site. Highway adjacent to site.	forest, mining, waste rock u/s	forest, mining, coal mountain operations	forest, livestock, commercial, train tracks adjacent to site	forest	forest	forest, wastewater treatment plant u/s	forest, livestock, residential, commerical, treated wastewater discharge u/s
Length of Reach Assessed (m)		15	30	20	100	100	100	50	100
% Riffle		0	25	90	70	50	40	15	70
% Run		100	25	10	15	50	60	45	20
% Rapids		0	0	0	15	0	0	30	10
% Pool/Back Eddy		0	50	0	0	0	0	0	0
Streamside Vegetation (most dominant first)		ferns/grass, shrubs	ferns/grass, shrubs, coniferous trees	ferns/grass, shrubs, deciduous trees, coniferous trees	deciduous trees, shrubs, coniferous trees	deciduous trees, ferns/grass, shrubs, coniferous trees	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, shrubs, deciduous trees	shrubs, deciduous trees, coniferous trees, ferns/grass
% Bedrock		0	0 / 100% Calcite	0	0	-	0	0	0
% Boulder		0	0	5	0	-	10	5	15
% Cobble		10	0	60	60	-	70	30	50
% Pebble		10	0	10	20	-	20	55	10
% Gravel		0	0	5	10	-	0	5	10
% Sand/Finer		80	0	20	10	-	0	5	5
% Organic		0	0	0	0	-	0	0	0
Canopy Coverage (%)		0	1.5	28	0	0	0	0	0
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0
Periphyton Coverage		1	2	4	3	3	3	2	4
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	0	-/0.5-1/brown	3/0.5-1/green, olive, brown, black	4/0.5-1/green, olive, brown	4/0.5-1/olive, brown	4/<0.5/brown	3/<0.5/olive	4/0.5-1/brown, black, red/rust
	Filamentous Algae	1/1-5/green	1/1-5/-	3/1-5/green	1/0.5-1/green	0	-	0	1/0.5-1/green, olive
	Slimes/Streamers	0	0	0	2/1-5/clear, green	2/1-5/green	1/1-5/olive	0	0
	Macrophytes	0	0	0	0	0	-	0	0
	Moss	1	4	4	0	0	-	0	0
Bank Stability		stable, no erosion	stable, no erosion	moderate	unstable, substantial erosion	moderate	moderate	unstable, substantial erosion	moderate
Water Colour & Clarity		colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		1.95	6.4	4.15	85	63	81	55	72
Wetted Width (m)		1.95	2.8	4.06	38	35	24	33	71
Bankfull-Wetted Depth (cm)		0	78	15	40	80	2	50	50
Gradient (%)		0.5	2 - 5	1	0.5	1.5	1.5	1	0.5
Mean Transect Depth (cm)		28.0	18.5	15.9	33.2	36.0	17.3	19.7	39.7
Mean Transect Velocity (m/s)		0.62	-0.10	0.15	0.51	0.78	0.67	0.61	0.57
Comments/Notes		Very muddy substrate, very little rocky substrate. Area is a ditch. Difficult overturning rocks for 3 min kick and sweep. Creek is narrow and sides of channel are mud. Calcite flakes off rocks easily in a sheet.	Calcite forming on top of moss. For each sample rock scrapings removed calcite too, not possible to separate surficial matter from calcite. Excavator taking soil samples (see comment). Water samples collected prior to disturbance. No 100 pebble count due to high calcification	dark calcite throughout and covering entire creek. Calcite and periphyton were also dark. Small piece of coal in creek. Calcite incorporated into periphyton, so therefore calcite thickness included the periphyton thickness.	Pool back eddy that flows into river d/s of reach. Cyanobacteria layer (up to about 1 cm thick) present on rocks at the edge of river.	-	highly braided area, chose the middle braid for a good riffle.	very little periphyton growth compared to other sites on the Elk River (for instance d/s of Fernie wastewater outflow)	site located next to highway, wastewater treatment outflow upstream from site.
Benthic Invertebrate Sampling									
Total Kick Distance (m)		8	7	11	14	13	14	12	11
# of Transects (if complete)		too narrow for transects	worked mid channel in flow	4	2	0.5	-	3	5
Dominant Taxa in Tissue Sample		Ephemeroptera, Plecoptera	Chironomidae, Tipulidae, Plecoptera, Hirudinea	Trichoptera	Plecoptera Trichoptera	-	Plecoptera Ephemeroptera Trichoptera	Plecoptera Ephemeroptera Trichoptera	Plecoptera Trichoptera Diptera

Table A.2: Habitat Information Associated with Lotic Mine-exposed Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**ELDGR**	**ELELKO**	**ELH93**	**ELUEL**	**ELUFE**	**ELUFO**	**ELUSP**	**FO10-SP1**	**FO22**
Waterbody		Elk River	Elk River	Elk River	Elk River	Elk River	Elk River	Elk River	Fording River	Fording River
Date Sampled		17-Sep-15	14-Sep-15	16-Sep-15	13-Sep-15	15-Sep-15	14-Sep-15	15-Sep-15	17-Sep-15	17-Sep-15
UTM	Easting	653098	639419	633954	649097	644255	652130	652337	654245	654794
(NAD83, 11U)	Northing	5521154	5463274	5449117	5544766	5490993	5528839	5512688	5555299	5553614
Samplers' Initials		OB, KB, HC, JG, TW	JT, SM	KB, HC, SW	JW, DB	KB, HC, SW	OB, TW	KB, HC	JT, SM	SW, LB, KH
Habitat Characteristics										
Surrounding Land Use		forest,livestock, fishing	forest, logging, bridge u/s	forest, livestock	forest, residential, logging, mining	forest, small boat launch just upstream off reach, highway directly beside site	forest, logging, livestock, mining	forest, residential, field crops, highway 43 bridge about 80 m u/s.	forest	forest
Length of Reach Assessed (m)		100	100	100	50	-	100	100	50	50
% Riffle		40	50	50	80	50	75	90	20	50
% Run		30	50	50	10	50	25	5	50	30
% Rapids		30	0	0	0	0	0	5	0	0
% Pool/Back Eddy		0	0	0	10	0	0	0	30	20
Streamside Vegetation (most dominant first)		ferns/grass, coniferous trees, shrubs, deciduous trees	deciduous trees, fern/grass, shrubs, coniferous trees	deciduous trees, shrubs, coniferous trees, fern/grass	coniferous trees, ferns/grass, shrubs, deciduous trees	decidious trees, ferns/grass, shrubs, coniferous trees	coniferous trees, ferns/grass, shrubs, deciduous trees	coniferous trees, ferns/grass, shrubs	coniferous trees, ferns/grass, shrubs, deciduous trees	ferns/grass, shrubs, coniferous trees
% Bedrock		0	0	0	0	0	5	0	0	0
% Boulder		30	5	20	5	25	5	0	0	0
% Cobble		45	60	60	60	50	75	85	35	0
% Pebble		15	10	10	20	15	5	10	45	50
% Gravel		5	10	10	10	10	5	5	10	40
% Sand/Finer		5	10	0	5	0	5	0	10	5
% Organic		0	5	0	0	0	0	0	0	5
Canopy Coverage (%)		0	5.5	0	9	0	0	25	5.3	7
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0	0
Periphyton Coverage		2	2	2	2	2	-	3	3	3
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	3/<0.5/olive	4/<0.5/brown	4/0.5-1/green, brown	4/<0.5/olive	4/0.5-1/green, olive	-	3/-/olive	4/0.5-1/green, olive, brown, black	3/<0.5/olive
	Filamentous Algae	0	0	2/1-5/green	0	2/0.5-1/green	-	0	0	2/<0.5/green
	Slimes/Streamers	0	2/1-5/olive	1/1-5/clear, green	2/0.5-1/green	0	-	4/-/green, brown	1/1-5/green	1/<0.5/brown
	Macrophytes	0	0	0	0	0	-	0	1	0
	Moss	0	0	0	1 (bryophyte)	0	-	1	0	1
Bank Stability		moderate	stable, no erosion	stable, no erosion	unstable, substantial erosion	moderate	moderate	stable, no erosion	moderate	moderate
Water Colour & Clarity		colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		112	133	86	153	71	55	45	6.1	22
Wetted Width (m)		40	17.67	82	26.7	45 (to cobble bar, 71 to opposite bank	29	45	4.2	13
Bankfull-Wetted Depth (cm)		100	130	70	320	40	88	30	50	50
Gradient (%)		1.5	1	0.5	1	0 - 0.5	1.9	0.5	1	0 - 0.5
Mean Transect Depth (cm)		41.7	8.0	42.0	39.6	63.0	44.5	32.0	18.3	25.5
Mean Transect Velocity (m/s)		0.66	0.47	0.39	0.50	0.90	0.59	0.50	0.18	0.50
Comments/Notes		pool/back eddy with a lot of algae growth flowing into river d/s of site. Bankfull width includes the width of the reach and the back eddy. Little periphyton compared to sites u/s and d/s of Fernie and at Lake Koocanusa.	-	All rocks covered in mat of periphyton and calcite/silt that was olive in colour.	-		-	faint wastewater smell at site. Slight fishy smell to periphyton. Thick gelatin like coating on some rocks, about 1 cm thick. Grey in colour under green surface. Very cohesive and gelatin-like sample kept for identification (identified as cyanobacteria)	-	-
Benthic Invertebrate Sampling										
Total Kick Distance (m)		10	20	12	27	15	10	12	23	30
# of Transects (if complete)		4	1	2	1	4	1	2	8	3
Dominant Taxa in Tissue Sample		Plecoptera Ephemeroptera Trichoptera	Plecoptera	Plecoptera Ephemeroptera Trichoptera	Plecoptera Ephemeroptera Trichoptera	Plecoptera Diptera	Plecoptera	Plecoptera Ephemeroptera Trichoptera Chironomidae	Trichoptera Plecoptera	Rhyacophila Plecoptera Ephemeroptera

Table A.2: Habitat Information Associated with Lotic Mine-exposed Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**FO23**	**FO29**	**FO9**	**FOBCP**	**FOBKS**	**FOBSC**	**FODGH**
Waterbody		Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River
Date Sampled		16-Sep-15	12-Sep-15	18-Sep-15	17-Sep-15	16-Sep-15	17-Sep-15	16-Sep-15
UTM (NAD83, 11U)	Easting	652965	655522	652235	652864	652065	652342	652941
	Northing	5528974	5543915	5540141	5557150	5558691	5558207	5545649
Samplers' Initials		JI, MW	SW, LB, KH	KB, HC, SW	JW, MR, DB	JW, DB, MR	JW, DB, MR	LB, JG, KH
Habitat Characteristics								
Surrounding Land Use		mining	forest, mining	forest, livestock	forest, logging, mining (FRO u/s of location)	forest, mining, logging. On mine property located d/s from FRO	forest, logging, mining (just d/s of FRO)	forest, mining
Length of Reach Assessed (m)		-	100	50	50	50	50	-
% Riffle		80	100	70	70	85	100	70
% Run		10	0	10	20	15	0	20
% Rapids		10	0	20	0	0	0	0
% Pool/Back Eddy		0	0	0	10	0	0	10
Streamside Vegetation (most dominant first)		coniferous trees, ferns/grass, shrubs, deciduous trees,	coniferous trees, ferns/grass, shrubs, deciduous trees,	ferns/grass, coniferous trees	coniferous trees, ferns/grass, shrubs	ferns/grass, coniferous trees, shrubs, deciduous trees,	ferns/grass, shrubs, deciduous trees, coniferous trees	coniferous trees, ferns/grass, shrubs, deciduous trees
% Bedrock		30	0	0	0	0	0	0
% Boulder		20	20	35	20	10	15	0
% Cobble		40	70	40	60	75	70	85
% Pebble		10	0	10	10	5	5	10
% Gravel		0	5	10	10	5	5	2.5
% Sand/Finer		0	5	5	0	5	5	2.5
% Organic		0	0	0	0	0	0	0
Canopy Coverage (%)		0	18	0	9.8	26	2	76 - 100
Macrophyte Coverage (%)		0	0	0	0	0	0	0
Periphyton Coverage		2	3	3	2	2	2	3
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	4/<0.5/olive, brown	2/<0.5/olive	3/-/brown	4/0.5-1/green, olive, brown	4/<0.5/olive, brown, little orange	4/<0.5/olive, brown	3/<0.5/brown
	Filamentous Algae	-	1/<0.5/olive	0	0	0	0	1/<0.5/-
	Slimes/Streamers	1/-/-	1/<0.5/brown	0	2/1-5/-	0	0	0
	Macrophytes	0	0	0	0	0	0	0
	Moss	0	1 (unknown)	0	0	0	0	0
Bank Stability		moderate	moderate	moderate	moderate	moderate	moderate	moderate
Water Colour & Clarity		colourless / very faint cloudiness	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		60	25	47	53.75	22	44.8	40
Wetted Width (m)		30	22	16	7.75	8.7	8.9	20
Bankfull-Wetted Depth (cm)		70	32	120	130	77	80	54
Gradient (%)		1.5	0.5	1	2.5	1 - 1.5	1.5 - 2.0	1.5
Mean Transect Depth (cm)		13.3	35.7	40.0	11.6	17.3	19.4	22.5
Mean Transect Velocity (m/s)		0.38	0.45	0.58	0.49	0.37	0.41	0.76
Comments/Notes		-	periphyton is in the calcite matrix	difficult to estimate bankful width because of damage/erosion from the 2013 storm	Calcite brown globules, black specks - some concretion of rocks. Algae long green thick strips on some rocks by shoreline	no periphyton smell, slight organic. Brown glocules on calcite, some black speckled calcite	Very thin periphyton (olive/brown colour). Calcite (brown globules/black specks)	moved station downstream of 2012 location to a good riffle
Benthic Invertebrate Sampling								
Total Kick Distance (m)		14	9 / 18 / 12	8	16	27	27	20
# of Transects (if complete)		0	3	2	2	3	3	5
Dominant Taxa in Tissue Sample		Plecoptera Ephemeroptera Trichoptera	Plecoptera Trichoptera Ephemeroptera	Plecoptera Trichoptera Ephemeroptera	Plecoptera Trichoptera Ephemeroptera Oligochaeta	Plecoptera Trichoptera Ephemeroptera Oligochaeta	Plecoptera Ephemeroptera Trichoptera	-

Table A.2: Habitat Information Associated with Lotic Mine-exposed Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**FODHE**	**FODNGD**	**FODPO**	**FOUEW**	**FOUKI**	**FRUL**	**FOUNGD**	**FOUSH**
Waterbody		Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River
Date Sampled		14-Sep-15	14-Sep-15	15-Sep-15	13-Sep-15	16-Sep-15	17-Sep-15	15-Sep-15	15-Sep-15
UTM (NAD83, 11U)	Easting	651295	650883	653901	656362	651838	654524	651021	650863
	Northing	5565429	5563190	5555074	5551883	5559855	5530128	5563445	5560970
Samplers' Initials		JW, DB	JW, DB, KC	LB, KH, JG	SW, LB, KH	JW, MR, DB	MW, JI, HL	JW, DB, KC	JW, DB, KC
Habitat Characteristics									
Surrounding Land Use		forest, mining (FRO), logging, powerlines overhead	forest (FRO), logging, mining	forest, mining	forest, gun range	forest, mining, logging	forest	forest, logging, mining	forest, logging, mining
Length of Reach Assessed (m)		50	50	100	100	50	50	50	50
% Riffle		100	100	65	70	100	70	100	100
% Run		0	0	20	30	0	20	0	0
% Rapids		0	0	0	0	0	0	0	0
% Pool/Back Eddy		0	0	15	0	0	0	0	0
Streamside Vegetation (most dominant first)		ferns/grass	ferns/grass, shrubs, coniferous trees	ferns/grass, shrubs, deciduous trees, coniferous trees	coniferous trees, ferns/grass, shrubs	ferns/grass, coniferous trees, deciduous trees	coniferous trees, ferns/grass, shrubs, deciduous trees	ferns/grass, coniferous trees, shrubs	coniferous trees, ferns/grass, shrubs, deciduous trees
% Bedrock		0	0	0	0	0	0	0	0
% Boulder		20	10	0	0	5	25	15	20
% Cobble		60	50	45	70	80	50	60	50
% Pebble		10	10	45	20	5	20	20	10
% Gravel		5	10	5	10	5	5	10	10
% Sand/Finer		5	20	5	0	5	0	5	10
% Organic		0	0	0	0	0	0	0	0
Canopy Coverage (%)		0	40	51 - 75	22	2	1 - 25	26	5.2
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0
Periphyton Coverage		2	2	3	3	2	2	2	2
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	4/<0.5/olive	3/<0.5/olive	2/<0.5/brown	2/0.5-1/brown (calcite)	4/<0.5/green, olive	4/0.5-1/olive, brown	4/<0.5/olive	4/<0.5/olive, brown
	Filamentous Algae	0	0	2/1-5/green	2/0.5-1/green	0	0	0	0
	Slimes/Streamers	1/-/brown	1/0.5-1/-	0	1/<0.5/green	0	1/-/clear,yellow	0	0
	Macrophytes	0	0	0	0	0	0	0	0
	Moss	0	0	1 (unknown)	0	0	0	0	0
Bank Stability		moderate	moderate	moderate	unstable, substantial erosion	moderate	moderate	moderate	moderate
Water Colour & Clarity		colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		14.8	15	13	15	38	33	12	15
Wetted Width (m)		12.7	10	10.9	12	10.4	13.2	8	9.1
Bankfull-Wetted Depth (cm)		120	66.5	72	30	67	150	63	65
Gradient (%)		1	1.5	0.75	1.5	1.5	2	1.5	1
Mean Transect Depth (cm)		12.4	22.1	13.2	29.0	23.3	34.3	24.6	23.0
Mean Transect Velocity (m/s)		0.28	0.33	0.60	0.68	0.35	0.68	0.49	0.41
Comments/Notes		FODHE coordinates were in a dry channel, it appears they have diverted the watercourse. Moved station about 80m. Mostly rocky boulders, some grasses/shrubs within rocks, some trees upstream and downstream, but not within the reach assesed. Very fine periphyton, faint smell. Calcite both soft/mushy thick areas and light green speckled calcite	calcite hard black specks, orange blotches	-	-	moved station slightly from 2012 location (about 25 m) as old coordinates are no longer part of this channel. Calcite - orange/brown globules and black specks along edge	-	organic smell, calcite - black patch and dots.	at high flow banks are eroded, lower flow banks are boulders. Slight organic smell. Calcite small brown globules/soft (b/w 1 -5 mm). Black speckling of rocks
Benthic Invertebrate Sampling									
Total Kick Distance (m)		25	30	24	16	20	14	24	18
# of Transects (if complete)		2	3	8	1.33	2	-	3	2
Dominant Taxa in Tissue Sample		Plecoptera Ephemeroptera Trichoptera	Ephemeroptera Plecoptera	Plecoptera Trichoptera	-	Ephemeroptera Trichoptera Plecoptera Oligochaeta	Plecoptera Ephemeroptera Tipulidae	Ephemeroptera Plecoptera Trichoptera	Ephemeroptera Plecoptera Hirudinea Trichoptera Oligochaeta

Table A.2: Habitat Information Associated with Lotic Mine-exposed Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**GHCKD**	**GHCKU**	**GRCK**	**GRDS**	**HACKDS**	**HACKUS**	**HENFO**	**KICK**
Waterbody		Greenhills Creek	Greenhills Creek	Grave Creek	Grave Creek	Harmer Creek	Harmer Creek	Henretta Creek	Killmarnock Creek
Date Sampled		15-Sep-15	15-Sep-15	17-Sep-15	12-Sep-15	10-Sep-15	11-Sep-15	16-Sep-15	17-Sep-15
UTM (NAD83, 11U)	Easting	653536	653911	656412	653936	656962	658180	652236	652704
	Northing	5545715	5546497	5522315	5523373	5522160	5520996	5566412	5559764
Samplers' Initials		JT, SM, MR	LB, KH, JG	KB, HC, JG	JW, DB, MR	JW, SW, DB	JW, DB, MR	JW, DB, MR	JW, DB, MR
Habitat Characteristics									
Surrounding Land Use		forest, logging, mining (d/s Greenhills settling pond), adjacent to clear cut	mining	forest, campground u/s	forest, logging, mining	forestry roads, logging, mining (settling pond outfall u/s)	forest, mining (LCO u/s), logging	forest, logging, mining	forest, logging, mining (d/s from FRO)
Length of Reach Assessed (m)		50	10	50	30	50	30	50	30
% Riffle		100	100	95	100	100	100	100	100
% Run		0	0	0	0	0	0	0	0
% Rapids		0	0	5	0	0	0	0	0
% Pool/Back Eddy		0	0	0	0	0	0	0	0
Streamside Vegetation (most dominant first)		deciduous trees, ferns/grass, shrubs, coniferous trees	deciduous trees, coniferous trees, ferns/grass, shrubs,	coniferous trees, shrubs, deciduous trees	deciduous trees, ferns/grass, shrubs, coniferous trees	coniferous trees, ferns/grass, shrubs, deciduous trees	ferns/grass, shrubs, deciduous trees, coniferous trees	shrubs, ferns/grass	ferns/grass
% Bedrock		0	0	0	0	0	0	0	0
% Boulder		10	5	25	40	40	5	15	20
% Cobble		60	60	35	40	60	70	60	60
% Pebble		10	20	30	10	0	10	10	10
% Gravel		10	10	5	5	0	5	10	10
% Sand/Finer		5	5	5	5	0	10	5	0
% Organic		5	0	0	0	0	0	0	0
Canopy Coverage (%)		44	76 - 100	26 - 50 (estimate 40%)	73	30	18	0.5	0
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0
Periphyton Coverage		3	2	3	2	3	2	2	2
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	4/0.5-1/green, olive, brown, black	4/<0.5/brown	4/0.5-1/olive, brown	4/<0.5/olive, brown	4/0.5-1/brown	4/0.5-1/olive	4/<0.5, 0.5-1/green, brown	3/<0.5/-
	Filamentous Algae	2/-/green	1/0.5-1/green	2/0.5-1/brown	0	0	0	0	0
	Slimes/Streamers	3/0.5-1/green	0	0	1/0.5-1/green, olive	3/1-5/olive, brown	1/-/green, olive	2/-/green	4/0.5-1/green
	Macrophytes	0	0	0	0	0	0	0	0
	Moss	0	0	0	1	1	2 (bryophytes)	0	0
Bank Stability		stable, no erosion	moderate	stable, no erosion	moderate	stable, no erosion	moderate	moderate	moderate
Water Colour & Clarity		colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		3.86	5.8	7.5	7.3	6.5	7	12.8	8.94
Wetted Width (m)		3.86	2.3	7.5	5.6	5.3	5	9.5	7.6
Bankfull-Wetted Depth (cm)		8	40	20	82	40	70	130	45
Gradient (%)		2	2.5	1	1.5	2.5 - 3.0	1.5 - 2.0	1.5	2
Mean Transect Depth (cm)		13.4	11.0	13.3	17.5	14.4	14.8	14.5	13.3
Mean Transect Velocity (m/s)		0.07	0.36	0.57	0.39	0.43	0.29	0.36	0.25
Comments/Notes		-	Calcite is very hard. Hard to scrape, very different than other sites, thin but tough. Cataract had a lot of thick calcite but still softer than what is here.	small campsite u/s with elk carcass present. Densiometer was left behind and there were concerns about bear safety so was not retrieved.	-	no smell - slightly organic smell. Some bryophytes. Noticeable white/blotchy calcite on rocks d/s of spillway	very slight smell rock (slightly organic). Mainly fine calcite on rocks/looks a bit like lichens (small patchy/tight to rocks)	Periphyton variable size, some globules that were thicker. Some green and some brown. Calcite, soft clumps and hard black and green spots. Faint organic smell.	borderd by rip-rap on each bank, some small failures have occurred. Calcite only on rocks, can't see very much calcite on surface but can't pick up. Bottom of rocks completely covered in calcite. Concreted can't even distinguish beginning and ending of rock (heavy calcited)
Benthic Invertebrate Sampling									
Total Kick Distance (m)		10	4	10	20	28	35	27	24
# of Transects (if complete)		1.5	5	4	4	3.5	7	3	3
Dominant Taxa in Tissue Sample		Tipulidae Ephemeroptera Plecoptera Chironomidae	Chironomidae Plecoptera Hirudinea	Trichoptera Plecoptera Ephemeroptera	Ephemeroptera Trichoptera Plecoptera	Ephemeroptera Plecoptera Trichoptera Hirudinea	Ephemeroptera Trichoptera Plecoptera	Plecoptera Ephemeroptera Trichoptera Oligochaeta	Trichoptera Plecoptera Hirudinea Oligochaeta

Table A.2: Habitat Information Associated with Lotic Mine-exposed Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**LC_DC1**	**LC_DCDS**	**LC_FRUS/FO28**	**LI8**	**LIDSL**	**LILC3**	**MI2**	**MI3**
Waterbody		Dry Creek	Dry Creek	Fording River	Line Creek	Line Creek	Line Creek	Michel Creek	Michel Creek
Date Sampled		13-Sep-15	16-Sep-15	13-Sep-15	13-Sep-15	12-Sep-15	14-Sep-15	10-Sep-15	14-Sep-15
UTM (NAD83, 11U)	Easting	656454	657719	656307	655424	659293	659931	653672	660077
	Northing	5544727	5542179	5545255	5528983	5530590	5531848	5511222	5504881
Samplers' Initials		SW, LB, KH	JI, MW	SW, LB, KH	MW, JI	MW, JI	JI, MR, MW	JW, DB	KB, HC, HL
Habitat Characteristics									
Surrounding Land Use		forest, mining	forest, mining	forest	forest, mining	forest, mining	forest, mining	forest, residential, logging, mining, commericial, d/s of EVO, near Sparwood	forest, mining, highway bridge upstream (~150m), CPR line alongside creek
Length of Reach Assessed (m)		30	-	100	50	50	50	100	50
% Riffle		100	70	70	80	80	70	100	15
% Run		0	20	30	0	10	10	0	30
% Rapids		0	0	0	20	10	20	0	55
% Pool/Back Eddy		0	0	0	0	0	0	0	0
Streamside Vegetation (most dominant first)		shrubs, deciduous trees, ferns/grass, coniferous trees	shrubs, deciduous trees, ferns/grass, coniferous trees	coniferous trees, deciduous trees, ferns/grass, shrubs	deciduous trees, ferns/grass, shrubs, coniferous trees	coniferous trees, ferns/grass, shrubs	ferns/grass, shrubs, coniferous trees	deciduous trees, ferns/grass	coniferous trees, deciduous trees, shrubs, ferns/grass
% Bedrock		0	0	0	0	0	0	0	0
% Boulder		5	5	25	20	15	30	40	10
% Cobble		55	50	70	50	70	60	60	70
% Pebble		10	30	5	20	10	10	0	10
% Gravel		25	10	0	10	5	0	0	5
% Sand/Finer		5	5	0	0	0	0	0	5
% Organic		0	0	0	0	0	0	0	0
Canopy Coverage (%)		33	31	47	1 - 25	1 - 25	0	18	7.8
Macrophyte Coverage (%)		0	0	0	0	0	0	0	0
Periphyton Coverage		3	2	3	2	2	3	2	-
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	4/<0.5/brown	4/0.5-1/brown, black	3/0.5-1/brown	4/<0.5/olive, brown	4/<0.5,0.5-1/olive, brown	4/0.5-1/olive, brown	4/<0.5/green, olive, brown	2/<0.5/green
	Filamentous Algae	2/0.5-1/olive	0	2/0.5-1/green	0	0	0	0	0
	Slimes/Streamers	0	0	0	0	0	1/1-5/- ? Green olive?	2/0.5-1/brown	0
	Macrophytes	0	0	0	0	0	0	0	0
	Moss	0	0	2	0	0	2	0	0
Bank Stability		moderate	moderate	moderate	moderate	moderate	moderate	moderate	unstable, substantial erosion
Water Colour & Clarity		colourless / clear	colourless / very slight cloudyness	colourless / clear	colourless / slightly cloudy	colourless / clear	colourless / clear	colourless / clear	colourless / clear
Bankfull Width (m)		14	3.9	23	-	22	11	55	31.2
Wetted Width (m)		2.4	3.3	23	11	9	9.5	12.3	27.2
Bankfull-Wetted Depth (cm)		40	14	35	-	55	30	150	40
Gradient (%)		1.5	1.5	0.5	1.5	2	1.5	0.5	1
Mean Transect Depth (cm)		14.3	7.3	28.7	25.2	30.0	14.9	42.3	24.3
Mean Transect Velocity (m/s)		0.18	0.15	0.53	0.63	0.47	0.64	0.73	0.49
Comments/Notes		-	Black sediment on all rocks	-	Submerged stream margins have heavy sedimentation - likely due to rock slide that occurred one month earlier.	-	-	-	Algae embedded in calcite, occasional cyanobacteria patches
Benthic Invertebrate Sampling									
Total Kick Distance (m)		14	13	7	3	12	12	20	8
# of Transects (if complete)		7	4	3	1.5	1.2	1.5	3	1.5
Dominant Taxa in Tissue Sample		Trichoptera Plecoptera	Diptera Ephemeroptera Trichoptera Chironomidae	Ephemeroptera Plecoptera Trichoptera	Trichoptera Ephemeroptera Plecoptera	Trichoptera Ephemeroptera Plecoptera	Trichoptera Ephemeroptera Plecoptera	Ephemeroptera Plecoptera Trichoptera	Ephemeroptera

Table A.2: Habitat Information Associated with Lotic Mine-exposed Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**MI5**	**MIDAG**	**MIDCO**	**MIUCO**	**MP1**	**NGD1**[a]	**OCNM**	**POCK**
Waterbody		Michel Creek	Michel Creek	Michel Creek	Michel Creek	Fording River	North Greenhills Diversion	Otto Creek	Porter Creek
Date Sampled		13-Sep-15	12-Sep-15	11-Sep-15	10-Sep-15	15-Sep-15	08-Oct-15	15-Sep-15	14-Sep-15
UTM (NAD83, 11U)	Easting	659497	665212	667757	668203	651133	650820	652337	653558
	Northing	5496573	5489264	5487611	5486653	5562401	5563294	5512615	5555328
Samplers' Initials		KB, HC, MR	KB, HC	KB, HC	KB, HC	JW, DB, KC	JW, IM	KB, HC, SW	LB, KH, JG
Habitat Characteristics									
Surrounding Land Use		forest, mining, campsite upstream, back roads bridge downstream	forest, mining, highway and railbridge d/s	forest, logging, mining, CMO upstream, highway near creek	forest, logging, mining (CMO)	forest, logging, mining	forest, logging, mining (GHO)	forest, highway and bridge u/s, garbage present in creek	mining, settling ponds upstream
Length of Reach Assessed (m)		50	50	40	30	30	30	10	30
% Riffle		60	90	90	95	100	60	10	90
% Run		30	10	10	5	0	0	40	0
% Rapids		10	0	0	0	0	40	0	0
% Pool/Back Eddy		0	0	0	0	0	0	50	5
Streamside Vegetation (most dominant first)		deciduous trees, shrubs (equally dominant), coniferous trees	deciduous trees and shrubs (equally dominant),coniferous trees	shrubs, ferns/grass,deciduous trees, coniferous trees	coniferous trees, fern/grass, shrubs, deciduous trees	ferns/grass	ferns/grass, shrubs, deciduous trees, coniferous trees	coniferous trees, ferns/grass	ferns/grass, deciduous trees, shrubs, coniferous trees
% Bedrock		0	0	0	0	0	0	0	0
% Boulder		2	2	5	5	50	30	0	2.5
% Cobble		92	83	80	75	30	40	25	85
% Pebble		2	5	5	10	10	10	25	5
% Gravel		2	5	5	5	10	10	15	5
% Sand/Finer		2	5	5	5	0	10	30	2.5
% Organic		0	0	0	0	0	0	5	0
Canopy Coverage (%)		0.5	4.7	3.4	8.1	0	1 - 25	68	76 - 100
Macrophyte Coverage (%)		0	0	0	0	0	0	1 - 25 (pennywart?)	0
Periphyton Coverage		2	2	3	2	2	4	1	3
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	2/<0.5/olive	2/<0.5/olive	2/<0.5/olive	2/<0.5/green, olive	4/<0.5, 0.5-1/olive, brown	4/<0.5/green, olive	0	-/<0.5/brown
	Filamentous Algae	0	0	2/1-5/green, brown	1/<0.5/green, olive, brown	1/0.5-1/green	2/green	0	3/1-5/-
	Slimes/Streamers	0	1/-/clear, green	1/<0.5/green	1/<0.5/green, olive, brown	2/-/brown	2/green	0	0
	Macrophytes	0	0	0	0	0	0	0	0
	Moss	0	0	2	0	1 (bryophytes)	0	0	3
Bank Stability		stable, no erosion	unstable, substantial erosion	unstable, substantial erosion	-	moderate	moderate	moderate	moderate
Water Colour & Clarity		colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / clear	colourless / cloudy	colourless / clear
Bankfull Width (m)		26.35	16.2	9.87	10	19	-	1.1	2.1
Wetted Width (m)		13.05	11.3	8.45	4.75	6	-	1.1	1.75
Bankfull-Wetted Depth (cm)		40	60	44	72	76	-	0	28
Gradient (%)		1	1	1	4	2	-	2	3.5
Mean Transect Depth (cm)		36.1	23.0	14.8	16.9	43.3	-	10.0	10.6
Mean Transect Velocity (m/s)		0.45	0.40	0.19	0.32	0.52	-	0.04	0.20
Comments/Notes		forest has been cleared nearby for campsite. Slightly fishy smell to periphyton	Difficult to turn rocks during kick and sweep. Two creek beds present (braided stream) within creek channel. Only the more western channel was assessed. Fishy smell to periphyton. Only small amount of periphyton on rocks.	Drainage ditch alongside highway, also flowing towards the creek at sampling site. Small pond/wetland upstream of site, visible from truck parking location. Fishy smell to periphyton layer on some rocks. Thin layer of yellow/olive flaky periphyton. Rocks on edge of creek had larger amounts of moss and filamentous algae, rocks in centre were thin yellow/olive periphyton (slimy) with clumps of filamentous algae	ATV trail nearby which was used to access site but trail does not intersect or cross creek. Slimes/streamers and filamentous algae mixed in with calcite present on rocks.	Rivers edge appears to be recently adjusted with a dozer - cobble/gravel on the left bank, looking upstream. No smell/slightly organic. Calcite - soft globules and black specks. Saw filamentous algae in benthic samples but did not really see it with the pebble count.	Some cut banks from high flows on north side. Coordinates from 2012 were not on creek/diversion. Periphyton had no smell, some filamentous/streaming algae. Calcite mainly thin dots on rocks (black/orange); very few rocks with thicker calcite.	Very muddy, silty area, deadfall over creek, garbage present in creek. Very minor flow. Weir and staff gauge d/s, closer to mouth with Elk River. Habitat d/s is narrower and shallower but with more gravel/cobble and step pools with very little flow. No visible periphtyon, rocks covered in dark brown mud.	-
Benthic Invertebrate Sampling									
Total Kick Distance (m)		10	8	10	11	24	17.5	15	10.5
# of Transects (if complete)		2	2.5	2.5	6	4	1	kicked in middle of creek	6
Dominant Taxa in Tissue Sample		Ephemeroptera Trichoptera	Trichoptera Ephemeroptera	Trichoptera Plecoptera	Trichoptera Tipulidae	Ephemeroptera Trichoptera Plecoptera	Ephemeroptera Chironomidae Plecoptera Trichoptera Hirudinea	Amphipoda Odonata	Plecoptera Chironomidae

[a] Channel measurements not recorded, as area sampled at a later date.

Table A.2: Habitat Information Associated with Lotic Mine-exposed Areas Sampled during the Benthic Invertebrate Survey, September 2015

Biological Area Code		**SWCK**	**THCK**	**WOCK**
Waterbody		Swift Creek	Thompson Creek	Wolfram Creek
Date Sampled		10-Sep-15	18-Sep-15	17-Sep-15
UTM (NAD83, 11U)	Easting	652062	648596	648277
	Northing	5558542	5550237	5552293
Samplers' Initials		KM, KH, LB	JW, MR, DB	LB, KH
Habitat Characteristics				
Surrounding Land Use		forest, mining	forest, logging, mining	forest, logging, mining, livestock
Length of Reach Assessed (m)		30	30	30
% Riffle		40	100	50
% Run		60	0	50
% Rapids		0	0	0
% Pool/Back Eddy		0	0	0
Streamside Vegetation (most dominant first)		coniferous trees	deciduous trees, coniferous trees, shrubs, fern/grass	ferns/grass, coniferous trees, deciduous trees, shrubs
% Bedrock		0	0	0
% Boulder		5	0	10
% Cobble		70	60	50
% Pebble		0	10	5
% Gravel		25	10	5
% Sand/Finer		0	20	30
% Organic		0	0	0
Canopy Coverage (%)		99	96	51 - 75
Macrophyte Coverage (%)		0	0	0
Periphyton Coverage		2	2	2
Algae Coverage Coverage/Thickness(mm)/Colour	Periphyton	3/<0.5/green	4/0.5-1/green, olive	2/<0.5/brown
	Filamentous Algae	4/0.5-1/green	0	1/<0.5/brown
	Slimes/Streamers	0	3/.0.5-1/green	0
	Macrophytes	0	0	0
	Moss	4	0	0
Bank Stability		stable, no erosion	moderate	moderate
Water Colour & Clarity		colourless / clear	colourless / clear	colourless, slightly turbid
Bankfull Width (m)		6.8	2.95	2
Wetted Width (m)		3.7	2	1.53
Bankfull-Wetted Depth (cm)		21	43	45
Gradient (%)		1.5	2.5	5
Mean Transect Depth (cm)		5.7	10.4	9.4
Mean Transect Velocity (m/s)		0.16	0.10	0.13
Comments/Notes		Scraped a layer of periphyton from bryophyte, removed bryophyte from area and rinsed scraped rock underneath for periphyton	No smell to faint organic, calcite very thin, no concretion, very little calcite especially compared to u/s on the North Thompson	-
Benthic Invertebrate Sampling				
Total Kick Distance (m)		8	16	3
# of Transects (if complete)		5	8	kicked straight up creek
Dominant Taxa in Tissue Sample		Ephemeroptera Chironomidae Plecoptera Trichoptera Hirudinea	Trichoptera Ephemeroptera Hirudinea Plecoptera	Plecoptera Hirudinea Chironomidae

Table A.3: Abbreviations and Data Sources for GIS-Derived Habitat Variables

Variable Abbreviation	Variable Description	Correlation with NMDS scores	Data Source
StrOrd	Stream order	y	http://www.geobase.ca/geobase/en/metadata.do?id=3A537B2D-7058-FCED-8D0B-76452EC9D01F
StaEle	Station elevation (m)	y	http://www.geobase.ca/geobase/en/metadata.do?id=3A537B2D-7058-FCED-8D0B-76452EC9D01F
SouEle	Source elevation (m)	y	http://www.geobase.ca/geobase/en/metadata.do?id=3A537B2D-7058-FCED-8D0B-76452EC9D01F
DiStSo	Distance to source (m)	y	https://apps.gov.bc.ca/pub/geometadata/metadataDetail.do?recordUID=3991&recordSet=ISO19115
StaGra	Station gradient (%) GIS	y	http://www.geobase.ca/geobase/en/metadata.do?id=3A537B2D-7058-FCED-8D0B-76452EC9D01F
WatPer	Watershed perimeter (m)	y	http://www.geobase.ca/geobase/en/metadata.do?id=3A537B2D-7058-FCED-8D0B-76452EC9D01F
WatAre	Watershed area (m^2)	y	http://www.geobase.ca/geobase/en/metadata.do?id=3A537B2D-7058-FCED-8D0B-76452EC9D01F
ArGT30	Area of catchment > 30% slope (m^2)	y	http://resources.arcgis.com/en/help/main/10.1/index.html#//009t00000056000000
PeGT30	Percentage of catchment > 30% slope (%)	y	http://resources.arcgis.com/en/help/main/10.1/index.html#//009t00000056000000
PeLT30	Percentage of catchment < 30% slope (%)	y	http://resources.arcgis.com/en/help/main/10.1/index.html#//009t00000056000000
UsGra	Average upstream gradient from station to source	y	http://www.geobase.ca/geobase/en/metadata.do?id=3A537B2D-7058-FCED-8D0B-76452EC9D01F
WaStLe	Watershed stream length (m)	y	file:///G:/Reference/BC_Data/NHN_Data/nhn_rhn_05ag000_1_1_fgdc_en.html
StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	y	file:///G:/Reference/BC_Data/NHN_Data/nhn_rhn_05ag000_1_1_fgdc_en.html
AnnCro	Annual Cropland (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
BroDen	Broadleaf Dense (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
BroOpe	Broadleaf Open (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
ConDen	Coniferous Dense (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
ConOpe	Coniferous Open (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
ConSpa	Coniferous Sparse (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
Devel	Developed (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
ExpLan	Exposed land (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
Grass	Grassland (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
Herb	Herb (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
MixDen	Mixedwood Dense (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
MixOpe	Mixedwood Open (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
PerCroPas	Perennial Cropland and Pasture (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
RocRubb	Rock/Rubble (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
ShrLow	Shrub low (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
ShrTal	Shrub tall (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
SnoIce	Snow/Ice (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
Water	Water (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
WetHer	Wetland - Herb (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
WetShr	Wetland - Shrub (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
WetTre	Wetland - Tree (%)	y	http://www.geobase.ca/geobase/en/data/landcover/csc2000v/description.html
HarAre	Area logged (Crown land, 1945-2012) (m^2)	y	ftp://ftp.for.gov.bc.ca/hts/external/!publish/consolidated_cutblocks/
HarPro	Percent of watershed logged (Crown land, 1945-2012)	y	ftp://ftp.for.gov.bc.ca/hts/external/!publish/consolidated_cutblocks/
ConSco	Calcite concretion score	y	Field measurement
CaPrSc	Calcite presence score	y	Field measurement
CalInd	Calcite index	y	Field measurement
IntAxi	Intermediate axis length - Wolman Mean (cm) (longest width of cobble perpendicular to the axis of longest length)	y	Field measurement
Embed	Embeddedness (10 value median measured as 0, 1/4, 1/2, 3/4, or full)	y	Field measurement
AFDM	Ash-free dry mass (g/m^2)	y	Field sample to ALS
Chloro	Chlorophyll-a (mg/m^2)	y	Field sample to ALS
AvChDe	Average transect depth (m)	y	Field measurement
AvChVe	Average transect velocity (m/s)	y	Field measurement
CanCov	Canopy Coverage (%)	y	Field measurement
MacCov	Macrophyte Coverage (% Class)	y	Field measurement
PerCov	Periphyton Coverage (% Class)	y	Field measurement
BanWid	Bankfull width (m)	y	Field measurement
WetWid	Wetted width (m)	y	Field measurement
BaWeDe	Bankfull-Wetted depth (cm) (Bankfull height of water level subtract height of current water level)	y	Field measurement
Grad	Station gradient (%) Clinometer	y	Field measurement
Temp	Temperature (°C)	y	Field measurement
DiOxCo	Dissolved Oxygen (mg/L)	y	Field measurement
DiOxPe	Dissolved Oxygen (%)	y	Field measurement
SpeCon	Specific Conductance (µS/cm)	y	Field measurement
pH	pH	y	Field measurement
PCA-1	Principal components analysis of water quality	y	Field water column sample to ALS

Table A.4: GIS-Derived Variables for Lotic Reference Areas

Analytes			Units	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK
				12-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	12-Sep-15	11-Sep-15	12-Sep-15
Field Name	Waterbody		Text	Andy Good Creek	Alexander Creek	Alexander Creek	Bull River	Bull River	Bull River	Cadorna Creek	Chauncey Creek	Cross River	Daisy Creek
	Variable Abbreviation	Variable Description	Text	Andy Good u/s CMO influence	Alexander u/s Michel Creek	N/A	N/A	Bull River 40 km Bridge	Bull River u/s Quinn	Cadorna Creek u/s Elk River	Chauncey Creek near mouth	Cross River u/s Kootenay River	Daisy Creek
	UTM (NAD83, 11U)	Easting	m	667,551	664,974	663,482	631,852	626,589	633,561	645,826	655,349	585,502	685,988
		Northing	m	5,488,669	5,509,024	5,502,718	5,505,579	5,499,846	5,519,210	5,589,227	5,552,776	5,614,058	5,523,955
	StrOrd	Stream order	Strahler Stream Order	4	4	5	5	7	4	5	4	6	4
	StaEle	Station elevation (m)	m	1,490	1,428	1,305	1,087	1,007	1,215	1,612	1,572	1,123	1,457
	SouEle	Source elevation (m)	m	2,187	2,175	2,310	2,671	2,202	2,202	2,420	2,185	2,480	2,144
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	22,111,518	65,470,107	108,052,133	467,551,274	805,029,669	255,860,897	84,931,422	22,584,085	401,370,507	23,686,079
	PeGT30	Percentage of catchment > 30% slope (%)	%	66.20	50.65	61.57	76.79	65.79	69.37	66.25	65.48	74.38	37.43
	PeLT30	Percentage of catchment < 30% slope (%)	%	33.80	49.35	38.43	23.21	34.21	30.63	33.75	34.52	25.62	62.57
	StaGra	Station gradient (%) GIS	%	2.50	1.35	2.04	0.20	0.64	0	1.67	6.67	0.40	3.05
	DiStSo	Distance to source (m)	m	9,500	19,900	32,001	66,460	69,100	44,600	20,780	8,500	42,700	17,700
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	2.22	1.72	1.71	2.50	2.30	2.61	2.64	2.90	3.10	1.39
	UsGra	Average upstream gradient from station to source	%	7.34	3.75	3.14	2.38	1.73	2.21	3.89	7.21	3.18	3.88
	WatAre	Watershed area (m^2)	m^2	33,401,210	129,264,287	175,482,059	608,853,118	1,223,595,317	368,853,829	128,191,889	34,491,856	539,604,269	63,287,757
	WatPer	Watershed perimeter (m)	m	28,656	55,897	75,974	154,591	231,224	119,727	55,200	25,946	127,020	39,002
	WaStLe	Watershed stream length (m)	m	74,194	222,896	300,472	1,521,070	2,813,594	963,037	338,586	100,157	1,672,031	87,673
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0	0	0	0	0	0	0	0	0	0.01
	BroDen	Broadleaf Dense	%	8.39	2.23	2.75	0	0	0	0.05	0.12	0.13	0.10
	BroOpe	Broadleaf Open	%	0	0.01	0.01	0.09	0.16	0.07	0.06	0	0.16	0
	ConDen	Coniferous Dense	%	29.00	45.92	47.35	0.55	0.54	0.54	15.98	32.24	9.80	71.13
	ConOpe	Coniferous Open	%	1.31	5.93	6.18	51.28	56.59	47.71	23.88	4.38	31.34	1.18
	ConSpa	Coniferous Sparse	%	0	0	0	0	0	0	0	0	0	0
	ExpLan	Exposed land	%	0	2.23	1.84	17.95	14.40	20.77	29.61	3.28	11.16	0
	Grass	Grassland	%	0.85	1.90	3.76	1.90	2.06	1.40	2.07	0.86	0.84	0.30
	Herb	Herb	%	1.45	5.76	5.21	8.80	7.86	10.22	9.67	7.07	3.59	3.72
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0	0	0	0	0	0	0	0	0	0
	RocRubb	Rock/Rubble	%	45.18	21.08	17.70	0.33	0.52	0.41	0.61	31.45	13.71	8.12
	ShrLow	Shrub low	%	0	0.11	0.08	2.62	3.80	1.44	1.33	0.73	2.01	0
	ShrTal	Shrub tall	%	12.22	9.75	10.82	0	0	0	0.22	5.74	3.39	15.40
	SnoIce	Snow/Ice	%	0	0	0	0.13	0.07	0.16	1.54	0	0.81	0
	Water	Water	%	0	0	0.01	0.12	0.13	0.11	0.80	0	0.34	0
	WetHer	Wetland - Herb	%	0	0	0	0.01	0.01	0.02	0.13	0	0.003	0
	WetShr	Wetland - Shrub	%	0	0	0	0	0.001	0	0.25	0	0	0
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	0	13,506,897	15,267,684	55,358,465	108,173,435	20,887,184	0	1,772,837	41,498,136	-
	HarPro	HARVEST_PERC	%	0	10.45	8.70	9.09	8.84	5.66	0	5.14	7.69	-

Table A.4: GIS-Derived Variables for Lotic Reference Areas

Analytes			Units	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FLRU	FO26	GRUHA	HENUP
				11-Sep-15	13-Sep-15	17-Sep-15	12-Sep-15	14-Sep-15	14-Sep-15	19-Sep-15	14-Sep-15	11-Sep-15	15-Sep-15
Field Name	Waterbody		Text	Dutch Creek	Elk River	Elk River	Ewin Creek	Flathead River	Flathead River	Flathead River	Fording River	Grave Creek	Henretta Creek
	Variable Abbreviation	Variable Description	Text	Dutch Creek	Elk River d/s Cadorna Creek	Elk River u/s Branch	Ewin Creek near mouth	N/A	N/A	N/A	Fording u/s Henretta (u/s all mines)	Grave Creek u/s Harmer	Henretta u/s all mine operations
	UTM (NAD83, 11U)	Easting	m	687,139	646,175	646,477	657,208	682,705	680,187	668,175	653,064	659,422	655,887
		Northing	m	5,531,110	5,589,009	5,557,523	5,547,645	5,443,985	5,453,294	5,470,823	5,569,601	5,523,781	5,567,716
	StrOrd	Stream order	Strahler Stream Order	4	6	6	4	6	6	6	4	3	3
	StaEle	Station elevation (m)	m	1,435	1,609	1,341	1,534	1,295	1,352	1,519	1,807	1,336	1,804
	SouEle	Source elevation (m)	m	2,138	2,545	2,545	2,094	1,992	1,992	1,992	2,388	2,131	2,479
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	48,608,883	163,854,516	428,944,370	53,716,182	327,280,410	247,095,775	60,034,470	16,221,255	12,721,462	15,061,957
	PeGT30	Percentage of catchment > 30% slope (%)	%	31.47	59.98	54.01	62.10	49.77	48.85	31.74	52.62	51.71	66.76
	PeLT30	Percentage of catchment < 30% slope (%)	%	68.53	40.02	45.99	37.90	50.23	51.15	68.26	47.38	48.29	33.24
	StaGra	Station gradient (%) GIS	%	1.28	0	0	2.66	0.41	0.41	0.86	0.79	4.94	1.27
	DiStSo	Distance to source (m)	m	29,900	28,800	63,200	10,100	68,105	55,437	25,499	8,600	8,400	11,300
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	1.09	2.65	2.45	2.37	2.38	2.32	2.15	2.10	1.63	1.73
	UsGra	Average upstream gradient from station to source	%	2.35	3.25	1.91	5.54	1.02	1.15	1.85	6.76	9.46	5.97
	WatAre	Watershed area (m^2)	m^2	154,460,682	273,191,442	794,191,935	86,497,617	657,520,337	505,795,257	189,147,582	30,830,077	24,602,239	22,561,742
	WatPer	Watershed perimeter (m)	m	67,945	79,031	168,653	40,698	164,731	132,498	65,073	24,062	23,814	21,011
	WaStLe	Watershed stream length (m)	m	167,859	724,478	1,948,272	205,131	1,561,671	1,175,034	406,572	64,859	40,205	38,934
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0	0	0	0	0	0	0	0	0	0
	BroDen	Broadleaf Dense	%	3.73	1.68	1.16	0.09	0.83	0.62	0	0.02	0	0
	BroOpe	Broadleaf Open	%	0	0.03	0.03	0	0.04	0.05	0.05	0	0	0
	ConDen	Coniferous Dense	%	60.61	29.26	17.02	35.70	15.99	14.84	1.10	37.03	17.52	11.32
	ConOpe	Coniferous Open	%	2.04	12.11	30.46	3.47	45.40	48.77	77.84	10.02	36.22	0.15
	ConSpa	Coniferous Sparse	%	0	0	0	0	0.04	0.01	0.02	0	0	0
	ExpLan	Exposed land	%	0.08	17.48	16.65	2.42	5.69	5.98	5.37	2.33	18.70	0
	Grass	Grassland	%	3.96	1.55	2.74	1.58	8.09	7.08	0	1.44	0.59	0.63
	Herb	Herb	%	1.20	5.84	7.62	2.55	9.56	8.99	10.17	2.04	2.11	1.82
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0	0	0	0	0	0	0	0	0	0
	RocRubb	Rock/Rubble	%	11.92	10.85	7.18	37.05	5.16	4.64	0	23.76	0	70.65
	ShrLow	Shrub low	%	0	0.64	1.25	0.31	1.67	1.84	2.89	0.45	0.28	0
	ShrTal	Shrub tall	%	14.67	5.48	3.74	5.21	1.73	1.65	0	5.55	0.04	10.85
	SnoIce	Snow/Ice	%	0	3.65	1.96	0	0	0	0	0	0	0
	Water	Water	%	0.01	1.01	0.73	0	0.05	0.05	0.07	0	0.27	0
	WetHer	Wetland - Herb	%	0	0.06	0.05	0	0.09	0.10	0.18	0	0	0
	WetShr	Wetland - Shrub	%	0	0.12	0.06	0	0.06	0.07	0.10	0	0	0
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	-	2,622,383	33,284,754	14,296,816	61,270,218	48,505,572	17,425,138	2,265,361	4,309,807	0
	HarPro	HARVEST_PERC	%	-	0.96	4.19	16.53	9.32	9.59	9.21	7.35	17.52	0

Table A.4: GIS-Derived Variables for Lotic Reference Areas

Analytes			Units	KO1	KODCR	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI
				13-Sep-15	12-Sep-15	12-Sep-15	10-Sep-15	19-Sep-15	18-Sep-15	11-Sep-15	11-Sep-15	10-Sep-15	12-Sep-15
Field Name	Waterbody		Text	Kootenay River	Kootenay River	Kootenay River	Kootenay River	Grace Creek	Line Creek	McCool Creek	Michel Creek	Oldman River	Oldman River
	Variable Abbreviation	Variable Description	Text	N/A	Kootenay River d/s Cross River	Kootenay River u/s Cross River	Kootenay River u/s Vermillion	N/A	Line Creek u/s LCO	N/A	Michel u/s CMO influence	Oldman d/s Dutch, u/s Racehorse	Oldman d/s Livingstone
	UTM (NAD83, 11U)	Easting	m	591,185	584,744	579,591	569,766	654,283	662,214	648,151	668,266	687,855	687,526
		Northing	m	5,561,577	5,607,649	5,616,187	5,630,957	5,540,738	5,538,393	5,499,951	5,482,795	5,530,302	5,532,685
	StrOrd	Stream order	Strahler Stream Order	7	7	6	5	4	3	4	4	6	6
	StaEle	Station elevation (m)	m	840.5	1,053	1,091	1,151	1,512	1,648	1,115	1,577	1,422	1,448
	SouEle	Source elevation (m)	m	2,252	2,344	2,344	2,344	2,421	2,019	2,315	1,848	2,200	2,200
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	3,663,969,868	1,447,793,635	1,008,872,077	220,007,027	15,130,356	18,111,980	16,787,215	3,976,311	282,498,484	231,820,770
	PeGT30	Percentage of catchment > 30% slope (%)	%	68.98	60.45	57.09	44.64	81.66	69.07	85.30	29.67	32.33	32.55
	PeLT30	Percentage of catchment < 30% slope (%)	%	31.02	39.55	42.91	55.36	18.34	30.93	14.70	70.33	67.67	67.45
	StaGra	Station gradient (%) GIS	%	0.40	1.88	0.44	4.64	13.33	2.23	5.52	2.32	0.58	1.21
	DiStSo	Distance to source (m)	m	181,296	85,400	73,500	52,400	5,574	6,100	8,215	4,300	47,700	45,200
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	2.62	2.68	2.57	2.54	1.56	2.40	2.34	2.05	1.19	1.21
	UsGra	Average upstream gradient from station to source	%	0.78	1.51	1.70	2.28	16.32	6.08	14.60	6.30	1.63	1.66
	WatAre	Watershed area (m^2)	m^2	5,311,878,002	2,395,039,468	1,767,195,901	492,819,712	18,528,035	26,221,000	19,681,225	13,400,142	873,918,726	712,124,434
	WatPer	Watershed perimeter (m)	m	541,873	325,256	309,943	121,201	18,670	22,949	21,061	17,962	157,647	140,079
	WaStLe	Watershed stream length (m)	m	13,893,818	6,426,928	4,543,582	1,251,868	28,886	63,058	46,152	27,462	1,043,255	864,956
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0.04	0.05	0.03	0	0	0.05	0	0	0	0
	BroDen	Broadleaf Dense	%	0.17	0.29	0.34	0.57	0	0	0	0.37	1.26	0.72
	BroOpe	Broadleaf Open	%	0.21	0.002	0.002	0.01	0.04	0	0.04	0	0	0
	ConDen	Coniferous Dense	%	7.02	12.10	13.30	7.30	1.61	37.33	0.29	47.19	67.89	69.49
	ConOpe	Coniferous Open	%	44.50	37.44	37.42	55.54	59.38	3.33	80.20	28.17	2.67	2.81
	ConSpa	Coniferous Sparse	%	0.43	0.96	1.30	3.69	0	0	0	0	0	0
	ExpLan	Exposed land	%	11.48	8.81	8.30	6.35	7.05	2.33	5.10	3.35	0.05	0.04
	Grass	Grassland	%	2.41	1.81	2.18	0.97	2.86	0.05	0.07	1.61	4.28	4.17
	Herb	Herb	%	4.09	2.36	2.00	0.59	6.53	2.02	6.42	3.62	1.97	2.10
	MixOpe	Mixedwood Open	%	0.56	1.27	1.72	5.84	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0.05	0	0	0	0	0	0	0	0	0
	RocRubb	Rock/Rubble	%	6.19	10.86	10.52	5.02	0	37.23	0	8.13	10.04	9.73
	ShrLow	Shrub low	%	2.23	2.39	2.54	6.09	2.03	0.47	1.36	0.49	0	0
	ShrTal	Shrub tall	%	1.23	2.00	1.68	0	0	5.08	0	1.23	10.79	10.04
	SnoIce	Snow/Ice	%	0.83	1.30	1.51	0.33	0	0	0	0	0	0
	Water	Water	%	0.44	0.41	0.42	0.29	0	0	0	0.24	0.01	0.01
	WetHer	Wetland - Herb	%	0.02	0.04	0.05	0.14	0	0	0	0	0	0
	WetShr	Wetland - Shrub	%	0.03	0.07	0.09	0.29	0	0	0	0	0.002	0.003
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	696,629,739	147,615,736	99,089,423	99,070,880	0	1,688,850	2,778,586	346,439	-	-
	HarPro	HARVEST_PERC	%	13.11	6.16	5.61	20.10	0	6.44	14.12	2.59	-	-

Table A.4: GIS-Derived Variables for Lotic Reference Areas

Analytes			Units	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU
				11-Sep-15	10-Sep-15	11-Sep-15	11-Sep-15	11-Sep-15	15-Sep-15	10-Sep-15	10-Sep-15	10-Sep-15	11-Sep-15
Field Name	Waterbody		Text	Oldman River	Palliser River	Palliser River	Racehorse Creek	South Line Creek	Vermillion River	Vermillion River	Vicary Creek	Wigwam River	Wigwam River
	Variable Abbreviation	Variable Description	Text	Oldman lower u/s reservoir	Palliser River d/s Albert	Palliser River u/s Kootenay, d/s Fenwick	Racehorse Creek	South Line Creek near mouth	Vermillion u/s Kootenay, d/s Simpson	Vermillion Upper, u/s Simpson	Vicary Creek	Lower Wigwam River	N/A
	UTM (NAD83, 11U)	Easting	m	710,028	601,173	595,626	687,621	661,122	569,465	561,227	682,461	646,099	648,769
		Northing	m	5,512,469	5,598,667	5,590,338	5,526,336	5,531,374	5,641,604	5,670,806	5,519,665	5,458,836	5,448,916
	StrOrd	Stream order	Strahler Stream Order	6	6	6	5	4	6	4	4	6	5
	StaEle	Station elevation (m)	m	1,186	1,088	942	1,413	1,478	1,202	1,463	1,553	926	1,121
	SouEle	Source elevation (m)	m	2,200	2,125	2,125	1,953	2,158	2,244	2,459	2,185	2,050	2,110
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	433,646,794	441,080,487	551,434,071	95,986,595	11,255,465	643,362,272	108,739,652	16,290,042	418,069,947	273,100,345
	PeGT30	Percentage of catchment > 30% slope (%)	%	23.62	69.67	65.95	31.92	46.94	65.24	72.35	29.78	60.13	65.54
	PeLT30	Percentage of catchment < 30% slope (%)	%	76.38	30.33	34.05	68.08	53.06	34.76	27.65	70.22	39.87	34.46
	StaGra	Station gradient (%) GIS	%	0	0.56	1.28	0.72	3.68	0.39	2.83	0.20	5.26	0.81
	DiStSo	Distance to source (m)	m	88,000	45,500	61,200	25,000	6,700	60,100	19,400	14,700	58,000	44,134
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	1.15	2.84	2.67	1.13	1.37	2.47	1.81	1.36	2.20	1.99
	UsGra	Average upstream gradient from station to source	%	1.15	2.28	1.93	2.16	10.15	1.73	5.13	4.30	1.94	2.24
	WatAre	Watershed area (m^2)	m^2	1,835,682,111	633,140,816	836,099,964	300,749,845	23,978,516	986,215,162	150,286,744	54,699,122	801,267,235	416,693,572
	WatPer	Watershed perimeter (m)	m	259,845	136,163	167,891	86,796	23,013	236,060	70,771	34,748	158,635	114,783
	WaStLe	Watershed stream length (m)	m	2,103,079	1,800,534	2,231,535	339,501	32,907	2,433,011	271,937	74,169	1,766,354	830,204
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0.30	0.03	0.08	0.001	0	0	0	0	0	0
	BroDen	Broadleaf Dense	%	3.41	1.21	0.91	1.64	0.35	0.06	0	0.24	0	0
	BroOpe	Broadleaf Open	%	0	0.07	0.11	0	0	0.27	0.15	0	0.14	0.01
	ConDen	Coniferous Dense	%	53.43	9.08	7.32	63.55	66.26	18.86	29.26	77.61	0.08	0.15
	ConOpe	Coniferous Open	%	1.77	32.48	40.98	1.50	3.91	20.80	0.52	1.01	64.00	68.45
	ConSpa	Coniferous Sparse	%	0	0	0	0	0	0.49	0.73	0	0.11	0.23
	ExpLan	Exposed land	%	0.04	15.50	13.41	0.06	0.61	10.08	4.59	0.14	14.69	15.18
	Grass	Grassland	%	16.24	1.64	1.57	3.45	0.16	3.40	6.65	1.30	1.23	1.93
	Herb	Herb	%	5.79	7.74	6.60	2.20	0.29	3.06	2.27	1.34	10.07	5.91
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0.16	0.20	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	1.57	0.20	0.24	0	0	0	0	0	0	0
	RocRubb	Rock/Rubble	%	6.45	9.02	7.02	9.51	18.54	14.59	30.26	8.40	0.04	0
	ShrLow	Shrub low	%	0	1.44	1.47	0	0.08	1.29	0.31	0	2.59	2.14
	ShrTal	Shrub tall	%	10.24	2.76	2.09	17.31	4.78	3.01	2.80	9.57	0	0
	SnoIce	Snow/Ice	%	0	1.60	1.21	0	0	2.54	9.30	0	0.002	0
	Water	Water	%	0.02	0.40	0.32	0.03	0	0.42	0	0	0.08	0.12
	WetHer	Wetland - Herb	%	0	0.004	0.003	0	0	0.01	0	0	0.01	0.01
	WetShr	Wetland - Shrub	%	0.001	0.01	0.01	0	0	0.02	0.06	0	0.01	0
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	-	59,732,420	110,388,119	-	8,360,419	18,542	18,542	-	59,741,236	14,845,456
	HarPro	HARVEST_PERC	%	-	9.43	13.20	-	34.87	0.002	0.01	-	7.46	3.56

Table A.5: GIS-Derived Variables for Lotic Mine-exposed Areas

Analytes			Units	BOCK	CATCK	CORCK	EL1	EL19	EL20	ELDEL	ELDFE	ELDGR	ELELKO
				14-Sep-15	11-Sep-15	11-Sep-15	16-Sep-15	17-Sep-15	17-Sep-15	17-Sep-15	16-Sep-15	17-Sep-15	14-Sep-15
Field Name	Waterbody		Text	Bodie Creek	Cataract Creek	Corbin Creek	Elk River	Elk River	Elk River	Elk River	Elk River	Elk River	Elk River
	Variable Abbreviation	Variable Description	Text	Bodie Creek d/s Bodie Pond	Cataract Creek near mouth	Corbin Creek near Mouth	Elk d/s Sparwood & Michel	Elk River d/s Fording, u/s Grave	Elk River d/s Thompson & GHO	Elk River d/s Elkford sewage ponds	Elk d/s Fernie	Elk River d/s Grave	Elk River u/s Elko
	UTM (NAD83, 11U)	Easting	m	655536	652429	668563	651655	653157	649186	649968	640103	653098	639419
		Northing	m	5509605	5557517	5487395	5508624	5525801	5548524	5540252	5479658	5521154	5463274
	StrOrd	Stream order	Strahler Stream Order	3	3	4	7	7	6	6	7	7	7
	StaEle	Station elevation (m)	m	1,155	1,618	1,518	1,104	1,196	1,282	1,241	974	1,161	924
	SouEle	Source elevation (m)	m	1,875	2,061	2,053	2,545	2,545	2,545	2,545	2,545	2,545	2,545
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	2,566,985	2,010,153	14,660,665	1,420,423,431	963,841,218	487,227,405	537,107,327	1,641,333,203	1,015,276,735	1,743,772,880
	PeGT30	Percentage of catchment > 30%	%	29.94	34.05	50.61	50.05	52.21	53.07	52.49	49.64	51.37	49.60
	PeLT30	Percentage of catchment < 30%	%	70.06	65.95	49.39	49.95	47.79	46.93	47.51	50.36	48.63	50.40
	StaGra	Station gradient (%) GIS	%	0.13	11.55	1.57	9.02	0.43	0.64	2.06	1.70	1.76	0.44
	DiStSo	Distance to source (m)	m	5,100	3,600	7,300	124,100	104,100	75,000	85,800	161,000	109,800	183,000
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	1.24	2.52	2.05	2.19	2.36	2.45	2.44	2.18	2.32	2.18
	UsGra	Average upstream gradient from station to source	%	14.12	12.31	7.33	1.16	1.30	1.68	1.52	0.98	1.26	0.89
	WatAre	Watershed area (m^2)	m^2	8,574,397	5,903,163	28,967,152	2,838,242,300	1,845,955,501	918,032,378	1,023,331,356	3,306,682,776	1,976,580,997	3,515,837,156
	WatPer	Watershed perimeter (m)	m	15,713	11,035	25,260	404,990	269,422	200,007	217,828	439,536	284,336	463,561
	WaStLe	Watershed stream length (m)	m	10,596	14,891	59,256	6,214,086	4,353,889	2,252,191	2,500,494	7,218,817	4,576,900	7,659,385
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0	0	0	0.14	0.09	0.01	0.05	0.17	0.13	0.16
	BroDen	Broadleaf Dense	%	0	0	0.23	0.81	0.53	1.00	0.90	0.70	0.49	0.66
	BroOpe	Broadleaf Open	%	0	0	0	0.02	0.02	0.03	0.03	0.05	0.02	0.08
	ConDen	Coniferous Dense	%	0	0	31.96	16.48	13.98	14.76	13.28	14.17	13.30	13.33
	ConOpe	Coniferous Open	%	2.89	2.96	2.15	35.84	34.34	33.94	35.68	39.28	35.71	40.48
	ConSpa	Coniferous Sparse	%	0	0	0	0.001	0	0	0	0.001	0	0.002
	ExpLan	Exposed land	%	34.97	39.78	0.44	11.64	14.04	16.36	16.66	11.10	13.80	10.92
	Grass	Grassland	%	1.98	0.70	1.93	2.79	2.68	2.85	2.79	2.56	2.59	2.41
	Herb	Herb	%	0.22	0.30	2.68	5.69	5.76	7.78	7.68	7.18	5.51	8.01
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0	0	0	0.74	0.37	0.03	0.16	0.95	0.57	0.89
	RocRubb	Rock/Rubble	%	0	0	28.59	7.89	8.88	6.21	5.61	6.78	8.29	6.38
	ShrLow	Shrub low	%	0	0	0	1.15	1.15	1.23	1.22	1.41	1.15	1.59
	ShrTal	Shrub tall	%	0	0	23.18	3.12	2.68	3.24	2.90	2.68	2.50	2.52
	SnoIce	Snow/Ice	%	0	0	0	0.57	0.85	1.70	1.52	0.49	0.79	0.46
	Water	Water	%	0	0	0	0.39	0.43	0.67	0.62	0.40	0.48	0.42
	WetHer	Wetland - Herb	%	0	0	0	0.03	0.04	0.06	0.05	0.04	0.04	0.05
	WetShr	Wetland - Shrub	%	0	0	0	0.02	0.03	0.06	0.06	0.03	0.03	0.03
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	0	0	505,775	184,829,545	132,973,548	47,350,779	58,679,380	202,699,814	145,345,672	212,127,734
	HarPro	HARVEST_PERC	%	0	0	1.75	6.51	7.20	5.16	5.73	6.13	7.35	6.03

Table A.5: GIS-Derived Variables for Lotic Mine-exposed Areas

Analytes			Units	ELH93	ELUEL	ELUFE	ELUFO	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9
				16-Sep-15	13-Sep-15	15-Sep-15	14-Sep-15	15-Sep-15	17-Sep-15	12-Sep-15	16-Sep-15	13-Sep-15	18-Sep-15
Field Name	Waterbody		Text	Elk River	Elk River	Elk River u/s of Fernie	Elk River	Elk River	Fording River	Fording River	Fording River	Fording River	Fording River
	Variable Abbreviation	Variable Description	Text	Elk River u/s Hwy 93 Bridge	Elk River u/s Elkford	Elk u/s Fernie	Elk River just u/s Fording	Elk d/s Otto, u/s Sparwood & Michel	N/A	Fording u/s Chauncey Creek	Fording d/s Line Creek	Fording d/s Dry, u/s GHO & Hwy Bridge	Fording d/s Josephine falls, u/s Grace & Line
	UTM (NAD83, 11U)	Easting	m	633954	649097	644755	652130	652337	654245	654794	652965	655522	652235
		Northing	m	5449117	5544766	5490993	5528839	5512688	5555299	5553614	5528974	5543915	5540141
	StrOrd	Stream order	Strahler Stream Order	7	6	7	6	7	6	5	6	5	5
	StaEle	Station elevation (m)	m	757	1,264	1,024	1,213	1,126	1,564	1,556	1,225	1,507	1,362
	SouEle	Source elevation (m)	m	2,545	2,545	2,545	2,545	2,545	2,741	2,388	2,388	2,388	2,388
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	2,207,701,442	488,236,210	1,516,699,704	643,899,745	1,123,371,395	120,178,048	89,106,286	319,875,126	197,283,101	208,037,284
	PeGT30	Percentage of catchment > 30%	%	49.89	52.26	50.10	53.03	51.88	59.66	41.92	51.51	50.27	48.62
	PeLT30	Percentage of catchment < 30%	%	50.11	47.74	49.90	46.97	48.12	40.34	58.08	48.49	49.73	51.38
	StaGra	Station gradient (%) GIS	%	0.20	0.34	0.06	0.27	1.24	0.42	0.24	1.03	0.54	0.08
	DiStSo	Distance to source (m)	m	204,000	79,900	145,500	100,500	119,100	30,651	30,100	67,700	42,800	53,400
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	2.17	2.44	2.20	2.45	2.28	2.01	2.06	2.20	2.31	2.28
	UsGra	Average upstream gradient from station to source	%	0.88	1.60	1.05	1.33	1.19	3.84	2.76	1.72	2.06	1.92
	WatAre	Watershed area (m^2)	m^2	4,424,933,956	934,217,937	3,027,611,459	1,214,148,937	2,165,220,877	201,437,191	212,539,036	620,955,450	392,431,954	427,916,952
	WatPer	Watershed perimeter (m)	m	608,759	206,841	397,530	251,390	292,939	68,420	75,735	148,301	116,700	126,925
	WaStLe	Watershed stream length (m)	m	9,615,193	2,276,275	6,657,090	2,974,574	4,928,254	404,017	438,753	1,367,927	907,179	975,893
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0.13	0.02	0.17	0.09	0.15	0	0	0.01	0	0
	BroDen	Broadleaf Dense	%	0.53	0.99	0.76	0.76	0.45	0.004	0.004	0.09	0.03	0.03
	BroOpe	Broadleaf Open	%	0.09	0.03	0.02	0.03	0.02	0	0	0.01	0.003	0.01
	ConDen	Coniferous Dense	%	10.87	14.51	15.47	11.25	12.18	17.52	16.65	19.55	20.16	18.54
	ConOpe	Coniferous Open	%	44.61	34.72	37.73	39.11	37.34	19.06	20.47	24.82	21.93	24.75
	ConSpa	Coniferous Sparse	%	0.03	0	0.001	0	0	0	0	0	0	0
	ExpLan	Exposed land	%	11.99	16.12	11.22	16.15	13.95	11.15	11.05	9.87	7.72	8.13
	Grass	Grassland	%	2.17	2.82	2.68	2.96	2.54	2.27	2.18	2.11	2.13	2.29
	Herb	Herb	%	8.29	7.77	5.93	7.38	5.71	1.18	1.52	2.65	2.74	3.05
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0.73	0.10	0.88	0.40	0.89	0	0	0.05	0	0
	RocRubb	Rock/Rubble	%	5.20	6.10	7.39	4.76	7.59	19.33	18.66	17.09	21.04	19.29
	ShrLow	Shrub low	%	1.76	1.26	1.22	1.25	1.17	0.60	0.58	0.94	0.61	0.77
	ShrTal	Shrub tall	%	2.05	3.18	2.93	2.45	2.29	3.28	3.11	3.19	3.34	3.06
	SnoIce	Snow/Ice	%	0.37	1.67	0.53	1.29	0.74	0	0	0	0	0
	Water	Water	%	0.37	0.66	0.41	0.57	0.49	0.28	0.28	0.15	0.16	0.20
	WetHer	Wetland - Herb	%	0.04	0.06	0.03	0.05	0.04	0.04	0.05	0.02	0.03	0.04
	WetShr	Wetland - Shrub	%	0.03	0.06	0.03	0.05	0.03	0.004	0.004	0.003	0.004	0.004
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	278,666,510	47,665,223	200,444,379	79,035,123	165,424,973	15,635,719	11,005,144	53,680,368	30,992,295	30,992,295
	HarPro	HARVEST_PERC	%	6.30	5.10	6.62	6.51	7.64	7.76	5.18	8.64	7.90	7.24

Table A.5: GIS-Derived Variables for Lotic Mine-exposed Areas

Analytes			Units	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODNGD	FODPO	FOUEW	FOUKI	FRUL
				17-Sep-15	16-Sep-15	17-Sep-15	16-Sep-15	14-Sep-15	14-Sep-15	15-Sep-15	13-Sep-15	16-Sep-15	17-Sep-15
Field Name	Waterbody		Text	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River
	Variable Abbreviation	Variable Description	Text	Fording between Cataract & Porter	Fording between Kilmarnock & Swift	Fording d/s Swift, u/s Cataract	Fording River d/s GHO	Fording d/s Henretta	North Greenhills Diversion	Fording d/s Porter, u/s Chauncey	Fording d/s Chauncey, u/s Ewin	Fording u/s Kilmarnock Creek	Fording d/s Grace, u/s Line
	UTM (NAD83, 11U)	Easting	m	652864	652065	652342	652941	651295	650883	653901	656362	651838	654524
		Northing	m	5557150	5558691	5558207	5545649	5565429	5563190	5555074	5551883	5559855	5530128
	StrOrd	Stream order	Strahler Stream Order	5	5	5	5	5	3	5	5	5	5
	StaEle	Station elevation (m)	m	1,579	1,595	1,588	1,489	1,692	1,662	1,563	1,546	1,603	1,242
	SouEle	Source elevation (m)	m	2,388	2,388	2,388	2,388	2,388	2,087	2,388	2,388	2,388	2,388
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	80,670,618	76,656,024	77,984,008	204,777,259	46,670,427	1,934,304	85,965,915	114,752,841	51,316,692	236,836,447
	PeGT30	Percentage of catchment > 30%	%	41.95	43.25	42.37	49.13	52.19	14.37	42.03	44.81	40.12	49.51
	PeLT30	Percentage of catchment < 30%	%	58.05	56.75	57.63	50.87	47.81	85.63	57.97	55.19	59.88	50.49
	StaGra	Station gradient (%) GIS	%	1.06	0.77	0.87	2.61	0.34	1.61	1.67	0.56	2.02	1.15
	DiStSo	Distance to source (m)	m	24,700	22,600	23,300	46,500	13,500	4,900	27,400	33,300	21,300	65,500
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	1.95	1.95	1.94	2.30	1.89	1.88	2.01	2.21	1.82	2.30
	UsGra	Average upstream gradient from station to source	%	3.28	3.51	3.43	1.93	5.16	8.67	3.01	2.53	3.69	1.75
	WatAre	Watershed area (m^2)	m^2	192,316,113	177,253,712	184,039,491	416,843,597	89,421,928	13,456,633	204,538,069	256,111,358	127,895,044	478,364,494
	WatPer	Watershed perimeter (m)	m	72,376	66,206	68,777	116,865	44,270	18,693	74,222	77,440	62,157	135,307
	WaStLe	Watershed stream length (m)	m	375,350	344,833	356,576	959,169	168,767	25,354	410,176	565,846	232,243	1,099,958
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0	0	0	0	0	0	0	0	0	0.02
	BroDen	Broadleaf Dense	%	0.004	0.004	0.004	0.03	0.01	0	0.004	0.02	0.01	0.03
	BroOpe	Broadleaf Open	%	0	0	0	0.01	0	0	0	0	0	0.01
	ConDen	Coniferous Dense	%	18.30	19.82	19.12	19.00	26.66	0	17.25	18.26	18.65	16.62
	ConOpe	Coniferous Open	%	16.51	15.11	16.52	23.45	8.74	66.71	18.70	20.18	18.24	27.98
	ConSpa	Coniferous Sparse	%	0	0	0	0	0	0	0	0	0	0
	ExpLan	Exposed land	%	11.51	10.27	10.57	8.26	4.71	7.84	11.30	9.72	8.34	8.79
	Grass	Grassland	%	2.07	1.76	1.86	2.29	0.66	4.11	2.26	2.03	1.73	2.42
	Herb	Herb	%	1.04	1.08	1.08	3.07	1.50	1.42	1.15	2.29	1.28	2.96
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0	0	0	0	0	0	0	0	0	0
	RocRubb	Rock/Rubble	%	20.63	22.38	21.55	19.81	32.16	0	19.39	19.72	22.49	17.26
	ShrLow	Shrub low	%	0.58	0.58	0.56	0.75	0.33	0.22	0.59	0.61	0.43	0.97
	ShrTal	Shrub tall	%	3.44	3.73	3.60	3.14	5.13	0	3.24	3.36	3.58	2.74
	SnoIce	Snow/Ice	%	0	0	0	0	0	0	0	0	0	0
	Water	Water	%	0.30	0.32	0.31	0.20	0	0.10	0.28	0.23	0.35	0.19
	WetHer	Wetland - Herb	%	0.04	0.05	0.04	0.03	0	0.61	0.04	0.05	0.06	0.03
	WetShr	Wetland - Shrub	%	0.004	0.005	0.004	0.004	0	0.06	0.004	0.01	0.01	0.003
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	10,357,290	10,126,821	10,323,250	30,992,295	2,701,243	1,692,726	11,005,144	13,833,198	6,489,987	30,992,295
	HarPro	HARVEST_PERC	%	5.39	5.71	5.61	7.43	3.02	12.58	5.38	5.40	5.07	6.48

Table A.5: GIS-Derived Variables for Lotic Mine-exposed Areas

Analytes			Units	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1
				15-Sep-15	15-Sep-15	15-Sep-15	15-Sep-15	17-Sep-15	12-Sep-15	10-Sep-15	11-Sep-15	16-Sep-15	17-Sep-15	13-Sep-15
Field Name	Waterbody		Text	Fording River	Fording river	Greenhills Creek	Greenhills Creek	Grave Creek	Grave Creek	Harmer Creek	Harmer Creek	Henretta Creek	Killmarnock Creek	Dry Creek
	Variable Abbreviation	Variable Description	Text	Fording u/s NGD	Fording u/s Shandley Creek	Greenhills Creek d/s of settling pond	Greenhills Creek u/s of pond	Grave Creek d/s Harmer	Grave Creek near mouth at Elk	Harmer d/s Pond near mouth at Grave	Harmer Creek u/s Harmer Pond	Henretta u/s confluence with Fording	Kilmarnock u/s road crossing near mouth	Dry Creek
	UTM (NAD83, 11U)	Easting	m	651021	650863	653536	653911	656412	653936	656962	658180	652236	652704	656454
		Northing	m	5563445	5560970	5545715	5546497	5522315	5523373	5522160	5520996	5566412	5559764	5544727
	StrOrd	Stream order	Strahler Stream Order	5	5	3	3	4	5	4	4	4	4	4
	StaEle	Station elevation (m)	m	1,665	1,628	1,494	1,523	1,293	1,200	1,315	1,357	1,714	1,625	1,528
	SouEle	Source elevation (m)	m	2,388	2,388	2,188	2,188	1,569	1,569	1,569	1,569	2,479	2,154	2,103
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	48,890,190	51,270,251	3,986,021	3,868,151	31,509,293	38,376,412	18,301,531	15,704,410	26,991,886	24,287,621	17,107,150
	PeGT30	Percentage of catchment > 30%	%	47.51	41.05	25.29	25.21	46.12	46.17	44.05	41.69	55.53	56.49	64.58
	PeLT30	Percentage of catchment < 30%	%	52.49	58.95	74.71	74.79	53.88	53.83	55.95	58.31	44.47	43.51	35.42
	StaGra	Station gradient (%) GIS	%	3.14	1.24	2.45	32.04	4.35	2.97	5.57	1.14	1.31	1.65	4.70
	DiStSo	Distance to source (m)	m	16,100	19,300	8,200	7,600	8,900	11,800	8,000	6,300	7,300	8,600	8,500
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	1.87	1.84	2.09	2.01	1.77	1.89	1.87	1.80	1.77	2.23	2.77
	UsGra	Average upstream gradient from station to source	%	4.49	3.94	8.46	8.75	3.10	3.13	3.18	3.37	10.48	6.15	6.76
	WatAre	Watershed area (m^2)	m^2	102,903,533	124,886,101	15,760,079	15,342,489	68,319,852	83,111,490	41,550,668	37,672,866	48,603,876	42,998,267	26,491,163
	WatPer	Watershed perimeter (m)	m	50,229	61,278	19,961	18,947	42,675	50,181	28,570	26,952	34,745	28,755	22,226
	WaStLe	Watershed stream length (m)	m	192,271	229,331	33,014	30,876	121,141	157,299	77,625	67,812	85,861	95,707	73,444
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0.01	0.01	0	0	0	0	0	0	0	0	0
	BroDen	Broadleaf Dense	%	0	0	0.05	0.05	0.02	0.02	0.03	0.03	0	0	0
	BroOpe	Broadleaf Open	%	0	0	0	0	0	0	0	0	0	0	0.03
	ConDen	Coniferous Dense	%	23.19	19.10	0	0	6.74	5.59	0.51	0.55	25.51	26.24	1.46
	ConOpe	Coniferous Open	%	12.32	18.67	31.72	32.00	46.84	49.04	52.04	50.87	1.25	6.50	59.95
	ConSpa	Coniferous Sparse	%	0	0	0	0	0	0	0	0	0	0	0
	ExpLan	Exposed land	%	6.25	7.96	24.10	24.42	15.49	14.50	14.38	15.35	4.34	12.68	7.71
	Grass	Grassland	%	1.04	1.76	6.00	5.87	0.48	0.54	0.24	0	0.30	0.74	3.48
	Herb	Herb	%	1.38	1.31	11.97	12.30	1.07	0.94	0.51	0.57	1.09	0.60	7.33
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0	0	0	0	0	0	0	0	0	0	0
	RocRubb	Rock/Rubble	%	27.95	23.03	0	0	0	0	0	0	44.10	25.37	0
	ShrLow	Shrub low	%	0.45	0.44	3.43	3.47	0.20	0.31	0.17	0.18	0.22	0.95	1.54
	ShrTal	Shrub tall	%	4.45	3.67	0	0	0.01	0.01	0	0	5.91	4.73	0
	SnoIce	Snow/Ice	%	0	0	0	0	0	0	0	0	0	0	0
	Water	Water	%	0.07	0.11	1.13	0.87	0.16	1.66	0.10	0.07	0	0.18	0
	WetHer	Wetland - Herb	%	0	0.07	0	0	0	0	0	0	0	0	0
	WetShr	Wetland - Shrub	%	0	0.01	0	0	0	0	0	0	0	0	0
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	4,017,229	6,489,987	0	0	4,309,807	4,309,807	0	0	0	3,636,833	1,033,742
	HarPro	HARVEST_PERC	%	3.90	5.20	0	0	6.31	5.19	0	0	0	8.46	3.90

Table A.5: GIS-Derived Variables for Lotic Mine-exposed Areas

Analytes			Units	LC_DCDS	LC_FRUS	LI8	LIDSL	LILC3	MI2	MI3	MI5	MIDAG	MIDCO
				13-Sep-15	13-Sep-15	14-Sep-15	14-Sep-15	14-Sep-15	10-Sep-15	14-Sep-15	13-Sep-15	12-Sep-15	11-Sep-15
Field Name	Waterbody		Text	Dry Creek	Fording River	Line Creek	Line Creek	Line Creek	Michel Creek	Michel Creek	Michel Creek	Michel Creek	Michel Creek
	Variable Abbreviation	Variable Description	Text	Dry Creek	Fording u/s Dry Creek	Line Creek d/s LCO	Upper Line Creek, d/s South Line	Line Creek Upstream of Active Water Treatment Facility	Michel Creek d/s EVO	Michel u/s Erickson Creek	Michel d/s CMO	Michel d/s Andy Good	Michel d/s Corbin, u/s Andy Good
	UTM (NAD83, 11U)	Easting	m	657719	656307	655424	659293	659931	653672	660077	659497	665212	667757
		Northing	m	5542179	5545255	5528983	5530590	5531848	5511222	5504881	5496573	5489264	5487611
	StrOrd	Stream order	Strahler Stream Order	4	5	5	5	4	6	6	6	5	5
	StaEle	Station elevation (m)	m	1,635	1,516	1,284	1,417	1,434	1,132	1,217	1,318	1,458	1,495
	SouEle	Source elevation (m)	m	2,100	2,388	2,019	2,019	2,019	1,848	1,848	1,848	1,848	1,848
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	7,086,872	178,877,442	82,972,008	67,108,772	45,120,906	289,627,569	250,315,880	132,248,179	57,967,997	29,020,012
	PeGT30	Percentage of catchment > 30%	%	81.07	49.45	60.26	60.54	65.91	44.54	43.94	44.03	51.07	43.95
	PeLT30	Percentage of catchment < 30%	%	18.93	50.55	39.74	39.46	34.09	55.46	56.06	55.97	48.93	56.05
	StaGra	Station gradient (%) GIS	%	3.51	0	6.96	3.28	2.19	1.63	1.07	1.44	3.71	1.50
	DiStSo	Distance to source (m)	m	5,564	40,800	18,600	13,200	12,600	44,300	34,600	25,000	13,200	9,700
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	5.38	2.29	1.88	1.92	2.29	1.92	1.93	2.13	2.21	2.25
	UsGra	Average upstream gradient from station to source	%	8.35	2.14	3.95	4.56	4.64	1.62	1.82	2.12	2.95	3.64
	WatAre	Watershed area (m^2)	m^2	8,741,252	361,757,449	137,697,673	110,846,825	68,454,705	650,319,004	569,684,364	300,371,538	113,516,592	66,022,351
	WatPer	Watershed perimeter (m)	m	13,698	104,751	62,483	59,171	42,585	169,354	167,594	95,951	52,124	36,787
	WaStLe	Watershed stream length (m)	m	47,007	826,647	259,466	212,540	156,596	1,249,143	1,097,378	640,525	250,962	148,296
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0	0	0.30	0.37	0.04	0	0	0	0	0
	BroDen	Broadleaf Dense	%	0	0.03	0	0	0	2.05	2.34	1.80	3.22	0.19
	BroOpe	Broadleaf Open	%	0	0.002	0	0	0	0.02	0.03	0.05	0.02	0.02
	ConDen	Coniferous Dense	%	0.34	21.76	30.43	36.77	24.99	31.34	34.75	27.43	35.56	35.44
	ConOpe	Coniferous Open	%	65.86	18.46	13.17	6.66	8.78	29.86	27.71	36.36	9.82	14.67
	ConSpa	Coniferous Sparse	%	0	0	0	0	0	0.004	0.005	0.01	0.01	0.02
	ExpLan	Exposed land	%	18.57	7.72	13.10	10.97	0.65	4.17	2.61	3.42	3.93	6.11
	Grass	Grassland	%	0.31	1.98	1.06	0.82	2.44	3.69	3.35	2.45	1.83	2.13
	Herb	Herb	%	1.21	2.40	1.64	1.85	0	5.61	5.81	6.45	5.73	6.98
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0	0	0	0	0	0	0	0	0	0
	RocRubb	Rock/Rubble	%	0	22.82	17.11	21.24	0	9.15	10.27	8.94	22.84	14.44
	ShrLow	Shrub low	%	0.94	0.54	0.83	0.83	1.20	1.06	1.05	1.65	0.98	1.26
	ShrTal	Shrub tall	%	0	3.62	4.86	6.04	4.75	6.01	6.81	5.50	11.43	11.86
	SnoIce	Snow/Ice	%	0	0	0	0	0	0	0	0	0	0
	Water	Water	%	0	0.18	0.03	0.02	0	0.06	0.06	0.11	0.26	0.44
	WetHer	Wetland - Herb	%	0	0.04	0	0	0	0.01	0.01	0.02	0.04	0.08
	WetShr	Wetland - Shrub	%	0	0.004	0	0	0	0	0	0	0	0
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	1,911,038	29,958,553	22,688,073	19,002,021	4,794,601	18,692,457	18,609,641	1,817,715	1,616,776	1,616,776
	HarPro	HARVEST_PERC	%	21.86	8.28	16.48	17.14	7.00	2.87	3.27	0.61	1.42	2.45

Table A.5: GIS-Derived Variables for Lotic Mine-exposed Areas

Analytes			Units	MIUCO	MP1	NGD1	OCNM	POCK	SWCK	THCK	WOCK
				10-Sep-15	15-Sep-15	8-Oct-15	15-Sep-15	14-Sep-15	10-Sep-15	18-Sep-15	17-Sep-15
Field Name	Waterbody		Text	Michel Creek	Fording River	Greenhills Creek	Otto Creek	Porter Creek	Swift Creek	Thompson Creek	Wolfram Creek
	Variable Abbreviation	Variable Description	Text	Michel u/s Corbin Creek	Fording Multiplate d/s Eagle Ponds	North Greenhills Diversion	Otto Creek near mouth	Porter Creek near mouth	Swift Creek near mouth	Thompson d/s pond	Wolfram d/s pond
	UTM (NAD83, 11U)	Easting	m	668203	651133	650820	652337	653558	652062	648596	648277
		Northing	m	5486653	5562401	5563294	5512615	5555328	5558542	5550237	5552293
	StrOrd	Stream order	Strahler Stream Order	4	5	3	1	3	3	3	3
	StaEle	Station elevation (m)	m	1,511	1,649	1,664	1,127	1,566	1,602	1,301	1,310
	SouEle	Source elevation (m)	m	1,848	2,388	2,218	1,668	2,123	2,012	2,091	1,976
	ArGT30	Area of catchment > 30% slope (m^2)	m^2	13,864,435	50,824,494	3,998,790	786,900	718,520	1,327,984	2,154,132	1,167,655
	PeGT30	Percentage of catchment > 30%	%	39.21	43.24	31.37	33.15	23.59	21.25	21.24	28.41
	PeLT30	Percentage of catchment < 30%	%	60.79	56.76	68.63	66.85	76.41	78.75	78.76	71.59
	StaGra	Station gradient (%) GIS	%	1.39	0.90	4.33	1.24	13.21	6.45	9.08	9.09
	DiStSo	Distance to source (m)	m	8,500	17,500	4,897	3,100	2,900	3,700	5,800	3,500
	StDen	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	km^{-1}	2.43	1.87	1.85	1.54	1.80	1.76	1.89	3.20
	UsGra	Average upstream gradient from station to source	%	3.96	4.22	11.32	17.45	19.21	11.08	13.62	19.03
	WatAre	Watershed area (m^2)	m^2	35,356,870	117,536,353	12,747,350	2,373,903	3,045,599	6,248,704	10,141,156	4,110,181
	WatPer	Watershed perimeter (m)	m	30,560	59,179	16,562	8,324	8,417	11,871	15,535	9,934
	WaStLe	Watershed stream length (m)	m	85,989	219,930	23,607	3,645	5,470	10,974	19,124	13,136
Land Cover Classification 2000	AnnCro	Annual Cropland	%	0	0	0	1.63	0	0	0	0
	BroDen	Broadleaf Dense	%	0.14	0.01	0	0	0	0	0	0
	BroOpe	Broadleaf Open	%	0.03	0	0	0	0	0	0.17	0
	ConDen	Coniferous Dense	%	37.53	20.30	0	0	0	0.72	0	0.34
	ConOpe	Coniferous Open	%	25.52	18.56	65.66	57.72	13.27	53.73	49.20	56.52
	ConSpa	Coniferous Sparse	%	0.01	0	0	0	0	0	0	0
	ExpLan	Exposed land	%	10.76	6.57	8.35	9.52	23.48	17.95	13.39	7.59
	Grass	Grassland	%	2.21	1.38	4.35	1.84	1.44	2.66	7.25	3.97
	Herb	Herb	%	10.48	1.37	1.49	0.28	0	1.07	13.20	23.41
	MixOpe	Mixedwood Open	%	0	0	0	0	0	0	0	0
	PerCroPas	Perennial Cropland and Pasture	%	0	0	0	2.01	0	0	0.16	0.16
	RocRubb	Rock/Rubble	%	3.25	24.47	0	0	0	0	0	0
	ShrLow	Shrub low	%	2.34	0.43	0.20	0.004	0	0.13	4.43	3.58
	ShrTal	Shrub tall	%	2.27	3.90	0	0	0	0	0	0
	SnoIce	Snow/Ice	%	0	0	0	0	0	0	0	0
	Water	Water	%	0.83	0.10	0.11	3.76	0	0	0	0
	WetHer	Wetland - Herb	%	0.14	0.07	0.36	0	0	0	0	0
	WetShr	Wetland - Shrub	%	0	0.01	0	0	0	0	0	0
Logging (1945-2012)	HarAre	HARVEST_m^2	m^2	1,111,002	5,709,693	4,767,672	0	0	196,428	0	0
	HarPro	HARVEST_PERC	%	3.14	4.86	37.40	0	0	3.14	0	0

Table A.6: Mean Pebble Measurements for Lotic Areas Sampled, September 2015

Exposure Type	Stream Name	Area Description	Biological Area Code	UTM (NAD83, 11U)		Sample Date	Intermediate Axis (cm)		Embededness (%)	
				Easting	Northing		Mean	SD	Mean	SD
Reference	Andy Good Creek	Andy Good u/s CMO influence	AGCK	667551	5488669	12-Sep-15	8.8	7.3	38	21
	Alexander Creek	Upper Alexander Creek	AL4	664974	5509024	13-Sep-15	9.0	5.1	40	17
		Alexander Creek upstream of Michel	ALUSM	663482	5502718	13-Sep-15	9.6	5.8	35	27
	Bull River	Bull River	BU2	631852	5505579	13-Sep-15	14.9	10.5	5	11
		Bull River 40 km Bridge	BU40	626589	5499846	13-Sep-15	11.8	5.0	18	26
		Bull River u/s Quinn	BUUQ	633561	5519210	13-Sep-15	13.0	12.5	18	24
	Cadorna Creek	Cadorna Creek u/s Elk River	CADCK	645826	5589227	13-Sep-15	10.3	5.6	23	18
	Chauncey Creek	Chauncey Creek near mouth	CHCK	655349	5552776	12-Sep-15	7.2	3.7	40	27
	Cross River	Cross River u/s Kootenay River	CRUKO	585502	5614058	11-Sep-15	8.0	3.3	33	17
	Daisy Creek	Daisy Creek	DACK	685988	5523955	12-Sep-15	11.9	7.9	15	17
	Dutch Creek	Dutch Creek	DUCK	687139	5531110	11-Sep-15	14.0	8.7	23	22
	Elk River	Elk River d/s of Cadorna	EL12	646175	5589009	13-Sep-15	9.5	6.3	15	13
		Elk River u/s Branch	ELUGH	646497	5557523	17-Sep-15	6.5	2.5	20	26
	Ewin Creek	Ewin Creek near mouth	EWCK	657208	5547645	12-Sep-15	10.5	5.1	13	18
	Flathead River	Flathead River Downstream	FLAD	682705	5443985	14-Sep-15	9.6	6.0	45	26
		Flathead River Upstream	FLAU	680187	5453294	14-Sep-15	7.6	3.8	48	14
		Upper Flathead River	FLRU	668175	5470823	19-Sep-15	10.6	3.8	15	13
	Fording River	Fording u/s Henretta (u/s all mines)	FO26	653064	5569601	14-Sep-15	6.4	3.6	18	12
	Grave Creek	Grave Creek u/s Harmer	GRUHA	659422	5523781	11-Sep-15	9.5	5.0	28	18
	Henretta Creek	Henretta u/s all mine operations	HENUP	655887	5567716	15-Sep-15	8.7	3.9	10	13
	Kootenay River	Kootenay River	KO1	591185	5561577	13-Sep-15	9.4	5.9	65	17
		Kootenay River d/s Cross River	KODCR	584744	5607649	12-Sep-15	8.4	2.8	48	22
		Kootenay River u/s Cross River	KOUCR	579591	5616187	12-Sep-15	8.5	4.3	35	17
		Kootenay River u/s Vermillion	KOUVE	569766	5630957	10-Sep-15	8.3	4.4	53	18
	Grace Creek	Grace Creek	LC_GRCK	654283	5540738	18-Sep-15	8.7	4.4	28	25
	Line Creek	Line Creek Reference	LI24	662214	5538393	10-Sep-15	11.5	8.3	35	13
	McCool Creek	McCool Creek	MCCR	648151	5499951	11-Sep-15	12.2	8.9	43	24
	Michel Creek	Michel u/s CMO influence	MI25	668266	5482795	10-Sep-15	8.5	7.1	38	27
	Oldman River	Oldman d/s Dutch, u/s Racehorse	OLDDU	687855	5530302	12-Sep-15	14.8	9.3	25	24
		Oldman d/s Livingstone	OLDLI	687526	5532685	11-Sep-15	11.4	6.7	5	11
		Oldman lower u/s reservoir	OLDLOW	710028	5512469	10-Sep-15	13.9	7.5	8	17
	Palliser River	Palliser River d/s Albert	PADAL	601173	5598667	11-Sep-15	13.0	6.2	48	18
		Palliser River u/s Kootenay, d/s Fenwick	PAUKO	595626	5590338	11-Sep-15	7.0	3.2	48	14
	Racehorse Creek	Racehorse Creek	RACK	687621	5526336	11-Sep-15	12.7	7.4	8	12
	South Line Creek	South Line Creek Reference	SLINE	661122	5531374	15-Sep-15	13.7	8.3	40	27
	Vermillion River	Vermillion u/s Kootenay, d/s Simpson	VEUKO	569465	5641604	10-Sep-15	7.7	3.0	53	18
		Vermillion Upper, u/s Simpson	VEUP	561227	5670806	10-Sep-15	13.1	6.8	48	25
	Vicary Creek	Vicary Creek	VICK	682461	5519665	10-Sep-15	13.8	7.2	10	13
	Wigwam River	Lower Wigwam River	WWRL	646099	5458836	11-Sep-15	7.5	4.9	25	17
		Upper Wigwam River	WWRU	648769	5448916	19-Sep-15	12.8	7.9	20	16
Mine-exposed	Bodie Creek	Bodie Creek d/s Bodie Pond	BOCK	655536	5509605	14-Sep-15	4.2	1.9	30	20
	Cataract Creek	Cataract Creek near mouth	CATCK	652429	5557517	11-Sep-15	-	-	-	-
	Corbin Creek	Corbin Creek near Mouth	CORCK	668563	5487395	11-Sep-15	6.7	4.8	45	28
	Elk River	Elk d/s Sparwood & Michel	EL1	651655	5508624	16-Sep-15	10.2	5.1	33	17
		Elk River d/s Fording, u/s Grave	EL19	653157	5525801	17-Sep-15	17.8	8.8	30	11
		Elk River d/s Thompson & GHO	EL20	649186	5548524	17-Sep-15	11.6	3.3	28	8
		Elk River d/s Elkford sewage ponds	ELDEL	649968	5540252	17-Sep-15	5.1	1.7	20	23
		Elk River d/s Fernie	ELDFE	640103	5479658	16-Sep-15	12.1	7.6	40	13
		Elk River d/s Grave	ELDGR	653098	5521154	17-Sep-15	11.3	6.2	35	13
		Elk River u/s Elko	ELELKO	639419	5463274	14-Sep-15	6.6	3.3	28	14
		Elk River u/s Hwy 93 Bridge	ELH93	633954	5449117	16-Sep-15	10.9	4.6	33	12
		Elk River u/s Elkford	ELUEL	649097	5544766	13-Sep-15	6.9	3.3	33	22
		Elk River u/s Fernie	ELUFE	644755	5490993	15-Sep-15	11.6	8.4	38	13
		Elk River just u/s Fording	ELUFO	652130	5528839	14-Sep-15	13.8	5.2	25	24
		Elk d/s Otto, u/s Sparwood & Michel	ELUSP	652337	5512688	15-Sep-15	9.8	4.5	48	18
	Fording River	Fording Side Channel (old Fording oxbow)	FO10-SP1	654245	5555299	17-Sep-15	3.5	1.1	50	17
		Fording u/s Chauncey Creek	FO22	654794	5553614	17-Sep-15	3.1	1.2	10	13
		Fording River Downstream of Line Creek	FO23	652965	5528974	16-Sep-15	12.0	8.2	33	21
		Fording d/s Dry, u/s GHO & Hwy Bridge	FO29	655522	5543915	12-Sep-15	13.3	7.9	25	22
		Fording d/s Josephine falls, u/s Grace & Line	FO9	652235	5540141	18-Sep-15	9.0	5.9	43	21
		Fording between Cataract & Porter	FOBCP	652864	5557150	17-Sep-15	10.3	4.4	38	18
		Fording between Kilmarnock & Swift	FOBKS	652065	5558691	16-Sep-15	10.6	4.9	18	12
		Fording d/s Swift, u/s Cataract	FOBSC	652342	5558207	17-Sep-15	11.3	6.0	20	11
		Fording River d/s GHO	FODGH	652941	5545649	16-Sep-15	10.3	3.0	0	0
		Fording d/s Henretta	FODHE	651295	5565429	14-Sep-15	8.2	4.3	25	17
		Fording d/s North Greenhills Diverson	FODNGD	650883	5563190	14-Sep-15	6.4	4.7	28	18
		Fording d/s Porter, u/s Chauncey	FODPO	653901	5555074	15-Sep-15	4.4	1.5	25	20
		Fording d/s Chauncey, u/s Ewin	FOUEW	656362	5551883	13-Sep-15	9.9	3.8	36	22
		Fording u/s Kilmarnock Creek	FOUKI	651838	5559855	16-Sep-15	7.9	4.0	20	16
		Fording River Upstream of Line Creek	FRUL	654524	5530128	17-Sep-15	12.5	8.4	38	13
		Fording u/s North Greenhills Diversion	FOUNGD	651021	5563445	15-Sep-15	7.7	3.8	20	11
		Fording u/s Shandley Creek	FOUSH	650863	5560970	15-Sep-15	8.4	3.4	25	12
	Greenhills Creek	Greenhills Creek d/s of settling pond	GHCKD	653534	5545741	15-Sep-15	8.8	3.8	38	13
		Greenhills Creek u/s settling pond	GHCKU	653911	5546497	15-Sep-15	6.3	3.3	30	20
	Grave Creek	Grave Creek d/s Harmer	GRCK	656412	5522315	17-Sep-15	12.3	10.4	40	17
		Grave Creek near mouth at Elk	GRDS	653936	5523373	12-Sep-15	10.6	6.6	18	17
	Harmer Creek	Harmer d/s Pond near mouth at Grave	HACKDS	656962	5522160	10-Sep-15	11.0	6.0	20	16
		Harmer Creek u/s Harmer Pond	HACKUS	658180	5520996	11-Sep-15	7.2	4.0	28	18
	Henretta Creek	Henretta u/s confluence with Fording	HENFO	652236	5566412	16-Sep-15	7.7	4.0	19	27
	Kilmarnock Creek	Kilmarnock u/s road crossing	KICK	652704	5559764	17-Sep-15	8.6	3.8	14	13
	Line Creek	Dry Creek near mouth	LC_DC1	656520	5544658.4	13-Sep-15	9.5	4.0	10	17
		d/s sedimentation ponds	LC_DCDS	657766	5542073	16-Sep-15	9.5	5.1	40	24
		Fording River u/s Dry Creek	LC_FRUS	656318	5545243.1	13-Sep-15	13.8	8.2	13	18
		Line Creek Downstream of Canyon	LI8	655424	5528983	13-Sep-15	9.5	5.2	28	25
		Line Creek Downstream of South Line Creek and Contingency Ponds	LIDSL	659293	5530590	12-Sep-15	14.5	9.4	38	18
		Line Creek Upstream of Active Water Treatment Facility	LILC3	659931	5531848	14-Sep-15	11.7	7.2	23	14
	Michel Creek	Michel Creek d/s EVO	MI2	653672	5511222	10-Sep-15	9.2	4.6	18	24
		Michel u/s Erickson Creek	MI3	660077	5504881	14-Sep-15	9.5	7.2	33	12
		Michel d/s CMO	MI5	659497	5496573	13-Sep-15	11.7	7.2	23	18
		Michel d/s Andy Good	MIDAG	665212	5489264	12-Sep-15	8.0	4.1	28	22
		Michel d/s Corbin, u/s Andy Good	MIDCO	667757	5487611	11-Sep-15	9.2	5.1	40	24
		Michel u/s Corbin Creek	MIUCO	668203	5486653	10-Sep-15	8.1	6.0	30	20
	North Greenhills Diversion	Fording Multiplate d/s Eagle Ponds	MP1	651133	5562401	15-Sep-15	12.3	13.8	18	12
		North Greenhills Diversion	NGD1	650820	5563294	08-Oct-15	9.1	4.9	18	12
	Otto Creek	Otto Creek near mouth	OCNM	652337	5512615	15-Sep-15	6.1	4.2	30	20
	Porter Creek	Porter Creek	POCK	653558	5555328	14-Sep-15	5.7	4.1	28	28
	Swift Creek	Swift Creek	SWCK	652062	5558542	10-Sep-15	8.1	4.7	35	24
	Thompson Creek	Thompson Creek	THCK	648596	5550237	18-Sep-15	7.5	3.5	25	20
	Wolfram Creek	Wolfram Creek	WOCK	648277	5552293	17-Sep-15	8.6	5.1	28	32

HABITAT INFORMATION

Lentic Areas

Table A.7: Habitat of Sediment Sampling Locations

Exposure Type		Reference					Mine-exposed								
Biological Area Code		EL14	LML	FO10	REFF	LCHO	HE27	FOXL	FMUCK	FWDEC	R5-1	R5-3	ERORP	EROU	ELKO
Area Description		Elk Lakes	Lake Mountain Lake	Fording River Oxbow	Unnamed Wetland hear Elk River North of Elkford	Leach Creek Oxbow	Henretta Lake	Lower Fording River Oxbow	Meadow Area Upstream Chauncy Creek	Fording River Wetland Downstream Ewin Creek	Off-Channel Area of Fording River Downstream Greenhills	Lentic Area off Fording River Downstream Josephine Falls	Elk River Oxbow/Wetland near Round Prairie	Upper Elk River Oxbow	Elko Reservoir
Date Sampled		13-Aug-15	6-Aug-15	8-Aug-15	15-Aug-15	11-Aug-15	7-Aug-15	9-Aug-15	8-Aug-15	9-Aug-15	14-Aug-15	9-Aug-15	-	10-Aug-15	7-Aug-15
UTM (NAD83, 11U)	Easting	635326	650106	654203	645869	658746	652573	654878	654771	656896	653010	652358	-	652364	637800
	Northing	5601876	5565031	5555233	5556297	5489172	5566275	5554437	5553328	5547095	5545714	5539932	-	5529872	5461540
Sampler' Initials		MW, DB	JW, JI	MW, DB	MW, DB	CR, AN	JW, JI	MW, DB	JW, JI	JW, JI	MW, DB	JW, JI	-	CR, AN	MW, DB
In Situ Water Quality (August)	Temperature (°C)	14	17	7.1	20	11	9.4	11	9.1	7.0	15	11	-	20	14
	Specific Conductance (µS/cm)	153	222	994	359	206	492	454	990	339	1,293	648	-	261	439
	DO (mg/L)	8.4	9.0	8.8	7.8	5.2	8.8	3.3	11	10	6.7	11	-	9.6	8.9
	DO (% Sat)	82	74	72	86	47	76	31	97	68	67	93	-	99	87
	pH	8.0	8.6	7.9	8.2	7.3	8.0	7.7	8.1	7.8	8.7	7.7	-	9.2	8.3
Sediment Sample Water Depth (m)		1.25 - 2.0	0.5 - 0.8	0.25	1.25 - 1.5	0.15 - 0.7	0.6 - 1.1	0.25	0.4 - 0.6	0.2 - 0.3	0.25	0.3 - 0.5	-	0.1 - 0.3	1.0 - 2.0
Comments		-	Lots of chara, sediment had red hues with dark brown to light brown layers.	-	-	Lots of chara, sediment black to dark brown underneath. Beaver dam present.	Substrate predominantly silt/clay with very little organic matter. Slight chemical odor detected.	-	Sediment predominantly silt/clay, with some sandy areas. WCT observed.	Some groundwater inflow. Sediment soft, predominantly silt/clay with some decaying vegetation and algal growth.	Oil sheen	Sediment predominantly soft with sandy/gritty particles present. Redox layer darker to lighter brown. Banks contained eroding rusty-red areas. WCT observed.	-	Very fine sediment along the ban, lots of aquatic vegetation, very muddy (dark brown sediment). GBH observed.	-

Table A.8: Habitat of Longnose Sucker Sampling Locations

		Exposure Type	Reference		Mine-exposed								
		Biological Area Code	FLA1	UNWNMO	ERUP	ELWDGC	GO13	OTTO	MIWW	MIC2	MI16	STPD	EROL
		Area Description	Flathead Side Channel	Unnamed Wetland Near Morrissey	Elk River Upper Ponds	Elk River Wetland Downstream of Grave Creek	Goddard Marsh	Otto Ponds	Lower Michel Wetland	Michel Oxbow #2	Michel Creek Wetland	Stanford Pond	Elk River Lower Oxbow
		Date Sampled	9-Aug-15	-	11-Aug-15	13-Aug-15	12-Aug-15	4-Aug-15	6-Aug-15	06-07/08/2015	7-Aug-15	6-Aug-15	5-Aug-15
UTM (NAD83, 11U)		Easting	681815	-	651742	653175	652955	652537	659707	659533	665083	639864	640877
		Northing	5443615	-	5530538	5521300	5514065	5512801	5498474	5496626	5489403	5483139	5477999
		Sampler' Initials	CR, AN (sed)	-	CR, AN (sed)	CR, AN	MW, DB (sed)	MW, DB (sed)	AN, CR (sed)	AN, CR (sed)	AN, CR (sed)	MW, DB (sed)	CR, AN, MW, DB, JW, JI
In Situ Water Quality (August)		Temperature (°C)	14	-	19	12	15	18	11	14	12	17	14
		Specific Conductance (µS/cm)	327	-	279	519	973	667	425	418	447	322	397
		DO (mg/L)	7.3	-	9.8	7.4	8.6	7.3	6.8	17	11	11	8.9
		DO (% Sat)	72	-	106	72	86	67	62	55	109	112	88
		pH	8.1	-	9.0	7.6	8.1	7.9	7.9	8.5	8.5	7.9	8.6
In Situ Water Quality (May)		Temperature (°C)	6.2	-	-[a]	-[a]	-[a]	-[a]	3.7	4.0	7.1	-[a]	9.2
		Specific Conductance	362	-	-[a]	-[a]	-[a]	-[a]	436	251	322	-[a]	478
		Dissolved Oxygen (%)	75	-	-[a]	-[a]	-[a]	-[a]	76	79	92	-[a]	86
		Dissolved Oxygen (mg/L)	9.2	-	-[a]	-[a]	-[a]	-[a]	10	10	11	-[a]	10
		pH	7.8	-	-[a]	-[a]	-[a]	-[a]	7.7	8.1	8.1	-[a]	7.6
In Situ Water Quality (September)		Temperature (°C)	-[b]	-[b]	9.2	-[b]	9.3	10	-[b]	-[b]	-[b]	12	-[b]
		Specific Conductance	-[b]	-[b]	422	-[b]	939	647	-[b]	-[b]	-[b]	319	-[b]
		Dissolved Oxygen (%)	-[b]	-[b]	74	-[b]	71	79	-[b]	-[b]	-[b]	78	-[b]
		Dissolved Oxygen (mg/L)	-[b]	-[b]	8.5	-[b]	8.1	8.8	-[b]	-[b]	-[b]	8.3	-[b]
		pH	-[b]	-[b]	7.9	-[b]	8.1	8.1	-[b]	-[b]	-[b]	7.4	-[b]
Waterbody Measurements		Approximate Area (m^2)	3,340	7,323	6,141	1,015	6,225	6,560	2,307	2,730	4,780	3,187	7,116
		Approximate Perimeter (m)	810	670	70	260	1060	780	420	480	420	280	780
		Average Depth (m)	0.8	0.5	1.0	0.8	1.0	2.0	0.4	0.6	0.8	2.0	1.0
		Sediment Sample Water Depth (m)	0.2 - 0.7	-	0.1 - 0.75	0.1 - 0.5	0.5	1.5 - 2.0	0.1 - 0.25	0.2	1.5	0.5	0.1 - 0.5
		Dominant Substrate	sand	predominantly fines, some gravel patches	fines	fines	clay	fines	predominantly fines, some cobble patches	hard packed fines	fines	fines	fines
		Aquatic Vegetation	thick carpet of mossy vegetation	grasses, thick patches of chara	thick carpet of chara, cattails, horsetails grasses and sedges	thick carpet of chara, cattails	cattails	patches of pondweed, cattails along E shore of upper pond	thick floating filamentous algae, thick carpet of mossy vegetation	patches of grasses	thick carpet of mossy vegetation, grasses and dead bushes	thick carpet of mossy vegetation	thick carpet of mossy vegetation, grasses and sedges, cattails
		Riparian Vegetation	grasses and sedges, conifers	conifers, shrubs, grasses	grasses, conifers	grasses, conifers	conifers, grasses and sedges, shrubs, cattails	grasses and sedges, shrubs	grasses and sedges	grasses and sedges, shrubs	grasses and sedges, shrubs	grasses, deciduous trees	grasses and sedges
		Other Habitat Features	upwelling through sand in a deep pool. lots of woody debris, particularly at the SW end of the pond.	woody debris and thick bryophytes	woody debris throughout the pond.	beaver damn along South shore.	small sections of woody debris found in main pond.	active beaver lodge on SW shore of upper pond.	woody debris at the N end of the wetland. one deep pool (~1 m).	sections of woody debris	small patch of woody debris	boulder riprap along sections of shoreline, deep pool	boulder riprap along west bank. deep pool (>2 m). woody debris along E shoreline.
		Comments	Upstream of a beaver dam, very muddy with some woody debris, very fine detritus and a slight odor	-	Cobble/gravel substrate with fines (black to dark brown to grey) over top. Lots of vegetation and goose scat. Cows nearby. Small trout (7 cm) observed.	Lots of chara present. Sediment black below the surface.	-	-	Cobble substrate covered with fines, detritus, organics with thick vegetation.	Located upstream of a beaver dam. Sediment depth shallow at some areas, and very hard below sediment.	Sediment very black below top 2 cm, lots of vegetation and a slight odor. Juvenile trout observed.	Thick chara covered the entire pond substrate.	Lots of vegetation

[a] Records Lost
[b] Was not re-visited

Table A.9: Pearson Correlations Between Environmental Variables and Principal Components from a PCA of Select Environmental Variable Data (Log-Transformed) Collected During Biological Sampling at 36 Reference and 54 Mine-exposed Areas, September 2015, Elk Valley

Variable		Transformation	PC1		PC2	
			r-value	P-value	r-value	P-value
GIS	Stream order	log	0.887	<0.001	-0.013	0.907
	Station elevation	log	-0.557	<0.001	0.002	0.987
	Source elevation	log	0.519	<0.001	-0.197	0.063
	Area of catchment > 30% slope	log	0.986	<0.001	-0.070	0.512
	Percentage of catchment > 30% slope	log	0.377	<0.001	-0.852	<0.001
	Percentage of catchment < 30% slope	log	-0.176	0.096	0.924	<0.001
	Station gradient	log(x+0.01)	-0.490	<0.001	-0.175	0.100
	Distance to source	log	0.969	<0.001	0.083	0.438
	Stream density of watershed	log	0.173	0.103	-0.682	<0.001
	Average upstream gradient from station to source	log	-0.925	<0.001	-0.200	0.058
	Watershed area	log	0.986	<0.001	0.085	0.424
	Watershed perimeter	log	0.981	<0.001	0.095	0.373
	Watershed stream length	log	0.987	<0.001	-0.006	0.953
Field	Intermediate axis length - Wolman Mean	log	0.316	0.002	-0.080	0.452
	Embeddedness	log(x+0.01)	-0.056	0.597	-0.161	0.130
	Canopy Coverage	log(x+0.1)	-0.469	<0.001	-0.152	0.154
	Periphyton Coverage	log	0.013	0.901	0.030	0.782
	Bankfull Width	log	0.894	<0.001	0.111	0.299
	Wetted Width	log	0.940	<0.001	0.068	0.524
	Bankfull-Wetted Depth	log(x+0.1)	0.321	0.002	-0.030	0.781
	Gradient	log	-0.561	<0.001	-0.234	0.026
	Mean Transect Velocity	log	0.681	<0.001	-0.113	0.290

r > 0.6 or r < -0.6
P-value < 0.05

Table A.10: Principal Components Analysis of Select Environmental Variable Data (Log-Transformed) Collected During Biological Sampling at 36 Reference and 54 Mine-exposed Areas, September 2015, Elk Valley

Type	Eigenvalue	PC1	PC2	PC3
		10.38	2.32	1.54
	% Variance explained	47.2%	10.6%	7.0%
	Monte Carlo P-value	0.0001	0.0001	0.9909
Reference	AGCK	-1.417	-1.484	0.076
	AL4	-0.893	-0.030	0.226
	ALUSM	0.224	-0.883	-0.317
	BU2	3.005	-2.525	0.307
	BU40	3.693	-0.779	-2.314
	BUUQ	2.177	-1.451	-0.835
	CADCK	0.216	-2.000	0.834
	CHCK	-2.289	-2.215	0.457
	DACK	-1.845	1.511	0.707
	DUCK	-0.541	2.630	-0.476
	EL12	1.692	-1.028	0.090
	ELUGH	2.787	-0.414	0.305
	EWCK	-1.410	-1.487	1.661
	FLAD	2.409	0.149	0.648
	FLAU	0.873	0.384	-0.301
	FLRU	0.100	1.568	0.580
	FO26	-2.085	-0.510	1.391
	GRUHA	-3.283	-0.434	-0.046
	HENUP	-2.246	-1.386	1.440
	KOUCR	4.033	-0.636	-1.645
	KOUVE	1.392	-0.116	-0.634
	LC_GRCK	-4.158	-3.478	0.121
	LI24	-2.958	-2.240	0.113
	MCCR	-2.565	-4.519	-0.707
	MI25	-4.592	1.052	0.191
	OLDDU	2.583	2.769	-0.811
	OLDLI	1.525	2.516	0.856
	OLDLOW	3.894	4.150	0.461
	PADAL	2.997	-2.117	-1.800
	PAUKO	3.120	-1.578	-2.295
	RACK	0.541	2.912	0.337
	VEUKO	2.928	-1.118	-2.096
	VEUP	-0.330	-2.083	-1.366
	VICK	-2.012	2.153	0.939
	WWRL	3.293	-0.429	-1.133
	WWRU	1.766	-1.048	-0.282
Mine-exposed	BOCK	-4.726	2.570	-5.004
	CORCK	-3.333	-0.270	0.161
	EL19	4.707	-0.170	0.758
	EL1	4.941	0.435	-0.146
	EL20	3.342	-0.257	-0.429
	ELDEL	3.494	-0.053	-0.274
	ELDFE	5.713	0.607	-0.108
	ELDGR	4.664	-0.067	-0.002
	ELELKO	5.104	0.467	-0.662
	ELH93	6.46	0.858	-1.921
	ELUEL	3.628	-0.145	0.501
	ELUFE	6.128	0.863	-1.352
	ELUSP	4.406	0.065	-0.235
	FO10-SP1	-0.301	-0.716	0.366
	FO22	0.831	1.322	0.725
	FO23	2.929	0.019	-0.236
	FO29	1.877	0.046	0.711
	FO9	2.500	0.345	0.495
	FOBCP	0.208	0.290	1.070
	FOBKS	-0.034	0.422	0.946
	FOBSC	0.286	0.511	0.965
	FODGH	1.752	0.514	4.697
	FODHE	-0.401	0.089	0.532
	FODPO	0.070	0.590	1.082
	FOUEW	0.642	0.020	0.942
	FOUKI	-0.246	0.827	0.793
	FRUL	2.047	-0.398	0.400
	FOUNGD	-0.959	-0.076	0.973
	FOUSH	-0.413	0.709	0.613
	GHCKD	-4.888	1.347	-0.173
	GHCKU	-4.757	0.960	0.444
	GRCK	-1.742	0.483	-0.478
	GRDS	-1.503	0.366	-0.395
	HACKDS	-2.718	0.303	0.329
	HACKUS	-2.870	0.828	-0.569
	HENFO	-1.767	-0.526	0.968
	KICK	-2.011	-0.779	0.318
	LC_DC1	-2.825	-1.965	1.155
	LC_DCDS	-3.689	-5.023	-0.404
	LC_FRUS	2.166	0.402	0.945
	LIDSL	-0.506	-1.064	0.129
	LILC3	-0.686	-1.486	0.313
	MI2	2.422	1.058	-0.260
	MI5	1.091	0.707	-0.423
	MIDAG	-0.555	-0.126	-0.161
	MIDCO	-1.584	0.363	0.139
	MIUCO	-2.739	0.041	0.304
	MP1	-0.281	0.427	1.015
	FODNGD	-4.218	2.842	0.614
	OCNM	-9.003	1.366	-5.342
	POCK	-7.166	1.135	0.901
	SWCK	-5.728	1.918	-0.093
	THCK	-5.795	1.595	-0.270
	WOCK	-6.595	-0.398	-0.047

Table A.11: Environmental Variables Used in Principal Components Analysis of Habitat Characteristics for Lotic Biological Sampling Areas, September 2015, Elk Valley

	Variable	Units	Transformation	Reference											
				AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	DACK	DUCK	EL12	ELUGH
GIS	Stream order	Strahler Stream Order	log	4	4	5	5	7	4	5	4	4	4	6	6
GIS	Station elevation	m	log	1,490	1,428	1,305	1,087	1,007	1,215	1,612	1,572	1,457	1,435	1,609	1,341
GIS	Source elevation	m	log	2,187	2,175	2,310	2,671	2,202	2,202	2,420	2,185	2,144	2,138	2,545	2,545
GIS	Area of catchment > 30% slope	m^2	log	22,111,518	65,470,107	108,052,133	467,551,274	805,029,669	255,860,897	84,931,422	22,584,085	23,686,079	48,608,883	163,854,516	428,944,370
GIS	Percentage of catchment > 30% slope	%	log	66.20	50.65	61.57	76.79	65.79	69	66.25	65.48	37.43	31.47	60	54
GIS	Percentage of catchment < 30% slope	%	log	34	49	38	23	34	31	34	35	63	69	40	46
GIS	Station gradient	%	log(x+0.01)	2	1	2	0	1	0	2	7	3	1	0	0
GIS	Distance to source	m	log	9,500	19,900	32,001	66,460	69,100	44,600	20,780	8,500	17,700	29,900	28,800	63,200
GIS	Stream density of watershed	km^{-1}	log	2.22	1.72	1.71	2.50	2.30	2.61	2.64	2.90	1.39	1.09	2.65	2.45
GIS	Average upstream gradient from station to source	%	log	7.34	3.75	3.14	2.38	1.73	2.21	3.89	7.21	3.88	2.35	3.25	1.91
GIS	Watershed area	m^2	log	33,401,210	129,264,287	175,482,059	608,853,118	1,223,595,317	368,853,829	128,191,889	34,491,856	63,287,757	154,460,682	273,191,442	794,191,935
GIS	Watershed perimeter	m	log	28,656	55,897	75,974	154,591	231,224	119,727	55,200	25,946	39,002	67,945	79,031	168,653
GIS	Watershed stream length	m	log	74,194	222,896	300,472	1,521,070	2,813,594	963,037	338,586	100,157	87,673	167,859	724,478	1,948,272
Field	Intermediate axis length - Wolman Mean	cm	log	8.78	9.02	9.57	14.88	11.78	12.98	10.26	7.20	11.90	14.01	9.47	6.53
Field	Embeddedness	%	log(x+0.01)	37.50	40.00	35.00	5.00	17.50	17.50	22.50	40.00	15.00	22.50	15.00	20.00
Field	Canopy Coverage	%	log(x+0.1)	0	17.7	17.7	9.5	0	0	20.75	0	28	0	14	76-100
Field	Periphyton Coverage	%	log	3	3	2	2	2	2	2	3	3	2	2	2
Field	Bankfull Width	m	log	13.7	11	13.85	28	39	20	15	8	9	14.7	44	20
Field	Wetted Width	m	log	10.5	10.3	9.85	20	34	17	13.4	4.4	7	12.4	24	18
Field	Bankfull-Wetted Depth	cm	log(x+0.1)	28	22	26	40	1	30	70	40	30	15	4.5	70
Field	Gradient	%	log	1	2	2	2	1	2	0.50 - 2	2	1	2	1.5 - 2.0	1.5
Field	Mean Transect Velocity	m/s	log	0.41	0.40	0.56	0.66	0.45	0.50	0.54	0.30	0.24	0.28	0.59	0.79

Note: if data were reported as a range, then the average of the range was used in the PCA.

Table A.11: Environmental Variables Used in Principal Components Analysis of Habitat Characteristics for Lotic Biological Sampling Areas, September 2015, Elk Valley

	Variable	Units	Transformation	Reference											
				EWCK	FLAD	FLAU	FLRU	FO26	GRUHA	HENUP	KOUCR	KOUVE	LC_GRCK	LI24	MCCR
GIS	Stream order	Strahler Stream Order	log	4	6	6	6	4	3	3	6	5	4	3	4
GIS	Station elevation	m	log	1,534	1,295	1,352	1,519	1,807	1,336	1,804	1,091	1,151	1,512	1,648	1,115
GIS	Source elevation	m	log	2,094	1,992	1,992	1,992	2,388	2,131	2,479	2,344	2,344	2,421	2,019	2,315
GIS	Area of catchment > 30% slope	m^2	log	53,716,182	327,280,410	247,095,775	60,034,470	16,221,255	12,721,462	15,061,957	1,008,872,077	220,007,027	15,130,356	18,111,980	16,787,215
GIS	Percentage of catchment > 30% slope	%	log	62.10	49.77	48.85	31.74	52.62	51.71	66.76	57.09	44.64	81.66	69.07	85.30
GIS	Percentage of catchment < 30% slope	%	log	38	50	51	68	47	48	33	43	55	18	31	15
GIS	Station gradient	%	log(x+0.01)	3	0	0	1	1	5	1	0	5	13	2	6
GIS	Distance to source	m	log	10,100	68,105	55,437	25,499	8,600	8,400	11,300	73,500	52,400	5,574	6,100	8,215
GIS	Stream density of watershed	km^{-1}	log	2.37	2.38	2.32	2.15	2.10	1.63	1.73	2.57	2.54	1.56	2.40	2.34
GIS	Average upstream gradient from station to source	%	log	5.54	1.02	1.15	1.85	6.76	9.46	5.97	1.70	2.28	16.32	6.08	14.60
GIS	Watershed area	m^2	log	86,497,617	657,520,337	505,795,257	189,147,582	30,830,077	24,602,239	22,561,742	1,767,195,901	492,819,712	18,528,035	26,221,000	19,681,225
GIS	Watershed perimeter	m	log	40,698	164,731	132,498	65,073	24,062	23,814	21,011	309,943	121,201	18,670	22,949	21,061
GIS	Watershed stream length	m	log	205,131	1,561,671	1,175,034	406,572	64,859	40,205	38,934	4,543,582	1,251,868	28,886	63,058	46,152
Field	Intermediate axis length - Wolman Mean	cm	log	10.46	9.65	7.59	10.65	6.41	9.49	8.70	8.52	8.31	8.66	11.53	12.23
Field	Embeddedness	%	log(x+0.01)	12.50	45.00	47.50	15.00	17.50	27.50	10.00	35.00	52.50	27.50	35.00	42.50
Field	Canopy Coverage	%	log(x+0.1)	5	6.75	5	19	12.2	90.5	0.5	8.5	21.5	97.8	1 - 25	58.5
Field	Periphyton Coverage	%	log	4	4	3	2	2/3	2	2	1	2	2	2	2
Field	Bankfull Width	m	log	7.6	30	9.12	22	38	8.6	21	46	20.51	1.98	8.8	5.6
Field	Wetted Width	m	log	7	20.92	5.73	13	5.83	6.5	5.2	55	13.45	1.75	4.8	4.1
Field	Bankfull-Wetted Depth	cm	log(x+0.1)	58	70	61	87	53	60	91.5	100	63	24	50	40
Field	Gradient	%	log	2	1.5	1	1	1.5	2 - 2.5	2.5 - 3.0	1	1	3	2	2.0 - 3.0
Field	Mean Transect Velocity	m/s	log	0.43	0.41	0.10	0.20	0.36	0.29	0.52	0.54	0.35	0.34	0.26	0.41

Note: if data were reported as a range, then the average of the range was used in the PCA.

Table A.11: Environmental Variables Used in Principal Components Analysis of Habitat Characteristics for Lotic Biological Sampling Areas, September 2015, Elk Valley

	Variable	Units	Transformation	Reference											
				MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	VEUKO	VEUP	VICK	WWRL	WWRU
GIS	Stream order	Strahler Stream Order	log	4	6	6	6	6	6	5	6	4	4	6	5
GIS	Station elevation	m	log	1,577	1,422	1,448	1,186	1,088	942	1,413	1,202	1,463	1,553	926	1,121
GIS	Source elevation	m	log	1,848	2,200	2,200	2,200	2,125	2,125	1,953	2,244	2,459	2,185	2,050	2,110
GIS	Area of catchment > 30% slope	m^2	log	3,976,311	282,498,484	231,820,770	433,646,794	441,080,487	551,434,071	95,986,595	643,362,272	108,739,652	16,290,042	418,069,947	273,100,345
GIS	Percentage of catchment > 30% slope	%	log	29.67	32.33	32.55	24	69.67	65.95	31.92	65.24	72.35	29.78	60.13	65.54
GIS	Percentage of catchment < 30% slope	%	log	70	68	67	76	30	34	68	35	28	70	40	34
GIS	Station gradient	%	log(x+0.01)	2	1	1	0	1	1	1	0	3	0	5	1
GIS	Distance to source	m	log	4,300	47,700	45,200	88,000	45,500	61,200	25,000	60,100	19,400	14,700	58,000	44,134
GIS	Stream density of watershed	km^{-1}	log	2.05	1.19	1.21	1.15	2.84	2.67	1.13	2.47	1.81	1.36	2.20	1.99
GIS	Average upstream gradient from station to source	%	log	6.30	1.63	1.66	1.15	2.28	1.93	2.16	1.73	5.13	4.30	1.94	2.24
GIS	Watershed area	m^2	log	13,400,142	873,918,726	712,124,434	1,835,682,111	633,140,816	836,099,964	300,749,845	986,215,162	150,286,744	54,699,122	801,267,235	416,693,572
GIS	Watershed perimeter	m	log	17,962	157,647	140,079	259,845	136,163	167,891	86,796	236,060	70,771	34,748	158,635	114,783
GIS	Watershed stream length	m	log	27,462	1,043,255	864,956	2,103,079	1,800,534	2,231,535	339,501	2,433,011	271,937	74,169	1,766,354	830,204
Field	Intermediate axis length - Wolman Mean	cm	log	8.54	14.76	11.38	13.95	13.00	6.99	12.69	7.74	13.14	13.76	7.53	12.77
Field	Embeddedness	%	log(x+0.01)	37.50	25.00	5.00	7.50	47.50	47.50	7.50	52.50	47.50	10.00	25.00	20.00
Field	Canopy Coverage	%	log(x+0.1)	6.8	0	1	0	12.75	14.25	0	8.5	14.5	12.5	0	28.65
Field	Periphyton Coverage	%	log	2	1	2	3	1	1	2	1	2	3	2	2
Field	Bankfull Width	m	log	14.4	98	30	63	43	52	27	36	15	11.2	69	37
Field	Wetted Width	m	log	2.8	24	17	31	41	36	18	30	13	7.2	25 (at sampling point) 42 (total)	13.6
Field	Bankfull-Wetted Depth	cm	log(x+0.1)	65	100	35	45	60	70	70	50	0.5	12	100	80
Field	Gradient	%	log	4	1	2	1	1.5	1.5	1.5	1	2	2	1	1.5
Field	Mean Transect Velocity	m/s	log	0.09	0.38	0.47	0.65	0.69	0.61	0.31	0.26	0.65	0.29	0.65	0.46

Note: if data were reported as a range, then the average of the range was used in the PCA.

Table A.11: Environmental Variables Used in Principal Components Analysis of Habitat Characteristics for Lotic Biological Sampling Areas, September 2015, Elk Valley

	Variable	Units	Transformation	Mine-exposed											
				BOCK	CORCK	EL19	EL1	EL20	ELDEL	ELDFE	ELDGR	ELELKO	ELH93	ELUEL	ELUFE
GIS	Stream order	Strahler Stream Order	log	3	4	7	7	6	6	7	7	7	7	6	7
GIS	Station elevation	m	log	1,155	1,518	1,196	1,104	1,282	1,241	974	1,161	924	757	1,264	1,024
GIS	Source elevation	m	log	1,875	2,053	2,545	2,545	2,545	2,545	2,545	2,545	2,545	2,545	2,545	2,545
GIS	Area of catchment > 30% slope	m^2	log	2,566,985	14,660,665	963,841,218	1,420,423,431	487,227,405	537,107,327	1,641,333,203	1,015,276,735	1,743,772,880	2,207,701,442	488,236,210	1,516,699,704
GIS	Percentage of catchment > 30% slope	%	log	29.94	50.61	52.21	50.05	53.07	52.49	49.64	51.37	49.60	49.89	52.26	50.10
GIS	Percentage of catchment < 30% slope	%	log	70	49	48	50	47	48	50	49	50	50	48	50
GIS	Station gradient	%	log(x+0.01)	0	2	0	9	1	2	2	2	0	0	0	0
GIS	Distance to source	m	log	5,100	7,300	104,100	124,100	75,000	85,800	161,000	109,800	183,000	204,000	79,900	145,500
GIS	Stream density of watershed	km^{-1}	log	1.24	2.05	2.36	2.19	2.45	2.44	2.18	2.32	2.18	2.17	2.44	2.20
GIS	Average upstream gradient from station to source	%	log	14.12	7.33	1.30	1.16	1.68	1.52	0.98	1.26	0.89	0.88	1.60	1.05
GIS	Watershed area	m^2	log	8,574,397	28,967,152	1,845,955,501	2,838,242,300	918,032,378	1,023,331,356	3,306,682,776	1,976,580,997	3,515,837,156	4,424,933,956	934,217,937	3,027,611,459
GIS	Watershed perimeter	m	log	15,713	25,260	269,422	404,990	200,007	217,828	439,536	284,336	463,561	608,759	206,841	397,530
GIS	Watershed stream length	m	log	10,596	59,256	4,353,889	6,214,086	2,252,191	2,500,494	7,218,817	4,576,900	7,659,385	9,615,193	2,276,275	6,657,090
Field	Intermediate axis length - Wolman Mean	cm	log	4.16	6.71	17.80	10.20	11.60	5.09	12.06	11.28	6.57	10.87	6.90	11.57
Field	Embeddedness	%	log(x+0.01)	30.00	45.00	30.00	32.50	27.50	20.00	40.00	35.00	27.50	32.50	33.33	37.50
Field	Canopy Coverage	%	log(x+0.1)	0	28.1	0	0	0	0	0	0	5.5	0	9	0
Field	Periphyton Coverage	%	log	1	4	3	3	3	2	4	2	2	2	2	2
Field	Bankfull Width	m	log	1.95	4.15	63	85	81	55	72	112	133	86	153	71
Field	Wetted Width	m	log	1.95	4.06	35	38	24	33	71	40	17.67	82	26.7	45 (to cobble bar, 71 to opposite bank
Field	Bankfull-Wetted Depth	cm	log(x+0.1)	0	15	80	40	2	50	50	100	130	70	320	40
Field	Gradient	%	log	1	1	1.5	0.5	1.5	1	0.5	1.5	1	0.5	1	0 - 0.5
Field	Mean Transect Velocity	m/s	log	0.62	0.15	0.78	0.51	0.67	0.61	0.57	0.66	0.47	0.39	0.50	0.90

Note: if data were reported as a range, then the average of the range was used in the PCA.

Table A.11: Environmental Variables Used in Principal Components Analysis of Habitat Characteristics for Lotic Biological Sampling Areas, September 2015, Elk Valley

	Variable	Units	Transformation	Mine-exposed											
				ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODPO
GIS	Stream order	Strahler Stream Order	log	7	6	5	6	5	5	5	5	5	5	5	5
GIS	Station elevation	m	log	1,126	1,564	1,556	1,225	1,507	1,362	1,579	1,595	1,588	1,489	1,692	1,563
GIS	Source elevation	m	log	2,545	2,741	2,388	2,388	2,388	2,388	2,388	2,388	2,388	2,388	2,388	2,388
GIS	Area of catchment > 30% slope	m^2	log	1,123,371,395	120,178,048	89,106,286	319,875,126	197,283,101	208,037,284	80,670,618	76,656,024	77,984,008	204,777,259	46,670,427	85,965,915
GIS	Percentage of catchment > 30% slope	%	log	51.88	59.66	41.92	51.51	50.27	48.62	41.95	43.25	42.37	49.13	52.19	42.03
GIS	Percentage of catchment < 30% slope	%	log	48	40	58	48	50	51	58	57	58	51	48	58
GIS	Station gradient	%	log(x+0.01)	1	0	0	1	1	0	1	1	1	3	0	2
GIS	Distance to source	m	log	119,100	30,651	30,100	67,700	42,800	53,400	24,700	22,600	23,300	46,500	13,500	27,400
GIS	Stream density of watershed	km^{-1}	log	2.28	2.01	2.06	2.20	2.31	2.28	1.95	1.95	1.94	2.30	1.89	2.01
GIS	Average upstream gradient from station to source	%	log	1.19	3.84	2.76	1.72	2.06	1.92	3.28	3.51	3.43	1.93	5.16	3.01
GIS	Watershed area	m^2	log	2,165,220,877	201,437,191	212,539,036	620,955,450	392,431,954	427,916,952	192,316,113	177,253,712	184,039,491	416,843,597	89,421,928	204,538,069
GIS	Watershed perimeter	m	log	292,939	68,420	75,735	148,301	116,700	126,925	72,376	66,206	68,777	116,865	44,270	74,222
GIS	Watershed stream length	m	log	4,928,254	404,017	438,753	1,367,927	907,179	975,893	375,350	344,833	356,576	959,169	168,767	410,176
Field	Intermediate axis length - Wolman Mean	cm	log	9.77	3.51	3.12	12.01	13.28	9.02	10.33	10.56	11.27	10.34	8.22	4.39
Field	Embeddedness	%	log(x+0.01)	47.50	50.00	10.00	32.50	25.00	42.50	37.50	17.50	20.00	0.00	25.00	25.00
Field	Canopy Coverage	%	log(x+0.1)	25	5.25	7	0	17.5	0	9.75	26.2	2	76 - 100	0	51 - 75
Field	Periphyton Coverage	%	log	3	3	3	2	3	3	2	2	2	3	2	3
Field	Bankfull Width	m	log	45	6.1	22	60	25	47	53.75	22	44.8	40	14.8	13
Field	Wetted Width	m	log	45	4.2	13	30	22	16	7.75	8.7	8.9	19.9	12.7	10.9
Field	Bankfull-Wetted Depth	cm	log(x+0.1)	30	50	50	70	32	120	130	77	80	54	120	72
Field	Gradient	%	log	0.5	1	0 - 0.5	1.5	0.5	1	2.5	1 - 1.5	1.5 - 2.0	1.5	1	0.75
Field	Mean Transect Velocity	m/s	log	0.50	0.18	0.50	0.38	0.45	0.58	0.49	0.37	0.41	0.76	0.28	0.60

Note: if data were reported as a range, then the average of the range was used in the PCA.

Table A.11: Environmental Variables Used in Principal Components Analysis of Habitat Characteristics for Lotic Biological Sampling Areas, September 2015, Elk Valley

	Variable	Units	Transformation	Mine-exposed											
				FOUEW	FOUKI	FRUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO
GIS	Stream order	Strahler Stream Order	log	5	5	5	5	5	3	3	4	5	4	4	4
GIS	Station elevation	m	log	1,546	1,603	1,242	1,665	1,628	1,494	1,523	1,293	1,200	1,315	1,357	1,714
GIS	Source elevation	m	log	2,388	2,388	2,388	2,388	2,388	2,188	2,188	1,569	1,569	1,569	1,569	2,479
GIS	Area of catchment > 30% slope	m^2	log	114,752,841	51,316,692	236,836,447	48,890,190	51,270,251	3,986,021	3,868,151	31,509,293	38,376,412	18,301,531	15,704,410	26,991,886
GIS	Percentage of catchment > 30% slope	%	log	44.81	40.12	49.51	47.51	41.05	25.29	25.21	46.12	46.17	44.05	41.69	55.53
GIS	Percentage of catchment < 30% slope	%	log	55	60	50	52	59	75	75	54	54	56	58	44
GIS	Station gradient	%	log(x+0.01)	1	2	1	3	1	2	32	4	3	6	1	1
GIS	Distance to source	m	log	33,300	21,300	65,500	16,100	19,300	8,200	7,600	8,900	11,800	8,000	6,300	7,300
GIS	Stream density of watershed	km^{-1}	log	2.21	1.82	2.30	1.87	1.84	2.09	2.01	1.77	1.89	1.87	1.80	1.77
GIS	Average upstream gradient from station to source	%	log	2.53	3.69	1.75	4.49	3.94	8.46	8.75	3.10	3.13	3.18	3.37	10.48
GIS	Watershed area	m^2	log	256,111,358	127,895,044	478,364,494	102,903,533	124,886,101	15,760,079	15,342,489	68,319,852	83,111,490	41,550,668	37,672,866	48,603,876
GIS	Watershed perimeter	m	log	77,440	62,157	135,307	50,229	61,278	19,961	18,947	42,675	50,181	28,570	26,952	34,745
GIS	Watershed stream length	m	log	565,846	232,243	1,099,958	192,271	229,331	33,014	30,876	121,141	157,299	77,625	67,812	85,861
Field	Intermediate axis length - Wolman Mean	cm	log	9.88	7.95	12.53	7.70	8.38	8.85	6.26	12.28	10.64	10.97	7.23	7.75
Field	Embeddedness	%	log(x+0.01)	36.11	20.00	37.50	20.00	25.00	37.50	30.00	40.00	17.50	20.00	27.50	19.44
Field	Canopy Coverage	%	log(x+0.1)	22	2	1 - 25	26	5.2	44.25	76 - 100	26 - 50 (estimate 40%)	72.75	30.2	17.75	0.5
Field	Periphyton Coverage	%	log	3	2	2	2	2	3	2	3	2	3	2	2
Field	Bankfull Width	m	log	15	38	33	12	15	3.86	5.8	7.5	7.3	6.5	7	12.8
Field	Wetted Width	m	log	12	10.4	13.2	8	9.1	3.86	2.3	7.5	5.6	5.3	5	9.5
Field	Bankfull-Wetted Depth	cm	log(x+0.1)	30	67	150	63	65	8	40	20	82	40	70	130
Field	Gradient	%	log	1.5	1.5	2	1.5	1	2	2.5	1	1.5	2.5 - 3.0	1.5 - 2.0	1.5
Field	Mean Transect Velocity	m/s	log	0.68	0.35	0.68	0.49	0.41	0.07	0.36	0.57	0.39	0.43	0.29	0.36

Note: if data were reported as a range, then the average of the range was used in the PCA.

Table A.11: Environmental Variables Used in Principal Components Analysis of Habitat Characteristics for Lotic Biological Sampling Areas, September 2015, Elk Valley

	Variable	Units	Transformation	Mine-exposed											
				KICK	LC_DC1	LC_DCDS	LC_FRUS	LIDSL	LILC3	MI2	MI5	MIDAG	MIDCO	MIUCO	MP1
GIS	Stream order	Strahler Stream Order	log	4	4	4	5	5	4	6	6	5	5	4	5
GIS	Station elevation	m	log	1,625	1,528	1,635	1,516	1,417	1,434	1,132	1,318	1,458	1,495	1,511	1,649
GIS	Source elevation	m	log	2,154	2,103	2,100	2,388	2,019	2,019	1,848	1,848	1,848	1,848	1,848	2,388
GIS	Area of catchment > 30% slope	m^2	log	24,287,621	17,107,150	7,086,872	178,877,442	67,108,772	45,120,906	289,627,569	132,248,179	57,967,997	29,020,012	13,864,435	50,824,494
GIS	Percentage of catchment > 30% slope	%	log	56.49	64.58	81.07	49	60.54	65.91	44.54	44.03	51.07	43.95	39.21	43.24
GIS	Percentage of catchment < 30% slope	%	log	44	35	19	51	39	34	55	56	49	56	61	57
GIS	Station gradient	%	log(x+0.01)	2	5	4	0	3	2	2	1	4	2	1	1
GIS	Distance to source	m	log	8,600	8,500	5,564	40,800	13,200	12,600	44,300	25,000	13,200	9,700	8,500	17,500
GIS	Stream density of watershed	km^{-1}	log	2.23	2.77	5.38	2.29	1.92	2.29	1.92	2.13	2.21	2.25	2.43	1.87
GIS	Average upstream gradient from station to source	%	log	6.15	6.76	8.35	2.14	4.56	4.64	1.62	2.12	2.95	3.64	3.96	4.22
GIS	Watershed area	m^2	log	42,998,267	26,491,163	8,741,252	361,757,449	110,846,825	68,454,705	650,319,004	300,371,538	113,516,592	66,022,351	35,356,870	117,536,353
GIS	Watershed perimeter	m	log	28,755	22,226	13,698	104,751	59,171	42,585	169,354	95,951	52,124	36,787	30,560	59,179
GIS	Watershed stream length	m	log	95,707	73,444	47,007	826,647	212,540	156,596	1,249,143	640,525	250,962	148,296	85,989	219,930
Field	Intermediate axis length - Wolman Mean	cm	log	8.57	9.55	9.51	13.82	14.52	11.74	9.22	11.69	7.96	9.19	8.06	12.29
Field	Embeddedness	%	log(x+0.01)	14.29	10.00	40.00	12.50	37.50	22.50	17.50	22.50	27.50	40.00	30.00	17.50
Field	Canopy Coverage	%	log(x+0.1)	0	32.5	30.75	47	1 - 25	0	18	0.5	4.7	3.4	8.1	0
Field	Periphyton Coverage	%	log	2	3	2	3	2	3	2	2	2	3	2	2
Field	Bankfull Width	m	log	8.94	14	3.9	23	22	11	55	26.35	16.2	9.87	10	19
Field	Wetted Width	m	log	7.6	2.4	3.3	23	9	9.5	12.3	13.05	11.3	8.45	4.75	6
Field	Bankfull-Wetted Depth	cm	log(x+0.1)	45	40	14	35	55	30	150	40	60	44	72	76
Field	Gradient	%	log	2	1.5	1.5	0.5	2	1.5	0.5	1	1	1	4	2
Field	Mean Transect Velocity	m/s	log	0.25	0.18	0.15	0.53	0.47	0.64	0.73	0.45	0.40	0.19	0.32	0.52

Note: if data were reported as a range, then the average of the range was used in the PCA.

Table A.11: Environmental Variables Used in Principal Components Analysis of Habitat Characteristics for Lotic Biological Sampling Areas, September 2015, Elk Valley

	Variable	Units	Transformation	Mine-exposed					
				FODNGD	OCNM	POCK	SWCK	THCK	WOCK
GIS	Stream order	Strahler Stream Order	log	3	1	3	3	3	3
GIS	Station elevation	m	log	1,662	1,127	1,566	1,602	1,301	1,310
GIS	Source elevation	m	log	2,087	1,668	2,123	2,012	2,091	1,976
GIS	Area of catchment > 30% slope	m^2	log	1,934,304	786,900	718,520	1,327,984	2,154,132	1,167,655
GIS	Percentage of catchment > 30% slope	%	log	14.37	33.15	23.59	21.25	21.24	28.41
GIS	Percentage of catchment < 30% slope	%	log	86	67	76	79	79	72
GIS	Station gradient	%	log(x+0.01)	2	1	13	6	9	9
GIS	Distance to source	m	log	4,900	3,100	2,900	3,700	5,800	3,500
GIS	Stream density of watershed	km^{-1}	log	1.88	1.54	1.80	1.76	1.89	3.20
GIS	Average upstream gradient from station to source	%	log	8.67	17.45	19.21	11.08	13.62	19.03
GIS	Watershed area	m^2	log	13,456,633	2,373,903	3,045,599	6,248,704	10,141,156	4,110,181
GIS	Watershed perimeter	m	log	18,693	8,324	8,417	11,871	15,535	9,934
GIS	Watershed stream length	m	log	25,354	3,645	5,470	10,974	19,124	13,136
Field	Intermediate axis length - Wolman Mean	cm	log	6.36	6.12	5.73	8.09	7.46	8.57
Field	Embeddedness	%	log(x+0.01)	27.50	30.00	27.50	35.00	25.00	27.50
Field	Canopy Coverage	%	log(x+0.1)	40.25	68	76 - 100	99	95.5	51 - 75
Field	Periphyton Coverage	%	log	2	1	3	2	2	2
Field	Bankfull Width	m	log	15	1.1	2.1	6.8	2.95	2
Field	Wetted Width	m	log	10	1.1	1.75	3.7	2	1.53
Field	Bankfull-Wetted Depth	cm	log(x+0.1)	66.5	0	28	21	43	45
Field	Gradient	%	log	1.5	2	3.5	1.5	2.5	5
Field	Mean Transect Velocity	m/s	log	0.33	0.04	0.20	0.16	0.10	0.13

Note: if data were reported as a range, then the average of the range was used in the PCA.

HABITAT INFORMATION

Lentic Habitat Photos


635,000
635,250
635,500
5,602,250
5,602,000
5,601,750
5,601,500
EL14
Lower Elk Lake
bing
EL14 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

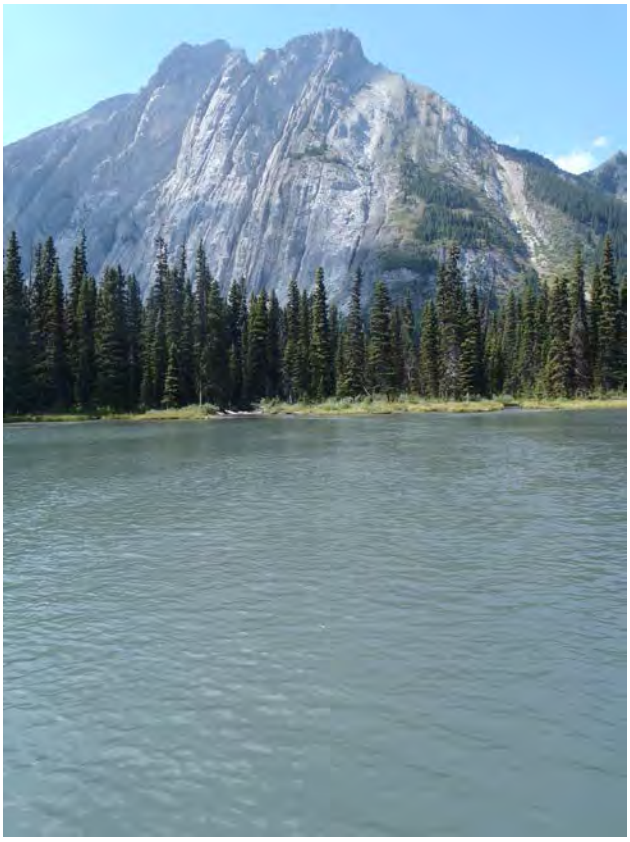


Photo 1: EL14


637,750
638,000
638,250
5,462,000
5,461,750
5,461,500
5,461,250
Elk River
ELKO
UNWNMO
Elko
ELKO
bing
ELKO Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Elko Reservoir from Upstream to Downstream


652,750
653,000
653,250
5,521,750
5,521,500
5,521,250
5,521,000
ELWDGC
GO13
OTTO
Sparwood
Elkview Operations
ELWDGC
Elk River
ELWDGC Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: ELWDGC Looking West

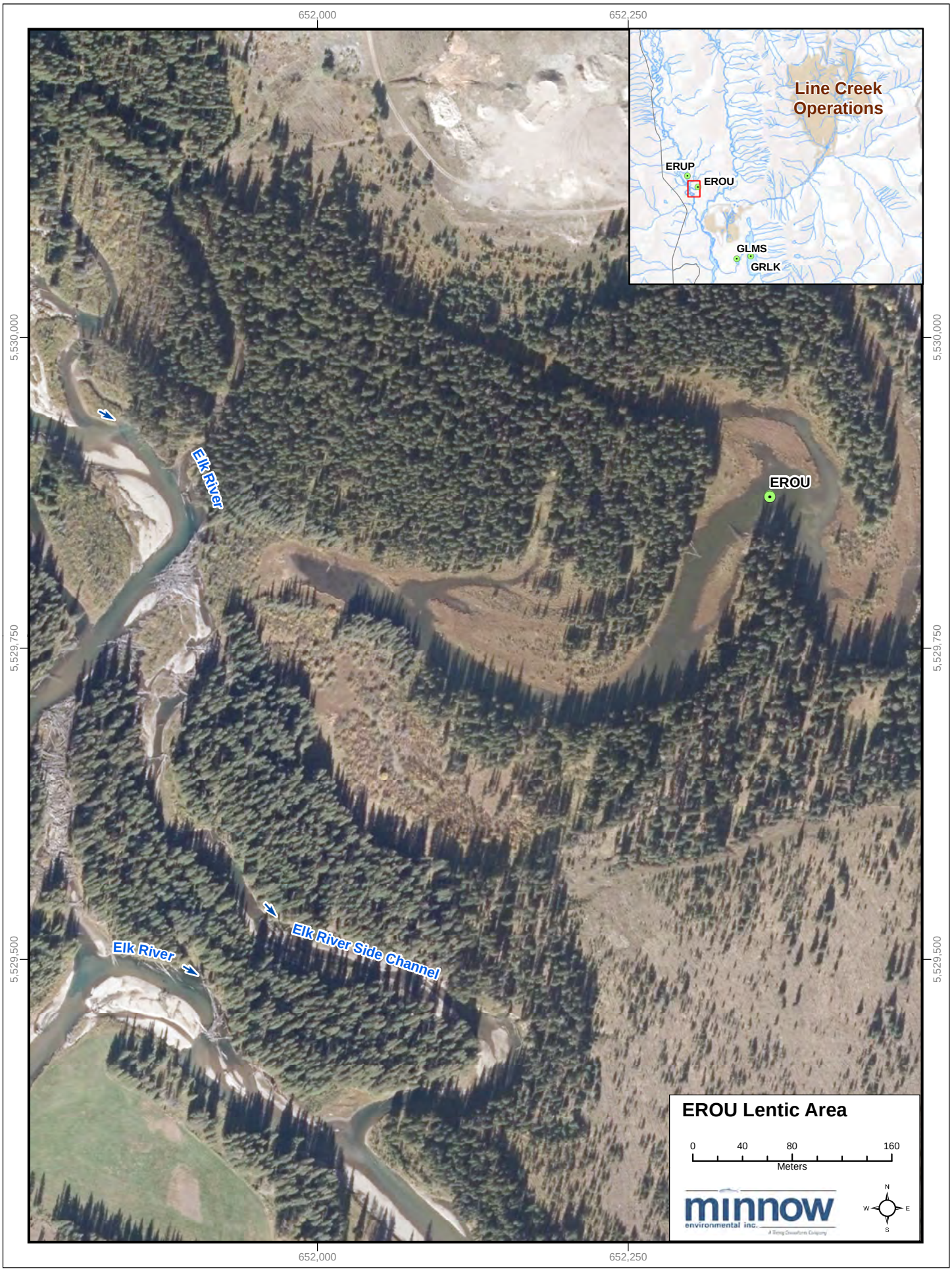
Photo 2: ELWDGC Looking North Along the Eastern Shore


641,000
641,250
5,478,500
5,478,250
5,478,000
5,477,750
Elk River
Fernie
STPD
EROL
EROL
Elk River
EROL Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Rip Rap, Boulder, and Cobble along the west bank of EROL Beside Deep Pool

Photo 2: Substrate and Macrophyte Growth

Photo 3: Shallow Habitat at the Northern End of EROL


652,000
652,250
5,530,000
5,529,750
5,529,500
Line Creek Operations
ERUP
EROU
GLMS
GRLK
Elk River
EROU
Elk River
Elk River Side Channel
EROU Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

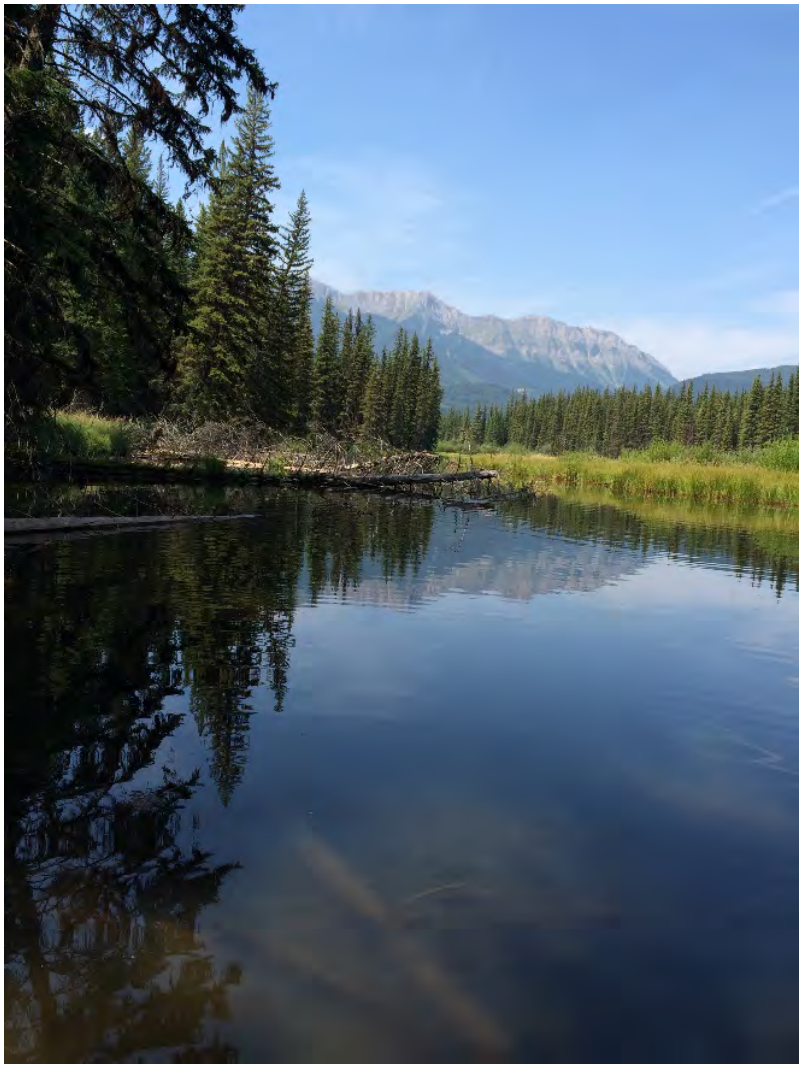


Photo 1: Representative Photo of Lentic Area Features at EROU


651,500
651,750
652,000
5,530,750
5,530,500
5,530,250
5,530,000
Line Creek Operations
ERUP
EROU
GLMS
GRLK
ERUP
Elk River
ERUP Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

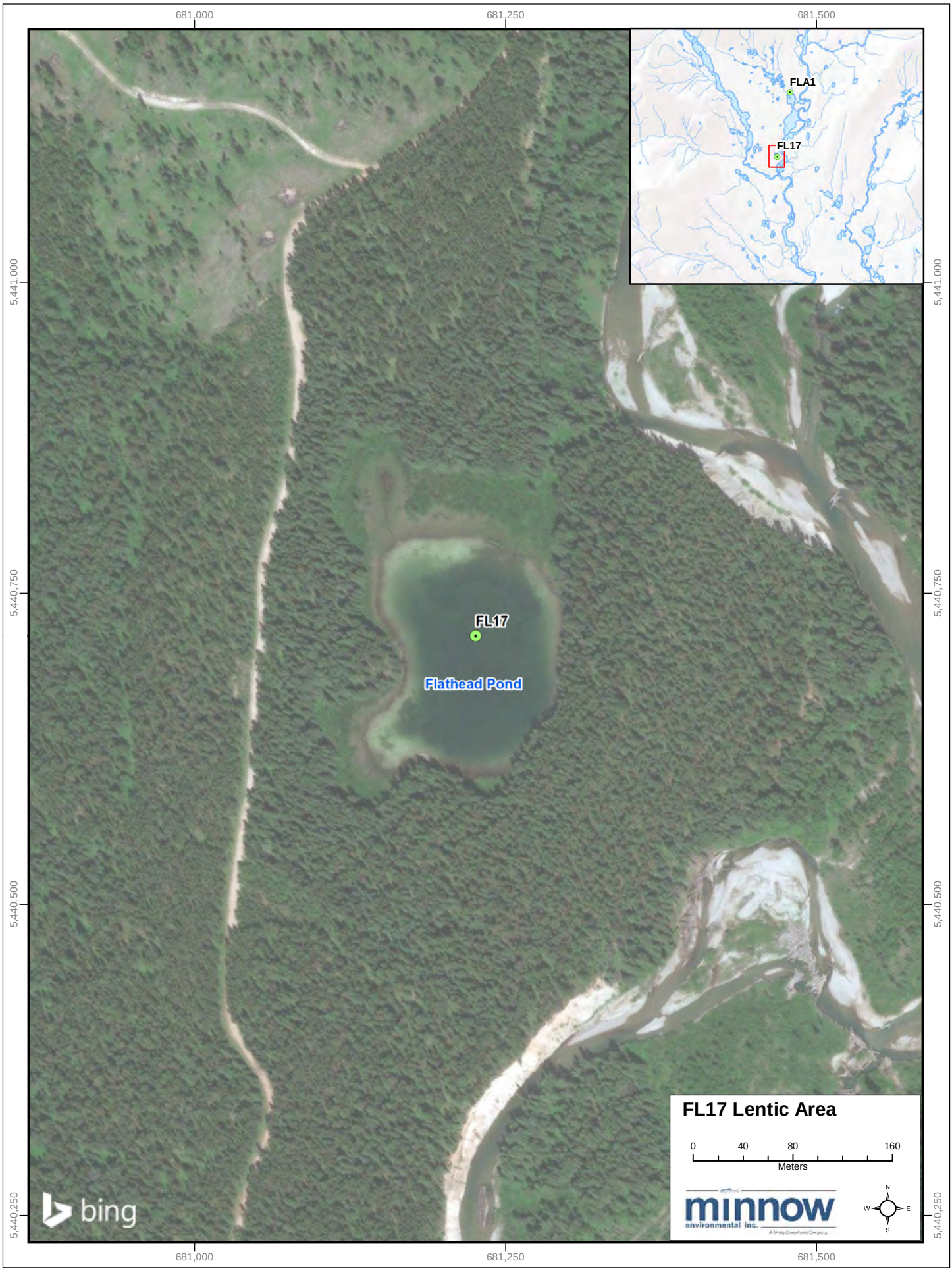
Photo 1: ERUP Looking North

Photo 2: ERUP Looking South


639,000
639,250
5,485,000
5,484,750
5,484,500
5,484,250
Fernie
ERWSF
STPD
ERWSF
Elk River
bing
ERWSF Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: ERWSF

Photo 2: ERWSF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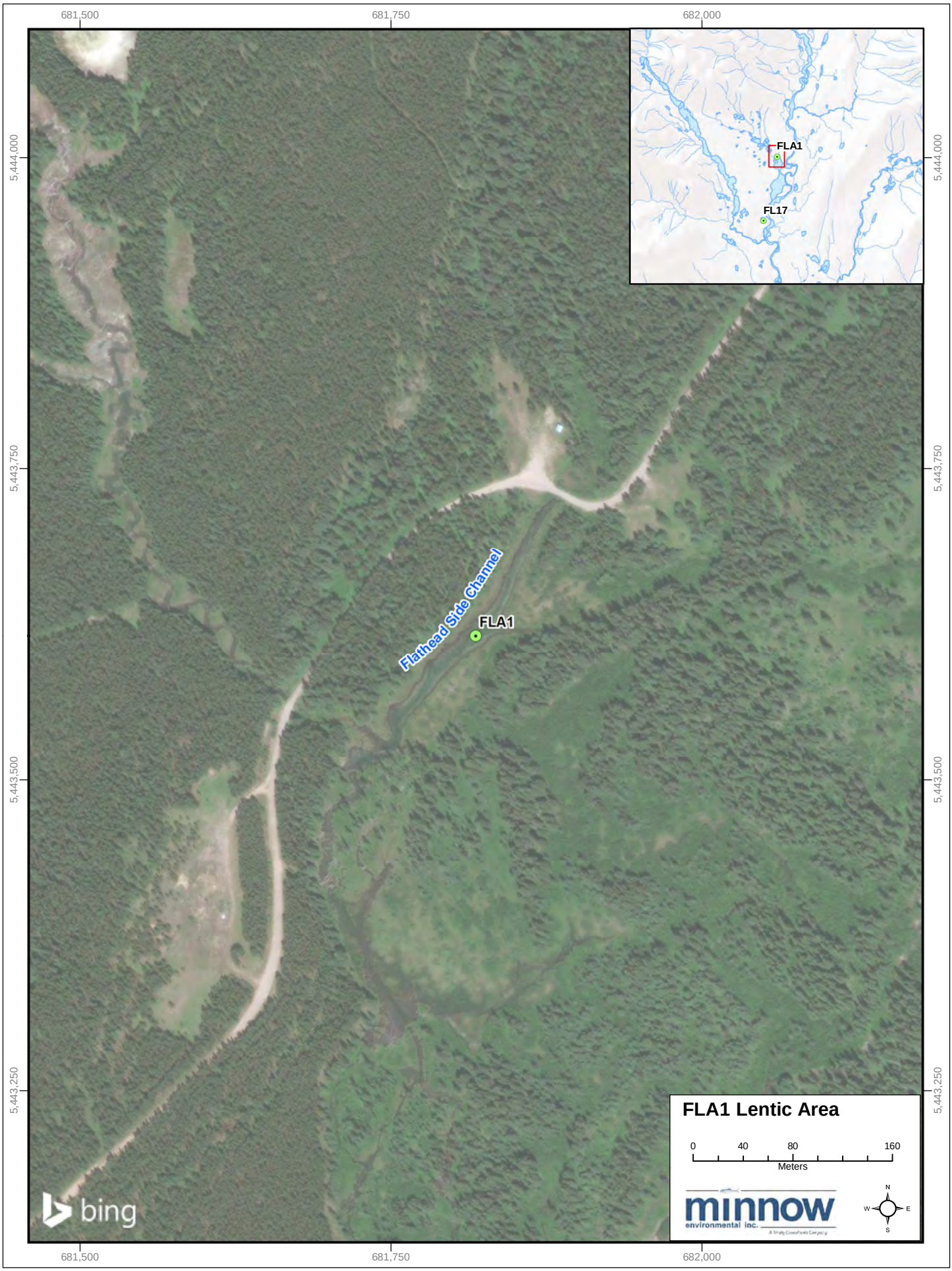
681,250
681,500
5,441,000
5,440,750
5,440,500
5,440,250
FLA1
FL17
FL17
Flathead Pond
bing
FL17 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: FL17 Looking Upstream

Photo 2: FL17 Looking Downstream


681,500
681,750
682,000
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5,443,750
5,443,500
5,443,250
FLA1
FL17
Flathead Side Channel
FLA1
bing
FLA1 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: FLA1 Looking Upstream

Photo 2: FLA1 Looking Downstream


654,500
654,750
655,000
5,553,750
5,553,500
5,553,250
5,553,000
Fording River
FMUCK
Fording River
REFF
FOXL
FMUCK
Greenhills Operations
ERORP
FWDEC
R5-1
Elkford
FO15
FMUCK Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: FMUCK Looking Northwest Upstream

Photo 2: FMUCK looking Southeast Downstream


654,000
654,250
654,500
5,555,750
5,555,500
5,555,250
5,555,000
FO10
FOXL
FMUCK
Fording River Oxbow
FO10
bing
FO10 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: FO10

Photo 2: FO10


654,750
655,000
655,250
5,542,750
5,542,500
5,542,250
5,542,000
REFF
FOXL
FMUCK
ERORP
Greenhills Operations
FWDEC
R5-1
Elkford
FO15
FO15
FO15 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: FO15 South of the Tracks

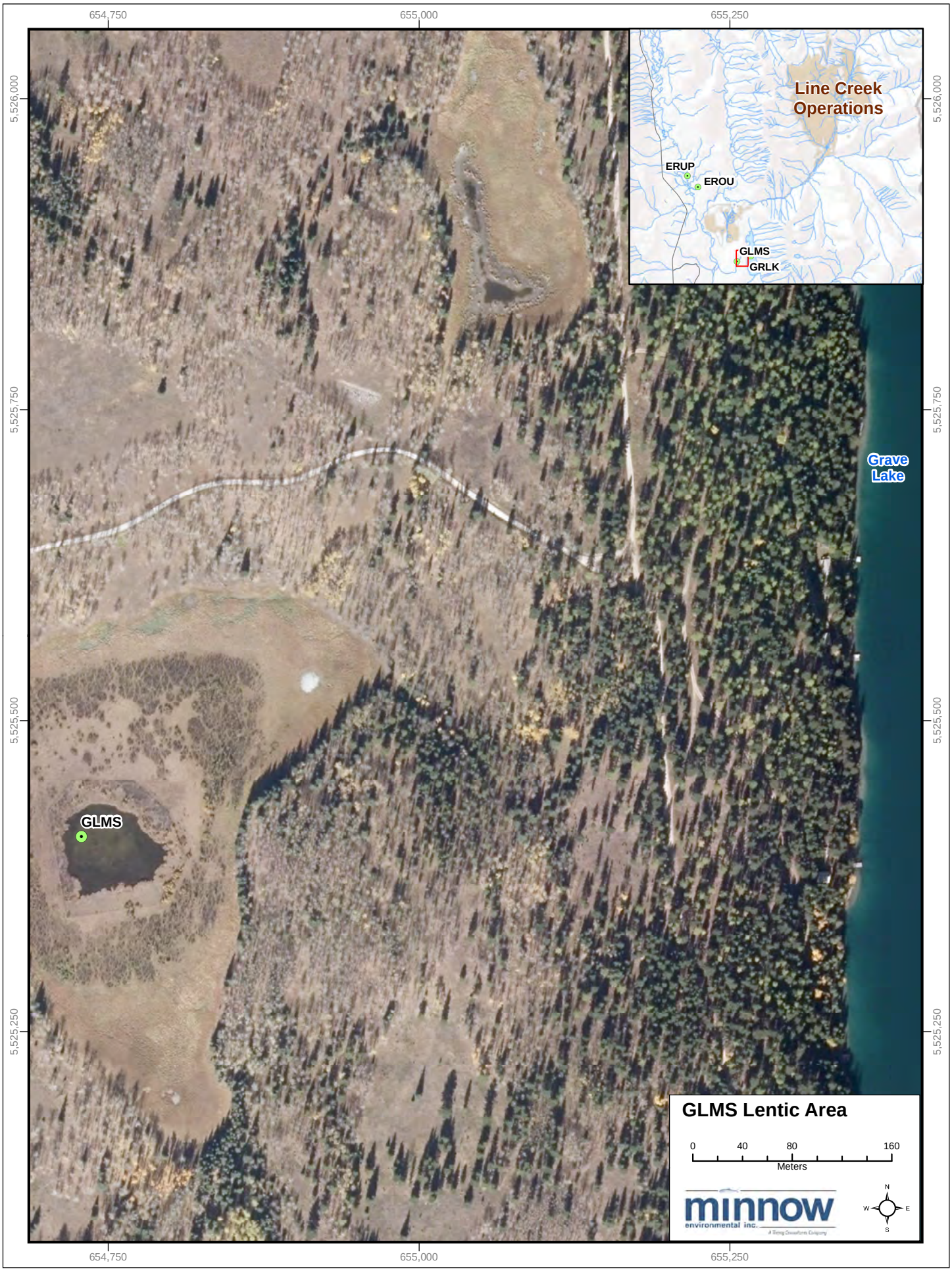
Photo 2: FO15 North of the Tracks


654,500
654,750
655,000
5,554,750
5,554,500
5,554,250
5,554,000
REFF
FOXL
FMUCK
ERORP
Greenhills Operations
FWDEC
R5-1
Elkford
FO15
FOXL
Fording River
FOXL Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Representative Photo of Lentic Area Features at FOXL


656,750
657,000
5,547,250
5,547,000
5,546,750
5,546,500
FWDEC
Fording River
REFF
FOXL
FMUCK
Greenhills Operations
ERORP
FWDEC
R5-1
Elkford
FO15
FWDEC Lentic Area
0
40
80
160
Meters
minnow environmental inc.
N
W
E
S

Photo 1: Representative Photo of Lentic Area Features at FWDEC


654,750
655,000
655,250
5,526,000
5,525,750
5,525,500
5,525,250
Line Creek Operations
ERUP
EROU
GLMS
GRLK
Grave Lake
GLMS
GLMS Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S


652,750
653,000
653,250
5,514,500
5,514,250
5,514,000
5,513,750
ELWDGC
GO13
OTTO
Sparwood
Elkview Operations
Elk River
Goddard Creek
GO13
GO13 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Representative Photo of Lentic Area Features at GO13


655,500
655,750
656,000
5,526,250
5,526,000
5,525,750
5,525,500
Line Creek Operations
ERUP
EROU
GLMS
GRLK
Grave Lake
GRLK
GRLK Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Representative Photo of Lentic Area Features at GRLK

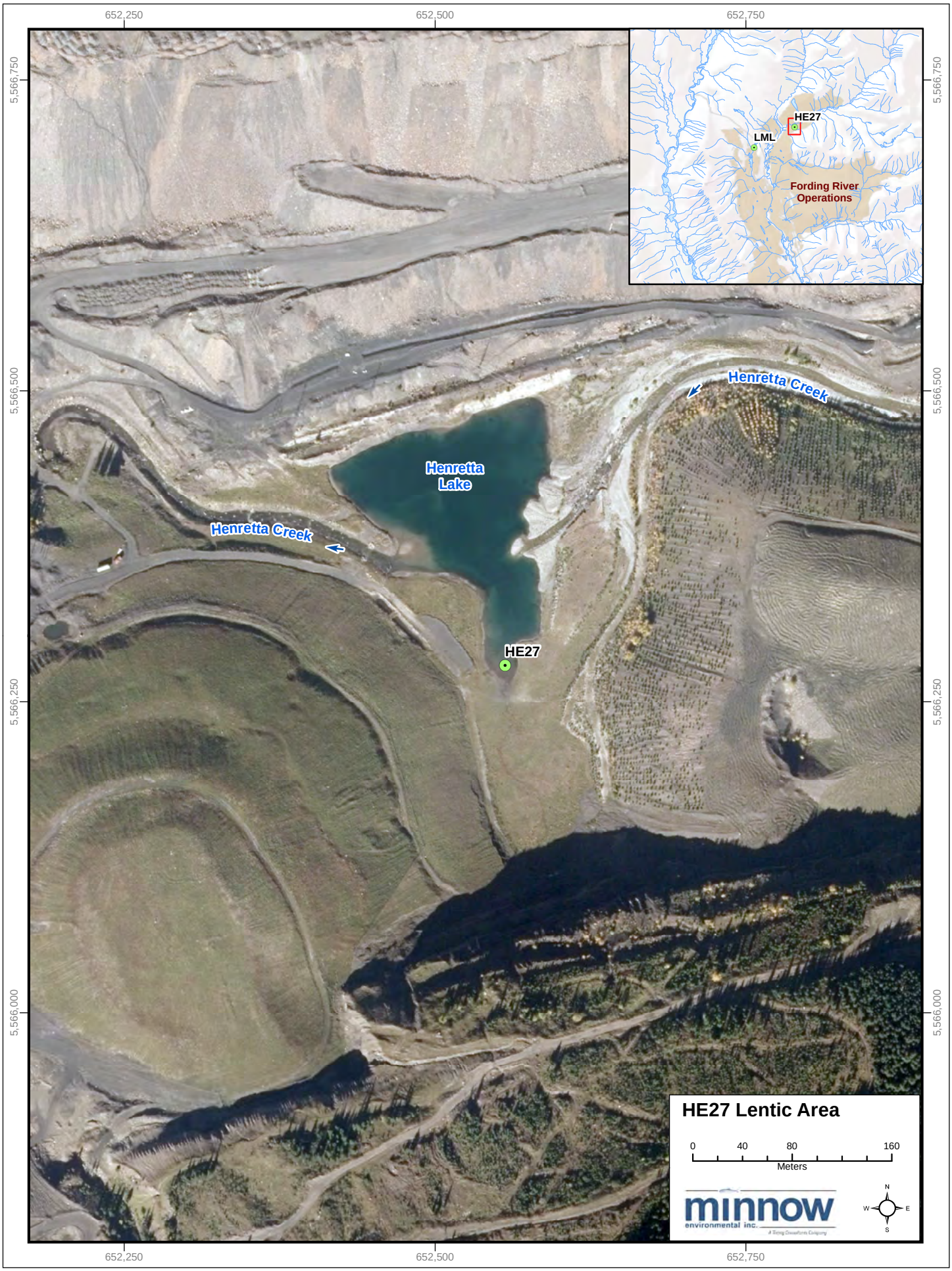

652,250
652,500
652,750
5,566,750
5,566,500
5,566,250
5,566,000
HE27
LML
Fording River Operations
Henretta Creek
Henretta Lake
Henretta Creek
HE27
HE27 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Looking East at HE27

Photo 2: The Western Side of HE27, With View of Mine Disturbance and Downstream Outlet


658,500
658,750
659,000
5,489,500
5,489,250
5,489,000
5,488,750
MIWW
MIC2
LCHO
MI16
Coal Mountain Operations
LCHO
Leach Creek
LCHO Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

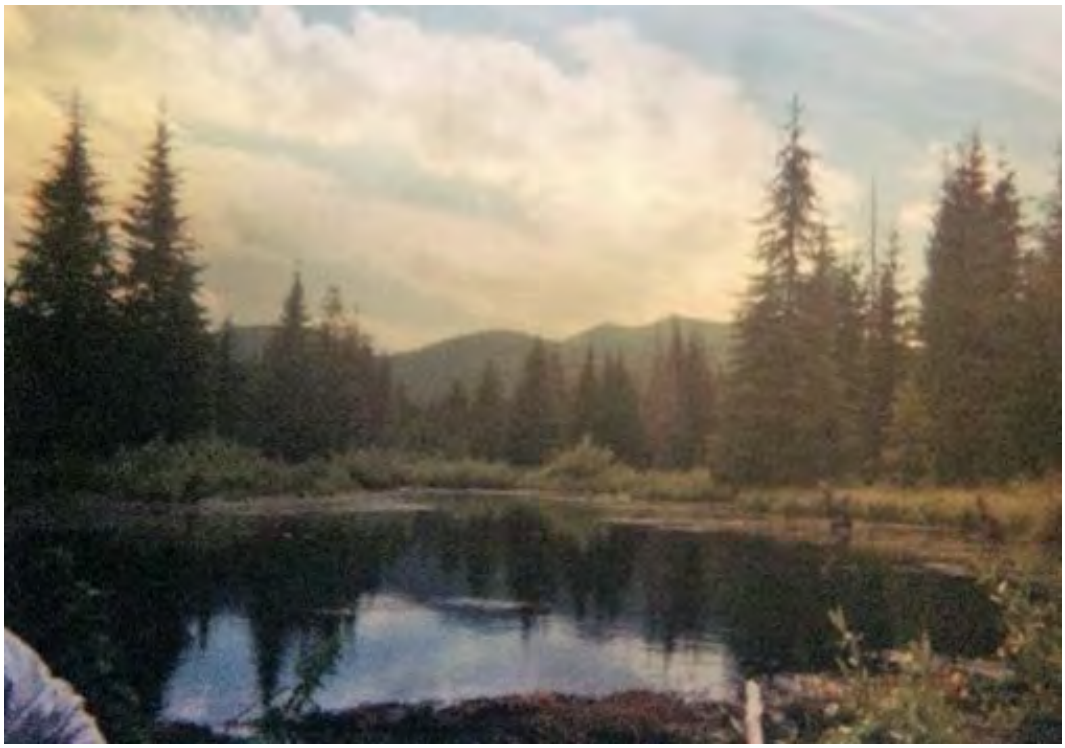


Photo 1: Representative View of Lentic Area Features at LCHO


649,750
650,000
650,250
5,565,250
5,565,000
5,564,750
5,564,500
HE27
LML
Fording River Operations
Lake Mountain Lake
LML
Lake Mountain Creek
LML Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Representative Photo of Lentic Area Features at LML, Looking at North Headwater Section of the Lake

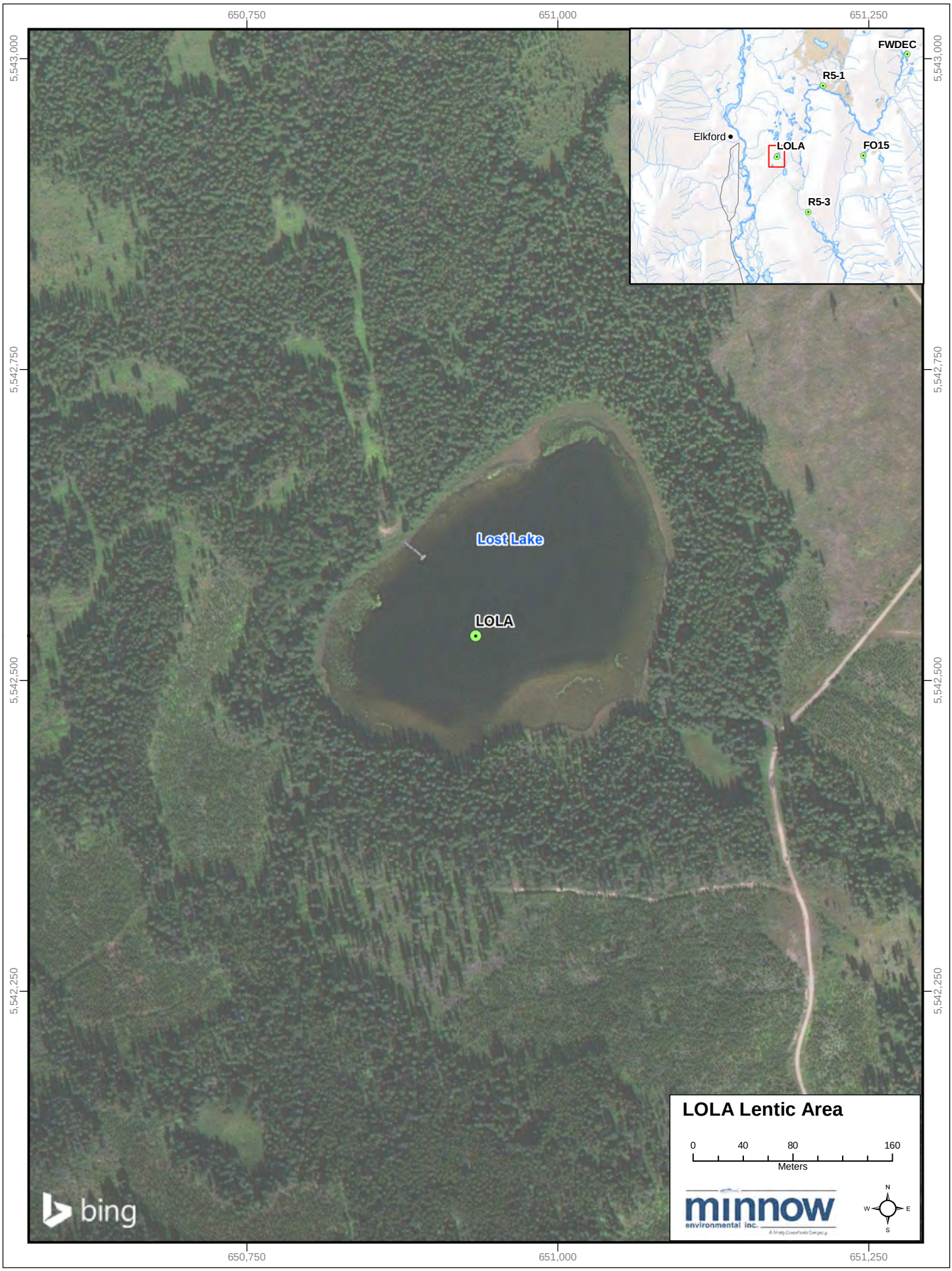

650,750
651,000
651,250
5,543,000
5,542,750
5,542,500
5,542,250
FWDEC
R5-1
Elkford
LOLA
FO15
R5-3
Lost Lake
LOLA
bing
LOLA Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: LOLA

Photo 2: LOLA

Photo 3: LOLA


665,000
665,250
665,500
5,489,750
5,489,500
5,489,250
5,489,000
MIWW
MIC2
LCHO
MI16
Coal Mountain Operations
Michel Creek
MI16
Michel Creek
MI16 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S
bing

Photo 1: MI16 Looking North

Photo 2: MI16 Looking South

Photo 3: Typical Substrate at MI16


659,500
659,750
660,000
5,497,000
5,496,750
5,496,500
5,496,250
Michel Creek
MIC2
Michel Creek
MIWW
MIC2
LCHO
MI16
Coal Mountain Operations
MIC2 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Emergent Grasses and Woody Debris in the Middle of MIC2

Photo 2: Typical Substrate at MIC2


659,500
659,750
660,000
5,498,750
5,498,500
5,498,250
5,498,000
MIWW
MIC2
LCHO
MI16
Coal Mountain Operations
Michel Creek
MIWW
Michel Creek Side Channel
MIWW Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Looking East at MIWW

Photo 2: Looking West at the Side Channel and Main Pond at MIWW

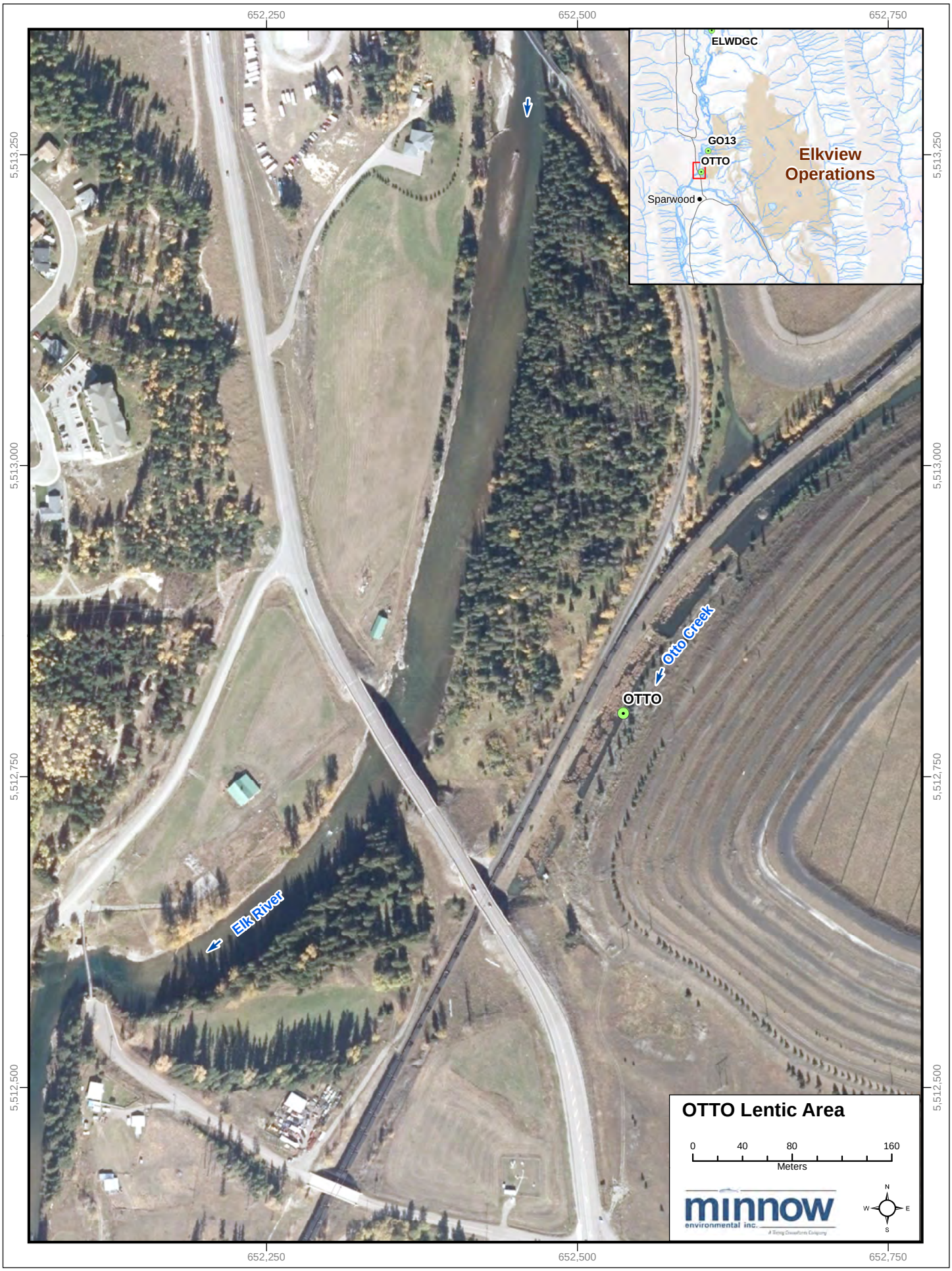

652,250
652,500
652,750
5,513,250
5,513,000
5,512,750
5,512,500
ELWDGC
GO13
OTTO
Elkview Operations
Sparwood
Otto Creek
OTTO
Elk River
OTTO Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Upper Section of OTTO, Showing Riparian Cattail Growth

Photo 2: Mid Section of Otto

Photo 3: Lower Section of OTTO

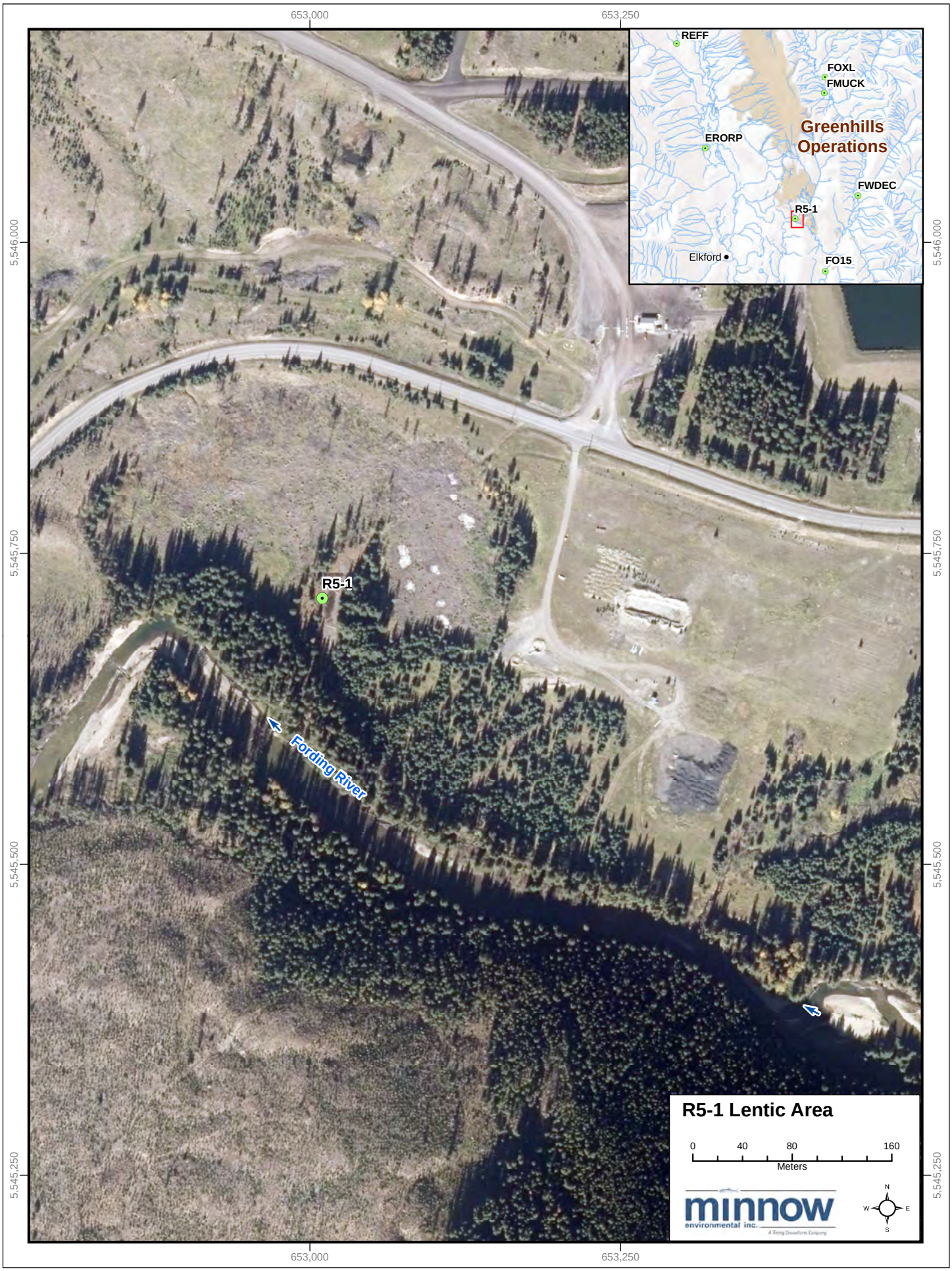

653,000
653,250
5,546,000
5,545,750
5,545,500
5,545,250
REFF
FOXL
FMUCK
Greenhills Operations
ERORP
FWDEC
R5-1
Elkford
FO15
R5-1
Fording River
R5-1 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

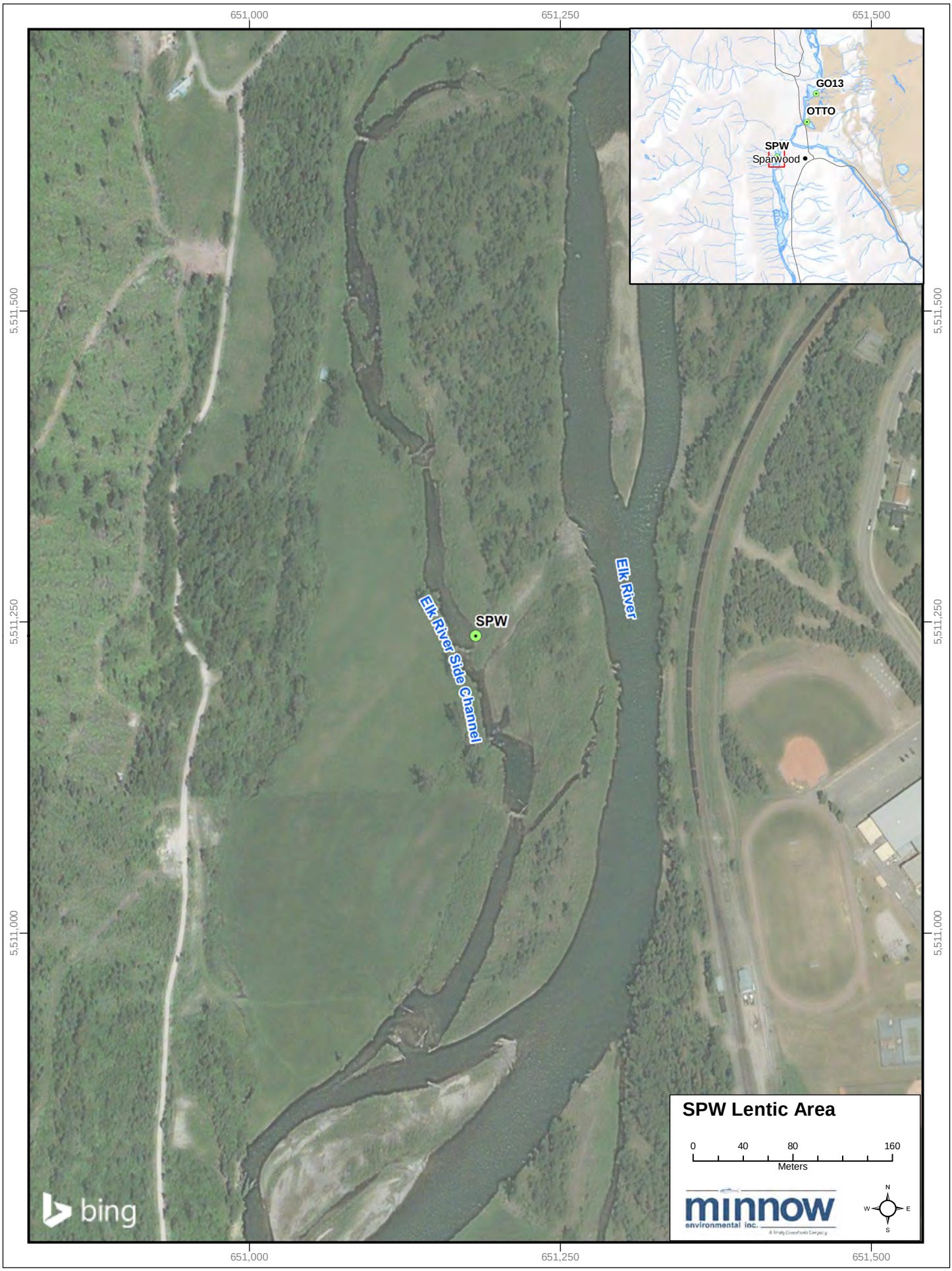
Photo 1: Representative Photo of Lentic Area Features at R5-1, South View


652,250
652,500
652,750
5,540,000
5,539,750
5,539,500
5,539,250
R5-3
Fording River
Line Creek Operations
ERUP
EROU
GLMS
GRLK
R5-3 Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Representative Photo of Lentic Area Features at R5-3


645,750
646,000
646,250
5,556,750
5,556,500
5,556,250
5,556,000
REFF
FOXL
FMUCK
Greenhills Operations
ERORP
FWDEC
R5-1
Elkford
FO15
REFF
REFF Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Representative Photo of Lentic Area Features at REFF


651,000
651,250
651,500
5,511,500
5,511,250
5,511,000
GO13
OTTO
SPW
Sparwood
SPW
Elk River Side Channel
Elk River
bing
SPW Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S


639,750
640,000
5,483,500
5,483,250
5,483,000
5,482,750
Fernie
STPD
EROL
Elk River
STPD
STPD Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S

Photo 1: Looking West at STPD

Photo 2: Typical Substrate Showing Aquatic Vegetation Growth


644,500
644,750
645,000
5,468,500
5,468,250
5,468,000
5,467,750
Elk River
Elk River Side Channel
UNWNMO
Elko
ELKO
UNWNMO Lentic Area
0
40
80
160
Meters
minnow
environmental inc.
N
W
E
S
bing

Photo 1: UNWNMO Looking Downstream from the Road

Photo 2: Close-up of Aquatic Vegetation at UNWNMO

APPENDIX B
DATA QUALITY ASSESSMENT

APPENDIX B DATA QUALITY ASSESSMENT

B1 INTRODUCTION

A Data Quality Assessment (DQA) was conducted on data collected as part of the Regional Aquatic Effects Monitoring Program (RAEMP) implemented for Teck's coal mining operations in the Elk River Watershed in 2015. The objective of the DQA is to define the overall quality of the data presented in the report, and, by extension, the confidence with which the data can be used to derive conclusions.

B1.1 Background

A variety of factors can influence the chemical and biological measurements made in an environmental study and thus affect the accuracy and/or precision of the data. Inconsistencies in sampling or laboratory methods, use of instruments that are inadequately calibrated or which cannot measure to the desired level of accuracy or precision, and contamination of samples in the field or laboratory are just some of the potential factors that can lead to the reporting of data that do not accurately reflect actual environmental conditions. Depending on the magnitude of the problem, inaccuracy or imprecision have the potential to affect the reliability of any conclusions made from the data. Therefore, it is important to ensure that monitoring programs incorporate appropriate steps to control the non-natural sources of data variability (i.e., minimize the variability that does not reflect natural spatial and temporal variability in the environment) and thus assure the quality of the data.

Data quality as a concept is meaningful only when it relates to the intended use of the data. That is, one must know the context in which the data will be interpreted in order to establish a relevant basis for judging whether or not the data set is adequate. DQA involves comparison of actual field and laboratory measurement performance to data quality objectives (DQOs) established for a particular study, such as evaluation of method detection limits, blank sample data, data precision (based on field and laboratory duplicate samples), and data accuracy (based on matrix spike recoveries and/or analysis of standards or certified reference materials).

DQOs were established at the outset of the field program that reflect reasonable and achievable performance expectations (Appendix Table B.1). Programs involving a large amount of samples and analytes usually have some results that exceed the DQOs. This is particularly so for multi-element scans (e.g., ICP scans for metals) since the analytical conditions are not necessarily optimal for every element included in the scan. Generally, scan results may be considered acceptable if no more than 20% of the analytes fail to meet the DQOs. Overall, the intent of comparing data to DQOs was not to reject any measurement that did not meet the DQO, but to ensure any questionable data received more scrutiny to

determine what effect, if any, this had on interpretation of results within the context of this project.

B1.2 Types of Quality Control Samples

Several types of quality control (QC) samples were assessed based on samples collected (or prepared) in the field and laboratory. These samples, and a description of each, include the following:

Blanks are samples of de-ionized water and/or appropriate reagent(s) that are handled and analyzed the same way as regular samples. These samples will reflect any contamination of samples occurring in the field (in the case of field or trip blanks) or the laboratory (in the case of laboratory or method blanks). Concentrations of analytes should not be detectable, although a DQO of twice the method detection limit allows for slight "noise" around the detection limit.

Field Duplicates are replicate samples collected from a randomly selected field station using identical collection and handling methods that are then analyzed separately in the laboratory. The data from field replicate samples reflect natural variability, as well as the variability associated with sample collection methods, and therefore provide a measure of field precision.

Laboratory Duplicates are replicate sub-samples created in the laboratory from randomly selected field samples which are sub-sampled and then analyzed independently using identical analytical methods. The laboratory duplicate sample results reflect any variability introduced during laboratory sample handling and analysis and thus provide a measure of laboratory precision.

Spike Recovery Samples are created in the laboratory by adding a known amount/concentration of a given analyte (or mixture of analytes) to a randomly selected test sample previously divided to create two sub-samples. The spiked and regular sub-samples are then analyzed in an identical manner. The spike recovery represents the difference between the measured spike amount (total amount in spiked sample minus amount in original sample) relative to the known spike amount (as a percentage). Two types of spike recovery samples are commonly analyzed. Spiked blanks are created using laboratory control materials, whereas matrix spikes are created using field-collected samples. The analysis of spiked samples provides an indication of the accuracy of analytical results.

Certified Reference Materials are samples containing known chemical concentrations that are processed and analyzed along with batches of environmental samples. The sample results are then compared to target results to provide a measure of analytical accuracy. The results are reported as the percent of the known amount that was recovered in the analysis.

Two additional types of QC, specific to benthic invertebrate community samples, included:

Organism Recovery Checks for benthic invertebrate community samples involve the re-processing of previously sorted material from a randomly selected sample to determine the number of invertebrates that were not recovered during the original sample processing. The reprocessing is conducted by an analyst not involved during the original processing to reduce any bias. This check allows the determination of accuracy through assessment of recovery efficiency.

Sub-Sampling Error is assessed for studies in which benthic invertebrate community samples require sub-sampling (due to excessive sample volume and/or invertebrate density). By comparing the numbers of benthic invertebrates recovered between at least two sub-samples, this measure provides an evaluation of how effective the sub-sampling method was in evenly dividing the original sample. Therefore, sub-sampling error provides a measure of analytical accuracy and precision. The processing of entire benthic invertebrate community samples in representative sample fractions also allows an evaluation of sub-sampling accuracy.

B2 WATER SAMPLES

B2.1 Laboratory Reporting Limits

Laboratory reporting limits (LRLs) that were reported for analysis of water samples were at or below the target concentrations, with the exception of hardness, TSS, aluminum, and calcium in some samples (Appendix Table B.2). The LRLs achieved for aluminum were consistently less than the water quality guideline, and there are no approved guidelines for hardness, TSS, or calcium. Only LRLs for aluminum, copper and zinc (0.005, 0.0005, and 0.003 mg/L respectively) were above or equivalent to the provincial baseline guidance of 0.001, 0.0005, and 0.003, respectively[1]. The low detection limits indicated for aluminum, copper, and zinc apply to water with <1NTU turbidity, which applies to most of the watershed. The LRL for each analyte was, however, below the WQG. The LRLs that were achieved for all substances were suitable for evaluation of observed concentrations relative to guidelines.

B2.2 Laboratory Blank Sample Analysis

Laboratory blank samples all met the DQO, which specified concentrations less than or equal to twice the LRL (Appendix Table B.3). This indicates no inadvertent contamination of samples during laboratory handling and analysis.

B2.3 Data Precision

B2.3.1 Laboratory Duplicate Samples

In general, close agreement was achieved between laboratory duplicate samples indicating reported sample results were associated with excellent analytical precision (Appendix Table B.4(a)). The DQO was met for all samples (Appendix Table B.4(a)).

B2.3.2 Field Duplicate Samples

Eleven sets of field duplicate water samples were collected, which were splits of the same sample. No DQO was established in the RAEMP study design for field split duplicates. The field duplicate samples showed agreement in analyte concentrations for 92% of comparisons (Appendix Table B.4(b)). Half of the duplicate pairs showing RPDs greater than 20% were associated with analysis of total kjeldahl nitrogen and nitrite. Most instances in which RPDs

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ENV. 2016. Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators. Prepared by the British Columbia Ministry of Environment. June. [1]

were greater than 20%, concentrations were very low (near or less than LRL). Good agreement was achieved between field duplicate samples for selenium. Overall, the data suggest that reported results were reasonably precise representations of conditions at the time of sampling.

B2.4 Data Accuracy

B2.4.1 Blank Spike Recovery Samples

Laboratory blank samples all met the DQO, which specified concentrations less than or equal to twice the LRL (Appendix Table B.3). This indicates no inadvertent contamination of samples during laboratory handling and analysis.

B2.4.2 Matrix Spike Recovery Samples

Analyte recoveries for matrix spike recoveries samples met the DQO in all instances (Appendix Table B.6), indicating excellent analytical accuracy associated with the analysis of water samples.

B2.4.3 Certified Reference Materials

Reference material recoveries were all reported within the target range except for five samples of iron (Appendix Table B.7), one sample of phosphorus and one sample of antimony. In all cases the target range was exceeded by no more than 1% at the upper limit of the DQO for recovery, indicating excellent analytical accuracy.

B3 SEDIMENT SAMPLES

B3.1 Method Detection Limits

LRLs reported by the laboratory were greater than the target LRL for some analytes, but were consistently less than the lower sediment quality guidelines of BCMOE (Appendix Table B.8). Therefore the LRLs were suitable for evaluation of observed concentrations in sediment samples relative to guidelines.

B3.2 Laboratory Blank Sample Analysis

Results for laboratory blanks analyzed concurrent with sediment samples were all less than the DQO (i.e., twice the LRL) (Appendix Table B.9). This indicates no inadvertent contamination of samples during laboratory handling and analysis.

B3.3 Data Precision

B3.3.1 Laboratory Duplicate Samples

The DQO was met for all metals measured in laboratory duplicate sediment samples, indicating excellent analytical precision for those analytes (Appendix Table B.10). The few cases in which particle size fractions did not meet the DQO when fractions comprised a small proportion of the overall sediment sample and absolute differences between samples were small (Appendix Table B.11). All but three PAH results associated with a single set of duplicates met the DQO, and those three cases only slightly exceeded DQO (Appendix Table B.11) Overall, there was good agreement between laboratory duplicate samples indicating reported sample results were associated with satisfactory analytical precision.

B3.3.2 Field Duplicate Samples

There was good agreement between field split-sample duplicate results for sediment, with 94% of comparisons meeting the DQO (Appendix Table B.12). Some PAHs exceeded the DQO in 3 of 11 sets duplicates and some metals exceeded in one set of duplicates. These results may reflect somewhat incomplete homogenization of the sample in the field prior to splitting. Overall, the data suggest that reported results were reasonably precise representations of conditions at the time of sampling.

B3.4 Data Accuracy

B3.4.1 Certified Reference Materials

Recoveries of metals from certified reference samples consistently met the DQO, except in some cases for boron and tin, which were present at low or non-detectable concentrations

(Appendix Table B.13). Recoveries were also good for particle size analyses, except for sand fractions comprising a small proportion of the overall sediment sample for which absolute differences in 170 comparisons (Table B.14). In the 9% of instances in which the recovery targets were not met, all recoveries were at least 61%, compared to the minimum DQO of 70% recovery. Overall, the data indicated satisfactory analytical accuracy associated with sediment samples.

B4 TISSUE CHEMISTRY

B4.1 Periphyton and Benthic Invertebrates

Selenium concentrations were determined for periphyton and benthic invertebrate samples by standard comparison using certified single-element selenium standards traceable to the U.S. National Institutes of Standards and Technology (NIST). Recoveries associated with analyses for periphyton and benthic invertebrate samples were within the DQO range of 70% and 130% (Tables B.15 and B.16)

B4.2 Fish

B4.2.1 Method Detection Limits

Laboratory LRLs associated with fish tissue analysis are shown in Appendix Table B.17. The LRLs for elements measured in fish tissue samples were variable, but were low enough to quantify tissue concentrations for most analytes, except beryllium, boron, cadmium, rhenium, thorium, and yttrium, whereas tissue concentrations of selenium were the main focus of this study (Appendix Table B.17). Element concentrations were generally lower in muscle than egg/ovary samples, so concentrations of silver, bismuth and tin were also frequently less than detection limits in fish muscle.

B4.2.2 Data Precision

Duplicate digestions of muscle samples were prepared and analyzed for four muscle samples (Appendix Table B.18) and five ovary samples (Appendix Table B.19). The DQO was met for 70% and 89% of analytes measured among muscle and ovary duplicate analyses. Duplicate tissue analyses for selenium consistently met the DQO and showed very low RPD of ≤ 6%. Results for other analytes were variable and should be taken into account for uses of the data outside of this study.

B4.2.3 Data Accuracy

Matrix spikes using approximately 3 ppm of two multi-element solutions (together containing many, but not all, analytes) were performed concurrent with analysis of MW muscle and ovary samples (Appendix Table B.20). Given the impracticality of splitting the very small WCT muscle plug samples, no matrix spikes were prepared/analyzed for those samples. Recoveries met the DQO for 90% of analytes yielding a quantifiable result. The spike for selenium was too small relative to the sample concentrations to allow for evaluation of analytical accuracy by this method.

Accuracy of elemental concentration data was also determined by comparing achieved values to either a range (mean ± standard deviation) of literature values or a percent recovery associated with three different certified reference materials - NIST SRM 1577 (bovine liver), NIST SRM 1566b (oyster tissue) and NRC CRM DOLT-4 (dogfish liver) (Appendix Table B.21). Selenium recoveries from certified reference materials met the DQO in eight of nine analyses, and the single exception was only slightly greater than the target value (135%).

Overall, results for analysis of matrix spikes and certified reference materials indicated acceptable analytical accuracy for fish tissue samples, particularly for selenium which is the substance of most relevance to the objectives of this study.

B5 BENTHIC COMMUNITY SAMPLES

The analysis of benthic invertebrate community samples involved concurrent assessment of data quality, including sub-sampling accuracy, precision and percent recovery of organisms. Canadian Aquatic Biomonitoring Network (CABIN) protocols were followed for sub-sampling (i.e., identification of a minimum 300 invertebrates), which often resulted in only 5% of a sample being assessed. Despite this, accuracy and recovery were very good, and generally met (or only slightly exceeded) the corresponding DQOs).

To measure the effectiveness of the sorters, 10% of samples were selected at random for re-sorting analysis by a different sorter from the original sorter. All of the re-sorted samples were above 95% efficiency of invertebrate removal and achieved industry standards (20% of total organism count). Only a single fraction of 5% failed the DQO by 35-40 organisms. This could be due to a piece of debris holding a large number of organisms, and no further action was required to correct sampling.

A detailed report providing discussion related to benthic invertebrate sample processing and QC (prepared by the analytical laboratory, Cordillera Consulting) is included after Appendix Table B.21.

B6 DATA QUALITY STATEMENT

Overall the quality of the data collected for this project was considered acceptable for serving the project objectives.

Table B.1: Data Quality Objectives for Aquatic Ecological Samples in the RAEMP

Quality Control Measure	Quality Control Sample Type/Check	Study Component				
		Water Quality	**Sediment Quality**	**Tissue Quality**	**Benthic Invertebrate Community**	**Fish Morphometrics**
Analytical Laboratory Reporting Limits (LRL)	Comparison actual LRL versus target LRL	LRL for each parameter should be at least as low as applicable guidelines, ideally ≤1/10th guideline valuea	LRL for each parameter should be at least as low as applicable guidelines, ideally ≤1/10th guideline valuea	LRL for each parameter should be at least as low as applicable guidelines, ideally ≤1/10th guideline valuea	n/a	n/a
Blank Analysis	Field or Laboratory Blank	<two-times the laboratory LRL	n/a	n/a	n/a	n/a
Laboratory Precision	Laboratory Duplicates	≤20% RPD	≤35% RPD	≤30% RPD	n/a	n/a
	Organism Sub-Sampling Precision	n/a	n/a	n/a	≤20% difference between sub-samples; minimum of 5% of each sample must be analyzed	n/a
Accuracy	Recovery of Blank Spike	80-120%	75-125%	75-125%	n/a	n/a
	Recovery Matrix Spike	75-125%	75-125%	75-125%	n/a	n/a
	Recovery of Certified Reference Material, QC Standards	85-115%	70-130%	70-130%	n/a	n/a
	Organism Recovery	n/a	n/a	n/a	minimum 90% recovery	n/a
	Organism Sub-Sampling Accuracy	n/a	n/a	n/a	80-120%	n/a
	Instrument Accuracy	n/a	n/a	n/a	n/a	use instruments that provide measurement accuracy of ≤10% for weight (whole organism or tissue) and length

[a] or below predictions, if applicable and no guideline exists for the substance.
[b] RPD - Relative Percent Difference.
n/a - not applicable.

Table B.2: Laboratory Reporting Limits (LRL) Relative to Targets and to Water Quality Guidelines

	Analyte	Units	BCWQG[a]		Target LRL	LRL Achieved						
						Sep-15						
			30-d Chronic	Maximum		L1671863	L1671882	L1671904	L16712373	L1673688	L1674349	L1675282
Non-metals	Hardness (as $CaCO_3$)	mg/L	-	-	0.5	0.5	0.5	0.75	0.75	0.75	0.75	0.75
	Total Suspended Solids (TSS)	mg/L	-	-	3	1.0	2.0	1.0	1.0	1.0	1.0	1.0
	Total Dissolved Solids (TDS)	mg/L			10	10	15	15	15	15	15	15
	Turbidity	NTU			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Alkalinity	mg/L			1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Ammonia (as N)	mg/L	0.298[b]	1.55[b]	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Bromide (Br)	mg/L	-	0.050[c]	0.250	0.05	0.05	0.05	0.05	0.05	0.25	0.25
	Chloride (Cl)	mg/L	150	600	2.5	0.5	0.5	0.5	0.5	0.5	2.5	0.5
	Fluoride (F)	mg/L	-	0.51[d]	0.100	0.02	0.02	0.02	0.02	0.02	0.1	0.1
	Nitrate (as N)	mg/L	3	32.8	0.025	0.005	0.005	0.005	0.005	0.005	0.025	0.025
	Nitrite (as N)	mg/L	0.02	0.06	0.005	0.001	0.001	0.001	0.001	0.001	0.005	0.005
	Total Kjeldahl Nitrogen	mg/L	-	-	0.050	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Orthophosphate	mg/L			0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Phosphorus (P)-Total	mg/L	-	-	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	Sulfate (SO4)	mg/L	-	100	2.5	0.3	0.3	0.3	0.3	0.3	1.5	1.5
	Dissolved Organic Carbon	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Total Organic Carbon	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Metals	Aluminum (Al)-Total	mg/L	0.053	0.13	0.005	0.0030	0.0030	0.0030	0.0150	0.015	0.015	0.015
	Antimony (Sb)-Total	mg/L	-	0.02[c]	0.0005	0.00010	0.00010	0.00010	0.00050	0.0005	0.0005	0.0005
	Arsenic (As)-Total	mg/L	-	0.005	0.0005	0.00010	0.00010	0.00010	0.00050	0.0005	0.0005	0.0005
	Barium (Ba)-Total	mg/L	1	5[c]	0.02	0.000050	0.000050	0.000050	0.000250	0.00025	0.00025	0.00025
	Beryllium (Be)-Total	mg/L	-	0.0053[c]	0.001	0.000020	0.000020	0.000020	0.000100	0.0001	0.0001	0.0001
	Bismuth (Bi)-Total	mg/L	-	-	0.0005	0.000050	0.000050	0.000050	0.000250	0.00025	0.00025	0.00025
	Boron (B)-Total	mg/L	-	1.2	0.1	0.010	0.010	0.010	0.050	0.05	0.05	0.05
	Cadmium (Cd)-Total	mg/L	-	0.0000057[c,d]	0.00001	0.0000050	0.0000050	0.0000050	0.0000250	0.000025	0.000025	0.000025
	Calcium (Ca)-Total	mg/L	-	-	0.1	0.050	0.050	0.050	0.250	0.25	0.25	0.25
	Chromium (Cr)-Total	mg/L	-	0.001[c]	0.001	0.00010	0.00010	0.00010	0.00050	0.0005	0.0005	0.0005
	Cobalt (Co)-Total	mg/L	0.004	0.11	0.0003	0.00010	0.00010	0.00010	0.00050	0.0005	0.0005	0.0005
	Copper (Cu)-Total	mg/L	0.002[d]	0.0032[d]	0.0010	0.00050	0.00050	0.00050	0.00250	0.0025	0.0025	0.0025
	Iron (Fe)-Total	mg/L	-	1	0.03	0.010	0.010	0.010	0.050	0.05	0.05	0.05
	Lead (Pb)-Total	mg/L	0.00354[d]	0.00596[d]	0.0005	0.000050	0.000050	0.000050	0.000250	0.00025	0.00025	0.00025
	Lithium (Li)-Total	mg/L	0.014[c]	0.870	0.005	0.0010	0.0010	0.0010	0.0050	0.005	0.005	0.005
	Magnesium (Mg)-Total	mg/L	-	-	0.1	0.10	0.10	0.10	0.10	0.1	0.1	0.1
	Manganese (Mn)-Total	mg/L	0.66	0.68	0.0003	0.00010	0.00010	0.00010	0.00050	0.00050	0.0005	0.0005
	Mercury (Hg) - Total	mg/L	-	-	0.00001	0.0000050	0.0000050	0.0000050	0.0000050	0.00001	0.000005	0.000005
	Molybdenum (Mo)-Total	mg/L	1	2	0.0010	0.000050	0.000050	0.000050	0.000250	0.00025	0.00025	0.00025
	Nickel (Ni)-Total	mg/L	-	0.025[c,d]	0.001	0.00050	0.00050	0.00050	0.00250	0.0025	0.0025	0.0025
	Phosphorus (P)-Total	mg/L	-	-	-	0.050	0.050	0.050	0.250	0.25	0.25	0.25
	Potassium (K)-Total	mg/L	-	373 - 432[c,e]	2	0.10	0.10	0.10	0.25	0.25	0.25	0.25
	Selenium (Se)-Total	mg/L	-	0.002	0.0001	0.000050	0.000050	0.000050	0.000250	0.00025	0.00025	0.00025
	Silicon (Si)-Total	mg/L	-	-	-	0.050	0.050	0.050	0.050	0.05	0.05	0.05
	Silver (Ag)-Total	mg/L	0.00005[d]	0.00010[d]	0.00002	0.000010	0.000010	0.000010	0.000050	0.00005	0.00005	0.00005
	Sodium (Na)-Total	mg/L	-	-	2	0.050	0.050	0.050	0.250	0.25	0.25	0.25
	Strontium (Sr)-Total	mg/L	-	-	0.002	0.00020	0.00020	0.00020	0.00100	0.001	0.001	0.001
	Sulfur (S) - Total	mg/L				1.0	1.0	1.0	1.0	1	1	1
	Thallium (Tl)-Total	mg/L	0.0008[c]		0.0002	0.000010	0.000010	0.000010	0.000050	0.00005	0.00005	0.00005
	Tin (Sn)-Total	mg/L	-	-	0.0005	0.00010	0.00010	0.00010	0.00050	0.0005	0.0005	0.0005
	Titanium (Ti)-Total	mg/L	-	2/4.6[c,f]	0.01	0.00030	0.00030	0.00030	0.00150	0.0015	0.0015	0.0015
	Uranium (U)-Total	mg/L	-	3[c]	0.0002	0.000010	0.000010	0.000010	0.000050	0.00005	0.00005	0.00005
	Vanadium (V)-Total	mg/L	-	0.006[c]	0.001	0.00050	0.00050	0.00050	0.00250	0.0025	0.0025	0.0025
	Zinc (Zn)-Total	mg/L	0.0075[d]	0.033[d]	0.005	0.0030	0.0030	0.0030	0.0150	0.015	0.015	0.015

Note: Any highlighted values indicate LRLs that were above the target.

[a] BC MOE (British Columbia Ministry of Environment). 2006. British Columbia Approved Water Quality Guidelines (Criteria)

[b] Based on lowest guideline using highest temperature and pH

[c] Working guideline

[d] Based on lowest guideline using lowest hardness

[e] Guideline based on threshold for Daphnia magna immobilization. Used lowest level in range

[f] Guidelines based on median threshold level of *Scenedesmus/Daphnia.* Used lowest level between given threshold levels

Table B.2: Laboratory Reporting Limits (LRL) Relative to Targets and to Water Quality Guidelines

	Analyte	Units	BCWQG[a]		Target LRL	LRL Achieved						
			30-d Chronic	Maximum		Sep-15			Aug-15			
						L1675621	L1676104	L1677598	L1654188	L1654831	L1655272	L1656408
Non-metals	Hardness (as $CaCO_3$)	mg/L	-	-	0.5	0.75	0.75	0.5	0.5	0.5	0.5	0.5
	Total Suspended Solids (TSS)	mg/L	-	-	3	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Total Dissolved Solids (TDS)	mg/L			10	15	10	15	15	15	15	15
	Turbidity	NTU			0.1	0.1	0.1	0.1	0.1	n/a	0.1	0.1
	Alkalinity	mg/L			1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Ammonia (as N)	mg/L	0.298[b]	1.55[b]	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Bromide (Br)	mg/L	-	0.050[c]	0.250	0.05	0.25	0.05	0.05	0.05	0.05	0.05
	Chloride (Cl)	mg/L	150	600	2.5	0.02	0.5	0.5	0.5	0.5	0.5	0.5
	Fluoride (F)	mg/L	-	0.51[d]	0.100	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	Nitrate (as N)	mg/L	3	32.8	0.025	0.025	0.005	0.005	0.005	n/a	0.005	0.005
	Nitrite (as N)	mg/L	0.02	0.06	0.005	0.005	0.001	0.001	0.001	n/a	0.001	0.001
	Total Kjeldahl Nitrogen	mg/L	-	-	0.050	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Orthophosphate	mg/L			0.001	0.001	0.001	0.001	0.001	n/a	0.001	0.001
	Phosphorus (P)-Total	mg/L	-	-	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	Sulfate (SO4)	mg/L	-	100	2.5	1.5	0.3	0.3	0.3	0.3	0.3	0.3
	Dissolved Organic Carbon	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Total Organic Carbon	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Metals	Aluminum (Al)-Total	mg/L	0.053	0.13	0.005	0.015	0.015	0.003	0.003	0.003	0.003	0.003
	Antimony (Sb)-Total	mg/L	-	0.02[c]	0.0005	0.0005	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001
	Arsenic (As)-Total	mg/L	-	0.005	0.0005	0.0005	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001
	Barium (Ba)-Total	mg/L	1	5[c]	0.02	0.00025	0.00025	0.00005	0.00005	0.00005	0.00005	0.00005
	Beryllium (Be)-Total	mg/L	-	0.0053[c]	0.001	0.0001	0.0001	0.00002	0.00002	0.00002	0.00002	0.00002
	Bismuth (Bi)-Total	mg/L	-	-	0.0005	0.00025	0.00025	0.00005	0.00005	0.00005	0.00005	0.00005
	Boron (B)-Total	mg/L	-	1.2	0.1	0.05	0.05	0.01	0.01	0.01	0.01	0.01
	Cadmium (Cd)-Total	mg/L	-	0.0000057[c,d]	0.00001	0.000025	0.000025	0.000005	0.000005	0.000005	0.000005	0.000005
	Calcium (Ca)-Total	mg/L	-	-	0.1	0.25	0.25	0.05	0.05	0.05	0.05	0.05
	Chromium (Cr)-Total	mg/L	-	0.001[c]	0.001	0.0005	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001
	Cobalt (Co)-Total	mg/L	0.004	0.11	0.0003	0.0005	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001
	Copper (Cu)-Total	mg/L	0.002[d]	0.0032[d]	0.0010	0.0025	0.0025	0.0005	0.0005	0.0005	0.0005	0.0005
	Iron (Fe)-Total	mg/L	-	1	0.03	0.05	0.05	0.01	0.01	0.01	0.01	0.01
	Lead (Pb)-Total	mg/L	0.00354[d]	0.00596[d]	0.0005	0.00025	0.00025	0.00005	0.00005	0.00005	0.00005	0.00005
	Lithium (Li)-Total	mg/L	0.014[c]	0.870	0.005	0.005	0.005	0.001	0.001	0.001	0.001	0.001
	Magnesium (Mg)-Total	mg/L	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Manganese (Mn)-Total	mg/L	0.66	0.68	0.0003	0.0005	0.0005	0.0001	0.00010	0.00010	0.00010	0.0001
	Mercury (Hg) - Total	mg/L	-	-	0.00001	0.000005	0.000005	0.000005	0.00001	0.00001	0.00001	0.000005
	Molybdenum (Mo)-Total	mg/L	1	2	0.0010	0.00025	0.00025	0.00005	0.00005	0.00005	0.00005	0.00005
	Nickel (Ni)-Total	mg/L	-	0.025[c,d]	0.001	0.0025	0.0025	0.0005	0.0005	0.0005	0.0005	0.0005
	Phosphorus (P)-Total	mg/L	-	-	-	0.25	0.25	0.05	0.05	0.05	0.05	0.05
	Potassium (K)-Total	mg/L	-	373 - 432[c,e]	2	0.25	0.25	0.1	0.1	0.1	0.1	0.1
	Selenium (Se)-Total	mg/L	-	0.002	0.0001	0.00025	0.00025	0.00005	0.00005	0.00005	0.00005	0.00005
	Silicon (Si)-Total	mg/L	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Silver (Ag)-Total	mg/L	0.00005[d]	0.00010[d]	0.00002	0.00005	0.00005	0.00001	0.00001	0.00001	0.00001	0.00001
	Sodium (Na)-Total	mg/L	-	-	2	0.25	0.25	0.05	0.05	0.05	0.05	0.05
	Strontium (Sr)-Total	mg/L	-	-	0.002	0.001	0.001	0.0002	0.0002	0.0002	0.0002	0.0002
	Sulfur (S) - Total	mg/L				1	1	1	1	1	1	1
	Thallium (Tl)-Total	mg/L	0.0008[c]		0.0002	0.00005	0.00005	0.00001	0.00001	0.00001	0.00001	0.00001
	Tin (Sn)-Total	mg/L	-	-	0.0005	0.0005	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001
	Titanium (Ti)-Total	mg/L	-	2/4.6[c,f]	0.01	0.0015	0.0015	0.0003	0.0003	0.0003	0.0003	0.0003
	Uranium (U)-Total	mg/L	-	3[c]	0.0002	0.00005	0.00005	0.00001	0.00001	0.00001	0.00001	0.00001
	Vanadium (V)-Total	mg/L	-	0.006[c]	0.001	0.0025	0.0025	0.0005	0.0005	0.0005	0.0005	0.0005
	Zinc (Zn)-Total	mg/L	0.0075[d]	0.033[d]	0.005	0.015	0.015	0.003	0.003	0.003	0.003	0.003

Note: Any highlighted values indicate LRLs that were above the target.

[a] BC MOE (British Columbia Ministry of Environment). 2006. British Columbia Approved Water Quality Guidelines (Criteria)

[b] Based on lowest guideline using highest temperature and pH

[c] Working guideline

[d] Based on lowest guideline using lowest hardness

[e] Guideline based on threshold for Daphnia magna immobilization. Used lowest level in range

[f] Guidelines based on median threshold level of *Scenedesmus/Daphnia.* Used lowest level between given threshold levels

Table B.2: Laboratory Reporting Limits (LRL) Relative to Targets and to Water Quality Guidelines

	Analyte	Units	BCWQG[a]		Target LRL	LRL Achieved					
			30-d Chronic	Maximum		Aug-15		May-15			
						L1657243	L1658246	L1611906-1	L1611906-2	L1611906-3	L1611906-4
Non-metals	Hardness (as $CaCO_3$)	mg/L	-	-	0.5	0.5	0.75	0.5	0.5	0.5	0.5
	Total Suspended Solids (TSS)	mg/L	-	-	3	1.0	1.0	1.0	1.0	1.0	1.0
	Total Dissolved Solids (TDS)	mg/L			10	15	15	15	15	15	15
	Turbidity	NTU			0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Alkalinity	mg/L			1	1.00	1.00	1.00	1.00	1.00	1.00
	Ammonia (as N)	mg/L	0.298[b]	1.55[b]	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Bromide (Br)	mg/L	-	0.050[c]	0.250	0.05	0.05	0.05	0.05	0.05	0.05
	Chloride (Cl)	mg/L	150	600	2.5	0.5	0.5	0.5	0.5	0.5	0.5
	Fluoride (F)	mg/L	-	0.51[d]	0.100	0.02	0.02	0.02	0.02	0.02	0.02
	Nitrate (as N)	mg/L	3	32.8	0.025	0.005	0.005	0.005	0.005	0.005	0.005
	Nitrite (as N)	mg/L	0.02	0.06	0.005	0.001	0.001	0.001	0.001	0.001	0.001
	Total Kjeldahl Nitrogen	mg/L	-	-	0.050	0.05	0.05	0.05	0.05	0.05	0.05
	Orthophosphate	mg/L			0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Phosphorus (P)-Total	mg/L	-	-	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	Sulfate (SO4)	mg/L	-	100	2.5	0.3	0.3	0.3	0.3	0.3	0.3
	Dissolved Organic Carbon	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Total Organic Carbon	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Metals	Aluminum (Al)-Total	mg/L	0.053	0.13	0.005	0.003	0.015	0.003	0.003	0.003	0.0030
	Antimony (Sb)-Total	mg/L	-	0.02[c]	0.0005	0.0001	0.0005	0.0001	0.0001	0.0001	0.00010
	Arsenic (As)-Total	mg/L	-	0.005	0.0005	0.0001	0.0005	0.0001	0.0001	0.0001	0.00010
	Barium (Ba)-Total	mg/L	1	5[c]	0.02	0.00005	0.00025	0.00005	0.00005	0.00005	0.000050
	Beryllium (Be)-Total	mg/L	-	0.0053[c]	0.001	0.00002	0.0001	0.00002	0.00002	0.00002	0.000020
	Bismuth (Bi)-Total	mg/L	-	-	0.0005	0.00005	0.00025	0.00005	0.00005	0.00005	0.000050
	Boron (B)-Total	mg/L	-	1.2	0.1	0.01	0.05	0.01	0.01	0.01	0.010
	Cadmium (Cd)-Total	mg/L	-	0.0000057[c,d]	0.00001	0.000005	0.000025	0.000005	0.000005	0.000005	0.0000050
	Calcium (Ca)-Total	mg/L	-	-	0.1	0.05	0.25	0.05	0.05	0.05	0.050
	Chromium (Cr)-Total	mg/L	-	0.001[c]	0.001	0.0001	0.0005	0.0001	0.0001	0.0001	0.00010
	Cobalt (Co)-Total	mg/L	0.004	0.11	0.0003	0.0001	0.0005	0.0001	0.0001	0.0001	0.00010
	Copper (Cu)-Total	mg/L	0.002[d]	0.0032[d]	0.0010	0.0005	0.0025	0.0005	0.0005	0.0005	0.00050
	Iron (Fe)-Total	mg/L	-	1	0.03	0.01	0.05	0.01	0.01	0.01	0.010
	Lead (Pb)-Total	mg/L	0.00354[d]	0.00596[d]	0.0005	0.00005	0.00025	0.00005	0.00005	0.00005	0.000050
	Lithium (Li)-Total	mg/L	0.014[c]	0.870	0.005	0.001	0.005	0.001	0.001	0.001	0.0010
	Magnesium (Mg)-Total	mg/L	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.10
	Manganese (Mn)-Total	mg/L	0.66	0.68	0.0003	0.00010	0.00050	0.00010	0.00010	0.00010	0.00010
	Mercury (Hg) - Total	mg/L	-	-	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.0000050
	Molybdenum (Mo)-Total	mg/L	1	2	0.0010	0.00005	0.00025	0.00005	0.00005	0.00005	0.000050
	Nickel (Ni)-Total	mg/L	-	0.025[c,d]	0.001	0.0005	0.0025	0.0005	0.0005	0.0005	0.00050
	Phosphorus (P)-Total	mg/L	-	-	-	0.05	0.25	0.05	0.05	0.05	0.050
	Potassium (K)-Total	mg/L	-	373 - 432[c,e]	2	0.1	0.25	0.1	0.1	0.1	0.10
	Selenium (Se)-Total	mg/L	-	0.002	0.0001	0.00005	0.00025	0.000050	0.00005	0.00005	0.000050
	Silicon (Si)-Total	mg/L	-	-	-	0.05	0.05	0.050	0.05	0.05	0.050
	Silver (Ag)-Total	mg/L	0.00005[d]	0.00010[d]	0.00002	0.00001	0.00005	0.000010	0.00001	0.00001	0.000010
	Sodium (Na)-Total	mg/L	-	-	2	0.05	0.25	0.050	0.05	0.05	0.050
	Strontium (Sr)-Total	mg/L	-	-	0.002	0.0002	0.001	0.00020	0.0002	0.0002	0.00020
	Sulfur (S) - Total	mg/L				1	1	0.50	0.5	0.5	0.5
	Thallium (Tl)-Total	mg/L	0.0008[c]		0.0002	0.00001	0.00005	0.000010	0.00001	0.00001	0.000010
	Tin (Sn)-Total	mg/L	-	-	0.0005	0.0001	0.0005	0.00010	0.0001	0.0001	0.00010
	Titanium (Ti)-Total	mg/L	-	2/4.6[c,f]	0.01	0.0003	0.0015	0.00030	0.0003	0.0003	0.00030
	Uranium (U)-Total	mg/L	-	3[c]	0.0002	0.00001	0.00005	0.000010	0.00001	0.00001	0.000010
	Vanadium (V)-Total	mg/L	-	0.006[c]	0.001	0.0005	0.0025	0.00050	0.0005	0.0005	0.00050
	Zinc (Zn)-Total	mg/L	0.0075[d]	0.033[d]	0.005	0.003	0.015	0.0030	0.003	0.003	0.0030

Note: Any highlighted values indicate LRLs that were above the target.

[a] BC MOE (British Columbia Ministry of Environment). 2006. British Columbia Approved Water Quality Guidelines (Criteria)

[b] Based on lowest guideline using highest temperature and pH

[c] Working guideline

[d] Based on lowest guideline using lowest hardness

[e] Guideline based on threshold for Daphnia magna immobilization. Used lowest level in range

[f] Guidelines based on median threshold level of *Scenedesmus/Daphnia.* Used lowest level between given threshold levels

Table B.2: Laboratory Reporting Limits (LRL) Relative to Targets and to Water Quality Guidelines

	Analyte	Units	BCWQG[a]		Target LRL	LRL Achieved					
						May-15					
			30-d Chronic	Maximum		L1611906-5	L1612928-1	L1612928-2	L1612928-3	L1612928-4	L1612928-5
Non-metals	Hardness (as $CaCO_3$)	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Total Suspended Solids (TSS)	mg/L	-	-	3	1.0	1.0	1.0	1.0	1.0	1.0
	Total Dissolved Solids (TDS)	mg/L			10	15	15	15	15	15	15
	Turbidity	NTU			0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Alkalinity	mg/L			1	1.00	1.00	1.00	1.00	1.00	1.00
	Ammonia (as N)	mg/L	0.298[b]	1.55[b]	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Bromide (Br)	mg/L	-	0.050[c]	0.250	0.05	0.05	0.05	0.05	0.1	0.1
	Chloride (Cl)	mg/L	150	600	2.5	0.5	0.5	0.5	0.5	0.5	0.5
	Fluoride (F)	mg/L	-	0.51[d]	0.100	0.02	0.02	0.02	0.02	0.01	0.04
	Nitrate (as N)	mg/L	3	32.8	0.025	0.005	0.005	0.005	0.005	0.01	0.01
	Nitrite (as N)	mg/L	0.02	0.06	0.005	0.001	0.001	0.001	0.001	0.001	0.001
	Total Kjeldahl Nitrogen	mg/L	-	-	0.050	0.05	0.05	0.05	0.05	0.05	0.05
	Orthophosphate	mg/L			0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Phosphorus (P)-Total	mg/L	-	-	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	Sulfate (SO4)	mg/L	-	100	2.5	0.3	0.3	0.3	0.3	0.3	0.3
	Dissolved Organic Carbon	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Total Organic Carbon	mg/L	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Metals	Aluminum (Al)-Total	mg/L	0.053	0.13	0.005	0.003	0.003	0.003	0.003	0.0030	0.003
	Antimony (Sb)-Total	mg/L	-	0.02[c]	0.0005	0.0001	0.0001	0.0001	0.0001	0.00010	0.0001
	Arsenic (As)-Total	mg/L	-	0.005	0.0005	0.0001	0.0001	0.0001	0.0001	0.00010	0.0001
	Barium (Ba)-Total	mg/L	1	5[c]	0.02	0.00005	0.00005	0.00005	0.00005	0.000050	0.00005
	Beryllium (Be)-Total	mg/L	-	0.0053[c]	0.001	0.00002	0.00002	0.00002	0.00002	0.000020	0.00002
	Bismuth (Bi)-Total	mg/L	-	-	0.0005	0.00005	0.00005	0.00005	0.00005	0.000050	0.00005
	Boron (B)-Total	mg/L	-	1.2	0.1	0.01	0.01	0.01	0.01	0.010	0.01
	Cadmium (Cd)-Total	mg/L	-	0.0000057[c,d]	0.00001	0.000005	0.000005	0.000005	0.000005	0.0000050	0.000005
	Calcium (Ca)-Total	mg/L	-	-	0.1	0.05	0.05	0.05	0.05	0.050	0.05
	Chromium (Cr)-Total	mg/L	-	0.001[c]	0.001	0.0001	0.0001	0.0001	0.0001	0.00010	0.0001
	Cobalt (Co)-Total	mg/L	0.004	0.11	0.0003	0.0001	0.0001	0.0001	0.0001	0.00010	0.0001
	Copper (Cu)-Total	mg/L	0.002[d]	0.0032[d]	0.0010	0.0005	0.0005	0.0005	0.0005	0.00050	0.0005
	Iron (Fe)-Total	mg/L	-	1	0.03	0.01	0.01	0.01	0.01	0.010	0.01
	Lead (Pb)-Total	mg/L	0.00354[d]	0.00596[d]	0.0005	0.00005	0.00005	0.00005	0.00005	0.000050	0.00005
	Lithium (Li)-Total	mg/L	0.014[c]	0.870	0.005	0.001	0.001	0.001	0.001	0.0010	0.001
	Magnesium (Mg)-Total	mg/L	-	-	0.1	0.1	0.1	0.1	0.1	0.10	0.1
	Manganese (Mn)-Total	mg/L	0.66	0.68	0.0003	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
	Mercury (Hg) - Total	mg/L	-	-	0.00001	0.00001	0.00001	0.00001	0.00001	0.0000050	0.00001
	Molybdenum (Mo)-Total	mg/L	1	2	0.0010	0.00005	0.00005	0.00005	0.00005	0.000050	0.00005
	Nickel (Ni)-Total	mg/L	-	0.025[c,d]	0.001	0.0005	0.0005	0.0005	0.0005	0.00050	0.0005
	Phosphorus (P)-Total	mg/L	-	-	-	0.05	0.05	0.05	0.05	0.050	0.05
	Potassium (K)-Total	mg/L	-	373 - 432[c,e]	2	0.1	0.1	0.1	0.1	0.10	0.1
	Selenium (Se)-Total	mg/L	-	0.002	0.0001	0.00005	0.000050	0.00005	0.00005	0.000050	0.00005
	Silicon (Si)-Total	mg/L	-	-	-	0.05	0.050	0.05	0.05	0.050	0.05
	Silver (Ag)-Total	mg/L	0.00005[d]	0.00010[d]	0.00002	0.00001	0.000010	0.00001	0.00001	0.000010	0.00001
	Sodium (Na)-Total	mg/L	-	-	2	0.05	0.050	0.05	0.05	0.050	0.05
	Strontium (Sr)-Total	mg/L	-	-	0.002	0.0002	0.00020	0.0002	0.0002	0.00020	0.0002
	Sulfur (S) - Total	mg/L				0.5	0.50	0.5	0.5	0.5	0.5
	Thallium (Tl)-Total	mg/L	0.0008[c]		0.0002	0.00001	0.000010	0.00001	0.00001	0.000010	0.00001
	Tin (Sn)-Total	mg/L	-	-	0.0005	0.0001	0.00010	0.0001	0.0001	0.00010	0.0001
	Titanium (Ti)-Total	mg/L	-	2/4.6[c,f]	0.01	0.0003	0.00030	0.0003	0.0003	0.00120	0.0012
	Uranium (U)-Total	mg/L	-	3[c]	0.0002	0.00001	0.000010	0.00001	0.00001	0.000010	0.00001
	Vanadium (V)-Total	mg/L	-	0.006[c]	0.001	0.0005	0.00050	0.0005	0.0005	0.00050	0.0005
	Zinc (Zn)-Total	mg/L	0.0075[d]	0.033[d]	0.005	0.003	0.0030	0.003	0.003	0.0030	0.003

Note: Any highlighted values indicate LRLs that were above the target.

[a] BC MOE (British Columbia Ministry of Environment). 2006. British Columbia Approved Water Quality Guidelines (Criteria)

[b] Based on lowest guideline using highest temperature and pH

[c] Working guideline

[d] Based on lowest guideline using lowest hardness

[e] Guideline based on threshold for Daphnia magna immobilization. Used lowest level in range

[f] Guidelines based on median threshold level of *Scenedesmus/Daphnia.* Used lowest level between given threshold levels

Table B.2: Laboratory Reporting Limits (LRL) Relative to Targets and to Water Quality Guidelines

	Analyte	Units	BCWQG[a]		Target LRL	LRL Achieved	
						May-15	
			30-d Chronic	Maximum		L1612928-6	L1612928-7
Non-metals	Hardness (as $CaCO_3$)	mg/L	-	-	0.5	0.5	0.5
	Total Suspended Solids (TSS)	mg/L	-	-	3	1.0	1.0
	Total Dissolved Solids (TDS)	mg/L			10	15	15
	Turbidity	NTU			0.1	0.1	0.1
	Alkalinity	mg/L			1	1.00	1.00
	Ammonia (as N)	mg/L	0.298[b]	1.55[b]	0.005	0.005	0.005
	Bromide (Br)	mg/L	-	0.050[c]	0.250	0.05	0.1
	Chloride (Cl)	mg/L	150	600	2.5	0.5	0.5
	Fluoride (F)	mg/L	-	0.51[d]	0.100	0.02	0.04
	Nitrate (as N)	mg/L	3	32.8	0.025	0.005	0.01
	Nitrite (as N)	mg/L	0.02	0.06	0.005	0.001	0.001
	Total Kjeldahl Nitrogen	mg/L	-	-	0.050	0.05	0.05
	Orthophosphate	mg/L			0.001	0.001	0.001
	Phosphorus (P)-Total	mg/L	-	-	0.002	0.002	0.002
	Sulfate (SO4)	mg/L	-	100	2.5	0.3	0.3
	Dissolved Organic Carbon	mg/L	-	-	0.5	0.5	0.5
	Total Organic Carbon	mg/L	-	-	0.5	0.5	0.5
Total Metals	Aluminum (Al)-Total	mg/L	0.053	0.13	0.005	0.003	0.003
	Antimony (Sb)-Total	mg/L	-	0.02[c]	0.0005	0.0001	0.0001
	Arsenic (As)-Total	mg/L	-	0.005	0.0005	0.0001	0.0001
	Barium (Ba)-Total	mg/L	1	5[c]	0.02	0.00005	0.00005
	Beryllium (Be)-Total	mg/L	-	0.0053[c]	0.001	0.00002	0.00002
	Bismuth (Bi)-Total	mg/L	-	-	0.0005	0.00005	0.00005
	Boron (B)-Total	mg/L	-	1.2	0.1	0.01	0.01
	Cadmium (Cd)-Total	mg/L	-	0.0000057[c,d]	0.00001	0.000005	0.000005
	Calcium (Ca)-Total	mg/L	-	-	0.1	0.05	0.05
	Chromium (Cr)-Total	mg/L	-	0.001[c]	0.001	0.0001	0.0001
	Cobalt (Co)-Total	mg/L	0.004	0.11	0.0003	0.0001	0.0001
	Copper (Cu)-Total	mg/L	0.002[d]	0.0032[d]	0.0010	0.0005	0.0005
	Iron (Fe)-Total	mg/L	-	1	0.03	0.01	0.01
	Lead (Pb)-Total	mg/L	0.00354[d]	0.00596[d]	0.0005	0.00005	0.00005
	Lithium (Li)-Total	mg/L	0.014[c]	0.870	0.005	0.001	0.001
	Magnesium (Mg)-Total	mg/L	-	-	0.1	0.1	0.1
	Manganese (Mn)-Total	mg/L	0.66	0.68	0.0003	0.00010	0.00010
	Mercury (Hg) - Total	mg/L	-	-	0.00001	0.00001	0.00001
	Molybdenum (Mo)-Total	mg/L	1	2	0.0010	0.00005	0.00005
	Nickel (Ni)-Total	mg/L	-	0.025[c,d]	0.001	0.0005	0.0005
	Phosphorus (P)-Total	mg/L	-	-	-	0.05	0.05
	Potassium (K)-Total	mg/L	-	373 - 432[c,e]	2	0.1	0.1
	Selenium (Se)-Total	mg/L	-	0.002	0.0001	0.00005	0.00005
	Silicon (Si)-Total	mg/L	-	-	-	0.05	0.05
	Silver (Ag)-Total	mg/L	0.00005[d]	0.00010[d]	0.00002	0.00001	0.00001
	Sodium (Na)-Total	mg/L	-	-	2	0.05	0.05
	Strontium (Sr)-Total	mg/L	-	-	0.002	0.0002	0.0002
	Sulfur (S) - Total	mg/L				0.5	0.5
	Thallium (Tl)-Total	mg/L	0.0008[c]		0.0002	0.00001	0.00001
	Tin (Sn)-Total	mg/L	-	-	0.0005	0.0001	0.0001
	Titanium (Ti)-Total	mg/L	-	2/4.6[c,f]	0.01	0.0003	0.0012
	Uranium (U)-Total	mg/L	-	3[c]	0.0002	0.00001	0.00001
	Vanadium (V)-Total	mg/L	-	0.006[c]	0.001	0.0005	0.0005
	Zinc (Zn)-Total	mg/L	0.0075[d]	0.033[d]	0.005	0.003	0.003

Note: Any highlighted values indicate LRLs that were above the target.

[a] BC MOE (British Columbia Ministry of Environment). 2006. British Columbia Approved Water Quality Guidelines (Criteria)

[b] Based on lowest guideline using highest temperature and pH

[c] Working guideline

[d] Based on lowest guideline using lowest hardness

[e] Guideline based on threshold for Daphnia magna immobilization. Used lowest level in range

[f] Guidelines based on median threshold level of *Scenedesmus/Daphnia.* Used lowest level between given threshold levels

Table B.3: Laboratory Blank Results Associated with Analysis of Water Samples

	Analyte	Units	Sep-15																	
			L1671863			L1671882			L1671904			L1672373			L1673688			L1674349		
			LRL	Total # of MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result
Non-metals	Total Suspended Solids (TSS)	mg/L	1.0	2	< 1.0	2.0	1	< 1.0	1.0	2	< 1.0	1.0	2	< 1.0	1.0	2	< 1.0	1.0	1	< 1.0
	Total Dissolved Solids (TDS)	mg/L	10	2	<3	15	2	<3.0	15	2	<3.0	15	2	<3.0	15	2	<3	15	3	<3
	Turbidity	NTU	0.1	2	<0.1	0.1	2	<0.1	0.1	2	<0.1	0.1	2	<0.1	0.1	2	<0.1	0.1	1	<0.1
	Alkalinity	mg/L	1.00	1	<1	1.00	1	<1.0	1.00	2	<1, 2	1.00	na	na	1.00	1	<1.0	1.00	1	<1.0
	Ammonia (as N)	mg/L	0.005	11	< 0.0050	0.005	5	< 0.0050	0.005	7	< 0.0050	0.005	8	< 0.0050	0.005	5	< 0.0050	0.005	13	< 0.0050
	Bromide (Br)	mg/L	0.05	1	< 0.050	0.05	1	< 0.050	0.05	2	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.25	1	< 0.050
	Chloride (Cl)	mg/L	0.5	1	< 0.50	0.5	1	< 0.50	0.5	2	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50	2.5	1	< 0.50
	Fluoride (F)	mg/L	0.02	1	< 0.020	0.02	1	< 0.020	0.02	2	< 0.020	0.02	1	< 0.020	0.02	1	< 0.020	0.1	1	< 0.020
	Nitrate (as N)	mg/L	0.005	1	< 0.050	0.005	1	< 0.050	0.005	1	< 0.050	0.005	1	< 0.050	0.005	1	< 0.050	0.025	1	< 0.050
	Nitrite (as N)	mg/L	0.001	1	< 0.0050	0.001	1	< 0.0050	0.001	2	< 0.0050	0.001	1	< 0.0050	0.001	1	< 0.0050	0.005	1	< 0.0050
	Total Kjeldahl Nitrogen	mg/L	0.05	1	< 0.0010	0.05	1	< 0.0010	0.05	2	< 0.0010	0.05	1	< 0.0010	0.05	1	< 0.0010	0.05	1	< 0.0010
	Orthophosphate	mg/L	0.001	3	<0.0010	0.001	3	<0.0010	0.001	3	<0.0010	0.001	2	<0.001	0.001	3	<0.001	0.001	1	<0.001
	Phosphorus (P)	mg/L	0.002	1	< 0.050	0.002	1	< 0.050	0.002	1	< 0.050	0.002	1	< 0.050	0.002	1	< 0.050	0.002	1	< 0.050
	Sulphate (SO_4)	mg/L	0.3	1	< 0.30	0.3	1	< 0.30	0.3	3	< 0.30	0.3	3	< 0.30	0.3	4	< 0.30	1.5	4	< 0.30
	Dissolved Organic Carbon	mg/L	0.5	1	< 0.50	0.5	1	< 0.50	0.5	2	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50
	Total Organic Carbon	mg/L	0.5	1	< 0.50	0.5	1	< 0.50	0.5	3	< 0.50	0.5	2	< 0.50	0.5	2	< 0.50	0.5	1	< 0.50
Metals	Aluminum (Al) - Total	mg/L	0.0030	4	< 0.0030	0.0030	4	< 0.0030	0.0030	3	< 0.0030	0.0150	3	< 0.0030	0.015	4	< 0.0030	0.015	5	< 0.0030
	Antimony (Sb) - Total	mg/L	0.00010	4	< 0.00010	0.00010	4	< 0.00010	0.00010	3	< 0.00010	0.00050	3	< 0.00010	0.0005	4	< 0.00010	0.0005	5	< 0.00010
	Arsenic (As) - Total	mg/L	0.00010	4	< 0.00010	0.00010	4	< 0.00010	0.00010	3	< 0.00010	0.00050	3	< 0.00010	0.0005	4	< 0.00010	0.0005	5	< 0.00010
	Barium (Ba) - Total	mg/L	0.000050	4	< 0.000050	0.000050	4	< 0.000050	0.000050	3	< 0.000050	0.000250	3	< 0.000050	0.00025	4	< 0.000050	0.00025	5	< 0.000050
	Beryllium (Be) - Total	mg/L	0.000020	4	< 0.000020	0.000020	4	< 0.000020	0.000020	3	< 0.000020	0.000100	3	< 0.000020	0.0001	4	< 0.000020	0.0001	5	< 0.000020
	Bismuth (Bi) - Total	mg/L	0.000050	4	< 0.000050	0.000050	4	< 0.000050	0.000050	3	< 0.000050	0.000250	3	< 0.000050	0.00025	4	< 0.000050	0.00025	5	< 0.000050
	Boron (B) -Total	mg/L	0.010	4	< 0.010	0.010	4	< 0.010	0.010	3	< 0.010	0.050	3	< 0.010	0.05	4	< 0.010	0.05	5	< 0.010
	Cadmium (Cd) - Total	mg/L	0.0000050	4	< 0.000005	0.0000050	4	< 0.000005	0.0000050	3	< 0.000005	0.0000250	3	< 0.000005	0.000025	4	< 0.000005	0.000025	5	< 0.000005
	Calcium (Ca) - Total	mg/L	0.050	4	< 0.050	0.050	4	< 0.050	0.050	3	< 0.050	0.250	3	< 0.050	0.25	4	< 0.050	0.25	5	< 0.050
	Chromium (Cr) - Total	mg/L	0.00010	4	< 0.00010	0.00010	4	< 0.00010	0.00010	3	< 0.00010	0.00050	3	< 0.00010	0.0005	4	< 0.00010	0.0005	5	< 0.00010
	Cobalt (Co) - Total	mg/L	0.00010	4	< 0.00010	0.00010	4	< 0.00010	0.00010	3	< 0.00010	0.00050	3	< 0.00010	0.0005	4	< 0.00010	0.0005	5	< 0.00010
	Copper (Cu) - Total	mg/L	0.00050	4	< 0.00050	0.00050	4	< 0.00050	0.00050	3	< 0.00050	0.00250	3	< 0.00050	0.0025	4	< 0.00050	0.0025	5	< 0.00050
	Iron (Fe) - Total	mg/L	0.010	4	< 0.010	0.010	4	< 0.010	0.010	3	< 0.010	0.050	3	< 0.010	0.05	4	< 0.010	0.05	5	< 0.010
	Lead (Pb) - Total	mg/L	0.000050	4	< 0.000050	0.000050	4	< 0.000050	0.000050	3	< 0.000050	0.000250	3	< 0.000050	0.00025	4	< 0.000050	0.00025	5	< 0.000050
	Lithium (Li) - Total	mg/L	0.0010	4	< 0.0010	0.0010	4	< 0.0010	0.0010	3	< 0.0010	0.0050	3	< 0.0010	0.005	4	< 0.0010	0.005	5	< 0.0010
	Magnesium (Mg) - Total	mg/L	0.10	4	< 0.10	0.10	4	< 0.10	0.10	3	< 0.10	0.10	3	< 0.10	0.1	4	< 0.10	0.1	5	< 0.10
	Manganese (Mn) - Total	mg/L	0.00010	4	< 0.00010	0.00010	4	< 0.00010	0.00010	3	< 0.00010	0.00050	3	< 0.00010	0.00050	4	< 0.00010	0.0005	5	< 0.00010
	Mercury (Hg) - Total	mg/L	0.0000050	1	< 0.000005	0.0000050	1	< 0.000005	0.0000050	3	< 0.000005	0.0000050	2	< 0.000005	0.00001	1	< 0.000005	0.000005	5	< 0.000005
	Molybdenum (Mo) - Total	mg/L	0.000050	4	< 0.000050	0.000050	4	< 0.000050	0.000050	3	< 0.000050	0.000250	3	< 0.000050	0.00025	4	< 0.000050	0.00025	5	< 0.000050
	Nickel (Ni) - Total	mg/L	0.00050	4	< 0.00050	0.00050	4	< 0.00050	0.00050	3	< 0.00050	0.00250	3	< 0.00050	0.0025	4	< 0.00050	0.0025	5	< 0.00050
	Phosphorus (P) - Total	mg/L	0.050	4	< 0.050	0.050	4	< 0.050	0.050	3	< 0.050	0.250	3	< 0.050	0.25	4	< 0.050	0.25	5	< 0.050
	Potassium (K) - Total	mg/L	0.10	4	< 0.050	0.10	4	< 0.050	0.10	3	< 0.050	0.25	3	< 0.050	0.25	4	< 0.050	0.25	5	< 0.050
	Selenium (Se) - Total	mg/L	0.000050	4	< 0.000050	0.000050	4	< 0.000050	0.000050	3	< 0.000050	0.000250	3	< 0.000050	0.00025	4	< 0.000050	0.00025	5	< 0.000050
	Silicon (Si) - Total	mg/L	0.050	4	< 0.050	0.050	4	< 0.050	0.050	3	< 0.050	0.050	3	< 0.050	0.05	4	< 0.050	0.05	5	< 0.050
	Silver (Ag) - Total	mg/L	0.000010	4	< 0.000010	0.000010	4	< 0.000010	0.000010	3	< 0.000010	0.000050	3	< 0.000010	0.00005	4	< 0.000010	0.00005	5	< 0.000010
	Sodium (Na) - Total	mg/L	0.050	4	< 0.050	0.050	4	< 0.050	0.050	3	< 0.050	0.250	3	< 0.050	0.25	4	< 0.050	0.25	5	< 0.050
	Strontium (Sr) - Total	mg/L	0.00020	4	< 0.00020	0.00020	4	< 0.00020	0.00020	3	< 0.00020	0.00100	3	< 0.00020	0.001	4	< 0.00020	0.001	5	< 0.00020
	Sulfur (S) - Total	mg/L	1.0	4	<1.0	1.0	4	<1.0	1.0	2	<1.0	1.0	2	<1	1	2	<1.0	1	2	<1.0
	Thallium (Tl) - Total	mg/L	0.000010	4	< 0.000010	0.000010	4	< 0.000010	0.000010	3	< 0.000010	0.000050	3	< 0.000010	0.00005	4	< 0.000010	0.00005	5	< 0.000010
	Tin (Sn) - Total	mg/L	0.00010	4	< 0.00010	0.00010	4	< 0.00010	0.00010	3	< 0.00010	0.00050	3	< 0.00010	0.0005	4	< 0.00010	0.0005	5	< 0.00010
	Titanium (Ti) - Total	mg/L	0.00030	4	< 0.00030	0.00030	4	< 0.00030	0.00030	3	< 0.00030	0.00150	3	< 0.00030	0.0015	4	< 0.00030	0.0015	5	< 0.00030
	Uranium (U) - Total	mg/L	0.000010	4	< 0.000010	0.000010	4	< 0.000010	0.000010	3	< 0.000010	0.000050	3	< 0.000010	0.00005	4	< 0.000010	0.00005	5	< 0.000010
	Vanadium (V) - Total	mg/L	0.00050	4	< 0.00050	0.00050	4	< 0.00050	0.00050	3	< 0.00050	0.00250	3	< 0.00050	0.0025	4	< 0.00050	0.0025	5	< 0.00050
	Zinc (Zn) - Total	mg/L	0.0030	4	< 0.0030	0.0030	4	< 0.0030	0.0030	3	< 0.0030	0.0150	3	< 0.0030	0.015	4	< 0.0030	0.015	5	< 0.0030

Note: Any highlighted data did not meet the data quality objective of ≤ 2x the laboratory reporting limit (LRL).
MB - Method Blank.

Table B.3: Laboratory Blank Results Associated with Analysis of Water Samples

	Analyte	Units	Sep-15												August-15					
			L1675282			L1675621			L1676104			L1677598			L1654188			L1654831		
			LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result
Non-metals	Total Suspended Solids (TSS)	mg/L	1.0	2	< 1.0	1.0	2	< 1.0	1.0	1	< 1.0	1.0	2	< 1.0	1.0	1	<1.0	1.0	1	<1.0
	Total Dissolved Solids (TDS)	mg/L	15	3	<3.0	15	1	<3.0	10	1	<3.0	15	2	<3.0	15	3	<3.0	15	1	<3.0
	Turbidity	NTU	0.1	2	<1.0	0.1	2	<0.1	0.1	1	<0.1	0.1	3	<0.1	0.1	1	<0.1	n/a	n/a	n/a
	Alkalinity	mg/L	1.00	2	<1.0	1.00	12	) (8), 1.1(2), 1.2,	1.00	2	<1.0	1.00	3	<1.0	1.00	1	<1.0	1.00	n/a	n/a
	Ammonia (as N)	mg/L	0.005	15	< 0.0050	0.005	11	< 0.0050	0.005	4	< 0.0050	0.005	17	< 0.0050	0.005	5	<0.005	0.005	5	<0.005
	Bromide (Br)	mg/L	0.25	1	< 0.050	0.05	1	< 0.050	0.25	1	< 0.050	0.05	3	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050
	Chloride (Cl)	mg/L	0.5	1	< 0.50	0.02	1	< 0.50	0.5	1	< 0.50	0.5	3	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50
	Fluoride (F)	mg/L	0.1	1	< 0.020	0.02	1	< 0.020	0.02	1	< 0.020	0.02	3	< 0.020	0.02	1	< 0.020	0.02	1	< 0.020
	Nitrate (as N)	mg/L	0.025	1	< 0.050	0.025	1	< 0.050	0.005	2	< 0.050	0.005	4	< 0.050	0.005	1	< 0.050	n/a	n/a	n/a
	Nitrite (as N)	mg/L	0.005	1	< 0.0050	0.005	1	< 0.0050	0.001	1	< 0.0050	0.001	3	< 0.0050	0.001	1	< 0.0050	n/a	n/a	n/a
	Total Kjeldahl Nitrogen	mg/L	0.05	1	< 0.0010	0.05	1	< 0.0010	0.05	1	< 0.0010	0.05	3	< 0.0010	0.05	1	< 0.0500	0.05	1	< 0.0500
	Orthophosphate	mg/L	0.001	2	<0.0010	0.001	2	<0.0010	0.001	1	<0.001	0.001	2	<0.001	0.001	1	<0.001	n/a	n/a	n/a
	Phosphorus (P)	mg/L	0.002	1	< 0.050	0.002	1	< 0.050	0.002	2	< 0.050	0.002	4	< 0.050	0.002	3	< 0.002	0.002	1	< 0.002
	Sulphate (SO_4)	mg/L	1.5	4	< 0.30	1.5	3	< 0.30	0.3	1	< 0.30	0.3	5	< 0.30	0.3	1	< 0.30	0.3	1	< 0.30
	Dissolved Organic Carbon	mg/L	0.5	1	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50	0.5	3	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50
	Total Organic Carbon	mg/L	0.5	2	< 0.50	0.5	2	< 0.50	0.5	1	< 0.50	0.5	2	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50
Metals	Aluminum (Al) - Total	mg/L	0.015	2	< 0.0030	0.015	2	< 0.0030	0.015	1	< 0.0030	0.003	8	< 0.0030	0.003	1	< 0.0030	0.003	1	< 0.0030
	Antimony (Sb) - Total	mg/L	0.0005	2	< 0.00010	0.0005	2	< 0.00010	0.0005	1	< 0.00010	0.0001	8	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Arsenic (As) - Total	mg/L	0.0005	2	< 0.00010	0.0005	2	< 0.00010	0.0005	1	< 0.00010	0.0001	8	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Barium (Ba) - Total	mg/L	0.00025	2	< 0.000050	0.00025	2	< 0.000050	0.00025	1	< 0.000050	0.00005	8	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Beryllium (Be) - Total	mg/L	0.0001	2	< 0.000020	0.0001	2	< 0.000020	0.0001	1	< 0.000020	0.00002	8	< 0.000020	0.00002	1	< 0.000020	0.00002	1	< 0.000020
	Bismuth (Bi) - Total	mg/L	0.00025	2	< 0.000050	0.00025	2	< 0.000050	0.00025	1	< 0.000050	0.00005	8	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Boron (B) -Total	mg/L	0.05	2	< 0.010	0.05	2	< 0.010	0.05	1	< 0.010	0.01	8	< 0.010	0.01	1	< 0.010	0.01	1	< 0.010
	Cadmium (Cd) - Total	mg/L	0.000025	2	< 0.000005	0.000025	2	< 0.000005	0.000025	1	< 0.000005	0.000005	8	< 0.000005	0.000005	1	< 0.000005	0.000005	1	< 0.000005
	Calcium (Ca) - Total	mg/L	0.25	2	< 0.050	0.25	2	< 0.050	0.25	1	< 0.050	0.05	8	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050
	Chromium (Cr) - Total	mg/L	0.0005	2	< 0.00010	0.0005	2	< 0.00010	0.0005	1	< 0.00010	0.0001	8	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Cobalt (Co) - Total	mg/L	0.0005	2	< 0.00010	0.0005	2	< 0.00010	0.0005	1	< 0.00010	0.0001	8	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Copper (Cu) - Total	mg/L	0.0025	2	< 0.00050	0.0025	2	< 0.00050	0.0025	1	< 0.00050	0.0005	8	< 0.00050	0.0005	1	< 0.00050	0.0005	1	< 0.00050
	Iron (Fe) - Total	mg/L	0.05	2	< 0.010	0.05	2	< 0.010	0.05	1	< 0.010	0.01	8	< 0.010	0.01	1	< 0.010	0.01	1	< 0.010
	Lead (Pb) - Total	mg/L	0.00025	2	< 0.000050	0.00025	2	< 0.000050	0.00025	1	< 0.000050	0.00005	8	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Lithium (Li) - Total	mg/L	0.005	2	< 0.0010	0.005	2	< 0.0010	0.005	1	< 0.0010	0.001	8	< 0.0010	0.001	1	< 0.0010	0.001	1	< 0.0010
	Magnesium (Mg) - Total	mg/L	0.1	2	< 0.10	0.1	2	< 0.10	0.1	1	< 0.10	0.1	8	< 0.10	0.1	1	< 0.10	0.1	1	< 0.10
	Manganese (Mn) - Total	mg/L	0.0005	2	< 0.00010	0.0005	2	< 0.00010	0.0005	1	< 0.00010	0.0001	8	< 0.00010	0.00010	1	< 0.00010	0.00010	1	< 0.00010
	Mercury (Hg) - Total	mg/L	0.000005	1	< 0.000005	0.000005	1	< 0.000005	0.000005	1	< 0.000005	0.000005	3	< 0.000005	0.00001	1	< 0.000005	0.00001	2	< 0.000005
	Molybdenum (Mo) - Total	mg/L	0.00025	2	< 0.000050	0.00025	2	< 0.000050	0.00025	1	< 0.000050	0.00005	8	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Nickel (Ni) - Total	mg/L	0.0025	2	< 0.00050	0.0025	2	< 0.00050	0.0025	1	< 0.00050	0.0005	8	< 0.00050	0.0005	1	< 0.00050	0.0005	1	< 0.00050
	Phosphorus (P) - Total	mg/L	0.25	2	< 0.050	0.25	2	< 0.050	0.25	1	< 0.050	0.05	8	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050
	Potassium (K) - Total	mg/L	0.25	2	< 0.050	0.25	2	< 0.050	0.25	1	< 0.050	0.1	8	< 0.050	0.1	1	< 0.050	0.1	1	< 0.050
	Selenium (Se) - Total	mg/L	0.00025	2	< 0.000050	0.00025	2	< 0.000050	0.00025	1	< 0.000050	0.00005	8	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Silicon (Si) - Total	mg/L	0.05	2	< 0.050	0.05	2	< 0.050	0.05	1	< 0.050	0.05	8	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050
	Silver (Ag) - Total	mg/L	0.00005	2	< 0.000010	0.00005	2	< 0.000010	0.00005	1	< 0.000010	0.00001	8	< 0.000010	0.00001	1	< 0.000010	0.00001	1	< 0.000010
	Sodium (Na) - Total	mg/L	0.25	2	< 0.050	0.25	2	< 0.050	0.25	1	< 0.050	0.05	8	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050
	Strontium (Sr) - Total	mg/L	0.001	2	< 0.00020	0.001	2	< 0.00020	0.001	1	< 0.00020	0.0002	8	< 0.00020	0.0002	1	< 0.00020	0.0002	1	< 0.00020
	Sulfur (S) - Total	mg/L	1	2	<1.0	1	2	<1.0	1	1	<1.0	1	7	<1.0	1	1	<1.0	1	1	<1.0
	Thallium (Tl) - Total	mg/L	0.00005	2	< 0.000010	0.00005	2	< 0.000010	0.00005	1	< 0.000010	0.00001	8	< 0.000010	0.00001	1	< 0.000010	0.00001	1	< 0.000010
	Tin (Sn) - Total	mg/L	0.0005	2	< 0.00010	0.0005	2	< 0.00010	0.0005	1	< 0.00010	0.0001	8	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Titanium (Ti) - Total	mg/L	0.0015	2	< 0.00030	0.0015	2	< 0.00030	0.0015	1	< 0.00030	0.0003	8	< 0.00030	0.0003	1	< 0.00030	0.0003	1	< 0.00030
	Uranium (U) - Total	mg/L	0.00005	2	< 0.000010	0.00005	2	< 0.000010	0.00005	1	< 0.000010	0.00001	8	< 0.000010	0.00001	1	< 0.000010	0.00001	1	< 0.000010
	Vanadium (V) - Total	mg/L	0.0025	2	< 0.00050	0.0025	2	< 0.00050	0.0025	1	< 0.00050	0.0005	8	< 0.00050	0.0005	1	< 0.00050	0.0005	1	< 0.00050
	Zinc (Zn) - Total	mg/L	0.015	2	< 0.0030	0.015	2	< 0.0030	0.015	1	< 0.0030	0.003	8	< 0.0030	0.003	1	< 0.0030	0.003	1	< 0.0030

Note: Any highlighted data did not meet the data quality objective of ≤ 2x the laboratory reporting limit (LRL).
MB - Method Blank.

Table B.3: Laboratory Blank Results Associated with Analysis of Water Samples

	Analyte	Units	August-15												May-15					
			L1655272			L1656408			L1657243			L1658246			L1611906			L1612928		
			LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result	LRL	Total # MB	Result
Non-metals	Total Suspended Solids (TSS)	mg/L	1.0	2	<1.0	1	1	<1.0	1	1	<1.0	1	1	<1.0	1.0	3	<1.0	1.0	2	<1.0
	Total Dissolved Solids (TDS)	mg/L	15	3	<3.0	15	2	<3.0	15	2	<3.0	15	1	<3.0	15	2	<3.0	15	2	<3.0
	Turbidity	NTU	0.1	2	<0.1	0.1	1	<0.1	0.1	1	<0.1	0.1	1	<0.1	0.1	6	<0.1	0.1	2	<0.1
	Alkalinity	mg/L	1.00	n/a	n/a	1	1	<1	1	1	<1	1	1	<1	1.00	4	<1	1.00	5	<1
	Ammonia (as N)	mg/L	0.005	9	<0.005	0.005	4	<0.005	0.005	4	<0.005	0.005	4	<0.005	0.005	5	<0.005	0.005	5	<0.005
	Bromide (Br)	mg/L	0.05	1	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050
	Chloride (Cl)	mg/L	0.5	1	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50	0.5	1	< 0.50
	Fluoride (F)	mg/L	0.02	1	< 0.020	0.02	1	< 0.020	0.02	1	< 0.020	0.02	1	< 0.020	0.02	1	< 0.020	0.02	1	< 0.020
	Nitrate (as N)	mg/L	0.005	1	<0.005	0.005	1	<0.005	0.005	1	<0.005	0.005	1	<0.005	0.005	1	<0.005	0.005	1	<0.005
	Nitrite (as N)	mg/L	0.001	1	<0.001	0.001	1	<0.001	0.001	1	<0.001	0.001	1	<0.001	0.001	1	<0.001	0.001	1	<0.001
	Total Kjeldahl Nitrogen	mg/L	0.05	1	< 0.0500	0.05	1	< 0.0500	0.05	1	< 0.0500	0.05	1	< 0.0500	0.05	2	< 0.0500	0.05	2	< 0.0500
	Orthophosphate	mg/L	0.001	2	<0.001	0.001	1	<0.001	0.001	1	<0.001	0.001	1	<0.001	0.001	8	<0.001	0.001	5	<0.001
	Phosphorus (P)	mg/L	0.002	2	< 0.002	0.002	4	< 0.002	0.002	4	< 0.002	0.002	4	< 0.002	0.002	4	< 0.002	0.002	3	< 0.002
	Sulphate (SO_4)	mg/L	0.3	1	< 0.30	0.3	1	< 0.30	0.3	1	< 0.30	0.3	1	< 0.30	0.3	1	< 0.30	0.3	1	< 0.30
	Dissolved Organic Carbon	mg/L	0.5	2	< 0.50	0.5	2	< 0.50	0.5	1	< 0.50	0.5	2	< 0.50	0.5	3	< 0.50	0.5	4	< 0.50
	Total Organic Carbon	mg/L	0.5	2	< 0.50	0.5	2	< 0.50	0.5	1	< 0.50	0.5	2	< 0.50	0.5	3	< 0.50	0.5	4	< 0.50
Metals	Aluminum (Al) - Total	mg/L	0.003	3	< 0.0030	0.003	1	< 0.0030	0.003	1	< 0.0030	0.015	1	< 0.0030	0.003	1	< 0.0030	0.003	1	< 0.0030
	Antimony (Sb) - Total	mg/L	0.0001	3	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010	0.0005	1	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Arsenic (As) - Total	mg/L	0.0001	3	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010	0.0005	1	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Barium (Ba) - Total	mg/L	0.00005	3	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050	0.00025	1	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Beryllium (Be) - Total	mg/L	0.00002	3	< 0.000020	0.00002	1	< 0.000020	0.00002	1	< 0.000020	0.0001	1	< 0.000020	0.00002	1	< 0.000020	0.00002	1	< 0.000020
	Bismuth (Bi) - Total	mg/L	0.00005	3	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050	0.00025	1	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Boron (B) -Total	mg/L	0.01	3	< 0.010	0.01	1	< 0.010	0.01	1	< 0.010	0.05	1	< 0.010	0.01	1	< 0.010	0.01	1	< 0.010
	Cadmium (Cd) - Total	mg/L	0.000005	3	< 0.000005	0.000005	1	< 0.000005	0.000005	1	< 0.000005	0.000025	1	< 0.000005	0.000005	1	< 0.000005	0.000005	1	< 0.000005
	Calcium (Ca) - Total	mg/L	0.05	3	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.25	1	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050
	Chromium (Cr) - Total	mg/L	0.0001	3	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010	0.0005	1	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Cobalt (Co) - Total	mg/L	0.0001	3	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010	0.0005	1	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010
	Copper (Cu) - Total	mg/L	0.0005	3	< 0.00050	0.0005	1	< 0.00050	0.0005	1	< 0.00050	0.0025	1	< 0.00050	0.0005	1	< 0.00050	0.0005	1	< 0.00050
	Iron (Fe) - Total	mg/L	0.01	3	< 0.010	0.01	1	< 0.010	0.01	1	< 0.010	0.05	1	< 0.010	0.01	1	< 0.010	0.01	1	< 0.010
	Lead (Pb) - Total	mg/L	0.00005	3	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050	0.00025	1	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Lithium (Li) - Total	mg/L	0.001	3	< 0.0010	0.001	1	< 0.0010	0.001	1	< 0.0010	0.005	1	< 0.0010	0.001	1	< 0.0010	0.001	1	< 0.0010
	Magnesium (Mg) - Total	mg/L	0.1	3	< 0.10	0.1	1	< 0.10	0.1	1	< 0.10	0.1	1	< 0.10	0.1	1	< 0.10	0.1	1	< 0.10
	Manganese (Mn) - Total	mg/L	0.00010	3	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010	0.0005	1	< 0.00010	0.00010	1	< 0.00010	0.00010	1	< 0.00010
	Mercury (Hg) - Total	mg/L	0.00001	2	< 0.000005	0.000005	1	< 0.000005	0.000005	1	< 0.000005	0.000005	1	< 0.000005	0.00001	1	< 0.000005	0.00001	1	< 0.000005
	Molybdenum (Mo) - Total	mg/L	0.00005	3	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050	0.00025	1	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050
	Nickel (Ni) - Total	mg/L	0.0005	3	< 0.00050	0.0005	1	< 0.00050	0.0005	1	< 0.00050	0.0025	1	< 0.00050	0.0005	1	< 0.00050	0.0005	1	< 0.00050
	Phosphorus (P) - Total	mg/L	0.05	3	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.25	1	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050
	Potassium (K) - Total	mg/L	0.1	3	< 0.050	0.1	1	< 0.050	0.1	1	< 0.050	0.25	1	< 0.050	0.1	1	< 0.050	0.1	1	< 0.050
	Selenium (Se) - Total	mg/L	0.00005	3	< 0.000050	0.00005	1	< 0.000050	0.00005	1	< 0.000050	0.00025	1	< 0.000050	0.000050	1	< 0.000050	0.000050	1	< 0.000050
	Silicon (Si) - Total	mg/L	0.05	3	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.050	1	< 0.050	0.050	1	< 0.050
	Silver (Ag) - Total	mg/L	0.00001	3	< 0.000010	0.00001	1	< 0.000010	0.00001	1	< 0.000010	0.00005	1	< 0.000010	0.000010	1	< 0.000010	0.000010	1	< 0.000010
	Sodium (Na) - Total	mg/L	0.05	3	< 0.050	0.05	1	< 0.050	0.05	1	< 0.050	0.25	1	< 0.050	0.050	1	< 0.050	0.050	1	< 0.050
	Strontium (Sr) - Total	mg/L	0.0002	3	< 0.00020	0.0002	1	< 0.00020	0.0002	1	< 0.00020	0.001	1	< 0.00020	0.00020	1	< 0.00020	0.00020	1	< 0.00020
	Sulfur (S) - Total	mg/L	1	3	<1.0	1	1	<1.0	1	1	<1.0	1	1	<1.0	0.50	1	<1.0	0.50	1	<1.0
	Thallium (Tl) - Total	mg/L	0.00001	3	< 0.000010	0.00001	1	< 0.000010	0.00001	1	< 0.000010	0.00005	1	< 0.000010	0.000010	1	< 0.000010	0.000010	1	< 0.000010
	Tin (Sn) - Total	mg/L	0.0001	3	< 0.00010	0.0001	1	< 0.00010	0.0001	1	< 0.00010	0.0005	1	< 0.00010	0.00010	1	< 0.00010	0.00010	1	< 0.00010
	Titanium (Ti) - Total	mg/L	0.0003	3	< 0.00030	0.0003	1	< 0.00030	0.0003	1	< 0.00030	0.0015	1	< 0.00030	0.00030	1	< 0.00030	0.00030	1	< 0.00030
	Uranium (U) - Total	mg/L	0.00001	3	< 0.000010	0.00001	1	< 0.000010	0.00001	1	< 0.000010	0.00005	1	< 0.000010	0.000010	1	< 0.000010	0.000010	1	< 0.000010
	Vanadium (V) - Total	mg/L	0.0005	3	< 0.00050	0.0005	1	< 0.00050	0.0005	1	< 0.00050	0.0025	1	< 0.00050	0.00050	1	< 0.00050	0.00050	1	< 0.00050
	Zinc (Zn) - Total	mg/L	0.003	3	< 0.0030	0.003	1	< 0.0030	0.003	1	< 0.0030	0.015	1	< 0.0030	0.0030	1	< 0.0030	0.0030	1	< 0.0030

Note: Any highlighted data did not meet the data quality objective of ≤ 2x the laboratory reporting limit (LRL).
MB - Method Blank.

Table B.4a: Laboratory Duplicate Results for Water Sample Analysis

	Analyte	Relative Percent Difference (RPD)																								
		Sep-15																								
		L1671863		L1671882		L1671904		L16712373		L1673688		L1674349		L1675282		L1675621		L1676104		L1677598						
Non-metals	Hardness (as $CaCO_3$)																									
	Total Suspended Solids (TSS)													0.0		7.7										
	Total Dissolved Solids (TDS)	3.6				5.1		6.7	3.5	7.3		2.6		2.8		0.1		0.0								
	Turbidity	1.3				2.1		3.7		7.8	0.9	0.5		1.7	2.1	5.3		4.0		2.5	0.3	1.2				
	Alkalinity					4.1	2.0	4.4		5.2		2.5		3.6	1.9	0.0				7.4						
	Ammonia (as N)					4.5						1.7		4.3		3.9										
	Bromide (Br)									6.8																
	Chloride (Cl)							0.0		0.1				0.1												
	Fluoride (F)					1.0	1.9	0.2	6.8	0.4				1.0	6.1	2.1				6.8						
	Nitrate (as N)					15.0	1.0	0.4	0.9	0.7		0.3		0.1	1.9	19.0				6.1						
	Nitrite (as N)											6.0														
	Total Kjeldahl Nitrogen							9.7								4.9										
	Orthophosphate							5.2						5.2	17.0			12.0								
	Phosphorus (P)-Total					6.9	2.9			9.4				9.3						15.0						
	Sulfate (SO4)					0.1	1.0	0.1	1.0	0.0		12.0		0.0	0.0	1.6				5.5						
	Dissolved Organic Carbon					3.6	2.5					11.0						0.2		0.8						
	Total Organic Carbon					3.5	1.3			9.8		5.1						0.0		17.0						
Total metals	Aluminum (Al)-Total													12.0						9.9						
	Antimony (Sb)-Total													1.0												
	Arsenic (As)-Total													16.0												
	Barium (Ba)-Total					3.1		1.1		2.7		8.1	0.2	1.6		0.0		0.7		5.3						
	Beryllium (Be)-Total																									
	Bismuth (Bi)-Total																									
	Boron (B)-Total																									
	Cadmium (Cd)-Total													0.6		5.6										
	Calcium (Ca)-Total					2.7		2.9		3.4		10.0	1.6	2.1		1.3		0.0		8.2						
	Chromium (Cr)-Total																									
	Cobalt (Co)-Total													2.1												
	Copper (Cu)-Total																									
	Iron (Fe)-Total																			11.0						
	Lead (Pb)-Total																									
	Lithium (Li)-Total											16.0	0.7	5.6		4.0										
	Magnesium (Mg)-Total					2.1		2.9		1.3		14.0	2.3	1.1		0.0		0.5		5.4						
	Manganese (Mn)-Total					6.0		3.9				0.8		1.2				0.6		14.0						
	Mercury (Hg) - Total		N/A																							
	Molybdenum (Mo)-Total							2.9		6.5		15.0	5.6	1.5		2.7		1.0		8.1						
	Nickel (Ni)-Total											11.0		1.7		2.9										
	Phosphorus (P)-Total																									
	Potassium (K)-Total					7.0		0.3		7.4		11.0	0.4	1.7		0.9		1.3		7.2						
	Selenium (Se)-Total					9.0		3.0				10.0	1.3	0.5		0.3										
	Silicon (Si)-Total					1.9		2.3		1.7		17.0	1.5	1.3		2.4		0.1		4.5						
	Silver (Ag)-Total																									
	Sodium (Na)-Total					3.3		0.7		3.4		6.6	0.8	2.1		0.3		1.4		6.5						
	Strontium (Sr)-Total					2.7		3.2		2.7		12.0	0.8	3.1		0.4		0.8		7.7						
	Sulfur (S) - Total					1.3		3.0		4.1		12.0	1.2	1.1		0.2		0.2		2.3						
	Thallium (Tl)-Total																									
	Tin (Sn)-Total																									
	Titanium (Ti)-Total																									
	Uranium (U)-Total					6.3		2.3		0.5		17.0	2.8	4.3		0.4		2.7		2.8						
	Vanadium (V)-Total																									
	Zinc (Zn)-Total													1.1												

Note: Any highlighted values did not meet data quality objective of ≤ 20% relative percent difference (RPD).

Table B.4a: Laboratory Duplicate Results for Water Sample Analysis

	Analyte	Relative Percent Difference (RPD)							
		Aug-15						May-15	
		L1654188	L1654831	L1655272		L1656408	L1657243	L1658246	L1611906	L1612928
Non-metals	Hardness (as $CaCO_3$)									
	Total Suspended Solids (TSS)		18.0	0.0						
	Total Dissolved Solids (TDS)		1.7	1.2	0.5	2.1				
	Turbidity	0.8		0.6	1.5	1.5	0.8	1.3		
	Alkalinity	2.0	1.2	10.0	1.6	0.0		1.7		
	Ammonia (as N)		1.7				0.9			
	Bromide (Br)									
	Chloride (Cl)			2.0		0.1				
	Fluoride (F)			0.9		6.7		1.2	0.1	
	Nitrate (as N)			0.9						
	Nitrite (as N)			5.8						
	Total Kjeldahl Nitrogen			4.8						
	Orthophosphate	7.0		11.0	15.0	10.0	0.5			
	Phosphorus (P)-Total					0.5				1.8
	Sulfate (SO4)			0.0		0.9		0.1	0.1	
	Dissolved Organic Carbon	6.3	2.6						7.5	4.1
	Total Organic Carbon	1.2	6.5	1.0		1.1	4.2		2.6	
Total metals	Aluminum (Al)-Total		13.0	7.1		5.5				1.3
	Antimony (Sb)-Total		1.7	1.3						1.1
	Arsenic (As)-Total		5.3	16.0		2.2				6.7
	Barium (Ba)-Total		0.3	2.6		1.6		1.7		1.2
	Beryllium (Be)-Total									
	Bismuth (Bi)-Total									
	Boron (B)-Total			2.0						0.6
	Cadmium (Cd)-Total		5.0	15.0						
	Calcium (Ca)-Total		1.0	4.1		2.3		1.8		3.2
	Chromium (Cr)-Total		8.8	19.0						14.0
	Cobalt (Co)-Total									4.3
	Copper (Cu)-Total									
	Iron (Fe)-Total		5.6	4.7		0.5				1.8
	Lead (Pb)-Total									6.6
	Lithium (Li)-Total		0.1	3.7		6.2		1.1		3.0
	Magnesium (Mg)-Total		3.7	3.2		1.8		2.1		3.2
	Manganese (Mn)-Total		4.0	3.2		2.0		0.7		8.1
	Mercury (Hg) - Total									
	Molybdenum (Mo)-Total		2.9	4.7		6.0		3.9		3.0
	Nickel (Ni)-Total		6.1	0.5						1.2
	Phosphorus (P)-Total									
	Potassium (K)-Total		3.0	0.9		1.4		0.5		1.7
	Selenium (Se)-Total		1.6	1.3		9.9		2.6		0.4
	Silicon (Si)-Total		3.3	0.7		2.0		1.9		3.5
	Silver (Ag)-Total									
	Sodium (Na)-Total		4.6	1.0		1.2		0.2		1.9
	Strontium (Sr)-Total		2.0	3.8		2.2		1.1		3.6
	Sulfur (S) - Total		4.0	2.6		2.4		0.5		2.5
	Thallium (Tl)-Total									
	Tin (Sn)-Total									
	Titanium (Ti)-Total									
	Uranium (U)-Total		2.3	2.2		1.4		2.0		5.8
	Vanadium (V)-Total					0.9				8.2
	Zinc (Zn)-Total									

Note: Any highlighted values did not meet data quality objective of ≤ 20% relative percent difference (RPD).

Table B.4b: Field Split-Samples Duplicate Results for Water Chemistry, September 2015

Analyte		Units	L1671904			L1672373			L1674349		
			CACK			EL12			EL1		
			CACK	CACK-X	RPD[a] (%)	EL12	EL12-X	RPD[a] (%)	EL1	EL1-X	RPD[a] (%)
Non-Metals	Hardness (as CaCO3)	mg/L	2390	2550	6%	129	128	1%	235	235	0%
	Total Suspended Solids	mg/L	< 1.0	< 1.0	0%	1.1	< 1.0	10%	< 1.0	< 1.0	0%
	Ammonia (as N)	mg/L	< 0.005	0.012	82%	< 0.005	< 0.005	0%	0.0117	0.0112	4%
	Bromide (Br)	mg/L	< 0.25	< 0.25	0%	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%
	Chloride (Cl)	mg/L	6.1	6.2	2%	< 0.5	< 0.5	0%	1.97	2	2%
	Fluoride (F)	mg/L	0.11	0.12	9%	0.121	0.12	1%	0.172	0.176	2%
	Total Kjeldahl Nitrogen	mg/L	0.159	< 0.05	104%	0.127	0.084	41%	< 0.05	< 0.05	0%
	Nitrate (as N)	mg/L	33.9	33.9	0%	0.0381	0.0405	6%	2.44	2.48	2%
	Nitrite (as N)	mg/L	< 0.005	0.0078	44%	< 0.001	0.0011	10%	0.0025	0.0041	48%
	Phosphorus (P)-Total	mg/L	0.0035	0.0034	3%	0.004	0.004	0%	0.0054	0.0055	2%
	Sulphate (SO4)	mg/L	1860	1860	0%	18.9	19.1	1%	76.5	77.5	1%
	Dissolved Organic Carbon	mg/L	1.45	1.39	4%	0.55	0.57	4%	1.13	0.98	14%
	Total Organic Carbon	mg/L	1.5	1.44	4%	0.55	0.52	6%	1.24	1.21	2%
Total metals	Aluminum (Al)-Total	mg/L	< 0.015	< 0.015	0%	< 0.015	0.02	29%	< 0.015	< 0.015	0%
	Antimony (Sb)-Total	mg/L	0.00055	0.00064	15%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Arsenic (As)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Barium (Ba)-Total	mg/L	0.0223	0.0252	12%	0.0196	0.0202	3%	0.0727	0.0777	7%
	Beryllium (Be)-Total	mg/L	< 0.0001	< 0.0001	0%	< 0.0001	< 0.0001	0%	< 0.0001	< 0.0001	0%
	Bismuth (Bi)-Total	mg/L	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%
	Boron (B)-Total	mg/L	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%
	Cadmium (Cd)-Total	mg/L	0.000618	0.000685	10%	< 0.000025	< 0.000025	0%	< 0.000025	< 0.000025	0%
	Calcium (Ca)-Total	mg/L	409	458	11%	38.9	40.1	3%	63	67	6%
	Chromium (Cr)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Cobalt (Co)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Copper (Cu)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Iron (Fe)-Total	mg/L	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%
	Lead (Pb)-Total	mg/L	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%
	Lithium (Li)-Total	mg/L	0.0583	0.0652	11%	< 0.005	< 0.005	0%	0.008	0.0085	6%
	Magnesium (Mg)-Total	mg/L	401	345	15%	7.96	8.38	5%	19.5	20.5	5%
	Manganese (Mn)-Total	mg/L	0.0009	0.00135	40%	0.00123	0.00188	42%	0.00169	0.00193	13%
	Mercury (Hg)-Total	mg/L	< 0.000005	< 0.000005	0%	< 0.000005	< 0.000005	0%	< 0.000005	< 0.000005	0%
	Molybdenum (Mo)-Total	mg/L	0.0023	0.00254	10%	0.00082	0.00079	4%	0.00115	0.00132	14%
	Nickel (Ni)-Total	mg/L	0.053	0.0592	11%	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Phosphorus (P)-Total	mg/L	< 0.25	< 0.25	0%	< 0.25	< 0.25	0%	< 0.25	< 0.25	0%
	Potassium (K)-Total	mg/L	4.23	4.65	9%	0.29	0.29	0%	0.68	0.72	6%
	Selenium (Se)-Total	mg/L	0.547	0.592	8%	0.00071	0.00069	3%	0.0107	0.0104	3%
	Silicon (Si)-Total	mg/L	3.5	2.84	21%	1.27	1.34	5%	2.03	2.11	4%
	Silver (Ag)-Total	mg/L	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%
	Sodium (Na)-Total	mg/L	1.64	1.9	15%	0.36	0.37	3%	2.43	2.61	7%
	Strontium (Sr)-Total	mg/L	0.231	0.259	11%	0.316	0.328	4%	0.208	0.22	6%
	Thallium (Tl)-Total	mg/L	0.000061	0.000092	41%	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%
	Tin (Sn)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Titanium (Ti)-Total	mg/L	< 0.0015	< 0.0015	0%	< 0.0015	< 0.0015	0%	< 0.0015	< 0.0015	0%
	Uranium (U)-Total	mg/L	0.019	0.0209	10%	0.000741	0.000766	3%	0.0012	0.00126	5%
	Vanadium (V)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Zinc (Zn)-Total	mg/L	0.035	0.044	23%	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%

[a] RPD - Relative Percent Difference. Values > 20% are highlighted. There was no DQO established for field duplicate samples.

Table B.4b: Field Split-Samples Duplicate Results for Water Chemistry, September 2015

Analyte		Units	L1672373			L1674349			L1675621		
			F029			FO23			FOBCP		
			F029	F029-X	RPD[a] (%)	FO23-1	FO23-X	RPD[a] (%)	FOBCP	FOBCP-X	RPD[a] (%)
Non-Metals	Hardness (as CaCO3)	mg/L	369	369	0%	376	374	1%	513	517	1%
	Total Suspended Solids	mg/L	< 1.0	< 1.0	0%	2.3	2.3	0%	< 1.0	< 1.0	0%
	Ammonia (as N)	mg/L	< 0.005	< 0.005	0%	< 0.005	< 0.005	0%	0.0075	0.0066	13%
	Bromide (Br)	mg/L	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%
	Chloride (Cl)	mg/L	0.94	0.94	0%	1.39	1.41	1%	1.21	1.21	0%
	Fluoride (F)	mg/L	0.126	0.124	2%	0.187	0.186	1%	0.16	0.161	1%
	Total Kjeldahl Nitrogen	mg/L	0.146	0.184	23%	0.081	< 0.05	47%	< 0.25	< 0.25	0%
	Nitrate (as N)	mg/L	9.58	9.56	0%	8.89	9.03	2%	11.4	11.4	0%
	Nitrite (as N)	mg/L	0.0061	0.0055	10%	0.0028	0.0022	24%	0.0151	0.0195	25%
	Phosphorus (P)-Total	mg/L	0.0036	0.0049	31%	0.0056	0.005	11%	0.0048	0.003	46%
	Sulphate (SO4)	mg/L	148	149	1%	164	165	1%	284	284	0%
	Dissolved Organic Carbon	mg/L	0.57	0.56	2%	1.09	1.04	5%	1.23	1.27	3%
	Total Organic Carbon	mg/L	0.6	0.57	5%	1.28	1.05	20%	1.33	1.4	5%
Total metals	Aluminum (Al)-Total	mg/L	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%
	Antimony (Sb)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Arsenic (As)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Barium (Ba)-Total	mg/L	0.116	0.114	2%	0.102	0.0879	15%	0.0767	0.0765	0%
	Beryllium (Be)-Total	mg/L	< 0.0001	< 0.0001	0%	< 0.0001	< 0.0001	0%	< 0.0001	< 0.0001	0%
	Bismuth (Bi)-Total	mg/L	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%
	Boron (B)-Total	mg/L	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%
	Cadmium (Cd)-Total	mg/L	0.000028	0.000027	4%	0.000069	0.000062	11%	0.000045	0.000053	16%
	Calcium (Ca)-Total	mg/L	95.5	93	3%	95.7	83.2	14%	106	108	2%
	Chromium (Cr)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Cobalt (Co)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Copper (Cu)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Iron (Fe)-Total	mg/L	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%
	Lead (Pb)-Total	mg/L	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%
	Lithium (Li)-Total	mg/L	0.016	0.0156	3%	0.0219	0.0189	15%	0.038	0.0382	1%
	Magnesium (Mg)-Total	mg/L	38.6	37.6	3%	38.9	34.2	13%	56	57.7	3%
	Manganese (Mn)-Total	mg/L	0.00143	0.00133	7%	0.00119	0.00096	21%	0.00727	0.00739	2%
	Mercury (Hg)-Total	mg/L	< 0.000005	< 0.000005	0%	0.0000053	< 0.000005	6%	< 0.000005	< 0.000005	0%
	Molybdenum (Mo)-Total	mg/L	0.0008	0.00084	5%	0.00113	0.0011	3%	0.00133	0.00139	4%
	Nickel (Ni)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%	0.0053	0.0057	7%
	Phosphorus (P)-Total	mg/L	< 0.25	< 0.25	0%	< 0.25	< 0.25	0%	< 0.25	< 0.25	0%
	Potassium (K)-Total	mg/L	1.14	1.12	2%	1.16	1.05	10%	1.69	1.73	2%
	Selenium (Se)-Total	mg/L	0.0348	0.0353	1%	0.0347	0.031	11%	0.0638	0.0638	0%
	Silicon (Si)-Total	mg/L	2.35	2.29	3%	2.32	2.05	12%	1.88	1.88	0%
	Silver (Ag)-Total	mg/L	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%
	Sodium (Na)-Total	mg/L	1.89	1.86	2%	3.4	2.98	13%	1.69	1.74	3%
	Strontium (Sr)-Total	mg/L	0.148	0.143	3%	0.168	0.146	14%	0.145	0.146	1%
	Thallium (Tl)-Total	mg/L	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%
	Tin (Sn)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Titanium (Ti)-Total	mg/L	< 0.0015	< 0.0015	0%	< 0.0015	< 0.0015	0%	< 0.0015	< 0.0015	0%
	Uranium (U)-Total	mg/L	0.00174	0.00172	1%	0.00208	0.00185	12%	0.00318	0.00318	0%
	Vanadium (V)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Zinc (Zn)-Total	mg/L	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%

[a] RPD - Relative Percent Difference. Values > 20% are highlighted. There was no DQO established for field duplicate samples.

Table B.4b: Field Split-Samples Duplicate Results for Water Chemistry, September 2015

Analyte		Units	L1674349 FOUNGD			L1674349 GHCKU			L1672373 KO1		
			FOUNGD	FOUNGD-X	RPD[a] (%)	GHCKU	GHCKU-X	RPD[a] (%)	KO1	KO1-X	RPD[a] (%)
Non-Metals	Hardness (as CaCO3)	mg/L	299	294	2%	1030	1020	1%	152	150	1%
	Total Suspended Solids	mg/L	< 1.0	< 1.0	0%	1.5	< 1.0	40%	15.3	15.7	3%
	Ammonia (as N)	mg/L	0.0196	0.0191	3%	0.0065	< 0.005	26%	< 0.005	< 0.005	0%
	Bromide (Br)	mg/L	< 0.05	< 0.05	0%	< 0.25	< 0.25	0%	< 0.05	< 0.05	0%
	Chloride (Cl)	mg/L	< 0.5	0.63	23%	< 2.5	< 2.5	0%	3.88	3.84	1%
	Fluoride (F)	mg/L	0.185	0.175	6%	0.17	0.17	0%	0.043	0.043	0%
	Total Kjeldahl Nitrogen	mg/L	0.09	0.085	6%	0.224	0.41	59%	0.131	0.182	33%
	Nitrate (as N)	mg/L	10.1	10.1	0%	6.09	6.02	1%	0.132	0.13	2%
	Nitrite (as N)	mg/L	0.005	0.0082	48%	< 0.005	0.0061	20%	< 0.001	0.0021	71%
	Phosphorus (P)-Total	mg/L	0.0039	0.0032	20%	0.006	0.0046	26%	0.0143	0.0163	13%
	Sulphate (SO4)	mg/L	116	118	2%	737	730	1%	32.9	32.7	1%
	Dissolved Organic Carbon	mg/L	1.14	1.13	1%	0.83	1.89	78%	0.87	0.8	8%
	Total Organic Carbon	mg/L	1.03	1.16	12%	2.34	2.44	4%	0.97	1.02	5%
Total metals	Aluminum (Al)-Total	mg/L	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%	0.154	0.127	19%
	Antimony (Sb)-Total	mg/L	< 0.0005	< 0.0005	0%	0.00143	0.00151	5%	< 0.0005	< 0.0005	0%
	Arsenic (As)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Barium (Ba)-Total	mg/L	0.0812	0.077	5%	0.0581	0.0575	1%	0.0356	0.0336	6%
	Beryllium (Be)-Total	mg/L	< 0.0001	< 0.0001	0%	< 0.0001	< 0.0001	0%	< 0.0001	< 0.0001	0%
	Bismuth (Bi)-Total	mg/L	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%
	Boron (B)-Total	mg/L	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%
	Cadmium (Cd)-Total	mg/L	< 0.000025	0.000031	21%	< 0.000025	< 0.000025	0%	< 0.000025	< 0.000025	0%
	Calcium (Ca)-Total	mg/L	81.3	76.9	6%	185	184	1%	47.9	45.2	6%
	Chromium (Cr)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Cobalt (Co)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Copper (Cu)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Iron (Fe)-Total	mg/L	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%	0.26	0.224	15%
	Lead (Pb)-Total	mg/L	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%	0.00026	< 0.00025	4%
	Lithium (Li)-Total	mg/L	0.0276	0.0255	8%	0.0115	0.0129	11%	< 0.005	< 0.005	0%
	Magnesium (Mg)-Total	mg/L	27	25.7	5%	144	137	5%	13	12.5	4%
	Manganese (Mn)-Total	mg/L	0.00097	0.00096	1%	0.0025	0.0023	8%	0.00776	0.00725	7%
	Mercury (Hg)-Total	mg/L	< 0.000005	< 0.000005	0%	< 0.000005	< 0.000005	0%	< 0.000005	< 0.000005	0%
	Molybdenum (Mo)-Total	mg/L	0.00117	0.00107	9%	0.00419	0.00422	1%	0.00055	0.00053	4%
	Nickel (Ni)-Total	mg/L	< 0.0025	< 0.0025	0%	0.04	0.0388	3%	< 0.0025	< 0.0025	0%
	Phosphorus (P)-Total	mg/L	< 0.25	< 0.25	0%	< 0.25	< 0.25	0%	< 0.25	< 0.25	0%
	Potassium (K)-Total	mg/L	1.15	1.11	4%	3.1	3.02	3%	0.4	0.37	8%
	Selenium (Se)-Total	mg/L	0.024	0.0225	6%	0.107	0.103	4%	< 0.00025	< 0.00025	0%
	Silicon (Si)-Total	mg/L	1.82	1.75	4%	3.49	3.41	2%	2.02	1.95	4%
	Silver (Ag)-Total	mg/L	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%
	Sodium (Na)-Total	mg/L	1.36	1.29	5%	2.78	2.71	3%	3.51	3.28	7%
	Strontium (Sr)-Total	mg/L	0.14	0.132	6%	0.223	0.219	2%	0.217	0.203	7%
	Thallium (Tl)-Total	mg/L	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%
	Tin (Sn)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Titanium (Ti)-Total	mg/L	< 0.0015	< 0.0015	0%	< 0.0015	< 0.0015	0%	< 0.0015	< 0.0015	0%
	Uranium (U)-Total	mg/L	0.00153	0.00143	7%	0.00813	0.00815	0%	0.000777	0.000722	7%
	Vanadium (V)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Zinc (Zn)-Total	mg/L	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%

[a] RPD - Relative Percent Difference. Values > 20% are highlighted. There was no DQO established for field duplicate samples.

Table B.4b: Field Split-Samples Duplicate Results for Water Chemistry, September 2015

Analyte		Units	L1671904			L1673688		
			MI25			OCNM		
			MI25	MI25-X	RPD[a] (%)	OCNM	OCNM-X	RPD[a] (%)
Non-Metals	Hardness (as CaCO3)	mg/L	150	151	1%	354	355	0%
	Total Suspended Solids	mg/L	< 1.0	< 1.0	0%	1.4	1.4	0%
	Ammonia (as N)	mg/L	< 0.005	< 0.005	0%	0.014	0.0149	6%
	Bromide (Br)	mg/L	< 0.05	< 0.05	0%	0.137	0.081	51%
	Chloride (Cl)	mg/L	< 0.5	< 0.5	0%	17	17	0%
	Fluoride (F)	mg/L	0.059	0.058	2%	0.399	0.4	0%
	Total Kjeldahl Nitrogen	mg/L	0.056	0.059	5%	0.191	0.155	21%
	Nitrate (as N)	mg/L	0.0153	0.0136	12%	0.0144	0.0169	16%
	Nitrite (as N)	mg/L	< 0.001	0.0015	40%	0.002	< 0.001	67%
	Phosphorus (P)-Total	mg/L	0.0061	0.008	27%	0.0086	0.0094	9%
	Sulphate (SO4)	mg/L	14.5	14.5	0%	22.5	22.5	0%
	Dissolved Organic Carbon	mg/L	0.78	0.75	4%	1.94	2.17	11%
	Total Organic Carbon	mg/L	0.81	0.81	0%	2.04	2.05	0%
Total metals	Aluminum (Al)-Total	mg/L	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%
	Antimony (Sb)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Arsenic (As)-Total	mg/L	< 0.0005	< 0.0005	0%	0.00088	0.00084	5%
	Barium (Ba)-Total	mg/L	0.0542	0.0558	3%	0.469	0.453	3%
	Beryllium (Be)-Total	mg/L	< 0.0001	< 0.0001	0%	< 0.0001	< 0.0001	0%
	Bismuth (Bi)-Total	mg/L	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%
	Boron (B)-Total	mg/L	< 0.05	< 0.05	0%	< 0.05	< 0.05	0%
	Cadmium (Cd)-Total	mg/L	< 0.000025	< 0.000025	0%	< 0.000025	< 0.000025	0%
	Calcium (Ca)-Total	mg/L	42.3	42.4	0%	91.3	89.7	2%
	Chromium (Cr)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Cobalt (Co)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Copper (Cu)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Iron (Fe)-Total	mg/L	< 0.05	< 0.05	0%	0.483	0.479	1%
	Lead (Pb)-Total	mg/L	< 0.00025	< 0.00025	0%	< 0.00025	< 0.00025	0%
	Lithium (Li)-Total	mg/L	< 0.005	< 0.005	0%	0.0284	0.0282	1%
	Magnesium (Mg)-Total	mg/L	11.1	11.3	2%	36.2	36.1	0%
	Manganese (Mn)-Total	mg/L	< 0.0005	< 0.0005	0%	0.217	0.214	1%
	Mercury (Hg)-Total	mg/L	< 0.000005	< 0.000005	0%	< 0.000005	< 0.000005	0%
	Molybdenum (Mo)-Total	mg/L	0.00102	0.001	2%	0.00438	0.00426	3%
	Nickel (Ni)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Phosphorus (P)-Total	mg/L	< 0.25	< 0.25	0%	< 0.25	< 0.25	0%
	Potassium (K)-Total	mg/L	0.52	0.54	4%	2.92	2.8	4%
	Selenium (Se)-Total	mg/L	< 0.00025	< 0.00025	0%	0.00028	0.00027	4%
	Silicon (Si)-Total	mg/L	2.29	2.33	2%	4.9	4.97	1%
	Silver (Ag)-Total	mg/L	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%
	Sodium (Na)-Total	mg/L	2.97	2.95	1%	11.6	11.3	3%
	Strontium (Sr)-Total	mg/L	0.157	0.157	0%	0.449	0.441	2%
	Thallium (Tl)-Total	mg/L	< 0.00005	< 0.00005	0%	< 0.00005	< 0.00005	0%
	Tin (Sn)-Total	mg/L	< 0.0005	< 0.0005	0%	< 0.0005	< 0.0005	0%
	Titanium (Ti)-Total	mg/L	< 0.0015	< 0.0015	0%	< 0.0015	< 0.0015	0%
	Uranium (U)-Total	mg/L	0.000244	0.000243	0%	0.000417	0.00039	7%
	Vanadium (V)-Total	mg/L	< 0.0025	< 0.0025	0%	< 0.0025	< 0.0025	0%
	Zinc (Zn)-Total	mg/L	< 0.015	< 0.015	0%	< 0.015	< 0.015	0%

[a] RPD - Relative Percent Difference. Values > 20% are highlighted. There was no DQO established for field duplicate samples.

Table B.5: **Blank Spike Recovery Resuts for Surface Water Sample Analyses**

	Analyte	Units	Sep-15																				
			L1671863		L1671882	L1671904			L1672373			L1673688				L1674349				L1675282			
Non-metals	Total Suspended Solids	mg/L	91	87	93	91	87	-	93	100	-	106	105	-	-	90	-	-	-	101	102	-	-
	Ammonia (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bromide (Br)	mg/L	100	-	100	97	102	-	108	-	-	103	-	-	-	103	-	-	-	103	-	-	-
	Chloride (Cl)	mg/L	102	-	102	102	102	-	103	-	-	101	-	-	-	101	-	-	-	101	-	-	-
	Fluoride (F)	mg/L	93	-	93	93	101	-	94	-	-	91	-	-	-	93	-	-	-	93	-	-	-
	Total Kjeldahl Nitrogen	mg/L	103	-	103	96	-	-	96	-	-	102	-	-	-	110	-	-	-	99	-	-	-
	Nitrate (as N)	mg/L	102	-	102	102	102	-	103	-	-	102	-	-	-	101	-	-	-	101	-	-	-
	Nitrite (as N)	mg/L	106	-	106	106	106	-	108	-	-	107	-	-	-	106	-	-	-	106	-	-	-
	Phosphorus (P)	mg/L	107	-	107	108	108	108	108	108	108	108	108	110	109	108	108	110	109	110	108	108	110
	Sulphate (SO_4)	mg/L	102	-	102	102	102	-	103	-	-	101	-	-	-	102	-	-	-	102	-	-	-
	Dissolved Organic Carbon	mg/L	94	-	94	96	91	91	91	89	-	99	99	-	-	114	-	-	-	89	94	-	-
	Total Organic Carbon	mg/L	94	-	94	96	91	91	91	89	-	99	-	-	-	114	-	-	-	89	94	-	-
Totals Metals	Aluminum (Al)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Antimony (Sb)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Arsenic (As)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Barium (Ba)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beryllium (Be)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bismuth (Bi)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Boron (B)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cadmium (Cd)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Calcium (Ca)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chromium (Cr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt (Co)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Copper (Cu)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Iron (Fe)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lead (Pb)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lithium (Li)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Magnesium (Mg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese (Mn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mercury (Hg)	mg/L	104	-	102	100	100	-	100	100	-	104	-	-	-	96	-	-	-	103	-	-	-
	Molybdenum (Mo)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nickel (Ni)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phosphorus (P) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Potassium (K)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Selenium (Se)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Silicon (Si)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Silver (Ag)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sodium (Na)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Strontium (Sr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Tl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tin (Sn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Titanium (Ti)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uranium (U)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vanadium (V)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc (Zn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] High background concentrations of the analyte in the samples

Note: Any shaded values indicate data quality objective of 80-120% recovery was not achieved.

Table B.5: **Blank Spike Recovery Resuts for Surface Water Sample Analyses**

	Analyte	Units	Sep-15									Aug-15															
			L1675621			L1676104		L1677598				L1654188			L1654831		L1655272		L1655687				L1656408			
Non-metals	Total Suspended Solids	mg/L	114	-	-	91	-	97	87	-	-	99	-	-	91	-	91	93	-	-	-	-	88	-	-	-
	Ammonia (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bromide (Br)	mg/L	85	-	-	109	-	103	103	100	-	100	-	-	102	-	105	-	-	-	-	-	102	-	-	-
	Chloride (Cl)	mg/L	103	-	-	101	-	100	101	102	-	101	-	-	102	-	101	-	-	-	-	-	102	-	-	-
	Fluoride (F)	mg/L	101	-	-	92	-	97	94	97	-	95	-	-	101	-	94	-	-	-	-	-	101	-	-	-
	Total Kjeldahl Nitrogen	mg/L	89	-	-	100	100	100	100	98	88	101	-	-	-	-	-	-	-	-	-	-	101	-	-	-
	Nitrate (as N)	mg/L	101	-	-	100	-	99	102	102	-	104	-	-	-	-	100	-	-	-	-	-	106	-	-	-
	Nitrite (as N)	mg/L	106	-	-	105	-	107	105	106	-	-	-	-	-	-	106	-	-	-	-	-	-	-	-	-
	Phosphorus (P)	mg/L	109	112	107	109	-	101	101	101	101	105	108	107	106	-	107	110	-	-	-	-	105	104	105	104
	Sulphate (SO_4)	mg/L	102	-	-	102	-	100	101	103	-	101	-	-	102	-	102	-	-	-	-	-	102	-	-	-
	Dissolved Organic Carbon	mg/L	107	96	-	96	-	96	104	-	-	106	-	-	104	-	102	95	-	-	-	-	102	102	-	-
	Total Organic Carbon	mg/L	-	-	-	107	-	96	108	-	-	106	-	-	104	-	102	95	-	-	-	-	102	102	-	-
Totals Metals	Aluminum (Al)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	111	111	117	107	-	-	-	-
	Antimony (Sb)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	108	107	112	99	-	-	-	-
	Arsenic (As)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	111	109	115	101	-	-	-	-
	Barium (Ba)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	107	108	115	100	-	-	-	-
	Beryllium (Be)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	106	107	105	100	-	-	-	-
	Bismuth (Bi)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102	102	109	98	-	-	-	-
	Boron (B)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	105	106	102	96	-	-	-	-
	Cadmium (Cd)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	103	105	113	98	-	-	-	-
	Calcium (Ca)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	106	109	106	101	-	-	-	-
	Chromium (Cr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	106	103	114	99	-	-	-	-
	Cobalt (Co)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	105	104	116	97	-	-	-	-
	Copper (Cu)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104	102	113	96	-	-	-	-
	Iron (Fe)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	121	120	123	114	-	-	-	-
	Lead (Pb)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102	102	111	97	-	-	-	-
	Lithium (Li)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	103	105	100	99	-	-	-	-
	Magnesium (Mg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102	100	109	96	-	-	-	-
	Manganese (Mn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	108	110	114	100	-	-	-	-
	Mercury (Hg)	mg/L	99	100	-	100	-	100	106	96	-	105	-	-	99	98	98	-	100	109	109	-	102	107	-	-
	Molybdenum (Mo)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104	105	107	96	-	-	-	-
	Nickel (Ni)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	107	106	114	99	-	-	-	-
	Phosphorus (P) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	111	107	105	-	-	-	-	-
	Potassium (K)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	107	113	100	-	-	-	-
	Selenium (Se)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104	105	107	96	-	-	-	-
	Silicon (Si)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Silver (Ag)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	96	97	93	-	-	-	-
	Sodium (Na)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	107	105	114	100	-	-	-	-
	Strontium (Sr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	105	105	108	99	-	-	-	-
	Thallium (Tl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104	104	109	101	-	-	-	-
	Tin (Sn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104	105	114	97	-	-	-	-
	Titanium (Ti)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	105	104	114	101	-	-	-	-
	Uranium (U)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101	100	100	97	-	-	-	-
	Vanadium (V)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	108	108	115	101	-	-	-	-
	Zinc (Zn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101	97	107	94	-	-	-	-

[a] High background concentrations of the analyte in the samples

Note: Any shaded values indicate data quality objective of 80-120% recovery was not achieved.

Table B.5: Blank Spike Recovery Resuts for Surface Water Sample Analyses

	Analyte	Units	Aug-15								May-15					
			L1657243				L1657243				L1611906				L1612928	
Non-metals	Total Suspended Solids	mg/L	86	-	-	-	95	-	-	-	107	97	-	-	98	98
	Ammonia (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bromide (Br)	mg/L	107	-	-	-	106	-	-	-	105	104	-	-	-	-
	Chloride (Cl)	mg/L	101	-	-	-	102	-	-	-	101	101	101	-	-	-
	Fluoride (F)	mg/L	102	-	-	-	95	-	-	-	103	103	101	-	-	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	93	-	-	-	104	105	-	-	-	-
	Nitrate (as N)	mg/L	102	-	-	-	101	-	-	-	101	101	-	-	-	-
	Nitrite (as N)	mg/L	108	-	-	-	106	-	-	-	102	102	-	-	-	-
	Phosphorus (P)	mg/L	105	104	105	104	105	104	105	104	-	-	-	-	-	-
	Sulphate (SO_4)	mg/L	102	-	-	-	102	-	-	-	101	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	97	-	-	-	107	101	-	-	98	104	98	-	-	-
	Total Organic Carbon	mg/L	97	-	-	-	107	110	-	-	97	98	98	97	-	-
Totals Metals	Aluminum (Al)	mg/L	-	-	-	-	-	-	-	-	107	102	-	-	105	-
	Antimony (Sb)	mg/L	-	-	-	-	-	-	-	-	94	97	-	-	92	97
	Arsenic (As)	mg/L	-	-	-	-	-	-	-	-	109	103	-	-	101	103
	Barium (Ba)	mg/L	-	-	-	-	-	-	-	-	105	102	-	-	100	101
	Beryllium (Be)	mg/L	-	-	-	-	-	-	-	-	85	93	-	-	86	96
	Bismuth (Bi)	mg/L	-	-	-	-	-	-	-	-	94	99	-	-	91	97
	Boron (B)	mg/L	-	-	-	-	-	-	-	-	88	93	-	-	83	93
	Cadmium (Cd)	mg/L	-	-	-	-	-	-	-	-	101	97	-	-	94	97
	Calcium (Ca)	mg/L	-	-	-	-	-	-	-	-	105	101	-	-	98	101
	Chromium (Cr)	mg/L	-	-	-	-	-	-	-	-	104	-	-	-	101	103
	Cobalt (Co)	mg/L	-	-	-	-	-	-	-	-	104	-	-	-	100	102
	Copper (Cu)	mg/L	-	-	-	-	-	-	-	-	100	-	-	-	97	100
	Iron (Fe)	mg/L	-	-	-	-	-	-	-	-	99	-	-	-	91	96
	Lead (Pb)	mg/L	-	-	-	-	-	-	-	-	94	-	-	-	94	99
	Lithium (Li)	mg/L	-	-	-	-	-	-	-	-	87	-	-	-	89	99
	Magnesium (Mg)	mg/L	-	-	-	-	-	-	-	-	104	-	-	-	95	100
	Manganese (Mn)	mg/L	-	-	-	-	-	-	-	-	110	-	-	-	102	100
	Mercury (Hg)	mg/L	96	-	-	-	104	-	-	-	97	-	-	-	101	-
	Molybdenum (Mo)	mg/L	-	-	-	-	-	-	-	-	103	-	-	-	91	99
	Nickel (Ni)	mg/L	-	-	-	-	-	-	-	-	103	-	-	-	100	102
	Phosphorus (P) - Total	mg/L	-	-	-	-	-	-	-	-	103	-	-	-	98	103
	Potassium (K)	mg/L	-	-	-	-	-	-	-	-	104	-	-	-	95	100
	Selenium (Se)	mg/L	-	-	-	-	-	-	-	-	100	-	-	-	99	101
	Silicon (Si)	mg/L	-	-	-	-	-	-	-	-	107	-	-	-	97	100
	Silver (Ag)	mg/L	-	-	-	-	-	-	-	-	87	-	-	-	90	96
	Sodium (Na)	mg/L	-	-	-	-	-	-	-	-	103	-	-	-	102	104
	Strontium (Sr)	mg/L	-	-	-	-	-	-	-	-	94	-	-	-	94	101
	Thallium (Tl)	mg/L	-	-	-	-	-	-	-	-	93	-	-	-	93	97
	Tin (Sn)	mg/L	-	-	-	-	-	-	-	-	91	-	-	-	93	98
	Titanium (Ti)	mg/L	-	-	-	-	-	-	-	-	102	-	-	-	101	99
	Uranium (U)	mg/L	-	-	-	-	-	-	-	-	91	-	-	-	95	99
	Vanadium (V)	mg/L	-	-	-	-	-	-	-	-	106	-	-	-	102	103
	Zinc (Zn)	mg/L	-	-	-	-	-	-	-	-	99	-	-	-	93	93

[a] High background concentrations of the analyte in the samples

Note: Any shaded values indicate data quality objective of 80-120% recovery was not achieved.

Table B.6: Laboratory Matrix Spike Recoveries for Surface Water Sample Analyses

	Analyte	Units	Sep-15																
			L1671863	L1671882	L1671904		L1672373			L1673688	L1674349		L1675282		L1675621		L1676104	L1677598	
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alkalinity		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	-	-	103	-	99	110	107	98	101	104	-	-	108	-	102	-	-
	Bromide (Br)	mg/L	-	-	105	103	108	117	-	-	116	-	106	-	-	-	-	101	-
	Chloride (Cl)	mg/L	-	-	104	107	106	109	-	-	107	-	105	-	-	-	-	105	-
	Fluoride (F)	mg/L	-	-	108	110	108	106	-	-	103	-	102	-	-	-	-	103	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	76	105	-	103	-	95	-	95	-	-
	Nitrate (as N)	mg/L	-	-	103	106	104	-	-	-	-	-	-	-	-	-	-	103	-
	Nitrite (as N)	mg/L	-	-	106	109	109	112	-	-	113	-	111	-	104	104	-	109	-
	Orthophosphate	mg/L	-	98	97	-	98	-	-	100	101	-	106	-	-	-	107	101	83
	Phosphorus (P)	mg/L	-	-	95	94	101	-	-	103	97	-	96	-	114	-	-	94	-
	Sulphate (SO_4)	mg/L	-	-	99	101	103	-	-	-	-	-	98	-	-	-	-	104	-
	Dissolved Organic Carbon	mg/L	-	94	-	-	91	-	-	86	-	-	99	-	-	-	-	-	-
	Total Organic Carbon	mg/L	-	89	-	-	90	-	-	85	-	-	97	-	-	-	-	-	-
Totals Metals	Aluminum (Al)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Antimony (Sb)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Arsenic (As)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Barium (Ba)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beryllium (Be)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bismuth (Bi)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Boron (B)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cadmium (Cd)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Calcium (Ca)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chromium (Cr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt (Co)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Copper (Cu)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Iron (Fe)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lead (Pb)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lithium (Li)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Magnesium (Mg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese (Mn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mercury (Hg)	mg/L	-	91	-	-	-	-	-	-	88	-	93	93	110	-	-	-	-
	Molybdenum (Mo)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nickel (Ni)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phosphorus (P) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Potassium (K)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Selenium (Se)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Silicon (Si)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Silver (Ag)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sodium (Na)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Strontium (Sr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphur (S) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Tl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tin (Sn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Titanium (Ti)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uranium (U)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vanadium (V)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc (Zn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Highlighted values did not meet the data quality objective of 75-125% recovery.

Table B.6: Laboratory Matrix Spike Recoveries for Surface Water Sample Analyses

	Analyte	Units	Aug-15							May-15														
			L1654188	L1654831	L1655272		L1656408	L1657243	L1658246	L1611906								L1612928					
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alkalinity		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	-	-	104	-	-	95	-	101	101	-	-	-	-	-	-	110	123	110	-	-	-	
	Bromide (Br)	mg/L	-	116	108	-	108	-	-	103	104	105	-	-	-	-	-	-	-	-	-	-	-	
	Chloride (Cl)	mg/L	-	106	102	-	103	-	-	102	104	104	101	-	-	-	-	96	103	101	-	-	-	
	Fluoride (F)	mg/L	-	108	106	-	102	-	-	103	-	105	105	100	-	-	-	95	-	105	-	-	-	
	Total Kjeldahl Nitrogen	mg/L	-	89	108	-	101	98	102	99	99	-	-	-	-	-	-	108	92	-	-	-	-	
	Nitrate (as N)	mg/L	-	-	102	-	103	-	-	102	104	101	-	-	-	-	-	103	101	-	-	-	-	
	Nitrite (as N)	mg/L	-	-	111	-	107	-	-	102	103	103	102	-	-	-	-	102	103	101	-	-	-	
	Orthophosphate	mg/L	96	-	97	102	94	-	99	102	103	100	103	93	103	99	101	95	100	76	88	-	-	
	Phosphorus (P)	mg/L	-	110	-	-	104	-	-	102	99	99	98	-	-	-	-	100	97	102	-	-	-	
	Sulphate (SO_4)	mg/L	-	98	103	-	103	-	-	102	103	103	101	-	-	-	-	91	102	100	-	-	-	
	Dissolved Organic Carbon	mg/L	121	103	87	95	101	-	-	-	-	-	-	-	-	-	-	113	115	108	-	-	-	
	Total Organic Carbon	mg/L	120	102	86	94	-	-	-	-	-	-	-	-	-	-	-	110	111	117	-	-	-	
Totals Metals	Aluminum (Al)	mg/L	-	-	103	-	-	-	101	99	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Antimony (Sb)	mg/L	-	-	106	-	-	-	105	99	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Arsenic (As)	mg/L	-	-	104	-	-	-	96	102	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Barium (Ba)	mg/L	-	-	104	-	-	-	92	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Beryllium (Be)	mg/L	-	-	-	-	-	-	-	99	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Bismuth (Bi)	mg/L	-	-	100	-	-	-	91	102	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Boron (B)	mg/L	-	-	106	-	-	-	112	103	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Cadmium (Cd)	mg/L	-	-	101	-	-	-	98	98	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Calcium (Ca)	mg/L	-	-	-	-	-	-	-	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Chromium (Cr)	mg/L	-	-	100	-	-	-	93	99	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Cobalt (Co)	mg/L	-	-	99	-	-	-	97	98	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Copper (Cu)	mg/L	-	-	102	-	-	-	99	96	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Iron (Fe)	mg/L	-	-	100	-	-	-	94	92	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Lead (Pb)	mg/L	-	-	100	-	-	-	94	100	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Lithium (Li)	mg/L	-	-	100	-	-	-	76	101	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Magnesium (Mg)	mg/L	-	-	112	-	-	-	-	95	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Manganese (Mn)	mg/L	-	-	103	-	-	-	98	98	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Mercury (Hg)	mg/L	-	103	100	-	103	-	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Molybdenum (Mo)	mg/L	-	-	105	-	-	-	105	96	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nickel (Ni)	mg/L	-	-	100	-	-	-	95	96	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Phosphorus (P) - Total	mg/L	-	-	103	-	-	-	98	99	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Potassium (K)	mg/L	-	-	98	-	-	-	97	98	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Selenium (Se)	mg/L	-	-	101	-	-	-	95	102	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Silicon (Si)	mg/L	-	-	-	-	-	-	-	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Silver (Ag)	mg/L	-	-	105	-	-	-	99	101	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sodium (Na)	mg/L	-	-	98	-	-	-	97	97	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Strontium (Sr)	mg/L	-	-	101	-	-	-	-	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sulphur (S) - Total	mg/L	-	-	115	-	-	-	-	101	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Thallium (Tl)	mg/L	-	-	102	-	-	-	91	98	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Tin (Sn)	mg/L	-	-	108	-	-	-	109	98	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Titanium (Ti)	mg/L	-	-	117	-	-	-	119	97	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Uranium (U)	mg/L	-	-	98	-	-	-	89	99	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Vanadium (V)	mg/L	-	-	102	-	-	-	98	102	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Zinc (Zn)	mg/L	-	-	93	-	-	-	93	91	-	-	-	-	-	-	-	-	-	-	-	-	-	

Note: Highlighted values did not meet the data quality objective of 75-125% recovery.

Table B.7: Laboratory Recoveries of Reference Material for Water Sample Analyses

	Analyte	Units	Sep-15																						
			L1671863											L1671882					L1671904						
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alkalinity		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	101	100	99	98	101	102	99	99	97	100	97	101	100	99	98	97	100	100	99	99	98	98	98
	Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fluoride (F)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrate (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate (SO_4)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals Metals	Aluminum (Al)	mg/L	104	106	108	109	-	-	-	-	-	-	-	104	106	108	109	-	109	111	109	-	-	-	-
	Antimony (Sb)	mg/L	101	104	106	109	-	-	-	-	-	-	-	101	104	106	109	-	112	111	109	-	-	-	-
	Arsenic (As)	mg/L	104	108	110	108	-	-	-	-	-	-	-	104	108	110	108	-	109	108	105	-	-	-	-
	Barium (Ba)	mg/L	105	108	110	109	-	-	-	-	-	-	-	105	108	110	109	-	108	110	108	-	-	-	-
	Beryllium (Be)	mg/L	97	98	100	108	-	-	-	-	-	-	-	97	98	100	108	-	111	107	107	-	-	-	-
	Bismuth (Bi)	mg/L	97	101	103	104	-	-	-	-	-	-	-	97	101	103	104	-	106	111	107	-	-	-	-
	Boron (B)	mg/L	95	94	96	104	-	-	-	-	-	-	-	95	94	96	104	-	106	105	103	-	-	-	-
	Cadmium (Cd)	mg/L	101	106	108	104	-	-	-	-	-	-	-	101	106	108	104	-	104	108	104	-	-	-	-
	Calcium (Ca)	mg/L	101	105	107	110	-	-	-	-	-	-	-	101	105	107	110	-	112	108	107	-	-	-	-
	Chromium (Cr)	mg/L	104	108	110	105	-	-	-	-	-	-	-	104	108	110	105	-	108	106	101	-	-	-	-
	Cobalt (Co)	mg/L	103	110	112	106	-	-	-	-	-	-	-	103	110	112	106	-	109	108	104	-	-	-	-
	Copper (Cu)	mg/L	104	107	109	102	-	-	-	-	-	-	-	104	107	109	102	-	107	104	102	-	-	-	-
	Iron (Fe)	mg/L	110	114	117	112	-	-	-	-	-	-	-	110	114	117	112	-	113	116	113	-	-	-	-
	Lead (Pb)	mg/L	100	103	105	107	-	-	-	-	-	-	-	100	103	105	107	-	108	109	106	-	-	-	-
	Lithium (Li)	mg/L	91	95	97	104	-	-	-	-	-	-	-	91	95	97	104	-	106	107	106	-	-	-	-
	Magnesium (Mg)	mg/L	104	105	95	101	-	-	-	-	-	-	-	104	105	95	101	-	113	112	-	-	-	-	-
	Manganese (Mn)	mg/L	104	110	112	108	-	-	-	-	-	-	-	104	110	112	108	-	111	109	106	-	-	-	-
	Mercury (Hg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	mg/L	98	103	105	106	-	-	-	-	-	-	-	98	103	105	106	-	109	108	103	-	-	-	-
	Nickel (Ni)	mg/L	100	108	110	103	-	-	-	-	-	-	-	100	108	110	103	-	105	105	101	-	-	-	-
	Phosphorus (P) - Total	mg/L	117	113	114	-	-	-	-	-	-	-	-	117	113	114	-	-	111	114	-	-	-	-	-
	Potassium (K)	mg/L	105	111	113	110	-	-	-	-	-	-	-	105	111	113	110	-	111	109	107	-	-	-	-
	Selenium (Se)	mg/L	101	106	108	101	-	-	-	-	-	-	-	101	106	108	101	-	103	107	103	-	-	-	-
	Silicon (Si)	mg/L	98	98	89	95	-	-	-	-	-	-	-	98	98	89	95	-	110	112	-	-	-	-	-
	Silver (Ag)	mg/L	102	105	107	110	-	-	-	-	-	-	-	102	105	107	110	-	113	112	110	-	-	-	-
	Sodium (Na)	mg/L	103	111	113	105	-	-	-	-	-	-	-	103	111	113	105	-	109	109	106	-	-	-	-
	Strontium (Sr)	mg/L	101	106	108	107	-	-	-	-	-	-	-	101	106	108	107	-	109	107	104	-	-	-	-
	Sulphur (S) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Tl)	mg/L	100	104	106	107	-	-	-	-	-	-	-	100	104	106	107	-	108	111	107	-	-	-	-
	Tin (Sn)	mg/L	99	103	105	107	-	-	-	-	-	-	-	99	103	105	107	-	108	107	105	-	-	-	-
	Titanium (Ti)	mg/L	99	109	112	99	-	-	-	-	-	-	-	99	109	112	99	-	102	104	107	-	-	-	-
	Uranium (U)	mg/L	98	101	103	106	-	-	-	-	-	-	-	98	101	103	106	-	108	111	106	-	-	-	-
	Vanadium (V)	mg/L	105	113	115	107	-	-	-	-	-	-	-	105	113	115	107	-	110	111	107	-	-	-	-
	Zinc (Zn)	mg/L	95	100	103	99	-	-	-	-	-	-	-	95	100	103	99	-	100	105	99	-	-	-	-

Note: Highlighted values did not meet the data quality objective of 85-115% recovery.

Table B.7: Laboratory Recoveries of Reference Material for Water Sample Analyses

	Analyte	Units	Sep-15																								
			L1672373								L1673688					L1674349											
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alkalinity		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	107	105	104	98	105	100	102	100	100	101	97	94	93	98	96	96	95	99	100	98	99	99	97	95	
	Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fluoride (F)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrate (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate (SO_4)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals Metals	Aluminum (Al)	mg/L	109	111	109	-	-	-	-	-	104	103	99	94	-	105	106	101	107	100	-	-	-	-	-	-	-
	Antimony (Sb)	mg/L	112	111	109	-	-	-	-	-	98	114	115	104	-	106	98	95	106	99	-	-	-	-	-	-	-
	Arsenic (As)	mg/L	109	108	105	-	-	-	-	-	99	105	106	100	-	103	101	98	105	95	-	-	-	-	-	-	-
	Barium (Ba)	mg/L	108	110	108	-	-	-	-	-	100	109	107	101	-	104	101	97	103	99	-	-	-	-	-	-	-
	Beryllium (Be)	mg/L	111	107	107	-	-	-	-	-	95	106	103	100	-	110	107	102	111	102	-	-	-	-	-	-	-
	Bismuth (Bi)	mg/L	106	111	107	-	-	-	-	-	98	103	106	99	-	102	99	96	104	98	-	-	-	-	-	-	-
	Boron (B)	mg/L	106	105	103	-	-	-	-	-	93	100	98	91	-	102	100	97	106	101	-	-	-	-	-	-	-
	Cadmium (Cd)	mg/L	104	108	104	-	-	-	-	-	97	107	105	99	-	104	99	97	104	96	-	-	-	-	-	-	-
	Calcium (Ca)	mg/L	112	108	107	-	-	-	-	-	98	107	106	100	-	108	102	100	110	102	-	-	-	-	-	-	-
	Chromium (Cr)	mg/L	108	106	101	-	-	-	-	-	96	103	101	95	-	103	99	97	104	97	-	-	-	-	-	-	-
	Cobalt (Co)	mg/L	109	108	104	-	-	-	-	-	99	104	106	97	-	104	100	98	105	95	-	-	-	-	-	-	-
	Copper (Cu)	mg/L	107	104	102	-	-	-	-	-	91	102	104	94	-	100	97	94	101	92	-	-	-	-	-	-	-
	Iron (Fe)	mg/L	113	116	113	-	-	-	-	-	103	111	112	100	-	114	109	107	116	107	-	-	-	-	-	-	-
	Lead (Pb)	mg/L	108	109	106	-	-	-	-	-	98	105	108	100	-	103	102	98	106	99	-	-	-	-	-	-	-
	Lithium (Li)	mg/L	106	107	106	-	-	-	-	-	92	103	99	92	-	106	106	101	109	107	-	-	-	-	-	-	-
	Magnesium (Mg)	mg/L	113	112	-	-	-	-	-	-	103	102	-	-	-	102	99	98	97	95	-	-	-	-	-	-	-
	Manganese (Mn)	mg/L	111	109	106	-	-	-	-	-	102	102	106	96	-	105	104	99	108	98	-	-	-	-	-	-	-
	Mercury (Hg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	mg/L	109	108	103	-	-	-	-	-	95	103	108	99	-	104	99	96	104	100	-	-	-	-	-	-	-
	Nickel (Ni)	mg/L	105	105	101	-	-	-	-	-	98	102	105	95	-	103	101	99	106	99	-	-	-	-	-	-	-
	Phosphorus (P) - Total	mg/L	111	114	-	-	-	-	-	-	106	106	97	89	-	110	98	110	116	92	-	-	-	-	-	-	-
	Potassium (K)	mg/L	111	109	107	-	-	-	-	-	100	100	99	98	-	103	100	96	104	100	-	-	-	-	-	-	-
	Selenium (Se)	mg/L	103	107	103	-	-	-	-	-	97	103	102	95	-	101	97	97	105	99	-	-	-	-	-	-	-
	Silicon (Si)	mg/L	110	112	-	-	-	-	-	-	104	100	-	-	-	103	103	93	100	95	-	-	-	-	-	-	-
	Silver (Ag)	mg/L	113	112	110	-	-	-	-	-	101	110	111	102	-	107	104	101	109	101	-	-	-	-	-	-	-
	Sodium (Na)	mg/L	109	109	106	-	-	-	-	-	100	103	103	94	-	103	101	99	108	100	-	-	-	-	-	-	-
	Strontium (Sr)	mg/L	109	107	104	-	-	-	-	-	95	101	104	95	-	103	101	98	105	101	-	-	-	-	-	-	-
	Sulphur (S) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Tl)	mg/L	108	111	107	-	-	-	-	-	99	106	108	101	-	103	102	99	106	99	-	-	-	-	-	-	-
	Tin (Sn)	mg/L	108	107	105	-	-	-	-	-	98	106	105	98	-	107	102	99	107	101	-	-	-	-	-	-	-
	Titanium (Ti)	mg/L	102	104	107	-	-	-	-	-	101	102	104	96	-	104	102	102	109	84	-	-	-	-	-	-	-
	Uranium (U)	mg/L	108	111	106	-	-	-	-	-	96	98	101	94	-	104	103	98	105	101	-	-	-	-	-	-	-
	Vanadium (V)	mg/L	110	111	107	-	-	-	-	-	102	104	103	97	-	102	101	97	104	97	-	-	-	-	-	-	-
	Zinc (Zn)	mg/L	100	105	99	-	-	-	-	-	97	94	99	92	-	95	95	93	98	90	-	-	-	-	-	-	-

Note: Highlighted values did not meet the data quality objective of 85-115% recovery.

Table B.7: Laboratory Recoveries of Reference Material for Water Sample Analyses

	Analyte	Units	Sep-15																							
			L1674349		L1675282															L1675621						
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alkalinity		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	95	99	97	96	94	94	99	93	101	99	98	98	96	96	92	96	95	99	99	104	95	92	101	92
	Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fluoride (F)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrate (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate (SO_4)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals Metals	Aluminum (Al)	mg/L	-	-	113	100	-	-	-	-	-	-	-	-	-	-	-	-	-	106	100	-	-	-	-	-
	Antimony (Sb)	mg/L	-	-	114	99	-	-	-	-	-	-	-	-	-	-	-	-	-	102	99	-	-	-	-	-
	Arsenic (As)	mg/L	-	-	113	101	-	-	-	-	-	-	-	-	-	-	-	-	-	101	98	-	-	-	-	-
	Barium (Ba)	mg/L	-	-	113	99	-	-	-	-	-	-	-	-	-	-	-	-	-	102	98	-	-	-	-	-
	Beryllium (Be)	mg/L	-	-	115	96	-	-	-	-	-	-	-	-	-	-	-	-	-	104	96	-	-	-	-	-
	Bismuth (Bi)	mg/L	-	-	104	94	-	-	-	-	-	-	-	-	-	-	-	-	-	100	97	-	-	-	-	-
	Boron (B)	mg/L	-	-	101	88	-	-	-	-	-	-	-	-	-	-	-	-	-	103	95	-	-	-	-	-
	Cadmium (Cd)	mg/L	-	-	109	95	-	-	-	-	-	-	-	-	-	-	-	-	-	104	100	-	-	-	-	-
	Calcium (Ca)	mg/L	-	-	109	97	-	-	-	-	-	-	-	-	-	-	-	-	-	103	98	-	-	-	-	-
	Chromium (Cr)	mg/L	-	-	110	99	-	-	-	-	-	-	-	-	-	-	-	-	-	100	96	-	-	-	-	-
	Cobalt (Co)	mg/L	-	-	112	102	-	-	-	-	-	-	-	-	-	-	-	-	-	102	100	-	-	-	-	-
	Copper (Cu)	mg/L	-	-	109	96	-	-	-	-	-	-	-	-	-	-	-	-	-	99	98	-	-	-	-	-
	Iron (Fe)	mg/L	-	-	116	101	-	-	-	-	-	-	-	-	-	-	-	-	-	106	104	-	-	-	-	-
	Lead (Pb)	mg/L	-	-	107	96	-	-	-	-	-	-	-	-	-	-	-	-	-	102	97	-	-	-	-	-
	Lithium (Li)	mg/L	-	-	100	87	-	-	-	-	-	-	-	-	-	-	-	-	-	102	96	-	-	-	-	-
	Magnesium (Mg)	mg/L	-	-	99	103	-	-	-	-	-	-	-	-	-	-	-	-	-	97	96	-	-	-	-	-
	Manganese (Mn)	mg/L	-	-	115	103	-	-	-	-	-	-	-	-	-	-	-	-	-	104	97	-	-	-	-	-
	Mercury (Hg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	mg/L	-	-	106	92	-	-	-	-	-	-	-	-	-	-	-	-	-	100	96	-	-	-	-	-
	Nickel (Ni)	mg/L	-	-	112	100	-	-	-	-	-	-	-	-	-	-	-	-	-	101	97	-	-	-	-	-
	Phosphorus (P) - Total	mg/L	-	-	119	112	-	-	-	-	-	-	-	-	-	-	-	-	-	99	96	-	-	-	-	-
	Potassium (K)	mg/L	-	-	115	103	-	-	-	-	-	-	-	-	-	-	-	-	-	103	98	-	-	-	-	-
	Selenium (Se)	mg/L	-	-	108	93	-	-	-	-	-	-	-	-	-	-	-	-	-	95	92	-	-	-	-	-
	Silicon (Si)	mg/L	-	-	99	98	-	-	-	-	-	-	-	-	-	-	-	-	-	97	99	-	-	-	-	-
	Silver (Ag)	mg/L	-	-	108	96	-	-	-	-	-	-	-	-	-	-	-	-	-	104	99	-	-	-	-	-
	Sodium (Na)	mg/L	-	-	113	102	-	-	-	-	-	-	-	-	-	-	-	-	-	104	100	-	-	-	-	-
	Strontium (Sr)	mg/L	-	-	108	93	-	-	-	-	-	-	-	-	-	-	-	-	-	101	97	-	-	-	-	-
	Sulphur (S) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Tl)	mg/L	-	-	107	98	-	-	-	-	-	-	-	-	-	-	-	-	-	101	97	-	-	-	-	-
	Tin (Sn)	mg/L	-	-	109	95	-	-	-	-	-	-	-	-	-	-	-	-	-	103	98	-	-	-	-	-
	Titanium (Ti)	mg/L	-	-	104	103	-	-	-	-	-	-	-	-	-	-	-	-	-	98	90	-	-	-	-	-
	Uranium (U)	mg/L	-	-	103	92	-	-	-	-	-	-	-	-	-	-	-	-	-	101	98	-	-	-	-	-
	Vanadium (V)	mg/L	-	-	114	104	-	-	-	-	-	-	-	-	-	-	-	-	-	105	101	-	-	-	-	-
	Zinc (Zn)	mg/L	-	-	102	89	-	-	-	-	-	-	-	-	-	-	-	-	-	98	96	-	-	-	-	-

Note: Highlighted values did not meet the data quality objective of 85-115% recovery.

Table B.7: Laboratory Recoveries of Reference Material for Water Sample Analyses

	Analyte	Units	Sep-15																							
			L1675621				L1676104				L1677598															
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alkalinity		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	95	96	101	110	105	103	94	106	104	104	102	104	103	98	106	102	101	102	98	99	101	101	101	101
	Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fluoride (F)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrate (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate (SO_4)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals Metals	Aluminum (Al)	mg/L	-	-	-	-	100	-	-	-	100	101	98	99	94	105	105	109	-	-	-	-	-	-	-	-
	Antimony (Sb)	mg/L	-	-	-	-	99	-	-	-	99	109	107	106	95	106	107	110	-	-	-	-	-	-	-	-
	Arsenic (As)	mg/L	-	-	-	-	98	-	-	-	98	98	100	100	92	102	99	100	-	-	-	-	-	-	-	-
	Barium (Ba)	mg/L	-	-	-	-	98	-	-	-	98	103	101	99	93	104	104	104	-	-	-	-	-	-	-	-
	Beryllium (Be)	mg/L	-	-	-	-	96	-	-	-	96	104	102	104	94	100	103	105	-	-	-	-	-	-	-	-
	Bismuth (Bi)	mg/L	-	-	-	-	97	-	-	-	97	102	99	99	90	105	104	106	-	-	-	-	-	-	-	-
	Boron (B)	mg/L	-	-	-	-	95	-	-	-	95	89	87	90	94	93	93	94	-	-	-	-	-	-	-	-
	Cadmium (Cd)	mg/L	-	-	-	-	100	-	-	-	100	102	101	101	92	103	107	107	-	-	-	-	-	-	-	-
	Calcium (Ca)	mg/L	-	-	-	-	98	-	-	-	98	102	100	101	91	102	106	107	-	-	-	-	-	-	-	-
	Chromium (Cr)	mg/L	-	-	-	-	96	-	-	-	96	101	101	102	93	103	106	107	-	-	-	-	-	-	-	-
	Cobalt (Co)	mg/L	-	-	-	-	100	-	-	-	100	100	98	99	93	102	106	108	-	-	-	-	-	-	-	-
	Copper (Cu)	mg/L	-	-	-	-	98	-	-	-	98	99	98	99	90	100	102	106	-	-	-	-	-	-	-	-
	Iron (Fe)	mg/L	-	-	-	-	104	-	-	-	104	107	104	105	99	108	116	116	-	-	-	-	-	-	-	-
	Lead (Pb)	mg/L	-	-	-	-	97	-	-	-	97	102	100	100	92	106	105	106	-	-	-	-	-	-	-	-
	Lithium (Li)	mg/L	-	-	-	-	96	-	-	-	96	99	101	102	89	85	93	88	-	-	-	-	-	-	-	-
	Magnesium (Mg)	mg/L	-	-	-	-	96	-	-	-	96	103	104	96	101	102	-	-	-	-	-	-	-	-	-	-
	Manganese (Mn)	mg/L	-	-	-	-	97	-	-	-	97	102	102	102	95	103	109	112	-	-	-	-	-	-	-	-
	Mercury (Hg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	mg/L	-	-	-	-	96	-	-	-	96	100	98	99	91	103	105	107	-	-	-	-	-	-	-	-
	Nickel (Ni)	mg/L	-	-	-	-	97	-	-	-	97	100	99	99	90	101	101	106	-	-	-	-	-	-	-	-
	Phosphorus (P) - Total	mg/L	-	-	-	-	96	-	-	-	96	113	111	103	94	111	107	107	-	-	-	-	-	-	-	-
	Potassium (K)	mg/L	-	-	-	-	98	-	-	-	98	102	100	101	92	103	104	107	-	-	-	-	-	-	-	-
	Selenium (Se)	mg/L	-	-	-	-	92	-	-	-	92	98	98	102	91	101	105	103	-	-	-	-	-	-	-	-
	Silicon (Si)	mg/L	-	-	-	-	99	-	-	-	99	100	102	92	105	102	-	-	-	-	-	-	-	-	-	-
	Silver (Ag)	mg/L	-	-	-	-	99	-	-	-	99	101	97	99	95	105	109	109	-	-	-	-	-	-	-	-
	Sodium (Na)	mg/L	-	-	-	-	100	-	-	-	100	101	99	101	92	102	106	109	-	-	-	-	-	-	-	-
	Strontium (Sr)	mg/L	-	-	-	-	97	-	-	-	97	99	97	98	88	104	108	108	-	-	-	-	-	-	-	-
	Sulphur (S) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Tl)	mg/L	-	-	-	-	97	-	-	-	97	101	100	100	92	106	107	109	-	-	-	-	-	-	-	-
	Tin (Sn)	mg/L	-	-	-	-	98	-	-	-	98	102	99	102	91	101	109	106	-	-	-	-	-	-	-	-
	Titanium (Ti)	mg/L	-	-	-	-	90	-	-	-	90	98	96	104	83	100	108	115	-	-	-	-	-	-	-	-
	Uranium (U)	mg/L	-	-	-	-	98	-	-	-	98	97	97	96	90	101	107	107	-	-	-	-	-	-	-	-
	Vanadium (V)	mg/L	-	-	-	-	101	-	-	-	101	103	101	103	96	104	109	109	-	-	-	-	-	-	-	-
	Zinc (Zn)	mg/L	-	-	-	-	96	-	-	-	96	94	95	97	86	94	98	101	-	-	-	-	-	-	-	-

Note: Highlighted values did not meet the data quality objective of 85-115% recovery.

Table B.7: Laboratory Recoveries of Reference Material for Water Sample Analyses

	Analyte	Units	Sep-15			Aug-15																		
			L1677598			L1654188					L1654831					L1655272								
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alkalinity		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	98	97	100	97	100	96	97	97	98	98	96	97	97	96	102	101	99	100	98	98	98	98
	Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fluoride (F)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrate (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate (SO_4)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals Metals	Aluminum (Al)	mg/L	-	-	-	101	-	-	-	-	100	-	-	-	-	106	106	104	-	-	-	-	-	-
	Antimony (Sb)	mg/L	-	-	-	101	-	-	-	-	108	-	-	-	-	102	103	103	-	-	-	-	-	-
	Arsenic (As)	mg/L	-	-	-	99	-	-	-	-	97	-	-	-	-	98	105	104	-	-	-	-	-	-
	Barium (Ba)	mg/L	-	-	-	99	-	-	-	-	103	-	-	-	-	100	104	102	-	-	-	-	-	-
	Beryllium (Be)	mg/L	-	-	-	98	-	-	-	-	103	-	-	-	-	104	108	109	-	-	-	-	-	-
	Bismuth (Bi)	mg/L	-	-	-	96	-	-	-	-	100	-	-	-	-	99	101	100	-	-	-	-	-	-
	Boron (B)	mg/L	-	-	-	87	-	-	-	-	104	-	-	-	-	99	105	104	-	-	-	-	-	-
	Cadmium (Cd)	mg/L	-	-	-	97	-	-	-	-	100	-	-	-	-	98	102	98	-	-	-	-	-	-
	Calcium (Ca)	mg/L	-	-	-	99	-	-	-	-	103	-	-	-	-	98	106	104	-	-	-	-	-	-
	Chromium (Cr)	mg/L	-	-	-	99	-	-	-	-	99	-	-	-	-	101	102	101	-	-	-	-	-	-
	Cobalt (Co)	mg/L	-	-	-	99	-	-	-	-	101	-	-	-	-	100	102	98	-	-	-	-	-	-
	Copper (Cu)	mg/L	-	-	-	97	-	-	-	-	97	-	-	-	-	97	99	97	-	-	-	-	-	-
	Iron (Fe)	mg/L	-	-	-	98	-	-	-	-	108	-	-	-	-	105	108	107	-	-	-	-	-	-
	Lead (Pb)	mg/L	-	-	-	99	-	-	-	-	101	-	-	-	-	99	101	99	-	-	-	-	-	-
	Lithium (Li)	mg/L	-	-	-	102	-	-	-	-	98	-	-	-	-	98	103	106	-	-	-	-	-	-
	Magnesium (Mg)	mg/L	-	-	-	99	-	-	-	-	94	-	-	-	-	107	106	111	-	-	-	-	-	-
	Manganese (Mn)	mg/L	-	-	-	100	-	-	-	-	103	-	-	-	-	100	105	104	-	-	-	-	-	-
	Mercury (Hg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	mg/L	-	-	-	96	-	-	-	-	101	-	-	-	-	96	103	101	-	-	-	-	-	-
	Nickel (Ni)	mg/L	-	-	-	97	-	-	-	-	99	-	-	-	-	103	102	100	-	-	-	-	-	-
	Phosphorus (P) - Total	mg/L	-	-	-	97	-	-	-	-	98	-	-	-	-	108	105	112	-	-	-	-	-	-
	Potassium (K)	mg/L	-	-	-	102	-	-	-	-	100	-	-	-	-	103	106	102	-	-	-	-	-	-
	Selenium (Se)	mg/L	-	-	-	96	-	-	-	-	97	-	-	-	-	96	100	99	-	-	-	-	-	-
	Silicon (Si)	mg/L	-	-	-	99	-	-	-	-	94	-	-	-	-	98	107	111	-	-	-	-	-	-
	Silver (Ag)	mg/L	-	-	-	102	-	-	-	-	105	-	-	-	-	97	106	106	-	-	-	-	-	-
	Sodium (Na)	mg/L	-	-	-	101	-	-	-	-	102	-	-	-	-	103	104	102	-	-	-	-	-	-
	Strontium (Sr)	mg/L	-	-	-	100	-	-	-	-	100	-	-	-	-	96	102	100	-	-	-	-	-	-
	Sulphur (S) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Tl)	mg/L	-	-	-	98	-	-	-	-	101	-	-	-	-	101	104	103	-	-	-	-	-	-
	Tin (Sn)	mg/L	-	-	-	98	-	-	-	-	98	-	-	-	-	99	102	98	-	-	-	-	-	-
	Titanium (Ti)	mg/L	-	-	-	97	-	-	-	-	106	-	-	-	-	106	100	103	-	-	-	-	-	-
	Uranium (U)	mg/L	-	-	-	94	-	-	-	-	97	-	-	-	-	91	103	99	-	-	-	-	-	-
	Vanadium (V)	mg/L	-	-	-	102	-	-	-	-	101	-	-	-	-	102	105	102	-	-	-	-	-	-
	Zinc (Zn)	mg/L	-	-	-	90	-	-	-	-	92	-	-	-	-	91	96	92	-	-	-	-	-	-

Note: Highlighted values did not meet the data quality objective of 85-115% recovery.

Table B.7: Laboratory Recoveries of Reference Material for Water Sample Analyses

	Analyte	Units	Aug-15												May-15							
			L1656408				L1657243				L1658246				L1611906							
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	98	100	99	99	99	99	-	-
	Alkalinity		-	-	-	-	-	-	-	-	-	-	-	-	99	99	101	102	92	102	99	85
	Ammonia (as N)	mg/L	98	99	92	96	102	104	100	99	97	98	100	109	99	96	100	94	95	-	-	-
	Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fluoride (F)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrate (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	98	97	96	102	94	86	93	95
	Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	107	105	110	106	-	-	-	-
	Sulphate (SO_4)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals Metals	Aluminum (Al)	mg/L	104	-	-	-	107	-	-	-	103	-	-	-	107	-	-	-	-	-	-	-
	Antimony (Sb)	mg/L	103	-	-	-	108	-	-	-	108	-	-	-	94	-	-	-	-	-	-	-
	Arsenic (As)	mg/L	104	-	-	-	101	-	-	-	103	-	-	-	109	-	-	-	-	-	-	-
	Barium (Ba)	mg/L	102	-	-	-	100	-	-	-	103	-	-	-	105	-	-	-	-	-	-	-
	Beryllium (Be)	mg/L	109	-	-	-	100	-	-	-	104	-	-	-	85	-	-	-	-	-	-	-
	Bismuth (Bi)	mg/L	100	-	-	-	101	-	-	-	100	-	-	-	94	-	-	-	-	-	-	-
	Boron (B)	mg/L	104	-	-	-	95	-	-	-	97	-	-	-	88	-	-	-	-	-	-	-
	Cadmium (Cd)	mg/L	98	-	-	-	99	-	-	-	100	-	-	-	101	-	-	-	-	-	-	-
	Calcium (Ca)	mg/L	104	-	-	-	101	-	-	-	103	-	-	-	105	-	-	-	-	-	-	-
	Chromium (Cr)	mg/L	101	-	-	-	99	-	-	-	100	-	-	-	104	-	-	-	-	-	-	-
	Cobalt (Co)	mg/L	98	-	-	-	102	-	-	-	101	-	-	-	104	-	-	-	-	-	-	-
	Copper (Cu)	mg/L	97	-	-	-	99	-	-	-	100	-	-	-	100	-	-	-	-	-	-	-
	Iron (Fe)	mg/L	107	-	-	-	102	-	-	-	108	-	-	-	99	-	-	-	-	-	-	-
	Lead (Pb)	mg/L	99	-	-	-	100	-	-	-	101	-	-	-	94	-	-	-	-	-	-	-
	Lithium (Li)	mg/L	106	-	-	-	98	-	-	-	106	-	-	-	87	-	-	-	-	-	-	-
	Magnesium (Mg)	mg/L	111	-	-	-	97	-	-	-	93	-	-	-	104	-	-	-	-	-	-	-
	Manganese (Mn)	mg/L	104	-	-	-	104	-	-	-	101	-	-	-	110	-	-	-	-	-	-	-
	Mercury (Hg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	mg/L	101	-	-	-	99	-	-	-	101	-	-	-	91	-	-	-	-	-	-	-
	Nickel (Ni)	mg/L	100	-	-	-	100	-	-	-	98	-	-	-	103	-	-	-	-	-	-	-
	Phosphorus (P) - Total	mg/L	112	-	-	-	110	-	-	-	96	-	-	-	103	-	-	-	-	-	-	-
	Potassium (K)	mg/L	102	-	-	-	105	-	-	-	103	-	-	-	104	-	-	-	-	-	-	-
	Selenium (Se)	mg/L	99	-	-	-	96	-	-	-	102	-	-	-	100	-	-	-	-	-	-	-
	Silicon (Si)	mg/L	111	-	-	-	96	-	-	-	90	-	-	-	107	-	-	-	-	-	-	-
	Silver (Ag)	mg/L	106	-	-	-	101	-	-	-	105	-	-	-	87	-	-	-	-	-	-	-
	Sodium (Na)	mg/L	102	-	-	-	106	-	-	-	104	-	-	-	103	-	-	-	-	-	-	-
	Strontium (Sr)	mg/L	100	-	-	-	100	-	-	-	101	-	-	-	94	-	-	-	-	-	-	-
	Sulphur (S) - Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	106	-	-	-	-	-	-	-
	Thallium (Tl)	mg/L	103	-	-	-	102	-	-	-	102	-	-	-	93	-	-	-	-	-	-	-
	Tin (Sn)	mg/L	98	-	-	-	98	-	-	-	100	-	-	-	91	-	-	-	-	-	-	-
	Titanium (Ti)	mg/L	103	-	-	-	106	-	-	-	101	-	-	-	102	-	-	-	-	-	-	-
	Uranium (U)	mg/L	99	-	-	-	96	-	-	-	97	-	-	-	91	-	-	-	-	-	-	-
	Vanadium (V)	mg/L	102	-	-	-	106	-	-	-	103	-	-	-	106	-	-	-	-	-	-	-
	Zinc (Zn)	mg/L	92	-	-	-	96	-	-	-	100	-	-	-	99	-	-	-	-	-	-	-

Note: Highlighted values did not meet the data quality objective of 85-115% recovery.

Table B.7: Laboratory Recoveries of Reference Material for Water Sample Analyses

	Analyte	Units	May-15 L1612928					
Non-metals	Total Suspended Solids	mg/L	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	-	-	-	-	-	-
	Turbidity	NTU	97	95	-	-	-	-
	Alkalinity		104	104	102	104	102	93
	Ammonia (as N)	mg/L	102	99	100	101	107	-
	Bromide (Br)	mg/L	-	-	-	-	-	-
	Chloride (Cl)	mg/L	-	-	-	-	-	-
	Fluoride (F)	mg/L	-	-	-	-	-	-
	Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-
	Nitrate (as N)	mg/L	-	-	-	-	-	-
	Nitrite (as N)	mg/L	-	-	-	-	-	-
	Orthophosphate	mg/L	100	91	99	91	89	-
	Phosphorus (P)	mg/L	107	108	108	-	-	-
	Sulphate (SO_4)	mg/L	-	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	-	-	-	-	-	-
	Total Organic Carbon	mg/L	-	-	-	-	-	-
Totals Metals	Aluminum (Al)	mg/L	-	105	-	-	-	-
	Antimony (Sb)	mg/L	92	97	-	-	-	-
	Arsenic (As)	mg/L	101	103	-	-	-	-
	Barium (Ba)	mg/L	100	101	-	-	-	-
	Beryllium (Be)	mg/L	86	96	-	-	-	-
	Bismuth (Bi)	mg/L	91	97	-	-	-	-
	Boron (B)	mg/L	83	93	-	-	-	-
	Cadmium (Cd)	mg/L	94	97	-	-	-	-
	Calcium (Ca)	mg/L	98	101	-	-	-	-
	Chromium (Cr)	mg/L	101	103	-	-	-	-
	Cobalt (Co)	mg/L	100	102	-	-	-	-
	Copper (Cu)	mg/L	97	100	-	-	-	-
	Iron (Fe)	mg/L	91	96	-	-	-	-
	Lead (Pb)	mg/L	94	99	-	-	-	-
	Lithium (Li)	mg/L	89	99	-	-	-	-
	Magnesium (Mg)	mg/L	95	100	-	-	-	-
	Manganese (Mn)	mg/L	-	-	-	-	-	-
	Mercury (Hg)	mg/L	102	100	-	-	-	-
	Molybdenum (Mo)	mg/L	91	99	-	-	-	-
	Nickel (Ni)	mg/L	100	102	-	-	-	-
	Phosphorus (P) - Total	mg/L	98	103	-	-	-	-
	Potassium (K)	mg/L	95	100	-	-	-	-
	Selenium (Se)	mg/L	99	101	-	-	-	-
	Silicon (Si)	mg/L	97	100	-	-	-	-
	Silver (Ag)	mg/L	90	96	-	-	-	-
	Sodium (Na)	mg/L	102	104	-	-	-	-
	Strontium (Sr)	mg/L	94	101	-	-	-	-
	Sulphur (S) - Total	mg/L	100	104	-	-	-	-
	Thallium (Tl)	mg/L	93	97	-	-	-	-
	Tin (Sn)	mg/L	93	98	-	-	-	-
	Titanium (Ti)	mg/L	101	99	-	-	-	-
	Uranium (U)	mg/L	95	99	-	-	-	-
	Vanadium (V)	mg/L	102	103	-	-	-	-
	Zinc (Zn)	mg/L	93	93	-	-	-	-

Note: Highlighted values did not meet the data quality objective of 85-115% recovery.

Table B.8: Laboratory Rporting Limits (LRLs) for Sediment Quality Analysis

	Analytes	Units	Target LRL	Sediment Quality Guidelines (SQG)[1]		Aug-15					
						L1655687		L1658282		L1659340	
				Lower SQG[a]	Upper SQG[b]	# Sample (out of 77)	LRL Achieved	# Sample (out of 45)	LRL Achieved	# Sample (out of 5)	LRL Achieved
Non-metal	Total Organic Carbon	%	0.1	-	-	77	0.1	45	0.1	5	0.1
	pH	pH units	0.1	-	-	77	0.1	45	0.1	5	0.1
	Moisture	%	0.25	-	-	77	0.25	45	0.25	5	0.25
	Particle Size	%	0.1	-	-	77	0.1	45	0.1	5	0.1
Metals	Aluminum (Al)	mg/kg	50	-	-	77	100	45	50	5	50
	Antimony (Sb)	mg/kg	0.1	-	-	77	0.2	45	0.1	5	0.10
	Arsenic (As)	mg/kg	0.05	5.9	17	77	0.2	45	0.1	5	0.10
	Barium (Ba)	mg/kg	0.5	-	-	77	1	45	0.5	5	0.50
	Beryllium (Be)	mg/kg	0.1	-	-	77	0.2	45	0.1	5	0.10
	Bismuth (Bi)	mg/kg	0.1	-	-	77	0.4	45	0.2	5	0.20
	Boron	mg/kg	5	-	-	77	10	45	5	5	5.0
	Cadmium (Cd)	mg/kg	0.05	0.6	3.5	77	0.04	45	0.02	5	0.020
	Calcium (Ca)	mg/kg	50	-	-	77	100	45	50	5	50
	Chromium (Cr)	mg/kg	0.5	37.3	90	77	1	45	0.5	5	0.50
	Cobalt (Co)	mg/kg	0.1	-	-	77	0.2	45	0.1	5	0.10
	Copper (Cu)	mg/kg	0.5	35.7	197	77	1	45	0.5	5	0.50
	Iron (Fe)	mg/kg	50	21,200	43,766	77	100	45	50	5	50
	Lead (Pb)	mg/kg	0.1	35	91	77	1	45	0.5	5	0.50
	Lithium (Li)	mg/kg	5	-	-	77	4	45	2	5	2.0
	Magnesium (Mg)	mg/kg	10	-	-	77	40	45	20	5	20
	Manganese (Mn)	mg/kg	0.2	460	1100	77	2	45	1	5	1.0
	Mercury (Hg)	mg/kg	0.005	0.17	0.486	77	0.005	45	0.005	5	0.0050
	Molybdenum (Mo)	mg/kg	0.1	-	-	77	0.2	45	0.1	5	0.10
	Nickel (Ni)	mg/kg	0.5	16	75	77	1	45	0.5	5	0.50
	Phosphorus (P)	mg/kg	20	-	-	77	100	45	50	5	50
	Potassium (K)	mg/kg	100	-	-	77	200	45	100	5	100
	Selenium (Se)	mg/kg	0.1	2 [c]		77	0.4	45	0.2	5	0.20
	Silver (Ag)	mg/kg	0.05	-	-	77	0.2	45	0.1	5	0.10
	Sodium (Na)	mg/kg	100	-	-	77	100	45	50	5	50
	Strontium (Sr)	mg/kg	0.1	-	-	77	1	45	0.5	5	0.50
	Sulphur (S)	mg/kg	500	-	-			45		5	
	Thallium (Tl)	mg/kg	0.05	-	-	77	0.1	45	0.05	5	0.050
	Tin (Sn)	mg/kg	0.2	-	-	77	4	45	2	5	2.0
	Titanium (Ti)	mg/kg	1	-	-	77	2	45	1	5	1.0
	Uranium (U)	mg/kg	0.05	-	-	77	0.1	45	0.05	5	0.050
	Vanadium (V)	mg/kg	0.2	-	-	77	0.4	45	0.2	5	0.20
	Zinc (Zn)	mg/kg	1	123	315	77	4	45	2	5	2.0
	Zirconium (Zr)	mgkg	-	-	-	77	2	45	1	5	1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene	mg/kg		0.007	0.089	62	0.005	36	0.005	3	0.015
	Acenaphthylene	mg/kg	0.035-1	0.006	0.128	62	0.005	36	0.005	3	0.015
	Anthracene	mg/kg	0.005	0.047	0.245	62	0.004	36	0.004	3	0.012
	Benz(a)anthracene	mg/kg	0.004	0.032	0.385	77	0.01	45	0.01	3	0.030
	Benzo(a)pyrene	mg/kg	0.01	0.032	0.782	77	0.01	45	0.01	3	0.030
	Benzo(b)fluoranthene	mg/kg	0.01	-	-	77	0.01	45	0.01	3	0.030
	Benzo(b+j+k)fluoranthene	mg/kg	0.01	-	-	77	0.015	36	0.015	3	0.042
	Benzo(g,h,i)perylene	mg/kg	0.015	0.170	3.2	77	0.01	45	0.01	3	0.030
	Benzo(k)fluoranthene	mg/kg	0.01	0.240	13.4	77	0.01	45	0.01	3	0.030
	Chrysene	mg/kg	0.01	0.057	0.862	77	0.01	45	0.01	3	0.030
	Dibenz(a,h)anthracene	mg/kg	0.01	0.006	0.135	77	0.005	45	0.005	3	0.015
	Fluoranthene	mg/kg	0.005-0.02	0.111	2.4	77	0.01	45	0.01	3	0.030
	Fluorene	mg/kg	0.01	0.021	0.144	77	0.01	45	0.01	3	0.030
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.01	0.200	3.2	77	0.01	45	0.01	3	0.030
	2-Methylnaphthalene	mg/kg	0.01	0.020	0.201	77	0.01	45	0.01	3	0.030
	Naphthalene	mg/kg	0.01	0.035	0.391	77	0.01	45	0.01	3	0.030
	Phenanthrene	mg/kg	0.01	0.042	0.515	77	0.01	45	0.01	3	0.030
	Pyrene	mg/kg	0.01	0.053	0.875	77	0.01	45	0.01	3	0.030

Note: Any highlighted values indicate LRLs that were above the target.

[1] Working guidelines (BCMOE 2006)

[a] A concentration that will protect aquatic life from adverse effects of toxic substances in most situations.

[b] A concentration that if exceeded will likely cause severe effects on aquatic life.

[c] Only a single guideline has been defined.

Shaded values indicate Achieved LRLs which exceed the Target LRL

Table B.9: Laboratory Blank Results Associated with Sediment Quality Analysis

Analytes		Units	Aug-15								
			L1655687			L1658282			L1659340		
			LRL	Total # of MB	Result	LRL	Total # of MB	Result	LRL	Total # of MB	Result
Non-metal	Total Organic Carbon	%	0.1	4	<0.1	0.1	3	<0.1	0.1	1	<0.1
	pH	pH units	0.1	-	-	0.1	-	-	0.1	-	-
	Moisture	%	0.25	3	<0.25	0.25	4	<0.25	0.25	1	<0.25
	Particle Size	%	0.1	-	-	0.1	-	-	0.1	-	-
Metals	Aluminum (Al)	mg/kg	100	4	<50	50	3	<50	50	1	<50
	Antimony (Sb)	mg/kg	0.2	4	<0.1	0.1	3	<0.1	0.1	1	<0.1
	Arsenic (As)	mg/kg	0.2	4	<0.1	0.1	3	<0.1	0.1	1	<0.1
	Barium (Ba)	mg/kg	1	4	<0.5	0.5	3	<0.5	0.5	1	<0.5
	Beryllium (Be)	mg/kg	0.2	4	<0.1	0.1	3	<0.1	0.1	1	<0.1
	Bismuth (Bi)	mg/kg	0.4	4	<0.2	0.2	3	<0.2	0.2	1	<0.2
	Boron	mg/kg	10	4	<5.0	5	3	<5.0	5	1	<5.0
	Cadmium (Cd)	mg/kg	0.04	4	<0.02	0.02	3	<0.02	0.02	1	<0.02
	Calcium (Ca)	mg/kg	100	4	<50	50	3	<50	50	1	<50
	Chromium (Cr)	mg/kg	1	4	<0.5	0.5	3	<0.5	0.5	1	<0.5
	Cobalt (Co)	mg/kg	0.2	4	<0.1	0.1	3	<0.1	0.1	1	<0.1
	Copper (Cu)	mg/kg	1	4	<0.5	0.5	3	<0.5	0.5	1	<0.5
	Iron (Fe)	mg/kg	100	4	<50	50	3	<50	50	1	<50
	Lead (Pb)	mg/kg	1	4	<0.5	0.5	3	<0.5	0.5	1	<0.5
	Lithium (Li)	mg/kg	4	4	<2.0	2	3	<2.0	2	1	<2.0
	Magnesium (Mg)	mg/kg	40	4	<20	20	3	<20	20	1	<20
	Manganese (Mn)	mg/kg	2	4	<1.0	1	3	<1.0	1	1	<1.0
	Mercury (Hg)	mg/kg	0.005	4	<0.005	0.005	3	<0.005	0.005	1	<0.005
	Molybdenum (Mo)	mg/kg	0.2	4	<0.1	0.1	3	<0.1	0.1	1	<0.1
	Nickel (Ni)	mg/kg	1	4	<0.5	0.5	3	<0.5	0.5	1	<0.5
	Phosphorus (P)	mg/kg	100	4	<50	50	3	<50	50	1	<50
	Potassium (K)	mg/kg	200	4	<100	100	3	<100	100	1	<100
	Selenium (Se)	mg/kg	0.4	4	<0.2	0.2	3	<0.2	0.2	1	<0.2
	Silver (Ag)	mg/kg	0.2	4	<0.1	0.1	3	<0.1	0.1	1	<0.1
	Sodium (Na)	mg/kg	100	4	<50	50	3	<50	50	1	<50
	Strontium (Sr)	mg/kg	1	4	<0.5	0.5	3	<0.5	0.5	1	<0.5
	Sulphur (S)	mg/kg	-	-	-	-	3	-	-	1	-
	Thallium (Tl)	mg/kg	0.1	4	<0.05	0.05	3	<0.05	0.05	1	<0.05
	Tin (Sn)	mg/kg	4	4	<2.0	2	3	<2.0	2	1	<2.0
	Titanium (Ti)	mg/kg	2	4	<1.0	1	3	<1.0	1	1	<1.0
	Uranium (U)	mg/kg	0.1	4	<0.05	0.05	3	<0.05	0.05	1	<0.05
	Vanadium (V)	mg/kg	0.4	4	<0.2	0.2	3	<0.2	0.2	1	<0.2
	Zinc (Zn)	mg/kg	4	4	<2.0	2	3	<2.0	2	1	<2.0
	Zirconium (Zr)	mgkg	2	4	<1.0	1	3	<1.0	1	1	<1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene	mg/kg	0.005	4	<0.005	0.005	3	<0.005	0.015	3	<0.005
	Acenaphthylene	mg/kg	0.005	4	<0.005	0.005	3	<0.005	0.015	3	<0.005
	Anthracene	mg/kg	0.004	4	<0.004	0.004	3	<0.004	0.012	3	<0.004
	Benz(a)anthracene	mg/kg	0.01	4	<0.001	0.01	3	<0.001	0.03	3	<0.001
	Benzo(a)pyrene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Benzo(b)fluoranthene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Benzo(b+j+k)fluoranthene	mg/kg	0.015	4	<0.01	0.015	3	<0.01	0.042	3	<0.01
	Benzo(g,h,i)perylene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Benzo(k)fluoranthene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Chrysene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Dibenz(a,h)anthracene	mg/kg	0.005	4	<0.005	0.005	3	<0.005	0.015	3	<0.005
	Fluoranthene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Fluorene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	2-Methylnaphthalene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Naphthalene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Phenanthrene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01
	Pyrene	mg/kg	0.01	4	<0.01	0.01	3	<0.01	0.03	3	<0.01

Notes: Any highlighted data did not meet the data quality objective of ≤ 2x the laboratory reporting limit. MB - Method Blank.

Table B.10: Laboratory Duplicate Results for Sediment Metal Analyses, August 2015

Analytes	Units	ALS Job Number L1655687												ALS Job Number L1658282								
		Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]
		FMUCK-SED-4			MIC2-SED-5			STPD-SED-4						EROU-SED-5			R5-1-SED-1					
Moisture	%	43.6	44.8	2.7	52.2	50.7	2.9	69.8	72.3	3.5	-	-	-	65.5	65.1	0.61	65.9	65.8	0.15	-	-	-
		FMUCK-SED-4			EROL-SED-1			FO10-SED-2			MIWW-SED-3			OTTO-SED-3			LCHO-SED-3					
pH (1:2 soil:water)	pH units	8.16	8.18	0.24	7.81	7.87	0.77	7.88	7.91	0.38	7.52	7.52	0	8.07	8.07	0	6.7	6.73	0.45	-	-	-
		LML-SED-4			R5-3-SED-2			FLA1-SED-2			FOXL-SED-1			ERUP-SED-4			EL14-SED-1					
Total Organic Carbon	%	26.1	26.0	0.38	2.58	2.68	3.8	9.89	9.69	2.0	9.54	10.0	4.7	4.65	4.58	1.5	5.22	5.2	0.38	-	-	-
		FMUCK-SED-4			EROL-SED-1			FO10-SED-2			MIWW-SED-4			EROU-SED-X			GO13-SED-3			R5-1-SED-1		
Aluminum (Al)	mg/kg	8,010	7,880	1.6	7,080	7,190	1.5	6,650	5,600	17	6,870	6,000	14	9,290	9,210	0.86	9,390	8,990	4.4	11,100	10,800	2.7
Antimony (Sb)	mg/kg	0.57	0.53	7.3	0.69	0.66	4.4	0.53	0.41	26	0.69	0.56	21	0.66	0.66	0	1.18	1.06	11	1.23	1.2	2.5
Arsenic (As)	mg/kg	4.92	4.96	0.81	5.99	5.91	1.3	4.11	3.35	20	3.10	2.70	14	7.43	7.69	3.4	4.51	3.99	12	6.45	6.18	4.3
Barium (Ba)	mg/kg	191	182	4.8	197	199	1.0	191	162	16	210	187	12	241	248	2.9	440	404	8.5	396	383	3.3
Beryllium (Be)	mg/kg	0.65	0.64	1.6	0.57	0.56	1.8	0.5	0.44	13	0.52	0.49	5.9	0.66	0.68	3.0	0.73	0.7	4.2	0.88	0.84	4.7
Bismuth (Bi)	mg/kg	< 0.40	< 0.40	0	< 0.40	< 0.40	0	< 0.40	< 0.40	0	< 0.40	< 0.40	0	< 0.20	< 0.20	0	0.25	< 0.20	22	0.24	< 0.20	18
Boron (B)	mg/kg	< 10.00	< 10.00	0	< 10.00	< 10.00	0	< 10.00	< 10.00	0	< 10.00	< 10.00	0	15.5	13.5	14	14.4	13.7	5.0	13.8	13.2	4.4
Cadmium (Cd)	mg/kg	1.01	0.966	4.5	1.02	1.03	1.0	1.22	1.03	17	1.49	1.34	11	1.41	1.45	2.8	1.34	1.22	9.4	1.88	1.78	5.5
Calcium (Ca)	mg/kg	40,800	41,500	1.7	71,600	68,900	3.8	30,700	25,700	18	30,600	26,700	14	121,000	121,000	0	73,900	67,800	8.6	95,300	93,800	1.6
Chromium (Cr)	mg/kg	14.3	13.5	5.8	15.6	15.9	1.9	13	11.3	14	13.1	11.1	17	23.5	24.4	3.8	15.1	14.5	4.1	21.9	21.8	0.46
Cobalt (Co)	mg/kg	5.25	5.23	0.38	4.72	4.66	1.3	4.00	3.33	18	4.72	4.11	14	6.21	6.25	0.64	6.16	5.61	9.3	9.73	9.28	4.7
Copper (Cu)	mg/kg	11.9	12	0.84	13.7	14.1	2.9	13.1	10.8	19	14	12.4	12	15.9	16.5	3.7	24.3	22.3	8.6	23.4	22.3	4.8
Iron (Fe)	mg/kg	13,500	13,100	3.0	13,500	13,500	0	13,100	10,700	20	9,940	8,640	14	17,200	17,700	2.9	13,700	12,600	8.4	14,200	13,700	3.6
Lead (Pb)	mg/kg	8.6	8.6	0	8.8	8.6	2.3	7.4	6.3	16	7.8	6.8	14	8.57	8.87	3.4	10.9	10.1	7.6	13.8	13.3	3.7
Lithium (Li)	mg/kg	9.8	9.7	1.0	10.6	10.2	3.8	8.0	7.0	13	7.8	6.9	12	14.4	14.2	1.4	11.1	10.7	3.7	12.9	12.6	2.4
Magnesium (Mg)	mg/kg	13,000	12,400	4.7	15,100	14,800	2.0	8,540	7,040	19	5,740	4,890	16	15,200	15,700	3.2	9,540	8,880	7.2	8,770	8,360	4.8
Manganese (Mn)	mg/kg	364	364	0	398	393	1.3	242	191	24	103	88.2	15	1,000	1,030	3.0	279	257	8.2	313	300	4.2
Mercury (Hg)	mg/kg	-	-	-	-	-	-	0.0735	0.0967	27	-	-	-	0.064	0.0809	23	0.0774	0.105	30	0.0632	0.0778	21
Molybdenum (Mo)	mg/kg	1.21	1.2	0.83	1.26	1.17	7.4	0.82	0.63	26	0.75	0.9	18	1.95	1.98	1.5	1.83	1.68	8.5	3.57	3.41	4.6
Nickel (Ni)	mg/kg	23.5	23.6	0.42	17.9	18.1	1.1	19.0	15.5	20	17.5	15.2	14	26.2	26.5	1.1	23.9	22.2	7.4	38.5	36.7	4.8
Phosphorus (P)	mg/kg	1,560	1,610	3.2	1,200	1,180	1.7	1,600	1,280	22	1,130	1,000	12	1,330	1,370	3.0	1,100	982	11	1,060	996	6.2
Potassium (K)	mg/kg	2,110	2,050	2.9	1,770	1,850	4.4	1,620	1,360	17	1,470	1,350	8.5	2,620	2,560	2.3	2,440	2,380	2.5	3,450	3,400	1.5
Selenium (Se)	mg/kg	1.91	1.99	4.1	4.42	4.25	3.9	3.41	2.82	19	2.26	2.21	2.2	2.08	2.07	0.48	30.4	27.5	10	19.7	18.5	6.3
Silver (Ag)	mg/kg	< 0.20	< 0.20	0	< 0.20	0.21	4.9	0.21	< 0.20	4.9	0.23	0.21	9.1	0.27	0.28	3.6	0.3	0.28	6.9	0.37	0.36	2.7
Sodium (Na)	mg/kg	< 100	< 100	0	< 100	< 100	0	< 100	< 100	0	< 100	< 100	0	147	139	5.6	148	127	15	286	266	7.2
Strontium (Sr)	mg/kg	60.9	59.6	2.2	86.7	83.6	3.6	51	43.3	16	62.2	55.1	12	224	217	3.2	125	115	8.3	142	139	2.1
Thallium (Tl)	mg/kg	0.23	0.23	0	0.25	0.24	4.1	0.24	0.19	23	0.27	0.23	16	0.423	0.376	12	0.303	0.245	21	0.472	0.429	9.5
Tin (Sn)	mg/kg	< 4.00	< 4.00	0	< 4.00	< 4.00	0	< 4.00	< 4.00	0	< 4.00	< 4.00	0	< 2.00	< 2.00	0	< 2.00	< 2.00	0	< 2.00	< 2.00	0
Titanium (Ti)	mg/kg	17.9	16.9	5.7	25.3	26.8	5.8	21.9	18.1	19	31.1	29.1	6.6	31.5	28.7	9.3	20.9	20.2	3.4	16.2	17.9	10
Uranium (U)	mg/kg	1.05	1.04	1.0	0.92	0.94	2.2	0.94	0.77	20	0.87	0.75	15	1.65	1.68	1.8	1.51	1.38	9.0	1.92	1.86	3.2
Vanadium (V)	mg/kg	33.3	32.6	2.1	29.9	30.2	1.0	28.3	23.2	20	31.1	27.3	13	40.2	40.4	0.50	32.9	31.5	4.3	49.5	48.2	2.7
Zinc (Zn)	mg/kg	101	100	1.0	82.2	79.3	3.6	86.6	72.4	18	86	74.2	15	119	123	3.3	122	111	9.4	162	156	3.8
Zirconium (Zr)	mg/kg	< 2.00	< 2.00	0	< 2.00	< 2.00	0	< 2.00	< 2.00	0	< 2.00	< 2.00	0	1.5	1.4	6.9	1.5	1.3	14	1.4	1.2	15

Note: Highlighted values did not meet the data quality objective of ≤ 35% relative percent difference.

[a] For calculation of the RPD, laboratory reporting limit (LRL) values were used in cases where the value reported was < LRL

Table B.11: Laboratory Duplicate Results of Sediment Non Metal Parameters, August 2015

	Analytes	Units	Relative Percent Difference											
			ALS Job Number L1655687											
			LML-SED-3			R5-3-SED-2			FLA1-SED-2			ELKO-SED-3		
			Replicate 1	Replicate 2	RPD[a]	Replicate 1	Replicate 2	RPD[a]	Replicate 1	Replicate 2	RPD[a]	Replicate 1	Replicate 2	RPD[a]
Particle size	Gravel (>2mm)	%	< 0.10	< 0.10	0	< 0.10	< 0.10	0	< 0.10	< 0.10	0	-	-	-
	Sand (2.00mm - 1.00mm)	%	0.52	1.12	73	0.21	0.24	13	0.54	0.93	53	< 0.10	< 0.10	0
	Sand (1.00mm - 0.50mm)	%	0.72	0.59	20	0.28	0.38	30	0.92	1.05	13	0.71	0.71	0
	Sand (0.50mm - 0.25mm)	%	1.12	0.93	19	5.72	5.90	3.1	1.36	1.49	9.1	1.44	1.44	0
	Sand (0.25mm - 0.125mm)	%	1.48	1.35	9.2	20.1	21.2	5.3	2.82	3.00	6.2	6.35	6.35	0
	Sand (0.125mm - 0.063mm)	%	2.23	1.93	14	17.9	18.3	2.2	3.97	3.17	22	17.2	17.2	0
	Silt (0.063mm - 0.0312mm)	%	40.8	41.3	1.2	27.4	26.7	2.6	35.3	36.0	2.0	28.8	28.8	0
	Silt (0.0312mm - 0.004mm)	%	46.2	46.5	0.65	26.1	25.2	3.5	47.7	47.4	0.63	36.8	36.8	0
	Clay (<4um)	%	6.92	6.21	11	2.33	2.05	13	7.34	6.99	4.9	6.92	6.21	11
	Analytes	Units	EROL-SED-1			STDP-SED-4								
			Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]
Polycyclic aromatic hydrocarbons	Acenaphthene	mg/kg	< 0.005	< 0.005	0	< 0.005	< 0.005	0	-	-	-	-	-	-
	Acenaphthylene	mg/kg	0.0068	0.0074	8.5	0.0063	0.0082	26	-	-	-	-	-	-
	Anthracene	mg/kg	0.0165	0.0142	15	0.0182	0.0247	30	-	-	-	-	-	-
	Benz(a)anthracene	mg/kg	0.057	0.053	7.3	0.135	0.173	25	-	-	-	-	-	-
	Benzo(a)pyrene	mg/kg	0.047	0.046	2.2	0.209	0.258	21	-	-	-	-	-	-
	Benzo(b)fluoranthene	mg/kg	0.107	0.101	5.8	0.530	0.634	18	-	-	-	-	-	-
	Benzo(g,h,i)perylene	mg/kg	0.046	0.041	11	0.207	0.250	19	-	-	-	-	-	-
	Benzo(k)fluoranthene	mg/kg	0.023	0.021	9.1	0.132	0.171	26	-	-	-	-	-	-
	Chrysene	mg/kg	0.147	0.143	2.8	0.433	0.526	19	-	-	-	-	-	-
	Dibenz(a,h)anthracene	mg/kg	0.0189	0.0169	11	0.0403	0.0451	11	-	-	-	-	-	-
	Fluoranthene	mg/kg	0.102	0.086	17	0.666	0.811	20	-	-	-	-	-	-
	Fluorene	mg/kg	0.021	0.019	10	0.029	0.034	16	-	-	-	-	-	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.032	0.032	0	0.137	0.166	19	-	-	-	-	-	-
	2-Methylnaphthalene	mg/kg	0.162	0.154	5.1	0.254	0.299	16	-	-	-	-	-	-
	Naphthalene	mg/kg	0.098	0.089	9.6	0.113	0.135	18	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.304	0.288	5.4	0.395	0.476	19	-	-	-	-	-	-
	Pyrene	mg/kg	0.079	0.068	15	0.459	0.559	20	-	-	-	-	-	-

Note: Highlighted values did not meet the data quality objective of ≤ 35% relative percent difference.

[a] For calculation of the RPD, laboratory reporting limit (LRL) values were used in cases where the value reported was LRL

Table B.11: Laboratory Duplicate Results of Sediment Non Metal Parameters, August 2015

	Analytes	Units	Relative Percent Difference											
			ALS Job Number L1658282									ALS Job Number L1659340		
			OTTO-SED-1			ELWDGC-SED-1			R5-SED-1					
			Replicate 1	Replicate 2	RPD[a]	Replicate 3	Replicate 4	RPD[a]	Replicate 5	Replicate 6	RPD[a]	Replicate 1	Replicate 2	RPD[a]
Particle size	Gravel (>2mm)	%	< 0.10	< 0.10	0	0.39	0.39	0	< 0.10	< 0.10	0	-	-	-
	Sand (2.00mm - 1.00mm)	%	0.15	0.11	31	0.32	0.37	14	0.19	0.10	62	-	-	-
	Sand (1.00mm - 0.50mm)	%	0.23	0.27	16	0.66	0.64	3.1	0.24	0.12	67	-	-	-
	Sand (0.50mm - 0.25mm)	%	0.27	0.32	17	1.45	1.3	13	0.34	0.16	72	-	-	-
	Sand (0.25mm - 0.125mm)	%	0.27	0.33	20	8.77	7.7	12	0.66	0.43	42	-	-	-
	Sand (0.125mm - 0.063mm)	%	0.72	0.62	15	26.3	25.8	1.9	1.35	1.75	26	-	-	-
	Silt (0.063mm - 0.0312mm)	%	4.13	2.4	53	28.2	29.0	2.8	9.83	11.6	17	-	-	-
	Silt (0.0312mm - 0.004mm)	%	33.6	35.6	5.8	29.7	30.4	2.3	40.8	41.6	1.9	-	-	-
	Clay (<4um)	%	60.6	60.3	0.50	4.31	4.4	1.4	46.6	44.2	5.3	-	-	-
	Analytes	Units	EROU-SED-5									REFF-SED-3		
			Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 3	Replicate 4	Relative Percent Difference[a]	Replicate 5	Replicate 6	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]
Polycyclic aromatic hydrocarbons	Acenaphthene	mg/kg	< 0.005	< 0.005	0	-	-	-	-	-	-	< 0.015	< 0.015	0
	Acenaphthylene	mg/kg	< 0.005	< 0.005	0	-	-	-	-	-	-	< 0.015	< 0.015	0
	Anthracene	mg/kg	< 0.004	< 0.004	0	-	-	-	-	-	-	< 0.012	< 0.012	0
	Benz(a)anthracene	mg/kg	0.016	0.015	6.5	-	-	-	-	-	-	< 0.030	< 0.030	0
	Benzo(a)pyrene	mg/kg	< 0.010	< 0.010	0	-	-	-	-	-	-	< 0.030	< 0.030	0
	Benzo(b)fluoranthene	mg/kg	0.047	0.045	4.3	-	-	-	-	-	-	< 0.030	< 0.030	0
	Benzo(g,h,i)perylene	mg/kg	0.015	0.014	6.9	-	-	-	-	-	-	< 0.030	< 0.030	0
	Benzo(k)fluoranthene	mg/kg	< 0.010	< 0.010	0	-	-	-	-	-	-	< 0.030	< 0.030	0
	Chrysene	mg/kg	0.091	0.088	3.4	-	-	-	-	-	-	0.062	0.041	41
	Dibenz(a,h)anthracene	mg/kg	0.0075	0.0068	9.8	-	-	-	-	-	-	< 0.015	< 0.015	0
	Fluoranthene	mg/kg	0.021	0.021	0	-	-	-	-	-	-	< 0.030	< 0.030	0
	Fluorene	mg/kg	0.014	0.012	15	-	-	-	-	-	-	0.047	0.031	41
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.010	< 0.010	0	-	-	-	-	-	-	< 0.030	< 0.030	0
	2-Methylnaphthalene	mg/kg	0.116	0.095	20	-	-	-	-	-	-	0.339	0.242	33
	Naphthalene	mg/kg	0.040	0.031	25	-	-	-	-	-	-	0.091	0.070	26
	Phenanthrene	mg/kg	0.191	0.182	4.8	-	-	-	-	-	-	0.198	0.135	38
	Pyrene	mg/kg	0.021	0.022	4.7	-	-	-	-	-	-	< 0.030	< 0.030	0

Note: Highlighted values did not meet the data quality objective of ≤ 35% relative percent difference.

[a] For calculation of the RPD, laboratory reporting limit (LRL) values were used in cases where the value reported was LRL

Table B.12: Field Duplicate Results for Sediment Chemistry Samples

	Analyte	Units	ALS Job # L1658282														
			EROU (10-Aug-2015)			OTTO (11-Aug-2015)			GO13 (12-Aug-2015)			LCHO (11-Aug-2015)			R5-1 (14-Aug-2015)		
			EROU-Sed-1	EROU-Sed-X	RPD[a] (%)	OTTO-Sed-2	OTTO-Sed-X	RPD[a] (%)	GO13-Sed-5	GO13-Sed-X	RPD[a] (%)	LCHO-Sed-1	LCHO-Sed-X	RPD[a] (%)	R5-1-Sed-2	R5-1-Sed-X	RPD[a] (%)
Non-metals	Moisture	%	74.1	73.1	1%	56.0	56.6	1%	66.0	66.0	0%	77.1	75.9	2%	70.4	69.9	1%
	pH (1:2 soil:water)	pH	7.68	7.68	0%	8.10	8.10	0%	7.80	7.76	1%	6.67	6.80	2%	7.77	7.68	1%
	Total Organic Carbon (TOC)	%	7.11	6.72	6%	36.1	36.9	2%	16.2	16.0	1%	10.4	9.61	8%	8.21	8.15	1%
Metals	Aluminum (Al)	mg/kg	9,450	9,290	2%	7,860	8,180	4%	10,200	10,100	1%	10,300	11,400	10%	6,370	4,810	28%
	Antimony (Sb)	mg/kg	0.62	0.66	6%	0.62	0.69	11%	1.12	1.04	7%	0.97	1.06	9%	0.68	0.46	39%
	Arsenic (As)	mg/kg	7.71	7.43	4%	6.24	6.93	10%	5.25	5.17	2%	3.28	3.62	10%	3.42	2.37	36%
	Barium (Ba)	mg/kg	246	241	2%	313	337	7%	465	438	6%	303	336	10%	322	217	39%
	Beryllium (Be)	mg/kg	0.67	0.66	2%	0.62	0.67	8%	0.80	0.76	5%	0.66	0.74	11%	0.49	0.37	28%
	Bismuth (Bi)	mg/kg	< 0.22	< 0.20	0%	< 0.200	< 0.200	0%	< 0.200	< 0.20	0%	< 0.20	< 0.20	0%	< 0.20	< 0.20	0%
	Boron (B)	mg/kg	14.2	15.5	9%	12.3	12.7	3%	14.3	13.7	4%	5.3	6.5	20%	13.2	9.7	31%
	Cadmium (Cd)	mg/kg	1.47	1.41	4%	0.998	1.07	7%	1.42	1.33	7%	3.53	4.03	13%	1.46	0.961	41%
	Calcium (Ca)	mg/kg	121,000	121,000	0%	20,900	23,300	11%	78,400	77,200	2%	7,070	8,740	21%	197,000	132,000	40%
	Chromium (Cr)	mg/kg	24.4	23.5	4%	10.7	11.0	3%	17.1	16.3	5%	20.0	21.4	7%	12.7	9.47	29%
	Cobalt (Co)	mg/kg	6.36	6.21	2%	5.55	6.07	9%	6.57	6.47	2%	6.21	6.60	6%	5.40	3.76	36%
	Copper (Cu)	mg/kg	16.4	15.9	3%	22.5	24.7	9%	23.7	23.1	3%	19.4	22.6	15%	14.0	9.66	37%
	Iron (Fe)	mg/kg	17,700	17,200	3%	16,200	17,500	8%	15,200	14,700	3%	10,700	11,900	11%	8,780	6,070	36%
	Lead (Pb)	mg/kg	8.59	8.57	0%	9.33	10.4	11%	11.2	11.0	2%	10.5	11.5	9%	7.96	5.73	33%
	Lithium (Li)	mg/kg	14.1	14.4	2%	8.8	9.5	8%	12.5	12.9	3%	11.5	13.0	12%	8.4	6.4	27%
	Magnesium (Mg)	mg/kg	15,500	15,200	2%	3,430	3,740	9%	11,500	11,200	3%	2,570	2,860	11%	7,800	5,330	38%
	Manganese (Mn)	mg/kg	1,030	1,000	3%	306	335	9%	351	338	4%	88.4	99.4	12%	231	150	43%
	Mercury (Hg)	mg/kg	0.0743	0.0640	15%	0.126	0.169	29%	0.0933	0.102	9%	0.143	0.134	6%	0.0445	0.0604	30%
	Molybdenum (Mo)	mg/kg	1.94	1.95	1%	1.44	1.57	9%	1.71	1.72	1%	1.34	1.50	11%	2.69	1.95	32%
	Nickel (Ni)	mg/kg	26.9	26.2	3%	19.1	21.4	11%	25.3	24.4	4%	25.7	28.2	9%	22.8	15.7	37%
	Phosphorus (P)	mg/kg	1,380	1,330	4%	662	715	8%	1,140	1,140	0%	930	1,080	15%	667	435	42%
	Potassium (K)	mg/kg	2,670	2,620	2%	2,100	2,160	3%	2,620	2,620	0%	1,690	1,910	12%	1,980	1,510	27%
	Selenium (Se)	mg/kg	2.27	2.08	9%	2.11	2.18	3%	30.0	28.6	5%	7.73	9.42	20%	34.1	21.7	44%
	Silver (Ag)	mg/kg	0.28	0.27	4%	0.25	0.27	8%	0.32	0.30	6%	0.48	0.53	10%	0.22	0.16	32%
	Sodium (Na)	mg/kg	143	147	3%	73	80	9%	120	123	2%	< 50	< 50	0%	310	202	42%
	Strontium (Sr)	mg/kg	218	224	3%	69.1	77.0	11%	130	126	3%	36.7	41.8	13%	247	167	39%
	Thallium (Tl)	mg/kg	0.372	0.423	13%	0.092	0.069	29%	0.272	0.262	4%	0.287	0.320	11%	0.276	0.200	32%
	Tin (Sn)	mg/kg	< 2.0	< 2.0	0%	< 2.000	< 2.0	0%	< 2.000	< 2.0	0%	< 2.0	< 2.0	0%	< 2.000	< 2.0	0%
	Titanium (Ti)	mg/kg	31.2	31.5	1%	15.1	17.8	16%	22.7	22.8	0%	41.8	44.1	5%	14.4	10.1	35%
	Uranium (U)	mg/kg	1.66	1.65	1%	0.513	0.561	9%	1.41	1.39	1%	2.58	2.96	14%	2.63	1.81	37%
	Vanadium (V)	mg/kg	41.3	40.2	3%	28.7	30.5	6%	36.0	35.1	3%	48.1	54.2	12%	26.5	19.8	29%
	Zinc (Zn)	mg/kg	120	119	1%	88.3	96.8	9%	127	122	4%	113	125	10%	111	75.0	39%
Polycyclic Aromatic Hydrocarbons	Acenaphthene	mg/kg	< 0.005	< 0.005	0%	< 0.270	< 0.240	12%	< 0.130	< 0.130	0%	< 0.010	< 0.010	0%	< 0.020	< 0.025	22%
	Acenaphthylene	mg/kg	< 0.005	< 0.005	0%	0.124	0.103	19%	0.0338	0.0314	7%	< 0.010	< 0.010	0%	0.0132	0.0150	13%
	Anthracene	mg/kg	< 0.004	< 0.004	0%	0.204	0.155	27%	0.149	0.173	15%	< 0.008	< 0.008	0%	0.0152	0.0184	19%
	Benz(a)anthracene	mg/kg	0.011	< 0.010	10%	0.89	0.71	23%	0.442	0.551	22%	0.024	< 0.020	18%	0.089	0.092	3%
	Benzo(a)pyrene	mg/kg	< 0.010	< 0.010	0%	0.55	0.41	29%	0.389	0.506	26%	< 0.020	< 0.020	0%	0.056	0.066	16%
	Benzo(b)fluoranthene	mg/kg	0.030	0.020	40%	1.67	1.33	23%	0.863	1.10	24%	0.032	0.023	33%	0.191	0.201	5%
	Benzo(b+j+k)fluoranthene	mg/kg	0.03	0.02	40%	1.79	1.33	29%	1	1.26	23%	0.032	< 0.028	13%	0.203	0.215	6%
	Benzo(g,h,i)perylene	mg/kg	< 0.010	< 0.010	0%	0.74	0.58	24%	0.331	0.408	21%	< 0.020	< 0.020	0%	0.059	0.067	13%
	Benzo(k)fluoranthene	mg/kg	< 0.010	< 0.010	0%	0.12	< 0.100	18%	0.137	0.163	17%	< 0.020	< 0.020	0%	0.012	0.013	8%
	Chrysene	mg/kg	0.062	0.043	36%	3.97	3.08	25%	1.30	1.80	32%	0.080	0.058	32%	0.490	0.535	9%
	Dibenz(a,h)anthracene	mg/kg	< 0.005	< 0.005	0%	0.421	0.324	26%	0.196	0.195	1%	< 0.010	< 0.010	0%	0.0322	0.0362	12%
	Fluoranthene	mg/kg	0.014	0.010	33%	0.84	0.69	20%	0.620	0.664	7%	0.025	< 0.020	22%	0.074	0.086	15%
	Fluorene	mg/kg	0.015	0.013	14%	3.81	3.18	18%	1.34	1.28	5%	< 0.020	< 0.020	0%	0.238	0.270	13%
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.010	< 0.010	0%	0.22	0.18	20%	0.174	0.150	15%	< 0.020	< 0.020	0%	0.019	0.020	5%
	2-Methylnaphthalene	mg/kg	0.096	0.073	27%	25.8	22.2	15%	6.61	6.24	6%	0.055	0.055	0%	1.56	1.86	18%
	Naphthalene	mg/kg	0.036	0.028	25%	6.40	5.71	11%	1.63	1.27	25%	0.028	0.029	4%	0.387	0.455	16%
	Phenanthrene	mg/kg	0.147	0.108	31%	15.0	11.9	23%	4.16	4.44	7%	0.150	0.123	20%	1.16	1.24	7%
	Pyrene	mg/kg	0.017	0.012	34%	1.48	1.06	33%	0.694	0.770	10%	0.034	0.028	19%	0.137	0.150	9%

Note: Highlighted values did not meet the data quality objective of ≤ 35% relative percent difference.

[a] For calculation of the RPD, laboratory reporting limit (LRL) values were used in cases where the value reported was LRL

Table B.12: Field Duplicate Results for Sediment Chemistry Samples

	Analyte	Units	ALS Job # L1655687														
			EROL (5-Aug-2015)			HE27 (7-Aug-2015)			FMUCK (8-Aug-2015)			R5-3 (9-Aug-2015)			MI16 (7-Aug-2015)		
			EROL-Sed-3	EROL-Sed-X	RPD[a] (%)	HE27-Sed-3	HE27-Sed-X	RPD[a] (%)	FMUCK-Sed-3	FMUCK-Sed-X	RPD[a] (%)	R5-3-Sed-3	R5-3-X	RPD[a] (%)	MI16-Sed-3	MI16-Sed-X	RPD[a] (%)
Non-metals	Moisture	%	63.70	54.6	15%	43.3	42.1	3%	50.8	52.8	4%	52.9	58.0	9%	83.7	83.9	0%
	pH (1:2 soil:water)	pH	7.84	8.0	2%	8.13	8.03	1%	8.03	8.09	1%	7.87	7.95	1%	7.06	7.10	1%
	Total Organic Carbon (TOC)	%	2.77	3.2	14%	5.55	4.85	13%	6.99	6.42	9%	5.45	4.25	25%	8.07	8.01	1%
Metals	Aluminum (Al)	mg/kg	6,440	6,370	1%	6,460	6,610	2%	6,550	6,710	2%	6,220	7,670	21%	7,320	7,160	2%
	Antimony (Sb)	mg/kg	0.56	0.51	9%	0.33	0.34	3%	0.61	0.57	7%	0.49	0.49	0%	0.50	0.46	8%
	Arsenic (As)	mg/kg	3.40	3.45	1%	3.14	3.12	1%	4.91	4.96	1%	5.97	5.88	2%	5.26	5.01	5%
	Barium (Ba)	mg/kg	184	175	5%	92.8	92.6	0%	179	180	1%	206	245	17%	223	218	2%
	Beryllium (Be)	mg/kg	0.47	0.43	9%	0.43	0.40	7%	0.58	0.55	5%	0.66	0.66	0%	0.65	0.56	15%
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	0%	< 0.40	< 0.40	0%	< 0.40	< 0.40	0%	< 0.40	< 0.40	0%	< 0.40	< 0.40	0%
	Boron (B)	mg/kg	< 10.00	< 10.00	0%	< 10	< 10	0%	< 10	< 10	0%	11	14	24%	13	14	7%
	Cadmium (Cd)	mg/kg	0.825	0.817	1%	0.740	0.709	4%	1.09	1.08	1%	0.647	0.684	6%	1.15	1.02	12%
	Calcium (Ca)	mg/kg	120,000	117,000	3%	165,000	161,000	2%	42,800	42,500	1%	47,700	48,500	2%	165,000	167,000	1%
	Chromium (Cr)	mg/kg	14.0	13.9	1%	14.7	14.4	2%	12.2	12.3	1%	12.2	14.4	17%	15.6	16.5	6%
	Cobalt (Co)	mg/kg	3.65	3.49	4%	3.40	3.38	1%	5.30	5.37	1%	8.52	8.64	1%	3.52	3.27	7%
	Copper (Cu)	mg/kg	13.6	11.1	20%	7.7	7.6	1%	13.6	12.9	5%	15.3	15.1	1%	15.7	13.3	17%
	Iron (Fe)	mg/kg	9,530	9,150	4%	8,030	8,000	0%	13,200	13,400	2%	16,900	16,900	0%	12,900	12,100	6%
	Lead (Pb)	mg/kg	7.5	7.2	4%	6.2	6.0	3%	8.8	8.7	1%	9.8	9.2	6%	7.8	7.1	9%
	Lithium (Li)	mg/kg	9.5	8.7	9%	17.4	17.4	0%	9.7	9.2	5%	9.1	9.0	1%	10.2	10.1	1%
	Magnesium (Mg)	mg/kg	12,900	12,600	2%	36,700	35,300	4%	12,900	13,400	4%	12,700	13,100	3%	9,420	9,020	4%
	Manganese (Mn)	mg/kg	205	199	3%	247	244	1%	377	367	3%	1,500	1,530	2%	157	151	4%
	Mercury (Hg)	mg/kg	0.0399	0.0370	8%	0.0351	0.0371	6%	0.0502	0.0441	13%	0.0437	0.0407	7%	0.0513	0.0514	0%
	Molybdenum (Mo)	mg/kg	1.16	1.08	7%	0.87	0.88	1%	1.33	1.24	7%	1.61	1.60	1%	2.79	2.65	5%
	Nickel (Ni)	mg/kg	14.4	13.9	4%	17.6	17.2	2%	25.5	25.0	2%	23.6	23.5	0%	17.6	17.1	3%
	Phosphorus (P)	mg/kg	1,130	1,090	4%	830	820	1%	1,460	1,560	7%	1,460	1,500	3%	1,330	1,300	2%
	Potassium (K)	mg/kg	1,620	1,630	1%	1,630	1,670	2%	1,540	1,570	2%	2,110	2,800	28%	2,050	2,080	1%
	Selenium (Se)	mg/kg	4.94	4.66	6%	1.63	1.55	5%	2.31	2.37	3%	4.31	4.28	1%	11.8	11.4	3%
	Silver (Ag)	mg/kg	< 0.20	< 0.20	0%	< 0.20	< 0.20	0%	< 0.20	< 0.20	0%	< 0.20	< 0.20	0%	0.20	< 0.20	0%
	Sodium (Na)	mg/kg	100	110	10%	150	140	7%	< 100	< 100	0%	< 100	100	0%	130	140	7%
	Strontium (Sr)	mg/kg	122	119	2%	95.3	94.0	1%	58.3	57.5	1%	57.1	61.0	7%	202	205	1%
	Thallium (Tl)	mg/kg	0.22	0.21	5%	0.16	0.16	0%	0.20	0.21	5%	0.23	0.26	12%	0.50	0.48	4%
	Tin (Sn)	mg/kg	< 4.00	< 4.00	0%	< 4.0	< 4.0	0%	< 4.0	< 4.0	0%	< 4.0	< 4.0	0%	< 4.0	< 4.0	0%
	Titanium (Ti)	mg/kg	28.0	26.7	5%	43.8	41.9	4%	17.4	17.9	3%	14.9	17.4	15%	27.1	29.7	9%
	Uranium (U)	mg/kg	1.05	1.06	1%	0.83	0.83	0%	1.05	1.05	0%	1.00	1.09	9%	1.86	1.75	6%
	Vanadium (V)	mg/kg	26.2	26.5	1%	19.4	19.6	1%	28.3	28.6	1%	23.1	27.4	17%	23.9	23.0	4%
	Zinc (Zn)	mg/kg	68.0	65.0	5%	82.0	78.1	5%	102	102	0%	74.6	77.7	4%	90.0	83.4	8%
Polycyclic Aromatic Hydrocarbons	Acenaphthene	mg/kg	< 0.005	< 0.005	0%	< 0.005	< 0.005	0%	< 0.005	< 0.005	0%	< 0.005	< 0.005	0%	< 0.010	< 0.010	0%
	Acenaphthylene	mg/kg	0.0062	< 0.005	21%	< 0.005	< 0.005	0%	< 0.005	< 0.005	0%	< 0.005	< 0.005	0%	< 0.010	< 0.010	0%
	Anthracene	mg/kg	0.0095	0.0083	13%	< 0.004	< 0.004	0%	< 0.004	< 0.004	0%	< 0.004	< 0.004	0%	< 0.008	< 0.008	0%
	Benz(a)anthracene	mg/kg	0.045	0.024	61%	0.012	< 0.010	18%	0.013	0.016	21%	< 0.01	0.013	26%	0.039	0.035	11%
	Benzo(a)pyrene	mg/kg	0.040	0.020	67%	< 0.010	< 0.010	0%	< 0.010	< 0.010	0%	< 0.01	< 0.01	0%	0.025	0.021	17%
	Benzo(b)fluoranthene	mg/kg	0.101	0.044	79%	0.026	0.019	31%	0.028	0.040	35%	0.011	0.036	106%	0.126	0.113	11%
	Benzo(b+j+k)fluoranthene	mg/kg	0.127	0.055	79%	0.026	0.019	31%	0.028	0.04	35%	< 0.02	0.036	82%	0.126	0.113	11%
	Benzo(g,h,i)perylene	mg/kg	0.027	0.017	45%	< 0.010	< 0.010	0%	< 0.010	< 0.010	0%	< 0.01	0.01	0%	0.059	0.052	13%
	Benzo(k)fluoranthene	mg/kg	0.027	0.011	84%	< 0.010	< 0.010	0%	< 0.010	< 0.010	0%	< 0.01	< 0.01	0%	< 0.020	< 0.020	0%
	Chrysene	mg/kg	0.080	0.058	32%	0.060	0.047	24%	0.074	0.104	34%	0.033	0.092	94%	0.206	0.185	11%
	Dibenz(a,h)anthracene	mg/kg	0.0111	0.0064	54%	0.0051	< 0.005	2%	< 0.005	< 0.005	0%	< 0.005	0.0061	20%	0.020	0.017	16%
	Fluoranthene	mg/kg	0.060	0.037	47%	0.011	< 0.010	10%	0.017	0.020	16%	< 0.01	0.014	33%	0.049	0.055	12%
	Fluorene	mg/kg	0.013	0.011	17%	0.042	0.033	24%	0.027	0.027	0%	< 0.01	0.012	18%	0.073	0.071	3%
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.025	0.014	56%	< 0.010	< 0.010	0%	< 0.010	< 0.010	0%	< 0.01	< 0.01	0%	< 0.020	< 0.020	0%
	2-Methylnaphthalene	mg/kg	0.093	0.076	20%	0.310	0.242	25%	0.343	0.299	14%	0.066	0.156	81%	0.570	0.628	10%
	Naphthalene	mg/kg	0.055	0.047	16%	0.078	0.070	11%	0.155	0.131	17%	0.044	0.097	75%	0.226	0.216	5%
	Phenanthrene	mg/kg	0.122	0.101	19%	0.195	0.151	25%	0.309	0.379	20%	0.103	0.237	79%	0.504	0.464	8%
	Pyrene	mg/kg	0.048	0.031	43%	0.019	0.015	24%	0.024	0.032	29%	< 0.01	0.023	79%	0.073	0.067	9%

Note: Highlighted values did not meet the data quality objective of ≤ 35% relative percent difference.

[a] For calculation of the RPD, laboratory reporting limit (LRL) values were used in cases where the value reported was LRL

Table B.12: Field Duplicate Results for Sediment Chemistry Samples

Analyte		Units	ALS Job # L1655687		
			ELKO (6-Aug-2015)		
			ELKO-Sed-3	ELKO-Sed-X	RPD[a] (%)
Non-metals	Moisture	%	34.8	37.5	7%
	pH (1:2 soil:water)	pH	8.21	8.16	1%
	Total Organic Carbon (TOC)	%	3.37	3.35	1%
Metals	Aluminum (Al)	mg/kg	5,960	6,850	14%
	Antimony (Sb)	mg/kg	0.45	0.55	20%
	Arsenic (As)	mg/kg	3.45	4.24	21%
	Barium (Ba)	mg/kg	129	154	18%
	Beryllium (Be)	mg/kg	0.44	0.53	19%
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	0%
	Boron (B)	mg/kg	< 10	< 10	0%
	Cadmium (Cd)	mg/kg	0.746	0.940	23%
	Calcium (Ca)	mg/kg	46,200	56,400	20%
	Chromium (Cr)	mg/kg	12.0	13.6	13%
	Cobalt (Co)	mg/kg	3.68	4.60	22%
	Copper (Cu)	mg/kg	10.2	13.4	27%
	Iron (Fe)	mg/kg	9,160	11,200	20%
	Lead (Pb)	mg/kg	7.6	9.6	23%
	Lithium (Li)	mg/kg	8.7	10.2	16%
	Magnesium (Mg)	mg/kg	10,300	12,700	21%
	Manganese (Mn)	mg/kg	229	283	21%
	Mercury (Hg)	mg/kg	0.0521	0.0402	26%
	Molybdenum (Mo)	mg/kg	0.94	1.19	23%
	Nickel (Ni)	mg/kg	15.2	18.3	19%
	Phosphorus (P)	mg/kg	920	1,120	20%
	Potassium (K)	mg/kg	1,370	1,500	9%
	Selenium (Se)	mg/kg	1.20	1.53	24%
	Silver (Ag)	mg/kg	< 0.20	< 0.20	0%
	Sodium (Na)	mg/kg	< 100	< 100	0%
	Strontium (Sr)	mg/kg	61.9	76.9	22%
	Thallium (Tl)	mg/kg	0.20	0.23	14%
	Tin (Sn)	mg/kg	< 4.0	< 4.0	0%
	Titanium (Ti)	mg/kg	20.3	24.2	18%
	Uranium (U)	mg/kg	0.80	1.03	25%
	Vanadium (V)	mg/kg	23.2	27.0	15%
	Zinc (Zn)	mg/kg	78.5	94.1	18%
Polycyclic Aromatic Hydrocarbons	Acenaphthene	mg/kg	< 0.005	< 0.005	0%
	Acenaphthylene	mg/kg	0.0069	0.0060	14%
	Anthracene	mg/kg	0.0175	0.0113	43%
	Benz(a)anthracene	mg/kg	0.077	0.049	44%
	Benzo(a)pyrene	mg/kg	0.07	0.048	37%
	Benzo(b)fluoranthene	mg/kg	0.139	0.102	31%
	Benzo(b+j+k)fluoranthene	mg/kg	0.172	0.123	33%
	Benzo(g,h,i)perylene	mg/kg	0.049	0.032	42%
	Benzo(k)fluoranthene	mg/kg	0.033	0.021	44%
	Chrysene	mg/kg	0.173	0.102	52%
	Dibenz(a,h)anthracene	mg/kg	0.0201	0.0126	46%
	Fluoranthene	mg/kg	0.104	0.065	46%
	Fluorene	mg/kg	0.03	0.026	14%
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.042	0.030	33%
	2-Methylnaphthalene	mg/kg	0.264	0.164	47%
	Naphthalene	mg/kg	0.117	0.074	45%
	Phenanthrene	mg/kg	0.296	0.179	49%
	Pyrene	mg/kg	0.091	0.056	48%

Note: Highlighted values did not meet the data quality objective of ≤ 35% relative percent difference.

[a] For calculation of the RPD, laboratory reporting limit (LRL) values were used in cases where the value reported was LRL

Table B.13: Analytical Accuracy of Sediment Metals Samples Based on Analysis of Certified Reference Materials, August 2015

Analytes	Units	Quality Control Type[a]	Percent Recovery											
			ALS Job Number L1655687											
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Aluminum (Al)	mg/kg	LCS	222	200	111%	223	200	112%	233	200	117%	213	200	107%
Antimony (Sb)	mg/kg	LCS	108	100	108%	107	100	107%	112	100	112%	99.3	100	99%
Arsenic (As)	mg/kg	LCS	111	100	111%	109	100	109%	115	100	115%	101	100	101%
Barium (Ba)	mg/kg	LCS	26.8	25	107%	27.1	25	108%	28.8	25	115%	25.1	25	100%
Beryllium (Be)	mg/kg	LCS	10.6	10	106%	10.7	10	107%	10.5	10	105%	9.97	10.00	100%
Bismuth (Bi)	mg/kg	LCS	102	100	102%	102	100	102%	109	100	109%	97.7	100	98%
Boron (B)	mg/kg	LCS	105	100	105%	106	100	106%	102	100	102%	96.4	100	96%
Cadmium (Cd)	mg/kg	LCS	10.3	10	103%	10.5	10	105%	11.3	10.0	113%	9.78	10	98%
Calcium (Ca)	mg/kg	LCS	5,300	5,000	106%	5,460	5,000	109%	5,310	5,000	106%	5,030	5,000	101%
Chromium (Cr)	mg/kg	LCS	26.4	25	106%	25.6	25	102%	28.5	25	114%	24.7	25	99%
Cobalt (Co)	mg/kg	LCS	26.3	25	105%	26.1	25	104%	29	25	116%	24.4	25	98%
Copper (Cu)	mg/kg	LCS	25.9	25.0	104%	25.5	25	102%	28.1	25	112%	24.1	25	96%
Iron (Fe)	mg/kg	LCS	121	100	121%	120	100	120%	123	100	123%	114	100	114%
Lead (Pb)	mg/kg	LCS	50.8	50	102%	50.8	50	102%	55.3	50	111%	48.2	50	96%
Lithium (Li)	mg/kg	LCS	25.7	25	103%	26.3	25	105%	25	25	100%	24.7	25	99%
Magnesium (Mg)	mg/kg	LCS	5,120	5,000	102%	5,020	5,000	100%	5,460	5,000	109%	4,790	5,000	96%
Manganese (Mn)	mg/kg	LCS	27	25	108%	27.4	25	110%	28.4	25	114%	25.1	25	100%
Mercury (Hg)	mg/kg	LCS	0.0996	0.1	100%	0.109	0.1	109%	0.108	0.1	108%	-	-	-
Molybdenum (Mo)	mg/kg	LCS	26	25	104%	26.3	25	105%	26.8	25	107%	23.9	25	96%
Nickel (Ni)	mg/kg	LCS	53.4	50	107%	52.8	50	106%	56.8	50	114%	49.3	50	99%
Phosphorus (P)	mg/kg	LCS	277	250	111%	269	250	108%	263	250	105%	-	-	-
Potassium (K)	mg/kg	LCS	5,490	5,000	110%	5,330	5,000	107%	5,640	5,000	113%	5,010	5,000	100%
Selenium (Se)	mg/kg	LCS	104	100	104%	105	100	105%	107	100	107%	96.3	100	96%
Silver (Ag)	mg/kg	LCS	9.84	10	98%	9.59	10	96%	9.7	10	97%	9.26	10.0	93%
Sodium (Na)	mg/kg	LCS	5,350	5,000	107%	5,240	5,000	105%	5,690	5,000	114%	5,000	5,000	100%
Strontium (Sr)	mg/kg	LCS	26.2	25	105%	26.3	25	105%	27	25	108%	24.6	25	98%
Thallium (Tl)	mg/kg	LCS	104	100	104%	104	100	104%	109	100	109%	101	100	101%
Tin (Sn)	mg/kg	LCS	52.2	50	104%	52.5	50	105%	56.9	50	114%	48.5	50	97%
Titanium (Ti)	mg/kg	LCS	26.3	25	105%	26	25	104%	28.6	25	114%	25.2	25	101%
Uranium (U)	mg/kg	LCS	0.504	0.5	101%	0.5	0.5	100%	0.502	0.5	100%	0.485	0.5	97%
Vanadium (V)	mg/kg	LCS	53.9	50	108%	53.9	50	108%	57.7	50	115%	50.3	50	101%
Zinc (Zn)	mg/kg	LCS	50.3	50	101%	48.5	50	97%	53.5	50	107%	46.9	50	94%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

[a] LCS = Laboratory Control Standard; CRM = Control Matrix Spike

Table B.13: Analytical Accuracy of Sediment Metals Samples Based on Analysis of Certified Reference Materials, August 2015

Analytes	Units	Quality Control Type[a]	Percent Recovery											
			ALS Job Number L1655687											
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Aluminum (Al)	mg/kg	CRM	18,900	18,200	104%	19,800	18,200	109%	20,000	18,200	110%	17,000	18,200	93%
Antimony (Sb)	mg/kg	CRM	6.77	6.27	108%	6.64	6.27	106%	6.8	6.27	108%	6.04	6.27	96%
Arsenic (As)	mg/kg	CRM	18	15.4	117%	17.7	15.4	115%	18.5	15.4	120%	15.7	15.4	102%
Barium (Ba)	mg/kg	CRM	86.7	80.6	108%	88.4	80.6	110%	94.1	80.6	117%	76.7	80.6	95%
Beryllium (Be)	mg/kg	CRM	0.54	0.54	99%	0.58	0.54	107%	0.57	0.54	105%	0.48	0.54	88%
Bismuth (Bi)	mg/kg	CRM	1.98	1.92	103%	1.99	1.92	104%	1.96	1.92	102%	1.78	1.92	93%
Boron (B)	mg/kg	CRM	< 5.0	3	166%	< 5.0	3	166%	< 5.0	3	166%	< 5.0	3	166%
Cadmium (Cd)	mg/kg	CRM	0.232	0.217	107%	0.22	0.217	101%	0.234	0.217	108%	0.203	0.217	94%
Calcium (Ca)	mg/kg	CRM	3,930	3,320	118%	4,130	3,320	124%	3,950	3,320	119%	3,530	3,320	106%
Chromium (Cr)	mg/kg	CRM	30.5	27.2	112%	30.6	27.2	113%	32.7	27.2	120%	26.8	27.2	99%
Cobalt (Co)	mg/kg	CRM	13.5	13	108%	13.8	13	110%	14.7	13	118%	11.8	13	94%
Copper (Cu)	mg/kg	CRM	47	44.9	105%	46.7	44.9	104%	50.4	44.9	112%	41.7	44.9	93%
Iron (Fe)	mg/kg	CRM	34,100	33,300	102%	34,100	33,300	102%	37,300	33,300	112%	30,200	33,300	91%
Lead (Pb)	mg/kg	CRM	14.1	14	98%	13.9	14	97%	14.3	14	99%	12.4	14	86%
Lithium (Li)	mg/kg	CRM	11	10	109%	10.8	10	107%	10.5	10	104%	9.4	10	93%
Magnesium (Mg)	mg/kg	CRM	6,060	5,830	104%	6,180	5,830	106%	6,510	5,830	112%	5,350	5,830	92%
Manganese (Mn)	mg/kg	CRM	1,160	1,100	105%	1,180	1,100	107%	1,230	1,100	112%	1,010	1,100	92%
Mercury (Hg)	mg/kg	CRM	0.127	0.098	130%	0.11	0.098	112%	0.117	0.098	119%	0.111	0.098	113%
Molybdenum (Mo)	mg/kg	CRM	0.75	0.738	102%	0.71	0.738	96%	0.74	0.738	100%	0.64	0.738	87%
Nickel (Ni)	mg/kg	CRM	19.2	17.4	110%	19.4	17.4	111%	20.3	17.4	117%	17.1	17.4	98%
Phosphorus (P)	mg/kg	CRM	860	796	108%	850	796	107%	950	796	119%	756	796	95%
Potassium (K)	mg/kg	CRM	720	619	116%	760	619	123%	770	619	124%	640	619	103%
Selenium (Se)	mg/kg	CRM	0.29	0.32	91%	0.3	0.32	94%	0.33	0.32	103%	0.29	0.32	91%
Silver (Ag)	mg/kg	CRM	0.25	0.2	114%	0.26	0.2	118%	0.24	0.2	109%	0.24	0.2	109%
Sodium (Na)	mg/kg	CRM	384	340	113%	408	340	120%	426	340	125%	337	340	99%
Strontium (Sr)	mg/kg	CRM	13.3	12	115%	13.8	12	119%	13.4	12	116%	11.9	12	103%
Thallium (Tl)	mg/kg	CRM	0.138	0	110%	0.138	0	110%	0.134	0	107%	0.122	0	98%
Tin (Sn)	mg/kg	CRM	< 2.0	1.1	182%	< 2.0	1.1	182%	< 2.0	1.1	182%	< 2.0	1.1	182%
Titanium (Ti)	mg/kg	CRM	975	873.9	112%	1,060	873.9	121%	1,070	873.9	122%	823	873.9	94%
Uranium (U)	mg/kg	CRM	0.9	0.8	113%	0.883	0.8	110%	0.864	0.8	108%	0.795	0.8	99%
Vanadium (V)	mg/kg	CRM	62.7	54.9	114%	63.8	54.9	116%	67.2	54.9	122%	55.1	54.9	100%
Zinc (Zn)	mg/kg	CRM	71.5	67.5	106%	71.8	67.5	106%	75.2	67.5	111%	63.4	67.5	94%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

[a] LCS = Laboratory Control Standard; CRM = Control Matrix Spike

Table B.13: Analytical Accuracy of Sediment Metals Samples Based on Analysis of Certified Reference Materials, August 2015

Analytes	Units	Percent Recovery														
		ALS Job Number L1658282									ALS Job Number L1659340					
		Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Aluminum (Al)	mg/kg	20,100	18,200	110%	19,600	18,200	108%	-	-	-	19,900	18,200	109%	219	200	110%
Antimony (Sb)	mg/kg	7.3	6.27	116%	6.87	6.27	110%	-	-	-	6.92	6.27	110%	113	100	113%
Arsenic (As)	mg/kg	18.6	15.4	121%	17.9	15.4	116%	-	-	-	18.2	15.4	118%	114	100	114%
Barium (Ba)	mg/kg	91.7	80.6	114%	87.5	80.6	109%	-	-	-	91.1	80.6	113%	28.9	25	116%
Beryllium (Be)	mg/kg	0.57	0.544	105%	0.54	0.544	99%	-	-	-	0.56	0.544	103%	10.9	10	109%
Bismuth (Bi)	mg/kg	2.13	1.92	111%	2.01	1.92	105%	-	-	-	2.12	1.92	110%	113	100	113%
Boron (B)	mg/kg	< 5.0	3	166%	< 5.0	3	166%	-	-	-	< 5.0	3	166%	104	100	104%
Cadmium (Cd)	mg/kg	0.241	0.217	111%	0.231	0.217	106%	-	-	-	0.236	0.217	109%	11.4	10	114%
Calcium (Ca)	mg/kg	4,040	3,320	122%	3,910	3,320	118%	-	-	-	4,090	3,320	123%	5,570	5,000	111%
Chromium (Cr)	mg/kg	31.6	27.2	116%	30.9	27.2	114%	-	-	-	31.4	27.2	115%	27.3	25.0	109%
Cobalt (Co)	mg/kg	14.5	13	116%	13.6	13	109%	-	-	-	13.8	13	110%	27.6	25	110%
Copper (Cu)	mg/kg	50.6	44.9	113%	47.5	44.9	106%	-	-	-	47.6	44.9	106%	27	25	108%
Iron (Fe)	mg/kg	37,600	33,300	113%	34,900	33,300	105%	-	-	-	36,000	33,300	108%	124	100	124%
Lead (Pb)	mg/kg	14.8	14	103%	13.8	14	96%	-	-	-	15	14	104%	56.3	50	113%
Lithium (Li)	mg/kg	11	10	109%	10	10	99%	-	-	-	10.7	10	106%	26.9	25	108%
Magnesium (Mg)	mg/kg	6,650	5,830	114%	6,460	5,830	111%	-	-	-	6,520	5,830	112%	5,510	5,000	110%
Manganese (Mn)	mg/kg	1,230	1,100	112%	1,190	1,100	108%	-	-	-	1,240	1,100	113%	28.1	25	112%
Mercury (Hg)	mg/kg	0.108	0.098	110%	0.122	0.098	124%	0.0872	0.098	89%	0.102	0.098	104%	0.0875	0.1	88%
Molybdenum (Mo)	mg/kg	0.77	0.738	104%	0.72	0.738	98%	-	-	-	0.77	0.738	104%	27.3	25	109%
Nickel (Ni)	mg/kg	20.4	17.4	117%	19.9	17.4	114%	-	-	-	19.1	17.4	110%	54	50	108%
Phosphorus (P)	mg/kg	928	796	117%	828	796	104%	-	-	-	874	796	110%	283	250	113%
Potassium (K)	mg/kg	760	619	123%	750	619	121%	-	-	-	720	619	116%	5,500	5,000	110%
Selenium (Se)	mg/kg	0.33	0.32	103%	0.35	0.32	109%	-	-	-	0.35	0.32	109%	111	100	111%
Silver (Ag)	mg/kg	0.26	0.22	118%	0.24	0.22	109%	-	-	-	0.25	0.22	114%	11.2	10	112%
Sodium (Na)	mg/kg	416	340	122%	404	340	119%	-	-	-	433	340	127%	5,570	5,000	111%
Strontium (Sr)	mg/kg	14.1	12	122%	14	11.6	121%	-	-	-	13.7	12	118%	27.4	25	110%
Thallium (Tl)	mg/kg	0.143	0.125	114%	0.141	0.125	113%	-	-	-	0.136	0.125	109%	111	100	111%
Tin (Sn)	mg/kg	< 2.0	1.1	182%	< 2.0	1.1	182%	-	-	-	< 2.0	1.1	182%	56.7	50.0	113%
Titanium (Ti)	mg/kg	1,050	874	120%	1,020	873.9	117%	-	-	-	1,100	873.9	126%	28.8	25	115%
Uranium (U)	mg/kg	0.947	0.8	118%	0.923	0.8	115%	-	-	-	0.929	0.8	116%	0.544	0.5	109%
Vanadium (V)	mg/kg	65.5	54.9	119%	62.3	54.9	113%	-	-	-	65	54.9	118%	56.1	50	112%
Zinc (Zn)	mg/kg	77.1	67.5	114%	72.9	67.5	108%	-	-	-	70.3	67.5	104%	51.7	50	103%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

[a] LCS = Laboratory Control Standard, CRM = Control Matrix Spike

Table B.14: Analytical Accuracy of Sediment Total Organic Carbon, Moisture, Polycyclic Aromatic Hydrocarbons and Particle Size Samples Based on Analysis of Reference Materials, August 2015

Analyte	Quality Control Type	Units	Percent Recovery											
			ALS Job Number L1655687											
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Total Organic Carbon (TOC)	IRM	%	1.06	1.10	96%	1.03	1.10	94%	0.99	1.10	90%	0.99	1.10	90%

Analyte	Quality Control Type	Units	Percent Recovery											
			ALS Job Number L1655687											
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Moisture	LCS	%	49.4	50.0	99%	45.5	50.0	91%	49.4	50.0	99%	49.9	50.0	100%

Analyte	Quality Control Type	Units	Percent Recovery											
			ALS Job Number L1655687											
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Acenaphthene	LCS	mg/kg	77.3	100	77%	67.9	100	68%	88.7	100	89%	76.6	100.000	77%
Acenaphthylene	LCS	mg/kg	78.4	100	78%	69	100	69%	89.9	100	90%	77.6	100	78%
Anthracene	LCS	mg/kg	76.5	100	77%	73	100	73%	94.6	100	95%	76.7	100	77%
Benz(a)anthracene	LCS	mg/kg	93.0	100	93%	88.1	100	88%	110	100	110%	78.9	100	79%
Benzo(a)pyrene	LCS	mg/kg	102.0	100	102%	98.8	100	99%	122	100	122%	82	100.00	82%
Benzo(b)fluoranthene	LCS	mg/kg	127.0	100	127%	91.2	100	91%	114	100	114%	77.2	100	77%
Benzo(g,h,i)perylene	LCS	mg/kg	91.2	100	91%	75.9	100	76%	104	100	104%	81.3	100	81%
Benzo(k)fluoranthene	LCS	mg/kg	126.0	100	126%	90.6	100	91%	114	100	114%	79.2	100	79%
Chrysene	LCS	mg/kg	90.5	100	91%	85.6	100	86%	107	100	107%	78.5	100.00	79%
Dibenz(a,h)anthracene	LCS	mg/kg	92.0	100	92%	85.3	100	85%	107	100	107%	81.4	100	81%
Fluoranthene	LCS	mg/kg	85.2	100	85%	76.6	100	77%	97.7	100	98%	79	100	79%
Fluorene	LCS	mg/kg	79.4	100	79%	70.7	100	71%	92.2	100	92%	78.8	100	79%
Indeno(1,2,3-c,d)pyrene	LCS	mg/kg	95.6	100	96%	79	100	79%	110	100	110%	77.8	100	78%
2-Methylnaphthalene	LCS	mg/kg	74.9	100	75%	65.3	100	65%	82.1	100	82%	73.5	100	74%
Naphthalene	LCS	mg/kg	91.4	100	91%	72.9	100	73%	89.8	100	90%	80.1	100	80%
Phenanthrene	LCS	mg/kg	73.6	100	74%	68.7	100	69%	87.9	100	88%	74.3	100	74%
Pyrene	LCS	mg/kg	87.0	100	87%	77.8	100	78%	99.7	100	100%	80.4	100	80%

Analyte	Quality Control Type	Units	Percent Recovery											
			ALS Job Number L1655687											
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Sand (2.00mm - 1.00mm)	IRM	%	0.98	1.00	98%	1.51	1.00	151%	1.2	0.64	188%	1.18	1.00	118%
Sand (1.00mm - 0.50mm)	IRM	%	3.32	5.00	66%	2.73	5.00	55%	2.66	9.58	28%	2.9	5.00	58%
Sand (0.50mm - 0.25mm)	IRM	%	6.07	5.00	121%	5.97	5.00	119%	5.15	6.08	85%	5.24	5.00	105%
Sand (0.25mm - 0.125mm)	IRM	%	14.1	14.0	101%	14.5	14.0	104%	13	14.2	92%	13.6	14.0	97%
Sand (0.125mm - 0.063mm)	IRM	%	11.1	11.0	101%	11.1	11.0	101%	10.3	10.8	95%	10.8	11.0	98%
Silt (0.063mm - 0.0312mm)	IRM	%	12.6	14.0	90%	13.9	14.0	99%	13.6	15.4	88%	12.4	14.0	89%
Silt (0.0312mm - 0.004mm)	IRM	%	27.8	26.0	107%	27.8	26.0	107%	27.8	26.4	105%	27.2	26.0	105%
Clay (<4um)	IRM	%	24.1	27.0	89%	22.5	27.0	83%	26.4	25.8	102%	26.4	27.0	98%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.
IRM = Internal Reference Material
LCS = Laboratory Control Standard

Table B.14: Analytical Accuracy of Sediment Total Organic Carbon, Moisture, Polycyclic Aromatic Hydrocarbons and Particle Size Samples Based on Analysis of Reference Materials, August 2015

Analyte	Quality Control Type	Units	Percent Recovery											
			ALS Job Number L1658282									ALS Job Number L1659340		
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Total Organic Carbon (TOC)	IRM	%	1.01	1.1	92%	0.97	1.10	88%	0.99	1.10	90%	1.10	1.10	100%

Analyte	Quality Control Type	Units	Percent Recovery															
			ALS Job Number L1658282												ALS Job Number L1659340			
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	
Moisture	LCS	%	48.5	50.0	97%	48.4	50.0	97%	52.8	50.0	106%	49.0	50.0	98%	47.2	50.0	94%	

Analyte	Quality Control Type	Units	Percent Recovery															
			ALS Job Number L1658282									ALS Job Number L1659340						
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	
Acenaphthene	LCS	mg/kg	63.9	100	64%	83.5	100	84%	82.9	100	83%	63.9	100.000	64%	83.5	100	84%	82.9	100	83%
Acenaphthylene	LCS	mg/kg	65.2	100	65%	85.7	100	86%	84.9	100	85%	65.2	100.000	65%	85.7	100.000	86%	84.9	100.000	85%
Anthracene	LCS	mg/kg	70.3	100	70%	87.1	100	87%	86.8	100	87%	70.3	100	70%	87.1	100	87%	86.8	100	87%
Benz(a)anthracene	LCS	mg/kg	87.1	100	87%	106	100	106%	98.1	100	98%	87.1	100	87%	106	100	106%	98.1	100	98%
Benzo(a)pyrene	LCS	mg/kg	95.2	100	95%	111	100	111%	115	100	115%	95.2	100	95%	111	100	111%	115	100	115%
Benzo(b)fluoranthene	LCS	mg/kg	88	100	88%	105	100	105%	105	100	105%	88	100	88%	105	100	105%	105	100	105%
Benzo(g,h,i)perylene	LCS	mg/kg	87.1	100	87%	105	100	105%	81.9	100	82%	87.1	100.00	87%	105	100	105%	81.9	100	82%
Benzo(k)fluoranthene	LCS	mg/kg	89.4	100	89%	105	100	105%	103	100	103%	89.4	100	89%	105	100	105%	103	100	103%
Chrysene	LCS	mg/kg	84.9	100.00	85%	104	100.00	104%	93.3	100.00	93%	84.9	100	85%	104	100	104%	93.3	100	93%
Dibenz(a,h)anthracene	LCS	mg/kg	87.2	100	87%	106	100	106%	92.8	100	93%	87.2	100	87%	106	100	106%	92.8	100	93%
Fluoranthene	LCS	mg/kg	75.9	100	76%	94.6	100	95%	87.4	100	87%	75.9	100	76%	94.6	100	95%	87.4	100	87%
Fluorene	LCS	mg/kg	65.3	100	65%	87.3	100	87%	85.3	100	85%	65.3	100	65%	87.3	100	87%	85.3	100	85%
Indeno(1,2,3-c,d)pyrene	LCS	mg/kg	89.3	100	89%	107	100	107%	82.1	100	82%	89.3	100.00	89%	107	100	107%	82.1	100	82%
2-Methylnaphthalene	LCS	mg/kg	61	100	61%	82.3	100	82%	79.3	100	79%	61	100.000	61%	82.3	100	82%	79.3	100	79%
Naphthalene	LCS	mg/kg	65.9	100.000	66%	101	100.000	101%	85.8	100.000	86%	65.9	100	66%	101	100	101%	85.8	100	86%
Phenanthrene	LCS	mg/kg	62.7	100	63%	83.1	100	83%	80.4	100	80%	62.7	100	63%	83.1	100	83%	80.4	100	80%
Pyrene	LCS	mg/kg	77.5	100	78%	97.9	100	98%	89.4	100	89%	77.5	100	78%	97.9	100	98%	89.4	100	89%

Analyte	Quality Control Type	Units	Percent Recovery											
			ALS Job Number L1658282									ALS Job Number L1659340		
			Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery	Result	Target	Percent Recovery
Sand (2.00mm - 1.00mm)	IRM	%	1.5	1.00	150%	1.03	1.00	103%	0.79	1.00	79%	-	-	-
Sand (1.00mm - 0.50mm)	IRM	%	2.83	5.00	57%	2.84	5.00	57%	2.39	5.00	48%	-	-	-
Sand (0.50mm - 0.25mm)	IRM	%	5.03	5.00	101%	5.95	5.00	119%	5.2	5.00	104%	-	-	-
Sand (0.25mm - 0.125mm)	IRM	%	12.4	14.0	89%	13.9	14.0	99%	13.6	14.0	97%	-	-	-
Sand (0.125mm - 0.063mm)	IRM	%	10.7	11.0	97%	12.1	11.0	110%	12.1	11.0	110%	-	-	-
Silt (0.063mm - 0.0312mm)	IRM	%	12.9	14.0	92%	12.2	14.0	87%	13.9	14.0	99%	-	-	-
Silt (0.0312mm - 0.004mm)	IRM	%	27.7	26.0	107%	25.7	26.0	99%	27	26.0	104%	-	-	-
Clay (<4um)	IRM	%	26.9	27.0	100%	26.2	27.0	97%	25	27.0	93%	26.4	27.0	98%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.
IRM = Internal Reference Material
LCS = Laboratory Control Standard

Table B.15: Laboratory Analyses of Certified Reference Materials Associated with Periphyton Tissue Chemistry Samples

Analyte	Units	Certified Reference Material	Achieved Value	Certified Value	% Recovery
Selenium (Se)	mg/kg dw	NIST SRM 1577	1.26	1.1	87%
		NIST SRM 1577	1.00	1.1	110%

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

Table B.16: Laboratory Analyses of Certified Reference Materials Associated with Benthic Invertebrate Tissue Chemistry Samples

Analyte	Units	Certified Reference Material	Achieved Value	Certified Value	% Recovery
Selenium (Se)	mg/kg dw	NIST SRM 1577	1.056	1.1	104%
		NIST SRM 1577	1.10	1.1	100%

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

Table B.17: Laboratory Reporting Limits (LRLs) Associated with Fish Tissue Chemical Analyses

Analyte	Units	Muscle Fillet	Muscle Plug	Egg and Ovary
Aluminum (Al)	mg/kg dw	0.0039 - 0.0075	0.0076 - 0.025	0.0037 - 0.0076
Antimony (Sb)	mg/kg dw	0.00033 - 0.0012	0.00059 - 0.002	0.00071 - 0.0012
Arsenic (As)	mg/kg dw	0.0023 - 0.0044	0.0041 - 0.014	0.0028 - 0.0044
Barium (Ba)	mg/kg dw	0.00061 - 0.0011	0.0011 - 0.0036	0.00064 - 0.0011
Beryllium (Be)	mg/kg dw	0.0014 - 0.0029	0.0025 - 0.0084	0.0022 - 0.003
Bismuth (Bi)	mg/kg dw	0.00017 - 0.00029	0.00046 - 0.0015	0.00017 - 0.0002
Boron (B)	mg/kg dw	0.07 - 0.18	0.2 - 0.65	0.067 - 0.18
Cadmium (Cd)	mg/kg dw	0.00069 - 0.0021	0.0016 - 0.0054	0.00066 - 0.0021
Calcium (Ca)	mg/kg dw	1.5 - 2.8	2.8 - 9.2	1.6 - 2.8
Cesium (Cs)	mg/kg dw	0.000052 - 0.00014	0.00014 - 0.00047	0.000053 - 0.00014
Chromium (Cr)	mg/kg dw	0.0019 - 0.0031	0.0049 - 0.016	0.0019 - 0.0027
Cobalt (Co)	mg/kg dw	0.00019 - 0.00058	0.00034 - 0.0011	0.00039 - 0.00058
Copper (Cu)	mg/kg dw	0.001 - 0.0024	0.0018 - 0.006	0.0019 - 0.0024
Gallium (Ga)	mg/kg dw	0.00056 - 0.0013	0.001 - 0.0034	0.0011 - 0.0013
Iron (Fe)	mg/kg dw	0.019 - 0.069	0.034 - 0.11	0.043 - 0.069
Lead (Pb)	mg/kg dw	0.00023 - 0.00034	0.00044 - 0.0015	0.00022 - 0.00035
Lithium (Li)	mg/kg dw	0.002 - 0.0035	0.0035 - 0.012	0.0024 - 0.0035
Magnesium (Mg)	mg/kg dw	0.029 - 0.069	0.052 - 0.17	0.039 - 0.069
Manganese (Mn)	mg/kg dw	0.0035 - 0.009	0.0064 - 0.021	0.007 - 0.0091
Mercury (Hg)	mg/kg dw	0.00045 - 0.00056	0.00088 -	0.00044 - 0.00056
Molybdenum (Mo)	mg/kg dw	0.00063 0.0014	0.0011 - 0.0037	0.00096 - 0.0014
Nickel (Ni)	mg/kg dw	0.00066 - 0.0026	0.0012 - 0.0039	0.0014 - 0.0026
Phosphorus (P)	mg/kg dw	3.9 - 7.9	7 - 23	5.4 - 7.9
Potassium (K)	mg/kg dw	0.58 - 1.3	1 - 3.5	1 - 1.3
Rhenium (Re)	mg/kg dw	0.0000035 - 0.000053	0.000058 - 0.00019	0.0000033 - 0.000053
Rubidium (Rb)	mg/kg dw	0.00043 - 0.0006	0.00081 - 0.0027	0.00041 - 0.00061
Selenium (Se)	mg/kg dw	0.047 - 0.075	0.11 - 0.37	0.048 - 0.075
Silver (Ag)	mg/kg dw	0.00024 - 0.00036	0.00056 - 0.0019	0.00023 - 0.00031
Sodium (Na)	mg/kg dw	0.041 - 0.13	0.087 - 0.29	0.039 - 0.13
Strontium (Sr)	mg/kg dw	0.0003 - 0.00046	0.00062 - 0.002	0.00031 - 0.00046
Thallium (Tl)	mg/kg dw	0.000038 - 0.00011	0.00018 - 0.00059	0.000037 - 0.000069
Thorium (Th)	mg/kg dw	0.000037 - 0.00008	0.00009 - 0.0003	0.000035 - 0.000081
Tin (Sn)	mg/kg dw	0.00055 - 0.0011	0.0014 - 0.0045	0.00057 - 0.0011
Titanium (Ti)	mg/kg dw	0.0044 - 0.013	0.008 - 0.027	0.0089 - 0.014
Uranium (U)	mg/kg dw	0.000022 - 0.000061	0.000096 - 0.00032	0.000023 - 0.000051
Vanadium (V)	mg/kg dw	0.00018 - 0.00047	0.00032 - 0.0011	0.00038 - 0.00047
Yttrium (Y)	mg/kg dw	0.0001 - 0.00025	0.00038 - 0.0013	0.0001 - 0.00025
Zinc (Zn)	mg/kg dw	0.007 - 0.014	0.022 - 0.074	0.0068 - 0.0086
Zirconium (Zr)	mg/kg dw	0.00046 - 0.00078	0.0012 - 0.0041	0.00045 - 0.00056

Table B.18: Laboratory Duplicate Results for Fish Muscle Samples

Analyte	Unit	UER-MW-07M rep 1	UER-MW-07M rep 2	RPD (%)	MC-MW-03M rep 1	MC-MW-03M rep 2	RPD (%)	LFR-MW-03M rep 1	LFR-MW-03M rep 2	RPD (%)	KR-MW-11M rep 1	KR-MW-11M rep 2	RPD (%)
Aluminum (Al)	mg/kg dw	9.5	6.9	32%	1.7	1.6	7%	1.1	1.1	0%	3.1	3.1	0%
Antimony (Sb)	mg/kg dw	0.00086	0.0016	61%	0.0020	0.0010	64%	0.0012	0.0012	0%	0.0011	0.0012	9%
Arsenic (As)	mg/kg dw	0.078	0.081	4%	0.20	0.24	14%	0.046	0.071	43%	0.078	0.072	8%
Barium (Ba)	mg/kg dw	0.27	0.38	34%	0.25	0.032	155%	0.54	0.033	177%	0.054	0.15	92%
Beryllium (Be)	mg/kg dw	0.0015	0.0015	0%	0.0015	0.0016	6%	0.0026	0.0026	0%	0.0024	0.0026	8%
Bismuth (Bi)	mg/kg dw	0.00055	0.00054	2%	0.00028	0.00029	4%	0.00020	0.00020	0%	0.00023	0.00026	12%
Boron (B)	mg/kg dw	0.12	0.12	0%	0.12	0.12	0%	0.080	0.079	1%	0.10	0.13	23%
Cadmium (Cd)	mg/kg dw	0.0094	0.0088	7%	0.0096	0.0085	12%	0.011	0.0094	16%	0.00086	0.0028	107%
Calcium (Ca)	mg/kg dw	2,030	3,620	56%	3,580	443	156%	6,850	586	168%	591	944	46%
Cesium (Cs)	mg/kg dw	0.024	0.023	6%	0.039	0.038	2%	0.034	0.033	4%	0.053	0.058	10%
Chromium (Cr)	mg/kg dw	0.11	0.072	43%	0.11	0.071	39%	0.062	0.072	15%	0.062	0.071	14%
Cobalt (Co)	mg/kg dw	0.041	0.039	5%	0.069	0.070	2%	0.035	0.036	1%	0.023	0.027	16%
Copper (Cu)	mg/kg dw	1.0	1.1	5%	1.0	1.2	20%	1.3	1.6	19%	0.75	0.86	14%
Gallium (Ga)	mg/kg dw	0.011	0.010	9%	0.0073	0.0073	0%	0.0087	0.0053	49%	0.0065	0.0055	17%
Iron (Fe)	mg/kg dw	18	19	5%	14	14	3%	15	18	20%	10	20	65%
Lead (Pb)	mg/kg dw	0.0098	0.011	10%	0.012	0.011	13%	0.015	0.0078	61%	0.0084	0.012	33%
Lithium (Li)	mg/kg dw	0.024	0.025	6%	0.018	0.015	20%	0.24	0.20	15%	0.0097	0.011	11%
Magnesium (Mg)	mg/kg dw	1,290	1,290	0%	1,310	1,260	4%	1,250	1,110	12%	1,140	1,260	10%
Manganese (Mn)	mg/kg dw	1.2	1.5	23%	0.90	0.57	46%	0.98	0.47	71%	0.56	0.63	13%
Mercury (Hg)	mg/kg dw	0.089	0.083	7%	0.060	0.057	5%	0.13	0.13	1%	0.16	0.16	0%
Molybdenum (Mo)	mg/kg dw	0.015	0.014	8%	0.0072	0.0095	28%	0.013	0.014	5%	0.0083	0.011	25%
Nickel (Ni)	mg/kg dw	0.026	0.031	17%	0.035	0.024	38%	0.033	0.017	66%	0.019	0.10	136%
Phosphorus (P)	mg/kg dw	11,800	12,600	7%	12,400	11,000	12%	14,600	10,700	31%	11,800	12,100	3%
Potassium (K)	mg/kg dw	21,700	21,700	0%	21,700	21,900	1%	20,800	20,100	3%	23,700	23,600	0%
Rhenium (Re)	mg/kg dw	0.000035	0.000035	0%	0.000035	0.000037	6%	0.0000090	0.000034	117%	0.000030	0.000025	18%
Rubidium (Rb)	mg/kg dw	5.0	5.0	1%	9.8	9.5	2%	5.4	5.4	1%	9.7	10	5%
Selenium (Se)	mg/kg dw	7.0	6.9	1%	3.0	2.7	8%	6.1	5.8	4%	2.5	2.7	7%
Silver (Ag)	mg/kg dw	0.00070	0.00081	15%	0.00092	0.00060	42%	0.00027	0.00037	31%	0.00059	0.00082	33%
Sodium (Na)	mg/kg dw	1,240	1,240	0%	956	961	1%	1,480	1,430	3%	1,130	1,120	1%
Strontium (Sr)	mg/kg dw	1.2	2.2	60%	1.6	0.099	176%	3.4	0.26	172%	0.17	0.28	52%
Thallium (Tl)	mg/kg dw	0.038	0.038	1%	0.19	0.19	0%	0.094	0.098	5%	0.037	0.041	11%
Thorium (Th)	mg/kg dw	0.0020	0.0014	34%	0.00022	0.00029	28%	0.00033	0.00024	33%	0.000095	0.0017	178%
Tin (Sn)	mg/kg dw	0.0026	0.0019	35%	0.0020	0.0017	12%	0.0012	0.0013	8%	0.0014	0.010	152%
Titanium (Ti)	mg/kg dw	0.30	0.27	12%	0.10	0.11	7%	0.13	0.11	21%	0.097	0.14	39%
Uranium (U)	mg/kg dw	0.0015	0.0013	15%	0.0011	0.00020	138%	0.0018	0.00074	86%	0.00018	0.00037	72%
Vanadium (V)	mg/kg dw	0.042	0.036	16%	0.013	0.0052	87%	0.0087	0.0052	51%	0.0028	0.0052	59%
Yttrium (Y)	mg/kg dw	0.0080	0.0066	19%	0.00063	0.00063	0%	0.00056	0.00056	0%	0.00074	0.00074	0%
Zinc (Zn)	mg/kg dw	13	15	12%	14	13	13%	14	11	22%	11	11	5%
Zirconium (Zr)	mg/kg dw	0.0089	0.0088	1%	0.0054	0.0033	48%	0.0042	0.0042	0%	0.0038	0.0038	1%

Notes: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table B.19: **Laboratory Duplicate Results for Fish Ovary Samples**

Analyte	Unit	FC-MW-05G rep 1	FC-MW-05G rep 2	RPD (%)	LER-MW-02G rep 1	LER-MW-02G rep 2	RPD (%)	LER-MW-05G rep 1	LER-MW-05G rep 2	RPD (%)	MC-MW-04G rep 1	MC-MW-04G rep 2	RPD (%)	BR-MW-04G rep 1	BR-MW-04G rep 2	RPD (%)
Aluminum (Al)	mg/kg dw	0.36	0.36	0%	0.45	0.45	0%	0.34	0.34	0%	2.3	2.3	0%	0.91	0.91	0%
Antimony (Sb)	mg/kg dw	0.0014	0.00074	60%	0.0012	0.0011	9%	0.0011	0.0012	9%	0.0012	0.0012	0%	0.0011	0.0012	9%
Arsenic (As)	mg/kg dw	0.090	0.099	10%	0.022	0.021	8%	0.031	0.025	22%	0.098	0.085	15%	0.097	0.095	1%
Barium (Ba)	mg/kg dw	0.50	0.51	0%	0.16	0.16	3%	0.19	0.19	1%	0.37	0.37	1%	0.32	0.13	85%
Beryllium (Be)	mg/kg dw	0.0027	0.0028	4%	0.0025	0.0023	8%	0.0024	0.0026	8%	0.0027	0.0026	4%	0.0024	0.0025	4%
Bismuth (Bi)	mg/kg dw	0.00054	0.00061	12%	0.00055	0.00058	5%	0.00018	0.00020	11%	0.00020	0.00019	5%	0.00018	0.00019	5%
Boron (B)	mg/kg dw	0.17	0.17	0%	0.076	0.071	7%	0.074	0.14	62%	0.082	0.078	5%	0.096	0.16	52%
Cadmium (Cd)	mg/kg dw	0.0087	0.0086	1%	0.039	0.046	16%	0.019	0.017	12%	0.032	0.028	12%	0.0049	0.0042	15%
Calcium (Ca)	mg/kg dw	973	958	2%	1,200	1,180	2%	972	1,010	4%	923	965	4%	2,820	868	106%
Cesium (Cs)	mg/kg dw	0.0028	0.0027	3%	0.0045	0.0044	1%	0.0031	0.0031	2%	0.0053	0.0055	3%	0.0091	0.0089	2%
Chromium (Cr)	mg/kg dw	0.059	0.061	3%	0.064	0.073	13%	0.064	0.064	1%	0.068	0.074	7%	0.12	0.070	52%
Cobalt (Co)	mg/kg dw	0.11	0.11	0%	0.14	0.14	6%	0.067	0.067	0%	0.30	0.31	3%	0.21	0.20	3%
Copper (Cu)	mg/kg dw	2.3	2.2	2%	2.2	2.2	0%	2.2	2.2	3%	2.0	2.0	2%	2.2	2.2	2%
Gallum (Ga)	mg/kg dw	0.0081	0.0045	57%	0.0052	0.0048	8%	0.0053	0.0055	4%	0.0074	0.0050	39%	0.0063	0.0049	25%
Iron (Fe)	mg/kg dw	28	30	8%	41	48	16%	34	32	5%	24	24	3%	45	43	4%
Lead (Pb)	mg/kg dw	0.0011	0.0013	13%	0.0024	0.0028	16%	0.0015	0.0017	10%	0.0050	0.0047	5%	0.012	0.0066	61%
Lithium (Li)	mg/kg dw	0.016	0.015	5%	0.035	0.034	1%	0.042	0.038	11%	0.032	0.035	9%	0.025	0.018	33%
Magnesium (Mg)	mg/kg dw	1,010	989	2%	1,020	994	3%	962	997	4%	974	962	1%	950	908	5%
Manganese (Mn)	mg/kg dw	13	12	3%	7.7	7.7	0%	13	13	3%	7.9	7.8	2%	9.4	8.7	7%
Mercury (Hg)	mg/kg dw	0.011	0.012	7%	0.019	0.021	6%	0.012	0.012	0%	0.0056	0.0052	6%	0.012	0.012	0%
Molybdenum (Mo)	mg/kg dw	0.020	0.018	9%	0.015	0.014	12%	0.019	0.021	10%	0.016	0.014	14%	0.021	0.020	8%
Nickel (Ni)	mg/kg dw	0.021	0.0086	82%	0.022	0.024	8%	0.027	0.025	8%	0.064	0.057	12%	0.023	0.016	34%
Phosphorus (P)	mg/kg dw	8,940	8,830	1%	9,190	9,290	1%	8,930	8,760	2%	8,870	8,740	1%	9,950	8,750	13%
Potassium (K)	mg/kg dw	6,120	6,050	1%	5,660	5,650	0%	5,660	5,790	2%	5,310	5,300	0%	5,390	5,320	1%
Rhenium (Re)	mg/kg dw	0.0018	0.0019	4%	0.0022	0.0027	18%	0.0017	0.0018	3%	0.00091	0.00098	8%	0.0021	0.0017	23%
Rubidium (Rb)	mg/kg dw	2.0	2.0	1%	2.2	2.2	1%	1.2	1.2	1%	2.9	2.9	1%	1.8	1.8	1%
Selenium (Se)	mg/kg dw	14	14	0%	29	31	6%	30	29	5%	26	26	1%	13	13	2%
Silver (Ag)	mg/kg dw	0.011	0.011	3%	0.011	0.012	10%	0.0089	0.0087	3%	0.0098	0.0093	6%	0.0069	0.0072	3%
Sodium (Na)	mg/kg dw	3,680	3,550	4%	2,340	2,310	1%	2,260	2,360	4%	2,940	2,920	1%	3,030	3,030	0%
Strontium (Sr)	mg/kg dw	0.38	0.39	2%	1.0	0.99	1%	0.85	0.86	1%	0.75	0.80	6%	2.0	0.88	80%
Thallium (Tl)	mg/kg dw	0.0050	0.0050	0%	0.0095	0.0096	1%	0.0047	0.0046	1%	0.016	0.016	1%	0.0029	0.0027	8%
Thorium (Th)	mg/kg dw	0.00011	0.00008	32%	0.00016	0.00026	51%	0.00011	0.00009	17%	0.00027	0.00074	93%	0.00084	0.00076	11%
Tin (Sn)	mg/kg dw	0.00057	0.00058	2%	0.0010	0.00094	6%	0.00097	0.0011	13%	0.0011	0.0010	10%	0.0022	0.0010	76%
Titanium (Ti)	mg/kg dw	0.061	0.055	10%	0.073	0.078	7%	0.063	0.066	5%	0.098	0.088	11%	0.11	0.074	40%
Uranium (U)	mg/kg dw	0.00055	0.00058	6%	0.0043	0.0044	3%	0.0016	0.0014	14%	0.0019	0.0019	1%	0.0018	0.0011	50%
Vanadium (V)	mg/kg dw	0.012	0.013	2%	0.012	0.014	13%	0.0078	0.0073	8%	0.012	0.015	18%	0.013	0.0088	41%
Yttrium (Y)	mg/kg dw	0.0038	0.0038	0%	0.0052	0.0056	9%	0.0018	0.0018	2%	0.0022	0.0022	0%	0.0044	0.0044	0%
Zinc (Zn)	mg/kg dw	54	53	2%	57	58	2%	74	72	3%	57	56	2%	74	73	2%
Zirconium (Zr)	mg/kg dw	0.0064	0.0024	92%	0.0044	0.0056	24%	0.0037	0.0030	22%	0.0066	0.0053	23%	0.0052	0.0037	34%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD) or relative standard deviation (RSD).

Table B.20: Laboratory Matrix Spike Recoveries Associated with Fish Tissue Sample

Analyte	Units	Matrix Spike (% Recovery)				
		Ovary			Muscle	
		FC-MW-05G	LER-MW-02G	MC-MW-04G	LFR-MW-03M	UER-MW-07M
Aluminum (Al)	mg/kg dw	§	§	§	§	†
Antimony (Sb)	mg/kg dw	93%	105%	107%	103%	103%
Arsenic (As)	mg/kg dw	95%	100%	104%	96%	105%
Barium (Ba)	mg/kg dw	98%	113%	116%	105%	128%
Beryllium (Be)	mg/kg dw	90%	70%	73%	69%	63%
Bismuth (Bi)	mg/kg dw	95%	111%	110%	108%	103%
Boron (B)	mg/kg dw	91%	67%	70%	68%	65%
Cadmium (Cd)	mg/kg dw	93%	98%	99%	97%	98%
Calcium (Ca)	mg/kg dw	*	*	*	*	*
Cesium (Cs)	mg/kg dw	*	*	*	*	*
Chromium (Cr)	mg/kg dw	94%	89%	91%	86%	92%
Cobalt (Co)	mg/kg dw	95%	87%	90%	85%	93%
Copper (Cu)	mg/kg dw	90%	83%	87%	74%	86%
Gallium (Ga)	mg/kg dw	*	*	*	*	*
Iron (Fe)	mg/kg dw	†	†	†	†	†
Lead (Pb)	mg/kg dw	97%	111%	111%	109%	108%
Lithium (Li)	mg/kg dw	93%	70%	72%	68%	63%
Magnesium (Mg)	mg/kg dw	†	†	†	†	†
Manganese (Mn)	mg/kg dw	†	†	†	87%	125%
Molybdenum (Mo)	mg/kg dw	99%	97%	98%	99%	107%
Nickel (Ni)	mg/kg dw	92%	83%	86%	81%	91%
Phosphorus (P)	mg/kg dw	†	†	†	†	†
Potassium (K)	mg/kg dw	*	*	*	*	*
Rhenium (Re)	mg/kg dw	101%	111%	112%	114%	115%
Rubidium (Rb)	mg/kg dw	*	*	*	*	*
Selenium (Se)	mg/kg dw	†	†	†	†	†
Silver (Ag)	mg/kg dw	92%	44%	93%	92%	95%
Sodium (Na)	mg/kg dw	†	†	†	†	†
Strontium (Sr)	mg/kg dw	100%	100%	102%	‡	214%
Thallium (Tl)	mg/kg dw	96%	111%	110%	109%	110%
Thorium (Th)	mg/kg dw	97%	125%	126%	125%	121%
Tin (Sn)	mg/kg dw	*	*	*	*	*
Titanium (Ti)	mg/kg dw	96%	100%	101%	97%	92%
Uranium (U)	mg/kg dw	99%	128%	126%	131%	124%
Vanadium (V)	mg/kg dw	98%	94%	98%	94%	101%
Yttrium (Y)	mg/kg dw	*	*	*	*	*
Zinc (Zn)	mg/kg dw	†	†	†	†	†
Zirconium (Zr)	mg/kg dw	77%	77%	82%	65%	59%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

* Not spiked (the element was not included in the multi-element spike solution).

† Spike too small (the concentration of the element spiked into sample was less than 50% of the average concentration measured in the replicates).

‡ High variability in replicates (the spike level was less than 2x the standard deviation of replicates).

§ Only one unspiked replicate was used for this element because the second replicate was digested in a vessel with known, significantly high background levels of this element. Thus the standard deviation of the replicates could not be accurately determined.

Table B.21: Laboratory Analyses of Certified Reference Materials Associated with Fish Tissue Chemistry Samples

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Aluminum (Al)	mg/kg dw	-	1.2 (0.7 - 1.7)	1.27	Yes	-	106%	01B SRM 1577
		-	1.2 (0.7 - 1.7)	1.34	Yes	-	112%	01B SRM 1577
		-	1.2 (0.7 - 1.7)	1.10	Yes	-	92%	02B SRM 1577
		-	1.2 (0.7 - 1.7)	1.63	Yes	-	136%	03B SRM 1577
		-	200	45.20	-	-	23%	01B CRM DOLT-4
		-	-	11.80	-	-	-	01B CRM DOLT-5
		-	-	12.00	-	-	-	02B CRM DOLT-5
		-	-	15.10	-	-	-	02B CRM DOLT-5
		-	-	20.50	-	-	-	04B CRM DOLT-5
Antimony (Sb)	mg/kg dw	-	0.009 (0.004 - 0.014)	0.013	Yes	-	144%	01B SRM 1577
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	77%	01B SRM 1577
		-	0.009 (0.004 - 0.014)	0.010	Yes	-	108%	02B SRM 1577
		-	0.009 (0.004 - 0.014)	0.008	Yes	-	84%	03B SRM 1577
		-	-	0.012	-	-	-	01B CRM DOLT-4
		-	0.013	0.015	-	-	115%	01B CRM DOLT-5
		-	0.013	0.013	-	-	98%	02B CRM DOLT-5
		-	0.013	0.012	-	-	90%	02B CRM DOLT-5
		-	0.013	0.012	-	-	95%	04B CRM DOLT-5
Arsenic (As)	mg/kg dw	0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.061	No	110%	112%	01B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.052	Yes	95%	97%	01B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.059	Yes	106%	108%	02B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.045	No	82%	84%	03B SRM 1577
		9.66 (9.04 - 10.28)	-	9.83	Yes	102%	-	01B CRM DOLT-4
		34.6 (32.2 - 37.0)	-	38.3	No	111%	-	01B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	35.4	Yes	102%	-	02B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	32.0	No	92%	-	02B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	32.3	Yes	93%	-	04B CRM DOLT-5
Cadmium (Cd)	mg/kg dw	0.27 (0.23 - 0.31)	0.28 (0.26 - 0.31)	0.33	No	122%	116%	01B SRM 1577
		0.27 (0.23 - 0.31)	0.28 (0.26 - 0.31)	0.30	Yes	110%	105%	01B SRM 1577
		0.27 (0.23 - 0.31)	0.28 (0.26 - 0.31)	0.33	No	123%	118%	02B SRM 1577
		0.27 (0.23 - 0.31)	0.28 (0.26 - 0.31)	0.29	Yes	106%	101%	03B SRM 1577
		24.3 (23.5 - 25.1)	-	23.9	Yes	98%	-	01B CRM DOLT-4
		14.5 (13.9 - 15.1)	-	14.8	Yes	102%	-	01B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.9	Yes	96%	-	02B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.6	No	94%	-	02B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.7	No	94%	-	04B CRM DOLT-5
Calcium (Ca)	mg/kg dw	124 (118 - 130)	121 (107 - 135)	215	No	173%	178%	01B SRM 1577
		124 (118 - 130)	121 (107 - 135)	124	Yes	100%	102%	01B SRM 1577
		124 (118 - 130)	121 (107 - 135)	117	No	94%	97%	02B SRM 1577
		124 (118 - 130)	121 (107 - 135)	121	Yes	98%	100%	03B SRM 1577
		-	680	597	-	-	88%	01B CRM DOLT-4
		550 (470 - 630)	-	600	Yes	109%	-	01B CRM DOLT-5
		550 (470 - 630)	-	537	Yes	98%	-	02B CRM DOLT-5
		550 (470 - 630)	-	581	Yes	106%	-	02B CRM DOLT-5
		550 (470 - 630)	-	561	Yes	102%	-	04B CRM DOLT-5
Cesium (Cs)	mg/kg dw	-	0.015 (0.011 - 0.019)	0.013	Yes	-	85%	01B SRM 1577
		-	0.015 (0.011 - 0.019)	0.014	Yes	-	90%	01B SRM 1577
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	79%	02B SRM 1577
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	87%	03B SRM 1577
		-	-	0.101	-	-	-	01B CRM DOLT-4
		-	-	0.070	-	-	-	01B CRM DOLT-5
		-	-	0.067	-	-	-	02B CRM DOLT-5
		-	-	0.074	-	-	-	02B CRM DOLT-5
		-	-	0.077	-	-	-	04B CRM DOLT-5
Chromium (Cr)	mg/kg dw	0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.10	Yes	117%	94%	01B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.12	No	131%	105%	01B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.08	Yes	90%	72%	02B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.10	Yes	115%	92%	03B SRM 1577
		-	1.40	0.89	-	-	64%	01B CRM DOLT-4
		-	-	3.79	-	-	-	01B CRM DOLT-5
		-	-	1.45	-	-	-	02B CRM DOLT-5
		-	-	1.78	-	-	-	02B CRM DOLT-5
		-	-	1.86	-	-	-	04B CRM DOLT-5
Cobalt (Co)	mg/kg dw	-	0.22 (0.18 - 0.26)	0.24	Yes	-	108%	01B SRM 1577
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	109%	01B SRM 1577
		-	0.22 (0.18 - 0.26)	0.23	Yes	-	104%	02B SRM 1577
		-	0.22 (0.18 - 0.26)	0.21	Yes	-	97%	03B SRM 1577
		-	0.25	0.20	-	-	82%	01B CRM DOLT-4
		0.267 (0.241 - 0.293)	-	0.257	Yes	96%	-	01B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.222	No	83%	-	02B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.225	No	84%	-	02B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.229	No	86%	-	04B CRM DOLT-5
Copper (Cu)	mg/kg dw	193 (183 - 203)	190 (180 - 200)	179	No	93%	94%	01B SRM 1577
		193 (183 - 203)	190 (180 - 200)	169	No	88%	89%	01B SRM 1577
		193 (183 - 203)	190 (180 - 200)	175	No	91%	92%	02B SRM 1577
		193 (183 - 203)	190 (180 - 200)	157	No	81%	83%	03B SRM 1577
		31.2 (30.1 - 32.3)	-	28.4	No	91%	-	01B CRM DOLT-4
		35.0 (32.6 - 37.4)	-	31.2	No	89%	-	01B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	28.8	No	82%	-	02B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	28.5	No	81%	-	02B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	28.9	No	83%	-	04B CRM DOLT-5
Iron (Fe)	mg/kg dw	268 (260 - 276)	263 (241 - 285)	267	Yes	100%	102%	01B SRM 1577
		268 (260 - 276)	263 (241 - 285)	259	No	97%	98%	01B SRM 1577
		268 (260 - 276)	263 (241 - 285)	249	No	93%	95%	02B SRM 1577
		268 (260 - 276)	263 (241 - 285)	241	No	90%	92%	03B SRM 1577
		1,833 (1,758 - 1,908)	-	1,640	No	89%	-	01B CRM DOLT-4
		1,070 (990 - 1,150)	-	1,020	Yes	95%	-	01B CRM DOLT-5
		1,070 (990 - 1,150)	-	981	No	92%	-	02B CRM DOLT-5
		1,070 (990 - 1,150)	-	994	Yes	93%	-	02B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,020	Yes	95%	-	04B CRM DOLT-5
Lead (Pb)	mg/kg dw	0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.52	No	153%	153%	01B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.35	Yes	104%	104%	01B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.37	Yes	107%	107%	02B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.37	Yes	109%	109%	03B SRM 1577
		0.16 (0.12 - 0.20)	-	0.13	Yes	84%	-	01B CRM DOLT-4
		0.16 (0.13 - 0.19)	-	0.16	Yes	100%	-	01B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.15	Yes	91%	-	02B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.20	No	122%	-	02B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.17	Yes	105%	-	04B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.
Only analytes for which certified or informational values are available.

Table B.21: Laboratory Analyses of Certified Reference Materials Associated with Fish Tissue Chemistry Samples

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Magnesium (Mg)	mg/kg dw	604 (595 - 613)	608 (577 - 639)	618	No	102%	102%	01B SRM 1577
		604 (595 - 613)	608 (577 - 639)	601	Yes	100%	99%	01B SRM 1577
		604 (595 - 613)	608 (577 - 639)	562	No	93%	92%	02B SRM 1577
		604 (595 - 613)	608 (577 - 639)	536	No	89%	88%	03B SRM 1577
		-	1,500	1,220	-	-	81%	01B CRM DOLT-4
		940 (840 - 1,040)	-	852	Yes	91%	-	01B CRM DOLT-5
		940 (840 - 1,040)	-	830	No	88%	-	02B CRM DOLT-5
		940 (840 - 1,040)	-	823	No	88%	-	02B CRM DOLT-5
		940 (840 - 1,040)	-	825	No	88%	-	04B CRM DOLT-5
Manganese (Mn)	mg/kg dw	10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.5	Yes	102%	103%	01B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.2	Yes	99%	100%	01B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	9.9	Yes	96%	97%	02B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.0	Yes	97%	98%	03B SRM 1577
		-	-	9.1	-	-	-	01B CRM DOLT-4
		-	-	9.0	-	-	-	01B CRM DOLT-5
		-	-	8.0	-	-	-	02B CRM DOLT-5
		-	-	8.8	-	-	-	02B CRM DOLT-5
		-	-	9.0	-	-	-	04B CRM DOLT-5
Mercury (Hg)	mg/kg dw	0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.021	No	133%	133%	01B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	136%	136%	01B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.020	No	128%	128%	02B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	135%	135%	03B SRM 1577
		2.58 (2.36 - 2.80)	-	2.32	No	90%	-	01B CRM DOLT-4
		0.44 (0.26 - 0.62)	-	0.38	Yes	87%	-	01B CRM DOLT-5
Molybdenum (Mo)	mg/kg dw	-	3.2 (2.8 - 3.6)	3.6	Yes	-	112%	01B SRM 1577
		-	3.2 (2.8 - 3.6)	3.7	No	-	116%	01B SRM 1577
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	113%	02B SRM 1577
		-	3.2 (2.8 - 3.6)	3.5	Yes	-	108%	03B SRM 1577
		-	1.0	1.1	-	-	108%	01B CRM DOLT-4
		1.41 (1.19 - 1.63)	-	1.47	Yes	104%	-	01B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.33	Yes	94%	-	02B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.34	Yes	95%	-	02B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.36	Yes	96%	-	04B CRM DOLT-5
Nickel (Ni)	mg/kg dw	-	0.18 (0.10 - 0.26)	0.07	-	-	37%	01B SRM 1577
		-	0.18 (0.10 - 0.26)	0.03	-	-	18%	01B SRM 1577
		-	0.18 (0.10 - 0.26)	0.03	No	-	18%	02B SRM 1577
		-	0.18 (0.10 - 0.26)	0.03	-	-	16%	03B SRM 1577
		0.97 (0.86 - 1.08)	-	0.62	No	64%	-	01B CRM DOLT-4
		-	-	2.31	-	-	-	01B CRM DOLT-5
		-	-	0.94	-	-	-	02B CRM DOLT-5
		-	-	1.18	-	-	-	02B CRM DOLT-5
		-	-	1.18	-	-	-	04B CRM DOLT-5
Phosphorus (P)	mg/kg dw	-	11,200 (10,100 - 12,300)	13,300	No	-	119%	01B SRM 1577
		-	11,200 (10,100 - 12,300)	11,600	Yes	-	104%	01B SRM 1577
		-	11,200 (10,100 - 12,300)	11,800	Yes	-	105%	02B SRM 1577
		-	11,200 (10,100 - 12,300)	11,800	Yes	-	105%	03B SRM 1577
		-	-	12,200	-	-	-	01B CRM DOLT-4
		-	11500	12,100	-	-	105%	01B CRM DOLT-5
		-	11500	11,600	-	-	101%	02B CRM DOLT-5
		-	11500	11,300	-	-	98%	02B CRM DOLT-5
		-	11,500	11,300	-	-	98%	04B CRM DOLT-5
Potassium (K)	mg/kg dw	9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,900	No	112%	112%	01B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,600	No	109%	109%	01B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	9,920	Yes	102%	102%	02B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,100	Yes	104%	104%	03B SRM 1577
		-	9,800	8,840	-	-	90%	01B CRM DOLT-4
		14,400 (11,400 - 17,400)	-	15,000	Yes	104%	-	01B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	14,500	Yes	101%	-	02B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	15,100	Yes	105%	-	02B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	15,000	Yes	104%	-	04B CRM DOLT-5
Rubidium (Rb)	mg/kg dw	-	18.3 (17.3 - 19.3)	18.7	Yes	-	102%	01B SRM 1577
		-	18.3 (17.3 - 19.3)	19.0	Yes	-	104%	01B SRM 1577
		-	18.3 (17.3 - 19.3)	19.0	Yes	-	104%	02B SRM 1577
		-	18.3 (17.3 - 19.3)	18.2	Yes	-	99%	03B SRM 1577
		-	-	3.2	-	-	-	01B CRM DOLT-4
		-	-	5.2	-	-	-	01B CRM DOLT-5
		-	-	4.7	-	-	-	02B CRM DOLT-5
		-	-	5.0	-	-	-	02B CRM DOLT-5
		-	-	5.0	-	-	-	04B CRM DOLT-5
Selenium (Se)	mg/kg dw	1.10 (1.00 - 1.20)	1.09 (1.02 - 1.16)	1.20	Yes	109%	110%	01B SRM 1577
		1.10 (1.00 - 1.20)	1.09 (1.02 - 1.16)	1.03	Yes	94%	94%	01B SRM 1577
		1.10 (1.00 - 1.20)	1.09 (1.02 - 1.16)	1.48	No	135%	136%	02B SRM 1577
		1.10 (1.00 - 1.20)	1.09 (1.02 - 1.16)	1.14	Yes	104%	105%	03B SRM 1577
		8.30 (6.96 - 9.64)	-	9.94	No	120%	-	01B CRM DOLT-4
		8.3 (6.5 - 10.1)	-	9.7	Yes	117%	-	01B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	8.5	Yes	103%	-	02B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.7	Yes	93%	-	02B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.8	Yes	94%	-	04B CRM DOLT-5
Silver (Ag)	mg/kg dw	-	0.062 (0.051 - 0.073)	0.060	Yes	-	96%	01B SRM 1577
		-	0.062 (0.051 - 0.073)	0.060	Yes	-	97%	01B SRM 1577
		-	0.062 (0.051 - 0.073)	0.055	Yes	-	88%	02B SRM 1577
		-	0.062 (0.051 - 0.073)	0.057	Yes	-	92%	03B SRM 1577
		0.93 (0.86 - 1.00)	-	0.85	No	92%	-	01B CRM DOLT-4
		2.05 (1.97 - 2.13)	-	1.66	No	81%	-	01B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.83	No	89%	-	02B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.81	No	88%	-	02B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.83	No	89%	-	04B CRM DOLT-5
Sodium (Na)	mg/kg dw	2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,170	No	89%	91%	01B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,270	No	93%	95%	01B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,170	No	89%	91%	02B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	1,790	No	74%	75%	03B SRM 1577
		-	6,800	6,380	-	-	94%	01B CRM DOLT-4
		9,900 (8,300 - 11,500)	-	10,000	Yes	101%	-	01B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	8,980	Yes	91%	-	02B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	8,530	Yes	86%	-	02B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	8,610	Yes	87%	-	04B CRM DOLT-5
Strontium (Sr)	mg/kg dw	-	0.16 (0.13 - 0.19)	0.17	Yes	-	103%	01B SRM 1577
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	91%	01B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	87%	02B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	03B SRM 1577
		-	5.5	4.9	-	-	89%	01B CRM DOLT-4
		3.73 (3.47 - 3.99)	-	3.88	Yes	104%	-	01B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.40	No	91%	-	02B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.75	Yes	101%	-	02B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.68	Yes	99%	-	04B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.
Only analytes for which certified or informational values are available.

Table B.21: Laboratory Analyses of Certified Reference Materials Associated with Fish Tissue Chemistry Samples

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Tin (Sn)	mg/kg dw	-	0.016 (0.012 - 0.020)	0.012	Yes	-	75%	01B SRM 1577
		-	0.016 (0.012 - 0.020)	0.029	No	-	183%	01B SRM 1577
		-	0.016 (0.012 - 0.020)	0.012	Yes	-	77%	02B SRM 1577
		-	0.016 (0.012 - 0.020)	0.015	Yes	-	94%	03B SRM 1577
		-	0.17	0.21	-	-	125%	01B CRM DOLT-4
		0.069 (0.033 - 0.105)	-	0.07	Yes	95%	-	01B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.04	Yes	63%	-	02B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	89%	-	02B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	87%	-	04B CRM DOLT-5
Vanadium (V)	mg/kg dw	-	0.058 (0.052 - 0.064)	0.055	Yes	-	96%	01B SRM 1577
		-	0.058 (0.052 - 0.064)	0.061	Yes	-	105%	01B SRM 1577
		-	0.058 (0.052 - 0.064)	0.057	Yes	-	98%	02B SRM 1577
		-	0.058 (0.052 - 0.064)	0.056	Yes	-	96%	03B SRM 1577
		-	0.6	0.45	-	-	75%	01B CRM DOLT-4
		0.51 (0.45 - 0.57)	-	0.50	Yes	97%	-	01B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.45	Yes	89%	-	02B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.47	Yes	93%	-	02B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.48	Yes	94%	-	04B CRM DOLT-5
Zinc (Zn)	mg/kg dw	130 (117 - 143)	131 (123 - 139)	168	No	129%	128%	01B SRM 1577
		130 (117 - 143)	131 (123 - 139)	120	Yes	92%	92%	01B SRM 1577
		130 (117 - 143)	131 (123 - 139)	148	No	114%	113%	02B SRM 1577
		130 (117 - 143)	131 (123 - 139)	117	Yes	90%	89%	03B SRM 1577
		116 (110 - 122)	-	124	No	107%	-	01B CRM DOLT-4
		105.3 (99.9 - 110.7)	-	112	No	106%	-	01B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	104	Yes	99%	-	02B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	92.3	No	88%	-	02B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	91.6	No	87%	-	04B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.
Only analytes for which certified or informational values are available.

Methods and QC Report for Teck Elk Valley RAEMP (2561) – Minnow Environmental
Benthic Invertebrate Samples processed by Cordillera Consulting

On September 24, 2015, 139 benthic samples were received by Cordillera Consulting from Minnow Environmental.
When samples arrive at Cordillera Consulting they are logged into a proprietary software data base (INSTAR1) and the client generated sample information is recorded along with a Cordillera Consulting number for cross reference. The client representative is notified of the arrival of the shipment. The samples are checked that all sites and replicates recorded on field sheets or packing lists have been delivered intact and with adequate preservative. If there are any missing, mislabelled or extra samples Cordillera Consulting will contact the client immediately to confirm the total numbers and correct names on the sample jars.
Each sample was assigned a distinct Cordillera Consulting code. See table below for summary:

Table 1: Summary of sample information including Cordillera Consulting number.

Site Code	CC#	Date	Size	# of Jars
AGCK-BIC-1	CC160676	9/12/2015	400µM	1
AL4-BIC-1	CC160677	9/13/2015	400µM	1
ALUSM-BIC-1	CC160678	9/13/2015	400µM	1
BOCK-BIC-1	CC160679	9/14/2015	400µM	3
BU2-BIC-1	CC160680	9/13/2015	400µM	1
BU40-BIC-1	CC160681	9/13/2015	400µM	1
BUUQ-BIC-1	CC160682	9/13/2015	400µM	1
CACK-BIC-1	CC160683	9/11/2015	400µM	1
CADCK-BIC-1	CC160684	9/13/2015	400µM	1
CATA2-25-BIC-1	CC160685	9/11/2015	400µM	1
CATA2-75-BIC-1	CC160686	9/11/2015	400µM	1
CHCK-BIC-1	CC160687	9/12/2015	400µM	1
COCK-BIC-1	CC160688	9/11/2015	400µM	2
CRUKO-BIC-1	CC160689	9/11/2015	400µM	1
DACK-BIC-1	CC160690	9/12/2015	400µM	1
DUCK-BIC-1	CC160691	9/11/2015	400µM	1
EL12-BIC-1	CC160692	9/13/2015	400µM	1
EL19-BIC-1	CC160693	9/17/2015	400µM	1
EL1-BIC-1	CC160694	9/16/2015	400µM	1
EL20-BIC-1	CC160695	9/17/2015	400µM	1
ELDFE-BIC-1	CC160696	9/16/2015	400µM	1
ELELKO-BIC-1	CC160697	9/14/2015	400µM	1
ELH93-BIC-1	CC160698	9/16/2015	400µM	1
ELUEL-BIC-1	CC160699	9/13/2015	400µM	1
ELUFE-BIC-1	CC160700	9/15/2015	400µM	1
ELUFO-BIC-1	CC160701	9/14/2015	400µM	2
ELUGH-BIC-1	CC160702	9/17/2015	400µM	1
ELUSP-BIC-1	CC160703	9/15/2015	400µM	1
EWCK-BIC-1	CC160704	9/12/2015	400µM	1
FLAD-BIC-1	CC160705	9/14/2015	400µM	2
FLAU-BIC-1	CC160706	9/14/2015	400µM	1
FO19-SP1-BIC-1	CC160707	9/17/2015	400µM	1
FO22-BIC-1	CC160708	9/12/2015	400µM	2

FO23-BIC-1	CC160709	9/16/2015	400µM	1
FO23-BIC-2	CC160710	9/16/2015	400µM	1
FO23-BIC-3	CC160711	9/16/2015	400µM	1
FO26-BIC-1	CC160712	9/14/2015	400µM	1
FO29-BIC-1	CC160713	9/12/2015	400µM	1
FO29-BIC-2	CC160714	9/13/2015	400µM	2
FO29-BIC-3	CC160715	9/13/2015	400µM	1
FO9-BIC-1	CC160716	9/18/2015	400µM	1
FOBCP-BIC-1	CC160717	9/17/2015	400µM	1
FOBKS-BIC-1	CC160718	9/16/2015	400µM	1
FOBSC-BIC-1	CC160719	9/17/2015	400µM	1
FODGH-BIC-1	CC160720	9/16/2015	400µM	1
FODHE-BIC-1	CC160721	9/14/2015	400µM	1
FODPO-BIC-1	CC160722	9/15/2015	400µM	1
FORD7-BIC-1	CC160723	9/18/2015	400µM	1
FOUEW-BIC-1	CC160724	9/13/2015	400µM	1
FOUKI-BIC-1	CC160725	9/16/2015	400µM	1
FOUL-BIC-1	CC160726	9/17/2015	400µM	1
FOUNGD-BIC-1	CC160727	9/15/2015	400µM	1
FOUSH-BIC-1	CC160728	9/15/2015	400µM	1
GHCKD-BIC-1	CC160729	9/15/2015	400µM	2
GHCKU-BIC-1	CC160730	9/15/2015	400µM	1
GRDS-BIC-1	CC160731	9/12/2015	400µM	1
GREE1-50-BIC-1	CC160732	9/14/2015	400µM	1
GREE3-75-BIC-1	CC160733	9/15/2015	400µM	1
GREE4-25-BIC-1	CC160734	9/16/2015	400µM	1
GREE4-75-BIC-1	CC160735	9/16/2015	400µM	1
GRUHA-BIC-1	CC160736	9/11/2015	400µM	1
HACKDS-BIC-1	CC160737	9/10/2015	400µM	1
HACKUS-BIC-1	CC160738	9/11/2015	400µM	1
HARM1-50-BIC-1	CC160739	9/12/2015	400µM	1
HARM5-25-BIC-1	CC160740	9/12/2015	400µM	1
HENFO-BIC-1	CC160741	9/16/2015	400µM	1
HENUP-BIC-1	CC160742	9/15/2015	400µM	1
KICK-BIC-1	CC160743	9/17/2015	400µM	1
KILM1-BIC-1	CC160744	9/17/2015	400µM	1
KO1-BIC-1	CC160745	9/13/2015	400µM	1
KO1-BIC-2	CC160746	9/13/2015	400µM	1
KO1-BIC-3	CC160747	9/13/2015	400µM	1
KODCR-BIC-1	CC160748	9/12/2015	400µM	1
KOUCR-BIC-1	CC160749	9/12/2015	400µM	1
KOUVE-BIC-1	CC160750	9/10/2015	400µM	1
LC_DC1-BIC-1	CC160751	9/13/2015	400µM	1
LC_DCDS-BIC-1	CC160752	9/16/2015	400µM	1
LC_FRUS-BIC-1	CC160753	9/13/2015	400µM	1
LC_GRCK-BIC-1	CC160754	9/18/2015	400µM	2
LI24-BIC-1	CC160755	9/11/2015	400µM	1
LI8-BIC-1	CC160756	9/13/2015	400µM	1
LIDSL-BIC-1	CC160757	9/12/2015	400µM	1
LILC3-BIC-1	CC160758	9/14/2015	400µM	1
MCCR-BIC-1	CC160759	9/11/2015	400µM	1

MI25-BIC-1	CC160760	9/10/2015	400µM	1
MI25-BIC-2	CC160761	9/10/2015	400µM	1
MI25-BIC-3	CC160762	9/10/2015	400µM	1
M12-BIC-1	CC160763	9/10/2015	400µM	1
M12-BIC-2	CC160764	9/10/2015	400µM	1
M12-BIC-3	CC160765	9/10/2015	400µM	1
M13-BIC-1	CC160766	9/14/2015	400µM	1
M15-BIC-1	CC160767	9/13/2015	400µM	1
MIDAG-BIC-1	CC160768	9/11/2015	400µM	1
MIDCO-BIC-1	CC160769	9/12/2015	400µM	1
MIUCO-BIC-1	CC160770	9/10/2015	400µM	1
MP1-BIC-1	CC160771	9/15/2015	400µM	1
NGD1-BIC-1	CC160772	9/14/2015	400µM	1
NTHO1-25-BIC-1	CC160773	9/18/2015	400µM	1
NTHO1-50-BIC-1	CC160774	9/18/2015	400µM	1
OCNM-BIC-1	CC160775	9/15/2015	400µM	1
OLDDU-BIC-1	CC160776	9/12/2015	400µM	1
OLDLI-BIC-1	CC160777	9/11/2015	400µM	1
OLDLOW-BIC-1	CC160778	9/10/2015	400µM	1
PADAL-BIC-1	CC160779	9/11/2015	400µM	1
PAUKO-BIC-1	CC160780	9/11/2015	400µM	1
POCK-BIC-1	CC160781	9/14/2015	400µM	1
PORT3-25-BIC-1	CC160782	9/13/2015	400µM	1
PORT3-50-BIC-1	CC160783	9/12/2015	400µM	1
RACK-BIC-1	CC160784	9/11/2015	400µM	1
SLINE-BIC-1	CC160785	9/10/2015	400µM	1
SWCK-BIC-1	CC160786	9/15/2015	400µM	1
SWIF2-75-BIC-1	CC160787	9/14/2015	400µM	1
THCK-BIC-1	CC160788	9/18/2015	400µM	1
VEUKO-BIC-1	CC160789	9/18/2015	400µM	1
VEUP-BIC-1	CC160790	9/15/2015	400µM	1
VICK-BIC-1	CC160791	9/12/2015	400µM	1
WOCK-BIC-1	CC160792	9/11/2015	400µM	1
WWRL-BIC-1	CC160793	9/10/2015	400µM	1
WWRU-BIC-1	CC160794	9/19/2015	400µM	1
FLRU-BIC-1	CC160795	9/19/2015	400µM	1
GRCK-BIC-1	CC160796	9/17/2015	400µM	1
ELDGR-BIC-1	CC160797	9/17/2015	400µM	1
ELDEL-BIC-1	CC160798	9/17/2015	400µM	2
CACK-BIC-A	CC160799	9/11/2015	400µM	1
CHCK-BIC-A	CC160800	9/12/2015	400µM	1
FORD7-75-BIC-A	CC160801	9/18/2015	400µM	1
GHCKU-BIC-A	CC160802	9/15/2015	400µM	1
GRDS-BIC-A	CC160803	9/12/2015	400µM	1
GREE1-50-BIC-A	CC160804	9/15/2015	400µM	2
GRUHA-BIC-A	CC160805	9/11/2015	400µM	1
HACKDS-BIC-A	CC160806	9/10/2015	400µM	1
HARM5-25-BIC-A	CC160807	9/12/2015	400µM	1
KICK-BIC-A	CC160808	9/17/2015	400µM	1
KILM1-50-BIC-A	CC160809	9/17/2015	400µM	1
MI2-BIC-A	CC160810	9/10/2015	400µM	1

NTHO1-50-BIC-A	CC160811	9/18/2015	400µM	1
PORT3-25-BIC-A	CC160812	9/14/2015	400µM	1
SWIF2-75-BIC-A	CC160813	9/10/2015	400µM	3
NGDLU-BIC-1	CC161215	10/8/2015	400µM	1

Sorting Effort

The sorting team at Cordillera Consulting sorted the invertebrates into order/family taxa level vials.

- Using a gridded Petri dish, fine forceps and a low power stereo microscope (Olympus, Nikon, Lieca) the sorting technicians removed the invertebrates and sorted them into family/orders at the same time
- The sorting technician kept a running tally of total numbers as they sorted the invertebrates into family/order specific vials. Excluded organisms from Porifera, Nemata, Platyhelminthes, Ostracoda, Copepoda, Cladocera and terrestrial drop-ins such as aphids were removed and counted but they were not included towards the total count
- Where specimens were broken or damaged, only heads were counted
- The number of organisms removed were recorded manually on a bench sheet. The number of organisms in each family or order were also recorded at this time.
- The groups of invertebrates and numbers of each group were entered into INSTAR1
- They are stored in 80% ethanol in separate vials (according to family/order) and an interior label using heavy laser paper is made using site names, date of sampling, site code numbers and portion subsampled. This information is also recorded on the laboratory bench sheet and on the data base.
- The sorted portion of the debris was preserved and labeled separately from the unsorted portion and was tested for sorting efficiency. The unsorted portion was also labeled and preserved in separate jars.

Percent sub-sampled and total countable invertebrates pulled from the samples are summarized in the table below.

Table 2: Percent sub-sample and invertebrate numbers for each sample.

Sample	**CC#**	**400 micron fraction**	
		% Sampled	**# Invertebrates**
AGCK-BIC-1	CC160676	5%	364
AL4-BIC-1	CC160677	5%	561
ALUSM-BIC-1	CC160678	5%	467
BOCK-BIC-1	CC160679	5%	412
BU2-BIC-1	CC160680	20%	305
BU40-BIC-1	CC160681	10%	345
BUUQ-BIC-1	CC160682	10%	308
CACK-BIC-1	CC160683	8%	324
CADCK-BIC-1	CC160684	5%	561
CATA2-25-BIC-1	CC160685	18%	408
CATA2-75-BIC-1	CC160686	10%	356
CHCK-BIC-1	CC160687	5%	670
COCK-BIC-1	CC160688	5%	1459
CRUKO-BIC-1	CC160689	100%	561
DACK-BIC-1	CC160690	5%	493
DUCK-BIC-1	CC160691	6%	358
EL12-BIC-1	CC160692	5%	465
EL19-BIC-1	CC160693	10%	332
EL1-BIC-1	CC160694	5%	386
EL20-BIC-1	CC160695	6%	384
ELDFE-BIC-1	CC160696	5%	858

ELELKO-BIC-1	CC160697	5%	394
ELH93-BIC-1	CC160698	14%	401
ELUEL-BIC-1	CC160699	6%	308
ELUFE-BIC-1	CC160700	5%	575
ELUFO-BIC-1	CC160701	5%	451
ELUGH-BIC-1	CC160702	9%	364
ELUSP-BIC-1	CC160703	5%	323
EWCK-BIC-1	CC160704	5%	306
FLAD-BIC-1	CC160705	5%	657
FLAU-BIC-1	CC160706	5%	326
FO19-SP1-BIC-1	CC160707	5%	690
FO22-BIC-1	CC160708	5%	1058
FO23-BIC-1	CC160709	10%	378
FO23-BIC-2	CC160710	8%	330
FO23-BIC-3	CC160711	10%	360
FO26-BIC-1	CC160712	5%	473
FO29-BIC-1	CC160713	5%	431
FO29-BIC-2	CC160714	5%	369
FO29-BIC-3	CC160715	6%	365
FO9-BIC-1	CC160716	5%	338
FOBCP-BIC-1	CC160717	8%	340
FOBKS-BIC-1	CC160718	8%	334
FOBSC-BIC-1	CC160719	11%	322
FODGH-BIC-1	CC160720	5%	551
FODHE-BIC-1	CC160721	5%	903
FODPO-BIC-1	CC160722	5%	517
FORD7-BIC-1	CC160723	6%	364
FOUEW-BIC-1	CC160724	5%	388
FOUKI-BIC-1	CC160725	10%	351
FOUL-BIC-1	CC160726	11%	332
FOUNGD-BIC-1	CC160727	5%	363
FOUSH-BIC-1	CC160728	5%	368
GHCKD-BIC-1	CC160729	5%	567
GHCKU-BIC-1	CC160730	45%	351
GRDS-BIC-1	CC160731	5%	420
GREE1-50-BIC-1	CC160732	6%	389
GREE3-75-BIC-1	CC160733	40%	320
GREE4-25-BIC-1	CC160734	17%	396
GREE4-75-BIC-1	CC160735	100%	306
GRUHA-BIC-1	CC160736	8%	392
HACKDS-BIC-1	CC160737	5%	510
HACKUS-BIC-1	CC160738	5%	817
HARM1-50-BIC-1	CC160739	5%	701
HARM5-25-BIC-1	CC160740	5%	666
HENFO-BIC-1	CC160741	5%	693
HENUP-BIC-1	CC160742	5%	375
KICK-BIC-1	CC160743	100%	500
KILM1-BIC-1	CC160744	100%	169
KO1-BIC-1	CC160745	40%	335
KO1-BIC-2	CC160746	50%	341
KO1-BIC-3	CC160747	40%	315

KODCR-BIC-1	CC160748	100%	467
KOUCR-BIC-1	CC160749	100%	499
KOUVE-BIC-1	CC160750	16%	374
LC_DC1-BIC-1	CC160751	5%	358
LC_DCDS-BIC-1	CC160752	5%	382
LC_FRUS-BIC-1	CC160753	15%	313
LC_GRCK-BIC-1	CC160754	5%	339
LI24-BIC-1	CC160755	11%	381
LI8-BIC-1	CC160756	10%	339
LIDSL-BIC-1	CC160757	5%	389
LILC3-BIC-1	CC160758	5%	970
MCCR-BIC-1	CC160759	5%	583
MI25-BIC-1	CC160760	5%	357
MI25-BIC-2	CC160761	5%	360
MI25-BIC-3	CC160762	5%	332
M12-BIC-1	CC160763	6%	368
M12-BIC-2	CC160764	10%	325
M12-BIC-3	CC160765	7%	308
M13-BIC-1	CC160766	5%	384
M15-BIC-1	CC160767	5%	376
MIDAG-BIC-1	CC160768	5%	726
MIDCO-BIC-1	CC160769	5%	621
MIUCO-BIC-1	CC160770	5%	392
MP1-BIC-1	CC160771	6%	338
NGD1-BIC-1	CC160772	5%	395
NTHO1-25-BIC-1	CC160773	5%	805
NTHO1-50-BIC-1	CC160774	5%	571
OCNM-BIC-1	CC160775	28%	388
OLDDU-BIC-1	CC160776	16%	318
OLDLI-BIC-1	CC160777	7%	427
OLDLOW-BIC-1	CC160778	11%	418
PADAL-BIC-1	CC160779	100%	557
PAUKO-BIC-1	CC160780	100%	471
POCK-BIC-1	CC160781	5%	1283
PORT3-25-BIC-1	CC160782	7%	329
PORT3-50-BIC-1	CC160783	12%	316
RACK-BIC-1	CC160784	10%	323
SLINE-BIC-1	CC160785	6%	392
SWCK-BIC-1	CC160786	7%	437
SWIF2-75-BIC-1	CC160787	5%	511
THCK-BIC-1	CC160788	15%	363
VEUKO-BIC-1	CC160789	100%	705
VEUP-BIC-1	CC160790	42%	318
VICK-BIC-1	CC160791	5%	429
WOCK-BIC-1	CC160792	25%	314
WWRL-BIC-1	CC160793	7%	342
WWRU-BIC-1	CC160794	40%	308
FLRU-BIC-1	CC160795	6%	330
GRCK-BIC-1	CC160796	5%	389
ELDGR-BIC-1	CC160797	25%	324
ELDEL-BIC-1	CC160798	5%	389

CACK-BIC-A	CC160799	20%	391
CHCK-BIC-A	CC160800	5%	912
FORD7-75-BIC-A	CC160801	5%	341
GHCKU-BIC-A	CC160802	20%	391
GRDS-BIC-A	CC160803	5%	452
GREE1-50-BIC-A	CC160804	5%	373
GRUHA-BIC-A	CC160805	5%	344
HACKDS-BIC-A	CC160806	5%	591
HARM5-25-BIC-A	CC160807	5%	635
KICK-BIC-A	CC160808	100%	210
KILM1-50-BIC-A	CC160809	100%	97
MI2-BIC-A	CC160810	7%	409
NTHO1-50-BIC-A	CC160811	5%	487
PORT3-25-BIC-A	CC160812	6%	569
SWIF2-75-BIC-A	CC160813	5%	410
NGDLU-BIC-1	CC161215	5%	491

Sorting QC – Sorting Efficiency

10% of samples were selected at random for resorting analysis to measure the effectiveness of the sorters. A different sorter from the original sorter did the resort.
All of the resorted samples were above 95% efficiency of invertebrate removal and so achieved industry standards.

Table 3: Summary of sorting efficiency

CC #	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
CC160676	364	2	99%
CC160690	493	17	97%
CC160696	858	3	100%
CC160702	364	10	97%
CC160710	330	7	98%
CC160725	351	9	97%
CC160736	392	8	98%
CC160742	375	3	99%
CC160756	339	1	100%
CC160761	360	5	99%
CC160764	325	10	97%
CC160790	318	5	98%
CC160806	591	5	99%
CC160810	409	2	100%
		Average % Recovery	98%

Sorting QC – SubSample QC

*Results presented in Appendix A
Sub-Sampling efficiency is measured on 10% of the number of sub-sampled samples in a project. Ex. In a project where 50 of 100 total samples were processed through subsampling using a Marchant box, then 10% of 50; or 5 samples will be used for sub sampling efficiency.
Sub-Sampling efficiency is performed by fractioning the entire sample into sub-sample percentages. On each sub-sampled portion, a total organism count is recorded and compared to the rest of the sub-samples. In order to pass, all fractions must be within 20% of total organism count.

Sorting Note: Of all of the subsampling QC conducted, only a single fraction of 5% failed by 35-40 organisms. This could be due to a piece of debris holding a large number of organisms. Other sub-sample QC from the same sorter were checked and passed, no further action was required to correct sampling.

Taxonomic Effort

The next procedure was the identification of invertebrates to genus-species level where possible. According to CABIN criteria[1], identifications were made at the genus/species level for all insect organisms found including Chironomidae. Non-insect organisms (except those not included in count) were identified to genus/species where possible and to a minimum of family level with intact and mature specimens. The Standard Taxonomic Effort lists compiled by SAFIT[2] was used as a guideline for what level of identification to achieve where the condition and maturity of the organism enables.
Appendix 1 lists the major reference texts used for identification, though other online keys and journal publications are also used.

- Organisms from the same families/order were kept in separate vials (unless directed to do otherwise) in 80% ethanol and labeled with an interior label of heavy laser paper. Where numbers of organisms in a family or genus was large (>30) it merited a separate vial.
- Chironomidae will be identified to genus/species level using slide mounts. CMC-10 will be used to clear and mount the slide.
- Oligochaetes were identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slide
- Decapoda, Amphipoda and Isopoda were identified at family/genus/species level where possible.
- Nemata remained at the phylum level
- Hydrachnidae were identified at the family/genus level where possible.

Taxonomic QC

The taxonomists for this project were certified by the Society of Freshwater Science (SFS) Taxonomic Certification Program, which is the required certification for CABIN projects:

Sue Salter: Holds 5 SFS certifications - Level 2 Group 1 General Arthropods East/West; Group 2 EPT West; Group 3 Chironomids EPT East/West

Scott Finlayson: Holds 6 SFS certifications **-** Level 2 Group 1 General Arthropods (East/West); Group 2 EPT East/West; Group 3 Chironomids East/West

Adam Bliss: Holds 4 SFS certifications - Level 2 Group 1 General Arthropods (East/West); Group 2 EPT East/West

Rita Avery: Holds 2 SFS certifications - Level 2 Group 2 EPT East/West

Taxonomic QC was performed in house by someone other than the original taxonomist.

CABIN protocol calculates taxonomic efficiency as:

$$\frac{\#\ Incorrect\ Identifications}{Total\ organisms\ found\ in\ audit} * 100\% = \%\ Identification\ Error$$

Error Summary

All samples report errors within the acceptable limits for CABIN Laboratory methods (less than 5% error).

Table 4: Summary of taxonomic error following QC

CC #	# Taxa identified	% Misidentifications
CC160686	354	0.00
CC160698	400	0.00
CC160710	329	0.00
CC160715	358	0.28
CC160727	362	0.00
CC160738	701	0.00
CC160747	314	0.00
CC160753	309	0.65
CC160766	382	0.00
CC160773	672	0.15
CC160782	326	0.00
CC160790	315	1.59

There will always be disagreements between taxonomists regarding the degree of taxonomic resolution in immature specimens and when laboratories make use of different keys for certain groups (Mollusks is an especially disputed group). It is always possible that some taxa found by the original taxonomist were overlooked in QC.

All of the Taxonomic QC samples that were observed passed testing according to the CABIN misidentification protocols. See the tables below for results from taxonomic QC audit.

Taxonomy Note

Misidentification of Drunella flavilinea as Ephemerella dorothea/excrucians occurred in only one sample CC160790, and so the data was changed to reflect this change.

Other errors were examined and no further changes required.

Site - CABIN Sample - CATA2-75-BIC-1, CC# - CC160686, Percent sampled = 10, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Perlodidae	3	3	Yes					
Limnophora sp.	5	5	Yes					
Limnephilidae	10	10	Yes					
Dicranota	1	1	Yes					
Capniidae	1	1	Yes					
Chironomidae	19	19	Yes					
Micropsectra	13	13	Yes					
Diamesa	1	1	Yes					
Pseudodiamesa	1	1	Yes					
Corynoneura	2	2	Yes					
Eukiefferiella	23	23	Yes					
Hydrobaenus	3	3	Yes					
Orthocladius	89	89	Yes					

Enchytraeus	176	176	Yes					
Fridericia	7	7	Yes					
Total:	**354**							
					0	0	0	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.00	**Pass**		

Site - CABIN Sample - ELH93-BIC-1, CC# - CC160698, Percent sampled = 14, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Leptophlebiidae	2	2	Yes					
Acentrella sp.	4	4	Yes					
Ephemerellidae	6	6	Yes					
Heptageniidae	28	28	Yes					
Ameletus	5	5	Yes					
Hydropsyche	7	7	Yes					
Perlodidae	11	11	Yes					
Lebertia	1	1	Yes					
Hydropsychidae	4	4	Yes					
Lepidostoma	6	6	Yes					
Capniidae	2	2	Yes					
Zapada cinctipes	1	1	Yes					
Taenionema	1	1	Yes					
Ephemerella	11	11	Yes					
Nais	93	93	Yes					
Chironomidae	23	23	Yes					
Potthastia longimana group	4	4	Yes					
Tvetenia bavarica group	11	11	Yes					
Microtendipes pedellus group	6	6	Yes					
Orthocladius	136	136	Yes					
Thienemannimyia group	7	7	Yes					
Micropsectra	26	26	Yes					
Paracladopelma	2	2	Yes					
Polypedilum	1	1	Yes					
Eukiefferiella	1	1	Yes					
Stempellinella	1	1	Yes					
Total:	**400**							
					0	0	0	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.00	**Pass**		

Site - CABIN Sample - FO23-BIC-2, CC# - CC160710, Percent sampled = 8, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Ameletus	2	2	Yes					
Baetis tricaudatus group	15	15	Yes					
Drunella doddsii	5	5	Yes					
Heptageniidae	16	16	Yes					
Atherix	1	1	Yes					
Rhyacophila brunnea/vemna group	5	5	Yes					
Taenionema	16	16	Yes					
Lebertia	9	9	Yes					
Ephemerellidae	5	5	Yes					
Drunella grandis group	1	1	Yes					
Ephemerella	1	1	Yes					
Baetis	8	8	Yes					
Acentrella turbida	1	1	Yes					
Pericoma/Telmatoscopus sp.	7	7	Yes					
Simuliidae	1	1	Yes					
Empididae	1	1	Yes					
Dicranota	1	1	Yes					
Simulium	1	1	Yes					
Testudacarus sp.	1	1	Yes					
Wiedemannia sp.	5	5	Yes					
Rhyacophila	25	25	Yes					
Arctopsyche sp.	1	1	Yes					
Brachycentridae	5	5	Yes					
Glossosoma	1	1	Yes					
Rhithrogena	1	1	Yes					
Sweltsa sp.	3	3	Yes					
Zapada oregonensis group	2	2	Yes					
Zapada columbiana	1	1	Yes					
Zapada cinctipes	29	29	Yes					
Zapada	6	6	Yes					
Perlidae	37	37	Yes					
Perlodidae	5	5	Yes					
Capniidae	1	1	Yes					
Hesperoperla sp.	5	5	Yes					
Nais	2	2	Yes					
Chironomidae	7	7	Yes					
Orthocladius	56	56	Yes					
Pagastia	1	1	Yes					
Tvetenia bavarica group	1	1	Yes					
Hydrobaenus	18	18	Yes					
Rheocricotopus	3	3	Yes					
Eukiefferiella	12	12	Yes					

Stictochironomus	1	1	Yes					
Micropsectra	2	2	Yes					
Limnophyes sp.	1	1	Yes					
Procladius	1	1	Yes					
Total:	**329**							
					0	0	0	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.00	**Pass**		

Site - CABIN Sample - FO29-BIC-3, CC# - CC160715, Percent sampled = 6, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Heptageniidae	103	99	No			X		
Drunella doddsii	18	18	Yes					
Ephemerellidae	12	12	Yes					
Ephemerella	1	1	Yes					
Baetis	28	28	Yes					
Drunella grandis group	3	3	Yes					
Epeorus	3	7	No			X		
Perlodidae	16	16	Yes					
Taenionema	3	3	Yes					
Megarcys sp.	4	4	Yes					
Sweltsa sp.	6	6	Yes					
Zapada oregonensis group	3	3	Yes					
Zapada columbiana	1	1	Yes					
Zapada cinctipes	6	6	Yes					
Zapada	8	8	Yes					
Rhyacophila brunnea/vemna group	6	6	Yes					
Optioservus sp.	1	1	Yes					
Parapsyche sp.	3	4	No			X		1 from Arctopsyche
Arctopsyche sp.	1	0	No	1				
Rhyacophila	3	3	Yes					
Rhyacophila hyalinata group	1	1	Yes					
Pericoma/Telmatoscopus sp.	12	12	Yes					
Simulium	1	1	Yes					
Baetis tricaudatus group	47	48	No			X		
Glossosoma	10	10	Yes					
Dicranota	3	3	Yes					
Lebertia	3	3	Yes					
Chironomidae	19	19	Yes					
Pagastia	7	7	Yes					
Micropsectra	4	4	Yes					

Eukiefferiella	7	7	Yes					
Hydrobaenus	1	1	Yes					
Rheocricotopus	1	1	Yes					
Orthocladius	13	13	Yes					
Total:	**358**							
					0	4	0	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.28	**Pass**		

Site - CABIN Sample - FOUNGD-BIC-1, CC# - CC160727, Percent sampled = 5, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Ameletus	3	3	Yes					
Baetis	25	25	Yes					
Ephemerellidae	25	25	Yes					
Heptageniidae	186	185	No			X		
Megarcys sp.	5	5	Yes					
Rhyacophila hyalinata group	1	1	Yes					
Dicranota	3	3	Yes					
Epeorus	3	4	No			X		
Cinygmula sp.	1	1	Yes					
Rhithrogena	5	5	Yes					
Drunella doddsii	4	4	Yes					
Drunella sp.	1	1	Yes					
Rhyacophila brunnea/vemna group	1	1	Yes					
Rhyacophila betteni group	1	1	Yes					
Rhyacophila	6	6	Yes					
Oligophlebodes	1	1	Yes					
Tipulidae	1	0	No		X	X		To Hesperoconopa
Hesperoconopa sp.	0	1	No			X		
Pericoma/Telmatoscopus sp.	2	2	Yes					
Bezzia/ Palpomyia	6	6	Yes					
Perlodidae	13	13	Yes					
Perlidae	1	1	Yes					
Taenionema	20	20	Yes					
Sweltsa sp.	4	4	Yes					
Zapada oregonensis group	1	1	Yes					
Zapada	12	12	Yes					
Baetis tricaudatus group	18	18	Yes					
Chironomidae	2	2	Yes					
Micropsectra	2	2	Yes					
Pagastia	1	1	Yes					

Eukiefferiella	1	1	Yes					
Orthocladius	7	7	Yes					
			Yes					
Total:	**362**							
					1	4	0	
% Total Misidentification Rate =	misidentifications		x100 =	0.00	**Pass**			
	total number							

Site - CABIN Sample - HARM1-50-BIC-1, CC# - CC160739, Percent sampled = 5, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Nais	10	10	Yes					
Chironomidae	49	49	Yes					
Micropsectra	3	3	Yes					
Rheotanytarsus	29	29	Yes					
Pagastia	4	4	Yes					
Eukiefferiella	20	20	Yes					
Hydrobaenus	1	1	Yes					
Orthocladius	65	65	Yes					
Rheocricotopus	40	40	Yes					
Thienemanniella	3	3	Yes					
Tvetenia bavarica group	18	18	Yes					
Baetis	111	111	Yes					
Ephemerellidae	69	69	Yes					
Heptageniidae	45	45	Yes					
Antocha sp.	5	5	Yes					
Parapsyche sp.	7	7	Yes					
Perlodidae	19	19	Yes					
Optioservus sp.	6	6	Yes					
Aturus	4	4	Yes					
Baetis tricaudatus group	65	65	Yes					
Baetis bicaudatus	15	15	Yes					
Zapada oregonensis group	15	15	Yes					
Zapada columbiana	17	17	Yes					
Zapada cinctipes	14	14	Yes					
Zapada	23	23	Yes					
Nemouridae	1	1	Yes					
Taenionema	4	4	Yes					
Sweltsa sp.	3	3	Yes					
Amphinemura sp.	1	1	Yes					
Chloroperlidae	1	1	Yes					
Drunella doddsii	2	2	Yes					
Epeorus	3	3	Yes					
Hydropsychidae	4	4	Yes					

Rhyacophila brunnea/vemna group	7	7	Yes					
Rhyacophila	2	2	Yes					
Uenoidae	5	5	Yes					
Pericoma/Telmatoscopus sp.	3	3	Yes					
Chelifera/ Metachela	2	2	Yes					
Dicranota	2	2	Yes					
Simulium	3	3	Yes					
Empididae	1	1	Yes					
Total:	**701**							
					0	**0**	**0**	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.00	**Pass**		

Site - CABIN Sample - KO1-BIC-3, CC# - CC160747, Percent sampled = 40, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Ameletus	37	37	Yes					
Baetis	1	1	Yes					
Ephemerellidae	1	1	Yes					
Heptageniidae	225	225	Yes					
Atherix	1	1	Yes					
Limnephilidae	1	1	Yes					
Capniidae	26	26	Yes					
Lebertia	2	2	Yes					
Oligochaeta	2	2	Yes					
Sweltsa sp.	3	3	Yes					
Tipulidae	1	1	Yes					
Sperchon	1	1	Yes					
Rhithrogena	2	2	Yes					
Chironomidae	4	4	Yes					
Micropsectra	1	1	Yes					
Hydrobaenus	1	1	Yes					
Orthocladius	3	3	Yes					
Tvetenia bavarica group	1	1	Yes					
Thienemannimyia group	1	1	Yes					
Total:	**314**							
					0	**0**	**0**	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.00	**Pass**		

Site - CABIN Sample - LC_FRUS-BIC-1, CC# - CC160753, EMS - QC, Percent sampled = 15, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Ephemerellidae	10	10	Yes					
Zapada oregonensis group	12	12	Yes					
Pericoma/Telmatoscopus sp.	7	7	Yes					
Optioservus sp.	2	0	No	2		X		
Heterlimnius	0	2	No			X		
Lebertia	4	4	Yes					
Rhyacophila brunnea/vemna group	13	13	Yes					
Pisidium	3	3	Yes					
Heptageniidae	84	84	Yes					
Baetis	13	13	Yes					
Ameletus	1	1	Yes					
Drunella grandis group	6	6	Yes					
Drunella doddsii	1	1	Yes					
Baetis bicaudatus	1	1	Yes					
Baetis tricaudatus group	5	5	Yes					
Baetidae	1	1	Yes					
Elmidae	1	1	Yes					
Sperchon	2	2	Yes					
Oribatida	1	1	Yes					
Testudacarus sp.	1	1	Yes					
Chelifera/ Metachela	2	2	Yes					
Glutops sp.	1	1	Yes					
Antocha sp.	1	1	Yes					
Zapada cinctipes	9	9	Yes					
Perlodidae	19	19	Yes					
Perlidae	1	1	Yes					
Megarcys sp.	1	1	Yes					
Hesperoperla sp.	2	2	Yes					
Sweltsa sp.	2	2	Yes					
Zapada	8	8	Yes					
Taenionema	2	2	Yes					
Rhyacophila	4	4	Yes					
Parapsyche sp.	3	3	Yes					
Chironomidae	10	10	Yes					
Pagastia	30	30	Yes					
Tvetenia bavarica group	1	1	Yes					
Hydrobaenus	1	1	Yes					
Eukiefferiella	4	4	Yes					
Micropsectra	3	3	Yes					
Orthocladius	37	37	Yes					

Total:	**309**							
					0	2	0	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.65	**Pass**		

Site - CABIN Sample - M13-BIC-1, CC# - CC160766, EMS - QC, Percent sampled = 5, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Rhithrogena	11	11	Yes					
Taenionema	11	11	Yes					
Pericoma/Telmatoscopus sp.	24	24	Yes					
Optioservus sp.	4	4	Yes					
Torrenticola	3	3	Yes					
Glossosoma	69	69	Yes					
Heptageniidae	72	71	No			X		
Epeorus	0	1	No			X		
Leptophlebiidae	1	1	Yes		X			
Ephemerellidae	22	22	Yes					
Baetis	18	18	Yes					
Baetis tricaudatus group	13	13	Yes					
Drunella doddsii	7	7	Yes					
Ephemerella	1	1	Yes					
Hexatoma sp.	4	4	Yes					
Zapada cinctipes	12	12	Yes					
Hesperoperla sp.	1	1	Yes					
Sweltsa sp.	4	4	Yes					
Perlodidae	4	4	Yes					
Leuctridae	1	1	Yes					
Nemouridae	1	1	Yes					
Taeniopterygidae	1	1	Yes					
Lebertia	2	2	Yes					
Glossosomatidae	8	8	Yes					
Hydropsychidae	2	2	Yes					
Arctopsyche sp.	2	2	Yes					
Hydropsychidae	1	1	Yes					
Hesperophylax sp.	1	1	Yes					
Apatania	45	45	Yes					
Chironomidae	19	19	Yes					
Micropsectra	8	8	Yes					
Eukiefferiella	1	1	Yes					
Orthocladius	1	1	Yes					
Rheocricotopus	8	8	Yes					
Total:	**382**							
					1	2	0	

% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**		

Site - CABIN Sample - NTHO1-25-BIC-1, CC# - CC160773, Percent sampled = 5, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Zapada cinctipes	70	70	Yes					
Hydroptila	11	11	Yes					
Pericoma/Telmatoscopus sp.	140	140	Yes					
Rhyacophila	1	1	Yes					
Parapsyche sp.	1	1	Yes					
Limnephilidae	1	1	Yes					
Simulium	117	117	Yes					
Limnophora sp.	3	3	Yes					
Dicranota	5	5	Yes					
Zapada	170	170	Yes					
Capniidae	6	6	Yes					
Chironomidae	16	16	Yes					
Tvetenia bavarica group	67	67	Yes					
Thienemanniella	4	4	Yes					
Eukiefferiella	7	7	Yes					
Orthocladius	11	11	Yes					
Micropsectra	20	20	Yes					
Diamesa	2	2	Yes					
Heleniella	3	3	Yes					
Nais	0	1	No	1		X		
Tubificinae	2	1	No			X		
Enchytraeus	15	15	Yes					
			Yes					
Total:	**672**							
					0	**2**	**0**	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.15	**Pass**		

Site - CABIN Sample - PORT3-25-BIC-1, CC# - CC160782, Percent sampled = 7, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Ameletus	8	8	Yes					
Yoraperla sp.	47	47	Yes					
Limnephilidae	1	1	Yes					

Pericoma/Telmatoscopus sp.	2	2	Yes					
Oribatida	2	2	Yes					
Dicranota	1	1	Yes					
Chelifera/ Metachela	1	1	Yes					
Glutops sp.	2	2	Yes					
Glossosoma	2	2	Yes					
Peltoperlidae	112	112	Yes					
Perlodidae	55	55	Yes					
Zapada	45	45	Yes					
Zapada columbiana	27	27	Yes					
Taenionema	1	1	Yes					
Chironomidae	1	1	Yes					
Pagastia	2	2	Yes					
Hydrobaenus	3	3	Yes					
Eukiefferiella	9	9	Yes					
Thienemanniella	1	1	Yes					
Orthocladius	1	1	Yes					
Parametriocnemus	1	1	Yes					
Limnophyes	1	1	Yes					
Tubificinae	1	1	Yes					
Total:	**326**							
					0	0	0	
% Total Misidentification Rate =	misidentifications / total number			x100 =	0.00	**Pass**		

Site - CABIN Sample - VEUP-BIC-1, CC# - CC160790, Percent sampled = 42, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficent Taxonomic Resolution	Comments
Baetis	23	23	Yes					
Taenionema	24	24	Yes					
Hydropsychidae	15	15	Yes					
Chelifera/ Metachela	1	1	Yes					
Trombidiformes	2	2	Yes					
Baetis tricaudatus group	2	2	Yes					
Baetis bicaudatus	15	15	Yes					
Heptageniidae	35	32	No		X	X		
Cinygmula sp.	2	2	Yes					
Epeorus	5	8	No			X		
Rhithrogena	4	4	Yes					
Ameletus	5	5	Yes					
Ephemerellidae	10	10	Yes					
Ephemerella dorothea/excrucians	5	0	No	5		X		
Drunella flavilinea	0	5	No			X		From Ephemerella
Sperchon	17	17	Yes					

Blepharicera sp.	2	2	Yes					
Glossosoma	8	8	Yes					
Ecclisomyia sp.	1	1	Yes					
Rhyacophila	3	3	Yes					
Hydropsyche	1	1	Yes					
Parapsyche sp.	3	3	Yes					
Capniidae	10	10	Yes					
Perlodidae	15	15	Yes					
Megarcys sp.	1	1	Yes					
Zapada oregonensis group	7	7	Yes					
Zapada columbiana	3	3	Yes					
Zapada	7	7	Yes					
Chironomidae	2	2	Yes					
Diamesa	1	1	Yes					
Eukiefferiella	15	15	Yes					
Hydrobaenus	1	1	Yes					
Orthocladius	70	70	Yes					
Total:	**315**							
					1	4	0	
% Total Misidentification Rate =	misidentifications / total number			x100 =	1.59	**Pass**		

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Keys used for Identification of Freshwater Benthic Invertebrates - Cordillera Consulting 2014

Below is a reference list of taxonomic keys utilized by taxonomists at Cordillera Consulting. Cordillera taxonomists routinely seek out new literature to ensure the most accurate identification keys are being utilized. This is not reflective of the exhaustive list of resources that we use for identification. A more complete list of taxonomic resources can be found at Southwest Association of Freshwater Invertebrate Taxonomists. (2015). http://www.safit.org/Docs/SAFIT_Taxonomic_Literature_Database_1_March_2011.enl

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Appendix A

Calculation of subsampling error for benthic macroinvertebrate samples, Teck Elk Valley, 2015

Table 1A: Raw data based on sub-sampling

Station ID		Organisms in Subsamples (sorted lowest to highest)																				Actual Density
Lab.	Minnow	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
160678	ALUSM-BIC-1	374	389	391	396	403	403	405	414	415	418	420	424	439	440	441	447	448	453	458	463	8,441
160680	BU2-BIC-1	269	272	300	303	311																1,455
160682	BUUQ-BIC-1	292	294	298	305	307	314	315	321	322	325											3,093
160697	ELELKO-BIC-1	333	334	351	351	354	354	356	359	361	366	375	375	376	381	382	394	394	414	415	438	7,463
160711	FO23-BIC-3	325	330	331	335	339	339	341	342	344	351											3,377
160716	FO9-BIC-1	254	258	270	275	289	289	291	292	293	294	298	301	310	314	317	324	333	336	339	404	6,081
160724	FOUEW-BIC-1	329	351	371	377	380	385	386	396	399	401	404	405	409	412	424	425	430	443	456	465	8,048
160746	KO1-BIC-2	340	352																			692
160791	VICK-BIC-1	327	350	354	354	357	358	360	372	378	380	385	390	394	401	409	411	420	426	432	453	7,711
160799	CACK-BIC-A	355	389	424	442	475																2,085
160801	FORD7-75-BIC-A	263	269	285	293	303	306	306	312	312	313	318	319	320	322	325	333	337	340	343	344	6,263
160802	GHCKU-BIC-A	362	381	386	390	396																1,915
160805	GRUHA-BIC-A	253	266	282	285	286	288	290	293	296	309	311	312	317	318	318	320	320	335	335	343	6,077

Table 2A: Results of precision and accuracy error

	Precision					Accuracy				
Sample ID: Minnow	Min (%)	Max (%)	Average (%)	Number of Subsample Comparisons	% of Comparisons > 20%	Min (%)	Max (%)	Average (%)	Number of Subsamples	% of Subsamples > 20%
ALUSM-BIC-1	0	19	6.8	190	0	0.46	11	5.1	20	0
BU2-BIC-1	1.0	14	7.5	10	0	3.1	7.6	5.6	5	0
BUUQ-BIC-1	0.3	10	4.5	45	0	0.74	5.6	3.3	10	0
ELELKO-BIC-1	0	24	7.7	190	1.1	0.50	17	5.7	20	0
FO23-BIC-3	0	7.4	2.6	45	0	0.38	3.9	1.8	10	0
FO9-BIC-1	0	37	11	190	13	1.0	33	8.0	20	5
FOUEW-BIC-1	0.2	29	8.9	190	5.8	0.35	18	6.2	20	0
KO1-BIC-2	3.4	3.4	3.4	1	0	1.7	1.7	1.7	2	0
VICK-BIC-1	0	28	9.2	190	6.3	0.14	17	6.9	20	0
CACK-BIC-A	4.1	25	13	10	10	1.7	15	8.6	5	0
FORD7-75-BIC-A	0	24	7.8	190	4.7	0.05	16	5.4	20	0
GHCKU-BIC-A	1.0	8.6	3.9	10	0	0.52	5.5	2.4	5	0
GRUHA-BIC-A	0	26	8.4	190	5.8	1.7	17	6.4	20	0
	Overall Average		**7.3**			**Overall Average**		**5.2**		

APPENDIX C
WATER QUALITY DATA

Raw Data

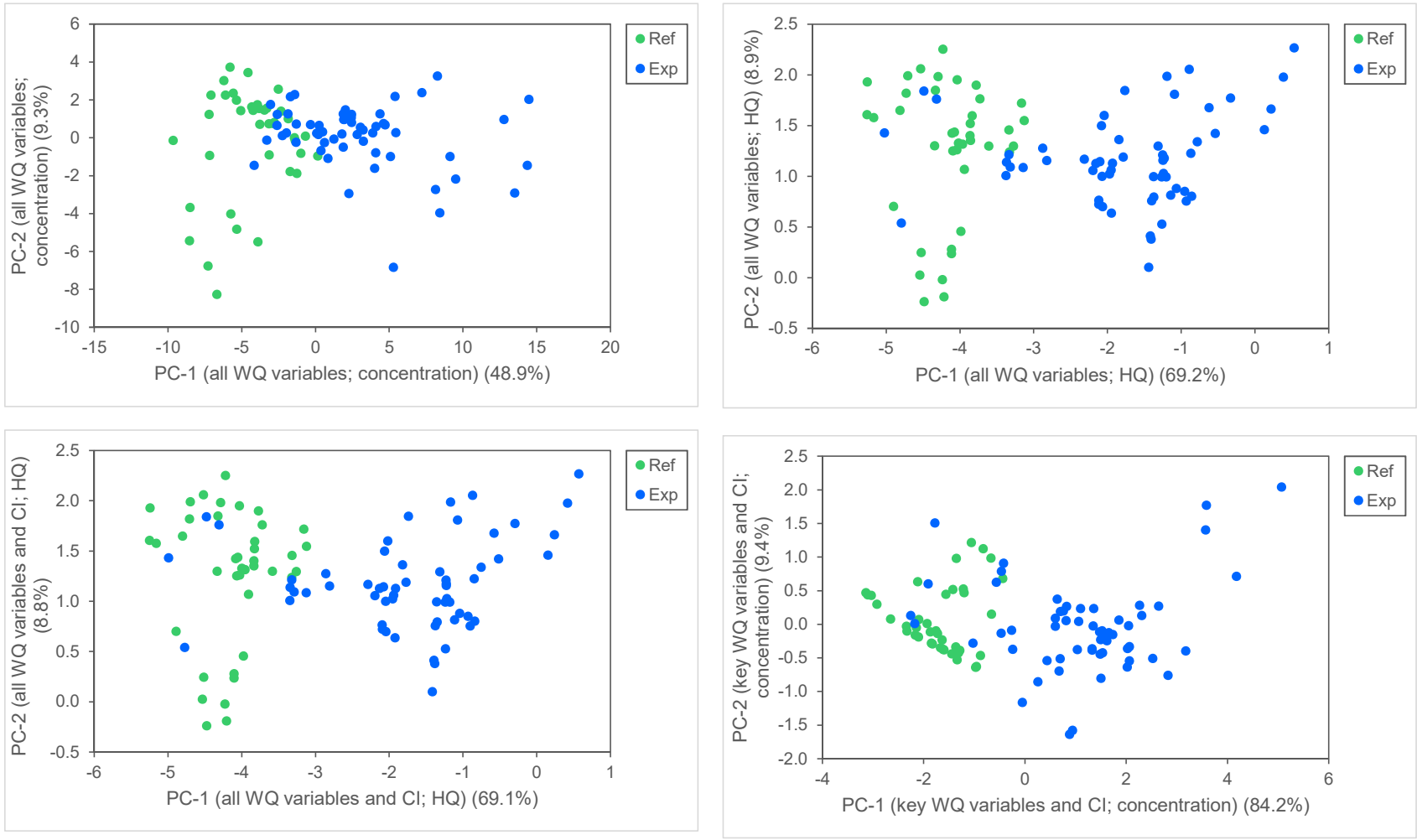

Figure C.1: Scatterplots of PC-2 Versus PC-1 from Five Different PCAs with Variations of Concentrations or Hazard Quotients for Water Quality (WQ) Variables and Calcite Index

Notes: Data are for lotic reference (n = 40) and mine-exposed (n = 59) areas. HQ - hazard quotient. Observed concentration divided by Level 1 effect benchmark defined in the Elk Valley Water Quality Plan (selenium, sulphate, nitrate, cadmium), the upper normal range limit defined by Minnow (2016b; calcite index), or BC water quality guidelines (the other water quality variables), as applicable. Key WQ variables = selenium, sulphate, nitrate.

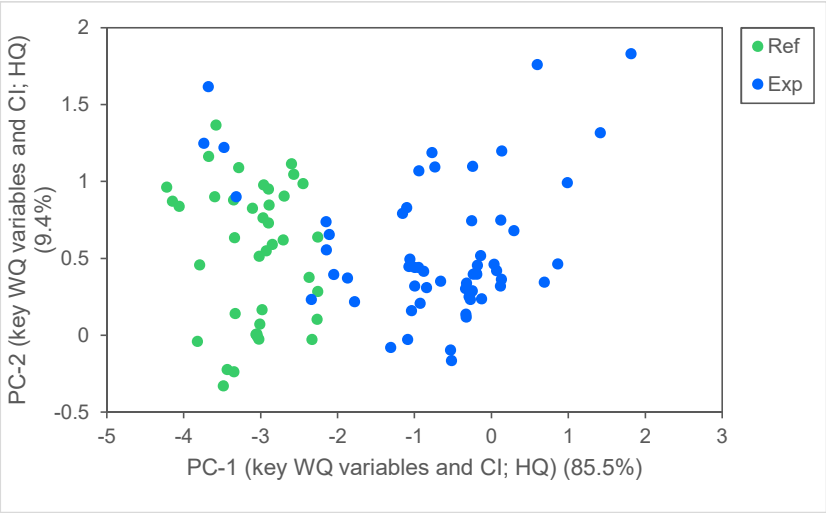

Figure C.1: Scatterplots of PC-2 Versus PC-1 from Five Different PCAs with Variations of Concentrations or Hazard Quotients for Water Quality (WQ) Variables and Calcite Index

Notes: Data are for lotic reference (n = 40) and mine-exposed (n = 59) areas where biological samples were collected in 2015. HQ - hazard quotient. Observed concentration divided by Level 1 effect benchmark defined in the Elk Valley Water Quality Plan (selenium, sulphate, nitrate, cadmium), the upper normal range limit defined by Minnow (2016b; calcite index), or BC water quality guidelines (the other water quality variables), as applicable. Key WQ variables = selenium, sulphate, nitrate.

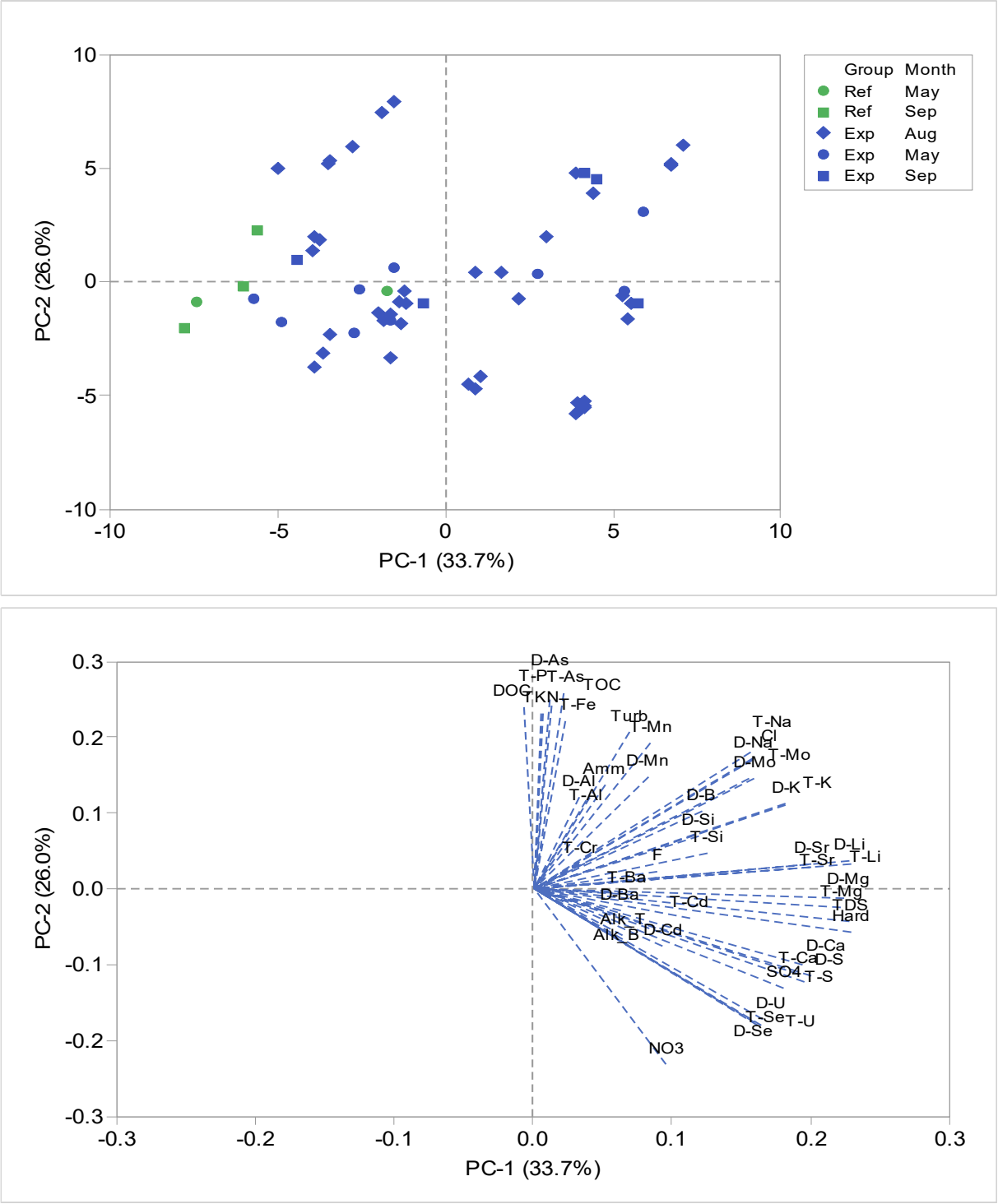

Figure C.2: Scatterplot of PC-2 versus PC-1 from a PCA of Concentrations (log_{10}-transformed) of Water Quality Parameters (Top Panel) and a Scatterplot of Weightings of each Water Quality Parameter to PC-2 and PC-1 (Bottom Panel) for 60 Samples Collected from Lentic Reference (n = 5) and Mine-exposed (n = 55) Areas Where Other Types of Samples were Also Collected in May, August, and September 2015

Notes: "T-" = total; "D-" = dissolved

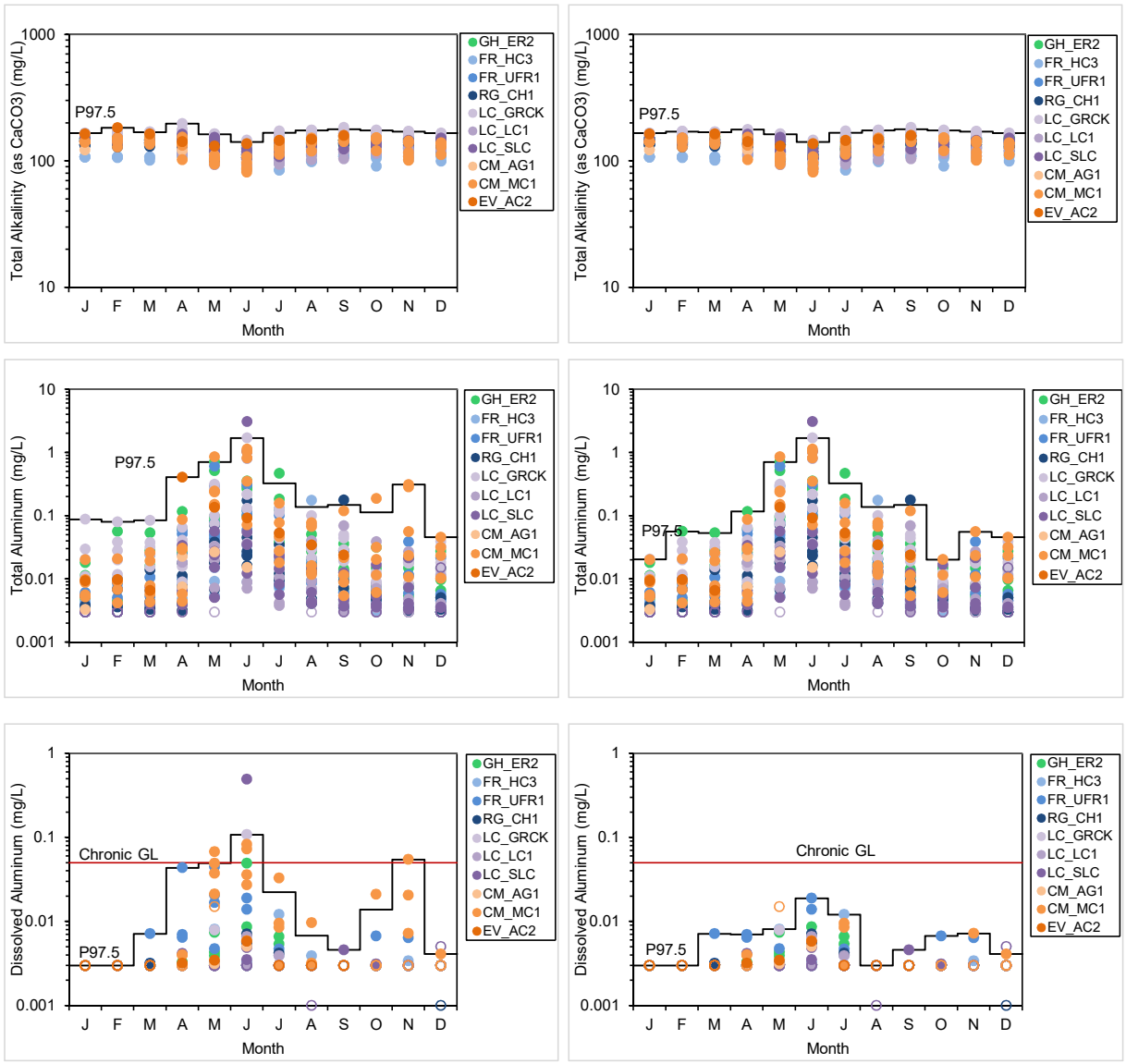

Figure C.3a: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

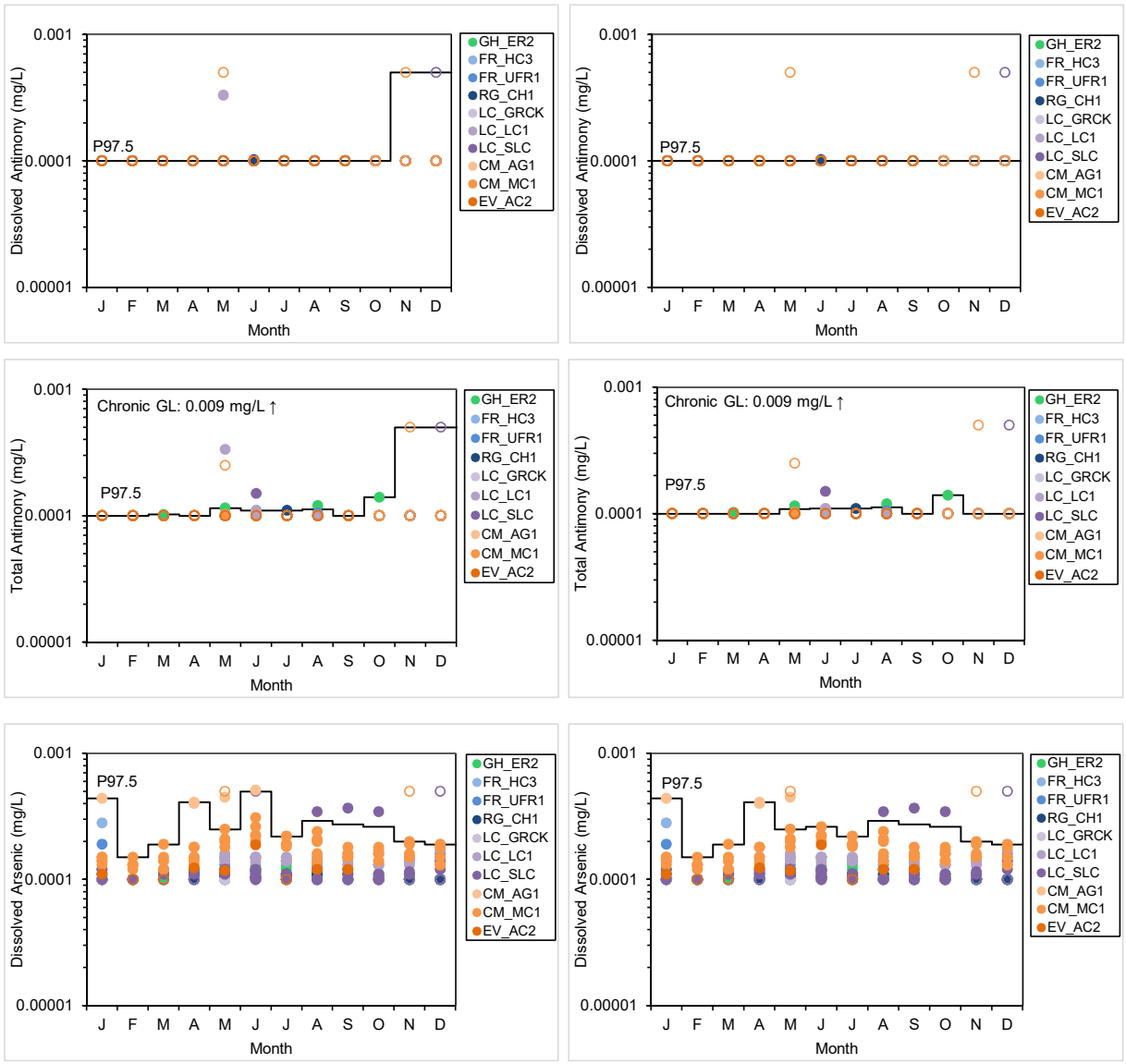

Figure C.3b: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

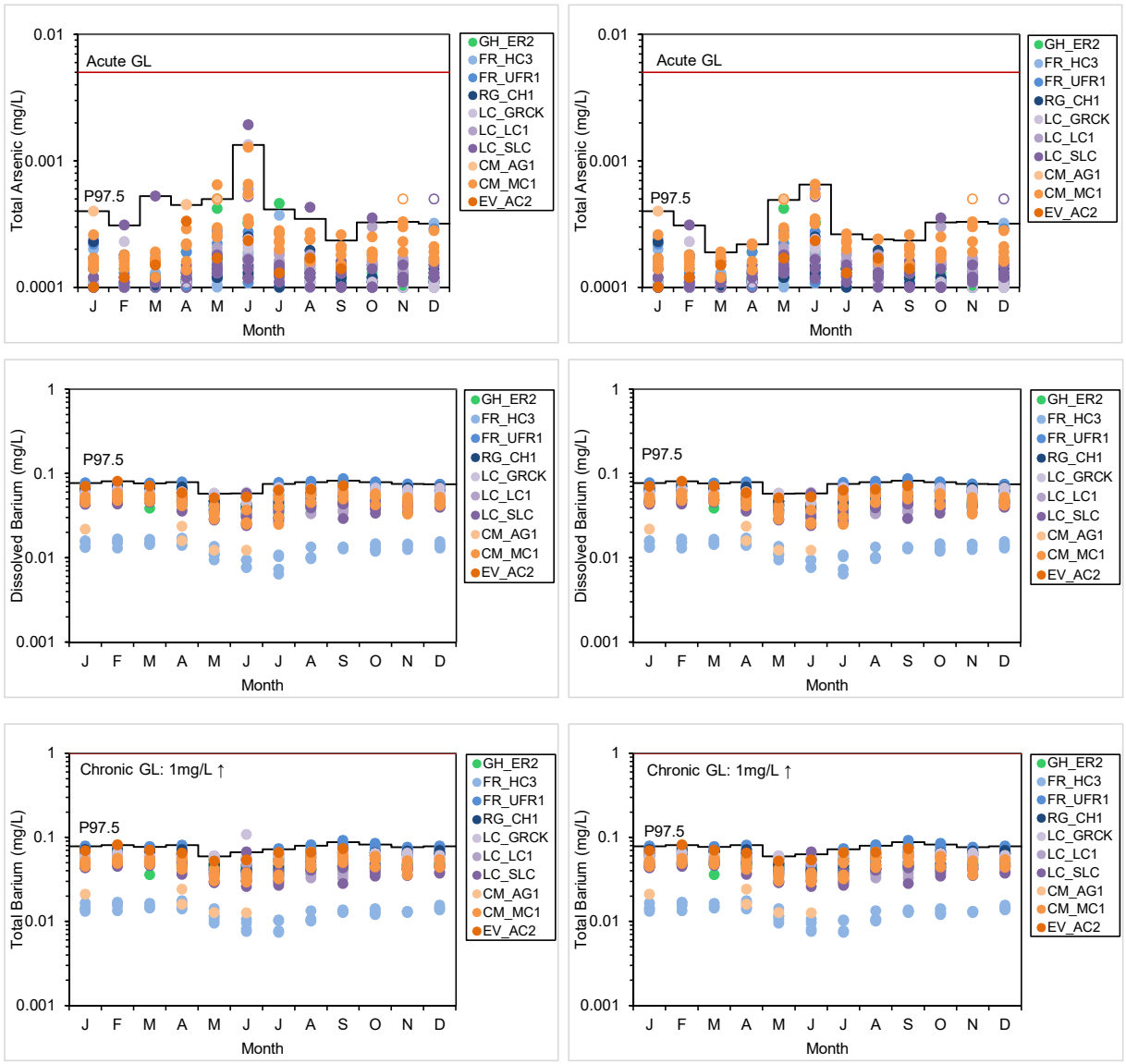

Figure C.3c: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

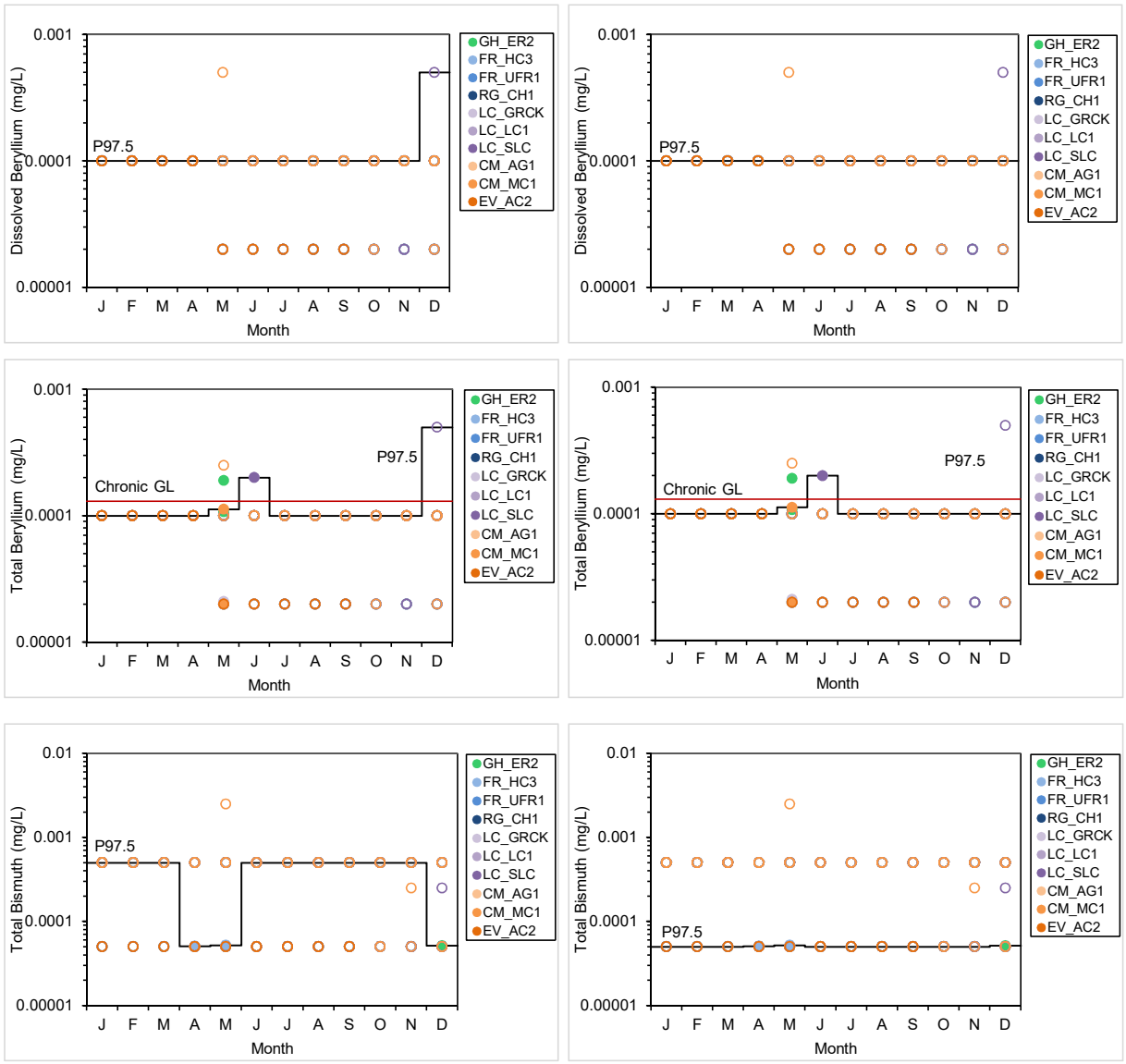

Figure C.3d: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.
GL - guideline; SSBM - Level 1 site-specific benchmark

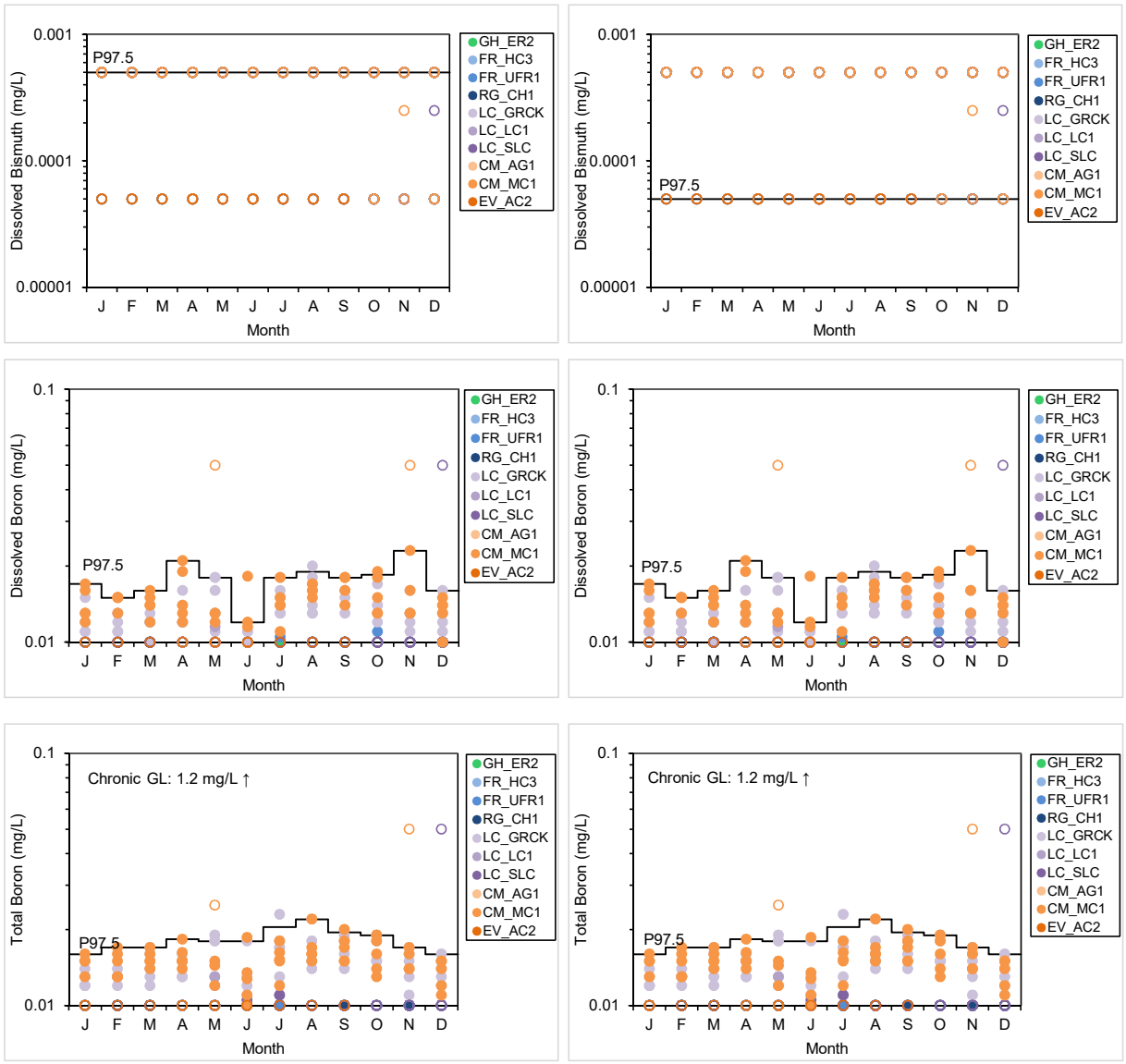

Figure C.3e: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.
GL - guideline; SSBM - Level 1 site-specific benchmark

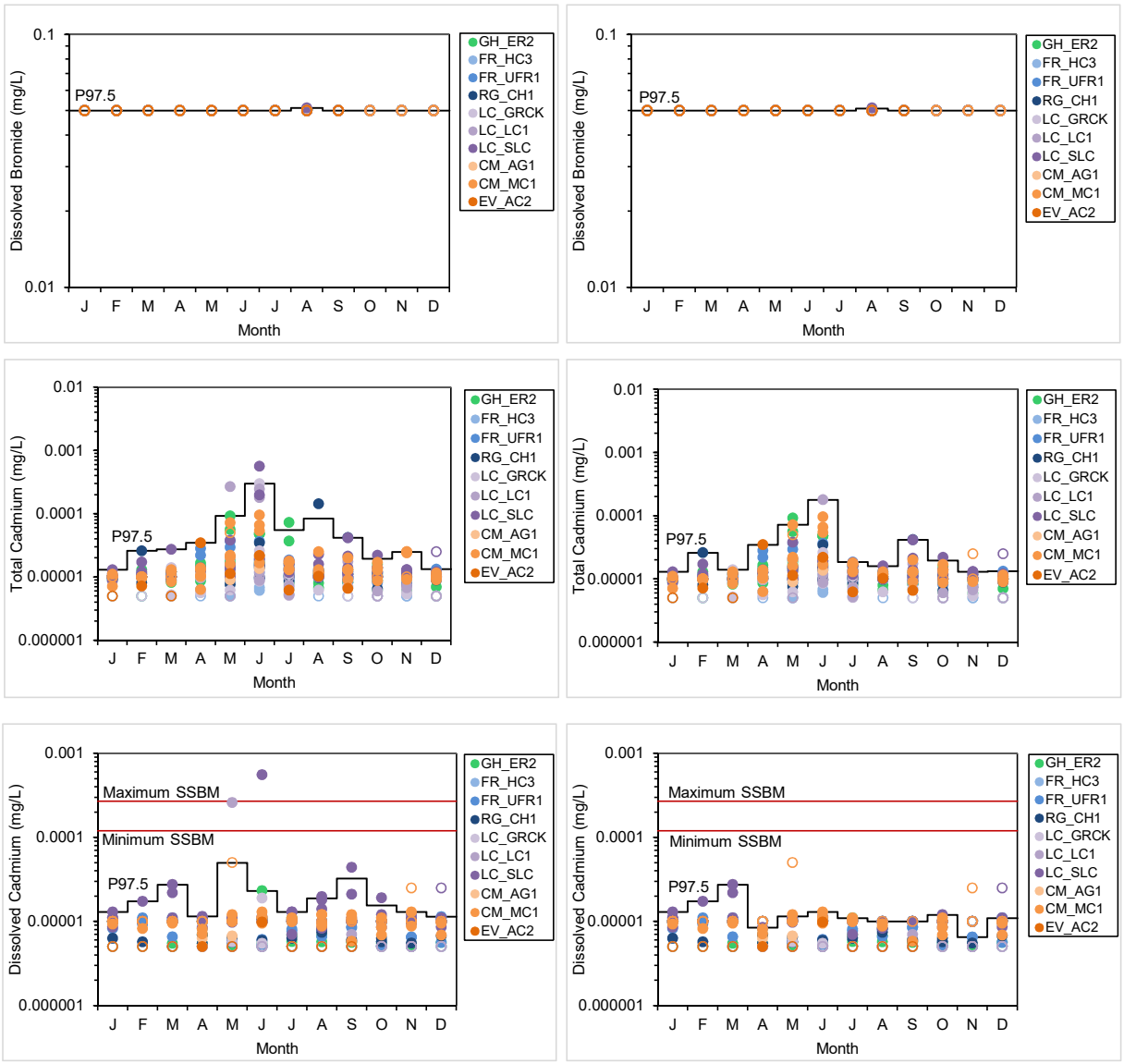

Figure C.3f: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.
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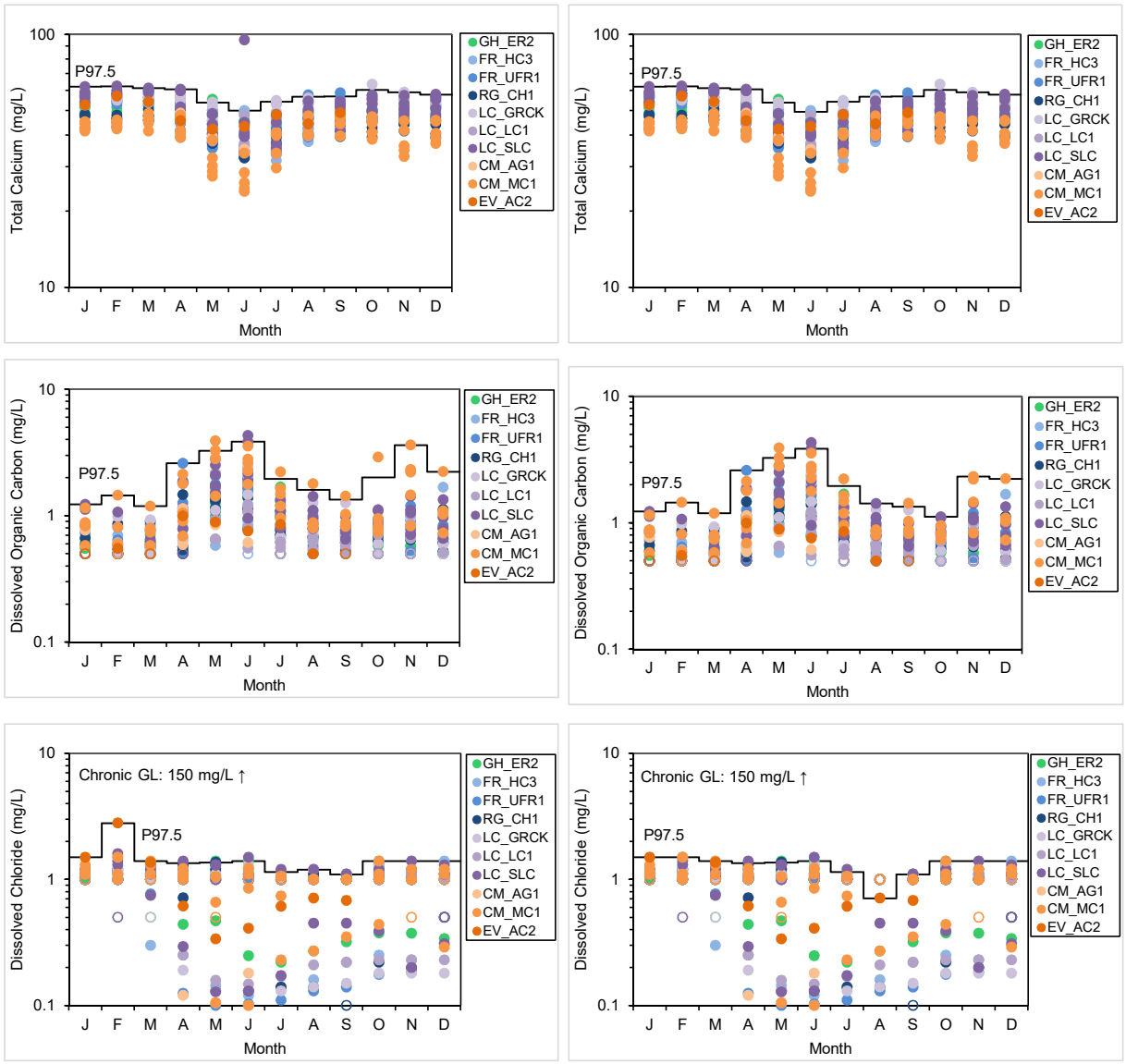

Figure C.3g: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

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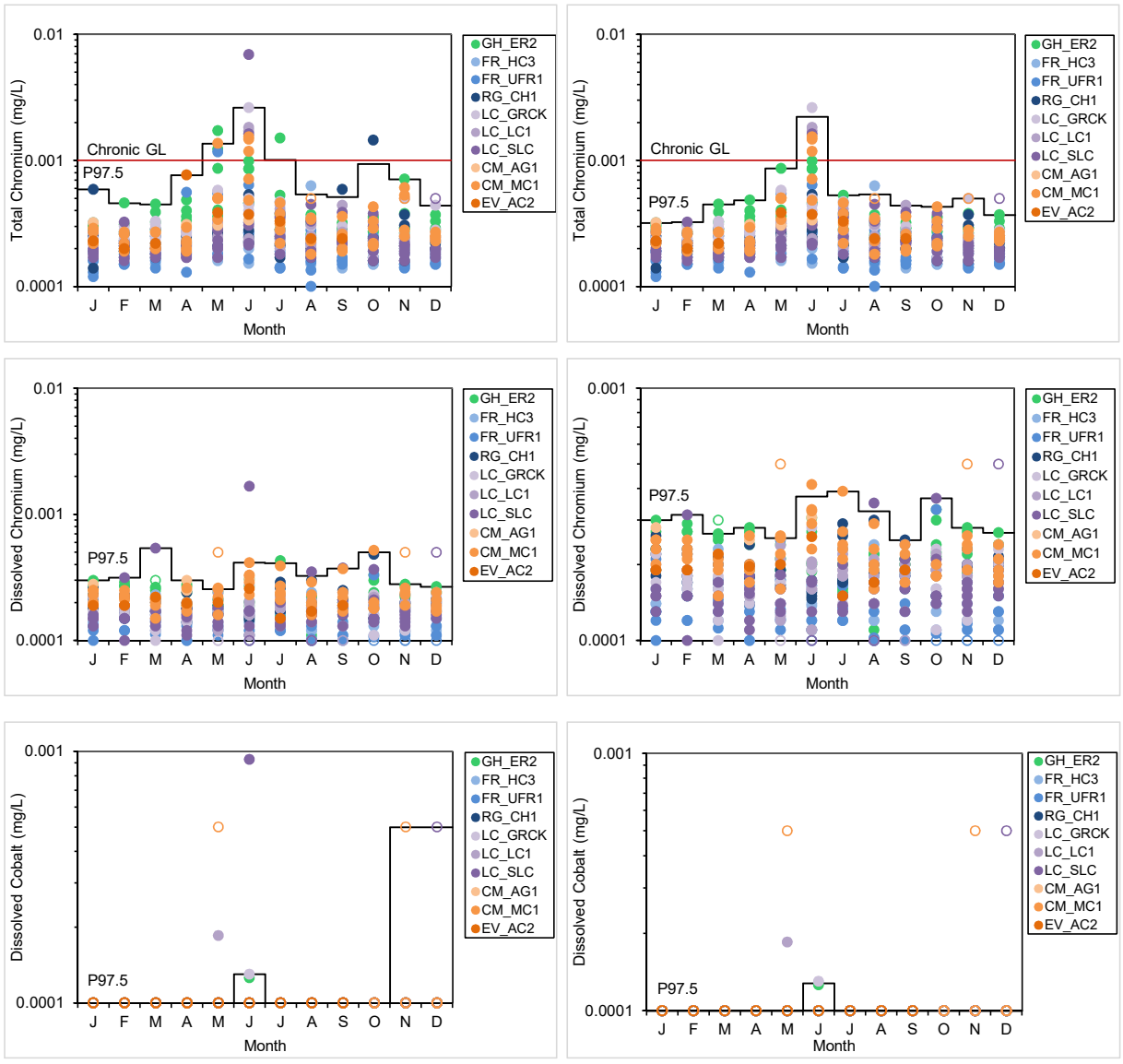

Figure C.3h: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

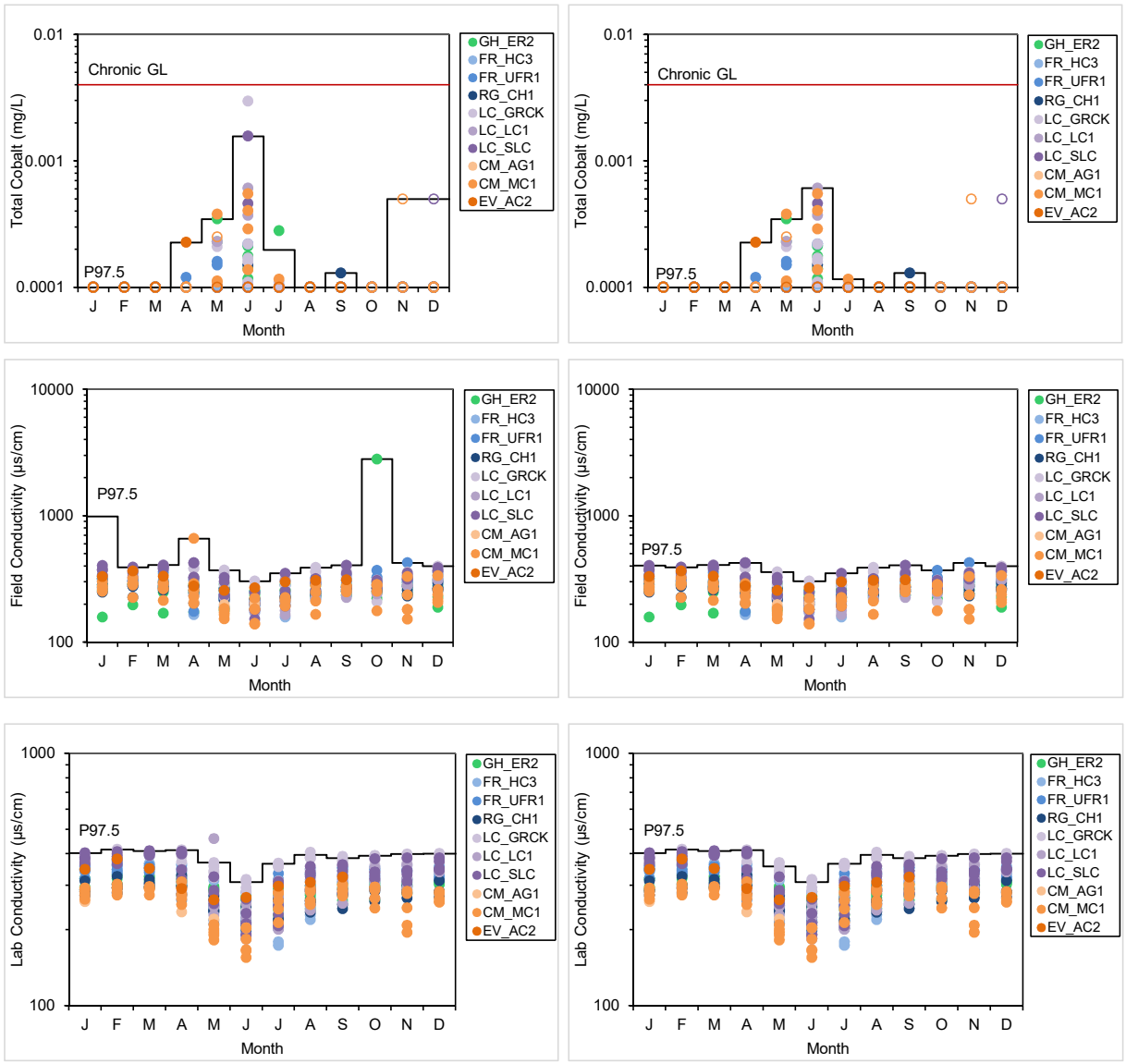

Figure C.3i: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012 -2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

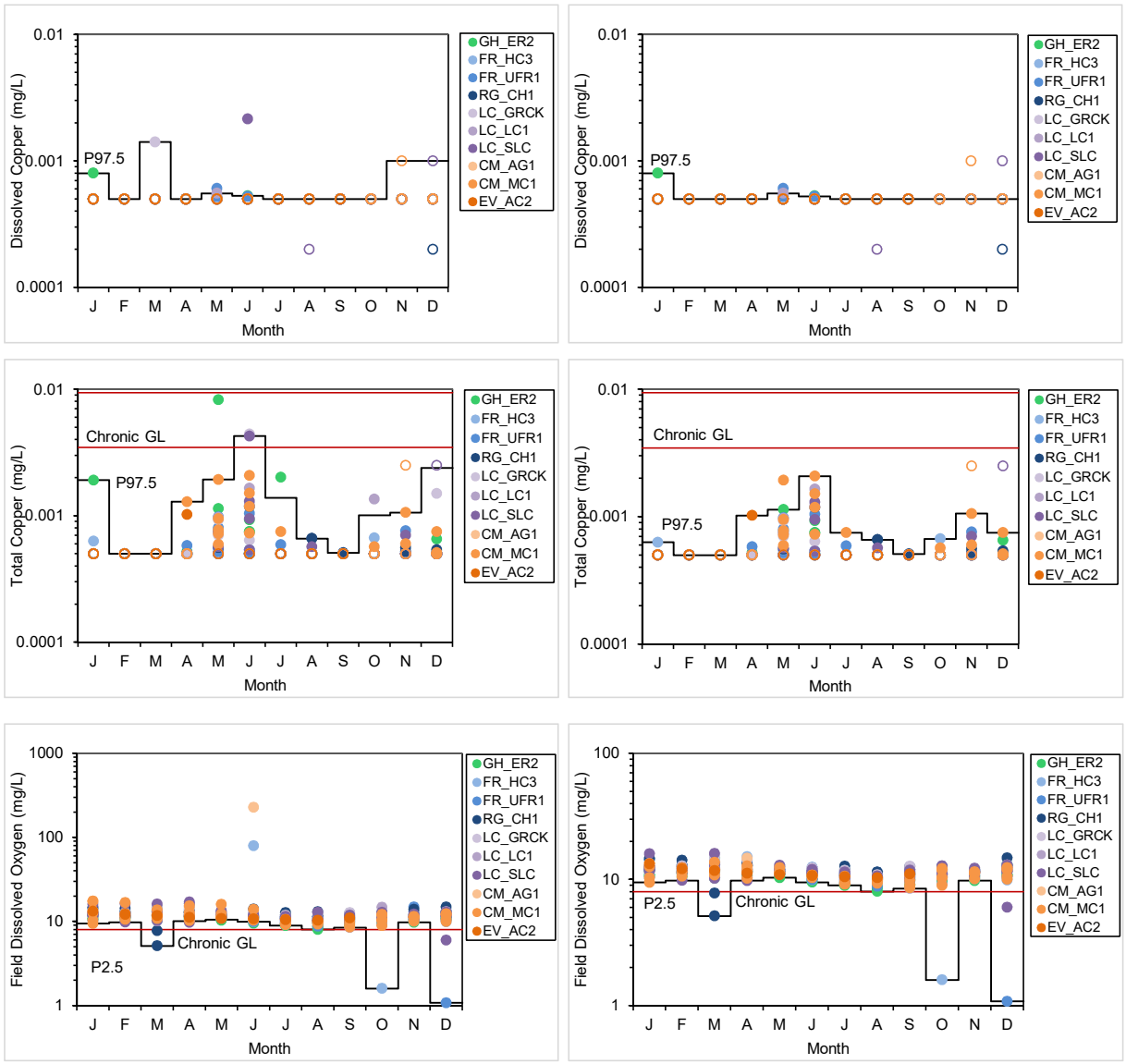

Figure C.3j: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012 -2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

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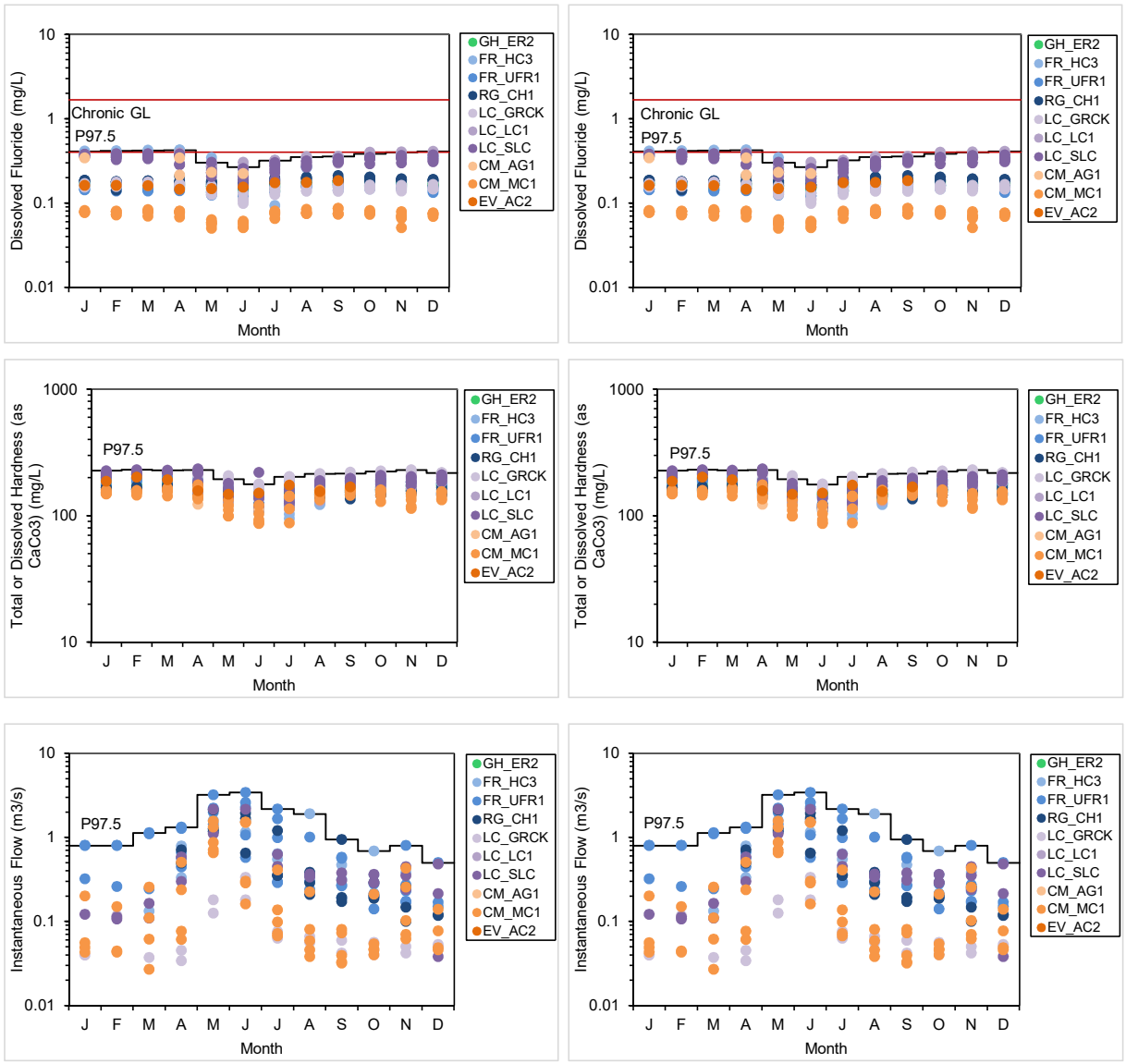

Figure C.3k: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

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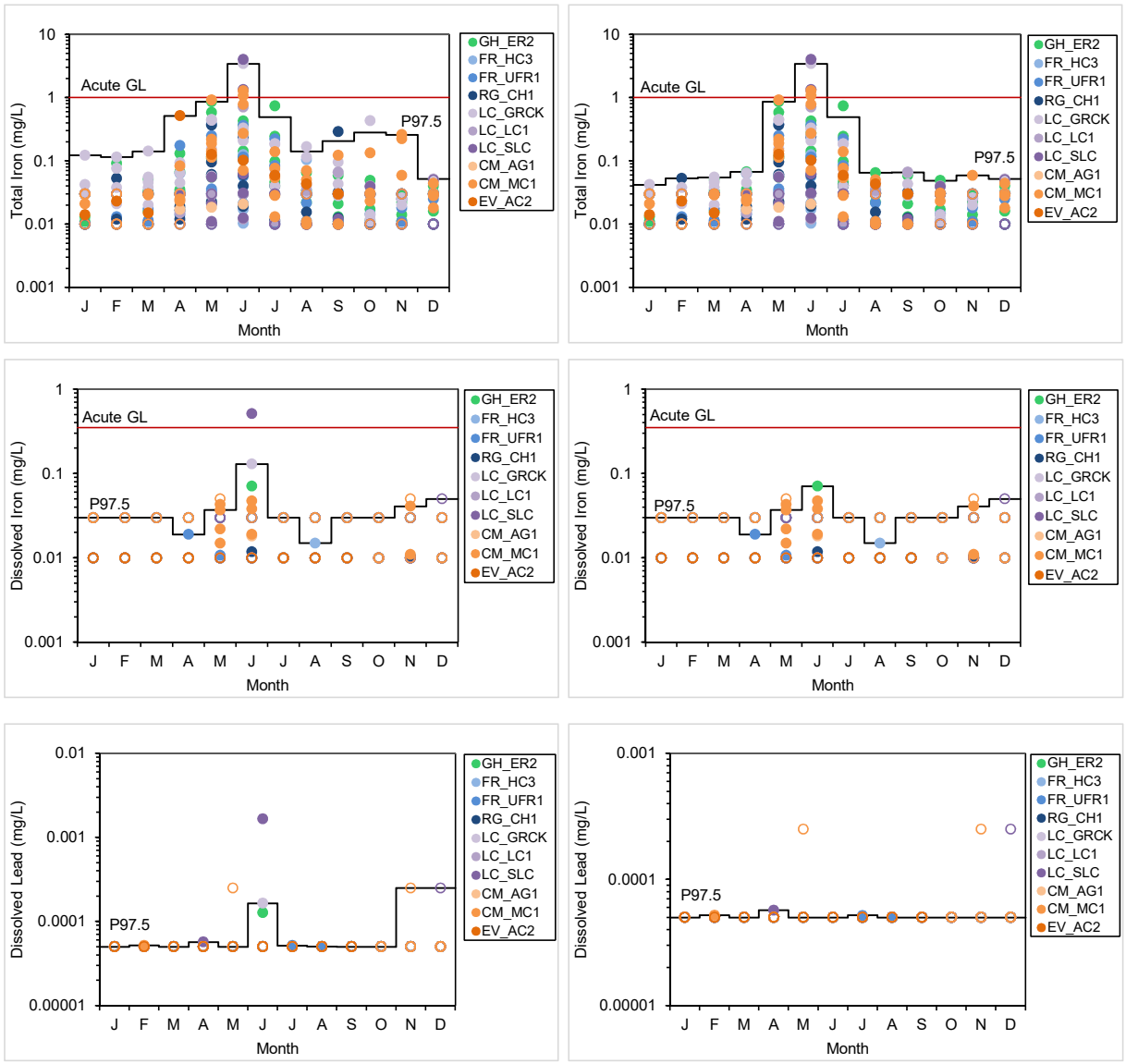

Figure C.3l: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012 -2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

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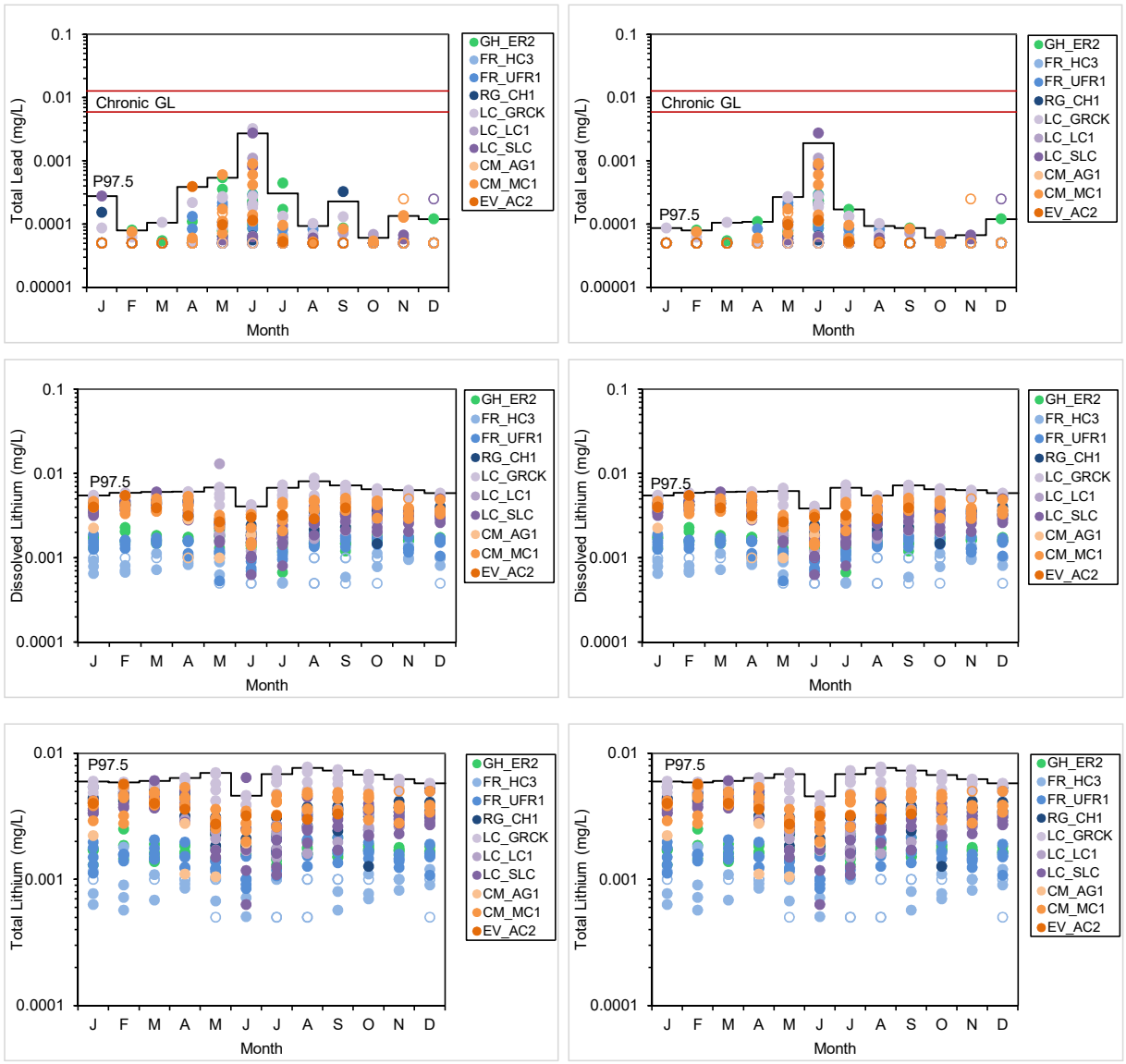

Figure C.3m: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

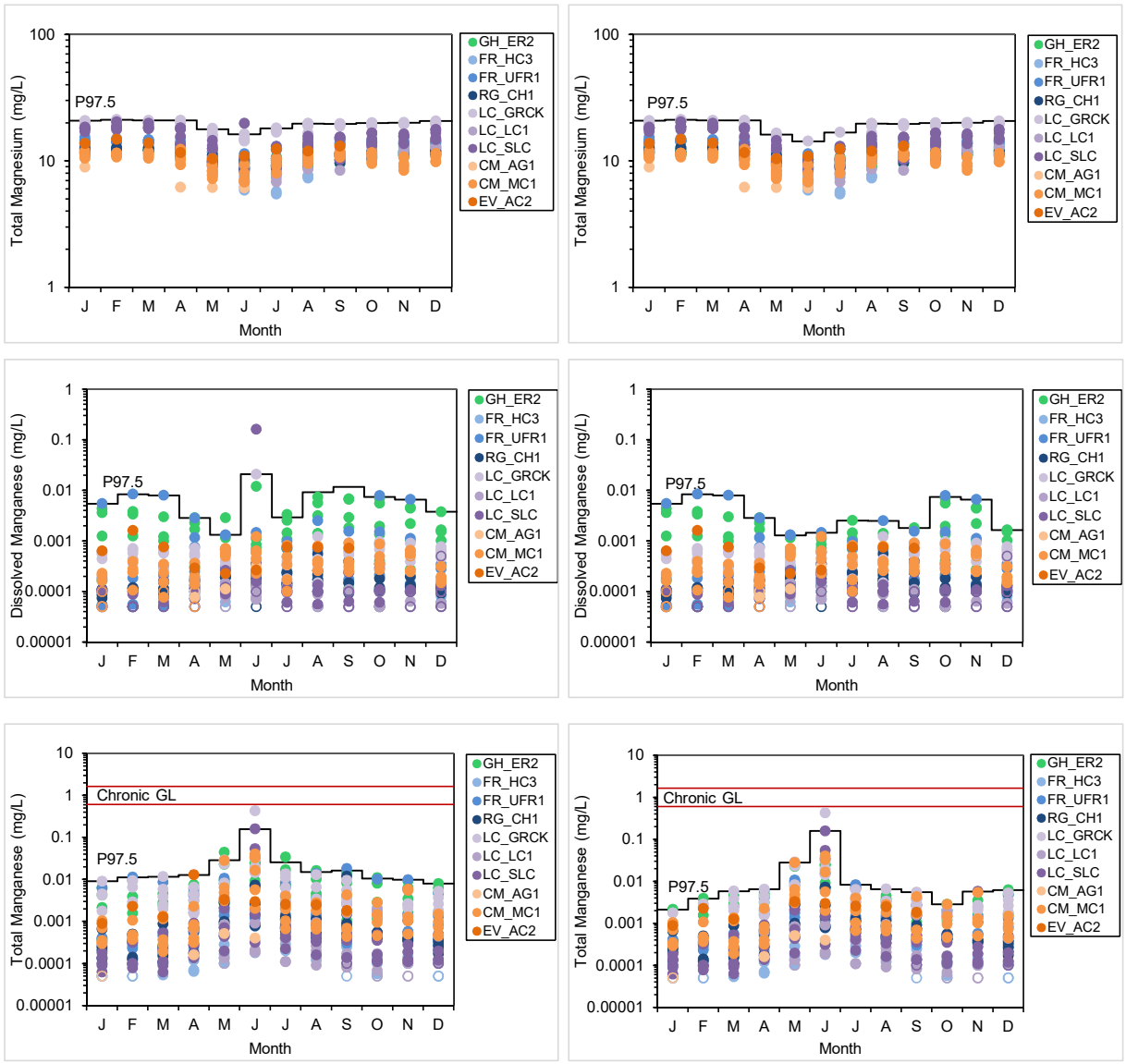

Figure C.3n: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.
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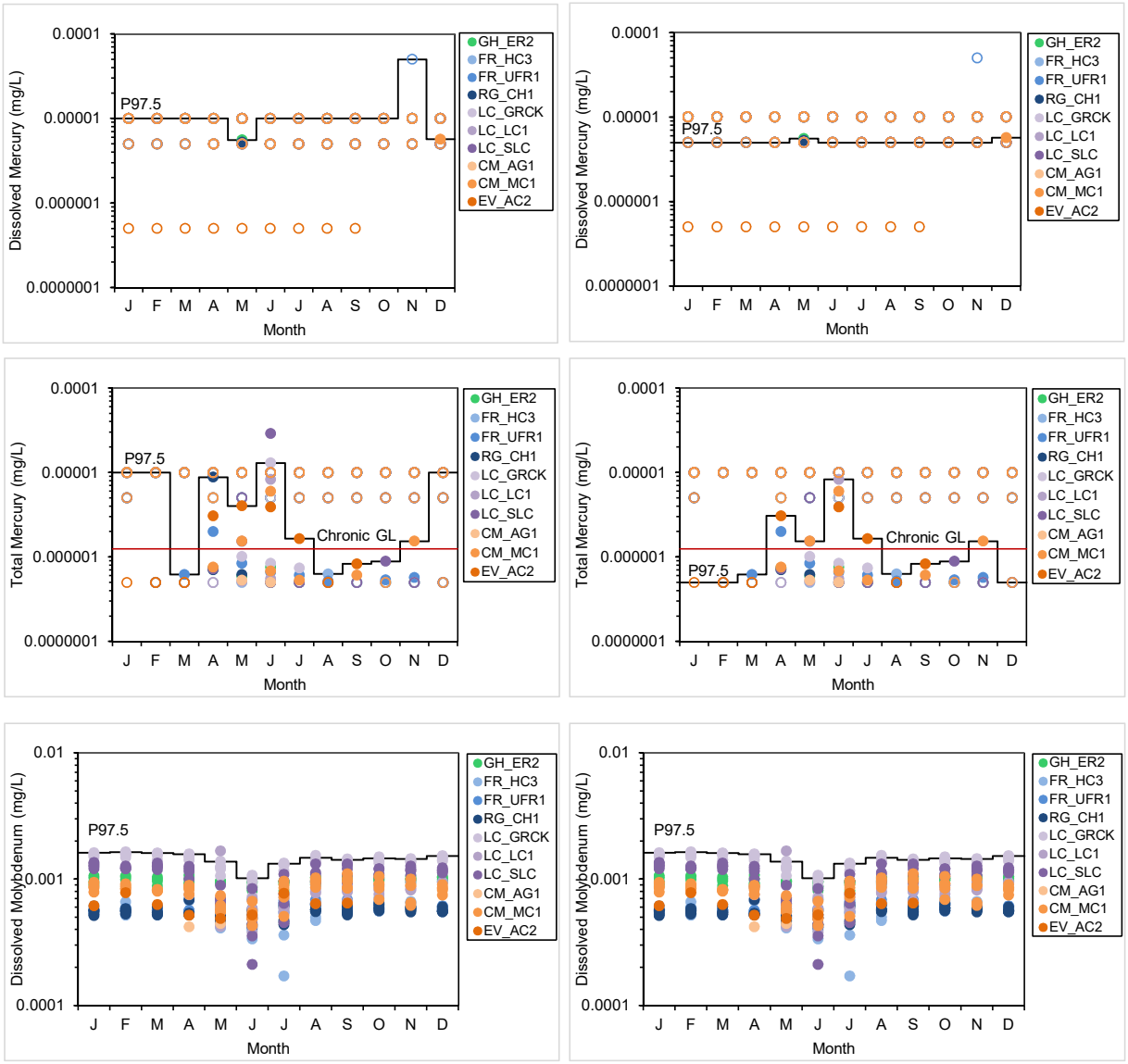

Figure C.3o: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

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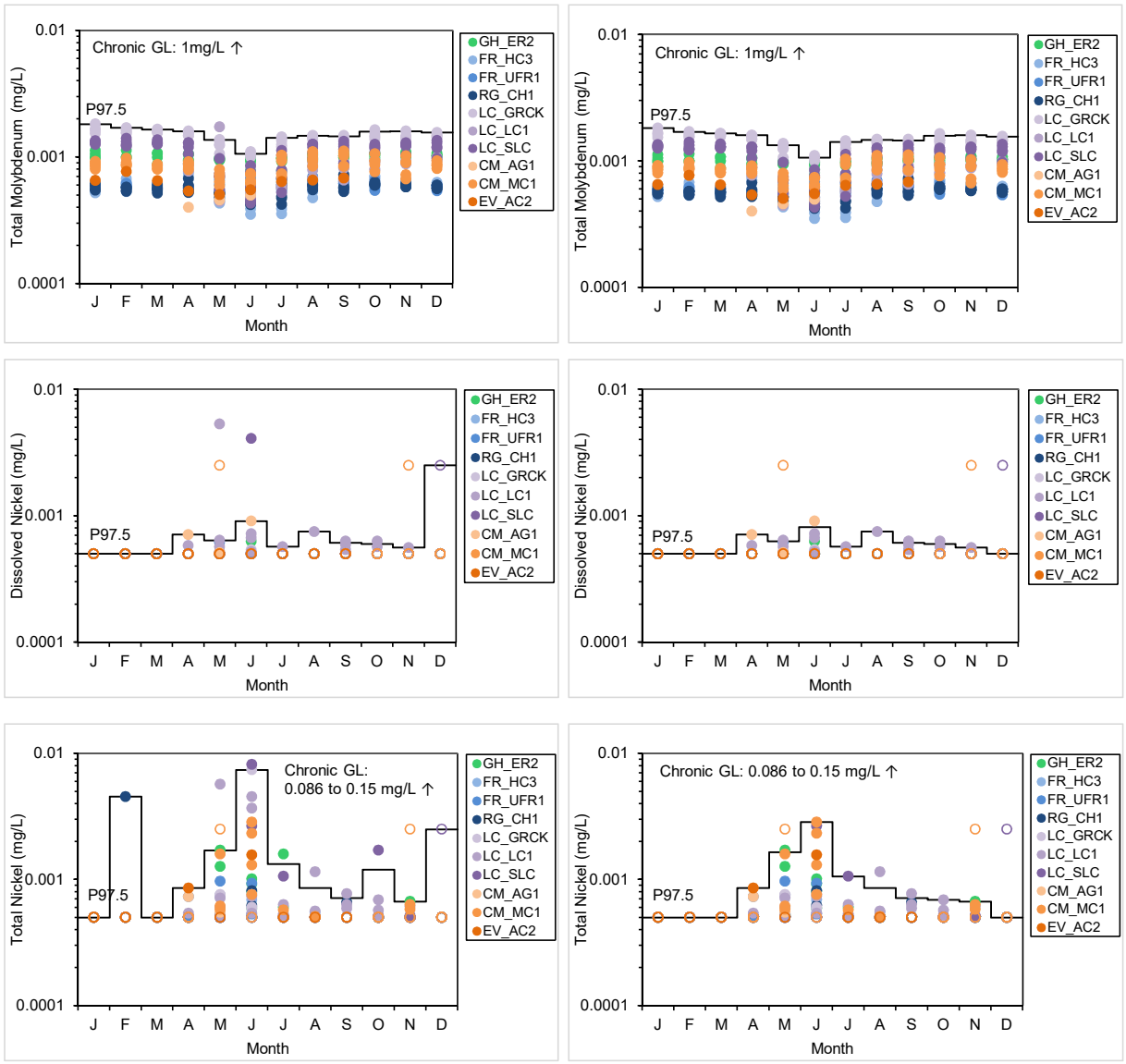


Figure C.3p: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

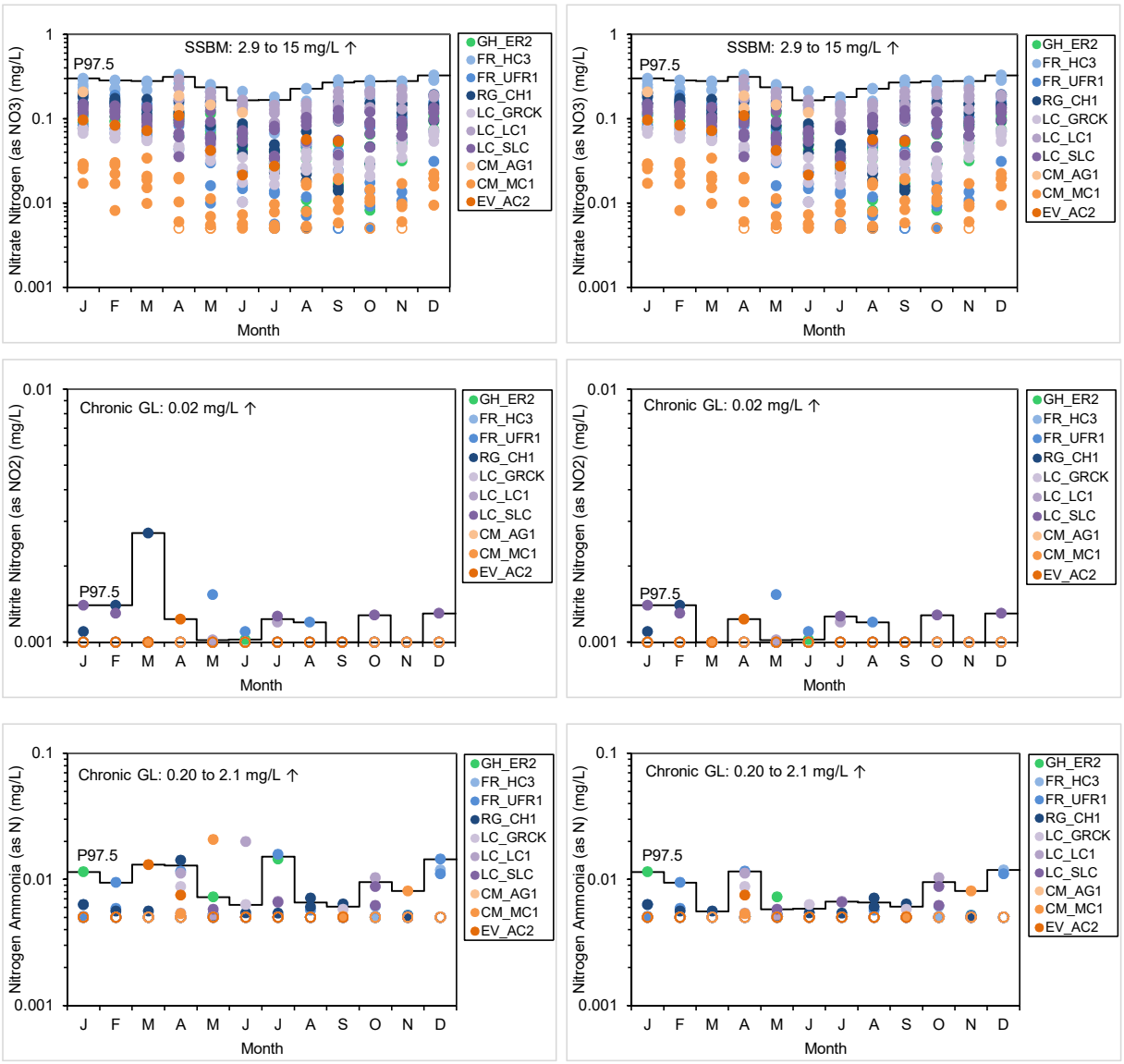


Figure C.3q: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

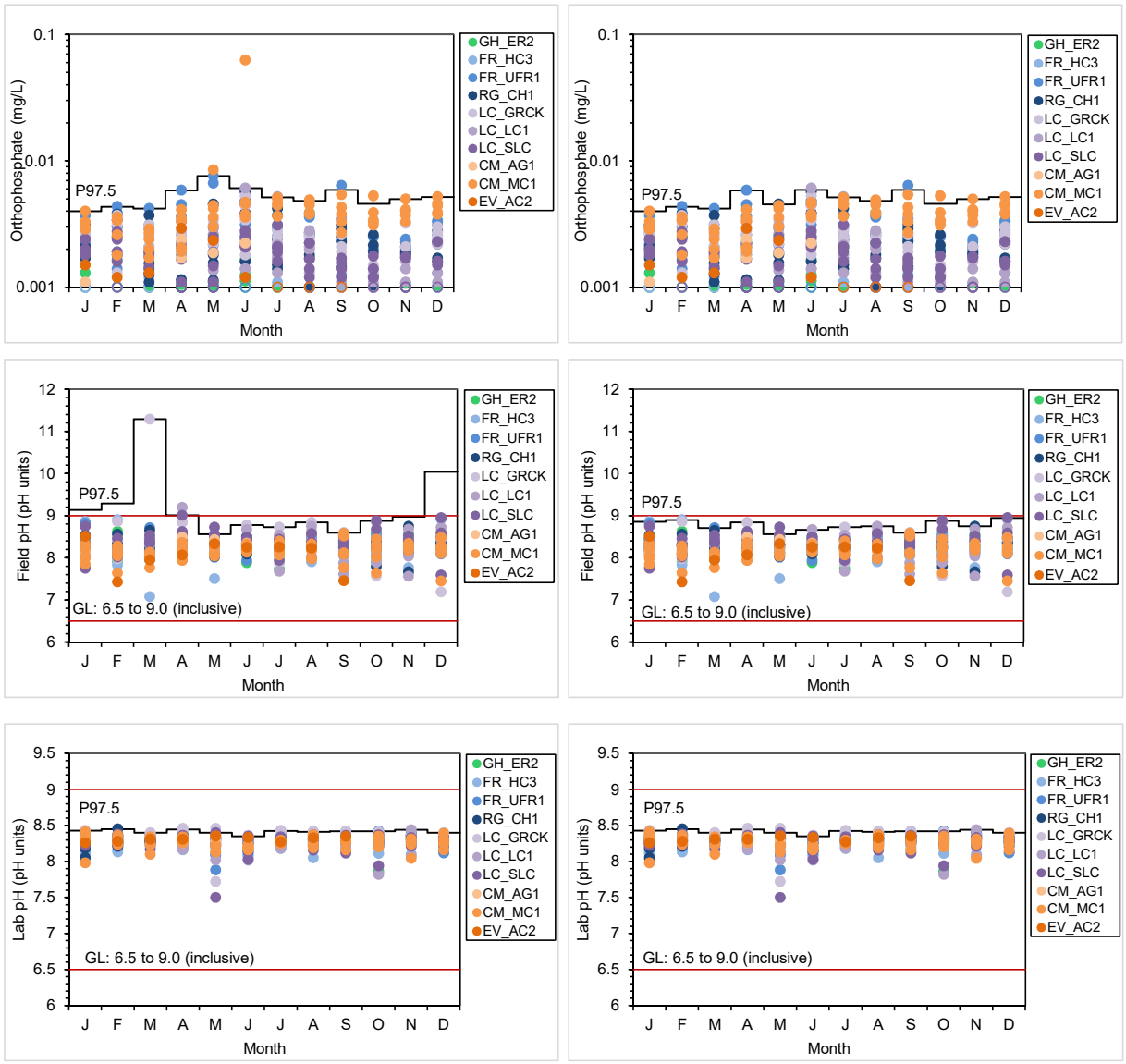


Figure C.3r: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

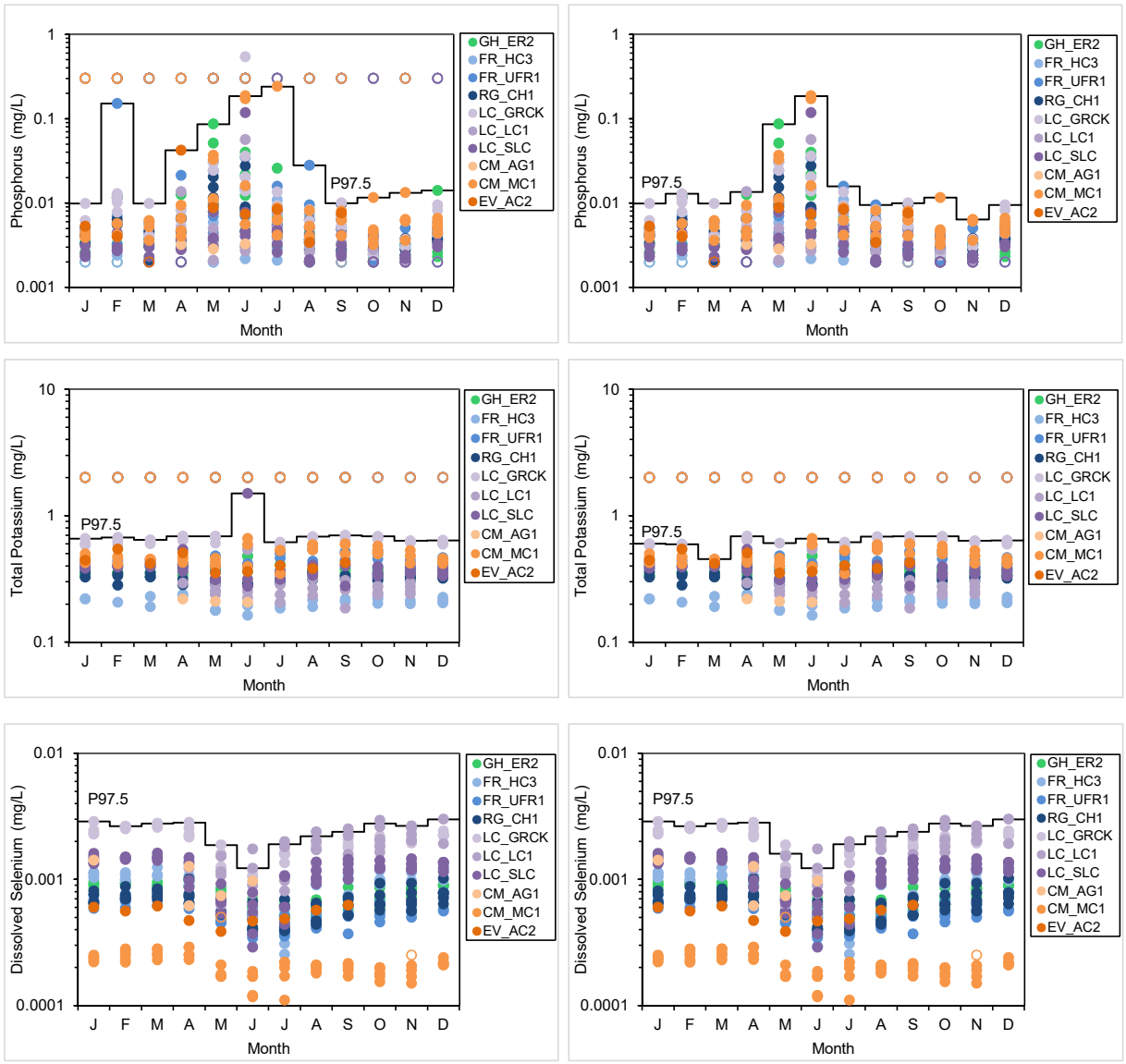


Figure C.3s: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

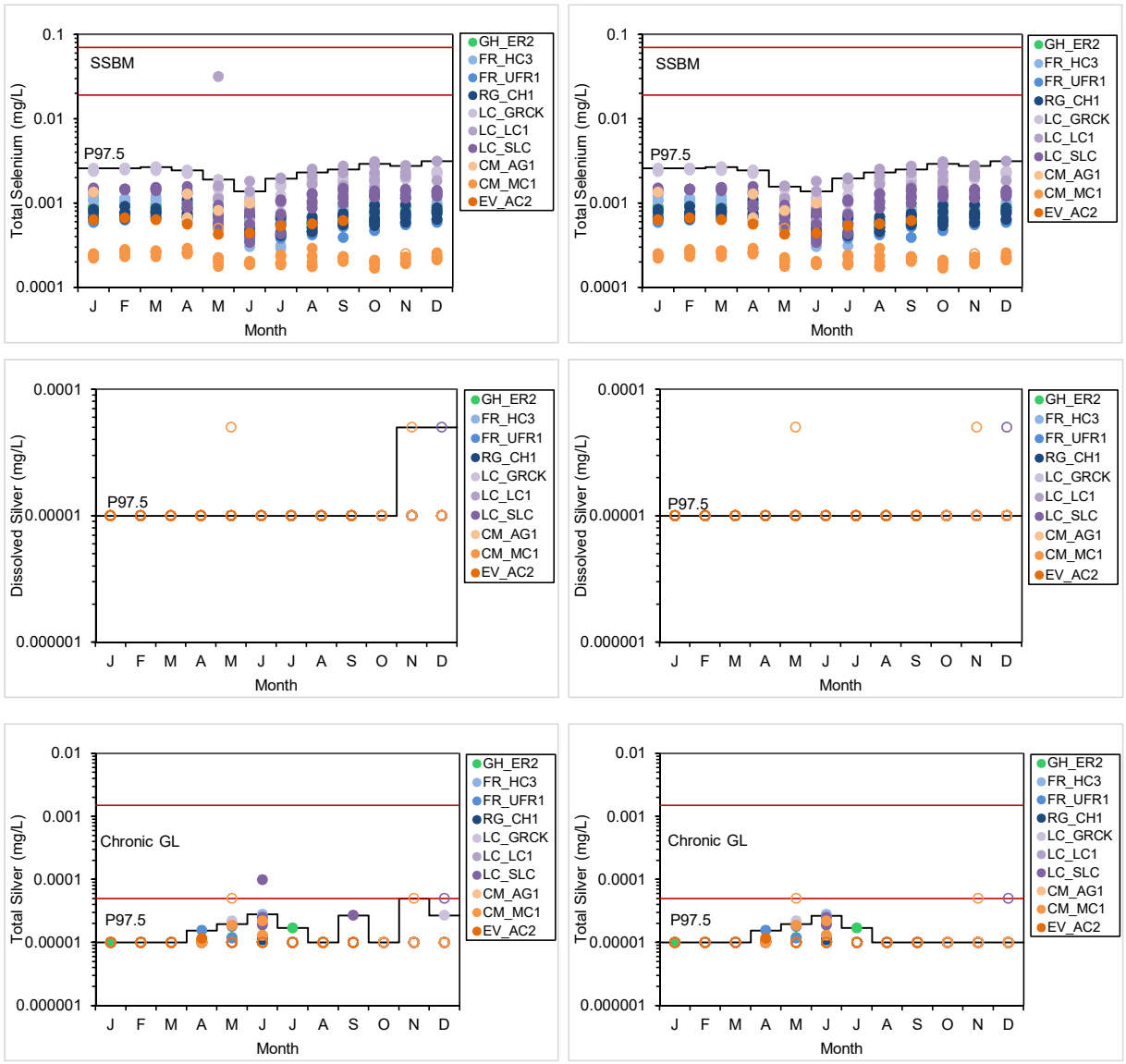


Figure C.3t: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

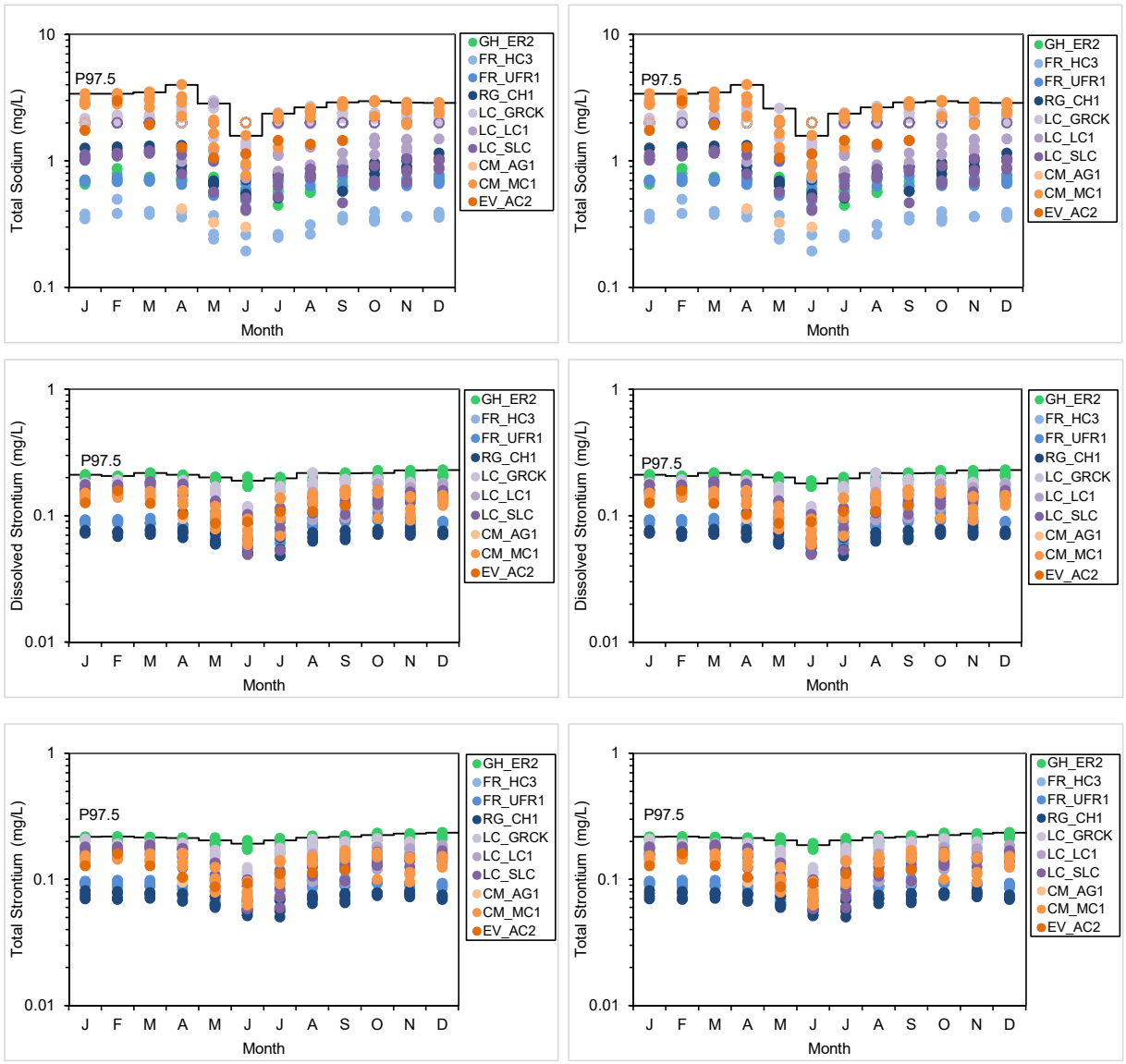


Figure C.3u: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

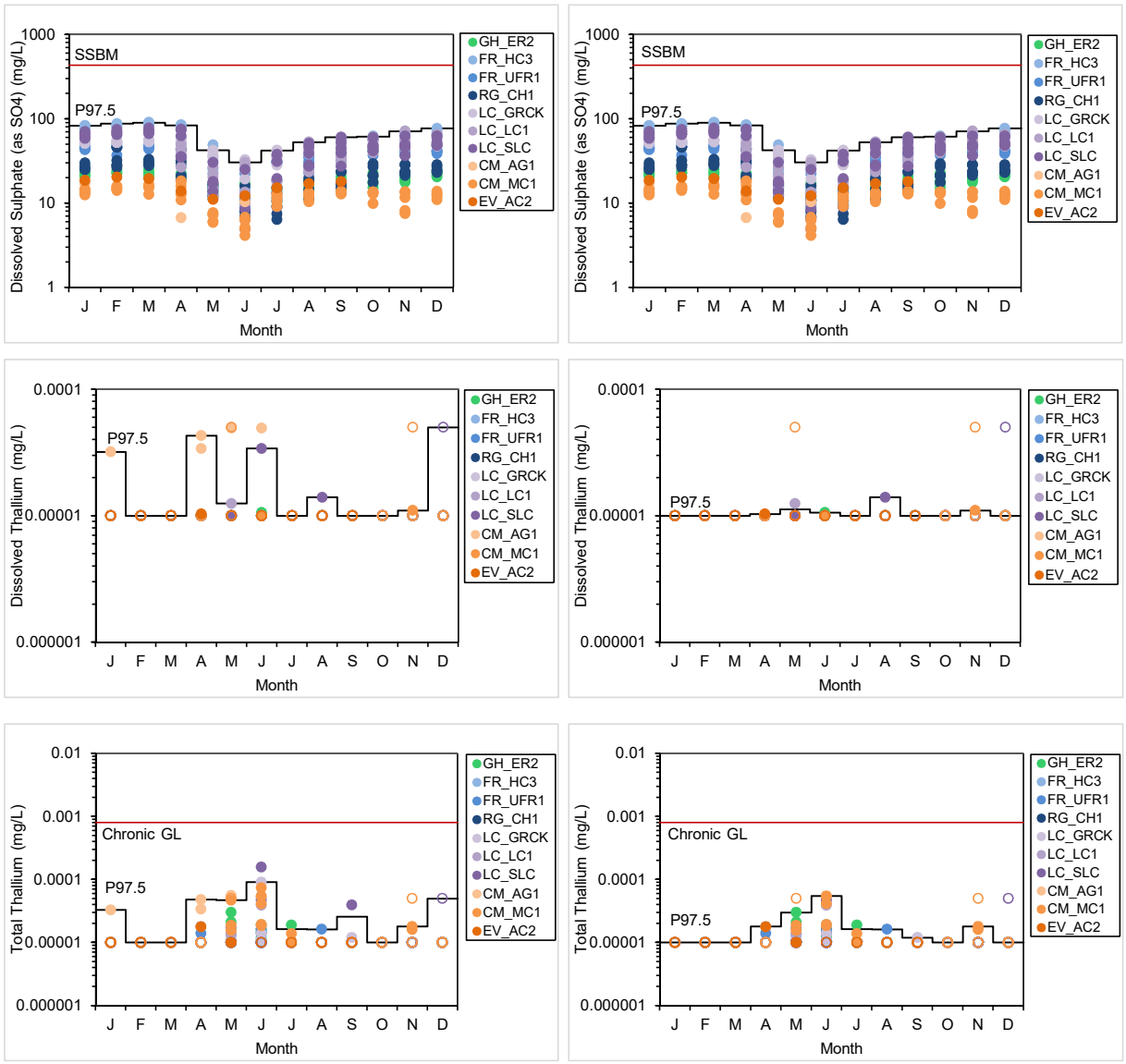


Figure C.3v: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

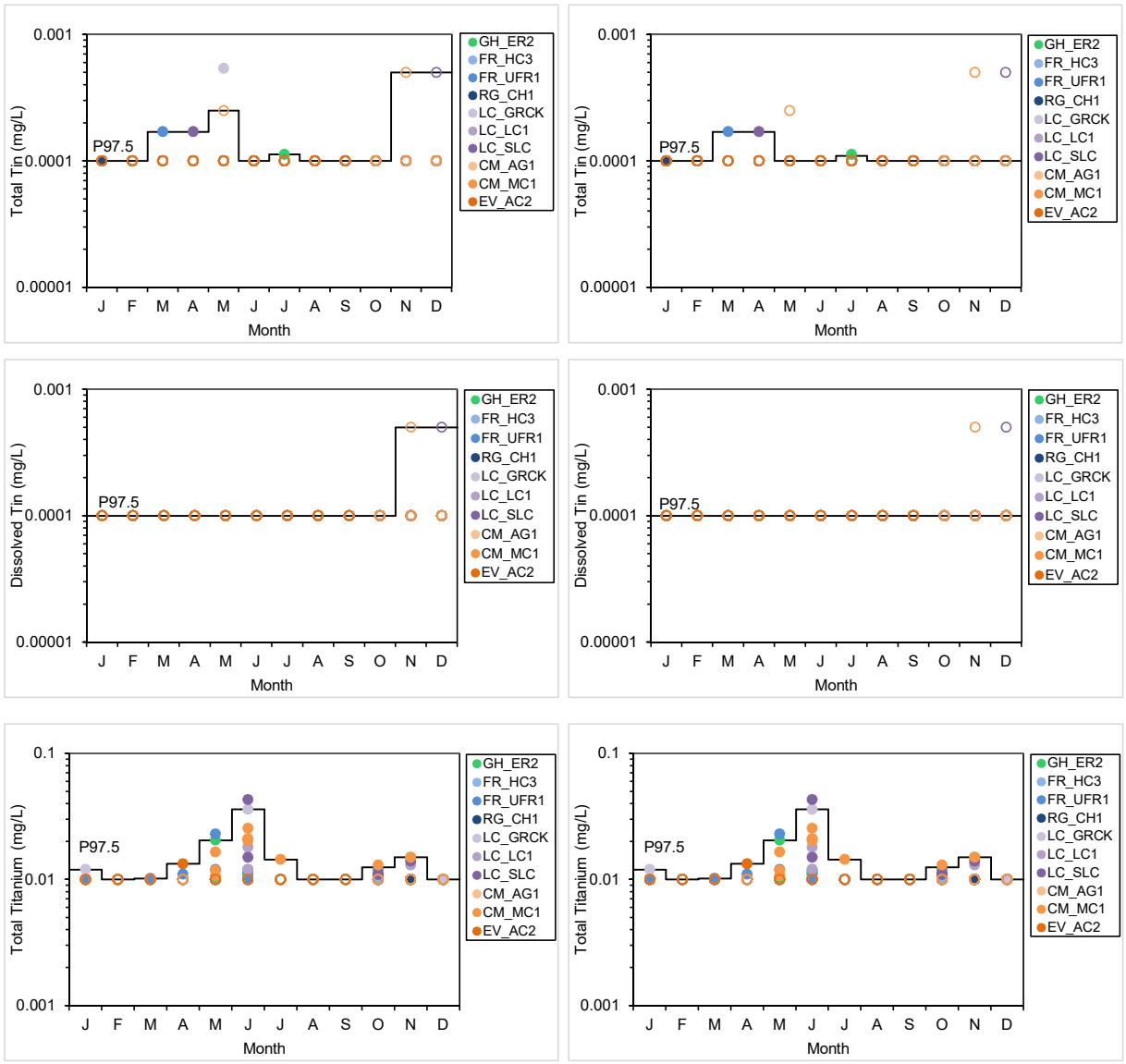


Figure C.3w: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

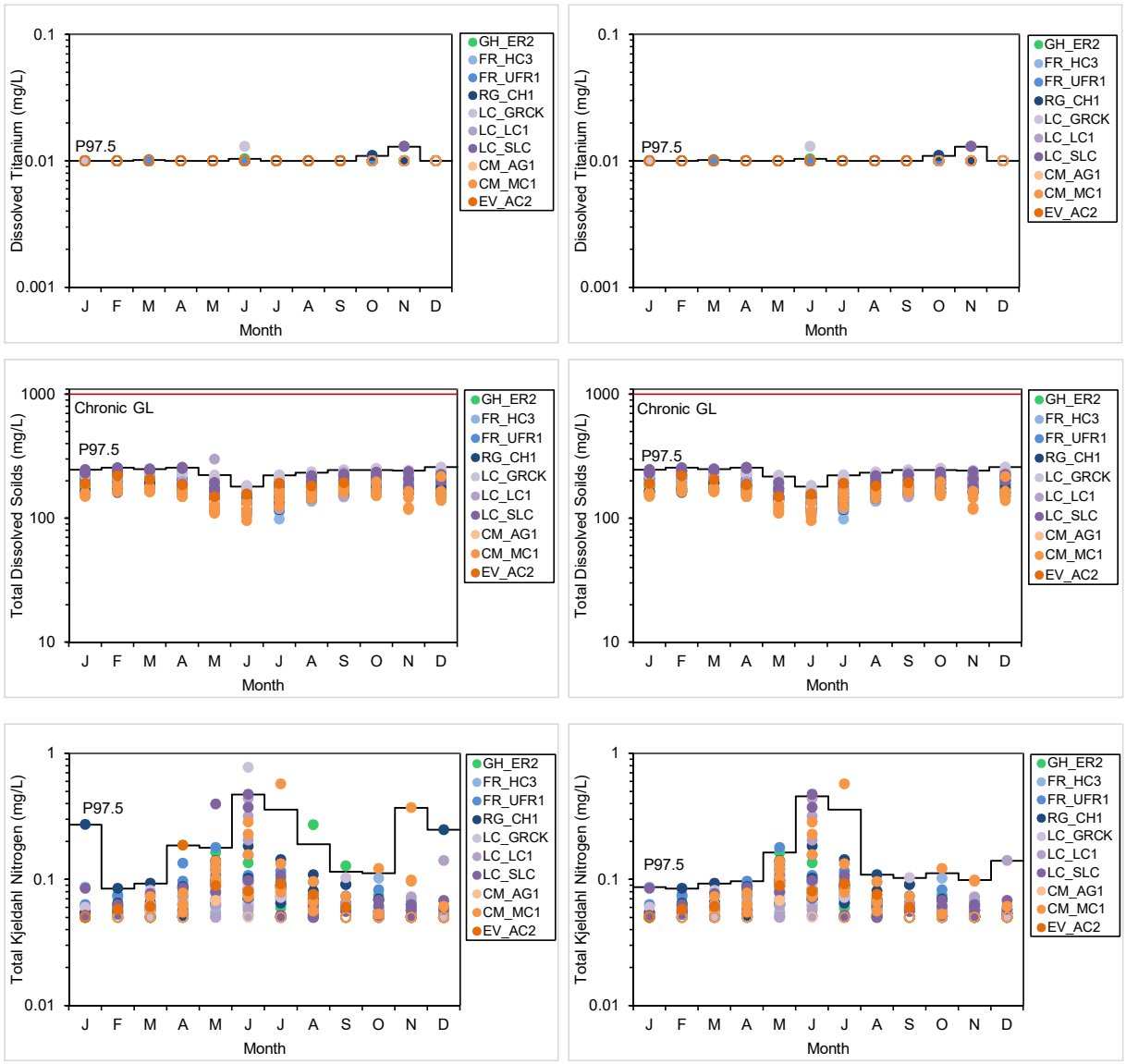


Figure C.3x: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

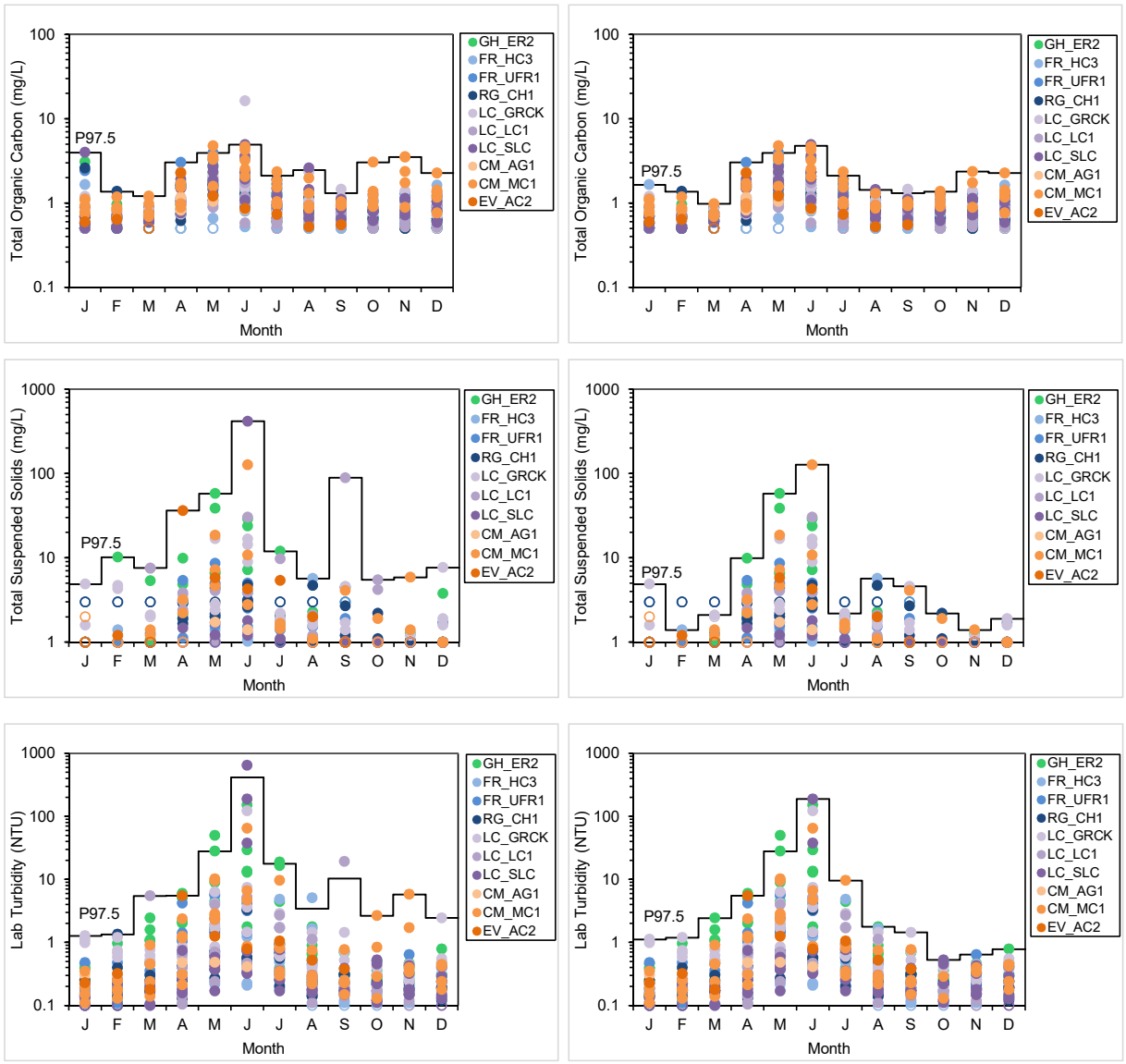


Figure C.3y: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

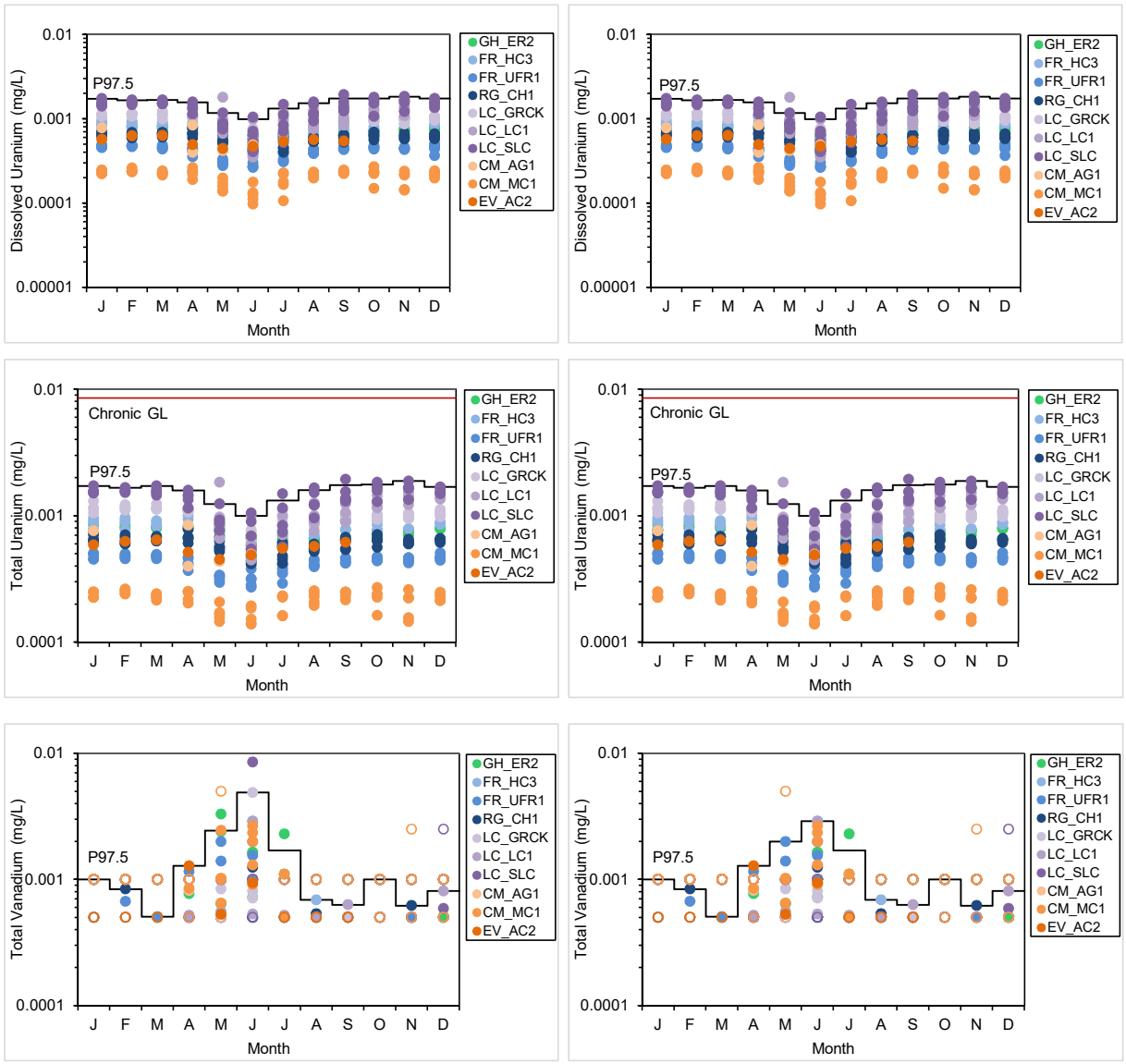


Figure C.3z: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

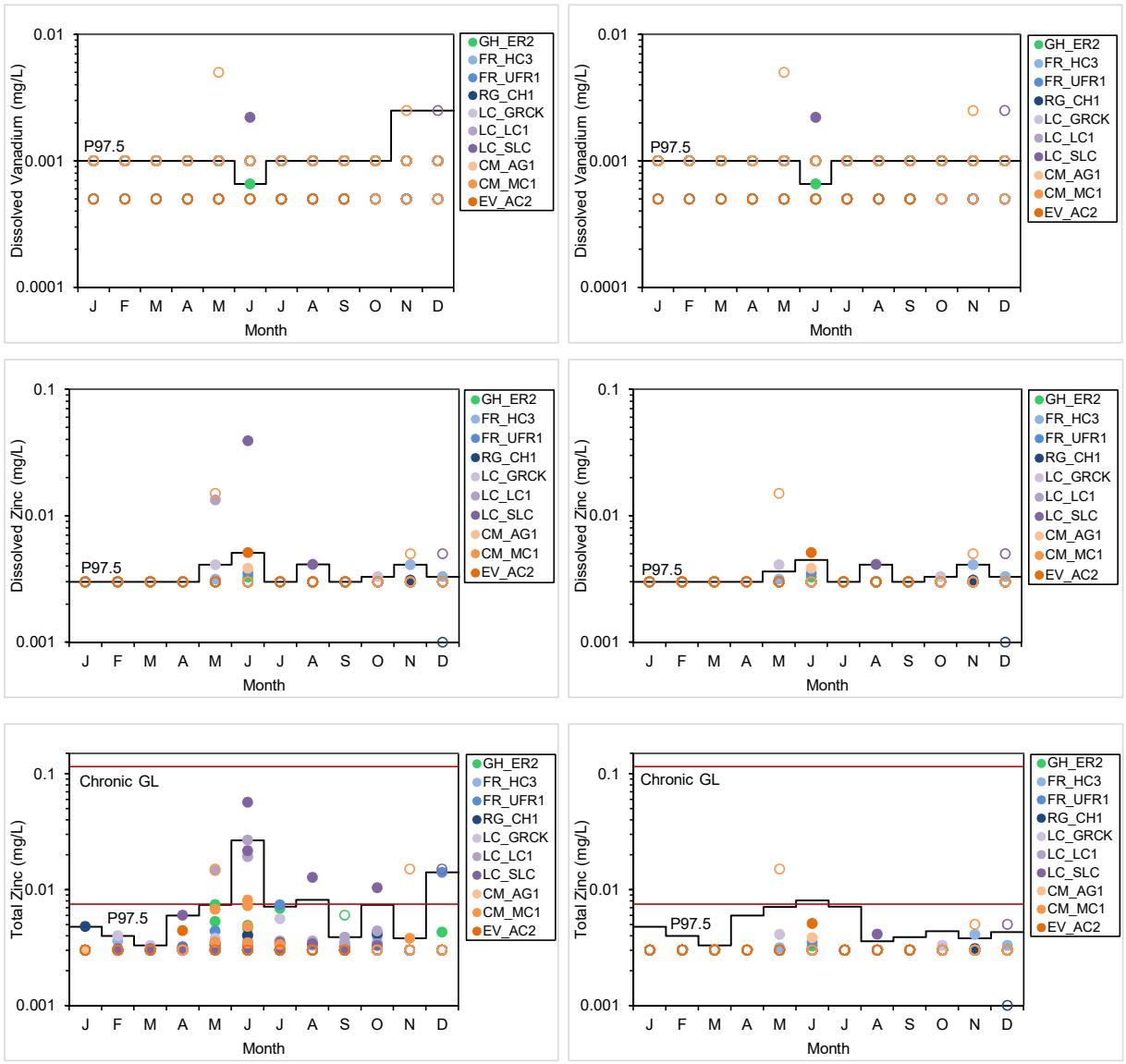


Figure C.3ba: Scatterplot of Monthly Normal Ranges Defined using Reference Area Data, 2012-2016

Note: All data (left) and outliers removed (right). Concentrations below the laboratory detection limit (LRL) are plotted as open symbols at the LRL. Elk River areas are plotted in green, Fording River areas are plotted in blue and purple, and Michel Creek areas are plotted in orange. Black lines represent monthly upper normal range values, while red lines represent the water quality guidelines. For analytes with parameter-dependent guidelines (e.g., hardness), then a range of guidelines was calculated using the minimum and maximum monthly mean parameter values. For some months with data below the LRL, the upper normal range was lowered to a lower LRL in order to be more conservative.

GL - guideline; SSBM - Level 1 site-specific benchmark

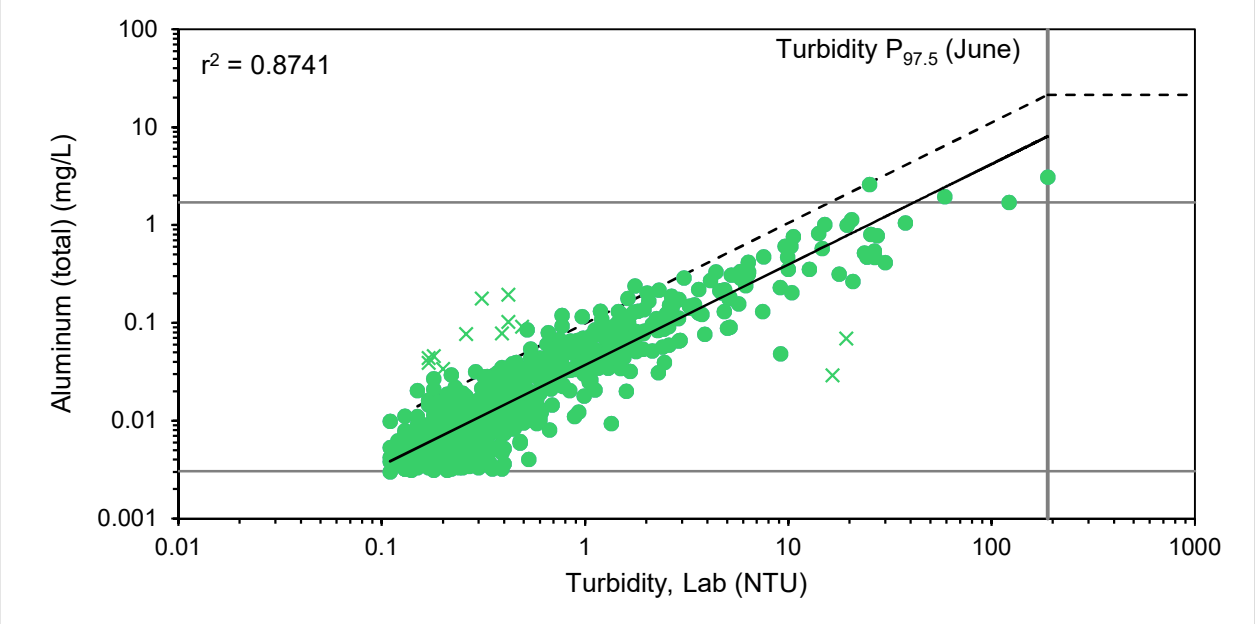


Figure C.4a: Total Aluminum Concentrations versus Total Suspended Solids or Turbidity (Detected Concentrations only) for Reference Area Samples Collected from 2012-2016

Notes: Dashed line = fitted value of the regression + the 97.5 th percentile of the residuals and the line is truncated at the upper limit of the normal range for the covariate (TSS or Turbidity) for each month. Plots shows truncation for the month with the maximum monthly upper limit of the normal range. Outliers were defined as residuals beyond Q3 + 1.5 (Q3-Q1) and were removed from the regression and plotted as an ×. Horizontal grey lines indicate the range of upper monthly normal ranges for reference areas, 2012-2016. The model with the highest r^2 was used to develop covariate-adjusted normal ranges.

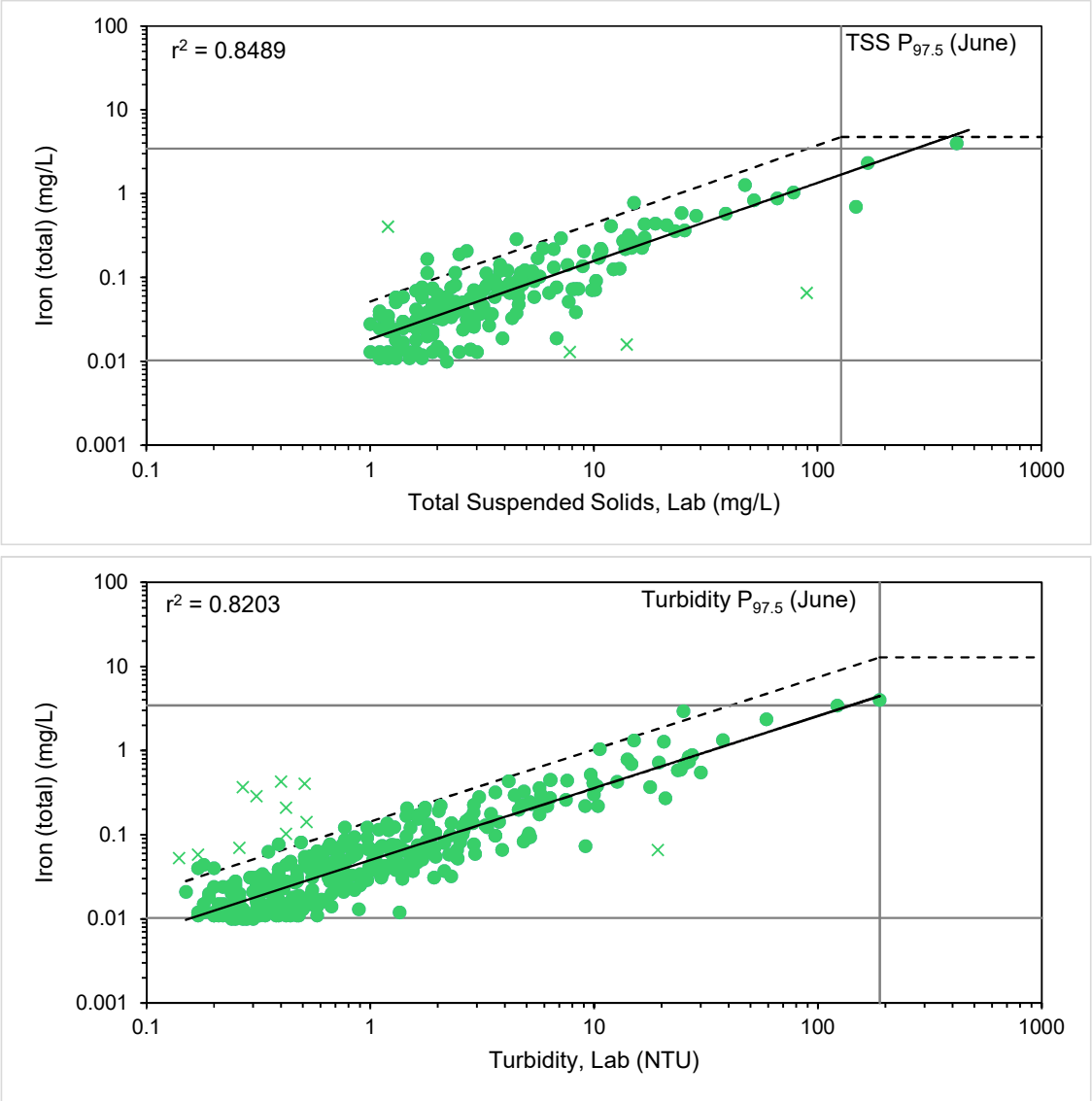


Figure C.4b: Total Iron Concentrations versus Total Suspended Solids or Turbidity (Detected Concentrations only) for Reference Area Samples Collected from 2012-2016

Notes: Dashed line = fitted value of the regression + the 97.5th percentile of the residuals and the line is truncated at the upper limit of the normal range for the covariate (TSS or Turbidity) for each month. Plots shows truncation for the month with the maximum monthly upper limit of the normal range. Outliers were defined as residuals beyond Q3 + 1.5 (Q3-Q1) and were removed from the regression and plotted as an ×. Horizontal grey lines indicate the range of upper monthly normal ranges for reference areas, 2012-2016. The model with the highest r^2 was used to develop covariate-adjusted normal ranges.

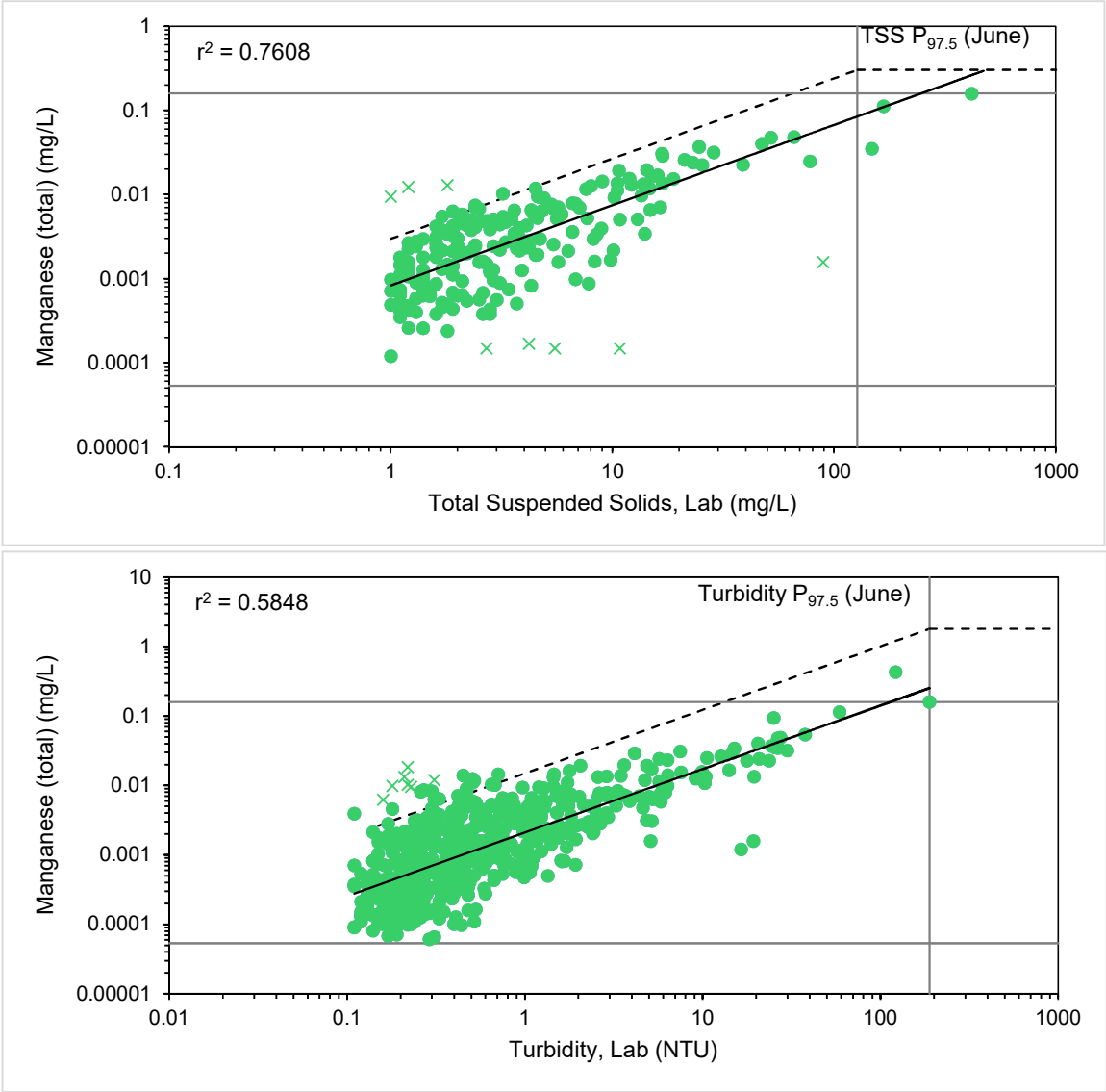


Figure C.4c: Total Manganese Concentrations versus Total Suspended Solids or Turbidity (Detected Concentrations only) for Reference Area Samples Collected from 2012-2016

Notes: Dashed line = fitted value of the regression + the 97.5th percentile of the residuals and the line is truncated at the upper limit of the normal range for the covariate (TSS or Turbidity) for each month. Plots shows truncation for the month with the maximum monthly upper limit of the normal range. Outliers were defined as residuals beyond Q3 + 1.5 (Q3-Q1) and were removed from the regression and plotted as an ×. Horizontal grey lines indicate the range of upper monthly normal ranges for reference areas, 2012-2016. The model with the highest r^2 was used to develop covariate-adjusted normal ranges.

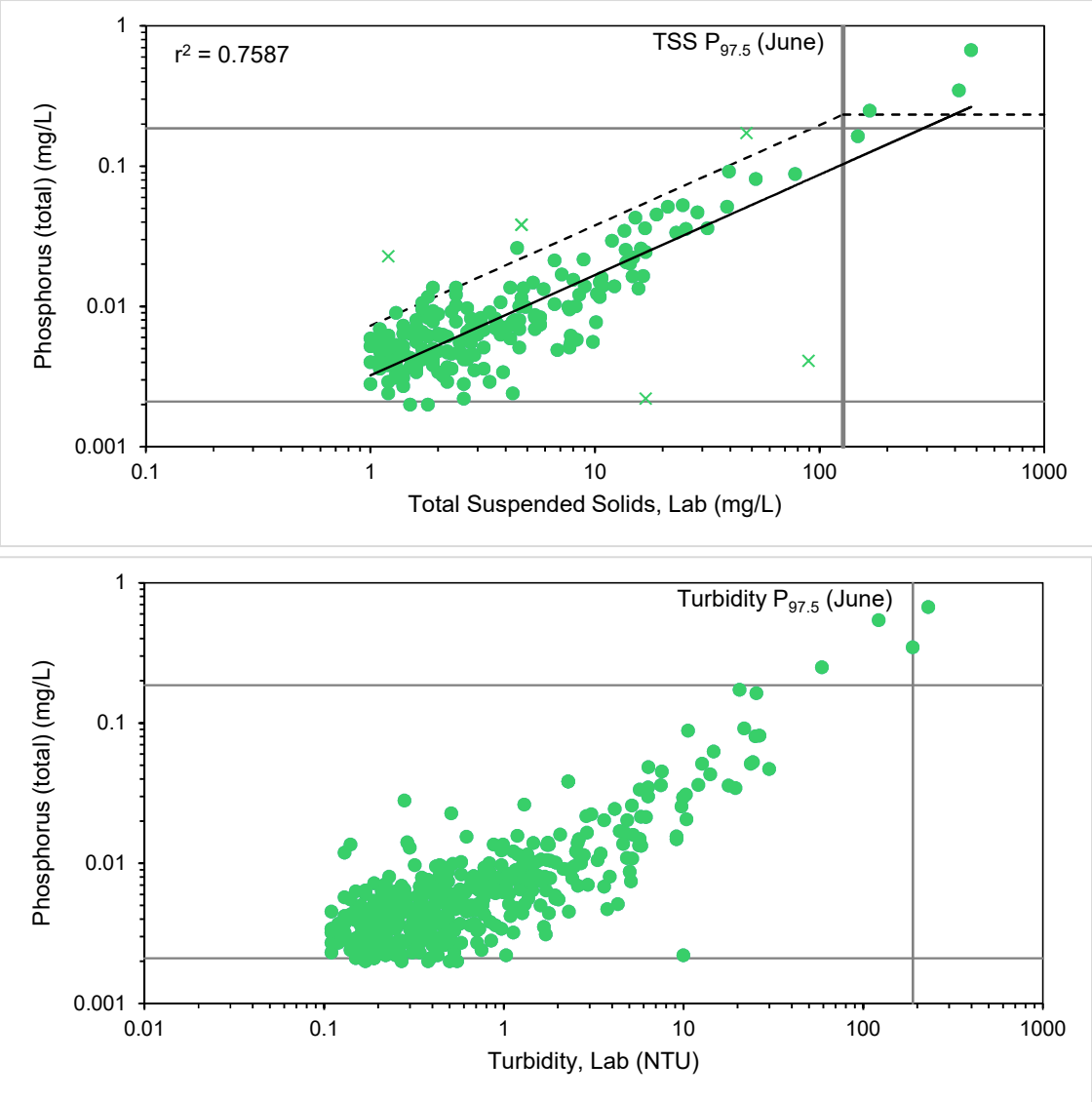
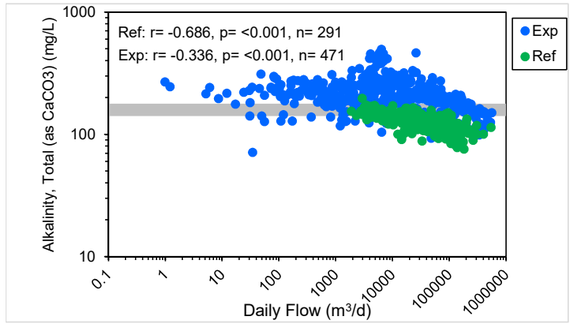
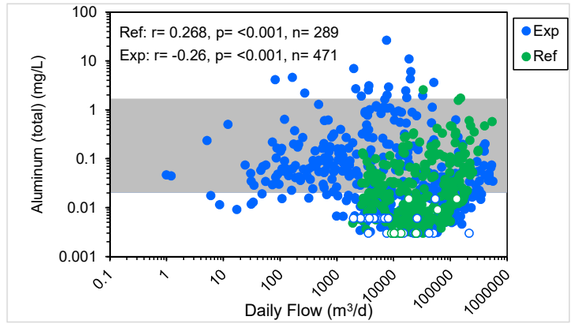
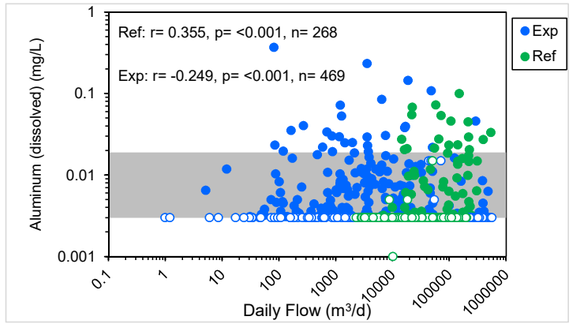


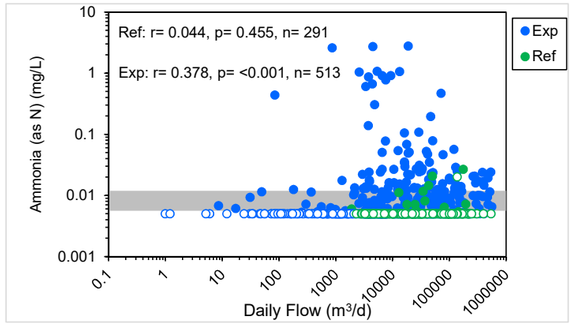
Figure C.4d: Total Phosphorus Concentrations versus Total Suspended Solids or Turbidity (Detected Concentrations only) for Reference Area Samples Collected from 2012-2016

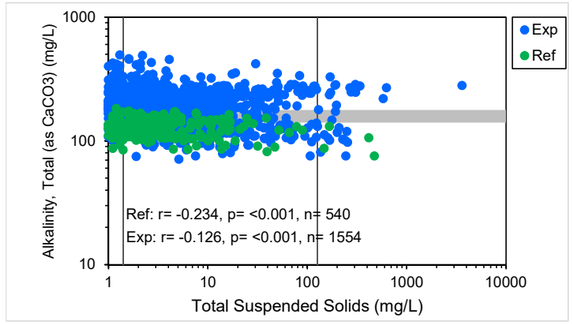
Notes: Dashed line = fitted value of the regression + the 97.5th percentile of the residuals and the line is truncated at the upper limit of the normal range for the covariate (TSS or Turbidity) for each month. Plots shows truncation for the month with the maximum monthly upper limit of the normal range. Outliers were defined as residuals beyond Q3 + 1.5 (Q3-Q1) and were removed from the regression and plotted as an ×. Horizontal grey lines indicate the range of upper monthly normal ranges for reference areas, 2012-2016. The model with the highest r^2 was used to develop covariate-adjusted normal ranges.

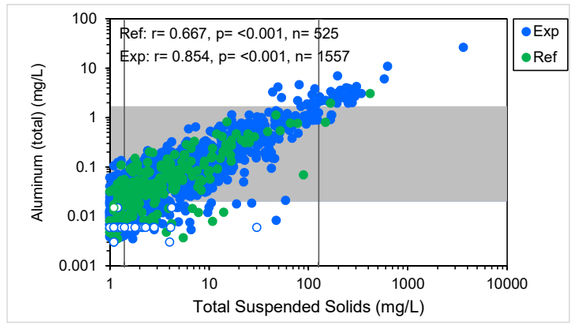


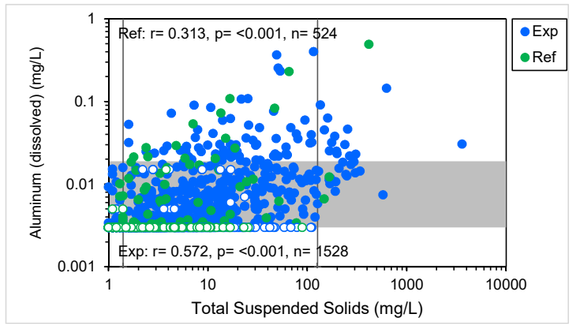


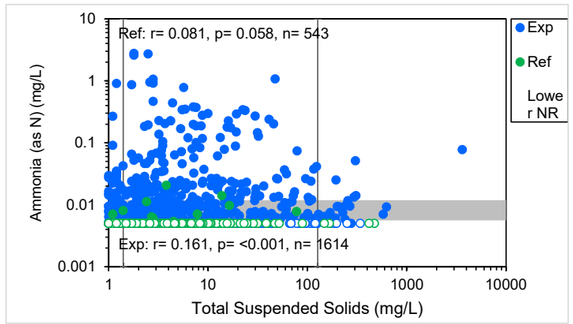


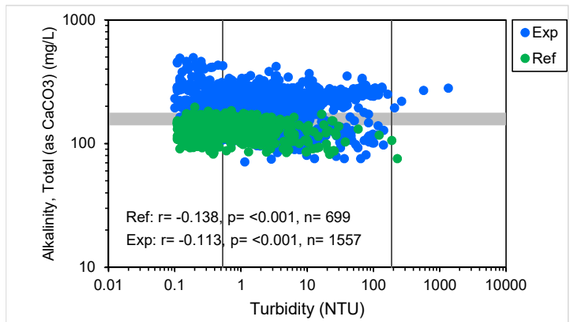


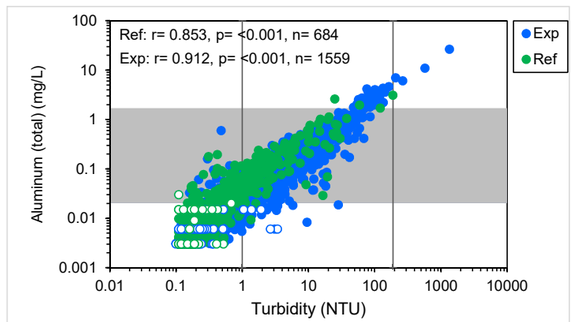


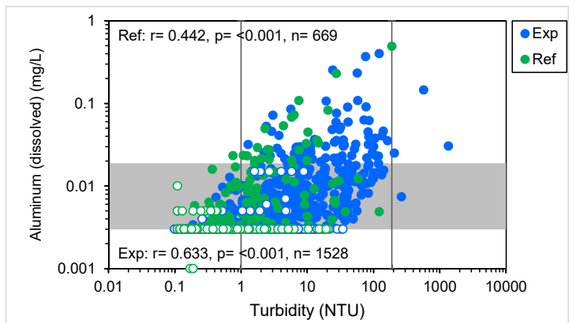












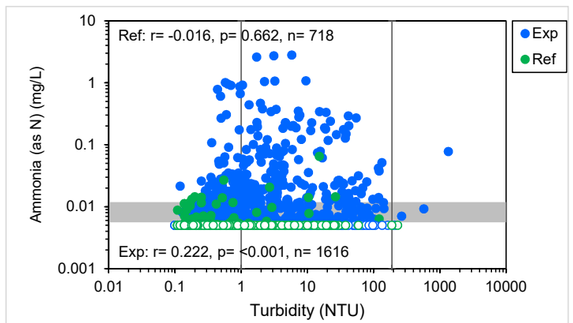
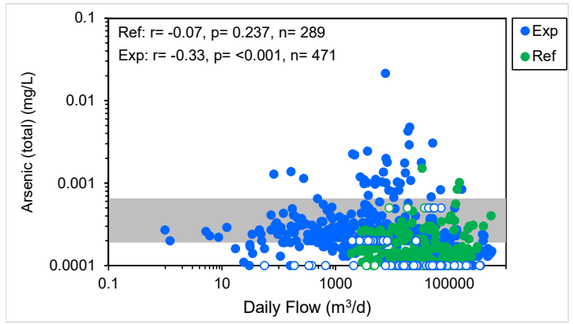
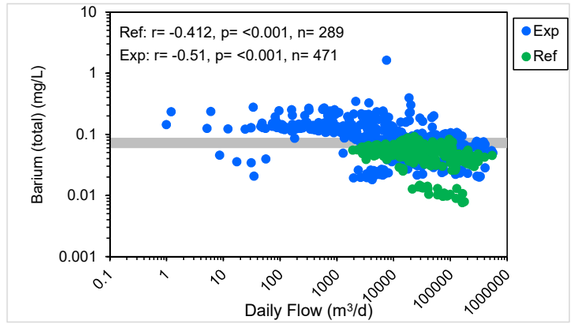
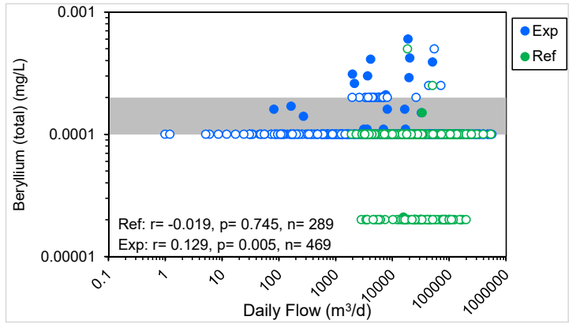


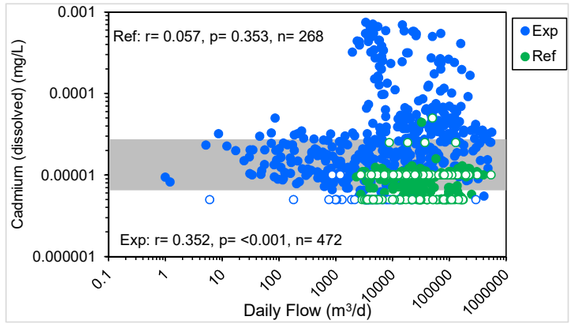
Figure C.5: Relationships and Spearman Correlations of Analytes with Daily Flow Rates, Total Suspended Solids, or Turbidity

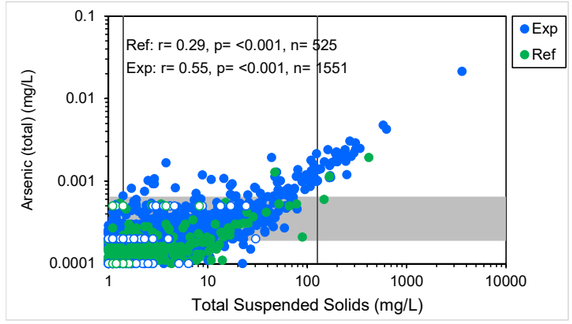
Note: open symbols indicate data below the laboratory reporting limit (LRL). For x-axis data <LRL, the data were not shown. Flow rates of zero were not included. Vertical and horizontal lines indicate the range of upper (97.5th percentile) monthly normal ranges. Analytes that correlated strongly with TSS or turbidity, and all constituents having a water quality guideline, are presented.

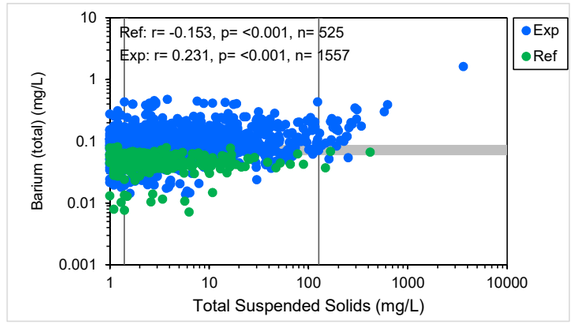


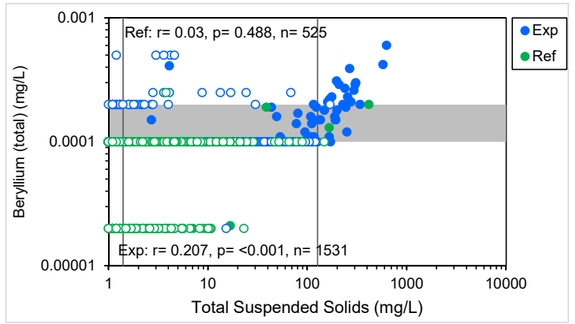


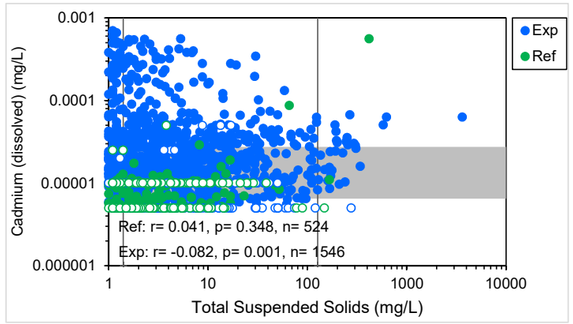


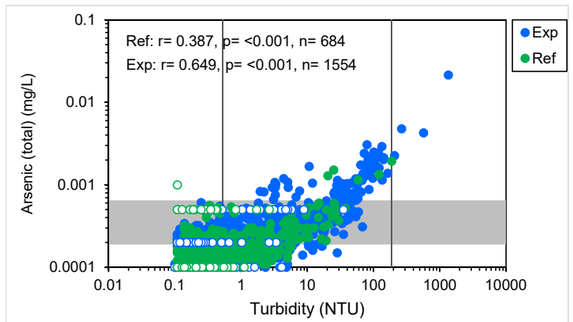


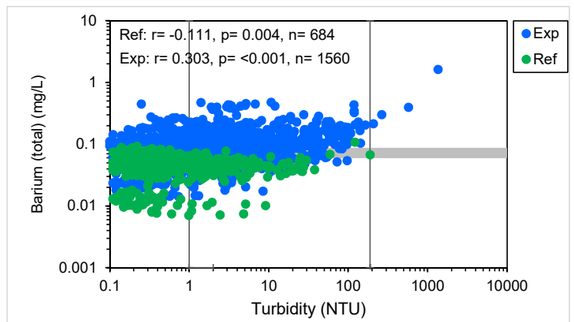


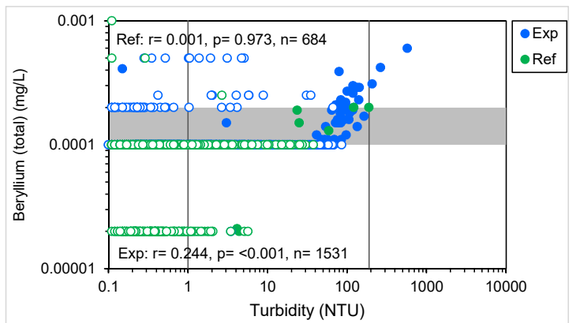












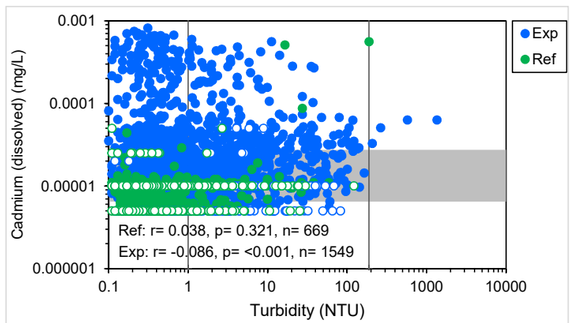


Figure C.5: Relationships and Spearman Correlations of Analytes with Daily Flow Rates, Total Suspended Solids, or Turbidity

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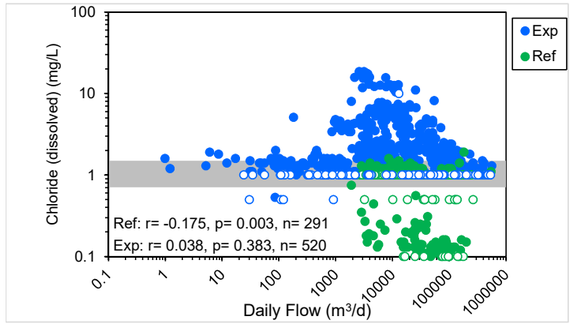

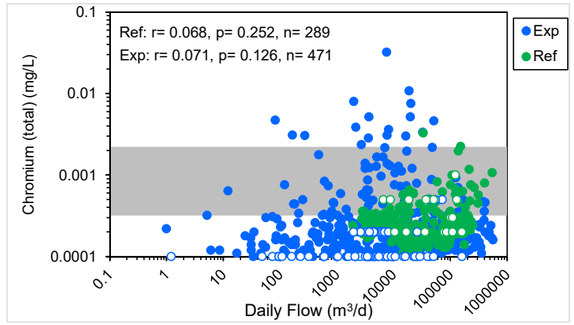

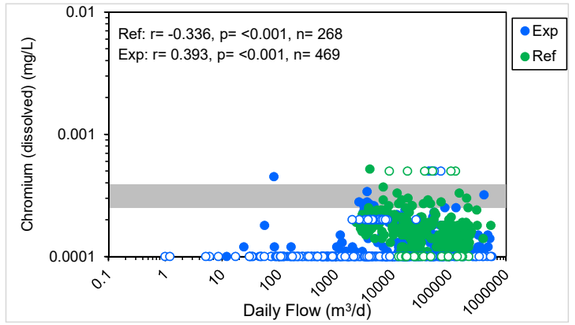

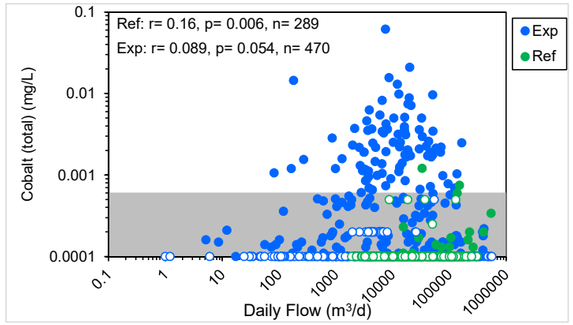

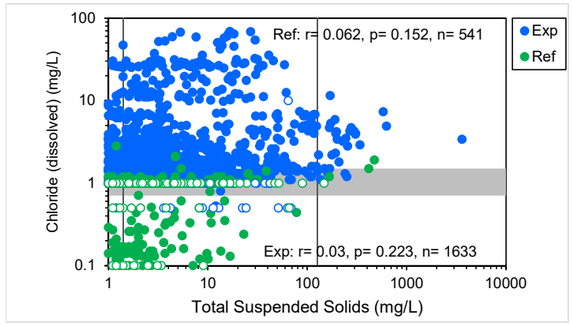

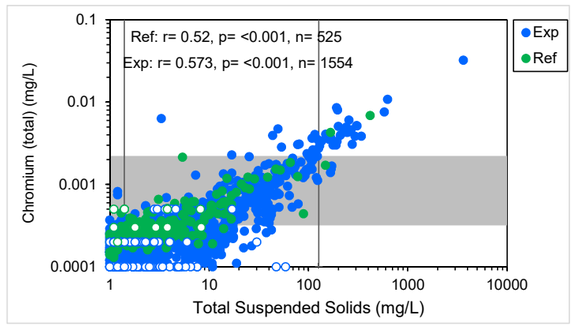

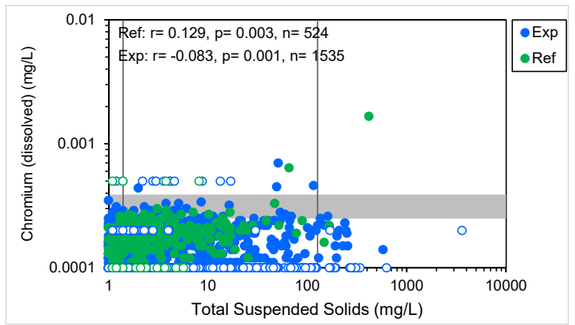

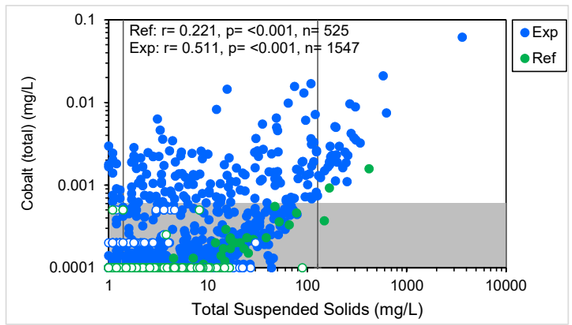

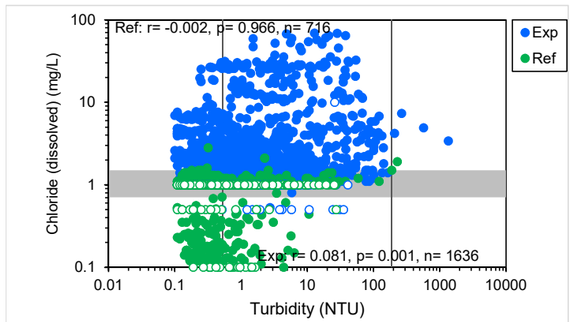

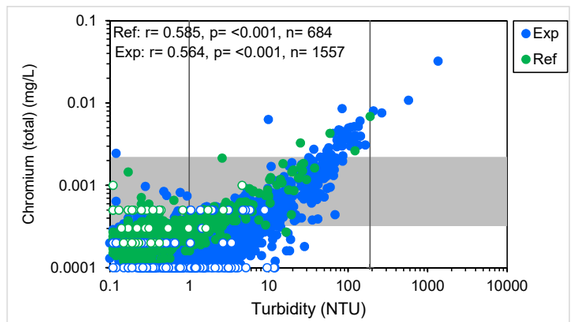

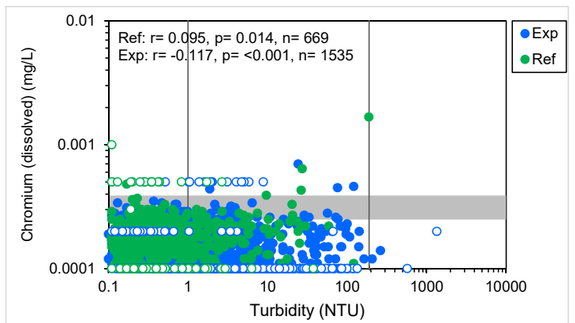

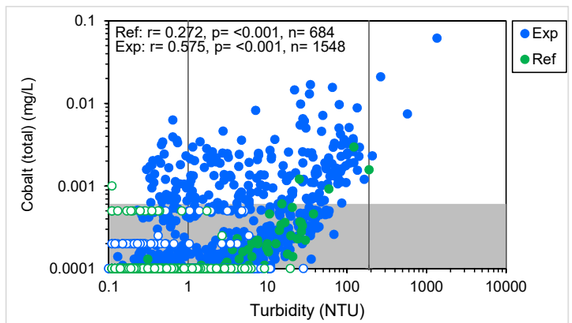

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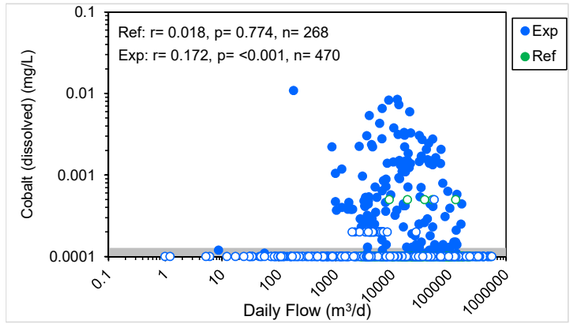

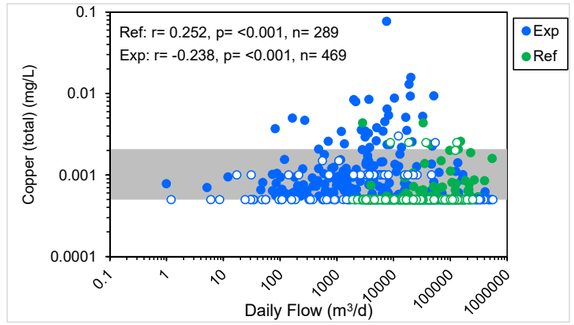

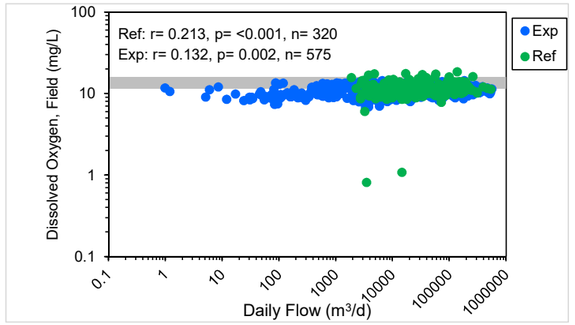

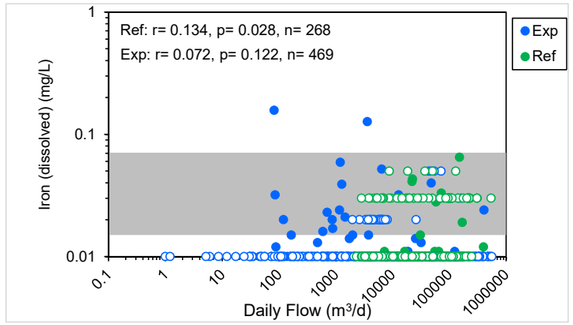

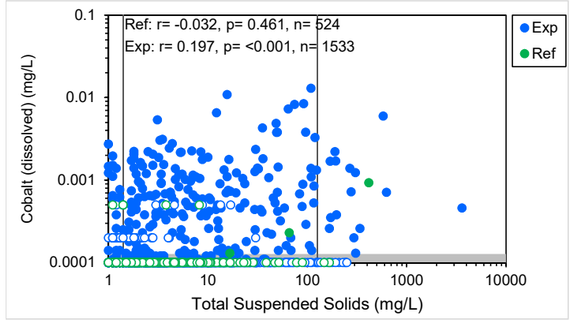

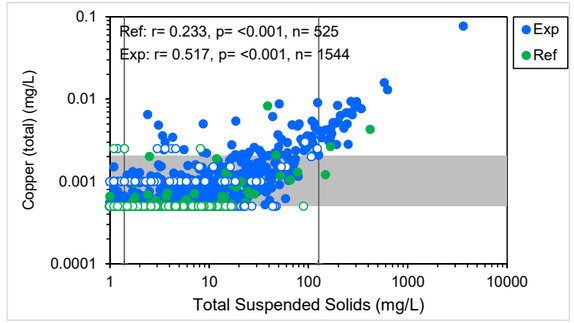

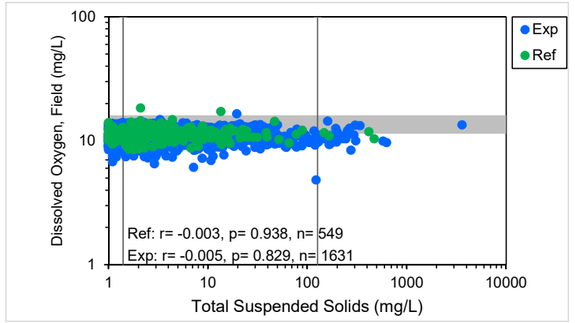

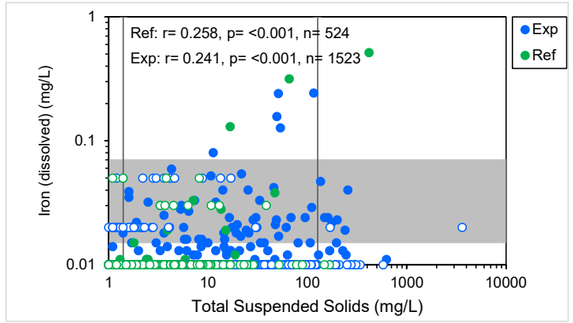

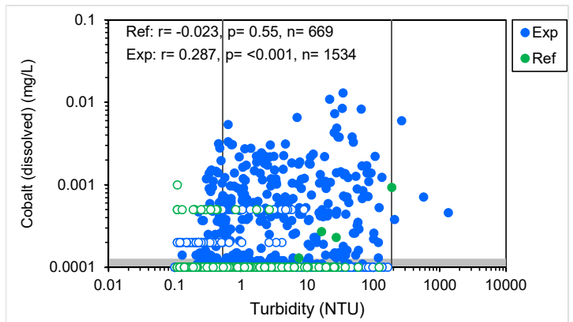

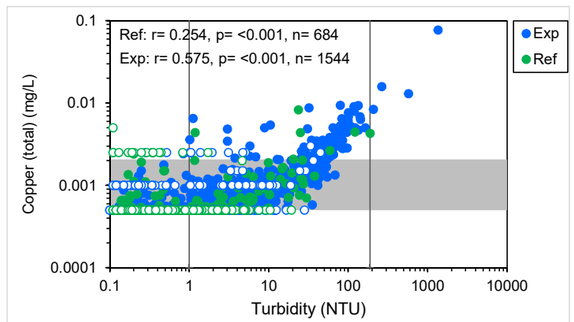

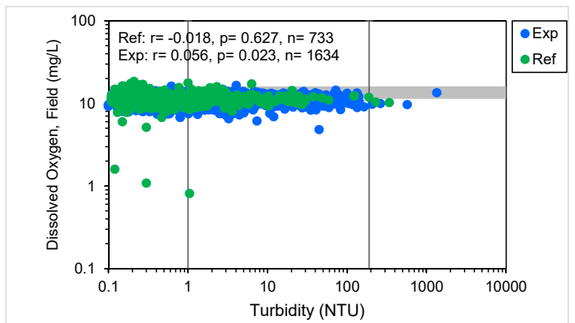

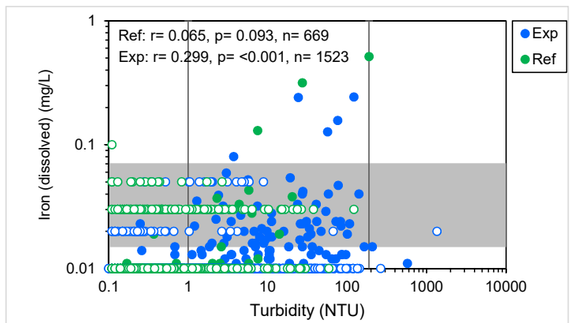

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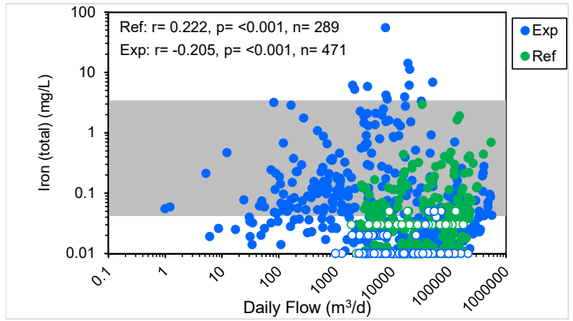

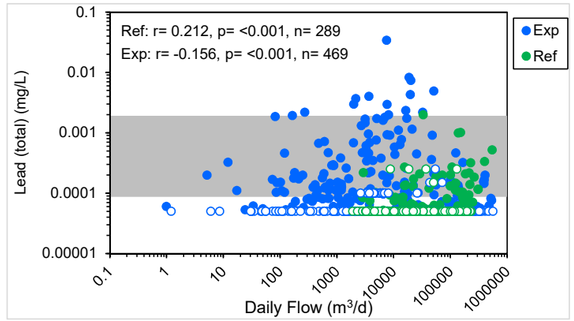

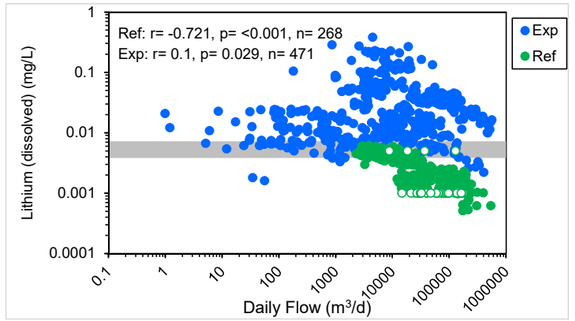

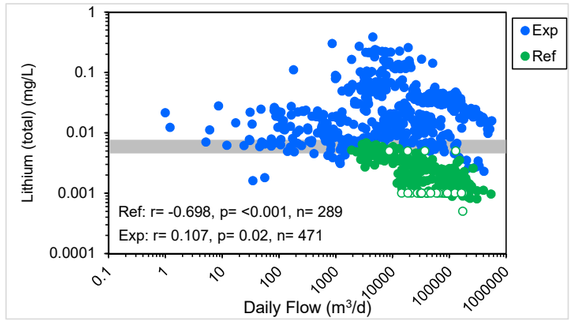

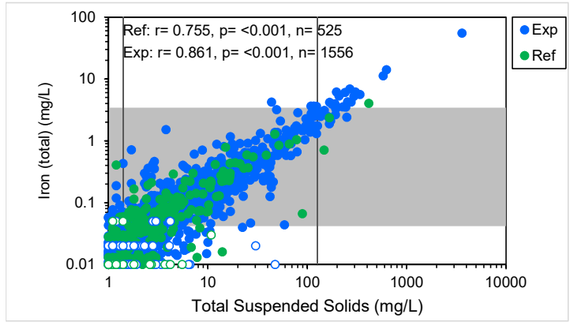

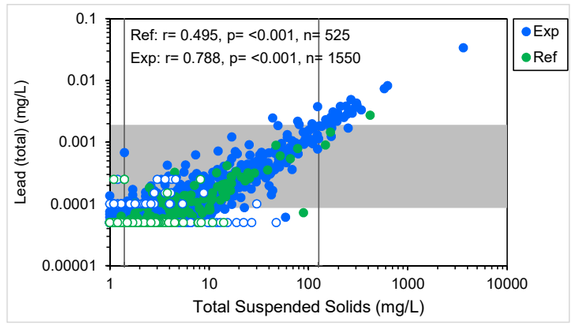

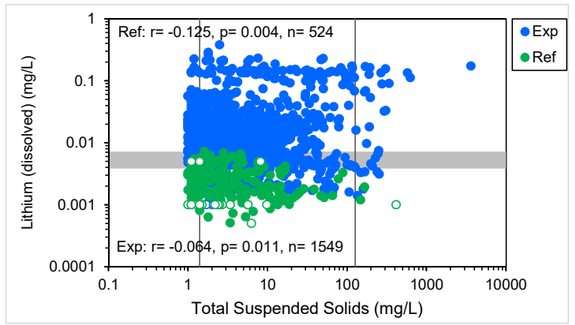

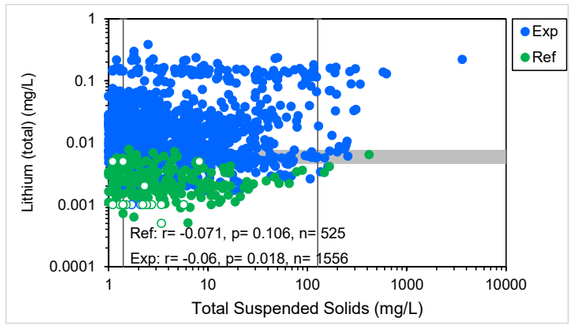

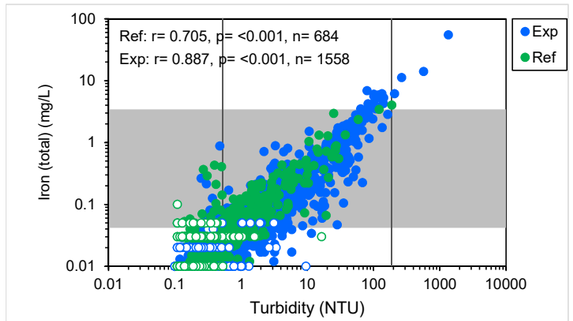

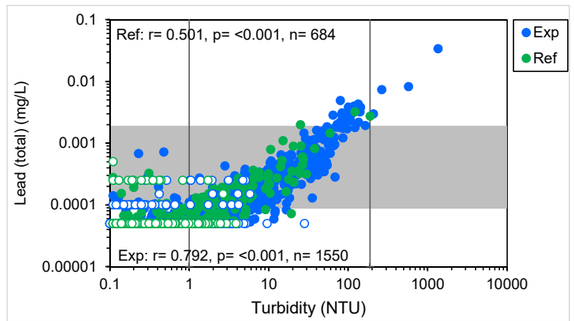

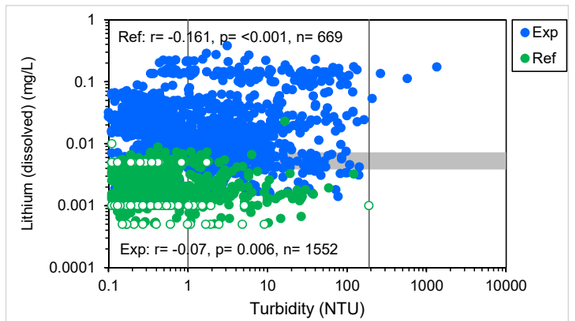

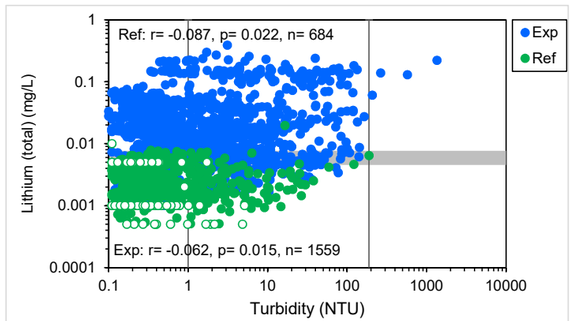

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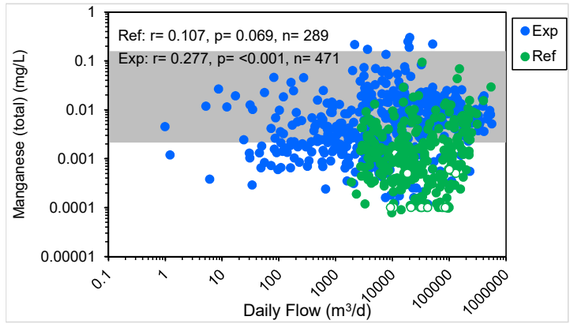

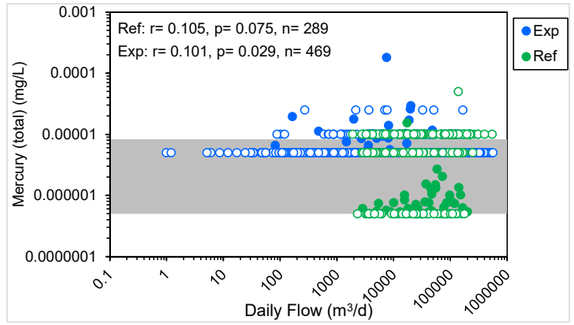

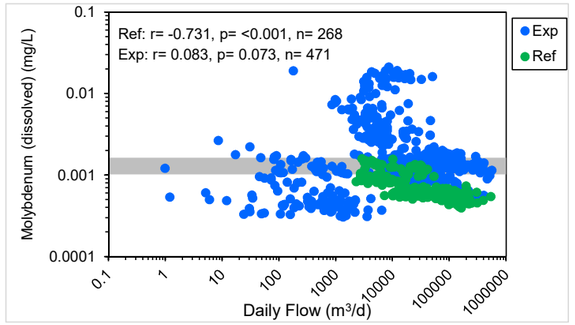

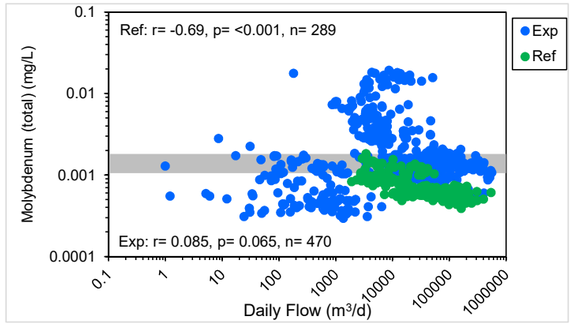

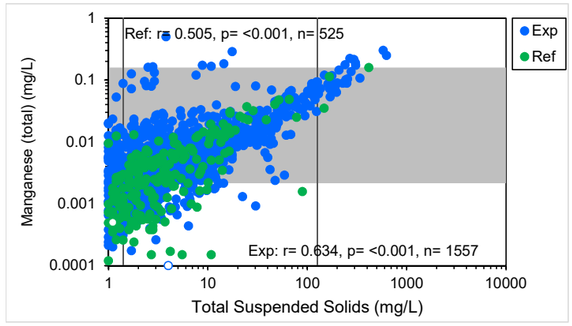

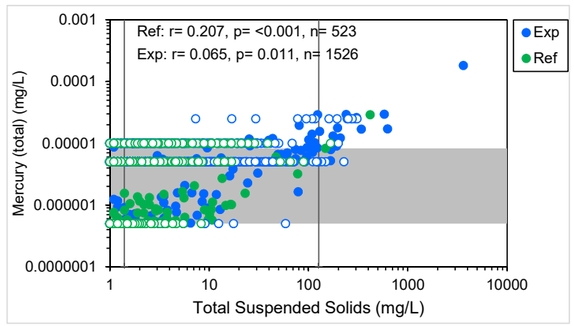

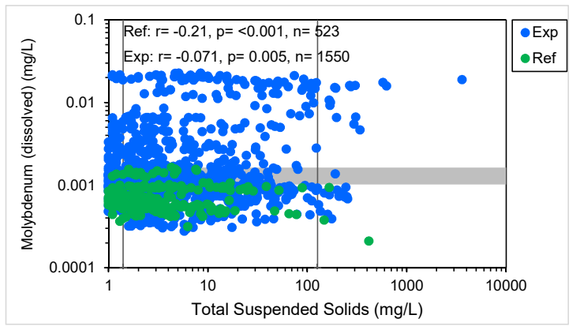

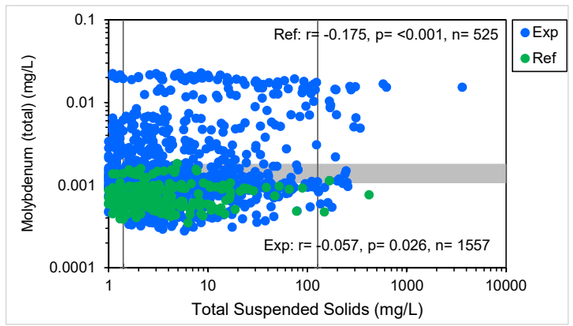

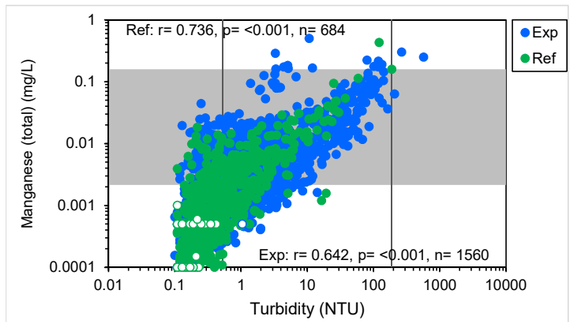

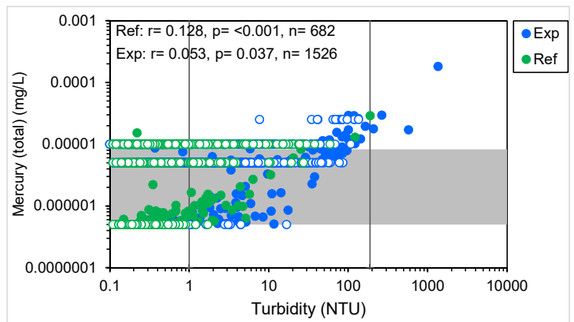

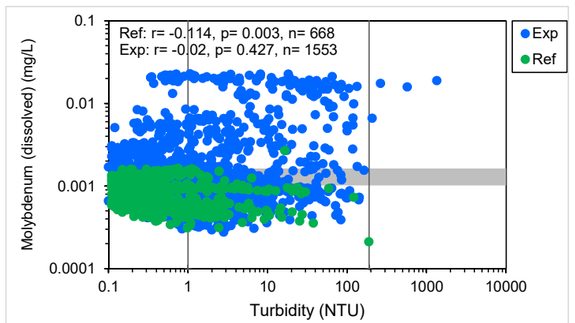

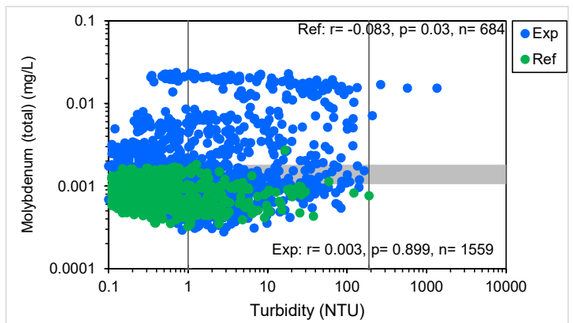

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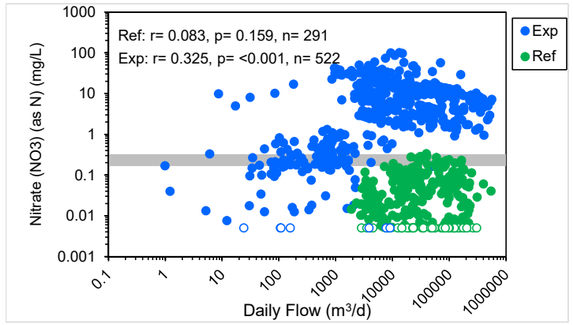
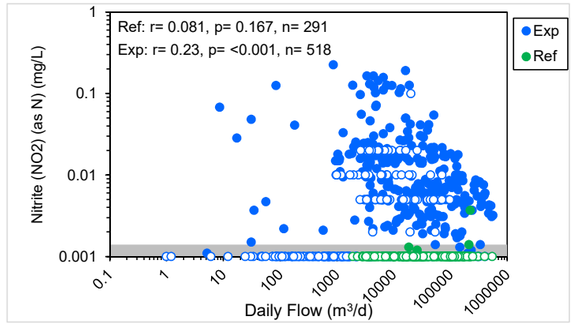
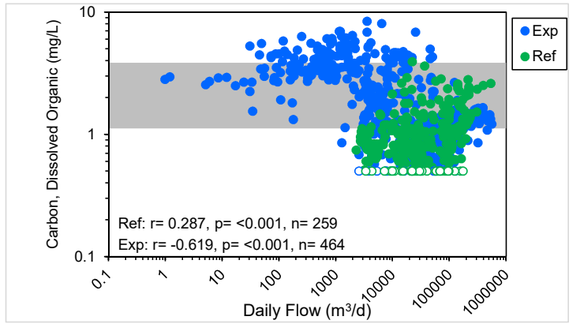
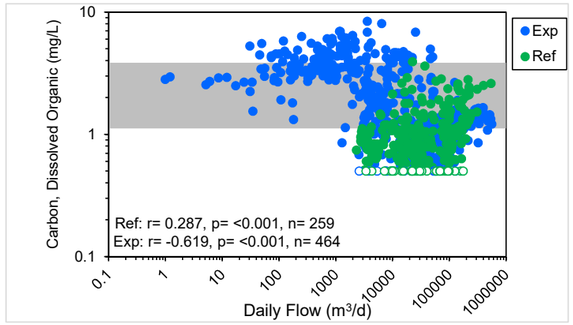
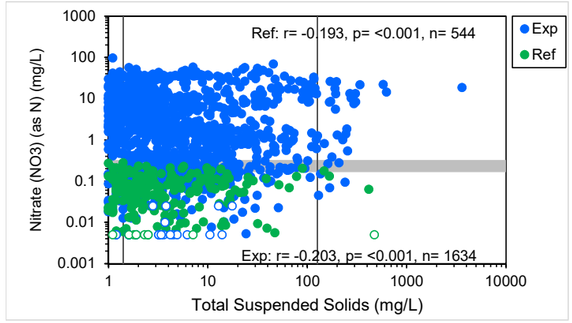
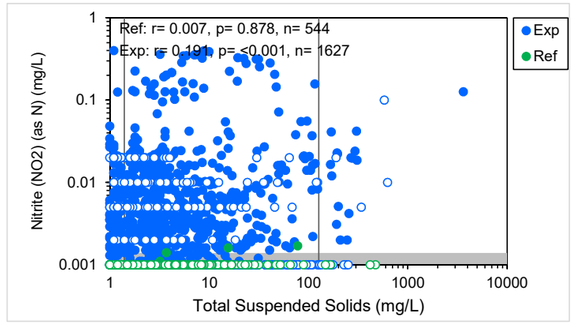


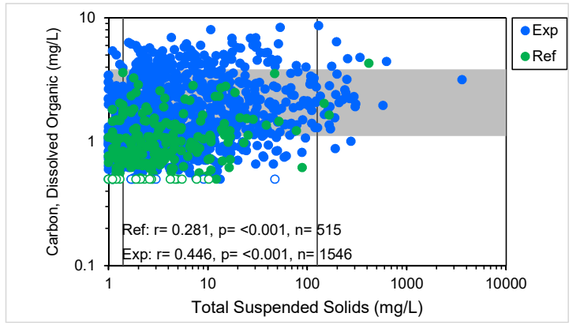


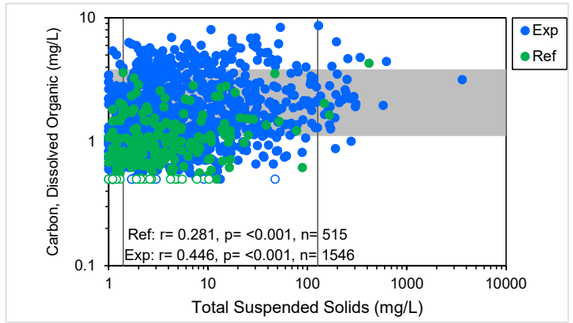


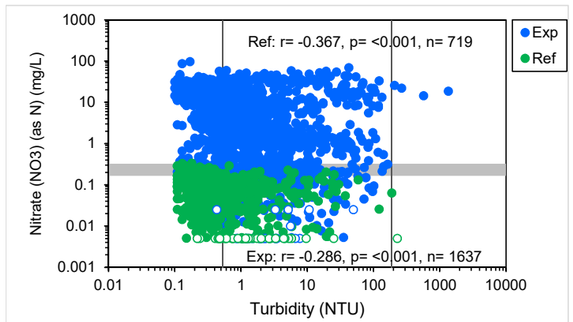


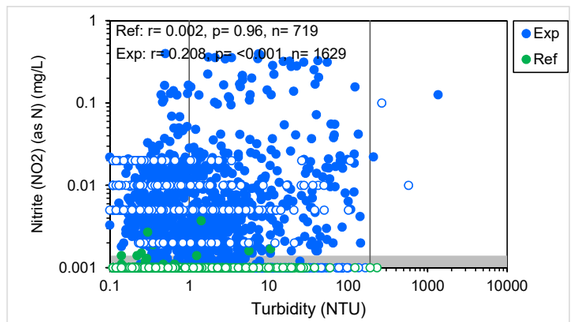


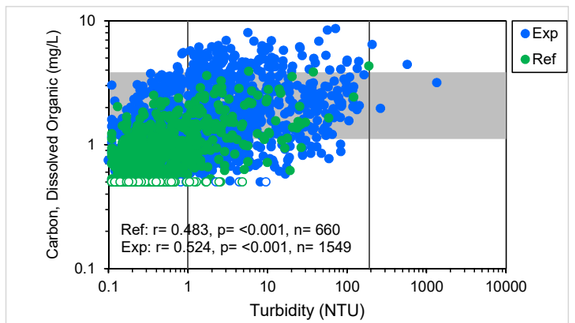












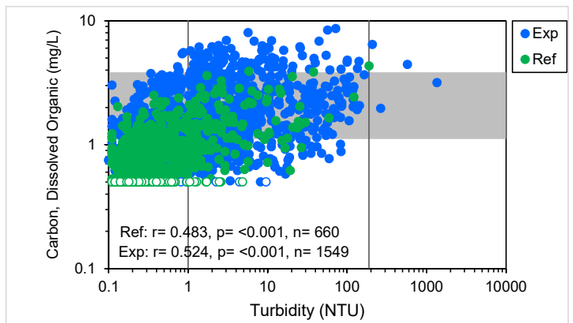
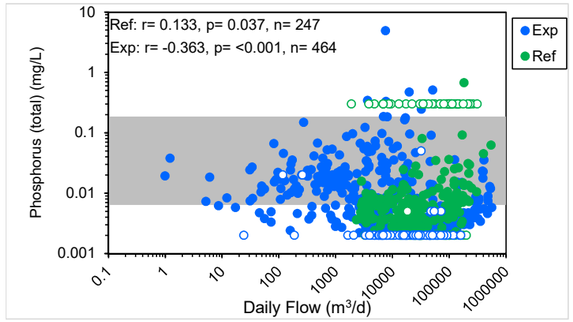
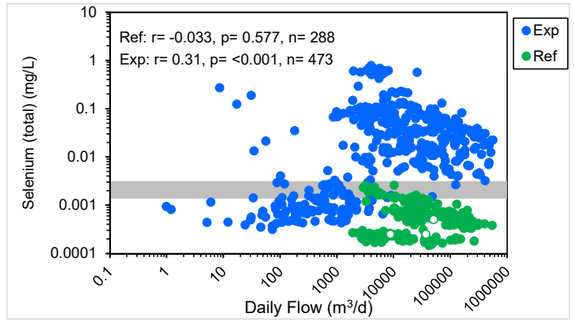
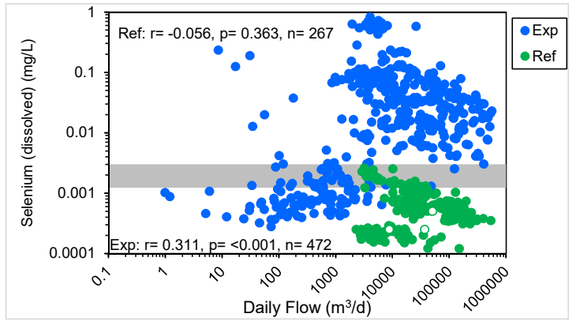


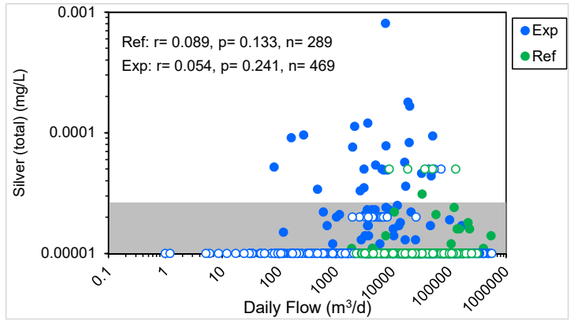
Figure C.5: Relationships and Spearman Correlations of Analytes with Daily Flow Rates, Total Suspended Solids, or Turbidity

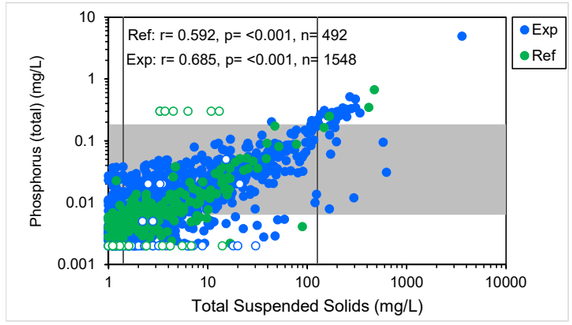
Note: open symbols indicate data below the laboratory reporting limit (LRL). For x-axis data <LRL, the data were not shown. Flow rates of zero were not included. Vertical and horizontal lines indicate the range of upper (97.5th percentile) monthly normal ranges. Analytes that correlated strongly with TSS or turbidity, and all constituents having a water quality guideline, are presented.

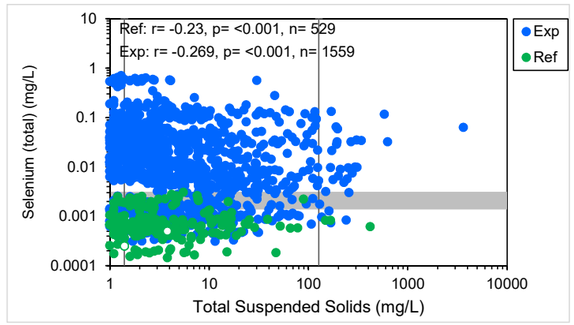


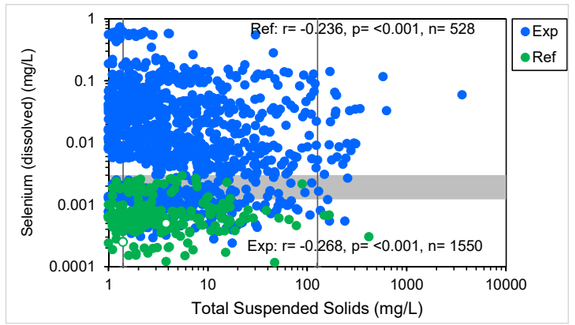


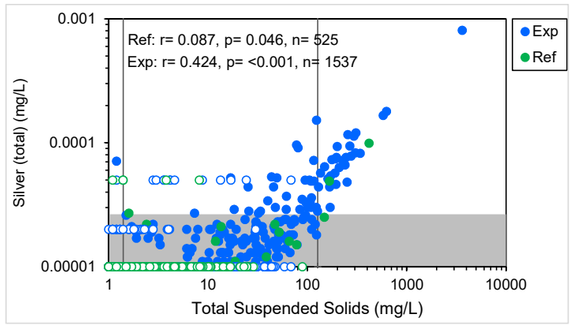


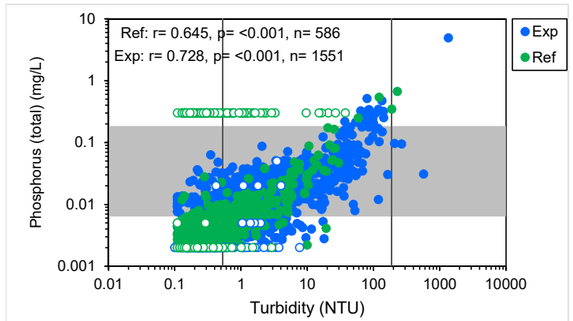


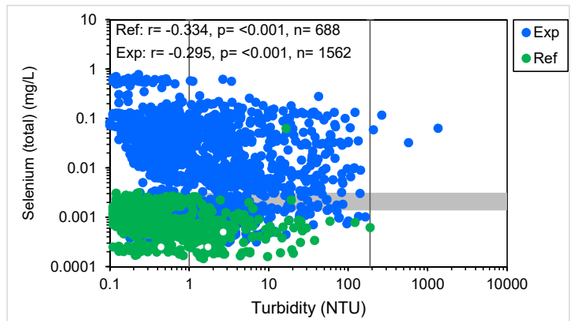


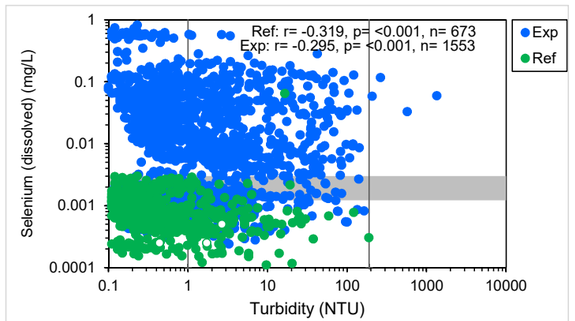












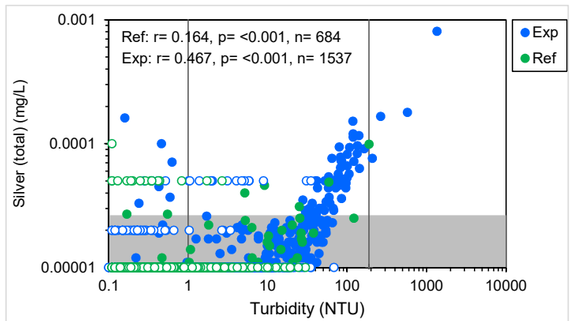
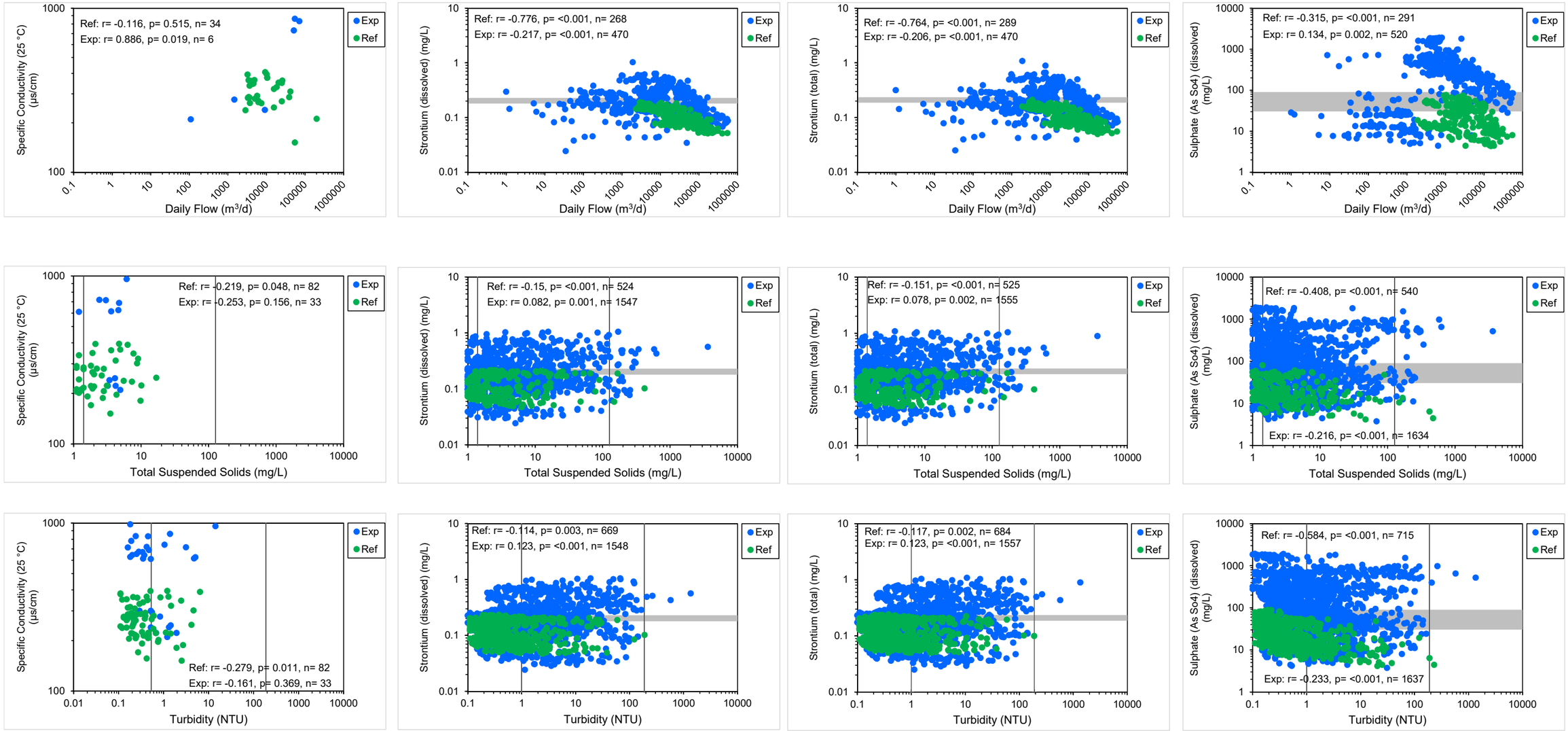


Figure C.5: Relationships and Spearman Correlations of Analytes with Daily Flow Rates, Total Suspended Solids, or Turbidity

Note: open symbols indicate data below the laboratory reporting limit (LRL). For x-axis data <LRL, the data were not shown. Flow rates of zero were not included. Vertical and horizontal lines indicate the range of upper (97.5th percentile) monthly normal ranges. Analytes that correlated strongly with TSS or turbidity, and all constituents having a water quality guideline, are presented.



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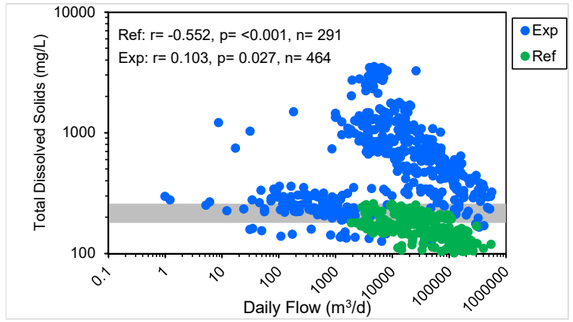
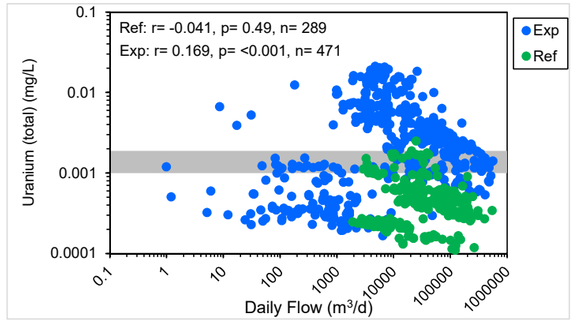
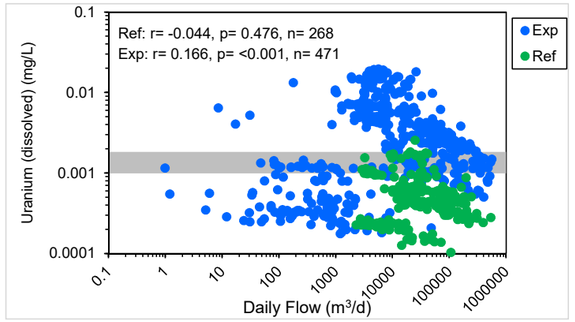
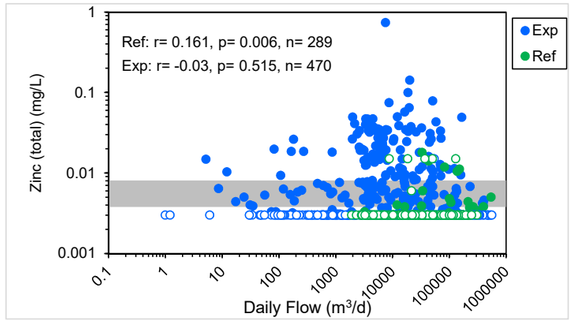
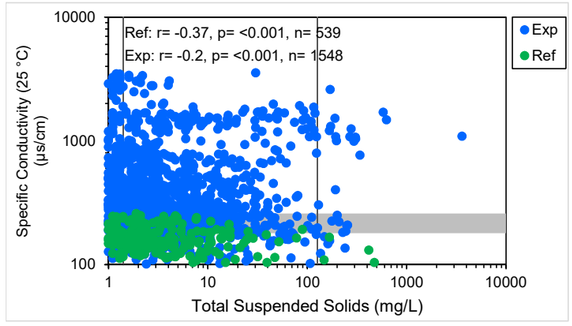
Note: open symbols indicate data below the laboratory reporting limit (LRL). For x-axis data <LRL, the data were not shown. Flow rates of zero were not included. Vertical and horizontal lines indicate the range of upper (97.5th percentile) monthly normal ranges. Analytes that correlated strongly with TSS or turbidity, and all constituents having a water quality guideline, are presented.

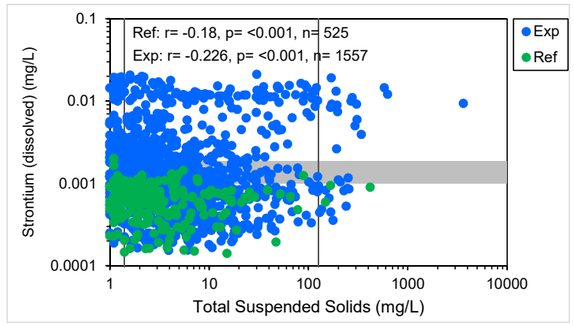


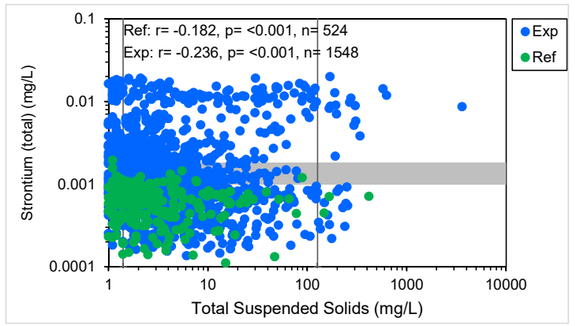


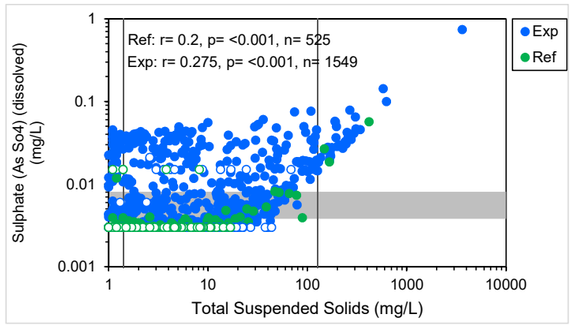


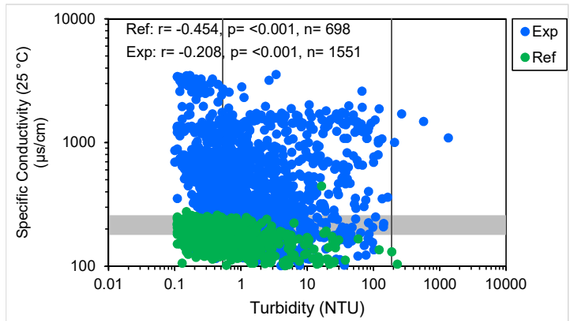


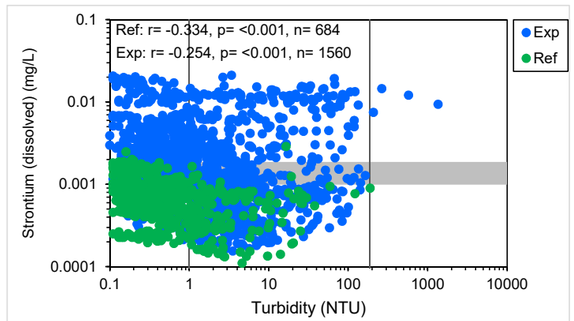


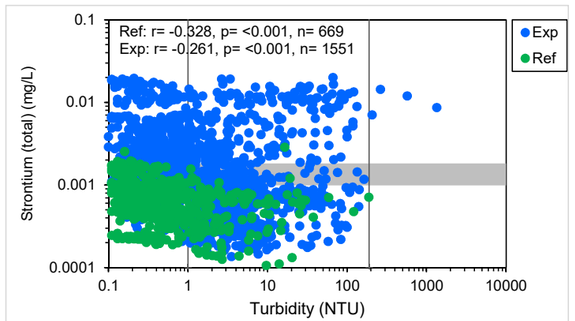












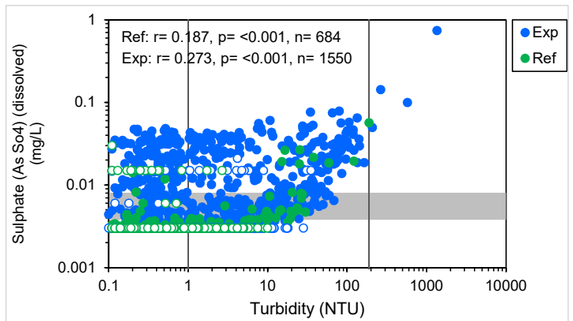


Figure C.5: Relationships and Spearman Correlations of Analytes with Daily Flow Rates, Total Suspended Solids, or Turbidity

Note: open symbols indicate data below the laboratory reporting limit (LRL). For x-axis data <LRL, the data were not shown. Flow rates of zero were not included. Vertical and horizontal lines indicate the range of upper (97.5th percentile) monthly normal ranges. Analytes that correlated strongly with TSS or turbidity, and all constituents having a water quality guideline, are presented.

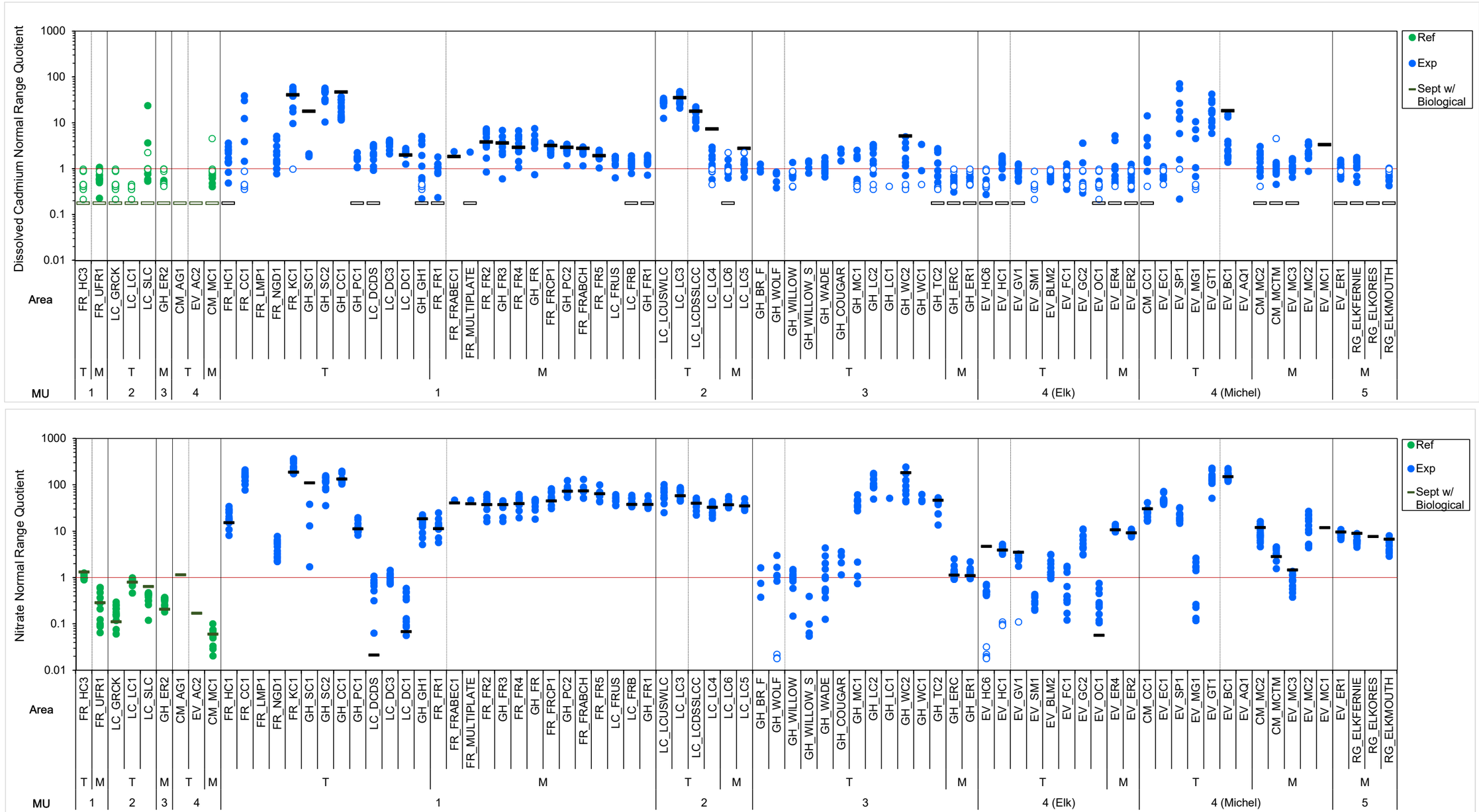
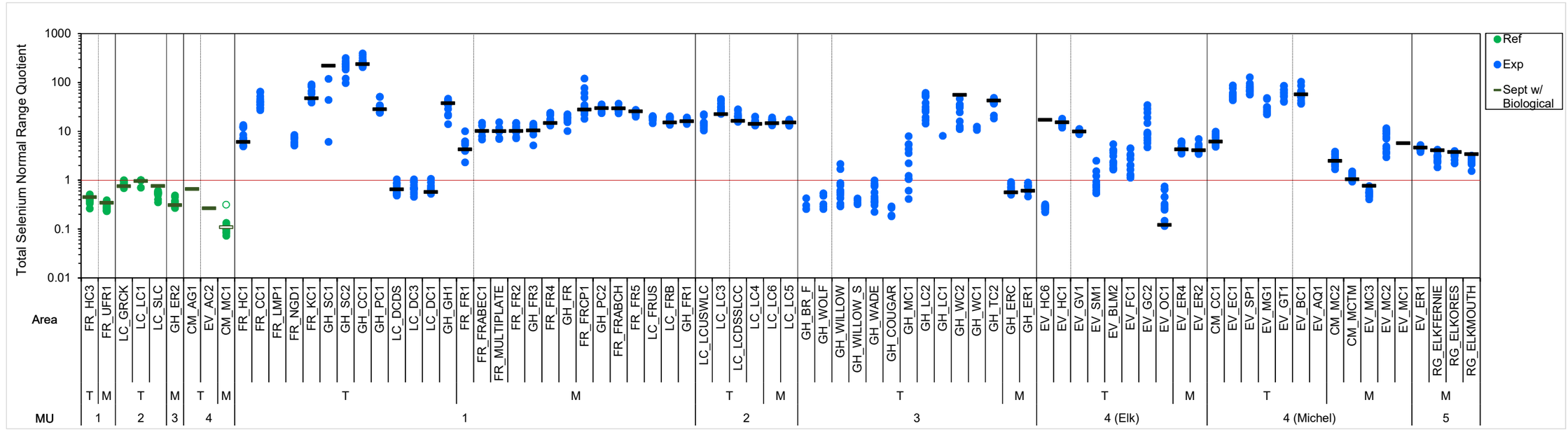
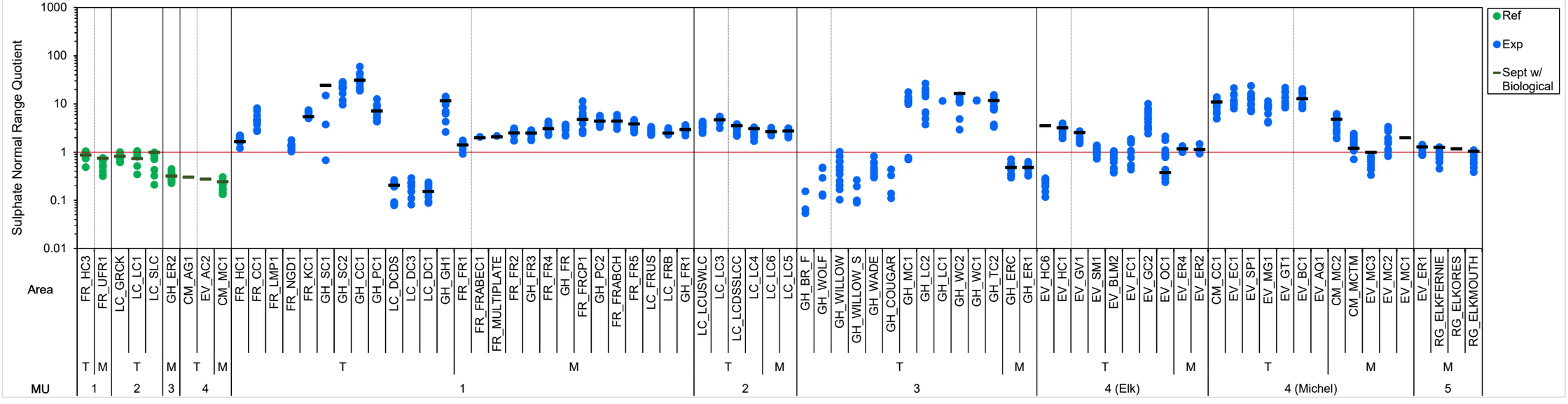


Figure C.6: Normal Range Quotients for Monthly Mean Aqueous Dissolved Cadmium, Nitrate-N, Total Selenium and Sulphate Concentrations in 2015 versus Concentrations in Grab Samples Collected from Lotic Areas Concurrently with Biological Samples in September 2015

Note: Normal range quotients calculated with a value below the laboratory reporting limit are plotted as open symbols. M - main stem; T - tributary; MU - management unit.





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Note: Normal range quotients calculated with a value below the laboratory reporting limit are plotted as open symbols. M - main stem; T - tributary; MU - management unit.

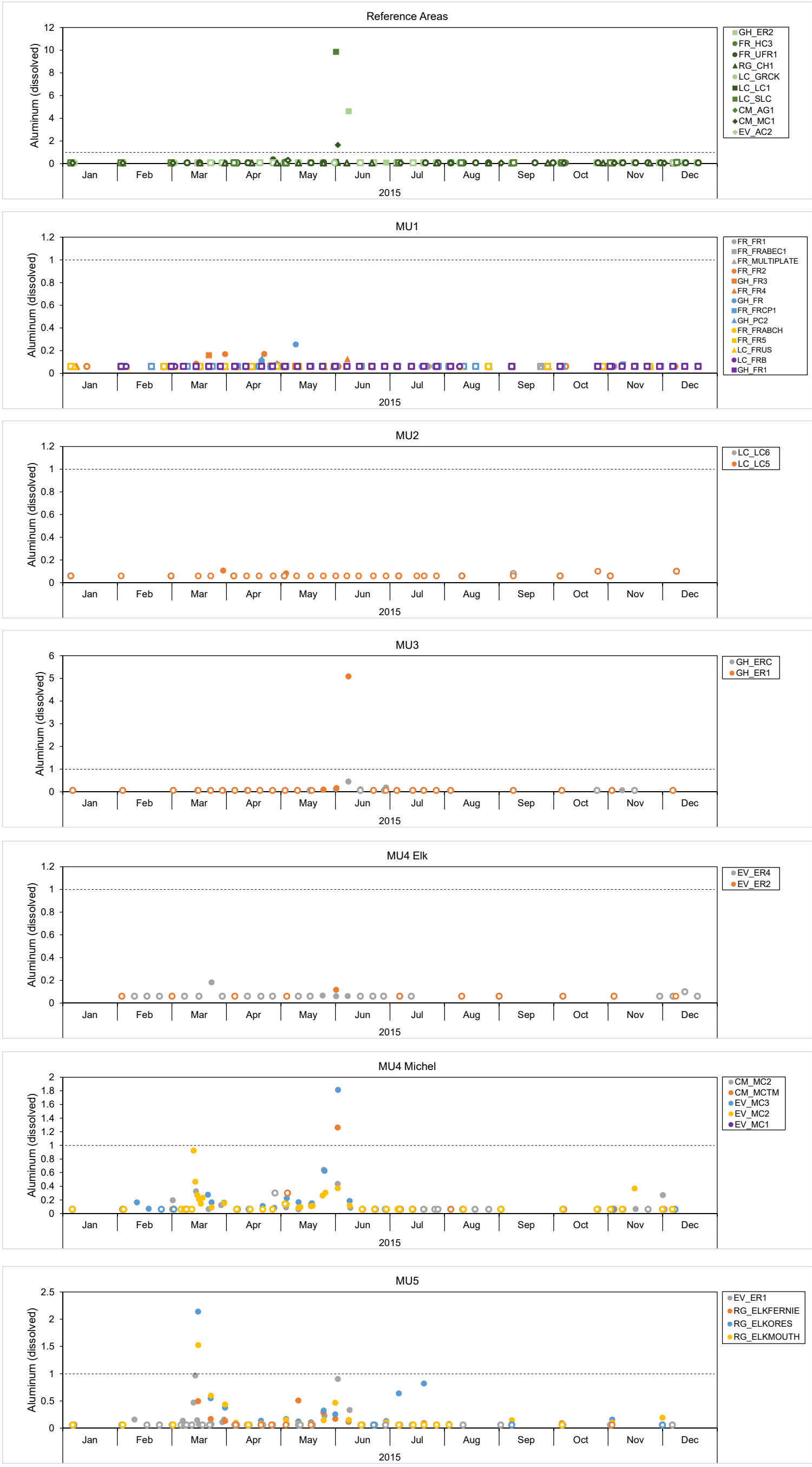


Figure C.7a: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

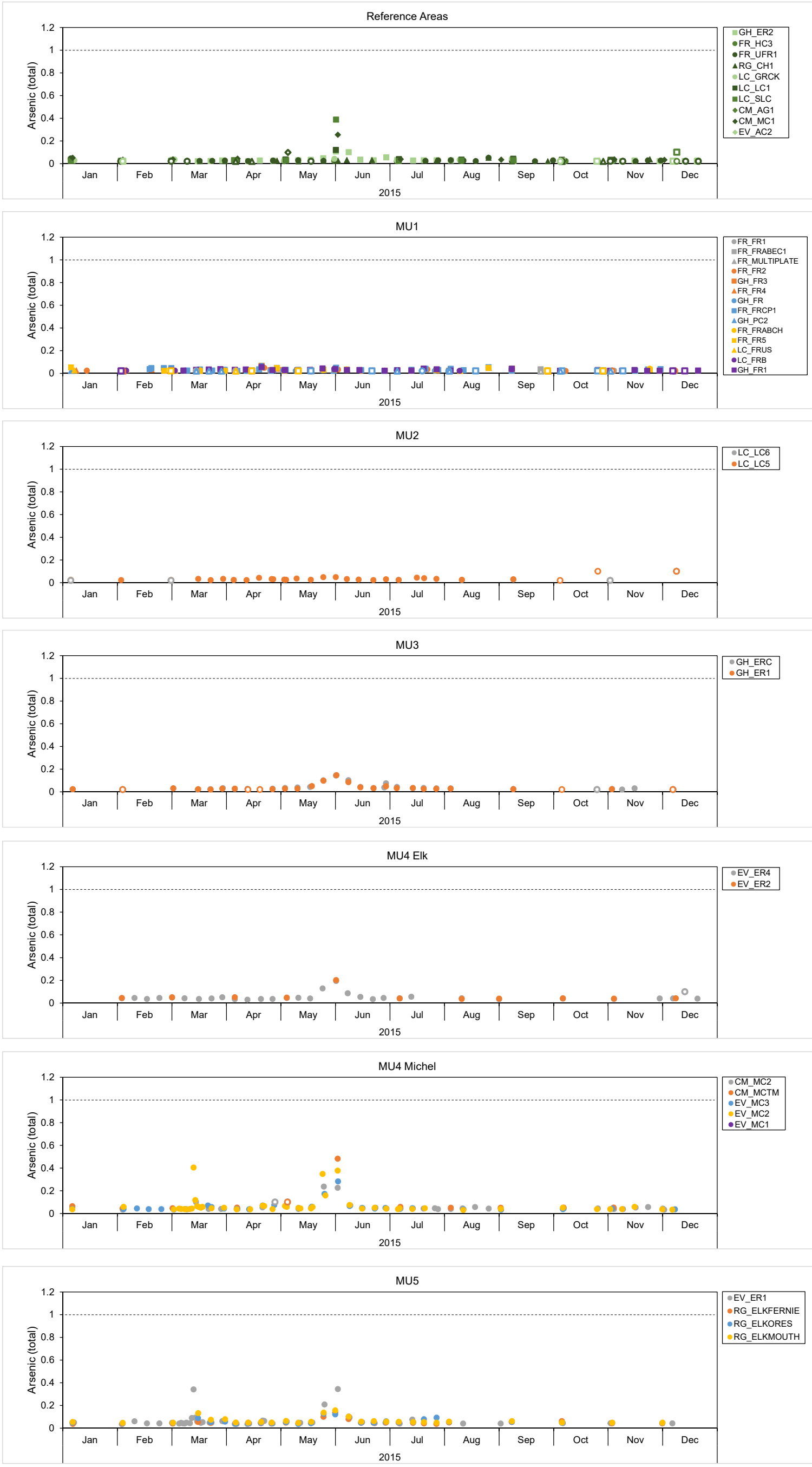
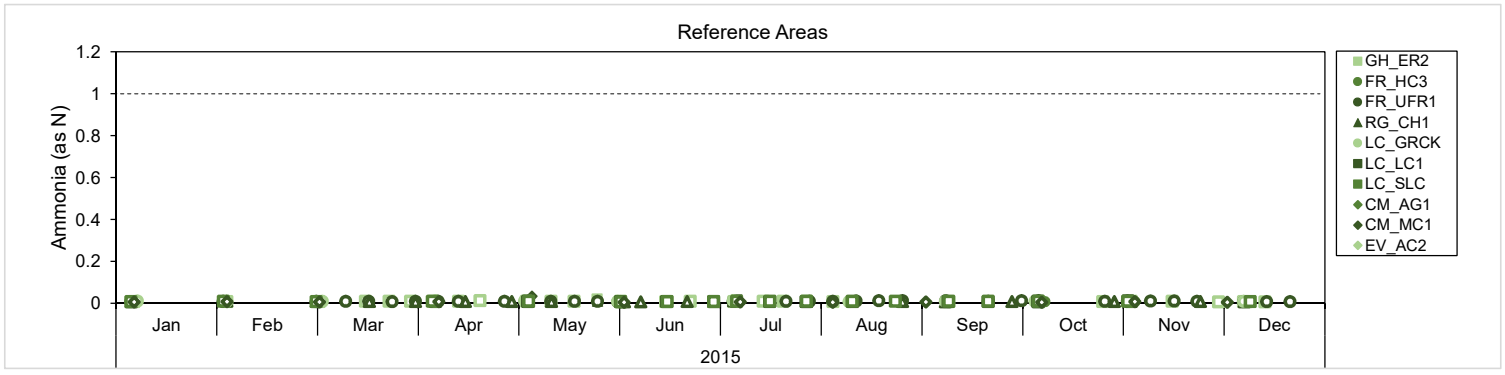
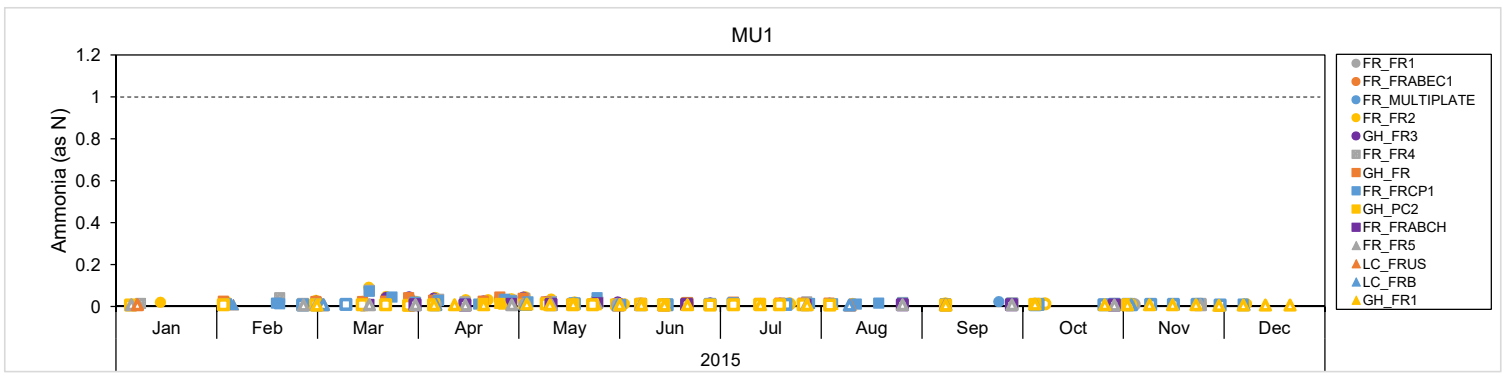
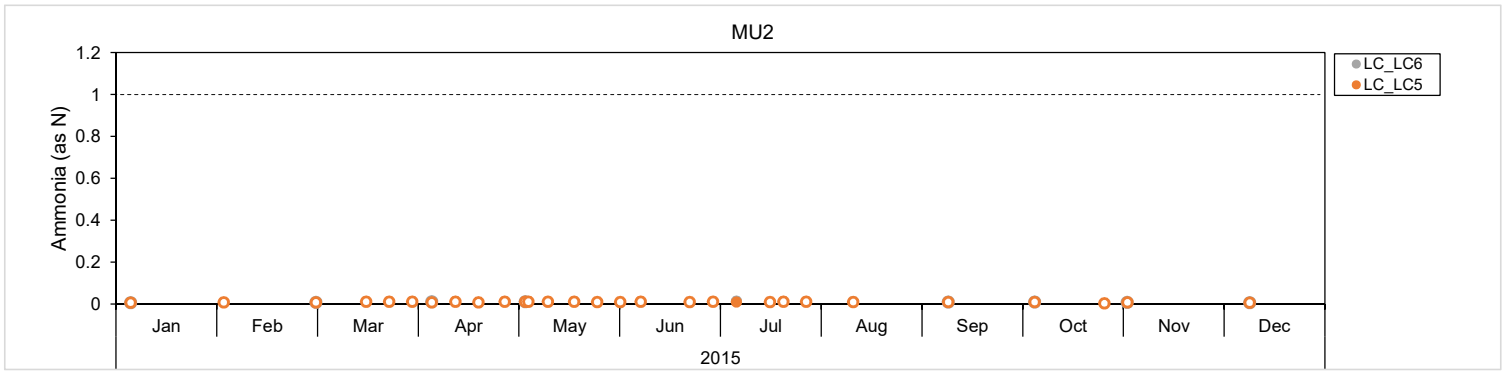


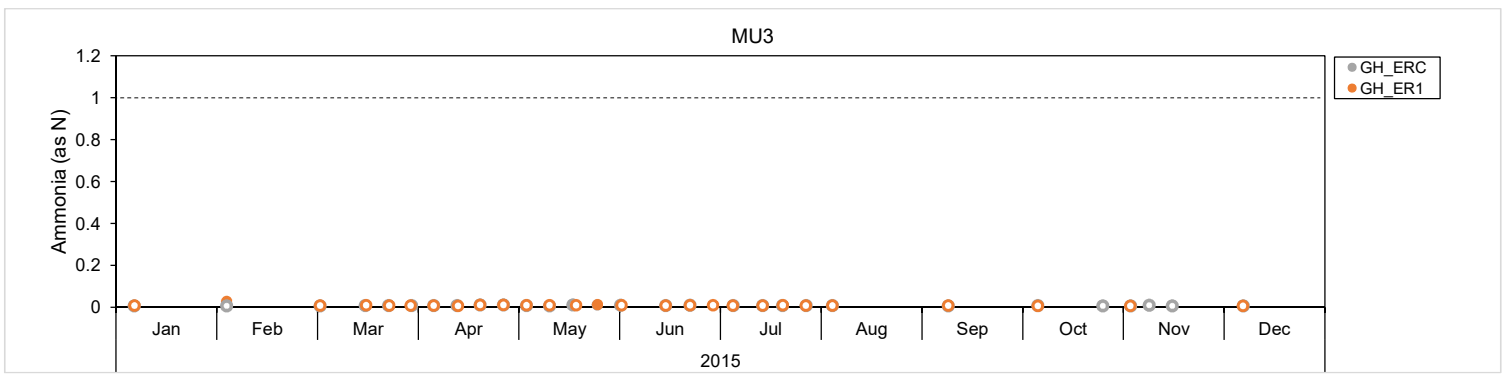
Figure C.7b: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

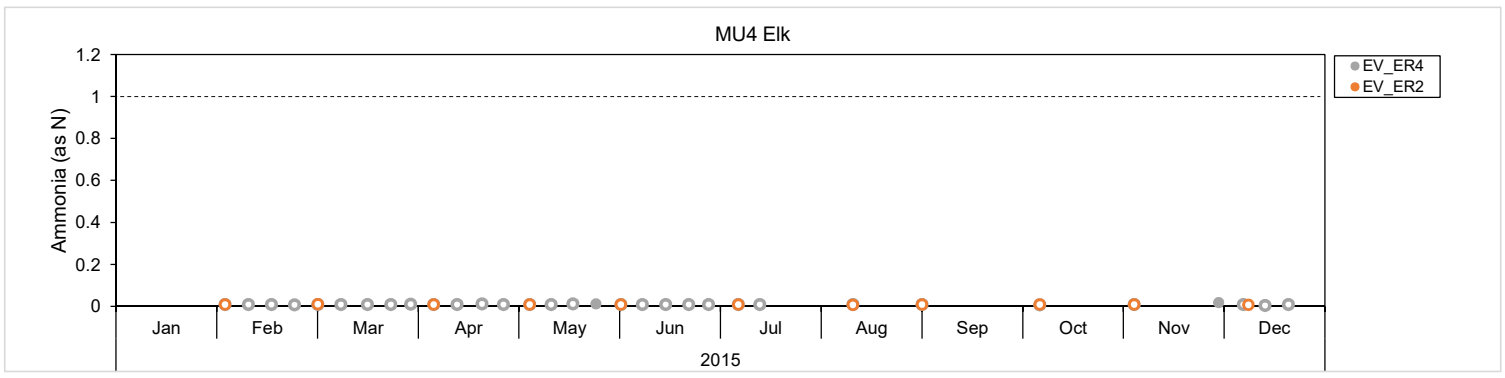
Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

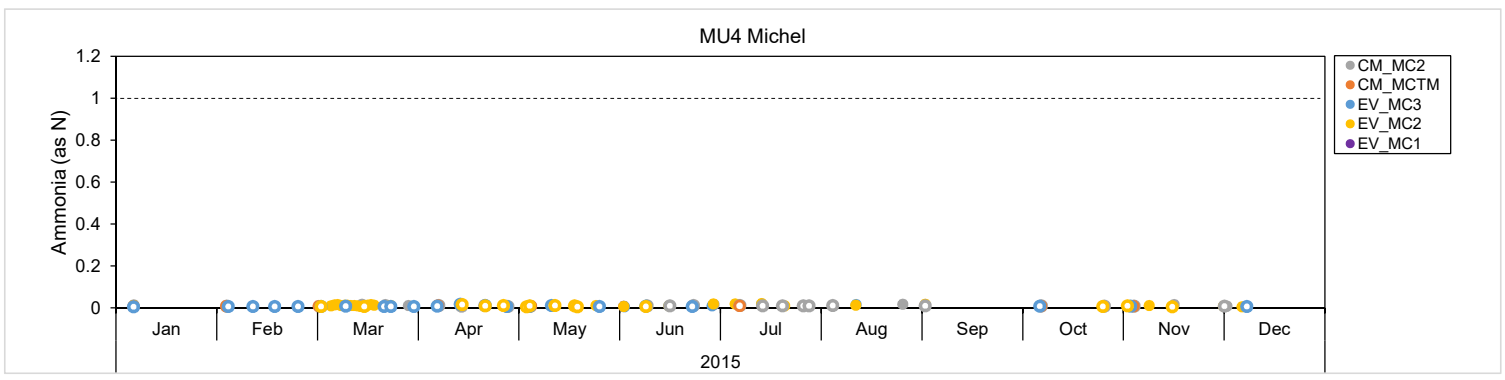












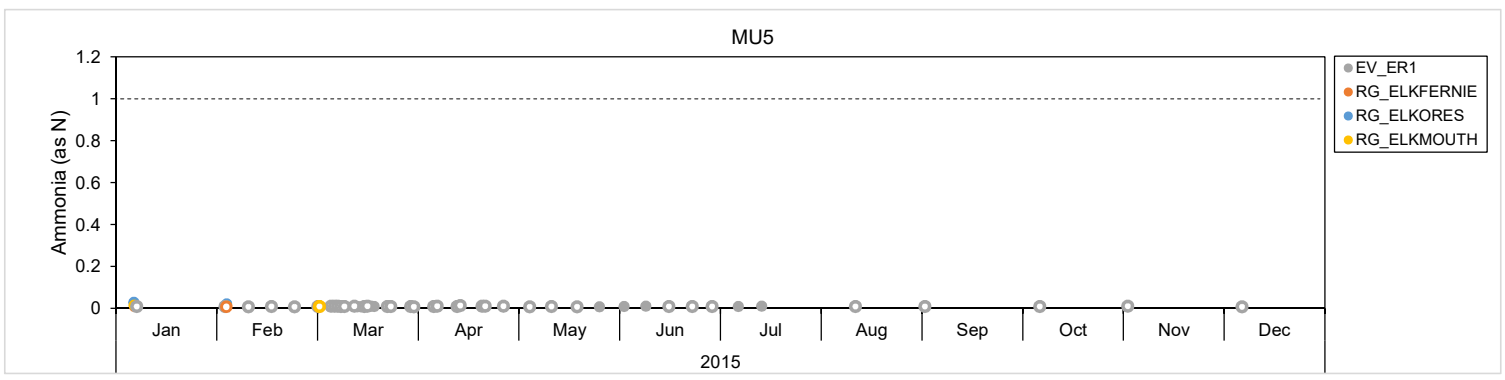


Figure C.7c: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

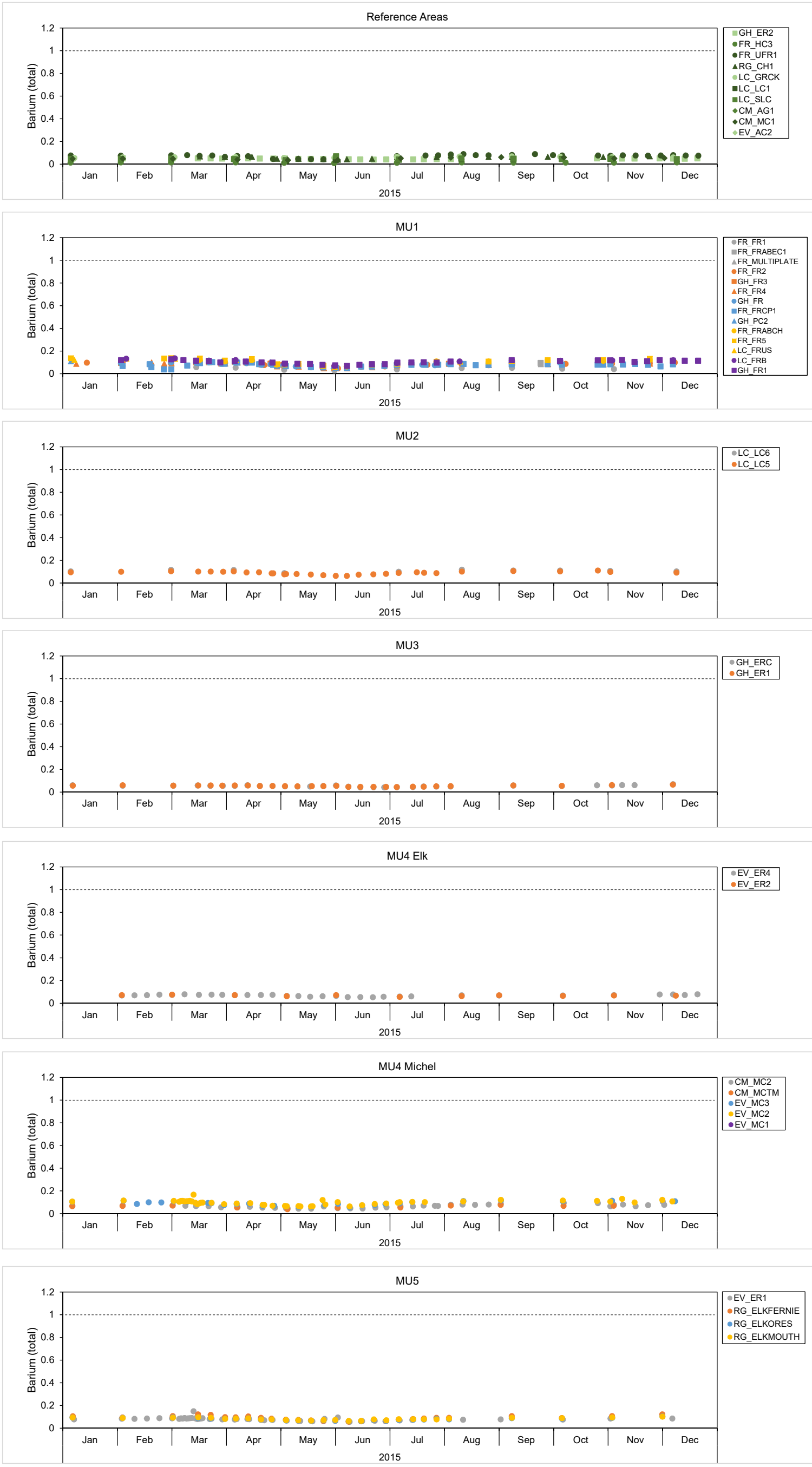


Figure C.7d: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

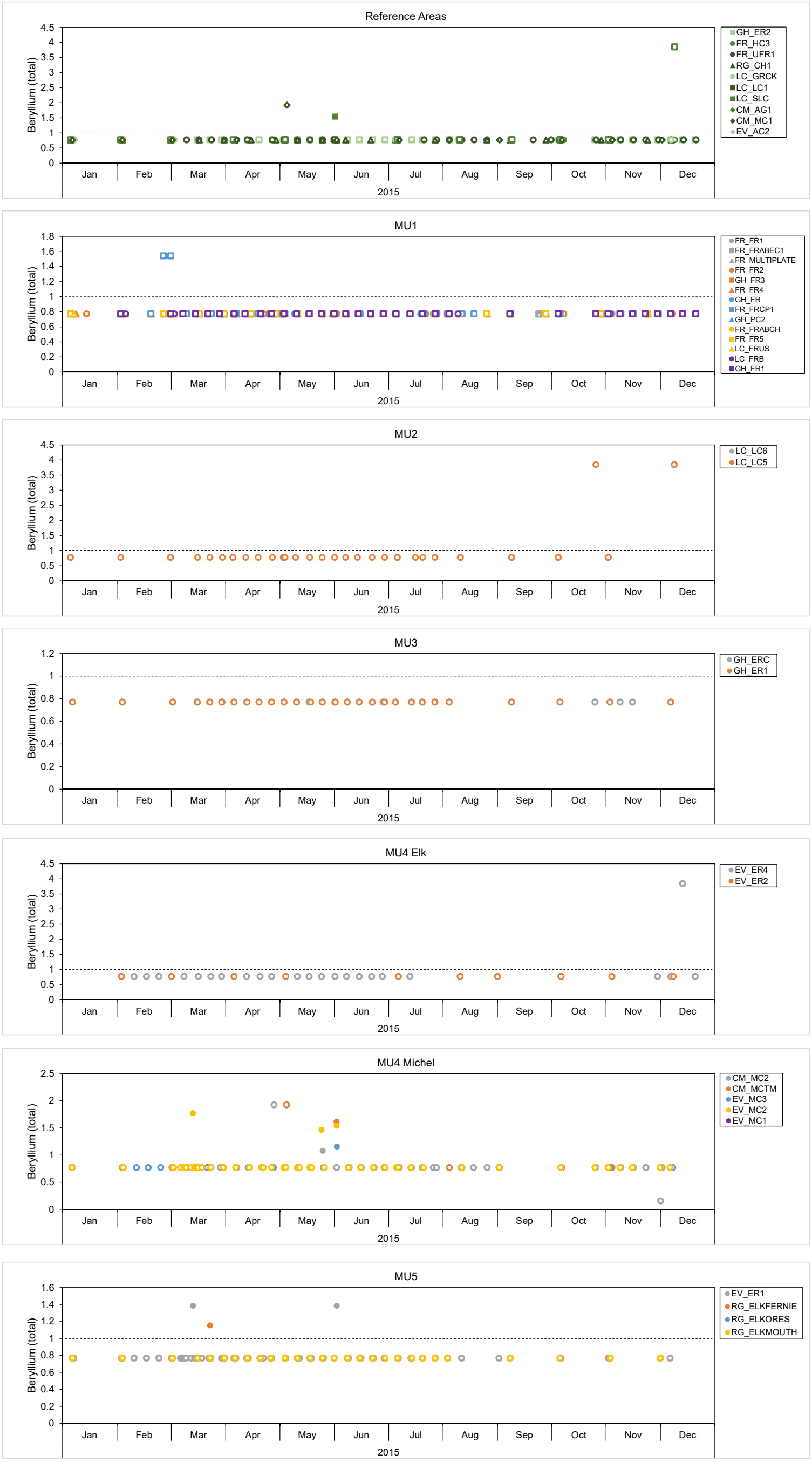


Figure C.7e: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

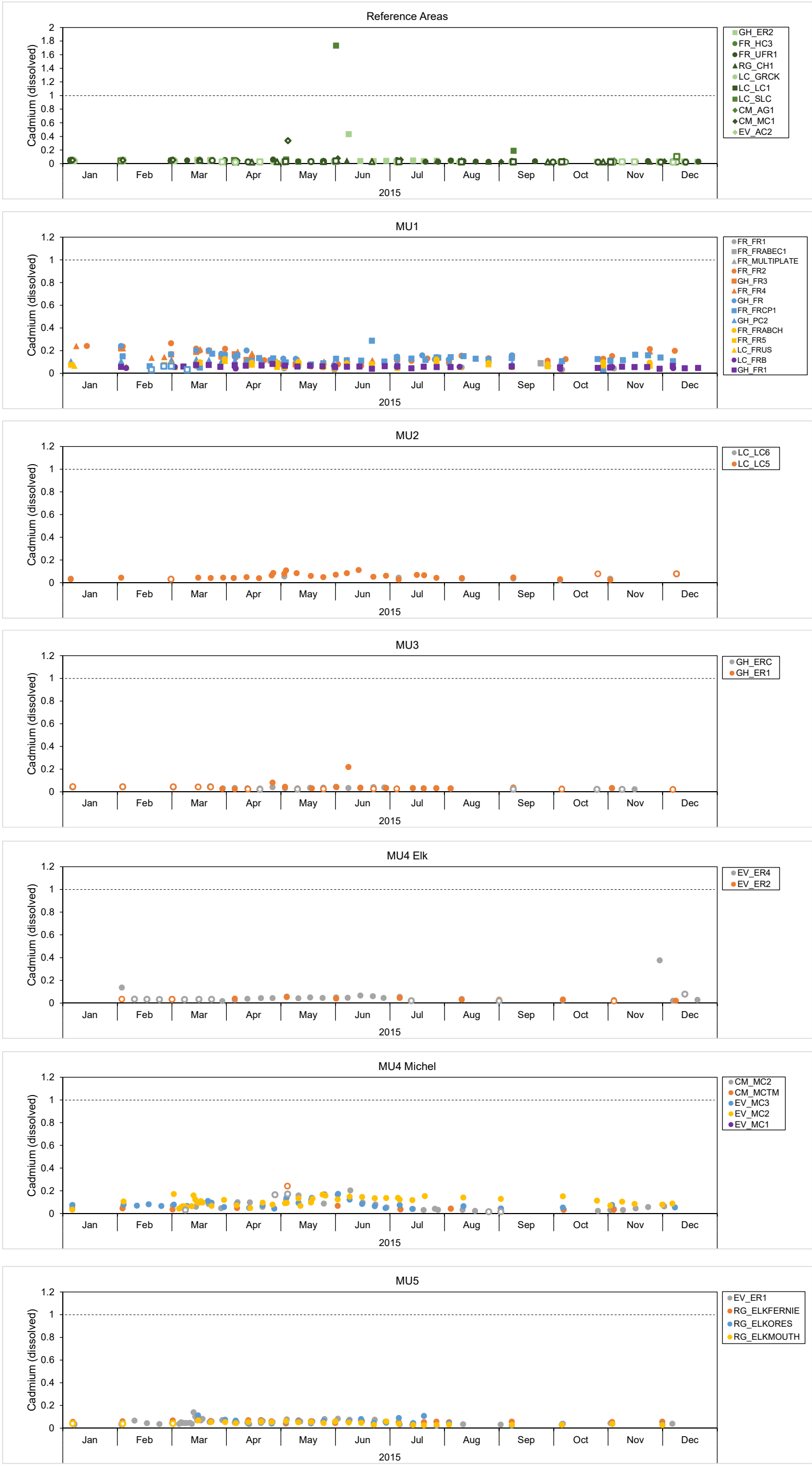
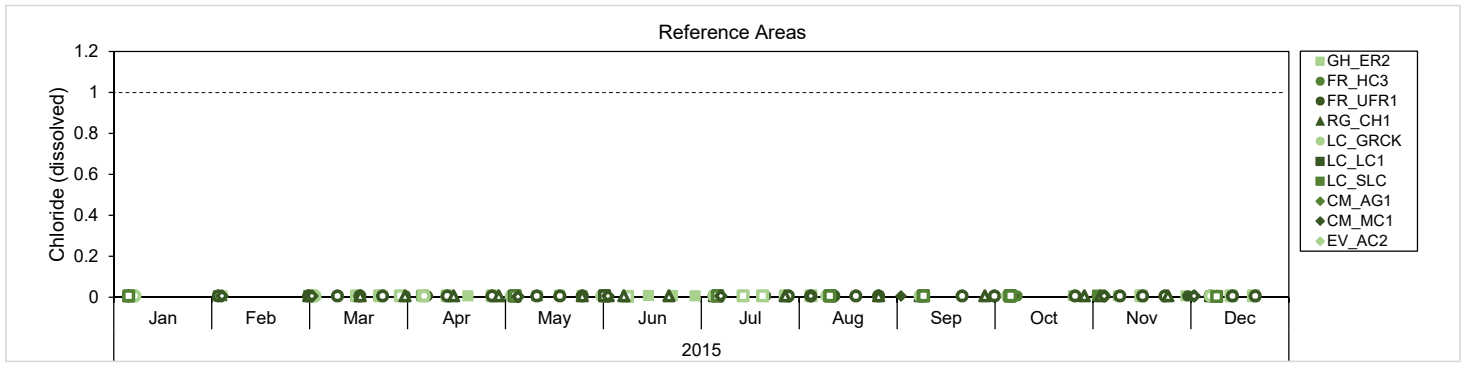
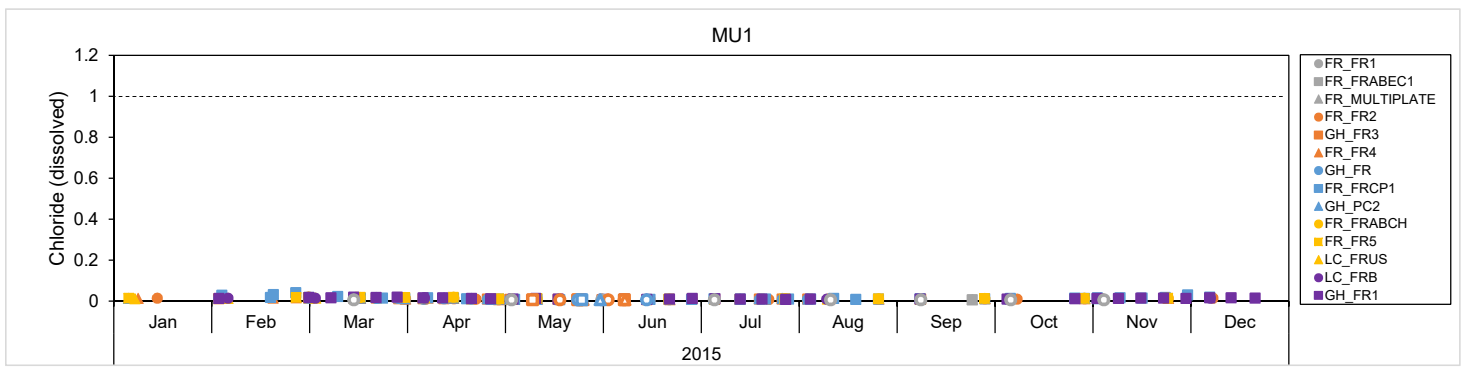
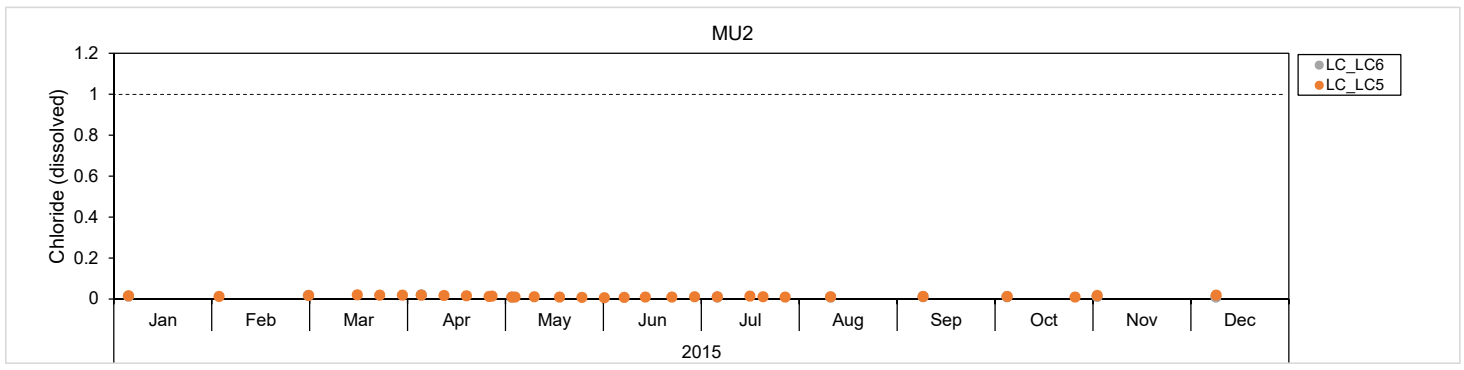


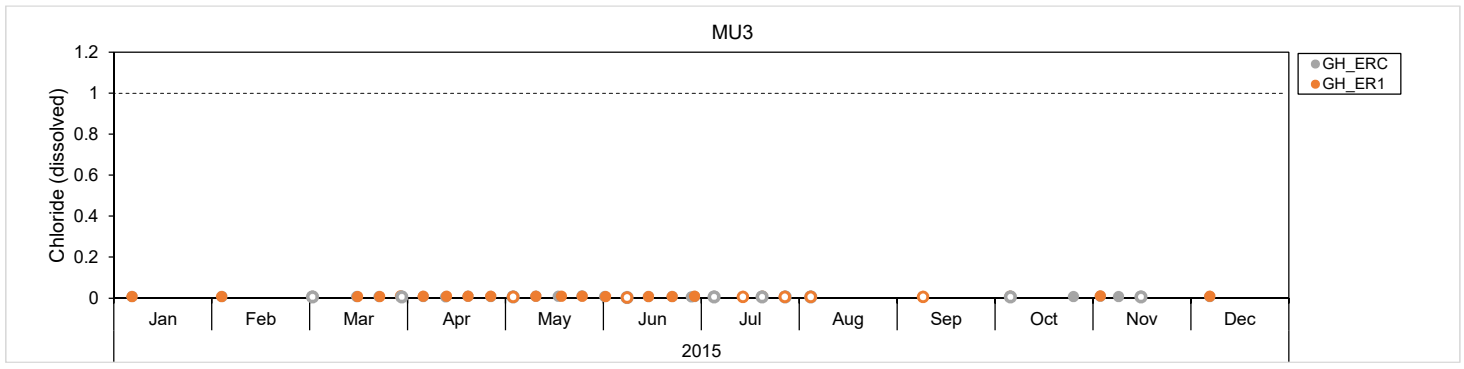
Figure C.7f: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

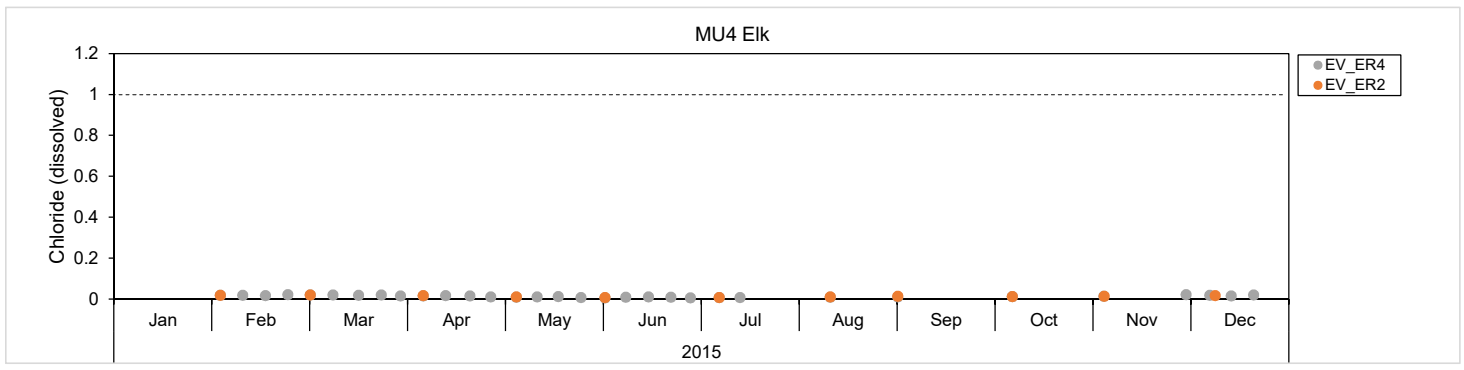
Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

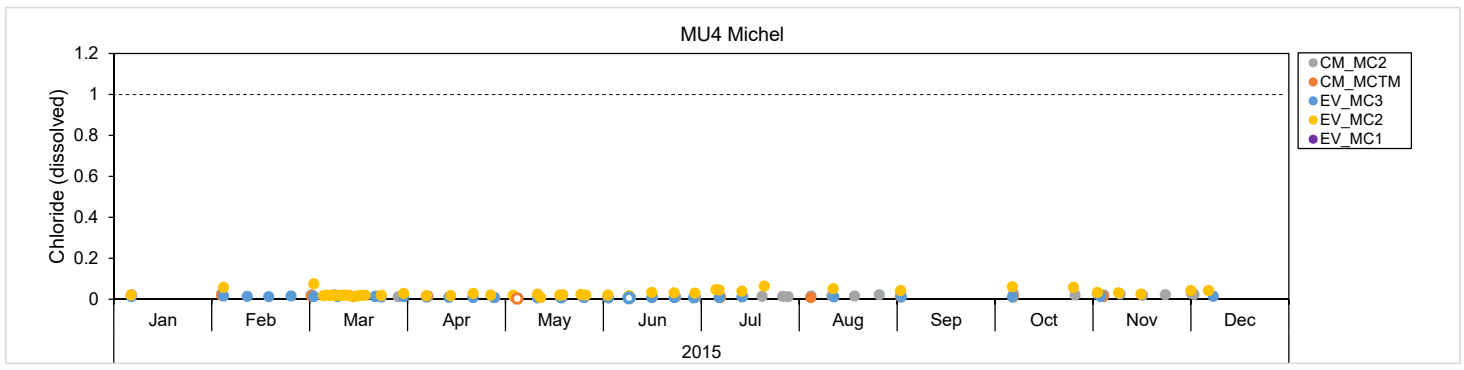












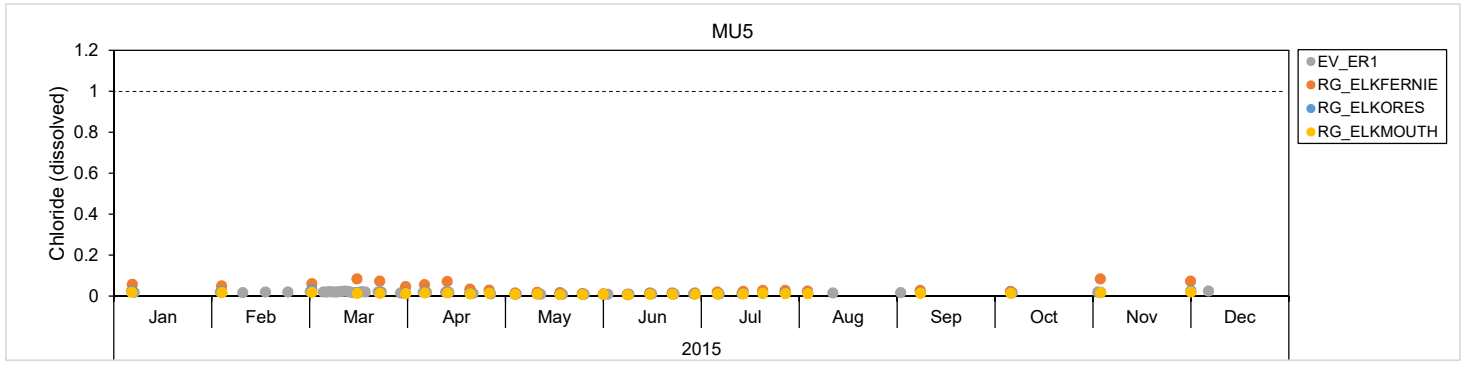


Figure C.7g: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

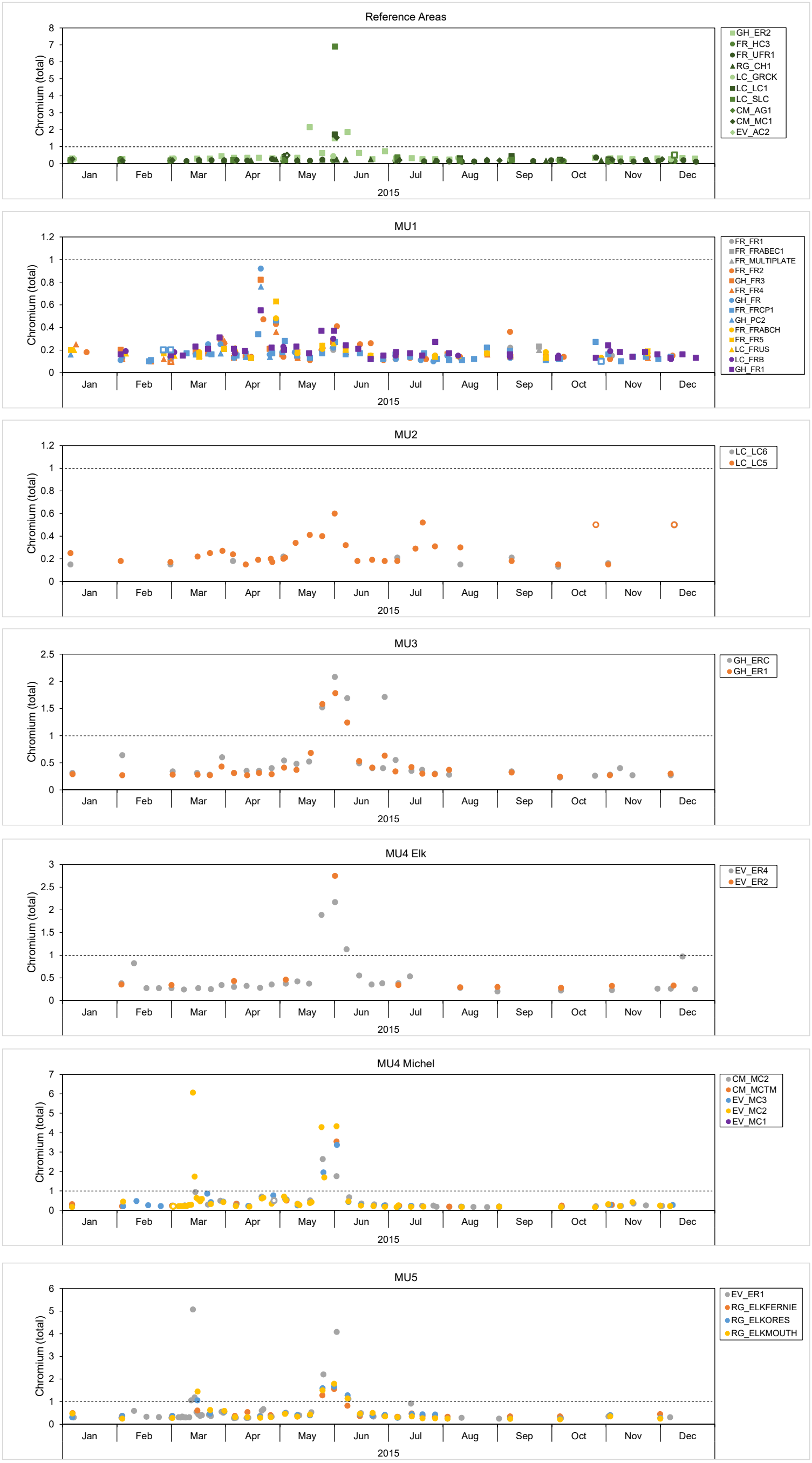


Figure C.7h: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

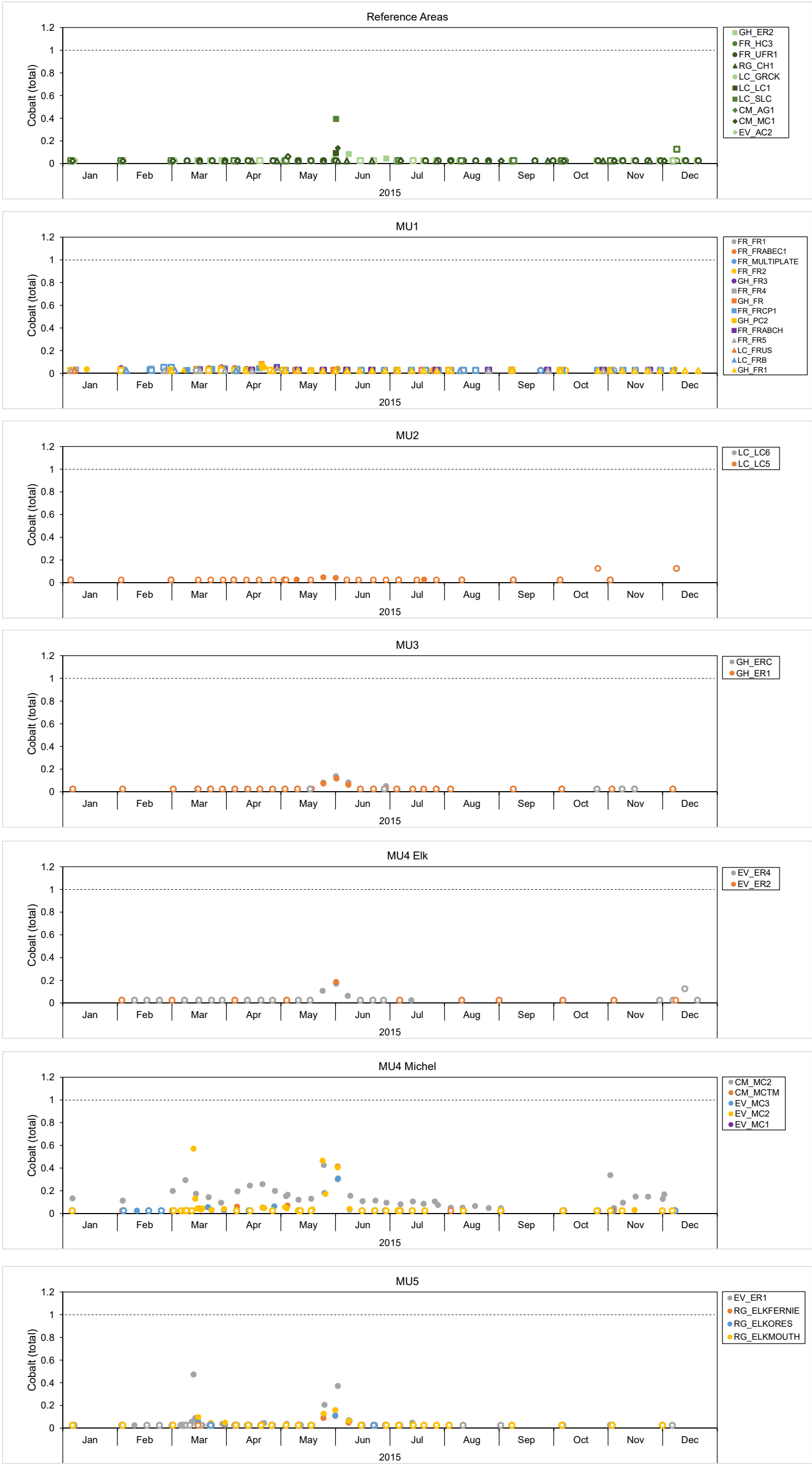


Figure C.7i: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

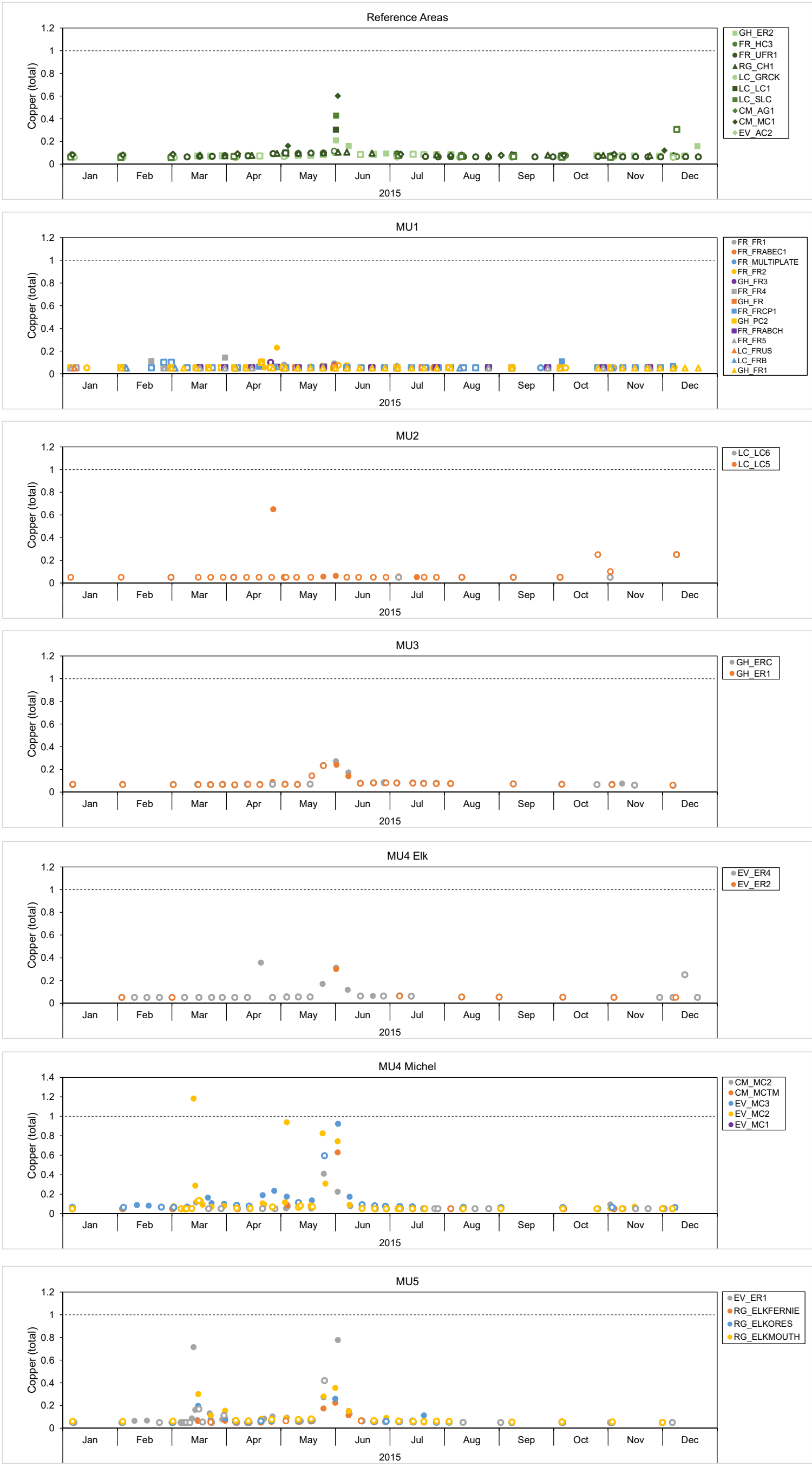


Figure C.7j: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

Figure C.7k: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

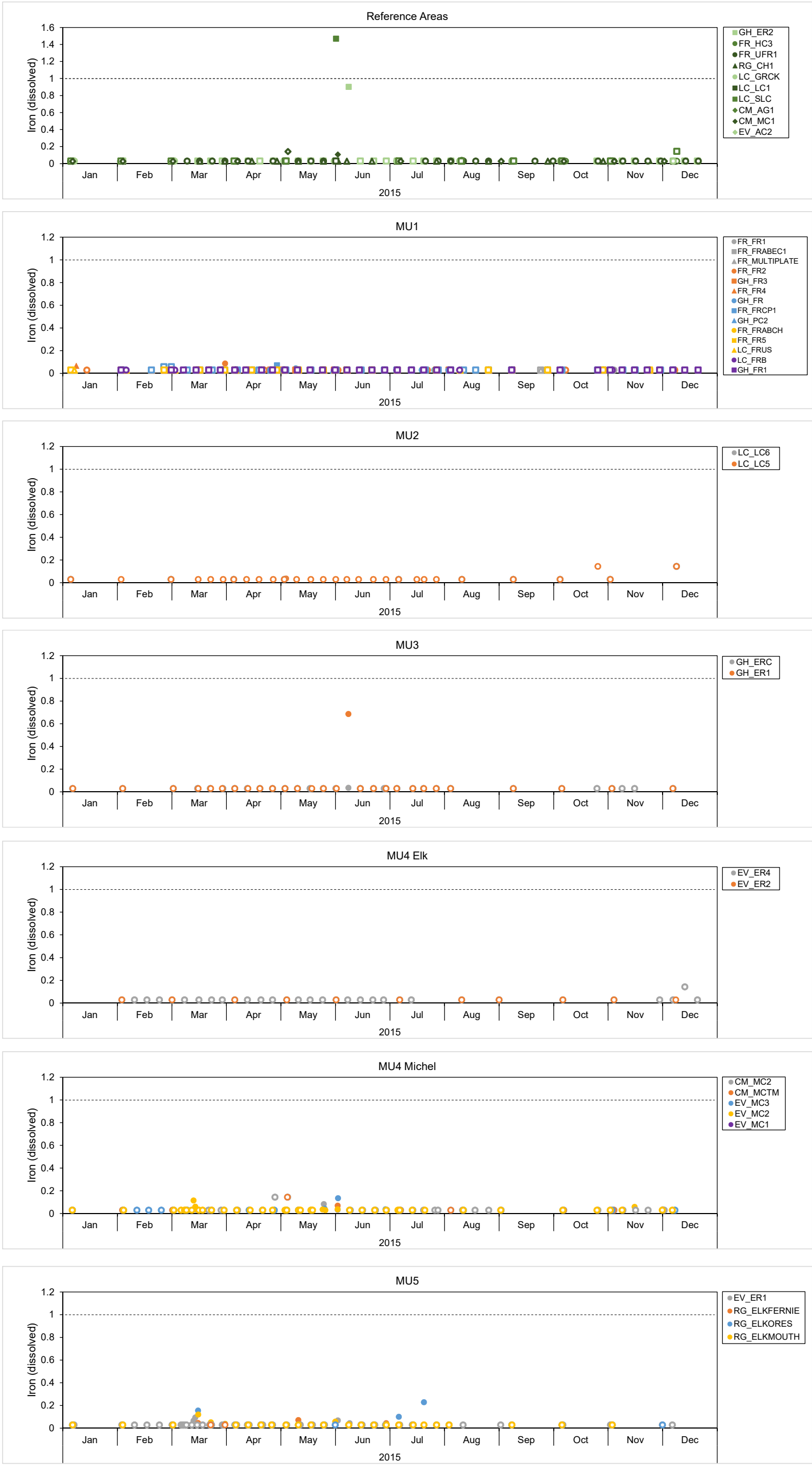


Figure C.7I: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

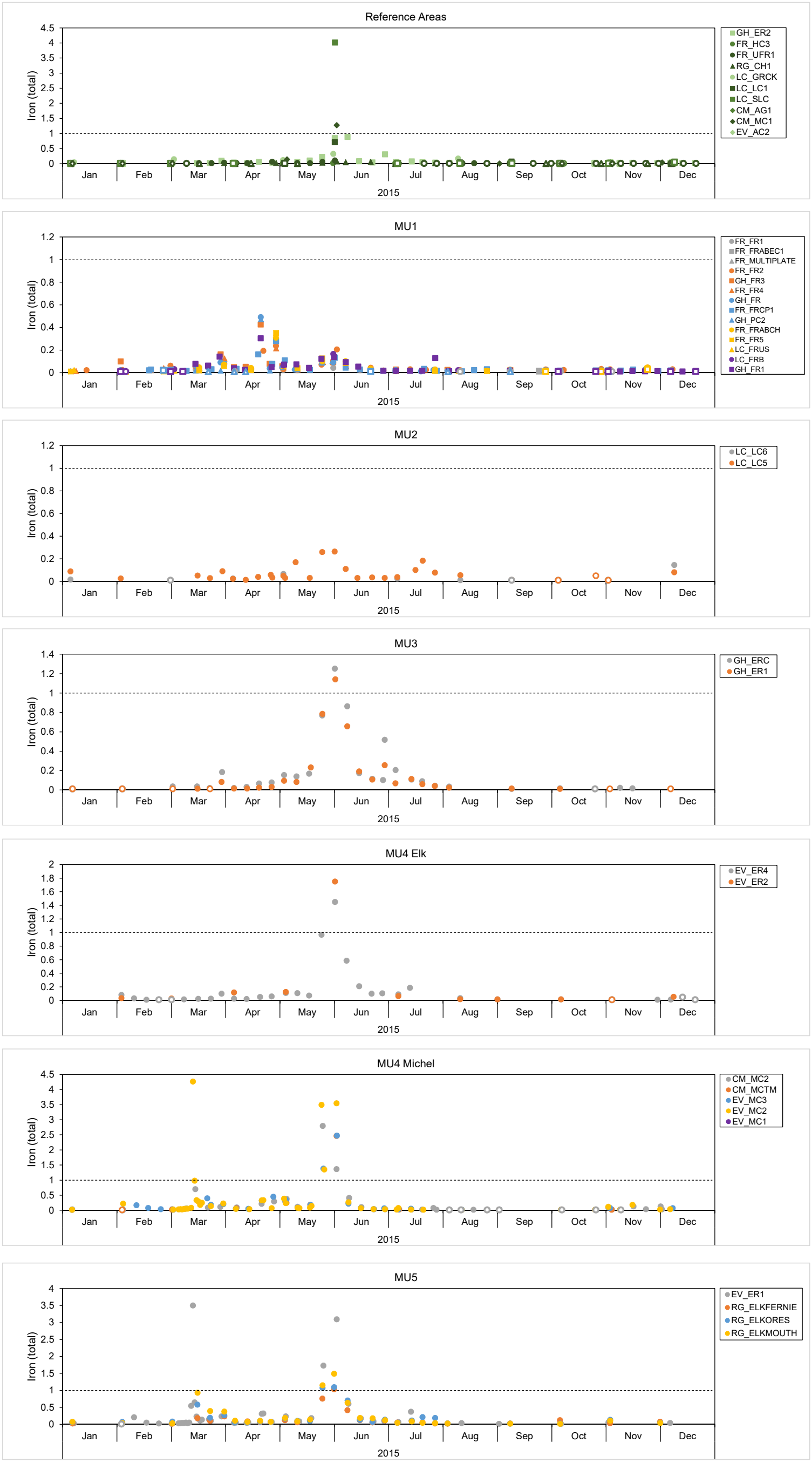


Figure C.7m: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

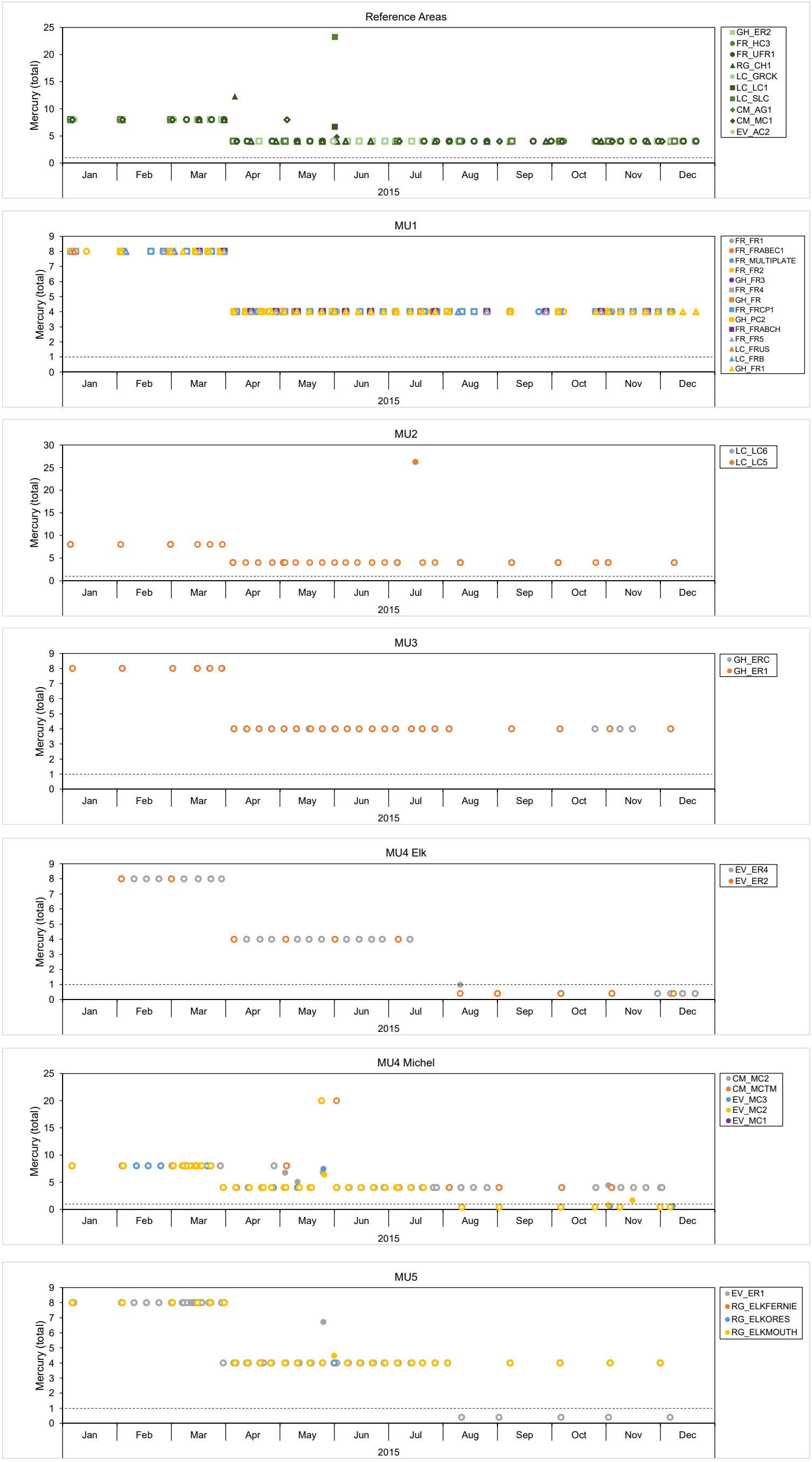


Figure C.7n: Scatterplots of Hazard Quotients for Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), sample-specific values were used to calculate the guideline. Values above the dashed line indicate concentrations observed in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

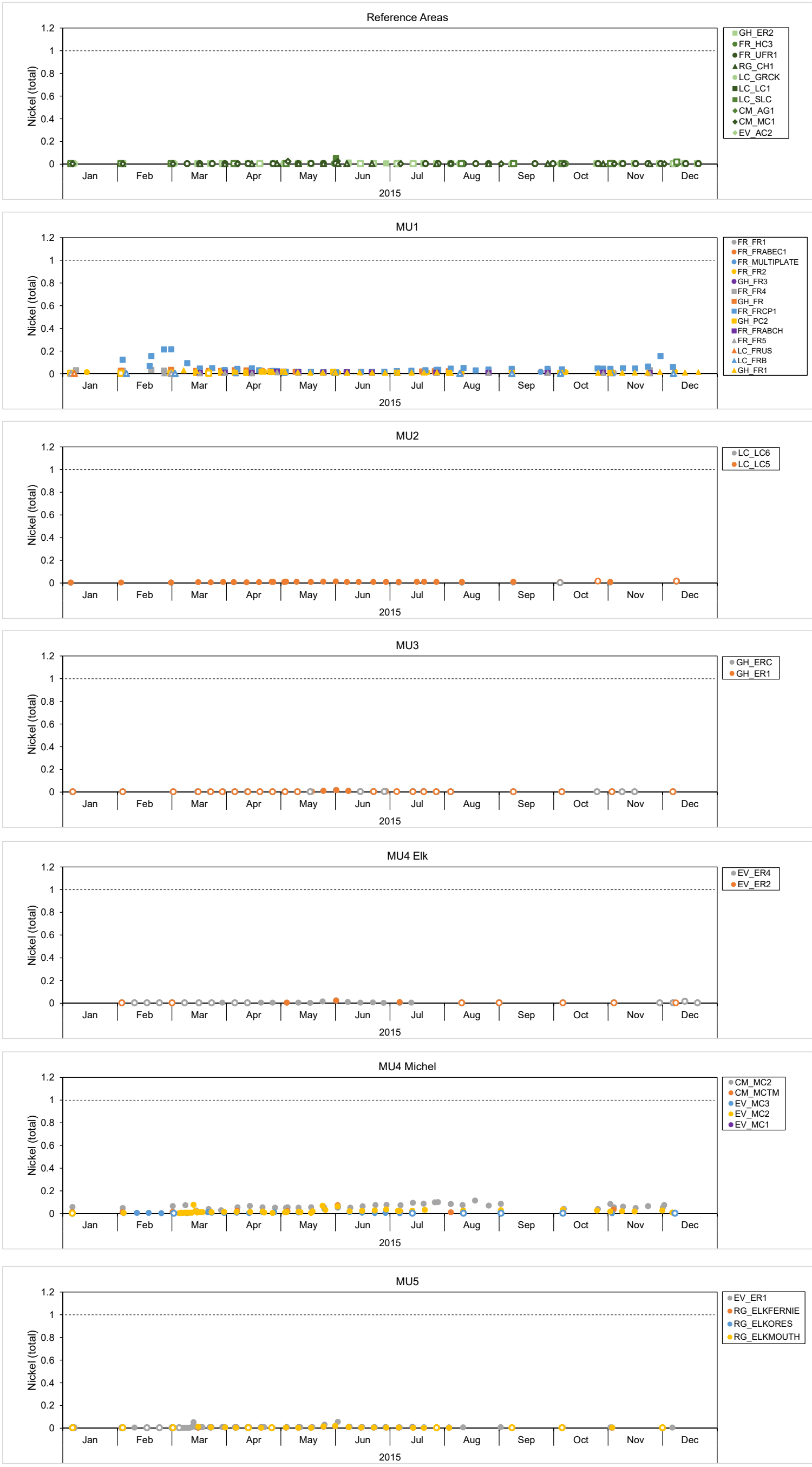


Figure C.7o: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

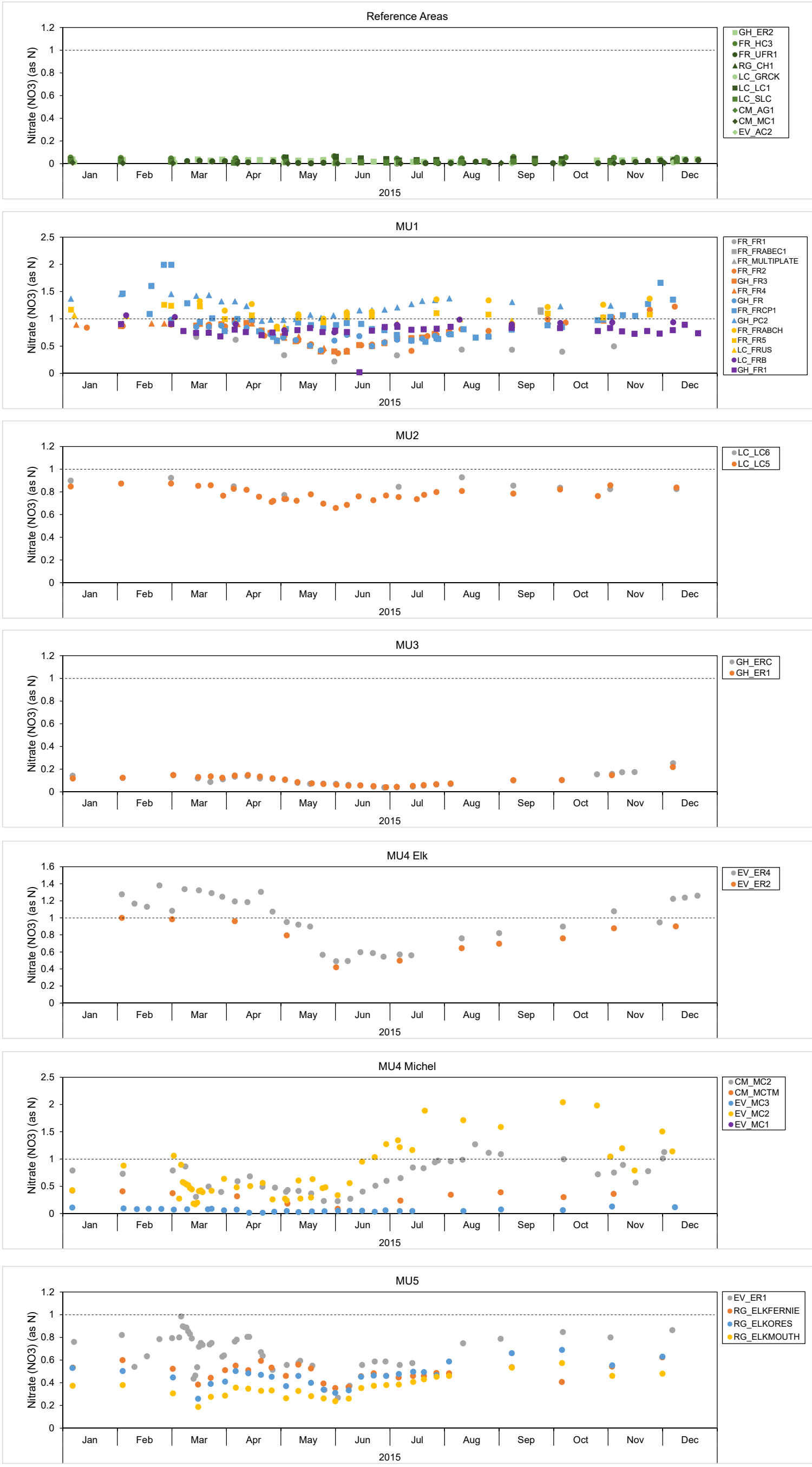


Figure C.7p: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

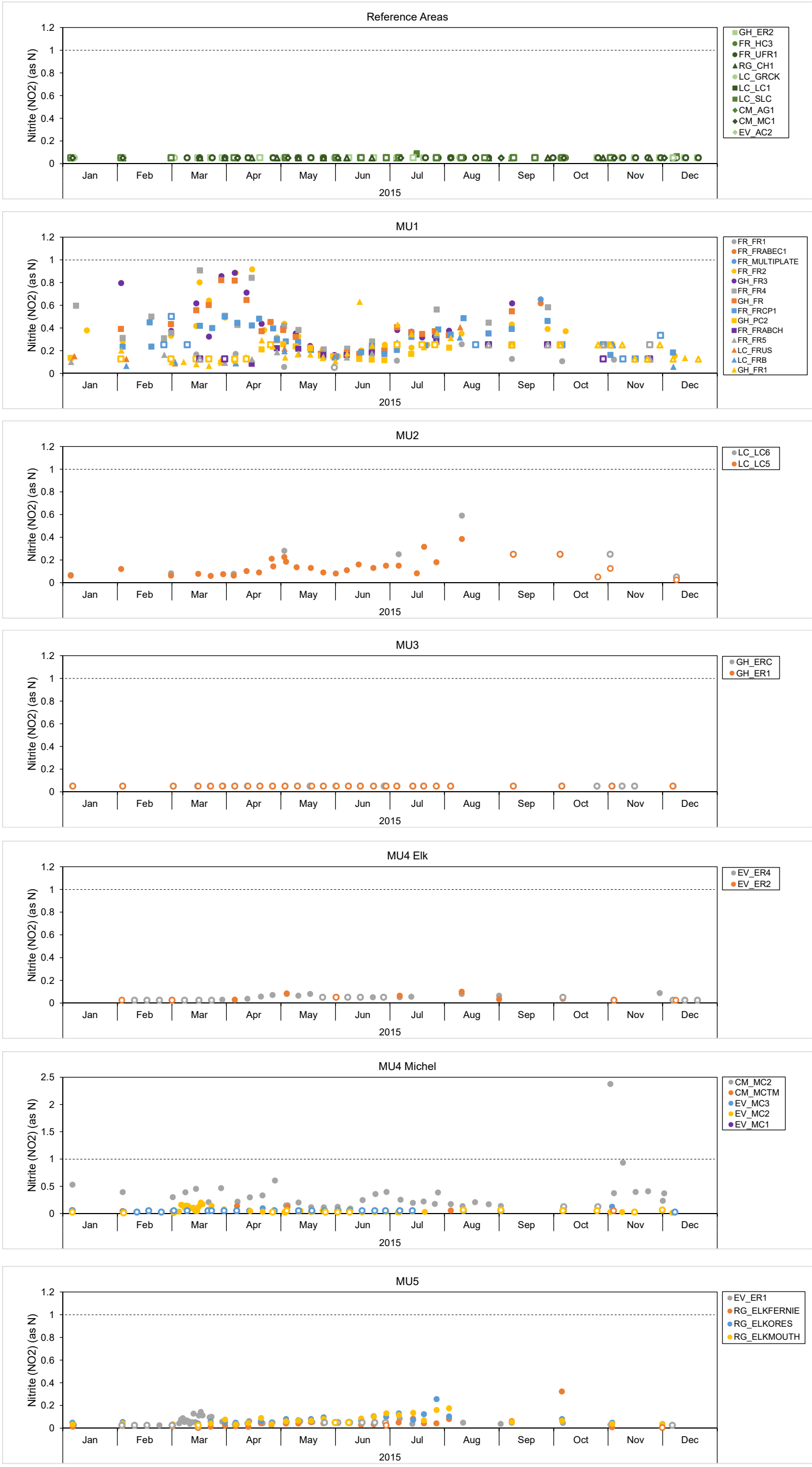


Figure C.7q: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

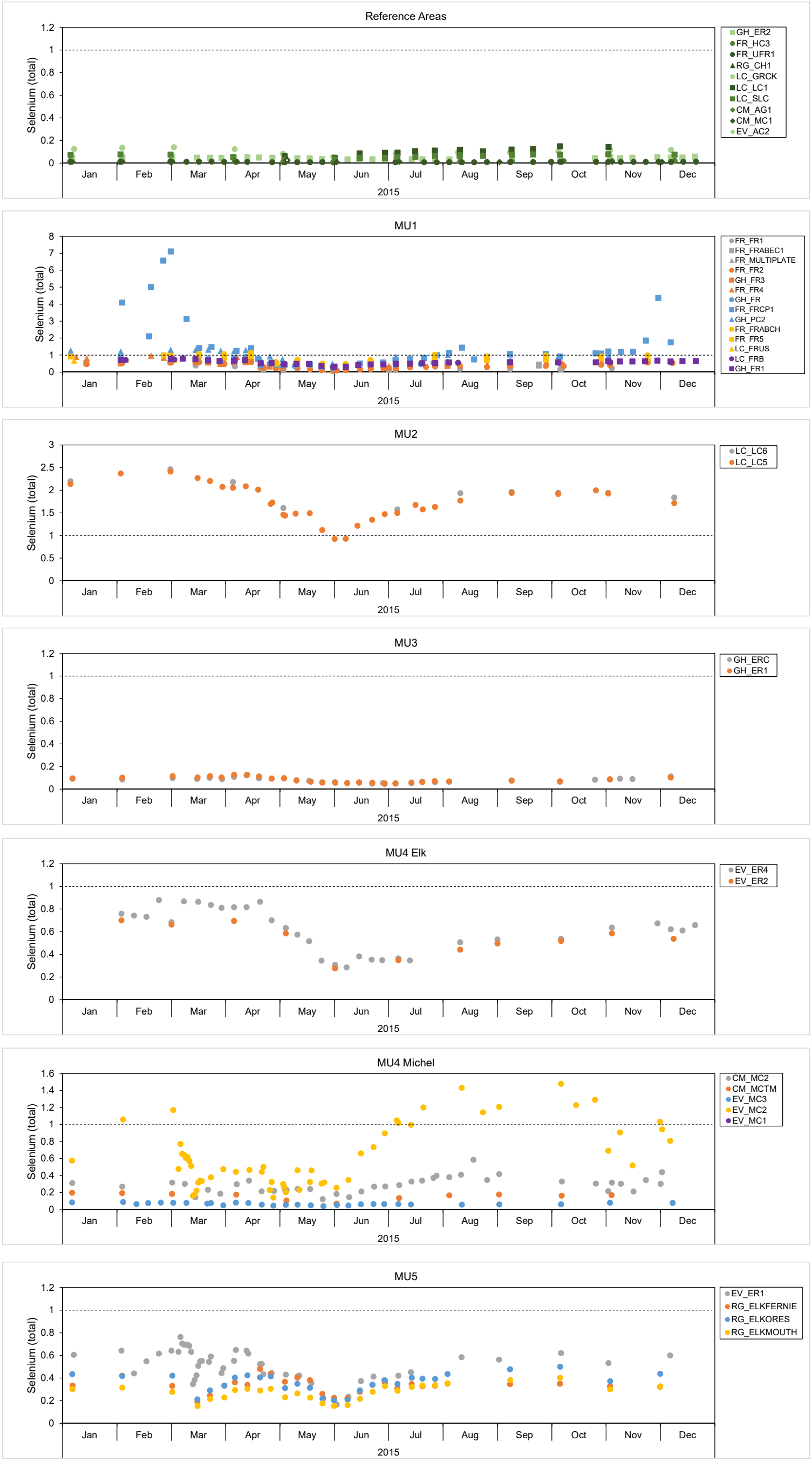


Figure C.7r: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

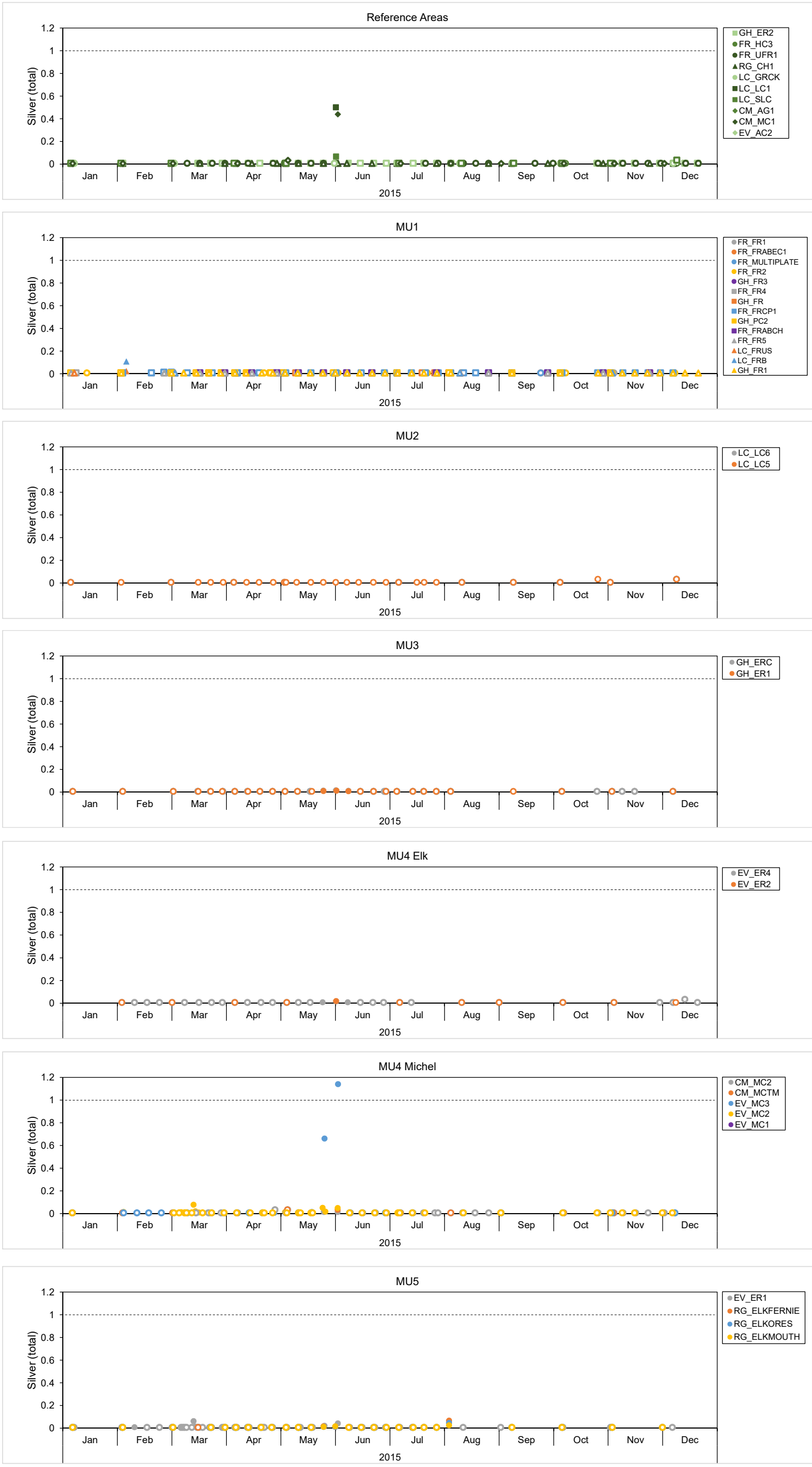


Figure C.7s: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

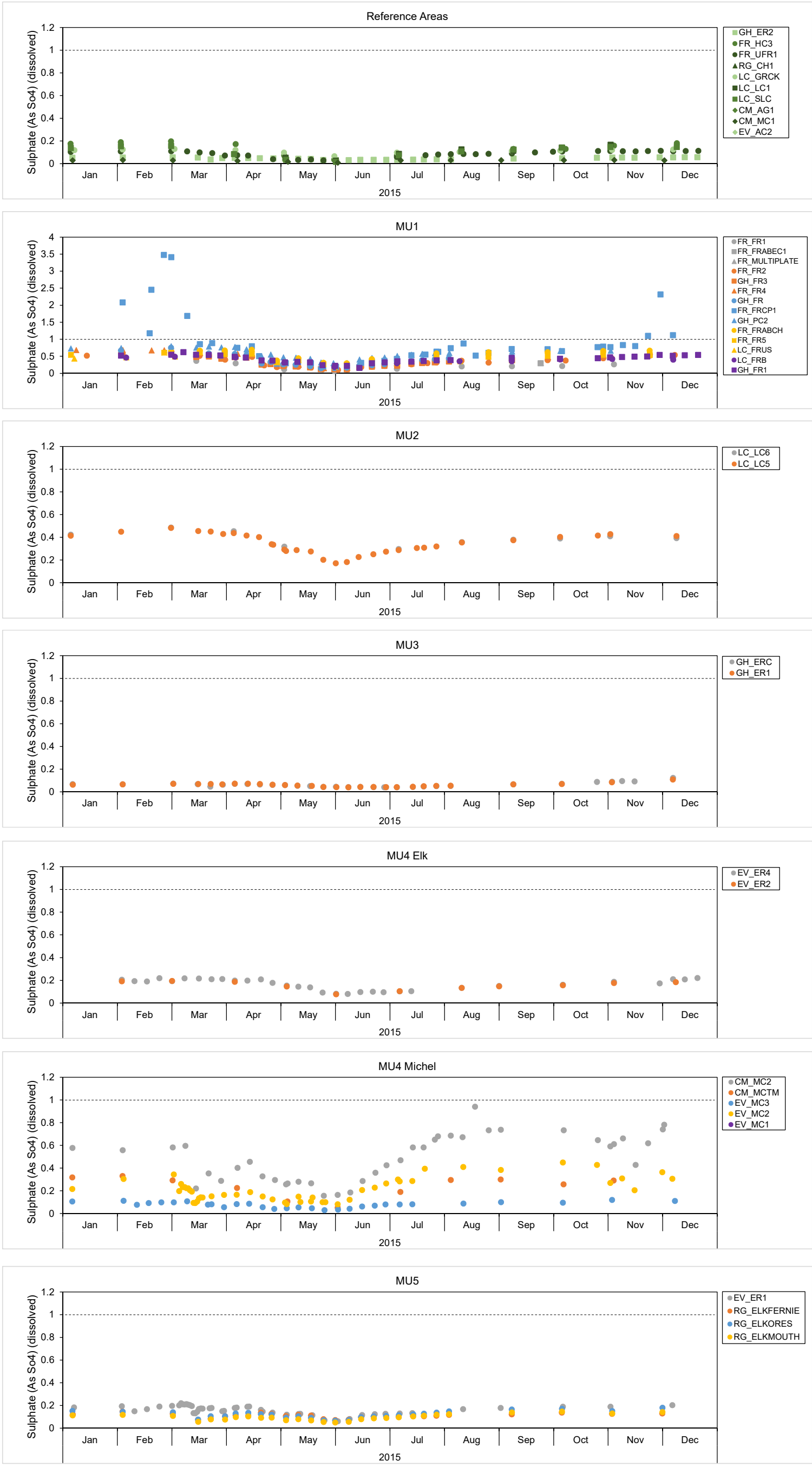


Figure C.7t: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

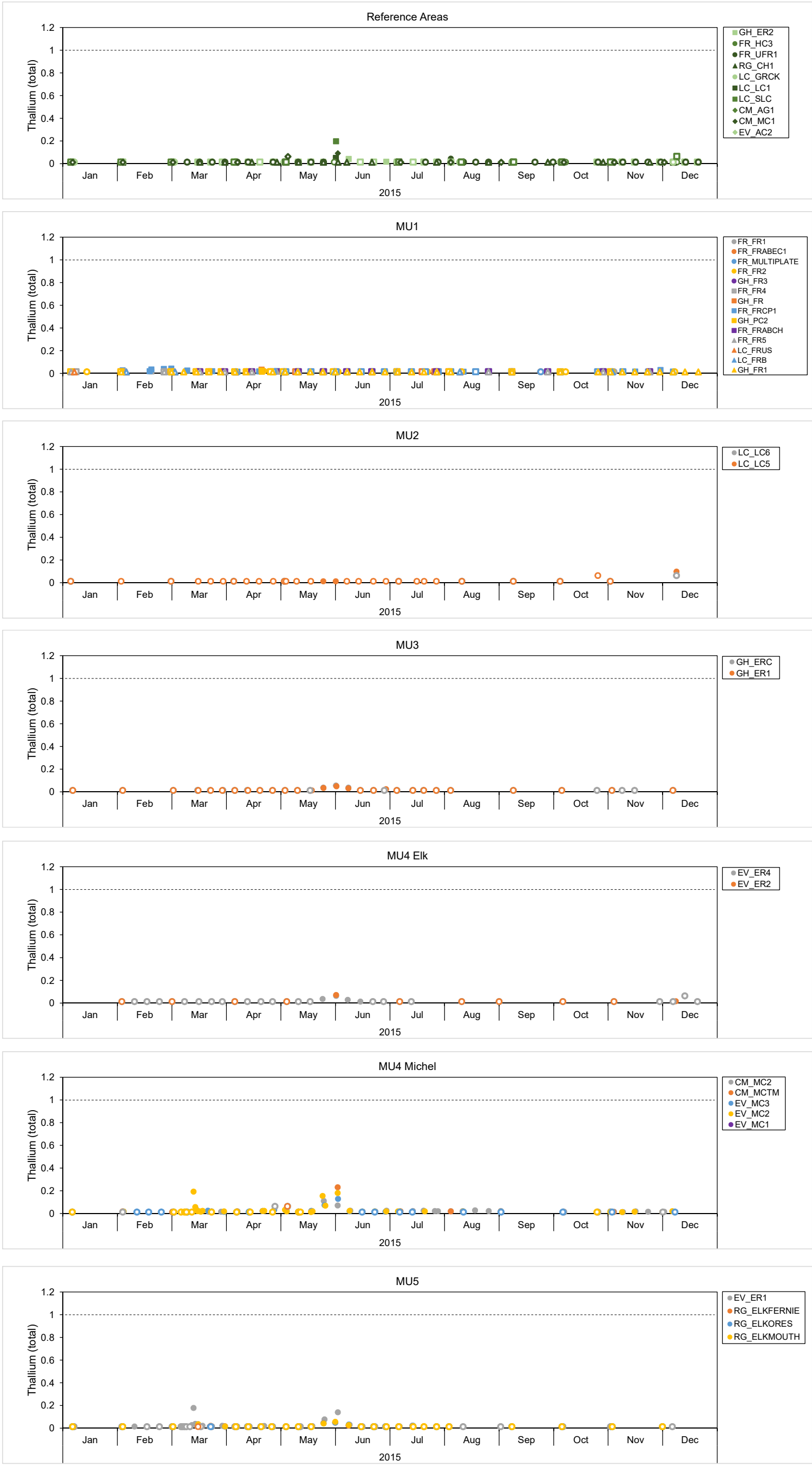


Figure C.7u: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

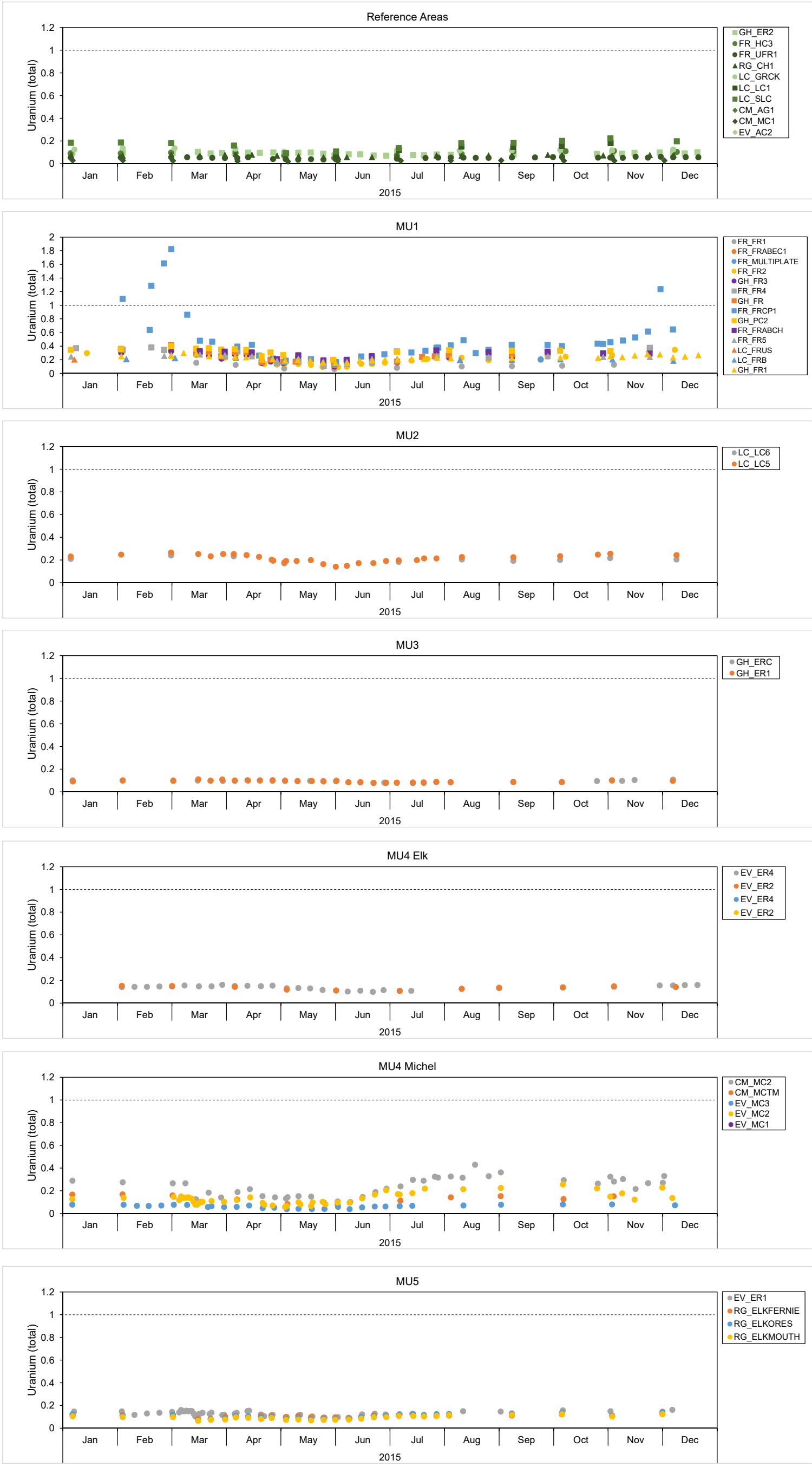


Figure C.7v: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).

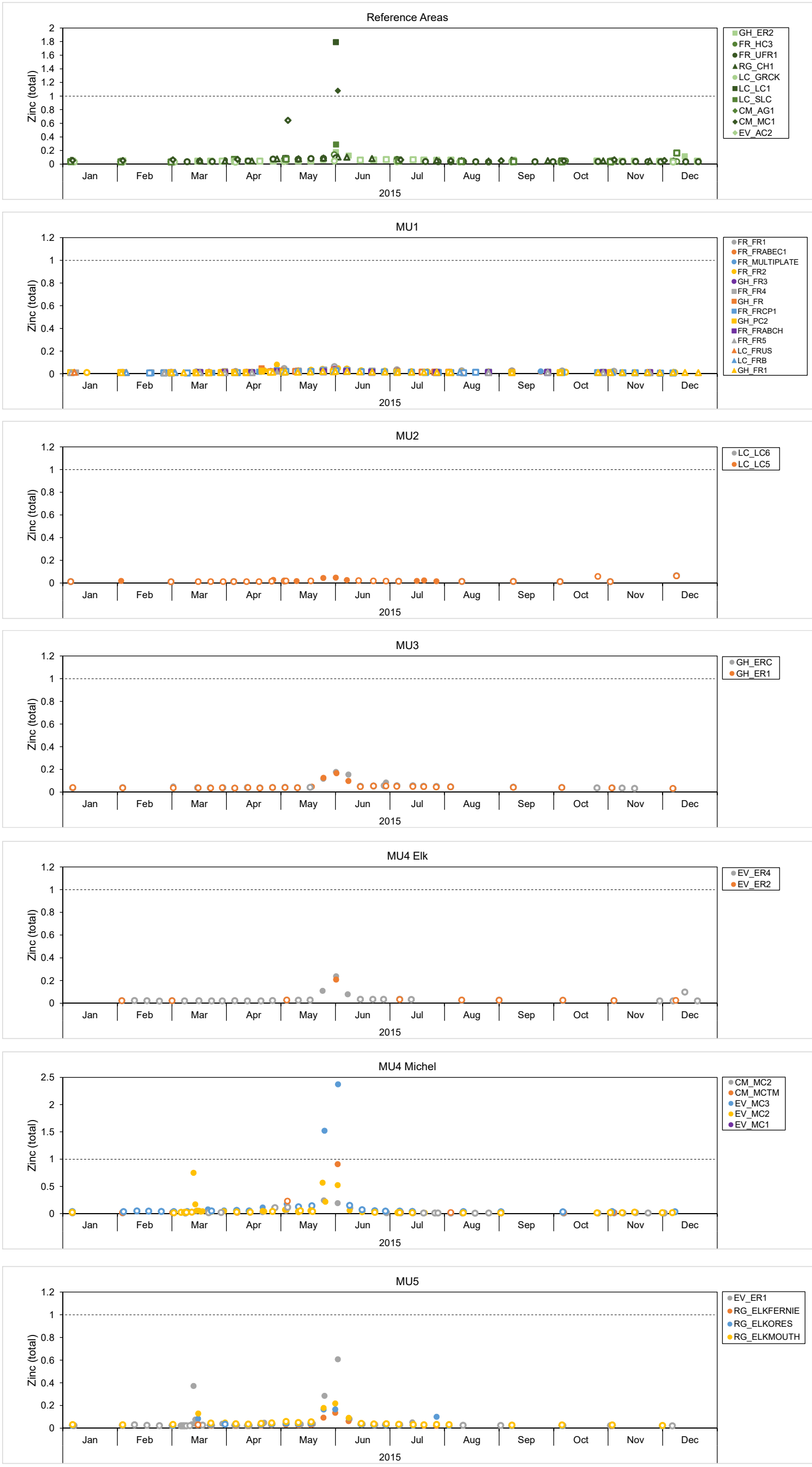
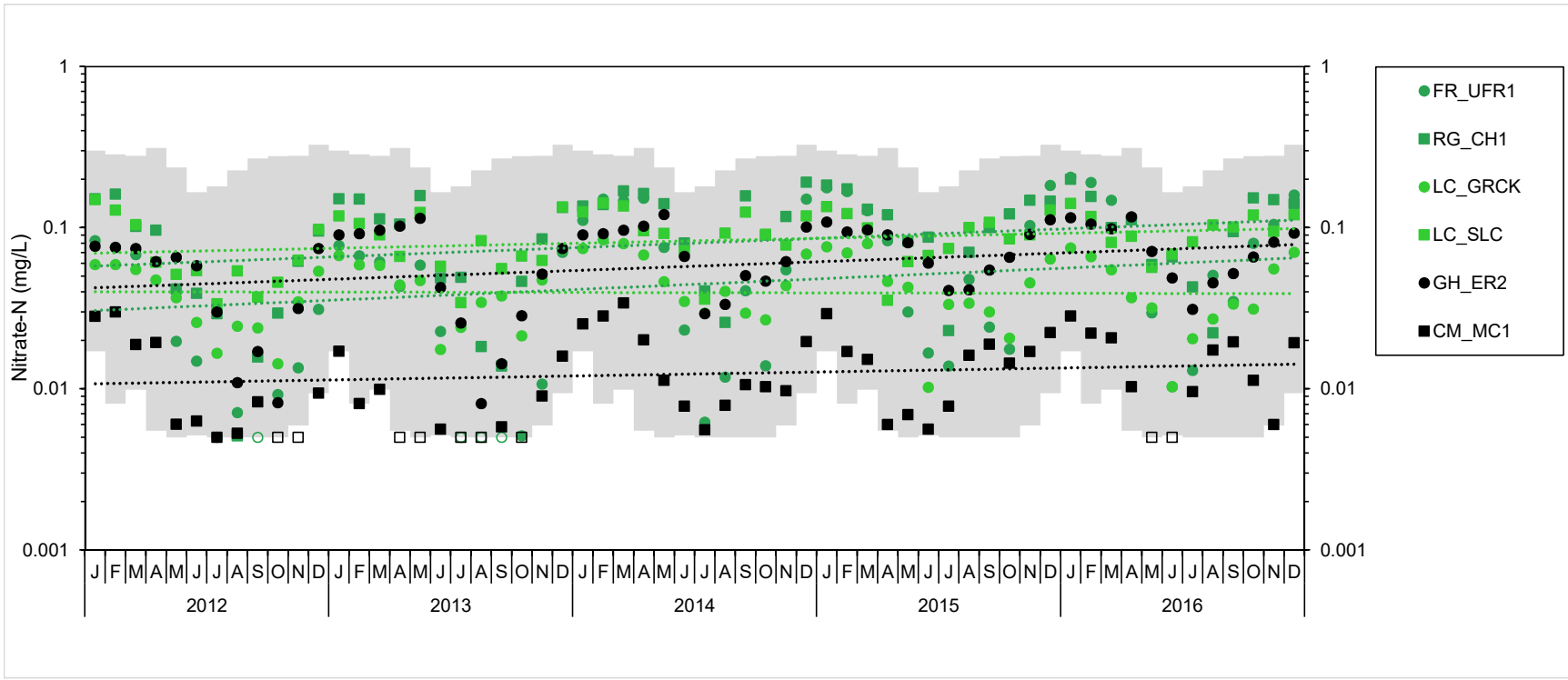
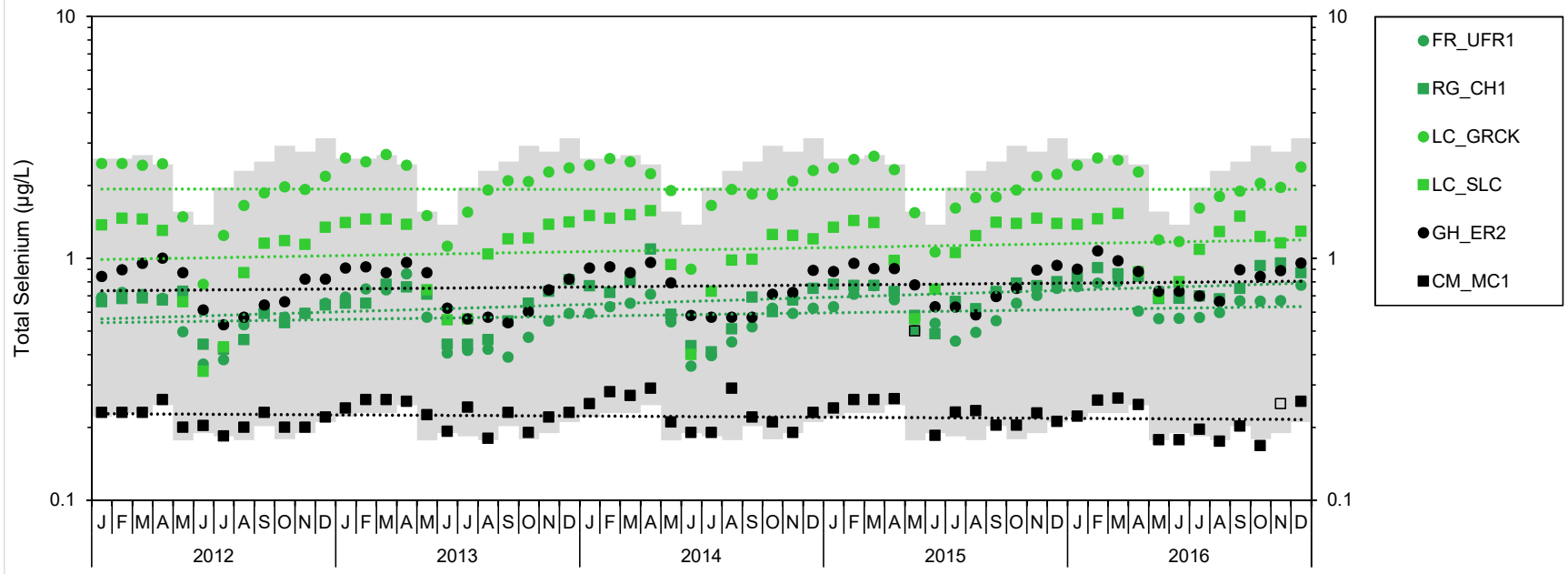


Figure C.7w: Scatterplots of Hazard Quotients for Key Water Quality Parameters for Reference and Main Stem Mine-exposed Areas, 2015, Elk Valley

Note: Hazard quotients were calculated by dividing the individual sample concentration by the individual sample guideline. For analytes with parameter-dependent guidelines (e.g., hardness-dependent guidelines), then concurrent parameter for individual samples was used to calculate the guideline. Values above the dashed line indicate the observed concentrations was in excess of the sample-specific guideline. Open symbols indicate hazard quotients calculated using concentrations reported as below the laboratory reporting limit (LRL).





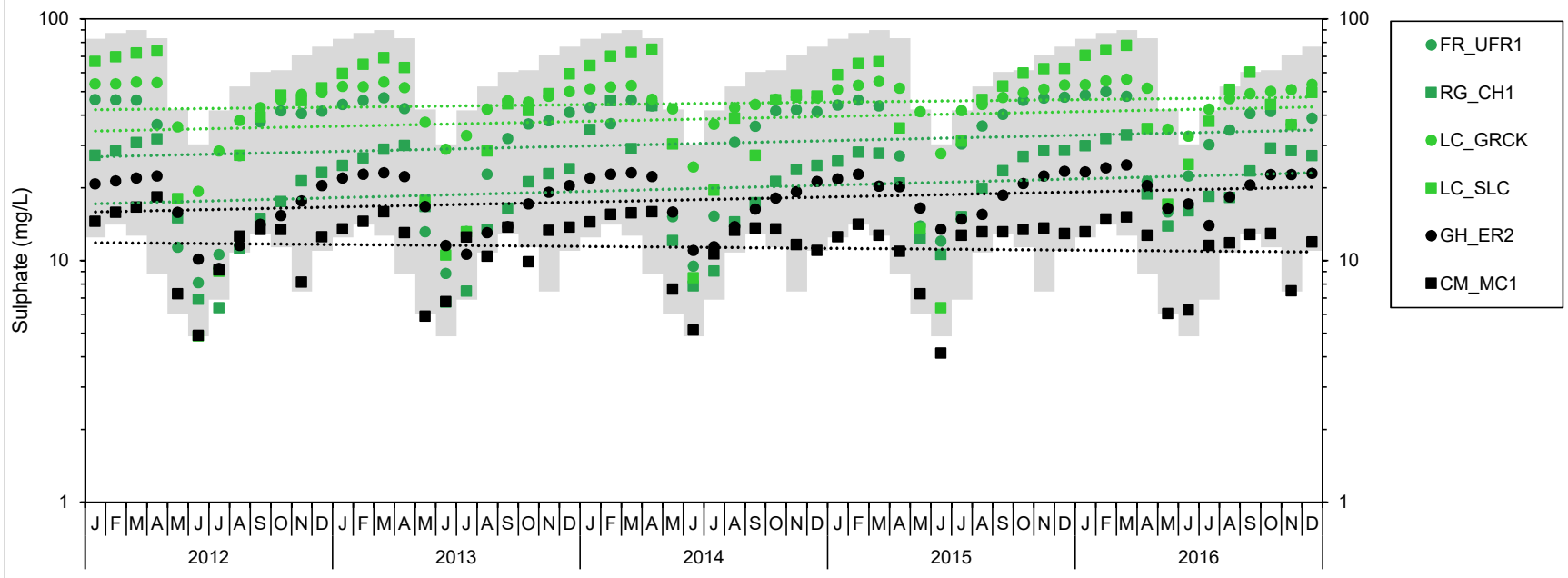


Figure C.8: Monthly Mean Water Concentrations and Linear Trendlines for Nitrate-N, Total Selenium, and Sulphate for the Six References Areas used in the Temporal Analysis, 2012 - 2016

Notes: Values below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL

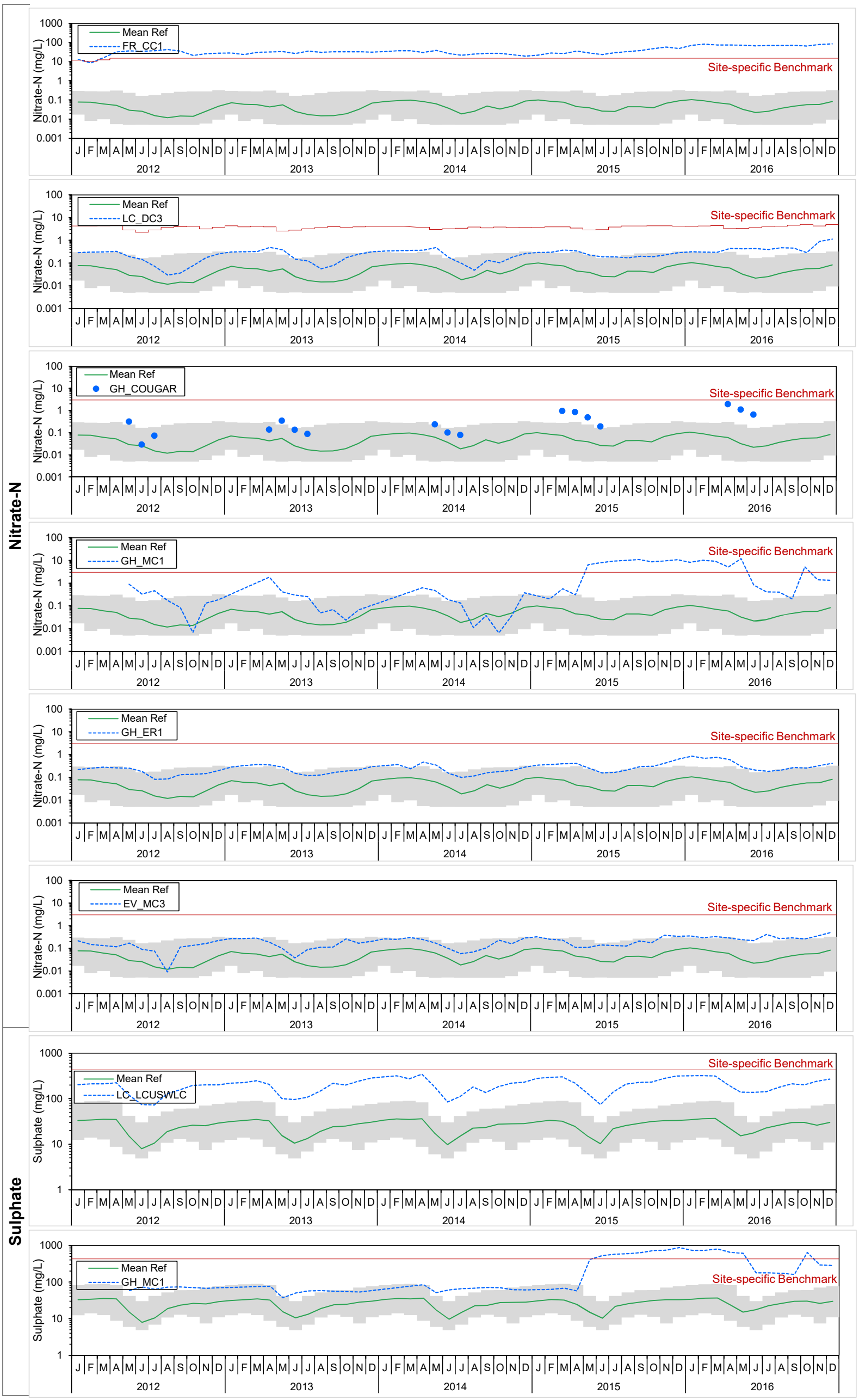


Figure C.9: Significant Increasing Temporal Changes for Nitrate, Sulphate and Selenium, Relative to Reference, 2012 - 2016

Notes: Grey shading represents the reference area normal range (2.5th and 97.5th percentiles)

Only changes greater than 50% are included for Nitrate, see Apprendix Figure C.5 for all significant trends for Nitrate.

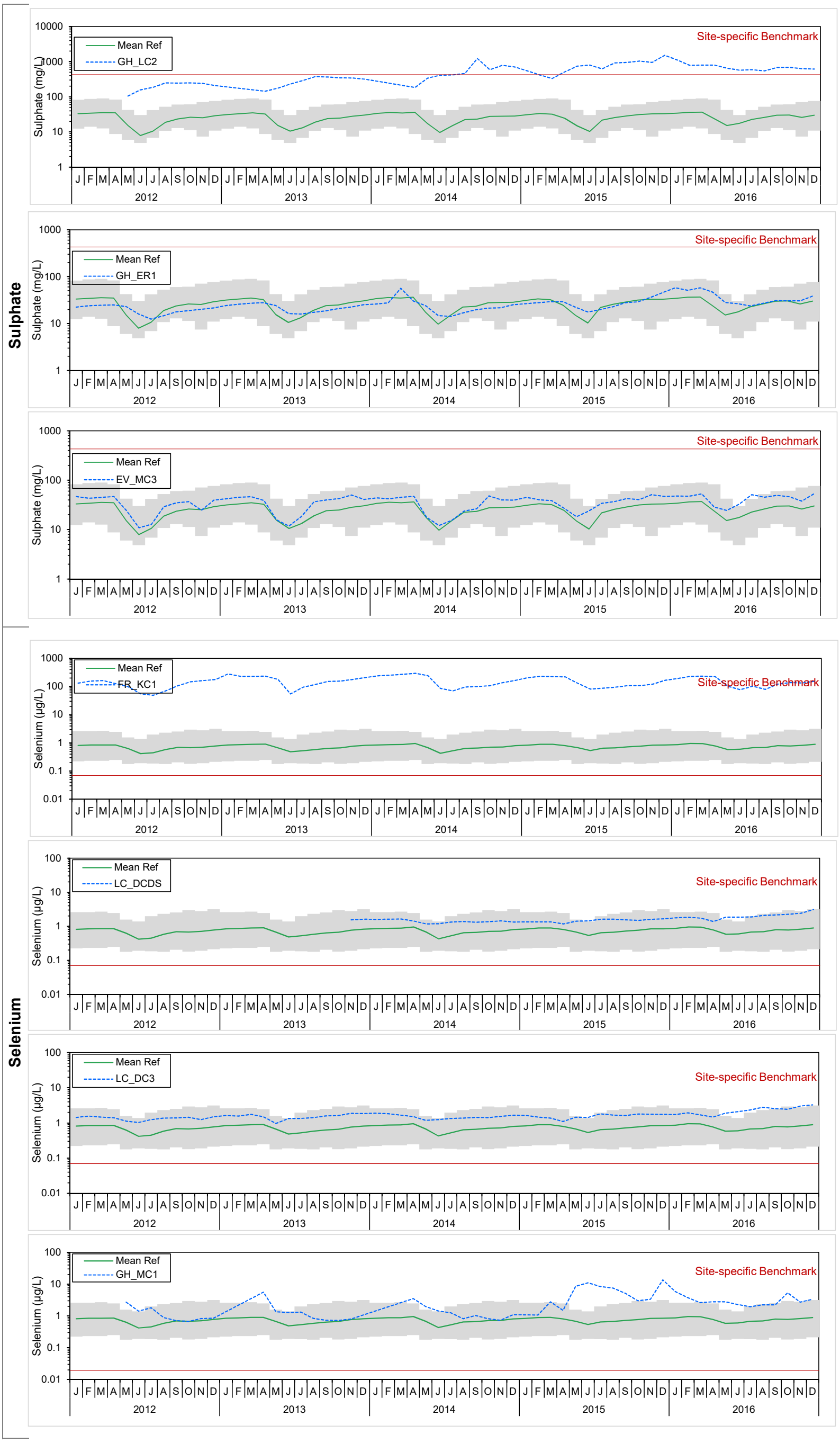
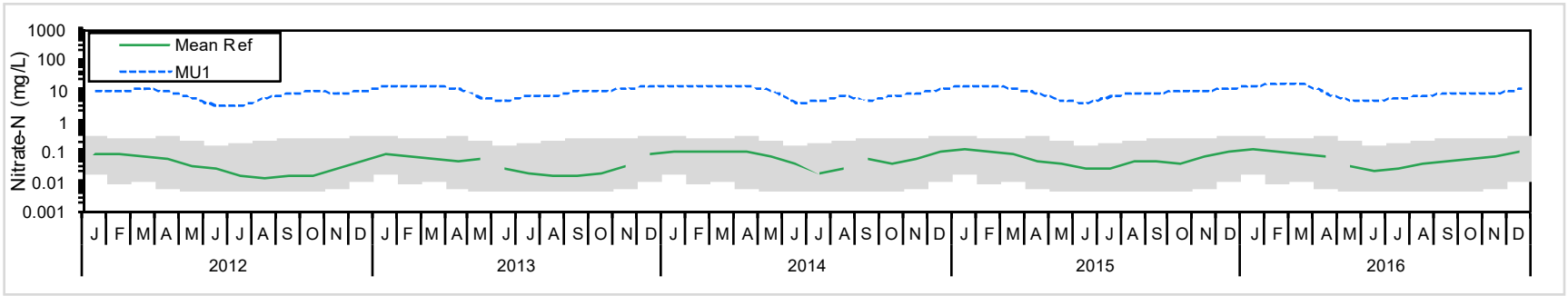
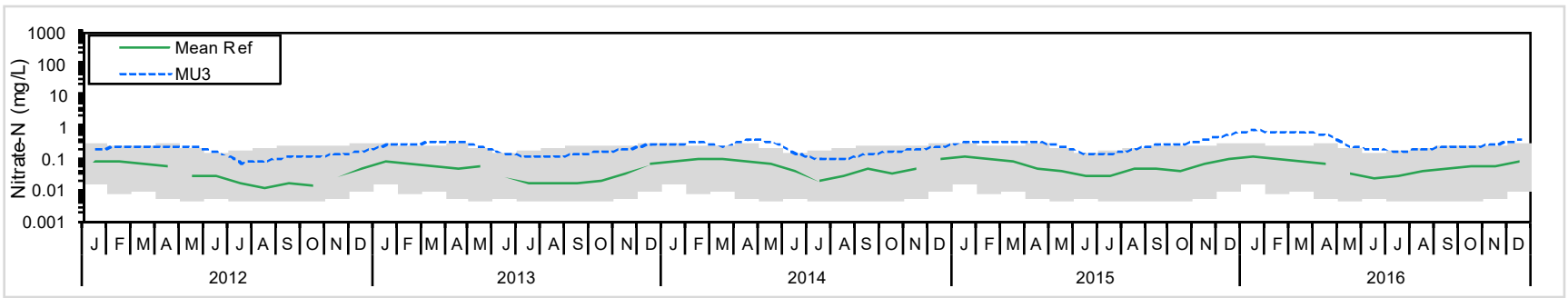


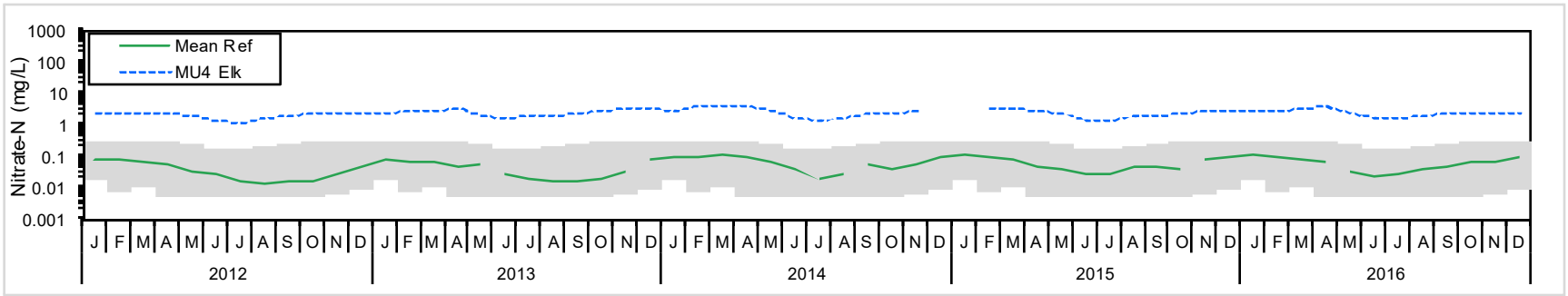
Figure C.9: Significant Increasing Temporal Changes for Nitrate, Sulphate and Selenium, Relative to Reference, 2012 - 2016

Notes: Grey shading represents the reference area normal range (2.5th and 97.5th percentiles)
Only changes greater than 50% are included for Nitrate, see Apprendix Figure C.5 for all significant trends for Nitrate.

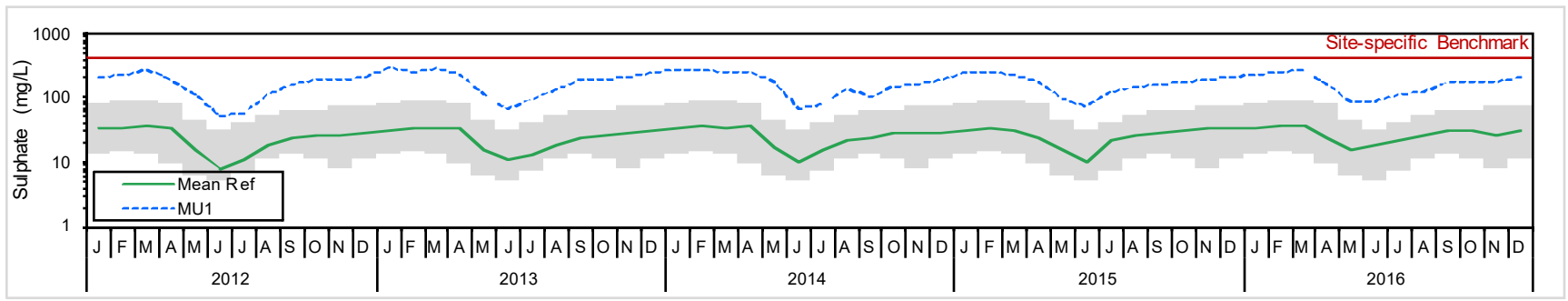
Nitrate-N

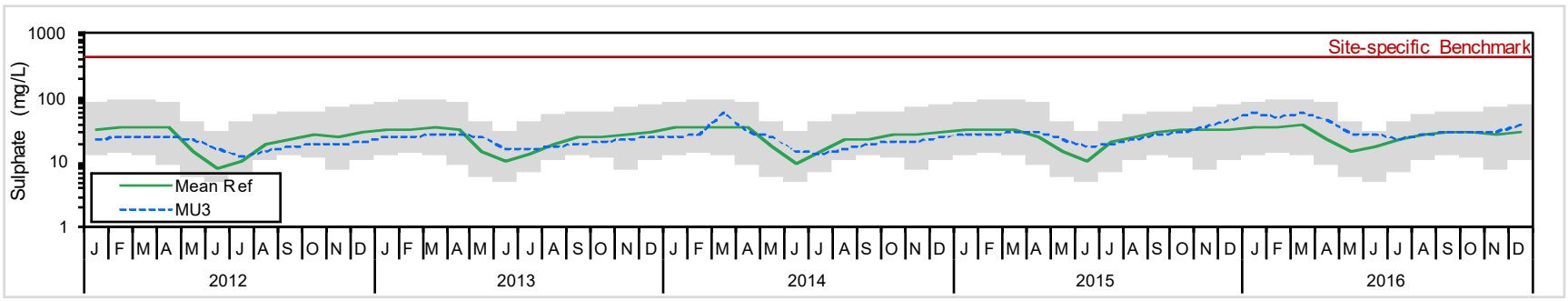




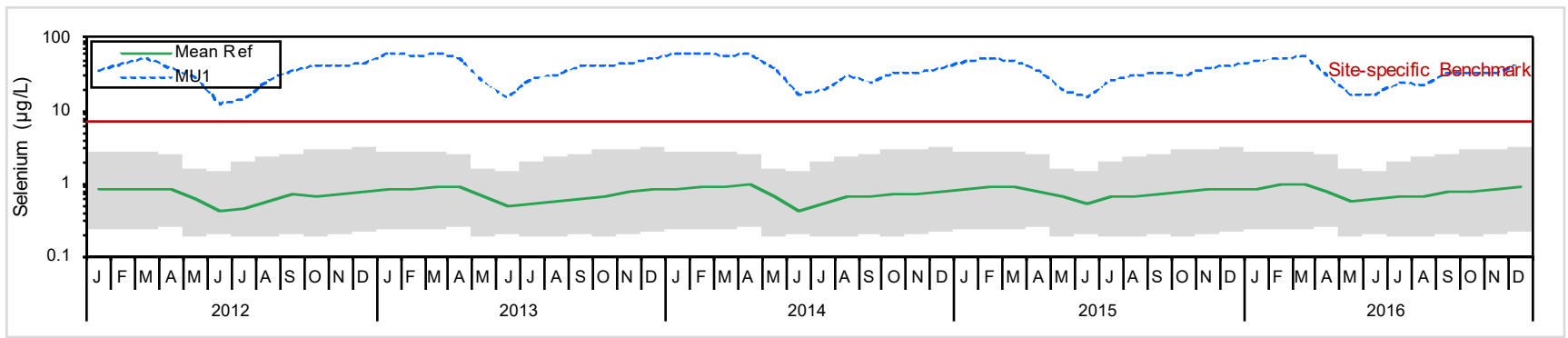


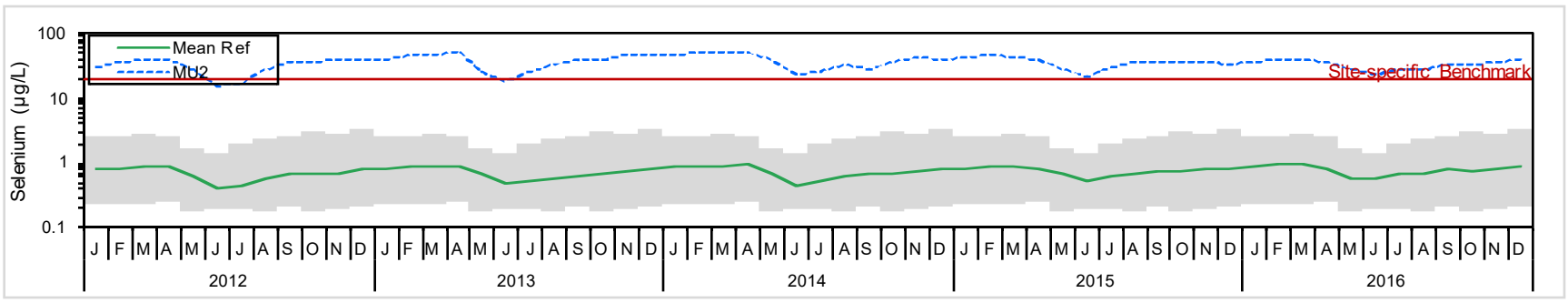
Sulphate





Selenium





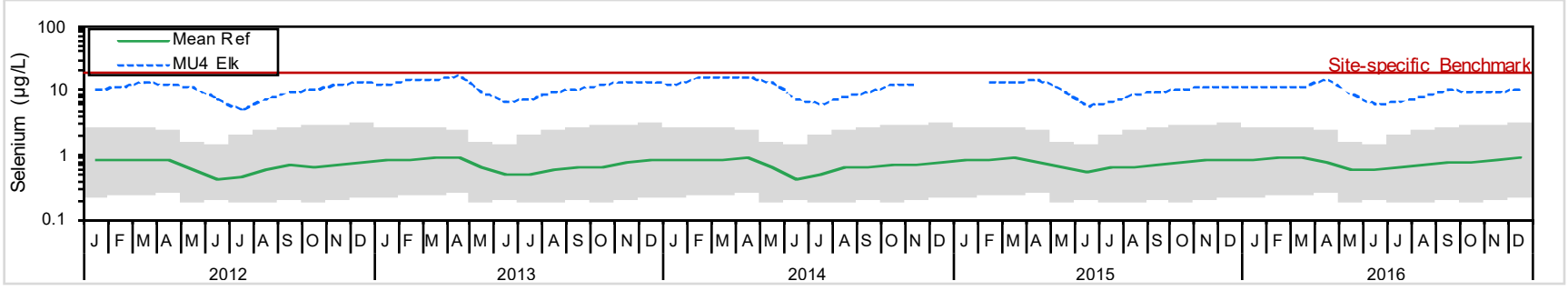
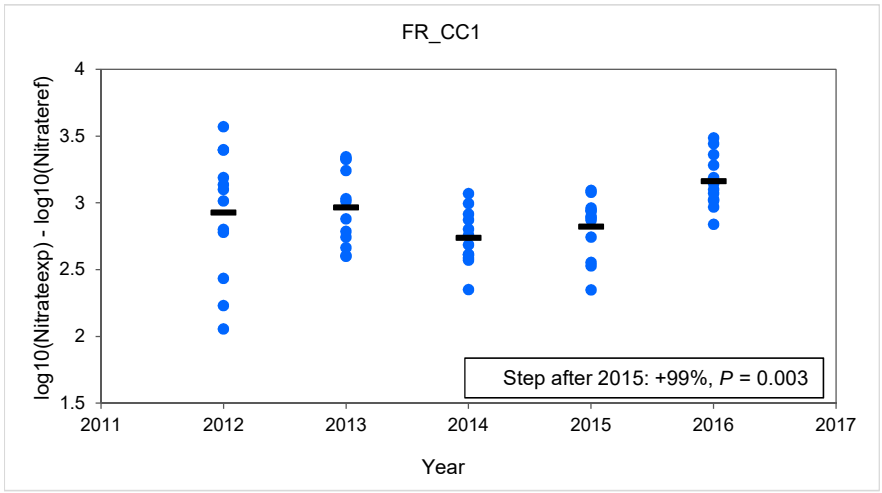
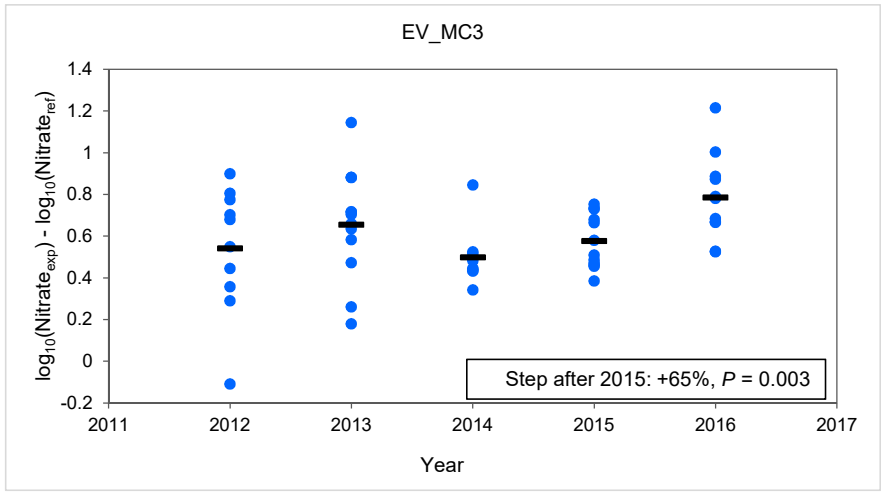


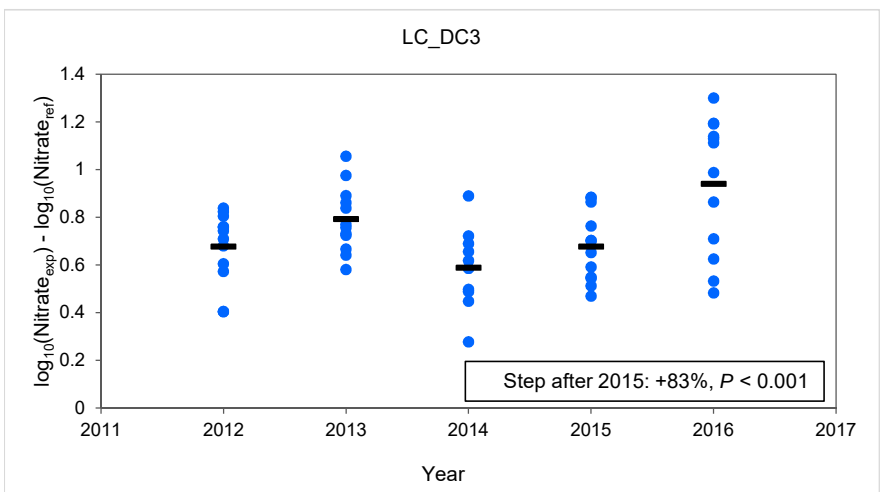
Figure C.10: MUs Where Significant Increases Were Observed Relative to the Reference Mean for Nitrate, Sulphate, or Selenium, 2012 - 2016

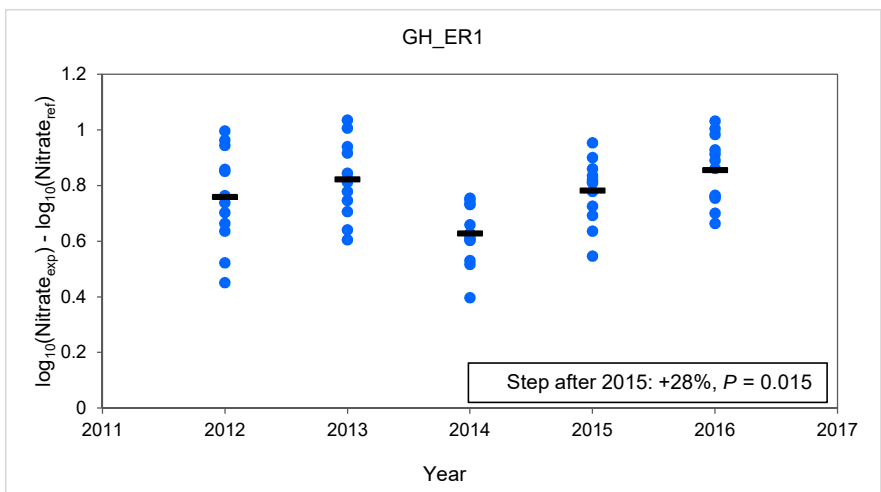
Notes: Grey shading represents the reference area normal range (2.5th and 97.5th percentiles)

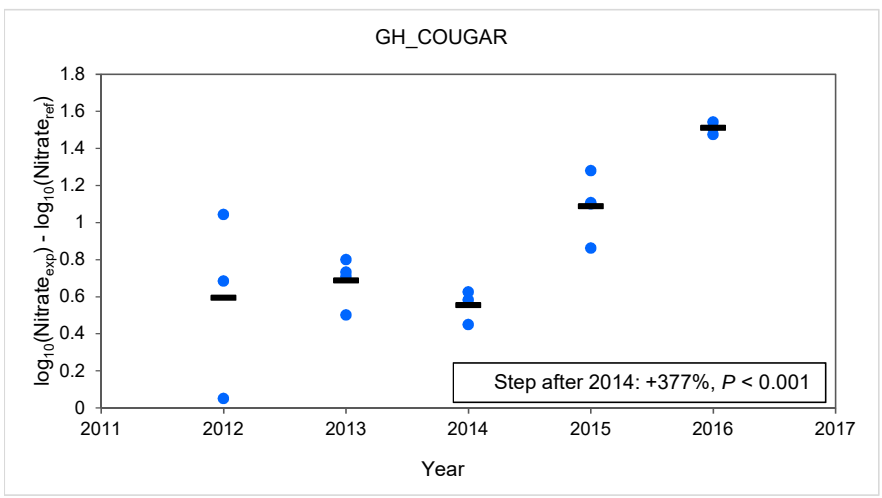
Only changes greater than 50% are included for Nitrate, see Apprendix Figure C.5 for all significant trends for Nitrate.











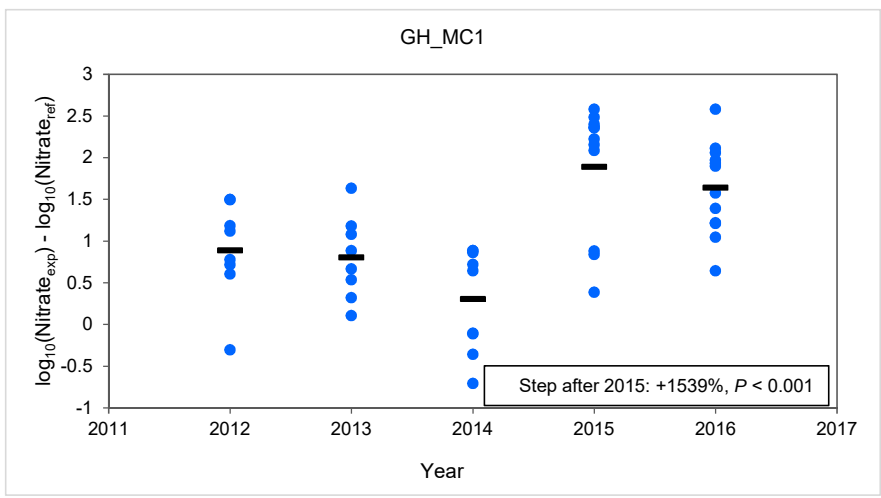


Figure C.11: Scatteplots of the Differences in Nitrate Concentrations (Log_{10}-transformed) Between Mine-exposed Monthly Means and the Mean of Reference Monthly Means by Year for Mine-exposed Areas With a Significant Increase Over Time

Notes: Blue circle = difference in monthly means (exp - ref) and black dash = average of the monthly means for a year

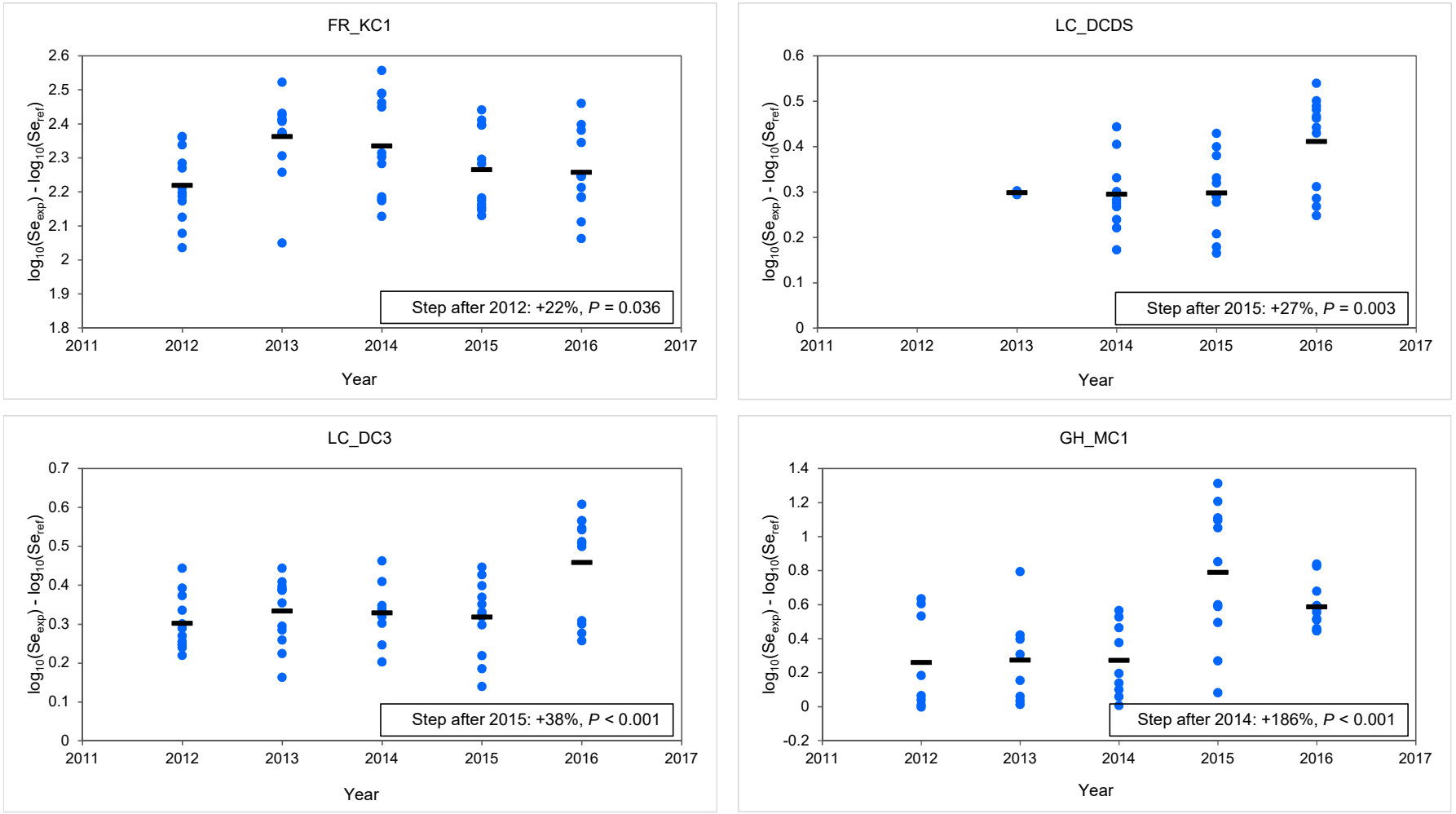
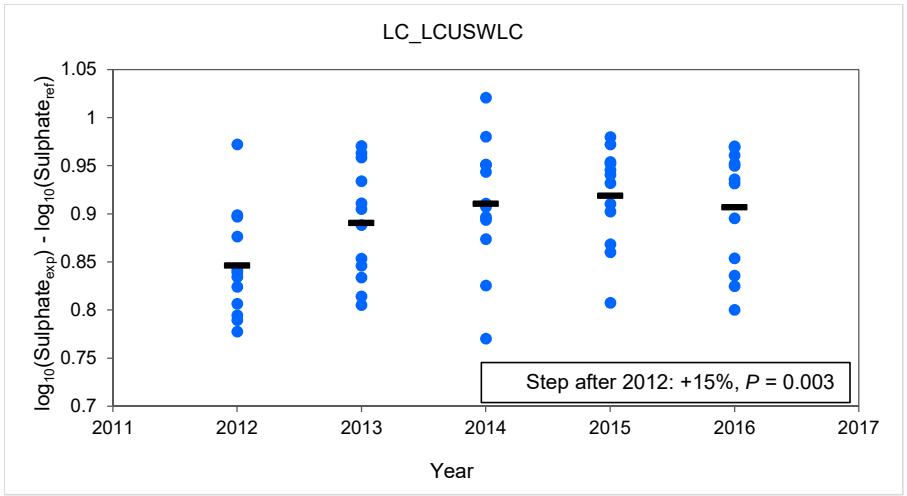
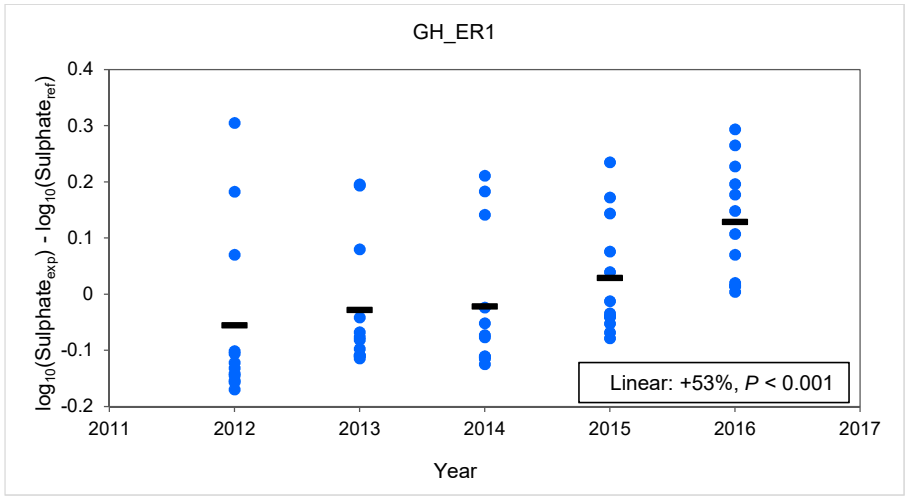
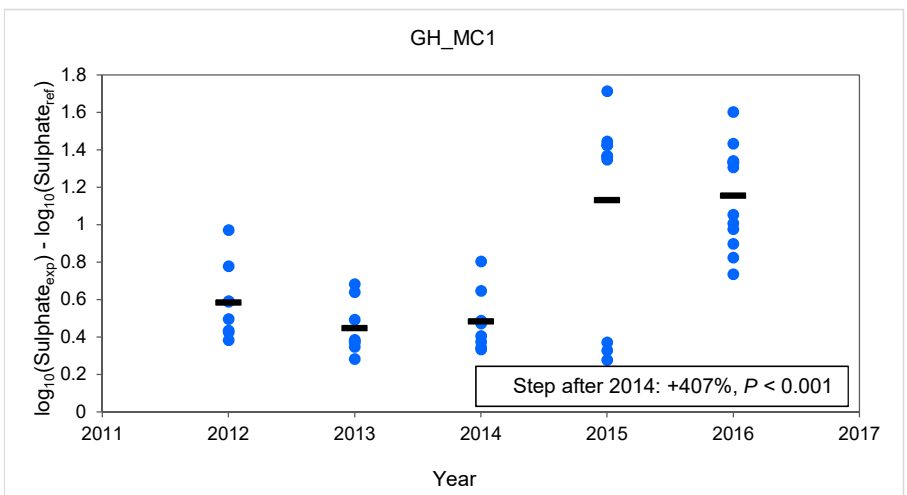


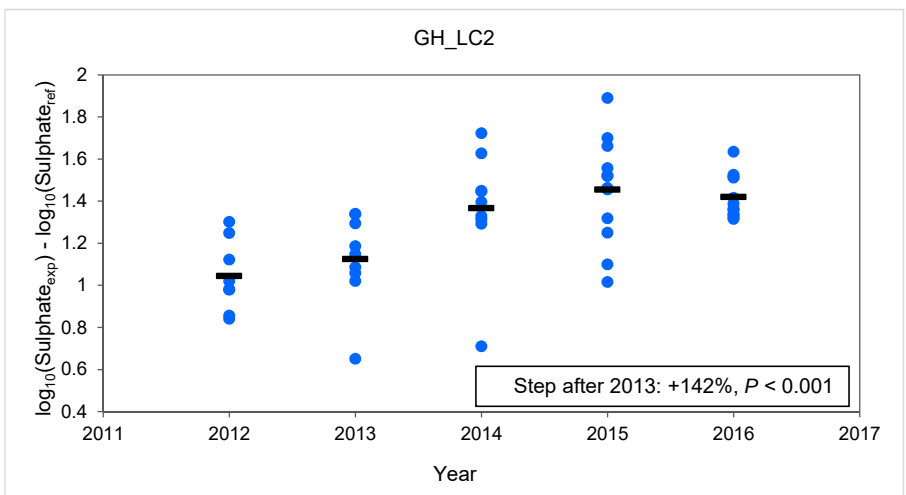
Figure C.12: Scatteplots of the Differences in Total Selenium Concentrations (Log_{10}-transformed) Between Mine-exposed Monthly Means and the Mean of Reference Monthly Means by Year for Mine-exposed Areas With a Significant Increase Over Time

Notes: Blue circle = difference in monthly means (exp - ref) and black dash = average of the monthly means for a year









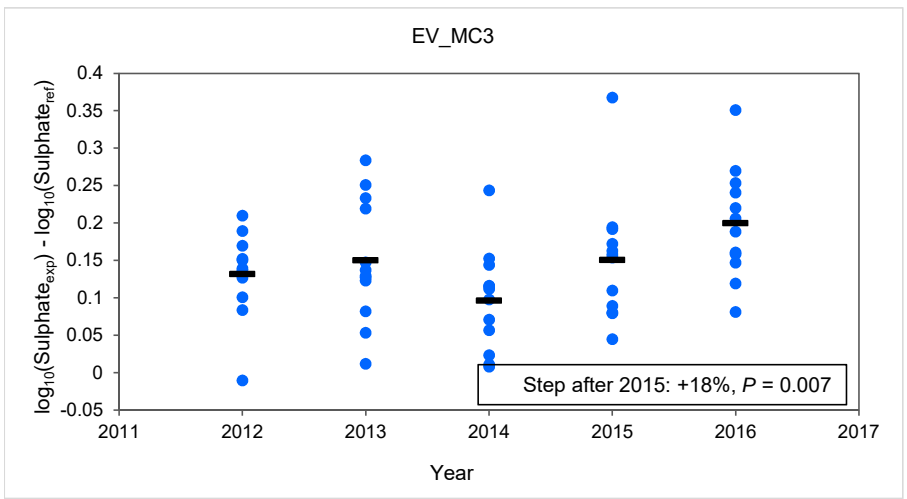


Figure C.13: Scatteplots of the Differences in Sulphate Concentrations (Log_{10}-transformed) Between Mine-exposed Monthly Means and the Mean of Reference Monthly Means by Year for Mine-exposed Areas With a Significant Increase Over Time

Notes: Blue circle = difference in monthly means (exp - ref) and black dash = average of the monthly means for a year

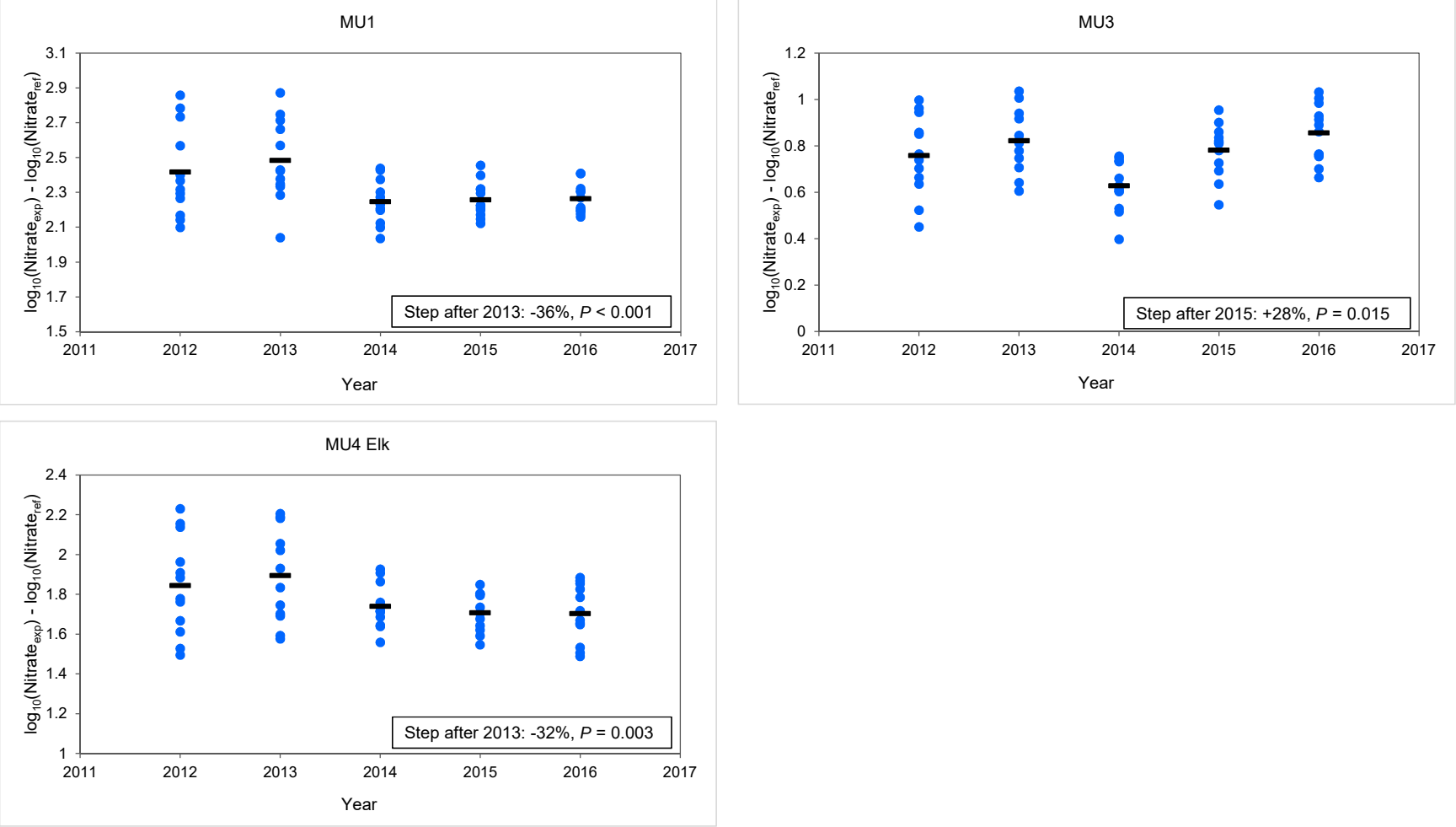
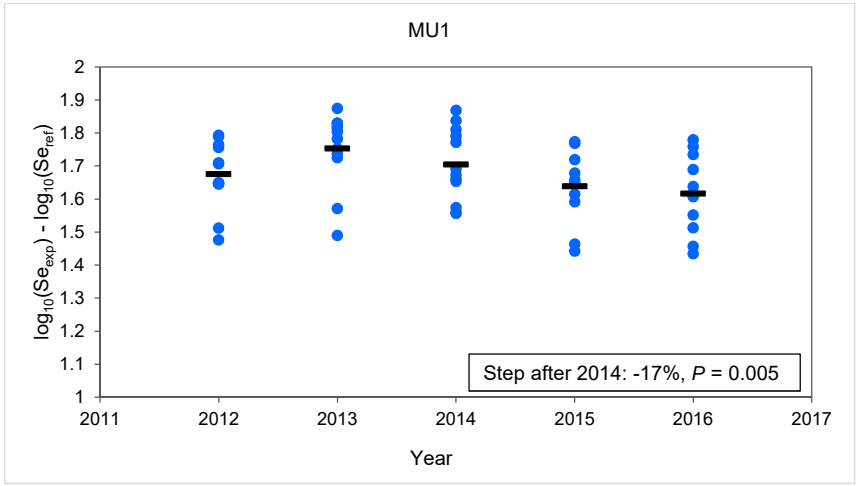
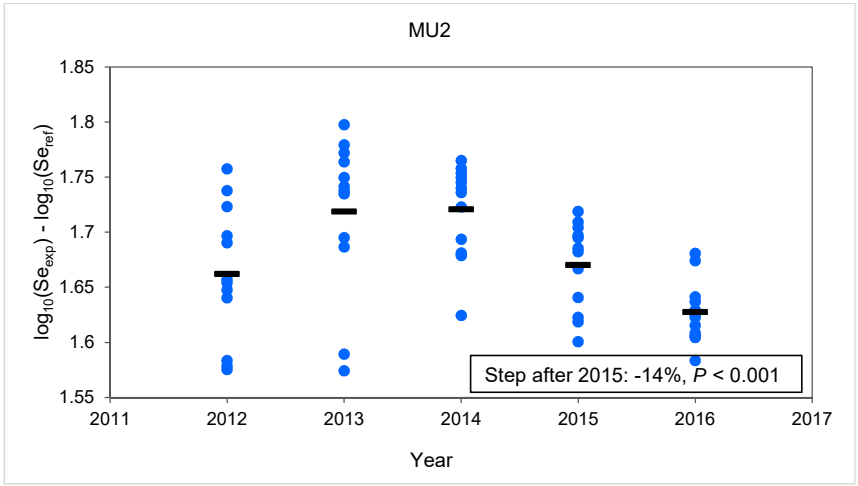


Figure C.14: Monthly Mean Nitrate Concentrations (Log_{10}-transformed) Main Stem Areas within each Management Unit Compared to Reference Monthly Means if a Significant Relative Increase was Observed Over Time

Notes: Blue circle = difference in monthly means (exp - ref) and black dash = average of the monthly means for a year





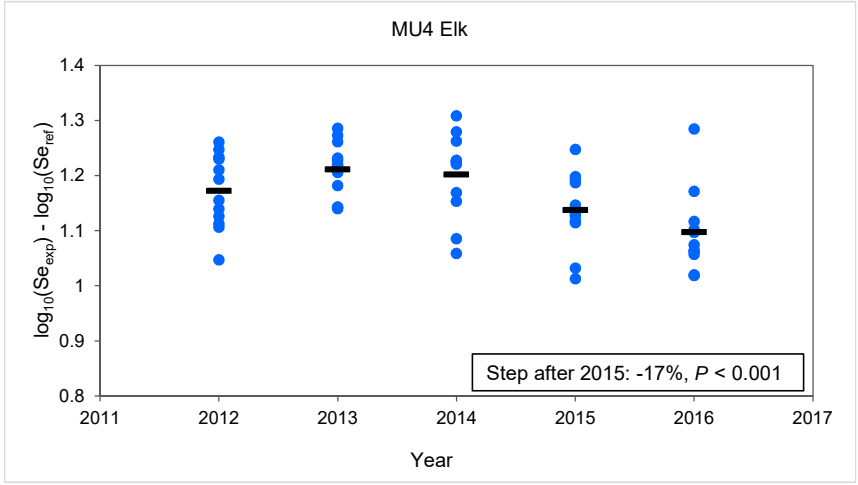


Figure C.14: Monthly Mean Total Selenium Concentrations (Log_{10}-transformed) Main Stem Areas within each Management Unit Compared to Reference Monthly Means if a Significant Relative Increase was Observed Over Time

Notes: Blue circle = difference in monthly means (exp - ref) and black dash = average of the monthly means for a year

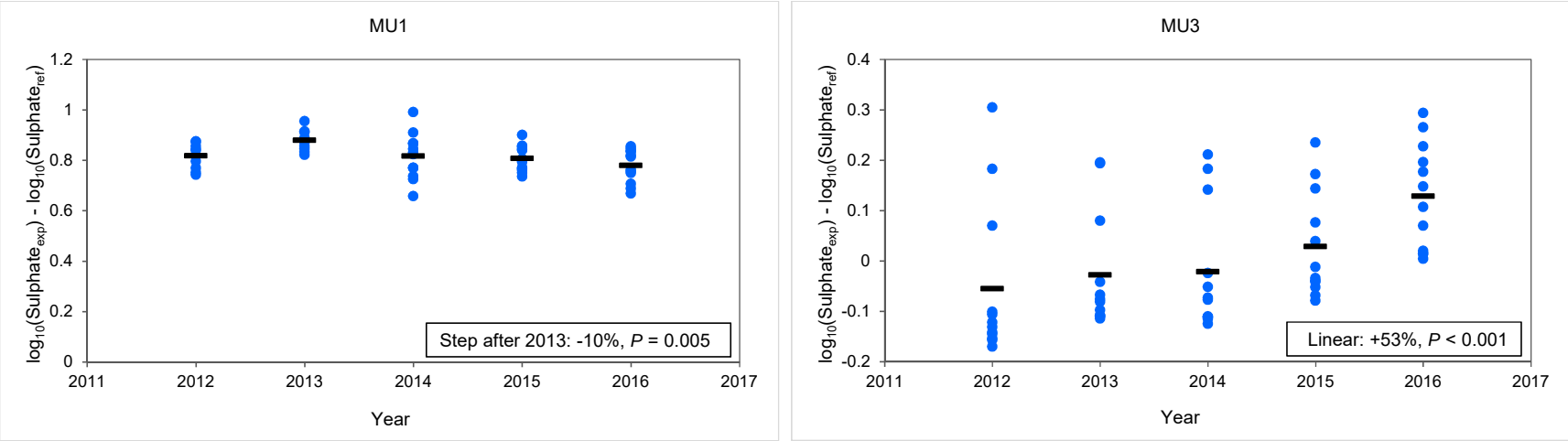


Figure C.14: Monthly Mean Sulphate Concentrations (Log10-transformed) Main Stem Areas within each Management Unit Compared to Reference Monthly Means if a Significant Relative Increase was Observed Over Time

Notes: Blue circle = difference in monthly means (exp - ref) and black dash = average of the monthly means for a year

Table C.1: Lotic Areas Where Water Samples were Collected Concurrently with Benthic Invertebrate Samples in September 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-Main Stem; T-Tributary)	Water Station Code	ENV EMS Number	Area Description	UTM (NAD83, 11U)	
							Easting	Northing
Reference	1	Fording	-	CHCK	E295214	Chauncey Creek near mouth	655965	5552879
				EWCK	-	Ewin Creek near mouth	657222	5547631
				FO26	E216777	Fording u/s Henretta (u/s all mines)	653064	5569601
				HENUP	E300096	Henretta u/s all mine operations	655893	5567697
	2	Fording		LC_GRCK	E288275	Grace Creek	654283	5540738
		Line		LI24	E216142	Line Creek u/s LCO	661968	5538259
				SLINE	E282149	South Line Creek near mouth	660980	5531449
	3	Elk		ELUGH	200389	Elk River u/s Branch	646561	5557474
	4	Michel		AGCK	-	Andy Good u/s CMO influence	667551	5488669
				AL4	-	Upper Alexander Creek	664974	5509024
				ALUSM	-	Alexander u/s Michel Creek and EVO	663482	5502718
				MI25	E258175	Michel u/s CMO influence	668209	5482832
		Elk		GRUHA	-	Grave Creek u/s Harmer	657125	5522471
	5			MCCR	-	McCool Creek	648147	5499947
				WWRL	-	Lower Wigwam River	646103	5458850
				WWRU	-	Upper Wigwam River	648769	5448916
	-	Elk		CADCK	-	Cadorna Creek u/s Elk River	645826	5589227
				EL12	-	Elk River d/s Cadorna Creek.	646175	5589009
		Kootenay		BU2	-	Bull River	631827	5505557
				BU40	-	Bull River 40 km Bridge	626565	5499828
				BUUQ	-	Bull River u/s Quinn	633548	5519175
				CRUKO	-	Cross River u/s Kootenay River	585467	5614088
				K01	-	Kootenay River	599237	5495599
				KODCR	-	Kootenay River d/s Cross River	584738	5607651
				KOUCR	-	Kootenay River u/s Cross River	579612	5616175
				KOUVE	-	Kootenay River u/s Vermillion	569766	5630957
				PADAL	-	Palliser River d/s Albert	601174	5598680
				PAUKO	-	Palliser River u/s Kootenay, d/s Fenwick	595669	5590189
				VEUKO	-	Vermillion u/s Kootenay, d/s Simpson	569465	5641604
				VEUP	-	Vermillion Upper, u/s Simpson	561227	5670814
		Oldman		DACK	-	Daisy Creek	685975	5523953
				DUCK	-	Dutch Creek	687139	5531110
				OLDDU	-	Oldman d/s Dutch, u/s Racehorse	687823	5530318
				OLDLI	-	Oldman d/s Livingstone	687516	5532685
				OLDLOW	-	Oldman lower u/s reservoir	710081	5512478
				RACK	-	Racehorse Creek	687681	5526380
				VICK	-	Vicary Creek	682455	5519662
		Flathead		FLAD	-	Flathead River Most d/s Station	682705	5443985
				FLAU	-	Flathead River Most u/s Station	680187	5453294
				FLRU	-	Flathead River - mid	668175	5470823
Mine-exposed	1	Fording	T	HENFO	E216778	Henretta u/s confluence with Fording	652236	5566472
				NGD1	E105060	Lower Lake Mountain Creek	650883	5563190
				KICK	0200252	Kilmarnock u/s road crossing near mouth	652878	5559847
				SWCK	E221329	Swift Creek near mouth	652062	5558541
				CATCK	0200384	Cataract Creek near mouth	652447	5557452
				POCK	200385	Porter Creek near mouth	653596	5555208
				LC_DCDS	E295210	Dry Creek d/s sedimentation ponds	657713	5542177
				LC_DC1	E288270	Dry Creek near mouth	656503	5544668
				GHCKD	E102709	Greenhills Creek d/s of settling pond	653537	5545602
				GHCKU	-	Greenhills Creek u/s of pond	653755	5546168
			M	FODHE	0200251	Fording d/s Henretta	651305	5565503
				FOUNGD	-	Fording u/s NGD	650993	5563529
				FODNGD	-	Fording d/s NGD	650883	5563190
				MP1	-	Fording Multiplate d/s Eagle Ponds	651158	5562442
				FOUSH	-	Fording u/s Shandley Creek	650863	5560970
				FOUKI	0200201	Fording u/s Kilmarnock Creek	651861	5559872
				FOBKS	-	Fording between Kilmarnock & Swift	652065	5558691
				FOBSC	0200311	Fording d/s Swift, u/s Cataract	652342	5558207
				FOBCP	E300071	Fording between Cataract & Porter	652846	5557174
				FODPO	E287431	Fording d/s Porter, u/s Chauncey	653877	5555083
				FO10-SP1	-	Fording River Oxbow	654245	5555299
				FO22	0	Fording u/s Chauncey Creek	654841	5553523
				FOUEW	-	Fording d/s Chauncey, u/s Ewin	656363	5551875
				FO28	-	Fording u/s Dry Creek	656453	5545433
				LC_FRUS	-	Fording River u/s Dry Creek	656304	5545239
				FO29	-	Fording d/s Dry, u/s GHO & Hwy Bridge	655434	5543797
				FODGH	0200251	Fording River d/s GHO	652942	5545635
	2		T	LILC3	0200337	Line d/s West Line, u/s South Line	659911	5531818
				LIDSL	E297110	Upper Line Creek, d/s South Line	659733	5531239
				LI8	0200044	Line Creek d/s LCO	655651	5528828
			M	FO9	-	Fording d/s Josephine falls, u/s Grace & Line	651932	5540294
				FRUL	0200338	Fording d/s Grace, u/s Line	654530	5530162
				FO23	0200028	Fording d/s Line Creek	652995	5528937
	3	Elk	T	WOCK	-	Wolfram d/s pond	648228	5552277
				THCK	E207436	Thompson d/s pond	648596	5550237
			M	EL20	E300090	Elk River d/s Thompson & GHO	649146	5548514
				ELUEL	0206661	Elk River u/s Elkford	649097	5544766
				ELDEL	-	Elk River d/s Elkford sewage ponds	649883	5539761
				ELUFO	-	Elk River just u/s Fording	652102	5528815
	4	Michel	T	CORCK	0200209	Corbin Creek near Mouth	668563	5487395
				ERCK	200097	Erickson at CPR main line near mouth	659931	5505119
				BOCK	E102685	Bodie Creek d/s Bodie Pond	655536	5509605
			M	MIUCO	-	Michel u/s Corbin Creek	668203	5486653
				MIDCO	E258937	Michel d/s Corbin, u/s Andy Good	667757	5487611
				MIDAG	-	Michel d/s Andy Good	665262	5489400
				MI5	-	Michel d/s CMO	659497	5496573
				MI3	0200203	Michel u/s Erickson Creek	660032	5505022
				MI2	-	Michel Creek d/s EVO	653672	5511222
		Elk	T	HACKUS	-	Harmer Creek u/s Harmer Pond	658180	5520996
				HACKDS	E102682	Harmer d/s Pond near mouth at Grave	656969	5522171
				GRCK	-	Grave Creek d/s Harmer	656215	5522446
				GRDS	-	Grave Creek near mouth at Elk	654077	5523402
				OCNM	E102679	Otto Creek near mouth	652337	5512615
			M	EL19	0200027	Elk River d/s Fording, u/s Grave	653146	5525824
				ELDGR	-	Elk River d/s Grave	653185	5520978
				ELUSP	0200111	Elk d/s Otto, u/s Sparwood & Michel	652325	5512688
	5	Elk	M	EL1	0200393	Elk d/s Sparwood & Michel	651657	5508511
				ELUFE	-	Elk u/s Fernie	644258	5490947
				ELDFE	-	Elk d/s Fernie	640097	5479596
				ELELKO	E294312	Elk River u/s Elko	639433	5463291
				ELH93	-	Elk River u/s Hwy 93 Bridge	633578	5449043

Table C.2: Lentic Areas Where Water Samples Were Collected Concurrently with Sediment and/or Longnose Sucker Surveys, 2015

Exposure Type	Management Unit	Water Station Code	Area Description	Water Samples	Sediment Quality/Biotic Samples	Sediment Toxicity	UTM (NAD 83, 11U)	
				Sampling Date			Easting	Northing
Reference	1	LML	Lake Mountain Lake	20-Sep-15	06-Aug-15	20-Sep-15	650106	5565031
	3	REFF	Unnamed Wetland near Elk River north of Elkford	-	14-Aug-15	-	645869	5556297
	4	LCHO	Leach Creek Oxbow	20-Sep-15	11-Aug-15	20-Sep-15	658746	5489172
	N/A	EL14	Elk Lakes	-	13-Aug-15	-	635326	5601876
		FLA1	Flathead Side Channel	11-May-15	09-Aug-15	21-Sep-15	681815	5443615
Mine-exposed	1	HE27	Henretta Lake	-	06-Aug-15	-	652573	5566275
		FO10-SP1	Former Fording River Oxbow	-	08-Aug-15	-	654209	5555290
		FOXL	Lower Fording River Oxbow	-	09-Aug-15	-	654878	5554437
		FMUCK	Meadow area u/s Chauncey Creek	-	08-Aug-15	-	654771	5553328
		FWDEC	Fording River wetland d/s Ewin Creek	-	09-Aug-15	-	656896	5547095
		R5-1	Off channel area of Fording d/s Greenhills	20-Sep-15	14-Aug-15	20-Sep-15	653010	5545714
	2	R5-3	Lentic area off Fording River d/s Josephine Falls	-	9-Aug-15	-	652358	5539932
	3	ERUP	Elk River Upper Ponds	11-May-15	11-Aug-15	-	651742	5530538
		EROU	Upper Elk River Oxbow	-	10-Aug-15	-	652364	5529872
	4	MI16	Michel Creek Wetland	13-May-15	07-Aug-15	21-Sep-15	665083	5489403
		MIWW	Lower Michel Wetland	13-May-15	06-Aug-15	-	659707	5498474
		MIC2	Michel Oxbow #2	13-May-15	07-Aug-15	-	659533	5496626
		ELWDGC	Elk River Wetland Downstream of Grave Creek	11-May-15	13-Aug-15	-	653175	5521300
		OTTO	Otto Creek	13-May-15	11-Aug-15	18-Sep-15	652537	5512801
		GO13	Goddard Marsh	13-May-15	12-Aug-15	18-Sep-15	652955	5514065
	5	STPD	Stanford Pond	11-May-15	6-Aug-15	18-Sep-15	639864	5483139
		EROL	Elk River Lower Oxbow	11-May-15	05-Aug-15	-	640877	5477999
		ELKO	Elko Reservoir	-	06-Aug-15	-	637800	5461540

Table C.3: Spearman Rank Correlation Coefficients for PC-1 and PC-2 vs. all Water Quality Parameters for 1,395 Samples Collected in Reference and Mine-exposed Areas in Routine Monitoring, 2015

	Analyte	PC-1 (42.0%)	PC-2 (19.3%)
Non-Metals	Instantaneous Flow	-	-
	Total Alkalinity (as $CaCO_3$)	0.794	0.114
	Conductivity, Field	0.900	0.283
	Conductivity, Lab	0.947	0.319
	Dissolved Organic Carbon	0.052	-0.639
	Dissolved Oxygen	-0.070	0.008
	Hardness (as $CaCO_3$)	0.942	0.325
	Nitrate-N	0.761	0.407
	Nitrite-N	0.851	0.253
	Nitrogen, Ammonia (as N)	-	-
	Ortho-phosphate	-0.144	-0.473
	pH, Field	-0.050	-0.181
	Sulphate	0.892	0.408
	pH, Lab	-0.099	-0.217
	Temperature, Field	-	-
	Total Dissolved Solids	0.947	0.327
	Total Kjeldahl Nitrogen	0.034	-0.549
	Total Organic Carbon	0.143	-0.752
	Total Suspended Solids	0.047	-0.790
	Turbidity	0.086	-0.870
Dissolved Metals	Dissolved Aluminum	-	-
	Dissolved Antimony	0.818	0.038
	Dissolved Arsenic	0.351	-0.534
	Dissolved Barium	0.182	-0.404
	Dissolved Beryllium	-	-
	Dissolved Bismuth	-	-
	Dissolved Boron	0.648	-0.205
	Dissolved Bromide	-	-
	Dissolved Cadmium	0.460	0.166
	Dissolved Chloride	0.767	-0.017
	Dissolved Chromium	-0.359	0.240
	Dissolved Cobalt	-	-
	Dissolved Copper	-	-
	Dissolved Fluoride	0.478	0.417
	Dissolved Iron	-	-
	Dissolved Lead	-	-
	Dissolved Lithium	0.891	0.093
	Dissolved Manganese	0.461	-0.073
	Dissolved Mercury	-	-
	Dissolved Molybdenum	0.829	0.124
	Dissolved Nickel	0.848	0.118
	Dissolved Selenium	0.811	0.442
	Dissolved Silver	-	-
	Dissolved Strontium	0.606	-0.116
	Dissolved Thallium	-	-
	Dissolved Tin	-	-
	Dissolved Titanium	-	-
	Dissolved Uranium	0.862	0.435
	Dissolved Vanadium	-	-
	Dissolved Zinc	-	-
Total Metals	Total Aluminum	-0.074	-0.899
	Total Antimony	0.826	-0.025
	Total Arsenic	0.305	-0.711
	Total Barium	0.211	-0.466
	Total Beryllium	-	-
	Total Bismuth	-	-
	Total Boron	0.670	-0.199
	Total Cadmium	0.615	-0.158
	Total Calcium	0.938	0.334
	Total Chromium	-0.239	-0.499
	Total Cobalt	0.577	-0.404
	Total Copper	-	-
	Total Iron	0.040	-0.877
	Total Lead	0.141	-0.704
	Total Lithium	0.899	0.088
	Total Magnesium	0.947	0.298
	Total Manganese	0.288	-0.559
	Total Mercury	-	-
	Total Molybdenum	0.832	0.105
	Total Nickel	0.824	-0.039
	Total Phosphorus	-0.042	-0.828
	Total Potassium	0.941	0.002
	Total Selenium	0.812	0.442
	Total Silver	-	-
	Total Sodium	0.607	-0.287
	Total Strontium	0.611	-0.109
	Total Thallium	0.590	-0.301
	Total Tin	-	-
	Total Titanium	-	-
	Total Uranium	0.865	0.428
	Total Vanadium	-	-
	Total Zinc	0.571	-0.169

r > 0.6 or r < -0.6

Notes: "-" = not included in PCA becase more than 50% of samples were less than laboratory reported limit. P-value not reported because with a large sample size (1,395), the critical is 0.052 at α=0.05

Table C.4: Spearman Rank Correlation Coefficients for Order Constituents vs. all Other Water Quality Constituents in Samples (n = 2,121) Collected at Mine-exposed Areas in Routine Monitoring in 2015

	Parameter	Dissolved Cadmium	Nitrate-N	Total Selenium	Sulphate
Non-metals	Instantaneous Flow	0.291	0.262	0.250	0.092
	Conductivity, Field	0.326	0.714	0.803	0.906
	Conductivity, Lab	0.331	0.794	0.858	0.957
	Dissolved Organic Carbon	-0.028	-0.344	-0.256	-0.242
	Dissolved Oxygen	0.094	0.017	0.050	-0.012
	Hardness (as $CaCO_3$)	0.333	0.797	0.865	0.964
	Nitrate-N	0.463	-	0.881	0.841
	Nitrite-N	<LRL	<LRL	<LRL	<LRL
	Nitrogen, Ammonia (as N)	<LRL	<LRL	<LRL	<LRL
	Ortho-phosphate	-0.075	-0.356	-0.284	-0.282
	pH, Field	-0.103	-0.102	-0.098	-0.064
	pH, Lab	-0.162	-0.269	-0.194	-0.197
	Sulphate	0.345	0.841	0.912	-
	Temperature, Field	-0.100	-0.023	-0.023	0.048
	Total Alkalinity (as $CaCO_3$)	0.154	0.456	0.527	0.666
	Total Dissolved Solids	0.342	0.808	0.873	0.967
	Total Kjeldahl Nitrogen	-0.236	-0.294	-0.259	-0.200
	Total Organic Carbon	-0.043	-0.285	-0.220	-0.170
	Total Suspended Solids	-0.188	-0.190	-0.248	-0.204
	Turbidity	-0.086	-0.259	-0.261	-0.211
Dissolved Metals	Dissolved Aluminum	<LRL	<LRL	<LRL	<LRL
	Dissolved Antimony	0.442	0.612	0.612	0.666
	Dissolved Arsenic	-0.099	-0.143	-0.086	0.047
	Dissolved Barium	-0.046	-0.093	-0.149	-0.145
	Dissolved Beryllium	<LRL	<LRL	<LRL	<LRL
	Dissolved Bismuth	<LRL	<LRL	<LRL	<LRL
	Dissolved Boron	0.076	0.253	0.224	0.402
	Dissolved Bromide	<LRL	<LRL	<LRL	<LRL
	Dissolved Cadmium	-	0.463	0.445	0.345
	Dissolved Chloride	0.107	0.521	0.547	0.660
	Dissolved Chromium	-0.270	-0.115	-0.109	-0.116
	Dissolved Cobalt	<LRL	<LRL	<LRL	<LRL
	Dissolved Copper	<LRL	<LRL	<LRL	<LRL
	Dissolved Fluoride	0.147	0.488	0.552	0.530
	Dissolved Iron	<LRL	<LRL	<LRL	<LRL
	Dissolved Lead	<LRL	<LRL	<LRL	<LRL
	Dissolved Lithium	0.398	0.720	0.686	0.729
	Dissolved Manganese	0.174	0.349	0.302	0.388
	Dissolved Mercury	<LRL	<LRL	<LRL	<LRL
	Dissolved Molybdenum	0.299	0.580	0.646	0.709
	Dissolved Nickel	0.467	0.707	0.684	0.778
	Dissolved Selenium	0.444	0.885	1.000	0.912
	Dissolved Silver	<LRL	<LRL	<LRL	<LRL
	Dissolved Strontium	-0.078	0.367	0.298	0.493
	Dissolved Thallium	<LRL	<LRL	<LRL	<LRL
	Dissolved Tin	<LRL	<LRL	<LRL	<LRL
	Dissolved Titanium	<LRL	<LRL	<LRL	<LRL
	Dissolved Uranium	0.355	0.858	0.895	0.960
	Dissolved Vanadium	<LRL	<LRL	<LRL	<LRL
	Dissolved Zinc	<LRL	<LRL	<LRL	<LRL
Total Metals	Total Aluminum	-0.146	-0.330	-0.369	-0.315
	Total Antimony	0.444	0.586	0.595	0.645
	Total Arsenic	-0.103	-0.170	-0.143	-0.022
	Total Barium	-0.050	-0.077	-0.140	-0.127
	Total Beryllium	<LRL	<LRL	<LRL	<LRL
	Total Bismuth	<LRL	<LRL	<LRL	<LRL
	Total Boron	0.074	0.258	0.237	0.412
	Total Cadmium	0.698	0.492	0.443	0.406
	Total Calcium	0.332	0.811	0.858	0.956
	Total Chromium	-0.189	-0.243	-0.284	-0.243
	Total Cobalt	<LRL	<LRL	<LRL	<LRL
	Total Copper	<LRL	<LRL	<LRL	<LRL
	Total Iron	-0.177	-0.260	-0.316	-0.258
	Total Lead	<LRL	<LRL	<LRL	<LRL
	Total Lithium	0.402	0.717	0.686	0.729
	Total Magnesium	0.338	0.785	0.871	0.964
	Total Manganese	0.009	0.046	-0.038	0.053
	Total Mercury	<LRL	<LRL	<LRL	<LRL
	Total Molybdenum	0.300	0.567	0.640	0.701
	Total Nickel	0.451	0.636	0.611	0.696
	Total Phosphorus	-0.123	-0.375	-0.338	-0.322
	Total Potassium	0.385	0.611	0.669	0.759
	Total Selenium	0.445	0.881	-	0.912
	Total Silver	<LRL	<LRL	<LRL	<LRL
	Total Sodium	0.017	0.255	0.178	0.362
	Total Strontium	-0.074	0.367	0.301	0.494
	Total Thallium	<LRL	<LRL	<LRL	<LRL
	Total Tin	<LRL	<LRL	<LRL	<LRL
	Total Titanium	<LRL	<LRL	<LRL	<LRL
	Total Uranium	0.361	0.859	0.898	0.959
	Total Vanadium	<LRL	<LRL	<LRL	<LRL
	Total Zinc	<LRL	<LRL	<LRL	<LRL

r > 0.6 or r < -0.6

Notes: less than laboratory report limit (LRL) = more than 50% of samples were < LRL and correlation was not conducted

Table C.5: Spearman Rank Correlation Coefficients for all Water Quality Constituents in Samples (n = 203) Measured at Reference Areas in Routine Monitoring, 2015

	Parameter	Instantaneous Flow	Conductivity, Field	Conductivity, Lab	Dissolved Organic Carbon	Dissolved Oxygen	Hardness (as $CaCO_3$)	Nitrate-N	Ortho-phosphate	pH, Field	pH, Lab	Specific Conductivity (Temp corrected)	Sulphate	Temperature, Field	Total Alkalinity (as $CaCO_3$)	Total Dissolved Solids	Total Kjeldahl Nitrogen	Total Organic Carbon	Turbidity	Dissolved Barium	Dissolved Chromium	Dissolved Fluoride	Dissolved Lithium	Dissolved Manganese	Dissolved Molybdenum	Dissolved Selenium	Dissolved Strontium	Dissolved Uranium	Total Aluminum	Total Arsenic	Total Barium	Total Cadmium	Total Calcium
Non-metals	Instantaneous Flow	-	-0.468	-0.562	0.285	0.153	-0.548	0.251	-0.308	-0.076	-0.032	-0.174	-0.253	0.130	-0.693	-0.569	0.459	0.212	0.266	-0.509	-0.264	0.352	-0.730	-0.195	-0.635	-0.182	-0.667	-0.056	0.150	-0.154	-0.530	0.090	-0.491
	Conductivity, Field	-0.468	-	0.875	-0.304	0.007	0.745	0.067	0.023	0.301	0.203	-	0.796	-0.151	0.549	0.835	-0.260	-0.224	-0.361	0.381	-0.330	0.095	0.190	-0.153	0.438	0.459	0.288	0.374	-0.423	-0.250	0.382	-0.103	0.756
	Conductivity, Lab	-0.562	0.875	-	-0.374	0.124	0.925	0.183	-0.017	0.193	0.252	0.659	0.867	-0.321	0.621	0.923	-0.409	-0.368	-0.381	0.408	-0.181	0.067	0.206	-0.134	0.452	0.617	0.317	0.450	-0.414	-0.317	0.415	-0.155	0.861
	Dissolved Organic Carbon	0.285	-0.304	-0.374	-	0.111	-0.306	-0.398	0.268	-0.191	0.203	0.415	-0.469	-0.014	-0.143	-0.370	0.454	0.829	0.371	-0.138	-0.060	-0.330	0.024	-0.022	-0.122	-0.361	-0.251	-0.263	0.448	0.273	-0.135	0.399	-0.346
	Dissolved Oxygen	0.153	0.007	0.124	0.111	-	0.106	0.357	0.082	0.043	0.152	0.095	0.207	-0.674	-0.089	0.108	0.060	0.018	-0.011	0.138	0.107	0.099	0.096	-0.298	-0.334	0.227	-0.341	0.103	-0.123	-0.123	0.136	0.034	0.022
	Hardness (as $CaCO_3$)	-0.548	0.745	0.925	-0.306	0.106	-	0.065	-0.003	0.145	0.219	0.862	0.789	-0.299	0.642	0.877	-0.283	-0.285	-0.275	0.457	-0.150	0.007	0.148	0.002	0.427	0.422	0.341	0.439	-0.346	-0.256	0.472	-0.074	0.939
	Nitrate-N	0.251	0.067	0.183	-0.398	0.357	0.065	-	-0.228	-0.092	-0.284	-0.905	0.452	-0.390	-0.265	0.154	-0.316	-0.507	-0.267	-0.181	0.108	0.586	-0.244	-0.430	-0.302	0.490	-0.061	0.379	-0.345	-0.250	-0.171	-0.118	0.198
	Ortho-phosphate	-0.308	0.023	-0.017	0.268	0.082	-0.003	-0.228	-	0.012	0.063	0.000	-0.094	-0.155	0.047	-0.007	-0.022	0.264	-0.016	0.386	-0.283	-0.473	0.198	-0.328	-0.161	-0.305	-0.435	-0.504	0.066	0.241	0.394	0.153	-0.038
	pH, Field	-0.076	0.301	0.193	-0.191	0.043	0.145	-0.092	0.012	-	0.307	-0.310	0.177	0.007	0.178	0.155	-0.036	-0.170	-0.140	0.322	-0.146	0.138	0.194	-0.032	0.121	0.137	-0.111	0.078	-0.117	-0.153	0.306	-0.076	0.124
	pH, Lab	-0.032	0.203	0.252	0.203	0.152	0.219	-0.284	0.063	0.307	-	0.228	0.129	-0.020	0.315	0.191	0.247	0.222	0.084	0.453	-0.239	-0.192	0.206	0.095	0.052	0.033	-0.142	-0.032	0.072	-0.122	0.429	-0.033	0.151
	Specific Conductivity (Temp corrected)	-0.174	-	0.659	0.415	0.095	0.862	-0.905	0.000	-0.310	0.228	-	-0.714	-0.048	0.886	0.690	0.049	0.436	0.167	0.419	-0.337	-0.643	0.755	0.609	0.738	-0.429	0.359	-0.286	-0.167	-0.740	0.643	-0.311	0.190
	Sulphate	-0.253	0.796	0.867	-0.469	0.207	0.789	0.452	-0.094	0.177	0.129	-0.714	-	-0.358	0.265	0.826	-0.387	-0.505	-0.474	0.213	-0.281	0.349	0.044	-0.389	0.209	0.684	0.114	0.496	-0.514	-0.366	0.215	-0.251	0.738
	Temperature, Field	0.130	-0.151	-0.321	-0.014	-0.674	-0.299	-0.390	-0.155	0.007	-0.020	-0.048	-0.358	-	-0.016	-0.285	0.098	0.066	0.133	-0.165	-0.039	0.052	-0.085	0.327	0.144	-0.246	0.137	-0.067	0.244	0.211	-0.173	0.050	-0.221
	Total Alkalinity (as $CaCO_3$)	-0.693	0.549	0.621	-0.143	-0.089	0.642	-0.265	0.047	0.178	0.315	0.886	0.265	-0.016	-	0.582	-0.261	-0.072	-0.072	0.594	0.042	-0.349	0.329	0.406	0.608	0.226	0.464	0.155	-0.160	-0.167	0.599	0.011	0.597
	Total Dissolved Solids	-0.569	0.835	0.923	-0.370	0.108	0.877	0.154	-0.007	0.155	0.191	0.690	0.826	-0.285	0.582	-	-0.367	-0.357	-0.383	0.410	-0.234	0.039	0.175	-0.150	0.380	0.536	0.284	0.384	-0.393	-0.258	0.421	-0.079	0.835
	Total Kjeldahl Nitrogen	0.459	-0.260	-0.409	0.454	0.060	-0.283	-0.316	-0.022	-0.036	0.247	0.049	-0.387	0.098	-0.261	-0.367	-	0.425	0.335	-0.069	-0.214	-0.126	-0.148	-0.110	-0.320	-0.409	-0.395	-0.291	0.405	0.034	-0.068	0.239	-0.376
	Total Organic Carbon	0.212	-0.224	-0.368	0.829	0.018	-0.285	-0.507	0.264	-0.170	0.222	0.436	-0.505	0.066	-0.072	-0.357	0.425	-	0.416	-0.059	-0.071	-0.421	0.029	0.023	-0.094	-0.380	-0.246	-0.324	0.525	0.312	-0.055	0.364	-0.350
	Turbidity	0.266	-0.361	-0.381	0.371	-0.011	-0.275	-0.267	-0.016	-0.140	0.084	0.167	-0.474	0.133	-0.072	-0.383	0.335	0.416	-	-0.194	0.117	-0.347	-0.124	0.516	0.028	-0.157	0.114	-0.095	0.812	0.321	-0.182	0.325	-0.314
Dissolved Metals	Dissolved Barium	-0.509	0.381	0.408	-0.138	0.138	0.457	-0.181	0.386	0.322	0.453	0.419	0.213	-0.165	0.594	0.410	-0.069	-0.059	-0.194	-	-0.230	-0.407	0.296	0.082	-0.028	-0.114	-0.250	-0.315	-0.239	-0.222	0.991	-0.035	0.394
	Dissolved Chromium	-0.264	-0.330	-0.181	-0.060	0.107	-0.150	0.108	-0.283	-0.146	-0.239	-0.337	-0.281	-0.039	0.042	-0.234	-0.214	-0.071	0.117	-0.230	-	0.093	0.205	0.262	0.242	0.224	0.430	0.320	0.108	0.147	-0.226	0.079	-0.189
	Dissolved Fluoride	0.352	0.095	0.067	-0.330	0.099	0.007	0.586	-0.473	0.138	-0.192	-0.643	0.349	0.052	-0.349	0.039	-0.126	-0.421	-0.347	-0.407	0.093	-	-0.040	-0.476	-0.066	0.459	-0.012	0.585	-0.345	-0.171	-0.416	-0.151	0.052
	Dissolved Lithium	-0.730	0.190	0.206	0.024	0.096	0.148	-0.244	0.198	0.194	0.206	0.755	0.044	-0.085	0.329	0.175	-0.148	0.029	-0.124	0.296	0.205	-0.040	-	-0.287	0.415	0.208	0.031	0.209	-0.037	0.162	0.279	-0.101	-0.031
	Dissolved Manganese	-0.195	-0.153	-0.134	-0.022	-0.298	0.002	-0.430	-0.328	-0.032	0.095	0.609	-0.389	0.327	0.406	-0.150	-0.110	0.023	0.516	0.082	0.262	-0.476	-0.287	-	0.372	-0.119	0.521	-0.041	0.407	0.071	0.090	0.040	0.010
	Dissolved Molybdenum	-0.635	0.438	0.452	-0.122	-0.334	0.427	-0.302	-0.161	0.121	0.052	0.738	0.209	0.144	0.608	0.380	-0.320	-0.094	0.028	-0.028	0.242	-0.066	0.415	0.372	-	0.477	0.768	0.539	0.041	0.059	-0.024	-0.017	0.346
	Dissolved Selenium	-0.182	0.459	0.617	-0.361	0.227	0.422	0.490	-0.305	0.137	0.033	-0.429	0.684	-0.246	0.226	0.536	-0.409	-0.380	-0.157	-0.114	0.224	0.459	0.208	-0.119	0.477	-	0.453	0.893	-0.215	-0.185	-0.115	-0.181	0.475
	Dissolved Strontium	-0.667	0.288	0.317	-0.251	-0.341	0.341	-0.061	-0.435	-0.111	-0.142	0.359	0.114	0.137	0.464	0.284	-0.395	-0.246	0.114	-0.250	0.430	-0.012	0.031	0.521	0.768	0.453	-	0.551	0.064	0.044	-0.234	-0.043	0.359
	Dissolved Uranium	-0.056	0.374	0.450	-0.263	0.103	0.439	0.379	-0.504	0.078	-0.032	-0.286	0.496	-0.067	0.155	0.384	-0.291	-0.324	-0.095	-0.315	0.320	0.585	0.209	-0.041	0.539	0.893	0.551	-	-0.134	-0.096	-0.309	-0.107	0.370
Total Metals	Total Aluminum	0.150	-0.423	-0.414	0.448	-0.123	-0.346	-0.345	0.066	-0.117	0.072	-0.167	-0.514	0.244	-0.160	-0.393	0.405	0.525	0.812	-0.239	0.108	-0.345	-0.037	0.407	0.041	-0.215	0.064	-0.134	-	0.426	-0.235	0.406	-0.373
	Total Arsenic	-0.154	-0.250	-0.317	0.273	-0.123	-0.256	-0.250	0.241	-0.153	-0.122	-0.740	-0.366	0.211	-0.167	-0.258	0.034	0.312	0.321	-0.222	0.147	-0.171	0.162	0.071	0.059	-0.185	0.044	-0.096	0.426	-	-0.209	0.373	-0.274
	Total Barium	-0.530	0.382	0.415	-0.135	0.136	0.472	-0.171	0.394	0.306	0.429	0.643	0.215	-0.173	0.599	0.421	-0.068	-0.055	-0.182	0.991	-0.226	-0.416	0.279	0.090	-0.024	-0.115	-0.234	-0.309	-0.235	-0.209	-	-0.010	0.423
	Total Cadmium	0.090	-0.103	-0.155	0.399	0.034	-0.074	-0.118	0.153	-0.076	-0.033	-0.311	-0.251	0.050	0.011	-0.079	0.239	0.364	0.325	-0.035	0.079	-0.151	-0.101	0.040	-0.017	-0.181	-0.043	-0.107	0.406	0.373	-0.010	-	-0.038
	Total Calcium	-0.491	0.756	0.861	-0.346	0.022	0.939	0.198	-0.038	0.124	0.151	0.190	0.738	-0.221	0.597	0.835	-0.376	-0.350	-0.314	0.394	-0.189	0.052	-0.031	0.010	0.346	0.475	0.359	0.370	-0.373	-0.274	0.423	-0.038	-
	Total Chromium	0.016	-0.402	-0.348	0.221	-0.039	-0.279	-0.092	-0.178	-0.148	-0.130	-0.470	-0.444	0.100	-0.066	-0.376	0.156	0.241	0.566	-0.360	0.579	-0.060	0.061	0.451	0.237	0.151	0.390	0.257	0.608	0.404	-0.349	0.284	-0.297
	Total Iron	0.180	-0.396	-0.355	0.287	-0.066	-0.263	-0.243	-0.179	-0.109	0.031	0.203	-0.454	0.169	-0.100	-0.339	0.201	0.323	0.814	-0.269	0.138	-0.263	-0.118	0.375	0.108	-0.058	0.145	0.033	0.905	0.307	-0.260	0.418	-0.312
	Total Lithium	-0.719	0.070	0.102	0.115	0.105	0.126	-0.280	0.254	0.124	0.125	0.635	-0.051	-0.030	0.226	0.087	-0.049	0.114	-0.008	0.236	0.255	-0.046	0.872	-0.198	0.346	0.144	0.022	0.189	0.069	0.312	0.236	0.046	-0.027
	Total Magnesium	-0.590	0.812	0.897	-0.193	0.211	0.949	0.092	0.127	0.240	0.289	0.778	0.765	-0.371	0.606	0.853	-0.296	-0.200	-0.300	0.531	-0.186	-0.022	0.277	-0.107	0.390	0.543	0.192	0.391	-0.331	-0.224	0.548	0.002	0.859
	Total Manganese	0.058	-0.306	-0.293	0.212	-0.230	-0.169	-0.403	-0.137	-0.068	0.064	0.228	-0.518	0.317	0.195	-0.299	0.176	0.311	0.753	-0.062	0.257	-0.419	-0.132	0.803	0.259	-0.130	0.346	-0.034	0.762	0.280	-0.052	0.276	-0.182
	Total Molybdenum	-0.591	0.346	0.385	-0.056	-0.325	0.423	-0.337	-0.125	0.062	-0.013	0.738	0.134	0.152	0.568	0.340	-0.286	-0.029	0.137	-0.082	0.306	-0.138	0.355	0.458	0.933	0.432	0.790	0.522	0.118	0.144	-0.064	0.052	0.352
	Total Phosphorus	0.175	-0.245	-0.276	0.492	0.129	-0.210	-0.252	0.274	-0.050	0.085	0.203	-0.386	-0.066	-0.028	-0.258	0.370	0.511	0.530	0.091	-0.054	-0.410	0.091	-0.042	-0.113	-0.282	-0.294	-0.291	0.604	0.306	0.099	0.366	-0.266
	Total Potassium	-0.613	0.282	0.292	0.296	-0.150	0.385	-0.594	0.529	0.057	0.236	0.929	-0.002	0.047	0.511	0.315	0.123	0.376	0.230	0.447	-0.171	-0.667	0.278	0.326	0.346	-0.177	0.115	-0.235	0.264	0.252	0.469	0.310	0.316
	Total Selenium	-0.154	0.439	0.608	-0.337	0.244	0.424	0.496	-0.291	0.124	0.012	-0.455	0.673	-0.258	0.210	0.527	-0.392	-0.361	-0.137	-0.123	0.221	0.451	0.176	-0.106	0.462	0.988	0.444	0.886	-0.190	-0.172	-0.117	-0.172	0.489
	Total Sodium	-0.813	0.267	0.295	0.152	0.141	0.243	-0.245	0.416	0.156	0.204	0.429	0.132	-0.217	0.380	0.301	-0.080	0.180	-0.120	0.402	0.120	-0.216	0.816	-0.160	0.366	0.206	0.004	0.083	-0.027	0.224	0.402	0.082	0.110
	Total Strontium	-0.673	0.291	0.318	-0.241	-0.335	0.344	-0.051	-0.420	-0.129	-0.165	0.500	0.113	0.130	0.468	0.288	-0.405	-0.236	0.117	-0.251	0.414	-0.024	0.027	0.525	0.759	0.449	0.992	0.547	0.061	0.052	-0.228	-0.032	0.372
	Total Uranium	-0.065	0.351	0.428	-0.251	0.092	0.440	0.375	-0.492	0.072	-0.057	-0.286	0.474	-0.051	0.149	0.366	-0.280	-0.308	-0.065	-0.326	0.329	0.586	0.192	-0.017	0.534	0.874	0.557	0.992	-0.107	-0.072	-0.313	-0.079	0.382

r > 0.6 or r < -0.6

Notes: Parameters with more than 50% of values less than laboratory reporting limit were not included (Total Suspended Solids, Nitrite-N, Nitrogen, Ammonia (as N), Dissolved Aluminum, Dissolved Antimony, Dissolved Arsenic, Dissolved Beryllium, Dissolved Bismuth, Dissolved Boron, Dissolved Bromide, Dissolved Cadmium, Dissolved Chloride, Dissolved Cobalt, Dissolved Copper, Dissolved Iron, Dissolved Lead, Dissolved Mercury, Dissolved Nickel, Dissolved Silver, Dissolved Thallium, Dissolved Tin, Dissolved Titanium, Dissolved Vanadium, Dissolved Zinc, Total Antimony, Total Beryllium, Total Bismuth, Total Boron, Total Cobalt, Total Copper, Total Lead, Total Mercury, Total Nickel, Total Silver, Total Thallium, Total Tin, Total Titanium, Total Vanadium, and Total Zinc).

Table C.5: Spearman Rank Correlation Coefficients for all Water Quality Constituents in Samples (n = 203) Measured at Reference Areas in Routine Monitoring, 2015

	Parameter	Total Chromium	Total Iron	Total Lithium	Total Magnesium	Total Manganese	Total Molybdenum	Total Phosphorus	Total Potassium	Total Selenium	Total Sodium	Total Strontium	Total Uranium
Non-metals	Instantaneous Flow	0.016	0.180	-0.719	-0.590	0.058	-0.591	0.175	-0.613	-0.154	-0.813	-0.673	-0.065
	Conductivity, Field	-0.402	-0.396	0.070	0.812	-0.306	0.346	-0.245	0.282	0.439	0.267	0.291	0.351
	Conductivity, Lab	-0.348	-0.355	0.102	0.897	-0.293	0.385	-0.276	0.292	0.608	0.295	0.318	0.428
	Dissolved Organic Carbon	0.221	0.287	0.115	-0.193	0.212	-0.056	0.492	0.296	-0.337	0.152	-0.241	-0.251
	Dissolved Oxygen	-0.039	-0.066	0.105	0.211	-0.230	-0.325	0.129	-0.150	0.244	0.141	-0.335	0.092
	Hardness (as $CaCO_3$)	-0.279	-0.263	0.126	0.949	-0.169	0.423	-0.210	0.385	0.424	0.243	0.344	0.440
	Nitrate-N	-0.092	-0.243	-0.280	0.092	-0.403	-0.337	-0.252	-0.594	0.496	-0.245	-0.051	0.375
	Ortho-phosphate	-0.178	-0.179	0.254	0.127	-0.137	-0.125	0.274	0.529	-0.291	0.416	-0.420	-0.492
	pH, Field	-0.148	-0.109	0.124	0.240	-0.068	0.062	-0.050	0.057	0.124	0.156	-0.129	0.072
	pH, Lab	-0.130	0.031	0.125	0.289	0.064	-0.013	0.085	0.236	0.012	0.204	-0.165	-0.057
	Specific Conductivity (Temp corrected)	-0.470	0.203	0.635	0.778	0.228	0.738	0.203	0.929	-0.455	0.429	0.500	-0.286
	Sulphate	-0.444	-0.454	-0.051	0.765	-0.518	0.134	-0.386	-0.002	0.673	0.132	0.113	0.474
	Temperature, Field	0.100	0.169	-0.030	-0.371	0.317	0.152	-0.066	0.047	-0.258	-0.217	0.130	-0.051
	Total Alkalinity (as $CaCO_3$)	-0.066	-0.100	0.226	0.606	0.195	0.568	-0.028	0.511	0.210	0.380	0.468	0.149
	Total Dissolved Solids	-0.376	-0.339	0.087	0.853	-0.299	0.340	-0.258	0.315	0.527	0.301	0.288	0.366
	Total Kjeldahl Nitrogen	0.156	0.201	-0.049	-0.296	0.176	-0.286	0.370	0.123	-0.392	-0.080	-0.405	-0.280
	Total Organic Carbon	0.241	0.323	0.114	-0.200	0.311	-0.029	0.511	0.376	-0.361	0.180	-0.236	-0.308
	Turbidity	0.566	0.814	-0.008	-0.300	0.753	0.137	0.530	0.230	-0.137	-0.120	0.117	-0.065
Dissolved Metals	Dissolved Barium	-0.360	-0.269	0.236	0.531	-0.062	-0.082	0.091	0.447	-0.123	0.402	-0.251	-0.326
	Dissolved Chromium	0.579	0.138	0.255	-0.186	0.257	0.306	-0.054	-0.171	0.221	0.120	0.414	0.329
	Dissolved Fluoride	-0.060	-0.263	-0.046	-0.022	-0.419	-0.138	-0.410	-0.667	0.451	-0.216	-0.024	0.586
	Dissolved Lithium	0.061	-0.118	0.872	0.277	-0.132	0.355	0.091	0.278	0.176	0.816	0.027	0.192
	Dissolved Manganese	0.451	0.375	-0.198	-0.107	0.803	0.458	-0.042	0.326	-0.106	-0.160	0.525	-0.017
	Dissolved Molybdenum	0.237	0.108	0.346	0.390	0.259	0.933	-0.113	0.346	0.462	0.366	0.759	0.534
	Dissolved Selenium	0.151	-0.058	0.144	0.543	-0.130	0.432	-0.282	-0.177	0.988	0.206	0.449	0.874
	Dissolved Strontium	0.390	0.145	0.022	0.192	0.346	0.790	-0.294	0.115	0.444	0.004	0.992	0.557
	Dissolved Uranium	0.257	0.033	0.189	0.391	-0.034	0.522	-0.291	-0.235	0.886	0.083	0.547	0.992
Total Metals	Total Aluminum	0.608	0.905	0.069	-0.331	0.762	0.118	0.604	0.264	-0.190	-0.027	0.061	-0.107
	Total Arsenic	0.404	0.307	0.312	-0.224	0.280	0.144	0.306	0.252	-0.172	0.224	0.052	-0.072
	Total Barium	-0.349	-0.260	0.236	0.548	-0.052	-0.064	0.099	0.469	-0.117	0.402	-0.228	-0.313
	Total Cadmium	0.284	0.418	0.046	0.002	0.276	0.052	0.366	0.310	-0.172	0.082	-0.032	-0.079
	Total Calcium	-0.297	-0.312	-0.027	0.859	-0.182	0.352	-0.266	0.316	0.489	0.110	0.372	0.382
	Total Chromium	-	0.675	0.183	-0.282	0.672	0.339	0.262	0.011	0.164	-0.005	0.389	0.278
	Total Iron	0.675	-	0.015	-0.264	0.836	0.200	0.508	0.217	-0.039	-0.085	0.146	0.065
	Total Lithium	0.183	0.015	-	0.258	-0.012	0.362	0.162	0.396	0.135	0.783	0.027	0.203
	Total Magnesium	-0.282	-0.264	0.258	-	-0.219	0.371	-0.109	0.426	0.549	0.391	0.200	0.391
	Total Manganese	0.672	0.836	-0.012	-0.219	-	0.357	0.400	0.333	-0.111	-0.137	0.354	0.000
	Total Molybdenum	0.339	0.200	0.362	0.371	0.357	-	-0.057	0.436	0.433	0.337	0.794	0.535
	Total Phosphorus	0.262	0.508	0.162	-0.109	0.400	-0.057	-	0.381	-0.260	0.206	-0.285	-0.269
	Total Potassium	0.011	0.217	0.396	0.426	0.333	0.436	0.381	-	-0.152	0.445	0.131	-0.209
	Total Selenium	0.164	-0.039	0.135	0.549	-0.111	0.433	-0.260	-0.152	-	0.196	0.445	0.874
	Total Sodium	-0.005	-0.085	0.783	0.391	-0.137	0.337	0.206	0.445	0.196	-	0.014	0.071
	Total Strontium	0.389	0.146	0.027	0.200	0.354	0.794	-0.285	0.131	0.445	0.014	-	0.558
	Total Uranium	0.278	0.065	0.203	0.391	0.000	0.535	-0.269	-0.209	0.874	0.071	0.558	-

r > 0.6 or r < -0.6

Notes: Parameters with more than 50% of values less than laboratory reporting limit were not included (Total Suspended Solids, Nitrite-N, Nitrogen, Ammonia (as N), Dissolved Aluminum, Dissolved Antimony, Dissolved Arsenic, Dissolved Beryllium, Dissolved Bismuth, Dissolved Boron, Dissolved Bromide, Dissolved Cadmium, Dissolved Chloride, Dissolved Cobalt, Dissolved Copper, Dissolved Iron, Dissolved Lead, Dissolved Mercury, Dissolved Nickel, Dissolved Silver, Dissolved Thallium, Dissolved Tin, Dissolved Titanium, Dissolved Vanadium, Dissolved Zinc, Total Antimony, Total Beryllium, Total Bismuth, Total Boron, Total Cobalt, Total Copper, Total Lead, Total Mercury, Total Nickel, Total Silver, Total Thallium, Total Tin, Total Titanium, Total Vanadium, and Total Zinc).

Table C.6: **Pearson Correlation of Log_{10}-transformed Water Quality Variables for Reference (n = 40) and Mine-exposed (n = 59) Lotic Monitoring Areas to Two Principal Components (PC-1 and PC-2) from PCAs of Chemical Quality Variables (Conducted Five Different Ways) for Samples Collected Concurrently with Biological Samples in September, 2015**

Variable	PCs for all WQ variables (concentration)				PCs for all WQ variables (HQ)[a]				PCs for all WQ variables and Calcite Index (HQ)[a]				PCs for key[b] WQ variables and Calcite Index (concentration)				PCs for key[b] WQ variables and Calcite Index (HQ)[a]			
	PC-1 (48.9%)		PC-2 (9.3%)		PC-1 (69.2%)		PC-2 (8.9%)		PC-1 (69.1%)		PC-2 (8.8%)		PC-1 (84.2%)		PC-2 (9.4%)		PC-1 (85.5%)		PC-2 (9.4%)	
	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value
Calcite Index	-	-	-	-	-	-	-	-	0.750	<0.001	0.033	0.747	0.842	<0.001	0.537	<0.001	0.779	<0.001	0.445	<0.001
Hardness (as $CaCO_3$)	0.967	<0.001	-0.029	0.780	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids	-0.223	0.027	-0.736	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	0.964	<0.001	-0.041	0.692	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	-0.195	0.054	-0.862	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Bicarbonate (as $CaCO_3$)	0.824	<0.001	-0.025	0.804	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as $CaCO_3$)	0.824	<0.001	-0.025	0.804	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia (as N)	0.392	<0.001	-0.167	0.101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	0.745	<0.001	-0.301	0.003	0.598	<0.001	0.020	0.840	0.598	<0.001	0.021	0.840	-	-	-	-	-	-	-	-
Fluoride	0.479	<0.001	0.384	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate (as N)	0.766	<0.001	0.067	0.514	0.934	<0.001	-0.276	0.006	0.934	<0.001	-0.277	0.006	0.928	<0.001	-0.243	0.015	0.963	<0.001	-0.252	0.012
Nitrite (as N)	0.672	<0.001	-0.085	0.404	0.539	<0.001	-0.314	0.002	0.540	<0.001	-0.314	0.002	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen	0.305	0.002	-0.034	0.741	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orthophosphate-Dissolved (as P)	-0.059	0.563	0.032	0.756	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Phosphate (as P)	-0.078	0.444	-0.607	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	0.898	<0.001	-0.048	0.637	0.922	<0.001	0.062	0.543	0.922	<0.001	0.062	0.543	0.943	<0.001	-0.121	0.234	0.914	<0.001	0.124	0.222
Dissolved Organic Carbon	0.329	0.001	-0.396	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	0.370	<0.001	-0.314	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Aluminum	-0.279	0.005	-0.778	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Arsenic	0.346	<0.001	0.165	0.105	0.304	0.002	0.132	0.190	0.305	0.002	0.133	0.190	-	-	-	-	-	-	-	-
Total Barium	0.416	<0.001	-0.016	0.877	0.231	0.021	0.249	0.013	0.231	0.021	0.249	0.013	-	-	-	-	-	-	-	-
Total Cadmium	0.682	<0.001	0.275	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Calcium	0.969	<0.001	0.005	0.964	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Iron	-0.153	0.134	-0.712	<0.001	-0.143	0.156	-0.618	<0.001	-0.144	0.156	-0.618	<0.001	-	-	-	-	-	-	-	-
Total Lithium	0.880	<0.001	0.108	0.289	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Magnesium	0.952	<0.001	-0.070	0.496	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Manganese	0.164	0.106	-0.705	<0.001	-0.281	0.005	-0.742	<0.001	-0.280	0.005	-0.741	<0.001	-	-	-	-	-	-	-	-
Total Molybdenum	0.815	<0.001	-0.089	0.385	0.600	<0.001	0.335	<0.001	0.600	<0.001	0.335	<0.001	-	-	-	-	-	-	-	-
Total Nickel	0.767	<0.001	0.059	0.562	0.186	0.064	0.244	0.015	0.187	0.064	0.244	0.015	-	-	-	-	-	-	-	-
Total Potassium	0.945	<0.001	-0.133	0.190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Selenium	0.891	<0.001	0.197	0.052	0.966	<0.001	0.163	0.108	0.966	<0.001	0.163	0.108	0.953	<0.001	-0.118	0.245	0.963	<0.001	0.151	0.136
Total Silicon	0.451	<0.001	-0.300	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Sodium	0.618	<0.001	-0.332	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Strontium	0.430	<0.001	-0.313	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Sulfur	0.905	<0.001	-0.046	0.652	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Uranium	0.893	<0.001	0.025	0.805	0.920	<0.001	0.101	0.322	0.920	<0.001	0.101	0.322	-	-	-	-	-	-	-	-
Dissolved Aluminum	-0.088	0.391	-0.116	0.254	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Barium	0.431	<0.001	-0.018	0.861	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Cadmium	0.701	<0.001	0.357	<0.001	-0.018	0.860	0.461	<0.001	-0.018	0.860	0.461	<0.001	-	-	-	-	-	-	-	-
Dissolved Calcium	0.968	<0.001	0.010	0.919	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Lithium	0.880	<0.001	0.135	0.184	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Magnesium	0.951	<0.001	-0.074	0.472	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Manganese	0.462	<0.001	-0.151	0.137	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Molybdenum	0.822	<0.001	-0.050	0.621	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Nickel	0.796	<0.001	0.138	0.175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Potassium	0.951	<0.001	-0.107	0.293	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Selenium	0.889	<0.001	0.195	0.054	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Silicon	0.410	<0.001	-0.196	0.053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Sodium	0.625	<0.001	-0.336	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Strontium	0.439	<0.001	-0.333	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Sulphur	0.900	<0.001	-0.050	0.627	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Uranium	0.887	<0.001	0.019	0.851	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Zinc	0.621	<0.001	0.446	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific Conductance	0.976	<0.001	-0.032	0.758	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	0.970	<0.001	-0.032	0.758	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

r ≥ 0.6 or r ≤ -0.6.

P-value < 0.05.

[a] HQ - hazard quotient. Observed concentration divided by Level 1 effect benchmark defined in the Elk Valley Water Quality Plan (selenium, sulphate, nitrate, cadmium), the upper normal range limit defined by Minnow (2016; calcite index), or BC water quality guidelines (the other water quality variables), as applicable.

[b] Selenium, sulphate, nitrate-N.

Note: All samples collected in September 2015 (one per area). PCA conducted on correlation matrix for concentration and covariance matrix for HQ.

Table C.7: Pearson Correlation of Log_{10}-transformed Water Quality Variables for n = 60 Samples from Reference (n = 5) and Mine-exposed (n = 55) Lentic Areas where Other Types of Samples were Collected in May, August, and September 2015 vs. the First Two Principal Components (PC-1 and PC-2) from a PCA of all Water Quality Variables

Variable	PC-1 (33.7%)		PC-2 (26.0%)	
	r	P-value	r	P-value
Total Dissolved Solids (TDS)	0.927	<0.001	-0.155	0.237
Turbidity	0.280	0.030	0.738	<0.001
Alkalinity, Bicarbonate (as $CaCO_3$)	0.276	0.033	-0.261	0.044
Alkalinity, Carbonate (as $CaCO_3$)	0.262	0.043	-0.222	0.089
Ammonia, Total (as N)	0.208	0.110	0.488	<0.001
Chloride	0.639	<0.001	0.639	<0.001
Fluoride	0.363	0.004	0.082	0.533
Hardness (as $CaCO_3$)	0.932	<0.001	-0.207	0.112
Nitrate-N	0.389	0.002	-0.822	<0.001
Total Kjeldahl Nitrogen	0.022	0.867	0.827	<0.001
Total Phosphorus	0.026	0.844	0.827	<0.001
Sulphate	0.735	<0.001	-0.467	<0.001
Dissolved Organic Carbon	-0.028	0.833	0.855	<0.001
Total Organic Carbon	0.054	0.683	0.860	<0.001
Total Aluminum	0.154	0.240	0.413	0.001
Total Arsenic	0.090	0.495	0.921	<0.001
Total Barium	0.272	0.035	-0.019	0.884
Total Cadmium	0.458	<0.001	-0.141	0.282
Total Calcium	0.777	<0.001	-0.404	0.001
Total Chromium	0.136	0.300	0.118	0.370
Total Iron	0.095	0.471	0.789	<0.001
Total Lithium	0.930	<0.001	0.120	0.361
Total Magnesium	0.904	<0.001	-0.090	0.496
Total Manganese	0.345	0.007	0.685	<0.001
Total Molybdenum	0.630	<0.001	0.520	<0.001
Total Potassium	0.740	<0.001	0.393	0.002
Total Selenium	0.660	<0.001	-0.639	<0.001
Total Silicon	0.511	<0.001	0.169	0.196
Total Sodium	0.644	<0.001	0.603	<0.001
Total Strontium	0.817	<0.001	0.099	0.453
Total Sulphur	0.797	<0.001	-0.435	<0.001
Total Uranium	0.649	<0.001	-0.626	<0.001
Dissolved Aluminum	0.136	0.300	0.429	<0.001
Dissolved Arsenic	0.047	0.724	0.895	<0.001
Dissolved Barium	0.256	0.048	-0.105	0.423
Dissolved Boron	0.495	<0.001	0.363	0.004
Dissolved Cadmium	0.380	0.003	-0.270	0.037
Dissolved Calcium	0.791	<0.001	-0.357	0.005
Dissolved Lithium	0.927	<0.001	0.134	0.306
Dissolved Magnesium	0.910	<0.001	-0.043	0.743
Dissolved Manganese	0.336	0.009	0.524	<0.001
Dissolved Molybdenum	0.650	<0.001	0.518	<0.001
Dissolved Potassium	0.741	<0.001	0.403	0.001
Dissolved Selenium	0.666	<0.001	-0.646	<0.001
Dissolved Silicon	0.483	<0.001	0.249	0.055
Dissolved Sodium	0.643	<0.001	0.612	<0.001
Dissolved Strontium	0.815	<0.001	0.118	0.369
Dissolved Sulphur	0.817	<0.001	-0.406	0.001
Dissolved Uranium	0.673	<0.001	-0.611	<0.001

$r \geq 0.6$ or $r \leq -0.6$.
P-value < 0.05.

Table C.8: Spearman Correlations Between Daily Flow, TSS, or Turbidity versus other Water Quality Constituents at Reference Stations Routinely Monitored in 2015

	Daily Flow			Total Suspended Solids			Turbidity		
Analyte	**r-value**	**p-value**	**n**	**r-value**	**p-value**	**n**	**r-value**	**p-value**	**n**
Daily Flow (m3/d)	-	-	-	-	-	-	-	-	-
Total Suspended Solids, Lab (mg/L)	0.389	<0.001	283	-	-	-	-	-	-
Turbidity, Lab (NTU)	0.330	<0.001	339	0.693	<0.001	626	-	-	-
Alkalinity, Total (as CaCO3) (mg/L)	-0.686	<0.001	291	-0.234	<0.001	540	-0.138	<0.001	699
Aluminum (total) (mg/L)	0.268	<0.001	289	0.667	<0.001	525	0.853	<0.001	684
Antimony (total) (mg/L)	0.030	0.609	289	-0.048	0.273	525	-0.011	0.781	684
Arsenic (total) (mg/L)	-0.070	0.237	289	0.290	<0.001	525	0.387	<0.001	684
Barium (total) (mg/L)	-0.412	<0.001	289	-0.153	<0.001	525	-0.111	0.004	684
Beryllium (total) (mg/L)	-0.019	0.745	289	0.030	0.488	525	0.001	0.973	684
Bismuth (total) (mg/L)	0.132	0.024	289	0.127	0.004	525	0.046	0.229	684
Boron (total) (mg/L)	-0.567	<0.001	289	-0.039	0.370	525	0.115	0.003	684
Cadmium (total) (mg/L)	0.215	<0.001	289	0.375	<0.001	525	0.450	<0.001	684
Calcium (total) (mg/L)	-0.484	<0.001	289	-0.326	<0.001	525	-0.409	<0.001	700
Chromium (total) (mg/L)	0.068	0.252	289	0.520	<0.001	525	0.585	<0.001	684
Cobalt (total) (mg/L)	0.160	0.006	289	0.221	<0.001	525	0.272	<0.001	684
Conductivity, Field (µs/cm)	-0.503	<0.001	292	-0.349	<0.001	473	-0.424	<0.001	660
Conductivity, Lab (µs/cm)	-0.569	<0.001	291	-0.392	<0.001	540	-0.446	<0.001	699
Copper (total) (mg/L)	0.252	<0.001	289	0.233	<0.001	525	0.254	<0.001	684
Hardness, Total Or Dissolved (as CaCO3) (mg/L)	-0.502	<0.001	281	-0.323	<0.001	537	-0.408	<0.001	712
Iron (total) (mg/L)	0.222	<0.001	289	0.755	<0.001	525	0.705	<0.001	684
Lead (total) (mg/L)	0.212	<0.001	289	0.495	<0.001	525	0.501	<0.001	684
Lithium (total) (mg/L)	-0.698	<0.001	289	-0.071	0.106	525	-0.087	0.022	684
Magnesium (total) (mg/L)	-0.514	<0.001	289	-0.293	<0.001	525	-0.376	<0.001	700
Manganese (total) (mg/L)	0.107	0.069	289	0.505	<0.001	525	0.736	<0.001	684
Mercury (total) (mg/L)	0.105	0.075	289	0.207	<0.001	523	0.128	<0.001	682
Nitrate Nitrogen (NO3) (as N) (mg/L)	0.083	0.159	291	-0.193	<0.001	544	-0.367	<0.001	719
Nitrite Nitrogen (NO2) (as N) (mg/L)	0.081	0.167	291	0.007	0.878	544	0.002	0.960	719
Ammonia (as N) (mg/L)	0.044	0.455	291	0.081	0.058	543	-0.016	0.662	718
Ortho-Phosphate (mg/L)	0.073	0.213	291	0.079	0.066	544	0.267	<0.001	703
pH (field) (pH units)	-0.044	0.429	323	-0.105	0.013	555	-0.144	<0.001	738
pH (lab) (pH units)	-0.249	<0.001	291	-0.021	0.622	540	-0.008	0.828	715
Phosphorus (mg/L)	0.133	0.037	247	0.592	<0.001	492	0.645	<0.001	586
Molybdenum (total) (mg/L)	-0.690	<0.001	289	-0.175	<0.001	525	-0.083	0.030	684
Nickel (total) (mg/L)	0.238	<0.001	289	0.253	<0.001	525	0.234	<0.001	684
Potassium (total) (mg/L)	-0.225	<0.001	289	0.310	<0.001	525	0.220	<0.001	684
Selenium (total) (mg/L)	-0.033	0.577	288	-0.230	<0.001	529	-0.334	<0.001	688
Silver (total) (mg/L)	0.089	0.133	289	0.087	0.046	525	0.164	<0.001	684
Sodium (total) (mg/L)	-0.581	<0.001	289	0.146	<0.001	525	0.042	0.270	684
Specific Conductivity (25 °C) (µs/cm)	-0.116	0.515	34	-0.219	0.048	82	-0.279	0.011	82
Strontium (total) (mg/L)	-0.764	<0.001	289	-0.151	<0.001	525	-0.117	0.002	684
Temperature, Field (°C)	0.050	0.364	326	0.156	<0.001	558	0.168	<0.001	745
Thallium (total) (mg/L)	0.135	0.022	289	0.186	<0.001	525	0.276	<0.001	684
Tin (total) (mg/L)	-0.009	0.876	289	-0.094	0.031	525	-0.080	0.036	684
Titanium (total) (mg/L)	0.204	<0.001	289	0.238	<0.001	525	0.258	<0.001	684
Total Kjeldahl Nitrogen (mg/L)	0.417	<0.001	260	0.448	<0.001	519	0.516	<0.001	664
Total Organic Carbon (mg/L)	0.325	<0.001	258	0.429	<0.001	517	0.541	<0.001	662
Uranium (total) (mg/L)	-0.041	0.490	289	-0.180	<0.001	525	-0.334	<0.001	684
Vanadium (total) (mg/L)	0.152	0.010	289	0.261	<0.001	525	0.167	<0.001	684
Zinc (total) (mg/L)	0.161	0.006	289	0.200	<0.001	525	0.187	<0.001	684
Aluminum (dissolved) (mg/L)	0.355	<0.001	268	0.313	<0.001	524	0.442	<0.001	669
Antimony (dissolved) (mg/L)	0.052	0.401	268	-0.076	0.084	524	-0.066	0.088	669
Arsenic (dissolved) (mg/L)	-0.176	0.004	268	0.118	0.007	524	0.120	0.002	669
Barium (dissolved) (mg/L)	-0.435	<0.001	268	-0.183	<0.001	524	-0.141	<0.001	669
Beryllium (dissolved) (mg/L)	-0.015	0.812	268	0.021	0.633	524	-0.030	0.441	669
Bismuth (dissolved) (mg/L)	0.150	0.014	268	0.138	0.002	524	0.031	0.423	669
Boron (dissolved) (mg/L)	-0.598	<0.001	268	-0.052	0.231	524	0.057	0.142	669
Bromide (dissolved) (mg/L)	-0.021	0.696	352	0.025	0.546	604	0.140	<0.001	790
Cadmium (dissolved) (mg/L)	0.057	0.353	268	0.041	0.348	524	0.038	0.321	669
Carbon, Dissolved Organic (mg/L)	0.287	<0.001	259	0.281	<0.001	515	0.483	<0.001	660
Chloride (dissolved) (mg/L)	-0.175	0.003	291	0.062	0.152	541	-0.002	0.966	716
Chromium (dissolved) (mg/L)	-0.336	<0.001	268	0.129	0.003	524	0.095	0.014	669
Cobalt (dissolved) (mg/L)	0.018	0.774	268	-0.032	0.461	524	-0.023	0.550	669
Copper (dissolved) (mg/L)	0.100	0.102	268	-0.009	0.833	524	-0.001	0.970	669
Dissolved Oxygen, Fieldn (mg/L)	0.213	<0.001	320	-0.003	0.938	549	-0.018	0.627	733
Fluoride (dissolved) (mg/L)	0.172	0.003	291	-0.246	<0.001	539	-0.493	<0.001	714
Iron (dissolved) (mg/L)	0.134	0.028	268	0.258	<0.001	524	0.065	0.093	669
Lead (dissolved) (mg/L)	0.011	0.857	268	-0.042	0.340	524	-0.044	0.260	669
Lithium (dissolved) (mg/L)	-0.721	<0.001	268	-0.125	0.004	524	-0.161	<0.001	669
Manganese (dissolved) (mg/L)	-0.063	0.308	268	0.120	0.006	524	0.426	<0.001	669
Mercury (dissolved) (mg/L)	0.131	0.032	266	0.155	<0.001	521	0.045	0.242	666
Molybdenum (dissolved) (mg/L)	-0.731	<0.001	268	-0.210	<0.001	523	-0.114	0.003	668
Nickel (dissolved) (mg/L)	0.061	0.323	268	0.039	0.377	524	-0.015	0.697	669
Sulphate (as SO4) (dissolved) (mg/L)	-0.315	<0.001	291	-0.408	<0.001	540	-0.584	<0.001	715
Selenium (dissolved) (mg/L)	-0.056	0.363	267	-0.236	<0.001	528	-0.319	<0.001	673
Silver (dissolved) (mg/L)	0.018	0.774	268	-0.090	0.039	524	-0.086	0.026	669
Strontium (dissolved) (mg/L)	-0.776	<0.001	268	-0.150	<0.001	524	-0.114	0.003	669
Thallium (dissolved) (mg/L)	0.010	0.877	268	-0.046	0.290	524	-0.014	0.720	669
Tin (dissolved) (mg/L)	0.004	0.948	268	-0.107	0.015	524	-0.102	0.008	669
Titanium (dissolved) (mg/L)	-0.053	0.391	268	0.015	0.728	524	-0.025	0.516	669
Total Dissolved Solids (Residue, Filterable) (mg/L)	-0.552	<0.001	291	-0.370	<0.001	539	-0.454	<0.001	698
Uranium (dissolved) (mg/L)	-0.044	0.476	268	-0.182	<0.001	524	-0.328	<0.001	669
Vanadium (dissolved) (mg/L)	0.146	0.017	268	0.120	0.006	524	0.014	0.709	669
Zinc (dissolved) (mg/L)	0.019	0.759	268	-0.015	0.726	524	-0.012	0.752	669

Shading indicates absolute r values greater than 0.6

Shading indicates P-values less than 0.05

Table C.9: Spearman Correlations Between Daily Flow, TSS, or Turbidity versus Water Chemistry Variables at Mine-exposed Stations Routinely Monitored in 2015

Analyte	Daily Flow			Total Suspended Solids			Turbidity		
	r-value	p-value	n	r-value	p-value	n	r-value	p-value	n
Daily Flow (m3/d)	-	-	-	-	-	-	-	-	-
Total Suspended Solids, Lab (mg/L)	-0.218	<0.001	572	-	-	-	-	-	-
Turbidity, Lab (NTU)	-0.241	<0.001	574	0.842	<0.001	1,914	-	-	-
Alkalinity, Total (as CaCO3) (mg/L)	-0.336	<0.001	471	-0.126	<0.001	1,554	-0.113	<0.001	1,557
Aluminum (total) (mg/L)	-0.260	<0.001	471	0.854	<0.001	1,557	0.912	<0.001	1,559
Antimony (total) (mg/L)	0.139	0.002	471	0.088	<0.001	1,553	0.125	<0.001	1,555
Arsenic (total) (mg/L)	-0.330	<0.001	471	0.550	<0.001	1,551	0.649	<0.001	1,554
Barium (total) (mg/L)	-0.510	<0.001	471	0.231	<0.001	1,557	0.303	<0.001	1,560
Beryllium (total) (mg/L)	0.129	0.005	469	0.207	<0.001	1,531	0.244	<0.001	1,531
Bismuth (total) (mg/L)	0.152	<0.001	469	0.144	<0.001	1,529	0.125	<0.001	1,529
Boron (total) (mg/L)	-0.256	<0.001	471	0.133	<0.001	1,549	0.224	<0.001	1,551
Cadmium (total) (mg/L)	0.181	<0.001	471	0.284	<0.001	1,555	0.258	<0.001	1,558
Calcium (total) (mg/L)	0.082	0.063	520	-0.211	<0.001	1,633	-0.222	<0.001	1,636
Chromium (total) (mg/L)	0.071	0.126	471	0.573	<0.001	1,554	0.564	<0.001	1,557
Cobalt (total) (mg/L)	0.089	0.054	470	0.511	<0.001	1,547	0.575	<0.001	1,548
Conductivity, Field (µs/cm)	0.010	0.820	559	-0.171	<0.001	1,480	-0.172	<0.001	1,482
Conductivity, Lab (µs/cm)	0.105	0.023	468	-0.202	<0.001	1,552	-0.206	<0.001	1,555
Copper (total) (mg/L)	-0.238	<0.001	469	0.517	<0.001	1,544	0.575	<0.001	1,544
Hardness, Total Or Dissolved (as CaCO3) (mg/L)	0.052	0.237	521	-0.215	<0.001	1,633	-0.224	<0.001	1,636
Iron (total) (mg/L)	-0.205	<0.001	471	0.861	<0.001	1,556	0.887	<0.001	1,558
Lead (total) (mg/L)	-0.156	<0.001	469	0.788	<0.001	1,550	0.792	<0.001	1,550
Lithium (total) (mg/L)	0.107	0.020	471	-0.060	0.018	1,556	-0.062	0.015	1,559
Magnesium (total) (mg/L)	0.048	0.271	520	-0.208	<0.001	1,633	-0.215	<0.001	1,636
Manganese (total) (mg/L)	0.277	<0.001	471	0.634	<0.001	1,557	0.642	<0.001	1,560
Mercury (total) (mg/L)	0.101	0.029	469	0.065	0.011	1,526	0.053	0.037	1,526
Nitrate Nitrogen (NO3) (as N) (mg/L)	0.325	<0.001	522	-0.203	<0.001	1,634	-0.286	<0.001	1,637
Nitrite Nitrogen (NO2) (as N) (mg/L)	0.230	<0.001	518	0.191	<0.001	1,627	0.208	<0.001	1,629
Ammonia (as N) (mg/L)	0.378	<0.001	513	0.161	<0.001	1,614	0.222	<0.001	1,616
Ortho-Phosphate (mg/L)	-0.493	<0.001	471	0.241	<0.001	1,548	0.316	<0.001	1,550
pH (field) (pH units)	-0.245	<0.001	577	0.152	<0.001	1,633	0.159	<0.001	1,636
pH (lab) (pH units)	-0.264	<0.001	519	0.098	<0.001	1,626	0.112	<0.001	1,628
Phosphorus (mg/L)	-0.363	<0.001	464	0.685	<0.001	1,548	0.728	<0.001	1,551
Molybdenum (total) (mg/L)	0.085	0.065	470	-0.057	0.026	1,557	0.003	0.899	1,559
Nickel (total) (mg/L)	0.221	<0.001	471	0.146	<0.001	1,557	0.154	<0.001	1,560
Potassium (total) (mg/L)	0.052	0.261	471	0.002	0.928	1,556	0.040	0.115	1,559
Selenium (total) (mg/L)	0.310	<0.001	473	-0.269	<0.001	1,559	-0.295	<0.001	1,562
Silver (total) (mg/L)	0.054	0.241	469	0.424	<0.001	1,537	0.467	<0.001	1,537
Sodium (total) (mg/L)	-0.334	<0.001	471	0.119	<0.001	1,556	0.191	<0.001	1,559
Specific Conductivity (25 °C) (µs/cm)	0.886	0.019	6	-0.253	0.156	33	-0.161	0.369	33
Strontium (total) (mg/L)	-0.206	<0.001	470	0.078	0.002	1,555	0.123	<0.001	1,557
Temperature, Field (°C)	-0.062	0.137	579	0.114	<0.001	1,566	0.054	0.031	1,569
Thallium (total) (mg/L)	-0.110	0.017	470	0.360	<0.001	1,547	0.382	<0.001	1,549
Tin (total) (mg/L)	0.141	0.002	469	0.112	<0.001	1,530	0.159	<0.001	1,530
Titanium (total) (mg/L)	0.027	0.561	470	0.273	<0.001	1,540	0.321	<0.001	1,541
Total Kjeldahl Nitrogen (mg/L)	-0.348	<0.001	463	0.413	<0.001	1,528	0.450	<0.001	1,530
Total Organic Carbon (mg/L)	-0.575	<0.001	463	0.610	<0.001	1,539	0.684	<0.001	1,542
Uranium (total) (mg/L)	0.169	<0.001	471	-0.226	<0.001	1,557	-0.254	<0.001	1,560
Vanadium (total) (mg/L)	-0.060	0.197	469	0.557	<0.001	1,541	0.570	<0.001	1,541
Zinc (total) (mg/L)	-0.030	0.515	470	0.275	<0.001	1,549	0.273	<0.001	1,550
Aluminum (dissolved) (mg/L)	-0.249	<0.001	469	0.572	<0.001	1,528	0.633	<0.001	1,528
Antimony (dissolved) (mg/L)	0.162	<0.001	470	0.039	0.125	1,541	0.072	0.005	1,543
Arsenic (dissolved) (mg/L)	-0.353	<0.001	470	0.341	<0.001	1,546	0.493	<0.001	1,547
Barium (dissolved) (mg/L)	-0.532	<0.001	471	0.143	<0.001	1,549	0.217	<0.001	1,552
Beryllium (dissolved) (mg/L)	0.182	<0.001	469	0.055	0.031	1,520	0.117	<0.001	1,520
Bismuth (dissolved) (mg/L)	0.156	<0.001	469	0.121	<0.001	1,520	0.102	<0.001	1,520
Boron (dissolved) (mg/L)	-0.260	<0.001	471	0.143	<0.001	1,540	0.225	<0.001	1,543
Bromide (dissolved) (mg/L)	0.045	0.303	517	0.197	<0.001	1,608	0.230	<0.001	1,609
Cadmium (dissolved) (mg/L)	0.352	<0.001	472	-0.082	0.001	1,546	-0.086	<0.001	1,549
Carbon, Dissolved Organic (mg/L)	-0.619	<0.001	464	0.446	<0.001	1,546	0.524	<0.001	1,549
Chloride (dissolved) (mg/L)	0.038	0.383	520	0.030	0.223	1,633	0.081	0.001	1,636
Chromium (dissolved) (mg/L)	0.393	<0.001	469	-0.083	0.001	1,535	-0.117	<0.001	1,535
Cobalt (dissolved) (mg/L)	0.172	<0.001	470	0.197	<0.001	1,533	0.287	<0.001	1,534
Copper (dissolved) (mg/L)	-0.268	<0.001	469	0.212	<0.001	1,525	0.229	<0.001	1,525
Dissolved Oxygen, Fieldn (mg/L)	0.132	0.002	575	-0.005	0.829	1,631	0.056	0.023	1,634
Fluoride (dissolved) (mg/L)	0.396	<0.001	520	-0.177	<0.001	1,630	-0.152	<0.001	1,632
Iron (dissolved) (mg/L)	0.072	0.122	469	0.241	<0.001	1,523	0.299	<0.001	1,523
Lead (dissolved) (mg/L)	0.173	<0.001	469	0.079	0.002	1,520	0.137	<0.001	1,520
Lithium (dissolved) (mg/L)	0.100	0.029	471	-0.064	0.011	1,549	-0.070	0.006	1,552
Manganese (dissolved) (mg/L)	0.514	<0.001	471	0.164	<0.001	1,550	0.221	<0.001	1,553
Mercury (dissolved) (mg/L)	0.130	0.005	469	0.018	0.477	1,519	0.004	0.884	1,519
Molybdenum (dissolved) (mg/L)	0.083	0.073	471	-0.071	0.005	1,550	-0.020	0.427	1,553
Nickel (dissolved) (mg/L)	0.256	<0.001	471	-0.017	0.494	1,550	0.000	0.985	1,553
Sulphate (as SO4) (dissolved) (mg/L)	0.134	0.002	520	-0.216	<0.001	1,634	-0.233	<0.001	1,637
Selenium (dissolved) (mg/L)	0.311	<0.001	472	-0.268	<0.001	1,550	-0.295	<0.001	1,553
Silver (dissolved) (mg/L)	0.179	<0.001	469	0.052	0.041	1,520	0.115	<0.001	1,520
Strontium (dissolved) (mg/L)	-0.217	<0.001	470	0.082	0.001	1,547	0.123	<0.001	1,548
Thallium (dissolved) (mg/L)	-0.030	0.511	470	0.039	0.130	1,535	0.062	0.015	1,536
Tin (dissolved) (mg/L)	0.179	<0.001	469	0.070	0.006	1,520	0.129	<0.001	1,520
Titanium (dissolved) (mg/L)	0.136	0.003	470	-0.102	<0.001	1,536	-0.068	0.008	1,537
Total Dissolved Solids (Residue, Filterable) (mg/L)	0.103	0.027	464	-0.200	<0.001	1,548	-0.208	<0.001	1,551
Uranium (dissolved) (mg/L)	0.166	<0.001	471	-0.236	<0.001	1,548	-0.261	<0.001	1,551
Vanadium (dissolved) (mg/L)	0.128	0.006	469	0.127	<0.001	1,521	0.152	<0.001	1,521
Zinc (dissolved) (mg/L)	0.070	0.132	469	-0.135	<0.001	1,534	-0.113	<0.001	1,534

Shading indicates absolute r values greater than 0.6

Shading indicates P-values less than 0.05

Note: NA indicates to few concurrent data pairs to perform correlation.

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Alkalinity (as $CaCO_3$)	Total Aluminum	Dissolved Aluminum	Dissolved Antimony	Total Antimony	Dissolved Arsenic	Total Arsenic	Dissolved Barium	Total Barium	Dissolved Beryllium	Total Beryllium	Total Bismuth	Dissolved Bismuth	Dissolved Boron	Total Boron	Dissolved Bromide	Total Cadmium	Dissolved Cadmium	Total Calcium	Dissolved Organic Carbon	Dissolved Chloride
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Guideline/SSBM [1]	-	-	**0.05**	-	**0.009**	-	**0.005**	-	**1**	-	**0.00013**	-	-	-	**1.2**	-	-	**0.00012 to 0.00027**	-	-	**150**
January	Sample size	33	31	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
	% of values < LRL	0	26	100	100	100	58	27	0	0	100	100	100	100	73	76	100	64	79	0	45	64
	Maximum LRL	-	0.0030	0.0030	0.00010	0.00010	0.00010	0.00010	-	-	0.00010	0.0001	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	1.0
	% of values > GL/SSBM	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	107	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.013	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	42	<0.5	<1
	2.5th Percentile	107	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.013	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	42	<0.5	<1
	25th Percentile	134	<0.0033	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.045	0.045	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.0000071	<0.00001	47	<0.5	<1
	Median	142	0.0047	<0.003	<0.0001	<0.0001	<0.0001	0.00011	0.050	0.050	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.0000089	0.0000063	53	0.58	<1
	75th Percentile	150	0.0088	<0.003	<0.0001	<0.0001	0.00012	0.00016	0.062	0.062	<0.0001	<0.0001	<0.0005	<0.0005	0.011	<0.01	<0.05	0.000010	0.0000086	57	0.83	1.1
	97.5th Percentile	166	0.021	<0.003	<0.0001	<0.0001	0.00044	0.00040	0.077	0.079	<0.0001	<0.0001	(<0.00005)	(<0.00005)	0.017	0.016	<0.05	0.000013	0.000013	62	1.2	1.5
	Maximum	166	0.021	<0.003	<0.0001	<0.0001	0.00044	0.00040	0.077	0.079	<0.0001	<0.0001	<0.0005	<0.0005	0.017	0.016	<0.05	0.000013	0.000013	62	1.2	1.5
	Mean	141	0.0065	<0.003	<0.0001	<0.0001	0.00013	0.00014	0.050	0.051	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.011	<0.05	0.0000084	0.0000070	52	0.69	1.1
	Standard Deviation	16	0.0050	-	-	-	0.000068	0.000066	0.018	0.018	-	-	-	-	0.0016	0.0011	-	0.0000021	0.0000028	6.0	0.21	0.11
February	Sample size	32	32	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	31
	% of values < LRL	0	34	100	100	100	79	36	0	0	100	100	100	100	70	70	100	61	82	0	55	39
	Maximum LRL	-	0.020	0.0030	0.00010	0.00010	0.00010	0.00010	-	-	0.00010	0.00010	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	106	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.013	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	42	<0.5	<0.5
	2.5th Percentile	106	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.013	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	42	<0.5	0.88
	25th Percentile	135	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.048	0.049	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000010	0.000010	47	<0.5	1.0
	Median	144	0.0045	<0.003	<0.0001	<0.0001	<0.0001	0.00011	0.055	0.056	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.0000081	0.000010	55	<0.5	1.0
	75th Percentile	151	0.0093	<0.003	<0.0001	<0.0001	<0.0001	0.00014	0.065	0.066	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.013	<0.05	0.000010	0.0000082	57	0.61	1.2
	97.5th Percentile	171	0.057	<0.003	<0.0001	<0.0001	0.00015	0.00031	0.081	0.081	<0.0001	<0.0001	(<0.00005)	(<0.00005)	0.015	0.017	<0.05	0.000026	0.000017	62	1.5	1.5
	Maximum	171	0.057	<0.003	<0.0001	<0.0001	0.00015	0.00031	0.081	0.081	<0.0001	<0.0001	<0.0005	<0.0005	0.015	0.017	<0.05	0.000026	0.000017	62	1.5	1.5
	Mean	141	0.0093	<0.003	<0.0001	<0.0001	0.00010	0.00013	0.054	0.054	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.011	<0.05	0.0000089	0.0000068	53	0.62	0.90
	Standard Deviation	17	0.012	-	-	-	0.000013	0.000046	0.018	0.018	-	-	-	-	0.0014	0.0013	-	0.0000041	0.0000038	5.9	0.22	0.15
March	Sample size	33	32	33	33	33	33	32	33	33	33	33	33	33	33	33	33	32	33	33	33	33
	% of values < LRL	0	16	91	100	97	70	38	0	0	100	100	100	100	70	70	100	56	73	0	36	33
	Maximum LRL	-	0.0030	0.0030	0.00010	0.00010	0.00010	0.00010	-	-	0.00010	0.0001	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	101	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.014	0.014	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	42	<0.5	0.30
	2.5th Percentile	101	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.014	0.014	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	42	<0.5	<0.5
	25th Percentile	138	0.0037	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.048	0.049	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000052	0.000010	49	<0.5	<0.5
	Median	143	0.0065	<0.003	<0.0001	<0.0001	<0.0001	0.00011	0.055	0.055	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.0000084	0.000010	54	0.57	1.0
	75th Percentile	151	0.018	<0.003	<0.0001	<0.0001	0.00011	0.00013	0.066	0.068	<0.0001	<0.0001	<0.0005	<0.0005	0.012	0.013	<0.05	0.000010	0.0000095	57	0.71	1.1
	97.5th Percentile	169	0.054	0.0072	<0.0001	<0.0001	0.00019	0.00019	0.077	0.078	<0.0001	<0.0001	(<0.00005)	(<0.00005)	0.016	0.017	<0.05	0.000014	0.000028	61	1.2	1.4
	Maximum	169	0.054	0.0072	<0.0001	0.00010	0.00019	0.00019	0.077	0.078	<0.0001	<0.0001	<0.0005	<0.0005	0.016	0.017	<0.05	0.000014	0.000028	61	1.2	1.4
	Mean	143	0.012	0.0031	<0.0001	0.00010	0.00011	0.00012	0.055	0.055	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.011	<0.05	0.0000085	0.0000075	53	0.62	0.86
	Standard Deviation	16	0.012	0.00084	-	-	0.000020	0.000027	0.016	0.017	-	-	-	-	0.0017	0.0017	-	0.0000036	0.0000054	5.4	0.16	0.43
April	Sample size	37	35	36	37	37	37	33	37	37	37	37	17	37	37	37	40	37	15	39	37	40
	% of values < LRL	0	5.7	81	100	100	51	15	0	0	100	100	94	100	73	73	100	24	33	0	11	30
	Maximum LRL	-	0.0060	0.0030	0.00010	0.00010	0.00010	0.00010	-	-	0.00010	0.0001	0.000050	0.00050	0.010	0.010	0.050	0.000010	0.0000050	-	0.50	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	102	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.014	0.014	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	39	<0.5	0.12
	2.5th Percentile	102	0.0032	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.014	0.014	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000055	<0.000005	39	<0.5	0.12
	25th Percentile	128	0.0049	<0.003	<0.0001	<0.0001	<0.0001	0.00011	0.042	0.043	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000086	<0.000005	46	0.57	0.25
	Median	137	0.016	<0.003	<0.0001	<0.0001	<0.0001	0.00012	0.053	0.050	<0.0001	<0.0001	<0.00005	<0.0005	<0.01	<0.01	<0.05	0.000010	0.0000055	51	0.91	0.72
	75th Percentile	151	0.034	<0.003	<0.0001	<0.0001	0.00012	0.00014	0.060	0.062	<0.0001	<0.0001	<0.00005	<0.0005	0.012	0.013	<0.05	0.000013	0.0000071	55	1.1	1.1
	97.5th Percentile	177	0.12	0.0070	<0.0001	<0.0001	0.00041	0.00022	0.079	0.081	<0.0001	<0.0001	0.000051	<0.0005	0.021	0.018	<0.05	0.000035	0.0000085	61	2.6	1.4
	Maximum	177	0.12	0.0070	<0.0001	<0.0001	0.00041	0.00022	0.079	0.081	<0.0001	<0.0001	0.000051	<0.0005	0.021	0.018	<0.05	0.000035	0.0000085	61	2.6	1.4
	Mean	138	0.025	0.0033	<0.0001	<0.0001	0.00013	0.00013	0.048	0.049	<0.0001	<0.0001	0.000050	<0.0005	0.011	0.011	<0.05	0.000012	0.0000062	50	1.0	0.70
	Standard Deviation	18	0.027	0.00090	-	-	0.000071	0.000036	0.017	0.017	-	-	-	-	0.0020	0.0013	-	0.0000061	0.0000013	5.9	0.53	0.46

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Alkalinity (as $CaCO_3$)	Total Aluminum	Dissolved Aluminum	Dissolved Antimony	Total Antimony	Dissolved Arsenic	Total Arsenic	Dissolved Barium	Total Barium	Dissolved Beryllium	Total Beryllium	Total Bismuth	Dissolved Bismuth	Dissolved Boron	Total Boron	Dissolved Bromide	Total Cadmium	Dissolved Cadmium	Total Calcium	Dissolved Organic Carbon	Dissolved Chloride
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Guideline/SSBM [1]	-	-	**0.05**	-	**0.009**	-	**0.005**	-	**1**	-	**0.00013**	-	-	-	**1.2**	-	-	**0.00012 to 0.00027**	-	-	**150**
May	Sample size	42	42	34	41	40	41	39	42	42	42	41	17	42	41	41	42	41	40	42	42	42
	% of values < LRL	0	2.4	65	100	93	27	0	0	0	100	88	94	100	78	78	100	24	55	0	0	31
	Maximum LRL	-	0.0030	0.0030	0.00050	0.00010	0.00010	-	-	-	0.00050	0.0001	0.000050	0.0025	0.010	0.010	0.050	0.000050	0.000010	-	-	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	2.4%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	93	<0.003	<0.003	<0.0001	<0.0001	<0.0001	0.00010	0.0094	0.0095	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	27	0.58	0.10
	2.5th Percentile	94	0.0051	<0.003	<0.0001	<0.0001	<0.0001	0.00010	0.011	0.010	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	29	0.64	0.10
	25th Percentile	108	0.018	<0.003	<0.0001	<0.0001	<0.0001	0.00013	0.033	0.033	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000086	0.0000057	38	0.93	0.13
	Median	117	0.052	<0.003	<0.0001	<0.0001	0.00011	0.00016	0.041	0.041	<0.0001	<0.0001	<0.00005	<0.0005	<0.01	<0.01	<0.05	0.000013	0.0000057	42	1.4	0.47
	75th Percentile	141	0.15	0.0031	<0.0001	<0.0001	0.00013	0.00021	0.047	0.048	<0.0001	0.00002	<0.00005	<0.0005	<0.01	<0.01	<0.05	0.000020	0.0000097	46	1.8	1.1
	97.5th Percentile	163	0.71	0.0081	<0.0001	0.00011	0.00025	0.00049	0.058	0.060	<0.0001	0.0001	0.000052	<0.0005	0.018	0.018	<0.05	0.000072	0.000012	54	3.3	1.4
	Maximum	163	0.86	0.0081	<0.0005	0.00012	0.00045	0.00049	0.059	0.061	<0.0005	0.0002	0.000052	<0.0025	0.018	0.019	<0.05	0.000092	0.000012	55	3.9	1.4
	Mean	123	0.13	0.0036	<0.0005	0.00010	0.00013	0.00018	0.038	0.039	<0.0001	0.00003	0.000050	<0.0005	0.011	0.011	<0.05	0.000018	0.0000069	42	1.5	0.62
	Standard Deviation	20	0.20	0.0014	-	0.0000024	0.000062	0.000082	0.014	0.014	-	0.00004	-	-	0.0018	0.0018	-	0.000018	0.0000026	6.4	0.76	0.52
June	Sample size	41	41	34	41	41	38	38	41	40	41	41	41	41	41	41	41	37	38	40	41	41
	% of values < LRL	0	0	50	98	88	24	0	0	0	100	95	100	100	85	68	100	2.7	53	0	2.4	41
	Maximum LRL	-	-	0.0030	0.00010	0.00010	0.00010	-	-	-	0.00010	0.0001	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	4.9%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	81	0.0071	<0.003	<0.0001	<0.0001	<0.0001	0.00011	0.0076	0.0076	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000061	<0.000005	24	<0.5	<0.1
	2.5th Percentile	85	0.0089	<0.003	<0.0001	<0.0001	<0.0001	0.00011	0.0078	0.0078	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000061	<0.000005	24	0.56	0.10
	25th Percentile	99	0.034	<0.003	<0.0001	<0.0001	0.00010	0.00014	0.026	0.031	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.000012	0.0000060	34	0.96	0.13
	Median	109	0.12	0.0030	<0.0001	<0.0001	0.00011	0.00019	0.035	0.038	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000017	0.0000059	38	1.4	0.25
	75th Percentile	126	0.31	0.0056	<0.0001	<0.0001	0.00015	0.00032	0.043	0.046	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	0.010	<0.05	0.000026	0.000010	44	2.0	1.1
	97.5th Percentile	141	1.7	0.019	<0.0001	0.00011	0.00026	0.00065	0.058	0.063	<0.0001	0.0002	(<0.00005)	(<0.00005)	0.012	0.018	<0.05	0.00018	0.000013	50	3.9	1.4
	Maximum	146	3.1	0.019	0.00010	0.00015	0.00026	0.00065	0.060	0.067	<0.0001	0.0002	<0.0005	<0.0005	0.018	0.019	<0.05	0.00018	0.000013	50	4.3	1.5
	Mean	111	0.35	0.0048	0.00010	0.00010	0.00013	0.00025	0.035	0.038	<0.0001	0.00003	<0.0005	<0.0005	0.010	0.011	<0.05	0.000028	0.0000075	38	1.6	0.54
	Standard Deviation	17	0.59	0.0034	-	0.0000089	0.000041	0.00016	0.014	0.014	-	-	-	-	0.0014	0.0020	-	0.000032	0.0000031	6.6	0.88	0.53
July	Sample size	40	40	39	40	40	40	36	40	40	40	40	40	40	40	40	40	38	38	40	40	40
	% of values < LRL	0	2.5	74	100	98	30	2.8	0	0	100	100	100	100	70	63	100	7.9	63	0	15	53
	Maximum LRL	-	0.0090	0.0030	0.00010	0.00010	0.00010	0.00010	-	-	0.00010	0.0001	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	85	0.0038	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.0064	0.0074	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000051	<0.000005	30	<0.5	0.11
	2.5th Percentile	85	0.0038	<0.003	<0.0001	<0.0001	<0.0001	0.00010	0.0069	0.0076	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000051	<0.000005	31	<0.5	0.11
	25th Percentile	109	0.0099	<0.003	<0.0001	<0.0001	<0.0001	0.00012	0.030	0.033	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000080	0.0000064	36	0.64	0.14
	Median	122	0.024	<0.003	<0.0001	<0.0001	0.00011	0.00014	0.041	0.041	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000011	0.0000058	41	0.82	0.22
	75th Percentile	139	0.053	0.0030	<0.0001	<0.0001	0.00014	0.00016	0.055	0.056	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.012	<0.05	0.000016	0.0000081	47	1.1	0.74
	97.5th Percentile	167	0.32	0.012	<0.0001	<0.00011	0.00022	0.00026	0.076	0.073	<0.0001	<0.0001	(<0.00005)	(<0.00005)	0.018	0.021	<0.05	0.000019	0.000011	54	2.0	1.2
	Maximum	172	0.47	0.012	<0.0001	0.00011	0.00022	0.00026	0.078	0.074	<0.0001	<0.0001	<0.0005	<0.0005	0.018	0.023	<0.05	0.000019	0.000011	55	2.2	1.2
	Mean	124	0.053	0.0038	<0.0001	0.00010	0.00012	0.00015	0.042	0.043	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.012	<0.05	0.000012	0.0000068	42	0.92	0.45
	Standard Deviation	22	0.082	0.0021	-	-	0.000034	0.000038	0.018	0.017	-	-	-	-	0.0024	0.0032	-	0.0000042	0.0000021	6.2	0.37	0.48
August	Sample size	40	40	36	40	40	40	38	40	40	40	40	40	40	40	40	40	37	35	40	39	9.0
	% of values < LRL	0	2.5	100	100	93	43	0	0	0	100	100	100	100	75	75	98	35	71	0	15	0
	Maximum LRL	-	0.0030	0.0030	0.00010	0.00010	0.00010	-	-	-	0.00010	0.0001	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	-
	% values > GL		-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	98	<0.003	<0.001	<0.0001	<0.0001	<0.0001	0.00010	0.0097	0.010	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	38	<0.5	0.13
	2.5th Percentile	99	0.0036	<0.003	<0.0001	<0.0001	<0.0001	0.00010	0.0099	0.010	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000061	<0.000005	38	<0.5	0.13
	25th Percentile	124	0.0069	<0.003	<0.0001	<0.0001	<0.0001	0.00012	0.041	0.041	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000080	0.0000067	41	0.56	0.14
	Median	138	0.016	<0.003	<0.0001	<0.0001	0.00010	0.00014	0.046	0.047	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000010	0.0000066	46	0.75	0.21
	75th Percentile	148	0.031	<0.003	<0.0001	<0.0001	0.00013	0.00016	0.063	0.063	<0.0001	<0.0001	<0.0005	<0.0005	0.012	0.012	<0.05	0.000011	0.0000082	50	0.87	0.27
	97.5th Percentile	175	0.14	<0.003	<0.0001	0.00011	0.00029	0.00024	0.079	0.080	<0.0001	<0.0001	(<0.00005)	(<0.00005)	0.019	0.022	<0.051	0.000016	0.000010	57	1.4	0.71
	Maximum	175	0.18	<0.003	<0.0001	0.00012	0.00034	0.00024	0.081	0.082	<0.0001	<0.0001	<0.0005	<0.0005	0.020	0.022	0.051	0.000016	0.000010	58	1.4	0.71
	Mean	136	0.027	<0.003	<0.0001	0.00010	0.00013	0.00015	0.048	0.049	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.012	0.050	0.000010	0.0000066	46	0.76	0.28
	Standard Deviation	20	0.033	-	-	0.0000039	0.000049	0.000036	0.017	0.018	-	-	-	-	0.0017	0.0020	-	0.0000029	0.0000020	5.5	0.22	0.19

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Alkalinity (as $CaCO_3$)	Total Aluminum	Dissolved Aluminum	Dissolved Antimony	Total Antimony	Dissolved Arsenic	Total Arsenic	Dissolved Barium	Total Barium	Dissolved Beryllium	Total Beryllium	Total Bismuth	Dissolved Bismuth	Dissolved Boron	Total Boron	Dissolved Bromide	Total Cadmium	Dissolved Cadmium	Total Calcium	Dissolved Organic Carbon	Dissolved Chloride
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Guideline/SSBM [1]	-	-	**0.05**	-	**0.009**	-	**0.005**	-	**1**	-	**0.00013**	-	-	-	**1.2**	-	-	**0.00012 to 0.00027**	-	-	**150**
September	Sample size	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	34	40	40	40
	% of values < LRL	0	2.5	98	100	100	45	15	0	0	100	100	100	100	75	73	100	30	74	0	15	58
	Maximum LRL	-	0.0030	0.0030	0.00010	0.00010	0.00010	0.00010	-	-	0.00010	0.0001	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	104	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.013	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	39	<0.5	<0.1
	2.5th Percentile	106	0.0031	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.013	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	40	<0.5	0.14
	25th Percentile	124	0.0046	<0.003	<0.0001	<0.0001	<0.0001	0.00011	0.043	0.043	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000082	0.0000058	45	0.59	0.15
	Median	144	0.0090	<0.003	<0.0001	<0.0001	0.00010	0.00013	0.051	0.053	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.000010	0.0000056	48	0.70	0.32
	75th Percentile	155	0.020	<0.003	<0.0001	<0.0001	0.00013	0.00015	0.063	0.064	<0.0001	<0.0001	<0.0005	<0.0005	0.012	0.012	<0.05	0.000012	0.0000070	52	0.80	0.68
	97.5th Percentile	178	0.15	<0.0046	<0.0001	<0.0001	0.00027	0.00024	0.082	0.088	<0.0001	<0.0001	(<0.00005)	(<0.00005)	0.018	0.020	<0.05	0.000042	0.000010	57	1.3	1.1
	Maximum	184	0.18	0.0046	<0.0001	<0.0001	0.00037	0.00026	0.087	0.092	<0.0001	<0.0001	<0.0005	<0.0005	0.018	0.020	<0.05	0.000042	0.000010	59	1.4	1.1
	Mean	141	0.021	0.0030	<0.0001	<0.0001	0.00012	0.00014	0.051	0.052	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.012	<0.05	0.000012	0.0000061	48	0.72	0.46
	Standard Deviation	19	0.034	-	-	-	0.000046	0.000039	0.018	0.019	-	-	-	-	0.0016	0.0033	-	0.0000078	0.0000019	4.6	0.20	0.43
October	Sample size	40	35	39	40	40	40	40	40	40	40	40	40	40	40	40	40	40	39	40	39	40
	% of values < LRL	0	5.7	92	100	98	50	30	0	0	100	100	100	100	73	75	100	45	67	0	28	30
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Maximum LRL	-	0.0030	0.0030	0.00010	0.00010	0.00010	0.00010	-	-	0.00010	0.0001	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	1.0
	Minimum	91	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.012	0.012	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	39	<0.5	0.18
	2.5th Percentile	98	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.012	0.012	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	39	<0.5	0.18
	25th Percentile	122	0.0039	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.041	0.042	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000087	0.0000057	46	<0.5	0.24
	Median	140	0.0055	<0.003	<0.0001	<0.0001	0.00010	0.00012	0.048	0.049	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.0000085	0.0000055	49	0.69	0.72
	75th Percentile	150	0.0084	<0.003	<0.0001	<0.0001	0.00013	0.00016	0.063	0.064	<0.0001	<0.0001	<0.0005	<0.0005	0.012	0.012	<0.05	0.000012	0.0000069	53	0.83	1.1
	97.5th Percentile	174	0.020	0.0067	<0.0001	<0.00014	0.00026	0.00033	0.079	0.082	<0.0001	<0.0001	(<0.00005)	(<0.00005)	0.019	0.019	<0.05	0.000020	0.000012	60	1.1	1.4
	Maximum	175	0.020	0.0067	<0.0001	0.00014	0.00034	0.00035	0.080	0.085	<0.0001	<0.0001	<0.0005	<0.0005	0.019	0.019	<0.05	0.000022	0.000012	63	1.1	1.4
	Mean	138	0.0071	0.0031	<0.0001	0.00010	0.00012	0.00014	0.049	0.050	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.012	<0.05	0.0000091	0.0000064	49	0.69	0.72
	Standard Deviation	20	0.0042	0.00070	-	-	0.000044	0.000056	0.018	0.018	-	-	-	-	0.0021	0.0018	-	0.0000040	0.0000023	5.4	0.18	0.47
November	Sample size	38	36	36	38	38	37	37	38	38	38	38	38	38	37	37	38	35	12	38	37	38
	% of values < LRL	0	8.3	92	100	100	59	30	0	0	100	100	100	100	76	73	100	54	67	0	22	42
	Maximum LRL	-	0.0030	0.0030	0.00050	0.00050	0.00010	0.00010	-	-	0.00010	0.0001	0.00050	0.00050	0.010	0.010	0.050	0.000010	0.0000050	-	0.50	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	101	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.013	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	33	<0.5	0.18
	2.5th Percentile	101	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.013	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	33	<0.5	0.18
	25th Percentile	121	0.0035	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.041	0.042	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000058	<0.000005	47	0.57	0.20
	Median	139	0.0075	<0.003	<0.0001	<0.0001	<0.0001	0.00012	0.046	0.048	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	<0.01	<0.05	0.0000075	<0.000005	50	0.71	0.23
	75th Percentile	147	0.018	<0.003	<0.0001	<0.0001	0.00012	0.00014	0.061	0.062	<0.0001	<0.0001	<0.0005	<0.0005	<0.01	0.010	<0.05	0.0000094	0.0000053	53	1.0	1.1
	97.5th Percentile	171	0.056	0.0072	(<0.0001)	(<0.0001)	0.00020	0.00033	0.075	0.077	<0.0001	<0.0001	(<0.00005)	(<0.00005)	0.023	0.017	<0.05	0.000013	0.0000065	59	2.3	1.4
	Maximum	171	0.056	0.0072	<0.0005	<0.0005	0.00020	0.00033	0.075	0.077	<0.0001	<0.0001	<0.0005	<0.0005	0.023	0.017	<0.05	0.000013	0.0000065	59	2.3	1.4
	Mean	136	0.012	0.0032	<0.0005	<0.0005	0.00011	0.00013	0.049	0.050	<0.0001	<0.0001	<0.0005	<0.0005	0.011	0.011	<0.05	0.0000079	0.0000053	49	0.86	0.58
	Standard Deviation	19	0.011	0.00096	-	-	0.000027	0.000053	0.015	0.016	-	-	-	-	0.0024	0.0024	-	0.0000029	0.0000006	5.9	0.42	0.46
December	Sample size	35	35	34	35	35	34	34	35	35	35	35	14	35	34	34	35	34	33	35	35	35
	% of values < LRL	0	26	97	100	100	65	18	0	0	100	100	93	100	71	71	100	62	70	0	14	51
	Maximum LRL	-	0.015	0.0030	0.00050	0.00050	0.00010	0.00010	-	-	0.00050	0.0005	0.000050	0.00050	0.010	0.010	0.050	0.000010	0.000010	-	0.50	1.0
	% values > GL	-	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%	-	-	0%	-	-	0%
	Minimum	99	<0.003	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.014	<0.00002	<0.00002	<0.00005	<0.00005	<0.01	<0.01	<0.05	<0.000005	<0.000005	37	<0.5	0.18
	2.5th Percentile	99	<0.003	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	0.013	0.014	<0.00002	<0.00002	<0.000052	<0.00025	<0.01	<0.01	<0.05	<0.000005	<0.000005	37	<0.5	0.18
	25th Percentile	128	0.0033	<0.003	<0.0001	<0.0001	<0.0001	0.00010	0.044	0.045	<0.0001	<0.0001	<0.00005	<0.00005	<0.01	<0.01	<0.05	0.0000091	0.0000067	46	0.52	0.23
	Median	140	0.0051	<0.003	<0.0001	<0.0001	<0.0001	0.00012	0.049	0.050	<0.0001	<0.0001	<0.00005	<0.0005	<0.01	<0.01	<0.05	0.0000070	0.0000056	52	0.66	0.31
	75th Percentile	150	0.015	<0.003	<0.0001	<0.0001	0.00013	0.00016	0.062	0.063	<0.0001	<0.0001	<0.00005	<0.0005	0.011	0.012	<0.05	0.000010	0.0000086	55	0.97	1.1
	97.5th Percentile	166	0.046	0.0041	(<0.0001)	(<0.0001)	0.00019	0.00032	0.075	0.079	(<0.0001)	(<0.0001)	0.000052	<0.0005	0.016	0.016	<0.05	0.000013	0.000011	58	2.2	1.4
	Maximum	166	0.046	0.0041	<0.0005	<0.0005	0.00019	0.00032	0.075	0.079	<0.0005	<0.0005	0.000052	<0.0005	0.016	0.016	<0.05	0.000013	0.000011	58	2.2	1.4
	Mean	138	0.011	0.0011	<0.0005	<0.0005	0.00012	0.00014	0.050	0.051	<0.0001	<0.0001	0.000050	<0.0005	0.011	0.011	<0.05	0.0000076	0.0000066	50	0.80	0.56
	Standard Deviation	17	0.012	-	-	-	0.000028	0.000057	0.017	0.017	-	-	-	-	0.0018	0.0016	-	0.0000022	0.0000025	5.8	0.37	0.44

Note: 97.5th percentiles in parentheses were manually lowered due to the presence of censored data at a higher laboratory reporting limit (LRL)

[1] Chronic guidelines were applied when available, otherwise acute guidelines were applied. For guidelines and site-specific benchmarks (SSBM) that are parameter-dependant (e.g., hardness), concurrent monthly means of parameters were used for determining the guideline or SSBM.

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Chromium	Dissolved Chromium	Dissolved Cobalt	Total Cobalt	Field Conductivity	Lab Conductivity	Dissolved Copper	Total Copper	Field Dissolved Oxygen	Dissolved Fluoride	Total or Dissolved Hardness (as $CaCo_3$)	Instantaneous Flow	Total Iron	Dissolved Iron	Dissolved Lead	Total Lead	Dissolved Lithium	Total Lithium	Total Magnesium	Dissolved Manganese
	Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µs/cm**	**µs/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**m^3/s**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Guideline/SSBM [1]	**0.001**	**-**	**-**	**0.004**	**-**	**-**	**-**	**0.0035-0.0094**	**<6**	**0.4-1.7**	**-**	**-**	**1**	**0.35**	**-**	**0.0060-0.013**	**-**	**-**	**-**	**-**
January	Sample size	32	33	33	33	26	33	33	31	28	33	33	9.0	32	33	33	31	33	33	33	33
	% of values < LRL	0	0	100	100	0	0	97	97	0	0	0	0	81	100	100	97	3.0	3.0	0	36
	Maximum LRL	-	-	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.030	0.000050	0.000050	0.0010	0.0010	-	0.00010
	% of values > GL/SSBM	0%	-	-	0%	-	-	-	0%	0%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00012	0.00010	<0.0001	<0.0001	158	258	<0.0005	<0.0005	9.5	0.077	148	0.040	<0.01	<0.01	<0.00005	<0.00005	0.00065	0.00063	8.9	<0.00005
	2.5th Percentile	0.00012	0.00010	<0.0001	<0.0001	158	258	<0.0005	<0.0005	9.5	0.077	148	0.040	<0.01	<0.01	<0.00005	<0.00005	0.00065	0.00063	8.9	<0.00005
	25th Percentile	0.00019	0.00015	<0.0001	<0.0001	275	290	<0.0005	<0.0005	12	0.15	166	0.049	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0017	12	0.000054
	Median	0.00022	0.00019	<0.0001	<0.0001	316	344	<0.0005	<0.0005	12	0.17	187	0.12	<0.03	<0.03	<0.00005	<0.00005	0.0035	0.0034	14	0.00011
	75th Percentile	0.00027	0.00023	<0.0001	<0.0001	335	363	<0.0005	<0.0005	13	0.35	203	0.32	0.013	<0.03	<0.00005	<0.00005	0.0043	0.0042	17	0.00044
	97.5th Percentile	0.00032	0.00030	<0.0001	<0.0001	404	403	<0.0008	<0.00063	16	0.41	227	0.80	0.042	<0.03	<0.00005	<0.000087	0.0055	0.0060	21	0.0055
	Maximum	0.00032	0.00030	<0.0001	<0.0001	404	403	0.00080	0.00063	16	0.41	227	0.80	0.042	<0.03	<0.00005	0.000087	0.0055	0.0060	21	0.0055
	Mean	0.00023	0.00019	<0.0001	<0.0001	309	332	0.00051	0.00050	12	0.21	185	0.27	0.013	<0.03	<0.00005	0.000051	0.0031	0.0030	14	0.00060
	Standard Deviation	0.000057	0.000052	-	-	54	43	-	-	1.4	0.11	25	0.31	0.0079	-	-	-	0.0016	0.0016	3.3	0.0013
February	Sample size	32	33	33	33	27	33	33	33	27	33	33	9.0	30	33	33	33	33	33	33	33
	% of values < LRL	0	0	100	100	0	0	100	100	0	0	0	0	80	100	97	88	3.0	0	0	36
	Maximum LRL	-	-	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.030	0.000050	0.000050	0.0010	-	-	0.00010
	% values > GL	0%	-	-	0%	-	-	-	0%	0%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00015	0.00010	<0.0001	<0.0001	197	274	<0.0005	<0.0005	9.8	0.072	145	0.043	<0.01	<0.01	<0.00005	<0.00005	0.00067	0.00057	11	<0.00005
	2.5th Percentile	0.00015	0.00010	<0.0001	<0.0001	197	274	<0.0005	<0.0005	9.8	0.072	145	0.043	<0.01	<0.01	<0.00005	<0.00005	0.00067	0.00057	11	<0.00005
	25th Percentile	0.00019	0.00015	<0.0001	<0.0001	282	303	<0.0005	<0.0005	11	0.16	163	0.11	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0016	12	<0.00005
	Median	0.00022	0.00018	<0.0001	<0.0001	303	346	<0.0005	<0.0005	12	0.16	193	0.12	0.017	<0.01	<0.00005	<0.00005	0.0041	0.0039	14	0.00012
	75th Percentile	0.00026	0.00022	<0.0001	<0.0001	340	381	<0.0005	<0.0005	12	0.33	212	0.26	0.012	<0.03	<0.00005	<0.00005	0.0047	0.0049	18	0.00044
	97.5th Percentile	0.00033	0.00032	<0.0001	<0.0001	392	416	<0.0005	<0.0005	14	0.42	231	0.80	0.053	<0.03	<0.000052	0.000080	0.0059	0.0059	21	0.0084
	Maximum	0.00033	0.00032	<0.0001	<0.0001	392	416	<0.0005	<0.0005	14	0.42	231	0.80	0.053	<0.03	0.000052	0.000080	0.0059	0.0059	21	0.0084
	Mean	0.00022	0.00019	<0.0001	<0.0001	305	344	<0.0005	<0.0005	12	0.21	189	0.27	0.014	<0.03	0.000050	0.000053	0.0034	0.0035	15	0.00072
	Standard Deviation	0.000046	0.000050	-	-	46	42	-	-	0.92	0.11	25	0.31	0.010	-	-	0.0000048	0.0017	0.0017	3.5	0.0017
March	Sample size	33	31	33	33	28	33	32	33	31	33	33	11	32	33	33	33	33	33	33	33
	% of values < LRL	3	0	100	100	0	0	100	100	0	0	0	0	59	100	100	94	3.0	3.0	0	27
	Maximum LRL	0.00020	-	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.030	0.000050	0.000050	0.0010	0.0010	-	0.00010
	% values > GL	0%	-	-	0%	-	-	-	0%	3.2%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00014	0.00010	<0.0001	<0.0001	169	274	<0.0005	<0.0005	5.1	0.070	143	0.027	<0.01	<0.01	<0.00005	<0.00005	0.00073	0.00069	11	<0.00005
	2.5th Percentile	0.00014	0.00010	<0.0001	<0.0001	169	274	<0.0005	<0.0005	5.1	0.070	143	0.027	<0.01	<0.01	<0.00005	<0.00005	0.00073	0.00069	11	<0.00005
	25th Percentile	0.00018	0.00014	<0.0001	<0.0001	268	303	<0.0005	<0.0005	11	0.15	169	0.061	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0016	12	0.000055
	Median	0.00020	0.00017	<0.0001	<0.0001	297	349	<0.0005	<0.0005	12	0.17	191	0.13	0.011	<0.01	<0.00005	<0.00005	0.0040	0.0042	14	0.00015
	75th Percentile	0.00027	0.00021	<0.0001	<0.0001	382	393	<0.0005	<0.0005	13	0.18	218	0.26	0.020	<0.03	<0.00005	<0.00005	0.0046	0.0046	18	0.00035
	97.5th Percentile	0.00045	0.00027	<0.0001	<0.0001	409	411	<0.0005	<0.0005	16	0.42	229	1.1	0.055	<0.03	<0.00005	0.00011	0.0061	0.0061	21	0.0080
	Maximum	0.00045	0.00027	<0.0001	<0.0001	409	411	<0.0005	<0.0005	16	0.42	229	1.1	0.055	<0.03	<0.00005	0.00011	0.0061	0.0061	21	0.0080
	Mean	0.00023	0.00017	<0.0001	<0.0001	313	346	<0.0005	<0.0005	12	0.20	192	0.31	0.018	<0.03	<0.00005	0.000052	0.0034	0.0034	15	0.00058
	Standard Deviation	0.000072	0.000044	-	-	64	44	-	-	2.1	0.10	25	0.41	0.014	-	-	0.000012	0.0016	0.0017	3.3	0.0014
April	Sample size	35	36	37	37	37	38	37	36	37	40	40	17	32	23	37	34	37	37	39	37
	% of values < LRL	0	0	100	95	0	0	100	86	0	0	0	0	47	96	97	82	8.1	5.4	0	22
	Maximum LRL	-	-	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.010	0.000050	0.000050	0.0010	0.0010	-	0.00010
	% values > GL	0%	-	-	0%	-	-	-	0%	0%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00013	0.00010	<0.0001	<0.0001	165	235	<0.0005	<0.0005	9.8	0.068	123	0.034	<0.01	<0.01	<0.00005	<0.00005	0.00083	0.00085	6.2	<0.00005
	2.5th Percentile	0.00013	0.00010	<0.0001	<0.0001	165	235	<0.0005	<0.0005	9.8	0.072	129	0.034	<0.01	<0.01	<0.00005	<0.00005	0.00083	0.00085	6.2	<0.00005
	25th Percentile	0.00019	0.00015	<0.0001	<0.0001	245	291	<0.0005	<0.0005	11	0.15	159	0.24	0.016	<0.01	<0.00005	<0.00005	0.0016	0.0016	11	0.000077
	Median	0.00022	0.00017	<0.0001	<0.0001	274	312	<0.0005	<0.0005	12	0.17	174	0.49	0.017	<0.01	<0.00005	<0.00005	0.0031	0.0032	13	0.00016
	75th Percentile	0.00027	0.00020	<0.0001	<0.0001	314	361	<0.0005	<0.0005	13	0.35	192	0.66	<0.03	<0.01	<0.00005	<0.00005	0.0046	0.0045	15	0.00038
	97.5th Percentile	0.00049	0.00028	<0.0001	0.00023	425	414	<0.0005	0.0010	15	0.42	231	1.3	0.067	<0.019	<0.000057	0.00011	0.0061	0.0064	21	0.0029
	Maximum	0.00049	0.00028	<0.0001	0.00023	425	414	<0.0005	0.0010	15	0.43	234	1.3	0.067	0.019	0.000057	0.00011	0.0061	0.0064	21	0.0029
	Mean	0.00024	0.00018	<0.0001	0.00010	280	324	<0.0005	0.00052	12	0.22	177	0.50	0.023	0.010	0.000050	0.000053	0.0031	0.0032	13	0.00047
	Standard Deviation	0.000072	0.000045	-	0.000024	65	49	-	0.000097	1.2	0.11	27	0.39	0.016	-	-	0.000012	0.0017	0.0017	3.5	0.00075

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Chromium	Dissolved Chromium	Dissolved Cobalt	Total Cobalt	Field Conductivity	Lab Conductivity	Dissolved Copper	Total Copper	Field Dissolved Oxygen	Dissolved Fluoride	Total or Dissolved Hardness (as $CaCo_3$)	Instantaneous Flow	Total Iron	Dissolved Iron	Dissolved Lead	Total Lead	Dissolved Lithium	Total Lithium	Total Magnesium	Dissolved Manganese
	Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µs/cm**	**µs/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**m^3/s**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Guideline/SSBM [1]	**0.001**	**-**	**-**	**0.004**	**-**	**-**	**-**	**0.0035-0.0094**	**<6**	**0.4-1.7**	**-**	**-**	**1**	**0.35**	**-**	**0.0060-0.013**	**-**	**-**	**-**	**-**
May	Sample size	38	41	41	42	38	41	42	41	39	42	42	19	42	41	42	39	40	41	40	41
	% of values < LRL	2.6	4.9	98	69	0	0	93	59	0	0	0	0	24	88	100	54	7.5	7.3	0	12
	Maximum LRL	0.00050	0.00010	0.00010	0.00025	-	-	0.00050	0.00050	-	-	-	-	0.030	0.030	0.00025	0.00015	0.0010	0.0010	-	0.00010
	% values > GL	0%	-	-	0%	-	-	-	0%	0%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00016	<0.0001	<0.0001	<0.0001	153	182	<0.0005	<0.0005	10	0.050	99	0.13	<0.01	<0.01	<0.00005	<0.00005	<0.0005	<0.0005	6.1	<0.00005
	2.5th Percentile	0.00016	<0.0001	<0.0001	<0.0001	153	191	<0.0005	<0.0005	10	0.056	100	0.13	<0.01	<0.01	<0.00005	<0.00005	0.00053	0.00068	6.7	<0.00005
	25th Percentile	0.00021	0.00013	<0.0001	<0.0001	214	236	<0.0005	<0.0005	11	0.14	131	0.87	0.019	<0.01	<0.00005	<0.00005	0.0012	0.0014	8.7	0.00011
	Median	0.00028	0.00017	<0.0001	<0.0001	231	253	<0.0005	<0.0005	11	0.17	141	1.3	0.056	<0.01	<0.00005	<0.00005	0.0019	0.0024	9.9	0.00020
	75th Percentile	0.00034	0.00020	<0.0001	0.00010	257	287	<0.0005	0.00072	12	0.24	160	2.0	0.16	<0.03	<0.00005	0.000092	0.0026	0.0028	11	0.00058
	97.5th Percentile	0.00087	0.00026	<0.0001	0.00035	359	357	0.00056	0.0011	13	0.30	195	3.2	0.86	0.037	<0.00005	0.00027	0.0062	0.0069	16	0.0013
	Maximum	0.00087	0.00026	0.00019	0.00038	359	369	0.00061	0.0019	13	0.34	207	3.2	0.92	0.043	<0.00025	0.00027	0.0067	0.0070	17	0.0013
	Mean	0.00031	0.00017	0.00010	0.00013	236	262	0.00050	0.00064	12	0.18	147	1.4	0.15	0.012	<0.00025	0.000083	0.0022	0.0024	10	0.00036
	Standard Deviation	0.00015	0.000045	-	0.000068	47	45	0.000017	0.00027	0.64	0.075	25	0.75	0.22	0.0076	-	0.000058	0.0014	0.0015	2.4	0.00034
June	Sample size	40	40	40	39	38	41	40	39	37	41	40	19	41	39	38	40	40	40	36	38
	% of values < LRL	0	7.5	95	54	0	0	95	51	0	0	0	0	4.9	85	100	25	15	7.5	0	11
	Maximum LRL	-	0.00010	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.030	0.000050	0.000050	0.0010	0.0010	-	0.00010
	% values > GL	18%	-	-	0%	-	-	-	0%	0%	0%	-	-	15%	0%	-	0%	-	-	-	-
	Minimum	0.00015	<0.0001	<0.0001	<0.0001	139	155	<0.0005	<0.0005	9.5	0.051	87	0.16	0.010	<0.01	<0.00005	<0.00005	<0.0005	0.00051	5.9	<0.00005
	2.5th Percentile	0.00016	<0.0001	<0.0001	<0.0001	139	165	<0.0005	<0.0005	9.5	0.052	87	0.16	0.010	<0.01	<0.00005	<0.00005	<0.0005	0.00051	5.9	0.000069
	25th Percentile	0.00025	0.00013	<0.0001	<0.0001	182	198	<0.0005	<0.0005	11	0.12	115	0.33	0.031	<0.01	<0.00005	0.000053	<0.001	0.0014	7.8	0.00013
	Median	0.00039	0.00017	<0.0001	<0.0001	207	218	<0.0005	<0.0005	11	0.16	121	1.5	0.12	0.018	<0.00005	0.00011	0.0015	0.0019	8.8	0.00024
	75th Percentile	0.00078	0.00022	<0.0001	0.00018	244	254	<0.0005	0.00093	11	0.20	145	1.9	0.36	<0.03	<0.00005	0.00026	0.0019	0.0028	9.8	0.00058
	97.5th Percentile	0.0022	0.00037	0.00013	0.00061	304	309	0.00053	0.0021	12	0.27	177	3.4	3.4	0.071	<0.00005	0.0019	0.0039	0.0046	14	0.0015
	Maximum	0.0026	0.00042	0.00013	0.00061	304	316	0.00053	0.0021	12	0.30	178	3.4	4.0	0.071	<0.00005	0.0027	0.0041	0.0046	14	0.0015
	Mean	0.00062	0.00019	0.00010	0.00017	211	226	0.00050	0.00073	11	0.16	129	1.3	0.44	0.014	<0.00005	0.00028	0.0017	0.0021	8.8	0.00037
	Standard Deviation	0.00057	0.000075	0.00000088	0.00013	37	39	0.0000017	0.00039	0.71	0.062	22	0.92	0.84	0.013	-	0.00048	0.00091	0.0011	1.7	0.00034
July	Sample size	39	39	40	39	33	40	40	39	37	39	40	19	40	40	40	39	40	40	36	39
	% of values < LRL	0	0	100	90	0	0	100	95	0	0	0	0	38	100	98	74	5.0	7.5	0	18
	Maximum LRL	-	-	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.030	0.000050	0.000050	0.0010	0.0010	-	0.00010
	% values > GL	0%	-	-	0%	-	-	-	0%	0%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00014	0.00012	<0.0001	<0.0001	158	173	<0.0005	<0.0005	9.0	0.065	88	0.063	<0.01	<0.01	<0.00005	<0.00005	<0.0005	<0.0005	5.5	<0.00005
	2.5th Percentile	0.00014	0.00012	<0.0001	<0.0001	158	176	<0.0005	<0.0005	9.0	0.065	91	0.063	<0.01	<0.01	<0.00005	<0.00005	0.00051	<0.0005	5.5	<0.00005
	25th Percentile	0.00022	0.00015	<0.0001	<0.0001	212	218	<0.0005	<0.0005	9.5	0.14	124	0.098	0.011	<0.01	<0.00005	<0.00005	0.0013	0.0014	8.7	0.000095
	Median	0.00027	0.00018	<0.0001	<0.0001	228	259	<0.0005	<0.0005	10	0.17	139	0.35	0.013	<0.01	<0.00005	<0.00005	0.0019	0.0021	9.3	0.00017
	75th Percentile	0.00037	0.00022	<0.0001	<0.0001	281	294	<0.0005	<0.0005	11	0.24	158	0.64	0.074	<0.03	<0.00005	0.000053	0.0029	0.0032	10	0.00049
	97.5th Percentile	0.00053	0.00039	<0.0001	0.00012	351	365	<0.0005	0.00075	13	0.32	204	2.2	0.49	<0.03	<0.000052	0.00017	0.0068	0.0069	17	0.0025
	Maximum	0.00053	0.00039	<0.0001	0.00012	351	367	<0.0005	0.00075	13	0.32	204	2.2	0.74	<0.03	0.000052	0.00017	0.0073	0.0073	17	0.0025
	Mean	0.00029	0.00019	<0.0001	0.00010	242	262	<0.0005	0.00051	10	0.18	143	0.55	0.068	<0.03	0.000050	0.000060	0.0024	0.0025	9.7	0.00038
	Standard Deviation	0.00010	0.000056	-	0.0000034	48	51	-	0.000036	0.97	0.071	29	0.58	0.13	-	-	0.000027	0.0017	0.0016	2.1	0.00049
August	Sample size	40	40	40	40	33	40	40	40	34	40	40	19	36	24	40	40	37	40	40	36
	% of values < LRL	2.5	13	100	100	0	0	100	93	0	0	0	0	56	96	98	85	11	13	0	22
	Maximum LRL	0.00050	0.00010	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.010	0.000050	0.000050	0.0010	0.0020	-	0.00010
	% values > GL	0%	-	-	0%	-	-	-	0%	0%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00010	<0.0001	<0.0001	<0.0001	166	219	<0.0002	<0.0005	8.0	0.075	122	0.038	<0.01	<0.01	<0.00005	<0.00005	<0.0005	<0.0005	7.3	<0.00005
	2.5th Percentile	0.00010	<0.0001	<0.0001	<0.0001	166	224	<0.0005	<0.0005	8.0	0.075	124	0.038	<0.01	<0.01	<0.00005	<0.00005	<0.0005	<0.0005	7.5	<0.00005
	25th Percentile	0.00019	0.00013	<0.0001	<0.0001	234	260	<0.0005	<0.0005	9.8	0.16	146	0.066	0.010	<0.01	<0.00005	<0.00005	0.0015	0.0016	9.8	0.000088
	Median	0.00024	0.00017	<0.0001	<0.0001	255	287	<0.0005	<0.0005	10	0.18	157	0.29	0.011	<0.01	<0.00005	<0.00005	0.0025	0.0026	11	0.00017
	75th Percentile	0.00031	0.00020	<0.0001	<0.0001	297	331	<0.0005	<0.0005	10	0.27	176	0.36	<0.03	<0.01	<0.00005	<0.00005	0.0032	0.0037	13	0.00041
	97.5th Percentile	0.00054	0.00033	<0.0001	<0.0001	390	396	<0.0005	0.00066	11	0.35	214	1.9	0.065	<0.015	<0.00005	0.000094	0.0055	0.0077	20	0.0025
	Maximum	0.00063	0.00035	<0.0001	<0.0001	390	405	<0.0005	0.00066	11	0.35	215	1.9	0.065	0.015	0.000050	0.00010	0.0055	0.0078	20	0.0025
	Mean	0.00026	0.00017	<0.0001	<0.0001	269	296	<0.0005	0.00051	10	0.20	161	0.35	0.020	0.010	0.000050	0.000054	0.0025	0.0030	12	0.00036
	Standard Deviation	0.000097	0.000058	-	-	48	47	-	0.000024	0.78	0.082	25	0.44	0.015	-	-	0.000011	0.0012	0.0018	3.3	0.00049

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Chromium	Dissolved Chromium	Dissolved Cobalt	Total Cobalt	Field Conductivity	Lab Conductivity	Dissolved Copper	Total Copper	Field Dissolved Oxygen	Dissolved Fluoride	Total or Dissolved Hardness (as $CaCo_3$)	Instantaneous Flow	Total Iron	Dissolved Iron	Dissolved Lead	Total Lead	Dissolved Lithium	Total Lithium	Total Magnesium	Dissolved Manganese
	Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µs/cm**	**µs/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**m^3/s**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Guideline/SSBM [1]	**0.001**	**-**	**-**	**0.004**	**-**	**-**	**-**	**0.0035-0.0094**	**<6**	**0.4-1.7**	**-**	**-**	**1**	**0.35**	**-**	**0.0060-0.013**	**-**	**-**	**-**	**-**
September	Sample size	39	38	40	40	33	40	40	40	36	40	40	19	37	40	40	38	40	40	40	36
	% of values < LRL	2.6	2.6	100	98	0	0	100	98	0	0	0	0	62	100	100	92	7.5	5.0	0	31
	Maximum LRL	0.00020	0.00010	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.030	0.000050	0.000050	0.0010	0.0010	-	0.00010
	% values > GL	0%	-	-	0%	-	-	-	0%	0%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00014	<0.0001	<0.0001	<0.0001	226	242	<0.0005	<0.0005	8.5	0.074	135	0.032	<0.01	<0.01	<0.00005	<0.00005	<0.0005	0.00057	8.4	<0.00005
	2.5th Percentile	0.00014	0.00010	<0.0001	<0.0001	226	247	<0.0005	<0.0005	8.5	0.074	140	0.032	<0.01	<0.01	<0.00005	<0.00005	0.00059	0.00057	9.0	<0.00005
	25th Percentile	0.00020	0.00016	<0.0001	<0.0001	255	278	<0.0005	<0.0005	9.9	0.16	155	0.060	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0017	11	<0.0001
	Median	0.00023	0.00019	<0.0001	<0.0001	274	303	<0.0005	<0.0005	11	0.18	164	0.19	0.010	<0.01	<0.00005	<0.00005	0.0031	0.0032	12	0.00017
	75th Percentile	0.00027	0.00020	<0.0001	<0.0001	310	341	<0.0005	<0.0005	11	0.31	188	0.38	0.021	<0.03	<0.00005	<0.00005	0.0040	0.0041	14	0.00047
	97.5th Percentile	0.00044	0.00025	<0.0001	<0.00013	406	385	<0.0005	<0.00051	13	0.36	216	0.95	0.066	<0.03	<0.00005	0.000087	0.0073	0.0073	20	0.0018
	Maximum	0.00044	0.00025	<0.0001	0.00013	406	390	<0.0005	0.00051	13	0.36	221	0.95	0.066	<0.03	<0.00005	0.000087	0.0073	0.0074	20	0.0018
	Mean	0.00024	0.00018	<0.0001	0.00010	288	310	<0.0005	0.00050	11	0.21	171	0.26	0.018	<0.03	<0.00005	0.000052	0.0031	0.0032	13	0.00035
	Standard Deviation	0.000063	0.000039	-	-	46	39	-	-	1.0	0.092	22	0.24	0.017	-	-	0.0000037	0.0018	0.0018	3.1	0.00042
October	Sample size	39	38	40	40	28	40	40	39	33	40	40	20	38	40	40	40	40	39	40	40
	% of values < LRL	0	2.6	100	100	0	0	100	95	0	0	0	0	66	100	100	95	7.5	2.6	0	28
	% values > GL	0%	-	-	0%	-	-	-	0%	2.9%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Maximum LRL	-	0.00010	0.00010	0.00010	-	-	0.00050	0.00050	-	-	-	-	0.030	0.030	0.000050	0.000050	0.0010	0.0010	-	0.00010
	Minimum	0.00015	<0.0001	<0.0001	<0.0001	177	243	<0.0005	<0.0005	1.6	0.073	129	0.040	<0.01	<0.01	<0.00005	<0.00005	<0.0005	0.00070	9.5	<0.00005
	2.5th Percentile	0.00015	0.00011	<0.0001	<0.0001	177	251	<0.0005	<0.0005	1.6	0.075	137	0.040	<0.01	<0.01	<0.00005	<0.00005	0.00077	0.00070	9.7	<0.00005
	25th Percentile	0.00019	0.00014	<0.0001	<0.0001	254	293	<0.0005	<0.0005	10	0.16	160	0.055	<0.01	<0.01	<0.00005	<0.00005	0.0015	0.0017	11	0.000054
	Median	0.00023	0.00018	<0.0001	<0.0001	279	312	<0.0005	<0.0005	11	0.18	168	0.20	0.014	<0.01	<0.00005	<0.00005	0.0027	0.0025	12	0.00020
	75th Percentile	0.00029	0.00021	<0.0001	<0.0001	299	342	<0.0005	<0.0005	11	0.34	189	0.29	0.014	<0.03	<0.00005	<0.00005	0.0038	0.0037	14	0.00083
	97.5th Percentile	0.00043	0.00037	<0.0001	<0.0001	370	393	<0.0005	0.00067	13	0.38	224	0.69	0.049	<0.03	<0.00005	0.000061	0.0065	0.0068	20	0.0075
	Maximum	0.00043	0.00037	<0.0001	<0.0001	370	394	<0.0005	0.00067	13	0.40	226	0.69	0.049	<0.03	<0.00005	0.000068	0.0066	0.0068	20	0.0080
	Mean	0.00024	0.00019	<0.0001	<0.0001	276	316	<0.0005	0.00051	11	0.22	175	0.21	0.014	<0.03	<0.00005	0.000051	0.0028	0.0029	13	0.00087
	Standard Deviation	0.000070	0.000062	-	-	38	38	-	0.000022	1.9	0.10	23	0.16	0.010	-	-	0.0000031	0.0016	0.0015	3.1	0.0018
November	Sample size	35	37	38	38	31	38	38	37	32	38	38	20	36	37	38	35	38	38	38	38
	% of values < LRL	2.9	5.4	100	100	0	0	100	84	0	0	0	0	69	92	100	94	5.3	5.3	0	34
	Maximum LRL	0.00050	0.00010	0.00050	0.00050	-	-	0.0010	0.00050	-	-	-	-	0.030	0.030	0.00025	0.000050	0.0050	0.0050	-	0.00050
	% values > GL	0%	-	-	0%	-	-	-	0%	0%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00014	<0.0001	<0.0001	<0.0001	152	195	<0.0005	<0.0005	9.8	0.051	114	0.042	<0.01	<0.01	<0.00005	<0.00005	0.00095	0.00082	8.4	<0.00005
	2.5th Percentile	0.00014	<0.0001	<0.0001	<0.0001	152	195	<0.0005	<0.0005	9.8	0.051	114	0.042	<0.01	<0.01	<0.00005	<0.00005	<0.001	0.00082	8.4	<0.00005
	25th Percentile	0.00018	0.00015	<0.0001	<0.0001	256	287	<0.0005	<0.0005	11	0.16	158	0.10	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0017	11	<0.0001
	Median	0.00021	0.00018	<0.0001	<0.0001	284	315	<0.0005	<0.0005	11	0.17	173	0.23	0.024	<0.01	<0.00005	<0.00005	0.0029	0.0029	12	0.00014
	75th Percentile	0.00026	0.00020	<0.0001	<0.0001	320	343	<0.0005	<0.0005	12	0.34	186	0.31	0.020	<0.03	<0.00005	<0.00005	0.0035	0.0037	14	0.00064
	97.5th Percentile	0.00050	0.00028	(<0.0001)	(<0.0001)	424	399	(<0.0005)	0.0011	12	0.40	230	0.80	0.059	0.041	(<0.00005)	0.000067	0.0064	0.0063	20	0.0066
	Maximum	0.00050	0.00028	<0.0005	<0.0005	424	399	<0.001	0.0011	12	0.40	230	0.80	0.059	0.041	<0.00025	0.000067	0.0064	0.0063	20	0.0066
	Mean	0.00023	0.00018	<0.0005	<0.0005	286	314	<0.001	0.00053	11	0.22	175	0.24	0.016	0.011	<0.00025	0.000051	0.0029	0.0029	13	0.00071
	Standard Deviation	0.000076	0.000045	-	-	56	45	-	0.00011	0.58	0.11	26	0.18	0.011	0.0061	-	0.0000021	0.0015	0.0015	3.1	0.0014
December	Sample size	33	34	35	35	27	35	35	32	32	35	35	14	35	35	35	34	35	35	35	33
	% of values < LRL	0	2.9	100	100	0	0	100	88	0	0	0	0	71	100	100	97	11	8.6	0	24
	Maximum LRL	-	0.00010	0.00050	0.00050	-	-	0.0010	0.00050	-	-	-	-	0.050	0.050	0.00025	0.000050	0.0050	0.0050	-	0.00050
	% values > GL	0%	-	-	0%	-	-	-	0%	3.1%	0%	-	-	0%	0%	-	0%	-	-	-	-
	Minimum	0.00015	<0.0001	<0.0001	<0.0001	189	257	<0.0002	<0.0005	1.1	0.069	133	0.038	<0.01	<0.01	<0.00005	<0.00005	<0.0005	<0.0005	9.8	<0.00005
	2.5th Percentile	0.00015	0.00011	<0.0001	<0.0001	189	257	<0.0005	<0.0005	1.1	0.069	133	0.038	<0.01	<0.01	<0.00005	<0.00005	0.00076	0.00084	9.8	<0.00005
	25th Percentile	0.00018	0.00015	<0.0001	<0.0001	260	283	<0.0005	<0.0005	11	0.15	160	0.050	<0.01	<0.01	<0.00005	<0.00005	0.0016	0.0016	12	0.000080
	Median	0.00022	0.00019	<0.0001	<0.0001	309	331	<0.0005	<0.0005	12	0.17	180	0.12	<0.03	<0.01	<0.00005	<0.00005	0.0030	0.0029	13	0.00013
	75th Percentile	0.00025	0.00021	<0.0001	<0.0001	341	352	<0.0005	<0.0005	13	0.33	197	0.17	0.025	<0.03	<0.00005	<0.00005	0.0037	0.0039	15	0.00035
	97.5th Percentile	0.00037	0.00027	(<0.0001)	(<0.0001)	399	401	(<0.0005)	0.00075	15	0.41	218	0.50	0.052	<0.05	(<0.00005)	<0.00012	0.0059	0.0058	21	0.0017
	Maximum	0.00037	0.00027	<0.0005	<0.0005	399	401	<0.001	0.00075	15	0.41	218	0.50	0.052	<0.05	<0.00025	0.00012	0.0059	0.0058	21	0.0017
	Mean	0.00022	0.00018	<0.0005	<0.0005	299	327	<0.001	0.00051	11	0.21	179	0.16	0.018	<0.03	<0.00025	0.000052	0.0029	0.0030	14	0.00032
	Standard Deviation	0.000053	0.000043	-	-	57	41	-	0.000056	2.4	0.10	24	0.15	0.011	-	-	-	0.0016	0.0016	3.1	0.00041

Note: 97.5th percentiles in parentheses were manually lowered due to the presence of censored data at a higher laboratory reporting limit

[1] Chronic guidelines were applied when available, otherwise acute guidelines were applied. For guidelines and site-specific benchmarks (SSBM) that are parameter-dependant (e.g., hardness), concurrent monthly means of parameters were used for determining the guideline or SSBM.

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Manganese	Dissolved Mercury	Total Mercury	Dissolved Molybdenum	Total Molybdenum	Dissolved Nickel	Total Nickel	Nitrate Nitrogen (as NO_3)	Nitrite Nitrogen (as NO_2)	Nitrogen Ammonia (as N)	Orthophosphate	Field pH	Lab pH	Phosphorus	Total Potassium	Dissolved Selenium	Total Selenium	Dissolved Silver	Total Silver
	Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Guideline/SSBM [1]	**0.61-1.6**	**-**	**0.00000125**	**-**	**1**	**-**	**0.086-0.15**	**2.9-15**	**0.02**	**0.20-2.1**	**-**	**6.5-9 (inclusive)**		**-**	**-**	**-**	**0.019-0.070**	**-**	**0.00005-0.0015**
January	Sample size	27	33	33	33	33	33	33	33	33	33	33	29	33	22	19	33	33	33	33
	% of values < LRL	22	100	100	0	0	100	100	0	94	88	21	0	0	14	0	0	0	100	97
	Maximum LRL	0.00010	0.000010	0.000010	-	-	0.00050	0.00050	-	0.0010	0.0050	0.0010	-	-	0.0020	-	-	-	0.000010	0.000010
	% of values > GL/SSBM	0%	-	0%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	<0.00005	<0.0000005	<0.0000005	0.00052	0.00052	<0.0005	<0.0005	0.017	<0.001	<0.005	<0.001	7.8	8.0	<0.002	0.22	0.00022	0.00022	<0.00001	<0.00001
	2.5th Percentile	<0.00005	<0.000005	<0.000005	0.00052	0.00052	<0.0005	<0.0005	0.017	<0.001	<0.005	<0.001	7.8	8.0	<0.002	0.22	0.00022	0.00022	<0.00001	<0.00001
	25th Percentile	<0.0001	<0.00001	<0.00001	0.00057	0.00059	<0.0005	<0.0005	0.076	<0.001	<0.005	0.0013	8.2	8.2	0.0026	0.34	0.00065	0.00065	<0.00001	<0.00001
	Median	0.00024	<0.00001	<0.00001	0.00086	0.00085	<0.0005	<0.0005	0.12	<0.001	<0.005	0.0022	8.3	8.3	0.0041	0.39	0.00090	0.00088	<0.00001	<0.00001
	75th Percentile	0.00041	<0.00001	<0.00001	0.0012	0.0013	<0.0005	<0.0005	0.18	<0.001	<0.005	0.0029	8.4	8.3	0.0046	0.45	0.0014	0.0013	<0.00001	<0.00001
	97.5th Percentile	0.0022	(0.000005)	(0.0000005)	0.0016	0.0018	<0.0005	<0.0005	0.30	0.0014	0.012	0.0040	8.9	8.4	0.0099	0.60	0.0029	0.0026	-	<0.00001
	Maximum	0.0022	<0.00001	<0.00001	0.0016	0.0018	<0.0005	<0.0005	0.30	0.0014	0.012	0.0040	8.9	8.4	0.0099	0.60	0.0029	0.0026	<0.00001	0.000010
	Mean	0.00041	<0.00001	<0.00001	0.00090	0.00093	<0.0005	<0.0005	0.13	0.0010	0.0053	0.0022	8.3	8.3	0.0040	0.40	0.0011	0.0010	<0.00001	0.000010
	Standard Deviation	0.00052	-	-	0.00036	0.00038	-	-	0.075	0.000073	0.0013	0.00086	0.25	0.098	0.0017	0.100	0.00067	0.00065	-	-
February	Sample size	29	33	33	33	33	33	32	33	33	33	33	28	33	24	19	33	33	33	33
	% of values < LRL	10	100	100	0	0	100	100	0	94	91	24	0	0	13	0	0	0	100	100
	Maximum LRL	0.00010	0.000010	0.000010	-	-	0.00050	0.00050	-	0.0010	0.0050	0.0010	-	-	0.0020	-	-	-	0.000010	0.000010
	% values > GL	0%	-	0%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	<0.00005	<0.0000005	<0.0000005	0.00052	0.00053	<0.0005	<0.0005	0.0081	<0.001	<0.005	<0.001	7.4	8.1	<0.002	0.21	0.00022	0.00023	<0.00001	<0.00001
	2.5th Percentile	<0.00005	<0.000005	<0.0000005	0.00052	0.00053	<0.0005	<0.0005	0.0081	<0.001	<0.005	<0.001	7.4	8.1	<0.002	0.21	0.00022	0.00023	<0.00001	<0.00001
	25th Percentile	0.00013	<0.00001	<0.00001	0.00057	0.00058	<0.0005	<0.0005	0.067	<0.001	<0.005	0.0012	8.1	8.3	0.0029	0.34	0.00069	0.00068	<0.00001	<0.00001
	Median	0.00034	<0.00001	<0.00001	0.00084	0.00086	<0.0005	<0.0005	0.11	<0.001	<0.005	0.0019	8.3	8.3	0.0043	0.40	0.00091	0.00092	<0.00001	<0.00001
	75th Percentile	0.00050	<0.00001	<0.00001	0.0012	0.0012	<0.0005	<0.0005	0.16	<0.001	<0.005	0.0031	8.4	8.3	0.0074	0.44	0.0014	0.0015	<0.00001	<0.00001
	97.5th Percentile	0.0039	(0.000005)	(0.0000005)	0.0016	0.0017	<0.0005	<0.0005	0.29	0.0014	0.0095	0.0044	8.9	8.5	0.013	0.60	0.0027	0.0026	-	-
	Maximum	0.0039	<0.00001	<0.00001	0.0016	0.0017	<0.0005	<0.0005	0.29	0.0014	0.0095	0.0044	8.9	8.5	0.013	0.60	0.0027	0.0026	<0.00001	<0.00001
	Mean	0.00076	<0.00001	<0.00001	0.00091	0.00094	<0.0005	<0.0005	0.12	0.0010	0.0052	0.0022	8.2	8.3	0.0057	0.39	0.0011	0.0011	<0.00001	<0.00001
	Standard Deviation	0.0010	-	-	0.00037	0.00038	-	-	0.071	0.000024	0.00081	0.0010	0.32	0.067	0.0035	0.091	0.00074	0.00071	-	-
March	Sample size	31	33	8	33	33	33	33	33	32	32	33	30	33	24	18	33	33	33	33
	% of values < LRL	3.2	100	88	0	0	100	100	0	97	97	15	0	0	17	0	0	0	100	100
	Maximum LRL	0.00010	0.000010	0.00000050	-	-	0.00050	0.00050	-	0.0010	0.0050	0.0010	-	-	0.0020	-	-	-	0.000010	0.000010
	% values > GL	0%	-	0%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	0.000054	<0.0000005	<0.0000005	0.00052	0.00052	<0.0005	<0.0005	0.0099	<0.001	<0.005	<0.001	7.1	8.1	<0.002	0.19	0.00023	0.00023	<0.00001	<0.00001
	2.5th Percentile	0.000053	<0.000005	<0.0000005	0.00052	0.00052	<0.0005	<0.0005	0.0099	<0.001	<0.005	<0.001	7.1	8.1	<0.002	0.19	0.00023	0.00023	<0.00001	<0.00001
	25th Percentile	0.00015	<0.00001	<0.0000005	0.00056	0.00058	<0.0005	<0.0005	0.061	<0.001	<0.005	0.0013	8.1	8.3	0.0027	0.33	0.00072	0.00071	<0.00001	<0.00001
	Median	0.00028	<0.00001	<0.0000005	0.00081	0.00085	<0.0005	<0.0005	0.096	<0.001	<0.005	0.0018	8.3	8.3	0.0037	0.39	0.00088	0.00087	<0.00001	<0.00001
	75th Percentile	0.0013	<0.00001	<0.0000005	0.0013	0.0013	<0.0005	<0.0005	0.13	<0.001	<0.005	0.0025	8.5	8.3	0.0050	0.43	0.0015	0.0015	<0.00001	<0.00001
	97.5th Percentile	0.0059	(0.000005)	0.00000062	0.0016	0.0017	<0.0005	<0.0005	0.28	<0.001	<0.0056	0.0042	8.7	8.4	0.0099	0.45	0.0028	0.0027	-	-
	Maximum	0.0059	<0.00001	0.00000062	0.0016	0.0017	<0.0005	<0.0005	0.28	0.0010	0.0056	0.0042	8.7	8.4	0.0099	0.45	0.0028	0.0027	<0.00001	<0.00001
	Mean	0.0011	<0.00001	0.00000052	0.00091	0.00093	<0.0005	<0.0005	0.100	0.0010	0.0050	0.0019	8.3	8.3	0.0040	0.37	0.0011	0.0011	<0.00001	<0.00001
	Standard Deviation	0.0015	-	-	0.00038	0.00039	-	-	0.063	-	-	0.00085	0.32	0.064	0.0019	0.073	0.00077	0.00072	-	-
April	Sample size	35	37	9	37	37	37	37	40	40	39	38	39	40	27	23	37	37	37	37
	% of values < LRL	0	100	33	0	0	95	84	2.5	98	85	29	0	0	15	0	0	0	100	86
	Maximum LRL	-	0.000010	0.00000050	-	-	0.00050	0.00050	0.0050	0.0010	0.0050	0.0010	-	-	0.0020	-	#VALUE!	-	0.000010	0.000010
	% values > GL	0%	-	22%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	0.000065	<0.0000005	<0.0000005	0.00042	0.00040	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.9	8.2	<0.002	0.22	0.00023	0.00025	<0.00001	<0.00001
	2.5th Percentile	0.000065	<0.000005	<0.0000005	0.00042	0.00040	<0.0005	<0.0005	0.0055	<0.001	<0.005	<0.001	7.9	8.2	<0.002	0.22	0.00023	0.00025	<0.00001	<0.00001
	25th Percentile	0.00022	<0.000005	<0.0000005	0.00056	0.00058	<0.0005	<0.0005	0.047	<0.001	<0.005	<0.001	8.2	8.3	0.0030	0.32	0.00065	0.00067	<0.00001	<0.00001
	Median	0.00068	<0.00001	0.00000072	0.00086	0.00085	<0.0005	<0.0005	0.096	<0.001	<0.005	0.0020	8.3	8.3	0.0046	0.41	0.00089	0.00090	<0.00001	<0.00001
	75th Percentile	0.0023	<0.00001	0.00000076	0.0010	0.0011	<0.0005	<0.0005	0.16	<0.001	<0.005	0.0026	8.5	8.3	0.0066	0.47	0.0012	0.0013	<0.00001	<0.00001
	97.5th Percentile	0.0065	(<0.000005)	0.0000031	0.0016	0.0016	0.00071	0.00086	0.31	<0.001233333	0.012	0.0059	8.8	8.4	0.014	0.69	0.0028	0.0025	<0.00001	0.000016
	Maximum	0.0065	<0.00001	0.0000031	0.0016	0.0016	0.00071	0.00086	0.34	0.0012	0.012	0.0059	8.8	8.5	0.014	0.69	0.0028	0.0025	<0.00001	0.000016
	Mean	0.0016	<0.00001	0.0000011	0.00087	0.00089	0.00051	0.00052	0.11	0.0010	0.0055	0.0021	8.3	8.3	0.0052	0.41	0.0010	0.0010	<0.00001	0.000010
	Standard Deviation	0.0019	-	0.00000087	0.00034	0.00034	0.000030	0.000083	0.083	-	0.0016	0.0012	0.19	0.066	0.0029	0.13	0.00064	0.00061	-	0.0000010

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Manganese	Dissolved Mercury	Total Mercury	Dissolved Molybdenum	Total Molybdenum	Dissolved Nickel	Total Nickel	Nitrate Nitrogen (as NO_3)	Nitrite Nitrogen (as NO_2)	Nitrogen Ammonia (as N)	Orthophosphate	Field pH	Lab pH	Phosphorus	Total Potassium	Dissolved Selenium	Total Selenium	Dissolved Silver	Total Silver
	Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Guideline/SSBM [1]	**0.61-1.6**	**-**	**0.00000125**	**-**	**1**	**-**	**0.086-0.15**	**2.9-15**	**0.02**	**0.20-2.1**	**-**	**6.5-9 (inclusive)**		**-**	**-**	**-**	**0.019-0.070**	**-**	**0.00005-0.0015**
May	Sample size	41	17	9	42	41	40	40	42	42	41	39	42	42	34	23	41	40	42	41
	% of values < LRL	2.4	88	11	0	0	85	50	4.8	93	85	23	0	0	8.8	0	2.4	2.5	100	85
	Maximum LRL	0.00010	0.0000050	0.00000050	-	-	0.00050	0.00050	0.0050	0.0010	0.0050	0.0010	-	-	0.0020	-	0.00050	0.00050	0.000050	0.000010
	% values > GL	0%	-	22%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	<0.0001	<0.0000005	<0.0000005	0.00041	0.00043	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.5	7.5	<0.002	0.18	0.00017	0.00018	<0.00001	<0.00001
	2.5th Percentile	0.00010	<0.000005	<0.000000516	0.00042	0.00044	<0.0005	<0.0005	0.0050	<0.001	<0.005	<0.001	8.0	7.7	<0.002	0.18	0.00017	0.00018	<0.00001	<0.00001
	25th Percentile	0.00052	<0.000005	0.00000053	0.00049	0.00052	<0.0005	<0.0005	0.042	<0.001	<0.005	0.0010	8.1	8.2	0.0038	0.26	0.00047	0.00053	<0.00001	<0.00001
	Median	0.0020	<0.000005	0.00000062	0.00059	0.00064	<0.0005	0.00050	0.068	<0.001	<0.005	0.0019	8.3	8.3	0.0085	0.32	0.00067	0.00067	<0.00001	<0.00001
	75th Percentile	0.0063	<0.000005	0.0000010	0.00092	0.00094	<0.0005	0.00059	0.15	<0.001	<0.005	0.0030	8.4	8.3	0.020	0.40	0.00081	0.00084	<0.00001	<0.00001
	97.5th Percentile	0.028	0.0000056	0.0000015	0.0014	0.0013	0.00063	0.0017	0.24	0.0010	0.0058	0.0046	8.6	8.4	0.087	0.61	0.0016	0.0016	<0.00001	0.000020
	Maximum	0.029	0.0000056	0.0000015	0.0017	0.0014	0.00064	0.0017	0.25	0.0015	0.0073	0.0046	8.7	8.5	0.087	0.61	0.0019	0.0016	<0.00005	0.000022
	Mean	0.0050	0.0000011	0.00000085	0.00071	0.00072	0.00051	0.00062	0.093	0.0010	0.0051	0.0021	8.3	8.2	0.015	0.34	0.00072	0.00072	<0.00005	0.000011
	Standard Deviation	0.0076	0.00000011	0.00000042	0.00030	0.00026	0.000030	0.00029	0.072	0.00010	0.00040	0.0011	0.21	0.18	0.017	0.10	0.00040	0.00036	-	0.0000026
June	Sample size	41	41	17	41	41	40	37	41	41	40	40	39	41	33	24	41	41	41	40
	% of values < LRL	0	100	47	0	0	83	46	2.4	95	95	10	0	0	0	0	0	0	100	70
	Maximum LRL	-	0.000010	0.0000050	-	-	0.00050	0.00050	0.0050	0.0010	0.0050	0.0010	-	-	-	-	#VALUE!	-	0.000010	0.000010
	% values > GL	0%	-	18%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	0.00018	<0.0000005	<0.0000005	0.00021	0.00035	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.9	8.0	0.0022	0.16	0.00012	0.00019	<0.00001	<0.00001
	2.5th Percentile	0.00019	<0.000005	<0.0000005	0.00033	0.00039	<0.0005	<0.0005	0.0051	<0.001	<0.005	<0.001	7.9	8.0	0.0022	0.16	0.00012	0.00019	<0.00001	<0.00001
	25th Percentile	0.0012	<0.000005	0.00000055	0.00043	0.00049	<0.0005	<0.0005	0.018	<0.001	<0.005	0.0015	8.2	8.2	0.0047	0.28	0.00037	0.00040	<0.00001	<0.00001
	Median	0.0068	<0.00001	0.00000066	0.00052	0.00058	<0.0005	0.00054	0.054	<0.001	<0.005	0.0024	8.3	8.3	0.0085	0.38	0.00052	0.00056	<0.00001	<0.00001
	75th Percentile	0.024	<0.00001	0.00000084	0.00073	0.00076	<0.0005	0.00080	0.087	<0.001	<0.005	0.0041	8.4	8.3	0.022	0.51	0.00077	0.00078	<0.00001	0.000012
	97.5th Percentile	0.16	(<0.000005)	0.0000083	0.0010	0.0011	0.00081	0.0029	0.17	<0.001025	0.0059	0.0059	8.7	8.4	0.19	0.66	0.0012	0.0014	<0.00001	0.000027
	Maximum	0.43	<0.00001	0.0000083	0.0011	0.0011	0.00091	0.0029	0.21	0.0011	0.0063	0.0061	8.7	8.4	0.19	0.66	0.0017	0.0018	<0.00001	0.000028
	Mean	0.025	<0.00001	0.0000017	0.00060	0.00064	0.00052	0.00081	0.065	0.0010	0.0050	0.0029	8.3	8.2	0.027	0.39	0.00059	0.00062	<0.00001	0.000013
	Standard Deviation	0.070	-	0.0000025	0.00021	0.00020	0.000080	0.00059	0.055	0.000016	0.00019	0.0015	0.15	0.10	0.045	0.14	0.00034	0.00034	-	0.0000051
July	Sample size	36	40	9	40	40	40	39	39	39	38	40	37	40	31	24	40	39	40	40
	% of values < LRL	0	100	56	0	0	98	85	7.7	95	92	15	0	0	0	0	0	0	100	98
	Maximum LRL	-	0.000010	0.00000050	-	-	0.00050	0.00050	0.0050	0.0010	0.0050	0.0010	-	-	-	-	#VALUE!	-	0.000010	0.000010
	% values > GL	0%	-	11%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	0.00011	<0.0000005	<0.0000005	0.00017	0.00036	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.7	8.2	0.0021	0.19	0.00011	0.00018	<0.00001	<0.00001
	2.5th Percentile	0.00011	<0.000005	<0.0000005	0.00027	0.00037	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.7	8.2	0.0021	0.19	0.00014	0.00018	<0.00001	<0.00001
	25th Percentile	0.00045	<0.000005	<0.0000005	0.00055	0.00057	<0.0005	<0.0005	0.014	<0.001	<0.005	0.0015	8.2	8.3	0.0040	0.30	0.00039	0.00042	<0.00001	<0.00001
	Median	0.00094	<0.00001	<0.0000005	0.00070	0.00069	<0.0005	<0.0005	0.030	<0.001	<0.005	0.0021	8.3	8.3	0.0054	0.36	0.00055	0.00057	<0.00001	<0.00001
	75th Percentile	0.0032	<0.00001	0.00000061	0.00095	0.00097	<0.0005	<0.0005	0.074	<0.001	<0.005	0.0030	8.4	8.3	0.0081	0.51	0.0010	0.0011	<0.00001	<0.00001
	97.5th Percentile	0.0083	(<0.000005)	0.0000017	0.0013	0.0014	<0.00057	0.0011	0.18	0.0013	0.0067	0.0052	8.7	8.4	0.016	0.62	0.0019	0.0020	<0.00001	<0.000017
	Maximum	0.0083	<0.00001	0.0000017	0.0013	0.0014	0.00057	0.0011	0.18	0.0013	0.0067	0.0052	8.7	8.4	0.016	0.62	0.0020	0.0020	<0.00001	0.000017
	Mean	0.0021	<0.00001	0.00000067	0.00075	0.00078	0.00050	0.00052	0.046	0.0010	0.0051	0.0024	8.3	8.3	0.0061	0.39	0.00072	0.00075	<0.00001	0.000010
	Standard Deviation	0.0024	-	0.00000040	0.00028	0.00028	-	0.00010	0.045	0.000015	0.00034	0.0012	0.21	0.067	0.0032	0.13	0.00050	0.00049	-	-
August	Sample size	36	40	9	40	40	40	40	40	40	40	40	35	40	31	24	40	40	40	40
	% of values < LRL	2.8	100	78	0	0	98	88	5.0	98	93	30	0	0	9.7	0	0	0	100	100
	Maximum LRL	0.00015	0.000010	0.00000050	-	-	0.00050	0.00050	0.0050	0.0010	0.0050	0.0010	-	-	0.0020	-	#VALUE!	-	0.000010	0.000010
	% values > GL	0%	-	0%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	0.000091	<0.0000005	<0.0000005	0.00047	0.00047	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.9	8.1	<0.002	0.19	0.00018	0.00018	<0.00001	<0.00001
	2.5th Percentile	0.000091	<0.000005	<0.0000005	0.00048	0.00050	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.9	8.1	<0.002	0.19	0.00018	0.00018	<0.00001	<0.00001
	25th Percentile	0.00038	<0.000005	<0.0000005	0.00063	0.00064	<0.0005	<0.0005	0.017	<0.001	<0.005	<0.001	8.2	8.3	0.0028	0.33	0.00048	0.00050	<0.00001	<0.00001
	Median	0.00084	<0.00001	<0.0000005	0.00088	0.00088	<0.0005	<0.0005	0.041	<0.001	<0.005	0.0020	8.3	8.3	0.0037	0.38	0.00062	0.00061	<0.00001	<0.00001
	75th Percentile	0.0024	<0.00001	<0.0000005	0.0010	0.0011	<0.0005	<0.0005	0.088	<0.001	<0.005	0.0027	8.4	8.4	0.0052	0.55	0.0013	0.0013	<0.00001	<0.00001
	97.5th Percentile	0.0066	(<0.000005)	0.00000063	0.0015	0.0015	<0.00075	0.00086	0.23	<0.0012	0.0066	0.0049	8.8	8.4	0.0095	0.68	0.0022	0.0023	<0.00001	<0.00001
	Maximum	0.0066	<0.00001	0.00000063	0.0015	0.0015	0.00075	0.0012	0.23	0.0012	0.0071	0.0049	8.8	8.4	0.0095	0.68	0.0024	0.0025	<0.00001	<0.00001
	Mean	0.0014	<0.00001	0.00000052	0.00087	0.00089	0.00051	0.00052	0.059	0.0010	0.0051	0.0022	8.3	8.3	0.0043	0.42	0.00089	0.00089	<0.00001	<0.00001
	Standard Deviation	0.0015	-	0.000000049	0.00029	0.00029	-	0.00011	0.058	-	0.00027	0.0012	0.20	0.076	0.0020	0.14	0.00060	0.00060	-	-

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Manganese	Dissolved Mercury	Total Mercury	Dissolved Molybdenum	Total Molybdenum	Dissolved Nickel	Total Nickel	Nitrate Nitrogen (as NO_3)	Nitrite Nitrogen (as NO_2)	Nitrogen Ammonia (as N)	Orthophosphate	Field pH	Lab pH	Phosphorus	Total Potassium	Dissolved Selenium	Total Selenium	Dissolved Silver	Total Silver
	Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	Guideline/SSBM [1]	**0.61-1.6**	**-**	**0.00000125**	**-**	**1**	**-**	**0.086-0.15**	**2.9-15**	**0.02**	**0.20-2.1**	**-**	**6.5-9 (inclusive)**		**-**	**-**	**-**	**0.019-0.070**	**-**	**0.00005-0.0015**
September	Sample size	35	40	9	40	40	40	40	40	40	40	40	37	40	32	23	40	40	40	39
	% of values < LRL	8.6	100	78	0	0	93	90	5.0	100	93	35	0	0	16	0	0	0	100	100
	Maximum LRL	0.00010	0.000010	0.00000050	-	-	0.00050	0.00050	0.0050	0.0010	0.0050	0.0010	-	-	0.0020	-	#VALUE!	-	0.000010	0.000010
	% values > GL	0%	-	0%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	<0.00005	<0.0000005	<0.0000005	0.00052	0.00053	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.5	8.1	<0.002	0.19	0.00017	0.00020	<0.00001	<0.00001
	2.5th Percentile	0.000076	<0.000005	<0.0000005	0.00053	0.00054	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.5	8.1	<0.002	0.19	0.00018	0.00020	<0.00001	<0.00001
	25th Percentile	0.00017	<0.000005	<0.0000005	0.00061	0.00064	<0.0005	<0.0005	0.019	<0.001	<0.005	<0.001	8.2	8.3	0.0026	0.31	0.00053	0.00056	<0.00001	<0.00001
	Median	0.00066	<0.00001	<0.0000005	0.00086	0.00086	<0.0005	<0.0005	0.045	<0.001	<0.005	0.0014	8.3	8.3	0.0041	0.38	0.00073	0.00079	<0.00001	<0.00001
	75th Percentile	0.0018	<0.00001	<0.0000005	0.0011	0.0011	<0.0005	<0.0005	0.11	<0.001	<0.005	0.0027	8.5	8.4	0.0063	0.51	0.0014	0.0014	<0.00001	<0.00001
	97.5th Percentile	0.0055	(<0.000005)	0.00000083	0.0014	0.0015	0.00061	0.00072	0.27	<0.001	0.0061	0.0059	8.6	8.4	0.010	0.69	0.0024	0.0025	<0.00001	<0.00001
	Maximum	0.0055	<0.00001	0.00000083	0.0014	0.0015	0.00063	0.00077	0.29	<0.001	0.0064	0.0064	8.6	8.4	0.010	0.69	0.0025	0.0027	<0.00001	<0.00001
	Mean	0.0012	<0.00001	0.00000055	0.00089	0.00091	0.00051	0.00052	0.074	<0.001	0.0051	0.0020	8.3	8.3	0.0045	0.40	0.00098	0.0010	<0.00001	<0.00001
	Standard Deviation	0.0014	-	0.00000010	0.00029	0.00029	0.000019	0.000035	0.071	-	0.00028	0.0013	0.26	0.075	0.0023	0.14	0.00063	0.00063	-	-
October	Sample size	37	40	40	40	40	40	39	40	40	40	40	36	40	34	32	40	40	40	40
	% of values < LRL	8.1	100	95	0	0	95	92	5.0	98	88	43	0	0	35	0	0	0	100	100
	% values > GL	0%	-	0%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Maximum LRL	0.00010	0.000010	0.000010	-	-	0.00050	0.00050	0.0050	0.0010	0.0050	0.0010	-	-	0.0020	-	#VALUE!	-	0.000010	0.000010
	Minimum	<0.00005	<0.000005	<0.0000005	0.00056	0.00054	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.6	7.8	<0.002	0.20	0.00015	0.00017	<0.00001	<0.00001
	2.5th Percentile	<0.00005	<0.000005	<0.0000005	0.00056	0.00055	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.6	7.8	<0.002	0.20	0.00016	0.00018	<0.00001	<0.00001
	25th Percentile	0.00015	<0.000005	<0.000005	0.00063	0.00063	<0.0005	<0.0005	0.016	<0.001	<0.005	<0.001	8.1	8.3	<0.002	0.29	0.00062	0.00061	<0.00001	<0.00001
	Median	0.00048	<0.00001	<0.00001	0.00088	0.00091	<0.0005	<0.0005	0.056	<0.001	<0.005	0.0012	8.3	8.3	0.0026	0.36	0.00092	0.00090	<0.00001	<0.00001
	75th Percentile	0.0015	<0.00001	0.00000052	0.0010	0.0011	<0.0005	<0.0005	0.13	<0.001	<0.005	0.0020	8.5	8.3	0.0035	0.50	0.0015	0.0015	<0.00001	<0.00001
	97.5th Percentile	0.0029	(<0.000005)	0.00000089	0.0015	0.0016	0.00060	0.00069	0.28	<0.00128	0.0096	0.0046	8.9	8.4	0.012	0.69	0.0028	0.0029	<0.00001	<0.00001
	Maximum	0.0029	<0.00001	0.000010	0.0015	0.0016	0.00063	0.00069	0.29	0.0013	0.010	0.0053	8.9	8.4	0.012	0.69	0.0029	0.0031	<0.00001	<0.00001
	Mean	0.00085	<0.00001	0.00000055	0.00089	0.00092	0.00051	0.00051	0.085	0.0010	0.0053	0.0016	8.3	8.3	0.0030	0.40	0.0011	0.0011	<0.00001	<0.00001
	Standard Deviation	0.00083	-	0.00000037	0.00028	0.00030	0.000013	0.000034	0.083	-	0.0011	0.0010	0.31	0.13	0.0017	0.14	0.00070	0.00072	-	-
November	Sample size	34	38	8	38	38	37	37	38	38	38	38	34	38	30	30	38	38	38	38
	% of values < LRL	12	100	75	0	0	97	84	2.6	100	89	39	0	0	30	0	2.6	2.6	100	100
	Maximum LRL	0.00010	0.000050	0.00000050	-	-	0.00050	0.00050	0.0050	0.0010	0.0050	0.0010	-	-	0.0020	-	0.00025	0.00025	0.000050	0.000050
	% values > GL	0%	-	13%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	<0.00005	<0.000005	<0.0000005	0.00055	0.00058	<0.0005	<0.0005	<0.005	<0.001	<0.005	<0.001	7.6	8.0	<0.002	0.20	0.00015	0.00019	<0.00001	<0.00001
	2.5th Percentile	<0.00005	<0.000005	<0.0000005	0.00055	0.00058	<0.0005	<0.0005	0.0059	<0.001	<0.005	<0.001	7.6	8.0	<0.002	0.20	0.00015	0.00019	<0.00001	<0.00001
	25th Percentile	0.00014	<0.000005	<0.0000005	0.00060	0.00062	<0.0005	<0.0005	0.044	<0.001	<0.005	<0.001	8.2	8.3	<0.002	0.32	0.00063	0.00067	<0.00001	<0.00001
	Median	0.00045	<0.00001	<0.0000005	0.00089	0.00091	<0.0005	<0.0005	0.070	<0.001	<0.005	0.0016	8.3	8.3	0.0024	0.36	0.00090	0.00091	<0.00001	<0.00001
	75th Percentile	0.0014	<0.00001	0.00000054	0.0011	0.0011	<0.0005	<0.0005	0.13	<0.001	<0.005	0.0021	8.5	8.3	0.0033	0.44	0.0015	0.0015	<0.00001	<0.00001
	97.5th Percentile	0.0058	(<0.000005)	0.0000015	0.0015	0.0016	<0.00056	0.00067	0.28	<0.001	0.0081	0.0050	8.8	8.4	0.0064	0.64	0.0027	0.0028	(<0.00001)	(<0.00001)
	Maximum	0.0058	<0.00005	0.0000015	0.0015	0.0016	0.00056	0.00067	0.28	<0.001	0.0081	0.0050	8.8	8.4	0.0064	0.64	0.0027	0.0028	<0.00005	<0.00005
	Mean	0.0011	<0.00001	0.00000064	0.00090	0.00093	0.00050	0.00051	0.093	<0.001	0.0051	0.0018	8.3	8.3	0.0030	0.39	0.0011	0.0011	<0.00005	<0.00005
	Standard Deviation	0.0014	-	0.00000045	0.00029	0.00030	-	0.000040	0.075	-	0.00055	0.0010	0.26	0.082	0.0013	0.12	0.00073	0.00072	-	-
December	Sample size	34	15	35	35	35	35	35	35	35	34	35	28	35	29	28	35	35	35	34
	% of values < LRL	18	93	100	0	0	100	100	0	97	94	23	0	0	21	0	0	0	100	100
	Maximum LRL	0.00050	0.0000050	0.000010	-	-	0.0025	0.0025	-	0.0010	0.0050	0.0010	-	-	0.0050	-	#VALUE!	-	0.000050	0.000050
	% values > GL	0%	-	0%	-	0%	-	0%	0%	0%	0%	-	0%	0%	-	-	-	0%	-	0%
	Minimum	<0.00005	<0.000005	<0.0000005	0.00055	0.00054	<0.0005	<0.0005	0.0094	<0.001	<0.005	<0.001	7.2	8.1	<0.002	0.21	0.00021	0.00021	<0.00001	<0.00001
	2.5th Percentile	<0.00005	<0.000005	<0.0000005	0.00055	0.00054	<0.0005	<0.0005	0.0094	<0.001	<0.005	<0.001	7.2	8.1	<0.002	0.21	0.00021	0.00021	<0.00001	<0.00001
	25th Percentile	0.00017	<0.000005	<0.000005	0.00058	0.00059	<0.0005	<0.0005	0.069	<0.001	<0.005	0.0010	8.2	8.3	0.0026	0.34	0.00071	0.00065	<0.00001	<0.00001
	Median	0.00044	<0.000005	<0.00001	0.00085	0.00089	<0.0005	<0.0005	0.11	<0.001	<0.005	0.0022	8.3	8.3	0.0038	0.38	0.00090	0.00093	<0.00001	<0.00001
	75th Percentile	0.0016	<0.000005	<0.00001	0.0012	0.0012	<0.0005	<0.0005	0.16	<0.001	<0.005	0.0030	8.5	8.4	0.0051	0.43	0.0014	0.0014	<0.00001	<0.00001
	97.5th Percentile	0.0063	0.0000057	(<0.000005)	0.0015	0.0016	(<0.0005)	(<0.0005)	0.33	<0.0013	0.012	0.0052	9.0	8.4	0.0095	0.64	0.0030	0.0031	(<0.00001)	(<0.00001)
	Maximum	0.0063	0.0000057	<0.00001	0.0015	0.0016	<0.0025	<0.0025	0.33	0.0013	0.012	0.0052	9.0	8.4	0.0095	0.64	0.0030	0.0031	<0.00005	<0.00005
	Mean	0.0012	0.0000050	<0.00001	0.00090	0.00091	<0.0025	<0.0025	0.12	0.0010	0.0054	0.0022	8.3	8.3	0.0042	0.40	0.0011	0.0011	<0.00005	<0.00005
	Standard Deviation	0.0017	-	-	0.00033	0.00033	-	-	0.078	-	0.00019	0.0012	0.38	0.074	0.0018	0.11	0.00071	0.00072	-	-

Note: 97.5th percentiles in parentheses were manually lowered due to the presence of censored data at a higher laboratory reporting limit

[1] Chronic guidelines were applied when available, otherwise acute guidelines were applied. For guidelines and site-specific benchmarks (SSBM) that are parameter-dependant (e.g., hardness), concurrent monthly means of parameters were used for determining the guideline or SSBM.

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Sodium	Dissolved Strontium	Total Strontium	Dissolved Sulphate (as SO_4)	Dissolved Thallium	Total Thallium	Total Tin	Dissolved Tin	Total Titanium	Dissolved Titanium	Total Dissolved Soilds	Total Kjeldahl Nitrogen	Total Organic Carbon	Total Suspended Solids	Lab Turbidity	Dissolved Uranium	Total Uranium	Total Vanadium	Dissolved Vanadium	Dissolved Zinc	Total Zinc
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Guideline/SSBM [1]	-	-	-	**429**	-	**0.0008**	-	-	-	-	**1000**	-	-	-	-	-	**0.0085**	-	-	-	**0.0075-0.12**
January	Sample size	33	33	33	33	32	32	33	33	33	33	33	32	29	20	31	33	33	33	33	33	33
	% of values < LRL	33	0	0	0	100	100	97	100	94	97	0	78	28	90	13	0	0	100	100	100	91
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	0.50	3.0	0.10	-	-	0.0010	0.0010	0.0030	0.0030
	% of values > GL/SSBM	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.35	0.072	0.070	13	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	150	<0.05	<0.5	<1	<0.1	0.00022	0.00023	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.35	0.072	0.070	13	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	150	<0.05	<0.5	<1	<0.1	0.00022	0.00023	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.69	0.093	0.097	22	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	167	<0.05	<0.5	<1	0.14	0.00047	0.00050	<0.001	<0.001	<0.003	<0.003
	Median	1.0	0.15	0.15	44	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	203	<0.05	0.60	<1	0.16	0.00076	0.00076	<0.001	<0.001	<0.003	<0.003
	75th Percentile	2.0	0.17	0.18	59	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	228	<0.05	0.81	<2	0.30	0.0011	0.0011	<0.001	<0.001	<0.003	<0.003
	97.5th Percentile	3.4	0.21	0.22	83	<0.00001	<0.00001	<0.0001	<0.0001	0.012	<0.01	247	0.087	1.7	4.9	1.1	0.0017	0.0017	<0.001	<0.001	<0.003	0.0048
	Maximum	3.4	0.21	0.22	83	<0.00001	<0.00001	0.00010	<0.0001	0.012	0.010	247	0.087	1.7	4.9	1.1	0.0017	0.0017	<0.001	<0.001	<0.003	0.0048
	Mean	1.3	0.14	0.15	41	<0.00001	<0.00001	0.00010	<0.0001	0.010	0.010	199	0.053	0.72	1.2	0.26	0.00079	0.00081	<0.001	<0.001	<0.003	0.0031
	Standard Deviation	0.94	0.042	0.045	23	-	-	-	-	0.00048	-	31	0.0091	0.27	1.0	0.24	0.00041	0.00043	-	-	-	0.00038
February	Sample size	33	33	33	33	33	33	33	33	33	33	33	33	33	18	32	33	33	8.0	33	33	33
	% of values < LRL	24	0	0	0	100	100	100	100	100	100	0	48	27	83	16	0	0	75	100	100	91
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	0.50	1.0	0.10	-	-	0.00050	0.0010	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.38	0.068	0.070	14	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	161	<0.05	<0.5	<1	<0.1	0.00024	0.00024	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.38	0.068	0.070	14	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	161	<0.05	<0.5	<1	<0.1	0.00024	0.00024	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.74	0.093	0.098	24	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	178	<0.05	<0.5	<1	0.13	0.00048	0.00049	<0.0005	<0.001	<0.003	<0.003
	Median	1.1	0.15	0.16	46	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	209	0.053	0.66	<1	0.19	0.00077	0.00077	<0.0005	<0.001	<0.003	<0.003
	75th Percentile	2.2	0.17	0.18	65	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	228	0.061	0.73	<1	0.31	0.0011	0.0011	0.00059	<0.001	<0.003	<0.003
	97.5th Percentile	3.4	0.21	0.22	88	-	-	<0.0001	<0.0001	<0.01	<0.01	256	0.085	1.4	1.4	1.2	0.0017	0.0017	0.00084	<0.001	<0.003	0.0040
	Maximum	3.4	0.21	0.22	88	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	256	0.085	1.4	1.4	1.2	0.0017	0.0017	0.00084	<0.001	<0.003	0.0040
	Mean	1.5	0.14	0.15	45	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	206	0.057	0.68	1.0	0.29	0.00081	0.00083	0.00056	<0.001	<0.003	0.0031
	Standard Deviation	0.97	0.044	0.045	23	-	-	-	-	-	-	30	0.0084	0.20	0.12	0.27	0.00042	0.00043	0.000080	-	-	0.00021
March	Sample size	33	33	33	33	33	33	33	33	33	33	33	33	31	20	34	33	33	9.0	33	33	33
	% of values < LRL	24	0	0	0	100	100	97	100	97	97	0	48	26	70	5.9	0	0	89	100	100	94
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	0.50	2.0	0.10	-	-	0.00050	0.0010	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.38	0.071	0.071	13	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	163	<0.05	<0.5	<1	<0.1	0.00021	0.00022	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.38	0.071	0.071	13	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	163	<0.05	<0.5	<1	<0.1	0.00021	0.00022	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.71	0.088	0.094	23	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	179	<0.05	<0.59	<1	0.17	0.00046	0.00049	<0.0005	<0.0005	<0.003	<0.003
	Median	1.2	0.16	0.16	46	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	203	0.051	0.67	<1	0.25	0.00076	0.00079	<0.0005	<0.001	<0.003	<0.003
	75th Percentile	2.1	0.18	0.18	56	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	234	0.061	0.74	1.1	0.51	0.0011	0.0011	<0.0005	<0.001	<0.003	<0.003
	97.5th Percentile	3.5	0.22	0.22	90	-	-	<0.00017	<0.0001	<0.0102	<0.0102	250	0.093	0.98	2.1	2.4	0.0017	0.0017	0.00051	<0.001	<0.003	0.0033
	Maximum	3.5	0.22	0.22	90	<0.00001	<0.00001	0.00017	<0.0001	0.010	0.010	250	0.093	0.98	2.1	2.4	0.0017	0.0017	0.00051	<0.001	<0.003	0.0033
	Mean	1.5	0.14	0.15	44	<0.00001	<0.00001	0.00010	<0.0001	0.010	0.010	208	0.057	0.66	1.1	0.46	0.00080	0.00082	0.00050	<0.001	<0.003	0.0030
	Standard Deviation	0.95	0.047	0.047	24	-	-	-	-	-	-	30	0.010	0.10	0.28	0.49	0.00042	0.00043	-	-	-	0.000048
April	Sample size	37	37	37	40	35	35	37	37	37	37	38	35	37	27	42	37	37	37	37	37	37
	% of values < LRL	27	0	0	0	97	91	97	100	95	100	0	26	11	37	0	0	0	81	100	100	84
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	0.50	3.0	-	-	-	0.0010	0.0010	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.36	0.067	0.067	6.7	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	149	<0.05	<0.5	<1	0.11	0.00019	0.00020	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.36	0.067	0.067	8.8	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	149	<0.05	<0.5	<1	0.11	0.00019	0.00020	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.70	0.095	0.095	20	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	171	<0.052	0.76	<1	0.20	0.00044	0.00046	<0.0005	<0.0005	<0.003	<0.003
	Median	0.91	0.15	0.16	35	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	185	0.059	1.1	1.9	0.41	0.00079	0.00080	<0.001	<0.001	<0.003	<0.003
	75th Percentile	2.2	0.18	0.18	52	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	224	0.074	1.5	3.2	1.1	0.0011	0.0011	0.00052	<0.001	<0.003	<0.003
	97.5th Percentile	4.0	0.21	0.21	83	<0.00001033333	0.000018	<0.00017	<0.0001	0.013	<0.01	257	0.097	3.0	9.9	5.5	0.0016	0.0016	0.0013	<0.001	<0.003	0.0060
	Maximum	4.0	0.21	0.21	84	0.000010	0.000018	0.00017	<0.0001	0.013	<0.01	257	0.097	3.0	9.9	6.0	0.0016	0.0016	0.0013	<0.001	<0.003	0.0060
	Mean	1.4	0.14	0.14	38	0.000010	0.000011	0.00010	<0.0001	0.010	<0.01	195	0.064	1.2	2.4	1.1	0.00077	0.00079	0.00060	<0.001	<0.003	0.0031
	Standard Deviation	1.0	0.045	0.045	21	-	0.0000011	-	-	0.00054	-	32	0.013	0.56	1.9	1.5	0.00038	0.00038	0.00026	-	-	0.00058

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Sodium	Dissolved Strontium	Total Strontium	Dissolved Sulphate (as SO_4)	Dissolved Thallium	Total Thallium	Total Tin	Dissolved Tin	Total Titanium	Dissolved Titanium	Total Dissolved Soilds	Total Kjeldahl Nitrogen	Total Organic Carbon	Total Suspended Solids	Lab Turbidity	Dissolved Uranium	Total Uranium	Total Vanadium	Dissolved Vanadium	Dissolved Zinc	Total Zinc
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Guideline/SSBM [1]	-	-	-	**429**	-	**0.0008**	-	-	-	-	**1000**	-	-	-	-	-	**0.0085**	-	-	-	**0.0075-0.12**
May	Sample size	39	42	42	42	40	39	41	42	42	42	41	41	42	30	42	42	42	38	42	40	40
	% of values < LRL	31	0	0	0	95	69	100	100	83	100	0	4.9	4.8	13	0	0	0	76	100	95	63
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00025	0.00010	0.010	0.010	-	0.050	0.50	3.0	-	-	-	0.0010	0.0050	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.24	0.059	0.060	5.9	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	110	<0.05	<0.5	<1	0.17	0.00014	0.00015	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.24	0.060	0.062	6.0	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	113	<0.05	0.50	<1	0.22	0.00014	0.00016	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.57	0.078	0.079	12	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	141	0.065	1.2	1.6	0.48	0.00042	0.00043	<0.0005	<0.0005	<0.003	<0.003
	Median	0.70	0.097	0.098	16	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	149	0.087	1.7	2.8	1.4	0.00068	0.00067	<0.001	<0.001	<0.003	<0.003
	75th Percentile	1.2	0.13	0.14	25	<0.00001	0.000011	<0.0001	<0.0001	<0.01	<0.01	174	0.11	2.6	6.5	4.0	0.00080	0.00082	0.00064	<0.001	<0.003	0.0033
	97.5th Percentile	2.6	0.20	0.20	42	0.000011	0.000030	<0.0001	<0.0001	0.021	<0.01	217	0.16	3.9	58	28	0.0012	0.0012	0.0020	<0.001	0.0036	0.0071
	Maximum	2.6	0.20	0.21	49	0.000013	0.000030	<0.00025	<0.0001	0.023	<0.01	223	0.18	4.8	58	50	0.0018	0.0018	0.0020	<0.005	0.0041	0.0074
	Mean	0.94	0.11	0.11	19	0.000010	0.000012	<0.00025	<0.0001	0.011	<0.01	156	0.092	1.9	7.2	4.0	0.00063	0.00065	0.00062	<0.001	0.0030	0.0034
	Standard Deviation	0.65	0.043	0.044	11	0.00000055	0.0000041	-	-	0.0028	-	28	0.031	0.98	12	8.7	0.00032	0.00033	0.00031	-	0.00021	0.0010
June	Sample size	25	40	40	41	39	38	41	41	41	41	41	40	40	27	39	41	41	39	41	40	36
	% of values < LRL	0	0	0	0	95	53	100	100	61	90	0	2.5	0	3.7	0	0	0	49	95	90	58
	Maximum LRL	-	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	-	3.0	-	-	-	0.0010	0.0010	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	2.8%
	Minimum	0.19	0.049	0.051	4.1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	96	<0.05	0.52	1.0	0.21	0.00010	0.00014	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.19	0.050	0.052	4.9	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	104	0.051	0.55	1.0	0.21	0.00011	0.00014	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.51	0.059	0.062	8.1	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	118	0.070	1.1	1.8	0.51	0.00038	0.00041	0.00077	<0.0005	<0.003	<0.003
	Median	0.60	0.068	0.072	11	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	132	0.084	1.5	3.8	1.8	0.00049	0.00054	0.00081	<0.001	<0.003	<0.003
	75th Percentile	0.95	0.095	0.099	16	<0.00001	0.000017	<0.0001	<0.0001	0.012	<0.01	151	0.15	2.2	11	6.6	0.00063	0.00067	0.0016	<0.001	<0.003	0.0035
	97.5th Percentile	1.6	0.18	0.19	30	0.000011	0.000055	<0.0001	<0.0001	0.036	0.010	180	0.46	4.8	127	189	0.00099	0.0010	0.0029	0.00066	0.0045	0.0081
	Maximum	1.6	0.19	0.19	33	0.000011	0.000055	<0.0001	<0.0001	0.043	0.013	184	0.47	4.9	127	189	0.0010	0.0010	0.0029	0.0022	0.0051	0.0081
	Mean	0.74	0.084	0.087	14	0.000010	0.000017	<0.0001	<0.0001	0.013	0.010	135	0.13	1.8	12	18	0.00049	0.00053	0.0011	0.00055	0.0031	0.0036
	Standard Deviation	0.38	0.036	0.037	7.7	0.00000013	0.000014	-	-	0.0072	0.00054	22	0.11	1.1	25	42	0.00022	0.00022	0.00073	0.00034	0.00035	0.0012
July	Sample size	40	40	40	40	40	40	40	40	40	40	40	40	40	21	38	40	40	40	40	40	40
	% of values < LRL	30	0	0	0	100	93	98	100	98	100	0	25	10	29	0	0	0	88	100	100	75
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	0.50	1.0	-	-	-	0.0010	0.0010	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.25	0.048	0.050	6.4	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	99	<0.05	<0.5	<1	0.17	0.00011	0.00016	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.25	0.049	0.053	6.9	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	105	<0.05	<0.5	<1	0.17	0.00014	0.00016	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.57	0.068	0.071	11	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	131	0.050	0.65	<1	0.32	0.00039	0.00040	<0.0005	<0.0005	<0.003	<0.003
	Median	0.75	0.095	0.097	15	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	154	0.073	0.94	1.5	0.65	0.00059	0.00059	<0.001	<0.001	<0.003	<0.003
	75th Percentile	1.5	0.14	0.14	31	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	176	0.089	1.3	1.9	0.97	0.00073	0.00076	<0.001	<0.001	<0.003	0.0030
	97.5th Percentile	2.4	0.20	0.20	42	<0.00001	0.000016	<0.00011	<0.0001	<0.0144	<0.01	222	0.36	2.1	2.2	9.7	0.0013	0.0013	0.0017	<0.001	<0.003	0.0072
	Maximum	2.4	0.20	0.21	42	<0.00001	0.000019	0.00011	<0.0001	0.014	<0.01	224	0.57	2.3	2.2	9.7	0.0015	0.0015	0.0023	<0.001	<0.003	0.0074
	Mean	1.1	0.10	0.11	19	<0.00001	0.000010	0.00010	<0.0001	0.010	<0.01	157	0.087	1.0	1.5	1.2	0.00059	0.00061	0.00058	<0.001	<0.003	0.0033
	Standard Deviation	0.75	0.044	0.045	11	-	0.0000018	-	-	-	-	32	0.083	0.45	0.44	1.8	0.00029	0.00029	0.00034	-	-	0.0010
August	Sample size	40	40	40	40	40	40	40	40	40	40	40	39	37	27	39	40	40	17	40	40	39
	% of values < LRL	30	0	0	0	98	98	100	100	100	100	0	28	5.4	52	2.6	0	0	71	100	98	90
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	0.50	3.0	0.10	-	-	0.00050	0.0010	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.26	0.063	0.064	10	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	137	<0.05	<0.5	<1	<0.1	0.00020	0.00020	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.26	0.064	0.067	11	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	138	<0.05	<0.5	<1	0.11	0.00020	0.00020	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.71	0.090	0.092	14	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	156	<0.05	0.73	<1	0.18	0.00048	0.00049	<0.0005	<0.0005	<0.003	<0.003
	Median	0.86	0.13	0.13	24	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	180	0.058	0.88	1.0	0.28	0.00062	0.00064	<0.0005	<0.001	<0.003	<0.003
	75th Percentile	2.0	0.16	0.17	40	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	208	0.066	0.96	1.8	0.55	0.00094	0.00094	0.00050	<0.001	<0.003	<0.003
	97.5th Percentile	2.7	0.22	0.21	53	<0.000014	<0.00001625	<0.0001	<0.0001	<0.01	<0.01	234	0.11	1.4	5.7	1.8	0.0015	0.0016	0.00069	<0.001	<0.0041	0.0036
	Maximum	2.7	0.22	0.22	53	0.000014	0.000016	<0.0001	<0.0001	<0.01	<0.01	237	0.11	1.4	5.7	1.8	0.0016	0.0017	0.00069	<0.001	0.0041	0.0036
	Mean	1.2	0.13	0.13	28	0.000010	0.000010	<0.0001	<0.0001	<0.01	<0.01	183	0.061	0.87	1.6	0.46	0.00070	0.00071	0.00052	<0.001	0.0030	0.0030
	Standard Deviation	0.82	0.044	0.045	14	-	-	-	-	-	-	30	0.014	0.23	1.2	0.43	0.00034	0.00035	0.000050	-	-	0.000060

Table C.10: Summary Statistics for the Reference Area Monthly Means used to Define Reference Normal Ranges for Water Quality Constituents in Samples Collected between 2012 and 2016

Month	Parameter	Total Sodium	Dissolved Strontium	Total Strontium	Dissolved Sulphate (as SO_4)	Dissolved Thallium	Total Thallium	Total Tin	Dissolved Tin	Total Titanium	Dissolved Titanium	Total Dissolved Soilds	Total Kjeldahl Nitrogen	Total Organic Carbon	Total Suspended Solids	Lab Turbidity	Dissolved Uranium	Total Uranium	Total Vanadium	Dissolved Vanadium	Dissolved Zinc	Total Zinc
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Guideline/SSBM [1]	-	-	-	**429**	-	**0.0008**	-	-	-	-	**1000**	-	-	-	-	-	**0.0085**	-	-	-	**0.0075-0.12**
September	Sample size	40	40	40	40	40	39	40	40	40	40	40	39	40	27	39	40	40	17	40	40	39
	% of values < LRL	30	0	0	0	100	97	100	100	100	100	0	51	7.5	67	2.6	0	0	88	100	100	87
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	0.50	3.0	0.10	-	-	0.00050	0.0010	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.34	0.064	0.065	13	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	148	<0.05	<0.5	<1	<0.1	0.00022	0.00022	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.34	0.066	0.067	13	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	150	<0.05	<0.5	<1	0.11	0.00023	0.00022	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.63	0.096	0.097	17	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	170	<0.05	0.61	<1	0.17	0.00049	0.00050	<0.0005	<0.0005	<0.003	<0.003
	Median	0.89	0.13	0.14	35	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	190	<0.05	0.83	<1	0.24	0.00066	0.00068	<0.0005	<0.001	<0.003	<0.003
	75th Percentile	<2	0.16	0.17	45	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	221	0.060	0.94	1.4	0.32	0.00098	0.0010	<0.0005	<0.001	<0.003	<0.003
	97.5th Percentile	2.9	0.22	0.22	60	<0.00001	<0.000012	<0.0001	<0.0001	<0.01	<0.01	245	0.10	1.3	4.6	1.5	0.0017	0.0017	0.00063	<0.001	<0.003	0.0039
	Maximum	2.9	0.22	0.22	61	<0.00001	0.000012	<0.0001	<0.0001	<0.01	<0.01	246	0.10	1.5	4.6	1.5	0.0019	0.0019	0.00063	<0.001	<0.003	0.0039
	Mean	1.3	0.14	0.14	33	<0.00001	0.000010	<0.0001	<0.0001	<0.01	<0.01	193	0.058	0.81	1.5	0.33	0.00078	0.00079	0.00051	<0.001	<0.003	0.0031
	Standard Deviation	0.88	0.043	0.044	15	-	-	-	-	-	-	28	0.011	0.22	1.2	0.26	0.00039	0.00040	0.000040	-	-	0.00019
October	Sample size	40	40	40	40	40	40	40	40	40	40	40	40	38	22	37	40	40	40	40	40	39
	% of values < LRL	15	0	0	0	100	100	100	100	85	90	0	58	18	73	2.7	0	0	100	100	98	85
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00010	0.00010	0.010	0.010	-	0.050	0.50	1.0	0.10	-	-	0.0010	0.0010	0.0030	0.0030
	Minimum	0.33	0.071	0.074	9.9	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	152	<0.05	<0.5	<1	<0.1	0.00015	0.00016	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.33	0.072	0.075	11	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	154	<0.05	<0.5	<1	0.11	0.00019	0.00020	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.66	0.10	0.098	21	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	173	<0.05	0.55	<1	0.16	0.00052	0.00052	<0.0005	<0.0005	<0.003	<0.003
	Median	0.83	0.14	0.14	42	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	195	<0.05	0.72	<1	0.22	0.00073	0.00077	<0.001	<0.001	<0.003	<0.003
	75th Percentile	<2	0.18	0.18	49	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	214	0.057	0.89	1.0	0.29	0.0011	0.0012	<0.001	<0.001	<0.003	<0.003
	97.5th Percentile	3.0	0.22	0.23	61	<0.00001	<0.00001	<0.0001	<0.0001	0.013	0.011	246	0.11	1.4	2.2	0.53	0.0017	0.0018	<0.001	<0.001	<0.0033	0.0044
	Maximum	3.0	0.23	0.23	62	<0.00001	<0.00001	<0.0001	<0.0001	0.013	0.011	253	0.12	1.4	2.2	0.53	0.0018	0.0018	<0.001	<0.001	0.0033	0.0044
	Mean	1.2	0.14	0.14	37	<0.00001	<0.00001	<0.0001	<0.0001	0.010	0.010	195	0.057	0.76	1.1	0.24	0.00083	0.00085	<0.001	<0.001	0.0030	0.0031
	Standard Deviation	0.85	0.042	0.044	16	-	-	-	-	0.00066	0.00030	27	0.015	0.23	0.33	0.12	0.00042	0.00043	-	-	-	0.00027
November	Sample size	38	38	38	38	37	37	38	38	38	38	38	37	36	26	35	38	38	15	38	37	37
	% of values < LRL	18	0	0	0	97	95	100	100	87	89	0	43	5.6	85	5.7	0	0	80	100	95	97
	Maximum LRL	2.0	-	-	-	0.000010	0.000010	0.00050	0.00050	0.010	0.010	-	0.050	0.50	1.0	0.10	-	-	0.00050	0.0025	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.36	0.070	0.073	7.5	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	118	<0.05	<0.5	<1	<0.1	0.00014	0.00015	<0.0005	<0.0005	<0.003	<0.003
	2.5th Percentile	0.36	0.070	0.073	7.5	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	118	<0.05	<0.5	<1	<0.1	0.00014	0.00015	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.69	0.092	0.094	22	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	169	<0.05	0.62	<1	0.17	0.00045	0.00047	<0.0005	<0.0005	<0.003	<0.003
	Median	0.90	0.14	0.15	41	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	192	0.051	0.72	<1	0.23	0.00077	0.00077	<0.0005	<0.001	<0.003	<0.003
	75th Percentile	1.5	0.17	0.17	50	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	213	0.060	1.0	<1	0.35	0.0011	0.0012	<0.0005	<0.001	<0.003	<0.003
	97.5th Percentile	2.9	0.23	0.23	71	<0.000011	0.000018	(<0.0001)	(<0.0001)	0.015	0.013	243	0.099	2.4	1.4	0.64	0.0018	0.0019	0.00062	(<0.001)	0.0041	<0.0038
	Maximum	2.9	0.23	0.23	71	0.000011	0.000018	<0.0005	<0.0005	0.015	0.013	243	0.099	2.4	1.4	0.64	0.0018	0.0019	0.00062	<0.0025	0.0041	0.0038
	Mean	1.2	0.14	0.14	38	0.000010	0.000010	<0.0005	<0.0005	0.010	0.010	191	0.057	0.85	1.0	0.26	0.00084	0.00087	0.00051	<0.001	0.0030	0.0030
	Standard Deviation	0.77	0.042	0.045	18	-	0.00000046	-	-	0.0015	0.00093	31	0.012	0.39	0.095	0.13	0.00045	0.00047	0.000037	-	0.00023	-
December	Sample size	35	35	35	35	35	35	35	35	35	35	35	34	35	24	33	35	35	14	35	34	33
	% of values < LRL	14	0	0	0	100	100	100	100	97	100	0	68	11	83	3.0	0	0	79	100	97	97
	Maximum LRL	2.0	-	-	-	0.000050	0.000050	0.00050	0.00050	0.010	0.010	-	0.050	0.50	1.0	0.10	-	-	0.00050	0.0025	0.0030	0.0030
	% values > GL	-	-	-	0%	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	0%
	Minimum	0.36	0.071	0.069	11	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	139	<0.05	<0.5	<1	<0.1	0.00020	0.00021	<0.0005	<0.0005	<0.001	<0.003
	2.5th Percentile	0.36	0.071	0.069	11	<0.00001	<0.00001	<0.0005	<0.0005	<0.01	<0.01	139	<0.05	<0.5	<1	0.12	0.00020	0.00021	<0.0005	<0.0005	<0.003	<0.003
	25th Percentile	0.69	0.089	0.091	23	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	176	<0.05	0.60	<1	0.15	0.00047	0.00047	<0.0005	<0.0005	<0.003	<0.003
	Median	1.0	0.15	0.15	41	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	202	<0.05	0.79	<1	0.24	0.00076	0.00080	<0.0005	<0.001	<0.003	<0.003
	75th Percentile	2.2	0.17	0.18	53	<0.00001	<0.00001	<0.0001	<0.0001	<0.01	<0.01	222	0.054	1.1	<1	0.40	0.0011	0.0011	<0.0005	<0.001	<0.003	<0.003
	97.5th Percentile	2.9	0.23	0.24	77	(<0.00001)	(<0.00001)	(<0.0001)	(<0.0001)	<0.01	<0.01	259	0.14	2.3	1.9	0.79	0.0017	0.0017	0.00081	(<0.001)	0.0033	<0.0043
	Maximum	2.9	0.23	0.24	77	<0.00005	<0.00005	<0.0005	<0.0005	0.010	<0.01	259	0.14	2.3	1.9	0.79	0.0017	0.0017	0.00081	<0.0025	0.0033	0.0043
	Mean	1.3	0.14	0.14	41	<0.00005	<0.00005	<0.0005	<0.0005	0.010	<0.01	198	0.055	0.88	1.1	0.28	0.00081	0.00084	0.00053	<0.001	0.0011	0.0030
	Standard Deviation	0.81	0.044	0.047	19	-	-	-	-	-	-	30	0.016	0.38	0.28	0.16	0.00044	0.00043	0.00010	-	-	-

Note: 97.5th percentiles in parentheses were manually lowered due to the presence of censored data at a higher laboratory reporting limit

[1] Chronic guidelines were applied when available, otherwise acute guidelines were applied. For guidelines and site-specific benchmarks (SSBM) that are parameter-dependant (e.g., hardness), concurrent monthly means of parameters were used for determining the guideline or SSBM.

Table C.11: Summary Statistics for the Reference Area Data used to Define Overall (Annual) Reference Normal Ranges for Key Water Quality Parameters, 2012 - 2016

Parameter	Units	Sample size and Laboratory Reporting Limit (LRL)			Statistics Estimated using the Kaplan-Meier Method								
		Sample size	% of values < LRL	Maximum LRL	Minimum	2.5th Percentile	25th Percentile	Median	75th Percentile	97.5th Percentile	Maximum	Mean	Standard Deviation
Dissolved Cadmium	µg/L	443	66	0.01	<0.005	<0.005	0.0069	0.0058	0.0085	0.012	0.018	0.0069	0.0028
Nitrate-N	mg/L	455	3.1	0.005	<0.005	0.005	0.029	0.070	0.133	0.28	0.34	0.089	0.073
Total Selenium	µg/L	452	0.44	0.5	0.168	0.19	0.56	0.77	1.2	2.6	3.1	0.96	0.63
Sulphate	mg/L	455	0	-	4.1	6.7	15	27	47	78	90	32	20

Estimates of the reference area normal range, all months combined.

Table C.12: Regression Statistics used to Define Covariate-adjusted (Total Suspended Solids and Turbidity) Reference Area Normal Ranges for Total Aluminum, Iron, Manganese, and Phosphorus, based on Values Above the Laboratory Reporting Limit at Reference Areas from 2012 - 2016

Parameter	Covariate	n (After Outliers Removed)	n Outliers Removed[a]	Slope	Intercept	r^2	$P_{97.5}$ of Residuals
$\log_{10}$(Aluminum)	$\log_{10}$(TSS)	218	2	0.893564	-1.80486	0.5969	0.6031576
	$\log_{10}$(Turbidity)	598	12	1.026581	-1.43008	0.8741	0.4240145
$\log_{10}$(Iron)	$\log_{10}$(TSS)	197	4	0.932715	-1.73366	0.8489	0.4508072
	$\log_{10}$(Turbidity)	341	11	0.857862	-1.30424	0.8203	0.4601021
$\log_{10}$(Manganese)	$\log_{10}$(TSS)	212	8	0.953787	-3.07948	0.7608	1.0650375
	$\log_{10}$(Turbidity)	616	7	0.914816	-2.67962	0.5848	0.8536949
$\log_{10}$(Phosphorus)	$\log_{10}$(TSS)	198	6	0.715018	-2.48996	0.7587	0.3524754
	$\log_{10}$(Turbidity)	-[b]	-	-	-	-	-

Note: only detected concentrations were used in the regression models.

[a] Outliers were considered to be observations with with Studentized residuals with magnitude > 4. Then assessed again as residuals that exceeded Q3 + 1.5(Q3 - Q1) to be consistent with outlier evaluations for defining normal ranges in this report.

[b] Regression not conducted due to non-linearity and higher variability than the regression with TSS

Table C.13: Frequency (%) of Individual Samples with Total Metal Concentrations Exceeding the Normal Range at Lotic Water Monitoring Stations, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Aluminum	Aluminum[1]	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Iron[1]	Lead	Lithium	Magnesium	Manganese	Manganese[1]	Mercury	Molybdenum	Nickel	Potassium	Selenium
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	FR_UFR1	Fording River	E216777	0%	2.9%	2.9%	2.9%	17%	0%	0%	0%	0%	14%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	17%	8.3%	0%	0%	0%	0%	0%	0%	0%	8.3%	0%	0%	0%	17%	17%	17%	0%	17%	25%	0%	0%	0%	0%	17%	0%
				LC_LC1	Line Creek	E216142	0%	14%	0%	0%	0%	0%	0%	0%	14%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	29%	0%	29%
				LC_SLC	South Line Creek	E282149	8.3%	0%	8.3%	8.3%	8.3%	0%	0%	0%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	0%	17%	8.3%	8.3%	0%	0%	8.3%	0%	8.3%	8.3%	0%
	3	Elk	M	GH_ER2	Elk River	200389	2.9%	0%	2.9%	0%	0%	0%	2.9%	0%	5.9%	2.9%	2.9%	0%	2.9%	2.9%	0%	2.9%	0%	0%	12%	0%	0%	0%	0%	0%	0%
	4	Michel	M	CM_MC1	Michel Creek	E258175	0%	8.3%	0%	8.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	7.1%	0%	14%	0%	0%	0%	0%	0%	50%	79%	0%	11%	7.1%	7.1%	0%	0%	50%	75%	39%	0%	0%	0%	54%	57%	100%
				FR_CC1	Clode Creek	E102481	7.1%	0%	100%	50%	100%	0%	0%	100%	71%	100%	0%	100%	7.1%	0%	0%	0%	100%	100%	43%	-	0%	100%	100%	100%	100%
				FR_NGD1	Lake Mountain Creek	E105060	0%	0%	100%	33%	100%	0%	0%	8.3%	75%	75%	0%	25%	0%	17%	8.3%	0%	100%	100%	67%	0%	0%	100%	100%	100%	100%
				FR_KC1	Kilmarnock Creek	0200252	0%	0%	100%	0%	0%	0%	0%	67%	100%	100%	0%	0%	8.3%	0%	0%	0%	100%	100%	0%	17%	0%	42%	100%	100%	100%
				GH_SC2	Swift Creek	E105061	0%	0%	100%	16%	0%	0%	0%	0%	100%	100%	0%	0%	11%	5.3%	0%	5.3%	100%	100%	5.3%	0%	0%	100%	100%	100%	100%
				GH_CC1	Cataract Creek	0200384	0%	0%	100%	8.3%	0%	4.2%	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	100%	100%	0%	0%	4.2%	100%	100%	100%	100%
				GH_PC1	Porter Creek	200385	5.3%	5.3%	16%	42%	74%	0%	0%	0%	58%	100%	5.3%	0%	0%	0%	0%	0%	100%	100%	0%	21%	0%	100%	89%	100%	100%
				LC_DCDS	LCO Dry Creek	E295210	17%	6.9%	97%	48%	100%	0%	0%	0%	76%	0%	10%	10%	17%	17%	21%	21%	69%	0%	10%	11%	10%	0%	24%	100%	14%
				LC_DC3	LCO Dry Creek	E288273	11%	0%	100%	54%	100%	3.6%	0%	0%	86%	0%	7.1%	14%	18%	18%	11%	21%	29%	0%	11%	11%	7.1%	0%	57%	100%	18%
				LC_DC1	LCO Dry Creek	E288270	3.6%	0%	93%	21%	100%	0%	0%	0%	61%	0%	7.1%	7.1%	11%	7.1%	11%	7.1%	100%	0%	3.6%	20%	3.7%	3.6%	7.1%	100%	18%
				GH_GH1	Greenhills Creek	E102709	45%	15%	100%	70%	0%	0%	0%	0%	50%	100%	15%	60%	20%	40%	20%	35%	85%	100%	55%	0%	0%	100%	100%	100%	100%
			M	FR_FR1	Fording River	0200251	0%	0%	11%	0%	0%	0%	11%	0%	33%	78%	0%	0%	0%	0%	0%	0%	22%	44%	0%	0%	0%	0%	33%	56%	100%
				FR_FR2	Fording River	0200201	6.1%	0%	100%	3.0%	61%	0%	0%	0%	73%	94%	0%	27%	3.0%	15%	3.0%	12%	100%	91%	73%	5.9%	0%	30%	76%	100%	100%
				GH_FR	Fording River	-	12%	0%	100%	5.9%	82%	0%	0%	0%	82%	96%	5.9%	35%	0%	18%	5.9%	5.9%	100%	100%	71%	0%	0%	59%	94%	100%	100%
				FR_FR4	Fording River	-	5.0%	0%	100%	0%	70%	0%	0%	5.0%	75%	100%	0%	35%	10%	10%	0%	10%	100%	100%	75%	14%	0%	40%	85%	100%	100%
				GH_FR3	Fording River	-	14%	0%	100%	7.1%	79%	0%	0%	0%	86%	92%	7.1%	43%	0%	36%	14%	14%	100%	96%	86%	0%	0%	43%	93%	100%	100%
				FR_FRCP1	Fording River	E300071	4.7%	2.3%	100%	7.0%	51%	0%	0%	0%	79%	100%	0%	12%	2.4%	9.3%	0%	4.9%	100%	100%	56%	5.9%	0%	62%	86%	100%	100%
				GH_PC2	Fording River	E287431	5.9%	0%	59%	5.9%	100%	0%	0%	0%	76%	100%	5.9%	5.9%	0%	5.9%	5.9%	5.9%	100%	100%	5.9%	0%	0%	0%	47%	100%	100%
				FR_FRABCH	Fording River	-	7.7%	0%	77%	0%	92%	0%	0%	0%	54%	100%	0%	7.7%	0%	15%	0%	7.7%	100%	100%	46%	0%	0%	0%	54%	100%	100%
				FR_FR5	Fording River	-	6.3%	0%	50%	6.3%	100%	0%	0%	0%	63%	100%	6.3%	0%	0%	6.3%	0%	6.3%	100%	100%	6.3%	0%	0%	0%	31%	100%	100%
				LC_FRUS	Fording River	E295232	0%	0%	44%	0%	89%	0%	0%	0%	44%	100%	0%	0%	0%	0%	0%	0%	100%	100%	0%	0%	0%	0%	0%	100%	100%
				LC_FRB	Fording River	-	0%	0%	45%	0%	100%	0%	0%	0%	45%	100%	0%	0%	0%	0%	0%	0%	100%	100%	0%	8.6%	0%	0%	0%	100%	100%
				GH_FR1	Fording River	0200251	8.6%	0%	94%	2.9%	100%	0%	0%	0%	60%	100%	2.9%	14%	2.9%	11%	8.6%	2.9%	100%	100%	8.6%	8.3%	0%	0%	83%	100%	100%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	8.3%	8.3%	100%	0%	50%	0%	0%	25%	100%	100%	0%	17%	0%	17%	8.3%	17%	100%	100%	0%	0%	0%	100%	100%	100%	100%
				LC_LC3	Line Creek	0200337	3.2%	0%	100%	6.5%	26%	0%	0%	16%	100%	100%	0%	9.7%	10%	0%	0%	3.2%	100%	100%	3.2%	0%	0%	100%	100%	100%	100%
				LC_LCDSSLCC	Line Creek	E297110	3.1%	0%	97%	6.3%	31%	0%	3.2%	3.2%	100%	100%	3.1%	3.2%	6.5%	0%	0%	3.2%	100%	100%	3.1%	7.1%	0%	63%	100%	100%	100%
				LC_LC4	Line Creek	0200044	6.9%	3.6%	93%	10%	31%	3.4%	0%	0%	83%	100%	14%	10%	6.9%	6.9%	7.1%	10%	100%	100%	10%	10%	3.4%	38%	100%	100%	100%
			M	LC_LC6	Fording River	0200338	10%	10%	60%	0%	100%	0%	0%	0%	20%	100%	0%	0%	0%	10%	10%	0%	100%	100%	10%	3.3%	0%	0%	20%	100%	100%
				LC_LC5	Fording River	0200028	9.7%	3.3%	77%	0%	94%	0%	0%	0%	55%	100%	0%	0%	3.2%	9.7%	3.3%	10%	100%	100%	6.5%	20%	3.3%	3.2%	68%	100%	100%
	3	Elk	T	GH_WILLOW	Willow Creek	-	19%	11%	7.4%	19%	100%	0%	0%	0%	19%	56%	3.7%	7.4%	11%	30%	11%	15%	100%	74%	7.4%	5.9%	0%	0%	11%	100%	33%
				GH_WADE	Wade Creek	E287433	43%	21%	100%	61%	100%	7.1%	0%	100%	46%	89%	18%	32%	46%	54%	29%	43%	100%	75%	25%	19%	11%	39%	57%	100%	11%
				GH_MC1	Michelson Creek	200388	54%	23%	100%	65%	92%	12%	3.8%	69%	77%	96%	31%	62%	54%	65%	46%	54%	100%	85%	58%	68%	12%	65%	96%	100%	73%
				GH_LC2	Leask Creek	-	82%	54%	100%	100%	96%	32%	25%	96%	100%	100%	71%	100%	93%	89%	68%	79%	100%	100%	79%	0%	43%	100%	100%	100%	100%
				GH_WC2	Wolfram Creek	-	61%	50%	100%	83%	94%	11%	5.6%	94%	67%	100%	61%	100%	78%	61%	61%	56%	100%	100%	56%	100%	22%	100%	100%	100%	100%
				GH_TC2	Thompson Creek	E207436	15%	5.0%	100%	35%	55%	0%	0%	100%	35%	100%	5.0%	15%	25%	25%	15%	10%	100%	100%	50%	6.3%	0%	55%	95%	100%	100%
			M	GH_ERC	Elk River	E300090	3.1%	0%	3.1%	6.3%	0%	0%	3.1%	0%	9.4%	9.4%	13%	0%	0%	6.3%	6.3%	9.4%	0%	0%	13%	3.6%	0%	0%	0%	3.1%	3.1%
				GH_ER1	Elk River	0206661	3.6%	0%	7.1%	3.6%	0%	0%	0%	0%	7.1%	11%	3.6%	0%	0%	3.6%	3.6%	3.6%	0%	0%	7.1%	0%	0%	3.6%	0%	7.1%	3.6%
	4	Elk	T	EV_HC6	Harmer Creek	-	4.8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	14%	0%	0%	0%	0%	0%	0%	0%	0%	2.9%	0%	0%	0%	0%	0%
				EV_HC1	Harmer Creek	E102682	12%	2.9%	26%	12%	0%	0%	0%	0%	38%	100%	0%	2.9%	2.9%	12%	2.9%	0%	68%	100%	2.9%	15%	0%	0%	56%	100%	100%
				EV_GV1	Grave Creek	-	20%	10%	10%	10%	15%	5.0%	5.0%	0%	30%	85%	10%	10%	10%	15%	15%	10%	70%	100%	5.0%	31%	15%	10%	25%	100%	100%
				EV_SM1	Six Mile Creek	E102681	54%	31%	31%	23%	69%	0%	0%	100%	0%	77%	15%	0%	0%	46%	31%	7.7%	100%	100%	15%	64%	7.7%	0%	15%	100%	31%
				EV_BLM2	Balmer Creek	E298592	91%	36%	18%	82%	100%	9.1%	0%	64%	64%	18%	45%	73%	55%	91%	64%	91%	100%	64%	73%	47%	55%	0%	45%	100%	100%
				EV_FC1	Fennelon Creek	E298591	53%	37%	100%	68%	79%	5.3%	0%	100%	32%	100%	21%	32%	58%	53%	47%	53%	100%	68%	32%	36%	26%	0%	58%	100%	95%
				EV_GC2	Goddard Creek	E208043	45%	41%	100%	27%	95%	0%	0%	100%	50%	100%	36%	59%	36%	45%	36%	50%	100%	100%	50%	95%	4.5%	91%	64%	100%	100%
				EV_OC1	Otto Creek	E102679	18%	18%	73%	100%	100%	0%	0%	100%	18%	100%	4.5%	55%	14%	59%	95%	14%	100%	100%	86%	6.3%	9.1%	100%	68%	100%	0%
			M	EV_ER4	Elk River	0200027	6.3%	6.3%	9.4%	22%	16%	0%	0%	0%	22%	97%	13%	6.3%	6.3%	9.4%	6.3%	3.1%	78%	78%	13%	0%	3.1%	13%	9.4%	56%	100%
				EV_ER2	Elk River	0200111	9.1%	18%	18%	27%	18%	0%	0%	0%	36%	91%	18%	9.1%	0%	18%	0%	9.1%	64%	55%	9.1%	3.6%	0%	9.1%	18%	45%	100%

Table C.13: Frequency (%) of Individual Samples with Total Metal Concentrations Exceeding the Normal Range at Lotic Water Monitoring Stations, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Aluminum	Aluminum[1]	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Iron[1]	Lead	Lithium	Magnesium	Manganese	Manganese[1]	Mercury	Molybdenum	Nickel	Potassium	Selenium
Mine-exposed	4	Michel	T	CM_CC1	Corbin Creek	0200209	7.1%	3.6%	96%	32%	0%	0%	7.1%	96%	89%	96%	0%	96%	7.1%	3.6%	3.6%	3.6%	96%	96%	43%	0%	0%	32%	96%	96%	96%
				EV_EC1	Erickson Creek	200097	0%	0%	100%	17%	26%	0%	4.3%	0%	0%	100%	4.3%	0%	0%	0%	0%	4.3%	100%	100%	0%	0%	0%	96%	39%	100%	100%
				EV_SP1	South Pit Creek	E296311	7.7%	0%	100%	0%	0%	0%	0%	100%	100%	100%	7.7%	7.7%	7.7%	7.7%	0%	7.7%	100%	100%	0%	0%	0%	100%	100%	100%	100%
				EV_MG1	Milligan Pond	E208057	18%	0%	100%	82%	45%	0%	9.1%	0%	82%	100%	0%	0%	45%	0%	0%	0%	18%	100%	0%	33%	9.1%	100%	100%	100%	100%
				EV_GT1	Gate Creek	E206231	33%	18%	100%	66%	58%	0%	2.6%	98%	100%	100%	14%	91%	45%	36%	33%	38%	100%	100%	36%	24%	0%	100%	100%	100%	100%
				EV_BC1	Bodie Creek	E102685	26%	11%	100%	61%	100%	0%	0%	100%	100%	100%	11%	100%	39%	39%	24%	37%	100%	100%	53%	33%	0%	100%	100%	100%	100%
				EV_AQ1	Aqueduct Creek	E210369	33%	22%	100%	39%	100%	5.6%	0%	83%	50%	100%	28%	33%	39%	44%	33%	33%	100%	100%	39%	18%	17%	56%	50%	100%	100%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	25%	10%	88%	23%	13%	2.5%	0%	78%	60%	95%	10%	88%	7.5%	25%	18%	15%	90%	100%	38%	0%	10%	0%	100%	100%	98%
				CM_MCTM	Michel Creek	-	9.1%	0%	64%	55%	0%	9.1%	0%	0%	36%	91%	9.1%	18%	9.1%	9.1%	0%	9.1%	9.1%	82%	0%	17%	0%	0%	100%	100%	91%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	40%	10%	30%	20%	83%	0%	0%	0%	53%	3.3%	20%	17%	20%	37%	17%	23%	0%	0%	17%	23%	6.7%	0%	40%	20%	0%
				EV_MC2	Michel Creek	E300091	40%	16%	92%	35%	92%	4.4%	2.3%	0%	73%	54%	24%	26%	26%	37%	23%	35%	86%	62%	18%	-	4.7%	30%	86%	92%	100%
	5	Elk	M	EV_ER1	Elk River	0200393	39%	8.3%	68%	47%	65%	2.2%	2.3%	0%	60%	65%	27%	19%	20%	35%	25%	32%	82%	53%	24%	11%	2.3%	6.1%	67%	90%	100%
				RG_ELKFERNIE	Elk River	-	14%	3.6%	64%	32%	93%	3.6%	0%	0%	39%	93%	29%	3.6%	7.1%	21%	11%	25%	61%	25%	29%	21%	0%	7.1%	25%	89%	100%
				RG_ELKORES	Elk River	E294312	29%	7.1%	50%	36%	79%	0%	0%	0%	39%	57%	18%	11%	14%	36%	21%	21%	61%	32%	36%	11%	0%	11%	21%	64%	100%
				RG_ELKMOUTH	Elk River	-	25%	11%	21%	50%	89%	0%	7.1%	0%	18%	29%	18%	14%	14%	36%	11%	14%	29%	3.6%	18%	-	0%	3.6%	18%	39%	100%

Note: if data were reported as below the laboratory reporting limit (LRL), then they were not included in the normal range screening. Normal ranges that were reported as below the LRL were screened as 1×LRL. Only stations with data for at least 8 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months.

[1] Analytes for which monthly NR's were adjusted for either concurrent total suspended solids or turbidity; see methods text for details.

Shading indicates frequencies above 2.5%

Table C.13: Frequency (%) of Individual Samples with Total Metal Concentrations Exceeding the Normal Range at Lotic Water Monitoring Stations, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Silver	Sodium	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	FR_UFR1	Fording River	E216777	0%	0%	0%	2.9%	0%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	8.3%	0%	0%	0%	8.3%	0%	0%	0%	0%
				LC_LC1	Line Creek	E216142	0%	0%	0%	0%	0%	0%	0%	0%	14%
				LC_SLC	South Line Creek	E282149	8.3%	0%	0%	8.3%	0%	8.3%	0%	8.3%	8.3%
	3	Elk	M	GH_ER2	Elk River	200389	0%	0%	32%	0%	2.9%	0%	0%	2.9%	2.9%
	4	Michel	M	CM_MC1	Michel Creek	E258175	0%	8.3%	0%	8.3%	0%	0%	0%	0%	0%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0%	0%	0%	3.6%	3.6%	7.1%	0%	0%	7.1%
				FR_CC1	Clode Creek	E102481	0%	100%	100%	93%	0%	21%	100%	0%	71%
				FR_NGD1	Lake Mountain Creek	E105060	8.3%	0%	0%	83%	0%	8.3%	0%	0%	0%
				FR_KC1	Kilmarnock Creek	0200252	0%	8.3%	33%	83%	0%	33%	100%	0%	100%
				GH_SC2	Swift Creek	E105061	0%	0%	11%	89%	0%	37%	100%	0%	100%
				GH_CC1	Cataract Creek	0200384	0%	17%	92%	100%	0%	33%	100%	0%	100%
				GH_PC1	Porter Creek	200385	0%	0%	0%	5.3%	0%	32%	100%	0%	58%
				LC_DCDS	LCO Dry Creek	E295210	10%	0%	0%	10%	0%	14%	0%	55%	10%
				LC_DC3	LCO Dry Creek	E288273	11%	0%	0%	11%	0%	3.7%	0%	79%	7.1%
				LC_DC1	LCO Dry Creek	E288270	0%	0%	0%	7.1%	0%	0%	0%	21%	7.1%
				GH_GH1	Greenhills Creek	E102709	10%	20%	5.0%	35%	0%	45%	100%	10%	20%
			M	FR_FR1	Fording River	0200251	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR2	Fording River	0200201	3.0%	0%	0%	0%	3.0%	12%	76%	0%	6.1%
				GH_FR	Fording River	-	0%	0%	0%	5.9%	0%	24%	94%	5.9%	18%
				FR_FR4	Fording River	-	0%	0%	0%	5.0%	0%	35%	90%	5.0%	5.0%
				GH_FR3	Fording River	-	0%	0%	0%	14%	0%	29%	71%	14%	21%
				FR_FRCP1	Fording River	E300071	0%	0%	4.8%	24%	0%	19%	98%	0%	2.4%
				GH_PC2	Fording River	E287431	0%	0%	0%	5.9%	0%	35%	100%	5.9%	5.9%
				FR_FRABCH	Fording River	-	0%	7.7%	0%	0%	0%	15%	100%	7.7%	0%
				FR_FR5	Fording River	-	0%	6.3%	0%	0%	0%	25%	94%	0%	0%
				LC_FRUS	Fording River	E295232	11%	0%	0%	0%	0%	22%	78%	0%	0%
				LC_FRB	Fording River	-	9.1%	0%	0%	0%	0%	9.1%	64%	0%	0%
				GH_FR1	Fording River	0200251	0%	0%	0%	0%	2.9%	20%	100%	5.7%	0%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	0%	100%	42%	58%	0%	25%	100%	8.3%	92%
				LC_LC3	Line Creek	0200337	0%	100%	45%	42%	3.3%	21%	100%	0%	93%
				LC_LCDSSLCC	Line Creek	E297110	3.2%	88%	13%	3.2%	0%	20%	100%	3.2%	75%
				LC_LC4	Line Creek	0200044	3.4%	90%	3.4%	6.9%	0%	14%	100%	6.9%	55%
			M	LC_LC6	Fording River	0200338	0%	0%	0%	0%	0%	20%	70%	0%	0%
				LC_LC5	Fording River	0200028	0%	29%	0%	3.3%	0%	14%	100%	0%	3.2%
	3	Elk	T	GH_WILLOW	Willow Creek	-	0%	78%	0%	0%	3.7%	3.7%	0%	3.7%	3.7%
				GH_WADE	Wade Creek	E287433	32%	100%	100%	29%	7.1%	29%	25%	29%	18%
				GH_MC1	Michelson Creek	200388	38%	85%	92%	62%	7.7%	31%	62%	42%	38%
				GH_LC2	Leask Creek	-	68%	100%	100%	100%	21%	86%	100%	75%	89%
				GH_WC2	Wolfram Creek	-	39%	100%	100%	83%	5.6%	67%	100%	61%	61%
				GH_TC2	Thompson Creek	E207436	10%	100%	100%	15%	0%	30%	85%	5.0%	10%
			M	GH_ERC	Elk River	E300090	3.1%	0%	25%	0%	3.1%	0%	0%	13%	9.4%
				GH_ER1	Elk River	0206661	0%	0%	18%	0%	3.6%	0%	0%	7.1%	7.1%
	4	Elk	T	EV_HC6	Harmer Creek	-	0%	0%	0%	4.8%	0%	0%	0%	0%	4.8%
				EV_HC1	Harmer Creek	E102682	2.9%	0%	0%	2.9%	0%	12%	100%	5.9%	2.9%
				EV_GV1	Grave Creek	-	10%	5.0%	0%	10%	5.0%	20%	95%	10%	10%
				EV_SM1	Six Mile Creek	E102681	7.7%	100%	100%	7.7%	0%	23%	0%	7.7%	0%
				EV_BLM2	Balmer Creek	E298592	27%	100%	9.1%	36%	0%	18%	0%	45%	18%
				EV_FC1	Fennelon Creek	E298591	5.3%	95%	100%	53%	0%	32%	0%	26%	5.3%
				EV_GC2	Goddard Creek	E208043	23%	100%	100%	36%	0%	32%	91%	36%	41%
				EV_OC1	Otto Creek	E102679	4.5%	100%	100%	32%	0%	14%	0%	9.1%	14%
			M	EV_ER4	Elk River	0200027	0%	13%	66%	0%	0%	3.1%	0%	9.4%	6.3%
				EV_ER2	Elk River	0200111	9.1%	9.1%	45%	18%	0%	0%	0%	9.1%	9.1%

Table C.13: Frequency (%) of Individual Samples with Total Metal Concentrations Exceeding the Normal Range at Lotic Water Monitoring Stations, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Silver	Sodium	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
Mine-exposed	4	Michel	T	CM_CC1	Corbin Creek	0200209	0%	96%	96%	68%	0%	25%	96%	0%	71%
				EV_EC1	Erickson Creek	200097	0%	52%	4.3%	0%	0%	35%	100%	0%	0%
				EV_SP1	South Pit Creek	E296311	0%	0%	0%	100%	0%	38%	100%	0%	100%
				EV_MG1	Milligan Pond	E208057	0%	0%	0%	73%	0%	18%	100%	36%	64%
				EV_GT1	Gate Creek	E206231	19%	84%	100%	100%	5.3%	47%	100%	14%	100%
				EV_BC1	Bodie Creek	E102685	20%	100%	100%	100%	0%	35%	100%	20%	100%
				EV_AQ1	Aqueduct Creek	E210369	33%	100%	83%	28%	5.6%	33%	0%	28%	33%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	2.5%	98%	70%	35%	0%	13%	70%	10%	10%
				CM_MCTM	Michel Creek	-	9.1%	82%	9.1%	36%	0%	9.1%	0%	9.1%	9.1%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	13%	6.7%	0%	20%	0%	10%	0%	17%	10%
				EV_MC2	Michel Creek	E300091	20%	39%	6.3%	26%	0%	19%	24%	28%	17%
	5	Elk	M	EV_ER1	Elk River	0200393	11%	8.2%	8.2%	23%	0%	15%	6.1%	17%	15%
				RG_ELKFERNIE	Elk River	-	11%	75%	0%	7.1%	0%	0%	0%	7.1%	3.6%
				RG_ELKORES	Elk River	E294312	7.1%	21%	25%	11%	3.6%	3.6%	0%	11%	14%
				RG_ELKMOUTH	Elk River	-	7.1%	11%	0%	11%	0%	7.1%	0%	11%	11%

Note: if data were reported as below the laboratory reporting limit (LRL), then they were not included in the normal range screening. Normal ranges that were reported as below the LRL were screened as 1×LRL. Only stations with data for at least 8 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months.

[1] Analytes for which monthly NR's were adjusted for either concurrent total suspended solids or turbidity; see methods text for details.

Shading indicates frequencies above 2.5%

Table C.14: Frequency (%) of Individual Samples with Dissolved Metal Concentrations Exceeding the Normal Range at Lotic Water Monitoring Stations, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	FR_UFR1	Fording River	E216777	5.7%	0%	0%	17%	0%	0%	0%	17%	0%	0%	0%	0%	5.7%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8.3%	0%	0%	0%	0%	0%	8.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC1	Line Creek	E216142	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	29%	29%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_SLC	South Line Creek	E282149	8.3%	0%	8.3%	0%	0%	0%	0%	33%	8.3%	8.3%	8.3%	8.3%	8.3%	0%	8.3%	0%	0%	8.3%	0%	0%	0%	8.3%	0%	0%	0%	8.3%	8.3%
	3	Elk	M	GH_ER2	Elk River	200389	2.9%	0%	2.9%	0%	0%	0%	0%	2.9%	12%	2.9%	2.9%	2.9%	2.9%	0%	44%	2.9%	0%	2.9%	0%	0%	29%	2.9%	0%	2.9%	0%	2.9%	0%
	4	Michel	M	CM_MC1	Michel Creek	E258175	8.3%	0%	8.3%	0%	0%	0%	0%	8.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	3.6%	7.1%	0%	0%	0%	0%	0%	64%	0%	3.6%	3.6%	0%	0%	50%	89%	0%	0%	75%	100%	0%	0%	0%	0%	7.1%	0%	0%	0%
				FR_CC1	Clode Creek	E102481	7.1%	100%	36%	100%	0%	0%	100%	36%	0%	100%	7.1%	0%	0%	100%	36%	0%	100%	100%	100%	0%	100%	100%	0%	21%	100%	0%	36%
				FR_NGD1	Lake Mountain Creek	E105060	0%	100%	25%	100%	0%	0%	17%	83%	0%	33%	8.3%	0%	0%	100%	33%	0%	100%	100%	100%	0%	0%	100%	0%	8.3%	0%	0%	8.3%
				FR_KC1	Kilmarnock Creek	0200252	0%	100%	0%	0%	0%	0%	67%	92%	0%	8.3%	17%	0%	0%	100%	0%	0%	75%	100%	100%	0%	33%	100%	0%	33%	100%	0%	83%
				GH_SC2	Swift Creek	E105061	5.3%	100%	5.3%	0%	0%	0%	0%	100%	0%	0%	79%	0%	5.3%	100%	16%	0%	100%	100%	100%	0%	5.3%	100%	0%	47%	100%	0%	100%
				GH_CC1	Cataract Creek	0200384	0%	100%	0%	0%	0%	0%	0%	100%	0%	0%	8.3%	0%	0%	100%	0%	0%	100%	100%	100%	0%	88%	100%	0%	33%	100%	0%	96%
				GH_PC1	Porter Creek	200385	0%	0%	21%	63%	0%	0%	0%	74%	11%	0%	0%	0%	0%	100%	0%	0%	100%	100%	100%	0%	0%	5.3%	0%	16%	100%	0%	89%
				LC_DCDS	LCO Dry Creek	E295210	55%	93%	55%	100%	0%	0%	3.4%	93%	0%	3.4%	3.4%	3.4%	3.4%	76%	10%	0%	3.4%	38%	17%	0%	0%	0%	0%	0%	0%	76%	10%
				LC_DC3	LCO Dry Creek	E288273	57%	96%	68%	100%	0%	0%	3.6%	100%	0%	3.6%	3.6%	0%	3.6%	36%	11%	0%	3.6%	71%	21%	0%	0%	3.6%	0%	0%	0%	100%	3.6%
				LC_DC1	LCO Dry Creek	E288270	14%	93%	0%	100%	0%	0%	3.6%	89%	0%	0%	3.6%	0%	3.6%	100%	0%	0%	7.1%	0%	18%	0%	0%	0%	0%	0%	0%	18%	3.6%
				GH_GH1	Greenhills Creek	E102709	10%	100%	55%	0%	0%	0%	0%	45%	0%	60%	20%	0%	0%	95%	50%	5.0%	100%	100%	100%	0%	5.0%	45%	0%	30%	100%	0%	10%
			M	FR_FR1	Fording River	0200251	0%	0%	0%	0%	0%	0%	0%	56%	0%	0%	0%	0%	0%	22%	0%	0%	0%	56%	100%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR2	Fording River	0200201	6.1%	100%	0%	67%	0%	0%	0%	100%	0%	33%	0%	3.0%	3.0%	100%	91%	0%	30%	100%	100%	0%	0%	0%	0%	18%	76%	0%	3.0%
				GH_FR	Fording River	-	5.9%	100%	0%	71%	0%	0%	5.9%	100%	0%	35%	0%	0%	0%	100%	94%	0%	71%	100%	100%	0%	0%	5.9%	0%	24%	94%	0%	5.9%
				FR_FR4	Fording River	-	0%	100%	0%	65%	0%	0%	0%	95%	0%	50%	0%	0%	0%	100%	85%	0%	45%	100%	100%	0%	0%	5.0%	0%	35%	90%	0%	10%
				GH_FR3	Fording River	-	6.7%	100%	0%	80%	0%	0%	6.7%	100%	0%	47%	0%	0%	0%	100%	93%	6.7%	40%	100%	100%	0%	0%	0%	0%	13%	67%	0%	0%
				FR_FRCP1	Fording River	E300071	0%	100%	0%	53%	0%	0%	4.7%	86%	2.4%	17%	0%	2.4%	2.4%	100%	67%	2.4%	65%	100%	100%	0%	4.8%	31%	0%	24%	98%	0%	0%
				GH_PC2	Fording River	E287431	0%	47%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	5.9%	0%	0%	65%	100%	0%	0%	5.9%	0%	35%	100%	0%	0%
				FR_FRABCH	Fording River	-	0%	69%	0%	92%	0%	0%	7.7%	100%	0%	7.7%	7.7%	0%	0%	100%	69%	0%	7.7%	100%	100%	0%	0%	0%	0%	31%	100%	0%	0%
				FR_FR5	Fording River	-	0%	31%	0%	100%	0%	0%	0%	94%	0%	0%	0%	0%	0%	100%	19%	6.3%	0%	63%	100%	0%	0%	0%	0%	38%	100%	0%	0%
				LC_FRUS	Fording River	E295232	0%	11%	0%	100%	0%	0%	0%	89%	0%	0%	11%	0%	0%	100%	11%	0%	0%	22%	100%	0%	0%	0%	0%	33%	78%	0%	0%
				LC_FRB	Fording River	-	0%	9.1%	0%	100%	0%	0%	0%	73%	0%	0%	0%	0%	0%	100%	0%	0%	0%	18%	100%	0%	0%	0%	0%	18%	64%	0%	0%
				GH_FR1	Fording River	0200251	0%	100%	0%	100%	0%	0%	0%	83%	0%	8.6%	0%	0%	0%	100%	8.6%	0%	0%	100%	100%	0%	0%	0%	0%	20%	100%	0%	2.9%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	0%	100%	0%	58%	0%	0%	25%	100%	0%	0%	0%	0%	0%	100%	0%	0%	100%	100%	100%	0%	58%	83%	0%	25%	100%	0%	100%
				LC_LC3	Line Creek	0200337	0%	100%	0%	23%	0%	0%	32%	100%	0%	3.3%	6.7%	0%	0%	100%	3.2%	0%	100%	100%	100%	0%	39%	97%	0%	20%	100%	0%	100%
				LC_LCDSSLCC	Line Creek	E297110	0%	97%	0%	28%	0%	0%	3.2%	100%	0%	0%	0%	0%	0%	100%	6.3%	3.2%	59%	100%	100%	0%	13%	6.3%	0%	19%	97%	0%	97%
				LC_LC4	Line Creek	0200044	3.6%	96%	0%	32%	0%	0%	0%	68%	0%	0%	0%	0%	0%	100%	3.6%	0%	39%	100%	100%	0%	7.1%	3.6%	0%	11%	96%	0%	54%
			M	LC_LC6	Fording River	0200338	0%	30%	0%	100%	0%	0%	0%	60%	0%	0%	0%	0%	0%	100%	0%	0%	0%	60%	100%	0%	0%	0%	0%	20%	60%	0%	0%
				LC_LC5	Fording River	0200028	0%	73%	0%	97%	0%	0%	0%	68%	0%	0%	3.3%	0%	0%	100%	3.2%	0%	6.5%	94%	100%	0%	0%	0%	0%	10%	97%	0%	6.7%
	3	Elk	T	GH_WILLOW	Willow Creek	-	11%	0%	3.7%	100%	0%	0%	19%	15%	0%	0%	7.4%	0%	0%	100%	0%	0%	0%	7.4%	37%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_WADE	Wade Creek	E287433	32%	100%	46%	100%	0%	0%	100%	61%	3.6%	0%	46%	3.6%	3.6%	100%	3.6%	0%	46%	75%	14%	0%	100%	3.6%	0%	7.1%	29%	3.6%	0%
				GH_MC1	Michelson Creek	200388	31%	100%	27%	92%	0%	0%	65%	42%	0%	58%	27%	0%	0%	100%	35%	0%	65%	100%	69%	0%	88%	65%	0%	7.7%	62%	0%	0%
				GH_LC2	Leask Creek	-	54%	100%	96%	79%	0%	0%	89%	57%	3.6%	100%	68%	3.6%	3.6%	100%	68%	0%	100%	100%	100%	0%	100%	100%	0%	36%	100%	3.6%	7.1%
				GH_WC2	Wolfram Creek	-	44%	100%	56%	89%	0%	0%	83%	61%	0%	100%	83%	5.6%	5.6%	100%	39%	5.6%	100%	100%	100%	0%	100%	89%	0%	33%	100%	5.6%	11%
				GH_TC2	Thompson Creek	E207436	5.0%	100%	20%	50%	0%	0%	85%	55%	0%	0%	5.0%	5.0%	0%	100%	45%	0%	50%	100%	100%	0%	100%	15%	0%	35%	85%	0%	0%
			M	GH_ERC	Elk River	E300090	3.1%	0%	0%	0%	0%	0%	0%	6.3%	16%	0%	0%	0%	3.1%	0%	3.1%	0%	0%	0%	3.1%	0%	41%	0%	0%	0%	0%	0%	0%
				GH_ER1	Elk River	0206661	3.6%	0%	0%	0%	0%	0%	0%	11%	11%	3.6%	0%	3.6%	3.6%	0%	3.6%	0%	0%	0%	3.6%	0%	32%	3.6%	0%	3.6%	0%	3.6%	3.6%
	4	Elk	T	EV_HC6	Harmer Creek	-	0%	0%	19%	0%	0%	0%	0%	0%	14%	0%	4.8%	0%	0%	0%	0%	0%	0%	4.8%	0%	0%	0%	4.8%	0%	0%	0%	0%	0%
				EV_HC1	Harmer Creek	E102682	5.9%	2.9%	5.9%	0%	0%	0%	0%	76%	0%	0%	0%	0%	5.9%	79%	32%	0%	0%	85%	100%	0%	0%	5.9%	0%	8.8%	100%	0%	0%
				EV_GV1	Grave Creek	-	5.0%	0%	0%	10%	0%	0%	0%	35%	0%	0%	0%	0%	0%	70%	5.0%	0%	0%	5.0%	100%	0%	0%	0%	0%	5.0%	90%	0%	0%
				EV_SM1	Six Mile Creek	E102681	30%	0%	0%	80%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	40%	0%	100%	10%	0%	0%	0%	0%	0%
				EV_BLM2	Balmer Creek	E298592	45%	0%	27%	100%	0%	0%	55%	27%	0%	0%	0%	0%	9.1%	100%	0%	0%	0%	0%	100%	0%	9.1%	0%	0%	0%	0%	0%	9.1%
				EV_FC1	Fennelon Creek	E298591	42%	74%	95%	79%	0%	0%	100%	11%	0%	0%	68%	0%	0%	100%	0%	0%	0%	63%	95%	0%	100%	5.3%	0%	0%	0%	0%	5.3%
				EV_GC2	Goddard Creek	E208043	45%	100%	23%	95%	0%	0%	100%	27%	0%	64%	9.1%	0%	4.5%	100%	64%	0%	95%	100%	100%	0%	100%	0%	0%	9.1%	91%	0%	4.5%
				EV_OC1	Otto Creek	E102679	4.5%	41%	91%	100%	0%	0%	100%	0%	0%	27%	4.5%	0%	0%	100%	95%	0%	100%	100%	0%	0%	100%	50%	0%	9.1%	0%	0%	0%
			M	EV_ER4	Elk River	0200027	3.1%	0%	19%	22%	0%	0%	0%	34%	6.3%	0%	3.1%	0%	3.1%	88%	6.3%	0%	13%	9.4%	100%	0%	72%	0%	0%	0%	0%	0%	0%
				EV_ER2	Elk River	0200111	0%	0%	27%	9.1%	0%	0%	0%	18%	9.1%	0%	0%	0%	0%	82%	0%	0%	0%	0%	100%	0%	45%	0%	0%	0%	0%	0%	0%

Table C.14: Frequency (%) of Individual Samples with Dissolved Metal Concentrations Exceeding the Normal Range at Lotic Water Monitoring Stations, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
Mine-exposed	4	Michel	T	CM_CC1	Corbin Creek	0200209	7.1%	89%	29%	0%	0%	0%	86%	82%	0%	96%	3.6%	0%	0%	96%	89%	0%	46%	96%	96%	0%	96%	86%	0%	29%	96%	0%	50%
				EV_EC1	Erickson Creek	200097	0%	100%	30%	35%	0%	0%	4.3%	30%	0%	0%	0%	0%	0%	100%	0%	0%	100%	52%	100%	0%	13%	0%	0%	43%	100%	0%	0%
				EV_SP1	South Pit Creek	E296311	0%	100%	0%	0%	0%	0%	100%	82%	0%	0%	9.1%	0%	0%	100%	0%	0%	100%	100%	100%	0%	0%	100%	0%	27%	100%	0%	64%
				EV_MG1	Milligan Pond	E208057	0%	100%	100%	44%	0%	0%	0%	56%	0%	0%	67%	0%	0%	22%	0%	0%	100%	100%	100%	0%	0%	100%	0%	11%	100%	0%	78%
				EV_GT1	Gate Creek	E206231	5.1%	100%	52%	53%	0%	0%	98%	100%	0%	86%	18%	0%	0%	100%	34%	0%	100%	100%	100%	0%	100%	100%	0%	56%	100%	0%	98%
				EV_BC1	Bodie Creek	E102685	6.1%	100%	39%	100%	0%	0%	100%	68%	0%	100%	9.4%	0%	0%	100%	41%	0%	100%	100%	100%	0%	100%	100%	3.1%	44%	100%	0%	47%
				EV_AQ1	Aqueduct Creek	E210369	11%	100%	50%	100%	0%	0%	83%	83%	0%	11%	11%	0%	0%	100%	17%	0%	50%	89%	100%	0%	94%	28%	0%	5.6%	0%	0%	11%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	13%	88%	0%	18%	0%	0%	65%	63%	2.5%	85%	0%	0%	0%	95%	35%	0%	2.5%	100%	98%	0%	70%	48%	0%	5.0%	70%	0%	5.0%
				CM_MCTM	Michel Creek	-	9.1%	36%	36%	0%	0%	0%	0%	45%	0%	9.1%	0%	0%	0%	27%	0%	0%	0%	100%	91%	0%	18%	45%	0%	9.1%	0%	0%	0%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	30%	0%	10%	67%	0%	0%	0%	63%	3.3%	0%	3.3%	0%	0%	3.3%	3.3%	0%	0%	37%	0%	0%	0%	3.3%	0%	0%	0%	3.3%	0%
				EV_MC2	Michel Creek	E300091	20%	80%	2.0%	88%	0%	0%	8.7%	72%	0%	0%	11%	2.3%	0%	84%	2.0%	0%	31%	92%	98%	0%	6.3%	20%	2.3%	2.2%	22%	0%	4.7%
	5	Elk	M	EV_ER1	Elk River	0200393	16%	55%	13%	60%	0%	0%	0%	45%	2.1%	0%	4.7%	2.3%	0%	85%	0%	0%	6.3%	77%	100%	0%	8.3%	2.3%	0%	0%	4.2%	0%	2.3%
				RG_ELKFERNIE	Elk River	-	14%	54%	3.6%	89%	0%	0%	0%	68%	32%	0%	0%	0%	0%	71%	79%	0%	11%	32%	100%	0%	0%	3.6%	29%	3.6%	0%	0%	0%
				RG_ELKORES	Elk River	E294312	32%	18%	21%	71%	0%	0%	0%	46%	0%	0%	3.6%	11%	7.1%	64%	54%	0%	11%	25%	100%	0%	32%	0%	25%	3.6%	0%	0%	3.6%
				RG_ELKMOUTH	Elk River	-	21%	3.6%	25%	79%	0%	0%	0%	25%	0%	0%	11%	3.6%	0%	29%	29%	0%	3.6%	0%	96%	0%	0%	0%	21%	0%	0%	0%	7.1%

Note: if data were reported as below the laboratory reporting limit, then they were not included in the normal range screening. Only stations with data for at least 8 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months.

Shading indicates frequencies above 2.5%

Table C.15: Frequency (%) of Individual Samples with Non-Metal Concentrations Exceeding the Normal Range at Lotic Water Monitoring Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Alkalinity (Total) (as CaCO3)	Ammonia as N	Bromide (Dissolved)	Chloride (Dissolved)	Conductivity (Field)	Conductivity (Lab)	Dissolved Oxygen [1]	Fluoride (Dissolved)	Hardness (Total or Dissolved)	Ortho-Phosphate	Phosphorus	Phosphorus [2]	Sulfate (as SO4) (Dissolved)	Total Dissolved Solids	Total Kjeldahl Nitrogen	Dissolved Organic Carbon	Total Organic Carbon	Total Suspended Solids	Turbidity (Lab)	Nitrate as N	Nitrite as N
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	5.6%	0%	17%	0%
			M	FR_UFR1	Fording River	E216777	0%	0%	0%	0%	0%	0%	5.0%	0%	0%	0%	0%	-	0%	2.9%	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	8.3%	0%	0%	0%	0%	8.3%	0%	0%	8.3%	0%	0%	-	0%	8.3%	0%	0%	9.1%	17%	8.3%	0%	0%
				LC_LC1	Line Creek	E216142	0%	7.1%	0%	0%	0%	0%	4.5%	0%	0%	0%	0%	-	14%	0%	7.7%	0%	7.1%	30%	5.0%	14%	7.7%
				LC_SLC	South Line Creek	E282149	0%	0%	0%	8.3%	0%	0%	5.6%	0%	8.3%	0%	5.3%	-	0%	0%	5.6%	8.3%	5.3%	8.3%	0%	0%	5.6%
	3	Elk	M	GH_ER2	Elk River	200389	0%	3.0%	0%	2.9%	3.7%	0%	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	15%	2.9%	0%	0%
	4	Michel	M	CM_MC1	Michel Creek	E258175	0%	8.3%	0%	0%	0%	0%	7.7%	0%	0%	0%	0%	-	0%	0%	8.3%	0%	8.3%	0%	0%	0%	0%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0%	61%	0%	0%	75%	86%	0%	0%	82%	0%	0%	-	96%	89%	3.6%	0%	3.6%	7.1%	7.1%	100%	93%
				FR_CC1	Clode Creek	E102481	100%	100%	0%	100%	96%	100%	0%	0%	100%	0%	0%	-	100%	100%	71%	7.1%	14%	16%	42%	100%	100%
				FR_NGD1	Lake Mountain Creek	E105060	75%	83%	0%	0%	48%	100%	3.8%	0%	83%	33%	75%	-	100%	100%	67%	67%	83%	23%	23%	100%	100%
				FR_KC1	Kilmarnock Creek	0200252	100%	0%	0%	92%	92%	100%	0%	8.3%	100%	0%	0%	-	100%	100%	0%	0%	0%	0%	0%	100%	17%
				GH_SC2	Swift Creek	E105061	89%	6.9%	0%	76%	96%	100%	0%	0%	100%	26%	16%	-	100%	100%	26%	63%	63%	14%	3.4%	100%	3.4%
				GH_CC1	Cataract Creek	0200384	100%	3.6%	0%	100%	96%	100%	0%	3.6%	100%	0%	0%	-	100%	100%	13%	38%	33%	3.6%	0%	100%	11%
				GH_PC1	Porter Creek	200385	100%	0%	0%	100%	96%	100%	0%	50%	100%	5.3%	5.3%	-	100%	100%	21%	21%	21%	3.6%	0%	100%	0%
				LC_DCDS	LCO Dry Creek	E295210	0%	0%	0%	6.9%	0%	0%	0%	0%	0%	79%	66%	-	0%	0%	28%	38%	46%	35%	35%	17%	10%
				LC_DC3	LCO Dry Creek	E288273	0%	3.6%	0%	7.1%	0%	0%	3.4%	0%	0%	100%	68%	-	0%	0%	32%	43%	37%	27%	17%	61%	3.6%
				LC_DC1	LCO Dry Creek	E288270	18%	3.7%	0%	3.6%	0%	0%	0%	0%	0%	86%	46%	-	0%	0%	11%	25%	26%	20%	10%	0%	3.7%
				GH_GH1	Greenhills Creek	E102709	95%	62%	0%	100%	100%	100%	0%	6.9%	100%	30%	40%	-	100%	100%	74%	84%	84%	19%	42%	100%	90%
			M	FR_FR1	Fording River	0200251	0%	22%	0%	0%	48%	78%	0%	0%	67%	0%	0%	-	89%	89%	22%	0%	11%	29%	29%	100%	89%
				FR_FR2	Fording River	0200201	70%	67%	0%	73%	94%	94%	0%	0%	94%	0%	6.1%	-	97%	100%	15%	9.1%	15%	12%	3.0%	100%	91%
				GH_FR	Fording River	-	59%	63%	0%	63%	92%	100%	0%	0%	100%	0%	5.9%	-	100%	100%	18%	18%	24%	17%	8.3%	100%	100%
				FR_FR4	Fording River	-	80%	65%	0%	75%	100%	100%	0%	0%	100%	0%	5.0%	-	100%	100%	20%	5.0%	10%	26%	8.7%	100%	90%
				GH_FR3	Fording River	-	64%	75%	0%	63%	75%	100%	0%	0%	100%	0%	14%	-	100%	100%	21%	21%	36%	25%	13%	100%	100%
				FR_FRCP1	Fording River	E300071	81%	33%	0%	77%	98%	100%	4.8%	4.7%	100%	0%	4.7%	-	100%	100%	33%	7.0%	12%	10%	0%	100%	76%
				GH_PC2	Fording River	E287431	100%	3.7%	0%	85%	100%	100%	0%	0%	100%	0%	5.9%	-	100%	100%	12%	0%	0%	3.7%	3.7%	100%	52%
				FR_FRABCH	Fording River	-	85%	15%	0%	85%	85%	100%	0%	0%	100%	0%	7.7%	-	100%	100%	7.7%	0%	7.7%	15%	0%	100%	54%
				FR_FR5	Fording River	-	88%	6.3%	0%	88%	100%	100%	0%	0%	100%	0%	6.3%	-	100%	100%	0%	0%	0%	6.3%	0%	100%	69%
				LC_FRUS	Fording River	E295232	89%	0%	0%	89%	100%	100%	0%	0%	100%	0%	0%	-	100%	100%	0%	0%	0%	0%	0%	100%	89%
				LC_FRB	Fording River	-	73%	0%	0%	73%	100%	100%	0%	0%	100%	0%	0%	-	100%	100%	9.1%	0%	0%	9.1%	0%	100%	73%
				GH_FR1	Fording River	0200251	91%	8.6%	0%	94%	96%	100%	0%	0%	100%	0%	5.7%	-	100%	100%	23%	8.6%	11%	14%	11%	97%	71%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	75%	0%	0%	83%	100%	100%	0%	0%	100%	0%	8.3%	-	100%	100%	8.3%	8.3%	8.3%	17%	17%	100%	8.3%
				LC_LC3	Line Creek	0200337	90%	0%	0%	94%	100%	100%	0%	0%	100%	3.0%	0%	-	100%	100%	3.1%	3.2%	9.1%	6.5%	13%	100%	18%
				LC_LCDSSLCC	Line Creek	E297110	77%	0%	0%	90%	94%	97%	0%	0%	97%	0%	3.0%	-	100%	100%	16%	0%	6.3%	3.3%	3.3%	100%	50%
				LC_LC4	Line Creek	0200044	59%	6.5%	0%	83%	100%	100%	0%	0%	100%	0%	13%	-	100%	100%	23%	7.1%	20%	69%	19%	100%	55%
			M	LC_LC6	Fording River	0200338	90%	0%	0%	100%	100%	100%	0%	0%	100%	0%	10%	-	100%	100%	20%	0%	11%	10%	10%	100%	60%
				LC_LC5	Fording River	0200028	74%	0%	0%	87%	100%	100%	6.5%	0%	100%	0%	3.2%	-	100%	100%	17%	3.2%	3.3%	57%	8.2%	100%	84%
	3	Elk	T	GH_WILLOW	Willow Creek	-	96%	0%	0%	7.4%	46%	70%	0%	0%	70%	100%	69%	-	11%	65%	58%	81%	69%	33%	19%	41%	3.7%
				GH_WADE	Wade Creek	E287433	100%	11%	0%	54%	68%	93%	0%	0%	89%	100%	63%	-	0%	100%	70%	89%	81%	46%	43%	71%	0%
				GH_MC1	Michelson Creek	200388	100%	23%	0%	100%	81%	100%	0%	0%	100%	65%	56%	-	67%	100%	64%	40%	68%	67%	52%	85%	63%
				GH_LC2	Leask Creek	-	100%	30%	0%	96%	100%	100%	0%	0%	100%	89%	74%	-	100%	100%	44%	52%	89%	82%	79%	100%	71%
				GH_WC2	Wolfram Creek	-	100%	23%	0%	100%	100%	100%	0%	0%	100%	11%	61%	-	100%	100%	61%	89%	83%	42%	42%	100%	65%
				GH_TC2	Thompson Creek	E207436	85%	68%	0%	100%	100%	100%	23%	0%	100%	35%	20%	-	100%	100%	80%	95%	90%	18%	18%	100%	89%
			M	GH_ERC	Elk River	E300090	3.1%	3.3%	0%	6.3%	0%	0%	0%	0%	0%	0%	6.5%	-	0%	3.2%	10%	0%	3.2%	19%	6.3%	69%	0%
				GH_ER1	Elk River	0206661	7.1%	7.4%	0%	25%	0%	0%	0%	0%	0%	0%	0%	-	0%	0%	3.7%	0%	3.7%	14%	7.4%	68%	0%
	4	Elk	T	EV_HC6	Harmer Creek	-	0%	0%	0%	0%	14%	0%	0%	0%	0%	19%	0%	-	0%	0%	9.5%	0%	0%	0%	4.8%	0%	0%
				EV_HC1	Harmer Creek	E102682	91%	24%	0%	85%	100%	100%	0%	0%	100%	50%	8.8%	-	100%	100%	41%	18%	18%	5.9%	5.9%	100%	5.9%
				EV_GV1	Grave Creek	-	80%	15%	0%	60%	90%	95%	0%	0%	90%	15%	15%	-	100%	95%	30%	10%	20%	15%	10%	100%	10%
				EV_SM1	Six Mile Creek	E102681	100%	0%	0%	54%	92%	100%	0%	0%	100%	7.7%	31%	-	62%	100%	54%	54%	54%	18%	45%	0%	7.7%
				EV_BLM2	Balmer Creek	E298592	73%	18%	0%	91%	55%	64%	9.1%	0%	45%	100%	91%	-	18%	73%	91%	55%	91%	72%	57%	82%	0%
				EV_FC1	Fennelon Creek	E298591	100%	11%	0%	89%	79%	95%	0%	0%	95%	100%	58%	-	63%	95%	63%	79%	68%	48%	64%	21%	0%
				EV_GC2	Goddard Creek	E208043	100%	73%	9.1%	100%	95%	100%	0%	0%	100%	41%	41%	-	100%	100%	55%	18%	55%	61%	42%	100%	77%
				EV_OC1	Otto Creek	E102679	100%	100%	82%	100%	95%	100%	0%	64%	100%	0%	27%	-	41%	100%	68%	50%	50%	37%	43%	0%	64%

Table C.15: Frequency (%) of Individual Samples with Non-Metal Concentrations Exceeding the Normal Range at Lotic Water Monitoring Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Alkalinity (Total) (as CaCO3)	Ammonia as N	Bromide (Dissolved)	Chloride (Dissolved)	Conductivity (Field)	Conductivity (Lab)	Dissolved Oxygen [1]	Fluoride (Dissolved)	Hardness (Total or Dissolved)	Ortho-Phosphate	Phosphorus	Phosphorus [2]	Sulfate (as SO4) (Dissolved)	Total Dissolved Solids	Total Kjeldahl Nitrogen	Dissolved Organic Carbon	Total Organic Carbon	Total Suspended Solids	Turbidity (Lab)	Nitrate as N	Nitrite as N
Mine-exposed	4	Elk	M	EV_ER4	Elk River	0200027	41%	6.3%	0%	94%	100%	94%	3.1%	0%	94%	0%	0%	-	81%	97%	9.4%	0%	0%	16%	3.1%	100%	31%
				EV_ER2	Elk River	0200111	18%	0%	0%	91%	91%	100%	0%	0%	82%	0%	9.1%	-	73%	100%	0%	0%	9.1%	28%	8.7%	100%	45%
		Michel	T	CM_CC1	Corbin Creek	0200209	96%	93%	0%	96%	96%	96%	3.6%	0%	96%	0%	3.6%	-	96%	96%	18%	7.1%	11%	17%	14%	96%	93%
				EV_EC1	Erickson Creek	200097	100%	0%	0%	100%	91%	100%	0%	0%	100%	100%	22%	-	100%	100%	17%	4.3%	0%	0%	0%	100%	4.3%
				EV_SP1	South Pit Creek	E296311	100%	0%	0%	100%	100%	100%	0%	100%	100%	0%	0%	-	100%	100%	31%	15%	0%	26%	12%	100%	23%
				EV_MG1	Milligan Pond	E208057	100%	36%	0%	100%	100%	100%	9.1%	0%	100%	45%	36%	-	100%	100%	73%	91%	82%	16%	22%	45%	9.1%
				EV_GT1	Gate Creek	E206231	100%	67%	0%	100%	98%	100%	0%	40%	100%	39%	45%	-	100%	100%	14%	41%	45%	39%	36%	100%	60%
				EV_BC1	Bodie Creek	E102685	97%	100%	9.1%	100%	100%	100%	0%	36%	100%	0%	32%	-	100%	100%	13%	5.4%	35%	53%	45%	100%	95%
				EV_AQ1	Aqueduct Creek	E210369	94%	28%	100%	100%	95%	100%	0%	0%	100%	56%	39%	-	50%	100%	44%	56%	61%	59%	56%	17%	22%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	73%	23%	0%	88%	92%	98%	9.1%	0%	98%	0%	15%	-	100%	100%	40%	7.5%	7.5%	29%	27%	100%	95%
				CM_MCTM	Michel Creek	-	27%	9.1%	0%	82%	75%	82%	8.3%	0%	82%	0%	9.1%	-	91%	82%	0%	0%	9.1%	9.1%	0%	100%	45%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	0%	13%	0%	63%	10%	3.3%	0%	0%	0%	40%	33%	-	3.3%	3.3%	37%	27%	33%	39%	27%	13%	6.7%
				EV_MC2	Michel Creek	E300091	35%	49%	0%	96%	67%	63%	0%	0%	58%	27%	31%	-	65%	67%	67%	33%	41%	43%	35%	100%	65%
	5	Elk	M	EV_ER1	Elk River	0200393	24%	11%	0%	100%	89%	73%	0%	0%	67%	4.3%	31%	-	35%	79%	38%	23%	33%	44%	35%	100%	71%
				RG_ELKFERNIE	Elk River	-	57%	36%	0%	100%	0%	93%	0%	0%	75%	25%	25%	-	43%	86%	39%	14%	11%	29%	21%	100%	79%
				RG_ELKORES	Elk River	E294312	25%	50%	0%	96%	0%	54%	0%	0%	54%	3.6%	18%	-	39%	57%	54%	14%	11%	36%	32%	100%	93%
				RG_ELKMOUTH	Elk River	-	7.1%	29%	0%	96%	0%	25%	0%	0%	25%	0%	11%	-	25%	39%	43%	7.1%	11%	29%	25%	100%	86%

[1] Dissovled oxygen NRQ was calculated as P2.5 / concentration since the concern is with lower oxygen, not higher

[2] Analytes for which monthly NR's were adjusted for either concurrent total suspended solids or turbidity; see methods text for details.

Note: if data were reported as below the laboratory reporting limit, then they were not included in the normal range screening. Only stations with data for at least 8 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months.

Shading indicates frequencies above 2.5%

Table C.16: Total Individual Sample Counts at Each Lotic Water Monitoring Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Non-metals										Non-metals									Total Metals				Total Metals					
							Alkalinity (Total) (as CaCO3)	Bromide (Dissolved)	Dissolved Organic Carbon	Chloride (Dissolved)	Conductivity (Field)	Conductivity (Lab)	Dissolved Oxygen	Fluoride (Dissolved)	Hardness (Total or Dissolved)	Sulphate (as SO4) (Dissolved)	Total Dissolved Solids	Total Kjeldahl Nitrogen	Total Organic Carbon	Total Suspended Solids	Turbidity (Lab)	Nitrate as N	Nitrite as N	Ammonia as N	Ortho-Phosphate	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	12	12	12	12	18	12	18	12	12	12	12	12	12	18	18	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
			M	FR_UFR1	Fording River	E216777	35	35	35	35	40	35	40	35	35	35	35	35	35	41	41	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	2	Fording	T	LC_GRCK	Grace Creek	E288275	12	12	12	12	4	12	12	12	12	12	12	12	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				LC_LC1	Line Creek	E216142	7	7	7	7	11	7	22	7	7	7	7	13	14	20	20	14	13	14	14	7	7	7	7	7	7	7	7	7	7	7
				LC_SLC	South Line Creek	E282149	12	12	12	12	6	12	18	12	12	12	12	18	19	12	12	19	18	19	19	12	12	12	12	12	12	12	12	12	12	12
	3	Elk	M	GH_ER2	Elk River	200389	34	34	33	34	27	34	27	34	34	34	33	33	33	34	34	34	34	33	34	34	34	34	34	34	34	34	34	34	34	34
	4	Michel	M	CM_MC1	Michel Creek	E258175	12	12	12	12	26	12	26	12	12	12	12	12	12	26	26	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				FR_CC1	Clode Creek	E102481	14	14	14	14	26	14	25	14	14	14	14	14	14	31	33	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
				FR_NGD1	Lake Mountain Creek	E105060	12	12	12	12	25	12	26	12	12	12	12	12	12	26	26	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				FR_KC1	Kilmarnock Creek	0200252	12	12	12	12	26	12	26	12	12	12	12	12	12	26	26	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				GH_SC2	Swift Creek	E105061	19	29	19	29	26	19	28	29	29	29	19	19	19	29	29	29	29	29	19	19	19	19	19	19	19	19	29	19	19	19	19
				GH_CC1	Cataract Creek	0200384	24	28	24	28	28	24	27	28	28	28	24	24	24	28	28	28	28	28	24	24	24	24	24	24	24	24	28	24	24	24	24
				GH_PC1	Porter Creek	200385	19	28	19	28	28	18	28	28	28	28	19	19	19	28	28	28	28	28	19	19	19	19	19	19	19	19	28	19	19	19	19
				LC_DCDS	LCO Dry Creek	E295210	29	29	29	29	14	29	29	29	29	29	29	29	28	34	34	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
				LC_DC3	LCO Dry Creek	E288273	28	28	28	28	14	28	29	28	28	28	28	28	27	30	30	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				LC_DC1	LCO Dry Creek	E288270	28	27	28	28	15	27	28	27	28	28	28	28	27	30	30	28	27	27	28	28	28	28	28	28	28	28	28	28	28	28	28
				GH_GH1	Greenhills Creek	E102709	20	29	19	29	28	19	28	29	29	29	20	19	19	31	31	29	29	29	20	20	20	20	20	20	20	20	29	20	20	20	20
			M	FR_FR1	Fording River	0200251	9	9	9	9	25	9	25	9	9	9	9	9	9	31	31	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
				FR_FR2	Fording River	0200201	33	33	33	33	34	33	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
				GH_FR	Fording River	-	17	24	17	24	24	17	24	24	24	24	17	17	17	24	24	24	24	24	17	17	17	17	17	17	17	17	24	17	17	17	17
				FR_FR4	Fording River	-	20	20	20	20	26	20	25	20	20	20	20	20	20	23	23	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
				GH_FR3	Fording River	-	14	24	14	24	24	14	24	24	24	24	14	14	14	24	24	24	24	24	14	14	14	14	14	14	14	14	24	14	14	14	14
				FR_FRCP1	Fording River	E300071	43	41	43	43	43	43	42	43	43	43	43	42	43	41	43	43	42	43	43	43	43	43	43	41	41	43	43	43	43	41	41	43
				GH_PC2	Fording River	E287431	17	27	17	27	26	17	26	27	27	27	17	17	17	27	27	27	27	27	17	17	17	17	17	17	17	17	27	17	17	17	17
				FR_FRABCH	Fording River	-	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
				FR_FR5	Fording River	-	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
				LC_FRUS	Fording River	E295232	9	9	9	9	3	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
				LC_FRB	Fording River	-	11	11	11	11	3	11	11	11	11	11	11	11	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
				GH_FR1	Fording River	0200251	35	35	35	35	28	35	30	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	12	12	12	12	4	12	13	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				LC_LC3	Line Creek	0200337	31	30	31	31	16	31	34	31	31	32	31	32	33	31	31	38	33	32	33	31	31	31	31	30	30	31	31	31	31	31	31	31
				LC_LCDSSLCC	Line Creek	E297110	31	30	31	31	16	31	34	31	34	31	31	32	32	30	30	46	32	31	33	32	31	32	32	31	31	31	31	32	32	32	32	32
				LC_LC4	Line Creek	0200044	29	29	28	29	14	29	30	29	29	29	29	30	30	64	64	31	31	31	31	29	29	29	29	29	29	29	29	29	29	29	29	29
			M	LC_LC6	Fording River	0200338	10	10	10	10	2	10	10	10	10	10	10	10	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
				LC_LC5	Fording River	0200028	31	30	31	31	16	31	31	30	31	31	31	30	30	58	61	31	31	30	31	31	31	31	31	30	30	30	31	31	31	31	31	31
	3	Elk	T	GH_WILLOW	Willow Creek	-	27	27	26	27	26	27	26	27	27	27	26	26	26	27	27	27	27	26	27	27	27	27	27	27	27	27	27	27	27	27	27
				GH_WADE	Wade Creek	E287433	28	28	27	28	25	28	27	28	28	28	27	27	27	28	28	28	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				GH_MC1	Michelson Creek	200388	26	26	25	27	26	26	26	27	27	27	25	25	25	27	27	27	27	26	26	26	26	26	26	26	26	26	26	26	27	26	26	26
				GH_LC2	Leask Creek	-	28	28	27	28	26	28	28	28	28	28	27	27	27	28	28	28	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				GH_WC2	Wolfram Creek	-	18	26	18	26	23	18	25	26	26	26	18	18	18	26	26	26	26	26	18	18	18	18	18	18	18	18	18	18	26	18	18	18
				GH_TC2	Thompson Creek	E207436	20	28	20	28	24	19	26	28	28	28	20	20	20	28	28	28	28	28	20	20	20	20	20	20	20	20	20	20	28	20	20	20
			M	GH_ERC	Elk River	E300090	32	32	31	32	31	32	31	32	32	32	31	31	31	32	32	32	32	30	32	32	32	32	32	32	32	32	32	32	32	32	32	32
				GH_ER1	Elk River	0206661	28	28	27	28	28	28	28	28	28	28	27	27	27	28	27	28	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28
	4	Elk	T	EV_HC6	Harmer Creek	-	21	21	21	21	22	21	22	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
				EV_HC1	Harmer Creek	E102682	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
				EV_GV1	Grave Creek	-	20	20	20	20	21	20	21	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
				EV_SM1	Six Mile Creek	E102681	13	13	13	13	13	13	13	13	13	13	13	13	13	33	33	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
				EV_BLM2	Balmer Creek	E298592	11	11	11	11	11	11	11	11	11	11	11	11	11	25	23	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
				EV_FC1	Fennelon Creek	E298591	19	19	19	19	19	19	17	19	19	19	19	19	19	27	25	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
				EV_GC2	Goddard Creek	E208043	22	22	22	22	22	22	22	22	22	22	22	22	22	62	59	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
				EV_OC1	Otto Creek	E102679	22	22	22	22	22	22	22	22	22	22	22	22	22	30	28	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
			M	EV_ER4	Elk River	0200027	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
				EV_ER2	Elk River	0200111	11	11	11	11	11	11	11	11	11	11	11	11	11	25	23	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11

Table C.16: Total Individual Sample Counts at Each Lotic Water Monitoring Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Non-metals										Non-metals									Total Metals				Total Metals					
							Alkalinity (Total) (as CaCO3)	Bromide (Dissolved)	Dissolved Organic Carbon	Chloride (Dissolved)	Conductivity (Field)	Conductivity (Lab)	Dissolved Oxygen	Fluoride (Dissolved)	Hardness (Total or Dissolved)	Sulphate (as SO4) (Dissolved)	Total Dissolved Solids	Total Kjeldahl Nitrogen	Total Organic Carbon	Total Suspended Solids	Turbidity (Lab)	Nitrate as N	Nitrite as N	Ammonia as N	Ortho-Phosphate	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium
Mine-exposed	4	Michel	T	CM_CC1	Corbin Creek	0200209	28	28	28	28	28	28	28	28	28	28	28	28	28	29	29	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				EV_EC1	Erickson Creek	200097	23	23	23	23	23	23	22	23	23	23	23	23	23	31	29	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
				EV_SP1	South Pit Creek	E296311	13	13	13	13	13	13	13	13	13	13	13	13	13	27	25	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
				EV_MG1	Milligan Pond	E208057	11	11	11	11	11	11	11	11	11	11	11	11	11	25	23	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
				EV_GT1	Gate Creek	E206231	44	40	44	44	44	43	44	43	45	44	44	37	44	44	45	44	42	42	44	45	45	44	45	38	38	45	45	45	44	
				EV_BC1	Bodie Creek	E102685	36	33	37	37	38	37	38	36	37	37	37	32	37	38	38	37	37	37	36	38	37	38	38	34	34	36	38	37	38	
				EV_AQ1	Aqueduct Creek	E210369	18	18	18	18	19	18	18	18	18	18	18	18	18	37	27	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		Upper Michel	M	CM_MC2	Michel Creek	E258937	40	40	40	40	38	40	33	40	40	40	40	40	40	41	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40
				CM_MCTM	Michel Creek	-	11	11	11	11	12	11	12	11	11	11	11	11	11	11	11	11	11	11	6	11	11	11	11	11	11	11	11	11	11	11
		Lower Michel	M	EV_MC3	Michel Creek	0200203	30	30	30	30	30	30	29	30	30	30	30	30	30	31	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
				EV_MC2	Michel Creek	E300091	49	44	49	49	48	49	47	49	50	49	49	49	49	49	49	49	48	49	49	50	50	48	50	45	44	49	49	50	50	
	5	Elk	M	EV_ER1	Elk River	0200393	46	44	48	48	47	48	47	48	49	48	48	45	48	48	48	48	48	46	46	49	47	47	49	45	44	47	48	49	48	
				RG_ELKFERNIE	Elk River	-	28	28	28	28	22	28	26	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				RG_ELKORES	Elk River	E294312	28	28	28	28	22	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				RG_ELKMOUTH	Elk River	-	28	28	28	28	22	28	26	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28

Note: if data were reported as below the laboratory reporting limit, then they were not included in the normal range screening. Only stations with data for at least 8 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months.

Table C.16: Total Individual Sample Counts at Each Lotic Water Monitoring Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Total Metals							Total Metals						Total Metals							Dissolved Metals											
							Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Chromium	Cobalt
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
			M	FR_UFR1	Fording River	E216777	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	2	Fording	T	LC_GRCK	Grace Creek	E288275	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				LC_LC1	Line Creek	E216142	7	7	7	7	7	7	7	7	7	7	14	7	14	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
				LC_SLC	South Line Creek	E282149	12	12	12	12	12	12	12	12	12	12	19	12	19	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	3	Elk	M	GH_ER2	Elk River	200389	34	34	34	34	34	34	34	34	34	34	33	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
	4	Michel	M	CM_MC1	Michel Creek	E258175	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				FR_CC1	Clode Creek	E102481	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
				FR_NGD1	Lake Mountain Creek	E105060	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				FR_KC1	Kilmarnock Creek	0200252	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				GH_SC2	Swift Creek	E105061	19	19	19	19	19	29	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
				GH_CC1	Cataract Creek	0200384	24	24	24	24	24	28	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
				GH_PC1	Porter Creek	200385	19	19	19	19	19	28	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
				LC_DCDS	LCO Dry Creek	E295210	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
				LC_DC3	LCO Dry Creek	E288273	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				LC_DC1	LCO Dry Creek	E288270	28	28	28	28	28	28	28	27	28	28	28	28	28	28	28	28	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				GH_GH1	Greenhills Creek	E102709	20	20	20	20	20	29	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
			M	FR_FR1	Fording River	0200251	9	9	9	9	9	9	9	9	9	9	9	9	12	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
				FR_FR2	Fording River	0200201	33	33	33	33	33	33	33	33	33	33	33	33	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
				GH_FR	Fording River	-	17	17	17	17	17	24	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
				FR_FR4	Fording River	-	20	20	20	20	20	20	20	20	20	20	20	20	24	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
				GH_FR3	Fording River	-	14	14	14	14	14	24	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15	15	15	15	15	15
				FR_FRCP1	Fording River	E300071	42	41	43	41	43	43	43	41	42	43	43	43	43	41	43	42	42	41	42	43	41	42	41	42	42	43	41	41	43	43	41	42	42
				GH_PC2	Fording River	E287431	17	17	17	17	17	27	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
				FR_FRABCH	Fording River	-	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
				FR_FR5	Fording River	-	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
				LC_FRUS	Fording River	E295232	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
				LC_FRB	Fording River	-	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
				GH_FR1	Fording River	0200251	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				LC_LC3	Line Creek	0200337	31	30	31	31	31	31	31	31	31	31	33	30	33	30	31	31	31	30	29	31	30	30	30	31	31	31	30	30	31	31	31	30	30
				LC_LCDSSLCC	Line Creek	E297110	31	31	32	31	32	32	32	32	32	32	33	32	35	31	32	32	31	31	30	32	31	32	31	32	32	32	31	31	31	33	31	31	31
				LC_LC4	Line Creek	0200044	29	29	29	29	29	29	29	29	29	29	31	29	31	29	29	29	29	29	28	29	29	29	28	28	28	28	28	28	28	28	28	28	28
			M	LC_LC6	Fording River	0200338	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
				LC_LC5	Fording River	0200028	30	31	31	31	30	31	31	30	31	31	31	31	31	30	31	31	30	30	29	31	30	31	30	30	30	31	30	30	30	31	30	30	30
	3	Elk	T	GH_WILLOW	Willow Creek	-	27	27	27	27	27	27	27	27	27	27	26	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
				GH_WADE	Wade Creek	E287433	28	28	28	28	28	28	28	28	28	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				GH_MC1	Michelson Creek	200388	26	26	26	26	26	27	26	26	26	26	25	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
				GH_LC2	Leask Creek	-	28	28	28	28	28	28	28	28	28	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				GH_WC2	Wolfram Creek	-	18	18	18	18	18	26	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
				GH_TC2	Thompson Creek	E207436	20	20	20	20	20	28	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
			M	GH_ERC	Elk River	E300090	32	32	32	32	32	32	32	31	32	32	31	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
				GH_ER1	Elk River	0206661	28	28	28	28	28	28	28	28	28	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
	4	Elk	T	EV_HC6	Harmer Creek	-	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
				EV_HC1	Harmer Creek	E102682	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
				EV_GV1	Grave Creek	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
				EV_SM1	Six Mile Creek	E102681	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	10	10	10	10	10	10	10	10	10	10	10	10
				EV_BLM2	Balmer Creek	E298592	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
				EV_FC1	Fennelon Creek	E298591	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
				EV_GC2	Goddard Creek	E208043	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
				EV_OC1	Otto Creek	E102679	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
			M	EV_ER4	Elk River	0200027	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
				EV_ER2	Elk River	0200111	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11

Table C.16: Total Individual Sample Counts at Each Lotic Water Monitoring Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Total Metals							Total Metals						Total Metals							Dissolved Metals											
							Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Chromium	Cobalt
Mine-exposed	4	Michel	T	CM_CC1	Corbin Creek	0200209	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				EV_EC1	Erickson Creek	200097	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
				EV_SP1	South Pit Creek	E296311	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	11	11	11	11	11	11	11	11	11	11	11	11
				EV_MG1	Milligan Pond	E208057	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	9	9	9	9	9	9	9	9	9	9	9	9
				EV_GT1	Gate Creek	E206231	45	44	45	45	45	45	45	38	45	45	44	45	49	42	45	45	45	38	45	45	43	45	39	44	42	43	37	37	42	44	38	44
				EV_BC1	Bodie Creek	E102685	38	38	38	38	38	37	38	34	38	38	37	38	42	35	38	38	38	34	37	38	35	38	33	37	36	37	32	32	37	37	32	37
				EV_AQ1	Aqueduct Creek	E210369	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		Upper Michel	M	CM_MC2	Michel Creek	E258937	40	40	40	40	40	40	40	40	40	40	39	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
				CM_MCTM	Michel Creek	-	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
		Lower Michel	M	EV_MC3	Michel Creek	0200203	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
				EV_MC2	Michel Creek	E300091	46	46	49	49	50	50	50	43	50	50	49	50	56	46	49	48	46	45	48	50	46	46	45	46	49	49	43	43	46	47	48	43
	5	Elk	M	EV_ER1	Elk River	0200393	47	46	49	47	49	49	49	43	49	49	48	49	49	45	49	49	47	44	48	49	46	46	44	44	48	48	42	42	46	47	48	42
				RG_ELKFERNIE	Elk River	-	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				RG_ELKORES	Elk River	E294312	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				RG_ELKMOUTH	Elk River	-	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28

Note: if data were reported as below the laboratory reporting limit, then they were not included in the normal range screening. Only stations with data for at least 8 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months.

Table C.16: Total Individual Sample Counts at Each Lotic Water Monitoring Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Dissolved Metals													Dissolved Metals			
							Copper	Iron	Lead	Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
			M	FR_UFR1	Fording River	E216777	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	2	Fording	T	LC_GRCK	Grace Creek	E288275	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				LC_LC1	Line Creek	E216142	7	7	7	7	7	7	7	7	14	7	7	7	7	7	7	7	7
				LC_SLC	South Line Creek	E282149	12	12	12	12	12	12	12	12	19	12	12	12	12	12	12	12	12
	3	Elk	M	GH_ER2	Elk River	200389	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
	4	Michel	M	CM_MC1	Michel Creek	E258175	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				FR_CC1	Clode Creek	E102481	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
				FR_NGD1	Lake Mountain Creek	E105060	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				FR_KC1	Kilmarnock Creek	0200252	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				GH_SC2	Swift Creek	E105061	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
				GH_CC1	Cataract Creek	0200384	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
				GH_PC1	Porter Creek	200385	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
				LC_DCDS	LCO Dry Creek	E295210	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
				LC_DC3	LCO Dry Creek	E288273	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				LC_DC1	LCO Dry Creek	E288270	28	28	28	28	28	27	28	28	28	28	28	28	28	28	28	28	28
				GH_GH1	Greenhills Creek	E102709	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
			M	FR_FR1	Fording River	0200251	9	9	9	9	9	9	9	9	12	9	9	9	9	9	9	9	9
				FR_FR2	Fording River	0200201	33	33	33	33	33	33	33	33	34	33	33	33	33	33	33	33	33
				GH_FR	Fording River	-	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
				FR_FR4	Fording River	-	20	20	20	20	20	20	20	20	24	20	20	20	20	20	20	20	20
				GH_FR3	Fording River	-	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
				FR_FRCP1	Fording River	E300071	41	41	41	43	43	41	43	43	43	41	42	42	41	42	43	41	41
				GH_PC2	Fording River	E287431	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
				FR_FRABCH	Fording River	-	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
				FR_FR5	Fording River	-	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
				LC_FRUS	Fording River	E295232	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
				LC_FRB	Fording River	-	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
				GH_FR1	Fording River	0200251	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
				LC_LC3	Line Creek	0200337	30	30	30	30	31	31	31	31	33	30	31	31	30	30	31	30	31
				LC_LCDSSLCC	Line Creek	E297110	31	31	31	32	32	31	32	32	34	31	32	32	31	31	32	31	32
				LC_LC4	Line Creek	0200044	28	28	28	28	28	28	28	28	30	28	28	28	28	28	28	28	28
			M	LC_LC6	Fording River	0200338	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
				LC_LC5	Fording River	0200028	30	30	30	31	31	30	31	31	31	30	30	30	30	30	31	30	30
	3	Elk	T	GH_WILLOW	Willow Creek	-	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
				GH_WADE	Wade Creek	E287433	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				GH_MC1	Michelson Creek	200388	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
				GH_LC2	Leask Creek	-	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				GH_WC2	Wolfram Creek	-	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
				GH_TC2	Thompson Creek	E207436	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
			M	GH_ERC	Elk River	E300090	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
				GH_ER1	Elk River	0206661	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
	4	Elk	T	EV_HC6	Harmer Creek	-	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
				EV_HC1	Harmer Creek	E102682	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
				EV_GV1	Grave Creek	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
				EV_SM1	Six Mile Creek	E102681	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
				EV_BLM2	Balmer Creek	E298592	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
				EV_FC1	Fennelon Creek	E298591	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
				EV_GC2	Goddard Creek	E208043	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
				EV_OC1	Otto Creek	E102679	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
			M	EV_ER4	Elk River	0200027	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
				EV_ER2	Elk River	0200111	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11

Table C.16: Total Individual Sample Counts at Each Lotic Water Monitoring Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Dissolved Metals													Dissolved Metals			
							Copper	Iron	Lead	Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
Mine-exposed	4	Michel	T	CM_CC1	Corbin Creek	0200209	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				EV_EC1	Erickson Creek	200097	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
				EV_SP1	South Pit Creek	E296311	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
				EV_MG1	Milligan Pond	E208057	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
				EV_GT1	Gate Creek	E206231	40	38	37	44	44	39	44	44	44	37	43	43	37	43	44	37	44
				EV_BC1	Bodie Creek	E102685	32	32	32	37	37	32	37	37	37	32	37	36	32	36	35	32	34
				EV_AQ1	Aqueduct Creek	E210369	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		Upper Michel	M	CM_MC2	Michel Creek	E258937	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
				CM_MCTM	Michel Creek	-	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
		Lower Michel	M	EV_MC3	Michel Creek	0200203	30	30	30	30	30	29	30	30	30	30	30	30	30	30	30	30	30
				EV_MC2	Michel Creek	E300091	44	44	43	49	49	42	49	49	49	43	48	44	43	45	49	43	43
	5	Elk	M	EV_ER1	Elk River	0200393	43	43	42	48	48	41	48	48	48	42	48	43	42	46	48	42	43
				RG_ELKFERNIE	Elk River	-	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				RG_ELKORES	Elk River	E294312	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
				RG_ELKMOUTH	Elk River	-	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28

Note: if data were reported as below the laboratory reporting limit, then they were not included in the normal range screening. Only stations with data for at least 8 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months.

Table C.17: Normal Range Quotients for Monthly Mean Dissolved Cadmium Concentrations at Each Water Station in 2015 and for the Samples Collected Concurrently with Biological Samples in September 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	January	February	March	April	May	June	July	August	September	October	November	December	Minimum	Median	Maximum	Concurrent with Biological Sampling (September)
Reference	1	Fording	T	FR_HC3	E300096	<0.9	<1	<0.9	<0.4	<0.5	<0.2	<0.4	<0.4	<0.4	<0.5	<0.4	<0.5	<0.2	<0.5	<1	<0.2
			M	FR_UFR1	E216777	<0.9	1.1	1.0	0.7	0.5	0.2	0.6	0.6	0.7	0.5	0.6	0.6	0.2	0.6	1.1	<0.2
	2	Fording	T	LC_GRCK	E288275	<0.9	<1	<0.9	<0.4	<0.5	<0.2	<0.4	<0.4	<0.4	<0.5	<0.4	<0.5	<0.2	<0.5	<1	<0.2
				LC_LC1	E216142	-	-	-	-	<0.5	<0.2	<0.4	<0.4	<0.4	<0.5	<0.4	-	<0.2	<0.4	<0.5	<0.2
				LC_SLC	E282149	1.0	<1	1.0	1.0	0.9	24	0.5	0.6	3.7	0.8	0.8	<2.3	0.5	0.9	24	<0.2
	3	Elk	M	GH_ER2	200389	<0.9	<1	<0.5	0.5	0.5	1.0	0.6	0.5	0.5	0.5	<0.4	0.5	<0.4	0.5	1.0	<0.2
	4	Michel	T	CM_AG1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2
				EV_AC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2
		Michel	M	CM_MC1	E258175	<0.9	<1	<0.9	0.7	<4.5	0.4	0.8	0.6	0.5	0.8	0.7	0.6	0.4	0.6	0.8	<0.2
Mine-exposed	1	Fording	T	FR_HC1	E216778	2.5	3.6	3.0	2.2	0.8	0.5	1.3	1.4	1.7	1.4	1.4	2.6	0.5	1.6	3.6	<0.2
				FR_CC1	E102481	<0.9	31	3.9	<0.4	<0.5	1.5	<0.4	<0.4	<0.4	<0.5	13	39	<0.4	<0.9	39	-
				FR_LMP1	E306924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	2.4	3.1	2.0	4.3	5.1	1.5	1.4	0.8	1.0	1.0	1.3	1.4	0.8	1.5	5.1	-
				FR_KC1	0200252	9.7	<1	21	60	50	18	39	38	48	52	48	53	<1	43	60	41
				GH_SC1	E221329	-	-	2.1	2.0	1.8	-	-	-	-	-	-	-	1.8	2.0	2.1	18
				GH_SC2	E105061	58	48	48	48	32	11	51	48	54	45	33	29	11	48	58	-
				GH_CC1	0200384	14	21	12	17	15	13	37	32	33	23	28	12	12	19	37	47
				GH_PC1	200385	1.7	1.7	1.8	1.8	2.2	1.1	1.6	1.1	1.6	1.7	1.7	1.6	1.1	1.7	2.2	<0.2
				LC_DCDS	E295210	3.2	-	2.9	3.4	3.0	2.1	2.0	0.9	1.9	1.1	1.6	2.2	0.9	2.1	3.4	<0.2
				LC_DC3	E288273	3.7	4.2	3.9	3.8	3.6	2.1	3.1	2.5	3.6	4.0	3.8	3.8	2.1	3.7	4.2	-
				LC_DC1	E288270	-	-	2.1	2.3	2.4	1.3	2.1	2.0	2.3	2.8	2.2	2.3	1.3	2.2	2.8	2.0
				GH_GH1	E102709	1.1	2.0	3.4	4.1	5.1	0.2	0.6	<0.4	<0.4	0.6	<0.4	<0.5	0.2	0.6	5.1	<0.2
			M	FR_FR1	0200251	-	-	1.8	1.3	0.8	0.2	1.1	1.0	1.3	0.9	1.1	-	0.2	1.1	1.8	<0.2
				FR_FRABEC1	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	2.4	1.8
				FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	2.3	<0.2
				FR_FR2	0200201	6.8	7.5	6.3	3.7	1.7	0.8	3.0	3.3	3.3	3.7	4.8	5.8	0.8	3.7	7.5	3.8
				GH_FR3	-	-	6.9	5.1	3.5	2.0	0.6	3.0	2.4	3.9	-	-	-	0.6	3.2	6.9	3.6
				FR_FR4	200311	6.8	5.3	5.3	4.5	2.9	1.4	3.6	2.8	2.3	1.1	5.1	-	1.1	3.6	6.8	2.9
				GH_FR	200311	-	7.5	5.4	3.9	3.7	0.7	3.5	2.8	4.2	-	-	-	0.7	3.8	7.5	-
				FR_FRCP1	E300071	-	2.6	2.2	3.6	2.3	2.0	3.3	3.1	2.8	2.5	3.6	3.1	2.0	2.8	3.6	3.2
				GH_PC2	E287431	3.0	3.4	3.4	3.1	2.9	1.2	2.5	2.1	2.4	2.7	2.4	-	1.2	2.7	3.4	2.9
				FR_FRABCH	0	-	-	2.8	2.9	2.2	1.2	3.0	2.1	2.1	2.8	2.5	-	1.2	2.5	3.0	2.8
				FR_FR5	-	2.1	2.4	2.5	2.2	2.2	1.0	2.5	1.8	1.7	2.0	1.7	-	1.0	2.1	2.5	1.9
				LC_FRUS	E295232	1.8	1.9	1.6	1.9	1.7	0.6	1.2	1.3	1.5	-	-	-	0.6	1.6	1.9	-
				LC_FRB	-	-	1.5	1.6	1.2	1.9	0.8	1.4	1.3	1.5	1.1	1.5	1.3	0.8	1.4	1.9	<0.2
				GH_FR1	0200251	-	1.8	1.9	2.0	1.8	0.7	1.3	1.2	1.6	1.4	1.3	1.5	0.7	1.5	2.0	<0.2
	2	Fording	T	LC_LCUSWLC	E293369	27	30	27	24	27	13	30	28	28	32	32	35	13	28	35	-
				LC_LC3	0200337	27	28	26	27	36	21	48	42	48	45	40	30	21	33	48	35
				LC_LCDSSLCC	E297110	11	7.9	8.0	11	12	7.6	20	19	22	23	16	13	7.6	12	23	18
				LC_LC4	0200044	<0.9	<1	1.0	1.2	3.0	1.9	1.6	0.6	1.1	<0.5	0.9	2.5	<0.5	1.1	3.0	7.4
			M	LC_LC6	0200338	1.0	-	<0.9	1.1	1.6	-	1.1	0.8	1.0	0.6	0.9	<2.3	0.6	1.0	1.6	<0.2
				LC_LC5	0200028	0.9	1.4	1.2	1.6	2.2	1.0	1.3	0.9	1.2	0.9	0.7	<2.3	0.7	1.2	2.2	2.8
	3	Elk	T	GH_BR_F	E287437	-	-	1.3	0.9	1.0	-	-	-	-	-	-	-	0.9	1.0	1.3	-
				GH_WOLF	-	-	-	0.9	0.8	0.8	0.4	0.5	-	-	-	-	-	0.4	0.8	0.9	-
				GH_WILLOW	-	<0.9	1.4	0.7	0.7	0.9	0.4	0.9	0.6	0.8	0.7	<0.4	-	0.4	0.7	1.4	-
				GH_WILLOW_S	-	-	-	1.1	1.4	1.5	0.8	-	-	-	-	-	-	0.8	1.2	1.5	-
				GH_WADE	E287433	1.8	1.2	1.4	1.4	1.4	0.7	1.3	1.1	0.8	0.9	1.1	0.8	0.7	1.1	1.8	-
				GH_COUGAR	E287432	-	-	2.2	2.2	2.7	1.5	-	-	-	-	-	-	1.5	2.2	2.7	-
				GH_MC1	200388	-	1.8	1.9	1.7	2.5	0.6	0.5	<0.4	<0.4	<0.5	<0.4	0.5	<0.4	0.5	2.5	-
				GH_LC2	-	1.5	<1	2.7	3.4	3.1	1.3	0.8	<0.4	2.9	<0.5	3.4	2.2	<0.4	1.8	3.4	-
				GH_LC1	E257796	-	-	-	-	-	-	-	-	<0.4	-	-	-	-	-	0.4	-
				GH_WC2	-	-	-	5.0	1.2	1.7	1.4	<0.4	<0.4	3.7	<0.5	2.8	0.7	<0.4	1.3	5.0	5.2
				GH_WC1	E257795	-	-	-	-	-	-	-	-	-	<0.5	0.9	3.4	<0.5	0.9	3.4	-
				GH_TC2	E207436	2.3	2.5	2.8	1.3	0.9	0.7	<0.4	<0.4	0.4	0.5	0.7	1.3	<0.4	0.8	2.8	<0.2
			M	GH_ERC	E300090	<0.9	<1	0.7	0.7	0.7	0.3	0.5	0.4	<0.4	0.6	0.5	0.6	0.3	0.5	0.7	<0.2
				GH_ER1	0206661	<0.9	<1	0.5	0.8	0.7	0.6	0.5	0.4	0.7	<0.5	0.6	<0.5	0.4	0.6	0.8	<0.2
	4	Elk	T	EV_HC6	-	<0.9	<1	<0.9	<0.4	<0.5	0.3	<0.4	0.4	0.6	<0.5	<0.4	<0.5	0.3	0.3	0.6	<0.2
				EV_HC1	E102682	1.4	1.9	1.6	1.8	1.5	0.7	1.3	0.6	1.0	1.2	1.3	1.3	0.6	1.3	1.9	<0.2
				EV_GV1	-	-	1.3	1.2	0.9	1.0	0.5	0.8	0.8	0.7	0.6	0.9	0.9	0.5	0.9	1.3	<0.2
				EV_SM1	E102681	<0.9	-	-	-	<0.5	<0.2	<0.4	<0.4	<0.4	<0.5	<0.4	<0.5	<0.2	<0.4	<0.9	-
				EV_BLM2	E298592	-	<1	<0.9	0.5	0.9	0.6	0.9	0.7	0.8	0.8	0.5	0.5	0.5	0.7	0.9	-
				EV_FC1	E298591	-	1.3	<0.9	0.7	1.1	0.4	0.5	0.5	0.7	0.7	0.5	<0.5	0.4	0.5	1.3	-
				EV_GC2	E208043	<0.9	3.6	<0.9	3.6	0.5	0.3	<0.4	<0.4	<0.4	<0.5	<0.4	1.4	0.3	0.3	3.6	-
				EV_OC1	E102679	<0.9	<1	<0.9	0.4	0.5	<0.2	<0.4	0.4	<0.4	<0.5	<0.4	<0.5	<0.2	0.4	0.5	<0.2
			M	EV_ER4	0200027	-	4.1	0.5	1.0	1.1	0.5	1.0	0.7	<0.4	0.6	5.2	0.7	<0.4	0.7	5.2	<0.2
				EV_ER2	0200111	-	<1	<0.9	1.0	1.3	0.4	0.8	0.6	0.6	0.8	<0.4	0.5	0.4	0.6	1.3	<0.2
		Michel	T	CM_CC1	0200209	0.9	4.8	4.7	4.4	14	3.2	1.4	1.4	<0.4	1.6	1.4	4.6	<0.4	2.4	14	<0.2
				EV_EC1	200097	<0.9	<1	<0.9	1.1	1.0	0.6	0.7	0.6	0.6	<0.5	0.7	<0.5	<0.5	0.6	1.1	-
				EV_SP1	E296311	72	<1	-	-	1.6	0.2	27	13	5.9	18	12	56	0.2	13	72	-
				EV_MG1	E208057	-	-	-	-	11	4.5	1.1	<0.4	<0.4	<0.5	0.7	7.1	<0.4	0.9	11	-
				EV_GT1	E206231	-	18	18	16	12	8.2	10	32	28	42	5.9	19	5.9	18	42	-
				EV_BC1	E102685	-	-	2.4	3.4	1.9	1.9	4.0	15	2.6	14	1.4	1.7	1.4	2.5	15	18
				EV_AQ1	E210369	-	3.3	<0.9	3.2	3.8	0.8	1.3	<0.4	<0.4	-	1.1	4.6	<0.4	1.2	4.6	-
		Upper Michel	M	CM_MC2	E258937	2.1	1.7	1.7	2.4	3.1	1.4	0.9	0.7	<0.4	0.9	1.1	2.0	<0.4	1.5	3.1	<0.2
				CM_MCTM	-	1.2	1.4	1.0	1.2	<4.5	0.5	0.8	0.9	1.1	0.9	0.8	-	0.5	0.9	1.4	<0.2
		Lower Michel	M	EV_MC3	0200203	1.5	1.6	1.7	1.0	1.7	0.7	0.9	1.1	0.9	1.1	1.4	1.2	0.7	1.2	1.7	<0.2
				EV_MC2	E300091	0.9	3.3	2.0	1.8	2.1	1.7	3.3	3.2	3.4	3.9	2.2	2.4	0.9	2.3	3.9	-
				EV_MC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3
	5	Elk	M	EV_ER1	0200393	<0.9	1.3	1.5	1.2	1.4	0.7	0.6	0.7	0.8	1.1	1.1	1.1	0.6	1.1	1.5	<0.2
				RG_ELKFERNIE	-	1.4	1.8	1.8	1.5	1.2	0.5	1.1	1.0	1.4	0.7	1.4	1.6	0.5	1.4	1.8	<0.2
				RG_ELKORES	E294312	1.1	1.3	1.5	1.2	1.0	0.6	1.3	0.9	0.6	0.9	0.9	0.9	0.6	1.0	1.5	<0.2
				RG_ELKMOUTH	-	<0.9	<1	1.0	1.0	0.9	0.4	0.6	0.5	0.7	0.7	0.8	0.7	0.4	0.7	1.0	<0.2

Maximum Monthly NRQ

Notes: "-" = not data; "ND" = not determined

Table C.18: Normal Range Quotients for Monthly Mean Nitrate-N Concentrations at Each Water Station in 2015 and for the Samples Collected Concurrently with Biological Samples in September, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	January	February	March	April	May	June	July	August	September	October	November	December	Minimum	Median	Maximum	Concurrent with Biological Sampling (September)
Reference	1	Fording	T	FR_HC3	E300096	1.0	1.0	1.0	0.9	1.0	1.3	1.2	1.0	1.1	1.0	1.0	1.0	0.9	1.0	1.3	1.3
			M	FR_UFR1	E216777	0.6	0.6	0.5	0.3	0.1	0.1	<0.1	0.2	0.1	<0.1	0.4	0.6	<0.1	0.2	0.6	0.3
	2	Fording	T	LC_GRCK	E288275	0.3	0.2	0.3	0.2	0.2	<0.1	0.2	0.2	0.1	<0.1	0.2	0.2	<0.1	0.2	0.3	0.1
				LC_LC1	E216142	-	-	-	-	0.9	1.0	0.9	0.7	0.8	0.8	0.5	-	0.5	0.8	1.0	0.8
				LC_SLC	E282149	0.5	0.4	0.4	0.1	0.3	0.4	0.5	0.4	0.4	0.3	0.3	0.4	0.1	0.4	0.5	0.6
	3	Elk	M	GH_ER2	200389	0.4	0.3	0.4	0.3	0.3	0.4	0.3	0.2	0.2	0.2	0.3	0.4	0.2	0.3	0.4	0.2
	4	Michel	T	CM_AG1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2
				EV_AC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
		Michel	M	CM_MC1	E258175	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1
Mine-exposed	1	Fording	T	FR_HC1	E216778	26	29	34	25	8.2	11	21	19	17	15	18	30	8.2	20	34	15
				FR_CC1	E102481	77	103	102	124	123	145	193	152	155	179	212	168	77	148	212	-
				FR_LMP1	E306924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	4.7	5.3	5.7	7.8	6.1	6.5	2.9	2.2	2.3	2.7	3.3	3.8	2.2	4.2	7.8	-
				FR_KC1	0200252	297	357	370	329	239	175	222	176	187	177	207	248	175	230	370	188
				GH_SC1	E221329	-	-	1.7	13	38	-	-	-	-	-	-	-	1.7	13	38	111
				GH_SC2	E105061	146	158	140	87	36	79	149	124	116	124	117	113	36	120	158	-
				GH_CC1	0200384	122	128	122	105	126	181	198	137	131	123	122	113	105	124	198	135
				GH_PC1	200385	10	10	9.6	8.2	15	20	18	12	10	11	11	9.7	8.2	10	20	11
				LC_DCDS	E295210	0.5	-	0.8	1.1	0.8	0.9	0.3	<0.1	<0.1	<0.1	<0.1	0.7	<0.1	0.5	1.1	<0.1
				LC_DC3	E288273	1.0	1.1	1.4	1.2	1.0	1.2	1.2	0.8	0.8	0.7	0.9	1.0	0.7	1.0	1.4	-
				LC_DC1	E288270	-	-	0.5	0.6	0.4	0.5	0.1	<0.1	<0.1	0.1	<0.1	0.3	<0.1	0.2	0.6	0.1
				GH_GH1	E102709	14	13	9.3	5.2	7.2	20	23	17	17	17	17	16	5.2	16	23	19
			M	FR_FR1	0200251	-	-	25	19	7.2	5.7	13	14	13	11	15	-	5.7	13	25	11
				FR_FRABEC1	-	-	-	-	-	-	-	-	-	47	-	-	-	-	-	47	41
				FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	47	-	-	-	-	-	47	39
				FR_FR2	0200201	41	46	47	30	16	20	38	39	42	45	55	62	16	42	62	38
				GH_FR3	-	-	44	46	33	16	20	42	39	41	-	-	-	16	40	46	38
				FR_FR4	200311	47	49	52	37	20	28	55	38	47	50	63	-	20	47	63	39
				GH_FR	200311	-	49	48	34	18	29	45	41	43	-	-	-	18	42	49	-
				FR_FRCP1	E300071	-	83	74	36	31	48	56	46	50	53	70	69	31	53	83	45
				GH_PC2	E287431	71	79	80	56	54	82	125	92	79	69	68	-	54	79	125	73
				FR_FRABCH	0	-	-	75	52	51	76	132	90	73	71	74	-	51	74	132	75
				FR_FR5	-	60	68	70	45	44	63	100	70	60	58	59	-	44	60	100	65
				LC_FRUS	E295232	46	52	55	45	36	37	62	52	45	-	-	-	36	46	62	-
				LC_FRB	-	-	50	54	42	34	35	60	51	41	41	41	39	34	41	60	38
				GH_FR1	0200251	-	46	42	31	33	35	59	45	41	38	38	38	31	38	59	38
	2	Fording	T	LC_LCUSWLC	E293369	71	77	83	53	39	25	59	52	51	69	88	102	25	64	102	-
				LC_LC3	0200337	72	77	77	53	45	47	75	59	59	71	84	88	45	71	88	58
				LC_LCDSSLCC	E297110	46	51	48	34	22	28	46	39	42	45	52	51	22	45	52	40
				LC_LC4	0200044	32	37	34	25	19	22	36	32	31	39	41	44	19	33	44	33
			M	LC_LC6	0200338	40	-	48	37	32	-	56	47	39	37	36	33	32	38	56	37
				LC_LC5	0200028	36	40	40	31	28	36	50	40	35	37	37	34	28	36	50	35
	3	Elk	T	GH_BR_F	E287437	-	-	1.6	0.8	0.4	-	-	-	-	-	-	-	0.4	0.8	1.6	-
				GH_WOLF	-	-	-	3.0	1.7	1.1	1.1	0.8	-	-	-	-	-	0.8	1.1	3.0	-
				GH_WILLOW	-	1.4	1.5	1.0	1.1	1.1	0.9	1.1	0.8	0.6	0.1	1.2	-	0.1	1.1	1.5	-
				GH_WILLOW_S	-	-	-	0.4	0.1	<0.1	<0.1	-	-	-	-	-	-	<0.1	<0.1	0.4	-
				GH_WADE	E287433	1.0	1.5	4.4	3.0	2.0	2.0	1.1	0.5	0.4	0.1	0.5	0.6	0.1	1.0	4.4	-
				GH_COUGAR	E287432	-	-	3.6	3.0	2.1	1.1	-	-	-	-	-	-	1.1	2.5	3.6	-
				GH_MC1	200388	-	0.7	2.2	1.1	28	49	61	45	45	33	35	37	0.7	35	61	-
				GH_LC2	-	177	163	87	50	95	107	106	88	131	136	95	88	50	100	177	-
				GH_LC1	E257796	-	-	-	-	-	-	-	-	52	-	-	-	-	-	52	-
				GH_WC2	-	-	-	76	95	125	175	243	176	126	62	47	43	43	110	243	183
				GH_WC1	E257795	-	-	-	-	-	-	-	-	-	62	47	44	44	47	62	-
				GH_TC2	E207436	48	53	24	14	24	40	51	43	45	46	49	38	14	44	53	47
			M	GH_ERC	E300090	1.5	1.3	1.3	1.3	1.0	0.9	1.0	0.9	1.2	1.4	1.8	2.5	0.9	1.3	2.5	1.1
				GH_ER1	0206661	1.2	1.3	1.5	1.4	1.1	1.0	1.1	1.0	1.2	1.2	1.6	2.2	1.0	1.2	2.2	1.1
	4	Elk	T	EV_HC6	-	0.4	0.4	0.5	0.4	0.5	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.7	4.7
				EV_HC1	E102682	4.7	4.4	4.1	3.6	3.2	4.2	5.3	3.6	3.8	4.2	4.2	4.1	3.2	4.1	5.3	3.9
				EV_GV1	-	-	3.1	3.1	2.5	1.8	2.4	3.3	2.5	2.6	2.6	3.0	2.7	1.8	2.6	3.3	3.5
				EV_SM1	E102681	0.4	0.4	0.3	0.2	0.4	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.2	0.4	-
				EV_BLM2	E298592	-	1.3	1.1	1.0	3.1	2.3	3.2	2.0	1.6	1.2	1.3	0.9	0.9	1.3	3.2	-
				EV_FC1	E298591	-	0.3	0.3	0.1	0.3	0.6	1.6	1.8	1.3	0.4	0.4	0.2	0.1	0.4	1.8	-
				EV_GC2	E208043	4.4	3.1	4.2	4.5	8.1	11	11	7.9	6.5	5.4	4.6	3.2	3.1	5.0	11	-
				EV_OC1	E102679	0.5	0.8	0.6	0.3	0.1	0.2	0.2	<0.1	<0.1	<0.1	0.1	0.3	<0.1	0.2	0.8	0.1
			M	EV_ER4	0200027	-	13	14	12	11	9.8	11	10	9.8	10	11	13	9.8	11	14	11
				EV_ER2	0200111	-	11	11	9.9	10	7.6	9.6	8.6	8.3	8.5	9.5	9.1	7.6	9.5	11	9.3
		Michel	T	CM_CC1	0200209	21	20	17	17	17	25	42	30	28	26	24	25	17	25	42	31
				EV_EC1	200097	40	42	45	38	49	69	73	50	47	44	43	45	38	45	73	-
				EV_SP1	E296311	17	17	19	15	20	31	32	24	23	23	19	18	15	19	32	-
				EV_MG1	E208057	-	-	1.7	2.2	1.4	2.6	0.2	<0.1	0.3	0.1	0.1	1.7	<0.1	0.8	2.6	-
				EV_GT1	E206231	-	52	108	127	149	211	230	164	141	130	131	121	52	131	230	-
				EV_BC1	E102685	-	-	178	133	175	206	227	163	140	130	126	119	119	151	227	151
				EV_AQ1	E210369	-	0.4	<0.1	<0.1	2.6	0.6	0.3	0.1	<0.1	-	<0.1	0.1	<0.1	0.1	2.6	-
		Upper Michel	M	CM_MC2	E258937	8.1	7.8	6.4	5.7	4.7	7.2	16	14	13	9.5	8.7	11	4.7	8.4	16	12
				CM_MCTM	-	4.3	4.4	4.2	3.2	2.3	1.6	4.5	4.6	4.6	3.3	3.9	-	1.6	4.2	4.6	2.8
		Lower Michel	M	EV_MC3	0200203	1.1	0.9	0.9	0.4	0.5	0.9	0.9	0.6	0.8	0.7	1.4	1.2	0.4	0.9	1.4	1.5
				EV_MC2	E300091	4.4	9.4	5.3	5.0	5.2	17	27	23	19	22	11	13	4.4	12	27	-
				EV_MC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
	5	Elk	M	EV_ER1	0200393	7.9	7.4	8.4	7.2	6.6	8.5	11	10	9.4	9.4	8.6	8.7	6.6	8.6	11	10
				RG_ELKFERNIE	-	5.5	6.4	5.1	5.5	6.2	7.6	8.9	6.4	6.4	4.5	5.9	6.3	4.5	6.2	8.9	9.1
				RG_ELKORES	E294312	5.5	5.4	4.1	4.8	5.0	7.3	9.3	7.8	7.9	7.7	6.0	6.4	4.1	6.2	9.3	7.7
				RG_ELKMOUTH	-	3.9	4.1	2.9	3.4	3.6	5.8	8.1	6.1	6.4	6.4	5.0	4.8	2.9	4.9	8.1	6.7

Maximum Monthly NRQ

Notes: "-" = not data; "ND" = not determined

Table C.19: Normal Range Quotients for Monthly Mean Total Selenium Concentrations at Each Water Station in 2015 and for the Samples Collected Concurrently with Biological Samples in September, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	January	February	March	April	May	June	July	August	September	October	November	December	Minimum	Median	Maximum	Concurrent with Biological Sampling (September)
Reference	1	Fording	T	FR_HC3	E300096	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.3	0.4	0.5	0.4
			M	FR_UFR1	E216777	0.3	0.3	0.3	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.4	0.3
	2	Fording	T	LC_GRCK	E288275	1.0	1.0	1.0	1.0	1.0	0.8	0.8	0.8	0.8	0.7	0.8	0.9	0.7	0.9	1.0	0.8
				LC_LC1	E216142	-	-	-	-	0.7	1.0	1.0	1.0	1.0	1.0	1.0	-	0.7	1.0	1.0	1.0
				LC_SLC	E282149	0.5	0.6	0.5	0.4	0.4	0.5	0.5	0.6	0.6	0.5	0.5	0.6	0.4	0.5	0.6	0.8
	3	Elk	M	GH_ER2	200389	0.4	0.4	0.3	0.4	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.5	0.3
	4	Michel	T	CM_AG1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
				EV_AC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
		Michel	M	CM_MC1	E258175	0.1	0.1	0.1	0.1	<0.3	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1
Mine-exposed	1	Fording	T	FR_HC1	E216778	12	13	14	12	5.1	4.9	6.7	8.4	7.3	5.2	7.3	12	4.9	7.8	14	6.0
				FR_CC1	E102481	27	31	30	52	65	63	46	43	39	35	40	35	27	40	65	-
				FR_LMP1	E306924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	7.6	7.4	7.0	8.5	7.9	7.1	6.0	7.6	5.4	5.1	5.9	7.3	5.1	7.2	8.5	-
				FR_KC1	0200252	84	89	84	91	82	59	45	45	47	39	45	67	39	63	91	47
				GH_SC1	E221329	-	-	6.1	44	118	-	-	-	-	-	-	-	6.1	44	118	219
				GH_SC2	E105061	317	273	239	184	121	97	218	239	238	205	214	239	97	228	317	-
				GH_CC1	0200384	279	254	216	243	356	394	317	280	263	215	206	246	206	259	394	238
				GH_PC1	200385	30	27	24	34	51	51	33	32	30	24	24	27	24	30	51	28
				LC_DCDS	E295210	0.5	-	0.5	0.5	0.9	1.0	0.8	0.8	0.7	0.5	0.6	0.7	0.5	0.7	1.0	0.6
				LC_DC3	E288273	0.7	0.6	0.5	0.5	0.9	1.0	0.9	0.8	0.7	0.6	0.7	0.7	0.5	0.7	1.0	-
				LC_DC1	E288270	-	-	0.6	0.6	0.9	1.1	0.8	0.7	0.6	0.5	0.6	0.6	0.5	0.6	1.1	0.6
				GH_GH1	E102709	36	29	22	14	21	38	47	44	43	35	36	41	14	36	47	37
			M	FR_FR1	0200251	-	-	10	6.3	4.1	2.3	4.0	6.2	5.3	4.0	5.7	-	2.3	5.3	10	4.3
				FR_FRABEC1	-	15	-	-	6.8	-	-	8.0	-	13	9.9	-	-	6.8	9.9	15	10
				FR_MULTIPLATE	-	15	-	-	7.0	-	-	7.3	-	12	9.8	-	-	7.0	9.8	15	10
				FR_FR2	0200201	13	15	15	12	7.7	7.2	9.7	11	11	9.6	13	15	7.2	12	15	10
				GH_FR3	-	-	14	14	13	10	5.2	8.6	12	12	-	-	-	5.2	12	14	10
				FR_FR4	200311	24	24	22	18	13	14	16	15	18	15	22	-	13	18	24	15
				GH_FR	200311	-	22	22	19	15	10	17	20	19	-	-	-	10	19	22	-
				FR_FRCP1	E300071	-	120	77	25	18	22	31	35	32	26	61	49	18	32	120	28
				GH_PC2	E287431	36	32	34	30	34	25	32	33	31	24	25	-	24	32	36	30
				FR_FRABCH	0	-	-	28	27	27	30	37	30	30	23	25	-	23	28	37	30
				FR_FR5	-	26	27	26	22	23	25	28	24	23	20	21	-	20	24	28	26
				LC_FRUS	E295232	19	20	20	20	21	15	17	19	17	-	-	-	15	19	21	-
				LC_FRB	-	-	19	19	21	20	14	16	18	17	14	15	16	14	17	21	15
				GH_FR1	0200251	-	19	19	17	19	19	18	19	18	14	16	18	14	18	19	16
	2	Fording	T	LC_LCUSWLC	E293369	21	22	22	15	14	10	14	15	13	12	15	15	10	15	22	-
				LC_LC3	0200337	42	46	37	26	31	27	32	31	28	23	28	23	23	30	46	22
				LC_LCDSSLCC	E297110	27	28	23	17	16	17	21	21	20	18	20	16	16	20	28	16
				LC_LC4	0200044	20	20	16	14	13	13	15	17	16	14	15	14	13	15	20	14
			M	LC_LC6	0200338	17	-	18	17	19	-	16	17	16	13	14	14	13	17	19	15
				LC_LC5	0200028	17	17	16	15	17	16	16	16	16	13	14	13	13	16	17	15
	3	Elk	T	GH_BR_F	E287437	-	-	0.3	0.3	0.4	-	-	-	-	-	-	-	0.3	0.3	0.4	-
				GH_WOLF	-	-	-	0.3	0.3	0.5	0.5	0.3	-	-	-	-	-	0.3	0.3	0.5	-
				GH_WILLOW	-	0.6	0.5	0.3	0.9	2.2	1.7	0.8	0.6	0.6	0.3	0.4	-	0.3	0.6	2.2	-
				GH_WILLOW_S	-	-	-	0.4	0.3	0.4	0.3	-	-	-	-	-	-	0.3	0.4	0.4	-
				GH_WADE	E287433	0.5	0.6	1.0	0.8	0.8	0.8	0.4	0.3	0.4	0.2	0.4	0.4	0.2	0.4	1.0	-
				GH_COUGAR	E287432	-	-	0.2	0.2	0.3	0.3	-	-	-	-	-	-	0.2	0.2	0.3	-
				GH_MC1	200388	-	0.4	1.1	0.6	5.3	8.0	4.3	3.6	2.2	1.1	1.2	5.5	0.4	2.2	8.0	-
				GH_LC2	-	32	25	17	14	52	61	19	38	57	53	28	53	14	35	61	-
				GH_LC1	E257796	-	-	-	-	-	-	-	-	8.1	-	-	-	-	-	8.1	-
				GH_WC2	-	-	-	16	35	47	24	36	32	31	12	11	13	11	28	47	56
				GH_WC1	E257795	-	-	-	-	-	-	-	-	-	13	11	12	11	12	13	-
				GH_TC2	E207436	49	46	21	18	37	46	37	45	45	38	41	39	18	40	49	43
			M	GH_ERC	E300090	0.7	0.6	0.7	0.8	0.9	0.7	0.6	0.6	0.6	0.5	0.6	0.9	0.5	0.6	0.9	0.6
				GH_ER1	0206661	0.7	0.7	0.8	0.9	0.9	0.8	0.6	0.6	0.6	0.5	0.6	0.8	0.5	0.7	0.9	0.6
	4	Elk	T	EV_HC6	-	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	17
				EV_HC1	E102682	15	14	12	14	17	18	15	16	15	13	14	16	12	15	18	15
				EV_GV1	-	-	9.7	8.9	9.2	8.8	10	10	11	11	9.4	9.9	10	8.8	9.9	11	10
				EV_SM1	E102681	0.8	0.8	0.7	0.7	1.5	2.5	1.2	0.9	0.8	0.5	0.5	0.6	0.5	0.8	2.5	-
				EV_BLM2	E298592	-	2.1	1.8	1.7	5.5	4.0	4.2	3.7	3.1	2.4	2.3	1.7	1.7	2.4	5.5	-
				EV_FC1	E298591	-	1.3	1.7	1.2	2.1	2.7	3.4	4.5	4.4	3.2	2.0	1.1	1.1	2.1	4.5	-
				EV_GC2	E208043	7.4	4.7	5.8	9.0	29	35	24	19	15	9.5	8.5	6.6	4.7	9.2	35	-
				EV_OC1	E102679	0.3	0.7	0.6	0.7	0.5	0.5	0.2	0.3	0.1	0.1	0.1	0.3	0.1	0.3	0.7	0.1
			M	EV_ER4	0200027	-	5.7	5.8	6.3	6.2	4.6	3.5	4.6	4.4	3.7	4.6	4.8	3.5	4.6	6.3	4.3
				EV_ER2	0200111	-	5.2	4.8	5.4	7.0	3.8	3.4	4.0	4.1	3.5	4.1	4.1	3.4	4.1	7.0	4.1
		Michel	T	CM_CC1	0200209	6.4	5.1	4.8	5.7	8.9	9.9	8.2	7.5	7.6	5.3	5.3	7.8	4.8	6.9	9.9	6.1
				EV_EC1	200097	53	50	46	55	76	87	62	55	51	43	46	51	43	52	87	-
				EV_SP1	E296311	65	58	57	67	96	128	87	80	74	70	68	80	57	72	128	-
				EV_MG1	E208057	-	-	24	30	46	48	32	32	26	23	22	28	22	29	48	-
				EV_GT1	E206231	-	65	57	51	85	71	72	85	61	53	40	42	40	61	85	-
				EV_BC1	E102685	-	-	50	43	86	66	67	104	63	50	37	38	37	57	104	57
				EV_AQ1	E210369	-	3.3	3.1	5.1	5.8	5.0	2.7	3.1	2.5	-	2.2	1.6	1.6	3.1	5.8	-
		Upper Michel	M	CM_MC2	E258937	2.4	2.0	1.7	2.1	2.5	2.9	3.4	3.9	3.4	2.1	2.0	2.8	1.7	2.5	3.9	2.5
				CM_MCTM	-	1.5	1.4	1.3	1.3	1.2	0.9	1.3	1.5	1.4	1.1	1.2	-	0.9	1.3	1.5	1.0
		Lower Michel	M	EV_MC3	0200203	0.6	0.5	0.5	0.5	0.6	0.8	0.6	0.5	0.5	0.4	0.5	0.6	0.4	0.5	0.8	0.8
				EV_MC2	E300091	4.4	7.8	3.6	2.9	3.8	8.9	11	12	10	9.1	5.0	7.1	2.9	7.4	12	-
				EV_MC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.7
	5	Elk	M	EV_ER1	0200393	4.7	4.1	4.2	4.2	4.4	4.3	4.3	5.3	4.6	4.2	3.7	4.6	3.7	4.3	5.3	4.6
				RG_ELKFERNIE	-	2.6	3.1	1.8	3.1	4.2	3.9	3.2	3.1	2.9	2.4	2.3	2.5	1.8	3.0	4.2	4.1
				RG_ELKORES	E294312	3.4	3.1	2.2	3.1	3.6	3.9	3.8	3.9	3.9	3.4	2.6	3.3	2.2	3.4	3.9	3.7
				RG_ELKMOUTH	-	2.3	2.3	1.5	2.2	2.7	3.1	3.2	3.2	3.2	2.7	2.1	2.5	1.5	2.6	3.2	3.4

Maximum Monthly NRQ

Notes: "-" = not data; "ND" = not determined

Table C.20: Normal Range Quotients for Monthly Mean Sulphate Concentrations at Each Water Station in 2015 and for the Samples Collected Concurrently with Biological Samples in September, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	January	February	March	April	May	June	July	August	September	October	November	December	Minimum	Median	Maximum	Concurrent with Biological Sampling (September)
Reference	1	Fording	T	FR_HC3	E300096	0.9	0.9	0.9	0.9	0.7	0.5	0.7	1.0	0.9	0.9	1.0	1.0	0.5	0.9	1.0	0.9
			M	FR_UFR1	E216777	0.5	0.5	0.5	0.3	0.3	0.4	0.7	0.7	0.7	0.8	0.7	0.6	0.3	0.6	0.8	0.7
	2	Fording	T	LC_GRCK	E288275	0.6	0.6	0.6	0.6	1.0	0.9	1.0	0.8	0.8	0.8	0.8	0.7	0.6	0.8	1.0	0.8
				LC_LC1	E216142	-	-	-	-	0.5	0.3	0.9	1.0	0.8	1.0	1.1	-	0.3	0.9	1.1	0.7
				LC_SLC	E282149	0.7	0.8	0.7	0.4	0.3	0.2	0.7	0.9	0.9	1.0	0.9	0.8	0.2	0.8	1.0	1.0
	3	Elk	M	GH_ER2	200389	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.3
	4	Michel	T	CM_AG1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
				EV_AC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
		Michel	M	CM_MC1	E258175	0.2	0.2	0.1	0.1	0.2	0.1	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.3	0.2
Mine-exposed	1	Fording	T	FR_HC1	E216778	2.0	2.2	2.2	1.9	1.2	1.6	2.0	2.0	1.8	1.8	1.9	2.2	1.2	1.9	2.2	1.7
				FR_CC1	E102481	2.7	2.9	2.8	4.4	7.2	8.1	5.7	4.8	4.1	4.5	4.6	3.7	2.7	4.4	8.1	-
				FR_LMP1	E306924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	1.4	1.5	1.3	1.0	1.2	1.1	1.3	1.8	1.1	1.3	1.4	1.4	1.0	1.3	1.8	-
				FR_KC1	0200252	6.5	7.3	6.8	7.1	7.4	5.6	5.2	5.0	5.2	5.2	5.6	6.4	5.0	6.0	7.4	5.5
				GH_SC1	E221329	-	-	0.7	3.7	15	-	-	-	-	-	-	-	0.7	3.7	15	24
				GH_SC2	E105061	21	21	17	12	9.6	22	29	27	24	27	24	22	9.6	22	29	-
				GH_CC1	0200384	22	22	19	20	41	59	43	34	30	30	28	26	19	29	59	31
				GH_PC1	200385	5.3	5.1	4.3	4.5	8.9	13	9.6	7.7	6.8	7.2	6.9	6.0	4.3	6.8	13	7.1
				LC_DCDS	E295210	<0.1	-	<0.1	<0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	<0.1	0.2	0.3	0.2
				LC_DC3	E288273	0.2	0.2	0.1	<0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	<0.1	0.2	0.3	-
				LC_DC1	E288270	-	-	<0.1	<0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	<0.1	0.2	0.2	0.2
				GH_GH1	E102709	7.0	6.5	4.3	2.6	6.3	14	14	12	11	11	10	9.6	2.6	9.9	14	12
			M	FR_FR1	0200251	-	-	1.7	1.5	1.1	0.9	1.3	1.7	1.5	1.5	1.7	-	0.9	1.5	1.7	1.4
				FR_FRABEC1	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	2.1	2.0
				FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	2.2	2.1
				FR_FR2	0200201	2.7	2.8	2.5	1.7	1.7	2.2	2.8	2.8	2.7	2.9	3.0	3.1	1.7	2.7	3.1	2.5
				GH_FR3	-	-	2.7	2.4	1.9	1.7	2.3	2.9	2.8	2.8	-	-	-	1.7	2.5	2.9	2.5
				FR_FR4	200311	3.6	3.4	3.1	2.4	2.2	2.9	4.3	3.2	3.4	3.7	4.0	-	2.2	3.4	4.3	3.1
				GH_FR	200311	-	3.3	2.9	2.3	2.2	3.0	3.8	3.6	3.4	-	-	-	2.2	3.2	3.8	-
				FR_FRCP1	E300071	-	12	8.2	2.8	2.5	3.9	5.7	5.6	5.0	5.2	8.6	6.5	2.5	5.6	12	4.7
				GH_PC2	E287431	3.8	3.7	3.7	3.3	4.2	5.4	5.7	4.9	4.6	4.7	4.2	-	3.3	4.2	5.7	4.4
				FR_FRABCH	0	-	-	3.2	3.0	3.8	5.0	6.0	5.1	4.4	4.6	4.2	-	3.0	4.4	6.0	4.4
				FR_FR5	-	2.8	3.0	2.9	2.5	3.3	4.3	4.7	4.0	3.6	3.8	3.4	-	2.5	3.4	4.7	3.9
				LC_FRUS	E295232	2.3	2.4	2.4	2.6	3.4	2.7	3.1	2.9	2.8	-	-	-	2.3	2.7	3.4	-
				LC_FRB	-	-	2.3	2.3	2.4	3.2	2.6	3.0	2.9	2.5	2.8	2.7	2.3	2.3	2.6	3.2	2.5
				GH_FR1	0200251	-	2.6	2.6	2.2	3.0	3.4	3.6	3.1	3.2	3.1	3.1	3.1	2.2	3.1	3.6	2.9
	2	Fording	T	LC_LCUSWLC	E293369	3.4	3.4	3.4	2.7	3.1	2.5	3.4	4.0	3.8	3.9	4.2	4.3	2.5	3.4	4.3	-
				LC_LC3	0200337	4.6	4.6	4.1	3.1	4.5	4.8	5.5	5.4	4.8	5.1	5.3	5.3	3.1	4.8	5.5	4.7
				LC_LCDSSLCC	E297110	3.1	3.2	2.7	2.2	2.4	3.1	3.7	3.8	3.6	3.8	3.7	3.8	2.2	3.4	3.8	3.5
				LC_LC4	0200044	2.3	2.5	2.0	1.7	2.1	2.7	3.0	3.3	2.9	3.2	3.0	2.9	1.7	2.8	3.3	3.1
			M	LC_LC6	0200338	2.2	-	2.3	2.4	3.2	-	3.0	2.9	2.7	2.7	2.6	2.3	2.2	2.6	3.2	2.7
				LC_LC5	0200028	2.1	2.2	2.2	2.0	2.7	3.1	3.1	2.9	2.7	2.9	2.7	2.4	2.0	2.7	3.1	2.7
	3	Elk	T	GH_BR_F	E287437	-	-	<0.1	<0.1	0.2	-	-	-	-	-	-	-	<0.1	<0.1	0.2	-
				GH_WOLF	-	-	-	0.1	0.1	0.3	0.5	0.5	-	-	-	-	-	0.1	0.3	0.5	-
				GH_WILLOW	-	0.3	0.2	0.1	0.2	0.6	1.0	0.8	0.7	0.5	0.4	0.3	-	0.1	0.4	1.0	-
				GH_WILLOW_S	-	-	-	<0.1	0.1	0.2	0.3	-	-	-	-	-	-	<0.1	0.1	0.3	-
				GH_WADE	E287433	0.3	0.3	0.3	0.3	0.6	0.8	0.6	0.5	0.4	0.4	0.4	0.4	0.3	0.4	0.8	-
				GH_COUGAR	E287432	-	-	0.1	0.1	0.3	0.4	-	-	-	-	-	-	0.1	0.2	0.4	-
				GH_MC1	200388	-	0.7	0.8	0.7	9.9	18	14	12	11	12	11	12	0.7	11	18	-
				GH_LC2	-	6.7	4.9	3.8	6.3	18	27	15	18	16	17	14	21	3.8	16	27	-
				GH_LC1	E257796	-	-	-	-	-	-	-	-	12	-	-	-	-	-	12	-
				GH_WC2	-	-	-	2.9	4.9	11	15	14	11	11	11	12	12	2.9	11	15	16
				GH_WC1	E257795	-	-	-	-	-	-	-	-	-	12	12	12	12	12	12	-
				GH_TC2	E207436	7.8	7.5	3.8	3.3	8.8	15	14	12	12	12	11	8.5	3.3	9.7	15	12
			M	GH_ERC	E300090	0.3	0.3	0.3	0.3	0.5	0.6	0.5	0.4	0.5	0.6	0.6	0.7	0.3	0.5	0.7	0.5
				GH_ER1	0206661	0.3	0.3	0.3	0.4	0.5	0.6	0.5	0.4	0.5	0.5	0.5	0.6	0.3	0.5	0.6	0.5
	4	Elk	T	EV_HC6	-	0.2	0.2	0.2	0.2	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.2	0.3	3.5
				EV_HC1	E102682	2.6	2.3	2.0	1.9	2.7	4.0	3.8	3.3	3.2	3.5	3.2	2.9	1.9	3.1	4.0	3.2
				EV_GV1	-	-	1.8	1.7	1.5	1.6	2.5	2.7	2.6	2.5	2.6	2.6	2.0	1.5	2.5	2.7	2.5
				EV_SM1	E102681	0.9	1.0	0.8	0.7	1.2	1.3	1.4	1.2	1.1	1.2	1.1	1.0	0.7	1.1	1.4	-
				EV_BLM2	E298592	-	0.5	0.4	0.4	0.9	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.7	1.1	-
				EV_FC1	E298591	-	0.5	0.5	0.4	1.1	1.6	1.5	1.9	1.8	1.7	1.0	0.8	0.4	1.1	1.9	-
				EV_GC2	E208043	3.4	2.4	2.9	3.2	7.2	10	8.0	6.3	5.4	4.8	4.1	3.1	2.4	4.5	10	-
				EV_OC1	E102679	0.9	0.9	0.9	1.1	1.8	2.1	0.9	0.3	0.3	0.2	0.4	0.8	0.2	0.9	2.1	0.4
			M	EV_ER4	0200027	-	1.0	1.0	1.0	1.3	1.3	1.1	1.1	1.1	1.1	1.1	1.2	1.0	1.1	1.3	1.2
				EV_ER2	0200111	-	1.0	0.9	1.0	1.5	1.1	1.1	1.1	1.0	1.1	1.1	1.1	0.9	1.1	1.5	1.1
		Michel	T	CM_CC1	0200209	7.0	6.4	4.9	5.0	8.4	13	14	11	10	11	9.1	9.2	4.9	9.2	14	11
				EV_EC1	200097	8.3	8.1	8.0	8.3	16	21	15	12	11	11	9.5	9.7	8.0	10	21	-
				EV_SP1	E296311	7.3	7.7	7.0	7.2	16	24	16	14	12	13	10	9.4	7.0	11	24	-
				EV_MG1	E208057	-	-	4.3	4.1	8.8	11	9.7	9.2	8.3	8.7	8.0	6.3	4.1	8.5	11	-
				EV_GT1	E206231	-	8.6	9.1	8.4	18	22	18	18	14	14	11	10	8.4	14	22	-
				EV_BC1	E102685	-	-	8.5	8.1	17	21	17	18	14	14	10	9.2	8.1	14	21	13
				EV_AQ1	E210369	-	0.6	0.6	0.7	1.3	1.6	0.9	0.6	0.5	-	1.4	1.0	0.5	0.8	1.6	-
		Upper Michel	M	CM_MC2	E258937	3.0	2.8	1.9	1.9	2.5	4.0	6.1	6.2	5.3	4.9	3.7	4.4	1.9	3.8	6.2	4.8
				CM_MCTM	-	1.7	1.6	1.4	1.2	1.1	0.7	1.9	2.4	2.1	1.8	1.8	-	0.7	1.7	2.4	1.2
		Lower Michel	M	EV_MC3	0200203	0.5	0.5	0.4	0.3	0.4	0.8	0.8	0.7	0.7	0.7	0.8	0.6	0.3	0.7	0.8	1.0
				EV_MC2	E300091	1.1	1.5	0.9	0.8	1.1	2.8	3.2	3.4	2.7	3.1	1.7	2.0	0.8	1.8	3.4	-
				EV_MC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
	5	Elk	M	EV_ER1	0200393	0.9	0.9	0.9	0.9	1.1	1.4	1.3	1.4	1.3	1.3	1.2	1.2	0.9	1.2	1.4	1.3
				RG_ELKFERNIE	-	0.6	0.7	0.5	0.6	1.0	1.3	1.1	1.0	0.9	1.0	0.8	0.8	0.5	0.8	1.3	1.3
				RG_ELKORES	E294312	0.8	0.7	0.5	0.6	0.9	1.3	1.3	1.2	1.2	1.2	1.0	1.0	0.5	1.0	1.3	1.2
				RG_ELKMOUTH	-	0.6	0.6	0.4	0.5	0.7	1.0	1.1	1.0	1.0	1.0	0.8	0.8	0.4	0.8	1.1	1.0

Maximum Monthly NRQ

Notes: "-" = not data; "ND" = not determined

Table C.21: Normal Range and Hazard Quotients for Maximum Monthly Mean Concentrations at Each Lotic Water Station, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Normal Range Quotients				Hazard Quotients			
							Dissolved Cadmium	Nitrate-N	Total Selenium	Sulphate	Dissolved Cadmium	Nitrate-N	Total Selenium	Sulphate
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	<1	1.3	0.5	1.0	<0.1	<0.1	<0.1	0.2
			M	FR_UFR1	Fording River	E216777	1.1	0.6	0.4	0.8	<0.1	<0.1	<0.1	0.1
	2	Fording	T	LC_GRCK	Grace Creek	E288275	<1	0.3	1.0	1.0	<0.1	<0.1	0.1	0.1
				LC_LC1	Line Creek	E216142	<0.5	1.0	1.0	1.1	<0.1	<0.1	0.1	0.2
				LC_SLC	South Line Creek	E282149	24	0.5	0.6	1.0	2.1	<0.1	<0.1	0.2
	3	Elk	M	GH_ER2	Elk River	200389	1.0	0.4	0.5	0.4	0.1	<0.1	<0.1	<0.1
	4	Michel	M	CM_MC1	Michel Creek	E258175	0.8	0.1	0.1	0.3	<0.3	<0.1	<0.1	<0.1
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	3.6	34	14	2.2	0.1	0.8	0.5	0.5
				FR_CC1	Clode Creek	E102481	39	212	65	8.1	1.3	3.9	1.8	0.8
				FR_LMP1	Lake Mountain Creek	E306924	-	-	-	-	-	-	-	-
				FR_NGD1	Lake Mountain Creek	E105060	5.1	7.8	8.5	1.8	0.2	0.3	0.3	0.3
				FR_KC1	Kilmarnock Creek	0200252	60	370	91	7.4	2.2	6.6	3.3	1.5
				GH_SC1	Swift Creek	E221329	2.1	38	118	15	0.1	0.6	2.7	1.5
				GH_SC2	Swift Creek	E105061	58	158	317	29	2.1	2.9	11.1	4.2
				GH_CC1	Cataract Creek	0200384	37	198	394	59	1.5	2.4	9.8	4.5
				GH_PC1	Porter Creek	200385	2.2	20	51	13	<0.1	0.2	1.2	1.1
				LC_DCDS	LCO Dry Creek	E295210	3.4	1.1	1.0	0.3	0.4	0.1	<0.1	<0.1
				LC_DC3	LCO Dry Creek	E288273	4.2	1.4	1.0	0.3	0.5	0.1	<0.1	<0.1
				LC_DC1	LCO Dry Creek	E288270	2.8	0.6	1.1	0.2	0.2	<0.1	<0.1	<0.1
				GH_GH1	Greenhills Creek	E102709	5.1	23	47	14	0.2	0.3	1.5	1.6
			M	FR_FR1	Fording River	0200251	1.8	25	10	1.7	<0.1	0.7	0.4	0.4
				FR_FRABEC1	Fording River	-	-	47	15	2.1	<0.1	1.2	0.5	0.3
				FR_MULTIPLATE	Fording River	-	-	47	15	2.2	<0.1	1.1	0.5	0.3
				GH_FR3	Fording River	-	6.9	46	14	2.9	0.2	0.9	0.5	0.5
				FR_FR4	Fording River	-	6.8	63	24	4.3	0.2	1.2	0.9	0.7
				GH_FR3	Fording River	-	7.5	49	22	3.8	0.2	0.9	0.8	0.7
				FR_FRCP1	Fording River	E300071	3.6	83	120	12	0.1	1.5	4.4	2.3
				GH_PC2	Fording River	E287431	3.4	125	36	5.7	0.1	1.5	1.3	0.8
				FR_FRABCH	Fording River	-	3.0	132	37	6.0	0.1	1.4	1.1	0.7
				FR_FR5	Fording River	-	2.5	100	28	4.7	0.1	1.3	1	0.6
				LC_FRUS	Fording River	E295232	1.9	62	21	3.4	<0.1	1.1	0.7	0.5
				LC_FRB	Fording River	-	1.9	60	21	3.2	<0.1	1.1	0.7	0.5
				GH_FR1	Fording River	0200251	2.0	59	19	3.6	<0.1	0.9	0.7	0.6
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	35	102	22	4.3	1.2	2	3.1	0.7
				LC_LC3	Line Creek	0200337	48	88	46	5.5	1.9	1.7	6.2	0.9
				LC_LCDSSLCC	Line Creek	E297110	23	52	28	3.8	0.8	1	3.8	0.6
				LC_LC4	Line Creek	0200044	3.0	44	20	3.3	0.2	1	2.7	0.5
			M	LC_LC6	Fording River	0200338	1.6	56	19	3.2	<0.1	0.9	2.5	0.5
				LC_LC5	Fording River	0200028	2.2	50	17	3.1	<0.1	0.9	2.4	0.5
	3	Elk	T	GH_BR_F	Branch F Creek	E287437	1.3	1.6	0.4	0.2	<0.1	0.1	<0.1	<0.1
				GH_WOLF	Wolf Creek	-	0.9	3.0	0.5	0.5	<0.1	0.3	<0.1	<0.1
				GH_WILLOW	Willow Creek	-	1.4	1.5	2.2	1.0	<0.1	0.1	0.2	<0.1
				GH_WILLOW_S	Willow Creek	-	1.5	0.4	0.4	0.3	<0.1	<0.1	<0.1	<0.1
				GH_WADE	Wade Creek	E287433	1.8	4.4	1.0	0.8	<0.1	0.4	0.1	<0.1
				GH_COUGAR	Cougar Creek	E287432	2.7	3.6	0.3	0.4	0.1	0.3	<0.1	<0.1
				GH_MC1	Michelson Creek	200388	2.5	61	8.0	18	<0.1	3.7	0.7	2.1
				GH_LC2	Leask Creek	-	3.4	177	61	27	0.1	17.1	7.7	3.6
				GH_LC1	Leask Creek	E257796	-	52	8.1	12	<0.1	4.3	1	1.6
				GH_WC2	Wolfram Creek	-	5.0	243	47	15	0.2	13.2	4.5	2
				GH_WC1	Wolfram Creek	E257795	3.4	62	13	12	0.1	5.6	1.8	2
				GH_TC2	Thompson Creek	E207436	2.8	53	49	15	<0.1	4.9	6.3	1.7
			M	GH_ERC	Elk River	E300090	0.7	2.5	0.9	0.7	<0.1	0.3	0.1	0.1
				GH_ER1	Elk River	0206661	0.8	2.2	0.9	0.6	<0.1	0.2	0.1	0.1
	4	Elk	T	EV_HC6	Harmer Creek	-	0.6	0.7	0.3	0.3	<0.1	<0.1	<0.1	<0.1
				EV_HC1	Harmer Creek	E102682	1.9	5.3	18	4.0	<0.1	0.5	2.1	0.5
				EV_GV1	Grave Creek	-	1.3	3.3	11	2.7	<0.1	0.3	1.4	0.4
				EV_SM1	Six Mile Creek	E102681	<0.9	0.4	2.5	1.4	<0.1	<0.1	0.2	0.2
				EV_BLM2	Balmer Creek	E298592	0.9	3.2	5.5	1.1	<0.1	0.2	0.5	0.1
				EV_FC1	Fennelon Creek	E298591	1.3	1.8	4.5	1.9	<0.1	0.1	0.5	0.3
				EV_GC2	Goddard Creek	E208043	3.6	11	35	10	0.1	0.6	2.5	0.8
				EV_OC1	Otto Creek	E102679	0.5	0.8	0.7	2.1	<0.1	<0.1	0.1	0.2
			M	EV_ER4	Elk River	0200027	5.2	14	6.3	1.3	0.2	1.3	0.8	0.2
				EV_ER2	Elk River	0200111	1.3	11	7.0	1.5	<0.1	1	0.7	0.2
		Michel	T	CM_CC1	Corbin Creek	0200209	14	42	9.9	14	0.5	2.5	1	1.6
				EV_EC1	Erickson Creek	200097	1.1	73	87	21	<0.1	4.5	7	1.7
				EV_SP1	South Pit Creek	E296311	72	32	128	24	2.5	2.1	10.5	1.9
				EV_MG1	Milligan Pond	E208057	11	2.6	48	11	0.4	0.2	3.8	1.3
				EV_BC1	Bodie Creek	E102685	15	227	104	21	0.7	16	11.5	2.2
				EV_AQ1	Aqueduct Creek	E210369	4.6	2.6	5.8	1.6	0.2	0.2	0.6	0.2
		Upper Michel	M	CM_MC2	Michel Creek	E258937	3.1	16	3.9	6.2	0.1	1.1	0.4	0.8
				CM_MCTM	Michel Creek	-	1.4	4.6	1.5	2.4	<0.2	0.4	0.2	0.3
		Lower Michel	M	EV_MC3	Michel Creek	0200203	1.7	1.4	0.8	0.8	0.1	0.1	<0.1	0.1
				EV_MC2	Michel Creek	E300091	3.9	27	12	3.4	0.1	2	1.3	0.4
				EV_MC1	Michel Creek	-	-	-	-	-	-	-	-	-
	5	Elk	M	EV_ER1	Elk River	0200393	1.5	11	5.3	1.4	<0.1	0.9	0.6	0.2
				RG_ELKFERNIE	Elk River	-	1.8	8.9	4.2	1.3	<0.1	0.6	0.4	0.1
				RG_ELKORES	Elk River	E294312	1.5	9.3	3.9	1.3	<0.1	0.7	0.5	0.2
				RG_ELKMOUTH	Elk River	-	1.0	8.1	3.2	1.1	<0.1	0.6	0.4	0.1

Good (Quotient < 0.7)
Marginal (Quotient between 0.7 and 1.0)
Poor (Quotient > 1.0)

Table C.22: Maximum Normal Range and Maximum Hazard Quotients for Dissolved Cadmium, Nitrate-N, Total Selenium, and Sulphate for Samples Collected at Lentic Areas in May, August, and Concurrently with Other Samples, 2015

Management Unit	Main Watershed	Exposure Type	Biological Area Description	Biological Area Code	Maximum Normal Range Quotient				Maximum Hazard Quotient			
					Dissolved Cadmium	Nitrate-N	Total Selenium	Sulphate	Dissolved Cadmium	Nitrate-N	Total Selenium	Sulphate
1	Fording	Reference	Lake Mountain Lake	LML	2.4	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1
		Mine-exposed	Henretta Lake	HE27	1.9	-	8.2	2.0	<0.1	-	0.2	<0.1
			Fording River Oxbow	FO10-SP1 (now lotic)	2.7	97	35	4.6	0.1	6.4	1.0	<0.1
			Lower Fording River Oxbow	FOXL	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			Meadow area u/s Chauncey Creek	FMUCK	2.6	94	35	4.9	0.1	6.2	1.0	<0.1
			Fording River wetland d/s Ewin Creek	FWDEC	0.6	0.4	0.5	0.6	<0.1	<0.1	<0.1	<0.1
			Off channel area of Fording River d/s Greenhills	R5-1	**<1.8**	0.2	2.2	7.6	<0.1	<0.1	<0.1	<0.1
2	Elk	Mine-exposed	Lentic area off Fording River d/s Josephine Falls	R5-3	0.7	34	13	2.5	<0.1	3.3	1.5	<0.1
3	Elk	Reference	Unnamed Wetland near Elk River north of Elkford	REFF	**<1.8**	<0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1
		Mine-exposed	Elk River Upper Ponds	ERUP	0.1	<0.1	0.2	0.5	<0.1	<0.1	<0.1	<0.1
			Upper Elk River Oxbow	EROU	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4	Elk	Reference	Leach Creek Oxbow	LCHO	1.4	<0.1	0.4	<0.1	0.2	<0.1	<0.1	<0.1
		Mine-exposed	Elk River Wetland Downstream of Grave Creek	ELWDGC	1.0	0.9	1.6	1.3	<0.1	0.3	0.2	<0.1
			Goddard Marsh (and lower Goddard Pond decant)	GO13	<0.1	8.3	30	7.0	<0.1	2.8	2.5	<0.1
			Otto Creek wetlands	OTTO	2.3	0.1	0.9	2.6	<0.1	<0.1	<0.1	<0.1
			Michel Creek Wetland	MI16	0.5	1.4	0.8	2.0	<0.1	0.5	<0.1	<0.1
			Michel Oxbow #2	MIC2	1.6	0.8	0.8	1.4	0.1	0.3	<0.1	<0.1
			Lower Michel Wetland	MIWW	2.3	0.2	0.6	0.9	0.1	<0.1	<0.1	<0.1
5	Elk	Reference	Unnamed Wetland near Morrissey	UNWNMO	0.9	0.3	0.4	0.9	<0.1	0.1	<0.1	<0.1
		Mine-exposed	Stanford Pond	STPD	0.6	3.4	3.4	0.9	<0.1	1.1	0.3	<0.1
			Lower Elk River Oxbow (d/s Fernie)	EROL	0.8	3.0	1.8	0.7	<0.1	1.0	0.2	<0.1
			Elko Resevoir	ELKO	0.9	-	4.2	1.3	<0.1	-	0.5	<0.1
N/A	Elk	Reference	Elk Lakes	EL14	**<1.8**	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Flathead		Flathead Side Channel	FLA1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes: "-" = no data

Bold: Poor detection limit (shading based on highest NRQ for Nitrate-N, Total Selenium, and Sulphate)

Good (Quotient < 0.7)

Marginal (Quotient between 0.7 and 1.0)

Poor (Quotient > 1.0)

Table C.23: Maximum Normal Range Quotient for Individual Samples when Normal Range Limit was Greater than Sample-specific SSBM/ Guideline [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	SSBM					Acute			Chronic							
							Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total) [2]	Aluminum (Dissolved)	Barium (Total)	Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [3]
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	-	-	-	-	-	-	-	-	-	-	-	-	0.09	-	-	-
			M	FR_UFR1	Fording River	E216777	-	-	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-
	2	Fording	T	LC_GRCK	Grace Creek	E288275	-	-	-	-	-	-	-	-	-	-	-	-	0.20	-	-	-
				LC_LC1	Line Creek	E216142	-	-	-	-	-	-	-	0.15	-	-	-	-	0.77	-	-	1.0
				LC_SLC	South Line Creek	E282149	-	-	-	-	-	-	-	0.84	-	-	1.0	-	3.1	-	-	3.5
	3	Elk	M	GH_ER2	Elk River	200389	-	-	-	-	-	-	-	0.41	-	-	-	-	0.83	-	-	-
	4	Michel	M	CM_MC1	Michel Creek	E258175	-	-	-	-	-	-	-	0.67	-	-	-	-	0.69	-	-	0.72
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	-	-	-	-	-	-	-	-	-	-	-	-	0.11	-	-	-
				FR_CC1	Clode Creek	E102481	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	-
				FR_NGD1	Lake Mountain Creek	E105060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_KC1	Kilmarnock Creek	0200252	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				GH_SC2	Swift Creek	E105061	-	-	-	-	-	-	-	-	-	-	-	-	0.07	-	-	-
				GH_CC1	Cataract Creek	0200384	-	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-
				GH_PC1	Porter Creek	200385	-	-	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-
				LC_DCDS	LCO Dry Creek	E295210	-	-	-	-	-	-	-	0.86	-	-	-	-	0.98	-	-	3.6
				LC_DC3	LCO Dry Creek	E288273	-	-	-	-	-	-	-	0.53	-	-	-	-	0.51	-	-	3.8
				LC_DC1	LCO Dry Creek	E288270	-	-	-	-	-	-	-	-	-	-	-	-	0.25	-	-	3.1
				GH_GH1	Greenhills Creek	E102709	-	-	-	-	-	-	-	-	-	-	-	-	0.08	-	-	-
			M	FR_FR1	Fording River	0200251	-	-	-	-	-	-	-	-	-	-	-	-	0.09	-	-	-
				FR_FR2	Fording River	0200201	-	-	-	-	-	-	-	-	-	-	-	-	0.18	-	-	-
				GH_FR	Fording River	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	-	-	-
				FR_FR4	Fording River	-	-	-	-	-	-	-	-	-	-	-	-	-	0.08	-	-	-
				GH_FR3	Fording River	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-
				FR_FRCP1	Fording River	E300071	-	-	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-
				GH_PC2	Fording River	E287431	-	-	-	-	-	-	-	-	-	-	-	-	0.11	-	-	-
				FR_FRABCH	Fording River	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	-	-	-
				FR_FR5	Fording River	-	-	-	-	-	-	-	-	-	-	-	-	-	0.09	-	-	-
				LC_FRUS	Fording River	E295232	-	-	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-
				LC_FRB	Fording River	-	-	-	-	-	-	-	-	-	-	-	-	-	0.13	-	-	-
				GH_FR1	Fording River	0200251	-	-	-	-	-	-	-	-	-	-	-	-	0.17	-	-	-
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	-	-	-	-	-	-	-	-	-	-	-	-	0.08	-	-	-
				LC_LC3	Line Creek	0200337	-	-	-	-	-	-	-	-	-	-	-	-	0.08	-	-	0.44
				LC_LCDSSLCC	Line Creek	E297110	-	-	-	-	-	-	-	0.50	-	-	0.60	-	1.9	-	-	-
				LC_LC4	Line Creek	0200044	-	-	-	-	-	-	-	0.27	-	-	-	-	0.31	-	-	5.5
			M	LC_LC6	Fording River	0200338	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				LC_LC5	Fording River	0200028	-	-	-	-	-	-	-	-	-	-	-	-	0.27	-	-	20
				GH_WILLOW	Willow Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	0.13	-	-	-
	3	Elk	T	GH_WADE	Wade Creek	E287433	-	-	-	-	-	-	-	0.91	-	-	0.9	-	1.4	-	-	4.3
				GH_MC1	Michelson Creek	200388	-	-	-	-	-	-	-	2.6	-	-	0.6	-	0.75	-	-	6.0
				GH_LC2	Leask Creek	-	-	-	-	-	-	-	-	4.9	-	-	3	-	4.9	-	-	19
				GH_WC2	Wolfram Creek	-	-	-	-	-	-	-	-	2.7	-	-	0.6	-	1.3	-	-	11
				GH_TC2	Thompson Creek	E207436	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			M	GH_ERC	Elk River	E300090	-	-	-	-	-	-	-	0.46	-	-	-	-	0.93	-	-	-
				GH_ER1	Elk River	0206661	-	-	-	-	-	-	-	0.44	-	-	-	-	0.80	-	-	-

Table C.23: Maximum Normal Range Quotient for Individual Samples when Normal Range Limit was Greater than Sample-specific SSBM/ Guideline [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	SSBM					Acute			Chronic							
							Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total) [2]	Aluminum (Dissolved)	Barium (Total)	Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [3]
Mine-exposed	4	Elk	T	EV_HC6	Harmer Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15	-	-	-
				EV_HC1	Harmer Creek	E102682	-	-	-	-	-	-	-	0.51	-	-	-	-	0.67	-	-	0.84
				EV_GV1	Grave Creek	-	-	-	-	-	-	-	-	1.1	-	-	1.5	-	1.8	-	-	7.4
				EV_SM1	Six Mile Creek	E102681	-	-	-	-	-	-	-	0.41	-	-	-	-	0.66	-	-	0.40
				EV_BLM2	Balmer Creek	E298592	-	-	-	-	-	-	-	0.82	-	-	1.2	-	1.3	-	-	1.6
				EV_FC1	Fennelon Creek	E298591	-	-	-	-	-	-	-	1.2	-	-	-	-	0.49	-	-	10
				EV_GC2	Goddard Creek	E208043	-	-	-	-	-	-	-	0.25	-	-	-	-	0.09	-	-	0.55
				EV_OC1	Otto Creek	E102679	-	-	-	-	-	-	-	-	-	-	-	-	0.09	-	-	-
			M	EV_ER4	Elk River	0200027	-	-	-	-	-	-	-	0.42	-	-	-	-	0.98	-	-	-
				EV_ER2	Elk River	0200111	-	-	-	-	-	-	-	0.37	-	-	0.50	-	1.2	-	-	-
		Michel	T	CM_CC1	Corbin Creek	0200209	-	-	-	-	-	-	-	0.21	-	-	-	-	0.22	-	-	-
				EV_EC1	Erickson Creek	200097	-	-	-	-	-	-	-	-	-	-	-	-	0.09	-	-	-
				EV_SP1	South Pit Creek	E296311	-	-	-	-	-	-	-	-	-	-	-	-	0.08	-	-	0.43
				EV_MG1	Milligan Pond	E208057	-	-	-	-	-	-	-	-	-	-	-	-	0.21	-	-	0.35
				EV_GT1	Gate Creek	E206231	-	-	-	-	-	-	-	0.18	-	-	-	-	0.06	-	-	-
				EV_BC1	Bodie Creek	E102685	-	-	-	-	-	-	-	-	-	-	-	-	0.06	-	-	-
				EV_AQ1	Aqueduct Creek	E210369	-	-	-	-	-	-	-	1.6	-	-	-	-	0.30	-	-	19
		Upper Michel	M	CM_MC2	Michel Creek	E258937	-	-	-	-	-	-	-	1.2	-	-	-	-	0.79	-	-	5.4
				CM_MCTM	Michel Creek	-	-	-	-	-	-	-	-	0.51	-	-	1.1	-	1.6	-	-	-
		Lower Michel	M	EV_MC3	Michel Creek	0200203	-	-	-	-	-	-	-	0.60	-	-	0.75	-	1.5	-	-	6.0
				EV_MC2	Michel Creek	E300091	-	-	-	-	-	-	-	1.5	-	-	1.0	-	1.9	-	-	5.2
				EV_ER1	Elk River	0200393	-	-	-	-	-	-	-	0.75	-	-	0.90	-	1.8	-	-	5.4
	5	Elk	M	RG_ELKFERNIE	Elk River	-	-	-	-	-	-	-	-	0.47	-	-	-	-	0.70	-	-	-
				RG_ELKORES	Elk River	E294312	-	-	-	-	-	-	-	0.58	-	-	-	-	0.75	-	-	-
				RG_ELKMOUTH	Elk River	-	-	-	-	-	-	-	-	0.61	-	-	-	-	0.80	-	-	0.67

[1] Only stations with data for at least 7 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM / guideline. Only constituents that had at least one SSBM/ guideline exceedance are reported.

[2] For total iron, normal ranges were adjusted for total suspended solids for each month. Refer to methods for details.

[3] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.23: Maximum Normal Range Quotient for Individual Samples when Normal Range Limit was Greater than Sample-specific SSBM/ Guideline [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Chronic						
							Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	-	-	-	-	-	-	-
			M	FR_UFR1	Fording River	E216777	-	-	-	-	-	-	-
	2	Fording	T	LC_GRCK	Grace Creek	E288275	-	-	-	-	-	-	-
				LC_LC1	Line Creek	E216142	-	-	-	-	-	-	-
				LC_SLC	South Line Creek	E282149	-	-	-	-	-	-	-
	3	Elk	M	GH_ER2	Elk River	200389	-	-	-	-	-	-	-
	4	Michel	M	CM_MC1	Michel Creek	E258175	-	-	-	-	-	-	1.0
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	-	-	-	-	-	-	-
				FR_CC1	Clode Creek	E102481	-	-	-	-	-	-	-
				FR_NGD1	Lake Mountain Creek	E105060	-	-	-	-	-	-	-
				FR_KC1	Kilmarnock Creek	0200252	-	-	-	-	-	-	-
				GH_SC2	Swift Creek	E105061	-	-	-	-	-	-	-
				GH_CC1	Cataract Creek	0200384	-	-	-	-	-	-	-
				GH_PC1	Porter Creek	200385	-	-	-	-	-	-	-
				LC_DCDS	LCO Dry Creek	E295210	-	-	-	-	-	-	-
				LC_DC3	LCO Dry Creek	E288273	-	-	-	-	-	-	-
				LC_DC1	LCO Dry Creek	E288270	-	-	-	-	-	-	-
				GH_GH1	Greenhills Creek	E102709	-	-	-	-	-	-	-
			M	FR_FR1	Fording River	0200251	-	-	-	-	-	-	-
				FR_FR2	Fording River	0200201	-	-	-	-	-	-	-
				GH_FR	Fording River	-	-	-	-	-	-	-	-
				FR_FR4	Fording River	-	-	-	-	-	-	-	-
				GH_FR3	Fording River	-	-	-	-	-	-	-	-
				FR_FRCP1	Fording River	E300071	-	-	-	-	-	-	-
				GH_PC2	Fording River	E287431	-	-	-	-	-	-	-
				FR_FRABCH	Fording River	-	-	-	-	-	-	-	-
				FR_FR5	Fording River	-	-	-	-	-	-	-	-
				LC_FRUS	Fording River	E295232	-	-	-	-	-	-	-
				LC_FRB	Fording River	-	-	-	-	-	-	-	-
				GH_FR1	Fording River	0200251	-	-	-	-	-	-	-
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	-	-	-	-	-	-	-
				LC_LC3	Line Creek	0200337	-	-	-	-	-	-	-
				LC_LCDSSLCC	Line Creek	E297110	-	-	-	-	-	-	-
				LC_LC4	Line Creek	0200044	-	-	-	-	-	-	-
			M	LC_LC6	Fording River	0200338	-	-	-	-	-	-	-
				LC_LC5	Fording River	0200028	-	-	-	-	-	-	-
				GH_WILLOW	Willow Creek	-	-	-	-	-	-	-	-
				GH_WADE	Wade Creek	E287433	-	-	-	-	-	-	-
	3	Elk	T	GH_MC1	Michelson Creek	200388	-	-	-	-	-	-	-
				GH_LC2	Leask Creek	-	-	-	-	-	-	-	-
				GH_WC2	Wolfram Creek	-	-	-	-	-	-	-	-
				GH_TC2	Thompson Creek	E207436	-	-	-	-	-	-	-
			M	GH_ERC	Elk River	E300090	-	-	-	-	-	-	-
				GH_ER1	Elk River	0206661	-	-	-	-	-	-	-

Table C.23: Maximum Normal Range Quotient for Individual Samples when Normal Range Limit was Greater than Sample-specific SSBM/ Guideline [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Chronic						
							Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Mine-exposed	4	Elk	T	EV_HC6	Harmer Creek	-	-	-	-	-	-	-	-
				EV_HC1	Harmer Creek	E102682	-	-	-	-	-	-	-
				EV_GV1	Grave Creek	-	-	-	-	-	-	-	-
				EV_SM1	Six Mile Creek	E102681	-	-	-	-	-	-	-
				EV_BLM2	Balmer Creek	E298592	-	-	-	-	-	-	-
				EV_FC1	Fennelon Creek	E298591	-	-	-	-	-	-	-
				EV_GC2	Goddard Creek	E208043	-	-	-	-	-	-	-
				EV_OC1	Otto Creek	E102679	-	-	-	-	-	-	-
			M	EV_ER4	Elk River	0200027	-	-	-	-	-	-	-
				EV_ER2	Elk River	0200111	-	-	-	-	-	-	-
		Michel	T	CM_CC1	Corbin Creek	0200209	-	-	-	-	-	-	-
				EV_EC1	Erickson Creek	200097	-	-	-	-	-	-	-
				EV_SP1	South Pit Creek	E296311	-	-	-	-	-	-	-
				EV_MG1	Milligan Pond	E208057	-	-	-	-	-	-	-
				EV_GT1	Gate Creek	E206231	-	-	-	-	-	-	-
				EV_BC1	Bodie Creek	E102685	-	-	-	-	-	-	-
				EV_AQ1	Aqueduct Creek	E210369	-	-	-	-	-	-	-
		Upper Michel	M	CM_MC2	Michel Creek	E258937	-	-	-	-	-	-	-
				CM_MCTM	Michel Creek	-	-	-	-	-	-	-	-
		Lower Michel	M	EV_MC3	Michel Creek	0200203	-	-	-	-	-	-	-
				EV_MC2	Michel Creek	E300091	-	-	-	-	-	-	-
				EV_ER1	Elk River	0200393	-	-	-	-	-	-	-
	5	Elk	M	RG_ELKFERNIE	Elk River	-	-	-	-	-	-	-	-
				RG_ELKORES	Elk River	E294312	-	-	-	-	-	-	-
				RG_ELKMOUTH	Elk River	-	-	-	-	-	-	-	-

[1] Only stations with data for at least 7 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM / guideline. Only constituents that had at least one SSBM/ guideline exceedance are reported.

[2] For total iron, normal ranges were adjusted for total suspended solids for each month. Refer to methods for details.

[3] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.24: Maximum Hazard Quotient (or Normal Range Quotient if Normal Range Exceeded Sample-specific SSBM/ Guideline) for Individual Samples at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	SSBM					Acute			Chronic							
							Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total) [2]	Aluminum (Dissolved)	Barium (Total)	Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [3]
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0.06	0.20	<0.05	0.02	0.24	0.04	0.04	0.02	<0.06	0.01	<0.77	0.01	0.27	<0.03	<0.11	<8
			M	FR_UFR1	Fording River	E216777	0.03	0.11	0.06	0.01	0.25	0.05	<0.03	0.10	0.37	0.09	<0.77	0.01	0.46	<0.03	0.10	<8
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0.01	0.13	<0.04	0.14	0.24	0.04	<0.03	0.32	<0.06	0.07	<0.77	0.01	0.34	0.04	0.09	<8
				LC_LC1	Line Creek	E216142	0.06	0.17	<0.04	0.15	0.23	0.12	<0.03	0.15	0.13	0.05	<0.77	0.01	0.77	0.09	0.30	1.0
				LC_SLC	South Line Creek	E282149	0.02	0.15	1.7	0.08	0.26	0.39	1.5	0.84	9.8	0.07	1.0	0.01	3.1	0.39	0.43	3.5
	3	Elk	M	GH_ER2	Elk River	200389	0.04	0.06	0.43	0.06	0.23	0.11	0.90	0.41	4.6	0.05	<0.77	0.01	2.1	0.09	0.21	<8
	4	Michel	M	CM_MC1	Michel Creek	E258175	0.01	0.03	0.08	0.01	0.22	0.26	0.11	0.67	1.7	0.06	<1.9	0.01	0.69	0.14	0.60	0.72
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0.84	0.48	0.12	0.56	0.52	0.04	<0.03	0.10	0.91	0.04	<0.77	0.01	0.35	0.05	0.06	<8
				FR_CC1	Clode Creek	E102481	3.9	0.84	1.3	1.8	1.1	0.11	<0.03	0.03	0.07	0.23	<0.77	0.02	0.15	0.71	0.08	<8
				FR_NGD1	Lake Mountain Creek	E105060	0.29	0.29	0.24	0.29	0.41	0.07	<0.03	0.11	0.14	0.19	<0.77	0.01	0.20	0.04	0.07	<8
				FR_KC1	Kilmarnock Creek	0200252	6.6	1.5	2.2	3.3	1.8	0.03	<0.03	<0.01	<0.06	0.04	<0.77	0.02	0.16	0.03	0.10	<8
				GH_SC2	Swift Creek	E105061	2.9	4.2	2.3	11	3.2	0.06	<0.06	0.09	0.21	0.03	<1.5	0.02	0.29	<0.05	0.13	<8
				GH_CC1	Cataract Creek	0200384	2.4	4.5	1.6	9.8	3.5	0.06	<0.06	0.02	<0.06	0.03	2.1	0.05	<0.2	<0.05	<0.1	7.0
				GH_PC1	Porter Creek	200385	0.25	1.1	0.08	1.3	0.92	0.06	<0.03	0.03	<0.06	0.09	<0.77	0.01	0.45	<0.03	<0.05	<8
				LC_DCDS	LCO Dry Creek	E295210	0.12	0.03	0.90	0.03	0.16	0.18	0.11	1.2	2.2	0.19	<3.8	0.01	2.3	0.16	0.58	6.0
				LC_DC3	LCO Dry Creek	E288273	0.15	0.03	0.47	0.03	0.16	0.16	0.08	1.0	1.2	0.14	0.92	0.01	1.5	0.18	1.0	3.8
				LC_DC1	LCO Dry Creek	E288270	0.06	0.02	0.19	0.03	0.20	0.07	0.04	0.40	0.61	0.20	<3.8	0.01	0.75	0.04	0.49	3.1
				GH_GH1	Greenhills Creek	E102709	0.39	1.6	0.18	1.5	1.3	0.08	<0.03	0.46	0.20	0.07	<0.77	0.03	0.88	0.58	0.14	<8
			M	FR_FR1	Fording River	0200251	0.67	0.36	0.06	0.38	0.38	0.03	<0.03	0.04	<0.06	0.06	<0.77	0.01	0.22	<0.03	<0.09	<8
				FR_FR2	Fording River	0200201	1.2	0.58	0.26	0.59	0.64	0.05	0.09	0.24	0.17	0.11	<0.77	0.02	0.47	0.05	0.23	<8
				GH_FR	Fording River	-	0.98	0.75	0.24	1.0	0.78	0.06	0.04	0.49	0.25	0.10	<0.77	0.02	0.92	0.08	<0.1	<8
				FR_FR4	Fording River	-	1.2	0.71	0.24	0.97	0.73	0.05	0.07	0.22	0.13	0.10	<0.77	0.02	0.36	0.05	0.14	<8
				GH_FR3	Fording River	-	0.96	0.58	0.22	0.59	0.64	0.06	<0.03	0.43	0.16	0.10	<0.77	0.02	0.82	0.08	<0.1	<8
				FR_FRCP1	Fording River	E300071	2.0	3.5	0.29	7.1	2.6	0.05	0.07	0.28	0.08	0.10	<1.5	0.04	0.46	0.06	0.11	<8
				GH_PC2	Fording River	E287431	1.5	0.80	0.13	1.3	0.86	0.06	<0.03	0.47	0.13	0.12	<0.77	0.02	0.76	0.07	0.05	<8
				FR_FRABCH	Fording River	-	1.4	0.69	0.12	1.1	0.76	0.05	<0.03	0.31	<0.06	0.12	<0.77	0.02	0.48	0.05	0.06	<8
				FR_FR5	Fording River	-	1.3	0.61	0.11	0.99	0.68	0.05	<0.03	0.35	<0.06	0.14	<0.77	0.02	0.63	0.05	0.06	<8
				LC_FRUS	Fording River	E295232	1.1	0.49	0.07	0.74	0.57	0.04	<0.03	0.14	<0.06	0.13	<0.77	0.02	0.22	<0.03	<0.05	<8
				LC_FRB	Fording River	-	1.1	0.48	0.07	0.73	0.56	0.04	<0.03	0.17	<0.06	0.14	<0.77	0.02	0.23	0.03	0.05	<8
				GH_FR1	Fording River	0200251	0.90	0.62	0.08	0.79	0.65	0.05	<0.03	0.30	<0.06	0.13	<0.77	0.02	0.55	0.05	0.05	<8
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	2.0	0.74	1.2	3.1	0.79	0.04	<0.14	0.09	0.09	0.10	<3.8	0.03	0.31	0.06	0.09	<8
				LC_LC3	Line Creek	0200337	2.4	0.95	2.2	6.2	0.98	0.04	<0.14	0.05	<0.1	0.09	<3.8	0.10	0.26	0.04	0.08	0.44
				LC_LCDSSLCC	Line Creek	E297110	1.1	0.66	0.84	3.8	0.69	0.24	<0.14	0.50	0.25	0.09	0.60	0.05	1.9	0.28	0.42	<8
				LC_LC4	Line Creek	0200044	0.95	0.50	0.37	2.7	0.56	0.43	<0.14	2.6	0.16	0.09	1.2	0.04	8.5	0.28	0.28	5.5
			M	LC_LC6	Fording River	0200338	0.93	0.48	0.05	2.5	0.56	0.03	<0.14	0.15	<0.1	0.12	<3.8	0.02	0.22	<0.13	0.05	<8
				LC_LC5	Fording River	0200028	0.87	0.48	0.11	2.4	0.55	0.05	0.04	0.26	0.11	0.11	<3.8	0.02	0.52	0.05	0.65	20
	3	Elk	T	GH_WILLOW	Willow Creek	-	0.14	0.08	0.05	0.27	0.29	0.06	0.06	0.35	0.60	0.28	<0.77	0.01	0.46	0.06	0.13	<8
				GH_WADE	Wade Creek	E287433	0.45	0.07	0.10	0.16	0.36	0.28	0.45	3.2	7.3	0.21	1.2	0.01	4.7	0.39	0.51	4.3
				GH_MC1	Michelson Creek	200388	3.7	2.1	0.09	1.1	1.5	0.49	0.06	4.2	0.46	0.35	2.3	0.05	5.2	2.1	0.84	6.0
				GH_LC2	Leask Creek	-	17	3.6	0.21	7.7	2.6	4.3	0.69	55	8.0	1.6	16	0.08	32	15	7.7	145
				GH_WC2	Wolfram Creek	-	14	2.0	0.23	4.8	1.6	0.45	0.36	4.2	4.7	0.21	2.4	0.05	8.0	4.2	0.84	11
				GH_TC2	Thompson Creek	E207436	4.9	1.7	0.16	6.3	1.4	0.08	0.09	0.52	0.25	0.09	<0.77	0.13	0.79	0.08	0.13	<8
			M	GH_ERC	Elk River	E300090	0.25	0.12	0.04	0.12	0.23	0.14	0.03	0.46	0.45	0.07	<0.77	0.01	1.5	0.14	0.27	<8
				GH_ER1	Elk River	0206661	0.22	0.11	0.22	0.13	0.22	0.15	0.69	0.44	5.1	0.07	<0.77	0.01	1.6	0.12	0.24	<8

Table C.24: Maximum Hazard Quotient (or Normal Range Quotient if Normal Range Exceeded Sample-specific SSBM/ Guideline) for Individual Samples at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	SSBM					Acute			Chronic							
							Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total) [2]	Aluminum (Dissolved)	Barium (Total)	Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [3]
Mine-exposed	4	Elk	T	EV_HC6	Harmer Creek	-	0.05	0.04	0.04	0.04	0.17	0.05	<0.03	0.03	0.06	0.05	<0.77	0.01	0.40	<0.03	<0.11	<8
				EV_HC1	Harmer Creek	E102682	0.45	0.52	0.08	2.1	0.54	0.14	<0.03	0.51	0.56	0.07	<0.77	0.01	0.67	0.17	0.31	0.84
				EV_GV1	Grave Creek	-	0.31	0.40	0.06	1.4	0.48	0.43	0.04	1.1	0.31	0.10	1.5	0.01	2.2	0.74	0.91	7.4
				EV_SM1	Six Mile Creek	E102681	0.04	0.20	<0.03	0.18	0.35	0.07	<0.03	0.43	0.31	0.10	<0.77	0.01	0.95	0.06	0.13	0.87
				EV_BLM2	Balmer Creek	E298592	0.24	0.11	0.07	0.46	0.29	0.34	0.06	0.82	0.64	0.17	1.2	0.01	1.3	0.57	0.72	3.0
				EV_FC1	Fennelon Creek	E298591	0.13	0.25	0.05	0.53	0.46	0.28	0.05	1.2	0.50	0.14	1.2	0.01	3.0	0.33	0.50	10
				EV_GC2	Goddard Creek	E208043	0.65	0.78	0.15	2.6	0.75	0.09	<0.03	0.46	0.42	0.13	<0.77	0.18	1.3	0.13	0.22	1.8
				EV_OC1	Otto Creek	E102679	0.08	0.21	0.02	0.12	0.49	0.33	0.05	1.5	0.12	0.48	<0.77	0.25	1.3	0.14	0.17	0.66
			M	EV_ER4	Elk River	0200027	1.4	0.22	0.38	0.88	0.34	0.19	<0.14	0.42	0.18	0.08	<3.8	0.02	1.9	0.17	0.36	0.98
				EV_ER2	Elk River	0200111	1.0	0.19	0.05	0.70	0.32	0.20	<0.03	0.37	0.12	0.07	0.50	0.02	1.2	0.19	0.30	<8
		Michel	T	CM_CC1	Corbin Creek	0200209	2.5	1.6	0.85	1.0	1.3	0.17	<0.14	0.21	0.22	0.07	<1.9	0.05	0.45	0.98	0.10	<8
				EV_EC1	Erickson Creek	200097	4.5	1.7	0.06	7.0	1.4	0.07	<0.03	0.01	<0.06	0.07	<0.77	0.03	2.5	<0.03	0.05	<8
				EV_SP1	South Pit Creek	E296311	2.1	1.9	2.5	10	1.6	0.04	<0.03	0.09	0.17	0.02	<0.77	0.01	0.69	0.03	0.08	0.43
				EV_MG1	Milligan Pond	E208057	0.21	1.3	0.36	3.8	1.0	0.12	<0.03	0.15	0.19	0.10	<0.77	0.01	0.26	0.07	0.48	0.73
				EV_GT1	Gate Creek	E206231	16	2.3	1.7	11	1.9	0.14	0.08	0.62	0.61	0.21	<1.5	0.19	6.3	0.68	0.24	0.46
				EV_BC1	Bodie Creek	E102685	23	2.3	0.67	15	2.0	0.12	<0.03	0.57	0.20	0.30	<0.77	0.40	1.2	0.65	0.22	0.49
				EV_AQ1	Aqueduct Creek	E210369	0.20	0.22	0.19	0.65	0.80	0.43	<0.03	1.6	0.29	0.44	1.5	1.3	3.5	0.65	0.91	19
		Upper Michel	M	CM_MC2	Michel Creek	E258937	1.3	0.94	0.20	0.58	0.86	0.24	0.08	1.2	0.64	0.10	1.1	0.03	2.6	0.43	0.41	5.4
				CM_MCTM	Michel Creek	-	0.42	0.33	0.07	0.20	0.38	0.48	0.07	0.51	1.3	0.08	1.1	0.02	1.6	0.41	0.63	<8
		Lower Michel	M	EV_MC3	Michel Creek	0200203	0.13	0.12	0.17	0.09	0.23	0.28	0.13	0.60	1.8	0.12	0.75	0.02	2.0	0.31	0.92	6.0
				EV_MC2	Michel Creek	E300091	2.0	0.45	0.17	1.5	0.54	0.40	0.11	4.3	0.92	0.17	1.8	0.08	6.1	0.57	1.2	5.2
	5	Elk	M	EV_ER1	Elk River	0200393	0.98	0.22	0.14	0.76	0.33	0.34	0.09	3.5	1.0	0.15	1.4	0.03	5.1	0.47	0.78	5.4
				RG_ELKFERNIE	Elk River	-	0.62	0.15	0.08	0.48	0.36	0.14	0.07	0.47	0.51	0.12	1.2	0.08	1.3	0.11	0.22	<8
				RG_ELKORES	Elk River	E294312	0.69	0.18	0.11	0.50	0.34	0.13	0.23	0.58	2.1	0.10	<0.77	0.03	1.6	0.13	0.27	<8
				RG_ELKMOUTH	Elk River	-	0.57	0.15	0.07	0.40	0.31	0.16	0.12	0.93	1.5	0.10	<0.77	0.02	1.5	0.16	0.35	0.67

Shading indicates values that are Normal Range Quotients.

[1] Only stations with data for at least 7 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM / guideline. Only constituents that had at least one SSBM/ guideline exceedance are reported.

[2] For total iron, normal ranges were adjusted for total suspended solids for each month. Refer to methods for details.

[3] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.24: Maximum Hazard Quotient (or Normal Range Quotient if Normal Range Exceeded Sample-specific SSBM/ Guideline) for Individual Samples at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Chronic						
							Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	<0.005	<0.05	0.01	<0.007	<0.01	0.11	<0.14
			M	FR_UFR1	Fording River	E216777	<0.004	<0.05	0.01	<0.007	0.04	0.06	0.06
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0.00	<0.05	<0.01	0.01	0.02	0.14	<0.05
				LC_LC1	Line Creek	E216142	0.05	0.08	0.01	0.50	0.05	0.18	1.8
				LC_SLC	South Line Creek	E282149	0.05	0.09	<0.009	0.07	0.20	0.22	0.29
	3	Elk	M	GH_ER2	Elk River	200389	0.01	<0.05	0.02	0.01	0.04	0.10	0.17
	4	Michel	M	CM_MC1	Michel Creek	E258175	0.03	0.05	0.03	0.44	0.09	0.03	1.0
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0.02	0.39	0.02	<0.007	0.02	0.18	0.02
				FR_CC1	Clode Creek	E102481	0.28	8.3	3.5	0.01	0.07	0.79	0.08
				FR_NGD1	Lake Mountain Creek	E105060	0.03	0.78	0.40	0.03	0.05	0.18	0.04
				FR_KC1	Kilmarnock Creek	0200252	0.13	0.43	<0.008	<0.007	0.04	1.3	0.03
				GH_SC2	Swift Creek	E105061	0.46	1.5	0.11	0.01	0.07	2.0	0.05
				GH_CC1	Cataract Creek	0200384	0.38	0.28	0.01	<0.01	0.08	2.5	0.02
				GH_PC1	Porter Creek	200385	0.01	<0.25	0.01	<0.007	0.02	0.60	0.02
				LC_DCDS	LCO Dry Creek	E295210	0.03	0.11	0.01	0.88	0.08	0.06	0.85
				LC_DC3	LCO Dry Creek	E288273	0.03	0.18	0.02	0.56	0.08	0.05	0.67
				LC_DC1	LCO Dry Creek	E288270	0.01	1.8	0.01	0.01	0.02	0.05	0.28
				GH_GH1	Greenhills Creek	E102709	0.24	5.1	0.27	0.01	0.03	1.0	0.03
			M	FR_FR1	Fording River	0200251	0.01	0.26	0.01	<0.007	<0.0125	0.15	<0.06
				FR_FR2	Fording River	0200201	0.02	0.92	0.09	0.01	0.02	0.34	0.08
				GH_FR	Fording River	-	0.03	0.82	0.04	0.01	0.03	0.41	0.05
				FR_FR4	Fording River	-	0.03	0.91	0.07	<0.007	0.02	0.39	0.03
				GH_FR3	Fording River	-	0.02	0.89	0.04	0.01	0.03	0.33	0.04
				FR_FRCP1	Fording River	E300071	0.21	0.50	0.07	<0.01	0.04	1.8	0.03
				GH_PC2	Fording River	E287431	0.02	0.26	0.01	0.01	0.02	0.39	0.03
				FR_FRABCH	Fording River	-	0.01	0.28	0.02	<0.007	0.02	0.33	0.03
				FR_FR5	Fording River	-	0.01	0.28	0.01	<0.007	0.02	0.28	0.02
				LC_FRUS	Fording River	E295232	0.01	0.41	0.01	0.02	0.01	0.24	<0.02
				LC_FRB	Fording River	-	0.01	0.32	0.01	0.11	<0.0125	0.23	<0.02
				GH_FR1	Fording River	0200251	0.03	0.63	0.01	<0.007	0.01	0.30	0.02
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	0.10	0.03	<0.007	<0.03	0.03	0.65	0.13
				LC_LC3	Line Creek	0200337	0.10	0.17	0.01	<0.03	0.03	0.74	0.13
				LC_LCDSSLCC	Line Creek	E297110	0.05	0.17	<0.01	0.03	0.12	0.49	0.65
				LC_LC4	Line Creek	0200044	0.08	0.15	0.01	0.05	0.19	0.40	0.33
			M	LC_LC6	Fording River	0200338	0.01	0.59	0.01	<0.03	<0.06	0.24	<0.06
				LC_LC5	Fording River	0200028	0.01	0.39	0.01	<0.03	0.10	0.26	0.05
	3	Elk	T	GH_WILLOW	Willow Creek	-	0.01	0.11	<0.01	<0.007	0.01	0.08	0.05
				GH_WADE	Wade Creek	E287433	0.03	<0.05	0.02	0.06	0.13	0.18	0.15
				GH_MC1	Michelson Creek	200388	0.62	0.47	0.02	0.08	0.22	2.0	0.09
				GH_LC2	Leask Creek	-	1.9	3.2	0.12	0.54	1.7	2.3	1.4
				GH_WC2	Wolfram Creek	-	0.89	0.63	0.03	0.05	0.32	1.8	0.11
				GH_TC2	Thompson Creek	E207436	0.04	0.23	0.07	0.01	0.03	0.60	0.03
			M	GH_ERC	Elk River	E300090	0.02	<0.05	0.01	0.01	0.06	0.11	0.18
				GH_ER1	Elk River	0206661	0.02	<0.05	0.03	0.01	0.05	0.11	0.17

Table C.24: Maximum Hazard Quotient (or Normal Range Quotient if Normal Range Exceeded Sample-specific SSBM/ Guideline) for Individual Samples at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Chronic						
							Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Mine-exposed	4	Elk	T	EV_HC6	Harmer Creek	-	<0.005	<0.05	<0.008	<0.007	0.03	0.09	0.18
				EV_HC1	Harmer Creek	E102682	0.02	0.18	0.02	0.02	0.06	0.36	0.24
				EV_GV1	Grave Creek	-	0.06	0.10	0.01	0.04	0.20	0.27	0.43
				EV_SM1	Six Mile Creek	E102681	0.01	0.06	<0.01	0.01	0.03	0.07	0.05
				EV_BLM2	Balmer Creek	E298592	0.04	<0.05	0.12	0.05	0.11	0.04	0.37
				EV_FC1	Fennelon Creek	E298591	0.03	<0.25	0.03	0.03	0.13	0.07	0.14
				EV_GC2	Goddard Creek	E208043	0.02	0.08	0.04	0.02	0.04	0.40	0.03
				EV_OC1	Otto Creek	E102679	0.02	0.03	0.28	0.01	0.04	0.09	0.05
			M	EV_ER4	Elk River	0200027	0.03	0.09	0.02	0.02	0.06	0.16	0.24
				EV_ER2	Elk River	0200111	0.02	0.10	<0.01	0.02	0.07	0.15	0.21
		Michel	T	CM_CC1	Corbin Creek	0200209	0.30	2.4	0.78	0.01	0.06	0.83	0.19
				EV_EC1	Erickson Creek	200097	0.02	0.33	<0.01	<0.007	0.03	0.82	0.00
				EV_SP1	South Pit Creek	E296311	0.30	0.70	<0.007	<0.007	0.24	1.3	0.07
				EV_MG1	Milligan Pond	E208057	0.03	0.13	0.04	0.01	0.04	0.38	0.03
				EV_GT1	Gate Creek	E206231	0.47	2.0	0.49	0.02	0.16	1.6	0.08
				EV_BC1	Bodie Creek	E102685	0.47	2.0	0.50	0.03	0.16	1.6	0.07
				EV_AQ1	Aqueduct Creek	E210369	0.08	0.04	0.07	0.10	0.16	0.14	0.16
		Upper Michel	M	CM_MC2	Michel Creek	E258937	0.11	2.4	0.02	0.01	0.11	0.43	0.24
				CM_MCTM	Michel Creek	-	0.07	0.14	0.01	0.03	0.23	0.17	0.90
		Lower Michel	M	EV_MC3	Michel Creek	0200203	0.06	0.13	0.02	1.1	0.13	0.08	2.4
				EV_MC2	Michel Creek	E300091	0.08	0.20	0.02	0.08	0.19	0.25	0.75
	5	Elk	M	EV_ER1	Elk River	0200393	0.06	0.14	0.01	0.06	0.18	0.16	0.61
				RG_ELKFERNIE	Elk River	-	0.02	0.32	0.01	0.07	0.05	0.13	0.13
				RG_ELKORES	Elk River	E294312	0.02	0.26	0.03	0.05	0.05	0.14	0.17
				RG_ELKMOUTH	Elk River	-	0.02	0.18	0.01	0.02	0.06	0.12	0.22

Shading indicates values that are Normal Range Quotients.

[1] Only stations with data for at least 7 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM / guideline. Only constituents that had at least one SSBM/ guideline exceedance are reported.

[2] For total iron, normal ranges were adjusted for total suspended solids for each month. Refer to methods for details.

[3] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.25: Frequency (%) of Individual Samples Exceeding a SSBM or Guideline at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Number of Parameters Exceeding a Guideline	Site-Specific Benchmark					Acute			Chronic							
								Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total)	Aluminum (Dissolved)	Barium (Total)	Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [2]
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	FR_UFR1	Fording River	E216777	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC1	Line Creek	E216142	3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	14%	0%	0%	14%
				LC_SLC	South Line Creek	E282149	7	0%	0%	8.3%	0%	0%	0%	8.3%	8.3%	8.3%	0%	8.3%	0%	8.3%	0%	0%	8.3%
	3	Elk	M	GH_ER2	Elk River	200389	2	0%	0%	0%	0%	0%	0%	0%	0%	2.9%	0%	0%	0%	8.8%	0%	0%	0%
	4	Michel	M	CM_MC1	Michel Creek	E258175	5	0%	0%	0%	0%	0%	0%	0%	8.3%	8.3%	0%	0%	0%	8.3%	0%	0%	8.3%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_CC1	Clode Creek	E102481	7	100%	0%	7.1%	93%	7.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_NGD1	Lake Mountain Creek	E105060	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_KC1	Kilmarnock Creek	0200252	6	100%	42%	75%	100%	83%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_SC2	Swift Creek	E105061	7	72%	90%	89%	100%	84%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_CC1	Cataract Creek	0200384	8	100%	100%	42%	100%	100%	0%	0%	0%	0%	0%	4.2%	0%	0%	0%	0%	4.2%
				GH_PC1	Porter Creek	200385	2	0%	21%	0%	42%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_DCDS	LCO Dry Creek	E295210	4	0%	0%	0%	0%	0%	0%	0%	3.4%	14%	0%	0%	0%	10%	0%	0%	10%
				LC_DC3	LCO Dry Creek	E288273	5	0%	0%	0%	0%	0%	0%	0%	3.6%	7.1%	0%	0%	0%	11%	0%	3.6%	7.1%
				LC_DC1	LCO Dry Creek	E288270	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7.4%
				GH_GH1	Greenhills Creek	E102709	6	0%	55%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	FR_FR1	Fording River	0200251	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR2	Fording River	0200201	1	12%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR	Fording River	-	1	0%	0%	0%	5.9%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR4	Fording River	-	1	5.0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR3	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FRCP1	Fording River	E300071	5	30%	21%	0%	51%	19%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_PC2	Fording River	E287431	2	85%	0%	0%	53%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FRABCH	Fording River	-	2	92%	0%	0%	31%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				FR_FR5	Fording River	-	2	81%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_FRUS	Fording River	E295232	1	33%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_FRB	Fording River	-	1	18%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_FR1	Fording River	0200251	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	3	58%	0%	58%	92%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC3	Line Creek	0200337	3	47%	0%	68%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LCDSSLCC	Line Creek	E297110	4	6.5%	0%	0%	91%	0%	0%	0%	3.1%	0%	0%	0%	0%	3.1%	0%	0%	0%
				LC_LC4	Line Creek	0200044	5	0%	0%	0%	90%	0%	0%	0%	3.4%	0%	0%	3.4%	0%	6.9%	0%	0%	3.4%
			M	LC_LC6	Fording River	0200338	1	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				LC_LC5	Fording River	0200028	2	0%	0%	0%	94%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.3%
	3	Elk	T	GH_WILLOW	Willow Creek	-	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				GH_WADE	Wade Creek	E287433	6	0%	0%	0%	0%	0%	0%	0%	14%	3.6%	0%	11%	0%	14%	0%	0%	11%
				GH_MC1	Michelson Creek	200388	10	63%	63%	0%	3.8%	52%	0%	0%	27%	0%	0%	12%	0%	27%	15%	0%	15%
				GH_LC2	Leask Creek	-	18	100%	86%	0%	100%	89%	3.6%	0%	71%	7.1%	3.6%	36%	0%	71%	36%	11%	43%
				GH_WC2	Wolfram Creek	-	11	100%	69%	0%	100%	50%	0%	0%	39%	5.6%	0%	11%	0%	39%	22%	0%	28%
				GH_TC2	Thompson Creek	E207436	4	96%	54%	0%	100%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			M	GH_ERC	Elk River	E300090	2	0%	0%	0%	0%	0%	0%	0%	3.1%	0%	0%	0%	0%	13%	0%	0%	0%
				GH_ER1	Elk River	0206661	3	0%	0%	0%	0%	0%	0%	0%	3.6%	3.6%	0%	0%	0%	11%	0%	0%	0%

Table C.25: Frequency (%) of Individual Samples Exceeding a SSBM or Guideline at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Number of Parameters Exceeding a Guideline	Site-Specific Benchmark					Acute			Chronic							
								Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total)	Aluminum (Dissolved)	Barium (Total)	Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [2]
Mine-exposed	4	Elk	T	EV_HC6	Harmer Creek	-	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_HC1	Harmer Creek	E102682	4	0%	0%	0%	97%	0%	0%	0%	2.9%	0%	0%	0%	0%	2.9%	0%	0%	2.9%
				EV_GV1	Grave Creek	-	5	0%	0%	0%	65%	0%	0%	0%	10%	0%	0%	5.0%	0%	10%	0%	0%	10%
				EV_SM1	Six Mile Creek	E102681	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7.7%	0%	0%	0%
				EV_BLM2	Balmer Creek	E298592	4	0%	0%	0%	0%	0%	0%	0%	9.1%	0%	0%	9.1%	0%	9.1%	0%	0%	55%
				EV_FC1	Fennelon Creek	E298591	4	0%	0%	0%	0%	0%	0%	0%	11%	0%	0%	5.3%	0%	11%	0%	0%	26%
				EV_GC2	Goddard Creek	E208043	3	0%	0%	0%	64%	0%	0%	0%	0%	0%	0%	0%	0%	9.1%	0%	0%	4.5%
				EV_OC1	Otto Creek	E102679	3	0%	0%	0%	0%	0%	0%	0%	9.1%	0%	0%	0%	0%	4.5%	0%	0%	0%
			M	EV_ER4	Elk River	0200027	3	53%	0%	0%	0%	0%	0%	0%	3.1%	0%	0%	0%	0%	9.4%	0%	0%	0%
				EV_ER2	Elk River	0200111	2	0%	0%	0%	0%	0%	0%	0%	9.1%	0%	0%	0%	0%	9.1%	0%	0%	0%
		Michel	T	CM_CC1	Corbin Creek	0200209	6	96%	61%	0%	3.6%	43%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_EC1	Erickson Creek	200097	5	100%	100%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	4.3%	0%	0%	0%
				EV_SP1	South Pit Creek	E296311	6	100%	100%	27%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_MG1	Milligan Pond	E208057	3	0%	55%	0%	100%	18%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				EV_GT1	Gate Creek	E206231	8	100%	100%	18%	100%	100%	0%	0%	0%	0%	0%	0%	0%	6.8%	0%	0%	0%
				EV_BC1	Bodie Creek	E102685	7	100%	100%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	2.6%	0%	0%	0%
				EV_AQ1	Aqueduct Creek	E210369	5	0%	0%	0%	0%	0%	0%	0%	5.6%	0%	0%	5.6%	17%	11%	0%	0%	17%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	6	15%	0%	0%	0%	0%	0%	0%	5.0%	0%	0%	2.5%	0%	5.0%	0%	0%	10%
				CM_MCTM	Michel Creek	-	4	0%	0%	0%	0%	0%	0%	0%	9.1%	9.1%	0%	9.1%	0%	9.1%	0%	0%	0%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	7	0%	0%	0%	0%	0%	0%	0%	6.7%	3.3%	0%	3.3%	0%	6.7%	0%	0%	3.3%
				EV_MC2	Michel Creek	E300091	7	31%	0%	0%	21%	0%	0%	0%	8.2%	0%	0%	6.7%	0%	10%	0%	2.2%	4.7%
	5	Elk	M	EV_ER1	Elk River	0200393	5	0%	0%	0%	0%	0%	0%	0%	6.1%	0%	0%	4.4%	0%	13%	0%	0%	2.3%
				RG_ELKFERNIE	Elk River	-	3	0%	0%	0%	0%	0%	0%	0%	3.6%	0%	0%	3.6%	0%	7.1%	0%	0%	0%
				RG_ELKORES	Elk River	E294312	4	0%	0%	0%	0%	0%	0%	0%	7.1%	3.6%	0%	0%	0%	14%	0%	0%	0%
				RG_ELKMOUTH	Elk River	-	4	0%	0%	0%	0%	0%	0%	0%	7.1%	3.6%	0%	0%	0%	14%	0%	0%	3.6%

Shading indicates frequency exceeded 0%.

[1] Only stations with data for at least 7 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM / guideline. Only constituents that had at least one SSBM/ guideline exceedance are reported.

[2] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.25: Frequency (%) of Individual Samples Exceeding a SSBM or Guideline at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Number of Parameters Exceeding a Guideline	Chronic						
								Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	1	0%	0%	0%	0%	0%	0%	0%
			M	FR_UFR1	Fording River	E216777	0	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0	0%	0%	0%	0%	0%	0%	0%
				LC_LC1	Line Creek	E216142	3	0%	0%	0%	0%	0%	0%	14%
				LC_SLC	South Line Creek	E282149	7	0%	0%	0%	0%	0%	0%	0%
	3	Elk	M	GH_ER2	Elk River	200389	2	0%	0%	0%	0%	0%	0%	0%
	4	Michel	M	CM_MC1	Michel Creek	E258175	5	0%	0%	0%	0%	0%	0%	8.3%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0	0%	0%	0%	0%	0%	0%	0%
				FR_CC1	Clode Creek	E102481	7	0%	100%	64%	0%	0%	0%	0%
				FR_NGD1	Lake Mountain Creek	E105060	0	0%	0%	0%	0%	0%	0%	0%
				FR_KC1	Kilmarnock Creek	0200252	6	0%	0%	0%	0%	0%	33%	0%
				GH_SC2	Swift Creek	E105061	7	0%	3.4%	0%	0%	0%	79%	0%
				GH_CC1	Cataract Creek	0200384	8	0%	0%	0%	0%	0%	100%	0%
				GH_PC1	Porter Creek	200385	2	0%	0%	0%	0%	0%	0%	0%
				LC_DCDS	LCO Dry Creek	E295210	4	0%	0%	0%	0%	0%	0%	0%
				LC_DC3	LCO Dry Creek	E288273	5	0%	0%	0%	0%	0%	0%	0%
				LC_DC1	LCO Dry Creek	E288270	2	0%	3.7%	0%	0%	0%	0%	0%
				GH_GH1	Greenhills Creek	E102709	6	0%	6.9%	0%	0%	0%	5.0%	0%
			M	FR_FR1	Fording River	0200251	0	0%	0%	0%	0%	0%	0%	0%
				FR_FR2	Fording River	0200201	1	0%	0%	0%	0%	0%	0%	0%
				GH_FR	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%
				FR_FR4	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%
				GH_FR3	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%
				FR_FRCP1	Fording River	E300071	5	0%	0%	0%	0%	0%	12%	0%
				GH_PC2	Fording River	E287431	2	0%	0%	0%	0%	0%	0%	0%
				FR_FRABCH	Fording River	-	2	0%	0%	0%	0%	0%	0%	0%
				FR_FR5	Fording River	-	2	0%	0%	0%	0%	0%	0%	0%
				LC_FRUS	Fording River	E295232	1	0%	0%	0%	0%	0%	0%	0%
				LC_FRB	Fording River	-	1	0%	0%	0%	0%	0%	0%	0%
				GH_FR1	Fording River	0200251	0	0%	0%	0%	0%	0%	0%	0%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	3	0%	0%	0%	0%	0%	0%	0%
				LC_LC3	Line Creek	0200337	3	0%	0%	0%	0%	0%	0%	0%
				LC_LCDSSLCC	Line Creek	E297110	4	0%	0%	0%	0%	0%	0%	0%
				LC_LC4	Line Creek	0200044	5	0%	0%	0%	0%	0%	0%	0%
			M	LC_LC6	Fording River	0200338	1	0%	0%	0%	0%	0%	0%	0%
				LC_LC5	Fording River	0200028	2	0%	0%	0%	0%	0%	0%	0%
	3	Elk	T	GH_WILLOW	Willow Creek	-	1	0%	0%	0%	0%	0%	0%	0%
				GH_WADE	Wade Creek	E287433	6	0%	0%	0%	0%	0%	0%	0%
				GH_MC1	Michelson Creek	200388	10	0%	0%	0%	0%	0%	35%	0%
				GH_LC2	Leask Creek	-	18	3.6%	18%	0%	0%	3.6%	75%	3.6%
				GH_WC2	Wolfram Creek	-	11	0%	0%	0%	0%	0%	39%	0%
				GH_TC2	Thompson Creek	E207436	4	0%	0%	0%	0%	0%	0%	0%
			M	GH_ERC	Elk River	E300090	2	0%	0%	0%	0%	0%	0%	0%
				GH_ER1	Elk River	0206661	3	0%	0%	0%	0%	0%	0%	0%

Table C.25: Frequency (%) of Individual Samples Exceeding a SSBM or Guideline at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Number of Parameters Exceeding a Guideline	Chronic						
								Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Mine-exposed	4	Elk	T	EV_HC6	Harmer Creek	-	0	0%	0%	0%	0%	0%	0%	0%
				EV_HC1	Harmer Creek	E102682	4	0%	0%	0%	0%	0%	0%	0%
				EV_GV1	Grave Creek	-	5	0%	0%	0%	0%	0%	0%	0%
				EV_SM1	Six Mile Creek	E102681	1	0%	0%	0%	0%	0%	0%	0%
				EV_BLM2	Balmer Creek	E298592	4	0%	0%	0%	0%	0%	0%	0%
				EV_FC1	Fennelon Creek	E298591	4	0%	0%	0%	0%	0%	0%	0%
				EV_GC2	Goddard Creek	E208043	3	0%	0%	0%	0%	0%	0%	0%
				EV_OC1	Otto Creek	E102679	3	0%	0%	0%	0%	0%	0%	0%
			M	EV_ER4	Elk River	0200027	3	0%	0%	0%	0%	0%	0%	0%
				EV_ER2	Elk River	0200111	2	0%	0%	0%	0%	0%	0%	0%
		Michel	T	CM_CC1	Corbin Creek	0200209	6	0%	18%	0%	0%	0%	0%	0%
				EV_EC1	Erickson Creek	200097	5	0%	0%	0%	0%	0%	0%	0%
				EV_SP1	South Pit Creek	E296311	6	0%	0%	0%	0%	0%	92%	0%
				EV_MG1	Milligan Pond	E208057	3	0%	0%	0%	0%	0%	0%	0%
				EV_GT1	Gate Creek	E206231	8	0%	19%	0%	0%	0%	73%	0%
				EV_BC1	Bodie Creek	E102685	7	0%	38%	0%	0%	0%	100%	0%
				EV_AQ1	Aqueduct Creek	E210369	5	0%	0%	0%	0%	0%	0%	0%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	6	0%	2.5%	0%	0%	0%	0%	0%
				CM_MCTM	Michel Creek	-	4	0%	0%	0%	0%	0%	0%	0%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	7	0%	0%	0%	3.3%	0%	0%	6.7%
				EV_MC2	Michel Creek	E300091	7	0%	0%	0%	0%	0%	0%	0%
	5	Elk	M	EV_ER1	Elk River	0200393	5	0%	0%	0%	0%	0%	0%	0%
				RG_ELKFERNIE	Elk River	-	3	0%	0%	0%	0%	0%	0%	0%
				RG_ELKORES	Elk River	E294312	4	0%	0%	0%	0%	0%	0%	0%
				RG_ELKMOUTH	Elk River	-	4	0%	0%	0%	0%	0%	0%	0%

Shading indicates frequency exceeded 0%.

[1] Only stations with data for at least 7 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM / guideline. Only constituents that had at least one SSBM/ guideline exceedance are reported.

[2] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.26: Maximum Hazard Quotient for Individual Samples at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Site-Specific Benchmark					Acute			Chronic							
							Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total)	Aluminum (Dissolved)	Barium (Total)	Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [1]
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0.06	0.20	<0.05	0.02	0.24	0.04	0.04	0.02	<0.06	0.01	<0.77	0.01	0.27	<0.03	<0.11	<8
			M	FR_UFR1	Fording River	E216777	0.03	0.11	0.06	0.01	0.25	0.05	<0.03	0.10	0.37	0.09	<0.77	0.01	0.46	<0.03	0.10	<8
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0.01	0.13	<0.04	0.14	0.24	0.04	<0.03	0.32	<0.06	0.07	<0.77	0.01	0.44	0.04	0.09	<8
				LC_LC1	Line Creek	E216142	0.06	0.17	<0.04	0.15	0.23	0.12	<0.03	0.71	0.13	0.05	<0.77	0.01	1.7	0.09	0.30	6.6
				LC_SLC	South Line Creek	E282149	0.02	0.15	1.7	0.08	0.26	0.39	1.5	4.0	9.8	0.07	1.5	0.01	6.9	0.39	0.43	23
	3	Elk	M	GH_ER2	Elk River	200389	0.04	0.06	0.43	0.06	0.23	0.11	0.90	0.88	4.6	0.05	<0.77	0.01	2.1	0.09	0.21	<8
	4	Michel	M	CM_MC1	Michel Creek	E258175	0.01	0.03	0.08	0.01	0.22	0.26	0.11	1.3	1.7	0.06	<1.92	0.01	1.5	0.14	0.60	4.8
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0.84	0.48	0.12	0.56	0.52	0.04	<0.03	0.10	0.91	0.04	<0.77	0.01	0.35	0.05	0.06	<8
				FR_CC1	Clode Creek	E102481	3.9	0.84	1.4	1.8	1.1	0.11	<0.03	0.03	0.07	0.23	<0.77	0.02	0.15	0.71	0.08	<8
				FR_NGD1	Lake Mountain Creek	E105060	0.29	0.29	0.24	0.29	0.41	0.07	<0.03	0.11	0.14	0.19	<0.77	0.01	0.20	0.04	0.07	<8
				FR_KC1	Kilmarnock Creek	0200252	6.6	1.5	2.2	3.3	1.8	0.03	<0.03	<0.01	<0.06	0.04	<0.77	0.02	0.16	0.03	0.10	<8
				GH_SC2	Swift Creek	E105061	2.9	4.2	2.3	11	3.2	0.06	<0.06	0.09	0.21	0.03	<1.54	0.02	0.29	<0.05	0.13	<8
				GH_CC1	Cataract Creek	0200384	2.4	4.5	1.6	9.8	3.5	0.06	<0.06	0.02	<0.06	0.03	3.2	0.05	<0.2	<0.05	<0.1	7.0
				GH_PC1	Porter Creek	200385	0.25	1.1	0.08	1.3	0.92	0.06	<0.03	0.03	<0.06	0.09	<0.77	0.01	0.45	<0.03	<0.05	<8
				LC_DCDS	LCO Dry Creek	E295210	0.12	0.03	0.90	0.03	0.16	0.18	0.11	1.2	2.2	0.19	<3.85	0.01	2.3	0.16	0.58	9.4
				LC_DC3	LCO Dry Creek	E288273	0.15	0.03	0.47	0.03	0.16	0.16	0.08	1.0	1.2	0.14	0.92	0.01	1.5	0.18	1.0	7.3
				LC_DC1	LCO Dry Creek	E288270	0.06	0.02	0.19	0.03	0.20	0.07	0.04	0.40	0.61	0.20	<3.85	0.01	0.75	0.04	0.49	4.5
				GH_GH1	Greenhills Creek	E102709	0.39	1.6	0.18	1.5	1.3	0.08	<0.03	0.46	0.20	0.07	<0.77	0.03	0.88	0.58	0.14	<8
			M	FR_FR1	Fording River	0200251	0.67	0.36	0.06	0.38	0.38	0.03	<0.03	0.04	<0.06	0.06	<0.77	0.01	0.22	<0.03	<0.09	<8
				FR_FR2	Fording River	0200201	1.2	0.58	0.26	0.59	0.64	0.05	0.09	0.24	0.17	0.11	<0.77	0.02	0.47	0.05	0.23	<8
				GH_FR	Fording River	-	0.98	0.75	0.24	1.03	0.78	0.06	0.04	0.49	0.25	0.10	<0.77	0.02	0.92	0.08	<0.1	<8
				FR_FR4	Fording River	-	1.2	0.71	0.24	0.97	0.73	0.05	0.07	0.22	0.13	0.10	<0.77	0.02	0.36	0.05	0.14	<8
				GH_FR3	Fording River	-	0.96	0.58	0.22	0.59	0.64	0.06	<0.03	0.43	0.16	0.10	<0.77	0.02	0.82	0.08	<0.1	<8
				FR_FRCP1	Fording River	E300071	2.0	3.5	0.29	7.1	2.6	0.05	0.07	0.28	0.08	0.10	<1.54	0.04	0.46	0.06	0.11	<8
				GH_PC2	Fording River	E287431	1.5	0.80	0.13	1.3	0.86	0.06	<0.03	0.47	0.13	0.12	<0.77	0.02	0.76	0.07	0.05	<8
				FR_FRABCH	Fording River	-	1.4	0.69	0.12	1.1	0.76	0.05	<0.03	0.31	<0.06	0.12	<0.77	0.02	0.48	0.05	0.06	<8
				FR_FR5	Fording River	-	1.3	0.61	0.11	0.99	0.68	0.05	<0.03	0.35	<0.06	0.14	<0.77	0.02	0.63	0.05	0.06	<8
				LC_FRUS	Fording River	E295232	1.1	0.49	0.07	0.74	0.57	0.04	<0.03	0.14	<0.06	0.13	<0.77	0.02	0.26	<0.03	<0.05	<8
				LC_FRB	Fording River	-	1.1	0.48	0.07	0.73	0.56	0.04	<0.03	0.17	<0.06	0.14	<0.77	0.02	0.30	0.03	0.05	<8
				GH_FR1	Fording River	0200251	0.90	0.62	0.08	0.79	0.65	0.05	<0.03	0.30	<0.06	0.13	<0.77	0.02	0.55	0.05	0.05	<8
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	2.0	0.74	1.2	3.1	0.79	0.04	<0.14	0.09	0.09	0.10	<3.85	0.03	0.31	0.06	0.09	<8
				LC_LC3	Line Creek	0200337	2.4	0.95	2.2	6.2	0.98	0.04	<0.14	0.05	<0.1	0.09	<3.85	0.10	0.26	0.04	0.08	0.54
				LC_LCDSSLCC	Line Creek	E297110	1.1	0.66	0.84	3.9	0.69	0.24	<0.14	2.4	0.25	0.09	0.92	0.05	4.3	0.28	0.42	<20
				LC_LC4	Line Creek	0200044	0.95	0.50	0.37	2.7	0.56	0.43	<0.14	2.6	0.16	0.09	1.2	0.04	8.5	0.28	0.28	7.2
			M	LC_LC6	Fording River	0200338	0.93	0.48	0.05	2.5	0.56	0.03	<0.14	0.15	<0.1	0.12	<3.85	0.02	0.22	<0.13	0.05	<8
				LC_LC5	Fording River	0200028	0.87	0.48	0.11	2.4	0.55	0.05	0.04	0.26	0.11	0.11	<3.85	0.02	0.60	0.05	0.65	26
	3	Elk	T	GH_WILLOW	Willow Creek	-	0.14	0.08	0.05	0.27	0.29	0.06	0.06	0.35	0.60	0.28	<0.77	0.01	0.46	0.06	0.13	<8
				GH_WADE	Wade Creek	E287433	0.45	0.07	0.10	0.16	0.36	0.28	0.45	3.2	7.3	0.21	1.3	0.01	4.7	0.39	0.51	16
				GH_MC1	Michelson Creek	200388	3.7	2.1	0.09	1.1	1.5	0.49	0.06	5.9	0.46	0.35	2.3	0.05	5.2	2.1	0.84	7.4
				GH_LC2	Leask Creek	-	17	3.6	0.21	7.7	2.6	4.3	0.69	55	8.0	1.6	16	0.08	32	15	7.7	145
				GH_WC2	Wolfram Creek	-	14	2.0	0.23	4.8	1.6	0.45	0.36	6.1	4.7	0.21	2.4	0.05	8.0	4.2	0.84	14
				GH_TC2	Thompson Creek	E207436	4.9	1.7	0.16	6.3	1.4	0.08	0.09	0.52	0.25	0.09	<0.77	0.13	0.79	0.08	0.13	<8
			M	GH_ERC	Elk River	E300090	0.25	0.12	0.04	0.12	0.23	0.14	0.03	1.3	0.45	0.07	<0.77	0.01	2.1	0.14	0.27	<8
				GH_ER1	Elk River	0206661	0.22	0.11	0.22	0.13	0.22	0.15	0.69	1.1	5.1	0.07	<0.77	0.01	1.8	0.12	0.24	<8

Table C.26: Maximum Hazard Quotient for Individual Samples at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Site-Specific Benchmark					Acute			Chronic							
							Nitrate	Sulphate	Cadmium (Dissolved)	Selenium (Total)	Total Dissolved Solids	Arsenic (Total)	Iron (Dissolved)	Iron (Total)	Aluminum (Dissolved)	Barium (Total)	Beryllium (Total)	Chloride	Chromium (Total)	Cobalt (Total)	Copper (Total)	Mercury (Total) [1]
Mine-exposed	4	Elk	T	EV_HC6	Harmer Creek	-	0.05	0.04	0.04	0.04	0.17	0.05	<0.03	0.03	0.06	0.05	<0.77	0.01	0.40	<0.03	<0.11	<8
				EV_HC1	Harmer Creek	E102682	0.45	0.52	0.08	2.1	0.54	0.14	<0.03	1.2	0.56	0.07	<0.77	0.01	1.5	0.17	0.31	5.6
				EV_GV1	Grave Creek	-	0.31	0.40	0.06	1.4	0.48	0.43	0.04	5.3	0.31	0.10	2.2	0.01	4.0	0.74	0.91	9.8
				EV_SM1	Six Mile Creek	E102681	0.04	0.20	<0.03	0.18	0.35	0.07	<0.03	0.53	0.31	0.10	<0.77	0.01	1.5	0.06	0.13	0.87
				EV_BLM2	Balmer Creek	E298592	0.24	0.11	0.07	0.46	0.29	0.34	0.06	3.9	0.64	0.17	1.8	0.01	3.0	0.57	0.72	10
				EV_FC1	Fennelon Creek	E298591	0.13	0.25	0.05	0.53	0.46	0.28	0.05	2.7	0.50	0.14	1.2	0.01	3.0	0.33	0.50	12
				EV_GC2	Goddard Creek	E208043	0.65	0.78	0.15	2.6	0.75	0.09	<0.03	0.58	0.42	0.13	<0.77	0.18	1.3	0.13	0.22	1.8
				EV_OC1	Otto Creek	E102679	0.08	0.21	0.02	0.12	0.49	0.33	0.05	1.5	0.12	0.48	<0.77	0.25	1.3	0.14	0.17	0.66
			M	EV_ER4	Elk River	0200027	1.4	0.22	0.38	0.88	0.34	0.19	<0.14	1.5	0.18	0.08	<3.85	0.02	2.2	0.17	0.36	0.98
				EV_ER2	Elk River	0200111	1.0	0.19	0.05	0.70	0.32	0.20	<0.03	1.8	0.12	0.07	0.77	0.02	2.8	0.19	0.30	<8
		Michel	T	CM_CC1	Corbin Creek	0200209	2.5	1.6	0.85	1.0	1.3	0.17	<0.14	0.26	0.22	0.07	<1.92	0.05	0.50	0.98	0.10	<20
				EV_EC1	Erickson Creek	200097	4.5	1.7	0.06	7.0	1.4	0.07	<0.03	0.01	<0.06	0.07	<0.77	0.03	2.5	<0.03	0.05	<8
				EV_SP1	South Pit Creek	E296311	2.1	1.9	2.5	10	1.6	0.04	<0.03	0.09	0.17	0.02	<0.77	0.01	0.69	0.03	0.08	0.53
				EV_MG1	Milligan Pond	E208057	0.21	1.3	0.36	3.8	1.0	0.12	<0.03	0.15	0.19	0.10	<0.77	0.01	0.47	0.07	0.48	0.73
				EV_GT1	Gate Creek	E206231	16	2.3	1.7	11	1.9	0.14	0.08	0.62	0.61	0.21	<1.54	0.19	6.3	0.68	0.24	0.46
				EV_BC1	Bodie Creek	E102685	23	2.3	0.67	15	2.0	0.12	<0.03	0.57	0.20	0.30	<0.77	0.40	1.2	0.65	0.22	0.49
				EV_AQ1	Aqueduct Creek	E210369	0.20	0.22	0.19	0.65	0.80	0.43	<0.03	3.6	0.29	0.44	1.5	1.3	3.5	0.65	0.91	23
		Upper Michel	M	CM_MC2	Michel Creek	E258937	1.3	0.94	0.20	0.58	0.86	0.24	0.08	2.8	0.64	0.10	1.1	0.03	2.6	0.43	0.41	6.7
				CM_MCTM	Michel Creek	-	0.42	0.33	0.07	0.20	0.38	0.48	0.07	2.5	1.3	0.08	1.6	0.02	3.5	0.41	0.63	<20
		Lower Michel	M	EV_MC3	Michel Creek	0200203	0.13	0.12	0.17	0.09	0.23	0.28	0.13	2.5	1.8	0.12	1.2	0.02	3.4	0.31	0.92	7.4
				EV_MC2	Michel Creek	E300091	2.0	0.45	0.17	1.5	0.54	0.40	0.11	4.3	0.92	0.17	1.8	0.08	6.1	0.57	1.2	6.4
	5	Elk	M	EV_ER1	Elk River	0200393	0.98	0.22	0.14	0.76	0.33	0.34	0.09	3.5	0.97	0.15	1.4	0.03	5.1	0.47	0.78	6.7
				RG_ELKFERNIE	Elk River	-	0.62	0.15	0.08	0.48	0.36	0.14	0.07	1.0	0.51	0.12	1.2	0.08	1.6	0.11	0.22	<8
				RG_ELKORES	Elk River	E294312	0.69	0.18	0.11	0.50	0.34	0.13	0.23	1.1	2.1	0.10	<0.77	0.03	1.7	0.13	0.27	<8
				RG_ELKMOUTH	Elk River	-	0.57	0.15	0.07	0.40	0.31	0.16	0.12	1.5	1.5	0.10	<0.77	0.02	1.8	0.16	0.35	4.5

Shading indicates HQ > 1. If the concentration was < the laboratory reporting limit (LRL) and the LRL exceeded the guideline, the HQ was not shaded.

[1] Only stations with data for at least 7 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM / guideline. Only constituents that had at least one SSBM/ guideline exceedance are reported.

[2] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.26: Maximum Hazard Quotient for Individual Samples at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Chronic						
							Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	<0.005	<0.05	0.01	<0.01	<0.01	0.11	<0.14
			M	FR_UFR1	Fording River	E216777	<0.004	<0.05	0.01	<0.01	0.04	0.06	0.06
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0.004	<0.05	<0.01	0.01	0.02	0.14	<0.04
				LC_LC1	Line Creek	E216142	0.05	0.08	0.01	0.50	0.05	0.18	1.8
				LC_SLC	South Line Creek	E282149	0.05	0.09	<0.01	0.07	0.20	0.22	0.29
	3	Elk	M	GH_ER2	Elk River	200389	0.01	<0.05	0.02	0.01	0.04	0.10	0.17
	4	Michel	M	CM_MC1	Michel Creek	E258175	0.03	0.05	0.03	0.44	0.09	0.03	1.1
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0.02	0.39	0.02	<0.01	0.02	0.18	0.02
				FR_CC1	Clode Creek	E102481	0.28	8.3	3.5	0.01	0.07	0.79	0.08
				FR_NGD1	Lake Mountain Creek	E105060	0.03	0.78	0.40	0.03	0.05	0.18	0.04
				FR_KC1	Kilmarnock Creek	0200252	0.13	0.43	<0.01	<0.01	0.04	1.3	0.03
				GH_SC2	Swift Creek	E105061	0.46	1.5	0.11	0.01	0.07	2.0	0.05
				GH_CC1	Cataract Creek	0200384	0.38	0.28	0.01	<0.01	0.08	2.5	0.02
				GH_PC1	Porter Creek	200385	0.01	<0.25	0.01	<0.01	0.02	0.60	0.02
				LC_DCDS	LCO Dry Creek	E295210	0.03	0.11	0.01	0.88	0.08	0.06	0.85
				LC_DC3	LCO Dry Creek	E288273	0.03	0.18	0.02	0.56	0.08	0.05	0.67
				LC_DC1	LCO Dry Creek	E288270	0.01	1.8	0.01	0.01	0.02	0.05	0.28
				GH_GH1	Greenhills Creek	E102709	0.24	5.1	0.27	0.01	0.03	1.0	0.03
			M	FR_FR1	Fording River	0200251	0.01	0.26	0.01	<0.01	<0.01	0.15	<0.06
				FR_FR2	Fording River	0200201	0.02	0.92	0.09	0.01	0.02	0.34	0.08
				GH_FR	Fording River	-	0.03	0.82	0.04	0.01	0.03	0.41	0.05
				FR_FR4	Fording River	-	0.03	0.91	0.07	<0.01	0.02	0.39	0.03
				GH_FR3	Fording River	-	0.02	0.89	0.04	0.01	0.03	0.33	0.04
				FR_FRCP1	Fording River	E300071	0.21	0.50	0.07	<0.01	0.04	1.8	0.03
				GH_PC2	Fording River	E287431	0.02	0.26	0.01	0.01	0.02	0.39	0.03
				FR_FRABCH	Fording River	-	0.01	0.28	0.02	<0.01	0.02	0.33	0.03
				FR_FR5	Fording River	-	0.01	0.28	0.01	<0.01	0.02	0.28	0.02
				LC_FRUS	Fording River	E295232	0.01	0.41	0.01	0.02	0.01	0.24	<0.02
				LC_FRB	Fording River	-	0.01	0.32	0.01	0.11	<0.01	0.23	<0.02
				GH_FR1	Fording River	0200251	0.03	0.63	0.01	<0.01	0.01	0.30	0.02
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	0.10	0.03	<0.01	<0.03	0.03	0.65	0.13
				LC_LC3	Line Creek	0200337	0.10	0.17	0.01	<0.03	0.03	0.74	0.13
				LC_LCDSSLCC	Line Creek	E297110	0.05	0.17	<0.01	0.03	0.12	0.49	0.65
				LC_LC4	Line Creek	0200044	0.08	0.15	0.01	0.05	0.19	0.40	0.33
			M	LC_LC6	Fording River	0200338	0.01	0.59	0.01	<0.03	<0.06	0.24	<0.06
				LC_LC5	Fording River	0200028	0.01	0.39	0.01	<0.03	0.10	0.26	0.05
	3	Elk	T	GH_WILLOW	Willow Creek	-	0.01	0.11	<0.01	<0.01	0.01	0.08	0.05
				GH_WADE	Wade Creek	E287433	0.03	<0.05	0.02	0.06	0.13	0.18	0.15
				GH_MC1	Michelson Creek	200388	0.62	0.47	0.02	0.08	0.22	2.0	0.09
				GH_LC2	Leask Creek	-	1.9	3.2	0.12	0.54	1.7	2.3	1.4
				GH_WC2	Wolfram Creek	-	0.89	0.63	0.03	0.05	0.32	1.8	0.11
				GH_TC2	Thompson Creek	E207436	0.04	0.23	0.07	0.01	0.03	0.60	0.03
			M	GH_ERC	Elk River	E300090	0.02	<0.05	0.01	0.01	0.06	0.11	0.18
				GH_ER1	Elk River	0206661	0.02	<0.05	0.03	0.01	0.05	0.11	0.17

Table C.26: Maximum Hazard Quotient for Individual Samples at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	Chronic						
							Nickel (Total)	Nitrite	Ammonia	Silver (Total)	Thallium (Total)	Uranium (Total)	Zinc (Total)
Mine-exposed	4	Elk	T	EV_HC6	Harmer Creek	-	<0.005	<0.05	<0.01	<0.01	0.03	0.09	0.18
				EV_HC1	Harmer Creek	E102682	0.02	0.18	0.02	0.02	0.06	0.36	0.24
				EV_GV1	Grave Creek	-	0.06	0.10	0.01	0.04	0.20	0.27	0.43
				EV_SM1	Six Mile Creek	E102681	0.01	0.06	<0.01	0.01	0.03	0.07	0.05
				EV_BLM2	Balmer Creek	E298592	0.04	<0.05	0.12	0.05	0.11	0.04	0.37
				EV_FC1	Fennelon Creek	E298591	0.03	<0.25	0.03	0.03	0.13	0.07	0.14
				EV_GC2	Goddard Creek	E208043	0.02	0.08	0.04	0.02	0.04	0.40	0.03
				EV_OC1	Otto Creek	E102679	0.02	0.03	0.28	0.01	0.04	0.09	0.05
			M	EV_ER4	Elk River	0200027	0.03	0.09	0.02	0.02	0.06	0.16	0.24
				EV_ER2	Elk River	0200111	0.02	0.10	<0.01	0.02	0.07	0.15	0.21
		Michel	T	CM_CC1	Corbin Creek	0200209	0.30	2.4	0.78	0.01	0.06	0.83	0.19
				EV_EC1	Erickson Creek	200097	0.02	0.33	<0.01	<0.01	0.03	0.82	0.004
				EV_SP1	South Pit Creek	E296311	0.30	0.70	<0.01	<0.01	0.24	1.3	0.07
				EV_MG1	Milligan Pond	E208057	0.03	0.13	0.04	0.01	0.04	0.38	0.03
				EV_GT1	Gate Creek	E206231	0.47	2.0	0.49	0.02	0.16	1.6	0.08
				EV_BC1	Bodie Creek	E102685	0.47	2.0	0.50	0.03	0.16	1.6	0.07
				EV_AQ1	Aqueduct Creek	E210369	0.08	0.04	0.07	0.10	0.16	0.14	0.16
		Upper Michel	M	CM_MC2	Michel Creek	E258937	0.11	2.4	0.02	0.01	0.11	0.43	0.24
				CM_MCTM	Michel Creek	-	0.07	0.14	0.01	0.03	0.23	0.17	0.90
		Lower Michel	M	EV_MC3	Michel Creek	0200203	0.06	0.13	0.02	1.1	0.13	0.08	2.4
				EV_MC2	Michel Creek	E300091	0.08	0.20	0.02	0.08	0.19	0.25	0.75
	5	Elk	M	EV_ER1	Elk River	0200393	0.06	0.14	0.01	0.06	0.18	0.16	0.61
				RG_ELKFERNIE	Elk River	-	0.02	0.32	0.01	0.07	0.05	0.13	0.13
				RG_ELKORES	Elk River	E294312	0.02	0.26	0.03	0.05	0.05	0.14	0.17
				RG_ELKMOUTH	Elk River	-	0.02	0.18	0.01	0.02	0.06	0.12	0.22

Shading indicates HQ > 1. If the concentration was < the laboratory reporting limit (LRL) and the LRL exceeded the guideline, the HQ was not shaded.

[1] Only stations with data for at least 7 months were included to ensure sufficient annual coverage. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM / guideline. Only constituents that had at least one SSBM/ guideline exceedance are reported.

[2] For total mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.27a: Frequency of Individual Samples with Dissolved Metal Concentrations Exceeding Total Metal Guidelines at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	SSBM	Chronic			
							Selenium (Dissolved)	Chromium (Dissolved)	Cobalt (Dissolved)	Mercury (Dissolved) [2]	Uranium (Dissolved)
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0%	0%	0%	0%	0%
			M	FR_UFR1	Fording River	E216777	0%	0%	0%	0%	0%
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0%	0%	0%	0%	0%
				LC_LC1	Line Creek	E216142	0%	0%	0%	0%	0%
				LC_SLC	South Line Creek	E282149	0%	8.3%	0%	0%	0%
	3	Elk	M	GH_ER2	Elk River	200389	0%	0%	0%	2.9%	0%
	4	Michel	M	CM_MC1	Michel Creek	E258175	0%	0%	0%	8.3%	0%
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0%	0%	0%	0%	0%
				FR_CC1	Clode Creek	E102481	93%	0%	0%	0%	0%
				FR_NGD1	Lake Mountain Creek	E105060	0%	0%	0%	0%	0%
				FR_KC1	Kilmarnock Creek	0200252	100%	0%	0%	0%	33%
				GH_SC2	Swift Creek	E105061	100%	0%	0%	0%	79%
				GH_CC1	Cataract Creek	0200384	100%	0%	0%	0%	100%
				GH_PC1	Porter Creek	200385	42%	0%	0%	0%	0%
				LC_DCDS	LCO Dry Creek	E295210	0%	0%	0%	0%	0%
				LC_DC3	LCO Dry Creek	E288273	0%	0%	0%	0%	0%
				LC_DC1	LCO Dry Creek	E288270	0%	0%	0%	0%	0%
				GH_GH1	Greenhills Creek	E102709	50%	0%	0%	5.0%	0%
			M	FR_FR1	Fording River	0200251	0%	0%	0%	0%	0%
				FR_FR2	Fording River	0200201	0%	0%	0%	0%	0%
				GH_FR	Fording River	-	5.9%	0%	0%	0%	0%
				FR_FR4	Fording River	-	0%	0%	0%	0%	0%
				GH_FR3	Fording River	-	0%	0%	0%	6.7%	0%
				FR_FRCP1	Fording River	E300071	51%	0%	0%	2.4%	12%
				GH_PC2	Fording River	E287431	59%	0%	0%	0%	0%
				FR_FRABCH	Fording River	-	23%	0%	0%	0%	0%
				FR_FR5	Fording River	-	0%	0%	0%	6.3%	0%
				LC_FRUS	Fording River	E295232	0%	0%	0%	0%	0%
				LC_FRB	Fording River	-	0%	0%	0%	0%	0%
				GH_FR1	Fording River	0200251	0%	0%	0%	0%	0%
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	92%	0%	0%	0%	0%
				LC_LC3	Line Creek	0200337	100%	0%	0%	0%	0%
				LC_LCDSSLCC	Line Creek	E297110	91%	0%	0%	3.2%	0%
				LC_LC4	Line Creek	0200044	87%	0%	0%	0%	0%
			M	LC_LC6	Fording River	0200338	100%	0%	0%	0%	0%
				LC_LC5	Fording River	0200028	94%	0%	0%	0%	0%
	3	Elk	T	GH_WILLOW	Willow Creek	-	0%	0%	0%	0%	0%
				GH_WADE	Wade Creek	E287433	0%	0%	0%	0%	0%
				GH_MC1	Michelson Creek	200388	3.8%	0%	7.7%	0%	35%
				GH_LC2	Leask Creek	-	100%	0%	11%	0%	75%
				GH_WC2	Wolfram Creek	-	100%	0%	17%	5.6%	39%
				GH_TC2	Thompson Creek	E207436	100%	0%	0%	0%	0%
			M	GH_ERC	Elk River	E300090	0%	0%	0%	0%	0%
				GH_ER1	Elk River	0206661	0%	0%	0%	0%	0%
	4	Elk	T	EV_HC6	Harmer Creek	-	0%	0%	0%	0%	0%
				EV_HC1	Harmer Creek	E102682	94%	0%	0%	0%	0%
				EV_GV1	Grave Creek	-	60%	0%	0%	0%	0%
				EV_SM1	Six Mile Creek	E102681	0%	0%	0%	0%	0%
				EV_BLM2	Balmer Creek	E298592	0%	0%	0%	0%	0%
				EV_FC1	Fennelon Creek	E298591	0%	0%	0%	0%	0%
				EV_GC2	Goddard Creek	E208043	64%	0%	0%	0%	0%
				EV_OC1	Otto Creek	E102679	0%	0%	0%	0%	0%
			M	EV_ER4	Elk River	0200027	0%	0%	0%	0%	0%
				EV_ER2	Elk River	0200111	0%	0%	0%	0%	0%
		Michel	T	CM_CC1	Corbin Creek	0200209	0%	0%	0%	0%	0%
				EV_EC1	Erickson Creek	200097	100%	0%	0%	0%	0%
				EV_SP1	South Pit Creek	E296311	100%	0%	0%	0%	100%
				EV_MG1	Milligan Pond	E208057	100%	0%	0%	0%	0%
				EV_GT1	Gate Creek	E206231	100%	0%	0%	0%	73%
				EV_BC1	Bodie Creek	E102685	100%	0%	0%	0%	100%
				EV_AQ1	Aqueduct Creek	E210369	0%	0%	0%	0%	0%
		Upper Michel	M	CM_MC2	Michel Creek	E258937	0%	0%	0%	0%	0%
				CM_MCTM	Michel Creek	-	0%	0%	0%	0%	0%
		Lower Michel	M	EV_MC3	Michel Creek	0200203	0%	0%	0%	0%	0%
				EV_MC2	Michel Creek	E300091	20%	0%	0%	2.4%	0%
	5	Elk	M	EV_ER1	Elk River	0200393	0%	0%	0%	0%	0%
				RG_ELKFERNIE	Elk River	-	0%	0%	0%	0%	0%
				RG_ELKORES	Elk River	E294312	0%	0%	0%	0%	0%
				RG_ELKMOUTH	Elk River	-	0%	0%	0%	0%	0%

Shading indicates frequency exceeded 0%.

[1] Only stations with data for at least 8 months were included. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM/ guideline. Only parameters that had at least one guideline exceedance are reported.

[2] For mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.27b: Maximum Hazard Quotient for Individual Dissolved Metal Samples Exceeding Total Metal Guidelines at Each Lotic Water Station, 2015 [1]

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	Stream Name	ENV EMS Number	SSBM	Chronic			
							Selenium (Dissolved)	Chromium (Dissolved)	Cobalt (Dissolved)	Mercury (Dissolved) [2]	Uranium (Dissolved)
Reference	1	Fording	T	FR_HC3	Henretta Creek	E300096	0.02	0.23	<0.025	<8	0.11
			M	FR_UFR1	Fording River	E216777	0.01	0.21	<0.025	<8	0.06
	2	Fording	T	LC_GRCK	Grace Creek	E288275	0.14	0.22	<0.025	<8	0.13
				LC_LC1	Line Creek	E216142	0.14	0.24	<0.025	<4	0.18
				LC_SLC	South Line Creek	E282149	0.08	1.7	0.23	<8	0.22
	3	Elk	M	GH_ER2	Elk River	200389	0.05	0.64	0.06	5.8	0.10
	4	Michel	M	CM_MC1	Michel Creek	E258175	0.01	0.33	<0.125	4.6	0.03
Mine-exposed	1	Fording	T	FR_HC1	Henretta Creek	E216778	0.54	0.19	0.03	<8	0.18
				FR_CC1	Clode Creek	E102481	1.8	0.13	0.56	<8	0.79
				FR_NGD1	Lake Mountain Creek	E105060	0.31	<0.1	0.03	<8	0.17
				FR_KC1	Kilmarnock Creek	0200252	3.3	0.12	0.03	<8	1.3
				GH_SC2	Swift Creek	E105061	12	0.10	<0.05	<8	2.0
				GH_CC1	Cataract Creek	0200384	10	0.22	<0.05	<8	2.3
				GH_PC1	Porter Creek	200385	1.3	0.34	<0.025	<8	0.60
				LC_DCDS	LCO Dry Creek	E295210	0.03	0.18	0.03	<8	0.05
				LC_DC3	LCO Dry Creek	E288273	0.03	0.14	0.04	<8	0.04
				LC_DC1	LCO Dry Creek	E288270	0.02	0.13	<0.125	<8	0.05
				GH_GH1	Greenhills Creek	E102709	1.4	0.18	0.55	5.4	1.0
			M	FR_FR1	Fording River	0200251	0.36	0.14	<0.025	<8	0.15
				FR_FR2	Fording River	0200201	0.60	0.16	0.06	<40	0.34
				GH_FR	Fording River	-	1.0	0.15	0.04	<8	0.40
				FR_FR4	Fording River	-	0.97	0.15	0.04	<8	0.39
				GH_FR3	Fording River	-	0.57	0.12	0.04	12	0.33
				FR_FRCP1	Fording River	E300071	7.0	0.32	0.04	7.4	1.8
				GH_PC2	Fording River	E287431	1.3	0.19	<0.025	<8	0.36
				FR_FRABCH	Fording River	-	1.2	0.16	0.03	<8	0.33
				FR_FR5	Fording River	-	0.99	0.16	<0.025	4.7	0.27
				LC_FRUS	Fording River	E295232	0.77	0.15	<0.025	<8	0.24
				LC_FRB	Fording River	-	0.74	0.13	<0.025	<8	0.23
				GH_FR1	Fording River	0200251	0.80	0.21	0.03	<8	0.29
	2	Fording	T	LC_LCUSWLC	Line Creek	E293369	3.1	0.22	0.03	<8	0.63
				LC_LC3	Line Creek	0200337	5.9	0.22	0.03	<8	0.72
				LC_LCDSSLCC	Line Creek	E297110	4.0	0.21	<0.125	4.6	0.49
				LC_LC4	Line Creek	0200044	2.8	0.19	<0.125	<8	0.40
			M	LC_LC6	Fording River	0200338	2.5	0.15	<0.125	<8	0.23
				LC_LC5	Fording River	0200028	2.5	0.22	<0.125	<8	0.26
	3	Elk	T	GH_WILLOW	Willow Creek	-	0.27	0.11	<0.025	<8	0.08
				GH_WADE	Wade Creek	E287433	0.16	0.45	0.03	<8	0.18
				GH_MC1	Michelson Creek	200388	1.1	0.13	1.6	<8	2.0
				GH_LC2	Leask Creek	-	8.1	0.46	2.1	<8	2.4
				GH_WC2	Wolfram Creek	-	5.0	0.28	3.3	4.4	1.8
				GH_TC2	Thompson Creek	E207436	6.4	0.11	<0.025	<8	0.60
			M	GH_ERC	Elk River	E300090	0.11	0.30	<0.025	<8	0.10
				GH_ER1	Elk River	0206661	0.12	0.70	0.04	<8	0.11
	4	Elk	T	EV_HC6	Harmer Creek	-	0.04	0.31	<0.025	<8	0.09
				EV_HC1	Harmer Creek	E102682	2.1	0.20	<0.025	0.52	0.35
				EV_GV1	Grave Creek	-	1.4	0.25	<0.025	<8	0.26
				EV_SM1	Six Mile Creek	E102681	0.18	0.12	<0.025	<8	0.07
				EV_BLM2	Balmer Creek	E298592	0.48	0.14	<0.025	0.50	0.04
				EV_FC1	Fennelon Creek	E298591	0.53	0.12	<0.025	0.84	0.07
				EV_GC2	Goddard Creek	E208043	2.6	0.12	0.05	<8	0.40
				EV_OC1	Otto Creek	E102679	0.12	<0.1	0.03	<8	0.09
			M	EV_ER4	Elk River	0200027	0.87	0.34	<0.125	<8	0.16
				EV_ER2	Elk River	0200111	0.68	0.29	<0.025	<8	0.15
		Michel	T	CM_CC1	Corbin Creek	0200209	0.98	0.18	0.83	<8	0.79
				EV_EC1	Erickson Creek	200097	7.1	0.25	<0.025	<8	0.80
				EV_SP1	South Pit Creek	E296311	10	0.16	<0.025	<8	1.3
				EV_MG1	Milligan Pond	E208057	4.0	0.13	<0.025	<4	0.38
				EV_GT1	Gate Creek	E206231	11	0.14	0.57	<8	1.5
				EV_BC1	Bodie Creek	E102685	15	0.11	0.55	<8	1.6
				EV_AQ1	Aqueduct Creek	E210369	0.68	0.12	0.07	0.50	0.11
		Upper Michel	M	CM_MC2	Michel Creek	E258937	0.61	0.26	0.30	<8	0.42
				CM_MCTM	Michel Creek	-	0.19	0.26	0.03	<8	0.17
		Lower Michel	M	EV_MC3	Michel Creek	0200203	0.08	0.28	<0.025	<8	0.08
				EV_MC2	Michel Creek	E300091	1.5	0.22	<0.025	1.0	0.24
	5	Elk	M	EV_ER1	Elk River	0200393	0.74	0.29	<0.025	<8	0.16
				RG_ELKFERNIE	Elk River	-	0.50	0.44	<0.025	<8	0.12
				RG_ELKORES	Elk River	E294312	0.49	0.28	<0.025	<8	0.14
				RG_ELKMOUTH	Elk River	-	0.40	0.24	<0.025	<8	0.12

Shading indicates frequency exceeded 0%.

[1] Only stations with data for at least 8 months were included. One exception, LC_LC1, had data for 7 months. Values less than the laboratory reporting limit (LRL) were excluded from evaluation if the LRL was greater than the SSBM/ guideline. Only parameters that had at least one guideline exceedance are reported.

[2] For mercury, the most conservative guideline was applied (0.00000125 mg/L).

Table C.28: Hazard Quotients for Monthly Mean Dissolved Cadmium Concentrations at Each Water Station in 2015 and the Samples Collected Concurrently with Biological Samples in September, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	January	February	March	April	May	June	July	August	September	October	November	December	Minimum	Median	Maximum	Concurrent with Biological Sampling (September)
Reference	1	Fording	T	FR_HC3	E300096	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			M	FR_UFR1	E216777	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	2	Fording	T	LC_GRCK	E288275	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				LC_LC1	E216142	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1
				LC_SLC	E282149	<0.1	<0.1	<0.1	<0.1	<0.1	2.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	2.1	<0.1
	3	Elk	M	GH_ER2	200389	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
	4	Michel	T	CM_AG1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
				EV_AC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
		Michel	M	CM_MC1	E258175	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1
Mine-exposed	1	Fording	T	FR_HC1	E216778	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
				FR_CC1	E102481	<0.1	1.0	0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.5	1.3	<0.1	<0.1	1.3	-
				FR_LMP1	E306924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	<0.1	0.1	<0.1	0.2	0.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	-
				FR_KC1	0200252	0.3	<0.1	0.7	2.2	1.7	1.3	1.6	1.7	1.8	1.8	1.8	1.8	<0.1	1.7	2.2	1.2
				GH_SC1	E221329	-	-	0.1	<0.1	<0.1	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.5
				GH_SC2	E105061	2.0	1.5	1.7	1.7	1.1	0.8	2.1	2.1	2.0	1.5	1.2	1.0	0.8	1.6	2.1	-
				GH_CC1	0200384	0.5	0.7	0.4	0.6	0.5	0.9	1.5	1.4	1.2	0.8	1.1	0.4	0.4	0.7	1.5	1.3
				GH_PC1	200385	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				LC_DCDS	E295210	0.2	-	0.2	0.3	0.2	0.4	0.1	<0.1	0.1	<0.1	0.1	0.1	<0.1	0.1	0.4	<0.1
				LC_DC3	E288273	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.5	0.2	0.3	0.2	0.2	0.3	0.5	-
				LC_DC1	E288270	-	-	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
				GH_GH1	E102709	<0.1	<0.1	0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1
			M	FR_FR1	0200251	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1
				FR_FRABEC1	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	<0.1	0.1
				FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	<0.1	<0.1
				FR_FR2	0200201	0.2	0.2	0.2	0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.2	0.2	<0.1	0.1	0.2	0.1
				GH_FR3	-	-	0.2	0.2	0.1	<0.1	<0.1	0.1	0.1	0.1	-	-	-	<0.1	0.1	0.2	0.1
				FR_FR4	200311	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	<0.1	<0.1	0.2	-	<0.1	0.1	0.2	0.1
				GH_FR	200311	-	0.2	0.2	0.1	0.1	<0.1	0.1	0.1	0.2	-	-	-	<0.1	0.1	0.2	-
				FR_FRCP1	E300071	-	<0.1	<0.1	0.1	<0.1	0.1	0.1	0.1	0.1	<0.1	0.1	0.1	<0.1	0.1	0.1	0.1
				GH_PC2	E287431	0.1	0.1	0.1	0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	0.1	0.1	0.1
				FR_FRABCH	0	-	-	0.1	0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	-	<0.1	<0.1	0.1	0.1
				FR_FR5	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.1	0.1
				LC_FRUS	E295232	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	<0.1	<0.1	<0.1	-
				LC_FRB	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				GH_FR1	0200251	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	2	Fording	T	LC_LCUSWLC	E293369	1.0	0.9	0.9	0.9	0.9	1.1	1.2	1.2	1.1	1.1	1.2	1.2	0.9	1.1	1.2	-
				LC_LC3	0200337	0.9	0.9	0.9	1.0	1.2	1.5	1.9	1.8	1.8	1.5	1.5	1.0	0.9	1.4	1.9	1.0
				LC_LCDSSLCC	E297110	0.4	0.3	0.3	0.4	0.4	0.6	0.8	0.8	0.8	0.8	0.6	0.4	0.3	0.5	0.8	0.6
				LC_LC4	0200044	<0.1	<0.1	<0.1	<0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.3
			M	LC_LC6	0200338	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				LC_LC5	0200028	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
	3	Elk	T	GH_BR_F	E287437	-	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WOLF	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WILLOW	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
				GH_WILLOW_S	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WADE	E287433	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				GH_COUGAR	E287432	-	-	0.1	0.1	0.1	0.1	-	-	-	-	-	-	0.1	0.1	0.1	-
				GH_MC1	200388	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				GH_LC2	-	<0.1	<0.1	<0.1	0.1	0.1	0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	-
				GH_LC1	E257796	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	<0.1	-
				GH_WC2	-	-	-	0.2	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2	0.1
				GH_WC1	E257795	-	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	<0.1	<0.1	0.1	-
				GH_TC2	E207436	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			M	GH_ERC	E300090	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				GH_ER1	0206661	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	4	Elk	T	EV_HC6	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				EV_HC1	E102682	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				EV_GV1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				EV_SM1	E102681	<0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				EV_BLM2	E298592	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				EV_FC1	E298591	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				EV_GC2	E208043	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	-
				EV_OC1	E102679	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			M	EV_ER4	0200027	-	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	<0.1
				EV_ER2	0200111	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		Michel	T	CM_CC1	0200209	<0.1	0.2	0.2	0.2	0.5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.1	0.5	<0.1
				EV_EC1	200097	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				EV_SP1	E296311	2.5	<0.1	-	-	<0.1	<0.1	1.1	0.6	0.2	0.6	0.5	1.9	<0.1	0.5	2.5	-
				EV_MG1	E208057	-	-	-	-	0.4	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.4	-
				EV_GT1	E206231	-	0.6	0.6	0.6	0.4	0.6	0.4	1.4	1.0	1.5	0.2	0.7	0.2	0.6	1.5	-
				EV_BC1	E102685	-	-	<0.1	0.1	<0.1	0.1	0.2	0.7	0.1	0.5	<0.1	<0.1	<0.1	0.1	0.7	0.5
				EV_AQ1	E210369	-	0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	0.2	<0.1	<0.1	0.2	-
		Upper Michel	M	CM_MC2	E258937	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
				CM_MCTM	-	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.2	<0.1
		Lower Michel	M	EV_MC3	0200203	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
				EV_MC2	E300091	<0.1	0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1	-
				EV_MC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
	5	Elk	M	EV_ER1	0200393	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				RG_ELKFERNIE	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				RG_ELKORES	E294312	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				RG_ELKMOUTH	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Maximum Monthly HQ

Notes: "-" = not data; "ND" = not determined

Table C.29: Hazard Quotients for Monthly Mean Nitrate-N Concentrations at Each Water Station in 2015 and for the Samples Collected Concurrently with Biological Samples in September, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	January	February	March	April	May	June	July	August	September	October	November	December	Minimum	Median	Maximum	Concurrent with Biological Sampling (September)
Reference	1	Fording	T	FR_HC3	E300096	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
			M	FR_UFR1	E216777	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	2	Fording	T	LC_GRCK	E288275	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				LC_LC1	E216142	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1
				LC_SLC	E282149	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	3	Elk	M	GH_ER2	200389	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	4	Michel	T	CM_AG1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
				EV_AC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
		Michel	M	CM_MC1	E258175	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mine-exposed	1	Fording	T	FR_HC1	E216778	0.7	0.7	0.8	0.7	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.8	0.4	0.6	0.8	0.5
				FR_CC1	E102481	1.5	1.9	1.8	2.4	1.9	1.6	2.0	2.3	2.6	3.2	3.9	3.3	1.5	2.1	3.9	-
				FR_LMP1	E306924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	0.1	0.1	0.1	0.3	0.2	0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	0.1	0.3	-
				FR_KC1	0200252	5.7	6.6	6.5	6.3	3.7	1.9	2.3	2.6	3.1	3.2	3.8	4.9	1.9	3.8	6.6	3.3
				GH_SC1	E221329	-	-	0.1	0.3	0.6	-	-	-	-	-	-	-	0.1	0.3	0.6	1.9
				GH_SC2	E105061	2.8	2.9	2.5	1.7	0.6	0.9	1.5	1.8	1.9	2.2	2.2	2.2	0.6	2.0	2.9	-
				GH_CC1	0200384	2.3	2.4	2.1	2.0	2.0	2.0	2.0	2.0	2.2	2.2	2.2	2.2	2.0	2.2	2.4	2.3
				GH_PC1	200385	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				LC_DCDS	E295210	<0.1	-	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
				LC_DC3	E288273	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	-
				LC_DC1	E288270	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				GH_GH1	E102709	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.1	0.2	0.3	0.3
			M	FR_FR1	0200251	-	-	0.7	0.6	0.3	0.2	0.3	0.4	0.4	0.4	0.5	-	0.2	0.4	0.7	0.5
				FR_FRABEC1	-	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-	1.2	1.2
				FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	1.1	1.1
				FR_FR2	0200201	0.8	0.9	0.9	0.9	0.6	0.5	0.6	0.8	0.9	1.0	1.1	1.2	0.5	0.9	1.2	0.8
				GH_FR3	-	-	0.9	0.9	0.9	0.5	0.5	0.7	0.8	0.9	-	-	-	0.5	0.8	0.9	0.8
				FR_FR4	200311	0.9	0.9	0.9	0.8	0.6	0.6	0.7	0.7	1.0	1.0	1.2	-	0.6	0.9	1.2	0.8
				GH_FR	200311	-	0.9	0.9	0.8	0.6	0.6	0.6	0.7	0.8	-	-	-	0.6	0.8	0.9	-
				FR_FRCP1	E300071	-	1.5	1.3	0.8	0.9	0.9	0.6	0.7	0.8	0.9	1.3	1.3	0.6	0.9	1.5	0.8
				GH_PC2	E287431	1.4	1.5	1.4	1.1	1.0	1.1	1.3	1.4	1.3	1.2	1.2	-	1.0	1.3	1.5	1.3
				FR_FRABCH	0	-	-	1.3	1.0	1.0	1.1	1.4	1.3	1.2	1.3	1.4	-	1.0	1.3	1.4	1.3
				FR_FR5	-	1.2	1.3	1.2	1.0	1.0	1.0	1.1	1.1	1.1	1.0	1.1	-	1.0	1.1	1.3	1.1
				LC_FRUS	E295232	1.1	1.1	1.0	0.9	0.9	0.8	0.9	1.0	1.0	-	-	-	0.8	1.0	1.1	-
				LC_FRB	-	-	1.1	1.0	0.9	0.8	0.8	0.9	1.0	0.9	0.9	0.9	0.9	0.8	0.9	1.1	0.9
				GH_FR1	0200251	-	0.9	0.8	0.8	0.8	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.8	0.9	0.8
	2	Fording	T	LC_LCUSWLC	E293369	1.4	1.4	1.5	1.1	1.0	0.6	0.9	0.9	0.9	1.3	1.6	2.0	0.6	1.2	2.0	-
				LC_LC3	0200337	1.4	1.4	1.4	1.0	0.9	0.8	0.8	0.9	1.0	1.3	1.5	1.7	0.8	1.2	1.7	1.0
				LC_LCDSSLCC	E297110	0.9	1.0	0.9	0.8	0.6	0.6	0.7	0.7	0.9	1.0	1.0	1.0	0.6	0.9	1.0	0.8
				LC_LC4	0200044	0.8	0.8	0.8	0.7	0.6	0.5	0.6	0.6	0.7	0.8	0.9	1.0	0.5	0.7	1.0	0.7
			M	LC_LC6	0200338	0.9	-	0.9	0.8	0.8	-	0.8	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.8
				LC_LC5	0200028	0.8	0.9	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.8	0.7	0.8	0.9	0.8
	3	Elk	T	GH_BR_F	E287437	-	-	0.1	<0.1	<0.1	-	-	-	-	-	-	-	<0.1	<0.1	0.1	-
				GH_WOLF	-	-	-	0.3	0.2	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	<0.1	0.3	-
				GH_WILLOW	-	0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	-	<0.1	<0.1	0.1	-
				GH_WILLOW_S	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WADE	E287433	<0.1	0.1	0.4	0.3	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	-
				GH_COUGAR	E287432	-	-	0.3	0.3	0.2	<0.1	-	-	-	-	-	-	<0.1	0.2	0.3	-
				GH_MC1	200388	-	<0.1	0.2	0.1	2.2	2.7	3.2	3.4	3.7	3.0	3.2	3.7	<0.1	3.0	3.7	-
				GH_LC2	-	17	15	7.7	5.0	7.5	5.9	5.5	6.6	11	12	8.8	8.7	5.0	8.2	17	-
				GH_LC1	E257796	-	-	-	-	-	-	-	-	4.3	-	-	-	-	-	4.3	-
				GH_WC2	-	-	-	6.8	9.3	9.8	9.7	13	13	11	5.6	4.3	4.3	4.3	9.5	13	3.2
				GH_WC1	E257795	-	-	-	-	-	-	-	-	-	5.6	4.4	4.4	4.4	4.4	5.6	-
				GH_TC2	E207436	4.6	4.9	2.1	1.3	1.9	2.2	2.7	3.2	3.8	4.1	4.6	3.7	1.3	3.5	4.9	0.8
			M	GH_ERC	E300090	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.2	0.3	<0.1	0.1	0.3	0.1
				GH_ER1	0206661	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.2	<0.1	0.1	0.2	0.1
	4	Elk	T	EV_HC6	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
				EV_HC1	E102682	0.5	0.4	0.4	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.2	0.4	0.5	0.1
				EV_GV1	-	-	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.2	0.3	0.1
				EV_SM1	E102681	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				EV_BLM2	E298592	-	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.1	<0.1	<0.1	0.1	0.2	-
				EV_FC1	E298591	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	-
				EV_GC2	E208043	0.4	0.3	0.4	0.4	0.6	0.6	0.6	0.6	0.6	0.5	0.4	0.3	0.3	0.5	0.6	-
				EV_OC1	E102679	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			M	EV_ER4	0200027	-	1.2	1.3	1.2	0.8	0.5	0.6	0.8	0.8	0.9	1.0	1.2	0.5	0.9	1.3	0.4
				EV_ER2	0200111	-	1.0	1.0	1.0	0.8	0.4	0.5	0.6	0.7	0.8	0.9	0.9	0.4	0.8	1.0	0.3
		Michel	T	CM_CC1	0200209	2.0	1.9	1.5	1.6	1.3	1.4	2.2	2.3	2.3	2.3	2.2	2.5	1.3	2.1	2.5	0.5
				EV_EC1	200097	3.9	3.9	4.0	3.7	3.8	3.8	3.8	3.7	4.0	4.0	4.0	4.5	3.7	3.9	4.5	-
				EV_SP1	E296311	1.6	1.6	1.6	1.5	1.5	1.7	1.7	1.8	1.9	2.1	1.8	1.7	1.5	1.7	2.1	-
				EV_MG1	E208057	-	-	0.2	0.2	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2	-
				EV_GT1	E206231	-	4.8	9.6	12	12	12	12	12	12	12	12	12	4.8	12	12	-
				EV_BC1	E102685	-	-	16	13	14	11	12	12	12	12	12	12	11	12	16	2.6
				EV_AQ1	E210369	-	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	0.2	-
		Upper Michel	M	CM_MC2	E258937	0.8	0.7	0.6	0.6	0.4	0.4	0.8	1.1	1.1	0.9	0.8	1.1	0.4	0.8	1.1	0.2
				CM_MCTM	-	0.4	0.4	0.4	0.3	0.2	<0.1	0.2	0.3	0.4	0.3	0.4	-	<0.1	0.3	0.4	0.1
		Lower Michel	M	EV_MC3	0200203	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	0.1	0.1
				EV_MC2	E300091	0.4	0.9	0.5	0.5	0.4	0.9	1.4	1.7	1.6	2.0	1.0	1.3	0.4	1.0	2.0	-
				EV_MC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
	5	Elk	M	EV_ER1	0200393	0.8	0.7	0.7	0.7	0.5	0.4	0.6	0.7	0.8	0.8	0.8	0.9	0.4	0.7	0.9	0.3
				RG_ELKFERNIE	-	0.5	0.6	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.4	0.5	0.6	0.4	0.5	0.6	0.3
				RG_ELKORES	E294312	0.5	0.5	0.4	0.5	0.4	0.4	0.5	0.6	0.7	0.7	0.6	0.6	0.4	0.5	0.7	0.3
				RG_ELKMOUTH	-	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.6	0.5	0.5	0.3	0.4	0.6	0.3

Maximum Monthly HQ

Notes: "-" = not data; "ND" = not determined

Table C.30: Hazard Quotients for Monthly Mean Total Selenium Concentrations at Each Water Station in 2015 and the Samples Collected Concurrently with Biological Samples in September, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	January	February	March	April	May	June	July	August	September	October	November	December	Minimum	Median	Maximum	Concurrent with Biological Sampling (September)
Reference	1	Fording	T	FR_HC3	E300096	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			M	FR_UFR1	E216777	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	2	Fording	T	LC_GRCK	E288275	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	<0.1	0.1	0.1	<0.1
				LC_LC1	E216142	-	-	-	-	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1	-	<0.1	0.1	0.1	<0.1
				LC_SLC	E282149	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	3	Elk	M	GH_ER2	200389	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	4	Michel	T	CM_AG1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
				EV_AC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
		Michel	M	CM_MC1	E258175	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mine-exposed	1	Fording	T	FR_HC1	E216778	0.4	0.5	0.5	0.4	0.1	0.1	0.2	0.3	0.2	0.2	0.3	0.4	0.1	0.3	0.5	0.1
				FR_CC1	E102481	1.0	1.1	1.1	1.8	1.5	1.2	1.3	1.3	1.3	1.4	1.5	1.3	1.0	1.3	1.8	-
				FR_LMP1	E306924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	0.3	0.3	0.3	0.3	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.1	0.2	0.3	-
				FR_KC1	0200252	3.0	3.3	3.2	3.2	1.9	1.2	1.2	1.4	1.5	1.5	1.7	2.4	1.2	1.8	3.3	1.0
				GH_SC1	E221329	-	-	0.2	1.5	2.7	-	-	-	-	-	-	-	0.2	1.5	2.7	4.9
				GH_SC2	E105061	11	10	9.0	6.4	2.7	1.9	6.0	7.2	7.8	8.2	8.2	8.5	1.9	8.0	11	-
				GH_CC1	0200384	9.8	9.4	8.2	8.4	8.1	7.8	8.7	8.5	8.6	8.6	7.9	8.8	7.8	8.5	9.8	5.3
				GH_PC1	200385	1.0	1.0	0.9	1.2	1.2	1.0	0.9	1.0	1.0	1.0	0.9	1.0	0.9	1.0	1.2	0.6
				LC_DCDS	E295210	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				LC_DC3	E288273	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				LC_DC1	E288270	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				GH_GH1	E102709	1.2	1.1	0.8	0.5	0.5	0.7	1.3	1.3	1.4	1.4	1.4	1.5	0.5	1.3	1.5	0.8
			M	FR_FR1	0200251	-	-	0.4	0.2	<0.1	<0.1	0.1	0.2	0.2	0.2	0.2	-	<0.1	0.2	0.4	0.1
				FR_FRABEC1	-	0.5	-	-	0.2	-	-	0.2	-	0.4	0.4	-	-	0.2	0.4	0.5	0.2
				FR_MULTIPLATE	-	0.5	-	-	0.2	-	-	0.2	-	0.4	0.4	-	-	0.2	0.4	0.5	0.2
				FR_FR2	0200201	0.5	0.5	0.6	0.4	0.2	0.1	0.3	0.3	0.4	0.4	0.5	0.5	0.1	0.4	0.6	0.2
				GH_FR3	-	-	0.5	0.5	0.4	0.2	0.1	0.2	0.4	0.4	-	-	-	0.1	0.4	0.5	0.2
				FR_FR4	200311	0.8	0.9	0.9	0.5	0.3	0.3	0.4	0.5	0.6	0.6	0.9	-	0.3	0.6	0.9	0.3
				GH_FR	200311	-	0.8	0.8	0.6	0.4	0.2	0.5	0.6	0.6	-	-	-	0.2	0.6	0.8	-
				FR_FRCP1	E300071	-	4.4	3.3	0.9	0.4	0.4	0.8	1.0	1.1	1.0	2.3	1.7	0.4	1.0	4.4	0.6
				GH_PC2	E287431	1.3	1.2	1.3	1.0	0.8	0.5	0.9	1.0	1.0	0.9	1.0	-	0.5	1.0	1.3	0.7
				FR_FRABCH	0	-	-	1.1	0.9	0.6	0.6	1.0	0.9	1.0	0.9	1.0	-	0.6	0.9	1.1	0.7
				FR_FR5	-	0.9	1.0	1.0	0.8	0.5	0.5	0.8	0.7	0.8	0.8	0.8	-	0.5	0.8	1.0	0.6
				LC_FRUS	E295232	0.7	0.7	0.7	0.7	0.5	0.3	0.5	0.6	0.6	-	-	-	0.3	0.6	0.7	-
				LC_FRB	-	-	0.7	0.7	0.7	0.5	0.3	0.5	0.5	0.6	0.5	0.6	0.6	0.3	0.6	0.7	0.3
				GH_FR1	0200251	-	0.7	0.7	0.6	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.4	0.6	0.7	0.4
	2	Fording	T	LC_LCUSWLC	E293369	2.7	3.0	3.1	1.9	1.1	0.8	1.4	1.6	1.6	1.7	2.1	2.0	0.8	1.8	3.1	-
				LC_LC3	0200337	5.5	6.2	5.1	3.3	2.6	1.9	3.2	3.4	3.4	3.4	4.0	3.0	1.9	3.4	6.2	0.5
				LC_LCDSSLCC	E297110	3.5	3.8	3.2	2.2	1.3	1.2	2.1	2.3	2.4	2.6	2.8	2.1	1.2	2.3	3.8	0.4
				LC_LC4	0200044	2.5	2.7	2.2	1.8	1.1	1.0	1.6	1.8	1.9	2.0	2.1	1.8	1.0	1.9	2.7	0.3
			M	LC_LC6	0200338	2.2	-	2.5	2.2	1.6	-	1.6	1.9	2.0	1.9	1.9	1.8	1.6	1.9	2.5	0.3
				LC_LC5	0200028	2.1	2.4	2.2	1.9	1.4	1.2	1.6	1.8	1.9	2.0	1.9	1.7	1.2	1.9	2.4	0.3
	3	Elk	T	GH_BR_F	E287437	-	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WOLF	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WILLOW	-	<0.1	<0.1	<0.1	0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.2	-
				GH_WILLOW_S	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WADE	E287433	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	-
				GH_COUGAR	E287432	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_MC1	200388	-	<0.1	0.1	<0.1	0.4	0.6	0.4	0.4	0.3	0.2	0.2	0.7	<0.1	0.3	0.7	-
				GH_LC2	-	4.1	3.4	2.4	1.9	4.3	4.4	2.0	4.2	6.9	7.7	4.0	7.0	1.9	4.2	7.7	-
				GH_LC1	E257796	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	1.0	-
				GH_WC2	-	-	-	2.2	4.5	3.9	1.8	3.6	3.6	3.7	1.7	1.6	1.7	1.6	2.9	4.5	1.2
				GH_WC1	E257795	-	-	-	-	-	-	-	-	-	1.8	1.5	1.6	1.5	1.6	1.8	-
				GH_TC2	E207436	6.3	6.2	2.9	2.3	3.1	3.3	3.8	5.0	5.5	5.6	5.8	5.1	2.3	5.1	6.3	0.9
			M	GH_ERC	E300090	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1
				GH_ER1	0206661	<0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1
	4	Elk	T	EV_HC6	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4
				EV_HC1	E102682	2.0	1.8	1.7	1.8	1.4	1.3	1.5	1.8	1.8	1.9	2.0	2.1	1.3	1.8	2.1	0.3
				EV_GV1	-	-	1.3	1.2	1.2	0.7	0.7	1.1	1.2	1.3	1.4	1.4	1.3	0.7	1.2	1.4	0.2
				EV_SM1	E102681	0.1	0.1	0.1	<0.1	0.1	0.2	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2	-
				EV_BLM2	E298592	-	0.3	0.2	0.2	0.5	0.3	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.3	0.5	-
				EV_FC1	E298591	-	0.2	0.2	0.2	0.2	0.2	0.3	0.5	0.5	0.5	0.3	0.1	0.1	0.2	0.5	-
				EV_GC2	E208043	1.0	0.6	0.8	1.1	2.4	2.5	2.5	2.1	1.8	1.4	1.2	0.9	0.6	1.3	2.5	-
				EV_OC1	E102679	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
			M	EV_ER4	0200027	-	0.8	0.8	0.8	0.5	0.3	0.4	0.5	0.5	0.5	0.7	0.6	0.3	0.5	0.8	0.1
				EV_ER2	0200111	-	0.7	0.7	0.7	0.6	0.3	0.3	0.4	0.5	0.5	0.6	0.5	0.3	0.5	0.7	0.1
		Michel	T	CM_CC1	0200209	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.9	0.8	0.7	1.0	0.7	0.8	1.0	0.1
				EV_EC1	200097	6.8	6.7	6.3	7.0	6.4	6.3	6.2	6.1	6.2	6.4	6.6	6.7	6.1	6.4	7.0	-
				EV_SP1	E296311	8.4	7.8	7.9	8.6	8.0	9.3	8.8	8.9	8.9	10	9.6	11	7.8	8.9	11	-
				EV_MG1	E208057	-	-	3.4	3.8	3.8	3.5	3.2	3.5	3.1	3.3	3.1	3.6	3.1	3.4	3.8	-
				EV_GT1	E206231	-	8.8	8.1	6.5	7.1	5.1	7.3	9.4	7.4	7.8	5.7	5.6	5.1	7.3	9.4	-
				EV_BC1	E102685	-	-	7.2	5.5	7.2	4.8	6.8	12	7.7	7.3	5.2	5.0	4.8	7.0	12	1.3
				EV_AQ1	E210369	-	0.5	0.4	0.6	0.5	0.4	0.3	0.3	0.3	-	0.3	0.2	0.2	0.4	0.6	-
		Upper Michel	M	CM_MC2	E258937	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.4	0.4	0.3	0.3	0.4	0.2	0.3	0.4	0.1
				CM_MCTM	-	0.2	0.2	0.2	0.2	0.1	<0.1	0.1	0.2	0.2	0.2	0.2	-	<0.1	0.2	0.2	<0.1
		Lower Michel	M	EV_MC3	0200203	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				EV_MC2	E300091	0.6	1.1	0.5	0.4	0.3	0.6	1.1	1.3	1.2	1.3	0.7	0.9	0.3	0.8	1.3	-
				EV_MC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
	5	Elk	M	EV_ER1	0200393	0.6	0.6	0.6	0.5	0.4	0.3	0.4	0.6	0.6	0.6	0.5	0.6	0.3	0.6	0.6	0.1
				RG_ELKFERNIE	-	0.3	0.4	0.3	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.1
				RG_ELKORES	E294312	0.4	0.4	0.3	0.4	0.3	0.3	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.4	0.5	0.1
				RG_ELKMOUTH	-	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.4	0.4	0.4	0.3	0.3	0.2	0.3	0.4	0.1

Maximum Monthly HQ

Notes: "-" = not data; "ND" = not determined

Table C.31: Hazard Quotients for Monthly Mean Sulphate Concentrations at Each Water Station in 2015 and the Samples Collected Concurrently with Biological Samples in September, 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	January	February	March	April	May	June	July	August	September	October	November	December	Minimum	Median	Maximum	Concurrent with Biological Sampling (September)
Reference	1	Fording	T	FR_HC3	E300096	0.2	0.2	0.2	0.2	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.2	0.2	<0.1	0.1	0.2	0.1
			M	FR_UFR1	E216777	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	<0.1	0.1	0.1	0.1
	2	Fording	T	LC_GRCK	E288275	0.1	0.1	0.1	0.1	0.1	<0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	0.1	0.1	0.1
				LC_LC1	E216142	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.2	-	<0.1	0.1	0.2	0.1
				LC_SLC	E282149	0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1	<0.1	0.1	0.2	0.1
	3	Elk	M	GH_ER2	200389	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	4	Michel	T	CM_AG1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
				EV_AC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
		Michel	M	CM_MC1	E258175	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mine-exposed	1	Fording	T	FR_HC1	E216778	0.4	0.4	0.5	0.4	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.1	0.3	0.5	0.2
				FR_CC1	E102481	0.5	0.6	0.6	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.5	0.6	0.8	-
				FR_LMP1	E306924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	0.3	0.3	0.3	0.2	0.1	<0.1	0.1	0.2	0.2	0.2	0.2	0.2	<0.1	0.2	0.3	-
				FR_KC1	0200252	1.3	1.5	1.4	1.4	0.7	0.4	0.5	0.6	0.7	0.7	0.9	1.1	0.4	0.8	1.5	0.8
				GH_SC1	E221329	-	-	0.1	0.7	1.5	-	-	-	-	-	-	-	0.1	0.7	1.5	3.4
				GH_SC2	E105061	4	4.2	3.5	2.3	1	1.5	2.8	3.2	3.3	3.8	3.7	3.8	1	3.4	4.2	-
				GH_CC1	0200384	4.2	4.3	3.9	3.8	4	4.2	4.2	4.1	4.2	4.3	4.5	4.4	3.8	4.2	4.5	4.3
				GH_PC1	200385	1	1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1.1	1	0.9	0.9	1.1	1.0
				LC_DCDS	E295210	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				LC_DC3	E288273	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				LC_DC1	E288270	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				GH_GH1	E102709	1.3	1.3	0.9	0.5	0.6	1	1.3	1.4	1.5	1.6	1.6	1.6	0.5	1.3	1.6	1.6
			M	FR_FR1	0200251	-	-	0.4	0.3	0.1	<0.1	0.1	0.2	0.2	0.2	0.3	-	<0.1	0.2	0.4	0.2
				FR_FRABEC1	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	0.3	0.3
				FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	0.3	0.3
				FR_FR2	0200201	0.5	0.6	0.5	0.3	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.2	0.4	0.6	0.3
				GH_FR3	-	-	0.5	0.5	0.4	0.2	0.2	0.3	0.3	0.4	-	-	-	0.2	0.3	0.5	0.3
				FR_FR4	200311	0.7	0.7	0.7	0.5	0.2	0.2	0.4	0.4	0.5	0.5	0.6	-	0.2	0.5	0.7	0.4
				GH_FR	200311	-	0.7	0.6	0.4	0.2	0.2	0.4	0.4	0.5	-	-	-	0.2	0.4	0.7	-
				FR_FRCP1	E300071	-	2.3	1.7	0.5	0.3	0.3	0.5	0.7	0.7	0.7	1.4	1.1	0.3	0.7	2.3	0.7
				GH_PC2	E287431	0.7	0.7	0.8	0.6	0.4	0.4	0.6	0.6	0.6	0.7	0.7	-	0.4	0.6	0.8	0.6
				FR_FRABCH	0	-	-	0.7	0.6	0.4	0.4	0.6	0.6	0.6	0.7	0.7	-	0.4	0.6	0.7	0.6
				FR_FR5	-	0.5	0.6	0.6	0.5	0.3	0.3	0.5	0.5	0.5	0.5	0.5	-	0.3	0.5	0.6	0.5
				LC_FRUS	E295232	0.4	0.5	0.5	0.5	0.3	0.2	0.3	0.4	0.4	-	-	-	0.2	0.4	0.5	-
				LC_FRB	-	-	0.5	0.5	0.5	0.3	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.2	0.4	0.5	0.3
				GH_FR1	0200251	-	0.5	0.6	0.4	0.3	0.2	0.4	0.4	0.4	0.4	0.5	0.5	0.2	0.4	0.6	0.4
	2	Fording	T	LC_LCUSWLC	E293369	0.7	0.7	0.7	0.5	0.3	0.2	0.3	0.5	0.5	0.5	0.7	0.7	0.2	0.5	0.7	-
				LC_LC3	0200337	0.9	0.9	0.8	0.6	0.4	0.3	0.5	0.7	0.7	0.7	0.8	0.9	0.3	0.7	0.9	0.7
				LC_LCDSSLCC	E297110	0.6	0.6	0.6	0.4	0.2	0.2	0.4	0.5	0.5	0.5	0.6	0.6	0.2	0.5	0.6	0.5
				LC_LC4	0200044	0.4	0.5	0.4	0.3	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.2	0.4	0.5	0.4
			M	LC_LC6	0200338	0.4	-	0.5	0.5	0.3	-	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.5	0.4
				LC_LC5	0200028	0.4	0.4	0.5	0.4	0.3	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.2	0.4	0.5	0.4
	3	Elk	T	GH_BR_F	E287437	-	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WOLF	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WILLOW	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
				GH_WILLOW_S	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_WADE	E287433	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
				GH_COUGAR	E287432	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	<0.1	<0.1	<0.1	-
				GH_MC1	200388	-	0.1	0.2	0.1	1	1.2	1.4	1.4	1.5	1.7	1.8	2.1	0.1	1.4	2.1	-
				GH_LC2	-	1.3	1	0.8	1.2	1.8	1.9	1.5	2.2	2.2	2.4	2.2	3.6	0.8	1.8	3.6	-
				GH_LC1	E257796	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	1.6	-
				GH_WC2	-	-	-	0.6	0.9	1	1.1	1.3	1.4	1.5	1.6	2	2	0.6	1.3	2	2.3
				GH_WC1	E257795	-	-	-	-	-	-	-	-	-	1.7	1.9	2	1.7	1.9	2	-
				GH_TC2	E207436	1.5	1.5	0.8	0.6	0.9	1.1	1.4	1.5	1.6	1.6	1.7	1.4	0.6	1.5	1.7	1.6
			M	GH_ERC	E300090	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	0.1
				GH_ER1	0206661	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	0.1
	4	Elk	T	EV_HC6	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5
				EV_HC1	E102682	0.5	0.5	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.3	0.4	0.5	0.4
				EV_GV1	-	-	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.3	0.2	0.3	0.4	0.4
				EV_SM1	E102681	0.2	0.2	0.2	0.1	0.1	<0.1	0.1	0.1	0.2	0.2	0.2	0.2	<0.1	0.2	0.2	-
				EV_BLM2	E298592	-	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	0.1	-
				EV_FC1	E298591	-	0.1	0.1	<0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.1	<0.1	0.1	0.3	-
				EV_GC2	E208043	0.7	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.5	0.5	0.7	0.8	-
				EV_OC1	E102679	0.2	0.2	0.2	0.2	0.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1	0.2	0.1
			M	EV_ER4	0200027	-	0.2	0.2	0.2	0.1	<0.1	0.1	0.1	0.1	0.2	0.2	0.2	<0.1	0.2	0.2	0.2
				EV_ER2	0200111	-	0.2	0.2	0.2	0.1	<0.1	0.1	0.1	0.1	0.2	0.2	0.2	<0.1	0.2	0.2	0.2
		Michel	T	CM_CC1	0200209	1.3	1.3	1	1	0.8	0.9	1.4	1.4	1.4	1.5	1.4	1.6	0.8	1.3	1.6	1.5
				EV_EC1	200097	1.6	1.6	1.7	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.7	1.5	1.6	1.7	-
				EV_SP1	E296311	1.4	1.5	1.5	1.4	1.6	1.7	1.6	1.7	1.7	1.9	1.6	1.6	1.4	1.6	1.9	-
				EV_MG1	E208057	-	-	0.9	0.8	0.9	0.8	0.9	1.1	1.2	1.2	1.3	1.1	0.8	1	1.3	-
				EV_GT1	E206231	-	1.7	1.9	1.6	1.8	1.5	1.7	2.2	1.9	1.9	1.8	1.7	1.5	1.8	2.2	-
				EV_BC1	E102685	-	-	1.8	1.6	1.6	1.5	1.6	2.2	1.9	1.9	1.6	1.6	1.5	1.6	2.2	1.8
				EV_AQ1	E210369	-	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	-	0.2	0.2	<0.1	0.1	0.2	-
		Upper Michel	M	CM_MC2	E258937	0.6	0.6	0.4	0.4	0.2	0.3	0.6	0.8	0.7	0.7	0.6	0.8	0.2	0.6	0.8	0.7
				CM_MCTM	-	0.3	0.3	0.3	0.2	0.1	<0.1	0.2	0.3	0.3	0.3	0.3	-	<0.1	0.3	0.3	0.2
		Lower Michel	M	EV_MC3	0200203	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	<0.1	<0.1	0.1	0.1
				EV_MC2	E300091	0.2	0.3	0.2	0.2	0.1	0.2	0.3	0.4	0.4	0.4	0.3	0.3	0.1	0.3	0.4	-
				EV_MC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
	5	Elk	M	EV_ER1	0200393	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2
				RG_ELKFERNIE	-	0.1	0.1	<0.1	0.1	0.1	<0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	0.1	0.1	0.2
				RG_ELKORES	E294312	0.2	0.1	0.1	0.1	<0.1	<0.1	0.1	0.1	0.2	0.2	0.2	0.2	<0.1	0.1	0.2	0.2
				RG_ELKMOUTH	-	0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	0.1	0.1	0.1

Maximum Monthly HQ

Notes: "-" = not data; "ND" = not determined

Table C.32: Temporal Analysis of the Differences between Mine-exposed and Mean Reference Area Concentrations of Nitrate, 2012 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	Years included in Analysis	ANOVA P-value	Linear		Step after 2012		Step after 2013		Step after 2014		Step after 2015	
							P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]
1	Fording	T	FR_HC1	E216778	12,13,14,15,16	<0.001	<0.001	-51	0.007	-32	<0.001	-49	<0.001	-40	<0.001	-39
			FR_CC1	E102481	12,13,14,15,16	0.014	0.237	-	0.957	-	0.625	-	0.150	-	0.003	99
			FR_LMP1	E306924	12,13,14,15	ND	ND	-	ND	-	ND	-	ND	-	ND	-
			FR_NGD1	E105060	12,13,14,15,16	0.004	<0.001	-44	0.038	-29	<0.001	-41	0.004	-32	0.021	-32
			FR_KC1	200252	12,13,14,15,16	<0.001	<0.001	-42	0.007	-28	<0.001	-42	<0.001	-36	0.003	-30
			GH_SC1	E221329	12,13,14,15	0.030	0.007	-94	0.021	-81	0.035	-77	0.009	-88	ND	-
			GH_SC2	E105061	12,13,14,15,16	<0.001	<0.001	-63	<0.001	-57	<0.001	-58	<0.001	-54	0.037	-31
			GH_CC1	200384	12,13,14,15,16	0.029	0.021	-39	0.007	-36	0.004	-36	0.039	-25	0.121	-
			GH_PC1	200385	12,13,14,15,16	0.946	-	-	-	-	-	-	-	-	-	-
			LC_DCDS	E295210	13,14,15,16	0.250	-	-	-	-	-	-	-	-	-	-
			LC_DC3	E288273	12,13,14,15,16	<0.001	0.018	83	0.230	-	0.985	-	0.015	35	<0.001	83
			LC_DC1	E288270	12,13,14,15,16	0.283	-	-	-	-	-	-	-	-	-	-
			GH_GH1	E102709	12,13,14,15,16	0.035	0.037	-32	0.017	-41	0.007	-39	0.138	-	0.825	-
		M	FR_FR1	200251	12,13,14,15,16	<0.001	<0.001	-51	0.045	-27	<0.001	-51	<0.001	-43	0.003	-44
			FR_FRABEC1	-	12,15	0.253	-	-	-	-	-	-	-	-	-	-
			FR_MULTIPLATE	-	12,13,15,16	0.098	-	-	-	-	-	-	-	-	-	-
			FR_FR2	200201	12,13,14,15,16	0.066	-	-	-	-	-	-	-	-	-	-
			GH_FR3	-	12,13,14,15	0.040	0.013	-39	0.078	-	0.005	-44	0.131	-	ND	-
			FR_FR4	200311	12,13,14,15,16	0.003	0.001	-21	0.013	-21	<0.001	-34	0.016	-20	0.282	-
			GH_FR	200311	12,13,14,15	0.007	0.001	-48	0.015	-33	<0.001	-44	0.029	-37	ND	-
			FR_FRCP1	E300071	15,16	0.882	-	-	-	-	-	-	-	-	-	-
			GH_PC2	E287431	12,13,14,15	0.093	-	-	-	-	-	-	-	-	-	-
			FR_FRABCH	-	13,15,16	0.716	-	-	-	-	-	-	-	-	-	-
			FR_FR5	-	12,13,14,15,16	0.019	0.006	-31	0.078	-	<0.001	-34	0.050	-	0.158	-
			LC_FRUS	E295232	13,14,15	0.503	-	-	-	-	-	-	-	-	-	-
			LC_FRB	-	12,13,14,15,16	<0.001	<0.001	-19	0.028	-8	<0.001	-24	<0.001	-21	0.009	-16
			GH_FR1	200251	12,13,14,15,16	0.110	-	-	-	-	-	-	-	-	-	-
2	Fording	T	LC_LCUSWLC	E293369	12,13,14,15,16	0.391	-	-	-	-	-	-	-	-	-	-
			LC_LC3	200337	12,13,14,15,16	0.042	0.008	-32	0.215	-	0.004	-31	0.030	-24	0.046	-26
			LC_LCDSSLCC	E297110	14,15,16	0.694	-	-	-	-	-	-	-	-	-	-
			LC_LC4	200044	12,13,14,15,16	0.175	-	-	-	-	-	-	-	-	-	-
		M	LC_LC6	200338	12,13,14,15,16	0.034	0.007	-25	0.152	-	0.002	-28	0.023	-21	0.155	-
			LC_LC5	200028	12,13,14,15,16	0.117	-	-	-	-	-	-	-	-	-	-
3	Elk	T	GH_BR_F	E287437	12,13,14,15,16	0.914	-	-	-	-	-	-	-	-	-	-
			GH_WOLF	-	12,13,14,15,16	0.782	-	-	-	-	-	-	-	-	-	-
			GH_WILLOW	-	12,13,14,15,16	0.429	-	-	-	-	-	-	-	-	-	-
			GH_WILLOW_S	-	13,14,15,16	0.248	-	-	-	-	-	-	-	-	-	-
			GH_WADE	E287433	12,13,14,15,16	0.005	<0.001	-77	0.006	-63	<0.001	-63	<0.001	-63	0.025	-55
			GH_COUGAR	E287432	12,13,14,15,16	0.001	<0.001	659	0.031	143	0.004	123	<0.001	377	<0.001	418
			GH_MC1	200388	12,13,14,15,16	<0.001	<0.001	731	0.269	-	0.029	255	<0.001	1,539	0.003	490
			GH_LC2	-	12,13,14,15,16	0.002	<0.001	-49	0.043	-27	<0.001	-48	<0.001	-45	0.006	-41
			GH_LC1	E257796	15,16	0.924	-	-	-	-	-	-	-	-	-	-
			GH_WC2	-	12,13,14,15,16	0.628	-	-	-	-	-	-	-	-	-	-
			GH_WC1	E257795	12,15,16	0.415	-	-	-	-	-	-	-	-	-	-
			GH_TC2	E207436	12,13,14,15,16	0.005	<0.001	-57	0.016	-45	<0.001	-51	0.001	-46	0.048	-36
		M	GH_ERC	E300090	15,16	0.084	-	-	-	-	-	-	-	-	-	-
			GH_ER1	206661	12,13,14,15,16	0.001	0.209	-	0.755	-	0.321	-	0.022	21	0.015	28
4	Elk	T	EV_HC6	-	13,14,15,16	0.052	-	-	-	-	-	-	-	-	-	-
			EV_HC1	E102682	12,13,14,15,16	<0.001	<0.001	-47	<0.001	-37	<0.001	-42	<0.001	-34	0.023	-27
			EV_GV1	-	13,14,15,16	<0.001	<0.001	-41	-	-	<0.001	-38	<0.001	-26	0.026	-21
			EV_SM1	E102681	12,13,14,15,16	0.043	0.004	-66	0.057	-	0.002	-66	0.030	-45	0.083	-
			EV_BLM2	E298592	13,14,15,16	0.151	-	-	-	-	-	-	-	-	-	-
			EV_FC1	E298591	13,14,15,16	0.039	0.013	-67	-	-	0.022	-57	0.088	-	0.015	-47
			EV_GC2	E208043	12,13,14,15,16	0.077	-	-	-	-	-	-	-	-	-	-
			EV_OC1	E102679	12,13,14,15,16	<0.001	<0.001	-85	<0.001	-77	<0.001	-72	<0.001	-59	<0.001	-57
		M	EV_ER4	200027	12,13,14,15,16	0.015	0.003	-30	0.079	-	<0.001	-35	0.013	-26	0.112	-
			EV_ER2	200111	12,13,14,15,16	0.105	-	-	-	-	-	-	-	-	-	-
	Michel	T	CM_CC1	200209	12,13,14,15,16	0.464	-	-	-	-	-	-	-	-	-	-
			EV_EC1	200097	12,13,14,15,16	0.427	-	-	-	-	-	-	-	-	-	-
			EV_SP1	E296311	12,13,14,15,16	0.004	0.001	-62	0.292	-	0.005	-55	<0.001	-50	0.008	-44
			EV_MG1	E208057	12,13,14,15,16	<0.001	<0.001	-83	0.001	-67	<0.001	-81	<0.001	-77	<0.001	-68
			EV_GT1	E206231	12,13,14,15,16	0.043	0.272	-	0.073	-	0.039	-19	0.569	-	0.842	-
			EV_BC1	E102685	12,13,14,15,16	<0.001	<0.001	-66	0.018	-44	<0.001	-56	<0.001	-60	0.005	-54
			EV_AQ1	E210369	12,13,14,15,16	0.023	0.002	-86	0.106	-	0.002	-80	0.002	-77	0.049	-72
	Upper Michel	M	CM_MC2	E258937	12,13,14,15,16	0.427	-	-	-	-	-	-	-	-	-	-
			CM_MCTM	-	12,13,14,15,16	0.274	-	-	-	-	-	-	-	-	-	-
	Lower Michel	M	EV_MC3	200203	12,13,14,15,16	0.016	0.045	74.2	0.237	-	0.694	-	0.043	30.6	0.003	65
			EV_MC2	E300091	14,15,16	0.440	-	-	-	-	-	-	-	-	-	-
			EV_MC1	-	12,13,14	0.207	-	-	-	-	-	-	-	-	-	-
5	Elk	M	EV_ER1	200393	12,13,14,15,16	0.582	-	-	-	-	-	-	-	-	-	-
			RG_ELKFERNIE	-	13,14,15,16	<0.001	<0.001	-38	-	-	<0.001	-40	<0.001	-21	0.032	-12
			RG_ELKORES	E294312	12,13,14,15,16	0.103	-	-	-	-	-	-	-	-	-	-
			RG_ELKMOUTH	-	12,13,14,15,16	0.095	-	-	-	-	-	-	-	-	-	-

P-value < 0.05
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast)

[a] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

Table C.33: Temporal Analysis of the Differences between Mine-exposed and Mean Reference Area Concentrations of Total Selenium, 2012 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	Years included in Analysis	ANOVA P-value	Linear		Step after 2012		Step after 2013		Step after 2014		Step after 2015	
							P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]
1	Fording	T	FR_HC1	E216778	12,13,14,15,16	0.024	0.010	-27	0.738	-	0.016	-25	0.005	-28	0.014	-30
			FR_CC1	E102481	12,13,14,15,16	0.657	-	-	-	-	-	-	-	-	-	-
			FR_LMP1	E306924	16	ND	ND	-	ND	-	ND	-	ND	-	ND	-
			FR_NGD1	E105060	12,13,14,15,16	<0.001	<0.001	-40	<0.001	-26	<0.001	-36	<0.001	-31	<0.001	-28
			FR_KC1	200252	12,13,14,15,16	0.038	0.853	-	0.036	22	0.878	-	0.180	-	0.345	-
			GH_SC1	E221329	12,13,14,15	0.029	0.009	-85	0.037	-64	0.054	-	0.007	-77	-	-
			GH_SC2	E105061	12,13,14,15,16	0.003	0.238	-	0.242	-	0.137	-	0.070	-	0.884	-
			GH_CC1	200384	12,13,14,15,16	0.716	-	-	-	-	-	-	-	-	-	-
			GH_PC1	200385	12,13,14,15,16	0.315	-	-	-	-	-	-	-	-	-	-
			LC_DCDS	E295210	13,14,15,16	0.010	0.110	-	-	-	0.581	-	0.147	-	0.003	27
			LC_DC3	E288273	12,13,14,15,16	<0.001	<0.001	43	0.061	-	0.046	12	0.009	17	<0.001	38
			LC_DC1	E288270	12,13,14,15,16	0.251	-	-	-	-	-	-	-	-	-	-
			GH_GH1	E102709	12,13,14,15,16	0.004	0.001	-38	0.040	-27	0.011	-27	<0.001	-38	0.061	-
		M	FR_FR1	200251	12,13,14,15,16	0.073	-	-	-	-	-	-	-	-	-	-
			FR_FRABEC1	-	12,15	0.844	-	-	-	-	-	-	-	-	-	-
			FR_MULTIPLATE	-	12,13,15,16	0.226	-	-	-	-	-	-	-	-	-	-
			FR_FR2	200201	12,13,14,15,16	0.113	-	-	-	-	-	-	-	-	-	-
			GH_FR3	-	12,13,14,15	0.038	0.014	-28	0.291	-	0.008	-27	0.021	-27	-	-
			FR_FR4	200311	12,13,14,15,16	0.022	0.004	-23	0.220	-	0.016	-18	<0.001	-25	0.029	-19
			GH_FR	200311	12,13,14,15	0.032	0.004	-32	0.042	-18	0.015	-20	0.006	-28	-	-
			FR_FRCP1	E300071	15,16	0.596	-	-	-	-	-	-	-	-	-	-
			GH_PC2	E287431	12,13,14,15	0.040	0.395	-	0.343	-	0.495	-	0.024	-12	-	-
			FR_FRABCH	0	13,15,16	0.083	-	-	-	-	-	-	-	-	-	-
			FR_FR5	-	12,13,14,15,16	0.009	0.040	-4.2	0.403	-	0.184	-	0.005	-10	0.008	-9.4
			LC_FRUS	E295232	13,14,15	0.150	-	-	-	-	-	-	-	-	-	-
			LC_FRB	-	12,13,14,15,16	0.011	0.392	-	0.092	-	0.817	-	0.028	-2.6	0.043	-4.3
			GH_FR1	200251	12,13,14,15,16	<0.001	0.006	-6.6	0.279	-	0.051	-	<0.001	-14	0.002	-12
2	Fording	T	LC_LCUSWLC	E293369	12,13,14,15,16	0.148	-	-	-	-	-	-	-	-	-	-
			LC_LC3	200337	12,13,14,15,16	<0.001	<0.001	-55	<0.001	-26	<0.001	-28	<0.001	-35	<0.001	-51
			LC_LCDSSLCC	E297110	14,15,16	<0.001	<0.001	-26	-	-	-	-	0.021	-8	<0.001	-31
			LC_LC4	200044	12,13,14,15,16	<0.001	<0.001	-43	0.014	-17	<0.001	-23	<0.001	-29	<0.001	-40
		M	LC_LC6	200338	12,13,14,15,16	0.017	0.431	-	0.097	-	0.931	-	0.048	-3	0.047	-7
			LC_LC5	200028	12,13,14,15,16	<0.001	<0.001	-14	0.636	-	0.015	-7	<0.001	-14	<0.001	-19
3	Elk	T	GH_BR_F	E287437	12,13,14,15,16	0.325	-	-	-	-	-	-	-	-	-	-
			GH_WOLF	-	12,13,14,15,16	0.563	-	-	-	-	-	-	-	-	-	-
			GH_WILLOW	-	12,13,14,15,16	0.262	-	-	-	-	-	-	-	-	-	-
			GH_WILLOW_S	-	13,14,15,16	0.634	-	-	-	-	-	-	-	-	-	-
			GH_WADE	E287433	12,13,14,15,16	0.357	-	-	-	-	-	-	-	-	-	-
			GH_COUGAR	E287432	12,13,14,15,16	<0.001	<0.001	-34	<0.001	-29	<0.001	-29	<0.001	-23	0.045	-16
			GH_MC1	200388	12,13,14,15,16	<0.001	<0.001	137	0.045	78	0.002	107	<0.001	186	0.047	66
			GH_LC2	-	12,13,14,15,16	0.080	-	-	-	-	-	-	-	-	-	-
			GH_LC1	E257796	15,16	0.597	-	-	-	-	-	-	-	-	-	-
			GH_WC2	-	12,13,14,15,16	0.250	-	-	-	-	-	-	-	-	-	-
			GH_WC1	E257795	12,15,16	0.565	-	-	-	-	-	-	-	-	-	-
			GH_TC2	E207436	12,13,14,15,16	0.087	-	-	-	-	-	-	-	-	-	-
		M	GH_ERC	E300090	15,16	0.948	-	-	-	-	-	-	-	-	-	-
			GH_ER1	206661	12,13,14,15,16	0.402	-	-	-	-	-	-	-	-	-	-
4	Elk	T	EV_HC6	-	13,14,15,16	0.296	-	-	-	-	-	-	-	-	-	-
			EV_HC1	E102682	12,13,14,15,16	0.434	-	-	-	-	-	-	-	-	-	-
			EV_GV1	-	13,14,15,16	0.079	-	-	-	-	-	-	-	-	-	-
			EV_SM1	E102681	12,13,14,15,16	0.491	-	-	-	-	-	-	-	-	-	-
			EV_BLM2	E298592	13,14,15,16	0.370	-	-	-	-	-	-	-	-	-	-
			EV_FC1	E298591	13,14,15,16	0.400	-	-	-	-	-	-	-	-	-	-
			EV_GC2	E208043	12,13,14,15,16	0.607	-	-	-	-	-	-	-	-	-	-
			EV_OC1	E102679	12,13,14,15,16	<0.001	<0.001	-76	<0.001	-58	<0.001	-57	<0.001	-61	<0.001	-60
		M	EV_ER4	200027	12,13,14,15,16	<0.001	<0.001	-19	0.164	-	<0.001	-14	<0.001	-17	<0.001	-17
			EV_ER2	200111	12,13,14,15,16	0.010	0.015	-12	0.835	-	0.113	-	0.002	-13	0.004	-15
	Michel	T	CM_CC1	200209	12,13,14,15,16	0.957	-	-	-	-	-	-	-	-	-	-
			EV_EC1	200097	12,13,14,15,16	0.267	-	-	-	-	-	-	-	-	-	-
			EV_SP1	E296311	12,13,14,15,16	0.184	-	-	-	-	-	-	-	-	-	-
			EV_MG1	E208057	12,13,14,15,16	0.006	<0.001	-33	0.010	-20	0.003	-22	<0.001	-23	0.002	-24
			EV_GT1	E206231	12,13,14,15,16	<0.001	<0.001	-39	0.018	-18	<0.001	-30	<0.001	-23	<0.001	-33
			EV_BC1	E102685	12,13,14,15,16	<0.001	<0.001	-71	0.025	-30	<0.001	-53	<0.001	-71	<0.001	-69
			EV_AQ1	E210369	12,13,14,15,16	0.227	-	-	-	-	-	-	-	-	-	-
	Upper Michel	M	CM_MC2	E258937	12,13,14,15,16	0.821	-	-	-	-	-	-	-	-	-	-
			CM_MCTM	-	12,13,14,15,16	0.686	-	-	-	-	-	-	-	-	-	-
	Lower Michel	M	EV_MC3	200203	12,13,14,15,16	0.186	-	-	-	-	-	-	-	-	-	-
			EV_MC2	E300091	14,15,16	0.755	-	-	-	-	-	-	-	-	-	-
			EV_MC1	-	12,13,14	0.897	-	-	-	-	-	-	-	-	-	-
5	Elk	M	EV_ER1	200393	12,13,14,15,16	0.195	-	-	-	-	-	-	-	-	-	-
			RG_ELKFERNIE	-	13,14,15,16	0.019	0.002	-30	-	-	0.014	-23	0.003	-21	0.009	-20
			RG_ELKORES	E294312	12,13,14,15,16	0.252	-	-	-	-	-	-	-	-	-	-
			RG_ELKMOUTH	-	12,13,14,15,16	0.012	0.581	-	0.344	-	0.816	-	0.222	-	0.009	-27

P-value < 0.05
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast)

[a] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

Table C.34: Temporal Analysis of the Differences between Mine-exposed and Mean Reference Area Concentrations of Sulphate, 2012 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	Years included in Analysis	ANOVA P-value	Linear		Step after 2012		Step after 2013		Step after 2014		Step after 2015	
							P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]
1	Fording	T	FR_HC1	E216778	12,13,14,15,16	0.117	-	-	-	-	-	-	-	-	-	-
			FR_CC1	E102481	12,13,14,15,16	0.316	-	-	-	-	-	-	-	-	-	-
			FR_LMP1	E306924	16	ND	ND	-	ND	-	ND	-	ND	-	ND	-
			FR_NGD1	E105060	12,13,14,15,16	<0.001	<0.001	-42	<0.001	-26	<0.001	-30	<0.001	-29	<0.001	-31
			FR_KC1	200252	12,13,14,15,16	0.286	-	-	-	-	-	-	-	-	-	-
			GH_SC1	E221329	12,13,14,15	0.055	-	-	-	-	-	-	-	-	-	-
			GH_SC2	E105061	12,13,14,15,16	0.303	-	-	-	-	-	-	-	-	-	-
			GH_CC1	200384	12,13,14,15,16	0.988	-	-	-	-	-	-	-	-	-	-
			GH_PC1	200385	12,13,14,15,16	0.846	-	-	-	-	-	-	-	-	-	-
			LC_DCDS	E295210	13,14,15,16	0.121	-	-	-	-	-	-	-	-	-	-
			LC_DC3	E288273	12,13,14,15,16	0.422	-	-	-	-	-	-	-	-	-	-
			LC_DC1	E288270	12,13,14,15,16	0.997	-	-	-	-	-	-	-	-	-	-
			GH_GH1	E102709	12,13,14,15,16	0.636	-	-	-	-	-	-	-	-	-	-
		M	FR_FR1	200251	12,13,14,15,16	0.078	-	-	-	-	-	-	-	-	-	-
			FR_FRABEC1	-	12,15	0.426	-	-	-	-	-	-	-	-	-	-
			FR_MULTIPLATE	-	12,13,15,16	0.334	-	-	-	-	-	-	-	-	-	-
			FR_FR2	200201	12,13,14,15,16	0.022	0.006	-14	0.342	-	0.003	-14	0.014	-12	0.034	-12
			GH_FR3	-	12,13,14,15	0.006	0.003	-21	0.048	-13	<0.001	-24	0.066	-	-	-
			FR_FR4	200311	12,13,14,15,16	0.022	0.005	-11	0.366	-	0.004	-12	0.007	-13	0.015	-13
			GH_FR	200311	12,13,14,15	0.008	0.001	-25	0.008	-15	<0.001	-18	0.019	-19	-	-
			FR_FRCP1	E300071	15,16	0.610	-	-	-	-	-	-	-	-	-	-
			GH_PC2	E287431	12,13,14,15	0.639	-	-	-	-	-	-	-	-	-	-
			FR_FRABCH	-	13,15,16	0.145	-	-	-	-	-	-	-	-	-	-
			FR_FR5	-	12,13,14,15,16	0.338	-	-	-	-	-	-	-	-	-	-
			LC_FRUS	E295232	13,14,15	0.872	-	-	-	-	-	-	-	-	-	-
			LC_FRB	-	12,13,14,15,16	0.240	-	-	-	-	-	-	-	-	-	-
			GH_FR1	200251	12,13,14,15,16	0.127	-	-	-	-	-	-	-	-	-	-
2	Fording	T	LC_LCUSWLC	E293369	12,13,14,15,16	0.032	0.008	15	0.003	15	0.007	11	0.057	-	0.430	-
			LC_LC3	200337	12,13,14,15,16	0.689	-	-	-	-	-	-	-	-	-	-
			LC_LCDSSLCC	E297110	14,15,16	0.942	-	-	-	-	-	-	-	-	-	-
			LC_LC4	200044	12,13,14,15,16	0.051	-	-	-	-	-	-	-	-	-	-
		M	LC_LC6	200338	12,13,14,15,16	0.883	-	-	-	-	-	-	-	-	-	-
			LC_LC5	200028	12,13,14,15,16	0.704	-	-	-	-	-	-	-	-	-	-
3	Elk	T	GH_BR_F	E287437	12,13,14,15,16	0.881	-	-	-	-	-	-	-	-	-	-
			GH_WOLF	-	12,13,14,15,16	0.395	-	-	-	-	-	-	-	-	-	-
			GH_WILLOW	-	12,13,14,15,16	0.862	-	-	-	-	-	-	-	-	-	-
			GH_WILLOW_S	-	13,14,15,16	0.859	-	-	-	-	-	-	-	-	-	-
			GH_WADE	E287433	12,13,14,15,16	0.434	-	-	-	-	-	-	-	-	-	-
			GH_COUGAR	E287432	12,13,14,15,16	0.740	-	-	-	-	-	-	-	-	-	-
			GH_MC1	200388	12,13,14,15,16	<0.001	<0.001	361	0.077	-	<0.001	195	<0.001	407	<0.001	254
			GH_LC2	-	12,13,14,15,16	<0.001	<0.001	194	<0.001	132	<0.001	142	<0.001	111	0.019	66
			GH_LC1	E257796	15,16	0.819	-	-	-	-	-	-	-	-	-	-
			GH_WC2	-	12,13,14,15,16	0.479	-	-	-	-	-	-	-	-	-	-
			GH_WC1	E257795	12,15,16	0.068	-	-	-	-	-	-	-	-	-	-
			GH_TC2	E207436	12,13,14,15,16	0.844	-	-	-	-	-	-	-	-	-	-
		M	GH_ERC	E300090	15,16	0.054	-	-	-	-	-	-	-	-	-	-
			GH_ER1	206661	12,13,14,15,16	0.005	<0.001	53	0.042	21	0.010	22	<0.001	30	<0.001	40
4	Elk	T	EV_HC6	-	13,14,15,16	0.101	-	-	-	-	-	-	-	-	-	-
			EV_HC1	E102682	12,13,14,15,16	0.680	-	-	-	-	-	-	-	-	-	-
			EV_GV1	-	13,14,15,16	0.721	-	-	-	-	-	-	-	-	-	-
			EV_SM1	E102681	12,13,14,15,16	0.520	-	-	-	-	-	-	-	-	-	-
			EV_BLM2	E298592	13,14,15,16	0.098	-	-	-	-	-	-	-	-	-	-
			EV_FC1	E298591	13,14,15,16	0.979	-	-	-	-	-	-	-	-	-	-
			EV_GC2	E208043	12,13,14,15,16	0.397	-	-	-	-	-	-	-	-	-	-
			EV_OC1	E102679	12,13,14,15,16	0.373	-	-	-	-	-	-	-	-	-	-
		M	EV_ER4	200027	12,13,14,15,16	0.913	-	-	-	-	-	-	-	-	-	-
			EV_ER2	200111	12,13,14,15,16	0.941	-	-	-	-	-	-	-	-	-	-
	Michel	T	CM_CC1	200209	12,13,14,15,16	0.801	-	-	-	-	-	-	-	-	-	-
			EV_EC1	200097	12,13,14,15,16	0.999	-	-	-	-	-	-	-	-	-	-
			EV_SP1	E296311	12,13,14,15,16	0.459	-	-	-	-	-	-	-	-	-	-
			EV_MG1	E208057	12,13,14,15,16	0.271	-	-	-	-	-	-	-	-	-	-
			EV_GT1	E206231	12,13,14,15,16	0.094	-	-	-	-	-	-	-	-	-	-
			EV_BC1	E102685	12,13,14,15,16	0.324	-	-	-	-	-	-	-	-	-	-
			EV_AQ1	E210369	12,13,14,15,16	0.490	-	-	-	-	-	-	-	-	-	-
	Upper Michel	M	CM_MC2	E258937	12,13,14,15,16	0.908	-	-	-	-	-	-	-	-	-	-
			CM_MCTM	-	12,13,14,15,16	0.396	-	-	-	-	-	-	-	-	-	-
	Lower Michel	M	EV_MC3	200203	12,13,14,15,16	0.025	0.053	-	0.488	-	0.691	-	0.016	14	0.007	18
			EV_MC2	E300091	14,15,16	0.816	-	-	-	-	-	-	-	-	-	-
			EV_MC1	-	12,13,14	0.884	-	-	-	-	-	-	-	-	-	-
5	Elk	M	EV_ER1	200393	12,13,14,15,16	0.121	-	-	-	-	-	-	-	-	-	-
			RG_ELKFERNIE	-	13,14,15,16	0.849	-	-	-	-	-	-	-	-	-	-
			RG_ELKORES	E294312	12,13,14,15,16	0.460	-	-	-	-	-	-	-	-	-	-
			RG_ELKMOUTH	-	12,13,14,15,16	0.358	-	-	-	-	-	-	-	-	-	-

P-value < 0.05
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast)

[a] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

Table C.35: Temporal Analysis of the Differences between Mean Concentrations of Nitrate, Sulphate, and Selenium for Mine-exposed Main Stem Areas (combined) in each Management Unit Relative to Reference Areas, 2012 - 2016

Parameter	Management Unit	Number of Stations	Teck Water Station Codes	ANOVA P-value	Linear		Step after 2012		Step after 2013		Step after 2014		Step after 2015	
					P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [a]
Nitrate	1	6	FR_FR1, FR_FR2, FR_FR4, FR_FR5, GH_FR1, LC_FRB	0.003	0.002	-30	0.075	-	<0.001	-36	0.012	-24	0.132	-
	2	2	LC_LC5, LC_LC6	0.125	-	-	-	-	-	-	-	-	-	-
	3	1	GH_ER1	0.001	0.209	-	0.755	-	0.321	-	0.022	21	0.015	28
	4 Elk	2	EV_ER2, EV_ER4	0.041	0.007	-28	0.164	-	0.003	-32	0.016	-25	0.120	-
	4 Michel	3	CM_MC2, CM_MCTM, EV_MC3	0.164	-	-	-	-	-	-	-	-	-	-
	5	3	EV_ER1, RG_ELKMOUTH, RG_ELKORES	0.307	-	-	-	-	-	-	-	-	-	-
Sulphate	1	6	FR_FR1, FR_FR2, FR_FR4, FR_FR5, GH_FR1, LC_FRB	0.004	0.009	-8.6	0.902	-	0.005	-10	0.007	-10	0.012	-11
	2	2	LC_LC5, LC_LC6	0.870	-	-	-	-	-	-	-	-	-	-
	3	1	GH_ER1	0.005	<0.001	53	0.042	21	0.010	22	<0.001	30	<0.001	40
	4 Elk	2	EV_ER2, EV_ER4	0.972	-	-	-	-	-	-	-	-	-	-
	4 Michel	3	CM_MC2, CM_MCTM, EV_MC3	0.354	-	-	-	-	-	-	-	-	-	-
	5	3	EV_ER1, RG_ELKMOUTH, RG_ELKORES	0.371	-	-	-	-	-	-	-	-	-	-
Selenium	1	6	FR_FR1, FR_FR2, FR_FR4, FR_FR5, GH_FR1, LC_FRB	0.026	0.022	-13	0.935	-	0.037	-13	0.005	-17	0.033	-16
	2	2	LC_LC5, LC_LC6	<0.001	0.015	-7.6	0.182	-	0.202	-	<0.001	-11	<0.001	-14
	3	1	GH_ER1	0.402	-	-	-	-	-	-	-	-	-	-
	4 Elk	2	EV_ER2, EV_ER4	<0.001	<0.001	-16	0.642	-	0.014	-11	<0.001	-16	<0.001	-17
	4 Michel	3	CM_MC2, CM_MCTM, EV_MC3	0.735	-	-	-	-	-	-	-	-	-	-
	5	3	EV_ER1, RG_ELKMOUTH, RG_ELKORES	0.270	-	-	-	-	-	-	-	-	-	-

P-value < 0.05
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast)

[a] Percent change = (observed - expected)/expected × 100%; For linear change: observed = value observed in the most recent year and expected = predicted value if the mine-exposed area did not change relative to reference in the first year of the comparison; For step change: observed = mean value observed after the step change and expected = predicted mean value after the step change if the mine-exposed area did not change relative to reference prior to the step change

Table C.36: Temporal Analysis of Monthly Mean Nitrate Concentrations in Reference and Mine-exposed Areas, 2012 - 2016 (not relative to reference means)

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	Years included in Analysis	ANOVA P-value	Linear		Step after 2012		Step after 2013		Step after 2014		Step after 2015	
								P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]
Reference	1	Fording	T	FR_HC3	E300096	12,13,14,15,16	0.002	<0.001	63	0.001	50	<0.001	56	0.014	31	0.094	22
			M	FR_UFR1	E216777	12,13,14,15,16	0.022	0.002	220	0.032	117	0.001	170	0.010	116	0.057	98
	2	Elk	T	LC_GRCK	E288275	12,13,14,15,16	0.456	0.542	16	0.149	29	0.301	15	0.857	-2.4	0.707	-6.1
				LC_LC1	E216142	12,13,14,15,16	0.297	0.062	25	0.102	22	0.034	25	0.187	15	0.504	8.4
				LC_SLC	E282149	12,13,14,15,16	0.111	0.019	45	0.021	35	0.015	29	0.154	16	0.193	18
	3	Elk	M	GH_ER2	200389	12,13,14,15,16	0.002	<0.001	111	0.010	74	<0.001	111	0.002	71	0.055	46
	4	Elk	T	CM_MC1	E258175	12,13,14,15,16	0.055	0.042	30	0.409	17	0.005	56	0.096	30	0.367	19
				RG_CH1	E295214	12,13,14,15,16	0.078	0.017	92	0.012	89	0.009	72	0.104	39	0.471	19
Mine-exposed	1	Fording	T	FR_HC1	E216778	12,13,14,15,16	0.375	-	-	-	-	-	-	-	-	-	-
				FR_CC1	E102481	12,13,14,15,16	<0.001	<0.001	191	<0.001	52	<0.001	48	<0.001	77	<0.001	151
				FR_LMP1	E306924	16	ND	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	12,13,14,15,16	0.626	-	-	-	-	-	-	-	-	-	-
				FR_KC1	200252	12,13,14,15,16	0.631	-	-	-	-	-	-	-	-	-	-
				GH_SC1	E221329	12,13,14,15	0.031	0.009	-90	0.030	-72	0.052	-	0.008	-84	-	-
				GH_SC2	E105061	12,13,14,15,16	<0.001	0.045	-37	0.008	-34	0.011	-32	0.015	-37	0.654	-
				GH_CC1	200384	12,13,14,15,16	0.443	-	-	-	-	-	-	-	-	-	-
				GH_PC1	200385	12,13,14,15,16	<0.001	<0.001	78	<0.001	64	<0.001	51	<0.001	37	<0.001	25
				LC_DCDS	E295210	13,14,15,16	0.315	-	-	-	-	-	-	-	-	-	-
				LC_DC3	E288273	12,13,14,15,16	<0.001	<0.001	211	0.005	79	0.007	59	<0.001	84	<0.001	130
				LC_DC1	E288270	12,13,14,15,16	0.078	-	-	-	-	-	-	-	-	-	-
				GH_GH1	E102709	12,13,14,15,16	0.269	-	-	-	-	-	-	-	-	-	-
			M	FR_FR1	200251	12,13,14,15,16	0.288	-	-	-	-	-	-	-	-	-	-
				FR_FRABEC1	-	12,15	0.195	-	-	-	-	-	-	-	-	-	-
				FR_MULTIPLATE	-	12,13,15,16	0.438	-	-	-	-	-	-	-	-	-	-
				FR_FR2	200201	12,13,14,15,16	0.325	-	-	-	-	-	-	-	-	-	-
				GH_FR3	-	12,13,14,15	0.703	-	-	-	-	-	-	-	-	-	-
				FR_FR4	200311	12,13,14,15,16	0.660	-	-	-	-	-	-	-	-	-	-
				GH_FR	200311	12,13,14,15	0.762	-	-	-	-	-	-	-	-	-	-
				FR_FRCP1	E300071	15,16	0.818	-	-	-	-	-	-	-	-	-	-
				GH_PC2	E287431	12,13,14,15	0.252	-	-	-	-	-	-	-	-	-	-
				FR_FRABCH	0	13,15,16	0.011	<0.001	133	ND	-	<0.001	121	ND	-	<0.001	61
				FR_FR5	-	12,13,14,15,16	0.270	-	-	-	-	-	-	-	-	-	-
				LC_FRUS	E295232	13,14,15	0.371	-	-	-	-	-	-	-	-	-	-
				LC_FRB	-	12,13,14,15,16	0.051	-	-	-	-	-	-	-	-	-	-
				GH_FR1	200251	12,13,14,15,16	0.384	-	-	-	-	-	-	-	-	-	-
	2	Fording	T	LC_LCUSWLC	E293369	12,13,14,15,16	0.122	-	-	-	-	-	-	-	-	-	-
				LC_LC3	200337	12,13,14,15,16	0.228	-	-	-	-	-	-	-	-	-	-
				LC_LCDSSLCC	E297110	14,15,16	0.341	-	-	-	-	-	-	-	-	-	-
				LC_LC4	200044	12,13,14,15,16	0.092	-	-	-	-	-	-	-	-	-	-
			M	LC_LC6	200338	12,13,14,15,16	0.072	-	-	-	-	-	-	-	-	-	-
				LC_LC5	200028	12,13,14,15,16	0.034	0.038	28	0.002	31	0.041	15	0.350	-	0.618	-
	3	Elk	T	GH_BR_F	E287437	12,13,14,15,16	0.811	-	-	-	-	-	-	-	-	-	-
				GH_WOLF	-	12,13,14,15,16	0.337	-	-	-	-	-	-	-	-	-	-
				GH_WILLOW	-	12,13,14,15,16	0.615	-	-	-	-	-	-	-	-	-	-
				GH_WILLOW_S	-	13,14,15,16	0.762	-	-	-	-	-	-	-	-	-	-
				GH_WADE	E287433	12,13,14,15,16	0.400	-	-	-	-	-	-	-	-	-	-
				GH_COUGAR	E287432	12,13,14,15,16	0.005	<0.001	1,186	0.018	273	0.005	261	<0.001	548	0.002	552
				GH_MC1	200388	12,13,14,15,16	<0.001	<0.001	1,309	0.032	268	<0.001	473	<0.001	2,126	<0.001	642
				GH_LC2	-	12,13,14,15,16	0.052	-	-	-	-	-	-	-	-	-	-
				GH_LC1	E257796	15,16	0.594	-	-	-	-	-	-	-	-	-	-
				GH_WC2	-	12,13,14,15,16	0.113	-	-	-	-	-	-	-	-	-	-
				GH_WC1	E257795	12,15,16	0.131	-	-	-	-	-	-	-	-	-	-
				GH_TC2	E207436	12,13,14,15,16	0.069	-	-	-	-	-	-	-	-	-	-
			M	GH_ERC	E300090	15,16	0.799	-	-	-	-	-	-	-	-	-	-
				GH_ER1	206661	12,13,14,15,16	0.002	<0.001	112	0.003	59	0.002	49	<0.001	64	0.002	61
	4	Elk	T	EV_HC6	-	13,14,15,16	0.161	-	-	-	-	-	-	-	-	-	-
				EV_HC1	E102682	12,13,14,15,16	0.584	-	-	-	-	-	-	-	-	-	-
				EV_GV1	-	13,14,15,16	0.778	-	-	-	-	-	-	-	-	-	-
				EV_SM1	E102681	12,13,14,15,16	0.648	-	-	-	-	-	-	-	-	-	-
				EV_BLM2	E298592	13,14,15,16	0.141	-	-	-	-	-	-	-	-	-	-
				EV_FC1	E298591	13,14,15,16	0.118	-	-	-	-	-	-	-	-	-	-
				EV_GC2	E208043	12,13,14,15,16	0.069	-	-	-	-	-	-	-	-	-	-
				EV_OC1	E102679	12,13,14,15,16	<0.001	<0.001	-74	<0.001	-65	<0.001	-55	0.005	-45	0.014	-47
			M	EV_ER4	200027	12,13,14,15,16	0.414	-	-	-	-	-	-	-	-	-	-
				EV_ER2	200111	12,13,14,15,16	0.117	-	-	-	-	-	-	-	-	-	-
		Michel	T	CM_CC1	200209	12,13,14,15,16	<0.001	<0.001	83	0.001	35	<0.001	39	<0.001	41	<0.001	58
				EV_EC1	200097	12,13,14,15,16	<0.001	<0.001	72	<0.001	48	<0.001	32	<0.001	29	<0.001	34
				EV_SP1	E296311	12,13,14,15,16	<0.001	<0.001	-36	0.021	-19	<0.001	-27	<0.001	-32	<0.001	-30
				EV_MG1	E208057	12,13,14,15,16	0.003	<0.001	-72	0.135	-	<0.001	-69	<0.001	-69	0.016	-60
				EV_GT1	E206231	12,13,14,15,16	<0.001	<0.001	64	0.290	-	0.016	30	<0.001	87	<0.001	59
				EV_BC1	E102685	12,13,14,15,16	<0.001	<0.001	-42	0.067	-	<0.001	-30	<0.001	-46	<0.001	-42
				EV_AQ1	E210369	12,13,14,15,16	0.136	-	-	-	-	-	-	-	-	-	-
		Upper Michel	M	CM_MC2	E258937	12,13,14,15,16	0.020	0.001	81	0.040	35	0.013	34	0.004	41	0.003	56
				CM_MCTM	-	12,13,14,15,16	0.646	-	-	-	-	-	-	-	-	-	-
		Lower Michel	M	EV_MC3	200203	12,13,14,15,16	0.002	<0.001	195	0.003	87	0.002	69	<0.001	77	<0.001	107
				EV_MC2	E300091	14,15,16	0.735	-	-	-	-	-	-	-	-	-	-
				EV_MC1	-	12,13,14	0.955	-	-	-	-	-	-	-	-	-	-
	5	Elk	M	EV_ER1	200393	12,13,14,15,16	0.017	0.002	60	0.002	51	0.004	35	0.012	30	0.164	-
				RG_ELKFERNIE	-	13,14,15,16	0.848	-	-	-	-	-	-	-	-	-	-
				RG_ELKORES	E294312	12,13,14,15,16	0.658	-	-	-	-	-	-	-	-	-	-
				RG_ELKMOUTH	-	12,13,14,15,16	0.425	-	-	-	-	-	-	-	-	-	-

P-value < 0.05
Reference area included in temporal analysis relative to reference mean
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast). Analysis is based on absolute change(s) in each area not relative to reference mean.

[a] For linear change: percent change in the most recent year relative to the first year of the comparison; For step change: percent chance after the step change relative to before the step change.

Table C.37: Results of Temporal Analysis of Monthly Mean Total Selenium Concentrations in Reference and Mine-exposed Areas, 2012 - 2016 (not relative to reference means)

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	Years included in Analysis	ANOVA P-value	Linear		Step after 2012		Step after 2013		Step after 2014		Step after 2015	
								P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]
Reference	1	Fording	T	FR_HC3	E300096	12,13,14,15,16	0.328	0.050	30	0.232	19	0.050	31	0.242	17	0.287	17
			M	FR_UFR1	E216777	12,13,14,15,16	0.152	0.042	16	0.603	3.6	0.182	7.8	0.019	14	0.030	16
	2	Elk	T	LC_GRCK	E288275	12,13,14,15,16	0.841	0.631	9.0	0.282	11	0.754	2.4	0.882	1.1	0.967	0.4
				LC_LC1	E216142	12,13,14,15,16	0.402	0.191	28	0.863	-4.4	0.294	26	0.099	44	0.162	43
				LC_SLC	E282149	12,13,14,15,16	0.760	0.222	20	0.222	16	0.322	10	0.304	11	0.529	7.9
	3	Elk	M	GH_ER2	200389	12,13,14,15,16	0.068	0.016	15	0.691	2.7	0.024	14	0.011	15	0.020	16
	4	Elk	T	CM_MC1	E258175	12,13,14,15,16	0.309	0.697	-0.7	0.274	6.3	0.375	4.1	0.717	1.7	0.213	-7
				RG_CH1	E295214	12,13,14,15,16	0.003	<0.001	38	0.015	18	0.003	18	<0.001	22	<0.001	26
Mine-exposed	1	Fording	T	FR_HC1	E216778	12,13,14,15,16	0.369	-	-	-	-	-	-	-	-	-	-
				FR_CC1	E102481	12,13,14,15,16	0.678	-	-	-	-	-	-	-	-	-	-
				FR_LMP1	E306924	16	ND	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	12,13,14,15,16	0.001	<0.001	-31	0.035	-20	<0.001	-31	0.001	-25	0.022	-21
				FR_KC1	200252	12,13,14,15,16	0.295	-	-	-	-	-	-	-	-	-	-
				GH_SC1	E221329	12,13,14,15	0.064	-	-	-	-	-	-	-	-	-	-
				GH_SC2	E105061	12,13,14,15,16	0.012	0.522	-	0.431	-	0.394	-	0.206	-	0.804	-
				GH_CC1	200384	12,13,14,15,16	0.554	-	-	-	-	-	-	-	-	-	-
				GH_PC1	200385	12,13,14,15,16	0.237	-	-	-	-	-	-	-	-	-	-
				LC_DCDS	E295210	13,14,15,16	<0.001	0.029	26	ND	-	0.936	-	0.023	16	<0.001	35
				LC_DC3	E288273	12,13,14,15,16	<0.001	<0.001	64	<0.001	24	<0.001	20	<0.001	28	<0.001	50
				LC_DC1	E288270	12,13,14,15,16	0.013	0.137	-	0.270	-	0.787	-	0.212	-	0.004	11
				GH_GH1	E102709	12,13,14,15,16	0.049	0.017	-28	0.163	-	0.069	-	0.003	-33	0.216	-
			M	FR_FR1	200251	12,13,14,15,16	0.442	-	-	-	-	-	-	-	-	-	-
				FR_FRABEC1	-	12,15	0.850	-	-	-	-	-	-	-	-	-	-
				FR_MULTIPLATE	-	12,13,15,16	0.601	-	-	-	-	-	-	-	-	-	-
				FR_FR2	200201	12,13,14,15,16	0.789	-	-	-	-	-	-	-	-	-	-
				GH_FR3	-	12,13,14,15	0.338	-	-	-	-	-	-	-	-	-	-
				FR_FR4	200311	12,13,14,15,16	0.624	-	-	-	-	-	-	-	-	-	-
				GH_FR	200311	12,13,14,15	0.569	-	-	-	-	-	-	-	-	-	-
				FR_FRCP1	E300071	15,16	0.725	-	-	-	-	-	-	-	-	-	-
				GH_PC2	E287431	12,13,14,15	0.552	-	-	-	-	-	-	-	-	-	-
				FR_FRABCH	0	13,15,16	0.016	<0.001	121	ND	-	<0.001	117	ND	-	<0.001	52
				FR_FR5	-	12,13,14,15,16	0.628	-	-	-	-	-	-	-	-	-	-
				LC_FRUS	E295232	13,14,15	0.591	-	-	-	-	-	-	-	-	-	-
				LC_FRB	-	12,13,14,15,16	0.239	-	-	-	-	-	-	-	-	-	-
				GH_FR1	200251	12,13,14,15,16	0.416	-	-	-	-	-	-	-	-	-	-
	2	Fording	T	LC_LCUSWLC	E293369	12,13,14,15,16	0.832	-	-	-	-	-	-	-	-	-	-
				LC_LC3	200337	12,13,14,15,16	<0.001	<0.001	-49	0.085	-	0.018	-22	0.002	-28.4	<0.001	-46
				LC_LCDSSLCC	E297110	14,15,16	0.011	0.158	-	ND	-	ND	-	0.957	-	0.012	-27
				LC_LC4	200044	12,13,14,15,16	0.025	0.009	-35	0.409	-	0.071	-	0.016	-23	0.001	-35
			M	LC_LC6	200338	12,13,14,15,16	0.234	-	-	-	-	-	-	-	-	-	-
				LC_LC5	200028	12,13,14,15,16	0.285	-	-	-	-	-	-	-	-	-	-
	3	Elk	T	GH_BR_F	E287437	12,13,14,15,16	0.031	0.013	27	0.402	-	0.146	-	0.003	28	0.016	27
				GH_WOLF	-	12,13,14,15,16	0.921	-	-	-	-	-	-	-	-	-	-
				GH_WILLOW	-	12,13,14,15,16	0.013	<0.001	133	0.004	68	0.004	52	0.009	46	0.005	72
				GH_WILLOW_S	-	13,14,15,16	0.869	-	-	-	-	-	-	-	-	-	-
				GH_WADE	E287433	12,13,14,15,16	0.669	-	-	-	-	-	-	-	-	-	-
				GH_COUGAR	E287432	12,13,14,15,16	0.094	-	-	-	-	-	-	-	-	-	-
				GH_MC1	200388	12,13,14,15,16	<0.001	<0.001	172	0.006	94	<0.001	123	<0.001	213	0.005	80
				GH_LC2	-	12,13,14,15,16	0.028	0.330	-	0.035	53	0.086	-	0.697	-	0.107	-
				GH_LC1	E257796	15,16	0.532	-	-	-	-	-	-	-	-	-	-
				GH_WC2	-	12,13,14,15,16	0.215	-	-	-	-	-	-	-	-	-	-
				GH_WC1	E257795	12,15,16	0.553	-	-	-	-	-	-	-	-	-	-
				GH_TC2	E207436	12,13,14,15,16	0.151	-	-	-	-	-	-	-	-	-	-
			M	GH_ERC	E300090	15,16	0.922	-	-	-	-	-	-	-	-	-	-
				GH_ER1	206661	12,13,14,15,16	0.337	-	-	-	-	-	-	-	-	-	-
	4	Elk	T	EV_HC6	-	13,14,15,16	0.941	-	-	-	-	-	-	-	-	-	-
				EV_HC1	E102682	12,13,14,15,16	0.137	-	-	-	-	-	-	-	-	-	-
				EV_GV1	-	13,14,15,16	0.839	-	-	-	-	-	-	-	-	-	-
				EV_SM1	E102681	12,13,14,15,16	0.670	-	-	-	-	-	-	-	-	-	-
				EV_BLM2	E298592	13,14,15,16	0.843	-	-	-	-	-	-	-	-	-	-
				EV_FC1	E298591	13,14,15,16	0.206	-	-	-	-	-	-	-	-	-	-
				EV_GC2	E208043	12,13,14,15,16	0.152	-	-	-	-	-	-	-	-	-	-
				EV_OC1	E102679	12,13,14,15,16	<0.001	<0.001	-72	<0.001	-54	<0.001	-54	<0.001	-57	<0.001	-56
			M	EV_ER4	200027	12,13,14,15,16	0.616	-	-	-	-	-	-	-	-	-	-
				EV_ER2	200111	12,13,14,15,16	0.649	-	-	-	-	-	-	-	-	-	-
		Michel	T	CM_CC1	200209	12,13,14,15,16	0.058	-	-	-	-	-	-	-	-	-	-
				EV_EC1	200097	12,13,14,15,16	<0.001	<0.001	38	<0.001	25	<0.001	20	<0.001	19	<0.001	19
				EV_SP1	E296311	12,13,14,15,16	0.781	-	-	-	-	-	-	-	-	-	-
				EV_MG1	E208057	12,13,14,15,16	0.062	-	-	-	-	-	-	-	-	-	-
				EV_GT1	E206231	12,13,14,15,16	0.003	0.006	-30	0.340	-	0.004	-25	0.056	-	0.002	-28
				EV_BC1	E102685	12,13,14,15,16	<0.001	<0.001	-67	0.020	-24	<0.001	-49	<0.001	-69	<0.001	-67
				EV_AQ1	E210369	12,13,14,15,16	0.493	-	-	-	-	-	-	-	-	-	-
		Upper Michel	M	CM_MC2	E258937	12,13,14,15,16	0.505	-	-	-	-	-	-	-	-	-	-
				CM_MCTM	-	12,13,14,15,16	0.846	-	-	-	-	-	-	-	-	-	-
		Lower Michel	M	EV_MC3	200203	12,13,14,15,16	0.077	-	-	-	-	-	-	-	-	-	-
				EV_MC2	E300091	14,15,16	0.836	-	-	-	-	-	-	-	-	-	-
				EV_MC1	-	12,13,14	0.859	-	-	-	-	-	-	-	-	-	-
	5	Elk	M	EV_ER1	200393	12,13,14,15,16	0.397	-	-	-	-	-	-	-	-	-	-
				RG_ELKFERNIE	-	13,14,15,16	0.266	-	-	-	-	-	-	-	-	-	-
				RG_ELKORES	E294312	12,13,14,15,16	0.241	-	-	-	-	-	-	-	-	-	-
				RG_ELKMOUTH	-	12,13,14,15,16	0.074	-	-	-	-	-	-	-	-	-	-

P-value < 0.05
Reference area included in temporal analysis relative to reference mean
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast). Analysis is based on absolute change(s) in each area not relative to reference mean.

[a] For linear change: percent change in the most recent year relative to the first year of the comparison; For step change: percent chance after the step change relative to before the step change.

Table C.38: Results of Temporal Analysis of Monthly Mean Sulphate Concentrations in Reference and Mine-exposed Areas, 2012 - 2016 (not relative to reference means)

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Teck Water Station Code	ENV EMS Number	Years included in Analysis	ANOVA P-value	Linear		Step after 2012		Step after 2013		Step after 2014		Step after 2015	
								P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]
Reference	1	Fording	T	FR_HC3	E300096	12,13,14,15,16	0.578	0.184	23	0.574	13	0.128	37	0.390	19	0.558	14
			M	FR_UFR1	E216777	12,13,14,15,16	0.866	0.286	20	0.546	11	0.336	15	0.291	16	0.481	13
	2	Elk	T	LC_GRCK	E288275	12,13,14,15,16	0.590	0.118	15	0.187	11	0.241	7.4	0.149	9.1	0.294	8.0
				LC_LC1	E216142	12,13,14,15,16	0.261	0.030	66	0.271	27	0.063	41	0.045	46	0.074	48
				LC_SLC	E282149	12,13,14,15,16	0.915	0.350	30	0.478	17	0.427	16	0.479	14	0.446	19
	3	Elk	M	GH_ER2	200389	12,13,14,15,16	0.019	<0.001	34	0.065	17	0.002	25	0.002	24	0.012	23
	4	Elk	T	CM_MC1	E258175	12,13,14,15,16	0.984	0.680	-5.1	0.906	-1.3	0.855	-1.7	0.596	-4.7	0.641	-5.1
				RG_CH1	E295214	12,13,14,15,16	0.552	0.088	34	0.282	18	0.145	20	0.125	21	0.196	22
Mine-exposed	1	Fording	T	FR_HC1	E216778	12,13,14,15,16	0.870	-	-	-	-	-	-	-	-	-	-
				FR_CC1	E102481	12,13,14,15,16	<0.001	<0.001	70	<0.001	29	<0.001	20	<0.001	22	<0.001	50
				FR_LMP1	E306924	16	ND	-	-	-	-	-	-	-	-	-	-
				FR_NGD1	E105060	12,13,14,15,16	0.307	-	-	-	-	-	-	-	-	-	-
				FR_KC1	200252	12,13,14,15,16	0.772	-	-	-	-	-	-	-	-	-	-
				GH_SC1	E221329	12,13,14,15	0.142	-	-	-	-	-	-	-	-	-	-
				GH_SC2	E105061	12,13,14,15,16	0.066	-	-	-	-	-	-	-	-	-	-
				GH_CC1	200384	12,13,14,15,16	<0.001	0.002	24	0.001	11	<0.001	15	0.003	14	0.045	17
				GH_PC1	200385	12,13,14,15,16	0.795	-	-	-	-	-	-	-	-	-	-
				LC_DCDS	E295210	13,14,15,16	0.005	0.281	-	ND	-	0.781	-	0.211	-	0.006	35
				LC_DC3	E288273	12,13,14,15,16	0.013	0.003	42	0.128	-	0.044	15	0.015	19	<0.001	36
				LC_DC1	E288270	12,13,14,15,16	0.005	<0.001	30	0.042	13	0.005	15	0.002	17	<0.001	23
				GH_GH1	E102709	12,13,14,15,16	0.953	-	-	-	-	-	-	-	-	-	-
			M	FR_FR1	200251	12,13,14,15,16	0.795	-	-	-	-	-	-	-	-	-	-
				FR_FRABEC1	-	12,15	0.521	-	-	-	-	-	-	-	-	-	-
				FR_MULTIPLATE	-	12,13,15,16	0.903	-	-	-	-	-	-	-	-	-	-
				FR_FR2	200201	12,13,14,15,16	0.967	-	-	-	-	-	-	-	-	-	-
				GH_FR3	-	12,13,14,15	0.682	-	-	-	-	-	-	-	-	-	-
				FR_FR4	200311	12,13,14,15,16	0.939	-	-	-	-	-	-	-	-	-	-
				GH_FR	200311	12,13,14,15	0.902	-	-	-	-	-	-	-	-	-	-
				FR_FRCP1	E300071	15,16	0.883	-	-	-	-	-	-	-	-	-	-
				GH_PC2	E287431	12,13,14,15	0.909	-	-	-	-	-	-	-	-	-	-
				FR_FRABCH	0	13,15,16	0.004	<0.001	182	ND	-	<0.001	171	ND	-	<0.001	75
				FR_FR5	-	12,13,14,15,16	0.858	-	-	-	-	-	-	-	-	-	-
				LC_FRUS	E295232	13,14,15	0.811	-	-	-	-	-	-	-	-	-	-
				LC_FRB	-	12,13,14,15,16	0.238	-	-	-	-	-	-	-	-	-	-
				GH_FR1	200251	12,13,14,15,16	0.754	-	-	-	-	-	-	-	-	-	-
	2	Fording	T	LC_LCUSWLC	E293369	12,13,14,15,16	0.295	-	-	-	-	-	-	-	-	-	-
				LC_LC3	200337	12,13,14,15,16	0.541	-	-	-	-	-	-	-	-	-	-
				LC_LCDSSLCC	E297110	14,15,16	0.301	-	-	-	-	-	-	-	-	-	-
				LC_LC4	200044	12,13,14,15,16	0.423	-	-	-	-	-	-	-	-	-	-
			M	LC_LC6	200338	12,13,14,15,16	0.389	-	-	-	-	-	-	-	-	-	-
				LC_LC5	200028	12,13,14,15,16	0.489	-	-	-	-	-	-	-	-	-	-
	3	Elk	T	GH_BR_F	E287437	12,13,14,15,16	0.650	-	-	-	-	-	-	-	-	-	-
				GH_WOLF	-	12,13,14,15,16	0.710	-	-	-	-	-	-	-	-	-	-
				GH_WILLOW	-	12,13,14,15,16	0.729	-	-	-	-	-	-	-	-	-	-
				GH_WILLOW_S	-	13,14,15,16	0.198	-	-	-	-	-	-	-	-	-	-
				GH_WADE	E287433	12,13,14,15,16	<0.001	<0.001	68	0.001	27	<0.001	45	<0.001	37	<0.001	50
				GH_COUGAR	E287432	12,13,14,15,16	0.739	-	-	-	-	-	-	-	-	-	-
				GH_MC1	200388	12,13,14,15,16	<0.001	<0.001	448	0.004	112	<0.001	229	<0.001	464	<0.001	295
				GH_LC2	-	12,13,14,15,16	<0.001	<0.001	250	<0.001	158	<0.001	170	<0.001	135	<0.001	85
				GH_LC1	E257796	15,16	0.972	-	-	-	-	-	-	-	-	-	-
				GH_WC2	-	12,13,14,15,16	0.002	<0.001	73	0.061	-	0.003	40	<0.001	56	<0.001	55
				GH_WC1	E257795	12,15,16	<0.001	<0.001	280	<0.001	340	-	-	-	-	0.009	68
				GH_TC2	E207436	12,13,14,15,16	0.593	-	-	-	-	-	-	-	-	-	-
			M	GH_ERC	E300090	15,16	0.117	-	-	-	-	-	-	-	-	-	-
				GH_ER1	206661	12,13,14,15,16	<0.001	<0.001	82	0.002	35	<0.001	36	<0.001	44	<0.001	57
	4	Elk	T	EV_HC6	-	13,14,15,16	0.843	-	-	-	-	-	-	-	-	-	-
				EV_HC1	E102682	12,13,14,15,16	0.699	-	-	-	-	-	-	-	-	-	-
				EV_GV1	-	13,14,15,16	0.986	-	-	-	-	-	-	-	-	-	-
				EV_SM1	E102681	12,13,14,15,16	0.552	-	-	-	-	-	-	-	-	-	-
				EV_BLM2	E298592	13,14,15,16	0.621	-	-	-	-	-	-	-	-	-	-
				EV_FC1	E298591	13,14,15,16	0.196	-	-	-	-	-	-	-	-	-	-
				EV_GC2	E208043	12,13,14,15,16	<0.001	<0.001	78	<0.001	59	<0.001	40	<0.001	37	0.001	30
				EV_OC1	E102679	12,13,14,15,16	0.423	-	-	-	-	-	-	-	-	-	-
			M	EV_ER4	200027	12,13,14,15,16	0.564	-	-	-	-	-	-	-	-	-	-
				EV_ER2	200111	12,13,14,15,16	0.433	-	-	-	-	-	-	-	-	-	-
		Michel	T	CM_CC1	200209	12,13,14,15,16	0.228	-	-	-	-	-	-	-	-	-	-
				EV_EC1	200097	12,13,14,15,16	<0.001	<0.001	26	<0.001	15	<0.001	15	<0.001	14	<0.001	16
				EV_SP1	E296311	12,13,14,15,16	0.660	-	-	-	-	-	-	-	-	-	-
				EV_MG1	E208057	12,13,14,15,16	0.275	-	-	-	-	-	-	-	-	-	-
				EV_GT1	E206231	12,13,14,15,16	0.012	0.171	-	0.463	-	0.729	-	0.012	18	0.107	-
				EV_BC1	E102685	12,13,14,15,16	0.002	0.040	-8.0	0.289	-	0.181	-	0.001	-19	0.023	-16
				EV_AQ1	E210369	12,13,14,15,16	0.056	-	-	-	-	-	-	-	-	-	-
		Upper Michel	M	CM_MC2	E258937	12,13,14,15,16	0.933	-	-	-	-	-	-	-	-	-	-
				CM_MCTM	-	12,13,14,15,16	0.965	-	-	-	-	-	-	-	-	-	-
		Lower Michel	M	EV_MC3	200203	12,13,14,15,16	0.230	-	-	-	-	-	-	-	-	-	-
				EV_MC2	E300091	14,15,16	0.965	-	-	-	-	-	-	-	-	-	-
				EV_MC1	-	12,13,14	0.949	-	-	-	-	-	-	-	-	-	-
	5	Elk	M	EV_ER1	200393	12,13,14,15,16	0.350	-	-	-	-	-	-	-	-	-	-
				RG_ELKFERNIE	-	13,14,15,16	0.815	-	-	-	-	-	-	-	-	-	-
				RG_ELKORES	E294312	12,13,14,15,16	0.775	-	-	-	-	-	-	-	-	-	-
				RG_ELKMOUTH	-	12,13,14,15,16	0.651	-	-	-	-	-	-	-	-	-	-

P-value < 0.05
Reference area included in temporal analysis relative to reference mean
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast). Analysis is based on absolute change(s) in each area not relative to reference mean.

[a] For linear change: percent change in the most recent year relative to the first year of the comparison; For step change: percent chance after the step change relative to before the step change.

Table C.39: Results of Temporal Analysis on the Mean Concentrations of Nitrate, Sulphate, and Selenium for Mine-exposed Main Stem Areas, 2012 - 2016 (not relative to reference means)

Parameter	Management Unit	Number of Stations	Teck Water Station Codes	ANOVA P-value	Linear		Step after 2012		Step after 2013		Step after 2014		Step after 2015	
					P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]	P-value	Magnitude Change [a]
Nitrate	1	6	FR_FR1, FR_FR2, FR_FR4, FR_FR5, GH_FR1, LC_FRB	0.674	-	-	-	-	-	-	-	-	-	-
	2	2	LC_LC5, LC_LC6	0.046	0.042	27	0.003	28	0.044	14	0.383	-	0.544	-
	3	1	GH_ER1	0.002	<0.001	112	0.003	59	0.002	49	<0.001	64	0.002	61
	4 Elk	2	EV_ER2, EV_ER4	0.172	-	-	-	-	-	-	-	-	-	-
	4 Michel	3	CM_MC2, CM_MCTM, EV_MC3	0.069	-	-	-	-	-	-	-	-	-	-
	5	3	EV_ER1, RG_ELKMOUTH, RG_ELKORES	0.244	-	-	-	-	-	-	-	-	-	-
Sulphate	1	6	FR_FR1, FR_FR2, FR_FR4, FR_FR5, GH_FR1, LC_FRB	0.910	-	-	-	-	-	-	-	-	-	-
	2	2	LC_LC5, LC_LC6	0.523	-	-	-	-	-	-	-	-	-	-
	3	1	GH_ER1	<0.001	<0.001	82	0.002	35	<0.001	36	<0.001	44	<0.001	57
	4 Elk	2	EV_ER2, EV_ER4	0.521	-	-	-	-	-	-	-	-	-	-
	4 Michel	3	CM_MC2, CM_MCTM, EV_MC3	0.915	-	-	-	-	-	-	-	-	-	-
	5	3	EV_ER1, RG_ELKMOUTH, RG_ELKORES	0.921	-	-	-	-	-	-	-	-	-	-
Selenium	1	6	FR_FR1, FR_FR2, FR_FR4, FR_FR5, GH_FR1, LC_FRB	0.640	-	-	-	-	-	-	-	-	-	-
	2	2	LC_LC5, LC_LC6	0.360	-	-	-	-	-	-	-	-	-	-
	3	1	GH_ER1	0.337	-	-	-	-	-	-	-	-	-	-
	4 Elk	2	EV_ER2, EV_ER4	0.572	-	-	-	-	-	-	-	-	-	-
	4 Michel	3	CM_MC2, CM_MCTM, EV_MC3	0.717	-	-	-	-	-	-	-	-	-	-
	5	3	EV_ER1, RG_ELKMOUTH, RG_ELKORES	0.361	-	-	-	-	-	-	-	-	-	-

P-value < 0.05
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast)

[a] For linear change: percent change in the most recent year relative to the first year of the comparison; For step change: percent chance after the step change relative to before the step change

WATER QUALITY DATA

Raw Data

Table C.40: Water Chemistry at Reference Lotic Areas, September 2015

	Analytes	Units	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK
			12-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	13-Sep-15	12-Sep-15
			Andy Good	Alexander	Alexander	Bull	Bull	Bull	Cadorna	Chauncey
Physical	Total Suspended Solids (TSS)	mg/L	< 1.0	< 1.0	< 1.0	1.1	1.3	1.3	< 1.0	1.7
	Total Dissolved Solids (TDS)	mg/L	138	169	187	227	195	225	154	180
	Turbidity	NTU	0.32	0.24	0.36	0.28	0.57	0.56	0.29	0.34
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	90	130	130	130	130	130	100	125
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	90	130	130	130	130	130	100	125
	Ammonia, Total (as N)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	0.0057	< 0.005	0.0058	< 0.005
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	< 0.5	< 0.5	0.59	0.84	< 0.5	< 0.5	< 0.5	< 0.5
	Fluoride (F)	mg/L	0.224	0.131	0.12	0.133	0.069	0.07	0.13	0.134
	Hardness (as $CaCO_3$)	mg/L	122	159	166	196	173	200	134	155
	Nitrate (as N)	mg/L	0.291	0.0803	0.043	0.0648	0.0979	0.145	0.0496	0.0955
	Nitrite (as N)	mg/L	< 0.001	0.0035	0.0041	0.0011	< 0.001	0.0017	< 0.001	< 0.001
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.167	0.072	0.128	0.09	0.099	0.087	0.074	< 0.05
	Orthophosphate-Dissolved (as P)	mg/L	0.0015	0.0012	< 0.001	0.0016	< 0.001	< 0.001	< 0.001	0.0018
	Phosphorus (P)-Total	mg/L	0.0027	0.0048	0.0045	0.0036	0.0024	0.0026	0.0186	0.0067
	Sulphate (SO_4)	mg/L	18.1	15.8	16.5	56.7	38.6	55.5	21.5	23.8
	Organic Carbon, Dissolved (DOC)	mg/L	< 0.5	< 0.5	0.92	< 0.5	< 0.5	< 0.5	< 0.5	0.57
	Organic Carbon, Total (TOC)	mg/L	0.57	< 0.5	0.99	< 0.5	< 0.5	< 0.5	< 0.5	0.55
Total Metals	Aluminum (Al)	mg/L	0.018	0.015	< 0.015	< 0.015	< 0.015	< 0.015	0.016	0.017
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	0.00061	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0139	0.0633	0.0698	0.0355	0.0309	0.0285	0.0201	0.0652
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	37	46.8	48.5	59	52.1	60.6	40.9	43.7
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	< 0.05	< 0.05	0.057	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Magnesium (Mg)	mg/L	6.69	11.9	12.5	14.8	12.1	12.5	8.6	11.6
	Manganese (Mn)	mg/L	0.0006	0.00234	0.00188	< 0.0005	< 0.0005	< 0.0005	0.00151	0.00115
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00065	0.00061	0.0007	0.00101	0.00055	0.00055	0.00083	0.00063
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	< 0.25	0.32	0.42	0.39	0.37	0.36	0.31	0.33
	Selenium (Se)	mg/L	0.00151	0.00067	0.00061	0.00085	< 0.00025	< 0.00025	0.00063	0.00069
	Silicon (Si)	mg/L	1.12	1.97	2.12	2.23	1.99	1.97	1.36	1.97
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.33	0.89	1.51	1.5	0.99	0.98	0.32	0.85
	Strontium (Sr)	mg/L	0.095	0.0971	0.115	0.267	0.178	0.208	0.358	0.0786
	Sulphur (S)	mg/L	6.2	5.9	5.9	20.5	13.7	20.5	7.7	8.6
	Thallium (Tl)	mg/L	0.000063	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00069	0.000617	0.000617	0.00076	0.00046	0.000448	0.00083	0.000626
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	0.0052	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	0.00062	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0142	0.0624	0.0683	0.0343	0.031	0.0276	0.0192	0.0674
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	37.7	44.7	46	55.7	49.6	58.6	39.5	43.6
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Magnesium (Mg)	mg/L	6.68	11.5	12.4	13.8	12	13	8.51	11.2
	Manganese (Mn)	mg/L	< 0.0005	0.00201	0.00109	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00066	0.00061	0.00066	0.00089	0.00054	0.00047	0.00079	0.0006
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	< 0.25	0.32	0.4	0.4	0.37	0.39	0.28	0.35
	Selenium (Se)	mg/L	0.00159	0.00049	0.00053	0.00084	< 0.00025	< 0.00025	0.00072	0.00066
	Silicon (Si)	mg/L	1.15	1.93	2.13	2.11	1.99	2.09	1.38	1.9
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.34	0.85	1.4	1.45	0.93	0.93	0.29	0.89
	Strontium (Sr)	mg/L	0.0968	0.0923	0.111	0.25	0.168	0.201	0.342	0.08
	Sulphur (S)	mg/L	6.4	5.6	5.9	19	13.2	21.1	7.6	8.3
	Thallium (Tl)	mg/L	0.000059	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00072	0.000588	0.000569	0.000686	0.000441	0.000433	0.000771	0.000648
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	0.0073	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.40: Water Chemistry at Reference Lotic Areas, September 2015

	Analytes	Units	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU
			11-Sep-15	12-Sep-15	11-Sep-15	13-Sep-15	17-Sep-15	12-Sep-15	14-Sep-15	14-Sep-15
			Cross	Daisy	Dutch	Elk	Elk	Ewin	Flathead	Flathead
Physical	Total Suspended Solids (TSS)	mg/L	6.1	< 1.0	1	1.1	< 1.0	< 1.0	< 1.0	< 1.0
	Total Dissolved Solids (TDS)	mg/L	161	240	201	146	165	206	171	173
	Turbidity	NTU	2.58	0.51	0.45	0.5	0.51	0.22	0.31	0.18
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	93.3	120	167	95	133	130	150	160
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	93.3	120	167	95	133	130	150	160
	Ammonia, Total (as N)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	Fluoride (F)	mg/L	0.026	0.244	0.127	0.121	0.117	0.17	0.063	0.067
	Hardness (as $CaCO_3$)	mg/L	131	204	176	129	148	176	145	156
	Nitrate (as N)	mg/L	0.135	0.0363	0.0312	0.0381	0.0525	0.165	0.0062	< 0.005
	Nitrite (as N)	mg/L	< 0.001	0.0014	0.001	< 0.001	< 0.001	0.0011	< 0.001	< 0.001
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	0.171	0.158	0.127	< 0.05	0.109	0.143	0.055
	Orthophosphate-Dissolved (as P)	mg/L	0.0016	0.0017	0.0014	< 0.001	< 0.001	0.0022	< 0.001	< 0.001
	Phosphorus (P)-Total	mg/L	0.0053	0.0042	0.0027	0.004	0.0044	0.0567	0.003	0.0025
	Sulphate (SO_4)	mg/L	21.3	65.2	11.3	18.9	19	47	3.71	3.76
	Organic Carbon, Dissolved (DOC)	mg/L	1.26	0.6	1.43	0.55	< 0.5	0.53	< 0.5	< 0.5
	Organic Carbon, Total (TOC)	mg/L	< 0.5	0.66	1.43	0.55	< 0.5	0.52	0.51	0.6
Total Metals	Aluminum (Al)	mg/L	0.077	< 0.015	0.0086	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Antimony (Sb)	mg/L	< 0.0001	< 0.0005	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	0.00021	< 0.0005	0.00019	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0127	0.0807	0.125	0.0196	0.0437	0.0568	0.051	0.0366
	Beryllium (Be)	mg/L	< 0.00002	< 0.0001	< 0.00002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00005	< 0.00025	< 0.00005	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.01	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000005	< 0.000025	0.0000063	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	33.7	59.4	53.1	38.9	44.5	50.9	47.1	48.9
	Chromium (Cr)	mg/L	0.00017	< 0.0005	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0001	< 0.0005	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0005	< 0.0025	0.00056	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	0.145	< 0.05	0.011	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	0.000136	< 0.00025	< 0.00005	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.001	< 0.005	0.0031	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Magnesium (Mg)	mg/L	13.2	16	11.2	7.96	10.2	13.5	9.94	10.9
	Manganese (Mn)	mg/L	0.00424	0.00081	0.00072	0.00123	0.00248	0.00103	0.00125	< 0.0005
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00042	0.00247	0.000734	0.00082	0.0009	0.00089	0.00028	0.00032
	Nickel (Ni)	mg/L	< 0.0005	< 0.0025	< 0.0005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.05	< 0.25	< 0.05	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.24	0.71	0.73	0.29	0.35	0.43	0.27	< 0.25
	Selenium (Se)	mg/L	0.000058	0.00122	0.000637	0.00071	0.00071	0.00167	< 0.00025	< 0.00025
	Silicon (Si)	mg/L	1.74	3	2.49	1.27	1.67	2.09	2.12	2.07
	Silver (Ag)	mg/L	< 0.00001	< 0.00005	< 0.00001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.59	2.54	4.39	0.36	0.63	1.13	0.71	0.47
	Strontium (Sr)	mg/L	0.171	0.537	0.232	0.316	0.212	0.134	0.0622	0.0573
	Sulphur (S)	mg/L	7.8	23	4.1	6.9	6.4	16.3	1.5	1.5
	Thallium (Tl)	mg/L	< 0.00001	< 0.00005	< 0.00001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0001	< 0.0005	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	0.00046	< 0.0015	< 0.0003	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000768	0.000564	0.00045	0.000741	0.000664	0.000911	0.000245	0.000364
	Vanadium (V)	mg/L	< 0.0005	< 0.0025	< 0.0005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.003	< 0.015	< 0.003	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0003	< 0.0015	< 0.0003	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	0.004	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	0.00013	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.012	0.0773	0.119	0.0189	0.0429	0.0578	0.0458	0.0359
	Beryllium (Be)	mg/L	< 0.00002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000005	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	31.4	55.9	52.1	38.8	42.6	49.1	43	46
	Chromium (Cr)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Magnesium (Mg)	mg/L	12.8	15.7	11.2	7.86	10.2	12.9	9.12	9.86
	Manganese (Mn)	mg/L	0.00051	< 0.0005	< 0.0005	< 0.0005	0.00118	< 0.0005	0.00108	< 0.0005
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.000365	0.00224	0.00062	0.00075	0.00085	0.00088	0.00031	0.00032
	Nickel (Ni)	mg/L	< 0.0005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.05	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.23	0.68	0.65	0.28	0.33	0.42	0.28	< 0.25
	Selenium (Se)	mg/L	0.000067	0.00118	0.00055	0.00057	0.00079	0.00167	< 0.00025	< 0.00025
	Silicon (Si)	mg/L	1.63	2.98	2.54	1.26	1.74	2.04	2.01	1.96
	Silver (Ag)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.561	2.41	4.07	0.34	0.6	1.12	0.66	0.47
	Strontium (Sr)	mg/L	0.16	0.506	0.214	0.319	0.203	0.131	0.0558	0.0537
	Sulphur (S)	mg/L	7.5	22.2	4.2	7	6.8	15.8	1.3	1.4
	Thallium (Tl)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000731	0.000515	0.000447	0.000737	0.000646	0.000904	0.000234	0.000345
	Vanadium (V)	mg/L	< 0.0005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.40: Water Chemistry at Reference Lotic Areas, September 2015

	Analytes	Units	FLRU	FO26	GRUHA	HENUP	KO1	KODCR	KOUCR	KOUVE
			19-Sep-15	14-Sep-15	11-Sep-15	15-Sep-15	13-Sep-15	12-Sep-15	12-Sep-15	10-Sep-15
			Flathead	Fording	Grave	Henretta	Kootenay	Kootenay	Kootenay	Kootenay
Physical	Total Suspended Solids (TSS)	mg/L	< 1.0	< 1.0	2.4	< 1.0	15.3	16.5	17.9	< 1.0
	Total Dissolved Solids (TDS)	mg/L	105	215	215	171	185	153	178	169
	Turbidity	NTU	0.32	0.34	2.09	0.15	12.5	12.8	14.5	0.83
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	93.3	137	167	103	105	110	110	133
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	93.3	137	167	103	105	110	110	133
	Ammonia, Total (as N)	mg/L	< 0.005	0.0121	< 0.005	0.0058	< 0.005	< 0.005	< 0.005	0.0147
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	< 0.5	< 0.5	0.56	< 0.5	3.88	< 0.5	0.67	< 0.5
	Fluoride (F)	mg/L	0.045	0.142	0.104	0.291	0.043	0.032	0.039	0.041
	Hardness (as $CaCO_3$)	mg/L	87.9	182	190	155	152	134	136	146
	Nitrate (as N)	mg/L	< 0.005	0.0725	0.066	0.333	0.132	0.144	0.137	0.066
	Nitrite (as N)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.0011	< 0.001	0.0014
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	0.075	0.06	< 0.05	0.131	0.083	< 0.05	< 0.05
	Orthophosphate-Dissolved (as P)	mg/L	0.0039	0.0023	0.0045	0.0017	< 0.001	< 0.001	< 0.001	0.0012
	Phosphorus (P)-Total	mg/L	0.0067	0.0089	0.0092	0.0025	0.0143	0.0089	0.0105	0.0032
	Sulphate (SO_4)	mg/L	4.91	44.8	24.6	51.9	32.9	20.9	20.3	9.4
	Organic Carbon, Dissolved (DOC)	mg/L	0.95	0.57	0.94	0.76	0.87	0.69	0.73	0.85
	Organic Carbon, Total (TOC)	mg/L	0.92	0.55	1.01	1.05	0.97	0.77	0.87	0.57
Total Metals	Aluminum (Al)	mg/L	< 0.015	< 0.015	0.044	< 0.015	0.154	0.144	0.197	0.0186
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00021
	Barium (Ba)	mg/L	0.0549	0.0535	0.0942	0.0112	0.0356	0.0269	0.0341	0.0865
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.00002
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00005
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	0.0000053
	Calcium (Ca)	mg/L	25	54.5	49.8	44.7	47.9	37.9	40.9	40.2
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005
	Iron (Fe)	mg/L	< 0.05	< 0.05	0.055	< 0.05	0.26	0.239	0.337	0.043
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	0.00026	0.00025	0.0003	< 0.00005
	Lithium (Li)	mg/L	< 0.005	< 0.005	0.0076	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
	Magnesium (Mg)	mg/L	7.13	14	17.6	9.71	13	11.3	11.9	10.7
	Manganese (Mn)	mg/L	0.00139	0.00093	0.00223	< 0.0005	0.00776	0.0076	0.0092	0.00122
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00048	0.00071	0.00114	0.00066	0.00055	0.00039	0.00047	0.00034
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.05
	Potassium (K)	mg/L	0.31	0.41	0.59	< 0.25	0.4	0.28	0.32	0.36
	Selenium (Se)	mg/L	< 0.00025	0.00079	0.00107	0.00103	< 0.00025	< 0.00025	< 0.00025	< 0.00005
	Silicon (Si)	mg/L	1.73	2	2.88	1.13	2.02	1.72	1.96	2.15
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00001
	Sodium (Na)	mg/L	1.23	0.69	3.5	0.33	3.51	0.88	1.15	0.894
	Strontium (Sr)	mg/L	0.0832	0.106	0.162	0.121	0.217	0.184	0.197	0.147
	Sulphur (S)	mg/L	2	15.5	8.5	15.8	12.1	6.9	7.4	3.5
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00001
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	0.0056	< 0.0003
	Uranium (U)	mg/L	0.000223	0.000486	0.000626	0.000859	0.000777	0.000764	0.000786	0.000346
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.003
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0003
Dissolved Metals	Aluminum (Al)	mg/L	0.0053	< 0.005	< 0.005	< 0.005	0.0115	0.0095	0.0088	0.0024
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00018
	Barium (Ba)	mg/L	0.0501	0.0506	0.0937	0.0123	0.0313	0.0253	0.0316	0.091
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.00002
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00005
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000005
	Calcium (Ca)	mg/L	23.8	51.2	48.4	46.3	41.4	34.9	36.2	40.8
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0002
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00005
	Lithium (Li)	mg/L	< 0.005	< 0.005	0.0067	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
	Magnesium (Mg)	mg/L	6.92	13.2	16.7	9.49	11.8	11.3	11	10.8
	Manganese (Mn)	mg/L	0.00058	< 0.0005	< 0.0005	< 0.0005	0.00051	< 0.0005	< 0.0005	0.00049
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00051	0.00065	0.00124	0.00066	0.00047	0.0004	0.00043	0.000315
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	0.0036	< 0.0025	< 0.0025	< 0.0025	< 0.0005
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.05
	Potassium (K)	mg/L	0.3	0.39	0.61	< 0.25	0.42	0.29	0.3	0.37
	Selenium (Se)	mg/L	< 0.00025	0.00071	0.00087	0.00111	< 0.00025	< 0.00025	< 0.00025	0.000055
	Silicon (Si)	mg/L	1.77	1.93	2.75	1.16	1.76	1.63	1.7	2.18
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00001
	Sodium (Na)	mg/L	1.16	0.63	3.55	0.35	3.29	0.91	1.16	0.905
	Strontium (Sr)	mg/L	0.0801	0.0982	0.158	0.132	0.192	0.176	0.182	0.148
	Sulphur (S)	mg/L	1.8	14	8.7	16.9	11.2	7.1	6.9	3.4
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00001
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0003
	Uranium (U)	mg/L	0.000218	0.000452	0.000594	0.000926	0.00068	0.000764	0.000763	0.000347
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005
	Zinc (Zn)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0003

Table C.40: Water Chemistry at Reference Lotic Areas, September 2015

	Analytes	Units	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL
			18-Sep-15	11-Sep-15	11-Sep-15	10-Sep-15	12-Sep-15	11-Sep-15	10-Sep-15	11-Sep-15
			Grace	Line	McCool	Michel	Oldman	Oldman	Oldman	Palliser
Physical	Total Suspended Solids (TSS)	mg/L	1	2.4	1	< 1.0	< 1.0	< 1.0	2.6	40.2
	Total Dissolved Solids (TDS)	mg/L	245	181	288	170	206	223	244	196
	Turbidity	NTU	0.49	0.61	0.34	0.24	0.39	0.19	0.65	31
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	160	83.3	195	160	140	150	167	110
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	160	83.3	195	160	140	150	167	110
	Ammonia, Total (as N)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.51
	Fluoride (F)	mg/L	0.081	0.326	0.136	0.059	0.134	0.192	0.192	0.032
	Hardness (as $CaCO_3$)	mg/L	200	157	249	150	181	183	192	153
	Nitrate (as N)	mg/L	0.0282	0.202	0.117	0.0153	0.0268	0.0123	< 0.005	0.144
	Nitrite (as N)	mg/L	< 0.001	0.0013	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.172	0.095	0.088	0.056	0.232	0.175	0.22	< 0.05
	Orthophosphate-Dissolved (as P)	mg/L	0.0015	0.002	0.0101	0.0056	0.0017	0.0019	0.0013	0.0014
	Phosphorus (P)-Total	mg/L	0.0087	0.006	0.0125	0.0061	0.0042	0.0041	0.0046	0.0297
	Sulphate (SO_4)	mg/L	48.9	44.1	74.1	14.5	35.8	40.8	40.9	50.2
	Organic Carbon, Dissolved (DOC)	mg/L	1.41	0.67	0.65	0.78	0.91	1.22	1.16	0.73
	Organic Carbon, Total (TOC)	mg/L	1.56	0.61	0.7	0.81	0.97	1.24	1.35	0.62
Total Metals	Aluminum (Al)	mg/L	0.019	< 0.015	0.017	< 0.015	< 0.015	0.0077	0.0352	0.178
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00018	0.00026	0.00035
	Barium (Ba)	mg/L	0.0652	0.0398	0.0924	0.0542	0.114	0.103	0.117	0.0189
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.00002	< 0.00002	0.000023
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00005	0.000055	< 0.00005
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.011	0.014	< 0.01
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	0.00001	0.0000071	0.0000069
	Calcium (Ca)	mg/L	50.1	45.3	67	42.3	56.9	52.5	53.6	41.8
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00013	0.00023	0.00034
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	0.00021
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005	0.0011	0.00077
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	0.038	0.363
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00005	0.000058	0.00031
	Lithium (Li)	mg/L	0.0065	< 0.005	< 0.005	< 0.005	< 0.005	0.0036	0.0047	0.0016
	Magnesium (Mg)	mg/L	18.3	11.2	21.2	11.1	14.2	13	14.5	10.5
	Manganese (Mn)	mg/L	0.00317	0.00057	0.00393	< 0.0005	0.00061	0.00055	0.0013	0.00766
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00134	0.00085	0.0032	0.00102	0.00116	0.00121	0.00136	0.000441
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.00105
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.05	< 0.05	< 0.05
	Potassium (K)	mg/L	0.63	0.27	0.45	0.52	0.74	0.7	0.96	0.4
	Selenium (Se)	mg/L	0.00173	0.00221	0.00088	< 0.00025	0.00093	0.000976	0.000834	0.000153
	Silicon (Si)	mg/L	2.52	1.51	3.43	2.29	2.65	2.36	2.43	1.85
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00001	< 0.00001	< 0.00001
	Sodium (Na)	mg/L	2.16	1.06	1.11	2.97	3.87	3.62	7.02	0.827
	Strontium (Sr)	mg/L	0.171	0.129	0.592	0.157	0.441	0.471	0.477	0.135
	Sulphur (S)	mg/L	16.9	15.8	26	5.3	13.7	13.2	13.5	17.1
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00001	0.00001	0.000028
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0003	0.00078	0.00116
	Uranium (U)	mg/L	0.000984	0.00129	0.000863	0.000244	0.000535	0.000535	0.000646	0.00042
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.001
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.003	< 0.003	< 0.003
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0003	< 0.0003	< 0.0003
Dissolved Metals	Aluminum (Al)	mg/L	< 0.005	0.0161	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0046
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Barium (Ba)	mg/L	0.0648	0.0418	0.0934	0.0554	0.107	0.102	0.111	0.0212
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.00002
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00005
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000005
	Calcium (Ca)	mg/L	50.1	45.3	65.7	42.6	52.4	52.4	52.4	43
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0002
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00005
	Lithium (Li)	mg/L	0.0063	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0014
	Magnesium (Mg)	mg/L	18.3	10.7	20.7	10.7	12.2	12.8	14.9	11
	Manganese (Mn)	mg/L	0.00103	< 0.0005	0.00114	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00032
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.0013	0.00082	0.00322	0.00101	0.00102	0.00109	0.00122	0.000355
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.05
	Potassium (K)	mg/L	0.63	0.27	0.48	0.54	0.7	0.63	0.87	0.34
	Selenium (Se)	mg/L	0.00175	0.00205	0.00079	< 0.00025	0.00076	0.00085	0.00086	0.000152
	Silicon (Si)	mg/L	2.57	1.47	3.36	2.24	2.34	2.34	2.48	1.6
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00001
	Sodium (Na)	mg/L	2.15	1.1	1.13	3.01	3.53	3.41	6.5	0.989
	Strontium (Sr)	mg/L	0.17	0.131	0.593	0.158	0.402	0.443	0.439	0.157
	Sulphur (S)	mg/L	15.6	15.3	25.2	5.2	12.1	14.1	14.4	17
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00001
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0003
	Uranium (U)	mg/L	0.000951	0.00131	0.000853	0.000236	0.000489	0.00049	0.000602	0.000469
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0005
	Zinc (Zn)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0003

Table C.40: Water Chemistry at Reference Lotic Areas, September 2015

	Analytes	Units	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU
			11-Sep-15	11-Sep-15	15-Sep-15	10-Sep-15	10-Sep-15	10-Sep-15	11-Sep-15	19-Sep-15
			Palliser	Racehorse	South Line	Vermillion	Vermillion	Vicary	Wigwam	Wigwam
Physical	Total Suspended Solids (TSS)	mg/L	59.2	< 1.0	< 1.0	15.4	1	< 1.0	< 1.0	< 1.0
	Total Dissolved Solids (TDS)	mg/L	186	226	214	150	129	170	125	104
	Turbidity	NTU	54.9	0.33	0.24	13.6	1.58	0.33	0.15	0.13
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	120	160	120	117	117	100	120	93.3
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	120	160	120	117	117	100	120	93.3
	Ammonia, Total (as N)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	< 0.5	< 0.5	< 0.5	< 0.5	0.92	< 0.5	< 0.5	< 0.5
	Fluoride (F)	mg/L	0.031	0.15	0.299	0.034	< 0.02	0.119	0.078	< 0.02
	Hardness (as $CaCO_3$)	mg/L	150	173	177	124	115	137	114	90.9
	Nitrate (as N)	mg/L	0.143	0.0172	0.162	0.146	0.143	< 0.005	0.061	0.0158
	Nitrite (as N)	mg/L	< 0.001	0.0011	< 0.001	0.0014	0.0039	< 0.001	0.001	< 0.001
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	0.273	0.097	< 0.05	< 0.05	0.175	0.055	< 0.05
	Orthophosphate-Dissolved (as P)	mg/L	0.0012	0.0019	0.0015	0.0013	0.0017	0.0041	0.0026	0.0029
	Phosphorus (P)-Total	mg/L	0.0482	0.0031	0.0035	0.0066	0.0033	0.0063	0.0032	0.004
	Sulphate (SO_4)	mg/L	44.6	32	58.9	21.4	14.7	38.9	8.13	3.72
	Organic Carbon, Dissolved (DOC)	mg/L	0.73	1.55	0.62	0.92	< 0.5	2	< 0.5	< 0.5
	Organic Carbon, Total (TOC)	mg/L	0.8	1.57	0.54	< 0.5	1.18	2.09	< 0.5	< 0.5
Total Metals	Aluminum (Al)	mg/L	0.383	< 0.015	< 0.015	0.145	0.0152	0.0149	< 0.015	< 0.015
	Antimony (Sb)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	0.00056	< 0.0005	< 0.0005	0.00011	< 0.0001	0.00021	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0186	0.107	0.0385	0.0128	0.00576	0.0946	0.0953	0.118
	Beryllium (Be)	mg/L	0.000038	< 0.0001	< 0.0001	< 0.00002	< 0.00002	< 0.00002	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00005	0.000057	< 0.00005	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	0.015	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	0.0000133	< 0.000025	< 0.000025	< 0.000005	< 0.000005	0.0000093	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	41.6	51.3	52.6	32.1	28.7	33.6	31.4	23.5
	Chromium (Cr)	mg/L	0.00062	< 0.0005	< 0.0005	0.00023	0.0001	< 0.0001	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	0.00043	< 0.0005	< 0.0005	0.00017	< 0.0001	< 0.0001	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	0.00128	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.00071	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	0.71	< 0.05	< 0.05	0.234	0.027	0.017	< 0.05	< 0.05
	Lead (Pb)	mg/L	0.000581	< 0.00025	< 0.00025	0.000207	< 0.00005	< 0.00005	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0019	< 0.005	< 0.005	0.0011	< 0.001	0.005	< 0.005	< 0.005
	Magnesium (Mg)	mg/L	11.8	12.4	14.5	11.1	12.4	11.4	9.11	7.83
	Manganese (Mn)	mg/L	0.0137	0.00058	< 0.0005	0.00709	0.00121	0.00102	0.00086	< 0.0005
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.000619	0.0011	0.00134	0.000357	0.000162	0.000731	0.00057	0.00039
	Nickel (Ni)	mg/L	0.00194	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.05	< 0.25	< 0.25	< 0.05	< 0.05	< 0.05	< 0.25	< 0.25
	Potassium (K)	mg/L	0.52	0.7	0.36	0.26	0.2	0.81	0.32	0.33
	Selenium (Se)	mg/L	0.000169	0.0006	0.00174	0.00007	< 0.00005	0.000438	0.00027	< 0.00025
	Silicon (Si)	mg/L	2.53	2.75	1.79	1.69	1.43	2.59	2.7	3
	Silver (Ag)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00001	< 0.00001	< 0.00001	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	1.24	4.35	0.67	0.802	0.975	7.32	1.01	1.1
	Strontium (Sr)	mg/L	0.135	0.33	0.152	0.168	0.0756	0.31	0.0516	0.0326
	Sulphur (S)	mg/L	16	10.6	20.6	7.6	5.4	12.3	2.8	1.5
	Thallium (Tl)	mg/L	0.000056	< 0.00005	< 0.00005	< 0.00001	< 0.00001	< 0.00001	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	0.00307	< 0.0015	< 0.0015	0.00124	< 0.0003	< 0.0003	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000454	0.000435	0.00227	0.000719	0.000541	0.000379	0.000439	0.000372
	Vanadium (V)	mg/L	0.00166	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.003	< 0.015	< 0.015	< 0.003	< 0.003	< 0.003	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0003	< 0.0003	< 0.0003	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	0.0032	< 0.005	< 0.005	0.0069	0.0037	0.0088	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.02	0.113	0.0365	0.0127	0.00555	0.0951	0.097	0.116
	Beryllium (Be)	mg/L	< 0.00002	< 0.0001	< 0.0001	< 0.00002	< 0.00002	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00005	< 0.00005	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000005	< 0.000025	< 0.000025	< 0.000005	< 0.000005	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	42.3	49.6	48.9	31.2	26.7	35	30.7	23.5
	Chromium (Cr)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0002	< 0.001	< 0.001	0.00024	< 0.0002	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00005	< 0.00005	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0014	< 0.005	< 0.005	< 0.001	< 0.001	< 0.005	< 0.005	< 0.005
	Magnesium (Mg)	mg/L	10.7	12	13.3	11.1	11.7	12	9.14	7.83
	Manganese (Mn)	mg/L	0.00021	< 0.0005	< 0.0005	0.00045	0.00012	< 0.0005	< 0.0005	< 0.0005
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.000367	0.00104	0.00116	0.000358	0.000125	0.00069	0.00057	0.00042
	Nickel (Ni)	mg/L	< 0.0005	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.05	< 0.25	< 0.25	< 0.05	< 0.05	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.34	0.65	0.34	0.27	0.18	0.77	0.32	0.32
	Selenium (Se)	mg/L	0.000171	0.0007	0.00137	0.000071	< 0.00005	0.00037	0.00032	< 0.00025
	Silicon (Si)	mg/L	1.6	2.71	1.68	1.56	1.39	2.75	2.73	3.11
	Silver (Ag)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00001	< 0.00001	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.972	4.18	0.62	0.861	0.901	7.13	1.05	1.09
	Strontium (Sr)	mg/L	0.16	0.321	0.141	0.168	0.0699	0.306	0.0515	0.0332
	Sulphur (S)	mg/L	15.2	10.9	17.7	7.4	5.3	13.5	2.9	1.4
	Thallium (Tl)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00001	< 0.00001	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0003	< 0.0003	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000503	0.000413	0.00205	0.000766	0.00051	0.000364	0.000453	0.000366
	Vanadium (V)	mg/L	< 0.0005	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.001	< 0.005	< 0.005	0.0014	< 0.001	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0003	< 0.0003	< 0.0015	< 0.0015	< 0.0015

Table C.41: Water Chemistry at Mine-exposed Lotic Areas, September 2015

	Analytes	Units	BOCK	CATCK	CATCK-X	CORCK	EL1	EL1-X	EL19	EL20
			14-Sep-15	11-Sep-15	11-Sep-15	11-Sep-15	16-Sep-15	16-Sep-15	17-Sep-15	17-Sep-15
			Bodie	Cataract	Cataract	Corbin	Elk	Elk	Elk	Elk
Physical	Total Suspended Solids	mg/L	1.8	< 1.0	< 1.0	1	< 1.0	< 1.0	1.6	< 1.0
	Total Dissolved Solids	mg/L	1650	3240	3380	1220	280	288	271	192
	Turbidity	NTU	2.28	0.1	0.13	0.7	1.03	0.78	0.6	0.26
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	227	467	450	270	163	160	157	150
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	227	467	450	270	163	160	157	150
	Ammonia, Total (as N)	mg/L	0.0649	< 0.005	0.012	0.0151	0.0117	0.0112	< 0.005	< 0.005
	Bromide (Br)	mg/L	< 0.05	< 0.25	< 0.25	< 0.25	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	27.9	6.1	6.2	5.7	1.97	2	1.35	< 0.5
	Fluoride (F)	mg/L	0.306	0.11	0.12	0.13	0.172	0.176	0.137	0.112
	Hardness (as $CaCO_3$)	mg/L	1170	2390	2550	913	235	235	231	166
	Nitrate (as N)	mg/L	38	33.9	33.9	7.72	2.44	2.48	2.71	0.286
	Nitrite (as N)	mg/L	0.0335	< 0.005	0.0078	0.0232	0.0025	0.0041	< 0.001	< 0.001
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	0.159	< 0.05	0.224	< 0.05	< 0.05	< 0.05	< 0.05
	Orthophosphate-Dissolved (as P)	mg/L	< 0.001	< 0.001	< 0.001	0.0011	0.0033	0.0026	0.0011	0.001
	Phosphorus (P)-Total	mg/L	0.0058	0.0035	0.0034	0.0038	0.0054	0.0055	0.0028	0.0027
	Sulphate (SO_4)	mg/L	765	1860	1860	659	76.5	77.5	69.9	28.8
	Organic Carbon, Dissolved (DOC)	mg/L	0.58	1.45	1.39	0.74	1.13	0.98	< 0.5	< 0.5
	Organic Carbon, Total (TOC)	mg/L	0.64	1.5	1.44	0.79	1.24	1.21	0.61	< 0.5
Total Metals	Aluminum (Al)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Antimony (Sb)	mg/L	0.00447	0.00055	0.00064	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.189	0.0223	0.0252	0.0661	0.0727	0.0777	0.0684	0.0558
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	0.000255	0.000618	0.000685	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	235	409	458	196	63	67	61.1	49
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	0.00056	< 0.0005	< 0.0005	0.00219	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.146	0.0583	0.0652	0.0293	0.008	0.0085	0.0075	< 0.005
	Magnesium (Mg)	mg/L	154	401	345	111	19.5	20.5	18.3	11.4
	Manganese (Mn)	mg/L	0.00381	0.0009	0.00135	0.00905	0.00169	0.00193	0.00205	0.00172
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.0184	0.0023	0.00254	0.00152	0.00115	0.00132	0.00111	0.00096
	Nickel (Ni)	mg/L	0.0671	0.053	0.0592	0.0387	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	6.47	4.23	4.65	3.27	0.68	0.72	0.6	0.38
	Selenium (Se)	mg/L	0.131	0.547	0.592	0.0141	0.0107	0.0104	0.00983	0.00129
	Silicon (Si)	mg/L	2.54	3.5	2.84	2.18	2.03	2.11	1.98	1.81
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	8.32	1.64	1.9	20.5	2.43	2.61	2.11	0.84
	Strontium (Sr)	mg/L	0.805	0.231	0.259	0.563	0.208	0.22	0.224	0.213
	Sulphur (S)	mg/L	274	711	610	231	23.4	24.4	21.9	9.4
	Thallium (Tl)	mg/L	0.000077	0.000061	0.000092	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.0117	0.019	0.0209	0.00626	0.0012	0.00126	0.00106	0.000721
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	0.018	0.035	0.044	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	0.00422	0.00059	0.00095	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.22	0.025	0.0245	0.0641	0.0781	0.0785	0.0667	0.0529
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	0.000259	0.000661	0.000618	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	226	449	440	185	63	63.3	60.9	47.3
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	0.00052	< 0.0005	< 0.0005	0.00196	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.146	0.0642	0.064	0.0278	0.008	0.0087	0.0076	< 0.005
	Magnesium (Mg)	mg/L	147	308	351	109	18.8	18.7	19.2	11.7
	Manganese (Mn)	mg/L	0.00267	0.00089	0.00094	0.00592	0.00084	0.00084	0.00102	0.00099
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.0172	0.00244	0.00247	0.0015	0.00124	0.00124	0.00107	0.00089
	Nickel (Ni)	mg/L	0.062	0.0592	0.059	0.0381	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	6.07	4.6	4.57	3.14	0.68	0.67	0.62	0.38
	Selenium (Se)	mg/L	0.127	0.577	0.565	0.0135	0.0114	0.0108	0.00996	0.00143
	Silicon (Si)	mg/L	2.42	2.43	2.8	2.07	2	2.01	2.14	1.9
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	8.25	1.79	1.78	19.7	2.57	2.54	2.09	0.9
	Strontium (Sr)	mg/L	0.763	0.251	0.248	0.542	0.214	0.219	0.225	0.209
	Sulphur (S)	mg/L	242	557	619	218	25.7	25.6	24.5	10.3
	Thallium (Tl)	mg/L	0.000073	0.000067	0.000078	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.0113	0.0204	0.0198	0.0059	0.00123	0.00123	0.00107	0.000701
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	0.0152	0.0389	0.0381	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.41: Water Chemistry at Mine-exposed Lotic Areas, September 2015

	Analytes	Units	ELDEL	ELDFE	ELDGR	ELELKO	ELH93	ELUEL	ELUFE	ELUFO
			17-Sep-15	16-Sep-15	17-Sep-15	14-Sep-15	16-Sep-15	13-Sep-15	15-Sep-15	14-Sep-15
			Elk	Elk	Elk	Elk	Elk	Elk	Elk	Elk
Physical	Total Suspended Solids	mg/L	< 1.0	1.9	< 1.0	2.2	< 1.0	< 1.0	2	2
	Total Dissolved Solids	mg/L	201	270	292	275	253	201	302	204
	Turbidity	NTU	0.28	1.44	0.33	1.15	0.58	0.53	0.6	0.81
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	147	160	157	153	153	130	160	143
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	147	160	157	153	153	130	160	143
	Ammonia, Total (as N)	mg/L	< 0.005	0.0078	0.0071	0.0126	< 0.005	< 0.005	< 0.005	0.0058
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	< 0.5	2.22	1.44	2.21	1.86	< 0.5	2.2	1.39
	Fluoride (F)	mg/L	0.141	0.168	0.156	0.167	0.154	0.11	0.172	0.167
	Hardness (as $CaCO_3$)	mg/L	164	232	221	231	212	174	235	175
	Nitrate (as N)	mg/L	0.26	2.09	2.7	1.95	1.7	0.278	2.28	0.237
	Nitrite (as N)	mg/L	0.0015	0.0041	0.0033	0.0011	0.0024	0.0019	< 0.001	< 0.001
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	0.135	0.091	0.403	0.092	0.076	0.118	0.1
	Orthophosphate-Dissolved (as P)	mg/L	< 0.001	0.0013	< 0.001	< 0.001	0.0019	< 0.001	< 0.001	< 0.001
	Phosphorus (P)-Total	mg/L	0.0021	0.005	0.0035	0.0063	0.004	0.0042	0.0034	0.0022
	Sulphate (SO_4)	mg/L	31.4	73	72.6	69.9	61.9	28.9	75.1	32.6
	Organic Carbon, Dissolved (DOC)	mg/L	1.21	0.97	1.08	0.71	1.11	1.02	0.6	0.57
	Organic Carbon, Total (TOC)	mg/L	1.37	1.52	1	1.08	1.21	1.23	0.56	0.56
Total Metals	Aluminum (Al)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0536	0.0789	0.0716	0.0881	0.0869	0.0574	0.0838	0.059
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	0.000027	< 0.000025
	Calcium (Ca)	mg/L	50.7	64.7	62.8	64.4	60	52.2	66.7	52.9
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.005	0.0087	0.0089	0.0074	0.0081	< 0.005	0.01	< 0.005
	Magnesium (Mg)	mg/L	11.5	18.4	18.4	19.7	18.7	11.8	21.6	12.7
	Manganese (Mn)	mg/L	0.00125	0.00559	0.00109	0.0027	0.00124	0.00192	0.00196	0.00364
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00101	0.00119	0.00107	0.00124	0.00118	0.00103	0.00132	0.00109
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.38	0.71	0.64	0.73	0.67	0.42	0.67	0.49
	Selenium (Se)	mg/L	0.00129	0.00883	0.01	0.00862	0.00785	0.0014	0.00941	0.00123
	Silicon (Si)	mg/L	1.83	1.88	1.95	1.9	2.14	1.88	2.18	2.02
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.9	2.72	2.15	2.94	2.56	0.9	2.89	2
	Strontium (Sr)	mg/L	0.249	0.228	0.228	0.228	0.2	0.228	0.222	0.265
	Sulphur (S)	mg/L	11	22	24.7	24.3	20.1	10.1	25.8	11.4
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000777	0.00114	0.00115	0.00105	0.00105	0.000812	0.00119	0.000757
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0509	0.0835	0.0661	0.0826	0.089	0.0561	0.0789	0.0566
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	47.4	62.9	58.4	62.2	56.9	50.5	62.2	50.6
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.005	0.0082	0.0082	0.0072	0.0077	< 0.005	0.0086	< 0.005
	Magnesium (Mg)	mg/L	11.2	18.2	18.3	18.3	17.1	11.5	19.3	11.8
	Manganese (Mn)	mg/L	0.00091	0.00417	0.00098	0.00107	0.00081	0.00088	0.00123	0.00209
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00092	0.00126	0.00097	0.00127	0.00124	0.00099	0.00128	0.00113
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.37	0.69	0.59	0.67	0.61	0.4	0.68	0.43
	Selenium (Se)	mg/L	0.00108	0.00958	0.00949	0.00852	0.00796	0.00137	0.00925	0.00122
	Silicon (Si)	mg/L	1.84	1.92	2.01	1.78	2.04	1.87	2	1.91
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.85	2.81	2.02	2.74	2.5	0.85	2.73	1.85
	Strontium (Sr)	mg/L	0.236	0.228	0.212	0.215	0.203	0.217	0.207	0.252
	Sulphur (S)	mg/L	10	23.7	23.1	21.3	21.1	9.9	23.4	10.2
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000731	0.00113	0.00104	0.00101	0.00103	0.000752	0.00112	0.000738
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.41: Water Chemistry at Mine-exposed Lotic Areas, September 2015

	Analytes	Units	ELUSP	FO29	FO10-SP1	FO22	FO23	FO9	FOBCP	FOBKS
			15-Sep-15	13-Sep-15	17-Sep-15	12-Sep-15	16-Sep-15	18-Sep-15	17-Sep-15	16-Sep-15
			Elk	Fording	Fording	Fording	Fording	Fording	Fording	Fording
Physical	Total Suspended Solids	mg/L	1.2	< 1.0	11	< 1.0	2.3	< 1.0	< 1.0	1.6
	Total Dissolved Solids	mg/L	282	438	658	714	464	474	669	429
	Turbidity	NTU	0.55	0.39	3.2	0.25	1.37	0.19	0.23	0.56
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	157	160	210	200	183	183	187	167
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	157	160	210	200	183	183	187	167
	Ammonia, Total (as N)	mg/L	< 0.005	< 0.005	< 0.005	0.0073	< 0.005	< 0.005	0.0075	0.0056
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	1.55	0.94	1.56	1.38	1.39	1.26	1.21	0.83
	Fluoride (F)	mg/L	0.175	0.126	0.107	0.114	0.187	0.146	0.16	0.183
	Hardness (as $CaCO_3$)	mg/L	227	369	532	550	376	374	513	369
	Nitrate (as N)	mg/L	2.34	9.58	17.4	18.8	8.89	9.95	11.4	9.46
	Nitrite (as N)	mg/L	0.0013	0.0061	0.0072	0.0061	0.0028	0.0041	0.0151	0.0095
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.112	0.146	< 0.05	0.069	0.081	< 0.05	< 0.25	0.11
	Orthophosphate-Dissolved (as P)	mg/L	< 0.001	< 0.001	0.002	< 0.001	0.0018	< 0.001	< 0.001	< 0.001
	Phosphorus (P)-Total	mg/L	0.0041	0.0036	0.0046	0.0037	0.0056	0.003	0.0048	0.0042
	Sulphate (SO_4)	mg/L	67.7	148	75.8	263	164	160	284	149
	Organic Carbon, Dissolved (DOC)	mg/L	0.58	0.57	< 0.5	0.55	1.09	1.11	1.23	< 0.5
	Organic Carbon, Total (TOC)	mg/L	0.57	0.6	< 0.5	0.53	1.28	1.39	1.33	< 0.5
Total Metals	Aluminum (Al)	mg/L	< 0.015	< 0.015	0.019	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0742	0.116	0.132	0.118	0.102	0.109	0.0767	0.0848
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	0.000028	0.000044	0.000042	0.000069	< 0.000025	0.000045	0.000056
	Calcium (Ca)	mg/L	63.6	95.5	117	124	95.7	87.4	106	84.7
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0076	0.016	0.0323	0.0288	0.0219	0.0179	0.038	0.0322
	Magnesium (Mg)	mg/L	19.8	38.6	53.2	60.6	38.9	35.5	56	34.5
	Manganese (Mn)	mg/L	0.00503	0.00143	0.00275	0.00439	0.00119	0.00087	0.00727	0.0117
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	0.0000053	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00121	0.0008	0.00083	0.00083	0.00113	0.00083	0.00133	0.00116
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	0.0053	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.62	1.14	1.89	1.78	1.16	1.08	1.69	1.48
	Selenium (Se)	mg/L	0.00937	0.0348	0.0606	0.068	0.0347	0.0336	0.0638	0.0239
	Silicon (Si)	mg/L	2.2	2.35	2.04	2.31	2.32	1.97	1.88	1.86
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	2.5	1.89	2.06	2.15	3.4	1.83	1.69	1.69
	Strontium (Sr)	mg/L	0.228	0.148	0.147	0.161	0.168	0.134	0.145	0.141
	Sulphur (S)	mg/L	23.3	55.4	79.3	94.7	54.7	54.7	96.8	48.3
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00117	0.00174	0.00268	0.00276	0.00208	0.00162	0.00318	0.00178
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0678	0.111	0.127	0.12	0.102	0.108	0.0764	0.0836
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	0.000036	0.000039	0.000039	< 0.000025	0.000045	0.000051
	Calcium (Ca)	mg/L	60.2	88.3	113	123	88.3	86.4	105	82.6
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0073	0.0156	0.032	0.0297	0.0209	0.0182	0.0375	0.0317
	Magnesium (Mg)	mg/L	18.6	36	60.8	58.8	37.7	38.4	60.7	39.6
	Manganese (Mn)	mg/L	0.00368	0.00079	0.00216	0.00398	< 0.0005	< 0.0005	0.00651	0.00985
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00118	0.0008	0.00083	0.00083	0.00107	0.00076	0.00134	0.00112
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	0.006	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.6	1.11	1.91	1.79	1.16	1.08	1.73	1.48
	Selenium (Se)	mg/L	0.0094	0.0342	0.0601	0.0664	0.0349	0.0339	0.064	0.023
	Silicon (Si)	mg/L	2.08	2.17	2.19	2.21	2.18	2.06	1.9	2.01
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	2.33	1.77	2.01	2.14	3.25	1.79	1.73	1.65
	Strontium (Sr)	mg/L	0.215	0.137	0.142	0.161	0.168	0.134	0.144	0.137
	Sulphur (S)	mg/L	21.3	50.3	84.9	89.2	55.2	52.8	89.1	53.4
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00108	0.00167	0.00254	0.00273	0.00205	0.00155	0.00308	0.00175
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.41: Water Chemistry at Mine-exposed Lotic Areas, September 2015

	Analytes	Units	FOBSC	FODGH	FODHE	FODNGD	FODPO	FOUEW	FOUKI	FRUL
			17-Sep-15	16-Sep-15	14-Sep-15	14-Sep-15	15-Sep-15	13-Sep-15	16-Sep-15	17-Sep-15
			Fording	Fording	Fording	Fording	Fording	Fording	Fording	Fording
Physical	Total Suspended Solids	mg/L	< 1.0	< 1.0	1	1.4	1.1	< 1.0	< 1.0	< 1.0
	Total Dissolved Solids	mg/L	483	475	280	406	711	630	440	453
	Turbidity	NTU	0.25	0.38	0.37	0.73	0.25	0.25	0.39	0.38
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	190	167	133	160	243	195	177	177
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	190	167	133	160	243	195	177	177
	Ammonia, Total (as N)	mg/L	< 0.005	< 0.005	< 0.005	0.0274	< 0.005	< 0.005	0.0056	< 0.005
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	0.86	1.12	< 0.5	< 0.5	1.3	1.42	0.84	1.13
	Fluoride (F)	mg/L	0.169	0.129	0.215	0.181	0.146	0.103	0.151	0.12
	Hardness (as $CaCO_3$)	mg/L	400	403	208	294	551	495	373	380
	Nitrate (as N)	mg/L	9.95	9.53	2.86	10.3	18.4	16.3	9.47	9.41
	Nitrite (as N)	mg/L	0.0094	0.005	0.0032	0.0071	0.0024	0.0058	0.012	0.0016
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	0.084	< 0.05	0.134	< 0.05	0.055	0.096	0.069
	Orthophosphate-Dissolved (as P)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	0.0021	0.0013	< 0.001	0.0011
	Phosphorus (P)-Total	mg/L	0.0058	0.0037	0.0034	0.0051	0.0047	0.0033	0.0068	0.0032
	Sulphate (SO_4)	mg/L	183	175	84.4	119	264	231	150	159
	Organic Carbon, Dissolved (DOC)	mg/L	1.2	0.59	0.51	0.54	1.01	0.83	0.57	< 0.5
	Organic Carbon, Total (TOC)	mg/L	1.36	0.62	0.53	0.55	1.15	0.86	0.53	< 0.5
Total Metals	Aluminum (Al)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0804	0.11	0.0438	0.0849	0.106	0.118	0.0845	0.112
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	0.000056	0.000028	< 0.000025	0.000037	0.00003	0.00004	0.000045	< 0.000025
	Calcium (Ca)	mg/L	90.7	89.4	64.5	81.8	119	118	85	87.3
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0352	0.0154	< 0.005	0.0273	0.0314	0.0262	0.0321	0.0149
	Magnesium (Mg)	mg/L	38.7	38.9	19	26.7	58	54	34.8	38.1
	Manganese (Mn)	mg/L	0.00956	0.00161	0.0029	0.00181	0.00132	0.00323	0.0128	0.00078
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.0013	0.00092	0.00077	0.00121	0.00087	0.00083	0.00126	0.0009
	Nickel (Ni)	mg/L	0.0028	< 0.0025	< 0.0025	0.0028	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	1.5	1.12	0.58	1.16	1.81	1.64	1.48	1.13
	Selenium (Se)	mg/L	0.0339	0.037	0.00982	0.0234	0.0682	0.0588	0.0233	0.0338
	Silicon (Si)	mg/L	1.81	2.09	1.58	1.83	2.21	2.25	1.9	2.24
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	1.69	1.81	0.66	1.43	2.16	2.09	1.72	1.9
	Strontium (Sr)	mg/L	0.137	0.14	0.114	0.141	0.157	0.157	0.145	0.142
	Sulphur (S)	mg/L	62.7	57.9	28.9	42.9	86	83.2	48.6	53.5
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00215	0.00179	0.000865	0.0015	0.00283	0.00254	0.00184	0.00164
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	0.0054	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.08	0.111	0.0389	0.0807	0.11	0.114	0.0847	0.105
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	0.000041	< 0.000025	< 0.000025	0.000026	0.000041	0.000027	0.000054	< 0.000025
	Calcium (Ca)	mg/L	90.8	87.2	57.1	75.8	124	110	83.7	84
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	0.0016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0349	0.0161	< 0.005	0.0258	0.0314	0.0251	0.0324	0.0153
	Magnesium (Mg)	mg/L	42.1	45.1	15.9	25.4	58.4	53.1	39.8	41.4
	Manganese (Mn)	mg/L	0.00895	0.00101	0.00188	0.00061	0.00078	0.0028	0.0121	< 0.0005
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00133	0.00092	0.00078	0.00121	0.00078	0.00076	0.00113	0.00083
	Nickel (Ni)	mg/L	0.003	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	1.54	1.16	0.49	1.13	1.75	1.6	1.49	1.13
	Selenium (Se)	mg/L	0.0336	0.0366	0.0102	0.0233	0.0701	0.057	0.023	0.0331
	Silicon (Si)	mg/L	1.89	2.28	1.41	1.73	2.18	2.13	2.03	2.31
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	1.68	1.77	0.52	1.35	2.12	2.01	1.66	1.84
	Strontium (Sr)	mg/L	0.139	0.135	0.103	0.13	0.161	0.149	0.138	0.136
	Sulphur (S)	mg/L	59.3	63.2	27.6	35.9	93	78.2	53.2	55.6
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00211	0.00177	0.000799	0.00138	0.00281	0.00245	0.00176	0.00152
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.41: Water Chemistry at Mine-exposed Lotic Areas, September 2015

	Analytes	Units	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS
			15-Sep-15	15-Sep-15	15-Sep-15	15-Sep-15	17-Sep-15	12-Sep-15	10-Sep-15	11-Sep-15
			Fording	Fording	Greenhills	Greenhills	Grave	Grave	Harmer	Harmer
Physical	Total Suspended Solids	mg/L	< 1.0	6.3	< 1.0	1.5	< 1.0	2.1	< 1.0	1
	Total Dissolved Solids	mg/L	369	382	1200	1370	428	429	482	528
	Turbidity	NTU	0.27	3.56	1.06	0.24	0.31	0.47	0.25	0.24
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	157	160	210	273	183	175	315	210
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	157	160	210	273	183	175	315	210
	Ammonia, Total (as N)	mg/L	0.0196	0.008	0.0094	0.0065	0.0081	0.0086	< 0.005	0.0112
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.25	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	< 0.5	< 0.5	< 2.5	< 2.5	0.89	2.42	1.37	1.13
	Fluoride (F)	mg/L	0.185	0.178	0.14	0.17	0.181	0.117	0.188	0.18
	Hardness (as $CaCO_3$)	mg/L	299	312	917	1030	341	353	400	428
	Nitrate (as N)	mg/L	10.1	9.84	4.67	6.09	0.754	0.889	0.994	1.19
	Nitrite (as N)	mg/L	0.005	0.0086	0.012	< 0.005	< 0.001	< 0.001	0.0023	< 0.001
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.09	0.075	0.28	0.224	0.319	0.22	0.148	0.169
	Orthophosphate-Dissolved (as P)	mg/L	0.0021	0.0019	0.0015	0.0019	0.0032	0.0015	0.0062	0.0077
	Phosphorus (P)-Total	mg/L	0.0039	0.0123	0.0141	0.006	0.0045	0.0071	0.0108	0.0098
	Sulphate (SO_4)	mg/L	116	128	696	737	155	152	192	212
	Organic Carbon, Dissolved (DOC)	mg/L	1.14	1.16	2.72	0.83	1.44	0.66	0.92	0.83
	Organic Carbon, Total (TOC)	mg/L	1.03	1.33	2.75	2.34	1.54	0.67	0.99	0.86
Total Metals	Aluminum (Al)	mg/L	< 0.015	0.054	0.037	< 0.015	0.021	0.016	< 0.015	< 0.015
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	0.00108	0.00143	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0812	0.087	0.0446	0.0581	0.0679	0.071	0.067	0.0682
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	0.000039	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	81.3	84.2	136	185	75	76.8	86.8	88.7
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	< 0.05	0.125	0.07	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0276	0.028	0.0111	0.0115	0.0081	0.0061	0.0065	0.0063
	Magnesium (Mg)	mg/L	27	31.3	120	144	37.7	39.1	47.9	52.4
	Manganese (Mn)	mg/L	0.00097	0.0162	0.00471	0.0025	0.00239	0.00185	0.00344	0.00078
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00117	0.0012	0.00396	0.00419	0.0011	0.00108	0.00102	0.00102
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	0.025	0.04	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	1.15	1.29	2.55	3.1	0.82	0.83	0.95	0.97
	Selenium (Se)	mg/L	0.024	0.0255	0.0861	0.107	0.0251	0.0228	0.0352	0.0395
	Silicon (Si)	mg/L	1.82	2.02	2.35	3.49	2.12	2.32	2.21	2.2
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	1.36	1.53	2.41	2.78	1.78	1.91	1.67	1.68
	Strontium (Sr)	mg/L	0.14	0.141	0.169	0.223	0.129	0.147	0.13	0.122
	Sulphur (S)	mg/L	37.8	42.4	199	236	53.8	52.4	66.3	74
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00153	0.00161	0.00635	0.00813	0.00222	0.00213	0.00274	0.00292
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	< 0.005	< 0.005	0.0051	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	0.00113	0.00126	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0822	0.0837	0.0496	0.0564	0.065	0.0699	0.0637	0.0654
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	0.000028	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	79.6	81.5	155	186	72.6	76.3	82.6	85.8
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0276	0.0283	0.0121	0.0113	0.0073	0.0069	0.0056	0.0058
	Magnesium (Mg)	mg/L	24.4	26.4	129	138	38.9	39.6	47.2	51.8
	Manganese (Mn)	mg/L	0.00061	0.00964	0.00118	0.00214	0.00108	0.00067	0.0024	0.00063
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00118	0.00121	0.00442	0.00395	0.00097	0.00106	0.00093	0.00092
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	0.0283	0.0369	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	1.12	1.23	2.67	2.88	0.8	0.84	0.93	0.96
	Selenium (Se)	mg/L	0.024	0.0242	0.0974	0.107	0.0248	0.0237	0.0326	0.0387
	Silicon (Si)	mg/L	1.74	1.8	2.48	3.22	2.1	2.31	2.07	2.03
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	1.32	1.47	2.61	2.69	1.67	1.86	1.62	1.66
	Strontium (Sr)	mg/L	0.143	0.143	0.195	0.213	0.125	0.144	0.123	0.12
	Sulphur (S)	mg/L	38.2	41.8	210	241	51.3	50.9	65.6	73.4
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00147	0.00154	0.00702	0.00769	0.00208	0.00211	0.00253	0.00275
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.41: Water Chemistry at Mine-exposed Lotic Areas, September 2015

	Analytes	Units	HENFO	KICK	LC_DC1	LC_FRUS	LC_DCDS	LI8	LIDSL	LILC3
			16-Sep-15	17-Sep-15	13-Sep-15	13-Sep-15	16-Sep-15	14-Sep-15	14-Sep-15	14-Sep-15
			Henretta	Kilmarnock	Dry	Fording	Dry	Line	Line	Line
Physical	Total Suspended Solids	mg/L	< 1.0	< 1.0	1.1	< 1.0	5.9	23.2	< 1.0	< 1.0
	Total Dissolved Solids	mg/L	281	1110	186	452	119	481	535	712
	Turbidity	NTU	0.33	< 0.1	0.75	0.28	4.42	5.1	0.44	0.39
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	133	310	180	160	130	177	190	213
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	133	310	180	160	130	177	190	213
	Ammonia, Total (as N)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	< 0.5	0.79	< 0.5	1.44	< 0.5	1.67	1.77	2.35
	Fluoride (F)	mg/L	0.242	0.164	0.081	0.105	0.079	0.238	0.208	0.185
	Hardness (as $CaCO_3$)	mg/L	238	817	170	376	130	384	426	536
	Nitrate (as N)	mg/L	3.88	47.3	0.0173	9.97	0.0054	8.33	10.1	14.7
	Nitrite (as N)	mg/L	0.0017	0.0022	< 0.001	0.0086	0.0021	0.0029	0.0017	0.0012
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.065	0.251	0.167	0.129	0.21	< 0.05	< 0.05	< 0.05
	Orthophosphate-Dissolved (as P)	mg/L	< 0.001	< 0.001	0.008	< 0.001	< 0.001	0.0017	0.0012	0.0011
	Phosphorus (P)-Total	mg/L	0.0026	< 0.002	0.0145	0.0042	0.0272	0.0104	0.0026	0.0038
	Sulphate (SO_4)	mg/L	99.1	327	9.14	155	12.3	183	212	279
	Organic Carbon, Dissolved (DOC)	mg/L	< 0.5	0.98	1.03	0.54	1.75	0.59	0.55	0.5
	Organic Carbon, Total (TOC)	mg/L	< 0.5	0.98	1.06	0.55	2.42	0.59	0.52	0.56
Total Metals	Aluminum (Al)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	0.027	0.03	< 0.015	< 0.015
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0297	0.0339	0.19	0.11	0.123	0.0821	0.0786	0.0829
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	0.000617	0.00005	0.000029	0.00005	0.000192	0.00033	0.000539
	Calcium (Ca)	mg/L	62.5	180	45.9	93.7	32.9	97.9	103	126
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.005	0.0593	0.0095	0.0158	0.0076	0.0317	0.0385	0.0583
	Magnesium (Mg)	mg/L	19	84.2	17.2	37.7	10.6	39.7	51	57.6
	Manganese (Mn)	mg/L	0.0045	< 0.0005	0.00198	0.00126	0.00191	0.00254	< 0.0005	< 0.0005
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00081	0.00162	0.00124	0.00078	0.00095	0.00167	0.00174	0.0022
	Nickel (Ni)	mg/L	< 0.0025	0.0123	< 0.0025	< 0.0025	< 0.0025	0.0046	0.0076	0.0127
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.59	3.31	1.3	1.08	1.04	1.21	1.35	1.82
	Selenium (Se)	mg/L	0.0139	0.109	0.00132	0.0348	0.00149	0.0326	0.0376	0.0514
	Silicon (Si)	mg/L	1.42	1.71	3	2.21	1.61	2.27	2.68	2.27
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.54	2.11	1.11	1.78	0.7	6.32	7.41	10.5
	Strontium (Sr)	mg/L	0.116	0.158	0.0557	0.146	0.0439	0.2	0.201	0.229
	Sulphur (S)	mg/L	31.2	114	3.7	55.1	3.7	61.3	82.3	96.8
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000976	0.00674	0.000357	0.00176	0.000272	0.00293	0.00318	0.00421
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	0.022
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	< 0.005	< 0.005	0.0059	< 0.005	0.0112	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.0297	0.0346	0.18	0.109	0.134	0.0774	0.0741	0.0789
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	0.000573	0.000028	< 0.000025	< 0.000025	0.000104	0.000252	0.000498
	Calcium (Ca)	mg/L	62.5	179	42.9	89.7	34	91	99.7	121
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0054	0.0579	0.0096	0.0155	0.0077	0.0321	0.0392	0.0578
	Magnesium (Mg)	mg/L	19.9	89.8	15.2	36.9	11	38.1	43.1	56.5
	Manganese (Mn)	mg/L	0.00349	< 0.0005	0.00117	0.00088	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00077	0.00155	0.0012	0.00083	0.00098	0.0016	0.00164	0.00207
	Nickel (Ni)	mg/L	< 0.0025	0.0123	< 0.0025	< 0.0025	< 0.0025	0.0041	0.007	0.0118
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.58	3.21	1.27	1.09	0.98	1.1	1.26	1.68
	Selenium (Se)	mg/L	0.0136	0.11	0.00148	0.0348	0.00162	0.0324	0.0392	0.0513
	Silicon (Si)	mg/L	1.53	1.77	2.72	2.13	1.7	2.15	2.1	2.18
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.5	2.04	1.03	1.76	0.75	6.19	7.14	9.75
	Strontium (Sr)	mg/L	0.114	0.156	0.0518	0.14	0.0466	0.188	0.193	0.215
	Sulphur (S)	mg/L	35.4	104	3.4	52.2	4.2	55.3	65	83.4
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000948	0.00655	0.00033	0.00171	0.000295	0.00277	0.0031	0.00389
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.005	0.0068	< 0.005	< 0.005	< 0.005	0.0057	0.0102	0.0191
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.41: Water Chemistry at Mine-exposed Lotic Areas, September 2015

	Analytes	Units	MI2	MI3	MI5	MIDAG	MIDCO	MIUCO	MP1	NGD1
			10-Sep-15	14-Sep-15	13-Sep-15	12-Sep-15	11-Sep-15	10-Sep-15	15-Sep-15	8-Oct-15
			Michel	Michel	Michel	Michel	Michel	Michel	Fording	#N/A
Physical	Total Suspended Solids	mg/L	2.8	1	< 1.0	< 1.0	1.4	< 1.0	< 1.0	1
	Total Dissolved Solids	mg/L	360	243	247	248	637	180	381	316
	Turbidity	NTU	0.59	0.71	0.36	0.39	0.5	0.4	0.37	0.65
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	75	147	130	125	225	163	150	190
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	75	147	130	125	225	163	150	190
	Ammonia, Total (as N)	mg/L	0.0061	0.0053	< 0.005	< 0.005	< 0.005	0.0059	0.0097	0.0051
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Chloride (Cl)	mg/L	3.11	0.97	0.84	0.69	3.24	< 0.5	< 0.5	< 0.5
	Fluoride (F)	mg/L	0.167	0.121	0.119	0.18	0.105	0.069	0.174	0.136
	Hardness (as $CaCO_3$)	mg/L	293	198	204	201	480	164	307	254
	Nitrate (as N)	mg/L	3.01	0.37	0.531	0.716	3.05	< 0.005	9.86	0.783
	Nitrite (as N)	mg/L	0.0028	< 0.001	0.0029	< 0.001	0.0049	0.0012	0.0078	< 0.001
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.138	0.104	0.171	0.187	0.207	< 0.05	0.111	< 0.50
	Orthophosphate-Dissolved (as P)	mg/L	0.0042	0.0052	0.0063	0.0013	0.0018	0.0032	0.0021	< 0.001
	Phosphorus (P)-Total	mg/L	0.0081	0.0077	0.0091	0.0057	0.0039	0.0054	0.0044	0.0076
	Sulphate (SO_4)	mg/L	119	59	63.6	71.7	288	20.1	124	85.7
	Organic Carbon, Dissolved (DOC)	mg/L	0.87	0.78	0.58	0.5	0.71	0.62	0.93	2.30
	Organic Carbon, Total (TOC)	mg/L	0.87	0.76	0.59	0.53	0.74	0.62	1.08	2.13
Total Metals	Aluminum (Al)	mg/L	< 0.015	0.024	< 0.015	0.021	< 0.015	0.018	< 0.015	<0.015
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.116	0.131	0.101	0.0431	0.0859	0.0777	0.0801	0.155
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	0.000055	0.000036	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	0.000028
	Calcium (Ca)	mg/L	75.7	57	57.5	55.5	110	45.8	75.9	64
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0141	< 0.005	< 0.005	< 0.005	0.0139	< 0.005	0.0249	0.0152
	Magnesium (Mg)	mg/L	29.4	15.4	16.4	16.2	56	13.6	28.1	30.2
	Manganese (Mn)	mg/L	0.0025	0.00258	0.00078	0.00121	0.00268	0.00566	0.00202	0.00627
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00189	0.00072	0.00081	0.00077	0.00114	0.00077	0.00115	0.0032
	Nickel (Ni)	mg/L	0.0038	< 0.0025	< 0.0025	< 0.0025	0.0107	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	1.08	0.68	0.7	0.55	1.69	0.49	1.17	1.97
	Selenium (Se)	mg/L	0.0131	0.00176	0.00213	0.0024	0.00571	0.00028	0.0232	0.0146
	Silicon (Si)	mg/L	2.35	2.19	2.09	1.53	2.2	2.24	1.78	2.33
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	3.21	2.96	2.83	2.49	10.8	2.56	1.4	1.26
	Strontium (Sr)	mg/L	0.189	0.156	0.153	0.151	0.327	0.145	0.127	0.0851
	Sulphur (S)	mg/L	40.5	20.7	22.8	25.2	105	7.3	38.2	29.7
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00172	0.000634	0.00076	0.001	0.00267	0.000304	0.00144	0.0011
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	0.0052	< 0.005	0.0058	< 0.005	0.0053	0.0061	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.117	0.127	0.102	0.0439	0.0861	0.0777	0.0853	0.141
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	0.000047	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	73	55	55.5	54.6	104	44.6	79.8	60.7
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0137	< 0.005	< 0.005	< 0.005	0.0132	< 0.005	0.0281	0.0161
	Magnesium (Mg)	mg/L	26.8	14.7	15.8	15.8	53.3	12.8	26.2	24.9
	Manganese (Mn)	mg/L	0.00123	0.00077	< 0.0005	0.00055	0.00213	0.00387	0.00152	0.00408
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00201	0.00074	0.00076	0.00077	0.00119	0.00074	0.00118	0.00304
	Nickel (Ni)	mg/L	0.0037	< 0.0025	< 0.0025	< 0.0025	0.0114	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	1.08	0.7	0.67	0.56	1.61	0.49	1.2	1.94
	Selenium (Se)	mg/L	0.0136	0.00162	0.0021	0.00242	0.00557	0.00031	0.026	0.0152
	Silicon (Si)	mg/L	2.29	2.13	2.06	1.5	2.07	2.12	1.81	2.01
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	3.19	2.95	2.72	2.52	10.4	2.57	1.43	1.23
	Strontium (Sr)	mg/L	0.185	0.149	0.148	0.15	0.318	0.141	0.14	0.0853
	Sulphur (S)	mg/L	41	18.1	21.7	24.2	98.3	7	41.8	27.4
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.00164	0.000621	0.000754	0.000983	0.00255	0.00029	0.00156	0.0011
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.41: Water Chemistry at Mine-exposed Lotic Areas, September 2015

	Analytes	Units	OCNM	POCK	SWCK	THCK	WOCK
			15-Sep-15	14-Sep-15	10-Sep-15	18-Sep-15	17-Sep-15
			Otto	Porter	Swift	Thompson	Wolfram
Physical	Total Suspended Solids	mg/L	1.4	1	< 1.0	1.6	< 1.0
	Total Dissolved Solids	mg/L	391	855	2550	1290	1820
	Turbidity	NTU	3.84	0.45	0.21	1.24	1.03
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	327	200	323	190	260
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	327	200	323	190	260
	Ammonia, Total (as N)	mg/L	0.014	< 0.005	< 0.005	< 0.005	0.0222
	Bromide (Br)	mg/L	0.137	< 0.05	< 0.25	< 0.05	< 0.05
	Chloride (Cl)	mg/L	17	1.12	< 2.5	17.8	6.1
	Fluoride (F)	mg/L	0.399	0.33	0.12	0.048	< 0.1
	Hardness (as $CaCO_3$)	mg/L	354	671	1760	940	1410
	Nitrate (as N)	mg/L	0.0144	2.85	28	11.8	46.2
	Nitrite (as N)	mg/L	0.002	< 0.001	0.0057	0.0107	0.0054
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.191	0.142	0.223	0.32	< 0.05
	Orthophosphate-Dissolved (as P)	mg/L	< 0.001	0.0015	0.0047	0.0011	0.0011
	Phosphorus (P)-Total	mg/L	0.0086	0.0042	0.0059	0.009	0.0065
	Sulphate (SO_4)	mg/L	22.5	428	1450	702	983
	Organic Carbon, Dissolved (DOC)	mg/L	1.94	0.76	1.91	2.86	1.8
	Organic Carbon, Total (TOC)	mg/L	2.04	0.8	1.99	2.99	1.55
Total Metals	Aluminum (Al)	mg/L	< 0.015	< 0.015	< 0.015	0.026	0.022
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	0.00084	< 0.0005	0.00253
	Arsenic (As)	mg/L	0.00088	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.469	0.0954	0.0262	0.0825	0.118
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	0.000258	< 0.000025	0.000093
	Calcium (Ca)	mg/L	91.3	122	334	180	253
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00423
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	0.483	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0284	0.0066	0.0479	0.0329	0.0792
	Magnesium (Mg)	mg/L	36.2	91.3	292	116	168
	Manganese (Mn)	mg/L	0.217	0.00066	0.00153	0.00204	0.0053
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.00438	0.00307	0.0046	0.00168	0.0091
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	0.0487	< 0.0025	0.132
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	2.92	1.06	4.05	2.17	5.36
	Selenium (Se)	mg/L	0.00028	0.0649	0.505	0.0981	0.128
	Silicon (Si)	mg/L	4.9	2.4	2.88	2.77	3.02
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	11.6	0.94	2.22	15.4	16
	Strontium (Sr)	mg/L	0.449	0.148	0.19	0.564	0.699
	Sulphur (S)	mg/L	8.1	145	558	252	295
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000417	0.00532	0.0137	0.00468	0.0135
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.015	< 0.015	0.018	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Antimony (Sb)	mg/L	< 0.0005	< 0.0005	0.00085	< 0.0005	0.00246
	Arsenic (As)	mg/L	0.00072	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Barium (Ba)	mg/L	0.428	0.0903	0.027	0.0796	0.114
	Beryllium (Be)	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	0.000253	< 0.000025	0.000073
	Calcium (Ca)	mg/L	83.6	116	347	180	246
	Chromium (Cr)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00407
	Copper (Cu)	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	0.0257	0.0067	0.0503	0.0311	0.0786
	Magnesium (Mg)	mg/L	35.3	92.9	217	119	194
	Manganese (Mn)	mg/L	0.198	< 0.0005	0.00149	< 0.0005	0.00457
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.0041	0.00268	0.00468	0.00165	0.00889
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	0.0485	< 0.0025	0.13
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	2.74	1.01	4.25	2.1	5.41
	Selenium (Se)	mg/L	< 0.00025	0.0651	0.498	0.0981	0.129
	Silicon (Si)	mg/L	4.74	2.26	1.88	2.73	3.15
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	10.8	0.92	2.3	15	15.9
	Strontium (Sr)	mg/L	0.419	0.135	0.191	0.558	0.675
	Sulphur (S)	mg/L	7.7	139	426	217	319
	Thallium (Tl)	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000358	0.00478	0.0137	0.00457	0.0131
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.005	< 0.005	0.0187	< 0.005	0.0068
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.42: *In Situ* Water Quality Measured at Reference Lotic Areas, September 2015

Water Station Code	Waterbody	Date Sampled	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)	Conductivity (µS/cm)	pH
AGCK	Andy Good Creek	12-Sep-15	6.2	12.8	103.2	230	148	8.11
AL4	Alexander Creek	13-Sep-15	7.3	10.6	87.7	293	194	8.27
ALUSM	Alexander Creek	13-Sep-15	9.5	9.3	81.3	308	217	8.68
BU2	Bull River	13-Sep-15	8.6	10.8	92.0	371	254	8.38
BU40	Bull River	13-Sep-15	9.6	10.7	94.3	327	231	8.42
BUUQ	Bull River	13-Sep-15	6.7	11.5	93.8	343	223	8.25
CADCK	Cadorna Creek	13-Sep-15	7.4	11.5	95.6	250	165	8.52
CHCK	Chauncey Creek	12-Sep-15	7.3	10.5	95.5	240	159	8.50
CRUKO	Cross River	11-Sep-15	8.9	11.1	96.1	226	156	-
DACK	Daisy Creek	12-Sep-15	10.2	9.8	90.6	390	280	8.19
DUCK	Dutch Creek	11-Sep-15	6.4	11.3	91.6	332	214	8.14
EL12	Elk River	13-Sep-15	7.9	12.0	101.5	233	156	8.50
ELUGH	Elk River	17-Sep-15	6.5	11.6	94.0	234	151	8.28
EWCK	Ewin Creek	12-Sep-15	6.2	11.0	88.6	279	179	8.26
FLAD	Flathead River	14-Sep-15	6.3	10.9	88.2	256	165	-
FLAU	Flathead River	14-Sep-15	5.6	10.2	81.3	207	170	-
FLRU	Flathead River	19-Sep-15	7.2	11.8	97.5	170	112	8.42
FO26	Fording River	14-Sep-15	7.8	9.4	83.0	335	225	8.45
GRUHA	Grave Creek	11-Sep-15	5.6	9.4	74.4	375	236	8.33
HENUP	Henretta Creek	15-Sep-15	4.4	10.4	82.0	291	176	8.37
KO1	Kootenay River	13-Sep-15	9.3	11.7	102.2	268	187	-
KODCR	Kootenay River	12-Sep-15	6.0	12.5	100.5	233	143	-
KOUCR	Kootenay River	12-Sep-15	5.3	12.2	95.8	234	145	-
KOUVE	Kootenay River	10-Sep-15	7.0	11.4	94.0	253	167	-
LC_GRCK	Grace Creek	18-Sep-15	4.0	11.9	91.1	401	241	8.18
LI24	Line Creek	10-Sep-15	4.3	10.2	78.7	289	176	8.27
MCCR	Michel Creek	11-Sep-15	10.2	10.4	92.6	397	285	8.44
MI25	Michel Creek	10-Sep-15	6.6	8.9	73.5	285	185	8.36
OLDDU	Oldman River	12-Sep-15	10.7	9.7	87.7	351	255	8.27
OLDLI	Oldman River	11-Sep-15	9.4	10.6	93.3	356	250	7.75
OLDLOW	Oldman River	10-Sep-15	10.9	13.9	125.5	382	279	6.55
PADAL	Palliser River	11-Sep-15	5.3	10.6	84.1	274	171	-
PAUKO	Palliser River	11-Sep-15	4.2	12.0	91.6	270	162	-
RACK	Racehorse Creek	11-Sep-15	12.6	10.0	94.6	337	257	8.04
SLINE	South Line Creek	15-Sep-15	3.2	11.9	88.8	336	196	8.55
VEUKO	Vermillion River	10-Sep-15	4.9	11.9	93.1	221	136	8.10
VEUP	Vermillion River	10-Sep-15	2.0	13.2	95.5	208	116	-
VICK	Vicary Creek	10-Sep-15	11.0	12.3	111.0	288	211	7.40
WWRL	Wigwam River	11-Sep-15	7.2	11.2	92.5	191	126	8.14
WWRU	Wigwam River	19-Sep-15	8.8	10.5	90.8	172	119	8.41
Sample Size (n)			**40**	**40**	**40**	**40**	**40**	**30**
Minimum			**2.0**	**8.9**	**73.5**	**170**	**112**	**6.55**
Maximum			**12.6**	**13.9**	**125.5**	**401**	**285**	**8.68**
Median			**7.1**	**11.0**	**92.6**	**282**	**178**	**8.28**
Mean			**7.2**	**11.1**	**92.2**	**286**	**190**	**8.22**
Standard Deviation			**2.4**	**1.1**	**9.3**	**64**	**48**	**0.40**

Notes: "-" = Not available. Meter not functioning properly.

Table C.43: *In Situ* Water Quality Measured at Mine-exposed Lotic Areas, September 2015

Water Station Code	Waterbody	Date Sampled	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)	Conductivity (µS/cm)	pH
BOCK	Bodie Creek	14-Sep-15	8.7	10.4	90.0	1,890	1,301	8.18
CATCK	Cataract Creek	11-Sep-15	4.8	-	-	3,249	1,993	8.06
CORCK	Corbin Creek	11-Sep-15	9.8	10.7	94.7	1,461	1,036	7.94
EL1	Elk River	16-Sep-15	7.0	11.0	90.4	461	302	8.47
EL19	Elk River	17-Sep-15	5.1	10.2	80.4	428	265	8.48
EL20	Elk River	17-Sep-15	7.5	14.0	116.4	309	205	8.27
ELDEL	Elk River	17-Sep-15	9.2	10.3	89.5	318	222	8.30
ELDFE	Elk River	16-Sep-15	10.1	-	86.6	453	324	8.54
ELDGR	Elk River	17-Sep-15	7.9	10.2	86.2	439	296	8.55
ELELKO	Elk River	14-Sep-15	9.2	12.5	108.8	396	277	-
ELH93	Elk River	16-Sep-15	10.0	10.2	90.7	413	294	8.68
ELUEL	Elk River	13-Sep-15	10.5	11.3	101.0	308	223	8.36
ELUFE	Elk River	15-Sep-15	9.9	10.6	94.1	463	330	8.50
ELUFO	Elk River	14-Sep-15	9.6	11.6	102.1	347	245	8.33
ELUSP	Elk River	15-Sep-15	8.4	10.6	90.1	446	305	8.37
FO10-SP1	Fording River	17-Sep-15	4.9	12.3	96.5	898	553	-
FO22	Fording River	17-Sep-15	6.1	11.0	88.8	806	516	8.03
FO23	Fording River	16-Sep-15	5.5	12.3	98.2	658	413	8.71
FO29	Fording River	12-Sep-15	8.9	11.3	97.9	552	382	8.44
FO9	Fording River	18-Sep-15	5.7	12.1	96.9	706	446	8.30
FOBCP	Fording River	17-Sep-15	11.1	9.6	87.3	840	616	8.52
FOBKS	Fording River	16-Sep-15	9.5	8.5	74.7	628	442	8.49
FOBSC	Fording River	17-Sep-15	11.3	9.9	90.6	689	509	8.49
FODGH	Fording River	16-Sep-15	6.0	13.4	108.1	579	369	8.50
FODHE	Fording River	14-Sep-15	7.2	9.7	81.4	411	271	8.45
FODNGD	Fording River	14-Sep-15	8.5	10.7	91.6	544	377	8.27
FODPO	Fording River	15-Sep-15	6.5	11.6	94.5	799	516	7.89
FOUEW	Fording River	13-Sep-15	7.2	11.1	92.1	714	471	8.37
FOUKI	Fording River	16-Sep-15	9.8	8.9	78.5	627	445	8.42
FRUL	Fording River	17-Sep-15	5.3	11.4	90.2	654	408	8.63
FOUNGD	Fording River	15-Sep-15	8.3	10.0	94.3	550	375	8.23
FOUSH	Fording River	15-Sep-15	9.2	11.1	96.5	577	403	8.33
GHCKD	Greenhills Creek	15-Sep-15	8.2	10.3	87.9	1,302	883	-
GHCKU	Greenhills Creek	15-Sep-15	5.4	12.8	102.2	1,291	807	8.67
GRCK	Grave Creek	17-Sep-15	5.2	10.6	83.7	596	371	8.46
GRDS	Grave Creek	12-Sep-15	-	-	-	397	153	8.11
HACKDS	Harmer Creek	10-Sep-15	7.6	11.9	99.5	641	429	8.35
HACKUS	Harmer Creek	11-Sep-15	4.6	11.1	85.8	717	437	8.28
HENFO	Henretta Creek	16-Sep-15	6.2	11.0	89.0	431	276	8.20
KICK	Kilmarnock Creek	17-Sep-15	6.7	11.6	95.6	1,380	897	7.59
LC_DC1	Dry Creek	13-Sep-15	8.0	11.0	92.7	256	173	8.74
LC_DCDS	Dry Creek	16-Sep-15	5.7	11.6	92.3	240	151	8.77
LC_FRUS/FO28	Fording River	13-Sep-15	6.0	10.9	87.3	557	354	8.39
LI8	Line Creek	13-Sep-15	7.6	10.0	83.8	681	454	8.65
LIDSL	Line Creek	12-Sep-15	6.5	10.0	80.9	749	483	8.30
LILC3	Line Creek	14-Sep-15	5.2	12.5	98.6	943	587	8.13
MI2	Michel Creek	10-Sep-15	7.6	11.9	99.3	518	346	8.22
MI3	Michel Creek	14-Sep-15	10.2	9.6	85.4	378	271	8.33
MI5	Michel Creek	13-Sep-15	8.7	10.1	86.5	386	266	7.97
MIDAG	Michel Creek	12-Sep-15	10.8	10.8	97.9	381	278	8.31
MIDCO	Michel Creek	11-Sep-15	13.2	10.1	96.2	849	657	8.34
MIUCO	Michel Creek	10-Sep-15	12.7	8.6	82.2	306	234	8.91
MP1	Fording River	15-Sep-15	8.7	9.0	78.4	567	390	8.31
NGD1[a]	Greenhills Creek	8-Oct-15	-	-	-	-	-	-
OCNM	Otto Creek	15-Sep-15	9.8	6.5	57.2	689	490	7.63
POCK	Porter Creek	14-Sep-15	6.14	11.73	94.9	865	553	8.53
SWCK	Swift Creek	10-Sep-15	4.4	12.4	96.7	2,575	1,559	7.96
THCK	Thompson Creek	18-Sep-15	10.3	9.0	80.5	1,503	1,080	8.55
WOCK	Wolfram Creek	17-Sep-15	6.0	11.7	94.3	1,739	1,109	8.80
Sample Size (n)			**57**	**55**	**56**	**58**	**58**	**55**
Minimum			**4.4**	**6.5**	**57.2**	**240**	**151**	**7.59**
Maximum			**13.2**	**14.0**	**116.4**	**3,249**	**1,993**	**8.91**
Median			**7.9**	**10.9**	**91.2**	**588**	**397**	**8.36**

Note: "-" = Not available. Meter not functioning properly.

[a] Not sampled.

Table C.44: Water Chemistry at Reference Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Elk Lakes					Flathead Side Channel				
			EL14-AUG-1	EL14-AUG-2	EL14-AUG-3	Mean	SD	FLA1-AUG-1	FLA1-AUG-2	FLA1-AUG-3	Mean	SD
			13-Aug-15	13-Aug-15	13-Aug-15			9-Aug-15	9-Aug-15	9-Aug-15		
Physical	pH	pH	8.26	8.24	8.26	8.25	0.01	8.21	8.19	8.21	8.20	0.01
	Total Suspended Solids (TSS)	mg/L	1.8	1.2	1.0	1.3	0.4	4.5	5.3	< 1.0	3.6	2.3
	Total Dissolved Solids (TDS)	mg/L	78	84	79	80	3	205	186	172	188	17
	Turbidity	NTU	7.27	6.22	6.94	6.81	0.54	1.96	2.03	0.55	1.51	0.84
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	80	77	80	79	2	150	167	167	161	10
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	80.0	76.7	80.0	78.9	1.9	150	167	167	161.3	9.8
	Ammonia, Total (as N)	mg/L	< 0.0050	< 0.0050	< 0.0050	0.005	0.000	< 0.0050	< 0.0050	< 0.0050	0.005	0.000
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	< 0.50	0.82	0.58	0.63	0.17	< 0.50	< 0.50	< 0.50	0.50	0.00
	Fluoride (F)	mg/L	0.088	0.088	0.086	0.087	0.001	0.079	0.080	0.065	0.075	0.008
	Hardness (as $CaCO_3$)	mg/L	71	75	75	74	2	157	168	163	163	6
	Nitrate (as N)	mg/L	0.0643	0.0489	0.0461	0.0531	0.0098	0.0662	0.0080	0.0135	0.0292	0.0321
	Nitrite (as N)	mg/L	< 0.0010	0.0018	< 0.0010	0.0013	0.0005	0.0023	0.0025	0.0015	0.0021	0.0005
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.092	0.108	< 0.05	0.08	0.03	0.267	0.222	0.116	0.20	0.08
	Orthophosphate-Dissolved (as P)	mg/L	< 0.0010	< 0.0010	< 0.0010	0.0010	0.0000	< 0.0010	< 0.0010	< 0.0010	0.0010	0.0000
	Phosphorus (P)-Total	mg/L	0.0171	0.0092	0.0099	0.0121	0.0044	0.0125	0.0104	0.0034	0.0088	0.0048
	Sulphate (SO_4)	mg/L	3.87	4.37	4.18	4.14	0.25	2.10	1.53	1.28	1.64	0.42
	Organic Carbon, Dissolved (DOC)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	0.79	0.68	0.66	0.71	0.07
	Organic Carbon, Total (TOC)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	0.78	0.65	0.62	0.68	0.09
Total Metals (mg/L)	Aluminum (Al)	mg/L	0.081	0.070	0.092	0.081	0.011	0.0158	0.0910	0.0083	0.038	0.046
	Antimony (Sb)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Arsenic (As)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000	0.00030	0.00032	0.00030	0.00031	0.00001
	Barium (Ba)	mg/L	0.00486	0.00494	0.00486	0.00489	0.00005	0.0361	0.0377	0.0325	0.03543	0.00266
	Beryllium (Be)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	0.00025	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	< 0.050	< 0.050	< 0.050	0.050	0.000	< 0.010	< 0.010	< 0.010	0.010	0.000
	Cadmium (Cd)	mg/L	0.000025	0.000036	< 0.000025	0.000029	0.000006	< 0.000005	0.0000067	< 0.000005	0.000006	0.000001
	Cadmium (Cd) - Dissolved	mg/L	< 0.000025	< 0.000025	< 0.000025	0.000025	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Calcium (Ca)	mg/L	24.4	25.3	25.6	25.1	0.6	46.9	51.0	49.3	49.1	2.1
	Chromium (Cr)	mg/L	0.00055	< 0.00050	< 0.00050	0.00052	0.00003	0.00019	0.00037	0.00015	0.00024	0.00012
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0000	< 0.0001	< 0.0001	< 0.0001	0.0001	0.0000
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0000
	Iron (Fe)	mg/L	0.074	0.057	0.077	0.069	0.011	0.031	0.075	0.011	0.039	0.033
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	0.00025	0.00000	< 0.000050	0.000074	< 0.000050	0.00006	0.00001
	Lithium (Li)	mg/L	< 0.0050	< 0.0050	< 0.0050	0.0050	0.0000	< 0.0010	< 0.0010	< 0.0010	0.0010	0.0000
	Magnesium (Mg)	mg/L	2.31	2.87	2.87	2.68	0.32	11.5	11.7	10.7	11.30	0.53
	Manganese (Mn)	mg/L	0.00297	0.00215	0.00240	0.00251	0.00042	0.00102	0.00123	0.00073	0.00099	0.00025
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	0.000005	0.000000	< 0.000005	< 0.000005	< 0.000005	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.00063	0.00037	0.00038	0.00046	0.00015	0.000243	0.000258	0.000244	0.00025	0.00001
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	0.25	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	< 0.25	< 0.25	< 0.25	0.25	0.00	0.35	0.41	0.37	0.38	0.03
	Selenium (Se)	mg/L	0.00029	0.00032	0.00033	0.00031	0.00002	0.000171	0.000199	0.000111	0.00016	0.00004
	Silicon (Si)	mg/L	0.501	0.592	0.643	0.579	0.072	3.26	3.47	3.08	3.270	0.195
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	0.00005	0.00000	< 0.00001	< 0.00001	< 0.00001	0.00001	0.00000
	Sodium (Na)	mg/L	< 0.250	0.58	0.46	0.43	0.17	1.05	1.06	0.814	0.97	0.14
	Strontium (Sr)	mg/L	0.0983	0.103	0.103	0.101	0.003	0.0599	0.0622	0.0555	0.059	0.003
	Sulphur (S)	mg/L	1.2	1.6	1.6	1.5	0.2	< 1.0	< 1.0	< 1.0	1.0	0.0
	Thallium (Tl)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.000050	0.000000	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000
	Tin (Sn)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	0.0015	0.0000	0.00032	0.00123	< 0.00030	0.0006	0.0005
	Uranium (U)	mg/L	0.000236	0.000243	0.000236	0.000238	0.000004	0.000263	0.000279	0.000257	0.000266	0.000011
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000	< 0.00050	0.00062	< 0.00050	0.0005	0.0001
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	0.015	0.000	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	0.0015	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.44: Water Chemistry at Reference Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Leach Creek Oxbow					Lake Mountain Lake				
			LCHO-AUG-1	LCHO-AUG-2	LCHO-AUG-3	Mean	SD	LML-AUG-01	LML-AUG-02	LML-AUG-03	Mean	SD
			11-Aug-15	12-Aug-15	12-Aug-15			6-Aug-15	6-Aug-15	6-Aug-15		
Physical	pH	pH	8.20	7.94	7.96	8.03	0.14	8.23	8.45	8.57	8.42	0.17
	Total Suspended Solids (TSS)	mg/L	12.0	1.4	4.0	5.8	5.5	5.1	5.3	1.1	3.8	2.4
	Total Dissolved Solids (TDS)	mg/L	106	105	112	108	4	151	146	129	142	12
	Turbidity	NTU	0.90	2.60	2.99	2.16	1.11	na	na	na	na	na
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	103	83	97	94	10	120	103	113	112	9
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	< 0.0	< 1.0	13.4	< 1.0	5.1	7.2
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	< 0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	103	83.3	96.7	94.3	10.1	120	117	113	116.7	3.5
	Ammonia, Total (as N)	mg/L	< 0.0050	< 0.0050	0.0064	0.005	0.0008	0.0188	0.0178	0.0130	0.017	0.003
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	< 0.000	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	< 0.50	< 0.50	< 0.50	0.50	< 0.00	< 0.50	< 0.50	< 0.50	0.50	0.00
	Fluoride (F)	mg/L	0.065	0.052	0.059	0.059	0.007	0.103	0.101	0.097	0.100	0.003
	Hardness (as $CaCO_3$)	mg/L	100	88	101	96	7	116	117	118	117	1
	Nitrate (as N)	mg/L	0.0096	0.040	0.0086	0.0194	0.0178	na	na	na	na	na
	Nitrite (as N)	mg/L	0.0025	0.0016	< 0.0010	0.0017	< 0.0008	na	na	na	na	na
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	0.064	< 0.05	0.05	< 0.01	0.510	0.461	0.374	0.45	0.07
	Orthophosphate-Dissolved (as P)	mg/L	0.0088	0.0084	0.0117	0.0096	0.0018	na	na	na	na	na
	Phosphorus (P)-Total	mg/L	0.0175	0.0184	0.0278	0.0212	0.0057	0.0122	0.0115	0.0066	0.0101	0.0031
	Sulphate (SO_4)	mg/L	5.01	4.65	4.43	4.70	0.29	2.01	2.36	2.32	2.23	0.19
	Organic Carbon, Dissolved (DOC)	mg/L	0.77	0.69	0.76	0.74	0.04	6.75	6.83	6.80	6.79	0.04
	Organic Carbon, Total (TOC)	mg/L	0.65	0.65	0.69	0.66	0.02	7.25	6.92	6.98	7.05	0.18
Total Metals (mg/L)	Aluminum (Al)	mg/L	0.0128	0.0281	0.0474	0.029	0.0173	0.0201	0.0209	0.0085	0.017	0.007
	Antimony (Sb)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	< 0.00000	0.00015	0.00013	0.00014	0.00014	0.00001
	Arsenic (As)	mg/L	0.00023	0.00026	0.00029	0.00026	0.00003	0.00048	0.00042	0.00043	0.00044	0.00003
	Barium (Ba)	mg/L	0.121	0.122	0.121	0.12133	0.001	0.0943	0.0868	0.0885	0.08987	0.00393
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	< 0.000000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	< 0.000000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	< 0.010	< 0.010	< 0.010	0.010	< 0.000	< 0.010	< 0.010	< 0.010	0.010	0.000
	Cadmium (Cd)	mg/L	0.0000230	0.0000368	0.0000328	0.000031	0.0000071	0.0000115	0.0000110	0.0000084	0.000010	0.000002
	Cadmium (Cd) - Dissolved	mg/L	0.0000222	0.0000251	0.0000128	0.000020	0.0000064	< 0.0000050	< 0.0000050	0.0000051	0.000005	0.000000
	Calcium (Ca)	mg/L	27.5	25.6	26.7	26.6	1.0	29.0	26.7	27.6	27.8	1.2
	Chromium (Cr)	mg/L	< 0.00010	0.00015	0.00013	0.00013	0.00003	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Cobalt (Co)	mg/L	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0000	< 0.0001	< 0.0001	< 0.0001	0.0001	0.0000
	Copper (Cu)	mg/L	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0000	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0000
	Iron (Fe)	mg/L	0.095	0.129	0.336	0.187	0.130	0.114	0.079	0.064	0.086	0.026
	Lead (Pb)	mg/L	< 0.000050	< 0.000050	0.000060	0.00005	0.000006	0.000050	0.000052	< 0.000050	0.00005	0.00000
	Lithium (Li)	mg/L	0.0019	< 0.0010	< 0.0010	0.0013	< 0.0005	0.0039	0.0037	0.0040	0.0039	0.0002
	Magnesium (Mg)	mg/L	9.31	8.89	9.21	9.14	0.22	13.8	13.9	14.1	13.93	0.15
	Manganese (Mn)	mg/L	0.00357	0.00812	0.0175	0.00973	0.0071	0.00444	0.00338	0.00285	0.00356	0.00081
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	0.000005	< 0.000000	< 0.000005	< 0.000005	< 0.000005	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.000865	0.000745	0.000755	0.00079	0.000067	0.000617	0.000554	0.000577	0.00058	0.00003
	Nickel (Ni)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	< 0.00000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	< 0.000	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	0.72	0.62	0.62	0.65	0.06	1.05	0.97	1.02	1.01	0.04
	Selenium (Se)	mg/L	0.000959	0.000660	0.000609	0.00074	0.000189	0.000277	0.000294	0.000298	0.00029	0.00001
	Silicon (Si)	mg/L	2.06	2.11	2.02	2.063	0.05	6.32	6.49	6.59	6.467	0.137
	Silver (Ag)	mg/L	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00000	< 0.00001	< 0.00001	< 0.00001	0.00001	0.00000
	Sodium (Na)	mg/L	0.634	0.626	0.640	0.63	0.007	0.791	0.734	0.779	0.77	0.03
	Strontium (Sr)	mg/L	0.0805	0.0703	0.0731	0.075	0.0053	0.0442	0.0406	0.0420	0.042	0.002
	Sulphur (S)	mg/L	2.0	1.9	1.9	1.9	0.1	1.2	1.2	1.2	1.2	0.0
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	< 0.000000	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	< 0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Titanium (Ti)	mg/L	< 0.00030	< 0.00030	0.00043	0.0003	0.00008	0.00053	0.00068	< 0.00030	0.0005	0.0002
	Uranium (U)	mg/L	0.000302	0.000173	0.000204	0.000226	0.000067	0.000107	0.000102	0.000104	0.000104	0.000003
	Vanadium (V)	mg/L	0.00059	0.00057	0.00061	0.0006	0.00002	0.00093	0.00075	0.00080	0.0008	0.0001
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	< 0.0030	0.003	< 0.0000	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	< 0.00000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.44: Water Chemistry at Reference Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Reference Pond				
			REFF-AUG-1	REFF-AUG-2	REFF-AUG-3	Mean	SD
			14-Aug-15	14-Aug-15	14-Aug-15		
Physical	pH	pH	8.46	8.47	8.46	8.46	0.01
	Total Suspended Solids (TSS)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0
	Total Dissolved Solids (TDS)	mg/L	198	202	204	201	3
	Turbidity	NTU	0.46	0.45	0.65	0.52	0.11
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	200	203	200	201	2
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	200	203	200	201.0	1.7
	Ammonia, Total (as N)	mg/L	0.0201	0.0235	0.0169	0.020	0.003
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00
	Fluoride (F)	mg/L	0.142	0.142	0.143	0.142	0.001
	Hardness (as $CaCO_3$)	mg/L	184	182	181	182	2
	Nitrate (as N)	mg/L	0.0219	0.0069	< 0.0050	0.0113	0.0093
	Nitrite (as N)	mg/L	0.0012	< 0.0010	0.0013	0.0012	0.0002
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.271	0.221	0.246	0.25	0.03
	Orthophosphate-Dissolved (as P)	mg/L	< 0.0010	< 0.0010	< 0.0010	0.0010	0.0000
	Phosphorus (P)-Total	mg/L	0.0049	0.0039	0.0049	0.0046	0.0006
	Sulphate (SO_4)	mg/L	9.58	9.52	9.50	9.53	0.04
	Organic Carbon, Dissolved (DOC)	mg/L	3.40	3.30	3.47	3.39	0.09
	Organic Carbon, Total (TOC)	mg/L	3.25	3.37	3.40	3.34	0.08
Total Metals (mg/L)	Aluminum (Al)	mg/L	< 0.02	< 0.02	< 0.02	0.015	0.000
	Antimony (Sb)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Arsenic (As)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Barium (Ba)	mg/L	0.147	0.135	0.143	0.14167	0.00611
	Beryllium (Be)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Bismuth (Bi)	mg/L	< 0.00025	< 0.00025	< 0.00025	0.00025	0.00000
	Boron (B)	mg/L	< 0.050	< 0.050	< 0.050	0.050	0.000
	Cadmium (Cd)	mg/L	< 0.000025	< 0.000025	< 0.000025	0.000025	0.000000
	Cadmium (Cd) - Dissolved	mg/L	< 0.000025	< 0.000025	< 0.000025	0.000025	0.000000
	Calcium (Ca)	mg/L	48.4	44.8	46.8	46.7	1.8
	Chromium (Cr)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Cobalt (Co)	mg/L	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0000
	Copper (Cu)	mg/L	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000
	Iron (Fe)	mg/L	< 0.05	< 0.05	< 0.05	0.050	0.000
	Lead (Pb)	mg/L	< 0.00025	< 0.00025	< 0.00025	0.00025	0.00000
	Lithium (Li)	mg/L	< 0.0050	< 0.0050	< 0.0050	0.0050	0.0000
	Magnesium (Mg)	mg/L	17.4	16.0	17.8	17.07	0.95
	Manganese (Mn)	mg/L	0.00138	0.00157	0.00128	0.00141	0.00015
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.00138	0.00128	0.00149	0.00138	0.00011
	Nickel (Ni)	mg/L	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000
	Phosphorus (P)	mg/L	< 0.25	< 0.25	< 0.25	0.25	0.00
	Potassium (K)	mg/L	0.46	0.46	0.47	0.46	0.01
	Selenium (Se)	mg/L	0.00050	0.00049	0.00042	0.00047	0.00004
	Silicon (Si)	mg/L	4.25	3.88	4.34	4.157	0.244
	Silver (Ag)	mg/L	< 0.00005	< 0.00005	< 0.00005	0.00005	0.00000
	Sodium (Na)	mg/L	2.20	2.08	2.19	2.16	0.07
	Strontium (Sr)	mg/L	0.141	0.130	0.139	0.137	0.006
	Sulphur (S)	mg/L	3.7	3.4	3.6	3.6	0.2
	Thallium (Tl)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.000050	0.000000
	Tin (Sn)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Titanium (Ti)	mg/L	< 0.0015	< 0.0015	< 0.0015	0.0015	0.0000
	Uranium (U)	mg/L	0.000762	0.000695	0.000739	0.000732	0.000034
	Vanadium (V)	mg/L	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000
	Zinc (Zn)	mg/L	< 0.015	< 0.015	< 0.015	0.015	0.000
	Zirconium (Zr)	mg/L	< 0.0015	< 0.0015	< 0.0015	0.0015	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Henretta Lake					Fording River Oxbow/Side Channel				
			HE27-AUG-01	HE27-AUG-02	HE27-AUG-03	Mean	SD	FO10-AUG-1	FO10-AUG-2	FO10-AUG-3	Mean	SD
			6-Aug-15	6-Aug-15	6-Aug-15			8-Aug-15	8-Aug-15	8-Aug-15		
Physical	pH	pH	8.25	8.23	8.23	8.24	0.01	8.07	8.11	8.10	8.09	0.02
	Total Suspended Solids (TSS)	mg/L	< 1.0	< 1.0	1.7	1.2	0.4	< 1.0	1.7	< 2.0	1.6	0.5
	Total Dissolved Solids (TDS)	mg/L	311	296	308	305	8	736	748	729	738	10
	Turbidity	NTU	na	na	na	na	na	0.32	0.79	0.58	0.56	0.24
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	143	138	133	138	5	227	220	216	221	6
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	143	138	133	138	5	227	220	216	221	6
	Ammonia, Total (as N)	mg/L	0.0206	0.0153	0.0148	0.017	0.003	< 0.0050	< 0.0050	< 0.0050	0.005	0.000
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	1.51	1.28	1.29	1.36	0.13
	Fluoride (F)	mg/L	0.252	0.256	0.247	0.252	0.005	0.144	0.141	0.144	0.143	0.002
	Hardness (as $CaCO_3$)	mg/L	247	242	250	246	4	542	540	534	539	4
	Nitrate (as N)	mg/L	na	na	na	na	na	21.8	21.8	21.9	21.8333	0.0577
	Nitrite (as N)	mg/L	na	na	na	na	na	0.0053	0.0050	0.0081	0.0061	0.0017
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	< 0.05	< 0.05	0.05	0.00	0.121	< 0.05	< 0.05	0.07	0.04
	Orthophosphate-Dissolved (as P)	mg/L	na	na	na	na	na	0.0032	0.0017	0.0020	0.0023	0.0008
	Phosphorus (P)-Total	mg/L	0.0026	0.0040	0.0032	0.0033	0.0007	0.0041	0.0058	0.0049	0.0049	0.0009
	Sulphate (SO_4)	mg/L	105	105	105	105.00	0.00	238	238	238	238.00	0.00
	Organic Carbon, Dissolved (DOC)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	< 0.50	0.55	0.56	0.54	0.03
	Organic Carbon, Total (TOC)	mg/L	< 0.50	< 0.50	0.52	0.51	0.01	< 0.50	0.60	0.60	0.57	0.06
Total Metals	Aluminum (Al)	mg/L	0.0063	0.0134	0.0102	0.010	0.004	0.0096	0.0176	0.0152	0.014	0.004
	Antimony (Sb)	mg/L	0.00011	0.00011	0.00010	0.00011	0.00001	0.00014	0.00014	0.00014	0.00014	0.00000
	Arsenic (As)	mg/L	0.00014	0.00014	0.00014	0.00014	0.00000	0.00016	0.00013	0.00014	0.00014	0.00002
	Barium (Ba)	mg/L	0.0347	0.0359	0.0340	0.03487	0.00096	0.142	0.139	0.144	0.14167	0.00252
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	< 0.010	< 0.010	< 0.010	0.010	0.000	0.015	0.014	0.014	0.014	0.001
	Cadmium (Cd)	mg/L	0.0000306	0.0000264	0.0000250	0.000027	0.000003	0.0000442	0.0000464	0.0000443	0.000045	0.000001
	Cadmium (Cd) - Dissolved	mg/L	0.0000255	0.0000259	0.0000274	0.000026	0.000001	0.0000381	0.0000379	0.0000403	0.000039	0.000001
	Calcium (Ca)	mg/L	69.9	68.7	68.3	69.0	0.8	129	132	135	132.0	3.0
	Chromium (Cr)	mg/L	0.00013	0.00015	0.00015	0.00014	0.00001	0.00014	0.00019	0.00019	0.00017	0.00003
	Cobalt (Co)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000
	Copper (Cu)	mg/L	< 0.00050	< 0.00050	0.00065	0.0006	0.0001	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Iron (Fe)	mg/L	0.017	0.030	0.024	0.024	0.007	0.016	0.040	0.023	0.026	0.012
	Lead (Pb)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Lithium (Li)	mg/L	0.0079	0.0074	0.0079	0.0077	0.0003	0.0307	0.0323	0.0326	0.0319	0.0010
	Magnesium (Mg)	mg/L	22.4	21.5	22.1	22.00	0.46	61.0	62.0	63.2	62.07	1.10
	Manganese (Mn)	mg/L	0.00792	0.00778	0.00829	0.00800	0.00026	0.00185	0.00399	0.00312	0.00299	0.00108
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.00101	0.00102	0.000990	0.00101	0.00002	0.000876	0.000887	0.000915	0.00089	0.00002
	Nickel (Ni)	mg/L	0.00121	0.00099	0.00115	0.0011	0.0001	0.00103	0.00107	0.00107	0.0011	0.0000
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	0.83	0.79	0.83	0.82	0.02	2.22	2.19	2.21	2.21	0.02
	Selenium (Se)	mg/L	0.0176	0.0173	0.0169	0.01727	0.00035	0.0742	0.0727	0.0735	0.07347	0.00075
	Silicon (Si)	mg/L	1.50	1.51	1.49	1.500	0.010	2.37	2.43	2.42	2.407	0.032
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000
	Sodium (Na)	mg/L	0.660	0.644	0.644	0.65	0.01	2.36	2.33	2.34	2.34	0.02
	Strontium (Sr)	mg/L	0.130	0.128	0.125	0.128	0.003	0.157	0.161	0.164	0.161	0.004
	Sulphur (S)	mg/L	41.7	39.3	40.6	40.5	1.2	87.1	88.7	90.3	88.7	1.6
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Titanium (Ti)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000
	Uranium (U)	mg/L	0.00110	0.00105	0.00105	0.001067	0.000029	0.00311	0.00300	0.00306	0.003057	0.000055
	Vanadium (V)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	< 0.0030	0.003	0.000	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Lower Fording River Oxbow					Fording Meadow u/s Chauncey Creek				
			FOXL-AUG-1	FOXL-AUG-2	FOXL-AUG-3	Mean	SD	FMUCK-AUG-1	FMUCK-AUG-2	FMUCK-AUG-3	Mean	SD
			9-Aug-15	9-Aug-15	9-Aug-15			8-Aug-15	8-Aug-15	8-Aug-15		
Physical	pH	pH	8.05	8.08	8.17	8.10	0.06	8.17	8.16	8.14	8.16	0.02
	Total Suspended Solids (TSS)	mg/L	7.4	40.9	4.5	17.6	20.2	< 1.0	< 1.0	< 1.0	1.0	0.0
	Total Dissolved Solids (TDS)	mg/L	305	275	263	281	22	760	765	751	759	7
	Turbidity	NTU	10.9	23.2	5.73	13.28	8.97	0.25	0.22	0.37	0.28	0.08
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	227	217	200	215	14	216	214	208	213	4
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	227	217	200	215	14	216	214	208	213	4
	Ammonia, Total (as N)	mg/L	0.185	0.0102	0.0058	0.067	0.102	0.0072	0.0057	0.0074	0.007	0.001
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	15.6	11.8	9.31	12.24	3.17	10.2	1.30	1.30	4.27	5.14
	Fluoride (F)	mg/L	0.128	0.110	0.105	0.114	0.012	0.139	0.139	0.139	0.139	0.000
	Hardness (as $CaCO_3$)	mg/L	231	202	189	207	22	547	547	544	546	2
	Nitrate (as N)	mg/L	< 0.0050	0.0065	< 0.0050	0.0055	0.0009	21.2	20.9	21.3	21.1333	0.2082
	Nitrite (as N)	mg/L	0.0085	0.0012	0.0016	0.0038	0.0041	0.0187	0.0170	0.0139	0.0165	0.0024
	Total Kjeldahl Nitrogen (TKN)	mg/L	1.03	1.58	0.942	1.18	0.35	< 0.05	< 0.05	0.155	0.09	0.06
	Orthophosphate-Dissolved (as P)	mg/L	0.0037	0.0101	0.0021	0.0053	0.0042	< 0.0010	< 0.0010	0.0012	0.0011	0.0001
	Phosphorus (P)-Total	mg/L	0.0658	0.0974	0.0445	0.0692	0.0266	0.0035	0.0037	0.0028	0.0033	0.0005
	Sulphate (SO_4)	mg/L	< 0.30	< 0.30	< 0.30	0.30	0.00	261	256	255	257.33	3.21
	Organic Carbon, Dissolved (DOC)	mg/L	10.0	9.09	8.25	9.11	0.88	0.58	0.61	0.66	0.62	0.04
	Organic Carbon, Total (TOC)	mg/L	10.2	9.49	8.51	9.40	0.85	0.62	0.58	0.75	0.65	0.09
Total Metals	Aluminum (Al)	mg/L	0.0222	0.0886	0.0458	0.052	0.034	0.0038	0.0041	0.0075	0.005	0.002
	Antimony (Sb)	mg/L	< 0.00010	0.00013	0.00013	0.00012	0.00002	0.00013	0.00013	0.00012	0.00013	0.00001
	Arsenic (As)	mg/L	0.00151	0.00127	0.00090	0.00123	0.00031	0.00012	0.00012	0.00011	0.00012	0.00001
	Barium (Ba)	mg/L	0.207	0.173	0.148	0.17600	0.02961	0.125	0.124	0.124	0.12433	0.00058
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	< 0.010	< 0.010	< 0.010	0.010	0.000	0.013	0.013	0.013	0.013	0.000
	Cadmium (Cd)	mg/L	0.0000089	0.0000280	0.0000198	0.000019	0.000010	0.0000316	0.0000362	0.0000335	0.000034	0.000002
	Cadmium (Cd) - Dissolved	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	0.0000349	0.0000372	0.0000385	0.000037	0.000002
	Calcium (Ca)	mg/L	67.5	59.7	54.8	60.7	6.4	137	134	136	135.7	1.5
	Chromium (Cr)	mg/L	0.00012	0.00023	0.00012	0.00016	0.00006	0.00012	0.00018	0.00016	0.00015	0.00003
	Cobalt (Co)	mg/L	0.00161	0.00073	0.00032	0.0009	0.0007	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000
	Copper (Cu)	mg/L	< 0.00050	0.00065	0.00064	0.0006	0.0001	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Iron (Fe)	mg/L	2.02	1.21	0.423	1.218	0.799	0.016	0.017	0.022	0.018	0.003
	Lead (Pb)	mg/L	0.000052	0.000183	0.000119	0.00012	0.00007	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Lithium (Li)	mg/L	0.0065	0.0064	0.0067	0.0065	0.0002	0.0288	0.0280	0.0284	0.0284	0.0004
	Magnesium (Mg)	mg/L	17.5	15.8	15.2	16.17	1.19	64.5	64.2	65.2	64.63	0.51
	Manganese (Mn)	mg/L	0.892	0.261	0.0856	0.41287	0.42411	0.00513	0.00527	0.00553	0.00531	0.00020
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.00198	0.00225	0.00215	0.00213	0.00014	0.000879	0.000882	0.000872	0.00088	0.00001
	Nickel (Ni)	mg/L	0.00355	0.00334	0.00296	0.0033	0.0003	0.00082	0.00071	0.00079	0.0008	0.0001
	Phosphorus (P)	mg/L	0.073	0.121	0.062	0.09	0.03	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	1.23	1.50	1.43	1.39	0.14	1.96	1.95	2.01	1.97	0.03
	Selenium (Se)	mg/L	0.000245	0.000273	0.000251	0.00026	0.00001	0.0732	0.0733	0.0731	0.07320	0.00010
	Silicon (Si)	mg/L	4.62	3.33	2.48	3.477	1.078	2.43	2.41	2.43	2.423	0.012
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000
	Sodium (Na)	mg/L	12.1	9.21	8.12	9.81	2.06	2.32	2.29	2.34	2.32	0.03
	Strontium (Sr)	mg/L	0.0974	0.0841	0.0766	0.086	0.011	0.174	0.170	0.173	0.172	0.002
	Sulphur (S)	mg/L	< 1.00	< 1.00	< 1.00	1.0	0.0	96.8	96.1	97.7	96.9	0.8
	Thallium (Tl)	mg/L	< 0.000010	0.000013	0.000010	0.000011	0.000002	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Titanium (Ti)	mg/L	0.00036	0.00136	0.00050	0.0007	0.0005	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000
	Uranium (U)	mg/L	0.000142	0.000213	0.000229	0.000195	0.000046	0.00281	0.00279	0.00281	0.002803	0.000012
	Vanadium (V)	mg/L	< 0.00050	0.00076	0.00059	0.0006	0.0001	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	< 0.0030	0.003	0.000	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Fording Wetland d/s Ewin Creek					Off channel area of Fording d/s Greenhills				
			FWDEC-AUG-1	FWDEC-AUG-2	FWDEC-AUG-3	Mean	SD	R5-1-AUG-1	R5-1-AUG-2	R5-1-AUG-3	Mean	SD
			9-Aug-15	9-Aug-15	9-Aug-15			14-Aug-15	14-Aug-15	14-Aug-15		
Physical	pH	pH	8.14	7.99	8.06	8.06	0.08	8.13	8.35	8.27	8.25	0.11
	Total Suspended Solids (TSS)	mg/L	5.9	< 1.0	1.1	2.7	2.8	2.0	1.0	10.6	4.5	5.3
	Total Dissolved Solids (TDS)	mg/L	201	194	190	195	6	921	929	925	925	4
	Turbidity	NTU	2.35	0.22	0.60	1.06	1.14	4.73	2.83	6.02	4.53	1.60
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	140	147	137	141	5	96.7	70	65	77	17
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	140	147	137	141	5	97	70	65	77	17
	Ammonia, Total (as N)	mg/L	< 0.0050	< 0.0050	< 0.0050	0.005	0.000	0.0126	0.0156	0.0118	0.013	0.002
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	0.57	0.64	0.71	0.64	0.07
	Chloride (Cl)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	153	151	156	153.33	2.52
	Fluoride (F)	mg/L	0.205	0.199	0.200	0.201	0.003	0.12	0.13	0.12	0.123	0.006
	Hardness (as $CaCO_3$)	mg/L	166	165	166	166	1	520	515	510	515	5
	Nitrate (as N)	mg/L	0.0903	0.0940	0.0884	0.0909	0.0028	< 0.025	0.054	< 0.025	0.0347	0.0167
	Nitrite (as N)	mg/L	0.0019	0.0014	0.0022	0.0018	0.0004	< 0.0050	0.0068	0.0104	0.0074	0.0027
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.194	0.084	0.060	0.11	0.07	0.868	0.791	0.734	0.80	0.07
	Orthophosphate-Dissolved (as P)	mg/L	< 0.0010	0.0014	0.0014	0.0013	0.0002	< 0.0010	< 0.0010	< 0.0010	0.0010	0.0000
	Phosphorus (P)-Total	mg/L	0.0061	0.0022	0.0038	0.0040	0.0020	0.0321	0.0250	0.0198	0.0256	0.0062
	Sulphate (SO_4)	mg/L	33.8	33.9	33.8	33.83	0.06	383	399	408	396.67	12.66
	Organic Carbon, Dissolved (DOC)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	13.5	12.1	12.1	12.57	0.81
	Organic Carbon, Total (TOC)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	14.0	12.5	12.4	12.97	0.90
Total Metals	Aluminum (Al)	mg/L	0.0799	0.0081	0.0234	0.037	0.038	0.018	< 0.015	< 0.015	0.016	0.002
	Antimony (Sb)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Arsenic (As)	mg/L	0.00015	0.00015	0.00015	0.00015	0.00000	0.00181	0.00163	0.00155	0.00166	0.00013
	Barium (Ba)	mg/L	0.0663	0.0646	0.0641	0.06500	0.00115	0.0325	0.0363	0.0295	0.03277	0.00341
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.00025	< 0.00025	< 0.00025	0.00025	0.00000
	Boron (B)	mg/L	< 0.010	< 0.010	< 0.010	0.010	0.000	0.059	0.052	0.054	0.055	0.004
	Cadmium (Cd)	mg/L	0.0000152	0.0000124	0.0000105	0.000013	0.000002	< 0.000025	< 0.000025	< 0.000025	0.000025	0.000000
	Cadmium (Cd) - Dissolved	mg/L	0.0000090	0.0000056	0.0000115	0.000009	0.000003	< 0.000025	< 0.000025	< 0.000025	0.000025	0.000000
	Calcium (Ca)	mg/L	52.2	52.0	51.4	51.9	0.4	84.6	80.3	82.1	82.3	2.2
	Chromium (Cr)	mg/L	0.00028	0.00027	0.00020	0.00025	0.00004	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Cobalt (Co)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Copper (Cu)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000
	Iron (Fe)	mg/L	0.083	0.014	0.039	0.045	0.035	0.310	0.062	< 0.050	0.141	0.147
	Lead (Pb)	mg/L	0.000068	< 0.000050	< 0.000050	0.00006	0.00001	< 0.00025	< 0.00025	< 0.00025	0.00025	0.00000
	Lithium (Li)	mg/L	0.0040	0.0039	0.0040	0.0040	0.0001	0.0683	0.0642	0.0673	0.0666	0.0021
	Magnesium (Mg)	mg/L	14.5	14.8	14.6	14.63	0.15	76.1	66.9	68.5	70.50	4.92
	Manganese (Mn)	mg/L	0.00060	0.00021	0.00041	0.00041	0.00020	0.0406	0.0186	0.0150	0.02473	0.01386
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.000919	0.000890	0.000903	0.00090	0.00001	0.00233	0.00209	0.00224	0.00222	0.00012
	Nickel (Ni)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	0.0041	0.0036	0.0035	0.0037	0.0003
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.250	< 0.250	< 0.250	0.25	0.00
	Potassium (K)	mg/L	0.54	0.50	0.51	0.52	0.02	5.53	5.28	5.66	5.49	0.19
	Selenium (Se)	mg/L	0.00116	0.00109	0.00110	0.00112	0.00004	0.00371	0.00533	0.00518	0.00474	0.00090
	Silicon (Si)	mg/L	2.56	2.47	2.47	2.500	0.052	6.62	5.06	5.13	5.603	0.881
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Sodium (Na)	mg/L	1.25	1.22	1.23	1.23	0.02	65.7	62.6	65.9	64.73	1.85
	Strontium (Sr)	mg/L	0.133	0.133	0.133	0.133	0.000	0.455	0.447	0.467	0.456	0.010
	Sulphur (S)	mg/L	12.6	12.9	12.8	12.8	0.2	155	123	126	134.7	17.7
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000	< 0.000050	< 0.000050	< 0.000050	0.000050	0.000000
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Titanium (Ti)	mg/L	0.00121	< 0.00030	< 0.00030	0.0006	0.0005	< 0.0015	< 0.0015	< 0.0015	0.0015	0.0000
	Uranium (U)	mg/L	0.000845	0.000823	0.000825	0.000831	0.000012	0.000603	0.000712	0.000738	0.000684	0.000072
	Vanadium (V)	mg/L	0.00061	< 0.00050	< 0.00050	0.0005	0.0001	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	< 0.0030	0.003	0.000	< 0.015	< 0.015	< 0.015	0.015	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.0015	< 0.0015	< 0.0015	0.0015	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Lentic area off Fording River d/s Josephine Falls					Elk River Upper Oxbow				
			R5-3-AUG-1	R5-3-AUG-2	R5-3-AUG-3	Mean	SD	EROU-AUG-1	EROU-AUG-2	EROU-AUG-3	Mean	SD
			9-Aug-15	9-Aug-15	9-Aug-15			10-Aug-15	10-Aug-15	10-Aug-15		
Physical	pH	pH	8.04	8.04	8.07	8.05	0.02	8.13	8.35	9.10	8.53	0.51
	Total Suspended Solids (TSS)	mg/L	6.1	< 1.0	< 1.0	2.7	2.9	7.4	4.2	< 1.0	4.2	3.2
	Total Dissolved Solids (TDS)	mg/L	422	426	424	424	2	169	159	134	154	18
	Turbidity	NTU	1.83	0.35	0.26	0.81	0.88	3.40	5.31	1.43	3.38	1.94
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	197	190	203	197	7	150	130	50.1	110	53
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	10	46.6	19.2	24.2
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	197	190	203	197	7	150	140	97	129	28
	Ammonia, Total (as N)	mg/L	0.0060	< 0.0050	0.0057	0.006	0.001	0.0056	0.0062	0.0097	0.007	0.002
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	0.93	0.91	0.93	0.92	0.01	5.74	5.47	5.77	5.66	0.17
	Fluoride (F)	mg/L	0.172	0.164	0.170	0.169	0.004	0.184	0.166	0.141	0.164	0.022
	Hardness (as $CaCO_3$)	mg/L	348	335	341	341	7	149	146	123	139	14
	Nitrate (as N)	mg/L	7.55	7.45	7.66	7.5533	0.1050	< 0.0050	< 0.0050	< 0.0050	0.0050	0.0000
	Nitrite (as N)	mg/L	0.0011	0.0054	0.0068	0.0044	0.0030	0.0012	< 0.0010	0.0022	0.0015	0.0006
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.182	0.150	0.197	0.18	0.02	0.566	0.596	0.618	0.59	0.03
	Orthophosphate-Dissolved (as P)	mg/L	< 0.0010	< 0.0010	< 0.0010	0.0010	0.0000	0.0016	0.0018	0.0022	0.0019	0.0003
	Phosphorus (P)-Total	mg/L	< 0.0020	< 0.0020	0.0028	0.0023	0.0005	0.0317	0.0267	0.0233	0.0272	0.0042
	Sulphate (SO_4)	mg/L	127	128	130	128.33	1.53	2.71	3.24	3.31	3.09	0.33
	Organic Carbon, Dissolved (DOC)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	5.71	5.35	5.36	5.47	0.21
	Organic Carbon, Total (TOC)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	6.74	5.99	5.31	6.01	0.72
Total Metals	Aluminum (Al)	mg/L	0.0032	0.0044	< 0.0030	0.004	0.001	0.0138	0.0237	0.0079	0.015	0.008
	Antimony (Sb)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	0.00015	0.00012	0.00010	0.00012	0.00003
	Arsenic (As)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	0.00090	0.00105	0.00095	0.00097	0.00008
	Barium (Ba)	mg/L	0.0915	0.0910	0.0951	0.09253	0.00224	0.0499	0.0461	0.0281	0.04137	0.01165
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	< 0.010	< 0.010	< 0.010	0.010	0.000	0.015	0.015	0.013	0.014	0.001
	Cadmium (Cd)	mg/L	0.0000097	0.0000085	0.0000087	0.000009	0.000001	< 0.000005	0.0000066	0.0000066	0.000006	0.000001
	Cadmium (Cd) - Dissolved	mg/L	0.0000093	0.0000080	0.0000109	0.000009	0.000001	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Calcium (Ca)	mg/L	89.9	88.9	92.0	90.3	1.6	25.2	22.3	14.6	20.7	5.5
	Chromium (Cr)	mg/L	0.00011	0.00010	0.00013	0.00011	0.00002	0.00012	< 0.00010	< 0.00010	0.00011	0.00001
	Cobalt (Co)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000	< 0.00010	0.00012	0.00012	0.0001	0.0000
	Copper (Cu)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Iron (Fe)	mg/L	0.014	0.013	< 0.010	0.012	0.002	0.781	0.702	0.356	0.613	0.226
	Lead (Pb)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Lithium (Li)	mg/L	0.0107	0.0107	0.0116	0.0110	0.0005	0.0071	0.0073	0.0070	0.0071	0.0002
	Magnesium (Mg)	mg/L	38.1	37.9	38.8	38.27	0.47	22.0	23.8	21.7	22.50	1.14
	Manganese (Mn)	mg/L	0.00966	0.00773	0.00600	0.00780	0.00183	0.110	0.111	0.0291	0.08337	0.04700
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.000958	0.00101	0.00101	0.00099	0.00003	0.00164	0.00153	0.00159	0.00159	0.00006
	Nickel (Ni)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	0.00088	0.00096	0.00082	0.0009	0.0001
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	1.36	1.28	1.31	1.32	0.04	2.60	3.08	3.47	3.05	0.44
	Selenium (Se)	mg/L	0.0273	0.0268	0.0287	0.02760	0.00098	0.000196	0.000205	0.000179	0.00019	0.00001
	Silicon (Si)	mg/L	3.15	2.93	3.04	3.040	0.110	1.04	0.912	0.573	0.842	0.241
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000
	Sodium (Na)	mg/L	1.90	1.87	1.93	1.90	0.03	3.94	3.71	3.70	3.78	0.14
	Strontium (Sr)	mg/L	0.144	0.142	0.148	0.145	0.003	0.122	0.115	0.0736	0.104	0.026
	Sulphur (S)	mg/L	48.5	48.8	50.1	49.1	0.9	1.4	1.6	1.6	1.5	0.1
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Titanium (Ti)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	0.00033	< 0.00030	0.0003	0.0000
	Uranium (U)	mg/L	0.00116	0.00117	0.00120	0.001177	0.000021	0.000389	0.000474	0.000462	0.000442	0.000046
	Vanadium (V)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	< 0.0030	0.003	0.000	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Elk River Upper Ponds					Elk River Wetland d/s Grave Creek				
			ERUP-AUG-1	ERUP-AUG-2	ERUP-AUG-3	Mean	SD	ELWDGC-AUG-1	ELWDGC-AUG-2	ELWDGC-AUG-3	Mean	SD
			11-Aug-15	11-Aug-15	11-Aug-15			13-Aug-15	13-Aug-15	13-Aug-15		
Physical	pH	pH	8.63	8.71	8.66	8.67	0.04	8.13	8.26	8.37	8.25	0.12
	Total Suspended Solids (TSS)	mg/L	< 1.0	2.4	1.2	1.5	0.8	< 1.0	1.2	2.2	1.5	0.6
	Total Dissolved Solids (TDS)	mg/L	156	147	144	149	6	332	312	264	303	35
	Turbidity	NTU	0.57	1.05	3.60	1.74	1.63	0.53	1.02	1.59	1.05	0.53
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	83.3	91.7	88.3	88	4	272	263	213	249	32
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	13.4	20	20	17.8	3.8	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	97	112	108	106	8	272	263	213	249	32
	Ammonia, Total (as N)	mg/L	< 0.0050	< 0.0050	< 0.0050	0.005	0.000	< 0.0050	0.0068	< 0.0050	0.006	0.001
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	4.02	4.02	4.07	4.04	0.03	2.71	2.31	2.05	2.36	0.33
	Fluoride (F)	mg/L	0.167	0.167	0.168	0.167	0.001	0.180	0.170	0.161	0.170	0.010
	Hardness (as $CaCO_3$)	mg/L	140	138	141	140	2	275	254	222	250	27
	Nitrate (as N)	mg/L	< 0.0050	< 0.0050	0.0054	0.0051	0.0002	0.514	0.0964	0.0131	0.2078	0.2684
	Nitrite (as N)	mg/L	0.0033	0.0010	0.0019	0.0021	0.0012	< 0.0010	0.0050	0.0011	0.0024	0.0023
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.172	0.190	0.143	0.17	0.02	0.181	0.209	0.311	0.23	0.07
	Orthophosphate-Dissolved (as P)	mg/L	0.0017	0.0017	< 0.0010	0.0015	0.0004	< 0.0010	< 0.0010	< 0.0010	0.0010	0.0000
	Phosphorus (P)-Total	mg/L	0.0089	0.0167	0.0106	0.0121	0.0041	0.0038	0.0053	0.0061	0.0051	0.0012
	Sulphate (SO_4)	mg/L	20.9	20.9	21.0	20.93	0.06	52.2	50.1	50.8	51.03	1.07
	Organic Carbon, Dissolved (DOC)	mg/L	1.89	1.88	1.73	1.83	0.09	0.77	1.24	1.68	1.23	0.46
	Organic Carbon, Total (TOC)	mg/L	1.99	2.26	2.17	2.14	0.14	0.76	1.26	1.82	1.28	0.53
Total Metals	Aluminum (Al)	mg/L	0.0065	0.0197	0.0079	0.011	0.007	< 0.015	< 0.015	< 0.015	0.015	0.000
	Antimony (Sb)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Arsenic (As)	mg/L	0.00073	0.00073	0.00074	0.00073	0.00001	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Barium (Ba)	mg/L	0.0516	0.0509	0.0537	0.05207	0.00146	0.0979	0.0855	0.0727	0.08537	0.01260
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.00025	< 0.00025	< 0.00025	0.00025	0.00000
	Boron (B)	mg/L	< 0.010	< 0.010	< 0.010	0.010	0.000	< 0.050	< 0.050	< 0.050	0.050	0.000
	Cadmium (Cd)	mg/L	< 0.000005	0.0000050	< 0.000005	0.000005	0.000000	< 0.000025	< 0.000025	< 0.000025	0.000025	0.000000
	Cadmium (Cd) - Dissolved	mg/L	0.0000052	0.0000053	< 0.0000050	0.000005	0.000000	< 0.000025	< 0.000025	< 0.000025	0.000025	0.000000
	Calcium (Ca)	mg/L	23.0	22.4	23.7	23.0	0.7	78.6	73.2	59.8	70.5	9.7
	Chromium (Cr)	mg/L	< 0.00010	0.00012	< 0.00010	0.00011	0.00001	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Cobalt (Co)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Copper (Cu)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000
	Iron (Fe)	mg/L	0.042	0.059	0.052	0.051	0.009	< 0.050	0.115	0.057	0.074	0.036
	Lead (Pb)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.00025	< 0.00025	< 0.00025	0.00025	0.00000
	Lithium (Li)	mg/L	0.0073	0.0071	0.0073	0.0072	0.0001	0.0227	0.0204	0.0210	0.0214	0.0012
	Magnesium (Mg)	mg/L	21.2	20.6	21.1	20.97	0.32	21.5	20.5	21.4	21.13	0.55
	Manganese (Mn)	mg/L	0.00684	0.00757	0.00790	0.00744	0.00054	0.00243	0.0228	0.00252	0.00925	0.01173
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.000905	0.000876	0.000871	0.00088	0.00002	0.00149	0.00134	0.00142	0.00142	0.00008
	Nickel (Ni)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.25	< 0.25	< 0.25	0.25	0.00
	Potassium (K)	mg/L	0.61	0.60	0.63	0.61	0.02	1.04	0.71	0.71	0.82	0.19
	Selenium (Se)	mg/L	0.000207	0.000194	0.000217	0.00021	0.00001	0.00360	0.00304	0.00344	0.00336	0.00029
	Silicon (Si)	mg/L	2.74	2.66	2.75	2.717	0.049	4.33	3.67	2.99	3.663	0.670
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Sodium (Na)	mg/L	3.97	3.87	4.12	3.99	0.13	5.80	5.44	5.92	5.72	0.25
	Strontium (Sr)	mg/L	0.135	0.132	0.138	0.135	0.003	0.431	0.397	0.383	0.404	0.025
	Sulphur (S)	mg/L	7.8	7.6	7.9	7.8	0.2	17.7	16.1	17.8	17.2	1.0
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000	< 0.000050	< 0.000050	< 0.000050	0.000050	0.000000
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00050	< 0.00050	< 0.00050	0.00050	0.00000
	Titanium (Ti)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00150	< 0.00150	< 0.00150	0.0015	0.0000
	Uranium (U)	mg/L	0.000571	0.000583	0.000613	0.000589	0.000022	0.000988	0.000829	0.000919	0.000912	0.000080
	Vanadium (V)	mg/L	0.00054	0.00058	0.00060	0.0006	0.0000	< 0.0025	< 0.0025	< 0.0025	0.0025	0.0000
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	< 0.0030	0.003	0.000	< 0.015	< 0.015	< 0.015	0.015	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.0015	< 0.0015	< 0.0015	0.0015	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Goddard Marsh					Otto Creek Ponds				
			GO13-AUG-1	GO13-AUG-2	GO13-AUG-3	Mean	SD	OTTO-AUG-1	OTTO-AUG-2	OTTO-AUG-3	Mean	SD
			12-Aug-15	12-Aug-15	12-Aug-15			11-Aug-15	11-Aug-15	11-Aug-15		
Physical	pH	pH	8.17	8.20	8.23	8.20	0.03	8.31	8.32	8.30	8.31	0.01
	Total Suspended Solids (TSS)	mg/L	2.6	4.8	5.0	4.1	1.3	1.6	4.0	4.2	3.3	1.4
	Total Dissolved Solids (TDS)	mg/L	718	696	700	705	12	428	383	343	385	43
	Turbidity	NTU	3.11	3.24	2.50	2.95	0.40	3.75	3.69	7.27	4.90	2.05
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	207	207	207	207	0	253	290	297	280	24
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	207	207	207	207	0	253	290	297	280	24
	Ammonia, Total (as N)	mg/L	0.0107	0.0115	0.0091	0.010	0.001	< 0.0050	< 0.0050	0.0790	0.030	0.043
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	0.132	0.140	0.101	0.12	0.02
	Chloride (Cl)	mg/L	10.1	9.68	9.63	9.80	0.26	19.4	19.4	12.9	17.23	3.75
	Fluoride (F)	mg/L	0.158	0.162	0.161	0.160	0.002	0.232	0.398	0.489	0.373	0.130
	Hardness (as $CaCO_3$)	mg/L	557	556	553	555	2	335	341	317	331	12
	Nitrate (as N)	mg/L	1.09	1.51	1.62	1.4067	0.2797	< 0.0050	0.0053	0.0105	0.0069	0.0031
	Nitrite (as N)	mg/L	0.0127	0.0082	0.0088	0.0099	0.0024	< 0.0010	0.0019	0.0015	0.0015	0.0005
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.193	0.123	0.071	0.13	0.06	0.237	0.227	0.240	0.23	0.01
	Orthophosphate-Dissolved (as P)	mg/L	< 0.0010	< 0.0010	0.0014	0.0011	0.0002	0.0020	< 0.0010	0.0011	0.0014	0.0006
	Phosphorus (P)-Total	mg/L	0.0138	0.0161	0.0122	0.0140	0.0020	0.0109	0.0115	0.0108	0.0111	0.0004
	Sulphate (SO_4)	mg/L	326	328	328	327.33	1.15	86.5	50.1	25.1	53.90	30.88
	Organic Carbon, Dissolved (DOC)	mg/L	0.83	0.55	< 0.50	0.63	0.18	1.66	1.11	0.78	1.18	0.44
	Organic Carbon, Total (TOC)	mg/L	0.93	0.79	0.65	0.79	0.14	2.05	1.37	0.97	1.46	0.55
Total Metals	Aluminum (Al)	mg/L	0.0277	0.0955	0.0536	0.059	0.034	0.0291	0.0179	0.0266	0.025	0.006
	Antimony (Sb)	mg/L	0.00036	0.00045	0.00044	0.00042	0.00005	0.00020	0.00012	< 0.00010	0.00014	0.00005
	Arsenic (As)	mg/L	0.00035	0.00032	0.00026	0.00031	0.00005	0.00058	0.00111	0.00153	0.00107	0.00048
	Barium (Ba)	mg/L	0.0719	0.0882	0.0887	0.08293	0.00956	0.150	0.482	0.878	0.50333	0.36447
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	0.026	0.023	0.022	0.024	0.002	0.059	0.058	0.038	0.052	0.012
	Cadmium (Cd)	mg/L	0.0000076	0.0000168	0.0000148	0.000013	0.000005	0.0000099	0.0000083	0.0000126	0.000010	0.000002
	Cadmium (Cd) - Dissolved	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	0.0000051	0.0000072	0.000006	0.000001
	Calcium (Ca)	mg/L	110	108	107	108.3	1.5	73.9	81.6	78.7	78.1	3.9
	Chromium (Cr)	mg/L	< 0.00010	0.00021	0.00017	0.00016	0.00006	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Cobalt (Co)	mg/L	0.00014	0.00019	0.00016	0.0002	0.0000	< 0.00010	0.00026	0.00015	0.0002	0.0001
	Copper (Cu)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	0.00053	< 0.00050	< 0.00050	0.0005	0.0000
	Iron (Fe)	mg/L	0.120	0.171	0.122	0.138	0.029	0.062	0.206	0.618	0.295	0.289
	Lead (Pb)	mg/L	0.000064	0.000140	0.000092	0.00010	0.00004	0.000067	< 0.000050	0.000062	0.00006	0.00001
	Lithium (Li)	mg/L	0.0260	0.0246	0.0234	0.0247	0.0013	0.0298	0.0303	0.0262	0.0288	0.0022
	Magnesium (Mg)	mg/L	67.2	67.1	69.1	67.80	1.13	41.8	37.5	34.1	37.80	3.86
	Manganese (Mn)	mg/L	0.0381	0.0216	0.0184	0.02603	0.01057	0.00821	0.174	0.0911	0.09110	0.08290
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.00259	0.00280	0.00286	0.00275	0.00014	0.00152	0.00754	0.0117	0.00692	0.00512
	Nickel (Ni)	mg/L	0.00095	0.00126	0.00111	0.0011	0.0002	0.00129	0.00156	0.00109	0.0013	0.0002
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	1.70	1.69	1.68	1.69	0.01	1.74	3.12	3.38	2.75	0.88
	Selenium (Se)	mg/L	0.0320	0.0374	0.0389	0.03610	0.00363	0.00106	0.000400	0.000203	0.00055	0.00045
	Silicon (Si)	mg/L	2.47	2.91	2.94	2.773	0.263	3.45	4.18	3.71	3.780	0.370
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000
	Sodium (Na)	mg/L	6.98	6.71	6.59	6.76	0.20	11.7	11.7	7.71	10.37	2.30
	Strontium (Sr)	mg/L	0.406	0.373	0.365	0.381	0.022	0.445	0.479	0.392	0.439	0.044
	Sulphur (S)	mg/L	116	117	120	117.7	2.1	31.8	18.1	9.3	19.7	11.3
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000	0.000011	0.000011	< 0.000010	0.000011	0.000001
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Titanium (Ti)	mg/L	0.00032	0.00104	0.00050	0.0006	0.0004	< 0.00030	0.00055	< 0.00030	0.0004	0.0001
	Uranium (U)	mg/L	0.00260	0.00290	0.00295	0.002817	0.000189	0.000652	0.000595	0.000360	0.000536	0.000155
	Vanadium (V)	mg/L	0.00053	0.00072	0.00063	0.0006	0.0001	0.00054	< 0.00050	< 0.00050	0.0005	0.0000
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	< 0.0030	0.003	0.000	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Michel Wetland					Michel Creek Oxbow #2				
			MI16-AUG-1	MI16-AUG-2	MI16-AUG-3	Mean	SD	MIC2-AUG-1	MIC2-AUG-2	MIC2-AUG-3	Mean	SD
			8-Aug-15	8-Aug-15	8-Aug-15			8-Aug-15	8-Aug-15	6-Aug-15		
Physical	pH	pH	8.19	8.14	8.17	8.17	0.03	8.21	8.21	8.31	8.24	0.06
	Total Suspended Solids (TSS)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	2.5	2.7	2.1	0.9
	Total Dissolved Solids (TDS)	mg/L	307	296	278	294	15	266	271	246	261	13
	Turbidity	NTU	0.44	0.42	0.36	0.41	0.04	0.73	1.68	na	1.21	0.67
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	128	124	124	125	2	144	148	142	145	3
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	128	124	124	125	2	144	148	142	145	3
	Ammonia, Total (as N)	mg/L	< 0.0050	< 0.0050	< 0.0050	0.005	0.000	0.0056	0.0068	0.0063	0.006	0.001
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	< 0.50	< 0.50	< 0.50	0.50	0.00	0.83	0.83	0.74	0.80	0.05
	Fluoride (F)	mg/L	0.126	0.126	0.124	0.125	0.001	0.110	0.110	0.111	0.110	0.001
	Hardness (as $CaCO_3$)	mg/L	204	214	205	208	6	201	202	205	203	2
	Nitrate (as N)	mg/L	0.151	0.165	0.151	0.1557	0.0081	0.481	0.433	na	0.4570	0.0339
	Nitrite (as N)	mg/L	0.0039	0.0037	0.0039	0.0038	0.0001	0.0041	0.0032	na	0.0037	0.0006
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.305	0.292	0.280	0.29	0.01	0.142	0.212	0.072	0.14	0.07
	Orthophosphate-Dissolved (as P)	mg/L	< 0.0010	< 0.0010	0.0014	0.0011	0.0002	0.0086	0.0060	na	0.0073	0.0018
	Phosphorus (P)-Total	mg/L	0.0059	0.0058	0.0055	0.0057	0.0002	0.0116	0.0148	0.0164	0.0143	0.0024
	Sulphate (SO_4)	mg/L	107	108	101	105.33	3.79	73.6	74.1	70.8	72.83	1.78
	Organic Carbon, Dissolved (DOC)	mg/L	1.56	1.68	1.58	1.61	0.06	1.00	1.13	1.35	1.16	0.18
	Organic Carbon, Total (TOC)	mg/L	1.58	1.71	1.56	1.62	0.08	0.86	0.97	1.31	1.05	0.23
Total Metals	Aluminum (Al)	mg/L	< 0.0030	< 0.0030	0.0364	0.014	0.019	0.0175	0.0326	0.0407	0.030	0.012
	Antimony (Sb)	mg/L	< 0.00010	0.00010	0.00011	0.00010	0.00001	0.00014	0.00015	0.00015	0.00015	0.00001
	Arsenic (As)	mg/L	0.00025	0.00028	0.00044	0.00032	0.00010	0.00032	0.00034	0.00063	0.00043	0.00017
	Barium (Ba)	mg/L	0.0819	0.0836	0.0851	0.08353	0.00160	0.133	0.132	0.144	0.13633	0.00666
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	0.019	0.020	0.020	0.020	0.001	0.012	0.012	0.014	0.013	0.001
	Cadmium (Cd)	mg/L	< 0.000005	< 0.000005	0.0000182	0.000009	0.000008	0.0000357	0.0000378	0.0000240	0.000033	0.000007
	Cadmium (Cd) - Dissolved	mg/L	< 0.0000050	0.0000063	< 0.0000050	0.000005	0.000001	0.0000329	0.0000249	0.0000097	0.000023	0.000012
	Calcium (Ca)	mg/L	60.0	61.4	59.6	60.3	0.9	61.9	60.4	60.8	61.0	0.8
	Chromium (Cr)	mg/L	0.00011	0.00015	0.00046	0.00024	0.00019	0.00015	0.00019	0.00014	0.00016	0.00003
	Cobalt (Co)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000	< 0.00010	< 0.00010	0.00011	0.0001	0.0000
	Copper (Cu)	mg/L	< 0.00050	< 0.00050	0.00064	0.0005	0.0001	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Iron (Fe)	mg/L	0.020	0.024	0.085	0.043	0.036	0.023	0.050	0.155	0.076	0.070
	Lead (Pb)	mg/L	< 0.000050	< 0.000050	0.000278	0.00013	0.00013	< 0.000050	0.000060	0.000074	0.00006	0.00001
	Lithium (Li)	mg/L	0.0074	0.0074	0.0077	0.0075	0.0002	0.0045	0.0043	0.0063	0.0050	0.0011
	Magnesium (Mg)	mg/L	21.9	22.2	20.6	21.57	0.85	19.9	19.4	16.5	18.60	1.84
	Manganese (Mn)	mg/L	0.00453	0.00582	0.00663	0.00566	0.00106	0.00161	0.00280	0.0217	0.00870	0.01127
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.000626	0.000621	0.000588	0.00061	0.00002	0.000905	0.000859	0.00101	0.00092	0.00008
	Nickel (Ni)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.00050	0.00057	0.00076	0.0006	0.0001
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	0.65	0.67	0.73	0.68	0.04	0.92	0.97	0.90	0.93	0.04
	Selenium (Se)	mg/L	0.00165	0.00174	0.00172	0.00170	0.00005	0.00206	0.00202	0.00130	0.00179	0.00043
	Silicon (Si)	mg/L	2.15	2.26	2.28	2.230	0.070	2.64	2.48	0.720	1.947	1.065
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	0.000048	0.00002	0.00002	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000
	Sodium (Na)	mg/L	3.90	4.03	4.21	4.05	0.16	3.20	3.13	3.34	3.22	0.11
	Strontium (Sr)	mg/L	0.235	0.238	0.242	0.238	0.004	0.172	0.170	0.178	0.173	0.004
	Sulphur (S)	mg/L	40.9	41.1	37.5	39.8	2.0	28.4	28.3	26.3	27.7	1.2
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000	< 0.000010	< 0.000010	0.000011	0.000010	0.000001
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00010	< 0.00010	0.00013	0.00011	0.00002
	Titanium (Ti)	mg/L	< 0.00030	< 0.00030	0.00068	0.0004	0.0002	< 0.00030	0.00036	0.00072	0.0005	0.0002
	Uranium (U)	mg/L	0.000663	0.000687	0.000639	0.000663	0.000024	0.000742	0.000763	0.000661	0.000722	0.000054
	Vanadium (V)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	0.00061	0.00081	0.00082	0.0007	0.0001
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	0.0041	0.003	0.001	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Lower Michel Wetland					Elk River Lower Oxbow				
			MIWW-AUG-01	MIWW-AUG-02	MIWW-AUG-03	Mean	SD	EROL-AUG-1	EROL-AUG-2	EROL-AUG-3	Mean	SD
			6-Aug-15	6-Aug-15	6-Aug-15			5-Aug-15	5-Aug-15	5-Aug-15		
Physical	pH	pH	8.22	8.22	8.22	8.22	0.00	8.11	8.20	8.24	8.18	0.07
	Total Suspended Solids (TSS)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	17.2	1.6	6.6	9.2
	Total Dissolved Solids (TDS)	mg/L	237	240	240	239	2	253	239	234	242	10
	Turbidity	NTU	na	na	na	na	na	0.51	4.22	1.00	1.91	2.02
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	180	187	186	184	4	170	157	167	165	7
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	180	187	186	184	4	170	157	167	165	7
	Ammonia, Total (as N)	mg/L	< 0.0050	< 0.0050	< 0.0050	0.005	0.000	< 0.0050	0.0090	0.0074	0.007	0.002
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	2.48	2.48	2.36	2.44	0.07	1.98	2.68	2.88	2.51	0.47
	Fluoride (F)	mg/L	0.110	0.111	0.109	0.110	0.001	0.125	0.118	0.106	0.116	0.010
	Hardness (as $CaCO_3$)	mg/L	215	216	215	215	1	211	204	205	207	4
	Nitrate (as N)	mg/L	na	na	na	na	na	1.03	0.556	0.461	0.6823	0.3048
	Nitrite (as N)	mg/L	na	na	na	na	na	< 0.0010	0.0072	0.0059	0.0047	0.0033
	Total Kjeldahl Nitrogen (TKN)	mg/L	< 0.05	< 0.05	< 0.05	0.05	0.00	0.106	0.185	0.161	0.15	0.04
	Orthophosphate-Dissolved (as P)	mg/L	na	na	na	na	na	0.0025	< 0.0010	< 0.0010	0.0015	0.0009
	Phosphorus (P)-Total	mg/L	0.0039	0.0057	0.0046	0.0047	0.0009	0.0057	0.0181	0.0085	0.0108	0.0065
	Sulphate (SO_4)	mg/L	43.7	43.8	43.4	43.63	0.21	43.9	36.3	30.0	36.73	6.96
	Organic Carbon, Dissolved (DOC)	mg/L	0.52	0.71	0.92	0.72	0.20	< 0.50	0.70	0.63	0.61	0.10
	Organic Carbon, Total (TOC)	mg/L	0.54	0.78	1.02	0.78	0.24	< 0.50	0.74	0.53	0.59	0.13
Total Metals	Aluminum (Al)	mg/L	0.0037	0.0272	0.0080	0.013	0.013	0.0033	0.0818	0.0224	0.036	0.041
	Antimony (Sb)	mg/L	0.00010	0.00011	0.00010	0.00010	0.00001	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Arsenic (As)	mg/L	0.00018	0.00019	0.00020	0.00019	0.00001	0.00016	0.00025	0.00023	0.00021	0.00005
	Barium (Ba)	mg/L	0.154	0.162	0.162	0.15933	0.00462	0.104	0.116	0.115	0.11167	0.00666
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	0.018	0.019	0.020	0.019	0.001	< 0.010	< 0.010	< 0.010	0.010	0.000
	Cadmium (Cd)	mg/L	0.0000339	0.0000293	0.0000135	0.000026	0.000011	0.0000101	0.0000252	0.0000125	0.000016	0.000008
	Cadmium (Cd) - Dissolved	mg/L	0.0000322	0.0000244	0.0000086	0.000022	0.000012	0.0000123	0.0000070	0.0000071	0.000009	0.000003
	Calcium (Ca)	mg/L	63.6	66.8	68.9	66.4	2.7	59.3	61.9	60.9	60.7	1.3
	Chromium (Cr)	mg/L	0.00014	0.00022	0.00010	0.00015	0.00006	0.00017	0.00031	0.00024	0.00024	0.00007
	Cobalt (Co)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000
	Copper (Cu)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Iron (Fe)	mg/L	0.016	0.065	0.026	0.036	0.026	< 0.010	0.208	0.093	0.104	0.099
	Lead (Pb)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	0.000136	< 0.000050	0.00008	0.00005
	Lithium (Li)	mg/L	0.0110	0.0115	0.0120	0.0115	0.0005	0.0067	0.0065	0.0058	0.0063	0.0005
	Magnesium (Mg)	mg/L	15.1	15.2	13.7	14.67	0.84	15.4	16.1	15.2	15.57	0.47
	Manganese (Mn)	mg/L	0.00215	0.00328	0.00174	0.00239	0.00080	0.00068	0.00901	0.00568	0.00512	0.00419
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	0.0000084	< 0.0000050	< 0.0000050	0.000006	0.000002
	Molybdenum (Mo)	mg/L	0.000815	0.000866	0.000857	0.00085	0.00003	0.00104	0.000979	0.000881	0.00097	0.00008
	Nickel (Ni)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	0.99	0.98	0.99	0.99	0.01	0.63	0.71	0.60	0.65	0.06
	Selenium (Se)	mg/L	0.00114	0.00106	0.000830	0.00101	0.00016	0.00500	0.00359	0.00303	0.00387	0.00102
	Silicon (Si)	mg/L	2.67	2.58	2.36	2.537	0.159	2.44	2.63	2.50	2.523	0.097
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000
	Sodium (Na)	mg/L	4.21	4.45	4.65	4.44	0.22	2.77	3.35	3.35	3.16	0.33
	Strontium (Sr)	mg/L	0.271	0.287	0.296	0.285	0.013	0.183	0.176	0.159	0.173	0.012
	Sulphur (S)	mg/L	16.8	16.4	14.8	16.0	1.1	17.5	15.0	12.5	15.0	2.5
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000
	Tin (Sn)	mg/L	0.00021	0.00017	0.00016	0.00018	0.00003	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Titanium (Ti)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	0.00076	< 0.00030	0.0005	0.0003
	Uranium (U)	mg/L	0.000495	0.000514	0.000514	0.000508	0.000011	0.000645	0.000635	0.000570	0.000617	0.000041
	Vanadium (V)	mg/L	< 0.00050	0.00054	< 0.00050	0.0005	0.0000	< 0.00050	0.00071	< 0.00050	0.0006	0.0001
	Zinc (Zn)	mg/L	< 0.0030	< 0.0030	< 0.0030	0.003	0.000	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.45: Water Chemistry at Mine-exposed Lentic Areas where Sediment and Benthic Invertebrates were Sampled in August 2015

Analytes		Units	Stanford Pond					Elko Reservoir				
			STPD-AUG-01	STPD-AUG-02	STPD-AUG-03	Mean	SD	ELKO-AUG-01	ELKO-AUG-02	ELKO-AUG-03	Mean	SD
			6-Aug-15	6-Aug-15	6-Aug-15			6-Aug-15	6-Aug-15	6-Aug-15		
Physical	pH	pH	8.20	8.23	8.25	8.23	0.03	8.39	8.39	8.36	8.38	0.02
	Total Suspended Solids (TSS)	mg/L	< 1.0	1.3	< 1.0	1.1	0.2	< 1.0	< 1.0	1.7	1.2	0.4
	Total Dissolved Solids (TDS)	mg/L	175	176	181	177	3	262	263	259	261	2
	Turbidity	NTU	na	na	na	na	na	na	na	na	na	na
Anions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	133	132	135	133	2	160	157	157	158	2
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	1.0	0.0	< 1.0	< 1.0	< 1.0	1.0	0.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	133	132	135	133	2	160	157	157	158	2
	Ammonia, Total (as N)	mg/L	0.0268	0.0243	0.0204	0.024	0.003	< 0.0050	< 0.0050	0.0059	0.005	0.001
	Bromide (Br)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Chloride (Cl)	mg/L	1.60	1.42	1.44	1.49	0.10	2.17	2.18	2.13	2.16	0.03
	Fluoride (F)	mg/L	0.149	0.144	0.146	0.146	0.003	0.179	0.182	0.183	0.181	0.002
	Hardness (as $CaCO_3$)	mg/L	162	160	157	160	3	223	222	222	222	1
	Nitrate (as N)	mg/L	na	na	na	na	na	na	na	na	na	na
	Nitrite (as N)	mg/L	na	na	na	na	na	na	na	na	na	na
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.171	0.152	0.139	0.15	0.02	< 0.05	< 0.05	0.053	0.05	0.00
	Orthophosphate-Dissolved (as P)	mg/L	na	na	na	na	na	na	na	na	na	na
	Phosphorus (P)-Total	mg/L	0.0093	0.0097	0.0090	0.0093	0.0004	0.0036	0.0055	0.0051	0.0047	0.0010
	Sulphate (SO_4)	mg/L	32.5	32.5	32.1	32.37	0.23	66.3	66.0	65.5	65.93	0.40
	Organic Carbon, Dissolved (DOC)	mg/L	1.13	1.04	0.92	1.03	0.11	0.60	< 0.50	0.51	0.54	0.06
	Organic Carbon, Total (TOC)	mg/L	1.42	1.08	0.96	1.15	0.24	0.54	0.55	0.68	0.59	0.08
Total Metals	Aluminum (Al)	mg/L	0.0204	0.0181	0.0129	0.017	0.004	0.0175	0.0253	0.0336	0.025	0.008
	Antimony (Sb)	mg/L	0.00012	0.00013	0.00011	0.00012	0.00001	0.00013	0.00015	0.00014	0.00014	0.00001
	Arsenic (As)	mg/L	0.00040	0.00034	0.00032	0.00035	0.00004	0.00027	0.00028	0.00029	0.00028	0.00001
	Barium (Ba)	mg/L	0.0953	0.0893	0.0810	0.08853	0.00718	0.0840	0.0860	0.0858	0.08527	0.00110
	Beryllium (Be)	mg/L	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000	< 0.000020	< 0.000020	< 0.000020	0.00002	0.00000
	Bismuth (Bi)	mg/L	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000	< 0.000050	< 0.000050	< 0.000050	0.00005	0.00000
	Boron (B)	mg/L	< 0.010	< 0.010	< 0.010	0.010	0.000	< 0.010	< 0.010	0.010	0.010	0.000
	Cadmium (Cd)	mg/L	0.0000298	0.0000090	0.0000090	0.000016	0.000012	0.0000161	0.0000183	0.0000172	0.000017	0.000001
	Cadmium (Cd) - Dissolved	mg/L	< 0.0000050	< 0.0000050	0.0000065	0.000006	0.000001	0.0000126	0.0000132	0.0000127	0.000013	0.000000
	Calcium (Ca)	mg/L	48.0	49.1	45.7	47.6	1.7	62.6	64.4	63.9	63.6	0.9
	Chromium (Cr)	mg/L	0.00021	0.00022	0.00021	0.00021	0.00001	0.00027	0.00030	0.00032	0.00030	0.00003
	Cobalt (Co)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000	< 0.00010	< 0.00010	< 0.00010	0.0001	0.0000
	Copper (Cu)	mg/L	0.00092	< 0.00050	< 0.00050	0.0006	0.0002	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000
	Iron (Fe)	mg/L	0.108	0.095	0.083	0.095	0.013	0.029	0.043	0.057	0.043	0.014
	Lead (Pb)	mg/L	0.000515	< 0.000050	< 0.000050	0.00021	0.00027	0.000118	< 0.00	0.000066	0.00008	0.00004
	Lithium (Li)	mg/L	0.0054	0.0057	0.0053	0.0055	0.0002	0.0097	0.0099	0.0099	0.0098	0.0001
	Magnesium (Mg)	mg/L	13.7	13.0	13.0	13.23	0.40	18.7	18.7	19.1	18.83	0.23
	Manganese (Mn)	mg/L	0.0149	0.00827	0.00735	0.01017	0.00412	0.00240	0.00306	0.00364	0.00303	0.00062
	Mercury (Hg)	mg/L	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000	< 0.0000050	< 0.0000050	< 0.0000050	0.000005	0.000000
	Molybdenum (Mo)	mg/L	0.00108	0.00110	0.00103	0.00107	0.00004	0.00145	0.00150	0.00148	0.00148	0.00003
	Nickel (Ni)	mg/L	< 0.00050	< 0.00050	< 0.00050	0.0005	0.0000	0.00064	0.00070	0.00075	0.0007	0.0001
	Phosphorus (P)	mg/L	< 0.050	< 0.050	< 0.050	0.05	0.00	< 0.050	< 0.050	< 0.050	0.05	0.00
	Potassium (K)	mg/L	0.99	0.78	0.69	0.82	0.15	0.75	0.78	0.78	0.77	0.02
	Selenium (Se)	mg/L	0.00336	0.00360	0.00338	0.00345	0.00013	0.00865	0.00912	0.00903	0.00893	0.00025
	Silicon (Si)	mg/L	1.16	1.11	1.21	1.160	0.050	1.68	1.69	1.75	1.707	0.038
	Silver (Ag)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000	< 0.000010	< 0.000010	< 0.000010	0.00001	0.00000
	Sodium (Na)	mg/L	1.92	1.78	1.62	1.77	0.15	2.54	2.64	2.60	2.59	0.05
	Strontium (Sr)	mg/L	0.147	0.149	0.136	0.144	0.007	0.237	0.244	0.243	0.241	0.004
	Sulphur (S)	mg/L	13.3	12.9	12.5	12.9	0.4	24.8	24.6	25.2	24.9	0.3
	Thallium (Tl)	mg/L	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000	< 0.000010	< 0.000010	< 0.000010	0.000010	0.000000
	Tin (Sn)	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00000
	Titanium (Ti)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	0.00059	0.0004	0.0002
	Uranium (U)	mg/L	0.000698	0.000720	0.000682	0.000700	0.000019	0.00109	0.00113	0.00111	0.001110	0.000020
	Vanadium (V)	mg/L	0.00056	0.00057	0.00053	0.0006	0.0000	0.00051	0.00056	0.00058	0.0006	0.0000
	Zinc (Zn)	mg/L	0.0044	< 0.0030	< 0.0030	0.003	0.001	< 0.0030	< 0.0030	< 0.0030	0.003	0.000
	Zirconium (Zr)	mg/L	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000	< 0.00030	< 0.00030	< 0.00030	0.0003	0.0000

na - not analyzed, samples exceeded hold time.

Table C.46: *In Situ* Water Quality Measurements at Reference Lentic Areas Sampled for Sediment Quality Evaluation, August 2015

Area ID	Area Description	Date	UTM (NAD83, 11U)		Station Depth (m)	Temperature (°C)	Dissolved Oxygen		pH	Specific Conductance (µS/cm)
			Easting	Northing			(mg/L)	(% sat)		
EL14-1	Elk Lakes	13-Aug-15	635364	5601830	1.3	12.8	8.59	80.9	8.10	147
EL14-2		13-Aug-15	635266	5601280	2.0	14.3	8.15	79.5	8.06	154
EL14-3		13-Aug-15	635562	5601491	2.0	13.3	8.08	77.2	7.48	153
EL14-4		13-Aug-15	635222	5601727	1.3	15.6	8.26	83.2	8.20	153
EL14-5		13-Aug-15	635422	5601312	1.3	15.5	8.85	88.9	8.02	159
FLA1-1	Flathead Side Channel	09-Aug-15	681851	5443687	0.5	18.2	9.17	99.6	8.06	316
FLA1-2		09-Aug-15	681795	5443608	0.7	12.1	7.17	67.0	7.98	333
FLA1-3		09-Aug-15	681724	5443528	0.5	11.9	5.86	54.7	8.06	324
FLA1-4		09-Aug-15	681836	5443618	0.5	16.1	8.09	82.7	8.08	329
FLA1-5		09-Aug-15	681777	5443593	0.2	12.8	6.10	56.3	8.20	336
LCHO-1	Leach Creek Oxbow	11-Aug-15	658746	5489123	0.7	16.3	8.05	80.7	7.65	228
LCHO-2		12-Aug-15	658708	5489134	0.7	9.5	3.90	34.0	7.16	205
LCHO-3		12-Aug-15	658746	5489141	0.5	10.0	5.79	51.4	7.35	199
LCHO-4		12-Aug-15	658725	5489099	0.5	7.5	4.58	38.5	7.16	193
LCHO-5		12-Aug-15	658732	5489126	0.5	10.0	3.53	31.3	7.17	206
LML-1	Lake Mountain Lake	06-Aug-15	650190	5565230	0.3	16.9	10.16	105.6	8.82	222
LML-2		06-Aug-15	650169	5565117	0.6	17.5	9.52	98.3	8.84	221
LML-3		06-Aug-15	650119	5565059	0.5	17.5	11.39	121.8	8.97	216
LML-4		06-Aug-15	650109	5565171	0.5	16.0	7.30	74.2	8.70	224
LML-5		06-Aug-15	650103	5565112	0.5	16.0	6.72	67.8	8.66	225
REFF-1	Reference Pond	14-Aug-15	645899	5556258	1.3	20.0	8.08	87.9	8.01	361
REFF-2		14-Aug-15	645912	5556304	1.3	20.7	7.97	88.3	8.28	360
REFF-3		14-Aug-15	645911	5556366	4.0	21.1	7.93	88.7	8.30	357
REFF-4		15-Aug-15	645805	5556257	1.5	18.9	7.44	80.0	7.97	360
REFF-5		15-Aug-15	645852	5556353	0.8	18.8	7.75	83.2	8.25	359
Sample Size (n)					**25**	**25**	**25**	**25**	**25**	**25**
Minimum					**0.2**	**7.5**	**3.53**	**31.3**	**7.16**	**147**
Maximum					**4.0**	**21.1**	**11.39**	**121.8**	**8.97**	**361**
Median					**0.7**	**16.0**	**7.97**	**80.7**	**8.06**	**224**
Mean					**1.0**	**15.2**	**7.5**	**76.1**	**8.1**	**253.5**
Standard Deviation					**0.8**	**3.7**	**1.83**	**22.0**	**0.52**	**79**

Table C.47: *In Situ* Water Quality Measurements at Mine-exposed Lentic Areas Sampled for Sediment Quality Evaluation, August 2015

Area ID	Area Description	Sample Date	UTM (NAD83, 11U)		Station Depth (m)	Temperature (°C)	Dissolved Oxygen		pH	Specific Conductance (µS/cm)
			Easting	Northing			(mg/L)	(% sat)		
ELKO-1	Elko Reservoir	06-Aug-15	637742	5461942	1.5	15.4	9.28	93.2	8.44	437
ELKO-2		06-Aug-15	637798	5461828	1.0	15.2	9.20	92.4	8.40	437
ELKO-3		06-Aug-15	637803	5461610	1.0	15.3	9.22	92.5	8.34	438
ELKO-4		07-Aug-15	637799	5461686	1.5	12.7	8.34	78.6	8.24	437
ELKO-5		07-Aug-15	637798	5461641	2.0	12.9	8.37	80.5	8.02	447
ELWDGC-1	Elk River Wetland d/s Grave Creek	13-Aug-15	653165	5521363	0.3	7.2	3.70	30.7	7.29	565
ELWDGC-2		13-Aug-15	653179	5521333	0.4	11.2	5.11	46.8	7.43	536
ELWDGC-3		13-Aug-15	653186	5521298	0.5	16.2	10.16	103.0	7.88	458
ELWDGC-4		13-Aug-15	653183	5521320	0.5	17.5	13.30	140.0	7.99	468
ELWDGC-5		13-Aug-15	653172	5521348	0.3	8.2	4.83	41.3	7.37	565
EROL-1	Elk River Lower Oxbow	05-Aug-15	640906	5478404	0.3	10.3	4.03	35.8	8.29	110
EROL-2		05-Aug-15	640838	5478128	0.5	14.2	10.62	103.5	8.72	397
EROL-3		05-Aug-15	640879	5477993	0.2	12.9	8.89	83.7	8.16	379
EROL-4		05-Aug-15	640829	5478172	0.3	16.8	10.02	104.6	8.59	401
EROL-5		05-Aug-15	640894	5477979	0.2	15.2	11.10	110.5	9.18	398
EROU-1	Elk River Upper Oxbow	10-Aug-15	652392	5529923	0.3	14.7	3.12	30.9	8.08	299
EROU-2		10-Aug-15	652362	5529902	0.2	17.9	6.17	65.9	8.70	293
EROU-3		10-Aug-15	652229	5529714	0.2	18.1	10.93	114.4	9.63	241
EROU-4		10-Aug-15	652301	5529766	0.3	22.8	15.40	180.6	9.68	246
EROU-5		10-Aug-15	652090	5529795	0.3	24.1	12.56	132.7	9.73	229
ERUP-1	Elk River Upper Ponds	11-Aug-15	651869	5530427	0.5	18.1	7.37	76.6	8.92	283
ERUP-2		11-Aug-15	651807	5530400	0.8	19.2	8.18	88.6	8.99	278
ERUP-3		11-Aug-15	651838	5530469	0.8	19.5	11.02	119.9	8.93	281
ERUP-4		11-Aug-15	651857	5530400	0.7	19.1	10.01	108.3	8.86	283
ERUP-5		11-Aug-15	651814	5530429	0.6	19.7	12.48	136.5	9.18	269
FMUCK-1	Fording Meadow u/s Chauncey Creek	08-Aug-15	654712	5553364	0.5	10.4	11.16	101.0	8.16	991
FMUCK-2		08-Aug-15	654755	5553328	0.4	9.4	11.62	101.9	8.15	992
FMUCK-3		08-Aug-15	654809	5553335	0.6	6.5	10.48	85.7	8.06	991
FMUCK-4		08-Aug-15	654726	5553335	0.5	10.3	10.79	97.0	8.19	991
FMUCK-5		08-Aug-15	654780	5553326	0.6	8.9	11.41	99.0	8.16	987
FO10-1	Fording River Oxbow/Side Channel	08-Aug-15	654218	5555289	0.3	7.2	8.69	72.1	7.89	993
FO10-2		08-Aug-15	654203	5555233	0.3	7.1	8.71	72.4	7.89	993
FO10-3		08-Aug-15	654181	5555217	0.3	6.9	8.85	72.9	7.83	995
FO10-4		08-Aug-15	654219	5555277	0.3	7.1	8.72	72.3	7.88	994
FO10-5		08-Aug-15	654185	5555228	0.3	7.0	8.80	72.6	7.82	994
FOXL-1	Lower Fording River Oxbow	09-Aug-15	654893	5554367	0.3	9.8	1.70	15.3	7.61	503
FOXL-2		09-Aug-15	654857	5554318	0.3	11.4	3.62	33.2	7.71	437
FOXL-3		09-Aug-15	654713	5554354	0.3	12.6	5.38	50.5	7.81	404
FOXL-4		09-Aug-15	654887	5554350	0.3	10.1	1.58	14.4	7.55	504
FOXL-5		09-Aug-15	654832	5554306	0.3	11.9	4.29	39.6	7.78	425
FWDEC 5		09-Aug-15	656824	5547136	0.3	7.0	10.01	83.8	7.73	338
FWDEC-1	Fording Wetland d/s Ewin Creek	09-Aug-15	656827	5547188	0.2	6.1	10.17	82.1	7.67	341
FWDEC-2		09-Aug-15	656818	5547147	0.3	7.2	10.05	83.7	7.75	338
FWDEC-3		09-Aug-15	656806	5547128	0.3	6.7	9.86	80.8	7.77	339
FWDEC-4		09-Aug-15	656831	5547165	0.2	8.0	10.23	86.8	7.89	339
GO13-1	Goddard Marsh	12-Aug-15	652969	5514032	0.5	15.5	8.76	87.7	8.07	982
GO13-2		12-Aug-15	652957	5514045	0.5	15.0	8.55	85.0	8.13	972
GO13-3		12-Aug-15	652939	5514057	0.5	14.7	8.34	82.5	8.19	972
GO13-4		12-Aug-15	652979	5514047	0.5	15.0	8.57	85.1	8.12	971
GO13-5		12-Aug-15	652946	5514057	0.5	14.8	8.90	88.0	8.20	970
HE27-1	Henretta lake	06-Aug-15	652563	5566372	1.1	9.2	8.90	76.0	8.03	486
HE27-2		06-Aug-15	652568	5566300	0.6	8.4	8.46	71.3	8.01	476
HE27-3		06-Aug-15	652507	5566355	0.6	9.3	8.65	75.1	7.90	502
HE27-4		07-Aug-15	652577	5566491	0.8	10.8	8.72	77.7	8.01	502
HE27-5		07-Aug-15	652499	5566466	0.8	9.4	9.01	78.5	8.05	494
MI16-1	Michel Wetland	08-Aug-15	665055	5489432	1.3	12.3	12.32	117.6	8.79	441
MI16-2		07-Aug-15	665049	5489392	1.8	10.8	6.67	60.5	7.95	453
MI16-3		07-Aug-15	665021	5489382	1.5	11.0	14.65	137.8	8.78	437
MI16-4		07-Aug-15	665058	5489397	1.1	12.0	11.94	116.8	8.95	453
MI16-5		08-Aug-15	665043	5489401	1.7	12.2	11.78	110.8	8.22	452
MIC2-1	Michel Creek Oxbow #2	07-Aug-15	659528	5496542	0.4	12.4	7.35	68.5	8.37	427
MIC2-2		07-Aug-15	659535	5496571	0.5	12.5	7.89	73.5	8.13	426
MIC2-3		06-Aug-15	659532	5496644	0.3	16.9	6.78	70.0	8.37	403
MIC2-4		07-Aug-15	659523	5496572	0.2	13.2	5.82	55.2	9.49	421
MIC2-5		07-Aug-15	659526	5496615	0.4	13.7	5.91	57.6	8.25	413
MIWW-1	Lower Michel Wetland	06-Aug-15	659704	5498454	0.2	9.1	5.49	47.3	7.71	433
MIWW-2		06-Aug-15	659692	5498474	0.3	9.6	8.05	70.8	7.96	427
MIWW-3		06-Aug-15	659694	5498515	0.2	10.7	4.33	38.9	7.82	433
MIWW-4		06-Aug-15	659696	5498518	0.1	11.7	9.94	91.9	7.91	414
MIWW-5		06-Aug-15	659678	5498469	0.3	12.8	6.35	60.4	8.25	416
OTTO-1	Otto Creek Ponds	11-Aug-15	653034	5513256	1.5	18.3	7.61	80.1	7.68	681
OTTO-2		11-Aug-15	652976	5513190	2.0	18.3	7.16	75.5	8.10	694
OTTO-3		11-Aug-15	652877	5513151	2.0	18.3	6.99	74.5	7.92	639
OTTO-4		11-Aug-15	653036	5513249	1.5	18.3	7.00	74.7	7.91	639
OTTO-5		11-Aug-15	652902	5513145	1.5	18.3	7.60	80.1	7.68	681
R5-1-1	Off channel area of Fording d/s Greenhills	14-Aug-15	653022	5545730	0.3	14.4	5.20	50.9	7.84	1,313
R5-1-2		14-Aug-15	653013	5545719	0.3	15.0	6.87	68.4	8.88	1,286
R5-1-3		14-Aug-15	653012	5545711	0.3	15.1	8.58	85.4	9.14	1,280
R5-1-4		14-Aug-15	653021	5545721	0.3	14.5	6.06	59.9	8.69	1,302
R5-1-5		14-Aug-15	653014	5545716	0.3	15.3	6.88	68.2	8.93	1,285

Table C.47: *In Situ* Water Quality Measurements at Mine-exposed Lentic Areas Sampled for Sediment Quality Evaluation, August 2015

Area ID	Area Description	Sample Date	UTM (NAD83, 11U)		Station Depth (m)	Temperature (°C)	Dissolved Oxygen		pH	Specific Conductance (µS/cm)
			Easting	Northing			(mg/L)	(% sat)		
R5-3-1	Lentic area off Fording River d/s Josephine Falls	9-Aug-15	652344	5540103	0.3	18.5	10.71	92.3	7.77	649
R5-3-2		9-Aug-15	652346	5540064	0.3	9.2	10.30	91.3	7.84	643
R5-3-3		9-Aug-15	652353	5540039	0.5	9.7	11.25	100.6	7.86	649
R5-3-4		10-Aug-15	652348	5540082	0.4	7.8	10.67	90.2	7.60	649
R5-3-5		10-Aug-15	652340	5540074	0.3	7.7	10.51	88.8	7.56	650
STPD-1	Stanford Pond	6-Aug-15	639888	5483077	0.5	17.0	9.98	102.5	7.55	325
STPD-2		6-Aug-15	639888	5483134	0.5	16.9	10.99	113.1	7.86	322
STPD-3		6-Aug-15	639844	5483160	0.5	17.0	11.01	113.2	8.00	319
STPD-4		6-Aug-15	639865	5483096	0.5	17.6	11.01	116.3	8.14	323
STPD-5		6-Aug-15	639843	5483186	0.5	18.7	10.87	116.9	8.07	323
Sample Size (n)					**25**	**25**	**25**	**25**	**25**	**25**
Minimum					**0.1**	**7.7**	**4.33**	**38.9**	**7.55**	**319**
Maximum					**2.0**	**18.7**	**11.25**	**116.9**	**9.14**	**1,313**
Median					**0.3**	**15.1**	**8.05**	**80.1**	**7.91**	**643**

Table C.48: Water Chemistry at Lentic Areas Sampled in May 2015

	Analytes	Units	Reference		Mine-exposed									
			FLA1	UWNMO	MIWW	MIC2	MI16	GO13	GO13 DUP	OTTO	EROL	ELWDGC	ERUP	STPD
			11-May-15	13-May-15	13-May-15	13-May-15	13-May-15	13-May-15	13-May-15	13-May-15	11-May-15	11-May-15	11-May-15	11-May-15
Physical Tests	Total Suspended Solids	mg/L	<1.0	<1.0	<1.0	<1.0	38.3	<1.0	27.8	5.2	1.1	1.2	1.0	<1.0
	Total Dissolved Solids	mg/L	233	230	235	145	176	706	705	555	257	390	277	224
	Turbidity	NTU	0.53	0.35	2.73	1.02	0.39	16.0	7.30	4.60	1.14	1.19	1.89	0.49
	pH	-	8.26	8.35	8.37	8.21	8.35	8.36	8.34	8.37	8.26	8.23	8.28	8.32
Anions, Nutrients and Carbon	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	176	162	163	86.5	131	205	160	254	212	279	238	120
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	<1.0	3.9	4.5	<1.0	3.0	5.0	5.1	10.1	<1.0	<1.0	2.7	1.6
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	177	166	167	86.5	134	210	165	264	212	279	241	122
	Ammonia, Total (as N)	mg/L	0.0161	0.0076	<0.0050	<0.0050	0.0097	0.0278	0.0216	0.0213	<0.0050	0.0077	<0.0050	0.0052
	Bromide (Br)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	0.15	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl)	mg/L	<0.50	6.45	2.92	<0.50	<0.50	9.8	9.8	31.2	7.69	7.19	<0.50	2.24
	Fluoride (F)	mg/L	0.096	0.262	0.151	0.115	0.165	0.174	0.174	0.304	0.102	0.194	0.219	0.145
	Hardness (as $CaCO_3$)	mg/L	190	186	207	113	151	536	540	426	241	354	263	196
	Nitrate (as N)	mg/L	0.0117	0.0733	0.0533	0.184	0.0793	1.96	1.97	0.030	0.119	0.0526	<0.0050	0.792
	Nitrite (as N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0086	0.0081	<0.0020	0.0012	<0.0010	<0.0010	0.0051
	Total Kjeldahl Nitrogen	mg/L	0.132	0.181	0.133	0.094	0.258	0.287	0.145	0.242	0.154	0.192	0.220	0.145
	Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	<0.0010	0.0062	<0.0010	0.0010	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Phosphorus (P)	mg/L	0.0040	0.0033	0.0028	0.0102	0.0044	0.0134	0.0112	0.0094	0.0042	0.0053	0.0161	0.0048
	Sulphate (SO_4)	mg/L	1.47	38.4	36.3	25.6	33.3	295	297	109	12.8	57.0	21.7	39.8
	Dissolved Organic Carbon	mg/L	1.61	1.23	1.48	1.81	1.98	0.90	0.95	2.06	1.19	2.86	2.35	1.02
	Total Organic Carbon	mg/L	1.24	1.29	1.33	1.87	2.06	5.43	5.70	2.85	1.35	2.88	2.37	1.15
Total Metals	Aluminum (Al)	mg/L	0.0191	0.0087	0.0049	0.0303	0.0103	0.0863	0.0718	0.0479	0.0134	0.0218	0.0098	0.0101
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00035	0.00034	0.00015	<0.00010	0.00014	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.00028	0.00138	0.00016	0.00023	0.00020	0.00022	0.00021	0.00056	0.00025	0.00029	0.00038	0.00018
	Barium (Ba)	mg/L	0.0377	0.0367	0.132	0.0562	0.0494	0.105	0.106	0.206	0.139	0.0998	0.101	0.0916
	Beryllium (Be)	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000024	<0.000020	<0.000020
	Bismuth (Bi)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000077	<0.000050	<0.000050
	Boron (B)	mg/L	<0.010	0.018	0.017	<0.010	0.012	0.023	0.024	0.079	<0.010	0.029	0.013	<0.010
	Cadmium (Cd)	mg/L	<0.0000050	0.0000242	0.0000254	0.0000213	<0.0000050	0.0000097	0.0000206	0.0000372	0.0000117	0.0000149	<0.0000050	0.0000087
	Calcium (Ca)	mg/L	58.7	52.2	62.9	32.3	40.2	110	109	99.8	72.5	98.9	63.2	56.1
	Chromium (Cr)	mg/L	0.00024	0.00027	0.00014	0.00018	0.00018	0.00016	0.00014	0.00032	0.00019	0.00015	0.00014	0.00029
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	0.00014	0.00032	<0.00010	0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00054	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)	mg/L	0.024	<0.010	0.014	0.034	0.018	0.057	0.052	0.371	0.207	0.132	0.278	0.045
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000075	0.000065	0.000071	<0.000050	0.000073	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	0.0200	0.0088	0.0026	0.0050	0.0249	0.0244	0.0424	0.0030	0.0232	0.0073	0.0047
	Magnesium (Mg)	mg/L	11.5	14.5	13.9	8.77	13.1	60.7	59.8	39.6	13.2	25.7	25.9	13.9
	Manganese (Mn)	mg/L	0.00220	0.00032	0.00187	0.00410	0.00089	0.00444	0.00426	0.135	0.0204	0.0248	0.0234	0.00490
	Mercury (Hg)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)	mg/L	0.000223	0.000892	0.000680	0.000617	0.000572	0.00265	0.00259	0.00235	0.000633	0.00145	0.000871	0.000914
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00102	0.00104	0.00200	<0.00050	0.00073	0.00053	<0.00050
	Phosphorus (P)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)	mg/L	0.39	0.69	0.81	0.48	0.42	1.61	1.59	2.34	0.46	1.02	0.62	0.52
	Rubidium (Rb)	mg/L	0.00027	0.00071	0.00033	0.00021	<0.00020	0.00142	0.00138	0.00079	<0.00020	0.00032	0.00025	0.00021
	Selenium (Se)	mg/L	0.000147	0.000662	0.00102	0.00127	0.00106	0.0473	0.0471	0.00140	0.00142	0.00197	0.000244	0.00535
	Silicon (Si)	mg/L	2.95	1.65	2.18	1.60	0.556	2.61	2.57	3.69	2.28	4.00	2.19	1.41
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	0.957	8.36	4.84	1.40	3.59	6.73	6.71	23.1	6.62	8.28	2.85	2.56
	Strontium (Sr)	mg/L	0.0657	0.129	0.238	0.0781	0.135	0.332	0.323	0.680	0.123	0.491	0.206	0.151
	Sulphur (S)	mg/L	0.66	13.7	13.0	8.98	11.9	103	102	37.0	4.30	19.9	7.70	14.0
	Thallium (Tl)	mg/L	<0.000010	0.000025	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	0.000022	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	0.00039	<0.00030	<0.00030	0.00033	<0.00030	<0.0012	<0.0012	<0.0012	0.00031	0.00032	<0.00030	<0.00030
	Uranium (U)	mg/L	0.000307	0.000752	0.000472	0.000326	0.000578	0.00282	0.00271	0.000788	0.000556	0.00127	0.00104	0.000743
	Vanadium (V)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00056	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)	mg/L	<0.0030	0.0064	<0.0030	<0.0030	0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0037	<0.0030	<0.0030
	Zirconium (Zr)	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Aluminum (Al)	mg/L	0.0020	0.0014	0.0010	0.0027	0.0014	0.0050	0.0057	<0.0010	0.0037	0.0015	<0.0010	0.0012
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00034	0.00032	0.00014	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.00025	0.00147	0.00013	0.00024	0.00018	0.00017	0.00019	0.00043	0.00021	0.00020	0.00029	0.00016
	Barium (Ba)	mg/L	0.0377	0.0345	0.132	0.0621	0.0494	0.104	0.104	0.209	0.140	0.0990	0.0994	0.0908
	Beryllium (Be)	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)	mg/L	<0.010	0.016	0.014	<0.010	0.011	0.021	0.021	0.078	<0.010	0.027	0.013	<0.010
	Cadmium (Cd)	mg/L	<0.0000050	0.0000096	0.0000250	0.0000172	0.0000059	<0.0000050	<0.0000050	0.0000256	0.0000083	0.0000105	<0.0000050	0.0000062
	Calcium (Ca)	mg/L	57.8	51.5	60.5	31.4	39.6	112	112	102	74.5	99.3	63.2	55.9
	Chromium (Cr)	mg/L	0.00010	0.00014	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00010	0.00031	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	<0.00020	<0.00020	0.00022	0.00030	0.00021	0.00020	0.00026	0.00039	<0.00020	0.00034	<0.00020	<0.00020
	Iron (Fe)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.029	0.015	0.058	<0.010
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	0.0205	0.0085	0.0025	0.0050	0.0241	0.0240	0.0431	0.0029	0.0234	0.0076	0.0045
	Magnesium (Mg)	mg/L	11.2	13.9	13.5	8.51	12.7	62.5	63.1	41.4	13.3	25.7	25.6	13.8
	Manganese (Mn)	mg/L	0.00215	0.00025	0.00161	0.00411	0.00078	0.00327	0.00309	0.126	0.0198	0.0215	0.0223	0.00254
	Mercury (Hg)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)	mg/L	0.000181	0.000828	0.000560	0.000538	0.000515	0.00250	0.00251	0.00231	0.000563	0.00117	0.000790	0.000815
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00090	0.00079	0.00189	<0.00050	0.00064	<0.00050	<0.00050
	Phosphorus (P)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)	mg/L	0.37	0.67	0.79	0.45	0.41	1.63	1.64	2.36	0.45	1.00	0.62	0.49
	Selenium (Se)	mg/L	0.000136	0.000715	0.00122	0.00131	0.00117	0.0539	0.0542	0.00151	0.00148	0.00205	0.000254	0.00566
	Silicon (Si)	mg/L	2.93	1.58	2.11	1.53	0.530	2.60	2.60	3.78	2.31	4.01	2.17	1.39
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	0.917	8.55	4.78	1.53	3.55	6.71	6.76	23.6	6.73	8.07	2.82	2.55
	Strontium (Sr)	mg/L	0.0578	0.131	0.227	0.0749	0.134	0.326	0.324	0.685	0.119	0.492	0.215	0.147
	Sulphur (S)	mg/L	0.60	13.8	12.6	8.84	11.5	101	104	36.9	3.95	19.3	7.40	13.5
	Thallium (Tl)	mg/L	<0.000010	0.000022	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000020	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)	mg/L	0.000259	0.000710	0.000409	0.000302	0.000548	0.00261	0.00264	0.000763	0.000544	0.00125	0.00103	0.000705
	Vanadium (V)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)	mg/L	<0.0010	0.0049	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	0.0032	<0.0010	0.0012
	Zirconium (Zr)	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Table C.49: Water Chemistry at Lentic Areas Sampled for Sediment Toxicity Supporting Study (Minnow 2016d), September 2015

Analytes		Units	Reference			Mine-exposed				
			FLA1	LCHO	LML	GO13	MI16	OTTO	R5-1	STPD
			21-Sep-15	20-Sep-15	20-Sep-15	18-Sep-15	21-Sep-15	18-Sep-15	20-Sep-15	18-Sep-15
Physical	Total Suspended Solids (TSS)	mg/L	< 1.0	< 1.0	< 1.0	2.8	< 1.0	5.4	1.6	3.2
	Total Dissolved Solids (TDS)	mg/L	203	109	164	693	294	435	643	148
	Turbidity	NTU	0.49	0.34	0.54	1.73	0.45	5.35	1.99	2.44
Ions & Nutrients	Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	233	103	137	210	147	247	43.3	117
	Alkalinity, Carbonate (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	13.3	< 1.0
	Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Alkalinity, Total (as $CaCO_3$)	mg/L	233	103	137	210	147	247	56.7	117
	Ammonia, Total (as N)	mg/L	0.0062	< 0.005	0.0238	0.0082	0.0128	0.327	0.013	0.0374
	Bromide (Br)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.197	0.356	< 0.05
	Chloride (Cl)	mg/L	< 0.5	< 0.5	< 0.5	12.1	0.98	27.2	109	0.87
	Fluoride (F)	mg/L	0.061	0.045	0.086	0.117	0.131	0.165	0.112	0.11
	Hardness (as $CaCO_3$)	mg/L	170	105	134	522	227	315	383	126
	Nitrate (as N)	mg/L	0.0224	0.016	< 0.005	1.76	0.35	< 0.005	< 0.005	0.0845
	Nitrite (as N)	mg/L	< 0.001	0.0011	0.001	0.0081	0.0025	< 0.001	< 0.001	0.0026
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.123	< 0.05	0.452	0.095	0.081	0.498	0.624	0.313
	Orthophosphate-Dissolved (as P)	mg/L	< 0.001	0.0079	< 0.001	< 0.001	0.002	0.0013	0.0025	0.0011
	Phosphorus (P)-Total	mg/L	0.0049	0.012	0.0098	0.006	0.0067	0.0103	0.0148	0.0139
	Sulphate (SO_4)	mg/L	1.67	5.61	2.26	316	94.8	88.9	263	16.5
	Organic Carbon, Dissolved (DOC)	mg/L	0.75	0.96	5.68	1.28	1.3	2.45	9.64	2.21
	Organic Carbon, Total (TOC)	mg/L	0.84	0.81	5.69	1.29	1.27	2.47	10.1	2.07
Total Metals	Aluminum (Al)	mg/L	0.0057	< 0.015	< 0.015	< 0.015	< 0.015	0.041	< 0.015	0.024
	Antimony (Sb)	mg/L	< 0.0001	< 0.0005	< 0.0005	0.00056	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	0.0003	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00136	0.00152	< 0.0005
	Barium (Ba)	mg/L	0.0387	0.115	0.0859	0.0974	0.091	0.81	0.0156	0.0591
	Beryllium (Be)	mg/L	< 0.00002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000005	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	53.1	27.2	32.4	102	63.1	82.2	63.1	36.7
	Chromium (Cr)	mg/L	0.00016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	0.00061	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Iron (Fe)	mg/L	0.014	< 0.05	< 0.05	0.056	< 0.05	0.884	< 0.05	0.107
	Lead (Pb)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.001	< 0.005	< 0.005	0.0307	0.0085	0.0317	0.0561	< 0.005
	Magnesium (Mg)	mg/L	10.7	9.34	13.6	61.6	18	31.4	51.1	9.38
	Manganese (Mn)	mg/L	0.00059	0.00129	0.00183	0.0206	0.00285	0.136	0.00531	0.0086
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.000223	0.00068	0.00058	0.00231	0.00052	0.00971	0.00138	0.00096
	Nickel (Ni)	mg/L	< 0.0005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	0.0028	< 0.0025
	Phosphorus (P)	mg/L	< 0.05	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.38	0.71	0.9	1.73	0.86	3.13	3.83	0.61
	Selenium (Se)	mg/L	0.000149	0.0006	< 0.00025	0.0272	0.00166	0.00033	0.00506	0.00123
	Silicon (Si)	mg/L	2.99	2.13	4.66	2.85	2.01	3.5	4.48	1.02
	Silver (Ag)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	1.02	0.62	0.71	6.74	3.83	7.92	46.4	0.77
	Strontium (Sr)	mg/L	0.0617	0.0728	0.0395	0.382	0.224	0.373	0.321	0.0835
	Sulphur (S)	mg/L	< 1.0	2.2	1.2	107	32.6	9.7	92.3	6.1
	Thallium (Tl)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000278	0.000248	0.000137	0.00267	0.000632	0.000464	0.00077	0.000593
	Vanadium (V)	mg/L	< 0.0005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.003	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
	Zirconium (Zr)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Dissolved Metals	Aluminum (Al)	mg/L	0.0013	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0075	< 0.005
	Antimony (Sb)	mg/L	< 0.0001	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Arsenic (As)	mg/L	0.00023	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00133	< 0.0005
	Barium (Ba)	mg/L	0.0372	0.112	0.0844	0.0969	0.0876	0.138	0.0151	0.0558
	Beryllium (Be)	mg/L	< 0.00002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Bismuth (Bi)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Boron (B)	mg/L	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	0.053	< 0.05	< 0.05
	Cadmium (Cd)	mg/L	< 0.000005	< 0.000025	0.000029	< 0.000025	< 0.000025	< 0.000025	< 0.000025	< 0.000025
	Calcium (Ca)	mg/L	51.5	26.9	30.9	102	60.8	69.7	61.2	35.5
	Chromium (Cr)	mg/L	0.00015	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Cobalt (Co)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Copper (Cu)	mg/L	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	Iron (Fe)	mg/L	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Lead (Pb)	mg/L	< 0.00005	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
	Lithium (Li)	mg/L	< 0.001	< 0.005	< 0.005	0.0297	0.0075	0.0393	0.0536	< 0.005
	Magnesium (Mg)	mg/L	10	9.12	13.7	65.1	18.1	34.4	55.8	9.07
	Manganese (Mn)	mg/L	0.00053	0.00115	0.0006	0.019	0.00285	0.00237	0.00242	0.00131
	Mercury (Hg)	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
	Molybdenum (Mo)	mg/L	0.000203	0.00074	0.00057	0.00227	0.00052	0.00178	0.00128	0.00085
	Nickel (Ni)	mg/L	< 0.0005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Phosphorus (P)	mg/L	< 0.05	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
	Potassium (K)	mg/L	0.37	0.7	0.87	1.7	0.79	2.16	3.69	0.58
	Selenium (Se)	mg/L	0.00018	0.00084	< 0.00025	0.0273	0.00167	0.00081	0.00541	0.00095
	Silicon (Si)	mg/L	2.9	2	4.84	2.87	2.1	3.07	4.68	0.96
	Silver (Ag)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Sodium (Na)	mg/L	0.984	0.6	0.68	6.65	3.68	12.4	44.6	0.74
	Strontium (Sr)	mg/L	0.0583	0.0748	0.0384	0.376	0.218	0.425	0.318	0.0795
	Sulphur (S)	mg/L	< 1.0	2	1	104	31	29.5	87.1	5.5
	Thallium (Tl)	mg/L	< 0.00001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
	Tin (Sn)	mg/L	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
	Titanium (Ti)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
	Uranium (U)	mg/L	0.000261	0.000289	0.000168	0.00257	0.000618	0.000654	0.00075	0.000566
	Vanadium (V)	mg/L	< 0.0005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
	Zinc (Zn)	mg/L	< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Zirconium (Zr)	mg/L	< 0.0003	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015

Table C.50: Acute Toxicity Test Results, 2015 - 2016[a]

Management Unit	Teck Water Station Code	ENV EMS Number	Stream Name	Area Description	Sample Date	% Mortality	
						Daphnia magna	Rainbow Trout
1	FR_CC1	E102481	Clode Creek	Decant from Clode sediment pond	11-May-15	0	0
					22-May-15	3	0
					6-Jul-15	0	0
					6-Oct-15	0	0
					3-Feb-16	3.3	0
					10-May-16	0	0
					3-Aug-16	0	0
					5-Oct-16	0	0
	FR_EC1	E102480	Eagle Creek	Sedimentation pond decant	27-Jan-15	0	0
					11-May-15	0	0
					8/Seo/15	0	0
					24-Sep-15	0	0
					7-Oct-15	0	0
					15-Mar-16	0	0
					5-Oct-16	0	0
					8-Feb-16	0	0
	FR_LMP1	-	Lake Mountain Creek	Lake Mountain sediment pond decant (initiated 2017)	6-Dec-16	0	0
	FR_SP1	E261897	Smith Pond	Sediment pond decant	12-Jan-15	0	0
					11-Mar-15	-	0
					11-May-15	0	0
					22-Jul-15	0	0
					6-Oct-15	0	0
					2-Apr-16	63	0
					2-Nov-16	-	-
					5-Oct-16	0	0
					8-Mar-16	13.3	0
					15-Nov-16	37	0
	FR_SKP1	E208394	Kilmarnock Settling Pond 1	Kimarnock outflow from settling pond	11-May-15	0	0
					11-Aug-15	0	0
	FR_SKP2	E208395	Kilmarnock Settling Pond 2	Kimarnock outflow from settling pond	2-Jun-15	0	0
	FR_FRABEC1	-	Fording River	u/s Eagle Pond discharge (EC1)	24-Sep-15	0	0
	FR_MULTIPLATE	-	Fording River	Multiplate Culvert on Greenhills Access Road	24-Sep-15	3	0
	GH_SC1	E221329	Swift Creek	sediment pond decant	10-May-16	0	0
					2-Aug-16	0	0
					15-Nov-16	0	0
	GH_SC2	E105061	Swift Creek	sediment pond bypass	1-Jun-15	0	0
					2-Nov-15	100	0
	GH_CC1	200384	Cataract Creek	sediment pond decant	2-Mar-15	17	0
					1-Jun-15	90	0
					27-Jul-15	70	0
					7-Dec-15	77	10
					3-Feb-16	100	0
					10-May-16	100	0
					27-May-16	10	-
					2-Aug-16	100	0
					15-Nov-16	100	0
	GH_PC1	200385	Porter Creek	sediment pond decant	2-Mar-15	0	0
					1-Jun-15	0	0
					27-Jul-15	0	0
					2-Nov-15	0	0
					3-Feb-16	0	0
					10-May-16	0	0
					2-Aug-16	0	0
					15-Nov-15	17	0
	GH_FR1	200251	Fording River	d/s GHO and Greenhills Cr.	2-Jun-15	0	0
					28-Jul-15	0	0
	GH_GH1	E102709	Greenhills Creek	sediment pond decant	2-Mar-15	0	0
					27-Jul-15	0	0
					2-Nov-15	0	0
					7-Mar-16	3.3	0
					6-Jun-16	0	0
					8-Aug-16	0	0
					5-Dec-16	0	0
2	LC_LCUSWLC	E293369	Line Creek	d/s rock drain, u/s West Line Cr. and AWTF outfall	6-Jan-15	0	0
	LC_LC3	200337	Line Creek	d/s West Line Cr. and AWTF outfall	6-Jan-15	0	0
					1-Oct-15	0	0
	LC_LCDSSLC	E297110	Line Creek	immediately d/s of South Line Cr. Confluence	24-Jun-15	0	0
					31-Oct-16	0	0
					15-Nov-16	0	0
					19-Dec-16	0	0
	LC_LC5	200028	Fording River	d/s Line Cr.	15-Nov-16	0	0
					19-Dec-16	0	0
3	GH_WADE	E287433	Wade Creek	at LRP Road culvert	3-Mar-15	73	0
					11-Mar-15	0	-
					2-Jun-15	7	0
					3-Nov-15	0	0
					8-Mar-16	0	0
					7-Jun-16	0	0
					15-Aug-16	0	0
	GH_COUGAR	E287432	Cougar Creek	at LRP Road culvert	2-Jun-15	0	0
					7-Jun-16	0	0
	GH_MC1	200388	Michelson Creek	at LRP Road culvert	3-Mar-15	0	0
					2-Jun-15	0	0
					28-Jul-15	0	0
					3-Nov-15	0	0
					8-Mar-16	0	0
					7-Jun-16	0	0
	GH_LC1	E257796	Leask Creek	sediment pond decant (goes to ground)	14-Sep-15	0	0
					15-Aug-16	0	0
	GH_WC1	E257795	Wolfram Creek	sediment pond decant (goes to ground)	7-Dec-15	0	0
					7-Jun-16	0	0
					9-Aug-16	0	0
					7-Dec-16	0	0

Test failure (>50% mortality)

'-' no data

[a] From Appendix F of Teck (2017), Appendix G of Teck (2016), and data downloaded from Teck's EQuIS database.

Table C.50: Acute Toxicity Test Results, 2015 - 2016[a]

Management Unit	Teck Water Station Code	ENV EMS Number	Stream Name	Area Description	Sample Date	% Mortality	
						Daphnia magna	Rainbow Trout
3	GH_TC1	E102714	Thompson Creek	sediment pond decant	3-Mar-15	0	0
					2-Jun-15	0	0
					28-Jul-15	0	0
					3-Nov-15	0	0
					8-Mar-16	0	0
					7-Jun-16	0	0
					9-Aug-16	13.3	0
					7-Dec-16	0	0
	GH_TC2	E305876	Thompson Creek	sediment pond decant	3-Mar-15	0	0
					2-Jun-15	0	0
					28-Jul-15	0	0
					3-Nov-15	0	0
					8-Mar-16	0	0
					7-Jun-16	0	0
					9-Aug-16	3.3	0
					7-Dec-16	0	0
	GH_ERC	E300090	Elk River	220 m d/s of Thompson Cr.and d/s all GHO	2-Jun-15	0	0
					28-Jul-15	0	0
4	EV_HC1	E102682	Harmer Creek	dam/spillway at d/s end of Harmer Pond	3-Feb-15	3	0
	EV_SM1	E102681	Six Mile Creek	sediment pond decant	3-Feb-15	0	0
					5-May-15	0	0
					7-Jul-15	-	0
					22-Jul-15	0	-
					6-Oct-15	0	0
					2-Feb-16	0	0
					6-Jun-16	0	0
					11-Jul-16	0	0
					3-Oct-16	0	0
	EV_LC1	E258135	Lindsay Creek	Lindsay Creek infiltration basin discharge	3-Feb-15	0	0
					5-May-15	0	0
					22-Jul-15	0	-
					6-Oct-15	0	0
					2-Feb-16	0	0
					9/26/2016	0	10
					10-Mar-16	0	0
	EV_GC2	E208043	Goddard Creek	sediment pond decant	3-Feb-15	0	0
					5-May-15	0	0
					7-Jul-15	0	0
					6-Oct-15	0	0
					2-Feb-16	0	0
					8-Jun-16	0	0
					13-Jul-16	0	0
					3-Oct-16	3	0
	EV_OC1	E102679	Otto Creek	near mouth (~80m upstream of Elk R.)	3-Feb-15	0	0
					5-May-15	0	0
					7-Jul-15	0	0
					6-Oct-15	0	0
					2-Feb-16	0	0
					6-Jun-16	0	0
					11-Jul-16	0	0
					3-Oct-16	0	0
	CM_MC2	E258937	Michel Creek	d/s Corbin Cr. and CMO, 50 m u/s Andy Good Cr.	3-Jun-15	0	0
	CM_CCPD	E206438	Corbin Sediment Pond	Decant discharge from Corbin Sediment Pond	3-Mar-15	0	0
					3-Jun-15	7	20
					28-Sep-15	0	0
					5-Nov-15	0	0
					2-Mar-16	46.7	0
					2/23/2016	0	-
					6-Jan-16	0	0
					8-Mar-16	0	0
					11-Feb-16	3	0
					11/15/2016	0	0
					11/30/2016	0	0
	CM_PC2	E298733	Pengelly Channel	Pengelly channel decant	16-Mar-15	0	0
					3-Jun-15	3	70
					6-Jan-16	0	0
					11-Feb-16	0	20
	CM_SPD	E102488	Main Pond	Main pond decant	Mar 03 2015	0	0
					Jun 03 2015	0	0
					Sep 28 2015	0	0
					Nov 04 2015	0	0
					2-Mar-16	13.3	0
					6-Jan-16	0	0
					8-Mar-16	0	0
					11-Feb-16	0	0
					11/15/2016	0	0
					11/23/2016	0	30
					11/30/2016	0	0
					12/21/2016	0	10
	CM_CC1	200209	Corbin Creek	near mouth and d/s CMO	15-Nov-16	0	0
					23-Nov-16	0	20
					30-Nov-16	0	0
					21-Dec-16	0	0
	EV_EC1	200097	Erickson Creek	at CPR main line near mouth	4-Feb-15	0	0
					5-May-15	0	0
					7-Jul-15	-	0
					22-Jul-15	0	-
					6-Oct-15	0	0
					2-Feb-16	0	0
					7-Jun-16	0	0
					12-Jul-16	0	0
					4-Oct-16	0	0

Test failure (>50% mortality)

'-' no data

[a] From Appendix F of Teck (2017a), Appendix G of Teck (2016a), and data downloaded from Teck's EQuIS database.

Table C.50: Acute Toxicity Test Results, 2015 - 2016[a]

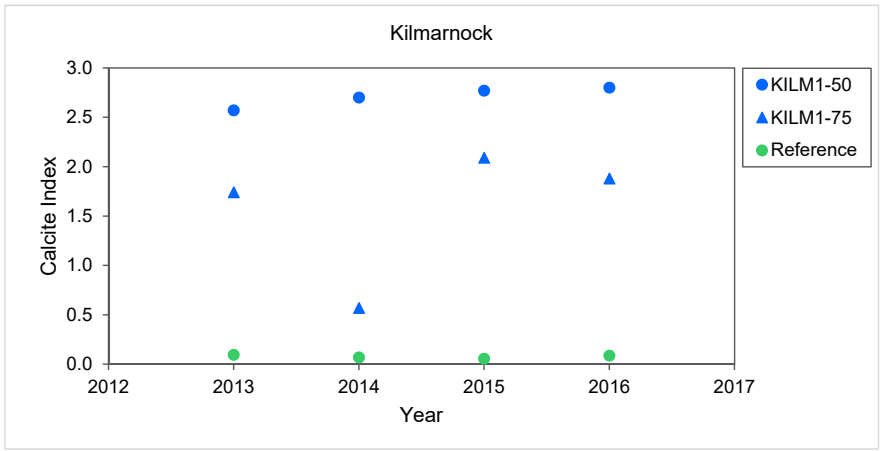
Management Unit	Teck Water Station Code	ENV EMS Number	Stream Name	Area Description	Sample Date	% Mortality	
						Daphnia magna	Rainbow Trout
4	EV_SP1	E296311	South Pit Creek	sediment pond decant	4-Feb-15	33.3	0
					5-May-15	0	0
					7-Jul-15	-	0
					22-Jul-15	0	-
					6-Oct-15	0	0
					2-Feb-16	0	0
					7-Jun-16	3.3	0
					12-Jul-16	0	0
					4-Oct-16	0	0
	EV_MG1	E208057	Milligan Pond	sediment pond decant	4-Mar-15	0	0
					5-May-15	0	0
					7-Jul-15	-	0
					22-Jul-15	0	-
					6-Oct-15	0	0
					2-Feb-16	0	0
					7-Jun-16	0	0
					12-Jul-16	0	0
					4-Oct-16	0	0
	EV_GT1	E206231	Gate Creek	sediment pond decant	18-Feb-15	0	10
					5-May-15	0	0
					7-Jul-15	-	0
					22-Jul-15	0	-
					6-Oct-15	0	0
					2-Feb-16	0	0
					8-Jun-16	0	0
					13-Jul-16	0	0
					4-Oct-16	0	10
	EV_BC1	E102685	Bodie Creek	sediment pond decant	11-Mar-15	0	0
					6-May-15	0	0
					7-Jul-15	-	0
					22-Jul-15	0	-
					6-Oct-15	0	0
					2-Feb-16	0	0
					8-Jun-16	0	0
					13-Jul-16	0	0
					8-Aug-16	0	0
	EV_MC2	E300091	Michel Creek	between Bodie Cr. and Aqueduct Cr., d/s HWY #3 bridge (Shell Plant)	4-Feb-15	0	0
	EV_AQ1	E210369	Aqueduct Creek	at Great Northern Road	11-Mar-15	0	0
					5-May-15	0	0
					7-Jul-15	-	0
					28-Sep-15	3	-
					7-Mar-16	0	0
					7-Jun-16	0	0
					12-Jul-16	0	0
					17-Oct-16	0	0
	EV_DC1	E298590	EVO Dry Creek	-	3-Feb-15	0	0
					5-May-15	0	0
					22-Jul-15	0	-
					6-Oct-15	0	0
					2-Feb-16	100	0
					15-Feb-16	0	0
					6-Jun-16	0	0
					3-Oct-16	0	0

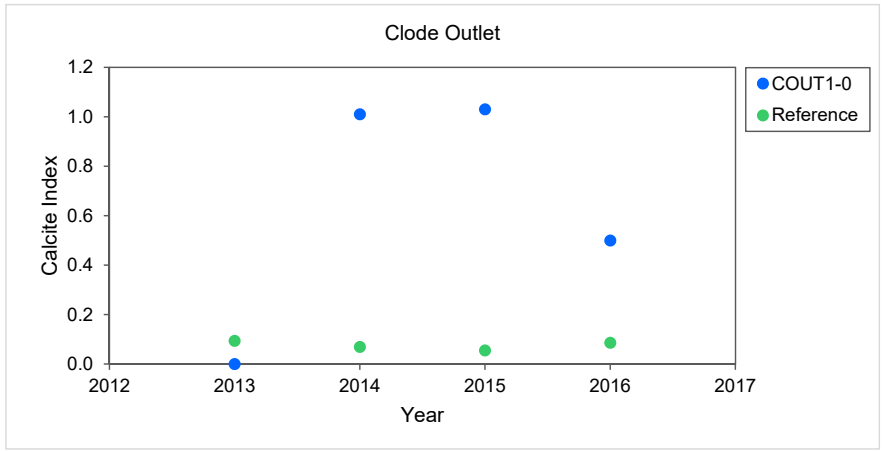
Test failure (>50% mortality)

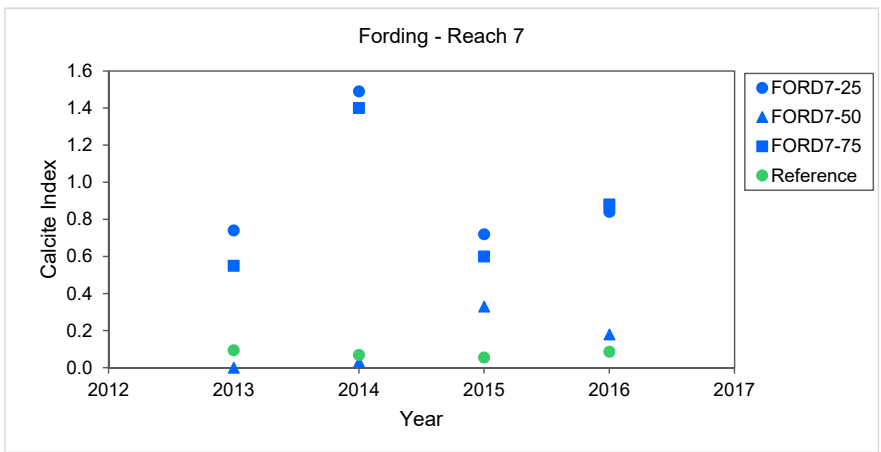
'-' no data

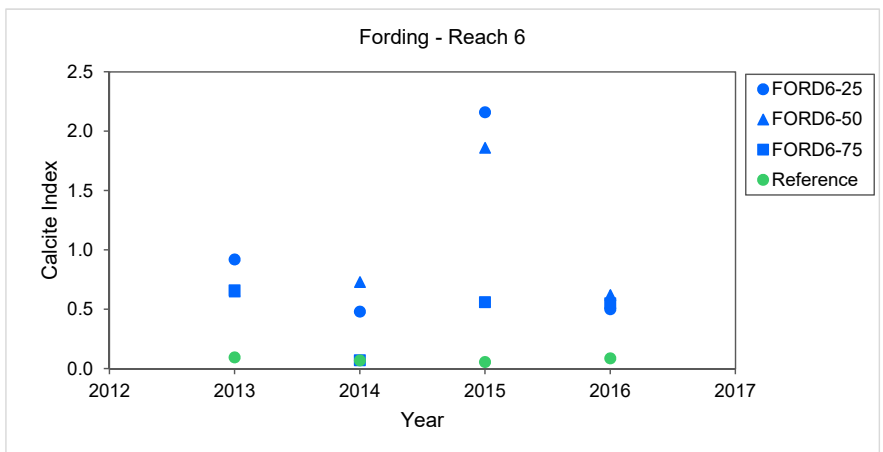
[a] From Appendix F of Teck (2017a), Appendix G of Teck (2016a), and data downloaded from Teck's EQuIS database.

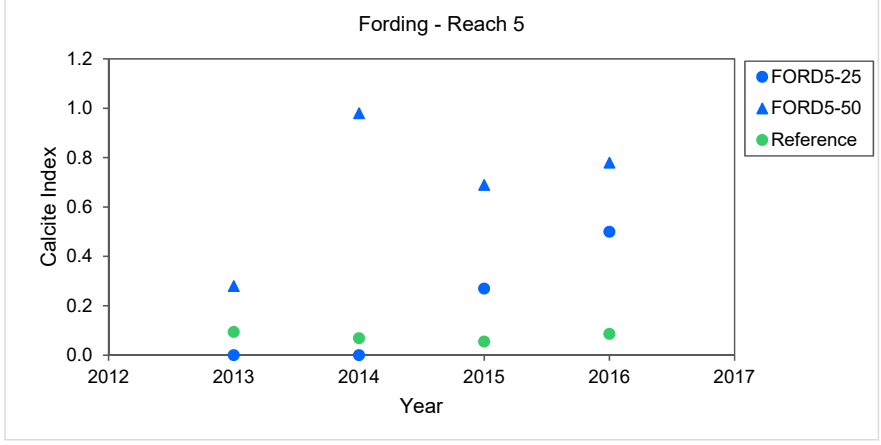
APPENDIX D
CALCITE

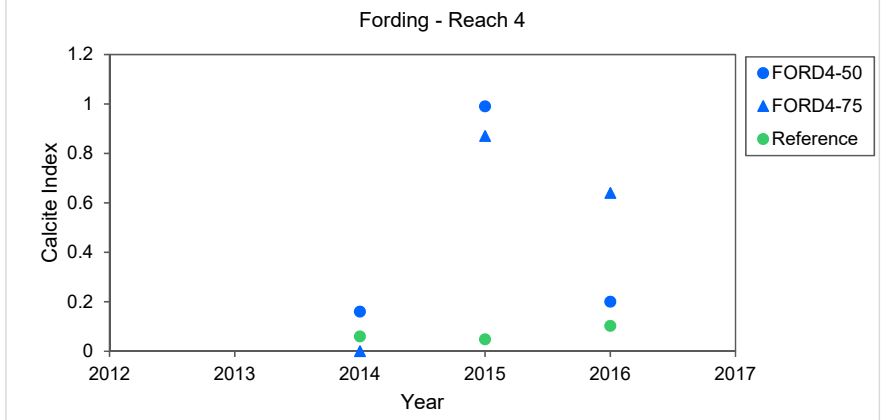


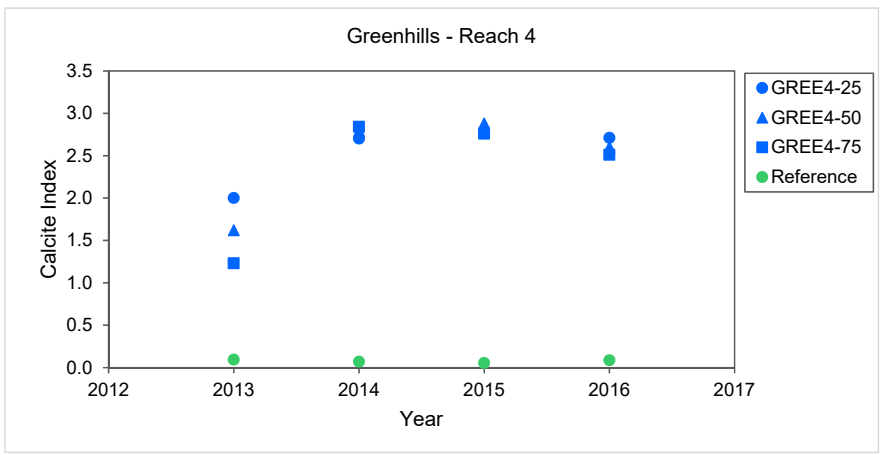


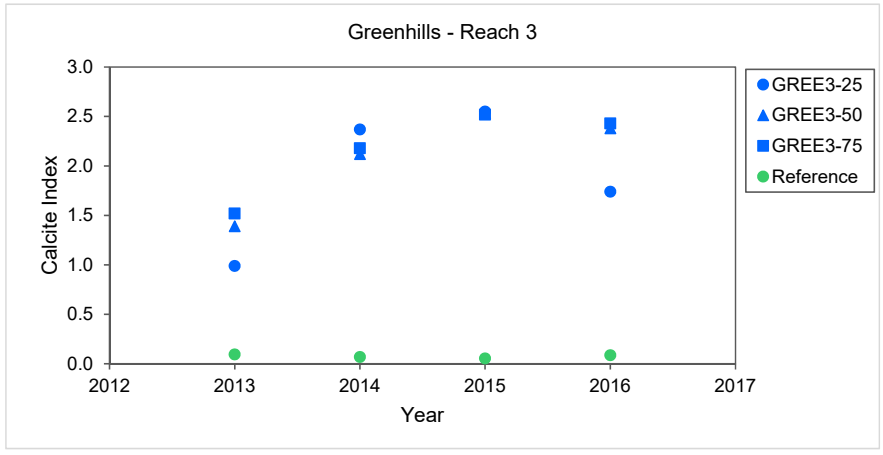


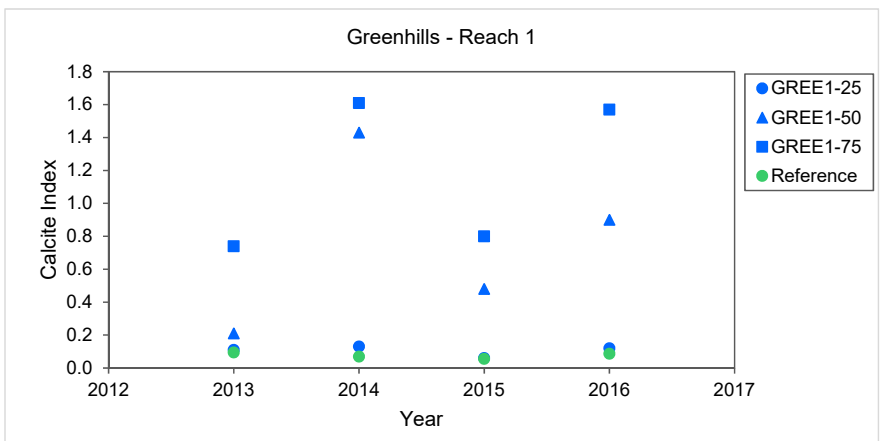


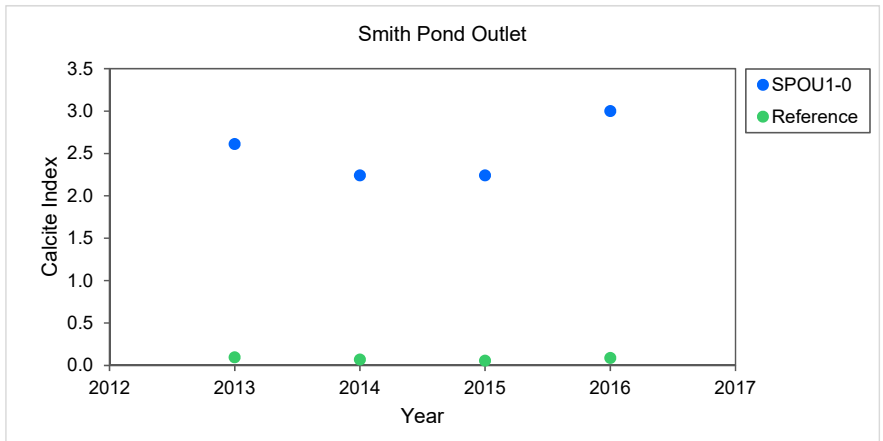


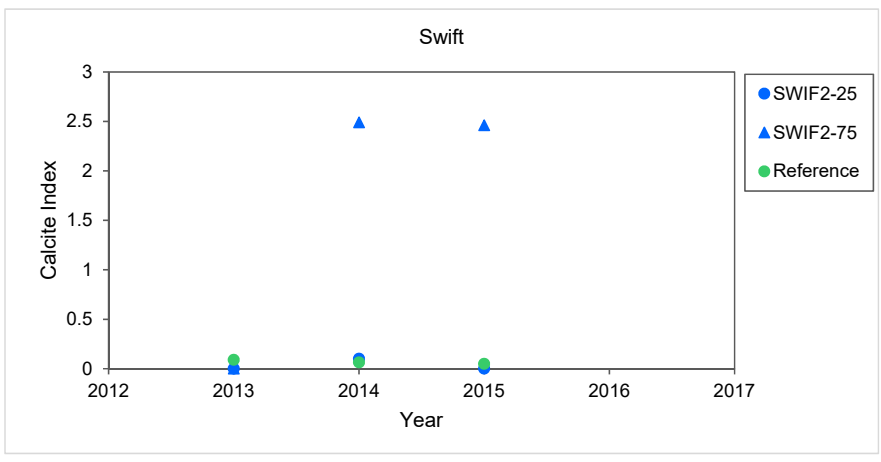












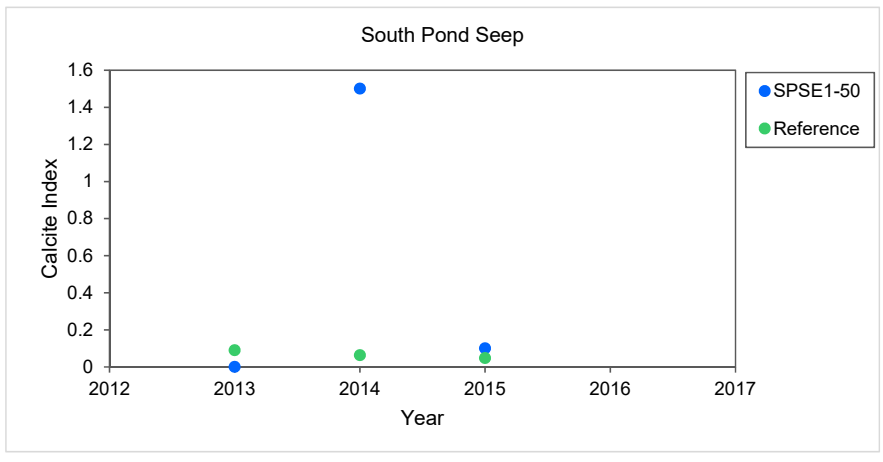
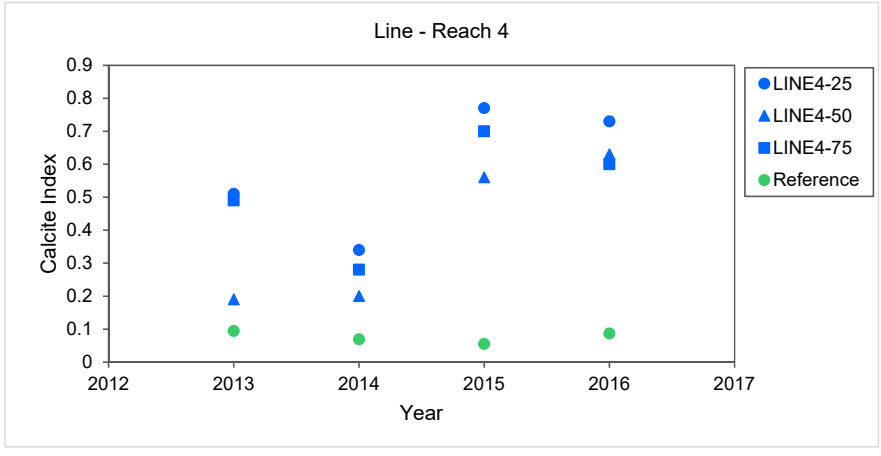
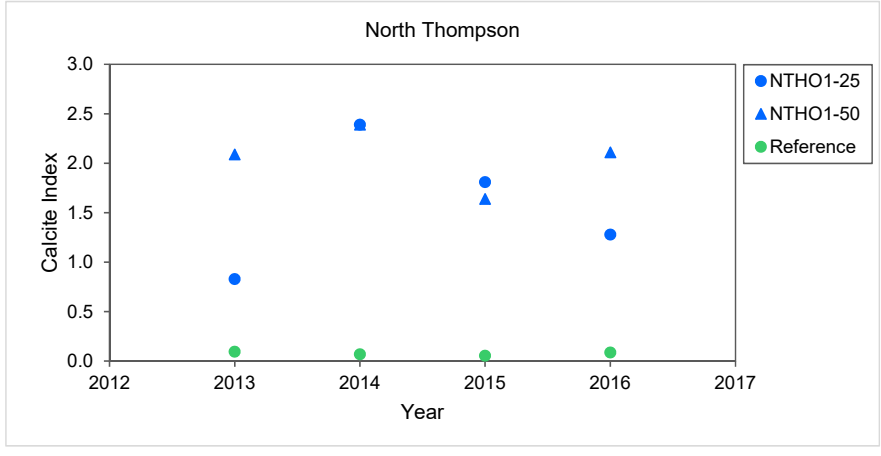
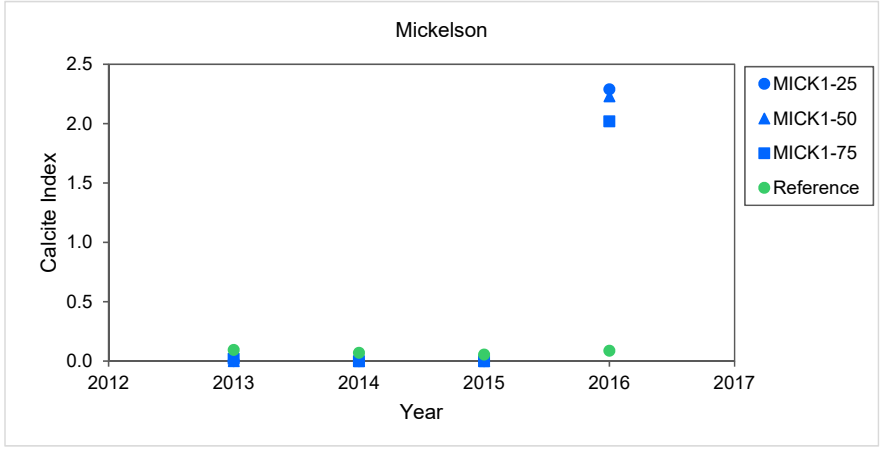


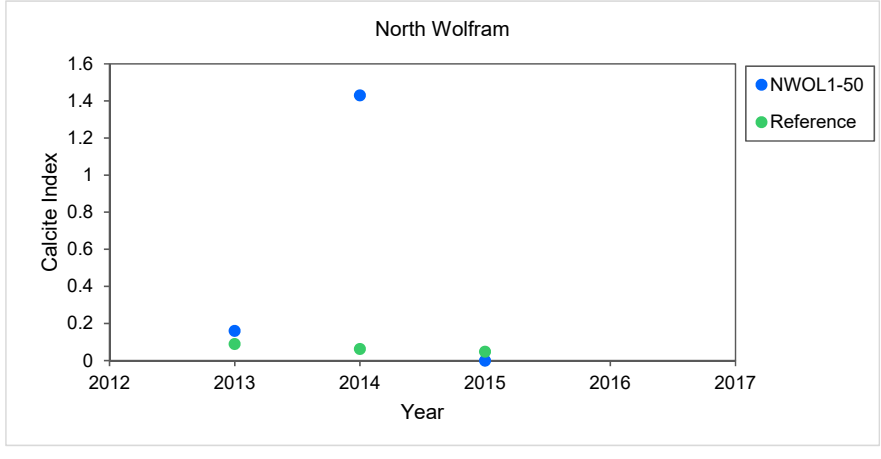
Figure D.1: Scatterplots of Calcite Index versus Year for the Mean Reference and Mine-exposed Stations within Reaches that had at Least One Significant Contrast with an Increase Relative to Reference

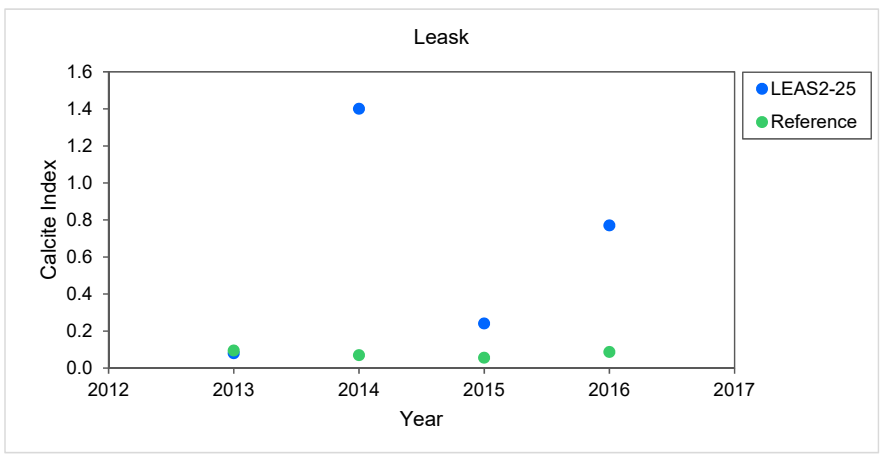
Note: Reference means in each plot represent the means of the reference area data used in that specific contrast

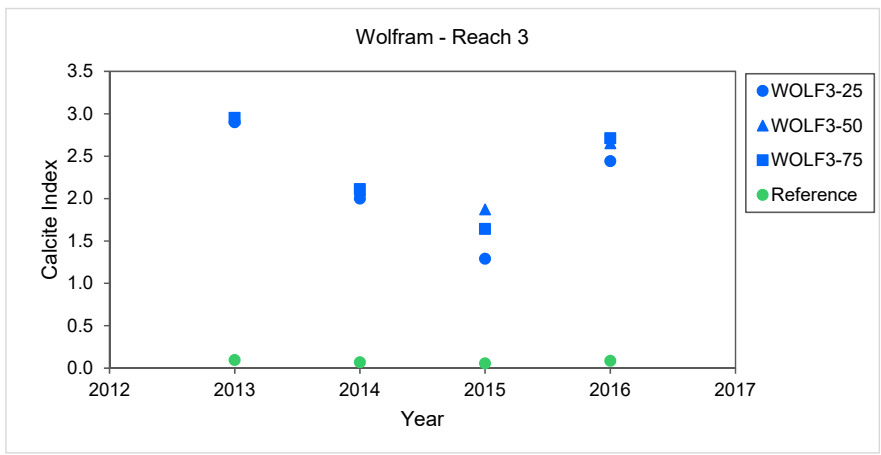


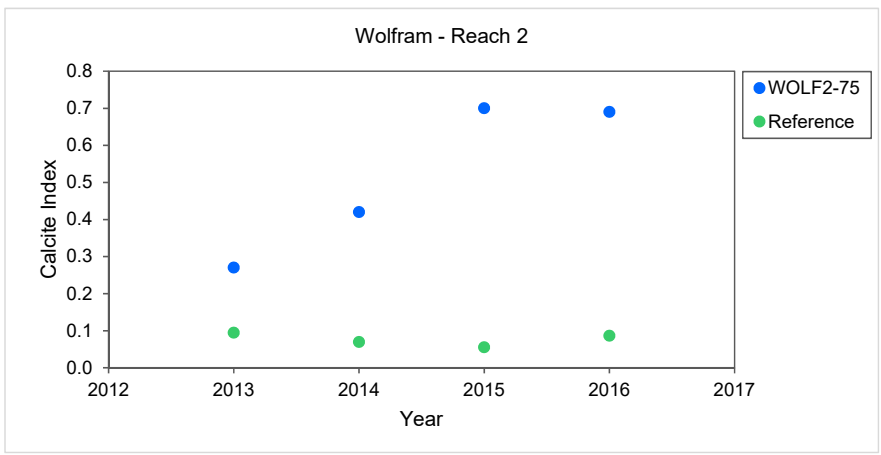


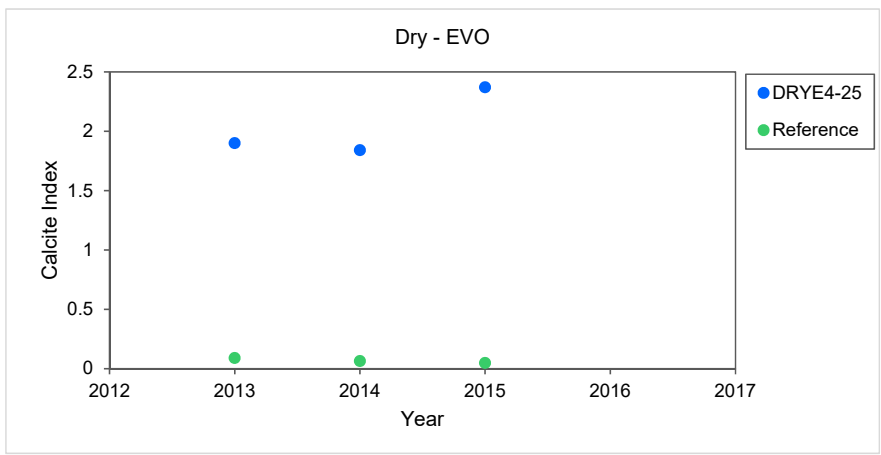


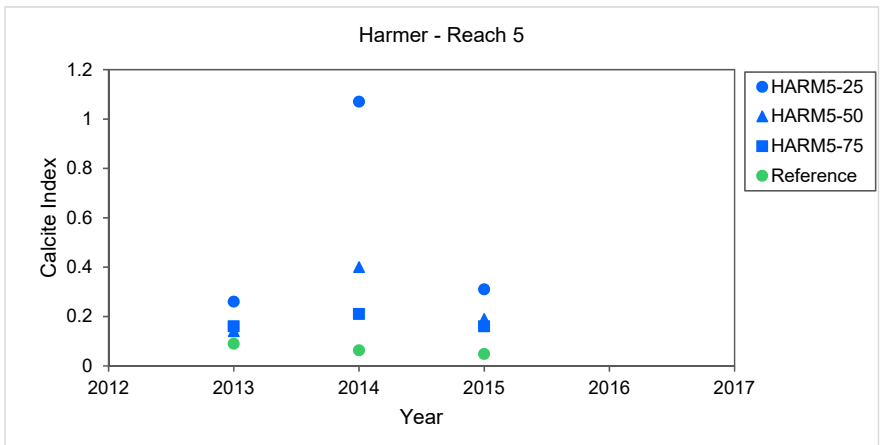


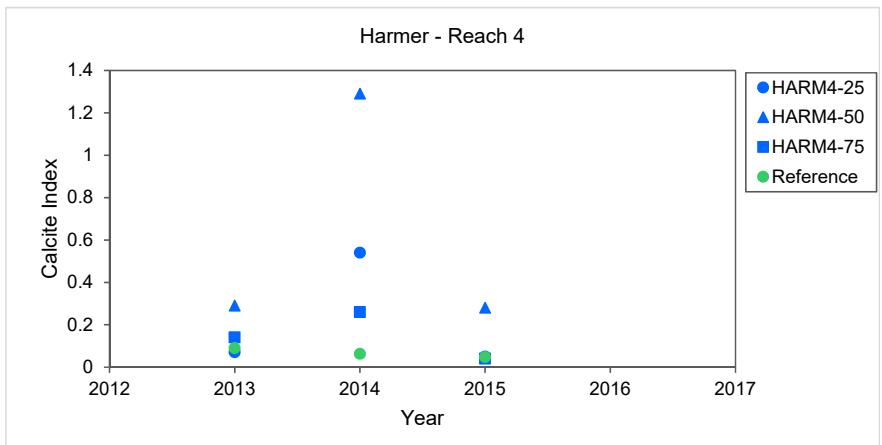


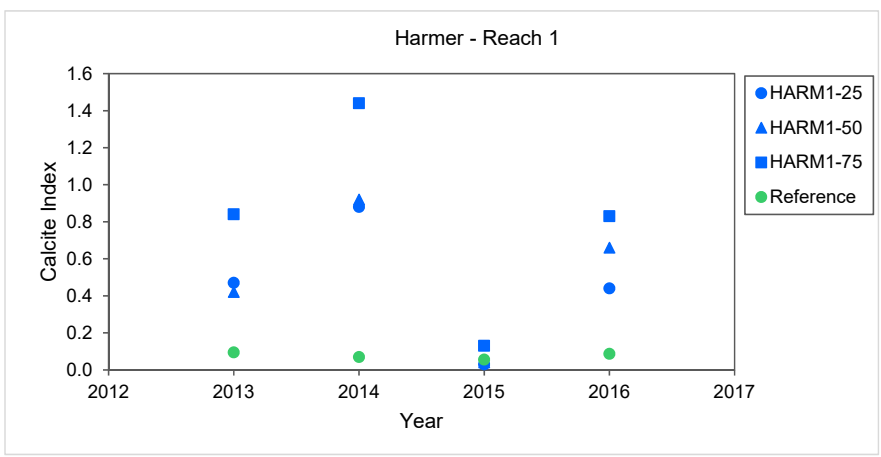












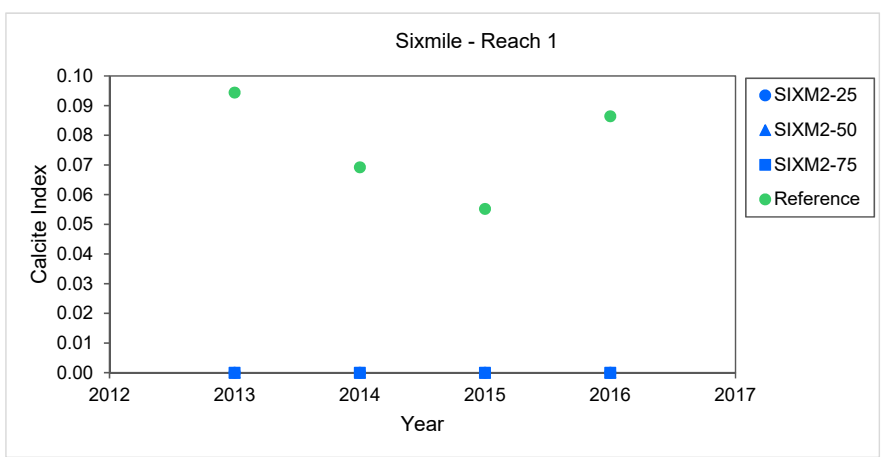
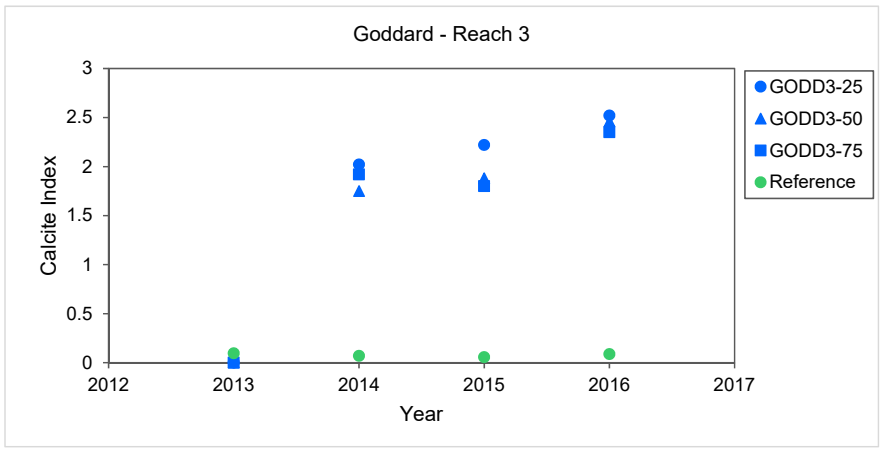
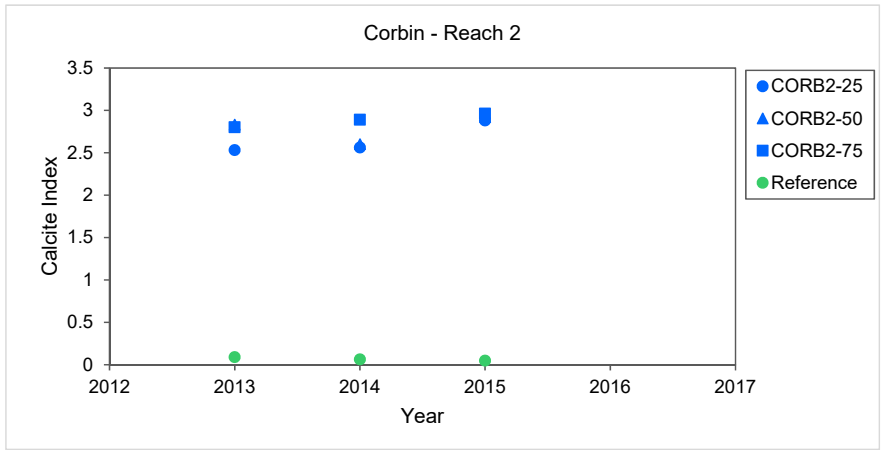
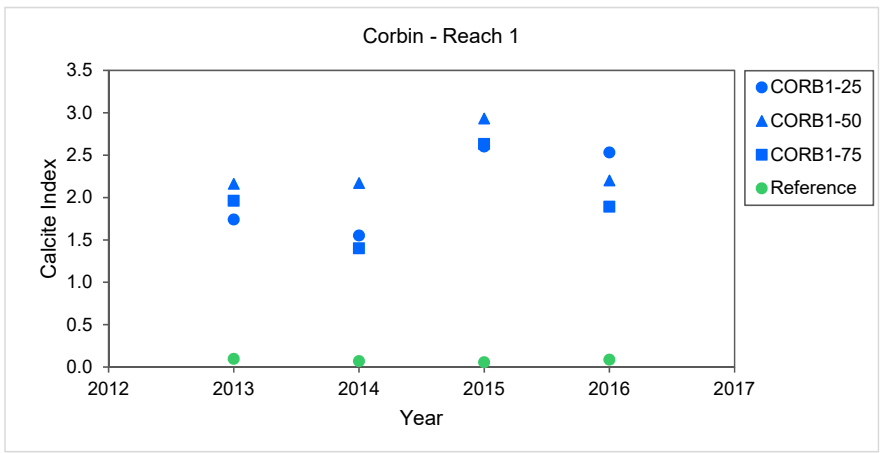


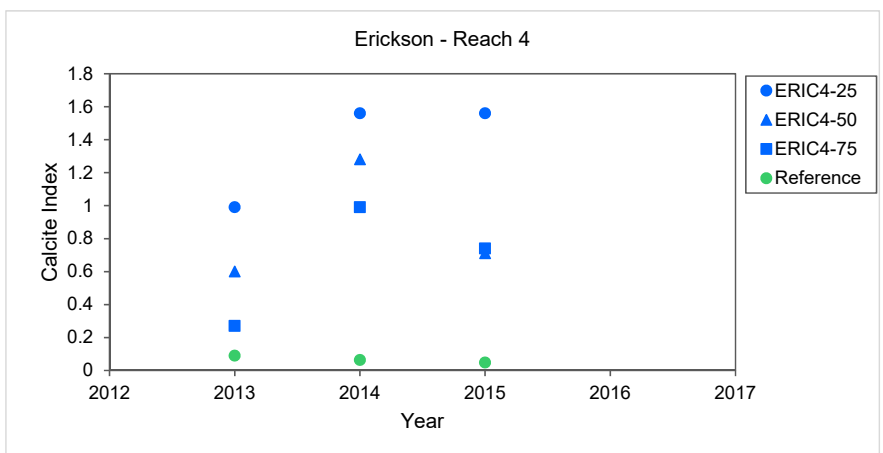
Figure D.1: Scatterplots of Calcite Index versus Year for the Mean Reference and Mine-exposed Stations within Reaches that had at Least One Significant Contrast with an Increase Relative to Reference

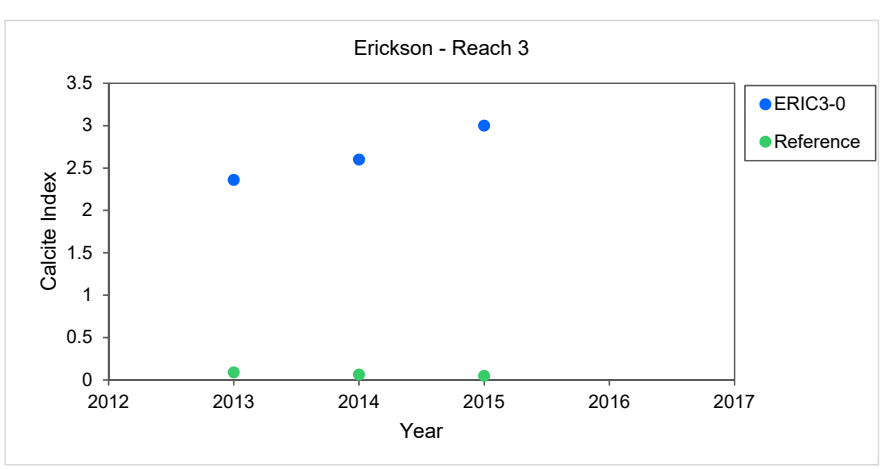
Note: Reference means in each plot represent the means of the reference area data used in that specific contrast

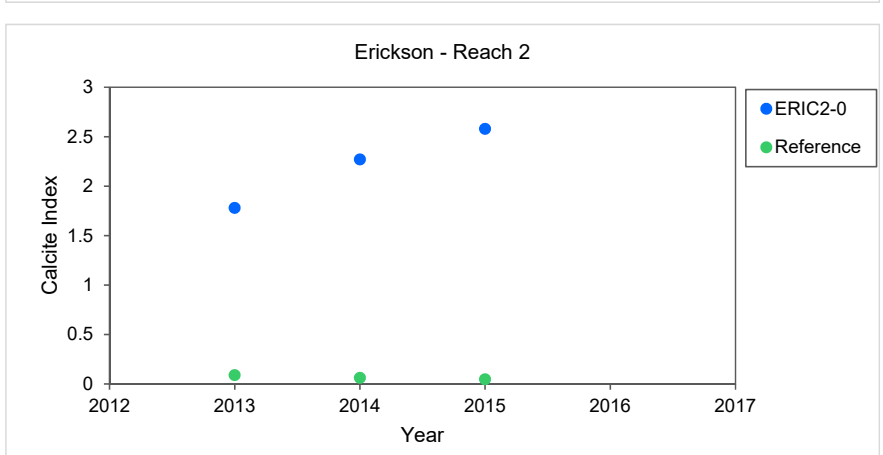


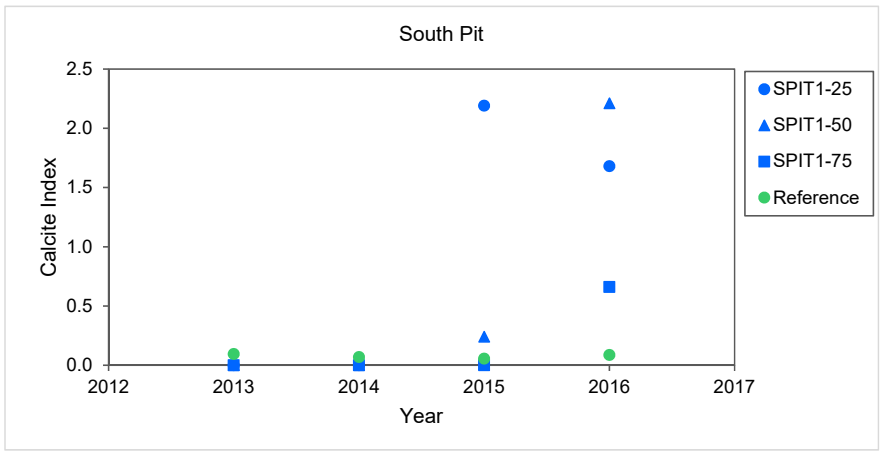


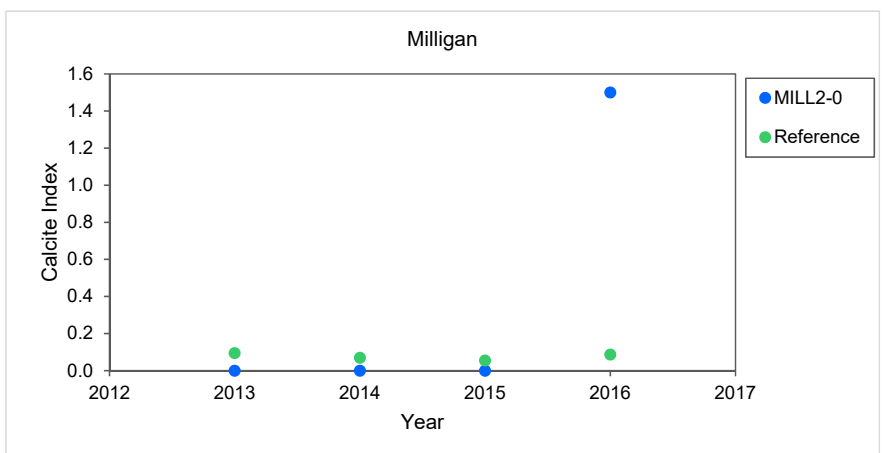


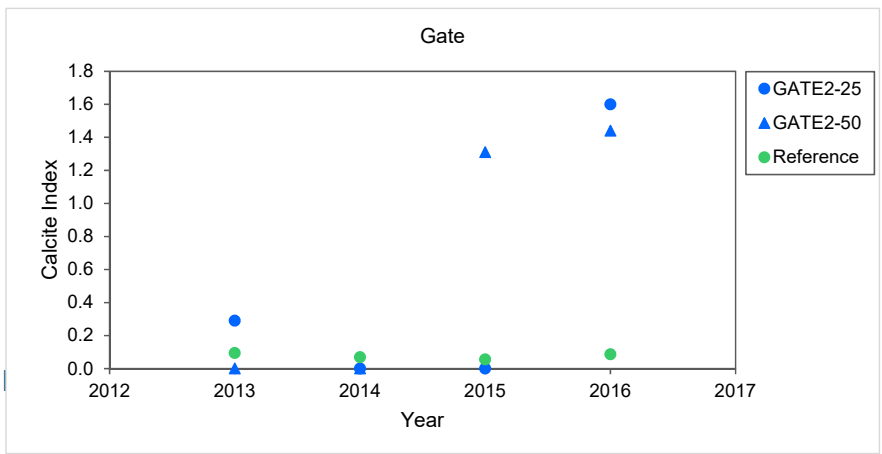


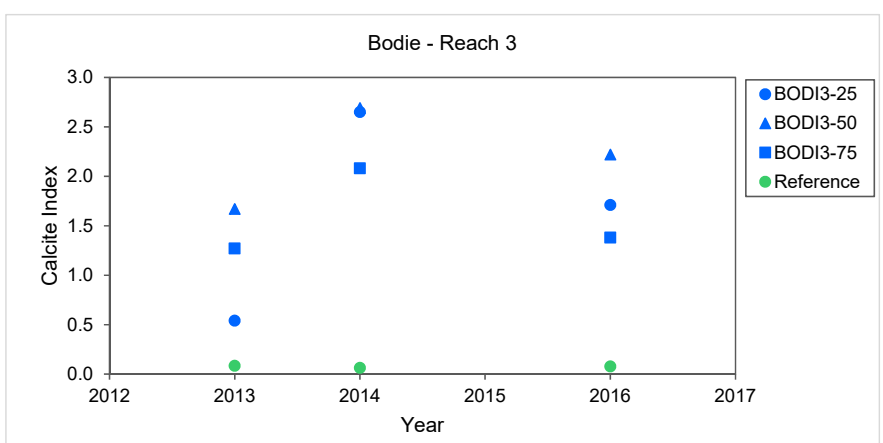












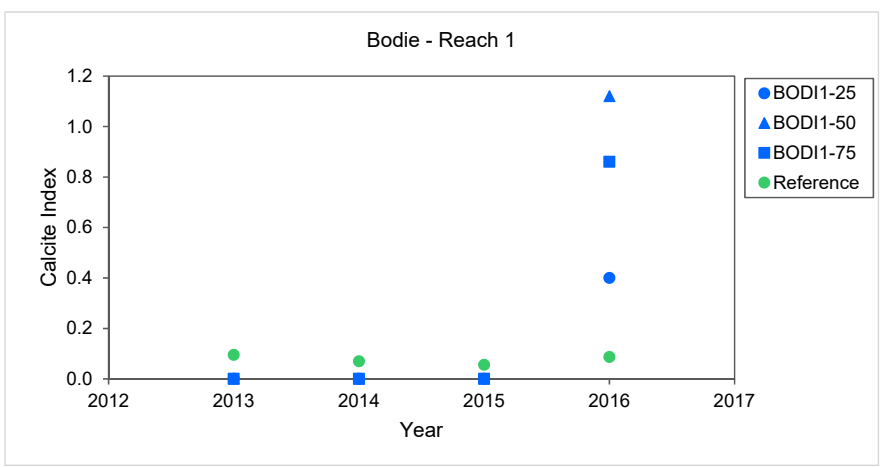


Figure D.1: Scatterplots of Calcite Index versus Year for the Mean Reference and Mine-exposed Stations within Reaches that had at Least One Significant Contrast with an Increase Relative to Reference

Note: Reference means in each plot represent the means of the reference area data used in that specific contrast

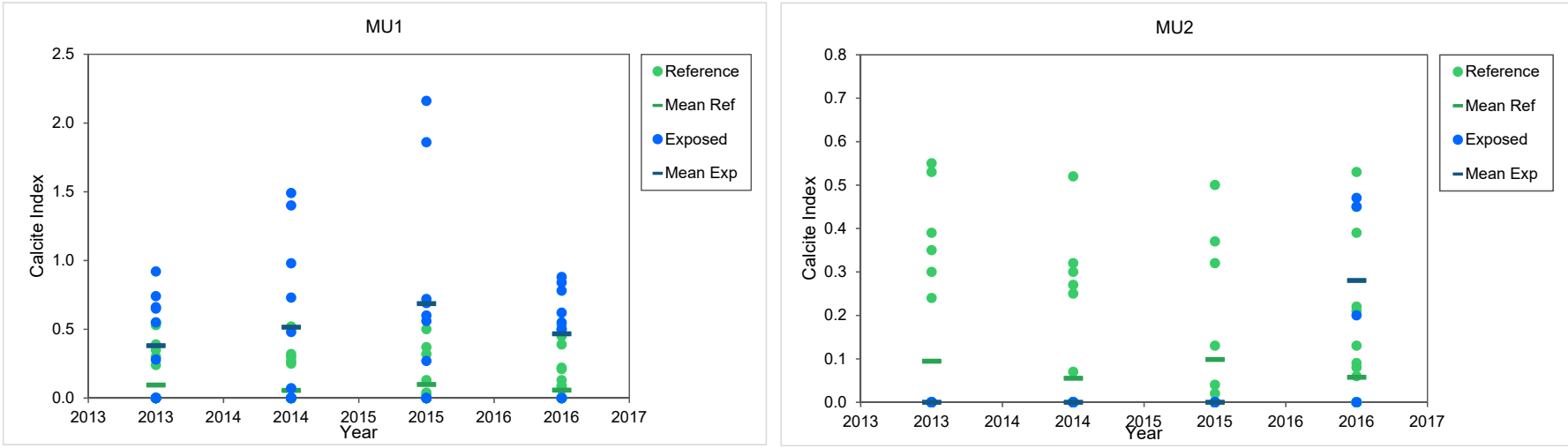


Figure D.2: Scatterplots of Calcite Index versus Year for the Mean Reference and Main Stem Mine-exposed Stations by Management Unit for Comparisons that had at Least One Significant Contrast with an Increase Relative to Reference

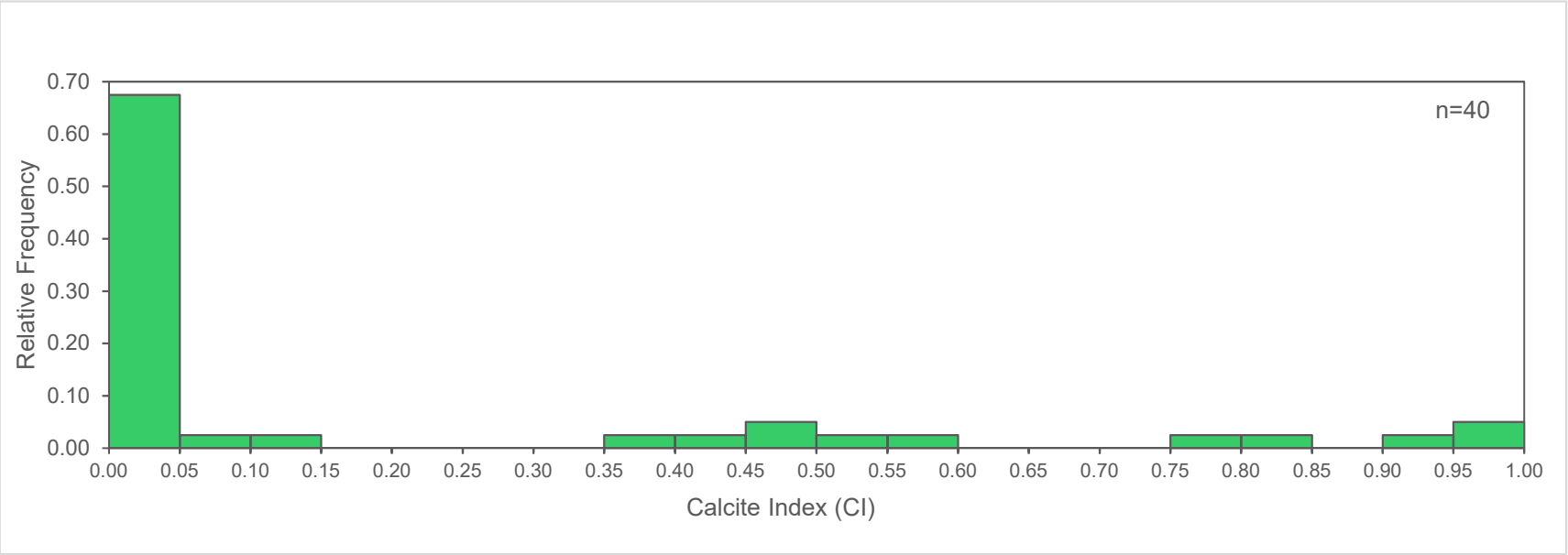


Figure D.3: Distribution of Reference Area Calcite Index Values, September 2015

Notes: 2.5th and 97.5th percentiles are 0 and 0.97, respectively. The upper limit of the normal range (i.e., the 97.5th percentile) was rounded to 1.

Measured concurrently with invertebrate samples

Table D.1: Results for the Analysis of Temporal Changes in Calcite Index over Time by Reach for Reaches Sampled from 2013 to 2016

Manage-ment Unit	Stream Name	Reach	Number of Stations	Linear		Step after 2013		Step after 2014		Step after 2015	
				P-value	Magnitude Change (CI units) [a]	P-value	Magnitude Change (CI units) [b]	P-value	Magnitude Change (CI units) [b]	P-value	Magnitude Change (CI units) [b]
1	Henretta	HENR3	1	0.865	-	0.868	-	0.898	-	ND	-
		HENR2	3	0.775	-	0.781	-	0.829	-	ND	-
		HENR1	3	0.950	-	0.878	-	0.935	-	0.931	-
	Fish Pond	FPON1	3	0.695	-	0.703	-	0.800	-	0.734	-
	Kilmarnock	KILM1	2	0.060	-	0.982	-	0.003	0.50	0.181	-
	Swift	SWIF1	1	0.842	-	0.396	-	0.856	-	0.899	-
	Gardine	GARD1	3	0.199	-	0.421	-	0.065	-	0.049	-0.31
	Cataract	CATA3	2	0.016	-0.40	0.011	-0.37	0.101	-	ND	-
		CATA1	1	0.970	-	0.926	-	0.961	-	0.959	-
	Porter	PORT3	1	<0.001	-1.6	<0.001	-1.3	<0.001	-1.0	0.002	-0.84
		PORT1	1	0.012	-0.16	0.056	-	ND	-	0.007	-0.15
	Clode Outlet	COUT1	1	0.126	-	0.001	0.87	0.233	-	0.460	-
	Fording	FORD11	3	0.775	-	0.781	-	0.829	-	ND	-
		FORD10	3	0.775	-	0.781	-	0.829	-	ND	-
		FORD9	3	0.933	-	0.867	-	0.913	-	0.865	-
		FORD8	3	0.121	-	0.076	-	0.363	-	ND	-
		FORD7	3	<0.001	0.21	0.573	-	<0.001	-0.10	<0.001	-0.03
		FORD6	3	<0.001	-0.18	<0.001	0.12	<0.001	0.47	<0.001	-0.36
		FORD5	2	0.105	-	0.784	-	0.012	0.26	0.015	0.26
		FORD4	3	0.001	0.50	ND	-	<0.001	0.56	0.112	-
		FORD3	2	0.813	-	0.817	-	0.858	-	ND	-
		FORD2	1	0.958	-	0.920	-	0.946	-	0.908	-
	LCO Dry	DRYL4	3	0.727	-	0.477	-	ND	-	0.725	-
		DRYL3	3	0.933	-	0.867	-	0.913	-	0.865	-
		DRYL2	3	0.933	-	0.867	-	0.913	-	0.865	-
		DRYL1	3	0.933	-	0.867	-	0.913	-	0.865	-
	Eagle Pond Outlet	EPOU1	1	<0.001	-1.7	<0.001	-1.2	<0.001	-1.2	<0.001	-1.1
	Greenhills	GREE4	3	<0.001	1.0	<0.001	1.1	<0.001	0.52	<0.001	0.19
		GREE3	3	<0.001	0.89	<0.001	1.0	<0.001	0.61	<0.001	0.15
		GREE1	3	<0.001	0.52	0.873	-	<0.001	-0.04	<0.001	0.23
	Smith Ponds Outlet	SPOU1	1	0.235	-	0.723	-	0.364	-	0.019	0.62
	Grassy	GRAS1	2	0.978	-	0.816	-	0.895	-	ND	-
	Swift	SWIF2	2	<0.001	1.3	<0.001	1.3	<0.001	0.61	ND	-
	South Pond Seep	SPSE1	1	0.543	-	<0.001	0.83	0.002	-0.62	ND	-
2	Line	LINE4	3	0.002	0.26	0.054	-	0.002	0.34	0.004	0.19
		LINE2	3	0.775	-	0.781	-	0.829	-	ND	-
		LINE3	3	0.775	-	0.781	-	0.829	-	ND	-
		LINE1	3	0.094	-	0.096	-	0.227	-	0.198	-
	Fording	FORD1	3	0.933	-	0.867	-	0.913	-	0.865	-
3	North Thompson	NTHO1	1	0.915	-	0.013	0.50	0.237	-	0.436	-
	Thompson	THOM3	3	0.775	-	0.781	-	0.829	-	ND	-
		THOM2	3	0.836	-	0.729	-	0.991	-	ND	-
		THOM1	1	0.491	-	0.709	-	0.593	-	0.430	-
	Elk	ELKR12	3	0.950	-	0.878	-	0.935	-	0.931	-
		ELKR11	2	0.813	-	0.817	-	0.858	-	ND	-
	Mickelson	MICK2	2	0.909	-	0.945	-	0.789	-	ND	-
		MICK1	3	<0.001	2.2	<0.001	0.74	<0.001	1.1	<0.001	2.2
	North Wolfram	NWOL1	1	0.594	-	0.004	0.59	<0.001	-0.77	ND	-
	South Wolfram	SWOL1	2	<0.001	-1.5	0.017	-0.34	<0.001	-1.9	ND	-
	Leask	LEAS2	1	0.350	-	0.005	0.75	0.324	-	0.484	-
	Wolfram	WOLF3	3	<0.001	-0.32	<0.001	-0.82	<0.001	-0.39	<0.001	0.39
		WOLF2	1	0.105	-	0.659	-	0.043	0.36	0.039	0.21
	Balmer	BALM1	1	0.970	-	0.926	-	0.961	-	0.959	-
4	Dry - EVO	DRYE4	1	0.028	0.51	0.230	-	0.009	0.53	ND	-
		DRYE3	3	0.095	-	0.078	-	0.144	-	0.384	-
		DRYE1	1	0.995	-	0.850	-	0.858	-	ND	-
	Feltham	FELT1	3	0.950	-	0.878	-	0.935	-	0.931	-
	Harmer	HARM5	3	0.595	-	0.047	0.24	0.277	-	ND	-
		HARM4	3	0.973	-	0.021	0.28	0.018	-0.28	ND	-
		HARM3	3	0.124	-	0.798	-	0.046	-0.14	0.050	-
		HARM1	3	<0.001	0.07	0.185	-	<0.001	-0.46	<0.001	0.06
	Lindsay	LIND1	3	0.954	-	0.778	-	0.850	-	0.831	-
	Grave	GRAV2	3	0.154	-	0.408	-	0.100	-	ND	-
		GRAV1	3	0.003	-0.39	0.152	-	<0.001	-0.54	0.061	-
	Elk	ELKR10	3	0.775	-	0.781	-	0.829	-	ND	-
		ELKR9	3	0.950	-	0.878	-	0.935	-	0.931	-
	Six Mile	SIXM2	3	0.967	-	1.000	-	0.661	-	ND	-
		SIXM1	3	<0.001	-0.14	0.011	0.00	<0.001	-0.42	<0.001	-0.19
	Pengelly	PENG1	1	0.796	-	0.831	-	0.863	-	0.798	-
	Fennelon	FENN1	3	0.950	-	0.878	-	0.935	-	0.931	-
	Goddard	GODD3	3	<0.001	2.5	<0.001	2.1	<0.001	1.3	<0.001	1.1
		GODD2	3	0.775	-	0.781	-	0.829	-	ND	-
		GODD1	1	0.958	-	0.920	-	0.946	-	0.908	-
	Otto	OTTO3	3	0.890	-	0.836	-	0.975	-	ND	-
		OTTO2	3	0.929	-	0.959	-	0.919	-	ND	-
		OTTO1	1	0.773	-	0.723	-	0.711	-	0.970	-
	Sawmill	SAWM2	2	0.003	-0.37	0.311	-	<0.001	-0.14	<0.001	-0.53
		SAWM1	3	0.272	-	0.855	-	0.512	-	0.025	-0.01
	Corbin	CORB2	3	0.082	-	0.331	-	0.041	0.24	ND	-
		CORB1	3	0.004	0.26	0.074	-	<0.001	0.64	0.671	-

P-value < 0.05
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast)

[a] Change in relative difference between mine-exposed and mean reference calcite index based on linear trends (from 2013 to 2016)

[b] Change in relative difference between mine-exposed and mean reference calcite index (step change)

Table D.1: Results for the Analysis of Temporal Changes in Calcite Index over Time by Reach for Reaches Sampled from 2013 to 2016

Manage-ment Unit	Stream Name	Reach	Number of Stations	Linear		Step after 2013		Step after 2014		Step after 2015	
				P-value	Magnitude Change (CI units) [a]	P-value	Magnitude Change (CI units) [b]	P-value	Magnitude Change (CI units) [b]	P-value	Magnitude Change (CI units) [b]
4	Michel	MICH4	3	0.933	-	0.867	-	0.913	-	0.865	-
		MICH3	2	0.813	-	0.817	-	0.858	-	ND	-
		MICH2	3	0.914	-	0.971	-	0.822	-	ND	-
		MICH1	3	0.051	-	0.050	-	0.156	-	0.143	-
	Erickson	ERIC4	3	0.003	0.42	<0.001	0.55	0.494	-	ND	-
		ERIC3	1	0.004	0.68	0.019	0.47	0.007	0.55	ND	-
		ERIC2	1	<0.001	0.84	<0.001	0.68	0.004	0.58	ND	-
		ERIC1	1	0.884	-	0.308	-	0.874	-	0.408	-
	South Pit	SPIT2	2	0.969	-	0.931	-	0.984	-	ND	-
		SPIT1	3	<0.001	1.5	<0.001	0.80	<0.001	1.2	<0.001	1.2
	Milligan	MILL2	1	<0.001	1.5	0.047	0.52	0.001	0.76	<0.001	1.5
		MILL1	1	0.865	-	0.868	-	0.898	-	ND	-
	Gate	GATE2	2	<0.001	1.4	0.002	0.60	<0.001	1.0	<0.001	1.2
	Aqueduct	AQUE3	3	0.775	-	0.781	-	0.829	-	ND	-
		AQUE2	2	0.813	-	0.817	-	0.858	-	ND	-
		AQUE1	1	0.970	-	0.926	-	0.961	-	0.959	-
	Bodie	BODI3	3	<0.001	0.62	<0.001	0.98	0.932	-	ND	-
		BODI1	3	<0.001	0.80	0.068	-	0.003	0.41	<0.001	0.78
	Pengelly	PENG1	1	0.796	-	0.831	-	0.863	-	0.798	-
	Qualtieri	QUAL1	1	0.970	-	0.926	-	0.961	-	0.959	-
5	Elk	ELKR8	3	0.058	-	0.018	-0.38	0.166	-	0.350	-

P-value < 0.05
Increase
Decrease

Notes: "ND" = not determined (insufficient data to test this contrast)

[a] Change in relative difference between mine-exposed and mean reference calcite index based on linear trends (from 2013 to 2016)

[b] Change in relative difference between mine-exposed and mean reference calcite index (step change)

Table D.2: Results for the Analysis of Temporal Changes in Calcite Index over Time for Main Stem Mine-exposed Stations by Management Unit, 2013 - 2016

Management Unit	Number of Stations	Linear		Step after 2013		Step after 2014		Step after 2015	
		P-value	Magnitude Change (CI units) [a]	P-value	Magnitude Change (CI units) [b]	P-value	Magnitude Change (CI units) [b]	P-value	Magnitude Change (CI units) [b]
1	11	0.158	-	0.033	0.19	0.063	-	0.512	-
2	4	0.104	-	0.395	-	0.208	-	0.039	0.36
3	3	0.950	-	0.877	-	0.935	-	0.931	-
4 Elk	3	0.950	-	0.877	-	0.935	-	0.931	-
4 Michel	6	0.343	-	0.261	-	0.508	-	0.574	-
5	3	0.059	-	0.019	-0.38	0.166	-	0.349	-

P-value < 0.05
Increase
Decrease

[a] Change in relative difference between mean mine-exposed and mean reference calcite index based on linear trends (from 2013 to 2016)

[b] Change in relative difference between mean mine-exposed and mean reference calcite index (step change)

Table D.3: Reference Sampling Areas and Calcite Measurements for the Calcite-Biological Effects Study, September 2015 (Minnow 2016b)

Management Unit	Stream Name	Biological Area Code	Area Description	UTM (NAD83, 11U)		2015				Alternative Area Code (other studies)
				Easting	Northing	Sample Date	Calcite Presence Score (Clp)	Calcite Concretion Score (Clc)	Calcite Index (CI)	
-	Bull River	BU2	Bull River	631852	5505579	13-Sep-15	0	0	0	
		BU40	Bull River 40 km Bridge	626589	5499846	13-Sep-15	0.57	0	0.57	
		BUUQ	Bull River u/s Quinn	633561	5519210	13-Sep-15	0	0	0	
	Cadorna Creek	CADCK	Cadorna Creek u/s Elk River	645826	5589227	13-Sep-15	0.49	0	0.49	
	Cross River	CRUKO	Cross River u/s Kootenay River	585502	5614058	11-Sep-15	0	0	0	
	Daisy Creek	DACK	Daisy Creek	685988	5523955	12-Sep-15	0	0	0	
	Dutch Creek	DUCK	Dutch Creek	687139	5531110	11-Sep-15	0	0	0	
	Elk River	EL12	Elk River d/s of Cadorna	646175	5589009	13-Sep-15	0.41	0	0.41	
	Flathead River	FLAD	Flathead River Downstream	682705	5443985	14-Sep-15	0	0	0	
		FLAU	Flathead River Upstream	680187	5453294	14-Sep-15	0	0	0	
		FLRU	Upper Flathead River	668175	5470823	19-Sep-15	0	0	0	
	Kootenay River	KO1	Kootenay River	591185	5561577	13-Sep-15	0	0	0	
		KODCR	Kootenay River d/s Cross River	584744	5607649	12-Sep-15	0	0	0	
		KOUCR	Kootenay River u/s Cross River	579591	5616187	12-Sep-15	0	0	0	
		KOUVE	Kootenay River u/s Vermillion	569766	5630957	10-Sep-15	0	0	0	
	Oldman River	OLDDU	Oldman d/s Dutch, u/s Racehorse	687855	5530302	12-Sep-15	0	0	0	
		OLDLI	Oldman d/s Livingstone	687526	5532685	11-Sep-15	0	0	0	
		OLDLOW	Oldman lower u/s reservoir	710028	5512469	10-Sep-15	0	0	0	
	Palliser River	PADAL	Palliser River d/s Albert	601173	5598667	11-Sep-15	0	0	0	
		PAUKO	Palliser River u/s Kootenay, d/s Fenwick	595626	5590338	11-Sep-15	0	0	0	
	Racehorse Creek	RACK	Racehorse Creek	687621	5526336	11-Sep-15	0	0	0	
	Vermillion River	VEUKO	Vermillion u/s Kootenay, d/s Simpson	569465	5641604	10-Sep-15	0	0	0	
		VEUP	Vermillion Upper, u/s Simpson	561227	5670806	10-Sep-15	0	0	0	
	Vicary Creek	VICK	Vicary Creek	682461	5519665	10-Sep-15	0	0	0	
1	Henretta Creek	HENUP	Henretta u/s all mine operations	655887	5567716	15-Sep-15	0.14	0	0.14	
	Chauncey Creek	CHCK	Chauncey Creek near mouth	655349	5552776	12-Sep-15	0.54	0	0.54	
	Ewin Creek	EWCK	Ewin Creek near mouth	657208	5547645	12-Sep-15	0.50	0	0.50	
	Fording River	FO26	Fording u/s Henretta (u/s all mines)	653064	5569601	14-Sep-15	0.93	0	0.93	
2	Grace Creek	LC_GRCK	Grace Creek	654283	5540738	18-Sep-15	0	0	0	
	Line Creek	LI24	Line Creek Reference	662214	5538393	10-Sep-15	0	0	0	
	South Line Creek	SLINE	South Line Creek Reference	661122	5531374	15-Sep-15	0	0	0	
3	Elk River	ELUGH	Elk River u/s Branch	646497	5557523	17-Sep-15	0.08	0	0.08	
4	Grave Creek	GRUHA	Grave Creek u/s Harmer	659422	5523781	11-Sep-15	0.97	0	0.97	GRAV3-75
	Michel Creek	MI25	Michel u/s CMO influence	668266	5482795	10-Sep-15	0.36	0	0.36	
	Andy Good Creek	AGCK	Andy Good u/s CMO influence	667551	5488669	12-Sep-15	0	0	0	
	Alexander Creek	AL4	Upper Alexander Creek	664974	5509024	13-Sep-15	0.89	0.09	0.98	
		ALUSM	Alexander Creek upstream of Michel	663482	5502718	13-Sep-15	0.69	0.07	0.76	
5	McCool Creek	MCCR	McCool Creek	648151	5499951	11-Sep-15	0.83	0	0.83	
	Wigwam River	WWRL	Lower Wigwam River	646099	5458836	11-Sep-15	0	0	0	
		WWRU	Upper Wigwam River	648769	5448916	19-Sep-15	0	0	0	
Summary Statistics						**Sample Size**	**40**	**40**	**40**	
						Minimum	**0**	**0**	**0**	
						2.5th Percentile	**0**	**0**	**0**	
						25th Percentile	**0**	**0**	**0**	
						Median	**0**	**0**	**0**	
						75th Percentile	**0.37**	**0**	**0.37**	
						97.5th Percentile	**0.93**	**0.07**	**0.97[a]**	
						Maximum	**0.97**	**0.09**	**0.98**	
						Mean	**0.19**	**0.00**	**0.19**	
						Standard Deviation	**0.31**	**0.02**	**0.32**	

Normal (Reference Area) Range Limits

[a] The upper limit of the normal range (i.e., the 97.5th percentile) was rounded to 1.0 to better reflect the (limited) precision of the method.

Table D.4: Mine-exposed Sampling Areas and Calcite Measurements for the Calcite-biological Effects Study, September 2015 (Minnow 2016b)

Management Unit	Stream Name	Biological Area Code	Area Description	UTM (NAD83, 11U)		2015				Alternative Area Code (other studies)
				Easting	Northing	Sample Date	Calcite Presence Score (CI_p)	Calcite Concretion Score (CI_c)	Calcite Index (CI)	
1	Henretta Creek	HENFO	Henretta u/s confluence with Fording	652236	5566412	16-Sep-15	0.9	0	0.9	
	North Greenhills Diversion	NGD1	North Greenhills Diversion	650820	5563294	08-Oct-15	0.8	0	0.8	
	Fording River	FODHE	Fording d/s Henretta	651295	5565429	14-Sep-15	0.9	0	0.9	
		FOUNGD	Fording u/s North Greenhills Diversion	651021	5563445	15-Sep-15	0.8	0	0.8	
		FODNGD	Fording d/s North Greenhills Diverson	650883	5563190	14-Sep-15	0.8	0	0.8	
		MP1	Fording Multiplate d/s Eagle Ponds	651133	5562401	15-Sep-15	1.0	0	1.0	
		FOUSH	Fording u/s Shandley Creek	650863	5560970	15-Sep-15	1.0	0	1.0	
		FOUKI	Fording u/s Kilmarnock Creek	651838	5559855	16-Sep-15	1.0	0	1.0	
	Kilmarnock Creek	KILM1-50	Kilmarnock d/s of KICK	652442	5559534	17-Sep-15	1.0	1.8	2.8	
		KICK	Kilmarnock u/s road crossing	652704	5559764	17-Sep-15	1.0	1.4	2.3	KILM1-75
	Fording River	FOBKS	Fording between Kilmarnock & Swift	652065	5558691	16-Sep-15	0.9	0	0.9	
	Swift Creek	SWCK	Swift Creek	652062	5558542	10-Sep-15	0.9	1.1	2.1	
		SWIF2-75	Swift Creek u/s of SWIF2-50	651761	5558515	10-Sep-15	1.0	1.5	2.5	
	Fording River	FOBSC	Fording d/s Swift, u/s Cataract	652342	5558207	17-Sep-15	1.0	0.2	1.2	
	Cataract Creek	CATCK	Cataract Creek near mouth	652429	5557517	11-Sep-15	1.0	2.0	3.0	CATA2-50
		CATA2-25	Cataract Creek d/s of CACK	652464	5557536	11-Sep-15	1.0	2.0	3.0	
		CATA2-75	Cataract Creek d/s of CATA2-25	652464	5557463	11-Sep-15	1.0	2.0	3.0	
	Fording River	FOBCP	Fording between Cataract & Porter	652864	5557150	17-Sep-15	1.0	0.3	1.3	
	Porter Creek	POCK	Porter Creek	653558	5555328	14-Sep-15	1.0	0.1	1.1	PORT2-0/PORT1-0
		PORT3-25	Porter Creek u/s of PORT2-0	653206	5555289	14-Sep-15	0.8	0.3	1.1	
		PORT3-50	Porter Creek u/s of PORT3-25	653072	5554971	14-Sep-15	0.7	0.7	1.5	
	Fording River	FO10-SP1	Fording Side Channel (old Fording	654245	5555299	17-Sep-15	0.8	0	0.8	
		FODPO	Fording d/s Porter, u/s Chauncey	653901	5555074	15-Sep-15	0.9	0	0.9	
		FO22	Fording u/s Chauncey Creek	654794	5553614	17-Sep-15	0.8	0	0.8	
		FOUEW	Fording d/s Chauncey, u/s Ewin	656362	5551883	13-Sep-15	1.0	0	1.0	FORD7-25
	Dry Creek	LC_DCDS	Dry Creek d/s sedimentation ponds	657719	5542179	16-Sep-15	0	0	0	
		LC_DC1	Dry Creek near mouth	656454	5544727	13-Sep-15	0	0	0	
	Fording River	FO29	Fording d/s Dry, u/s GHO & Hwy Bridge	655522	5543915	12-Sep-15	1.0	0.01	1.0	
		FODGH	Fording River d/s GHO	652941	5545649	16-Sep-15	1.0	0.01	1.0	
	Greenhills Creek	GHCKU	Greenhills Creek u/s settling pond	653911	5546497	15-Sep-15	1.0	1.5	2.5	GREE3-25
		GHCKD	Greenhills Creek d/s of settling pond	653534	5545741	15-Sep-15	1.0	0.4	1.4	GREE1-75
		GREE1-25	Greenhills Creek d/s of GHCKD, near mouth	653386	5545504	15-Sep-15	0.3	0	0.3	
		GREE1-50	Greenhills Creek d/s of GHCKD	653494	5545590	15-Sep-15	0.8	0.03	0.9	
		GREE3-75	Greenhills Creek u/s of GHCKU	654188	5547262	15-Sep-15	1.0	1.7	2.7	
		GREE4-25	Greenhills Creek u/s of GREE3-75	654524	5548403	16-Sep-15	1.0	1.9	2.9	
		GREE4-75	Greenhills Creek u/s of GREE4-25	654139	5550048	16-Sep-15	1.0	1.5	2.5	
	Fording River	FORD7-75	Fording u/s FOUEW	655447	5552357	18-Sep-15	1.0	0	1.0	
2	Fording River	FO9	Fording d/s Josephine falls, u/s Grace & Line	652235	5540141	18-Sep-15	0.8	0	0.8	
		FRUL	Fording River Upstream of Line Creek	654524	5530128	17-Sep-15	0	0	0	
	Line Creek	LCUT	d/s rock drain, u/s West Line Cr. and AWTF outfall	660114	5532140	-	-	-	-	
		LILC3	Line Creek Upstream of Active Water Treatment Facility	659931	5531848	14-Sep-15	1.0	0	1.0	
		LIDSL	Line Creek Downstream of South Line Creek and Contingency Ponds	659293	5530590	12-Sep-15	0.6	0	0.6	
		LI8	Line Creek Downstream of Canyon	655424	5528983	13-Sep-15	0.02	0.02	0.04	
	Fording River	FO23	Fording River Downstream of Line Creek	652965	5528974	16-Sep-15	0.9	0	0.9	
		LC_FRUS/FO28	Fording River u/s Dry Creek	656307	5545255	13-Sep-15	1.0	0	1.0	
		LC_FRB	Fording River	655487	5543711	-	-	-	-	
3	Wolfram Creek	WOCK	Wolfram Creek	648277	5552293	17-Sep-15	0.9	0.4	1.3	
	Thompson Creek	THCK	Thompson Creek	648596	5550237	18-Sep-15	1.0	0	1.0	
	North Thompson Creek	NTHO1-25	North Thompson Creek	649731	5551308	18-Sep-15	1.0	0.5	1.5	
		NTHO1-50	North Thompson Creek	649915	5551422	18-Sep-15	1.0	1.7	2.7	
	Elk River	EL20	Elk River d/s Thompson & GHO	649186	5548524	17-Sep-15	0.8	0	0.8	
		ELUEL	Elk River u/s Elkford	649097	5544766	13-Sep-15	0.9	0.03	0.9	
		ELDEL	Elk River d/s Elkford sewage ponds	649968	5540252	17-Sep-15	0.2	0	0.2	
		ELUFO	Elk River just u/s Fording	652130	5528839	14-Sep-15	1.0	0	1.0	
4	Elk River	EL19	Elk River d/s Fording, u/s Grave	653157	5525801	17-Sep-15	1.0	0	1.0	
	Harmer Creek	HACKUS	Harmer Creek u/s Harmer Pond	658180	5520996	11-Sep-15	0.9	0	0.9	
		HACKDS	Harmer d/s Pond near mouth at Grave	656962	5522160	10-Sep-15	1.0	0.1	1.1	HARM1-75
		HARM1-50	Harmer Creek d/s of HACKDS	656764	5522109	12-Sep-15	1.0	0	1.0	
		HARM5-25	Harmer Creek u/s of HACKUS	659229	5518106	12-Sep-15	0.9	0	0.9	
	Grave Creek	GRCK	Grave Creek d/s Harmer	656412	5522315	17-Sep-15	0.5	0	0.5	
		GRDS	Grave Creek near mouth at Elk	653936	5523373	12-Sep-15	1.0	0	1.0	GRAV1-50
	Elk River	ELDGR	Elk River d/s Grave	653098	5521154	17-Sep-15	0.3	0	0.3	
	Otto Creek	OCNM	Otto Creek near mouth	652337	5512615	15-Sep-15	0.4	0	0.4	
	Elk River	ELUSP	Elk d/s Otto, u/s Sparwood & Michel	652337	5512688	15-Sep-15	0.8	0	0.8	
	Michel Creek	MIUCO	Michel u/s Corbin Creek	668203	5486653	10-Sep-15	0.7	0.1	0.9	
		MI3	Michel u/s Erickson Creek	660077	5504881	14-Sep-15	0.4	0	0.4	
	Corbin Creek	CORCK	Corbin Creek near Mouth	668563	5487395	11-Sep-15	1.0	0.4	1.4	
	Michel Creek	MIDCO	Michel d/s Corbin, u/s Andy Good	667757	5487611	11-Sep-15	0.7	0	0.7	
		MIDAG	Michel d/s Andy Good	665212	5489264	12-Sep-15	0.3	0.1	0.4	
		MI5	Michel d/s CMO	659497	5496573	13-Sep-15	0.5	0	0.5	
	Bodie Creek	BOCK	Bodie Creek d/s Bodie Pond	655536	5509605	14-Sep-15	1.0	0	1.0	
	Michel Creek	MI2	Michel Creek d/s EVO	653672	5511222	10-Sep-15	0.4	0	0.4	
5	Elk River	EL1	Elk d/s Sparwood & Michel	651655	5508624	16-Sep-15	0.5	0	0.5	
		ELUFE	Elk River u/s Fernie	644755	5490993	15-Sep-15	0.9	0	0.9	
		ELDFE	Elk River d/s Fernie	640103	5479658	16-Sep-15	0.9	0	0.9	
		ELELKO	Elk River u/s Elko	639419	5463274	14-Sep-15	0	0	0	
		ELH93	Elk River u/s Hwy 93 Bridge	633954	5449117	16-Sep-15	1.0	0	1.0	

CI values greater than the upper limit of the normal range (i.e., CI > 1.0; see Appendix Table D.4)

Table D.5: Sampling Areas and Calcite Measurements for the Calcite-Biological Effects Study in September 2014 (Minnow 2016b)

Manage-ment Unit	Stream Name	Reach	UTM (NAD83, 11U)		Sample Date	Calcite Presence Score (CI^P)	Calcite Concretion Score (CI^C)	Calcite Index (CI)
			Easting	Northing				
1	Porter Creek	PORT1-0	653602	5555325	15-Sep-14	0.96	0.73	1.69
	Chauncey Creek	CHAU1-50	655734	5552765	12-Sep-14	0	0	0
		CHAU1-75	655981	5552897	12-Sep-14	0	0	0
	Fording River	FO29	655430	5543794	16-Sep-14	0.28	0	0.28
		FORD7-25	656018	5551838	17-Sep-14	0.60	0.04	0.64
		FORD7-50	655616	5552075	13-Sep-14	0.03	0	0.03
	Greenhills Creek	GREE1-75	653534	5545741	17-Sep-14	0.81	0.68	1.49
		GREE3-25	653905	5546493	14-Sep-14	1	1.43	2.43
		GREE3-75	654174	5547280	14-Sep-14	0.97	0.91	1.88
		GREE4-25	654521	5548405	14-Sep-14	0.97	1.56	2.53
		GREE4-75	654134	5550052	14-Sep-14	1	1.34	2.34
2	Grace Creek	GRAC2-25	654319	5540780	14-Sep-14	0.08	0.02	0.10
		GRAC2-75	655502	5540694	14-Sep-14	0	0	0
	Grave Creek	GRAV1-25	653658	5523369	13-Sep-14	0.07	0.01	0.08
		GRAV1-50	653936	5523373	17-Sep-14	0.46	0.29	0.75
		GRAV1-75	654338	5523448	13-Sep-14	0.28	0.15	0.43
		GRAV3-75	659422	5523781	17-Sep-14	0	0	0
	Line Creek	LILC3	659947	5531859	18-Sep-14	1	0	1
		LIDSL	659320	5530619	18-Sep-14	0.24	0	0.24
		LI8	655421	5528971	18-Sep-14	0.50	0	0.50
3	North Thompson Creek	NTHO1-25	649731	5551308	14-Sep-14	0.98	0.6	1.58
		NTHO1-50	649915	5551422	14-Sep-14	0.98	1.23	2.21
4	Alexander Creek	ALEX3-25	663885	5504524	16-Sep-14	0.57	0	0.57
	Erickson Creek	ERIC2-0	660091	5505192	15-Sep-14	0.92	1.79	2.71
		ERIC4-25	660656	5505720	15-Sep-14	0.70	0	0.70
		ERIC4-75	660818	5506460	15-Sep-14	0.23	0	0.23
	Harmer Creek	HARM1-50	656764	5522109	17-Sep-14	0.75	0.17	0.92
		HARM1-75	656962	5522160	15-Sep-14	0.99	0.67	1.66
		HARM5-25	659229	5518106	16-Sep-14	0.82	0.30	1.12
		HARM6-25	659488	5517110	16-Sep-14	0	0	0
	Michel Creek	MICH1-25	652519	5511603	13-Sep-14	0	0	0
5	Elk River	ELKR8-75	652014	5505118	15-Sep-14	0	0	0

Calcite Index values greater than the normal range (i.e., CI > 1.0; see Appendix Table D.4)

Table D.6: Sampling Areas and Calcite Measurements, September 2016

Management Unit	Main Watershed	Exposure Type	Stream Name	Biological Area Code	Area Description	UTM (NAD83, 11U)		Sample Date	Calcite Presence Score (CI_p)	Calcite Concretion Score (CI_c)	Calcite Index (CI)
						Easting	Northing				
1	Fording	Reference	Fording River	FO26	u/s Henretta Cr. and FRO	653064	5569601	12-Sep-16	0.8	0	0.8
			Henretta Creek	HENUP	upper creek, u/s FRO	655893	5567697	12-Sep-16	0	0	0
		Mine-exposed	Fording River	FODHE	d/s Henretta Cr.	651305	5565503	12-Sep-16	0	0	0
				FOUKI	u/s Kilmarnock Cr.	651861	5559872	12-Sep-16	1.0	0.8	1.8
				FOBKS	at Fording R. bridge, d/s Kilmarnock & u/s Swift Cr.	652065	5558691	12-Sep-16	1.0	1.0	2.0
				FOBSC	d/s Swift Cr., u/s Cataract Cr.	652342	5558207	12-Sep-16	1.0	0.8	1.8
				FOBCP	d/s Cataract, u/s Porter	652846	5557174	12-Sep-16	1.0	0.6	1.6
				FODPO	d/s Porter Cr., u/s Chauncey Cr.	653877	5555083	12-Sep-16	1.0	0	1.0
				FOUEW	d/s Chauncey Cr., u/s Ewin Cr.	656363	5551875	12-Sep-16	1.0	0	8.6
				FO28/LC-FRUS	Fording River u/s Dry Creek	656307	5545255	10-Sep-16	1.0	0	1.0
				LC_FRB	d/s Dry Cr., u/s GHO at Fording R. Bridge	655276	5543711	10-Sep-16	1.0	0.4	1.4
				FODGH	d/s GHO and Greenhills Cr.	652942	5545635	14-Sep-16	1.0	0	1.0
			Dry Creek	LC_DCDS	d/s sedimentation ponds	657713	5542177	10-Sep-16	0.8	0	0.8
				LC_DC1	Dry Creek near mouth	656503	5544668	10-Sep-16	0.6	0	0.6
2	Fording	Reference	Line Creek	LI24	u/s LCO	661968	5538259	08-Sep-16	0	0	0
			South Line Creek	SLINE	u/s Line Creek and LCO	660980	5531449	08-Sep-16	0.3	0	0.3
		Mine-exposed	Fording River	FRUL	d/s Grace Cr., u/s Line Cr.	654530	5530162	10-Sep-16	0.0	0	0.0
				FO23	d/s Line Creek	652995	5528937	09-Sep-16	0.4	0	0.4
			Line Creek	LCUT	d/s rock drain, u/s West Line Cr. and AWTF outfall	660114	5532140	09-Sep-16	0.9	0	0.9
				LILC3	d/s West Line Cr. and AWTF outfall	659911	5531818	09-Sep-16	1.0	0.1	1.1
				LIDSL	d/s South Line	659294	5530583	07-Sep-16	0.8	0	0.8
				LI8	Line Creek canyon	655651	5528828	09-Sep-16	0.5	0	0.5
3	Elk	Reference	Elk River	ELUGH	u/s Branch Cr. and GHO	646561	5557474	10-Sep-16	0.2	0	0.2
4	Michel	Reference	Michel Creek	MI25	u/s CMO	668209	5482832	13-Sep-16	0	0	0
				MIUCO	u/s Corbin Cr.	668203	5486653	13-Sep-16	0.5	0	0.5
			Alexander Creek	ALUSM	near bend to west	663482	5502718	13-Sep-16	1.0	0.5	1.5
	Elk	Mine-exposed	Elk River	EL19	d/s Fording R., u/s Grave Cr.	653146	5525824	10-Sep-16	0	0	0
			Harmer Creek	HACKUS	u/s from Harmer Pond	658180	5520996	14-Sep-16	0.8	0	0.8
				HACKDS	dam/spillway at d/s end of Harmer Pond	656969	5522171	14-Sep-16	1.0	0	1.0
	Upper Michel		Michel Creek	MIDCO	d/s Corbin Creek, u/s Andy Good Creek	667757	5487611	13-Sep-16	1.0	0	1.0
	Lower Michel			MI3	u/s Erickson Creek	660032	5505022	11-Sep-16	0	0	0
				MI2	d/s EVO and Aqueduct Creek	653672	5511222	11-Sep-16	0.7	0	0.7
	Michel		Corbin Creek	CORCK	near mouth and d/s CMO	668563	5487395	11-Sep-16	1.0	0	1.0
5	Elk	Mine-exposed	Elk River	EL1	d/s Sparwood & Michel Creek, d/s EV_ER1	651657	5508511	11-Sep-16	0.9	0	0.9
				ELELKO	u/s Elko	639433	5463291	11-Sep-16	0	0	0
				ELH93	u/s Hwy 93 bridge and Elk R. mouth at Koocanusa	633578	5449043	11-Sep-16	0.7	0	0.7

Calcite Index values greater than the upper limit of the normal range (i.e., CI>1.0; see Appendix Table D.4)

Table D.7: Data from Regional Calcite Monitoring Program (Lotic 2014 - 2017)

Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
1	Fording	Chauncey	Reference	CHAU1-25	655552	5552769	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				CHAU1-50	655747	5552787	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
				CHAU1-75	655971	5552881	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
		Fording		FORD12.5	-	-	-	-	-	-	-	-	-	-	-	0.5	0.0	0.5
				FORD12-25	651642	5567502	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FORD12-50	652624	5568589	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FORD12-75	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.8
		Henretta		HENR3-50	656045	5567915	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-
		Cataract	Mine-exposed	CATA1-0	652606	5557629	1.0	2.0	3.0	1.0	2.0	3.0	1.0	2.0	3.0	1.0	2.0	3.0
				CATA2-25	652496	5557494	1.0	2.0	3.0	0.2	0.0	0.2	-	-	-	-	-	-
				CATA2-50	652428	5557516	1.0	0.4	1.4	0.6	1.0	1.6	-	-	-	-	-	-
				CATA2-75	652471	5557457	1.0	0.3	1.3	0.1	0.1	0.2	-	-	-	-	-	-
				CATA3-0	652391	5557455	1.0	2.0	3.0	0.8	1.5	2.3	1.0	1.5	2.5	-	-	-
				CATA3-50	652251	5557423	1.0	2.0	3.0	1.0	2.0	3.0	1.0	1.6	2.6	-	-	-
		Clode Outlet		COUT1-0	650789	5564241	0.0	0.0	0.0	0.4	0.7	1.0	0.9	0.2	1.0	0.5	0.0	0.5
		Clode West Infiltration		CLOW1-0	650854	5563993	-	-	-	0.3	0.0	0.3	0.0	0.0	0.0	-	-	-
				CLOW1-50	650895	5564101	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Dry - LCO		DRYL1-25	656119	5545115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL1-50	656375	5544792	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL1-75	656550	5544406	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL2-25	656899	5543858	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL2-50	656946	5543658	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL2-75	657013	5543459	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL3-25	657287	5543052	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL3-50	657404	5542814	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL3-75	657435	5542553	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL4-25	657746	5542094	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL4-50	657870	5541803	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
				DRYL4-75	657998	5541531	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
		Eagle Pond Outlet		EPOU1-0	651235	5562779	1.0	0.9	1.9	0.6	0.7	1.3	0.3	0.3	0.6	0.1	0.1	0.2
		Fish Pond		FPON1-25	650858	5564603	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FPON1-50	650940	5564716	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
				FPON1-75	651010	5564887	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
		Fording		FORD10-25	651235	5560464	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD10-50	650921	5561083	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD10-75	651170	5561863	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD11-25	651016	5563511	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD11-50	650783	5564492	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD11-75	651171	5565341	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD4-50	652229	5543405	-	-	-	0.2	0.0	0.2	1.0	0.0	1.0	0.2	0.0	0.2
				FORD4-75	652315	5544881	-	-	-	0.0	0.0	0.0	0.9	0.0	0.9	0.6	0.0	0.6
				FORD5-12.5	653911	5545046	-	-	-	-	-	-	0.3	0.0	0.3	0.5	0.0	0.5
				FORD5-25	654497	5544143	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.5	0.0	0.5
				FORD5-37.5	655396	5543778	-	-	-	-	-	-	0.5	0.0	0.5	-	-	-
				FORD5-50	655854	5544822	0.3	0.0	0.3	0.8	0.2	1.0	0.7	0.0	0.7	0.8	0.0	0.8
				FORD5-75	656566	5546901	0.7	0.0	0.7	0.1	0.0	0.1	0.7	0.0	0.7	-	-	-
				FORD5-87.5	656691	5548103	-	-	-	-	-	-	0.8	0.0	0.8	-	-	-
				FORD6-12.5	657071	5549414	-	-	-	-	-	-	-	-	-	0.8	0.0	0.8
				FORD6-25	657110	5549626	0.8	0.1	0.9	0.4	0.1	0.5	1.0	1.2	2.2	0.5	0.0	0.5
				FORD6-37.5	657157	5549977	-	-	-	-	-	-	-	-	-	0.6	0.0	0.6

CI>1

Table D.7: Data from Regional Calcite Monitoring Program (Lotic 2014 - 2017)

Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
1	Fording	Fording	Mine-exposed	FORD6-50	656990	5550052	0.6	0.0	0.7	0.5	0.2	0.7	0.9	0.9	1.9	0.6	0.1	0.6
				FORD6-62.5	656995	5550566	-	-	-	-	-	-	-	-	-	0.7	0.0	0.8
				FORD6-75	656555	5550902	0.7	0.0	0.7	0.1	0.0	0.1	0.6	0.0	0.6	0.6	0.0	0.6
				FORD7-25	656018	5551825	0.7	0.1	0.7	0.9	0.6	1.5	0.7	0.0	0.7	0.8	0.0	0.8
				FORD7-50	655712	5551933	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.2	0.0	0.2
				FORD7-75	655485	5552320	0.5	0.0	0.6	0.9	0.5	1.4	0.6	0.0	0.6	0.9	0.0	0.9
				FORD8-25	654790	5553492	0.2	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	-	-	-
				FORD8-50	654374	5554251	0.3	0.0	0.3	0.9	0.2	1.0	0.9	0.0	0.9	-	-	-
				FORD8-75	653940	5555077	0.5	0.0	0.5	0.4	0.0	0.4	0.4	0.0	0.4	-	-	-
				FORD9-25	652959	5556915	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FORD9-50	652462	5557991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FORD9-75	651945	5559026	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Gardine		GARD1-25	653929	5548089	0.9	0.0	0.9	0.9	1.2	2.1	0.8	0.2	1.0	0.4	0.1	0.4
				GARD1-50	653642	5548600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				GARD1-75	653317	5549075	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Grassy		GRAS1-0	650962	5563716	0.0	0.0	0.0	0.0	0.1	0.2	-	-	-	-	-	-
				GRAS1-0	650976	5563754	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0
				GRAS1-0	650985	5563839	0.0	0.0	0.0	0.0	0.1	0.1	-	-	-	0.0	0.0	0.0
		Greenhills		GH_GH1	653577	5545871	-	-	-	-	-	-	-	-	-	1.0	0.7	1.7
				GH_GH1	653577	5545871	-	-	-	-	-	-	-	-	-	0.9	0.7	1.6
				GH_GH1	653577	5545871	-	-	-	-	-	-	-	-	-	0.9	0.7	1.6
				GH_GH1	653577	5545871	-	-	-	-	-	-	-	-	-	1.0	0.7	1.7
				GH_GH1	653577	5545871	-	-	-	-	-	-	-	-	-	1.0	0.9	1.9
				GH_GH1	653577	5545871	-	-	-	-	-	-	-	-	-	1.0	0.6	1.6
				GH_GH1	653577	5545871	-	-	-	-	-	-	-	-	-	1.0	0.6	1.6
				GH_GH1	653577	5545871	-	-	-	-	-	-	-	-	-	1.0	0.8	1.8
				GREE1-25	653382	5545512	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1
				GREE1-50	653476	5545575	0.2	0.0	0.2	0.9	0.6	1.4	0.5	0.0	0.5	0.7	0.2	0.9
				GREE1-75	653540	5545667	0.7	0.0	0.7	0.9	0.7	1.6	0.7	0.1	0.8	1.0	0.6	1.6
				GREE2-25	653435	5545974	0.6	0.0	0.6	0.0	0.0	0.0	-	-	-	-	-	-
				GREE3-12.5	653859	5546289	-	-	-	-	-	-	0.9	1.3	2.2	-	-	-
				GREE3-25	653918	5546481	0.8	0.2	1.0	1.0	1.4	2.4	1.0	1.6	2.6	0.9	0.8	1.7
				GREE3-37.5	653954	5546673	-	-	-	-	-	-	1.0	1.3	2.2	-	-	-
				GREE3-50	653990	5546883	0.8	0.6	1.4	0.9	1.3	2.1	0.9	1.6	2.5	1.0	1.4	2.4
				GREE3-62.5	654048	5547076	-	-	-	-	-	-	1.0	1.7	2.7	-	-	-
				GREE3-75	654172	5547243	0.9	0.7	1.5	0.9	1.3	2.2	0.9	1.6	2.5	1.0	1.5	2.4
				GREE4-12.5	654393	5547996	-	-	-	-	-	-	1.0	1.9	2.9	-	-	-
				GREE4-25	654512	5548365	1.0	1.0	2.0	1.0	1.7	2.7	0.9	1.8	2.8	1.0	1.7	2.7
				GREE4-37.5	654447	5548758	-	-	-	-	-	-	1.0	1.8	2.8	-	-	-
				GREE4-50	654336	5549133	0.8	0.8	1.6	1.0	1.8	2.8	1.0	1.9	2.9	0.9	1.7	2.6
				GREE4-62.5	654195	5549512	-	-	-	-	-	-	0.9	1.8	2.7	-	-	-
				GREE4-75	654152	5549910	0.6	0.6	1.2	1.0	1.9	2.8	0.9	1.8	2.8	1.0	1.5	2.5
		Henretta		HENR1-25	651881	5566240	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				HENR1-50	651961	5566272	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				HENR1-75	652039	5566302	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				HENR2-25	652398	5566393	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				HENR2-50	652652	5566399	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				HENR2-75	652963	5566520	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				HENR3-25	654604	5567432	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Kilmarnock		FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	1.0	1.2	2.2

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Table D.7: Data from Regional Calcite Monitoring Program (Lotic 2014 - 2017)

Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
1	Fording	Kilmarnock	Mine-exposed	FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	1.0	1.1	2.1
				FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	1.0	1.5	2.5
				FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	1.0	1.1	2.1
				FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	0.9	1.1	1.9
				FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	0.8	1.1	2.0
				FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	0.9	1.1	2.0
				FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	0.9	1.0	2.0
				FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	0.9	1.2	2.1
				FR_KC1	652612	5559619	-	-	-	-	-	-	-	-	-	0.9	1.3	2.3
				KILM1-25	652332	5558843	-	-	-	-	-	-	1.0	1.6	2.6	1.0	2.0	3.0
				KILM1-37.5	652326	5559379	-	-	-	-	-	-	-	-	-	1.0	2.0	3.0
				KILM1-50	652443	5559533	0.9	1.6	2.6	1.0	1.7	2.7	0.9	1.8	2.8	1.0	1.8	2.8
				KILM1-62.5	652576	5559604	-	-	-	-	-	-	0.8	1.6	2.4	0.9	1.3	2.3
				KILM1-75	652705	5559764	0.7	1.0	1.7	0.2	0.4	0.6	0.7	1.4	2.1	0.8	1.1	1.9
				KILM1-87.5	652852	5559870	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
		Porter		PORT1-0	653683	5555223	0.8	0.1	0.9	-	-	-	0.6	0.2	0.9	0.8	0.0	0.8
				PORT2-0	653567	5555328	0.1	0.1	0.1	0.1	0.0	0.1	-	-	-	-	-	-
				PORT3-12.5	653367	5555368	-	-	-	-	-	-	-	-	-	0.2	0.0	0.2
				PORT3-25	653210	5555303	0.9	1.4	2.3	0.9	0.4	1.3	0.6	0.3	0.9	0.7	0.1	0.7
				PORT3-37.5	653151	5555133	-	-	-	-	-	-	-	-	2.8	0.5	0.0	0.5
				PORT3-50	653074	5554975	1.0	2.0	3.0	0.9	0.9	1.7	0.8	1.3	2.1	0.7	1.0	1.7
				PORT3-62.5	652973	5554823	-	-	-	-	-	-	-	-	-	1.0	1.8	2.8
				PORT3-75	652909	5554660	1.0	2.0	3.0	0.9	1.8	2.7	1.0	1.9	2.8	1.0	1.9	2.9
		Smith Ponds Outlet		SPOU1-0	651002	5560588	0.9	1.7	2.6	0.9	1.4	2.2	0.9	1.4	2.2	1.0	2.0	3.0
		Swift		SWIF1-0	652168	5558591	0.9	1.7	2.6	1.3	0.9	2.2	0.9	1.5	2.4	1.0	1.5	2.4
				SWIF2-25	652056	5558307	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-	-	-
				SWIF2-50	651886	5558427	-	-	-	0.1	0.4	0.5	0.0	0.0	0.0	-	-	-
				SWIF2-75	651761	5558522	0.0	0.0	0.0	1.6	0.9	2.5	0.9	1.5	2.5	-	-	-
		South Pond Seep		SPSE1-50	651932	5559919	0.0	0.0	0.0	0.5	1.0	1.5	0.1	0.0	0.1	-	-	-
	Elk	Grassy		GRAS1-25	650962	5563716	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				GRAS1-50	650962	5563716	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				GRAS1-75	650976	5563754	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
		Lake Mountain		LMOU1-25	650761	5563296	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				LMOU1-50	650644	5563311	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				LMOU1-75	650544	5563220	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				LMOU3-25	650104	5563121	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				LMOU3-50	649956	5563348	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				LMOU3-75	649963	5563622	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				LMOU4-25	649944	5564015	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				LMOU4-50	649949	5564138	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				LMOU4-75	649944	5564283	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
2	Fording	Grace	Reference	GRAC1-12.5	653678	5538513	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				GRAC1-25	650968	5563655	0.4	0.0	0.4	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
				GRAC1-37.5	653427	5538956	-	-	-	-	-	-	0.1	0.0	0.1	-	-	-
				GRAC1-50	650976	5563753	0.2	0.0	0.2	0.2	0.1	0.3	0.0	0.0	0.0	0.1	0.0	0.1
				GRAC1-75	650985	5563839	0.3	0.0	0.3	0.3	0.0	0.3	0.1	0.0	0.1	0.1	0.0	0.1
				GRAC1-87.5	653806	5540046	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				GRAC2-25	654282	5540746	0.3	0.0	0.3	0.1	0.0	0.1	0.1	0.0	0.1	-	-	-
				GRAC2-50	654899	5540729	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	-	-	-
				GRAC2-75	655478	5540685	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	-	-	-
				GRAC3-25	656122	5539755	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				GRAC3-50	656345	5539192	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				GRAC3-75	656574	5538709	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-

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Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
2	Fording	Line	Reference	LINE7-25	661895	5538290	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				LINE7-50	661921	5538388	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				LINE7-75	661960	5538485	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		South Line		SLIN2-25	661087	5531406	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	-
				SLIN2-50	661290	5531166	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	-
				SLIN2-75	661555	5530978	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	-
		Contingency Pond Outlet	Mine-exposed	CPOU1-0	659699	5531186	0.9	0.0	0.9	0.0	0.9	0.9	-	-	-	-	-	-
		Contingency Pond Seep		CPOS1-0	659492	5530958	0.9	0.0	0.9	0.0	0.8	0.8	-	-	-	-	-	-
		Fording		FORD1-25	652749	5528341	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5
				FORD1-50	652965	5528899	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
				FORD1-75	653424	5529183	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5
				FORD2-25	654509	5530256	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FORD2-50	654493	5531343	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FORD2-75	654427	5532316	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FORD3-25	653949	5535464	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD3-50	654047	5537217	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD3-75	653242	5538740	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				FORD4-25	651861	5540530	-	-	-	0.0	0.0	0.0	0.1	0.0	0.1	0.8	0.2	1.0
		Line		LINE1-25	654200	5529047	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				LINE1-50	654711	5528956	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				LINE1-75	655213	5529091	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				LINE2-25	656502	5529046	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				LINE2-50	657254	5529214	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				LINE2-75	657925	5529475	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				LINE3-25	658973	5530185	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				LINE3-50	659309	5530587	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				LINE3-75	659578	5531063	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				LINE4-25	659869	5531736	0.5	0.0	0.5	0.3	0.0	0.3	0.6	0.2	0.8	0.7	0.0	0.7
				LINE4-50	660000	5531919	0.2	0.0	0.2	0.2	0.0	0.2	0.5	0.1	0.6	0.6	0.0	0.6
				LINE4-75	660130	5532092	0.5	0.0	0.5	0.3	0.0	0.3	0.6	0.1	0.7	0.6	0.0	0.6
3	Elk	Elk		ELKR11-25	651323	5531889	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				ELKR11-50	649948	5535826	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				ELKR11-75	649341	5539043	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	-
				ELKR12-25	649370	5547290	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ELKR12-50	647678	5549943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ELKR12-75	647704	5553218	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Leask		LEAS1-25	648180	5552897	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-
				LEAS1-50	648220	5553017	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-
				LEAS1-75	648266	5553123	0.1	0.0	0.1	0.3	0.2	0.5	-	-	-	-	-	-
				LEAS2-18.2	648605	5552845	-	-	-	-	-	-	-	-	-	0.9	1.2	2.1
				LEAS2-25	648764	5552881	0.1	0.0	0.1	0.7	0.7	1.4	0.2	0.0	0.2	0.5	0.3	0.8
				LEAS2-50	649230	5553230	0.1	0.0	0.1	0.9	0.9	1.8	-	-	-	-	-	-
				LEAS2-75	649726	5553477	0.2	0.0	0.2	-	-	-	-	-	-	-	-	-
				LEAS2-9.1	648387	5552832	-	-	-	-	-	-	-	-	-	1.0	1.6	2.6
		Mickelson		GH_MC1	648209	5553862	-	-	-	-	-	-	-	-	-	0.9	0.3	1.2
				GH_MC1	648209	5553862	-	-	-	-	-	-	-	-	-	0.9	0.7	1.5
				GH_MC1	648209	5553862	-	-	-	-	-	-	-	-	-	1.0	0.4	1.3
				GH_MC1	648209	5553862	-	-	-	-	-	-	-	-	-	1.0	0.4	1.4
				GH_MC1	648209	5553862	-	-	-	-	-	-	-	-	-	1.0	0.6	1.6
				GH_MC1	648209	5553862	-	-	-	-	-	-	-	-	-	1.0	0.5	1.5
				GH_MC1	648209	5553862	-	-	-	-	-	-	-	-	-	0.6	1.0	1.6
				MICK1-25	648024	5553511	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.3	2.3
				MICK1-50	648109	5553682	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.3	2.2

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Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
3	Elk	Mickelson	Mine-exposed	MICK1-75	648194	5553850	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.1	2.0
				MICK2-25	648607	5554154	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				MICK2-50	648840	5554361	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	-	-	-
				MICK2-75	649092	5554560	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	-
		Thompson		GH_TC1	648550	5550218	-	-	-	-	-	-	-	-	-	0.7	0.0	0.7
				GH_TC1	648550	5550218	-	-	-	-	-	-	-	-	-	0.4	0.0	0.4
				GH_TC1	648550	5550218	-	-	-	-	-	-	-	-	-	0.5	0.0	0.5
				GH_TC1	648550	5550218	-	-	-	-	-	-	-	-	-	0.5	0.0	0.5
				GH_TC1	648550	5550218	-	-	-	-	-	-	-	-	-	0.5	0.0	0.5
				GH_TC1	648550	5550218	-	-	-	-	-	-	-	-	-	0.4	0.0	0.4
				THOM1-0	648355	5550164	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
				THOM2-25	648656	5550292	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				THOM2-50	648887	5550469	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				THOM2-75	649070	5550691	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				THOM3-25	649392	5550959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				THOM3-50	649511	5550946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				THOM3-75	649614	5550963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Thompson, North		NTHO1-12.5	649690	5551126	-	-	-	-	-	-	0.3	0.0	0.3	0.7	0.2	0.8
				NTHO1-25	649573	5551409	0.7	0.1	0.8	0.9	1.5	2.4	0.9	0.9	1.8	0.7	0.6	1.3
				NTHO1-37.5	649812	5551381	-	-	-	-	-	-	0.8	0.9	1.7	0.7	0.9	1.6
				NTHO1-50	649853	5551500	0.9	1.2	2.1	0.9	1.5	2.4	0.7	0.9	1.6	0.9	1.2	2.1
				NTHO1-62.5	650087	5551490	-	-	-	-	-	-	0.8	0.6	1.3	0.9	0.9	1.8
				NTHO1-75	650306	5551596	0.7	0.1	0.8	-	-	-	0.2	0.1	0.3	0.7	0.9	1.6
		Wolfram		GH_WC2	648347	5552251	-	-	-	-	-	-	-	-	-	0.9	0.9	1.7
				GH_WC2	648347	5552251	-	-	-	-	-	-	-	-	-	0.8	0.9	1.7
				GH_WC2	648347	5552251	-	-	-	-	-	-	-	-	-	0.9	1.1	1.9
				GH_WC2	648347	5552251	-	-	-	-	-	-	-	-	-	0.9	1.2	2.1
				GH_WC2	648347	5552251	-	-	-	-	-	-	-	-	-	1.0	1.6	2.6
				GH_WC2	648347	5552251	-	-	-	-	-	-	-	-	-	1.0	1.7	2.7
				GH_WC2	648347	5552251	-	-	-	-	-	-	-	-	-	1.0	1.6	2.6
				WOLF2-25	648219	5552153	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WOLF2-50	648192	5552283	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WOLF2-75	648246	5552373	0.3	0.0	0.3	0.2	0.2	0.4	0.6	0.1	0.7	0.5	0.2	0.7
				WOLF3-12.5	648346	5552252	-	-	-	-	-	-	-	-	-	1.0	1.4	2.4
				WOLF3-25	648378	5552263	1.0	1.9	2.9	0.9	1.1	2.0	0.9	0.4	1.3	1.0	1.5	2.4
				WOLF3-37.5	648411	5552252	-	-	-	-	-	-	-	-	-	1.0	1.7	2.7
				WOLF3-50	648458	5552260	1.0	1.9	2.9	0.9	1.2	2.1	0.9	1.0	1.9	1.0	1.7	2.7
				WOLF3-62.5	648484	5552279	-	-	-	-	-	-	-	-	-	1.0	1.8	2.8
				WOLF3-75	648509	5552323	1.0	2.0	3.0	0.8	1.3	2.1	0.8	0.8	1.6	1.0	1.8	2.7
		Wolfram, North		NWOL1-25	649038	5552683	1.0	0.7	1.7	0.6	0.6	1.2	0.3	0.1	0.4	0.1	0.0	0.1
				NWOL1-50	649558	5552925	0.2	0.0	0.2	0.9	0.5	1.4	0.0	0.0	0.0	-	-	-
				NWOL1-75	649983	5553097	0.2	0.0	0.2	-	-	-	-	-	-	-	-	-
		Wolfram, South		SWOL1-16	648798	5552497	-	-	-	0.7	0.6	1.3	-	-	-	1.0	1.4	2.4
				SWOL1-25	648959	5552507	1.0	1.8	2.8	0.6	0.7	1.3	0.6	0.2	0.9	1.0	0.6	1.6
				SWOL1-32.1	649063	5552425	-	-	-	-	-	-	-	-	-	0.9	0.6	1.5
				SWOL1-50	649344	5552286	0.9	0.4	1.3	1.2	0.8	2.0	0.0	0.0	0.0	-	-	-
				SWOL1-7.5	648656	5552459	-	-	-	-	-	-	-	-	-	0.9	1.0	1.9
				SWOL1-75	649788	5552182	1.0	0.7	1.7	1.8	1.0	2.7	0.0	0.0	0.0	-	-	-
	Michel	Balmer		BALM1-25	653306	5517470	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Elk	Elk	Reference	ELKR15-25	648281	5580666	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ELKR15-50	647615	5583471	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ELKR15-75	646839	5586387	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Pit Road 12 Seep	Mine-exposed	P12S1-0	657137	5513657	0.0	0.0	0.0	0.8	0.1	0.8	-	-	-	-	-	-

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Table D.7: Data from Regional Calcite Monitoring Program (Lotic 2014 - 2017)

Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
3	Elk	Pit Road 12 Seep	Mine-exposed	P12S1-50	657100	5513757	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-
		Thresher		THRE1-25	658068	5506957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				THRE1-50	657722	5507592	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Willow Creek North		WILN2-25	648086	5556562	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0
		Willow Creek South		WILS1-25	648116	5556066	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0
		Willow Creek North		WILN2-50	648454	5557006	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0
		Willow Creek South		WILS1-50	648540	5556364	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0
		Wolf Creek		WOL1-25	647954	5557172	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0
				WOL1-50	648153	5557491	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0
4		Grave	Reference	GRAV3-25	657425	5522824	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				GRAV3-50	658311	5523476	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				GRAV3-75	659404	5523738	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Dry - EVO	Mine-exposed	DRYE1-0	659420	5517528	0.9	1.4	2.2	1.2	1.0	2.1	0.9	1.3	2.2	-	-	-
				DRYE2-0	659385	5517547	0.9	1.4	2.2	0.0	0.0	0.0	-	-	-	-	-	-
				DRYE3-25	659341	5517341	1.0	1.2	2.2	0.8	1.6	2.4	0.9	1.4	2.3	0.9	1.6	2.5
				DRYE3-37.5	659306	5517296	-	-	-	-	-	-	1.0	1.8	2.8	-	-	-
				DRYE3-50	659274	5517241	1.0	1.9	2.9	0.6	1.2	1.9	1.0	1.8	2.8	1.0	1.5	2.5
				DRYE3-62.5	659236	5517192	-	-	-	-	-	-	0.8	1.3	2.2	-	-	-
				DRYE3-75	659207	5517140	0.6	1.0	1.6	1.0	1.9	2.9	0.9	1.4	2.3	1.0	1.5	2.5
				DRYE3-99	659130	5517053	-	-	-	-	-	-	1.0	1.6	2.6	-	-	-
				DRYE4-25	659030	5516839	0.9	1.0	1.9	0.6	1.2	1.8	0.9	1.4	2.4	-	-	-
				DRYE4-50	658890	5516659	0.7	0.7	1.4	-	-	-	-	-	-	-	-	-
				DRYE4-75	658751	5516490	0.7	0.3	1.0	-	-	-	-	-	-	-	-	-
				EV_DC1	659398	5517530	-	-	-	-	-	-	-	-	-	1.0	1.1	2.1
				EV_DC1	659398	5517530	-	-	-	-	-	-	-	-	-	1.0	1.4	2.4
				EV_DC1	659398	5517530	-	-	-	-	-	-	-	-	-	1.0	1.2	2.2
				EV_DC1	659398	5517530	-	-	-	-	-	-	-	-	-	1.0	1.6	2.6
				EV_DC1	659398	5517530	-	-	-	-	-	-	-	-	-	1.0	1.4	2.4
				EV_DC1	659398	5517530	-	-	-	-	-	-	-	-	-	1.0	1.4	2.4
		Elk		ELKR10-25	652506	5517216	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				ELKR10-50	653185	5520697	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				ELKR10-75	653337	5524283	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				ELKR9-25	652004	5512333	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ELKR9-50	652356	5512773	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ELKR9-75	652458	5513391	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Feltham		FELT1-25	654232	5515897	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FELT1-50	654371	5515955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FELT1-75	654519	5515977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Fennelon		FENN1-25	653452	5516226	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FENN1-50	653826	5516301	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				FENN1-75	654165	5516506	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Goddard		GODD1-0	652848	5514113	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
				GODD2-25	653342	5514127	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				GODD2-50	653546	5514045	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				GODD2-75	653748	5514121	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				GODD3-12.5	654110	5514142	-	-	-	-	-	-	-	-	-	0.5	0.7	1.2
				GODD3-25	654225	5514162	0.0	0.0	0.0	0.9	1.1	2.0	0.9	1.4	2.2	0.9	1.7	2.5
				GODD3-37.5	654343	5514224	-	-	-	-	-	-	-	-	-	0.9	1.5	2.4
				GODD3-50	654478	5514246	0.0	0.0	0.0	0.8	1.0	1.8	0.7	1.1	1.9	0.9	1.6	2.5
				GODD3-62.5	654595	5514239	-	-	-	-	-	-	-	-	-	0.9	1.5	2.4
				GODD3-75	654655	5514347	0.0	0.0	0.0	0.8	1.1	1.9	0.7	1.1	1.8	0.9	1.5	2.4
		Grave		GRAV1-25	653635	5523372	0.6	0.0	0.6	0.3	0.1	0.4	0.0	0.0	0.0	0.2	0.0	0.2
				GRAV1-50	653930	5523364	0.1	0.0	0.1	0.5	0.3	0.8	0.0	0.0	0.0	0.1	0.0	0.1

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Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
4	Elk	Grave	Mine-exposed	GRAV1-75	654261	5523397	1.0	0.0	1.0	0.7	0.3	1.1	0.0	0.0	0.0	0.1	0.0	0.1
				GRAV2-25	655168	5523686	0.3	0.0	0.3	0.3	0.0	0.3	0.0	0.0	0.0	-	-	-
				GRAV2-50	655638	5523149	0.2	0.0	0.2	0.1	0.2	0.3	0.0	0.0	0.0	-	-	-
				GRAV2-75	655995	5522591	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Harmer		HARM1-25	656652	5522086	0.5	0.0	0.5	0.7	0.2	0.9	0.0	0.0	0.0	0.4	0.0	0.4
				HARM1-50	656794	5522098	0.4	0.0	0.4	0.8	0.2	0.9	0.0	0.0	0.0	0.7	0.0	0.7
				HARM1-75	656925	5522139	0.8	0.0	0.8	1.0	0.5	1.4	0.1	0.0	0.1	0.8	0.0	0.8
				HARM2-0	657048	5522158	0.3	0.0	0.3	0.2	0.0	0.2	-	-	-	-	-	-
				HARM2-50	657124	5522033	0.0	0.0	0.0	0.1	0.0	0.1	-	-	-	-	-	-
				HARM3-25	657722	5521573	0.2	0.0	0.2	0.3	0.3	0.6	0.0	0.0	0.0	0.2	0.0	0.2
				HARM3-50	658100	5521123	0.1	0.0	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.1
				HARM3-75	658278	5520622	0.2	0.0	0.2	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
				HARM4-12.5	658667	5519944	-	-	-	-	-	-	0.2	0.0	0.2	-	-	-
				HARM4-25	658708	5519703	0.1	0.0	0.1	0.3	0.2	0.5	0.1	0.0	0.1	-	-	-
				HARM4-37.5	658815	5519476	-	-	-	-	-	-	0.1	0.0	0.1	-	-	-
				HARM4-50	658973	5519293	0.3	0.0	0.3	0.7	0.6	1.3	0.3	0.0	0.3	-	-	-
				HARM4-62.5	659093	5519114	-	-	-	-	-	-	0.3	0.0	0.3	-	-	-
				HARM4-75	659123	5518861	0.1	0.0	0.1	0.3	0.0	0.3	0.0	0.0	0.0	-	-	-
				HARM5-25	659216	5518149	0.3	0.0	0.3	0.7	0.3	1.1	0.3	0.0	0.3	-	-	-
				HARM5-50	659340	5517972	0.1	0.0	0.1	0.3	0.1	0.4	0.2	0.0	0.2	-	-	-
				HARM5-75	659404	5517755	0.2	0.0	0.2	0.2	0.1	0.2	0.2	0.0	0.2	-	-	-
		Harmer Dump Seep		HDSE1-0	656262	5515301	0.5	0.0	0.5	-	-	-	-	-	-	-	-	-
		Lindsay		LIND1-25	654528	5515016	0.6	0.0	0.6	0.7	0.1	0.8	0.5	0.1	0.6	0.5	0.1	0.5
				LIND1-50	654687	5515221	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				LIND1-75	654887	5515370	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
		Otto		OTTO1-0	652233	5512621	0.3	0.0	0.3	0.2	0.0	0.2	0.1	0.0	0.1	0.2	0.0	0.2
				OTTO2-25	652506	5512782	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				OTTO2-50	652646	5512963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				OTTO2-75	652826	5513105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				OTTO3-25	653070	5513282	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	-	-	-
				OTTO3-50	653126	5513352	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				OTTO3-75	653207	5513414	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Sawmill		SAWM1-0	658703	5519718	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				SAWM1-50	658571	5519763	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				SAWM2-25	657944	5519718	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				SAWM2-50	657620	5519352	0.8	0.0	0.8	0.6	0.5	1.1	0.6	0.6	1.2	0.0	0.0	0.0
				SAWM2-75	657265	5518992	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
				SIXM1-25	653334	5519955	1.0	0.0	1.0	1.0	0.3	1.3	0.6	0.0	0.6	0.9	0.0	0.9
				SIXM1-50	653478	5519864	0.9	0.0	0.9	0.9	0.3	1.2	0.4	0.0	0.4	0.6	0.0	0.7
				SIXM1-75	653638	5520033	0.5	0.0	0.5	0.7	0.3	1.0	0.5	0.0	0.5	0.4	0.0	0.4
				SIXM2-25	654400	5519957	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0
				SIXM2-50	654930	5519723	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0
				SIXM2-75	655338	5519304	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0
	Michel	Alexander	Reference	ALEX3-25	664041	5504488	0.5	0.1	0.6	0.4	0.1	0.5	0.5	0.0	0.5	0.4	0.0	0.4
				ALEX3-50	664615	5505891	0.4	0.0	0.4	0.3	0.0	0.3	0.3	0.0	0.3	0.5	0.0	0.5
				ALEX3-75	664910	5507397	0.4	0.2	0.5	0.3	0.1	0.3	0.4	0.0	0.4	0.4	0.1	0.5
		Andy Good		ANDY1-25	667666	5488732	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ANDY1-50	668302	5488764	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ANDY1-75	668924	5488724	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Carbon		CARB1-25	658991	5494090	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				CARB1-50	658520	5493818	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				CARB1-75	658273	5493366	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				CARB2-25	657518	5492846	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-

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Table D.7: Data from Regional Calcite Monitoring Program (Lotic 2014 - 2017)

Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
4	Michel	Carbon	Reference	CARB2-50	657157	5492677	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				CARB2-75	656787	5492583	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Michel		MICH5-25	667900	5485585	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MICH5-50	667934	5484333	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MICH5-75	668258	5482527	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Snowslide		SNOW1-25	658687	5494560	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				SNOW1-50	657799	5494568	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				SNOW1-75	657012	5494534	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Unnamed South of Sawmill		USOS1-25	658493	5518730	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				USOS1-50	658011	5518283	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Wheeler		WHEE1-25	658408	5496804	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WHEE1-50	657313	5496989	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WHEE1-75	656695	5497808	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WHEE2-25	655458	5497414	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WHEE2-50	655343	5496890	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WHEE2-75	655061	5496430	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WHEE3-25	654871	5495687	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WHEE3-50	654794	5495379	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				WHEE3-75	654653	5495127	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Aqueduct	Mine-exposed	AQUE1-0	653567	5511559	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				AQUE2-0	653572	5511672	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				AQUE2-50	653787	5511651	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				AQUE3-25	654037	5511425	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				AQUE3-50	654199	5511305	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				AQUE3-75	654271	5511163	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Bodie		BODI1-25	655431	5509654	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.4
				BODI1-50	655508	5509636	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.1	1.1
				BODI1-75	655572	5509553	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.2	0.9
				BODI2-0	655656	5509576	0.1	0.0	0.1	0.0	0.0	0.0	-	-	-	-	-	-
				BODI3-25	655916	5509557	0.5	0.0	0.5	1.0	1.7	2.7	-	-	-	0.8	0.9	1.7
				BODI3-50	656007	5509631	0.8	0.9	1.7	1.0	1.7	2.7	-	-	-	0.8	1.4	2.2
				BODI3-75	656074	5509726	0.6	0.6	1.3	0.9	1.2	2.1	-	-	-	0.6	0.7	1.4
				EV_BC1	655676	5509584	-	-	-	-	-	-	-	-	-	0.9	0.2	1.1
				EV_BC1	655676	5509584	-	-	-	-	-	-	-	-	-	1.0	0.3	1.3
				EV_BC1	655676	5509584	-	-	-	-	-	-	-	-	-	1.0	0.3	1.3
				EV_BC1	655676	5509584	-	-	-	-	-	-	-	-	-	1.0	0.5	1.5
				EV_BC1	655676	5509584	-	-	-	-	-	-	-	-	-	1.0	0.6	1.6
				EV_BC1	655676	5509584	-	-	-	-	-	-	-	-	-	1.0	0.8	1.8
		Corbin		CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	0.9	0.3	1.2
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	1.0	0.2	1.1
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	1.0	0.1	1.1
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	0.9	0.2	1.1
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	0.9	0.1	1.0
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	0.9	0.5	1.4
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	1.0	0.7	1.7
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	0.9	0.4	1.3
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	1.0	0.4	1.3
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	1.0	0.5	1.5
				CM_CC1	668520	5487364	-	-	-	-	-	-	-	-	-	1.0	0.5	1.5
				CORB1-25	668316	5487123	0.9	0.8	1.7	0.8	0.8	1.6	1.0	1.6	2.6	1.0	1.5	2.5
				CORB1-37.5	668380	5487160	-	-	-	-	-	-	1.0	1.8	2.8	-	-	-
				CORB1-50	668438	5487186	1.0	1.2	2.2	0.9	1.2	2.2	1.0	1.9	2.9	1.0	1.2	2.2
				CORB1-62.5	668465	5487253	-	-	-	-	-	-	1.0	1.8	2.8	-	-	-

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Table D.7: Data from Regional Calcite Monitoring Program (Lotic 2014 - 2017)

Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
4	Michel	Corbin	Mine-exposed	CORB1-75	668480	5487325	1.0	1.0	2.0	0.9	0.5	1.4	1.0	1.6	2.6	1.0	0.9	1.9
				CORB1-87.5	668528	5487372	-	-	-	-	-	-	1.0	1.0	2.0	-	-	-
				CORB2-12.5	668849	5487449	-	-	-	-	-	-	1.0	0.8	1.8	-	-	-
				CORB2-25	669115	5487471	0.9	1.6	2.5	1.0	1.6	2.6	1.0	1.9	2.9	-	-	-
				CORB2-37.5	669376	5487407	-	-	-	-	-	-	1.0	2.0	3.0	-	-	-
				CORB2-50	669631	5487351	1.0	1.8	2.8	1.0	1.6	2.6	1.0	1.9	2.9	-	-	-
				CORB2-75	669961	5486919	1.0	1.8	2.8	1.0	1.9	2.9	1.0	2.0	3.0	-	-	-
				CORB2-87.5	670034	5486645	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
		Erickson		ERIC1-0	659848	5505073	1.0	1.4	2.3	1.0	1.7	2.7	0.9	1.8	2.7	0.9	1.4	2.4
				ERIC1-50	659918	5505183	1.0	1.2	2.2	1.0	1.5	2.5	1.0	1.9	2.9	-	-	-
				ERIC2-0	660119	5505189	0.9	0.9	1.8	0.9	1.4	2.3	0.9	1.7	2.6	-	-	-
				ERIC3-0	660284	5505338	1.0	1.4	2.4	1.0	1.6	2.6	1.0	2.0	3.0	-	-	-
				ERIC4-12.5	-	-	-	-	-	-	-	-	0.9	1.4	2.3	-	-	-
				ERIC4-25	660663	5505716	0.7	0.3	1.0	1.0	0.6	1.6	0.7	0.9	1.6	-	-	-
				ERIC4-37.5	660716	5505899	-	-	-	-	-	-	0.7	0.2	0.9	-	-	-
				ERIC4-50	660809	5506061	0.6	0.0	0.6	0.8	0.5	1.3	0.6	0.1	0.7	-	-	-
				ERIC4-62.5	660801	5506254	-	-	-	-	-	-	0.8	0.1	0.8	-	-	-
				ERIC4-75	660804	5506442	0.3	0.0	0.3	0.7	0.3	1.0	0.6	0.1	0.7	-	-	-
		Gate		GATE1-0	655639	5509248	0.1	0.0	0.1	0.1	0.0	0.1	-	-	-	-	-	-
				GATE2-25	655965	5509195	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.7	1.6
				GATE2-50	656079	5509288	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.8	1.3	0.9	0.6	1.4
				GATE2-75	656203	5509420	-	-	-	0.0	0.0	0.0	0.6	0.4	0.9	0.9	0.5	1.4
		Michel		MICH1-25	652367	5511652	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MICH1-50	653084	5511690	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MICH1-75	653632	5511165	0.9	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MICH2-25	655773	5509086	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				MICH2-50	656992	5507316	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				MICH2-75	658604	5506053	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	-	-	-
				MICH3-25	660365	5502437	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				MICH3-50	659705	5499439	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				MICH3-75	659519	5496925	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				MICH4-25	661762	5493058	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MICH4-50	663679	5490944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MICH4-75	665800	5488748	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Milligan		MILL1-0	658677	5506090	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				MILL2-0	658827	5506096	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.7	1.5
				MILL2-14.3	658831	5506200	-	-	-	-	-	-	-	-	-	0.9	0.8	1.7
				MILL2-29.9	658864	5506313	-	-	-	-	-	-	-	-	-	0.9	0.8	1.7
				MILL2-42.6	658871	5506408	-	-	-	-	-	-	-	-	-	0.8	0.6	1.4
				MILL2-55.2	658869	5506505	-	-	-	-	-	-	-	-	-	0.2	0.1	0.2
				MILL2-71.5	658919	5506612	-	-	-	-	-	-	-	-	-	0.1	0.0	0.1
		Pengelly		PENG1-0	670063	5486606	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				PENG1-50	670140	5486520	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
		Qualtieri		QUAL1-0	654105	5511353	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		South Pit		SPIT1-12.5	659483	5505526	-	-	-	-	-	-	-	-	-	1.0	1.6	2.6
				SPIT1-25	659519	5505540	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.3	2.2	0.9	0.8	1.7
				SPIT1-37.5	659504	5505557	-	-	-	-	-	-	-	-	-	1.0	1.3	2.3
				SPIT1-50	659480	5505587	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	1.0	1.2	2.2
				SPIT1-62.5	659506	5505602	-	-	-	-	-	-	-	-	-	0.1	0.0	0.1
				SPIT1-75	659539	5505583	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.7
				SPIT2-25	659661	5505594	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
				SPIT2-50	659685	5505693	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-
				SPIT2-75	659677	5505797	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-

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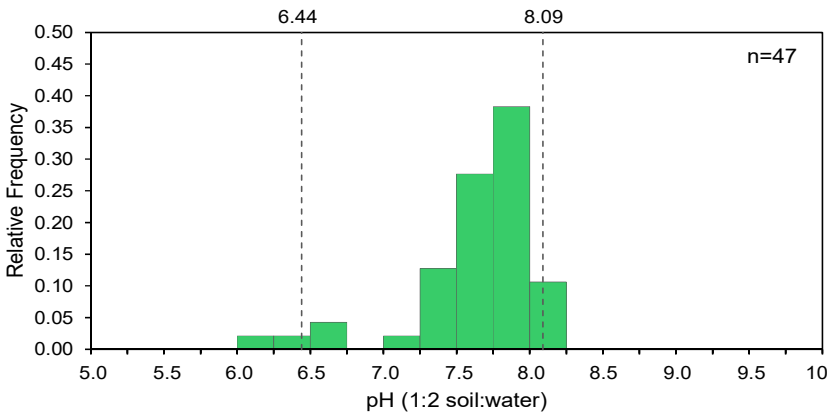
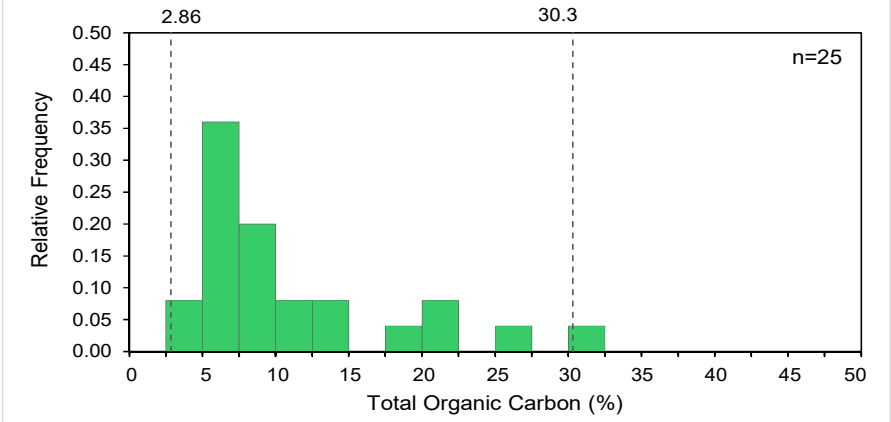
Table D.7: Data from Regional Calcite Monitoring Program (Lotic 2014 - 2017)

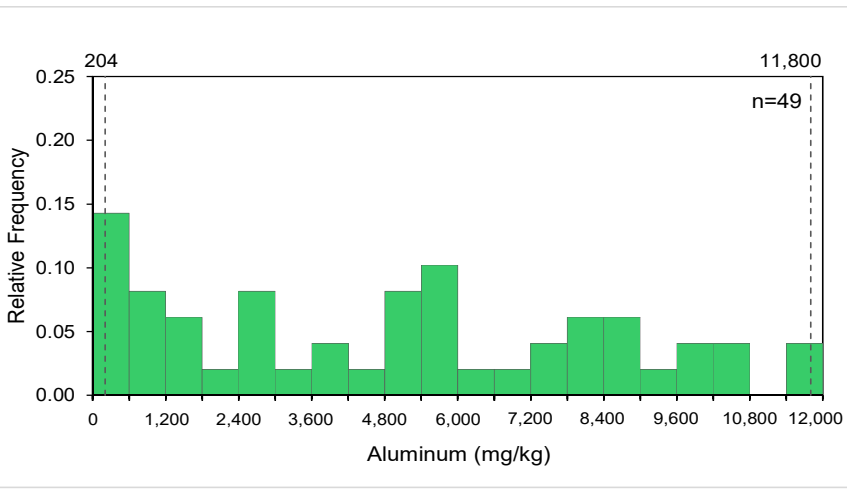
Management Unit	Main Watershed	Stream Name	Exposure Type	Station ID	UTM (NAD 83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index	Presence Score	Concretion Score	Calcite Index
4	Elk	Spring	Mine-exposed	SPRI1-0	653917	5511549	0.2	0.0	0.2	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1
		Otto		LCSE1-0	652689	5513001	0.4	0.0	0.4	0.0	0.0	0.0	-	-	-	-	-	-
		CCR Seep		CSEE1-0	653425	5514076	-	-	-	-	-	-	0.3	0.5	0.9	-	-	-
5		Elk		ELKR8-25	645757	5491857	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ELKR8-50	648446	5498834	0.7	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				ELKR8-75	651967	5504751	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
unknown		South Line	Reference	SLINE2-25	-	-	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				SLINE2-50	-	-	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
				SLINE2-75	-	-	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-
		South Pit	Mine-exposed	SPIT1-0	-	-	-	-	-	-	-	-	0.9	1.3	2.1	-	-	-

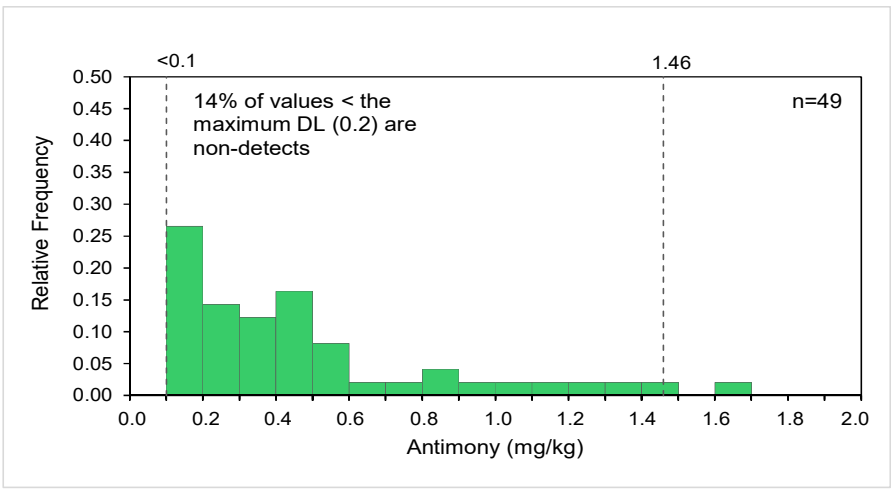
CI>1

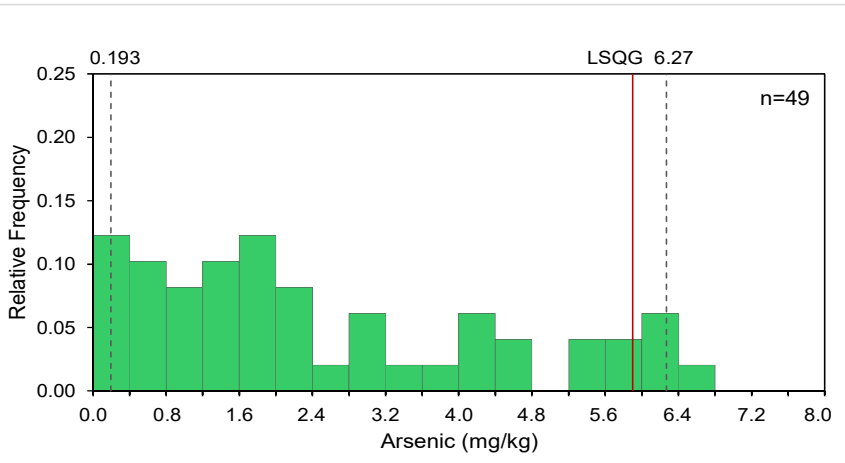
APPENDIX E
SEDIMENT QUALITY

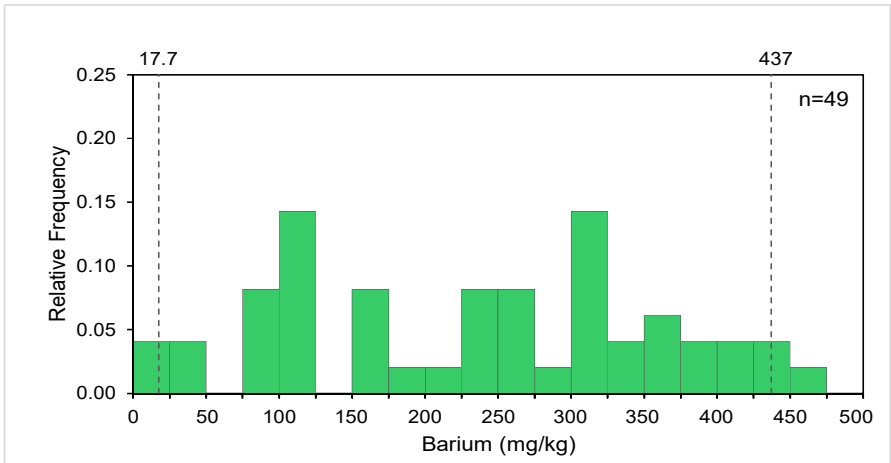


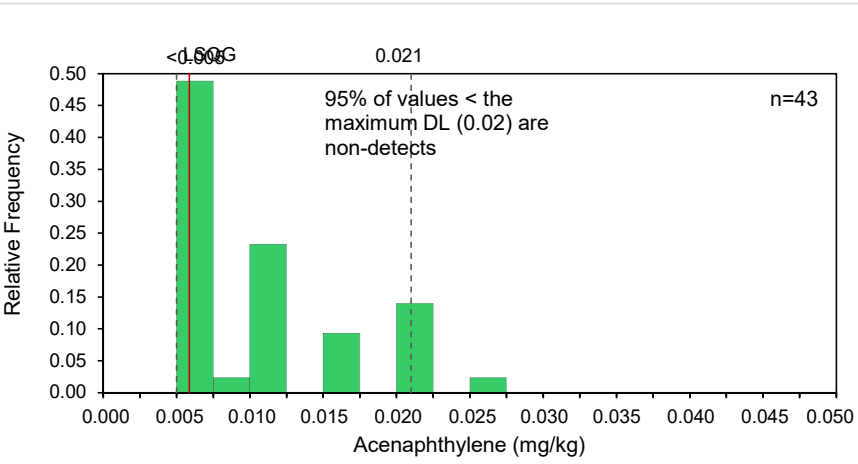


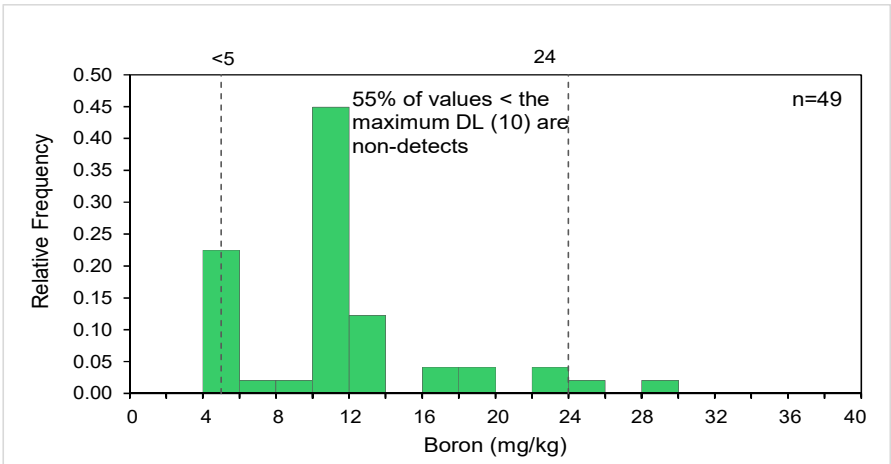


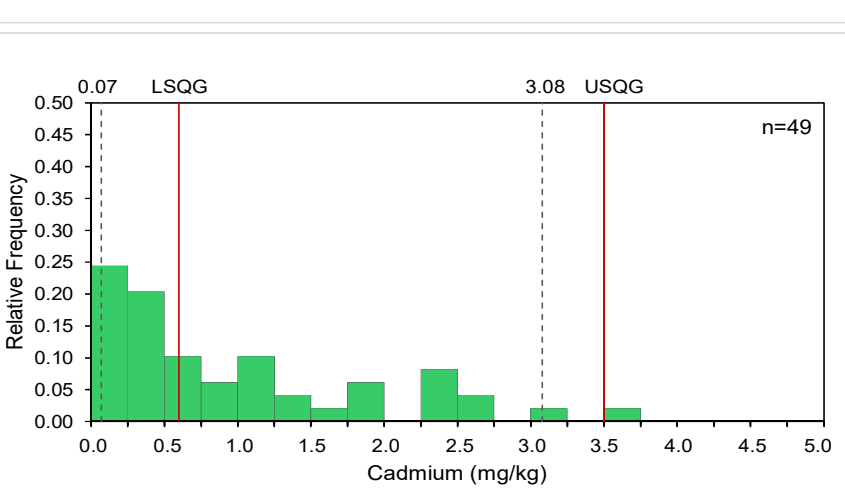












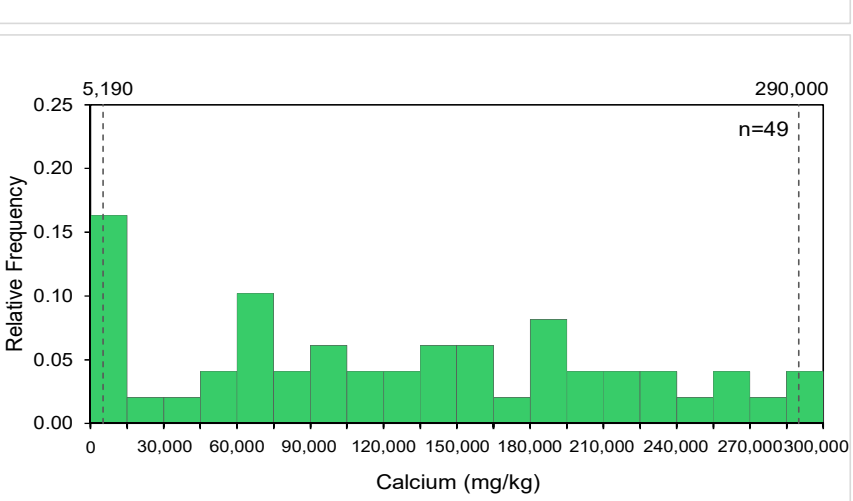


Figure E.1: Distribution of Reference Area Data (after Removal of Outliers and Poor Detection Limits) used to Define Reference Normal Ranges ($P_{2.5}$ and $P_{97.5}$) for Parameters Measured in Sediment, 2013 and 2015

Notes: Dashed vertical lines = 2.5th and 97.5th percentiles
LSQG = Lower Working Sediment Quality Guideline
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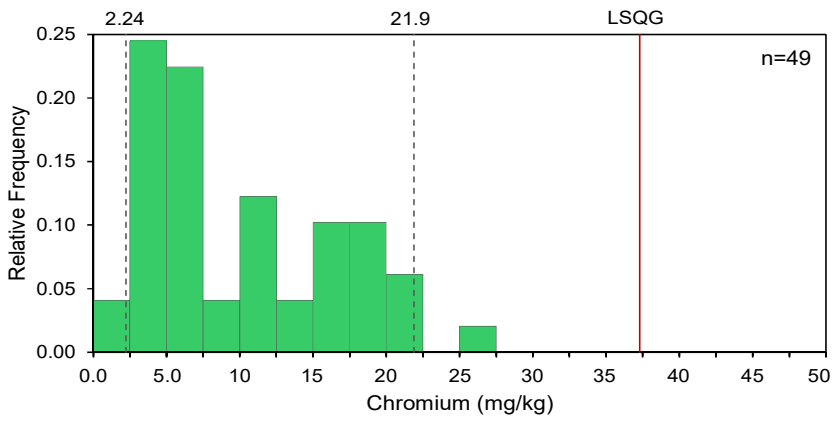

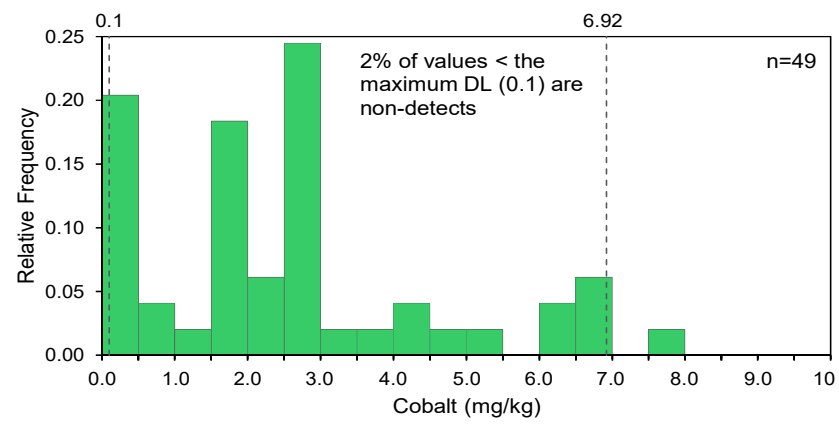

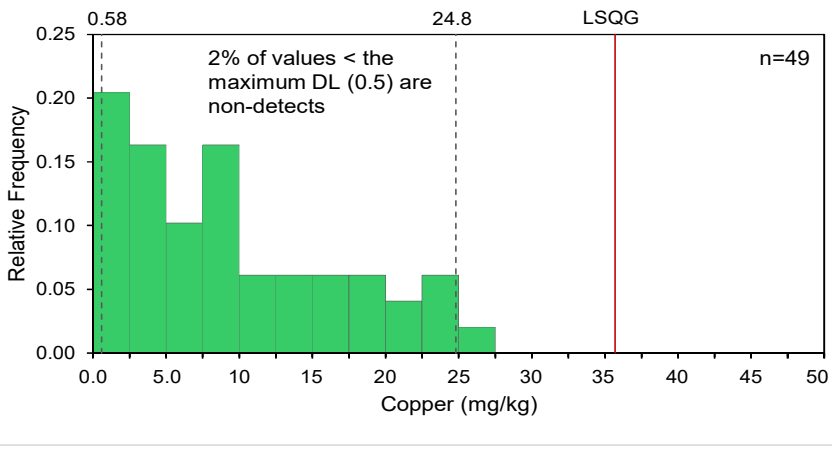

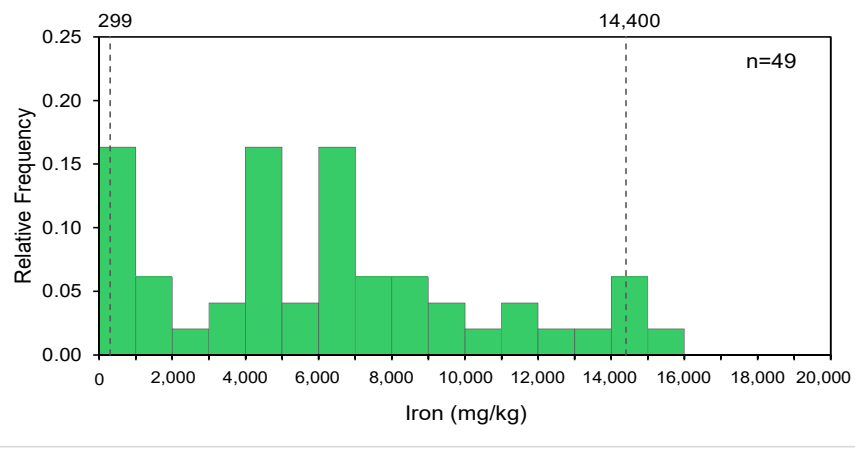

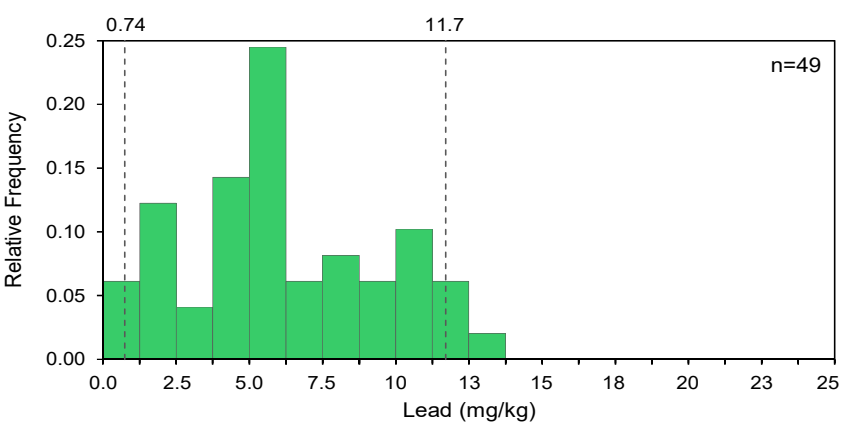

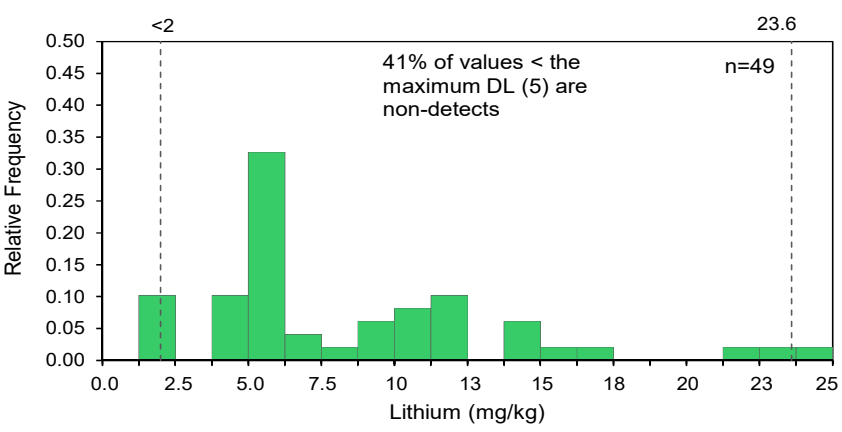

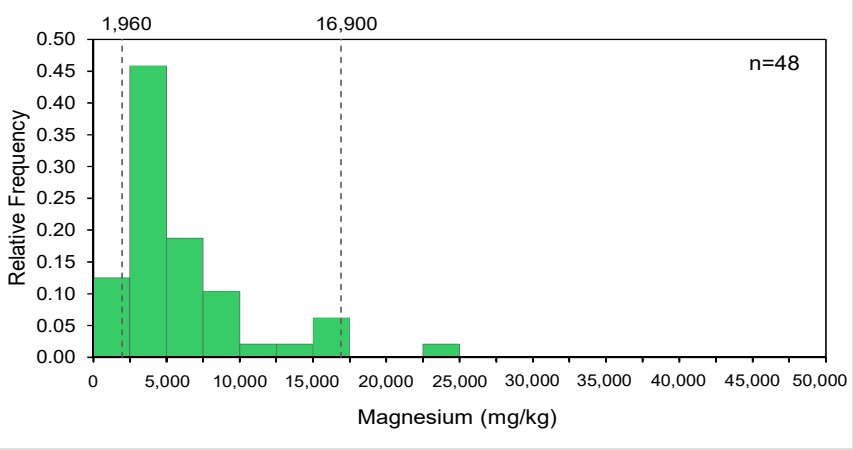

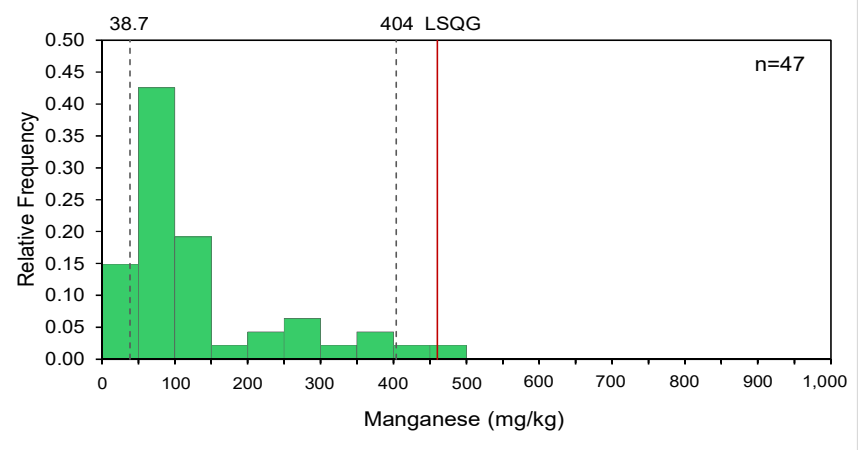

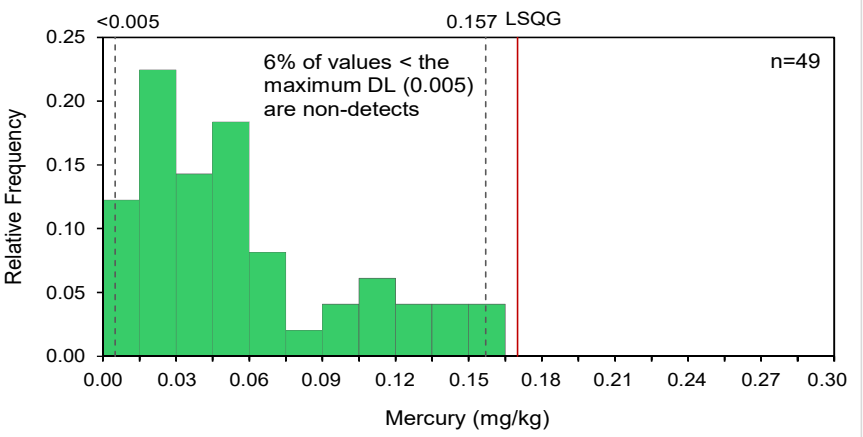

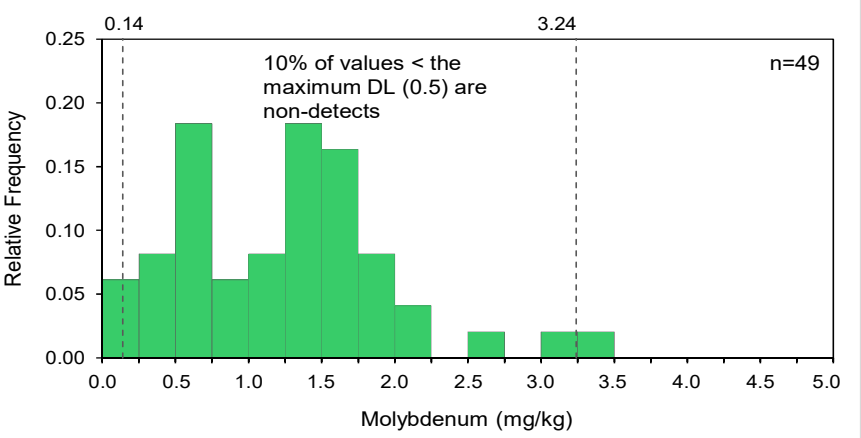

Figure E.1: Distribution of Reference Area Data (after Removal of Outliers and Poor Detection Limits) used to Define Reference Normal Ranges ($P_{2.5}$ and $P_{97.5}$) for Parameters Measured in Sediment, 2013 and 2015

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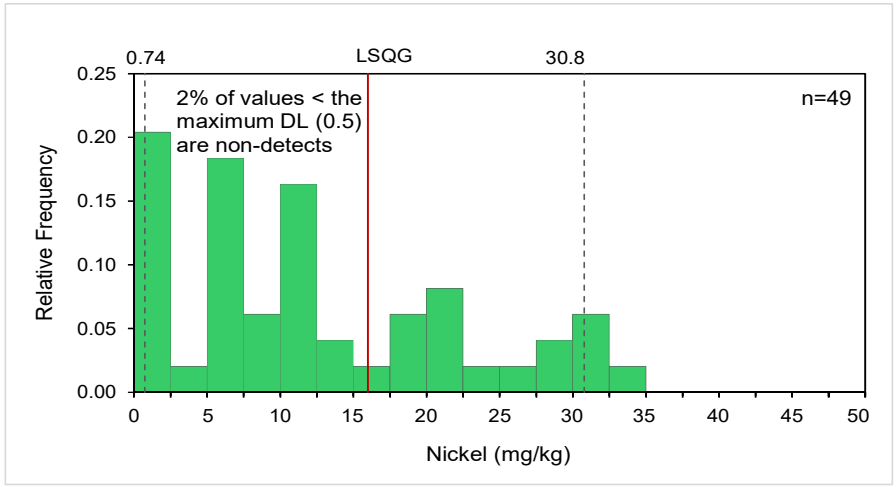

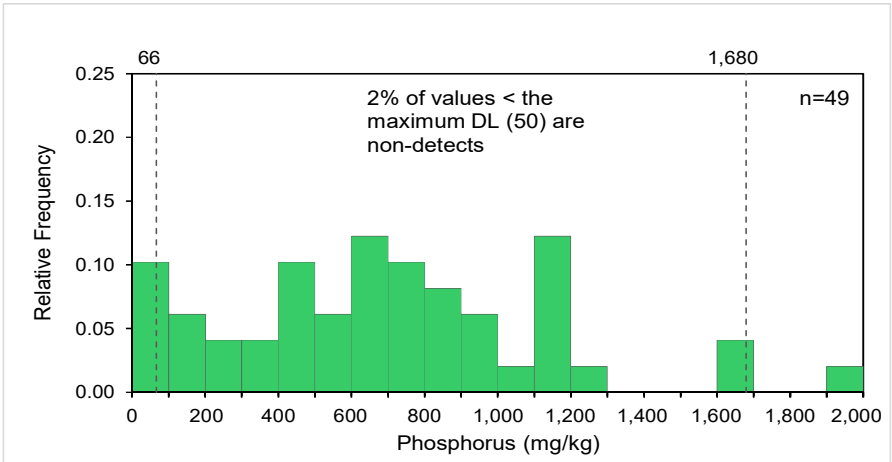

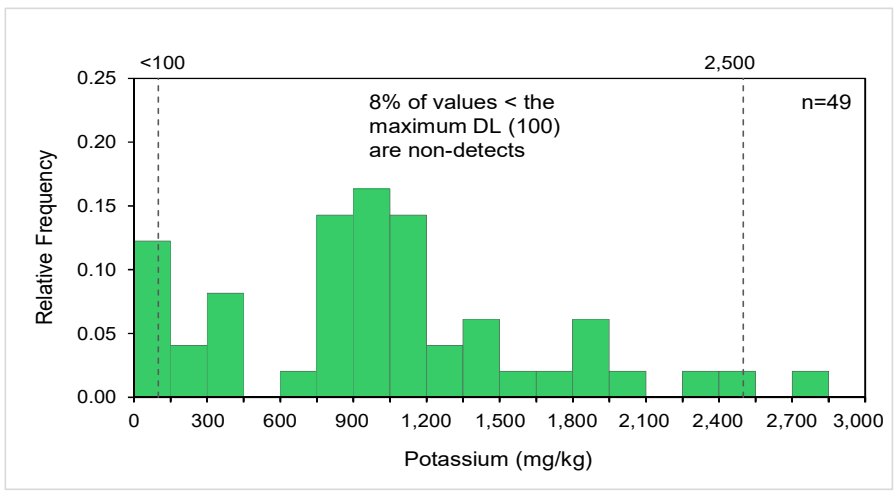

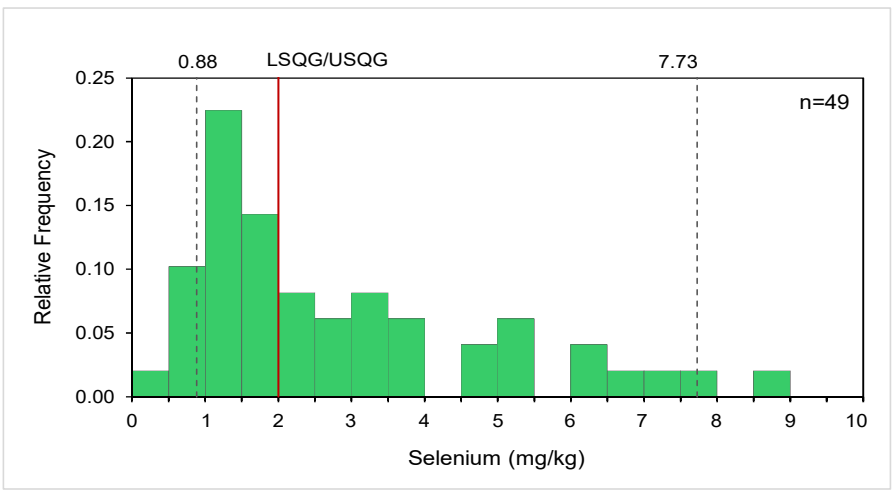

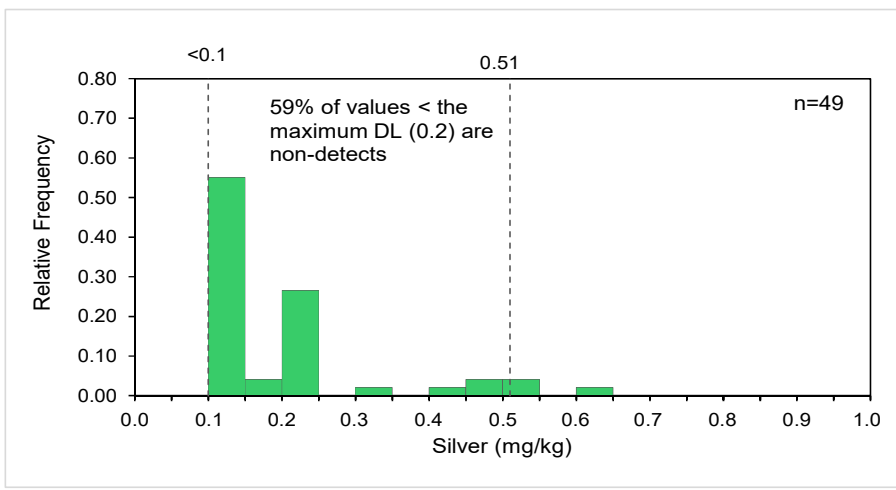

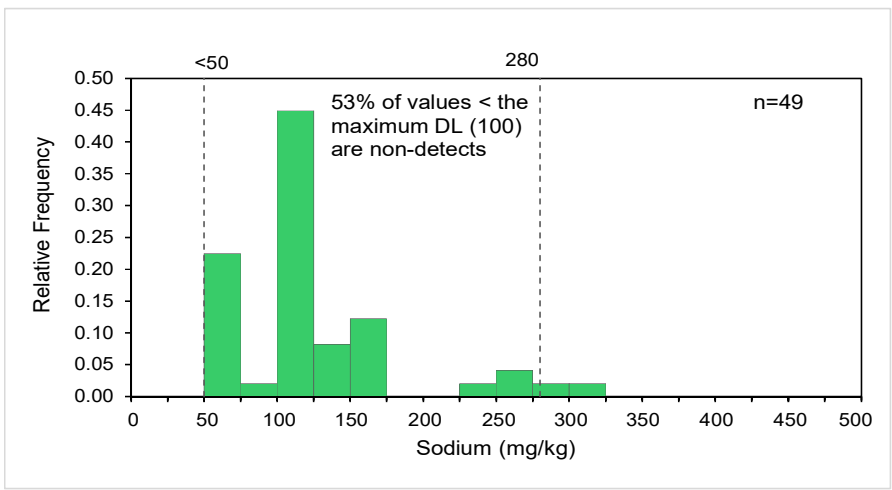

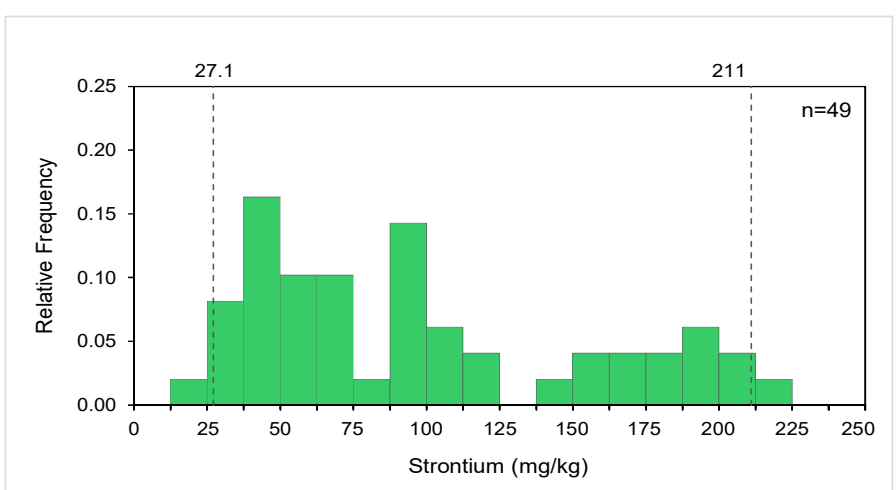

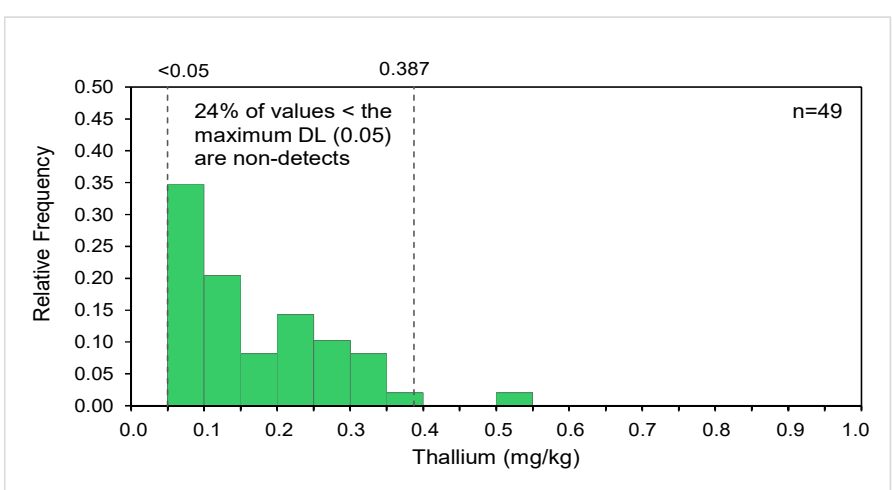

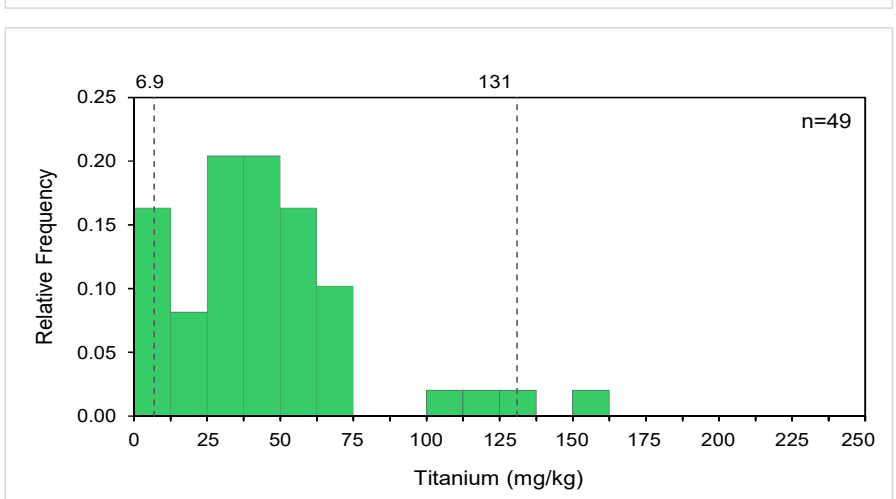

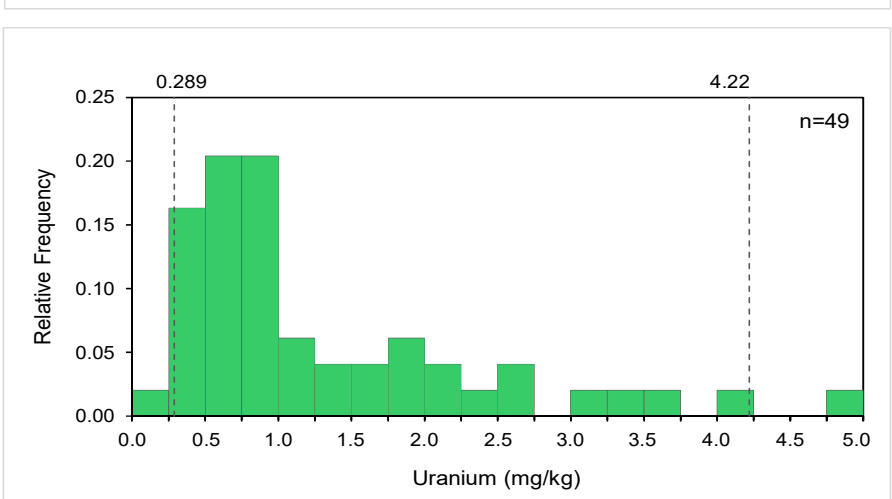

Figure E.1: Distribution of Reference Area Data (after Removal of Outliers and Poor Detection Limits) used to Define Reference Normal Ranges ($P_{2.5}$ and $P_{97.5}$) for Parameters Measured in Sediment, 2013 and 2015

Notes: Dashed vertical lines = 2.5th and 97.5th percentiles
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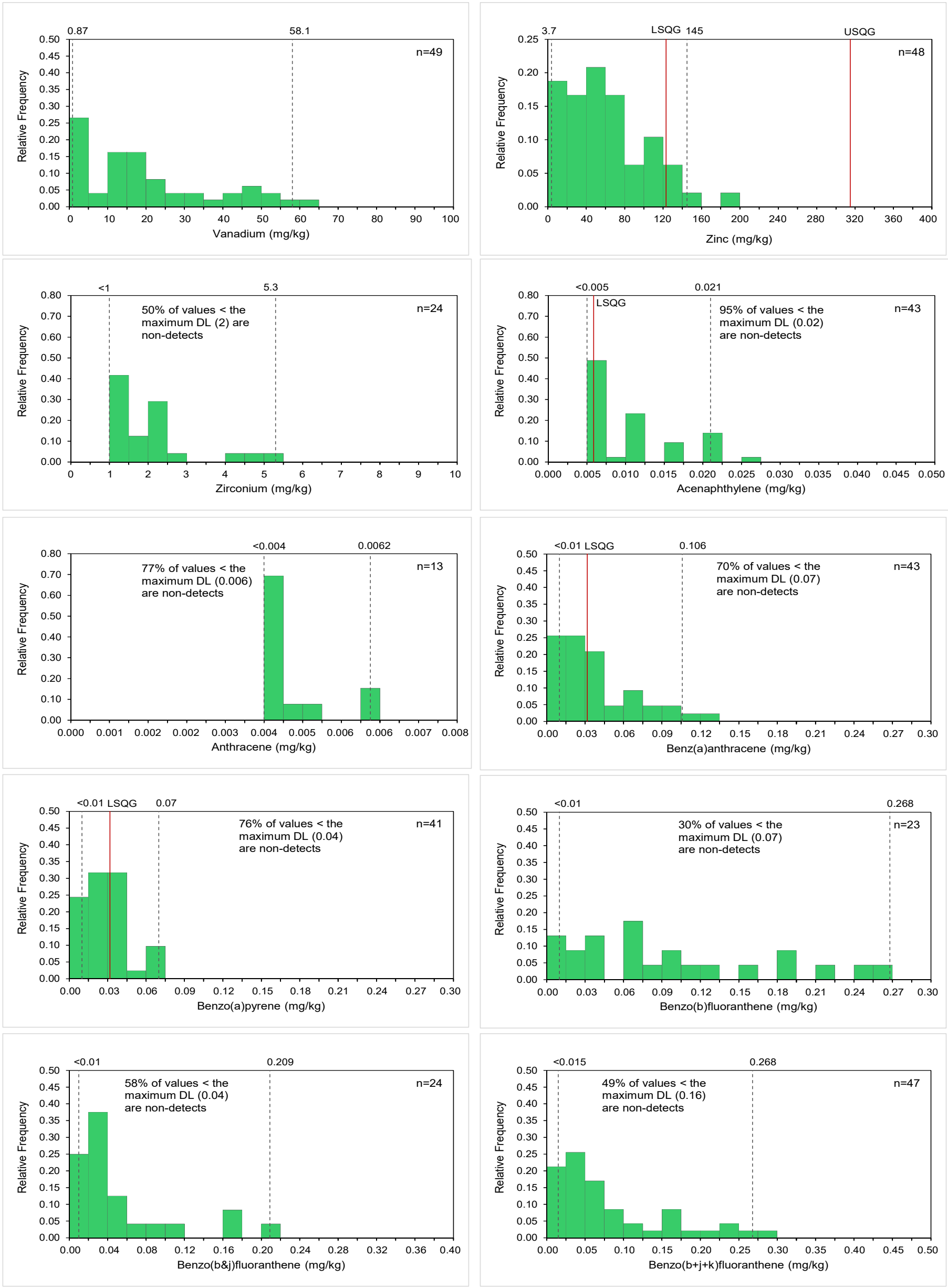

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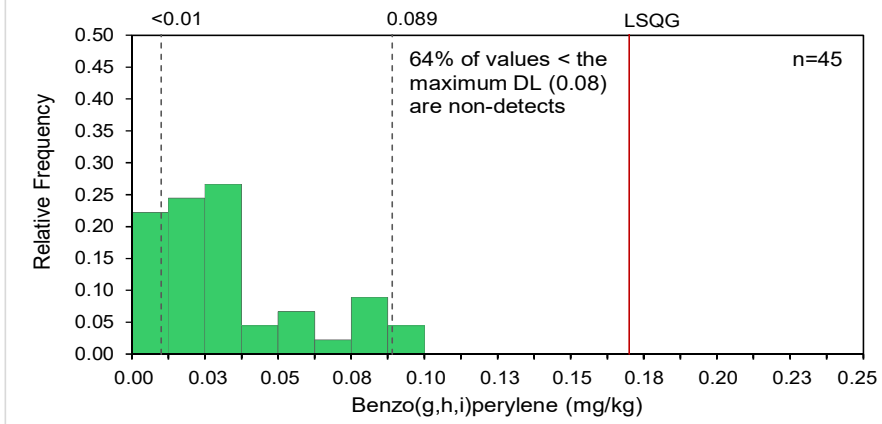

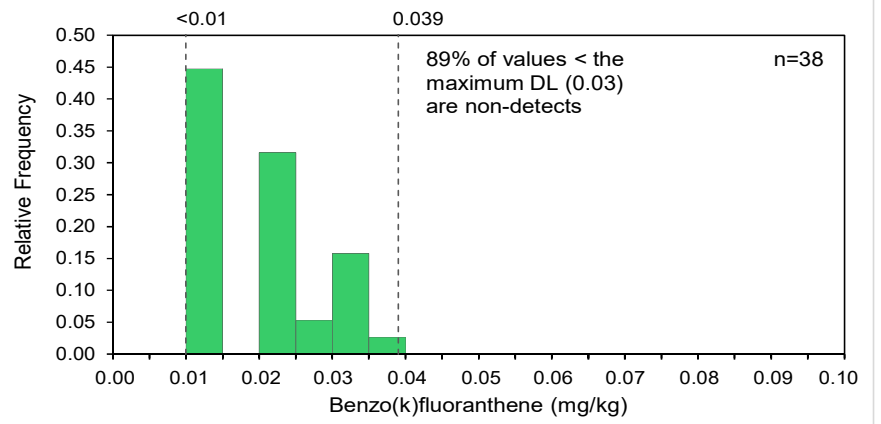

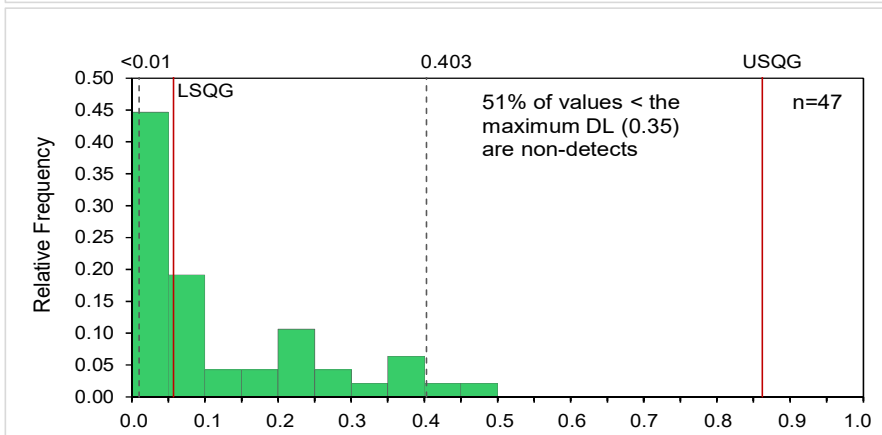

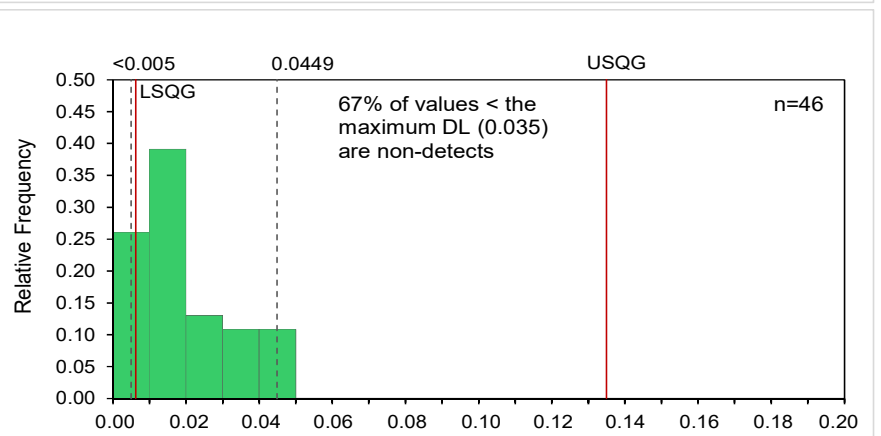

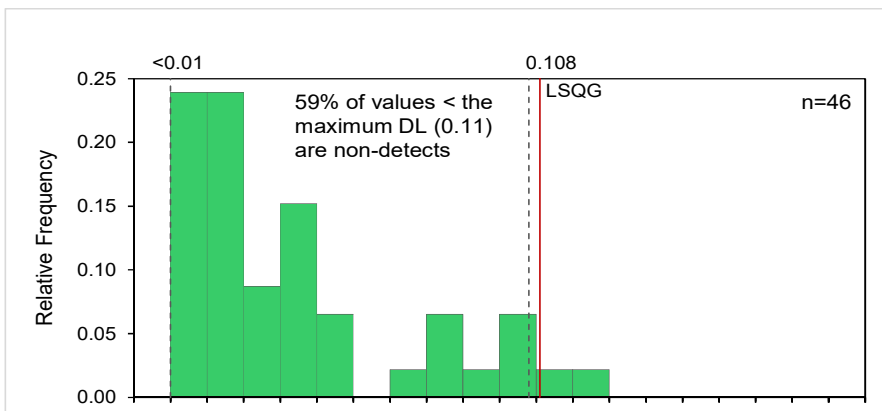

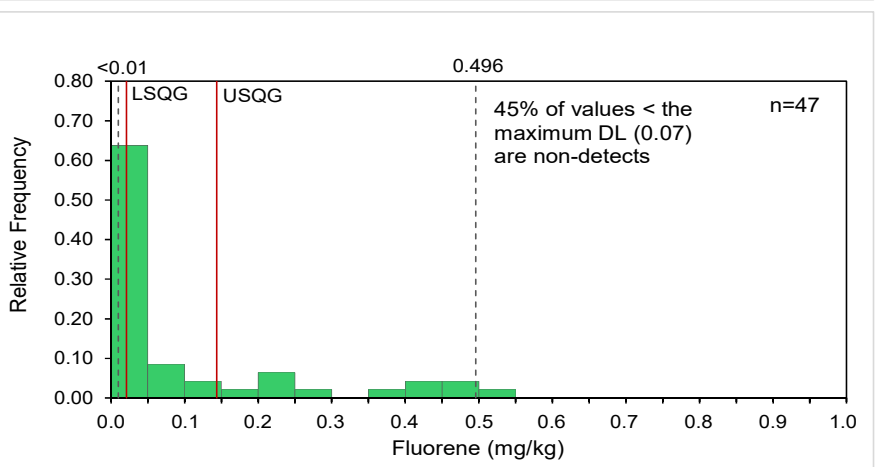

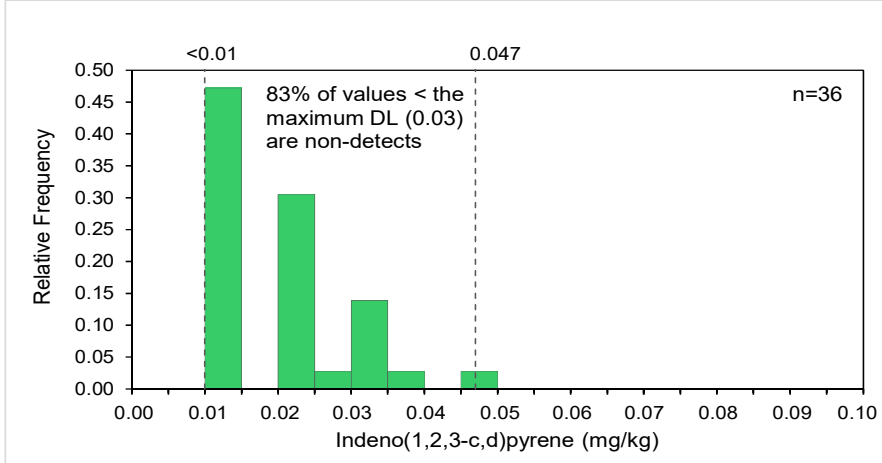

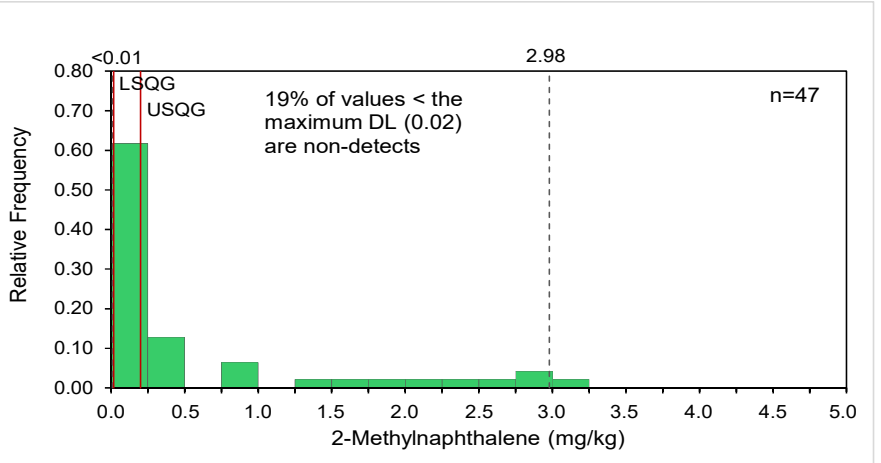

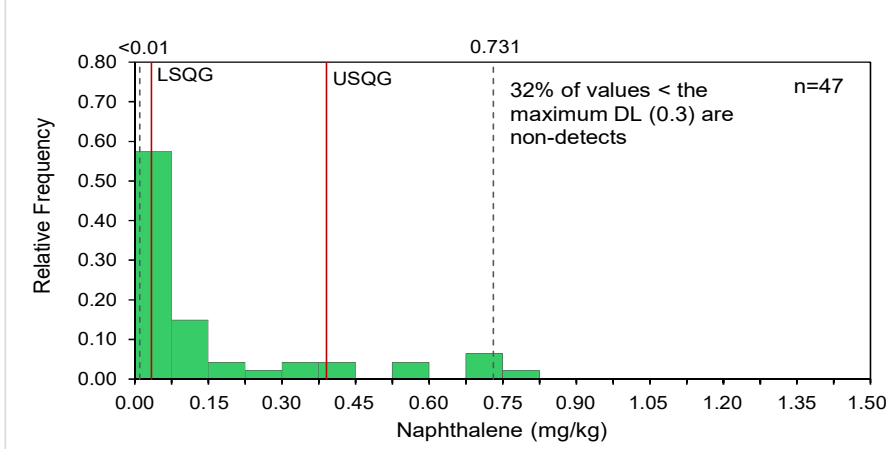

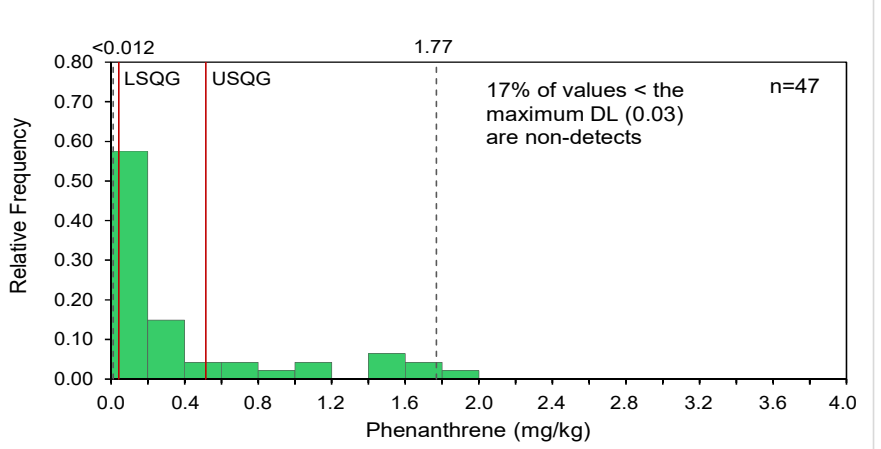

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Notes: Dashed vertical lines = 2.5th and 97.5th percentiles
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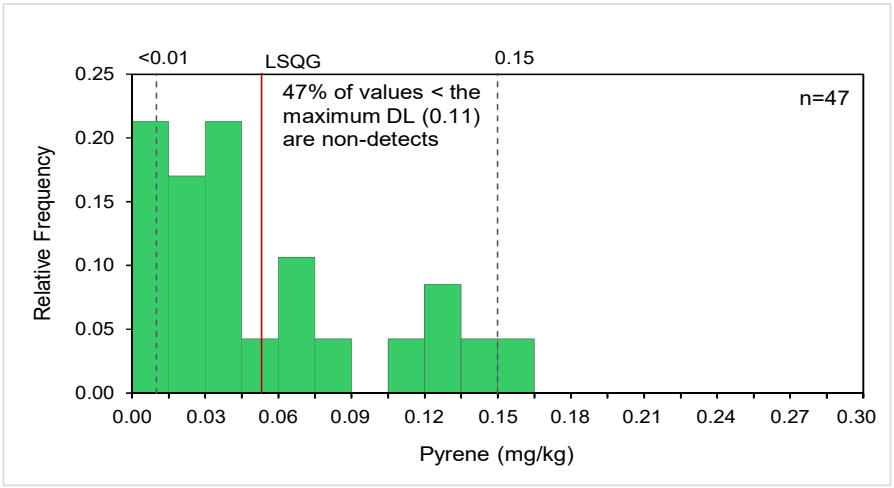

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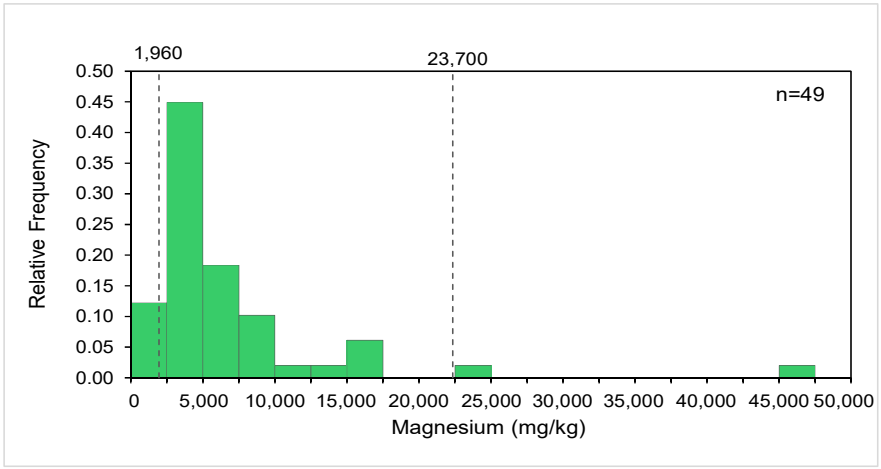
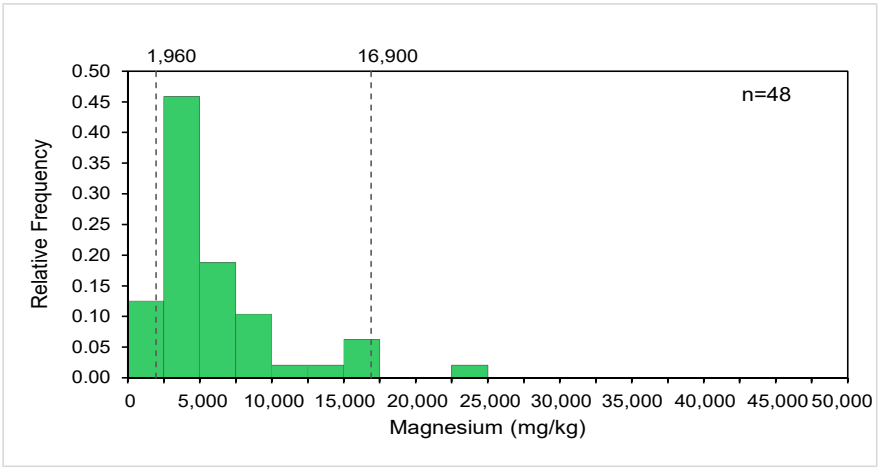
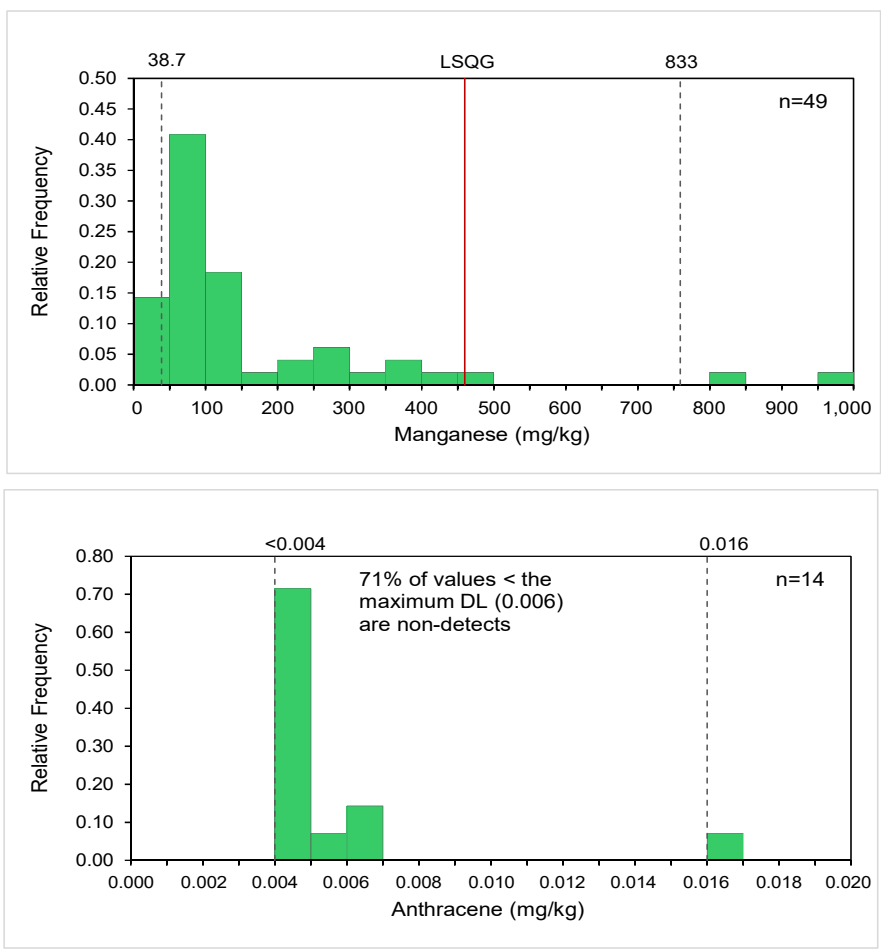
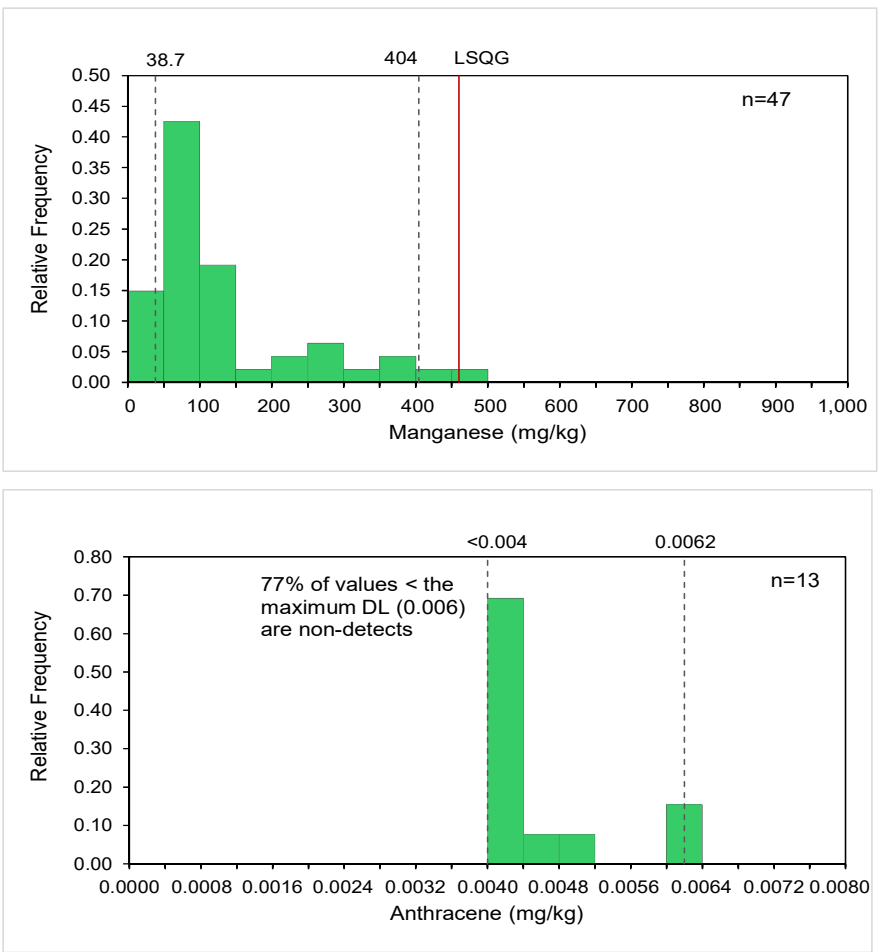
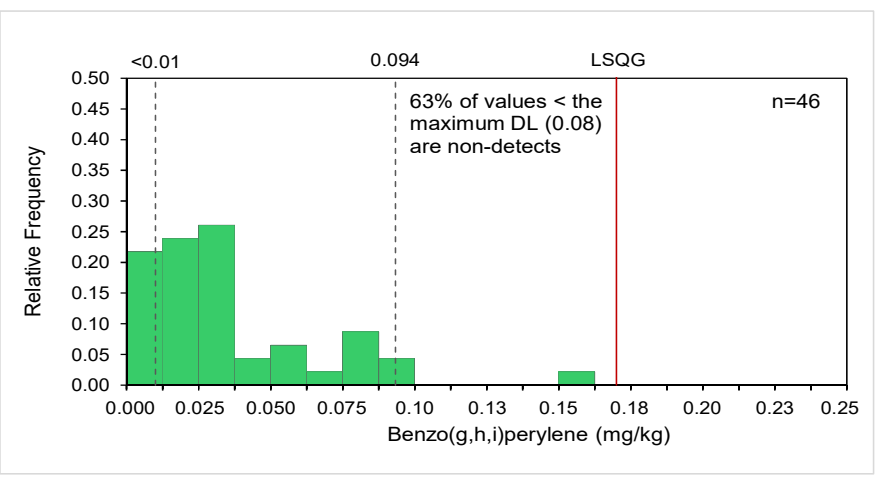










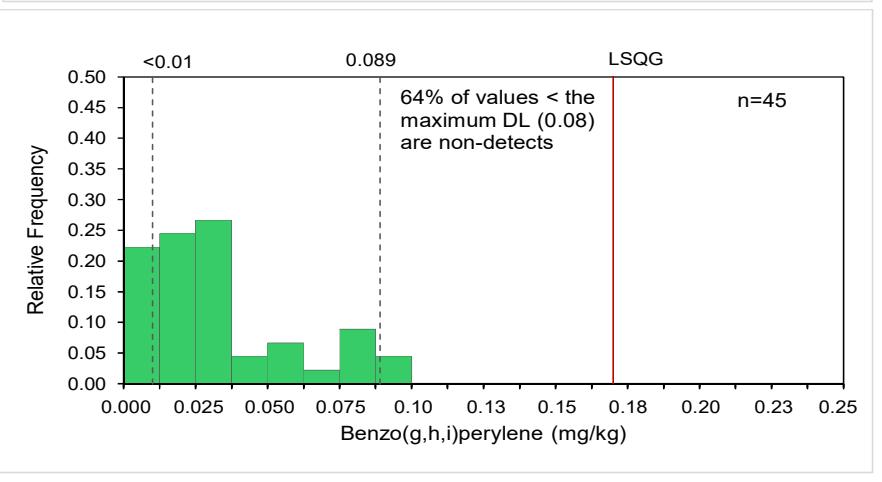
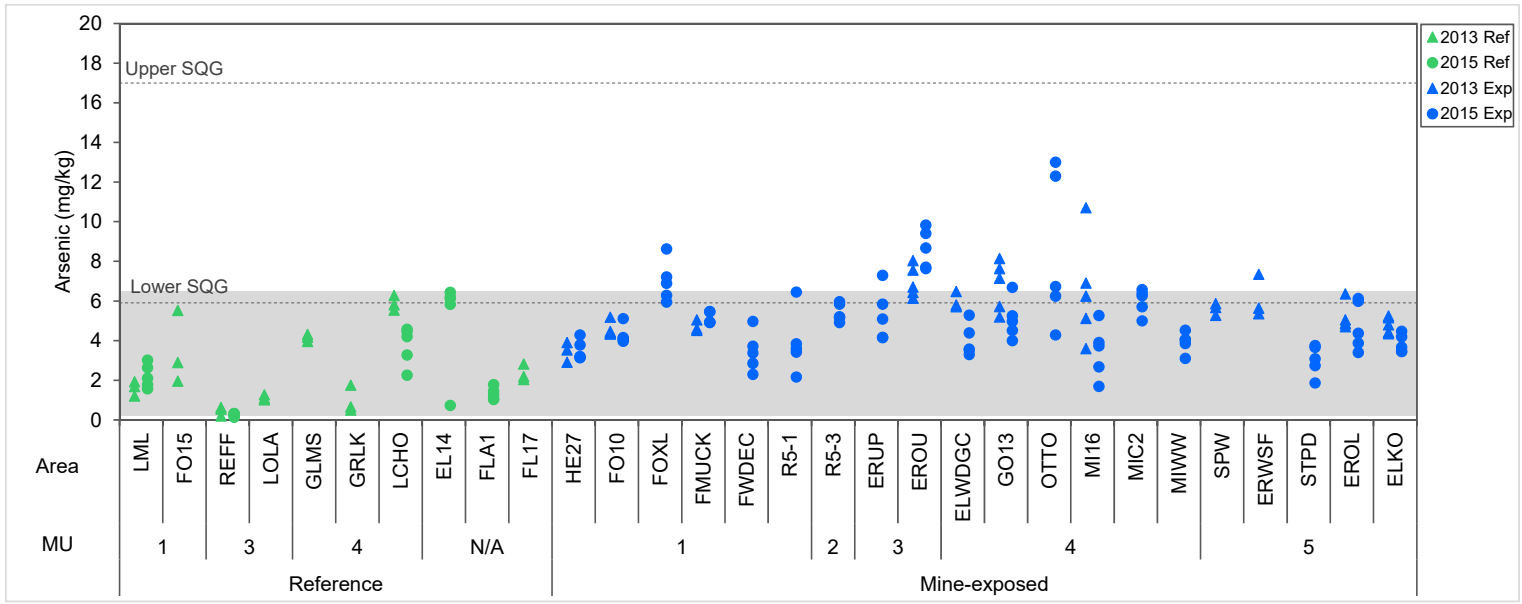
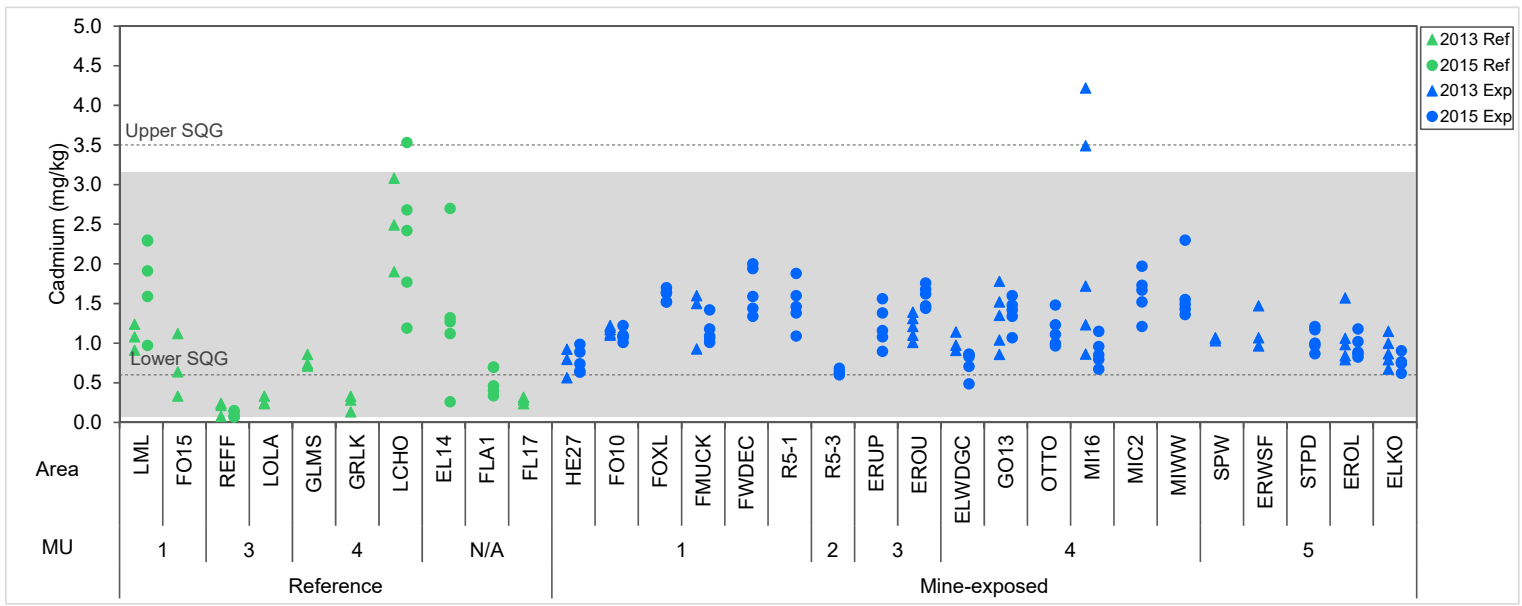
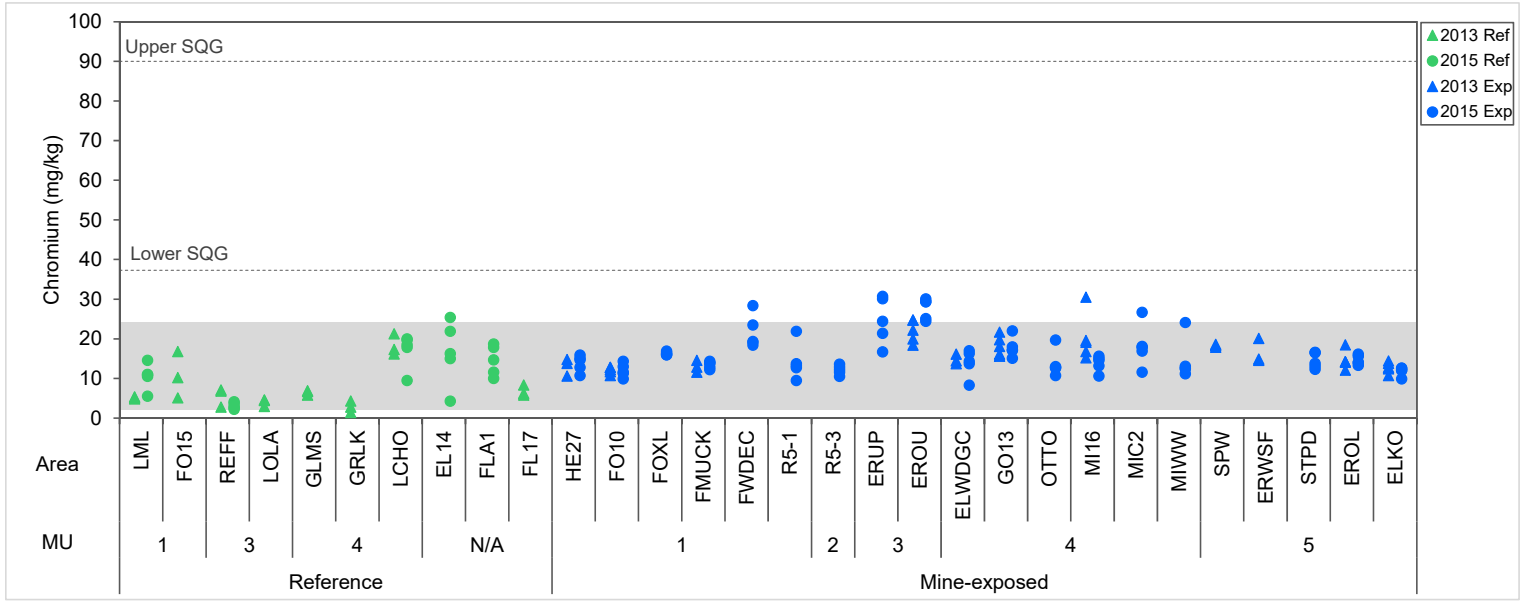


Figure E.2: Distribution of Reference Area Sediment Data (2013 and 2015) for Parameters with Outliers (all data on left and data after removal of outliers on right)

Notes: Dashed vertical lines = 2.5th and 97.5th percentiles
LSQG = Lower Sediment Quality Guideline
USQG = Upper Sediment Quality Guideline







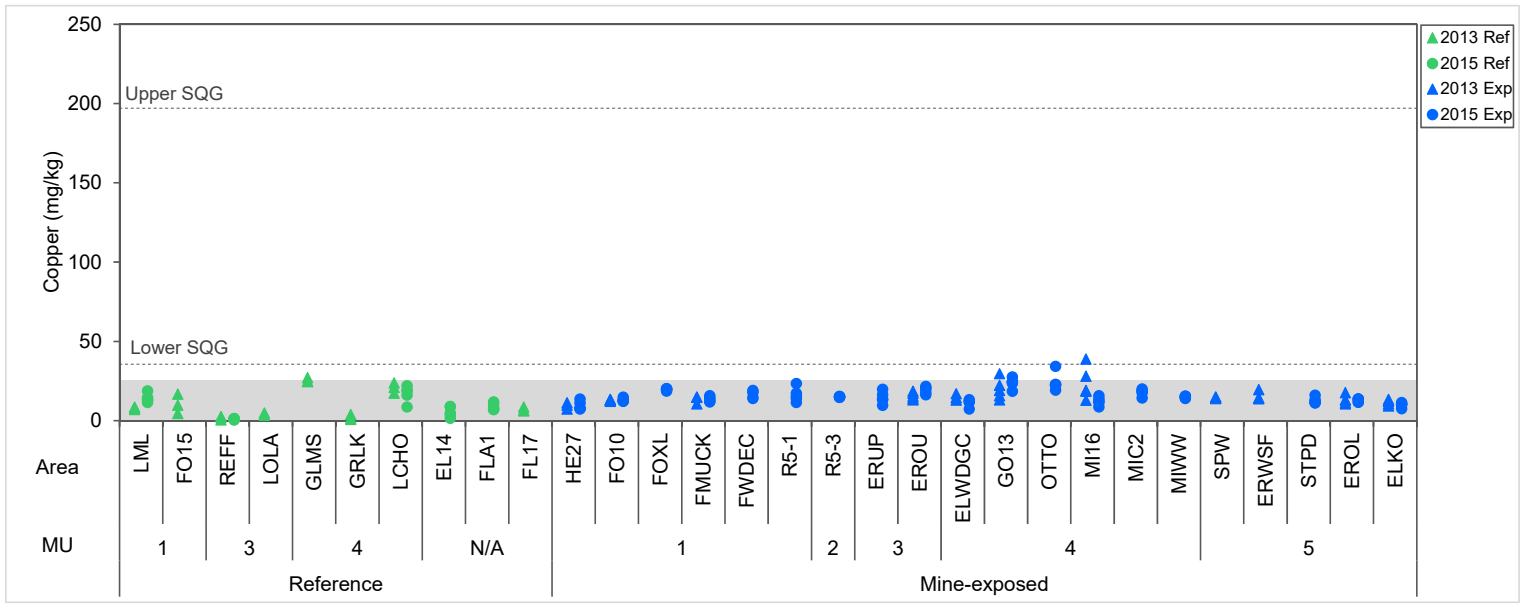
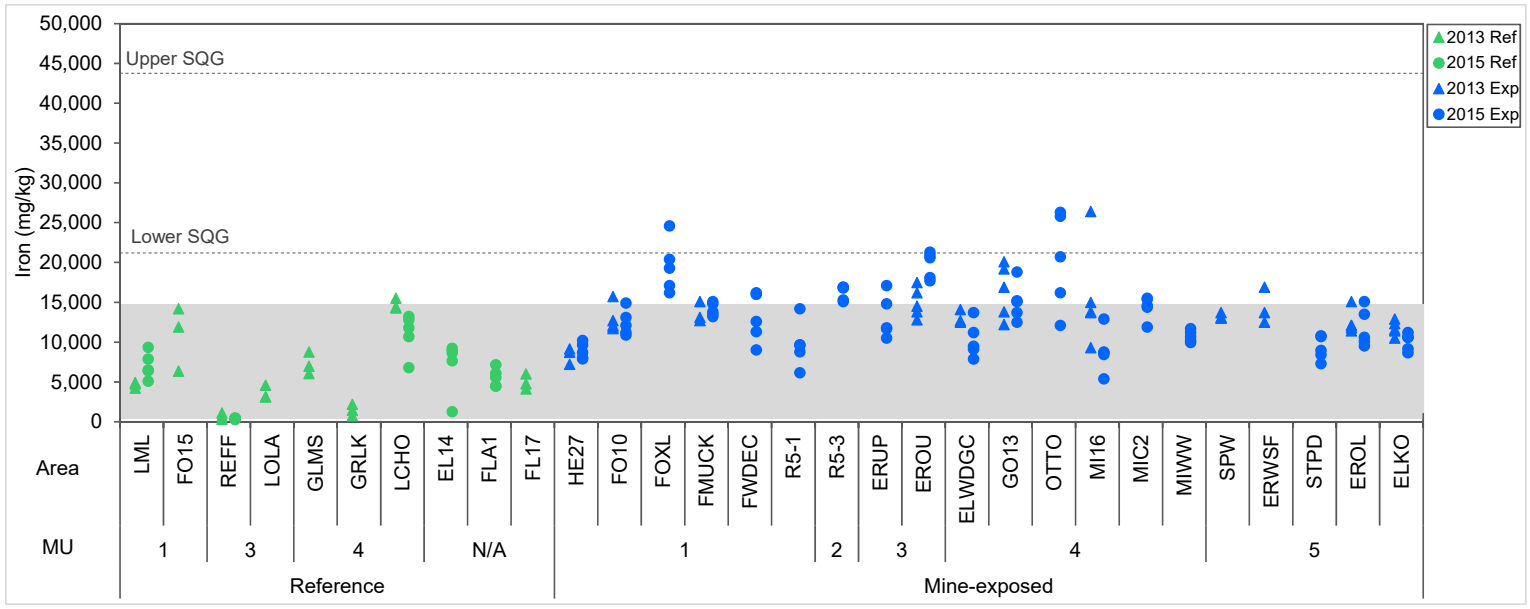
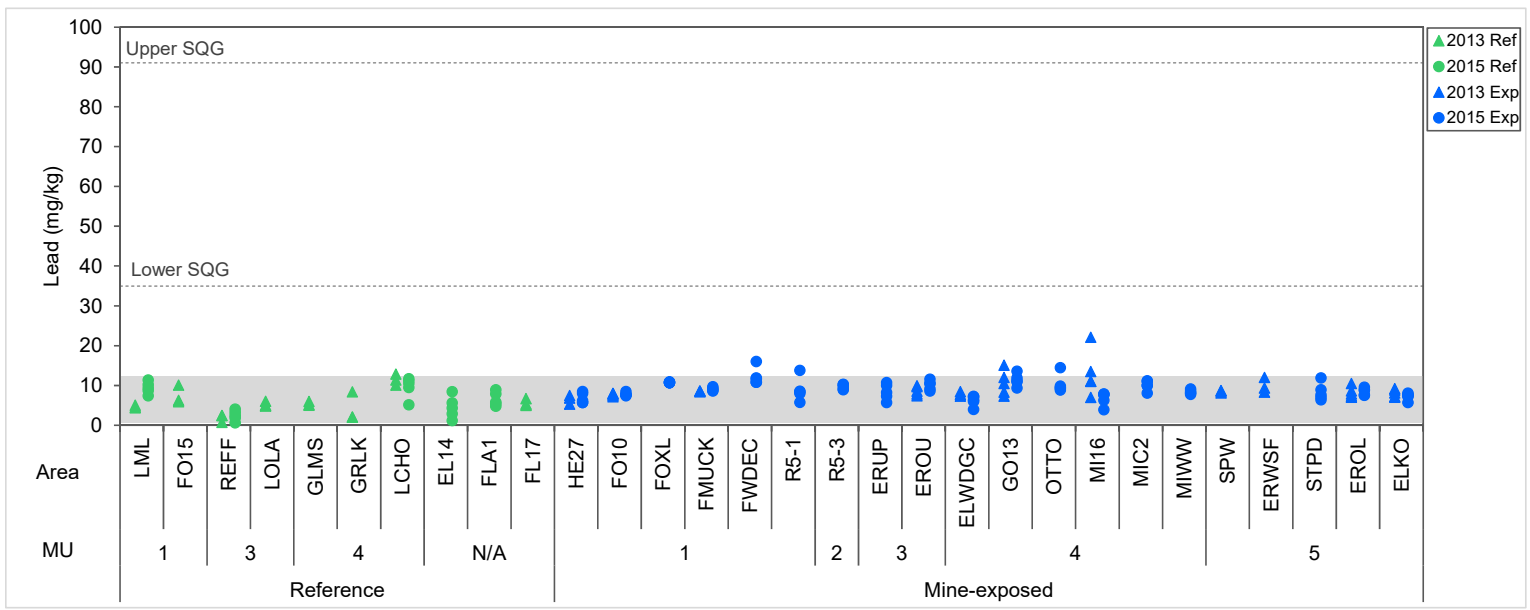
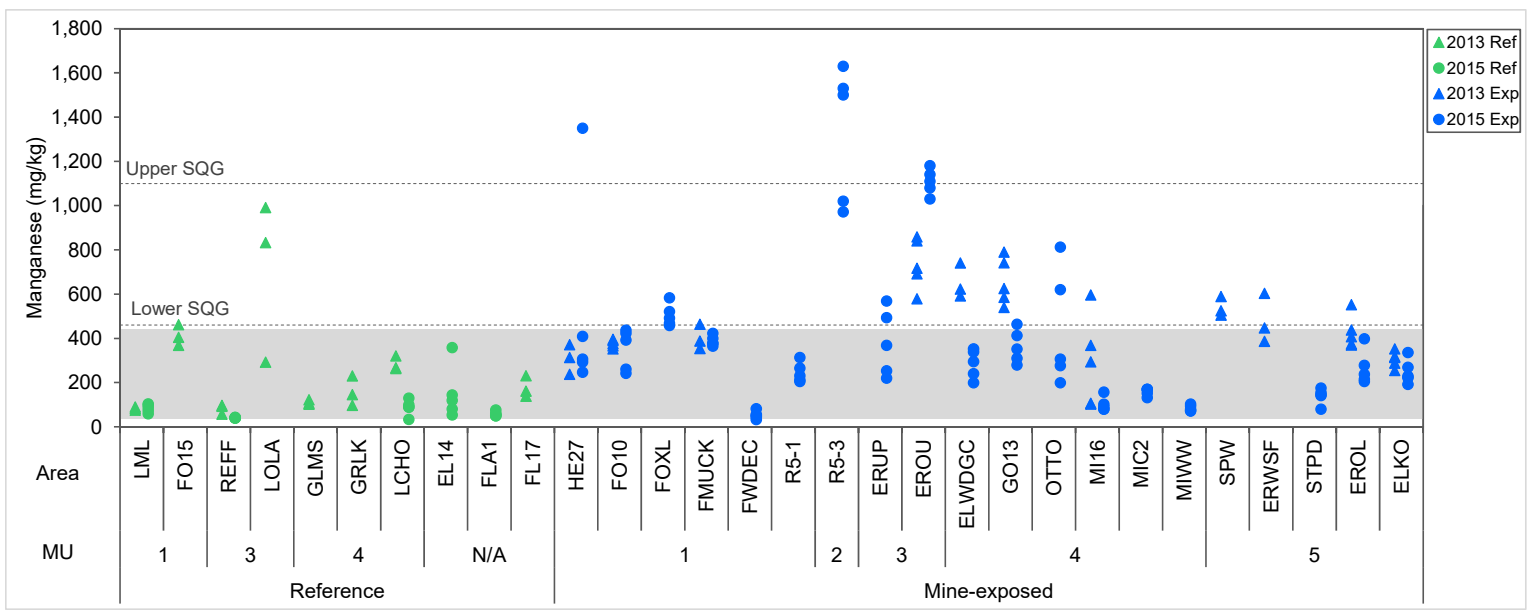


Figure E.3: Sediment Metal Concentrations Relative to BC Sediment Quality Guidelines, August 2013 and 2015

Notes: Samples areas are shown in Figure 6.1. Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).







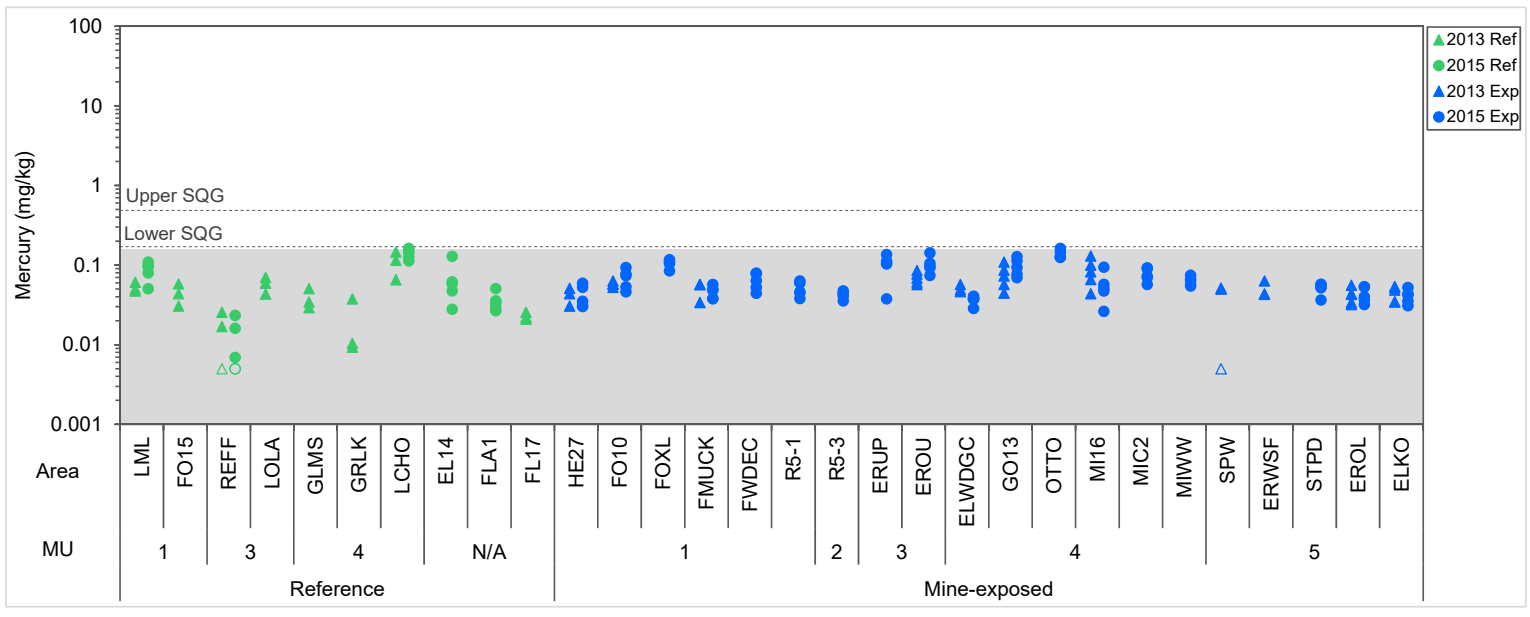
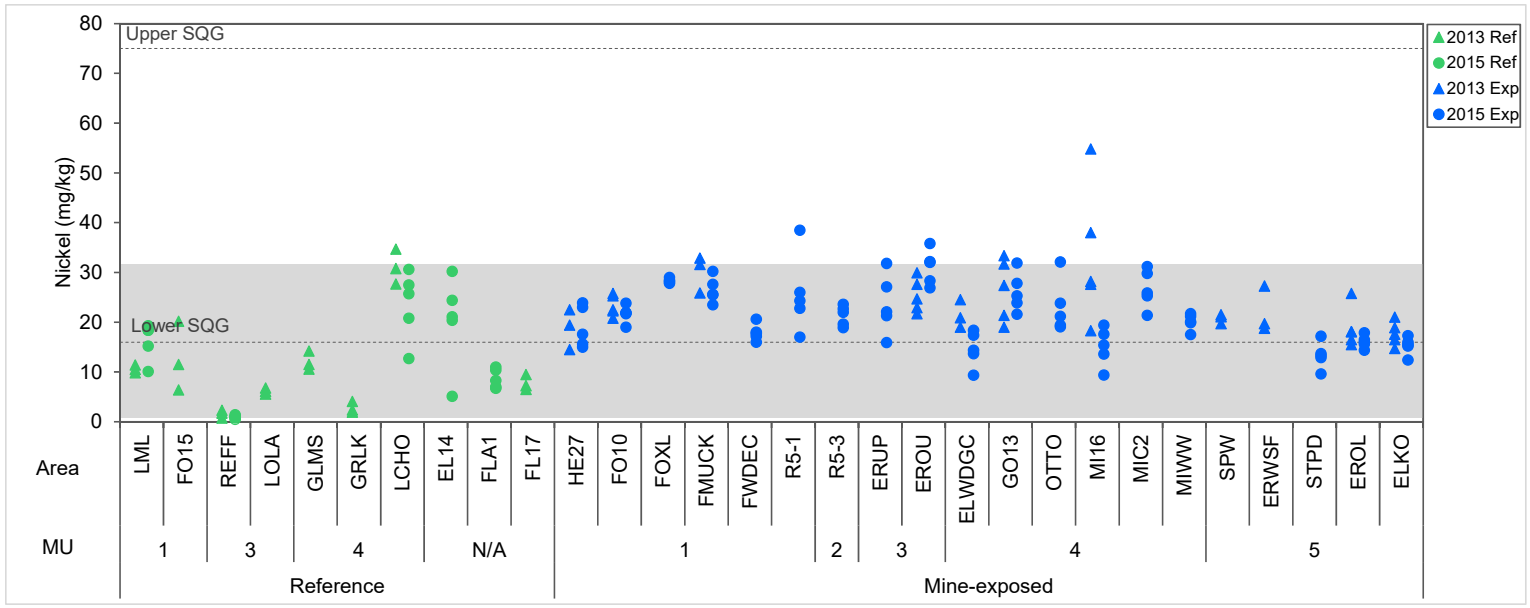
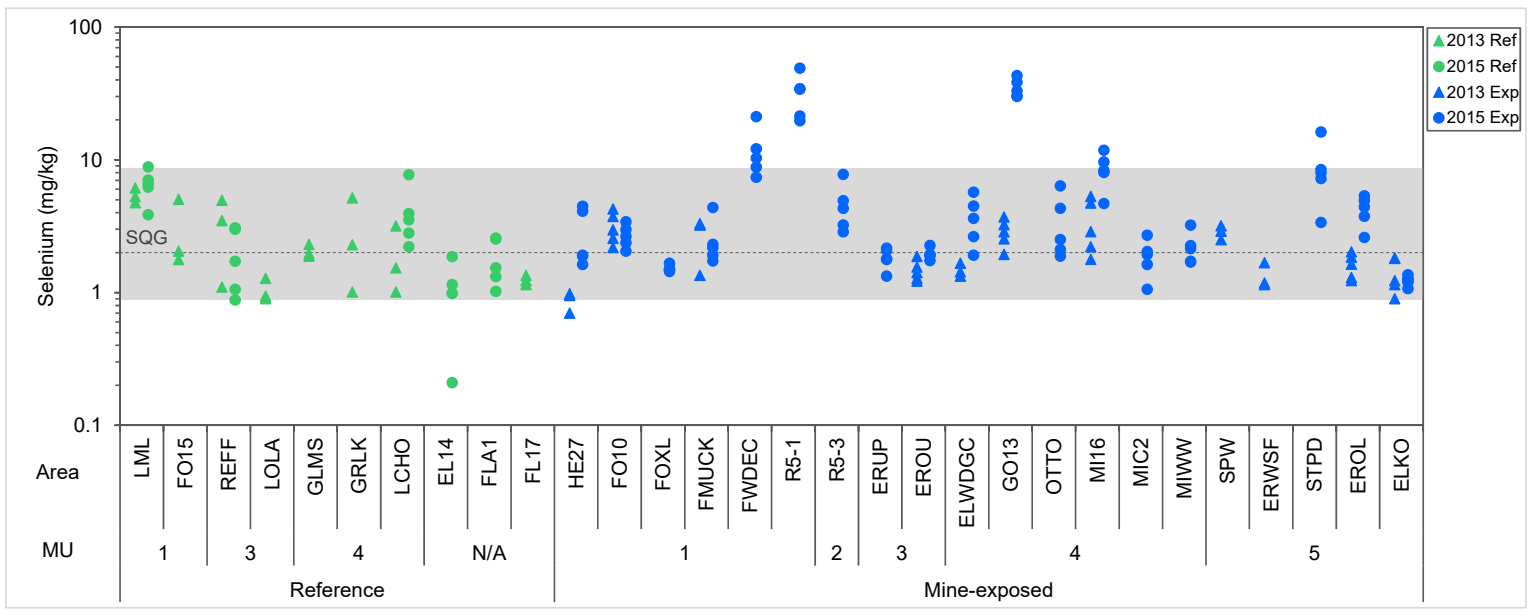


Figure E.3: Sediment Metal Concentrations Relative to BC Sediment Quality Guidelines, August 2013 and 2015

Notes: Samples areas are shown in Figure 6.1. Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).





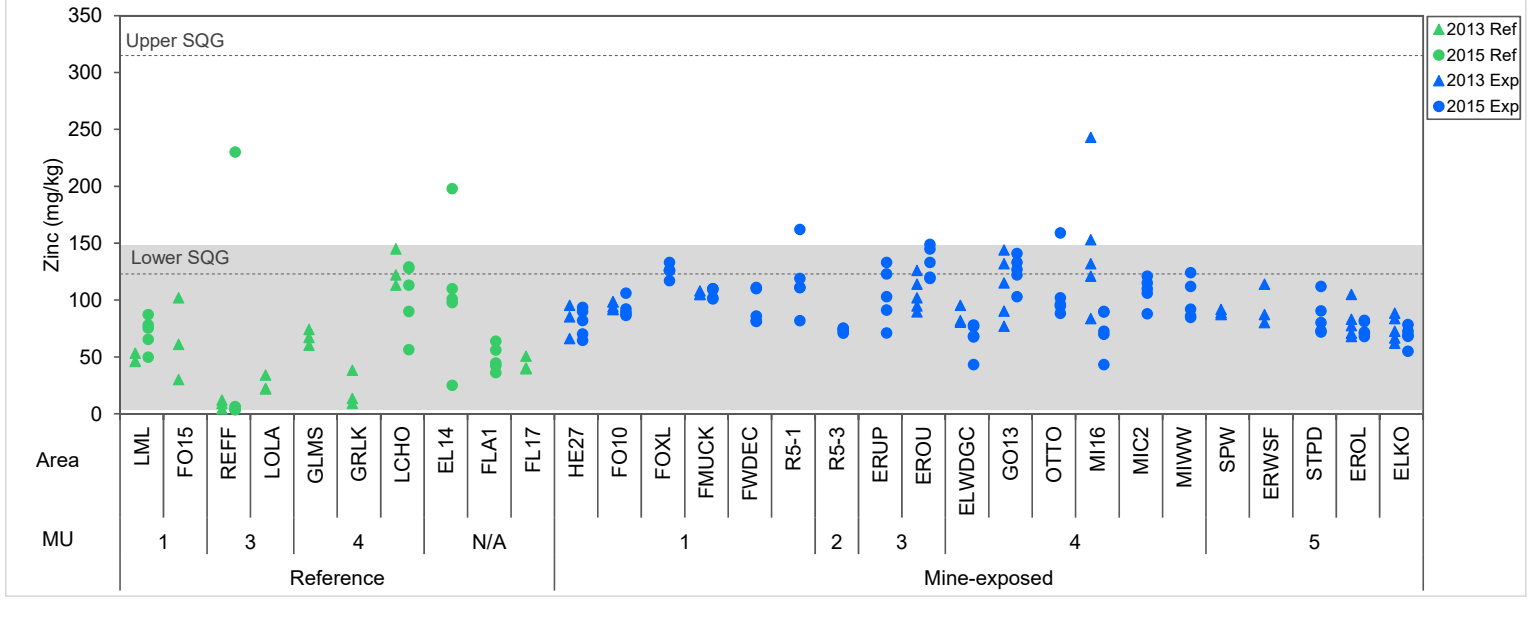
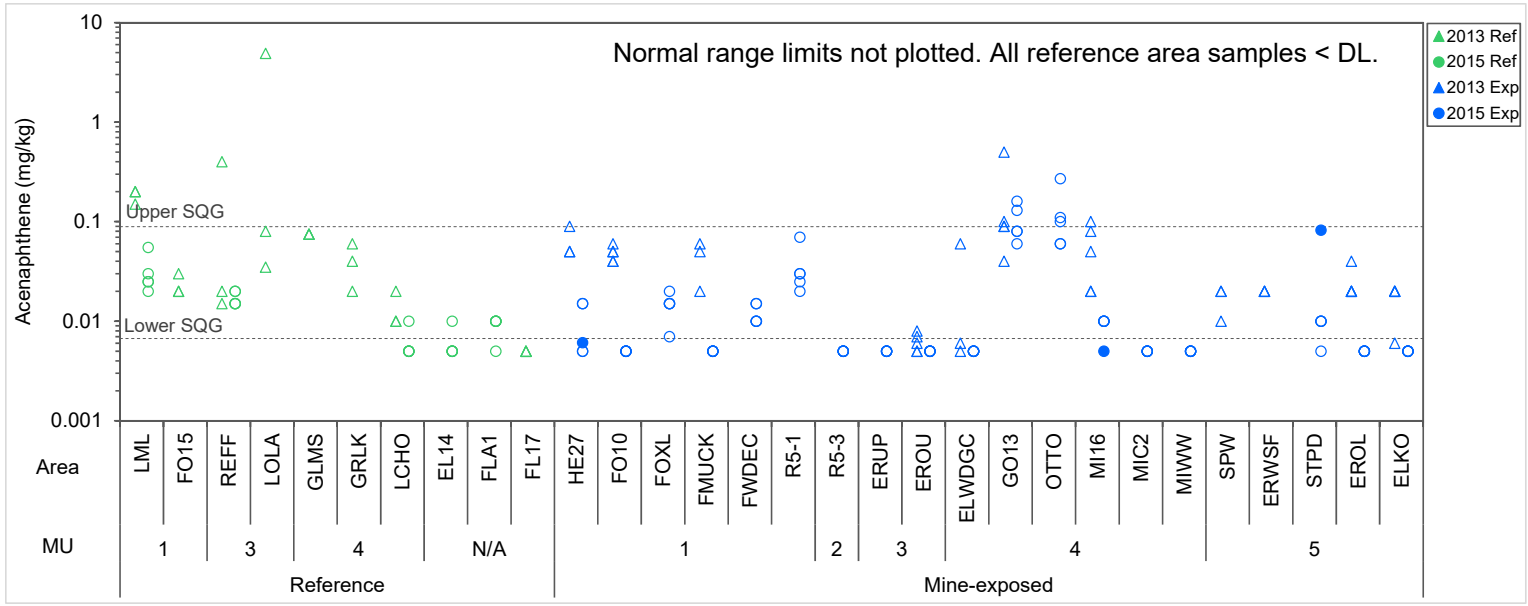
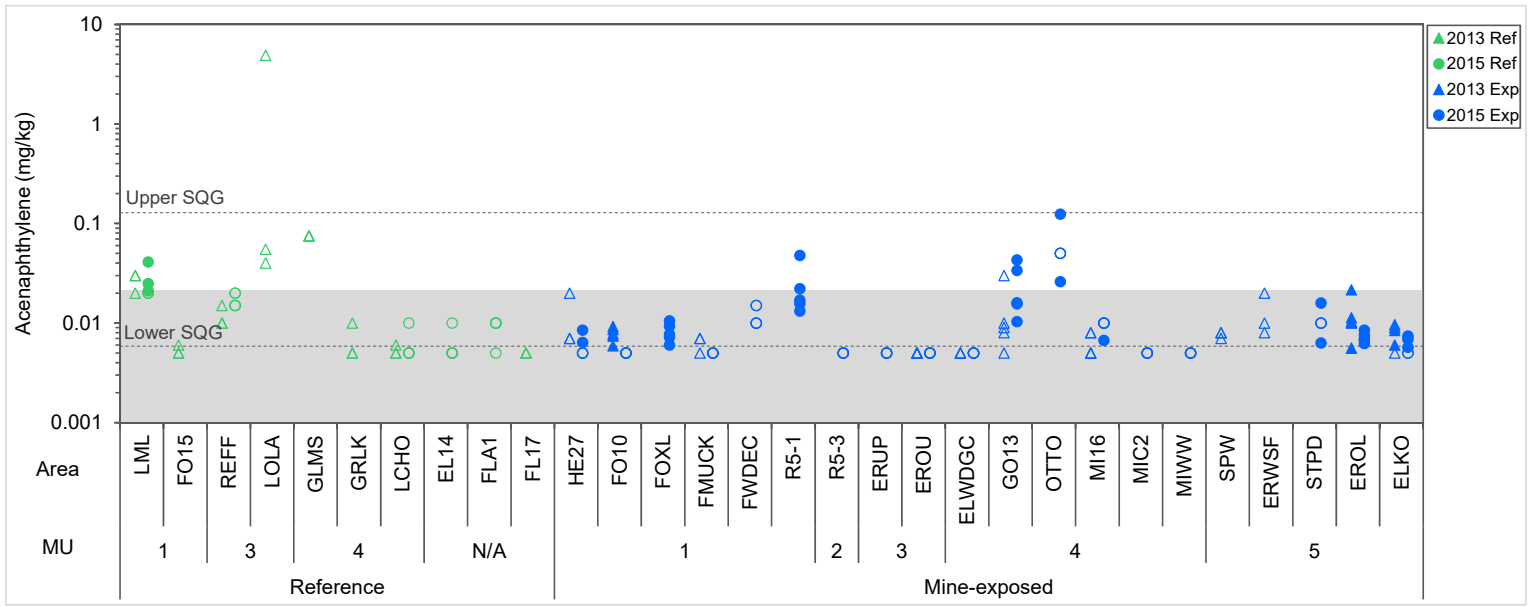
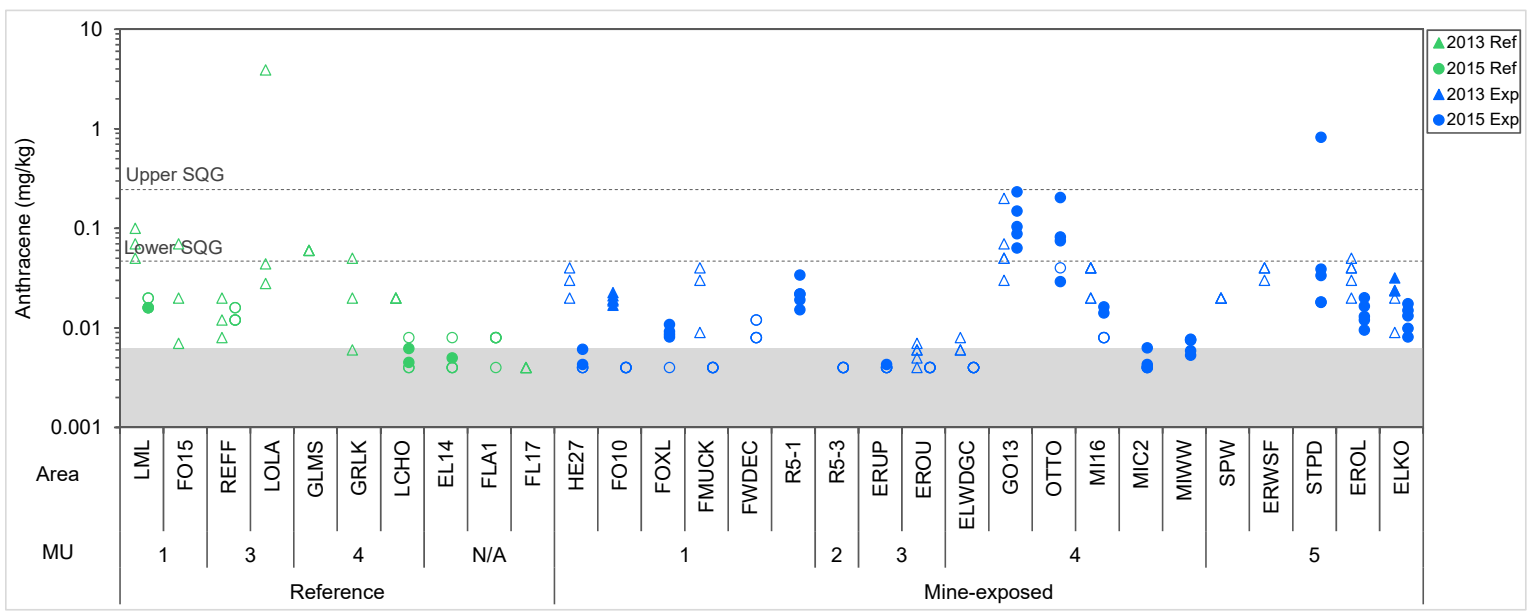


Figure E.3: Sediment Metal Concentrations Relative to BC Sediment Quality Guidelines, August 2013 and 2015

Notes: Samples areas are shown in Figure 6.1. Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).







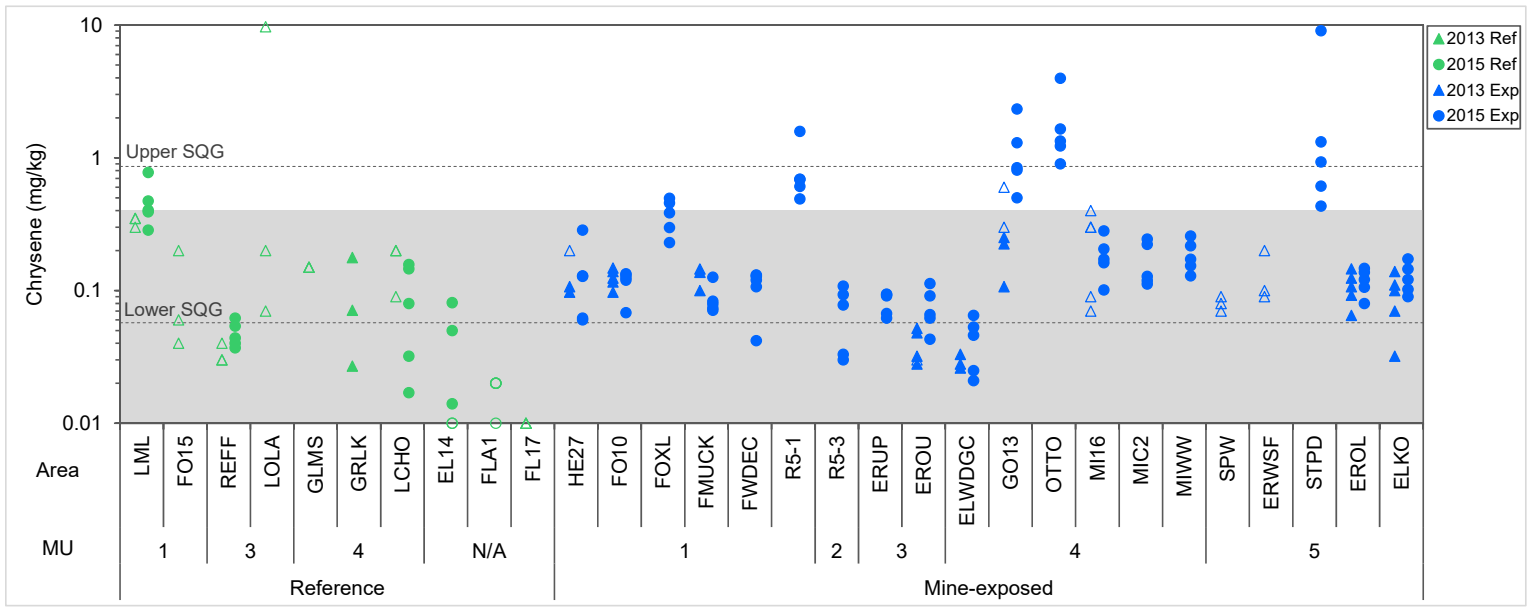
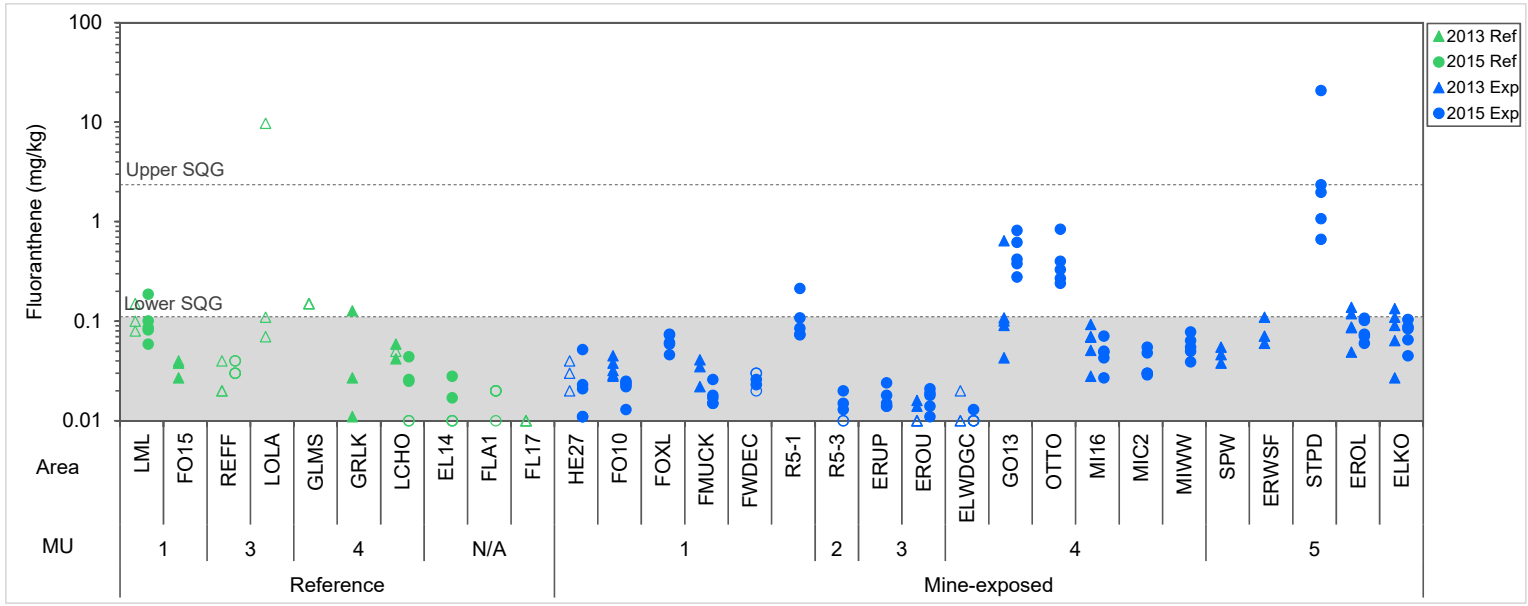
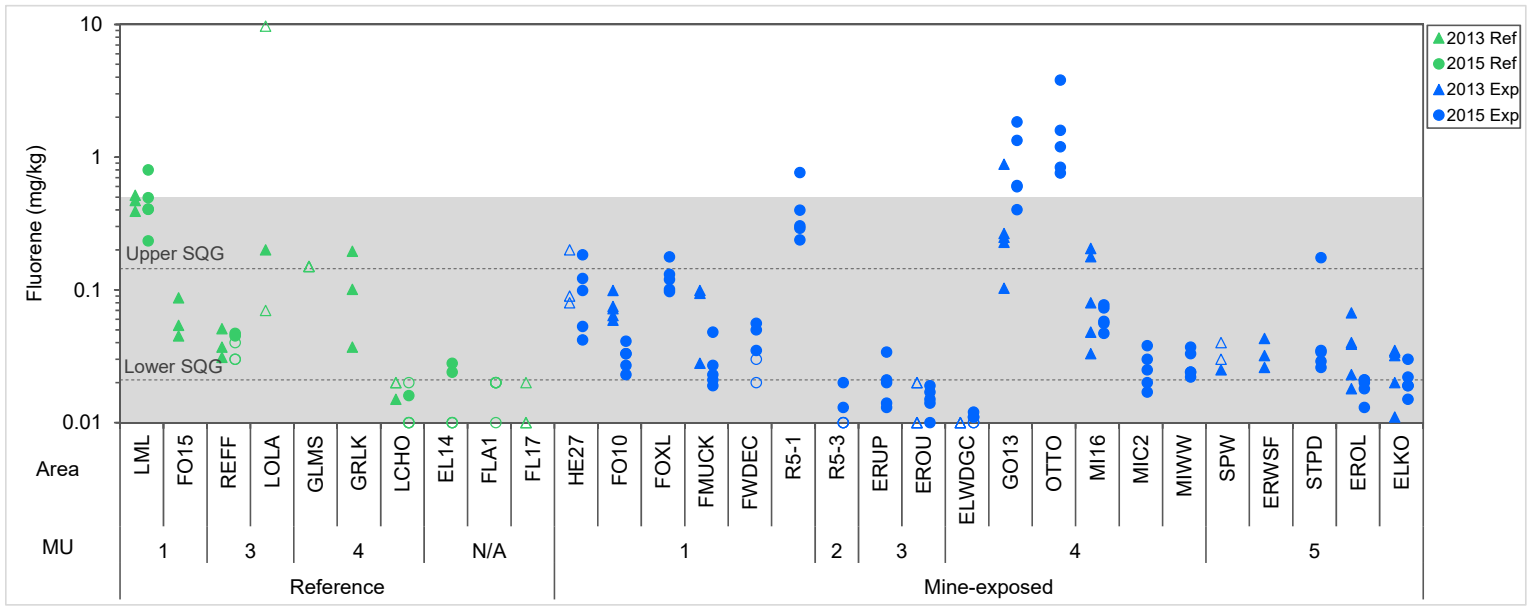
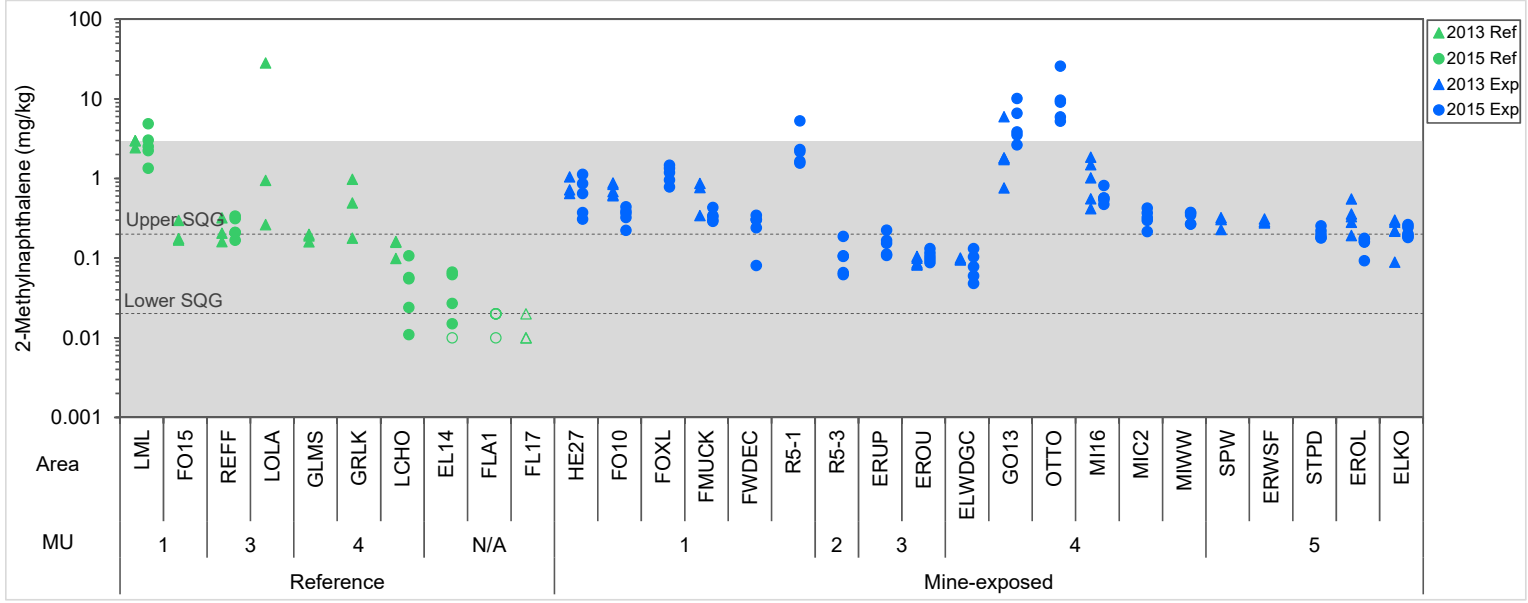


Figure E.4: Sediment Polycyclic Aromatic Hydrocarbon (PAH) Concentrations Relative to BC Sediment Quality Guidelines, August 2013 and 2015

Notes: Sampling areas are shown in Figure 6.1. Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).







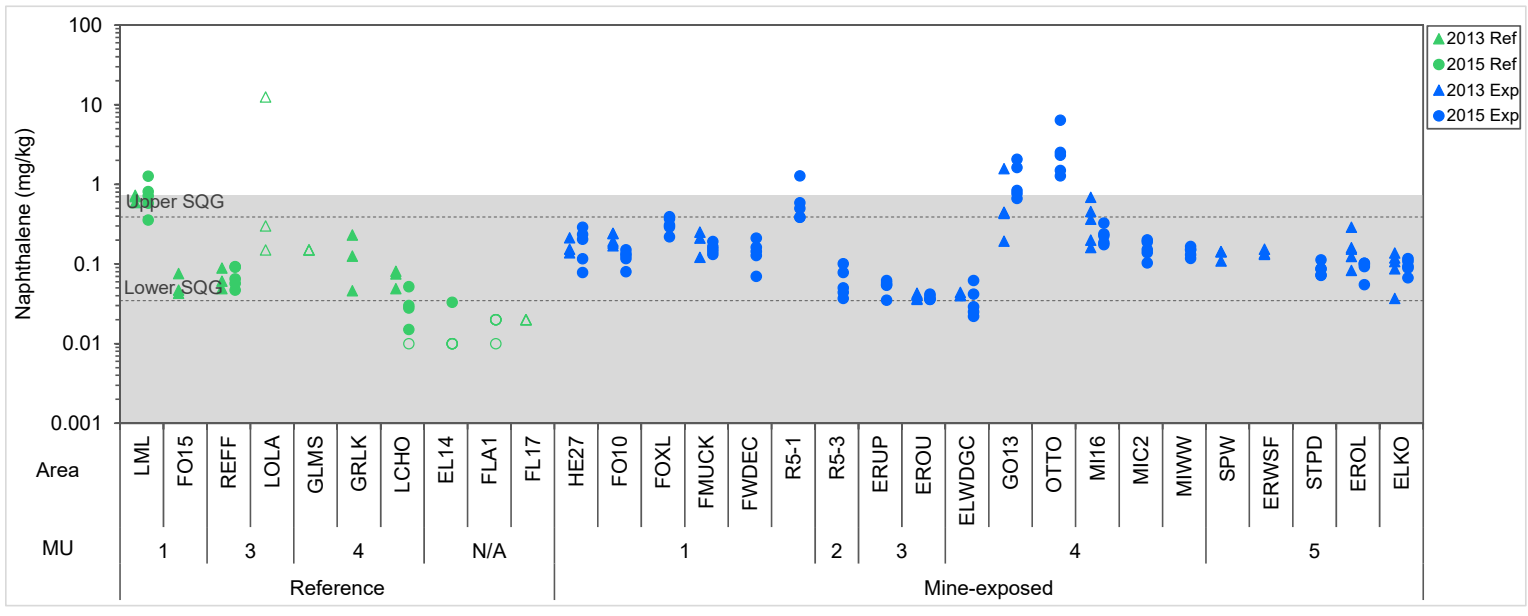
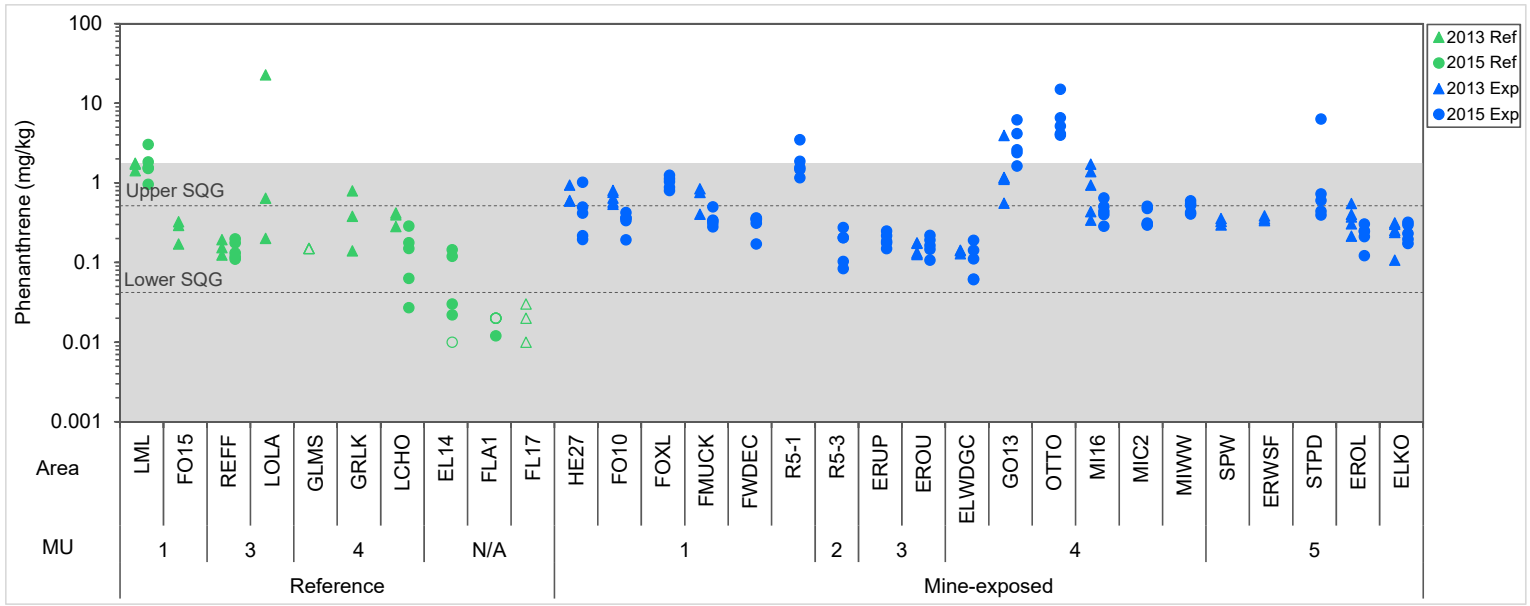


Figure E.4: Sediment Polycyclic Aromatic Hydrocarbon (PAH) Concentrations Relative to BC Sediment Quality Guidelines, August 2013 and 2015

Notes: Sampling areas are shown in Figure 6.1. Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).



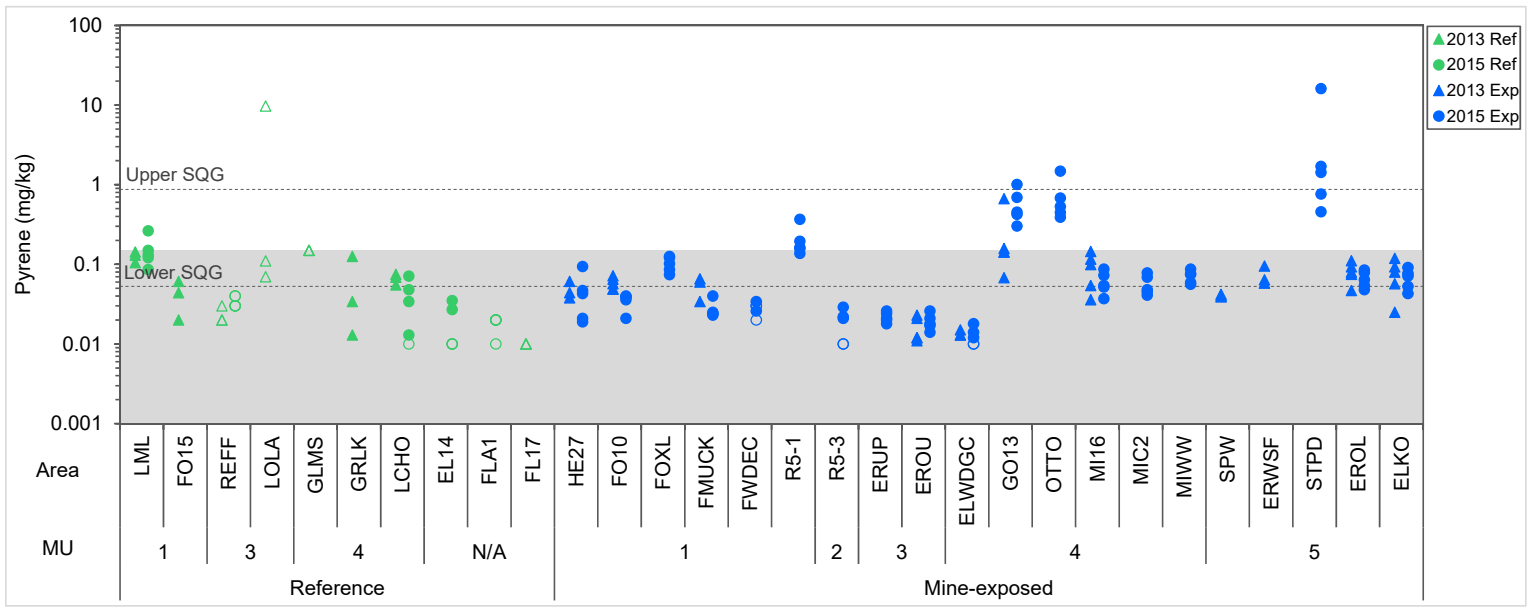
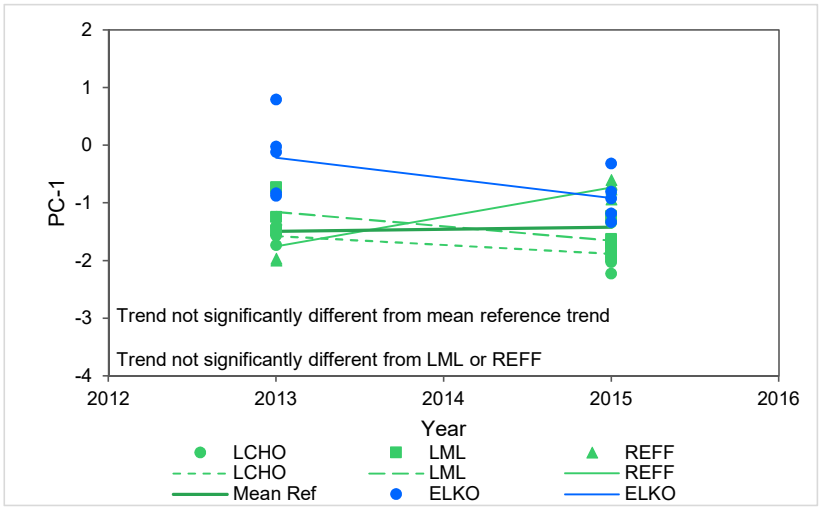
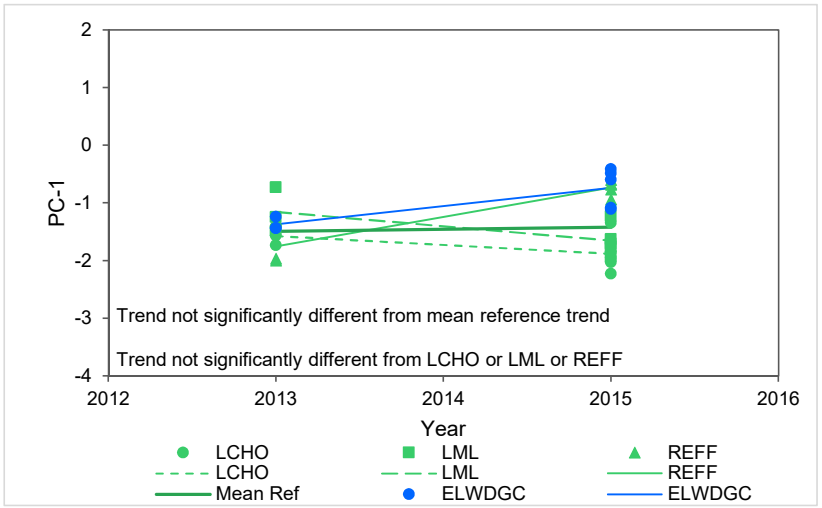
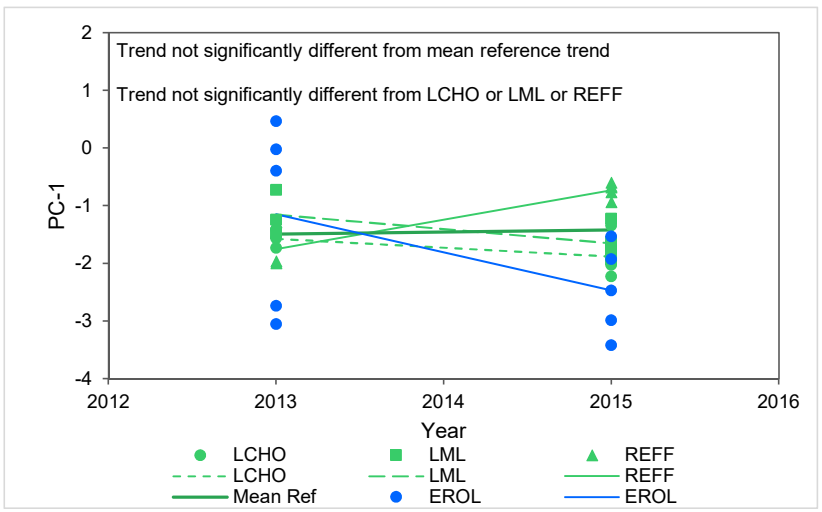


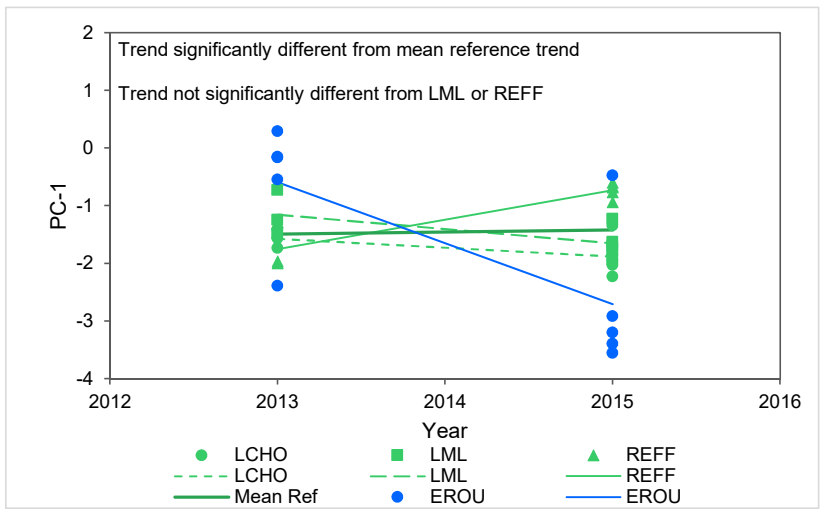
Figure E.4: Sediment Polycyclic Aromatic Hydrocarbon (PAH) Concentrations Relative to BC Sediment Quality Guidelines, August 2013 and 2015

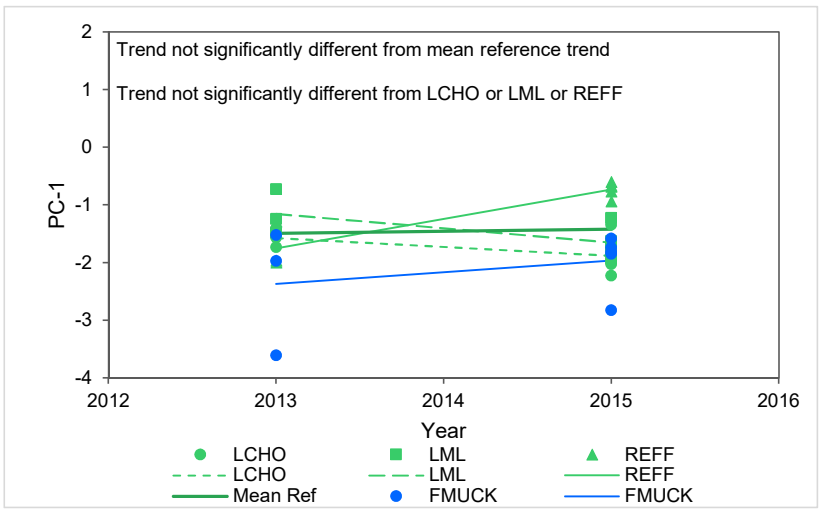
Notes: Sampling areas are shown in Figure 6.1. Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Shading represents the normal range (2.5th and 97.5th percentiles of the pooled 2013 and 2015 reference area distribution after removal of outliers).

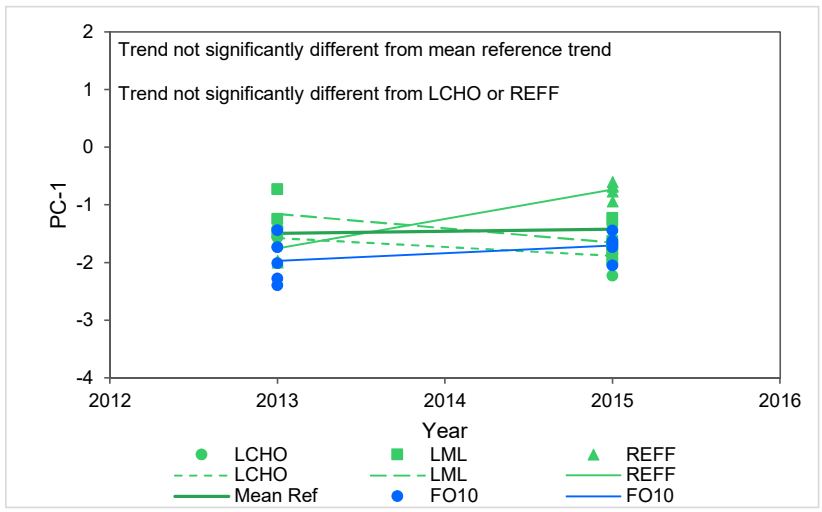


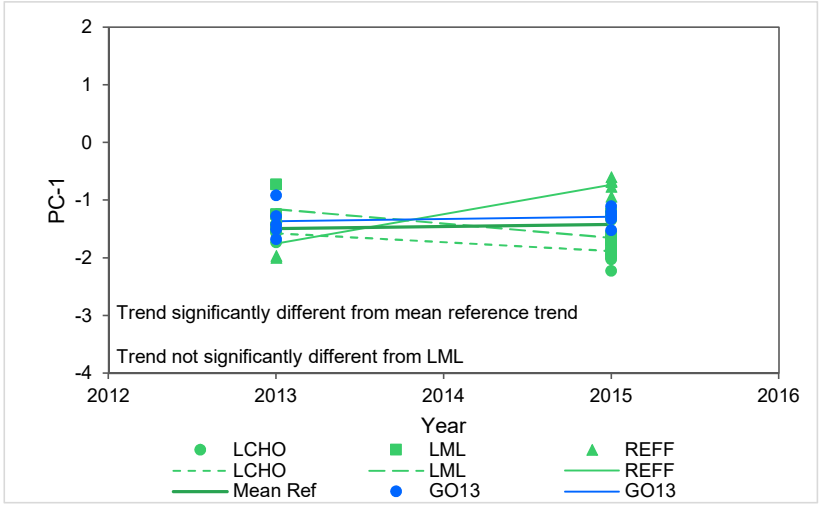


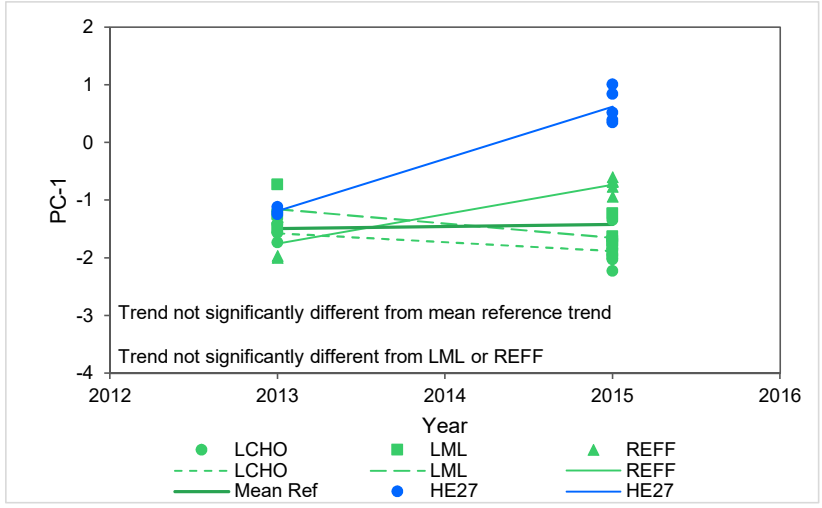












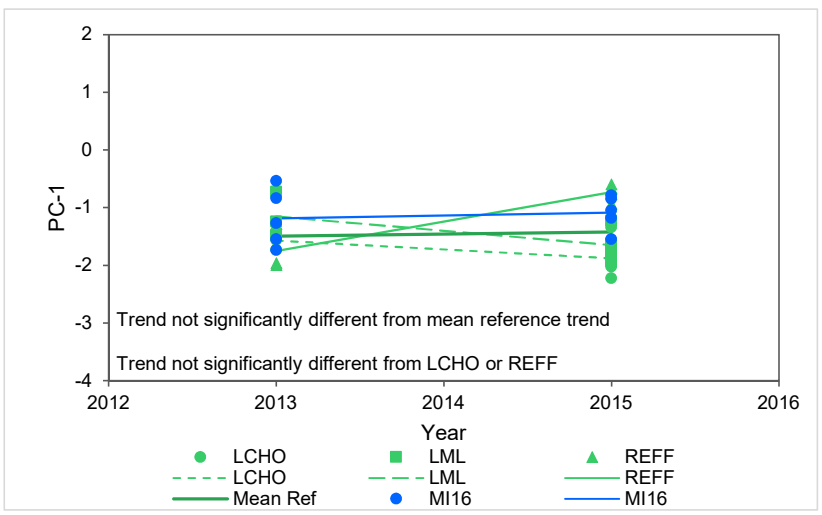
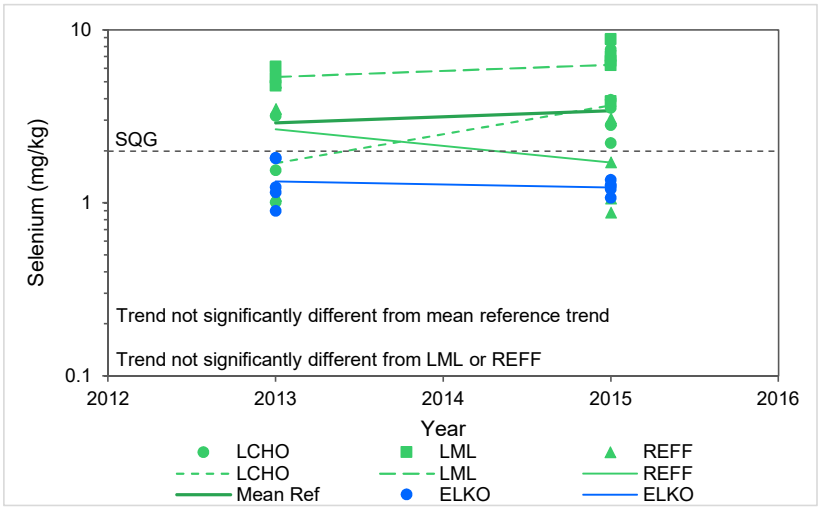
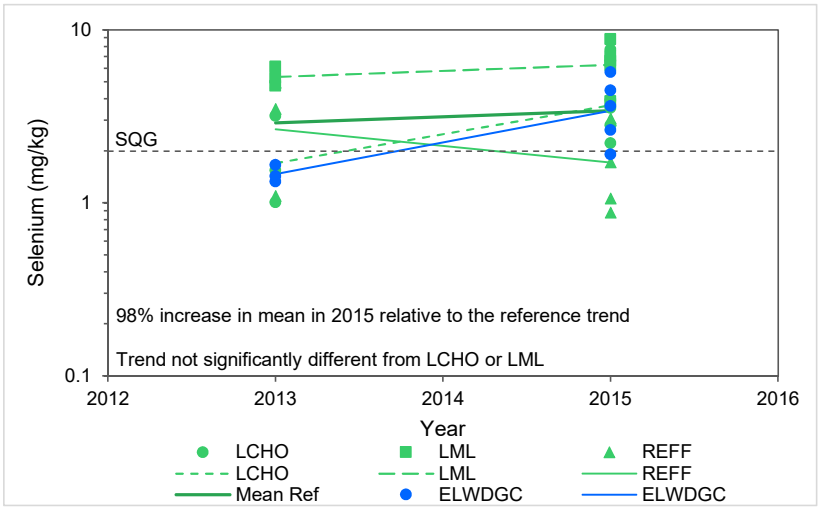
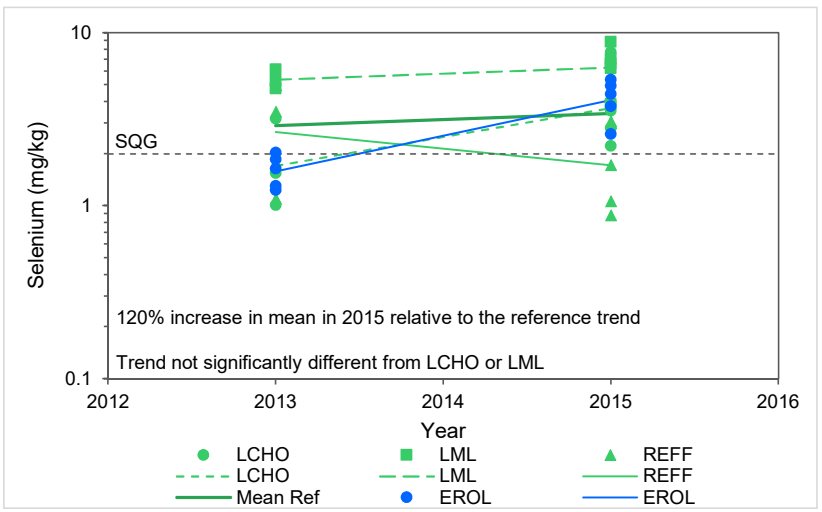
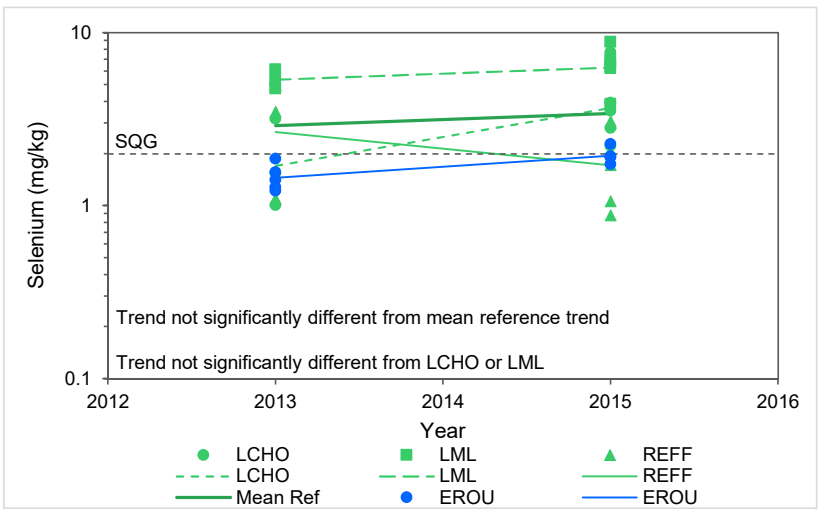


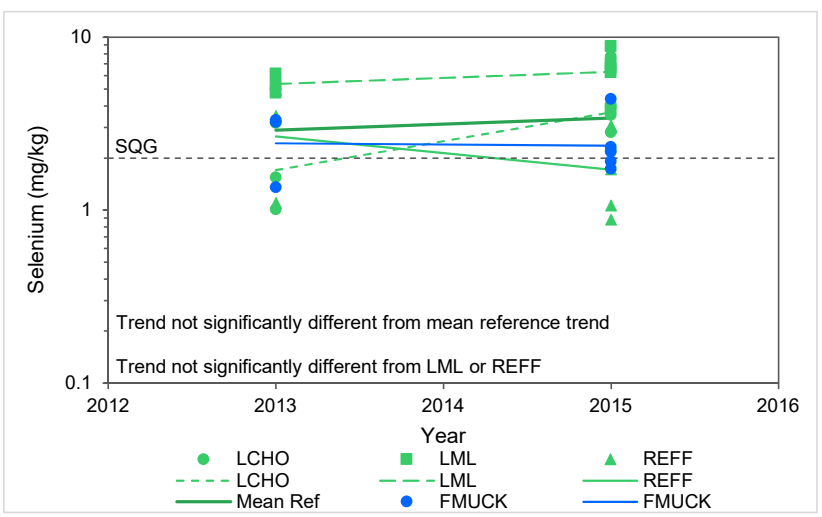
Figure E.5: Scatterplot of Principle Component 1 (PC-1) from a PCA of Metals and PAH Concentrations in Sediment for Reference Areas (LCHO, LML, and REFF) and Each Mine-exposed Area in 2013 and 2015

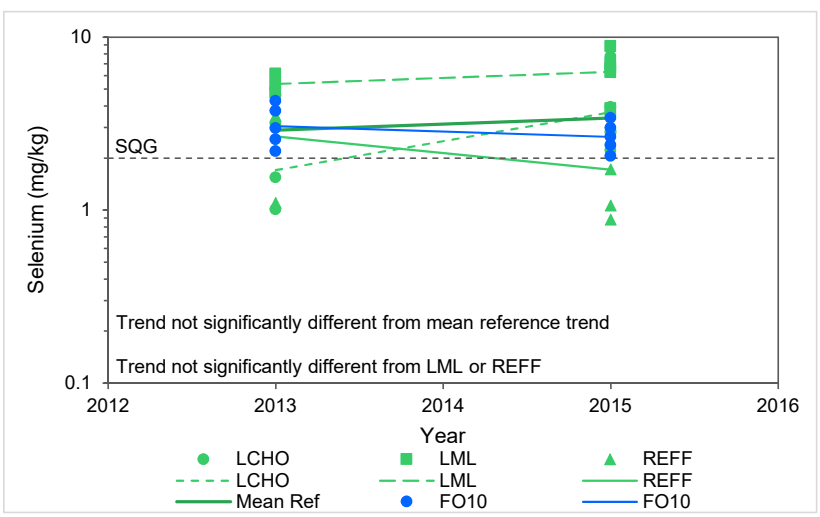


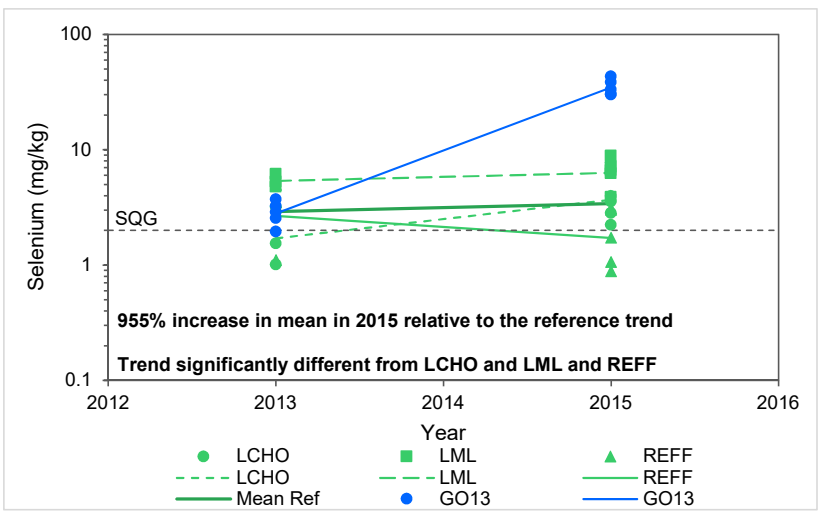


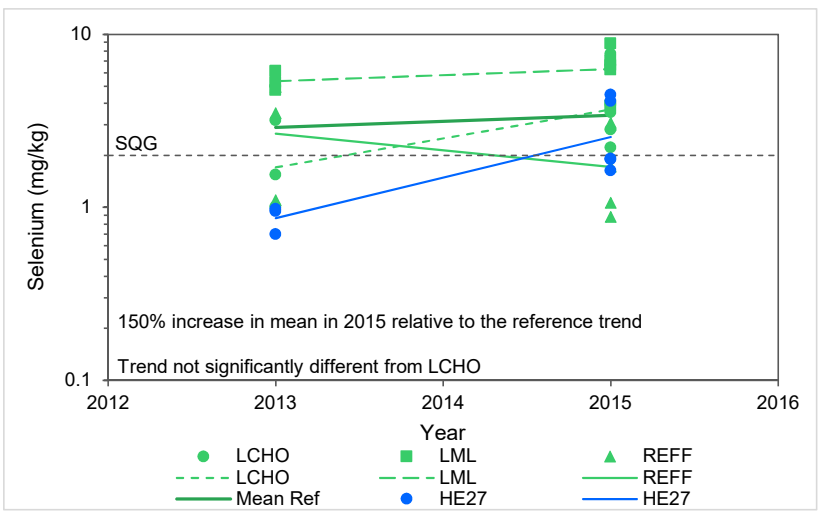












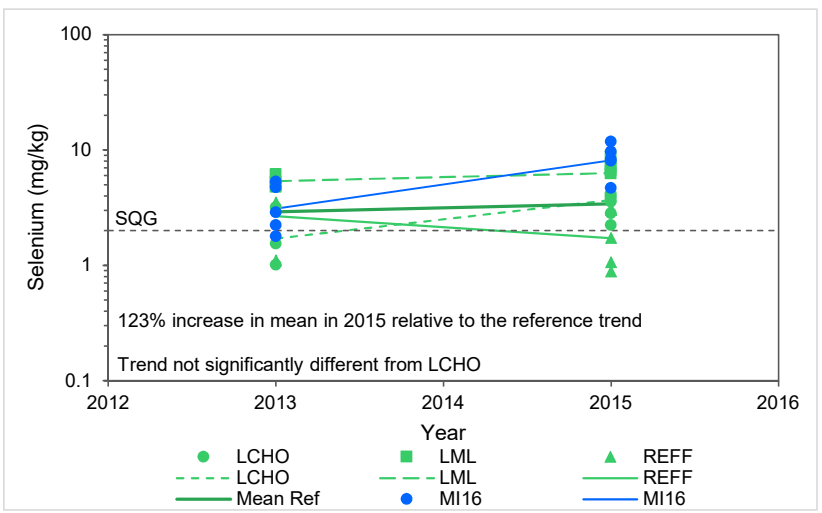
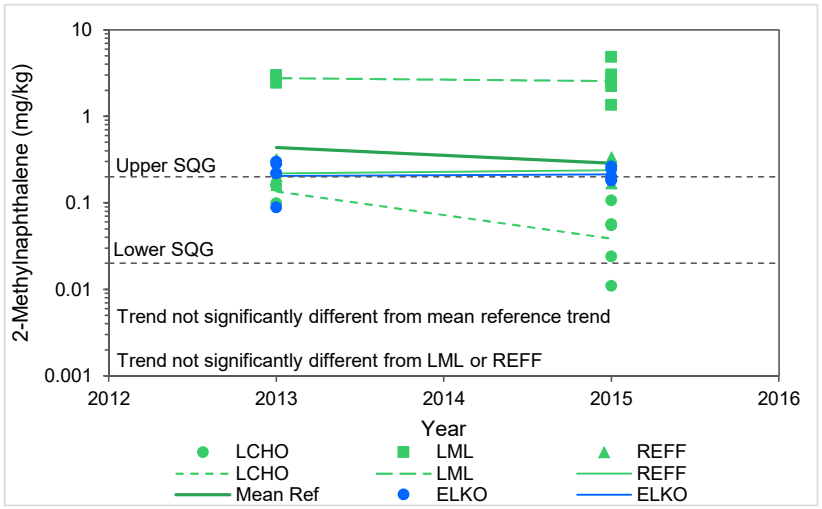
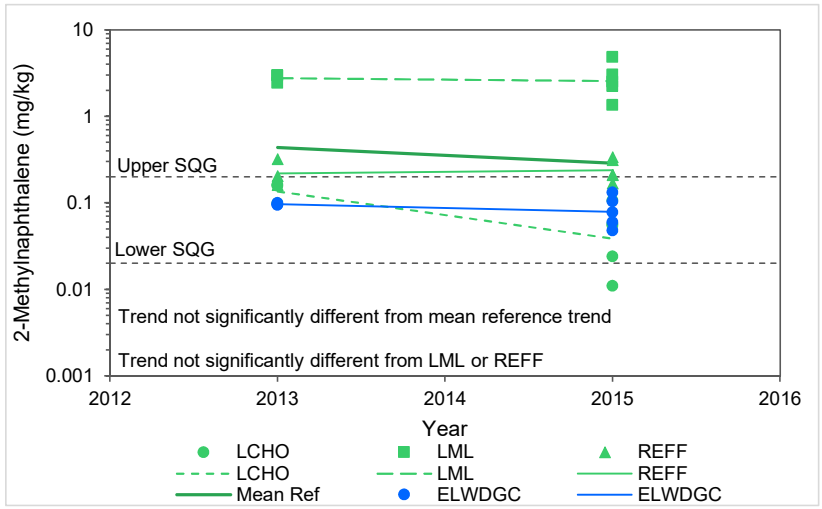
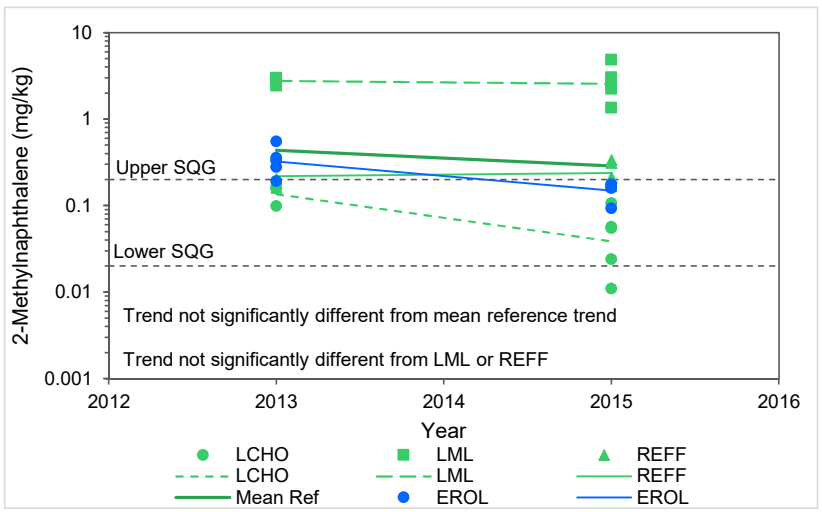
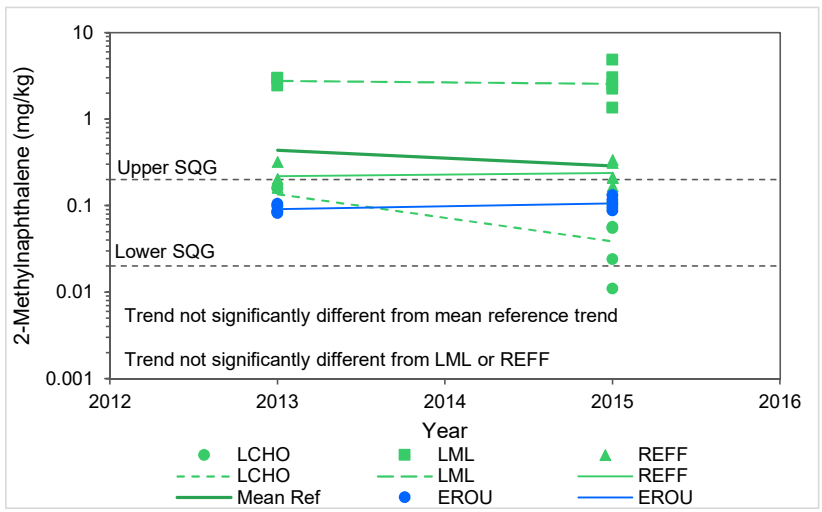


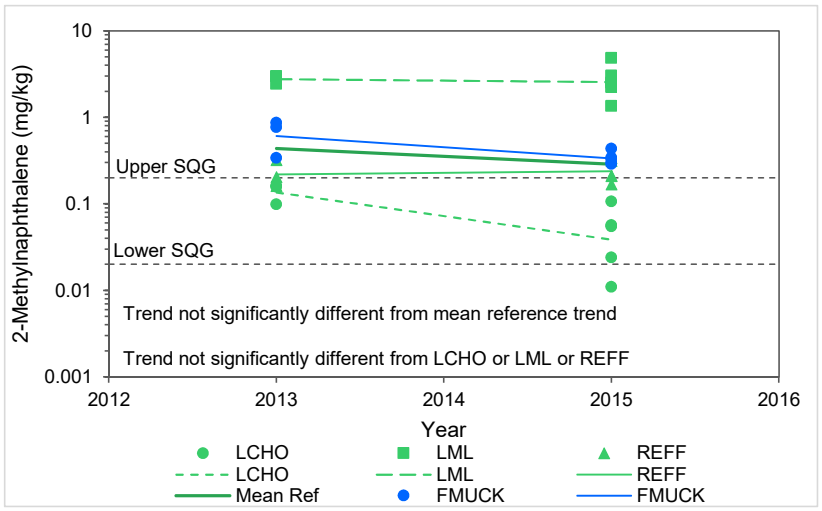
Figure E.6: Scatterplot of Concentrations of Selenium in Sediment for Reference Areas (LCHO, LML, and REFF) and Each Mine-exposed Area in 2013 and 2015

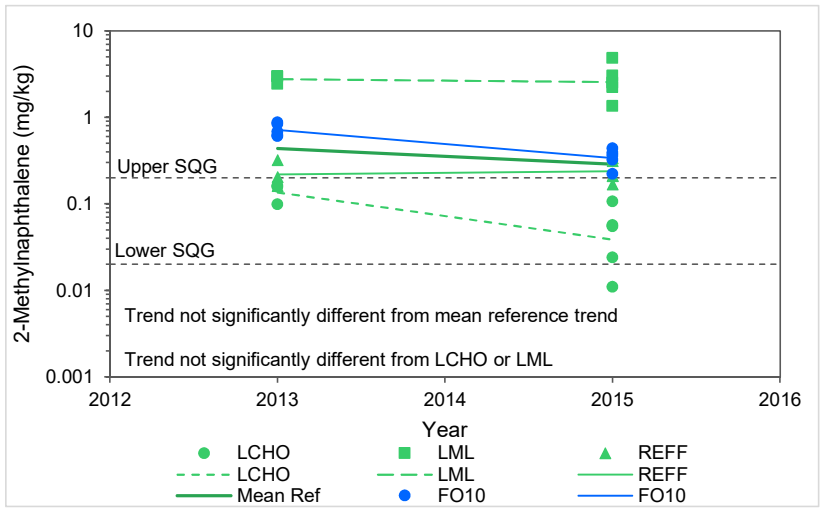


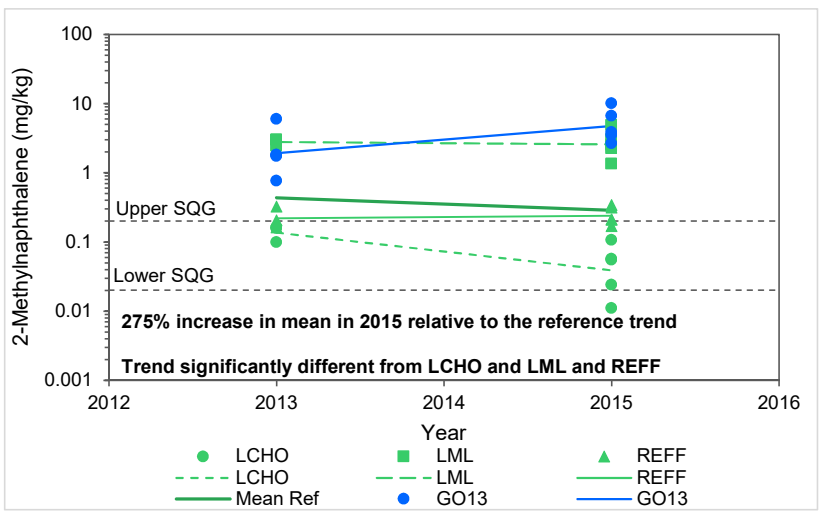


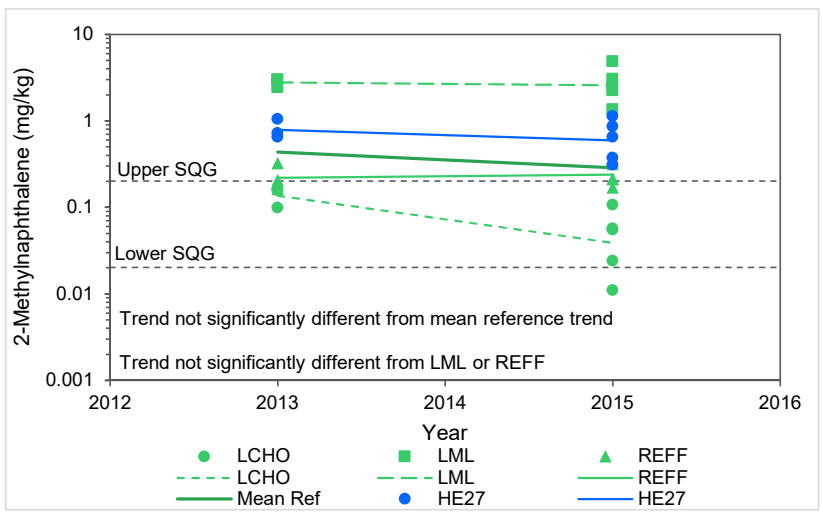












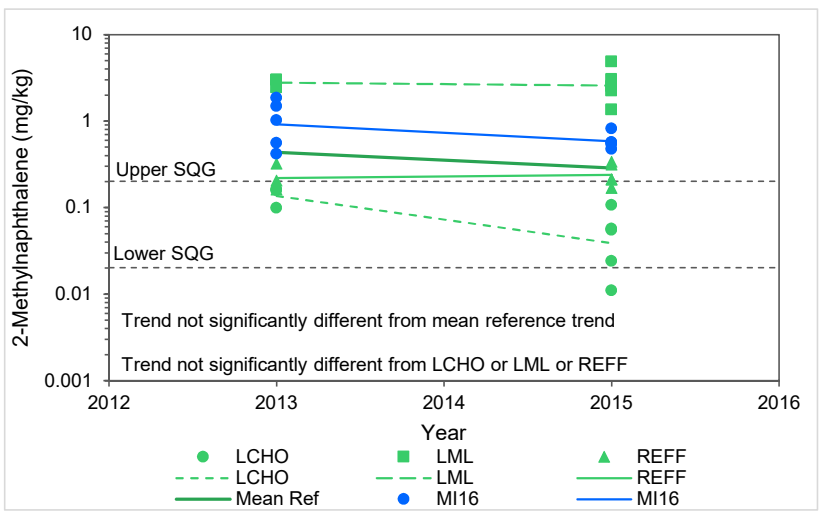
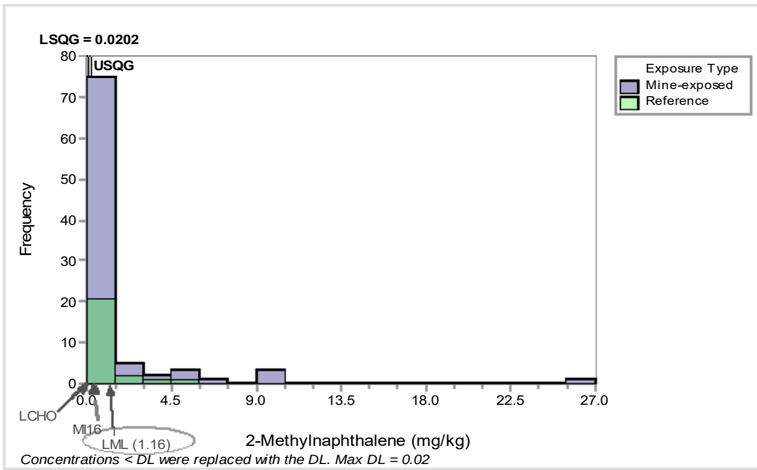
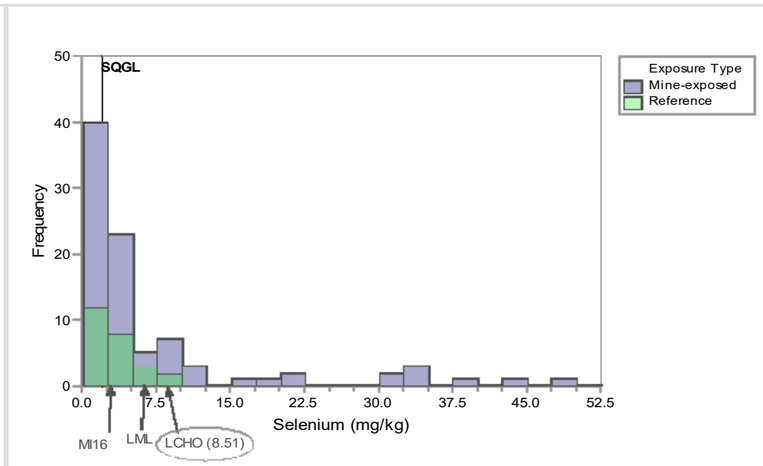
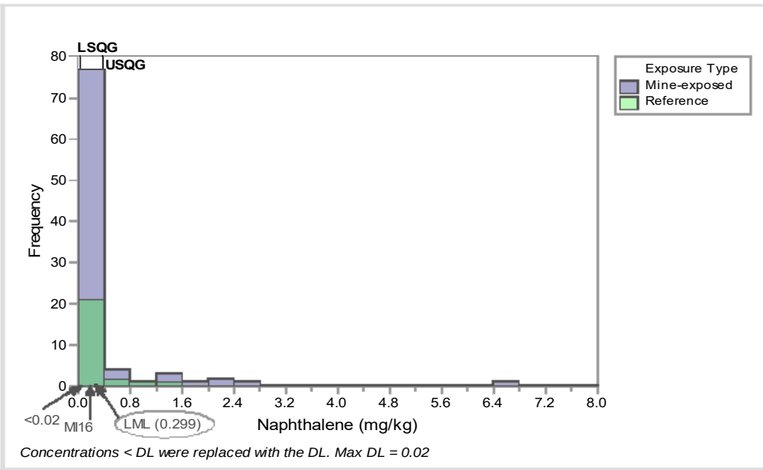
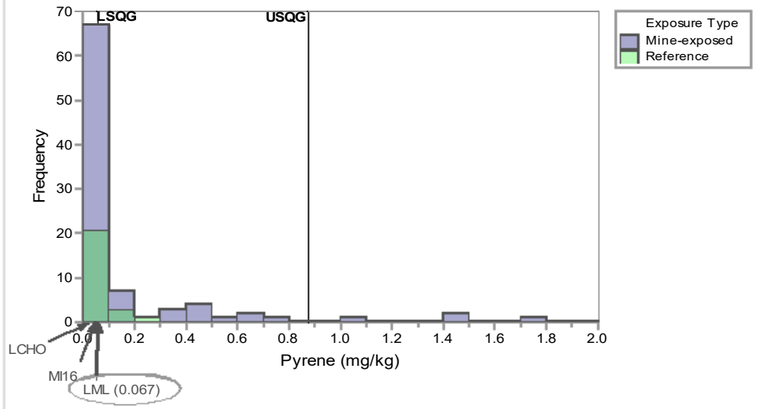


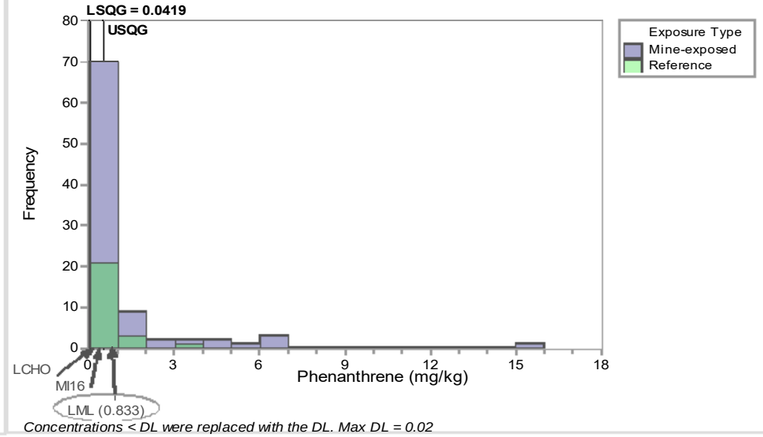
Figure E.7: Scatterplot of Concentrations of 2-Methylnaphthalene in Sediment for Reference Areas (LCHO, LML, and REFF) and Each Mine-exposed Area in 2013 and 2015











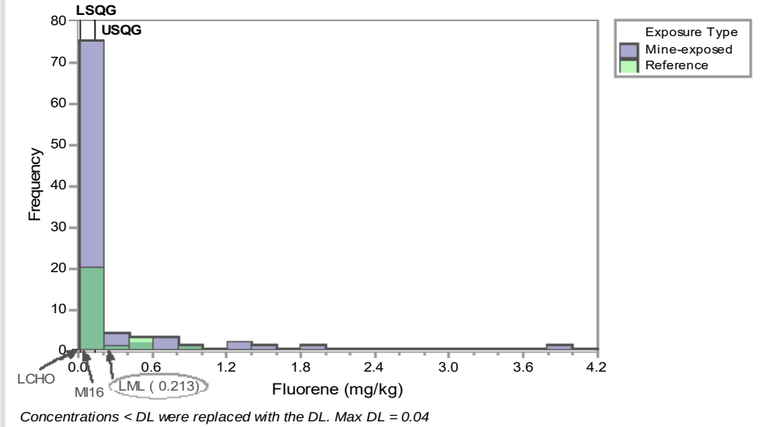


Figure E.8: Histograms of Concentrations of Selenium and 5 PAHs in Sediment Samples Collected from Reference and Mine-exposed Areas for the REAMP, August 2015

Notes: Grey labels depict areas that showed no toxicity in the sediment toxicity testing conducted in September 2015. Grey circles depict the highest non-toxic concentration (See Appendix Table E.17).
LCHO and LML are reference areas and MI16, R5-1, GO13, OTTO, and STPD are mine-exposed areas.

Table E.1: Areas Sampled for Sediment Chemistry in August 2013 and/or August 2015

Exposure Type	Manage-ment Unit	Monitoring Area Code	Stream Name	UTM (NAD 83, 11U)		Sampling Method	Rationale for 2015 Sampling
				Easting	Northing		
Reference	1	LML	Lake Mountain Lake	650106	5565031	Corer	Previously sampled for sediment in 2013 with high PAH concentrations.
		FO15	Fording River Wetland	654807	5542584	Ponar	Sampled in 2013 only.
	3	REFF	Unnamed Wetland near Elk River north of Elkford	645869	5556297	Corer	Proposed reference area for LSU. Area used by amphibians. Previously sampled for sediment in 2013.
		LOLA	Lost Lake	650934	5542536	Corer	Sampled in 2013 only.
	4	GLMS	Grave Lake Marsh	654720	5525553	Corer	Sampled in 2013 only.
		GRLK	Grave Lake	655563	5525690	Corer	Sampled in 2013 only.
		LCHO	Leach Creek Oxbow	658746	5489172	Ponar	Previously sampled for sediment in 2013. Some elevated metal concentrations observed.
	Not Applicable	EL14	Elk Lakes	635321	5601878	Corer	Commonly used reference area for WCT that was inaccessible in 2013 due to flood/washed out road.
		FLA1	Flathead Side Channel	681815	5443615	Corer	Proposed reference area for LSU. Not previously sampled for sediment.
		FL17	Flathead Pond	681226	5440716	Corer	Sampled in 2013 only.
Mine-exposed	1	HE27	Henretta Lake	652573	5566275	Corer	Area used by WCT for overwintering. Previously sampled for sediment in 2013.
		FO10	Fording River Oxbow	654209	5555290	Corer	Area used by WCT and SPSA. Previously sampled for sediment in 2013.
		FOXL	Lower Fording River Oxbow	654878	5554437	Corer	Oxbow previously isolated from Fording River (very low Se in water and BI in 2012). May have changed after flood. Not previously sampled for sediment.
		FMUCK	Meadow area u/s Chauncey Creek	654771	5553328	Corer	Overwintering area for WCT. Previously sampled for sediment in 2013.
		FWDEC	Fording River wetland d/s Ewin Creek	656896	5547095	Corer	Extensive lentic area not previously sampled for sediment or biota
		R5-1	Off channel area of Fording d/s Greenhills	653010	5545714	Corer	Larger area with elevated selenium concentrations in invertebrates. Not previously sampled for sediment.
	2	R5-3	Lentic area off Fording River d/s Josephine Falls	652358	5539932	Corer	Larger area with elevated selenium concentrations in water and invertebrates. Not previously sampled for sediment.
	3	ERUP	Elk River Upper Ponds	651742	5530538	Ponar	Area used by fish. Proposed LSU sampling area downstream of FRO and GHO. Not previously sampled for sediment.
		EROU	Upper Elk River Oxbow	652364	5529872	Corer	Area used by fish. Alternative to ERUP for LSU sampling. Previously sampled for sediment in 2013.
	4	ELWDGC	Elk River Wetland Downstream of Grave Creek	653175	5521300	Corer	Area used by amphibians. Proposed LSU sampling area downstream of FRO, GHO and EVO (if LSU present). Previously sampled for sediment in 2013.
		GO13	Goddard Marsh	652955	5514065	Corer	Area used by fish,amphibians and RWBL. Proposed LSU sampling area downstream of EVO. Previously sampled for sediment in 2013 with potential toxicity to *Chironomus riparius* noted.
		OTTO	Otto Creek	652537	5512801	Corer	Area used by fish, amphibians and RWBL. Proposed LSU sampling area downstream of EVO. Not previously sampled for sediment.
		MI16	Michel Creek Wetland	665083	5489403	Corer	Area used by RWBL and amphibians. Previously sampled for sediment in 2013, with Cd concentrations exceeding PEL.
		MIC2	Michel Oxbow #2	659533	5496626	Ponar	Alternate LSU sampling area (for MIWW) downstream of CMO. Not previously sampled for sediment.
		MIWW	Lower Michel Wetland	659707	5498474	Spoon	Area used by RWBL and amphibians. Proposed LSU sampling area downstream of CMO (if present). Previously sampled for sediment in 2013.
	5	SPW	Sparwood Wetland	651182	5511239	Corer	Sampled in 2013 only.
		ERWSF	Elk River	639138	5484622	Corer	Sampled in 2013 only.
		STPD	Stanford Pond	639864	5483139	Spoon	Area used by fish. Proposed LSU sampling area downstream of all mines. Not previously sampled for sediment.
		EROL	Elk River Lower Oxbow	640877	5477999	Corer	Area used by fish. Alternative to STPD for LSU sampling. Previously sampled for sediment in 2013.
		ELKO	Elko Reservoir	637800	5461540	Corer	Area used by fish. Lentic area furthest downstream of all mines. Previously sampled for sediment in 2013.

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Fording River Watershed									
			Henretta Lake									
			HE27-1	HE27-2	HE27-3	HE27-4	HE27-5	Minimum	Median	Maximum	Mean	Standard Deviation
			7-Aug-15	7-Aug-15	7-Aug-15	7-Aug-15	7-Aug-15					
Physical Tests	% Moisture	%	43.7	45.4	43.3	46.5	47.2	43.3	45.4	47.2	45.2	1.7
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	8.10	7.98	8.13	7.92	8.00	7.92	8.00	8.13	8.03	0.09
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	33.7	3.05	29.6	7.14	24.8	3.05	24.8	33.7	19.7	13.7
	% Sand (2.00mm - 1.00mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	%	0.33	< 0.10	0.53	< 0.10	< 0.10	<0.1	<0.1	0.53	<0.23	-
	% Sand (0.50mm - 0.25mm)	%	2.69	< 0.10	5.11	0.18	0.27	<0.1	0.27	5.11	1.67	2.21
	% Sand (0.25mm - 0.125mm)	%	12.2	0.31	9.24	1.24	5.88	0.31	5.88	12.2	5.8	5.1
	% Sand (0.125mm - 0.063mm)	%	18.5	2.69	14.7	5.68	18.6	2.69	14.7	18.6	12	7.4
	% Silt (0.063mm - 0.004mm)	%	57.3	83.6	62.6	80.9	68.6	57.3	68.6	83.6	70.6	11.4
	% Silt (0.063mm - 0.0312mm)	%	24.4	28.4	25.8	29.3	29.8	24.4	28.4	29.8	27.5	2.3
	% Silt (0.0312mm - 0.004mm)	%	32.9	55.3	36.8	51.6	38.8	32.9	38.8	55.3	43.1	9.8
	% Clay (<4µm)	%	9.02	13.3	7.78	12.0	6.61	6.61	9.02	13.3	9.7	2.8
	Texture	-	Silt loam	Silt	Silt loam	Silt	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	4.73	8.03	5.55	8.65	4.59	4.59	5.55	8.65	6.31	1.90
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	4,520	6,990	6,460	7,340	5,980	4,520	6,460	7,340	6,258	1,101
	Antimony (Sb)	mg/kg	0.34	0.57	0.33	0.54	0.35	0.33	0.35	0.57	0.43	0.12
	Arsenic (As)	mg/kg	3.14	4.29	3.14	3.78	3.20	3.14	3.20	4.29	3.51	0.51
	Barium (Ba)	mg/kg	99.6	169	92.8	159	104	92.8	104	169	125	36
	Beryllium (Be)	mg/kg	0.35	0.57	0.43	0.51	0.38	0.35	0.43	0.57	0.45	0.09
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10	< 10	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	0.634	0.986	0.740	0.889	0.647	0.634	0.740	0.986	0.779	0.154
	Calcium (Ca)	mg/kg	153,000	143,000	165,000	149,000	156,000	143,000	153,000	165,000	153,200	8,198
	Chromium (Cr)	mg/kg	10.7	15.1	14.7	15.9	12.8	10.7	14.7	15.9	13.8	2.1
	Cobalt (Co)	mg/kg	3.33	5.44	3.40	8.44	3.47	3.33	3.47	8.44	4.82	2.21
	Copper (Cu)	mg/kg	7.4	13.6	7.7	11.1	8.1	7.4	8.1	13.6	9.6	2.7
	Iron (Fe)	mg/kg	7,910	10,200	8,030	9,620	8,710	7,910	8,710	10,200	8,894	998
	Lead (Pb)	mg/kg	5.70	8.00	6.20	8.50	5.70	5.7	6.2	8.5	6.8	1.3
	Lithium (Li)	mg/kg	10.2	15.7	17.4	17.4	13.2	10.2	15.7	17.4	14.8	3.1
	Magnesium (Mg)	mg/kg	30,900	29,000	36,700	31,800	37,200	29,000	31,800	37,200	33,120	3,644
	Manganese (Mn)	mg/kg	293	409	247	1,350	306	247	306	1,350	521	467
	Mercury (Hg)	mg/kg	0.0300	0.0592	0.0351	0.0524	0.0308	0.0300	0.0351	0.0592	0.0415	0.0134
	Molybdenum (Mo)	mg/kg	0.85	1.22	0.87	1.36	0.82	0.82	0.87	1.36	1.02	0.25
	Nickel (Ni)	mg/kg	15.0	23.0	17.6	23.9	15.6	15	17.6	23.9	19	4.2
	Phosphorus (P)	mg/kg	770	950	830	840	770	770	830	950	832	74
	Potassium (K)	mg/kg	1,240	1,780	1,630	2,060	1,680	1,240	1,680	2,060	1,678	296
	Selenium (Se)	mg/kg	1.89	4.47	1.63	1.91	4.11	1.63	1.91	4.47	2.80	1.37
	Silver (Ag)	mg/kg	< 0.20	0.24	< 0.20	< 0.20	< 0.20	<0.2	<0.2	0.24	<0.21	-
	Sodium (Na)	mg/kg	130	110	150	140	160	110	140	160	138	19
	Strontium (Sr)	mg/kg	98.0	99.7	95.3	93.8	89.2	89.2	95.3	99.7	95.2	4.1
	Thallium (Tl)	mg/kg	0.13	0.19	0.16	0.20	0.16	0.13	0.16	0.2	0.17	0.03
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	21.9	39.1	43.8	34.1	28.3	21.9	34.1	43.8	33.4	8.7
	Uranium (U)	mg/kg	0.72	0.97	0.83	0.90	0.72	0.72	0.83	0.97	0.83	0.11
	Vanadium (V)	mg/kg	16.8	25.8	19.4	25.6	20.4	16.8	20.4	25.8	21.6	4
	Zinc (Zn)	mg/kg	64.6	93.5	82.0	90.0	70.1	64.6	82.0	93.5	80.0	12.5
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	0.0061	< 0.015	< 0.005	< 0.015	< 0.005	<0.005	<0.005	0.0061	<0.009	-
	Acenaphthylene	mg/kg	< 0.005	0.0085	< 0.005	0.0064	< 0.005	<0.005	<0.005	0.0085	<0.006	-
	Anthracene	mg/kg	< 0.004	0.0061	< 0.004	0.0043	< 0.004	<0.004	<0.004	0.0061	<0.004	-
	Benz(a)anthracene	mg/kg	0.019	0.047	0.012	0.024	0.011	0.011	0.019	0.047	0.023	0.015
	Benzo(a)pyrene	mg/kg	0.012	0.025	< 0.01	0.015	< 0.01	<0.01	0.012	0.025	0.014	0.006
	Benzo(b&j)fluoranthene	mg/kg	0.054	0.116	0.026	0.052	0.023	0.023	0.052	0.116	0.054	0.037
	Benzo(b+j+k)fluoranthene	mg/kg	0.054	0.116	0.026	0.052	0.023	0.023	0.052	0.116	0.054	0.037
	Benzo(g,h,i)perylene	mg/kg	0.017	0.033	< 0.01	0.015	< 0.01	<0.01	0.015	0.033	0.017	0.009
	Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.128	0.286	0.060	0.129	0.062	0.06	0.128	0.286	0.133	0.092
	Dibenz(a,h)anthracene	mg/kg	0.0099	0.0213	0.0051	0.0102	< 0.005	<0.005	0.0099	0.0213	0.01	0.007
	Fluoranthene	mg/kg	0.021	0.052	0.011	0.023	0.011	0.011	0.021	0.052	0.024	0.017
	Fluorene	mg/kg	0.099	0.184	0.042	0.122	0.053	0.042	0.099	0.184	0.1	0.057
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.010	0.012	< 0.010	< 0.010	< 0.010	<0.01	<0.01	0.012	<0.01	-
	2-Methylnaphthalene	mg/kg	0.651	1.13	0.310	0.862	0.375	0.31	0.651	1.13	0.67	0.34
	Naphthalene	mg/kg	0.204	0.290	0.078	0.236	0.116	0.078	0.204	0.29	0.185	0.087
	Phenanthrene	mg/kg	0.417	1.02	0.195	0.496	0.217	0.195	0.417	1.02	0.47	0.33
	Pyrene	mg/kg	0.043	0.094	0.019	0.047	0.021	0.019	0.043	0.094	0.045	0.03
	Acenaphthene d10	%	94.2	90.5	86.3	83.8	82.5	82.5	86.3	94.2	87.5	4.8
	Chrysene d12	%	93.4	102.4	88.7	81.0	85.4	81	88.7	102.4	90	8
	Naphthalene d8	%	115.5	86.8	87.3	95.2	98.2	86.8	95.2	115.5	97	12
	Phenanthrene d10	%	89.9	97.3	84.3	78.4	81.4	78.4	84.3	97.3	86.3	7.5
	B(a)P Total Potency Equivalent	mg/kg	0.031	0.068	< 0.02	0.035	< 0.02	<0.02	0.031	0.068	0.035	0.02
	IACR (CCME)	mg/kg	0.56	1.20	0.29	0.58	0.27	0.27	0.56	1.2	0.58	0.38

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Fording River Watershed									
			Fording Oxbow Lower									
			FOXL-1	FOXL-2	FOXL-3	FOXL-4	FOXL-5	Minimum	Median	Maximum	Mean	Standard Deviation
			9-Aug-15	9-Aug-15	9-Aug-15	9-Aug-15	9-Aug-15					
Physical Tests	% Moisture	%	62.0	59.9	66.4	65.0	59.1	59.1	62.0	66.4	62.5	3.2
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.84	7.83	7.78	7.75	7.86	7.75	7.83	7.86	7.81	0.05
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	0.37	0.46	0.69	0.62	0.39	0.37	0.46	0.69	0.506	0.142
	% Sand (2.00mm - 1.00mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	%	< 0.10	< 0.10	0.11	< 0.10	< 0.10	<0.1	<0.1	0.11	<0.1	-
	% Sand (0.50mm - 0.25mm)	%	< 0.10	< 0.10	0.11	< 0.10	< 0.10	<0.1	<0.1	0.11	<0.102	-
	% Sand (0.25mm - 0.125mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (0.125mm - 0.063mm)	%	0.19	0.25	0.37	0.37	0.20	0.19	0.25	0.37	0.276	0.089
	% Silt (0.063mm - 0.004mm)	%	84.2	83.0	85.2	83.9	83.1	83	83.9	85.2	83.9	0.9
	% Silt (0.063mm - 0.0312mm)	%	25.3	23.7	26.6	25.4	23.7	23.7	25.3	26.6	24.9	1.2
	% Silt (0.0312mm - 0.004mm)	%	58.9	59.2	58.6	58.6	59.5	58.6	58.9	59.5	59	0.4
	% Clay (<4µm)	%	15.5	16.6	14.1	15.4	16.5	14.1	15.5	16.6	15.6	1
	Texture	-	Silt	Silt	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	9.54	9.44	9.61	10.2	25.7	9.44	9.61	25.7	12.9	7.20
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	7,890	7,930	8,360	7,770	8,140	7,770	7,930	8,360	8,018	233
	Antimony (Sb)	mg/kg	0.85	0.83	0.76	0.83	0.78	0.76	0.83	0.85	0.81	0.04
	Arsenic (As)	mg/kg	6.89	7.21	5.94	8.62	6.28	5.94	6.89	8.62	6.99	1.04
	Barium (Ba)	mg/kg	283	261	245	314	250	245	261	314	271	28
	Beryllium (Be)	mg/kg	0.70	0.69	0.68	0.66	0.64	0.64	0.68	0.7	0.67	0.02
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10	< 10	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	1.64	1.63	1.52	1.70	1.52	1.520	1.630	1.700	1.600	0.080
	Calcium (Ca)	mg/kg	46,200	50,000	53,000	42,200	49,700	42,200	49,700	53,000	48,220	4,139
	Chromium (Cr)	mg/kg	16.0	16.2	16.9	15.9	16.5	15.9	16.2	16.9	16.3	0.4
	Cobalt (Co)	mg/kg	7.31	7.22	7.31	7.72	6.84	6.84	7.31	7.72	7.28	0.31
	Copper (Cu)	mg/kg	20.1	20.2	18.7	20.0	19.3	18.7	20	20.2	19.7	0.6
	Iron (Fe)	mg/kg	20,400	19,300	16,200	24,600	17,100	16,200	19,300	24,600	19,520	3,298
	Lead (Pb)	mg/kg	10.7	10.9	10.7	10.7	10.7	10.7	10.7	10.9	10.7	0.1
	Lithium (Li)	mg/kg	11.8	12.4	12.4	10.8	12.1	10.8	12.1	12.4	11.9	0.7
	Magnesium (Mg)	mg/kg	10,400	10,800	13,400	9,080	11,000	9,080	10,800	13,400	10,936	1,567
	Manganese (Mn)	mg/kg	468	458	583	521	491	458	491	583	504	50
	Mercury (Hg)	mg/kg	0.109	0.111	0.0845	0.117	0.104	0.0845	0.1090	0.1170	0.1051	0.0124
	Molybdenum (Mo)	mg/kg	1.30	1.34	1.28	1.36	1.30	1.28	1.3	1.36	1.32	0.03
	Nickel (Ni)	mg/kg	28.3	29.0	28.0	28.4	27.8	27.8	28.3	29	28.3	0.5
	Phosphorus (P)	mg/kg	1,520	1,430	1,410	1,630	1,350	1350	1430	1630	1468	109
	Potassium (K)	mg/kg	1,880	1,860	2,040	1,830	2,020	1,830	1,880	2,040	1,926	97
	Selenium (Se)	mg/kg	1.49	1.48	1.51	1.66	1.44	1.44	1.49	1.66	1.52	0.08
	Silver (Ag)	mg/kg	0.42	0.42	0.34	0.39	0.37	0.34	0.39	0.42	0.39	0.03
	Sodium (Na)	mg/kg	100	< 100	110	110	< 100	<100	100	110	104	5
	Strontium (Sr)	mg/kg	65.8	65.2	62.9	61.7	63.4	61.7	63.4	65.8	63.8	1.7
	Thallium (Tl)	mg/kg	0.33	0.32	0.30	0.33	0.32	0.3	0.32	0.33	0.32	0.01
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	22.8	24.2	23.2	20.2	23.2	20.2	23.2	24.2	22.7	1.5
	Uranium (U)	mg/kg	1.06	1.07	1.05	1.02	1.04	1.02	1.05	1.07	1.05	0.02
	Vanadium (V)	mg/kg	35.0	34.7	34.6	34.8	34.8	34.6	34.8	35	34.8	0.1
	Zinc (Zn)	mg/kg	126	126	126	133	117	117.0	126.0	133.0	126.0	6.0
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.007	< 0.015	< 0.020	< 0.015	< 0.015	<0.007	<0.015	<0.02	<0.0144	-
	Acenaphthylene	mg/kg	0.0072	0.0077	0.0105	0.0060	0.0093	0.006	0.0077	0.0105	0.008	0.002
	Anthracene	mg/kg	< 0.004	0.0092	0.0108	0.0081	0.0086	<0.004	0.0086	0.0108	0.008	0.003
	Benz(a)anthracene	mg/kg	0.033	0.055	0.072	0.043	0.068	0.033	0.055	0.072	0.054	0.016
	Benzo(a)pyrene	mg/kg	0.014	0.027	0.042	0.020	0.033	0.014	0.027	0.042	0.027	0.011
	Benzo(b&j)fluoranthene	mg/kg	0.087	0.164	0.212	0.115	0.228	0.087	0.164	0.228	0.161	0.061
	Benzo(b+j+k)fluoranthene	mg/kg	0.087	0.174	0.222	0.115	0.241	0.087	0.174	0.241	0.168	0.066
	Benzo(g,h,i)perylene	mg/kg	0.019	0.047	0.071	0.033	0.066	0.019	0.047	0.071	0.047	0.022
	Benzo(k)fluoranthene	mg/kg	< 0.01	0.010	0.010	< 0.01	0.013	<0.01	0.01	0.013	0.011	0.001
	Chrysene	mg/kg	0.230	0.385	0.456	0.298	0.495	0.23	0.385	0.495	0.373	0.11
	Dibenz(a,h)anthracene	mg/kg	0.0118	0.0298	0.0443	0.0186	0.0431	0.0118	0.0298	0.0443	0.03	0.014
	Fluoranthene	mg/kg	0.046	0.061	0.074	0.059	0.073	0.046	0.061	0.074	0.063	0.012
	Fluorene	mg/kg	0.101	0.120	0.177	0.097	0.131	0.097	0.12	0.177	0.125	0.032
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	0.018	0.025	0.012	0.024	<0.01	0.018	0.025	0.018	0.007
	2-Methylnaphthalene	mg/kg	0.783	1.19	1.47	0.961	1.35	0.783	1.19	1.47	1.15	0.28
	Naphthalene	mg/kg	0.219	0.307	0.369	0.291	0.393	0.219	0.307	0.393	0.316	0.069
	Phenanthrene	mg/kg	0.800	1.04	1.25	0.878	1.13	0.8	1.04	1.25	1.02	0.18
	Pyrene	mg/kg	0.074	0.102	0.126	0.086	0.121	0.074	0.102	0.126	0.102	0.022
	Acenaphthene d10	%	99.6	78.0	80.8	75.9	91	75.9	80.8	99.6	85.1	10
	Chrysene d12	%	125	94.3	101	104	106	94.3	103.8	124.7	106	11
	Naphthalene d8	%	72.1	70.6	70.4	75.3	98.6	70.4	72.1	98.6	77.4	12
	Phenanthrene d10	%	122.2	92.8	98.2	95.7	102.4	92.8	98.2	122.2	102	12
	B(a)P Total Potency Equivalent	mg/kg	0.042	0.086	0.123	0.059	0.115	0.042	0.086	0.123	0.085	0.035
	IACR (CCME)	mg/kg	0.88	1.66	2.15	1.17	2.24	0.88	1.66	2.24	1.62	0.6

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Fording River Watershed									
			Fording River Side Channel									
			FO10-1	FO10-2	FO10-3	FO10-4	FO10-5	Minimum	Median	Maximum	Mean	Standard Deviation
			8-Aug-15	8-Aug-15	8-Aug-15	8-Aug-15	8-Aug-15					
Physical Tests	% Moisture	%	48.2	58.2	53.2	50.7	47.2	47.2	50.7	58.2	51.5	4.4
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	8.02	7.88	7.98	7.99	7.96	7.88	7.98	8.02	7.97	0.05
Particle Size	% Gravel (>2mm)	%	< 0.10	8.20	< 0.10	0.37	< 0.10	<0.1	<0.1	8.2	<1.77	-
	% Sand (2.0mm - 0.063mm)	%	50.7	35.6	40.1	49.3	47.9	35.6	47.9	50.7	44.7	6.5
	% Sand (2.00mm - 1.00mm)	%	2.03	2.46	0.14	1.58	0.19	0.14	1.58	2.46	1.28	1.06
	% Sand (1.00mm - 0.50mm)	%	7.87	3.53	0.94	4.70	0.48	0.48	3.53	7.87	3.5	3.01
	% Sand (0.50mm - 0.25mm)	%	7.77	3.72	3.76	10.8	4.00	3.72	4	10.8	6	3.2
	% Sand (0.25mm - 0.125mm)	%	15.6	12.2	14.7	18.6	19.5	12.2	15.6	19.5	16.1	3
	% Sand (0.125mm - 0.063mm)	%	17.4	13.6	20.6	13.6	23.8	13.6	17.4	23.8	17.8	4.5
	% Silt (0.063mm - 0.004mm)	%	46.2	52.0	55.4	45.7	48.5	45.7	48.5	55.4	49.6	4.1
	% Silt (0.063mm - 0.0312mm)	%	22.9	23.9	26.6	21.2	24.4	21.2	23.9	26.6	23.8	2
	% Silt (0.0312mm - 0.004mm)	%	23.3	28.1	28.8	24.5	24.2	23.3	24.5	28.8	25.8	2.5
	% Clay (<4µm)	%	3.17	4.20	4.51	4.72	3.59	3.17	4.2	4.72	4.04	0.65
	Texture	-	Sandy loam	Silt loam	Silt loam	Sandy loam	Sandy loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	4.11	5.95	6.59	7.44	4.53	4.11	5.95	7.44	5.72	1.39
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	7,920	6,650	6,360	5,880	6,470	5,880	6,470	7,920	6,656	762
	Antimony (Sb)	mg/kg	0.63	0.53	0.53	0.56	0.57	0.53	0.56	0.63	0.56	0.04
	Arsenic (As)	mg/kg	5.11	4.11	3.97	4.07	4.15	3.97	4.11	5.11	4.28	0.47
	Barium (Ba)	mg/kg	229	191	182	194	186	182	191	229	196	19
	Beryllium (Be)	mg/kg	0.64	0.50	0.55	0.54	0.53	0.5	0.54	0.64	0.55	0.05
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10	< 10	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	1.09	1.22	1.07	1.10	1.01	1.010	1.090	1.220	1.100	0.080
	Calcium (Ca)	mg/kg	37,600	30,700	36,400	32,500	42,300	30,700	36,400	42,300	35,900	4,547
	Chromium (Cr)	mg/kg	14.3	13.0	11.3	9.90	11.6	9.9	11.6	14.3	12	1.7
	Cobalt (Co)	mg/kg	5.08	4.00	4.71	4.50	4.74	4.00	4.71	5.08	4.61	0.40
	Copper (Cu)	mg/kg	14.8	13.1	12.3	12.2	12.5	12.2	12.5	14.8	13	1.1
	Iron (Fe)	mg/kg	14,900	13,100	10,900	11,200	12,100	10,900	12,100	14,900	12,440	1,621
	Lead (Pb)	mg/kg	8.50	7.40	7.60	7.80	7.70	7.4	7.7	8.5	7.8	0.4
	Lithium (Li)	mg/kg	8.90	8.00	8.20	8.20	9.20	8	8.2	9.2	8.5	0.52
	Magnesium (Mg)	mg/kg	10,000	8,540	9,630	8,070	11,800	8,070	9,630	11,800	9,608	1,455
	Manganese (Mn)	mg/kg	423	242	437	261	392	242	392	437	351	93
	Mercury (Hg)	mg/kg	0.0462	0.0735	0.0771	0.0935	0.0532	0.0462	0.0735	0.0935	0.0687	0.0191
	Molybdenum (Mo)	mg/kg	1.37	0.82	1.01	0.97	1.12	0.82	1.01	1.37	1.06	0.2
	Nickel (Ni)	mg/kg	23.8	19.0	21.9	21.7	21.9	19	21.9	23.8	21.7	1.7
	Phosphorus (P)	mg/kg	1,680	1,600	1,230	1,280	1,410	1230	1410	1680	1440	196
	Potassium (K)	mg/kg	2,090	1,620	1,570	1,360	1,550	1,360	1,570	2,090	1,638	271
	Selenium (Se)	mg/kg	2.05	3.41	2.65	2.98	2.37	2.05	2.65	3.41	2.69	0.53
	Silver (Ag)	mg/kg	< 0.20	0.21	< 0.20	< 0.20	< 0.20	<0.2	<0.2	0.21	<0.2	-
	Sodium (Na)	mg/kg	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	mg/kg	66.2	51.0	51.0	53.1	56.8	51	53.1	66.2	55.6	6.4
	Thallium (Tl)	mg/kg	0.23	0.24	0.22	0.20	0.21	0.2	0.22	0.24	0.22	0.02
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	16.7	21.9	17.0	16.4	17.6	16.4	17	21.9	17.9	2.3
	Uranium (U)	mg/kg	1.11	0.94	0.87	0.97	0.93	0.87	0.94	1.11	0.96	0.09
	Vanadium (V)	mg/kg	36.0	28.3	26.7	25.5	27.3	25.5	27.3	36	28.8	4.2
	Zinc (Zn)	mg/kg	106	86.6	87.5	89.4	92.1	86.6	89.4	106.0	92.0	8.0
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	mg/kg	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	<0.004	<0.004	<0.004	<0.004	-
	Benz(a)anthracene	mg/kg	0.011	0.018	0.022	0.020	0.019	0.011	0.019	0.022	0.018	0.004
	Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b&j)fluoranthene	mg/kg	0.028	0.052	0.057	0.058	0.055	0.028	0.055	0.058	0.05	0.013
	Benzo(b+j+k)fluoranthene	mg/kg	0.028	0.052	0.057	0.058	0.055	0.028	0.055	0.058	0.05	0.013
	Benzo(g,h,i)perylene	mg/kg	< 0.01	0.014	0.016	0.015	0.015	<0.01	0.015	0.016	0.014	0.002
	Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.068	0.120	0.134	0.125	0.131	0.068	0.125	0.134	0.116	0.027
	Dibenz(a,h)anthracene	mg/kg	< 0.0050	0.0077	0.0075	0.0070	0.0091	<0.005	0.0075	0.0091	0.007	0.001
	Fluoranthene	mg/kg	0.013	0.022	0.025	0.024	0.023	0.013	0.023	0.025	0.021	0.005
	Fluorene	mg/kg	0.023	0.027	0.041	0.033	0.033	0.023	0.033	0.041	0.031	0.007
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	mg/kg	0.223	0.325	0.441	0.389	0.365	0.223	0.365	0.441	0.349	0.082
	Naphthalene	mg/kg	0.080	0.117	0.151	0.136	0.128	0.08	0.128	0.151	0.122	0.027
	Phenanthrene	mg/kg	0.193	0.336	0.423	0.363	0.363	0.193	0.363	0.423	0.336	0.086
	Pyrene	mg/kg	0.021	0.036	0.039	0.039	0.040	0.021	0.039	0.04	0.035	0.008
	Acenaphthene d10	%	70.2	97.2	81.9	83.0	73.4	70.2	81.9	97.2	81.1	10.5
	Chrysene d12	%	86.4	102	87.8	90.8	92.6	86.4	90.8	102	92	6
	Naphthalene d8	%	77.7	95.1	78.6	81.5	70	70	78.6	95.1	80.6	9.2
	Phenanthrene d10	%	78.2	99.7	85.4	86.5	82.2	78.2	85.4	99.7	86.4	8.1
	B(a)P Total Potency Equivalent	mg/kg	< 0.02	0.022	0.023	0.022	0.024	<0.02	0.022	0.024	0.022	0.001
	IACR (CCME)	mg/kg	0.3	0.51	0.57	0.56	0.55	0.3	0.55	0.57	0.498	0.113

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Fording River Watershed									
			Fording Wetland Downstream of Ewin Creek									
			FWDEC-1	FWDEC-2	FWDEC-3	FWDEC-4	FWDEC-5	Minimum	Median	Maximum	Mean	Standard Deviation
			9-Aug-15	9-Aug-15	9-Aug-15	9-Aug-15	9-Aug-15					
Physical Tests	% Moisture	%	79.4	90.5	86.0	87.1	87.0	79.4	87.0	90.5	86.0	4.1
	pH (1:9)	pH units	-	6.70	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.05	-	7.21	7.10	7.02	7.02	7.10	7.21	7.10	3.17
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	2.64	< 0.10	< 0.10	<0.1	<0.1	2.64	<0.61	-
	% Sand (2.0mm - 0.063mm)	%	23.0	8.44	11.1	3.85	15.7	3.85	11.1	23	12.4	7.3
	% Sand (2.00mm - 1.00mm)	%	0.22	0.27	0.90	< 0.10	0.13	<0.1	0.22	0.9	0.324	0.329
	% Sand (1.00mm - 0.50mm)	%	0.59	0.37	0.81	0.14	0.48	0.14	0.48	0.81	0.48	0.25
	% Sand (0.50mm - 0.25mm)	%	1.35	1.17	1.15	0.16	1.33	0.16	1.17	1.35	1.03	0.5
	% Sand (0.25mm - 0.125mm)	%	6.02	2.66	3.20	0.74	4.95	0.74	3.2	6.02	3.51	2.05
	% Sand (0.125mm - 0.063mm)	%	14.8	3.97	5.05	2.81	8.79	2.81	5.05	14.8	7.1	4.9
	% Silt (0.063mm - 0.004mm)	%	68.2	82.1	77.4	84.9	75.9	68.2	77.4	84.9	77.7	6.4
	% Silt (0.063mm - 0.0312mm)	%	31.2	37.0	34.0	36.8	34.2	31.2	34.2	37	34.6	2.4
	% Silt (0.0312mm - 0.004mm)	%	37.0	45.1	43.4	48.1	41.7	37	43.4	48.1	43.1	4.1
	% Clay (<4µm)	%	8.83	9.51	8.85	11.3	8.43	8.43	8.85	11.3	9.4	1.1
	Texture	-	Silt loam	Silt	Silt	Silt	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	12.2	18.5	12.0	16.2	11.5	11.5	12.2	18.5	14.1	3.10
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	9,640	6,870	9,250	8,930	8,100	6,870	8,930	9,640	8,558	1,101
	Antimony (Sb)	mg/kg	0.70	0.94	0.55	0.66	0.63	0.55	0.66	0.94	0.7	0.15
	Arsenic (As)	mg/kg	3.38	4.97	2.30	3.72	2.85	2.30	3.38	4.97	3.44	1.01
	Barium (Ba)	mg/kg	177	159	203	195	148	148	177	203	176	23
	Beryllium (Be)	mg/kg	0.67	0.44	0.62	0.53	0.51	0.44	0.53	0.67	0.55	0.09
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	11	14	14	16	11	11	14	16	13.2	2.2
	Cadmium (Cd)	mg/kg	1.44	2.00	1.59	1.94	1.34	1.340	1.590	2.000	1.660	0.300
	Calcium (Ca)	mg/kg	26,800	24,100	27,500	30,200	27,200	24,100	27,200	30,200	27,160	2,171
	Chromium (Cr)	mg/kg	19.1	19.3	28.4	23.5	18.4	18.4	19.3	28.4	21.7	4.2
	Cobalt (Co)	mg/kg	3.76	5.18	2.61	2.83	3.15	2.61	3.15	5.18	3.51	1.03
	Copper (Cu)	mg/kg	19.1	17.7	14.0	18.6	14.7	14	17.7	19.1	16.8	2.3
	Iron (Fe)	mg/kg	12,600	16,000	9,010	16,200	11,300	9,010	12,600	16,200	13,022	3,091
	Lead (Pb)	mg/kg	11.9	10.8	10.8	16.0	11.6	10.8	11.6	16.0	12.2	2.2
	Lithium (Li)	mg/kg	12.1	10.2	13.0	12.6	10.8	10.2	12.1	13	11.7	1.2
	Magnesium (Mg)	mg/kg	9,050	6,780	8,480	10,200	11,000	6,780	9,050	11,000	9,102	1,627
	Manganese (Mn)	mg/kg	55	33	82	51	45	32.9	50.5	81.6	53	18
	Mercury (Hg)	mg/kg	0.0524	0.0640	0.0784	0.0789	0.0442	0.0442	0.0640	0.0789	0.0636	0.0155
	Molybdenum (Mo)	mg/kg	2.01	1.95	1.30	1.79	2.75	1.3	1.95	2.75	1.96	0.52
	Nickel (Ni)	mg/kg	20.6	17.7	18.0	17.2	16.0	16	17.7	20.6	17.9	1.7
	Phosphorus (P)	mg/kg	950	1,330	1,450	1,560	1,350	950	1350	1560	1328	230
	Potassium (K)	mg/kg	1,870	1,880	2,180	2,290	2,120	1,870	2,120	2,290	2,068	186
	Selenium (Se)	mg/kg	7.38	21.2	8.82	12.1	10.3	7.38	10.30	21.20	12.00	5.50
	Silver (Ag)	mg/kg	0.22	< 0.20	0.25	0.24	< 0.20	<0.2	0.22	0.25	0.22	0.02
	Sodium (Na)	mg/kg	< 100	< 100	170	110	100	<100	100	170	116	30
	Strontium (Sr)	mg/kg	51.4	52.5	57.5	55.1	44.6	44.6	52.5	57.5	52.2	4.9
	Thallium (Tl)	mg/kg	0.21	0.23	0.23	0.23	0.21	0.21	0.23	0.23	0.22	0.01
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	31.8	32.9	32.1	32.0	27.5	27.5	32	32.9	31.3	2.1
	Uranium (U)	mg/kg	3.19	3.83	2.93	2.42	3.17	2.42	3.17	3.83	3.11	0.51
	Vanadium (V)	mg/kg	33.4	35.0	33.9	37.7	34.4	33.4	34.4	37.7	34.9	1.7
	Zinc (Zn)	mg/kg	81.8	110	81.1	111	86.0	81.1	86.0	111.0	94.0	15.0
	Zirconium (Zr)	mg/kg	4.4	2.7	2.2	2.9	2.0	2	2.7	4.4	2.84	0.94
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.010	< 0.015	< 0.010	< 0.010	< 0.015	<0.01	<0.01	<0.015	<0.012	-
	Acenaphthylene	mg/kg	< 0.010	< 0.015	< 0.010	< 0.010	< 0.015	<0.01	<0.01	<0.015	<0.012	-
	Anthracene	mg/kg	< 0.008	< 0.012	< 0.008	< 0.008	< 0.012	<0.008	<0.008	<0.012	<0.0096	-
	Benz(a)anthracene	mg/kg	< 0.020	< 0.030	< 0.020	0.026	< 0.030	<0.02	<0.02	0.026	<0.025	-
	Benzo(a)pyrene	mg/kg	< 0.020	< 0.030	< 0.020	< 0.020	< 0.030	<0.02	<0.02	<0.03	<0.024	-
	Benzo(b&j)fluoranthene	mg/kg	< 0.020	0.047	0.053	0.062	0.058	<0.02	0.053	0.062	0.048	0.017
	Benzo(b+j+k)fluoranthene	mg/kg	< 0.028	0.047	0.053	0.062	0.058	<0.028	0.053	0.062	0.05	0.013
	Benzo(g,h,i)perylene	mg/kg	< 0.020	< 0.030	< 0.020	0.024	< 0.030	<0.02	<0.02	0.024	<0.025	-
	Benzo(k)fluoranthene	mg/kg	< 0.020	< 0.030	< 0.020	< 0.020	< 0.030	<0.02	<0.02	<0.03	<0.024	-
	Chrysene	mg/kg	0.042	0.107	0.120	0.131	0.128	0.042	0.12	0.131	0.106	0.037
	Dibenz(a,h)anthracene	mg/kg	< 0.010	< 0.015	< 0.010	0.011	< 0.015	<0.01	<0.01	0.011	<0.012	-
	Fluoranthene	mg/kg	< 0.02	< 0.03	0.023	0.026	< 0.03	<0.02	<0.02	0.026	<0.026	-
	Fluorene	mg/kg	< 0.02	0.056	0.035	0.050	< 0.03	<0.02	0.035	0.056	0.038	0.015
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.02	< 0.03	< 0.02	< 0.02	< 0.03	<0.02	<0.02	<0.03	<0.024	-
	2-Methylnaphthalene	mg/kg	0.081	0.304	0.306	0.346	0.241	0.081	0.304	0.346	0.256	0.105
	Naphthalene	mg/kg	0.070	0.128	0.162	0.212	0.144	0.07	0.144	0.212	0.143	0.052
	Phenanthrene	mg/kg	0.171	0.353	0.311	0.345	0.363	0.171	0.345	0.363	0.309	0.079
	Pyrene	mg/kg	< 0.02	< 0.03	0.026	0.034	< 0.03	<0.02	<0.02	0.034	<0.028	-
	Acenaphthene d10	%	80.6	88.1	76.4	103.7	87.8	76.4	87.8	103.7	87	10
	Chrysene d12	%	118.4	120.8	77.0	99.8	121.5	77	118.4	121.5	108	19
	Naphthalene d8	%	65.2	71.3	84.3	103.5	73.2	65.2	73.2	103.5	80	15
	Phenanthrene d10	%	112.6	116.1	78.6	110.2	110.6	78.6	110.6	116.1	106	15
	B(a)P Total Potency Equivalent	mg/kg	< 0.02	0.033	0.025	0.034	0.034	<0.02	0.033	0.034	0.029	0.006
	IACR (CCME)	mg/kg	0.23	0.57	0.54	0.67	0.64	0.23	0.57	0.67	0.53	0.176

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Fording River Watershed									
			Fording Meadow near Chauncey Creek									
			FMUCK-1	FMUCK-2	FMUCK-3	FMUCK-4	FMUCK-5	Minimum	Median	Maximum	Mean	Standard Deviation
			8-Aug-15	8-Aug-15	8-Aug-15	8-Aug-15	8-Aug-15					
Physical Tests	% Moisture	%	64.2	36.4	50.8	43.6	43.4	36.4	43.6	64.2	47.7	10.5
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.86	8.18	8.03	8.16	8.07	7.86	8.07	8.18	8.06	0.13
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	28.6	66.0	37.9	57.6	52.6	28.6	52.6	66	48.5	15.1
	% Sand (2.00mm - 1.00mm)	%	0.11	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	0.11	<0.102	-
	% Sand (1.00mm - 0.50mm)	%	0.22	0.82	< 0.10	0.19	0.53	<0.1	0.22	0.82	0.37	0.3
	% Sand (0.50mm - 0.25mm)	%	1.45	12.0	0.96	1.56	6.17	0.96	1.56	12	4.4	4.7
	% Sand (0.25mm - 0.125mm)	%	11.8	38.8	16.6	28.3	26.5	11.8	26.5	38.8	24.4	10.6
	% Sand (0.125mm - 0.063mm)	%	15.0	14.3	20.3	27.6	19.4	14.3	19.4	27.6	19.3	5.3
	% Silt (0.063mm - 0.004mm)	%	66.2	31.8	58.7	39.7	45.1	31.8	45.1	66.2	48.3	14
	% Silt (0.063mm - 0.0312mm)	%	30.8	15.6	28.8	21.3	23.4	15.6	23.4	30.8	24	6.1
	% Silt (0.0312mm - 0.004mm)	%	35.4	16.2	29.9	18.4	21.8	16.2	21.8	35.4	24.3	8.1
	% Clay (<4µm)	%	5.26	2.18	3.44	2.65	2.27	2.18	2.65	5.26	3.16	1.27
	Texture	-	Silt loam	Sandy loam	Silt loam	Sandy loam	Sandy loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	8.06	3.31	6.99	3.94	7.48	3.31	6.99	8.06	5.96	2.17
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	7,620	7,840	6,550	8,010	7,000	6,550	7,620	8,010	7,404	612
	Antimony (Sb)	mg/kg	0.67	0.62	0.61	0.57	0.68	0.57	0.62	0.68	0.63	0.05
	Arsenic (As)	mg/kg	4.94	5.45	4.91	4.92	5.47	4.91	4.94	5.47	5.14	0.29
	Barium (Ba)	mg/kg	197	194	179	191	206	179	194	206	193	10
	Beryllium (Be)	mg/kg	0.68	0.70	0.58	0.65	0.68	0.58	0.68	0.7	0.66	0.05
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	1.42	1.06	1.09	1.01	1.18	1.010	1.090	1.420	1.150	0.160
	Calcium (Ca)	mg/kg	43,700	38,400	42,800	40,800	38,900	38,400	40,800	43,700	40,920	2,330
	Chromium (Cr)	mg/kg	13.8	13.9	12.2	14.3	12.9	12.2	13.8	14.3	13.4	0.9
	Cobalt (Co)	mg/kg	5.43	5.63	5.30	5.25	5.91	5.25	5.43	5.91	5.50	0.27
	Copper (Cu)	mg/kg	15.7	12.4	13.6	11.9	14.4	11.9	13.6	15.7	13.6	1.5
	Iron (Fe)	mg/kg	13,800	15,100	13,200	13,500	14,800	13,200	13,800	15,100	14,080	829
	Lead (Pb)	mg/kg	9.3	9.0	8.8	8.6	9.7	8.6	9.0	9.7	9.1	0.4
	Lithium (Li)	mg/kg	10.7	9.4	9.7	9.8	9.3	9.3	9.7	10.7	9.8	0.6
	Magnesium (Mg)	mg/kg	12,900	10,800	12,900	13,000	10,400	10,400	12,900	13,000	12,000	1,286
	Manganese (Mn)	mg/kg	377	400	377	364	423	364	377	423	388	23
	Mercury (Hg)	mg/kg	0.0570	0.0377	0.0502	0.0381	0.0480	0.0377	0.0480	0.0570	0.0462	0.0083
	Molybdenum (Mo)	mg/kg	1.32	1.30	1.33	1.21	1.32	1.21	1.32	1.33	1.3	0.05
	Nickel (Ni)	mg/kg	30.2	25.6	25.5	23.5	27.6	23.5	25.6	30.2	26.5	2.5
	Phosphorus (P)	mg/kg	1,480	1,770	1,460	1,560	1,680	1460	1560	1770	1590	133
	Potassium (K)	mg/kg	1,870	2,020	1,540	2,110	1,690	1,540	1,870	2,110	1,846	234
	Selenium (Se)	mg/kg	4.38	1.73	2.31	1.91	2.17	1.73	2.17	4.38	2.50	1.07
	Silver (Ag)	mg/kg	0.23	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	0.23	<0.21	-
	Sodium (Na)	mg/kg	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	mg/kg	60.7	65.8	58.3	60.9	67.1	58.3	60.9	67.1	62.6	3.7
	Thallium (Tl)	mg/kg	0.23	0.21	0.20	0.23	0.21	0.2	0.21	0.23	0.22	0.01
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	20.6	16.7	17.4	17.9	15.6	15.6	17.4	20.6	17.6	1.9
	Uranium (U)	mg/kg	1.17	1.17	1.05	1.05	1.18	1.05	1.17	1.18	1.12	0.07
	Vanadium (V)	mg/kg	32.4	33.7	28.3	33.3	31.3	28.3	32.4	33.7	31.8	2.2
	Zinc (Zn)	mg/kg	110	109	102	101	110	101.0	109.0	110.0	106.0	5.0
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	mg/kg	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	<0.004	<0.004	<0.004	<0.004	-
	Benz(a)anthracene	mg/kg	0.020	0.012	0.013	0.012	0.016	0.012	0.013	0.02	0.015	0.003
	Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b&j)fluoranthene	mg/kg	0.047	0.024	0.028	0.030	0.030	0.024	0.03	0.047	0.032	0.009
	Benzo(b+j+k)fluoranthene	mg/kg	0.047	0.024	0.028	0.03	0.03	0.024	0.03	0.047	0.032	0.009
	Benzo(g,h,i)perylene	mg/kg	0.012	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	0.012	<0.01	-
	Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.126	0.071	0.074	0.079	0.083	0.071	0.079	0.126	0.087	0.023
	Dibenz(a,h)anthracene	mg/kg	0.0065	< 0.005	< 0.005	0.0051	< 0.005	<0.005	<0.005	0.0065	<0.005	-
	Fluoranthene	mg/kg	0.026	0.015	0.017	0.015	0.018	0.015	0.017	0.026	0.018	0.005
	Fluorene	mg/kg	0.048	0.019	0.027	0.023	0.021	0.019	0.023	0.048	0.028	0.012
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	mg/kg	0.435	0.290	0.343	0.301	0.332	0.29	0.332	0.435	0.34	0.057
	Naphthalene	mg/kg	0.166	0.132	0.155	0.143	0.191	0.132	0.155	0.191	0.157	0.023
	Phenanthrene	mg/kg	0.501	0.332	0.309	0.280	0.341	0.28	0.332	0.501	0.353	0.086
	Pyrene	mg/kg	0.040	0.024	0.024	0.023	0.025	0.023	0.024	0.04	0.027	0.007
	Acenaphthene d10	%	81.4	75.8	79.8	73.3	80	73.3	79.8	81.4	78.1	3.4
	Chrysene d12	%	108.1	105.4	85.8	76.5	85.1	76.5	85.8	108.1	92	14
	Naphthalene d8	%	70.5	69.8	84.3	78	87	69.8	78	87	77.9	7.8
	Phenanthrene d10	%	103.6	97.7	80.7	73.8	81.6	73.8	81.6	103.6	87	13
	B(a)P Total Potency Equivalent	mg/kg	0.021	< 0.02	< 0.02	< 0.02	< 0.02	<0.02	<0.02	0.021	<0.02	-
	IACR (CCME)	mg/kg	0.49	0.28	0.31	0.33	0.34	0.28	0.33	0.49	0.35	0.082

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Fording River Watershed									
			Fording Wetland near Greenhills									
			R5-1-1	R5-1-2	R5-1-3	R5-1-4	R5-1-5	Minimum	Median	Maximum	Mean	Standard Deviation
			14-Aug-15	14-Aug-15	14-Aug-15	14-Aug-15	14-Aug-15					
Physical Tests	% Moisture	%	65.9	70.4	79.5	67.1	66.8	65.9	67.1	79.5	69.9	5.6
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.77	7.70	7.69	7.97	7.83	7.69	7.77	7.97	7.79	0.11
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	2.78	22.9	19.6	15.5	16.1	2.78	16.1	22.9	15.4	7.6
	% Sand (2.00mm - 1.00mm)	%	0.19	0.19	0.36	0.34	0.45	0.19	0.34	0.45	0.306	0.114
	% Sand (1.00mm - 0.50mm)	%	0.24	0.92	0.82	0.46	0.79	0.24	0.79	0.92	0.65	0.29
	% Sand (0.50mm - 0.25mm)	%	0.34	3.51	2.52	1.25	1.81	0.34	1.81	3.51	1.89	1.21
	% Sand (0.25mm - 0.125mm)	%	0.66	9.60	6.73	5.68	5.39	0.66	5.68	9.6	5.61	3.23
	% Sand (0.125mm - 0.063mm)	%	1.35	8.73	9.15	7.72	7.70	1.35	7.72	9.15	6.93	3.18
	% Silt (0.063mm - 0.004mm)	%	50.7	50.8	57.7	53.7	57.6	50.7	53.7	57.7	54.1	3.5
	% Silt (0.063mm - 0.0312mm)	%	9.83	15.6	19.4	15.1	16.4	9.83	15.6	19.4	15.3	3.5
	% Silt (0.0312mm - 0.004mm)	%	40.8	35.3	38.4	38.6	41.2	35.3	38.6	41.2	38.9	2.4
	% Clay (<4µm)	%	46.6	26.2	22.7	30.8	26.2	22.7	26.2	46.6	30.5	9.4
	Texture	-	Silty clay	Silt loam	Silt loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	9.83	8.21	7.81	8.76	8.96	7.81	8.76	9.83	8.71	0.77
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	11,100	6,370	4,640	6,880	7,030	4,640	6,880	11,100	7,204	2,376
	Antimony (Sb)	mg/kg	1.23	0.68	0.48	0.79	0.78	0.48	0.78	1.23	0.79	0.27
	Arsenic (As)	mg/kg	6.45	3.42	2.16	3.84	3.60	2.16	3.60	6.45	3.89	1.57
	Barium (Ba)	mg/kg	396	322	285	255	293	255	293	396	310	54
	Beryllium (Be)	mg/kg	0.88	0.49	0.36	0.55	0.51	0.36	0.51	0.88	0.56	0.19
	Bismuth (Bi)	mg/kg	0.24	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	0.24	<0.208	-
	Boron (B)	mg/kg	13.8	13.2	12.7	10.3	14.0	10.3	13.2	14	12.8	1.5
	Cadmium (Cd)	mg/kg	1.88	1.46	1.09	1.60	1.38	1.090	1.460	1.880	1.480	0.290
	Calcium (Ca)	mg/kg	95,300	197,000	202,000	158,000	194,000	95,300	194,000	202,000	169,260	44,862
	Chromium (Cr)	mg/kg	21.9	12.7	9.47	13.2	13.7	9.47	13.2	21.9	14.2	4.6
	Cobalt (Co)	mg/kg	9.73	5.40	4.01	6.23	5.97	4.01	5.97	9.73	6.27	2.12
	Copper (Cu)	mg/kg	23.4	14.0	11.4	15.3	17.2	11.4	15.3	23.4	16.3	4.5
	Iron (Fe)	mg/kg	14,200	8,780	6,150	9,670	9,630	6,150	9,630	14,200	9,686	2,903
	Lead (Pb)	mg/kg	13.8	7.96	5.78	8.57	8.47	5.8	8.5	13.8	8.9	3.0
	Lithium (Li)	mg/kg	12.9	8.4	6.2	9.3	9.4	6.2	9.3	12.9	9.2	2.4
	Magnesium (Mg)	mg/kg	8,770	7,800	6,680	7,790	8,510	6,680	7,800	8,770	7,910	812
	Manganese (Mn)	mg/kg	313	231	205	212	265	205	231	313	245	44
	Mercury (Hg)	mg/kg	0.0632	0.0445	0.0460	0.0595	0.0379	0.0379	0.0460	0.0632	0.0502	0.0107
	Molybdenum (Mo)	mg/kg	3.57	2.69	2.84	2.84	3.14	2.69	2.84	3.57	3.02	0.35
	Nickel (Ni)	mg/kg	38.5	22.8	17.0	26.0	24.3	17	24.3	38.5	25.7	7.9
	Phosphorus (P)	mg/kg	1,060	667	510	750	722	510	722	1060	742	201
	Potassium (K)	mg/kg	3,450	1,980	1,540	2,110	2,210	1,540	2,110	3,450	2,258	714
	Selenium (Se)	mg/kg	19.7	34.1	49.1	21.4	34.4	19.70	34.10	49.10	31.70	11.90
	Silver (Ag)	mg/kg	0.37	0.22	0.14	0.25	0.22	0.14	0.22	0.37	0.24	0.08
	Sodium (Na)	mg/kg	286	310	327	292	361	286	310	361	315	30
	Strontium (Sr)	mg/kg	142	247	256	211	253	142	247	256	222	48
	Thallium (Tl)	mg/kg	0.472	0.276	0.228	0.300	0.301	0.228	0.3	0.472	0.32	0.09
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	16.2	14.4	13.3	14.0	17.9	13.3	14.4	17.9	15.2	1.9
	Uranium (U)	mg/kg	1.92	2.63	2.86	2.49	2.89	1.92	2.63	2.89	2.56	0.39
	Vanadium (V)	mg/kg	49.5	26.5	19.4	28.6	29.2	19.4	28.6	49.5	30.6	11.2
	Zinc (Zn)	mg/kg	162	111	81.8	119	111	81.8	111.0	162.0	117.0	29.0
	Zirconium (Zr)	mg/kg	1.4	1.1	< 1.0	< 1.0	1.0	<1	1	1.4	1.1	0.17
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.070	< 0.020	< 0.030	< 0.030	< 0.025	<0.02	<0.03	<0.07	<0.035	-
	Acenaphthylene	mg/kg	0.0477	0.0132	0.017	0.0222	0.0157	0.0132	0.017	0.0477	0.023	0.014
	Anthracene	mg/kg	0.0339	0.0152	0.0191	0.0218	0.0219	0.0152	0.0218	0.0339	0.022	0.007
	Benz(a)anthracene	mg/kg	0.292	0.089	0.122	0.127	0.112	0.089	0.122	0.292	0.148	0.082
	Benzo(a)pyrene	mg/kg	0.157	0.056	0.084	0.086	0.081	0.056	0.084	0.157	0.093	0.038
	Benzo(b&j)fluoranthene	mg/kg	0.486	0.191	0.281	0.281	0.282	0.191	0.281	0.486	0.304	0.109
	Benzo(b+j+k)fluoranthene	mg/kg	0.508	0.203	0.281	0.298	0.295	0.203	0.295	0.508	0.317	0.114
	Benzo(g,h,i)perylene	mg/kg	0.240	0.059	0.103	0.137	0.081	0.059	0.103	0.24	0.124	0.071
	Benzo(k)fluoranthene	mg/kg	0.022	0.012	< 0.02	0.016	0.013	<0.02	0.013	0.022	0.017	0.004
	Chrysene	mg/kg	1.58	0.490	0.687	0.691	0.609	0.49	0.687	1.58	0.81	0.44
	Dibenz(a,h)anthracene	mg/kg	0.158	0.0322	0.058	0.0774	0.0521	0.0322	0.058	0.158	0.076	0.049
	Fluoranthene	mg/kg	0.213	0.074	0.085	0.108	0.073	0.073	0.085	0.213	0.111	0.059
	Fluorene	mg/kg	0.764	0.238	0.292	0.399	0.303	0.238	0.303	0.764	0.399	0.212
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.076	0.019	0.036	0.047	0.025	0.019	0.036	0.076	0.041	0.023
	2-Methylnaphthalene	mg/kg	5.29	1.56	1.65	2.31	2.18	1.56	2.18	5.29	2.6	1.54
	Naphthalene	mg/kg	1.28	0.387	0.385	0.587	0.500	0.385	0.5	1.28	0.63	0.37
	Phenanthrene	mg/kg	3.47	1.16	1.47	1.87	1.56	1.16	1.56	3.47	1.91	0.91
	Pyrene	mg/kg	0.368	0.137	0.157	0.195	0.163	0.137	0.163	0.368	0.204	0.094
	Acenaphthene d10	%	110.3	77.8	71.8	84.1	73.2	71.8	77.8	110.3	83	16
	Chrysene d12	%	N/A	111.5	111.7	94.3	108.7	94.3	111.5	111.7	107	48
	Naphthalene d8	%	74.5	62.9	61.4	74.7	61.7	61.4	62.9	74.7	67	6.9
	Phenanthrene d10	%	106.9	87.2	89	90.6	91.3	87.2	90.6	106.9	93	8
	B(a)P Total Potency Equivalent	mg/kg	0.421	0.124	0.194	0.219	0.183	0.124	0.194	0.421	0.228	0.113
	IACR (CCME)	mg/kg	5.99	2.08	3.02	3.18	2.94	2.08	3.02	5.99	3.44	1.49

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Fording River Watershed									
			Fording Wetland Below Josephine Falls									
			R5-3-1	R5-3-2	R5-3-3	R5-3-4	R5-3-5	Minimum	Median	Maximum	Mean	Standard Deviation
			9-Aug-15	10-Aug-15	10-Aug-15	10-Aug-15	9-Aug-15					
Physical Tests	% Moisture	%	65.9	52.0	52.9	74.5	63.3	52.0	63.3	74.5	61.7	9.4
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.76	7.92	7.87	7.62	8.01	7.62	7.87	8.01	7.84	0.15
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	33.9	44.2	35.2	32.6	41.9	32.6	35.2	44.2	37.6	5.2
	% Sand (2.00mm - 1.00mm)	%	< 0.10	0.21	0.19	0.29	0.20	<0.1	0.2	0.29	0.198	0.068
	% Sand (1.00mm - 0.50mm)	%	0.33	0.28	0.22	0.73	0.46	0.22	0.33	0.73	0.4	0.2
	% Sand (0.50mm - 0.25mm)	%	2.24	5.72	2.69	4.58	3.58	2.24	3.58	5.72	3.76	1.41
	% Sand (0.25mm - 0.125mm)	%	14.2	20.1	13.6	12.6	19.7	12.6	14.2	20.1	16	3.6
	% Sand (0.125mm - 0.063mm)	%	17.1	17.9	18.6	14.4	18.0	14.4	17.9	18.6	17.2	1.7
	% Silt (0.063mm - 0.004mm)	%	60.8	53.5	61.3	61.8	54.7	53.5	60.8	61.8	58.4	4
	% Silt (0.063mm - 0.0312mm)	%	28.1	27.4	30.6	27.9	27.7	27.4	27.9	30.6	28.3	1.3
	% Silt (0.0312mm - 0.004mm)	%	32.7	26.1	30.6	33.9	27.0	26.1	30.6	33.9	30.1	3.4
	% Clay (<4µm)	%	5.26	2.33	3.52	5.62	3.36	2.33	3.52	5.62	4.02	1.38
	Texture	-	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	6.30	2.58	5.45	8.64	4.55	2.58	5.45	8.64	5.5	2.23
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	7,100	5,670	6,220	6,580	5,950	5,670	6,220	7,100	6,304	558
	Antimony (Sb)	mg/kg	0.45	0.51	0.49	0.51	0.47	0.45	0.49	0.51	0.49	0.03
	Arsenic (As)	mg/kg	5.20	5.84	5.97	4.91	5.17	4.91	5.20	5.97	5.42	0.46
	Barium (Ba)	mg/kg	194	190	206	198	188	188	194	206	195	7
	Beryllium (Be)	mg/kg	0.63	0.61	0.66	0.58	0.60	0.58	0.61	0.66	0.62	0.03
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	13	< 10.0	11	12	11	<10	11	13	11.4	1.1
	Cadmium (Cd)	mg/kg	0.611	0.599	0.647	0.682	0.613	0.599	0.613	0.682	0.630	0.034
	Calcium (Ca)	mg/kg	43,800	47,200	47,700	43,600	42,000	42,000	43,800	47,700	44,860	2,471
	Chromium (Cr)	mg/kg	13.6	10.5	12.2	12.9	11.6	10.5	12.2	13.6	12.2	1.2
	Cobalt (Co)	mg/kg	7.30	8.04	8.52	6.38	8.10	6.38	8.04	8.52	7.67	0.84
	Copper (Cu)	mg/kg	14.7	14.7	15.3	15.2	15.1	14.7	15.1	15.3	15	0.3
	Iron (Fe)	mg/kg	15,100	16,900	16,900	16,800	15,300	15,100	16,800	16,900	16,200	917
	Lead (Pb)	mg/kg	8.9	10.3	9.8	10.2	9.1	8.9	9.8	10.3	9.7	0.6
	Lithium (Li)	mg/kg	8.5	8.4	9.1	8.2	7.6	7.6	8.4	9.1	8.36	0.54
	Magnesium (Mg)	mg/kg	13,200	12,800	12,700	12,400	11,900	11,900	12,700	13,200	12,600	485
	Manganese (Mn)	mg/kg	1,020	1,530	1,500	972	1,630	972	1500	1630	1330	310
	Mercury (Hg)	mg/kg	0.0443	0.0355	0.0437	0.0476	0.0406	0.0355	0.0437	0.0476	0.0423	0.0046
	Molybdenum (Mo)	mg/kg	1.60	1.79	1.61	1.41	1.71	1.41	1.61	1.79	1.62	0.14
	Nickel (Ni)	mg/kg	19.6	22.7	23.6	18.9	22.0	18.9	22	23.6	21.4	2
	Phosphorus (P)	mg/kg	1,510	1,580	1,460	1,460	1,340	1340	1460	1580	1470	88
	Potassium (K)	mg/kg	2,540	1,880	2,110	2,210	2,120	1,880	2,120	2,540	2,172	239
	Selenium (Se)	mg/kg	4.93	2.87	4.31	7.76	3.23	2.87	4.31	7.76	4.62	1.94
	Silver (Ag)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Sodium (Na)	mg/kg	120	100	< 100	< 100	< 100	<100	<100	120	<104	-
	Strontium (Sr)	mg/kg	55.1	59.0	57.1	54.4	52.4	52.4	55.1	59	55.6	2.5
	Thallium (Tl)	mg/kg	0.24	0.23	0.23	0.22	0.24	0.22	0.23	0.24	0.23	0.01
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	17.0	13.9	14.9	16.2	15.7	13.9	15.7	17	15.5	1.2
	Uranium (U)	mg/kg	1.13	1.00	1.00	1.03	1.14	1	1.03	1.14	1.06	0.07
	Vanadium (V)	mg/kg	24.9	21.5	23.1	23.8	22.0	21.5	23.1	24.9	23.1	1.4
	Zinc (Zn)	mg/kg	72.2	75.4	74.6	73.5	70.8	70.8	73.5	75.4	73.3	1.8
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	mg/kg	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	<0.004	<0.004	<0.004	<0.004	-
	Benz(a)anthracene	mg/kg	0.010	< 0.01	< 0.01	0.018	0.016	<0.01	0.01	0.018	0.013	0.004
	Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b&j)fluoranthene	mg/kg	0.028	0.010	0.011	0.042	0.037	0.01	0.028	0.042	0.026	0.015
	Benzo(b+j+k)fluoranthene	mg/kg	0.028	< 0.015	< 0.015	0.042	0.037	<0.015	0.028	0.042	0.027	0.012
	Benzo(g,h,i)perylene	mg/kg	< 0.01	< 0.01	< 0.01	0.015	0.012	<0.01	<0.01	0.015	<0.011	-
	Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.078	0.030	0.033	0.108	0.093	0.03	0.078	0.108	0.068	0.035
	Dibenz(a,h)anthracene	mg/kg	< 0.005	< 0.005	< 0.005	0.0072	0.0074	<0.005	<0.005	0.0074	<0.006	-
	Fluoranthene	mg/kg	0.013	< 0.01	< 0.01	0.020	0.015	<0.01	0.013	0.02	0.014	0.004
	Fluorene	mg/kg	0.013	< 0.01	< 0.01	0.020	< 0.01	<0.01	<0.01	0.02	<0.013	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	mg/kg	0.105	0.062	0.066	0.188	0.107	0.062	0.105	0.188	0.106	0.051
	Naphthalene	mg/kg	0.050	0.037	0.044	0.101	0.078	0.037	0.05	0.101	0.062	0.027
	Phenanthrene	mg/kg	0.204	0.084	0.103	0.275	0.206	0.084	0.204	0.275	0.174	0.079
	Pyrene	mg/kg	0.021	< 0.01	< 0.01	0.029	0.022	<0.01	0.021	0.029	0.018	0.008
	Acenaphthene d10	%	92.1	83.4	77.5	101.1	78.1	77.5	83.4	101.1	86	10
	Chrysene d12	%	116.4	83.4	110.1	109.6	107.5	83.4	109.6	116.4	105	13
	Naphthalene d8	%	79	95.2	73.7	108	96.4	73.7	95.2	108	90	14
	Phenanthrene d10	%	110.1	81.9	97.3	109.8	95.1	81.9	97.3	110.1	99	12
	B(a)P Total Potency Equivalent	mg/kg	< 0.02	< 0.02	< 0.02	0.02	< 0.02	<0.02	<0.02	0.02	<0.02	-
	IACR (CCME)	mg/kg	0.3	0.15	0.16	0.45	0.4	0.15	0.3	0.45	0.292	0.136

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Elk River Watershed									
			Upper Elk River Oxbow									
			EROU-1	EROU-2	EROU-3	EROU-4	EROU-5	Minimum	Median	Maximum	Mean	Standard Deviation
			10-Aug-15	10-Aug-15	10-Aug-15	10-Aug-15	10-Aug-15					
Physical Tests	% Moisture	%	74.1	71.7	65.7	72.4	65.5	65.5	71.7	74.1	69.9	4.0
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.68	7.68	7.84	7.82	7.80	7.68	7.80	7.84	7.76	0.08
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	8.25	1.77	2.53	3.34	3.40	1.77	3.34	8.25	3.86	2.54
	% Sand (2.00mm - 1.00mm)	%	0.12	< 0.10	0.22	0.32	0.28	<0.1	0.22	0.32	0.208	0.097
	% Sand (1.00mm - 0.50mm)	%	0.31	0.19	0.27	0.36	0.61	0.19	0.31	0.61	0.35	0.16
	% Sand (0.50mm - 0.25mm)	%	0.99	0.31	0.61	0.58	0.86	0.31	0.61	0.99	0.67	0.264
	% Sand (0.25mm - 0.125mm)	%	2.31	0.36	0.65	0.85	0.71	0.36	0.71	2.31	0.98	0.77
	% Sand (0.125mm - 0.063mm)	%	4.53	0.82	0.78	1.22	0.95	0.78	0.95	4.53	1.66	1.61
	% Silt (0.063mm - 0.004mm)	%	77.9	82.5	75.0	74.7	83.9	74.7	77.9	83.9	78.8	4.2
	% Silt (0.063mm - 0.0312mm)	%	24.8	24.1	11.1	16.0	26.6	11.1	24.1	26.6	20.5	6.7
	% Silt (0.0312mm - 0.004mm)	%	53.1	58.4	64.0	58.7	57.3	53.1	58.4	64	58.3	3.9
	% Clay (<4µm)	%	13.8	15.7	22.5	22.0	12.7	12.7	15.7	22.5	17.3	4.6
	Texture	-	Silt	Silt	Silt	Silt loam	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	7.11	6.81	5.46	6.05	5.65	5.46	6.05	7.11	6.22	0.72
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	9,450	9,730	12,200	11,600	11,500	9,450	11,500	12,200	10,896	1,226
	Antimony (Sb)	mg/kg	0.62	0.67	0.91	0.77	0.79	0.62	0.77	0.91	0.75	0.11
	Arsenic (As)	mg/kg	7.71	7.63	9.41	8.67	9.83	7.63	8.67	9.83	8.65	0.99
	Barium (Ba)	mg/kg	246	248	244	233	239	233	244	248	242	6
	Beryllium (Be)	mg/kg	0.67	0.74	0.88	0.85	0.85	0.67	0.85	0.88	0.8	0.09
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	14.2	13.9	16.2	15.9	16.2	13.9	15.9	16.2	15.3	1.1
	Cadmium (Cd)	mg/kg	1.47	1.44	1.76	1.68	1.62	1.440	1.620	1.760	1.590	0.140
	Calcium (Ca)	mg/kg	121,000	114,000	105,000	99,700	106,000	99,700	106,000	121,000	109,140	8,372
	Chromium (Cr)	mg/kg	24.4	25.1	30.1	29.4	29.3	24.4	29.3	30.1	27.7	2.7
	Cobalt (Co)	mg/kg	6.36	6.53	8.02	7.43	7.23	6.36	7.23	8.02	7.11	0.68
	Copper (Cu)	mg/kg	16.4	17.7	21.6	19.8	20.6	16.4	19.8	21.6	19.2	2.1
	Iron (Fe)	mg/kg	17,700	18,100	21,300	20,600	20,900	17,700	20,600	21,300	19,720	1,686
	Lead (Pb)	mg/kg	8.59	9.18	11.6	10.6	10.4	8.6	10.4	11.6	10.1	1.2
	Lithium (Li)	mg/kg	14.1	15.7	20.1	18.9	17.5	14.1	17.5	20.1	17.3	2.4
	Magnesium (Mg)	mg/kg	15,500	15,600	18,200	16,500	20,200	15,500	16,500	20,200	17,200	1,996
	Manganese (Mn)	mg/kg	1,030	1,110	1,140	1,180	1,080	1030	1110	1180	1108	57
	Mercury (Hg)	mg/kg	0.0743	0.0929	0.0970	0.142	0.105	0.0743	0.0970	0.1420	0.1022	0.0249
	Molybdenum (Mo)	mg/kg	1.94	2.17	2.33	1.99	2.01	1.94	2.01	2.33	2.09	0.16
	Nickel (Ni)	mg/kg	26.9	28.3	35.8	32.0	32.2	26.9	32	35.8	31	3.5
	Phosphorus (P)	mg/kg	1,380	1,350	1,570	1,510	1,630	1350	1510	1630	1488	120
	Potassium (K)	mg/kg	2,670	2,770	3,250	3,220	3,200	2,670	3,200	3,250	3,022	279
	Selenium (Se)	mg/kg	2.27	1.91	1.93	1.74	1.92	1.74	1.92	2.27	1.95	0.19
	Silver (Ag)	mg/kg	0.28	0.30	0.38	0.35	0.34	0.28	0.34	0.38	0.33	0.04
	Sodium (Na)	mg/kg	143	145	144	147	157	143	145	157	147	6
	Strontium (Sr)	mg/kg	218	219	201	189	192	189	201	219	204	14
	Thallium (Tl)	mg/kg	0.372	0.405	0.505	0.457	0.455	0.372	0.455	0.505	0.44	0.05
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	31.2	28.8	32.0	32.1	35.0	28.8	32	35	31.8	2.2
	Uranium (U)	mg/kg	1.66	1.71	1.77	1.67	1.73	1.66	1.71	1.77	1.71	0.04
	Vanadium (V)	mg/kg	41.3	43.1	53.1	50.2	51.0	41.3	50.2	53.1	47.7	5.2
	Zinc (Zn)	mg/kg	120	119	149	145	133	119.0	133.0	149.0	133.0	14.0
	Zirconium (Zr)	mg/kg	1.3	1.3	1.7	1.4	1.5	1.3	1.4	1.7	1.44	0.17
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	mg/kg	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	<0.004	<0.004	<0.004	<0.004	-
	Benz(a)anthracene	mg/kg	0.011	0.011	< 0.01	0.017	0.016	<0.01	0.011	0.017	0.013	0.003
	Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.02	< 0.01	<0.01	<0.01	<0.02	<0.012	-
	Benzo(b&j)fluoranthene	mg/kg	0.030	0.030	0.019	0.062	0.047	0.019	0.03	0.062	0.038	0.017
	Benzo(b+j+k)fluoranthene	mg/kg	0.03	0.03	0.019	0.062	0.047	0.019	0.03	0.062	0.038	0.017
	Benzo(g,h,i)perylene	mg/kg	< 0.01	< 0.01	< 0.01	0.020	0.015	<0.01	<0.01	0.02	<0.013	-
	Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.062	0.066	0.043	0.113	0.091	0.043	0.066	0.113	0.075	0.027
	Dibenz(a,h)anthracene	mg/kg	< 0.005	< 0.005	< 0.005	0.0099	0.0075	<0.005	<0.005	0.0099	<0.006	-
	Fluoranthene	mg/kg	0.014	0.019	0.011	0.018	0.021	0.011	0.018	0.021	0.017	0.004
	Fluorene	mg/kg	0.015	0.017	0.010	0.019	0.014	0.01	0.015	0.019	0.015	0.003
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	0.011	< 0.01	<0.01	<0.01	0.011	<0.01	-
	2-Methylnaphthalene	mg/kg	0.096	0.105	0.088	0.132	0.116	0.088	0.105	0.132	0.107	0.017
	Naphthalene	mg/kg	0.036	0.036	0.037	0.042	0.040	0.036	0.037	0.042	0.038	0.003
	Phenanthrene	mg/kg	0.147	0.164	0.107	0.219	0.191	0.107	0.164	0.219	0.166	0.043
	Pyrene	mg/kg	0.017	0.018	0.014	0.026	0.021	0.014	0.018	0.026	0.019	0.005
	Acenaphthene d10	%	78.7	77.6	73.6	87.3	76.8	73.6	77.6	87.3	78.8	5.1
	Chrysene d12	%	110.1	102.9	80.7	109.8	108	80.7	108	110.1	102	12
	Naphthalene d8	%	74	72.1	80.8	70.1	69.9	69.9	72.1	80.8	73.4	4.5
	Phenanthrene d10	%	97.2	95.3	78.1	100.6	97.4	78.1	97.2	100.6	94	9
	B(a)P Total Potency Equivalent	mg/kg	< 0.02	< 0.02	< 0.02	0.031	0.021	<0.02	<0.02	0.031	<0.022	-
	IACR (CCME)	mg/kg	0.31	0.31	0.21	0.6	0.46	0.21	0.31	0.6	0.378	0.153

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Elk River Watershed									
			Elk River Upper Ponds									
			ERUP-1	ERUP-2	ERUP-3	ERUP-4	ERUP-5	Minimum	Median	Maximum	Mean	Standard Deviation
			11-Aug-15	11-Aug-15	11-Aug-15	11-Aug-15	11-Aug-15					
Physical Tests	% Moisture	%	61.2	67.0	64.7	61.0	61.5	61.0	61.5	67.0	63.1	2.7
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.84	7.85	7.52	7.62	7.58	7.52	7.62	7.85	7.68	0.15
Particle Size	% Gravel (>2mm)	%	< 0.10	4.37	11.9	2.56	< 0.10	<0.1	2.56	11.9	3.8	4.9
	% Sand (2.0mm - 0.063mm)	%	5.50	15.2	28.1	9.90	12.0	5.5	12	28.1	14.1	8.6
	% Sand (2.00mm - 1.00mm)	%	0.63	1.35	1.37	0.57	0.13	0.13	0.63	1.37	0.81	0.54
	% Sand (1.00mm - 0.50mm)	%	0.62	1.27	2.53	0.61	1.34	0.61	1.27	2.53	1.27	0.78
	% Sand (0.50mm - 0.25mm)	%	1.39	3.63	9.67	2.22	2.71	1.39	2.71	9.67	3.92	3.31
	% Sand (0.25mm - 0.125mm)	%	1.22	3.90	6.94	3.05	3.83	1.22	3.83	6.94	3.79	2.07
	% Sand (0.125mm - 0.063mm)	%	1.64	5.07	7.56	3.45	4.00	1.64	4	7.56	4.34	2.19
	% Silt (0.063mm - 0.004mm)	%	76.2	69.4	51.6	73.4	71.6	51.6	71.6	76.2	68.4	9.7
	% Silt (0.063mm - 0.0312mm)	%	18.7	22.9	18.4	20.4	18.0	18	18.7	22.9	19.7	2
	% Silt (0.0312mm - 0.004mm)	%	57.5	46.5	33.1	53.0	53.5	33.1	53	57.5	48.7	9.6
	% Clay (<4µm)	%	18.3	11.1	8.52	14.2	16.4	8.52	14.2	18.3	13.7	3.9
	Texture	-	Silt	Silt loam	Silt loam	Silt	Silt loam / Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	4.98	6.60	5.75	4.65	5.11	4.65	5.11	6.6	5.42	0.77
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	12,200	8,670	5,720	11,800	8,380	5,720	8,670	12,200	9,354	2,679
	Antimony (Sb)	mg/kg	0.82	0.54	0.39	0.69	0.52	0.39	0.54	0.82	0.59	0.17
	Arsenic (As)	mg/kg	7.29	4.16	4.15	5.84	5.09	4.15	5.09	7.29	5.31	1.32
	Barium (Ba)	mg/kg	252	193	157	193	160	157	193	252	191	38
	Beryllium (Be)	mg/kg	0.86	0.64	0.45	0.85	0.63	0.45	0.64	0.86	0.69	0.17
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	17.9	13.2	9.4	17.3	12.9	9.4	13.2	17.9	14.1	3.5
	Cadmium (Cd)	mg/kg	1.56	1.16	0.897	1.38	1.08	0.897	1.160	1.560	1.220	0.260
	Calcium (Ca)	mg/kg	126,000	95,900	134,000	98,300	73,700	73,700	98,300	134,000	105,580	24,432
	Chromium (Cr)	mg/kg	30.7	24.4	16.7	30.1	21.4	16.7	24.4	30.7	24.7	5.9
	Cobalt (Co)	mg/kg	6.87	4.85	3.62	5.92	4.58	3.62	4.85	6.87	5.17	1.26
	Copper (Cu)	mg/kg	19.8	13.6	9.67	16.4	13.3	9.67	13.6	19.8	14.6	3.8
	Iron (Fe)	mg/kg	17,100	11,700	10,500	14,800	11,800	10,500	11,800	17,100	13,180	2,705
	Lead (Pb)	mg/kg	10.7	8.25	5.73	10.0	7.30	5.7	8.3	10.7	8.4	2.0
	Lithium (Li)	mg/kg	19.0	13.1	9.0	18.1	13.6	9	13.6	19	14.6	4.1
	Magnesium (Mg)	mg/kg	19,200	16,800	14,500	19,800	12,500	12,500	16,800	19,800	16,560	3,092
	Manganese (Mn)	mg/kg	568	220	253	368	493	220	368	568	380	150
	Mercury (Hg)	mg/kg	0.136	0.105	0.0377	0.103	0.112	0.0377	0.1050	0.1360	0.0987	0.0366
	Molybdenum (Mo)	mg/kg	2.69	2.55	2.52	1.88	1.62	1.62	2.52	2.69	2.25	0.47
	Nickel (Ni)	mg/kg	31.8	22.1	15.9	27.1	21.3	15.9	22.1	31.8	23.6	6
	Phosphorus (P)	mg/kg	1,470	1,390	1,260	1,600	1,070	1070	1390	1600	1358	203
	Potassium (K)	mg/kg	3,410	2,380	1,700	3,400	2,440	1,700	2,440	3,410	2,666	735
	Selenium (Se)	mg/kg	2.16	2.08	1.77	1.79	1.33	1.33	1.79	2.16	1.83	0.33
	Silver (Ag)	mg/kg	0.33	0.23	0.15	0.29	0.25	0.15	0.25	0.33	0.25	0.07
	Sodium (Na)	mg/kg	152	133	127	153	100	100	133	153	133	22
	Strontium (Sr)	mg/kg	200	159	192	145	112	112	159	200	162	36
	Thallium (Tl)	mg/kg	0.472	0.309	0.231	0.427	0.340	0.231	0.34	0.472	0.36	0.1
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	37.3	28.6	22.4	35.7	25.3	22.4	28.6	37.3	29.9	6.5
	Uranium (U)	mg/kg	2.13	2.60	2.00	1.81	1.30	1.3	2	2.6	1.97	0.47
	Vanadium (V)	mg/kg	52.7	37.1	26.9	49.5	35.7	26.9	37.1	52.7	40.4	10.6
	Zinc (Zn)	mg/kg	133	103	71.0	123	91.2	71.0	103.0	133.0	104.0	25.0
	Zirconium (Zr)	mg/kg	1.7	1.6	< 1.0	1.5	< 1.0	<1	1.5	1.7	1.36	0.34
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	mg/kg	< 0.004	< 0.004	0.0043	< 0.004	< 0.004	<0.004	<0.004	0.0043	<0.004	-
	Benz(a)anthracene	mg/kg	0.015	0.012	0.016	0.015	0.011	0.011	0.015	0.016	0.014	0.002
	Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b&j)fluoranthene	mg/kg	0.049	0.034	0.044	0.047	0.028	0.028	0.044	0.049	0.04	0.009
	Benzo(b+j+k)fluoranthene	mg/kg	0.049	0.034	0.044	0.047	0.028	0.028	0.044	0.049	0.04	0.009
	Benzo(g,h,i)perylene	mg/kg	0.014	0.018	0.020	0.023	0.010	0.01	0.018	0.023	0.017	0.005
	Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.094	0.067	0.091	0.093	0.062	0.062	0.091	0.094	0.081	0.016
	Dibenz(a,h)anthracene	mg/kg	0.0082	0.0077	0.0091	0.0108	< 0.005	<0.005	0.0082	0.0108	0.008	0.002
	Fluoranthene	mg/kg	0.015	0.014	0.018	0.024	0.014	0.014	0.015	0.024	0.017	0.004
	Fluorene	mg/kg	0.014	0.021	0.034	0.020	0.013	0.013	0.02	0.034	0.02	0.008
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	mg/kg	0.112	0.154	0.224	0.167	0.108	0.108	0.154	0.224	0.153	0.047
	Naphthalene	mg/kg	0.035	0.058	0.062	0.055	0.054	0.035	0.055	0.062	0.053	0.01
	Phenanthrene	mg/kg	0.185	0.176	0.248	0.217	0.149	0.149	0.185	0.248	0.195	0.038
	Pyrene	mg/kg	0.021	0.020	0.026	0.024	0.018	0.018	0.021	0.026	0.022	0.003
	Acenaphthene d10	%	82.5	78.7	83.8	85.4	72.6	72.6	82.5	85.4	80.6	5.1
	Chrysene d12	%	111	90	106.3	101.3	95	90	101.3	111	101	8
	Naphthalene d8	%	73.5	84	73	84.8	73.7	73	73.7	84.8	77.8	6
	Phenanthrene d10	%	101.9	97.2	113.4	107.4	91.2	91.2	101.9	113.4	102	9
	B(a)P Total Potency Equivalent	mg/kg	0.022	< 0.02	0.022	0.024	< 0.02	<0.02	0.022	0.024	0.022	0.002
	IACR (CCME)	mg/kg	0.48	0.36	0.46	0.48	0.29	0.29	0.46	0.48	0.414	0.085

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Elk River Watershed									
			Elk River Wetland downstream of Grave Creek									
			ELWDGC-1	ELWDGC-2	ELWDGC-3	ELWDGC-4	ELWDGC-5	Minimum	Median	Maximum	Mean	Standard Deviation
			13-Aug-15	13-Aug-15	13-Aug-15	13-Aug-15	13-Aug-15					
Physical Tests	% Moisture	%	55.3	55.3	57.6	52.6	60.3	52.6	55.3	60.3	56.2	2.9
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.71	8.00	7.91	7.87	7.61	7.61	7.87	8.00	7.82	0.16
Particle Size	% Gravel (>2mm)	%	0.39	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	0.39	<0.158	-
	% Sand (2.0mm - 0.063mm)	%	37.5	27.0	24.4	24.8	21.7	21.7	24.8	37.5	27.1	6.1
	% Sand (2.00mm - 1.00mm)	%	0.32	<0.10	0.20	0.21	0.14	<0.1	0.2	0.32	0.194	0.084
	% Sand (1.00mm - 0.50mm)	%	0.66	0.14	0.38	0.34	0.32	0.14	0.34	0.66	0.37	0.19
	% Sand (0.50mm - 0.25mm)	%	1.45	0.43	0.91	1.24	0.72	0.43	0.91	1.45	0.95	0.41
	% Sand (0.25mm - 0.125mm)	%	8.77	5.82	5.96	7.03	4.39	4.39	5.96	8.77	6.39	1.63
	% Sand (0.125mm - 0.063mm)	%	26.3	20.6	17.0	16.0	16.1	16	17	26.3	19.2	4.4
	% Silt (0.063mm - 0.004mm)	%	57.8	66.7	69.8	67.3	73.4	57.8	67.3	73.4	67	5.8
	% Silt (0.063mm - 0.0312mm)	%	28.2	30.1	31.2	28.9	34.3	28.2	30.1	34.3	30.5	2.4
	% Silt (0.0312mm - 0.004mm)	%	29.7	36.6	38.5	38.4	39.1	29.7	38.4	39.1	36.5	3.9
	% Clay (<4µm)	%	4.31	6.29	5.78	7.84	4.87	4.31	5.78	7.84	5.82	1.37
	Texture	-	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	2.83	6.21	4.07	4.12	4.02	2.83	4.07	6.21	4.25	1.22
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	3,530	7,080	6,310	7,390	6,270	3,530	6,310	7,390	6,116	1,525
	Antimony (Sb)	mg/kg	0.30	0.49	0.39	0.49	0.39	0.3	0.39	0.49	0.41	0.08
	Arsenic (As)	mg/kg	3.30	4.39	3.52	3.57	5.28	3.30	3.57	5.28	4.01	0.82
	Barium (Ba)	mg/kg	89.0	141	126	129	149	89	129	149	127	23
	Beryllium (Be)	mg/kg	0.31	0.55	0.49	0.55	0.47	0.31	0.49	0.55	0.47	0.1
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	5.5	11.2	9.3	11.6	10.2	5.5	10.2	11.6	9.6	2.4
	Cadmium (Cd)	mg/kg	0.488	0.851	0.707	0.863	0.826	0.488	0.826	0.863	0.747	0.157
	Calcium (Ca)	mg/kg	43,200	73,100	61,300	66,900	72,700	43,200	66,900	73,100	63,440	12,301
	Chromium (Cr)	mg/kg	8.28	16.3	13.7	17.0	14.3	8.28	14.3	17	13.9	3.4
	Cobalt (Co)	mg/kg	2.38	4.30	3.55	4.46	3.44	2.38	3.55	4.46	3.63	0.83
	Copper (Cu)	mg/kg	7.28	13.3	11.8	12.6	11.9	7.28	11.9	13.3	11.4	2.4
	Iron (Fe)	mg/kg	7,880	11,200	9,110	9,490	13,700	7,880	9,490	13,700	10,276	2,253
	Lead (Pb)	mg/kg	3.98	7.14	6.37	7.24	5.97	4.0	6.4	7.2	6.1	1.3
	Lithium (Li)	mg/kg	5.5	10.5	9.3	10.7	9.0	5.5	9.3	10.7	9	2.1
	Magnesium (Mg)	mg/kg	10,400	16,700	15,300	16,700	15,600	10,400	15,600	16,700	14,940	2,616
	Manganese (Mn)	mg/kg	199	352	295	240	338	199	295	352	285	65
	Mercury (Hg)	mg/kg	0.0374	0.0379	0.0375	0.0286	0.0407	0.0286	0.0375	0.0407	0.0364	0.0046
	Molybdenum (Mo)	mg/kg	0.86	1.19	0.94	1.04	1.38	0.86	1.04	1.38	1.08	0.21
	Nickel (Ni)	mg/kg	9.35	17.4	14.4	18.4	13.7	9.35	14.4	18.4	14.7	3.6
	Phosphorus (P)	mg/kg	735	1,240	1,110	1,280	1,120	735	1120	1280	1097	215
	Potassium (K)	mg/kg	970	2,050	1,770	2,110	1,850	970	1,850	2,110	1,750	458
	Selenium (Se)	mg/kg	1.91	2.64	3.63	5.71	4.48	1.91	3.63	5.71	3.67	1.50
	Silver (Ag)	mg/kg	< 0.10	0.18	0.14	0.17	0.14	<0.1	0.14	0.18	0.15	0.03
	Sodium (Na)	mg/kg	66	112	101	114	113	66	112	114	101	20
	Strontium (Sr)	mg/kg	57.7	105	91.1	96.8	104	57.7	96.8	105	91	19
	Thallium (Tl)	mg/kg	0.140	0.258	0.223	0.278	0.214	0.14	0.223	0.278	0.22	0.05
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	11.4	22.6	18.3	21.9	19.3	11.4	19.3	22.6	18.7	4.5
	Uranium (U)	mg/kg	0.662	1.04	0.906	1.22	1.01	0.662	1.01	1.22	0.97	0.2
	Vanadium (V)	mg/kg	14.7	28.9	24.2	29.9	24.9	14.7	24.9	29.9	24.5	6
	Zinc (Zn)	mg/kg	43.2	78.0	68.3	76.8	67.7	43.2	68.3	78.0	66.8	14.0
	Zirconium (Zr)	mg/kg	< 1.00	1.1	< 1.00	1.3	< 1.00	<1	<1	1.3	<1.08	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	mg/kg	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	<0.004	<0.004	<0.004	<0.004	-
	Benz(a)anthracene	mg/kg	< 0.010	0.011	< 0.010	< 0.010	< 0.010	<0.01	<0.01	0.011	<0.01	-
	Benzo(a)pyrene	mg/kg	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b&j)fluoranthene	mg/kg	< 0.010	0.023	0.018	0.022	< 0.010	<0.01	0.018	0.023	0.017	0.006
	Benzo(b+j+k)fluoranthene	mg/kg	< 0.015	0.023	0.018	0.022	< 0.015	<0.015	0.018	0.023	0.019	0.004
	Benzo(g,h,i)perylene	mg/kg	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(k)fluoranthene	mg/kg	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.025	0.065	0.046	0.053	0.021	0.021	0.046	0.065	0.042	0.019
	Dibenz(a,h)anthracene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Fluoranthene	mg/kg	< 0.01	0.013	< 0.01	< 0.01	< 0.01	<0.01	<0.01	0.013	<0.011	-
	Fluorene	mg/kg	< 0.01	0.011	0.011	0.012	< 0.01	<0.01	0.011	0.012	0.011	0.001
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	mg/kg	0.048	0.132	0.078	0.104	0.060	0.048	0.078	0.132	0.084	0.034
	Naphthalene	mg/kg	0.022	0.062	0.029	0.042	0.025	0.022	0.029	0.062	0.036	0.016
	Phenanthrene	mg/kg	0.062	0.190	0.111	0.142	0.061	0.061	0.111	0.19	0.113	0.055
	Pyrene	mg/kg	< 0.01	0.018	0.012	0.014	< 0.01	<0.01	0.012	0.018	0.013	0.003
	Acenaphthene d10	%	84.6	70.6	71	64.4	67.2	64.4	70.6	84.6	71.6	7.8
	Chrysene d12	%	110.4	94.4	77	62.1	66.7	62.1	77	110.4	82	20
	Naphthalene d8	%	88.3	73.7	75.8	65.9	70.3	65.9	73.7	88.3	74.8	8.4
	Phenanthrene d10	%	99.6	85.6	74.7	66	69.3	66	74.7	99.6	79	13.7
	B(a)P Total Potency Equivalent	mg/kg	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	<0.02	<0.02	<0.02	<0.02	-
	IACR (CCME)	mg/kg	< 0.15	0.27	0.21	0.23	< 0.15	<0.15	0.21	0.27	0.202	0.052

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Elk River Watershed									
			Goddard Marsh									
			GO13-1	GO13-2	GO13-3	GO13-4	GO13-5	Minimum	Median	Maximum	Mean	Standard Deviation
			12-Aug-15	12-Aug-15	12-Aug-15	12-Aug-15	12-Aug-15					
Physical Tests	% Moisture	%	80.5	73.9	75.4	73.9	66.0	66.0	73.9	80.5	73.9	5.2
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.67	7.75	7.72	7.74	7.80	7.67	7.74	7.80	7.74	0.05
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	6.05	13.7	0.65	0.33	2.09	0.33	2.09	13.7	4.6	5.6
	% Sand (2.00mm - 1.00mm)	%	0.15	0.32	< 0.10	< 0.10	< 0.10	<0.1	<0.1	0.32	<0.154	-
	% Sand (1.00mm - 0.50mm)	%	0.33	0.33	< 0.10	< 0.10	< 0.10	<0.1	<0.1	0.33	<0.19	-
	% Sand (0.50mm - 0.25mm)	%	0.44	0.78	< 0.10	< 0.10	0.12	<0.1	0.12	0.78	0.308	0.301
	% Sand (0.25mm - 0.125mm)	%	1.38	3.56	0.10	< 0.10	0.33	<0.1	0.33	3.56	1.09	1.48
	% Sand (0.125mm - 0.063mm)	%	3.76	8.69	0.48	0.14	1.58	0.14	1.58	8.69	2.93	3.52
	% Silt (0.063mm - 0.004mm)	%	72.3	69.8	68.8	66.2	71.0	66.2	69.8	72.3	69.6	2.3
	% Silt (0.063mm - 0.0312mm)	%	21.6	22.8	15.9	10.8	16.1	10.8	16.1	22.8	17.4	4.9
	% Silt (0.0312mm - 0.004mm)	%	50.7	47.0	52.9	55.4	54.9	47	52.9	55.4	52.2	3.4
	% Clay (<4µm)	%	21.6	16.5	30.6	33.5	26.9	16.5	26.9	33.5	25.8	6.8
	Texture	-	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	13.8	9.24	18.9	10.7	16.2	9.24	13.8	18.9	13.8	3.90
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	10,100	9,010	9,390	12,600	10,200	9,010	10,100	12,600	10,260	1,399
	Antimony (Sb)	mg/kg	1.05	0.87	1.18	1.23	1.12	0.87	1.12	1.23	1.09	0.14
	Arsenic (As)	mg/kg	4.98	4.00	4.51	6.69	5.25	4.00	4.98	6.69	5.09	1.02
	Barium (Ba)	mg/kg	410	390	440	437	465	390	437	465	428	29
	Beryllium (Be)	mg/kg	0.82	0.71	0.73	0.97	0.80	0.71	0.8	0.97	0.81	0.1
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	0.25	0.21	< 0.20	<0.2	<0.2	0.25	<0.212	-
	Boron (B)	mg/kg	15.2	13.1	14.4	15.6	14.3	13.1	14.4	15.6	14.5	1
	Cadmium (Cd)	mg/kg	1.48	1.07	1.34	1.60	1.42	1.070	1.420	1.600	1.380	0.200
	Calcium (Ca)	mg/kg	66,700	80,100	73,900	82,000	78,400	66,700	78,400	82,000	76,220	6,108
	Chromium (Cr)	mg/kg	18.0	17.2	15.1	22.0	17.1	15.1	17.2	22	17.9	2.5
	Cobalt (Co)	mg/kg	6.64	4.95	6.16	8.31	6.57	4.95	6.57	8.31	6.53	1.21
	Copper (Cu)	mg/kg	24.7	18.6	24.3	27.5	23.7	18.6	24.3	27.5	23.8	3.2
	Iron (Fe)	mg/kg	15,100	12,500	13,700	18,800	15,200	12,500	15,100	18,800	15,060	2,367
	Lead (Pb)	mg/kg	11.9	9.35	10.9	13.6	11.2	9.4	11.2	13.6	11.4	1.5
	Lithium (Li)	mg/kg	14.7	12.8	11.1	16.5	12.5	11.1	12.8	16.5	13.5	2.1
	Magnesium (Mg)	mg/kg	12,700	14,400	9,540	11,200	11,500	9,540	11,500	14,400	11,868	1,810
	Manganese (Mn)	mg/kg	464	310	279	413	351	279	351	464	363	75
	Mercury (Hg)	mg/kg	0.113	0.0694	0.0774	0.128	0.0933	0.0694	0.0933	0.1280	0.0962	0.0244
	Molybdenum (Mo)	mg/kg	2.52	1.54	1.83	2.27	1.71	1.54	1.83	2.52	1.97	0.41
	Nickel (Ni)	mg/kg	27.8	21.6	23.9	31.9	25.3	21.6	25.3	31.9	26.1	3.9
	Phosphorus (P)	mg/kg	1,330	1,320	1,100	1,160	1,140	1100	1160	1330	1210	107
	Potassium (K)	mg/kg	2,680	2,460	2,440	3,240	2,620	2,440	2,620	3,240	2,688	325
	Selenium (Se)	mg/kg	43.1	38.5	30.4	33.2	30.0	30.00	33.20	43.10	35.00	5.60
	Silver (Ag)	mg/kg	0.32	0.25	0.30	0.42	0.32	0.25	0.32	0.42	0.32	0.06
	Sodium (Na)	mg/kg	147	162	148	133	120	120	147	162	142	16
	Strontium (Sr)	mg/kg	124	125	125	143	130	124	125	143	129	8
	Thallium (Tl)	mg/kg	0.325	0.279	0.303	0.400	0.272	0.272	0.303	0.4	0.32	0.05
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	22.0	20.9	20.9	22.9	22.7	20.9	22	22.9	21.9	1
	Uranium (U)	mg/kg	2.16	1.62	1.51	1.55	1.41	1.41	1.55	2.16	1.65	0.3
	Vanadium (V)	mg/kg	36.0	32.7	32.9	42.4	36.0	32.7	36	42.4	36	3.9
	Zinc (Zn)	mg/kg	133	103	122	141	127	103.0	127.0	141.0	125.0	14.0
	Zirconium (Zr)	mg/kg	1.9	1.3	1.5	1.4	1.5	1.3	1.5	1.9	1.52	0.23
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.080	< 0.080	< 0.160	< 0.060	< 0.130	<0.06	<0.08	<0.16	<0.102	-
	Acenaphthylene	mg/kg	0.016	0.0156	0.0430	0.0103	0.0338	0.0103	0.016	0.043	0.024	0.014
	Anthracene	mg/kg	0.104	0.0882	0.233	0.0634	0.149	0.0634	0.104	0.233	0.128	0.067
	Benz(a)anthracene	mg/kg	0.237	0.218	0.696	0.140	0.442	0.14	0.237	0.696	0.347	0.225
	Benzo(a)pyrene	mg/kg	0.188	0.203	0.561	0.111	0.389	0.111	0.203	0.561	0.29	0.183
	Benzo(b&j)fluoranthene	mg/kg	0.492	0.524	1.33	0.274	0.863	0.274	0.524	1.33	0.7	0.41
	Benzo(b+j+k)fluoranthene	mg/kg	0.55	0.589	1.51	0.308	1	0.308	0.589	1.51	0.79	0.47
	Benzo(g,h,i)perylene	mg/kg	0.218	0.227	0.485	0.111	0.331	0.111	0.227	0.485	0.274	0.141
	Benzo(k)fluoranthene	mg/kg	0.058	0.065	0.180	0.034	0.137	0.034	0.065	0.18	0.095	0.061
	Chrysene	mg/kg	0.843	0.808	2.33	0.499	1.30	0.499	0.843	2.33	1.16	0.72
	Dibenz(a,h)anthracene	mg/kg	0.109	0.107	0.262	0.0584	0.196	0.0584	0.109	0.262	0.146	0.081
	Fluoranthene	mg/kg	0.378	0.421	0.816	0.278	0.620	0.278	0.421	0.816	0.503	0.215
	Fluorene	mg/kg	0.612	0.599	1.84	0.402	1.34	0.402	0.612	1.84	0.96	0.61
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.091	0.092	0.161	0.053	0.174	0.053	0.092	0.174	0.114	0.051
	2-Methylnaphthalene	mg/kg	3.52	3.84	10.1	2.65	6.61	2.65	3.84	10.1	5.3	3
	Naphthalene	mg/kg	0.766	0.838	2.07	0.665	1.63	0.665	0.838	2.07	1.19	0.62
	Phenanthrene	mg/kg	2.60	2.40	6.17	1.63	4.16	1.63	2.6	6.17	3.39	1.8
	Pyrene	mg/kg	0.423	0.452	1.01	0.302	0.694	0.302	0.452	1.01	0.58	0.28
	Acenaphthene d10	%	89.1	91.5	96.7	76.3	105.1	76.3	91.5	105.1	92	11
	Chrysene d12	%	105.4	106.7	124.8	74.4	106.2	74.4	106.2	124.8	104	18
	Naphthalene d8	%	71.6	80.5	65.8	74.3	68.8	65.8	71.6	80.5	72.2	5.6
	Phenanthrene d10	%	106.9	109.4	107.7	84.5	101	84.5	106.9	109.4	102	10
	B(a)P Total Potency Equivalent	mg/kg	0.395	0.41	1.09	0.226	0.763	0.226	0.41	1.09	0.58	0.35
	IACR (CCME)	mg/kg	5.6	5.81	15.4	3.17	10.2	3.17	5.81	15.4	8	4.8

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Elk River Watershed									
			Otto Ponds									
			OTTO-1	OTTO-2	OTTO-3	OTTO-4	OTTO-5	Minimum	Median	Maximum	Mean	Standard Deviation
			11-Aug-15	11-Aug-15	11-Aug-15	11-Aug-15	11-Aug-15					
Physical Tests	% Moisture	%	61.0	56.2	61.8	61.0	51.7	51.7	61.0	61.8	58.3	4.3
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.95	8.10	8.07	8.00	8.02	7.95	8.02	8.10	8.03	0.06
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	1.65	0.53	3.08	0.82	8.41	0.53	1.65	8.41	2.9	3.24
	% Sand (2.00mm - 1.00mm)	%	0.15	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	0.15	<0.11	-
	% Sand (1.00mm - 0.50mm)	%	0.23	< 0.10	< 0.10	< 0.10	0.10	<0.1	<0.1	0.23	<0.13	-
	% Sand (0.50mm - 0.25mm)	%	0.27	< 0.10	0.15	< 0.10	0.54	<0.1	0.15	0.54	0.232	0.186
	% Sand (0.25mm - 0.125mm)	%	0.27	< 0.10	0.51	0.12	1.54	<0.1	0.27	1.54	0.51	0.6
	% Sand (0.125mm - 0.063mm)	%	0.72	0.31	2.32	0.63	6.18	0.31	0.72	6.18	2.03	2.45
	% Silt (0.063mm - 0.004mm)	%	37.7	51.7	55.5	42.1	67.3	37.7	51.7	67.3	50.9	11.6
	% Silt (0.063mm - 0.0312mm)	%	4.13	5.49	12.5	5.73	20.5	4.13	5.73	20.5	9.7	6.9
	% Silt (0.0312mm - 0.004mm)	%	33.6	46.3	43.0	36.3	46.7	33.6	43	46.7	41.2	5.9
	% Clay (<4µm)	%	60.6	47.7	41.4	57.1	24.3	24.3	47.7	60.6	46.2	14.4
	Texture	-	Silty clay	Silty clay loam	Silty clay loam	Silty clay	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	18.3	36.1	24.3	24.4	18.9	18.3	24.3	36.1	24.4	7.10
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	14,400	7,860	8,310	8,410	7,640	7,640	8,310	14,400	9,324	2,855
	Antimony (Sb)	mg/kg	1.04	0.62	0.66	0.67	0.64	0.62	0.66	1.04	0.73	0.18
	Arsenic (As)	mg/kg	6.73	6.24	13.0	4.29	12.3	4.29	6.73	13.00	8.50	3.90
	Barium (Ba)	mg/kg	396	313	471	243	376	243	376	471	360	86
	Beryllium (Be)	mg/kg	1.05	0.62	0.66	0.63	0.62	0.62	0.63	1.05	0.72	0.19
	Bismuth (Bi)	mg/kg	0.23	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	0.23	<0.206	-
	Boron (B)	mg/kg	16.5	12.3	12.2	10.5	11.6	10.5	12.2	16.5	12.6	2.3
	Cadmium (Cd)	mg/kg	1.48	0.998	1.23	0.965	1.11	0.965	1.110	1.480	1.160	0.210
	Calcium (Ca)	mg/kg	40,200	20,900	31,200	23,800	37,600	20,900	31,200	40,200	30,740	8,393
	Chromium (Cr)	mg/kg	19.7	10.7	12.8	12.6	13.0	10.7	12.8	19.7	13.8	3.4
	Cobalt (Co)	mg/kg	8.48	5.55	6.25	5.31	5.37	5.31	5.55	8.48	6.19	1.33
	Copper (Cu)	mg/kg	34.3	22.5	22.7	22.9	19.3	19.3	22.7	34.3	24.3	5.8
	Iron (Fe)	mg/kg	20,700	16,200	26,300	12,100	25,800	12,100	20,700	26,300	20,220	6,132
	Lead (Pb)	mg/kg	14.5	9.33	9.84	9.43	8.87	8.9	9.4	14.5	10.4	2.3
	Lithium (Li)	mg/kg	16.2	8.8	9.7	9.7	9.5	8.8	9.7	16.2	10.8	3.1
	Magnesium (Mg)	mg/kg	6,550	3,430	5,600	3,700	7,570	3,430	5,600	7,570	5,370	1,791
	Manganese (Mn)	mg/kg	276	306	812	199	620	199	306	812	443	262
	Mercury (Hg)	mg/kg	0.147	0.126	0.129	0.162	0.125	0.1250	0.1290	0.1620	0.1378	0.0162
	Molybdenum (Mo)	mg/kg	1.86	1.44	1.98	1.09	1.88	1.09	1.86	1.98	1.65	0.38
	Nickel (Ni)	mg/kg	32.1	19.1	23.8	19.4	21.2	19.1	21.2	32.1	23.1	5.4
	Phosphorus (P)	mg/kg	1,100	662	837	660	1,000	660	837	1100	852	198
	Potassium (K)	mg/kg	3,650	2,100	2,190	2,240	1,920	1,920	2,190	3,650	2,420	698
	Selenium (Se)	mg/kg	6.35	2.11	2.51	4.31	1.88	1.88	2.51	6.35	3.43	1.89
	Silver (Ag)	mg/kg	0.45	0.25	0.26	0.26	0.21	0.21	0.26	0.45	0.29	0.09
	Sodium (Na)	mg/kg	140	73	81	80	78	73	80	140	90	28
	Strontium (Sr)	mg/kg	105	69.1	80.2	64.4	76.3	64.4	76.3	105	79	16
	Thallium (Tl)	mg/kg	0.297	0.092	0.138	0.153	0.180	0.092	0.153	0.297	0.17	0.08
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	19.1	15.1	21.4	14.2	19.8	14.2	19.1	21.4	17.9	3.1
	Uranium (U)	mg/kg	0.819	0.513	0.599	0.504	0.622	0.504	0.599	0.819	0.61	0.13
	Vanadium (V)	mg/kg	47.1	28.7	30.5	28.4	28.9	28.4	28.9	47.1	32.7	8.1
	Zinc (Zn)	mg/kg	159	88.3	102	96.3	94.6	88.3	96.3	159.0	108.0	29.0
	Zirconium (Zr)	mg/kg	1.6	< 1.0	< 1.0	< 1.0	< 1.0	<1	<1	1.6	<1.12	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.060	< 0.270	< 0.110	< 0.100	< 0.060	<0.06	<0.1	<0.27	<0.12	-
	Acenaphthylene	mg/kg	0.0260	0.124	< 0.050	< 0.050	< 0.050	<0.05	<0.05	0.124	<0.06	-
	Anthracene	mg/kg	0.0292	0.204	0.075	0.082	< 0.040	<0.04	0.075	0.204	0.086	0.07
	Benz(a)anthracene	mg/kg	0.305	0.890	0.270	0.350	0.210	0.21	0.305	0.89	0.405	0.276
	Benzo(a)pyrene	mg/kg	0.139	0.550	0.150	0.190	0.110	0.11	0.15	0.55	0.228	0.182
	Benzo(b&j)fluoranthene	mg/kg	0.517	1.670	0.480	0.610	0.390	0.39	0.517	1.67	0.73	0.53
	Benzo(b+j+k)fluoranthene	mg/kg	0.567	1.790	0.480	0.610	0.390	0.39	0.567	1.79	0.77	0.58
	Benzo(g,h,i)perylene	mg/kg	0.148	0.740	0.150	0.200	0.160	0.148	0.16	0.74	0.28	0.258
	Benzo(k)fluoranthene	mg/kg	0.051	0.12	< 0.10	< 0.10	< 0.10	<0.1	<0.1	0.12	<0.094	-
	Chrysene	mg/kg	1.34	3.97	1.23	1.65	0.90	0.9	1.34	3.97	1.82	1.23
	Dibenz(a,h)anthracene	mg/kg	0.0962	0.421	0.096	0.118	0.082	0.082	0.0962	0.421	0.163	0.145
	Fluoranthene	mg/kg	0.269	0.84	0.33	0.40	0.24	0.24	0.33	0.84	0.416	0.245
	Fluorene	mg/kg	0.838	3.81	1.20	1.59	0.76	0.76	1.2	3.81	1.64	1.26
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.048	0.22	< 0.10	< 0.10	< 0.10	<0.1	<0.1	0.22	<0.114	-
	2-Methylnaphthalene	mg/kg	5.24	25.8	9.11	9.62	5.94	5.24	9.11	25.8	11.1	8.4
	Naphthalene	mg/kg	1.28	6.40	2.53	2.33	1.50	1.28	2.33	6.4	2.81	2.08
	Phenanthrene	mg/kg	4.13	15.0	5.19	6.58	3.96	3.96	5.19	15	7	4.6
	Pyrene	mg/kg	0.447	1.48	0.53	0.68	0.39	0.39	0.53	1.48	0.71	0.45
	Acenaphthene d10	%	87.8	N/A	91.2	93.3	79.2	79.2	91.2	93.3	87.9	39.7
	Chrysene d12	%	100.8	119.3	79	82	84.6	79	84.6	119.3	93	17
	Naphthalene d8	%	73.5	92.2	72.7	75.8	64.8	64.8	73.5	92.2	75.8	10.1
	Phenanthrene d10	%	104	N/A	91.7	93.5	89	89	93.5	104	95	43
	B(a)P Total Potency Equivalent	mg/kg	0.342	1.3	0.346	0.430	0.277	0.277	0.346	1.3	0.54	0.43
	IACR (CCME)	mg/kg	5.94	19.3	5.60	7.00	4.6	4.6	5.94	19.3	8.5	6.1

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Michel Creek Watershed									
			Michel Creek Wetland									
			MI16-1	MI16-2	MI16-3	MI16-4	MI16-5	Minimum	Median	Maximum	Mean	Standard Deviation
			8-Aug-15	8-Aug-15	7-Aug-15	8-Aug-15	8-Aug-15					
Physical Tests	% Moisture	%	72.4	80.5	83.7	80.3	82.3	72.4	80.5	83.7	79.8	4.4
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.51	7.27	7.06	7.67	7.35	7.06	7.35	7.67	7.37	0.23
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	6.88	8.75	2.07	6.08	6.95	2.07	6.88	8.75	6.15	2.48
	% Sand (2.00mm - 1.00mm)	%	0.46	0.19	< 0.10	0.26	0.27	<0.1	0.26	0.46	0.256	0.133
	% Sand (1.00mm - 0.50mm)	%	0.71	1.11	< 0.10	1.67	0.94	<0.1	0.94	1.67	0.91	0.57
	% Sand (0.50mm - 0.25mm)	%	0.35	0.97	< 0.10	0.75	1.12	<0.1	0.75	1.12	0.66	0.43
	% Sand (0.25mm - 0.125mm)	%	0.60	1.59	0.26	1.01	1.73	0.26	1.01	1.73	1.04	0.63
	% Sand (0.125mm - 0.063mm)	%	4.76	4.89	1.68	2.41	2.89	1.68	2.89	4.89	3.33	1.44
	% Silt (0.063mm - 0.004mm)	%	84.5	83.3	86.7	83.5	84.0	83.3	84	86.7	84.4	1.4
	% Silt (0.063mm - 0.0312mm)	%	34.3	36.1	36.1	33.7	34.2	33.7	34.3	36.1	34.9	1.1
	% Silt (0.0312mm - 0.004mm)	%	50.3	47.2	50.7	49.8	49.8	47.2	49.8	50.7	49.6	1.4
	% Clay (<4µm)	%	8.61	7.94	11.2	10.4	9.05	7.94	9.05	11.2	9.4	1.3
	Texture	-	Silt	Silt	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	7.92	7.09	8.07	6.97	6.18	6.18	7.09	8.07	7.25	0.77
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	7,280	6,400	7,320	6,770	4,540	4,540	6,770	7,320	6,462	1,140
	Antimony (Sb)	mg/kg	0.48	0.43	0.50	0.35	0.28	0.28	0.43	0.5	0.41	0.09
	Arsenic (As)	mg/kg	3.73	3.90	5.26	2.68	1.69	1.69	3.73	5.26	3.45	1.35
	Barium (Ba)	mg/kg	144	175	223	196	251	144	196	251	198	41
	Beryllium (Be)	mg/kg	0.65	0.55	0.65	0.59	0.33	0.33	0.59	0.65	0.55	0.13
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	11	12	13	12	13	11	12	13	12.2	0.8
	Cadmium (Cd)	mg/kg	0.957	0.796	1.15	0.853	0.671	0.671	0.853	1.150	0.890	0.180
	Calcium (Ca)	mg/kg	81,300	138,000	165,000	128,000	267,000	81,300	138,000	267,000	155,860	69,083
	Chromium (Cr)	mg/kg	15.0	13.2	15.6	14.6	10.6	10.6	14.6	15.6	13.8	2
	Cobalt (Co)	mg/kg	4.03	2.91	3.52	2.63	1.73	1.73	2.91	4.03	2.96	0.88
	Copper (Cu)	mg/kg	13.6	12.4	15.7	11.5	8.6	8.6	12.4	15.7	12.4	2.6
	Iron (Fe)	mg/kg	8,660	8,750	12,900	8,460	5,390	5,390	8,660	12,900	8,832	2,673
	Lead (Pb)	mg/kg	7.7	7.9	7.8	6.3	3.9	3.9	7.7	7.9	6.7	1.7
	Lithium (Li)	mg/kg	10.5	9.1	10.2	9.8	6.4	6.4	9.8	10.5	9.2	1.7
	Magnesium (Mg)	mg/kg	9,630	8,290	9,420	7,720	5,690	5,690	8,290	9,630	8,150	1,586
	Manganese (Mn)	mg/kg	80	91	157	102	80	79.6	91.1	157	102	32
	Mercury (Hg)	mg/kg	0.0937	0.0575	0.0513	0.0473	0.0262	0.0262	0.0513	0.0937	0.0552	0.0245
	Molybdenum (Mo)	mg/kg	1.28	1.48	2.79	1.40	1.80	1.28	1.48	2.79	1.75	0.61
	Nickel (Ni)	mg/kg	19.4	15.4	17.6	13.6	9.4	9.4	15.4	19.4	15.1	3.9
	Phosphorus (P)	mg/kg	870	910	1,330	1,030	660	660	910	1330	960	246
	Potassium (K)	mg/kg	1,780	1,810	2,050	1,880	1,500	1,500	1,810	2,050	1,804	200
	Selenium (Se)	mg/kg	4.68	8.05	11.8	8.31	9.66	4.68	8.31	11.80	8.50	2.60
	Silver (Ag)	mg/kg	0.24	< 0.20	0.20	< 0.20	< 0.20	<0.2	<0.2	0.24	<0.21	-
	Sodium (Na)	mg/kg	< 100	110	130	110	110	<100	110	130	112	11
	Strontium (Sr)	mg/kg	113	164	202	157	305	113	164	305	188	73
	Thallium (Tl)	mg/kg	0.52	0.41	0.50	0.43	0.28	0.28	0.43	0.52	0.43	0.09
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	21.6	21.1	27.1	22.9	21.3	21.1	21.6	27.1	22.8	2.5
	Uranium (U)	mg/kg	1.00	1.19	1.86	1.22	1.34	1	1.22	1.86	1.32	0.32
	Vanadium (V)	mg/kg	22.6	20.2	23.9	20.7	14.9	14.9	20.7	23.9	20.5	3.4
	Zinc (Zn)	mg/kg	89.4	70.0	90.0	72.7	43.3	43.3	72.7	90.0	73.1	19.0
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	0.0050	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	0.005	<0.009	-
	Acenaphthylene	mg/kg	0.0067	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	0.0067	<0.009	-
	Anthracene	mg/kg	0.0163	< 0.008	< 0.008	0.0141	< 0.008	<0.008	<0.008	0.0163	<0.011	-
	Benz(a)anthracene	mg/kg	0.047	0.028	0.039	0.029	0.023	0.023	0.029	0.047	0.033	0.01
	Benzo(a)pyrene	mg/kg	0.025	< 0.02	0.025	< 0.02	< 0.02	<0.02	<0.02	0.025	<0.022	-
	Benzo(b&j)fluoranthene	mg/kg	0.187	0.101	0.126	0.098	0.065	0.065	0.101	0.187	0.115	0.046
	Benzo(b+j+k)fluoranthene	mg/kg	0.199	0.101	0.126	0.098	0.065	0.065	0.101	0.199	0.118	0.05
	Benzo(g,h,i)perylene	mg/kg	0.052	0.039	0.059	0.048	0.039	0.039	0.048	0.059	0.047	0.009
	Benzo(k)fluoranthene	mg/kg	0.013	< 0.02	< 0.02	< 0.02	< 0.02	<0.02	<0.02	0.013	<0.019	-
	Chrysene	mg/kg	0.282	0.172	0.206	0.162	0.101	0.101	0.172	0.282	0.185	0.066
	Dibenz(a,h)anthracene	mg/kg	0.0210	0.012	0.020	0.015	0.010	0.01	0.015	0.021	0.016	0.005
	Fluoranthene	mg/kg	0.071	0.043	0.049	0.050	0.027	0.027	0.049	0.071	0.048	0.016
	Fluorene	mg/kg	0.077	0.056	0.073	0.058	0.047	0.047	0.058	0.077	0.062	0.012
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.022	< 0.02	< 0.02	< 0.02	< 0.02	<0.02	<0.02	0.022	<0.02	-
	2-Methylnaphthalene	mg/kg	0.816	0.570	0.570	0.538	0.473	0.473	0.57	0.816	0.593	0.131
	Naphthalene	mg/kg	0.326	0.239	0.226	0.186	0.175	0.175	0.226	0.326	0.23	0.06
	Phenanthrene	mg/kg	0.645	0.440	0.504	0.399	0.284	0.284	0.44	0.645	0.454	0.133
	Pyrene	mg/kg	0.087	0.052	0.073	0.054	0.037	0.037	0.054	0.087	0.061	0.02
	Acenaphthene d10	%	98.3	85.3	73.2	80.1	79.8	73.2	80.1	98.3	83.3	9.4
	Chrysene d12	%	109.6	88.3	84.5	86.1	82	82	86.1	109.6	90	11
	Naphthalene d8	%	90.5	82.6	60.7	65.7	80.6	60.7	80.6	90.5	76	12.4
	Phenanthrene d10	%	102.3	85.5	91.1	92.1	87.6	85.5	91.1	102.3	92	6
	B(a)P Total Potency Equivalent	mg/kg	0.076	0.039	0.066	0.042	0.032	0.032	0.042	0.076	0.051	0.019
	IACR (CCME)	mg/kg	1.7	0.95	1.23	0.94	0.67	0.67	0.95	1.7	1.1	0.39

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Michel Creek Watershed									
			Lower Michel Creek Wetland near Wheeler Creek									
			MIWW-1	MIWW-2	MIWW-3	MIWW-4	MIWW-5	Minimum	Median	Maximum	Mean	Standard Deviation
			6-Aug-15	6-Aug-15	6-Aug-15	6-Aug-15	6-Aug-15					
Physical Tests	% Moisture	%	73.7	58.2	60.7	61.7	48.0	48.0	60.7	73.7	60.5	9.2
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.43	7.65	7.52	7.54	7.95	7.43	7.54	7.95	7.62	0.20
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	6.00	<0.1	<0.1	6	<1.28	-
	% Sand (2.0mm - 0.063mm)	%	31.5	33.9	36.5	33.7	37.3	31.5	33.9	37.3	34.6	2.3
	% Sand (2.00mm - 1.00mm)	%	1.76	0.53	0.25	0.20	2.58	0.2	0.53	2.58	1.06	1.06
	% Sand (1.00mm - 0.50mm)	%	3.53	1.51	1.36	1.31	2.11	1.31	1.51	3.53	1.96	0.93
	% Sand (0.50mm - 0.25mm)	%	5.67	4.07	4.01	3.38	5.99	3.38	4.07	5.99	4.62	1.14
	% Sand (0.25mm - 0.125mm)	%	7.52	12.0	11.4	9.10	12.6	7.52	11.4	12.6	10.5	2.1
	% Sand (0.125mm - 0.063mm)	%	13.0	15.7	19.5	19.8	14.0	13	15.7	19.8	16.4	3.1
	% Silt (0.063mm - 0.004mm)	%	63.6	60.4	59.6	60.8	53.0	53	60.4	63.6	59.5	3.9
	% Silt (0.063mm - 0.0312mm)	%	29.6	28.0	29.0	29.0	25.1	25.1	29	29.6	28.1	1.8
	% Silt (0.0312mm - 0.004mm)	%	33.9	32.4	30.6	31.8	27.9	27.9	31.8	33.9	31.3	2.3
	% Clay (<4µm)	%	4.93	5.71	3.93	5.51	3.74	3.74	4.93	5.71	4.76	0.9
	Texture	-	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	6.41	5.24	5.26	6.15	5.50	5.24	5.5	6.41	5.71	0.54
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	7,410	6,950	6,910	6,870	6,970	6,870	6,950	7,410	7,022	220
	Antimony (Sb)	mg/kg	0.80	0.79	0.85	0.69	0.78	0.69	0.79	0.85	0.78	0.06
	Arsenic (As)	mg/kg	3.85	4.03	4.06	3.10	4.52	3.10	4.03	4.52	3.91	0.52
	Barium (Ba)	mg/kg	196	197	200	210	193	193	197	210	199	7
	Beryllium (Be)	mg/kg	0.55	0.54	0.56	0.52	0.57	0.52	0.55	0.57	0.55	0.02
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	2.30	1.43	1.55	1.49	1.36	1.360	1.490	2.300	1.630	0.380
	Calcium (Ca)	mg/kg	29,300	31,400	39,000	30,600	22,100	22,100	30,600	39,000	30,480	6,022
	Chromium (Cr)	mg/kg	24.1	12.6	11.2	13.1	12.4	11.2	12.6	24.1	14.7	5.3
	Cobalt (Co)	mg/kg	4.50	4.61	5.29	4.72	4.70	4.50	4.70	5.29	4.76	0.31
	Copper (Cu)	mg/kg	15.5	14.6	15.2	14.0	15.4	14	15.2	15.5	14.9	0.6
	Iron (Fe)	mg/kg	11,200	10,200	10,700	9,940	11,700	9,940	10,700	11,700	10,748	719
	Lead (Pb)	mg/kg	8.1	8.2	8.6	7.8	9.1	7.8	8.2	9.1	8.4	0.5
	Lithium (Li)	mg/kg	8.5	9.0	8.8	7.8	8.5	7.8	8.5	9	8.52	0.45
	Magnesium (Mg)	mg/kg	6,210	5,600	5,850	5,740	5,550	5,550	5,740	6,210	5,790	263
	Manganese (Mn)	mg/kg	73	79	71	103	93	71.1	79.4	103	84	14
	Mercury (Hg)	mg/kg	0.0669	0.0747	0.0545	0.0572	0.0645	0.0545	0.0645	0.0747	0.0636	0.0080
	Molybdenum (Mo)	mg/kg	1.48	1.20	1.11	0.75	0.92	0.75	1.11	1.48	1.09	0.28
	Nickel (Ni)	mg/kg	21.7	19.9	21.2	17.5	20.1	17.5	20.1	21.7	20.1	1.6
	Phosphorus (P)	mg/kg	1,120	940	1,150	1,130	1,130	940	1130	1150	1094	87
	Potassium (K)	mg/kg	1,700	1,610	1,420	1,470	1,350	1,350	1,470	1,700	1,510	143
	Selenium (Se)	mg/kg	3.22	1.72	2.14	2.26	1.70	1.70	2.14	3.22	2.21	0.62
	Silver (Ag)	mg/kg	0.21	0.28	0.27	0.23	0.26	0.21	0.26	0.28	0.25	0.03
	Sodium (Na)	mg/kg	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	mg/kg	61.5	62.8	73.3	62.2	53.9	53.9	62.2	73.3	62.7	6.9
	Thallium (Tl)	mg/kg	0.31	0.28	0.30	0.27	0.27	0.27	0.28	0.31	0.29	0.02
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	32.6	28.4	29.2	31.1	29.7	28.4	29.7	32.6	30.2	1.7
	Uranium (U)	mg/kg	1.20	1.04	1.17	0.87	0.90	0.87	1.04	1.2	1.04	0.15
	Vanadium (V)	mg/kg	35.4	32.2	32.4	31.1	32.0	31.1	32.2	35.4	32.6	1.6
	Zinc (Zn)	mg/kg	124	84.7	112	86.0	91.9	84.7	91.9	124.0	100.0	17.0
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	mg/kg	0.0076	0.0077	0.0053	0.0075	0.0059	0.0053	0.0075	0.0077	0.007	0.001
	Benz(a)anthracene	mg/kg	0.044	0.037	0.025	0.053	0.033	0.025	0.037	0.053	0.038	0.011
	Benzo(a)pyrene	mg/kg	0.022	0.017	0.010	0.028	0.016	0.01	0.017	0.028	0.019	0.007
	Benzo(b&j)fluoranthene	mg/kg	0.102	0.081	0.051	0.140	0.078	0.051	0.081	0.14	0.09	0.033
	Benzo(b+j+k)fluoranthene	mg/kg	0.102	0.081	0.051	0.14	0.078	0.051	0.081	0.14	0.09	0.033
	Benzo(g,h,i)perylene	mg/kg	0.047	0.032	0.018	0.047	0.024	0.018	0.032	0.047	0.034	0.013
	Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.217	0.172	0.129	0.258	0.154	0.129	0.172	0.258	0.186	0.052
	Dibenz(a,h)anthracene	mg/kg	0.0169	0.0129	0.0074	0.0182	0.0093	0.0074	0.0129	0.0182	0.013	0.005
	Fluoranthene	mg/kg	0.055	0.064	0.050	0.078	0.039	0.039	0.055	0.078	0.057	0.015
	Fluorene	mg/kg	0.037	0.024	0.024	0.033	0.022	0.022	0.024	0.037	0.028	0.007
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.015	0.010	< 0.01	0.013	< 0.01	<0.01	0.01	0.015	0.012	0.002
	2-Methylnaphthalene	mg/kg	0.369	0.349	0.269	0.377	0.269	0.269	0.349	0.377	0.327	0.054
	Naphthalene	mg/kg	0.166	0.151	0.131	0.152	0.118	0.118	0.151	0.166	0.144	0.019
	Phenanthrene	mg/kg	0.546	0.521	0.406	0.595	0.427	0.406	0.521	0.595	0.499	0.08
	Pyrene	mg/kg	0.076	0.075	0.056	0.087	0.059	0.056	0.075	0.087	0.071	0.013
	Acenaphthene d10	%	80.4	74.7	78.2	76.7	74.5	74.5	76.7	80.4	76.9	2.5
	Chrysene d12	%	93.1	85.1	89.4	105.7	106.4	85.1	93.1	106.4	96	10
	Naphthalene d8	%	74.1	67.4	69.2	65.7	60.2	60.2	67.4	74.1	67.3	5.1
	Phenanthrene d10	%	100.1	91.5	94.6	99.3	101.2	91.5	99.3	101.2	97	4
	B(a)P Total Potency Equivalent	mg/kg	0.058	0.045	0.028	0.071	0.039	0.028	0.045	0.071	0.048	0.017
	IACR (CCME)	mg/kg	1.05	0.84	0.55	1.36	0.78	0.55	0.84	1.36	0.92	0.31

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Michel Creek Watershed									
			Michel Creek Oxbow #2									
			MIC2-1	MIC2-2	MIC2-3	MIC2-4	MIC2-5	Minimum	Median	Maximum	Mean	Standard Deviation
			7-Aug-15	7-Aug-15	6-Aug-15	7-Aug-15	7-Aug-15					
Physical Tests	% Moisture	%	53.1	50.0	45.2	54.5	52.2	45.2	52.2	54.5	51.0	3.6
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.94	8.07	7.81	7.76	7.77	7.76	7.81	8.07	7.87	0.13
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	9.63	25.6	33.2	17.3	11.4	9.63	17.3	33.2	19.4	9.9
	% Sand (2.00mm - 1.00mm)	%	0.15	0.54	0.24	0.19	< 0.10	<0.1	0.19	0.54	0.244	0.173
	% Sand (1.00mm - 0.50mm)	%	< 0.10	1.27	0.77	0.46	0.12	<0.1	0.46	1.27	0.54	0.49
	% Sand (0.50mm - 0.25mm)	%	0.19	3.95	2.98	1.68	0.57	0.19	1.68	3.95	1.87	1.59
	% Sand (0.25mm - 0.125mm)	%	1.10	6.42	10.1	3.35	2.95	1.1	3.35	10.1	4.8	3.5
	% Sand (0.125mm - 0.063mm)	%	8.12	13.4	19.2	11.7	7.71	7.71	11.7	19.2	12	4.7
	% Silt (0.063mm - 0.004mm)	%	83.2	69.5	61.2	76.8	80.3	61.2	76.8	83.2	74.2	8.9
	% Silt (0.063mm - 0.0312mm)	%	35.9	31.9	29.2	35.6	32.7	29.2	32.7	35.9	33.1	2.8
	% Silt (0.0312mm - 0.004mm)	%	47.3	37.6	32.0	41.2	47.6	32	41.2	47.6	41.1	6.6
	% Clay (<4µm)	%	7.23	4.98	5.54	5.89	8.31	4.98	5.89	8.31	6.39	1.36
	Texture	-	Silt	Silt loam	Silt loam	Silt loam	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	5.56	4.24	4.80	5.46	4.19	4.19	4.8	5.56	4.85	0.65
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	11,400	10,400	6,640	9,690	10,400	6,640	10,400	11,400	9,706	1,819
	Antimony (Sb)	mg/kg	1.01	0.89	0.75	0.92	0.99	0.75	0.92	1.01	0.91	0.1
	Arsenic (As)	mg/kg	6.38	6.26	5.00	5.71	6.57	5.00	6.26	6.57	5.98	0.64
	Barium (Ba)	mg/kg	252	218	184	221	239	184	221	252	223	26
	Beryllium (Be)	mg/kg	0.85	0.78	0.56	0.77	0.82	0.56	0.78	0.85	0.76	0.11
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	12	10	< 10.0	< 10.0	< 10.0	<10	<10	12	<10.4	-
	Cadmium (Cd)	mg/kg	1.97	1.52	1.21	1.67	1.73	1.210	1.670	1.970	1.620	0.280
	Calcium (Ca)	mg/kg	33,700	29,700	27,800	30,300	38,900	27,800	30,300	38,900	32,080	4,367
	Chromium (Cr)	mg/kg	26.7	18.1	11.6	16.9	17.8	11.6	17.8	26.7	18.2	5.4
	Cobalt (Co)	mg/kg	6.52	5.96	5.01	5.77	6.95	5.01	5.96	6.95	6.04	0.74
	Copper (Cu)	mg/kg	20.0	17.7	14.3	18.7	19.0	14.3	18.7	20	17.9	2.2
	Iron (Fe)	mg/kg	15,400	14,600	11,900	14,400	15,500	11,900	14,600	15,500	14,360	1,457
	Lead (Pb)	mg/kg	11.0	10.0	8.1	10.0	11.2	8.1	10.0	11.2	10.1	1.2
	Lithium (Li)	mg/kg	12.7	11.6	8.3	11.2	12.2	8.3	11.6	12.7	11.2	1.7
	Magnesium (Mg)	mg/kg	8,900	8,190	6,580	8,480	9,230	6,580	8,480	9,230	8,276	1,028
	Manganese (Mn)	mg/kg	170	169	132	152	170	132	169	170	159	17
	Mercury (Hg)	mg/kg	0.0925	0.0696	0.0571	0.0729	0.0900	0.0571	0.0729	0.0925	0.0764	0.0148
	Molybdenum (Mo)	mg/kg	1.77	1.38	1.15	1.31	1.64	1.15	1.38	1.77	1.45	0.25
	Nickel (Ni)	mg/kg	31.2	25.3	21.4	25.9	29.8	21.4	25.9	31.2	26.7	3.9
	Phosphorus (P)	mg/kg	1,290	1,310	1,110	1,320	1,310	1110	1310	1320	1268	89
	Potassium (K)	mg/kg	2,630	2,410	1,330	2,150	2,240	1,330	2,240	2,630	2,152	495
	Selenium (Se)	mg/kg	2.71	1.63	1.06	1.94	2.04	1.06	1.94	2.71	1.88	0.60
	Silver (Ag)	mg/kg	0.39	0.29	0.23	0.31	0.37	0.23	0.31	0.39	0.32	0.06
	Sodium (Na)	mg/kg	< 100	< 100	< 100	< 100	110	<100	<100	110	<102	-
	Strontium (Sr)	mg/kg	63.4	57.8	51.0	56.7	65.1	51	57.8	65.1	58.8	5.6
	Thallium (Tl)	mg/kg	0.50	0.40	0.30	0.39	0.48	0.3	0.4	0.5	0.41	0.08
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	34.6	37.9	26.3	34.0	33.2	26.3	34	37.9	33.2	4.3
	Uranium (U)	mg/kg	1.33	1.14	0.98	1.15	1.29	0.98	1.15	1.33	1.18	0.14
	Vanadium (V)	mg/kg	48.1	45.8	30.0	42.9	44.4	30	44.4	48.1	42.2	7.1
	Zinc (Zn)	mg/kg	115	106	87.9	110	121	87.9	110.0	121.0	108.0	13.0
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	mg/kg	0.0063	0.0043	< 0.004	< 0.004	0.0040	<0.004	0.004	0.0063	0.005	0.001
	Benz(a)anthracene	mg/kg	0.050	0.043	0.020	0.024	0.024	0.02	0.024	0.05	0.032	0.013
	Benzo(a)pyrene	mg/kg	0.026	0.021	< 0.01	0.012	0.012	<0.01	0.012	0.026	0.016	0.007
	Benzo(b&j)fluoranthene	mg/kg	0.137	0.112	0.048	0.077	0.058	0.048	0.077	0.137	0.086	0.037
	Benzo(b+j+k)fluoranthene	mg/kg	0.137	0.112	0.048	0.077	0.058	0.048	0.077	0.137	0.086	0.037
	Benzo(g,h,i)perylene	mg/kg	0.050	0.039	0.018	0.020	0.021	0.018	0.021	0.05	0.03	0.014
	Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.244	0.223	0.112	0.128	0.119	0.112	0.128	0.244	0.165	0.063
	Dibenz(a,h)anthracene	mg/kg	0.0206	0.0162	0.0068	0.0079	0.0091	0.0068	0.0091	0.0206	0.012	0.006
	Fluoranthene	mg/kg	0.055	0.048	0.030	0.030	0.029	0.029	0.03	0.055	0.038	0.012
	Fluorene	mg/kg	0.038	0.030	0.017	0.020	0.025	0.017	0.025	0.038	0.026	0.008
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.014	0.011	< 0.01	< 0.01	< 0.01	<0.01	<0.01	0.014	<0.011	-
	2-Methylnaphthalene	mg/kg	0.425	0.370	0.298	0.216	0.325	0.216	0.325	0.425	0.327	0.078
	Naphthalene	mg/kg	0.201	0.189	0.139	0.103	0.152	0.103	0.152	0.201	0.157	0.039
	Phenanthrene	mg/kg	0.510	0.478	0.313	0.295	0.302	0.295	0.313	0.51	0.38	0.105
	Pyrene	mg/kg	0.078	0.069	0.041	0.048	0.045	0.041	0.048	0.078	0.056	0.016
	Acenaphthene d10	%	84.8	95.9	65.7	70.1	72.7	65.7	72.7	95.9	77.8	12.3
	Chrysene d12	%	97.8	113.4	72.1	85.4	68.1	68.1	85.4	113.4	87	19
	Naphthalene d8	%	97.1	108.9	68	72	92.4	68	92.4	108.9	88	17
	Phenanthrene d10	%	91.6	105.6	71.6	81.5	71.6	71.6	81.5	105.6	84	14
	B(a)P Total Potency Equivalent	mg/kg	0.07	0.057	0.021	0.032	0.032	0.021	0.032	0.07	0.042	0.02
	IACR (CCME)	mg/kg	1.32	1.1	0.5	0.71	0.6	0.5	0.71	1.32	0.85	0.35

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Elk River Watershed									
			Stanford Pond									
			STPD-1	STPD-2	STPD-3	STPD-4	STPD-5	Minimum	Median	Maximum	Mean	Standard Deviation
			6-Aug-15	6-Aug-15	6-Aug-15	6-Aug-15	6-Aug-15					
Physical Tests	% Moisture	%	78.8	77.9	59.0	69.8	84.8	59.0	77.9	84.8	74.1	10.0
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.44	7.38	7.54	7.59	7.29	7.29	7.44	7.59	7.45	0.12
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	10.2	12.0	27.7	11.7	12.3	10.2	12	27.7	14.8	7.3
	% Sand (2.00mm - 1.00mm)	%	0.58	0.48	0.34	0.44	3.33	0.34	0.48	3.33	1.03	1.29
	% Sand (1.00mm - 0.50mm)	%	1.13	1.16	1.47	1.33	3.44	1.13	1.33	3.44	1.71	0.98
	% Sand (0.50mm - 0.25mm)	%	1.54	2.23	3.97	2.32	2.03	1.54	2.23	3.97	2.42	0.92
	% Sand (0.25mm - 0.125mm)	%	2.69	4.01	8.33	2.63	1.47	1.47	2.69	8.33	3.83	2.67
	% Sand (0.125mm - 0.063mm)	%	4.22	4.14	13.6	5.00	2.00	2	4.22	13.6	5.8	4.5
	% Silt (0.063mm - 0.004mm)	%	76.5	73.4	65.6	77.1	75.1	65.6	75.1	77.1	73.5	4.7
	% Silt (0.063mm - 0.0312mm)	%	27.8	24.9	27.8	29.0	27.8	24.9	27.8	29	27.5	1.5
	% Silt (0.0312mm - 0.004mm)	%	48.7	48.5	37.9	48.2	47.3	37.9	48.2	48.7	46.1	4.6
	% Clay (<4µm)	%	13.3	14.6	6.62	11.2	12.7	6.62	12.7	14.6	11.7	3.1
	Texture	-	Silt	Silt loam	Silt loam	Silt	Silt loam / Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	5.70	5.93	5.27	5.13	8.81	5.13	5.7	8.81	6.17	1.51
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	5,770	5,820	6,080	7,430	4,410	4,410	5,820	7,430	5,902	1,074
	Antimony (Sb)	mg/kg	0.45	0.42	0.74	0.57	0.36	0.36	0.45	0.74	0.51	0.15
	Arsenic (As)	mg/kg	2.74	3.08	3.75	3.66	1.86	1.86	3.08	3.75	3.02	0.77
	Barium (Ba)	mg/kg	161	170	127	194	153	127	161	194	161	24
	Beryllium (Be)	mg/kg	0.38	0.38	0.41	0.54	0.29	0.29	0.38	0.54	0.4	0.09
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	0.999	0.971	0.865	1.21	1.17	0.865	0.999	1.210	1.040	0.140
	Calcium (Ca)	mg/kg	78,800	97,100	77,300	88,100	93,200	77,300	88,100	97,100	86,900	8,703
	Chromium (Cr)	mg/kg	13.1	13.8	16.6	16.5	12.3	12.3	13.8	16.6	14.5	2
	Cobalt (Co)	mg/kg	3.25	3.44	3.46	4.25	2.09	2.09	3.44	4.25	3.30	0.78
	Copper (Cu)	mg/kg	11.2	11.3	16.1	13.1	12.1	11.2	12.1	16.1	12.8	2
	Iron (Fe)	mg/kg	8,420	8,970	10,800	10,700	7,300	7,300	8,970	10,800	9,238	1,506
	Lead (Pb)	mg/kg	7.0	7.6	11.9	8.9	6.4	6.4	7.6	11.9	8.4	2.2
	Lithium (Li)	mg/kg	7.9	8.2	8.6	9.9	6.5	6.5	8.2	9.9	8.22	1.23
	Magnesium (Mg)	mg/kg	7,100	7,090	13,500	9,350	5,550	5,550	7,100	13,500	8,518	3,097
	Manganese (Mn)	mg/kg	146	141	155	175	80	80.1	146	175	139	36
	Mercury (Hg)	mg/kg	0.0575	0.0518	0.0364	0.0572	0.0524	0.0364	0.0524	0.0575	0.0511	0.0086
	Molybdenum (Mo)	mg/kg	1.06	1.20	1.14	1.35	1.06	1.06	1.14	1.35	1.16	0.12
	Nickel (Ni)	mg/kg	12.9	13.3	13.7	17.2	9.6	9.6	13.3	17.2	13.3	2.7
	Phosphorus (P)	mg/kg	840	880	1,020	960	730	730	880	1020	886	112
	Potassium (K)	mg/kg	1,580	1,590	1,490	1,950	1,310	1,310	1,580	1,950	1,584	233
	Selenium (Se)	mg/kg	7.22	8.45	3.38	7.97	16.2	3.38	7.97	16.20	8.60	4.70
	Silver (Ag)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Sodium (Na)	mg/kg	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	mg/kg	90.8	105	79.2	105	104	79.2	104	105	97	12
	Thallium (Tl)	mg/kg	0.22	0.21	0.18	0.28	0.19	0.18	0.21	0.28	0.22	0.04
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	20.5	19.6	40.8	23.4	18.5	18.5	20.5	40.8	24.6	9.3
	Uranium (U)	mg/kg	0.86	1.03	0.82	1.10	1.05	0.82	1.03	1.1	0.97	0.12
	Vanadium (V)	mg/kg	22.4	23.1	26.1	29.9	17.6	17.6	23.1	29.9	23.8	4.6
	Zinc (Zn)	mg/kg	72.0	80.2	112	90.5	73.1	72.0	80.2	112.0	86.0	17.0
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.010	< 0.010	0.0821	< 0.005	< 0.010	<0.005	<0.01	0.0821	<0.023	-
	Acenaphthylene	mg/kg	< 0.010	< 0.010	0.0159	0.0063	< 0.010	<0.01	<0.01	0.0159	<0.01	-
	Anthracene	mg/kg	0.0181	0.0336	0.824	0.0182	0.0389	0.0181	0.0336	0.824	0.187	0.356
	Benz(a)anthracene	mg/kg	0.222	0.484	6.00	0.135	0.325	0.135	0.325	6	1.43	2.56
	Benzo(a)pyrene	mg/kg	0.379	0.888	8.29	0.209	0.662	0.209	0.662	8.29	2.09	3.48
	Benzo(b&j)fluoranthene	mg/kg	0.828	1.90	12.9	0.530	1.26	0.53	1.26	12.9	3.5	5.3
	Benzo(b+j+k)fluoranthene	mg/kg	1.06	2.44	16.9	0.662	1.65	0.662	1.65	16.9	4.5	6.9
	Benzo(g,h,i)perylene	mg/kg	0.354	0.755	4.57	0.207	0.775	0.207	0.755	4.57	1.33	1.83
	Benzo(k)fluoranthene	mg/kg	0.232	0.540	3.94	0.132	0.391	0.132	0.391	3.94	1.05	1.62
	Chrysene	mg/kg	0.611	1.32	9.06	0.433	0.930	0.433	0.93	9.06	2.47	3.7
	Dibenz(a,h)anthracene	mg/kg	0.059	0.115	1.05	0.0403	0.124	0.0403	0.115	1.05	0.28	0.43
	Fluoranthene	mg/kg	1.07	2.35	20.8	0.666	1.97	0.666	1.97	20.8	5.4	8.7
	Fluorene	mg/kg	0.026	0.034	0.175	0.029	0.035	0.026	0.034	0.175	0.06	0.065
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.273	0.606	4.04	0.137	0.591	0.137	0.591	4.04	1.13	1.64
	2-Methylnaphthalene	mg/kg	0.181	0.198	0.221	0.254	0.179	0.179	0.198	0.254	0.207	0.031
	Naphthalene	mg/kg	0.072	0.073	0.087	0.113	0.087	0.072	0.087	0.113	0.086	0.017
	Phenanthrene	mg/kg	0.442	0.729	6.35	0.395	0.602	0.395	0.602	6.35	1.7	2.6
	Pyrene	mg/kg	0.763	1.70	16.1	0.459	1.43	0.459	1.43	16.1	4.1	6.7
	Acenaphthene d10	%	77.2	85.5	83.7	87.5	88.5	77.2	85.5	88.5	84.5	4.5
	Chrysene d12	%	91.1	98.7	93.3	92.4	83.7	83.7	92.4	98.7	91.8	5.4
	Naphthalene d8	%	72.5	73.4	75.3	83.9	92.7	72.5	75.3	92.7	79.6	8.6
	Phenanthrene d10	%	85.8	93.7	93.4	87.2	96.9	85.8	93.4	96.9	91.4	4.7
	B(a)P Total Potency Equivalent	mg/kg	0.604	1.38	12.2	0.349	1.06	0.349	1.06	12.2	3.1	5.1
	IACR (CCME)	mg/kg	9.02	20.6	157	5.57	14.4	5.57	14.4	157	41	65

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Elk River Watershed									
			Lower Elk River Oxbow									
			EROL-1	EROL-2	EROL-3	EROL-4	EROL-5	Minimum	Median	Maximum	Mean	Standard Deviation
			5-Aug-15	5-Aug-15	5-Aug-15	5-Aug-15	5-Aug-15					
Physical Tests	% Moisture	%	63.8	52.9	63.7	73.2	51.8	51.8	63.7	73.2	61.1	8.9
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.81	7.88	7.84	7.71	7.89	7.71	7.84	7.89	7.83	0.07
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	36.0	4.95	26.5	8.49	32.2	4.95	26.5	36	21.6	14.1
	% Sand (2.00mm - 1.00mm)	%	0.61	< 0.10	0.59	0.11	0.24	<0.1	0.24	0.61	0.33	0.253
	% Sand (1.00mm - 0.50mm)	%	3.80	< 0.10	2.62	0.66	1.88	<0.1	1.88	3.8	1.81	1.49
	% Sand (0.50mm - 0.25mm)	%	6.19	0.10	5.23	0.91	7.43	0.1	5.23	7.43	3.97	3.27
	% Sand (0.25mm - 0.125mm)	%	12.9	0.43	7.89	1.80	10.4	0.43	7.89	12.9	6.7	5.4
	% Sand (0.125mm - 0.063mm)	%	12.5	4.40	10.2	5.01	12.3	4.4	10.2	12.5	8.9	3.9
	% Silt (0.063mm - 0.004mm)	%	58.4	90.5	68.0	84.8	61.8	58.4	68	90.5	72.7	14.2
	% Silt (0.063mm - 0.0312mm)	%	24.9	40.5	28.5	35.8	25.4	24.9	28.5	40.5	31	6.9
	% Silt (0.0312mm - 0.004mm)	%	33.5	50.0	39.5	49.1	36.3	33.5	39.5	50	41.7	7.5
	% Clay (<4µm)	%	5.59	4.60	5.53	6.71	6.06	4.6	5.59	6.71	5.7	0.77
	Texture	-	Silt loam	Silt	Silt loam	Silt	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	3.60	4.04	2.77	4.49	3.42	2.77	3.6	4.49	3.66	0.65
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	7,080	6,360	6,440	6,990	6,060	6,060	6,440	7,080	6,586	435
	Antimony (Sb)	mg/kg	0.69	0.63	0.56	0.56	0.59	0.56	0.59	0.69	0.61	0.06
	Arsenic (As)	mg/kg	5.99	4.37	3.40	6.12	3.87	3.40	4.37	6.12	4.75	1.24
	Barium (Ba)	mg/kg	197	158	184	185	161	158	184	197	177	17
	Beryllium (Be)	mg/kg	0.57	0.49	0.47	0.53	0.51	0.47	0.51	0.57	0.51	0.04
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	1.02	0.863	0.825	1.18	0.885	0.825	0.885	1.180	0.950	0.150
	Calcium (Ca)	mg/kg	71,600	94,000	120,000	96,700	102,000	71,600	96,700	120,000	96,860	17,379
	Chromium (Cr)	mg/kg	15.6	14.0	14.0	16.1	13.3	13.3	14	16.1	14.6	1.2
	Cobalt (Co)	mg/kg	4.72	3.83	3.65	4.32	3.95	3.65	3.95	4.72	4.09	0.43
	Copper (Cu)	mg/kg	13.7	11.6	13.6	13.6	11.9	11.6	13.6	13.7	12.9	1
	Iron (Fe)	mg/kg	13,500	10,600	9,530	15,100	10,100	9,530	10,600	15,100	11,766	2,411
	Lead (Pb)	mg/kg	8.8	7.6	7.5	8.9	9.6	7.5	8.8	9.6	8.5	0.9
	Lithium (Li)	mg/kg	10.6	9.5	9.5	10.6	8.9	8.9	9.5	10.6	9.8	0.8
	Magnesium (Mg)	mg/kg	15,100	12,900	12,900	14,300	12,400	12,400	12,900	15,100	13,520	1,132
	Manganese (Mn)	mg/kg	398	237	205	278	215	205	237	398	267	79
	Mercury (Hg)	mg/kg	0.0534	0.0319	0.0399	0.0532	0.0369	0.0319	0.0399	0.0534	0.0431	0.0098
	Molybdenum (Mo)	mg/kg	1.26	1.23	1.16	1.15	1.37	1.15	1.23	1.37	1.23	0.09
	Nickel (Ni)	mg/kg	17.9	15.6	14.4	16.5	16.0	14.4	16	17.9	16.1	1.3
	Phosphorus (P)	mg/kg	1,200	1,120	1,130	1,150	1,110	1110	1130	1200	1142	36
	Potassium (K)	mg/kg	1,770	1,580	1,620	1,810	1,400	1,400	1,620	1,810	1,636	164
	Selenium (Se)	mg/kg	4.42	2.60	4.94	5.36	3.76	2.60	4.42	5.36	4.22	1.08
	Silver (Ag)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Sodium (Na)	mg/kg	< 100	< 100	100	100	100	<100	<100	100	<100	-
	Strontium (Sr)	mg/kg	86.7	107	122	104	106	86.7	106	122	105	13
	Thallium (Tl)	mg/kg	0.25	0.22	0.22	0.23	0.21	0.21	0.22	0.25	0.23	0.02
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	25.3	25.7	28.0	28.4	24.3	24.3	25.7	28.4	26.3	1.8
	Uranium (U)	mg/kg	0.92	1.01	1.05	0.86	1.14	0.86	1.01	1.14	1	0.11
	Vanadium (V)	mg/kg	29.9	28.0	26.2	29.0	25.5	25.5	28	29.9	27.7	1.9
	Zinc (Zn)	mg/kg	82.2	71.7	68.0	81.1	70.4	68.0	71.7	82.2	74.7	6.5
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	0.0068	0.0085	0.0062	0.0075	0.0068	0.0062	0.0068	0.0085	0.007	0.001
	Anthracene	mg/kg	0.0165	0.0201	0.0095	0.0120	0.0130	0.0095	0.013	0.0201	0.014	0.004
	Benz(a)anthracene	mg/kg	0.057	0.069	0.045	0.053	0.038	0.038	0.053	0.069	0.052	0.012
	Benzo(a)pyrene	mg/kg	0.047	0.066	0.040	0.048	0.030	0.03	0.047	0.066	0.046	0.013
	Benzo(b&j)fluoranthene	mg/kg	0.107	0.115	0.101	0.104	0.073	0.073	0.104	0.115	0.1	0.016
	Benzo(b+j+k)fluoranthene	mg/kg	0.13	0.146	0.127	0.126	0.086	0.086	0.127	0.146	0.123	0.022
	Benzo(g,h,i)perylene	mg/kg	0.046	0.048	0.027	0.038	0.030	0.027	0.038	0.048	0.038	0.009
	Benzo(k)fluoranthene	mg/kg	0.023	0.031	0.027	0.022	0.014	0.014	0.023	0.031	0.023	0.006
	Chrysene	mg/kg	0.147	0.121	0.080	0.137	0.106	0.08	0.121	0.147	0.118	0.026
	Dibenz(a,h)anthracene	mg/kg	0.0189	0.0197	0.0111	0.0163	0.0132	0.0111	0.0163	0.0197	0.016	0.004
	Fluoranthene	mg/kg	0.102	0.107	0.060	0.074	0.071	0.06	0.074	0.107	0.083	0.021
	Fluorene	mg/kg	0.021	0.018	0.013	0.020	0.021	0.013	0.02	0.021	0.019	0.003
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.032	0.043	0.025	0.028	0.022	0.022	0.028	0.043	0.03	0.008
	2-Methylnaphthalene	mg/kg	0.162	0.159	0.093	0.177	0.174	0.093	0.162	0.177	0.153	0.034
	Naphthalene	mg/kg	0.098	0.093	0.055	0.102	0.102	0.055	0.098	0.102	0.09	0.02
	Phenanthrene	mg/kg	0.304	0.212	0.122	0.248	0.245	0.122	0.245	0.304	0.226	0.067
	Pyrene	mg/kg	0.079	0.085	0.048	0.064	0.054	0.048	0.064	0.085	0.066	0.016
	Acenaphthene d10	%	60.3	62	73.4	73.1	73.4	60.3	73.1	73.4	68.4	6.7
	Chrysene d12	%	87.4	80.8	91	93.7	87.7	80.8	87.7	93.7	88.1	4.8
	Naphthalene d8	%	55.9	65.7	80.1	75.6	80	55.9	75.6	80.1	71.5	10.5
	Phenanthrene d10	%	86.8	80.9	85.9	91.2	93.1	80.9	86.8	93.1	87.6	4.8
	B(a)P Total Potency Equivalent	mg/kg	0.089	0.113	0.072	0.087	0.059	0.059	0.087	0.113	0.084	0.02
	IACR (CCME)	mg/kg	1.28	1.46	1.14	1.23	0.86	0.86	1.23	1.46	1.19	0.22

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.2: Sediment Quality in Mine-exposed Areas and Associated Summary statistics, 2015

Analyte		Units	Elk River Watershed									
			Elko Reservoir									
			ELKO-1	ELKO-2	ELKO-3	ELKO-4	ELKO-5	Minimum	Median	Maximum	Mean	Standard Deviation
			7-Aug-15	7-Aug-15	7-Aug-15	7-Aug-15	7-Aug-15					
Physical Tests	% Moisture	%	39.8	39.0	34.8	41.2	43.1	34.8	39.8	43.1	39.6	3.1
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	8.20	8.19	8.21	8.16	8.10	8.10	8.19	8.21	8.17	0.04
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	51.1	22.2	25.7	40.4	27.7	22.2	27.7	51.1	33.4	12
	% Sand (2.00mm - 1.00mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	%	0.70	0.85	0.71	0.41	0.25	0.25	0.7	0.85	0.58	0.25
	% Sand (0.50mm - 0.25mm)	%	5.82	2.27	1.44	2.81	1.59	1.44	2.27	5.82	2.79	1.78
	% Sand (0.25mm - 0.125mm)	%	23.0	6.01	6.35	16.2	9.43	6.01	9.43	23	12.2	7.3
	% Sand (0.125mm - 0.063mm)	%	21.6	13.0	17.2	20.9	16.4	13	17.2	21.6	17.8	3.5
	% Silt (0.063mm - 0.004mm)	%	42.8	68.5	65.6	52.2	63.1	42.8	63.1	68.5	58.4	10.7
	% Silt (0.063mm - 0.0312mm)	%	19.8	29.4	28.8	22.9	27.1	19.8	27.1	29.4	25.6	4.1
	% Silt (0.0312mm - 0.004mm)	%	23.1	39.1	36.8	29.3	36.0	23.1	36	39.1	32.9	6.6
	% Clay (<4µm)	%	6.05	9.33	8.73	7.43	9.22	6.05	8.73	9.33	8.15	1.4
	Texture	-	Sandy loam	Silt loam	Silt loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	2.82	3.52	3.37	3.26	3.23	2.82	3.26	3.52	3.24	0.26
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	4,920	6,330	5,960	6,270	6,450	4,920	6,270	6,450	5,986	623
	Antimony (Sb)	mg/kg	0.43	0.55	0.45	0.49	0.48	0.43	0.48	0.55	0.48	0.05
	Arsenic (As)	mg/kg	3.46	4.47	3.45	4.19	3.67	3.45	3.67	4.47	3.85	0.46
	Barium (Ba)	mg/kg	116	157	129	133	131	116	131	157	133	15
	Beryllium (Be)	mg/kg	0.36	0.46	0.44	0.49	0.45	0.36	0.45	0.49	0.44	0.05
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	0.622	0.903	0.746	0.765	0.747	0.622	0.747	0.903	0.757	0.100
	Calcium (Ca)	mg/kg	46,800	56,500	46,200	52,700	44,400	44,400	46,800	56,500	49,320	5,081
	Chromium (Cr)	mg/kg	9.9	12.6	12.0	12.1	12.5	9.9	12.1	12.6	11.8	1.1
	Cobalt (Co)	mg/kg	3.03	4.08	3.68	3.76	4.06	3.03	3.76	4.08	3.72	0.43
	Copper (Cu)	mg/kg	7.6	11.4	10.2	10.3	10.5	7.6	10.3	11.4	10	1.4
	Iron (Fe)	mg/kg	8,660	11,200	9,160	10,600	10,600	8,660	10,600	11,200	10,044	1,078
	Lead (Pb)	mg/kg	5.7	7.5	7.6	7.2	8.1	5.7	7.5	8.1	7.2	0.9
	Lithium (Li)	mg/kg	7.0	9.0	8.7	9.0	9.2	7	9	9.2	8.58	0.9
	Magnesium (Mg)	mg/kg	8,750	12,500	10,300	10,700	10,500	8,750	10,500	12,500	10,550	1,335
	Manganese (Mn)	mg/kg	192	336	229	269	222	192	229	336	250	56
	Mercury (Hg)	mg/kg	0.0353	0.0423	0.0521	0.0308	0.0432	0.0308	0.0423	0.0521	0.0407	0.0082
	Molybdenum (Mo)	mg/kg	0.76	1.11	0.94	0.97	0.82	0.76	0.94	1.11	0.92	0.14
	Nickel (Ni)	mg/kg	12.4	17.3	15.2	16.0	15.5	12.4	15.5	17.3	15.3	1.8
	Phosphorus (P)	mg/kg	880	1,130	920	1,060	1,010	880	1010	1130	1000	102
	Potassium (K)	mg/kg	1,090	1,430	1,370	1,440	1,450	1,090	1,430	1,450	1,356	152
	Selenium (Se)	mg/kg	1.07	1.27	1.20	1.25	1.36	1.07	1.25	1.36	1.23	0.11
	Silver (Ag)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Sodium (Na)	mg/kg	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	mg/kg	63.4	74.0	61.9	70.2	58.0	58	63.4	74	65.5	6.5
	Thallium (Tl)	mg/kg	0.16	0.23	0.20	0.20	0.21	0.16	0.2	0.23	0.2	0.03
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	19.8	20.9	20.3	22.9	24.2	19.8	20.9	24.2	21.6	1.9
	Uranium (U)	mg/kg	0.68	0.85	0.80	0.78	0.75	0.68	0.78	0.85	0.77	0.06
	Vanadium (V)	mg/kg	20.2	25.6	23.2	24.8	24.5	20.2	24.5	25.6	23.7	2.1
	Zinc (Zn)	mg/kg	54.9	72.7	78.5	69.2	68.2	54.9	69.2	78.5	68.7	8.7
	Zirconium (Zr)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	mg/kg	< 0.005	0.0074	0.0069	0.0057	< 0.005	<0.005	0.0057	0.0074	0.006	0.001
	Anthracene	mg/kg	0.0099	0.0150	0.0175	0.0132	0.0081	0.0081	0.0132	0.0175	0.013	0.004
	Benz(a)anthracene	mg/kg	0.051	0.071	0.077	0.056	0.029	0.029	0.056	0.077	0.057	0.019
	Benzo(a)pyrene	mg/kg	0.046	0.054	0.070	0.047	0.024	0.024	0.047	0.07	0.048	0.017
	Benzo(b&j)fluoranthene	mg/kg	0.087	0.117	0.139	0.097	0.057	0.057	0.097	0.139	0.099	0.031
	Benzo(b+j+k)fluoranthene	mg/kg	0.111	0.141	0.172	0.12	0.069	0.069	0.12	0.172	0.123	0.038
	Benzo(g,h,i)perylene	mg/kg	0.032	0.033	0.049	0.034	0.022	0.022	0.033	0.049	0.034	0.01
	Benzo(k)fluoranthene	mg/kg	0.024	0.024	0.033	0.023	0.012	0.012	0.024	0.033	0.023	0.007
	Chrysene	mg/kg	0.102	0.145	0.173	0.121	0.090	0.09	0.121	0.173	0.126	0.033
	Dibenz(a,h)anthracene	mg/kg	0.0122	0.0128	0.0201	0.0144	0.0084	0.0084	0.0128	0.0201	0.014	0.004
	Fluoranthene	mg/kg	0.065	0.088	0.104	0.084	0.045	0.045	0.084	0.104	0.077	0.023
	Fluorene	mg/kg	0.015	0.022	0.030	0.019	0.019	0.015	0.019	0.03	0.021	0.006
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.027	0.033	0.042	0.027	0.015	0.015	0.027	0.042	0.029	0.01
	2-Methylnaphthalene	mg/kg	0.190	0.244	0.264	0.202	0.181	0.181	0.202	0.264	0.216	0.036
	Naphthalene	mg/kg	0.089	0.108	0.117	0.094	0.067	0.067	0.094	0.117	0.095	0.019
	Phenanthrene	mg/kg	0.173	0.320	0.296	0.231	0.196	0.173	0.231	0.32	0.243	0.063
	Pyrene	mg/kg	0.053	0.077	0.091	0.071	0.043	0.043	0.071	0.091	0.067	0.019
	Acenaphthene d10	%	73.5	72.2	74.3	71.5	60.6	60.6	72.2	74.3	70.4	5.6
	Chrysene d12	%	92.2	103	103.6	97.1	94.4	92.2	97.1	103.6	98	5
	Naphthalene d8	%	75.5	65.1	76.4	70.8	61.3	61.3	70.8	76.4	69.8	6.5
	Phenanthrene d10	%	79.7	94.5	89.4	83.8	82.6	79.7	83.8	94.5	86	5.9
	B(a)P Total Potency Equivalent	mg/kg	0.079	0.093	0.122	0.083	0.045	0.045	0.083	0.122	0.084	0.028
	IACR (CCME)	mg/kg	1.09	1.39	1.69	1.18	0.67	0.67	1.18	1.69	1.2	0.38

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.3: Sediment Quality in Reference Areas and Associated Summary Statistics, 2015

Analytes		Units	Fording River Watershed									
			Lake Mountain Lake									
			LML-1	LML-2	LML-3	LML-4	LML-5	Minimum	Median	Maximum	Mean	Standard Deviation
			6-Aug-15	6-Aug-15	6-Aug-15	7-Aug-15	7-Aug-15					
Physical Tests	% Moisture	%	92.4	94.5	92.7	94.9	92.2	92.2	92.7	94.9	93.3	1.3
	pH (1:9)	pH units	7.77	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	-	7.27	7.40	7.71	7.86	7.27	7.71	7.86	7.56	3.39
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	3.21	2.02	6.08	3.47	1.02	1.02	3.21	6.08	3.16	1.9
	% Sand (2.00mm - 1.00mm)	%	0.44	0.43	0.52	0.25	<0.10	<0.1	0.43	0.52	0.348	0.17
	% Sand (1.00mm - 0.50mm)	%	0.32	0.32	0.72	0.25	<0.10	<0.1	0.32	0.72	0.34	0.23
	% Sand (0.50mm - 0.25mm)	%	0.44	0.42	1.12	0.41	0.17	0.17	0.42	1.12	0.51	0.36
	% Sand (0.25mm - 0.125mm)	%	0.54	0.43	1.48	0.60	0.23	0.23	0.54	1.48	0.66	0.48
	% Sand (0.125mm - 0.063mm)	%	1.47	0.43	2.23	1.96	0.59	0.43	1.47	2.23	1.34	0.8
	% Silt (0.063mm - 4um)	%	85.6	89.0	87.0	89.0	88.5	85.6	88.5	89	87.8	1.5
	% Silt (0.063mm - 0.0312mm)	%	35.5	41.2	40.8	41.9	38.8	35.5	40.8	41.9	39.6	2.6
	% Silt (0.0312mm - 0.004mm)	%	50.1	47.8	46.2	47.1	49.6	46.2	47.8	50.1	48.2	1.7
	% Clay (<4um)	%	11.2	8.94	6.92	7.55	10.5	6.92	8.94	11.2	9	1.8
	Texture	-	Silt	Silt	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	30.3	22.2	19.7	26.1	20.2	19.7	22.2	30.3	23.7	4.5
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	5,800	5,230	5,930	5,470	2,630	2,630	5,470	5,930	5,012	1,360
	Antimony (Sb)	mg/kg	1.03	0.55	0.62	0.77	0.46	0.46	0.62	1.03	0.69	0.22
	Arsenic (As)	mg/kg	2.64	1.77	2.10	3.02	1.57	1.57	2.10	3.02	2.22	0.60
	Barium (Ba)	mg/kg	245	322	278	267	437	245	278	437	310	76
	Beryllium (Be)	mg/kg	0.33	0.28	0.35	0.39	< 0.20	<0.2	0.33	0.39	0.31	0.07
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	12	16	< 10	13	12	<10	12	16	12.6	2.2
	Cadmium (Cd)	mg/kg	2.30	1.59	2.29	1.91	0.970	0.970	1.910	2.300	1.810	0.560
	Calcium (Ca)	mg/kg	35,000	112,000	64,600	48,000	206,000	35,000	64,600	206,000	93,120	69,508
	Chromium (Cr)	mg/kg	11.0	10.5	14.6	10.9	5.5	5.5	10.9	14.6	10.5	3.2
	Cobalt (Co)	mg/kg	2.73	2.55	2.97	3.22	1.72	1.72	2.73	3.22	2.64	0.57
	Copper (Cu)	mg/kg	14.6	13.5	13.2	18.8	11.4	11.4	13.5	18.8	14.3	2.8
	Iron (Fe)	mg/kg	9,350	6,490	6,410	7,890	5,090	5,090	6,490	9,350	7,046	1,625
	Lead (Pb)	mg/kg	9.4	8.7	7.4	11.4	10.2	7.4	9.4	11.4	9.4	1.5
	Lithium (Li)	mg/kg	4.8	4.2	4.4	4.7	< 4.0	<4	4.4	4.8	4.42	0.33
	Magnesium (Mg)	mg/kg	2,990	3,750	3,310	3,640	4,400	2,990	3,640	4,400	3,618	529
	Manganese (Mn)	mg/kg	104	97.9	73.2	58.8	87.1	58.8	87.1	104	84	18
	Mercury (Hg)	mg/kg	0.109	0.0795	0.0949	0.0983	0.0505	0.0505	0.0949	0.1090	0.0864	0.0227
	Molybdenum (Mo)	mg/kg	1.90	2.18	1.31	2.00	1.61	1.31	1.9	2.18	1.8	0.34
	Nickel (Ni)	mg/kg	18.4	15.2	19.3	18.4	10.1	10.1	18.4	19.3	16.3	3.8
	Phosphorus (P)	mg/kg	1,050	1,180	970	1,160	820	820	1050	1180	1036	148
	Potassium (K)	mg/kg	850	1,110	1,000	1,310	920	850	1,000	1,310	1,038	180
	Selenium (Se)	mg/kg	7.06	6.23	8.84	6.61	3.87	3.87	6.61	8.84	6.52	1.79
	Silver (Ag)	mg/kg	< 0.20	< 0.20	< 0.20	0.22	< 0.20	<0.2	<0.2	0.22	<0.2	-
	Sodium (Na)	mg/kg	170	140	160	130	< 100	<100	140	170	140	27
	Strontium (Sr)	mg/kg	43.7	72.8	56.1	58.3	106	43.7	58.3	106	67	24
	Thallium (Tl)	mg/kg	0.22	0.16	0.30	0.22	0.12	0.12	0.22	0.3	0.2	0.07
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	113	65.2	66.9	53.5	28.7	28.7	65.2	113	65	31
	Uranium (U)	mg/kg	0.89	0.88	0.79	0.93	0.60	0.6	0.88	0.93	0.82	0.13
	Vanadium (V)	mg/kg	30.6	24.1	28.8	31.5	19.8	19.8	28.8	31.5	27	4.9
	Zinc (Zn)	mg/kg	78.0	65.4	75.3	87.2	49.8	49.8	75.3	87.2	71.1	14.2
	Zirconium (Zr)	mg/kg	7.8	< 2.0	5.3	4.0	2.1	<2	4	7.8	4.24	2.42
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.025	< 0.030	< 0.020	< 0.055	< 0.025	<0.02	<0.025	<0.055	<0.031	-
	Acenaphthylene	mg/kg	0.021	0.025	< 0.020	0.041	< 0.020	<0.02	0.021	0.041	0.025	0.009
	Anthracene	mg/kg	< 0.016	< 0.020	< 0.016	< 0.020	0.016	<0.016	<0.016	0.016	<0.018	-
	Benz(a)anthracene	mg/kg	0.106	0.120	0.072	0.234	0.096	0.072	0.106	0.234	0.126	0.063
	Benzo(a)pyrene	mg/kg	0.063	0.074	0.044	0.142	0.059	0.044	0.063	0.142	0.076	0.038
	Benzo(b&j)fluoranthene	mg/kg	0.170	0.209	0.119	0.379	0.164	0.119	0.17	0.379	0.208	0.101
	Benzo(b+j+k)fluoranthene	mg/kg	0.170	0.209	0.119	0.463	0.164	0.119	0.17	0.463	0.225	0.137
	Benzo(g,h,i)perylene	mg/kg	0.085	0.094	0.058	0.207	0.081	0.058	0.085	0.207	0.105	0.059
	Benzo(k)fluoranthene	mg/kg	< 0.040	< 0.050	< 0.040	0.084	< 0.040	<0.04	<0.04	0.084	<0.051	-
	Chrysene	mg/kg	0.403	0.474	0.286	0.776	0.392	0.286	0.403	0.776	0.466	0.186
	Dibenz(a,h)anthracene	mg/kg	0.0370	0.042	0.024	0.118	0.036	0.024	0.037	0.118	0.051	0.038
	Fluoranthene	mg/kg	0.086	0.101	0.059	0.187	0.082	0.059	0.086	0.187	0.103	0.049
	Fluorene	mg/kg	0.405	0.496	0.234	0.802	0.406	0.234	0.406	0.802	0.469	0.209
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.040	< 0.050	< 0.040	0.101	< 0.040	<0.04	<0.04	0.101	<0.054	-
	2-Methylnaphthalene	mg/kg	2.24	3.04	1.35	4.87	2.52	1.35	2.52	4.87	2.8	1.31
	Naphthalene	mg/kg	0.579	0.814	0.356	1.27	0.720	0.356	0.72	1.27	0.75	0.34
	Phenanthrene	mg/kg	1.55	1.83	0.963	3.04	1.52	0.963	1.55	3.04	1.78	0.77
	Pyrene	mg/kg	0.131	0.150	0.086	0.263	0.121	0.086	0.131	0.263	0.15	0.067
	Acenaphthene d10	%	85.1	78.4	73.4	104.9	92.2	73.4	85.1	104.9	87	12
	Chrysene d12	%	109.5	92.7	100.7	117.5	118.1	92.7	109.5	118.1	108	11
	Naphthalene d8	%	81.7	82	76	103.9	96.8	76	82	103.9	88	12
	Phenanthrene d10	%	102.1	86.5	90.5	112.3	108.3	86.5	102.1	112.3	100	11
	B(a)P Total Potency Equivalent	mg/kg	0.137	0.16	0.095	0.35	0.13	0.095	0.137	0.35	0.174	0.101
	IACR (CCME)	mg/kg	2.06	2.46	1.46	4.94	1.96	1.46	2.06	4.94	2.58	1.37

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.3: Sediment Quality in Reference Areas and Associated Summary Statistics, 2015

Analytes		Units	Michel Creek Watershed									
			Leach Creek Oxbow									
			LCHO-1	LCHO-2	LCHO-3	LCHO-4	LCHO-5	Minimum	Median	Maximum	Mean	Standard Deviation
			12-Aug-15	12-Aug-15	12-Aug-15	12-Aug-15	12-Aug-15					
Physical Tests	% Moisture	%	77.1	60.3	66.7	73.5	72.9	60.3	72.9	77.1	70.1	6.6
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	6.67	7.08	6.70	6.44	6.21	6.21	6.67	7.08	6.62	0.32
Particle Size	% Gravel (>2mm)	%	1.74	< 0.10	5.91	1.66	< 0.10	<0.1	1.66	5.91	1.9	2.38
	% Sand (2.0mm - 0.063mm)	%	10.7	8.20	22.3	11.6	11.3	8.2	11.3	22.3	12.8	5.5
	% Sand (2.00mm - 1.00mm)	%	0.84	<0.10	1.96	0.27	0.48	<0.1	0.48	1.96	0.73	0.74
	% Sand (1.00mm - 0.50mm)	%	0.90	0.27	2.15	0.63	0.56	0.27	0.63	2.15	0.9	0.73
	% Sand (0.50mm - 0.25mm)	%	1.68	0.64	3.76	1.90	1.76	0.64	1.76	3.76	1.95	1.13
	% Sand (0.25mm - 0.125mm)	%	3.09	0.98	6.07	3.60	3.78	0.98	3.6	6.07	3.5	1.82
	% Sand (0.125mm - 0.063mm)	%	4.13	6.27	8.37	5.14	4.73	4.13	5.14	8.37	5.73	1.67
	% Silt (0.063mm - 4um)	%	72.6	82.4	63.0	57.7	75.9	57.7	72.6	82.4	70.3	9.9
	% Silt (0.063mm - 0.0312mm)	%	25.7	33.6	26.3	17.2	29.3	17.2	26.3	33.6	26.4	6
	% Silt (0.0312mm - 0.004mm)	%	46.9	48.7	36.7	40.5	46.5	36.7	46.5	48.7	43.9	5.1
	% Clay (<4um)	%	15.1	9.41	8.74	29.1	12.8	8.74	12.8	29.1	15	8.3
	Texture	-	Silt loam	Silt	Silt loam	Silt loam	Silt loam / Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	10.4	5.79	7.00	7.13	8.98	5.79	7.13	10.4	7.9	1.8
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	10,300	9,950	11,800	10,500	5,170	5,170	10,300	11,800	9,544	2,543
	Antimony (Sb)	mg/kg	0.97	1.32	1.13	0.80	0.50	0.5	0.97	1.32	0.94	0.31
	Arsenic (As)	mg/kg	3.28	4.46	4.57	4.20	2.26	2.26	4.20	4.57	3.75	0.98
	Barium (Ba)	mg/kg	303	311	324	315	159	159	311	324	282	69
	Beryllium (Be)	mg/kg	0.66	0.72	0.77	0.65	0.32	0.32	0.66	0.77	0.62	0.18
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	5.3	5.0	5.5	< 5.0	< 5.0	<5	5	5.5	5.16	0.23
	Cadmium (Cd)	mg/kg	3.53	2.68	2.42	1.77	1.19	1.190	2.420	3.530	2.320	0.890
	Calcium (Ca)	mg/kg	7,070	6,580	6,430	5,190	3,120	3,120	6,430	7,070	5,678	1,589
	Chromium (Cr)	mg/kg	20.0	18.5	19.7	17.8	9.47	9.47	18.5	20	17.1	4.4
	Cobalt (Co)	mg/kg	6.21	6.83	6.67	4.59	2.90	2.90	6.21	6.83	5.44	1.67
	Copper (Cu)	mg/kg	19.4	22.0	18.7	16.1	8.67	8.67	18.7	22	17	5.1
	Iron (Fe)	mg/kg	10,700	12,800	13,200	11,800	6,790	6,790	11,800	13,200	11,058	2,575
	Lead (Pb)	mg/kg	10.5	11.2	11.7	9.47	5.16	5.2	10.5	11.7	9.6	2.6
	Lithium (Li)	mg/kg	11.5	11.1	13.9	11.8	5.9	5.9	11.5	13.9	10.8	3
	Magnesium (Mg)	mg/kg	2,570	2,760	2,660	1,960	1,130	1,130	2,570	2,760	2,216	683
	Manganese (Mn)	mg/kg	88.4	130	90.4	99.6	33.8	33.8	90.4	130	88	35
	Mercury (Hg)	mg/kg	0.143	0.126	0.113	0.157	0.162	0.1130	0.1430	0.1620	0.1402	0.0207
	Molybdenum (Mo)	mg/kg	1.34	1.35	1.39	1.23	0.68	0.68	1.34	1.39	1.2	0.3
	Nickel (Ni)	mg/kg	25.7	30.6	27.5	20.8	12.7	12.7	25.7	30.6	23.5	7
	Phosphorus (P)	mg/kg	930	1,130	1,120	969	562	562	969	1130	942	230
	Potassium (K)	mg/kg	1,690	1,860	1,820	1,490	800	800	1,690	1,860	1,532	434
	Selenium (Se)	mg/kg	7.73	2.81	3.54	3.94	2.22	2.22	3.54	7.73	4.05	2.16
	Silver (Ag)	mg/kg	0.48	0.51	0.44	0.51	0.22	0.22	0.48	0.51	0.43	0.12
	Sodium (Na)	mg/kg	< 50	< 50	< 50	< 50	< 50	<50	<50	<50	<50	-
	Strontium (Sr)	mg/kg	36.7	40.7	41.5	27.7	18.3	18.3	36.7	41.5	33	9.9
	Thallium (Tl)	mg/kg	0.287	0.326	0.300	0.261	0.147	0.147	0.287	0.326	0.26	0.07
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	41.8	38.0	49.1	27.7	20.5	20.5	38	49.1	35.4	11.4
	Uranium (U)	mg/kg	2.58	1.99	2.29	4.75	1.21	1.21	2.29	4.75	2.56	1.32
	Vanadium (V)	mg/kg	48.1	52.8	58.1	48.2	25.1	25.1	48.2	58.1	46.5	12.6
	Zinc (Zn)	mg/kg	113	128	129	90.0	56.4	56.4	113.0	129.0	103.0	31.0
	Zirconium (Zr)	mg/kg	1.8	< 1.0	1.1	1.4	< 1.0	<1	1.1	1.8	1.26	0.34
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.010	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.01	<0.006	-
	Acenaphthylene	mg/kg	< 0.010	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.01	<0.006	-
	Anthracene	mg/kg	< 0.008	0.0062	< 0.004	< 0.004	0.0045	<0.004	<0.004	0.0062	<0.005	-
	Benz(a)anthracene	mg/kg	0.024	0.052	< 0.010	< 0.010	0.040	<0.01	0.024	0.052	0.027	0.019
	Benzo(a)pyrene	mg/kg	< 0.020	0.024	< 0.010	< 0.010	0.020	<0.01	<0.01	0.024	<0.017	-
	Benzo(b&j)fluoranthene	mg/kg	0.032	0.086	0.012	< 0.010	0.069	<0.01	0.032	0.086	0.042	0.034
	Benzo(b+j+k)fluoranthene	mg/kg	0.032	0.086	< 0.015	< 0.015	0.069	<0.015	0.032	0.086	0.043	0.032
	Benzo(g,h,i)perylene	mg/kg	< 0.020	0.035	< 0.010	< 0.010	0.030	<0.01	<0.01	0.035	<0.021	-
	Benzo(k)fluoranthene	mg/kg	< 0.020	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.02	<0.012	-
	Chrysene	mg/kg	0.080	0.157	0.032	0.017	0.146	0.017	0.08	0.157	0.086	0.064
	Dibenz(a,h)anthracene	mg/kg	< 0.010	0.0145	< 0.005	< 0.005	0.0123	<0.005	<0.005	0.0145	<0.009	-
	Fluoranthene	mg/kg	0.025	0.044	< 0.010	< 0.010	0.026	<0.01	0.025	0.044	0.023	0.014
	Fluorene	mg/kg	< 0.020	0.016	< 0.010	< 0.010	< 0.010	<0.01	<0.01	0.016	<0.013	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.020	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.02	<0.012	-
	2-Methylnaphthalene	mg/kg	0.055	0.107	0.024	0.011	0.057	0.011	0.055	0.107	0.051	0.037
	Naphthalene	mg/kg	0.028	0.052	0.015	< 0.01	0.030	<0.01	0.028	0.052	0.027	0.016
	Phenanthrene	mg/kg	0.150	0.287	0.063	0.027	0.177	0.027	0.15	0.287	0.141	0.102
	Pyrene	mg/kg	0.034	0.071	0.013	< 0.01	0.048	<0.01	0.034	0.071	0.035	0.025
	Acenaphthene d10	%	73.4	68.5	69.8	72.2	89.6	68.5	72.2	89.6	74.7	8.5
	Chrysene d12	%	77.1	73.4	75.3	83.5	119.4	73.4	77.1	119.4	86	19
	Naphthalene d8	%	73.6	71.9	74.3	79.4	74.4	71.9	74.3	79.4	74.7	2.8
	Phenanthrene d10	%	79.0	75.9	75.8	79.00	101.2	75.8	79	101.2	82	11
	B(a)P Total Potency Equivalent	mg/kg	0.024	0.055	< 0.02	< 0.02	0.046	<0.02	0.024	0.055	0.033	0.016
	IACR (CCME)	mg/kg	0.43	0.93	0.17	< 0.15	0.77	<0.15	0.43	0.93	0.49	0.351

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.3: Sediment Quality in Reference Areas and Associated Summary Statistics, 2015

Analytes		Units	Elk River Watershed									
			Unnamed Wetland near Elk River north of Elkford									
			REFF-1	REFF-2	REFF-3	REFF-4	REFF-5	Minimum	Median	Maximum	Mean	Standard Deviation
			15-Aug-15	15-Aug-15	15-Aug-15	15-Aug-15	15-Aug-15					
Physical Tests	% Moisture	%	89.8	91.9	86.9	92.7	90.0	86.9	90.0	92.7	90.3	2.2
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	7.80	7.80	7.93	7.70	7.69	7.69	7.80	7.93	7.78	0.10
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	6.21	2.18	8.09	1.56	6.57	1.56	6.21	8.09	4.92	2.88
	% Sand (2.00mm - 1.00mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	%	< 0.10	< 0.10	0.15	< 0.10	< 0.10	<0.1	<0.1	0.15	<0.11	-
	% Sand (0.50mm - 0.25mm)	%	0.29	< 0.10	0.7	0.16	0.38	<0.1	0.29	0.7	0.326	0.236
	% Sand (0.25mm - 0.125mm)	%	1.52	0.4	2.71	0.42	2.34	0.4	1.52	2.71	1.48	1.07
	% Sand (0.125mm - 0.063mm)	%	4.3	1.63	4.51	0.93	3.79	0.93	3.79	4.51	3.03	1.64
	% Silt (0.063mm - 4um)	%	84.7	85.7	77.3	83.7	80.6	77.3	83.7	85.7	82.4	3.4
	% Silt (0.063mm - 0.0312mm)	%	38.3	37.81	34.11	34.93	35.62	34.11	35.62	38.3	36.2	1.8
	% Silt (0.0312mm - 0.004mm)	%	46.35	47.92	43.16	48.76	45	43.16	46.35	48.76	46.2	2.2
	% Clay (<4um)	%	9.13	12.1	14.7	14.8	12.8	9.13	12.8	14.8	12.7	2.3
	Texture	-	Silt	Silt	Silt loam	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	13.7	9.09	6.02	12.7	8.00	6.02	9.09	13.7	9.9	3.20
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	418	304	204	407	263	204	304	418	319	92
	Antimony (Sb)	mg/kg	0.13	0.11	< 0.10	0.13	< 0.10	<0.1	0.11	0.13	0.11	0.02
	Arsenic (As)	mg/kg	0.32	0.28	0.13	0.32	0.22	0.13	0.28	0.32	0.25	0.08
	Barium (Ba)	mg/kg	234	225	258	208	249	208	234	258	235	20
	Beryllium (Be)	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Cadmium (Cd)	mg/kg	0.140	0.083	0.070	0.149	0.069	0.069	0.083	0.149	0.102	0.039
	Calcium (Ca)	mg/kg	138,000	156,000	180,000	134,000	170,000	134,000	156,000	180,000	155,600	19,870
	Chromium (Cr)	mg/kg	3.72	2.95	2.24	4.12	2.56	2.24	2.95	4.12	3.12	0.79
	Cobalt (Co)	mg/kg	0.19	0.17	< 0.10	0.19	0.11	<0.1	0.17	0.19	0.15	0.04
	Copper (Cu)	mg/kg	1.28	1.11	< 0.50	1.35	0.67	<0.5	1.11	1.35	0.98	0.38
	Iron (Fe)	mg/kg	455	362	284	456	315	284	362	456	374	79
	Lead (Pb)	mg/kg	1.87	2.45	0.61	3.23	4.06	0.6	2.5	4.1	2.4	1.3
	Lithium (Li)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Magnesium (Mg)	mg/kg	2,270	2,630	2,930	2,410	2,920	2,270	2,630	2,930	2,632	297
	Manganese (Mn)	mg/kg	42.5	41.6	38.7	39.6	39.7	38.7	39.7	42.5	40.4	1.6
	Mercury (Hg)	mg/kg	0.0160	0.0069	< 0.0050	0.0233	< 0.0050	<0.005	0.0069	0.0233	0.0112	0.0081
	Molybdenum (Mo)	mg/kg	0.92	0.72	0.14	1.46	0.26	0.14	0.72	1.46	0.7	0.53
	Nickel (Ni)	mg/kg	0.92	1.39	< 0.50	1.10	0.78	<0.5	0.92	1.39	0.94	0.33
	Phosphorus (P)	mg/kg	93.0	68.0	50.0	112	69.0	<50	69	112	78	24
	Potassium (K)	mg/kg	< 100	< 100	< 100	< 100	110	<100	<100	110	<102	-
	Selenium (Se)	mg/kg	3.08	1.72	0.88	3.00	1.06	0.88	1.72	3.08	1.95	1.05
	Silver (Ag)	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Sodium (Na)	mg/kg	< 50	< 50	< 50	< 50	< 50	<50	<50	<50	<50	-
	Strontium (Sr)	mg/kg	106	104	121	98.2	113	98.2	106	121	108	9
	Thallium (Tl)	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	-
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	10.8	8.7	6.9	11.7	7.8	6.9	8.7	11.7	9.2	2
	Uranium (U)	mg/kg	1.24	0.978	0.342	1.69	0.393	0.342	0.978	1.69	0.93	0.57
	Vanadium (V)	mg/kg	1.34	1.18	0.73	1.46	0.87	0.73	1.18	1.46	1.12	0.31
	Zinc (Zn)	mg/kg	6.3	10.6	3.6	5.8	3.7	3.6	5.8	230.0	50.0	101.0
	Zirconium (Zr)	mg/kg	2.0	< 1.0	< 1.0	< 1.0	< 1.0	<1	<1	2	<1.2	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.015	< 0.020	< 0.015	< 0.020	< 0.015	<0.015	<0.015	<0.02	<0.017	-
	Acenaphthylene	mg/kg	< 0.015	< 0.020	< 0.015	< 0.020	< 0.015	<0.015	<0.015	<0.02	<0.017	-
	Anthracene	mg/kg	< 0.012	< 0.016	< 0.012	< 0.016	< 0.012	<0.012	<0.012	<0.016	<0.0136	-
	Benz(a)anthracene	mg/kg	< 0.030	< 0.040	< 0.030	< 0.040	< 0.030	<0.03	<0.03	<0.04	<0.034	-
	Benzo(a)pyrene	mg/kg	< 0.03	< 0.04	< 0.03	< 0.04	< 0.03	<0.03	<0.03	<0.04	<0.034	-
	Benzo(b&j)fluoranthene	mg/kg	< 0.03	< 0.04	< 0.03	< 0.04	< 0.03	<0.03	<0.03	<0.04	<0.034	-
	Benzo(b+j+k)fluoranthene	mg/kg	< 0.04	< 0.06	< 0.04	< 0.06	< 0.04	<0.042	<0.042	<0.057	<0.048	-
	Benzo(g,h,i)perylene	mg/kg	< 0.03	< 0.04	< 0.03	< 0.04	< 0.03	<0.03	<0.03	<0.04	<0.034	-
	Benzo(k)fluoranthene	mg/kg	< 0.03	< 0.04	< 0.03	< 0.04	< 0.03	<0.03	<0.03	<0.04	<0.034	-
	Chrysene	mg/kg	0.040	0.054	0.062	0.044	0.037	0.037	0.044	0.062	0.047	0.01
	Dibenz(a,h)anthracene	mg/kg	< 0.015	< 0.020	< 0.015	< 0.020	< 0.015	<0.015	<0.015	<0.02	<0.017	-
	Fluoranthene	mg/kg	< 0.030	< 0.040	< 0.030	< 0.040	< 0.030	<0.03	<0.03	<0.04	<0.034	-
	Fluorene	mg/kg	< 0.030	0.045	0.047	< 0.040	< 0.030	<0.03	<0.03	0.047	<0.038	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.030	< 0.040	< 0.030	< 0.040	< 0.030	<0.03	<0.03	<0.04	<0.034	-
	2-Methylnaphthalene	mg/kg	0.168	0.313	0.339	0.209	0.211	0.168	0.211	0.339	0.248	0.074
	Naphthalene	mg/kg	0.047	0.093	0.091	0.057	0.065	0.047	0.065	0.093	0.071	0.021
	Phenanthrene	mg/kg	0.110	0.176	0.198	0.132	0.118	0.11	0.132	0.198	0.147	0.038
	Pyrene	mg/kg	< 0.03	< 0.04	< 0.03	< 0.04	< 0.03	<0.03	<0.03	<0.04	<0.034	-
	Acenaphthene d10	%	88.7	99	116.5	79.6	75.5	75.5	88.7	116.5	92	16
	Chrysene d12	%	108.8	112.9	108.5	97.7	96.3	96.3	108.5	112.9	105	7
	Naphthalene d8	%	98.7	111.4	104.3	90.8	86.4	86.4	98.7	111.4	98	10
	Phenanthrene d10	%	97.3	105.3	121.6	85.3	82.2	82.2	97.3	121.6	98	16
	B(a)P Total Potency Equivalent	mg/kg	0.029	0.039	0.029	0.039	0.029	0.029	0.029	0.039	0.033	0.005
	IACR (CCME)	mg/kg	0.33	0.44	0.34	0.44	0.33	0.33	0.34	0.44	0.376	0.059

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.3: Sediment Quality in Reference Areas and Associated Summary Statistics, 2015

Analytes		Units	Elk River Watershed									
			Elk Lakes									
			EL14-1	EL14-2	EL14-3	EL14-4	EL14-5	Minimum	Median	Maximum	Mean	Standard Deviation
			13-Aug-15	13-Aug-15	13-Aug-15	13-Aug-15	13-Aug-15					
Physical Tests	% Moisture	%	54.2	71.9	60.5	82.1	68.9	54.2	68.9	82.1	67.5	10.7
	pH (1:9)	pH units	-	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	8.07	7.58	8.09	7.47	7.56	7.47	7.58	8.09	7.75	0.30
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	44.2	5.51	< 0.10	<0.1	<0.1	44.2	<10	-
	% Sand (2.0mm - 0.063mm)	%	60.0	32.1	14.9	9.18	12.3	9.18	14.9	60	25.7	21.1
	% Sand (2.00mm - 1.00mm)	%	< 0.10	1.41	2.13	1.59	0.15	<0.1	1.41	2.13	1.08	0.91
	% Sand (1.00mm - 0.50mm)	%	0.31	1.42	1.43	0.81	0.62	0.31	0.81	1.43	0.92	0.5
	% Sand (0.50mm - 0.25mm)	%	4.08	4.46	2.65	1.13	0.88	0.88	2.65	4.46	2.64	1.64
	% Sand (0.25mm - 0.125mm)	%	36.8	12.0	4.24	2.14	2.25	2.14	4.24	36.8	11.5	14.7
	% Sand (0.125mm - 0.063mm)	%	18.7	12.7	4.42	3.51	8.40	3.51	8.4	18.7	9.5	6.3
	% Silt (0.063mm - 4um)	%	31.4	57.7	22.2	66.7	78.3	22.2	57.7	78.3	51.3	23.7
	% Silt (0.063mm - 0.0312mm)	%	14.7	22.4	6.41	23.4	33.9	6.41	22.4	33.9	20.2	10.3
	% Silt (0.0312mm - 0.004mm)	%	16.8	35.4	15.8	43.3	44.3	15.8	35.4	44.3	31.1	14
	% Clay (<4um)	%	8.59	10.2	18.8	18.7	9.41	8.59	10.2	18.8	13.1	5.2
	Texture	-	Sandy loam	Silt loam	Clay loam	Silt loam	Silt loam / Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	5.22	6.01	2.86	7.41	3.68	2.86	5.22	7.41	5.04	1.82
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	1,430	3,860	7,670	7,680	5,530	1,430	5,530	7,680	5,234	2,663
	Antimony (Sb)	mg/kg	< 0.10	0.35	0.56	0.40	0.21	<0.1	0.35	0.56	0.32	0.18
	Arsenic (As)	mg/kg	0.73	6.20	5.83	6.12	6.44	0.73	6.12	6.44	5.06	2.43
	Barium (Ba)	mg/kg	7.31	17.7	75.6	46.2	29.6	7.31	29.6	75.6	35.3	26.8
	Beryllium (Be)	mg/kg	< 0.10	0.23	0.48	0.45	0.26	<0.1	0.26	0.48	0.3	0.16
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	< 5.0	6.3	12.4	12.3	8.1	<5	8.1	12.4	8.8	3.4
	Cadmium (Cd)	mg/kg	0.259	1.27	1.12	2.70	1.32	0.259	1.270	2.700	1.330	0.880
	Calcium (Ca)	mg/kg	64,900	100,000	226,000	82,200	95,400	64,900	95,400	226,000	113,700	64,241
	Chromium (Cr)	mg/kg	4.27	15.0	25.4	21.9	16.3	4.27	16.3	25.4	16.6	8.1
	Cobalt (Co)	mg/kg	0.58	2.94	4.16	5.14	3.56	0.58	3.56	5.14	3.28	1.71
	Copper (Cu)	mg/kg	1.59	3.71	8.99	8.74	4.88	1.59	4.88	8.99	5.58	3.22
	Iron (Fe)	mg/kg	1,270	8,960	9,230	8,650	7,660	1,270	8,650	9,230	7,154	3,342
	Lead (Pb)	mg/kg	1.19	2.88	5.63	8.46	4.31	1.2	4.3	8.5	4.5	2.8
	Lithium (Li)	mg/kg	5.8	23.6	17.0	24.0	21.7	5.8	21.7	24	18.4	7.6
	Magnesium (Mg)	mg/kg	16,900	15,100	46,300	23,700	15,400	15,100	16,900	46,300	23,480	13,225
	Manganese (Mn)	mg/kg	53.4	144	358	120	81.1	53.4	120	358	151	121
	Mercury (Hg)	mg/kg	0.0580	0.0617	0.0278	0.129	0.0474	0.0278	0.0580	0.1290	0.0648	0.0382
	Molybdenum (Mo)	mg/kg	0.20	0.96	1.27	1.00	1.97	0.2	1	1.97	1.08	0.64
	Nickel (Ni)	mg/kg	5.12	21.1	24.4	30.2	20.4	5.12	21.1	30.2	20.2	9.3
	Phosphorus (P)	mg/kg	149	324	621	600	449	149	449	621	429	197
	Potassium (K)	mg/kg	410	1,080	2,500	2,280	1,540	410	1,540	2,500	1,562	860
	Selenium (Se)	mg/kg	0.21	1.15	0.99	1.86	0.99	0.21	0.99	1.86	1.04	0.59
	Silver (Ag)	mg/kg	< 0.10	0.10	0.19	0.23	0.13	<0.1	0.13	0.23	0.15	0.06
	Sodium (Na)	mg/kg	< 50	75	154	119	169	<50	119	169	113	51
	Strontium (Sr)	mg/kg	36.4	66.3	175	78.2	91.9	36.4	78.2	175	90	52
	Thallium (Tl)	mg/kg	0.074	0.225	0.292	0.536	0.280	0.074	0.28	0.536	0.28	0.17
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	8.8	31.7	31.8	63.3	59.1	8.8	31.8	63.3	38.9	22.4
	Uranium (U)	mg/kg	0.242	0.854	1.48	0.941	0.516	0.242	0.854	1.48	0.81	0.47
	Vanadium (V)	mg/kg	7.44	20.4	37.1	40.1	22.6	7.44	22.6	40.1	25.5	13.3
	Zinc (Zn)	mg/kg	25.1	110	97.8	198	101	25.1	101.0	198.0	106.0	61.0
	Zirconium (Zr)	mg/kg	< 1.0	1.1	1.7	4.7	1.5	<1	1.5	4.7	2	1.54
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.010	< 0.005	<0.005	<0.005	<0.01	<0.006	-
	Acenaphthylene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.010	< 0.005	<0.005	<0.005	<0.01	<0.006	-
	Anthracene	mg/kg	< 0.004	< 0.004	0.0050	< 0.008	< 0.004	<0.004	<0.004	0.005	<0.005	-
	Benz(a)anthracene	mg/kg	< 0.010	< 0.010	0.013	< 0.020	< 0.010	<0.01	<0.01	0.013	<0.013	-
	Benzo(a)pyrene	mg/kg	< 0.010	< 0.010	< 0.010	< 0.020	< 0.010	<0.01	<0.01	<0.02	<0.012	-
	Benzo(b&j)fluoranthene	mg/kg	< 0.010	< 0.010	0.024	0.057	< 0.010	<0.01	<0.01	0.057	<0.022	-
	Benzo(b+j+k)fluoranthene	mg/kg	< 0.015	< 0.015	0.024	0.057	< 0.015	<0.015	<0.015	0.057	<0.025	-
	Benzo(g,h,i)perylene	mg/kg	< 0.010	< 0.010	0.013	0.023	< 0.010	<0.01	<0.01	0.023	<0.013	-
	Benzo(k)fluoranthene	mg/kg	< 0.010	< 0.010	< 0.010	< 0.020	< 0.010	<0.01	<0.01	<0.02	<0.012	-
	Chrysene	mg/kg	< 0.010	< 0.010	0.050	0.081	0.014	<0.01	0.014	0.081	0.033	0.032
	Dibenz(a,h)anthracene	mg/kg	< 0.005	< 0.005	< 0.005	< 0.010	< 0.005	<0.005	<0.005	<0.01	<0.006	-
	Fluoranthene	mg/kg	< 0.010	< 0.010	0.017	0.028	< 0.010	<0.01	<0.01	0.028	<0.015	-
	Fluorene	mg/kg	< 0.010	< 0.010	0.024	0.028	< 0.010	<0.01	<0.01	0.028	<0.016	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.010	< 0.010	< 0.010	< 0.020	< 0.010	<0.01	<0.01	<0.02	<0.012	-
	2-Methylnaphthalene	mg/kg	0.027	< 0.010	0.062	0.067	0.015	<0.01	0.027	0.067	0.036	0.027
	Naphthalene	mg/kg	< 0.010	< 0.010	< 0.010	0.033	< 0.010	<0.01	<0.01	0.033	<0.015	-
	Phenanthrene	mg/kg	0.022	< 0.010	0.120	0.145	0.030	<0.01	0.03	0.145	0.065	0.062
	Pyrene	mg/kg	< 0.010	< 0.010	0.027	0.035	< 0.010	<0.01	<0.01	0.035	<0.018	-
	Acenaphthene d10	%	68.0	60.9	71.3	87.4	75.3	60.9	71.3	87.4	72.6	9.8
	Chrysene d12	%	67.2	60.8	69.4	119	78.6	60.8	69.4	118.7	79	23
	Naphthalene d8	%	78.4	66.5	77.8	64.5	80.3	64.5	77.8	80.3	73.5	7.4
	Phenanthrene d10	%	69.8	60.2	72.0	103	80.4	60.2	72	103	77	16
	B(a)P Total Potency Equivalent	mg/kg	< 0.020	< 0.020	< 0.020	0.025	< 0.020	<0.02	<0.02	0.025	<0.021	-
	IACR (CCME)	mg/kg	< 0.15	< 0.15	0.28	0.54	< 0.15	<0.15	<0.15	0.54	<0.254	-

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.3: Sediment Quality in Reference Areas and Associated Summary Statistics, 2015

Analytes		Units	Flathead River Watershed									
			Flathead River Side Channel									
			FLA1-1	FLA1-2	FLA1-3	FLA1-4	FLA1-5	Minimum	Median	Maximum	Mean	Standard Deviation
			9-Aug-15	9-Aug-15	9-Aug-15	9-Aug-15	9-Aug-15					
Physical Tests	% Moisture	%	87.4	79.7	63.6	82.6	81.4	63.6	81.4	87.4	78.9	9.0
	pH (1:9)	pH units	8.07	-	-	-	-	-	-	-	-	-
	pH (1:2 soil:water)	pH units	-	7.72	7.95	7.73	7.61	7.61	7.73	7.95	7.75	3.47
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.0mm - 0.063mm)	%	9.45	9.62	33.8	5.07	6.63	5.07	9.45	33.8	12.9	11.8
	% Sand (2.00mm - 1.00mm)	%	0.51	0.54	0.28	0.10	0.25	0.1	0.28	0.54	0.336	0.186
	% Sand (1.00mm - 0.50mm)	%	1.78	0.92	1.43	1.35	1.14	0.92	1.35	1.78	1.32	0.32
	% Sand (0.50mm - 0.25mm)	%	1.98	1.36	3.63	1.41	1.40	1.36	1.41	3.63	1.96	0.97
	% Sand (0.25mm - 0.125mm)	%	2.59	2.82	12.2	0.98	1.61	0.98	2.59	12.2	4	4.6
	% Sand (0.125mm - 0.063mm)	%	2.58	3.97	16.3	1.23	2.24	1.23	2.58	16.3	5.3	6.2
	% Silt (0.063mm - 4um)	%	83.2	83.0	61.6	87.0	86.7	61.6	83.2	87	80.3	10.6
	% Silt (0.063mm - 0.0312mm)	%	35.9	35.3	27.4	37.0	38.1	27.4	35.9	38.1	34.7	4.2
	% Silt (0.0312mm - 0.004mm)	%	47.3	47.7	34.2	50.1	48.6	34.2	47.7	50.1	45.6	6.5
	% Clay (<4um)	%	7.33	7.34	4.59	7.91	6.72	4.59	7.33	7.91	6.78	1.29
	Texture	-	Silt	Silt	Silt loam	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	12.2	9.89	5.58	7.24	8.19	5.58	8.19	12.2	8.6	2.50
Metals (1 mm) (mg/kg)	Aluminum (Al)	mg/kg	8,590	8,100	5,280	5,250	6,960	5,250	6,960	8,590	6,836	1,551
	Antimony (Sb)	mg/kg	0.41	0.24	< 0.20	0.27	0.23	<0.2	0.24	0.41	0.27	0.08
	Arsenic (As)	mg/kg	1.78	1.28	1.03	1.46	1.08	1.03	1.28	1.78	1.33	0.31
	Barium (Ba)	mg/kg	108	102	76.4	86.9	106	76.4	102	108	96	14
	Beryllium (Be)	mg/kg	0.50	0.51	0.31	0.31	0.39	0.31	0.39	0.51	0.4	0.1
	Bismuth (Bi)	mg/kg	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<0.4	<0.4	<0.4	<0.4	-
	Boron (B)	mg/kg	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	0.695	0.699	0.335	0.400	0.462	0.335	0.462	0.699	0.518	0.169
	Calcium (Ca)	mg/kg	93,600	110,000	120,000	147,000	162,000	93,600	120,000	162,000	126,520	27,737
	Chromium (Cr)	mg/kg	18.7	17.8	11.6	10.0	14.7	10	14.7	18.7	14.6	3.8
	Cobalt (Co)	mg/kg	2.88	2.52	1.87	2.06	2.17	1.87	2.17	2.88	2.30	0.40
	Copper (Cu)	mg/kg	11.8	10.3	7.0	7.3	8.2	7	8.2	11.8	8.9	2.1
	Iron (Fe)	mg/kg	7,170	6,080	4,500	4,460	5,570	4,460	5,570	7,170	5,556	1,140
	Lead (Pb)	mg/kg	8.9	7.9	5.4	4.8	5.8	4.8	5.8	8.9	6.6	1.8
	Lithium (Li)	mg/kg	14.6	14.6	7.4	9.8	11.8	7.4	11.8	14.6	11.6	3.1
	Magnesium (Mg)	mg/kg	8,630	9,550	10,600	7,070	7,500	7,070	8,630	10,600	8,670	1,452
	Manganese (Mn)	mg/kg	61.0	55.2	75.6	50.5	49.4	49.4	55.2	75.6	58.3	10.7
	Mercury (Hg)	mg/kg	0.0506	0.0298	0.0355	0.0342	0.0268	0.0268	0.0342	0.0506	0.0354	0.0092
	Molybdenum (Mo)	mg/kg	0.53	0.39	0.20	0.39	0.34	0.2	0.39	0.53	0.37	0.119
	Nickel (Ni)	mg/kg	11.0	10.4	6.7	7.0	8.3	6.7	8.3	11	8.7	2
	Phosphorus (P)	mg/kg	630	630	590	430	600	430	600	630	576	84
	Potassium (K)	mg/kg	1,260	1,150	620	860	1,050	620	1,050	1,260	988	253
	Selenium (Se)	mg/kg	2.58	2.53	1.02	1.32	1.54	1.02	1.54	2.58	1.80	0.72
	Silver (Ag)	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Sodium (Na)	mg/kg	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	mg/kg	46.3	51.3	66.9	54.9	63.0	46.3	54.9	66.9	56.5	8.4
	Thallium (Tl)	mg/kg	0.22	0.21	0.14	0.15	0.16	0.14	0.16	0.22	0.18	0.04
	Tin (Sn)	mg/kg	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	<4	<4	<4	<4	-
	Titanium (Ti)	mg/kg	56.2	55.1	68.9	35.8	54.6	35.8	55.1	68.9	54.1	11.8
	Uranium (U)	mg/kg	0.85	0.65	0.52	0.44	0.45	0.44	0.52	0.85	0.58	0.17
	Vanadium (V)	mg/kg	19.2	16.2	11.9	12.2	14.9	11.9	14.9	19.2	14.9	3
	Zinc (Zn)	mg/kg	63.8	56.0	36.3	42.3	44.7	36.3	44.7	63.8	48.6	11.1
	Zirconium (Zr)	mg/kg	2.5	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	2.5	<2.1	-
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.010	< 0.010	< 0.005	< 0.010	< 0.010	<0.005	<0.01	<0.01	<0.009	-
	Acenaphthylene	mg/kg	< 0.010	< 0.010	< 0.005	< 0.010	< 0.010	<0.005	<0.01	<0.01	<0.009	-
	Anthracene	mg/kg	< 0.008	< 0.008	< 0.004	< 0.008	< 0.008	<0.004	<0.008	<0.008	<0.0072	-
	Benz(a)anthracene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Benzo(a)pyrene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Benzo(b&j)fluoranthene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Benzo(b+j+k)fluoranthene	mg/kg	< 0.028	< 0.028	< 0.015	< 0.028	< 0.028	<0.015	<0.028	<0.028	<0.0254	-
	Benzo(g,h,i)perylene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Benzo(k)fluoranthene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Chrysene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Dibenz(a,h)anthracene	mg/kg	< 0.010	< 0.010	< 0.005	< 0.010	< 0.010	<0.005	<0.01	<0.01	<0.009	-
	Fluoranthene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Fluorene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	2-Methylnaphthalene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Naphthalene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Phenanthrene	mg/kg	< 0.020	< 0.020	0.012	< 0.020	< 0.020	<0.02	<0.02	0.012	<0.018	-
	Pyrene	mg/kg	< 0.020	< 0.020	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.018	-
	Acenaphthene d10	%	86.2	82.9	76.2	76.8	65.9	65.9	76.8	86.2	77.6	7.8
	Chrysene d12	%	113.7	111.0	93.2	107.6	88.1	88.1	107.6	113.7	103	11
	Naphthalene d8	%	78.7	74.5	74.8	68.5	56.2	56.2	74.5	78.7	70.5	8.8
	Phenanthrene d10	%	104.5	100.6	87.5	98.9	79.4	79.4	98.9	104.5	94	10
	B(a)P Total Potency Equivalent	mg/kg	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	<0.02	<0.02	<0.02	<0.02	-
	IACR (CCME)	mg/kg	< 0.21	< 0.21	< 0.15	< 0.21	< 0.21	<0.15	<0.21	<0.21	<0.198	-

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Units	Fording River Watershed							
			Henretta Lake							
			HE27-1	HE27-2	HE27-3	Minimum	Median	Maximum	Mean	Standard Deviation
			07-Aug-13	07-Aug-13	07-Aug-13					
Physical Tests	Moisture (%)	%	45.4	42.8	36.2	36.20	42.80	45.40	41.50	4.70
	(63 µm) pH (1:2 soil:water)	pH units	8.05	8.17	8.15	8.05	8.15	8.17	8.12	0.06
	(1mm) pH	pH units	8.29	8.30	8.34	8.29	8.30	8.34	8.31	0.03
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	%	< 0.10	0.39	< 0.10	<0.1	<0.1	0.39	0.20	0.17
	% Sand (1.00mm - 0.50mm)	%	0.47	0.32	0.44	0.32	0.44	0.47	0.41	0.08
	% Sand (0.50mm - 0.25mm)	%	1.39	0.36	2.21	0.36	1.39	2.21	1.32	0.93
	% Sand (0.25mm - 0.125mm)	%	4.86	2.41	16.60	2.41	4.86	16.60	8.00	7.60
	% Sand (0.125mm - 0.063mm)	%	13.80	6.23	21.90	6.23	13.80	21.90	14.00	7.80
	% Silt (0.063mm - 0.0312mm)	%	28.80	28.70	26.20	26.20	28.70	28.80	27.90	1.50
	% Silt (0.0312mm - 0.004mm)	%	41.50	48.20	27.30	27.30	41.50	48.20	39.00	10.70
	% Clay (<4um)	%	9.13	13.40	5.31	5.31	9.13	13.40	9.30	4.00
	Texture	-	Silt loam	Silt	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	%	7.41	8.82	7.59	7.41	7.59	8.82	7.94	0.77
Metals (<63 µm) (mg/kg)	Aluminum (Al)	mg/kg	5,780	6,470	5,090	5,090	5,780	6,470	5,780	690.00
	Antimony (Sb)	mg/kg	0.42	0.49	0.32	0.32	0.42	0.49	0.41	0.09
	Arsenic (As)	mg/kg	3.65	3.93	3.05	3.05	3.65	3.93	3.54	0.45
	Barium (Ba)	mg/kg	124	166	93	92.80	124.00	166.00	128.00	37.00
	Beryllium (Be)	mg/kg	0.44	0.46	0.34	0.34	0.44	0.46	0.41	0.06
	Bismuth (Bi)	mg/kg	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Boron (B)	mg/kg	5.7	7.0	6.1	5.70	6.10	7.00	6.27	0.67
	Cadmium (Cd)	mg/kg	0.75	0.89	0.61	0.61	0.75	0.89	0.75	0.14
	Calcium (Ca)	mg/kg	146,000	146,000	157,000	146,000	146,000	157,000	149,667	6,351
	Chromium (Cr)	mg/kg	13.4	14.1	11.6	11.60	13.40	14.10	13.00	1.30
	Cobalt (Co)	mg/kg	4.35	5.43	3.34	3.34	4.35	5.43	4.37	1.05
	Copper (Cu)	mg/kg	9.99	11.0	7.10	7.10	9.99	11.00	9.40	2.00
	Iron (Fe)	mg/kg	8,620	8,270	7,520	7,520	8,270	8,620	8,137	562.00
	Lead (Pb)	mg/kg	6.69	7.23	5.08	5.08	6.69	7.23	6.33	1.12
	Lithium (Li)	mg/kg	15.3	16.6	13.8	13.80	15.30	16.60	15.20	1.40
	Magnesium (Mg)	mg/kg	37,200	33,900	43,000	33,900	37,200	43,000	38,033	4,607
	Manganese (Mn)	mg/kg	311	379	247	247.00	311.00	379.00	312.00	66.00
	Mercury (Hg)	mg/kg	0.049	0.052	0.033	0.03	0.05	0.05	0.04	0.01
	Molybdenum (Mo)	mg/kg	1.12	1.30	0.88	0.88	1.12	1.30	1.10	0.21
	Nickel (Ni)	mg/kg	18.9	21.3	14.7	14.70	18.90	21.30	18.30	3.30
	Phosphorus (P)	mg/kg	893	893	813	813.00	893.00	893.00	866.00	46.00
	Potassium (K)	mg/kg	1,330	1,590	1,290	1,290	1,330	1,590	1,403	163.00
	Selenium (Se)	mg/kg	0.88	0.88	0.72	0.72	0.88	0.88	0.83	0.09
	Silver (Ag)	mg/kg	0.184	0.209	0.126	0.13	0.18	0.21	0.17	0.04
	Sodium (Na)	mg/kg	130	120	140	120.00	130.00	140.00	130.00	10.00
	Strontium (Sr)	mg/kg	85	91	81	81.00	84.70	91.10	85.60	5.10
	Thallium (Tl)	mg/kg	0.158	0.167	0.138	0.14	0.16	0.17	0.15	0.02
	Tin (Sn)	mg/kg	0.77	0.50	0.31	0.31	0.50	0.77	0.53	0.23
	Titanium (Ti)	mg/kg	40.1	37.2	40.1	37.20	40.10	40.10	39.10	1.70
	Uranium (U)	mg/kg	0.87	0.87	0.73	0.73	0.87	0.87	0.82	0.08
	Vanadium (V)	mg/kg	19.6	22.6	17.3	17.30	19.60	22.60	19.80	2.70
	Zinc (Zn)	mg/kg	88.0	95.5	69.6	69.60	88.00	95.50	84.40	13.30
Metals (<1 mm) (mg/kg)	Aluminum (Al)	mg/kg	6,250	6,650	4,800	4,800	6,250	6,650	5,900	973.40
	Antimony (Sb)	mg/kg	0.43	0.53	0.34	0.34	0.43	0.53	0.43	0.10
	Arsenic (As)	mg/kg	3.53	3.90	2.91	2.91	3.53	3.90	3.45	0.50
	Barium (Ba)	mg/kg	130	155	107	107.00	130.00	155.00	130.67	24.01
	Beryllium (Be)	mg/kg	0.43	0.47	0.35	0.35	0.43	0.47	0.42	0.06
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	mg/kg	0.80	0.92	0.56	0.56	0.80	0.92	0.76	0.18
	Calcium (Ca)	mg/kg	138,000	139,000	141,000	138,000	139,000	141,000	139,333	1,528
	Chromium (Cr)	mg/kg	13.8	14.8	10.6	10.60	13.80	14.80	13.10	2.20
	Cobalt (Co)	mg/kg	4.50	5.65	3.50	3.50	4.50	5.65	4.55	1.08
	Copper (Cu)	mg/kg	9.8	11.3	7.4	7.38	9.83	11.30	9.50	2.00
	Iron (Fe)	mg/kg	8,730	9,150	7,220	7,220	8,730	9,150	8,367	1,015
	Lead (Pb)	mg/kg	6.84	7.49	5.32	5.32	6.84	7.49	6.55	1.11
	Lithium (Li)	mg/kg	14.8	15.1	10.6	10.60	14.80	15.10	13.50	2.50
	Magnesium (Mg)	mg/kg	33,700	32,700	35,800	32,700	33,700	35,800	34,067	1,582
	Manganese (Mn)	mg/kg	313	371	237	237.00	313.00	371.00	307.00	67.20
	Mercury (Hg)	mg/kg	0.044	0.051	0.031	0.03	0.04	0.05	0.04	0.01
	Molybdenum (Mo)	mg/kg	1.09	1.31	0.94	0.94	1.09	1.31	1.11	0.19
	Nickel (Ni)	mg/kg	19.4	22.5	14.5	14.50	19.40	22.50	18.80	4.00
	Phosphorus (P)	mg/kg	861	844	751	751.00	844.00	861.00	819.00	59.00
	Potassium (K)	mg/kg	1,500	1,670	1,260	1,260	1,500	1,670	1,477	206.00
	Selenium (Se)	mg/kg	0.95	0.98	0.70	0.70	0.95	0.98	0.88	0.15
	Silver (Ag)	mg/kg	0.18	0.20	0.11	0.11	0.18	0.20	0.16	0.05
	Sodium (Na)	mg/kg	130	120	140	120.00	130.00	140.00	130.00	10.00
	Strontium (Sr)	mg/kg	83.5	88.3	82.3	82.30	83.50	88.30	84.70	3.17
	Thallium (Tl)	mg/kg	0.179	0.191	0.141	0.14	0.18	0.19	0.17	0.03
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	36.5	39.3	24.0	24.00	36.50	39.30	33.27	8.15
	Uranium (U)	mg/kg	0.92	0.93	0.74	0.74	0.92	0.93	0.86	0.11
	Vanadium (V)	mg/kg	21.3	23.6	17.5	17.50	21.30	23.60	20.80	3.10
	Zinc (Zn)	mg/kg	85.2	95.3	66.2	66.20	85.20	95.30	82.20	14.80
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.050	< 0.090	< 0.050	<0.05	<0.05	<0.09	<0.0633	-
	Acenaphthylene	mg/kg	< 0.007	< 0.020	< 0.007	<0.007	<0.007	<0.02	<0.0113	-
	Anthracene	mg/kg	< 0.020	< 0.040	< 0.030	<0.02	<0.03	<0.04	<0.03	-
	Benz(a)anthracene	mg/kg	0.028	0.046	0.034	0.03	0.03	0.05	0.04	0.01
	Benzo(a)pyrene	mg/kg	0.014	0.026	0.022	0.01	0.02	0.03	0.02	0.01
	Benzo(b)fluoranthene	mg/kg	0.078	0.117	0.078	0.08	0.08	0.12	0.09	0.02
	Benzo(b+j+k)fluoranthene	mg/kg	0.078	0.117	0.078	0.08	0.08	0.12	0.09	0.02
	Benzo(g,h,i)perylene	mg/kg	0.022	0.032	0.023	0.02	0.02	0.03	0.03	0.01
	Benzo(k)fluoranthene	mg/kg	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	mg/kg	0.11	< 0.20	0.10	<0.2	0.10	0.11	0.14	0.06
	Dibenz(a,h)anthracene	mg/kg	0.015	0.021	0.015	0.01	0.01	0.02	0.02	0.00
	Fluoranthene	mg/kg	< 0.030	< 0.040	< 0.020	<0.02	<0.03	<0.04	<0.03	-
	Fluorene	mg/kg	< 0.08	< 0.20	< 0.09	<0.08	<0.09	<0.2	<0.123	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	mg/kg	0.65	1.05	0.72	0.65	0.72	1.05	0.81	0.21
	Naphthalene	mg/kg	0.138	0.213	0.154	0.14	0.15	0.21	0.17	0.04
	Phenanthrene	mg/kg	0.589	0.940	0.603	0.59	0.60	0.94	0.71	0.20
	Pyrene	mg/kg	0.044	0.061	0.038	0.04	0.04	0.06	0.05	0.01
	Acenaphthene d10	%	82.4	84.8	83.9	82.40	84.80	84.80	83.70	1.20
	Chrysene d12	%	94.4	98.6	101	94.40	101.00	101.00	98.00	3.00
	Naphthalene d8	%	81	75	83.7	75.00	83.70	83.70	79.90	4.50
	Phenanthrene d10	%	95.7	96.3	100.5	95.70	100.50	100.50	98.00	3.00
	B(a)P Total Potency Equivalent	mg/kg	0.042	0.066	0.05	0.04	0.07	0.07	0.05	0.01
	IACR (CCME)	mg/kg	0.76	1.12	0.8	0.76	1.12	1.12	0.89	0.20

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Fording River Watershed									
		Fording River Oxbow									
		FO10-1	FO10-2	FO10-3	FO10-4	FO10-5	Minimum	Median	Maximum	Mean	Standard Deviation
		14-Aug-13	14-Aug-13	14-Aug-13	14-Aug-13	14-Aug-13					
Physical Tests	Moisture (%)	47.4	50.5	62.6	58.3	56.9	47.4	56.9	62.6	55.1	6.1
	(63 µm) pH (1:2 soil:water)	8.34	8.19	8.20	7.97	7.90	7.9	8.19	8.34	8.12	0.18
	(1mm) pH	8.17	7.93	7.94	7.86	7.75	7.75	7.93	8.17	7.93	0.15
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	0.22	0.39	0.12	0.30	< 0.10	<0.1	0.22	0.39	0.226	0.122
	% Sand (1.00mm - 0.50mm)	0.89	0.55	0.14	1.13	0.44	0.14	0.55	1.13	0.63	0.39
	% Sand (0.50mm - 0.25mm)	4.52	1.12	0.73	3.35	2.24	0.73	2.24	4.52	2.39	1.57
	% Sand (0.25mm - 0.125mm)	11.80	6.80	7.34	10.00	9.96	6.8	9.96	11.8	9.2	2.1
	% Sand (0.125mm - 0.063mm)	18.60	19.50	22.30	16.80	16.70	16.7	18.6	22.3	18.8	2.3
	% Silt (0.063mm - 0.0312mm)	29.20	33.20	32.50	31.10	32.30	29.2	32.3	33.2	31.7	1.6
	% Silt (0.0312mm - 0.004mm)	30.00	33.70	31.80	32.20	33.40	30	32.2	33.7	32.2	1.5
	% Clay (<4um)	4.78	4.80	5.07	5.08	4.91	4.78	4.91	5.08	4.93	0.14
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	6.63	6.56	6.79	7.83	8.43	6.56	6.79	8.43	7.25	0.84
Metals (<63 µm) (mg/kg)	Aluminum (Al)	5,880	5,370	5,960	6,360	6,410	5,370	5,960	6,410	5,996	421
	Antimony (Sb)	0.52	0.53	0.54	0.67	0.54	0.52	0.54	0.67	0.56	0.062
	Arsenic (As)	4.09	4.04	4.25	5.08	3.78	3.78	4.09	5.08	4.25	0.49
	Barium (Ba)	170	165	185	236	197	165	185	236	191	28
	Beryllium (Be)	0.43	0.43	0.46	0.46	0.44	0.43	0.44	0.46	0.444	0.015
	Bismuth (Bi)	0.11	0.10	0.11	0.10	< 0.10	<0.1	0.1	0.11	0.104	0.005
	Boron (B)	5.8	< 5.0	6.0	6.9	7.2	<5	6	7.2	6.18	0.88
	Cadmium (Cd)	0.963	0.967	1.19	1.04	0.954	0.954	0.967	1.19	1.02	0.1
	Calcium (Ca)	55,200	54,900	58,600	51,100	55,800	51,100	55,200	58,600	55,120	2,683
	Chromium (Cr)	11.8	10.9	12.0	12.3	12.5	10.9	12	12.5	11.9	0.6
	Cobalt (Co)	4.26	4.29	4.68	4.61	4.13	4.13	4.29	4.68	4.39	0.24
	Copper (Cu)	11.10	11.20	12.10	10.90	10.70	10.7	11.1	12.1	11.2	0.5
	Iron (Fe)	11,400	11,200	11,600	17,300	11,800	11,200	11,600	17,300	12,660	2,603
	Lead (Pb)	6.95	6.78	7.20	7.00	6.51	6.51	6.95	7.2	6.89	0.26
	Lithium (Li)	8.6	8.7	9.2	9.2	9.1	8.6	9.1	9.2	8.96	0.29
	Magnesium (Mg)	17,700	17,400	18,200	16,800	17,100	16,800	17,400	18,200	17,440	541
	Manganese (Mn)	338	307	350	426	281	281	338	426	340	55
	Mercury (Hg)	0.047	0.049	0.050	0.047	0.049	0.0472	0.0489	0.0501	0.049	0.001
	Molybdenum (Mo)	1.14	1.24	1.34	1.44	1.36	1.14	1.34	1.44	1.3	0.12
	Nickel (Ni)	19.8	20.8	23.9	20.0	17.9	17.9	20	23.9	20.5	2.2
	Phosphorus (P)	1,180	1,240	1,270	1,350	1,270	1,180	1,270	1,350	1,262	61
	Potassium (K)	1,420	1,240	1,410	1,570	1,660	1,240	1,420	1,660	1,460	162
	Selenium (Se)	1.74	1.83	2.72	4.87	2.75	1.74	2.72	4.87	2.78	1.26
	Silver (Ag)	0.173	0.191	0.198	0.191	0.181	0.173	0.191	0.198	0.187	0.01
	Sodium (Na)	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	54	51	55	52	54	51.3	54	55.1	53.4	1.6
	Thallium (Tl)	0.173	0.169	0.188	0.186	0.182	0.169	0.182	0.188	0.18	0.008
	Tin (Sn)	0.29	0.27	0.28	0.29	0.29	0.27	0.29	0.29	0.284	0.009
	Titanium (Ti)	16.3	21.1	18.5	22.6	25.3	16.3	21.1	25.3	20.8	3.5
	Uranium (U)	0.88	0.92	0.93	0.94	0.96	0.884	0.934	0.961	0.927	0.028
	Vanadium (V)	25.8	23.8	25.9	28.3	26.9	23.8	25.9	28.3	26.1	1.7
	Zinc (Zn)	85.0	87.9	97.6	89.4	81.6	81.6	87.9	97.6	88.3	6
Metals (<1 mm) (mg/kg)	Aluminum (Al)	6,740	6,800	6,110	5,250	5,640	5,250	6,110	6,800	6,108	677.03
	Antimony (Sb)	0.60	0.66	0.57	0.69	0.67	0.57	0.66	0.69	0.64	0.05
	Arsenic (As)	4.38	4.33	4.37	5.18	4.46	4.33	4.38	5.18	4.54	0.36
	Barium (Ba)	192	184	172	203	188	172	188	203	187.8	11.32
	Beryllium (Be)	0.54	0.52	0.54	0.51	0.55	0.51	0.54	0.55	0.532	0.016
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	1.12	1.20	1.22	1.10	1.17	1	1	1	1	0
	Calcium (Ca)	47,500	44,600	48,100	35,100	40,300	35,100	44,600	48,100	43,120	5,442
	Chromium (Cr)	12.8	12.8	12.2	10.7	11.7	10.70	12.20	12.80	12.00	0.90
	Cobalt (Co)	5.08	5.38	5.21	4.73	5.03	4.73	5.08	5.38	5.09	0.24
	Copper (Cu)	12.7	13.2	13.1	12.2	13.4	12	13	13	13	1
	Iron (Fe)	11,900	11,700	12,100	15,700	12,700	11,700	12,100	15,700	12,820	1,653
	Lead (Pb)	7.47	7.77	8.00	7.15	7.99	7.15	7.77	8	7.68	0.36
	Lithium (Li)	9.8	9.2	10.3	7.7	8.2	8	9	10	9	1
	Magnesium (Mg)	14,400	14,000	14,300	11,400	12,200	11,400	14,000	14,400	13,260	1,370
	Manganese (Mn)	390	376	396	352	366	352.0000	376.0000	396.0000	376.0000	17.8326
	Mercury (Hg)	0.053	0.063	0.058	0.058	0.058	0.0525	0.0576	0.063	0.058	0.004
	Molybdenum (Mo)	1.24	1.44	1.43	1.35	1.54	1.24	1.43	1.54	1.4	0.11
	Nickel (Ni)	22.5	25.3	25.8	20.8	22.3	20.8	22.5	25.8	23.3	2.1
	Phosphorus (P)	1,290	1,200	1,270	1,280	1,200	1,200	1,270	1,290	1,248	44
	Potassium (K)	1,760	1,800	1,490	1,220	1,310	1,220	1,490	1,800	1,516	260.00
	Selenium (Se)	2.19	2.56	2.97	4.27	3.74	2.19	2.97	4.27	3.15	0.85
	Silver (Ag)	0.19	0.21	0.20	0.17	0.21	0.17	0.2	0.21	0.196	0.017
	Sodium (Na)	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	59.1	55.6	58.1	52.1	52.6	52.1	55.6	59.1	55.5	3.15
	Thallium (Tl)	0.204	0.215	0.200	0.169	0.198	0.169	0.2	0.215	0.197	0.017
	Tin (Sn)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	24.8	23.5	21.4	31.0	20.3	20.3	23.5	31	24.2	4.19
	Uranium (U)	1.03	1.09	1.00	0.95	1.25	0.952	1.03	1.25	1.06	0.12
	Vanadium (V)	29.5	29.2	26.4	25.1	25.6	25.1	26.4	29.5	27.2	2.1
	Zinc (Zn)	91.6	98.5	98.5	94.1	92.0	91.6	94.1	98.5	94.9	3.4
Hydrocarbons (mg/kg)	Acenaphthene	< 0.050	< 0.040	< 0.060	< 0.040	< 0.050	<0.04	<0.05	<0.06	<0.048	-
	Acenaphthylene	0.009	0.006	0.009	0.007	0.008	0.0059	0.0078	0.0092	0.008	0.001
	Anthracene	0.021	0.019	0.023	0.017	0.019	0.0169	0.0193	0.0226	0.02	0.002
	Benz(a)anthracene	0.037	0.030	0.049	0.030	0.035	0.03	0.035	0.049	0.036	0.008
	Benzo(a)pyrene	0.023	0.017	0.024	0.014	0.017	0.014	0.017	0.024	0.019	0.004
	Benzo(b)fluoranthene	0.104	0.071	0.106	0.068	0.076	0.068	0.076	0.106	0.085	0.018
	Benzo(b+j+k)fluoranthene	0.115	0.071	0.118	0.078	0.076	0.071	0.078	0.118	0.092	0.023
	Benzo(g,h,i)perylene	0.030	0.019	0.031	0.019	0.022	0.019	0.022	0.031	0.024	0.006
	Benzo(k)fluoranthene	0.011	< 0.010	0.012	0.010	< 0.010	<0.01	0.01	0.012	0.011	0.001
	Chrysene	0.14	0.12	0.15	0.10	0.12	0.097	0.124	0.148	0.125	0.02
	Dibenz(a,h)anthracene	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	<0.02	<0.02	<0.02	<0.02	-
	Fluoranthene	0.038	0.029	0.045	0.028	0.032	0.028	0.032	0.045	0.034	0.007
	Fluorene	0.08	0.06	0.10	0.06	0.07	0.059	0.072	0.099	0.074	0.015
	Indeno(1,2,3-c,d)pyrene	< 0.010	< 0.010	0.013	< 0.010	< 0.010	<0.01	<0.01	0.013	<0.011	-
	2-Methylnaphthalene	0.84	0.61	0.88	0.62	0.69	0.61	0.685	0.879	0.728	0.125
	Naphthalene	0.241	0.169	0.242	0.184	0.194	0.169	0.194	0.242	0.206	0.034
	Phenanthrene	0.761	0.538	0.802	0.572	0.644	0.538	0.644	0.802	0.663	0.115
	Pyrene	0.065	0.049	0.072	0.049	0.057	0.049	0.057	0.072	0.058	0.01
	Acenaphthene d10	91.9	86	93.3	94.9	88.1	86	91.9	94.9	90.8	3.7
	Chrysene d12	117.5	116.4	122.5	123.7	123.9	116.4	122.5	123.9	121	4
	Naphthalene d8	76.5	73.2	76	81.8	72.9	72.9	76	81.8	76.1	3.6
	Phenanthrene d10	101.9	97.5	104.6	107.8	101.6	97.5	101.9	107.8	103	4
	B(a)P Total Potency Equivalent	0.051	0.039	0.054	0.037	0.04	0.037	0.04	0.054	0.044	0.008
	IACR (CCME)	1.01	0.72	1.08	0.71	0.76	0.71	0.76	1.08	0.86	0.18

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Fording River Watershed Meadow near Chauncey Creek							
		FMUCK-1	FMUCK-2	FMUCK-3	Minimum	Median	Maximum	Mean	Standard Deviation
		11-Aug-13	11-Aug-13	11-Aug-13					
Physical Tests	Moisture (%)	27.2	55.8	49.0	27.20	49.00	55.80	44.00	14.90
	(63 µm) pH (1:2 soil:water)	8.11	7.63	7.72	7.63	7.72	8.11	7.82	0.26
	(1mm) pH	8.31	7.86	8.01	7.86	8.01	8.31	8.06	0.23
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	0.27	< 0.10	< 0.10	<0.1	<0.1	0.27	0.16	0.10
	% Sand (1.00mm - 0.50mm)	2.48	0.10	< 0.10	<0.1	0.10	2.48	0.89	1.37
	% Sand (0.50mm - 0.25mm)	16.70	1.16	0.63	0.63	1.16	16.70	6.20	9.10
	% Sand (0.25mm - 0.125mm)	28.5	8.80	4.37	4.37	8.80	28.50	13.90	12.80
	% Sand (0.125mm - 0.063mm)	14.80	15.90	17.20	14.80	15.90	17.20	16.00	1.20
	% Silt (0.063mm - 0.0312mm)	17.70	33.00	34.60	17.70	33.00	34.60	28.40	9.30
	% Silt (0.0312mm - 0.004mm)	17.50	36.00	37.80	17.50	36.00	37.80	30.40	11.20
	% Clay (<4um)	2.09	5.05	5.27	2.09	5.05	5.27	4.14	1.78
	Texture	Sandy loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	2.72	10.00	6.89	2.72	6.89	10.00	6.50	3.70
Metals (<63 µm) (mg/kg)	Aluminum (Al)	6,330	6,470	7,020	6,330	6,470	7,020	6,607	365.00
	Antimony (Sb)	0.54	0.60	0.56	0.54	0.56	0.60	0.57	0.03
	Arsenic (As)	4.46	4.45	4.62	4.45	4.46	4.62	4.51	0.10
	Barium (Ba)	181	177	187	177.00	181.00	187.00	182.00	5.00
	Beryllium (Be)	0.53	0.52	0.51	0.51	0.52	0.53	0.52	0.01
	Bismuth (Bi)	0.11	0.12	0.11	0.11	0.11	0.12	0.11	0.01
	Boron (B)	6.3	6.8	6.8	6.30	6.80	6.80	6.63	0.29
	Cadmium (Cd)	1.37	1.38	1.29	1.29	1.37	1.38	1.35	0.05
	Calcium (Ca)	55,600	56,500	56,900	55,600	56,500	56,900	56,333	666.00
	Chromium (Cr)	13.2	13.4	14.2	13.20	13.40	14.20	13.60	0.50
	Cobalt (Co)	4.80	4.87	5.11	4.80	4.87	5.11	4.93	0.16
	Copper (Cu)	12.90	13.00	13.30	12.90	13.00	13.30	13.10	0.20
	Iron (Fe)	13,300	12,700	13,100	12,700	13,100	13,300	13,033	306.00
	Lead (Pb)	8.14	8.07	7.94	7.94	8.07	8.14	8.05	0.10
	Lithium (Li)	10.4	10.6	10.6	10.40	10.60	10.60	10.50	0.10
	Magnesium (Mg)	17,300	17,100	18,100	17,100	17,300	18,100	17,500	529.00
	Manganese (Mn)	372	349	415	349.00	372.00	415.00	379.00	34.00
	Mercury (Hg)	0.049	0.057	0.054	0.05	0.05	0.06	0.05	0.00
	Molybdenum (Mo)	1.34	1.38	1.39	1.34	1.38	1.39	1.37	0.03
	Nickel (Ni)	27.8	28.0	27.6	27.60	27.80	28.00	27.80	0.20
	Phosphorus (P)	1,360	1,330	1,290	1,290	1,330	1,360	1,327	35.00
	Potassium (K)	1,500	1,510	1,650	1,500	1,510	1,650	1,553	84.00
	Selenium (Se)	2.07	2.55	2.77	2.07	2.55	2.77	2.46	0.36
	Silver (Ag)	0.212	0.222	0.224	0.21	0.22	0.22	0.22	0.01
	Sodium (Na)	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	58	58	58	57.50	57.60	57.80	57.60	0.20
	Thallium (Tl)	0.206	0.213	0.213	0.21	0.21	0.21	0.21	0.00
	Tin (Sn)	1.12	0.47	0.40	0.40	0.47	1.12	0.66	0.40
	Titanium (Ti)	26.7	33.0	23.2	23.20	26.70	33.00	27.60	5.00
	Uranium (U)	1.06	1.06	0.995	1.00	1.06	1.06	1.04	0.04
	Vanadium (V)	26.5	27.3	28.8	26.50	27.30	28.80	27.50	1.20
	Zinc (Zn)	103.0	102.0	105.0	102.00	103.00	105.00	103.00	2.00
Metals (<1 mm) (mg/kg)	Aluminum (Al)	6,670	6,540	7,350	6,540	6,670	7,350	6,853	435.01
	Antimony (Sb)	0.63	0.62	0.60	0.60	0.62	0.63	0.62	0.02
	Arsenic (As)	5.05	4.51	4.60	4.51	4.60	5.05	4.72	0.29
	Barium (Ba)	177	174	178	174.00	177.00	178.00	176.33	2.08
	Beryllium (Be)	0.60	0.58	0.58	0.58	0.58	0.60	0.59	0.01
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	0.93	1.60	1.50	0.93	1.50	1.60	1.34	0.36
	Calcium (Ca)	31,700	43,700	48,000	31,700	43,700	48,000	41,133	8,448
	Chromium (Cr)	11.6	12.9	14.6	11.60	12.90	14.60	13.00	1.50
	Cobalt (Co)	5.56	5.31	5.66	5.31	5.56	5.66	5.51	0.18
	Copper (Cu)	10.5	14.9	14.7	10.50	14.70	14.90	13.40	2.50
	Iron (Fe)	15,100	12,700	13,100	12,700	13,100	15,100	13,633	1,286
	Lead (Pb)	8.39	8.60	8.62	8.39	8.60	8.62	8.54	0.13
	Lithium (Li)	7.8	9.1	10.5	7.80	9.10	10.50	9.10	1.40
	Magnesium (Mg)	8,900	12,700	14,000	8,900	12,700	14,000	11,867	2,650
	Manganese (Mn)	354	388	464	354.00	388.00	464.00	402.00	56.32
	Mercury (Hg)	0.034	0.057	0.057	0.03	0.06	0.06	0.05	0.01
	Molybdenum (Mo)	1.27	1.27	1.42	1.27	1.27	1.42	1.32	0.09
	Nickel (Ni)	25.9	32.9	31.6	25.90	31.60	32.90	30.10	3.70
	Phosphorus (P)	1,840	1,260	1,270	1,260	1,270	1,840	1,457	332.00
	Potassium (K)	1,630	1,570	1,830	1,570	1,630	1,830	1,677	136.00
	Selenium (Se)	1.35	3.22	3.31	1.35	3.22	3.31	2.63	1.11
	Silver (Ag)	0.12	0.25	0.25	0.12	0.25	0.25	0.21	0.08
	Sodium (Na)	< 100	< 100	110	<100	<100	110.00	103.00	6.00
	Strontium (Sr)	63.0	55.0	57.7	55.00	57.70	63.00	58.57	4.07
	Thallium (Tl)	0.183	0.228	0.242	0.18	0.23	0.24	0.22	0.03
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	27.3	41.4	29.8	27.30	29.80	41.40	32.83	7.52
	Uranium (U)	1.19	1.18	1.10	1.10	1.18	1.19	1.16	0.05
	Vanadium (V)	29.6	28.0	30.5	28.00	29.60	30.50	29.40	1.30
	Zinc (Zn)	105.0	105.0	108.0	105.00	105.00	108.00	106.00	2.00
Hydrocarbons (mg/kg)	Acenaphthene	< 0.020	< 0.060	< 0.050	<0.02	<0.05	<0.06	<0.0433	-
	Acenaphthylene	< 0.005	< 0.007	< 0.007	<0.005	<0.007	<0.007	<0.00633	-
	Anthracene	< 0.009	< 0.040	< 0.030	<0.009	<0.03	<0.04	<0.0263	-
	Benz(a)anthracene	0.021	0.043	0.040	0.02	0.04	0.04	0.04	0.01
	Benzo(a)pyrene	0.011	0.027	0.023	0.01	0.02	0.03	0.02	0.01
	Benzo(b)fluoranthene	0.069	0.129	0.113	0.07	0.11	0.13	0.10	0.03
	Benzo(b+j+k)fluoranthene	0.069	0.141	0.124	0.07	0.12	0.14	0.11	0.04
	Benzo(g,h,i)perylene	0.017	0.034	0.029	0.02	0.03	0.03	0.03	0.01
	Benzo(k)fluoranthene	< 0.010	0.012	0.011	<0.01	0.01	0.01	0.01	0.00
	Chrysene	0.10	0.15	0.14	0.10	0.14	0.15	0.13	0.02
	Dibenz(a,h)anthracene	0.011	0.021	0.019	0.01	0.02	0.02	0.02	0.01
	Fluoranthene	0.022	0.041	0.035	0.02	0.04	0.04	0.03	0.01
	Fluorene	0.03	0.10	0.09	0.03	0.09	0.10	0.07	0.04
	Indeno(1,2,3-c,d)pyrene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	0.34	0.87	0.77	0.34	0.77	0.87	0.66	0.28
	Naphthalene	0.121	0.252	0.212	0.12	0.21	0.25	0.20	0.07
	Phenanthrene	0.403	0.842	0.757	0.40	0.76	0.84	0.67	0.23
	Pyrene	0.034	0.066	0.060	0.03	0.06	0.07	0.05	0.02
	Acenaphthene d10	92.3	89.3	96.9	89.30	96.90	96.90	92.80	3.80
	Chrysene d12	120.9	106.7	116.3	106.70	120.90	120.90	115.00	7.00
	Naphthalene d8	91.1	81.2	83.8	81.20	91.10	91.10	85.40	5.10
	Phenanthrene d10	109.9	98.9	112.8	98.90	112.80	112.80	107.00	7.00
	B(a)P Total Potency Equivalent	0.033	0.069	0.061	0.03	0.07	0.07	0.05	0.02
	IACR (CCME)	0.66	1.25	1.11	0.66	1.25	1.25	1.01	0.31

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Michel Creek Watershed									
		Michel Creek Wetland									
		MI16-1	MI16-2	MI16-3	MI16-4	MI16-5	Minimum	Median	Maximum	Mean	Standard Deviation
		09-Aug-13	09-Aug-13	09-Aug-13	09-Aug-13	09-Aug-13					
Physical Tests	Moisture (%)	68.3	60.2	53.3	63.2	53.6	53.3	60.2	68.3	59.7	6.4
	(63 µm) pH (1:2 soil:water)	7.99	7.80	7.40	7.87	7.44	7.4	7.8	7.99	7.7	0.26
	(1mm) pH	8.07	7.90	7.60	8.14	7.65	7.60	7.90	8.14	7.87	0.24
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	< 0.10	0.11	0.11	< 0.10	< 0.10	<0.1	<0.1	0.11	<0.104	-
	% Sand (0.50mm - 0.25mm)	< 0.10	0.37	0.15	< 0.10	< 0.10	<0.1	<0.1	0.37	<0.164	-
	% Sand (0.25mm - 0.125mm)	0.69	2.74	0.71	0.15	< 0.10	<0.1	0.69	2.74	0.88	1.08
	% Sand (0.125mm - 0.063mm)	4.15	7.23	6.63	2.61	0.71	0.71	4.15	7.23	4.27	2.73
	% Silt (0.063mm - 0.0312mm)	35.70	27.10	37.80	30.10	36.20	27.1	35.7	37.8	33.4	4.6
	% Silt (0.0312mm - 0.004mm)	50.50	48.00	48.10	54.50	54.70	48	50.5	54.7	51.2	3.3
	% Clay (<4um)	8.79	14.40	6.49	12.60	8.36	6.49	8.79	14.4	10.1	3.3
	Texture	Silt	Silt loam	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	5.52	6.99	14.20	8.66	16.30	5.52	8.66	16.3	10.3	4.7
Metals (<63 µm) (mg/kg)	Aluminum (Al)	6,880	11,400	7,330	10,300	7,210	6,880	7,330	11,400	8,624	2,075
	Antimony (Sb)	0.44	0.63	0.97	0.82	1.73	0.44	0.82	1.73	0.92	0.5
	Arsenic (As)	3.32	6.26	5.50	5.13	6.33	3.32	5.5	6.33	5.31	1.22
	Barium (Ba)	186	147	332	268	450	147	268	450	277	121
	Beryllium (Be)	0.56	0.94	0.56	0.84	0.82	0.56	0.82	0.94	0.744	0.174
	Bismuth (Bi)	0.11	0.16	0.11	0.16	0.17	0.11	0.16	0.17	0.142	0.029
	Boron (B)	9.2	12.7	5.1	10.3	5.2	5.1	9.2	12.7	8.5	3.3
	Cadmium (Cd)	0.76	1.01	2.08	1.55	3.40	0.758	1.55	3.4	1.76	1.05
	Calcium (Ca)	150,000	31,800	12,400	29,400	11,100	11,100	29,400	150,000	46,940	58,386
	Chromium (Cr)	13.6	23.9	15.4	19.5	16.1	13.6	16.1	23.9	17.7	4.1
	Cobalt (Co)	3.52	5.67	5.53	5.68	7.82	3.52	5.67	7.82	5.64	1.52
	Copper (Cu)	12.10	18.30	18.70	18.60	27.70	12.1	18.6	27.7	19.1	5.6
	Iron (Fe)	9,070	13,800	12,800	14,200	14,400	9,070	13,800	14,400	12,854	2,203
	Lead (Pb)	6.85	10.30	8.47	11.40	13.50	6.85	10.3	13.5	10.1	2.6
	Lithium (Li)	10.8	15.2	7.3	14.8	6.4	6.4	10.8	15.2	10.9	4.1
	Magnesium (Mg)	12,600	12,700	5,460	11,200	2,580	2,580	11,200	12,700	8,908	4,615
	Manganese (Mn)	105	105	265	273	322	105	265	322	214	102
	Mercury (Hg)	0.047	0.066	0.090	0.088	0.140	0.0473	0.0878	0.14	0.086	0.035
	Molybdenum (Mo)	1.48	1.22	1.32	1.61	2.28	1.22	1.48	2.28	1.58	0.42
	Nickel (Ni)	17.4	28.7	26.6	28.7	38.5	17.4	28.7	38.5	28	7.5
	Phosphorus (P)	838	1,300	1,400	1,400	1,440	838	1,400	1,440	1,276	250
	Potassium (K)	1,560	2,490	1,580	2,160	1,530	1,530	1,580	2,490	1,864	437
	Selenium (Se)	4.66	1.61	1.66	2.66	2.13	1.61	2.13	4.66	2.54	1.26
	Silver (Ag)	0.191	0.275	0.294	0.377	0.670	0.191	0.294	0.67	0.361	0.185
	Sodium (Na)	100	100	< 100	< 100	< 100	<100	<100	100	<100	-
	Strontium (Sr)	174	53	48	67	72	48.4	67.3	174	83	52
	Thallium (Tl)	0.423	0.532	0.215	0.489	0.249	0.215	0.423	0.532	0.382	0.142
	Tin (Sn)	1.20	1.02	1.02	0.59	0.57	0.57	1.02	1.2	0.88	0.28
	Titanium (Ti)	24.7	34.3	32.6	43.8	35.1	24.7	34.3	43.8	34.1	6.8
	Uranium (U)	1.06	0.97	1.10	1.15	1.91	0.969	1.1	1.91	1.24	0.38
	Vanadium (V)	21.3	34.1	37.1	35.3	49.4	21.3	35.3	49.4	35.4	10
	Zinc (Zn)	80.1	118.0	122.0	133.0	152.0	80.1	122	152	121	26
Metals (<1 mm) (mg/kg)	Aluminum (Al)	7,600	11,000	15,300	10,400	7,780	7,600	10,400	15,300	10,416	3,125
	Antimony (Sb)	0.46	0.66	1.91	0.78	1.66	0.46	0.78	1.91	1.09	0.65
	Arsenic (As)	3.60	6.90	10.70	5.12	6.24	3.6	6.24	10.7	6.5	2.7
	Barium (Ba)	202	145	575	248	447	145	248	575	323.4	180.85
	Beryllium (Be)	0.62	0.94	1.45	0.79	0.85	0.62	0.85	1.45	0.93	0.31
	Bismuth (Bi)	< 0.20	< 0.20	0.31	< 0.20	< 0.20	<0.2	<0.2	0.31	<0.222	-
	Boron (B)	12	13	15	10	< 10	<10	12.000	15.000	12.000	2.100
	Cadmium (Cd)	0.86	1.23	4.22	1.72	3.49	1	2	4	2	1
	Calcium (Ca)	172,000	31,300	37,400	23,100	11,600	11,600	31,300	172,000	55,080	66,071
	Chromium (Cr)	15.2	19.6	30.5	19.1	16.8	15.20	19.10	30.50	20.20	6.00
	Cobalt (Co)	3.80	6.14	11.20	5.65	8.04	3.8	6.14	11.2	7	2.8
	Copper (Cu)	12.9	18.5	38.9	19.0	28.1	13	19	39	24	10
	Iron (Fe)	9,290	15,000	26,400	13,800	13,700	9,290	13,800	26,400	15,638	6,396
	Lead (Pb)	7.03	11.10	22.10	11.00	13.50	7.03	11.1	22.1	12.9	5.6
	Lithium (Li)	10.3	15.1	21.0	13.7	6.6	7	14	21	13	5
	Magnesium (Mg)	10,800	11,400	13,200	9,380	2,690	2,690	10,800	13,200	9,494	4,043
	Manganese (Mn)	103	107	596	294	368	103.0000	294.0000	596.0000	293.6000	205.0178
	Mercury (Hg)	0.044	0.066	0.100	0.082	0.130	0.0438	0.0824	0.13	0.084	0.033
	Molybdenum (Mo)	1.63	1.37	3.00	1.46	2.22	1.37	1.63	3	1.94	0.68
	Nickel (Ni)	18.3	27.6	54.8	28.2	38.0	18.3	28.2	54.8	33.4	13.9
	Phosphorus (P)	833	1,230	2,760	1,430	1,430	833	1,430	2,760	1,537	726
	Potassium (K)	1,920	2,460	3,180	2,200	1,570	1,570	2,200	3,180	2,266	609.00
	Selenium (Se)	5.30	1.78	4.74	2.88	2.22	1.78	2.88	5.3	3.38	1.56
	Silver (Ag)	0.19	0.29	0.78	0.37	0.71	0.19	0.37	0.78	0.468	0.262
	Sodium (Na)	120	110	150	< 100	< 100	<100	110	150	116	21
	Strontium (Sr)	200.0	55.2	123	61.1	78.4	55.2	78.4	200	103.54	60.11
	Thallium (Tl)	0.447	0.539	0.745	0.484	0.285	0.285	0.484	0.745	0.5	0.166
	Tin (Sn)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	30.2	32.5	62.5	31.6	33.6	30.2	32.5	62.5	38.08	13.71
	Uranium (U)	1.23	1.01	2.39	1.07	2.02	1.01	1.23	2.39	1.54	0.62
	Vanadium (V)	24.6	34.5	65.6	35.1	52.0	24.6	35.1	65.6	42.4	16.3
	Zinc (Zn)	83.7	121.0	243.0	132.0	153.0	83.7	132	243	147	59
Hydrocarbons (mg/kg)	Acenaphthene	< 0.020	< 0.020	< 0.100	< 0.050	< 0.080	<0.02	<0.05	<0.1	<0.054	-
	Acenaphthylene	< 0.005	< 0.005	< 0.008	< 0.008	< 0.005	<0.005	<0.005	<0.008	<0.0062	-
	Anthracene	< 0.020	< 0.020	< 0.040	< 0.040	< 0.040	<0.02	<0.04	<0.04	<0.032	-
	Benz(a)anthracene	< 0.030	< 0.020	< 0.080	< 0.050	< 0.070	<0.02	<0.05	<0.08	<0.05	-
	Benzo(a)pyrene	< 0.040	< 0.030	< 0.060	< 0.050	< 0.050	<0.03	<0.05	<0.06	<0.046	-
	Benzo(b)fluoranthene	0.138	0.104	0.326	0.238	0.245	0.104	0.238	0.326	0.21	0.089
	Benzo(b+j+k)fluoranthene	0.138	0.104	0.326	0.238	0.245	0.104	0.238	0.326	0.21	0.089
	Benzo(g,h,i)perylene	0.043	0.026	0.061	0.054	0.051	0.026	0.051	0.061	0.047	0.013
	Benzo(k)fluoranthene	< 0.020	< 0.020	< 0.030	< 0.030	< 0.020	<0.02	<0.02	<0.03	<0.024	-
	Chrysene	< 0.09	< 0.07	< 0.40	< 0.30	< 0.30	<0.07	<0.3	<0.4	<0.232	-
	Dibenz(a,h)anthracene	0.016	0.012	0.040	0.025	0.034	0.0118	0.0252	0.0401	0.025	0.012
	Fluoranthene	0.051	0.028	0.093	0.070	0.069	0.028	0.069	0.093	0.062	0.024
	Fluorene	0.05	0.03	0.18	0.08	0.21	0.033	0.08	0.205	0.109	0.078
	Indeno(1,2,3-c,d)pyrene	0.028	0.017	0.026	0.020	0.020	0.017	0.02	0.028	0.022	0.005
	2-Methylnaphthalene	0.56	0.42	1.86	1.02	1.49	0.419	1.02	1.86	1.07	0.61
	Naphthalene	0.200	0.161	0.689	0.365	0.454	0.161	0.365	0.689	0.374	0.213
	Phenanthrene	0.434	0.341	1.720	0.940	1.380	0.341	0.94	1.72	0.96	0.59
	Pyrene	0.054	0.036	0.145	0.099	0.116	0.036	0.099	0.145	0.09	0.045
	Acenaphthene d10	103.9	99.2	102.5	99.6	105.9	99.2	102.5	105.9	102	3
	Chrysene d12	126.7	118.9	112.7	123.4	123	112.7	123	126.7	121	5
	Naphthalene d8	90.5	90.4	84.3	88.3	87.9	84.3	88.3	90.5	88.3	2.5
	Phenanthrene d10	120.5	116.4	110.9	118.6	119.2	110.9	118.6	120.5	117	4
	B(a)P Total Potency Equivalent	0.056	0.042	0.113	0.082	0.092	0.042	0.082	0.113	0.077	0.028
	IACR (CCME)	1.13	0.86	2.62	1.92	2	0.86	1.92	2.62	1.71	0.71

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Michel Creek Watershed							
		Lower Michel Creek Wetland near Wheeler Creek							
		MIWW-1	MIWW-2	MIWW-3	Minimum	Median	Maximum	Mean	Standard Deviation
		10-Aug-13	10-Aug-13	10-Aug-13					
Physical Tests	Moisture (%)	74.4	56.0	48.9	48.90	56.00	74.40	59.80	13.20
	(63 µm) pH (1:2 soil:water)	7.75	7.78	7.79	7.75	7.78	7.79	7.77	0.02
	(1mm) pH	7.93	8.07	8.04	7.93	8.04	8.07	8.01	0.07
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	0.34	<0.1	<0.1	0.34	0.18	0.14
	% Sand (2.00mm - 1.00mm)	0.14	< 0.10	0.10	<0.1	0.10	0.14	0.11	0.02
	% Sand (1.00mm - 0.50mm)	0.25	< 0.10	0.20	<0.1	0.20	0.25	0.18	0.08
	% Sand (0.50mm - 0.25mm)	1.12	0.60	1.01	0.60	1.01	1.12	0.91	0.27
	% Sand (0.25mm - 0.125mm)	7.53	6.69	6.59	6.59	6.69	7.53	6.94	0.52
	% Sand (0.125mm - 0.063mm)	16.70	16.50	15.10	15.10	16.50	16.70	16.10	0.90
	% Silt (0.063mm - 0.0312mm)	32.60	32.90	30.70	30.70	32.60	32.90	32.10	1.20
	% Silt (0.0312mm - 0.004mm)	35.70	37.50	39.00	35.70	37.50	39.00	37.40	1.70
	% Clay (<4um)	5.92	5.76	6.94	5.76	5.92	6.94	6.21	0.64
	Texture	Silt loam	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	5.52	5.60	4.75	4.75	5.52	5.60	5.29	0.47
Metals (<63 µm) (mg/kg)	Aluminum (Al)	8,440	8,840	8,540	8,440	8,540	8,840	8,607	208.00
	Antimony (Sb)	0.89	0.94	0.94	0.89	0.94	0.94	0.92	0.03
	Arsenic (As)	6.13	5.67	5.03	5.03	5.67	6.13	5.61	0.55
	Barium (Ba)	259	253	247	247.00	253.00	259.00	253.00	6.00
	Beryllium (Be)	0.57	0.64	0.62	0.57	0.62	0.64	0.61	0.04
	Bismuth (Bi)	0.13	0.13	0.12	0.12	0.13	0.13	0.13	0.01
	Boron (B)	7.6	7.5	6.9	6.90	7.50	7.60	7.33	0.38
	Cadmium (Cd)	1.40	1.40	1.56	1.40	1.40	1.56	1.45	0.09
	Calcium (Ca)	28,500	31,900	32,100	28,500	31,900	32,100	30,833	2,023
	Chromium (Cr)	15.4	15.8	15.7	15.40	15.70	15.80	15.60	0.20
	Cobalt (Co)	5.62	5.68	5.47	5.47	5.62	5.68	5.59	0.11
	Copper (Cu)	16.10	15.90	16.10	15.90	16.10	16.10	16.00	0.10
	Iron (Fe)	14,600	14,300	12,900	12,900	14,300	14,600	13,933	907.00
	Lead (Pb)	9.15	9.71	9.42	9.15	9.42	9.71	9.43	0.28
	Lithium (Li)	9.8	10.8	10.3	9.80	10.30	10.80	10.30	0.50
	Magnesium (Mg)	8,690	8,860	8,240	8,240	8,690	8,860	8,597	320.00
	Manganese (Mn)	197	188	144	144.00	188.00	197.00	176.00	28.00
	Mercury (Hg)	0.063	0.061	0.062	0.06	0.06	0.06	0.06	0.00
	Molybdenum (Mo)	1.42	1.44	1.36	1.36	1.42	1.44	1.41	0.04
	Nickel (Ni)	24.3	24.0	23.8	23.80	24.00	24.30	24.00	0.30
	Phosphorus (P)	1,180	1,180	1,190	1,180	1,180	1,190	1,183	6.00
	Potassium (K)	1,780	1,960	1,770	1,770	1,780	1,960	1,837	107.00
	Selenium (Se)	1.12	1.16	1.72	1.12	1.16	1.72	1.33	0.34
	Silver (Ag)	0.260	0.276	0.268	0.26	0.27	0.28	0.27	0.01
	Sodium (Na)	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	57	61	62	56.90	61.30	62.10	60.10	2.80
	Thallium (Tl)	0.310	0.330	0.325	0.31	0.33	0.33	0.32	0.01
	Tin (Sn)	1.58	0.50	0.51	0.50	0.51	1.58	0.86	0.62
	Titanium (Ti)	61.3	49.8	41.6	41.60	49.80	61.30	50.90	9.90
	Uranium (U)	1.14	1.14	1.22	1.14	1.14	1.22	1.17	0.05
	Vanadium (V)	39.0	39.5	38.5	38.50	39.00	39.50	39.00	0.50
	Zinc (Zn)	103.0	102.0	105.0	102.00	103.00	105.00	103.00	2.00
Metals (<1 mm) (mg/kg)	Aluminum (Al)	7,230	9,170	9,240	7,230	9,170	9,240	8,547	1,141
	Antimony (Sb)	1.04	0.94	0.97	0.94	0.97	1.04	0.98	0.05
	Arsenic (As)	6.10	5.63	5.41	5.41	5.63	6.10	5.71	0.35
	Barium (Ba)	213	224	227	213.00	224.00	227.00	221.33	7.37
	Beryllium (Be)	0.65	0.68	0.68	0.65	0.68	0.68	0.67	0.02
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	1.74	1.52	1.70	1.52	1.70	1.74	1.65	0.12
	Calcium (Ca)	24,900	25,900	28,200	24,900	25,900	28,200	26,333	1,692
	Chromium (Cr)	13.8	16.2	16.7	13.80	16.20	16.70	15.60	1.60
	Cobalt (Co)	6.29	6.05	6.10	6.05	6.10	6.29	6.15	0.13
	Copper (Cu)	18.2	16.8	16.7	16.70	16.80	18.20	17.20	0.80
	Iron (Fe)	14,300	13,900	13,500	13,500	13,900	14,300	13,900	400.00
	Lead (Pb)	10.20	9.89	9.84	9.84	9.89	10.20	10.00	0.20
	Lithium (Li)	10.0	10.7	10.6	10.00	10.60	10.70	10.40	0.40
	Magnesium (Mg)	6,350	7,030	6,930	6,350	6,930	7,030	6,770	367.00
	Manganese (Mn)	211	178	143	143.00	178.00	211.00	177.33	34.00
	Mercury (Hg)	0.071	0.062	0.060	0.06	0.06	0.07	0.06	0.01
	Molybdenum (Mo)	1.52	1.37	1.52	1.37	1.52	1.52	1.47	0.09
	Nickel (Ni)	26.2	24.9	24.9	24.90	24.90	26.20	25.30	0.80
	Phosphorus (P)	1,160	1,140	1,150	1,140	1,150	1,160	1,150	10.00
	Potassium (K)	1,310	1,980	1,980	1,310	1,980	1,980	1,757	387.00
	Selenium (Se)	1.41	1.24	1.81	1.24	1.41	1.81	1.49	0.29
	Silver (Ag)	0.33	0.28	0.28	0.28	0.28	0.33	0.30	0.03
	Sodium (Na)	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	59.4	59.8	62.7	59.40	59.80	62.70	60.63	1.80
	Thallium (Tl)	0.324	0.343	0.348	0.32	0.34	0.35	0.34	0.01
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	34.9	48.6	42.1	34.90	42.10	48.60	41.87	6.85
	Uranium (U)	1.30	1.21	1.39	1.21	1.30	1.39	1.30	0.09
	Vanadium (V)	35.7	41.2	41.9	35.70	41.20	41.90	39.60	3.40
	Zinc (Zn)	105.0	101.0	107.0	101.00	105.00	107.00	104.00	3.00
Hydrocarbons (mg/kg)	Acenaphthene	< 0.040	< 0.020	< 0.020	<0.02	<0.02	<0.04	<0.0267	-
	Acenaphthylene	< 0.020	< 0.009	< 0.005	<0.005	<0.009	<0.02	<0.0113	-
	Anthracene	< 0.050	< 0.030	< 0.020	<0.02	<0.03	<0.05	<0.0333	-
	Benz(a)anthracene	0.076	0.045	0.029	0.03	0.05	0.08	0.05	0.02
	Benzo(a)pyrene	0.044	0.026	0.015	0.02	0.03	0.04	0.03	0.02
	Benzo(b)fluoranthene	0.231	0.119	0.089	0.09	0.12	0.23	0.15	0.08
	Benzo(b+j+k)fluoranthene	0.231	0.119	0.089	0.09	0.12	0.23	0.15	0.08
	Benzo(g,h,i)perylene	0.072	0.044	0.031	0.03	0.04	0.07	0.05	0.02
	Benzo(k)fluoranthene	< 0.030	< 0.020	< 0.010	<0.01	<0.02	<0.03	<0.02	-
	Chrysene	< 0.30	< 0.20	< 0.09	<0.09	<0.2	<0.3	<0.197	-
	Dibenz(a,h)anthracene	0.031	0.016	0.011	0.01	0.02	0.03	0.02	0.01
	Fluoranthene	0.105	0.054	0.038	0.04	0.05	0.11	0.07	0.04
	Fluorene	0.07	0.04	0.03	0.03	0.04	0.07	0.05	0.02
	Indeno(1,2,3-c,d)pyrene	0.021	0.014	< 0.010	<0.01	0.01	0.02	0.02	0.01
	2-Methylnaphthalene	0.85	0.46	0.28	0.28	0.46	0.85	0.53	0.29
	Naphthalene	0.411	0.204	0.124	0.12	0.20	0.41	0.25	0.15
	Phenanthrene	1.350	0.692	0.439	0.44	0.69	1.35	0.83	0.47
	Pyrene	0.139	0.080	0.054	0.05	0.08	0.14	0.09	0.04
	Acenaphthene d10	83.4	83.9	82.8	82.80	83.90	83.90	83.40	0.60
	Chrysene d12	101.4	107.1	108.2	101.40	108.20	108.20	106.00	4.00
	Naphthalene d8	75.6	75.4	75.3	75.30	75.60	75.60	75.40	0.20
	Phenanthrene d10	102.4	104.3	107	102.40	107.00	107.00	105.00	2.00
	B(a)P Total Potency Equivalent	0.112	0.062	0.04	0.04	0.11	0.11	0.07	0.04
	IACR (CCME)	2.11	1.14	0.79	0.79	2.11	2.11	1.35	0.68

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed									
		Upper Elk River Oxbow									
		EROU-1	EROU-2	EROU-3	EROU-4	EROU-5	Minimum	Median	Maximum	Mean	Standard Deviation
		07-Aug-13	07-Aug-13	07-Aug-13	07-Aug-13	07-Aug-13					
Physical Tests	Moisture (%)	61.3	58.8	49.8	49.3	43.7	43.7	49.8	61.3	52.6	7.3
	(63 µm) pH (1:2 soil:water)	-	-	-	-	-					
	(1mm) pH	8.00	8.07	8.06	8.02	8.08	8.00	8.06	8.08	8.05	0.03
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	0.13	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	0.13	<0.106	-
	% Sand (1.00mm - 0.50mm)	0.25	< 0.10	< 0.10	< 0.10	0.12	<0.1	<0.1	0.25	<0.134	-
	% Sand (0.50mm - 0.25mm)	0.17	< 0.10	< 0.10	< 0.10	0.20	<0.1	<0.1	0.2	<0.134	-
	% Sand (0.25mm - 0.125mm)	0.13	< 0.10	< 0.10	0.11	0.37	<0.1	0.11	0.37	0.162	0.117
	% Sand (0.125mm - 0.063mm)	0.11	0.10	0.61	1.49	4.65	0.1	0.61	4.65	1.39	1.91
	% Silt (0.063mm - 0.0312mm)	15.60	20.00	28.30	26.90	32.30	15.6	26.9	32.3	24.6	6.7
	% Silt (0.0312mm - 0.004mm)	59.80	58.70	55.70	56.20	51.00	51	56.2	59.8	56.3	3.4
	% Clay (<4um)	23.90	21.10	15.20	15.10	11.30	11.3	15.2	23.9	17.3	5.1
	Texture	Silt loam	Silt loam	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	4.91	4.53	4.07	3.56	3.35	3.35	4.07	4.91	4.08	0.65
Metals (<63 µm) (mg/kg)	Aluminum (Al)	10,200	10,400	8,590	7,080	7,420	7,080	8,590	10,400	8,738	1,534
	Antimony (Sb)	0.76	0.75	0.65	0.57	0.58	0.57	0.65	0.76	0.662	0.09
	Arsenic (As)	8.52	7.87	7.00	6.00	6.64	6	7	8.52	7.21	1
	Barium (Ba)	204	193	164	144	154	144	164	204	172	26
	Beryllium (Be)	0.77	0.79	0.65	0.55	0.63	0.55	0.65	0.79	0.678	0.101
	Bismuth (Bi)	0.15	0.15	0.13	0.11	0.12	0.11	0.13	0.15	0.132	0.018
	Boron (B)	13.1	15.9	11.2	8.5	9.2	8.5	11.2	15.9	11.6	3
	Cadmium (Cd)	1.42	1.42	1.15	1.00	1.08	0.995	1.15	1.42	1.21	0.2
	Calcium (Ca)	91,900	85,000	80,600	70,800	77,700	70,800	80,600	91,900	81,200	7,901
	Chromium (Cr)	26.7	26.6	23.0	19.5	20.0	19.5	23	26.7	23.2	3.5
	Cobalt (Co)	6.53	6.26	5.62	4.86	5.14	4.86	5.62	6.53	5.68	0.71
	Copper (Cu)	18.00	17.90	15.20	12.90	13.90	12.9	15.2	18	15.6	2.3
	Iron (Fe)	18,000	17,100	15,100	13,200	14,000	13,200	15,100	18,000	15,480	2,032
	Lead (Pb)	10.2	9.81	8.51	7.29	7.94	7.29	8.51	10.2	8.8	1.2
	Lithium (Li)	17.7	17.1	13.9	11.6	12.8	11.6	13.9	17.7	14.6	2.7
	Magnesium (Mg)	16,900	18,200	18,900	17,800	18,300	16,900	18,200	18,900	18,020	740
	Manganese (Mn)	836	849	731	582	687	582	731	849	737	111
	Mercury (Hg)	0.076	0.077	0.061	0.052	0.059	0.0516	0.0613	0.0771	0.065	0.011
	Molybdenum (Mo)	2.52	2.19	1.91	1.65	1.91	1.65	1.91	2.52	2.04	0.33
	Nickel (Ni)	30.3	29.4	25.4	21.2	23.4	21.2	25.4	30.3	25.9	3.9
	Phosphorus (P)	1,310	1,290	1,250	1,270	1,240	1,240	1,270	1,310	1,272	29
	Potassium (K)	2,730	2,780	2,200	1,780	1,850	1,780	2,200	2,780	2,268	473
	Selenium (Se)	1.62	1.59	1.24	1.08	1.22	1.08	1.24	1.62	1.35	0.24
	Silver (Ag)	0.330	0.332	0.272	0.216	0.245	0.216	0.272	0.332	0.279	0.051
	Sodium (Na)	120	120	110	100	130	100	120	130	116	11
	Strontium (Sr)	134	118	105	88.7	101	88.7	105	134	109	17
	Thallium (Tl)	0.405	0.401	0.318	0.272	0.293	0.272	0.318	0.405	0.338	0.062
	Tin (Sn)	0.52	0.96	0.49	0.46	0.36	0.36	0.49	0.96	0.558	0.233
	Titanium (Ti)	32.0	32.1	37.0	32.3	30.2	30.2	32.1	37	32.7	2.5
	Uranium (U)	1.52	1.47	1.34	1.17	1.28	1.17	1.34	1.52	1.36	0.14
	Vanadium (V)	44.8	46.5	39.4	33.5	34.6	33.5	39.4	46.5	39.8	5.8
	Zinc (Zn)	127.0	121.0	106.0	91.7	96.7	91.7	106	127	108	15
Metals (<1 mm) (mg/kg)	Aluminum (Al)	9,580	9,770	8,560	7,780	7,090	7,090	8,560	9,770	8,556	1,148
	Antimony (Sb)	0.75	0.77	0.66	0.60	0.57	0.57	0.66	0.77	0.67	0.09
	Arsenic (As)	8.04	7.56	6.71	6.43	6.14	6.14	6.71	8.04	6.98	0.8
	Barium (Ba)	216	191	162	155	143	143	162	216	173.4	29.65
	Beryllium (Be)	0.78	0.76	0.67	0.64	0.62	0.62	0.67	0.78	0.694	0.072
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	12	14	12	10	< 10	<10	12.000	14.000	11.600	1.700
	Cadmium (Cd)	1.39	1.31	1.21	1.10	1.01	1	1	1	1	0
	Calcium (Ca)	95,100	83,100	82,400	77,100	72,200	72,200	82,400	95,100	81,980	8,559
	Chromium (Cr)	24.7	24.8	22.2	20.0	18.4	18.40	22.20	24.80	22.00	2.80
	Cobalt (Co)	6.36	5.96	5.31	5.01	4.74	4.74	5.31	6.36	5.48	0.67
	Copper (Cu)	18.6	17.3	15.3	14.1	13.2	13	15	19	16	2
	Iron (Fe)	17,500	16,200	14,500	13,800	12,800	12,800	14,500	17,500	14,960	1,885
	Lead (Pb)	9.93	9.71	8.57	7.86	7.40	7.4	8.57	9.93	8.69	1.11
	Lithium (Li)	17.6	16.7	14.2	13.6	12.8	13	14	18	15	2
	Magnesium (Mg)	15,800	16,400	17,000	17,400	16,000	15,800	16,400	17,400	16,520	672
	Manganese (Mn)	859	841	717	692	579	579.0000	717.0000	859.0000	737.6000	115.2033
	Mercury (Hg)	0.085	0.077	0.069	0.061	0.057	0.0568	0.0685	0.0852	0.07	0.012
	Molybdenum (Mo)	2.53	2.12	1.87	1.88	1.67	1.67	1.88	2.53	2.01	0.33
	Nickel (Ni)	29.9	27.6	24.7	22.9	21.7	21.7	24.7	29.9	25.4	3.4
	Phosphorus (P)	1,290	1,240	1,200	1,200	1,240	1,200	1,240	1,290	1,234	37
	Potassium (K)	2,480	2,570	2,210	1,950	1,760	1,760	2,210	2,570	2,194	343.00
	Selenium (Se)	1.87	1.56	1.41	1.28	1.22	1.22	1.41	1.87	1.47	0.26
	Silver (Ag)	0.33	0.31	0.27	0.24	0.22	0.22	0.27	0.33	0.274	0.046
	Sodium (Na)	130	120	120	120	110	110	120	130	120	7
	Strontium (Sr)	135.0	115.0	103.0	103.0	103.0	103	103	135	111.8	13.97
	Thallium (Tl)	0.388	0.388	0.329	0.302	0.285	0.285	0.329	0.388	0.338	0.048
	Tin (Sn)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	30.3	35.5	29.8	26.7	25.1	25.1	29.8	35.5	29.48	4
	Uranium (U)	1.46	1.43	1.34	1.23	1.18	1.18	1.34	1.46	1.33	0.12
	Vanadium (V)	42.0	42.8	38.6	35.6	32.6	32.6	38.6	42.8	38.3	4.3
	Zinc (Zn)	126.0	114.0	102.0	94.8	89.6	89.6	102	126	105	15
Hydrocarbons (mg/kg)	Acenaphthene	< 0.008	< 0.070	< 0.060	< 0.005	< 0.005	<0.005	<0.006	<0.008	<0.0062	-
	Acenaphthylene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	< 0.007	< 0.006	< 0.004	< 0.005	< 0.006	<0.004	<0.006	<0.007	<0.0056	-
	Benz(a)anthracene	0.014	0.014	< 0.010	< 0.010	< 0.010	<0.01	<0.01	0.014	<0.012	-
	Benzo(a)pyrene	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b)fluoranthene	0.043	0.043	0.026	0.030	0.023	0.023	0.03	0.043	0.033	0.009
	Benzo(b+j+k)fluoranthene	0.043	0.043	0.026	0.030	0.023	0.023	0.03	0.043	0.033	0.009
	Benzo(g,h,i)perylene	0.013	0.013	< 0.010	< 0.010	< 0.010	<0.01	<0.01	0.013	<0.011	-
	Benzo(k)fluoranthene	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	0.05	0.05	0.03	0.03	0.03	<0.03	0.032	0.052	0.038	0.011
	Dibenz(a,h)anthracene	< 0.008	< 0.008	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.008	<0.0062	-
	Fluoranthene	0.014	0.016	< 0.010	< 0.010	< 0.010	<0.01	<0.01	0.016	<0.012	-
	Fluorene	< 0.02	< 0.02	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.02	<0.014	-
	Indeno(1,2,3-c,d)pyrene	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	0.11	0.10	0.08	0.08	0.09	0.082	0.087	0.105	0.092	0.01
	Naphthalene	0.043	0.041	0.036	0.037	0.041	0.036	0.041	0.043	0.04	0.003
	Phenanthrene	0.176	0.174	0.126	0.133	0.129	0.126	0.133	0.176	0.148	0.025
	Pyrene	0.021	0.023	0.012	0.012	0.011	0.011	0.012	0.023	0.016	0.006
	Acenaphthene d10	82.00	78.40	79.20	82.70	79.60	78.40	79.60	82.70	80.40	1.90
	Chrysene d12	103.40	98.50	80.40	83.80	78.30	78.30	83.80	103.40	89.00	11.00
	Naphthalene d8	77.50	75.10	84.80	84.70	85.10	75.10	84.70	85.10	81.40	4.80
	Phenanthrene d10	95.40	90.20	83.40	87.90	83.20	83.20	87.90	95.40	88.00	5.10
	B(a)P Total Potency Equivalent	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-
	IACR (CCME)	0.40	0.40	0.25	0.28	0.23	0.23	0.28	0.40	0.31	0.08

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed							
		Elk River Wetland downstream of Grave Creek							
		ELWDGC-1	ELWDGC-2	ELWDGC-3	Minimum	Median	Maximum	Mean	Standard Deviation
		08-Aug-13	08-Aug-13	08-Aug-13					
Physical Tests	Moisture (%)	46.6	44.7	59.8	44.70	46.60	59.80	50.40	8.20
	(63 µm) pH (1:2 soil:water)	-	-	-		#NUM!			
	(1mm) pH	7.95	8.01	7.98	7.95	7.98	8.01	7.98	0.03
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	0.26	0.41	0.15	0.15	0.26	0.41	0.27	0.13
	% Sand (0.50mm - 0.25mm)	0.65	0.74	0.26	0.26	0.65	0.74	0.55	0.26
	% Sand (0.25mm - 0.125mm)	4.25	3.99	1.61	1.61	3.99	4.25	3.28	1.45
	% Sand (0.125mm - 0.063mm)	11.50	20.10	8.64	8.64	11.50	20.10	13.40	6.00
	% Silt (0.063mm - 0.0312mm)	24.50	29.80	29.40	24.50	29.40	29.80	27.90	3.00
	% Silt (0.0312mm - 0.004mm)	47.00	37.10	47.80	37.10	47.00	47.80	44.00	6.00
	% Clay (<4um)	11.70	7.80	12.10	7.80	11.70	12.10	10.50	2.40
	Texture	Silt loam	Silt loam	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	2.93	3.51	3.90	2.93	3.51	3.90	3.45	0.49
Metals (<63 µm) (mg/kg)	Aluminum (Al)	6,050	6,580	8,270	6,050	6,580	8,270	6,967	1,159
	Antimony (Sb)	0.54	0.53	0.59	0.53	0.54	0.59	0.55	0.03
	Arsenic (As)	6.10	5.57	6.32	5.57	6.10	6.32	6.00	0.39
	Barium (Ba)	171	162	179	162.00	171.00	179.00	171.00	9.00
	Beryllium (Be)	0.57	0.52	0.61	0.52	0.57	0.61	0.57	0.05
	Bismuth (Bi)	0.12	0.11	0.14	0.11	0.12	0.14	0.12	0.02
	Boron (B)	7.5	9.5	12.3	7.50	9.50	12.30	9.80	2.40
	Cadmium (Cd)	0.99	0.84	1.00	0.84	0.99	1.00	0.94	0.09
	Calcium (Ca)	80,900	70,400	75,600	70,400	75,600	80,900	75,633	5,250
	Chromium (Cr)	15.5	15.7	19.3	15.50	15.70	19.30	16.80	2.10
	Cobalt (Co)	5.37	4.61	5.38	4.61	5.37	5.38	5.12	0.44
	Copper (Cu)	13.90	12.60	14.20	12.60	13.90	14.20	13.60	0.90
	Iron (Fe)	14,000	12,400	14,300	12,400	14,000	14,300	13,567	1,021
	Lead (Pb)	8.22	7.33	8.12	7.33	8.12	8.22	7.89	0.49
	Lithium (Li)	11.9	11.2	13.1	11.20	11.90	13.10	12.10	1.00
	Magnesium (Mg)	18,900	17,700	18,900	17,700	18,900	18,900	18,500	693.00
	Manganese (Mn)	648	545	677	545.00	648.00	677.00	623.00	69.00
	Mercury (Hg)	0.052	0.041	0.052	0.04	0.05	0.05	0.05	0.01
	Molybdenum (Mo)	1.83	1.66	1.82	1.66	1.82	1.83	1.77	0.10
	Nickel (Ni)	21.3	18.6	22.0	18.60	21.30	22.00	20.60	1.80
	Phosphorus (P)	1,270	1,170	1,280	1,170	1,270	1,280	1,240	61.00
	Potassium (K)	1,390	1,710	2,250	1,390	1,710	2,250	1,783	435.00
	Selenium (Se)	1.37	1.09	1.22	1.09	1.22	1.37	1.23	0.14
	Silver (Ag)	0.213	0.181	0.216	0.18	0.21	0.22	0.20	0.02
	Sodium (Na)	110	110	150	110.00	110.00	150.00	123.00	23.00
	Strontium (Sr)	99	88	95	87.50	95.30	98.70	93.80	5.70
	Thallium (Tl)	0.260	0.278	0.307	0.26	0.28	0.31	0.28	0.02
	Tin (Sn)	0.32	0.46	0.43	0.32	0.43	0.46	0.40	0.07
	Titanium (Ti)	22.7	37.3	39.2	22.70	37.30	39.20	33.10	9.00
	Uranium (U)	1.12	1.05	1.17	1.05	1.12	1.17	1.11	0.06
	Vanadium (V)	25.8	28.4	35.0	25.80	28.40	35.00	29.70	4.70
	Zinc (Zn)	88.8	81.1	92.8	81.10	88.80	92.80	87.60	5.90
Metals (<1 mm) (mg/kg)	Aluminum (Al)	5,960	5,580	6,280	5,580	5,960	6,280	5,940	350.43
	Antimony (Sb)	0.53	0.58	0.61	0.53	0.58	0.61	0.57	0.04
	Arsenic (As)	5.71	5.80	6.48	5.71	5.80	6.48	6.00	0.42
	Barium (Ba)	150	147	167	147.00	150.00	167.00	154.67	10.79
	Beryllium (Be)	0.59	0.53	0.64	0.53	0.59	0.64	0.59	0.06
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	0.91	0.97	1.14	0.91	0.97	1.14	1.01	0.12
	Calcium (Ca)	77,000	63,100	68,200	63,100	68,200	77,000	69,433	7,032
	Chromium (Cr)	14.4	13.7	16.1	13.70	14.40	16.10	14.70	1.20
	Cobalt (Co)	4.62	5.01	5.60	4.62	5.01	5.60	5.08	0.49
	Copper (Cu)	13.0	14.5	17.0	13.00	14.50	17.00	14.80	2.00
	Iron (Fe)	12,700	12,500	14,100	12,500	12,700	14,100	13,100	872.00
	Lead (Pb)	7.33	7.80	8.44	7.33	7.80	8.44	7.86	0.56
	Lithium (Li)	13.9	11.4	13.5	11.40	13.50	13.90	12.90	1.30
	Magnesium (Mg)	15,500	13,900	15,200	13,900	15,200	15,500	14,867	850.00
	Manganese (Mn)	592	623	741	592.00	623.00	741.00	652.00	78.62
	Mercury (Hg)	0.047	0.049	0.057	0.05	0.05	0.06	0.05	0.01
	Molybdenum (Mo)	1.42	1.36	1.56	1.36	1.42	1.56	1.45	0.10
	Nickel (Ni)	19.0	20.9	24.5	19.00	20.90	24.50	21.50	2.80
	Phosphorus (P)	1,170	1,170	1,220	1,170	1,170	1,220	1,187	29.00
	Potassium (K)	1,430	1,240	1,440	1,240	1,430	1,440	1,370	113.00
	Selenium (Se)	1.33	1.43	1.66	1.33	1.43	1.66	1.47	0.17
	Silver (Ag)	0.17	0.18	0.23	0.17	0.18	0.23	0.19	0.03
	Sodium (Na)	100	< 100	100	<100	100.00	100.00	100.00	0.00
	Strontium (Sr)	94.5	83.8	88.9	83.80	88.90	94.50	89.07	5.35
	Thallium (Tl)	0.259	0.265	0.310	0.26	0.27	0.31	0.28	0.03
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	22.2	17.1	19.6	17.10	19.60	22.20	19.63	2.55
	Uranium (U)	1.00	1.10	1.14	1.00	1.10	1.14	1.08	0.07
	Vanadium (V)	25.2	24.1	28.0	24.10	25.20	28.00	25.80	2.00
	Zinc (Zn)	80.5	81.9	95.4	80.50	81.90	95.40	85.90	8.20
Hydrocarbons (mg/kg)	Acenaphthene	< 0.060	< 0.005	< 0.006	<0.005	<0.006	<0.06	<0.0237	-
	Acenaphthylene	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	< 0.006	< 0.008	< 0.006	<0.006	<0.006	<0.008	<0.00667	-
	Benz(a)anthracene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(a)pyrene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b)fluoranthene	0.025	0.026	0.033	0.03	0.03	0.03	0.03	0.00
	Benzo(b+j+k)fluoranthene	0.025	0.026	0.033	0.03	0.03	0.03	0.03	0.00
	Benzo(g,h,i)perylene	< 0.010	< 0.010	0.011	<0.01	<0.01	0.01	0.01	0.00
	Benzo(k)fluoranthene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.00
	Dibenz(a,h)anthracene	< 0.005	< 0.005	0.005	<0.005	<0.005	0.01	0.01	0.00
	Fluoranthene	< 0.010	< 0.010	< 0.020	<0.01	<0.01	<0.02	<0.0133	-
	Fluorene	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	Indeno(1,2,3-c,d)pyrene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
	Naphthalene	0.040	0.044	0.041	0.04	0.04	0.04	0.04	0.00
	Phenanthrene	0.129	0.142	0.141	0.13	0.14	0.14	0.14	0.01
	Pyrene	0.013	0.013	0.015	0.01	0.01	0.02	0.01	0.00
	Acenaphthene d10	89.3	79	78.3	78.30	89.30	89.30	82.20	6.20
	Chrysene d12	91.8	88.4	78.5	78.50	91.80	91.80	86.20	6.90
	Naphthalene d8	94.5	83	82.8	82.80	94.50	94.50	86.80	6.70
	Phenanthrene d10	96.7	90	82.6	82.60	96.70	96.70	89.80	7.10
	B(a)P Total Potency Equivalent	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-
	IACR (CCME)	0.24	0.25	0.3	0.24	0.30	0.30	0.26	0.03

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed Goddard Marsh									
		GO13-1	GO13-2	GO13-3	GO13-4	GO13-5	Minimum	Median	Maximum	Mean	Standard Deviation
		12-Aug-13	12-Aug-13	12-Aug-13	12-Aug-13	12-Aug-13					
Physical Tests	Moisture (%)	55.5	51.1	52.6	49.2	47.9	47.9	51.1	55.5	51.3	3
	(63 µm) pH (1:2 soil:water)	7.80	7.86	8.00	7.92	7.99	7.8	7.92	8	7.91	0.09
	(1mm) pH	8.01	8.22	8.13	8.14	8.11	8.01	8.13	8.22	8.12	0.08
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (0.50mm - 0.25mm)	< 0.10	< 0.10	< 0.10	< 0.10	0.22	<0.1	<0.1	0.22	<0.124	-
	% Sand (0.25mm - 0.125mm)	< 0.10	< 0.10	0.10	0.22	6.54	<0.1	0.1	6.54	1.41	2.87
	% Sand (0.125mm - 0.063mm)	0.12	< 0.10	0.57	8.11	15.8	<0.1	0.57	15.8	4.9	7
	% Silt (0.063mm - 0.0312mm)	5.31	10.60	18.00	26.10	28.70	5.31	18	28.7	17.7	9.9
	% Silt (0.0312mm - 0.004mm)	36.80	51.30	55.90	50.00	38.90	36.8	50	55.9	46.6	8.3
	% Clay (<4um)	57.80	38.00	25.40	15.50	9.82	9.82	25.4	57.8	29.3	19.2
	Texture	Silty clay	Silty clay loam	Silt loam	Silt	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	12.70	6.41	6.52	6.43	4.19	4.19	6.43	12.7	7.3	3.2
Metals (<63 µm) (mg/kg)	Aluminum (Al)	12,600	11,400	9,990	7,870	7,100	7,100	9,990	12,600	9,792	2,316
	Antimony (Sb)	1.20	1.01	0.92	0.76	0.57	0.57	0.92	1.20	0.89	0.24
	Arsenic (As)	7.99	8.40	7.84	6.32	6.16	6.16	7.84	8.4	7.34	1.03
	Barium (Ba)	413	269	241	208	175	175	241	413	261	92
	Beryllium (Be)	0.98	0.90	0.77	0.58	0.51	0.51	0.77	0.98	0.748	0.201
	Bismuth (Bi)	0.23	0.20	0.16	0.14	0.11	0.11	0.16	0.23	0.168	0.048
	Boron (B)	13.7	13.4	12.9	9.4	8.2	8.200	12.900	13.700	11.500	2.500
	Cadmium (Cd)	1.71	1.50	1.32	1.07	0.92	1	1	2	1	0
	Calcium (Ca)	38,500	82,400	79,800	68,300	68,200	38,500	68,300	82,400	67,440	17,431
	Chromium (Cr)	18.3	29.3	22.2	17.7	16.1	16.10	18.30	29.30	20.70	5.30
	Cobalt (Co)	10.10	8.26	7.37	5.88	4.96	4.96	7.37	10.1	7.3	2
	Copper (Cu)	30.50	22.70	20.30	16.50	14.50	15	20	31	21	6
	Iron (Fe)	20,300	19,300	18,100	14,900	13,400	13,400	18,100	20,300	17,200	2,939
	Lead (Pb)	16.00	12.30	11.30	9.07	7.40	7.4	11.3	16	11.2	3.3
	Lithium (Li)	15.7	17.2	15.3	11.5	10.4	10	15	17	14	3
	Magnesium (Mg)	6,020	15,600	16,700	16,500	17,800	6,020	16,500	17,800	14,524	4,818
	Manganese (Mn)	615	824	817	647	600	600.0000	647.0000	824.0000	701.0000	111.0000
	Mercury (Hg)	0.118	0.091	0.077	0.062	0.052	0.0521	0.0765	0.118	0.08	0.026
	Molybdenum (Mo)	2.39	2.61	2.27	1.76	1.51	1.51	2.27	2.61	2.11	0.46
	Nickel (Ni)	33.9	37.3	30.0	24.3	21.2	21.2	30	37.3	29.3	6.6
	Phosphorus (P)	1,110	1,310	1,370	1,340	1,270	1,110	1,310	1,370	1,280	102
	Potassium (K)	3,040	2,920	2,530	1,890	1,710	1,710	2,530	3,040	2,418	598.00
	Selenium (Se)	2.75	3.54	3.05	2.47	1.89	1.89	2.75	3.54	2.74	0.62
	Silver (Ag)	0.512	0.359	0.325	0.244	0.194	0.194	0.325	0.512	0.327	0.122
	Sodium (Na)	110	120	110	100	110	100	110	120	110	7
	Strontium (Sr)	106	115	106	88	82	81.9	106	115	99	14
	Thallium (Tl)	0.204	0.364	0.333	0.258	0.227	0.204	0.258	0.364	0.277	0.069
	Tin (Sn)	2.69	0.66	0.66	0.41	0.44	0.41	0.66	2.69	0.97	0.97
	Titanium (Ti)	26.8	27.8	41.8	25.4	29.0	25.4	27.8	41.8	30.2	6.6
	Uranium (U)	0.95	1.28	1.23	1.07	0.99	0.947	1.07	1.28	1.1	0.15
	Vanadium (V)	43.9	42.7	38.9	31.0	28.6	28.6	38.9	43.9	37.0	6.9
	Zinc (Zn)	146.0	137.0	125.0	101.0	88.2	88.2	125	146	119	24
Metals (<1 mm) (mg/kg)	Aluminum (Al)	12,100	10,500	9,200	7,630	6,910	6,910	9,200	12,100	9,268	2,109
	Antimony (Sb)	1.10	0.94	0.80	0.74	0.56	0.56	0.8	1.1	0.83	0.2
	Arsenic (As)	7.63	8.14	7.15	5.72	5.19	5.19	7.15	8.14	6.77	1.26
	Barium (Ba)	381	251	213	183	154	154	213	381	236.4	88.47
	Beryllium (Be)	0.90	0.79	0.68	0.61	0.54	0.54	0.68	0.9	0.704	0.143
	Bismuth (Bi)	0.23	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	0.23	<0.206	-
	Boron (B)	12	11	12	10	< 10	<10	11	12	11	1
	Cadmium (Cd)	1.78	1.52	1.35	1.04	0.86	0.858	1.35	1.78	1.31	0.37
	Calcium (Ca)	36,900	75,200	70,800	62,800	66,800	36,900	66,800	75,200	62,500	15,034
	Chromium (Cr)	18.1	21.7	19.8	16.1	15.6	15.6	18.1	21.7	18.3	2.5
	Cobalt (Co)	9.74	8.12	6.92	5.49	4.79	4.79	6.92	9.74	7.01	2
	Copper (Cu)	29.6	22.3	19.0	15.7	13.1	13.1	19	29.6	19.9	6.4
	Iron (Fe)	20,100	19,200	16,900	13,800	12,200	12,200	16,900	20,100	16,440	3,397
	Lead (Pb)	15.10	12.00	10.50	8.35	7.32	7.32	10.5	15.1	10.7	3.1
	Lithium (Li)	15.3	16.0	14.3	11.1	10.2	10.2	14.3	16	13.4	2.6
	Magnesium (Mg)	5,880	15,000	14,900	14,700	14,800	5,880	14,800	15,000	13,056	4,013
	Manganese (Mn)	625	790	742	585	540	540	625	790	656.4	105.8409
	Mercury (Hg)	0.109	0.087	0.073	0.057	0.045	0.0446	0.073	0.109	0.074	0.025
	Molybdenum (Mo)	2.26	2.40	2.07	1.61	1.54	1.54	2.07	2.4	1.98	0.39
	Nickel (Ni)	33.4	31.7	27.4	21.4	19.0	19	27.4	33.4	26.6	6.3
	Phosphorus (P)	1,150	1,330	1,230	1,140	1,150	1,140	1,150	1,330	1,200	81
	Potassium (K)	2,980	2,560	2,350	2,020	1,860	1,860	2,350	2,980	2,354	444
	Selenium (Se)	2.87	3.71	3.25	2.54	1.94	1.94	2.87	3.71	2.86	0.68
	Silver (Ag)	0.48	0.36	0.30	0.24	0.20	0.2	0.3	0.48	0.316	0.11
	Sodium (Na)	110	120	110	100	130	100	110	130	114	11
	Strontium (Sr)	97.6	107.0	95.9	81.4	82.6	81.4	95.9	107	92.9	10.82
	Thallium (Tl)	0.191	0.332	0.312	0.254	0.244	0.191	0.254	0.332	0.267	0.056
	Tin (Sn)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	37.0	35.4	43.0	42.6	34.9	34.9	37	43	38.58	3.93
	Uranium (U)	0.92	1.25	1.17	1.06	1.14	0.916	1.14	1.25	1.11	0.13
	Vanadium (V)	41.4	39.3	35.5	30.1	27.8	27.8	35.5	41.4	34.8	5.8
	Zinc (Zn)	144.0	132.0	115.0	90.4	77.0	77	115	144	112	28
Hydrocarbons (mg/kg)	Acenaphthene	< 0.500	< 0.009	< 0.100	< 0.090	< 0.040	<0.04	<0.09	<0.5	<0.164	-
	Acenaphthylene	< 0.030	< 0.009	< 0.010	< 0.008	< 0.005	<0.005	<0.009	<0.03	<0.0124	-
	Anthracene	< 0.200	< 0.070	< 0.050	< 0.050	< 0.030	<0.03	<0.05	<0.2	<0.08	-
	Benz(a)anthracene	0.317	0.070	0.096	0.085	0.040	0.04	0.085	0.317	0.122	0.111
	Benzo(a)pyrene	0.177	0.049	0.070	0.061	0.026	0.026	0.061	0.177	0.077	0.059
	Benzo(b)fluoranthene	0.630	0.223	0.249	0.220	0.101	0.101	0.223	0.63	0.285	0.201
	Benzo(b+j+k)fluoranthene	0.706	0.242	0.278	0.245	0.112	0.112	0.245	0.706	0.317	0.227
	Benzo(g,h,i)perylene	0.167	0.070	0.089	0.083	0.037	0.037	0.083	0.167	0.089	0.048
	Benzo(k)fluoranthene	0.076	0.019	0.029	0.025	0.011	0.011	0.025	0.076	0.032	0.026
	Chrysene	< 0.60	< 0.30	0.25	0.23	0.11	<0.3	0.107	0.251	0.297	0.184
	Dibenz(a,h)anthracene	0.095	0.038	0.042	0.040	0.019	0.0186	0.0401	0.095	0.047	0.029
	Fluoranthene	0.643	0.101	0.108	0.091	0.043	0.043	0.101	0.643	0.197	0.251
	Fluorene	0.89	0.23	0.27	0.25	0.10	0.103	0.249	0.885	0.346	0.308
	Indeno(1,2,3-c,d)pyrene	0.076	0.023	0.035	0.027	0.012	0.012	0.027	0.076	0.035	0.025
	2-Methylnaphthalene	5.96	1.81	1.81	1.73	0.76	0.761	1.81	5.96	2.41	2.03
	Naphthalene	1.570	0.446	0.438	0.432	0.194	0.194	0.438	1.57	0.62	0.54
	Phenanthrene	3.930	1.150	1.170	1.110	0.557	0.557	1.15	3.93	1.58	1.34
	Pyrene	0.667	0.142	0.158	0.143	0.068	0.068	0.143	0.667	0.236	0.244
	Acenaphthene d10	106.7	98.2	93.7	97	87.6	87.6	97	106.7	97	7
	Chrysene d12	103.9	117.1	117.5	120	111.9	103.9	117.1	120	114	6
	Naphthalene d8	87.9	93.7	81.9	85.9	80	80	85.9	93.7	85.9	5.4
	Phenanthrene d10	106.3	116.8	108	108.6	102.8	102.8	108	116.8	109	5
	B(a)P Total Potency Equivalent	0.386	0.123	0.156	0.14	0.063	0.063	0.14	0.386	0.174	0.124
	IACR (CCME)	6.46	2.11	2.54	2.26	1.04	1.04	2.26	6.46	2.88	2.08

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed							
		Sparwood Wetland							
		SPW-1	SPW-2	SPW-3	Minimum	Median	Maximum	Mean	Standard Deviation
		10-Aug-13	10-Aug-13	10-Aug-13					
Physical Tests	Moisture (%)	61.6	64.9	63.1	61.60	63.10	64.90	63.20	1.70
	(63 µm) pH (1:2 soil:water)	7.92	7.91	7.89	7.89	7.91	7.92	7.91	0.02
	(1mm) pH	8.11	8.10	8.15	8.10	8.11	8.15	8.12	0.03
Particle Size	% Gravel (>2mm)	0.11	0.76	< 0.10	<0.1	0.11	0.76	0.32	0.38
	% Sand (2.00mm - 1.00mm)	0.13	0.21	< 0.10	<0.1	0.13	0.21	0.15	0.06
	% Sand (1.00mm - 0.50mm)	0.15	0.82	0.43	0.15	0.43	0.82	0.47	0.34
	% Sand (0.50mm - 0.25mm)	0.23	1.22	1.94	0.23	1.22	1.94	1.13	0.86
	% Sand (0.25mm - 0.125mm)	1.01	1.64	2.08	1.01	1.64	2.08	1.58	0.54
	% Sand (0.125mm - 0.063mm)	8.51	5.99	5.11	5.11	5.99	8.51	6.54	1.76
	% Silt (0.063mm - 0.0312mm)	35.40	33.30	31.40	31.40	33.30	35.40	33.40	2.00
	% Silt (0.0312mm - 0.004mm)	47.20	48.10	49.90	47.20	48.10	49.90	48.40	1.40
	% Clay (<4um)	7.25	7.95	9.09	7.25	7.95	9.09	8.10	0.93
	Texture	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	5.21	4.90	4.27	4.27	4.90	5.21	4.79	0.48
Metals (<63 µm) (mg/kg)	Aluminum (Al)	7,080	6,990	6,640	6,640	6,990	7,080	6,903	232.00
	Antimony (Sb)	0.53	0.53	0.57	0.53	0.53	0.57	0.54	0.02
	Arsenic (As)	5.50	5.64	5.71	5.50	5.64	5.71	5.62	0.11
	Barium (Ba)	182	178	180	178.00	180.00	182.00	180.00	2.00
	Beryllium (Be)	0.52	0.55	0.56	0.52	0.55	0.56	0.54	0.02
	Bismuth (Bi)	0.10	0.11	0.11	0.10	0.11	0.11	0.11	0.01
	Boron (B)	8.8	9.3	8.6	8.60	8.80	9.30	8.90	0.36
	Cadmium (Cd)	1.00	0.96	1.02	0.96	1.00	1.02	0.99	0.03
	Calcium (Ca)	66,100	73,600	74,500	66,100	73,600	74,500	71,400	4,612
	Chromium (Cr)	17.7	17.8	17.2	17.20	17.70	17.80	17.60	0.30
	Cobalt (Co)	4.91	4.73	4.96	4.73	4.91	4.96	4.87	0.12
	Copper (Cu)	14.10	13.40	14.10	13.40	14.10	14.10	13.90	0.40
	Iron (Fe)	13,000	13,300	13,800	13,000	13,300	13,800	13,367	404.00
	Lead (Pb)	7.94	8.24	8.36	7.94	8.24	8.36	8.18	0.22
	Lithium (Li)	10.1	10.9	11.0	10.10	10.90	11.00	10.70	0.50
	Magnesium (Mg)	16,800	17,600	17,300	16,800	17,300	17,600	17,233	404.00
	Manganese (Mn)	553	537	589	537.00	553.00	589.00	560.00	27.00
	Mercury (Hg)	0.049	0.048	0.050	0.05	0.05	0.05	0.05	0.00
	Molybdenum (Mo)	1.47	1.51	1.54	1.47	1.51	1.54	1.51	0.04
	Nickel (Ni)	20.9	19.9	20.9	19.90	20.90	20.90	20.60	0.60
	Phosphorus (P)	1,220	1,200	1,210	1,200	1,210	1,220	1,210	10.00
	Potassium (K)	1,830	1,860	1,660	1,660	1,830	1,860	1,783	108.00
	Selenium (Se)	2.49	2.80	2.40	2.40	2.49	2.80	2.56	0.21
	Silver (Ag)	0.192	0.194	0.211	0.19	0.19	0.21	0.20	0.01
	Sodium (Na)	120	< 100	100	<100	100.00	120.00	107.00	12.00
	Strontium (Sr)	79	86	89	78.60	85.70	88.70	84.30	5.20
	Thallium (Tl)	0.275	0.275	0.278	0.28	0.28	0.28	0.28	0.00
	Tin (Sn)	0.49	0.53	0.40	0.40	0.49	0.53	0.47	0.07
	Titanium (Ti)	39.8	28.8	28.8	28.80	28.80	39.80	32.50	6.40
	Uranium (U)	1.08	1.11	1.10	1.08	1.10	1.11	1.10	0.02
	Vanadium (V)	30.4	29.8	28.6	28.60	29.80	30.40	29.60	0.90
	Zinc (Zn)	88.5	85.6	88.5	85.60	88.50	88.50	87.50	1.70
Metals (<1 mm) (mg/kg)	Aluminum (Al)	7,920	7,250	7,690	7,250	7,690	7,920	7,620	340.44
	Antimony (Sb)	0.59	0.55	0.60	0.55	0.59	0.60	0.58	0.03
	Arsenic (As)	5.67	5.27	5.86	5.27	5.67	5.86	5.60	0.30
	Barium (Ba)	169	169	172	169.00	169.00	172.00	170.00	1.73
	Beryllium (Be)	0.62	0.57	0.61	0.57	0.61	0.62	0.60	0.03
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	11	10	11	10.00	11.00	11.00	10.70	0.60
	Cadmium (Cd)	1.06	1.03	1.07	1.03	1.06	1.07	1.05	0.02
	Calcium (Ca)	66,200	68,300	71,300	66,200	68,300	71,300	68,600	2,563
	Chromium (Cr)	18.3	17.9	18.6	17.90	18.30	18.60	18.30	0.40
	Cobalt (Co)	5.00	4.70	5.23	4.70	5.00	5.23	4.98	0.27
	Copper (Cu)	14.8	13.9	14.8	13.90	14.80	14.80	14.50	0.50
	Iron (Fe)	13,100	13,000	13,700	13,000	13,100	13,700	13,267	379.00
	Lead (Pb)	8.73	8.16	8.59	8.16	8.59	8.73	8.49	0.30
	Lithium (Li)	11.2	10.8	12.0	10.80	11.20	12.00	11.30	0.60
	Magnesium (Mg)	16,100	15,700	16,400	15,700	16,100	16,400	16,067	351.00
	Manganese (Mn)	525	505	589	505.00	525.00	589.00	539.67	43.88
	Mercury (Hg)	0.051	< 0.005	0.050	<0.005	0.05	0.05	0.04	0.03
	Molybdenum (Mo)	1.43	1.48	1.52	1.43	1.48	1.52	1.48	0.05
	Nickel (Ni)	21.1	19.7	21.5	19.70	21.10	21.50	20.80	0.90
	Phosphorus (P)	1,260	1,170	1,240	1,170	1,240	1,260	1,223	47.00
	Potassium (K)	2,090	1,990	2,060	1,990	2,060	2,090	2,047	51.00
	Selenium (Se)	2.90	3.19	2.50	2.50	2.90	3.19	2.86	0.35
	Silver (Ag)	0.22	0.19	0.22	0.19	0.22	0.22	0.21	0.02
	Sodium (Na)	100	< 100	110	<100	100.00	110.00	103.00	6.00
	Strontium (Sr)	82.6	83.0	86.1	82.60	83.00	86.10	83.90	1.92
	Thallium (Tl)	0.301	0.278	0.307	0.28	0.30	0.31	0.30	0.02
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	38.8	32.1	29.3	29.30	32.10	38.80	33.40	4.88
	Uranium (U)	1.17	1.17	1.17	1.17	1.17	1.17	1.17	0.00
	Vanadium (V)	33.2	30.5	32.0	30.50	32.00	33.20	31.90	1.40
	Zinc (Zn)	88.9	87.2	91.8	87.20	88.90	91.80	89.30	2.30
Hydrocarbons (mg/kg)	Acenaphthene	< 0.020	< 0.020	< 0.010	<0.01	<0.02	<0.02	<0.0167	-
	Acenaphthylene	< 0.008	< 0.008	< 0.007	<0.007	<0.008	<0.008	<0.00767	-
	Anthracene	< 0.020	< 0.020	< 0.020	<0.02	<0.02	<0.02	<0.02	-
	Benz(a)anthracene	< 0.030	< 0.040	0.029	<0.03	<0.03	0.03	0.03	0.01
	Benzo(a)pyrene	< 0.040	< 0.050	< 0.030	<0.03	<0.04	<0.05	<0.04	-
	Benzo(b)fluoranthene	0.077	0.091	0.073	0.07	0.08	0.09	0.08	0.01
	Benzo(b+j+k)fluoranthene	0.077	0.091	0.073	0.07	0.08	0.09	0.08	0.01
	Benzo(g,h,i)perylene	0.020	0.022	0.024	0.02	0.02	0.02	0.02	0.00
	Benzo(k)fluoranthene	< 0.020	< 0.020	< 0.020	<0.02	<0.02	<0.02	<0.02	-
	Chrysene	< 0.08	< 0.09	< 0.07	<0.07	<0.08	<0.09	<0.08	-
	Dibenz(a,h)anthracene	0.010	0.013	0.012	0.01	0.01	0.01	0.01	0.00
	Fluoranthene	0.046	0.055	0.038	0.04	0.05	0.06	0.05	0.01
	Fluorene	< 0.03	< 0.04	0.03	<0.03	<0.03	0.03	0.03	0.01
	Indeno(1,2,3-c,d)pyrene	0.015	0.021	0.014	0.01	0.02	0.02	0.02	0.00
	2-Methylnaphthalene	0.31	0.32	0.23	0.23	0.31	0.32	0.29	0.05
	Naphthalene	0.143	0.142	0.109	0.11	0.14	0.14	0.13	0.02
	Phenanthrene	0.329	0.356	0.296	0.30	0.33	0.36	0.33	0.03
	Pyrene	0.039	0.042	0.040	0.04	0.04	0.04	0.04	0.00
	Acenaphthene d10	89.1	89.1	82.4	82.40	89.10	89.10	86.90	3.90
	Chrysene d12	112.3	110.5	107.7	107.70	112.30	112.30	110.00	2.00
	Naphthalene d8	83.6	78.8	76.5	76.50	83.60	83.60	79.60	3.60
	Phenanthrene d10	101.6	100.4	94.3	94.30	101.60	101.60	99.00	4.00
	B(a)P Total Potency Equivalent	0.043	0.053	0.04	0.04	0.05	0.05	0.05	0.01
	IACR (CCME)	0.71	0.85	0.72	0.71	0.85	0.85	0.76	0.08

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed							
		Elk River Wetland south of Fernie							
		ERWSF-1	ERWSF-2	ERWSF-3	Minimum	Median	Maximum	Mean	Standard Deviation
		10-Aug-13	10-Aug-13	10-Aug-13					
Physical Tests	Moisture (%)	46.6	49.3	45.9	45.90	46.60	49.30	47.30	1.80
	(63 µm) pH (1:2 soil:water)	7.96	7.83	7.95	7.83	7.95	7.96	7.91	0.07
	(1mm) pH	8.18	7.89	8.20	7.89	8.18	8.20	8.09	0.17
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	0.12	<0.1	<0.1	0.12	0.11	0.01
	% Sand (1.00mm - 0.50mm)	< 0.10	< 0.10	0.13	<0.1	<0.1	0.13	0.11	0.02
	% Sand (0.50mm - 0.25mm)	< 0.10	< 0.10	0.49	<0.1	<0.1	0.49	0.23	0.23
	% Sand (0.25mm - 0.125mm)	0.38	0.15	5.31	0.15	0.38	5.31	1.95	2.92
	% Sand (0.125mm - 0.063mm)	10.80	2.23	10.00	2.23	10.00	10.80	7.70	4.70
	% Silt (0.063mm - 0.0312mm)	37.00	27.50	28.20	27.50	28.20	37.00	30.90	5.30
	% Silt (0.0312mm - 0.004mm)	45.70	55.10	45.10	45.10	45.70	55.10	48.60	5.60
	% Clay (<4um)	6.02	15.00	10.60	6.02	10.60	15.00	10.50	4.50
	Texture	Silt	Silt	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	3.87	4.58	4.21	3.87	4.21	4.58	4.22	0.36
Metals (<63 µm) (mg/kg)	Aluminum (Al)	6,700	7,810	6,660	6,660	6,700	7,810	7,057	653.00
	Antimony (Sb)	0.57	0.80	0.65	0.57	0.65	0.80	0.67	0.12
	Arsenic (As)	4.90	7.12	5.93	4.90	5.93	7.12	5.98	1.11
	Barium (Ba)	178	217	180	178.00	180.00	217.00	192.00	22.00
	Beryllium (Be)	0.52	0.64	0.53	0.52	0.53	0.64	0.56	0.07
	Bismuth (Bi)	0.10	0.15	0.13	0.10	0.13	0.15	0.13	0.03
	Boron (B)	8.7	8.8	6.0	6.00	8.70	8.80	7.83	1.59
	Cadmium (Cd)	0.89	1.40	1.19	0.89	1.19	1.40	1.16	0.26
	Calcium (Ca)	72,600	75,800	73,200	72,600	73,200	75,800	73,867	1,701
	Chromium (Cr)	15.6	18.2	15.5	15.50	15.60	18.20	16.40	1.50
	Cobalt (Co)	4.45	6.23	4.83	4.45	4.83	6.23	5.17	0.94
	Copper (Cu)	12.30	18.50	15.90	12.30	15.90	18.50	15.60	3.10
	Iron (Fe)	12,200	16,100	14,800	12,200	14,800	16,100	14,367	1,986
	Lead (Pb)	8.10	11.70	10.30	8.10	10.30	11.70	10.00	1.80
	Lithium (Li)	10.3	12.3	10.7	10.30	10.70	12.30	11.10	1.10
	Magnesium (Mg)	16,300	16,700	16,200	16,200	16,300	16,700	16,400	265.00
	Manganese (Mn)	444	599	431	431.00	444.00	599.00	491.00	93.00
	Mercury (Hg)	0.042	0.064	0.051	0.04	0.05	0.06	0.05	0.01
	Molybdenum (Mo)	1.41	1.99	1.48	1.41	1.48	1.99	1.63	0.32
	Nickel (Ni)	18.6	26.6	20.6	18.60	20.60	26.60	21.90	4.20
	Phosphorus (P)	1,190	1,280	1,260	1,190	1,260	1,280	1,243	47.00
	Potassium (K)	1,710	1,810	1,330	1,330	1,710	1,810	1,617	253.00
	Selenium (Se)	1.04	1.49	1.22	1.04	1.22	1.49	1.25	0.23
	Silver (Ag)	0.187	0.304	0.209	0.19	0.21	0.30	0.23	0.06
	Sodium (Na)	110	150	120	110.00	120.00	150.00	127.00	21.00
	Strontium (Sr)	82	89	83	82.10	83.10	89.40	84.90	4.00
	Thallium (Tl)	0.253	0.348	0.259	0.25	0.26	0.35	0.29	0.05
	Tin (Sn)	0.55	0.50	0.46	0.46	0.50	0.55	0.50	0.05
	Titanium (Ti)	29.3	33.7	26.2	26.20	29.30	33.70	29.70	3.80
	Uranium (U)	0.99	1.13	0.98	0.98	0.99	1.13	1.03	0.08
	Vanadium (V)	28.9	34.1	27.5	27.50	28.90	34.10	30.20	3.50
	Zinc (Zn)	76.8	110.0	94.8	76.80	94.80	110.00	94.00	17.00
Metals (<1 mm) (mg/kg)	Aluminum (Al)	6,800	8,820	6,470	6,470	6,800	8,820	7,363	1,272
	Antimony (Sb)	0.57	0.84	0.60	0.57	0.60	0.84	0.67	0.15
	Arsenic (As)	5.36	7.35	5.64	5.36	5.64	7.35	6.12	1.08
	Barium (Ba)	171	217	168	168.00	171.00	217.00	185.33	27.47
	Beryllium (Be)	0.52	0.70	0.51	0.51	0.52	0.70	0.58	0.11
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	0.97	1.47	1.07	0.97	1.07	1.47	1.17	0.27
	Calcium (Ca)	64,400	72,900	67,100	64,400	67,100	72,900	68,133	4,343
	Chromium (Cr)	14.9	20.1	14.6	14.60	14.90	20.10	16.50	3.10
	Cobalt (Co)	4.56	6.41	4.65	4.56	4.65	6.41	5.21	1.04
	Copper (Cu)	13.8	19.6	14.4	13.80	14.40	19.60	15.90	3.20
	Iron (Fe)	12,500	16,900	13,700	12,500	13,700	16,900	14,367	2,274
	Lead (Pb)	8.35	12.00	9.35	8.35	9.35	12.00	9.90	1.90
	Lithium (Li)	9.5	13.1	10.5	9.50	10.50	13.10	11.00	1.90
	Magnesium (Mg)	14,900	16,400	14,400	14,400	14,900	16,400	15,233	1,041
	Manganese (Mn)	447	604	387	387.00	447.00	604.00	479.33	112.06
	Mercury (Hg)	0.043	0.063	0.043	0.04	0.04	0.06	0.05	0.01
	Molybdenum (Mo)	1.39	2.02	1.42	1.39	1.42	2.02	1.61	0.36
	Nickel (Ni)	18.8	27.3	19.7	18.80	19.70	27.30	21.90	4.70
	Phosphorus (P)	1,170	1,390	1,230	1,170	1,230	1,390	1,263	114.00
	Potassium (K)	1,640	2,080	1,390	1,390	1,640	2,080	1,703	349.00
	Selenium (Se)	1.15	1.68	1.18	1.15	1.18	1.68	1.34	0.30
	Silver (Ag)	0.19	0.31	0.20	0.19	0.20	0.31	0.23	0.07
	Sodium (Na)	100	160	100	100.00	100.00	160.00	120.00	35.00
	Strontium (Sr)	77.4	89.7	81.4	77.40	81.40	89.70	82.83	6.27
	Thallium (Tl)	0.262	0.375	0.247	0.25	0.26	0.38	0.30	0.07
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	27.1	32.0	23.3	23.30	27.10	32.00	27.47	4.36
	Uranium (U)	0.99	1.16	0.98	0.98	0.99	1.16	1.04	0.10
	Vanadium (V)	29.1	36.2	27.2	27.20	29.10	36.20	30.80	4.70
	Zinc (Zn)	80.2	114.0	87.3	80.20	87.30	114.00	94.00	18.00
Hydrocarbons (mg/kg)	Acenaphthene	< 0.020	< 0.020	< 0.020	<0.02	<0.02	<0.02	<0.02	-
	Acenaphthylene	< 0.008	< 0.010	< 0.020	<0.008	<0.01	<0.02	<0.0127	-
	Anthracene	< 0.040	< 0.030	< 0.040	<0.03	<0.04	<0.04	<0.0367	-
	Benz(a)anthracene	0.050	0.041	0.073	0.04	0.05	0.07	0.06	0.02
	Benzo(a)pyrene	0.052	0.040	0.062	0.04	0.05	0.06	0.05	0.01
	Benzo(b)fluoranthene	0.123	0.110	0.146	0.11	0.12	0.15	0.13	0.02
	Benzo(b+j+k)fluoranthene	0.151	0.132	0.180	0.13	0.15	0.18	0.15	0.02
	Benzo(g,h,i)perylene	0.043	0.041	0.044	0.04	0.04	0.04	0.04	0.00
	Benzo(k)fluoranthene	0.028	0.022	0.034	0.02	0.03	0.03	0.03	0.01
	Chrysene	< 0.10	< 0.09	< 0.20	<0.09	<0.1	<0.2	<0.13	-
	Dibenz(a,h)anthracene	0.016	0.015	0.016	0.02	0.02	0.02	0.02	0.00
	Fluoranthene	0.071	0.060	0.110	0.06	0.07	0.11	0.08	0.03
	Fluorene	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.01
	Indeno(1,2,3-c,d)pyrene	0.034	0.026	0.047	0.03	0.03	0.05	0.04	0.01
	2-Methylnaphthalene	0.28	0.29	0.31	0.28	0.29	0.31	0.29	0.02
	Naphthalene	0.136	0.132	0.154	0.13	0.14	0.15	0.14	0.01
	Phenanthrene	0.355	0.337	0.386	0.34	0.36	0.39	0.36	0.03
	Pyrene	0.064	0.058	0.095	0.06	0.06	0.10	0.07	0.02
	Acenaphthene d10	86.5	82.8	80.7	80.70	86.50	86.50	83.30	2.90
	Chrysene d12	110.9	105.9	101.9	101.90	110.90	110.90	106.00	5.00
	Naphthalene d8	82.9	77.3	71.2	71.20	82.90	82.90	77.10	5.90
	Phenanthrene d10	106.7	101.8	99.1	99.10	106.70	106.70	103.00	4.00
	B(a)P Total Potency Equivalent	0.093	0.076	0.109	0.08	0.11	0.11	0.09	0.02
	IACR (CCME)	1.35	1.16	1.65	1.16	1.65	1.65	1.39	0.25

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed									
		Lower Elk River Oxbow									
		EROL-1	EROL-2	EROL-3	EROL-4	EROL-5	Minimum	Median	Maximum	Mean	Standard Deviation
		11-Aug-13	11-Aug-13	11-Aug-13	11-Aug-13	11-Aug-13					
Physical Tests	Moisture (%)	64.7	55.4	48.0	53.5	40.2	40.2	53.5	64.7	52.4	9.1
	(63 µm) pH (1:2 soil:water)	7.66	7.76	8.06	7.86	7.99	7.66	7.86	8.06	7.87	0.16
	(1mm) pH	7.92	8.01	8.17	8.08	8.20	7.92	8.08	8.20	8.08	0.12
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	< 0.10	0.20	0.33	0.19	0.81	<0.1	0.2	0.81	0.326	0.283
	% Sand (0.50mm - 0.25mm)	0.35	1.29	0.99	0.71	1.25	0.35	0.99	1.29	0.92	0.39
	% Sand (0.25mm - 0.125mm)	1.29	3.08	8.67	2.00	7.77	1.29	3.08	8.67	4.56	3.41
	% Sand (0.125mm - 0.063mm)	1.92	7.97	15.70	9.14	12.60	1.92	9.14	15.7	9.5	5.2
	% Silt (0.063mm - 0.0312mm)	26.10	30.40	29.30	31.90	29.50	26.1	29.5	31.9	29.4	2.1
	% Silt (0.0312mm - 0.004mm)	57.30	48.60	38.60	47.30	41.00	38.6	47.3	57.3	46.6	7.3
	% Clay (<4um)	12.90	8.45	6.45	8.77	6.95	6.45	8.45	12.9	8.7	2.5
	Texture	Silt	Silt	Silt loam	Silt	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	5.26	4.25	3.18	3.87	2.87	2.87	3.87	5.26	3.89	0.94
Metals (<63 µm) (mg/kg)	Aluminum (Al)	7,030	7,840	7,280	7,400	6,590	6,590	7,280	7,840	7,228	462
	Antimony (Sb)	0.71	0.65	0.59	0.62	0.55	0.55	0.62	0.71	0.624	0.061
	Arsenic (As)	6.34	5.13	5.35	5.44	4.99	4.99	5.35	6.34	5.45	0.53
	Barium (Ba)	210	201	186	190	181	181	190	210	194	12
	Beryllium (Be)	0.58	0.53	0.50	0.56	0.46	0.46	0.53	0.58	0.526	0.048
	Bismuth (Bi)	0.14	0.11	0.10	0.11	0.12	0.1	0.11	0.14	0.116	0.015
	Boron (B)	7.0	9.4	9.0	8.4	7.7	7	8.4	9.4	8.3	0.97
	Cadmium (Cd)	1.47	1.15	0.88	1.04	0.802	0.802	1.04	1.47	1.07	0.26
	Calcium (Ca)	97,700	104,000	77,800	87,800	78,800	77,800	87,800	104,000	89,220	11,526
	Chromium (Cr)	15.9	16.8	16.0	17.3	15.3	15.3	16	17.3	16.3	0.8
	Cobalt (Co)	6.17	4.68	4.47	4.72	4.36	4.36	4.68	6.17	4.88	0.74
	Copper (Cu)	16.50	14.10	12.60	13.60	11.50	11.5	13.6	16.5	13.7	1.9
	Iron (Fe)	14,900	12,800	12,700	13,000	12,000	12,000	12,800	14,900	13,080	1,085
	Lead (Pb)	11.10	9.21	7.95	8.54	7.38	7.38	8.54	11.1	8.8	1.4
	Lithium (Li)	11.4	11.6	10.8	11.2	9.9	9.9	11.2	11.6	11	0.7
	Magnesium (Mg)	14,600	15,200	17,200	16,100	17,700	14,600	16,100	17,700	16,160	1,305
	Manganese (Mn)	555	466	463	468	433	433	466	555	477	46
	Mercury (Hg)	0.064	0.046	0.039	0.046	0.037	0.0368	0.0461	0.0643	0.046	0.011
	Molybdenum (Mo)	2.33	1.56	1.54	1.65	1.47	1.47	1.56	2.33	1.71	0.35
	Nickel (Ni)	24.8	19.4	18.5	20.5	17.8	17.8	19.4	24.8	20.2	2.8
	Phosphorus (P)	1,130	1,080	1,140	1,120	1,190	1,080	1,130	1,190	1,132	40
	Potassium (K)	1,470	1,840	1,740	1,680	1,500	1,470	1,680	1,840	1,646	158
	Selenium (Se)	1.91	2.16	1.31	1.82	1.35	1.31	1.82	2.16	1.71	0.37
	Silver (Ag)	0.266	0.205	0.170	0.201	0.170	0.17	0.201	0.266	0.202	0.039
	Sodium (Na)	< 100	110	100	100	100	<100	100	110	102	4
	Strontium (Sr)	97	105	87	96	85	85.2	96.2	105	94	8
	Thallium (Tl)	0.343	0.277	0.249	0.256	0.229	0.229	0.256	0.343	0.271	0.044
	Tin (Sn)	0.87	0.68	0.66	0.75	0.65	0.65	0.68	0.87	0.722	0.091
	Titanium (Ti)	26.3	32.5	31.4	44.7	27.1	26.3	31.4	44.7	32.4	7.4
	Uranium (U)	1.23	1.03	0.99	1.02	1.10	0.987	1.03	1.23	1.07	0.1
	Vanadium (V)	29.1	31.8	30.0	30.6	26.9	26.9	30	31.8	29.7	1.8
	Zinc (Zn)	103.0	91.3	80.3	86.7	75.8	75.8	86.7	103	87	11
Metals (<1 mm) (mg/kg)	Aluminum (Al)	8,660	6,500	6,270	6,060	5,250	5,250	6,270	8,660	6,548	1,271
	Antimony (Sb)	0.68	0.54	0.51	0.55	0.50	0.50	0.54	0.68	0.56	0.07
	Arsenic (As)	6.36	4.85	4.85	5.05	4.70	4.7	4.85	6.36	5.16	0.68
	Barium (Ba)	213	193	157	167	148	148	167	213	175.6	26.85
	Beryllium (Be)	0.57	0.49	0.48	0.46	0.42	0.42	0.48	0.57	0.484	0.055
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	1.57	1.06	0.84	0.98	0.79	1	1	2	1	0
	Calcium (Ca)	91,800	86,300	67,700	76,800	71,000	67,700	76,800	91,800	78,720	10,164
	Chromium (Cr)	18.5	14.2	14.1	14.2	12.1	12.10	14.20	18.50	14.60	2.30
	Cobalt (Co)	6.62	4.39	4.09	4.54	3.86	3.86	4.39	6.62	4.7	1.11
	Copper (Cu)	17.7	13.1	11.2	12.9	10.5	11	13	18	13	3
	Iron (Fe)	15,100	12,100	11,800	12,100	11,400	11,400	12,100	15,100	12,500	1,482
	Lead (Pb)	10.50	7.90	7.29	8.64	7.05	7.05	7.9	10.5	8.3	1.4
	Lithium (Li)	11.5	9.3	9.0	9.2	8.6	9	9	12	10	1
	Magnesium (Mg)	14,500	13,400	13,600	14,000	14,300	13,400	14,000	14,500	13,960	462
	Manganese (Mn)	552	407	375	438	370	370.0000	407.0000	552.0000	428.4000	74.3122
	Mercury (Hg)	0.056	0.043	0.034	0.044	0.032	0.032	0.0429	0.0556	0.042	0.009
	Molybdenum (Mo)	2.31	1.32	1.32	1.38	1.29	1.29	1.32	2.31	1.52	0.44
	Nickel (Ni)	25.8	18.1	16.5	18.1	15.5	15.5	18.1	25.8	18.8	4.1
	Phosphorus (P)	1,180	1,080	1,140	1,080	1,210	1,080	1,140	1,210	1,138	58
	Potassium (K)	2,130	1,530	1,510	1,370	1,220	1,220	1,510	2,130	1,552	346.00
	Selenium (Se)	2.03	1.85	1.23	1.64	1.30	1.23	1.64	2.03	1.61	0.34
	Silver (Ag)	0.25	0.18	0.16	0.20	0.14	0.14	0.18	0.25	0.186	0.042
	Sodium (Na)	130	< 100	< 100	< 100	< 100	<100	<100	130	<106	-
	Strontium (Sr)	91.7	90.8	79.1	85.5	80.4	79.1	85.5	91.7	85.5	5.78
	Thallium (Tl)	0.360	0.226	0.214	0.230	0.192	0.192	0.226	0.36	0.244	0.066
	Tin (Sn)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	52.9	24.5	37.9	29.7	33.3	24.5	33.3	52.9	35.66	10.82
	Uranium (U)	1.27	0.91	0.93	0.99	0.96	0.907	0.959	1.27	1.01	0.15
	Vanadium (V)	34.7	26.7	26.6	25.6	22.7	22.7	26.6	34.7	27.3	4.5
	Zinc (Zn)	105.0	83.2	70.8	77.5	68.0	68	77.5	105	81	15
Hydrocarbons (mg/kg)	Acenaphthene	< 0.040	< 0.020	< 0.020	< 0.020	< 0.020	<0.02	<0.02	<0.04	<0.024	-
	Acenaphthylene	0.022	0.011	0.010	0.010	0.006	0.0056	0.0103	0.0215	0.012	0.006
	Anthracene	< 0.050	< 0.040	< 0.030	< 0.040	< 0.020	<0.02	<0.04	<0.05	<0.036	-
	Benz(a)anthracene	0.096	0.056	0.087	0.077	0.037	0.037	0.077	0.096	0.071	0.024
	Benzo(a)pyrene	0.081	0.045	0.086	0.063	0.031	0.031	0.063	0.086	0.061	0.023
	Benzo(b)fluoranthene	0.200	0.117	0.176	0.153	0.085	0.085	0.153	0.2	0.146	0.046
	Benzo(b+j+k)fluoranthene	0.244	0.141	0.224	0.186	0.103	0.103	0.186	0.244	0.18	0.058
	Benzo(g,h,i)perylene	0.057	0.030	0.047	0.042	0.022	0.022	0.042	0.057	0.04	0.014
	Benzo(k)fluoranthene	0.045	0.024	0.049	0.033	0.018	0.018	0.033	0.049	0.034	0.013
	Chrysene	0.15	0.09	0.11	0.12	0.07	0.065	0.107	0.146	0.107	0.031
	Dibenz(a,h)anthracene	0.025	0.013	0.019	0.018	0.010	0.0101	0.0184	0.0245	0.017	0.006
	Fluoranthene	0.138	0.086	0.087	0.119	0.049	0.049	0.087	0.138	0.096	0.034
	Fluorene	0.07	0.04	0.02	0.04	0.02	0.018	0.039	0.067	0.037	0.019
	Indeno(1,2,3-c,d)pyrene	0.056	0.030	0.054	0.038	0.020	0.02	0.038	0.056	0.04	0.015
	2-Methylnaphthalene	0.55	0.33	0.28	0.36	0.19	0.192	0.333	0.552	0.343	0.133
	Naphthalene	0.290	0.160	0.124	0.154	0.083	0.083	0.154	0.29	0.162	0.078
	Phenanthrene	0.551	0.375	0.306	0.402	0.214	0.214	0.375	0.551	0.37	0.125
	Pyrene	0.111	0.075	0.080	0.093	0.047	0.047	0.08	0.111	0.081	0.024
	Acenaphthene d10	93	87.7	85.6	86	81.3	81.3	86	93	86.7	4.2
	Chrysene d12	117.8	117	109.7	107.2	101.7	101.7	109.7	117.8	111	7
	Naphthalene d8	86.6	81.2	81.5	79.1	76.9	76.9	81.2	86.6	81.1	3.6
	Phenanthrene d10	109	104.6	100.9	100.4	96	96	100.9	109	102	5
	B(a)P Total Potency Equivalent	0.147	0.083	0.142	0.113	0.058	0.058	0.113	0.147	0.109	0.038
	IACR (CCME)	2.24	1.29	2.06	1.73	0.93	0.93	1.73	2.24	1.65	0.54

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.4: Sediment Quality in Mine-exposed Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed									
		Elko Reservoir									
		ELKO-1	ELKO-2	ELKO-3	ELKO-4	ELKO-5	Minimum	Median	Maximum	Mean	Standard Deviation
		13-Aug-13	13-Aug-13	13-Aug-13	13-Aug-13	13-Aug-13					
Physical Tests	Moisture (%)	46.4	36.6	45.6	47.3	43.9	36.6	45.6	47.3	44	4.3
	(63 µm) pH (1:2 soil:water)	8.06	8.32	8.21	8.09	8.35	8.06	8.21	8.35	8.21	0.13
	(1mm) pH	8.03	8.26	8.07	8.01	8.23	8.01	8.07	8.26	8.12	0.12
Particle Size	% Gravel (>2mm)	1.48	< 0.10	< 0.10	< 0.10	< 0.10	<0.1	<0.1	1.48	<0.38	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	< 0.10	0.10	<0.1	<0.1	0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	0.10	< 0.10	0.27	0.10	0.41	<0.1	0.1	0.41	0.196	0.14
	% Sand (0.50mm - 0.25mm)	0.83	2.86	1.92	0.61	4.72	0.61	1.92	4.72	2.19	1.68
	% Sand (0.25mm - 0.125mm)	8.36	27.40	12.50	9.93	15.40	8.36	12.5	27.4	14.7	7.6
	% Sand (0.125mm - 0.063mm)	19.30	22.70	20.20	19.50	19.20	19.2	19.5	22.7	20.2	1.5
	% Silt (0.063mm - 0.0312mm)	27.90	20.60	27.00	24.90	23.30	20.6	24.9	27.9	24.7	2.9
	% Silt (0.0312mm - 0.004mm)	33.90	21.00	30.90	33.70	27.90	21	30.9	33.9	29.5	5.3
	% Clay (<4um)	8.11	5.35	7.20	11.20	9.05	5.35	8.11	11.2	8.2	2.2
	Texture	Silt loam	Sandy loam	Silt loam	Silt loam	Silt loam / Loam / Sandy loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	3.33	2.29	3.76	3.63	2.18	2.18	3.33	3.76	3.04	0.75
Metals (<63 µm) (mg/kg)	Aluminum (Al)	5,370	4,320	4,380	5,300	4,410	4,320	4,410	5,370	4,756	530
	Antimony (Sb)	0.59	0.51	0.55	0.66	0.55	0.51	0.55	0.66	0.572	0.057
	Arsenic (As)	4.32	4.64	4.68	5.38	4.95	4.32	4.68	5.38	4.79	0.4
	Barium (Ba)	170	136	136	184	125	125	136	184	150	25
	Beryllium (Be)	0.45	0.42	0.43	0.49	0.41	0.41	0.43	0.49	0.44	0.032
	Bismuth (Bi)	0.15	0.11	0.12	0.13	0.12	0.11	0.12	0.15	0.126	0.015
	Boron (B)	< 5.0	< 5.0	< 5.0	6.1	< 5.0	<5	<5	6.1	<5.22	-
	Cadmium (Cd)	1.05	0.89	0.92	1.18	0.94	0.885	0.936	1.18	1	0.12
	Calcium (Ca)	72,000	71,400	68,300	70,400	77,600	68,300	71,400	77,600	71,940	3,462
	Chromium (Cr)	11.5	10.1	10.9	13.9	10.4	10.1	10.9	13.9	11.4	1.5
	Cobalt (Co)	4.61	4.20	4.36	5.09	4.42	4.2	4.42	5.09	4.54	0.34
	Copper (Cu)	14.10	11.60	12.50	14.30	12.50	11.6	12.5	14.3	13	1.2
	Iron (Fe)	11,600	11,500	11,600	13,000	11,800	11,500	11,600	13,000	11,900	624
	Lead (Pb)	9.21	7.49	8.26	9.12	7.28	7.28	8.26	9.21	8.27	0.89
	Lithium (Li)	11.7	9.8	9.2	11.0	9.4	9.2	9.8	11.7	10.2	1.1
	Magnesium (Mg)	14,300	15,300	16,400	12,700	15,600	12,700	15,300	16,400	14,860	1,422
	Manganese (Mn)	278	390	380	364	354	278	364	390	353	44
	Mercury (Hg)	0.053	0.040	0.039	0.050	0.041	0.0392	0.0405	0.0531	0.044	0.006
	Molybdenum (Mo)	1.25	1.24	1.34	1.30	1.18	1.18	1.25	1.34	1.26	0.06
	Nickel (Ni)	18.5	16.9	17.4	22.1	17.5	16.9	17.5	22.1	18.5	2.1
	Phosphorus (P)	1,110	1,180	1,150	1,160	1,140	1,110	1,150	1,180	1,148	26
	Potassium (K)	750	630	630	700	610	610	630	750	664	59
	Selenium (Se)	1.86	1.15	1.19	1.88	1.35	1.15	1.35	1.88	1.49	0.36
	Silver (Ag)	0.228	0.159	0.177	0.210	0.173	0.159	0.177	0.228	0.189	0.029
	Sodium (Na)	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	86	81	80	86	84	79.5	84	86.3	83.3	3.1
	Thallium (Tl)	0.189	0.163	0.176	0.187	0.156	0.156	0.176	0.189	0.174	0.015
	Tin (Sn)	0.50	0.54	0.46	0.44	0.32	0.32	0.46	0.54	0.452	0.083
	Titanium (Ti)	29.2	23.7	52.0	27.2	27.7	23.7	27.7	52	32	11.4
	Uranium (U)	0.89	0.79	0.84	0.80	0.80	0.79	0.802	0.886	0.823	0.041
	Vanadium (V)	19.2	17.0	17.5	19.8	17.0	17	17.5	19.8	18.1	1.3
	Zinc (Zn)	87.7	71.7	76.3	91.7	70.9	70.9	76.3	91.7	79.7	9.5
Metals (<1 mm) (mg/kg)	Aluminum (Al)	6,830	5,100	5,980	7,600	6,400	5,100	6,400	7,600	6,382	934.03
	Antimony (Sb)	0.61	0.51	0.55	0.61	0.53	0.51	0.55	0.61	0.56	0.05
	Arsenic (As)	4.35	4.42	4.80	5.24	5.15	4.35	4.8	5.24	4.79	0.41
	Barium (Ba)	157	112	144	183	131	112	144	183	145.4	26.8
	Beryllium (Be)	0.50	0.42	0.47	0.53	0.44	0.42	0.47	0.53	0.472	0.044
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	1.00	0.67	0.87	1.15	0.79	1	1	1	1	0
	Calcium (Ca)	60,600	63,100	61,600	60,200	71,300	60,200	61,600	71,300	63,360	4,577
	Chromium (Cr)	13.8	10.7	12.4	14.4	12.8	10.70	12.80	14.40	12.80	1.40
	Cobalt (Co)	4.63	3.58	4.16	4.99	4.24	3.58	4.24	4.99	4.32	0.53
	Copper (Cu)	12.7	9.3	12.1	13.4	10.7	9	12	13	12	2
	Iron (Fe)	11,400	10,500	11,600	12,900	12,300	10,500	11,600	12,900	11,740	913.0
	Lead (Pb)	8.84	7.22	8.14	9.21	7.06	7.06	8.14	9.21	8.09	0.95
	Lithium (Li)	11.2	8.8	9.8	11.2	9.6	9	10	11	10	1
	Magnesium (Mg)	12,800	12,200	13,700	11,700	13,400	11,700	12,800	13,700	12,760	826
	Manganese (Mn)	255	288	352	318	313	255.0000	313.0000	352.0000	305.2000	36.1621
	Mercury (Hg)	0.054	0.035	0.049	0.053	0.034	0.0344	0.0486	0.0537	0.045	0.01
	Molybdenum (Mo)	1.14	1.06	1.17	1.17	1.01	1.01	1.14	1.17	1.11	0.07
	Nickel (Ni)	18.9	14.7	17.6	21.0	16.5	14.7	17.6	21	17.7	2.4
	Phosphorus (P)	1,100	1,150	1,200	1,200	1,140	1,100	1,150	1,200	1,158	43
	Potassium (K)	1,280	1,040	1,250	1,490	1,360	1,040	1,280	1,490	1,284	165.00
	Selenium (Se)	1.81	0.90	1.15	1.82	1.23	0.9	1.23	1.82	1.38	0.41
	Silver (Ag)	0.21	0.13	0.17	0.20	0.15	0.13	0.17	0.21	0.172	0.033
	Sodium (Na)	< 100	< 100	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	78.6	79.1	77.9	79.4	82.5	77.9	79.1	82.5	79.5	1.77
	Thallium (Tl)	0.215	0.169	0.203	0.231	0.182	0.169	0.203	0.231	0.2	0.025
	Tin (Sn)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	25.5	21.0	20.8	24.2	26.6	20.8	24.2	26.6	23.62	2.63
	Uranium (U)	0.96	0.91	0.94	0.93	0.90	0.899	0.932	0.959	0.928	0.024
	Vanadium (V)	25.3	21.2	24.4	29.1	25.0	21.2	25.0	29.1	25.0	2.8
	Zinc (Zn)	83.7	62.0	72.6	88.6	66.7	62	72.6	88.6	74.7	11.2
Hydrocarbons (mg/kg)	Acenaphthene	< 0.020	< 0.020	< 0.020	< 0.020	< 0.006	<0.006	<0.02	<0.02	<0.0172	-
	Acenaphthylene	0.006	0.009	0.010	0.008	< 0.005	<0.005	0.0084	0.0096	0.008	0.002
	Anthracene	< 0.020	0.024	0.032	0.024	< 0.009	<0.009	0.0236	0.0318	0.022	0.008
	Benz(a)anthracene	0.039	0.080	0.105	0.067	0.018	0.018	0.067	0.105	0.062	0.034
	Benzo(a)pyrene	0.041	0.077	0.108	0.075	0.022	0.022	0.075	0.108	0.065	0.034
	Benzo(b)fluoranthene	0.094	0.163	0.228	0.149	0.047	0.047	0.149	0.228	0.136	0.069
	Benzo(b+j+k)fluoranthene	0.117	0.208	0.295	0.188	0.060	0.06	0.188	0.295	0.174	0.09
	Benzo(g,h,i)perylene	0.022	0.036	0.052	0.036	0.012	0.012	0.036	0.052	0.032	0.015
	Benzo(k)fluoranthene	0.023	0.045	0.068	0.039	0.013	0.013	0.039	0.068	0.038	0.021
	Chrysene	0.07	0.10	0.14	0.11	0.03	0.032	0.1	0.139	0.09	0.041
	Dibenz(a,h)anthracene	0.011	0.016	0.023	0.016	0.006	0.0056	0.0161	0.0232	0.014	0.007
	Fluoranthene	0.064	0.110	0.134	0.091	0.027	0.027	0.091	0.134	0.085	0.041
	Fluorene	0.03	0.02	0.03	0.04	0.01	0.011	0.032	0.035	0.026	0.011
	Indeno(1,2,3-c,d)pyrene	0.022	0.047	0.067	0.043	0.012	0.012	0.043	0.067	0.038	0.022
	2-Methylnaphthalene	0.22	0.22	0.30	0.28	0.09	0.089	0.221	0.301	0.222	0.083
	Naphthalene	0.087	0.107	0.137	0.119	0.037	0.037	0.107	0.137	0.097	0.038
	Phenanthrene	0.253	0.238	0.315	0.303	0.107	0.107	0.253	0.315	0.243	0.083
	Pyrene	0.057	0.093	0.119	0.080	0.025	0.025	0.08	0.119	0.075	0.036
	Acenaphthene d10	100.4	102	95.4	101.6	91.4	91.4	100.4	102	98	5
	Chrysene d12	118.2	120.9	117.5	120.5	113.4	113.4	118.2	120.9	118	3
	Naphthalene d8	92.4	96.3	89.5	93	86.6	86.6	92.4	96.3	91.6	3.7
	Phenanthrene d10	113.9	113.6	110.1	116.3	108.7	108.7	113.6	116.3	113	3
	B(a)P Total Potency Equivalent	0.071	0.128	0.18	0.122	0.037	0.037	0.122	0.18	0.108	0.055
	IACR (CCME)	1.05	1.89	2.65	1.72	0.53	0.53	1.72	2.65	1.57	0.81

" - " = no data or standard deviation not estimate

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.5: Sediment Quality in Reference Areas and Associated Summary Statistics, 2013

Analytes		Units	Fording River Watershed							
			Lake Mountain Lake							
			LML-1	LML-2	LML-3	Minimum	Median	Maximum	Mean	Standard Deviation
			12-Aug-13	12-Aug-13	12-Aug-13					
Physical Tests	Moisture (%)	%	93.6	93.5	95.1	93.50	93.60	95.10	94.10	0.90
	(63 µm) pH (1:2 soil:water)	pH units	7.72	7.50	7.68	7.50	7.68	7.72	7.63	0.12
	(1 mm) pH (1:2 soil:water)	pH units	7.75	7.84	7.53	7.53	7.75	7.84	7.71	0.16
Particle Size	% Gravel (>2mm)	%	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	%	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	%	0.27	< 0.10	0.11	<0.1	0.11	0.27	0.16	0.10
	% Sand (0.50mm - 0.25mm)	%	0.43	0.22	0.21	0.21	0.22	0.43	0.29	0.12
	% Sand (0.25mm - 0.125mm)	%	0.45	0.32	0.42	0.32	0.42	0.45	0.40	0.07
	% Sand (0.125mm - 0.063mm)	%	1.18	0.61	0.78	0.61	0.78	1.18	0.86	0.29
	% Silt (0.063mm - 0.0312mm)	%	38.3	35.8	37.7	35.80	37.70	38.30	37.30	1.30
	% Silt (0.0312mm - 0.004mm)	%	48.1	47.6	47.7	47.60	47.70	48.10	47.80	0.30
	% Clay (<4um)	%	11.2	15.4	13.0	11.20	13.00	15.40	13.20	2.10
	Texture	-	Silt	Silt loam	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	%	16.80	17.80	19.70	16.80	17.80	19.70	18.10	1.50
Metals (<63 µm) (mg/kg)	Aluminum (Al)	mg/kg	1,780	1,630	1,840	1,630	1,780	1,840	1,750	108.00
	Antimony (Sb)	mg/kg	0.26	0.23	0.26	0.23	0.26	0.26	0.25	0.02
	Arsenic (As)	mg/kg	0.93	1.32	1.22	0.93	1.22	1.32	1.16	0.20
	Barium (Ba)	mg/kg	459	460	432	432.00	459.00	460.00	450.00	16.00
	Beryllium (Be)	mg/kg	0.12	0.12	0.13	0.12	0.12	0.13	0.12	0.01
	Bismuth (Bi)	mg/kg	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Boron (B)	mg/kg	6.5	6.6	6.3	6.30	6.50	6.60	6.47	0.15
	Cadmium (Cd)	mg/kg	0.59	0.48	0.70	0.48	0.59	0.70	0.59	0.11
	Calcium (Ca)	mg/kg	243,000	235,000	204,000	204,000	235,000	243,000	227,333	20,599
	Chromium (Cr)	mg/kg	9.27	4.84	3.10	3.10	4.84	9.27	5.74	3.18
	Cobalt (Co)	mg/kg	1.22	1.16	1.23	1.16	1.22	1.23	1.20	0.04
	Copper (Cu)	mg/kg	7.1	5.0	5.9	4.98	5.91	7.07	5.99	1.05
	Iron (Fe)	mg/kg	3,030	3,120	3,290	3,030	3,120	3,290	3,147	132.00
	Lead (Pb)	mg/kg	3.03	3.09	3.59	3.03	3.09	3.59	3.24	0.31
	Lithium (Li)	mg/kg	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Magnesium (Mg)	mg/kg	4,280	4,150	3,820	3,820	4,150	4,280	4,083	237.00
	Manganese (Mn)	mg/kg	92.3	82.4	78.0	78.00	82.40	92.30	84.20	7.30
	Mercury (Hg)	mg/kg	0.035	0.033	0.042	0.03	0.04	0.04	0.04	0.01
	Molybdenum (Mo)	mg/kg	1.05	0.81	0.87	0.81	0.87	1.05	0.91	0.12
	Nickel (Ni)	mg/kg	10.5	7.7	7.2	7.21	7.66	10.50	8.50	1.80
	Phosphorus (P)	mg/kg	437	494	531	437.00	494.00	531.00	487.00	47.00
	Potassium (K)	mg/kg	440	550	490	440.00	490.00	550.00	493.00	55.00
	Selenium (Se)	mg/kg	3.83	2.74	3.24	2.74	3.24	3.83	3.27	0.55
	Silver (Ag)	mg/kg	0.074	0.069	0.095	0.07	0.07	0.10	0.08	0.01
	Sodium (Na)	mg/kg	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	mg/kg	113	109	97	96.70	109.00	113.00	106.00	8.00
	Thallium (Tl)	mg/kg	0.070	0.070	0.069	0.07	0.07	0.07	0.07	0.00
	Tin (Sn)	mg/kg	4.84	0.93	0.89	0.89	0.93	4.84	2.22	2.27
	Titanium (Ti)	mg/kg	29.0	26.6	36.9	26.60	29.00	36.90	30.80	5.40
	Uranium (U)	mg/kg	0.38	0.32	0.35	0.32	0.35	0.38	0.35	0.03
	Vanadium (V)	mg/kg	10.4	11.1	9.8	9.80	10.40	11.10	10.40	0.70
	Zinc (Zn)	mg/kg	31.1	28.0	33.3	28.00	31.10	33.30	30.80	2.70
Metals (<1 mm) (mg/kg)	Aluminum (Al)	mg/kg	2,950	2,990	3,320	2,950	2,990	3,320	3,087	203.06
	Antimony (Sb)	mg/kg	0.39	0.40	0.43	0.39	0.40	0.43	0.41	0.02
	Arsenic (As)	mg/kg	1.21	1.93	1.68	1.21	1.68	1.93	1.61	0.37
	Barium (Ba)	mg/kg	364	399	349	349.00	364.00	399.00	370.67	25.66
	Beryllium (Be)	mg/kg	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Bismuth (Bi)	mg/kg	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	19	28	19	19.00	19.00	28.00	22.00	5.20
	Cadmium (Cd)	mg/kg	1.08	0.91	1.24	0.91	1.08	1.24	1.08	0.16
	Calcium (Ca)	mg/kg	185,000	184,000	138,000	138,000	184,000	185,000	169,000	26,851
	Chromium (Cr)	mg/kg	4.9	5.4	5.2	4.86	5.16	5.38	5.13	0.26
	Cobalt (Co)	mg/kg	1.87	1.67	1.86	1.67	1.86	1.87	1.80	0.11
	Copper (Cu)	mg/kg	7.07	7.73	8.62	7.07	7.73	8.62	7.81	0.78
	Iron (Fe)	mg/kg	4,220	4,730	4,910	4,220	4,730	4,910	4,620	358.00
	Lead (Pb)	mg/kg	4.40	4.52	5.05	4.40	4.52	5.05	4.66	0.35
	Lithium (Li)	mg/kg	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Magnesium (Mg)	mg/kg	3,750	3,880	3,410	3,410	3,750	3,880	3,680	243.00
	Manganese (Mn)	mg/kg	90	84	75	75.20	83.90	90.00	83.03	7.44
	Mercury (Hg)	mg/kg	0.050	0.047	0.061	0.05	0.05	0.06	0.05	0.01
	Molybdenum (Mo)	mg/kg	1.40	1.29	1.19	1.19	1.29	1.40	1.29	0.11
	Nickel (Ni)	mg/kg	9.8	10.5	11.4	9.83	10.50	11.40	10.60	0.80
	Phosphorus (P)	mg/kg	704	701	783	701.00	704.00	783.00	729.00	47.00
	Potassium (K)	mg/kg	770	1,050	850	770.00	850.00	1,050	890.00	144.00
	Selenium (Se)	mg/kg	6.14	4.75	5.28	4.75	5.28	6.14	5.39	0.70
	Silver (Ag)	mg/kg	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.00
	Sodium (Na)	mg/kg	100	120	120	100.00	120.00	120.00	113.00	12.00
	Strontium (Sr)	mg/kg	89	92	73	73.30	89.00	92.20	84.83	10.12
	Thallium (Tl)	mg/kg	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.00
	Tin (Sn)	mg/kg	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	50.1	54.1	64.3	50.10	54.10	64.30	56.17	7.32
	Uranium (U)	mg/kg	0.58	0.50	0.51	0.50	0.51	0.58	0.53	0.04
	Vanadium (V)	mg/kg	16.8	18.9	16.2	16.20	16.80	18.90	17.30	1.40
	Zinc (Zn)	mg/kg	45.9	46.3	53.3	45.90	46.30	53.30	48.50	4.20
Hydrocarbons (mg/kg)	Acenaphthene	mg/kg	< 0.200	< 0.150	< 0.200	<0.15	<0.2	<0.2	<0.183	-
	Acenaphthylene	mg/kg	< 0.030	< 0.020	< 0.030	<0.02	<0.03	<0.03	<0.0267	-
	Anthracene	mg/kg	< 0.100	< 0.050	< 0.070	<0.05	<0.07	<0.1	<0.0733	-
	Benz(a)anthracene	mg/kg	< 0.150	< 0.100	< 0.100	<0.1	<0.1	<0.15	<0.117	-
	Benzo(a)pyrene	mg/kg	< 0.150	< 0.100	< 0.090	<0.09	<0.1	<0.15	<0.113	-
	Benzo(b)fluoranthene	mg/kg	0.268	0.156	0.186	0.16	0.19	0.27	0.20	0.06
	Benzo(b+j+k)fluoranthene	mg/kg	0.268	0.156	0.186	0.16	0.19	0.27	0.20	0.06
	Benzo(g,h,i)perylene	mg/kg	< 0.150	< 0.060	< 0.080	<0.06	<0.08	<0.15	<0.097	-
	Benzo(k)fluoranthene	mg/kg	< 0.060	< 0.030	< 0.030	<0.03	<0.03	<0.06	<0.04	-
	Chrysene	mg/kg	< 0.350	< 0.300	< 0.350	<0.3	<0.35	<0.35	<0.333	-
	Dibenz(a,h)anthracene	mg/kg	0.049	0.035	0.045	0.04	0.04	0.05	0.04	0.01
	Fluoranthene	mg/kg	< 0.150	< 0.080	< 0.100	<0.08	<0.1	<0.15	<0.11	-
	Fluorene	mg/kg	0.516	0.391	0.471	0.39	0.47	0.52	0.46	0.06
	Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.15	< 0.07	< 0.09	<0.07	<0.09	<0.15	<0.103	-
	2-Methylnaphthalene	mg/kg	2.98	2.43	2.98	2.43	2.98	2.98	2.80	0.32
	Naphthalene	mg/kg	0.73	0.59	0.70	0.59	0.70	0.73	0.67	0.07
	Phenanthrene	mg/kg	1.77	1.42	1.72	1.42	1.72	1.77	1.64	0.19
	Pyrene	mg/kg	0.143	0.105	0.130	0.11	0.13	0.14	0.13	0.02
	Acenaphthene d10	%	97.9	96	90.6	90.60	96.00	97.90	94.80	3.80
	Chrysene d12	%	114.1	114.1	111.8	111.80	114.10	114.10	113.00	1.00
	Naphthalene d8	%	85.4	86.4	84.5	84.50	85.40	86.40	85.40	1.00
	Phenanthrene d10	%	106.4	104.3	99.6	99.60	104.30	106.40	103.00	3.00
	B(a)P Total Potency Equivalent	mg/kg	0.172	0.113	0.122	0.11	0.12	0.17	0.14	0.03
	IACR (CCME)	mg/kg	2.63	1.59	1.83	1.59	1.83	2.63	2.02	0.54

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.5: Sediment Quality in Reference Areas and Associated Summary Statistics, 2013

Analytes		Fording River Watershed							
		Fording River Wetland							
		FO15-1	FO15-2	FO15-3	Minimum	Median	Maximum	Mean	Standard Deviation
		10-Aug-13	10-Aug-13	10-Aug-13					
Physical Tests	Moisture (%)	85.3	84.2	79.0	79.00	84.20	85.30	82.80	3.40
	(63 µm) pH (1:2 soil:water)	7.90	7.94	7.88	7.88	7.90	7.94	7.91	0.03
	(1 mm) pH (1:2 soil:water)	7.93	8.03	7.89	7.89	7.93	8.03	7.95	0.07
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	0.24	0.22	0.10	0.10	0.22	0.24	0.19	0.08
	% Sand (0.50mm - 0.25mm)	0.31	0.40	0.11	0.11	0.31	0.40	0.27	0.15
	% Sand (0.25mm - 0.125mm)	0.18	0.53	< 0.10	<0.1	0.18	0.53	0.27	0.23
	% Sand (0.125mm - 0.063mm)	0.20	0.66	0.12	0.12	0.20	0.66	0.33	0.29
	% Silt (0.063mm - 0.0312mm)	31.6	37.8	14.4	14.40	31.60	37.80	27.90	12.10
	% Silt (0.0312mm - 0.004mm)	50.3	50.2	40.6	40.60	50.20	50.30	47.00	5.60
	% Clay (<4um)	17.2	10.2	44.7	10.20	17.20	44.70	24.00	18.20
	Texture	Silt loam	Silt	Silt Clay loam / Silty clay	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	8.97	13.3	4.84	4.84	8.97	13.30	9.00	4.20
Metals (<63 µm) (mg/kg)	Aluminum (Al)	4,640	2,350	8,970	2,350	4,640	8,970	5,320	3,362
	Antimony (Sb)	0.39	0.26	0.70	0.26	0.39	0.70	0.45	0.23
	Arsenic (As)	2.41	1.71	4.68	1.71	2.41	4.68	2.93	1.55
	Barium (Ba)	462	325	472	325.00	462.00	472.00	420.00	82.00
	Beryllium (Be)	0.29	0.15	0.58	0.15	0.29	0.58	0.34	0.22
	Bismuth (Bi)	< 0.10	< 0.10	0.11	<0.1	<0.1	0.11	0.10	0.01
	Boron (B)	7.9	9.0	11.0	7.90	9.00	11.00	9.30	1.60
	Cadmium (Cd)	0.46	0.27	0.82	0.27	0.46	0.82	0.52	0.28
	Calcium (Ca)	264,000	278,000	219,000	219,000	264,000	278,000	253,667	30,827
	Chromium (Cr)	12.20	4.55	14.40	4.55	12.20	14.40	10.40	5.20
	Cobalt (Co)	2.18	1.70	3.96	1.70	2.18	3.96	2.61	1.19
	Copper (Cu)	7.8	3.9	13.0	3.94	7.80	13.00	8.20	4.50
	Iron (Fe)	10,000	5,900	12,900	5,900	10,000	12,900	9,600	3,517
	Lead (Pb)	4.77	5.34	8.84	4.77	5.34	8.84	6.32	2.20
	Lithium (Li)	< 5.0	< 5.0	7.3	<5	<5	7.30	5.77	1.33
	Magnesium (Mg)	8,140	6,800	8,440	6,800	8,140	8,440	7,793	873.00
	Manganese (Mn)	465.0	442.0	373.0	373.00	442.00	465.00	427.00	48.00
	Mercury (Hg)	0.033	0.029	0.048	0.03	0.03	0.05	0.04	0.01
	Molybdenum (Mo)	2.72	1.05	2.27	1.05	2.27	2.72	2.01	0.86
	Nickel (Ni)	12.3	5.9	17.5	5.86	12.30	17.50	11.90	5.80
	Phosphorus (P)	548	323	701	323.00	548.00	701.00	524.00	190.00
	Potassium (K)	1,310	640	2,500	640.00	1,310	2,500	1,483	942.00
	Selenium (Se)	1.55	3.44	1.53	1.53	1.55	3.44	2.17	1.10
	Silver (Ag)	0.106	0.050	0.187	0.05	0.11	0.19	0.11	0.07
	Sodium (Na)	100	< 100	120	<100	100.00	120.00	107.00	12.00
	Strontium (Sr)	248	195	215	195.00	215.00	248.00	219.00	27.00
	Thallium (Tl)	0.150	0.077	0.281	0.08	0.15	0.28	0.17	0.10
	Tin (Sn)	0.98	0.47	0.92	0.47	0.92	0.98	0.79	0.28
	Titanium (Ti)	15.3	17.8	19.6	15.30	17.80	19.60	17.60	2.20
	Uranium (U)	1.38	0.82	1.25	0.82	1.25	1.38	1.15	0.29
	Vanadium (V)	18.2	08.9	35.4	8.89	18.20	35.40	20.80	13.40
	Zinc (Zn)	46.7	26.7	81.5	26.70	46.70	81.50	51.60	27.70
Metals (<1 mm) (mg/kg)	Aluminum (Al)	6,190	2,920	10,100	2,920	6,190	10,100	6,403	3,595
	Antimony (Sb)	0.49	0.30	0.84	0.30	0.49	0.84	0.54	0.27
	Arsenic (As)	2.90	1.96	5.52	1.96	2.90	5.52	3.46	1.84
	Barium (Ba)	386	269	404	269.00	386.00	404.00	353.00	73.30
	Beryllium (Be)	0.41	< 0.20	0.70	<0.2	0.41	0.70	0.44	0.25
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	11	12	11	11.00	11.00	12.00	11.30	0.60
	Cadmium (Cd)	0.64	0.33	1.12	0.33	0.64	1.12	0.70	0.40
	Calcium (Ca)	200,000	219,000	156,000	156,000	200,000	219,000	191,667	32,316
	Chromium (Cr)	10.2	5.1	16.8	5.08	10.20	16.80	10.70	5.90
	Cobalt (Co)	2.74	1.78	4.36	1.78	2.74	4.36	2.96	1.30
	Copper (Cu)	9.84	4.50	16.70	4.50	9.84	16.70	10.30	6.10
	Iron (Fe)	11,900	6,370	14,200	6,370	11,900	14,200	10,823	4,025
	Lead (Pb)	6.28	5.90	10.1	5.90	6.28	10.10	7.40	2.30
	Lithium (Li)	< 5.0	< 5.0	8.2	<5	<5	8.20	6.07	1.85
	Magnesium (Mg)	7,290	6,000	7,810	6,000	7,290	7,810	7,033	932.00
	Manganese (Mn)	462	404	368	368.00	404.00	462.00	411.33	47.43
	Mercury (Hg)	0.044	0.031	0.058	0.03	0.04	0.06	0.04	0.01
	Molybdenum (Mo)	3.24	1.21	2.66	1.21	2.66	3.24	2.37	1.05
	Nickel (Ni)	11.5	6.4	20.2	6.37	11.50	20.20	12.70	7.00
	Phosphorus (P)	726	444	848	444.00	726.00	848.00	673.00	207.00
	Potassium (K)	1,810	820	2,780	820.00	1,810	2,780	1,803	980.00
	Selenium (Se)	2.05	5.05	1.77	1.77	2.05	5.05	2.96	1.82
	Silver (Ag)	0.15	< 0.10	0.24	<0.1	0.15	0.24	0.16	0.07
	Sodium (Na)	110	< 100	110	<100	110.00	110.00	107.00	6.00
	Strontium (Sr)	193	157	164	157.00	164.00	193.00	171.33	19.09
	Thallium (Tl)	0.20	0.09	0.30	0.09	0.20	0.30	0.20	0.11
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	33.7	32.3	38.1	32.30	33.70	38.10	34.70	3.03
	Uranium (U)	1.94	1.14	1.49	1.14	1.49	1.94	1.52	0.40
	Vanadium (V)	24.9	10.8	40.9	10.80	24.90	40.90	25.50	15.10
	Zinc (Zn)	61.1	30.1	102.0	30.10	61.10	102.00	64.00	36.00
Hydrocarbons (mg/kg)	Acenaphthene	< 0.030	< 0.020	< 0.020	<0.02	<0.02	<0.03	<0.0233	-
	Acenaphthylene	< 0.005	< 0.006	< 0.005	<0.005	<0.005	<0.006	<0.00533	-
	Anthracene	< 0.020	< 0.070	< 0.007	<0.007	<0.02	<0.07	<0.0323	-
	Benz(a)anthracene	< 0.030	< 0.020	< 0.020	<0.02	<0.02	<0.03	<0.0233	-
	Benzo(a)pyrene	< 0.040	< 0.030	< 0.020	<0.02	<0.03	<0.04	<0.03	-
	Benzo(b)fluoranthene	0.092	0.044	0.125	0.04	0.09	0.13	0.09	0.04
	Benzo(b+j+k)fluoranthene	0.092	0.044	0.125	0.04	0.09	0.13	0.09	0.04
	Benzo(g,h,i)perylene	< 0.030	< 0.020	< 0.030	<0.02	<0.03	<0.03	<0.0267	-
	Benzo(k)fluoranthene	< 0.020	< 0.010	< 0.020	<0.01	<0.02	<0.02	<0.0167	-
	Chrysene	< 0.060	< 0.040	< 0.200	<0.04	<0.06	<0.2	<0.1	-
	Dibenz(a,h)anthracene	< 0.020	< 0.009	< 0.020	<0.009	<0.02	<0.02	<0.0163	-
	Fluoranthene	< 0.040	0.027	0.038	<0.04	0.03	0.04	0.04	0.01
	Fluorene	0.087	0.045	0.054	0.05	0.05	0.09	0.06	0.02
	Indeno(1,2,3-c,d)pyrene	< 0.03	< 0.02	< 0.02	<0.02	<0.02	<0.03	<0.0233	-
	2-Methylnaphthalene	0.30	0.18	0.17	0.17	0.18	0.30	0.21	0.07
	Naphthalene	0.08	0.05	0.04	0.04	0.05	0.08	0.06	0.02
	Phenanthrene	0.33	0.17	0.29	0.17	0.29	0.33	0.26	0.08
	Pyrene	0.044	0.020	0.061	0.020	0.044	0.061	0.042	0.021
	Acenaphthene d10	103.6	104.9	101.6	101.60	103.60	104.90	103.00	2.00
	Chrysene d12	123.2	118	119.1	118.00	119.10	123.20	120.00	3.00
	Naphthalene d8	94.2	97	90.3	90.30	94.20	97.00	93.80	3.40
	Phenanthrene d10	122.1	118.1	116.2	116.20	118.10	122.10	119.00	3.00
	B(a)P Total Potency Equivalent	0.044	0.027	0.037	0.03	0.04	0.04	0.04	0.01
	IACR (CCME)	0.8	0.41	1	0.41	0.80	1.00	0.74	0.30

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.5: Sediment Quality in Reference Areas and Associated Summary Statistics, 2013

Analytes		Michel Creek Watershed							
		Leach Creek Oxbow							
		LCHO-1	LCHO-2	LCHO-3	Minimum	Median	Maximum	Mean	Standard Deviation
		09-Aug-13	09-Aug-13	09-Aug-13					
Physical Tests	Moisture (%)	52.9	37.1	32.9	32.90	37.10	52.90	41.00	10.50
	(63 µm) pH (1:2 soil:water)	7.34	-	7.61	7.34	7.61	7.61	7.48	0.19
	(1 mm) pH (1:2 soil:water)	7.40	7.42	7.73	7.40	7.42	7.73	7.52	0.19
Particle Size	% Gravel (>2mm)	0.25	< 0.10	< 0.10	<0.1	<0.1	0.25	0.15	0.09
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	0.22	0.17	0.18	0.17	0.18	0.22	0.19	0.03
	% Sand (0.50mm - 0.25mm)	0.38	0.52	1.07	0.38	0.52	1.07	0.66	0.36
	% Sand (0.25mm - 0.125mm)	1.19	5.28	13.60	1.19	5.28	13.60	6.70	6.30
	% Sand (0.125mm - 0.063mm)	5.16	16.20	20.50	5.16	16.20	20.50	14.00	7.90
	% Silt (0.063mm - 0.0312mm)	33.3	32.3	29.0	29.00	32.30	33.30	31.50	2.30
	% Silt (0.0312mm - 0.004mm)	49.7	36.7	29.8	29.80	36.70	49.70	38.70	10.10
	% Clay (<4um)	9.8	8.8	5.8	5.78	8.76	9.77	8.10	2.07
	Texture	Silt	Silt loam	Silt loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	5.50	5.54	3.66	3.66	5.50	5.54	4.90	1.07
Metals (<63 µm) (mg/kg)	Aluminum (Al)	9,470	9,610	10,000	9,470	9,610	10,000	9,693	275.00
	Antimony (Sb)	1.51	1.30	1.23	1.23	1.30	1.51	1.35	0.15
	Arsenic (As)	5.35	5.34	5.29	5.29	5.34	5.35	5.33	0.03
	Barium (Ba)	356	368	370	356.00	368.00	370.00	365.00	8.00
	Beryllium (Be)	0.71	0.65	0.64	0.64	0.65	0.71	0.67	0.04
	Bismuth (Bi)	0.15	0.14	0.12	0.12	0.14	0.15	0.14	0.02
	Boron (B)	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Cadmium (Cd)	2.55	1.96	1.75	1.75	1.96	2.55	2.09	0.41
	Calcium (Ca)	7,530	7,400	7,450	7,400	7,450	7,530	7,460	66.00
	Chromium (Cr)	18.30	17.60	17.60	17.60	17.60	18.30	17.80	0.40
	Cobalt (Co)	6.74	6.05	5.71	5.71	6.05	6.74	6.17	0.52
	Copper (Cu)	21.2	17.8	15.8	15.80	17.80	21.20	18.30	2.70
	Iron (Fe)	14,500	14,100	14,200	14,100	14,200	14,500	14,267	208.00
	Lead (Pb)	11.90	10.60	9.64	9.64	10.60	11.90	10.70	1.10
	Lithium (Li)	11.5	10.8	10.8	10.80	10.80	11.50	11.00	0.40
	Magnesium (Mg)	3,420	3,290	3,130	3,130	3,290	3,420	3,280	145.00
	Manganese (Mn)	197.0	208.0	224.0	197.00	208.00	224.00	210.00	14.00
	Mercury (Hg)	0.102	0.098	0.067	0.07	0.10	0.10	0.09	0.02
	Molybdenum (Mo)	1.70	1.53	1.61	1.53	1.61	1.70	1.61	0.09
	Nickel (Ni)	32.2	28.1	26.6	26.60	28.10	32.20	29.00	2.90
	Phosphorus (P)	1,250	1,220	1,270	1,220	1,250	1,270	1,247	25.00
	Potassium (K)	1,590	1,770	1,840	1,590	1,770	1,840	1,733	129.00
	Selenium (Se)	2.48	1.07	0.91	0.91	1.07	2.48	1.49	0.86
	Silver (Ag)	0.511	0.385	0.321	0.32	0.39	0.51	0.41	0.10
	Sodium (Na)	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	42	41	42	40.50	41.60	41.90	41.30	0.70
	Thallium (Tl)	0.291	0.282	0.267	0.27	0.28	0.29	0.28	0.01
	Tin (Sn)	0.46	0.41	1.52	0.41	0.46	1.52	0.80	0.63
	Titanium (Ti)	60.5	66.6	48.2	48.20	60.50	66.60	58.40	9.40
	Uranium (U)	2.04	1.73	1.59	1.59	1.73	2.04	1.79	0.23
	Vanadium (V)	50.3	51.2	52.2	50.30	51.20	52.20	51.20	1.00
	Zinc (Zn)	137.0	118.0	116.0	116.00	118.00	137.00	124.00	12.00
Metals (<1 mm) (mg/kg)	Aluminum (Al)	11,800	9,280	8,490	8,490	9,280	11,800	9,857	1,729
	Antimony (Sb)	1.61	1.46	1.24	1.24	1.46	1.61	1.44	0.19
	Arsenic (As)	5.81	6.27	5.54	5.54	5.81	6.27	5.87	0.37
	Barium (Ba)	364	335	300	300.00	335.00	364.00	333.00	32.05
	Beryllium (Be)	0.87	0.75	0.66	0.66	0.75	0.87	0.76	0.11
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	3.08	2.49	1.90	1.90	2.49	3.08	2.49	0.59
	Calcium (Ca)	8,210	7,050	6,080	6,080	7,050	8,210	7,113	1,066
	Chromium (Cr)	21.3	17.3	16.2	16.20	17.30	21.30	18.30	2.70
	Cobalt (Co)	7.88	6.92	6.25	6.25	6.92	7.88	7.02	0.82
	Copper (Cu)	23.80	21.00	17.40	17.40	21.00	23.80	20.70	3.20
	Iron (Fe)	15,500	14,400	14,300	14,300	14,400	15,500	14,733	666.00
	Lead (Pb)	12.90	11.40	10.10	10.10	11.40	12.90	11.50	1.40
	Lithium (Li)	15.4	11.7	10.0	10.00	11.70	15.40	12.40	2.80
	Magnesium (Mg)	3,340	2,340	2,470	2,340	2,470	3,340	2,717	544.00
	Manganese (Mn)	263	321	267	263.00	267.00	321.00	283.67	32.39
	Mercury (Hg)	0.115	0.146	0.065	0.07	0.12	0.15	0.11	0.04
	Molybdenum (Mo)	1.65	1.54	1.65	1.54	1.65	1.65	1.61	0.06
	Nickel (Ni)	34.7	30.8	27.7	27.70	30.80	34.70	31.10	3.50
	Phosphorus (P)	1,290	1,130	1,170	1,130	1,170	1,290	1,197	83.00
	Potassium (K)	2,090	1,450	1,450	1,450	1,450	2,090	1,663	370.00
	Selenium (Se)	3.18	1.54	1.01	1.01	1.54	3.18	1.91	1.13
	Silver (Ag)	0.60	0.49	0.34	0.34	0.49	0.60	0.48	0.13
	Sodium (Na)	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	47	46	39	38.60	45.80	47.20	43.87	4.61
	Thallium (Tl)	0.39	0.30	0.25	0.25	0.30	0.39	0.31	0.07
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	46.3	50.0	48.7	46.30	48.70	50.00	48.33	1.88
	Uranium (U)	2.24	1.99	1.60	1.60	1.99	2.24	1.94	0.32
	Vanadium (V)	60.9	51.6	47.5	47.50	51.60	60.90	53.30	6.90
	Zinc (Zn)	145.0	122.0	113.0	113.00	122.00	145.00	127.00	17.00
Hydrocarbons (mg/kg)	Acenaphthene	< 0.010	< 0.010	< 0.020	<0.01	<0.01	<0.02	<0.0133	-
	Acenaphthylene	< 0.005	< 0.006	< 0.005	<0.005	<0.005	<0.006	<0.00533	-
	Anthracene	< 0.020	< 0.020	< 0.020	<0.02	<0.02	<0.02	<0.02	-
	Benz(a)anthracene	< 0.050	< 0.070	< 0.060	<0.05	<0.06	<0.07	<0.06	-
	Benzo(a)pyrene	< 0.040	< 0.040	0.031	<0.04	<0.04	0.03	<0.037	0.01
	Benzo(b)fluoranthene	0.068	0.080	0.069	0.07	0.07	0.08	0.07	0.01
	Benzo(b+j+k)fluoranthene	0.068	0.080	0.069	0.07	0.07	0.08	0.07	0.01
	Benzo(g,h,i)perylene	0.027	0.030	0.023	0.02	0.03	0.03	0.03	0.00
	Benzo(k)fluoranthene	< 0.010	< 0.020	< 0.020	<0.01	<0.02	<0.02	<0.0167	-
	Chrysene	< 0.090	< 0.200	< 0.200	<0.09	<0.2	<0.2	<0.163	-
	Dibenz(a,h)anthracene	0.012	0.012	0.011	0.01	0.01	0.01	0.01	0.00
	Fluoranthene	0.042	0.059	< 0.050	<0.05	0.04	0.06	0.05	0.01
	Fluorene	< 0.020	< 0.020	0.015	<0.02	<0.02	0.02	0.02	0.00
	Indeno(1,2,3-c,d)pyrene	0.01	0.01	< 0.01	<0.01	0.01	0.01	0.01	0.00
	2-Methylnaphthalene	0.10	0.16	0.16	0.10	0.16	0.16	0.14	0.04
	Naphthalene	0.05	0.08	0.08	0.05	0.08	0.08	0.07	0.02
	Phenanthrene	0.28	0.42	0.40	0.28	0.40	0.42	0.37	0.07
	Pyrene	0.055	0.075	0.069	0.055	0.069	0.08	0.07	0.01
	Acenaphthene d10	89.30	87.70	101.20	87.70	89.30	101.20	93.00	7.00
	Chrysene d12	110.70	111.20	126.10	110.70	111.20	126.10	116.00	9.00
	Naphthalene d8	81.20	80.70	92.80	80.70	81.20	92.80	84.90	6.80
	Phenanthrene d10	98.70	98.00	120.70	98.00	98.70	120.70	106.00	13.00
	B(a)P Total Potency Equivalent	0.04	0.05	0.06	0.04	0.05	0.06	0.05	0.01
	IACR (CCME)	0.67	0.83	0.77	0.67	0.77	0.83	0.76	0.08

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.5: Sediment Quality in Reference Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed							
		Unnamed Wetland near Elk River north of Elkford							
		REFF-1	REFF-2	REFF-3	Minimum	Median	Maximum	Mean	Standard Deviation
		11-Aug-13	11-Aug-13	11-Aug-13					
Physical Tests	Moisture (%)	92.2	90.5	88.9	88.90	90.50	92.20	90.50	1.70
	(63 µm) pH (1:2 soil:water)	8.04	8.03	7.57	7.57	8.03	8.04	7.88	0.27
	(1 mm) pH (1:2 soil:water)	7.94	8.01	7.83	7.83	7.94	8.01	7.93	0.09
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	< 0.10	0.36	0.23	<0.1	0.23	0.36	0.23	0.13
	% Sand (0.50mm - 0.25mm)	0.29	0.79	0.66	0.29	0.66	0.79	0.58	0.26
	% Sand (0.25mm - 0.125mm)	0.47	0.66	1.47	0.47	0.66	1.47	0.87	0.53
	% Sand (0.125mm - 0.063mm)	0.82	1.28	1.32	0.82	1.28	1.32	1.14	0.28
	% Silt (0.063mm - 0.0312mm)	39.1	35.9	35.6	35.60	35.90	39.10	36.90	1.90
	% Silt (0.0312mm - 0.004mm)	48.8	49.9	46.8	46.80	48.80	49.90	48.50	1.60
	% Clay (<4um)	10.5	11.2	13.9	10.50	11.20	13.90	11.90	1.80
	Texture	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	16.90	9.28	6.14	6.14	9.28	16.90	10.80	5.50
Metals (<63 µm) (mg/kg)	Aluminum (Al)	557	383	286	286.00	383.00	557.00	409.00	137.00
	Antimony (Sb)	0.11	< 0.10	< 0.10	<0.1	<0.1	0.11	0.10	0.01
	Arsenic (As)	0.45	0.26	0.23	0.23	0.26	0.45	0.31	0.12
	Barium (Ba)	443	447	389	389.00	443.00	447.00	426.00	32.00
	Beryllium (Be)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Bismuth (Bi)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Boron (B)	6.1	< 5.0	7.6	<5	6.10	7.60	6.23	1.31
	Cadmium (Cd)	0.19	0.14	0.10	0.10	0.14	0.19	0.14	0.05
	Calcium (Ca)	274,000	299,000	268,000	268,000	274,000	299,000	280,333	16,442
	Chromium (Cr)	4.69	4.42	3.59	3.59	4.42	4.69	4.23	0.57
	Cobalt (Co)	0.30	0.16	0.13	0.13	0.16	0.30	0.20	0.09
	Copper (Cu)	2.0	1.3	0.7	0.69	1.26	1.98	1.31	0.65
	Iron (Fe)	707	427	382	382.00	427.00	707.00	505.00	176.00
	Lead (Pb)	1.86	1.36	0.80	0.80	1.36	1.86	1.34	0.53
	Lithium (Li)	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Magnesium (Mg)	4,480	5,150	5,060	4,480	5,060	5,150	4,897	364.00
	Manganese (Mn)	94.8	93.6	62.0	62.00	93.60	94.80	83.50	18.60
	Mercury (Hg)	0.019	0.011	< 0.005	<0.005	0.01	0.02	0.01	0.01
	Molybdenum (Mo)	1.09	1.18	0.36	0.36	1.09	1.18	0.88	0.45
	Nickel (Ni)	1.6	1.3	1.1	1.12	1.29	1.59	1.33	0.24
	Phosphorus (P)	194	104	67	67.00	104.00	194.00	122.00	65.00
	Potassium (K)	130	100	140	100.00	130.00	140.00	123.00	21.00
	Selenium (Se)	2.93	1.89	1.20	1.20	1.89	2.93	2.01	0.87
	Silver (Ag)	< 0.050	< 0.050	< 0.050	<0.05	<0.05	<0.05	<0.05	-
	Sodium (Na)	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	211	220	167	167.00	211.00	220.00	199.00	28.00
	Thallium (Tl)	< 0.050	< 0.050	< 0.050	<0.05	<0.05	<0.05	<0.05	-
	Tin (Sn)	0.55	0.52	0.84	0.52	0.55	0.84	0.64	0.18
	Titanium (Ti)	15.3	11.4	8.0	8.00	11.40	15.30	11.60	3.70
	Uranium (U)	1.45	1.36	0.51	0.51	1.36	1.45	1.11	0.52
	Vanadium (V)	1.7	1.3	1.2	1.21	1.32	1.71	1.41	0.26
	Zinc (Zn)	8.8	5.5	4.5	4.50	5.50	8.80	6.27	2.25
Metals (<1 mm) (mg/kg)	Aluminum (Al)	1,020	623	197	197.00	623.00	1,020	613.33	411.59
	Antimony (Sb)	0.22	0.14	0.10	<0.1	0.14	0.22	0.15	0.06
	Arsenic (As)	0.63	0.55	0.19	0.19	0.55	0.63	0.46	0.23
	Barium (Ba)	432	459	405	405.00	432.00	459.00	432.00	27.00
	Beryllium (Be)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	16	< 10	< 10	<10	<10	16.00	12.00	3.50
	Cadmium (Cd)	0.24	0.21	0.08	0.08	0.21	0.24	0.18	0.09
	Calcium (Ca)	263,000	297,000	290,000	263,000	290,000	297,000	283,333	17,954
	Chromium (Cr)	7.1	6.8	2.8	2.76	6.78	7.09	5.54	2.42
	Cobalt (Co)	0.42	0.32	0.10	0.10	0.32	0.42	0.28	0.16
	Copper (Cu)	2.62	2.18	0.58	0.58	2.18	2.62	1.79	1.07
	Iron (Fe)	1,120	706	299	299.00	706.00	1,120	708.00	411.00
	Lead (Pb)	2.48	2.47	0.74	0.74	2.47	2.48	1.90	1.00
	Lithium (Li)	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Magnesium (Mg)	5,000	5,140	5,010	5,000	5,010	5,140	5,050	78.00
	Manganese (Mn)	97	93	58	57.60	93.00	97.00	82.53	21.69
	Mercury (Hg)	0.026	0.017	< 0.005	<0.005	0.02	0.03	0.02	0.01
	Molybdenum (Mo)	1.68	1.89	< 0.50	<0.5	1.68	1.89	1.36	0.75
	Nickel (Ni)	2.3	1.7	0.7	0.74	1.74	2.31	1.60	0.79
	Phosphorus (P)	283	173	66	66.00	173.00	283.00	174.00	109.00
	Potassium (K)	210	150	120	120.00	150.00	210.00	160.00	46.00
	Selenium (Se)	4.95	3.49	1.10	1.10	3.49	4.95	3.18	1.94
	Silver (Ag)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Sodium (Na)	< 100	300	< 100	<100	<100	300.00	167.00	115.00
	Strontium (Sr)	211	217	194	194.00	211.00	217.00	207.33	11.93
	Thallium (Tl)	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	-
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	25.1	19.5	5.2	5.20	19.50	25.10	16.60	10.26
	Uranium (U)	2.57	2.14	0.542	0.54	2.14	2.57	1.75	1.07
	Vanadium (V)	3.2	2.2	0.9	0.93	2.23	3.16	2.11	1.12
	Zinc (Zn)	12.1	9.0	4.3	4.30	9.00	12.10	8.50	3.90
Hydrocarbons (mg/kg)	Acenaphthene	< 0.015	< 0.020	< 0.400	<0.015	<0.02	<0.4	<0.145	-
	Acenaphthylene	< 0.015	< 0.010	< 0.010	<0.01	<0.01	<0.015	<0.0117	-
	Anthracene	< 0.012	< 0.008	< 0.020	<0.008	<0.012	<0.02	<0.0133	-
	Benz(a)anthracene	< 0.030	< 0.020	< 0.020	<0.02	<0.02	<0.03	<0.0233	-
	Benzo(a)pyrene	< 0.030	< 0.020	< 0.020	<0.02	<0.02	<0.03	<0.0233	-
	Benzo(b)fluoranthene	< 0.040	< 0.020	< 0.030	<0.02	<0.03	<0.04	<0.03	-
	Benzo(b+j+k)fluoranthene	< 0.050	< 0.028	< 0.036	<0.028	<0.036	<0.05	<0.038	-
	Benzo(g,h,i)perylene	< 0.030	< 0.030	< 0.020	<0.02	<0.03	<0.03	<0.0267	-
	Benzo(k)fluoranthene	< 0.030	< 0.020	< 0.020	<0.02	<0.02	<0.03	<0.0233	-
	Chrysene	< 0.040	< 0.030	< 0.030	<0.03	<0.03	<0.04	<0.0333	-
	Dibenz(a,h)anthracene	< 0.015	< 0.010	< 0.010	<0.01	<0.01	<0.015	<0.0117	-
	Fluoranthene	< 0.040	< 0.020	< 0.020	<0.02	<0.02	<0.04	<0.0267	-
	Fluorene	0.037	0.031	0.051	0.03	0.04	0.05	0.04	0.01
	Indeno(1,2,3-c,d)pyrene	< 0.03	< 0.02	< 0.02	<0.02	<0.02	<0.03	<0.0233	-
	2-Methylnaphthalene	0.21	0.16	0.32	0.16	0.21	0.32	0.23	0.08
	Naphthalene	0.06	0.05	0.09	0.05	0.06	0.09	0.07	0.02
	Phenanthrene	0.15	0.12	0.19	0.12	0.15	0.19	0.16	0.04
	Pyrene	0.03	0.02	0.020	<0.02	<0.02	<0.03	<0.0233	-
	Acenaphthene d10	79.4	79.3	110	79.30	79.40	110.00	90.00	18.00
	Chrysene d12	103.9	97.4	116.4	97.40	103.90	116.40	106.00	10.00
	Naphthalene d8	71.9	75.3	98.7	71.90	75.30	98.70	82.00	14.60
	Phenanthrene d10	100.4	98.1	124.8	98.10	100.40	124.80	108.00	15.00
	B(a)P Total Potency Equivalent	<0.029	<0.02	<0.02	<0.02	<0.02	<0.029	<0.023	-
	IACR (CCME)	<0.35	<0.22	<0.25	<0.22	<0.25	<0.35	<0.273	-

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.5: Sediment Quality in Reference Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed							
		Grave Lake Marsh							
		GLMS-1	GLMS-2	GLMS-3	Minimum	Median	Maximum	Mean	Standard Deviation
		07-Aug-13	07-Aug-13	07-Aug-13					
Physical Tests	Moisture (%)	86.6	85.9	88.2	85.90	86.60	88.20	86.90	1.20
	(63 µm) pH (1:2 soil:water)	7.69	7.75	7.81	7.69	7.75	7.81	7.75	0.06
	(1 mm) pH (1:2 soil:water)	7.74	7.85	7.85	7.74	7.85	7.85	7.81	0.06
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	0.21	< 0.10	<0.1	<0.1	0.21	0.14	0.06
	% Sand (1.00mm - 0.50mm)	0.13	0.33	0.10	0.10	0.13	0.33	0.19	0.13
	% Sand (0.50mm - 0.25mm)	0.27	0.30	0.18	0.18	0.27	0.30	0.25	0.06
	% Sand (0.25mm - 0.125mm)	0.47	0.42	0.38	0.38	0.42	0.47	0.42	0.05
	% Sand (0.125mm - 0.063mm)	0.65	0.59	0.59	0.59	0.59	0.65	0.61	0.04
	% Silt (0.063mm - 0.0312mm)	41.0	38.8	41.9	38.80	41.00	41.90	40.60	1.60
	% Silt (0.0312mm - 0.004mm)	49.8	49.8	50.0	49.80	49.80	50.00	49.90	0.10
	% Clay (<4um)	7.6	9.5	6.9	6.88	7.56	9.46	7.97	1.34
	Texture	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	23.60	18.00	22.80	18.00	22.80	23.60	21.50	3.00
Metals (<63 µm) (mg/kg)	Aluminum (Al)	9,390	11,700	9,660	9,390	9,660	11,700	10,250	1,263
	Antimony (Sb)	0.52	0.46	0.47	0.46	0.47	0.52	0.48	0.03
	Arsenic (As)	4.43	4.92	4.32	4.32	4.43	4.92	4.56	0.32
	Barium (Ba)	399	411	337	337.00	399.00	411.00	382.00	40.00
	Beryllium (Be)	0.46	0.46	0.32	0.32	0.46	0.46	0.41	0.08
	Bismuth (Bi)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Boron (B)	10.2	10.2	10.0	10.00	10.20	10.20	10.10	0.10
	Cadmium (Cd)	0.91	0.89	0.82	0.82	0.89	0.91	0.87	0.05
	Calcium (Ca)	86,500	102,000	85,800	85,800	86,500	102,000	91,433	9,158
	Chromium (Cr)	11.00	9.60	7.31	7.31	9.60	11.00	9.30	1.90
	Cobalt (Co)	3.22	3.04	3.08	3.04	3.08	3.22	3.11	0.09
	Copper (Cu)	28.2	27.6	24.6	24.60	27.60	28.20	26.80	1.90
	Iron (Fe)	7,820	10,600	6,780	6,780	7,820	10,600	8,400	1,975
	Lead (Pb)	5.57	6.29	5.09	5.09	5.57	6.29	5.65	0.60
	Lithium (Li)	11.8	13.8	11.7	11.70	11.80	13.80	12.40	1.20
	Magnesium (Mg)	5,990	6,130	4,670	4,670	5,990	6,130	5,597	806.00
	Manganese (Mn)	124.0	159.0	118.0	118.00	124.00	159.00	134.00	22.00
	Mercury (Hg)	0.042	0.032	0.032	0.03	0.03	0.04	0.04	0.01
	Molybdenum (Mo)	3.08	1.86	1.52	1.52	1.86	3.08	2.15	0.82
	Nickel (Ni)	16.7	12.1	12.6	12.10	12.60	16.70	13.80	2.50
	Phosphorus (P)	2,220	2,230	1,980	1,980	2,220	2,230	2,143	142.00
	Potassium (K)	1,210	1,500	1,110	1,110	1,210	1,500	1,273	203.00
	Selenium (Se)	2.29	1.88	1.98	1.88	1.98	2.29	2.05	0.21
	Silver (Ag)	0.131	0.129	0.104	0.10	0.13	0.13	0.12	0.02
	Sodium (Na)	270	330	360	270.00	330.00	360.00	320.00	46.00
	Strontium (Sr)	221	241	200	200.00	221.00	241.00	221.00	21.00
	Thallium (Tl)	0.116	0.146	0.111	0.11	0.12	0.15	0.12	0.02
	Tin (Sn)	1.26	0.62	0.44	0.44	0.62	1.26	0.77	0.43
	Titanium (Ti)	127.0	175.0	180.0	127.00	175.00	180.00	161.00	29.00
	Uranium (U)	4.08	4.18	3.51	3.51	4.08	4.18	3.92	0.36
	Vanadium (V)	19.6	19.6	16.5	16.50	19.60	19.60	18.60	1.80
	Zinc (Zn)	81.3	85.6	69.7	69.70	81.30	85.60	78.90	8.20
Metals (<1 mm) (mg/kg)	Aluminum (Al)	7,950	8,730	7,820	7,820	7,950	8,730	8,167	492.17
	Antimony (Sb)	0.51	0.38	0.45	0.38	0.45	0.51	0.45	0.07
	Arsenic (As)	4.32	4.17	3.96	3.96	4.17	4.32	4.15	0.18
	Barium (Ba)	370	309	272	272.00	309.00	370.00	317.00	49.49
	Beryllium (Be)	0.42	0.34	0.33	0.33	0.34	0.42	0.36	0.05
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	11	< 10	< 10	<10	<10	11.00	10.30	0.60
	Cadmium (Cd)	0.86	0.74	0.71	0.71	0.74	0.86	0.77	0.08
	Calcium (Ca)	71,200	69,200	57,100	57,100	69,200	71,200	65,833	7,629
	Chromium (Cr)	6.9	6.7	5.8	5.84	6.69	6.89	6.47	0.56
	Cobalt (Co)	2.86	2.63	2.73	2.63	2.73	2.86	2.74	0.12
	Copper (Cu)	27.20	24.60	24.80	24.60	24.80	27.20	25.50	1.40
	Iron (Fe)	6,980	8,770	6,050	6,050	6,980	8,770	7,267	1,382
	Lead (Pb)	5.97	5.20	5.06	5.06	5.20	5.97	5.41	0.49
	Lithium (Li)	10.8	9.8	8.9	8.90	9.80	10.80	9.80	1.00
	Magnesium (Mg)	5,370	4,570	3,930	3,930	4,570	5,370	4,623	721.00
	Manganese (Mn)	107	122	102	102.00	107.00	122.00	110.33	10.41
	Mercury (Hg)	0.051	0.029	0.034	0.03	0.03	0.05	0.04	0.01
	Molybdenum (Mo)	3.44	1.71	1.58	1.58	1.71	3.44	2.24	1.04
	Nickel (Ni)	14.2	10.6	11.5	10.60	11.50	14.20	12.10	1.90
	Phosphorus (P)	1,910	1,680	1,620	1,620	1,680	1,910	1,737	153.00
	Potassium (K)	1,040	1,040	920	920.00	1,040	1,040	1,000	69.00
	Selenium (Se)	2.31	1.88	1.96	1.88	1.96	2.31	2.05	0.23
	Silver (Ag)	0.11	< 0.10	< 0.10	<0.1	<0.1	0.11	0.10	0.01
	Sodium (Na)	270	230	270	230.00	270.00	270.00	257.00	23.00
	Strontium (Sr)	187	167	138	138.00	167.00	187.00	164.00	24.64
	Thallium (Tl)	0.10	0.11	0.09	0.09	0.10	0.11	0.10	0.01
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	105.0	131.0	153.0	105.00	131.00	153.00	129.67	24.03
	Uranium (U)	4.22	3.54	3.44	3.44	3.54	4.22	3.73	0.42
	Vanadium (V)	18.0	15.2	14.5	14.50	15.20	18.00	15.90	1.90
	Zinc (Zn)	74.1	67.1	60.2	60.20	67.10	74.10	67.10	7.00
Hydrocarbons (mg/kg)	Acenaphthene	< 0.075	< 0.075	< 0.075	<0.075	<0.075	<0.075	<0.075	-
	Acenaphthylene	< 0.075	< 0.075	< 0.075	<0.075	<0.075	<0.075	<0.075	-
	Anthracene	< 0.060	< 0.060	< 0.060	<0.06	<0.06	<0.06	<0.06	-
	Benz(a)anthracene	< 0.15	< 0.15	< 0.15	<0.15	<0.15	<0.15	<0.15	-
	Benzo(a)pyrene	< 0.150	< 0.150	< 0.150	<0.15	<0.15	<0.15	<0.15	-
	Benzo(b)fluoranthene	< 0.150	< 0.150	< 0.150	<0.15	<0.15	<0.15	<0.15	-
	Benzo(b+j+k)fluoranthene	< 0.210	< 0.210	< 0.210	<0.21	<0.21	<0.21	<0.21	-
	Benzo(g,h,i)perylene	< 0.150	< 0.150	< 0.150	<0.15	<0.15	<0.15	<0.15	-
	Benzo(k)fluoranthene	< 0.150	< 0.150	< 0.150	<0.15	<0.15	<0.15	<0.15	-
	Chrysene	< 0.150	< 0.150	< 0.150	<0.15	<0.15	<0.15	<0.15	-
	Dibenz(a,h)anthracene	< 0.075	< 0.075	< 0.075	<0.075	<0.075	<0.075	<0.075	-
	Fluoranthene	< 0.150	< 0.150	< 0.150	<0.15	<0.15	<0.15	<0.15	-
	Fluorene	< 0.150	< 0.150	< 0.150	<0.15	<0.15	<0.15	<0.15	-
	Indeno(1,2,3-c,d)pyrene	< 0.15	< 0.15	< 0.15	<0.15	<0.15	<0.15	<0.15	-
	2-Methylnaphthalene	0.19	0.16	0.20	0.16	0.19	0.20	0.18	0.02
	Naphthalene	< 0.15	< 0.15	< 0.15	<0.15	<0.15	<0.15	<0.15	-
	Phenanthrene	< 0.15	< 0.15	< 0.15	<0.15	<0.15	<0.15	<0.15	-
	Pyrene	0.15	0.15	0.15	<0.15	<0.15	<0.15	<0.15	-
	Acenaphthene d10	70.7	70.4	73.4	70.40	70.70	73.40	71.50	1.70
	Chrysene d12	67.9	68.1	75.8	67.90	68.10	75.80	70.60	4.50
	Naphthalene d8	65.7	67.2	69.4	65.70	67.20	69.40	67.40	1.90
	Phenanthrene d10	74.5	74.1	75	74.10	74.50	75.00	74.50	0.50
	B(a)P Total Potency Equivalent	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	-
	IACR (CCME)	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	-

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.5: Sediment Quality in Reference Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed							
		Grave Lake							
		GRLK-1	GRLK-2	GRLK-3	Minimum	Median	Maximum	Mean	Standard Deviation
		13-Aug-13	13-Aug-13	13-Aug-13					
Physical Tests	Moisture (%)	89.3	88.3	66.6	66.60	88.30	89.30	81.40	12.80
	(63 µm) pH (1:2 soil:water)	7.55	7.19	7.73	7.19	7.55	7.73	7.49	0.27
	(1 mm) pH (1:2 soil:water)	7.75	7.99	8.15	7.75	7.99	8.15	7.96	0.20
Particle Size	% Gravel (>2mm)	3.68	< 0.10	0.12	<0.1	0.12	3.68	1.30	2.06
	% Sand (2.00mm - 1.00mm)	5.79	1.02	1.57	1.02	1.57	5.79	2.79	2.61
	% Sand (1.00mm - 0.50mm)	8.27	1.46	2.16	1.46	2.16	8.27	3.96	3.75
	% Sand (0.50mm - 0.25mm)	4.82	1.21	17.6	1.21	4.82	17.60	7.90	8.60
	% Sand (0.25mm - 0.125mm)	3.96	1.78	50.0	1.78	3.96	50.00	18.60	27.20
	% Sand (0.125mm - 0.063mm)	3.41	2.62	4.91	2.62	3.41	4.91	3.65	1.16
	% Silt (0.063mm - 0.0312mm)	30.5	35.4	3.3	3.28	30.50	35.40	23.10	17.30
	% Silt (0.0312mm - 0.004mm)	34.3	46.5	15.0	15.00	34.30	46.50	31.90	15.90
	% Clay (<4um)	5.4	10.0	5.4	5.37	5.37	10.00	6.90	2.70
	Texture	Silt loam	Silt	Loamy sand	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	12.10	8.07	2.01	2.01	8.07	12.10	7.40	5.10
Metals (<63 µm) (mg/kg)	Aluminum (Al)	1,020	1,020	1,220	1,020	1,020	1,220	1,087	115.00
	Antimony (Sb)	< 0.20	< 0.10	< 0.10	<0.1	<0.1	<0.2	<0.133	-
	Arsenic (As)	0.98	0.58	0.92	0.58	0.92	0.98	0.83	0.22
	Barium (Ba)	215	221	216	215.00	216.00	221.00	217.00	3.00
	Beryllium (Be)	< 0.20	< 0.10	< 0.10	<0.1	<0.1	<0.2	<0.133	-
	Bismuth (Bi)	< 0.20	< 0.10	< 0.10	<0.1	<0.1	<0.2	<0.133	-
	Boron (B)	< 10.0	6.6	5.8	<10	5.80	6.60	7.47	2.23
	Cadmium (Cd)	0.25	0.16	0.27	0.16	0.25	0.27	0.23	0.06
	Calcium (Ca)	281,000	294,000	285,000	281,000	285,000	294,000	286,667	6,658
	Chromium (Cr)	5.40	2.78	2.92	2.78	2.92	5.40	3.70	1.47
	Cobalt (Co)	0.53	0.32	0.54	0.32	0.53	0.54	0.46	0.12
	Copper (Cu)	3.6	1.6	2.4	1.60	2.38	3.60	2.53	1.01
	Iron (Fe)	1,570	999	2,220	999.00	1,570	2,220	1,596	611.00
	Lead (Pb)	4.83	2.69	4.91	2.69	4.83	4.91	4.14	1.26
	Lithium (Li)	< 10.0	< 5.0	< 5.0	<5	<5	<10	<6.6667	-
	Magnesium (Mg)	6,930	6,760	8,610	6,760	6,930	8,610	7,433	1,023
	Manganese (Mn)	127.0	189.0	215.0	127.00	189.00	215.00	177.00	45.00
	Mercury (Hg)	0.023	0.014	0.018	0.01	0.02	0.02	0.02	0.00
	Molybdenum (Mo)	1.41	0.55	0.48	0.48	0.55	1.41	0.81	0.52
	Nickel (Ni)	5.2	3.1	3.5	3.07	3.51	5.20	3.93	1.12
	Phosphorus (P)	375	325	507	325.00	375.00	507.00	402.00	94.00
	Potassium (K)	340	430	390	340.00	390.00	430.00	387.00	45.00
	Selenium (Se)	3.89	2.62	2.07	2.07	2.62	3.89	2.86	0.93
	Silver (Ag)	< 0.100	< 0.050	< 0.050	<0.05	<0.05	<0.1	<0.0667	-
	Sodium (Na)	400	120	< 100	<100	120.00	400.00	207.00	168.00
	Strontium (Sr)	288	258	256	256.00	258.00	288.00	267.00	18.00
	Thallium (Tl)	< 0.100	< 0.050	< 0.050	<0.05	<0.05	<0.1	<0.0667	-
	Tin (Sn)	32.30	0.59	0.72	0.59	0.72	32.30	11.20	18.30
	Titanium (Ti)	22.6	19.1	41.0	19.10	22.60	41.00	27.60	11.80
	Uranium (U)	3.01	0.55	0.61	0.55	0.61	3.01	1.39	1.40
	Vanadium (V)	4.1	3.3	4.2	3.26	4.08	4.24	3.86	0.53
	Zinc (Zn)	24.4	13.2	20.3	13.20	20.30	24.40	19.30	5.70
Metals (<1 mm) (mg/kg)	Aluminum (Al)	914	590	989	590.00	914.00	989.00	831.00	212.05
	Antimony (Sb)	0.22	< 0.10	< 0.10	<0.1	<0.1	0.22	0.14	0.07
	Arsenic (As)	1.75	0.494	0.664	0.49	0.66	1.75	0.97	0.68
	Barium (Ba)	166	161	79.0	79.00	161.00	166.00	135.33	48.85
	Beryllium (Be)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	0.33	0.13	0.28	0.13	0.28	0.33	0.25	0.10
	Calcium (Ca)	213,000	227,000	181,000	181,000	213,000	227,000	207,000	23,580
	Chromium (Cr)	2.8	1.4	4.4	1.38	2.76	4.35	2.83	1.49
	Cobalt (Co)	0.66	0.23	0.41	0.23	0.41	0.66	0.43	0.22
	Copper (Cu)	3.86	1.26	0.82	0.82	1.26	3.86	1.98	1.64
	Iron (Fe)	2,190	763	1,440	763.00	1,440	2,190	1,464	714.00
	Lead (Pb)	8.38	2.13	2.00	2.00	2.13	8.38	4.17	3.65
	Lithium (Li)	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Magnesium (Mg)	4,940	4,960	13,800	4,940	4,960	13,800	7,900	5,110
	Manganese (Mn)	98	146	230	97.80	146.00	230.00	157.93	66.90
	Mercury (Hg)	0.038	0.010	0.009	0.01	0.01	0.04	0.02	0.02
	Molybdenum (Mo)	1.79	< 0.50	< 0.50	<0.5	<0.5	1.79	0.93	0.74
	Nickel (Ni)	4.1	2.4	2.0	1.95	2.38	4.09	2.81	1.13
	Phosphorus (P)	698	282	808	282.00	698.00	808.00	596.00	277.00
	Potassium (K)	360	310	380	310.00	360.00	380.00	350.00	36.00
	Selenium (Se)	5.17	2.29	1.01	1.01	2.29	5.17	2.82	2.13
	Silver (Ag)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Sodium (Na)	280	130	120	120.00	130.00	280.00	177.00	90.00
	Strontium (Sr)	211	195	162	162.00	195.00	211.00	189.33	24.99
	Thallium (Tl)	0.08	< 0.05	0.09	<0.05	0.08	0.09	0.07	0.02
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	19.8	12.6	7.7	7.70	12.60	19.80	13.37	6.09
	Uranium (U)	3.21	0.44	0.99	0.44	0.99	3.21	1.55	1.47
	Vanadium (V)	3.5	1.8	4.9	1.80	3.46	4.92	3.39	1.56
	Zinc (Zn)	38.2	9.2	13.5	9.20	13.50	38.20	20.30	15.70
Hydrocarbons (mg/kg)	Acenaphthene	< 0.060	< 0.040	< 0.020	<0.02	<0.04	<0.06	<0.04	-
	Acenaphthylene	< 0.010	< 0.005	< 0.005	<0.005	<0.005	<0.01	<0.00667	-
	Anthracene	< 0.050	< 0.020	< 0.006	<0.006	<0.02	<0.05	<0.0253	-
	Benz(a)anthracene	0.084	0.028	< 0.010	<0.01	0.03	0.08	0.04	0.04
	Benzo(a)pyrene	< 0.200	< 0.040	< 0.020	<0.02	<0.04	<0.2	<0.087	-
	Benzo(b)fluoranthene	0.186	0.067	0.025	0.03	0.07	0.19	0.09	0.08
	Benzo(b+j+k)fluoranthene	0.225	0.067	0.025	0.03	0.07	0.23	0.11	0.11
	Benzo(g,h,i)perylene	0.053	0.021	< 0.010	<0.01	0.02	0.05	0.03	0.02
	Benzo(k)fluoranthene	0.039	< 0.010	< 0.010	<0.01	<0.01	0.04	0.02	0.02
	Chrysene	0.177	0.071	0.027	0.03	0.07	0.18	0.09	0.08
	Dibenz(a,h)anthracene	< 0.030	< 0.020	< 0.006	<0.006	<0.02	<0.03	<0.0187	-
	Fluoranthene	0.127	0.027	0.011	0.01	0.03	0.13	0.06	0.06
	Fluorene	0.195	0.101	0.037	0.04	0.10	0.20	0.11	0.08
	Indeno(1,2,3-c,d)pyrene	0.05	< 0.02	< 0.01	<0.01	<0.01	0.05	0.03	0.02
	2-Methylnaphthalene	0.98	0.49	0.18	0.18	0.49	0.98	0.55	0.40
	Naphthalene	0.23	0.13	0.05	0.05	0.13	0.23	0.14	0.09
	Phenanthrene	0.80	0.38	0.14	0.14	0.38	0.80	0.44	0.33
	Pyrene	0.13	0.03	0.01	0.01	0.034	0.126	0.058	0.060
	Acenaphthene d10	97.9	100.7	98.8	97.90	98.80	100.70	99.00	1.00
	Chrysene d12	117.7	121.5	118.8	117.70	118.80	121.50	119.00	2.00
	Naphthalene d8	88.3	91.7	90.6	88.30	90.60	91.70	90.20	1.70
	Phenanthrene d10	110.9	115.4	113.1	110.90	113.10	115.40	113.00	2.00
	B(a)P Total Potency Equivalent	0.15	0.042	<0.02	<0.02	0.04	0.15	0.07	0.07
	IACR (CCME)	2.1	0.67	0.26	0.26	0.67	2.10	1.01	0.97

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.5: Sediment Quality in Reference Areas and Associated Summary Statistics, 2013

Analytes		Elk River Watershed							
		Lost Lake							
		LOLA-1	LOLA-2	LOLA-3	Minimum	Median	Maximum	Mean	Standard Deviation
		15-Aug-13	15-Aug-13	15-Aug-13					
Physical Tests	Moisture (%)	96.5	100.0	98.1	96.50	98.10	100.00	98.00	2.00
	(63 µm) pH (1:2 soil:water)	<	8.05	7.66	7.66	8.05	8.05	7.86	0.28
	(1 mm) pH (1:2 soil:water)	7.38	7.79	7.51	7.38	7.51	7.79	7.56	0.21
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (1.00mm - 0.50mm)	<0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (0.50mm - 0.25mm)	0.22	< 0.10	< 0.10	<0.1	<0.1	0.22	0.14	0.07
	% Sand (0.25mm - 0.125mm)	1.46	< 0.10	< 0.10	<0.1	<0.1	1.46	0.55	0.79
	% Sand (0.125mm - 0.063mm)	2.02	< 0.10	< 0.10	<0.1	<0.1	2.02	0.74	1.11
	% Silt (0.063mm - 0.0312mm)	43.0	43.8	42.6	42.60	43.00	43.80	43.10	0.60
	% Silt (0.0312mm - 0.004mm)	45.0	46.3	46.0	45.00	46.00	46.30	45.80	0.70
	% Clay (<4um)	8.2	9.8	11.2	8.23	9.79	11.20	9.70	1.50
	Texture	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	20.50	33.30	30.30	20.50	30.30	33.30	28.00	6.70
Metals (<63 µm) (mg/kg)	Aluminum (Al)	-	-	-	-	-	-	-	-
	Antimony (Sb)	-	-	-	-	-	-	-	-
	Arsenic (As)	-	-	-	-	-	-	-	-
	Barium (Ba)	-	-	-	-	-	-	-	-
	Beryllium (Be)	-	-	-	-	-	-	-	-
	Bismuth (Bi)	-	-	-	-	-	-	-	-
	Boron (B)	-	-	-	-	-	-	-	-
	Cadmium (Cd)	-	-	-	-	-	-	-	-
	Calcium (Ca)	-	-	-	-	-	-	-	-
	Chromium (Cr)	-	-	-	-	-	-	-	-
	Cobalt (Co)	-	-	-	-	-	-	-	-
	Copper (Cu)	-	-	-	-	-	-	-	-
	Iron (Fe)	-	-	-	-	-	-	-	-
	Lead (Pb)	-	-	-	-	-	-	-	-
	Lithium (Li)	-	-	-	-	-	-	-	-
	Magnesium (Mg)	-	-	-	-	-	-	-	-
	Manganese (Mn)	-	-	-	-	-	-	-	-
	Mercury (Hg)	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	-	-	-	-	-	-	-	-
	Nickel (Ni)	-	-	-	-	-	-	-	-
	Phosphorus (P)	-	-	-	-	-	-	-	-
	Potassium (K)	-	-	-	-	-	-	-	-
	Selenium (Se)	-	-	-	-	-	-	-	-
	Silver (Ag)	-	-	-	-	-	-	-	-
	Sodium (Na)	-	-	-	-	-	-	-	-
	Strontium (Sr)	-	-	-	-	-	-	-	-
	Thallium (Tl)	-	-	-	-	-	-	-	-
	Tin (Sn)	-	-	-	-	-	-	-	-
	Titanium (Ti)	-	-	-	-	-	-	-	-
	Uranium (U)	-	-	-	-	-	-	-	-
	Vanadium (V)	-	-	-	-	-	-	-	-
	Zinc (Zn)	-	-	-	-	-	-	-	-
Metals (<1 mm) (mg/kg)	Aluminum (Al)	1,750	2,090	1,500	1,500	1,750	2,090	1,780	296.14
	Antimony (Sb)	0.15	0.18	0.13	0.13	0.15	0.18	0.15	0.03
	Arsenic (As)	1.08	1.27	1.01	1.01	1.08	1.27	1.12	0.13
	Barium (Ba)	196	112	161	112.00	161.00	196.00	156.33	42.19
	Beryllium (Be)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	23	24	23	23.00	23.00	24.00	23.30	0.60
	Cadmium (Cd)	0.238	0.332	0.243	0.24	0.24	0.33	0.27	0.05
	Calcium (Ca)	84,500	21,500	62,900	21,500	62,900	84,500	56,300	32,014
	Chromium (Cr)	4.6	4.4	2.9	2.92	4.44	4.57	3.98	0.92
	Cobalt (Co)	1.60	2.24	1.44	1.44	1.60	2.24	1.76	0.42
	Copper (Cu)	3.65	4.90	3.51	3.51	3.65	4.90	4.02	0.77
	Iron (Fe)	3,140	4,580	3,110	3,110	3,140	4,580	3,610	840.00
	Lead (Pb)	4.85	6.01	5.04	4.85	5.04	6.01	5.30	0.62
	Lithium (Li)	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Magnesium (Mg)	3,980	3,530	4,000	3,530	3,980	4,000	3,837	266.00
	Manganese (Mn)	833	292	991	292.00	833.00	991.00	705.33	366.57
	Mercury (Hg)	0.043	0.070	0.059	0.04	0.06	0.07	0.06	0.01
	Molybdenum (Mo)	1.37	1.68	0.97	0.97	1.37	1.68	1.34	0.36
	Nickel (Ni)	6.1	6.8	5.6	5.58	6.09	6.79	6.15	0.61
	Phosphorus (P)	564	840	709	564.00	709.00	840.00	704.00	138.00
	Potassium (K)	930	1,070	940	930.00	940.00	1,070	980.00	78.00
	Selenium (Se)	0.90	1.28	0.94	0.90	0.94	1.28	1.04	0.21
	Silver (Ag)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Sodium (Na)	140	170	150	140.00	150.00	170.00	153.00	15.00
	Strontium (Sr)	57	27	47	27.10	47.30	56.90	43.77	15.21
	Thallium (Tl)	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	-
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	39.3	46.4	37.6	37.60	39.30	46.40	41.10	4.67
	Uranium (U)	0.48	0.51	0.29	0.29	0.48	0.51	0.43	0.12
	Vanadium (V)	4.4	5.0	3.5	3.53	4.41	5.00	4.31	0.74
	Zinc (Zn)	22.2	34.0	22.0	22.00	22.20	34.00	26.10	6.90
Hydrocarbons (mg/kg)	Acenaphthene	< 0.035	< 4.900	< 0.080	<0.035	<0.08	<4.9	<1.672	-
	Acenaphthylene	< 0.040	< 4.900	< 0.055	<0.04	<0.055	<4.9	<1.665	-
	Anthracene	< 0.028	< 3.900	< 0.044	<0.028	<0.044	<3.9	<1.324	-
	Benz(a)anthracene	< 0.070	< 9.700	< 0.110	<0.07	<0.11	<9.7	<3.293	-
	Benzo(a)pyrene	< 0.070	< 9.700	< 0.110	<0.07	<0.11	<9.7	<3.293	-
	Benzo(b)fluoranthene	< 0.070	< 9.700	< 0.110	<0.07	<0.07	0.11	3.29	5.55
	Benzo(b+j+k)fluoranthene	< 0.099	< 14.000	< 0.160	<0.099	<0.16	<14	<4.753	-
	Benzo(g,h,i)perylene	< 0.070	< 9.700	< 0.160	<0.07	<0.07	0.16	3.31	5.53
	Benzo(k)fluoranthene	< 0.070	< 9.700	< 0.110	<0.07	<0.11	<9.7	<3.293	-
	Chrysene	< 0.070	< 9.700	< 0.200	<0.07	<0.2	<9.7	<3.323	-
	Dibenz(a,h)anthracene	< 0.035	< 4.900	< 0.055	<0.035	<0.055	<4.9	<1.663	-
	Fluoranthene	< 0.070	< 9.700	< 0.110	<0.07	<0.11	<9.7	<3.293	-
	Fluorene	< 0.070	< 9.700	< 0.200	<0.07	<0.07	0.20	3.32	5.52
	Indeno(1,2,3-c,d)pyrene	< 0.07	< 9.70	< 0.11	<0.07	<0.11	<9.7	<3.293	-
	2-Methylnaphthalene	0.26	28.30	0.95	0.26	0.95	28.30	9.80	16.00
	Naphthalene	< 0.15	< 12.50	< 0.30	<0.15	<0.3	<12.5	<4.3167	-
	Phenanthrene	0.20	22.70	0.64	0.20	0.64	22.70	7.80	12.90
	Pyrene	0.070	9.7	0.11	<0.07	<0.11	<9.7	<3.293	-
	Acenaphthene d10	88.3	83.5	96.4	83.50	88.30	96.40	89.40	6.50
	Chrysene d12	114.3	105.8	119.6	105.80	114.30	119.60	113.00	7.00
	Naphthalene d8	82.7	77.7	89.1	77.70	82.70	89.10	83.20	5.70
	Phenanthrene d10	103.4	93.2	108.4	93.20	103.40	108.40	102.00	8.00
	B(a)P Total Potency Equivalent	<0.067	<9.3	0.11	-0.07	<0.067	0.11	3.16	5.32
	IACR (CCME)	<0.75	<100	1.6	-0.75	<0.75	1.60	34.12	57.06

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.5: Sediment Quality in Reference Areas and Associated Summary Statistics, 2013

Analytes		Flathead River Watershed							
		Flathead Marsh							
		FL17-1	FL17-2	FL17-3	Minimum	Median	Maximum	Mean	Standard Deviation
		08-Aug-13	08-Aug-13	08-Aug-13					
Physical Tests	Moisture (%)	86.0	82.2	87.9	82.20	86.00	87.90	85.40	2.90
	(63 µm) pH (1:2 soil:water)	-	-	-		#NUM!			
	(1 mm) pH (1:2 soil:water)	7.79	7.79	7.69	7.69	7.79	7.79	7.76	0.06
Particle Size	% Gravel (>2mm)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	% Sand (2.00mm - 1.00mm)	0.28	0.27	0.20	0.20	0.27	0.28	0.25	0.04
	% Sand (1.00mm - 0.50mm)	1.29	1.00	1.09	1.00	1.09	1.29	1.13	0.15
	% Sand (0.50mm - 0.25mm)	0.74	1.15	1.38	0.74	1.15	1.38	1.09	0.32
	% Sand (0.25mm - 0.125mm)	1.92	1.22	1.86	1.22	1.86	1.92	1.67	0.39
	% Sand (0.125mm - 0.063mm)	2.41	1.80	2.01	1.80	2.01	2.41	2.07	0.31
	% Silt (0.063mm - 0.0312mm)	32.7	28.6	34.6	28.60	32.70	34.60	32.00	3.10
	% Silt (0.0312mm - 0.004mm)	46.5	49.7	45.4	45.40	46.50	49.70	47.20	2.20
	% Clay (<4um)	14.1	16.3	13.4	13.40	14.10	16.30	14.60	1.50
	Texture	Silt	Silt	Silt	-	-	-	-	-
Organic Carbon	Total Organic Carbon (%)	7.11	5.37	7.10	5.37	7.10	7.11	6.53	1.00
Metals (<63 µm) (mg/kg)	Aluminum (Al)	2,160	4,320	1,970	1,970	2,160	4,320	2,817	1,305
	Antimony (Sb)	0.19	0.36	0.19	0.19	0.19	0.36	0.25	0.10
	Arsenic (As)	1.54	2.59	1.36	1.36	1.54	2.59	1.83	0.66
	Barium (Ba)	124	129	118	118.00	124.00	129.00	124.00	6.00
	Beryllium (Be)	0.17	0.32	0.14	0.14	0.17	0.32	0.21	0.10
	Bismuth (Bi)	< 0.10	< 0.10	< 0.10	<0.1	<0.1	<0.1	<0.1	-
	Boron (B)	< 5.0	< 5.0	< 5.0	<5	<5	<5	<5	-
	Cadmium (Cd)	0.17	0.22	0.14	0.14	0.17	0.22	0.18	0.04
	Calcium (Ca)	324,000	299,000	322,000	299,000	322,000	324,000	315,000	13,892
	Chromium (Cr)	3.62	6.77	3.11	3.11	3.62	6.77	4.50	1.98
	Cobalt (Co)	1.09	2.00	0.99	0.99	1.09	2.00	1.36	0.56
	Copper (Cu)	4.4	6.4	3.5	3.51	4.35	6.40	4.75	1.49
	Iron (Fe)	2,770	4,810	2,400	2,400	2,770	4,810	3,327	1,298
	Lead (Pb)	3.65	5.48	3.00	3.00	3.65	5.48	4.04	1.29
	Lithium (Li)	< 5.0	7.8	< 5.0	<5	<5	7.80	5.93	1.62
	Magnesium (Mg)	4,770	7,820	4,470	4,470	4,770	7,820	5,687	1,854
	Manganese (Mn)	152.0	126.0	187.0	126.00	152.00	187.00	155.00	31.00
	Mercury (Hg)	0.013	0.019	0.012	0.01	0.01	0.02	0.02	0.00
	Molybdenum (Mo)	0.49	0.78	0.40	0.40	0.49	0.78	0.56	0.20
	Nickel (Ni)	4.4	7.4	3.8	3.81	4.44	7.38	5.21	1.91
	Phosphorus (P)	287	403	253	253.00	287.00	403.00	314.00	79.00
	Potassium (K)	490	870	440	440.00	490.00	870.00	600.00	235.00
	Selenium (Se)	0.98	1.02	0.80	0.80	0.98	1.02	0.93	0.12
	Silver (Ag)	< 0.05	0.079	< 0.050	<0.05	<0.05	0.08	0.06	0.02
	Sodium (Na)	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	116	115	110	110.00	115.00	116.00	114.00	3.00
	Thallium (Tl)	0.080	0.142	0.060	0.06	0.08	0.14	0.09	0.04
	Tin (Sn)	1.17	0.76	0.74	0.74	0.76	1.17	0.89	0.24
	Titanium (Ti)	19.6	37.0	19.3	19.30	19.60	37.00	25.30	10.10
	Uranium (U)	0.49	0.68	0.34	0.34	0.49	0.68	0.50	0.17
	Vanadium (V)	6.4	11.4	5.8	5.75	6.36	11.40	7.80	3.10
	Zinc (Zn)	26.8	40.4	20.0	20.00	26.80	40.40	29.10	10.40
Metals (<1 mm) (mg/kg)	Aluminum (Al)	3,880	5,640	4,540	3,880	4,540	5,640	4,687	889.12
	Antimony (Sb)	0.34	0.49	0.37	0.34	0.37	0.49	0.40	0.08
	Arsenic (As)	2.04	2.82	2.18	2.04	2.18	2.82	2.35	0.42
	Barium (Ba)	101	118	117	101.00	117.00	118.00	112.00	9.54
	Beryllium (Be)	0.27	0.40	0.30	0.27	0.30	0.40	0.32	0.07
	Bismuth (Bi)	< 0.20	< 0.20	< 0.20	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	< 10	< 10	< 10	<10	<10	<10	<10	-
	Cadmium (Cd)	0.24	0.32	0.28	0.24	0.28	0.32	0.28	0.04
	Calcium (Ca)	244,000	256,000	283,000	244,000	256,000	283,000	261,000	19,975
	Chromium (Cr)	5.8	8.4	6.2	5.83	6.22	8.36	6.80	1.36
	Cobalt (Co)	1.70	2.52	1.95	1.70	1.95	2.52	2.06	0.42
	Copper (Cu)	6.16	8.59	6.73	6.16	6.73	8.59	7.16	1.27
	Iron (Fe)	4,120	6,010	4,760	4,120	4,760	6,010	4,963	961.00
	Lead (Pb)	4.98	6.72	5.29	4.98	5.29	6.72	5.66	0.93
	Lithium (Li)	6.9	11.6	10.1	6.90	10.10	11.60	9.50	2.40
	Magnesium (Mg)	5,010	8,020	5,770	5,010	5,770	8,020	6,267	1,565
	Manganese (Mn)	161	138	231	138.00	161.00	231.00	176.67	48.44
	Mercury (Hg)	0.021	0.026	0.022	0.02	0.02	0.03	0.02	0.00
	Molybdenum (Mo)	< 0.50	0.74	< 0.50	<0.5	<0.5	0.74	0.58	0.14
	Nickel (Ni)	6.5	9.5	7.3	6.53	7.25	9.46	7.75	1.53
	Phosphorus (P)	398	484	478	398.00	478.00	484.00	453.00	48.00
	Potassium (K)	880	1,050	920	880.00	920.00	1,050	950.00	89.00
	Selenium (Se)	1.23	1.15	1.35	1.15	1.23	1.35	1.24	0.10
	Silver (Ag)	< 0.10	0.10	< 0.10	<0.1	<0.1	0.10	0.10	0.00
	Sodium (Na)	< 100	< 100	< 100	<100	<100	<100	<100	-
	Strontium (Sr)	91	100	93	91.30	92.70	99.60	94.53	4.44
	Thallium (Tl)	0.14	0.19	0.13	0.13	0.14	0.19	0.15	0.03
	Tin (Sn)	< 2.0	< 2.0	< 2.0	<2	<2	<2	<2	-
	Titanium (Ti)	28.9	47.7	35.2	28.90	35.20	47.70	37.27	9.57
	Uranium (U)	0.63	0.82	0.54	0.54	0.63	0.82	0.66	0.15
	Vanadium (V)	10.1	14.9	11.8	10.10	11.80	14.90	12.30	2.40
	Zinc (Zn)	39.4	50.7	40.3	39.40	40.30	50.70	43.50	6.30
Hydrocarbons (mg/kg)	Acenaphthene	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Acenaphthylene	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Anthracene	< 0.004	< 0.004	< 0.004	<0.004	<0.004	<0.004	<0.004	-
	Benz(a)anthracene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(a)pyrene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b)fluoranthene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(b+j+k)fluoranthene	< 0.015	< 0.015	< 0.015	<0.015	<0.015	<0.015	<0.015	-
	Benzo(g,h,i)perylene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Benzo(k)fluoranthene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Chrysene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Dibenz(a,h)anthracene	< 0.005	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	-
	Fluoranthene	< 0.010	< 0.010	< 0.010	<0.01	<0.01	<0.01	<0.01	-
	Fluorene	< 0.020	< 0.010	< 0.010	<0.01	<0.01	<0.02	<0.0133	-
	Indeno(1,2,3-c,d)pyrene	< 0.01	< 0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	-
	2-Methylnaphthalene	< 0.01	< 0.02	< 0.01	<0.01	<0.01	<0.02	<0.0133	-
	Naphthalene	< 0.02	< 0.02	< 0.02	<0.02	<0.02	<0.02	<0.02	-
	Phenanthrene	< 0.02	< 0.03	< 0.01	<0.01	<0.02	<0.03	<0.02	-
	Pyrene	0.010	0.01	0.01	<0.01	<0.01	<0.01	<0.01	-
	Acenaphthene d10	83.2	85.9	77	77.00	83.20	85.90	82.00	4.60
	Chrysene d12	88	92	76.5	76.50	88.00	92.00	85.50	8.00
	Naphthalene d8	86.5	86.9	82.5	82.50	86.50	86.90	85.30	2.40
	Phenanthrene d10	86.6	95.3	81.5	81.50	86.60	95.30	87.80	7.00
	B(a)P Total Potency Equivalent	<0.02	<0.02	<0.02	-0.02	<0.02	-0.02	-0.02	-
	IACR (CCME)	<0.15	<0.15	<0.15	-0.15	<0.15	-0.15	-0.15	-

" - " = no data or standard deviation not estimated

concentration exceeds lower SQG

concentration exceeds upper SQG

Table E.6: Reference Area Data used to Define Reference Normal Ranges for Individual Samples Collected in Sediment, 2013 and 2015

Sample ID	Exposure Type	Year	Moisture	pH (1:2 soil:water)	Total Organic Carbon	Aluminum (Al)	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Boron (B)	Cadmium (Cd)	Calcium (Ca)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Iron (Fe)
FL17-1	Reference	2013	-	7.79	-	3,880	0.34	2.04	101	0.27	<0.2	<10	0.24	244,000	5.83	1.70	6.16	4,120
FL17-2	Reference	2013	-	7.79	-	5,640	0.49	2.82	118	0.40	<0.2	<10	0.32	256,000	8.36	2.52	8.59	6,010
FL17-3	Reference	2013	-	7.69	-	4,540	0.37	2.18	117	0.30	<0.2	<10	0.28	283,000	6.22	1.95	6.73	4,760
FO15-1	Reference	2013	-	7.93	-	6,190	0.49	2.90	386	0.41	<0.2	11.0	0.64	200,000	10.2	2.74	9.84	11,900
FO15-2	Reference	2013	-	8.03	-	2,920	0.30	1.96	269	<0.2	<0.2	12.0	0.33	219,000	5.08	1.78	4.50	6,370
FO15-3	Reference	2013	-	7.89	-	10,100	0.84	5.52	404	0.70	<0.2	11.0	1.12	156,000	16.8	4.36	16.7	14,200
GLMS-1	Reference	2013	-	7.74	-	7,950	0.51	4.32	370	0.42	<0.2	11.0	0.86	71,200	6.89	2.86	27.2	6,980
GLMS-2	Reference	2013	-	7.85	-	8,730	0.38	4.17	309	0.34	<0.2	<10	0.74	69,200	6.69	2.63	24.6	8,770
GLMS-3	Reference	2013	-	7.85	-	7,820	0.45	3.96	272	0.33	<0.2	<10	0.71	57,100	5.84	2.73	24.8	6,050
GRLK-1	Reference	2013	-	7.75	-	914	0.22	1.75	166	<0.2	<0.2	<10	0.33	213,000	2.76	0.66	3.86	2,190
GRLK-2	Reference	2013	-	7.99	-	590	<0.1	0.49	161	<0.2	<0.2	<10	0.13	227,000	1.38	0.23	1.26	763
GRLK-3	Reference	2013	-	8.15	-	989	<0.1	0.66	79.0	<0.2	<0.2	<10	0.28	181,000	4.35	0.41	0.82	1,440
LCHO-1	Reference	2013	-	7.4	-	11,800	1.61	5.81	364	0.87	<0.2	<10	3.08	8,210	21.3	7.88	23.8	15,500
LCHO-2	Reference	2013	-	7.42	-	9,280	1.46	6.27	335	0.75	<0.2	<10	2.49	7,050	17.3	6.92	21.0	14,400
LCHO-3	Reference	2013	-	7.73	-	8,490	1.24	5.54	300	0.66	<0.2	<10	1.90	6,080	16.2	6.25	17.4	14,300
LML-1	Reference	2013	-	7.75	-	2,950	0.39	1.21	364	<0.2	<0.2	19.0	1.08	185,000	4.86	1.87	7.07	4,220
LML-2	Reference	2013	-	7.84	-	2,990	0.40	1.93	399	<0.2	<0.2	28.0	0.91	184,000	5.38	1.67	7.73	4,730
LML-3	Reference	2013	-	7.53	-	3,320	0.43	1.68	349	<0.2	<0.2	19.0	1.24	138,000	5.16	1.86	8.62	4,910
LOLA-1	Reference	2013	-	7.38	-	1,750	0.15	1.08	196	<0.2	<0.2	23.0	0.24	84,500	4.57	1.60	3.65	3,140
LOLA-2	Reference	2013	-	7.79	-	2,090	0.18	1.27	112	<0.2	<0.2	24.0	0.33	21,500	4.44	2.24	4.90	4,580
LOLA-3	Reference	2013	-	7.51	-	1,500	0.13	1.01	161	<0.2	<0.2	23.0	0.24	62,900	2.92	1.44	3.51	3,110
REFF-1	Reference	2013	-	7.94	-	1,020	0.22	0.63	432	<0.2	<0.2	16.0	0.24	263,000	7.09	0.42	2.62	1,120
REFF-2	Reference	2013	-	8.01	-	623	0.14	0.55	459	<0.2	<0.2	<10	0.21	297,000	6.78	0.32	2.18	706
REFF-3	Reference	2013	-	7.83	-	197	<0.1	0.19	405	<0.2	<0.2	<10	0.078	290,000	2.76	0.10	0.58	299
EL14-SED-1	Reference	2015	54.2	8.07	5.22	1,430	<0.1	0.73	7.31	<0.1	<0.2	<5	0.26	64,900	4.27	0.58	1.59	1,270
EL14-SED-2	Reference	2015	71.9	7.58	6.01	3,860	0.35	6.20	17.7	0.23	<0.2	6.30	1.27	100,000	15.0	2.94	3.71	8,960
EL14-SED-3	Reference	2015	60.5	8.09	2.86	7,670	0.56	5.83	75.6	0.48	<0.2	12.4	1.12	226,000	25.4	4.16	8.99	9,230
EL14-SED-4	Reference	2015	82.1	7.47	7.41	7,680	0.40	6.12	46.2	0.45	<0.2	12.3	2.70	82,200	21.9	5.14	8.74	8,650
EL14-SED-5	Reference	2015	68.9	7.56	3.68	5,530	0.21	6.44	29.6	0.26	<0.2	8.10	1.32	95,400	16.3	3.56	4.88	7,660
FLA1-SED-1	Reference	2015	87.4	-	12.2	8,590	0.41	1.78	108	0.50	<0.4	<10	0.70	93,600	18.7	2.88	11.8	7,170
FLA1-SED-2	Reference	2015	79.7	7.72	9.89	8,100	0.24	1.28	102	0.51	<0.4	<10	0.70	110,000	17.8	2.52	10.3	6,080
FLA1-SED-3	Reference	2015	63.6	7.95	5.58	5,280	<0.2	1.03	76.4	0.31	<0.4	<10	0.34	120,000	11.6	1.87	7.00	4,500
FLA1-SED-4	Reference	2015	82.6	7.73	7.24	5,250	0.27	1.46	86.9	0.31	<0.4	<10	0.40	147,000	10.0	2.06	7.30	4,460
FLA1-SED-5	Reference	2015	81.4	7.61	8.19	6,960	0.23	1.08	106	0.39	<0.4	<10	0.46	162,000	14.7	2.17	8.20	5,570
LCHO-SED-1	Reference	2015	77.1	6.67	10.4	10,300	0.97	3.28	303	0.66	<0.2	5.30	3.53	7,070	20.0	6.21	19.4	10,700
LCHO-SED-2	Reference	2015	60.3	7.08	5.79	9,950	1.32	4.46	311	0.72	<0.2	5.00	2.68	6,580	18.5	6.83	22.0	12,800
LCHO-SED-3	Reference	2015	66.7	6.70	7.00	11,800	1.13	4.57	324	0.77	<0.2	5.50	2.42	6,430	19.7	6.67	18.7	13,200
LCHO-SED-4	Reference	2015	73.5	6.44	7.13	10,500	0.80	4.20	315	0.65	<0.2	<5	1.77	5,190	17.8	4.59	16.1	11,800
LCHO-SED-5	Reference	2015	72.9	6.21	8.98	5,170	0.50	2.26	159	0.32	<0.2	<5	1.19	3,120	9.47	2.90	8.67	6,790
LML-SED-1	Reference	2015	92.4	-	30.3	5,800	1.03	2.64	245	0.33	<0.4	12.0	2.30	35,000	11.0	2.73	14.6	9,350
LML-SED-2	Reference	2015	94.5	7.27	22.2	5,230	0.55	1.77	322	0.28	<0.4	16.0	1.59	112,000	10.5	2.55	13.5	6,490
LML-SED-3	Reference	2015	92.7	7.40	19.7	5,930	0.62	2.10	278	0.35	<0.4	<10	2.29	64,600	14.6	2.97	13.2	6,410
LML-SED-4	Reference	2015	94.9	7.71	26.1	5,470	0.77	3.02	267	0.39	<0.4	13.0	1.91	48,000	10.9	3.22	18.8	7,890
LML-SED-5	Reference	2015	92.2	7.86	20.2	2,630	0.46	1.57	437	<0.2	<0.4	12.0	0.97	206,000	5.50	1.72	11.4	5,090
REFF-SED-1	Reference	2015	89.8	7.80	13.7	418	0.13	0.32	234	<0.1	<0.2	<5	0.14	138,000	3.72	0.19	1.28	455
REFF-SED-2	Reference	2015	91.9	7.80	9.09	304	0.11	0.28	225	<0.1	<0.2	<5	0.083	156,000	2.95	0.17	1.11	362
REFF-SED-3	Reference	2015	86.9	7.93	6.02	204	<0.1	0.13	258	<0.1	<0.2	<5	0.070	180,000	2.24	<0.1	<0.5	284
REFF-SED-4	Reference	2015	92.7	7.70	12.7	407	0.13	0.32	208	<0.1	<0.2	<5	0.15	134,000	4.12	0.19	1.35	456
REFF-SED-5	Reference	2015	90.0	7.69	8.00	263	<0.1	0.22	249	<0.1	<0.2	<5	0.069	170,000	2.56	0.11	0.67	315

Outlier
Poor LRL (concentrations <LRL with LRL > maximum detected concentration).
Poor LRL for many parameters for a particular sample so all PAH values for that sample removed.

Table E.6: Reference Area Data used to Define Reference Normal Ranges for Individual Samples Collected in Sediment, 2013 and 2015

Sample ID	Exposure Type	Year	Lead (Pb)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Phosphorus (P)	Potassium (K)	Selenium (Se)	Silver (Ag)	Sodium (Na)	Strontium (Sr)	Thallium (Tl)	Tin (Sn)	Titanium (Ti)
FL17-1	Reference	2013	4.98	6.90	5,010	161	0.021	<0.5	6.53	398	880	1.23	<0.1	<100	91.3	0.14	<2	28.9
FL17-2	Reference	2013	6.72	11.6	8,020	138	0.026	0.74	9.46	484	1,050	1.15	0.10	<100	99.6	0.19	<2	47.7
FL17-3	Reference	2013	5.29	10.1	5,770	231	0.022	<0.5	7.25	478	920	1.35	<0.1	<100	92.7	0.13	<2	35.2
FO15-1	Reference	2013	6.28	<5	7,290	462	0.044	3.24	11.5	726	1,810	2.05	0.15	110	193	0.20	<2	33.7
FO15-2	Reference	2013	5.90	<5	6,000	404	0.031	1.21	6.37	444	820	5.05	<0.1	<100	157	0.089	<2	32.3
FO15-3	Reference	2013	10.1	8.20	7,810	368	0.058	2.66	20.2	848	2,780	1.77	0.24	110	164	0.30	<2	38.1
GLMS-1	Reference	2013	5.97	10.8	5,370	107	0.051	3.44	14.2	1,910	1,040	2.31	0.11	270	187	0.10	<2	105
GLMS-2	Reference	2013	5.20	9.80	4,570	122	0.029	1.71	10.6	1,680	1,040	1.88	<0.1	230	167	0.11	<2	131
GLMS-3	Reference	2013	5.06	8.90	3,930	102	0.034	1.58	11.5	1,620	920	1.96	<0.1	270	138	0.085	<2	153
GRLK-1	Reference	2013	8.38	<5	4,940	97.8	0.038	1.79	4.09	698	360	5.17	<0.1	280	211	0.075	<2	19.8
GRLK-2	Reference	2013	2.13	<5	4,960	146	0.010	<0.5	2.38	282	310	2.29	<0.1	130	195	<0.05	<2	12.6
GRLK-3	Reference	2013	2.00	<5	13,800	230	0.0093	<0.5	1.95	808	380	1.01	<0.1	120	162	0.092	<2	7.70
LCHO-1	Reference	2013	12.9	15.4	3,340	263	0.12	1.65	34.7	1,290	2,090	3.18	0.60	<100	47.2	0.39	<2	46.3
LCHO-2	Reference	2013	11.4	11.7	2,340	321	0.15	1.54	30.8	1,130	1,450	1.54	0.49	<100	45.8	0.30	<2	50.0
LCHO-3	Reference	2013	10.1	10.0	2,470	267	0.065	1.65	27.7	1,170	1,450	1.01	0.34	<100	38.6	0.25	<2	48.7
LML-1	Reference	2013	4.40	<5	3,750	90.0	0.050	1.40	9.83	704	770	6.14	0.12	100	89.0	0.13	<2	50.1
LML-2	Reference	2013	4.52	<5	3,880	83.9	0.047	1.29	10.5	701	1,050	4.75	0.12	120	92.2	0.13	<2	54.1
LML-3	Reference	2013	5.05	<5	3,410	75.2	0.061	1.19	11.4	783	850	5.28	0.12	120	73.3	0.13	<2	64.3
LOLA-1	Reference	2013	4.85	<5	3,980	833	0.043	1.37	6.09	564	930	0.90	<0.1	140	56.9	<0.05	<2	39.3
LOLA-2	Reference	2013	6.01	<5	3,530	292	0.070	1.68	6.79	840	1,070	1.28	<0.1	170	27.1	<0.05	<2	46.4
LOLA-3	Reference	2013	5.04	<5	4,000	991	0.059	0.97	5.58	709	940	0.94	<0.1	150	47.3	<0.05	<2	37.6
REFF-1	Reference	2013	2.48	<5	5,000	97.0	0.026	1.68	2.31	283	210	4.95	<0.1	<100	211	<0.05	<2	25.1
REFF-2	Reference	2013	2.47	<5	5,140	93.0	0.017	1.89	1.74	173	150	3.49	<0.1	300	217	<0.05	<2	19.5
REFF-3	Reference	2013	0.74	<5	5,010	57.6	<0.005	<0.5	0.74	66.0	120	1.10	<0.1	<100	194	<0.05	<2	5.20
EL14-SED-1	Reference	2015	1.19	5.80	16,900	53.4	0.058	0.20	5.12	149	410	0.21	<0.1	<50	36.4	0.074	<2	8.80
EL14-SED-2	Reference	2015	2.88	23.6	15,100	144	0.062	0.96	21.1	324	1,080	1.15	0.10	75.0	66.3	0.23	<2	31.7
EL14-SED-3	Reference	2015	5.63	17.0	46,300	358	0.028	1.27	24.4	621	2,500	0.99	0.19	154	175	0.29	<2	31.8
EL14-SED-4	Reference	2015	8.46	24.0	23,700	120	0.13	1.00	30.2	600	2,280	1.86	0.23	119	78.2	0.54	<2	63.3
EL14-SED-5	Reference	2015	4.31	21.7	15,400	81.1	0.047	1.97	20.4	449	1,540	0.99	0.13	169	91.9	0.28	<2	59.1
FLA1-SED-1	Reference	2015	8.90	14.6	8,630	61.0	0.051	0.53	11.0	630	1,260	2.58	<0.2	<100	46.3	0.22	<4	56.2
FLA1-SED-2	Reference	2015	7.90	14.6	9,550	55.2	0.030	0.39	10.4	630	1,150	2.53	<0.2	<100	51.3	0.21	<4	55.1
FLA1-SED-3	Reference	2015	5.40	7.40	10,600	75.6	0.036	0.20	6.70	590	620	1.02	<0.2	<100	66.9	0.14	<4	68.9
FLA1-SED-4	Reference	2015	4.80	9.80	7,070	50.5	0.034	0.39	7.00	430	860	1.32	<0.2	<100	54.9	0.15	<4	35.8
FLA1-SED-5	Reference	2015	5.80	11.8	7,500	49.4	0.027	0.34	8.30	600	1,050	1.54	<0.2	<100	63.0	0.16	<4	54.6
LCHO-SED-1	Reference	2015	10.5	11.5	2,570	88.4	0.14	1.34	25.7	930	1,690	7.73	0.48	<50	36.7	0.29	<2	41.8
LCHO-SED-2	Reference	2015	11.2	11.1	2,760	130	0.13	1.35	30.6	1,130	1,860	2.81	0.51	<50	40.7	0.33	<2	38.0
LCHO-SED-3	Reference	2015	11.7	13.9	2,660	90.4	0.11	1.39	27.5	1,120	1,820	3.54	0.44	<50	41.5	0.30	<2	49.1
LCHO-SED-4	Reference	2015	9.47	11.8	1,960	99.6	0.16	1.23	20.8	969	1,490	3.94	0.51	<50	27.7	0.26	<2	27.7
LCHO-SED-5	Reference	2015	5.16	5.90	1,130	33.8	0.16	0.68	12.7	562	800	2.22	0.22	<50	18.3	0.15	<2	20.5
LML-SED-1	Reference	2015	9.40	4.80	2,990	104	0.11	1.90	18.4	1,050	850	7.06	<0.2	170	43.7	0.22	<4	113
LML-SED-2	Reference	2015	8.70	4.20	3,750	97.9	0.080	2.18	15.2	1,180	1,110	6.23	<0.2	140	72.8	0.16	<4	65.2
LML-SED-3	Reference	2015	7.40	4.40	3,310	73.2	0.095	1.31	19.3	970	1,000	8.84	<0.2	160	56.1	0.30	<4	66.9
LML-SED-4	Reference	2015	11.4	4.70	3,640	58.8	0.098	2.00	18.4	1,160	1,310	6.61	0.22	130	58.3	0.22	<4	53.5
LML-SED-5	Reference	2015	10.2	<4	4,400	87.1	0.051	1.61	10.1	820	920	3.87	<0.2	<100	106	0.12	<4	28.7
REFF-SED-1	Reference	2015	1.87	<2	2,270	42.5	0.016	0.92	0.92	93.0	<100	3.08	<0.1	<50	106	<0.05	<2	10.8
REFF-SED-2	Reference	2015	2.45	<2	2,630	41.6	0.0069	0.72	1.39	68.0	<100	1.72	<0.1	<50	104	<0.05	<2	8.70
REFF-SED-3	Reference	2015	0.61	<2	2,930	38.7	<0.005	0.14	<0.5	<50	<100	0.88	<0.1	<50	121	<0.05	<2	6.90
REFF-SED-4	Reference	2015	3.23	<2	2,410	39.6	0.023	1.46	1.10	112	<100	3.00	<0.1	<50	98.2	<0.05	<2	11.7
REFF-SED-5	Reference	2015	4.06	<2	2,920	39.7	<0.005	0.26	0.78	69.0	110	1.06	<0.1	<50	113	<0.05	<2	7.80

Outlier
Poor LRL (concentrations <LRL with LRL > maximum detected concentration).
Poor LRL for many parameters for a particular sample so all PAH values for that sample removed.

Table E.6: Reference Area Data used to Define Reference Normal Ranges for Individual Samples Collected in Sediment, 2013 and 2015

Sample ID	Exposure Type	Year	Uranium (U)	Vanadium (V)	Zinc (Zn)	Zirconium (Zr)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(b&j)fluoranthene
FL17-1	Reference	2013	0.63	10.1	39.4	-	<0.005	<0.005	<0.004	<0.01	<0.01	<0.01	-
FL17-2	Reference	2013	0.82	14.9	50.7	-	<0.005	<0.005	<0.004	<0.01	<0.01	<0.01	-
FL17-3	Reference	2013	0.54	11.8	40.3	-	<0.005	<0.005	<0.004	<0.01	<0.01	<0.01	-
FO15-1	Reference	2013	1.94	24.9	61.1	-	<0.03	<0.005	<0.02	<0.03	<0.04	0.092	-
FO15-2	Reference	2013	1.14	10.8	30.1	-	<0.02	<0.006	<0.07	<0.02	<0.03	0.044	-
FO15-3	Reference	2013	1.49	40.9	102	-	<0.02	<0.005	<0.007	<0.02	<0.02	0.13	-
GLMS-1	Reference	2013	4.22	18.0	74.1	-	<0.1	<0.01	<0.05	0.096	0.070	0.25	-
GLMS-2	Reference	2013	3.54	15.2	67.1	-	<0.09	<0.008	<0.05	0.085	0.061	0.22	-
GLMS-3	Reference	2013	3.44	14.5	60.2	-	<0.04	<0.005	<0.03	0.040	0.026	0.10	-
GRLK-1	Reference	2013	3.21	3.46	38.2	-	<0.06	<0.01	<0.05	0.084	<0.2	0.19	-
GRLK-2	Reference	2013	0.44	1.80	9.20	-	<0.04	<0.005	<0.02	0.028	<0.04	0.067	-
GRLK-3	Reference	2013	0.99	4.92	13.5	-	<0.02	<0.005	<0.006	<0.01	<0.02	0.025	-
LCHO-1	Reference	2013	2.24	60.9	145	-	<0.01	<0.005	<0.02	<0.05	<0.04	0.068	-
LCHO-2	Reference	2013	1.99	51.6	122	-	<0.01	<0.006	<0.02	<0.07	<0.04	0.080	-
LCHO-3	Reference	2013	1.60	47.5	113	-	<0.02	<0.005	<0.02	<0.06	0.031	0.069	-
LML-1	Reference	2013	0.58	16.8	45.9	-	<0.2	<0.03	<0.1	<0.15	<0.15	0.27	-
LML-2	Reference	2013	0.50	18.9	46.3	-	<0.15	<0.02	<0.05	<0.1	<0.1	0.16	-
LML-3	Reference	2013	0.51	16.2	53.3	-	<0.2	<0.03	<0.07	<0.1	<0.09	0.19	-
LOLA-1	Reference	2013	0.48	4.41	22.2	-	<0.035	<0.04	<0.028	<0.07	<0.07	<0.07	-
LOLA-2	Reference	2013	0.51	5.00	34.0	-	<4.9	<4.9	<3.9	<9.7	<9.7	<9.7	-
LOLA-3	Reference	2013	0.29	3.53	22.0	-	<0.08	<0.055	<0.044	<0.11	<0.11	0.11	-
REFF-1	Reference	2013	2.57	3.16	12.1	-	<0.015	<0.015	<0.012	<0.03	<0.03	<0.04	-
REFF-2	Reference	2013	2.14	2.23	9.00	-	<0.02	<0.01	<0.008	<0.02	<0.02	<0.02	-
REFF-3	Reference	2013	0.54	0.93	4.30	-	<0.4	<0.01	<0.02	<0.02	<0.02	<0.03	-
EL14-SED-1	Reference	2015	0.24	7.44	25.1	<1	<0.005	<0.005	<0.004	<0.01	<0.01	-	<0.01
EL14-SED-2	Reference	2015	0.85	20.4	110	1.10	<0.005	<0.005	<0.004	<0.01	<0.01	-	<0.01
EL14-SED-3	Reference	2015	1.48	37.1	97.8	1.70	<0.005	<0.005	0.0050	0.013	<0.01	-	0.024
EL14-SED-4	Reference	2015	0.94	40.1	198	4.70	<0.01	<0.01	<0.008	<0.02	<0.02	-	0.057
EL14-SED-5	Reference	2015	0.52	22.6	101	1.50	<0.005	<0.005	<0.004	<0.01	<0.01	-	<0.01
FLA1-SED-1	Reference	2015	0.85	19.2	63.8	2.50	<0.01	<0.01	<0.008	<0.02	<0.02	-	<0.02
FLA1-SED-2	Reference	2015	0.65	16.2	56.0	<2	<0.01	<0.01	<0.008	<0.02	<0.02	-	<0.02
FLA1-SED-3	Reference	2015	0.52	11.9	36.3	<2	<0.005	<0.005	<0.004	<0.01	<0.01	-	<0.01
FLA1-SED-4	Reference	2015	0.44	12.2	42.3	<2	<0.01	<0.01	<0.008	<0.02	<0.02	-	<0.02
FLA1-SED-5	Reference	2015	0.45	14.9	44.7	<2	<0.01	<0.01	<0.008	<0.02	<0.02	-	<0.02
LCHO-SED-1	Reference	2015	2.58	48.1	113	1.80	<0.01	<0.01	<0.008	0.024	<0.02	-	0.032
LCHO-SED-2	Reference	2015	1.99	52.8	128	<1	<0.005	<0.005	0.0062	0.052	0.024	-	0.086
LCHO-SED-3	Reference	2015	2.29	58.1	129	1.10	<0.005	<0.005	<0.004	<0.01	<0.01	-	0.012
LCHO-SED-4	Reference	2015	4.75	48.2	90.0	1.40	<0.005	<0.005	<0.004	<0.01	<0.01	-	<0.01
LCHO-SED-5	Reference	2015	1.21	25.1	56.4	<1	<0.005	<0.005	0.0045	0.040	0.020	-	0.069
LML-SED-1	Reference	2015	0.89	30.6	78.0	7.80	<0.025	0.021	<0.016	0.11	0.063	-	0.17
LML-SED-2	Reference	2015	0.88	24.1	65.4	<2	<0.03	0.025	<0.02	0.12	0.074	-	0.21
LML-SED-3	Reference	2015	0.79	28.8	75.3	5.30	<0.02	<0.02	<0.016	0.072	0.044	-	0.12
LML-SED-4	Reference	2015	0.93	31.5	87.2	4.00	<0.055	0.041	<0.02	0.23	0.14	-	0.38
LML-SED-5	Reference	2015	0.60	19.8	49.8	2.10	<0.025	<0.02	0.016	0.096	0.059	-	0.16
REFF-SED-1	Reference	2015	1.24	1.34	6.30	2.00	<0.015	<0.015	<0.012	<0.03	<0.03	-	<0.03
REFF-SED-2	Reference	2015	0.98	1.18	230	<1	<0.02	<0.02	<0.016	<0.04	<0.04	-	<0.04
REFF-SED-3	Reference	2015	0.34	0.73	3.60	<1	<0.015	<0.015	<0.012	<0.03	<0.03	-	<0.03
REFF-SED-4	Reference	2015	1.69	1.46	5.80	<1	<0.02	<0.02	<0.016	<0.04	<0.04	-	<0.04
REFF-SED-5	Reference	2015	0.39	0.87	3.70	<1	<0.015	<0.015	<0.012	<0.03	<0.03	-	<0.03

Outlier
Poor LRL (concentrations <LRL with LRL > maximum detected concentration).
Poor LRL for many parameters for a particular sample so all PAH values for that sample removed.

Table E.6: Reference Area Data used to Define Reference Normal Ranges for Individual Samples Collected in Sediment, 2013 and 2015

Sample ID	Exposure Type	Year	Benzo(b+j+k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene
FL17-1	Reference	2013	<0.015	<0.01	<0.01	<0.01	<0.005	<0.01	<0.02	<0.01
FL17-2	Reference	2013	<0.015	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01
FL17-3	Reference	2013	<0.015	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01
FO15-1	Reference	2013	0.092	<0.03	<0.02	<0.06	<0.02	<0.04	0.087	<0.03
FO15-2	Reference	2013	0.044	<0.02	<0.01	<0.04	<0.009	0.027	0.045	<0.02
FO15-3	Reference	2013	0.13	<0.03	<0.02	<0.2	<0.02	0.038	0.054	<0.02
GLMS-1	Reference	2013	0.28	0.089	0.029	0.25	0.042	0.11	0.27	0.035
GLMS-2	Reference	2013	0.25	0.083	0.025	0.23	0.040	0.091	0.25	0.027
GLMS-3	Reference	2013	0.11	0.037	0.011	0.11	0.019	0.043	0.10	0.012
GRLK-1	Reference	2013	0.23	0.053	0.039	0.18	<0.03	0.13	0.20	0.047
GRLK-2	Reference	2013	0.067	0.021	<0.01	0.071	<0.02	0.027	0.10	<0.02
GRLK-3	Reference	2013	0.025	<0.01	<0.01	0.027	<0.006	0.011	0.037	<0.01
LCHO-1	Reference	2013	0.068	0.027	<0.01	<0.09	0.012	0.042	<0.02	0.010
LCHO-2	Reference	2013	0.080	0.030	<0.02	<0.2	0.012	0.059	<0.02	0.012
LCHO-3	Reference	2013	0.069	0.023	<0.02	<0.2	0.011	<0.05	0.015	<0.01
LML-1	Reference	2013	0.27	<0.15	<0.06	<0.35	0.049	<0.15	0.52	<0.15
LML-2	Reference	2013	0.16	<0.06	<0.03	<0.3	0.035	<0.08	0.39	<0.07
LML-3	Reference	2013	0.19	<0.08	<0.03	<0.35	0.045	<0.1	0.47	<0.09
LOLA-1	Reference	2013	<0.099	<0.07	<0.07	<0.07	<0.035	<0.07	<0.07	<0.07
LOLA-2	Reference	2013	<14	<9.7	<9.7	-	-	<9.7	<9.7	<9.7
LOLA-3	Reference	2013	<0.16	0.16	<0.11	<0.2	<0.055	<0.11	0.20	<0.11
REFF-1	Reference	2013	<0.05	<0.03	<0.03	<0.04	<0.015	<0.04	0.037	<0.03
REFF-2	Reference	2013	<0.028	<0.03	<0.02	<0.03	<0.01	<0.02	0.031	<0.02
REFF-3	Reference	2013	<0.036	<0.02	<0.02	<0.03	<0.01	<0.02	0.051	<0.02
EL14-SED-1	Reference	2015	<0.015	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01
EL14-SED-2	Reference	2015	<0.015	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01
EL14-SED-3	Reference	2015	0.024	0.013	<0.01	0.050	<0.005	0.017	0.024	<0.01
EL14-SED-4	Reference	2015	0.057	0.023	<0.02	0.081	<0.01	0.028	0.028	<0.02
EL14-SED-5	Reference	2015	<0.015	<0.01	<0.01	0.014	<0.005	<0.01	<0.01	<0.01
FLA1-SED-1	Reference	2015	<0.028	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02
FLA1-SED-2	Reference	2015	<0.028	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02
FLA1-SED-3	Reference	2015	<0.015	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01
FLA1-SED-4	Reference	2015	<0.028	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02
FLA1-SED-5	Reference	2015	<0.028	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02
LCHO-SED-1	Reference	2015	0.032	<0.02	<0.02	0.080	<0.01	0.025	<0.02	<0.02
LCHO-SED-2	Reference	2015	0.086	0.035	<0.01	0.16	0.015	0.044	0.016	<0.01
LCHO-SED-3	Reference	2015	<0.015	<0.01	<0.01	0.032	<0.005	<0.01	<0.01	<0.01
LCHO-SED-4	Reference	2015	<0.015	<0.01	<0.01	0.017	<0.005	<0.01	<0.01	<0.01
LCHO-SED-5	Reference	2015	0.069	0.030	<0.01	0.15	0.012	0.026	<0.01	<0.01
LML-SED-1	Reference	2015	0.17	0.085	<0.04	0.40	0.037	0.086	0.41	<0.04
LML-SED-2	Reference	2015	0.21	0.094	<0.05	0.47	0.042	0.10	0.50	<0.05
LML-SED-3	Reference	2015	0.12	0.058	<0.04	0.29	0.024	0.059	0.23	<0.04
LML-SED-4	Reference	2015	0.46	0.21	0.084	0.78	0.12	0.19	0.80	0.10
LML-SED-5	Reference	2015	0.16	0.081	<0.04	0.39	0.036	0.082	0.41	<0.04
REFF-SED-1	Reference	2015	<0.042	<0.03	<0.03	0.040	<0.015	<0.03	<0.03	<0.03
REFF-SED-2	Reference	2015	<0.057	<0.04	<0.04	0.054	<0.02	<0.04	0.045	<0.04
REFF-SED-3	Reference	2015	<0.042	<0.03	<0.03	0.062	<0.015	<0.03	0.047	<0.03
REFF-SED-4	Reference	2015	<0.057	<0.04	<0.04	0.044	<0.02	<0.04	<0.04	<0.04
REFF-SED-5	Reference	2015	<0.042	<0.03	<0.03	0.037	<0.015	<0.03	<0.03	<0.03

Outlier
Poor LRL (concentrations <LRL with LRL > maximum detected concentration).
Poor LRL for many parameters for a particular sample so all PAH values for that sample removed.

Table E.6: Reference Area Data used to Define Reference Normal Ranges for Individual Samples Collected in Sediment, 2013 and 2015

Sample ID	Exposure Type	Year	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene	Surrogate: Acenaphthene d10	Surrogate: Chrysene d12	Surrogate: Naphthalene d8	Surrogate: Phenanthrene d10	B(a)P Total Potency Equivalent	IACR (CCME)
FL17-1	Reference	2013	<0.01	<0.02	<0.02	<0.01	83.2	88.0	86.5	86.6	<0.02	<0.15
FL17-2	Reference	2013	<0.02	<0.02	<0.03	<0.01	85.9	92.0	86.9	95.3	<0.02	<0.15
FL17-3	Reference	2013	<0.01	<0.02	<0.01	<0.01	77.0	76.5	82.5	81.5	<0.02	<0.15
FO15-1	Reference	2013	0.30	0.076	0.33	0.044	104	123	94.2	122	0.044	0.80
FO15-2	Reference	2013	0.18	0.047	0.17	0.020	105	118	97.0	118	0.027	0.41
FO15-3	Reference	2013	0.17	0.043	0.29	0.061	102	119	90.3	116	0.037	1.00
GLMS-1	Reference	2013	1.81	0.44	1.17	0.16	93.7	118	81.9	108	0.16	2.54
GLMS-2	Reference	2013	1.73	0.43	1.11	0.14	97.0	120	85.9	109	0.14	2.26
GLMS-3	Reference	2013	0.76	0.19	0.56	0.068	87.6	112	80.0	103	0.063	1.04
GRLK-1	Reference	2013	0.98	0.23	0.80	0.13	97.9	118	88.3	111	0.15	2.10
GRLK-2	Reference	2013	0.49	0.13	0.38	0.034	101	122	91.7	115	0.042	0.67
GRLK-3	Reference	2013	0.18	0.046	0.14	0.013	98.8	119	90.6	113	<0.02	0.26
LCHO-1	Reference	2013	0.099	0.049	0.28	0.055	89.3	111	81.2	98.7	0.043	0.67
LCHO-2	Reference	2013	0.16	0.081	0.42	0.075	87.7	111	80.7	98.0	0.047	0.83
LCHO-3	Reference	2013	0.16	0.075	0.40	0.069	101	126	92.8	121	0.055	0.77
LML-1	Reference	2013	2.98	0.73	1.77	0.14	97.9	114	85.4	106	0.17	2.63
LML-2	Reference	2013	2.43	0.59	1.42	0.11	96.0	114	86.4	104	0.11	1.59
LML-3	Reference	2013	2.98	0.70	1.72	0.13	90.6	112	84.5	99.6	0.12	1.83
LOLA-1	Reference	2013	0.26	<0.15	0.20	<0.07	88.3	114	82.7	103	<0.067	<0.75
LOLA-2	Reference	2013	28.3	<12.5	22.7	<9.7	83.5	106	77.7	93.2	<9.3	<100
LOLA-3	Reference	2013	0.95	<0.3	0.64	<0.11	96.4	120	89.1	108	0.11	1.60
REFF-1	Reference	2013	0.21	0.061	0.15	<0.03	79.4	104	71.9	100	<0.029	<0.35
REFF-2	Reference	2013	0.16	0.049	0.12	<0.02	79.3	97.4	75.3	98.1	<0.02	<0.22
REFF-3	Reference	2013	0.32	0.089	0.19	<0.02	110	116	98.7	125	<0.02	<0.25
EL14-SED-1	Reference	2015	0.027	<0.01	0.022	<0.01	68.0	67.2	78.4	69.8	<0.02	<0.15
EL14-SED-2	Reference	2015	<0.01	<0.01	<0.01	<0.01	60.9	60.8	66.5	60.2	<0.02	<0.15
EL14-SED-3	Reference	2015	0.062	<0.01	0.12	0.027	71.3	69.4	77.8	72.0	<0.02	0.28
EL14-SED-4	Reference	2015	0.067	0.033	0.15	0.035	87.4	119	64.5	103	0.025	0.54
EL14-SED-5	Reference	2015	0.015	<0.01	0.030	<0.01	75.3	78.6	80.3	80.4	<0.02	<0.15
FLA1-SED-1	Reference	2015	<0.02	<0.02	<0.02	<0.02	86.2	114	78.7	105	<0.02	<0.21
FLA1-SED-2	Reference	2015	<0.02	<0.02	<0.02	<0.02	82.9	111	74.5	101	<0.02	<0.21
FLA1-SED-3	Reference	2015	<0.01	<0.01	0.012	<0.01	76.2	93.2	74.8	87.5	<0.02	<0.15
FLA1-SED-4	Reference	2015	<0.02	<0.02	<0.02	<0.02	76.8	108	68.5	98.9	<0.02	<0.21
FLA1-SED-5	Reference	2015	<0.02	<0.02	<0.02	<0.02	65.9	88.1	56.2	79.4	<0.02	<0.21
LCHO-SED-1	Reference	2015	0.055	0.028	0.15	0.034	73.4	77.1	73.6	79.0	0.024	0.43
LCHO-SED-2	Reference	2015	0.11	0.052	0.29	0.071	68.5	73.4	71.9	75.9	0.055	0.93
LCHO-SED-3	Reference	2015	0.024	0.015	0.063	0.013	69.8	75.3	74.3	75.8	<0.02	0.17
LCHO-SED-4	Reference	2015	0.011	<0.01	0.027	<0.01	72.2	83.5	79.4	79.0	<0.02	<0.15
LCHO-SED-5	Reference	2015	0.057	0.030	0.18	0.048	89.6	119	74.4	101	0.046	0.77
LML-SED-1	Reference	2015	2.24	0.58	1.55	0.13	85.1	110	81.7	102	0.14	2.06
LML-SED-2	Reference	2015	3.04	0.81	1.83	0.15	78.4	92.7	82.0	86.5	0.16	2.46
LML-SED-3	Reference	2015	1.35	0.36	0.96	0.086	73.4	101	76.0	90.5	0.095	1.46
LML-SED-4	Reference	2015	4.87	1.27	3.04	0.26	105	118	104	112	0.35	4.94
LML-SED-5	Reference	2015	2.52	0.72	1.52	0.12	92.2	118	96.8	108	0.13	1.96
REFF-SED-1	Reference	2015	0.17	0.047	0.11	<0.03	88.7	109	98.7	97.3	0.029	0.33
REFF-SED-2	Reference	2015	0.31	0.093	0.18	<0.04	99.0	113	111	105	0.039	0.44
REFF-SED-3	Reference	2015	0.34	0.091	0.20	<0.03	117	109	104	122	0.029	0.34
REFF-SED-4	Reference	2015	0.21	0.057	0.13	<0.04	79.6	97.7	90.8	85.3	0.039	0.44
REFF-SED-5	Reference	2015	0.21	0.065	0.12	<0.03	75.5	96.3	86.4	82.2	0.029	0.33

Outlier
Poor LRL (concentrations <LRL with LRL > maximum detected concentration).
Poor LRL for many parameters for a particular sample so all PAH values for that sample removed.

Table E.7: Summary Statistics for the Reference Area Data used to Define Reference Normal Ranges for Individual Sediment Samples, 2013 and 2015

Parameter	Units	Sample size and Laboratory Reporting Limit (LRL)			Statistics Estimated using the Kaplan-Meier Method									BC Working Sediment Quality Guidelines		Comparison to Guidelines		
		Sample size	% of values < LRL	Maximum LRL	Minimum	2.5th Percentile	25th Percentile	Median	75th Percentile	97.5th Percentile	Maximum	Mean	Standard Deviation	Lower SQG [a]	Upper SQG [b]	% of values > LRL and > Lower SQG	% of values > LRL and > Upper SQG	% of values < LRL and LRL > Lower SQG
pH (1:2 soil:water)	-	47	0	-	6.21	6.44	7.51	7.74	7.86	8.09	8.15	7.63	0.415	-	-	-	-	-
Total Organic Carbon	%	25	0	-	2.86	2.86	6.02	8.19	12.7	30.3	30.3	11.0	7.19	-	-	-	-	-
Aluminum	mg/kg	49	0	-	197	204	1,500	5,230	7,820	11,800	11,800	4,918	3,519	-	-	-	-	-
Antimony	mg/kg	49	14	0.2	<0.1	<0.1	0.15	0.38	0.55	1.46	1.61	0.462	0.385	-	-	-	-	-
Arsenic	mg/kg	49	0	-	0.13	0.193	1.03	1.93	4.17	6.27	6.44	2.51	1.96	5.9	17	8	0	0
Barium	mg/kg	49	0	-	7.31	17.7	112	249	324	437	459	233	127	-	-	-	-	-
Beryllium	mg/kg	49	41	0.2	<0.1	<0.1	<0.2	0.3	0.42	0.77	0.87	0.313	0.181	-	-	-	-	-
Bismuth	mg/kg	49	100	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	<0.4	<0.4	-	-	-	-	-	-
Boron	mg/kg	49	55	10	<5	<5	8.1	5.3	12	24	28	9.13	6.25	-	-	-	-	-
Cadmium	mg/kg	49	0	-	0.069	0.07	0.259	0.699	1.32	3.08	3.53	0.989	0.918	0.6	3.5	55	2	0
Calcium	mg/kg	49	0	-	3,120	5,190	62,900	120,000	185,000	290,000	297,000	126,466	87,394	-	-	-	-	-
Chromium	mg/kg	49	0	-	1.38	2.24	4.57	7.09	16.2	21.9	25.4	9.97	6.49	37.3	90	0	0	0
Cobalt	mg/kg	49	2	0.1	<0.1	0.1	1.44	2.24	2.97	6.92	7.88	2.57	2.03	-	-	-	-	-
Copper	mg/kg	49	2	0.5	<0.5	0.58	3.65	8.2	14.6	24.8	27.2	9.63	7.58	35.7	197	0	0	0
Iron	mg/kg	49	0	-	284	299	3,110	6,010	8,770	14,400	15,500	6,133	4,336	21,200	43,766	0	0	0
Lead	mg/kg	49	0	-	0.61	0.74	4.31	5.4	8.7	11.7	12.9	6.13	3.22	35	91	0	0	0
Lithium	mg/kg	49	41	5	<2	<2	<5	5.8	11.5	23.6	24	7.76	5.39	-	-	-	-	-
Magnesium	mg/kg	48	0	-	1,130	1,960	2,960	4,200	7,180	16,900	23,700	5,835	4,501	-	-	-	-	-
Manganese	mg/kg	47	0	-	33.8	38.7	58.8	97	146	404	462	135	107	460	1,100	2	0	0
Mercury	mg/kg	49	6	0.005	<0.005	<0.005	0.0255	0.0473	0.07	0.157	0.162	0.0565	0.0432	0.17	0.486	0	0	0
Molybdenum	mg/kg	49	10	0.5	0.14	0.14	0.53	1.29	1.65	3.24	3.44	1.22	0.771	-	-	-	-	-
Nickel	mg/kg	49	2	0.5	<0.5	0.74	5.58	10.4	19.3	30.8	34.7	12.3	9.50	16	75	31	0	0
Phosphorus	mg/kg	49	2	50	<50	66	430	630	969	1,680	1,910	696	435	-	-	-	-	-
Potassium	mg/kg	49	8	100	<100	<100	620	940	1,310	2,500	2,780	1,010	646	-	-	-	-	-
Selenium	mg/kg	49	0	-	0.21	0.88	1.15	2.05	3.87	7.73	8.84	2.83	2.09	2 [c]		51	51	0
Silver	mg/kg	49	59	0.2	<0.1	<0.1	<0.1	0.12	0.19	0.51	0.6	0.171	0.139	-	-	-	-	-
Sodium	mg/kg	49	53	100	<50	<50	100	100	140	280	300	103	62.3	-	-	-	-	-
Strontium	mg/kg	49	0	-	18.3	27.1	47.3	89	138	211	217	97.4	58.1	-	-	-	-	-
Thallium	mg/kg	49	24	0.05	<0.05	<0.05	0.074	0.14	0.225	0.387	0.536	0.164	0.103	-	-	-	-	-
Tin	mg/kg	49	100	4	<2	<2	<2	<2	<2	<4	<4	<4	-	-	-	-	-	-
Titanium	mg/kg	49	0	-	5.2	6.9	25.1	38.1	54.6	131	153	43.8	31.0	-	-	-	-	-
Uranium	mg/kg	49	0	-	0.242	0.289	0.52	0.89	1.94	4.22	4.75	1.32	1.08	-	-	-	-	-
Vanadium	mg/kg	49	0	-	0.73	0.87	4.92	16.2	28.8	58.1	60.9	19.9	17.1	-	-	-	-	-
Zinc	mg/kg	48	0	-	3.6	3.7	27.6	52	88.6	145	198	60.0	43.4	123	315	8	0	0
Zirconium	mg/kg	24	50	2	<1	<1	<1	1.1	1.9	5.3	5.3	1.76	1.22	-	-	-	-	-
Acenaphthene	mg/kg	47	100	0.4	<0.005	<0.005	<0.01	<0.015	<0.03	<0.2	<0.4	<0.04	-	0.00671	0.0889	0	0	74
Acenaphthylene	mg/kg	43	95	0.02	<0.005	<0.005	<0.005	<0.008	<0.015	0.021	0.025	0.00584	0.000853	0.00587	0.128	5	0	51
Anthracene	mg/kg	13	77	0.006	<0.004	<0.004	<0.004	<0.004	0.0045	0.0062	0.0062	0.00430	0.000568	0.0469	0.245	0	0	0
Benz(a)anthracene	mg/kg	43	70	0.07	<0.01	<0.01	<0.02	0.028	0.028	0.106	0.12	0.0276	0.0318	0.0317	0.385	23	0	14
Benzo(a)pyrene	mg/kg	41	76	0.04	<0.01	<0.01	0.02	0.02	0.02	0.07	0.074	0.0196	0.0160	0.0319	0.782	15	0	15

Estimates of the reference area normal range
Upper limit of nomal range exceeds the Lower SQG
Upper limit of nomal range exceeds the Upper SQG

[a] A concentration that will protect aquatic life from adverse effects of toxic substances in most situations.
[b] A concentration that if exceeded will likely cause severe effects on aquatic life.
[c] Only a single guideline has been defined.

Table E.7: Summary Statistics for the Reference Area Data used to Define Reference Normal Ranges for Individual Sediment Samples, 2013 and 2015

Parameter	Units	Sample size and Laboratory Reporting Limit (LRL)			Statistics Estimated using the Kaplan-Meier Method									BC Working Sediment Quality Guidelines		Comparison to Guidelines		
		Sample size	% of values < LRL	Maximum LRL	Minimum	2.5th Percentile	25th Percentile	Median	75th Percentile	97.5th Percentile	Maximum	Mean	Standard Deviation	Lower SQG [a]	Upper SQG [b]	% of values > LRL and > Lower SQG	% of values > LRL and > Upper SQG	% of values < LRL and LRL > Lower SQG
Benzo(b)fluoranthene	mg/kg	23	30	0.07	<0.01	<0.01	<0.04	0.069	0.156	0.268	0.268	0.0932	0.0788	-	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	24	58	0.04	<0.01	<0.01	<0.02	<0.03	0.063	0.209	0.209	0.0456	0.0613	-	-	-	-	-
Benzo(b+j+k)fluoranthene	mg/kg	47	49	0.16	<0.015	<0.015	<0.028	<0.028	0.112	0.268	0.278	0.0721	0.0757	-	-	-	-	-
Benzo(g,h,i)perylene	mg/kg	45	64	0.08	<0.01	<0.01	<0.02	0.03	0.03	0.089	0.094	0.0250	0.0248	0.17	3.2	0	0	0
Benzo(k)fluoranthene	mg/kg	38	89	0.03	<0.01	<0.01	<0.01	<0.02	<0.02	0.039	0.039	0.0119	0.00701	0.24	13.4	0	0	0
Chrysene	mg/kg	47	51	0.35	<0.01	<0.01	0.0235	0.032	<0.09	0.403	0.474	0.0808	0.117	0.0571	0.862	30	0	21
Dibenz(a,h)anthracene	mg/kg	46	67	0.035	<0.005	<0.005	<0.01	0.01195	0.0145	0.0449	0.0493	0.0131	0.0120	0.00622	0.135	33	0	43
Fluoranthene	mg/kg	46	59	0.11	<0.01	<0.01	<0.02	0.011	0.042	0.108	0.127	0.0307	0.0320	0.111	2.355	2	0	0
Fluorene	mg/kg	47	45	0.07	<0.01	<0.01	<0.02	<0.03	0.103	0.496	0.516	0.102	0.151	0.021	0.144	51	23	9
Indeno(1,2,3-c,d)pyrene	mg/kg	36	83	0.03	<0.01	<0.01	<0.01	<0.02	<0.02	0.047	0.047	0.0125	0.00855	0.2	3.2	0	0	0
2-Methylnaphthalene	mg/kg	47	19	0.02	<0.01	<0.01	0.024	0.169	0.761	2.98	3.04	0.600	0.922	0.0202	0.201	77	45	0
Naphthalene	mg/kg	47	32	0.3	<0.01	<0.01	<0.02	0.049	0.126	0.731	0.814	0.155	0.232	0.0346	0.391	60	17	4
Phenanthrene	mg/kg	47	17	0.03	<0.01	<0.012	0.03	0.176	0.557	1.77	1.83	0.425	0.548	0.0419	0.515	74	26	0
Pyrene	mg/kg	47	47	0.11	<0.01	<0.01	0.02	0.02	0.071	0.15	0.158	0.0475	0.0479	0.053	0.875	34	0	4

Estimates of the reference area normal range
Upper limit of nomal range exceeds the Lower SQG
Upper limit of nomal range exceeds the Upper SQG

[a] A concentration that will protect aquatic life from adverse effects of toxic substances in most situations.
[b] A concentration that if exceeded will likely cause severe effects on aquatic life.
[c] Only a single guideline has been defined.

Table E.8: Normal Range Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Total Organic Carbon	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
				$P_{97.5}$	30.3	11,800	1.46	6.27	437	0.77	<0.4	24	3.08	290,000	21.9	6.92	24.8	14,400	11.7
Reference	EL14	EL14-SED-1	1.0	Magnesium	0.2	0.1	<0.1	0.1	<0.1	<0.1	N/C	<0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1
		EL14-SED-2	1.0	Arsenic	0.2	0.3	0.2	1.0	<0.1	0.3	N/C	0.3	0.4	0.3	0.7	0.4	0.2	0.6	0.3
		EL14-SED-3	2.7	Magnesium	0.1	0.7	0.4	0.9	0.2	0.6	N/C	0.5	0.4	0.8	1.2	0.6	0.4	0.6	0.5
		EL14-SED-4	1.4	Magnesium	0.2	0.7	0.3	1.0	0.1	0.6	N/C	0.5	0.9	0.3	1.0	0.7	0.4	0.6	0.7
		EL14-SED-5	1.0	Arsenic	0.1	0.5	0.1	1.0	0.1	0.3	N/C	0.3	0.4	0.3	0.7	0.5	0.2	0.5	0.4
	FLA1	FLA1-SED-1	0.9	Chromium	0.4	0.7	0.3	0.3	0.3	0.7	N/C	<0.4	0.2	0.3	0.9	0.4	0.5	0.5	0.8
		FLA1-SED-2	0.8	Chromium	0.3	0.7	0.2	0.2	0.2	0.7	N/C	<0.4	0.2	0.4	0.8	0.4	0.4	0.4	0.7
		FLA1-SED-3	0.6	Magnesium	0.2	0.5	<0.1	0.2	0.2	0.4	N/C	<0.4	0.1	0.4	0.5	0.3	0.3	0.3	0.5
		FLA1-SED-4	0.5	Calcium	0.2	0.4	0.2	0.2	0.2	0.4	N/C	<0.4	0.1	0.5	0.5	0.3	0.3	0.3	0.4
		FLA1-SED-5	0.7	Chromium	0.3	0.6	0.2	0.2	0.2	0.5	N/C	<0.4	0.2	0.6	0.7	0.3	0.3	0.4	0.5
	LCHO	LCHO-SED-1	1.2	Cadmium	0.3	0.9	0.7	0.5	0.7	0.9	N/C	0.2	1.2	<0.1	0.9	0.9	0.8	0.7	0.9
		LCHO-SED-2	1.0	Cobalt	0.2	0.8	0.9	0.7	0.7	0.9	N/C	0.2	0.9	<0.1	0.8	1.0	0.9	0.9	1.0
		LCHO-SED-3	1.0	Aluminum	0.2	1.0	0.8	0.7	0.7	1.0	N/C	0.2	0.8	<0.1	0.9	1.0	0.8	0.9	1.0
		LCHO-SED-4	1.1	Uranium	0.2	0.9	0.6	0.7	0.7	0.8	N/C	<0.2	0.6	<0.1	0.8	0.7	0.7	0.8	0.8
		LCHO-SED-5	1.0	Mercury	0.3	0.4	0.3	0.4	0.4	0.4	N/C	<0.2	0.4	<0.1	0.4	0.4	0.4	0.5	0.4
	LML	LML-SED-1	1.5	Zirconium	1.0	0.5	0.7	0.4	0.6	0.4	N/C	0.5	0.8	0.1	0.5	0.4	0.6	0.7	0.8
		LML-SED-2	1.2	Acenaphthylene	0.7	0.4	0.4	0.3	0.7	0.4	N/C	0.7	0.5	0.4	0.5	0.4	0.5	0.5	0.7
		LML-SED-3	1.1	Selenium	0.7	0.5	0.4	0.3	0.6	0.5	N/C	<0.4	0.7	0.2	0.7	0.4	0.5	0.5	0.6
		LML-SED-4	2.6	Dibenz(a,h)anthracene	0.9	0.5	0.5	0.5	0.6	0.5	N/C	0.5	0.6	0.2	0.5	0.5	0.8	0.6	1.0
		LML-SED-5	2.6	Anthracene	0.7	0.2	0.3	0.3	1.0	<0.3	N/C	0.5	0.3	0.7	0.3	0.3	0.5	0.4	0.9
	REFF	REFF-SED-1	0.5	Total Organic Carbon	0.5	<0.1	0.1	0.1	0.5	<0.1	N/C	<0.2	0.1	0.5	0.2	<0.1	0.1	<0.1	0.2
		REFF-SED-2	1.6	Zinc	0.3	<0.1	0.1	<0.1	0.5	<0.1	N/C	<0.2	<0.1	0.5	0.1	<0.1	<0.1	<0.1	0.2
		REFF-SED-3	0.6	Barium	0.2	<0.1	<0.1	<0.1	0.6	<0.1	N/C	<0.2	<0.1	0.6	0.1	<0.1	<0.1	<0.1	0.1
		REFF-SED-4	0.5	Barium	0.4	<0.1	0.1	0.1	0.5	<0.1	N/C	<0.2	0.1	0.5	0.2	<0.1	0.1	<0.1	0.3
		REFF-SED-5	0.6	Barium	0.3	<0.1	<0.1	<0.1	0.6	<0.1	N/C	<0.2	<0.1	0.6	0.1	<0.1	<0.1	<0.1	0.4
Mine-exposed	ELKO	ELKO-SED-1	1.6	Anthracene	0.1	0.4	0.3	0.6	0.3	0.5	N/C	<0.4	0.2	0.2	0.5	0.4	0.3	0.6	0.5
		ELKO-SED-2	2.4	Anthracene	0.1	0.5	0.4	0.7	0.4	0.6	N/C	<0.4	0.3	0.2	0.6	0.6	0.5	0.8	0.6
		ELKO-SED-3	2.8	Anthracene	0.1	0.5	0.3	0.6	0.3	0.6	N/C	<0.4	0.2	0.2	0.6	0.5	0.4	0.6	0.7
		ELKO-SED-4	2.1	Anthracene	0.1	0.5	0.3	0.7	0.3	0.6	N/C	<0.4	0.3	0.2	0.6	0.5	0.4	0.7	0.6
		ELKO-SED-5	1.3	Anthracene	0.1	0.6	0.3	0.6	0.3	0.6	N/C	<0.4	0.2	0.2	0.6	0.6	0.4	0.7	0.7
	ELWDGC	ELWDGC-SED-1	0.6	Iron	0.1	0.3	0.2	0.5	0.2	0.4	N/C	0.2	0.2	0.2	0.4	0.3	0.3	0.6	0.3
		ELWDGC-SED-2	1.0	Magnesium	0.2	0.6	0.3	0.7	0.3	0.7	N/C	0.5	0.3	0.3	0.7	0.6	0.5	0.8	0.6
		ELWDGC-SED-3	0.9	Magnesium	0.1	0.5	0.3	0.6	0.3	0.6	N/C	0.4	0.2	0.2	0.6	0.5	0.5	0.6	0.5
		ELWDGC-SED-4	1.0	Magnesium	0.1	0.6	0.3	0.6	0.3	0.7	N/C	0.5	0.3	0.2	0.8	0.6	0.5	0.7	0.6
		ELWDGC-SED-5	1.0	Iron	0.1	0.5	0.3	0.8	0.3	0.6	N/C	0.4	0.3	0.3	0.7	0.5	0.5	1.0	0.5
	EROL	EROL-SED-1	2.7	Anthracene	0.1	0.6	0.5	1.0	0.5	0.7	N/C	<0.4	0.3	0.3	0.7	0.7	0.6	0.9	0.8
		EROL-SED-2	3.2	Anthracene	0.1	0.5	0.4	0.7	0.4	0.6	N/C	<0.4	0.3	0.3	0.6	0.6	0.5	0.7	0.7
		EROL-SED-3	1.5	Anthracene	0.1	0.6	0.4	0.5	0.4	0.6	N/C	<0.4	0.3	0.4	0.6	0.5	0.6	0.7	0.6
		EROL-SED-4	1.9	Anthracene	0.2	0.6	0.4	1.0	0.4	0.7	N/C	<0.4	0.4	0.3	0.7	0.6	0.6	1.1	0.8
		EROL-SED-5	2.1	Anthracene	0.1	0.5	0.4	0.6	0.4	0.7	N/C	<0.4	0.3	0.4	0.6	0.6	0.5	0.7	0.8
	EROU	EROU-SED-1	2.6	Manganese	0.2	0.8	0.4	1.2	0.6	0.9	N/C	0.6	0.5	0.4	1.1	0.9	0.7	1.2	0.7
		EROU-SED-2	2.8	Manganese	0.2	0.8	0.5	1.2	0.6	1.0	N/C	0.6	0.5	0.4	1.2	0.9	0.7	1.3	0.8
		EROU-SED-3	2.8	Manganese	0.2	1.0	0.6	1.5	0.6	1.1	N/C	0.7	0.6	0.4	1.4	1.2	0.9	1.5	1.0
		EROU-SED-4	2.9	Manganese	0.2	1.0	0.5	1.4	0.5	1.1	N/C	0.7	0.6	0.3	1.3	1.1	0.8	1.4	0.9
		EROU-SED-5	2.7	Manganese	0.2	1.0	0.5	1.6	0.6	1.1	N/C	0.7	0.5	0.4	1.3	1.0	0.8	1.5	0.9
	ERUP	ERUP-SED-1	1.4	Chromium	0.2	1.0	0.6	1.2	0.6	1.1	N/C	0.8	0.5	0.4	1.4	1.0	0.8	1.2	0.9
		ERUP-SED-2	1.1	Chromium	0.2	0.7	0.4	0.7	0.4	0.8	N/C	0.6	0.4	0.3	1.1	0.7	0.6	0.8	0.7
		ERUP-SED-3	0.9	Magnesium	0.2	0.5	0.3	0.7	0.4	0.6	N/C	0.4	0.3	0.5	0.8	0.5	0.4	0.7	0.5
		ERUP-SED-4	1.4	Chromium	0.2	1.0	0.5	0.9	0.4	1.1	N/C	0.7	0.5	0.3	1.4	0.9	0.7	1.0	0.9
		ERUP-SED-5	1.2	Manganese	0.2	0.7	0.4	0.8	0.4	0.8	N/C	0.5	0.4	0.3	1.0	0.7	0.5	0.8	0.6
	FMUCK	FMUCK-SED-1	1.0	Iron	0.3	0.7	0.5	0.8	0.5	0.9	N/C	<0.4	0.5	0.2	0.6	0.8	0.6	1.0	0.8
		FMUCK-SED-2	1.1	Iron	0.1	0.7	0.4	0.9	0.4	0.9	N/C	<0.4	0.3	0.1	0.6	0.8	0.5	1.1	0.8
		FMUCK-SED-3	0.9	Iron	0.2	0.6	0.4	0.8	0.4	0.8	N/C	<0.4	0.4	0.2	0.6	0.8	0.6	0.9	0.8
		FMUCK-SED-4	0.9	Iron	0.1	0.7	0.4	0.8	0.4	0.8	N/C	<0.4	0.3	0.1	0.7	0.8	0.5	0.9	0.7
		FMUCK-SED-5	1.1	Manganese	0.3	0.6	0.5	0.9	0.5	0.9	N/C	<0.4	0.4	0.1	0.6	0.9	0.6	1.0	0.8
	FO10	FO10-SED-1	1.1	Manganese	0.1	0.7	0.4	0.8	0.5	0.8	N/C	<0.4	0.4	0.1	0.7	0.7	0.6	1.0	0.7
		FO10-SED-2	1.0	Phosphorus	0.2	0.6	0.4	0.7	0.4	0.7	N/C	<0.4	0.4	0.1	0.6	0.6	0.5	0.9	0.6
		FO10-SED-3	1.1	Manganese	0.2	0.5	0.4	0.6	0.4	0.7	N/C	<0.4	0.4	0.1	0.5	0.7	0.5	0.8	0.7
		FO10-SED-4	0.8	Iron	0.3	0.5	0.4	0.7	0.4	0.7	N/C	<0.4	0.4	0.1	0.5	0.7	0.5	0.8	0.7
		FO10-SED-5	1.0	Manganese	0.2	0.6	0.4	0.7	0.4	0.7	N/C	<0.4	0.3	0.2	0.5	0.7	0.5	0.8	0.7
	FOXL	FOXL-SED-1	1.4	Iron	0.3	0.7	0.6	1.1	0.7	0.9	N/C	<0.4	0.5	0.2	0.7	1.1	0.8	1.4	0.9
		FOXL-SED-2	1.5	Anthracene	0.3	0.7	0.6	1.2	0.6	0.9	N/C	<0.4	0.5	0.2	0.7	1.0	0.8	1.3	0.9
		FOXL-SED-3	1.7	Anthracene	0.3	0.7	0.5	1.0	0.6	0.9	N/C	<0.4	0.5	0.2	0.8	1.1	0.8	1.1	0.9
		FOXL-SED-4	1.7	Iron	0.3	0.7	0.6	1.4	0.7	0.9	N/C	<0.4	0.6	0.2	0.7	1.1	0.8	1.7	0.9
		FOXL-SED-5	1.4	Anthracene	0.9	0.7	0.5	1.0	0.6	0.8	N/C	<0.4	0.5	0.2	0.8	1.0	0.8	1.2	0.9
	FWDEC	FWDEC-SED-1	1.0	Lead	0.4	0.8	0.5	0.5	0.4	0.9	N/C	0.5	0.5	0.1	0.9	0.5	0.8	0.9	1.0
		FWDEC-SED-2	2.7	Selenium	0.6	0.6	0.6	0.8	0.4	0.6	N/C	0.6	0.7	0.1	0.9	0.8	0.7	1.1	0.9
		FWDEC-SED-3	1.3	Chromium	0.4	0.8	0.4	0.4	0.5	0.8	N/C	0.6	0.5	0.1	1.3	0.4	0.6	0.6	0.9
		FWDEC-SED-4	1.6	Selenium	0.5	0.8	0.5	0.6	0.5	0.7	N/C	0.7	0.6	0.1	1.1	0.4	0.8	1.1	1.4
		FWDEC-SED-5	1.3	Selenium	0.4	0.7	0.4	0.5	0.3	0.7	N/C	0.5	0.4	0.1	0.8	0.5	0.6	0.8	1.0
	GO13	GO13-SED-1	17	Anthracene	0.5	0.9	0.7	0.8	0.9	1.1	N/C	0.6	0.5	0.2	0.8	1.0	1.0	1.1	1.0
		GO13-SED-2	14	Anthracene	0.3	0.8	0.6	0.6	0.9	0.9	N/C	0.6	0.4	0.3	0.8	0.7	0.8	0.9	0.8
		GO13-SED-3	38	Anthracene	0.6	0.8	0.8	0.7	1.0	1.0	N/C	0.6	0.4	0.3	0.7	0.9	1.0	1.0	0.9
		GO13-SED-4	10	Anthracene	0.4	1.1	0.8	1.1	1.0	1.3	N/C	0.7	0.5	0.3	1.0	1.2	1.1	1.3	1.2
		GO13-SED-5	24	Anthracene	0.5	0.9	0.8	0.8	1.1	1.0	N/C	0.6	0.5	0.3	0.8	1.0	1.0	1.1	1.0
	HE27	HE27-SED-1	1.8	Magnesium	0.2	0.4	0.2	0.5	0.2	0.5	N/C	<0.4	0.2	0.5	0.5	0.5	0.3	0.6	0.5
		HE27-SED-2	1.7	Magnesium	0.3	0.6	0.4	0.7	0.4	0.7	N/C	<0.4	0.3	0.5	0.7	0.8	0.6	0.7	0.7
		HE27-SED-3	2.2	Magnesium	0.2	0.6	0.2	0.5	0.2	0.6	N/C	<0.4	0.2	0.6	0.7	0.5	0.3	0.6	0.5
		HE27-SED-4	3.3	Manganese	0.3	0.6	0.4	0.6	0.4	0.7	N/C	0.4	0.3	0.5	0.7	1.2	0.5	0.7	0.7
		HE27-SED-5	2.2	Magnesium	0.2	0.5	0.2	0.5	0.2	0.5	N/C	<0.4	0.2	0.5	0.6	0.5	0.3	0.6	0.5

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

Table E.8: Normal Range Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Total Organic Carbon	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
				$P_{97.5}$	30.3	11,800	1.46	6.27	437	0.77	<0.4	24	3.08	290,000	21.9	6.92	24.8	14,400	11.7
Mine-exposed	MI16	MI16-SED-1	2.6	Anthracene	0.3	0.6	0.3	0.6	0.3	0.8	N/C	0.5	0.3	0.3	0.7	0.6	0.6	0.6	0.7
		MI16-SED-2	1.1	Thallium	0.2	0.5	0.3	0.6	0.4	0.7	N/C	0.5	0.3	0.5	0.6	0.4	0.5	0.6	0.7
		MI16-SED-3	1.5	Selenium	0.3	0.6	0.3	0.8	0.5	0.8	N/C	0.5	0.4	0.6	0.7	0.5	0.6	0.9	0.7
		MI16-SED-4	2.3	Anthracene	0.2	0.6	0.2	0.4	0.5	0.8	N/C	0.5	0.3	0.4	0.7	0.4	0.5	0.6	0.5
		MI16-SED-5	1.5	Strontium	0.2	0.4	0.2	0.3	0.6	0.4	N/C	0.5	0.2	0.9	0.5	0.3	0.4	0.4	0.3
	MIC2	MIC2-SED-1	1.3	Thallium	0.2	1.0	0.7	1.0	0.6	1.1	N/C	0.5	0.6	0.1	1.2	0.9	0.8	1.1	0.9
		MIC2-SED-2	1.0	Arsenic	0.1	0.9	0.6	1.0	0.5	1.0	N/C	0.4	0.5	0.1	0.8	0.9	0.7	1.0	0.9
		MIC2-SED-3	0.8	Arsenic	0.2	0.6	0.5	0.8	0.4	0.7	N/C	<0.4	0.4	0.1	0.5	0.7	0.6	0.8	0.7
		MIC2-SED-4	1.0	Beryllium	0.2	0.8	0.6	0.9	0.5	1.0	N/C	<0.4	0.5	0.1	0.8	0.8	0.8	1.0	0.9
		MIC2-SED-5	1.2	Thallium	0.1	0.9	0.7	1.1	0.6	1.1	N/C	<0.4	0.6	0.1	0.8	1.0	0.8	1.1	1.0
	MIWW	MIWW-SED-1	1.2	Anthracene	0.2	0.6	0.6	0.6	0.5	0.7	N/C	<0.4	0.8	0.1	1.1	0.7	0.6	0.8	0.7
		MIWW-SED-2	1.2	Anthracene	0.2	0.6	0.5	0.6	0.5	0.7	N/C	<0.4	0.5	0.1	0.6	0.7	0.6	0.7	0.7
		MIWW-SED-3	0.9	Anthracene	0.2	0.6	0.6	0.7	0.5	0.7	N/C	<0.4	0.5	0.1	0.5	0.8	0.6	0.7	0.7
		MIWW-SED-4	1.2	Anthracene	0.2	0.6	0.5	0.5	0.5	0.7	N/C	<0.4	0.5	0.1	0.6	0.7	0.6	0.7	0.7
		MIWW-SED-5	1.0	Anthracene	0.2	0.6	0.5	0.7	0.4	0.7	N/C	<0.4	0.4	0.1	0.6	0.7	0.6	0.8	0.8
	OTTO	OTTO-SED-1	4.7	Anthracene	0.6	1.2	0.7	1.1	0.9	1.4	N/C	0.7	0.5	0.1	0.9	1.2	1.4	1.4	1.2
		OTTO-SED-2	33	Anthracene	1.2	0.7	0.4	1.0	0.7	0.8	N/C	0.5	0.3	0.1	0.5	0.8	0.9	1.1	0.8
		OTTO-SED-3	12	Anthracene	0.8	0.7	0.5	2.1	1.1	0.9	N/C	0.5	0.4	0.1	0.6	0.9	0.9	1.8	0.8
		OTTO-SED-4	13	Anthracene	0.8	0.7	0.5	0.7	0.6	0.8	N/C	0.4	0.3	0.1	0.6	0.8	0.9	0.8	0.8
		OTTO-SED-5	2.6	Pyrene	0.6	0.7	0.4	2.0	0.9	0.8	N/C	0.5	0.4	0.1	0.6	0.8	0.8	1.8	0.8
	R5-1	R5-1-SED-1	5.5	Anthracene	0.3	0.9	0.8	1.0	0.9	1.1	N/C	0.6	0.6	0.3	1.0	1.4	0.9	1.0	1.2
		R5-1-SED-2	4.4	Selenium	0.3	0.5	0.5	0.6	0.7	0.6	N/C	0.6	0.5	0.7	0.6	0.8	0.6	0.6	0.7
		R5-1-SED-3	6.4	Selenium	0.3	0.4	0.3	0.3	0.7	0.5	N/C	0.5	0.4	0.7	0.4	0.6	0.5	0.4	0.5
		R5-1-SED-4	3.5	Anthracene	0.3	0.6	0.5	0.6	0.6	0.7	N/C	0.4	0.5	0.5	0.6	0.9	0.6	0.7	0.7
		R5-1-SED-5	4.5	Selenium	0.3	0.6	0.5	0.6	0.7	0.7	N/C	0.6	0.5	0.7	0.6	0.9	0.7	0.7	0.7
	R5-3	R5-3-SED-1	2.5	Manganese	0.2	0.6	0.3	0.8	0.4	0.8	N/C	0.5	0.2	0.2	0.6	1.1	0.6	1.1	0.8
		R5-3-SED-2	3.8	Manganese	0.1	0.5	0.4	0.9	0.4	0.8	N/C	<0.4	0.2	0.2	0.5	1.2	0.6	1.2	0.9
		R5-3-SED-3	3.7	Manganese	0.2	0.5	0.3	1.0	0.5	0.9	N/C	0.5	0.2	0.2	0.6	1.2	0.6	1.2	0.8
		R5-3-SED-4	2.4	Manganese	0.3	0.6	0.4	0.8	0.5	0.8	N/C	0.5	0.2	0.2	0.6	0.9	0.6	1.2	0.9
		R5-3-SED-5	4.0	Manganese	0.2	0.5	0.3	0.8	0.4	0.8	N/C	0.5	0.2	0.1	0.5	1.2	0.6	1.1	0.8
	STPD	STPD-SED-1	9.9	Fluoranthene	0.2	0.5	0.3	0.4	0.4	0.5	N/C	<0.4	0.3	0.3	0.6	0.5	0.5	0.6	0.6
		STPD-SED-2	22	Fluoranthene	0.2	0.5	0.3	0.5	0.4	0.5	N/C	<0.4	0.3	0.3	0.6	0.5	0.5	0.6	0.7
		STPD-SED-3	193	Fluoranthene	0.2	0.5	0.5	0.6	0.3	0.5	N/C	<0.4	0.3	0.3	0.8	0.5	0.7	0.8	1.0
		STPD-SED-4	6.2	Fluoranthene	0.2	0.6	0.4	0.6	0.4	0.7	N/C	<0.4	0.4	0.3	0.8	0.6	0.5	0.7	0.8
		STPD-SED-5	18	Fluoranthene	0.3	0.4	0.3	0.3	0.4	0.4	N/C	<0.4	0.4	0.3	0.6	0.3	0.5	0.5	0.6

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

Table E.8: Normal Range Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Tin	Titanium
				$P_{97.5}$	23.6	16,900	404	0.16	3.24	30.8	1,680	2,500	7.73	0.51	280	211	0.39	<4	131
Reference	EL14	EL14-SED-1	1.0	Magnesium	0.3	1.0	0.1	0.4	0.1	0.2	0.1	0.2	<0.1	<0.2	<0.2	0.2	0.2	N/C	0.1
		EL14-SED-2	1.0	Arsenic	1.0	0.9	0.4	0.4	0.3	0.7	0.2	0.4	0.2	0.2	0.3	0.3	0.6	N/C	0.2
		EL14-SED-3	2.7	Magnesium	0.7	2.7	0.9	0.2	0.4	0.8	0.4	1.0	0.1	0.4	0.6	0.8	0.8	N/C	0.2
		EL14-SED-4	1.4	Magnesium	1.0	1.4	0.3	0.8	0.3	1.0	0.4	0.9	0.2	0.5	0.4	0.4	1.4	N/C	0.5
		EL14-SED-5	1.0	Arsenic	0.9	0.9	0.2	0.3	0.6	0.7	0.3	0.6	0.1	0.3	0.6	0.4	0.7	N/C	0.5
	FLA1	FLA1-SED-1	0.9	Chromium	0.6	0.5	0.2	0.3	0.2	0.4	0.4	0.5	0.3	<0.4	<0.4	0.2	0.6	N/C	0.4
		FLA1-SED-2	0.8	Chromium	0.6	0.6	0.1	0.2	0.1	0.3	0.4	0.5	0.3	<0.4	<0.4	0.2	0.5	N/C	0.4
		FLA1-SED-3	0.6	Magnesium	0.3	0.6	0.2	0.2	0.1	0.2	0.4	0.3	0.1	<0.4	<0.4	0.3	0.4	N/C	0.5
		FLA1-SED-4	0.5	Calcium	0.4	0.4	0.1	0.2	0.1	0.2	0.3	0.3	0.2	<0.4	<0.4	0.3	0.4	N/C	0.3
		FLA1-SED-5	0.7	Chromium	0.5	0.4	0.1	0.2	0.1	0.3	0.4	0.4	0.2	<0.4	<0.4	0.3	0.4	N/C	0.4
	LCHO	LCHO-SED-1	1.2	Cadmium	0.5	0.2	0.2	0.9	0.4	0.8	0.6	0.7	1.0	0.9	<0.2	0.2	0.7	N/C	0.3
		LCHO-SED-2	1.0	Cobalt	0.5	0.2	0.3	0.8	0.4	1.0	0.7	0.7	0.4	1.0	<0.2	0.2	0.8	N/C	0.3
		LCHO-SED-3	1.0	Aluminum	0.6	0.2	0.2	0.7	0.4	0.9	0.7	0.7	0.5	0.9	<0.2	0.2	0.8	N/C	0.4
		LCHO-SED-4	1.1	Uranium	0.5	0.1	0.3	1.0	0.4	0.7	0.6	0.6	0.5	1.0	<0.2	0.1	0.7	N/C	0.2
		LCHO-SED-5	1.0	Mercury	0.3	0.1	0.1	1.0	0.2	0.4	0.3	0.3	0.3	0.4	<0.2	0.1	0.4	N/C	0.2
	LML	LML-SED-1	1.5	Zirconium	0.2	0.2	0.3	0.7	0.6	0.6	0.6	0.3	0.9	<0.4	0.6	0.2	0.6	N/C	0.9
		LML-SED-2	1.2	Acenaphthylene	0.2	0.2	0.2	0.5	0.7	0.5	0.7	0.4	0.8	<0.4	0.5	0.4	0.4	N/C	0.5
		LML-SED-3	1.1	Selenium	0.2	0.2	0.2	0.6	0.4	0.6	0.6	0.4	1.1	<0.4	0.6	0.3	0.8	N/C	0.5
		LML-SED-4	2.6	Dibenz(a,h)anthracene	0.2	0.2	0.2	0.6	0.6	0.6	0.7	0.5	0.9	0.4	0.5	0.3	0.6	N/C	0.4
		LML-SED-5	2.6	Anthracene	<0.2	0.3	0.2	0.3	0.5	0.3	0.5	0.4	0.5	<0.4	<0.4	0.5	0.3	N/C	0.2
	REFF	REFF-SED-1	0.5	Total Organic Carbon	<0.1	0.1	0.1	0.1	0.3	<0.1	0.1	<0.1	0.4	<0.2	<0.2	0.5	<0.1	N/C	0.1
		REFF-SED-2	1.6	Zinc	<0.1	0.2	0.1	<0.1	0.2	0.1	<0.1	<0.1	0.2	<0.2	<0.2	0.5	<0.1	N/C	0.1
		REFF-SED-3	0.6	Barium	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.2	<0.2	0.6	<0.1	N/C	0.1
		REFF-SED-4	0.5	Barium	<0.1	0.1	0.1	0.2	0.5	<0.1	0.1	<0.1	0.4	<0.2	<0.2	0.5	<0.1	N/C	0.1
		REFF-SED-5	0.6	Barium	<0.1	0.2	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.2	<0.2	0.5	<0.1	N/C	0.1
Mine-exposed	ELKO	ELKO-SED-1	1.6	Anthracene	0.3	0.5	0.5	0.2	0.2	0.4	0.5	0.4	0.1	<0.4	<0.4	0.3	0.4	N/C	0.2
		ELKO-SED-2	2.4	Anthracene	0.4	0.7	0.8	0.3	0.3	0.6	0.7	0.6	0.2	<0.4	<0.4	0.4	0.6	N/C	0.2
		ELKO-SED-3	2.8	Anthracene	0.4	0.6	0.6	0.3	0.3	0.5	0.6	0.6	0.2	<0.4	<0.4	0.3	0.5	N/C	0.2
		ELKO-SED-4	2.1	Anthracene	0.4	0.6	0.7	0.2	0.3	0.5	0.6	0.6	0.2	<0.4	<0.4	0.3	0.5	N/C	0.2
		ELKO-SED-5	1.3	Anthracene	0.4	0.6	0.6	0.3	0.3	0.5	0.6	0.6	0.2	<0.4	<0.4	0.3	0.5	N/C	0.2
	ELWDGC	ELWDGC-SED-1	0.6	Iron	0.2	0.6	0.5	0.2	0.3	0.3	0.4	0.4	0.3	<0.2	0.2	0.3	0.4	N/C	0.1
		ELWDGC-SED-2	1.0	Magnesium	0.4	1.0	0.9	0.2	0.4	0.6	0.7	0.8	0.3	0.4	0.4	0.5	0.7	N/C	0.2
		ELWDGC-SED-3	0.9	Magnesium	0.4	0.9	0.7	0.2	0.3	0.5	0.7	0.7	0.5	0.3	0.4	0.4	0.6	N/C	0.1
		ELWDGC-SED-4	1.0	Magnesium	0.5	1.0	0.6	0.2	0.3	0.6	0.8	0.8	0.7	0.3	0.4	0.5	0.7	N/C	0.2
		ELWDGC-SED-5	1.0	Iron	0.4	0.9	0.8	0.3	0.4	0.4	0.7	0.7	0.6	0.3	0.4	0.5	0.6	N/C	0.2
	EROL	EROL-SED-1	2.7	Anthracene	0.5	0.9	1.0	0.3	0.4	0.6	0.7	0.7	0.6	<0.4	<0.4	0.4	0.7	N/C	0.2
		EROL-SED-2	3.2	Anthracene	0.4	0.8	0.6	0.2	0.4	0.5	0.7	0.6	0.3	<0.4	<0.4	0.5	0.6	N/C	0.2
		EROL-SED-3	1.5	Anthracene	0.4	0.8	0.5	0.3	0.4	0.5	0.7	0.7	0.6	<0.4	0.4	0.6	0.6	N/C	0.2
		EROL-SED-4	1.9	Anthracene	0.5	0.9	0.7	0.3	0.4	0.5	0.7	0.7	0.7	<0.4	0.4	0.5	0.6	N/C	0.2
		EROL-SED-5	2.1	Anthracene	0.4	0.7	0.5	0.2	0.4	0.5	0.7	0.6	0.5	<0.4	<0.4	0.5	0.5	N/C	0.2
	EROU	EROU-SED-1	2.6	Manganese	0.6	0.9	2.6	0.5	0.6	0.9	0.8	1.1	0.3	0.6	0.5	1.0	1.0	N/C	0.2
		EROU-SED-2	2.8	Manganese	0.7	0.9	2.8	0.6	0.7	0.9	0.8	1.1	0.3	0.6	0.5	1.0	1.1	N/C	0.2
		EROU-SED-3	2.8	Manganese	0.9	1.1	2.8	0.6	0.7	1.2	0.9	1.3	0.3	0.8	0.5	1.0	1.3	N/C	0.2
		EROU-SED-4	2.9	Manganese	0.8	1.0	2.9	0.9	0.6	1.0	0.9	1.3	0.2	0.7	0.5	0.9	1.2	N/C	0.3
		EROU-SED-5	2.7	Manganese	0.7	1.2	2.7	0.7	0.6	1.1	1.0	1.3	0.3	0.7	0.6	0.9	1.2	N/C	0.3
	ERUP	ERUP-SED-1	1.4	Chromium	0.8	1.1	1.4	0.9	0.8	1.0	0.9	1.4	0.3	0.7	0.5	1.0	1.2	N/C	0.3
		ERUP-SED-2	1.1	Chromium	0.6	1.0	0.5	0.7	0.8	0.7	0.8	1.0	0.3	0.5	0.5	0.8	0.8	N/C	0.2
		ERUP-SED-3	0.9	Magnesium	0.4	0.9	0.6	0.2	0.8	0.5	0.8	0.7	0.2	0.3	0.5	0.9	0.6	N/C	0.2
		ERUP-SED-4	1.4	Chromium	0.8	1.2	0.9	0.7	0.6	0.9	1.0	1.4	0.2	0.6	0.6	0.7	1.1	N/C	0.3
		ERUP-SED-5	1.2	Manganese	0.6	0.7	1.2	0.7	0.5	0.7	0.6	1.0	0.2	0.5	0.4	0.5	0.9	N/C	0.2
	FMUCK	FMUCK-SED-1	1.0	Iron	0.5	0.8	0.9	0.4	0.4	1.0	0.9	0.8	0.6	0.5	<0.4	0.3	0.6	N/C	0.2
		FMUCK-SED-2	1.1	Iron	0.4	0.6	1.0	0.2	0.4	0.8	1.1	0.8	0.2	<0.4	<0.4	0.3	0.5	N/C	0.1
		FMUCK-SED-3	0.9	Iron	0.4	0.8	0.9	0.3	0.4	0.8	0.9	0.6	0.3	<0.4	<0.4	0.3	0.5	N/C	0.1
		FMUCK-SED-4	0.9	Iron	0.4	0.8	0.9	0.2	0.4	0.8	0.9	0.8	0.3	<0.4	<0.4	0.3	0.6	N/C	0.1
		FMUCK-SED-5	1.1	Manganese	0.4	0.6	1.1	0.3	0.4	0.9	1.0	0.7	0.3	<0.4	<0.4	0.3	0.5	N/C	0.1
	FO10	FO10-SED-1	1.1	Manganese	0.4	0.6	1.1	0.3	0.4	0.8	1.0	0.8	0.3	<0.4	<0.4	0.3	0.6	N/C	0.1
		FO10-SED-2	1.0	Phosphorus	0.3	0.5	0.6	0.5	0.3	0.6	1.0	0.7	0.4	0.4	<0.4	0.2	0.6	N/C	0.2
		FO10-SED-3	1.1	Manganese	0.4	0.6	1.1	0.5	0.3	0.7	0.7	0.6	0.3	<0.4	<0.4	0.2	0.6	N/C	0.1
		FO10-SED-4	0.8	Iron	0.4	0.5	0.7	0.6	0.3	0.7	0.8	0.5	0.4	<0.4	<0.4	0.3	0.5	N/C	0.1
		FO10-SED-5	1.0	Manganese	0.4	0.7	1.0	0.3	0.4	0.7	0.8	0.6	0.3	<0.4	<0.4	0.3	0.5	N/C	0.1
	FOXL	FOXL-SED-1	1.4	Iron	0.5	0.6	1.2	0.7	0.4	0.9	0.9	0.8	0.2	0.8	0.4	0.3	0.9	N/C	0.2
		FOXL-SED-2	1.5	Anthracene	0.5	0.6	1.1	0.7	0.4	0.9	0.9	0.7	0.2	0.8	<0.4	0.3	0.8	N/C	0.2
		FOXL-SED-3	1.7	Anthracene	0.5	0.8	1.4	0.5	0.4	0.9	0.8	0.8	0.2	0.7	0.4	0.3	0.8	N/C	0.2
		FOXL-SED-4	1.7	Iron	0.5	0.5	1.3	0.8	0.4	0.9	1.0	0.7	0.2	0.8	0.4	0.3	0.9	N/C	0.2
		FOXL-SED-5	1.4	Anthracene	0.5	0.7	1.2	0.7	0.4	0.9	0.8	0.8	0.2	0.7	<0.4	0.3	0.8	N/C	0.2
	FWDEC	FWDEC-SED-1	1.0	Lead	0.5	0.5	0.1	0.3	0.6	0.7	0.6	0.8	1.0	0.4	<0.4	0.2	0.5	N/C	0.2
		FWDEC-SED-2	2.7	Selenium	0.4	0.4	0.1	0.4	0.6	0.6	0.8	0.8	2.7	<0.4	<0.4	0.3	0.6	N/C	0.3
		FWDEC-SED-3	1.3	Chromium	0.6	0.5	0.2	0.5	0.4	0.6	0.9	0.9	1.1	0.5	0.6	0.3	0.6	N/C	0.3
		FWDEC-SED-4	1.6	Selenium	0.5	0.6	0.1	0.5	0.6	0.6	0.9	0.9	1.6	0.5	0.4	0.3	0.6	N/C	0.2
		FWDEC-SED-5	1.3	Selenium	0.5	0.7	0.1	0.3	0.9	0.5	0.8	0.9	1.3	<0.4	0.4	0.2	0.5	N/C	0.2
	GO13	GO13-SED-1	17	Anthracene	0.6	0.8	1.2	0.7	0.8	0.9	0.8	1.1	5.6	0.6	0.5	0.6	0.8	N/C	0.2
		GO13-SED-2	14	Anthracene	0.5	0.9	0.8	0.4	0.5	0.7	0.8	1.0	5	0.5	0.6	0.6	0.7	N/C	0.2
		GO13-SED-3	38	Anthracene	0.5	0.6	0.7	0.5	0.6	0.8	0.7	1.0	3.9	0.6	0.5	0.6	0.8	N/C	0.2
		GO13-SED-4	10	Anthracene	0.7	0.7	1.0	0.8	0.7	1.0	0.7	1.3	4.3	0.8	0.5	0.7	1.0	N/C	0.2
		GO13-SED-5	24	Anthracene	0.5	0.7	0.9	0.6	0.5	0.8	0.7	1.1	3.9	0.6	0.4	0.6	0.7	N/C	0.2
	HE27	HE27-SED-1	1.8	Magnesium	0.4	1.8	0.7	0.2	0.3	0.5	0.5	0.5	0.2	<0.4	0.5	0.5	0.3	N/C	0.2
		HE27-SED-2	1.7	Magnesium	0.7	1.7	1.0	0.4	0.4	0.8	0.6	0.7	0.6	0.5	0.4	0.5	0.5	N/C	0.3
		HE27-SED-3	2.2	Magnesium	0.7	2.2	0.6	0.2	0.3	0.6	0.5	0.7	0.2	<0.4	0.5	0.5	0.4	N/C	0.3
		HE27-SED-4	3.3	Manganese	0.7	1.9	3.3	0.3	0.4	0.8	0.5	0.8	0.3	<0.4	0.5	0.4	0.5	N/C	0.3
		HE27-SED-5	2.2	Magnesium	0.6	2.2	0.8	0.2	0.3	0.5	0.5	0.7	0.5	<0.4	0.6	0.4	0.4	N/C	0.2

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

Table E.8: Normal Range Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Tin	Titanium
				$P_{97.5}$	23.6	16,900	404	0.16	3.24	30.8	1,680	2,500	7.73	0.51	280	211	0.39	<4	131
Mine-exposed	MI16	MI16-SED-1	2.6	Anthracene	0.4	0.6	0.2	0.6	0.4	0.6	0.5	0.7	0.6	0.5	<0.4	0.5	1.3	N/C	0.2
		MI16-SED-2	1.1	Thallium	0.4	0.5	0.2	0.4	0.5	0.5	0.5	0.7	1.0	<0.4	0.4	0.8	1.1	N/C	0.2
		MI16-SED-3	1.5	Selenium	0.4	0.6	0.4	0.3	0.9	0.6	0.8	0.8	1.5	0.4	0.5	1.0	1.3	N/C	0.2
		MI16-SED-4	2.3	Anthracene	0.4	0.5	0.3	0.3	0.4	0.4	0.6	0.8	1.1	<0.4	0.4	0.7	1.1	N/C	0.2
		MI16-SED-5	1.5	Strontium	0.3	0.3	0.2	0.2	0.6	0.3	0.4	0.6	1.3	<0.4	0.4	1.5	0.7	N/C	0.2
	MIC2	MIC2-SED-1	1.3	Thallium	0.5	0.5	0.4	0.6	0.6	1.0	0.8	1.1	0.4	0.8	<0.4	0.3	1.3	N/C	0.3
		MIC2-SED-2	1.0	Arsenic	0.5	0.5	0.4	0.4	0.4	0.8	0.8	1.0	0.2	0.6	<0.4	0.3	1.0	N/C	0.3
		MIC2-SED-3	0.8	Arsenic	0.4	0.4	0.3	0.4	0.4	0.7	0.7	0.5	0.1	0.5	<0.4	0.2	0.8	N/C	0.2
		MIC2-SED-4	1.0	Beryllium	0.5	0.5	0.4	0.5	0.4	0.8	0.8	0.9	0.3	0.6	<0.4	0.3	1.0	N/C	0.3
		MIC2-SED-5	1.2	Thallium	0.5	0.6	0.4	0.6	0.5	1.0	0.8	0.9	0.3	0.7	0.4	0.3	1.2	N/C	0.3
	MIWW	MIWW-SED-1	1.2	Anthracene	0.4	0.4	0.2	0.4	0.5	0.7	0.7	0.7	0.4	0.4	<0.4	0.3	0.8	N/C	0.3
		MIWW-SED-2	1.2	Anthracene	0.4	0.3	0.2	0.5	0.4	0.7	0.6	0.6	0.2	0.6	<0.4	0.3	0.7	N/C	0.2
		MIWW-SED-3	0.9	Anthracene	0.4	0.4	0.2	0.4	0.3	0.7	0.7	0.6	0.3	0.5	<0.4	0.4	0.8	N/C	0.2
		MIWW-SED-4	1.2	Anthracene	0.3	0.3	0.3	0.4	0.2	0.6	0.7	0.6	0.3	0.5	<0.4	0.3	0.7	N/C	0.2
		MIWW-SED-5	1.0	Anthracene	0.4	0.3	0.2	0.4	0.3	0.7	0.7	0.5	0.2	0.5	<0.4	0.3	0.7	N/C	0.2
	OTTO	OTTO-SED-1	4.7	Anthracene	0.7	0.4	0.7	0.9	0.6	1.0	0.7	1.5	0.8	0.9	0.5	0.5	0.8	N/C	0.2
		OTTO-SED-2	33	Anthracene	0.4	0.2	0.8	0.8	0.4	0.6	0.4	0.8	0.3	0.5	0.3	0.3	0.2	N/C	0.1
		OTTO-SED-3	12	Anthracene	0.4	0.3	2.0	0.8	0.6	0.8	0.5	0.9	0.3	0.5	0.3	0.4	0.4	N/C	0.2
		OTTO-SED-4	13	Anthracene	0.4	0.2	0.5	1.0	0.3	0.6	0.4	0.9	0.6	0.5	0.3	0.3	0.4	N/C	0.1
		OTTO-SED-5	2.6	Pyrene	0.4	0.5	1.5	0.8	0.6	0.7	0.6	0.8	0.2	0.4	0.3	0.4	0.5	N/C	0.2
	R5-1	R5-1-SED-1	5.5	Anthracene	0.6	0.5	0.8	0.4	1.1	1.3	0.6	1.4	2.6	0.7	1.0	0.7	1.2	N/C	0.1
		R5-1-SED-2	4.4	Selenium	0.4	0.5	0.6	0.3	0.8	0.7	0.4	0.8	4.4	0.4	1.1	1.2	0.7	N/C	0.1
		R5-1-SED-3	6.4	Selenium	0.3	0.4	0.5	0.3	0.9	0.6	0.3	0.6	6.4	0.3	1.2	1.2	0.6	N/C	0.1
		R5-1-SED-4	3.5	Anthracene	0.4	0.5	0.5	0.4	0.9	0.8	0.5	0.8	2.8	0.5	1.0	1.0	0.8	N/C	0.1
		R5-1-SED-5	4.5	Selenium	0.4	0.5	0.7	0.2	1.0	0.8	0.4	0.9	4.5	0.4	1.3	1.2	0.8	N/C	0.1
	R5-3	R5-3-SED-1	2.5	Manganese	0.4	0.8	2.5	0.3	0.5	0.6	0.9	1.0	0.6	<0.4	0.4	0.3	0.6	N/C	0.1
		R5-3-SED-2	3.8	Manganese	0.4	0.8	3.8	0.2	0.6	0.7	0.9	0.8	0.4	<0.4	0.4	0.3	0.6	N/C	0.1
		R5-3-SED-3	3.7	Manganese	0.4	0.8	3.7	0.3	0.5	0.8	0.9	0.8	0.6	<0.4	<0.4	0.3	0.6	N/C	0.1
		R5-3-SED-4	2.4	Manganese	0.4	0.7	2.4	0.3	0.4	0.6	0.9	0.9	1.0	<0.4	<0.4	0.3	0.6	N/C	0.1
		R5-3-SED-5	4.0	Manganese	0.3	0.7	4.0	0.3	0.5	0.7	0.8	0.9	0.4	<0.4	<0.4	0.3	0.6	N/C	0.1
	STPD	STPD-SED-1	9.9	Fluoranthene	0.3	0.4	0.4	0.4	0.3	0.4	0.5	0.6	0.9	<0.4	<0.4	0.4	0.6	N/C	0.2
		STPD-SED-2	22	Fluoranthene	0.4	0.4	0.4	0.3	0.4	0.4	0.5	0.6	1.1	<0.4	<0.4	0.5	0.5	N/C	0.2
		STPD-SED-3	193	Fluoranthene	0.4	0.8	0.4	0.2	0.4	0.4	0.6	0.6	0.4	<0.4	<0.4	0.4	0.5	N/C	0.3
		STPD-SED-4	6.2	Fluoranthene	0.4	0.6	0.4	0.4	0.4	0.6	0.6	0.8	1.0	<0.4	<0.4	0.5	0.7	N/C	0.2
		STPD-SED-5	18	Fluoranthene	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.5	2.1	<0.4	<0.4	0.5	0.5	N/C	0.1

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

Table E.8: Normal Range Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Uranium	Vanadium	Zinc	Zirconium	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b&j)fluoranthene	Benzo(b+j+k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene
				$P_{97.5}$	4.22	58.1	145	5.3	<0.2	0.02	0.01	0.11	0.07	0.21	0.27	0.09	0.04	0.4	0.04	0.11
Reference	EL14	EL14-SED-1	1.0	Magnesium	0.1	0.1	0.2	<0.2	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1
		EL14-SED-2	1.0	Arsenic	0.2	0.4	0.8	0.2	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1
		EL14-SED-3	2.7	Magnesium	0.4	0.6	0.7	0.3	N/C	<0.2	0.8	0.1	<0.1	0.1	0.1	0.2	<0.3	0.1	<0.1	0.2
		EL14-SED-4	1.4	Magnesium	0.2	0.7	1.4	0.9	N/C	<0.5	<1.3	<0.2	<0.3	0.3	0.2	0.3	<0.5	0.2	<0.2	0.3
		EL14-SED-5	1.0	Arsenic	0.1	0.4	0.7	0.3	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1
	FLA1	FLA1-SED-1	0.9	Chromium	0.2	0.3	0.4	0.5	N/C	<0.5	<1.3	<0.2	<0.3	<0.1	<0.1	<0.2	<0.5	<0.1	<0.2	<0.2
		FLA1-SED-2	0.8	Chromium	0.2	0.3	0.4	<0.4	N/C	<0.5	<1.3	<0.2	<0.3	<0.1	<0.1	<0.2	<0.5	<0.1	<0.2	<0.2
		FLA1-SED-3	0.6	Magnesium	0.1	0.2	0.3	<0.4	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1
		FLA1-SED-4	0.5	Calcium	0.1	0.2	0.3	<0.4	N/C	<0.5	<1.3	<0.2	<0.3	<0.1	<0.1	<0.2	<0.5	<0.1	<0.2	<0.2
		FLA1-SED-5	0.7	Chromium	0.1	0.3	0.3	<0.4	N/C	<0.5	<1.3	<0.2	<0.3	<0.1	<0.1	<0.2	<0.5	<0.1	<0.2	<0.2
	LCHO	LCHO-SED-1	1.2	Cadmium	0.6	0.8	0.8	0.3	N/C	<0.5	<1.3	0.2	<0.3	0.2	0.1	<0.2	<0.5	0.2	<0.2	0.2
		LCHO-SED-2	1.0	Cobalt	0.5	0.9	0.9	<0.2	N/C	<0.2	1.0	0.5	0.3	0.4	0.3	0.4	<0.3	0.4	0.3	0.4
		LCHO-SED-3	1.0	Aluminum	0.5	1.0	0.9	0.2	N/C	<0.2	<0.7	<0.1	<0.1	0.1	<0.1	<0.1	<0.3	0.1	<0.1	<0.1
		LCHO-SED-4	1.1	Uranium	1.1	0.8	0.6	0.3	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1
		LCHO-SED-5	1.0	Mercury	0.3	0.4	0.4	<0.2	N/C	<0.2	0.7	0.4	0.3	0.3	0.3	0.3	<0.3	0.4	0.3	0.2
	LML	LML-SED-1	1.5	Zirconium	0.2	0.5	0.5	1.5	N/C	1.0	<2.6	1.0	0.9	0.8	0.6	1.0	<1	1.0	0.8	0.8
		LML-SED-2	1.2	Acenaphthylene	0.2	0.4	0.5	<0.4	N/C	1.2	<3.2	1.1	1.1	1.0	0.8	1.1	<1.3	1.2	0.9	0.9
		LML-SED-3	1.1	Selenium	0.2	0.5	0.5	1.0	N/C	<1	<2.6	0.7	0.6	0.6	0.4	0.7	<1	0.7	0.5	0.6
		LML-SED-4	2.6	Dibenz(a,h)anthracene	0.2	0.5	0.6	0.8	N/C	2	<3.2	2.2	2	1.8	1.7	2.3	2.2	1.9	2.6	1.7
		LML-SED-5	2.6	Anthracene	0.1	0.3	0.3	0.4	N/C	<1	2.6	0.9	0.8	0.8	0.6	0.9	<1	1.0	0.8	0.8
	REFF	REFF-SED-1	0.5	Total Organic Carbon	0.3	<0.1	<0.1	0.4	N/C	<0.7	<1.9	<0.3	<0.4	<0.1	<0.2	<0.3	<0.8	0.1	<0.3	<0.3
		REFF-SED-2	1.6	Zinc	0.2	<0.1	1.6	<0.2	N/C	<1	<2.6	<0.4	<0.6	<0.2	<0.2	<0.5	<1	0.1	<0.5	<0.4
		REFF-SED-3	0.6	Barium	0.1	<0.1	<0.1	<0.2	N/C	<0.7	<1.9	<0.3	<0.4	<0.1	<0.2	<0.3	<0.8	0.2	<0.3	<0.3
		REFF-SED-4	0.5	Barium	0.4	<0.1	<0.1	<0.2	N/C	<1	<2.6	<0.4	<0.6	<0.2	<0.2	<0.5	<1	0.1	<0.5	<0.4
		REFF-SED-5	0.6	Barium	0.1	<0.1	<0.1	<0.2	N/C	<0.7	<1.9	<0.3	<0.4	<0.1	<0.2	<0.3	<0.8	0.1	<0.3	<0.3
Mine-exposed	ELKO	ELKO-SED-1	1.6	Anthracene	0.2	0.4	0.4	<0.4	N/C	<0.2	1.6	0.5	0.7	0.4	0.4	0.4	0.6	0.3	0.3	0.6
		ELKO-SED-2	2.4	Anthracene	0.2	0.4	0.5	<0.4	N/C	0.4	2.4	0.7	0.8	0.6	0.5	0.4	0.6	0.4	0.3	0.8
		ELKO-SED-3	2.8	Anthracene	0.2	0.4	0.5	<0.4	N/C	0.3	2.8	0.7	1.0	0.7	0.6	0.6	0.9	0.4	0.5	1.0
		ELKO-SED-4	2.1	Anthracene	0.2	0.4	0.5	<0.4	N/C	0.3	2.1	0.5	0.7	0.5	0.5	0.4	0.6	0.3	0.3	0.8
		ELKO-SED-5	1.3	Anthracene	0.2	0.4	0.5	<0.4	N/C	<0.2	1.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.4
	ELWDGC	ELWDGC-SED-1	0.6	Iron	0.2	0.3	0.3	<0.2	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	0.1	<0.1	<0.1
		ELWDGC-SED-2	1.0	Magnesium	0.3	0.5	0.5	0.2	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.1
		ELWDGC-SED-3	0.9	Magnesium	0.2	0.4	0.5	<0.2	N/C	<0.2	<0.7	<0.1	<0.1	0.1	0.1	<0.1	<0.3	0.1	<0.1	<0.1
		ELWDGC-SED-4	1.0	Magnesium	0.3	0.5	0.5	0.3	N/C	<0.2	<0.7	<0.1	<0.1	0.1	0.1	<0.1	<0.3	0.1	<0.1	<0.1
		ELWDGC-SED-5	1.0	Iron	0.2	0.4	0.5	<0.2	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	0.1	<0.1	<0.1
	EROL	EROL-SED-1	2.7	Anthracene	0.2	0.5	0.6	<0.4	N/C	0.3	2.7	0.5	0.7	0.5	0.5	0.5	0.6	0.4	0.4	0.9
		EROL-SED-2	3.2	Anthracene	0.2	0.5	0.5	<0.4	N/C	0.4	3.2	0.7	0.9	0.6	0.5	0.5	0.8	0.3	0.4	1.0
		EROL-SED-3	1.5	Anthracene	0.3	0.5	0.5	<0.4	N/C	0.3	1.5	0.4	0.6	0.5	0.5	0.3	0.7	0.2	0.3	0.6
		EROL-SED-4	1.9	Anthracene	0.2	0.5	0.6	<0.4	N/C	0.4	1.9	0.5	0.7	0.5	0.5	0.4	0.6	0.3	0.4	0.7
		EROL-SED-5	2.1	Anthracene	0.3	0.4	0.5	<0.4	N/C	0.3	2.1	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.7
	EROU	EROU-SED-1	2.6	Manganese	0.4	0.7	0.8	0.3	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.1
		EROU-SED-2	2.8	Manganese	0.4	0.7	0.8	0.3	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.2
		EROU-SED-3	2.8	Manganese	0.4	0.9	1.0	0.3	N/C	<0.2	<0.7	<0.1	<0.1	0.1	0.1	<0.1	<0.3	0.1	<0.1	0.1
		EROU-SED-4	2.9	Manganese	0.4	0.9	1.0	0.3	N/C	<0.2	<0.7	0.2	<0.3	0.3	0.2	0.2	<0.3	0.3	0.2	0.2
		EROU-SED-5	2.7	Manganese	0.4	0.9	0.9	0.3	N/C	<0.2	<0.7	0.2	<0.1	0.2	0.2	0.2	<0.3	0.2	0.2	0.2
	ERUP	ERUP-SED-1	1.4	Chromium	0.5	0.9	0.9	0.3	N/C	<0.2	<0.7	0.1	<0.1	0.2	0.2	0.2	<0.3	0.2	0.2	0.1
		ERUP-SED-2	1.1	Chromium	0.6	0.6	0.7	0.3	N/C	<0.2	<0.7	0.1	<0.1	0.2	0.1	0.2	<0.3	0.2	0.2	0.1
		ERUP-SED-3	0.9	Magnesium	0.5	0.5	0.5	<0.2	N/C	<0.2	0.7	0.2	<0.1	0.2	0.2	0.2	<0.3	0.2	0.2	0.2
		ERUP-SED-4	1.4	Chromium	0.4	0.9	0.9	0.3	N/C	<0.2	<0.7	0.1	<0.1	0.2	0.2	0.3	<0.3	0.2	0.2	0.2
		ERUP-SED-5	1.2	Manganese	0.3	0.6	0.6	<0.2	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	0.1	<0.3	0.2	<0.1	0.1
	FMUCK	FMUCK-SED-1	1.0	Iron	0.3	0.6	0.8	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.2	0.2	0.1	<0.3	0.3	0.1	0.2
		FMUCK-SED-2	1.1	Iron	0.3	0.6	0.8	<0.4	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.1
		FMUCK-SED-3	0.9	Iron	0.3	0.5	0.7	<0.4	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.2
		FMUCK-SED-4	0.9	Iron	0.3	0.6	0.7	<0.4	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	0.1	0.1
		FMUCK-SED-5	1.1	Manganese	0.3	0.5	0.8	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.2
	FO10	FO10-SED-1	1.1	Manganese	0.3	0.6	0.7	<0.4	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.1
		FO10-SED-2	1.0	Phosphorus	0.2	0.5	0.6	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.3	0.2	0.2	<0.3	0.3	0.2	0.2
		FO10-SED-3	1.1	Manganese	0.2	0.5	0.6	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.3	0.2	0.2	<0.3	0.3	0.2	0.2
		FO10-SED-4	0.8	Iron	0.2	0.4	0.6	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.3	0.2	0.2	<0.3	0.3	0.2	0.2
		FO10-SED-5	1.0	Manganese	0.2	0.5	0.6	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.3	0.2	0.2	<0.3	0.3	0.2	0.2
	FOXL	FOXL-SED-1	1.4	Iron	0.3	0.6	0.9	<0.4	N/C	0.3	<0.7	0.3	0.2	0.4	0.3	0.2	<0.3	0.6	0.3	0.4
		FOXL-SED-2	1.5	Anthracene	0.3	0.6	0.9	<0.4	N/C	0.4	1.5	0.5	0.4	0.8	0.7	0.5	0.3	1.0	0.7	0.6
		FOXL-SED-3	1.7	Anthracene	0.3	0.6	0.9	<0.4	N/C	0.5	1.7	0.7	0.6	1.0	0.8	0.8	0.3	1.1	1.0	0.7
		FOXL-SED-4	1.7	Iron	0.2	0.6	0.9	<0.4	N/C	0.3	1.3	0.4	0.3	0.6	0.4	0.4	<0.3	0.7	0.4	0.6
		FOXL-SED-5	1.4	Anthracene	0.3	0.6	0.8	<0.4	N/C	0.4	1.4	0.6	0.5	1.1	0.9	0.7	0.3	1.2	1.0	0.7
	FWDEC	FWDEC-SED-1	1.0	Lead	0.8	0.6	0.6	0.8	N/C	<0.5	<1.3	<0.2	<0.3	<0.1	<0.1	<0.2	<0.5	0.1	<0.2	<0.2
		FWDEC-SED-2	2.7	Selenium	0.9	0.6	0.8	0.5	N/C	<0.7	<1.9	<0.3	<0.4	0.2	0.2	<0.3	<0.8	0.3	<0.3	<0.3
		FWDEC-SED-3	1.3	Chromium	0.7	0.6	0.6	0.4	N/C	<0.5	<1.3	<0.2	<0.3	0.3	0.2	<0.2	<0.5	0.3	<0.2	0.2
		FWDEC-SED-4	1.6	Selenium	0.6	0.7	0.8	0.6	N/C	<0.5	<1.3	0.3	<0.3	0.3	0.2	0.3	<0.5	0.3	0.2	0.2
		FWDEC-SED-5	1.3	Selenium	0.8	0.6	0.6	0.4	N/C	<0.7	<1.9	<0.3	<0.4	0.3	0.2	<0.3	<0.8	0.3	<0.3	<0.3
	GO13	GO13-SED-1	17	Anthracene	0.5	0.6	0.9	0.4	N/C	0.8	17	2.2	2.7	2.4	2.1	2.5	1.5	2.1	2.4	3.5
		GO13-SED-2	14	Anthracene	0.4	0.6	0.7	0.3	N/C	0.7	14	2.1	2.9	2.5	2.2	2.6	1.7	2	2.4	3.9
		GO13-SED-3	38	Anthracene	0.4	0.6	0.8	0.3	N/C	2.1	38	6.6	8	6.4	5.6	5.5	4.6	5.8	5.8	7.6
		GO13-SED-4	10	Anthracene	0.4	0.7	1.0	0.3	N/C	0.5	10	1.3	1.6	1.3	1.2	1.3	0.9	1.2	1.3	2.6
		GO13-SED-5	24	Anthracene	0.3	0.6	0.9	0.3	N/C	1.6	24	4.2	5.6	4.1	3.7	3.7	3.5	3.2	4.4	5.7
	HE27	HE27-SED-1	1.8	Magnesium	0.2	0.3	0.5	<0.4	N/C	<0.2	<0.7	0.2	0.2	0.3	0.2	0.2	<0.3	0.3	0.2	0.2
		HE27-SED-2	1.7	Magnesium	0.2	0.4	0.6	<0.4	N/C	0.4	1.0	0.4	0.4	0.6	0.4	0.4	<0.3	0.7	0.5	0.5
		HE27-SED-3	2.2	Magnesium	0.2	0.3	0.6	<0.4	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	0.1	0.1
		HE27-SED-4	3.3	Manganese	0.2	0.4	0.6	<0.4	N/C	0.3	0.7	0.2	0.2	0.3	0.2	0.2	<0.3	0.3	0.2	0.2
		HE27-SED-5	2.2	Magnesium	0.2	0.4	0.5	<0.4	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.1

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

Table E.8: Normal Range Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Uranium	Vanadium	Zinc	Zirconium	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b&j)fluoranthene	Benzo(b+j+k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene
				$P_{97.5}$	4.22	58.1	145	5.3	<0.2	0.02	0.01	0.11	0.07	0.21	0.27	0.09	0.04	0.4	0.04	0.11
Mine-exposed	MI16	MI16-SED-1	2.6	Anthracene	0.2	0.4	0.6	<0.4	N/C	0.3	2.6	0.4	0.4	0.9	0.7	0.6	0.3	0.7	0.5	0.7
		MI16-SED-2	1.1	Thallium	0.3	0.4	0.5	<0.4	N/C	<0.5	<1.3	0.3	<0.3	0.5	0.4	0.4	<0.5	0.4	0.3	0.4
		MI16-SED-3	1.5	Selenium	0.4	0.4	0.6	<0.4	N/C	<0.5	<1.3	0.4	0.4	0.6	0.5	0.7	<0.5	0.5	0.5	0.5
		MI16-SED-4	2.3	Anthracene	0.3	0.4	0.5	<0.4	N/C	<0.5	2.3	0.3	<0.3	0.5	0.4	0.5	<0.5	0.4	0.3	0.5
		MI16-SED-5	1.5	Strontium	0.3	0.3	0.3	<0.4	N/C	<0.5	<1.3	0.2	<0.3	0.3	0.2	0.4	<0.5	0.3	0.2	0.3
	MIC2	MIC2-SED-1	1.3	Thallium	0.3	0.8	0.8	<0.4	N/C	<0.2	1.0	0.5	0.4	0.7	0.5	0.6	<0.3	0.6	0.5	0.5
		MIC2-SED-2	1.0	Arsenic	0.3	0.8	0.7	<0.4	N/C	<0.2	0.7	0.4	0.3	0.5	0.4	0.4	<0.3	0.6	0.4	0.4
		MIC2-SED-3	0.8	Arsenic	0.2	0.5	0.6	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.2	0.2	0.2	<0.3	0.3	0.2	0.3
		MIC2-SED-4	1.0	Beryllium	0.3	0.7	0.8	<0.4	N/C	<0.2	<0.7	0.2	0.2	0.4	0.3	0.2	<0.3	0.3	0.2	0.3
		MIC2-SED-5	1.2	Thallium	0.3	0.8	0.8	<0.4	N/C	<0.2	0.7	0.2	0.2	0.3	0.2	0.2	<0.3	0.3	0.2	0.3
	MIWW	MIWW-SED-1	1.2	Anthracene	0.3	0.6	0.9	<0.4	N/C	<0.2	1.2	0.4	0.3	0.5	0.4	0.5	<0.3	0.5	0.4	0.5
		MIWW-SED-2	1.2	Anthracene	0.3	0.6	0.6	<0.4	N/C	<0.2	1.2	0.4	0.2	0.4	0.3	0.4	<0.3	0.4	0.3	0.6
		MIWW-SED-3	0.9	Anthracene	0.3	0.6	0.8	<0.4	N/C	<0.2	0.9	0.2	0.1	0.2	0.2	0.2	<0.3	0.3	0.2	0.5
		MIWW-SED-4	1.2	Anthracene	0.2	0.5	0.6	<0.4	N/C	<0.2	1.2	0.5	0.4	0.7	0.5	0.5	<0.3	0.6	0.4	0.7
		MIWW-SED-5	1.0	Anthracene	0.2	0.6	0.6	<0.4	N/C	<0.2	1.0	0.3	0.2	0.4	0.3	0.3	<0.3	0.4	0.2	0.4
	OTTO	OTTO-SED-1	4.7	Anthracene	0.2	0.8	1.1	0.3	N/C	1.2	4.7	2.9	2.0	2.5	2.1	1.7	1.3	3.3	2.1	2.5
		OTTO-SED-2	33	Anthracene	0.1	0.5	0.6	<0.2	N/C	5.9	33	8.4	7.9	8.0	6.7	8.3	3.1	9.9	9.4	7.8
		OTTO-SED-3	12	Anthracene	0.1	0.5	0.7	<0.2	N/C	<2.4	12	2.6	2.1	2.3	1.8	1.7	<2.6	3.1	2.1	3.1
		OTTO-SED-4	13	Anthracene	0.1	0.5	0.7	<0.2	N/C	<2.4	13	3.3	2.7	2.9	2.3	2.3	<2.6	4.1	2.6	3.7
		OTTO-SED-5	2.6	Pyrene	0.2	0.5	0.7	<0.2	N/C	<2.4	<6.5	2.0	1.6	1.9	1.5	1.8	<2.6	2.2	1.8	2.2
	R5-1	R5-1-SED-1	5.5	Anthracene	0.5	0.9	1.1	0.3	N/C	2.3	5.5	2.8	2.2	2.3	1.9	2.7	0.6	3.9	3.5	2.0
		R5-1-SED-2	4.4	Selenium	0.6	0.5	0.8	0.2	N/C	0.6	2.5	0.8	0.8	0.9	0.8	0.7	0.3	1.2	0.7	0.7
		R5-1-SED-3	6.4	Selenium	0.7	0.3	0.6	<0.2	N/C	0.8	3.1	1.2	1.2	1.3	1.1	1.2	<0.5	1.7	1.3	0.8
		R5-1-SED-4	3.5	Anthracene	0.6	0.5	0.8	<0.2	N/C	1.1	3.5	1.2	1.2	1.3	1.1	1.5	0.4	1.7	1.7	1.0
		R5-1-SED-5	4.5	Selenium	0.7	0.5	0.8	0.2	N/C	0.8	3.5	1.1	1.2	1.4	1.1	0.9	0.3	1.5	1.2	0.7
	R5-3	R5-3-SED-1	2.5	Manganese	0.3	0.4	0.5	<0.4	N/C	<0.2	<0.7	0.1	<0.1	0.1	0.1	<0.1	<0.3	0.2	<0.1	0.1
		R5-3-SED-2	3.8	Manganese	0.2	0.4	0.5	<0.4	N/C	<0.2	<0.7	<0.1	<0.1	0.1	<0.1	<0.1	<0.3	0.1	<0.1	<0.1
		R5-3-SED-3	3.7	Manganese	0.2	0.4	0.5	<0.4	N/C	<0.2	<0.7	<0.1	<0.1	0.1	<0.1	<0.1	<0.3	0.1	<0.1	<0.1
		R5-3-SED-4	2.4	Manganese	0.2	0.4	0.5	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.2	0.2	0.2	<0.3	0.3	0.2	0.2
		R5-3-SED-5	4.0	Manganese	0.3	0.4	0.5	<0.4	N/C	<0.2	<0.7	0.2	<0.1	0.2	0.1	0.1	<0.3	0.2	0.2	0.1
	STPD	STPD-SED-1	9.9	Fluoranthene	0.2	0.4	0.5	<0.4	N/C	<0.5	2.9	2.1	5.4	4.0	4.0	4.0	6.0	1.5	1.3	9.9
		STPD-SED-2	22	Fluoranthene	0.2	0.4	0.6	<0.4	N/C	<0.5	5.4	4.6	13	9.1	9.1	8.5	14	3.3	2.6	22
		STPD-SED-3	193	Fluoranthene	0.2	0.5	0.8	<0.4	N/C	0.8	133	57	118	62	63	51	101	22	23	193
		STPD-SED-4	6.2	Fluoranthene	0.3	0.5	0.6	<0.4	N/C	0.3	2.9	1.3	3.0	2.5	2.5	2.3	3.4	1.1	0.9	6.2
		STPD-SED-5	18	Fluoranthene	0.3	0.3	0.5	<0.4	N/C	<0.5	6.3	3.1	9.5	6.0	6.2	8.7	10	2.3	2.8	18

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

Table E.8: Normal Range Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
				$P_{97.5}$	0.5	0.05	2.98	0.73	1.77	0.15
Reference	EL14	EL14-SED-1	1.0	Magnesium	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
		EL14-SED-2	1.0	Arsenic	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
		EL14-SED-3	2.7	Magnesium	0.1	<0.2	<0.1	<0.1	0.1	0.2
		EL14-SED-4	1.4	Magnesium	0.1	<0.4	<0.1	0.1	0.1	0.2
		EL14-SED-5	1.0	Arsenic	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
	FLA1	FLA1-SED-1	0.9	Chromium	<0.1	<0.4	<0.1	<0.1	<0.1	<0.1
		FLA1-SED-2	0.8	Chromium	<0.1	<0.4	<0.1	<0.1	<0.1	<0.1
		FLA1-SED-3	0.6	Magnesium	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
		FLA1-SED-4	0.5	Calcium	<0.1	<0.4	<0.1	<0.1	<0.1	<0.1
		FLA1-SED-5	0.7	Chromium	<0.1	<0.4	<0.1	<0.1	<0.1	<0.1
	LCHO	LCHO-SED-1	1.2	Cadmium	<0.1	<0.4	<0.1	<0.1	0.1	0.2
		LCHO-SED-2	1.0	Cobalt	<0.1	<0.2	<0.1	0.1	0.2	0.5
		LCHO-SED-3	1.0	Aluminum	<0.1	<0.2	<0.1	<0.1	<0.1	0.1
		LCHO-SED-4	1.1	Uranium	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
		LCHO-SED-5	1.0	Mercury	<0.1	<0.2	<0.1	<0.1	0.1	0.3
	LML	LML-SED-1	1.5	Zirconium	0.8	<0.9	0.8	0.8	0.9	0.9
		LML-SED-2	1.2	Acenaphthylene	1.0	<1.1	1.0	1.1	1.0	1.0
		LML-SED-3	1.1	Selenium	0.5	<0.9	0.5	0.5	0.5	0.6
		LML-SED-4	2.6	Dibenz(a,h)anthracene	1.6	2.2	1.6	1.7	1.7	1.8
		LML-SED-5	2.6	Anthracene	0.8	<0.9	0.9	1.0	0.9	0.8
	REFF	REFF-SED-1	0.5	Total Organic Carbon	<0.1	<0.6	0.1	0.1	0.1	<0.2
		REFF-SED-2	1.6	Zinc	0.1	<0.9	0.1	0.1	0.1	<0.3
		REFF-SED-3	0.6	Barium	0.1	<0.6	0.1	0.1	0.1	<0.2
		REFF-SED-4	0.5	Barium	<0.1	<0.9	0.1	0.1	0.1	<0.3
		REFF-SED-5	0.6	Barium	<0.1	<0.6	0.1	0.1	0.1	<0.2
Mine-exposed	ELKO	ELKO-SED-1	1.6	Anthracene	<0.1	0.6	0.1	0.1	0.1	0.4
		ELKO-SED-2	2.4	Anthracene	<0.1	0.7	0.1	0.2	0.2	0.5
		ELKO-SED-3	2.8	Anthracene	0.1	0.9	0.1	0.2	0.2	0.6
		ELKO-SED-4	2.1	Anthracene	<0.1	0.6	0.1	0.1	0.1	0.5
		ELKO-SED-5	1.3	Anthracene	<0.1	0.3	0.1	0.1	0.1	0.3
	ELWDGC	ELWDGC-SED-1	0.6	Iron	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
		ELWDGC-SED-2	1.0	Magnesium	<0.1	<0.2	<0.1	0.1	0.1	0.1
		ELWDGC-SED-3	0.9	Magnesium	<0.1	<0.2	<0.1	<0.1	0.1	0.1
		ELWDGC-SED-4	1.0	Magnesium	<0.1	<0.2	<0.1	0.1	0.1	0.1
		ELWDGC-SED-5	1.0	Iron	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
	EROL	EROL-SED-1	2.7	Anthracene	<0.1	0.7	0.1	0.1	0.2	0.5
		EROL-SED-2	3.2	Anthracene	<0.1	0.9	0.1	0.1	0.1	0.6
		EROL-SED-3	1.5	Anthracene	<0.1	0.5	<0.1	0.1	0.1	0.3
		EROL-SED-4	1.9	Anthracene	<0.1	0.6	0.1	0.1	0.1	0.4
		EROL-SED-5	2.1	Anthracene	<0.1	0.5	0.1	0.1	0.1	0.4
	EROU	EROU-SED-1	2.6	Manganese	<0.1	<0.2	<0.1	0.1	0.1	0.1
		EROU-SED-2	2.8	Manganese	<0.1	<0.2	<0.1	0.1	0.1	0.1
		EROU-SED-3	2.8	Manganese	<0.1	<0.2	<0.1	0.1	0.1	0.1
		EROU-SED-4	2.9	Manganese	<0.1	0.2	<0.1	0.1	0.1	0.2
		EROU-SED-5	2.7	Manganese	<0.1	<0.2	<0.1	0.1	0.1	0.1
	ERUP	ERUP-SED-1	1.4	Chromium	<0.1	<0.2	<0.1	0.1	0.1	0.1
		ERUP-SED-2	1.1	Chromium	<0.1	<0.2	0.1	0.1	0.1	0.1
		ERUP-SED-3	0.9	Magnesium	0.1	<0.2	0.1	0.1	0.1	0.2
		ERUP-SED-4	1.4	Chromium	<0.1	<0.2	0.1	0.1	0.1	0.2
		ERUP-SED-5	1.2	Manganese	<0.1	<0.2	<0.1	0.1	0.1	0.1
	FMUCK	FMUCK-SED-1	1.0	Iron	0.1	<0.2	0.2	0.2	0.3	0.3
		FMUCK-SED-2	1.1	Iron	<0.1	<0.2	0.1	0.2	0.2	0.2
		FMUCK-SED-3	0.9	Iron	0.1	<0.2	0.1	0.2	0.2	0.2
		FMUCK-SED-4	0.9	Iron	0.1	<0.2	0.1	0.2	0.2	0.2
		FMUCK-SED-5	1.1	Manganese	<0.1	<0.2	0.1	0.3	0.2	0.2
	FO10	FO10-SED-1	1.1	Manganese	0.1	<0.2	0.1	0.1	0.1	0.1
		FO10-SED-2	1.0	Phosphorus	0.1	<0.2	0.1	0.2	0.2	0.2
		FO10-SED-3	1.1	Manganese	0.1	<0.2	0.2	0.2	0.2	0.3
		FO10-SED-4	0.8	Iron	0.1	<0.2	0.1	0.2	0.2	0.3
		FO10-SED-5	1.0	Manganese	0.1	<0.2	0.1	0.2	0.2	0.3
	FOXL	FOXL-SED-1	1.4	Iron	0.2	<0.2	0.3	0.3	0.5	0.5
		FOXL-SED-2	1.5	Anthracene	0.2	0.4	0.4	0.4	0.6	0.7
		FOXL-SED-3	1.7	Anthracene	0.4	0.5	0.5	0.5	0.7	0.8
		FOXL-SED-4	1.7	Iron	0.2	0.3	0.3	0.4	0.5	0.6
		FOXL-SED-5	1.4	Anthracene	0.3	0.5	0.5	0.5	0.6	0.8
	FWDEC	FWDEC-SED-1	1.0	Lead	<0.1	<0.4	<0.1	0.1	0.1	<0.1
		FWDEC-SED-2	2.7	Selenium	0.1	<0.6	0.1	0.2	0.2	<0.2
		FWDEC-SED-3	1.3	Chromium	0.1	<0.4	0.1	0.2	0.2	0.2
		FWDEC-SED-4	1.6	Selenium	0.1	<0.4	0.1	0.3	0.2	0.2
		FWDEC-SED-5	1.3	Selenium	<0.1	<0.6	0.1	0.2	0.2	<0.2
	GO13	GO13-SED-1	17	Anthracene	1.2	1.9	1.2	1.1	1.5	2.8
		GO13-SED-2	14	Anthracene	1.2	2	1.3	1.2	1.4	3
		GO13-SED-3	38	Anthracene	3.7	3.4	3.4	2.8	3.5	6.7
		GO13-SED-4	10	Anthracene	0.8	1.1	0.9	0.9	0.9	2
		GO13-SED-5	24	Anthracene	2.7	3.7	2.2	2.2	2.4	4.6
	HE27	HE27-SED-1	1.8	Magnesium	0.2	<0.2	0.2	0.3	0.2	0.3
		HE27-SED-2	1.7	Magnesium	0.4	0.3	0.4	0.4	0.6	0.6
		HE27-SED-3	2.2	Magnesium	0.1	<0.2	0.1	0.1	0.1	0.1
		HE27-SED-4	3.3	Manganese	0.3	<0.2	0.3	0.3	0.3	0.3
		HE27-SED-5	2.2	Magnesium	0.1	<0.2	0.1	0.2	0.1	0.1

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

Table E.8: Normal Range Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
				$P_{97.5}$	0.5	0.05	2.98	0.73	1.77	0.15
Mine-exposed	MI16	MI16-SED-1	2.6	Anthracene	0.2	0.5	0.3	0.5	0.4	0.6
		MI16-SED-2	1.1	Thallium	0.1	<0.4	0.2	0.3	0.3	0.4
		MI16-SED-3	1.5	Selenium	0.2	<0.4	0.2	0.3	0.3	0.5
		MI16-SED-4	2.3	Anthracene	0.1	<0.4	0.2	0.3	0.2	0.4
		MI16-SED-5	1.5	Strontium	0.1	<0.4	0.2	0.2	0.2	0.3
	MIC2	MIC2-SED-1	1.3	Thallium	0.1	0.3	0.1	0.3	0.3	0.5
		MIC2-SED-2	1.0	Arsenic	0.1	0.2	0.1	0.3	0.3	0.5
		MIC2-SED-3	0.8	Arsenic	<0.1	<0.2	0.1	0.2	0.2	0.3
		MIC2-SED-4	1.0	Beryllium	<0.1	<0.2	0.1	0.1	0.2	0.3
		MIC2-SED-5	1.2	Thallium	0.1	<0.2	0.1	0.2	0.2	0.3
	MIWW	MIWW-SED-1	1.2	Anthracene	0.1	0.3	0.1	0.2	0.3	0.5
		MIWW-SED-2	1.2	Anthracene	0.1	0.2	0.1	0.2	0.3	0.5
		MIWW-SED-3	0.9	Anthracene	0.1	<0.2	0.1	0.2	0.2	0.4
		MIWW-SED-4	1.2	Anthracene	0.1	0.3	0.1	0.2	0.3	0.6
		MIWW-SED-5	1.0	Anthracene	<0.1	<0.2	0.1	0.2	0.2	0.4
	OTTO	OTTO-SED-1	4.7	Anthracene	1.7	1.0	1.8	1.8	2.3	3.0
		OTTO-SED-2	33	Anthracene	7.7	4.7	8.7	8.8	8.5	9.9
		OTTO-SED-3	12	Anthracene	2.4	<2.1	3.1	3.5	2.9	3.5
		OTTO-SED-4	13	Anthracene	3.2	<2.1	3.2	3.2	3.7	4.5
		OTTO-SED-5	2.6	Pyrene	1.5	<2.1	2.0	2.1	2.2	2.6
	R5-1	R5-1-SED-1	5.5	Anthracene	1.5	1.6	1.8	1.8	2.0	2.5
		R5-1-SED-2	4.4	Selenium	0.5	0.4	0.5	0.5	0.7	0.9
		R5-1-SED-3	6.4	Selenium	0.6	0.8	0.6	0.5	0.8	1.1
		R5-1-SED-4	3.5	Anthracene	0.8	1.0	0.8	0.8	1.1	1.3
		R5-1-SED-5	4.5	Selenium	0.6	0.5	0.7	0.7	0.9	1.1
	R5-3	R5-3-SED-1	2.5	Manganese	<0.1	<0.2	<0.1	0.1	0.1	0.1
		R5-3-SED-2	3.8	Manganese	<0.1	<0.2	<0.1	0.1	0.1	<0.1
		R5-3-SED-3	3.7	Manganese	<0.1	<0.2	<0.1	0.1	0.1	<0.1
		R5-3-SED-4	2.4	Manganese	<0.1	<0.2	0.1	0.1	0.2	0.2
		R5-3-SED-5	4.0	Manganese	<0.1	<0.2	<0.1	0.1	0.1	0.2
	STPD	STPD-SED-1	9.9	Fluoranthene	0.1	5.8	0.1	0.1	0.3	5.1
		STPD-SED-2	22	Fluoranthene	0.1	13	0.1	0.1	0.4	11
		STPD-SED-3	193	Fluoranthene	0.4	86	0.1	0.1	3.6	107
		STPD-SED-4	6.2	Fluoranthene	0.1	2.9	0.1	0.2	0.2	3.1
		STPD-SED-5	18	Fluoranthene	0.1	13	0.1	0.1	0.3	9.5

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

Table E.9: Normal Range Quotients for Sediment Samples Collected in 2013 from Areas not Sampled in 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Tin	Titanium	Uranium
				$P_{97.5}$	11,800	1.46	6.27	437	0.77	<0.4	24	3.08	290,000	21.9	6.92	24.8	14,400	11.7	23.6	16,900	404	0.16	3.24	30.8	1,680	2,500	7.73	0.51	280	211	0.39	<4	131	4.22
Reference	LOLA	LOLA-1	2.1	Manganese	0.2	0.1	0.2	0.5	<0.3	N/C	1.0	0.1	0.3	0.2	0.2	0.2	0.2	0.4	<0.2	0.2	2.1	0.3	0.4	0.2	0.3	0.4	0.1	<0.2	0.5	0.3	<0.1	N/C	0.3	0.1
		LOLA-2	13	Phenanthrene	0.2	0.1	0.2	0.3	<0.3	N/C	1.0	0.1	0.1	0.2	0.3	0.2	0.3	0.5	<0.2	0.2	0.7	0.5	0.5	0.2	0.5	0.4	0.2	<0.2	0.6	0.1	<0.1	N/C	0.4	0.1
		LOLA-3	2.5	Manganese	0.1	0.1	0.2	0.4	<0.3	N/C	1.0	0.1	0.2	0.1	0.2	0.1	0.2	0.4	<0.2	0.2	2.5	0.4	0.3	0.2	0.4	0.4	0.1	<0.2	0.5	0.2	<0.1	N/C	0.3	0.1
	GLMS	GLMS-1	1.1	Phosphorus	0.7	0.4	0.7	0.9	0.6	N/C	0.5	0.3	0.3	0.3	0.4	1.1	0.5	0.5	0.5	0.3	0.3	0.3	1.1	0.5	1.1	0.4	0.3	0.2	1.0	0.9	0.3	N/C	0.8	1.0
		GLMS-2	1.0	Phosphorus	0.7	0.3	0.7	0.7	0.4	N/C	<0.4	0.2	0.2	0.3	0.4	1.0	0.6	0.4	0.4	0.3	0.3	0.2	0.5	0.3	1.0	0.4	0.2	<0.2	0.8	0.8	0.3	N/C	1.0	0.8
		GLMS-3	1.2	Titanium	0.7	0.3	0.6	0.6	0.4	N/C	<0.4	0.2	0.2	0.3	0.4	1.0	0.4	0.4	0.4	0.2	0.3	0.2	0.5	0.4	1.0	0.4	0.3	<0.2	1.0	0.7	0.2	N/C	1.2	0.8
	GRLK	GRLK-1	1.2	Fluoranthene	0.1	0.2	0.3	0.4	<0.3	N/C	<0.4	0.1	0.7	0.1	0.1	0.2	0.2	0.7	<0.2	0.3	0.2	0.2	0.6	0.1	0.4	0.1	0.7	<0.2	1.0	1.0	0.2	N/C	0.2	0.8
		GRLK-2	0.9	Strontium	0.1	<0.1	0.1	0.4	<0.3	N/C	<0.4	<0.1	0.8	0.1	<0.1	0.1	0.1	0.2	<0.2	0.3	0.4	0.1	<0.2	0.1	0.2	0.1	0.3	<0.2	0.5	0.9	<0.1	N/C	0.1	0.1
		GRLK-3	0.8	Magnesium	0.1	<0.1	0.1	0.2	<0.3	N/C	<0.4	0.1	0.6	0.2	0.1	<0.1	0.1	0.2	<0.2	0.8	0.6	0.1	<0.2	0.1	0.5	0.2	0.1	<0.2	0.4	0.8	0.2	N/C	0.1	0.2
	FL17	FL17-1	0.8	Calcium	0.3	0.2	0.3	0.2	0.4	N/C	<0.4	0.1	0.8	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.1	<0.2	0.2	0.2	0.4	0.2	<0.2	<0.4	0.4	0.4	N/C	0.2	0.2
		FL17-2	0.9	Calcium	0.5	0.3	0.5	0.3	0.5	N/C	<0.4	0.1	0.9	0.4	0.4	0.4	0.4	0.6	0.5	0.5	0.3	0.2	0.2	0.3	0.3	0.4	0.2	0.2	<0.4	0.5	0.5	N/C	0.4	0.2
		FL17-3	1.0	Calcium	0.4	0.3	0.4	0.3	0.4	N/C	<0.4	0.1	1.0	0.3	0.3	0.3	0.3	0.5	0.4	0.3	0.6	0.1	<0.2	0.2	0.3	0.4	0.2	<0.2	<0.4	0.4	0.3	N/C	0.3	0.1
Mine-exposed	ERWSF	ERWSF-1	1.1	Manganese	0.6	0.4	0.9	0.4	0.7	N/C	<0.4	0.3	0.2	0.7	0.7	0.6	0.9	0.7	0.4	0.9	1.1	0.3	0.4	0.6	0.7	0.7	0.2	0.4	0.4	0.4	0.7	N/C	0.2	0.2
		ERWSF-2	1.5	Manganese	0.8	0.6	1.2	0.5	0.9	N/C	<0.4	0.5	0.3	0.9	0.9	0.8	1.2	1.0	0.6	1.0	1.5	0.4	0.6	0.9	0.8	0.8	0.2	0.6	0.6	0.4	1.0	N/C	0.2	0.3
		ERWSF-3	1.0	Fluoranthene	0.6	0.4	0.9	0.4	0.7	N/C	<0.4	0.4	0.2	0.7	0.7	0.6	1.0	0.8	0.4	0.9	1.0	0.3	0.4	0.6	0.7	0.6	0.2	0.4	0.4	0.4	0.6	N/C	0.2	0.2
	SPW	SPW-1	1.3	Manganese	0.7	0.4	0.9	0.4	0.8	N/C	0.5	0.3	0.2	0.8	0.7	0.6	0.9	0.8	0.5	1.0	1.3	0.3	0.4	0.7	0.8	0.8	0.4	0.4	0.4	0.4	0.8	N/C	0.3	0.3
		SPW-2	1.3	Manganese	0.6	0.4	0.8	0.4	0.7	N/C	0.4	0.3	0.2	0.8	0.7	0.6	0.9	0.7	0.5	0.9	1.3	<0.1	0.5	0.6	0.7	0.8	0.4	0.4	<0.4	0.4	0.7	N/C	0.3	0.3
		SPW-3	1.5	Manganese	0.7	0.4	0.9	0.4	0.8	N/C	0.5	0.4	0.3	0.9	0.8	0.6	1.0	0.7	0.5	1.0	1.5	0.3	0.5	0.7	0.7	0.8	0.3	0.4	0.4	0.4	0.8	N/C	0.2	0.3

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

"-" = not sampled

Table E.9: **Normal Range Quotients for Sediment Samples Collected in 2013 from Areas not Sampled in 2015**

Exposure Type	Monitoring Area Code	Sample ID	Maximum Normal Range Quotient by Sample ID	Parameter with Maximum Normal Range Quotient	Vanadium	Zinc	Zirconium	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b&j)fluoranthene	Benzo(b+j+k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
				$P_{97.5}$	58.1	145	5.3	<0.2	0.02	0.01	0.11	0.07	0.21	0.27	0.09	0.04	0.4	0.04	0.11	0.5	0.05	2.98	0.73	1.77	0.15
Reference	LOLA	LOLA-1	2.1	Manganese	0.1	0.2	-	N/C	<1.9	<4.5	<0.7	<1.0	<0.3	<0.4	<0.8	<1.8	<0.2	<0.8	<0.7	<0.1	<1.5	0.1	<0.2	0.1	<0.5
		LOLA-2	13	Phenanthrene	0.1	0.2	-	N/C	<233	<629	<92	<139	<46	<52	<109	<249	<24	<109	<90	<20	<206	9.5	<17	13	<65
		LOLA-3	2.5	Manganese	0.1	0.2	-	N/C	<2.6	<7.1	<1.0	<1.6	0.5	<0.6	1.8	<2.8	<0.5	<1.2	<1.0	0.4	<2.3	0.3	<0.4	0.4	<0.7
	GLMS	GLMS-1	1.1	Phosphorus	0.3	0.5	-	N/C	<3.6	<9.7	<1.4	<2.1	<0.7	<0.8	<1.7	<3.9	<0.4	<1.7	<1.4	<0.3	<3.2	0.1	<0.2	<0.1	<1
		GLMS-2	1.0	Phosphorus	0.3	0.5	-	N/C	<3.6	<9.7	<1.4	<2.1	<0.7	<0.8	<1.7	<3.9	<0.4	<1.7	<1.4	<0.3	<3.2	0.1	<0.2	<0.1	<1
		GLMS-3	1.2	Titanium	0.3	0.4	-	N/C	<3.6	<9.7	<1.4	<2.1	<0.7	<0.8	<1.7	<3.9	<0.4	<1.7	<1.4	<0.3	<3.2	0.1	<0.2	<0.1	<1
	GRLK	GRLK-1	1.2	Fluoranthene	0.1	0.3	-	N/C	<0.5	<8.1	0.8	<2.9	0.9	0.8	0.6	1.0	0.4	<0.7	1.2	0.4	1.0	0.3	0.3	0.5	0.8
		GRLK-2	0.9	Strontium	<0.1	0.1	-	N/C	<0.2	<3.2	0.3	<0.6	0.3	0.3	0.2	<0.3	0.2	<0.5	0.3	0.2	<0.4	0.2	0.2	0.2	0.2
		GRLK-3	0.8	Magnesium	0.1	0.1	-	N/C	<0.2	<1.0	<0.1	<0.3	0.1	0.1	<0.1	<0.3	0.1	<0.1	0.1	0.1	<0.2	0.1	0.1	0.1	0.1
	FL17	FL17-1	0.8	Calcium	0.2	0.3	-	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
		FL17-2	0.9	Calcium	0.3	0.4	-	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
		FL17-3	1.0	Calcium	0.2	0.3	-	N/C	<0.2	<0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
Mine-exposed	ERWSF	ERWSF-1	1.1	Manganese	0.5	0.6	-	N/C	<0.4	<6.5	0.5	0.7	0.6	0.6	0.5	0.7	<0.3	0.4	0.7	0.1	0.7	0.1	0.2	0.2	0.4
		ERWSF-2	1.5	Manganese	0.6	0.8	-	N/C	<0.5	<4.8	0.4	0.6	0.5	0.5	0.5	0.6	<0.2	0.3	0.6	0.1	0.6	0.1	0.2	0.2	0.4
		ERWSF-3	1.0	Fluoranthene	0.5	0.6	-	N/C	<1.0	<6.5	0.7	0.9	0.7	0.7	0.5	0.9	<0.5	0.4	1.0	0.1	1.0	0.1	0.2	0.2	0.6
	SPW	SPW-1	1.3	Manganese	0.6	0.6	-	N/C	<0.4	<3.2	<0.3	<0.6	0.4	0.3	0.2	<0.5	<0.2	0.2	0.4	<0.1	0.3	0.1	0.2	0.2	0.3
		SPW-2	1.3	Manganese	0.5	0.6	-	N/C	<0.4	<3.2	<0.4	<0.7	0.4	0.3	0.3	<0.5	<0.2	0.3	0.5	<0.1	0.5	0.1	0.2	0.2	0.3
		SPW-3	1.5	Manganese	0.6	0.6	-	N/C	<0.3	<3.2	0.3	<0.4	0.4	0.3	0.3	<0.5	<0.2	0.3	0.4	0.1	0.3	0.1	0.2	0.2	0.3

Quotient > 1

LRL exceeds upper bound of normal range

Notes: N/C = not calculated because the upper bound of the normal range is < LRL

"-" = not sampled

Table E.10: Hazard Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Hazard Quotient by Sample ID	Parameter with Maximum Hazard Quotient	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
				USQG	17	3.5	90	197	43,766	91	1,100	0.486	75	2	315	0.0889	0.128	0.245	0.385	0.782	3.2	13.4	0.862	0.135	2.355	0.144	3.2	0.201	0.391	0.515	0.875
Reference	EL14	EL14-SED-1	0.1	Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
		EL14-SED-2	0.6	Selenium	0.4	0.4	0.2	<0.1	0.2	<0.1	0.1	0.1	0.3	0.6	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		EL14-SED-3	0.5	Selenium	0.3	0.3	0.3	<0.1	0.2	<0.1	0.3	<0.1	0.3	0.5	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.3	<0.1	0.2	<0.1
		EL14-SED-4	0.9	Selenium	0.4	0.8	0.2	<0.1	0.2	<0.1	0.1	0.3	0.4	0.9	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.3	<0.1	0.3	<0.1
		EL14-SED-5	0.5	Selenium	0.4	0.4	0.2	<0.1	0.2	<0.1	<0.1	<0.1	0.3	0.5	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	FLA1	FLA1-SED-1	1.3	Selenium	0.1	0.2	0.2	<0.1	0.2	<0.1	<0.1	0.1	0.1	1.3	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		FLA1-SED-2	1.3	Selenium	<0.1	0.2	0.2	<0.1	0.1	<0.1	<0.1	<0.1	0.1	1.3	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		FLA1-SED-3	0.5	Selenium	<0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		FLA1-SED-4	0.7	Selenium	<0.1	0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.7	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		FLA1-SED-5	0.8	Selenium	<0.1	0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.8	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	LCHO	LCHO-SED-1	3.9	Selenium	0.2	1.0	0.2	<0.1	0.2	0.1	<0.1	0.3	0.3	3.9	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.3	<0.1
		LCHO-SED-2	1.4	Selenium	0.3	0.8	0.2	0.1	0.3	0.1	0.1	0.3	0.4	1.4	0.4	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.1	<0.1	0.5	0.1	0.6	<0.1
		LCHO-SED-3	1.8	Selenium	0.3	0.7	0.2	<0.1	0.3	0.1	<0.1	0.2	0.4	1.8	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1
		LCHO-SED-4	2.0	Selenium	0.2	0.5	0.2	<0.1	0.3	0.1	<0.1	0.3	0.3	2.0	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		LCHO-SED-5	1.1	Selenium	0.1	0.3	0.1	<0.1	0.2	<0.1	<0.1	0.3	0.2	1.1	0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.3	<0.1
	LML	LML-SED-1	11	2-Methylnaphthalene	0.2	0.7	0.1	<0.1	0.2	0.1	<0.1	0.2	0.2	3.5	0.2	<0.3	0.2	<0.1	0.3	<0.1	<0.1	<0.1	0.5	0.3	<0.1	2.8	<0.1	11	1.5	3.0	0.1
		LML-SED-2	15	2-Methylnaphthalene	0.1	0.5	0.1	<0.1	0.1	<0.1	<0.1	0.2	0.2	3.1	0.2	<0.3	0.2	<0.1	0.3	<0.1	<0.1	<0.1	0.5	0.3	<0.1	3.4	<0.1	15	2.1	3.6	0.2
		LML-SED-3	6.7	2-Methylnaphthalene	0.1	0.7	0.2	<0.1	0.1	<0.1	<0.1	0.2	0.3	4.4	0.2	<0.2	<0.2	<0.1	0.2	<0.1	<0.1	<0.1	0.3	0.2	<0.1	1.6	<0.1	6.7	0.9	1.9	<0.1
		LML-SED-4	24	2-Methylnaphthalene	0.2	0.5	0.1	<0.1	0.2	0.1	<0.1	0.2	0.2	3.3	0.3	<0.6	0.3	<0.1	0.6	0.2	<0.1	<0.1	0.9	0.9	<0.1	5.6	<0.1	24	3.2	5.9	0.3
		LML-SED-5	13	2-Methylnaphthalene	<0.1	0.3	<0.1	<0.1	0.1	0.1	<0.1	0.1	0.1	1.9	0.2	<0.3	<0.2	<0.1	0.2	<0.1	<0.1	<0.1	0.5	0.3	<0.1	2.8	<0.1	13	1.8	3.0	0.1
	REFF	REFF-SED-1	1.5	Selenium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.5	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	0.8	0.1	0.2	<0.1
		REFF-SED-2	1.6	2-Methylnaphthalene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.9	0.7	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	1.6	0.2	0.3	<0.1
		REFF-SED-3	1.7	2-Methylnaphthalene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	1.7	0.2	0.4	<0.1
		REFF-SED-4	1.5	Selenium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.5	<0.1	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	1.0	0.1	0.3	<0.1
		REFF-SED-5	1.0	2-Methylnaphthalene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	1.0	0.2	0.2	<0.1
Mine-exposed	ELKO	ELKO-SED-1	0.9	2-Methylnaphthalene	0.2	0.2	0.1	<0.1	0.2	<0.1	0.2	<0.1	0.2	0.5	0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	0.9	0.2	0.3	<0.1
		ELKO-SED-2	1.2	2-Methylnaphthalene	0.3	0.3	0.1	<0.1	0.3	<0.1	0.3	<0.1	0.2	0.6	0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2	<0.1	1.2	0.3	0.6	<0.1
		ELKO-SED-3	1.3	2-Methylnaphthalene	0.2	0.2	0.1	<0.1	0.2	<0.1	0.2	0.1	0.2	0.6	0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.2	<0.1	1.3	0.3	0.6	0.1
		ELKO-SED-4	1.0	2-Methylnaphthalene	0.2	0.2	0.1	<0.1	0.2	<0.1	0.2	<0.1	0.2	0.6	0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	0.1	<0.1	1.0	0.2	0.4	<0.1
		ELKO-SED-5	0.9	2-Methylnaphthalene	0.2	0.2	0.1	<0.1	0.2	<0.1	0.2	<0.1	0.2	0.7	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	0.9	0.2	0.4	<0.1
	ELWDGC	ELWDGC-SED-1	1.0	Selenium	0.2	0.1	<0.1	<0.1	0.2	<0.1	0.2	<0.1	0.1	1.0	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.1	<0.1
		ELWDGC-SED-2	1.3	Selenium	0.3	0.2	0.2	<0.1	0.3	<0.1	0.3	<0.1	0.2	1.3	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.7	0.2	0.4	<0.1
		ELWDGC-SED-3	1.8	Selenium	0.2	0.2	0.2	<0.1	0.2	<0.1	0.3	<0.1	0.2	1.8	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	0.2	<0.1
		ELWDGC-SED-4	2.9	Selenium	0.2	0.2	0.2	<0.1	0.2	<0.1	0.2	<0.1	0.2	2.9	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.1	0.3	<0.1
		ELWDGC-SED-5	2.2	Selenium	0.3	0.2	0.2	<0.1	0.3	<0.1	0.3	<0.1	0.2	2.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.1	<0.1
	EROL	EROL-SED-1	2.2	Selenium	0.4	0.3	0.2	<0.1	0.3	<0.1	0.4	0.1	0.2	2.2	0.3	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.1	<0.1	0.8	0.3	0.6	<0.1
		EROL-SED-2	1.3	Selenium	0.3	0.2	0.2	<0.1	0.2	<0.1	0.2	<0.1	0.2	1.3	0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.1	<0.1	0.1	<0.1	0.8	0.2	0.4	<0.1
		EROL-SED-3	2.5	Selenium	0.2	0.2	0.2	<0.1	0.2	<0.1	0.2	<0.1	0.2	2.5	0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.1	0.2	<0.1
		EROL-SED-4	2.7	Selenium	0.4	0.3	0.2	<0.1	0.3	<0.1	0.3	0.1	0.2	2.7	0.3	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.1	<0.1	0.9	0.3	0.5	<0.1
		EROL-SED-5	1.9	Selenium	0.2	0.3	0.1	<0.1	0.2	0.1	0.2	<0.1	0.2	1.9	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	0.9	0.3	0.5	<0.1
	EROU	EROU-SED-1	1.1	Selenium	0.5	0.4	0.3	<0.1	0.4	<0.1	0.9	0.2	0.4	1.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.5	<0.1	0.3	<0.1
		EROU-SED-2	1.0	Manganese	0.4	0.4	0.3	<0.1	0.4	0.1	1.0	0.2	0.4	1.0	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.5	<0.1	0.3	<0.1
		EROU-SED-3	1.0	Manganese	0.6	0.5	0.3	0.1	0.5	0.1	1.0	0.2	0.5	1.0	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	0.2	<0.1
		EROU-SED-4	1.1	Manganese	0.5	0.5	0.3	0.1	0.5	0.1	1.1	0.3	0.4	0.9	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	0.7	0.1	0.4	<0.1
		EROU-SED-5	1.0	Manganese	0.6	0.5	0.3	0.1	0.5	0.1	1.0	0.2	0.4	1.0	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.6	0.1	0.4	<0.1
	ERUP	ERUP-SED-1	1.1	Selenium	0.4	0.4	0.3	0.1	0.4	0.1	0.5	0.3	0.4	1.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	0.4	<0.1
		ERUP-SED-2	1.0	Selenium	0.2	0.3	0.3	<0.1	0.3	<0.1	0.2	0.2	0.3	1.0	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.8	0.1	0.3	<0.1
		ERUP-SED-3	1.1	2-Methylnaphthalene	0.2	0.3	0.2	<0.1	0.2	<0.1	0.2	<0.1	0.2	0.9	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.2	<0.1	1.1	0.2	0.5	<0.1

Quotient > 1

Table E.10: Hazard Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Hazard Quotient by Sample ID	Parameter with Maximum Hazard Quotient	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
				USQG	17	3.5	90	197	43,766	91	1,100	0.486	75	2	315	0.0889	0.128	0.245	0.385	0.782	3.2	13.4	0.862	0.135	2.355	0.144	3.2	0.201	0.391	0.515	0.875
Mine-exposed	ERUP	ERUP-SED-4	0.9	Selenium	0.3	0.4	0.3	<0.1	0.3	0.1	0.3	0.2	0.4	0.9	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	0.8	0.1	0.4	<0.1
		ERUP-SED-5	0.7	Selenium	0.3	0.3	0.2	<0.1	0.3	<0.1	0.4	0.2	0.3	0.7	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.1	0.3	<0.1
	FMUCK	FMUCK-SED-1	2.2	Selenium	0.3	0.4	0.2	<0.1	0.3	0.1	0.3	0.1	0.4	2.2	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.3	<0.1	2.2	0.4	1.0	<0.1
		FMUCK-SED-2	1.4	2-Methylnaphthalene	0.3	0.3	0.2	<0.1	0.3	<0.1	0.4	<0.1	0.3	0.9	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	1.4	0.3	0.6	<0.1
		FMUCK-SED-3	1.7	2-Methylnaphthalene	0.3	0.3	0.1	<0.1	0.3	<0.1	0.3	0.1	0.3	1.2	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	1.7	0.4	0.6	<0.1
		FMUCK-SED-4	1.5	2-Methylnaphthalene	0.3	0.3	0.2	<0.1	0.3	<0.1	0.3	<0.1	0.3	1.0	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	1.5	0.4	0.5	<0.1
		FMUCK-SED-5	1.7	2-Methylnaphthalene	0.3	0.3	0.1	<0.1	0.3	0.1	0.4	<0.1	0.4	1.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	1.7	0.5	0.7	<0.1
	FO10	FO10-SED-1	1.1	2-Methylnaphthalene	0.3	0.3	0.2	<0.1	0.3	<0.1	0.4	<0.1	0.3	1.0	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	1.1	0.2	0.4	<0.1
		FO10-SED-2	1.7	Selenium	0.2	0.3	0.1	<0.1	0.3	<0.1	0.2	0.2	0.3	1.7	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.2	<0.1	1.6	0.3	0.7	<0.1
		FO10-SED-3	2.2	2-Methylnaphthalene	0.2	0.3	0.1	<0.1	0.2	<0.1	0.4	0.2	0.3	1.3	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.3	<0.1	2.2	0.4	0.8	<0.1
		FO10-SED-4	1.9	2-Methylnaphthalene	0.2	0.3	0.1	<0.1	0.3	<0.1	0.2	0.2	0.3	1.5	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.2	<0.1	1.9	0.3	0.7	<0.1
		FO10-SED-5	1.8	2-Methylnaphthalene	0.2	0.3	0.1	<0.1	0.3	<0.1	0.4	0.1	0.3	1.2	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2	<0.1	1.8	0.3	0.7	<0.1
	FOXL	FOXL-SED-1	3.9	2-Methylnaphthalene	0.4	0.5	0.2	0.1	0.5	0.1	0.4	0.2	0.4	0.7	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	0.7	<0.1	3.9	0.6	1.6	<0.1
		FOXL-SED-2	5.9	2-Methylnaphthalene	0.4	0.5	0.2	0.1	0.4	0.1	0.4	0.2	0.4	0.7	0.4	<0.2	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.4	0.2	<0.1	0.8	<0.1	5.9	0.8	2.0	0.1
		FOXL-SED-3	7.3	2-Methylnaphthalene	0.3	0.4	0.2	<0.1	0.4	0.1	0.5	0.2	0.4	0.8	0.4	<0.2	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.5	0.3	<0.1	1.2	<0.1	7.3	0.9	2.4	0.1
		FOXL-SED-4	4.8	2-Methylnaphthalene	0.5	0.5	0.2	0.1	0.6	0.1	0.5	0.2	0.4	0.8	0.4	<0.2	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.3	0.1	<0.1	0.7	<0.1	4.8	0.7	1.7	<0.1
		FOXL-SED-5	6.7	2-Methylnaphthalene	0.4	0.4	0.2	<0.1	0.4	0.1	0.4	0.2	0.4	0.7	0.4	<0.2	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.6	0.3	<0.1	0.9	<0.1	6.7	1.0	2.2	0.1
	FWDEC	FWDEC-SED-1	3.7	Selenium	0.2	0.4	0.2	<0.1	0.3	0.1	<0.1	0.1	0.3	3.7	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.2	0.3	<0.1
		FWDEC-SED-2	11	Selenium	0.3	0.6	0.2	<0.1	0.4	0.1	<0.1	0.1	0.2	11	0.3	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.4	<0.1	1.5	0.3	0.7	<0.1
		FWDEC-SED-3	4.4	Selenium	0.1	0.5	0.3	<0.1	0.2	0.1	<0.1	0.2	0.2	4.4	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.2	<0.1	1.5	0.4	0.6	<0.1
		FWDEC-SED-4	6.1	Selenium	0.2	0.6	0.3	<0.1	0.4	0.2	<0.1	0.2	0.2	6.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.3	<0.1	1.7	0.5	0.7	<0.1
		FWDEC-SED-5	5.2	Selenium	0.2	0.4	0.2	<0.1	0.3	0.1	<0.1	<0.1	0.2	5.2	0.3	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.2	<0.1	1.2	0.4	0.7	<0.1
	GO13	GO13-SED-1	22	Selenium	0.3	0.4	0.2	0.1	0.3	0.1	0.4	0.2	0.4	22	0.4	<0.9	0.1	0.4	0.6	0.2	<0.1	<0.1	1.0	0.8	0.2	4.3	<0.1	18	2.0	5.0	0.5
		GO13-SED-2	19	Selenium	0.2	0.3	0.2	<0.1	0.3	0.1	0.3	0.1	0.3	19	0.3	<0.9	0.1	0.4	0.6	0.3	<0.1	<0.1	0.9	0.8	0.2	4.2	<0.1	19	2.1	4.7	0.5
		GO13-SED-3	50	2-Methylnaphthalene	0.3	0.4	0.2	0.1	0.3	0.1	0.3	0.2	0.3	15	0.4	<1.8	0.3	1.0	1.8	0.7	0.2	<0.1	2.7	1.9	0.3	13	<0.1	50	5.3	12	1.2
		GO13-SED-4	17	Selenium	0.4	0.5	0.2	0.1	0.4	0.1	0.4	0.3	0.4	17	0.4	<0.7	<0.1	0.3	0.4	0.1	<0.1	<0.1	0.6	0.4	0.1	2.8	<0.1	13	1.7	3.2	0.3
		GO13-SED-5	33	2-Methylnaphthalene	0.3	0.4	0.2	0.1	0.3	0.1	0.3	0.2	0.3	15	0.4	<1.5	0.3	0.6	1.1	0.5	0.1	<0.1	1.5	1.5	0.3	9.3	<0.1	33	4.2	8.1	0.8
	HE27	HE27-SED-1	3.2	2-Methylnaphthalene	0.2	0.2	0.1	<0.1	0.2	<0.1	0.3	<0.1	0.2	0.9	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.7	<0.1	3.2	0.5	0.8	<0.1
		HE27-SED-2	5.6	2-Methylnaphthalene	0.3	0.3	0.2	<0.1	0.2	<0.1	0.4	0.1	0.3	2.2	0.3	<0.2	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.3	0.2	<0.1	1.3	<0.1	5.6	0.7	2.0	0.1
		HE27-SED-3	1.5	2-Methylnaphthalene	0.2	0.2	0.2	<0.1	0.2	<0.1	0.2	<0.1	0.2	0.8	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	1.5	0.2	0.4	<0.1
		HE27-SED-4	4.3	2-Methylnaphthalene	0.2	0.3	0.2	<0.1	0.2	<0.1	1.2	0.1	0.3	1.0	0.3	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.8	<0.1	4.3	0.6	1.0	<0.1
		HE27-SED-5	2.1	Selenium	0.2	0.2	0.1	<0.1	0.2	<0.1	0.3	<0.1	0.2	2.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	1.9	0.3	0.4	<0.1
	MI16	MI16-SED-1	4.1	2-Methylnaphthalene	0.2	0.3	0.2	<0.1	0.2	<0.1	<0.1	0.2	0.3	2.3	0.3	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.3	0.2	<0.1	0.5	<0.1	4.1	0.8	1.3	<0.1
		MI16-SED-2	4.0	Selenium	0.2	0.2	0.1	<0.1	0.2	<0.1	<0.1	0.1	0.2	4.0	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.4	<0.1	2.8	0.6	0.9	<0.1
		MI16-SED-3	5.9	Selenium	0.3	0.3	0.2	<0.1	0.3	<0.1	0.1	0.1	0.2	5.9	0.3	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.5	<0.1	2.8	0.6	1.0	<0.1
		MI16-SED-4	4.2	Selenium	0.2	0.2	0.2	<0.1	0.2	<0.1	<0.1	<0.1	0.2	4.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.4	<0.1	2.7	0.5	0.8	<0.1
		MI16-SED-5	4.8	Selenium	<0.1	0.2	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	4.8	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.3	<0.1	2.4	0.4	0.6	<0.1

Quotient > 1

Table E.10: Hazard Quotients for Sediment Samples Collected in 2015, from Reference and Mine-exposed Areas, 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Hazard Quotient by Sample ID	Parameter with Maximum Hazard Quotient	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
		USQG	17	3.5	90	197	43,766	91	1,100	0.486	75	2	315	0.0889	0.128	0.245	0.385	0.782	3.2	13.4	0.862	0.135	2.355	0.144	3.2	0.201	0.391	0.515	0.875
Mine-exposed	MIC2	MIC2-SED-1	2.1	2-Methylnaphthalene	0.4	0.6	0.3	0.1	0.4	0.1	0.2	0.2	0.4	1.4	0.4	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.3	0.2	<0.1	0.3	<0.1	2.1	0.5	1.0	<0.1
		MIC2-SED-2	1.8	2-Methylnaphthalene	0.4	0.4	0.2	<0.1	0.3	0.1	0.2	0.1	0.3	0.8	0.3	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.3	0.1	<0.1	0.2	<0.1	1.8	0.5	0.9	<0.1
		MIC2-SED-3	1.5	2-Methylnaphthalene	0.3	0.3	0.1	<0.1	0.3	<0.1	0.1	0.1	0.3	0.5	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	1.5	0.4	0.6	<0.1
		MIC2-SED-4	1.1	2-Methylnaphthalene	0.3	0.5	0.2	<0.1	0.3	0.1	0.1	0.2	0.3	1.0	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	1.1	0.3	0.6	<0.1
		MIC2-SED-5	1.6	2-Methylnaphthalene	0.4	0.5	0.2	<0.1	0.4	0.1	0.2	0.2	0.4	1.0	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.2	<0.1	1.6	0.4	0.6	<0.1
	MIWW	MIWW-SED-1	1.8	2-Methylnaphthalene	0.2	0.7	0.3	<0.1	0.3	<0.1	<0.1	0.1	0.3	1.6	0.4	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.3	0.1	<0.1	0.3	<0.1	1.8	0.4	1.1	<0.1
		MIWW-SED-2	1.7	2-Methylnaphthalene	0.2	0.4	0.1	<0.1	0.2	<0.1	<0.1	0.2	0.3	0.9	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2	<0.1	1.7	0.4	1.0	<0.1
		MIWW-SED-3	1.3	2-Methylnaphthalene	0.2	0.4	0.1	<0.1	0.2	<0.1	<0.1	0.1	0.3	1.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.2	<0.1	1.3	0.3	0.8	<0.1
		MIWW-SED-4	1.9	2-Methylnaphthalene	0.2	0.4	0.1	<0.1	0.2	<0.1	<0.1	0.1	0.2	1.1	0.3	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.3	0.1	<0.1	0.2	<0.1	1.9	0.4	1.2	<0.1
		MIWW-SED-5	1.3	2-Methylnaphthalene	0.3	0.4	0.1	<0.1	0.3	0.1	<0.1	0.1	0.3	0.9	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2	<0.1	1.3	0.3	0.8	<0.1
	OTTO	OTTO-SED-1	26	2-Methylnaphthalene	0.4	0.4	0.2	0.2	0.5	0.2	0.3	0.3	0.4	3.2	0.5	<0.7	0.2	0.1	0.8	0.2	<0.1	<0.1	1.6	0.7	0.1	5.8	<0.1	26	3.3	8.0	0.5
		OTTO-SED-2	128	2-Methylnaphthalene	0.4	0.3	0.1	0.1	0.4	0.1	0.3	0.3	0.3	1.1	0.3	<3	1.0	0.8	2.3	0.7	0.2	<0.1	4.6	3.1	0.4	27	<0.1	128	16	29	1.7
		OTTO-SED-3	45	2-Methylnaphthalene	0.8	0.4	0.1	0.1	0.6	0.1	0.7	0.3	0.3	1.3	0.3	<1.2	<0.4	0.3	0.7	0.2	<0.1	<0.1	1.4	0.7	0.1	8.3	<0.1	45	6.5	10	0.6
		OTTO-SED-4	48	2-Methylnaphthalene	0.3	0.3	0.1	0.1	0.3	0.1	0.2	0.3	0.3	2.2	0.3	<1.1	<0.4	0.3	0.9	0.2	<0.1	<0.1	1.9	0.9	0.2	11	<0.1	48	6.0	13	0.8
		OTTO-SED-5	30	2-Methylnaphthalene	0.7	0.3	0.1	<0.1	0.6	<0.1	0.6	0.3	0.3	0.9	0.3	<0.7	<0.4	<0.2	0.5	0.1	<0.1	<0.1	1.0	0.6	0.1	5.3	<0.1	30	3.8	7.7	0.4
	R5-1	R5-1-SED-1	26	2-Methylnaphthalene	0.4	0.5	0.2	0.1	0.3	0.2	0.3	0.1	0.5	9.9	0.5	<0.8	0.4	0.1	0.8	0.2	<0.1	<0.1	1.8	1.2	<0.1	5.3	<0.1	26	3.3	6.7	0.4
		R5-1-SED-2	17	Selenium	0.2	0.4	0.1	<0.1	0.2	<0.1	0.2	<0.1	0.3	17	0.4	<0.2	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.6	0.2	<0.1	1.7	<0.1	7.8	1.0	2.3	0.2
		R5-1-SED-3	25	Selenium	0.1	0.3	0.1	<0.1	0.1	<0.1	0.2	<0.1	0.2	25	0.3	<0.3	0.1	<0.1	0.3	0.1	<0.1	<0.1	0.8	0.4	<0.1	2.0	<0.1	8.2	1.0	2.9	0.2
		R5-1-SED-4	12	2-Methylnaphthalene	0.2	0.5	0.1	<0.1	0.2	<0.1	0.2	0.1	0.3	11	0.4	<0.3	0.2	<0.1	0.3	0.1	<0.1	<0.1	0.8	0.6	<0.1	2.8	<0.1	12	1.5	3.6	0.2
		R5-1-SED-5	17	Selenium	0.2	0.4	0.2	<0.1	0.2	<0.1	0.2	<0.1	0.3	17	0.4	<0.3	0.1	<0.1	0.3	0.1	<0.1	<0.1	0.7	0.4	<0.1	2.1	<0.1	11	1.3	3.0	0.2
	R5-3	R5-3-SED-1	2.5	Selenium	0.3	0.2	0.2	<0.1	0.3	<0.1	0.9	<0.1	0.3	2.5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.1	0.4	<0.1
		R5-3-SED-2	1.4	Manganese	0.3	0.2	0.1	<0.1	0.4	0.1	1.4	<0.1	0.3	1.4	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.2	<0.1
		R5-3-SED-3	2.2	Selenium	0.4	0.2	0.1	<0.1	0.4	0.1	1.4	<0.1	0.3	2.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.1	0.2	<0.1
		R5-3-SED-4	3.9	Selenium	0.3	0.2	0.1	<0.1	0.4	0.1	0.9	<0.1	0.3	3.9	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	0.9	0.3	0.5	<0.1
		R5-3-SED-5	1.6	Selenium	0.3	0.2	0.1	<0.1	0.3	0.1	1.5	<0.1	0.3	1.6	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.2	0.4	<0.1
	STPD	STPD-SED-1	3.6	Selenium	0.2	0.3	0.1	<0.1	0.2	<0.1	0.1	0.1	0.2	3.6	0.2	<0.1	<0.1	<0.1	0.6	0.5	0.1	<0.1	0.7	0.4	0.5	0.2	<0.1	0.9	0.2	0.9	0.9
		STPD-SED-2	4.2	Selenium	0.2	0.3	0.2	<0.1	0.2	<0.1	0.1	0.1	0.2	4.2	0.3	<0.1	<0.1	0.1	1.3	1.1	0.2	<0.1	1.5	0.9	1.0	0.2	0.2	1.0	0.2	1.4	1.9
		STPD-SED-3	18	Pyrene	0.2	0.2	0.2	<0.1	0.2	0.1	0.1	<0.1	0.2	1.7	0.4	0.9	0.1	3.4	16	11	1.4	0.3	11	7.8	8.8	1.2	1.3	1.1	0.2	12	18
		STPD-SED-4	4.0	Selenium	0.2	0.3	0.2	<0.1	0.2	<0.1	0.2	0.1	0.2	4.0	0.3	<0.1	<0.1	<0.1	0.4	0.3	<0.1	<0.1	0.5	0.3	0.3	0.2	<0.1	1.3	0.3	0.8	0.5
		STPD-SED-5	8.1	Selenium	0.1	0.3	0.1	<0.1	0.2	<0.1	<0.1	0.1	0.1	8.1	0.2	<0.1	<0.1	0.2	0.8	0.8	0.2	<0.1	1.1	0.9	0.8	0.2	0.2	0.9	0.2	1.2	1.6

Quotient > 1

Table E.11: Hazard Quotients for Sediment Samples Collected in 2013 from Areas not Sampled in 2015

Exposure Type	Monitoring Area Code	Sample ID	Maximum Hazard Quotient by Sample ID	Parameter with Maximum Hazard Quotient	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene
				USQG	17	3.5	90	197	43,766	91	1,100	0.49	75	2	315	0.09	0.13	0.25	0.39	0.78	3.2	13.4	0.86	0.14	2.36	0.14	3.2	0.2	0.39	0.52	0.88
Reference	LOLA	LOLA-1	1.3	2-Methylnaphthalene	0.1	0.1	0.1	<0.1	0.1	0.1	0.8	0.1	0.1	0.5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.3	<0.1	0.4	<0.1
		LOLA-2	141	2-Methylnaphthalene	0.1	0.1	0.1	<0.1	0.1	0.1	0.3	0.1	0.1	0.6	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	141	<0.1	44	<0.1
		LOLA-3	4.7	2-Methylnaphthalene	0.1	0.1	<0.1	<0.1	0.1	0.1	0.9	0.1	0.1	0.5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	1.4	<0.1	4.7	<0.1	1.2	<0.1
	GLMS	GLMS-1	1.2	Selenium	0.3	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.2	1.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.0	<0.1	<0.1	<0.1
		GLMS-2	0.9	Selenium	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.9	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.8	<0.1	<0.1	<0.1
		GLMS-3	1.0	2-Methylnaphthalene	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.0	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1
	GRLK	GRLK-1	4.9	2-Methylnaphthalene	0.1	0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1	2.6	0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	<0.1	0.1	1.4	<0.1	4.9	0.6	1.6	0.1
		GRLK-2	2.5	2-Methylnaphthalene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	1.2	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.7	<0.1	2.5	0.3	0.7	<0.1
		GRLK-3	0.9	2-Methylnaphthalene	<0.1	0.1	0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.9	0.1	0.3	<0.1
	FL17	FL17-1	0.6	Selenium	0.1	0.1	0.1	<0.1	0.1	0.1	0.2	<0.1	0.1	0.6	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		FL17-2	0.6	Selenium	0.2	0.1	0.1	<0.1	0.1	0.1	0.1	0.1	0.1	0.6	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		FL17-3	0.7	Selenium	0.1	0.1	0.1	<0.1	0.1	0.1	0.2	0.1	0.1	0.7	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mine-exposed	ERWSF	ERWSF-1	1.4	2-Methylnaphthalene	0.3	0.3	0.2	0.1	0.3	0.1	0.4	0.1	0.3	0.6	0.3	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	1.4	0.4	0.7	0.1
		ERWSF-2	1.4	2-Methylnaphthalene	0.4	0.4	0.2	0.1	0.4	0.1	0.6	0.1	0.4	0.8	0.4	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	1.4	0.3	0.7	0.1
		ERWSF-3	1.6	2-Methylnaphthalene	0.3	0.3	0.2	0.1	0.3	0.1	0.4	0.1	0.3	0.6	0.3	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	0.1	0.1	0.3	<0.1	1.6	0.4	0.8	0.1
	SPW	SPW-1	1.5	2-Methylnaphthalene	0.3	0.3	0.2	0.1	0.3	0.1	0.5	0.1	0.3	1.5	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	1.5	0.4	0.6	<0.1
		SPW-2	1.6	2-Methylnaphthalene	0.3	0.3	0.2	0.1	0.3	0.1	0.5	<0.1	0.3	1.6	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	1.6	0.4	0.7	0.1
		SPW-3	1.3	Selenium	0.3	0.3	0.2	0.1	0.3	0.1	0.5	0.1	0.3	1.3	0.3	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	1.1	0.3	0.6	0.1

Quotient > 1

Table E.12: Sediment Normal Range Quotients and Hazard Quotients (Maximum Quotient for a Station in a Given Area) for Selenium and for the PAH with the Highest Quotient

Exposure Type	Management Unit	Main Watershed	Moniroting Area Code	Normal Range Quotient			Hazard Quotient		
				Selenium	Max PAH	PAH	Selenium	Max PAH	PAH
Reference	1	Fording	LML	1.1	2.6	Dibenz(a,h)anthracene	4.4	24	2-Methylnaphthalene
			FO15	0.7	0.6	Benzo(b&j)fluoranthene	2.5	1.5	2-Methylnaphthalene
	3	Elk	REFF	0.4	0.2	Chrysene	1.5	1.7	2-Methylnaphthalene
			LOLA	0.2	13	Phenanthrene	0.6	141	2-Methylnaphthalene
	4	Elk	GLMS	0.3	0.1	2-Methylnaphthalene	1.2	1.0	2-Methylnaphthalene
			GRLK	0.7	1.2	Fluoranthene	2.6	4.9	2-Methylnaphthalene
			LCHO	1.0	1.0	Anthracene	3.9	0.6	Phenanthrene
	Not Applicable	Elk	EL14	0.2	0.8	Anthracene	0.9	0.3	2-Methylnaphthalene
		Flathead	FLA1	0.3	<0.1	all PAHs	1.3	<0.1	all PAHs
			FL17	0.2	<0.1	all PAHs	0.7	<0.1	all PAHs
Mine-exposed	1	Fording	HE27	0.6	1.0	Anthracene	2.2	5.6	2-Methylnaphthalene
			FO10	0.4	0.3	Chrysene	1.7	2.2	2-Methylnaphthalene
			FOXL	0.2	1.7	Anthracene	0.8	7.3	2-Methylnaphthalene
			FMUCK	0.6	0.3	Chrysene	2.2	2.2	2-Methylnaphthalene
			FWDEC	2.7	0.3	Chrysene	11	1.7	2-Methylnaphthalene
			R5-1	6.4	5.5	Anthracene	25	26	2-Methylnaphthalene
	2	Elk	R5-3	1.0	0.3	Chrysene	3.9	0.9	2-Methylnaphthalene
	3	Elk	ERUP	0.3	0.7	Anthracene	1.1	1.1	2-Methylnaphthalene
			EROU	0.3	0.3	Benzo(b&j)fluoranthene	1.1	0.7	2-Methylnaphthalene
	4	Elk	ELWDGC	0.7	0.2	Chrysene	2.9	0.7	2-Methylnaphthalene
			GO13	5.6	38	Anthracene	22	50	2-Methylnaphthalene
			OTTO	0.8	33	Anthracene	3.2	128	2-Methylnaphthalene
			MI16	1.5	2.6	Anthracene	5.9	4.1	2-Methylnaphthalene
			MIC2	0.4	1.0	Anthracene	1.4	2.1	2-Methylnaphthalene
			MIWW	0.4	1.2	Anthracene	1.6	1.9	2-Methylnaphthalene
	5	Elk	SPW	0.4	0.5	Fluoranthene	1.6	1.6	2-Methylnaphthalene
			ERWSF	0.2	1.0	Fluoranthene	0.8	1.5	2-Methylnaphthalene
			STPD	2.1	193	Fluoranthene	8.1	18	Pyrene
			EROL	0.7	3.2	Anthracene	2.7	0.9	2-Methylnaphthalene
			ELKO	0.2	2.8	Anthracene	0.7	1.3	2-Methylnaphthalene

Results shown for 2013 (not sampled in 2015)
Good (Quotient < 0.7)
Marginal (Quotient between 0.7 and 1.0)
Poor (Quotient > 1.0)

Table E.13: Pearson Correlation Coefficients for Sediment Quality Variables for Reference (n = 40) and Mine-exposed (n = 141) Samples Versus the First Two Principal Components (PC-1 and PC-2) Calculated from a PCA Based on Hazard Quotients, August 2013 and August 2015 (see Figure 6.3)

Variables		Sediment Quality Variables (Hazard Quotient) PC-1 (54.2%)		Sediment Quality Variables (Hazard Quotient) PC-2 (29.1%)	
		r	P-value	r	P-value
Metals	Arsenic	0.531	<0.001	-0.806	<0.001
	Cadmium	0.619	<0.001	-0.641	<0.001
	Chromium	0.361	<0.001	-0.806	<0.001
	Copper	0.668	<0.001	-0.688	<0.001
	Iron	0.562	<0.001	-0.800	<0.001
	Lead	0.624	<0.001	-0.632	<0.001
	Manganese	0.332	<0.001	-0.515	<0.001
	Mercury	0.564	<0.001	-0.547	<0.001
	Nickel	0.594	<0.001	-0.779	<0.001
	Selenium	0.479	<0.001	0.182	0.014
	Zinc	0.568	<0.001	-0.708	<0.001
PAHs	2-Methylnaphthalene	0.891	<0.001	0.432	<0.001
	Naphthalene	0.905	<0.001	0.382	<0.001
	Phenanthrene	0.931	<0.001	0.296	<0.001

$r \geq 0.6$ or $r \leq -0.6$.

P-value < 0.05.

Table E.14: ANOVA Table and Contrasts for the Temporal Analysis of PC-1 in Sediment from 9 Mine-exposed (Impact) and 3 Reference (Control) Areas Sampled in 2013 and 2015

Source	DF	Type II SS	MS	F-Statistic	P-Value
Year	1	1.47	1.47	12.1	0.001
CI	1	7.28	7.28	59.6	<0.001
Area(CI)	10	70.4	7.04	57.7	<0.001
Year×CI	1	0.100	0.104	0.850	0.359
Area(CI)×Year	10	4.79	0.479	3.93	<0.001
Error	84	10.3	0.122		

Management Unit	Monitoring Area Code	Contrasts versus Mean Reference[a]					Contrasts versus Each Reference (P-value)		
		Estimate[b]	SE	DF	T-Statistic	P-value	LCHO	LML	REFF
1	HE27	0.624	0.884	84	0.706	0.482	0.027	0.308	0.614
	FO10	-0.490	0.797	84	-0.615	0.540	0.195	0.031	0.578
	FMUCK	-0.080	0.884	84	-0.091	0.928	0.114	0.097	0.886
3	EROU	1.592	0.797	84	2.00	0.049	0.001	0.887	0.138
4	MI16	-1.109	0.797	84	-1.392	0.168	0.490	0.006	0.245
	ELWDGC	-0.097	0.884	84	-0.110	0.913	0.117	0.094	0.873
	GO13	3.08	0.797	84	3.87	<0.001	<0.001	0.187	0.004
5	EROL	-0.2482	0.797	84	-0.311	0.756	0.126	0.053	0.750
	ELKO	0.631	0.797	84	0.79	0.431	0.018	0.279	0.585

[a] Contrasts test the hypothesis: $[3(\mu_{E(2015)})- (\mu_{R1(2015)}+\mu_{R2(2015)}+\mu_{R3(2015)})] - [3(\mu_{E(2013)})- (\mu_{R1(2013)}+\mu_{R2(2013)}+\mu_{R3(2013)})]=0$ where $\mu_{E(j)}$ = mean for the mine-exposed area in year j and $\mu_{Ri(j)}$ = mean of reference area i in year j

[b] Estimate of $[3(\mu_{E(2015)})- (\mu_{R1(2015)}+\mu_{R2(2015)}+\mu_{R3(2015)})] - [3(\mu_{E(2013)})- (\mu_{R1(2013)}+\mu_{R2(2013)}+\mu_{R3(2013)})]$. A positive estimate indicates that the mine-exposed mean in 2015 is greater than predicted if the mine-exposed area had a trend equal to the mean reference area trend.

Note: Magnitude of difference not reported for PC-1 due to scale

P-value < 0.05

Table E.15: ANOVA Table and Contrasts for the Temporal Analysis of $\log_{10}$(2-Methylnaphthalene) in Sediment from 9 Mine-exposed (Impact) and 3 Reference (Control) Areas Sampled in 2013 and 2015

Source	DF	Type II SS	MS	F-Statistic	P-Value
Year	1	0.400	0.400	11.9	0.001
CI	1	0.0200	0.0198	0.590	0.445
Area(CI)	10	28.4	2.84	84.7	<0.001
Year×CI	1	0.037	0.0369	1.10	0.297
Area(CI)×Year	10	1.43	0.143	4.27	<0.001
Error	84	2.82	0.034		

Management Unit	Monitoring Area Code	Contrasts versus Mean Reference[a]						Contrasts versus Each Reference (P-value)		
		Estimate[b]	SE	DF	T-Statistic	P-value	Magnitude of Difference (%)	LCHO	LML	REFF
1	HE27	0.171	0.463	84	0.368	0.714	14	0.029	0.637	0.396
	FO10	-0.434	0.418	84	-1.04	0.301	-28	0.218	0.103	0.043
	FMUCK	-0.238	0.463	84	-0.513	0.609	-17	0.135	0.236	0.120
3	EROU	0.742	0.418	84	1.78	0.079	77	0.001	0.569	0.868
4	MI16	-0.0527	0.418	84	-0.126	0.900	-4.0	0.053	0.357	0.187
	ELWDGC	0.275	0.463	84	0.595	0.554	24	0.018	0.773	0.506
	GO13	1.72	0.418	84	4.13	<0.001	275	<0.001	0.018	0.047
5	EROL	-0.467	0.418	84	-1.12	0.266	-30	0.241	0.091	0.038
	ELKO	0.595	0.418	84	1.43	0.158	58	0.002	0.770	0.911

[a] Contrasts test the hypothesis: $[3(\mu_{E(2015)})- (\mu_{R1(2015)}+\mu_{R2(2015)}+\mu_{R3(2015)})] - [3(\mu_{E(2013)})- (\mu_{R1(2013)}+\mu_{R2(2013)}+\mu_{R3(2013)})]=0$ where $\mu_{E(j)}$ = mean for the mine-exposed area in year j and $\mu_{Ri(j)}$ = mean of reference area i in year j

[b] Estimate of $[3(\mu_{E(2015)})- (\mu_{R1(2015)}+\mu_{R2(2015)}+\mu_{R3(2015)})] - [3(\mu_{E(2013)})- (\mu_{R1(2013)}+\mu_{R2(2013)}+\mu_{R3(2013)})]$. A positive estimate indicates that the mine-exposed mean in 2015 is greater than predicted if the mine-exposed area had a trend equal to the mean reference area trend.

P-value < 0.05

Table E.16: ANOVA Table and Contrasts for the Temporal Analysis of log_{10}(Phenanthrene) in Sediment from 9 Mine-exposed (Impact) and 3 Reference (Control) Areas Sampled in 2013 and 2015

Source	DF	Type II SS	MS	F-Statistic	P-Value
Year	1	1.65	1.65	69.4	<0.001
CI	1	0.0380	0.0383	1.61	0.208
Area(CI)	10	6.83	0.683	28.7	<0.001
Year×CI	1	0.257	0.257	10.8	0.001
Area(CI)×Year	10	2.83	0.283	11.9	<0.001
Error	84	2.00	0.0237		

Management Unit	Monitoring Area Code	Contrasts versus Mean Reference[a]						Contrasts versus Each Reference (P-value)		
		Estimate[b]	SE	DF	T-Statistic	P-value	Magnitude of Difference (%)	LCHO	LML	REFF
1	HE27	1.19	0.390	84	3.06	0.003	150	0.400	0.014	<0.001
	FO10	-0.397	0.351	84	-1.13	0.262	-26	0.009	0.378	0.383
	FMUCK	-0.254	0.390	84	-0.652	0.516	-18	0.032	0.598	0.266
3	EROU	0.171	0.351	84	0.486	0.628	14	0.169	0.701	0.035
4	MI16	1.045	0.351	84	2.98	0.004	123	0.569	0.022	<0.001
	ELWDGC	0.891	0.390	84	2.28	0.025	98	0.834	0.065	0.001
	GO13	3.07	0.351	84	8.73	<0.001	955	<0.001	<0.001	<0.001
5	EROL	1.03	0.351	84	2.92	0.005	120	0.598	0.024	<0.001
	ELKO	-0.320	0.351	84	-0.911	0.365	-22	0.015	0.297	0.297

[a] Contrasts test the hypothesis: $[3(\mu_{E(2015)})- (\mu_{R1(2015)}+\mu_{R2(2015)}+\mu_{R3(2015)})] - [3(\mu_{E(2013)})- (\mu_{R1(2013)}+\mu_{R2(2013)}+\mu_{R3(2013)})]=0$ where $\mu_{E(j)}$ = mean for the mine-exposed area in year j and $\mu_{Ri(j)}$ = mean of reference area i in year j

[b] Estimate of $[3(\mu_{E(2015)})- (\mu_{R1(2015)}+\mu_{R2(2015)}+\mu_{R3(2015)})] - [3(\mu_{E(2013)})- (\mu_{R1(2013)}+\mu_{R2(2013)}+\mu_{R3(2013)})]$. A positive estimate indicates that the mine-exposed mean in 2015 is greater than predicted if the mine-exposed area had a trend equal to the mean reference area trend.

P-value < 0.05

Table E.17: Physical and Chemical Data Associated with Sediment Toxicity Samples Collected in September 2015

	Analyte	Units	Guideline		R5-1	GO13	OTTO	STPD	MI16	LML	LCHO	FLA1
			ISQG/LEL	PEL/SEL								
Physical Tests	% Moisture	%	-	-	60.7	61.6	47.0	66.6	56.8	89.7	77.1	70.1
	pH (1:2 soil:water)	pH	-	-	7.56	7.70	8.00	7.72	7.66	7.46	6.76	7.88
	% Gravel (>2mm)	%	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.91
	% Sand (2.00mm - 1.00mm)	%	-	-	0.22	<0.10	<0.10	<0.10	<0.10	0.11	0.28	<0.10
	% Sand (1.00mm - 0.50mm)	%	-	-	0.79	<0.10	<0.10	<0.10	<0.10	0.16	0.31	0.12
	% Sand (0.50mm - 0.25mm)	%	-	-	3.58	0.21	<0.10	<0.10	<0.10	0.49	0.85	0.36
	% Sand (0.25mm - 0.125mm)	%	-	-	6.29	1.74	0.16	0.17	<0.10	0.83	2.17	1.03
	% Sand (0.125mm - 0.063mm)	%	-	-	7.46	4.63	0.70	1.45	1.20	2.63	3.64	6.19
	% Silt (0.063mm - 0.0312mm)	%	-	-	17.5	20.5	11.0	22.1	34.9	38.4	32.0	32.2
	% Silt (0.0312mm - 0.004mm)	%	-	-	37.7	51.2	47.3	59.1	55.8	47.7	49.4	51.1
	% Clay (<4um)	%	-	-	26.5	21.7	40.8	17.1	8.09	9.69	11.3	8.06
Carbon	Total Organic Carbon	%	-	-	7.18	9.35	36.7	7.45	5.27	19.6	11.8	4.51
SEM-AVS	Acid Volatile Sulphides	umol/g	-	-	144	180	1.37	85.3	212	15.2	15.0	1.32
	Cadmium (Cd)	umol/g	-	-	<0.050	<0.010	<0.010	<0.025	<0.010	<0.020	0.030	<0.050
	Copper (Cu)	umol/g	-	-	<0.10	<0.020	0.204	0.105	<0.020	0.041	0.152	0.10
	Lead (Pb)	umol/g	-	-	<0.20	0.049	0.040	<0.10	<0.040	<0.080	0.053	<0.20
	Mercury (Hg)	umol/g	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)	umol/g	-	-	<0.50	0.21	0.13	<0.25	0.23	<0.20	0.15	<0.50
	Zinc (Zn)	umol/g	-	-	1.36	1.08	0.567	0.961	1.09	0.680	1.09	0.258
Total Metals	Aluminum (Al)	mg/kg	-	-	6770	7970	6400	7640	10100	4320	10000	6550
	Antimony (Sb)	mg/kg	-	-	0.72	0.82	0.78	0.67	0.70	0.62	0.99	0.23
	Arsenic (As)	mg/kg	5.9	17	4.10	5.56	8.69	3.98	7.57	3.69	3.72	1.19
	Barium (Ba)	mg/kg	-	-	361	345	407	288	178	283	346	124
	Beryllium (Be)	mg/kg	-	-	0.54	0.67	0.63	0.54	0.87	0.26	0.63	0.43
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)	mg/kg	-	-	13.6	7.8	8.4	7.9	10.7	7.1	<5.0	<5.0
	Cadmium (Cd)	mg/kg	0.6	3.5	1.53	1.23	1.18	1.79	1.12	1.95	3.52	0.497
	Calcium (Ca)	mg/kg	-	-	209000	66900	29000	137000	79500	86700	9600	194000
	Chromium (Cr)	mg/kg	37.3	90	14.2	17.1	10.4	21.5	19.7	9.65	18.1	18.9
	Cobalt (Co)	mg/kg	-	-	6.29	6.41	6.76	4.32	6.33	2.56	5.86	2.29
	Copper (Cu)	mg/kg	35.7	197	14.7	21.2	25.8	19.3	19.0	10.2	19.6	9.68
	Iron (Fe)	mg/kg	21200	43766	9750	15000	17500	12900	15300	5680	10400	5770
	Lead (Pb)	mg/kg	35	91	8.65	11.0	11.1	11.8	10.6	6.89	11.9	6.32
	Lithium (Li)	mg/kg	-	-	11.5	14.8	9.6	13.0	16.6	4.4	12.4	13.4
	Magnesium (Mg)	mg/kg	-	-	8170	12300	4810	11500	16000	3110	2700	10900
	Manganese (Mn)	mg/kg	460	1100	294	421	519	180	174	61.4	90.8	62.4
	Mercury (Hg)	mg/kg	0.17	0.486	0.050	0.076	0.071	0.055	0.065	0.082	0.117	<0.050
	Molybdenum (Mo)	mg/kg	-	-	2.46	1.99	1.94	1.68	2.00	2.39	1.73	0.27
	Nickel (Ni)	mg/kg	16	75	23.8	26.0	23.2	19.1	29.4	16.2	25.3	8.63
	Phosphorus (P)	mg/kg	-	-	770	1210	819	1110	1140	721	943	598
	Potassium (K)	mg/kg	-	-	2140	1840	1560	1860	2160	680	1510	830
	Selenium (Se)	mg/kg	2		34.0	19.5	2.06	19.9	2.93	6.43	8.51	1.76
	Silver (Ag)	mg/kg	-	-	0.24	0.32	0.27	0.24	0.31	0.16	0.51	<0.10
	Sodium (Na)	mg/kg	-	-	282	137	106	104	117	89	<50	68
	Strontium (Sr)	mg/kg	-	-	237	111	81.4	167	106	60.3	39.0	81.3
	Sulfur (S)-Total	mg/kg	-	-	2700	5100	9400	4100	6800	7600	5900	3000
	Thallium (Tl)	mg/kg	-	-	0.263	0.216	<0.050	0.305	0.638	0.218	0.270	0.130
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti)	mg/kg	-	-	23.3	8.8	8.2	27.8	41.5	54.1	33.7	42.4
	Uranium (U)	mg/kg	-	-	2.28	1.37	0.638	1.11	1.20	0.901	2.92	0.552
	Vanadium (V)	mg/kg	-	-	31.0	30.7	28.6	31.5	33.0	24.4	48.1	13.2
	Zinc (Zn)	mg/kg	123	315	116	119	104	110	120	68.9	127	42.9
	Zirconium (Zr)	mg/kg	-	-	1.3	1.4	<1.0	1.2	1.9	4.6	2.5	1.6
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	mg/kg	0.00671	0.0889	<0.030	<0.040	<0.18	<0.010	<0.010	<0.015	<0.010	<0.0050
	Acenaphthylene	mg/kg	0.00587	0.128	0.0113	0.0092	0.0701	0.0099	<0.0050	<0.015	<0.010	<0.0050
	Acridine	mg/kg	-	-	<0.010	<0.010	<0.10	0.085	<0.010	<0.030	<0.020	<0.010
	Anthracene	mg/kg	0.0469	0.245	0.0107	0.0459	0.0785	0.0835	0.0051	0.018	<0.0080	<0.0040
	Benz(a)anthracene	mg/kg	0.0317	0.385	0.075	0.100	0.425	0.779	0.020	0.054	<0.020	<0.010
	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.053	0.084	0.266	1.58	0.011	<0.030	<0.020	<0.010
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.160	0.205	0.832	2.63	0.065	0.085	0.021	<0.010
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.16	0.234	0.892	3.53	0.065	0.085	<0.028	<0.015
	Benzo(e)pyrene	mg/kg	-	-	0.203	0.173	0.885	1.42	0.059	0.078	<0.020	<0.010
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.081	0.085	0.402	1.39	0.023	0.036	<0.020	<0.010
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.010	0.029	0.060	0.900	<0.010	<0.030	<0.020	<0.010
	Biphenyl	mg/kg	-	-	0.491	0.525	4.74	0.051	0.108	0.361	0.020	<0.010
	Chrysene	mg/kg	0.0571	0.862	0.445	0.366	1.78	1.72	0.114	0.219	0.049	<0.010
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	0.0401	0.0422	0.223	0.244	0.0081	<0.015	<0.010	<0.0050
	Dibenzothiophene	mg/kg	-	-	0.196	0.094	0.55	0.047	0.020	0.117	<0.020	<0.010
	Fluoranthene	mg/kg	0.111	2.355	0.069	0.203	0.359	3.35	0.039	0.053	<0.020	<0.010
	Fluorene	mg/kg	0.021	0.144	0.219	0.290	2.21	0.034	0.040	0.213	<0.020	<0.010
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	0.027	0.044	0.148	1.11	<0.010	<0.030	<0.020	<0.010
	C1 Acenaphthenes	mg/kg	-	-	0.113	0.091	0.61	<0.040	<0.040	<0.12	<0.080	<0.040
	C1 Benz(a)Anthracenes/Chrysenes	mg/kg	-	-	0.795	0.536	3.67	0.286	0.098	0.33	<0.080	<0.040
	C1 Benzofluoranthenes/Benzopyrenes	mg/kg	-	-	1.13	0.966	6.03	1.01	0.215	0.57	<0.080	<0.040
	C1 Biphenyls	mg/kg	-	-	0.925	0.825	7.76	0.085	0.132	0.64	<0.080	<0.040
	C1 Dibenzothiophenes	mg/kg	-	-	0.552	0.196	1.16	0.053	<0.040	0.24	<0.080	<0.040
	C1 Fluoranthenes/Pyrenes	mg/kg	-	-	0.738	0.529	4.26	0.556	0.108	0.41	<0.080	<0.040
	C1 Fluorenes	mg/kg	-	-	0.565	0.514	4.90	0.051	0.067	0.42	<0.080	<0.040
	C1 Phenanthrenes/Anthracenes	mg/kg	-	-	2.30	1.72	14.3	0.370	0.378	1.44	0.152	<0.040
	Retene	mg/kg	-	-	0.204	0.083	0.32	0.047	0.025	0.169	0.133	0.025
	1-Methylnaphthalene	mg/kg	-	-	1.08	0.763	7.42	0.105	0.268	0.699	0.036	<0.020
	2-Methylnaphthalene	mg/kg	0.0202	0.201	1.88	1.55	15.5	0.174	0.423	1.16	0.039	<0.010
	Naphthalene	mg/kg	0.0346	0.391	0.484	0.359	5.00	0.065	0.171	0.299	<0.020	<0.010
	Perylene	mg/kg	-	-	0.020	0.021	<0.010	0.337	0.112	0.066	<0.020	0.022
	Phenanthrene	mg/kg	0.0419	0.515	1.16	1.12	7.38	0.924	0.322	0.833	0.091	<0.010
	Pyrene	mg/kg	0.053	0.875	0.132	0.228	0.680	2.57	0.048	0.067	0.021	<0.010
	Quinoline	mg/kg	-	-	<0.010	<0.010	0.038	<0.010	<0.010	<0.030	<0.020	<0.010
	C2 sub'd B(a)A/chrysene	mg/kg	-	-	0.906	0.510	3.70	0.183	0.080	0.36	<0.080	<0.040
	C2 Benzofluoranthenes/Benzopyrenes	mg/kg	-	-	1.13	0.946	6.12	0.493	0.158	0.54	<0.080	<0.040
	C2 Biphenyls	mg/kg	-	-	0.498	0.370	3.27	0.051	0.050	0.33	<0.080	<0.040
	C2 Dibenzothiophenes	mg/kg	-	-	0.747	0.196	1.06	0.052	<0.040	0.21	<0.080	<0.040
	C2 Fluoranthenes/Pyrenes	mg/kg	-	-	1.33	0.834	6.33	0.317	0.162	0.63	<0.080	<0.040
	C2 Fluorenes	mg/kg	-	-	0.967	0.741	6.01	0.112	0.146	0.57	0.081	<0.040
	C2 Naphthalenes	mg/kg	-	-	3.57	2.76	24.0	0.641	0.675	2.93	0.184	0.094
	C2 Phenanthrenes/Anthracenes	mg/kg	-	-	2.36	1.47	11.7	0.286	0.294	1.28	0.173	<0.040
	C3 Benzanthracenes/Chrysenes	mg/kg	-	-	0.774	0.429	3.40	0.187	0.091	0.38	<0.080	<0.040
	C3 Dibenzothiophenes	mg/kg	-	-	0.681	0.153	0.59	0.047	0.059	0.12	<0.080	<0.040
	C3 Fluoranthenes/Pyrenes	mg/kg	-	-	1.33	0.781	5.46	0.222	0.126	0.58	0.086	<0.040
	C3 Fluorenes	mg/kg	-	-	0.899	0.498	3.82	0.068	0.099	0.42	0.085	<0.040
	C3 Naphthalenes	mg/kg	-	-	2.20	1.19	11.5	0.211	0.285	1.48	0.100	<0.040
	C3 Phenanthrenes/Anthracenes	mg/kg	-	-	1.27	0.629	4.77	0.131	0.116	0.63	0.101	<0.040
	C4 Benzanthracenes/Chrysenes	mg/kg	-	-	0.453	0.197	1.71	0.055	0.045	0.18	<0.080	<0.040
	C4 Dibenzothiophenes	mg/kg	-	-	0.587	0.056	<0.40	<0.040	<0.040	<0.12	<0.080	<0.040
	C4 Fluoranthenes/Pyrenes	mg/kg	-	-	0.869	0.356	2.94	0.171	0.076	0.29	<0.080	<0.040
	C4 Naphthalenes	mg/kg	-	-	0.885	0.438	3.63	0.087	0.107	0.59	0.113	<0.040
	C4 Phenanthrenes/Anthracenes	mg/kg	-	-	1.00	0.444	2.86	0.075	0.098	0.44	0.117	<0.040
	Acenaphthene d10	%	-	-	74.3	66.4	N/A	72.9	67.2	67.8	69.8	68.9
	Chrysene d12	%	-	-	82.9	78.8	N/A	83.3	80.7	81.1	75.0	79
	Naphthalene d8	%	-	-	61.5	58.0	N/A	64.1	59.9	62.5	65.3	64.6
	Phenanthrene d10	%	-	-	79.7	75.4	N/A	83.2	78	79.1	79.3	77.8
	B(a)P Total Potency Equivalent	mg/kg	-	-	0.125	0.168	0.658	2.4	0.03	0.042	0.021	<0.020
	IACR (CCME)	mg/kg	-	-	1.81	2.37	9.51	31.2	0.62	0.98	0.3	<0.15
	Total PAHs	mg/kg	10[a]	20[b]	4.61	4.44	34.2	11.5	1.20	2.99	0.338	0.109

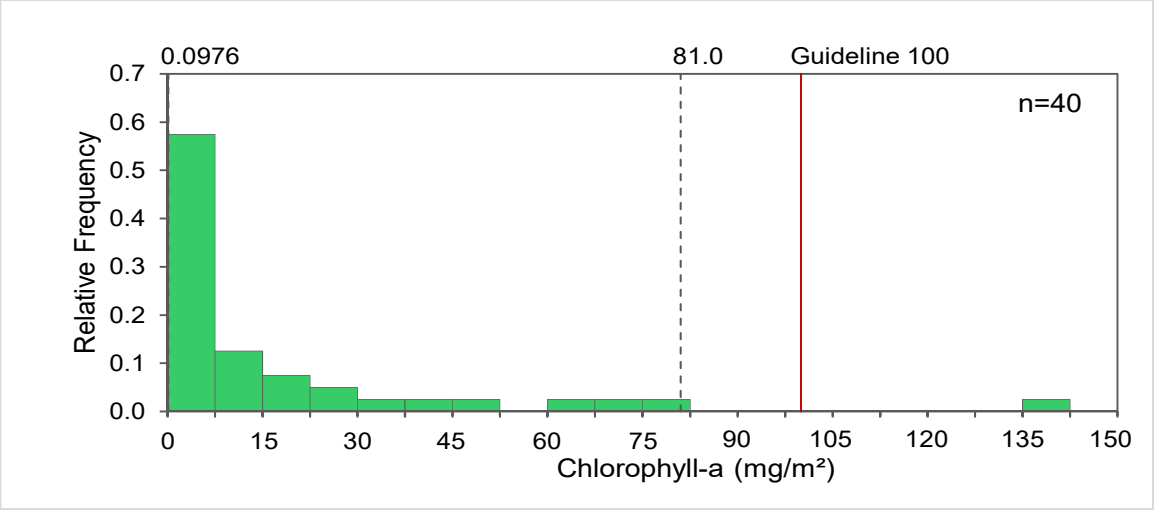
Concentration exceeds the Interim Sediment Quality Guideline (ISQG)/Lowest Effect Level (LEL) or single guideline (for selenium)

Concentration exceeds the Probable Effect Level (PEL)/Severe Effect Level (SEL)

[a] Total PAH guideline for sensitive sites (i.e., sites with sensitive aquatic habitat) based on the British Columbia Contaminated Sites Regulation B.C. Reg. 375/96 Schedule 9

[b] Total PAH guideline for typical sites (i.e., not a sensitive sediment site) based on the British Columbia Contaminated Sites Regulation B.C. Reg. 375/96 Schedule 9

APPENDIX F
PERIPHYTON PRODUCTIVITY AND SELENIUM



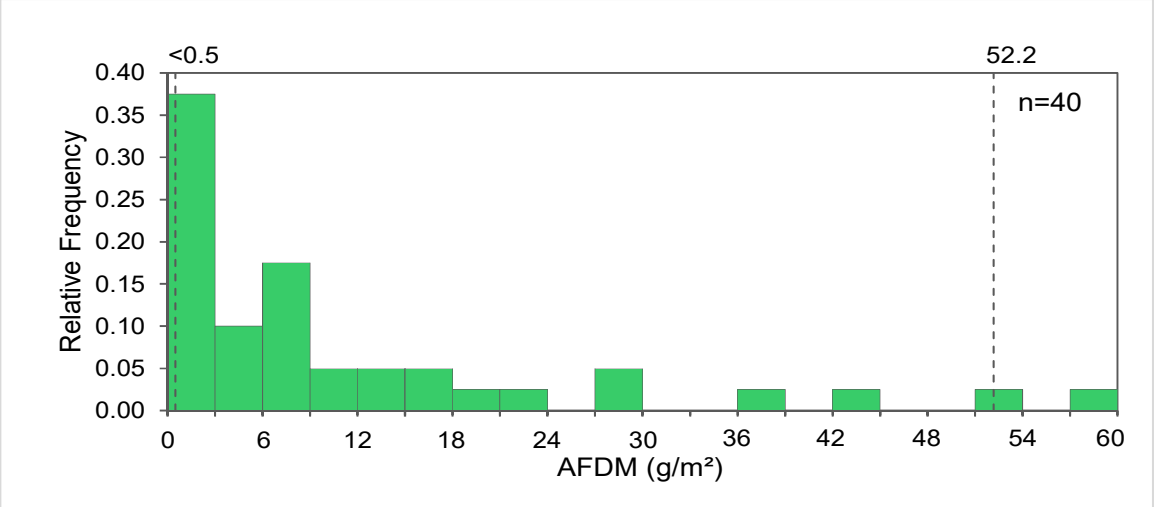
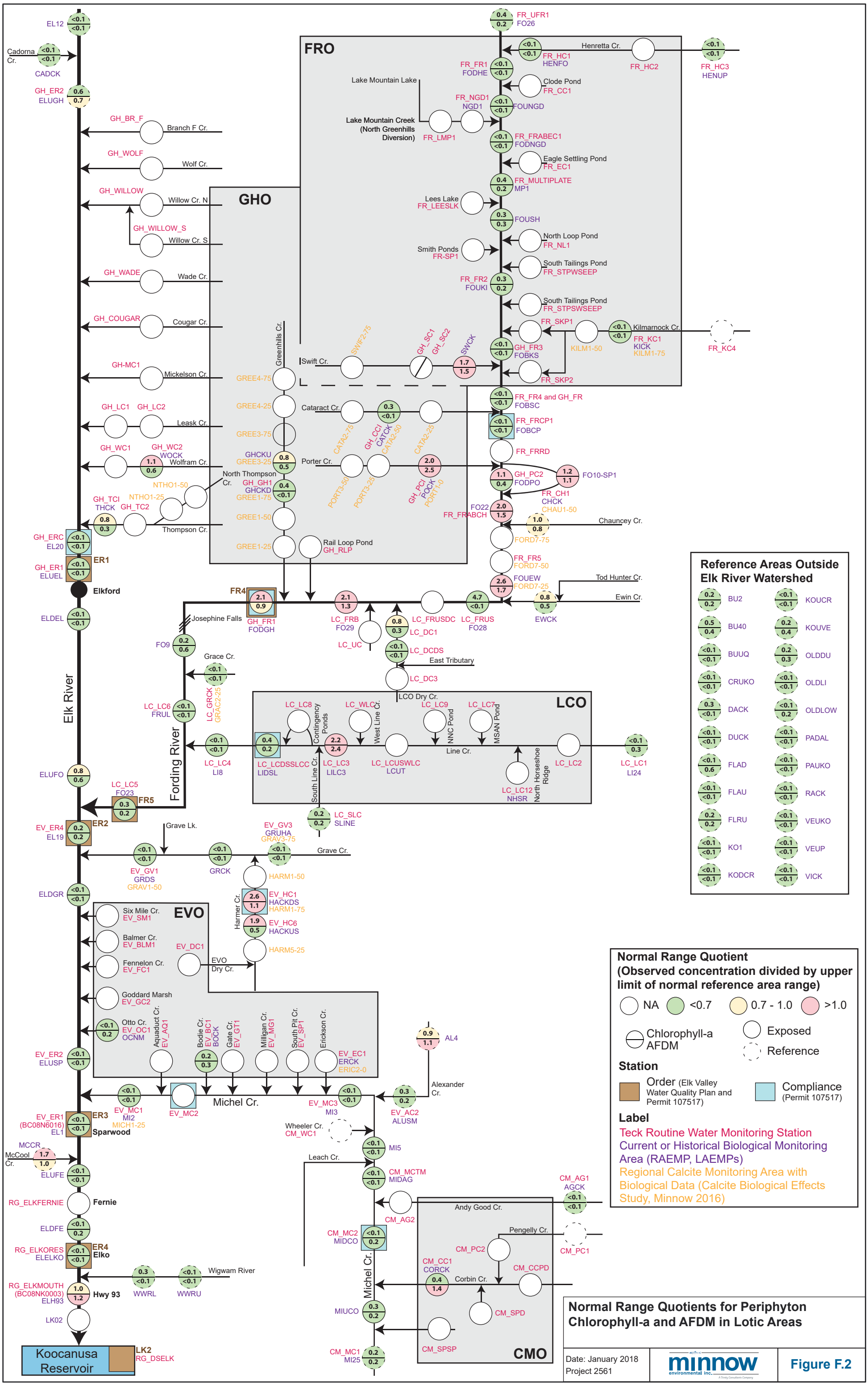


Figure F.1: Distribution of Reference Area Data (n = 40) for Periphyton Chlorophyll-a and Ash-Free-Dry-Mass (AFDM) collected in September, 2015 for all Reference Areas

Notes: Dashed vertical lines represent the 2.5th and 97.5th percentiles. No outliers were identified.


EL12
Cadorna Cr.
CADCK
GH_ER2
ELUGH
GH_BR_F
Branch F Cr.
GH_WOLF
Wolf Cr.
GH_WILLOW
Willow Cr. N
GH_WILLOW_S
Willow Cr. S
GH_WADE
Wade Cr.
GH_COUGAR
Cougar Cr.
GH-MC1
Mickelson Cr.
GH_LC1
GH_LC2
Leask Cr.
GH_WC1
GH_WC2
WOCK
Wolfram Cr.
North Thompson Cr.
GH_GH1
GHCKD
NTHO1-50
GH_TCI
THCK
NTHO1-25
GH_TC2
Thompson Cr.
GH_ERC
EL20
ER1
GH_ER1
ELUEL
Elkford
ELDEL
Elk River
ELUFO
LC_LC5
FO23
FR5
Fording River
EV_ER4
EL19
ER2
Grave Lk.
EV_GV1
GRDS
GRAV1-50
ELDGR
Six Mile Cr.
EV_SM1
Balmer Cr.
EV_BLM1
Fennelon Cr.
EV_FC1
Goddard Marsh
EV_GC2
Otto Cr.
EV_OC1
OCNM
EV_ER2
ELUSP
EV_ER1
(BC08N6016)
EL1
ER3
Sparwood
MCCR
McCool Cr.
ELUFE
RG_ELKFERNIE
Fernie
ELDFE
RG_ELKORES
ELELKO
ER4
Elko
RG_ELKMOUTH
(BC08NK0003)
ELH93
Hwy 93
LK02
Koocanusa Reservoir
LK2
RG_DSELK
WWRL
WWRU
Wigwam River
EVO
Aquaduct Cr.
EV_AQ1
Bodie Cr.
EV_BC1
BOCK
Gate Cr.
EV_GT1
Milligan Cr.
EV_MG1
South Pit Cr.
EV_SP1
Erickson Cr.
EV_EC1
ERCK
ERIC2-0
EV_DC1
EVO Dry Cr.
EV_MC1
MI2
MICH1-25
EV_MC2
Michel Cr.
EV_MC3
MI3
Wheeler Cr.
CM_WC1
Leach Cr.
MI5
CM_MCTM
MIDAG
CM_MC2
MIDCO
MIUCO
CM_MC1
MI25
AL4
Alexander Cr.
EV_AC2
ALUSM
CM_AG2
CM_AG1
AGCK
Andy Good Cr.
Pengelly Cr.
CM_PC1
CM_PC2
CM_CC1
CORCK
Corbin Cr.
CM_CCPD
CM_SPD
CM_SPSP
CMO
EV_GV3
GRUHA
GRAV3-75
Grave Cr.
HARM1-50
Harmer Cr.
EV_HC1
HACKDS
HARM1-75
EV_HC6
HACKUS
HARM5-25
GRCK
GRAC2-25
LC_GRCK
Grace Cr.
LC_LC6
FRUL
LC_LC4
LI8
FR4
GH_FR1
FODGH
Josephine Falls
FO9
LC_FRB
FO29
LC_UC
LC_FRUSDC
LC_FRUS
FO28
LC_DC1
LC_DCDS
East Tributary
LC_DC3
LCO Dry Cr.
LCO
LC_LC8
Contingency Ponds
LC_WLC
West Line Cr.
LC_LC9
NNC Pond
LC_LC7
MSAN Pond
Line Cr.
LC_LCDSSLCC
LIDSL
LC_LC3
LILC3
LC_LCUSWLC
LCUT
LC_LC12
NHSR
North Horseshoe Ridge
LC_LC2
LC_LC1
LI24
South Line Cr.
LC_SLC
SLINE
Greenhills Cr.
GREE4-75
GREE4-25
GREE3-75
GHCKU
GREE3-25
GREE1-75
GREE1-50
GREE1-25
Rail Loop Pond
GH_RLP
Swift Cr.
SWIF2-75
GH_SC1
GH_SC2
SWCK
Cataract Cr.
CATA2-75
GH_CC1
CATCK
CATA2-50
CATA2-25
Porter Cr.
PORT3-50
PORT3-25
GH_PC1
POCK
PORT1-0
FRO
FR_UFR1
FO26
FR_HC1
HENFO
Henretta Cr.
FR_HC2
FR_HC3
HENUP
FR_FR1
FODHE
Lake Mountain Lake
Clode Pond
FR_CC1
FR_NGD1
NGD1
FOUNGD
Lake Mountain Creek (North Greenhills Diversion)
FR_LMP1
FR_FRABEC1
FODNGD
Eagle Settling Pond
FR_EC1
FR_MULTIPLATE
MP1
Lees Lake
FR_LEESLK
FOUSH
North Loop Pond
FR_NL1
Smith Ponds
FR-SP1
South Tailings Pond
FR_STPWSEEP
FR_FR2
FOUKI
South Tailings Pond
FR_STPSWSEEP
FR_SKP1
Kilmarnock Cr.
FR_KC1
KICK
KILM1-75
KILM1-50
FR_KC4
GH_FR3
FOBKS
FR_SKP2
FR_FR4 and GH_FR
FOBSC
FR_FRCP1
FOBCP
FR_FRRD
GH_PC2
FODPO
FO10-SP1
FR_CH1
CHCK
CHAU1-50
FO22
FR_FRABCH
Chauncey Cr.
FORD7-75
FR_FR5
FORD7-50
FOUEW
FORD7-25
Tod Hunter Cr.
Ewin Cr.
EWCK
Reference Areas Outside Elk River Watershed
BU2
BU40
BUUQ
CRUKO
DACK
DUCK
FLAD
FLAU
FLRU
KO1
KODCR
KOUCR
KOUVE
OLDDU
OLDLI
OLDLOW
PADAL
PAUKO
RACK
VEUKO
VEUP
VICK
Normal Range Quotient
(Observed concentration divided by upper limit of normal reference area range)
NA
<0.7
0.7 - 1.0
>1.0
Chlorophyll-a
AFDM
Exposed
Reference
Station
Order (Elk Valley Water Quality Plan and Permit 107517)
Compliance (Permit 107517)
Label
Teck Routine Water Monitoring Station
Current or Historical Biological Monitoring Area (RAEMP, LAEMPs)
Regional Calcite Monitoring Area with Biological Data (Calcite Biological Effects Study, Minnow 2016)
Normal Range Quotients for Periphyton Chlorophyll-a and AFDM in Lotic Areas
Date: January 2018
Project 2561
minnow environmental inc.
Figure F.2

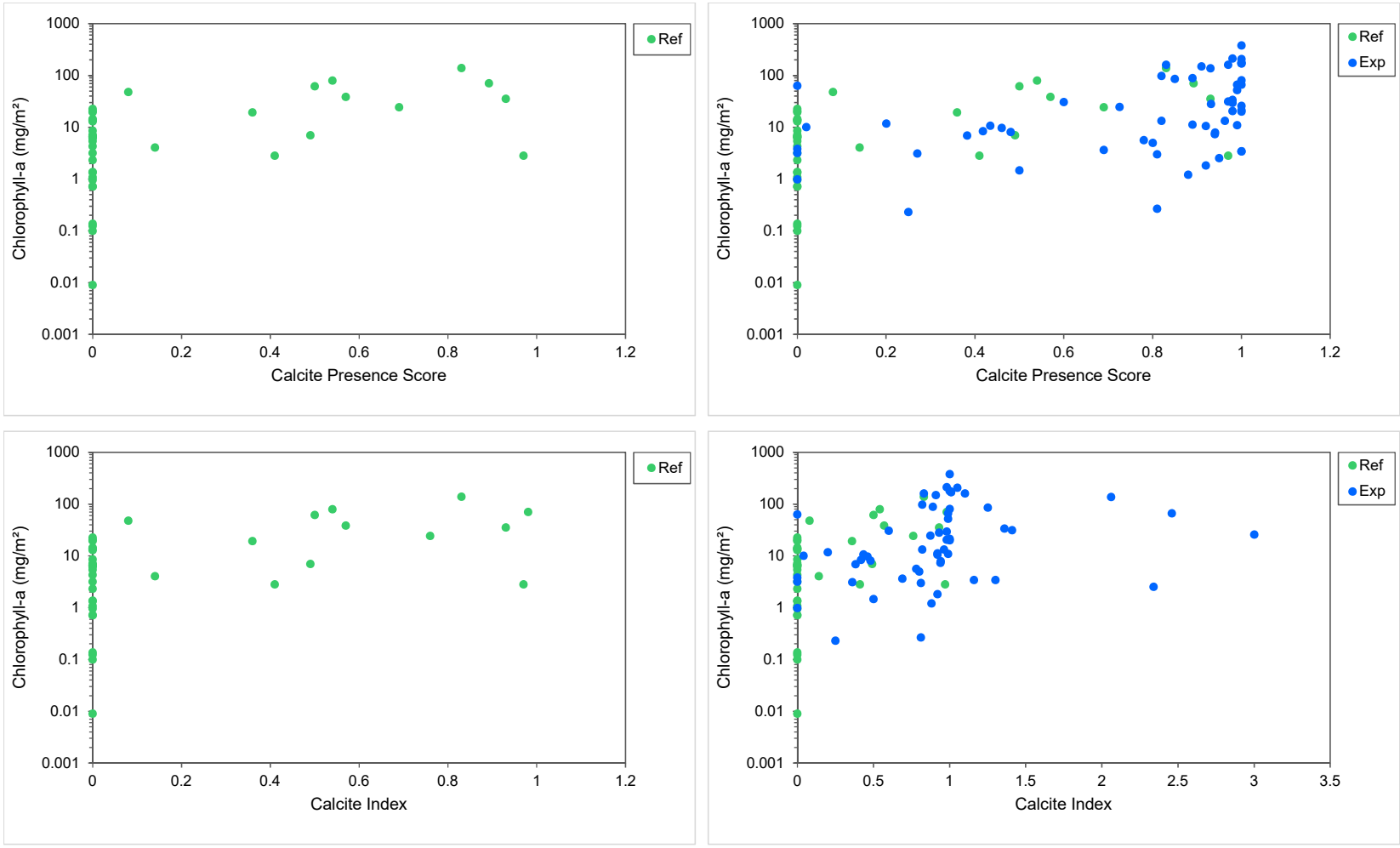
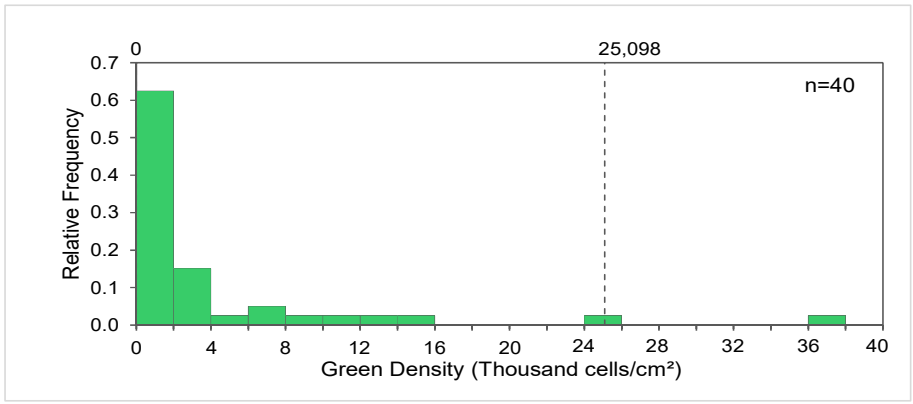
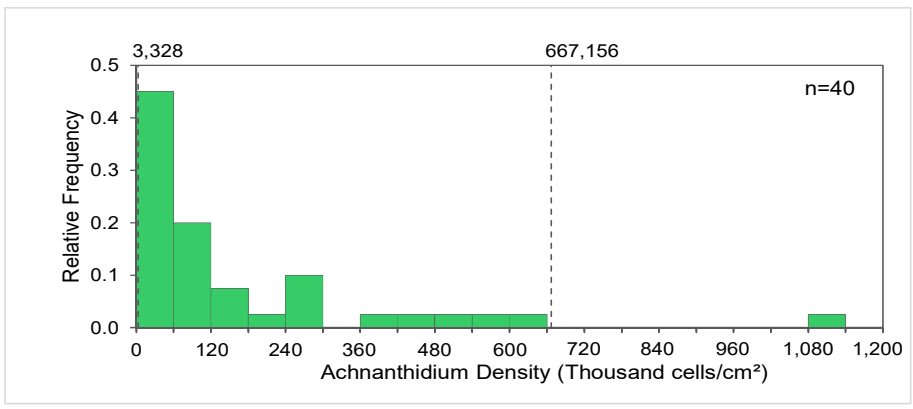
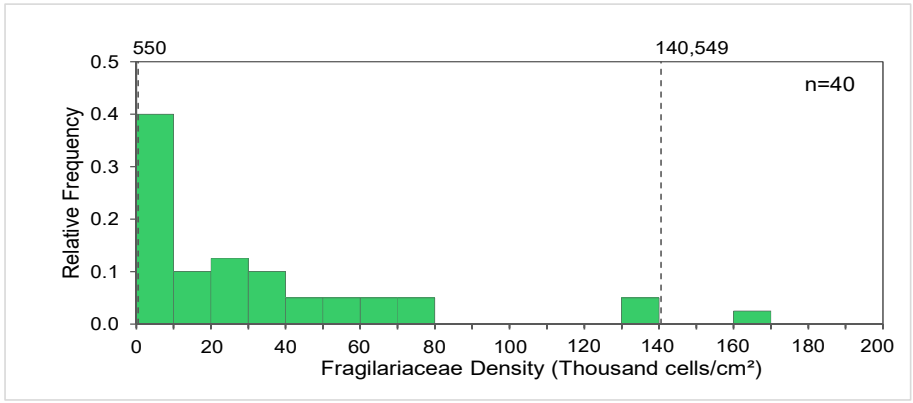


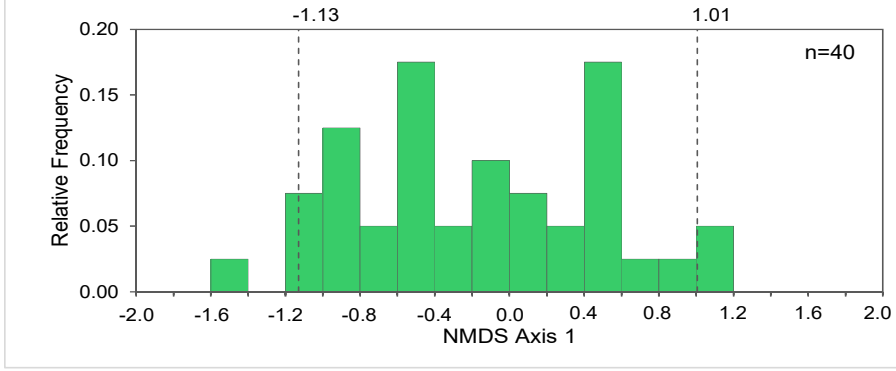
Figure F.3: Scatterplots of Periphyton Chlorophyll-a versus Calcite Presence Score and Calcite Index for Reference Areas (n = 40) (left) and Reference (n = 40) and Mine-exposed (n = 58*) Areas (Right)

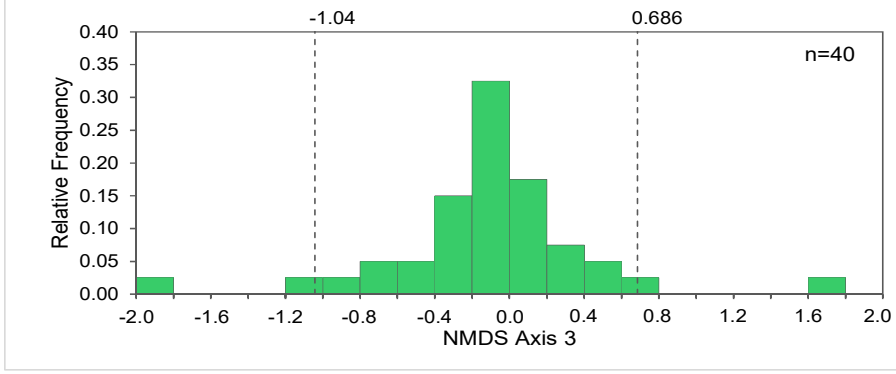
Notes: * Chlorophyll-a was not sampled at mine-exposed area NGD1.
Calcite presence score and calcite index were the two environmental variables that had Spearman correlation coefficients (r) with magnitude greater than 0.5 with chlorophyll-a











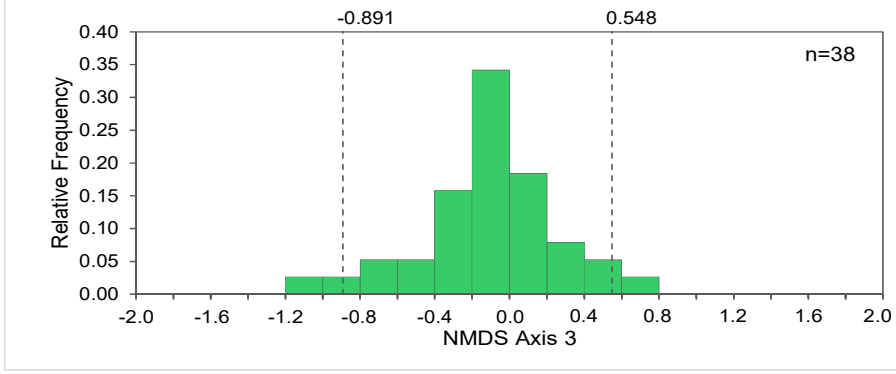


Figure F.4: Distribution of Reference Area Data (n = 40) for Periphyton Community Endpoints collected in 2015 for all Reference Areas (Left) and After Removal of Outliers (Right; when Applicable)

Notes: Dashed vertical lines represent the 2.5th and 97.5th percentiles.

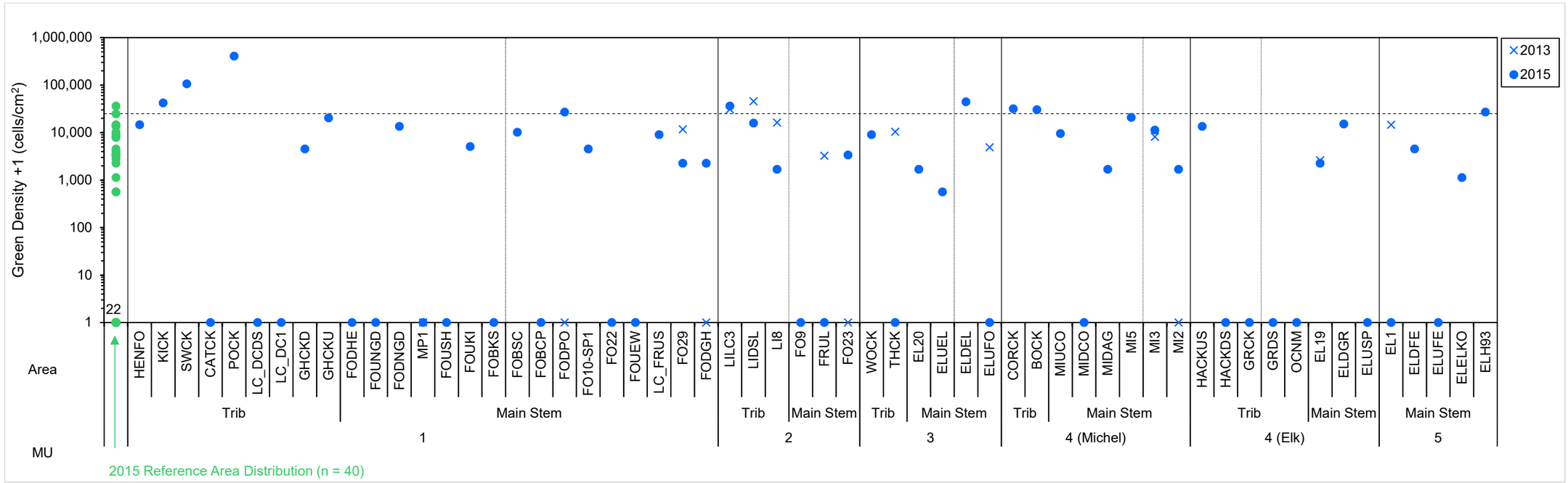


Figure F.5: Green Density for Mine-exposed Areas in Lotic Habitats, 2013 and 2015

Note: Dashed horiztonal lines represent the limits of the reference area normal range. The lower limit is a density of zero (plotted at Y = 1 in the plot)
A value of 1 has been added to the density to accommodate a log-transformation (zeros were present)

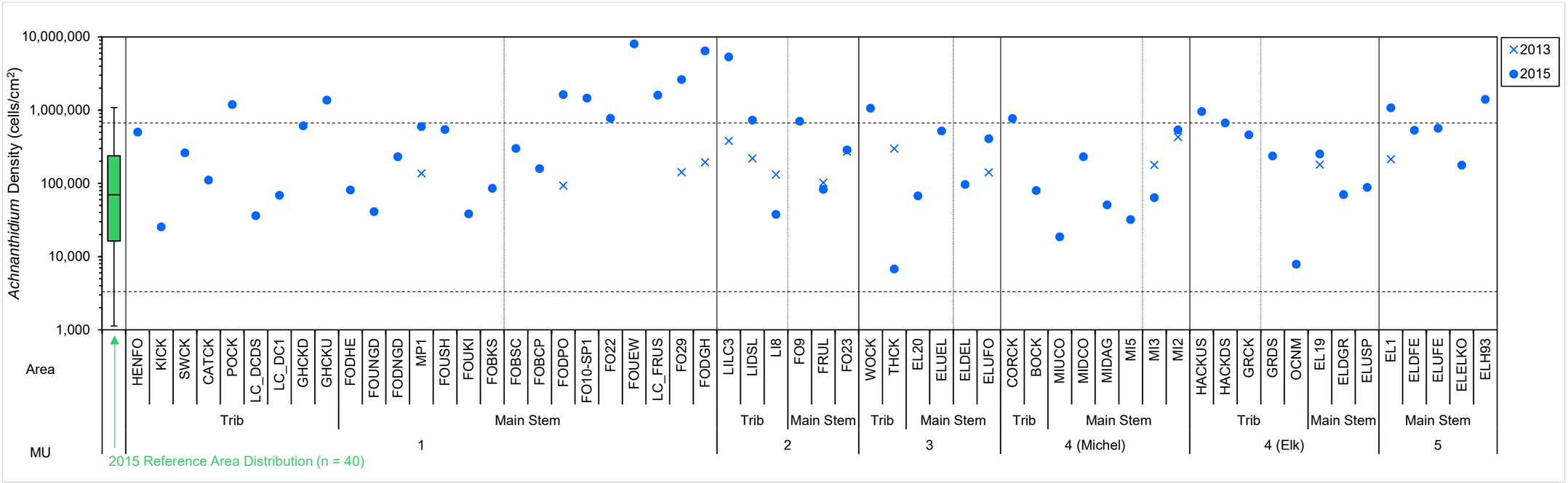


Figure F.6: *Achnanthidium* Density for Mine-exposed Areas in Lotic Habitats, 2013 and 2015

Note: Dashed horiztonal lines represent the limits of the reference area normal range.

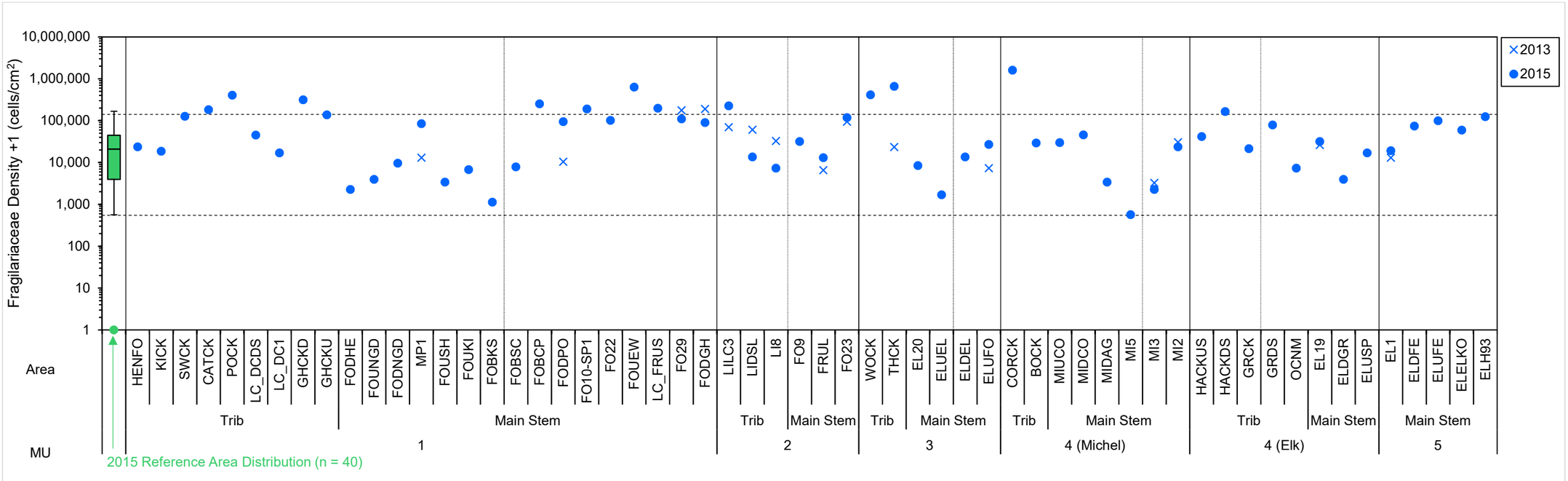


Figure F.7: Fragilariaceae Density for Mine-exposed Areas in Lotic Habitats, 2013 and 2015

Note: Dashed horiztonal lines represent the limits of the reference area normal range.
A value of 1 has been added to the density to accommodate a log-transformation (zeros were present)

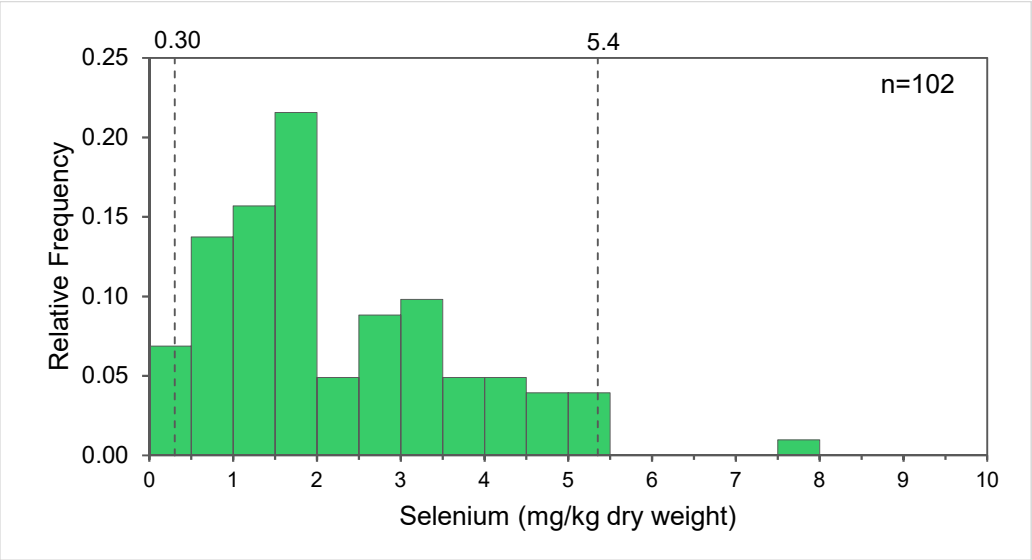


Figure F.8: Distribution of Reference Area Data for Tissue Selenium Concentrations for Periphyton in the Elk Valley, 1996 - 2015

Notes: Dashed vertical lines represent the 2.5th and 97.5th percentiles. No outliers were identified.

EL12
Cadorna Cr.
CADCK
GH_ER2
ELUGH
0.1
GH_BR_F
Branch F Cr.
GH_WOLF
Wolf Cr.
GH_WILLOW
Willow Cr. N
GH_WILLOW_S
Willow Cr. S
GH_WADE
Wade Cr.
GH_COUGAR
Cougar Cr.
GH-MC1
Mickelson Cr.
GH_LC1
GH_LC2
Leask Cr.
GH_WC1
GH_WC2
WOCK
Wolfram Cr.
NTHO1-50
North Thompson Cr.
GH_GH1
GHCKD
GREE1-75
GH_TCI
THCK
NTHO1-25
GH_TC2
Thompson Cr.
GH_ERC
EL20
0.2
ER1
GH_ER1
ELUEL
Elkford
ELDEL
Elk River
ELUFO
LC_LC5
FO23
1.7
FR5
Fording River
EV_ER4
EL19
0.3
ER2
Grave Lk.
EV_GV1
GRDS
GRAV1-50
ELDGR
Six Mile Cr.
EV_SM1
Balmer Cr.
EV_BLM1
Fennelon Cr.
EV_FC1
Goddard Marsh
EV_GC2
Otto Cr.
EV_OC1
OCNM
EV_ER2
ELUSP
Koocanusa Reservoir
LK2
RG_DSELK
RG_ELKMOUTH
(BC08NK0003)
ELH93
Hwy 93
LK02
RG_ELKORES
ELELKO
0.2
ER4
Elko
RG_ELKFERNIE
Fernie
ELDFE
MCCR
McCool Cr.
ELUFE
EV_ER1
(BC08N6016)
EL1
0.3
ER3
Sparwood
WWRL
WWRU
Wigwam River
EV_MC1
MI2
MICH1-25
0.4
EV_MC2
Michel Cr.
EV_MC3
MI3
0.2
EV_AC2
ALUSM
0.3
AL4
Alexander Cr.
Wheeler Cr.
CM_WC1
MI5
Leach Cr.
CM_MCTM
MIDAG
CM_AG2
CM_MC2
MIDCO
0.2
Michel Cr.
MIUCO
CM_MC1
MI25
0.1
CM_SPSP
CMO
Andy Good Cr.
CM_AG1
AGCK
Pengelly Cr.
CM_PC1
CM_PC2
CM_CC1
CORCK
Corbin Cr.
CM_CCPD
CM_SPD
EV_DC1
EVO Dry Cr.
EVO
Aquaduct Cr.
EV_AQ1
Bodie Cr.
EV_BC1
BOCK
Gate Cr.
EV_GT1
Milligan Cr.
EV_MG1
South Pit Cr.
EV_SP1
Erickson Cr.
EV_EC1
ERCK
ERIC2-0
EV_HC1
HACKDS
HARM1-75
Harmer Cr.
2.9
EV_HC6
HACKUS
HARM5-25
EV_GV3
GRUHA
GRAV3-75
Grave Cr.
HARM1-50
GRCK
LC_SLC
SLINE
0.3
South Line Cr.
LC_LC12
NHSR
North Horseshoe Ridge
LC_LC2
LC_LC1
LI24
0.5
Line Cr.
LC_LCUSWLC
LCUT
LC_LC3
LILC3
0.7
LC_LCDSSLCC
LIDSL
0.3
LC_LC4
LI8
1.0
LC_LC6
FRUL
0.7
LC_GRCK
GRAC2-25
Grace Cr.
LCO Dry Cr.
East Tributary
LC_DC3
LC_DCDS
LC_DC1
LC_UC
LC_FRB
FO29
LC_FRUSDC
LC_FRUS
FO28
EWCK
Tod Hunter Cr.
Ewin Cr.
FOUEW
FORD7-25
FR_FR5
FORD7-50
FORD7-75
Chauncey Cr.
FO22
FR_FRABCH
FR_CH1
CHCK
CHAU1-50
1.2
GH_PC2
FODPO
FO10-SP1
FR_FRRD
FR_FRCP1
FOBCP
FR_FR4 and GH_FR
FOBSC
GH_FR3
FOBKS
FR_SKP2
FR_SKP1
KILM1-50
Kilmarnock Cr.
FR_KC1
KICK
KILM1-75
FR_KC4
LC_LC8
Contingency Ponds
LC_WLC
West Line Cr.
LC_LC9
NNC Pond
LC_LC7
MSAN Pond
LCO
FR4
0.8
GH_FR1
FODGH
Josephine Falls
FO9
Rail Loop Pond
GH_RLP
GREE1-25
GREE1-50
GREE3-25
GHCKU
GREE3-75
GREE4-25
GREE4-75
Greenhills Cr.
Cataract Cr.
CATA2-75
GH_CCI
CATCK
CATA2-50
CATA2-25
Porter Cr.
PORT3-50
PORT3-25
GH_PCI
POCK
PORT1-0
Swift Cr.
SWIF2-75
GH_SC1
GH_SC2
SWCK
GH_FR2
FOUKI
FR_STPSWSEEP
South Tailings Pond
FR_STPSWSEEP
Smith Ponds
FR-SP1
North Loop Pond
FR_NL1
FOUSH
Lees Lake
FR_LEESLK
FR_MULTIPLATE
MP1
Eagle Settling Pond
FR_EC1
FR_FRABEC1
FODNGD
FR_NGD1
NGD1
FOUNGD
Lake Mountain Creek
(North Greenhills Diversion)
FR_LMP1
Lake Mountain Lake
Clode Pond
FR_CC1
FR_FR1
FODHE
Henretta Cr.
FR_HC1
HENFO
FR_HC2
FR_HC3
HENUP
0.2
FR_UFR1
FO26
FRO
GHO

Normal Range Quotient

NA | 0.5 - 1.0 | Reference

0 - 0.5 | >1.0 | Exposed

Station

Order (Elk Valley Water Quality Plan and Permit 107517)

Compliance (Permit 107517)

Label

Teck Routine Water Monitoring Station

Current or Historical Biological Monitoring Area (RAEMP, LAEMPs)

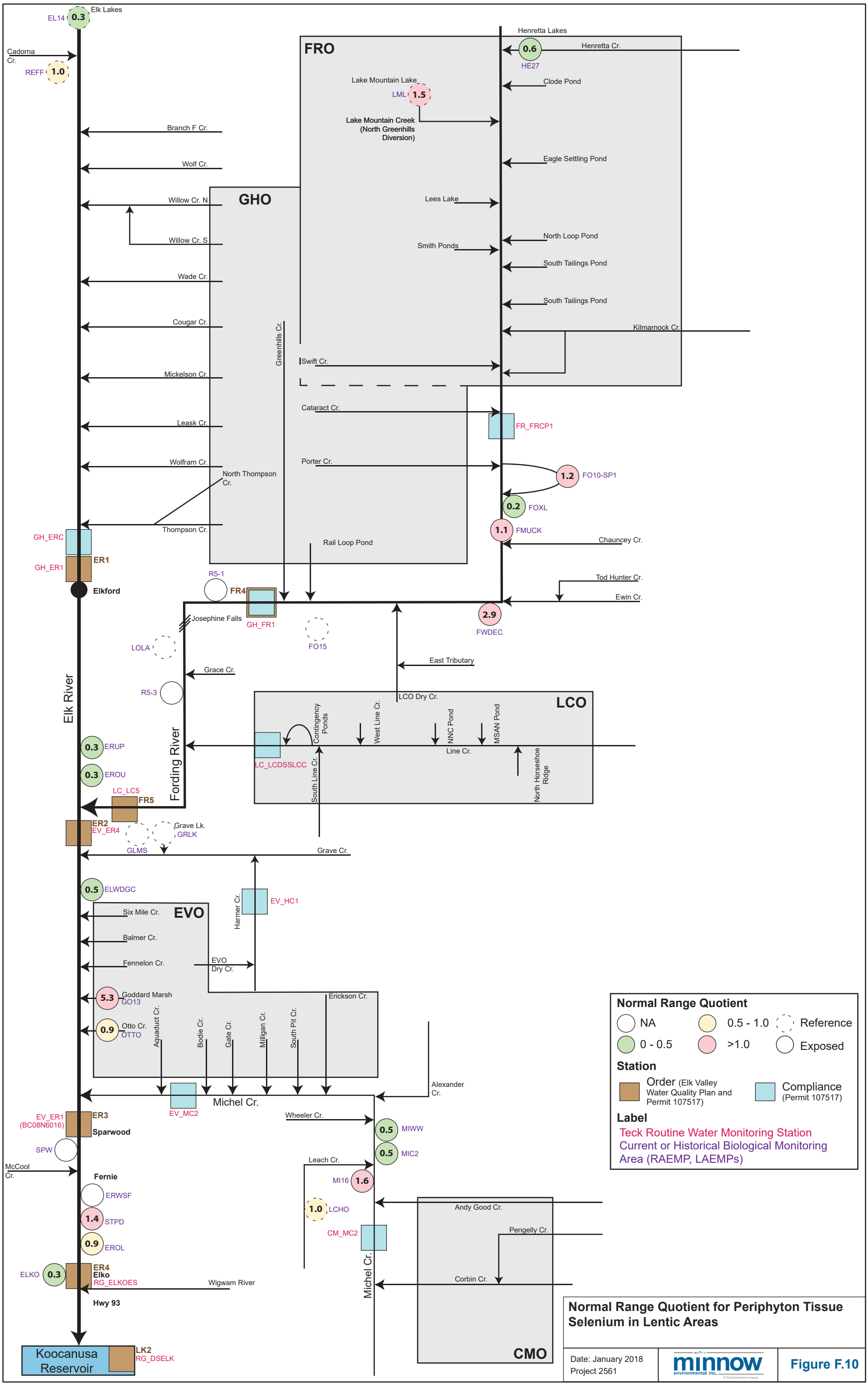
Regional Calcite Monitoring Area with Biological Data (Calcite Biological Effects Study, Minnow 2016)

Normal Range Quotient for Periphyton Tissue Selenium in Lotic Areas

Date: January 2018
Project 2561

minnow environmental inc.

Figure F.9



Normal Range Quotient for Periphyton Tissue Selenium in Lentic Areas

Date: January 2018
Project 2561

minnow environmental inc. A Trinity Consultants Company

Figure F.10

Table F.1: **Periphyton Ash-Free Dry Mass (AFDM) and Chlorophyll-a for Samples Collected from Reference Lotic Areas**

Management Unit	Main Watershed	Stream Type	Area Description	Biological Area Code	UTM (NAD83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)
1	Upper Fording	Tributary	Henretta u/s all mine operations	HENUP	655887	5567716	-	-	-	-	-	-	15-Sep-15	1.0	4.1	-	-	-
			Chauncey Creek near mouth (CHCK)	CHCK-1	655349	5552776	17-Sep-13	5.4	0.1	-	-	-	-	-	-	-	-	-
				CHCK-2			17-Sep-13	5.8	0.1	-	-	-	-	-	-	-	-	-
				CHCK-3			17-Sep-13	2.2	0.6	-	-	-	-	-	-	-	-	-
				CHCK-4			17-Sep-13	2.7	0.6	-	-	-	-	-	-	-	-	-
				CHCK-5			17-Sep-13	6.3	0.2	-	-	-	12-Sep-15	42	80	-	-	-
							Mean[a] =	4.4	0.3	-	-	-	-	-	-	-	-	-
			Ewin Creek near mouth	EWCK	657208	5547645	-	-	-	-	-	-	12-Sep-15	27	62	-	-	-
		Main Stem	Fording u/s Henretta (u/s all mines)	FO26	653064	5569601	-	-	-	-	-	-	14-Sep-15	13	36	12-Sep-16	81	**159**
2	Lower Fording	Tributary	Grace Creek	LC_GRCK	654283	5540738	-	-	-	-	-	-	18-Sep-15	0.50	1.4	-	-	-
	Line	Tributary	Line Creek Reference (LI24)	LI24-1	662214	5538393	21-Sep-13	6.2	1.7	6-Sep-14	3.0	1.2	10-Sep-15	3.4	7.2	8-Sep-16	12	17
				LI24-2			21-Sep-13	3.6	1.5	6-Sep-14	2.1	0.9	10-Sep-15	3.5	9.7	-	-	-
				LI24-3			21-Sep-13	5.7	1.4	6-Sep-14	2.8	3.9	10-Sep-15	3.3	7.1	-	-	-
				LI24-4			21-Sep-13	7.0	2.5	6-Sep-14	4.6	1.2	10-Sep-15	5.0	7.9	-	-	-
				LI24-5			21-Sep-13	8.4	5.0	6-Sep-14	5.7	2.3	10-Sep-15	4.8	9.6	-	-	-
				LI24-6			-	-	-	6-Sep-14	4.1	0.5	10-Sep-15	3.0	4.9	-	-	-
				LI24-7			-	-	-	6-Sep-14	3.1	0.8	10-Sep-15	3.2	6.5	-	-	-
				LI24-8			-	-	-	6-Sep-14	3.3	1.6	10-Sep-15	3.0	8.1	-	-	-
				LI24-9			-	-	-	6-Sep-14	3	0.3	10-Sep-15	-	5.8	-	-	-
				LI24-10			-	-	-	6-Sep-14	3.5	0.7	10-Sep-15	3.2	4.8	-	-	-
							Mean[a] =	6.2	2.4	-	3.5	1.3	-	3.6	7.2	-	12.4	17
			South Line Creek Reference (SLINE)	SLINE-1	661122	5531374	23-Sep-13	5.2	3.6	4-Sep-14	2	1.1	15-Sep-15	20	42	8-Sep-16	8.2	23
				SLINE-2			23-Sep-13	7.2	8.2	4-Sep-14	1.9	1	15-Sep-15	6.3	16	-	-	-
				SLINE-3			23-Sep-13	5.9	7.0	4-Sep-14	3	0	15-Sep-15	11	24	-	-	-
				SLINE-4			23-Sep-13	13	2.8	4-Sep-14	2	1	15-Sep-15	13	29	-	-	-
				SLINE-5			23-Sep-13	13	5.2	4-Sep-14	1.7	3	15-Sep-15	7.4	18	-	-	-
				SLINE-6			-	-	-	4-Sep-14	2.6	1	15-Sep-15	9.6	28	-	-	-
				SLINE-7			-	-	-	4-Sep-14	1.8	0.1	15-Sep-15	4.2	9.9	-	-	-
				SLINE-8			-	-	-	4-Sep-14	0.8	0.1	15-Sep-15	3.8	9.2	-	-	-
				SLINE-9			-	-	-	4-Sep-14	1.8	0.6	15-Sep-15	1.6	4.8	-	-	-
				SLINE-10			-	-	-	4-Sep-14	0.6	0	15-Sep-15	6.1	17	-	-	-
							Mean[a] =	8.9	5.3	-	1.8	0.7	-	8.3	20	-	8.2	23
3	Elk	Main Stem	Elk River u/s Branch	ELUGH	646477	5557523	-	-	-	-	-	-	17-Sep-15	37	48	10-Sep-16	31	38
4	Michel	Tributary	Grave Creek u/s Harmer	GRUHA	659422	5523781	-	-	-	-	-	-	11-Sep-15	0.50	2.8	-	-	-
			Upper Alexander Creek	AL4	664974	5509024	-	-	-	-	-	-	13-Sep-15	59	71	-	-	-
			Alexander Creek upstream of Michel	ALUSM	663482	5502718	-	-	-	-	-	-	13-Sep-15	10	24	13-Sep-16	16	23
			Andy Good u/s CMO influence	AGCK	667551	5488669	-	-	-	-	-	-	12-Sep-15	0.50	0.97	-	-	-
		Main Stem	Michel u/s CMO influence	MI25	668266	5482795	22-Sep-13	3.0	0.47	-	-	-	10-Sep-15	8.0	19	12-Sep-16	22.1	39
							22-Sep-13	1.6	0.71	-	-	-	-	-	-	-	-	-
							22-Sep-13	0.50	0.99	-	-	-	-	-	-	-	-	-
							Mean[a] =	1.7	0.72	-	-	-	-	8.0	19	-	-	-

Chlorophyll-a values outside normal range

AFDM values outside normal range

Bold indicates result above the BC periphyton chlorophyll-a guideline of 100 mg/m^2.

[a] The Method Detection Limit (MDL) was used to calculate the mean where measured concentrations were below the MDL.

NA - not applicable.

Table F.1: **Periphyton Ash-Free Dry Mass (AFDM) and Chlorophyll-a for Samples Collected from Reference Lotic Areas**

Management Unit	Main Watershed	Stream Type	Area Description	Biological Area Code	UTM (NAD83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)
5	Elk	Tributary	McCool Creek	MCCR	648151	5499951	-	-	-	-	-	-	11-Sep-15	52	**139**	-	-	-
NA	Kootenay	-	Bull River	BU2	631852	5505579	-	-	-	-	-	-	13-Sep-15	13	14	-	-	-
NA	Kootenay		Bull River 40 km Bridge	BU40	626589	5499846	-	-	-	-	-	-	13-Sep-15	22	39	-	-	-
NA	Kootenay		Bull River u/s Quinn	BUUQ	633561	5519210	-	-	-	-	-	-	13-Sep-15	0.50	1.4	-	-	-
NA	Elk		Cadorna Creek u/s Elk River	CADCK	645826	5589227	-	-	-	-	-	-	13-Sep-15	7.8	7.0	-	-	-
NA	Kootenay		Cross River u/s Kootenay River	CRUKO	585502	5614058	-	-	-	-	-	-	11-Sep-15	0.50	0.10	-	-	-
NA	Oldman		Daisy Creek	DACK	685988	5523955	-	-	-	-	-	-	12-Sep-15	6.9	23	-	-	-
NA	Oldman		Dutch Creek	DUCK	687139	5531110	-	-	-	-	-	-	11-Sep-15	5.4	6.6	-	-	-
NA	Elk		Elk River d/s of Cadorna	EL12	646175	5589009	-	-	-	-	-	-	13-Sep-15	1.7	2.8	-	-	-
NA	Flathead		Flathead River Downstream	FLAD	682705	5443985	-	-	-	-	-	-	14-Sep-15	29	6.7	-	-	-
NA	Flathead		Flathead River Upstream	FLAU	680187	5453294	-	-	-	-	-	-	14-Sep-15	0.50	0.72	-	-	-
NA	Flathead		Upper Flathead River	FLRU	668175	5470823	-	-	-	-	-	-	19-Sep-15	8.5	13	-	-	-
NA	Kootenay		Kootenay River	KO1	591185	5561577	-	-	-	-	-	-	13-Sep-15	0.50	0.14	-	-	-
NA	Kootenay		Kootenay River d/s Cross River	KODCR	584744	5607649	-	-	-	-	-	-	12-Sep-15	1.2	3.2	-	-	-
NA	Kootenay		Kootenay River u/s Cross River	KOUCR	579591	5616187	-	-	-	-	-	-	12-Sep-15	5.5	2.3	-	-	-
NA	Kootenay		Kootenay River u/s Vermillion	KOUVE	569766	5630957	-	-	-	-	-	-	10-Sep-15	19	15	-	-	-
NA	Oldman		Oldman d/s Dutch, u/s Racehorse	OLDDU	687855	5530302	-	-	-	-	-	-	12-Sep-15	17	14	-	-	-
NA	Oldman		Oldman d/s Livingstone	OLDLI	687526	5532685	-	-	-	-	-	-	11-Sep-15	5.3	6.6	-	-	-
NA	Oldman		Oldman lower u/s reservoir	OLDLOW	710028	5512469	-	-	-	-	-	-	10-Sep-15	9.8	5.5	-	-	-
NA	Kootenay		Palliser River d/s Albert	PADAL	601173	5598667	-	-	-	-	-	-	11-Sep-15	0.60	0.73	-	-	-
NA	Oldman		Palliser River u/s Kootenay, d/s Fenwick	PAUKO	595626	5590338	-	-	-	-	-	-	11-Sep-15	0.50	0.0091	-	-	-
NA	Oldman		Racehorse Creek	RACK	687621	5526336	-	-	-	-	-	-	11-Sep-15	1.3	4.3	-	-	-
NA	Kootenay		Vermillion u/s Kootenay, d/s Simpson	VEUKO	569465	5641604	-	-	-	-	-	-	10-Sep-15	0.95	1.1	-	-	-
NA	Kootenay		Vermillion Upper, u/s Simpson	VEUP	561227	5670806	-	-	-	-	-	-	10-Sep-15	4.3	6.2	-	-	-
NA	Oldman		Vicary Creek	VICK	682461	5519665	-	-	-	-	-	-	10-Sep-15	6.9	8.7	-	-	-
5	Elk		Lower Wigwam River	WWRL	646099	5458836	-	-	-	-	-	-	11-Sep-15	7.6	21	-	-	-
			Upper Wigwam River	WWRU	648769	5448916	-	-	-	-	-	-	19-Sep-15	1.2	0.13	-	-	-

Chlorophyll-a values outside normal range

AFDM values outside normal range

Bold indicates result above the BC periphyton chlorophyll-a guideline of 100 mg/m^2.

[a] The laboratory reporting limit (LRL) was used to calculate the mean where measured concentrations were below the LRL.

NA - not applicable.

Table F.2: **Periphyton Ash-Free Dry Mass (AFDM) and Chlorophyll-a for Samples Collected from Mine-exposed Lotic Areas**

Management Unit	Main Watershed	Stream Type	Area Description	Biological Area Code	UTM (NAD83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)
1	Fording	Tributary	Henretta u/s confluence with Fording	HENFO	652236	5566472	-	-	-	-	-	-	16-Sep-15	3.5	7.4	-	-	-
			Kilmarnock u/s road crossing	KICK	652878	5559847	-	-	-	-	-	-	17-Sep-15	1.3	2.5	-	-	-
			Swift Creek	SWCK	652062	5558541	-	-	-	-	-	-	10-Sep-15	78	**138**	-	-	-
			Cataract Creek near mouth	CATCK	652447	5557452	-	-	-	-	-	-	11-Sep-15	3.4	26	-	-	-
			Porter Creek	POCK	653596	5555208	-	-	-	-	-	-	14-Sep-15	133	**161**	-	-	-
			Fording Side Channel (old Fording oxbow)	FO10-SP1	654245	5555299	-	-	-	-	-	-	17-Sep-15	59	98	-	-	-
			Dry Creek d/s sedimentation ponds	LC_DCDS	657713	5542177	-	-	-	-	-	-	15-Sep-15	2.2	3.9	-	-	-
			Dry Creek near mouth	LC_DC1	656503	5544668	-	-	-	-	-	-	13-Sep-15	17	64	-	-	-
			Greenhills Creek d/s of settling pond	GHCKD	653537	5545602	-	-	-	-	-	-	15-Sep-15	6.8	31	-	-	-
			Greenhills Creek u/s settling pond	GHCKU	653755	5546168	-	-	-	-	-	-	15-Sep-15	26	67	-	-	-
	Fording	Main Stem	Fording d/s Henretta	FODHE	651305	5565503	-	-	-	-	-	-	14-Sep-15	<0.50	1.2	-	-	-
			Fording u/s North Greenhills Diversion	FOUNGD	650993	5563529	-	-	-	-	-	-	15-Sep-15	0.75	3.0	-	-	-
			Fording d/s North Greenhills Diverson	FODNGD	650883	5563190	-	-	-	-	-	-	14-Sep-15	0.75	5.0	-	-	-
			Fording Multiplate d/s Eagle Ponds	MP1	651158	5562442	-	-	-	-	-	-	15-Sep-15	9.4	30	-	-	-
			Fording u/s Shandley Creek	FOUSH	650863	5560970	-	-	-	-	-	-	15-Sep-15	16	21	-	-	-
			Fording u/s Kilmarnock Creek	FOUKI	651861	5559872	-	-	-	-	-	-	16-Sep-15	11	21	-	-	-
			Fording between Kilmarnock & Swift	FOBKS	652065	5558691	-	-	-	-	-	-	16-Sep-15	2.2	1.8	-	-	-
			Fording d/s Swift, u/s Cataract	FOBSC	652342	5558207	-	-	-	-	-	-	17-Sep-15	3.7	3.4	-	-	-
			Fording between Cataract & Porter	FOBCP	652846	5557174	-	-	-	-	-	-	17-Sep-15	2.6	3.4	-	-	-
			Fording d/s Porter, u/s Chauncey	FODPO	653877	5555083	-	-	-	-	-	-	15-Sep-15	23	90	12-Sep-16	59	**161**
			Fording u/s Chauncey Creek	FO22	654841	5553523	-	-	-	-	-	-	12-Sep-15	81	**162**	-	-	-
			Fording d/s Chauncey, u/s Ewin	FOUEW	656363	5551875	-	-	-	-	-	-	13-Sep-15	87	**213**	-	-	-
			Fording River u/s Dry Creek	LC_FRUS	656304	5545239	-	-	-	-	-	-	13-Sep-15	5.7	**382**	-	-	-
			Fording d/s Dry, u/s GHO & Hwy Bridge	FO29	655434	5543797	-	-	-	-	-	-	12-Sep-15	70	**172**	-	-	-
			Fording River d/s GHO	FODGH	652942	5545635	-	-	-	-	-	-	16-Sep-15	48	**172**	14-Sep-16	80	**118**
2	Line	Tributary	Line Creek Upstream of Active Water Treatment Facility (LILC3)	LILC3-1	659911	5531818	21-Sep-13	16	6.5	3-Sep-14	63	3.1	14-Sep-15	81	69	9-Sep-16	191	**321**
				LILC3-2			21-Sep-13	28	5.7	3-Sep-14	47	5	14-Sep-15	77	**123**	-	-	-
				LILC3-3			21-Sep-13	17	5.6	3-Sep-14	37	16	14-Sep-15	89	**179**	-	-	-
				LILC3-4			21-Sep-13	34	3.3	3-Sep-14	49	27	14-Sep-15	168	**260**	-	-	-
				LILC3-5			21-Sep-13	55	3.8	3-Sep-14	37	0	14-Sep-15	118	**242**	-	-	-
				LILC3-6			-	-	-	3-Sep-14	81	11	14-Sep-15	172	**223**	-	-	-
				LILC3-7			-	-	-	3-Sep-14	55	8	14-Sep-15	117	**197**	-	-	-
				LILC3-8			-	-	-	3-Sep-14	41	1	14-Sep-15	132	**185**	-	-	-
				LILC3-9			-	-	-	3-Sep-14	88	6	14-Sep-15	140	**188**	-	-	-
				LILC3-10			-	-	-	3-Sep-14	58	0	14-Sep-15	135	**139**	-	-	-
				Mean[a] =			-	30	5.0	-	56	8	-	123	**180**	-	191	**321**
			Line Creek Downstream of South Line Creek and Contingency Ponds (LIDSL)	LIDSL-1	659733	5531239	20-Sep-13	12.50	0.21	8-Sep-14	92	15.2	12-Sep-15	37	73	7-Sep-16	20	30
				LIDSL-2			20-Sep-13	8.05	0.92	8-Sep-14	106	14	12-Sep-15	17	69	7-Sep-16	-	87
				LIDSL-3			20-Sep-13	2.30	0.57	8-Sep-14	59.0	1.4	12-Sep-15	5.3	9.4	7-Sep-16	-	94
				LIDSL-4			20-Sep-13	4.40	0.27	8-Sep-14	97	3	12-Sep-15	14	25	7-Sep-16	-	60
				LIDSL-5			20-Sep-13	9.45	0.58	8-Sep-14	48	7	12-Sep-15	26	52	7-Sep-16	-	43
				LIDSL-6			-	-	-	8-Sep-14	55.0	2	12-Sep-15	6.1	25	-	-	-
				LIDSL-7			-	-	-	8-Sep-14	49.0	3	12-Sep-15	7.6	17	-	-	-
				LIDSL-8			-	-	-	8-Sep-14	51.5	3	12-Sep-15	5.2	14	-	-	-
				LIDSL-9			-	-	-	8-Sep-14	94.5	14.0	12-Sep-15	1.2	4.0	-	-	-
				LIDSL-10			-	-	-	8-Sep-14	42.6	2	12-Sep-15	5.9	21	-	-	-
				Mean[a] =			-	7.34	0.51	-	69	6	-	13	31	-	20	63

Chlorophyll-a values outside normal range

AFDM values outside normal range

Bold indicates result above the BC periphyton chlorophyll-a guideline of 100 mg/m^2.

[a] The laboratory reporting limit (LRL) was used to calculate the mean where measured concentrations were below the LRL.

Table F.2: **Periphyton Ash-Free Dry Mass (AFDM) and Chlorophyll-a for Samples Collected from Mine-exposed Lotic Areas**

Management Unit	Main Watershed	Stream Type	Area Description	Biological Area Code	UTM (NAD83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)
2	Line	Tributary	Line Creek Downstream of Canyon (LI8)	LI8-1	655651	5528828	21-Sep-13	5.5	8.3	5-Sep-14	30.5	4.8	13-Sep-15	0.50	1.4	9-Sep-16	8	29
				LI8-2			21-Sep-13	6.7	5.7	5-Sep-14	<0.50	0.40	13-Sep-15	<0.50	0.59	-	-	-
				LI8-3			23-Sep-13	8.6	18	5-Sep-14	10.4	12	13-Sep-15	5.2	15	-	-	-
				LI8-4			23-Sep-13	8.5	17	5-Sep-14	0.5	0.8	13-Sep-15	2.7	9.0	-	-	-
				LI8-5			23-Sep-13	8.7	12	5-Sep-14	6.35	9.5	13-Sep-15	0.75	2.6	-	-	-
				LI8-6			-	-	-	5-Sep-14	0.5	0.3	13-Sep-15	1.5	4.0	-	-	-
				LI8-7			-	-	-	5-Sep-14	0.50	1.3	13-Sep-15	0.75	2.3	-	-	-
				LI8-8			-	-	-	5-Sep-14	0.5	0.3	13-Sep-15	1.1	4.9	-	-	-
				LI8-9			-	-	-	5-Sep-14	18.6	13	13-Sep-15	2.7	10	-	-	-
				LI8-10			-	-	-	5-Sep-14	22.8	1	13-Sep-15	7.7	51	-	-	-
				Mean[a] =			-	7.6	12	-	9.1	4	-	2.3	10	-	8	29
2	Fording	Main Stem	Fording d/s Josephine falls, u/s Grace & Line	FO9	651932	5540294	-	-	-	-	-	-	18-Sep-15	31	13	-	-	-
			Fording River Upstream of Line Creek (FRUL)	FRUL-1	654530	5530162	17-Sep-13	0.95	0.11	7-Sep-14	2.0	0.03	17-Sep-15	2.5	0.95	10-Sep-16	16	13
				FRUL-2			17-Sep-13	2.3	0.20	7-Sep-14	0.8	0.08	17-Sep-15	2.0	1.1	-	-	-
				FRUL-3			17-Sep-13	0.50	0.052	7-Sep-14	2.8	0.64	17-Sep-15	1.3	1.1	-	-	-
				FRUL-4			21-Sep-13	2.5	5.2	7-Sep-14	1.1	0.20	17-Sep-15	<0.50	0.77	-	-	-
				FRUL-5			21-Sep-13	2.2	3.4	7-Sep-14	1.0	0.44	17-Sep-15	<0.50	0.37	-	-	-
				FRUL-6			-	-	-	7-Sep-14	2.7	0.3	17-Sep-15	<0.50	1.9	-	-	-
				FRUL-7			-	-	-	7-Sep-14	<0.50	0.17	17-Sep-15	1.9	0.35	-	-	-
				FRUL-8			-	-	-	7-Sep-14	4.4	0.30	17-Sep-15	1.9	0.25	-	-	-
				FRUL-9			-	-	-	7-Sep-14	<0.50	0.15	17-Sep-15	0.50	0.80	-	-	-
				FRUL-10			-	-	-	7-Sep-14	<0.50	0.04	17-Sep-15	1.7	2.3	-	-	-
				Mean[a] =			-	1.7	1.8	-	2.1	0.2	-	1.3	0.99	-	16	13
			Fording River Downstream of Line Creek (FO23)	FO23-1	652995	5528937	24-Sep-13	6.9	23	2-Sep-14	9.4	0.38	16-Sep-15	0.65	4.1	9-Sep-16	14	18.3
				FO23-2			24-Sep-13	26	23	2-Sep-14	6.7	1.6	16-Sep-15	5.4	26	-	-	-
				FO23-3			24-Sep-13	18	9.8	2-Sep-14	11	1.0	16-Sep-15	15	31	-	-	-
				FO23-4			24-Sep-13	23	9.4	2-Sep-14	12	1.3	16-Sep-15	73	**125**	-	-	-
				FO23-5			24-Sep-13	29	9.6	2-Sep-14	7.4	0.45	16-Sep-15	3.9	24	-	-	-
				FO23-6			-	-	-	2-Sep-14	4.8	0.19	16-Sep-15	3.9	8.7	-	-	-
				FO23-7			-	-	-	2-Sep-14	5	5.3	16-Sep-15	12	57	-	-	-
				FO23-8			-	-	-	2-Sep-14	4.2	0.01	16-Sep-15	0.90	2.3	-	-	-
				FO23-9			-	-	-	2-Sep-14	8.2	0.92	16-Sep-15	<0.50	1.2	-	-	-
				FO23-10			-	-	-	2-Sep-14	1.1	0.82	16-Sep-15	1.3	4.1	-	-	-
				Mean[a] =			-	21	15	-	6.9	1.2	-	12	28	-	14	18
3	Elk	Tributary	Wolfram Creek	WOCK	648228	5552277	-	-	-	-	-	-	17-Sep-15	33	86	-	-	-
			Thompson Creek	THCK- 1	648596	5550237	21-Sep-13	16.85	18.40	-	-	-	18-Sep-15	0	66	-	-	-
				THCK- 2			21-Sep-13	16.80	20.90	-	-	-	-	-	-	-	-	-
				THCK- 3			21-Sep-13	13.00	25.70	-	-	-	-	-	-	-	-	-
				Mean[a] =			-	15.6	22	-	-	-	-	-	-	-	-	-
		Main Stem	Elk River d/s Thompson & GHO	EL20	649146	5548514	-	-	-	-	-	-	17-Sep-15	6.1	0.27	13-Sep-16	12	20
			Elk River u/s Elkford	ELUEL	649097	5544766	-	-	-	-	-	-	13-Sep-15	5.8	11	-	-	-
			Elk River d/s Elkford sewage ponds	ELDEL	649883	5539761	-	-	-	-	-	-	19-Sep-15	2.8	12	-	-	-
			Elk River just u/s Fording	ELUFO	652102	5528815	-	-	-	-	-	-	18-Sep-15	42	52	-	-	-
4	Elk	Tributary	Harmer Creek u/s Harmer Pond	HACKUS	658180	5520996	-	-	-	-	-	-	11-Sep-15	24	**150**	-	-	-
			Harmer d/s Pond near mouth at Grave	HACKDS	656969	5522171	-	-	-	-	-	-	10-Sep-15	56	**208**	14-Sep-16	100	**151**
			Grave Creek d/s Harmer	GRCK	656215	5522446	-	-	-	-	-	-	19-Sep-15	1.9	8.1	-	-	-
			Grave Creek near mouth at Elk	GRDS	654077	5523402	-	-	-	-	-	-	12-Sep-15	1.5	11	-	-	-
			Otto Creek near mouth	OCNM	652337	5512615	-	-	-	-	-	-	15-Sep-15	11	7.0	-	-	-

Chlorophyll-a values outside normal range

AFDM values outside normal range

Bold indicates result above the BC periphyton chlorophyll-a guideline of 100 mg/m^2.

[a] The laboratory reporting limit (LRL) was used to calculate the mean where measured concentrations were below the LRL.

Table F.2: Periphyton Ash-Free Dry Mass (AFDM) and Chlorophyll-a for Samples Collected from Mine-exposed Lotic Areas

Management Unit	Main Watershed	Stream Type	Area Description	Biological Area Code	UTM (NAD83, 11U)		2013			2014			2015			2016		
					Easting	Northing	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)	Date	AFDM (g/m^2)	Chlorophyll-a (mg/m^2)
4	Elk	Main Stem	Elk River d/s Fording, u/s Grave	EL19	653146	5525824	24-Sep-13	5.2	16	-	-	-	17-Sep-15	9.7	20	10-Sep-16	4	3.9
							24-Sep-13	6.1	13	-	-	-	-	-	-	-	-	-
							24-Sep-13	4.0	4.5	-	-	-	-	-	-	-	-	-
						Mean[a] =	-	5.1	11	-	-	-	-	9.7	20	-	4	3.9
			Elk River d/s Grave	ELDGR	653185	5520978	-	-	-	-	-	-	19-Sep-15	<0.50	0.23	-	-	-
			Elk d/s Otto, u/s Sparwood & Michel	ELUSP	652325	5512688	-	-	-	-	-	-	15-Sep-15	6.4	5.6	-	-	-
	Michel	Tributary	Corbin Creek near Mouth	CORCK	668563	5487395	-	-	-	-	-	-	11-Sep-15	71	34	-	-	-
			Bodie Creek d/s Bodie Pond	BOCK	655536	5509605	-	-	-	-	-	-	14-Sep-15	14	13	-	-	-
		Main Stem	Michel u/s Corbin Creek	MIUCO	668203	5486653	-	-	-	-	-	-	11-Sep-15	8.1	25	-	-	-
			Michel d/s Corbin, u/s Andy Good	MIDCO	667757	5487611	-	-	-	-	-	-	11-Sep-15	12	3.7	13-Sep-16	30	46
			Michel d/s Andy Good	MIDAG	665262	5489400	-	-	-	-	-	-	12-Sep-15	<0.50	3.1	-	-	-
			Michel d/s CMO	MI5	659497	5496573	-	-	-	-	-	-	13-Sep-15	0.60	1.5	-	-	-
			Michel u/s Erickson Creek	MI3	660032	5505022	-	-	-	-	-	-	14-Sep-15	2.4	8.4	11-Sep-16	1	5.8
			Michel Creek d/s EVO	MI2	653672	5511222	-	-	-	-	-	-	10-Sep-15	5.2	11	11-Sep-16	1	1.9
5	Elk	Main Stem	Elk d/s Sparwood & Michel	EL1	651657	5508511	24-Sep-13	4.4	1.9	-	-	-	16-Sep-15	4.9	9.8	11-Sep-16	3	23
							24-Sep-13	4.0	7.2	-	-	-	-	-	-	-	-	-
							24-Sep-13	5.6	3.0	-	-	-	-	-	-	-	-	-
						Mean[a] =	-	4.6	4.0	-	-	-	-	4.9	9.8	-	3	23
			Elk River d/s Fernie	ELUFE	644258	5490947	-	-	-	-	-	-	15-Sep-15	7.8	7.9	-	-	-
			Elk River u/s Fernie	ELDFE	640097	5479596	-	-	-	-	-	-	16-Sep-15	12	11	-	-	-
			Elk River u/s Elko	ELELKO	639433	5463291	-	-	-	-	-	-	14-Sep-15	1.5	3.2	11-Sep-16	37	71.2
			Elk River u/s Hwy 93 Bridge	ELH93	633578	5449043	-	-	-	-	-	-	16-Sep-15	61	81	-	-	-

Chlorophyll-a values outside normal range

AFDM values outside normal range

Bold indicates result above the BC periphyton chlorophyll-a guideline of 100 mg/m^2.

[a] The laboratory reporting limit (LRL) was used to calculate the mean where measured concentrations were below the LRL.

Table F.3: Comparison of Reference Area Data Distributions for Periphyton Chlorophyll-a and Ash-Free-Dry-Mass (AFDM) based on Percentiles Derived from the 2015 (n = 40) Reference Area Data Before and After the Removal of Potential Outliers

Main Watershed	Management Unit	Percentile and Biological Area Code	Chlorophyll-a (mg/m²)	AFDM (g/m²)
			n=40	n=40
		2.5	**0.0976**	**<0.5**
		5	**0.124**	**<0.5**
		10	**0.661**	**<0.5**
		25	**2.09**	**0.988**
		50	**6.65**	**6.90**
		75	**19.9**	**13.7**
		90	**49.3**	**30.3**
		95	**71.4**	**42.6**
		97.5	**81.0**	**52.2**
Kootenay	N/A	BU2	14	13
		BU40	39	22
		BUUQ	1.4	<0.5
		CRUKO	0.10	0.5
		KO1	0.14	<0.5
		KODCR	3.2	1.2
		KOUCR	2.3	5.5
		KOUVE	15	19
		PADAL	0.73	0.6
		PAUKO	0.01	<0.5
		VEUKO	1.1	1.0
		VEUP	6.2	4.3
Oldman	N/A	DACK	23	6.9
		DUCK	6.6	5.4
		OLDDU	14	17
		OLDLI	6.6	5.3
		OLDLOW	5.5	10
		RACK	4.3	1.3
		VICK	8.7	6.9
Fording	1	FO26	36	13
		HENUP	4.1	1.0
		CHCK	80	42
		EWCK	62	27
	2	LC_GRCK	1.4	<0.5
Line	2	LI24	7.2	16
		SLINE	20	8.3
Michel	4	AGCK	1.0	0.5
		AL4	71	59
		ALUSM	24	10
		MI25	19	8.0
Elk	N/A	CADCK	7.0	7.8
		EL12	2.8	1.7
	3	ELUGH	48	37
	4	GRUHA	2.8	<0.5
	5	MCCR	139	52
		WWRL	21	7.6
		WWRU	0.13	1.2
Flathead	N/A	FLAD	6.7	29
		FLAU	0.72	<0.5
		FLRU	13	8.5

Outlier removed from estimation of percentiles.
Value < 2.5th percentile of reference distribution
Value < 5th percentile of reference distribution
Value < 10th percentile of reference distribution
Value < 25th percentile of reference distribution
Value > 75th percentile of reference distribution
Value > 90th percentile of reference distribution
Value > 95th percentile of reference distribution
Value > 97.5th percentile of reference distribution

Note: Coloured cells show individual reference area values that were at the low (blue shade) and high (gold shade) ends of the distribution range.

Table F.4: Comarprison of Periphyton Chlorophyll-a and Ash-free Dry Mass for Mine-exposed Areas (n = 58) in the Elk Valley (September 2015) to the Normal Ranges Calculated as the 2.5th and 97.5th Percentiles for the Reference Area Distributions

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Chlorophyll-a (mg/m^2)	AFDM (g/m^2)
				$P_{2.5}$	**0.0976**	**<0.5**
				$P_{97.5}$	**81.0**	**52.2**
Mine-exposed	1	Fording	T	HENFO	7.4	3.5
				KICK	2.5	1.3
				SWCK	138	78
				CATCK	26	3.4
				POCK	161	133
				LC_DCDS	3.9	2.2
				LC_DC1	64	17
				GHCKD	31	6.8
				GHCKU	67	26
			M	FODHE	1.2	<0.5
				FOUNGD	3.0	0.75
				FODNGD	5.0	0.75
				MP1	30	9.4
				FOUSH	21	16
				FOUKI	21	11
				FOBKS	1.8	2.2
				FOBSC	3.4	3.7
				FOBCP	3.4	2.6
				FODPO	90	23
				FO10-SP1	98	59
				FO22	162	81
				FOUEW	213	87
				LC_FRUS	382	5.7
				FO29	172	70
				FODGH	172	48
	2	Fording	T	LILC3	180	123
				LIDSL	31	13
				LI8	10	2.3
			M	FO9	13	31
				FRUL	0.99	1.3
				FO23	28	12
	3	Elk	T	WOCK	86	33
				THCK	66	16
			M	EL20	0.27	6.1
				ELUEL	11	5.8
				ELDEL	12	2.8
				ELUFO	52	42
	4	Michel	T	CORCK	34	71
				BOCK	13	14
			M	MIUCO	25	8.1
				MIDCO	3.7	12
				MIDAG	3.1	<0.5
				MI5	1.5	0.60
				MI3	8.4	2.4
				MI2	11	5.2
		Elk	T	HACKUS	150	24
				HACKDS	208	56
				GRCK	8.1	1.9
				GRDS	11	1.5
				OCNM	7.0	11
			M	EL19	20	9.7
				ELDGR	0.23	<0.5
				ELUSP	5.6	6.4
	5	Elk	M	EL1	9.8	4.9
				ELDFE	11	12
				ELUFE	7.9	7.8
				ELELKO	3.2	1.5
				ELH93	81	61

value > upper limit ($P_{97.5}$) of the normal range

value < lower limit ($P_{2.5}$) of the normal range

Table F.5: **Normal Range Quotients for Ash-free Dry Mass and Periphyton Chlorophyll-a, and Hazard Quotients for Periphyton Chlorophyll-a, 2015 - 2016**

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	2015			2016		
					Normal Range Quotient		Hazard Quotient	Normal Range Quotient		Hazard Quotient
					AFDM	Chlorophyll-a	Chlorophyll-a	AFDM	Chlorophyll-a	Chlorophyll-a
				Benchmark	52.2 g/m^2	81.0 mg/m^2	100 mg/m^2	52.2 g/m^2	81.0 mg/m^2	100 mg/m^2
Reference	1	Fording	T	HENUP	<0.1	<0.1	<0.1	-	-	-
				CHCK	0.8	1.0	0.8	-	-	-
				EWCK	0.5	0.8	0.6	-	-	-
			M	FO26	0.2	0.4	0.4	1.5	2	1.6
	2	Fording	T	LC_GRCK	<0.1	<0.1	<0.1	-	-	-
				LI24	0.3	<0.1	<0.1	0.2	0.2	0.2
				SLINE	0.2	0.2	0.2	0.2	0.3	0.2
	3	Elk	M	ELUGH	0.7	0.6	0.5	0.6	0.5	0.4
	4	Michel	T	ALUSM	0.2	0.3	0.2	0.3	0.3	0.2
				MI25	0.2	0.2	0.2	0.4	0.5	0.4
			M	AGCK	<0.1	<0.1	<0.1	-	-	-
				AL4	1.1	0.9	0.7	-	-	-
		Elk	T	GRUHA	<0.1	<0.1	<0.1	-	-	-
	5	Elk	T	MCCR	1.0	1.7	1.4	-	-	-
				WWRU	<0.1	<0.1	<0.1	-	-	-
				WWRL	<0.1	0.3	0.2	-	-	-
	N/A	Kootenay	-	BU2	0.2	0.2	<0.1	-	-	-
				BU40	0.4	0.5	0.4	-	-	-
				BUUQ	<0.1	<0.1	<0.1	-	-	-
				CRUKO	<0.1	<0.1	<0.1	-	-	-
				KO1	<0.1	<0.1	<0.1	-	-	-
				KODCR	<0.1	<0.1	<0.1	-	-	-
				KOUCR	<0.1	<0.1	<0.1	-	-	-
				KOUVE	0.4	0.2	<0.1	-	-	-
				PADAL	<0.1	<0.1	<0.1	-	-	-
				PAUKO	<0.1	<0.1	<0.1	-	-	-
				VEUKO	<0.1	<0.1	<0.1	-	-	-
				VEUP	<0.1	<0.1	<0.1	-	-	-
		Oldman	-	DACK	<0.1	0.3	0.2	-	-	-
				DUCK	<0.1	<0.1	<0.1	-	-	-
				OLDDU	0.3	0.2	<0.1	-	-	-
				OLDLI	<0.1	<0.1	<0.1	-	-	-
				OLDLOW	0.2	<0.1	<0.1	-	-	-
				RACK	<0.1	<0.1	<0.1	-	-	-
				VICK	<0.1	<0.1	<0.1	-	-	-
		Elk	-	CADCK	<0.1	<0.1	<0.1	-	-	-
				EL12	<0.1	<0.1	<0.1	-	-	-
		Flathead	-	FLAD	0.6	<0.1	<0.1	-	-	-
				FLAU	<0.1	<0.1	<0.1	-	-	-
				FLRU	0.2	0.2	<0.1	-	-	-
Mine-exposed	1	Fording	M	FODHE	<0.1	<0.1	<0.1	-	-	-
				FOUNGD	<0.1	<0.1	<0.1	-	-	-
				FODNGD	<0.1	<0.1	<0.1	-	-	-
				MP1	0.2	0.4	0.3	-	-	-
				FOUSH	0.3	0.3	0.2	-	-	-
				FOUKI	0.2	0.3	0.2	-	-	-
				FOBKS	<0.1	<0.1	<0.1	-	-	-
				FOBSC	<0.1	<0.1	<0.1	-	-	-
				FOBCP	<0.1	<0.1	<0.1	-	-	-
				FODPO	0.4	1.1	0.9	1.1	2	1.6
				FO10-SP1	1.1	1.2	1.0	-	-	-
				FO22	1.5	2.0	1.6	-	-	-
				FOUEW	1.7	2.6	2.1	-	-	-
				LC_FRUS	<0.1	4.7	3.8	-	-	-
				FO29	1.3	2.1	1.7	-	-	-
				FODGH	0.9	2.1	1.7	1.5	1.5	1.2
			T	HENFO	<0.1	<0.1	<0.1	-	-	-
				KICK	<0.1	<0.1	<0.1	-	-	-
				SWCK	1.5	1.7	1.4	-	-	-
				CATCK	<0.1	0.3	0.3	-	-	-
				POCK	2.5	2.0	1.6	-	-	-
				LC_DCDS	<0.1	<0.1	<0.1	-	-	-
				LC_DC1	0.3	0.8	0.6	-	-	-
				GHCKD	<0.1	0.4	0.3	-	-	-
				GHCKU	0.5	0.8	0.7	-	-	-
	2	Fording	M	FO9	0.6	0.2	<0.1	-	-	-
				FRUL	<0.1	<0.1	<0.1	0.3	0.2	0.1
				FO23	0.2	0.3	0.3	0.3	0.2	0.2
			T	LILC3	2.4	2.2	1.8	3.7	4	3.2
				LIDSL	0.2	0.4	0.3	0.4	0.4	0.3
				LI8	<0.1	<0.1	<0.1	0.2	0.4	0.3

Good (Quotient < 0.7)
Marginal (Quotient between 0.7 and 1.0)
Poor (Quotient > 1.0)

Table F.5: Normal Range Quotients for Ash-free Dry Mass and Periphyton Chlorophyll-a, and Hazard Quotients for Periphyton Chlorophyll-a, 2015 - 2016

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	2015			2016		
					Normal Range Quotient		Hazard Quotient	Normal Range Quotient		Hazard Quotient
					AFDM	Chlorophyll-a	Chlorophyll-a	AFDM	Chlorophyll-a	Chlorophyll-a
				Benchmark	52.2 g/m^2	81.0 mg/m^2	100 mg/m^2	52.2 g/m^2	81.0 mg/m^2	100 mg/m^2
Mine-exposed	3	Elk	T	WOCK	0.6	1.1	0.9	-	-	-
				THCK	0.3	0.8	0.7	-	-	-
			M	EL20	<0.1	<0.1	<0.1	0.2	0.2	0.2
				ELUEL	<0.1	<0.1	<0.1	-	-	-
				ELDEL	<0.1	<0.1	<0.1	-	-	-
				ELUFO	0.8	0.6	0.5	-	-	-
	4	Michel	T	CORCK	1.4	0.4	0.3	-	-	-
				BOCK	0.3	0.2	<0.1	-	-	-
			M	MIUCO	0.2	0.3	0.2	-	-	-
				MIDCO	0.2	<0.1	<0.1	0.6	0.6	0.5
				MIDAG	<0.1	<0.1	<0.1	-	-	-
				MI5	<0.1	<0.1	<0.1	-	-	-
				MI3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
				MI2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		Elk	T	HACKUS	0.5	1.9	1.5	-	-	-
				HACKDS	1.1	2.6	2.1	1.9	1.9	1.5
				GRCK	<0.1	<0.1	<0.1	-	-	-
				GRDS	<0.1	<0.1	<0.1	-	-	-
				OCNM	0.2	<0.1	<0.1	-	-	-
			M	EL19	0.2	0.2	0.2	<0.1	<0.1	<0.1
				ELDGR	<0.1	<0.1	<0.1	-	-	-
				ELUSP	<0.1	<0.1	<0.1	-	-	-
	5	Elk	M	EL1	<0.1	<0.1	<0.1	<0.1	0.3	0.2
				ELDFE	0.2	<0.1	<0.1	-	-	-
				ELUFE	<0.1	<0.1	<0.1	-	-	-
				ELELKO	<0.1	<0.1	<0.1	0.7	0.9	0.7
				ELH93	1.2	1.0	0.8	-	-	-

Good (Quotient < 0.7)
Marginal (Quotient between 0.7 and 1.0)
Poor (Quotient > 1.0)

Table F.6: Spearman Correlation of Primary Productivity Endpoints for Reference Areas (n = 40) to Water Quality, Habitat, and Landscape Variables, September 2015

Variables		Ash-free dry mass		Chlorophyll-a	
		r	P-value	r	P-value
GIS derived variables	Stream order	-0.094	0.564	-0.278	0.082
	Station elevation (m)	0.166	0.305	0.275	0.086
	Source elevation (m)	-0.021	0.898	-0.012	0.940
	Distance to source (m)	-0.078	0.633	-0.293	0.066
	Station gradient (%) GIS	0.145	0.371	0.354	0.025
	Watershed perimeter (m)	-0.102	0.531	-0.311	0.051
	Watershed area (m^2)	-0.100	0.541	-0.312	0.050
	Area of catchment > 30% slope (m^2)	-0.129	0.428	-0.347	0.028
	Percentage of catchment > 30% slope (%)	-0.244	0.130	-0.248	0.122
	Percentage of catchment < 30% slope (%)	0.244	0.130	0.248	0.122
	Average upstream gradient from station to source	0.075	0.646	0.293	0.067
	Watershed stream length (m)	-0.116	0.476	-0.332	0.036
	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	-0.099	0.542	-0.232	0.149
	Area logged (Crown land, 1945-2012) (m^2)	-0.004	0.984	-0.146	0.418
	Precent of watershed logged (Crown land, 1945-2012)	0.222	0.214	0.189	0.292
	Annual Cropland (%)	-0.213	0.187	-0.326	0.040
	Broadleaf Dense (%)	0.037	0.820	-0.070	0.667
	Broadleaf Open (%)	-0.216	0.181	-0.291	0.069
	Coniferous Dense (%)	0.204	0.207	0.268	0.094
	Coniferous Open (%)	-0.025	0.877	-0.106	0.514
	Coniferous Sparse (%)	-0.134	0.409	-0.270	0.092
	Developed (%)	0.118	0.470	0.004	0.979
	Exposed land (%)	-0.215	0.183	-0.279	0.082
	Grassland (%)	-0.030	0.853	-0.186	0.249
	Herb (%)	0.052	0.749	0.005	0.977
	Mixedwood Dense (%)	-0.077	0.635	-0.168	0.301
	Mixedwood Open (%)	-0.150	0.356	-0.228	0.157
	Perennial Cropland and Pasture (%)	-0.256	0.110	-0.383	0.015
	Rock/Rubble (%)	0.093	0.570	0.109	0.503
	Shrub low (%)	-0.034	0.837	-0.158	0.332
	Shrub tall (%)	0.065	0.692	0.115	0.481
	Snow/Ice (%)	-0.244	0.129	-0.321	0.044
	Water (%)	-0.282	0.078	-0.418	0.007
	Wetland - Herb (%)	-0.091	0.576	-0.266	0.097
	Wetland - Shrub (%)	-0.040	0.804	-0.214	0.186
	Wetland - Tree (%)	-0.013	0.937	-0.153	0.346
Field Measurements and Samples	Intermediate axis length - Wolman Mean (cm) (longest width of cobble perpendicular to the axis of longest length)	0.089	0.587	0.040	0.806
	Embeddedness (10 value median measured as 0, 1/4, 1/2, 3/4, or full)	-0.130	0.424	-0.207	0.200
	Average channel depth (m)	0.012	0.939	-0.049	0.763
	Average channel velocity (m/s)	-0.070	0.670	-0.168	0.301
	Canopy Coverage (%)	-0.014	0.934	0.050	0.757
	Macrophyte Coverage (% Class)	-	-	-	-
	Periphyton Coverage (% Class)	0.399	0.012	0.451	0.004
	Bankfull width (m)	-0.183	0.257	-0.369	0.019
	Wetted width (m)	-0.204	0.208	-0.389	0.013
	Bankfull-Wetted depth (cm) (Bankfull height of water level subtract height of current water level)	-0.105	0.523	-0.219	0.181
	Station gradient (%) Clinometer	0.073	0.660	0.209	0.201
	Temperature (°C)	0.300	0.060	0.297	0.063
	Dissolved Oxygen (mg/L)	-0.257	0.110	-0.351	0.026
	Dissolved Oxygen (%)	-0.124	0.445	-0.192	0.235
	Specific Conductance (µS/cm)	0.174	0.283	0.292	0.067
	pH	0.416	0.020	0.347	0.056
	Calcite concretion score	0.272	0.089	0.299	0.061
	Calcite presence score	0.427	0.006	0.546	<0.001
	Calcite index	0.437	0.005	0.553	<0.001
	PC1 - First principal component of water quality[a]	-0.277	0.084	-0.428	0.006
	PC2 - Second principal component of water quality[a]	-0.275	0.086	-0.269	0.094

r ≥ 0.5 or r ≤ -0.5

P-value < 0.05

[a] Calculated using water chemistry data collected from field samples.

Table F.7: Spearman Correlation of Primary Productivity Endpoints for Reference (n = 40) and Mine-exposed Areas (n = 58[a]) to Water Quality, Habitat and Landscape Variables, September 2015

	Variables	Ash-Free Dry Mass		Chlorophyll-a	
		r	P-value	r	P-value
GIS derived variables	Stream order	-0.178	0.080	-0.280	0.005
	Station elevation (m)	0.105	0.303	0.184	0.069
	Source elevation (m)	-0.007	0.947	-0.066	0.518
	Distance to source (m)	-0.128	0.210	-0.251	0.013
	Station gradient (%) GIS	0.046	0.654	0.206	0.042
	Watershed perimeter (m)	-0.160	0.115	-0.274	0.006
	Watershed area (m^2)	-0.152	0.136	-0.271	0.007
	Area of catchment > 30% slope (m^2)	-0.169	0.096	-0.289	0.004
	Percentage of catchment > 30% slope (%)	-0.230	0.023	-0.274	0.006
	Percentage of catchment < 30% slope (%)	0.230	0.023	0.274	0.006
	Average upstream gradient from station to source	0.132	0.195	0.235	0.020
	Watershed stream length (m)	-0.156	0.125	-0.275	0.006
	Stream density of watershed (Total stream length in watershed / area of watershed) (km/km^2)	-0.041	0.692	-0.105	0.303
	Area logged (Crown land, 1945-2012) (m^2)	-0.073	0.489	-0.165	0.117
	Precent of watershed logged (Crown land, 1945-2012)	-0.013	0.901	-0.040	0.709
	Annual Cropland (%)	-0.107	0.295	-0.200	0.049
	Broadleaf Dense (%)	-0.127	0.213	-0.203	0.045
	Broadleaf Open (%)	-0.187	0.065	-0.256	0.011
	Coniferous Dense (%)	-0.009	0.929	-0.040	0.695
	Coniferous Open (%)	-0.019	0.852	-0.020	0.843
	Coniferous Sparse (%)	-0.187	0.065	-0.276	0.006
	Developed (%)	0.018	0.860	-0.044	0.666
	Exposed land (%)	0.013	0.896	0.054	0.600
	Grassland (%)	0.053	0.605	-0.038	0.709
	Herb (%)	-0.007	0.947	-0.052	0.609
	Mixedwood Dense (%)	-0.102	0.315	-0.172	0.090
	Mixedwood Open (%)	-0.154	0.130	-0.222	0.028
	Perennial Cropland and Pasture (%)	-0.043	0.675	-0.128	0.208
	Rock/Rubble (%)	-0.023	0.820	-0.054	0.596
	Shrub low (%)	-0.071	0.486	-0.128	0.209
	Shrub tall (%)	-0.065	0.524	-0.095	0.351
	Snow/Ice (%)	-0.209	0.038	-0.309	0.002
	Water (%)	-0.161	0.113	-0.216	0.033
	Wetland - Herb (%)	-0.018	0.863	-0.122	0.231
	Wetland - Shrub (%)	-0.049	0.632	-0.174	0.087
	Wetland - Tree (%)	0.000	1.000	-0.088	0.389
Field Measurements and Samples	Intermediate axis length - Wolman Mean (cm) (longest width of cobble perpendicular to the axis of longest length)	-0.045	0.658	-0.069	0.501
	Embeddedness (10 value median measured as 0, 1/4, 1/2, 3/4, or full)	-0.020	0.845	-0.155	0.129
	Average channel depth (m)	-0.040	0.699	-0.056	0.581
	Average channel velocity (m/s)	-0.097	0.342	-0.137	0.178
	Canopy Coverage (%)	0.102	0.316	0.202	0.046
	Macrophyte Coverage (% Class)	0.036	0.723	-0.044	0.671
	Periphyton Coverage (% Class)	0.440	<0.001	0.420	<0.001
	Bankfull width (m)	-0.239	0.019	-0.329	0.001
	Wetted width (m)	-0.232	0.022	-0.320	0.001
	Bankfull-Wetted depth (cm) (Bankfull height of water level subtract height of current water level)	-0.243	0.018	-0.209	0.042
	Station gradient (%) Clinometer	0.025	0.811	0.079	0.444
	Temperature (°C)	0.020	0.848	-0.035	0.737
	Dissolved Oxygen (mg/L)	0.106	0.307	0.022	0.832
	Dissolved Oxygen (%)	0.131	0.204	0.025	0.807
	Specific Conductance (µS/cm)	0.342	<0.001	0.409	<0.001
	pH	0.092	0.399	0.097	0.371
	Calcite concretion score	0.187	0.065	0.268	0.008
	Calcite presence score	0.434	<0.001	0.546	<0.001
	Calcite index	0.441	<0.001	0.547	<0.001
	PC1 - First principal component of water quality[b]	-0.359	<0.001	-0.438	<0.001

r ≥ 0.5 or r ≤ -0.5

P-value < 0.05

[a] NGD1 was not included as no chlorophyll-a or ash free dry mass samples were taken.

[b] Calculated using water chemistry data collected from field samples.

Table F.8: Periphyton Community Metrics Investigated at Reference (n = 40) and Mine-exposed (n = 58) Areas in Elk Valley, 2015

Endpoint			Units	Reference															
				AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU
Total Density			#cells/cm^2	413,976	1,256,592	505,344	657,624	1,252,080	93,060	453,456	3,282,480	38,916	707,256	812,160	298,920	518,316	3,034,320	436,536	31,584
Total Biovolume			µg/cm^2	61,299,468	826,323,168	332,605,464	192,442,005	444,378,033	18,542,628	332,413,323	1,844,962,847	10,920,309	381,693,659	1,111,697,728	84,435,993	237,746,649	492,734,088	3,158,303,099	376,224,660
Total Family Richness			#/cm^2	10	16	14	8	15	10	13	15	7	13	8	13	17	10	16	9
Total Genus Richness			#/cm^2	12	19	18	15	23	12	19	24	8	17	15	18	21	15	24	13
Density	**Major Groups**	**Blue Green Density**	#cells/cm^2	2,820	482,784	59,784	3,384	31,584	31,020	19,176	171,456	3,384	19,176	9,024	32,712	32,712	233,496	12,408	3,384
		Green Density	#cells/cm^2	0	4,512	14,664	0	0	564	2,820	13,536	0	3,384	0	1,128	24,816	0	10,152	7,896
		Golden Density	#cells/cm^2	364,908	97,008	53,016	291,024	0	14,100	72,756	1,173,120	0	0	0	51,324	0	2,256,000	0	0
		Diatom Density	#cells/cm^2	46,248	613,632	230,112	363,216	1,211,472	47,376	359,268	1,924,368	35,532	683,568	803,136	212,064	445,560	547,080	413,976	12,972
		Red Density	#cells/cm^2	0	78,960	147,768	0	9,024	0	0	0	0	0	0	1,692	14,664	0	0	7,332
		Flagellate Density	#cells/cm^2	0	155,664	2,256	4,512	2,256	0	1,128	9,024	0	4,512	24,816	564	1,692	0	0	0
		Blue Green Biovolume	cm^3/m^2	996,588	431,464,512	40,540,320	304,560	14,551,200	3,107,640	4,559,376	149,466,768	2,199,600	16,006,320	14,348,160	9,715,017	33,315,480	127,103,040	9,452,640	304,560
		Green Biovolume	cm^3/m^2	0	13,626,240	17,904,744	0	0	688,644	148,050,000	710,640,000	0	60,776,640	0	2,030,400	43,400,581	0	301,429,105	357,350,400
		Golden Biovolume	cm^3/m^2	43,788,960	11,640,960	6,361,920	34,922,880	0	1,692,000	8,730,720	140,774,400	0	0	0	6,158,880	0	270,720,000	0	0
		Diatom Biovolume	cm^3/m^2	16,513,920	262,038,912	95,410,752	157,155,909	419,214,609	13,054,344	170,960,427	843,964,367	8,720,709	304,635,467	1,096,661,488	64,536,264	143,798,697	94,911,048	2,847,421,353	10,020,588
		Red Biovolume	cm^3/m^2	0	92,067,360	172,297,488	0	10,521,984	0	0	0	0	0	0	1,972,872	17,098,224	0	0	8,549,112
		Flagellate Biovolume	cm^3/m^2	0	15,485,184	90,240	58,656	90,240	0	112,800	117,312	0	275,232	688,080	22,560	133,668	0	0	0
	Blue Green Algae	**Family: Oscillatoriaceae**	#cells/cm^2	564	230,112	22,560	0	6,768	1,128	1,692	85,728	1,128	3,384	9,024	2,820	19,740	60,912	2,256	0
	Diatom	**Family: Achnanthaceae**	#cells/cm^2	12,408	259,440	98,136	172,584	665,520	28,764	253,800	1,085,136	22,560	318,096	433,152	160,740	297,228	413,976	125,208	5,076
		Genus: *Achnanthidium*	#cells/cm^2	12,408	252,672	97,008	165,816	656,496	27,636	253,800	1,082,880	22,560	294,408	421,872	160,740	296,664	413,976	111,672	4,512
		Family: Cymbellaceae	#cells/cm^2	564	248,160	60,912	62,040	63,168	2,256	37,788	487,296	2,256	160,176	38,352	23,124	70,500	54,144	208,680	0
		Family: Fragilariaceae	#cells/cm^2	1,692	69,936	38,352	39,480	137,616	5,640	33,840	78,960	1,692	139,872	166,944	20,868	25,944	48,504	29,328	3,384
		Family : Naviculaceae	#cells/cm^3	1,692	11,280	9,024	23,688	302,304	9,588	21,996	227,856	0	36,096	94,752	2,256	19,740	6,768	31,584	2,256
		Family: Nitzchiaceae	#cells/cm^2	1,692	2,256	0	0	4,512	0	0	4,512	0	1,128	24,816	564	564	0	6,768	0
		Genus: *Gomphoneis*	#cells/cm^2	1,128	0	0	32,712	2,256	0	564	15,792	0	2,256	4,512	0	0	9,024	1,128	0
		Genus: *Nostoc*	#cells/cm^2	0	0	0	0	4,512	0	0	0	0	0	0	0	0	0	0	0
	Golden Algae	**Family: Hydruraceae**	#cells/cm^2	364,908	97,008	53,016	291,024	0	14,100	72,756	1,173,120	0	0	0	51,324	0	2,256,000	0	0
		Genus: *Hydrurus*	#cells/cm^2	364,908	97,008	53,016	291,024	0	14,100	72,756	1,173,120	0	0	0	51,324	0	2,256,000	0	0
	Red Algae	**Family: Acrochaeriaceae**	#cells/cm^2	0	78,960	147,768	0	9,024	0	0	0	0	0	0	1,692	14,664	0	0	7,332
		Genus: *Audouinella*	#cells/cm^2	0	78,960	147,768	0	9,024	0	0	0	0	0	0	1,692	14,664	0	0	7,332
Proportion	**Biological Characteristics**	**Highly Motile Diatoms**	% cells/cm^2	1.3	0.5	1.2	3.8	16.3	14.9	5.2	5.2	0.0	3.8	3.3	1.8	2.1	0.4	0.8	1.6
		Eutrophic	% cells/cm^2	6.9	4.1	6.9	25.1	40.6	25.0	36.8	36.5	0.0	3.2	17.5	5.9	31.8	1.3	10.7	94.6
		Oligotrophic	% cells/cm^2	64.1	15.3	47.5	20.0	2.4	5.9	3.3	10.9	0.0	1.6	0.0	12.4	7.6	52.0	0.2	2.9
		Alkalibiontic	% cells/cm^2	24.9	20.1	9.0	10.9	5.7	1.5	3.3	7.5	47.2	3.5	2.5	14.1	14.2	2.8	1.5	0.3
		Slowing Growing	% cells/cm^2	3.9	19.0	54.6	10.0	41.9	25.0	39.1	35.8	5.5	9.5	22.7	8.7	39.4	0.8	11.2	97.5
		Dead	%	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.2	0.1	0.1	0.0	0.2	0.0
		Ratio of Live to Dead	#cells/cm^2	30.6	18.1	12.9	16.3	6.9	6.9	19.7	16.4	3.1	7.1	6.6	6.7	10.8	79.2	6.4	28.0
		Siltation	% cells/cm^2	1.3	0.5	1.2	3.8	16.7	14.9	5.2	5.2	0.0	3.8	3.3	1.8	2.1	0.4	0.3	0.2
	Blue Green Algae	**Family: Oscillatoriaceae**	% cells/cm^2	0.1	18.3	4.5	0.0	0.5	1.2	0.4	2.6	2.9	0.5	1.1	0.9	3.8	2.0	0.5	0.0
	Diatom	**Family: Achnanthaceae**	% cells/cm^2	3.0	20.6	19.4	26.2	53.2	30.9	56.0	33.1	58.0	45.0	53.3	53.8	57.3	13.6	28.7	16.1
		Genus: *Achnanthidium*	% cells/cm^2	3.0	20.1	19.2	25.2	52.4	29.7	56.0	33.0	58.0	41.6	51.9	53.8	57.2	13.6	25.6	14.3
		Family: Cymbellaceae	% cells/cm^2	0.1	19.7	12.1	9.4	5.0	2.4	8.3	14.8	5.8	22.6	4.7	7.7	13.6	1.8	47.8	0.0
		Family: Fragilariaceae	% cells/cm^2	0.4	5.6	7.6	6.0	11.0	6.1	7.5	2.4	4.3	19.8	20.6	7.0	5.0	1.6	6.7	10.7
		Family: Naviculaceae	% cells/cm^2	0.4	0.9	1.8	3.6	24.1	10.3	4.9	6.9	0.0	5.1	11.7	0.8	3.8	0.2	7.2	7.1
		Family: Nitzchiaceae	% cells/cm^2	0.4	0.2	0.0	0.0	0.4	0.0	0.0	0.1	0.0	0.2	3.1	0.2	0.1	0.0	1.6	0.0
		Genus: *Gomphoneis*	% cells/cm^2	0.3	0.0	0.0	5.0	0.2	0.0	0.1	0.5	0.0	0.3	0.6	0.0	0.0	0.3	0.3	0.0
		Genus: *Nostoc*	% cells/cm^2	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Golden Algae	**Family: Hydruraceae**	% cells/cm^2	88.1	7.7	10.5	44.3	0.0	15.2	16.0	35.7	0.0	0.0	0.0	17.2	0.0	74.3	0.0	0.0
		Genus: *Hydrurus*	% cells/cm^2	88.1	7.7	10.5	44.3	0.0	15.2	16.0	35.7	0.0	0.0	0.0	17.2	0.0	74.3	0.0	0.0
	Red Algae	**Family: Acrochaeriaceae**	% cells/cm^2	0.0	6.3	29.2	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.8	0.0	0.0	23.2
		Genus: *Audouinella*	% cells/cm^2	0.0	6.3	29.2	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.8	0.0	0.0	23.2

Table F.8: Periphyton Community Metrics Investigated at Reference (n = 40) and Mine-exposed (n = 58) Areas in Elk Valley, 2015

Endpoint			Units	Reference																
				FO26	FLRU	GRUHA	HENUP	KO1	KODCR	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK
Total Density			#cells/cm^2	475,452	389,160	200,220	112,236	110,544	151,152	356,448	742,224	24,816	629,988	832,464	1,684,104	311,892	129,720	276,360	25,380	8,460	125,772
Total Biovolume			µg/cm^2	335,767,758	259,053,139	34,973,586	14,385,844	29,676,443	56,388,611	139,402,138	321,383,506	10,126,078	99,840,972	208,977,614	761,862,480	165,225,633	88,557,493	258,487,013	11,336,400	11,699,616	84,505,812
Total Family Richness			#/cm^2	12	13	10	9	7	11	7	14	10	10	8	21	14	18	12	5	5	11
Total Genus Richness			#/cm^2	16	16	13	11	12	17	9	21	11	11	10	28	16	20	18	7	9	16
Density	**Major Groups**	**Blue Green Density**	#cells/cm^2	198,528	324,864	40,044	10,716	5,640	13,536	0	151,152	5,640	7,896	64,296	1,338,936	266,772	41,736	27,072	0	0	37,224
		Green Density	#cells/cm^2	3,948	2,256	3,384	0	0	0	0	0	0	3,384	0	9,024	564	0	7,896	0	0	0
		Golden Density	#cells/cm^2	137,616	0	60,912	88,548	0	0	0	0	0	533,544	0	13,536	0	0	0	0	0	0
		Diatom Density	#cells/cm^2	108,852	62,040	99,264	12,972	104,904	137,616	356,448	591,072	15,792	88,548	768,168	318,096	41,736	80,652	242,520	25,380	8,460	76,704
		Red Density	#cells/cm^2	26,508	0	0	0	0	0	0	0	2,256	0	0	6,768	2,820	9,024	0	0	0	12,408
		Flagellate Density	#cells/cm^2	3,948	38,352	564	0	0	1,128	0	0	1,692	2,256	7,896	1,128	84,600	0	2,256	0	0	2,820
		Blue Green Biovolume	cm^3/m^2	52,418,160	123,782,251	4,449,960	1,330,936	3,891,600	8,501,736	0	29,086,608	963,898	710,640	85,310,640	495,182,976	105,365,352	12,453,025	5,819,352	0	0	23,197,320
		Green Biovolume	cm^3/m^2	207,270,000	4,060,800	135,360	0	0	0	0	0	0	135,360	0	17,732,160	29,610,000	0	66,912,960	0	0	0
		Golden Biovolume	cm^3/m^2	16,513,920	0	7,309,440	10,625,760	0	0	0	0	0	64,025,280	0	1,624,320	0	0	0	0	0	0
		Diatom Biovolume	cm^3/m^2	28,590,798	127,374,888	23,056,266	2,429,148	25,784,843	47,872,211	139,402,138	292,296,898	6,384,480	34,879,452	123,503,414	239,416,872	18,502,161	65,582,484	185,694,917	11,336,400	11,699,616	46,758,420
		Red Biovolume	cm^3/m^2	30,908,328	0	0	0	0	0	0	0	2,630,496	0	0	7,891,488	3,288,120	10,521,984	0	0	0	14,467,728
		Flagellate Biovolume	cm^3/m^2	66,552	3,835,200	22,560	0	0	14,664	0	0	147,204	90,240	163,560	14,664	8,460,000	0	59,784	0	0	82,344
	Blue Green Algae	**Family: Oscillatoriaceae**	#cells/cm^2	12,408	1,128	564	0	2,256	4,512	0	2,256	564	0	53,016	1,128	2,256	564	0	0	0	3,384
	Diatom	**Family: Achnanthaceae**	#cells/cm^2	55,272	23,688	76,704	8,460	65,424	66,552	175,968	245,904	14,100	14,664	566,256	110,544	29,892	43,992	117,312	3,384	1,692	7,896
		Genus: *Achnanthidium*	#cells/cm^2	54,708	6,768	75,576	8,460	64,296	64,296	175,968	232,368	10,152	14,664	562,872	99,264	22,560	11,844	103,776	3,384	1,128	3,384
		Family: Cymbellaceae	#cells/cm^2	19,176	2,256	3,384	564	0	6,768	45,120	36,096	564	3,948	5,640	4,512	2,256	2,820	7,896	564	564	1,692
		Family: Fragilariaceae	#cells/cm^2	1,128	24,816	9,024	2,256	13,536	22,560	40,608	76,704	0	7,896	1,128	57,528	2,820	2,256	60,912	17,484	2,820	56,400
		Family : Naviculaceae	#cells/cm^3	1,692	0	2,256	1,692	4,512	12,408	18,048	76,704	564	1,128	172,584	58,656	1,692	3,948	33,840	0	1,692	1,128
		Family: Nitzchiaceae	#cells/cm^2	564	3,384	0	0	3,384	3,384	9,024	4,512	564	0	0	1,128	0	564	0	0	0	1,692
		Genus: *Gomphoneis*	#cells/cm^2	2,820	0	0	0	14,664	19,176	58,656	76,704	0	2,820	4,512	28,200	1,128	564	5,640	0	564	564
		Genus: *Nostoc*	#cells/cm^2	0	309,072	0	0	0	0	0	0	0	0	0	1,212,600	258,312	18,612	12,408	0	0	33,840
	Golden Algae	**Family: Hydruraceae**	#cells/cm^2	137,616	0	60,912	88,548	0	0	0	0	0	533,544	0	13,536	0	0	0	0	0	0
		Genus: *Hydrurus*	#cells/cm^2	137,616	0	60,912	88,548	0	0	0	0	0	533,544	0	13,536	0	0	0	0	0	0
	Red Algae	**Family: Acrochaeriaceae**	#cells/cm^2	26,508	0	0	0	0	0	0	0	2,256	0	0	6,768	2,820	9,024	0	0	0	12,408
		Genus: *Audouinella*	#cells/cm^2	26,508	0	0	0	0	0	0	0	2,256	0	0	6,768	2,820	9,024	0	0	0	12,408
Proportion	**Biological Characteristics**	**Highly Motile Diatoms**	% cells/cm^2	1.1	4.4	2.2	9.3	5.2	9.7	7.4	8.6	2.8	0.3	26.1	2.7	0.2	6.4	5.6	0.0	13.4	1.0
		Eutrophic	% cells/cm^2	45.3	27.0	16.7	0.0	35.6	34.0	54.5	29.6	0.0	3.9	1.5	10.3	11.0	1.0	20.2	16.3	35.4	17.0
		Oligotrophic	% cells/cm^2	10.8	52.0	20.0	58.2	0.0	0.0	0.0	0.0	20.4	64.4	0.0	55.7	59.4	21.7	1.3	0.0	0.0	38.9
		Alkalibiontic	% cells/cm^2	11.5	9.8	8.0	9.4	15.1	9.0	2.0	5.0	24.6	22.7	2.7	3.0	2.7	9.3	1.7	21.5	22.4	5.1
		Slowing Growing	% cells/cm^2	47.5	27.6	25.6	0.0	4.8	10.1	22.9	13.7	20.4	2.0	2.8	12.8	13.3	28.5	23.2	33.0	23.1	36.1
		Dead	%	0.0	0.0	0.0	0.1	0.3	0.2	0.2	0.1	0.3	0.0	0.1	0.0	0.0	0.1	0.2	0.1	0.1	0.1
		Ratio of Live to Dead	#cells/cm^2	70.8	47.4	20.1	14.2	3.9	6.4	4.4	12.7	3.2	47.0	8.4	51.6	63.9	10.1	4.7	9.0	7.5	14.7
		Siltation	% cells/cm^2	1.1	0.4	3.1	9.3	5.2	9.7	5.8	7.4	2.8	0.3	26.1	2.7	0.2	2.7	5.6	0.0	13.4	1.0
	Blue Green Algae	**Family: Oscillatoriaceae**	% cells/cm^2	0.3	2.6	0.3	0.0	2.0	3.0	0.0	0.3	2.3	0.0	6.4	0.1	0.7	0.4	0.0	0.0	0.0	2.7
	Diatom	**Family: Achnanthaceae**	% cells/cm^2	6.1	11.6	38.3	7.5	59.2	44.0	49.4	33.1	56.8	2.3	68.0	6.6	9.6	33.9	42.4	13.3	20.0	6.3
		Genus: *Achnanthidium*	% cells/cm^2	11.5	1.7	37.7	7.5	58.2	42.5	49.4	31.3	40.9	2.3	67.6	5.9	7.2	9.1	37.6	13.3	13.3	2.7
		Family: Cymbellaceae	% cells/cm^2	0.6	4.0	1.7	0.5	0.0	4.5	12.7	4.9	2.3	0.6	0.7	0.3	0.7	2.2	2.9	2.2	6.7	1.3
		Family: Fragilariaceae	% cells/cm^2	6.4	0.2	4.5	2.0	12.2	14.9	11.4	10.3	0.0	1.3	0.1	3.4	0.9	1.7	22.0	68.9	33.3	44.8
		Family: Naviculaceae	% cells/cm^2	0.0	0.4	1.1	1.5	4.1	8.2	5.1	10.3	2.3	0.2	20.7	3.5	0.5	3.0	12.2	0.0	20.0	0.9
		Family: Nitzchiaceae	% cells/cm^2	0.9	0.1	0.0	0.0	3.1	2.2	2.5	0.6	2.3	0.0	0.0	0.1	0.0	0.4	0.0	0.0	0.0	1.3
		Genus: *Gomphoneis*	% cells/cm^2	0.6	0.0	0.0	0.0	13.3	12.7	16.5	10.3	0.0	0.4	0.5	1.7	0.4	0.4	2.0	0.0	6.7	0.4
		Genus: *Nostoc*	% cells/cm^2	0.0	79.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	72.0	82.8	14.3	4.5	0.0	0.0	26.9
	Golden Algae	**Family: Hydruraceae**	% cells/cm^2	0.0	28.9	30.4	78.9	0.0	0.0	0.0	0.0	0.0	84.7	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0
		Genus: *Hydrurus*	% cells/cm^2	28.9	0.0	30.4	78.9	0.0	0.0	0.0	0.0	0.0	84.7	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0
	Red Algae	**Family: Acrochaeriaceae**	% cells/cm^2	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.4	0.9	7.0	0.0	0.0	0.0	9.9
		Genus: *Audouinella*	% cells/cm^2	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.4	0.9	7.0	0.0	0.0	0.0	9.9

Table F.8: Periphyton Community Metrics Investigated at Reference (n = 40) and Mine-exposed (n = 58) Areas in Elk Valley, 2015

Endpoint			Units	Reference						Mine-exposed										
				SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CACK	COCK	EL19	EL1	EL20	ELDEL	ELDFE	ELDGR	ELELKO	ELH93
Total Density			#cells/cm^2	1,809,312	94,752	113,928	499,704	187,248	63,168	219,960	917,064	3,329,856	539,184	1,247,568	152,844	288,204	772,680	151,152	324,864	1,849,920
Total Biovolume			µg/cm^2	512,636,876	53,601,432	121,605,168	2,156,678,750	1,092,723,932	23,703,909	1,651,922,040	378,962,669	5,143,580,459	594,177,097	178,733,863	47,867,639	181,493,168	604,379,242	80,340,179	242,135,406	1,052,811,768
Total Family Richness			#/cm^2	16	8	8	15	11	10	10	13	11	20	13	16	18	15	15	13	17
Total Genus Richness			#/cm^2	15	13	13	20	15	12	16	18	17	19	18	18	25	18	19	17	21
Density	**Major Groups**	**Blue Green Density**	#cells/cm^2	288,768	18,048	25,944	210,936	564	8,460	4,512	16,356	27,072	168,072	31,584	47,376	60,912	24,816	15,792	12,408	60,912
		Green Density	#cells/cm^2	0	0	0	36,096	0	0	30,456	0	31,584	2,256	0	1,692	44,556	4,512	15,228	1,128	27,072
		Golden Density	#cells/cm^2	408,336	0	0	0	19,176	0	36,096	0	0	4,512	57,528	11,280	19,176	0	0	0	0
		Diatom Density	#cells/cm^2	1,112,208	76,704	89,112	254,928	163,560	54,708	148,896	904,092	3,248,640	356,448	1,152,816	91,368	146,076	714,024	101,520	309,636	1,752,912
		Red Density	#cells/cm^2	0	0	0	0	3,384	0	0	0	36,096	7,896	6,204	2,820	15,228	29,328	18,612	1,692	9,024
		Flagellate Density	#cells/cm^2	6,768	0	0	4,512	63,732	564	0	4,512	0	57,528	15,792	53,580	10,152	21,432	3,384	0	42,864
		Blue Green Biovolume	cm^3/m^2	97,987,104	18,544,320	39,558,960	81,352,766	896,760	6,466,377	688,549	17,734,650	18,273,600	242,896,752	45,850,944	20,853,167	47,052,264	21,714,000	9,159,594	2,170,272	27,584,112
		Green Biovolume	cm^3/m^2	0	0	0	1,895,040,000	0	0	1,598,940,000	0	3,790,080,000	243,693,120	0	67,680	54,402,876	121,104,553	18,593,388	1,332,276	243,304,681
		Golden Biovolume	cm^3/m^2	49,000,320	0	0	0	2,301,120	0	5,414,400	0	0	541,440	6,903,360	1,353,600	2,301,120	0	0	0	0
		Diatom Biovolume	cm^3/m^2	365,022,185	35,057,112	82,046,208	180,166,416	1,079,263,632	17,214,972	46,879,091	360,983,243	1,293,138,923	92,583,697	115,139,422	17,659,404	58,753,647	425,958,754	30,763,781	236,659,986	762,032,491
		Red Biovolume	cm^3/m^2	0	0	0	0	3,945,744	0	0	0	42,087,936	9,206,736	7,233,864	3,288,120	17,755,848	34,196,448	21,701,592	1,972,872	10,521,984
		Flagellate Biovolume	cm^3/m^2	627,267	0	0	119,568	6,316,676	22,560	0	244,776	0	5,255,352	3,606,272	4,645,668	1,227,413	1,405,488	121,824	0	9,368,500
	Blue Green Algae	**Family: Oscillatoriaceae**	#cells/cm^2	40,608	11,280	24,816	12,408	564	2,820	0	8,460	0	151,152	28,764	6,768	26,508	12,408	5,076	0	13,536
	Diatom	**Family: Achnanthaceae**	#cells/cm^2	530,160	40,608	27,072	59,784	80,088	36,096	81,216	111,108	776,064	254,928	1,076,676	69,372	99,264	552,720	76,140	186,684	1,430,304
		Genus: *Achnanthidium*	#cells/cm^2	527,904	38,352	25,944	16,920	78,960	32,712	80,088	111,108	767,040	252,672	1,073,856	67,680	96,444	532,416	70,500	177,660	1,398,720
		Family: Cymbellaceae	#cells/cm^2	9,024	5,640	12,408	77,832	70,500	7,896	6,768	15,792	699,360	20,304	27,072	3,384	10,716	33,840	3,948	45,684	81,216
		Family: Fragilariaceae	#cells/cm^2	6,768	12,408	19,176	39,480	4,512	564	29,328	182,172	1,597,248	31,584	19,176	8,460	13,536	74,448	3,948	59,220	124,080
		Family : Naviculaceae	#cells/cm^3	2,256	4,512	2,256	19,176	6,768	1,692	22,560	474,888	121,824	31,584	16,920	6,204	12,972	34,968	7,332	7,332	90,240
		Family: Nitzchiaceae	#cells/cm^2	0	0	2,256	5,640	0	1,128	6,768	2,256	0	0	0	1,692	2,256	3,384	0	1,128	4,512
		Genus: *Gomphoneis*	#cells/cm^2	313,584	4,512	10,152	7,896	0	1,692	1,128	2,256	4,512	1,128	3,384	0	3,384	0	0	0	0
		Genus: *Nostoc*	#cells/cm^2	0	0	0	147,768	0	5,076	0	0	0	0	0	0	0	0	0	0	0
	Golden Algae	**Family: Hydruraceae**	#cells/cm^2	408,336	0	0	0	19,176	0	36,096	0	0	4,512	57,528	11,280	19,176	0	0	0	0
		Genus: *Hydrurus*	#cells/cm^2	408,336	0	0	0	19,176	0	36,096	0	0	4,512	57,528	11,280	19,176	0	0	0	0
	Red Algae	**Family: Acrochaeriaceae**	#cells/cm^2	0	0	0	0	3,384	0	0	0	36,096	7,896	6,204	2,820	15,228	29,328	18,612	1,692	9,024
		Genus: *Audouinella*	#cells/cm^2	0	0	0	0	3,384	0	0	0	36,096	7,896	6,204	2,820	15,228	29,328	18,612	1,692	9,024
Proportion	**Biological Characteristics**	**Highly Motile Diatoms**	% cells/cm^2	0.2	5.4	0.9	1.1	0.2	4.4	6.1	39.1	0.8	1.5	2.3	6.2	2.0	2.5	2.7	1.8	3.8
		Eutrophic	% cells/cm^2	43.7	34.3	8.5	75.1	0.0	6.8	69.5	6.8	73.3	40.6	3.6	6.3	37.5	41.1	23.1	41.3	22.7
		Oligotrophic	% cells/cm^2	11.0	0.0	0.0	3.7	3.3	5.3	3.1	0.0	1.0	3.4	7.3	10.8	11.2	4.8	30.8	0.9	1.1
		Alkalibiontic	% cells/cm^2	19.6	10.8	9.2	4.0	2.4	18.0	8.4	59.0	8.6	2.2	8.5	8.1	2.0	7.0	8.6	5.4	4.4
		Slowing Growing	% cells/cm^2	0.0	27.3	3.6	78.4	3.7	4.9	67.4	10.8	74.6	44.7	7.6	10.8	46.6	47.4	54.6	42.5	24.1
		Dead	%	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.1	0.1	0.3	0.1
		Ratio of Live to Dead	#cells/cm^2	20.1	6.5	4.4	19.5	13.5	8.1	6.9	23.4	5.1	22.2	20.2	12.3	29.2	10.1	11.4	3.6	8.0
		Siltation	% cells/cm^2	0.2	5.4	0.9	0.7	0.2	4.4	6.1	39.1	0.8	1.5	2.3	6.2	1.8	2.5	2.7	1.8	3.8
	Blue Green Algae	**Family: Oscillatoriaceae**	% cells/cm^2	2.2	11.9	21.8	2.5	0.3	4.5	0.0	0.9	0.0	2.3	28.0	4.4	0.0	9.2	0.5	1.6	3.4
	Diatom	**Family: Achnanthaceae**	% cells/cm^2	29.3	42.9	23.8	12.0	42.8	57.1	36.9	12.1	23.3	86.3	47.3	45.4	36.2	34.4	6.7	71.5	50.4
		Genus: *Achnanthidium*	% cells/cm^2	29.2	40.5	22.8	3.4	42.2	51.8	36.4	12.1	23.0	46.9	86.1	44.3	33.5	68.9	46.6	54.7	75.6
		Family: Cymbellaceae	% cells/cm^2	0.5	6.0	10.9	15.6	37.7	12.5	3.1	1.7	21.0	2.2	3.8	2.2	40.8	3.7	0.3	4.4	2.6
		Family: Fragilariaceae	% cells/cm^2	0.4	13.1	16.8	7.9	2.4	0.9	13.3	19.9	48.0	1.5	5.9	5.5	14.1	4.7	78.0	9.6	2.6
		Family: Naviculaceae	% cells/cm^2	0.1	4.8	2.0	3.8	3.6	2.7	10.3	51.8	3.7	1.4	5.9	4.1	3.1	4.5	11.3	4.5	4.9
		Family: Nitzchiaceae	% cells/cm^2	0.0	0.0	2.0	1.1	0.0	1.8	3.1	0.2	0.0	0.0	0.0	1.1	0.3	0.8	0.0	0.4	0.0
		Genus: *Gomphoneis*	% cells/cm^2	17.3	4.8	8.9	1.6	0.0	2.7	0.5	0.2	0.1	0.2	0.3	0.0	1.2	0.0	0.0	0.0	0.0
		Genus: *Nostoc*	% cells/cm^2	0.0	0.0	0.0	29.6	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Golden Algae	**Family: Hydruraceae**	% cells/cm^2	22.6	0.0	0.0	0.0	10.2	0.0	16.4	0.0	0.0	4.6	0.8	7.4	0.0	6.7	0.0	0.0	0.0
		Genus: *Hydrurus*	% cells/cm^2	22.6	0.0	0.0	0.0	10.2	0.0	16.4	0.0	0.0	0.8	4.6	7.4	6.7	0.0	0.0	0.0	0.0
	Red Algae	**Family: Acrochaeriaceae**	% cells/cm^2	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	1.1	0.5	1.5	1.8	0.0	5.3	0.0	3.8	12.3
		Genus: *Audouinella*	% cells/cm^2	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	1.1	1.5	0.5	1.8	5.3	3.8	12.3	0.5	0.5

Table F.8: Periphyton Community Metrics Investigated at Reference (n = 40) and Mine-exposed (n = 58) Areas in Elk Valley, 2015

Endpoint			Units	Mine-exposed															
				ELUEL	ELUFE	ELUFO	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODPO	FOUEW	FOUKI
Total Density			#cells/cm^2	639,012	798,624	637,320	287,640	1,951,440	997,152	579,228	3,451,680	873,072	459,096	157,920	688,080	6,912,384	152,280	2,120,640	9,154,848	73,884
Total Biovolume			µg/cm^2	193,259,135	277,289,145	393,952,703	221,073,776	1,498,544,655	126,790,149	358,349,355	796,687,182	133,025,337	134,451,396	21,332,063	127,915,731	657,837,902	114,657,836	1,828,756,344	1,045,568,966	312,276,648
Total Family Richness			#/cm^2	14	11	14	10	17	11	18	12	8	11	10	17	14	10	13	12	12
Total Genus Richness			#/cm^2	16	14	19	14	20	15	22	17	10	12	13	21	18	16	15	16	12
Density	**Major Groups**	**Blue Green Density**	#cells/cm^2	52,452	40,608	67,680	44,556	99,264	94,752	33,840	433,152	124,080	30,456	35,532	233,496	266,208	10,716	128,592	198,528	11,844
		Green Density	#cells/cm^2	564	0	0	0	4,512	0	3,384	2,256	0	0	0	10,152	2,256	0	27,072	0	5,076
		Golden Density	#cells/cm^2	14,100	0	0	45,120	9,024	0	0	13,536	0	0	27,072	71,064	0	2,820	0	0	0
		Diatom Density	#cells/cm^2	538,620	737,712	547,080	113,364	1,834,128	896,760	502,524	3,002,736	746,736	420,744	92,496	342,912	6,610,080	132,540	1,935,648	8,956,320	46,812
		Red Density	#cells/cm^2	23,124	21,432	22,560	84,036	6,768	5,640	38,916	0	2,256	7,896	2,820	36,096	36,096	6,204	29,328	0	10,152
		Flagellate Density	#cells/cm^2	12,408	7,896	1,128	564	227,856	5,640	3,948	2,256	0	2,256	0	18,048	13,536	2,256	2,256	4,512	6,204
		Blue Green Biovolume	cm^3/m^2	53,732,280	22,228,368	79,997,760	60,731,520	65,974,464	18,421,368	15,443,257	174,330,144	64,647,936	4,633,824	3,841,968	29,434,119	118,913,760	2,312,400	174,706,896	123,394,176	674,544
		Green Biovolume	cm^3/m^2	29,610,000	0	0	0	961,146,240	0	91,875,600	118,440,000	0	0	0	4,402,584	2,754,576	0	1,421,280,000	0	266,490,000
		Golden Biovolume	cm^3/m^2	1,692,000	0	0	10,828,800	1,082,880	0	0	1,624,320	0	0	3,248,640	8,527,680	0	338,400	0	0	0
		Diatom Biovolume	cm^3/m^2	46,808,052	229,741,689	287,604,863	51,493,764	439,934,703	101,719,221	205,494,830	502,202,478	65,746,905	120,385,236	10,953,335	42,847,773	493,722,926	104,743,844	198,293,256	921,723,590	10,256,340
		Red Biovolume	cm^3/m^2	26,962,584	24,989,712	26,304,960	97,985,976	7,891,488	6,576,240	45,376,056	0	2,630,496	9,206,736	3,288,120	42,087,936	42,087,936	7,233,864	34,196,448	0	11,837,232
		Flagellate Biovolume	cm^3/m^2	34,454,219	329,376	45,120	33,716	22,514,880	73,320	159,612	90,240	0	225,600	0	615,640	358,704	29,328	279,744	451,200	23,018,532
	Blue Green Algae	**Family: Oscillatoriaceae**	#cells/cm^2	28,764	11,280	48,504	37,788	36,096	4,512	8,460	67,680	33,840	0	564	3,384	45,120	1,128	108,288	63,168	0
	Diatom	**Family: Achnanthaceae**	#cells/cm^2	522,264	568,512	423,000	89,676	1,461,888	772,680	288,204	2,623,728	708,384	159,612	86,292	301,176	6,445,392	82,344	1,631,088	8,044,896	38,352
		Genus: *Achnanthidium*	#cells/cm^2	519,444	565,128	408,336	87,984	1,459,632	772,680	285,948	2,616,960	703,872	159,048	85,728	300,048	6,436,368	81,216	1,628,832	8,040,384	38,352
		Family: Cymbellaceae	#cells/cm^2	6,204	57,528	40,608	2,256	101,520	5,640	21,432	171,456	2,256	2,820	1,692	15,792	20,304	41,172	130,848	203,040	1,128
		Family: Fragilariaceae	#cells/cm^2	1,692	99,264	27,072	16,920	189,504	101,520	118,440	110,544	31,584	253,236	1,128	7,896	90,240	2,256	94,752	631,680	6,768
		Family : Naviculaceae	#cells/cm^3	4,512	4,512	39,480	4,512	47,376	12,408	68,244	85,728	4,512	2,820	3,384	15,792	40,608	3,948	60,912	36,096	564
		Family: Nitzchiaceae	#cells/cm^2	564	0	0	0	4,512	0	2,256	0	0	0	0	0	0	0	0	4,512	0
		Genus: *Gomphoneis*	#cells/cm^2	0	2,256	0	0	11,280	0	1,692	2,256	0	0	0	0	4,512	564	0	0	0
		Genus: *Nostoc*	#cells/cm^2	0	0	1,128	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Golden Algae	**Family: Hydruraceae**	#cells/cm^2	14,100	0	0	45,120	9,024	0	0	13,536	0	0	27,072	71,064	0	2,820	0	0	0
		Genus: *Hydrurus*	#cells/cm^2	14,100	0	0	45,120	9,024	0	0	13,536	0	0	27,072	71,064	0	2,820	0	0	0
	Red Algae	**Family: Acrochaeriaceae**	#cells/cm^2	23,124	21,432	22,560	84,036	6,768	5,640	38,916	0	2,256	7,896	2,820	36,096	36,096	6,204	29,328	0	10,152
		Genus: *Audouinella*	#cells/cm^2	23,124	21,432	22,560	84,036	6,768	5,640	38,916	0	2,256	7,896	2,820	36,096	36,096	6,204	29,328	0	10,152
Proportion	**Biological Characteristics**	**Highly Motile Diatoms**	% cells/cm^2	1.2	0.6	4.3	0.9	2.0	5.0	5.2	5.0	1.6	0.7	5.6	0.8	4.3	3.2	3.4	1.8	0.0
		Eutrophic	% cells/cm^2	15.1	41.7	10.7	16.3	42.7	7.4	41.7	14.0	0.0	19.6	9.4	7.2	2.6	0.2	31.7	9.2	54.3
		Oligotrophic	% cells/cm^2	13.1	11.0	6.6	50.1	0.5	5.3	13.9	0.2	2.3	6.7	36.3	32.6	7.1	10.2	4.7	0.0	2.5
		Alkalibiontic	% cells/cm^2	3.3	7.1	10.3	0.3	1.1	2.8	2.8	5.4	10.5	1.2	4.9	5.5	2.2	7.2	2.1	7.0	9.3
		Slowing Growing	% cells/cm^2	27.1	52.2	19.9	62.8	44.5	14.2	55.8	14.1	2.3	26.3	25.4	33.3	9.2	9.9	36.3	9.2	56.9
		Dead	%	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.0	0.1	0.3	0.1	0.0	0.1
		Ratio of Live to Dead	#cells/cm^2	13.7	7.1	9.1	53.6	18.8	15.6	13.2	16.3	3.5	9.5	20.0	24.3	12.3	3.5	9.9	20.9	12.9
		Siltation	% cells/cm^2	1.2	0.6	4.3	0.9	2.0	5.0	5.2	5.0	1.6	0.7	5.6	0.8	4.3	3.2	3.4	1.8	0.0
	Blue Green Algae	**Family: Oscillatoriaceae**	% cells/cm^2	0.0	0.7	4.5	1.4	7.6	13.1	1.8	0.5	1.5	2.0	3.9	0.0	0.4	0.5	0.7	0.7	5.1
	Diatom	**Family: Achnanthaceae**	% cells/cm^2	57.5	77.3	81.7	71.2	66.4	31.2	74.9	77.5	49.8	76.0	81.1	34.8	54.6	43.8	93.2	54.1	76.9
		Genus: *Achnanthidium*	% cells/cm^2	81.3	70.8	64.1	30.6	74.8	77.5	49.4	75.8	80.6	34.6	54.3	43.6	93.1	53.3	76.8	87.8	51.9
		Family: Cymbellaceae	% cells/cm^2	14.1	4.4	1.0	7.2	6.4	0.8	5.2	0.6	3.7	5.0	0.3	0.6	1.1	2.3	0.3	27.0	6.2
		Family: Fragilariaceae	% cells/cm^2	18.2	6.7	0.3	12.4	4.2	5.9	9.7	10.2	20.4	3.2	3.6	55.2	0.7	1.1	1.3	1.5	4.5
		Family: Naviculaceae	% cells/cm^2	2.3	4.9	0.7	0.6	6.2	1.6	2.4	1.2	11.8	2.5	0.5	0.6	2.1	2.3	0.6	2.6	2.9
		Family: Nitzchiaceae	% cells/cm^2	0.3	0.2	0.1	0.0	0.0	0.0	0.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Genus: *Gomphoneis*	% cells/cm^2	0.0	0.3	0.0	0.0	0.6	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.0
		Genus: *Nostoc*	% cells/cm^2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Golden Algae	**Family: Hydruraceae**	% cells/cm^2	0.0	0.0	2.2	0.0	0.0	15.7	0.5	0.0	0.0	0.4	0.0	0.0	17.1	10.3	0.0	1.9	0.0
		Genus: *Hydrurus*	% cells/cm^2	2.2	0.0	0.0	15.7	0.5	0.0	0.0	0.4	0.0	0.0	17.1	10.3	0.0	1.9	0.0	0.0	0.0
	Red Algae	**Family: Acrochaeriaceae**	% cells/cm^2	0.5	0.5	3.6	2.7	3.5	29.2	0.3	0.6	6.7	0.0	0.3	1.7	1.8	5.2	0.5	4.1	1.4
		Genus: *Audouinella*	% cells/cm^2	3.6	2.7	3.5	29.2	0.3	0.6	6.7	0.0	0.3	1.7	1.8	5.2	0.5	4.1	1.4	0.0	13.7

Table F.8: Periphyton Community Metrics Investigated at Reference (n = 40) and Mine-exposed (n = 58) Areas in Elk Valley, 2015

Endpoint			Units	Mine-exposed															
				FOUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL	LILC3
Total Density			#cells/cm^2	198,528	85,164	816,672	1,323,144	1,724,712	774,936	486,732	1,076,112	1,530,696	773,808	132,540	821,184	1,080,624	2,125,152	382,956	1,121,232	6,569,472
Total Biovolume			µg/cm^2	90,490,894	17,968,827	252,522,708	788,475,166	167,493,563	114,006,960	94,925,039	297,055,238	1,047,667,481	1,455,014,522	2,217,386,492	239,053,547	416,106,548	1,423,150,619	153,724,336	212,571,912	876,657,650
Total Family Richness			#/cm^2	18	15	14	13	10	12	12	14	14	14	10	13	13	15	23	19	21
Total Genus Richness			#/cm^2	23	17	16	22	13	14	16	17	21	23	13	17	16	22	22	20	21
Density	**Major Groups**	**Blue Green Density**	#cells/cm^2	86,292	23,688	63,168	23,688	66,552	154,536	32,148	80,088	311,328	46,248	1,692	234,624	182,736	117,312	212,064	215,448	469,248
		Green Density	#cells/cm^2	0	0	0	4,512	20,304	0	0	0	13,536	14,664	42,300	0	0	9,024	1,692	15,792	36,096
		Golden Density	#cells/cm^2	0	11,280	68,808	6,768	71,064	104,904	81,216	3,384	83,472	9,024	8,460	399,312	11,280	0	14,100	54,144	0
		Diatom Density	#cells/cm^2	108,852	49,068	566,256	1,097,544	1,587,096	515,496	369,420	982,488	1,122,360	703,872	67,116	188,376	821,184	1,967,232	157,356	835,848	6,064,128
		Red Density	#cells/cm^2	2,256	0	118,440	191,760	0	0	3,948	7,896	0	0	0	0	0	31,584	0	0	0
		Flagellate Density	#cells/cm^2	1,128	5,076	2,256	2,256	2,256	67,680	564	4,512	3,384	0	16,920	2,256	78,960	0	16,356	82,344	9,024
		Blue Green Biovolume	cm^3/m^2	45,456,964	4,283,931	14,635,800	34,279,920	8,087,760	38,414,040	7,562,112	90,973,200	196,249,440	19,063,200	152,280	131,225,880	52,831,008	117,282,672	27,068,286	74,145,696	192,472,896
		Green Biovolume	cm^3/m^2	0	0	0	5,509,152	812,160	0	0	0	710,640,000	769,860,000	2,134,965,600	0	0	473,760,000	67,680	22,061,262	34,676,814
		Golden Biovolume	cm^3/m^2	0	1,353,600	8,256,960	812,160	8,527,680	12,588,480	9,745,920	406,080	10,016,640	2,707,200	1,015,200	47,917,440	1,353,600	0	1,692,000	6,497,280	0
		Diatom Biovolume	cm^3/m^2	42,299,782	12,075,804	91,370,988	524,191,534	150,036,635	56,642,520	72,991,079	196,031,558	130,686,953	663,384,122	63,921,687	59,819,987	267,157,776	795,281,003	123,798,510	102,107,035	649,146,981
		Red Biovolume	cm^3/m^2	2,630,496	0	138,101,040	223,592,160	0	0	4,603,368	9,206,736	0	0	0	0	0	36,826,944	0	0	0
		Flagellate Biovolume	cm^3/m^2	103,652	255,492	157,920	90,240	29,328	6,361,920	22,560	437,664	74,448	0	17,331,725	90,240	94,764,164	0	1,097,860	7,760,640	360,960
	Blue Green Algae	**Family: Oscillatoriaceae**	#cells/cm^2	23,688	1,692	4,512	21,432	1,128	15,792	2,256	55,272	107,160	7,896	0	72,192	18,048	69,936	0	31,584	72,192
	Diatom	**Family: Achnanthaceae**	#cells/cm^2	85,728	41,736	544,824	627,168	1,371,648	460,224	237,444	672,288	959,928	508,728	25,380	68,808	42,864	1,615,296	37,788	730,944	5,333,184
		Genus: *Achnanthidium*	#cells/cm^2	82,908	41,172	544,824	611,376	1,371,648	459,096	236,316	671,160	957,672	500,832	25,380	68,808	36,096	1,604,016	37,788	730,944	5,333,184
		Family: Cymbellaceae	#cells/cm^2	2,256	1,128	6,768	41,736	41,736	9,024	43,992	16,920	10,152	89,112	1,692	57,528	36,096	74,448	103,212	38,352	279,744
		Family: Fragilariaceae	#cells/cm^2	12,972	3,948	3,384	313,584	137,616	21,432	78,960	164,688	41,736	23,688	18,612	16,920	45,120	198,528	7,332	13,536	225,600
		Family : Naviculaceae	#cells/cm^3	2,256	1,128	7,896	71,064	15,792	13,536	1,692	125,208	67,680	69,936	0	2,256	2,256	69,936	4,512	2,256	108,288
		Family: Nitzchiaceae	#cells/cm^2	564	0	0	10,152	0	0	0	1,128	6,768	1,128	0	21,432	419,616	4,512	564	0	9,024
		Genus: *Gomphoneis*	#cells/cm^2	0	0	0	1,128	9,024	0	0	2,256	7,896	1,128	19,740	0	2,256	0	1,128	25,944	63,168
		Genus: *Nostoc*	#cells/cm^2	0	0	0	0	0	0	4,512	0	0	0	0	0	0	0	0	0	0
	Golden Algae	**Family: Hydruraceae**	#cells/cm^2	0	11,280	68,808	6,768	71,064	104,904	81,216	3,384	83,472	9,024	8,460	399,312	11,280	0	14,100	54,144	0
		Genus: *Hydrurus*	#cells/cm^2	0	11,280	68,808	6,768	71,064	104,904	81,216	3,384	83,472	9,024	8,460	399,312	11,280	0	14,100	54,144	0
	Red Algae	**Family: Acrochaeriaceae**	#cells/cm^2	2,256	0	118,440	191,760	0	0	3,948	7,896	0	0	0	0	0	31,584	0	0	0
		Genus: *Audouinella*	#cells/cm^2	2,256	0	118,440	191,760	0	0	3,948	7,896	0	0	0	0	0	31,584	0	0	0
Proportion	**Biological Characteristics**	**Highly Motile Diatoms**	% cells/cm^2	1.4	6.2	0.9	3.4	2.6	3.1	1.2	23.3	5.1	4.7	0.0	4.0	45.2	3.9	2.7	0.9	3.4
		Eutrophic	% cells/cm^2	27.7	30.4	2.9	34.1	4.1	0.0	1.1	7.1	30.4	26.8	99.0	0.0	2.2	35.3	6.3	16.7	13.8
		Oligotrophic	% cells/cm^2	2.8	9.0	55.8	28.6	5.0	10.7	18.4	5.2	2.1	0.4	0.1	19.0	0.4	4.2	0.4	3.7	1.4
		Alkalibiontic	% cells/cm^2	3.0	1.5	1.5	11.9	3.1	3.5	4.1	1.3	3.8	4.4	0.0	15.3	47.2	3.9	40.8	10.8	7.5
		Slowing Growing	% cells/cm^2	30.1	30.4	55.8	66.2	1.0	9.8	11.4	11.8	29.2	27.5	97.8	0.0	1.6	39.5	6.1	6.8	10.1
		Dead	%	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.1
		Ratio of Live to Dead	#cells/cm^2	19.6	6.9	7.6	7.9	13.5	15.2	14.2	5.2	19.2	8.6	12.7	36.6	13.1	16.8	71.2	42.7	10.9
		Siltation	% cells/cm^2	1.4	6.2	0.9	3.4	2.6	3.1	1.2	23.3	5.1	4.7	0.0	4.0	45.2	3.9	2.7	0.9	3.4
	Blue Green Algae	**Family: Oscillatoriaceae**	% cells/cm^2	0.7	0.0	11.9	2.0	0.6	1.6	0.1	2.0	0.5	5.1	7.0	1.0	0.0	1.7	8.8	3.3	0.0
	Diatom	**Family: Achnanthaceae**	% cells/cm^2	87.9	51.9	43.2	49.0	66.7	47.4	79.5	59.4	48.8	62.5	62.7	65.7	19.1	4.0	8.4	76.0	9.9
		Genus: *Achnanthidium*	% cells/cm^2	41.8	48.3	66.7	46.2	79.5	59.2	48.6	62.4	62.6	64.7	19.1	8.4	3.3	75.5	9.9	65.2	81.2
		Family: Cymbellaceae	% cells/cm^2	2.2	1.5	1.1	1.3	0.8	3.2	2.4	1.2	9.0	1.6	0.7	11.5	1.3	3.3	7.0	3.5	27.0
		Family: Fragilariaceae	% cells/cm^2	6.9	9.2	6.5	4.6	0.4	23.7	8.0	2.8	16.2	15.3	2.7	3.1	14.0	4.2	2.1	9.3	1.9
		Family: Naviculaceae	% cells/cm^2	0.4	0.8	1.1	1.3	1.0	5.4	0.9	1.7	0.3	11.6	4.4	9.0	0.0	0.2	0.3	3.3	1.2
		Family: Nitzchiaceae	% cells/cm^2	0.0	0.0	0.3	0.0	0.0	0.8	0.0	0.0	0.0	0.1	0.4	0.1	0.0	38.8	2.6	0.2	0.1
		Genus: *Gomphoneis*	% cells/cm^2	0.0	0.0	0.0	0.1	0.5	0.0	0.0	0.2	0.5	0.1	14.9	0.0	0.2	0.0	0.3	2.3	1.0
		Genus: *Nostoc*	% cells/cm^2	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Golden Algae	**Family: Hydruraceae**	% cells/cm^2	0.0	0.0	0.0	13.2	8.4	0.5	4.1	13.5	16.7	0.3	5.5	1.2	6.4	1.0	48.6	0.0	3.7
		Genus: *Hydrurus*	% cells/cm^2	0.0	13.2	8.4	0.5	4.1	13.5	16.7	0.3	5.5	1.2	6.4	48.6	1.0	0.0	3.7	4.8	0.0
	Red Algae	**Family: Acrochaeriaceae**	% cells/cm^2	0.0	13.7	1.1	0.0	14.5	14.5	0.0	0.0	0.8	0.7	0.0	0.0	0.0	0.0	0.0	1.5	0.0
		Genus: *Audouinella*	% cells/cm^2	1.1	0.0	14.5	14.5	0.0	0.0	0.8	0.7	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0

Table F.8: Periphyton Community Metrics Investigated at Reference (n = 40) and Mine-exposed (n = 58) Areas in Elk Valley, 2015

Endpoint			Units	Mine-exposed												
				MI2	MI3	MI5	MIDAG	MIDCO	MIUCO	MP1	FODNGD	OCNM	POCK	SWCK	THCK	WOCK
Total Density			#cells/cm^2	620,400	138,744	67,680	113,364	349,680	269,028	979,104	631,116	29,328	2,632,752	645,216	841,488	2,950,848
Total Biovolume			µg/cm^2	108,051,630	83,265,576	50,475,180	44,883,651	535,361,631	163,881,062	239,022,873	450,148,018	34,665,555	22,195,747,368	5,882,935,104	1,885,618,658	1,050,198,713
Total Family Richness			#/cm^2	10	12	10	14	13	12	10	17	11	15	9	9	9
Total Genus Richness			#/cm^2	13	13	11	17	15	18	14	23	14	23	19	12	13
Density	**Major Groups**	**Blue Green Density**	#cells/cm^2	5,076	2,256	2,820	12,972	13,536	135,924	119,568	50,760	1,128	342,912	0	13,536	0
		Green Density	#cells/cm^2	1,692	11,280	20,868	1,692	0	9,588	0	13,536	0	408,336	106,032	0	9,024
		Golden Density	#cells/cm^2	0	5,076	0	0	0	0	58,656	0	0	0	0	0	0
		Diatom Density	#cells/cm^2	610,812	79,524	43,992	78,960	336,144	123,516	762,528	297,792	25,380	1,881,504	539,184	827,952	2,950,848
		Red Density	#cells/cm^2	5,076	40,608	0	19,176	0	0	38,352	271,284	2,820	0	0	0	0
		Flagellate Density	#cells/cm^2	564	0	564	1,128	5,076	0	1,128	3,384	6,204	0	13,536	2,256	121,824
		Blue Green Biovolume	cm^3/m^2	456,840	134,232	456,840	1,242,514	3,807,000	47,436,348	36,885,600	18,911,263	101,520	113,377,536	0	7,412,366	0
		Green Biovolume	cm^3/m^2	67,680	13,772,880	37,145,040	5,109,840	414,540,000	28,955,760	0	9,784,332	0	21,437,640,000	5,566,680,000	1,302,840,000	360,960
		Golden Biovolume	cm^3/m^2	0	609,120	0	0	0	0	7,038,720	0	0	0	0	0	0
		Diatom Biovolume	cm^3/m^2	101,552,094	21,400,416	12,850,740	16,094,814	116,902,959	87,488,954	150,335,001	104,404,335	31,149,579	644,729,832	315,896,400	575,276,052	1,037,926,073
		Red Biovolume	cm^3/m^2	5,918,616	47,348,928	0	22,359,216	0	0	44,718,432	316,317,144	3,288,120	0	0	0	0
		Flagellate Biovolume	cm^3/m^2	56,400	0	22,560	77,268	111,672	0	45,120	730,944	126,336	0	358,704	90,240	11,911,680
	Blue Green Algae	**Family: Oscillatoriaceae**	#cells/cm^2	0	0	0	0	1,128	0	12,408	6,768	0	36,096	0	4,512	0
	Diatom	**Family: Achnanthaceae**	#cells/cm^2	544,824	72,192	37,224	54,144	240,828	29,892	598,968	232,932	7,896	1,191,168	277,488	56,400	1,069,344
		Genus: *Achnanthidium*	#cells/cm^2	537,492	63,732	32,148	50,760	230,676	18,612	596,712	231,804	7,896	1,191,168	261,696	6,768	1,064,832
		Family: Cymbellaceae	#cells/cm^2	21,432	1,128	1,128	6,768	19,740	2,256	31,584	18,612	564	85,728	31,584	2,256	1,204,704
		Family: Fragilariaceae	#cells/cm^2	23,688	2,256	564	3,384	45,684	29,892	84,600	9,588	7,332	406,080	126,336	656,496	415,104
		Family : Naviculaceae	#cells/cm^3	10,152	564	2,820	10,716	12,972	37,224	41,736	31,020	2,820	29,328	42,864	94,752	90,240
		Family: Nitzchiaceae	#cells/cm^2	0	564	564	564	564	1,692	0	1,128	0	13,536	15,792	0	9,024
		Genus: *Gomphoneis*	#cells/cm^2	564	0	0	0	0	0	0	564	0	51,888	6,768	4,512	22,560
		Genus: *Nostoc*	#cells/cm^2	0	0	0	0	2,820	106,596	0	0	0	2,256	0	0	0
	Golden Algae	**Family: Hydruraceae**	#cells/cm^2	0	5,076	0	0	0	0	58,656	0	0	0	0	0	0
		Genus: *Hydrurus*	#cells/cm^2	0	5,076	0	0	0	0	58,656	0	0	0	0	0	0
	Red Algae	**Family: Acrochaeriaceae**	#cells/cm^2	5,076	40,608	0	19,176	0	0	38,352	271,284	2,820	0	0	0	0
		Genus: *Audouinella*	#cells/cm^2	5,076	40,608	0	19,176	0	0	38,352	271,284	2,820	0	0	0	0
Proportion	**Biological Characteristics**	**Highly Motile Diatoms**	% cells/cm^2	4.3	0.7	2.3	8.2	0.9	8.2	5.7	2.4	2.0	0.6	0.3	3.0	2.2
		Eutrophic	% cells/cm^2	34.6	21.6	0.0	7.7	63.4	31.2	24.4	9.4	15.9	75.9	95.9	77.4	39.5
		Oligotrophic	% cells/cm^2	6.1	52.6	0.0	42.6	0.2	25.4	20.9	50.1	8.7	0.1	0.0	0.0	0.0
		Alkalibiontic	% cells/cm^2	5.4	3.3	0.1	21.8	13.5	2.2	4.3	1.0	18.9	5.0	0.9	2.2	10.8
		Slowing Growing	% cells/cm^2	41.2	74.9	73.0	47.6	67.3	47.8	40.9	59.5	45.8	75.1	95.9	77.4	39.2
		Dead	%	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.2	0.2	0.1
		Ratio of Live to Dead	#cells/cm^2	12.8	16.4	7.6	14.4	18.4	26.5	17.0	28.2	7.0	10.1	6.2	5.7	10.2
		Siltation	% cells/cm^2	4.3	0.7	2.3	8.2	0.9	8.1	5.7	2.4	2.0	0.5	0.3	3.0	2.7
	Blue Green Algae	**Family: Oscillatoriaceae**	% cells/cm^2	2.8	1.1	0.0	0.0	0.0	0.0	0.3	0.0	1.3	1.1	0.0	1.4	0.0
	Diatom	**Family: Achnanthaceae**	% cells/cm^2	65.2	81.2	87.8	52.0	55.0	47.8	68.9	11.1	61.2	36.9	26.9	45.2	43.0
		Genus: *Achnanthidium*	% cells/cm^2	86.6	45.9	47.5	44.8	66.0	6.9	60.9	36.7	26.9	45.2	40.6	0.8	36.1
		Family: Cymbellaceae	% cells/cm^2	3.4	4.3	3.5	0.8	1.7	6.0	5.6	0.8	3.2	2.9	1.9	3.3	4.9
		Family: Fragilariaceae	% cells/cm^2	1.2	3.4	3.8	1.6	0.8	3.0	13.1	11.1	8.6	1.5	25.0	15.4	19.6
		Family: Naviculaceae	% cells/cm^2	0.2	1.6	1.6	0.4	4.2	9.5	3.7	13.8	4.3	4.9	9.6	1.1	6.6
		Family: Nitzchiaceae	% cells/cm^2	0.0	0.1	0.0	0.4	0.8	0.5	0.2	0.6	0.0	0.2	0.0	0.5	2.4
		Genus: *Gomphoneis*	% cells/cm^2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	2.0	1.0	0.5	0.8
		Genus: *Nostoc*	% cells/cm^2	0.0	0.0	0.0	0.0	0.8	39.6	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Golden Algae	**Family: Hydruraceae**	% cells/cm^2	4.8	0.0	0.0	3.7	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
		Genus: *Hydrurus*	% cells/cm^2	0.0	3.7	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
	Red Algae	**Family: Acrochaeriaceae**	% cells/cm^2	0.0	0.0	0.8	29.3	0.0	16.9	0.0	0.0	3.9	43.0	9.6	0.0	0.0
		Genus: *Audouinella*	% cells/cm^2	0.8	29.3	0.0	16.9	0.0	0.0	3.9	43.0	9.6	0.0	0.0	0.0	0.0

Table F.9: Pearson Correlation Coefficients for Periphyton Community Endpoints for Reference (n = 40) and Mine-exposed (n = 58) Areas Versus the First Principal Component (PC-1) Calculated from Five Different PCAs for Water Quality Measured at the Same Areas, September 2015

Variables			All Water Quality Variables (concentration) PC-1		All Water Quality Variables (HQ[a]) PC-1		All Water Quality Variables and Calcite Index (HQ[a]) PC-1		Key[b] Water Quality Variables (concentration) and Calcite Index PC-1		Key[b] Water Quality Variables and Calcite Index (HQ[a]) PC-1		Calcite Index	
			r	P-value	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value
Green Density			0.208	0.040	0.195	0.053	0.195	0.058	0.192	0.057	0.191	0.058	0.199	0.050
Diatom Density			0.348	<0.001	0.383	<0.001	0.383	<0.001	0.306	0.002	0.381	<0.001	0.300	0.003
Green Biovolume			0.224	0.027	0.206	0.041	0.206	0.046	0.213	0.034	0.201	0.046	0.202	0.046
Flagellate Biovolume			-0.016	0.879	-0.038	0.713	-0.037	0.728	-0.069	0.499	-0.035	0.728	0.008	0.941
Achnanthaceae Density			0.269	0.007	0.344	<0.001	0.344	<0.001	0.264	0.008	0.345	<0.001	0.247	0.014
Achnanthidium Density			0.269	0.007	0.344	<0.001	0.344	<0.001	0.264	0.008	0.346	<0.001	0.248	0.014
Fragilariaceae Density			0.434	<0.001	0.346	<0.001	0.346	<0.001	0.299	0.003	0.334	<0.001	0.325	0.001
% Alkalibiontic			-0.066	0.516	-0.101	0.316	-0.102	0.289	-0.080	0.429	-0.108	0.289	-0.076	0.458
% Achnanthaceae			0.189	0.062	0.252	0.012	0.252	0.008	0.168	0.096	0.266	0.008	0.202	0.046
% *Achnanthidium*			0.257	0.011	0.430	<0.001	0.430	<0.001	0.310	0.002	0.440	<0.001	0.291	0.004
NMDS 3-D	Genus-Level/Relative Abundance/Fourth Root Transformed	Axis 1	0.002	0.986	0.196	0.052	0.196	0.045	0.033	0.746	0.202	0.045	0.047	0.642
		Axis 2	-0.039	0.706	0.009	0.932	0.009	0.944	0.082	0.420	0.007	0.944	0.027	0.794
		Axis 3	0.187	0.065	0.209	0.038	0.209	0.031	0.137	0.176	0.217	0.031	0.178	0.080

r ≥ 0.6 or r ≤ -0.6.

P-value < 0.05.

Note: PCA Details in Appendix A. The mine-exposed area NGD1 was not sampled for periphyton in 2015.

[a] HQ - hazard quotient. Observed concentration divided by Level 1 effect benchmark defined in the Elk Valley Water Quality Plan (selenium, sulphate, nitrate, cadmium), the upper normal range limit defined by Minnow (2016; calcite index), or BC water quality guidelines (the other water quality variables), as applicable.

[b] Selenium, sulphate, nitrate.

Table F.10: Comparison of Reference Area Data Distributions for Periphyton Community Endpoints Based on Percentiles Derived from the 2015 (n = 40) Reference Area Results Before and After the Removal of Potential Outliers

Main Watershed	Management Unit	Percentile and Biological Area Code	Green Density	Achnanthidium Density	Fragilariaceae Density	NMDS Axis 1[a]	NMDS Axis 3[a]	
			All Areas	All Areas	All Areas	All Areas	All Areas	All Areas (2 Outliers Removed)
		n	40	40	40	40	40	38
		2.5	0	3,328	550	-1.13	-1.04	-0.891
		5	0	3,384	1,100	-1.10	-0.888	-0.772
		10	0	6,542	1,636	-1.00	-0.623	-0.518
		25	0	16,356	3,243	-0.647	-0.333	-0.330
		50	0	69,936	20,022	-0.257	-0.135	-0.135
		75	3,525	237,444	42,582	0.428	0.124	0.109
		90	10,490	432,475	76,930	0.583	0.347	0.285
		95	15,172	567,553	137,729	0.820	0.545	0.443
		97.5	25,098	667,156	140,549	1.01	0.686	0.548
Kootenay	N/A	BU2	0	165,816	39,480	-0.18	0.071	0.071
	N/A	BU40	0	656,496	137,616	-0.41	-0.003	-0.003
	N/A	BUUQ	564	27,636	5,640	0.43	0.34	0.34
	N/A	CRUKO	0	22,560	1,692	-0.52	-0.75	-0.75
	N/A	KO1	0	64,296	13,536	-0.65	-0.15	-0.15
	N/A	KODCR	0	64,296	22,560	-0.33	-0.27	-0.27
	N/A	KOUCR	0	175,968	40,608	-1.1	-0.20	-0.20
	N/A	KOUVE	0	232,368	76,704	-0.65	-0.40	-0.40
	N/A	PADAL	0	3,384	17,484	-1.6	0.10	0.10
	N/A	PAUKO	0	1,128	2,820	-1.1	0.20	0.20
	N/A	VEUKO	0	38,352	12,408	-0.50	0.088	0.088
	N/A	VEUP	0	25,944	19,176	-0.60	-0.18	-0.18
Oldman	N/A	DACK	3,384	294,408	139,872	-0.38	-0.12	-0.12
	N/A	DUCK	0	421,872	166,944	-0.82	-0.049	-0.049
	N/A	OLDDU	564	22,560	2,820	-0.44	-0.020	-0.020
	N/A	OLDLI	0	11,844	2,256	-0.15	-0.34	-0.34
	N/A	OLDLOW	7,896	103,776	60,912	-0.99	0.26	0.26
	N/A	RACK	0	3,384	56,400	-0.97	-0.089	-0.089
	N/A	VICK	36,096	16,920	39,480	-0.89	-0.88	-0.88
Fording	1	CHCK	13,536	1,082,880	78,960	0.17	-0.33	-0.33
	1	EWCK	0	413,976	48,504	0.53	-0.33	-0.33
	2	LC_GRCK	0	10,152	0	1.0	0.54	0.54
	1	FO26	3,948	54,708	1,128	0.81	-0.19	-0.19
	1	HENUP	0	8,460	2,256	1.2	-0.48	-0.48
Line	2	LI24	3,384	14,664	7,896	0.43	-0.036	-0.036
	2	SLINE	0	527,904	6,768	0.65	-0.40	-0.40
Michel	4	AGCK	0	12,408	1,692	0.55	-0.32	-0.32
	4	AL4	4,512	252,672	69,936	0.58	-0.20	-0.20
	4	ALUSM	14,664	97,008	38,352	0.54	0.20	0.20
	4	MI25	9,024	99,264	57,528	0.33	-1.0	-1.0
Elk	N/A	CADCK	2,820	253,800	33,840	0.21	-0.16	-0.16
	N/A	EL12	1,128	160,740	20,868	0.45	-0.17	-0.17
	3	ELUGH	24,816	296,664	25,944	-0.037	0.22	0.22
	4	GRUHA	3,384	75,576	9,024	0.084	0.11	0.11
	5	MCCR	0	562,872	1,128	-0.47	0.43	0.43
	5	WWRL	0	78,960	4,512	0.093	0.66	0.66
	5	WWRU	0	32,712	564	-0.89	-0.61	-0.61
Flathead	N/A	FLAD	10,152	111,672	29,328	-1.0	0.16	0.16
	N/A	FLAU	7,896	4,512	3,384	-0.57	1.7	
	N/A	FLRU	2,256	6,768	24,816	-0.17	-1.9	

Outlier removed from estimation of percentiles.

Value < 2.5th percentile of reference distribution

Value < 5th percentile of reference distribution

Value < 10th percentile of reference distribution

Value < 25th percentile of reference distribution

Value > 75th percentile of reference distribution

Value > 90th percentile of reference distribution

Value > 95th percentile of reference distribution

Value > 97.5th percentile of reference distribution

[a] 3-D Ordination (Genus-Level/ Relative Abundance/ Fourth Root Transformed)

Notes: Coloured cells show individual reference area values that were at the low (blue shade) and high (gold shade) ends of the distribution range. Green highlights the reference area data set recommended for the evaluation of communities in mine-exposed areas.

Table F.11: Pearson Correlation Between Reference Area (n = 40) Values of Environmental Variables and Area NMDS Scores of Periphyton Community Structure (fourthroot transformed proportional abundance data matrix using genus-level taxonomy)

Category	Variable	NMDS Axis 1		NMDS Axis 2		NMDS Axis 3	
		r	P-value	r	P-value	r	P-value
GIS derived variables	Stream order	-0.486	0.001	-0.246	0.125	-0.106	0.513
	Station elevation (m)	0.358	0.023	0.571	< 0.001	0.166	0.307
	Source elevation (m)	0.312	0.050	-0.103	0.527	-0.425	0.006
	Distance to source (m)	-0.348	0.028	-0.419	0.007	-0.138	0.394
	Station gradient (%) GIS	0.076	0.641	0.307	0.054	-0.299	0.061
	Watershed perimeter (m)	-0.331	0.037	-0.443	0.004	-0.149	0.358
	Watershed area (m^2)	-0.248	0.123	-0.385	0.014	-0.124	0.447
	Area of catchment > 30% slope (m^2)	-0.178	0.271	-0.400	0.011	-0.151	0.353
	Percentage of catchment > 30% slope (%)	0.419	0.007	-0.270	0.092	-0.218	0.177
	Percentage of catchment < 30% slope (%)	-0.419	0.007	0.270	0.092	0.218	0.177
	Average upstream gradient from station to source	0.332	0.036	0.283	0.077	-0.058	0.721
	Watershed stream length (m)	-0.187	0.247	-0.412	0.008	-0.159	0.328
	Stream density of watershed (Total stream length in watershed/ area of watershed) (km^{-1})	0.258	0.108	-0.405	0.010	-0.075	0.644
	Annual Cropland (%)	-0.134	0.410	-0.261	0.104	0.112	0.491
	Broadleaf Dense (%)	0.134	0.410	0.017	0.916	0.106	0.513
	Broadleaf Open (%)	-0.096	0.556	-0.376	0.017	-0.125	0.442
	Coniferous Dense (%)	-0.045	0.781	0.180	0.267	0.120	0.462
	Coniferous Open (%)	-0.348	0.028	-0.025	0.876	-0.057	0.725
	Coniferous Sparse (%)	-0.173	0.286	-0.306	0.055	-0.193	0.234
	Developed (%)	-0.210	0.193	0.001	0.995	0.155	0.339
	Exposed land (%)	0.076	0.643	-0.258	0.108	-0.201	0.213
	Grassland (%)	-0.365	0.021	-0.086	0.596	0.047	0.774
	Herb (%)	-0.150	0.355	0.111	0.497	-0.001	0.995
	Mixedwood Dense (%)	-0.149	0.359	-0.236	0.143	-0.163	0.314
	Mixedwood Open (%)	-0.151	0.351	-0.252	0.117	-0.168	0.300
	Perennial Cropland and Pasture (%)	-0.156	0.337	-0.176	0.277	0.126	0.439
	Rock/Rubble (%)	0.633	< 0.001	0.088	0.587	0.140	0.389
	Shrub low (%)	-0.287	0.072	-0.190	0.239	-0.207	0.199
	Shrub tall (%)	0.045	0.784	0.166	0.305	0.072	0.657
	Snow/Ice (%)	0.030	0.855	-0.381	0.015	-0.177	0.275
	Water (%)	0.073	0.655	-0.277	0.083	-0.273	0.089
	Wetland - Herb (%)	-0.223	0.166	0.080	0.624	0.068	0.676
	Wetland - Shrub (%)	-0.076	0.643	-0.137	0.399	-0.133	0.413
	Wetland - Tree (%)	-0.223	0.166	0.012	0.942	0.267	0.096
Field Measurements and Samples	Intermediate axis length - Wolman Mean (cm) (longest width of cobble perpendicular to the axis of longest length)	-0.225	0.162	-0.192	0.236	0.219	0.175
	Embeddedness (10 value median measured as 0, 1/4, 1/2, 3/4, or full)	-0.030	0.854	-0.499	0.001	0.006	0.973
	Ash-free dry mass (g/m^2)	0.124	0.444	0.107	0.509	-0.141	0.386
	Chlorophyll-a (mg/m^2)	0.188	0.245	0.093	0.570	-0.026	0.874
	Average channel depth (m)	0.021	0.898	-0.067	0.683	-0.263	0.101
	Average channel velocity (m/s)	0.153	0.345	-0.395	0.012	-0.400	0.011
	Canopy Coverage (%)	0.001	0.995	0.170	0.293	-0.296	0.063
	Macrophyte Coverage (% Class)	-	-	-	-	-	-
	Periphyton Coverage (% Class)	0.166	0.312	0.371	0.020	0.052	0.753
	Bankfull width (m)	-0.268	0.094	-0.265	0.099	-0.036	0.826
	Wetted width (m)	-0.243	0.131	-0.527	< 0.001	-0.212	0.189
	Bankfull-Wetted depth (cm) (Bankfull height of water level subtract height of current water level)	-0.053	0.748	-0.115	0.488	0.051	0.756
	Station gradient (%) Clinometer	0.226	0.167	0.369	0.021	-0.051	0.759
	Total Kick Distance	-0.073	0.661	0.154	0.349	0.120	0.469
	Temperature (°C)	-0.339	0.032	0.138	0.397	0.031	0.848
	Dissolved Oxygen (mg/L)	-0.064	0.694	-0.274	0.087	-0.192	0.234
	Dissolved Oxygen (%)	-0.223	0.167	-0.162	0.319	-0.163	0.314
	Specific Conductance (µS/cm)	0.007	0.966	0.141	0.386	0.029	0.858
	pH	0.258	0.161	0.078	0.677	-0.208	0.262
	Calcite concretion score	0.131	0.419	0.180	0.267	-0.126	0.440
	Calcite presence score	0.356	0.024	0.198	0.221	-0.014	0.932
	Calcite index	0.354	0.025	0.203	0.210	-0.020	0.900

Note: "-" = cannot be computed because at least one of the variables is constant.

r ≥ 0.6 or r ≤ -0.6

P-value < 0.05

Table F.12: Reference Tissue Selenium Concentrations for Periphyton in the Elk Valley for Lentic and Lotic Habitats, 1996 - 2015

Habitat Type	Sample Size	Units	Minimum	2.5th Percentile	25th Percentile	Median	75th Percentile	97.5th Percentile	Maximum	Mean	Standard Deviation	95% CI on the 97.5th percentile
Lentic	35	mg/kg dw	0.10	0.27	0.80	1.42	3.21	5.80	7.80	2.13	1.83	4.84 - 7.04 [a]
Lotic	67	mg/kg dw	0.31	0.66	1.44	1.87	3.03	4.86	5.48	2.33	1.22	4.28 - 5.31 [a]
All	102	mg/kg dw	0.10	0.30	1.30	1.85	3.13	5.35	7.80	2.26	1.45	-

[a] 95% confidence intervals on the 97.5th percentiles for lentic and lotic habitat overlap (there is no significant difference ($\alpha = 0.05$) between the 97.5th percentiles)

Estimate of reference area normal range

Table F.13: Reference Tissue Selenium Concentrations for Periphyton in the Elk Valley, 1996 - 2015

Tissue Type	Year	Area Description	Biological Area Code	Habitat Type	Selenium (mg/kg dw)
Periphyton	2013	GLM	GLM	Lentic	0.10
Periphyton	2013	FO15	FO15	Lentic	0.30
Periphyton	2012	Fording River Wetland	FO15	Lentic	0.30
Periphyton	2015	Elk Lakes	EL14	Lentic	0.30
Periphyton	1996	Elk River u/s Cadorna Creek	ELUCA	Lotic	0.31
Periphyton	2009	Elk Lakes	EL14	Lentic	0.35
Periphyton	2012	Fording River Wetland	FO15	Lentic	0.45
Periphyton	2015	Elk River	ELUGH	Lotic	0.53
Periphyton	2009	Koocanusa Reservoir at Sand Creek	LK01	Lentic	0.67
Periphyton	2015	Michel Creek	MI25	Lotic	0.73
Periphyton	2012	Fording River Wetland	FO15	Lentic	0.77
Periphyton	2009	Koocanusa Reservoir at Sand Creek	LK01	Lentic	0.79
Periphyton	2001	Alexander Creek	AL4	Lotic	0.80
Periphyton	2009	Koocanusa Reservoir at Sand Creek	LK01	Lentic	0.80
Periphyton	2015	Fording River	FO26	Lotic	0.84
Periphyton	2009	Koocanusa Reservoir at Sand Creek	LK01	Lentic	0.87
Periphyton	2012	Chauncey Creek	CHCK	Lotic	0.87
Periphyton	2012	Carbon Creek	CA1	Lotic	0.93
Periphyton	2015	Elk Lakes	EL14	Lentic	0.94
Periphyton	2009	Elk Lakes	EL14	Lentic	0.96
Periphyton	2009	Flathead Wetland	FL17	Lentic	0.98
Periphyton	2012	Leach Creek	LE1	Lotic	1.13
Periphyton	2012	Henretta Creek u/s all mine operations	HENUP	Lotic	1.19
Periphyton	2015	Flathead Side Channel	FLA1	Lentic	1.28
Periphyton	2015	Leach Creek Oxbow	LCHO	Lentic	1.28
Periphyton	2012	Chauncey Creek	CHCK	Lotic	1.30
Periphyton	2001	Elk River u/s Quarrie Creek	ELUQU	Lotic	1.30
Periphyton	2012	Wheeler Creek	WH1	Lotic	1.30
Periphyton	2009	Dry Creek	DRCK	Lotic	1.32
Periphyton	2012	Leach Creek	LE1	Lotic	1.32
Periphyton	2012	Mine Creek	MC1	Lotic	1.32
Periphyton	2012	Carbon Creek	CA1	Lotic	1.36
Periphyton	2015	Elk Lakes	EL14	Lentic	1.41
Periphyton	2010	Lake Mountain Lake	LkMtn2	Lentic	1.42
Periphyton	2012	Carbon Creek	CA1	Lotic	1.42
Periphyton	2015	South Line Creek	SLINE	Lotic	1.47
Periphyton	2012	Leach Creek	LE1	Lotic	1.48
Periphyton	2009	Dry Creek	DRCK	Lotic	1.53
Periphyton	2012	Carbon Creek	CA1	Lotic	1.54
Periphyton	2015	Unnamed Wetland north of Elkford	REFF	Lentic	1.59
Periphyton	2012	Mine Creek	MC1	Lotic	1.62
Periphyton	2015	Alexander Creek	ALUSM	Lotic	1.68
Periphyton	2012	Alexander Creek	AX1	Lotic	1.73
Periphyton	2012	Mine Creek	MC1	Lotic	1.73
Periphyton	2013	Chauncey Creek	CHCK	Lotic	1.75
Periphyton	2012	Alexander Creek	AX1	Lotic	1.76
Periphyton	2012	Mine Creek	MC1	Lotic	1.76
Periphyton	2012	Upper Fording River (FO26)	FO26	Lotic	1.80
Periphyton	2012	Leach Creek	LE1	Lotic	1.82
Periphyton	2009	Dry Creek	DRCK	Lotic	1.83
Periphyton	2012	Carbon Creek	CA1	Lotic	1.83
Periphyton	2009	Flathead Wetland	FL17	Lentic	1.86
Periphyton	2012	Leach Creek	LE1	Lotic	1.86
Periphyton	2012	Wheeler Creek	WH1	Lotic	1.87
Periphyton	2010	Lake Mountain Lake	LkMtn2	Lentic	1.91
Periphyton	2012	Mine Creek	MC1	Lotic	1.91
Periphyton	2012	Wheeler Creek	WH1	Lotic	1.91
Periphyton	2015	Flathead Side Channel	FLA1	Lentic	1.92
Periphyton	2012	Leach Creek	LE1	Lotic	1.93
Periphyton	2001	Ewin Creek	EWCK	Lotic	2.00
Periphyton	2012	Wheeler Creek	WH1	Lotic	2.02
Periphyton	2012	Wheeler Creek	WH1	Lotic	2.03
Periphyton	2012	Line Creek u/s LCO	LI24	Lotic	2.12
Periphyton	2015	Leach Creek Oxbow	LCHO	Lentic	2.21
Periphyton	2012	Upper Fording River (FO26)	FO26	Lotic	2.53
Periphyton	2001	Line Creek u/s LCO	LI24	Lotic	2.60
Periphyton	2010	Lake Mountain Lake	LkMtn2	Lentic	2.68
Periphyton	2009	Elk River u/s Weary Creek	ELUWE	Lotic	2.75
Periphyton	2015	Line Creek	LI24	Lotic	2.88
Periphyton	2012	Dry Creek	DRCK	Lotic	2.89
Periphyton	2012	Mine Creek	MC1	Lotic	2.89
Periphyton	2012	Alexander Creek	AX1	Lotic	2.91
Periphyton	2012	Alexander Creek	AX1	Lotic	2.92
Periphyton	2012	Elk River d/s Cadorna Creek	EL12	Lotic	3.01
Periphyton	2012	Alexander Creek	AX1	Lotic	3.04
Periphyton	2015	Flathead Side Channel	FLA1	Lentic	3.05
Periphyton	2010	Lake Mountain Lake	LkMtn2	Lentic	3.16
Periphyton	2015	Unnamed Wetland north of Elkford	REFF	Lentic	3.27
Periphyton	2009	O'Rourke Lake	RL1	Lentic	3.29
Periphyton	2010	Lake Mountain Lake	LkMtn2	Lentic	3.38
Periphyton	2013	Dry Creek	DRCK	Lotic	3.44
Periphyton	2011	Fording River u/s of Swift Project	FR4	Lotic	3.45
Periphyton	2012	Alexander Creek	AX1	Lotic	3.47
Periphyton	2009	Dry Creek	DRCK	Lotic	3.64

Notes: No outliers were identified. Q3+1.5(IQR) = 5.89 and 11.76 on the untransformed and log scale, respectfully.

Table F.13: Reference Tissue Selenium Concentrations for Periphyton in the Elk Valley, 1996 - 2015

Tissue Type	Year	Area Description	Biological Area Code	Habitat Type	Selenium (mg/kg dw)
Periphyton	2011	Henretta Creek	HECK	Lotic	3.65
Periphyton	2012	Upper Fording River (FO26)	FO26	Lotic	3.66
Periphyton	2011	Henretta Creek	HECK	Lotic	3.71
Periphyton	2009	Koocanusa Reservoir at Sand Creek	LK01	Lentic	3.82
Periphyton	2011	Fording River u/s of Swift Project	FR4	Lotic	4.01
Periphyton	2011	Henretta Creek	HECK	Lotic	4.28
Periphyton	2011	Fording River u/s of Swift Project	FR4	Lotic	4.42
Periphyton	2011	Henretta Creek	HECK	Lotic	4.42
Periphyton	2011	Fording River u/s of Swift Project	FR4	Lotic	4.44
Periphyton	2015	Lake Mountain Lake	LML	Lentic	4.54
Periphyton	2012	Chauncey Creek	CHCK	Lotic	4.60
Periphyton	2011	Fording River u/s of Swift Project	FR4	Lotic	4.79
Periphyton	2011	Henretta Creek	HECK	Lotic	4.98
Periphyton	2015	Unnamed Wetland north of Elkford	REFF	Lentic	5.26
Periphyton	2015	Lake Mountain Lake	LML	Lentic	5.26
Periphyton	2015	Leach Creek Oxbow	LCHO	Lentic	5.45
Periphyton	2009	Dry Creek	DRCK	Lotic	5.48
Periphyton	2015	Lake Mountain Lake	LML	Lentic	7.80

Notes: No outliers were identified. Q3+1.5(IQR) = 5.89 and 11.76 on the untransformed and log scale, respectfully.

Tissue Type	Year	Summary Statistic	Area Code	Habitat Type	Selenium (mg/kg dw)
Periphyton	All	Sample Size	All Reference	All	102
Periphyton	All	Minimum	All Reference	All	0.10
Periphyton	All	2.5^{th} Percentile	All Reference	All	0.30
Periphyton	All	25^{th} Percentile	All Reference	All	1.30
Periphyton	All	Median	All Reference	All	1.85
Periphyton	All	75^{th} Percentile	All Reference	All	3.13
Periphyton	All	97.5^{th} Percentile	All Reference	All	5.35
Periphyton	All	Maximum	All Reference	All	7.80
Periphyton	All	Mean	All Reference	All	2.26
Periphyton	All	Standard Deviation	All Reference	All	1.45

Estimate of reference area normal range

Table F.14: Selenium Concentrations in Periphyton Samples Collected in Lotic Areas, September 2009, 2012, 2015, and 2016

Exposure Type	Management Unit	Main Watershed	Stream Type	Stream Name	Sample ID	Approximate UTM (NAD83, 11U)		Selenium (mg/kg dw)			
						Easting	Northing	2009	2012	2015	2016
Reference	3	Elk	Main Stem	Elk River	ELUGH-PERIT-1	646477	5557523			0.53	1.31
	1	Upper Fording	Main Stem	Fording River	FO26-PERT-1	653064	5569601			0.84	2.04
	1	Upper Fording	Main Stem	Fording River	FO26-R1	653064	5569601		1.80		
	1	Upper Fording	Main Stem	Fording River	FO26-R2	653064	5569601		2.53		
	1	Upper Fording	Main Stem	Fording River	FO26-R3	653064	5569601		3.66		
	1	Upper Fording	Tributary	Henretta Creek	HENUP	655893	5567697		1.19		
	1	Upper Fording	Tributary	Chauncey Creek	CHCK-A	655965	5552879		1.30		
	1	Upper Fording	Tributary	Chauncey Creek	CHCK-B	655965	5552879		0.87		
	1	Upper Fording	Tributary	Chauncey Creek	CHCK-C	655965	5552879		4.60		
	2	Line	Tributary	Line Creek	LI24-PERIT-1	662214	5538393		2.12	2.88	5.51
	3	Line	Tributary	South Line Creek	SLINE-PERT-1	661122	5531374			1.47	4.09
	4	Michel	Main Stem	Michel Creek	MI25-PERS-1	668266	5482795			0.73	1.35
	4	Michel	Tributary	Alexander Creek	ALUSM-PERS-1	663482	5502718			1.68	1.75
	1	Fording	Tributary	Dry Creek	DRCK	656357	5544814		2.89		
	3	Elk	Main Stem	Elk River	EL12	646175	5589009	2.75	3.01		
Mine-exposed	3	Elk	Main Stem	Elk River	EL20-PERT-1	649146	5548514			0.91	1.43
	1	Fording	Tributary	Lake Mountain Lake	NGD1	650883	5563190		7.54		
	1	Fording	Tributary	Fording Multiplate	MP1	651158	5562442	5.05			
	1	Fording	Tributary	Swift Creek	SWCK	652062	5558541		4.34		
	1	Fording	Tributary	Cataract Creek	CATCK	652447	5557452		1.99		
	1	Fording	Main Stem	Fording River	FODPO-PERIT-1	653877	5555083			6.45	18.86
	2	Fording	Main Stem	Fording River	FO22	654841	5553523		2.85		
	2	Fording	Main Stem	Fording River	FO28-1	656453	5545433		6.86		
	2	Fording	Main Stem	Fording River	FO28-2	656453	5545433		5.59		
	2	Fording	Main Stem	Fording River	FO28-3	656453	5545433		10.9		
	2	Fording	Main Stem	Fording River	FO29	655434	5543797		11.7		
	1	Fording	Main Stem	Fording River	FODGH-PERIT-1	652942	5545635			4.20	11.14
	2	Fording	Main Stem	Fording River	FRUL-PERT-1	654530	5530162			3.67	7.12
	2	Line	Tributary	Line Creek	LILC3-PERT-1	659911	5531818		18.1	3.83	15.90
	2	Line	Tributary	Line Creek	LIDSL-PERIT-1	659733	5531239			1.39	2.04
	2	Line	Tributary	Line Creek	LI8-PERIT-1	655651	5528828	4.17		5.30	2.58
	2	Fording	Main Stem	Fording River	FO23-1	652995	5528937	8.89			
	2	Fording	Main Stem	Fording River	FO23-2	652995	5528937	3.76			
	2	Fording	Main Stem	Fording River	FO23-PERT-1	652995	5528937		1.58	9.12	13.04
	4	Elk	Main Stem	Elk River	EL19-PERT-1	653146	5525824		2.53	1.48	3.42
	4	Elk	Tributary	Harmer Creek	HACKDS-PERIT-1	656969	5522171			15.43	10.58
	4	Michel	Main Stem	Michel Creek	MIDCO-PERS-1	667757	5487611			1.00	1.98
	4	Michel	Main Stem	Michel Creek	MI3-PERS-1	660032	5505022	< 1.26		1.04	1.89
	4	Michel	Main Stem	Michel Creek	MI2-1	653672	5511222	3.35			
	4	Michel	Main Stem	Michel Creek	MI2-2	653672	5511222	2.07			
	4	Michel	Main Stem	Michel Creek	MI2-PERIT-1	653672	5511222			2.09	1.84
	5	Elk	Main Stem	Elk River	EL1-1	651657	5508511	2.33			
	5	Elk	Main Stem	Elk River	EL1-2	651657	5508511	2.60			
	5	Elk	Main Stem	Elk River	EL1-PERS-1	651657	5508511		3.62	1.76	3.08
	5	Elk	Main Stem	Elk River	ELELKO-PERT-1	639433	5463291		5.76	0.96	5.30

Selenium values greater than upper limit of the normal range (i.e., Se > 5.35; see Appendix Table F.12)

Table F.15: Selenium Concentrations in Periphyton Samples Collected in Lentic Areas, 2009, 2012 and 2015

Exposure Type	Management Unit	Stream Name	Sample ID	UTM (NAD83, 11U)		Selenium (mg/kg dw)		
				Easting	Northing	2009	2012	2015
Reference	-	Flathead Side Channel	FLA1-PERT-1	681815	5443615			1.92
			FLA1-PERT-2					3.05
			FLA1-PERT-3					1.28
		Elk Lakes	EL14aE	635326	5601876	<0.96		
			EL14E			<0.35		
			EL14-PERT-1					0.30
			EL14-PERT-2					1.41
			EL14-PERT-3					0.94
	1	Lake Mountain Lake	LML-PERT-1	650106	5565031			5.26
			LML-PERT-2					4.54
			LML-PERT-3					7.80
		Fording	FO15	654802	5542557		0.30	
	3	Unnamed Wetland north of Elkford	REFF-PERT-1	645869	5556297			5.26
			REFF-PERT-2					3.27
			REFF-PERT-3					1.59
	4	Leach Creek Oxbow	LCHO-PERT-1	658746	5489172			5.45
			LCHO-PERT-2					2.21
			LCHO-PERT-3					1.28
	-	O'Rourke Lake	RL1	660476	5560640	3.29		
		Flathead Wetland	FL17aE	681226	5440716	<0.98		
			FL17E			1.86		
Mine-exposed	1	Henretta Lake	HE27aE	652573	5566275	<1.14		
			HE27E			7.47		
			HE27-PERT-1					2.39
			HE27-PERT-2					3.29
			HE27-PERT-3					2.20
		Fording River Side Channel	Fo10aE	655079	5553572	83.58		
			Fo10E			51.04		
			FO10-R	654225	5555306		3.92	
			FO10-PERT-1	654209	5555290			4.78
			FO10-PERT-2					6.30
			FO10-PERT-3					4.64
		Lower Fording River Oxbow	FOXL-PERT-1	654878	5554437			1.21
			FOXL-PERT-2					1.28
			FOXL-PERT-3					1.26
		Fording Meadow u/s Chauncey Creek	FMUCK-PERT-1	654771	5553328			6.08
			FMUCK-PERT-2					5.34
			FMUCK-PERT-3					4.70
		Fording Wetland d/s Ewin Creek	FWDEC-PERT-1	656896	5547095			10.57
			FWDEC-PERT-2					15.44
			FWDEC-PERT-3					9.04
		Off-channel area of Fording d/s GHO	R5-1-PERT-1	653010	5545714			19.04
			R5-1-PERT-2					17.68
			R5-1-PERT-3					18.00
	2	Lentic area off Fording d/s Josephine	R5-3-PERT-1	652358	5539932			7.76
			R5-3-PERT-2					2.73
			R5-3-PERT-3					3.62
	3	Elk River Upper Ponds	ERUP-PERT-1	651742	5530538			1.66
			ERUP-PERT-2					0.81
			ERUP-PERT-3					0.72
		Upper Elk River Oxbow	EROU-PERT-1	652364	5529872			1.36
			EROU-PERT-2					1.68
			EROU-PERT-3					1.37
	4	Elk River Wetland d/s Grave Creek	ELWDGC-PERT-1	653175	5521300			2.92
			ELWDGC-PERT-2					2.21
			ELWDGC-PERT-3					2.62
		Goddard Marsh	Go13aE	653323	5514291	14.61		
			Go13aE			18.15		
			Go13bE			18.51		
			GO13-PERT-1	652955	5514065			28.25
			GO13-PERT-2					26.37
			GO13-PERT-3					19.01
		Otto Creek Ponds	OTTO-PERT-1	652537	5512801			4.89
			OTTO-PERT-2					2.36
			OTTO-PERT-3					2.70
		Michel Creek Wetland	MI16-PERT-1	665083	5489403			6.38
			MI16-PERT-2					8.66
			MI16-PERT-3					6.55
		Michel Oxbow #2	MIC2-PERT-1	659533	5496626			2.42
			MIC2-PERT-2					1.87
			MIC2-PERT-3					1.18
		Lower Michel Wetland	MIWW-PERT-1	659707	5498474			1.41
			MIWW-PERT-2					1.85
			MIWW-PERT-3					2.55
	5	Stanford Pond	STPD-PERT-1	639864	5483139			7.55
			STPD-PERT-2					5.17
			STPD-PERT-3					1.79
		Lower Elk River Oxbow	EROL-PERT-1	640877	5477999			4.06
			EROL-PERT-2					2.73
			EROL-PERT-3					4.85
			EROL-PERT-FA					3.80
		Elko Reservoir	ELKO-PERT-1	637800	5461540			1.18
			ELKO-PERT-2					1.44
			ELKO-PERT-3					1.47

Selenium values greater than upper limit of the normal range (i.e., Se > 5.35; see Appendix Table F.12)

Table F.16: Normal Range Quotients for Periphyton Tissue Selenium Collected in Lotic Habitats, 2015 - 2016

Exposure Type	Management Unit	Main Watershed	Stream Type (M-Main Stem; T-Tributary)	Biological Area Code	2015		2016	
					Selenium (µg/g dw)	Normal Range Quotient	Selenium (µg/g dw)	Normal Range Quotient
				Upper Limit of Reference:		5.35 mg/kg dw	-	5.35 mg/kg dw
Reference	1	Fording	M	FO26	0.84	0.2	2.04	0.4
	2	Fording	T	LI24	2.88	0.5	5.51	1.0
				SLINE	1.47	0.3	4.09	0.8
	3	Elk	M	ELUGH	0.53	0.1	1.31	0.2
	4	Michel	T	ALUSM	1.68	0.3	1.75	0.3
			T	MI25	0.73	0.1	1.35	0.3
Mine-exposed	1	Fording	M	FODPO	6.45	1.2	18.9	3.5
				FODGH	4.20	0.8	11.1	2.1
	2	Fording	T	LILC3	3.83	0.7	15.9	3.0
				LIDSL	1.39	0.3	2.04	0.4
				LI8	5.30	1.0	2.58	0.5
			M	FRUL	3.67	0.7	7.12	1.3
				FO23	9.12	1.7	13.0	2.4
	3	Elk	M	EL20	0.91	0.2	1.43	0.3
	4	Michel	M	MIDCO	1.00	0.2	1.98	0.4
				MI3	1.04	0.2	1.89	0.4
				MI2	2.09	0.4	1.84	0.3
		Elk	T	HACKDS	15.4	2.9	10.6	2.0
			M	EL19	1.48	0.3	3.42	0.6
	5	Elk	M	EL1	1.76	0.3	3.08	0.6
				ELELKO	0.96	0.2	5.30	1.0

Value > upper limit of 2015 reference area normal range (5.35 mg/kg dw)
Good (Quotient < 0.7)
Marginal (Quotient between 0.7 and 1.0)
Poor (Quotient > 1.0)

Table F.17: Normal Range Quotients for Periphyton Tissue Selenium Collected in Lentic Habitats, 2015

Exposure Type	Management Unit	Main Watershed	Biological Area Code	Selenium (µg/g dw)	Normal Range Quotient
			Upper Limit of Reference:		5.35 mg/kg dw
Reference	1	Fording	LML	7.80	1.5
	3	Elk	REFF	5.26	1.0
	4	Elk	LCHO	5.45	1.0
	Not Applicable	Elk	EL14	1.41	0.3
		Flathead	FLA1	3.05	0.6
Mine-exposed	1	Fording	HE27	3.29	0.6
			FO10	6.30	1.2
			FOXL	1.28	0.2
			FMUCK	6.08	1.1
			FWDEC	15.4	2.9
	3	Elk	ERUP	1.66	0.3
			EROU	1.68	0.3
	4	Elk	ELWDGC	2.92	0.5
			GO13	28.2	5.3
			OTTO	4.89	0.9
			MI16	8.66	1.6
			MIC2	2.42	0.5
			MIWW	2.55	0.5
	5	Elk	STPD	7.55	1.4
			EROL	4.85	0.9
			ELKO	1.47	0.3

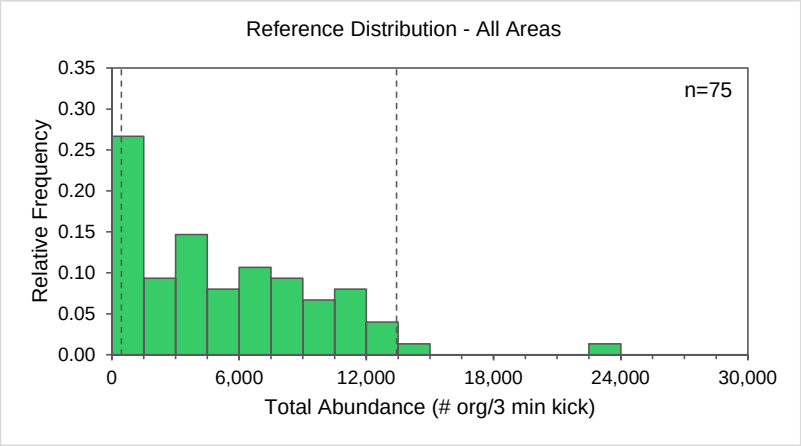
Value > upper limit of normal range (5.35 mg/kg dw)

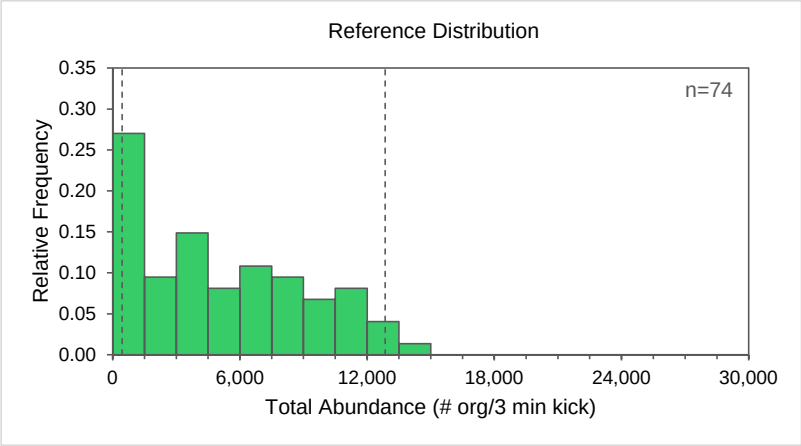
Good (Quotient < 0.7)

Marginal (Quotient between 0.7 and 1.0)

Poor (Quotient > 1.0)

APPENDIX G
BENTHIC INVERTEBRATES





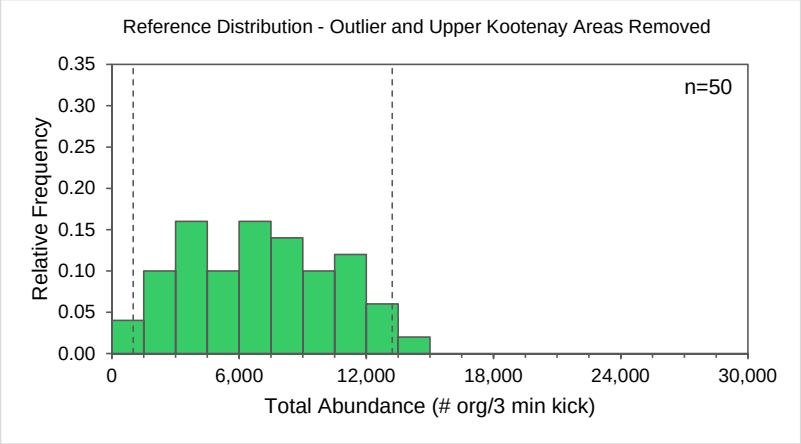
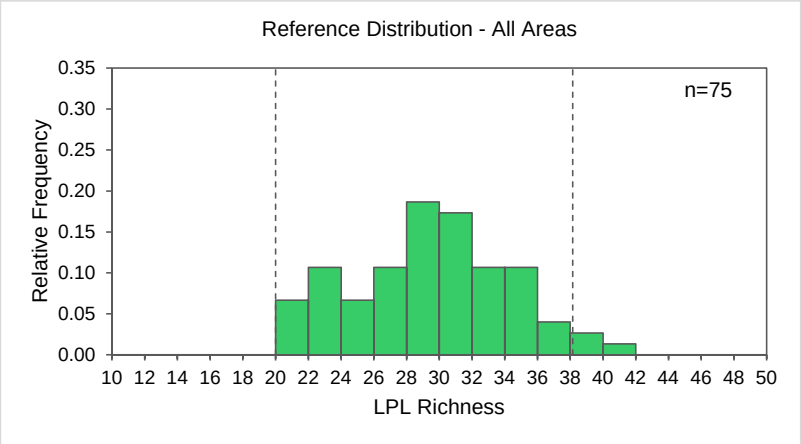
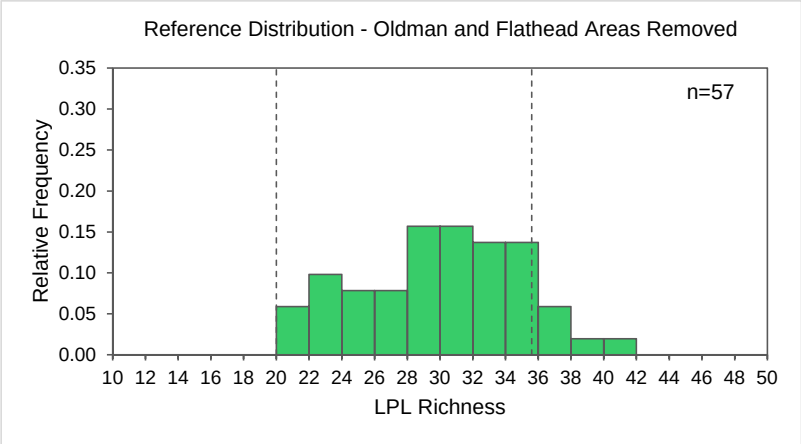


Figure G.1: Distribution of Reference Areas for Key Benthic Invertebrate Endpoints Sampled in 2012 and 2015 with Normal Ranges (2.5th and 97.5th Percentiles) Shown as Dashed Vertical Lines





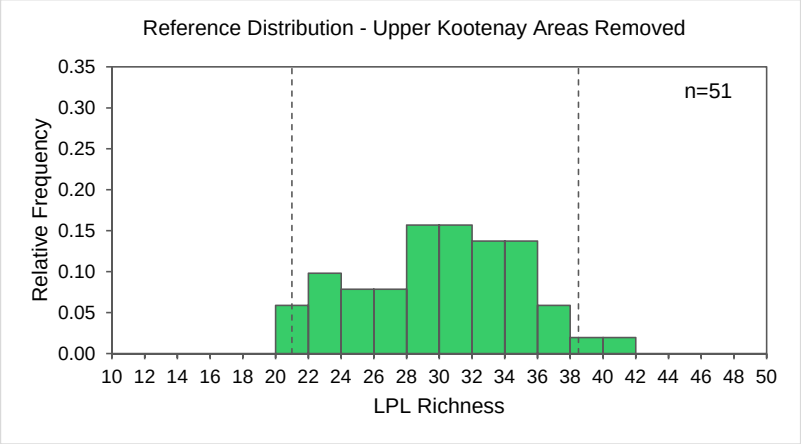
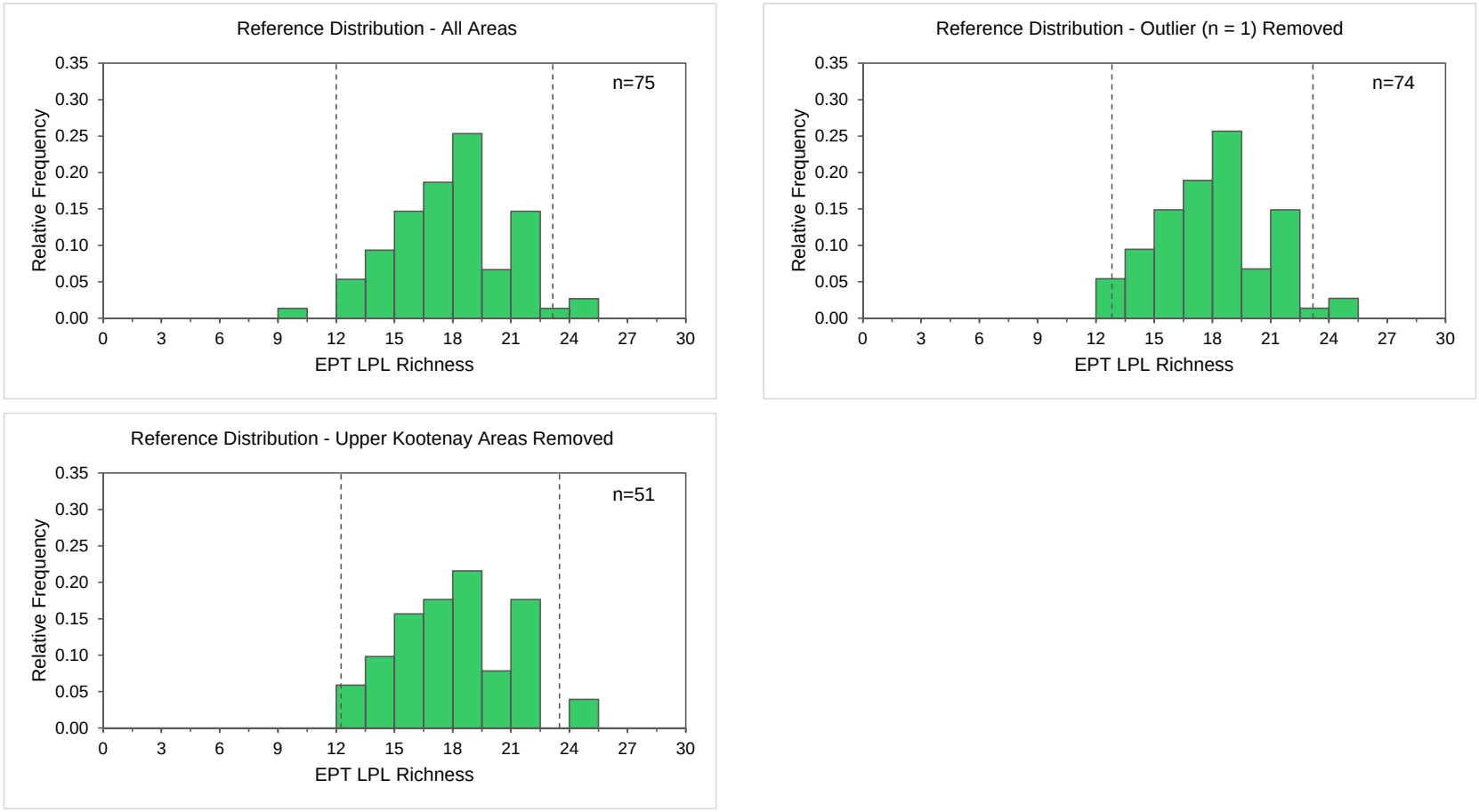


Figure G.1: Distribution of Reference Areas for Key Benthic Invertebrate Endpoints Sampled in 2012 and 2015 with Normal Ranges (2.5th and 97.5th Percentiles) Shown as Dashed Vertical Lines



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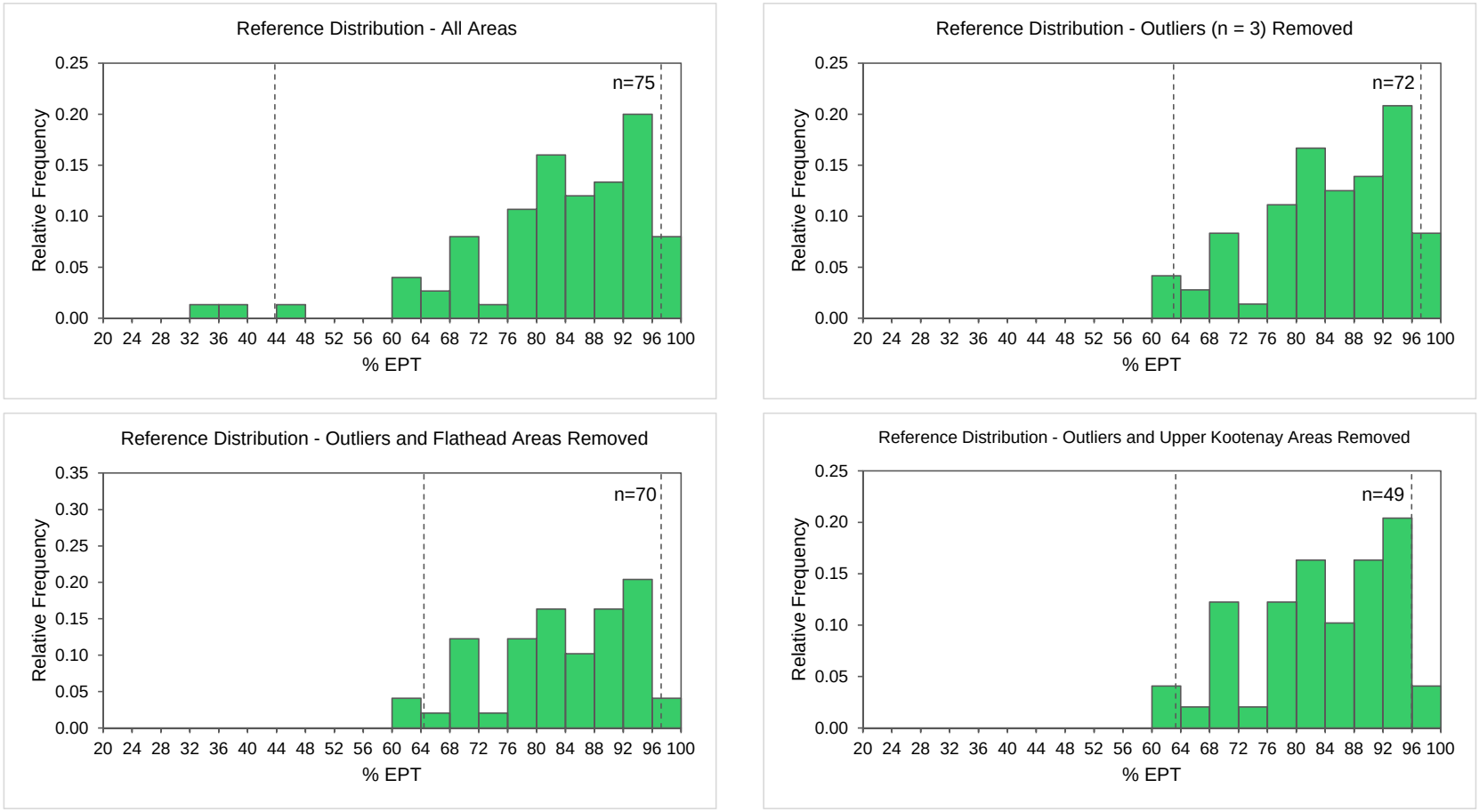

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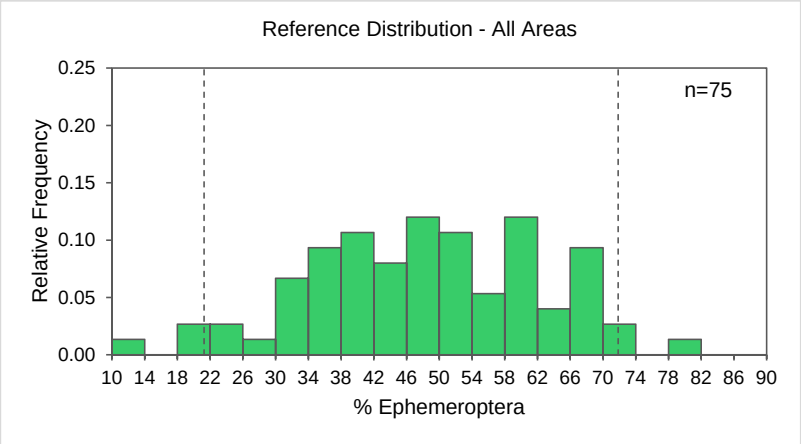
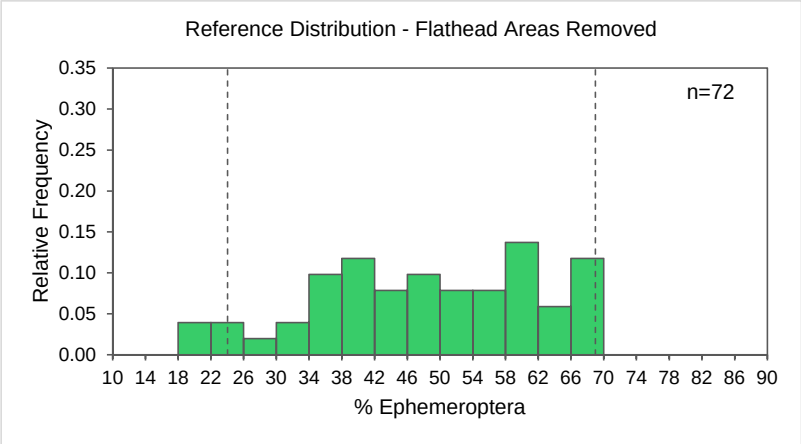




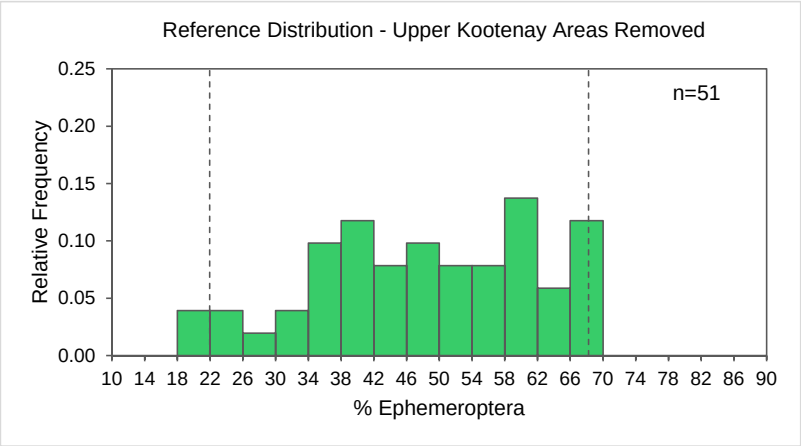
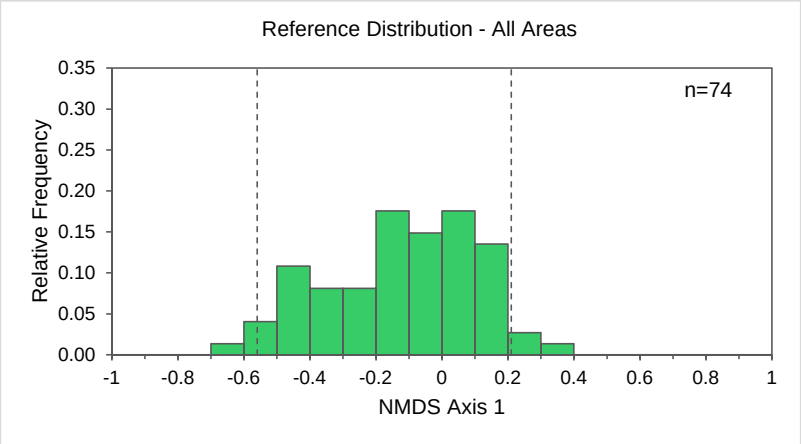
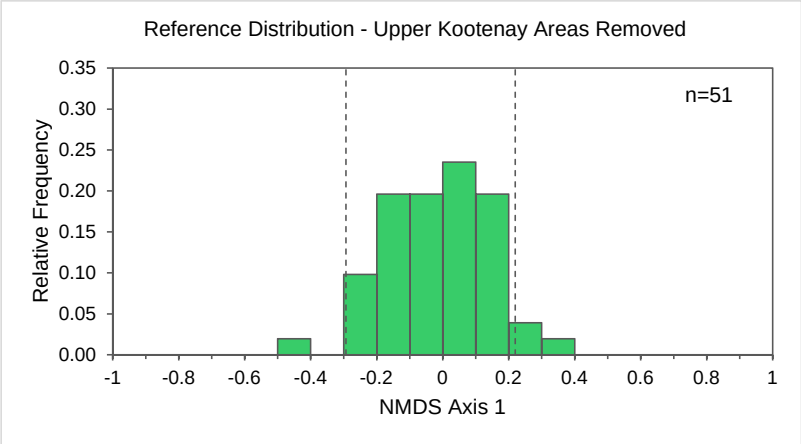


Figure G.1: Distribution of Reference Areas for Key Benthic Invertebrate Endpoints Sampled in 2012 and 2015 with Normal Ranges (2.5th and 97.5th Percentiles) Shown as Dashed Vertical Lines





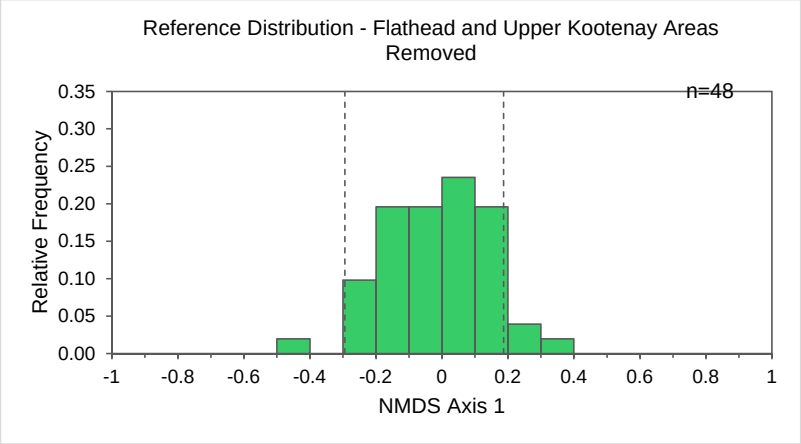
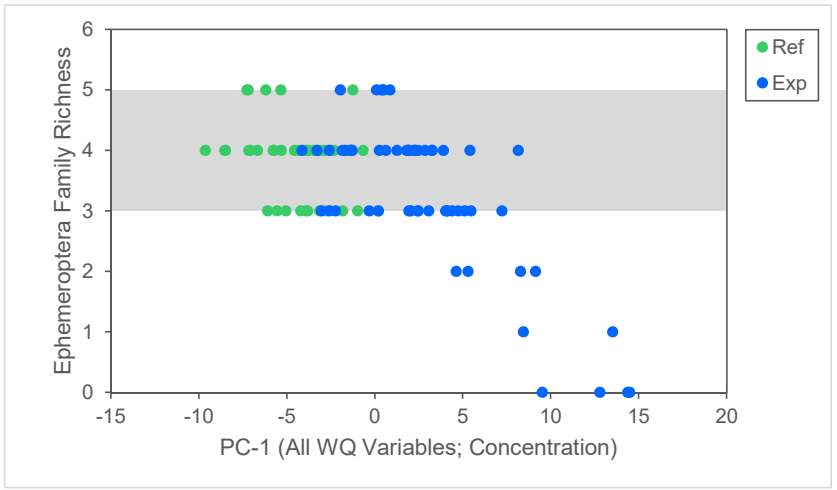
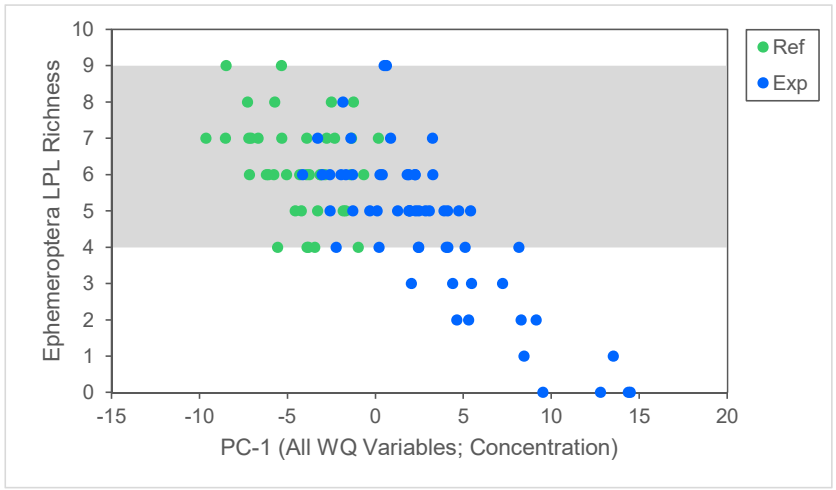
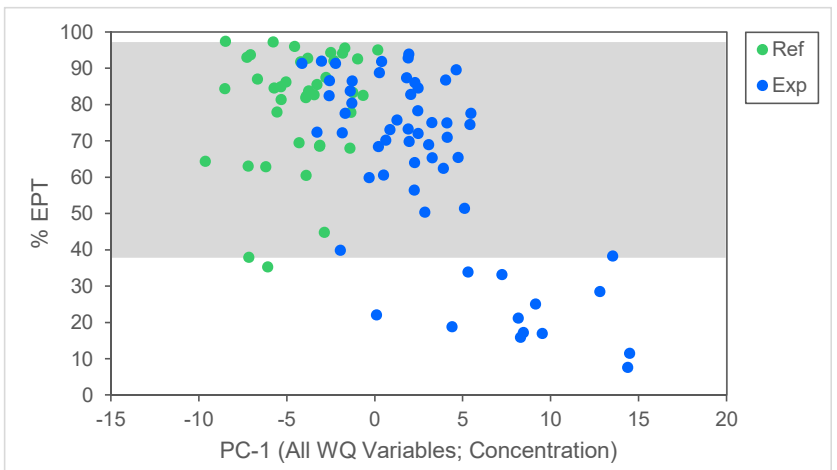


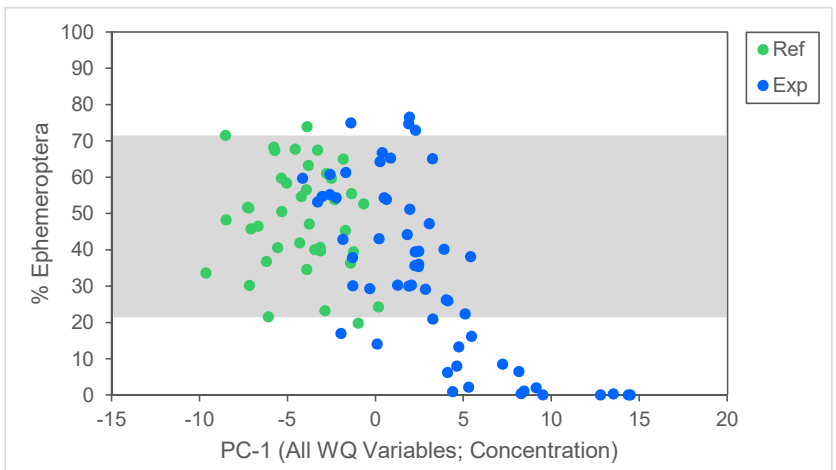
Figure G.1: Distribution of Reference Areas for Key Benthic Invertebrate Endpoints Sampled in 2012 and 2015 with Normal Ranges (2.5th and 97.5th Percentiles) Shown as Dashed Vertical Lines

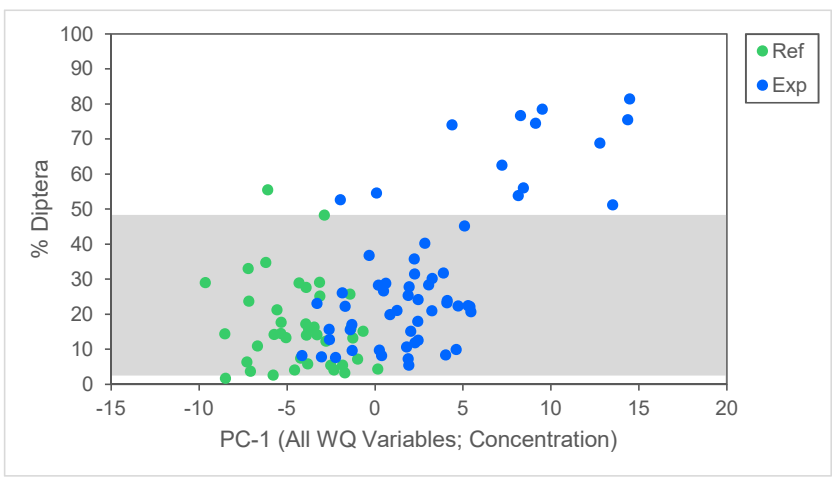
Notes: NMDS Axis 1 scores from an NMDS conducted on relative abundances (fourth-root transformed) using the family-level of taxonomy

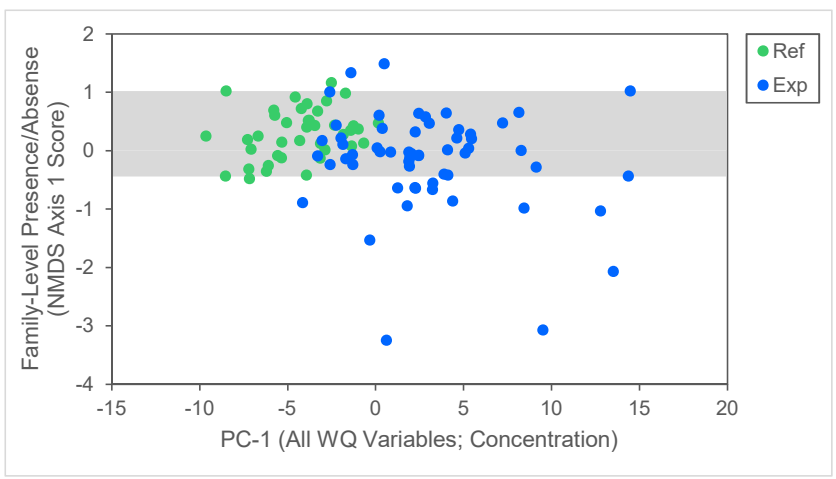


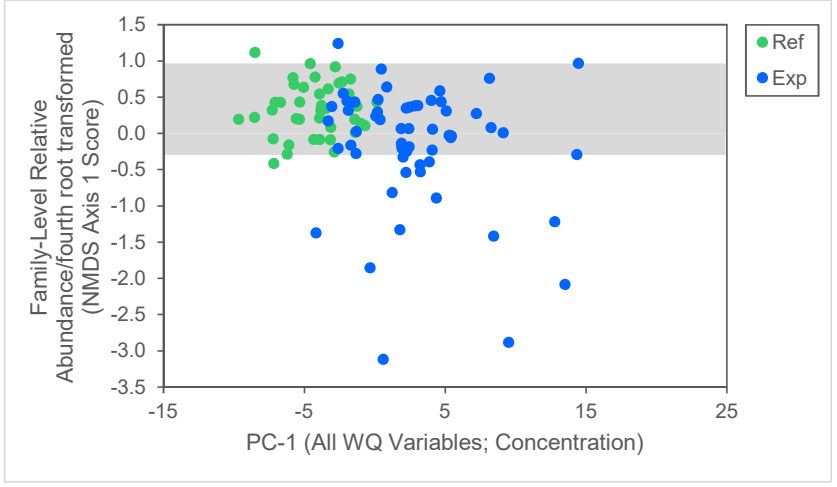












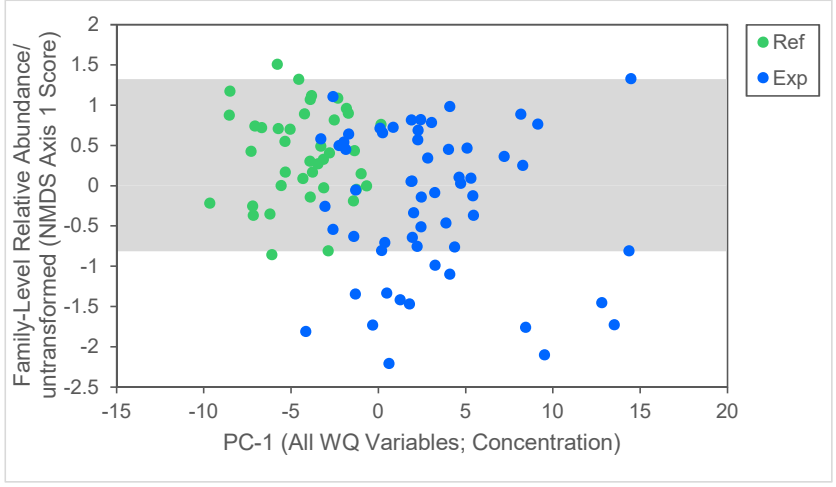
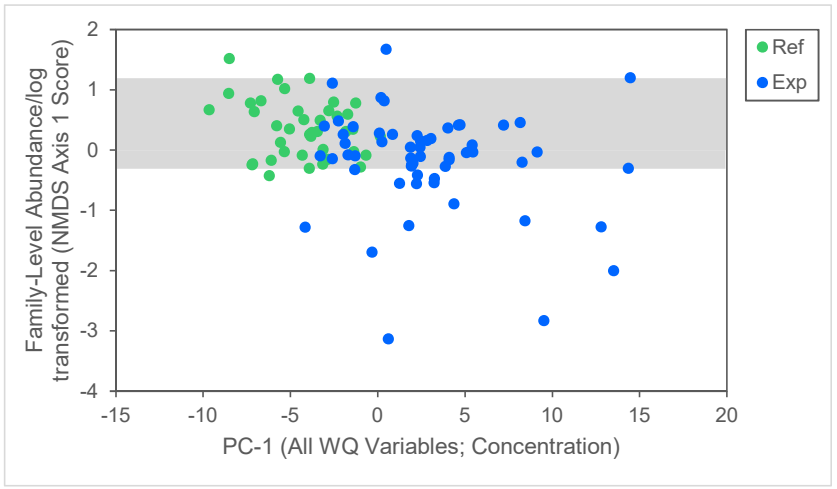
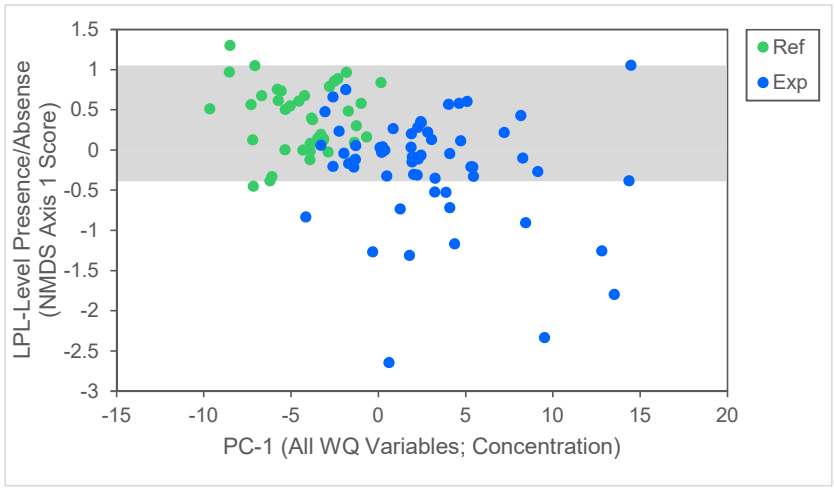
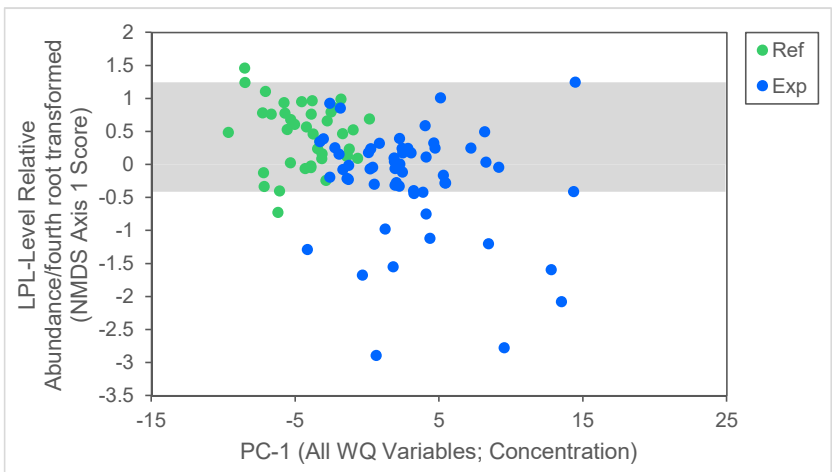


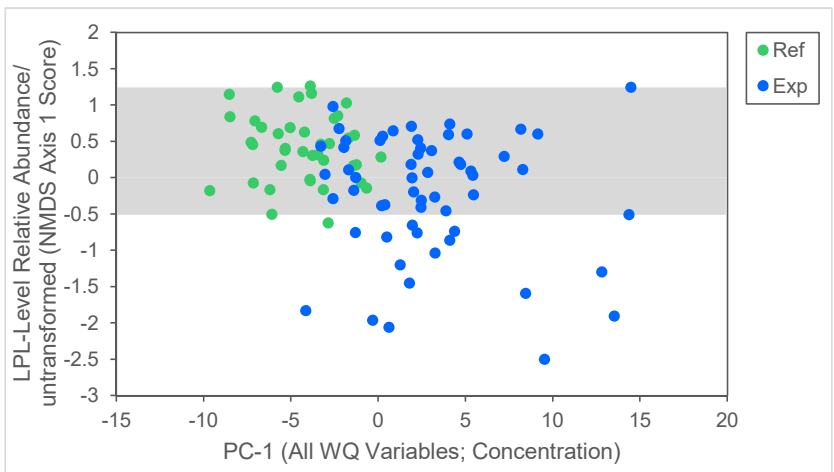
Figure G.2: Plots of Benthic Invertebrate Community Endpoints with Pearson's Correlation Coefficient (r) Greater than 0.6 or Less than -0.6 for Reference (n = 40) and Mine-exposed (n = 59) Areas to PC-1 for Concentrations of All Water Quality Variables (Most Plots) or For HQs of Key Mine-related Variables (Last Plot), September 2015

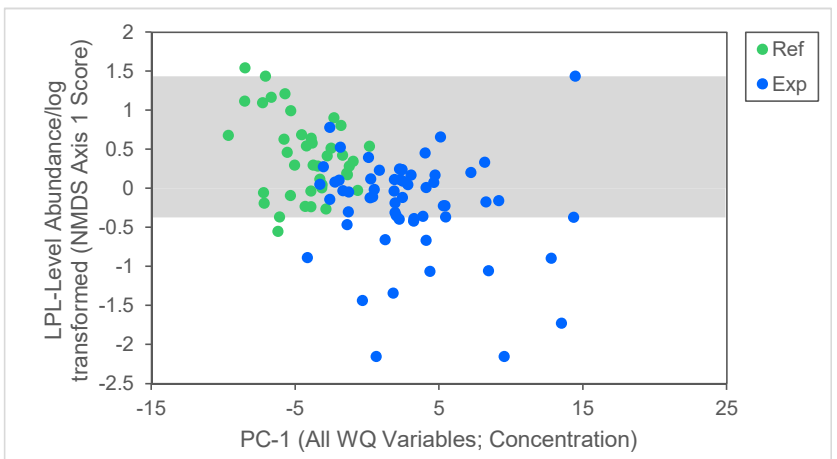
Notes: key WQ variables = calcite index, nitrate, sulphate, and total selenium; HQs calculated using level 1 effect benchmarks; gray shading represents the normal range defined as the 2.5th and 97.5th percentiles of the distribution of reference area values

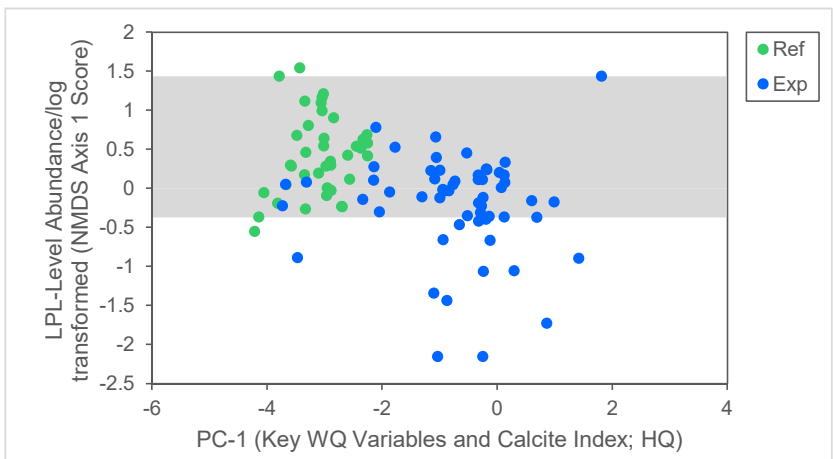


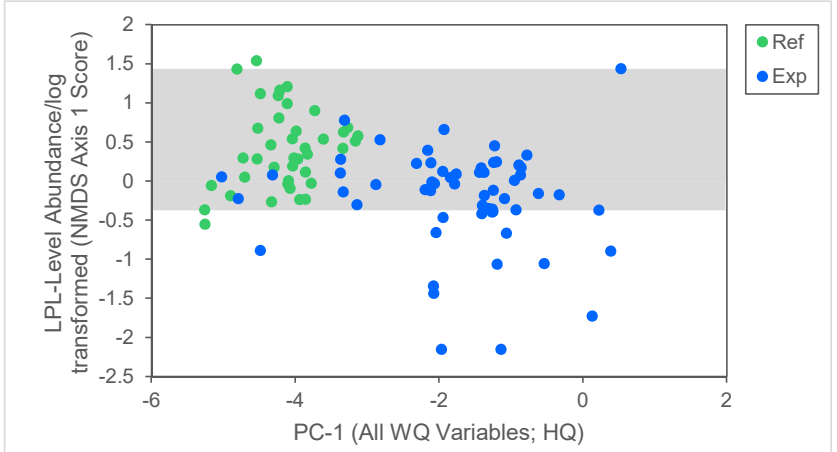












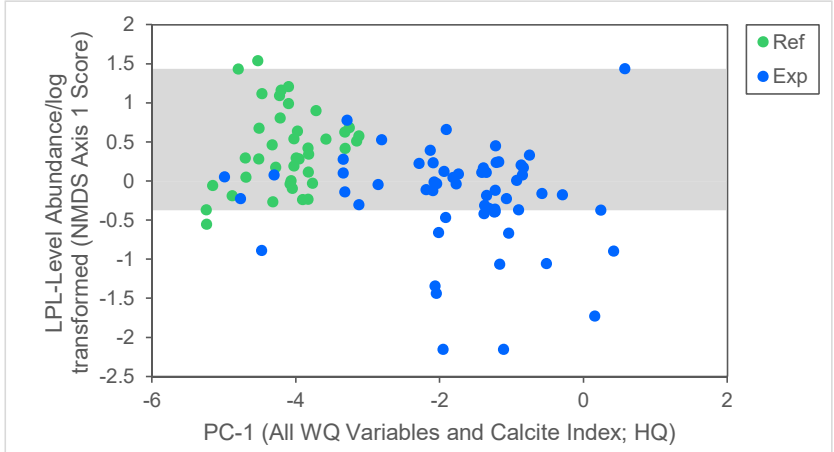


Figure G.2: Plots of Benthic Invertebrate Community Endpoints with Pearson's Correlation Coefficient (r) Greater than 0.6 or Less than -0.6 for Reference (n = 40) and Mine-exposed (n = 59) Areas to PC-1 for Concentrations of All Water Quality Variables (Most Plots) or For HQs of Key Mine-related Variables (Last Plot), September 2015

Notes: key WQ variables = calcite index, nitrate, sulphate, and total selenium; HQs calculated using level 1 effect benchmarks; gray shading represents the normal range defined as the 2.5th and 97.5th percentiles of the distribution of reference area values

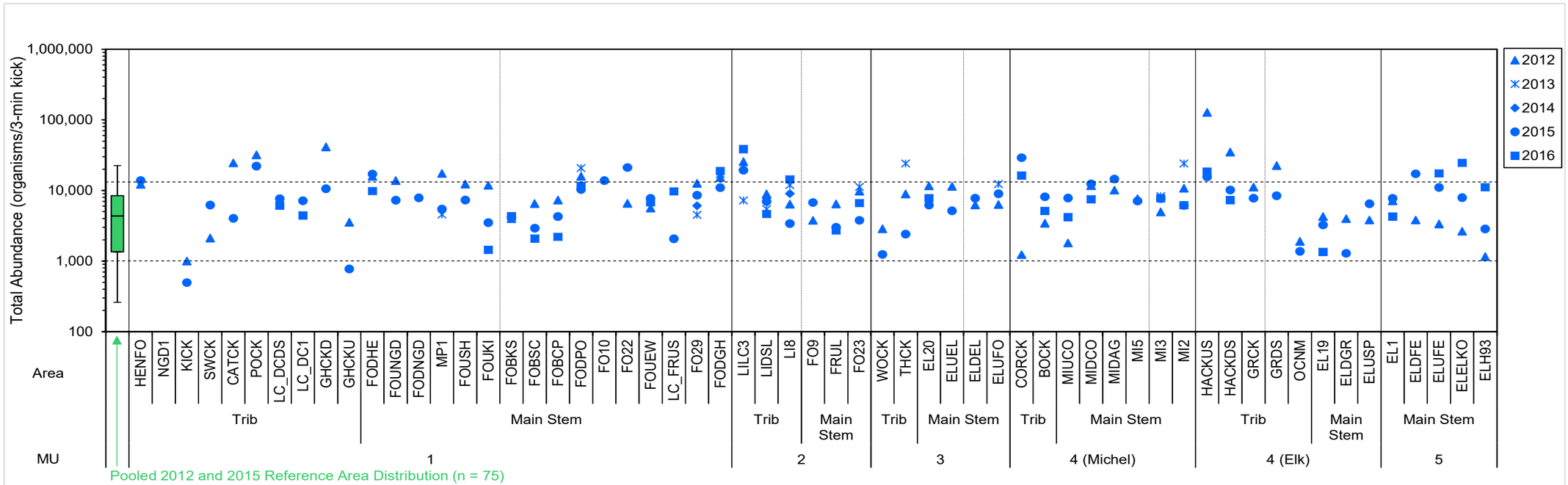


Figure G.3: **Total Benthic Invertebrate Abundance from 3-minute Kick Samples Collected in Lotic Habitats, 2012 - 2016**

Note: Dashed horiztonal lines represent the limits of the reference area normal range. The reference area distribution that is plotted in the boxplot includes all reference areas

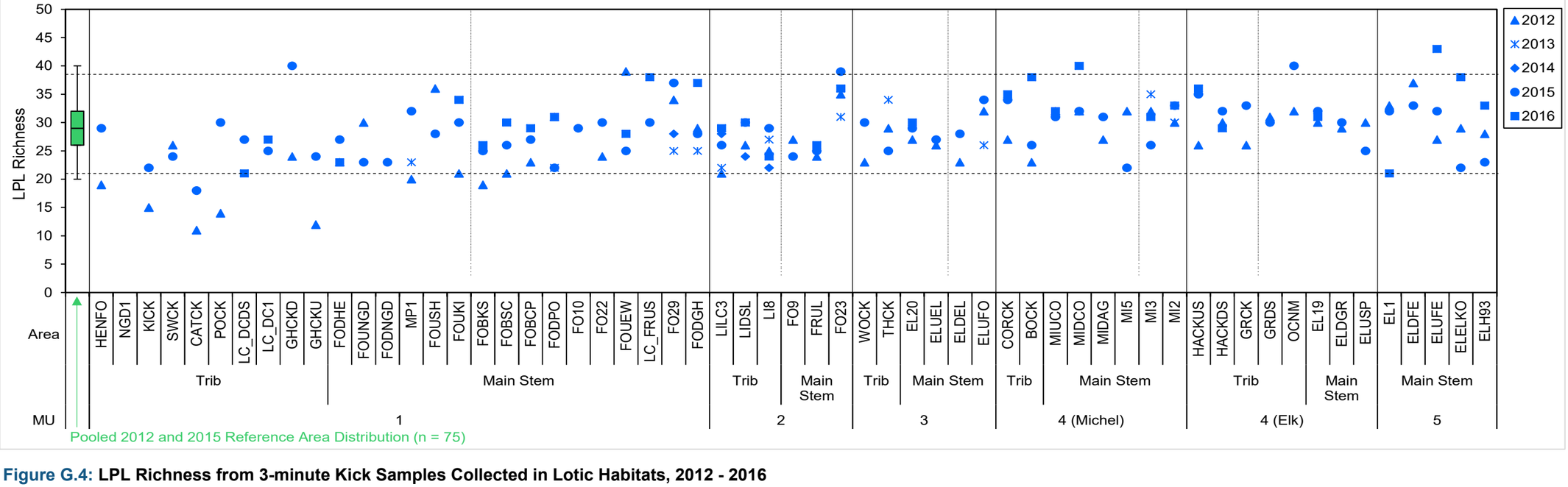


Figure G.4: LPL Richness from 3-minute Kick Samples Collected in Lotic Habitats, 2012 - 2016

Note: Dashed horiztonal lines represent the limits of the reference area normal range. The reference area distribution that is plotted in the boxplot includes all reference areas

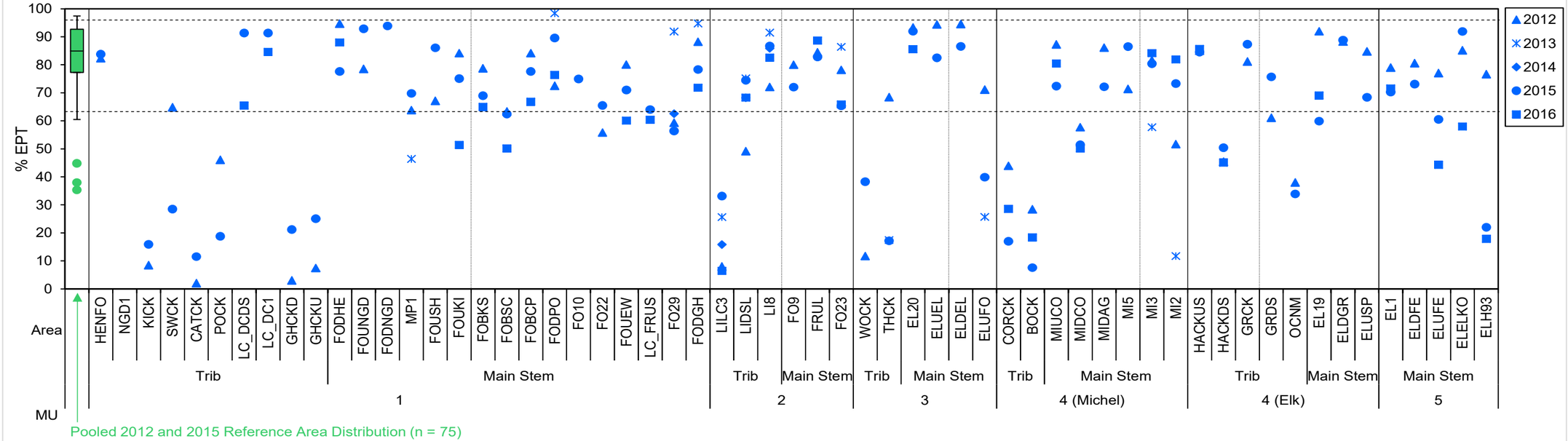


Figure G.5: % EPT from 3-minute Kick Samples Collected in Lotic Habitats, 2012 - 2016

Note: Dashed horiztonal lines represent the limits of the reference area normal range. The reference area distribution that is plotted in the boxplot includes all reference areas

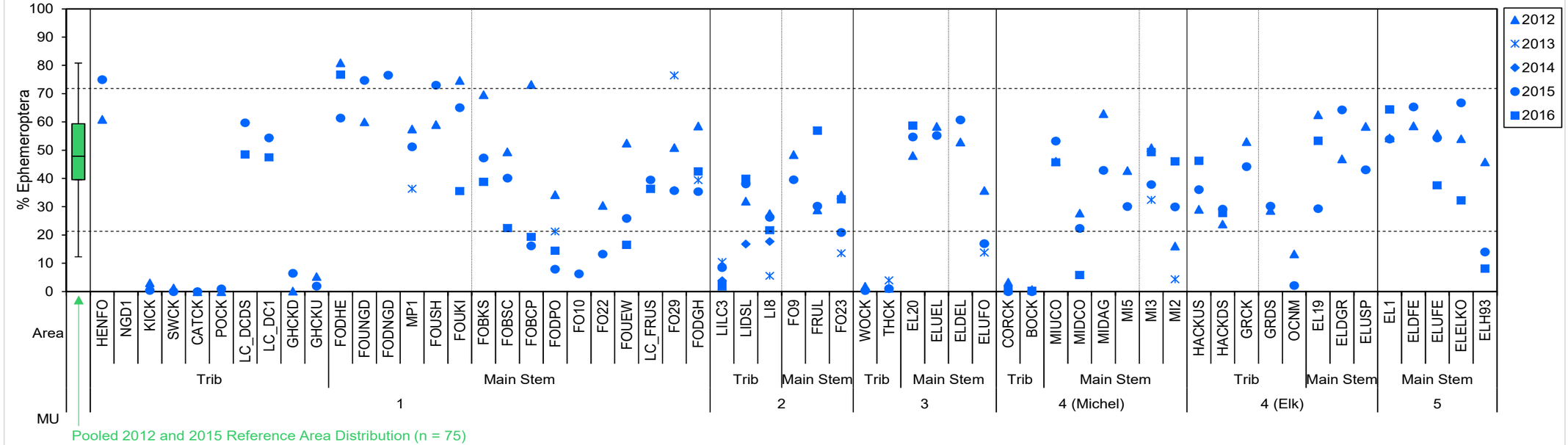
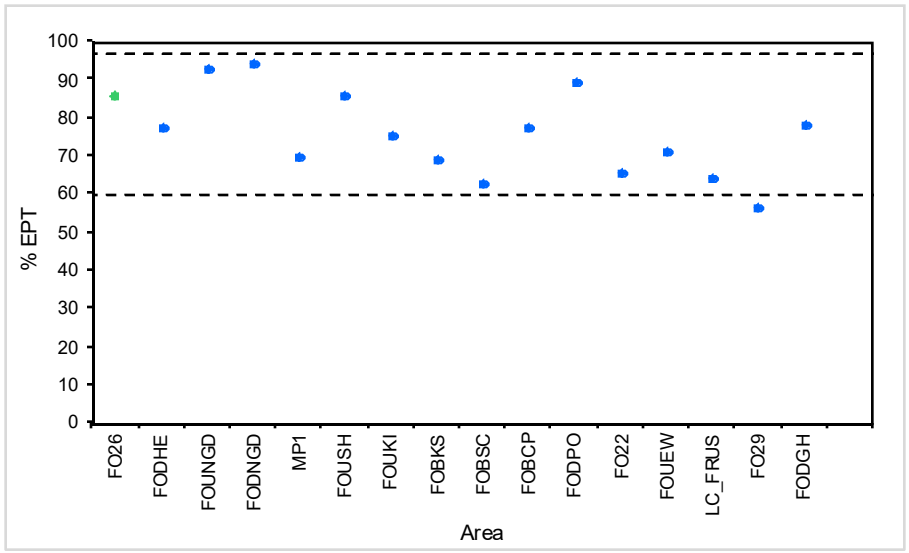
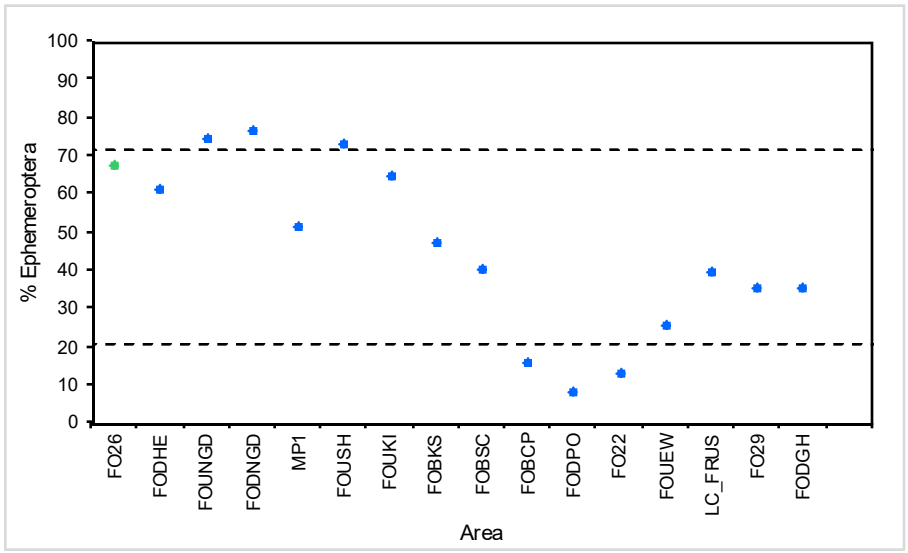
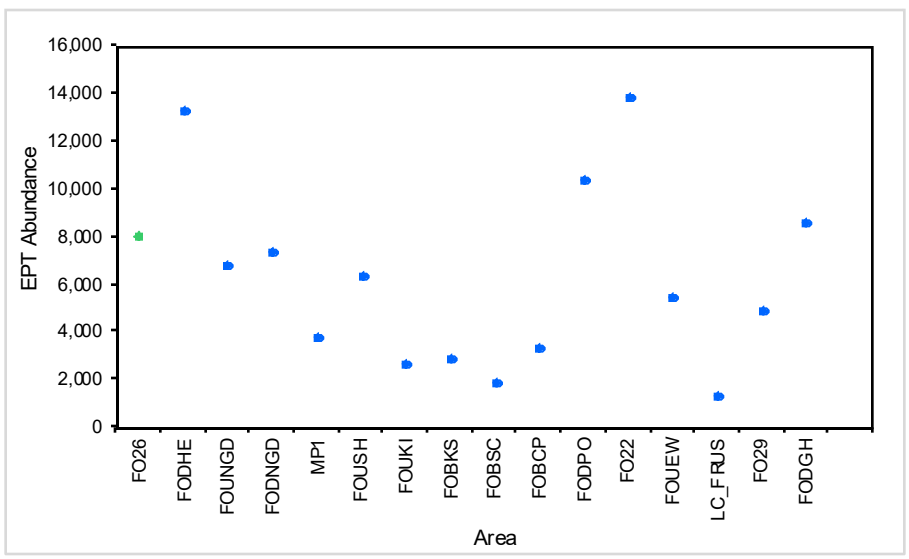


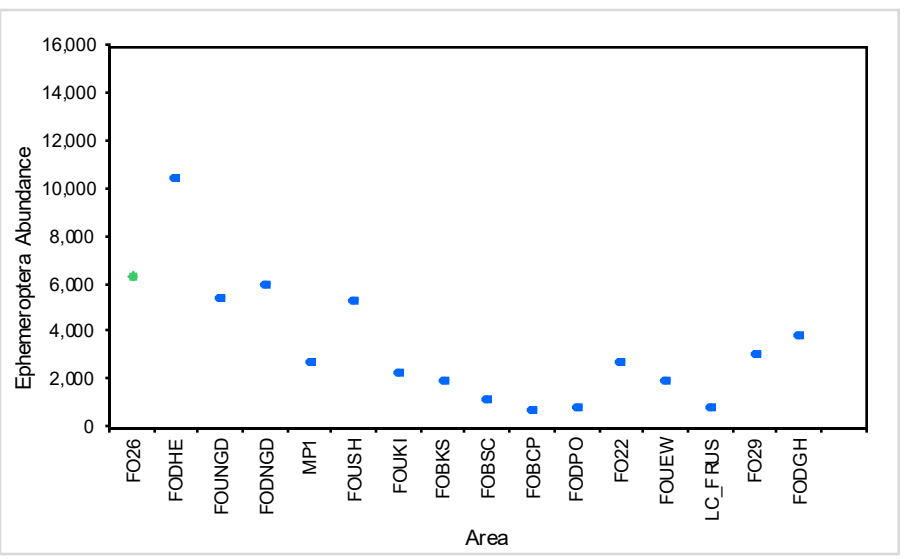
Figure G.6: % Ephemeroptera from 3-minute Kick Samples Collected in Lotic Habitats, 2012 - 2016

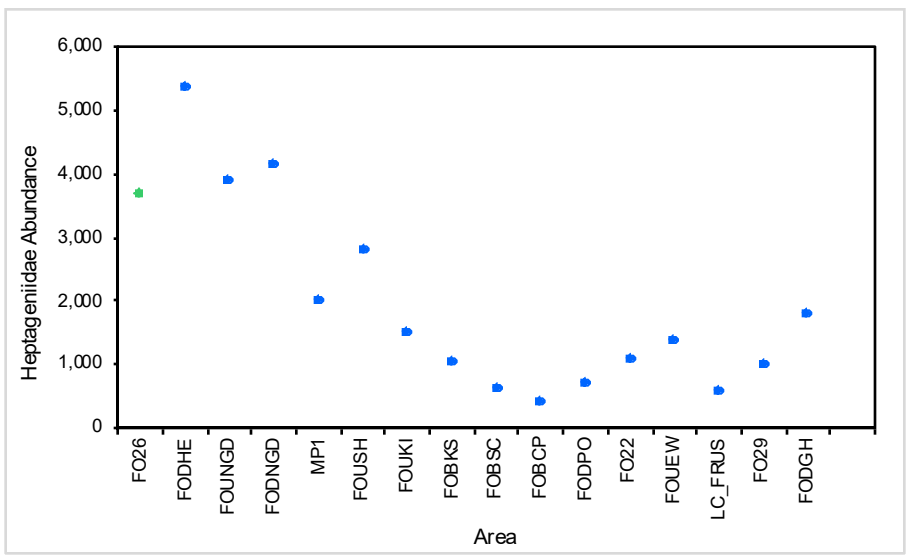
Note: Dashed horiztonal lines represent the limits of the reference area normal range. The reference area distribution that is plotted in the boxplot includes all reference areas

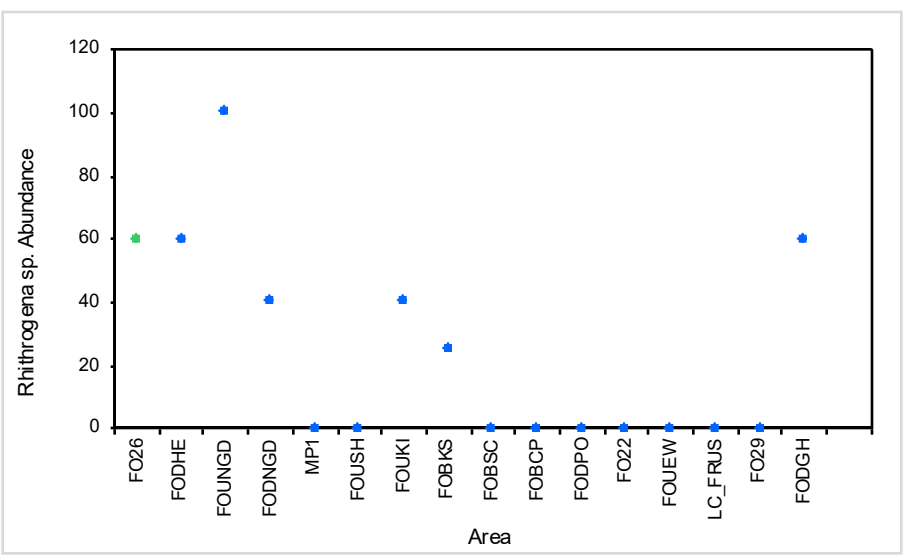


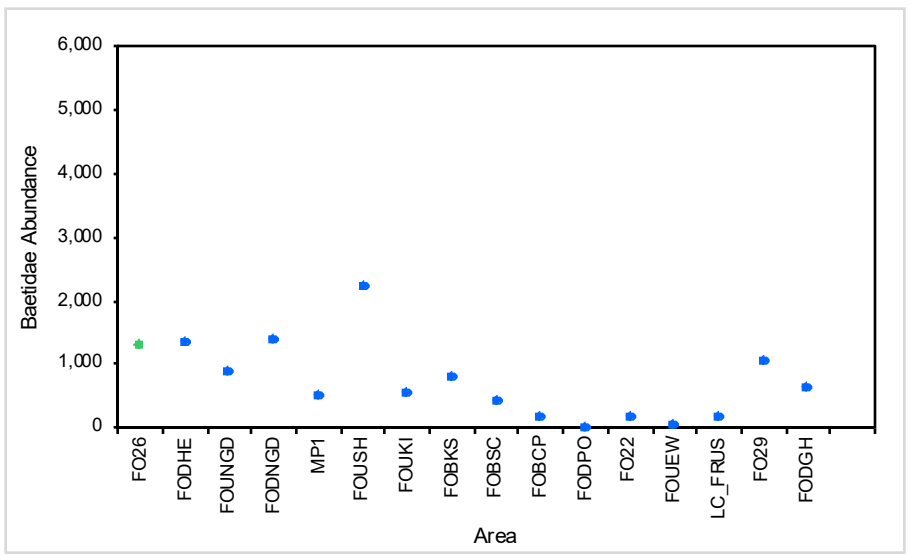


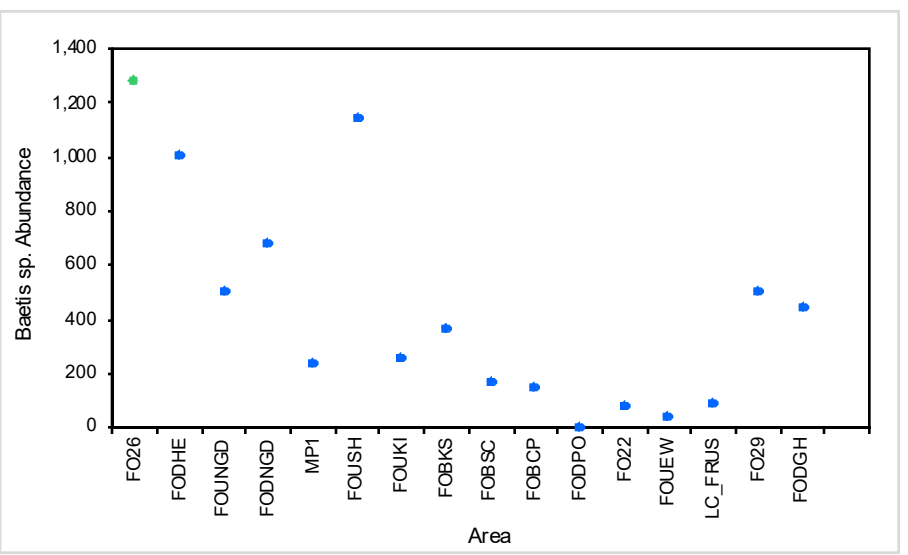


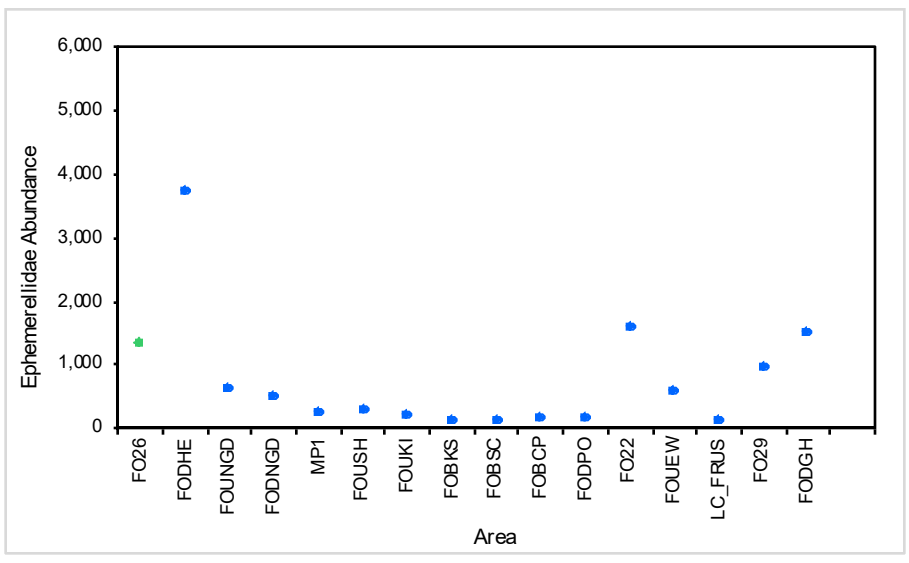












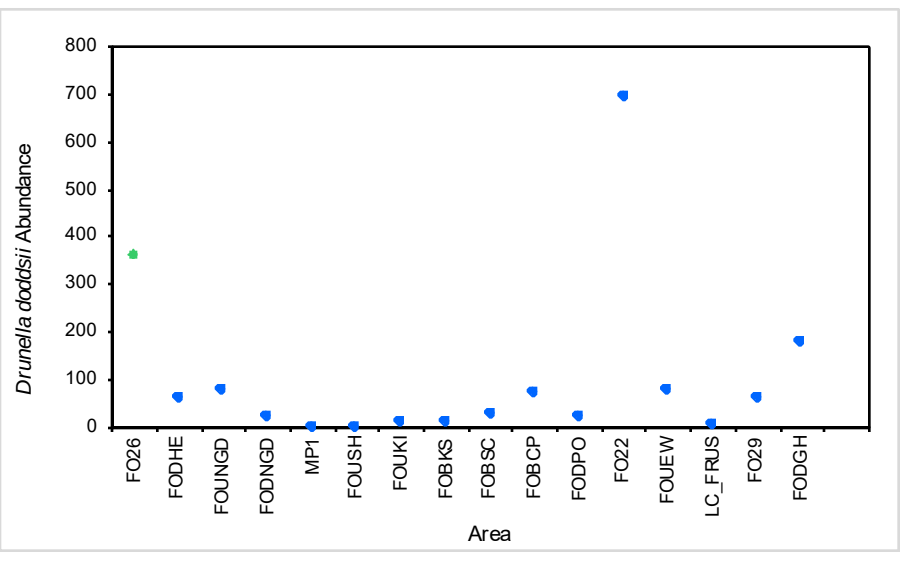


Figure G.7: EPT and Ephemeroptera (% and Abundance), and Ephemeroptera Taxa Abundance in the Upper Fording River, 2015

Note: Dashed horizontal lines represent the limits of the reference area normal range. The reference area distribution that is plotted in the boxplot includes all reference areas prior to the removal of outliers.

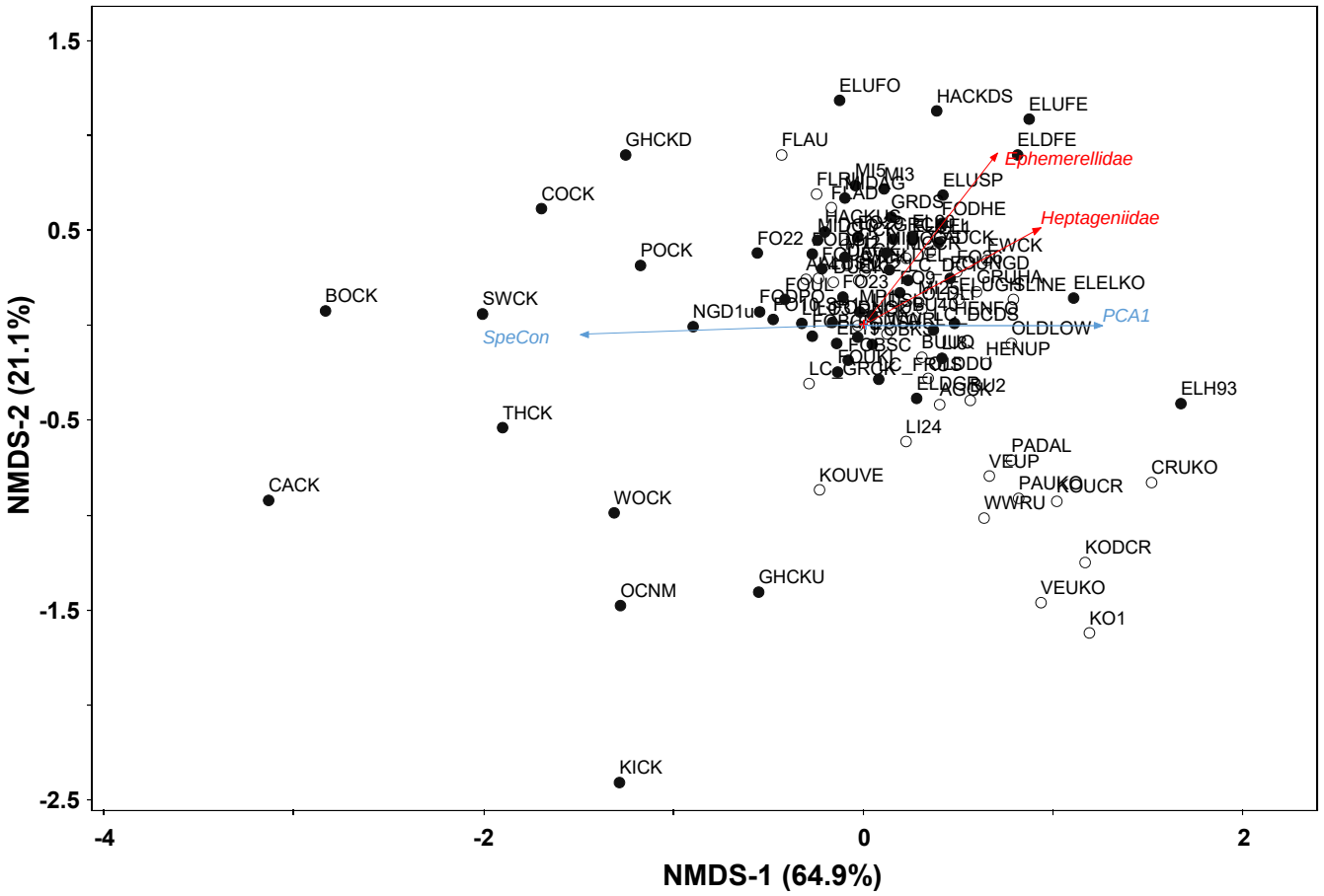


Figure G.8: Nonmetric Multidimensional Scaling Scatter Plot of Benthic Invertebrate Community Structure at 40 Reference Areas (Open Circles) and 59 Mine-exposed Areas (Closed Circles; Log_{10} Transformed Abundance Matrix, Family Level of Taxonomy)

Notes: Direct correlation vectors are displayed for family having an absolute Pearson's correlation coefficient (r) greater than 0.6 with NMDS area axis scores. Indirect correlation of environmental variables resulting in an absolute r value cutoff of 0.6 are shown. Vector length is proportional to correlation strength. A stable 2-dimensional solution was found with stress of 19.24.

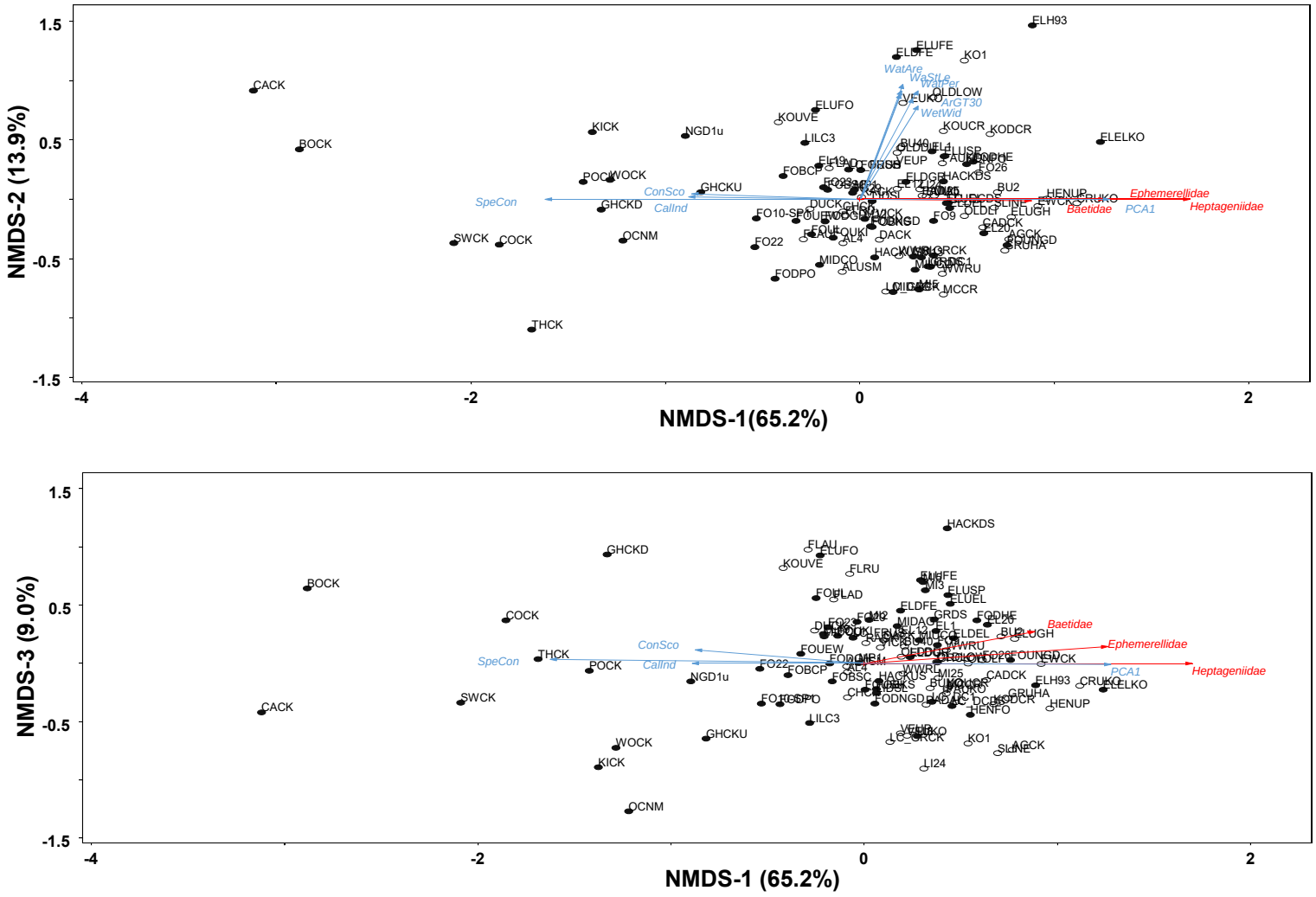


Figure G.9: Nonmetric Multidimensional Scaling Scatter Plot of Benthic Invertebrate Community Structure at 40 Reference Areas (Open Circles) and 59 Mine-exposed Areas (Closed Circles; Fourth Root Transformed Proportional Matrix, Family Level of Taxonomy)

Notes: Direct correlation vectors are displayed for family having an absolute Pearson's correlation coefficient (r) greater than 0.6 with NMDS area axis scores. Indirect correlation of environmental variables resulting in an absolute r value cutoff of 0.6 are shown. Vector length is proportional to correlation strength. A stable 3-dimensional solution was found with stress of 15.87.

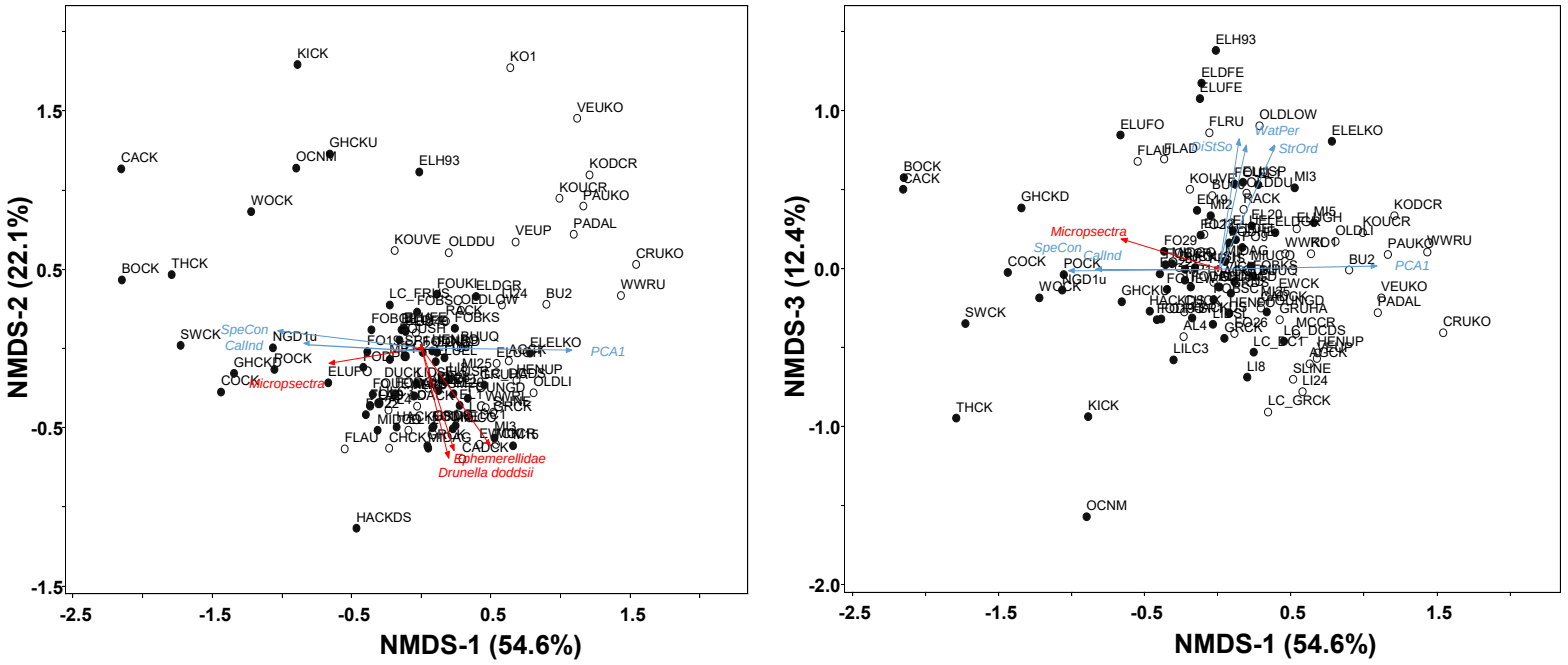


Figure G.10: Nonmetric Multidimensional Scaling Scatter Plot of Benthic Invertebrate Community Structure at 40 Reference Areas (Open Circles) and 59 Mine-exposed Areas (Closed Circles; Log_{10} Transformed Density Matrix, Lowest Practical Level [LPL] of Taxonomy)

Notes: Direct correlation vectors are displayed for LPL having an absolute Pearson's correlation coefficient (r) greater than 0.6 with NMDS area axis scores. Indirect correlation of environmental variables resulting in an absolute r value cutoff of 0.6 are shown. Vector length is proportional to correlation strength. A stable 3-dimensional solution was found with stress of 14.43.

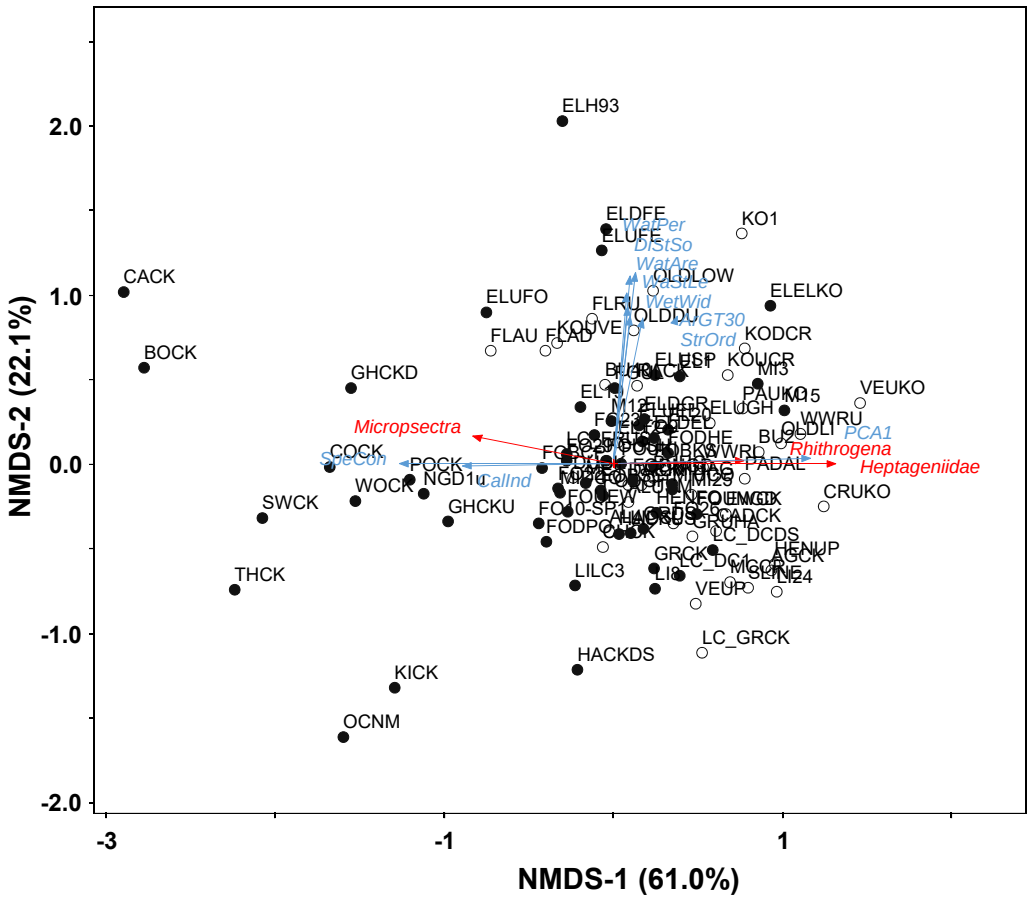


Figure G.11: Nonmetric Multidimensional Scaling Scatter Plot of Benthic Invertebrate Community Structure at 40 Reference Areas (Open Circles) and 59 Mine-exposed Areas (Closed Circles; Fourth Root Transformed Proportional Matrix, Lowest Practical Level [LPL] of Taxonomy)

Notes: Direct correlation vectors are displayed for LPL having an absolute Pearson's correlation coefficient (r) greater than 0.6 with NMDS area axis scores. Indirect correlation of environmental variables resulting in an absolute r value cutoff of 0.6 are shown. Vector length is proportional to correlation strength. A stable 2-dimensional solution was found with stress of 20.34.

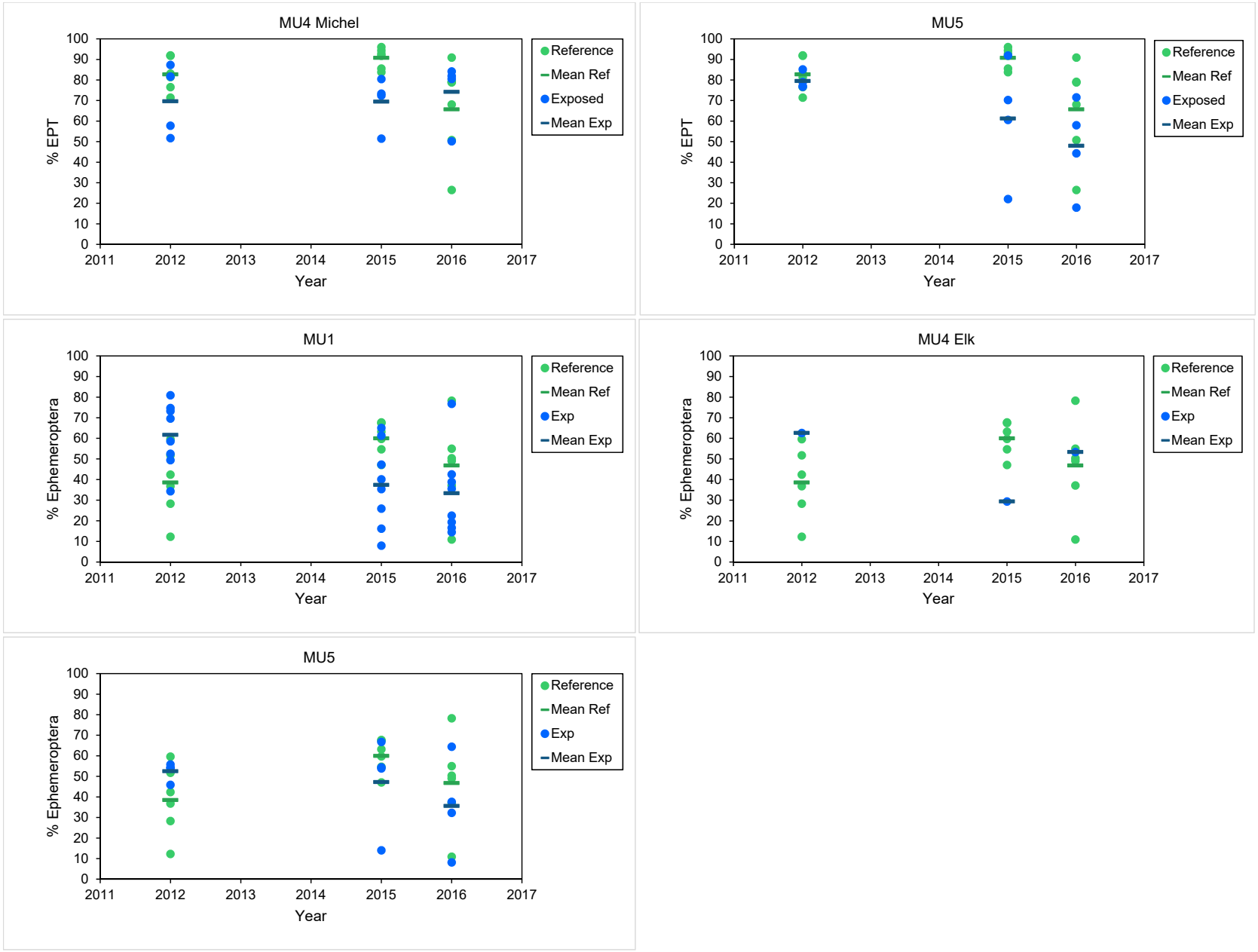
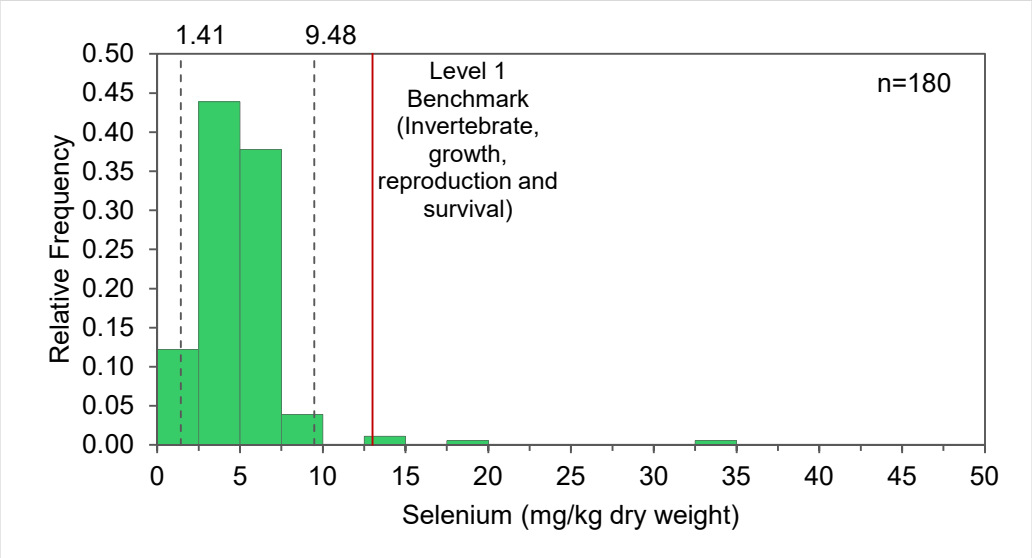


Figure G.12: Scatterplots of Benthic Invertebrate Endpoints for the Mean Reference and Mean Main Stem Mine-exposed Areas by Management Unit for Comparisons that had at Least One Significant Contrast Relative to Reference



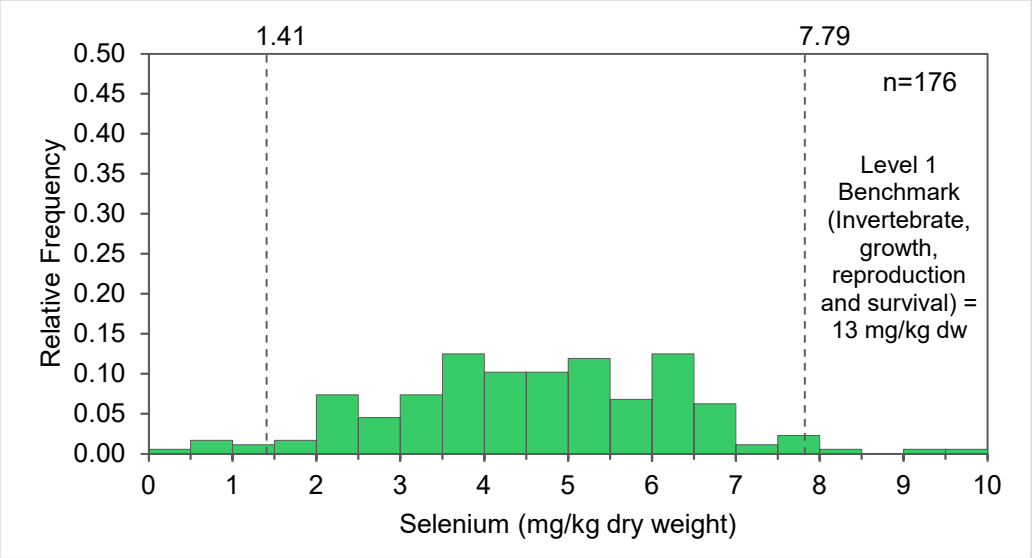
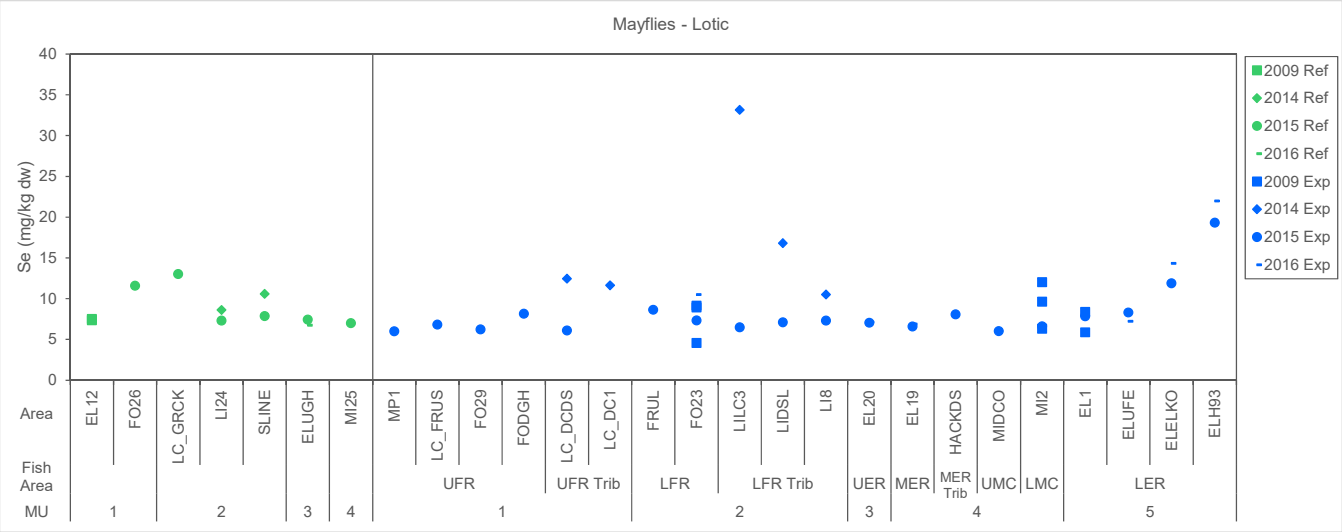


Figure G.13: Distribution of Reference Area Data (n = 180) for all Areas (top) and After Outlier Removal (n = 176; bottom) for Tissue Selenium Concentrations for Composite Benthic Invertebrates Samples in the Elk Valley, 1996 - 2015

Notes: Dashed vertical lines represent the 2.5th and 97.5th percentiles. 4 outliers were identified.



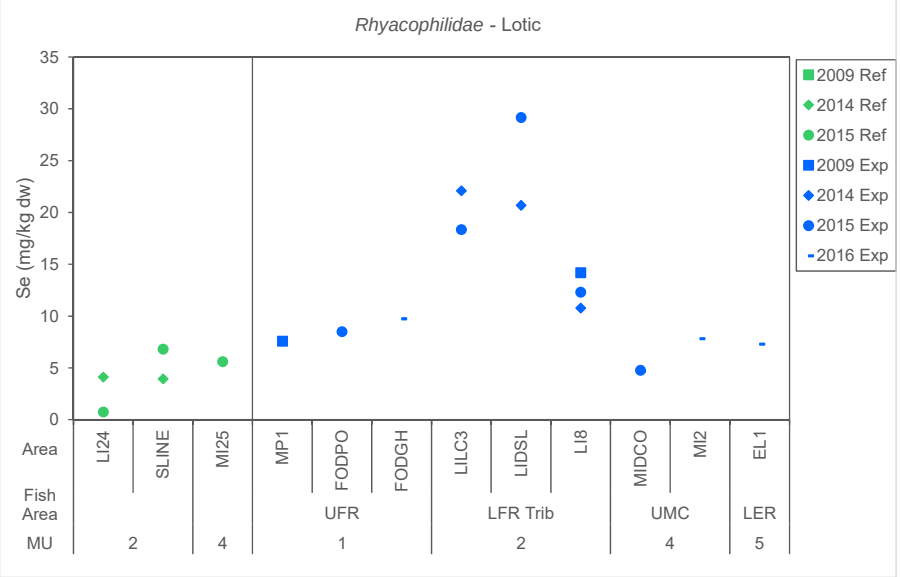


Figure G.14: Selenium Concentrations in Single-Taxon Benthic Invertebrate Samples Collected in Lotic and Lentic Habitats, 2006 - 2015

Notes: UFR = Upper Fording River; LFR = Lower Fording River; UER = Upper Elk River; MER = Middle Elk River; UMC = Upper Michel Creek; LMC = Lower Michel Creek; LER = Lower Elk River; Trib = Tributaries

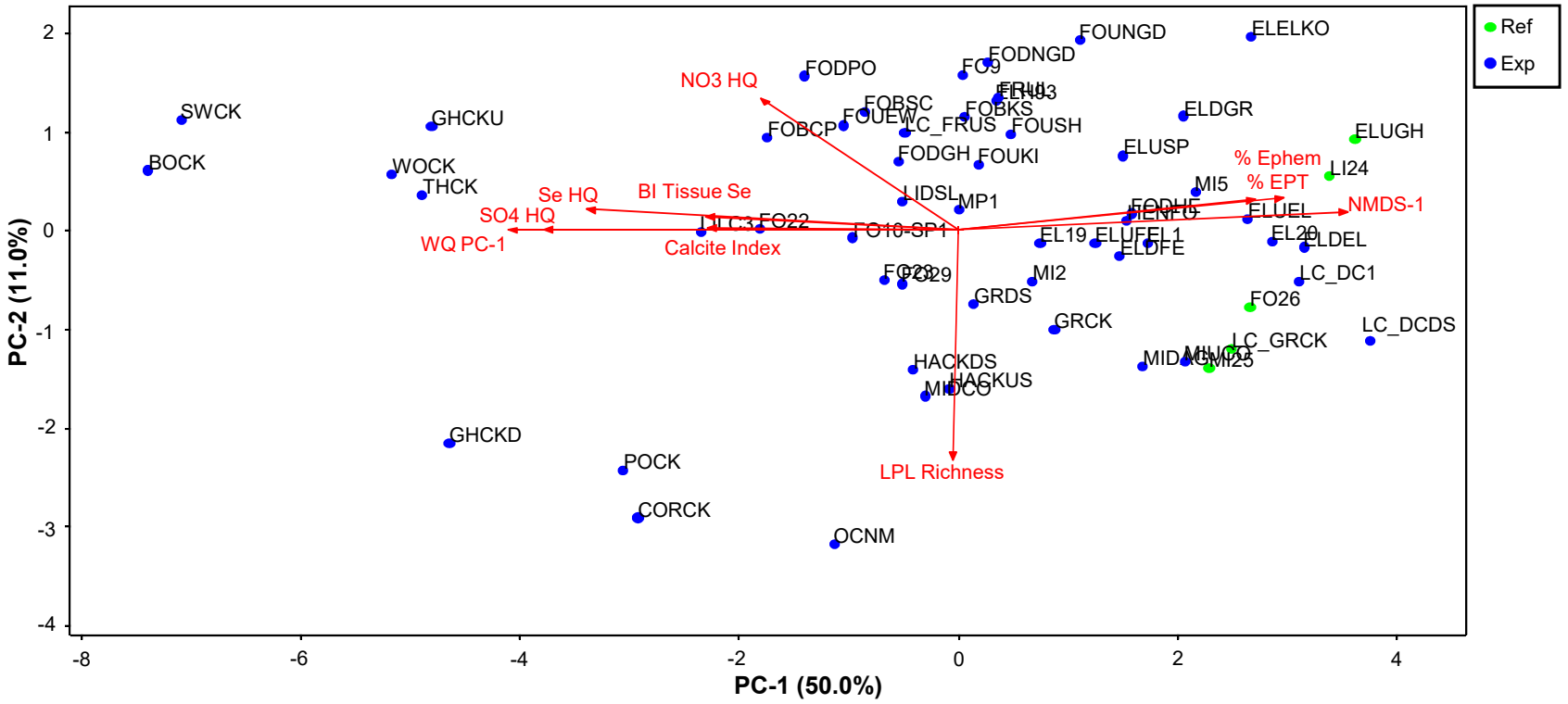


Figure G.15: Overall Principal Components Analysis Biplot of Biological and Abiotic Summary Variables Based on Data from 5 Reference and 53 Mine-exposed Areas, September 2015, Elk Valley

Note: Direct correlation vectors are displayed for variables having an absolute Pearson's correlation coefficient (r) greater than 0.6 with PCA axis scores. Vector length is proportional to correlation strength. Note that PC-2 is not a significant axis (Monte carlo simulation $p > 0.05$).

Table G.1: Lotic Reference and Mine-exposed Benthic Invertebrate Sampling Areas and Samples Collected

Area	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Area Description	UTM (NAD83, 11U)		2015		2016	
						Easting	Northing	Community	Se	Community	Se
Reference	1	Fording	T	HENUP	Henretta u/s all mine operations	655893	5567697	√	-	√	√
				CHCK	Chauncey Creek near mouth	655965	5552879	√	-	-	-
				EWCK	Ewin Creek near mouth	657222	5547631	√	-	-	-
			M	FO26	Fording u/s Henretta (u/s all mines)	653064	5569601	√	√	√	√
	2	Fording	T	LC_GRCK	Grace Creek	654283	5540738	√	√	-	-
				LI24	Line Creek u/s LCO	661968	5538259	√	√	√	√
				SLINE	South Line Creek near mouth	660980	5531449	√	√	√	√
	3	Elk	M	ELUGH	Elk River u/s Branch	646561	5557474	√	√	√	√
	4	Michel	T	ALUSM	Alexander u/s Michel Creek and EVO	663482	5502718	√	-	√	
				MI25	Michel u/s CMO influence	668209	5482832	√	√	√	√
			M	AGCK	Andy Good u/s CMO influence	667551	5488669	√	-	-	-
				AL4	Upper Alexander Creek	664974	5509024	√	-	-	-
		Elk	T	GRUHA	Grave Creek u/s Harmer	657125	5522471	√	-	-	-
	5	Elk	T	MCCR	McCool Creek	648147	5499947	√	-	-	-
				WWRU	Upper Wigwam River	648769	5448916	√	-	-	-
				WWRL	Lower Wigwam River	646103	5458850	√	-	-	-
	N/A	Kootenay	-	BU2	Bull River	631827	5505557	√	-	-	-
				BU40	Bull River 40 km Bridge	626565	5499828	√	-	-	-
				BUUQ	Bull River u/s Quinn	633548	5519175	√	-	-	-
				CRUKO	Cross River u/s Kootenay River	585467	5614088	√	-	-	-
				KO1	Kootenay River	599237	5495599	√	-	-	-
				KODCR	Kootenay River d/s Cross River	584738	5607651	√	-	-	-
				KOUCR	Kootenay River u/s Cross River	579612	5616175	√	-	-	-
				KOUVE	Kootenay River u/s Vermillion	569766	5630957	√	-	-	-
				PADAL	Palliser River d/s Albert	601174	5598680	√	-	-	-
				PAUKO	Palliser River u/s Kootenay, d/s Fenwick	595669	5590189	√	-	-	-
				VEUKO	Vermillion u/s Kootenay, d/s Simpson	569465	5641604	√	-	-	-
				VEUP	Vermillion Upper, u/s Simpson	561227	5670814	√	-	-	-
		Oldman	-	DACK	Daisy Creek	685975	5523953	√	-	-	-
				DUCK	Dutch Creek	687139	5531110	√	-	-	-
				OLDDU	Oldman d/s Dutch, u/s Racehorse	687823	5530318	√	-	-	-
				OLDLI	Oldman d/s Livingstone	687516	5532685	√	-	-	-
				OLDLOW	Oldman lower u/s reservoir	710081	5512478	√	-	-	-
				RACK	Racehorse Creek	687681	5526380	√	-	-	-
				VICK	Vicary Creek	682455	5519662	√	-	-	-
		Elk	-	CADCK	Cadorna Creek u/s Elk River	645826	5589227	√	-	-	-
				EL12	Elk River d/s Cadorna Creek.	646175	5589009	√	-	-	-
		Flathead	-	FLAD	Flathead River Most d/s Station	682705	5443985	√	-	-	-
				FLAU	Flathead River Most u/s Station	680187	5453294	√	-	-	-
				FLRU	Flathead River - mid	668175	5470823	√	-	-	-
Mine-exposed	1	Fording	T	HENFO	Henretta u/s confluence with Fording	652236	5566472	√	√	-	-
				NGD1	Lower Lake Mountain Creek	650883	5563190	√	√	-	-
				KICK	Kilmarnock u/s road crossing near mouth	652878	5559847	√	√	-	-
				SWCK	Swift Creek near mouth	652062	5558541	√	√	-	-
				CATCK	Cataract Creek near mouth	652447	5557452	√	√	-	-
				POCK	Porter Creek near mouth	653596	5555208	√	√	-	-
				LC_DCDS	Dry Creek d/s sedimentation ponds	657713	5542177	√	√	√	√
				LC_DC1	Dry Creek near mouth	656503	5544668	√	√	√	√
				GHCKD	Greenhills Creek d/s of settling pond	653537	5545602	√	√	-	-
				GHCKU	Greenhills Creek u/s of pond	653755	5546168	√	√	-	-
			M	FODHE	Fording d/s Henretta	651305	5565503	√	√	√	-
				FOUNGD	Fording u/s NGD	650993	5563529	√	√	-	-
				FODNGD	Fording d/s NGD	650883	5563190	√	√	-	-
				MP1	Fording Multiplate d/s Eagle Ponds	651158	5562442	√	√	-	-
				FOUSH	Fording u/s Shandley Creek	650863	5560970	√	√	-	-
				FOUKI	Fording u/s Kilmarnock Creek	651861	5559872	√	√	√	√
				FOBKS	Fording between Kilmarnock & Swift	652065	5558691	√	√	√	-
				FOBSC	Fording d/s Swift, u/s Cataract	652342	5558207	√	√	√	-
				FOBCP	Fording between Cataract & Porter	652846	5557174	√	√	√	√
				FODPO	Fording d/s Porter, u/s Chauncey	653877	5555083	√	√	√	√
				FO10-SP1	Fording River Oxbow	654245	5555299	√	√	-	-
				FO22	Fording u/s Chauncey Creek	654841	5553523	√	√	-	-
				FOUEW	Fording d/s Chauncey, u/s Ewin	656363	5551875	√	√	√	√
				LC_FRUS	Fording River u/s Dry Creek	656304	5545239	√	√	√	√
				FO29	Fording d/s Dry, u/s GHO & Hwy Bridge	655434	5543797	√	√	√	√
				FODGH	Fording River d/s GHO	652942	5545635	√	√	√	√
	2	Fording	T	LILC3	Line d/s West Line, u/s South Line	659911	5531818	√	√	√	√
				LIDSL	Upper Line Creek, d/s South Line	659733	5531239	√	√	√	√
				LI8	Line Creek d/s LCO	655651	5528828	√	√	√	√
			M	FO9	Fording d/s Josephine falls, u/s Grace & Line	651932	5540294	√	√	-	-
				FRUL	Fording d/s Grace, u/s Line	654530	5530162	√	√	√	
				FO23	Fording d/s Line Creek	652995	5528937	√	√	√	√
	3	Elk	T	WOCK	Wolfram d/s pond	648228	5552277	√	√	-	-
				THCK	Thompson d/s pond	648596	5550237	√	√	-	-
			M	EL20	Elk River d/s Thompson & GHO	649146	5548514	√	√	√	√
				ELUEL	Elk River u/s Elkford	649097	5544766	√	√	-	-
				ELDEL	Elk River d/s Elkford sewage ponds	649883	5539761	√	√	-	-
				ELUFO	Elk River just u/s Fording	652102	5528815	√	√	-	-
	4	Michel	T	CORCK	Corbin Creek near Mouth	668563	5487395	√	√	√	√
				BOCK	Bodie Creek d/s Bodie Pond	655536	5509605	√	√	√	√
			M	MIUCO	Michel u/s Corbin Creek	668203	5486653	√	√	√	√
				MIDCO	Michel d/s Corbin, u/s Andy Good	667757	5487611	√	√	√	
				MIDAG	Michel d/s Andy Good	665262	5489400	√	√	-	-
				MI5	Michel d/s CMO	659497	5496573	√	√	-	-
				MI3	Michel u/s Erickson Creek	660032	5505022	√	√	√	-
				MI2	Michel Creek d/s EVO	653672	5511222	√	√	√	√
		Elk	T	HACKUS	Harmer Creek u/s Harmer Pond	658180	5520996	√	√	√	√
				HACKDS	Harmer d/s Pond near mouth at Grave	656969	5522171	√	√	√	√
				GRCK	Grave Creek d/s Harmer	656215	5522446	√	√	-	-
				GRDS	Grave Creek near mouth at Elk	654077	5523402	√	√	-	-
				OCNM	Otto Creek near mouth	652337	5512615	√	√	-	-
			M	EL19	Elk River d/s Fording, u/s Grave	653146	5525824	√	√	√	√
				ELDGR	Elk River d/s Grave	653185	5520978	√	√	-	-
				ELUSP	Elk d/s Otto, u/s Sparwood & Michel	652325	5512688	√	√	-	-
	5	Elk	M	EL1	Elk d/s Sparwood & Michel	651657	5508511	√	√	√	√
				ELDFE	Elk d/s Fernie	640097	5479596	√	√	-	-
				ELUFE	Elk u/s Fernie	644258	5490947	√	√	√	√
				ELELKO	Elk River u/s Elko	639433	5463291	√	√	√	√
				ELH93	Elk River u/s Hwy 93 Bridge	633578	5449043	√	√	√	√

Notes: N/A = Not applicable; "-" = not applicable

Table G.2: Lentic Reference and Mine-exposed Benthic Invertebrate Sampling Areas and Samples Collected

Area	Management Unit	Main Watershed	Biological Area Code	Area Description	UTM (NAD83, 11U)		2015	2016
					Easting	Northing	Se	Se
Reference	1	Fording	LML	Lake Mountain Lake	650106	5565031	√	-
			FO15	Fording River Wetland	654807	5542584	√	-
	3	Elk	REFF	Unnamed Wetland near Elk River north of Elkford	645869	5556297	√	-
			ERORP	Elk River Oxbow, wetland near round prairie	647579	5549978	√	-
			LOLA	Lost Lake	650934	5542536	√	-
	4		GLMS	Grave Lake Marsh	654720	5525553	√	-
			GRLK	Grave Lake	655563	5525690	√	-
			LCHO	Leach Creek Oxbow	658746	5489172	√	-
	NA		EL14	Elk Lakes	635326	5601876	√	-
		Flathead	FLA1	Flathead Side Channel	681815	5443615	√	-
			FL17	Flathead Pond	681226	5440716	√	-
Mine-exposed	1	Fording	HE27	Henretta Lake	652573	5566275	√	-
			FOXL	Lower Fording River Oxbow	654878	5554437	√	-
			FMUCK	Meadow area u/s Chauncey Creek	654771	5553328	√	-
			FWDEC	Fording River wetland d/s Ewin Creek	656896	5547095	√	-
			R5-1	Off channel area of Fording River d/s Greenhills	653010	5545714	√	-
	2	Elk	R5-3	Lentic area off Fording River d/s Josephine Falls	652358	5539932	√	-
	3		ERUP	Elk River Upper Ponds	651742	5530538	√	-
			EROU	Upper Elk River Oxbow	652364	5529872	√	-
			GH-SCW1	side channel wetland near inlet	648345	5550229	√	-
			GH-SCW2	side channel wetland near input from thompson creek	648370	5550201	√	-
			GH-SC1-P1	western channel pool 1	648385	5549327	√	-
			GH-SC2-P1	eastern channel pool 1	648557	5549473	√	-
			GH-SC2-P2	eastern channel pool 2	648673	5549294	√	-
			GH-SC2-P3	eastern channel pool 3	648781	5549094	√	-
	4		ELWDGC	Elk River Wetland Downstream of Grave Creek	653175	5521300	√	-
			GO13	Goddard Marsh (and lower Goddard Pond decant)	652955	5514065	√	-
			OTTO	Otto Creek wetlands	652537	5512801	√	-
			MI16	Michel Creek Wetland	665083	5489403	√	-
			MIC2	Michel Oxbow #2	659533	5496626	√	-
			MIWW	Lower Michel Wetland	659707	5498474	√	-
	5		SPW	Sparwood Wetland	651182	5511239	√	-
			ERWSF	Elk River Wetland Downstream of Fernie	639138	5484622	√	-
			STPD	Stanford Pond	639864	5483139	√	-
			EROL	Lower Elk River Oxbow (d/s Fernie)	640877	5477999	√	-
			UNWNMO	Unnamed Wetland near Morrissey	644982	5468245	√	-
			ELKO	Elko Resevoir	637800	5461540	√	-

Notes: N/A = Not applicable; "-" = not applicable

Table G.3: Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2015)

Biological Area Code			HBI (Family)	HBI (LPL)	Simpson's Diversity (Family)	Evenness (Family)	Simpson's Diversity (LPL)	Evenness (LPL)	Abundance	Total Family Richness	Total LPL Richness	EPT	
												Total	%
2015	Reference	AGCK	2.70	3.18	0.55	0.16	0.73	0.17	7,180	14	22	6,980	97.21
		AL4	3.38	3.56	0.85	0.36	0.84	0.22	10,960	19	28	8,980	81.93
		ALUSM	3.39	2.60	0.83	0.29	0.84	0.19	8,900	21	34	6,100	68.54
		BU2	2.52	2.46	0.76	0.18	0.86	0.27	1,515	23	28	1,395	92.08
		BU40	3.58	3.80	0.90	0.45	0.93	0.43	3,440	22	34	2,080	60.47
		BUUQ	2.84	3.11	0.84	0.30	0.88	0.28	3,070	20	29	2,540	82.74
		CADCK	3.10	3.17	0.75	0.21	0.87	0.26	11,200	19	28	9,660	86.25
		CHCK	3.48	3.48	0.81	0.25	0.93	0.43	13,360	21	32	9,280	69.46
		CRUKO	2.63	2.61	0.78	0.28	0.69	0.13	541	16	23	527	97.41
		DACK	3.26	3.54	0.86	0.34	0.87	0.21	9,840	21	34	8,120	82.52
		DUCK	3.85	4.07	0.76	0.18	0.90	0.26	5,951	24	37	2,666	44.80
		EL12	3.36	3.68	0.82	0.25	0.87	0.24	8,740	22	32	7,420	84.90
		ELUGH	2.87	2.98	0.80	0.32	0.84	0.27	4,044	16	22	3,711	91.77
		EWCK	2.54	2.79	0.82	0.35	0.92	0.39	6,060	16	31	5,300	87.46
		FLAD	4.34	4.79	0.72	0.15	0.88	0.23	12,740	24	39	4,500	35.32
		FLAU	3.46	3.78	0.84	0.30	0.90	0.34	6,520	21	31	4,100	62.88
		FLRU	3.59	4.30	0.79	0.25	0.88	0.28	5,506	24	33	3,471	63.04
		FO26	2.97	3.52	0.83	0.25	0.89	0.26	9,400	19	29	8,040	85.53
		GRUHA	2.77	3.05	0.84	0.27	0.84	0.19	4,891	23	32	4,673	95.54
		HENUP	2.67	3.06	0.58	0.17	0.61	0.12	7,500	14	20	7,200	96.00
		KO1	2.83	3.27	0.64	0.16	0.75	0.19	846	18	23	697	82.39
		KODCR	2.96	3.03	0.84	0.33	0.86	0.25	466	19	28	394	84.55
		KOUCR	2.96	2.91	0.88	0.45	0.89	0.30	489	19	29	398	81.39
		KOUVE	5.88	6.16	0.81	0.23	0.77	0.16	2,276	22	30	863	37.92
		LC_GRCK	2.66	2.66	0.87	0.40	0.88	0.34	6,760	19	26	6,260	92.60
		LI24	2.48	2.83	0.67	0.17	0.90	0.46	3,008	18	21	2,791	92.79
		MCCR	3.04	3.10	0.72	0.20	0.67	0.13	11,620	18	24	11,040	95.01
		MI25	2.52	2.88	0.87	0.37	0.88	0.27	7,140	20	31	5,980	83.75
		OLDDU	3.16	3.54	0.87	0.35	0.91	0.34	1,977	22	35	1,345	68.03
		OLDLI	2.49	2.45	0.74	0.20	0.87	0.27	6,086	19	28	5,729	94.13
		OLDLOW	3.21	3.34	0.83	0.29	0.90	0.35	3,523	20	30	2,934	83.28
		PADAL	2.41	2.63	0.86	0.34	0.88	0.25	557	21	33	518	93.00
		PAUKO	2.87	3.02	0.86	0.37	0.83	0.18	471	19	31	410	87.05
		RACK	2.98	3.07	0.82	0.21	0.94	0.42	3,210	26	40	2,500	77.88
		SLINE	2.55	2.57	0.78	0.26	0.93	0.50	6,505	17	27	6,137	94.34
		VEUKO	2.56	3.04	0.71	0.16	0.79	0.18	705	22	30	595	84.40
		VEUP	3.65	4.02	0.86	0.42	0.87	0.29	756	17	25	487	64.42
		VICK	3.32	3.84	0.87	0.41	0.89	0.27	8,520	18	32	5,860	68.78
		WWRL	2.78	3.00	0.84	0.36	0.82	0.25	4,856	17	23	3,785	77.94
		WWRU	2.21	1.82	0.77	0.25	0.73	0.16	777	17	23	728	93.69
2015	Mine-exposed	BOCK	5.95	6.51	0.70	0.24	0.74	0.18	8,140	14	26	620	7.62
		CATCK	5.19	5.95	0.40	0.17	0.82	0.36	4,030	10	18	464	11.51
		CORCK	6.23	4.38	0.65	0.13	0.60	0.08	29,180	22	34	4,960	17.00
		EL1	2.90	3.08	0.79	0.22	0.83	0.19	7,720	22	32	5,420	70.21
		EL19	3.69	4.15	0.81	0.23	0.84	0.19	3,240	23	32	1,940	59.88
		EL20	2.60	2.71	0.84	0.33	0.87	0.29	6,218	19	29	5,718	91.96
		ELDEL	2.88	3.18	0.77	0.21	0.91	0.41	7,740	21	28	6,700	86.56
		ELDFE	2.50	2.62	0.62	0.12	0.82	0.17	17,160	21	33	12,540	73.08
		ELDGR	2.74	2.90	0.78	0.19	0.90	0.33	1,288	24	30	1,144	88.82
		ELELKO	2.98	2.36	0.72	0.23	0.80	0.23	7,880	16	22	7,240	91.88
		ELH93	5.12	5.66	0.64	0.20	0.74	0.18	2,858	14	23	630	22.04
		ELUEL	3.18	3.30	0.86	0.33	0.92	0.45	5,135	21	27	4,235	82.47
		ELUFE	3.04	3.22	0.72	0.18	0.80	0.17	11,000	20	32	6,660	60.55
		ELUFO	3.95	4.30	0.73	0.16	0.84	0.20	8,980	23	34	3,580	39.87
		ELUSP	3.36	3.78	0.85	0.33	0.88	0.33	6,460	20	25	4,420	68.42
		FO10-SP1	2.79	2.83	0.69	0.17	0.85	0.23	13,800	19	29	10,340	74.93
		FO22	2.88	2.90	0.81	0.24	0.91	0.34	21,140	22	30	13,840	65.47
		FO23	3.26	3.33	0.89	0.38	0.92	0.32	3,780	25	39	2,470	65.34
		FO29	3.82	4.01	0.85	0.27	0.94	0.40	8,580	25	37	4,840	56.41
		FO9	3.83	3.29	0.84	0.33	0.86	0.29	6,720	19	24	4,840	72.02
		FOBCP	2.94	2.91	0.84	0.29	0.91	0.44	4,260	21	27	3,305	77.58
		FOBKS	4.53	3.92	0.83	0.31	0.81	0.19	4,161	19	25	2,869	68.95
		FOBSC	4.57	3.98	0.87	0.34	0.85	0.25	2,923	22	26	1,825	62.44
		FODGH	2.96	2.98	0.89	0.38	0.89	0.29	10,980	23	28	8,600	78.32
		FODHE	3.01	3.53	0.79	0.25	0.85	0.25	17,060	19	27	13,240	77.61
		FODNGD	3.13	3.71	0.68	0.19	0.87	0.29	7,840	16	23	7,360	93.88
		FODPO	2.21	2.26	0.82	0.30	0.74	0.17	10,340	18	22	9,260	89.56
		FOUEW	2.92	3.11	0.84	0.33	0.86	0.28	7,720	19	25	5,480	70.98
		FOUKI	4.10	4.07	0.77	0.20	0.86	0.24	3,490	21	30	2,620	75.07
		FRUL	2.86	2.79	0.87	0.40	0.84	0.23	3,006	19	25	2,490	82.83
		FOUNGD	2.98	3.55	0.68	0.21	0.90	0.42	7,260	15	23	6,740	92.84
		FOUSH	3.80	4.32	0.75	0.19	0.84	0.22	7,320	21	28	6,300	86.07
		GHCKD	5.47	5.97	0.84	0.22	0.91	0.31	10,560	28	40	2,240	21.21
		GHCKU	4.33	4.61	0.55	0.15	0.68	0.13	774	15	24	194	25.06
		GRCK	2.79	2.68	0.89	0.43	0.93	0.40	7,740	22	33	6,760	87.34
		GRDS	3.56	3.20	0.89	0.42	0.90	0.34	8,400	22	30	6,360	75.71
		HACKDS	4.11	4.56	0.80	0.27	0.91	0.34	10,160	18	32	5,120	50.39
		HACKUS	2.82	2.90	0.89	0.41	0.89	0.24	15,540	23	35	13,140	84.56
		HENFO	2.63	3.13	0.71	0.19	0.89	0.29	13,820	18	29	11,580	83.79
		KICK	4.73	4.73	0.52	0.12	0.89	0.47	497	17	22	79	15.90
		LC_DC1	2.59	2.81	0.81	0.30	0.89	0.39	7,140	18	25	6,520	91.32
		LC_DCDS	2.37	2.64	0.79	0.25	0.85	0.22	7,640	19	27	6,980	91.36
		LC_FRUS	3.52	3.85	0.82	0.26	0.91	0.34	2,065	22	30	1,322	64.02
		LI8	2.59	2.75	0.86	0.35	0.85	0.22	3,390	21	29	2,940	86.73
		LIDSL	3.38	3.64	0.85	0.30	0.93	0.49	6,980	22	30	5,200	74.50
		LILC3	4.40	4.53	0.59	0.14	0.85	0.24	19,360	18	26	6,420	33.16
		MI2	3.08	3.26	0.89	0.39	0.93	0.40	6,119	23	33	4,486	73.31
		MI3	3.07	2.93	0.87	0.37	0.86	0.27	7,660	21	26	6,160	80.42
		MI5	2.83	2.85	0.80	0.27	0.74	0.18	7,120	19	22	6,160	86.52
		MIDAG	3.69	2.94	0.84	0.33	0.82	0.16	14,520	19	31	10,480	72.18
		MIDCO	4.03	3.17	0.85	0.31	0.87	0.24	12,360	21	32	6,360	51.46
		MIUCO	3.24	2.70	0.82	0.31	0.87	0.23	7,820	18	31	5,660	72.38
		MP1	3.55	3.99	0.79	0.21	0.90	0.31	5,470	23	32	3,818	69.80
		NGD1	3.90	4.14	0.79	0.31	0.88	0.29	9,760	15	27	5,820	59.63
		OCNM	4.94	5.71	0.89	0.31	0.86	0.26	1,373	29	40	465	33.87
		POCK	4.57	5.39	0.45	0.08	0.78	0.16	22,160	23	30	4,160	18.77
		SWCK	4.27	4.73	0.59	0.16	0.83	0.27	6,214	15	24	1,771	28.50
		THCK	5.16	5.40	0.74	0.21	0.71	0.14	2,412	18	25	415	17.21
		WOCK	4.25	4.12	0.81	0.26	0.90	0.38	1,244	20	30	476	38.26

Table G.3: Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2015)

Biological Area Code			EPT Richness		Ephemeroptera				Baetidae		Baetis		Baetis Tricaudatus group		Ephemerellidae	
			Family Richness	LPL Richness	Total	%	Family Richness	LPL Richness	Total	%	Total	%	Total	%	Total	%
2015	Reference	AGCK	11	15	4,900	68.25	4	6	60	0.84	40	0.01	0	0	80	1.11
		AL4	10	14	6,200	56.57	3	6	2,840	25.91	2,620	0.24	40	0.36	1,800	16.42
		ALUSM	12	16	3,620	40.67	3	6	260	2.92	220	0.02	40	0.45	2,660	29.89
		BU2	14	17	815	53.80	4	7	55	3.63	15	0.01	20	1.32	85	5.61
		BU40	14	19	1,190	34.59	4	7	250	7.27	160	0.05	0	0	400	11.63
		BUUQ	16	17	1,230	40.07	4	4	220	7.17	170	0.06	50	1.63	280	9.12
		CADCK	13	17	6,540	58.39	3	6	1,100	9.82	1,040	0.09	20	0.18	480	4.29
		CHCK	15	20	5,600	41.92	4	6	280	2.10	200	0.01	0	0	820	6.14
		CRUKO	12	18	261	48.24	4	9	57	10.54	54	0.10	1	0.18	43	7.95
		DACK	15	19	5,180	52.64	4	6	2,820	28.66	2,340	0.24	420	4.27	1,280	13.01
		DUCK	14	19	1,384	23.26	4	6	550	9.24	533	0.09	17	0.29	667	11.21
		EL12	15	20	5,220	59.73	5	9	1,620	18.54	1,480	0.17	100	1.14	560	6.41
		ELUGH	13	15	2,211	54.67	3	5	389	9.62	300	0.07	89	2.20	334	8.26
		EWCK	12	18	3,700	61.06	3	7	460	7.59	300	0.05	100	1.65	1,380	22.77
		FLAD	13	17	2,740	21.51	3	6	380	2.98	300	0.02	0	0	1,160	9.11
		FLAU	12	14	2,400	36.81	5	6	140	2.15	80	0.01	0	0	960	14.72
		FLRU	14	18	2,835	51.49	5	7	934	16.96	917	0.17	17	0.31	850	15.44
		FO26	13	15	6,340	67.45	4	5	1,280	13.62	1,280	0.14	0	0	1,320	14.04
		GRUHA	16	20	2,216	45.31	4	5	951	19.44	813	0.17	138	2.82	176	3.60
		HENUP	12	14	5,080	67.73	4	5	80	1.07	80	0.01	0	0	460	6.13
		KO1	10	10	625	73.88	4	4	8	0.95	3	0.00	5	0.59	16	1.89
		KODCR	12	16	314	67.38	4	8	101	21.67	94	0.20	6	1.29	23	4.94
		KOUCR	13	18	247	50.51	4	7	76	15.54	69	0.14	3	0.61	37	7.57
		KOUVE	12	14	687	30.18	4	6	137	6.02	131	0.06	6	0.26	68	2.99
		LC_GRCK	14	17	1,340	19.82	3	4	280	4.14	240	0.04	40	0.59	120	1.78
		LI24	13	14	1,901	63.20	3	4	0	0	0	0.00	0	0	73	2.43
		MCCR	13	18	2,820	24.27	3	7	1,460	12.56	1,160	0.10	280	2.41	680	5.85
		MI25	15	17	3,360	47.06	4	6	520	7.28	520	0.07	0	0	1,660	23.25
		OLDDU	14	16	719	36.37	4	6	206	10.42	156	0.08	50	2.53	157	7.94
		OLDLI	13	17	3,957	65.02	3	5	386	6.34	143	0.02	243	3.99	672	11.04
		OLDLOW	13	17	1,390	39.46	5	8	282	8.00	155	0.04	45	1.28	781	22.17
		PADAL	15	21	288	51.71	5	8	70	12.57	65	0.12	5	0.90	131	23.52
		PAUKO	12	17	219	46.50	4	7	69	14.65	64	0.14	5	1.06	59	12.53
		RACK	16	20	1,780	55.45	4	7	160	4.98	120	0.04	20	0.62	370	11.53
		SLINE	14	21	3,884	59.71	4	8	83	1.28	0	0.00	33	0.51	767	11.79
		VEUKO	9	13	504	71.49	4	7	5	0.71	3	0.00	2	0.28	48	6.81
		VEUP	12	17	254	33.60	4	7	96	12.70	55	0.07	5	0.66	36	4.76
		VICK	12	16	3,380	39.67	4	6	940	11.03	920	0.11	20	0.23	540	6.34
		WWRL	11	12	1,972	40.61	3	4	443	9.12	386	0.08	57	1.17	671	13.82
		WWRU	11	14	356	45.82	4	7	101	13.00	48	0.06	8	1.03	89	11.45
2015	Mine-exposed	BOCK	5	5	0	0	0	0	0	0	0	0.00	0	0	0	0
		CATCK	2	2	0	0	0	0	0	0	0	0.00	0	0	0	0
		CORCK	9	11	0	0	0	0	0	0	0	0.00	0	0	0	0
		EL1	15	20	4,160	53.89	4	9	480	6.22	160	0.02	120	1.55	2,440	31.61
		EL19	13	15	950	29.32	3	5	380	11.73	310	0.10	40	1.23	130	4.01
		EL20	14	19	3,401	54.70	3	6	533	8.57	283	0.05	167	2.69	984	15.83
		ELDEL	15	17	4,700	60.72	3	5	440	5.68	380	0.05	60	0.78	880	11.37
		ELDFE	12	15	11,200	65.27	5	7	320	1.86	100	0.01	20	0.12	10,060	58.62
		ELDGR	15	17	828	64.29	4	6	124	9.63	92	0.07	32	2.48	148	11.49
		ELELKO	13	15	5,260	66.75	5	6	860	10.91	340	0.04	300	3.81	460	5.84
		ELH93	11	11	401	14.03	5	5	29	1.01	0	0.00	0	0	122	4.27
		ELUEL	15	17	2,834	55.19	4	6	633	12.33	433	0.08	200	3.89	551	10.73
		ELUFE	11	15	5,980	54.36	5	9	240	2.18	120	0.01	20	0.18	5,120	46.55
		ELUFO	12	13	1,520	16.93	5	6	280	3.12	280	0.03	0	0	1,000	11.14
		ELUSP	12	13	2,780	43.03	3	4	700	10.84	400	0.06	300	4.64	400	6.19
		FO10-SP1	11	14	860	6.23	3	5	20	0.14	0	0.00	20	0.14	260	1.88
		FO22	12	14	2,800	13.25	3	5	160	0.76	80	0.00	60	0.28	1,580	7.47
		FO23	14	17	790	20.90	4	6	270	7.14	210	0.06	50	1.32	250	6.61
		FO29	15	19	3,060	35.66	4	6	1,020	11.89	500	0.06	520	6.06	960	11.19
		FO9	14	16	2,660	39.58	4	5	420	6.25	280	0.04	140	2.08	140	2.08
		FOBCP	11	13	689	16.17	3	3	163	3.83	150	0.04	13	0.31	138	3.24
		FOBKS	13	16	1,965	47.22	3	5	801	19.25	363	0.09	438	10.53	126	3.03
		FOBSC	14	16	1,172	40.10	4	5	391	13.38	164	0.06	227	7.77	127	4.34
		FODGH	12	14	3,880	35.34	3	4	600	5.46	440	0.04	160	1.46	1,480	13.48
		FODHE	13	15	10,460	61.31	4	6	1,340	7.85	1,000	0.06	300	1.76	3,700	21.69
		FODNGD	11	14	6,000	76.53	3	5	1,360	17.35	680	0.09	680	8.67	480	6.12
		FODPO	10	10	820	7.93	2	2	0	0	0	0.00	0	0	140	1.35
		FOUEW	12	14	2,000	25.91	3	4	40	0.52	40	0.01	0	0	580	7.51
		FOUKI	13	18	2,270	65.04	4	7	540	15.47	250	0.07	290	8.31	190	5.44
		FRUL	11	12	909	30.24	3	3	263	8.75	218	0.07	45	1.50	128	4.26
		FOUNGD	11	15	5,420	74.66	4	6	860	11.85	500	0.07	360	4.96	600	8.26
		FOUSH	12	13	5,340	72.95	4	5	2,200	30.05	1,140	0.16	1,000	13.66	260	3.55
		GHCKD	12	13	680	6.44	4	4	560	5.30	480	0.05	80	0.76	40	0.38
		GHCKU	8	9	15	1.94	2	2	0	0	0	0.00	0	0	9	1.16
		GRCK	14	20	3,420	44.19	4	6	580	7.49	20	0.00	80	1.03	1,340	17.31
		GRDS	16	20	2,540	30.24	4	5	1,480	17.62	1,020	0.12	460	5.48	740	8.81
		HACKDS	11	17	2,960	29.13	4	5	1,120	11.02	760	0.07	300	2.95	580	5.71
		HACKUS	15	19	5,600	36.04	3	4	1,400	9.01	980	0.06	420	2.70	1,780	11.45
		HENFO	13	18	10,360	74.96	4	7	220	1.59	180	0.01	40	0.29	4,060	29.38
		KICK	8	9	2	0.40	2	2	0	0	0	0.00	0	0	1	0.20
		LC_DC1	11	14	3,880	54.34	3	4	120	1.68	120	0.02	0	0	1,300	18.21
		LC_DCDS	14	17	4,560	59.69	4	6	200	2.62	180	0.02	20	0.26	1,720	22.51
		LC_FRUS	11	14	815	39.47	4	6	134	6.49	87	0.04	33	1.60	114	5.52
		LI8	13	17	890	26.25	3	4	240	7.08	130	0.04	100	2.95	110	3.24
		LIDSL	14	17	2,660	38.11	4	5	420	6.02	220	0.03	200	2.87	220	3.15
		LILC3	11	12	1,640	8.47	3	3	300	1.55	140	0.01	160	0.83	360	1.86
		MI2	15	18	1,834	29.97	4	5	401	6.55	267	0.04	117	1.91	366	5.98
		MI3	14	16	2,900	37.86	4	6	620	8.09	360	0.05	260	3.39	600	7.83
		MI5	13	14	2,140	30.06	4	5	240	3.37	220	0.03	20	0.28	840	11.80
		MIDAG	11	16	6,220	42.84	4	8	260	1.79	180	0.01	60	0.41	2,620	18.04
		MIDCO	14	17	2,760	22.33	3	4	200	1.62	180	0.01	20	0.16	2,160	17.48
		MIUCO	12	17	4,160	53.20	4	7	460	5.88	320	0.04	100	1.28	2,720	34.78
		MP1	14	17	2,800	51.19	4	5	483	8.83	233	0.04	233	4.26	250	4.57
		NGD1	7	10	2,760	28.28	2	2	1,700	17.42	1,680	0.17	0	0	0	0
		OCNM	9	10	29	2.11	2	2	0	0	0	0.00	0	0	11	0.80
		POCK	9	11	200	0.90	3	3	120	0.54	120	0.01	0	0	20	0.09
		SWCK	5	6	0	0	0	0	0	0	0	0.00	0	0	0	0
		THCK	7	9	26	1.08	1	1	26	1.08	13	0.01	13	0.54	0	0
		WOCK	10	10	4	0.32	1	1	0	0	0	0.00	0	0	4	0.32

Table G.3: Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2015)

Biological Area Code			*Drunella Doddsii* sp.		Heptageniidae		*Epeorus* sp.		*Rhithrogena* sp.		Plecoptera				Chloroperlidae	
			Total	%	Total	%	Total	%	Total	%	Total	%	Family Richness	LPL Richness	Total	%
2015	Reference	AGCK	40	0.56	4,580	63.79	20	0.28	220	3.06	1,760	24.51	4	6	160	2.23
		AL4	280	2.55	1,560	14.23	260	2.37	0	0.00	1,880	17.15	4	5	200	1.82
		ALUSM	160	1.80	700	7.87	60	0.67	80	0.90	820	9.21	5	6	140	1.57
		BU2	55	3.63	670	44.22	15	0.99	190	12.54	285	18.81	6	6	75	4.95
		BU40	30	0.87	530	15.41	0	0	0	0.00	450	13.08	6	8	130	3.78
		BUUQ	200	6.51	710	23.13	0	0	100	3.26	1,100	35.83	7	8	20	0.65
		CADCK	320	2.86	4,960	44.29	300	2.68	860	7.68	2,860	25.54	5	6	180	1.61
		CHCK	260	1.95	4,440	33.23	100	0.75	0	0.00	3,020	22.60	6	8	80	0.60
		CRUKO	4	0.74	157	29.02	28	5.18	19	3.51	219	40.48	5	5	7	1.29
		DACK	360	3.66	1,000	10.16	60	0.61	120	1.22	2,100	21.34	7	9	300	3.05
		DUCK	17	0.29	150	2.52	0	0	17	0.29	616	10.35	7	9	50	0.84
		EL12	160	1.83	2,980	34.10	0	0	340	3.89	1,880	21.51	6	6	60	0.69
		ELUGH	167	4.13	1,488	36.80	44	1.09	111	2.74	1,289	31.87	7	7	155	3.83
		EWCK	660	10.89	1,860	30.69	180	2.97	60	0.99	940	15.51	5	7	220	3.63
		FLAD	240	1.88	1,200	9.42	0	0	0	0.00	900	7.06	6	6	540	4.24
		FLAU	140	2.15	1,180	18.10	0	0	0	0.00	840	12.88	4	5	160	2.45
		FLRU	50	0.91	917	16.65	0	0	17	0.31	318	5.78	5	6	67	1.22
		FO26	360	3.83	3,660	38.94	40	0.43	60	0.64	1,480	15.74	5	6	320	3.40
		GRUHA	100	2.04	1,076	22.00	113	2.31	50	1.02	1,867	38.17	7	8	76	1.55
		HENUP	60	0.80	4,500	60.00	200	2.67	200	2.67	2,020	26.93	5	6	40	0.53
		KO1	0	0.00	476	56.26	0	0	3	0.35	61	7.21	3	3	5	0.59
		KODCR	3	0.64	112	24.03	5	1.07	35	7.51	59	12.66	6	6	21	4.51
		KOUCR	7	1.43	88	18.00	3	0.61	18	3.68	118	24.13	7	9	24	4.91
		KOUVE	31	1.36	338	14.85	0	0	19	0.83	170	7.47	7	7	44	1.93
		LC_GRCK	0	0.00	940	13.91	260	3.85	40	0.59	2,180	32.25	6	8	120	1.78
		LI24	9	0.30	1,664	55.32	0	0	155	5.15	754	25.07	6	6	300	9.97
		MCCR	300	2.58	680	5.85	80	0.69	80	0.69	1,980	17.04	6	6	160	1.38
		MI25	420	5.88	1,100	15.41	20	0.28	0	0.00	2,260	31.65	7	7	300	4.20
		OLDDU	44	2.23	306	15.48	0	0	0	0.00	237	11.99	6	6	125	6.32
		OLDLI	543	8.92	2,899	47.63	14	0.23	771	12.67	1,473	24.20	7	8	743	12.21
		OLDLOW	27	0.77	209	5.93	0	0	0	0.00	390	11.07	5	6	82	2.33
		PADAL	7	1.26	78	14.00	3	0.54	1	0.18	208	37.34	5	7	17	3.05
		PAUKO	8	1.70	86	18.26	0	0	11	2.34	169	35.88	6	7	14	2.97
		RACK	20	0.62	1,200	37.38	0	0	180	5.61	520	16.20	7	8	260	8.10
		SLINE	67	1.03	2,817	43.31	483	7.43	200	3.07	1,319	20.28	6	8	200	3.07
		VEUKO	0	0.00	344	48.79	2	0.28	3	0.43	91	12.91	5	6	10	1.42
		VEUP	0	0.00	110	14.55	12	1.59	10	1.32	160	21.16	4	5	0	0
		VICK	280	3.29	1,820	21.36	60	0.70	60	0.70	2,260	26.53	5	7	240	2.82
		WWRL	343	7.06	858	17.67	29	0.60	0	0.00	356	7.33	4	4	57	1.17
		WWRU	8	1.03	158	20.33	10	1.29	123	15.83	54	6.95	4	4	21	2.70
2015	Mine-exposed	BOCK	0	0.00	0	0	0	0	0	0.00	480	5.90	2	2	0	0
		CATCK	0	0.00	0	0	0	0	0	0.00	26	0.65	1	1	0	0
		CORCK	0	0.00	0	0	0	0	0	0.00	2,600	8.91	5	7	40	0.14
		EL1	260	3.37	1,220	15.80	20	0.26	180	2.33	920	11.92	6	6	140	1.81
		EL19	70	2.16	440	13.58	0	0	20	0.62	790	24.38	5	5	30	0.93
		EL20	850	13.67	1,884	30.30	17	0.27	300	4.82	1,517	24.40	6	7	133	2.14
		ELDEL	540	6.98	3,380	43.67	40	0.52	140	1.81	1,720	22.22	8	8	380	4.91
		ELDFE	0	0.00	460	2.68	0	0	0	0.00	1,080	6.29	5	5	60	0.35
		ELDGR	68	5.28	544	42.24	0	0	116	9.01	268	20.81	7	7	116	9.01
		ELELKO	40	0.51	3,880	49.24	0	0	2,200	27.92	1,200	15.23	6	6	340	4.31
		ELH93	0	0.00	200	7.00	0	0	0	0.00	107	3.74	4	4	0	0
		ELUEL	200	3.89	1,567	30.52	0	0	100	1.95	1,051	20.47	7	7	133	2.59
		ELUFE	20	0.18	560	5.09	0	0	20	0.18	580	5.27	3	3	0	0
		ELUFO	20	0.22	180	2.00	0	0	20	0.22	1,820	20.27	4	4	0	0
		ELUSP	120	1.86	1,680	26.01	0	0	120	1.86	1,120	17.34	5	5	220	3.41
		FO10-SP1	60	0.43	580	4.20	0	0	0	0.00	8,960	64.93	5	6	100	0.72
		FO22	700	3.31	1,060	5.01	0	0	0	0.00	9,440	44.65	5	5	120	0.57
		FO23	40	1.06	240	6.35	0	0	10	0.26	1,240	32.80	6	7	80	2.12
		FO29	60	0.70	980	11.42	0	0	0	0.00	1,420	16.55	6	8	60	0.70
		FO9	80	1.19	2,080	30.95	0	0	180	2.68	1,560	23.21	6	7	120	1.79
		FOBCP	75	1.76	388	9.11	0	0	0	0.00	2,376	55.77	5	5	0	0
		FOBKS	13	0.31	1,038	24.95	38	0.91	25	0.60	714	17.16	6	6	38	0.91
		FOBSC	27	0.92	609	20.83	27	0.92	0	0.00	509	17.41	6	6	9	0.31
		FODGH	180	1.64	1,800	16.39	0	0	60	0.55	3,940	35.88	4	5	60	0.55
		FODHE	60	0.35	5,340	31.30	60	0.35	60	0.35	2,700	15.83	6	6	40	0.23
		FODNGD	20	0.26	4,160	53.06	80	1.02	40	0.51	940	11.99	6	6	80	1.02
		FODPO	20	0.19	680	6.58	0	0	0	0.00	6,820	65.96	5	5	100	0.97
		FOUEW	80	1.04	1,380	17.88	40	0.52	0	0.00	2,500	32.38	4	5	0	0
		FOUKI	10	0.29	1,480	42.41	10	0.29	40	1.15	290	8.31	5	7	0	0
		FRUL	64	2.13	518	17.23	0	0	91	3.03	1,472	48.97	5	6	272	9.05
		FOUNGD	80	1.10	3,900	53.72	60	0.83	100	1.38	1,120	15.43	5	5	80	1.10
		FOUSH	0	0.00	2,780	37.98	80	1.09	0	0.00	820	11.20	5	5	60	0.82
		GHCKD	0	0.00	40	0.38	0	0	0	0.00	560	5.30	3	4	280	2.65
		GHCKU	0	0.00	6	0.78	0	0	2	0.26	173	22.35	4	5	0	0
		GRCK	300	3.88	1,480	19.12	300	3.88	0	0.00	1,800	23.26	5	7	180	2.33
		GRDS	20	0.24	300	3.57	20	0.24	80	0.95	2,160	25.71	7	9	180	2.14
		HACKDS	0	0.00	1,240	12.20	0	0	0	0.00	1,140	11.22	3	6	0	0
		HACKUS	140	0.90	2,420	15.57	20	0.13	0	0.00	5,780	37.19	6	8	260	1.67
		HENFO	0	0.00	5,780	41.82	140	1.01	20	0.14	1,080	7.81	5	7	40	0.29
		KICK	0	0.00	1	0.20	0	0	0	0.00	53	10.66	3	4	0	0
		LC_DC1	220	3.08	2,460	34.45	40	0.56	60	0.84	1,720	24.09	4	6	200	2.80
		LC_DCDS	320	4.19	2,600	34.03	20	0.26	20	0.26	2,100	27.49	6	7	380	4.97
		LC_FRUS	7	0.34	560	27.12	0	0	0	0.00	373	18.06	5	6	13	0.63
		LI8	70	2.06	540	15.93	20	0.59	0	0.00	950	28.02	5	6	20	0.59
		LIDSL	80	1.15	1,960	28.08	80	1.15	0	0.00	1,580	22.64	5	6	140	2.01
		LILC3	200	1.03	980	5.06	0	0	0	0.00	1,820	9.40	5	6	220	1.14
		MI2	183	2.99	1,000	16.34	0	0	17	0.28	1,851	30.25	5	6	267	4.36
		MI3	140	1.83	1,660	21.67	20	0.26	220	2.87	700	9.14	6	6	80	1.04
		MI5	480	6.74	1,040	14.61	0	0	60	0.84	480	6.74	6	6	120	1.69
		MIDAG	800	5.51	3,320	22.87	80	0.55	160	1.10	2,320	15.98	4	4	140	0.96
		MIDCO	640	5.18	400	3.24	20	0.16	0	0.00	2,540	20.55	6	7	220	1.78
		MIUCO	740	9.46	960	12.28	0	0	60	0.77	940	12.02	4	4	120	1.53
		MP1	0	0.00	2,017	36.87	0	0	0	0.00	768	14.04	7	8	17	0.31
		NGD1	0	0.00	1,060	10.86	0	0	0	0.00	2,660	27.25	4	5	140	1.43
		OCNM	0	0.00	0	0	0	0	0	0.00	187	13.62	4	5	4	0.29
		POCK	0	0.00	60	0.27	0	0	0	0.00	2,740	12.36	3	5	0	0
		SWCK	0	0.00	0	0	0	0	0	0.00	1,514	24.36	3	4	0	0
		THCK	0	0.00	0	0	0	0	0	0.00	194	8.04	2	4	7	0.29
		WOCK	4	0.32	0	0	0	0	0	0.00	440	35.37	6	6	4	0.32

Table G.3: Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2015)

Biological Area Code			*Sweltsa* sp.		Nemouridae		*Zapada* sp.		*Zapada Columbiana* sp.		Taeniopterygidae		*Taenionema* sp.		Trichoptera			
			Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Family Richness	LPL Richness
2015	Reference	AGCK	120	1.67	140	1.95	140	1.95	40	0.56	1,440	20.06	1,300	18.11	320	4.46	3	3
		AL4	120	1.09	240	2.19	240	2.19	20	0.18	1,160	10.58	1,000	9.12	900	8.21	3	3
		ALUSM	140	1.57	320	3.60	320	3.60	0	0.00	200	2.25	160	1.80	1,660	18.65	4	4
		BU2	30	1.98	20	1.32	15	0.99	0	0.00	150	9.90	135	8.91	295	19.47	4	4
		BU40	110	3.20	170	4.94	120	3.49	40	1.16	40	1.16	40	1.16	440	12.79	4	4
		BUUQ	20	0.65	180	5.86	180	5.86	140	4.56	790	25.73	590	19.22	210	6.84	5	5
		CADCK	60	0.54	220	1.96	100	0.89	20	0.18	1,640	14.64	1,640	14.64	260	2.32	5	5
		CHCK	80	0.60	860	6.44	460	3.44	140	1.05	180	1.35	180	1.35	660	4.94	5	6
		CRUKO	5	0.92	2	0.37	1	0.18	0	0.00	181	33.46	181	33.46	47	8.69	3	4
		DACK	240	2.44	1,000	10.16	1,000	10.16	160	1.63	240	2.44	240	2.44	840	8.54	4	4
		DUCK	50	0.84	216	3.63	216	3.63	17	0.29	33	0.55	33	0.55	666	11.19	3	4
		EL12	40	0.46	220	2.52	220	2.52	0	0.00	840	9.61	840	9.61	320	3.66	4	5
		ELUGH	133	3.29	78	1.93	78	1.93	0	0.00	767	18.97	767	18.97	211	5.22	3	3
		EWCK	60	0.99	340	5.61	340	5.61	0	0.00	280	4.62	280	4.62	660	10.89	4	4
		FLAD	520	4.08	140	1.10	140	1.10	0	0.00	60	0.47	60	0.47	860	6.75	4	5
		FLAU	0	0.00	480	7.36	140	2.15	0	0.00	40	0.61	40	0.61	860	13.19	3	3
		FLRU	50	0.91	150	2.72	150	2.72	17	0.31	17	0.31	17	0.31	318	5.78	4	5
		FO26	280	2.98	320	3.40	320	3.40	40	0.43	120	1.28	120	1.28	220	2.34	4	4
		GRUHA	38	0.78	476	9.73	476	9.73	138	2.82	1,188	24.29	1,188	24.29	590	12.06	5	7
		HENUP	40	0.53	160	2.13	160	2.13	60	0.80	1,760	23.47	1,760	23.47	100	1.33	3	3
		KO1	5	0.59	0	0	0	0	0	0.00	0	0.00	0	0.00	11	1.30	3	3
		KODCR	21	4.51	2	0.43	2	0.43	0	0.00	6	1.29	6	1.29	21	4.51	2	2
		KOUCR	16	3.27	5	1.02	5	1.02	1	0.20	12	2.45	12	2.45	33	6.75	2	2
		KOUVE	44	1.93	38	1.67	38	1.67	0	0.00	0	0.00	0	0.00	6	0.26	1	1
		LC_GRCK	40	0.59	1,620	23.96	1,620	23.96	560	8.28	20	0.30	20	0.30	2,740	40.53	5	5
		LI24	264	8.78	218	7.25	218	7.25	182	6.05	127	4.22	127	4.22	136	4.52	4	4
		MCCR	160	1.38	820	7.06	820	7.06	500	4.30	800	6.88	800	6.88	6,240	53.70	4	5
		MI25	240	3.36	380	5.32	380	5.32	0	0.00	1,040	14.57	1,040	14.57	360	5.04	4	4
		OLDDU	125	6.32	56	2.83	56	2.83	0	0.00	13	0.66	13	0.66	389	19.68	4	4
		OLDLI	743	12.21	58	0.95	58	0.95	0	0.00	343	5.64	343	5.64	299	4.91	3	4
		OLDLOW	64	1.82	18	0.51	18	0.51	0	0.00	9	0.26	9	0.26	1,154	32.76	3	3
		PADAL	12	2.15	42	7.54	42	7.54	9	1.62	46	8.26	46	8.26	22	3.95	5	6
		PAUKO	7	1.49	8	1.70	8	1.70	0	0.00	118	25.05	118	25.05	22	4.67	2	3
		RACK	260	8.10	110	3.43	110	3.43	60	1.87	60	1.87	60	1.87	200	6.23	5	5
		SLINE	200	3.07	501	7.70	501	7.70	217	3.34	267	4.10	267	4.10	934	14.36	4	5
		VEUKO	2	0.28	1	0.14	1	0.14	0	0.00	7	0.99	7	0.99	0	0.00	0	0
		VEUP	0	0.00	41	5.42	41	5.42	7	0.93	57	7.54	57	7.54	73	9.66	4	5
		VICK	240	2.82	1,140	13.38	1,140	13.38	80	0.94	360	4.23	360	4.23	220	2.58	3	3
		WWRL	57	1.17	71	1.46	71	1.46	0	0.00	157	3.23	157	3.23	1,457	30.00	4	4
		WWRU	18	2.32	10	1.29	10	1.29	0	0.00	13	1.67	13	1.67	318	40.93	3	3
2015	Mine-exposed	BOCK	0	0.00	320	3.93	260	3.19	0	0.00	160	1.97	160	1.97	140	1.72	3	3
		CATCK	0	0.00	0	0	0	0	0	0.00	0	0.00	0	0.00	438	10.87	1	1
		CORCK	20	0.07	2,420	8.29	680	2.33	40	0.14	20	0.07	20	0.07	2,360	8.09	4	4
		EL1	140	1.81	40	0.52	40	0.52	0	0.00	140	1.81	140	1.81	340	4.40	5	5
		EL19	30	0.93	30	0.93	30	0.93	0	0.00	60	1.85	60	1.85	200	6.17	5	5
		EL20	133	2.14	50	0.80	50	0.80	17	0.27	984	15.83	917	14.75	800	12.87	5	6
		ELDEL	380	4.91	140	1.81	140	1.81	0	0.00	620	8.01	620	8.01	280	3.62	4	4
		ELDFE	60	0.35	60	0.35	60	0.35	0	0.00	0	0.00	0	0.00	260	1.52	2	3
		ELDGR	116	9.01	12	0.93	12	0.93	0	0.00	40	3.11	40	3.11	48	3.73	4	4
		ELELKO	340	4.31	60	0.76	40	0.51	0	0.00	120	1.52	120	1.52	780	9.90	2	3
		ELH93	0	0.00	7	0.24	7	0.24	0	0.00	7	0.24	7	0.24	122	4.27	2	2
		ELUEL	133	2.59	34	0.66	34	0.66	0	0.00	317	6.17	317	6.17	350	6.82	4	4
		ELUFE	0	0.00	20	0.18	20	0.18	0	0.00	0	0.00	0	0.00	100	0.91	3	3
		ELUFO	0	0.00	440	4.90	440	4.90	0	0.00	0	0.00	0	0.00	240	2.67	3	3
		ELUSP	220	3.41	0	0	0	0	0	0.00	100	1.55	100	1.55	520	8.05	4	4
		FO10-SP1	100	0.72	1,140	8.26	1,140	8.26	120	0.87	680	4.93	680	4.93	520	3.77	3	3
		FO22	80	0.38	1,340	6.34	1,340	6.34	0	0.00	520	2.46	520	2.46	1,600	7.57	4	4
		FO23	70	1.85	560	14.81	560	14.81	0	0.00	90	2.38	90	2.38	440	11.64	4	4
		FO29	60	0.70	980	11.42	980	11.42	20	0.23	60	0.70	60	0.70	360	4.20	5	5
		FO9	120	1.79	400	5.95	400	5.95	0	0.00	580	8.63	580	8.63	620	9.23	4	4
		FOBCP	0	0.00	650	15.26	650	15.26	0	0.00	238	5.59	238	5.59	240	5.63	3	5
		FOBKS	25	0.60	75	1.80	75	1.80	0	0.00	200	4.81	200	4.81	190	4.57	4	5
		FOBSC	9	0.31	91	3.11	91	3.11	0	0.00	91	3.11	91	3.11	144	4.93	4	5
		FODGH	60	0.55	2,020	18.40	2,020	18.40	0	0.00	960	8.74	960	8.74	780	7.10	5	5
		FODHE	40	0.23	1,720	10.08	1,720	10.08	0	0.00	180	1.06	180	1.06	80	0.47	3	3
		FODNGD	80	1.02	260	3.32	260	3.32	0	0.00	240	3.06	240	3.06	420	5.36	2	3
		FODPO	80	0.77	1,260	12.19	1,260	12.19	0	0.00	3,180	30.75	3,180	30.75	1,620	15.67	3	3
		FOUEW	0	0.00	640	8.29	640	8.29	0	0.00	40	0.52	40	0.52	980	12.69	5	5
		FOUKI	0	0.00	120	3.44	120	3.44	30	0.86	10	0.29	10	0.29	60	1.72	4	4
		FRUL	227	7.55	218	7.25	209	6.95	0	0.00	782	26.01	782	26.01	109	3.63	3	3
		FOUNGD	80	1.10	260	3.58	260	3.58	0	0.00	400	5.51	400	5.51	200	2.75	2	4
		FOUSH	60	0.82	280	3.83	280	3.83	0	0.00	160	2.19	160	2.19	140	1.91	3	3
		GHCKD	280	2.65	260	2.46	120	1.14	0	0.00	0	0.00	0	0.00	1,000	9.47	5	5
		GHCKU	0	0.00	73	9.43	73	9.43	11	1.42	67	8.66	67	8.66	6	0.78	2	2
		GRCK	140	1.81	780	10.08	780	10.08	140	1.81	360	4.65	360	4.65	1,540	19.90	5	7
		GRDS	180	2.14	1,300	15.48	1,300	15.48	120	1.43	300	3.57	300	3.57	1,660	19.76	5	6
		HACKDS	0	0.00	980	9.65	960	9.45	280	2.76	20	0.20	20	0.20	1,020	10.04	4	6
		HACKUS	260	1.67	2,460	15.83	2,460	15.83	220	1.42	2,380	15.32	2,380	15.32	1,760	11.33	6	7
		HENFO	40	0.29	340	2.46	340	2.46	80	0.58	600	4.34	600	4.34	140	1.01	4	4
		KICK	0	0.00	51	10.26	51	10.26	1	0.20	0	0.00	0	0.00	24	4.83	3	3
		LC_DC1	160	2.24	1,080	15.13	1,020	14.29	120	1.68	340	4.76	340	4.76	920	12.89	4	4
		LC_DCDS	380	4.97	1,300	17.02	1,300	17.02	120	1.57	280	3.66	280	3.66	320	4.19	4	4
		LC_FRUS	13	0.63	193	9.35	193	9.35	0	0.00	13	0.63	13	0.63	134	6.49	2	2
		LI8	20	0.59	450	13.27	450	13.27	20	0.59	390	11.50	390	11.50	1,100	32.45	5	7
		LIDSL	140	2.01	820	11.75	820	11.75	20	0.29	400	5.73	400	5.73	960	13.75	5	6
		LILC3	220	1.14	840	4.34	840	4.34	40	0.21	80	0.41	80	0.41	2,960	15.29	3	3
		MI2	267	4.36	750	12.26	750	12.26	0	0.00	717	11.72	717	11.72	801	13.09	6	7
		MI3	80	1.04	260	3.39	240	3.13	0	0.00	240	3.13	220	2.87	2,560	33.42	4	4
		MI5	120	1.69	80	1.12	80	1.12	0	0.00	120	1.69	120	1.69	3,540	49.72	3	3
		MIDAG	140	0.96	700	4.82	700	4.82	0	0.00	1,140	7.85	1,140	7.85	1,940	13.36	3	4
		MIDCO	160	1.29	1,820	14.72	1,820	14.72	0	0.00	300	2.43	300	2.43	1,060	8.58	5	6
		MIUCO	120	1.53	180	2.30	180	2.30	0	0.00	420	5.37	420	5.37	560	7.16	4	6
		MP1	17	0.31	417	7.62	417	7.62	17	0.31	50	0.91	50	0.91	250	4.57	3	4
		NGD1	140	1.43	2,280	23.36	2,220	22.75	40	0.41	0	0.00	0	0.00	400	4.10	1	3
		OCNM	4	0.29	172	12.53	165	12.02	54	3.93	4	0.29	4	0.29	249	18.14	3	3
		POCK	0	0.00	2,460	11.10	2,460	11.10	20	0.09	0	0.00	0	0.00	1,220	5.51	3	3
		SWCK	0	0.00	1,314	21.15	1,014	16.32	0	0.00	0	0.00	0	0.00	257	4.14	2	2
		THCK	7	0.29	187	7.75	160	6.63	7	0.29	0	0.00	0	0.00	195	8.08	4	4
		WOCK	4	0.32	268	21.54	248	19.94	0	0.00	4	0.32	4	0.32	32	2.57	3	3

Table G.3: Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2015)

Biological Area Code			Diptera				Chironomidae			*Micropsectra* sp.		*Orthocladius* sp.		Muscidae		*Limnophora* sp.	
			Total	%	Family Richness	LPL Richness	Total	%	LPL Richness	Total	%	Total	%	Total	%	Total	%
2015	Reference	AGCK	180	2.51	2	6	140	1.95	5	20	0.28	20	0.28	0	0	0	0
		AL4	1,880	17.15	6	11	1,160	10.58	6	60	0.55	800	7.30	0	0	0	0
		ALUSM	2,580	28.99	5	14	500	5.62	10	100	1.12	100	1.12	0	0	0	0
		BU2	60	3.96	3	5	35	2.31	3	0	0	20	1.32	0	0	0	0
		BU40	950	27.62	3	10	660	19.19	8	10	0.29	410	11.92	0	0	0	0
		BUUQ	500	16.29	3	11	470	15.31	9	30	0.98	200	6.51	0	0	0	0
		CADCK	1,480	13.21	4	9	1,240	11.07	6	100	0.89	300	2.68	0	0	0	0
		CHCK	3,860	28.89	4	10	2,740	20.51	7	400	2.99	100	0.75	0	0	0	0
		CRUKO	9	1.66	2	3	2	0.37	2	0	0	0	0	0	0	0	0
		DACK	1,480	15.04	4	13	1,100	11.18	8	80	0.81	540	5.49	0	0	0	0
		DUCK	2,869	48.21	5	13	2,618	43.99	7	150	2.52	1,017	17.09	0	0	0	0
		EL12	1,260	14.42	6	11	880	10.07	6	340	3.89	200	2.29	0	0	0	0
		ELUGH	300	7.42	2	6	122	3.02	5	22	0.54	56	1.38	0	0	0	0
		EWCK	740	12.21	3	12	700	11.55	10	20	0.33	240	3.96	0	0	0	0
		FLAD	7,060	55.42	6	16	6,460	50.71	10	620	4.87	3,060	24.02	0	0	0	0
		FLAU	2,260	34.66	4	12	1,800	27.61	9	300	4.60	800	12.27	0	0	0	0
		FLRU	1,816	32.98	5	9	1,582	28.73	5	100	1.82	233	4.23	0	0	0	0
		FO26	1,320	14.04	4	12	1,140	12.13	9	220	2.34	360	3.83	0	0	0	0
		GRUHA	154	3.15	3	8	116	2.37	6	0	0	51	1.04	0	0	0	0
		HENUP	300	4.00	2	6	280	3.73	5	40	0.53	60	0.80	0	0	0	0
		KO1	118	13.95	4	10	104	12.29	7	3	0.35	23	2.72	0	0	0	0
		KODCR	66	14.16	4	9	60	12.88	5	1	0.21	45	9.66	0	0	0	0
		KOUCR	86	17.59	4	9	78	15.95	6	0	0	33	6.75	0	0	0	0
		KOUVE	538	23.64	4	10	413	18.15	6	25	1.10	256	11.25	0	0	0	0
		LC_GRCK	480	7.10	4	8	420	6.21	5	0	0	0	0	0	0	0	0
		LI24	172	5.72	2	4	118	3.92	3	0	0	9	0.30	0	0	0	0
		MCCR	500	4.30	3	4	320	2.75	2	0	0	0	0	0	0	0	0
		MI25	1,120	15.69	4	13	1,020	14.29	10	60	0.84	60	0.84	0	0	0	0
		OLDDU	507	25.64	3	14	457	23.12	11	0	0	181	9.16	0	0	0	0
		OLDLI	329	5.41	4	9	229	3.76	4	0	0	14	0.23	0	0	0	0
		OLDLOW	462	13.11	3	9	362	10.28	7	18	0.51	127	3.60	0	0	0	0
		PADAL	35	6.28	4	10	21	3.77	6	0	0	5	0.90	0	0	0	0
		PAUKO	51	10.83	5	12	22	4.67	8	0	0	8	1.70	0	0	0	0
		RACK	510	15.89	4	13	350	10.90	9	30	0.93	80	2.49	0	0	0	0
		SLINE	351	5.40	2	5	151	2.32	4	0	0	67	1.03	0	0	0	0
		VEUKO	101	14.33	7	11	87	12.34	5	0	0	16	2.27	1	0.14	1	0.14
		VEUP	219	28.97	3	6	212	28.04	4	0	0	167	22.09	0	0	0	0
		VICK	2,140	25.12	3	13	1,820	21.36	10	60	0.70	60	0.70	0	0	0	0
		WWRL	1,028	21.17	4	9	986	20.30	6	0	0	357	7.35	14	0.29	14	0.29
		WWRU	28	3.60	3	6	22	2.83	4	0	0	3	0.39	0	0	0	0
2015	Mine-exposed	BOCK	6,140	75.43	5	16	3,140	38.57	12	2,240	27.52	20	0.25	40	0.49	40	0.49
		CATCK	3,278	81.34	6	14	3,051	75.71	8	1,000	24.81	1,088	27.00	100	2.48	100	2.48
		CORCK	22,880	78.41	7	16	7,160	24.54	10	2,180	7.47	2,580	8.84	40	0.14	40	0.14
		EL1	2,220	28.76	5	10	2,100	27.20	5	20	0.26	1,360	17.62	0	0	0	0
		EL19	1,190	36.73	6	13	1,080	33.33	7	150	4.63	730	22.53	0	0	0	0
		EL20	483	7.77	4	9	333	5.36	6	50	0.80	100	1.61	0	0	0	0
		ELDEL	980	12.66	4	9	660	8.53	6	140	1.81	120	1.55	0	0	0	0
		ELDFE	3,400	19.81	4	13	3,140	18.30	9	60	0.35	2,160	12.59	0	0	0	0
		ELDGR	124	9.63	6	10	84	6.52	5	8	0.62	52	4.04	0	0	0	0
		ELELKO	640	8.12	3	7	320	4.06	5	20	0.25	80	1.02	0	0	0	0
		ELH93	1,557	54.48	1	10	1,557	54.48	10	186	6.51	971	33.97	0	0	0	0
		ELUEL	800	15.58	3	7	450	8.76	5	100	1.95	83	1.62	0	0	0	0
		ELUFE	2,920	26.55	5	13	2,540	23.09	8	120	1.09	1,900	17.27	0	0	0	0
		ELUFO	4,720	52.56	5	14	4,380	48.78	8	340	3.79	1,960	21.83	0	0	0	0
		ELUSP	1,820	28.17	5	9	1,540	23.84	5	20	0.31	1,100	17.03	0	0	0	0
		FO10-SP1	3,200	23.19	5	12	2,960	21.45	8	40	0.29	1,680	12.17	0	0	0	0
		FO22	4,700	22.23	6	12	3,880	18.35	6	320	1.51	1,660	7.85	0	0	0	0
		FO23	1,140	30.16	5	16	790	20.90	9	10	0.26	390	10.32	0	0	0	0
		FO29	3,060	35.66	4	12	2,580	30.07	9	400	4.66	580	6.76	0	0	0	0
		FO9	1,620	24.11	3	6	280	4.17	4	60	0.89	40	0.60	0	0	0	0
		FOBCP	878	20.61	6	10	652	15.31	5	13	0.31	238	5.59	0	0	0	0
		FOBKS	1,178	28.31	3	6	202	4.85	4	25	0.60	0	0	0	0	0	0
		FOBSC	926	31.68	5	7	108	3.69	3	45	1.54	0	0	0	0	0	0
		FODGH	1,960	17.85	4	8	1,280	11.66	5	160	1.46	420	3.83	0	0	0	0
		FODHE	3,780	22.16	4	10	3,680	21.57	7	1,600	9.38	900	5.28	0	0	0	0
		FODNGD	420	5.36	4	8	160	2.04	4	20	0.26	20	0.26	0	0	0	0
		FODPO	1,020	9.86	6	10	860	8.32	5	60	0.58	420	4.06	0	0	0	0
		FOUEW	1,840	23.83	4	8	1,720	22.28	5	20	0.26	1,080	13.99	0	0	0	0
		FOUKI	730	20.92	4	8	200	5.73	4	20	0.57	50	1.43	0	0	0	0
		FRUL	453	15.07	5	10	163	5.42	5	36	1.20	45	1.50	0	0	0	0
		FOUNGD	520	7.16	4	8	280	3.86	4	40	0.55	160	2.20	0	0	0	0
		FOUSH	860	11.75	6	12	520	7.10	6	80	1.09	120	1.64	20	0.27	20	0.27
		GHCKD	5,680	53.79	7	17	3,540	33.52	10	1,720	16.29	120	1.14	0	0	0	0
		GHCKU	576	74.42	5	13	506	65.37	9	9	1.16	364	47.03	0	0	0	0
		GRCK	820	10.59	3	8	400	5.17	6	0	0	220	2.84	0	0	0	0
		GRDS	1,760	20.95	3	7	620	7.38	5	20	0.24	360	4.29	0	0	0	0
		HACKDS	4,080	40.16	2	10	3,980	39.17	9	0	0	1,320	12.99	0	0	0	0
		HACKUS	1,940	12.48	4	12	1,140	7.34	9	20	0.13	360	2.32	0	0	0	0
		HENFO	2,140	15.48	3	9	2,080	15.05	7	900	6.51	460	3.33	0	0	0	0
		KICK	381	76.66	5	9	338	68.01	5	17	3.42	30	6.04	35	7.04	35	7.04
		LC_DC1	540	7.56	5	9	260	3.64	5	60	0.84	0	0	0	0	0	0
		LC_DCDS	620	8.12	3	8	580	7.59	6	100	1.31	0	0	0	0	0	0
		LC_FRUS	649	31.43	5	10	575	27.85	6	20	0.97	247	11.96	0	0	0	0
		LI8	280	8.26	4	8	220	6.49	5	0	0	60	1.77	0	0	0	0
		LIDSL	1,540	22.06	5	10	1,420	20.34	6	0	0	500	7.16	0	0	0	0
		LILC3	12,100	62.50	4	11	11,860	61.26	8	0	0	3,620	18.70	0	0	0	0
		MI2	1,550	25.33	5	12	1,217	19.89	8	300	4.90	300	4.90	0	0	0	0
		MI3	1,300	16.97	3	6	740	9.66	4	160	2.09	20	0.26	0	0	0	0
		MI5	680	9.55	4	6	360	5.06	3	140	1.97	0	0	0	0	0	0
		MIDAG	3,780	26.03	4	11	320	2.20	7	20	0.14	0	0	0	0	0	0
		MIDCO	5,580	45.15	4	12	2,540	20.55	7	40	0.32	1,300	10.52	0	0	0	0
		MIUCO	1,800	23.02	4	12	340	4.35	8	20	0.26	60	0.77	0	0	0	0
		MP1	1,518	27.75	5	11	1,284	23.47	7	50	0.91	700	12.80	0	0	0	0
		NGD1	3,800	38.93	5	14	3,260	33.40	10	580	5.94	440	4.51	0	0	0	0
		OCNM	307	22.36	8	18	202	14.71	11	7	0.51	0	0	0	0	0	0
		POCK	16,400	74.01	6	11	16,000	72.20	6	5,160	23.29	8,040	36.28	0	0	0	0
		SWCK	4,272	68.75	7	15	3,744	60.25	9	829	13.34	286	4.60	0	0	0	0
		THCK	1,350	55.97	6	11	195	8.08	6	47	1.95	0	0	0	0	0	0
		WOCK	636	51.13	6	16	412	33.12	11	12	0.96	88	7.07	0	0	0	0

Table G.3: Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2015)

Biological Area Code			Psychodidae		*Pericoma/ Telmatoscopus* sp.		Oligochaeta				Enchytraeidae		*Enchytraeus* sp.	
			Total	%	Total	%	Total	%	Family Richness	LPL Richness	Total	%	Total	%
2015	Reference	AGCK	40	0.56	40	0.56	0	0	0	0	0	0	0	0
		AL4	540	4.93	540	4.93	20	0.18	1	1	0	0	0	0
		ALUSM	1,900	21.35	1,900	21.35	120	1.35	1	1	0	0	0	0
		BU2	0	0	0	0	25	1.65	2	2	15	0.99	15	0.99
		BU40	0	0	0	0	20	0.58	1	1	20	0.58	20	0.58
		BUUQ	0	0	0	0	0	0	0	0	0	0	0	0
		CADCK	140	1.25	140	1.25	60	0.54	2	2	0	0	0	0
		CHCK	1,000	7.49	1,000	7.49	0	0	0	0	0	0	0	0
		CRUKO	0	0	0	0	4	0.74	1	1	0	0	0	0
		DACK	200	2.03	200	2.03	0	0	0	0	0	0	0	0
		DUCK	150	2.52	150	2.52	84	1.41	2	2	67	1.13	67	1.13
		EL12	300	3.43	300	3.43	0	0	0	0	0	0	0	0
		ELUGH	178	4.40	178	4.40	0	0	0	0	0	0	0	0
		EWCK	0	0	0	0	0	0	0	0	0	0	0	0
		FLAD	140	1.10	140	1.10	1060	8.32	2	2	800	6.28	800	6.28
		FLAU	280	4.29	280	4.29	0	0	0	0	0	0	0	0
		FLRU	67	1.22	67	1.22	17	0.31	1	1	0	0	0	0
		FO26	20	0.21	20	0.21	0	0	0	0	0	0	0	0
		GRUHA	13	0.27	13	0.27	0	0	0	0	0	0	0	0
		HENUP	0	0	0	0	0	0	0	0	0	0	0	0
		KO1	0	0	0	0	3	0.35	1	1	0	0	0	0
		KODCR	0	0	0	0	4	0.86	2	2	0	0	0	0
		KOUCR	0	0	0	0	1	0.20	1	1	1	0.20	1	0.20
		KOUVE	25	1.10	25	1.10	832	36.56	3	3	813	35.72	813	35.72
		LC_GRCK	0	0	0	0	0	0	0	0	0	0	0	0
		LI24	0	0	0	0	18	0.60	1	1	18	0.60	18	0.60
		MCCR	160	1.38	160	1.38	20	0.17	1	1	0	0	0	0
		MI25	20	0.28	20	0.28	0	0	0	0	0	0	0	0
		OLDDU	0	0	0	0	88	4.45	2	2	13	0.66	13	0.66
		OLDLI	0	0	0	0	0	0	0	0	0	0	0	0
		OLDLOW	0	0	0	0	18	0.51	1	1	0	0	0	0
		PADAL	0	0	0	0	0	0	0	0	0	0	0	0
		PAUKO	0	0	0	0	0	0	0	0	0	0	0	0
		RACK	100	3.12	100	3.12	20	0.62	2	2	10	0.31	10	0.31
		SLINE	0	0	0	0	0	0	0	0	0	0	0	0
		VEUKO	1	0.14	1	0.14	0	0	0	0	0	0	0	0
		VEUP	0	0	0	0	5	0.66	1	1	5	0.66	5	0.66
		VICK	220	2.58	220	2.58	0	0	0	0	0	0	0	0
		WWRL	14	0.29	14	0.29	0	0	0	0	0	0	0	0
		WWRU	3	0.39	3	0.39	5	0.64	1	1	0	0	0	0
2015	Mine-exposed	BOCK	20	0.25	20	0.25	1360	16.71	3	4	1180	14.50	1100	13.51
		CATCK	51	1.27	38	0.94	288	7.15	2	2	275	6.82	275	6.82
		CORCK	15,480	53.05	15,480	53.05	600	2.06	2	2	560	1.92	560	1.92
		EL1	0	0	0	0	0	0	0	0	0	0	0	0
		EL19	30	0.93	30	0.93	20	0.62	1	1	20	0.62	20	0.62
		EL20	100	1.61	100	1.61	17	0.27	1	1	0	0	0	0
		ELDEL	220	2.84	220	2.84	0	0	0	0	0	0	0	0
		ELDFE	0	0	0	0	600	3.50	1	1	600	3.50	600	3.50
		ELDGR	8	0.62	8	0.62	0	0	0	0	0	0	0	0
		ELELKO	0	0	0	0	0	0	0	0	0	0	0	0
		ELH93	0	0	0	0	664	23.23	1	1	0	0	0	0
		ELUEL	300	5.84	300	5.84	50	0.97	2	2	33	0.64	33	0.64
		ELUFE	20	0.18	20	0.18	460	4.18	1	1	0	0	0	0
		ELUFO	40	0.45	40	0.45	320	3.56	2	3	80	0.89	40	0.45
		ELUSP	40	0.62	40	0.62	0	0	0	0	0	0	0	0
		FO10-SP1	100	0.72	100	0.72	60	0.43	2	2	40	0.29	40	0.29
		FO22	220	1.04	220	1.04	60	0.28	1	1	60	0.28	60	0.28
		FO23	150	3.97	150	3.97	30	0.79	1	1	30	0.79	30	0.79
		FO29	380	4.43	380	4.43	220	2.56	1	1	0	0	0	0
		FO9	1,320	19.64	1,320	19.64	40	0.60	1	1	0	0	0	0
		FOBCP	100	2.35	100	2.35	26	0.61	2	2	13	0.31	13	0.31
		FOBKS	963	23.14	963	23.14	88	2.11	1	1	88	2.11	88	2.11
		FOBSC	664	22.72	664	22.72	109	3.73	1	1	109	3.73	109	3.73
		FODGH	480	4.37	480	4.37	120	1.09	3	3	80	0.73	80	0.73
		FODHE	40	0.23	40	0.23	20	0.12	1	1	20	0.12	20	0.12
		FODNGD	100	1.28	100	1.28	0	0	0	0	0	0	0	0
		FODPO	20	0.19	20	0.19	0	0	0	0	0	0	0	0
		FOUEW	80	1.04	80	1.04	0	0	0	0	0	0	0	0
		FOUKI	480	13.75	480	13.75	100	2.87	2	2	80	2.29	80	2.29
		FRUL	145	4.82	145	4.82	0	0	0	0	0	0	0	0
		FOUNGD	40	0.55	40	0.55	0	0	0	0	0	0	0	0
		FOUSH	240	3.28	240	3.28	60	0.82	1	1	60	0.82	60	0.82
		GHCKD	880	8.33	880	8.33	1680	15.91	2	3	360	3.41	360	3.41
		GHCKU	29	3.75	29	3.75	0	0	0	0	0	0	0	0
		GRCK	380	4.91	380	4.91	20	0.26	1	1	0	0	0	0
		GRDS	1,120	13.33	1,120	13.33	0	0	0	0	0	0	0	0
		HACKDS	0	0	0	0	800	7.87	1	1	0	0	0	0
		HACKUS	620	3.99	620	3.99	40	0.26	1	1	0	0	0	0
		HENFO	20	0.14	20	0.14	0	0	0	0	0	0	0	0
		KICK	5	1.01	5	1.01	7	1.41	2	2	0	0	0	0
		LC_DC1	120	1.68	120	1.68	60	0.84	1	1	0	0	0	0
		LC_DCDS	0	0	0	0	0	0	0	0	0	0	0	0
		LC_FRUS	47	2.28	47	2.28	0	0	0	0	0	0	0	0
		LI8	0	0	0	0	100	2.95	2	2	10	0.29	10	0.29
		LIDSL	60	0.86	60	0.86	20	0.29	1	1	0	0	0	0
		LILC3	0	0	0	0	0	0	0	0	0	0	0	0
		MI2	133	2.17	133	2.17	0	0	0	0	0	0	0	0
		MI3	480	6.27	480	6.27	20	0.26	1	1	0	0	0	0
		MI5	280	3.93	280	3.93	0	0	0	0	0	0	0	0
		MIDAG	3,340	23.00	3,340	23.00	60	0.41	2	2	20	0.14	20	0.14
		MIDCO	2,820	22.82	2,820	22.82	60	0.49	1	1	0	0	0	0
		MIUCO	1,380	17.65	1,380	17.65	0	0	0	0	0	0	0	0
		MP1	150	2.74	150	2.74	0	0	0	0	0	0	0	0
		NGD1	120	1.23	120	1.23	120	1.23	2	2	40	0.41	40	0.41
		OCNM	7	0.51	7	0.51	214	15.59	2	2	0	0	0	0
		POCK	140	0.63	140	0.63	480	2.17	3	3	100	0.45	100	0.45
		SWCK	271	4.36	271	4.36	43	0.69	1	1	43	0.69	43	0.69
		THCK	7	0.29	7	0.29	200	8.29	2	2	33	1.37	33	1.37
		WOCK	52	4.18	52	4.18	24	1.93	1	1	24	1.93	24	1.93

Table G.4: **Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2016)**

BiologicalArea Code		Abundance	Total Family Richness	Total LPL Richness	EPT			Ephemeroptera		Baetidae		Baetis		Baetis Tricaudatus group		Ephemerellidae		*Drunella Doddsii* sp.	
					Total	%	LPL Richness	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Reference	ALUSM	6,500	21	31	5,220	80	17	3,280	50	1,500	23	1,080	17	400	6	1,500	23	120	2
	ELUGH	10,560	19	28	5,360	51	15	3,920	37	620	6	420	4	200	2	1,660	16	180	2
	FO26	17,280	20	31	13,620	79	13	9,500	55	640	4	600	3	40	0	3,760	22	1,700	10
	HENUP	4,830	15	21	4,390	91	11	3,780	78	0	0	0	0	0	0	820	17	50	1
	LI24	6,960	18	30	1,840	26	13	760	11	80	1	60	1	0	0	280	4	160	2
	MI25	16,160	22	39	11,000	68	19	8,140	50	1,960	12	1,840	11	0	0	4,800	30	60	0
	SLINE	1,815	19	31	1,435	79	20	890	49	35	2	15	1	10	1	240	13	45	2
Mine-exposed	BOCK	5,127	26	38	942	18	8	14	0	14	0	14	0	0	0	0	0	0	0
	CORCK	16,180	22	35	4,620	29	8	80	0	0	0	0	0	0	0	40	0	0	0
	EL1	4,273	14	21	3,056	72	10	2,752	64	926	22	525	12	263	6	601	14	313	7
	EL19	1,347	23	31	930	69	13	718	53	367	27	204	15	163	12	101	7	63	5
	EL20	7,740	21	30	6,620	86	16	4,540	59	1,960	25	1,560	20	300	4	1,380	18	740	10
	ELELKO	24,540	23	38	14,220	58	17	7,920	32	1,960	8	1,120	5	160	1	2,880	12	180	1
	ELH93	11,060	16	33	1,980	18	9	900	8	200	2	160	1	0	0	360	3	0	0
	ELUFE	17,340	25	43	7,680	44	15	6,520	38	880	5	740	4	140	1	4,760	27	120	1
	FO23	6,620	26	36	4,360	66	16	2,160	33	640	10	380	6	260	4	980	15	780	12
	FOBCP	2,210	19	29	1,477	67	15	427	19	133	6	100	5	33	1	134	6	60	3
	FOBKS	4,323	17	26	2,808	65	16	1,678	39	326	8	263	6	63	1	376	9	63	1
	FOBSC	2,083	21	30	1,045	50	16	468	22	237	11	106	5	131	6	119	6	0	0
	FODGH	18,740	24	37	13,460	72	16	7,960	42	2,520	13	1,960	10	340	2	2,680	14	240	1
	FODHE	9,800	18	23	8,620	88	10	7,520	77	580	6	260	3	0	0	2,140	22	60	1
	FODPO	11,620	20	31	8,880	76	17	1,680	14	960	8	460	4	500	4	160	1	20	0
	FOUEW	6,760	21	28	4,060	60	11	1,120	17	420	6	240	4	180	3	120	2	0	0
	FOUKI	1,440	24	34	740	51	15	512	36	96	7	40	3	52	4	88	6	16	1
	FRUL	2,708	21	26	2,401	89	14	1,542	57	1,175	43	683	25	492	18	150	6	125	5
	HACKDS	7,280	17	29	3,280	45	15	2,020	28	1,260	17	960	13	300	4	160	2	20	0
	HACKUP	18,320	22	36	15,680	86	20	8,480	46	2,160	12	1,360	7	800	4	5,100	28	320	2
	LC_DC1	4,423	19	27	3,743	85	10	2,101	48	213	5	125	3	88	2	488	11	163	4
	LC_DCDS	6,116	13	21	4,000	65	10	2,967	49	0	0	0	0	0	0	1,134	19	17	0
	LC_FRB	5,527	19	26	4,428	80	13	3,871	70	2,785	50	771	14	2,014	36	257	5	0	0
	LC_FRUS	9,700	22	38	5,860	60	14	3,520	36	1,720	18	1,020	11	700	7	660	7	20	0
	LCUT	12,860	17	25	1,320	10	11	500	4	400	3	120	1	280	2	40	0	40	0
	LI8	14,360	14	24	11,860	83	14	3,120	22	860	6	320	2	540	4	740	5	520	4
	LIDSL	4,630	18	30	3,160	68	13	1,850	40	960	21	620	13	340	7	190	4	50	1
	LILC3	38,320	14	29	2,480	6	8	920	2	380	1	220	1	60	0	140	0	0	0
	MI2	6,186	20	33	5,068	82	15	2,850	46	716	12	333	5	383	6	917	15	317	5
	MI3	7,700	19	31	6,480	84	14	3,800	49	1,060	14	660	9	400	5	2,200	29	140	2
	MIDCO	7,500	27	40	3,760	50	20	440	6	220	3	80	1	120	2	180	2	40	1
	MIUCO	4,187	25	32	3,370	80	20	1,915	46	425	10	325	8	75	2	976	23	125	3

Table G.4: Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2016)

BiologicalArea Code		Heptageniidae		*Epeorus* sp.		*Rhithrogena* sp.		Plecoptera		Chloroperlidae		*Sweltsa* sp.		Nemouridae		*Zapada* sp.	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Reference	ALUSM	280	4	40	1	80	1	820	13	80	1	60	1	600	9	320	5
	ELUGH	1,540	15	0	0	100	1	1,360	13	40	0	40	0	460	4	180	2
	FO26	5,100	30	140	1	320	2	3,040	18	700	4	460	3	620	4	180	1
	HENUP	2,950	61	90	2	310	6	530	11	40	1	40	1	90	2	10	0
	LI24	240	3	100	1	0	0	960	14	280	4	140	2	360	5	100	1
	MI25	1,240	8	0	0	20	0	2,040	13	480	3	160	1	620	4	420	3
	SLINE	545	30	10	1	10	1	310	17	70	4	45	2	130	7	50	3
Mine-exposed	BOCK	0	0	0	0	0	0	399	8	14	0	14	0	343	7	14	0
	CORCK	40	0	0	0	0	0	2,560	16	40	0	20	0	2,500	15	1,240	8
	EL1	1,200	28	0	0	75	2	165	4	38	1	38	1	26	1	13	0
	EL19	233	17	4	0	21	2	184	14	88	7	88	7	12	1	8	1
	EL20	1,200	16	20	0	80	1	1,340	17	180	2	180	2	140	2	60	1
	ELELKO	2,940	12	0	0	760	3	1,780	7	220	1	220	1	40	0	0	0
	ELH93	320	3	0	0	0	0	180	2	20	0	0	0	80	1	0	0
	ELUFE	840	5	0	0	80	0	1,060	6	220	1	220	1	20	0	20	0
	FO23	540	8	0	0	60	1	1,680	25	800	12	720	11	360	5	140	2
	FOBCP	160	7	0	0	0	0	688	31	7	0	7	0	327	15	220	10
	FOBKS	976	23	13	0	0	0	715	17	38	1	25	1	301	7	225	5
	FOBSC	112	5	6	0	0	0	339	16	12	1	6	0	125	6	81	4
	FODGH	2,760	15	20	0	140	1	4,320	23	420	2	220	1	2,580	14	1,560	8
	FODHE	4,680	48	60	1	240	2	1,080	11	20	0	0	0	180	2	180	2
	FODPO	540	5	0	0	0	0	4,840	42	240	2	80	1	2,440	21	2,000	17
	FOUEW	580	9	0	0	0	0	2,040	30	60	1	60	1	1,860	28	1,180	17
	FOUKI	320	22	0	0	0	0	144	10	4	0	4	0	64	4	12	1
	FRUL	217	8	0	0	50	2	701	26	159	6	92	3	159	6	17	1
	HACKDS	560	8	20	0	0	0	800	11	20	0	20	0	680	9	240	3
	HACKUP	1,160	6	20	0	0	0	6,360	35	140	1	100	1	4,360	24	3,220	18
	LC_DC1	1,400	32	25	1	0	0	890	20	88	2	63	1	538	12	288	7
	LC_DCDS	1,666	27	100	2	0	0	649	11	133	2	83	1	333	5	233	4
	LC_FRB	772	14	29	1	14	0	428	8	72	1	43	1	299	5	157	3
	LC_FRUS	1,120	12	40	0	0	0	1,680	17	100	1	80	1	1,240	13	700	7
	LCUT	60	0	0	0	0	0	500	4	60	0	20	0	320	2	40	0
	LI8	1,260	9	40	0	280	2	7,340	51	20	0	20	0	1,300	9	800	6
	LIDSL	690	15	90	2	0	0	910	20	130	3	120	3	680	15	200	4
	LILC3	400	1	0	0	0	0	1,060	3	240	1	220	1	780	2	180	0
	MI2	1,200	19	17	0	83	1	818	13	667	11	667	11	50	1	0	0
	MI3	540	7	0	0	20	0	340	4	120	2	60	1	80	1	20	0
	MIDCO	40	1	0	0	0	0	2,120	28	20	0	20	0	1,140	15	620	8
	MIUCO	476	11	0	0	13	0	653	16	63	2	50	1	239	6	138	3

Table G.4: **Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2016)**

BiologicalArea Code		*Zapada Columbiana* sp.		Taeniopterygidae		*Taenionema* sp.		Trichoptera		Diptera		Chironomidae		*Micropsectra* sp.		*Orthocladius* sp.		Muscidae	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Reference	ALUSM	60	1	60	1	40	1	1,120	17	540	8	560	9	240	4	80	1	0	0
	ELUGH	0	0	220	2	0	0	80	1	660	6	4,420	42	1,000	9	1,980	19	0	0
	FO26	320	2	920	5	0	0	1,080	6	220	1	3,120	18	500	3	1,300	8	0	0
	HENUP	50	1	380	8	370	8	80	2	70	1	340	7	50	1	180	4	0	0
	LI24	140	2	40	1	40	1	120	2	80	1	4,940	71	40	1	3,060	44	0	0
	MI25	60	0	540	3	300	2	820	5	180	1	4,840	30	760	5	2,220	14	0	0
	SLINE	65	4	50	3	50	3	235	13	15	1	345	19	0	0	195	11	0	0
Mine-exposed	BOCK	0	0	14	0	14	0	529	10	1,971	38	1,615	31	200	4	214	4	57	1
	CORCK	20	0	0	0	0	0	1,980	12	2,820	17	6,360	39	1,780	11	1,800	11	20	0
	EL1	13	0	0	0	0	0	139	3	52	1	1,165	27	50	1	775	18	0	0
	EL19	0	0	13	1	0	0	28	2	104	8	197	15	96	7	46	3	0	0
	EL20	0	0	180	2	180	2	740	10	240	3	840	11	320	4	180	2	0	0
	ELELKO	0	0	140	1	140	1	4,520	18	160	1	9,420	38	920	4	1,260	5	0	0
	ELH93	0	0	40	0	0	0	900	8	0	0	7,120	64	220	2	5,260	48	0	0
	ELUFE	0	0	0	0	0	0	100	1	580	3	7,220	42	340	2	4,280	25	0	0
	FO23	0	0	160	2	0	0	520	8	380	6	1,260	19	840	13	180	3	0	0
	FOBCP	0	0	20	1	20	1	362	16	146	7	513	23	140	6	60	3	0	0
	FOBKS	0	0	50	1	0	0	415	10	538	12	914	21	438	10	13	0	0	0
	FOBSC	6	0	19	1	0	0	238	11	288	14	550	26	138	7	156	7	0	0
	FODGH	120	1	520	3	460	2	1,180	6	720	4	3,460	18	1,460	8	620	3	0	0
	FODHE	0	0	220	2	0	0	20	0	220	2	840	9	280	3	140	1	0	0
	FODPO	40	0	740	6	0	0	2,360	20	280	2	1,940	17	260	2	560	5	0	0
	FOUEW	180	3	20	0	20	0	900	13	300	4	1,780	26	220	3	620	9	0	0
	FOUKI	20	1	4	0	4	0	84	6	132	9	468	33	148	10	156	11	0	0
	FRUL	0	0	67	2	0	0	158	6	141	5	150	6	75	3	8	0	0	0
	HACKDS	120	2	0	0	0	0	460	6	80	1	3,200	44	200	3	400	5	0	0
	HACKUP	160	1	1,080	6	0	0	840	5	1,020	6	880	5	180	1	240	1	0	0
	LC_DC1	75	2	63	1	63	1	752	17	276	6	315	7	13	0	0	0	0	0
	LC_DCDS	67	1	100	2	0	0	384	6	1,317	22	766	13	233	4	0	0	0	0
	LC_FRB	0	0	0	0	0	0	129	2	71	1	714	13	229	4	114	2	0	0
	LC_FRUS	0	0	0	0	0	0	660	7	380	4	2,160	22	240	2	880	9	0	0
	LCUT	0	0	20	0	0	0	320	2	20	0	10,880	85	0	0	7,360	57	0	0
	LI8	20	0	5,880	41	0	0	1,400	10	0	0	2,480	17	1,300	9	100	1	0	0
	LIDSL	150	3	60	1	60	1	400	9	40	1	1,320	29	230	5	90	2	0	0
	LILC3	140	0	0	0	0	0	500	1	100	0	35,060	91	1,900	5	20,080	52	0	0
	MI2	17	0	50	1	0	0	1,400	23	183	3	618	10	83	1	67	1	0	0
	MI3	0	0	20	0	20	0	2,340	30	300	4	400	5	100	1	20	0	0	0
	MIDCO	0	0	540	7	360	5	1,200	16	440	6	2,540	34	40	1	1,340	18	0	0
	MIUCO	0	0	150	4	150	4	802	19	339	8	201	5	0	0	0	0	0	0

Table G.4: Benthic Invertebrate Community Endpoint Values for Each Area (3-Minute Kick Samples Collected in 2016)

BiologicalArea Code		*Limnophora* sp.		Psychodidae		*Pericoma/ Telmatoscopus* sp.		Oligochaeta		Enchytraeidae		*Enchytraeus* sp.	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Reference	ALUSM	0	0	360	6	360	6	20	0	0	0	0	0
	ELUGH	0	0	460	4	460	4	0	0	0	0	0	0
	FO26	0	0	40	0	40	0	20	0	20	0	20	0
	HENUP	0	0	0	0	0	0	0	0	0	0	0	0
	LI24	0	0	0	0	0	0	20	0	20	0	20	0
	MI25	0	0	40	0	40	0	0	0	0	0	0	0
	SLINE	0	0	0	0	0	0	0	0	0	0	0	0
Mine-exposed	BOCK	57	1	43	1	43	1	457	9	386	8	386	8
	CORCK	20	0	2,060	13	2,060	13	1,540	10	1,120	7	1,120	7
	EL1	0	0	0	0	0	0	0	0	0	0	0	0
	EL19	0	0	29	2	29	2	16	1	8	1	8	1
	EL20	0	0	100	1	100	1	0	0	0	0	0	0
	ELELKO	0	0	0	0	0	0	100	0	0	0	0	0
	ELH93	0	0	0	0	0	0	1,820	16	0	0	0	0
	ELUFE	0	0	0	0	0	0	840	5	20	0	20	0
	FO23	0	0	220	3	220	3	200	3	60	1	60	1
	FOBCP	0	0	120	5	120	5	47	2	40	2	40	2
	FOBKS	0	0	463	11	463	11	25	1	25	1	25	1
	FOBSC	0	0	225	11	225	11	106	5	106	5	106	5
	FODGH	0	0	260	1	260	1	220	1	0	0	0	0
	FODHE	0	0	140	1	140	1	20	0	20	0	20	0
	FODPO	0	0	40	0	40	0	0	0	0	0	0	0
	FOUEW	0	0	80	1	80	1	180	3	20	0	20	0
	FOUKI	0	0	84	6	84	6	40	3	36	3	36	3
	FRUL	0	0	58	2	58	2	8	0	0	0	0	0
	HACKDS	0	0	0	0	0	0	480	7	0	0	0	0
	HACKUP	0	0	800	4	800	4	40	0	40	0	40	0
	LC_DC1	0	0	50	1	50	1	25	1	25	1	25	1
	LC_DCDS	0	0	0	0	0	0	0	0	0	0	0	0
	LC_FRB	0	0	29	1	29	1	143	3	0	0	0	0
	LC_FRUS	0	0	80	1	80	1	80	1	0	0	0	0
	LCUT	0	0	20	0	20	0	0	0	0	0	0	0
	LI8	0	0	0	0	0	0	0	0	0	0	0	0
	LIDSL	0	0	0	0	0	0	0	0	0	0	0	0
	LILC3	0	0	0	0	0	0	0	0	0	0	0	0
	MI2	0	0	33	1	33	1	34	1	17	0	17	0
	MI3	0	0	260	3	260	3	320	4	0	0	0	0
	MIDCO	0	0	80	1	80	1	440	6	20	0	20	0
	MIUCO	0	0	250	6	250	6	13	0	0	0	0	0

Table G.5: Number and Percent of Mine-exposed Areas (n = 59), Sampled in September 2015, with Benthic Invertebrate Community Endpoints Outside of the Normal Range, Defined as the 2.5th and 97.5th Percentiles of the Distribution of Reference Area (n = 40) Values

Endpoint		Units	2.5th and 97.5th Percentiles of 2015 Reference Area Distribution		# of Mine-exposed Areas		% of Mine-exposed Areas	
			Lower ($P_{2.5}$)	Upper ($P_{97.5}$)	< Normal Range	> Normal Range	< Normal Range	> Normal Range
Hilsenhoff Biotic Index (HBI; Family)		unitless	2.4	4.4	2.0	12	3.4	20
HBI (LPL)		unitless	2.3	4.7	1.0	8.0	1.7	14
Simpson's Diversity (Family)		unitless	0.6	0.9	4.0	7.0	6.8	12
Simpson's Evenness (Family)		unitless	0.2	0.4	6.0	0	10	0
Simpson's Diversity (LPL)		unitless	0.7	0.9	1.0	1.0	1.7	1.7
Simpson's Evenness (LPL)		unitless	0.1	0.5	1.0	1.0	1.7	1.7
Total Abundance		#/sample	471	12,756	0	10	0	17
Total Family Richness		#/sample	14	24	1.0	4.0	1.7	6.8
Total LPL Richness		#/sample	21	39	1.0	2.0	1.7	3.4
EPT		#/sample	398	9,695	2.0	7.0	3.4	12
EPT Family Richness		#/sample	10	16	10	0	17	0
EPT LPL Richness		#/sample	12	21	13	0	22	0
Ephemeroptera	Order: Ephemeroptera	#/sample	246	6,345	10	3.0	17	5.1
	Ephemeroptera Family Richness	#/sample	3.0	5.0	11	0	19	0
	Ephemeroptera LPL Richness	#/sample	4.0	9.0	15	0	25	0
	Family: Baetidae	#/sample	4.9	2,821	9.0	0	15	0
	Genus: *Baetis*	#/sample	0	2,347	0	0	0	0
	Genus: Baetis tricaudatus group	#/sample	0	284	0	12	0	20
	Family: Ephemerellidae	#/sample	23	1,822	11	8.0	19	14
	Drunella doddsii	#/sample	0	546	0	5.0	0	8.5
	Family: Heptageniidae	#/sample	86	4,590	11	2.0	19	3.4
	Genus: Epeorus	#/sample	0	305	0	0	0	0
	Genus: Rhithrogena	#/sample	0	773	0	1.0	0	1.7
Plecoptera	Order: Plecoptera	#/sample	59	2,864	2.0	5.0	3.4	8.5
	Plecoptera Family Richness	#/sample	4.0	7.0	9.0	1.0	15	1.7
	Plecoptera LPL Richness	#/sample	4.0	9.0	3.0	0	5.1	0
	Family: Chloroperlidae	#/sample	4.9	545	15	0	25	0
	Genus: Sweltsa	#/sample	0	526	0	0	0	0
	Family: Nemouridae	#/sample	1.0	1,152	2.0	12	3.4	20
	Genus: Zapada	#/sample	1.0	1,152	2.0	10	3.4	17
	Zapada columbiana	#/sample	0	502	0	0	0	0
	Family: Taeniopterygidae	#/sample	0	1,643	0	2.0	0	3.4
	Genus: Taenionema	#/sample	0	1,643	0	2.0	0	3.4
Order: Trichoptera		#/sample	5.9	2,827	0	2.0	0	3.4
Trichoptera Family Richness		#/sample	1.0	5.0	0	2.0	0	3.4
Trichoptera LPL Richness		#/sample	1.0	6.0	0	4.0	0	6.8
Diptera	Order: Diptera	#/sample	28	3,940	0	10	0	17
	Diptera Family Richness	#/sample	2.0	6.0	1.0	4.0	1.7	6.8
	Diptera LPL Richness	#/sample	4.0	14	0	7.0	0	12
	Family: Chironomidae	#/sample	21	2,833	0	14	0	24
	Chironomidae LPL Richness	#/sample	2.0	10	0	3.0	0	5.1
	Genus: Micropsectra	#/sample	0	406	0	9.0	0	15
	Genus: Orthocladius	#/sample	0	1,068	0	14	0	24
	Family: Muscidae	#/sample	0	1.3	0	5.0	0	8.5
	Genus: Limnophora	#/sample	0	1.3	0	5.0	0	8.5
	Family: Psychodidae	#/sample	0	1,023	0	6.0	0	10
	Genus: Pericoma/Telmatoscopus	#/sample	0	1,023	0	6.0	0	10
Oligochaeta	Class: Oligochaeta	#/sample	0	838	0	2.0	0	3.4
	Oligochaeta Family Richness	#/sample	0	2.0	0	3.0	0	5.1
	Oligochaeta LPL Richness	#/sample	0	2.0	0	5.0	0	8.5
	Family: Enchytraeidae	#/sample	0	800	0	1.0	0	1.7
	Genus: Enchytraeus	#/sample	0	800	0	1.0	0	1.7
Class: Ostracoda		#/sample	0	86	0	10	0	17
EPT		%	38	97	12	0	20	0
Ephemeroptera	Order: Ephemeroptera	%	21	72	19	4.0	32	6.8
	Family: Baetidae	%	0.7	26	12	1.0	20	1.7
	Genus: *Baetis*	%	0	24	0	0	0	0
	Genus: Baetis tricaudatus group	%	0	4.0	0	10	0	17
	Family: Ephemerellidae	%	1.8	24	13	5.0	22	8.5
	Drunella doddsii	%	0	9.0	0	2.0	0	3.4
	Family: Heptageniidae	%	5.8	60	19	0	32	0
	Genus: Epeorus	%	0	5.2	0	0	0	0
	Genus: Rhithrogena	%	0	13	0	1.0	0	1.7
Plecoptera	Order: Plecoptera	%	6.9	38	7.0	5.0	12	8.5
	Family: Chloroperlidae	%	0.5	10	22	0	37	0
	Genus: Sweltsa	%	0	8.9	0	1.0	0	1.7
	Family: Nemouridae	%	0.1	14	2.0	11	3.4	19
	Genus: Zapada	%	0.1	14	2.0	11	3.4	19
	Zapada columbiana	%	0	6.1	0	0	0	0
	Family: Taeniopterygidae	%	0	26	0	2.0	0	3.4
	Genus: Taenionema	%	0	25	0	2.0	0	3.4
Order: Trichoptera		%	0.3	41	0	1.0	0	1.7

percentage > 10%, which was a value chosen to highlight endpoints most likely to identify communities that differed from reference communities.

Table G.5: Number and Percent of Mine-exposed Areas (n = 59), Sampled in September 2015, with Benthic Invertebrate Community Endpoints Outside of the Normal Range, Defined as the 2.5th and 97.5th Percentiles of the Distribution of Reference Area (n = 40) Values

Endpoint			Units	2.5th and 97.5th Percentiles of 2015 Reference Area Distribution		# of Mine-exposed Areas		% of Mine-exposed Areas	
				Lower ($P_{2.5}$)	Upper ($P_{97.5}$)	< Normal Range	> Normal Range	< Normal Range	> Normal Range
Diptera	Order: Diptera		%	2.5	48	0	13	0	22
	Family: Chironomidae		%	1.9	44	0	8.0	0	14
	Genus: Micropsectra		%	0	4.6	0	13	0	22
	Genus: Orthocladius		%	0	22	0	5.0	0	8.5
	Family: Muscidae		%	0	0.15	0	4.0	0	6.8
	Genus: Limnophora		%	0	0.15	0	4.0	0	6.8
	Family: Psychodidae		%	0	7.8	0	10	0	17
	Genus: Pericoma/Telmatoscopus		%	0	7.8	0	10	0	17
Oligochaeta	Class: Oligochaeta		%	0	9.0	0	4.0	0	6.8
	Family: Enchytraeidae		%	0	7.0	0	1.0	0	1.7
	Genus: Enchytraeus		%	0	7.0	0	1.0	0	1.7
Family-Level NMDS	Presence/Absence	Axis 1	-	-0.44	1.0	16	2.0	27	3.4
		Axis 2	-	-0.94	0.82	2.0	2.0	3.4	3.4
		Axis 3	-	-0.76	0.81	3.0	2.0	5.1	3.4
	Relative Abundance/fourth root transformed	Axis 1	-	-0.29	0.96	17	1.0	29	1.7
		Axis 2	-	-0.78	0.86	2.0	4.0	3.4	6.8
		Axis 3	-	-0.82	0.77	3.0	2.0	5.1	3.4
	Relative Abundance/untransformed	Axis 1	-	-0.81	1.3	15	0	25	0
		Axis 2	-	-0.78	1.2	4.0	1.0	6.8	1.7
	Abundance/log-transformed	Axis 1	-	-0.31	1.2	17	1.0	29	1.7
		Axis 2	-	-1.5	0.69	2.0	7.0	3.4	12
	Abundance/untransformed	Axis 1	-	-0.70	2.0	17	0	29	0
		Axis 2	-	-1.0	0.50	0	13	0	22
LPL-Level NMDS	Presence/Absence	Axis 1	-	-0.39	1.1	15	0	25	0
		Axis 2	-	-0.83	0.82	5.0	2.0	8.5	3.4
		Axis 3	-	-0.91	1.1	2.0	1.0	3.4	1.7
	Relative Abundance/fourth root transformed	Axis 1	-	-0.41	1.2	15	0	25	0
		Axis 2	-	-0.84	1.0	3.0	3.0	5.1	5.1
	Relative Abundance/untransformed	Axis 1	-	-0.51	1.2	18	0	31	0
		Axis 2	-	-1.2	0.83	2.0	6.0	3.4	10
	Abundance/log-transformed	Axis 1	-	-0.37	1.4	17	0	29	0
		Axis 2	-	-0.64	1.5	1.0	1.0	1.7	1.7
		Axis 3	-	-0.78	0.86	3.0	3.0	5.1	5.1
	Abundance/untransformed	Axis 1	-	-0.62	1.8	17	0	29	0
		Axis 2	-	-0.99	0.48	0	13	0	22

percentage > 10%, which was a value chosen to highlight endpoints most likely to identify communities that differed from reference communities.

Table G.6: Pearson Correlation Coefficients for Benthic Invertebrate Community Endpoints for Reference (n = 40) and Mine-exposed (n = 59) Areas Versus the First Principal Component (PC-1) Calculated from Five Different PCAs for Water Quality Measured at the Same Areas, September 2015

Variables			All Water Quality Variables (concentration) PC-1		All Water Quality Variables (HQ[a]) PC-1		All Water Quality Variables and Calcite Index (HQ[a]) PC-1		Key[b] Water Quality Variables (concentration) and Calcite Index PC-1		Key[b] Water Quality Variables and Calcite Index (HQ[a]) PC-1	
			r	P-value	r	P-value	r	P-value	r	P-value	r	P-value
HBI (Family)			0.544	<0.001	0.376	<0.001	0.378	<0.001	0.326	<0.001	0.377	<0.001
HBI (LPL)			0.469	<0.001	0.309	0.002	0.310	0.002	0.294	0.003	0.313	0.002
Simpson's Diversity (Family)			-0.313	0.002	-0.322	0.001	-0.323	<0.001	-0.300	0.003	-0.335	<0.001
Evenness (Family)			-0.229	0.023	-0.222	0.027	-0.223	0.023	-0.127	0.210	-0.229	0.023
Total Abundance			0.222	0.028	0.228	0.023	0.229	0.022	0.123	0.224	0.231	0.022
EPT Abundance			-0.055	0.588	0.042	0.673	0.043	0.580	-0.063	0.538	0.056	0.580
EPT Family Richness			-0.513	<0.001	-0.409	<0.001	-0.409	<0.001	-0.495	<0.001	-0.415	<0.001
EPT LPL Richness			-0.587	<0.001	-0.479	<0.001	-0.479	<0.001	-0.488	<0.001	-0.478	<0.001
Ephemeroptera Abundance			-0.235	0.020	-0.104	0.310	-0.103	0.436	-0.177	0.079	-0.079	0.436
Ephemeroptera Family Richness			-0.668	<0.001	-0.493	<0.001	-0.494	<0.001	-0.457	<0.001	-0.481	<0.001
Ephemeroptera LPL Richness			-0.749	<0.001	-0.583	<0.001	-0.584	<0.001	-0.490	<0.001	-0.569	<0.001
Baetidae Abundance			-0.110	0.282	-0.074	0.475	-0.073	0.616	-0.094	0.356	-0.051	0.616
Baetis tricaudatus group Abundance			0.130	0.201	0.235	0.019	0.235	0.013	0.133	0.189	0.248	0.013
Ephemerellidae Abundance			-0.099	0.334	-0.054	0.600	-0.053	0.740	-0.096	0.344	-0.034	0.740
Heptageniidae Abundance			-0.253	0.012	-0.087	0.388	-0.088	0.462	-0.167	0.098	-0.075	0.462
Plecoptera Family Richness			-0.387	<0.001	-0.340	<0.001	-0.341	<0.001	-0.445	<0.001	-0.349	<0.001
Chloroperlidae Abundance			-0.191	0.059	-0.274	0.006	-0.275	0.003	-0.331	<0.001	-0.294	0.003
Nemouridae Abundance			0.313	0.002	0.277	0.005	0.277	0.007	0.230	0.022	0.269	0.007
Zapada Abundance			0.268	0.008	0.264	0.008	0.264	0.010	0.217	0.031	0.258	0.010
Diptera Abundance			0.369	<0.001	0.287	0.004	0.288	0.005	0.235	0.019	0.279	0.005
Diptera LPL Richness			0.401	<0.001	0.173	0.085	0.174	0.086	0.132	0.192	0.173	0.086
Chironomidae Abundance			0.307	0.002	0.269	0.007	0.270	0.007	0.221	0.028	0.267	0.007
Micropsectra Abundance			0.312	0.002	0.273	0.006	0.274	0.008	0.231	0.022	0.266	0.008
Orthocladius Abundance			0.206	0.042	0.210	0.036	0.211	0.035	0.153	0.129	0.213	0.035
Psychodidae Abundance			0.200	0.049	0.115	0.253	0.116	0.282	0.102	0.315	0.109	0.282
Pericoma/Telmatoscopus sp. Abundance			0.199	0.049	0.115	0.254	0.116	0.283	0.102	0.316	0.109	0.283
Ostracoda Abundance			0.221	0.029	0.141	0.163	0.141	0.190	0.134	0.185	0.133	0.190
% EPT			-0.608	<0.001	-0.431	<0.001	-0.433	<0.001	-0.416	<0.001	-0.433	<0.001
% Ephemeroptera			-0.646	<0.001	-0.453	<0.001	-0.454	<0.001	-0.426	<0.001	-0.441	<0.001
% Baetidae			-0.317	0.001	-0.230	0.022	-0.230	0.038	-0.195	0.053	-0.209	0.038
% Baetistricaudatus group			0.102	0.316	0.214	0.034	0.214	0.025	0.117	0.248	0.225	0.025
% Ephemerellidae			-0.322	0.001	-0.296	0.003	-0.296	0.006	-0.289	0.004	-0.277	0.006
% Heptageniidae			-0.467	<0.001	-0.270	0.006	-0.272	0.006	-0.276	0.006	-0.275	0.006
% Plecoptera			0.022	0.831	0.115	0.261	0.114	0.299	0.020	0.843	0.105	0.299
% Chloroperlidae			-0.313	0.002	-0.345	<0.001	-0.347	<0.001	-0.409	<0.001	-0.375	<0.001
% Nemouridae			0.415	<0.001	0.312	0.002	0.312	0.003	0.274	0.006	0.298	0.003
% Zapada			0.383	<0.001	0.303	0.002	0.303	0.004	0.269	0.007	0.290	0.004
% Diptera			0.624	<0.001	0.486	<0.001	0.487	<0.001	0.473	<0.001	0.492	<0.001
% Chironomidae			0.458	<0.001	0.371	<0.001	0.372	<0.001	0.399	<0.001	0.387	<0.001
% Micropsectra			0.472	<0.001	0.389	<0.001	0.389	<0.001	0.336	<0.001	0.386	<0.001
% Orthocladius			0.203	0.045	0.219	0.029	0.220	0.018	0.252	0.012	0.238	0.018
% Psychodidae			0.230	0.023	0.168	0.095	0.169	0.092	0.128	0.206	0.171	0.092
% Pericoma/Telmatoscopus sp.			0.229	0.023	0.167	0.097	0.168	0.094	0.127	0.210	0.169	0.094
Family-Level NMDS	Presence/Absence	Axis 1	-0.629	<0.001	-0.466	<0.001	-0.467	<0.001	-0.459	<0.001	-0.460	<0.001
		Axis 2	-0.091	0.371	-0.120	0.238	-0.120	0.205	-0.148	0.145	-0.128	0.205
		Axis 3	-0.180	0.075	-0.080	0.427	-0.081	0.484	-0.096	0.344	-0.071	0.484
	Relative Abundance/fourth root transformed	Axis 1	0.740	<0.001	0.538	<0.001	0.539	<0.001	0.510	<0.001	0.530	<0.001
		Axis 2	-0.043	0.672	0.029	0.777	0.029	0.657	0.031	0.763	0.045	0.657
		Axis 3	0.067	0.515	0.038	0.716	0.037	0.717	0.148	0.145	0.037	0.717
	Relative Abundance/ untransformed	Axis 1	0.654	<0.001	0.461	<0.001	0.463	<0.001	0.444	<0.001	0.461	<0.001
		Axis 2	-0.032	0.752	-0.157	0.121	-0.157	0.127	-0.199	0.049	-0.154	0.127
	Abundance/log-transformed	Axis 1	-0.737	<0.001	-0.527	<0.001	-0.528	<0.001	-0.449	<0.001	-0.518	<0.001
		Axis 2	-0.002	0.985	0.036	0.718	0.037	0.731	-0.112	0.269	0.035	0.731
	Abundance/untransformed	Axis 1	0.411	<0.001	0.361	<0.001	0.362	<0.001	0.212	0.036	0.364	<0.001
		Axis 2	0.534	<0.001	0.337	<0.001	0.338	<0.001	0.366	<0.001	0.333	<0.001
LPL-Level NMDS	Presence/Absence	Axis 1	-0.764	<0.001	-0.583	<0.001	-0.584	<0.001	-0.449	<0.001	-0.582	<0.001
		Axis 2	0.146	0.152	0.125	0.217	0.125	0.201	0.195	0.053	0.130	0.201
		Axis 3	-0.016	0.876	-0.066	0.515	-0.066	0.534	0.029	0.779	-0.063	0.534
	Relative Abundance/fourth root transformed	Axis 1	0.774	<0.001	0.571	<0.001	0.572	<0.001	0.456	<0.001	0.569	<0.001
		Axis 2	-0.136	0.181	-0.089	0.382	-0.089	0.393	-0.158	0.119	-0.087	0.393
	Relative Abundance/ untransformed	Axis 1	-0.744	<0.001	-0.545	<0.001	-0.546	<0.001	-0.493	<0.001	-0.542	<0.001
		Axis 2	-0.138	0.177	-0.021	0.841	-0.020	0.974	-0.037	0.718	0.003	0.974
	Abundance/log-transformed	Axis 1	-0.785	<0.001	-0.604	<0.001	-0.605	<0.001	-0.468	<0.001	-0.603	<0.001
		Axis 2	0.096	0.347	0.061	0.548	0.061	0.501	0.165	0.102	0.068	0.501
		Axis 3	-0.107	0.296	-0.055	0.592	-0.055	0.615	-0.142	0.159	-0.051	0.615
	Abundance/untransformed	Axis 1	-0.388	<0.001	-0.356	<0.001	-0.357	<0.001	-0.196	0.052	-0.359	<0.001
		Axis 2	0.579	<0.001	0.379	<0.001	0.380	<0.001	0.370	<0.001	0.376	<0.001

r ≥ 0.6 or r ≤ -0.6

P-value < 0.05

Note: PCA Details in Appendix A.

[a] HQ - hazard quotient. Observed concentration divided by Level 1 effect benchmark defined in the Elk Valley Water Quality Plan (selenium, sulphate, nitrate, cadmium), the upper normal range limit defined by Minnow (2016b; calcite index), or BC water quality guidelines (the other water quality variables), as applicable.

[b] Selenium, sulphate, nitrate.

Table G.7: Correlation of Benthic Invertebrate Community Endpoints for Reference (n = 40) and Mine-exposed (n = 59) Areas Sampled in September 2015

Variables		HBI (Family)	HBI (LPL)	Simpson's Diversity (Family)	Evenness (Family)	Total Abundance	EPT Family Richness	EPT LPL Richness	Ephemeroptera Family Richness	Ephemeroptera LPL Richness	Plecoptera Family Richness	Diptera LPL Richness	Ostracoda	% EPT	% Ephemeroptera	% Baetidae	% Baetistricaudatus group	% Ephemerellidae	% Heptageniidae	% Plecoptera	% Chloroperlidae	% Nemouridae	% Zapada	% Diptera	% Chironomidae	% Micropsectra	% Orthocladius	% Psychodidae	% Pericoma/Telmatoscopus sp.
HBI (Family)	Pearson Correlation	-	0.884	-0.282	-0.262	0.142	-0.478	-0.502	-0.438	-0.504	-0.379	0.462	0.362	-0.891	-0.615	-0.129	0.026	-0.393	-0.498	-0.434	-0.378	0.041	-0.019	0.818	0.588	0.555	0.364	0.404	0.403
	P-value (2-tailed)	-	<0.001	0.005	0.009	0.162	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.204	0.797	<0.001	<0.001	<0.001	<0.001	0.684	0.850	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
HBI (LPL)	Pearson Correlation	0.884	-	-0.362	-0.305	0.049	-0.518	-0.530	-0.383	-0.468	-0.448	0.428	0.117	-0.815	-0.541	-0.090	-0.001	-0.417	-0.415	-0.447	-0.371	0.049	0.010	0.723	0.636	0.631	0.408	0.037	0.036
	P-value (2-tailed)	<0.001	-	<0.001	0.002	0.627	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.252	<0.001	<0.001	0.377	0.994	<0.001	<0.001	<0.001	<0.001	0.627	0.920	<0.001	<0.001	<0.001	<0.001	0.716	0.725
Simpson's Diversity (Family)	Pearson Correlation	-0.282	-0.362	-	0.826	-0.200	0.604	0.574	0.334	0.344	0.445	-0.040	-0.188	0.391	0.146	0.402	0.170	0.148	-0.054	0.288	0.204	0.177	0.200	-0.460	-0.534	-0.462	-0.406	0.086	0.088
	P-value (2-tailed)	0.005	<0.001	-	<0.001	0.047	<0.001	<0.001	0.001	<0.001	<0.001	0.696	0.064	<0.001	0.149	<0.001	0.093	0.142	0.595	0.004	0.043	0.080	0.047	<0.001	<0.001	<0.001	<0.001	0.395	0.386
Evenness (Family)	Pearson Correlation	-0.262	-0.305	0.826	-	-0.241	0.356	0.378	0.158	0.174	0.238	-0.121	-0.207	0.333	0.038	0.365	0.090	0.064	-0.126	0.328	0.150	0.263	0.292	-0.356	-0.399	-0.315	-0.297	0.047	0.048
	P-value (2-tailed)	0.009	0.002	<0.001	-	0.016	<0.001	<0.001	0.119	0.085	0.018	0.234	0.041	0.001	0.705	<0.001	0.373	0.527	0.215	0.001	0.139	0.009	0.003	<0.001	<0.001	0.002	0.003	0.642	0.638
Total Abundance	Pearson Correlation	0.142	0.049	-0.200	-0.241	-	-0.031	-0.013	-0.140	-0.129	-0.082	0.228	0.483	-0.168	-0.157	-0.174	-0.096	0.194	-0.195	-0.017	-0.245	0.148	0.106	0.230	0.157	0.261	0.105	0.356	0.356
	P-value (2-tailed)	0.162	0.627	0.047	0.016	-	0.762	0.900	0.167	0.202	0.420	0.023	<0.001	0.096	0.121	0.084	0.344	0.054	0.054	0.870	0.015	0.145	0.296	0.022	0.121	0.009	0.301	<0.001	<0.001
EPT Family Richness	Pearson Correlation	-0.478	-0.518	0.604	0.356	-0.031	-	0.902	0.678	0.617	0.788	-0.319	-0.158	0.574	0.457	0.343	0.259	0.277	0.300	0.174	0.349	-0.094	-0.049	-0.576	-0.504	-0.533	-0.267	0.004	0.006
	P-value (2-tailed)	<0.001	<0.001	<0.001	<0.001	0.762	-	<0.001	<0.001	<0.001	<0.001	0.001	0.120	<0.001	<0.001	0.001	0.010	0.005	0.003	0.085	<0.001	0.355	0.633	<0.001	<0.001	<0.001	0.008	0.970	0.956
EPT LPL Richness	Pearson Correlation	-0.502	-0.530	0.574	0.378	-0.013	0.902	-	0.667	0.769	0.673	-0.339	-0.146	0.600	0.518	0.391	0.207	0.374	0.297	0.123	0.284	-0.104	-0.062	-0.590	-0.525	-0.543	-0.287	0.008	0.009
	P-value (2-tailed)	<0.001	<0.001	<0.001	<0.001	0.900	<0.001	-	<0.001	<0.001	<0.001	0.001	0.151	<0.001	<0.001	<0.001	0.040	<0.001	0.003	0.226	0.004	0.304	0.542	<0.001	<0.001	<0.001	0.004	0.941	0.928
Ephemeroptera Family Richness	Pearson Correlation	-0.438	-0.383	0.334	0.158	-0.140	0.678	0.667	-	0.825	0.359	-0.316	-0.347	0.485	0.574	0.312	0.146	0.420	0.333	-0.095	0.151	-0.345	-0.290	-0.517	-0.336	-0.446	-0.069	-0.213	-0.212
	P-value (2-tailed)	<0.001	<0.001	0.001	0.119	0.167	<0.001	<0.001	-	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.002	0.150	<0.001	0.001	0.347	0.137	<0.001	0.004	<0.001	0.001	<0.001	0.495	0.034	0.035
Ephemeroptera LPL Richness	Pearson Correlation	-0.504	-0.468	0.344	0.174	-0.129	0.617	0.769	0.825	-	0.391	-0.348	-0.293	0.563	0.653	0.350	0.097	0.536	0.350	-0.116	0.197	-0.457	-0.406	-0.576	-0.437	-0.462	-0.149	-0.159	-0.158
	P-value (2-tailed)	<0.001	<0.001	<0.001	0.085	0.202	<0.001	<0.001	<0.001	-	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	0.342	<0.001	<0.001	0.253	0.051	<0.001	<0.001	<0.001	<0.001	<0.001	0.140	0.115	0.118
Plecoptera Family Richness	Pearson Correlation	-0.379	-0.448	0.445	0.238	-0.082	0.788	0.673	0.359	0.391	-	-0.257	-0.037	0.513	0.391	0.337	0.273	0.085	0.316	0.242	0.446	-0.064	-0.032	-0.502	-0.452	-0.493	-0.263	0.043	0.045
	P-value (2-tailed)	<0.001	<0.001	<0.001	0.018	0.420	<0.001	<0.001	<0.001	<0.001	-	0.010	0.716	<0.001	<0.001	0.001	0.006	0.405	0.001	0.016	<0.001	0.527	0.751	<0.001	<0.001	<0.001	0.008	0.671	0.661
Diptera LPL Richness	Pearson Correlation	0.462	0.428	-0.040	-0.121	0.228	-0.319	-0.339	-0.316	-0.348	-0.257	-	0.199	-0.603	-0.445	-0.171	-0.229	0.055	-0.532	-0.109	-0.141	0.200	0.153	0.572	0.496	0.390	0.306	0.111	0.110
	P-value (2-tailed)	<0.001	<0.001	0.696	0.234	0.023	0.001	0.001	0.001	<0.001	0.010	-	0.049	<0.001	<0.001	0.090	0.022	0.587	<0.001	0.283	0.164	0.047	0.131	<0.001	<0.001	<0.001	0.002	0.274	0.276
Ostracoda	Pearson Correlation	0.362	0.117	-0.188	-0.207	0.483	-0.158	-0.146	-0.347	-0.293	-0.037	0.199	-	-0.275	-0.226	-0.129	-0.077	-0.122	-0.158	-0.107	-0.108	0.058	-0.042	0.328	0.099	0.150	0.059	0.655	0.655
	P-value (2-tailed)	<0.001	0.252	0.064	0.041	<0.001	0.120	0.151	<0.001	0.003	0.716	0.049	-	0.006	0.025	0.205	0.448	0.230	0.119	0.293	0.291	0.571	0.682	0.001	0.332	0.141	0.564	<0.001	<0.001
% EPT	Pearson Correlation	-0.891	-0.815	0.391	0.333	-0.168	0.574	0.600	0.485	0.563	0.513	-0.603	-0.275	-	0.763	0.370	0.234	0.268	0.664	0.373	0.386	-0.124	-0.067	-0.957	-0.822	-0.618	-0.571	-0.210	-0.209
	P-value (2-tailed)	<0.001	<0.001	<0.001	0.001	0.096	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.006	-	<0.001	<0.001	0.020	0.007	<0.001	<0.001	<0.001	0.223	0.509	<0.001	<0.001	<0.001	<0.001	0.037	0.038
% Ephemeroptera	Pearson Correlation	-0.615	-0.541	0.146	0.038	-0.157	0.457	0.518	0.574	0.653	0.391	-0.445	-0.226	0.763	-	0.418	0.330	0.419	0.829	-0.138	0.352	-0.434	-0.392	-0.733	-0.630	-0.432	-0.420	-0.151	-0.150
	P-value (2-tailed)	<0.001	<0.001	0.149	0.705	0.121	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.025	<0.001	-	<0.001	0.001	<0.001	<0.001	0.174	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.137	0.139
% Baetidae	Pearson Correlation	-0.129	-0.090	0.402	0.365	-0.174	0.343	0.391	0.312	0.350	0.337	-0.171	-0.129	0.370	0.418	-	0.611	-0.018	0.142	-0.032	0.102	-0.141	-0.103	-0.347	-0.317	-0.244	-0.209	-0.019	-0.018
	P-value (2-tailed)	0.204	0.377	<0.001	<0.001	0.084	0.001	<0.001	0.002	<0.001	0.001	0.090	0.205	<0.001	<0.001	-	<0.001	0.861	0.160	0.751	0.314	0.163	0.311	<0.001	0.001	0.015	0.038	0.852	0.856
% Baetistricaudatus group	Pearson Correlation	0.026	-0.001	0.170	0.090	-0.096	0.259	0.207	0.146	0.097	0.273	-0.229	-0.077	0.234	0.330	0.611	-	-0.120	0.270	-0.110	-0.003	-0.110	-0.080	-0.219	-0.287	-0.175	-0.217	0.187	0.187
	P-value (2-tailed)	0.797	0.994	0.093	0.373	0.344	0.010	0.040	0.150	0.342	0.006	0.022	0.448	0.020	0.001	<0.001	-	0.236	0.007	0.279	0.975	0.279	0.432	0.030	0.004	0.083	0.031	0.064	0.063
% Ephemerellidae	Pearson Correlation	-0.393	-0.417	0.148	0.064	0.194	0.277	0.374	0.420	0.536	0.085	0.055	-0.122	0.268	0.419	-0.018	-0.120	-	-0.034	-0.196	0.050	-0.222	-0.200	-0.258	-0.217	-0.206	-0.051	-0.009	-0.009
	P-value (2-tailed)	<0.001	<0.001	0.142	0.527	0.054	0.005	<0.001	<0.001	<0.001	0.405	0.587	0.230	0.007	<0.001	0.861	0.236	-	0.740	0.052	0.624	0.027	0.047	0.010	0.031	0.041	0.617	0.929	0.932
% Heptageniidae	Pearson Correlation	-0.498	-0.415	-0.054	-0.126	-0.195	0.300	0.297	0.333	0.350	0.316	-0.532	-0.158	0.664	0.829	0.142	0.270	-0.034	-	-0.018	0.367	-0.330	-0.306	-0.634	-0.547	-0.320	-0.426	-0.158	-0.158
	P-value (2-tailed)	<0.001	<0.001	0.595	0.215	0.054	0.003	0.003	0.001	<0.001	0.001	<0.001	0.119	<0.001	<0.001	0.160	0.007	0.740	-	0.862	<0.001	0.001	0.002	<0.001	<0.001	0.001	<0.001	0.118	0.119
% Plecoptera	Pearson Correlation	-0.434	-0.447	0.288	0.328	-0.017	0.174	0.123	-0.095	-0.116	0.242	-0.109	-0.107	0.373	-0.138	-0.032	-0.110	-0.196	-0.018	-	0.118	0.444	0.469	-0.331	-0.270	-0.280	-0.182	-0.121	-0.121
	P-value (2-tailed)	<0.001	<0.001	0.004	0.001	0.870	0.085	0.226	0.347	0.253	0.016	0.283	0.293	<0.001	0.174	0.751	0.279	0.052	0.862	-	0.244	<0.001	<0.001	0.001	0.007	0.005	0.072	0.231	0.234
% Chloroperlidae	Pearson Correlation	-0.378	-0.371	0.204	0.150	-0.245	0.349	0.284	0.151	0.197	0.446	-0.141	-0.108	0.386	0.352	0.102	-0.003	0.050	0.367	0.118	-	-0.170	-0.154	-0.386	-0.334	-0.227	-0.258	-0.153	-0.153
	P-value (2-tailed)	<0.001	<0.001	0.043	0.139	0.015	<0.001	0.004	0.137	0.051	<0.001	0.164	0.291	<0.001	<0.001	0.314	0.975	0.624	<0.001	0.244	-	0.093	0.129	<0.001	0.001	0.024	0.010	0.130	0.131
% Nemouridae	Pearson Correlation	0.041	0.049	0.177	0.263	0.148	-0.094	-0.104	-0.345	-0.457	-0.064	0.200	0.058	-0.124	-0.434	-0.141	-0.110	-0.222	-0.330	0.444	-0.170	-	0.985	0.150	0.126	0.030	-0.065	0.052	0.052
	P-value (2-tailed)	0.684	0.627	0.080	0.009	0.145	0.355	0.304	<0.001	<0.001	0.527	0.047	0.571	0.223	<0.001	0.163	0.279	0.027	0.001	<0.001	0.093	-	<0.001	0.139	0.213	0.766	0.523	0.611	0.608
% Zapada	Pearson Correlation	-0.019	0.010	0.200	0.292	0.106	-0.049	-0.062	-0.290	-0.406	-0.032	0.153	-0.042	-0.067	-0.392	-0.103	-0.080	-0.200	-0.306	0.469	-0.154	0.985	-	0.088	0.096	-0.015	-0.063	-0.017	-0.017
	P-value (2-tailed)	0.850	0.920	0.047	0.003	0.296	0.633	0.542	0.004	<0.001	0.751	0.131	0.682	0.509	<0.001	0.311	0.432	0.047	0.002	<0.001	0.129	<0.001	-	0.387	0.346	0.879	0.538	0.864	0.867
% Diptera	Pearson Correlation	0.818	0.723	-0.460	-0.356	0.230	-0.576	-0.590	-0.517	-0.576	-0.502	0.572	0.328	-0.957	-0.733	-0.347	-0.219	-0.258	-0.634	-0.331	-0.386	0.150	0.088	-	0.879	0.645	0.616	0.263	0.262
	P-value (2-tailed)	<0.001	<0.001	<0.001	<0.001	0.022	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.030	0.010	<0.001	0.001	<0.001	0.139	0.387	-	<0.001	<0.001	<0.001	0.008	0.009
% Chironomidae	Pearson Correlation	0.588	0.636	-0.534	-0.399	0.157	-0.504	-0.525	-0.336	-0.437	-0.452	0.496	0.099	-0.822	-0.630	-0.317	-0.287	-0.217	-0.547	-0.270	-0.334	0.126	0.096	0.879	-	0.592	0.776	-0.111	-0.112
	P-value (2-tailed)	<0.001	<0.001	<0.001	<0.001	0.121	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.332	<0.001	<0.001	0.001	0.004	0.031	<0.001	0.007	0.001	0.213	0.346	<0.001	-	<0.001	<0.001	0.274	0.268
% Micropsectra	Pearson Correlation	0.555	0.631	-0.462	-0.315	0.261	-0.533	-0.543	-0.446	-0.462	-0.493	0.390	0.150	-0.618	-0.432	-0.244	-0.175	-0.206	-0.320	-0.280	-0.227	0.030	-0.015	0.645	0.592	-	0.288	0.032	0.030
	P-value (2-tailed)	<0.001	<0.001	<0.001	0.002	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.141	<0.001	<0.001	0.015	0.083	0.041	0.001	0.005	0.024	0.766	0.879	<0.001	<0.001	-	0.004	0.753	0.768
% Orthocladius	Pearson Correlation	0.364	0.408	-0.406	-0.297	0.105	-0.267	-0.287	-0.069	-0.149	-0.263	0.306	0.059	-0.571	-0.420	-0.209	-0.217	-0.051	-0.426	-0.182	-0.258	-0.065	-0.063	0.616	0.776	0.288	-	-0.122	-0.123
	P-value (2-tailed)	<0.001	<0.001	<0.001	0.003	0.301	0.008	0.004	0.495	0.140	0.008	0.002	0.564	<0.001	<0.001	0.038	0.031	0.617	<0.001	0.072	0.010	0.523	0.538	<0.001	<0.001	0.004	-	0.228	0.224
% Psychodidae	Pearson Correlation	0.404	0.037	0.086	0.047	0.356	0.004	0.008	-0.213	-0.159	0.043	0.111	0.655	-0.210	-0.151	-0.019	0.187	-0.009	-0.158	-0.121	-0.153	0.052	-0.017	0.263	-0.111	0.032	-0.122	-	1.000
	P-value (2-tailed)	<0.001	0.716	0.395	0.642	<0.001	0.970	0.941	0.034	0.115	0.671	0.274	<0.001	0.037	0.137	0.852	0.064	0.929	0.118	0.231	0.130	0.611	0.864	0.008	0.274	0.753	0.228	-	<0.001
% Pericoma/ Telmatoscopus sp.	Pearson Correlation	0.403	0.036	0.088	0.048	0.356	0.006	0.009	-0.212	-0.158	0.045	0.110	0.655	-0.209	-0.150	-0.018	0.187	-0.009	-0.158	-0.121	-0.153	0.052	-0.017	0.262	-0.112	0.030	-0.123	1.000	-
	P-value (2-tailed)	<0.001	0.725	0.386	0.638	<0.001	0.956	0.928	0.035	0.118	0.661	0.276	<0.001	0.038	0.139	0.856	0.063	0.932	0.119	0.234	0.131	0.608	0.867	0.009	0.268	0.768	0.224	<0.001	-

r ≥ 0.6 or r ≤ -0.6

P-value < 0.05

Table G.8: Comparison of Benthic Invertebrate Community Endpoints for Reference (n = 40) and Mine-exposed Areas (n = 59) in the Elk Valley to the 2.5th and 97.5th Percentiles (Prior to the Outlier Evaluation) for the 2015 Reference Area Distribution, September 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Univariate Indicators									Univariate Indicators (significantly correlated with WQ PC-1)					Axis 1 Scores from NMDS Ordinations[a] (significantly correlated with WQ PC-1)									
																			Family-Level NMDS (2015 data only)					LPL-Level NMDS (2015 data only)				
					Total Abundance	Simpson's Diversity (Family)	Simpson's Evenness (Family)	Simpson's Diversity (LPL)	Simpson's Evenness (LPL)	Family Richness	LPL Richness	EPT Family Richness	EPT LPL Richness	Ephemeroptera Family Richness	Ephemeroptera LPL Richness	% EPT	% Ephemeroptera	% Diptera	Presence/Absence (3D-Ordination)	Relative Abundance (4th root transformation) (3D-Ordination)	Relative Abundance (no transformation) (2D-Ordination)	Abundance (log transformation) (2D-Ordination)	Abundance (no transformation) (2D-Ordination)	Presence/Absence (3D-Ordination)	Relative Abundance (4th root transformation) (2D-Ordination)	Relative Abundance (no transformation) (2D-Ordination)	Abundance (log transformation) (3D-Ordination)	Abundance (no transformation) (2D-Ordination)
				$P_{2.5}$[b]	**471**	**0.633**	**0.154**	**0.695**	**0.132**	**16**	**22**	**10**	**12**	**3**	**4**	**38**	**21**	**2.4**	**-1.03**	**-0.810**	**-1.21**	**-1.22**	**-1.95**	**-1.07**	**-1.26**	**-1.25**	**-1.44**	**-1.78**
				$P_{97.5}$[b]	**11,732**	**0.884**	**0.447**	**0.931**	**0.459**	**24**	**39**	**16**	**21**	**5**	**9**	**97**	**72**	**49**	**0.444**	**0.304**	**0.816**	**0.317**	**0.561**	**0.392**	**0.436**	**0.519**	**0.385**	**0.502**
Reference	1	Fording	T	HENUP	7,500	0.579	0.170	0.607	0.121	14	20	12	14	4	5	96	68	4.0	-0.915	-0.961	-1.32	-0.641	-0.016	-0.605	-0.952	-1.11	-0.684	0.149
				CHCK	13,360	0.811	0.252	0.934	0.434	21	32	15	20	4	6	69	42	29	-0.168	0.086	-0.085	0.092	0.704	0.003	0.063	-0.358	0.233	0.624
				EWCK	6,060	0.824	0.355	0.917	0.389	16	31	12	18	3	7	87	61	12	-0.851	-0.917	-0.406	-0.649	0.074	-0.789	-0.660	-0.467	-0.416	0.034
			M	FO26	9,400	0.787	0.247	0.878	0.282	19	29	13	15	4	5	86	67	14	-0.673	-0.613	-0.487	-0.491	0.368	-0.194	-0.355	-0.462	-0.115	0.394
	2	Fording	T	LC_GRCK	6,760	0.867	0.395	0.878	0.329	19	26	14	17	3	4	93	20	7.1	-0.369	-0.133	-0.145	0.288	0.050	-0.578	-0.522	0.073	-0.344	-0.221
				LI24	3,008	0.670	0.168	0.904	0.454	18	21	13	14	3	4	93	63	5.7	-0.513	-0.310	-1.12	-0.222	-0.536	-0.394	-0.966	-1.16	-0.578	-0.441
				SLINE	6,505	0.777	0.264	0.926	0.498	17	27	14	21	4	8	94	60	5.4	-1.16	-0.692	-0.813	-0.790	0.043	-0.852	-0.797	-0.818	-0.513	0.094
	3	Elk	M	ELUGH	4,044	0.804	0.319	0.842	0.275	16	22	13	15	3	5	92	55	7.4	-0.716	-0.776	-0.892	-0.501	-0.273	-0.673	-0.568	-0.626	-0.542	-0.148
	4	Michel	T	ALUSM	8,900	0.835	0.288	0.840	0.184	21	34	12	16	3	6	69	41	29	0.130	0.093	-0.324	0.239	0.542	-0.121	-0.086	0.166	-0.003	0.490
				MI25	7,140	0.866	0.372	0.880	0.270	20	31	15	17	4	6	84	47	16	-0.513	-0.383	-0.168	-0.288	0.198	-0.375	-0.460	-0.304	-0.296	0.184
			M	AGCK	7,180	0.549	0.159	0.727	0.166	14	22	11	15	4	6	97	68	2.5	-0.693	-0.764	-1.51	-0.399	-0.088	-0.754	-0.934	-1.24	-0.628	0.086
				AL4	10,960	0.855	0.362	0.836	0.218	19	28	10	14	3	6	82	57	17	0.423	0.087	-0.301	0.305	0.480	0.124	0.025	0.024	0.237	0.392
		Elk	T	GRUHA	4,891	0.837	0.266	0.837	0.186	23	32	16	20	4	5	96	45	3.1	-0.979	-0.747	-0.898	-0.592	-0.229	-0.482	-0.468	-0.542	-0.422	-0.158
	5	Elk	T	MCCR	11,620	0.723	0.201	0.670	0.126	18	24	13	18	3	7	95	24	4.3	-0.470	-0.431	-0.759	-0.225	0.446	-0.837	-0.686	-0.283	-0.536	0.410
				WWRU	777	0.767	0.252	0.726	0.159	17	23	11	14	4	7	94	46	3.6	-0.019	-0.424	-0.739	-0.635	-1.77	-1.05	-1.10	-0.780	-1.43	-1.70
				WWRL	4,856	0.836	0.359	0.824	0.247	17	23	11	12	3	4	78	41	21	0.088	-0.199	0.000	-0.123	-0.095	-0.733	-0.527	-0.171	-0.461	-0.140
	N/A	Kootenay	-	BU2	1,515	0.761	0.182	0.862	0.268	23	28	14	17	4	7	92	54	4.0	-0.432	-0.707	-1.08	-0.560	-1.04	-0.885	-0.857	-0.854	-0.900	-0.911
				BU40	3,440	0.900	0.452	0.930	0.432	22	34	14	19	4	7	60	35	28	-0.401	-0.210	0.145	-0.256	-0.312	-0.079	0.049	0.041	0.037	-0.290
				BUUQ	3,070	0.835	0.303	0.883	0.284	20	29	16	17	4	4	83	40	16	-0.430	-0.343	-0.269	-0.303	-0.436	-0.148	-0.236	-0.313	-0.284	-0.415
				CRUKO	541	0.780	0.284	0.697	0.132	16	23	12	18	4	9	97	48	1.7	-1.02	-1.11	-1.17	-1.51	-1.85	-1.30	-1.24	-0.840	-1.54	-1.64
				KO1	846	0.642	0.155	0.751	0.183	18	23	10	10	4	4	82	74	14	-0.800	-0.538	-1.07	-1.19	-1.51	0.015	-0.760	-1.26	-0.640	-1.31
				KODCR	466	0.840	0.330	0.858	0.244	19	28	12	16	4	8	85	67	14	-0.601	-0.671	-0.706	-1.17	-1.97	-0.615	-0.774	-0.605	-1.21	-1.82
				KOUCR	489	0.882	0.446	0.897	0.303	19	29	13	18	4	7	81	51	18	-0.142	-0.428	-0.165	-1.01	-1.89	-0.501	-0.677	-0.402	-0.992	-1.77
				KOUVE	2,276	0.806	0.234	0.769	0.160	22	30	12	14	4	6	38	30	24	0.481	0.420	0.368	0.232	-0.847	0.454	0.334	0.071	0.190	-0.683
				PADAL	557	0.861	0.342	0.888	0.254	21	33	15	21	5	8	93	52	6.3	-0.184	-0.319	-0.424	-0.777	-1.74	-0.562	-0.779	-0.484	-1.09	-1.62
				PAUKO	471	0.857	0.368	0.829	0.177	19	31	12	17	4	7	87	46	11	-0.248	-0.425	-0.719	-0.816	-1.95	-0.675	-0.763	-0.692	-1.16	-1.77
				VEUKO	705	0.713	0.158	0.801	0.186	22	30	9	13	4	7	84	71	14	0.440	-0.219	-0.874	-0.933	-1.63	-0.968	-1.46	-1.15	-1.12	-1.49
				VEUP	756	0.860	0.421	0.873	0.293	17	25	12	17	4	7	64	34	29	-0.249	-0.189	0.219	-0.662	-1.39	-0.509	-0.485	0.181	-0.676	-1.31
		Oldman	-	DACK	9,840	0.859	0.339	0.868	0.211	21	34	15	19	4	6	83	53	15	-0.125	-0.101	0.004	0.090	0.452	-0.159	-0.090	0.143	0.028	0.326
				DUCK	5,951	0.763	0.176	0.896	0.254	24	37	14	19	4	6	45	23	48	-0.013	0.259	0.812	0.159	0.388	0.028	0.241	0.624	0.266	0.321
				OLDDU	1,977	0.870	0.350	0.912	0.344	22	35	14	16	4	6	68	36	26	-0.348	-0.192	0.193	-0.341	-0.749	0.132	-0.120	-0.165	-0.194	-0.774
				OLDLI	6,086	0.735	0.199	0.875	0.275	19	28	13	17	3	5	94	65	5.4	-0.273	-0.538	-0.958	-0.306	-0.081	-0.964	-0.990	-1.03	-0.804	-0.089
				OLDLOW	3,523	0.825	0.286	0.902	0.351	20	30	13	17	5	8	83	39	13	-0.420	-0.374	0.046	-0.777	-0.479	-0.301	-0.233	-0.180	-0.283	-0.364
				RACK	3,210	0.820	0.213	0.937	0.415	26	40	16	20	4	7	78	55	16	-0.075	-0.008	-0.434	0.032	-0.350	-0.091	-0.136	-0.583	-0.175	-0.360
				VICK	8,520	0.866	0.413	0.888	0.271	18	32	12	16	4	6	69	40	25	-0.121	-0.083	0.029	-0.004	0.350	-0.137	-0.162	-0.241	-0.047	0.226
		Elk	-	CADCK	11,200	0.755	0.215	0.874	0.264	19	28	13	17	3	6	86	58	13	-0.479	-0.631	-0.700	-0.347	0.409	-0.548	-0.608	-0.691	-0.295	0.393
				EL12	8,740	0.820	0.252	0.870	0.241	22	32	15	20	5	9	85	60	14	0.123	-0.192	-0.550	0.030	0.220	-0.001	-0.024	-0.375	0.093	0.277
		Flathead	-	FLAD	12,740	0.717	0.147	0.882	0.229	24	39	13	17	3	6	35	22	55	0.258	0.160	0.859	0.172	0.733	0.332	0.404	0.507	0.367	0.618
				FLAU	6,520	0.841	0.299	0.896	0.343	21	31	12	14	5	6	63	37	35	0.354	0.291	0.356	0.431	0.294	0.386	0.725	0.167	0.552	0.236
				FLRU	5,506	0.833	0.250	0.889	0.258	24	33	14	18	5	7	63	51	33	0.319	0.077	0.254	0.249	0.181	-0.124	0.128	-0.457	0.058	-0.139

value > upper limit ($P_{97.5}$) of the normal range

value < lower limit ($P_{2.5}$) of the normal range

[a] Axis is scaled so that it is positively correlated with PC-1 for water quality (i.e. multiplied by -1 when negatively correlated with PC-1)

[b] Percentiles based on 2015 reference area disitrbution (n = 40) prior to outlier evaluation

Table G.8: Comparison of Benthic Invertebrate Community Endpoints for Reference (n = 40) and Mine-exposed Areas (n = 59) in the Elk Valley to the 2.5th and 97.5th Percentiles (Prior to the Outlier Evaluation) for the 2015 Reference Area Distribution, September 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Univariate Indicators									Univariate Indicators (significantly correlated with WQ PC-1)					Axis 1 Scores from NMDS Ordinations[a] (significantly correlated with WQ PC-1)									
																			Family-Level NMDS (2015 data only)					LPL-Level NMDS (2015 data only)				
					Total Abundance	Simpson's Diversity (Family)	Simpson's Evenness (Family)	Simpson's Diversity (LPL)	Simpson's Evenness (LPL)	Family Richness	LPL Richness	EPT Family Richness	EPT LPL Richness	Ephemeroptera Family Richness	Ephemeroptera LPL Richness	% EPT	% Ephemeroptera	% Diptera	Presence/Absence (3D-Ordination)	Relative Abundance (4th root transformation) (3D-Ordination)	Relative Abundance (no transformation) (2D-Ordination)	Abundance (log transformation) (2D-Ordination)	Abundance (no transformation) (2D-Ordination)	Presence/Absence (3D-Ordination)	Relative Abundance (4th root transformation) (2D-Ordination)	Relative Abundance (no transformation) (2D-Ordination)	Abundance (log transformation) (3D-Ordination)	Abundance (no transformation) (2D-Ordination)
				$P_{2.5}$[b]	**471**	**0.633**	**0.154**	**0.695**	**0.132**	**16**	**22**	**10**	**12**	**3**	**4**	**38**	**21**	**2.4**	**-1.03**	**-0.810**	**-1.21**	**-1.22**	**-1.95**	**-1.07**	**-1.26**	**-1.25**	**-1.44**	**-1.78**
				$P_{97.5}$[b]	**11,732**	**0.884**	**0.447**	**0.931**	**0.459**	**24**	**39**	**16**	**21**	**5**	**9**	**97**	**72**	**49**	**0.444**	**0.304**	**0.816**	**0.317**	**0.561**	**0.392**	**0.436**	**0.519**	**0.385**	**0.502**
Mine-exposed	1	Fording	T	HENFO	13,820	0.713	0.193	0.887	0.287	18	29	13	18	4	7	84	75	15	-0.430	-0.548	-0.495	-0.479	0.734	-0.232	-0.252	-0.675	-0.079	0.730
				NGD1	9,760	0.787	0.313	0.879	0.285	15	27	7	10	2	2	60	28	39	0.868	0.897	0.761	0.897	0.725	1.17	1.12	0.738	1.06	0.534
				KICK	497	0.516	0.122	0.889	0.451	17	22	8	9	2	2	16	0	77	0.893	1.38	1.81	1.28	-1.17	0.837	1.29	1.83	0.889	-1.61
				SWCK	6,214	0.586	0.161	0.831	0.269	15	24	5	6	0	0	29	0	69	2.07	2.09	1.73	2.01	0.987	1.80	2.08	1.91	1.73	0.912
				CATCK	4,030	0.402	0.167	0.817	0.364	10	18	2	2	0	0	12	0	81	3.25	3.12	2.21	3.14	0.945	2.65	2.89	2.06	2.15	0.968
				POCK	22,160	0.453	0.079	0.779	0.162	23	30	9	11	3	3	19	0.9	74	0.984	1.42	1.76	1.18	1.66	0.908	1.20	1.60	1.05	1.49
				LC_DCDS	7,640	0.794	0.255	0.845	0.223	19	27	14	17	4	6	91	60	8.1	-0.642	-0.452	-0.450	-0.365	0.254	-0.566	-0.587	-0.591	-0.451	0.303
				LC_DC1	7,140	0.813	0.297	0.894	0.392	18	25	11	14	3	4	91	54	7.6	-0.320	-0.348	-0.570	-0.232	0.191	-0.279	-0.394	-0.521	-0.246	0.237
				GHCKD	10,560	0.838	0.220	0.911	0.303	28	40	12	13	4	4	21	6.4	54	0.947	1.33	1.47	1.26	0.854	1.31	1.55	1.45	1.34	0.620
				GHCKU	774	0.552	0.149	0.681	0.131	15	24	8	9	2	2	25	1.9	74	0.641	0.818	1.42	0.557	-0.937	0.735	0.979	1.20	0.658	-1.00
			M	FODHE	17,060	0.790	0.251	0.845	0.248	19	27	13	15	4	6	78	61	22	-0.213	-0.583	-0.103	-0.408	0.919	-0.578	-0.324	-0.214	-0.076	0.844
				FOUNGD	7,260	0.681	0.209	0.905	0.405	15	23	11	15	4	6	93	75	7.2	-0.655	-0.755	-0.885	-0.452	0.095	-0.425	-0.494	-0.666	-0.332	0.177
				FODNGD	7,840	0.677	0.194	0.870	0.284	16	23	11	14	3	5	94	77	5.4	0.422	-0.055	-0.981	0.165	0.153	0.046	-0.111	-0.738	-0.008	0.262
				MP1	5,470	0.790	0.207	0.901	0.305	23	32	14	17	4	5	70	51	28	-0.041	0.030	-0.091	0.020	0.068	0.211	0.166	-0.089	0.226	0.101
				FOUSH	7,320	0.754	0.193	0.837	0.219	21	28	12	13	4	5	86	73	12	0.285	-0.005	-0.764	0.036	0.065	0.270	0.046	-0.599	0.159	0.118
				FOUKI	3,490	0.767	0.204	0.859	0.236	21	30	13	18	4	7	75	65	21	0.186	0.138	-0.812	0.137	-0.347	-0.201	-0.042	-0.705	-0.111	-0.241
				FOBKS	4,161	0.832	0.314	0.808	0.193	19	25	13	16	3	5	69	47	28	0.090	-0.063	-0.820	-0.043	-0.308	-0.350	-0.241	-0.406	-0.239	-0.178
				FOBSC	2,923	0.867	0.343	0.849	0.245	22	26	14	16	4	5	62	40	32	0.141	0.167	-0.641	0.081	-0.593	0.170	0.075	-0.108	0.031	-0.387
				FOBCP	4,260	0.836	0.290	0.913	0.443	21	27	11	13	3	3	78	16	21	0.407	0.396	0.464	0.274	-0.141	0.528	0.421	0.458	0.359	-0.075
				FODPO	10,340	0.816	0.303	0.740	0.167	18	22	10	10	2	2	90	7.9	10	0.669	0.437	0.088	0.547	0.920	0.523	0.399	0.270	0.420	0.781
				FO10-SP1	13,800	0.692	0.171	0.854	0.229	19	29	11	14	3	5	75	6.2	23	0.559	0.534	0.989	0.474	1.11	0.355	0.441	1.04	0.388	1.10
				FO22	21,140	0.813	0.243	0.912	0.344	22	30	12	14	3	5	65	13	22	0.636	0.541	0.757	0.559	1.19	0.315	0.331	0.761	0.398	1.04
				FOUEW	7,720	0.841	0.330	0.861	0.277	19	25	12	14	3	4	71	26	24	0.054	0.329	0.338	0.221	0.407	0.306	0.274	0.195	0.351	0.380
				LC_FRUS	2,065	0.824	0.259	0.905	0.341	22	30	11	14	4	6	64	39	31	-0.280	0.060	0.128	-0.080	-0.535	0.214	0.281	-0.031	0.226	-0.511
				FO29	8,580	0.851	0.268	0.937	0.404	25	37	15	19	4	6	56	36	36	-0.202	0.036	0.372	0.035	0.447	0.329	0.280	0.237	0.369	0.313
				FODGH	10,980	0.886	0.381	0.887	0.287	23	28	12	14	3	4	78	35	18	0.268	0.180	-0.053	0.269	0.471	0.150	0.061	0.002	0.186	0.432
	2	Fording	T	LILC3	19,360	0.593	0.137	0.846	0.241	18	26	11	12	3	3	33	8.5	63	0.069	0.282	1.35	0.329	1.23	0.120	0.227	0.758	0.304	1.10
				LIDSL	6,980	0.847	0.297	0.934	0.486	22	30	14	17	4	5	74	38	22	0.027	-0.063	-0.053	-0.042	0.167	-0.031	-0.098	-0.180	0.035	0.109
				LI8	3,390	0.865	0.353	0.849	0.214	21	29	13	17	3	4	87	26	8.3	-0.472	-0.273	-0.363	-0.412	-0.591	-0.214	-0.249	-0.292	-0.203	-0.507
			M	FO9	6,720	0.840	0.330	0.863	0.291	19	24	14	16	4	5	72	40	24	-0.464	-0.380	-0.782	-0.187	-0.019	-0.129	-0.173	-0.371	-0.168	0.075
				FRUL	3,006	0.868	0.400	0.836	0.226	19	25	11	12	3	3	83	30	15	0.647	0.250	-0.685	0.416	-0.576	0.116	-0.007	-0.325	-0.111	-0.481
				FO23	3,780	0.895	0.380	0.922	0.321	25	39	14	17	4	6	65	21	30	0.080	0.187	0.514	0.113	-0.143	0.069	0.114	0.410	0.119	-0.129
	3	Elk	T	WOCK	1,244	0.809	0.262	0.903	0.369	20	30	10	10	1	1	38	0	51	0.782	1.29	1.69	1.31	-0.607	1.11	1.53	1.82	1.22	-0.754
				THCK	2,412	0.738	0.212	0.707	0.142	18	25	7	9	1	1	17	1.1	56	1.30	1.69	1.32	1.90	-0.386	1.57	2.24	2.00	1.79	-0.081
			M	EL20	6,218	0.840	0.329	0.873	0.291	19	29	14	19	3	6	92	55	7.8	0.027	-0.635	-0.722	-0.258	-0.036	-0.262	-0.322	-0.645	-0.232	-0.041
				ELUEL	5,135	0.857	0.332	0.918	0.450	21	27	15	17	4	6	82	55	16	-0.215	-0.445	-0.540	-0.255	-0.105	0.043	-0.153	-0.414	-0.104	-0.031
				ELDEL	7,740	0.773	0.210	0.915	0.405	21	28	15	17	3	5	87	61	13	0.024	-0.464	-0.654	-0.133	0.118	-0.037	-0.239	-0.571	-0.121	0.126
				ELUFO	8,980	0.731	0.162	0.836	0.196	23	34	12	13	5	6	40	17	53	-0.009	0.230	1.10	0.126	0.724	0.722	0.750	0.861	0.668	0.772
	4	Michel	T	CORCK	29,180	0.646	0.129	0.602	0.081	22	34	9	11	0	0	17	0	78	1.53	1.86	1.73	1.70	2.03	1.27	1.68	1.96	1.44	1.84
				BOCK	8,140	0.701	0.239	0.744	0.178	14	26	5	5	0	0	7.6	0	75	3.07	2.89	2.10	2.83	1.05	2.34	2.78	2.50	2.15	0.895

value > upper limit ($P_{97.5}$) of the normal range

value < lower limit ($P_{2.5}$) of the normal range

[a] Axis is scaled so that it is positively correlated with PC-1 for water quality (i.e. multiplied by -1 when negatively correlated with PC-1)

[b] Percentiles based on 2015 reference area disitrbution (n = 40) prior to outlier evaluation

Table G.8: Comparison of Benthic Invertebrate Community Endpoints for Reference (n = 40) and Mine-exposed Areas (n = 59) in the Elk Valley to the 2.5th and 97.5th Percentiles (Prior to the Outlier Evaluation) for the 2015 Reference Area Distribution, September 2015

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Univariate Indicators									Univariate Indicators (significantly correlated with WQ PC-1)					Axis 1 Scores from NMDS Ordinations[a] (significantly correlated with WQ PC-1)									
																			Family-Level NMDS (2015 data only)					LPL-Level NMDS (2015 data only)				
					Total Abundance	Simpson's Diversity (Family)	Simpson's Evenness (Family)	Simpson's Diversity (LPL)	Simpson's Evenness (LPL)	Family Richness	LPL Richness	EPT Family Richness	EPT LPL Richness	Ephemeroptera Family Richness	Ephemeroptera LPL Richness	% EPT	% Ephemeroptera	% Diptera	Presence/Absence (3D-Ordination)	Relative Abundance (4th root transformation) (3D-Ordination)	Relative Abundance (no transformation) (2D-Ordination)	Abundance (log transformation) (2D-Ordination)	Abundance (no transformation) (2D-Ordination)	Presence/Absence (3D-Ordination)	Relative Abundance (4th root transformation) (2D-Ordination)	Relative Abundance (no transformation) (2D-Ordination)	Abundance (log transformation) (3D-Ordination)	Abundance (no transformation) (2D-Ordination)
				$P_{2.5}$[b]	471	0.633	0.154	0.695	0.132	16	22	10	12	3	4	38	21	2.4	-1.03	-0.810	-1.21	-1.22	-1.95	-1.07	-1.26	-1.25	-1.44	-1.78
				$P_{97.5}$[b]	11,732	0.884	0.447	0.931	0.459	24	39	16	21	5	9	97	72	49	0.444	0.304	0.816	0.317	0.561	0.392	0.436	0.519	0.385	0.502
Mine-exposed	4	Michel	M	MIUCO	7,820	0.819	0.308	0.867	0.228	18	31	12	17	4	7	72	53	23	-0.306	-0.283	-0.507	-0.117	0.327	-0.294	-0.345	-0.134	-0.225	0.336
				MIDCO	12,360	0.847	0.311	0.872	0.236	21	32	14	17	3	4	51	22	45	0.121	0.210	0.643	0.243	0.870	0.088	0.313	0.657	0.312	0.720
				MIDAG	14,520	0.839	0.327	0.816	0.160	19	31	11	16	4	8	72	43	26	0.095	-0.170	-0.579	0.102	0.573	-0.056	-0.345	-0.432	-0.051	0.564
				MI5	7,120	0.804	0.269	0.742	0.176	19	22	13	14	4	5	87	30	10	0.046	-0.306	-0.464	0.046	-0.256	-0.604	-1.01	-0.601	-0.658	-0.167
				MI3	7,660	0.870	0.366	0.859	0.273	21	26	14	16	4	6	80	38	17	-0.105	-0.317	-0.448	-0.105	0.070	-0.751	-0.851	-0.509	-0.527	0.014
				MI2	6,119	0.889	0.393	0.931	0.401	23	33	15	18	4	5	73	30	25	0.242	-0.026	0.055	0.100	0.083	-0.054	0.015	0.000	0.047	0.023
		Elk	T	HACKUS	15,540	0.894	0.408	0.894	0.235	23	35	15	19	3	4	85	36	12	0.001	-0.076	-0.248	0.204	0.660	0.104	-0.032	-0.112	0.176	0.568
				HACKDS	10,160	0.796	0.273	0.906	0.345	18	32	11	17	4	5	50	29	40	-1.33	-0.429	0.631	-0.382	0.662	0.216	0.214	0.173	0.465	0.633
				GRCK	7,740	0.894	0.428	0.933	0.396	22	33	14	20	4	6	87	44	11	-0.575	-0.378	-0.341	-0.156	0.233	-0.220	-0.243	-0.073	-0.046	0.301
				GRDS	8,400	0.891	0.416	0.901	0.336	22	30	16	20	4	5	76	30	21	-0.635	-0.360	0.144	-0.145	0.546	-0.339	-0.176	0.313	-0.090	0.494
				OCNM	1,373	0.887	0.306	0.867	0.260	29	40	9	10	2	2	34	2.1	22	1.04	1.22	1.46	1.28	-0.979	1.26	1.60	1.30	0.898	-0.963
			M	EL19	3,240	0.815	0.235	0.835	0.189	23	32	13	15	3	5	60	29	37	0.239	0.212	0.545	0.145	-0.275	0.207	0.193	0.289	0.141	-0.215
				ELDGR	1,288	0.782	0.191	0.902	0.329	24	30	15	17	4	6	89	64	10	-0.045	-0.237	-0.710	-0.275	-1.05	-0.028	-0.180	-0.514	-0.393	-0.860
				ELUSP	6,460	0.847	0.326	0.877	0.326	20	25	12	13	3	4	68	43	28	-0.354	-0.433	-0.026	-0.415	0.138	-0.111	-0.245	-0.181	-0.171	0.139
	5	Elk	M	EL1	7,720	0.792	0.219	0.835	0.189	22	32	15	20	4	9	70	54	29	-0.168	-0.369	0.259	-0.396	0.386	-0.473	-0.389	-0.045	-0.277	0.279
				ELDFE	17,160	0.616	0.124	0.823	0.172	21	33	12	15	5	7	73	65	20	-0.380	-0.186	0.709	-0.812	1.35	0.004	0.042	0.374	0.112	1.38
				ELUFE	11,000	0.718	0.178	0.800	0.161	20	32	11	15	5	9	61	54	27	-0.603	-0.292	0.807	-0.869	0.939	0.032	0.066	0.387	0.122	0.944
				ELELKO	7,880	0.725	0.227	0.802	0.229	16	22	13	15	5	6	92	67	8.1	-1.00	-1.24	-1.10	-1.10	0.036	-0.659	-0.928	-0.980	-0.779	0.044
				ELH93	2,858	0.640	0.199	0.737	0.181	14	23	11	11	5	5	22	14	54	-1.49	-0.886	1.34	-1.67	-0.036	0.328	0.301	0.816	0.014	-0.160

value > upper limit ($P_{97.5}$) of the normal range

value < lower limit ($P_{2.5}$) of the normal range

[a] Axis is scaled so that it is positively correlated with PC-1 for water quality (i.e. multiplied by -1 when negatively correlated with PC-1)

[b] Percentiles based on 2015 reference area disitrbution (n = 40) prior to outlier evaluation

Table G.9: Summary Statistics for Benthic Invertebrate Endpoints for Reference Areas (n = 40), in the Elk Valley, September 2015

Endpoint		Units	Summary Statistics [a]								
			Minimum	2.5th Percentile	25th Percentile	Median	75th Percentile	97.5th Percentile	Maximum	Mean	SD
Hilsenhoff Biotic Index (HBI; Family)		unitless	2.21	2.41	2.65	2.96	3.37	4.37	5.88	3.07	0.641
HBI (LPL)		unitless	1.82	2.33	2.85	3.13	3.50	4.73	6.02	3.26	0.732
Simpson's Diversity (Family)		unitless	0.549	0.578	0.762	0.822	0.855	0.883	0.900	0.796	0.080
Evenness (Family)		unitless	0.147	0.155	0.210	0.275	0.351	0.447	0.452	0.281	0.087
Simpson's Diversity (LPL)		unitless	0.607	0.669	0.834	0.874	0.896	0.934	0.937	0.849	0.076
Evenness (LPL)		unitless	0.121	0.126	0.186	0.261	0.310	0.455	0.498	0.268	0.094
Total Abundance		#/sample	466	471	1,862	5,199	7,755	12,756	13,360	5,298	3,833
Total Family Richness		#/sample	14	14	18	19	22	24	26	20	3
Total LPL Richness		#/sample	20	21	26	30	32	39	40	29	5
EPT		#/sample	394	398	1,225	3,748	6,168	9,695	11,040	4,155	3,078
EPT Family Richness		#/sample	9	10	12	13	14	16	16	13	2
EPT LPL Richness		#/sample	10	12	15	17	18	21	21	17	2
Ephemeroptera	Order: Ephemeroptera	#/sample	219	246	711	2,092	3,746	6,345	6,540	2,491	1,960
	Ephemeroptera Family Richness	#/sample	3	3	3	4	4	5	5	4	1
	Ephemeroptera LPL Richness	#/sample	4	4	6	6	7	9	9	6	1
	Family: Baetidae	#/sample	0	5	82	255	528	2,821	2,840	504	682
	Genus: *Baetis*	#/sample	0	0	65	158	523	2,347	2,620	432	616
	Genus: Baetis tricaudatus group	#/sample	0	0	2	17	46	284	420	47	86
	Family: Ephemerellidae	#/sample	16	23	84	430	791	1,822	2,660	570	593
	Drunella doddsii	#/sample	0	0	9	58	265	546	660	145	167
	Family: Heptageniidae	#/sample	78	86	330	929	1,703	4,590	4,960	1,365	1,403
	Genus: Epeorus	#/sample	0	0	0	13	60	305	483	60	105
	Genus: Rhithrogena	#/sample	0	0	3	38	121	773	860	104	184
Plecoptera	Order: Plecoptera	#/sample	54	59	233	830	1,870	2,864	3,020	1,037	870
	Plecoptera Family Richness	#/sample	3	4	5	6	6	7	7	6	1
	Plecoptera LPL Richness	#/sample	3	4	6	6	8	9	9	7	1
	Family: Chloroperlidae	#/sample	0	5	36	101	200	545	743	143	151
	Genus: Sweltsa	#/sample	0	0	21	59	145	526	743	116	149
	Family: Nemouridae	#/sample	0	1	40	155	325	1,152	1,620	272	358
	Genus: Zapada	#/sample	0	1	40	140	320	1,152	1,620	249	346
	Zapada columbiana	#/sample	0	0	0	4	60	502	560	61	124
	Family: Taeniopterygidae	#/sample	0	0	30	139	462	1,643	1,760	365	496
	Genus: Taenionema	#/sample	0	0	30	131	418	1,643	1,760	351	480
Order: Trichoptera		#/sample	0	6	127	318	710	2,827	6,240	627	1,060
Trichoptera Family Richness		#/sample	0	1	3	4	4	5	5	4	1
Trichoptera LPL Richness		#/sample	0	1	3	4	5	6	7	4	1
Diptera	Order: Diptera	#/sample	9	28	168	500	1,360	3,940	7,060	997	1,341
	Diptera Family Richness	#/sample	2	2	3	4	4	6	7	4	1
	Diptera LPL Richness	#/sample	3	4	8	10	12	14	16	10	3
	Family: Chironomidae	#/sample	2	21	118	388	1,040	2,833	6,460	775	1,154
	Chironomidae LPL Richness	#/sample	2	2	5	6	8	10	11	6	2
	Genus: Micropsectra	#/sample	0	0	0	19	65	406	620	70	132
	Genus: Orthocladius	#/sample	0	0	20	74	244	1,068	3,060	252	515
	Family: Muscidae	#/sample	0	0	0	0	0	1	14	0	2
	Genus: Limnophora	#/sample	0	0	0	0	0	1	14	0	2
	Family: Psychodidae	#/sample	0	0	0	8	143	1,023	1,900	138	341
	Genus: Pericoma/Telmatoscopus	#/sample	0	0	0	8	143	1,023	1,900	138	341
Oligochaeta	Class: Oligochaeta	#/sample	0	0	0	1	20	838	1,060	61	209
	Oligochaeta Family Richness	#/sample	0	0	0	1	1	2	3	1	1
	Oligochaeta LPL Richness	#/sample	0	0	0	1	1	2	3	1	1
	Family: Enchytraeidae	#/sample	0	0	0	0	0	800	813	44	178
	Genus: Enchytraeus	#/sample	0	0	0	0	0	800	813	44	178
Class: Ostracoda		#/sample	0	0	0	0	20	86	200	18	37
EPT		%	35.3	37.9	69.3	84.1	92.6	97.2	97.4	80.1	15.8
Ephemeroptera	Order: Ephemeroptera	%	19.8	21.5	39.6	49.4	59.7	71.5	73.9	48.6	14.4
	Family: Baetidae	%	0	0.69	3.47	8.56	12.8	26.0	28.7	9.33	7.02
	Genus: *Baetis*	%	0	0	2.35	6.73	11.0	23.8	23.9	7.75	6.55
	Genus: Baetis tricaudatus group	%	0	0	0.18	0.59	1.28	4.00	4.27	0.92	1.07
	Family: Ephemerellidae	%	1.11	1.76	5.79	8.68	13.2	23.7	29.9	10.3	6.76
	Drunella doddsii	%	0	0	0.76	1.75	2.96	8.97	10.89	2.35	2.47
	Family: Heptageniidae	%	2.52	5.77	14.8	20.8	37.8	60.1	63.8	26.6	16.4
	Genus: Epeorus	%	0	0	0	0.57	1.14	5.23	7.43	1.05	1.58
	Genus: Rhithrogena	%	0	0	0.26	0.94	3.32	12.7	15.8	2.64	3.80
Plecoptera	Order: Plecoptera	%	5.78	6.92	12.5	19.5	25.8	38.2	40.5	20.1	9.93
	Family: Chloroperlidae	%	0	0.52	1.36	2.39	3.79	10.0	12.2	2.98	2.55
	Genus: Sweltsa	%	0	0	0.75	1.62	3.11	8.86	12.2	2.39	2.55
	Family: Nemouridae	%	0	0.14	1.43	2.78	6.01	13.6	24.0	4.30	4.47
	Genus: Zapada	%	0	0.14	1.24	2.62	5.47	13.6	24.0	4.02	4.47
	Zapada columbiana	%	0	0	0	0.18	1.08	6.11	8.28	1.04	1.86
	Family: Taeniopterygidae	%	0	0	1.12	3.67	10.1	25.9	33.5	7.47	8.95
	Genus: Taenionema	%	0	0	1.12	3.67	9.25	25.3	33.5	7.19	8.59
Order: Trichoptera		%	0	0.26	4.49	6.75	12.9	41.2	53.7	11.3	12.2
Diptera	Order: Diptera	%	1.66	2.49	6.14	14.2	24.0	48.4	55.4	16.5	12.3
	Family: Chironomidae	%	0.37	1.91	3.77	11.1	18.4	44.2	50.7	13.1	11.2
	Genus: Micropsectra	%	0	0.00	0	0.34	0.95	4.61	4.87	0.85	1.28
	Genus: Orthocladius	%	0	0.00	0.83	2.39	6.89	22.1	24.0	4.79	5.92
	Family: Muscidae	%	0	0.00	0	0	0	0.15	0.29	0.01	0.05
	Genus: Limnophora	%	0	0.00	0	0	0	0.15	0.29	0.01	0.05
	Family: Psychodidae	%	0	0.00	0	0.24	1.54	7.83	21.3	1.61	3.64
	Genus: Pericoma/Telmatoscopus	%	0	0.00	0	0.24	1.54	7.83	21.3	1.61	3.64
Oligochaeta	Class: Oligochaeta	%	0	0.00	0	0.09	0.63	9.03	36.6	1.52	5.87
	Family: Enchytraeidae	%	0	0.00	0	0	0.05	7.02	35.7	1.18	5.69
	Genus: Enchytraeus	%	0	0.00	0	0	0.05	7.02	35.7	1.18	5.69

Estimates of the reference area normal range.

[a] Percentiles based on 2015 reference area disitrbution (n = 40) prior to outlier evaluation

Table G.10: Comparison of Reference Area Data Distributions for Key Benthic Invertebrate Community Endpoints Based on Percentiles Derived from the Pooled 2012 (n = 35) and 2015 (n = 40) Reference Area Results

Main Watershed	Management Unit	Percentile	Total Abundance						LPL Richness						EPT LPL Richness					
			All Areas		Outlier (n = 1) Removed Based on Distribution Plot		Outlier and Upper Kootenay Areas Removed		All Areas (No Outliers Identified)		Oldman and Flathead Areas Removed		Upper Kootenay Areas Removed		All Areas		Outlier (n = 1) Removed Based on Distribution Plot		Upper Kootenay Areas Also Removed	
		n	75		74		50		75		57		51		75		74		51	
		2.5	447		444		1,005		20		20		21		12		13		12	
		5	484		483		1,875		21		21		22		13		14		14	
		10	579		574		2,353		22		22		22		14		14		14	
		25	1,379		1,349		3,802		26		24		26		16		16		16	
		50	4,372		4,365		6,640		29		28		30		18		18		18	
		75	8,630		8,421		9,495		32		31		33		20		20		20	
		90	11,104		10,942		11,656		35		32		35		21		21		22	
		95	12,320		12,036		12,470		36		34		37		22		22		22	
		97.5	13,426		12,849		13,221		38		36		39		23		23		24	
		Area	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Kootenay	N/A	ALB	1,440	-	1,440	-			20	-	20	-			16	-	16	-		
	N/A	BU2	-	1,515	-	1,515			-	28	-	28			-	17	-	17		
	N/A	BU40	4,683	3,440	4,683	3,440			26	34	26	34			18	19	18	19		
	N/A	BUUQ	996	3,070	996	3,070			28	29	28	29			18	17	18	17		
	N/A	CRUKO	536	541	536	541			38	23	38	23			23	18	23	18		
	N/A	KO1	-	846	-	846			-	23	-	23			-	10	-			
	N/A	KODCR	342	466	342	466			28	28	28	28			20	16	20	16		
	N/A	KOUCR	260	489	260	489			23	29	23	29			16	18	16	18		
	N/A	KOUVE	1,318	2,276	1,318	2,276			30	30	30	30			18	14	18	14		
	N/A	PADAL	955	557	955	557			26	33	26	33			19	21	19	21		
	N/A	PAUKO	612	471	612	471			30	31	30	31			17	17	17	17		
	N/A	VEUKO	1,025	705	1,025	705			20	30	20	30			14	13	14	13		
	N/A	VEUP	701	756	701	756			27	25	27	25			18	17	18	17		
	N/A	WIHR	4,357	-	4,357	-			27	-	27	-			21	-	21	-		
Oldman	N/A	DACK	9,480	9,840	9,480	9,840	9,480	9,840	36	34			36	34	22	19	22	19	22	19
	N/A	DUCK	2,950	5,951	2,950	5,951	2,950	5,951	35	37			35	37	25	19	25	19	25	19
	N/A	OLDDU	3,660	1,977	3,660	1,977	3,660	1,977	28	35			28	35	19	16	19	16	19	16
	N/A	OLDLI	1,791	6,086	1,791	6,086	1,791	6,086	31	28			31	28	19	17	19	17	19	17
	N/A	OLDLOW	726	3,523	726	3,523	726	3,523	34	30			34	30	19	17	19	17	19	17
	N/A	OLUP	6,440	-	6,440	-	6,440	-	30	-			30	-	17	-	17	-	17	-
	N/A	RACK	2,386	3,210	2,386	3,210	2,386	3,210	29	40			29	40	19	20	19	20	19	20
	N/A	VICK	3,459	8,520	3,459	8,520	3,459	8,520	34	32			34	32	22	16	22	16	22	16
Fording	1	CHCK	10,720	13,360	10,720	13,360	10,720	13,360	21	32	21	32	21	32	12	20	12	20	12	20
	1	DRCK	22,500	-		-		-	32	-	32	-	32	-	24	-	24	-	24	-
	1	EWCK	13,800	6,060	13,800	6,060	13,800	6,060	31	31	31	31	31	31	21	18	21	18	21	18
	2	LC_GRCK	-	6,760	-	6,760	-	6,760	-	26	-	26	-	26	-	17	-	17	-	17
	1	FO26	10,900	9,400	10,900	9,400	10,900	9,400	36	29	36	29	36	29	21	15	21	15	21	15
	1	HENUP	4,601	7,500	4,601	7,500	4,601	7,500	28	20	28	20	28	20	17	14	17	14	17	14
Line	2	LI24	3,721	3,008	3,721	3,008	3,721	3,008	24	21	24	21	24	21	15	14	15	14	15	14
	2	SLINE	8,125	6,505	8,125	6,505	8,125	6,505	25	27	25	27	25	27	17	21	17	21	17	21
Michel	4	AGCK	11,980	7,180	11,980	7,180	11,980	7,180	22	22	22	22	22	22	13	15	13	15	13	15
	4	AL4	12,140	10,960	12,140	10,960	12,140	10,960	35	28	35	28	35	28	22	14	22	14	22	14
	4	ALUSM	-	8,900	-	8,900	-	8,900	-	34	-	34	-	34	-	16	-	16	-	16
	4	MI25	2,054	7,140	2,054	7,140	2,054	7,140	32	31	32	31	32	31	21	17	21	17	21	17
Elk	N/A	CADCK	8,980	11,200	8,980	11,200	8,980	11,200	26	28	26	28	26	28	19	17	19	17	19	17
	N/A	EL12	9,500	8,740	9,500	8,740	9,500	8,740	31	32	31	32	31	32	21	20	21	20	21	20
	3	ELUGH	7,920	4,044	7,920	4,044	7,920	4,044	25	22	25	22	25	22	15	15	15	15	15	15
	4	GRUHA	10,100	4,891	10,100	4,891	10,100	4,891	26	32	26	32	26	32	18	20	18	20	18	20
	5	MCCR	-	11,620	-	11,620	-	11,620	-	24	-	24	-	24	-	18	-	18	-	18
	5	WWRL	4,372	4,856	4,372	4,856	4,372	4,856	29	23	29	23	29	23	22	12	22	12	22	12
	5	WWRU	-	777	-	777	-	777	-	23	-	23	-	23	-	14	-	14	-	14
Flathead	N/A	FLAD	-	12,740	-	12,740	-	12,740	-	39	-		-	39	-	17	-	17	-	17
	N/A	FLAU	-	6,520	-	6,520	-	6,520	-	31	-		-	31	-	14	-	14	-	14
	N/A	FLRU	-	5,506	-	5,506	-	5,506	-	33	-		-	33	-	18	-	18	-	18

Main Watershed	Management Unit	Percentile	% EPT								% Ephemeroptera						Axis 1 Scores from Family-Level NMDS Ordination[a] (presented for comparison - not proposed as a key endpoint for the integrated evaluation within the RAEMP)					
			All Areas		Outliers (n = 3) Removed Based on Distribution Plot		Outliers and Flathead Areas Removed		Outliers and Upper Kootenay Areas Removed		All Areas (No Outliers Identified)		Outliers and Flathead Areas Removed		Outliers and Upper Kootenay Areas Removed		All Areas (No Outliers Identified)		Upper Kootenay Areas Removed		Upper Kootenay and Flathead Areas Removed	
		n	75.0		72.0		70.0		49.0		75.0		70.0		49.0		74		51		48	
		2.5	43.8		63.0		64.4		63.3		21.3		24.0		21.9		-0.560		-0.293		-0.294	
		5	62.2		64.4		68.3		65.8		24.0		29.2		23.7		-0.507		-0.273		-0.276	
		10	65.9		68.8		71.1		68.7		31.5		33.1		31.3		-0.444		-0.218		-0.219	
		25	77.3		78.8		79.5		76.7		39.6		39.9		39.5		-0.293		-0.133		-0.139	
		50	84.9		85.5		85.9		84.9		47.9		48.0		47.7		-0.106		-0.009		-0.038	
		75	92.7		92.8		92.9		91.9		59.4		59.5		59.5		0.055		0.099		0.082	
		90	95.8		95.8		95.8		94.8		67.0		66.6		65.2		0.167		0.184		0.160	
		95	96.9		97.0		97.0		95.7		68.2		68.0		67.6		0.188		0.198		0.182	
		97.5	97.2		97.2		97.3		96.0		71.8		69.1		68.1		0.210		0.220		0.187	
		Area	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Kootenay	N/A	ALB	97	-	97	-	97	-			49	-	49	-			-0.483	-				
	N/A	BU2	-	92	-	92	-	92			-	54	-	54			-	-0.240				
	N/A	BU40	88	60	88	60	88	60			44	35	44	35			-	-0.037				
	N/A	BUUQ	91	83	91	83	91	83			59	40	59	40			-0.404	-0.135				
	N/A	CRUKO	96	97	96	97	96	97			48	48	48	48			-0.401	-0.594				
	N/A	KO1	-	82	-	82	-	82			-	74	-	74			-	-0.497				
	N/A	KODCR	97	85	97	85	97	85			53	67	53	67			-0.526	-0.474				
	N/A	KOUCR	95	81	95	81	95	81			67	51	67	51			-0.607	-0.403				
	N/A	KOUVE	76	38	76		76				62	30	62	30			-0.174	0.014				
	N/A	PADAL	90	93	90	93	90	93			48	52	48	52			-0.454	-0.322				
	N/A	PAUKO	84	87	84	87	84	87			40	46	40	46			-0.552	-0.386				
	N/A	VEUKO	97	84	97	84	97	84			46	71	46	71			-0.369	-0.362				
	N/A	VEUP	79	64	79	64	79	64			37	34	37	34			-0.365	-0.303				
	N/A	WIHR	96	-	96	-	96	-			31	-	31	-			-0.169	-				
Oldman	N/A	DACK	88	83	88	83	88	83	88	83	42	53	42	53	42	53	0.187	0.134	0.187	0.134	0.187	0.134
	N/A	DUCK	86	45	86		86		86		33	23	33	23	33	23	-0.072	0.155	-0.072	0.155	-0.072	0.155
	N/A	OLDDU	95	68	95	68	95	68	95	68	51	36	51	36	51	36	-0.139	-0.124	-0.139	-0.124	-0.139	-0.124
	N/A	OLDLI	95	94	95	94	95	94	95	94	59	65	59	65	59	65	-0.282	-0.088	-0.282	-0.088	-0.282	-0.088
	N/A	OLDLOW	76	83	76	83	76	83	76	83	48	39	48	39	48	39	-0.421	-0.153	-0.421	-0.153	-0.421	-0.153
	N/A	OLUP	77	-	77	-	77	-	77	-	44	-	44	-	44	-	0.061	-	0.061	-	0.061	-
	N/A	RACK	83	78	83	78	83	78	83	78	46	55	46	55	46	55	-0.039	0.018	-0.039	0.018	-0.039	0.018
	N/A	VICK	64	69	64	69	64	69	64	69	32	40	32	40	32	40	0.081	0.125	0.081	0.125	0.081	0.125
Fording	1	CHCK	80	69	80	69	80	69	80	69	60	42	60	42	60	42	-0.040	0.184	-0.040	0.184	-0.040	0.184
	1	DRCK	89	-	89	-	89	-	89	-	66	-	66	-	66	-	0.138	-	0.138	-	0.138	-
	1	EWCK	91	87	91	87	91	87	91	87	64	61	64	61	64	61	0.005	-0.128	0.005	-0.128	0.005	-0.128
	2	LC_GRCK	-	93	-	93	-	93	-	93	-	20	-	20	-	20	-	0.065	-	0.065	-	0.065
	1	FO26	77	86	77	86	77	86	77	86	42	67	42	67	42	67	0.172	-0.061	0.172	-0.061	0.172	-0.061
	1	HENUP	81	96	81	96	81	96	81	96	60	68	60	68	60	68	0.111	-0.264	0.111	-0.264	0.111	-0.264
Line	2	LI24	71	93	71	93	71	93	71	93	37	63	37	63	37	63	-0.051	-0.159	-0.051	-0.159	-0.051	-0.159
	2	SLINE	83	94	83	94	83	94	83	94	28	60	28	60	28	60	0.065	-0.124	0.065	-0.124	0.065	-0.124
Michel	4	AGCK	89	97	89	97	89	97	89	97	81	68		68		68	-0.218	-0.220	-0.218	-0.220	-0.218	-0.220
	4	AL4	89	82	89	82	89	82	89	82	68	57	68	57	68	57	0.086	0.190	0.086	0.190	0.086	0.190
	4	ALUSM	-	69	-	69	-	69	-	69	-	41	-	41	-	41	-	0.178	-	0.178	-	0.178
	4	MI25	92	84	92	84	92	84	92	84	12	47		47		47	-0.154	-0.037	-0.154	-0.037	-0.154	-0.037
Elk	N/A	CADCK	71	86	71	86	71	86	71	86	49	58	49	58	49	58	-0.063	-0.009	-0.063	-0.009	-0.063	-0.009
	N/A	EL12	73	85	73	85	73	85	73	85	57	60	57	60	57	60	0.003	0.084	0.003	0.084	0.003	0.084
	3	ELUGH	92	92	92	92	92	92	92	92	52	55	52	55	52	55	0.007	-0.151	0.007	-0.151	0.007	-0.151
	4	GRUHA	96	96	96	96	96	96	96	96	37	45	37	45	37	45	-0.048	-0.148	-0.048	-0.148	-0.048	-0.148
	5	MCCR	-	95	-	95	-	95	-	95	-	24	-	24	-	24	-	0.018	-	0.018	-	0.018
	5	WWRL	79	78	79	78	79	78	79	78	37	41	37	41	37	41	-0.139	0.037	-0.139	0.037	-0.139	0.037
	5	WWRU	-	94	-	94	-	94	-	94	-	46	-	46	-	46	-	-0.297	-	-0.297	-	-0.297
Flathead	N/A	FLAD	-	35	-		-		-		-	22	-		-	22	-	0.224	-	0.224	-	
	N/A	FLAU	-	63	-	63	-		-	63	-	37	-		-	37	-	0.326	-	0.326	-	
	N/A	FLRU	-	63	-	63	-		-	63	-	51	-		-	51	-	0.207	-	0.207	-	

Note: Results were before and after the removal of potential outliers. Coloured cells show individual reference area values that were at the low (blue shade) and high (gold shade) ends of the distribution range. Green highlights the reference area data set recommended for the evaluation of communities in mine-exposed areas.

- data set was used to define the normal range (2.5th and 97.5th percentiles)
- outlier or value removed from estimation of percentiles
- value < 2.5th percentile of reference distribution
- value < 5th percentile of reference distribution
- value < 10th percentile of reference distribution
- value < 25th percentile of reference distribution
- value > 75th percentile of reference distribution
- value > 90th percentile of reference distribution
- value > 95th percentile of reference distribution
- value > 97.5th percentile of reference distribution

[a] 3-D Ordination (relative abundance/fourth root transformed). The NMDS Axis is scaled so that it is positively correlated with PC-1 for water quality (i.e. multiplied by -1 when negatively correlated with PC-1)

Table G.11: Spearman Correlation of Environmental Variables with Endpoints for Reference (n = 40) Areas Sampled in September 2015

Variables		Total Abundance	LPL Richness	EPT LPL Richness	% EPT	% Ephemeroptera	NMDS Axis 1[a]
Stream Order	Spearman Correlation	-0.453	0.156	-0.089	-0.285	0.020	-0.196
	P-value (2-tailed)	0.003	0.338	0.584	0.074	0.903	0.227
Station Elevation (m)	Spearman Correlation	0.604	0.014	0.091	0.096	0.221	0.380
	P-value (2-tailed)	<0.001	0.931	0.578	0.557	0.170	0.016
Source Elevation (m)	Spearman Correlation	-0.087	-0.403	-0.103	0.228	0.126	-0.337
	P-value (2-tailed)	0.591	0.010	0.526	0.158	0.438	0.034
Distance to Source (m)	Spearman Correlation	-0.541	0.106	-0.237	-0.356	-0.052	-0.295
	P-value (2-tailed)	<0.001	0.516	0.142	0.024	0.751	0.065
Segment Gradient (%)	Spearman Correlation	0.292	-0.126	0.108	0.128	-0.133	0.221
	P-value (2-tailed)	0.068	0.439	0.507	0.432	0.413	0.170
Watershed Perimeter (m)	Spearman Correlation	-0.610	0.104	-0.195	-0.324	0.000	-0.358
	P-value (2-tailed)	<0.001	0.522	0.227	0.042	0.999	0.023
Watershed Area (m^2)	Spearman Correlation	-0.625	0.117	-0.195	-0.325	0.008	-0.355
	P-value (2-tailed)	<0.001	0.473	0.227	0.041	0.961	0.024
Area greater than 30 Percent Slope (m^2)	Spearman Correlation	-0.660	0.022	-0.187	-0.237	0.019	-0.438
	P-value (2-tailed)	<0.001	0.894	0.248	0.140	0.906	0.005
Percent Area greater than 30 Percent Slope (%)	Spearman Correlation	-0.216	-0.531	-0.075	0.455	0.097	-0.461
	P-value (2-tailed)	0.182	<0.001	0.644	0.003	0.553	0.003
Percent Area less than 30 Percent Slope (%)	Spearman Correlation	0.216	0.531	0.075	-0.455	-0.097	0.461
	P-value (2-tailed)	0.182	<0.001	0.644	0.003	0.553	0.003
Up Stream Gradient (%)	Spearman Correlation	0.462	-0.238	0.248	0.473	0.052	0.128
	P-value (2-tailed)	0.003	0.139	0.123	0.002	0.750	0.431
Watershed Stream Length (m)	Spearman Correlation	-0.631	0.064	-0.181	-0.286	0.026	-0.388
	P-value (2-tailed)	<0.001	0.696	0.263	0.073	0.873	0.013
Stream Density (length/watershed area) (km^{-1})	Spearman Correlation	-0.286	-0.211	-0.024	0.120	0.215	-0.366
	P-value (2-tailed)	0.073	0.191	0.882	0.461	0.182	0.020
Annual Cropland (%)	Spearman Correlation	-0.456	0.028	0.053	0.035	0.226	-0.425
	P-value (2-tailed)	0.003	0.865	0.747	0.829	0.161	0.006
Broadleaf Dense (%)	Spearman Correlation	0.084	0.355	0.071	-0.198	0.037	0.154
	P-value (2-tailed)	0.608	0.025	0.665	0.220	0.819	0.344
Broadleaf Open (%)	Spearman Correlation	-0.373	-0.162	-0.169	-0.140	-0.142	-0.211
	P-value (2-tailed)	0.018	0.318	0.298	0.390	0.383	0.192
Coniferous Dense (%)	Spearman Correlation	0.331	0.352	0.174	-0.114	0.169	0.258
	P-value (2-tailed)	0.037	0.026	0.284	0.485	0.299	0.108
Coniferous Open (%)	Spearman Correlation	-0.209	-0.089	-0.087	-0.045	-0.302	0.023
	P-value (2-tailed)	0.196	0.585	0.594	0.783	0.058	0.888
Coniferous Sparse (%)	Spearman Correlation	-0.423	-0.129	-0.404	-0.395	-0.051	-0.188
	P-value (2-tailed)	0.007	0.426	0.010	0.012	0.756	0.245
Developed Land (%)	Spearman Correlation	-	-	-	-	-	-
	P-value (2-tailed)	-	-	-	-	-	-
Exposed Land (%)	Spearman Correlation	-0.361	-0.130	0.027	0.099	-0.067	-0.263
	P-value (2-tailed)	0.022	0.425	0.867	0.544	0.680	0.101
Grass (%)	Spearman Correlation	-0.158	0.251	-0.160	-0.407	-0.246	0.023
	P-value (2-tailed)	0.331	0.118	0.324	0.009	0.126	0.886
Herbaceous (%)	Spearman Correlation	0.088	0.077	0.047	-0.140	-0.240	0.228
	P-value (2-tailed)	0.591	0.637	0.773	0.390	0.136	0.157
Mixed Forest Dense (%)	Spearman Correlation	-0.409	-0.132	-0.220	-0.211	0.123	-0.326
	P-value (2-tailed)	0.009	0.417	0.172	0.192	0.451	0.040
Mixed Forest Open (%)	Spearman Correlation	-0.512	-0.167	-0.282	-0.261	0.126	-0.434
	P-value (2-tailed)	<0.001	0.302	0.078	0.104	0.440	0.005
Perennial Crop and Pasture (%)	Spearman Correlation	-	-	-	-	-	-
	P-value (2-tailed)	-	-	-	-	-	-
Rock and Rubble (%)	Spearman Correlation	0.076	-0.107	-0.044	0.106	0.481	-0.179
	P-value (2-tailed)	0.641	0.513	0.785	0.517	0.002	0.268
Shrub Low (%)	Spearman Correlation	-0.388	-0.152	-0.131	-0.149	-0.173	-0.150
	P-value (2-tailed)	0.013	0.348	0.421	0.360	0.287	0.357
Shrub Tall (%)	Spearman Correlation	0.264	0.213	0.089	0.013	0.305	0.104
	P-value (2-tailed)	0.100	0.188	0.585	0.939	0.056	0.524
Snow and Ice (%)	Spearman Correlation	-0.551	-0.187	-0.033	-0.017	0.161	-0.517
	P-value (2-tailed)	<0.001	0.248	0.839	0.919	0.322	<0.001
Water (%)	Spearman Correlation	-0.495	0.052	-0.009	-0.036	0.122	-0.366
	P-value (2-tailed)	0.001	0.752	0.956	0.827	0.454	0.020
Wetland Herbaceous (%)	Spearman Correlation	-0.280	-0.017	-0.172	-0.274	-0.010	-0.045
	P-value (2-tailed)	0.080	0.915	0.288	0.087	0.950	0.785
Wetland Shrub (%)	Spearman Correlation	-0.285	0.064	-0.144	-0.385	-0.009	-0.068
	P-value (2-tailed)	0.075	0.696	0.375	0.014	0.957	0.679
Wetland Treed (%)	Spearman Correlation	-	-	-	-	-	-
	P-value (2-tailed)	-	-	-	-	-	-
Average Channel Depth (cm)	Spearman Correlation	-0.343	-0.240	-0.032	0.124	0.122	-0.373
	P-value (2-tailed)	0.030	0.135	0.843	0.447	0.455	0.018
Average Channel Velocity (m/s)	Spearman Correlation	-0.402	-0.393	-0.016	0.245	0.151	-0.544
	P-value (2-tailed)	0.010	0.012	0.923	0.128	0.354	<0.001
Bankfull Width (m)	Spearman Correlation	-0.560	0.046	-0.208	-0.170	0.147	-0.440
	P-value (2-tailed)	<0.001	0.780	0.199	0.294	0.365	0.005
Wetted Width (m)	Spearman Correlation	-0.651	0.078	-0.068	-0.192	0.101	-0.463
	P-value (2-tailed)	<0.001	0.630	0.675	0.235	0.534	0.003
Depth between Bankfull and Wetted Width (cm)	Spearman Correlation	-0.311	-0.206	-0.238	0.090	0.284	-0.305
	P-value (2-tailed)	0.051	0.202	0.139	0.582	0.076	0.055
Gradient (%) (Clinometer)	Spearman Correlation	0.320	-0.157	0.250	0.400	-0.114	0.095
	P-value (2-tailed)	0.044	0.334	0.120	0.011	0.484	0.558
Intermediate Axis Length (cm)	Spearman Correlation	-0.065	0.266	0.374	-0.055	-0.227	0.027
	P-value (2-tailed)	0.690	0.097	0.017	0.737	0.159	0.868
Embeddedness (0, 1/4, 1/2, 3/4, 1)	Spearman Correlation	-0.208	-0.118	-0.228	-0.126	-0.092	-0.173
	P-value (2-tailed)	0.199	0.468	0.157	0.437	0.573	0.286
Canopy Cover (%) (Densiometer)	Spearman Correlation	0.109	-0.101	0.159	0.210	-0.213	0.129
	P-value (2-tailed)	0.502	0.537	0.326	0.193	0.187	0.428

$r \geq 0.6$ or $r \leq -0.6$

P-value < 0.05

[a] NMDS Axis 1 scores from an NMDS conducted on relative abundances (fourth-root transformed) using the family-level of taxonomy

Notes: "-" = correlation not conducted (insufficient replication of habitat variable values, e.g. many values were zero)

Table G.12: Comparison of Key Benthic Invertebrate Community Endpoints for Reference (n = 40) Areas Sampled September, 2015 and 2016 in the Elk Valley to the Normal Ranges Calculated as the 2.5th and 97.5th Percentiles for the Pooled 2012 and 2015 Reference Area Distribution

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	2015						2016					
				Univariate Indicators					Axis 1 Scores from Family-Level NMDS Ordinations	Univariate Indicators					Axis 1 Scores from NMDS Ordinations
				Total Abundance (org/3-min kick)	LPL Richness	EPT LPL Richness	% EPT	% Ephemeroptera	Relative Abundance (fourth root transformation) (3D-Ordination)	Total Abundance (org/3-min kick)	LPL Richness	EPT LPL Richness	% EPT	% Ephemeroptera	Relative Abundance (fourth root transformation) (3D-Ordination)
			$P_{2.5}$	**1,005**	**20**	**13**	**63.0**	**21.3**	**-0.560**	**1,005**	**20**	**13**	**63.0**	**21.3**	**-0.316** [a]
			$P_{97.5}$	**13,221**	**38**	**23**	**97.2**	**71.8**	**0.210**	**13,221**	**38**	**23**	**97.2**	**71.8**	**0.280** [a]
1	Fording	M	FO26	9,400	29	15	86	67	-0.061	17,280	31	13	79	55	-0.040
		T	HENUP	7,500	20	14	96	68	-0.264	4,830	21	11	91	78	-0.224
			CHCK	13,360	32	20	69	42	0.184	-	-	-	-	-	-
			EWCK	6,060	31	18	87	61	-0.128	-	-	-	-	-	-
2	Fording	T	LC_GRCK	6,760	26	17	93	20	0.065	-	-	-	-	-	-
			LI24	3,008	21	14	93	63	-0.159	6,960	30	13	26	11	-0.028
			SLINE	6,505	27	21	94	60	-0.124	1,815	31	20	79	49	-0.102
3	Elk	M	ELUGH	4,044	22	15	92	55	-0.151	10,560	28	15	51	37	0.117
4	Michel	M	AGCK	7,180	22	15	97	68	-0.220	-	-	-	-	-	-
			AL4	10,960	28	14	82	57	0.190	-	-	-	-	-	-
		T	ALUSM	8,900	34	16	69	41	0.178	6,500	31	17	80	50	0.222
			MI25	7,140	31	17	84	47	-0.037	16,160	39	19	68	50	0.011
	Elk	T	GRUHA	4,891	32	20	96	45	-0.148	-	-	-	-	-	-
5	Elk	T	MCCR	11,620	24	18	95	24	0.018	-	-	-	-	-	-
			WWRU	777	23	14	94	46	-0.297	-	-	-	-	-	-
			WWRL	4,856	23	12	78	41	0.037	-	-	-	-	-	-
N/A	Kootenay	-	BU2	1,515	28	17	92	54	-0.240	-	-	-	-	-	-
			BU40	3,440	34	19	60	35	-0.037	-	-	-	-	-	-
			BUUQ	3,070	29	17	83	40	-0.135	-	-	-	-	-	-
			CRUKO	541	23	18	97	48	-0.594	-	-	-	-	-	-
			KO1	846	23	10	82	74	-0.497	-	-	-	-	-	-
			KODCR	466	28	16	85	67	-0.474	-	-	-	-	-	-
			KOUCR	489	29	18	81	51	-0.403	-	-	-	-	-	-
			KOUVE	2,276	30	14	38	30	0.014	-	-	-	-	-	-
			PADAL	557	33	21	93	52	-0.322	-	-	-	-	-	-
			PAUKO	471	31	17	87	46	-0.386	-	-	-	-	-	-
			VEUKO	705	30	13	84	71	-0.362	-	-	-	-	-	-
			VEUP	756	25	17	64	34	-0.303	-	-	-	-	-	-
	Oldman	-	DACK	9,840	34	19	83	53	0.134	-	-	-	-	-	-
			DUCK	5,951	37	19	45	23	0.155	-	-	-	-	-	-
			OLDDU	1,977	35	16	68	36	-0.124	-	-	-	-	-	-
			OLDLI	6,086	28	17	94	65	-0.088	-	-	-	-	-	-
			OLDLOW	3,523	30	17	83	39	-0.153	-	-	-	-	-	-
			RACK	3,210	40	20	78	55	0.018	-	-	-	-	-	-
			VICK	8,520	32	16	69	40	0.125	-	-	-	-	-	-
	Elk	-	CADCK	11,200	28	17	86	58	-0.009	-	-	-	-	-	-
			EL12	8,740	32	20	85	60	0.084	-	-	-	-	-	-
	Flathead	-	FLAD	12,740	39	17	35	22	0.224	-	-	-	-	-	-
			FLAU	6,520	31	14	63	37	0.326	-	-	-	-	-	-
			FLRU	5,506	33	18	63	51	0.207	-	-	-	-	-	-

[a] Normal range estimates are the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data (from an ordination of 2012 and 2015 reference area data and all areas in 2016)

value > upper limit ($P_{97.5}$) of the normal range

value < lower limit ($P_{2.5}$) of the normal range

Table G.13: Comparison of Key Benthic Invertebrate and Periphyton Community Endpoints for Reference (n = 40) and Mine-exposed Areas (n = 59) Sampled September, 2015 in the Elk Valley to the Normal Ranges

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Benthic Invertebrate Community					Periphyton Community Indicators				
					Total Abundance (org/3-min kick)	LPL Richness	% EPT	% Ephemeroptera	Family-Level NMDS Axis 1 Score / Relative Abundance (fourth root transformation) (3D-Ordination)	Green Density (# cells/cm^2)	Achnanthidium Density (# cells/cm^2)	Fragilariaceae Density (# cells/cm^2)	Genus-Level NMDS Axis 1 Score / Relative Abundance (fourth root transformation) (3D-Ordination)	Genus-Level NMDS Axis 3 Score / Relative Abundance (fourth root transformation) (3D-Ordination)
				$P_{2.5}$	**1,005**	**20**	**63.0**	**24.0**	**-0.560**	**0**	**3,328**	**550**	**-1.13**	**-0.891**
				$P_{97.5}$	**13,221**	**38**	**97.2**	**69.1**	**0.210**	**25,098**	**667,156**	**140,549**	**1.01**	**0.548**
Reference	1	Fording	T	HENUP	7,500	20	96	68	-0.264	0	8,460	2,256	1.184	-0.479
				CHCK	13,360	32	69	42	0.184	13,536	1,082,880	78,960	0.174	-0.334
				EWCK	6,060	31	87	61	-0.128	0	413,976	48,504	0.525	-0.333
			M	FO26	9,400	29	86	67	-0.061	3,948	54,708	1,128	0.810	-0.188
	2	Fording	T	LC_GRCK	6,760	26	93	20	0.065	0	10,152	0	1.002	0.539
				LI24	3,008	21	93	63	-0.159	3,384	14,664	7,896	0.429	-0.036
				SLINE	6,505	27	94	60	-0.124	0	527,904	6,768	0.651	-0.398
	3	Elk	M	ELUGH	4,044	22	92	55	-0.151	24,816	296,664	25,944	-0.037	0.217
	4	Michel	T	ALUSM	8,900	34	69	41	0.178	14,664	97,008	38,352	0.543	0.200
				MI25	7,140	31	84	47	-0.037	9,024	99,264	57,528	0.328	-1.020
			M	AGCK	7,180	22	97	68	-0.220	0	12,408	1,692	0.545	-0.322
				AL4	10,960	28	82	57	0.190	4,512	252,672	69,936	0.575	-0.197
		Elk	T	GRUHA	4,891	32	96	45	-0.148	3,384	75,576	9,024	0.084	0.112
	5	Elk	T	MCCR	11,620	24	95	24	0.018	0	562,872	1,128	-0.474	0.426
				WWRU	777	23	94	46	-0.297	0	32,712	564	-0.892	-0.609
				WWRL	4,856	23	78	41	0.037	0	78,960	4,512	0.093	0.661
	N/A	Kootenay	-	BU2	1,515	28	92	54	-0.240	0	165,816	39,480	-0.181	0.071
				BU40	3,440	34	60	35	-0.037	0	656,496	137,616	-0.411	-0.003
				BUUQ	3,070	29	83	40	-0.135	564	27,636	5,640	0.428	0.338
				CRUKO	541	23	97	48	-0.594	0	22,560	1,692	-0.521	-0.752
				KO1	846	23	82	74	-0.497	0	64,296	13,536	-0.653	-0.154
				KODCR	466	28	85	67	-0.474	0	64,296	22,560	-0.333	-0.270
				KOUCR	489	29	81	51	-0.403	0	175,968	40,608	-1.098	-0.195
				KOUVE	2,276	30	38	30	0.014	0	232,368	76,704	-0.645	-0.401
				PADAL	557	33	93	52	-0.322	0	3,384	17,484	-1.572	0.100
				PAUKO	471	31	87	46	-0.386	0	1,128	2,820	-1.119	0.197
				VEUKO	705	30	84	71	-0.362	0	38,352	12,408	-0.501	0.088
				VEUP	756	25	64	34	-0.303	0	25,944	19,176	-0.595	-0.185
		Oldman	-	DACK	9,840	34	83	53	0.134	3,384	294,408	139,872	-0.377	-0.115
				DUCK	5,951	37	45	23	0.155	0	421,872	166,944	-0.821	-0.049
				OLDDU	1,977	35	68	36	-0.124	564	22,560	2,820	-0.436	-0.020
				OLDLI	6,086	28	94	65	-0.088	0	11,844	2,256	-0.147	-0.341
				OLDLOW	3,523	30	83	39	-0.153	7,896	103,776	60,912	-0.992	0.263
				RACK	3,210	40	78	55	0.018	0	3,384	56,400	-0.971	-0.089
				VICK	8,520	32	69	40	0.125	36,096	16,920	39,480	-0.891	-0.881
		Elk	-	CADCK	11,200	28	86	58	-0.009	2,820	253,800	33,840	0.210	-0.159
				EL12	8,740	32	85	60	0.084	1,128	160,740	20,868	0.447	-0.170
		Flathead	-	FLAD	12,740	39	35	22	0.224	10,152	111,672	29,328	-1.032	0.161
				FLAU	6,520	31	63	37	0.326	7,896	4,512	3,384	-0.568	1.657
				FLRU	5,506	33	63	51	0.207	2,256	6,768	24,816	-0.171	-1.921
Mine-exposed	1	Fording	T	HENFO	13,820	29	84	75	-0.141	14,664	500,832	23,688	-0.056	-0.406
				NGD1	9,760	27	60	28	0.412	-	-	-	-	-
				KICK	497	22	16	0.40	0.042	42,300	25,380	18,612	-0.210	0.404
				SWCK	6,214	24	29	0	0.763	106,032	261,696	126,336	-1.138	0.023
				CATCK	4,030	18	12	0	0.886	0	111,108	182,172	-1.010	-0.420
				POCK	22,160	30	19	0.90	0.580	408,336	1,191,168	406,080	-0.233	-0.875
				LC_DCDS	7,640	27	91	60	-0.084	0	36,096	45,120	0.464	-1.069
				LC_DC1	7,140	25	91	54	0.025	0	68,808	16,920	0.803	-0.691
				GHCKD	10,560	40	21	6.4	0.640	4,512	611,376	313,584	-0.232	0.283
				GHCKU	774	24	25	1.9	-0.032	20,304	1,371,648	137,616	0.098	0.054
			M	FODHE	17,060	27	78	61	0.100	0	81,216	2,256	0.396	0.499
				FOUNGD	7,260	23	93	75	-0.069	0	41,172	3,948	0.962	-0.227
				FODNGD	7,840	23	94	77	0.102	13,536	231,804	9,588	0.268	0.390
				MP1	5,470	32	70	51	0.044	0	596,712	84,600	0.355	0.087
				FOUSH	7,320	28	86	73	0.083	0	544,824	3,384	0.939	0.209
				FOUKI	3,490	30	75	65	0.080	5,076	38,352	6,768	0.880	0.962
				FOBKS	4,161	25	69	47	0.007	0	85,728	1,128	1.069	0.208
				FOBSC	2,923	26	62	40	0.021	10,152	300,048	7,896	1.291	0.019
				FOBCP	4,260	27	78	16	0.125	0	159,048	253,236	0.278	0.863
				FODPO	10,340	22	90	7.9	0.282	27,072	1,628,832	94,752	0.060	0.484
				FO10-SP1	13,800	29	75	6.2	0.264	4,512	1,459,632	189,504	-0.021	0.003
				FO22	21,140	30	65	13	0.375	0	772,680	101,520	-0.073	0.594
				FOUEW	7,720	25	71	26	0.229	0	8,040,384	631,680	0.027	-0.411
				LC_FRUS	2,065	30	64	39	-0.033	9,024	1,604,016	198,528	0.160	0.184
				FO29	8,580	37	56	36	0.174	2,256	2,616,960	110,544	0.417	-0.685
				FODGH	10,980	28	78	35	0.237	2,256	6,436,368	90,240	0.687	0.356

Notes: Normal range estimates are the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data distribution (benthic invertebrates) and 2015 reference area data distribution (periphyton) after the removal of outliers

value > upper limit ($P_{97.5}$) of the normal range

value < lower limit ($P_{2.5}$) of the normal range

Table G.13: Comparison of Key Benthic Invertebrate and Periphyton Community Endpoints for Reference (n = 40) and Mine-exposed Areas (n = 59) Sampled September, 2015 in the Elk Valley to the Normal Ranges

Exposure Type	Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Benthic Invertebrate Community					Periphyton Community Indicators				
					Total Abundance (org/3-min kick)	LPL Richness	% EPT	% Ephemeroptera	Family-Level NMDS Axis 1 Score / Relative Abundance (fourth root transformation) (3D-Ordination)	Green Density (# cells/cm^2)	Achnanthidium Density (# cells/cm^2)	Fragilariaceae Density (# cells/cm^2)	Genus-Level NMDS Axis 1 Score / Relative Abundance (fourth root transformation) (3D-Ordination)	Genus-Level NMDS Axis 3 Score
				$P_{2.5}$	**1,005**	**20**	**63.0**	**24.0**	**-0.560**	**0**	**3,328**	**550**	**-1.13**	**-0.891**
				$P_{97.5}$	**13,221**	**38**	**97.2**	**69.1**	**0.210**	**25,098**	**667,156**	**140,549**	**1.01**	**0.548**
Mine-exposed	2	Fording	T	LILC3	19,360	26	33	8.5	0.205	36,096	5,333,184	225,600	0.026	-0.308
				LIDSL	6,980	30	74	38	0.047	15,792	730,944	13,536	0.610	-0.431
				LI8	3,390	29	87	26	-0.056	1,692	37,788	7,332	1.294	-0.764
			M	FO9	6,720	24	72	40	-0.006	0	703,872	31,584	0.394	0.905
				FRUL	3,006	25	83	30	0.130	0	82,908	12,972	0.675	-0.180
				FO23	3,780	39	65	21	0.088	3,384	285,948	118,440	-0.014	0.128
	3	Elk	T	WOCK	1,244	30	38	0.32	0.233	9,024	1,064,832	415,104	-1.099	-0.020
				THCK	2,412	25	17	1.1	0.531	0	6,768	656,496	-0.851	0.492
			M	EL20	6,218	29	92	55	-0.019	1,692	67,680	8,460	0.623	-0.132
				ELUEL	5,135	27	82	55	0.012	564	519,444	1,692	0.735	0.556
				ELDEL	7,740	28	87	61	0.050	44,556	96,444	13,536	0.524	-0.148
				ELUFO	8,980	34	40	17	0.280	0	408,336	27,072	-0.124	0.085
	4	Michel	T	CORCK	29,180	34	17	0	0.826	31,584	767,040	1,597,248	-0.631	0.542
				BOCK	8,140	26	7.6	0	0.960	30,456	80,088	29,328	-0.368	-0.484
			M	MIUCO	7,820	31	72	53	0.061	9,588	18,612	29,892	-0.659	-0.993
				MIDCO	12,360	32	51	22	0.256	0	230,676	45,684	-0.401	-0.129
				MIDAG	14,520	31	72	43	0.222	1,692	50,760	3,384	0.437	-0.387
				MI5	7,120	22	87	30	0.030	20,868	32,148	564	-0.255	-0.725
				MI3	7,660	26	80	38	0.132	11,280	63,732	2,256	0.491	0.947
				MI2	6,119	33	73	30	0.132	1,692	537,492	23,688	-0.285	0.562
		Elk	T	HACKUS	15,540	35	85	36	0.203	13,536	957,672	41,736	0.357	-0.357
				HACKDS	10,160	32	50	29	0.169	0	671,160	164,688	0.112	0.236
				GRCK	7,740	33	87	44	0.066	0	459,096	21,432	0.356	-0.070
				GRDS	8,400	30	76	30	0.112	0	236,316	78,960	0.128	0.370
				OCNM	1,373	40	34	2.1	0.163	0	7,896	7,332	-0.760	0.741
			M	EL19	3,240	32	60	29	0.062	2,256	252,672	31,584	-0.151	0.614
				ELDGR	1,288	30	89	64	-0.154	15,228	70,500	3,948	0.248	0.039
				ELUSP	6,460	25	68	43	0.040	0	87,984	16,920	0.894	0.629
	5	Elk	M	EL1	7,720	32	70	54	0.035	0	1,073,856	19,176	0.268	0.444
				ELDFE	17,160	33	73	65	0.053	4,512	532,416	74,448	-0.596	0.387
				ELUFE	11,000	32	61	54	0.059	0	565,128	99,264	0.240	0.297
				ELELKO	7,880	22	92	67	-0.321	1,128	177,660	59,220	-0.639	0.474
				ELH93	2,858	23	22	14	-0.506	27,072	1,398,720	124,080	-0.347	0.433

Notes: Normal range estimates are the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data distribution (benthic invertebrates) and 2015 reference area data distribution (periphyton) after the removal of outliers

value > upper limit ($P_{97.5}$) of the normal range

value < lower limit ($P_{2.5}$) of the normal range

Table G.14: Temporal Changes in Total Benthic Invertebrate Abundance for Mine-exposed Areas, 2012 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Years	Data Transformation	Linear		Step after 2012		Step after 2013		Step after 2015	
						P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]
1	Fording	T	HENFO	12,15	log	0.986	-	ND	-	ND	-	ND	-
			NGD1	12,15	log	0.931	-	ND	-	ND	-	ND	-
			KICK	12,15	log	0.273	-	ND	-	ND	-	ND	-
			SWCK	12,15	log	0.215	-	ND	-	ND	-	ND	-
			CATCK	12,15	log	0.013	-83	ND	-	ND	-	ND	-
			POCK	12,15	log	0.513	-	ND	-	ND	-	ND	-
			LC_DCDS	15,16	log	0.701	-	ND	-	ND	-	ND	-
			LC_DC1	15,16	log	0.529	-	ND	-	ND	-	ND	-
			GHCKD	12,15	log	0.052	-	ND	-	ND	-	ND	-
			GHCKU	12,15	log	0.033	-78	ND	-	ND	-	ND	-
		M	FODHE	12,15,16	log	0.577	-	0.697	-	ND	-	0.443	-
			FOUNGD	12,15	log	0.309	-	ND	-	ND	-	ND	-
			FODNGD	15	-	ND	-	ND	-	ND	-	ND	-
			MP1	12,13,15	none	0.410	-	0.139	-	0.827	-	ND	-
			FOUSH	12,15	log	0.390	-	ND	-	ND	-	ND	-
			FOUKI	12,15,16	log	0.058	-	0.084	-	ND	-	0.098	-
			FOBKS	12,15,16	log	0.858	-	0.893	-	ND	-	0.826	-
			FOBSC	12,15,16	log	0.233	-	0.270	-	ND	-	0.331	-
			FOBCP	12,15,16	log	0.239	-	0.310	-	ND	-	0.251	-
			FODPO	12,13,15,16	fourth root	0.286	-	0.976	-	0.184	-	0.411	-
			FO10-SP1	15	-	ND	-	ND	-	ND	-	ND	-
			FO22	12,15	log	0.175	-	ND	-	ND	-	ND	-
			FOUEW	12,15,16	log	0.963	-	0.965	-	ND	-	0.800	-
			LC_FRUS	15,16	log	0.201	-	ND	-	ND	-	ND	-
			FO29	12,13,15	none	0.901	-	0.389	-	0.712	-	ND	-
			FODGH	12,13,15,16	fourth root	0.696	-	0.853	-	0.486	-	0.987	-
2	Fording	T	LILC3	12,13,15,16	fourth root	0.638	-	0.726	-	0.464	-	0.289	-
			LIDSL	12,13,15,16	fourth root	0.321	-	0.693	-	0.432	-	0.359	-
			LI8	12,13,15,16	fourth root	0.991	-	0.558	-	0.451	-	0.532	-
		M	FO9	12,15	log	0.557	-	ND	-	ND	-	ND	-
			FRUL	12,13,15,16	fourth root	0.227	-	0.512	-	0.267	-	0.389	-
			FO23	12,13,15,16	fourth root	0.243	-	0.764	-	0.134	-	0.537	-
3	Elk	T	WOCK	12,15	log	0.206	-	ND	-	ND	-	ND	-
			THCK	12,13,15	none	0.490	-	0.814	-	0.267	-	ND	-
		M	EL20	12,15,16	log	0.504	-	0.492	-	ND	-	0.713	-
			ELUEL	12,15	log	0.223	-	ND	-	ND	-	ND	-
			ELDEL	12,15	log	0.913	-	ND	-	ND	-	ND	-
			ELUFO	12,13,15	none	0.733	-	0.810	-	0.738	-	ND	-
4	Michel	T	CORCK	12,15,16	log	0.033	842	0.017	968	ND	-	0.505	-
			BOCK	12,15,16	log	0.822	-	0.686	-	ND	-	0.758	-
		M	MIUCO	12,15,16	log	0.507	-	0.370	-	ND	-	0.860	-
			MIDCO	12,15,16	log	0.592	-	0.705	-	ND	-	0.469	-
			MIDAG	12,15	log	0.758	-	ND	-	ND	-	ND	-
			MI5	12,15	log	0.794	-	ND	-	ND	-	ND	-
			MI3	12,13,15,16	fourth root	0.933	-	0.460	-	0.794	-	0.769	-
			MI2	12,13,15,16	fourth root	0.141	-	0.913	-	0.056	-	0.198	-
	Elk	T	HACKUS	12,15,16	log	0.048	-90	0.042	-88	ND	-	0.266	-
			HACKDS	12,15,16	log	0.118	-	0.135	-	ND	-	0.243	-
			GRCK	12,15	log	0.513	-	ND	-	ND	-	ND	-
			GRDS	12,15	log	0.144	-	ND	-	ND	-	ND	-
			OCNM	12,15	log	0.546	-	ND	-	ND	-	ND	-
		M	EL19	12,15,16	log	0.277	-	0.384	-	ND	-	0.220	-
			ELDGR	12,15	log	0.101	-	ND	-	ND	-	ND	-
			ELUSP	12,15	log	0.602	-	ND	-	ND	-	ND	-
5	Elk	M	EL1	12,15,16	log	0.562	-	0.686	-	ND	-	0.423	-
			ELDFE	12,15	log	0.075	-	ND	-	ND	-	ND	-
			ELUFE	12,15,16	log	0.253	-	0.254	-	ND	-	0.471	-
			ELELKO	12,15,16	log	0.134	-	0.174	-	ND	-	0.192	-
			ELH93	12,15,16	log	0.139	-	0.197	-	ND	-	0.157	-

P-value < 0.05
Decrease
Increase

Notes: "ND" = Not determined due to insufficient data.

[a] Change in relative difference between mine-exposed and mean reference (from the first year to the last year included in the analysis) based on a linear trend

[b] Change in relative difference between mine-exposed and mean reference (step change)

Table G.15 : Temporal Changes in Benthic Invertebrate LPL Richness for Mine-exposed Areas, 2012 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Years	Data Transformation	Linear		Step after 2012		Step after 2013		Step after 2015	
						P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]
1	Fording	T	HENFO	12,15	none	0.155	-	ND	-	ND	-	ND	-
			NGD1	12,15	none	0.954	-	ND	-	ND	-	ND	-
			KICK	12,15	none	0.325	-	ND	-	ND	-	ND	-
			SWCK	12,15	none	0.721	-	ND	-	ND	-	ND	-
			CATCK	12,15	none	0.325	-	ND	-	ND	-	ND	-
			POCK	12,15	none	0.023	125	ND	-	ND	-	ND	-
			LC_DCDS	15,16	none	0.106	-	ND	-	ND	-	ND	-
			LC_DC1	15,16	none	0.741	-	ND	-	ND	-	ND	-
			GHCKD	12,15	none	0.023	72	ND	-	ND	-	ND	-
			GHCKU	12,15	none	0.087	-	ND	-	ND	-	ND	-
		M	FODHE	12,15,16	none	0.925	-	0.634	-	ND	-	0.374	-
			FOUNGD	12,15	none	0.272	-	ND	-	ND	-	ND	-
			FODNGD	15	-	ND	-	ND	-	ND	-	ND	-
			MP1	12,13,15	none	0.078	-	0.143	-	0.106	-	ND	-
			FOUSH	12,15	none	0.213	-	ND	-	ND	-	ND	-
			FOUKI	12,15,16	none	0.071	-	0.056	-	ND	-	0.389	-
			FOBKS	12,15,16	none	0.312	-	0.225	-	ND	-	0.911	-
			FOBSC	12,15,16	none	0.228	-	0.196	-	ND	-	0.595	-
			FOBCP	12,15,16	none	0.415	-	0.332	-	ND	-	0.911	-
			FODPO	12,13,15,16	none	0.833	-	0.118	-	0.901	-	0.598	-
			FO10-SP1	15	-	ND	-	ND	-	ND	-	ND	-
			FO22	12,15	none	0.403	-	ND	-	ND	-	ND	-
			FOUEW	12,15,16	none	0.059	-	0.060	-	ND	-	0.225	-
			LC_FRUS	15,16	none	0.466	-	ND	-	ND	-	ND	-
			FO29	12,13,15	none	0.478	-	0.785	-	0.248	-	ND	-
			FODGH	12,13,15,16	none	0.213	-	0.886	-	0.229	-	0.203	-
2	Fording	T	LILC3	12,13,15,16	none	0.195	-	0.522	-	0.188	-	0.598	-
			LIDSL	12,13,15,16	none	0.650	-	0.618	-	0.710	-	0.638	-
			LI8	12,13,15,16	none	0.790	-	1.000	-	1.000	-	0.177	-
		M	FO9	12,15	none	0.613	-	ND	-	ND	-	ND	-
			FRUL	12,13,15,16	none	0.991	-	0.943	-	0.901	-	0.541	-
			FO23	12,13,15,16	none	0.690	-	0.775	-	0.330	-	0.588	-
3	Elk	T	WOCK	12,15	none	0.325	-	ND	-	ND	-	ND	-
			THCK	12,13,15	none	0.480	-	0.743	-	0.236	-	ND	-
		M	EL20	12,15,16	none	0.706	-	0.576	-	ND	-	0.823	-
			ELUEL	12,15	none	0.927	-	ND	-	ND	-	ND	-
			ELDEL	12,15	none	0.492	-	ND	-	ND	-	ND	-
			ELUFO	12,13,15	none	0.626	-	0.919	-	0.454	-	ND	-
4	Michel	T	CORCK	12,15,16	none	0.243	-	0.170	-	ND	-	0.844	-
			BOCK	12,15,16	none	0.071	-	0.108	-	ND	-	0.098	-
		M	MIUCO	12,15,16	none	0.914	-	0.955	-	ND	-	0.634	-
			MIDCO	12,15,16	none	0.371	-	0.420	-	ND	-	0.435	-
			MIDAG	12,15	none	0.590	-	ND	-	ND	-	ND	-
			MI5	12,15	none	0.125	-	ND	-	ND	-	ND	-
			MI3	12,13,15,16	none	0.388	-	0.522	-	0.188	-	0.453	-
			MI2	12,13,15,16	none	0.650	-	0.943	-	0.538	-	0.742	-
	Elk	T	HACKUS	12,15,16	none	0.141	-	0.093	-	ND	-	0.716	-
			HACKDS	12,15,16	none	0.914	-	0.823	-	ND	-	0.374	-
			GRCK	12,15	none	0.325	-	ND	-	ND	-	ND	-
			GRDS	12,15	none	0.836	-	ND	-	ND	-	ND	-
			OCNM	12,15	none	0.258	-	ND	-	ND	-	ND	-
		M	EL19	12,15,16	none	0.893	-	0.695	-	ND	-	0.576	-
			ELDGR	12,15	none	0.927	-	ND	-	ND	-	ND	-
			ELUSP	12,15	none	0.422	-	ND	-	ND	-	ND	-
5	Elk	M	EL1	12,15,16	none	0.128	-	0.345	-	ND	-	0.019	-41
			ELDFE	12,15	none	0.513	-	ND	-	ND	-	ND	-
			ELUFE	12,15,16	none	0.048	50	0.067	-	ND	-	0.098	-
			ELELKO	12,15,16	none	0.461	-	0.758	-	ND	-	0.133	-
			ELH93	12,15,16	none	0.737	-	0.888	-	ND	-	0.486	-

P-value < 0.05
Decrease
Increase

Notes: "ND" = Not determined due to insufficient data.

[a] Change in relative difference between mine-exposed and mean reference (from the first year to the last year included in the analysis) based on a linear trend

[b] Change in relative difference between mine-exposed and mean reference (step change)

Table G.16: Temporal Changes in % EPT for Mine-exposed Areas, 2012 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Years	Data Transformation	Linear		Step after 2012		Step after 2013		Step after 2015	
						P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]
1	Fording	T	HENFO	12,15	none	0.721	-	ND	-	ND	-	ND	-
			NGD1	12,15	none	0.645	-	ND	-	ND	-	ND	-
			KICK	12,15	none	0.461	-	ND	-	ND	-	ND	-
			SWCK	12,15	none	0.043	-53	ND	-	ND	-	ND	-
			CATCK	12,15	none	0.386	-	ND	-	ND	-	ND	-
			POCK	12,15	none	0.141	-	ND	-	ND	-	ND	-
			LC_DCDS	15,16	none	0.810	-	ND	-	ND	-	ND	-
			LC_DC1	15,16	none	0.613	-	ND	-	ND	-	ND	-
			GHCKD	12,15	none	0.157	-	ND	-	ND	-	ND	-
			GHCKU	12,15	none	0.168	-	ND	-	ND	-	ND	-
		M	FODHE	12,15,16	none	0.926	-	0.615	-	ND	-	0.131	-
			FOUNGD	12,15	none	0.242	-	ND	-	ND	-	ND	-
			FODNGD	15	-	ND	-	ND	-	ND	-	ND	-
			MP1	12,13,15	none	0.691	-	0.558	-	0.358	-	ND	-
			FOUSH	12,15	none	0.144	-	ND	-	ND	-	ND	-
			FOUKI	12,15,16	none	0.300	-	0.271	-	ND	-	0.625	-
			FOBKS	12,15,16	none	0.892	-	0.619	-	ND	-	0.414	-
			FOBSC	12,15,16	none	0.963	-	0.866	-	ND	-	0.573	-
			FOBCP	12,15,16	none	0.799	-	0.613	-	ND	-	0.636	-
			FODPO	12,13,15,16	none	0.588	-	0.341	-	0.843	-	0.666	-
			FO10-SP1	15	-	ND	-	ND	-	ND	-	ND	-
			FO22	12,15	none	0.379	-	ND	-	ND	-	ND	-
			FOUEW	12,15,16	none	0.670	-	0.496	-	ND	-	0.707	-
			LC_FRUS	15,16	none	0.534	-	ND	-	ND	-	ND	-
			FO29	12,13,15	none	0.583	-	0.474	-	0.230	-	ND	-
			FODGH	12,13,15,16	none	0.669	-	0.802	-	0.495	-	0.869	-
2	Fording	T	LILC3	12,13,15,16	none	0.588	-	0.392	-	0.588	-	0.892	-
			LIDSL	12,13,15,16	none	0.206	-	0.177	-	0.355	-	0.277	-
			LI8	12,13,15,16	none	0.384	-	0.362	-	0.592	-	0.346	-
		M	FO9	12,15	none	0.804	-	ND	-	ND	-	ND	-
			FRUL	12,13,15,16	none	0.437	-	0.996	-	0.475	-	0.169	-
			FO23	12,13,15,16	none	0.749	-	0.843	-	0.484	-	0.681	-
3	Elk	T	WOCK	12,15	none	0.054	-	ND	-	ND	-	ND	-
			THCK	12,13,15	none	0.016	-76	0.003	-76	0.115	-	ND	-
		M	EL20	12,15,16	none	0.765	-	0.996	-	ND	-	0.349	-
			ELUEL	12,15	none	0.618	-	ND	-	ND	-	ND	-
			ELDEL	12,15	none	0.804	-	ND	-	ND	-	ND	-
			ELUFO	12,13,15	none	0.133	-	0.017	-56	0.581	-	ND	-
4	Michel	T	CORCK	12,15,16	none	0.623	-	0.263	-	ND	-	0.203	-
			BOCK	12,15,16	none	0.897	-	0.460	-	ND	-	0.156	-
		M	MIUCO	12,15,16	none	0.901	-	0.665	-	ND	-	0.150	-
			MIDCO	12,15,16	none	0.820	-	0.868	-	ND	-	0.267	-
			MIDAG	12,15	none	0.530	-	ND	-	ND	-	ND	-
			MI5	12,15	none	0.221	-	ND	-	ND	-	ND	-
			MI3	12,13,15,16	none	0.357	-	0.765	-	0.259	-	0.127	-
			MI2	12,13,15,16	none	0.018	107	0.742	-	0.006	197	0.010	200
	Elk	T	HACKUS	12,15,16	none	0.473	-	0.758	-	ND	-	0.148	-
			HACKDS	12,15,16	none	0.447	-	0.644	-	ND	-	0.225	-
			GRCK	12,15	none	0.510	-	ND	-	ND	-	ND	-
			GRDS	12,15	none	0.234	-	ND	-	ND	-	ND	-
			OCNM	12,15	none	0.996	-	ND	-	ND	-	ND	-
		M	EL19	12,15,16	none	0.348	-	0.127	-	ND	-	0.342	-
			ELDGR	12,15	none	0.764	-	ND	-	ND	-	ND	-
			ELUSP	12,15	none	0.433	-	ND	-	ND	-	ND	-
5	Elk	M	EL1	12,15,16	none	0.848	-	0.804	-	ND	-	0.231	-
			ELDFE	12,15	none	0.826	-	ND	-	ND	-	ND	-
			ELUFE	12,15,16	none	0.249	-	0.180	-	ND	-	0.813	-
			ELELKO	12,15,16	none	0.603	-	0.696	-	ND	-	0.518	-
			ELH93	12,15,16	none	0.005	-70	0.002	-75	ND	-	0.480	-

P-value < 0.05
Decrease
Increase

Notes: "ND" = Not determined due to insufficient data.

[a] Change in relative difference between mine-exposed and mean reference (from the first year to the last year included in the analysis) based on a linear trend

[b] Change in relative difference between mine-exposed and mean reference (step change)

Table G.17: Temporal Changes in % Ephemeroptera for Mine-exposed Areas, 2012 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Years	Data Transformation	Linear		Step after 2012		Step after 2013		Step after 2015	
						P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]
1	Fording	T	HENFO	12,15	none	0.435	-	ND	-	ND	-	ND	-
			NGD1	12,15	none	0.025	-50	ND	-	ND	-	ND	-
			KICK	12,15	none	0.720	-	ND	-	ND	-	ND	-
			SWCK	12,15	none	0.793	-	ND	-	ND	-	ND	-
			CATCK	12,15	none	0.860	-	ND	-	ND	-	ND	-
			POCK	12,15	none	0.909	-	ND	-	ND	-	ND	-
			LC_DCDS	15,16	none	0.952	-	ND	-	ND	-	ND	-
			LC_DC1	15,16	none	0.883	-	ND	-	ND	-	ND	-
			GHCKD	12,15	none	0.804	-	ND	-	ND	-	ND	-
			GHCKU	12,15	none	0.686	-	ND	-	ND	-	ND	-
		M	FODHE	12,15,16	none	0.288	-	0.136	-	ND	-	0.645	-
			FOUNGD	12,15	none	0.413	-	ND	-	ND	-	ND	-
			FODNGD	15	-	ND	-	ND	-	ND	-	ND	-
			MP1	12,13,15	none	0.660	-	0.233	-	0.889	-	ND	-
			FOUSH	12,15	none	0.444	-	ND	-	ND	-	ND	-
			FOUKI	12,15,16	none	0.025	-57	0.034	-60	ND	-	0.079	-
			FOBKS	12,15,16	none	0.036	-50	0.026	-54	ND	-	0.333	-
			FOBSC	12,15,16	none	0.072	-	0.070	-	ND	-	0.264	-
			FOBCP	12,15,16	none	0.001	-76	<0.001	-78	ND	-	0.199	-
			FODPO	12,13,15,16	none	0.064	-	0.014	-74	0.082	-	0.839	-
			FO10-SP1	15	-	ND	-	ND	-	ND	-	ND	-
			FO22	12,15	none	0.181	-	ND	-	ND	-	ND	-
			FOUEW	12,15,16	none	0.020	-73	0.014	-75	ND	-	0.256	-
			LC_FRUS	15,16	none	0.748	-	ND	-	ND	-	ND	-
			FO29	12,13,15	none	0.219	-	0.877	-	0.106	-	ND	-
			FODGH	12,13,15,16	none	0.122	-	0.015	-51	0.197	-	0.901	-
2	Fording	T	LILC3	12,13,15,16	none	0.483	-	0.288	-	0.555	-	0.956	-
			LIDSL	12,13,15,16	none	0.762	-	0.356	-	0.775	-	0.627	-
			LI8	12,13,15,16	none	0.525	-	0.051	-	0.953	-	0.695	-
		M	FO9	12,15	none	0.438	-	ND	-	ND	-	ND	-
			FRUL	12,13,15,16	none	0.350	-	0.364	-	0.370	-	0.035	144
			FO23	12,13,15,16	none	0.520	-	0.040	-59	0.762	-	0.359	-
3	Elk	T	WOCK	12,15	none	0.778	-	ND	-	ND	-	ND	-
			THCK	12,13,15	none	0.770	-	0.715	-	0.851	-	ND	-
		M	EL20	12,15,16	none	0.912	-	0.719	-	ND	-	0.580	-
			ELUEL	12,15	none	0.692	-	ND	-	ND	-	ND	-
			ELDEL	12,15	none	0.721	-	ND	-	ND	-	ND	-
			ELUFO	12,13,15	none	0.284	-	0.125	-	0.584	-	ND	-
4	Michel	T	CORCK	12,15,16	none	0.429	-	0.311	-	ND	-	0.941	-
			BOCK	12,15,16	none	0.512	-	0.384	-	ND	-	0.890	-
		M	MIUCO	12,15,16	none	0.583	-	0.514	-	ND	-	0.934	-
			MIDCO	12,15,16	none	0.118	-	0.114	-	ND	-	0.345	-
			MIDAG	12,15	none	0.127	-	ND	-	ND	-	ND	-
			MI5	12,15	none	0.301	-	ND	-	ND	-	ND	-
			MI3	12,13,15,16	none	0.501	-	0.044	-44	0.707	-	0.387	-
			MI2	12,13,15,16	none	0.188	-	0.486	-	0.111	-	0.038	253
	Elk	T	HACKUS	12,15,16	none	0.866	-	0.873	-	ND	-	0.360	-
			HACKDS	12,15,16	none	0.688	-	0.559	-	ND	-	0.832	-
			GRCK	12,15	none	0.439	-	ND	-	ND	-	ND	-
			GRDS	12,15	none	0.945	-	ND	-	ND	-	ND	-
			OCNM	12,15	none	0.350	-	ND	-	ND	-	ND	-
		M	EL19	12,15,16	none	0.151	-	0.049	-31	ND	-	0.576	-
			ELDGR	12,15	none	0.316	-	ND	-	ND	-	ND	-
			ELUSP	12,15	none	0.224	-	ND	-	ND	-	ND	-
5	Elk	M	EL1	12,15,16	none	0.821	-	0.567	-	ND	-	0.469	-
			ELDFE	12,15	none	0.781	-	ND	-	ND	-	ND	-
			ELUFE	12,15,16	none	0.169	-	0.167	-	ND	-	0.394	-
			ELELKO	12,15,16	none	0.184	-	0.274	-	ND	-	0.152	-
			ELH93	12,15,16	none	0.014	-85	0.009	-87	ND	-	0.276	-

P-value < 0.05
Decrease
Increase

Notes: "ND" = Not determined due to insufficient data.

[a] Change in relative difference between mine-exposed and mean reference (from the first year to the last year included in the analysis) based on a linear trend

[b] Change in relative difference between mine-exposed and mean reference (step change)

Table G.18: Summary of Mine-exposed Areas with Significant Temporal Changes in Benthic Invertebrate Community Endpoints, 2012 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Years Having Data (20xx)	Data Transformation	Abundance								LPL Richness								% EPT								% Ephemeroptera							
						Linear		Step after 2012		Step after 2013		Step after 2015		Linear		Step after 2012		Step after 2013		Step after 2015		Linear		Step after 2012		Step after 2013		Step after 2015		Linear		Step after 2012		Step after 2013		Step after 2015	
						P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]
1	Fording	T	SWCK	12,15	none	0.215	-	ND	-	ND	-	ND	-	0.721	-	ND	-	ND	-	ND	-	0.043	-52.8	ND	-	ND	-	ND	-	0.793	-	ND	-	ND	-	ND	-
			CATCK	12,15	log	0.013	-83	ND	-	ND	-	ND	-	0.325	-	ND	-	ND	-	ND	-	0.386	-	ND	-	ND	-	ND	-	0.860	-	ND	-	ND	-	ND	-
			POCK	12,15	none	0.513	-	ND	-	ND	-	ND	-	0.023	125	ND	-	ND	-	ND	-	0.141	-	ND	-	ND	-	ND	-	0.909	-	ND	-	ND	-	ND	-
			GHCKD	12,15	none	0.052	-	ND	-	ND	-	ND	-	0.023	72	ND	-	ND	-	ND	-	0.157	-	ND	-	ND	-	ND	-	0.804	-	ND	-	ND	-	ND	-
			GHCKU	12,15	log	0.033	-78	ND	-	ND	-	ND	-	0.087	-	ND	-	ND	-	ND	-	0.168	-	ND	-	ND	-	ND	-	0.686	-	ND	-	ND	-	ND	-
		M	FOUKI	12,15,16	none	0.058	-	0.084	-	ND	-	0.098	-	0.071	-	0.056	-	ND	-	0.389	-	0.300	-	0.271	-	ND	-	0.625	-	0.025	-57	0.034	-60	ND	-	0.079	-
			FOBKS	12,15,16	none	0.858	-	0.893	-	ND	-	0.826	-	0.312	-	0.225	-	ND	-	0.911	-	0.892	-	0.619	-	ND	-	0.414	-	0.036	-50.1	0.026	-54	ND	-	0.333	-
			FOBCP	12,15,16	none	0.239	-	0.310	-	ND	-	0.251	-	0.415	-	0.332	-	ND	-	0.911	-	0.799	-	0.613	-	ND	-	0.636	-	0.001	-76.3	<0.001	-78	ND	-	0.199	-
			FODPO	12,13,15,16	none	0.286	-	0.976	-	0.184	-	0.411	-	0.833	-	0.118	-	0.901	-	0.598	-	0.588	-	0.341	-	0.843	-	0.666	-	0.064	-	0.014	-74	0.082	-	0.839	-
			FOUEW	12,15,16	log	0.963	-	0.965	-	ND	-	0.800	-	0.059	-	0.060	-	ND	-	0.225	-	0.670	-	0.496	-	ND	-	0.707	-	0.020	-72.7	0.014	-75	ND	-	0.256	-
			FODGH	12,13,15,16	none	0.696	-	0.853	-	0.486	-	0.987	-	0.213	-	0.886	-	0.229	-	0.203	-	0.669	-	0.802	-	0.495	-	0.869	-	0.122	-	0.015	-51	0.197	-	0.901	-
2	Fording	M	FRUL	12,13,15,16	none	0.227	-	0.512	-	0.267	-	0.389	-	0.991	-	0.943	-	0.901	-	0.541	-	0.437	-	0.996	-	0.475	-	0.169	-	0.350	-	0.364	-	0.370	-	0.035	144
			FO23	12,13,15,16	none	0.243	-	0.764	-	0.134	-	0.537	-	0.690	-	0.775	-	0.330	-	0.588	-	0.749	-	0.843	-	0.484	-	0.681	-	0.520	-	0.040	-59	0.762	-	0.359	-
3	Elk	T	THCK	12,13,15	none	0.490	-	0.814	-	0.267	-	ND	-	0.480	-	0.743	-	0.236	-	ND	-	0.016	-75.7	0.003	-76	0.115	-	ND	-	0.770	-	0.715	-	0.851	-	ND	-
		M	ELUFO	12,13,15	none	0.733	-	0.810	-	0.738	-	ND	-	0.626	-	0.919	-	0.454	-	ND	-	0.133	-	0.017	-56	0.581	-	ND	-	0.284	-	0.125	-	0.584	-	ND	-
4	Michel	T	CORCK	12,15,16	log	0.033	842	0.017	968	ND	-	0.505	-	0.243	-	0.170	-	ND	-	0.844	-	0.623	-	0.263	-	ND	-	0.203	-	0.429	-	0.311	-	ND	-	0.941	-
		M	MI3	12,13,15,16	none	0.933	-	0.460	-	0.794	-	0.769	-	0.388	-	0.522	-	0.188	-	0.453	-	0.357	-	0.765	-	0.259	-	0.127	-	0.501	-	0.044	-44	0.707	-	0.387	-
			MI2	12,13,15,16	none	0.141	-	0.913	-	0.056	-	0.198	-	0.650	-	0.943	-	0.538	-	0.742	-	0.018	107.2	0.742	-	0.006	197	0.010	200	0.188	-	0.486	-	0.111	-	0.038	253.1
	Elk	T	HACKUS	12,15,16	log	0.048	-90	0.042	-88	ND	-	0.266	-	0.141	-	0.093	-	ND	-	0.716	-	0.473	-	0.758	-	ND	-	0.148	-	0.866	-	0.873	-	ND	-	0.360	-
		M	EL19	12,15,16	none	0.277	-	0.384	-	ND	-	0.220	-	0.893	-	0.695	-	ND	-	0.576	-	0.348	-	0.127	-	ND	-	0.342	-	0.151	-	0.049	-31	ND	-	0.576	-
5	Elk	M	EL1	12,15,16	log	0.562	-	0.686	-	ND	-	0.423	-	0.128	-	0.345	-	ND	-	0.019	-41.4	0.848	-	0.804	-	ND	-	0.231	-	0.821	-	0.567	-	ND	-	0.469	-
			ELUFE	12,15,16	none	0.253	-	0.254	-	ND	-	0.471	-	0.048	50	0.067	-	ND	-	0.098	-	0.249	-	0.180	-	ND	-	0.813	-	0.169	-	0.167	-	ND	-	0.394	-
			ELH93	12,15,16	none	0.139	-	0.197	-	ND	-	0.157	-	0.737	-	0.888	-	ND	-	0.486	-	0.005	-70	0.002	-75	ND	-	0.480	-	0.014	-85	0.009	-87	ND	-	0.276	-

P-value < 0.05
Decrease
Increase

Notes: "ND" = Not determined due to insufficient data.

[a] Change in relative difference between mine-exposed and mean reference (from the first year to the last year included in the analysis) based on a linear trend

[b] Change in relative difference between mine-exposed and mean reference (step change)

Table G.19: Temporal Changes in Benthic Invertebrate Endpoints for Main Stem Mine-exposed Areas by Management Unit, 2012 - 2016

Endpoint	Management Unit	Number of Stations	Years	Data Transformation	Linear		Step after 2012		Step after 2015	
					P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]
Abundance	1	8	12, 15, 16	log	0.107	-	0.914	-	0.911	-
	2	2	12, 15, 16	log	0.202	-	0.921	-	0.959	-
	3	1	12, 15, 16	log	0.453	-	0.954	-	0.976	-
	4 Elk	1	12, 15, 16	log	0.223	-	0.942	-	0.918	-
	4 Michel	4	12, 15, 16	log	0.823	-	1.000	-	0.958	-
	5	4	12, 15, 16	log	0.098	-	0.905	-	0.926	-
LPL Richness	1	8	12, 15, 16	none	0.347	-	0.267	-	0.879	-
	2	2	12, 15, 16	none	0.757	-	0.496	-	0.459	-
	3	1	12, 15, 16	none	0.683	-	0.545	-	0.808	-
	4 Elk	1	12, 15, 16	none	0.884	-	0.671	-	0.545	-
	4 Michel	4	12, 15, 16	none	0.723	-	0.630	-	0.919	-
	5	4	12, 15, 16	none	0.473	-	0.527	-	0.510	-
% EPT	1	8	12, 15, 16	none	0.847	-	0.478	-	0.243	-
	2	2	12, 15, 16	none	0.636	-	0.922	-	0.093	-
	3	1	12, 15, 16	none	0.780	-	0.996	-	0.380	-
	4 Elk	1	12, 15, 16	none	0.379	-	0.152	-	0.373	-
	4 Michel	4	12, 15, 16	none	0.157	-	0.479	-	0.011	40
	5	4	12, 15, 16	none	0.608	-	0.038	-27	0.926	-
% Ephemeroptera	1	8	12, 15, 16	none	<0.001	-41	<0.001	-44	0.116	-
	2	2	12, 15, 16	none	0.817	-	0.388	-	0.155	-
	3	1	12, 15, 16	none	0.910	-	0.712	-	0.569	-
	4 Elk	1	12, 15, 16	none	0.139	-	0.042	-47	0.565	-
	4 Michel	4	12, 15, 16	none	0.339	-	0.185	-	0.716	-
	5	4	12, 15, 16	none	0.022	-41	0.016	-39	0.252	-

P-value < 0.05
Decrease
Increase

Notes: "ND" = Not determined due to insufficient data.

[a] Change in relative difference between mine-exposed and mean reference (from the first year to the last year included in the analysis) based on a linear trend

[b] Change in relative difference between mine-exposed and mean reference (step change)

Table G.20: Mean Skewness and Kurtosis Values for Transformations of the Benthic Invertebrate Lowest Practical Level Abundance Data Matrix for Reference (n = 40) and Mine-exposed (n = 59) Areas, September 2015

Transformation	Endpoint	Skewness (mean)	Kurtosis (mean)
None	Area\Row	6.133	44.47
	Taxa\Col	5.341	36.21
Log_{10}	Area\Row	1.285	0.619
	Taxa\Col	1.911	5.981
Square root	Area\Row	3.278	14.15
	Taxa\Col	3.224	14.91
Fourth root	Area\Row	1.452	1.574
	Taxa\Col	1.998	6.210
Power 2	Area\Row	8.095	70.85
	Taxa\Col	7.392	61.45
Power 4	Area\Row	9.075	85.62
	Taxa\Col	8.732	80.26

Indicates lowest area mean skewness and kurtosis values.

Table G.21: Reference (n = 40) and Mine-exposed (n = 59) Area NMDS Scores for Benthic Community Structure (log10 Transformed Abundance Data Matrix Using Lowest Practical Level Taxonomy)

Axis		NMDS-1	NMDS-2	NMDS-3
% Variance explained		54.6	22.1	12.4
Monte Carlo P		0.004	0.004	0.004
Reference Area	AGCK	0.628	-0.084	-0.605
	AL4	-0.237	-0.392	-0.433
	ALUSM	0.003	-0.293	-0.119
	BU2	0.900	0.274	-0.010
	BU40	-0.037	0.093	0.460
	BUUQ	0.284	0.002	-0.082
	CADCK	0.295	-0.702	-0.249
	CHCK	-0.233	-0.631	-0.273
	CRUKO	1.540	0.524	-0.407
	DACK	-0.028	-0.368	-0.090
	DUCK	-0.266	-0.224	0.006
	EL12	-0.093	-0.520	0.215
	ELUGH	0.542	-0.100	0.251
	EWCK	0.416	-0.607	-0.161
	FLAD	-0.367	-0.370	0.694
	FLAU	-0.552	-0.640	0.676
	FO26	0.115	-0.259	-0.414
	FLRU	-0.058	-0.302	0.860
	GRUHA	0.422	-0.241	-0.325
	HENUP	0.684	-0.205	-0.534
	KO1	0.640	1.765	0.093
	KODCR	1.208	1.089	0.334
	KOUCR	0.992	0.943	0.227
	KOUVE	-0.190	0.615	0.500
	LC_GRCK	0.344	-0.442	-0.908
	LI24	0.578	0.271	-0.779
	MCCR	0.536	-0.610	-0.413
	MI25	0.296	-0.167	-0.218
	OLDDU	0.194	0.600	0.476
	OLDLI	0.804	-0.283	0.173
	OLDLOW	0.283	0.238	0.905
	PADAL	1.093	0.718	-0.278
	PAUKO	1.164	0.895	0.089
	RACK	0.175	0.166	0.371
	SLINE	0.513	-0.409	-0.702
	VEUKO	1.117	1.447	-0.187
	VEUP	0.676	0.669	-0.569
	VICK	0.047	-0.253	-0.056
	WWRL	0.461	-0.378	0.093
	WWRU	1.434	0.330	0.102
Mine-exposed Area	BOCK	-2.152	0.428	0.574
	CACK	-2.155	1.128	0.503
	COCK	-1.436	-0.278	-0.023
	EL19	-0.141	0.112	0.366
	EL1	0.277	-0.363	0.532
	EL20	0.232	-0.290	0.268
	ELDFE	-0.112	0.101	1.172
	ELELKO	0.779	-0.035	0.807
	ELH93	-0.014	1.112	1.381
	ELUEL	0.104	-0.088	0.238
	ELUFE	-0.122	0.123	1.077
	ELUFO	-0.668	-0.219	0.846
	ELUSP	0.171	-0.218	0.546
	FO10-SP1	-0.388	-0.026	-0.318
	FO22	-0.398	-0.423	-0.034
	FO23	-0.119	-0.056	0.210
	FO29	-0.369	-0.364	0.107
	FO9	0.168	-0.064	0.130
	FOBCP	-0.359	0.115	0.024
	FOBKS	0.239	0.123	-0.050
	FOBSC	-0.031	0.224	-0.198
	FODGH	-0.186	-0.290	-0.120
	FODHE	0.076	-0.506	0.161
	FODPO	-0.420	-0.121	-0.323
	FOUEW	-0.351	-0.296	-0.132
	FOUKI	0.111	0.341	-0.082
	FOUL	0.111	-0.031	0.536
	FOUNGD	0.332	-0.319	-0.274
	FOUSH	-0.159	0.047	0.004
	GHCKD	-1.344	-0.160	0.385
	GHCKU	-0.658	1.223	-0.209
	GRCK	0.046	-0.618	-0.443
	GRDS	0.090	-0.494	-0.158
	HACKDS	-0.465	-1.139	-0.268
	HACKUS	-0.176	-0.500	-0.315
	HENFO	0.079	-0.022	-0.287
	KICK	-0.889	1.786	-0.938
	LC_DC1	0.246	-0.493	-0.529
	LC_DCDS	0.451	-0.237	-0.463
	LC_FRUS	-0.226	0.271	-0.004
	LI8	0.203	-0.197	-0.686
	LIDSL	-0.035	-0.224	-0.353
	LILC3	-0.304	-0.351	-0.582
	MI2	-0.047	-0.306	0.335
	MI3	0.527	-0.570	0.512
	MI5	0.658	-0.620	0.289
	MIDAG	0.051	-0.631	0.043
	MIDCO	-0.312	-0.519	0.027
	MIUCO	0.225	-0.512	0.013
Mine-exposed Area	MP1	-0.226	-0.075	-0.074
	FODNGD	0.008	-0.031	-0.116
	OCNM	-0.898	1.133	-1.569
	POCK	-1.054	-0.136	-0.041
	SWCK	-1.728	0.017	-0.350
	THCK	-1.793	0.463	-0.946
	WOCK	-1.222	0.859	-0.187
	ELDGR	0.393	0.324	0.226
	ELDEL	0.121	-0.270	0.183
	NGD1u	-1.064	0.001	-0.137

Note: Percent Variance Explained, Monte Carlo Randomized p-values of Axis Significance, and Area Scores, September 2015.

Table G.22: Pearson Correlation Between Reference (n = 40) and Mine-exposed (n = 59) Area Taxon Densities and Area NMDS Scores of Benthic Community Structures (log10 Transformed Abundance Data Matrix Using Lowest Practical Level Taxonomy).

Category	Variable	NMS-1		NMS-2		NMS-3	
		r	p	r	p	r	p
Benthic LPL	Ameletus	0.299	0.003	0.099	0.329	0.152	0.132
	Baetidae	-0.013	0.902	-0.191	0.059	0.226	0.024
	Acentrella sp.	0.083	0.413	0.025	0.803	0.531	<0.001
	Baetis	0.302	0.002	-0.572	<0.001	0.210	0.037
	Baetis bicaudatus	0.123	0.226	-0.277	0.005	-0.178	0.078
	Baetis tricaudatus group	0.244	0.015	-0.420	<0.001	0.079	0.437
	Ephemerellidae	0.366	<0.001	-0.600	<0.001	0.111	0.275
	Drunella doddsii	0.329	<0.001	-0.623	<0.001	0.069	0.500
	Drunella flavilinea	0.153	0.130	-0.079	0.439	-0.185	0.067
	Drunella grandis group	-0.061	0.546	-0.145	0.151	0.286	0.004
	Drunella sp.	-0.021	0.837	-0.301	0.003	-0.020	0.842
	Ephemerella	0.206	0.041	0.039	0.700	0.469	<0.001
	Heptageniidae	0.526	<0.001	-0.586	<0.001	0.086	0.399
	Cinygmula sp.	0.239	0.017	-0.133	0.191	-0.227	0.024
	Epeorus	0.363	<0.001	-0.377	<0.001	-0.388	<0.001
	Rhithrogena	0.548	<0.001	-0.231	0.021	0.074	0.467
	Leptophlebiidae	0.003	0.976	-0.037	0.713	0.509	<0.001
	Capniidae	0.040	0.693	0.151	0.136	-0.011	0.915
	Chloroperlidae	0.170	0.092	-0.200	0.047	-0.079	0.436
	Sweltsa sp.	0.320	0.001	-0.497	<0.001	-0.010	0.923
	Leuctridae	0.088	0.388	-0.219	0.030	-0.075	0.463
	Nemouridae	-0.300	0.003	-0.130	0.199	0.082	0.418
	Amphinemura sp.	-0.426	<0.001	-0.008	0.939	-0.172	0.089
	Zapada	-0.146	0.148	-0.484	<0.001	-0.351	<0.001
	Zapada cinctipes	-0.380	<0.001	-0.250	0.013	0.251	0.012
	Zapada columbiana	-0.006	0.955	-0.268	0.007	-0.534	<0.001
	Zapada oregonensis group	0.007	0.947	-0.413	<0.001	-0.436	<0.001
	Peltoperlidae	0.019	0.853	-0.135	0.181	-0.185	0.067
	Yoraperla sp.	0.093	0.358	-0.234	0.020	-0.267	0.008
	Perlidae	0.038	0.710	-0.170	0.093	0.489	<0.001
	Hesperoperla sp.	0.106	0.296	-0.043	0.671	0.407	<0.001
	Perlodidae	0.061	0.547	-0.418	<0.001	0.038	0.708
	Megarcys sp.	0.095	0.349	-0.354	<0.001	-0.449	<0.001
	Pteronarcella sp.	0.064	0.528	-0.016	0.871	0.293	0.003
	Taeniopterygidae	0.115	0.257	-0.095	0.348	-0.066	0.519
	Taenionema	0.381	<0.001	-0.540	<0.001	-0.223	0.026
	Apataniidae	0.061	0.550	-0.265	0.008	0.049	0.631
	Brachycentridae	-0.126	0.215	-0.335	<0.001	0.270	0.007
	Glossosomatidae	0.189	0.061	-0.417	<0.001	-0.014	0.891
	Hydropsychidae	0.150	0.137	-0.219	0.030	-0.193	0.055
	Arctopsyche sp.	0.285	0.004	0.059	0.562	0.340	<0.001
	Hydropsyche	0.148	0.144	0.066	0.516	0.382	<0.001
	Parapsyche sp.	0.085	0.402	-0.374	<0.001	-0.286	0.004
	Lepidostoma	0.115	0.259	-0.025	0.810	0.222	0.027
	Limnephilidae	-0.389	<0.001	-0.154	0.128	-0.145	0.153
	Rhyacophila	-0.153	0.131	-0.499	<0.001	-0.306	0.002
	Rhyacophila brunnea/vemna group	-0.351	<0.001	-0.365	<0.001	-0.124	0.222
	Rhyacophila betteni group	-0.144	0.154	-0.158	0.118	-0.035	0.731
	Rhyacophila hyalinata group	-0.031	0.759	-0.284	0.004	-0.255	0.011
	Uenoidae	0.118	0.244	-0.294	0.003	-0.331	<0.001
	Elmidae	-0.322	0.001	-0.300	0.003	-0.116	0.252
	Optioservus sp.	-0.158	0.118	-0.353	<0.001	0.025	0.806
	Atherix	-0.027	0.788	0.006	0.956	0.448	<0.001
	Bezzia/ Palpomyia	-0.148	0.142	-0.200	0.047	0.049	0.632
	Probezzia	0.069	0.499	-0.115	0.255	0.007	0.942
	Paracladopelma sp.	-0.009	0.927	0.186	0.065	0.295	0.003
	Phaenopsectra	-0.001	0.990	0.007	0.943	-0.146	0.150
	Stempellina sp.	0.019	0.855	-0.176	0.082	0.066	0.517
	Corynoneura	-0.323	0.001	0.169	0.094	0.074	0.466
	Cricotopus	-0.349	<0.001	0.020	0.841	0.209	0.038
	Polypedilum sp.	0.049	0.628	-0.007	0.944	0.394	<0.001
	Micropsectra	-0.607	<0.001	-0.237	0.018	0.325	0.001
	Rheotanytarsus	-0.041	0.687	-0.186	0.065	0.055	0.588
	Stempellinella sp.	-0.367	<0.001	0.140	0.167	0.079	0.436
	Diamesa	-0.270	0.007	-0.024	0.813	-0.150	0.138
	Pagastia	-0.310	0.002	-0.333	<0.001	-0.175	0.083
	Pseudodiamesa sp.	-0.439	<0.001	0.057	0.573	-0.004	0.972
	Brillia sp.	0.027	0.793	0.045	0.661	-0.181	0.073
	Cricotopus (Nostococladius)	0.083	0.414	-0.092	0.367	0.184	0.068
	Eukiefferiella	-0.436	<0.001	-0.365	<0.001	0.171	0.091
	Heleniella sp.	-0.207	0.040	0.039	0.699	0.307	0.002
	Hydrobaenus	-0.195	0.053	-0.084	0.410	-0.244	0.015
	Limnophyes sp.	-0.236	0.019	0.157	0.121	0.052	0.610
	Orthocladius	-0.373	<0.001	-0.208	0.039	0.379	<0.001
	Parametriocnemus	-0.229	0.023	-0.021	0.834	0.007	0.948
	Rheocricotopus	0.029	0.777	-0.508	<0.001	-0.034	0.735
	Thienemanniella	-0.403	<0.001	0.067	0.507	-0.084	0.409
	Tvetenia bavarica group	-0.299	0.003	-0.293	0.003	0.173	0.086
	Thienemannimyia group	-0.361	<0.001	0.023	0.819	0.174	0.086
	Empididae	-0.299	0.003	0.064	0.527	0.206	0.041
	Chelifera/ Metachela	-0.287	0.004	-0.225	0.025	0.164	0.104
	Limnophora sp.	-0.427	<0.001	0.261	0.009	0.028	0.785
	Glutops sp.	-0.157	0.120	-0.090	0.374	-0.195	0.053
	Pericoma/Telmatoscopus sp.	-0.393	<0.001	-0.423	<0.001	0.045	0.660
	Simuliidae	-0.527	<0.001	0.072	0.477	0.007	0.943
	Tipulidae	0.021	0.838	0.160	0.114	-0.244	0.015
	Antocha sp.	-0.056	0.583	-0.150	0.138	0.345	<0.001
	Dicranota	-0.382	<0.001	-0.280	0.005	-0.232	0.021
	Hexatoma sp.	0.151	0.136	-0.065	0.524	0.253	0.011
	Limnophila sp.	0.150	0.138	-0.026	0.796	0.220	0.029
	Trombidiformes	-0.211	0.036	-0.105	0.301	0.040	0.697
	Aturus	-0.319	0.001	-0.186	0.065	-0.005	0.962
	Lebertia	-0.188	0.063	-0.170	0.092	0.161	0.112
	Sperchon	-0.025	0.805	0.116	0.254	-0.037	0.719
	Sperchonopsis sp.	-0.014	0.889	-0.004	0.965	0.253	0.012
	Testudacarus sp.	-0.068	0.502	-0.078	0.445	0.444	<0.001
	Torrenticola	0.004	0.971	-0.248	0.013	0.265	0.008
	Oribatida	-0.257	0.010	0.035	0.728	-0.037	0.717
	Pisidium	-0.324	0.001	0.047	0.646	-0.193	0.056

Table G.22: Pearson Correlation Between Reference (n = 40) and Mine-exposed (n = 59) Area Taxon Densities and Area NMDS Scores of Benthic Community Structures (log10 Transformed Abundance Data Matrix Using Lowest Practical Level Taxonomy).

Category	Variable	NMS-1		NMS-2		NMS-3	
		r	p	r	p	r	p
Benthic LPL	Lumbriculidae	-0.065	0.521	-0.050	0.620	-0.196	0.052
	Rhynchelmis sp.	0.089	0.382	-0.136	0.181	-0.168	0.096
	Enchytraeus	-0.529	<0.001	0.115	0.257	0.206	0.041
	Nais	-0.266	0.008	-0.045	0.657	0.357	<0.001
	Tubificinae	-0.333	<0.001	0.111	0.273	-0.159	0.116

indicates absolute r-value > 0.6.
indicates a p-value < 0.05.

Table G.23: Mean Skewness and Kurtosis Values for Transformations of the Benthic Invertebrate Family Abundance Matrix for Reference (n = 40) and Mine-exposed (n = 59) Areas, September 2015

Transformation	Endpoint	Skewness (mean)	Kurtosis (mean)
None	Area\Row	4.239	20.55
	Taxa\Col	5.177	35.59
Log_{10}	Area\Row	0.873	-0.463
	Taxa\Col	1.525	5.886
Square root	Area\Row	2.525	7.598
	Taxa\Col	3.027	14.49
Fourth root	Area\Row	1.115	0.528
	Taxa\Col	1.733	6.254
Power 2	Area\Row	5.452	31.87
	Taxa\Col	7.265	60.48
Power 4	Area\Row	6.103	38.54
	Taxa\Col	8.725	80.58

Indicates lowest area mean skewness and kurtosis values.

Table G.24 Reference Area (n = 40) and Mine-exposed (n = 59) NMDS Scores for Benthic Community Structure (log10 Transformed Abundance Data Matrix Using Family-Level Taxonomy)

Axis		NMDS-1	NMDS-2
% Variance explained		64.9	21.1
Monte Carlo P		0.004	0.004
Reference Area	AGCK	0.399	-0.422
	AL4	-0.305	0.237
	ALUSM	-0.239	0.244
	BU2	0.560	-0.402
	BU40	0.256	0.027
	BUUQ	0.303	-0.173
	CADCK	0.347	0.385
	CHCK	-0.092	0.419
	CRUKO	1.514	-0.835
	DACK	-0.090	0.311
	DUCK	-0.159	0.224
	EL12	-0.030	0.235
	ELUGH	0.501	0.135
	EWCK	0.649	0.341
	FLAD	-0.172	0.614
	FLAU	-0.431	0.895
	FLRU	-0.249	0.689
	FO26	0.491	0.278
	GRUHA	0.592	0.174
	HENUP	0.641	-0.207
	KO1	1.185	-1.628
	KODCR	1.167	-1.252
	KOUCR	1.013	-0.931
	KOUVE	-0.232	-0.869
	LC_GRCK	-0.288	-0.310
	LI24	0.222	-0.614
	MCCR	0.225	0.351
	MI25	0.288	0.115
	OLDDU	0.341	-0.281
	OLDLI	0.306	0.082
	OLDLOW	0.777	-0.100
	PADAL	0.777	-0.716
	PAUKO	0.816	-0.913
	RACK	-0.032	-0.006
	SLINE	0.790	0.133
	VEUKO	0.933	-1.467
	VEUP	0.662	-0.797
	VICK	0.004	0.280
	WWRL	0.123	-0.051
	WWRU	0.635	-1.020
Mine-exposed Area	BOCK	-2.835	0.073
	CACK	-3.137	-0.929
	COCK	-1.699	0.608
	EL19	-0.145	-0.097
	EL1	0.396	0.434
	EL20	0.258	0.467
	ELDEL	0.133	0.289
	ELDFE	0.812	0.893
	ELDGR	0.275	-0.391
	ELELKO	1.105	0.140
	ELH93	1.668	-0.416
	ELUEL	0.255	0.441
	ELUFE	0.869	1.084
	ELUFO	-0.126	1.183
	ELUSP	0.415	0.684
	FO10-SP1	-0.474	0.025
	FO22	-0.559	0.379
	FO23	-0.113	0.147
	FO29	-0.035	0.460
	FO9	0.187	0.169
	FOBCP	-0.274	-0.060
	FOBKS	0.043	-0.103
	FOBSC	-0.081	-0.186
	FODGH	-0.269	0.374
	FODHE	0.408	0.532

Table G.24 Reference Area (n = 40) and Mine-exposed (n = 59) NMDS Scores for Benthic Community Structure (log10 Transformed Abundance Data Matrix Using Family-Level Taxonomy)

Axis		NMDS-1	NMDS-2
% Variance explained		64.9	21.1
Monte Carlo P		0.004	0.004
Mine-exposed Area	FODPO	-0.547	0.067
	FOUEW	-0.221	0.293
	FOUKI	-0.137	-0.252
	FOUL	-0.416	0.131
	FOUNGD	0.452	0.243
	FOUSH	-0.036	-0.064
	GHCKD	-1.255	0.891
	GHCKU	-0.557	-1.409
	GRCK	0.156	0.448
	GRDS	0.145	0.567
	HACKDS	0.382	1.126
	HACKUS	-0.204	0.487
	HENFO	0.479	0.005
	KICK	-1.285	-2.412
	LC_DC1	0.232	0.234
	LC_DCDS	0.365	-0.026
	LC_FRUS	0.080	-0.286
	LI8	0.412	-0.180
	LIDSL	0.042	0.049
	LILC3	-0.329	0.006
	MI2	-0.100	0.358
	MI3	0.105	0.718
	MI5	-0.046	0.731
	MIDAG	-0.102	0.667
	MIDCO	-0.243	0.443
	MIUCO	0.117	0.378
	MP1	-0.020	0.066
	FODNGD	-0.165	0.013
	NGD1u	-0.897	-0.011
	OCNM	-1.280	-1.484
	POCK	-1.177	0.309
	SWCK	-2.006	0.055
	THCK	-1.904	-0.544
	WOCK	-1.313	-0.994

Note: Percent Variance Explained, Monte Carlo Randomized p-values of Axis Significance, and Area Scores, September 2015.

Table G.25: Pearson Correlation Between Reference (n = 40) and Mine-exposed (n = 59) Area Taxon Abundances and Area NMDS Scores of Benthic Community Structures (log10 Transformed Abundance Data Matrix Using Family-Level Taxonomy)

Category	Variable	NMDS-1		NMDS-2	
		r	p	r	p
Benthic Family	Ameletidae	0.438	<0.001	-0.012	0.907
	Baetidae	0.429	<0.001	0.587	<0.001
	Ephemerellidae	0.543	<0.001	0.614	<0.001
	Heptageniidae	0.625	<0.001	0.461	<0.001
	Leptophlebiidae	0.141	0.162	0.257	0.010
	Capniidae	-0.023	0.819	-0.176	0.082
	Chloroperlidae	0.248	0.013	0.379	<0.001
	Leuctridae	0.091	0.372	0.168	0.096
	Nemouridae	-0.333	<0.001	0.512	<0.001
	Peltoperlidae	0.068	0.504	0.090	0.374
	Perlidae	0.130	0.200	0.364	<0.001
	Perlodidae	0.267	0.008	0.459	<0.001
	Pteronarcyidae	0.148	0.142	0.172	0.089
	Taeniopterygidae	0.265	0.008	0.304	0.002
	Apataniidae	-0.004	0.971	0.244	0.015
	Brachycentridae	-0.002	0.980	0.459	<0.001
	Glossosomatidae	0.078	0.445	0.311	0.002
	Hydropsychidae	0.375	<0.001	0.121	0.232
	Hydroptilidae	-0.414	<0.001	0.193	0.056
	Lepidostomatidae	0.313	0.002	0.135	0.182
	Limnephilidae	-0.495	<0.001	0.070	0.491
	Rhyacophilidae	-0.221	0.028	0.380	<0.001
	Uenoidae	0.096	0.346	0.139	0.170
	Dytiscidae	-0.092	0.365	-0.187	0.064
	Elmidae	-0.293	0.003	0.424	<0.001
	Athericidae	0.141	0.163	0.258	0.010
	Ceratopogonidae	-0.216	0.032	0.217	0.031
	Chironomidae	-0.455	<0.001	0.564	<0.001
	Empididae	-0.261	0.009	0.249	0.013
	Muscidae	-0.527	<0.001	-0.219	0.030
	Pelecorhynchidae	-0.162	0.109	0.037	0.719
	Psychodidae	-0.427	<0.001	0.457	<0.001
	Simuliidae	-0.549	<0.001	-0.006	0.953
	Tipulidae	-0.255	0.011	0.347	<0.001
	Aturidae	-0.260	0.009	0.221	0.028
	Hydryphantidae	0.101	0.319	0.019	0.849
	Hygrobatidae	0.046	0.654	-0.045	0.661
	Lebertiidae	-0.063	0.538	0.301	0.002
	Sperchontidae	0.106	0.297	-0.005	0.959
	Torrenticolidae	0.051	0.615	0.401	<0.001
	Oribatidae	-0.252	0.012	0.023	0.823
	Pisidiidae	-0.248	0.013	0.003	0.974
	Lumbriculidae	-0.050	0.620	0.019	0.853
	Enchytraeidae	-0.502	<0.001	0.083	0.417
	Naididae	-0.049	0.628	0.241	0.016
	Tubificidae	-0.324	0.001	-0.035	0.727

indicates absolute r-value > 0.6.
indicates a p-value < 0.05.

Table G.26: Mean Skewness and Kurtosis Values for Transformations of the Benthic Invertebrate Lowest Practical Level Proportional Data Matrix for Reference (n = 40) and Mine-exposed (n = 59) Areas, September 2015

Transformation	Endpoint	Skewness (mean)	Kurtosis (mean)
None	Area\Row	6.145	44.63
	Taxa\Col	5.020	32.60
Log_{10}	Area\Row	5.893	41.24
	Taxa\Col	4.928	31.61
Square root	Area\Row	3.281	14.18
	Taxa\Col	2.944	12.77
Fourth root	Area\Row	1.453	1.578
	Taxa\Col	1.827	5.443
Power 2	Area\Row	8.126	71.34
	Taxa\Col	7.185	58.72
Power 4	Area\Row	9.111	86.22
	Taxa\Col	8.631	78.82

Indicates lowest area mean skewness and kurtosis values.

Table G.27: Reference (n = 40) and Mine-exposed (n = 59) Area NMDS Scores for Benthic Community Structure (Fourth Root Transformed Proportional Data Matrix Using Lowest Practical Level Taxonomy)

Axis		NMDS-1	NMDS-2
% Variance explained		61.0	22.1
Monte Carlo P		0.004	0.004
Reference Area	AGCK	0.934	-0.630
	AL4	-0.025	-0.405
	ALUSM	0.086	-0.227
	BU2	0.857	0.068
	BU40	-0.049	0.467
	BUUQ	0.236	-0.083
	CADCK	0.608	-0.400
	CHCK	-0.063	-0.494
	CRUKO	1.242	-0.253
	DACK	0.090	-0.129
	DUCK	-0.241	-0.081
	EL12	0.024	0.125
	ELUGH	0.568	0.237
	EWCK	0.660	-0.294
	FLAD	-0.404	0.669
	FLAU	-0.725	0.667
	FO26	0.355	-0.356
	FLRU	-0.128	0.858
	GRUHA	0.468	-0.429
	HENUP	0.952	-0.592
	KO1	0.760	1.366
	KODCR	0.774	0.683
	KOUCR	0.677	0.526
	KOUVE	-0.334	0.712
	LC_GRCK	0.522	-1.118
	LI24	0.966	-0.757
	MCCR	0.686	-0.698
	MI25	0.460	-0.184
	OLDDU	0.120	0.789
	OLDLI	0.990	0.120
	OLDLOW	0.233	1.024
	PADAL	0.779	-0.089
	PAUKO	0.763	0.326
	RACK	0.136	0.458
	SLINE	0.797	-0.731
	VEUKO	1.457	0.360
	VEUP	0.485	-0.828
	VICK	0.162	-0.124
	WWRL	0.527	-0.020
	WWRU	1.104	0.176
Mine-exposed Area	BOCK	-2.779	0.568
	CACK	-2.895	1.013
	COCK	-1.679	-0.017
	EL19	-0.193	0.335
	EL1	0.389	0.518
	EL20	0.322	0.203
	ELDFE	-0.042	1.386
	ELELKO	0.928	0.935
	ELH93	-0.301	2.028
	ELUEL	0.153	0.226
	ELUFE	-0.066	1.263
	ELUFO	-0.750	0.895
	ELUSP	0.245	0.523
	FO10-SP1	-0.441	-0.356
	FO22	-0.331	-0.143
	FO23	-0.114	0.170
	FO29	-0.280	0.021
	FO9	0.173	0.131
	FOBCP	-0.421	-0.024
	FOBKS	0.241	-0.010
	FOBSC	-0.075	-0.161
	FODGH	-0.061	-0.190
	FODHE	0.324	0.060
	FODPO	-0.399	-0.460
	FOUEW	-0.274	-0.286
	FOUKI	0.042	-0.002
	FOUL	0.007	0.451
	FOUNGD	0.494	-0.299
	FOUSH	-0.046	0.021
	GHCKD	-1.550	0.445
	GHCKU	-0.979	-0.343
	GRCK	0.243	-0.619
	GRDS	0.176	-0.382
	HACKDS	-0.214	-1.216
	HACKUS	0.032	-0.417
	HENFO	0.252	-0.292
	KICK	-1.291	-1.325
	LC_DC1	0.394	-0.665
	LC_DCDS	0.587	-0.509
	LC_FRUS	-0.281	0.060
	LI8	0.249	-0.740
	LIDSL	0.098	-0.412
	LILC3	-0.227	-0.718
Mine-exposed Area	MI2	-0.015	0.255
	MI3	0.851	0.472
	MI5	1.011	0.317
	MIDAG	0.345	-0.118
	MIDCO	-0.313	-0.171
	MIUCO	0.345	-0.151
	MP1	-0.166	-0.113
	FODNGD	0.111	-0.100
	OCNM	-1.596	-1.615
	POCK	-1.203	-0.098
	SWCK	-2.079	-0.324
	THCK	-2.237	-0.746
	WOCK	-1.526	-0.219
	ELDGR	0.180	0.262
	ELDEL	0.239	0.150
	NGD1	-1.120	-0.176

Note: Percent Variance Explained, Monte Carlo Randomized p-values of Axis Significance, and Area Scores, September 2015.

Table G.28: Pearson Correlation Between reference (n = 40) and Mine-exposed (n = 59) Area Taxon Densities and Area NMDS Scores of Benthic Community Structures (Fourth Root Transformed Proportional Data Matrix Using Lowest Practical Level Taxonomy)

Category	Variable	NMDS-1		NMDS-2	
		r	p	r	p
Benthic LPL	Ameletus	0.396	<0.001	0.276	0.006
	Baetidae	0.063	0.536	0.165	0.102
	Acentrella sp.	0.089	0.382	0.487	<0.001
	Baetis	0.479	<0.001	0.100	0.327
	Baetis bicaudatus	0.215	0.032	-0.230	0.022
	Baetis tricaudatus group	0.414	<0.001	0.047	0.643
	Ephemerellidae	0.580	<0.001	0.044	0.663
	Drunella doddsii	0.514	<0.001	0.011	0.916
	Drunella flavilinea	0.180	0.075	-0.172	0.088
	Drunella grandis group	0.054	0.592	0.254	0.011
	Drunella sp.	0.093	0.362	-0.050	0.623
	Ephemerella	0.255	0.011	0.515	<0.001
	Heptageniidae	0.810	<0.001	0.042	0.678
	Cinygmula sp.	0.362	<0.001	-0.184	0.068
	Epeorus	0.519	<0.001	-0.366	<0.001
	Rhithrogena	0.622	<0.001	0.098	0.335
	Leptophlebiidae	-0.014	0.892	0.421	<0.001
	Capniidae	0.095	0.347	0.109	0.283
	Chloroperlidae	0.296	0.003	-0.037	0.719
	Sweltsa sp.	0.528	<0.001	0.026	0.799
	Leuctridae	0.170	0.092	-0.087	0.391
	Nemouridae	-0.273	0.006	0.041	0.690
	Amphinemura sp.	-0.461	<0.001	-0.218	0.030
	Zapada	-0.023	0.820	-0.485	<0.001
	Zapada cinctipes	-0.332	<0.001	0.137	0.176
	Zapada columbiana	0.059	0.560	-0.589	<0.001
	Zapada oregonensis group	0.166	0.100	-0.501	<0.001
	Peltoperlidae	0.020	0.848	-0.197	0.050
	Yoraperla sp.	0.146	0.151	-0.289	0.004
	Perlidae	0.077	0.450	0.401	<0.001
	Hesperoperla sp.	0.116	0.255	0.354	<0.001
	Perlodidae	0.242	0.016	-0.031	0.764
	Megarcys sp.	0.254	0.011	-0.457	<0.001
	Pteronarcella sp.	0.081	0.426	0.274	0.006
	Taeniopterygidae	0.148	0.143	-0.054	0.595
	Taenionema	0.550	<0.001	-0.288	0.004
	Apataniidae	0.139	0.171	0.009	0.927
	Brachycentridae	-0.035	0.730	0.141	0.165
	Glossosomatidae	0.278	0.005	-0.092	0.364
	Hydropsychidae	0.177	0.079	-0.230	0.022
	Arctopsyche sp.	0.277	0.006	0.301	0.002
	Hydropsyche	0.149	0.141	0.340	<0.001
	Parapsyche sp.	0.203	0.044	-0.360	<0.001
	Lepidostoma	0.152	0.132	0.274	0.006
	Limnephilidae	-0.358	<0.001	-0.184	0.068
	Rhyacophila	0.014	0.891	-0.416	<0.001
	Rhyacophila brunnea/vemna group	-0.265	0.008	-0.230	0.022
	Rhyacophila betteni group	-0.129	0.204	-0.082	0.421
	Rhyacophila hyalinata group	0.019	0.852	-0.353	<0.001
	Uenoidae	0.188	0.062	-0.370	<0.001
	Elmidae	-0.276	0.006	-0.175	0.083
	Optioservus sp.	-0.079	0.438	-0.052	0.612
	Atherix	0.018	0.858	0.427	<0.001
	Bezzia/ Palpomyia	-0.140	0.168	-0.024	0.812
	Probezzia	0.149	0.140	0.015	0.880
	Paracladopelma sp.	0.008	0.939	0.418	<0.001
	Phaenopsectra	-0.062	0.542	-0.181	0.073
	Stempellina sp.	0.056	0.584	0.030	0.765
	Corynoneura	-0.282	0.005	0.223	0.026
	Cricotopus	-0.386	<0.001	0.231	0.021
	Polypedilum sp.	0.043	0.673	0.371	<0.001
	Micropsectra	-0.648	<0.001	0.290	0.004
	Rheotanytarsus	0.007	0.946	-0.053	0.605
	Stempellinella sp.	-0.418	<0.001	0.114	0.262
	Diamesa	-0.282	0.005	-0.225	0.025
	Pagastia	-0.220	0.028	-0.290	0.004
	Pseudodiamesa sp.	-0.482	<0.001	-0.132	0.193
	Brillia sp.	0.067	0.507	-0.096	0.344
	Cricotopus (Nostococladius)	0.100	0.324	0.171	0.091
	Eukiefferiella	-0.334	<0.001	0.088	0.388
	Heleniella sp.	-0.174	0.085	0.286	0.004
	Hydrobaenus	-0.087	0.392	-0.215	0.033
	Limnophyes sp.	-0.106	0.296	0.104	0.306
	Orthocladius	-0.282	0.005	0.352	<0.001
	Parametriocnemus	-0.250	0.013	-0.031	0.758
	Rheocricotopus	0.185	0.067	-0.135	0.183
	Thienemanniella	-0.412	<0.001	-0.027	0.789
	Tvetenia bavarica group	-0.184	0.068	0.125	0.216
	Thienemannimyia group	-0.378	<0.001	0.166	0.100
	Empididae	-0.259	0.010	0.221	0.028
	Chelifera/ Metachela	-0.194	0.055	0.100	0.323
	Limnophora sp.	-0.390	<0.001	-0.013	0.895
	Glutops sp.	-0.134	0.187	-0.177	0.079
	Pericoma/Telmatoscopus sp.	-0.310	0.002	-0.080	0.431
	Simuliidae	-0.560	<0.001	0.023	0.824
	Tipulidae	0.056	0.584	-0.159	0.116
	Antocha sp.	-0.017	0.865	0.240	0.017
	Dicranota	-0.295	0.003	-0.206	0.041
	Hexatoma sp.	0.203	0.044	0.189	0.061
	Limnophila sp.	0.188	0.062	0.184	0.068
	Trombidiformes	-0.162	0.110	0.016	0.873
	Aturus	-0.234	0.020	-0.034	0.741
	Lebertia	-0.089	0.381	0.123	0.224
	Sperchon	0.029	0.777	-0.032	0.755
	Sperchonopsis sp.	0.060	0.556	0.215	0.033
	Testudacarus sp.	-0.043	0.676	0.336	<0.001
	Torrenticola	0.036	0.722	0.163	0.106
	Oribatida	-0.194	0.055	-0.038	0.706
	Pisidium	-0.354	<0.001	-0.226	0.024
Benthic LPL	Lumbriculidae	-0.085	0.402	-0.237	0.018
	Rhynchelmis sp.	0.144	0.154	-0.118	0.246
	Enchytraeus	-0.503	<0.001	0.211	0.036
	Nais	-0.203	0.044	0.301	0.002
	Tubificinae	-0.383	<0.001	-0.154	0.127

indicates absolute r-value > 0.6.
indicates a p-value < 0.05.

Table G.29: Mean Skewness and Kurtosis Values for Transformations of the Benthic Invertebrate Family Proportional Abundance Matrix for Reference (n = 40) and Mine-exposed (n = 59) areas, September 2015

Transformation	Endpoint	Skewness (mean)	Kurtosis (mean)
None	Area\Row	4.239	20.55
	Taxa\Col	4.744	30.83
Log_{10}	Area\Row	4.049	18.78
	Taxa\Col	4.610	29.46
Square root	Area\Row	2.525	7.598
	Taxa\Col	2.736	12.37
Fourth root	Area\Row	1.115	0.528
	Taxa\Col	1.540	5.809
Power 2	Area\Row	5.452	31.87
	Taxa\Col	6.774	54.27
Power 4	Area\Row	6.103	38.54
	Taxa\Col	8.190	72.75

Indicates lowest area mean skewness and kurtosis values.

Table G.30: Reference (n = 40) and Mine-exposed (n = 59) Area NMDS Scores for Benthic Community Structure (Fourth Root Transformed Proportional Data Matrix Using Family-Level Taxonomy)

Axis		NMDS-1	NMDS-2	NMDS-3
% Variance explained		60.2	10.6	7.3
Monte Carlo P		0.004	0.004	0.004
Reference Area	AGCK	0.764	-0.336	0.741
	AL4	-0.087	-0.371	0.077
	ALUSM	-0.093	-0.611	0.027
	BU2	0.707	0.057	-0.235
	BU40	0.210	0.433	-0.147
	BUUQ	0.343	0.027	0.214
	CADCK	0.631	-0.239	0.140
	CHCK	-0.086	-0.104	0.293
	CRUKO	1.114	-0.035	0.191
	DACK	0.101	-0.339	-0.202
	DUCK	-0.259	-0.085	-0.284
	EL12	0.192	0.088	-0.245
	ELUGH	0.776	-0.148	-0.211
	EWCK	0.917	-0.059	0.003
	FLAD	-0.160	0.264	-0.550
	FLAU	-0.291	-0.339	-0.978
	FLRU	-0.077	-0.136	-0.772
	FO26	0.613	0.224	-0.027
	GRUHA	0.747	-0.435	0.298
	HENUP	0.961	0.003	0.389
	KO1	0.538	1.171	0.686
	KODCR	0.671	0.549	0.351
	KOUCR	0.428	0.574	0.212
	KOUVE	-0.420	0.649	-0.818
	LC_GRCK	0.133	-0.778	0.675
	LI24	0.310	0.081	0.904
	MCCR	0.431	-0.804	0.226
	MI25	0.383	0.028	0.125
	OLDDU	0.192	0.390	-0.059
	OLDLI	0.538	-0.142	0.001
	OLDLOW	0.374	0.855	-0.013
	PADAL	0.319	0.029	0.356
	PAUKO	0.425	0.304	0.258
	RACK	0.008	0.018	-0.176
	SLINE	0.692	-0.070	0.769
	VEUKO	0.219	0.811	0.622
	VEUP	0.189	0.282	0.597
	VICK	0.083	-0.164	-0.138
	WWRL	0.199	-0.480	0.086
	WWRU	0.424	-0.629	-0.114
Mine-exposed Area	BOCK	-2.885	0.420	-0.643
	CACK	-3.122	0.914	0.419
	COCK	-1.857	-0.383	-0.370
	EL19	-0.212	0.284	-0.255
	EL1	0.369	0.404	-0.277
	EL20	0.635	-0.289	-0.335
	ELDEL	0.464	-0.076	-0.217
	ELDFE	0.186	1.198	-0.454
	ELDGR	0.237	0.144	-0.054
	ELELKO	1.236	0.484	0.226
	ELH93	0.886	1.466	0.189
	ELUEL	0.445	-0.034	-0.514
	ELUFE	0.292	1.258	-0.716
	ELUFO	-0.230	0.753	-0.929
	ELUSP	0.433	0.363	-0.586
	FO10-SP1	-0.534	-0.163	0.346
	FO22	-0.541	-0.404	0.044
	FO23	-0.187	0.100	-0.311
	FO29	-0.036	0.055	-0.358
	FO9	0.380	-0.183	-0.159
	FOBCP	-0.396	0.196	0.101
	FOBKS	0.063	-0.235	0.221
	FOBSC	-0.167	0.080	0.154
	FODGH	-0.180	-0.187	0.000
	FODHE	0.583	0.315	-0.369
	FODPO	-0.437	-0.671	0.351
	FOUEW	-0.329	-0.185	-0.082
	FOUKI	-0.138	-0.325	-0.238
	FOUL	-0.250	-0.293	-0.561
	FOUNGD	0.755	-0.388	-0.027
	FOUSH	0.005	0.247	0.226
	GHCKD	-1.331	-0.086	-0.937
	GHCKU	-0.818	0.060	0.647
	GRCK	0.378	-0.474	-0.010
	GRDS	0.360	-0.571	-0.377
	HACKDS	0.429	0.148	-1.162
Mine-exposed Area	HACKUS	0.076	-0.493	0.150
	HENFO	0.548	0.296	0.440
	KICK	-1.376	0.567	0.891
	LC_DC1	0.348	-0.567	0.331
	LC_DCDS	0.452	-0.031	0.368
	LC_FRUS	-0.060	0.249	-0.219
	LI8	0.273	-0.482	0.622
	LIDSL	0.063	-0.015	0.254
	LILC3	-0.282	0.473	0.510
	MI2	0.026	-0.167	-0.376
	MI3	0.317	-0.492	-0.628
	MI5	0.306	-0.762	-0.698
	MIDAG	0.170	-0.783	-0.319
	MIDCO	-0.210	-0.554	-0.232
	MIUCO	0.283	-0.594	-0.201
	MP1	-0.030	0.081	-0.003
	FODNGD	0.055	-0.230	0.345
	NGD1u	-0.897	0.535	0.155
	OCNM	-1.219	-0.351	1.269
	POCK	-1.422	0.147	0.064
	SWCK	-2.089	-0.369	0.336
	THCK	-1.687	-1.097	-0.039
	WOCK	-1.288	0.164	0.725

Note: Percent variance explained, Monte Carlo randomized p-values of axis significance, and area scores, September 2015

Table G.31 Pearson Correlation Between Reference (n = 40) and Mine-exposed (n = 59) Area Taxon Abundances and Area NMDS Scores of Benthic Community Structures (Fourth Root Transformed Proportional Data Matrix Using Family-Level Taxonomy)

Category	Variable	NMDS-1		NMDS-2		NMDS-3	
		r	p	r	p	r	p
Benthic Family	Ameletidae	0.391	<0.001	0.395	<0.001	0.041	0.683
	Baetidae	0.606	<0.001	-0.074	0.465	-0.339	<0.001
	Ephemerellidae	0.725	<0.001	0.012	0.904	-0.248	0.013
	Heptageniidae	0.841	<0.001	-0.015	0.885	0.010	0.920
	Leptophlebiidae	0.077	0.449	0.272	0.006	-0.217	0.031
	Capniidae	-0.007	0.943	0.212	0.035	0.333	<0.001
	Chloroperlidae	0.497	<0.001	-0.240	0.017	-0.030	0.766
	Leuctridae	0.173	0.086	-0.110	0.277	-0.075	0.458
	Nemouridae	-0.214	0.034	-0.496	<0.001	0.141	0.165
	Peltoperlidae	0.131	0.197	-0.247	0.014	0.251	0.012
	Perlidae	0.169	0.094	0.214	0.033	-0.530	<0.001
	Perlodidae	0.351	<0.001	0.023	0.823	0.177	0.079
	Pteronarcyidae	0.183	0.070	0.215	0.032	-0.211	0.036
	Taeniopterygidae	0.514	<0.001	-0.427	<0.001	0.181	0.073
	Apataniidae	0.077	0.449	-0.303	0.002	-0.203	0.044
	Brachycentridae	0.097	0.340	0.055	0.592	-0.473	<0.001
	Glossosomatidae	0.208	0.039	-0.449	<0.001	-0.153	0.130
	Hydropsychidae	0.396	<0.001	0.131	0.196	0.336	<0.001
	Hydroptilidae	-0.445	<0.001	-0.047	0.643	-0.309	0.002
	Lepidostomatidae	0.292	0.003	0.316	0.001	0.037	0.719
	Limnephilidae	-0.442	<0.001	-0.239	0.017	0.174	0.085
	Rhyacophilidae	-0.066	0.514	-0.478	<0.001	0.072	0.480
	Uenoidae	0.171	0.091	-0.303	0.002	0.132	0.192
	Dytiscidae	-0.110	0.278	0.046	0.651	0.219	0.029
	Elmidae	-0.223	0.027	-0.480	<0.001	-0.396	<0.001
	Athericidae	0.076	0.455	0.431	<0.001	-0.246	0.014
	Ceratopogonidae	-0.172	0.089	-0.229	0.022	-0.088	0.385
	Chironomidae	-0.584	<0.001	0.458	<0.001	-0.159	0.116
	Empididae	-0.266	0.008	0.233	0.020	-0.021	0.839
	Muscidae	-0.500	<0.001	0.210	0.037	0.161	0.111
	Pelecorhynchidae	-0.143	0.159	-0.186	0.066	0.097	0.339
	Psychodidae	-0.333	<0.001	-0.445	<0.001	-0.301	0.002
	Simuliidae	-0.564	<0.001	-0.002	0.981	0.019	0.850
	Tipulidae	-0.172	0.089	-0.005	0.964	-0.011	0.917
	Aturidae	-0.264	0.008	0.027	0.794	-0.248	0.013
	Hydryphantidae	0.125	0.219	0.059	0.561	-0.035	0.728
	Hygrobatidae	0.040	0.696	0.158	0.118	0.032	0.753
	Lebertiidae	-0.073	0.471	0.137	0.177	-0.113	0.265
	Sperchontidae	0.022	0.833	0.411	<0.001	0.301	0.002
	Torrenticolidae	0.053	0.605	0.153	0.130	-0.554	<0.001
	Pisidiidae	-0.266	0.008	-0.107	0.292	-0.021	0.835
	Lumbriculidae	-0.016	0.875	-0.213	0.034	0.136	0.179
	Enchytraeidae	-0.544	<0.001	0.216	0.032	-0.199	0.049
	Naididae	-0.066	0.518	0.410	<0.001	-0.279	0.005
	Tubificidae	-0.322	0.001	-0.180	0.074	0.008	0.941
	Oribatidae	-0.208	0.039	0.064	0.530	0.074	0.469

indicates absolute r-value > 0.6.
indicates a p-value < 0.05.

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																					
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1	KODCR
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	180	0	0	5	10	20	0	60	4	80	17	40	0	0	0	40	80	17	13	40	125	78
| Family: Baetidae	0	0	0	5	90	0	20	40	0	20	0	0	0	0	60	60	0	0	0	0	0	1
Acentrella sp.	0	0	0	5	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis	40	2,620	220	15	160	170	1,040	200	54	2,340	533	1,480	300	300	300	80	1,280	917	813	80	3	94
Baetis bicaudatus	20	180	0	10	0	0	20	40	2	40	0	40	0	60	0	0	0	0	0	0	0	0
Baetis tricaudatus group	0	40	40	20	0	50	20	0	1	420	17	100	89	100	0	0	0	17	138	0	5	6
| Family: Ephemerellidae	40	1,080	2,320	30	250	40	160	500	33	900	550	320	167	640	440	400	960	50	63	400	13	4
Caudatella sp.	0	180	0	0	30	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	40	280	160	55	30	200	320	260	4	360	17	160	167	660	240	140	360	50	100	60	0	3
Drunella flavilinea	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0
Drunella grandis group	0	0	60	0	70	0	0	0	1	0	0	0	0	0	40	0	0	167	0	0	0	1
Drunella sp.	0	200	0	0	10	40	0	20	0	20	17	0	0	20	0	0	0	0	13	0	0	1
Drunella spinifera	0	0	0	0	0	0	0	40	0	0	33	60	0	0	0	0	0	0	0	0	0	0
Ephemerella	0	60	120	0	10	0	0	0	5	0	50	0	0	20	440	420	0	583	0	0	3	14
| Family: Heptageniidae	4,280	1,300	560	465	530	610	3,780	4,260	109	820	133	2,580	1,322	1,620	1,200	1,180	3,560	900	913	4,100	473	71
Cinygmula sp.	60	0	0	0	0	0	20	80	1	0	0	60	11	0	0	0	0	0	0	0	0	1
Epeorus	20	260	60	15	0	0	300	100	28	60	0	0	44	180	0	0	40	0	113	200	0	5
Rhithrogena	220	0	80	190	0	100	860	0	19	120	17	340	111	60	0	0	60	17	50	200	3	35
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	80	0	50	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	67	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	20	0	0	0	0	83	0	0	0	0	80	0	0	0	0	0	0
| Family: Capniidae	0	0	0	15	20	10	300	0	0	160	17	20	11	0	20	0	0	0	13	20	48	28
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	20	80	0	45	20	0	120	0	2	60	0	20	22	120	20	0	40	17	38	0	0	0
Suwallia	20	0	0	0	0	0	0	0	0	0	0	0	0	40	0	160	0	0	0	0	0	0
Sweltsa sp.	120	120	140	30	110	20	60	80	5	240	50	40	133	60	520	0	280	50	38	40	5	21
| Family: Leuctridae	0	0	0	0	0	30	0	20	3	60	33	0	11	0	0	0	20	0	13	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0
| Family: Nemouridae	0	0	0	5	50	0	120	400	1	0	0	0	0	0	0	340	0	0	0	0	0	0
Amphinemura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zapada	20	200	200	15	10	30	0	0	0	380	133	220	11	240	60	20	100	83	225	80	0	2
Zapada cinctipes	0	0	40	0	50	10	0	20	0	420	33	0	67	20	80	100	0	50	0	0	0	0
Zapada columbiana	40	20	0	0	40	140	20	140	0	160	17	0	0	0	0	0	40	17	138	60	0	0
Zapada oregonensis group	80	20	80	0	20	0	80	300	1	40	33	0	0	80	0	20	180	0	113	20	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Yoraperla sp.	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	25	0	0	0
| Family: Perlidae	0	0	0	5	20	10	0	0	0	160	50	280	78	0	60	40	0	0	0	0	0	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	40	17	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0	0	0	0	10	0	0	0	0	0	0	0	11	0	0	0	0	17	0	0	0	1
| Family: Perlodidae	0	260	120	15	60	20	280	1,580	24	80	100	360	178	0	80	0	520	67	50	0	8	0
Isoperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Megarcys sp.	20	20	0	5	0	20	240	280	2	40	17	0	0	80	0	0	180	0	13	40	0	0
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	140	160	40	15	0	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	1,300	1,000	160	135	40	590	1,640	180	181	240	33	840	767	280	60	40	120	17	1,188	1,760	0	6
| Order: Trichoptera	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	35	10	0	20	0	0	0	0	0	0	0	200	0	80	150	13	20	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0	100	0	0	0	60	144	60	0	0	0	17	0	0	0	0
| Family: Glossosomatidae	0	0	0	45	20	0	20	0	8	0	0	0	0	0	0	0	20	0	0	0	0	0
Glossosoma	0	0	1,080	185	70	80	0	20	8	20	83	0	0	160	360	0	0	17	138	0	0	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																				
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1	KODCR
| Family: Hydropsychidae	20	120	20	0	120	30	20	200	21	60	0	0	0	80	140	0	0	0	38	40	5	0
Arctopsyche sp.	0	0	0	0	140	0	0	0	3	0	0	0	56	0	40	0	0	0	0	0	0	16
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	10	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche sp.	20	0	0	0	0	0	0	60	6	20	33	20	0	20	20	0	20	0	0	20	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	120	0	0	0	0	0	0	340	0	0	100	0	50	0	3	0
| Family: Leptoceridae	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	60	440	0	0	50	0	60	0	60	0	100	0	0	0	780	0	67	0	0	0	0
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	20	620	60	20	70	30	40	140	1	660	450	80	0	0	60	40	0	17	275	0	3	5
Rhyacophila brunnea/vemna group	0	100	60	0	0	10	0	60	0	20	83	40	11	0	20	0	0	33	25	0	0	0
Rhyacophila betteni group	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	17	0	0	0	0
Rhyacophila hyalinata group	0	0	0	0	0	0	20	20	0	0	17	0	0	0	0	0	0	0	13	20	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0	0	0	100	50	0	0	0	20	0	0	0	0	0	0	0
Heterlimnius sp.	0	60	40	0	0	0	0	0	0	100	133	0	0	0	0	0	0	0	0	0	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	134	13	0	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	180	0	0	0	0	0	3	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	20	0	0	0	0	0	0	0	40	160	0	33	0	0	0	1
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	60	80	10	0	0	0	0	0	0	17	20	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	0	80	60	5	0	20	320	800	0	140	100	20	11	100	240	40	40	83	13	100	13	11
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	3	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum sp.	0	0	20	0	0	30	0	0	0	0	0	0	0	0	460	0	0	233	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	20	60	100	0	10	30	100	400	0	80	150	340	22	20	620	300	220	100	0	40	3	1
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sublettea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diamesa	0	120	20	0	0	0	60	0	0	0	0	20	0	20	0	0	20	0	0	0	0	0
Pagastia	40	20	40	5	50	20	60	260	1	20	717	120	11	20	0	120	180	0	0	20	0	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																					
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1	KODCR
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	20	80	20	100	0	0	20	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0	20	0	20	0	0	0	0	0	0	0	11	20	0	0	20	0	0	0	0	1
Corynoneura	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	3	0
Cricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	360	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	833	0	0	0	0
Eukiefferiella	0	60	40	5	100	70	360	280	0	80	350	140	0	40	860	0	60	0	13	0	0	1
Heleniella sp.	0	0	0	0	40	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	0	20	0	0	0	0	180	1	0	0	0	0	0	0	0	60	0	0	0	0	0
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Limnophyes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthocladius	20	800	100	20	410	200	300	100	0	540	1,017	200	56	240	3,060	800	360	233	38	60	23	45
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Parorthocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	20	0	60	0	20	70	40	420	0	120	200	0	0	180	100	280	80	0	13	40	0	0
Synorthocladius	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	13	0	3	0
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	0	20	20	0	10	10	0	300	0	80	67	0	11	20	540	20	0	0	13	0	0	1
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	0	0	20	0	0	0	0	120	120	0	100	0	0	3	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	20	0	0	0	5	1
Chelifera/ Metachela	0	40	80	0	180	10	0	60	0	0	17	20	0	0	80	20	0	0	25	0	0	1
Clinocera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	40	540	1,900	0	0	0	140	1,000	0	200	150	300	178	0	140	280	20	67	13	0	0	0
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0	20	0	40	0	0	0	0	0	0	0	0	0	0	0	0
Simulium	0	40	0	0	0	0	0	40	0	80	0	20	0	0	0	0	0	17	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	20	15	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	3	2
Antocha sp.	0	0	0	0	110	0	0	0	0	20	17	0	0	0	40	0	0	117	0	0	0	0
Dicranota	0	40	0	0	0	10	80	0	0	20	33	20	0	20	0	0	140	0	0	20	3	0
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	0	0	0	0	0	0	2	0	0	0	0	0	20	0	0	0	0	0	0	0
Limnophila sp.	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																					
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1	KODCR
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	5	30	0	0	60	0	0	33	20	0	0	0	20	0	0	0	0	0	1
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	0	0	0	33	0	0	0	0	20	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	5	30	0	0	0	0	40	0	0	0	0	0	0	0	0	13	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	20	20	40	10	170	0	0	140	0	0	83	0	33	20	40	20	20	0	0	0	3	0
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	0	0	20	10	110	30	0	0	1	0	0	0	0	0	0	0	20	17	25	0	10	0
Sperchonopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	0	5	50	0	0	0	0	0	0	40	0	0	40	0	0	17	0	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	20	0	17	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	13	0	0	1
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	20	20	10	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0
Rhynchelmis sp.	0	0	100	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	0	15	20	0	0	0	0	0	67	0	0	0	800	0	0	0	0	0	0	0
Fridericia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Nais	0	0	0	0	0	0	40	0	4	0	0	0	0	0	260	0	0	0	0	0	0	1
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0
Total Individuals	**7,180**	**10,960**	**8,900**	**1,515**	**3,440**	**3,070**	**11,200**	**13,360**	**541**	**9,840**	**5,951**	**8,740**	**4,044**	**6,060**	**12,740**	**6,520**	**9,400**	**5,506**	**4,891**	**7,500**	**846**	**466**

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																		Mine-exposed			
	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK	CORCK	EL19
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	46	144	0	164	0	80	50	0	18	8	5	50	217	107	12	80	0	8	0	0	0	0
| Family: Baetidae	4	0	0	0	0	0	0	0	0	0	0	0	33	0	0	0	0	0	0	0	0	20
Acentrella sp.	0	0	0	0	0	0	0	0	55	0	0	20	0	0	0	0	0	0	0	0	0	10
Acentrella turbida	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis	69	131	240	0	1,160	520	156	143	155	65	64	120	0	3	55	920	386	48	0	0	0	310
Baetis bicaudatus	0	0	0	0	20	0	0	0	0	0	0	0	17	0	36	0	0	45	0	0	0	0
Baetis tricaudatus group	3	6	40	0	280	0	50	243	45	5	5	20	33	2	5	20	57	8	0	0	0	40
| Family: Ephemerellidae	21	0	120	55	360	1,180	0	29	718	104	19	110	650	30	24	240	300	78	0	0	0	40
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	7	31	0	9	300	420	44	543	27	7	8	20	67	0	0	280	343	8	0	0	0	70
Drunella flavilinea	0	0	0	0	0	20	0	0	0	0	5	0	50	0	12	0	14	0	0	0	0	0
Drunella grandis group	0	31	0	0	0	0	13	0	0	5	1	10	0	1	0	20	0	0	0	0	0	20
Drunella sp.	0	0	0	9	0	0	0	0	0	0	1	0	0	0	0	0	14	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	9	6	0	0	20	40	100	100	36	15	25	230	0	17	0	0	0	3	0	0	0	0
| Family: Heptageniidae	65	319	640	1,291	480	1,080	306	2,114	209	74	75	1,020	2,117	332	83	1,700	829	25	0	0	0	420
Cinygmula sp.	2	0	0	218	40	0	0	0	0	0	0	0	17	7	5	0	0	0	0	0	0	0
Epeorus	3	0	260	0	80	20	0	14	0	3	0	0	483	2	12	60	29	10	0	0	0	0
Rhithrogena	18	19	40	155	80	0	0	771	0	1	11	180	200	3	10	60	0	123	0	0	0	20
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	100	1	0	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0
| Family: Capniidae	55	19	180	55	60	80	6	57	0	3	4	20	0	46	24	0	0	0	0	13	20	0
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	8	0	80	36	0	60	0	0	18	2	3	0	0	6	0	0	0	3	0	0	20	0
Suwallia	0	0	0	0	0	0	0	0	0	3	4	0	0	2	0	0	0	0	0	0	0	0
Sweltsa sp.	16	44	40	264	160	240	125	743	64	12	7	260	200	2	0	240	57	18	0	0	20	30
| Family: Leuctridae	0	6	0	9	0	40	0	14	0	0	0	20	17	0	0	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	1,740	0
Amphinemura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zapada	2	38	960	36	320	360	56	29	9	3	2	10	117	0	17	780	71	0	0	0	20	20
Zapada cinctipes	1	0	40	0	0	0	0	29	9	0	0	40	100	0	0	180	0	10	260	0	580	10
Zapada columbiana	1	0	560	182	500	0	0	0	0	9	0	60	217	0	7	80	0	0	0	0	40	0
Zapada oregonensis group	1	0	60	0	0	20	0	0	0	30	6	0	67	1	17	100	0	0	0	0	40	0
| Family: Peltoperlidae	0	0	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yoraperla sp.	0	0	20	0	20	0	0	0	0	0	0	0	67	0	0	0	0	0	0	0	0	0
| Family: Perlidae	4	19	0	0	0	0	25	86	36	0	1	30	0	0	0	220	0	0	0	0	0	590
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	20	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	1	19	0	0	0	0	0	86	9	0	0	0	0	0	0	0	0	0	0	0	0	40
| Family: Perlodidae	15	19	140	9	100	360	6	29	227	100	23	20	50	27	36	220	71	10	0	0	100	40
Isoperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	0	0	0	36	20	40	6	43	0	0	1	0	217	0	2	80	0	0	0	0	0	0
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	12	0	20	127	800	1,040	13	343	9	46	118	60	267	7	57	360	157	13	160	0	20	60
| Order: Trichoptera	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	40	0
| Family: Glossosomatidae	0	6	160	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glossosoma	0	0	200	0	140	40	300	57	0	2	0	10	0	0	19	20	1,200	310	0	0	0	20

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																		Mine-exposed			
	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK	CORCK	EL19
| Family: Hydropsychidae	0	0	200	27	200	60	13	43	718	4	0	10	467	0	36	0	71	0	0	0	0	10
Arctopsyche sp.	32	0	0	0	0	60	19	100	0	7	15	0	0	0	0	0	71	0	0	0	0	0
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	382	0	2	0	0	0	2	0	0	0	0	0	0	0
Parapsyche sp.	0	0	0	0	20	0	0	14	0	2	0	0	17	0	7	0	0	0	0	0	0	20
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	200	0
Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	1,000	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	820	73	0	0	0	0	36	1	0	120	133	0	0	20	86	3	20	425	100	10
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	67	0	2	0	0	0	0	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	1	0	200	18	160	140	13	71	9	3	5	50	183	0	7	140	29	5	0	0	760	90
Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	1	0	0	17	0	0	40	0	0	0	0	260	0
Rhyacophila betteni group	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila hyalinata group	0	0	0	0	0	20	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	1,160	18	280	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	5,440	20	19	0	0	0	0	10	33	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	6	0	0	20	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	160	0
Heterlimnius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
Optioservus sp.	0	0	20	0	40	0	6	14	0	0	0	120	0	2	0	480	0	8	0	0	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	20
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	0	0	0	14	0	0	0	0	0	1	0	0	0	0	0	0	0	0
| Family: Chironomidae	8	38	0	18	80	40	31	86	9	0	6	60	17	4	5	40	229	8	100	50	420	50
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum sp.	0	0	0	0	0	0	113	29	36	0	0	20	0	0	0	20	14	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	0	25	0	0	0	60	0	0	18	0	0	30	0	0	0	60	0	0	2,240	1,000	2,180	150
Rheotanytarsus	0	0	0	0	0	0	6	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	475	0	0
Sublettea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	160	0	0	0
Pagastia	0	56	20	0	0	80	13	0	0	0	1	0	0	0	0	80	57	0	0	0	840	10

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																		Mine-exposed			
	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK	CORCK	EL19
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	38	0	20
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	5	0	280	0	0	20	0	0	0	9	1	20	17	3	0	0	0	5	160	0	0	10
Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	20	0
Cricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	300	580	0
Cricotopus (Nostococladius)	0	0	0	0	0	640	19	43	9	0	1	10	0	0	0	1,420	0	3	0	0	0	0
Eukiefferiella	4	13	0	0	200	20	31	0	27	0	2	30	0	0	36	20	29	0	180	25	160	100
Heleniella sp.	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	20	0	40	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	1	0	40	0	0	20	13	0	0	1	0	0	0	60	2	0	0	0	0	0	140	0
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	0	6	0	0	3	1	0	0	1	0	0	0	0	80	0	0	0
Orthocladius	33	256	0	9	0	60	181	14	127	5	8	80	67	16	167	60	357	3	20	1,088	2,580	730
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
Parorthocladius sp.	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0	0	20	64	40	20	0	57	0	2	1	60	33	3	0	60	271	0	20	25	0	0
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	1	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	26	19	60	27	0	20	19	0	109	1	0	10	17	0	0	20	29	3	20	0	140	10
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	20	0	0	0	0	60	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	25	0	0	0	0	6	14	0	0	0	20	0	2	0	0	0	0	0	38	0	10
Chelifera/ Metachela	1	63	20	0	0	20	0	0	0	0	1	0	0	0	2	0	0	0	0	0	80	20
Clinocera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	6	0	0	0	0	0	0	0	1	0	0	183	0	0	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	14	0	40	100	40	0	
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	0	25	0	0	160	20	0	0	0	0	0	100	0	1	0	220	14	3	20	38	15,480	30
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0
| Family: Simuliidae	1	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	100	0	0	0
Simulium	0	6	0	0	0	0	0	0	55	1	9	0	0	0	0	0	0	0	2,800	13	20	10
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	5	0	20	18	0	0	0	0	0	5	0	0	0	7	0	0	0	0	0	0	0	0
Antocha sp.	0	0	0	0	0	0	31	29	0	0	0	10	0	0	0	0	14	0	0	0	0	10
Dicranota	0	0	0	36	20	60	13	14	0	0	0	0	0	0	0	20	0	0	40	25	60	0
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	0	0	0	0	0	29	45	3	0	30	0	1	0	0	0	0	0	0	0	0
Limnophila sp.	1	0	0	0	0	0	0	0	0	4	12	0	0	0	0	80	0	3	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																		Mine-exposed			
	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK	CORCK	EL19
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	9	0	0	0	0	0	5	0	0	0	0	0	60	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0	31	0	18	0	0	25	14	9	1	1	10	0	3	0	20	29	8	0	0	140	20
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	3	0	0	9	0	40	6	0	82	1	7	10	17	1	40	20	0	0	0	0	0	20
Sperchonopsis sp.	1	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	50
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	20	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	6	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhynchelmis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	1	813	0	18	0	0	13	0	0	0	0	10	0	0	5	0	0	0	1,100	275	560	20
Fridericia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160	13	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nais	0	13	0	0	0	0	75	0	18	0	0	10	0	0	0	0	0	0	20	0	40	0
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**489**	**2,276**	**6,760**	**3,008**	**11,620**	**7,140**	**1,977**	**6,086**	**3,523**	**557**	**471**	**3,210**	**6,505**	**705**	**756**	**8,520**	**4,856**	**777**	**8,140**	**4,030**	**29,180**	**3,240**

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	EL1	EL20	ELDFE	ELELKO	ELH93	ELDEL	ELUEL	ELUFE	ELUFO	ELDGR	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODPO
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	0	0	80	20	36	0	83	40	20	12	0	0	0	30	100	20	0	0	45	0	80	0
| Family: Baetidae	0	0	60	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	40	0
Acentrella sp.	140	83	140	220	29	0	0	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis	160	283	100	340	0	380	433	120	280	92	400	0	80	210	500	280	150	363	164	440	1,000	0
Baetis bicaudatus	60	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
Baetis tricaudatus group	120	167	20	300	0	60	200	20	0	32	300	20	60	50	520	140	13	438	227	160	300	0
| Family: Ephemerellidae	1,980	117	9,640	420	43	300	317	4,660	880	68	260	20	760	180	660	40	63	100	91	1,220	3,640	120
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	260	850	0	40	0	540	200	20	20	68	120	60	700	40	60	80	75	13	27	180	60	20
Drunella flavilinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
Drunella grandis group	20	17	100	0	0	0	17	20	80	8	20	160	80	10	200	20	0	0	9	80	0	0
Drunella sp.	20	0	0	0	0	40	0	0	20	0	0	0	20	20	20	0	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	160	0	320	0	79	0	17	420	0	4	0	20	20	0	0	0	0	13	0	0	0	0
| Family: Heptageniidae	1,020	1,567	460	1,680	200	3,140	1,467	540	160	428	1,560	580	1,060	230	980	1,900	388	975	582	1,740	5,200	680
Cinygmula sp.	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
Epeorus	20	17	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	38	27	0	60	0
Rhithrogena	180	300	0	2,200	0	140	100	20	20	116	120	0	0	10	0	180	0	25	0	60	60	0
| Family: Leptophlebiidae	20	0	280	40	14	0	0	20	40	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	0	20	20	14	40	17	0	0	4	0	160	40	10	0	140	50	13	18	0	0	20
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	0	0	0	0	0	0	0	0	0	0	40	10	0	0	0	13	0	0	0	20
Suwallia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweltsa sp.	140	133	60	340	0	380	133	0	0	116	220	100	80	70	60	120	0	25	9	60	40	80
| Family: Leuctridae	0	0	0	0	0	0	0	0	0	4	0	0	0	0	20	0	0	0	0	0	40	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphinemura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zapada	0	0	40	40	0	20	17	0	0	8	0	980	1,260	490	780	320	400	25	73	1,780	1,720	1,200
Zapada cinctipes	40	33	20	0	7	120	17	20	440	4	0	0	0	40	120	60	250	50	18	120	0	0
Zapada columbiana	0	17	0	0	0	0	0	0	0	0	0	120	0	0	20	0	0	0	0	0	0	0
Zapada oregonensis group	0	0	0	0	0	0	0	0	0	0	0	40	80	30	60	20	0	0	0	120	0	60
| Family: Peltoperlidae	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yoraperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	100	100	180	0	0	140	333	220	920	48	480	0	0	410	20	100	88	25	9	0	20	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	40	0	20	0	0	180	0	0	0	4	20	0	0	50	0	0	0	0	0	0	0	0
| Family: Perlodidae	360	217	740	200	79	160	200	340	400	40	240	6,860	7,320	40	280	220	1,275	338	236	820	580	2,120
Isoperla sp.	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	0	0	0	0	0	0	0	0	0	0	0	20	100	0	0	0	75	25	55	80	120	140
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	440	0	20	17	0	60	0	60	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	100	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	140	917	0	120	7	620	317	0	0	40	100	680	520	90	60	580	238	200	91	960	180	3,180
| Order: Trichoptera	0	0	0	20	0	0	0	0	0	0	0	20	0	0	0	20	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	20	383	0	0	0	20	0	0	0	0	60	0	0	80	60	20	38	0	0	20	20	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	183	40	140	0	0	0	0	10	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0	0	0	0	20	0	20	0	0	0	0	0	0	0	0	0
Glossosoma	80	233	0	0	0	120	83	0	80	20	340	20	780	50	160	160	0	25	36	300	0	1,200

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	EL1	EL20	ELDFE	ELELKO	ELH93	ELDEL	ELUEL	ELUFE	ELUFO	ELDGR	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODPO
| Family: Hydropsychidae	120	83	40	100	29	80	0	20	0	0	40	0	0	0	0	0	0	0	9	40	20	0
Arctopsyche sp.	0	33	20	100	0	0	0	20	0	0	0	0	0	10	0	20	13	63	0	0	0	0
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	17	40	440	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche sp.	40	0	0	0	0	0	0	0	0	4	0	0	0	0	20	0	25	13	9	20	20	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	160	120	43	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	60	17	0	0	0	60	0	0	0	12	0	80	40	0	20	0	0	13	0	40	20	60
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	20	17	0	0	0	0	50	0	0	8	40	260	480	250	80	300	138	63	27	100	0	300
Rhyacophila brunnea/vemna group	0	17	0	0	0	0	17	0	20	4	0	140	240	40	20	100	0	13	27	260	0	60
Rhyacophila betteni group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0
Rhyacophila hyalinata group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	27	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0	0	20	0	0	0	1,040	0	20	0	0	0	0	20	0	20
Heterlimnius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	0	0	20	0	0	0	0	0	0	0	0	0	1,460	20	120	0	0	0	0	60	0	20
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	20	0	120	0	0	0	0	160	60	8	80	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	25	13	9	0	40	40
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	400	33	340	40	164	160	167	300	140	4	40	660	860	60	460	140	138	88	18	300	520	200
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	0	0	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum sp.	0	0	200	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	20	50	60	20	186	140	100	120	340	8	20	40	320	10	400	60	13	25	45	160	1,600	60
Rheotanytarsus	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	7	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	320	0
Sublettea	0	0	40	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0
Pagastia	0	33	0	0	0	20	17	20	80	8	180	380	420	30	540	0	38	63	36	360	160	100

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	EL1	EL20	ELDFE	ELELKO	ELH93	ELDEL	ELUEL	ELUFE	ELUFO	ELDGR	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODPO
Potthastia longimana group	0	0	0	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	40	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0	0	240	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Eukiefferiella	0	50	40	40	7	60	50	80	1,460	4	40	20	160	80	140	0	75	13	0	0	60	20
Heleniella sp.	0	0	0	40	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	0	0	0	40	0	0	80	0	110	140	20	0	13	0	20	0	0
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Orthocladius	1,360	100	2,160	80	971	120	83	1,900	1,960	52	1,100	1,680	1,660	390	580	40	238	0	0	420	900	420
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parorthocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	160	50	60	0	0	80	33	0	60	0	0	20	80	70	120	0	0	0	0	20	20	0
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	120	17	140	100	79	80	0	40	0	8	160	60	380	10	120	20	150	0	0	0	100	60
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	80	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0	40	0	0	20	17	20	20	8	20	0	20	50	60	0	50	0	27	20	20	20
Chelifera/ Metachela	20	17	20	0	0	40	33	100	120	0	80	60	80	40	20	0	0	0	0	60	0	20
Clinocera sp.	40	0	0	0	0	0	0	40	60	0	0	0	0	30	0	0	0	0	0	0	0	0
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	0	100	0	0	0	220	300	20	40	8	40	100	220	150	380	1,320	100	963	664	480	40	20
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	40
Simulium	0	33	0	280	0	0	0	0	0	4	0	20	120	10	0	0	38	0	118	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	20	0	20	0	0	0	20	0	0	0	0	0	0	0	20	0	0
Antocha sp.	20	0	20	0	0	0	0	20	20	0	0	0	20	50	0	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	20	0	0	20	0	0	40	200	10	20	20	13	0	0	100	0	20
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophila sp.	0	0	60	40	0	0	0	0	0	12	60	0	0	10	0	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	EL1	EL20	ELDFE	ELELKO	ELH93	ELDEL	ELUEL	ELUFE	ELUFO	ELDGR	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODPO
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	20	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	40	0	480	0	7	20	50	760	60	12	140	200	20	60	200	220	38	13	36	160	0	20
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	20	0	40	0	0	0	0	140	20	4	40	0	0	10	0	0	13	13	27	40	0	0
Sperchonopsis sp.	0	0	0	0	0	0	0	20	40	0	20	0	0	0	60	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	60	0	0	0	0	40	220	4	20	0	0	40	20	0	0	0	0	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	17	0	0	0	0	17	0	0	0	0	20	0	0	0	0	13	0	0	20	0	0
Rhynchelmis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	600	0	0	0	33	0	40	0	0	40	60	30	0	0	13	88	109	80	20	0
Fridericia	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0
Nais	0	0	0	0	664	0	0	460	240	0	0	0	0	0	220	40	0	0	0	0	0	0
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**7,720**	**6,218**	**17,160**	**7,880**	**2,858**	**7,740**	**5,135**	**11,000**	**8,980**	**1,288**	**6,460**	**13,800**	**21,140**	**3,780**	**8,580**	**6,720**	**4,260**	**4,161**	**2,923**	**10,980**	**17,060**	**10,340**

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	FOUEW	FOUKI	FRUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL	LILC3	MI2	MI3	MI5
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0
Ameletus	0	60	0	60	100	40	0	20	20	20	0	300	0	0	40	7	0	0	0	67	0	0
| Family: Baetidae	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	7	10	0	0	0	0	0
Acentrella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis	40	250	218	500	1,140	480	0	20	1,020	760	980	180	0	120	180	87	130	220	140	267	360	220
Baetis bicaudatus	0	0	0	0	60	0	0	480	0	20	0	0	0	0	0	7	0	0	0	0	0	0
Baetis tricaudatus group	0	290	45	360	1,000	80	0	80	460	300	420	40	0	0	20	33	100	200	160	117	260	20
| Family: Ephemerellidae	460	120	64	500	240	0	9	1,000	720	580	1,620	4,000	1	1,080	1,400	67	10	120	160	183	440	320
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	80	10	64	80	0	0	0	300	20	0	140	0	0	220	320	7	70	80	200	183	140	480
Drunella flavilinea	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	20	0	0	0	0	0
Drunella grandis group	40	10	0	0	20	0	0	20	0	0	20	20	0	0	0	40	0	20	0	0	0	0
Drunella sp.	0	0	0	20	0	40	0	20	0	0	0	0	0	0	0	0	10	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	40
| Family: Heptageniidae	1,340	1,430	427	3,720	2,700	40	4	1,180	200	1,240	2,400	5,600	1	2,360	2,540	560	520	1,880	980	983	1,420	980
Cinygmula sp.	0	0	0	20	0	0	0	0	0	0	0	20	0	0	20	0	0	0	0	0	0	0
Epeorus	40	10	0	60	80	0	0	300	20	0	20	140	0	40	20	0	20	80	0	0	20	0
Rhithrogena	0	40	91	100	0	0	2	0	80	0	0	20	0	60	20	0	0	0	0	17	220	60
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	20
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	10	18	0	20	0	11	0	0	0	20	40	1	0	20	0	0	20	0	67	0	80
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	45	0	0	0	0	40	0	0	0	0	0	40	0	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweltsa sp.	0	0	227	80	60	280	0	140	180	0	260	40	0	160	380	13	20	140	220	267	80	120
| Family: Leuctridae	0	0	0	0	0	20	0	40	40	0	0	0	0	0	0	0	0	0	0	0	20	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	9	0	0	20	0	0	0	0	0	0	0	20	0	0	0	0	0	0	20	0
Amphinemura sp.	0	0	0	0	0	120	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0
Zapada	320	20	45	240	80	60	0	440	880	80	1,880	180	38	680	1,140	53	260	440	240	600	0	60
Zapada cinctipes	20	60	155	0	200	60	62	60	140	20	20	20	0	0	0	60	0	0	0	100	240	0
Zapada columbiana	0	30	0	0	0	0	11	140	120	280	220	80	1	120	120	0	20	20	40	0	0	0
Zapada oregonensis group	300	10	9	20	0	0	0	140	160	580	340	60	12	220	40	80	170	360	560	50	0	20
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	10	0	0	0	0	0
Yoraperla sp.	0	0	0	0	0	0	0	0	20	0	220	0	0	0	20	0	0	0	0	0	0	0
| Family: Perlidae	20	10	155	20	0	0	0	0	20	0	0	0	0	0	0	7	0	0	20	17	0	20
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	33	20	0
| Family: Perlodidae	1,700	130	0	260	200	0	20	340	300	140	280	40	1	60	80	127	50	120	300	0	80	60
Isoperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	100	10	0	100	100	0	2	100	0	0	100	20	0	40	20	7	30	80	360	0	0	0
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
Taenionema	40	10	782	400	160	0	67	360	300	20	2,380	600	0	340	280	13	390	400	80	717	220	120
| Order: Trichoptera	0	0	0	0	0	240	0	0	0	0	0	0	0	0	0	0	0	20	40	0	0	20
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	640	40	0	0	0	0	0	100	0	267	900	2,640
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	20	0	55	0	20	0	0	20	20	60	0	20	0	0	0	0	10	0	0	83	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	160	60
Glossosoma	680	10	0	0	0	0	4	40	40	0	240	0	0	120	40	0	860	40	0	267	1,380	800

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	FOUEW	FOUKI	FRUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL	LILC3	MI2	MI3	MI5
| Family: Hydropsychidae	20	0	0	0	80	20	0	200	20	0	200	40	6	140	20	0	30	460	1,920	50	60	0
Arctopsyche sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	40	0
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0
Parapsyche sp.	0	10	0	0	0	0	0	100	20	80	60	20	0	20	100	20	10	120	840	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	20	30	18	0	40	20	0	0	0	0	20	0	7	0	0	0	0	120	60	17	0	0
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	200	0	36	120	0	180	2	400	480	260	480	20	9	80	40	27	40	40	60	17	0	20
Rhyacophila brunnea/vemna group	40	0	0	20	0	160	0	20	80	60	40	0	0	0	0	87	20	0	0	17	0	0
Rhyacophila betteni group	0	0	0	20	0	0	0	20	0	20	0	0	0	0	0	0	0	40	0	0	0	0
Rhyacophila hyalinata group	0	10	0	20	0	0	0	40	40	60	40	0	2	0	0	0	10	0	40	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	10	20	0	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	110	0	0	0	0	0
Neothremma sp.	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	20	0	0	0	660	960	480	0	0	0	560	100	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	40	0	0	0	0	0	0	20	40	20	180	0	0	0	0	7	0	0	0	0	0	0
Heterlimnius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	80	10	9	0	0	40	0	60	200	60	120	0	0	0	0	0	0	0	0	17	80	260
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	30	0	120	20	20	0	0	0	0	0	0	1	0	0	0	0	20	0	0	0	0
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	360	90	55	40	160	200	64	0	100	440	200	320	174	120	260	67	90	360	2,900	250	380	80
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	0	0	33	0	0
Polypedilum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	20	20	36	40	80	1,720	9	0	20	0	20	900	17	60	100	20	0	0	0	300	160	140
Rheotanytarsus	0	0	0	0	0	0	0	60	0	1,200	40	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Stempellinella sp.	0	0	0	0	0	620	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sublettea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	7	0	0	0	0	40	12	0	0	0	0	0	60	0	0	0
Pagastia	140	30	0	20	40	0	11	0	0	120	100	220	40	20	0	200	10	60	300	17	0	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	FOUEW	FOUKI	FRUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL	LILC3	MI2	MI3	MI5
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	0	0	0	0	0	0	7	0	0	20	20	0	65	0	0	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0	0	0	0	0	0	20	0	0	0	0	0	0	20	0	0	0	20	0	0	0
Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	100	0	0	20	40	20	11	20	80	180	120	20	0	0	0	27	40	180	1,220	67	20	0
Heleniella sp.	0	0	9	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	0	13	0	0	40	140	0	0	20	40	7	0	40	60	0	0	0
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthocladius	1,080	50	45	160	120	120	364	220	360	1,320	360	460	30	0	0	247	60	500	3,620	300	20	0
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parorthocladius sp.	0	0	0	0	0	0	0	0	40	20	0	0	0	0	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0	0	9	0	40	0	0	0	20	420	120	40	0	20	60	0	10	240	3,000	117	160	120
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	10	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	33	0	0
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	0	0	9	0	40	20	16	40	0	220	20	80	0	20	20	7	10	40	680	100	0	0
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	20	0	0	0	0	540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	20	160	7	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0
Chelifera/ Metachela	20	0	18	0	0	20	7	0	0	0	20	0	0	100	20	13	30	0	0	17	0	0
Clinocera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0
Wiedemannia sp.	0	0	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	20	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	0	20	0	0	0	0	0	0	0	40	0	7	20	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	80	480	145	40	240	880	29	380	1,120	0	620	20	5	120	0	47	0	60	0	133	480	280
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	9	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	60	50	0	20
Simulium	0	0	9	0	0	900	7	0	0	0	0	40	0	0	0	0	0	0	120	33	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	80	4	20	0	0	60	0	2	0	0	0	10	0	0	0	0	0
Antocha sp.	0	10	0	0	20	0	0	0	0	100	0	0	0	0	0	7	0	0	0	0	0	0
Dicranota	20	10	0	60	20	20	16	20	20	0	100	0	0	20	20	0	0	20	20	0	0	20
Hesperoconopa sp.	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	80	0
Limnophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	FOUEW	FOUKI	FRUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL	LILC3	MI2	MI3	MI5
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	20	0	9	0	0	20	0	0	0	0	20	0	1	0	0	0	0	20	40	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	100	0	20	0	40	0	0	0	0	0	0	0	0	40	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	220	30	27	0	80	140	2	20	20	0	80	60	26	20	20	27	20	80	140	33	40	0
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	40	0	0	0	20	0	2	20	0	0	20	40	3	0	20	13	40	120	620	0	0	0
Sperchonopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	18	0	0	0	0	0	20	0	0	0	0	0	0	7	0	0	0	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	33	60	20
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	540	0	0	0	20	0	0	0	0	0	20	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	20	0	0	0	0	0	0	0	0	0	0	1	60	0	0	20	0	0	0	0	0
Rhynchelmis sp.	0	0	0	0	0	0	0	20	0	0	40	0	0	0	0	0	70	20	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	80	0	0	60	360	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0
Fridericia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nais	0	0	0	0	0	20	0	0	0	800	0	0	6	0	0	0	0	0	0	0	20	0
| Subfamily: Tubificinae	0	0	0	0	0	1,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**7,720**	**3,490**	**3,006**	**7,260**	**7,320**	**10,560**	**774**	**7,740**	**8,400**	**10,160**	**15,540**	**13,820**	**497**	**7,140**	**7,640**	**2,065**	**3,390**	**6,980**	**19,360**	**6,119**	**7,660**	**7,120**

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0
Ameletus	20	0	20	50	0	0	0	0	0	0	0
| Family: Baetidae	0	0	0	0	0	0	0	0	0	0	0
Acentrella sp.	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0
Baetis	180	180	320	233	680	1,680	0	120	0	13	0
Baetis bicaudatus	20	0	40	17	0	20	0	0	0	0	0
Baetis tricaudatus group	60	20	100	233	680	0	0	0	0	13	0
| Family: Ephemerellidae	1,600	1,300	1,880	217	420	0	11	20	0	0	0
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	800	640	740	0	20	0	0	0	0	0	4
Drunella flavilinea	0	0	0	0	0	0	0	0	0	0	0
Drunella grandis group	20	220	80	33	20	0	0	0	0	0	0
Drunella sp.	60	0	20	0	20	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	140	0	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	3,080	380	880	2,017	4,040	1,060	0	60	0	0	0
Cinygmula sp.	0	0	20	0	0	0	0	0	0	0	0
Epeorus	80	20	0	0	80	0	0	0	0	0	0
Rhithrogena	160	0	60	0	40	0	0	0	0	0	0
| Family: Leptophlebiidae	0	0	0	0	0	0	18	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	20	0	0	0	0	0
| Family: Capniidae	0	60	0	50	40	20	0	20	86	0	156
Capnia sp.	0	0	0	0	0	0	0	0	57	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	60	0	0	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0	0	0	0	0
Sweltsa sp.	140	160	120	17	80	140	4	0	0	7	4
| Family: Leuctridae	0	0	0	17	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	60	0	0	0	7	20
Amphinemura sp.	0	0	0	0	0	0	7	0	300	20	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0
Zapada	620	980	160	350	240	520	111	2,080	1,014	0	32
Zapada cinctipes	80	800	20	50	20	1,660	0	340	0	153	216
Zapada columbiana	0	0	0	17	0	40	54	20	0	7	0
Zapada oregonensis group	0	40	0	0	0	0	0	20	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	4
Yoraperla sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0	20	0	17	20	0	0	0	0	0	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	320	120	200	133	280	180	7	260	57	0	4
Isoperla sp.	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	20	0	20	67	20	20	0	0	0	0	0
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0
Taenionema	1,140	300	420	50	240	0	4	0	0	0	4
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
Apatania	1,640	680	260	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0	40	0	0	0
Glossosoma	220	60	80	0	0	0	0	0	0	7	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
| Family: Hydropsychidae	0	0	20	0	0	0	71	0	0	27	4
Arctopsyche sp.	0	0	0	0	0	0	0	0	0	0	0
Cheumatopsyche	0	0	0	0	0	0	146	0	0	0	4
Hydropsyche	0	0	0	0	0	0	0	0	0	0	0
Parapsyche sp.	0	40	20	33	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	20	0	67	20	0	11	520	200	127	20
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	0	0	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	40	160	100	100	320	300	7	360	14	27	0
Rhyacophila brunnea/vemna group	20	60	20	33	60	20	14	300	43	0	4
Rhyacophila betteni group	0	0	0	0	0	40	0	0	0	7	0
Rhyacophila hyalinata group	0	40	20	17	20	40	0	0	0	0	0
Rhyacophila vofixa group	20	0	40	0	0	0	0	0	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	14	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	7	0	0	0	0
| Family: Elmidae	20	120	0	0	0	0	0	0	86	73	0
Heterlimnius sp.	0	0	0	0	0	0	0	0	0	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	140	200	320	17	0	0	0	120	28	347	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	4	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	4
| Order: Diptera	0	0	0	0	0	0	7	0	14	0	8
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	4	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	20	100	40	17	0	0	0	0	0	7	0
Forcipomyia sp.	0	0	0	0	0	0	0	0	14	0	0
Probezzia	0	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	60	460	60	150	60	20	7	560	171	67	16
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	4	0	0	0	0
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	4	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	7	0	0	0	0
Polypedilum sp.	0	0	0	0	0	0	0	0	0	0	0
Stictochironomus	0	0	20	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	20	40	20	50	20	580	7	5,160	829	47	12
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	20	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	0	320	11	0	0	0	0
Sublettea	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0
Diamesa	60	180	0	0	0	180	0	0	0	0	136
Pagastia	20	40	20	233	40	20	4	740	29	0	40

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	20	0	0	0	0	120	4	0	100	0	36
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0	0	0	0	0	7	0	0	0	8
Corynoneura	0	0	0	0	0	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	100	0	0	0	0	0	0	0	0
Eukiefferiella	20	280	20	100	20	200	0	920	86	7	36
Heleniella sp.	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	4	0	0	0	0
Hydrobaenus	0	0	0	17	0	0	0	0	86	7	8
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	20	0	0	0	0	0
Orthocladius	0	1,300	60	700	20	440	0	8,040	286	0	88
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	4
Parorthocladius sp.	0	0	20	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	40	0	0	17	0	0	0	0	0	0	0
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	11	140	1,914	47	8
Tvetenia	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	80	220	0	17	0	1,300	0	440	229	0	20
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	20	0	0	60	132	0	14	13	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	7	0
| Family: Dixidae	0	0	0	0	0	0	0	20	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	20	4	40	0	27	28
Chelifera/ Metachela	0	0	0	17	0	20	0	100	14	0	4
Clinocera sp.	0	0	0	0	0	0	0	0	0	0	0
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	0	0	0	0	29	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	3,340	2,820	1,380	150	100	120	7	140	271	7	52
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0	0	0	7	0
Simulium	0	0	0	0	40	360	39	60	43	1,100	96
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	4	0	0	0	12
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	18	0	0	0	0
| Family: Tipulidae	0	0	0	0	20	0	18	0	0	0	4
Antocha sp.	0	20	0	0	40	0	0	0	0	0	0
Dicranota	60	80	20	50	60	20	0	40	143	7	20
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	20	0	0	0	0	0	0	0	0
Limnophila sp.	40	20	0	0	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	4	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	4	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	46	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0

Table G.32: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	18	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	86	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	7	220	0	0	4
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	620	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0
Lebertia	40	40	40	83	60	0	11	20	0	7	4
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0
Sperchon	0	0	0	17	0	20	11	120	0	0	96
Sperchonopsis sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	0	17	0	0	0	0	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	0	7	20	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	179	0	0	20	0
| Class: Gastropoda	0	0	0	0	0	0	7	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	7	80	0	0	0
Rhynchelmis sp.	0	0	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	20	0	0	0	0	40	0	100	43	33	24
Fridericia	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0
Nais	40	60	0	0	0	80	0	300	0	0	0
| Subfamily: Tubificinae	0	0	0	0	0	0	207	0	0	167	0
Total Individuals	**14,520**	**12,360**	**7,820**	**5,470**	**7,840**	**9,760**	**1,373**	**22,160**	**6,214**	**2,412**	**1,244**

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																				
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	0.025	0	0	0.003	0.003	0.007	0	0.004	0.007	0.008	0.003	0.005	0	0	0	0.006	0.009	0.003	0.003	0.005	0.148
| Family: Baetidae	0	0	0	0.003	0.026	0	0.002	0.003	0	0.002	0	0	0	0	0.005	0.009	0	0	0	0	0
Acentrella sp.	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis	0.006	0.239	0.025	0.01	0.047	0.055	0.093	0.015	0.1	0.238	0.09	0.169	0.074	0.05	0.024	0.012	0.136	0.167	0.166	0.011	0.004
Baetis bicaudatus	0.003	0.016	0	0.007	0	0	0.002	0.003	0.004	0.004	0	0.005	0	0.01	0	0	0	0	0	0	0
Baetis tricaudatus group	0	0.004	0.004	0.013	0	0.016	0.002	0	0.002	0.043	0.003	0.011	0.022	0.017	0	0	0	0.003	0.028	0	0.006
| Family: Ephemerellidae	0.006	0.099	0.261	0.02	0.073	0.013	0.014	0.037	0.061	0.091	0.092	0.037	0.041	0.106	0.035	0.061	0.102	0.009	0.013	0.053	0.015
Caudatella sp.	0	0.016	0	0	0.009	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0
Drunella doddsii	0.006	0.026	0.018	0.036	0.009	0.065	0.029	0.019	0.007	0.037	0.003	0.018	0.041	0.109	0.019	0.021	0.038	0.009	0.02	0.008	0
Drunella flavilinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0	0	0	0	0	0	0
Drunella grandis group	0	0	0.007	0	0.02	0	0	0	0.002	0	0	0	0	0	0.003	0	0	0.03	0	0	0
Drunella sp.	0	0.018	0	0	0.003	0.013	0	0.001	0	0.002	0.003	0	0	0.003	0	0	0	0	0.003	0	0
Drunella spinifera	0	0	0	0	0	0	0	0.003	0	0	0.006	0.007	0	0	0	0	0	0	0	0	0
Ephemerella	0	0.005	0.013	0	0.003	0	0	0	0.009	0	0.008	0	0	0.003	0.035	0.064	0	0.106	0	0	0.004
| Family: Heptageniidae	0.596	0.119	0.063	0.307	0.154	0.199	0.338	0.319	0.201	0.083	0.022	0.295	0.327	0.267	0.094	0.181	0.379	0.163	0.187	0.547	0.559
Cinygmula sp.	0.008	0	0	0	0	0	0.002	0.006	0.002	0	0	0.007	0.003	0	0	0	0	0	0	0	0
Epeorus	0.003	0.024	0.007	0.01	0	0	0.027	0.007	0.052	0.006	0	0	0.011	0.03	0	0	0.004	0	0.023	0.027	0
Rhithrogena	0.031	0	0.009	0.125	0	0.033	0.077	0	0.035	0.012	0.003	0.039	0.027	0.01	0	0	0.006	0.003	0.01	0.027	0.004
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0.012	0	0.009	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.012	0	0	0
| Order: Plecoptera	0	0	0	0	0	0.007	0	0	0	0	0.014	0	0	0	0	0.012	0	0	0	0	0
| Family: Capniidae	0	0	0	0.01	0.006	0.003	0.027	0	0	0.016	0.003	0.002	0.003	0	0.002	0	0	0	0.003	0.003	0.057
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0.011	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0.003	0.007	0	0.03	0.006	0	0.011	0	0.004	0.006	0	0.002	0.005	0.02	0.002	0	0.004	0.003	0.008	0	0
Suwallia	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0	0.025	0	0	0	0	0
Sweltsa sp.	0.017	0.011	0.016	0.02	0.032	0.007	0.005	0.006	0.009	0.024	0.008	0.005	0.033	0.01	0.041	0	0.03	0.009	0.008	0.005	0.006
| Family: Leuctridae	0	0	0	0	0	0.01	0	0.001	0.006	0.006	0.006	0	0.003	0	0	0	0.002	0	0.003	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0.004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0
| Family: Nemouridae	0	0	0	0.003	0.015	0	0.011	0.03	0.002	0	0	0	0	0	0	0.052	0	0	0	0	0
Amphinemura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zapada	0.003	0.018	0.022	0.01	0.003	0.01	0	0	0	0.039	0.022	0.025	0.003	0.04	0.005	0.003	0.011	0.015	0.046	0.011	0
Zapada cinctipes	0	0	0.004	0	0.015	0.003	0	0.001	0	0.043	0.006	0	0.017	0.003	0.006	0.015	0	0.009	0	0	0
Zapada columbiana	0.006	0.002	0	0	0.012	0.046	0.002	0.01	0	0.016	0.003	0	0	0	0	0	0.004	0.003	0.028	0.008	0
Zapada oregonensis group	0.011	0.002	0.009	0	0.006	0	0.007	0.022	0.002	0.004	0.006	0	0	0.013	0	0.003	0.019	0	0.023	0.003	0
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0
Yoraperla sp.	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0.005	0	0
| Family: Perlidae	0	0	0	0.003	0.006	0.003	0	0	0	0.016	0.008	0.032	0.019	0	0.005	0.006	0	0	0	0	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.006	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	0.004	0.003	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0	0	0	0	0.003	0	0	0	0	0	0	0	0.003	0	0	0	0	0.003	0	0	0
| Family: Perlodidae	0	0.024	0.013	0.01	0.017	0.007	0.025	0.118	0.044	0.008	0.017	0.041	0.044	0	0.006	0	0.055	0.012	0.01	0	0.009
Isoperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	0.003	0.002	0	0.003	0	0.007	0.021	0.021	0.004	0.004	0.003	0	0	0.013	0	0	0.019	0	0.003	0.005	0
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.019	0.015	0.004	0.01	0	0.065	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	0.181	0.091	0.018	0.089	0.012	0.192	0.146	0.013	0.335	0.024	0.006	0.096	0.19	0.046	0.005	0.006	0.013	0.003	0.243	0.235	0
| Order: Trichoptera	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0.023	0.003	0	0.002	0	0	0	0	0	0	0	0.016	0	0.009	0.027	0.003	0.003	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0	0.007	0	0	0	0.007	0.036	0.01	0	0	0	0.003	0	0	0
| Family: Glossosomatidae	0	0	0	0.03	0.006	0	0.002	0	0.015	0	0	0	0	0	0	0	0.002	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																			
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1
Glossosoma	0	0	0.121	0.122	0.02	0.026	0	0.001	0.015	0.002	0.014	0	0	0.026	0.028	0	0	0.003	0.028	0	0
| Family: Hydropsychidae	0.003	0.011	0.002	0	0.035	0.01	0.002	0.015	0.039	0.006	0	0	0	0.013	0.011	0	0	0	0.008	0.005	0.006
Arctopsyche sp.	0	0	0	0	0.041	0	0	0	0.006	0	0	0	0.014	0	0.003	0	0	0	0	0	0
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0.007	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche sp.	0.003	0	0	0	0	0	0	0.004	0.011	0.002	0.006	0.002	0	0.003	0.002	0	0.002	0	0	0.003	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.006	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0.011	0	0	0	0	0	0	0.056	0	0	0.011	0	0.01	0	0.004
| Family: Leptoceridae	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0.005	0.049	0	0	0.016	0	0.004	0	0.006	0	0.011	0	0	0	0.12	0	0.012	0	0	0
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0.036	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0.003	0.057	0.007	0.013	0.02	0.01	0.004	0.01	0.002	0.067	0.076	0.009	0	0	0.005	0.006	0	0.003	0.056	0	0.004
Rhyacophila brunnea/vemna group	0	0.009	0.007	0	0	0.003	0	0.004	0	0.002	0.014	0.005	0.003	0	0.002	0	0	0.006	0.005	0	0
Rhyacophila betteni group	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0.003	0	0	0
Rhyacophila hyalinata group	0	0	0	0	0	0	0.002	0.001	0	0	0.003	0	0	0	0	0	0	0	0.003	0.003	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0	0	0	0.01	0.008	0	0	0	0.002	0	0	0	0	0	0
Heterlimnius sp.	0	0.005	0.004	0	0	0	0	0	0	0.01	0.022	0	0	0	0	0	0	0	0	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.009	0	0.024	0.003	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.014	0	0	0	0	0	0.004
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0.003	0.025	0	0.006	0	0	0
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0.005	0.009	0.007	0	0	0	0	0	0	0.003	0.002	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	0	0.007	0.007	0.003	0	0.007	0.029	0.06	0	0.014	0.017	0.002	0.003	0.017	0.019	0.006	0.004	0.015	0.003	0.013	0.015
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0.004
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum sp.	0	0	0.002	0	0	0.01	0	0	0	0	0	0	0	0	0.036	0	0	0.042	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	0.003	0.005	0.011	0	0.003	0.01	0.009	0.03	0	0.008	0.025	0.039	0.005	0.003	0.049	0.046	0.023	0.018	0	0.005	0.004
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sublettea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																				
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1
Diamesa	0	0.011	0.002	0	0	0	0.005	0	0	0	0	0.002	0	0.003	0	0	0.002	0	0	0	0
Pagastia	0.006	0.002	0.004	0.003	0.015	0.007	0.005	0.019	0.002	0.002	0.12	0.014	0.003	0.003	0	0.018	0.019	0	0	0.003	0
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0.006	0.003	0.011	0	0	0.003	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0	0.002	0	0.006	0	0	0	0	0	0	0	0.003	0.003	0	0	0.002	0	0	0	0
Corynoneura	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0.004
Cricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.028	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.006	0	0.151	0	0	0
Eukiefferiella	0	0.005	0.004	0.003	0.029	0.023	0.032	0.021	0	0.008	0.059	0.016	0	0.007	0.068	0	0.006	0	0.003	0	0
Heleniella sp.	0	0	0	0	0.012	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	0	0.002	0	0	0	0	0.013	0.002	0	0	0	0	0	0	0	0.006	0	0	0	0
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004
Limnophyes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthocladius	0.003	0.073	0.011	0.013	0.119	0.065	0.027	0.007	0	0.055	0.171	0.023	0.014	0.04	0.24	0.123	0.038	0.042	0.008	0.008	0.027
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0
Parorthocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0.003	0	0.007	0	0.006	0.023	0.004	0.031	0	0.012	0.034	0	0	0.03	0.008	0.043	0.009	0	0.003	0.005	0
Synorthocladius	0.006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.009	0	0	0.003	0	0.004
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	0	0.002	0.002	0	0.003	0.003	0	0.022	0	0.008	0.011	0	0.003	0.003	0.042	0.003	0	0	0.003	0	0
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.059
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0.009	0.018	0	0.018	0	0	0.004
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0	0.002	0	0	0	0.006
Chelifera/ Metachela	0	0.004	0.009	0	0.052	0.003	0	0.004	0	0	0.003	0.002	0	0	0.006	0.003	0	0	0.005	0	0
Clinocera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	0.006	0.049	0.213	0	0	0	0.013	0.075	0	0.02	0.025	0.034	0.044	0	0.011	0.043	0.002	0.012	0.003	0	0
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0	0.001	0	0.004	0	0	0	0	0	0	0	0	0	0	0
Simulium	0	0.004	0	0	0	0	0	0.003	0	0.008	0	0.002	0	0	0	0	0	0.003	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0.002	0.01	0	0	0	0	0.009	0	0	0	0	0	0	0	0	0	0	0	0.004
Antocha sp.	0	0	0	0	0.032	0	0	0	0	0.002	0.003	0	0	0	0.003	0	0	0.021	0	0	0
Dicranota	0	0.004	0	0	0	0.003	0.007	0	0	0.002	0.006	0.002	0	0.003	0	0	0.015	0	0	0.003	0.004
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0.002	0	0	0	0	0	0
Limnophila sp.	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																			
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0.003	0.009	0	0	0.004	0	0	0.006	0.002	0	0	0	0.003	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	0	0	0	0.006	0	0	0	0	0.003	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0.003	0.009	0	0	0	0	0.004	0	0	0	0	0	0	0	0	0.003	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.018
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0.003	0.002	0.004	0.007	0.049	0	0	0.01	0	0	0.014	0	0.008	0.003	0.003	0.003	0.002	0	0	0	0.004
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	0	0	0.002	0.007	0.032	0.01	0	0	0.002	0	0	0	0	0	0	0	0.002	0.003	0.005	0	0.012
Sperchonopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	0	0.003	0.015	0	0	0	0	0	0	0.005	0	0	0.003	0	0	0.003	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0.003	0	0.003	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0.003	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0.002	0.002	0.007	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0
Rhynchelmis sp.	0	0	0.011	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0.01	0.006	0	0	0	0	0	0.011	0	0	0	0.063	0	0	0	0	0	0
Fridericia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004
Nais	0	0	0	0	0	0	0.004	0	0.007	0	0	0	0	0	0.02	0	0	0	0	0	0
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																		Mine-exposed	
	KODCR	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	0.167	0.094	0.063	0	0.055	0	0.011	0.025	0	0.005	0.014	0.011	0.016	0.033	0.152	0.016	0.009	0	0.01	0	0
| Family: Baetidae	0.002	0.008	0	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0
Acentrella sp.	0	0	0	0	0	0	0	0	0	0.016	0	0	0.006	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0.008	0	0	0	0	0	0	0	0	0	0	0
Baetis	0.202	0.141	0.058	0.036	0	0.1	0.073	0.079	0.023	0.044	0.117	0.136	0.037	0	0.004	0.073	0.108	0.079	0.062	0	0
Baetis bicaudatus	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0.003	0	0.048	0	0	0.058	0	0
Baetis tricaudatus group	0.013	0.006	0.003	0.006	0	0.024	0	0.025	0.04	0.013	0.009	0.011	0.006	0.005	0.003	0.007	0.002	0.012	0.01	0	0
| Family: Ephemerellidae	0.009	0.043	0	0.018	0.018	0.031	0.165	0	0.005	0.204	0.187	0.04	0.034	0.1	0.043	0.032	0.028	0.062	0.1	0	0
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	0.006	0.014	0.014	0	0.003	0.026	0.059	0.022	0.089	0.008	0.013	0.017	0.006	0.01	0	0	0.033	0.071	0.01	0	0
Drunella flavilinea	0	0	0	0	0	0	0.003	0	0	0	0	0.011	0	0.008	0	0.016	0	0.003	0	0	0
Drunella grandis group	0.002	0	0.014	0	0	0	0	0.007	0	0	0.009	0.002	0.003	0	0.001	0	0.002	0	0	0	0
Drunella sp.	0.002	0	0	0	0.003	0	0	0	0	0	0	0.002	0	0	0	0	0	0.003	0	0	0
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	0.03	0.018	0.003	0	0	0.002	0.006	0.051	0.016	0.01	0.027	0.053	0.072	0	0.024	0	0	0	0.004	0	0
| Family: Heptageniidae	0.152	0.133	0.14	0.095	0.429	0.041	0.151	0.155	0.347	0.059	0.133	0.159	0.318	0.325	0.471	0.11	0.2	0.171	0.032	0	0
Cinygmula sp.	0.002	0.004	0	0	0.072	0.003	0	0	0	0	0	0	0	0.003	0.01	0.007	0	0	0	0	0
Epeorus	0.011	0.006	0	0.038	0	0.007	0.003	0	0.002	0	0.005	0	0	0.074	0.003	0.016	0.007	0.006	0.013	0	0
Rhithrogena	0.075	0.037	0.008	0.006	0.052	0.007	0	0	0.127	0	0.002	0.023	0.056	0.031	0.004	0.013	0.007	0	0.158	0	0
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0.028	0.002	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
| Family: Capniidae	0.06	0.112	0.008	0.027	0.018	0.005	0.011	0.003	0.009	0	0.005	0.008	0.006	0	0.065	0.032	0	0	0	0	0.003
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0.016	0	0.012	0.012	0	0.008	0	0	0.005	0.004	0.006	0	0	0.009	0	0	0	0.004	0	0
Suwallia	0	0	0	0	0	0	0	0	0	0	0.005	0.008	0	0	0.003	0	0	0	0	0	0
Sweltsa sp.	0.045	0.033	0.019	0.006	0.088	0.014	0.034	0.063	0.122	0.018	0.022	0.015	0.081	0.031	0.003	0	0.028	0.012	0.023	0	0
| Family: Leuctridae	0	0	0.003	0	0.003	0	0.006	0	0.002	0	0	0	0.006	0.003	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0
Amphinemura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zapada	0.004	0.004	0.017	0.142	0.012	0.028	0.05	0.028	0.005	0.003	0.005	0.004	0.003	0.018	0	0.022	0.092	0.015	0	0	0
Zapada cinctipes	0	0.002	0	0.006	0	0	0	0	0.005	0.003	0	0	0.012	0.015	0	0	0.021	0	0.013	0.032	0
Zapada columbiana	0	0.002	0	0.083	0.061	0.043	0	0	0	0	0.016	0	0.019	0.033	0	0.009	0.009	0	0	0	0
Zapada oregonensis group	0	0.002	0	0.009	0	0	0.003	0	0	0	0.054	0.013	0	0.01	0.001	0.022	0.012	0	0	0	0
| Family: Peltoperlidae	0	0	0	0.012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yoraperla sp.	0	0	0	0.003	0	0.002	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0
| Family: Perlidae	0	0.008	0.008	0	0	0	0	0.013	0.014	0.01	0	0.002	0.009	0	0	0	0.026	0	0	0	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0.003	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0.002	0.002	0.008	0	0	0	0	0	0.014	0.003	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	0	0.031	0.008	0.021	0.003	0.009	0.05	0.003	0.005	0.064	0.18	0.049	0.006	0.008	0.038	0.048	0.026	0.015	0.013	0	0
Isoperla sp.	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	0	0	0	0	0.012	0.002	0.006	0.003	0.007	0	0	0.002	0	0.033	0	0.003	0.009	0	0	0	0
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0.004	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	0.013	0.025	0	0.003	0.042	0.069	0.146	0.007	0.056	0.003	0.083	0.251	0.019	0.041	0.01	0.075	0.042	0.032	0.017	0.02	0
| Order: Trichoptera	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0
| Family: Glossosomatidae	0	0	0.003	0.024	0	0	0	0.013	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																		Mine-exposed	
	KODCR	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK
Glossosoma	0	0	0	0.03	0	0.012	0.006	0.152	0.009	0	0.004	0	0.003	0	0	0.025	0.002	0.247	0.399	0	0
| Family: Hydropsychidae	0	0	0	0.03	0.009	0.017	0.008	0.007	0.007	0.204	0.007	0	0.003	0.072	0	0.048	0	0.015	0	0	0
Arctopsyche sp.	0.034	0.065	0	0	0	0	0.008	0.01	0.016	0	0.013	0.032	0	0	0	0	0	0.015	0	0	0
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	0	0.108	0	0.004	0	0	0	0.003	0	0	0	0	0
Parapsyche sp.	0	0	0	0	0	0.002	0	0	0.002	0	0.004	0	0	0.003	0	0.009	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0
Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0.121	0.024	0	0	0	0	0.01	0.002	0	0.037	0.02	0	0	0.002	0.018	0.004	0.002	0.105
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0.003	0	0	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0.011	0.002	0	0.03	0.006	0.014	0.02	0.007	0.012	0.003	0.005	0.011	0.016	0.028	0	0.009	0.016	0.006	0.006	0	0
Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.003	0	0	0.005	0	0	0	0
Rhyacophila betteni group	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila hyalinata group	0	0	0	0	0	0	0.003	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	0	0.172	0.006	0.024	0	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0.468	0.003	0.01	0	0	0	0	0.003	0.005	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0.003	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0
Heterlimnius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	0	0	0	0.003	0	0.003	0	0.003	0.002	0	0	0	0.037	0	0.003	0	0.056	0	0.01	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0.001	0	0	0	0	0	0
| Family: Chironomidae	0.024	0.016	0.017	0	0.006	0.007	0.006	0.016	0.014	0.003	0	0.013	0.019	0.003	0.006	0.007	0.005	0.047	0.01	0.012	0.012
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum sp.	0	0	0	0	0	0	0	0.057	0.005	0.01	0	0	0.006	0	0	0	0.002	0.003	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	0.002	0	0.011	0	0	0	0.008	0	0	0.005	0	0	0.009	0	0	0	0.007	0	0	0.275	0.248
Rheotanytarsus	0	0	0	0	0	0	0	0.003	0	0.008	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0.118
Sublettea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																		Mine-exposed	
	KODCR	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK
Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0.02	0
Pagastia	0	0	0.025	0.003	0	0	0.011	0.007	0	0	0	0.002	0	0	0	0	0.009	0.012	0	0	0
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0.009
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0.002	0.01	0	0.041	0	0	0.003	0	0	0	0.016	0.002	0.006	0.003	0.004	0	0	0	0.006	0.02	0
Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.012
Cricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.074
Cricotopus (Nostococladius)	0	0	0	0	0	0	0.09	0.01	0.007	0.003	0	0.002	0.003	0	0	0	0.167	0	0.004	0	0
Eukiefferiella	0.002	0.008	0.006	0	0	0.017	0.003	0.016	0	0.008	0	0.004	0.009	0	0	0.048	0.002	0.006	0	0.022	0.006
Heleniella sp.	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0.002	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	0.002	0	0.006	0	0	0.003	0.007	0	0	0.002	0	0	0	0.085	0.003	0	0	0	0	0
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	0	0	0.003	0	0	0.005	0.002	0	0	0.001	0	0	0	0	0.01	0
Orthocladius	0.097	0.067	0.112	0	0.003	0	0.008	0.092	0.002	0.036	0.009	0.017	0.025	0.01	0.023	0.221	0.007	0.074	0.004	0.002	0.27
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.012	0
Parorthocladius sp.	0	0	0	0	0	0	0.006	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0	0	0	0.003	0.021	0.003	0.003	0	0.009	0	0.004	0.002	0.019	0.005	0.004	0	0.007	0.056	0	0.002	0.006
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0.002	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	0.002	0.053	0.008	0.009	0.009	0	0.003	0.01	0	0.031	0.002	0	0.003	0.003	0	0	0.002	0.006	0.004	0.002	0
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0	0.009	0	0	0	0.002	0	0	0	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.002	0	0.011	0	0	0	0	0.003	0.002	0	0	0	0.006	0	0.003	0	0	0	0	0	0.009
Chelifera/ Metachela	0.002	0.002	0.028	0.003	0	0	0.003	0	0	0	0	0.002	0	0	0	0.003	0	0	0	0	0
Clinocera sp.	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0.003	0	0	0	0	0	0	0	0.002	0	0	0.028	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0.003	0	0.005	0.025
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	0	0	0.011	0	0	0.014	0.003	0	0	0	0	0	0.031	0	0.001	0	0.026	0.003	0.004	0.002	0.009
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
| Family: Simuliidae	0	0.002	0	0	0	0	0	0	0	0	0	0.013	0	0	0	0	0	0	0	0.012	0
Simulium	0	0	0.003	0	0	0	0	0	0	0.016	0.002	0.019	0	0	0	0	0	0	0	0.344	0.003
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0.004	0.01	0	0.003	0.006	0	0	0	0	0	0.009	0	0	0	0.01	0	0	0	0	0	0
Antocha sp.	0	0	0	0	0	0	0	0.016	0.005	0	0	0	0.003	0	0	0	0	0.003	0	0	0
Dicranota	0	0	0	0	0.012	0.002	0.008	0.007	0.002	0	0	0	0	0	0	0	0.002	0	0	0.005	0.006
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	0	0	0	0	0	0	0.005	0.013	0.005	0	0.009	0	0.001	0	0	0	0	0	0
Limnophila sp.	0	0.002	0	0	0	0	0	0	0	0	0.007	0.025	0	0	0	0	0.009	0	0.004	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Reference																		Mine-exposed	
	KODCR	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0.002	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0.007	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0	0	0.014	0	0.006	0	0	0.013	0.002	0.003	0.002	0.002	0.003	0	0.004	0	0.002	0.006	0.01	0	0
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	0	0.006	0	0	0.003	0	0.006	0.003	0	0.023	0.002	0.015	0.003	0.003	0.001	0.053	0.002	0	0	0	0
Sperchonopsis sp.	0	0.002	0	0	0	0	0	0	0	0	0.004	0.004	0	0	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0	0.009	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0.002	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0.003	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhynchelmis sp.	0.006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.006	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0.002	0.357	0	0.006	0	0	0.007	0	0	0	0	0.003	0	0	0.007	0	0	0	0.135	0.068
Fridericia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.003
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nais	0.002	0	0.006	0	0	0	0	0.038	0	0.005	0	0	0.003	0	0	0	0	0	0	0.002	0
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	CORCK	EL19	EL1	EL20	ELDFE	ELELKO	ELH93	ELDEL	ELUEL	ELUFE	ELUFO	ELDGR	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	0	0	0	0	0.005	0.003	0.013	0	0.016	0.004	0.002	0.009	0	0	0	0.008	0.012	0.003	0	0	0.015
| Family: Baetidae	0	0.006	0	0	0.003	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0
Acentrella sp.	0	0.003	0.018	0.013	0.008	0.028	0.01	0	0	0.007	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
Baetis	0	0.096	0.021	0.046	0.006	0.043	0	0.049	0.084	0.011	0.031	0.071	0.062	0	0.004	0.056	0.058	0.042	0.035	0.087	0.056
Baetis bicaudatus	0	0	0.008	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0
Baetis tricaudatus group	0	0.012	0.016	0.027	0.001	0.038	0	0.008	0.039	0.002	0	0.025	0.046	0.001	0.003	0.013	0.061	0.021	0.003	0.105	0.078
| Family: Ephemerellidae	0	0.012	0.256	0.019	0.562	0.053	0.015	0.039	0.062	0.424	0.098	0.053	0.04	0.001	0.036	0.048	0.077	0.006	0.015	0.024	0.031
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	0	0.022	0.034	0.137	0	0.005	0	0.07	0.039	0.002	0.002	0.053	0.019	0.004	0.033	0.011	0.007	0.012	0.018	0.003	0.009
Drunella flavilinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0
Drunella grandis group	0	0.006	0.003	0.003	0.006	0	0	0	0.003	0.002	0.009	0.006	0.003	0.012	0.004	0.003	0.023	0.003	0	0	0.003
Drunella sp.	0	0	0.003	0	0	0	0	0.005	0	0	0.002	0	0	0	0.001	0.005	0.002	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	0	0	0.021	0	0.019	0	0.028	0	0.003	0.038	0	0.003	0	0.001	0.001	0	0	0	0	0.003	0
| Family: Heptageniidae	0	0.13	0.132	0.252	0.027	0.213	0.07	0.406	0.286	0.049	0.018	0.332	0.241	0.042	0.05	0.061	0.114	0.283	0.091	0.234	0.199
Cinygmula sp.	0	0	0	0	0	0	0	0.008	0	0	0	0	0	0	0	0	0	0	0	0	0
Epeorus	0	0	0.003	0.003	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0	0	0.009	0.009
Rhithrogena	0	0.006	0.023	0.048	0	0.279	0	0.018	0.019	0.002	0.002	0.09	0.019	0	0	0.003	0	0.027	0	0.006	0
| Family: Leptophlebiidae	0	0	0.003	0	0.016	0.005	0.005	0	0	0.002	0.004	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0.001	0	0	0	0.001	0.003	0.005	0.005	0.003	0	0	0.003	0	0.012	0.002	0.003	0	0.021	0.012	0.003	0.006
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0.003	0	0	0	0.003	0
Suwallia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweltsa sp.	0.001	0.009	0.018	0.021	0.003	0.043	0	0.049	0.026	0	0	0.09	0.034	0.007	0.004	0.019	0.007	0.018	0	0.006	0.003
| Family: Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0.002	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0.06	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphinemura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zapada	0.001	0.006	0	0	0.002	0.005	0	0.003	0.003	0	0	0.006	0	0.071	0.06	0.13	0.091	0.048	0.094	0.006	0.025
Zapada cinctipes	0.02	0.003	0.005	0.005	0.001	0	0.002	0.016	0.003	0.002	0.049	0.003	0	0	0	0.011	0.014	0.009	0.059	0.012	0.006
Zapada columbiana	0.001	0	0	0.003	0	0	0	0	0	0	0	0	0	0.009	0	0	0.002	0	0	0	0
Zapada oregonensis group	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0.004	0.008	0.007	0.003	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0	0	0	0
Yoraperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0	0.182	0.013	0.016	0.01	0	0	0.018	0.065	0.02	0.102	0.037	0.074	0	0	0.108	0.002	0.015	0.021	0.006	0.003
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0	0.012	0.005	0	0.001	0	0	0.023	0	0	0	0.003	0.003	0	0	0.013	0	0	0	0	0
| Family: Perlodidae	0.003	0.012	0.047	0.035	0.043	0.025	0.028	0.021	0.039	0.031	0.045	0.031	0.037	0.497	0.346	0.011	0.033	0.033	0.299	0.081	0.081
Isoperla sp.	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0.005	0	0	0	0.018	0.006	0.019
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	0	0	0.056	0	0.003	0.003	0	0.007	0	0.009	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0.013	0.005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0.011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	0.001	0.019	0.018	0.147	0	0.015	0.002	0.08	0.062	0	0	0.031	0.015	0.049	0.025	0.024	0.007	0.086	0.056	0.048	0.031
| Order: Trichoptera	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0.001	0	0	0	0.003	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0.012	0.003	0.062	0	0	0	0.003	0	0	0	0	0.009	0	0	0.021	0.007	0.003	0.009	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0.001	0	0	0	0	0	0	0	0.036	0.004	0.016	0	0	0	0	0.003	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0.001	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																			
	CORCK	EL19	EL1	EL20	ELDFE	ELELKO	ELH93	ELDEL	ELUEL	ELUFE	ELUFO	ELDGR	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC
Glossosoma	0	0.006	0.01	0.037	0	0	0	0.016	0.016	0	0.009	0.016	0.053	0.001	0.037	0.013	0.019	0.024	0	0.006	0.012
| Family: Hydropsychidae	0	0.003	0.016	0.013	0.002	0.013	0.01	0.01	0	0.002	0	0	0.006	0	0	0	0	0	0	0	0.003
Arctopsyche sp.	0	0	0	0.005	0.001	0.013	0	0	0	0.002	0	0	0	0	0	0.003	0	0.003	0.003	0.015	0
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0.003	0.002	0.056	0.017	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche sp.	0	0.006	0.005	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0.002	0	0.006	0.003	0.003
| Family: Hydroptilidae	0.007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0.034	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0.009	0.015	0.015	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.003	0.003	0.008	0.003	0	0	0	0.008	0	0	0	0.009	0	0.006	0.002	0	0.002	0	0	0.003	0
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0.026	0.028	0.003	0.003	0	0	0	0	0.01	0	0	0.006	0.006	0.019	0.023	0.066	0.009	0.045	0.032	0.015	0.009
Rhyacophila brunnea/vemna group	0.009	0	0	0.003	0	0	0	0	0.003	0	0.002	0.003	0	0.01	0.011	0.011	0.002	0.015	0	0.003	0.009
Rhyacophila betteni group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0
Rhyacophila hyalinata group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0.009
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0.005	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0.049	0	0.002	0	0	0	0
Heterlimnius sp.	0.008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Narpus	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0.069	0.005	0.014	0	0	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0.006	0.003	0	0.007	0	0	0	0	0.015	0.007	0.006	0.012	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0.006	0.003	0.003
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	0.014	0.015	0.052	0.005	0.02	0.005	0.057	0.021	0.033	0.027	0.016	0.003	0.006	0.048	0.041	0.016	0.054	0.021	0.032	0.021	0.006
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	0	0	0	0	0	0.015	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum sp.	0	0	0	0	0.012	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	0.075	0.046	0.003	0.008	0.003	0.003	0.065	0.018	0.019	0.011	0.038	0.006	0.003	0.003	0.015	0.003	0.047	0.009	0.003	0.006	0.015
Rheotanytarsus	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0
Sublettea	0	0	0	0	0.002	0	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																			
	CORCK	EL19	EL1	EL20	ELDFE	ELELKO	ELH93	ELDEL	ELUEL	ELUFE	ELUFO	ELDGR	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC
Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
Pagastia	0.029	0.003	0	0.005	0	0	0	0.003	0.003	0.002	0.009	0.006	0.028	0.028	0.02	0.008	0.063	0	0.009	0.015	0.012
Potthastia longimana group	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	0	0.006	0.005	0	0	0	0	0	0	0	0.007	0	0	0	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0
Corynoneura	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus	0.02	0	0	0	0	0	0	0	0	0	0.027	0	0	0	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0
Eukiefferiella	0.005	0.031	0	0.008	0.002	0.005	0.002	0.008	0.01	0.007	0.163	0.003	0.006	0.001	0.008	0.021	0.016	0	0.018	0.003	0
Heleniella sp.	0.001	0	0	0	0	0.005	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0.005	0	0	0	0	0	0	0	0	0	0.004	0	0	0.006	0	0.029	0.016	0.003	0	0.003	0
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0
Orthocladius	0.088	0.225	0.176	0.016	0.126	0.01	0.34	0.016	0.016	0.173	0.218	0.04	0.17	0.122	0.079	0.103	0.068	0.006	0.056	0	0
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parorthocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0	0	0.021	0.008	0.003	0	0	0.01	0.006	0	0.007	0	0	0.001	0.004	0.019	0.014	0	0	0	0
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0	0	0	0
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	0.005	0.003	0.016	0.003	0.008	0.013	0.028	0.01	0	0.004	0	0.006	0.025	0.004	0.018	0.003	0.014	0.003	0.035	0	0
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0.002	0	0	0	0.005	0	0.017	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0.003	0	0	0.002	0	0	0.003	0.003	0.002	0.002	0.006	0.003	0	0.001	0.013	0.007	0	0.012	0	0.009
Chelifera/ Metachela	0.003	0.006	0.003	0.003	0.001	0	0	0.005	0.006	0.009	0.013	0	0.012	0.004	0.004	0.011	0.002	0	0	0	0
Clinocera sp.	0	0.003	0.005	0	0	0	0	0	0	0.004	0.007	0	0	0	0	0.008	0	0	0	0	0
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	0.531	0.009	0	0.016	0	0	0	0.028	0.058	0.002	0.004	0.006	0.006	0.007	0.01	0.04	0.044	0.196	0.023	0.231	0.227
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0
Simulium	0.001	0.003	0	0.005	0	0.036	0	0	0	0	0	0.003	0	0.001	0.006	0.003	0	0	0.009	0	0.04
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	0	0.003	0	0.002	0	0	0	0.001	0	0	0	0	0	0	0
Antocha sp.	0	0.003	0.003	0	0.001	0	0	0	0	0.002	0.002	0	0	0	0.001	0.013	0	0	0	0	0
Dicranota	0.002	0	0	0	0	0	0	0.003	0	0	0.002	0	0	0.003	0.009	0.003	0.002	0.003	0.003	0	0
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophila sp.	0	0	0	0	0.003	0.005	0	0	0	0	0	0.009	0.009	0	0	0.003	0	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																			
	CORCK	EL19	EL1	EL20	ELDFE	ELELKO	ELH93	ELDEL	ELUEL	ELUFE	ELUFO	ELDGR	ELUSP	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0.002	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0.005	0.006	0.005	0	0.028	0	0.002	0.003	0.01	0.069	0.007	0.009	0.022	0.014	0.001	0.016	0.023	0.033	0.009	0.003	0.012
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	0	0.006	0.003	0	0.002	0	0	0	0	0.013	0.002	0.003	0.006	0	0	0.003	0	0	0.003	0.003	0.009
Sperchonopsis sp.	0	0	0	0	0	0	0	0	0	0.002	0.004	0	0.003	0	0	0	0.007	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0.015	0	0	0.003	0	0	0	0	0.004	0.024	0.003	0.003	0	0	0.011	0.002	0	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0
| Class: Gastropoda	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0.003	0	0	0	0	0.003	0	0	0	0	0.001	0	0	0	0	0.003	0	0
Rhynchelmis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0.019	0.006	0	0	0.035	0	0	0	0.006	0	0.004	0	0	0.003	0.003	0.008	0	0	0.003	0.021	0.037
Fridericia	0	0	0	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nais	0.001	0	0	0	0	0	0.232	0	0	0.042	0.027	0	0	0	0	0	0.026	0.006	0	0	0
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	FODGH	FODHE	FODPO	FOUEW	FOUKI	FOUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.009
Ameletus	0	0.005	0	0	0.017	0	0.008	0.014	0.004	0	0.003	0.002	0.002	0	0.022	0	0	0.005	0.003	0	0
| Family: Baetidae	0	0.002	0	0	0	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0.003	0.003	0
Acentrella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis	0.04	0.059	0	0.005	0.072	0.073	0.069	0.156	0.045	0	0.003	0.121	0.075	0.063	0.013	0	0.017	0.024	0.042	0.038	0.032
Baetis bicaudatus	0	0	0	0	0	0	0	0.008	0	0	0.062	0	0.002	0	0	0	0	0	0.003	0	0
Baetis tricaudatus group	0.015	0.018	0	0	0.083	0.015	0.05	0.137	0.008	0	0.01	0.055	0.03	0.027	0.003	0	0	0.003	0.016	0.029	0.029
| Family: Ephemerellidae	0.111	0.213	0.012	0.06	0.034	0.021	0.069	0.033	0	0.012	0.129	0.086	0.057	0.104	0.289	0.002	0.151	0.183	0.032	0.003	0.017
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	0.016	0.004	0.002	0.01	0.003	0.021	0.011	0	0	0	0.039	0.002	0	0.009	0	0	0.031	0.042	0.003	0.021	0.011
Drunella flavilinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0.006	0
Drunella grandis group	0.007	0	0	0.005	0.003	0	0	0.003	0	0	0.003	0	0	0.001	0.001	0	0	0	0.019	0	0.003
Drunella sp.	0	0	0	0	0	0	0.003	0	0.004	0	0.003	0	0	0	0	0	0	0	0	0.003	0
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	0	0	0	0	0.014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	0.158	0.305	0.066	0.174	0.41	0.142	0.512	0.369	0.004	0.005	0.152	0.024	0.122	0.154	0.405	0.002	0.331	0.332	0.271	0.153	0.269
Cinygmula sp.	0	0.001	0	0	0	0	0.003	0	0	0	0	0	0	0	0.001	0	0	0.003	0	0	0
Epeorus	0	0.004	0	0.005	0.003	0	0.008	0.011	0	0	0.039	0.002	0	0.001	0.01	0	0.006	0.003	0	0.006	0.011
Rhithrogena	0.005	0.004	0	0	0.011	0.03	0.014	0	0	0.003	0	0.01	0	0	0.001	0	0.008	0.003	0	0	0
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	0	0.002	0	0.003	0.006	0	0.003	0	0.014	0	0	0	0.001	0.003	0.002	0	0.003	0	0	0.003
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	0.002	0	0	0.015	0	0	0	0	0.005	0	0	0	0	0	0.006	0	0	0	0
Suwallia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweltsa sp.	0.005	0.002	0.008	0	0	0.076	0.011	0.008	0.027	0	0.018	0.021	0	0.017	0.003	0	0.022	0.05	0.006	0.006	0.02
| Family: Leuctridae	0	0.002	0	0	0	0	0	0	0.002	0	0.005	0.005	0	0	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	0.003	0	0	0.002	0	0	0	0	0	0	0	0.003	0	0	0	0
Amphinemura sp.	0	0	0	0	0	0	0	0	0.011	0	0	0	0.002	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.006	0	0	0	0
Zapada	0.162	0.101	0.116	0.041	0.006	0.015	0.033	0.011	0.006	0	0.057	0.105	0.008	0.121	0.013	0.076	0.095	0.149	0.026	0.077	0.063
Zapada cinctipes	0.011	0	0	0.003	0.017	0.052	0	0.027	0.006	0.08	0.008	0.017	0.002	0.001	0.001	0	0	0	0.029	0	0
Zapada columbiana	0	0	0	0	0.009	0	0	0	0	0.014	0.018	0.014	0.028	0.014	0.006	0.002	0.017	0.016	0	0.006	0.003
Zapada oregonensis group	0.011	0	0.006	0.039	0.003	0.003	0.003	0	0	0	0.018	0.019	0.057	0.022	0.004	0.024	0.031	0.005	0.039	0.05	0.052
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0.003	0
Yoraperla sp.	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0.014	0	0	0	0.003	0	0	0
| Family: Perlidae	0	0.001	0	0.003	0.003	0.052	0.003	0	0	0	0	0.002	0	0	0	0	0	0	0.003	0	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0	0	0	0	0	0.009	0	0	0	0	0	0	0	0	0	0	0	0	0.006	0	0
| Family: Perlodidae	0.075	0.034	0.205	0.22	0.037	0	0.036	0.027	0	0.026	0.044	0.036	0.014	0.018	0.003	0.002	0.008	0.01	0.062	0.015	0.017
Isoperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	0.007	0.007	0.014	0.013	0.003	0	0.014	0.014	0	0.003	0.013	0	0	0.006	0.001	0	0.006	0.003	0.003	0.009	0.011
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	0.087	0.011	0.308	0.005	0.003	0.26	0.055	0.022	0	0.087	0.047	0.036	0.002	0.153	0.043	0	0.048	0.037	0.006	0.115	0.057
| Order: Trichoptera	0	0	0	0	0	0	0	0	0.023	0	0	0	0	0	0	0	0	0	0	0	0.003
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0.041	0.003	0	0	0	0	0	0.014
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0.002	0.001	0	0.003	0	0.018	0	0.003	0	0	0.003	0.002	0.006	0	0.001	0	0	0	0	0.003	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0	0	0.023	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	FODGH	FODHE	FODPO	FOUEW	FOUKI	FOUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL
Glossosoma	0.027	0	0.116	0.088	0.003	0	0	0	0	0.005	0.005	0.005	0	0.015	0	0	0.017	0.005	0	0.254	0.006
| Family: Hydropsychidae	0.004	0.001	0	0.003	0	0	0	0.011	0.002	0	0.026	0.002	0	0.013	0.003	0.012	0.02	0.003	0	0.009	0.066
Arctopsyche sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche sp.	0.002	0.001	0	0	0.003	0	0	0	0	0	0.013	0.002	0.008	0.004	0.001	0	0.003	0.013	0.01	0.003	0.017
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	0	0.013	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.004	0.001	0.006	0.003	0.009	0.006	0	0.005	0.002	0	0	0	0	0.001	0	0.014	0	0	0	0	0.017
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0.009	0	0.029	0.026	0	0.012	0.017	0	0.017	0.003	0.052	0.057	0.026	0.031	0.001	0.018	0.011	0.005	0.013	0.012	0.006
Rhyacophila brunnea/vemna group	0.024	0	0.006	0.005	0	0	0.003	0	0.015	0	0.003	0.01	0.006	0.003	0	0	0	0	0.042	0.006	0
Rhyacophila betteni group	0	0	0	0	0	0	0.003	0	0	0	0.003	0	0.002	0	0	0	0	0	0	0	0.006
Rhyacophila hyalinata group	0	0	0	0	0.003	0	0.003	0	0	0	0.005	0.005	0.006	0.003	0	0.004	0	0	0	0.003	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0.003	0.003
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.032	0
Neothremma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0.003	0	0	0	0.085	0.114	0.047	0	0	0	0.078	0.013	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0.002	0	0.002	0.005	0	0	0	0	0	0	0.003	0.005	0.002	0.012	0	0	0	0	0.003	0	0
Heterlimnius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.006	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	0.005	0	0.002	0.01	0.003	0.003	0	0	0.004	0	0.008	0.024	0.006	0.008	0	0	0	0	0	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0.002	0.004	0	0.009	0	0.017	0.003	0.002	0	0	0	0	0	0	0.002	0	0	0	0	0.003
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	0.027	0.03	0.019	0.047	0.026	0.018	0.006	0.022	0.019	0.083	0	0.012	0.043	0.013	0.023	0.35	0.017	0.034	0.032	0.027	0.052
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0
Polypedilum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	0.015	0.094	0.006	0.003	0.006	0.012	0.006	0.011	0.163	0.012	0	0.002	0	0.001	0.065	0.034	0.008	0.013	0.01	0	0
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0.008	0	0.118	0.003	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0.019	0	0	0	0	0	0	0.059	0.005	0	0	0	0	0	0	0	0	0	0	0
Sublettea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	FODGH	FODHE	FODPO	FOUEW	FOUKI	FOUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL
Diamesa	0	0	0	0	0	0	0	0	0	0.009	0	0	0	0	0.003	0.024	0	0	0	0	0
Pagastia	0.033	0.009	0.01	0.018	0.009	0	0.003	0.005	0	0.014	0	0	0.012	0.006	0.016	0.08	0.003	0	0.097	0.003	0.009
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	0	0	0	0	0	0	0	0	0	0.009	0	0	0.002	0.001	0	0.131	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0.003	0	0	0
Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	0	0.004	0.002	0.013	0	0	0.003	0.005	0.002	0.014	0.003	0.01	0.018	0.008	0.001	0	0	0	0.013	0.012	0.026
Heleniella sp.	0	0	0	0	0	0.003	0	0	0.004	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0.002	0	0	0	0	0	0	0	0	0.017	0	0	0.004	0.009	0	0	0.003	0.005	0.003	0	0.006
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthocladius	0.038	0.053	0.041	0.14	0.014	0.015	0.022	0.016	0.011	0.47	0.028	0.043	0.13	0.023	0.033	0.06	0	0	0.12	0.018	0.072
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0
Parorthocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0.005	0.002	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0.002	0.001	0	0	0	0.003	0	0.005	0	0	0	0.002	0.041	0.008	0.003	0	0.003	0.008	0	0.003	0.034
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0.003	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	0	0.006	0.006	0	0	0.003	0	0.005	0.002	0.021	0.005	0	0.022	0.001	0.006	0	0.003	0.003	0.003	0.003	0.006
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0.019	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0.003	0	0	0	0	0.051	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.002	0.001	0.002	0	0	0	0	0.003	0.015	0.009	0	0	0	0	0	0	0	0	0	0	0
Chelifera/ Metachela	0.005	0	0.002	0.003	0	0.006	0	0	0.002	0.009	0	0	0	0.001	0	0	0.014	0.003	0.006	0.009	0
Clinocera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
Wiedemannia sp.	0	0	0	0	0	0.021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0.07	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0.006	0	0.003	0.006	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	0.044	0.002	0.002	0.01	0.138	0.048	0.006	0.033	0.083	0.037	0.049	0.133	0	0.04	0.001	0.01	0.017	0	0.023	0	0.009
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0.004	0	0	0.003	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0
Simulium	0	0	0	0	0	0.003	0	0	0.085	0.009	0	0	0	0	0.003	0	0	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0.002	0	0	0	0	0	0	0	0.008	0.005	0.003	0	0	0.004	0	0.004	0	0	0	0.003	0
Antocha sp.	0	0	0	0	0.003	0	0	0.003	0	0	0	0	0.01	0	0	0	0	0	0.003	0	0
Dicranota	0.009	0	0.002	0.003	0.003	0	0.008	0.003	0.002	0.021	0.003	0.002	0	0.006	0	0	0.003	0.003	0	0	0.003
Hesperoconopa sp.	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	0	0	0	0.015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed																				
	FODGH	FODHE	FODPO	FOUEW	FOUKI	FOUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0.003	0	0.003	0	0	0.002	0	0	0	0	0.001	0	0.002	0	0	0	0	0.003
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	0	0.009	0	0.003	0	0.004	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0.015	0	0.002	0.028	0.009	0.009	0	0.011	0.013	0.003	0.003	0.002	0	0.005	0.004	0.052	0.003	0.003	0.013	0.006	0.011
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	0.004	0	0	0.005	0	0	0	0.003	0	0.003	0.003	0	0	0.001	0.003	0.006	0	0.003	0.006	0.012	0.017
Sperchonopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	0	0	0	0.006	0	0	0	0	0	0.002	0	0	0	0	0	0	0.003	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0.003	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0.051	0	0	0	0.002	0	0	0	0	0	0.01	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0.002	0	0	0	0.006	0	0	0	0	0	0	0	0	0	0	0.002	0.008	0	0	0.006	0
Rhynchelmis sp.	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0.003	0	0	0	0	0	0.021	0.003
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0.007	0.001	0	0	0.023	0	0	0.008	0.034	0	0	0	0	0	0	0	0	0	0	0.003	0
Fridericia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0	0	0.002	0	0	0	0.079	0	0	0.012	0	0	0	0	0
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0.123	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed														
	LILC3	MI2	MI3	MI5	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	0	0.011	0	0	0.001	0	0.003	0.009	0	0	0	0	0	0	0
| Family: Baetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acentrella sp.	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis	0.007	0.044	0.047	0.031	0.012	0.015	0.041	0.043	0.087	0.172	0	0.005	0	0.005	0
Baetis bicaudatus	0	0	0	0	0.001	0	0.005	0.003	0	0.002	0	0	0	0	0
Baetis tricaudatus group	0.008	0.019	0.034	0.003	0.004	0.002	0.013	0.043	0.087	0	0	0	0	0.005	0
| Family: Ephemerellidae	0.008	0.03	0.057	0.045	0.11	0.105	0.24	0.04	0.054	0	0.008	0.001	0	0	0
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	0.01	0.03	0.018	0.067	0.055	0.052	0.095	0	0.003	0	0	0	0	0	0.003
Drunella flavilinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella grandis group	0	0	0	0	0.001	0.018	0.01	0.006	0.003	0	0	0	0	0	0
Drunella sp.	0	0	0	0	0.004	0	0.003	0	0.003	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	0	0	0.003	0.006	0.01	0	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	0.051	0.161	0.185	0.138	0.212	0.031	0.113	0.369	0.515	0.109	0	0.003	0	0	0
Cinygmula sp.	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0
Epeorus	0	0	0.003	0	0.006	0.002	0	0	0.01	0	0	0	0	0	0
Rhithrogena	0	0.003	0.029	0.008	0.011	0	0.008	0	0.005	0	0	0	0	0	0
| Family: Leptophlebiidae	0	0	0.003	0.003	0	0	0	0	0	0	0.013	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0
| Family: Capniidae	0	0.011	0	0.011	0	0.005	0	0.009	0.005	0.002	0	0.001	0.014	0	0.125
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0.009	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweltsa sp.	0.011	0.044	0.01	0.017	0.01	0.013	0.015	0.003	0.01	0.014	0.003	0	0	0.003	0.003
| Family: Leuctridae	0	0	0.003	0	0	0	0	0.003	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0.003	0	0	0	0	0	0	0.006	0	0	0	0.003	0.016
Amphinemura sp.	0	0	0	0	0	0	0	0	0	0	0.005	0	0.048	0.008	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zapada	0.012	0.098	0	0.008	0.043	0.079	0.02	0.064	0.031	0.053	0.081	0.094	0.163	0	0.026
Zapada cinctipes	0	0.016	0.031	0	0.006	0.065	0.003	0.009	0.003	0.17	0	0.015	0	0.063	0.174
Zapada columbiana	0.002	0	0	0	0	0	0	0.003	0	0.004	0.039	0.001	0	0.003	0
Zapada oregonensis group	0.029	0.008	0	0.003	0	0.003	0	0	0	0	0	0.001	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
Yoraperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0.001	0.003	0	0.003	0	0.002	0	0.003	0.003	0	0	0	0	0	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0	0.005	0.003	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	0.015	0	0.01	0.008	0.022	0.01	0.026	0.024	0.036	0.018	0.005	0.012	0.009	0	0.003
Isoperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	0.019	0	0	0	0.001	0	0.003	0.012	0.003	0.002	0	0	0	0	0
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	0.004	0.117	0.029	0.017	0.079	0.024	0.054	0.009	0.031	0	0.003	0	0	0	0.003
| Order: Trichoptera	0.002	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0.044	0.117	0.371	0.113	0.055	0.033	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0.014	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0.021	0.008	0	0	0	0	0	0	0	0.002	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed														
	LILC3	MI2	MI3	MI5	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
Glossosoma	0	0.044	0.18	0.112	0.015	0.005	0.01	0	0	0	0	0	0	0.003	0
| Family: Hydropsychidae	0.099	0.008	0.008	0	0	0	0.003	0	0	0	0.052	0	0	0.011	0.003
Arctopsyche sp.	0	0.005	0.005	0	0	0	0	0	0	0	0	0	0	0	0
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0.106	0	0	0	0.003
Hydropsyche	0	0.008	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche sp.	0.043	0	0	0	0	0.003	0.003	0.006	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.003	0.003	0	0	0	0.002	0	0.012	0.003	0	0.008	0.023	0.032	0.053	0.016
Clostoeca disjuncta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperophylax sp.	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0.003	0.003	0	0.003	0.003	0.013	0.013	0.018	0.041	0.031	0.005	0.016	0.002	0.011	0
Rhyacophila brunnea/vemna group	0	0.003	0	0	0.001	0.005	0.003	0.006	0.008	0.002	0.01	0.014	0.007	0	0.003
Rhyacophila betteni group	0	0	0	0	0	0	0	0	0	0.004	0	0	0	0.003	0
Rhyacophila hyalinata group	0.002	0	0	0	0	0.003	0.003	0.003	0.003	0.004	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0.001	0	0.005	0	0	0	0	0	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0
| Family: Elmidae	0	0	0	0	0.001	0.01	0	0	0	0	0	0	0.014	0.03	0
Heterlimnius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	0	0.003	0.01	0.037	0.01	0.016	0.041	0.003	0	0	0	0.005	0.005	0.144	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0.005	0	0.002	0	0.006
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0.001	0.008	0.005	0.003	0	0	0	0	0	0.003	0
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0
Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	0.15	0.041	0.05	0.011	0.004	0.037	0.008	0.027	0.008	0.002	0.005	0.025	0.028	0.028	0.013
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0
Phaenopsectra	0	0.005	0	0	0	0	0	0	0	0	0.005	0	0	0	0
Polypedilum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	0	0.049	0.021	0.02	0.001	0.003	0.003	0.009	0.003	0.059	0.005	0.233	0.133	0.019	0.01
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0.003	0	0.002	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	0	0	0	0	0	0.033	0.008	0	0	0	0
Sublettea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed														
	LILC3	MI2	MI3	MI5	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
Diamesa	0.003	0	0	0	0.004	0.015	0	0	0	0.018	0	0	0	0	0.109
Pagastia	0.015	0.003	0	0	0.001	0.003	0.003	0.043	0.005	0.002	0.003	0.033	0.005	0	0.032
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	0	0	0	0	0.001	0	0	0	0	0.012	0.003	0	0.016	0	0.029
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	0.001	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0.006
Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0.013	0	0	0	0	0	0	0	0
Eukiefferiella	0.063	0.011	0.003	0	0.001	0.023	0.003	0.018	0.003	0.02	0	0.042	0.014	0.003	0.029
Heleniella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group.	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0
Hydrobaenus	0.003	0	0	0	0	0	0	0.003	0	0	0	0	0.014	0.003	0.006
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0
Orthocladius	0.187	0.049	0.003	0	0	0.105	0.008	0.128	0.003	0.045	0	0.363	0.046	0	0.071
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003
Parorthocladius sp.	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0.155	0.019	0.021	0.017	0.003	0	0	0.003	0	0	0	0	0	0	0
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0.005	0	0	0	0	0	0	0	0	0.008	0.006	0.308	0.019	0.006
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	0.035	0.016	0	0	0.006	0.018	0	0.003	0	0.133	0	0.02	0.037	0	0.016
| Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0.003	0	0	0.006	0.096	0	0.002	0.005	0
| Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.002	0	0	0	0	0	0	0	0	0.002	0.003	0.002	0	0.011	0.023
Chelifera/ Metachela	0	0.003	0	0	0	0	0	0.003	0	0.002	0	0.005	0.002	0	0.003
Clinocera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemerodromia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	0	0	0	0	0	0	0	0	0.005	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	0	0.022	0.063	0.039	0.23	0.228	0.176	0.027	0.013	0.012	0.005	0.006	0.044	0.003	0.042
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Simuliidae	0.003	0.008	0	0.003	0	0	0	0	0	0	0	0	0	0.003	0
Simulium	0.006	0.005	0	0	0	0	0	0	0.005	0.037	0.028	0.003	0.007	0.456	0.077
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0.01
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0.013	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	0	0	0.003	0	0.013	0	0	0	0.003
Antocha sp.	0	0	0	0	0	0.002	0	0	0.005	0	0	0	0	0	0
Dicranota	0.001	0	0	0.003	0.004	0.006	0.003	0.009	0.008	0.002	0	0.002	0.023	0.003	0.016
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0.016	0.01	0	0	0	0.003	0	0	0	0	0	0	0	0
Limnophila sp.	0	0	0	0	0.003	0.002	0	0	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.33: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-Exposed (n = 59) Areas based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Mine-exposed														
	LILC3	MI2	MI3	MI5	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0.034	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0.013	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0	0	0.063	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0.002	0	0	0	0	0	0	0	0	0	0.005	0.01	0	0	0.003
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0.002	0	0	0	0	0	0	0	0	0	0	0.028	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0.007	0.005	0.005	0	0.003	0.003	0.005	0.015	0.008	0	0.008	0.001	0	0.003	0.003
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	0.032	0	0	0	0	0	0	0.003	0	0.002	0.008	0.005	0	0	0.077
Sperchonopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0
Torrenticola	0	0.005	0.008	0.003	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	0	0	0	0	0	0	0	0	0.005	0.001	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0.008	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0.005	0.004	0	0	0
Rhynchelmis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	0.001	0	0	0	0	0.004	0	0.005	0.007	0.014	0.019
Fridericia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nais	0	0	0.003	0	0.003	0.005	0	0	0	0.008	0	0.014	0	0	0
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0	0	0.151	0	0	0.069	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Reference										
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	180	0	0	5	10	20	0	60	4	80	17
| Family: Baetidae	60	2,840	260	55	250	220	1,100	280	57	2,820	550
| Family: Ephemerellidae	80	1,800	2,660	85	400	280	480	820	43	1,280	667
| Family: Heptageniidae	4,580	1,560	700	670	530	710	4,960	4,440	157	1,000	150
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	20	0	0	0	0	83
| Family: Capniidae	0	0	0	15	20	10	300	0	0	160	17
| Family: Chloroperlidae	160	200	140	75	130	20	180	80	7	300	50
| Family: Leuctridae	0	0	40	0	0	30	0	20	3	80	33
| Family: Nemouridae	140	240	320	20	170	180	220	860	2	1,000	216
| Family: Peltoperlidae	0	0	0	0	0	0	0	20	0	0	0
| Family: Perlidae	0	0	0	5	30	10	0	0	0	200	67
| Family: Perlodidae	20	280	120	20	60	40	520	1,860	26	120	117
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	1,440	1,160	200	150	40	790	1,640	180	181	240	33
| Order: Trichoptera	0	0	0	0	10	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	35	10	0	20	100	0	0	0
| Family: Glossosomatidae	0	0	1,080	230	90	80	20	20	16	20	83
| Family: Hydropsychidae	40	120	20	10	260	30	40	260	30	80	33
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	120	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	10	0	0	0	0	0
| Family: Limnephilidae	260	60	440	0	0	50	0	60	0	60	0
| Family: Rhyacophilidae	20	720	120	20	70	40	60	220	1	680	550
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	60	40	0	0	0	0	0	0	200	183
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	10	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	60	80	10	0	0	20	0	0	0	17
| Family: Chironomidae	140	1,160	500	35	660	470	1,240	2,740	2	1,100	2,618
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	40	80	0	180	10	0	60	0	0	17
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	40	540	1,900	0	0	0	140	1,000	0	200	150
| Family: Simuliidae	0	40	0	0	0	0	0	60	0	120	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	40	20	15	110	10	80	0	7	60	67
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	5	30	0	0	60	0	0	33
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	33
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	5	30	0	0	0	0	40	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	20	20	40	10	170	0	0	140	0	0	83
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	20	10	110	30	0	0	1	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	5	50	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	20	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	20	120	10	0	0	20	0	0	0	17
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	15	20	0	0	0	0	0	67
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	40	0	4	0	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**7,180**	**10,960**	**8,900**	**1,515**	**3,440**	**3,070**	**11,200**	**13,360**	**541**	**9,840**	**5,951**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Reference										
	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1	KODCR
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	40	0	0	0	40	80	17	13	40	125	78
| Family: Baetidae	1,620	389	460	380	140	1,280	934	951	80	8	101
| Family: Ephemerellidae	560	334	1,380	1,160	960	1,320	850	176	460	16	23
| Family: Heptageniidae	2,980	1,488	1,860	1,200	1,180	3,660	917	1,076	4,500	476	112
| Family: Leptophlebiidae	20	0	0	0	80	0	117	0	0	0	0
| Order: Plecoptera	0	0	0	0	80	0	0	0	0	0	0
| Family: Capniidae	120	11	0	20	0	0	0	13	20	48	28
| Family: Chloroperlidae	60	155	220	540	160	320	67	76	40	5	21
| Family: Leuctridae	0	11	0	0	0	20	0	26	0	0	0
| Family: Nemouridae	220	78	340	140	480	320	150	476	160	0	2
| Family: Peltoperlidae	0	0	20	0	0	0	0	25	0	0	0
| Family: Perlidae	280	89	0	60	80	0	17	0	0	0	1
| Family: Perlodidae	360	178	80	80	0	700	67	63	40	8	1
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	840	767	280	60	40	120	17	1,188	1,760	0	6
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	60	144	60	220	0	80	167	13	20	0	0
| Family: Glossosomatidae	0	0	160	360	0	20	17	138	0	0	0
| Family: Hydropsychidae	20	56	100	200	0	20	0	38	60	5	16
| Family: Hydroptilidae	0	0	0	0	40	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	340	0	0	100	0	50	0	3	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	100	0	0	0	780	0	67	0	0	0	0
| Family: Rhyacophilidae	140	11	0	80	40	0	67	351	20	3	5
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	20	60	0	134	13	0	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	180	0	0	0	0	0	3	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	20	0	0	40	160	0	33	0	0	0	1
| Family: Chironomidae	880	122	700	6,460	1,800	1,140	1,582	116	280	104	60
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	20	0	20	180	20	20	0	25	0	5	3
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	300	178	0	140	280	20	67	13	0	0	0
| Family: Simuliidae	20	0	0	0	0	0	17	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	20	0	20	60	0	140	117	0	20	6	2
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	20	0	0	0	20	0	0	0	0	0	1
| Family: Aturidae	0	0	0	0	20	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	13	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	17	0	0	15	0
| Family: Lebertiidae	0	33	20	40	20	20	0	0	0	3	0
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	20	17	25	0	10	0
| Family: Stygothrombiidae	0	0	0	0	20	0	0	0	0	0	0
| Family: Torrenticolidae	40	0	0	60	20	0	34	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	13	0	0	1
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	3
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	800	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	260	0	0	0	0	0	3	1
| Family: Tubificidae	0	0	0	0	0	0	17	0	0	0	0
Total Individuals	**8,740**	**4,044**	**6,060**	**12,740**	**6,520**	**9,400**	**5,506**	**4,891**	**7,500**	**846**	**466**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Reference										
	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	46	144	0	164	0	80	50	0	18	8	5
| Family: Baetidae	76	137	280	0	1,460	520	206	386	282	70	69
| Family: Ephemerellidae	37	68	120	73	680	1,660	157	672	781	131	59
| Family: Heptageniidae	88	338	940	1,664	680	1,100	306	2,899	209	78	86
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	100	1	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	55	19	180	55	60	80	6	57	0	3	4
| Family: Chloroperlidae	24	44	120	300	160	300	125	743	82	17	14
| Family: Leuctridae	0	6	0	9	0	40	0	14	0	0	0
| Family: Nemouridae	5	38	1,620	218	820	380	56	58	18	42	8
| Family: Peltoperlidae	0	0	100	0	20	0	0	0	0	0	0
| Family: Perlidae	5	38	0	0	0	20	25	186	54	0	1
| Family: Perlodidae	15	19	140	45	120	400	12	72	227	100	24
| Family: Pteronarcyidae	2	6	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	12	0	20	127	800	1,040	13	343	9	46	118
| Order: Trichoptera	0	0	0	0	0	20	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	6	360	0	140	40	325	57	0	2	0
| Family: Hydropsychidae	32	0	200	27	220	120	32	157	1,100	13	17
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	820	73	0	0	0	0	36	1	0
| Family: Rhyacophilidae	1	0	200	18	160	160	13	85	18	4	5
| Family: Uenoidae	0	0	1,160	18	5,720	20	19	0	0	2	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	6	20	0	60	0	6	14	0	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	1
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	14	0	0	0
| Family: Chironomidae	78	413	420	118	320	1,020	457	229	362	21	22
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	1	94	20	0	0	20	6	14	0	1	1
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	20	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	25	0	0	160	20	0	0	0	0	0
| Family: Simuliidae	1	6	0	0	0	0	0	0	55	1	15
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	6	0	20	54	20	60	44	72	45	12	12
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	9	0	0
| Family: Aturidae	0	6	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	9	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	31	0	18	0	0	25	14	9	1	1
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	4	0	0	9	0	40	6	0	82	3	9
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	6	0	0	20	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	1	813	0	18	0	0	13	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	13	0	0	0	0	75	0	18	0	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**489**	**2,276**	**6,760**	**3,008**	**11,620**	**7,140**	**1,977**	**6,086**	**3,523**	**557**	**471**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Reference							Mine-exposed			
	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK	CORCK	EL19
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	50	217	107	12	80	0	8	0	0	0	0
| Family: Baetidae	160	83	5	96	940	443	101	0	0	0	380
| Family: Ephemerellidae	370	767	48	36	540	671	89	0	0	0	130
| Family: Heptageniidae	1,200	2,817	344	110	1,820	858	158	0	0	0	440
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	13	0	0
| Family: Capniidae	20	0	46	24	0	0	0	0	13	20	0
| Family: Chloroperlidae	260	200	10	0	240	57	21	0	0	40	30
| Family: Leuctridae	20	17	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	110	501	1	41	1,140	71	10	320	0	2,420	30
| Family: Peltoperlidae	0	67	0	0	0	0	0	0	0	0	0
| Family: Perlidae	30	0	0	0	220	0	0	0	0	0	630
| Family: Perlodidae	20	267	27	38	300	71	10	0	0	100	40
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	60	267	7	57	360	157	13	160	0	20	60
| Order: Trichoptera	0	0	0	0	0	0	0	0	13	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	20	0	40	50
| Family: Glossosomatidae	10	0	0	19	20	1,200	310	0	0	0	20
| Family: Hydropsychidae	10	484	0	45	0	142	0	0	0	0	30
| Family: Hydroptilidae	0	0	0	0	0	0	0	100	0	1,200	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	120	217	0	2	20	86	3	20	425	100	10
| Family: Rhyacophilidae	50	200	0	7	180	29	5	0	0	1,020	90
| Family: Uenoidae	10	33	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	1	0	0	0	0	0	0	0	0
| Family: Elmidae	120	0	2	0	480	14	8	0	0	420	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	17	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	20
| Family: Blephariceridae	0	0	1	5	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	1	0	0	0	0	0	0	40	0
| Family: Chironomidae	350	151	87	212	1,820	986	22	3,140	3,051	7,160	1,080
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	20	183	2	2	0	0	0	0	38	80	40
| Family: Muscidae	0	0	1	0	0	14	0	40	100	40	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	100	0	1	0	220	14	3	20	51	15,480	30
| Family: Simuliidae	0	0	0	0	0	0	0	2,900	13	20	10
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	40	0	8	0	100	14	3	40	25	60	10
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	5	0	0	0	0	0	60	0
| Family: Aturidae	0	0	1	0	0	0	0	0	0	100	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	20	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	10	0	3	0	20	29	8	0	0	140	20
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	10	17	1	40	20	0	0	0	0	0	20
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	40	0	0	0	0	0	0	0	0	0	50
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	1	0	0	0	0	20	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	5	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	10	0	0	5	0	0	0	1,180	275	560	20
| Family: Lumbricidae	0	0	0	0	0	0	0	160	13	0	0
| Family: Naididae	10	0	0	0	0	0	0	20	0	40	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**3,210**	**6,505**	**705**	**756**	**8,520**	**4,856**	**777**	**8,140**	**4,030**	**29,180**	**3,240**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	EL1	EL20	ELDEL	ELDFE	ELDGR	ELELKO	ELH93	ELUEL	ELUFE	ELUFO	ELUSP
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	80	12	20	36	83	40	20	0
| Family: Baetidae	480	533	440	320	124	860	29	633	240	280	700
| Family: Ephemerellidae	2,440	984	880	10,060	148	460	122	551	5,120	1,000	400
| Family: Heptageniidae	1,220	1,884	3,380	460	544	3,880	200	1,567	560	180	1,680
| Family: Leptophlebiidae	20	0	0	280	0	40	14	0	20	40	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	0	40	20	4	20	14	17	0	0	0
| Family: Chloroperlidae	140	133	380	60	116	340	0	133	0	0	220
| Family: Leuctridae	0	0	0	0	4	0	0	0	0	0	0
| Family: Nemouridae	40	50	140	60	12	60	7	34	20	440	0
| Family: Peltoperlidae	0	0	40	0	0	0	0	0	0	0	0
| Family: Perlidae	140	100	320	200	52	0	0	333	220	920	500
| Family: Perlodidae	360	217	160	740	40	220	79	200	340	400	240
| Family: Pteronarcyidae	100	33	20	0	0	440	0	17	0	60	60
| Family: Taeniopterygidae	140	984	620	0	40	120	7	317	0	0	100
| Order: Trichoptera	0	0	0	0	0	20	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	17	0	0	0
| Family: Brachycentridae	20	383	20	0	0	0	0	183	40	140	80
| Family: Glossosomatidae	80	233	120	0	20	0	0	83	0	80	360
| Family: Hydropsychidae	160	133	80	100	4	640	79	0	40	0	40
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	160	0	120	43	0	20	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	60	17	60	0	12	0	0	0	0	0	0
| Family: Rhyacophilidae	20	34	0	0	12	0	0	67	0	20	40
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	20	0	0	0	0	0	20	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	20	0	0	120	8	0	0	0	160	60	80
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	20	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	2,100	333	660	3,140	84	320	1,557	450	2,540	4,380	1,540
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	60	17	60	60	8	0	0	50	160	200	100
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	100	220	0	8	0	0	300	20	40	40
| Family: Simuliidae	0	33	0	0	4	280	0	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	20	0	40	80	12	40	0	0	40	40	60
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	20	0	0	0	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	40	0	20	480	12	0	7	50	760	60	140
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	20	0	0	40	4	0	0	0	160	60	60
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	60	4	0	0	0	40	220	20
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	40	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	20	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	17	0	0	0	0	0	17	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	600	0	0	0	33	0	80	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	664	0	460	240	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**7,720**	**6,218**	**7,740**	**17,160**	**1,288**	**7,880**	**2,858**	**5,135**	**11,000**	**8,980**	**6,460**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODPO
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	30	100	20	0	0	45	0	80	0
| Family: Baetidae	20	160	270	1,020	420	163	801	391	600	1,340	0
| Family: Ephemerellidae	260	1,580	250	960	140	138	126	127	1,480	3,700	140
| Family: Heptageniidae	580	1,060	240	980	2,080	388	1,038	609	1,800	5,340	680
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	160	40	10	0	140	50	13	18	0	0	20
| Family: Chloroperlidae	100	120	80	60	120	0	38	9	60	40	100
| Family: Leuctridae	0	0	0	20	0	0	0	0	0	40	0
| Family: Nemouridae	1,140	1,340	560	980	400	650	75	91	2,020	1,720	1,260
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0	0	460	20	100	88	25	9	0	20	0
| Family: Perlodidae	6,880	7,420	40	280	220	1,350	363	291	900	700	2,260
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	680	520	90	60	580	238	200	91	960	180	3,180
| Order: Trichoptera	20	0	0	0	20	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	90	60	20	38	0	0	20	20	0
| Family: Glossosomatidae	20	800	50	160	160	0	25	36	300	0	1,200
| Family: Hydropsychidae	0	0	10	20	20	38	76	18	60	40	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	80	40	0	20	0	0	13	9	40	20	60
| Family: Rhyacophilidae	400	720	290	100	400	164	76	81	360	0	360
| Family: Uenoidae	0	40	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	10	0	0	0	0	0	0	0	0
| Family: Elmidae	0	2,500	20	140	0	0	0	0	80	0	40
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	20	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	40	0	0	0	25	13	9	0	40	40
| Family: Chironomidae	2,960	3,880	790	2,580	280	652	202	108	1,280	3,680	860
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	60	100	120	80	0	50	0	27	80	20	40
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	100	220	150	380	1,320	100	963	664	480	40	20
| Family: Simuliidae	20	220	10	0	0	38	0	118	0	0	40
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	60	220	70	20	20	13	0	0	120	0	20
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	20	0	0	0	0	0	0	0
| Family: Aturidae	0	20	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	20	0	0
| Family: Lebertiidae	200	20	60	200	220	38	13	36	160	0	20
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	20	0
| Family: Sperchontidae	0	0	10	60	0	13	13	27	40	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	40	20	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	20	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	20	0	0	0	0	13	0	0	20	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	40	60	30	0	0	13	88	109	80	20	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	220	40	0	0	0	20	0	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**13,800**	**21,140**	**3,780**	**8,580**	**6,720**	**4,260**	**4,161**	**2,923**	**10,980**	**17,060**	**10,340**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	FOUEW	FOUKI	FRUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	60	0	60	100	40	0	20	20	20	0
| Family: Baetidae	40	540	263	860	2,200	560	0	580	1,480	1,120	1,400
| Family: Ephemerellidae	580	190	128	600	260	40	9	1,340	740	580	1,780
| Family: Heptageniidae	1,380	1,480	518	3,900	2,780	40	6	1,480	300	1,240	2,420
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	10	18	0	20	0	11	0	0	0	20
| Family: Chloroperlidae	0	0	272	80	60	280	0	180	180	0	260
| Family: Leuctridae	0	0	0	0	0	20	0	40	40	0	0
| Family: Nemouridae	640	120	218	260	280	260	73	780	1,300	980	2,460
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	20	0	280
| Family: Perlidae	20	10	182	20	0	0	0	0	20	0	0
| Family: Perlodidae	1,800	140	0	360	300	0	22	440	300	140	380
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	40	10	782	400	160	0	67	360	300	20	2,380
| Order: Trichoptera	0	0	0	0	0	240	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	640
| Family: Brachycentridae	20	0	55	0	20	240	0	20	20	60	0
| Family: Glossosomatidae	680	10	0	0	0	0	4	80	40	0	240
| Family: Hydropsychidae	20	10	0	0	80	20	0	300	40	80	260
| Family: Hydroptilidae	0	0	0	0	0	140	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	20	30	18	0	40	20	0	0	0	0	20
| Family: Rhyacophilidae	240	10	36	180	0	340	2	480	600	400	560
| Family: Uenoidae	0	0	0	20	0	0	0	660	960	480	40
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	120	10	9	0	0	40	0	80	240	80	300
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	30	0	120	20	20	0	0	0	0	0
| Family: Chironomidae	1,720	200	163	280	520	3,540	506	400	620	3,980	1,140
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	20	0	82	0	20	180	14	0	0	0	20
| Family: Muscidae	0	0	0	0	20	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	20	0	0	0	0	0
| Family: Psychodidae	80	480	145	40	240	880	29	380	1,120	0	620
| Family: Simuliidae	0	0	18	0	0	920	7	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	20	20	45	80	40	120	20	40	20	100	160
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	40	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	40	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	20	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	20	0	9	0	0	20	0	0	0	0	20
| Family: Aturidae	0	0	0	0	0	100	0	20	0	40	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	220	30	27	0	80	140	2	20	20	0	80
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	40	0	0	0	20	0	2	20	0	0	20
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	18	0	0	0	0	0	20	20	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	20	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	540	0	0	0	20	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	20	0	0	0	0	0	20	0	0	40
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	80	0	0	60	360	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	20	0	0	0	800	0
| Family: Tubificidae	0	0	0	0	0	1,300	0	0	0	0	0
Total Individuals	**7,720**	**3,490**	**3,006**	**7,260**	**7,320**	**10,560**	**774**	**7,740**	**8,400**	**10,160**	**15,540**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL	LILC3	MI2	MI3	MI5
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	300	0	0	40	7	0	60	0	67	0	0
| Family: Baetidae	220	0	120	200	134	240	420	300	401	620	240
| Family: Ephemerellidae	4,060	1	1,300	1,720	114	110	220	360	366	600	840
| Family: Heptageniidae	5,780	1	2,460	2,600	560	540	1,960	980	1,000	1,660	1,040
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	20	20
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	40	1	0	20	0	0	20	0	67	0	80
| Family: Chloroperlidae	40	0	200	380	13	20	140	220	267	80	120
| Family: Leuctridae	0	0	0	0	0	0	0	0	0	20	0
| Family: Nemouridae	340	51	1,080	1,300	193	450	820	840	750	260	80
| Family: Peltoperlidae	0	0	0	20	0	10	0	0	0	0	0
| Family: Perlidae	0	0	0	0	20	0	0	20	50	20	20
| Family: Perlodidae	60	1	100	100	134	80	200	660	0	80	60
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	600	0	340	280	13	390	400	80	717	240	120
| Order: Trichoptera	0	0	0	0	0	0	20	40	0	0	20
| Family: Apataniidae	40	0	0	0	0	0	100	0	267	900	2,640
| Family: Brachycentridae	20	0	0	0	0	10	0	0	83	0	0
| Family: Glossosomatidae	0	0	120	40	0	860	40	0	267	1,540	860
| Family: Hydropsychidae	60	6	160	120	20	40	580	2,760	133	100	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	7	0	0	0	0	120	60	17	20	0
| Family: Rhyacophilidae	20	11	80	60	114	80	100	100	34	0	20
| Family: Uenoidae	0	0	560	100	0	110	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	20	0	0	0	17	80	260
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	1	0	0	0	0	20	0	0	0	0
| Family: Chironomidae	2,080	338	260	580	575	220	1,420	11,860	1,217	740	360
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0	100	20	13	30	20	40	17	0	0
| Family: Muscidae	0	35	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	40	0	7	20	0	0	0	0	0
| Family: Psychodidae	20	5	120	0	47	0	60	0	133	480	280
| Family: Simuliidae	40	0	0	0	0	0	0	180	83	0	20
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	2	20	20	7	10	20	20	100	80	20
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	1	0	0	0	0	20	40	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	40	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	60	26	20	20	27	20	80	140	33	40	0
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	40	3	0	20	13	40	120	620	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	7	0	0	0	33	60	20
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	7	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	20	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	10	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	1	60	0	0	90	20	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	10	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	6	0	0	0	0	0	0	0	20	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**13,820**	**497**	**7,140**	**7,640**	**2,065**	**3,390**	**6,980**	**19,360**	**6,119**	**7,660**	**7,120**

Table G.34: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	20	0	20	50	0	0	0	0	0	0	0
| Family: Baetidae	260	200	460	483	1,360	1,700	0	120	0	26	0
| Family: Ephemerellidae	2,620	2,160	2,720	250	480	0	11	20	0	0	4
| Family: Heptageniidae	3,320	400	960	2,017	4,160	1,060	0	60	0	0	0
| Family: Leptophlebiidae	0	0	0	0	0	0	18	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	20	0	0	0	0	0
| Family: Capniidae	0	60	0	50	40	20	0	20	143	0	156
| Family: Chloroperlidae	140	220	120	17	80	140	4	0	0	7	4
| Family: Leuctridae	0	0	0	17	0	0	0	0	0	0	0
| Family: Nemouridae	700	1,820	180	417	260	2,280	172	2,460	1,314	187	268
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	4
| Family: Perlidae	0	20	0	17	20	0	0	0	0	0	0
| Family: Perlodidae	340	120	220	200	300	200	7	260	57	0	4
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	1,140	300	420	50	240	0	4	0	0	0	4
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	1,640	680	260	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	220	60	80	0	0	0	0	40	0	7	0
| Family: Hydropsychidae	0	40	40	33	0	0	217	0	0	27	8
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	20	0	67	20	0	11	520	200	127	20
| Family: Rhyacophilidae	80	260	180	150	400	400	21	660	57	34	4
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	14	0	0
| Family: Dytiscidae	0	0	0	0	0	0	7	0	0	0	0
| Family: Elmidae	160	320	320	17	0	0	0	120	114	420	0
| Family: Hydrophilidae	0	0	0	0	0	0	4	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	4
| Order: Diptera	0	0	0	0	0	0	7	0	14	0	8
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	20	100	40	17	0	0	4	0	14	7	0
| Family: Chironomidae	320	2,540	340	1,284	160	3,260	202	16,000	3,744	195	412
| Family: Dixidae	0	0	0	0	0	0	0	20	0	0	0
| Family: Empididae	0	0	0	17	0	40	4	140	14	27	32
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	29	0	0
| Family: Psychodidae	3,340	2,820	1,380	150	100	120	7	140	271	7	52
| Family: Simuliidae	0	0	0	0	40	360	39	60	43	1,107	96
| Family: Stratiomyidae	0	0	0	0	0	0	4	0	0	0	12
| Family: Tabanidae	0	0	0	0	0	0	18	0	0	0	0
| Family: Tipulidae	100	120	40	50	120	20	22	40	143	7	24
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	4	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	46	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	18	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	86	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	7	220	0	0	4
| Family: Aturidae	0	0	0	0	0	0	0	620	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	40	40	40	83	60	0	11	20	0	7	4
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	17	0	20	11	120	0	0	96
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	17	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	7	20	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	179	0	0	20	0
| Class: Gastropoda	0	0	0	0	0	0	7	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	7	80	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	20	0	0	0	0	40	0	100	43	33	24
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	40	60	0	0	0	80	0	300	0	0	0
| Family: Tubificidae	0	0	0	0	0	0	207	0	0	167	0
Total Individuals	**14,520**	**12,360**	**7,820**	**5,470**	**7,840**	**9,760**	**1,373**	**22,160**	**6,214**	**2,412**	**1,244**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Reference										
	AGCK	AL4	ALUSM	BU2	BU40	BUUQ	CADCK	CHCK	CRUKO	DACK	DUCK
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0.025	0	0	0.003	0.003	0.007	0	0.004	0.007	0.008	0.003
| Family: Baetidae	0.008	0.259	0.029	0.036	0.073	0.072	0.098	0.021	0.105	0.287	0.092
| Family: Ephemerellidae	0.011	0.164	0.299	0.056	0.116	0.091	0.043	0.061	0.079	0.13	0.112
| Family: Heptageniidae	0.638	0.142	0.079	0.442	0.154	0.231	0.443	0.332	0.29	0.102	0.025
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0.007	0	0	0	0	0.014
| Family: Capniidae	0	0	0	0.01	0.006	0.003	0.027	0	0	0.016	0.003
| Family: Chloroperlidae	0.022	0.018	0.016	0.05	0.038	0.007	0.016	0.006	0.013	0.03	0.008
| Family: Leuctridae	0	0	0.004	0	0	0.01	0	0.001	0.006	0.008	0.006
| Family: Nemouridae	0.019	0.022	0.036	0.013	0.049	0.059	0.02	0.064	0.004	0.102	0.036
| Family: Peltoperlidae	0	0	0	0	0	0	0	0.001	0	0	0
| Family: Perlidae	0	0	0	0.003	0.009	0.003	0	0	0	0.02	0.011
| Family: Perlodidae	0.003	0.026	0.013	0.013	0.017	0.013	0.046	0.139	0.048	0.012	0.02
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.201	0.106	0.022	0.099	0.012	0.257	0.146	0.013	0.335	0.024	0.006
| Order: Trichoptera	0	0	0	0	0.003	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0.023	0.003	0	0.002	0.007	0	0	0
| Family: Glossosomatidae	0	0	0.121	0.152	0.026	0.026	0.002	0.001	0.03	0.002	0.014
| Family: Hydropsychidae	0.006	0.011	0.002	0.007	0.076	0.01	0.004	0.019	0.055	0.008	0.006
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0.011	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0.003	0	0	0	0	0
| Family: Limnephilidae	0.036	0.005	0.049	0	0	0.016	0	0.004	0	0.006	0
| Family: Rhyacophilidae	0.003	0.066	0.013	0.013	0.02	0.013	0.005	0.016	0.002	0.069	0.092
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0.005	0.004	0	0	0	0	0	0	0.02	0.031
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0.003	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0.005	0.009	0.007	0	0	0.002	0	0	0	0.003
| Family: Chironomidae	0.019	0.106	0.056	0.023	0.192	0.153	0.111	0.205	0.004	0.112	0.44
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0.004	0.009	0	0.052	0.003	0	0.004	0	0	0.003
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0.006	0.049	0.213	0	0	0	0.013	0.075	0	0.02	0.025
| Family: Simuliidae	0	0.004	0	0	0	0	0	0.004	0	0.012	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	0.004	0.002	0.01	0.032	0.003	0.007	0	0.013	0.006	0.011
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0.003	0.009	0	0	0.004	0	0	0.006
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0.006
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0.003	0.009	0	0	0	0	0.004	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0.003	0.002	0.004	0.007	0.049	0	0	0.01	0	0	0.014
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0.002	0.007	0.032	0.01	0	0	0.002	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0.003	0.015	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0.001	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0.002	0.013	0.007	0	0	0.002	0	0	0	0.003
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0.01	0.006	0	0	0	0	0	0.011
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0.004	0	0.007	0	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Reference										
	EL12	ELUGH	EWCK	FLAD	FLAU	FO26	FLRU	GRUHA	HENUP	KO1	KODCR
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0.005	0	0	0	0.006	0.009	0.003	0.003	0.005	0.148	0.167
| Family: Baetidae	0.185	0.096	0.076	0.03	0.021	0.136	0.17	0.194	0.011	0.009	0.217
| Family: Ephemerellidae	0.064	0.083	0.228	0.091	0.147	0.14	0.154	0.036	0.061	0.019	0.049
| Family: Heptageniidae	0.341	0.368	0.307	0.094	0.181	0.389	0.167	0.22	0.6	0.563	0.24
| Family: Leptophlebiidae	0.002	0	0	0	0.012	0	0.021	0	0	0	0
| Order: Plecoptera	0	0	0	0	0.012	0	0	0	0	0	0
| Family: Capniidae	0.014	0.003	0	0.002	0	0	0	0.003	0.003	0.057	0.06
| Family: Chloroperlidae	0.007	0.038	0.036	0.042	0.025	0.034	0.012	0.016	0.005	0.006	0.045
| Family: Leuctridae	0	0.003	0	0	0	0.002	0	0.005	0	0	0
| Family: Nemouridae	0.025	0.019	0.056	0.011	0.074	0.034	0.027	0.097	0.021	0	0.004
| Family: Peltoperlidae	0	0	0.003	0	0	0	0	0.005	0	0	0
| Family: Perlidae	0.032	0.022	0	0.005	0.012	0	0.003	0	0	0	0.002
| Family: Perlodidae	0.041	0.044	0.013	0.006	0	0.074	0.012	0.013	0.005	0.009	0.002
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.096	0.19	0.046	0.005	0.006	0.013	0.003	0.243	0.235	0	0.013
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0.007	0.036	0.01	0.017	0	0.009	0.03	0.003	0.003	0	0
| Family: Glossosomatidae	0	0	0.026	0.028	0	0.002	0.003	0.028	0	0	0
| Family: Hydropsychidae	0.002	0.014	0.017	0.016	0	0.002	0	0.008	0.008	0.006	0.034
| Family: Hydroptilidae	0	0	0	0	0.006	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0.056	0	0	0.011	0	0.01	0	0.004	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.011	0	0	0	0.12	0	0.012	0	0	0	0
| Family: Rhyacophilidae	0.016	0.003	0	0.006	0.006	0	0.012	0.072	0.003	0.004	0.011
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0.002	0.009	0	0.024	0.003	0	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0.014	0	0	0	0	0	0.004	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0.002	0	0	0.003	0.025	0	0.006	0	0	0	0.002
| Family: Chironomidae	0.101	0.03	0.116	0.507	0.276	0.121	0.287	0.024	0.037	0.123	0.129
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.002	0	0.003	0.014	0.003	0.002	0	0.005	0	0.006	0.006
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0.034	0.044	0	0.011	0.043	0.002	0.012	0.003	0	0	0
| Family: Simuliidae	0.002	0	0	0	0	0	0.003	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0.002	0	0.003	0.005	0	0.015	0.021	0	0.003	0.007	0.004
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0.002	0	0	0	0.003	0	0	0	0	0	0.002
| Family: Aturidae	0	0	0	0	0.003	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0.003	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0.003	0	0	0.018	0
| Family: Lebertiidae	0	0.008	0.003	0.003	0.003	0.002	0	0	0	0.004	0
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0.002	0.003	0.005	0	0.012	0
| Family: Stygothrombiidae	0	0	0	0	0.003	0	0	0	0	0	0
| Family: Torrenticolidae	0.005	0	0	0.005	0.003	0	0.006	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0.003	0	0	0.002
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0.006
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0.063	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0.02	0	0	0	0	0	0.004	0.002
| Family: Tubificidae	0	0	0	0	0	0	0.003	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Reference										
	KOUCR	KOUVE	LC_GRCK	LI24	MCCR	MI25	OLDDU	OLDLI	OLDLOW	PADAL	PAUKO
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0.094	0.063	0	0.055	0	0.011	0.025	0	0.005	0.014	0.011
| Family: Baetidae	0.155	0.06	0.041	0	0.126	0.073	0.104	0.063	0.08	0.126	0.146
| Family: Ephemerellidae	0.076	0.03	0.018	0.024	0.059	0.232	0.079	0.11	0.222	0.235	0.125
| Family: Heptageniidae	0.18	0.149	0.139	0.553	0.059	0.154	0.155	0.476	0.059	0.14	0.183
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0.028	0.002	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0.112	0.008	0.027	0.018	0.005	0.011	0.003	0.009	0	0.005	0.008
| Family: Chloroperlidae	0.049	0.019	0.018	0.1	0.014	0.042	0.063	0.122	0.023	0.031	0.03
| Family: Leuctridae	0	0.003	0	0.003	0	0.006	0	0.002	0	0	0
| Family: Nemouridae	0.01	0.017	0.24	0.072	0.071	0.053	0.028	0.01	0.005	0.075	0.017
| Family: Peltoperlidae	0	0	0.015	0	0.002	0	0	0	0	0	0
| Family: Perlidae	0.01	0.017	0	0	0	0.003	0.013	0.031	0.015	0	0.002
| Family: Perlodidae	0.031	0.008	0.021	0.015	0.01	0.056	0.006	0.012	0.064	0.18	0.051
| Family: Pteronarcyidae	0.004	0.003	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.025	0	0.003	0.042	0.069	0.146	0.007	0.056	0.003	0.083	0.251
| Order: Trichoptera	0	0	0	0	0	0.003	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0.003	0.053	0	0.012	0.006	0.164	0.009	0	0.004	0
| Family: Hydropsychidae	0.065	0	0.03	0.009	0.019	0.017	0.016	0.026	0.312	0.023	0.036
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0.121	0.024	0	0	0	0	0.01	0.002	0
| Family: Rhyacophilidae	0.002	0	0.03	0.006	0.014	0.022	0.007	0.014	0.005	0.007	0.011
| Family: Uenoidae	0	0	0.172	0.006	0.492	0.003	0.01	0	0	0.004	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0.003	0.003	0	0.005	0	0.003	0.002	0	0	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0.002
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0.002	0	0	0
| Family: Chironomidae	0.16	0.181	0.062	0.039	0.028	0.143	0.231	0.038	0.103	0.038	0.047
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.002	0.041	0.003	0	0	0.003	0.003	0.002	0	0.002	0.002
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0.003	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0.011	0	0	0.014	0.003	0	0	0	0	0
| Family: Simuliidae	0.002	0.003	0	0	0	0	0	0	0.016	0.002	0.032
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0.012	0	0.003	0.018	0.002	0.008	0.022	0.012	0.013	0.022	0.025
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	0.003	0	0
| Family: Aturidae	0	0.003	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0.003	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0.014	0	0.006	0	0	0.013	0.002	0.003	0.002	0.002
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0.008	0	0	0.003	0	0.006	0.003	0	0.023	0.005	0.019
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0.003	0	0	0.002	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0.002	0.357	0	0.006	0	0	0.007	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0.006	0	0	0	0	0.038	0	0.005	0	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Reference							Mine-exposed			
	RACK	SLINE	VEUKO	VEUP	VICK	WWRL	WWRU	BOCK	CATCK	CORCK	EL19
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0.016	0.033	0.152	0.016	0.009	0	0.01	0	0	0	0
| Family: Baetidae	0.05	0.013	0.007	0.127	0.11	0.091	0.13	0	0	0	0.117
| Family: Ephemerellidae	0.115	0.118	0.068	0.048	0.063	0.138	0.115	0	0	0	0.04
| Family: Heptageniidae	0.374	0.433	0.488	0.146	0.214	0.177	0.203	0	0	0	0.136
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0.003	0	0
| Family: Capniidae	0.006	0	0.065	0.032	0	0	0	0	0.003	0.001	0
| Family: Chloroperlidae	0.081	0.031	0.014	0	0.028	0.012	0.027	0	0	0.001	0.009
| Family: Leuctridae	0.006	0.003	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0.034	0.077	0.001	0.054	0.134	0.015	0.013	0.039	0	0.083	0.009
| Family: Peltoperlidae	0	0.01	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0.009	0	0	0	0.026	0	0	0	0	0	0.194
| Family: Perlodidae	0.006	0.041	0.038	0.05	0.035	0.015	0.013	0	0	0.003	0.012
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.019	0.041	0.01	0.075	0.042	0.032	0.017	0.02	0	0.001	0.019
| Order: Trichoptera	0	0	0	0	0	0	0	0	0.003	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	0.002	0	0.001	0.015
| Family: Glossosomatidae	0.003	0	0	0.025	0.002	0.247	0.399	0	0	0	0.006
| Family: Hydropsychidae	0.003	0.074	0	0.06	0	0.029	0	0	0	0	0.009
| Family: Hydroptilidae	0	0	0	0	0	0	0	0.012	0	0.041	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.037	0.033	0	0.003	0.002	0.018	0.004	0.002	0.105	0.003	0.003
| Family: Rhyacophilidae	0.016	0.031	0	0.009	0.021	0.006	0.006	0	0	0.035	0.028
| Family: Uenoidae	0.003	0.005	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0.001	0	0	0	0	0	0	0	0
| Family: Elmidae	0.037	0	0.003	0	0.056	0.003	0.01	0	0	0.014	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0.003	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0.006
| Family: Blephariceridae	0	0	0.001	0.007	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0.001	0	0	0	0	0	0	0.001	0
| Family: Chironomidae	0.109	0.023	0.123	0.28	0.214	0.203	0.028	0.386	0.757	0.245	0.333
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.006	0.028	0.003	0.003	0	0	0	0	0.009	0.003	0.012
| Family: Muscidae	0	0	0.001	0	0	0.003	0	0.005	0.025	0.001	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0.031	0	0.001	0	0.026	0.003	0.004	0.002	0.013	0.531	0.009
| Family: Simuliidae	0	0	0	0	0	0	0	0.356	0.003	0.001	0.003
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0.012	0	0.011	0	0.012	0.003	0.004	0.005	0.006	0.002	0.003
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0.007	0	0	0	0	0	0.002	0
| Family: Aturidae	0	0	0.001	0	0	0	0	0	0	0.003	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0.001	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0.003	0	0.004	0	0.002	0.006	0.01	0	0	0.005	0.006
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0.003	0.003	0.001	0.053	0.002	0	0	0	0	0	0.006
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0.012	0	0	0	0	0	0	0	0	0	0.015
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0.001	0	0	0	0	0.002	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0.006	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0.003	0	0	0.007	0	0	0	0.145	0.068	0.019	0.006
| Family: Lumbricidae	0	0	0	0	0	0	0	0.02	0.003	0	0
| Family: Naididae	0.003	0	0	0	0	0	0	0.002	0	0.001	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	EL1	EL20	ELDEL	ELDFE	ELDGR	ELELKO	ELH93	ELUEL	ELUFE	ELUFO	ELUSP
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0.005	0.009	0.003	0.013	0.016	0.004	0.002	0
| Family: Baetidae	0.062	0.086	0.057	0.019	0.096	0.109	0.01	0.123	0.022	0.031	0.108
| Family: Ephemerellidae	0.316	0.158	0.114	0.586	0.115	0.058	0.043	0.107	0.465	0.111	0.062
| Family: Heptageniidae	0.158	0.303	0.437	0.027	0.422	0.492	0.07	0.305	0.051	0.02	0.26
| Family: Leptophlebiidae	0.003	0	0	0.016	0	0.005	0.005	0	0.002	0.004	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	0	0.005	0.001	0.003	0.003	0.005	0.003	0	0	0
| Family: Chloroperlidae	0.018	0.021	0.049	0.003	0.09	0.043	0	0.026	0	0	0.034
| Family: Leuctridae	0	0	0	0	0.003	0	0	0	0	0	0
| Family: Nemouridae	0.005	0.008	0.018	0.003	0.009	0.008	0.002	0.007	0.002	0.049	0
| Family: Peltoperlidae	0	0	0.005	0	0	0	0	0	0	0	0
| Family: Perlidae	0.018	0.016	0.041	0.012	0.04	0	0	0.065	0.02	0.102	0.077
| Family: Perlodidae	0.047	0.035	0.021	0.043	0.031	0.028	0.028	0.039	0.031	0.045	0.037
| Family: Pteronarcyidae	0.013	0.005	0.003	0	0	0.056	0	0.003	0	0.007	0.009
| Family: Taeniopterygidae	0.018	0.158	0.08	0	0.031	0.015	0.002	0.062	0	0	0.015
| Order: Trichoptera	0	0	0	0	0	0.003	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0.003	0	0	0
| Family: Brachycentridae	0.003	0.062	0.003	0	0	0	0	0.036	0.004	0.016	0.012
| Family: Glossosomatidae	0.01	0.037	0.016	0	0.016	0	0	0.016	0	0.009	0.056
| Family: Hydropsychidae	0.021	0.021	0.01	0.006	0.003	0.081	0.028	0	0.004	0	0.006
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0.009	0	0.015	0.015	0	0.002	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.008	0.003	0.008	0	0.009	0	0	0	0	0	0
| Family: Rhyacophilidae	0.003	0.005	0	0	0.009	0	0	0.013	0	0.002	0.006
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0.001	0	0	0	0	0	0.002	0
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0.003	0	0	0.007	0.006	0	0	0	0.015	0.007	0.012
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0.003	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	0.272	0.054	0.085	0.183	0.065	0.041	0.545	0.088	0.231	0.488	0.238
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.008	0.003	0.008	0.003	0.006	0	0	0.01	0.015	0.022	0.015
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0.016	0.028	0	0.006	0	0	0.058	0.002	0.004	0.006
| Family: Simuliidae	0	0.005	0	0	0.003	0.036	0	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0.003	0	0.005	0.005	0.009	0.005	0	0	0.004	0.004	0.009
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0.003	0	0	0	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0.005	0	0.003	0.028	0.009	0	0.002	0.01	0.069	0.007	0.022
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0.003	0	0	0.002	0.003	0	0	0	0.015	0.007	0.009
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0.003	0.003	0	0	0	0.004	0.024	0.003
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0.005	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0.001	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0.003	0	0	0	0	0	0.003	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0.035	0	0	0	0.006	0	0.009	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0.232	0	0.042	0.027	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	FO10-SP1	FO22	FO23	FO29	FO9	FOBCP	FOBKS	FOBSC	FODGH	FODHE	FODPO
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0.008	0.012	0.003	0	0	0.015	0	0.005	0
| Family: Baetidae	0.001	0.008	0.071	0.119	0.063	0.038	0.193	0.134	0.055	0.079	0
| Family: Ephemerellidae	0.019	0.075	0.066	0.112	0.021	0.032	0.03	0.043	0.135	0.217	0.014
| Family: Heptageniidae	0.042	0.05	0.063	0.114	0.31	0.091	0.249	0.208	0.164	0.313	0.066
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0.012	0.002	0.003	0	0.021	0.012	0.003	0.006	0	0	0.002
| Family: Chloroperlidae	0.007	0.006	0.021	0.007	0.018	0	0.009	0.003	0.005	0.002	0.01
| Family: Leuctridae	0	0	0	0.002	0	0	0	0	0	0.002	0
| Family: Nemouridae	0.083	0.063	0.148	0.114	0.06	0.153	0.018	0.031	0.184	0.101	0.122
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0	0	0.122	0.002	0.015	0.021	0.006	0.003	0	0.001	0
| Family: Perlodidae	0.499	0.351	0.011	0.033	0.033	0.317	0.087	0.1	0.082	0.041	0.219
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.049	0.025	0.024	0.007	0.086	0.056	0.048	0.031	0.087	0.011	0.308
| Order: Trichoptera	0.001	0	0	0	0.003	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0.024	0.007	0.003	0.009	0	0	0.002	0.001	0
| Family: Glossosomatidae	0.001	0.038	0.013	0.019	0.024	0	0.006	0.012	0.027	0	0.116
| Family: Hydropsychidae	0	0	0.003	0.002	0.003	0.009	0.018	0.006	0.005	0.002	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.006	0.002	0	0.002	0	0	0.003	0.003	0.004	0.001	0.006
| Family: Rhyacophilidae	0.029	0.034	0.077	0.012	0.06	0.038	0.018	0.028	0.033	0	0.035
| Family: Uenoidae	0	0.002	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0.003	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0.118	0.005	0.016	0	0	0	0	0.007	0	0.004
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0.001	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0.002	0	0	0	0.006	0.003	0.003	0	0.002	0.004
| Family: Chironomidae	0.214	0.184	0.209	0.301	0.042	0.153	0.049	0.037	0.117	0.216	0.083
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.004	0.005	0.032	0.009	0	0.012	0	0.009	0.007	0.001	0.004
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0.007	0.01	0.04	0.044	0.196	0.023	0.231	0.227	0.044	0.002	0.002
| Family: Simuliidae	0.001	0.01	0.003	0	0	0.009	0	0.04	0	0	0.004
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0.004	0.01	0.019	0.002	0.003	0.003	0	0	0.011	0	0.002
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0.002	0	0	0	0	0	0	0
| Family: Aturidae	0	0.001	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0.002	0	0
| Family: Lebertiidae	0.014	0.001	0.016	0.023	0.033	0.009	0.003	0.012	0.015	0	0.002
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0.001	0
| Family: Sperchontidae	0	0	0.003	0.007	0	0.003	0.003	0.009	0.004	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0.011	0.002	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0.002	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0.001	0	0	0	0	0.003	0	0	0.002	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0.003	0.003	0.008	0	0	0.003	0.021	0.037	0.007	0.001	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0.026	0.006	0	0	0	0.002	0	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	FOUEW	FOUKI	FRUL	FOUNGD	FOUSH	GHCKD	GHCKU	GRCK	GRDS	HACKDS	HACKUS
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0.017	0	0.008	0.014	0.004	0	0.003	0.002	0.002	0
| Family: Baetidae	0.005	0.155	0.087	0.118	0.301	0.053	0	0.075	0.176	0.11	0.09
| Family: Ephemerellidae	0.075	0.054	0.043	0.083	0.036	0.004	0.012	0.173	0.088	0.057	0.115
| Family: Heptageniidae	0.179	0.424	0.172	0.537	0.38	0.004	0.008	0.191	0.036	0.122	0.156
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	0.003	0.006	0	0.003	0	0.014	0	0	0	0.001
| Family: Chloroperlidae	0	0	0.09	0.011	0.008	0.027	0	0.023	0.021	0	0.017
| Family: Leuctridae	0	0	0	0	0	0.002	0	0.005	0.005	0	0
| Family: Nemouridae	0.083	0.034	0.073	0.036	0.038	0.025	0.094	0.101	0.155	0.096	0.158
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0.002	0	0.018
| Family: Perlidae	0.003	0.003	0.061	0.003	0	0	0	0	0.002	0	0
| Family: Perlodidae	0.233	0.04	0	0.05	0.041	0	0.028	0.057	0.036	0.014	0.024
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.005	0.003	0.26	0.055	0.022	0	0.087	0.047	0.036	0.002	0.153
| Order: Trichoptera	0	0	0	0	0	0.023	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0.041
| Family: Brachycentridae	0.003	0	0.018	0	0.003	0.023	0	0.003	0.002	0.006	0
| Family: Glossosomatidae	0.088	0.003	0	0	0	0	0.005	0.01	0.005	0	0.015
| Family: Hydropsychidae	0.003	0.003	0	0	0.011	0.002	0	0.039	0.005	0.008	0.017
| Family: Hydroptilidae	0	0	0	0	0	0.013	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.003	0.009	0.006	0	0.005	0.002	0	0	0	0	0.001
| Family: Rhyacophilidae	0.031	0.003	0.012	0.025	0	0.032	0.003	0.062	0.071	0.039	0.036
| Family: Uenoidae	0	0	0	0.003	0	0	0	0.085	0.114	0.047	0.003
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0.016	0.003	0.003	0	0	0.004	0	0.01	0.029	0.008	0.019
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0.009	0	0.017	0.003	0.002	0	0	0	0	0
| Family: Chironomidae	0.223	0.057	0.054	0.039	0.071	0.335	0.654	0.052	0.074	0.392	0.073
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.003	0	0.027	0	0.003	0.017	0.018	0	0	0	0.001
| Family: Muscidae	0	0	0	0	0.003	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0.002	0	0	0	0	0
| Family: Psychodidae	0.01	0.138	0.048	0.006	0.033	0.083	0.037	0.049	0.133	0	0.04
| Family: Simuliidae	0	0	0.006	0	0	0.087	0.009	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0.003	0.006	0.015	0.011	0.005	0.011	0.026	0.005	0.002	0.01	0.01
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0.004	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0.004	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0.002	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0.003	0	0.003	0	0	0.002	0	0	0	0	0.001
| Family: Aturidae	0	0	0	0	0	0.009	0	0.003	0	0.004	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0.028	0.009	0.009	0	0.011	0.013	0.003	0.003	0.002	0	0.005
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0.005	0	0	0	0.003	0	0.003	0.003	0	0	0.001
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0.006	0	0	0	0	0	0.002	0.002	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0.002	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0.051	0	0	0	0.002	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0.006	0	0	0	0	0	0.003	0	0	0.003
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0.023	0	0	0.008	0.034	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0.002	0	0	0	0.079	0
| Family: Tubificidae	0	0	0	0	0	0.123	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	HENFO	KICK	LC_DC1	LC_DCDS	LC_FRUS	LI8	LIDSL	LILC3	MI2	MI3	MI5
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0.022	0	0	0.005	0.003	0	0.009	0	0.011	0	0
| Family: Baetidae	0.016	0	0.017	0.026	0.065	0.071	0.06	0.015	0.066	0.081	0.034
| Family: Ephemerellidae	0.294	0.002	0.182	0.225	0.055	0.032	0.032	0.019	0.06	0.078	0.118
| Family: Heptageniidae	0.418	0.002	0.345	0.34	0.271	0.159	0.281	0.051	0.163	0.217	0.146
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0.003	0.003
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0.003	0.002	0	0.003	0	0	0.003	0	0.011	0	0.011
| Family: Chloroperlidae	0.003	0	0.028	0.05	0.006	0.006	0.02	0.011	0.044	0.01	0.017
| Family: Leuctridae	0	0	0	0	0	0	0	0	0	0.003	0
| Family: Nemouridae	0.025	0.103	0.151	0.17	0.093	0.133	0.117	0.043	0.123	0.034	0.011
| Family: Peltoperlidae	0	0	0	0.003	0	0.003	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0.01	0	0	0.001	0.008	0.003	0.003
| Family: Perlodidae	0.004	0.002	0.014	0.013	0.065	0.024	0.029	0.034	0	0.01	0.008
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.043	0	0.048	0.037	0.006	0.115	0.057	0.004	0.117	0.031	0.017
| Order: Trichoptera	0	0	0	0	0	0	0.003	0.002	0	0	0.003
| Family: Apataniidae	0.003	0	0	0	0	0	0.014	0	0.044	0.117	0.371
| Family: Brachycentridae	0.001	0	0	0	0	0.003	0	0	0.014	0	0
| Family: Glossosomatidae	0	0	0.017	0.005	0	0.254	0.006	0	0.044	0.201	0.121
| Family: Hydropsychidae	0.004	0.012	0.022	0.016	0.01	0.012	0.083	0.143	0.022	0.013	0
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0.014	0	0	0	0	0.017	0.003	0.003	0.003	0
| Family: Rhyacophilidae	0.001	0.022	0.011	0.008	0.055	0.024	0.014	0.005	0.006	0	0.003
| Family: Uenoidae	0	0	0.078	0.013	0	0.032	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0.01	0	0	0	0.003	0.01	0.037
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0.002	0	0	0	0	0.003	0	0	0	0
| Family: Chironomidae	0.151	0.68	0.036	0.076	0.278	0.065	0.203	0.613	0.199	0.097	0.051
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0	0.014	0.003	0.006	0.009	0.003	0.002	0.003	0	0
| Family: Muscidae	0	0.07	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0.006	0	0.003	0.006	0	0	0	0	0
| Family: Psychodidae	0.001	0.01	0.017	0	0.023	0	0.009	0	0.022	0.063	0.039
| Family: Simuliidae	0.003	0	0	0	0	0	0	0.009	0.014	0	0.003
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	0.004	0.003	0.003	0.003	0.003	0.003	0.001	0.016	0.01	0.003
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0.002	0	0	0	0	0.003	0.002	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0.002	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0.004	0.052	0.003	0.003	0.013	0.006	0.011	0.007	0.005	0.005	0
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0.003	0.006	0	0.003	0.006	0.012	0.017	0.032	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0.003	0	0	0	0.005	0.008	0.003
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0.003	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0.01	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0.003	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0.002	0.008	0	0	0.027	0.003	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0.003	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0.012	0	0	0	0	0	0	0	0.003	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.35: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 40) and Mine-exposed (n = 59) Areas based on Family Level of Taxonomy, September 2015

Organism Identification	Mine-exposed										
	MIDAG	MIDCO	MIUCO	MP1	FODNGD	NGD1	OCNM	POCK	SWCK	THCK	WOCK
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0.001	0	0.003	0.009	0	0	0	0	0	0	0
| Family: Baetidae	0.018	0.016	0.059	0.088	0.173	0.174	0	0.005	0	0.011	0
| Family: Ephemerellidae	0.18	0.175	0.348	0.046	0.061	0	0.008	0.001	0	0	0.003
| Family: Heptageniidae	0.229	0.032	0.123	0.369	0.531	0.109	0	0.003	0	0	0
| Family: Leptophlebiidae	0	0	0	0	0	0	0.013	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0.002	0	0	0	0	0
| Family: Capniidae	0	0.005	0	0.009	0.005	0.002	0	0.001	0.023	0	0.125
| Family: Chloroperlidae	0.01	0.018	0.015	0.003	0.01	0.014	0.003	0	0	0.003	0.003
| Family: Leuctridae	0	0	0	0.003	0	0	0	0	0	0	0
| Family: Nemouridae	0.048	0.147	0.023	0.076	0.033	0.234	0.125	0.111	0.211	0.078	0.215
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0.003
| Family: Perlidae	0	0.002	0	0.003	0.003	0	0	0	0	0	0
| Family: Perlodidae	0.023	0.01	0.028	0.037	0.038	0.02	0.005	0.012	0.009	0	0.003
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0.079	0.024	0.054	0.009	0.031	0	0.003	0	0	0	0.003
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0.113	0.055	0.033	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0.015	0.005	0.01	0	0	0	0	0.002	0	0.003	0
| Family: Hydropsychidae	0	0.003	0.005	0.006	0	0	0.158	0	0	0.011	0.006
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0.002	0	0.012	0.003	0	0.008	0.023	0.032	0.053	0.016
| Family: Rhyacophilidae	0.006	0.021	0.023	0.027	0.051	0.041	0.015	0.03	0.009	0.014	0.003
| Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0.002	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0.005	0	0	0	0
| Family: Elmidae	0.011	0.026	0.041	0.003	0	0	0	0.005	0.018	0.174	0
| Family: Hydrophilidae	0	0	0	0	0	0	0.003	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0.003
| Order: Diptera	0	0	0	0	0	0	0.005	0	0.002	0	0.006
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0.001	0.008	0.005	0.003	0	0	0.003	0	0.002	0.003	0
| Family: Chironomidae	0.022	0.206	0.043	0.235	0.02	0.334	0.147	0.722	0.603	0.081	0.331
| Family: Dixidae	0	0	0	0	0	0	0	0.001	0	0	0
| Family: Empididae	0	0	0	0.003	0	0.004	0.003	0.006	0.002	0.011	0.026
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0.005	0	0
| Family: Psychodidae	0.23	0.228	0.176	0.027	0.013	0.012	0.005	0.006	0.044	0.003	0.042
| Family: Simuliidae	0	0	0	0	0.005	0.037	0.028	0.003	0.007	0.459	0.077
| Family: Stratiomyidae	0	0	0	0	0	0	0.003	0	0	0	0.01
| Family: Tabanidae	0	0	0	0	0	0	0.013	0	0	0	0
| Family: Tipulidae	0.007	0.01	0.005	0.009	0.015	0.002	0.016	0.002	0.023	0.003	0.019
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0.003	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0.034	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0.013	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0.063	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0.005	0.01	0	0	0.003
| Family: Aturidae	0	0	0	0	0	0	0	0.028	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0.003	0.003	0.005	0.015	0.008	0	0.008	0.001	0	0.003	0.003
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0.003	0	0.002	0.008	0.005	0	0	0.077
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0.003	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0.005	0.001	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0.13	0	0	0.008	0
| Class: Gastropoda	0	0	0	0	0	0	0.005	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0.005	0.004	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0.001	0	0	0	0	0.004	0	0.005	0.007	0.014	0.019
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0.003	0.005	0	0	0	0.008	0	0.014	0	0	0
| Family: Tubificidae	0	0	0	0	0	0	0.151	0	0	0.069	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.36: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Reference							Mine-exposed				
Area	**ALUSM**	**ELUGH**	**FO26**	**HENUP**	**LI24**	**MI25**	**SLINE**	**BOCK**	**CORCK**	**EL19**	**EL1**	**EL20**
| Order: Collembola	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	4	0	0
Ameletus	0	60	0	10	160	140	70	0	0	13	25	0
| Family: Baetidae	20	0	0	0	0	120	0	0	0	0	25	100
Acentrella	0	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	113	0
Baetis	1,080	420	600	0	60	1,840	15	14	0	204	525	1,560
Baetis tricaudatus group	400	200	40	0	0	0	10	0	0	163	263	300
Baetis bicaudatus	0	0	0	0	20	0	10	0	0	0	0	0
| Family: Ephemerellidae	1,260	920	2,060	770	100	4,720	145	0	20	38	275	460
Drunella	0	0	0	0	0	0	30	0	20	0	13	20
Drunella coloradensis	20	0	0	0	20	20	20	0	0	0	0	0
Drunella doddsii	120	180	1,700	50	160	60	45	0	0	63	313	740
Drunella spinifera	0	100	0	0	0	0	0	0	0	0	0	160
Ephemerella	100	460	0	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	160	1,420	4,640	2,550	140	1,220	525	0	40	208	1,125	1,100
Cinygmula	0	20	0	0	0	0	0	0	0	0	0	0
Epeorus	40	0	140	90	100	0	10	0	0	4	0	20
Rhithrogena	80	100	320	310	0	20	10	0	0	21	75	80
| Family: Leptophlebiidae	0	40	0	0	0	0	0	0	0	0	0	0
Neoleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	20	0	0	0	20	0	14	0	0	0	20
| Family: Chloroperlidae	20	0	240	0	140	320	10	0	20	0	0	0
Suwallia	0	0	0	0	0	0	15	0	0	0	0	0
Sweltsa	60	40	460	40	140	160	45	14	20	88	38	180
| Family: Leuctridae	40	0	20	0	0	0	10	0	0	0	0	20
Despaxia augusta	0	0	0	0	0	20	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	20	0	29	0	0	0	0
Visoka cataractae	0	0	0	10	20	0	0	0	0	0	0	0
Zapada	320	180	180	10	100	420	50	14	1,240	8	13	60
Zapada oregonensis group	40	0	120	20	100	120	15	0	0	0	0	0
Zapada cinctipes	180	280	0	0	0	0	0	300	1,240	4	0	80
Zapada columbiana	60	0	320	50	140	60	65	0	20	0	13	0
| Family: Peltoperlidae	0	0	0	0	0	20	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	5	0	0	0	0	0
| Family: Perlidae	0	200	0	0	0	0	0	0	0	38	88	180
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla	0	120	0	0	0	0	0	0	0	25	0	0
Hesperoperla pacifica	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	40	300	420	0	40	300	15	14	20	8	13	600
Isoperla	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys	0	0	360	20	240	40	30	0	0	0	0	0
Skwala	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella	0	0	0	0	0	0	0	0	0	0	0	20
| Family: Taeniopterygidae	20	220	920	10	0	240	0	0	0	13	0	0
Taenionema	40	0	0	370	40	300	50	14	0	0	0	180
| Order: Trichoptera	0	0	0	0	0	0	0	157	0	0	0	40
| Family: Apataniidae	20	0	0	0	0	120	0	0	0	0	0	0
Allomyia	0	0	0	0	0	20	0	0	0	0	0	0
Apatania	0	0	0	0	0	20	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	4	0	0
| Family: Brachycentridae	0	60	0	0	0	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	100
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	20
| Family: Glossosomatidae	480	0	0	0	0	0	0	0	0	0	38	120
Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0
Glossosoma	320	0	0	20	0	40	10	0	0	4	38	160
| Family: Hydropsychidae	0	0	240	20	20	80	50	0	20	8	0	160
Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0
Arctopsyche grandis	0	0	0	0	0	0	0	0	0	4	0	100
Arctopsyche ladogensis	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche	40	0	80	20	0	220	5	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	229	1,360	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	0	63	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0	129	0	0	0	0
Ecclisomyia	0	0	0	0	80	0	0	0	0	0	0	0
Rhyacophila	200	0	20	0	20	260	20	14	500	0	0	20
Rhyacophila betteni group	40	0	0	0	0	20	0	0	0	0	0	0
Rhyacophila brunnea/vemna gr	20	0	0	0	0	20	15	0	100	0	0	20
Rhyacophila hyalinata group	0	0	120	20	0	0	10	0	0	0	0	0
Rhyacophila vofixa group	0	0	80	0	0	20	5	0	0	0	0	0
Rhyacophila atrata complex	0	0	0	0	0	0	0	0	0	8	0	0
Rhyacophila narvae	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	20	540	0	0	0	120	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	14	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0	14	0	0	0	0
| Family: Elmidae	80	0	0	0	0	80	0	0	140	0	0	0
Heterlimnius	40	20	0	0	0	20	0	14	60	8	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	13	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	186	0	0	0	0
Probezzia	20	0	0	20	0	0	0	0	0	0	0	20
| Family: Chironomidae	140	520	220	20	540	140	50	157	320	17	63	120
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0	0
Pagastiella	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0	0	0	0	13	0
Constempellina sp. C	0	0	0	0	0	20	0	0	0	0	0	0
Micropsectra	240	1,000	500	50	40	760	0	200	1,780	96	50	320
Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0
Sublettea coffmani	0	0	0	0	0	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Diamesa	0	0	380	0	620	0	10	0	0	0	0	0
Pagastia	40	540	300	0	20	620	0	29	1,760	13	13	20
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa	0	0	0	0	0	20	0	0	0	0	0	0
Brillia	20	0	20	0	0	60	0	14	0	0	0	0
Corynoneura	0	0	0	0	0	0	0	486	0	0	0	0
Cricotopus (Nostococladius)	0	0	40	0	0	400	0	0	20	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	0	220	260	60	400	180	55	186	220	4	25	100
Heleniella	0	0	0	0	0	0	0	200	60	0	0	20
Hydrobaenus	0	0	0	0	120	40	5	0	20	0	0	0
Limnophyes	0	0	0	0	0	0	0	29	0	0	0	0
Metriocnemus	0	0	0	0	0	0	0	29	0	0	0	0

Table G.36: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Reference							Mine-exposed				
Area	**ALUSM**	**ELUGH**	**FO26**	**HENUP**	**LI24**	**MI25**	**SLINE**	**BOCK**	**CORCK**	**EL19**	**EL1**	**EL20**
Orthocladiinae RAI 004 (Like *H*	0	0	0	0	0	0	0	0	0	0	0	0
Orthocladius complex	80	1,980	1,300	180	3,060	2,220	195	214	1,800	46	775	180
Parakiefferiella	0	0	0	0	0	0	0	0	0	0	0	0
Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	40	0	0	0	0	0	0
Rheocricotopus	0	0	80	0	60	140	0	0	0	8	13	20
Synorthocladius	0	0	0	0	0	40	10	0	0	0	0	0
Thienemanniella	0	20	0	0	0	0	0	0	20	0	0	0
Tvetenia	40	140	20	30	80	160	20	0	320	13	213	60
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	20	0	0	0
Zavrelimyia	0	0	0	0	0	0	0	14	0	0	0	0
Pentaneura	0	0	0	0	0	0	0	14	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	43	20	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	43	0	0	0	0
| Family: Empididae	20	20	0	10	0	100	0	14	440	4	26	0
Chelifera/ Metachela	40	0	0	0	0	20	0	0	40	50	0	80
Clinocera	0	60	0	0	0	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	0	0	0	0	0	13	0	0
Oreogeton	0	0	20	40	0	0	10	71	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0	29	0	0	0	20
Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0	57	20	0	0	0
Pericoma/Telmatoscopus	360	460	40	0	0	40	0	43	2,060	29	0	100
| Family: Simuliidae	0	0	0	0	0	0	0	843	60	0	13	0
Prosimulium	0	0	0	0	0	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0
Simulium	100	0	140	0	0	0	0	471	0	0	0	0
Euparyphus	0	0	0	0	0	0	0	14	0	0	0	0
| Family: Syrphidae	0	0	20	0	0	0	0	0	0	0	0	0
Antocha	0	80	0	0	20	0	0	0	20	4	0	0
Dicranota	0	0	0	0	0	20	5	200	180	0	0	20
Gonomyodes	0	0	0	0	40	0	0	0	0	0	0	0
Hesperoconopa	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma	0	40	0	0	0	0	0	0	0	4	0	0
Tipula	0	0	0	0	20	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	20	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	0	460	0	0	0
Feltria	0	0	0	0	0	0	0	0	80	0	0	0
Protzia	0	0	0	0	20	0	0	0	0	0	0	0
Atractides	0	0	0	0	20	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	20	100	120	10	20	20	15	57	60	54	0	40
Sperchon	0	0	160	20	20	0	0	29	20	25	0	0
Sperchonopsis	0	0	0	0	0	0	5	0	0	0	0	0
Testudacarus	20	0	20	0	0	0	0	0	0	13	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0	14	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	20	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	20	0	20	0	0	386	1,120	8	0	0
Chaetogaster	0	0	0	0	0	0	0	0	400	0	0	0
Nais	20	0	0	0	0	0	0	57	20	8	0	0
Pristina	0	0	0	0	0	0	0	0	0	0	0	0
Tubifex	0	0	0	0	0	0	0	0	0	0	0	0
Hydra	0	0	0	0	0	0	0	14	0	0	0	0
Total	**6,500**	**10,560**	**17,280**	**4,830**	**6,960**	**16,160**	**1,815**	**5,127**	**16,180**	**1,347**	**4,273**	**7,740**

Table G.36: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed										
Area	**ELELKO**	**ELUFE**	**ELH93**	**FO23**	**FOBCP**	**FOBKS**	**FOBSC**	**FODGH**	**FODHE**	**FODPO**	**FOUEW**
| Order: Collembola	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
Ameletus	120	0	0	0	0	0	0	0	120	20	0
| Family: Baetidae	40	0	40	0	0	0	0	220	0	0	0
Acentrella	580	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	60	0	0	0	0	0	0	0	0	0	0
Baetis	1,120	740	160	380	100	263	106	1,960	260	460	240
Baetis tricaudatus group	160	140	0	260	33	63	131	340	0	500	180
Baetis bicaudatus	0	0	0	0	0	0	0	0	320	0	0
| Family: Ephemerellidae	2,440	4,380	180	200	67	313	94	2,360	2,080	140	100
Drunella	20	0	0	0	0	0	0	0	0	0	0
Drunella coloradensis	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	180	120	0	780	60	63	0	240	60	20	0
Drunella spinifera	0	160	0	0	7	0	19	80	0	0	20
Ephemerella	240	100	180	0	0	0	6	0	0	0	0
| Family: Heptageniidae	2,180	760	320	480	160	963	106	2,600	4,380	540	580
Cinygmula	0	0	0	0	0	0	0	0	0	0	0
Epeorus	0	0	0	0	0	13	6	20	60	0	0
Rhithrogena	760	80	0	60	0	0	0	140	240	0	0
| Family: Leptophlebiidae	20	20	0	0	0	0	0	0	0	0	0
Neoleptophlebia	0	20	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	20	0	0	0	0	0	0	0	0
| Order: Plecoptera	80	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	180	20	0	60	7	0	13	40	0	100	0
| Family: Chloroperlidae	0	0	20	80	0	13	6	200	20	160	0
Suwallia	0	0	0	0	0	0	0	0	0	0	0
Sweltsa	220	220	0	720	7	25	6	220	0	80	60
| Family: Leuctridae	0	0	0	0	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	80	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0
Zapada	0	20	0	140	220	225	81	1,560	180	2,000	1,180
Zapada oregonensis group	0	0	0	0	0	13	0	400	0	140	200
Zapada cinctipes	40	0	0	220	107	63	38	500	0	260	300
Zapada columbiana	0	0	0	0	0	0	6	120	0	40	180
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	100	240	0	20	0	25	0	40	20	20	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla	0	0	0	120	0	0	13	0	0	0	0
Hesperoperla pacifica	40	100	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	920	440	40	140	247	113	69	380	460	800	0
Isoperla	0	0	0	0	0	38	44	0	0	300	0
Megarcys	0	0	0	20	80	150	44	340	180	200	100
Skwala	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella	60	20	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	40	160	0	50	19	60	220	740	0
Taenionema	140	0	0	0	20	0	0	460	0	0	20
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
Allomyia	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	20	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	25	6	0	0	0	0
Brachycentrus	0	0	0	0	7	0	0	80	0	0	0
Brachycentrus americanus	0	20	0	0	7	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	60	0	0	0	120	0	180	360
Anagapetus	0	0	0	0	0	0	0	0	0	0	0
Glossosoma	0	0	0	160	0	25	19	60	0	1,620	40
| Family: Hydropsychidae	2,920	20	540	0	33	0	0	0	0	0	80
Arctopsyche	40	0	0	0	0	0	0	0	0	0	0
Arctopsyche grandis	20	0	0	20	113	0	6	0	0	0	0
Arctopsyche ladogensis	0	0	0	0	7	0	0	0	0	0	0
Hydropsyche	1,360	0	200	0	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	27	38	0	200	20	0	20
Hydroptila	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	180	40	140	20	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	20	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0	0	0	20	0
Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0	20	0	0	147	200	163	620	0	380	320
Rhyacophila betteni group	0	0	0	40	7	13	0	0	0	40	0
Rhyacophila brunnea/vemna gr	0	0	0	20	7	63	25	100	0	100	60
Rhyacophila hyalinata group	0	0	0	0	7	38	19	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila atrata complex	0	0	0	160	0	13	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0	0	0	20	0
Neothremma	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	20	0	0	0	0	0	0	20
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	20	0	0	0	0	0	200	0	200	180
Heterlimnius	0	20	0	20	0	0	0	260	0	180	40
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	80	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	13	75	19	0	40	40	20
| Family: Chironomidae	200	220	120	100	93	200	100	440	240	540	240
Microtendipes pedellus group	0	0	20	0	0	0	0	0	0	0	0
Pagastiella	0	0	20	0	0	0	0	0	0	0	0
Polypedilum	4,260	300	140	0	0	0	0	0	0	0	0
Constempellina sp. C	0	20	0	0	0	0	0	0	0	0	0
Micropsectra	920	340	220	840	140	438	138	1,460	280	260	220
Paratanytarsus	0	620	0	0	0	0	0	0	0	0	0
Rheotanytarsus	180	140	20	0	0	0	0	100	0	0	0
Stempellinella	20	0	40	0	0	0	0	0	0	0	0
Sublettea coffmani	0	0	20	0	0	0	0	0	0	0	0
Tanytarsus	0	0	20	0	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	6	0	0	0	0
Pagastia	0	180	60	40	53	75	69	560	80	220	460
Potthastia longimana group	0	0	40	0	0	0	0	0	0	0	0
Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0	40	0	0	0
Corynoneura	0	0	0	0	0	0	0	20	0	0	20
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	40	340	540	20	40	113	25	160	40	180	180
Heleniella	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	20	0	0	0	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0	0	0	0	0	0
Metriocnemus	0	0	0	0	0	0	0	0	0	0	0

Table G.36: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed										
Area	**ELELKO**	**ELUFE**	**ELH93**	**FO23**	**FOBCP**	**FOBKS**	**FOBSC**	**FODGH**	**FODHE**	**FODPO**	**FOUEW**
Orthocladiinae RAI 004 (Like *H*	0	0	0	0	0	0	0	0	0	0	0
Orthocladius complex	1,260	4,280	5,260	180	60	13	156	620	140	560	620
Parakiefferiella	0	0	20	0	0	0	0	0	0	0	0
Paraphaenocladius	0	20	0	0	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	60	140	20	40	0	0	0	20	0	0	0
Synorthocladius	0	0	20	0	0	0	0	0	0	0	0
Thienemanniella	60	0	0	0	0	0	0	0	0	20	0
Tvetenia	1,840	300	260	40	127	75	56	40	60	160	40
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0
Pentaneura	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	580	300	280	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	60	0	0	0	0	38	140	0	20	40
Chelifera/ Metachela	0	60	0	40	0	0	0	200	0	40	140
Clinocera	0	80	0	40	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	0	0	0	0	0	60	0
Oreogeton	0	0	0	0	0	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia	0	40	0	20	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	0	0	220	120	463	225	260	140	40	80
| Family: Simuliidae	80	0	0	0	0	0	0	20	0	0	0
Prosimulium	0	0	0	0	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0
Simulium	0	0	0	0	13	0	0	60	40	80	20
Euparyphus	0	0	0	0	0	0	0	0	0	0	0
| Family: Syrphidae	0	0	0	0	0	0	0	0	0	0	0
Antocha	0	220	0	0	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	0	0	40	0	0	0
Gonomyodes	0	0	0	0	0	0	0	0	0	0	0
Hesperoconopa	0	0	0	0	0	0	0	0	0	0	0
Hexatoma	80	40	0	40	0	0	6	0	0	0	0
Tipula	0	0	0	20	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	20	0	0	0	0	0	0	40
| Family: Aturidae	0	0	20	0	0	0	0	0	0	0	0
Aturus	0	0	20	0	0	0	0	20	0	0	40
Feltria	0	20	0	0	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0	0	0	0	0
Atractides	20	0	0	0	0	0	0	0	0	0	0
Hygrobates	20	0	0	0	0	0	0	0	20	0	0
Lebertia	400	820	60	320	13	38	88	360	40	140	140
Sperchon	180	80	20	40	7	0	6	20	40	0	0
Sperchonopsis	0	0	20	0	7	0	0	0	0	0	0
Testudacarus	0	60	0	0	0	0	0	20	0	0	0
Torrenticola	20	0	0	0	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	20	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	20	0	0	0	0	0	0	0
Enchytraeus	0	20	0	60	40	25	106	0	20	0	20
Chaetogaster	0	0	0	0	0	0	0	0	0	0	0
Nais	40	800	1,820	120	7	0	0	220	0	0	160
Pristina	20	0	0	0	0	0	0	0	0	0	0
Tubifex	0	20	0	0	0	0	0	0	0	0	0
Hydra	40	0	0	0	0	0	0	0	0	0	0
Total	**24,540**	**17,340**	**11,060**	**6,620**	**2,210**	**4,323**	**2,083**	**18,740**	**9,800**	**11,620**	**6,760**

Table G.36: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed										
Area	**FOUKI**	**FRUL**	**HACKDS**	**HACKUP**	**LCUT**	**LC_DC1**	**LC_DCDS**	**LC_FRB**	**LC_FRUS**	**LI8**	**LIDSL**
| Order: Collembola	0	0	0	20	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
Ameletus	8	0	40	60	0	0	167	57	20	260	10
| Family: Baetidae	4	0	0	0	0	0	0	0	0	0	0
Acentrella	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0
Baetis	40	683	960	1,360	120	125	0	771	1,020	320	620
Baetis tricaudatus group	52	492	300	800	280	88	0	2,014	700	540	340
Baetis bicaudatus	0	0	0	0	0	0	0	0	0	0	0
| Family: Ephemerellidae	72	25	140	4,460	0	300	1,117	143	420	220	140
Drunella	0	0	0	0	0	25	0	0	0	0	0
Drunella coloradensis	0	0	0	0	0	0	0	14	0	0	0
Drunella doddsii	16	125	20	320	40	163	17	0	20	520	50
Drunella spinifera	0	0	0	320	0	0	0	100	220	0	0
Ephemerella	0	0	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	320	167	540	1,140	60	1,375	1,533	729	1,060	940	590
Cinygmula	0	0	0	0	0	0	33	0	20	0	10
Epeorus	0	0	20	20	0	25	100	29	40	40	90
Rhithrogena	0	50	0	0	0	0	0	14	0	280	0
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
Neoleptophlebia	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	25	0	0	0	0	0	0	20	40	0
| Family: Chloroperlidae	0	67	0	40	40	25	50	29	20	0	10
Suwallia	0	0	0	0	0	0	0	0	0	0	0
Sweltsa	4	92	20	100	20	63	83	43	80	20	120
| Family: Leuctridae	0	8	0	20	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	0	0	0	0	0	20
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0
Zapada	12	17	240	3,220	40	288	233	157	700	800	200
Zapada oregonensis group	4	0	140	860	280	175	33	71	500	440	270
Zapada cinctipes	28	142	180	120	0	0	0	71	40	40	40
Zapada columbiana	20	0	120	160	0	75	67	0	0	20	150
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0
Yoraperla	0	0	0	220	20	0	0	0	0	0	0
| Family: Perlidae	0	133	0	0	20	0	0	0	40	0	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla	0	100	0	0	0	0	0	0	20	0	0
Hesperoperla pacifica	12	0	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	32	50	40	400	40	63	50	57	200	60	30
Isoperla	0	0	0	0	0	0	0	0	0	0	0
Megarcys	28	0	60	140	20	138	33	0	60	40	10
Skwala	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	67	0	1,080	20	0	100	0	0	5,880	0
Taenionema	4	0	0	0	0	63	0	0	0	0	60
| Order: Trichoptera	0	0	0	0	20	0	0	0	0	20	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	60
Allomyia	0	0	0	0	0	0	0	0	0	0	0
Apatania	8	0	0	120	0	0	0	0	20	880	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	8	40	0	0	0	0	14	0	0	0
Brachycentrus	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	20	0	0	0	0	0	0	0	0	0	10
Anagapetus	0	0	0	0	0	0	0	0	0	160	0
Glossosoma	28	42	0	0	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	60	80	113	0	14	0	0	260
Arctopsyche	0	0	0	0	0	0	0	0	0	0	0
Arctopsyche grandis	8	8	0	0	0	0	0	0	0	0	0
Arctopsyche ladogensis	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	0	0	0
Parapsyche	8	0	200	40	160	188	150	0	0	0	40
Hydroptila	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	8	0	0	0	0	0	14	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	4	0	0	0	20	13	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	4	67	20	80	20	25	17	29	260	0	20
Rhyacophila betteni group	0	25	0	60	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna gr	4	0	20	20	0	0	0	29	100	0	10
Rhyacophila hyalinata group	0	0	60	0	20	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	17	0	0	0	0
Rhyacophila atrata complex	0	0	0	0	0	13	0	0	100	0	0
Rhyacophila narvae	0	0	60	20	0	0	0	0	180	0	0
Neothremma	0	0	0	40	0	0	0	0	0	0	0
Oligophlebodes	0	0	60	400	0	400	200	29	0	340	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	4	0	0	220	0	0	0	0	420	0	0
Heterlimnius	0	0	60	460	0	0	0	0	300	0	0
| Order: Diptera	4	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0
Probezzia	28	0	0	0	0	0	0	0	20	0	0
| Family: Chironomidae	84	25	300	160	1,080	13	50	114	200	320	290
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0
Pagastiella	0	0	0	0	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	20	0	50	0	0	0	0
Constempellina sp. C	0	17	0	0	0	0	0	0	0	0	0
Micropsectra	148	75	200	180	0	13	233	229	240	1,300	230
Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0
Rheotanytarsus	0	0	1,720	0	0	0	0	0	0	0	10
Stempellinella	0	0	0	0	0	0	0	0	0	0	0
Sublettea coffmani	0	0	0	0	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0	0	0	0	0
Diamesa	0	0	0	0	160	0	33	0	0	0	30
Pagastia	28	17	140	200	700	50	0	214	600	20	60
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa	0	0	20	0	20	13	33	0	0	60	0
Brillia	4	0	0	0	0	25	0	0	20	0	0
Corynoneura	0	0	0	0	0	0	0	0	20	20	10
Cricotopus (Nostococladius)	0	0	0	0	0	88	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	16	0	180	40	940	25	17	29	60	0	10
Heleniella	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	0	20	0	20	50	300	14	40	540	270
Limnophyes	0	0	0	0	0	0	0	0	20	0	0
Metriocnemus	0	0	0	0	0	0	0	0	0	0	0

Table G.36: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed										
Area	**FOUKI**	**FRUL**	**HACKDS**	**HACKUP**	**LCUT**	**LC_DC1**	**LC_DCDS**	**LC_FRB**	**LC_FRUS**	**LI8**	**LIDSL**
Orthocladiinae RAI 004 (Like *H*	0	0	0	0	0	0	0	0	0	0	0
Orthocladius complex	156	8	400	240	7,360	0	0	114	880	100	90
Parakiefferiella	0	0	0	0	0	0	0	0	0	0	0
Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	50	0	0	0	0
Rheocricotopus	0	0	120	40	280	0	0	0	20	20	180
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0	0	0	0	0
Tvetenia	28	8	100	20	300	38	0	0	60	100	140
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0
Pentaneura	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	4	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	8	0	0	0	0	0	0	14	20	0	10
Chelifera/ Metachela	4	33	0	40	0	75	0	14	100	0	0
Clinocera	0	0	0	0	0	0	0	0	40	0	0
Neoplasta	0	0	0	0	0	0	0	0	100	0	0
Oreogeton	0	0	0	0	0	0	0	0	0	0	10
Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia	0	33	0	0	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	84	58	0	800	20	50	0	29	80	0	0
| Family: Simuliidae	0	0	0	0	0	51	717	0	0	0	0
Prosimulium	0	0	0	0	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	20	0	0	0	0	0	0	0
Simulium	0	0	0	80	0	100	600	14	0	0	20
Euparyphus	0	0	0	0	0	0	0	0	0	0	0
| Family: Syrphidae	0	0	0	0	0	0	0	0	0	0	0
Antocha	0	0	80	0	0	0	0	0	20	0	0
Dicranota	0	17	0	40	0	0	0	0	0	0	0
Gonomyodes	0	0	0	0	0	0	0	0	0	0	0
Hesperoconopa	0	0	0	20	0	0	0	0	0	0	0
Hexatoma	4	0	0	20	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	40	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	140	0	0	13	0	0	40	0	0
Feltria	0	0	40	0	140	0	0	0	20	0	10
Protzia	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0
Lebertia	40	0	0	0	100	38	33	157	340	0	40
Sperchon	12	0	0	0	400	0	0	0	0	20	60
Sperchonopsis	4	0	0	0	0	0	0	14	60	0	0
Testudacarus	0	8	0	0	0	0	0	0	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	13	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	36	0	0	40	0	25	0	0	0	0	0
Chaetogaster	0	0	0	0	0	0	0	0	0	0	0
Nais	4	8	480	0	0	0	0	143	80	0	0
Pristina	0	0	0	0	0	0	0	0	0	0	0
Tubifex	0	0	0	0	0	0	0	0	0	0	0
Hydra	0	0	0	0	0	0	0	0	0	0	0
Total	**1,440**	**2,708**	**7,280**	**18,320**	**12,860**	**4,423**	**6,116**	**5,527**	**9,700**	**14,360**	**4,630**

Table G.36: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed				
Area	**LILC3**	**MI2**	**MI3**	**MIDCO**	**MIUCO**
| Order: Collembola	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0
Ameletus	0	17	0	0	25
| Family: Baetidae	100	0	0	20	25
Acentrella	0	0	0	0	0
Acentrella turbida	0	0	0	0	0
Baetis	220	333	660	80	325
Baetis tricaudatus group	60	383	400	120	75
Baetis bicaudatus	0	0	0	0	0
| Family: Ephemerellidae	100	433	1,360	80	838
Drunella	0	0	0	0	0
Drunella coloradensis	0	0	20	0	0
Drunella doddsii	0	317	140	40	125
Drunella spinifera	20	17	100	60	13
Ephemerella	20	150	580	0	0
| Family: Heptageniidae	400	1,100	520	40	463
Cinygmula	0	0	0	0	0
Epeorus	0	17	0	0	0
Rhithrogena	0	83	20	0	13
| Family: Leptophlebiidae	0	0	0	0	13
Neoleptophlebia	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0
| Family: Capniidae	0	17	0	160	0
| Family: Chloroperlidae	20	0	60	0	13
Suwallia	0	0	0	0	0
Sweltsa	220	667	60	20	50
| Family: Leuctridae	0	0	0	100	13
Despaxia augusta	0	0	0	40	0
| Family: Nemouridae	0	0	0	0	0
Visoka cataractae	0	0	0	0	0
Zapada	180	0	20	620	138
Zapada oregonensis group	460	0	0	40	13
Zapada cinctipes	0	33	60	480	88
Zapada columbiana	140	17	0	0	0
| Family: Peltoperlidae	0	0	0	0	0
Yoraperla	0	0	0	20	0
| Family: Perlidae	0	0	0	0	13
Calineuria californica	0	0	0	20	0
Hesperoperla	0	0	0	0	0
Hesperoperla pacifica	0	0	0	0	0
| Family: Perlodidae	40	0	20	80	175
Isoperla	0	0	0	0	0
Megarcys	0	17	0	0	0
Skwala	0	17	100	0	0
Pteronarcella	0	0	0	0	0
| Family: Taeniopterygidae	0	50	0	180	0
Taenionema	0	0	20	360	150
| Order: Trichoptera	40	17	0	0	0
| Family: Apataniidae	0	0	0	80	0
Allomyia	0	0	0	300	63
Apatania	0	733	760	100	250
Pedomoecus sierra	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0
Brachycentrus	0	0	20	0	0
Brachycentrus americanus	0	0	0	0	0
| Family: Glossosomatidae	0	33	680	40	13
Anagapetus	0	0	0	0	0
Glossosoma	0	617	860	40	13
| Family: Hydropsychidae	140	0	0	100	13
Arctopsyche	0	0	0	0	0
Arctopsyche grandis	0	0	0	0	0
Arctopsyche ladogensis	0	0	0	0	0
Hydropsyche	0	0	0	20	0
Parapsyche	300	0	0	100	0
Hydroptila	0	0	0	0	0
Lepidostoma	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0
| Family: Limnephilidae	0	0	20	40	0
Ecclisomyia	0	0	0	0	0
Rhyacophila	20	0	0	360	375
Rhyacophila betteni group	0	0	0	0	25
Rhyacophila brunnea/vemna gr	0	0	0	20	25
Rhyacophila hyalinata group	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	25
Rhyacophila atrata complex	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0
Neothremma	0	0	0	0	0
Oligophlebodes	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0
Stictotarsus	0	0	0	0	0
| Family: Elmidae	0	0	20	120	63
Heterlimnius	0	50	20	80	150
| Order: Diptera	0	0	0	0	0
Atherix	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0
Probezzia	0	0	0	40	13
| Family: Chironomidae	3,980	83	100	240	0
Microtendipes pedellus group	0	0	0	0	0
Pagastiella	0	0	0	0	0
Polypedilum	40	17	40	0	0
Constempellina sp. C	0	0	0	0	0
Micropsectra	1,900	83	100	40	0
Paratanytarsus	0	0	0	0	0
Rheotanytarsus	80	0	0	0	0
Stempellinella	0	0	0	0	0
Sublettea coffmani	0	0	0	0	0
Tanytarsus	0	0	0	0	0
Diamesa	520	0	0	120	0
Pagastia	1,460	17	60	320	63
Potthastia longimana group	0	0	0	0	0
Pseudodiamesa	80	0	0	0	0
Brillia	0	0	0	0	0
Corynoneura	0	0	20	0	0
Cricotopus (Nostococladius)	40	0	0	0	100
Diplocladius cultriger	80	0	0	0	0
Eukiefferiella	1,060	100	0	380	0
Heleniella	0	0	0	0	0
Hydrobaenus	200	0	0	0	0
Limnophyes	0	0	0	0	0
Metriocnemus	0	0	0	0	0

Table G.36: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed				
Area	**LILC3**	**MI2**	**MI3**	**MIDCO**	**MIUCO**
Orthocladiinae RAI 004 (Like *H*	0	17	0	0	0
Orthocladius complex	20,080	67	20	1,340	0
Parakiefferiella	0	0	0	0	0
Paraphaenocladius	0	0	0	0	0
Parorthocladius	0	0	0	0	0
Rheocricotopus	3,260	167	20	0	0
Synorthocladius	0	0	0	0	0
Thienemanniella	0	0	0	0	0
Tvetenia	2,280	67	20	40	0
| Subfamily: Tanypodinae	0	0	0	0	0
Zavrelimyia	0	0	0	0	0
Pentaneura	0	0	0	0	0
Thienemannimyia group	0	0	20	60	38
| Family: Dixidae	0	0	0	0	0
| Family: Empididae	40	0	0	0	13
Chelifera/ Metachela	20	0	20	0	50
Clinocera	40	0	0	0	0
Neoplasta	0	33	0	0	0
Oreogeton	0	0	0	0	0
Trichoclinocera	0	0	0	0	0
Wiedemannia	0	0	20	0	0
Limnophora	0	0	0	0	0
Pericoma/Telmatoscopus	0	33	260	80	250
| Family: Simuliidae	0	0	0	0	0
Prosimulium	0	0	0	80	0
Prosimulium/Helodon	0	0	0	0	0
Simulium	0	0	0	0	0
Euparyphus	0	0	0	0	0
| Family: Syrphidae	0	0	0	0	0
Antocha	0	17	0	180	0
Dicranota	0	33	0	40	0
Gonomyodes	0	0	0	0	0
Hesperoconopa	0	0	0	0	0
Hexatoma	0	67	0	20	13
Tipula	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0
Aturus	0	0	0	0	0
Feltria	140	0	0	0	0
Protzia	0	0	0	0	0
Atractides	0	0	0	0	0
Hygrobates	0	0	0	20	13
Lebertia	240	183	80	40	13
Sperchon	280	0	20	60	25
Sperchonopsis	0	0	0	0	0
Testudacarus	0	0	20	0	0
Torrenticola	20	50	40	0	0
| Order: Oribatida	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0
Enchytraeus	0	17	0	20	0
Chaetogaster	0	0	0	80	0
Nais	0	17	320	340	13
Pristina	0	0	0	0	0
Tubifex	0	0	0	0	0
Hydra	0	0	0	0	0
Total	**38,320**	**6,186**	**7,700**	**7,500**	**4,187**

Table G.37: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Reference							Mine-exposed				
Area	**ALUSM**	**ELUGH**	**FO26**	**HENUP**	**LI24**	**MI25**	**SLINE**	**BOCK**	**CORCK**	**EL19**	**EL1**	**EL20**
| Order: Collembola	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0.003	0	0
Ameletus	0	0.006	0	0.002	0.023	0.009	0.039	0	0	0.01	0.006	0
| Family: Baetidae	0.003	0	0	0	0	0.007	0	0	0	0	0.006	0.013
Acentrella	0	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0.026	0
Baetis	0	0.04	0.035	0	0.009	0	0.008	0.003	0	0.151	0.123	0
Baetis tricaudatus group	0.062	0.019	0.002	0	0	0	0.006	0	0	0.121	0.062	0.039
Baetis bicaudatus	0	0	0	0	0.003	0	0.006	0	0	0	0	0
| Family: Ephemerellidae	0	0.087	0	0.159	0.014	0	0.08	0	0.001	0.028	0.064	0.059
Drunella	0	0	0	0	0	0	0.017	0	0.001	0	0.003	0.003
Drunella coloradensis	0.003	0	0	0	0.003	0.001	0.011	0	0	0	0	0
Drunella doddsii	0.018	0.017	0	0.01	0.023	0.004	0.025	0	0	0.047	0.073	0.096
Drunella spinifera	0	0.009	0	0	0	0	0	0	0	0	0	0.021
Ephemerella	0.015	0.044	0	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	0.025	0	0	1	0.02	0	0.289	0	0.002	0.154	0	0
Cinygmula	0	0.002	0	0	0	0	0	0	0	0	0	0
Epeorus	0.006	0	0.008	0.019	0.014	0	0.006	0	0	0.003	0	0.003
Rhithrogena	0.012	0.009	0.019	0.064	0	0.001	0.006	0	0	0.016	0.018	0.01
| Family: Leptophlebiidae	0	0.004	0	0	0	0	0	0	0	0	0	0
Neoleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	0.002	0	0	0	0.001	0	0.003	0	0	0	0.003
| Family: Chloroperlidae	0.003	0	0.014	0	0.02	0.02	0.006	0	0.001	0	0	0
Suwallia	0	0	0	0	0	0	0.008	0	0	0	0	0
Sweltsa	0.009	0.004	0.027	0.008	0.02	0.01	0.025	0.003	0.001	0.065	0.009	0.023
| Family: Leuctridae	0.006	0	0.001	0	0	0	0.006	0	0	0	0	0.003
Despaxia augusta	0	0	0	0	0	0.001	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	0.001	0	0.006	0	0	0	0
Visoka cataractae	0	0	0	0.002	0.003	0	0	0	0	0	0	0
Zapada	0.049	0.017	0.01	0.002	0.014	0.026	0.028	0.003	0	0.006	0.003	0.008
Zapada oregonensis group	0.006	0	0.007	0.004	0.014	0.007	0.008	0	0	0	0	0
Zapada cinctipes	0.028	0.027	0	0	0	0	0	0.059	0	0.003	0	0.01
Zapada columbiana	0.009	0	0.019	0.01	0.02	0.004	0.036	0	0.001	0	0.003	0
| Family: Peltoperlidae	0	0	0	0	0	0.001	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0.003	0	0	0	0	0
| Family: Perlidae	0	0.019	0	0	0	0	0	0	0	0.028	0.021	0.023
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla	0	0.011	0	0	0	0	0	0	0	0.019	0	0
Hesperoperla pacifica	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	0.006	0.028	0.024	0	0.006	0.019	0.008	0.003	0.001	0.006	0.003	0.078
Isoperla	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys	0	0	0.021	0.004	0.034	0.002	0.017	0	0	0	0	0
Skwala	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella	0	0	0	0	0	0	0	0	0	0	0	0.003
| Family: Taeniopterygidae	0.003	0.021	0.053	0.002	0	0.015	0	0	0	0.01	0	0
Taenionema	0.006	0	0	0.077	0.006	0.019	0.028	0.003	0	0	0	0.023
| Order: Trichoptera	0	0	0	0	0	0	0	0.031	0	0	0	0.005
| Family: Apataniidae	0.003	0	0	0	0	0.007	0	0	0	0	0	0
Allomyia	0	0	0	0	0	0.001	0	0	0	0	0	0
Apatania	0	0	0	0	0	0.001	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0.003	0	0
| Family: Brachycentridae	0	0.006	0	0	0	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0.013
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0.003
| Family: Glossosomatidae	0.074	0	0	0	0	0	0	0	0	0	0.009	0.016
Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0
Glossosoma	0.049	0	0	0.004	0	0.002	0.006	0	0	0.003	0.009	0.021
| Family: Hydropsychidae	0	0	0.014	0.004	0.003	0.005	0.028	0	0.001	0.006	0	0.021
Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0
Arctopsyche grandis	0	0	0	0	0	0	0	0	0	0.003	0	0.013
Arctopsyche ladogensis	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche	0.006	0	0.005	0.004	0	0.014	0.003	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	0.045	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	0	0.015	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0	0.025	0	0	0	0
Ecclisomyia	0	0	0	0	0.011	0	0	0	0	0	0	0
Rhyacophila	0.031	0	0.001	0	0.003	0.016	0.011	0.003	0.031	0	0	0.003
Rhyacophila betteni group	0.006	0	0	0	0	0.001	0	0	0	0	0	0
Rhyacophila brunnea/vemna g	0.003	0	0	0	0	0.001	0.008	0	0.006	0	0	0.003
Rhyacophila hyalinata group	0	0	0.007	0.004	0	0	0.006	0	0	0	0	0
Rhyacophila vofixa group	0	0	0.005	0	0	0.001	0.003	0	0	0	0	0
Rhyacophila atrata complex	0	0	0	0	0	0	0	0	0	0.006	0	0
Rhyacophila narvae	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0.002	0.031	0	0	0	0.066	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0.003	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0	0.003	0	0	0	0
| Family: Elmidae	0.012	0	0	0	0	0.005	0	0	0.009	0	0	0
Heterlimnius	0.006	0.002	0	0	0	0.001	0	0.003	0.004	0.006	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0.003	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0.036	0	0	0	0
Probezzia	0.003	0	0	0.004	0	0	0	0	0	0	0	0.003
| Family: Chironomidae	0.022	0.049	0.013	0.004	0.078	0.009	0.028	0.031	0.02	0.013	0.015	0.016
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0	0
Pagastiella	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0	0	0	0	0.003	0
Constempellina sp. C	0	0	0	0	0	0.001	0	0	0	0	0	0
Micropsectra	0.037	0	0.029	0.01	0.006	0.047	0	0.039	0	0.071	0.012	0.041
Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0
Sublettea coffmani	0	0	0	0	0	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Diamesa	0	0	0.022	0	0.089	0	0.006	0	0	0	0	0
Pagastia	0.006	0.051	0.017	0	0.003	0.038	0	0.006	0	0.01	0.003	0.003
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa	0	0	0	0	0	0.001	0	0	0	0	0	0
Brillia	0.003	0	0.001	0	0	0.004	0	0.003	0	0	0	0
Corynoneura	0	0	0	0	0	0	0	0.095	0	0	0	0
Cricotopus (*Nostococladius*)	0	0	0.002	0	0	0.025	0	0	0.001	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	0	0.021	0.015	0.012	0.057	0.011	0.03	0.036	0.014	0.003	0.006	0.013
Heleniella	0	0	0	0	0	0	0	0.039	0.004	0	0	0.003
Hydrobaenus	0	0	0	0	0.017	0.002	0.003	0	0.001	0	0	0
Limnophyes	0	0	0	0	0	0	0	0.006	0	0	0	0
Metriocnemus	0	0	0	0	0	0	0	0.006	0	0	0	0

Table G.37: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Reference							Mine-exposed				
Area	**ALUSM**	**ELUGH**	**FO26**	**HENUP**	**LI24**	**MI25**	**SLINE**	**BOCK**	**CORCK**	**EL19**	**EL1**	**EL20**
Orthocladiinae RAI 004 (Like *Heleniella*)	0	0	0	0	0	0	0	0	0	0	0	0
Orthocladius complex	0.012	0	0	0.037	0	0	0.107	0.042	0	0.034	0.181	0.023
Parakiefferiella	0	0	0	0	0	0	0	0	0	0	0	0
Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0.002	0	0	0	0	0	0
Rheocricotopus	0	0	0.005	0	0.009	0.009	0	0	0	0.006	0.003	0.003
Synorthocladius	0	0	0	0	0	0.002	0.006	0	0	0	0	0
Thienemanniella	0	0.002	0	0	0	0	0	0	0.001	0	0	0
Tvetenia	0.006	0.013	0.001	0.006	0.011	0.01	0.011	0	0.02	0.01	0.05	0.008
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0.001	0	0	0
Zavrelimyia	0	0	0	0	0	0	0	0.003	0	0	0	0
Pentaneura	0	0	0	0	0	0	0	0.003	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	0.008	0.001	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0.008	0	0	0	0
| Family: Empididae	0.003	0.002	0	0.002	0	0.006	0	0.003	0.027	0.003	0.006	0
Chelifera/ Metachela	0.006	0	0	0	0	0.001	0	0	0.002	0.037	0	0.01
Clinocera	0	0.006	0	0	0	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	0	0	0	0	0	0.01	0	0
Oreogeton	0	0	0.001	0.008	0	0	0.006	0.014	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0	0.006	0	0	0	0.003
Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0	0.011	0.001	0	0	0
Pericoma/Telmatoscopus	0.055	0.044	0.002	0	0	0.002	0	0.008	0	0.022	0	0.013
| Family: Simuliidae	0	0	0	0	0	0	0	0.164	0.004	0	0.003	0
Prosimulium	0	0	0	0	0	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0
Simulium	0.015	0	0.008	0	0	0	0	0.092	0	0	0	0
Euparyphus	0	0	0	0	0	0	0	0.003	0	0	0	0
| Family: Syrphidae	0	0	0.001	0	0	0	0	0	0	0	0	0
Antocha	0	0.008	0	0	0.003	0	0	0	0.001	0.003	0	0
Dicranota	0	0	0	0	0	0.001	0.003	0.039	0.011	0	0	0.003
Gonomyodes	0	0	0	0	0.006	0	0	0	0	0	0	0
Hesperoconopa	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma	0	0.004	0	0	0	0	0	0	0	0.003	0	0
Tipula	0	0	0	0	0.003	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0.001	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	0	0.028	0	0	0
Feltria	0	0	0	0	0	0	0	0	0.005	0	0	0
Protzia	0	0	0	0	0.003	0	0	0	0	0	0	0
Atractides	0	0	0	0	0.003	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0.003	0.009	0.007	0.002	0.003	0.001	0.008	0.011	0.004	0.04	0	0.005
Sperchon	0	0	0.009	0.004	0.003	0	0	0.006	0.001	0.019	0	0
Sperchonopsis	0	0	0	0	0	0	0.003	0	0	0	0	0
Testudacarus	0.003	0	0.001	0	0	0	0	0	0	0.01	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0	0.003	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0.001	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	0.001	0	0.003	0	0	0.075	0	0.006	0	0
Chaetogaster	0	0	0	0	0	0	0	0	0.025	0	0	0
Nais	0.003	0	0	0	0	0	0	0.011	0.001	0.006	0	0
Pristina	0	0	0	0	0	0	0	0	0	0	0	0
Tubifex	0	0	0	0	0	0	0	0	0	0	0	0
Hydra	0	0	0	0	0	0	0	0.003	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.37: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed										
Area	**ELELKO**	**ELUFE**	**ELH93**	**FO23**	**FOBCP**	**FOBKS**	**FOBSC**	**FODGH**	**FODHE**	**FODPO**	**FOUEW**
| Order: Collembola	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
Ameletus	0.005	0	0	0	0	0	0	0	0.012	0.002	0
| Family: Baetidae	0.002	0	0.004	0	0	0	0	0.012	0	0	0
Acentrella	0.024	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0.002	0	0	0	0	0	0	0	0	0	0
Baetis	0	0.043	0.014	0.057	0.045	0.061	0.051	0	0.027	0.04	0.036
Baetis tricaudatus group	0.007	0.008	0	0.039	0.015	0.015	0.063	0.018	0	0.043	0.027
Baetis bicaudatus	0	0	0	0	0	0	0	0	0.033	0	0
| Family: Ephemerellidae	0	0	0.016	0.03	0.03	0.072	0.045	0	0	0.012	0.015
Drunella	0.001	0	0	0	0	0	0	0	0	0	0
Drunella coloradensis	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	0.007	0.007	0	0.118	0.027	0.015	0	0.013	0.006	0.002	0
Drunella spinifera	0	0.009	0	0	0.003	0	0.009	0.004	0	0	0.003
Ephemerella	0.01	0.006	0.016	0	0	0	0.003	0	0	0	0
| Family: Heptageniidae	0	0.044	0.029	0.073	0.072	0.223	0.051	0	0	0.046	0.086
Cinygmula	0	0	0	0	0	0	0	0	0	0	0
Epeorus	0	0	0	0	0	0.003	0.003	0.001	0.006	0	0
Rhithrogena	0.031	0.005	0	0.009	0	0	0	0.007	0.024	0	0
| Family: Leptophlebiidae	0.001	0.001	0	0	0	0	0	0	0	0	0
Neoleptophlebia	0	0.001	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0.002	0	0	0	0	0	0	0	0
| Order: Plecoptera	0.003	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0.007	0.001	0	0.009	0.003	0	0.006	0.002	0	0.009	0
| Family: Chloroperlidae	0	0	0.002	0.012	0	0.003	0.003	0.011	0.002	0.014	0
Suwallia	0	0	0	0	0	0	0	0	0	0	0
Sweltsa	0.009	0.013	0	0.109	0.003	0.006	0.003	0.012	0	0.007	0.009
| Family: Leuctridae	0	0	0	0	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0.007	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0
Zapada	0	0.001	0	0.021	0.1	0.052	0.039	0	0.018	0	0
Zapada oregonensis group	0	0	0	0	0	0.003	0	0.021	0	0.012	0.03
Zapada cinctipes	0.002	0	0	0.033	0.048	0.015	0.018	0.027	0	0.022	0.044
Zapada columbiana	0	0	0	0	0	0	0.003	0.006	0	0.003	0.027
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0.004	0.014	0	0.003	0	0.006	0	0.002	0.002	0.002	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0.018	0	0	0.006	0	0	0	0
Hesperoperla pacifica	0.002	0.006	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	0.037	0.025	0.004	0.021	0.112	0.026	0.033	0.02	0.047	0.069	0
Isoperla	0	0	0	0	0	0.009	0.021	0	0	0.026	0
Megarcys	0	0	0	0.003	0.036	0.035	0.021	0.018	0.018	0.017	0.015
Skwala	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella	0.002	0.001	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0.004	0.024	0	0.012	0.009	0.003	0.022	0.064	0
Taenionema	0.006	0	0	0	0.009	0	0	0.025	0	0	0.003
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0
Allomyia	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0.003	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0.006	0.003	0	0	0	0
Brachycentrus	0	0	0	0	0.003	0	0	0.004	0	0	0
Brachycentrus americanus	0	0.001	0	0	0.003	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0.009	0	0	0	0.006	0	0.015	0.053
Anagapetus	0	0	0	0	0	0	0	0	0	0	0
Glossosoma	0	0	0	0.024	0	0.006	0.009	0.003	0	0	0.006
| Family: Hydropsychidae	0	0.001	0.049	0	0.015	0	0	0	0	0	0.012
Arctopsyche	0.002	0	0	0	0	0	0	0	0	0	0
Arctopsyche grandis	0.001	0	0	0.003	0.051	0	0.003	0	0	0	0
Arctopsyche ladogensis	0	0	0	0	0.003	0	0	0	0	0	0
Hydropsyche	0	0	0.018	0	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	0.012	0.009	0	0.011	0.002	0	0.003
Hydroptila	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0.007	0.002	0.013	0.003	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0.002	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0	0	0	0.002	0
Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0	0.001	0	0	0.067	0.046	0.078	0.033	0	0.033	0.047
Rhyacophila betteni group	0	0	0	0.006	0.003	0.003	0	0	0	0.003	0
Rhyacophila brunnea/vemna g	0	0	0	0.003	0.003	0.015	0.012	0.005	0	0.009	0.009
Rhyacophila hyalinata group	0	0	0	0	0.003	0.009	0.009	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila atrata complex	0	0	0	0.024	0	0.003	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0	0	0	0.002	0
Neothremma	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0.003	0	0	0	0	0	0	0.003
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0.001	0	0	0	0	0	0.011	0	0.017	0.027
Heterlimnius	0	0.001	0	0.003	0	0	0	0.014	0	0.015	0.006
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0.005	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	0.006	0.017	0.009	0	0.004	0.003	0.003
| Family: Chironomidae	0.008	0.013	0.011	0.015	0.042	0.046	0.048	0.023	0.024	0.046	0.036
Microtendipes pedellus group	0	0	0.002	0	0	0	0	0	0	0	0
Pagastiella	0	0	0.002	0	0	0	0	0	0	0	0
Polypedilum	0	0.017	0.013	0	0	0	0	0	0	0	0
Constempellina sp. C	0	0.001	0	0	0	0	0	0	0	0	0
Micropsectra	0.037	0.02	0.02	0.127	0.063	0.101	0.066	0	0.029	0.022	0.033
Paratanytarsus	0	0.036	0	0	0	0	0	0	0	0	0
Rheotanytarsus	0.007	0.008	0.002	0	0	0	0	0.005	0	0	0
Stempellinella	0.001	0	0.004	0	0	0	0	0	0	0	0
Sublettea coffmani	0	0	0.002	0	0	0	0	0	0	0	0
Tanytarsus	0	0	0.002	0	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	0.003	0	0	0	0
Pagastia	0	0.01	0.005	0.006	0.024	0.017	0.033	0.03	0.008	0.019	0.068
Potthastia longimana group	0	0	0.004	0	0	0	0	0	0	0	0
Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0	0.002	0	0	0
Corynoneura	0	0	0	0	0	0	0	0.001	0	0	0.003
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	0.002	0.02	0.049	0.003	0.018	0.026	0.012	0.009	0.004	0.015	0.027
Heleniella	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	0.001	0	0	0	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0	0	0	0	0	0
Metriocnemus	0	0	0	0	0	0	0	0	0	0	0

Table G.37: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed										
Area	**ELELKO**	**ELUFE**	**ELH93**	**FO23**	**FOBCP**	**FOBKS**	**FOBSC**	**FODGH**	**FODHE**	**FODPO**	**FOUEW**
Orthocladiinae RAI 004 (Like *Heleniella*)	0	0	0	0	0	0	0	0	0	0	0
Orthocladius complex	0	0	0	0.027	0.027	0.003	0.075	0.033	0.014	0.048	0.092
Parakiefferiella	0	0	0.002	0	0	0	0	0	0	0	0
Paraphaenocladius	0	0.001	0	0	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0.002	0.008	0.002	0.006	0	0	0	0.001	0	0	0
Synorthocladius	0	0	0.002	0	0	0	0	0	0	0	0
Thienemanniella	0.002	0	0	0	0	0	0	0	0	0.002	0
Tvetenia	0	0.017	0.024	0.006	0.057	0.017	0.027	0.002	0.006	0.014	0.006
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0
Pentaneura	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0.024	0.017	0.025	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0.003	0	0	0	0	0.018	0.007	0	0.002	0.006
Chelifera/ Metachela	0	0.003	0	0.006	0	0	0	0.011	0	0.003	0.021
Clinocera	0	0.005	0	0.006	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	0	0	0	0	0	0.005	0
Oreogeton	0	0	0	0	0	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia	0	0.002	0	0.003	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	0	0	0.033	0.054	0.107	0.108	0.014	0.014	0.003	0.012
| Family: Simuliidae	0.003	0	0	0	0	0	0	0.001	0	0	0
Prosimulium	0	0	0	0	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0
Simulium	0	0	0	0	0.006	0	0	0.003	0.004	0.007	0.003
Euparyphus	0	0	0	0	0	0	0	0	0	0	0
| Family: Syrphidae	0	0	0	0	0	0	0	0	0	0	0
Antocha	0	0.013	0	0	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	0	0	0.002	0	0	0
Gonomyodes	0	0	0	0	0	0	0	0	0	0	0
Hesperoconopa	0	0	0	0	0	0	0	0	0	0	0
Hexatoma	0.003	0.002	0	0.006	0	0	0.003	0	0	0	0
Tipula	0	0	0	0.003	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0.003	0	0	0	0	0	0	0.006
| Family: Aturidae	0	0	0.002	0	0	0	0	0	0	0	0
Aturus	0	0	0.002	0	0	0	0	0.001	0	0	0.006
Feltria	0	0.001	0	0	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0	0	0	0	0
Atractides	0.001	0	0	0	0	0	0	0	0	0	0
Hygrobates	0.001	0	0	0	0	0	0	0	0.002	0	0
Lebertia	0.016	0.047	0.005	0.048	0.006	0.009	0.042	0.019	0.004	0.012	0.021
Sperchon	0.007	0.005	0.002	0.006	0.003	0	0.003	0.001	0.004	0	0
Sperchonopsis	0	0	0.002	0	0.003	0	0	0	0	0	0
Testudacarus	0	0.003	0	0	0	0	0	0.001	0	0	0
Torrenticola	0.001	0	0	0	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0.003	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0.003	0	0	0	0	0	0	0
Enchytraeus	0	0.001	0	0.009	0.018	0.006	0.051	0	0.002	0	0.003
Chaetogaster	0	0	0	0	0	0	0	0	0	0	0
Nais	0.002	0.046	0	0.018	0.003	0	0	0.012	0	0	0.024
Pristina	0.001	0	0	0	0	0	0	0	0	0	0
Tubifex	0	0.001	0	0	0	0	0	0	0	0	0
Hydra	0.002	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.37: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed										
Area	**FOUKI**	**FRUL**	**HACKDS**	**HACKUP**	**LCUT**	**LC_DC1**	**LC_DCDS**	**LC_FRB**	**LC_FRUS**	**LI8**	**LIDSL**
| Order: Collembola	0	0	0	0.001	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0
Ameletus	0.006	0	0.005	0.003	0	0	0.027	0.01	0.002	0.018	0.002
| Family: Baetidae	0.003	0	0	0	0	0	0	0	0	0	0
Acentrella	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0
Baetis	0.028	0.252	0.132	0	0.009	0.028	0	0.139	0	0.022	0.134
Baetis tricaudatus group	0.036	0.182	0.041	0.044	0.022	0.02	0	0	0.072	0.038	0.073
Baetis bicaudatus	0	0	0	0	0	0	0	0	0	0	0
| Family: Ephemerellidae	0.05	0.009	0.019	0	0	0.068	0	0.026	0.043	0.015	0.03
Drunella	0	0	0	0	0	0.006	0	0	0	0	0
Drunella coloradensis	0	0	0	0	0	0	0	0.003	0	0	0
Drunella doddsii	0.011	0.046	0.003	0.017	0.003	0.037	0.003	0	0.002	0.036	0.011
Drunella spinifera	0	0	0	0.017	0	0	0	0.018	0.023	0	0
Ephemerella	0	0	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	0.222	0.062	0.074	0	0.005	0	0	0.132	0	0.065	0.127
Cinygmula	0	0	0	0	0	0	0.005	0	0.002	0	0.002
Epeorus	0	0	0.003	0.001	0	0.006	0.016	0.005	0.004	0.003	0.019
Rhithrogena	0	0.018	0	0	0	0	0	0.003	0	0.019	0
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0
Neoleptophlebia	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	0.009	0	0	0	0	0	0	0.002	0.003	0
| Family: Chloroperlidae	0	0.025	0	0.002	0.003	0.006	0.008	0.005	0.002	0	0.002
Suwallia	0	0	0	0	0	0	0	0	0	0	0
Sweltsa	0.003	0.034	0.003	0.005	0.002	0.014	0.014	0.008	0.008	0.001	0.026
| Family: Leuctridae	0	0.003	0	0.001	0	0	0	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	0	0	0	0	0	0.004
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0
Zapada	0.008	0.006	0.033	0	0.003	0.065	0.038	0.028	0.072	0.056	0.043
Zapada oregonensis group	0.003	0	0.019	0.047	0.022	0.04	0.005	0.013	0.052	0.031	0.058
Zapada cinctipes	0.019	0.052	0.025	0.007	0	0	0	0.013	0.004	0.003	0.009
Zapada columbiana	0.014	0	0.016	0.009	0	0.017	0.011	0	0	0.001	0.032
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0
Yoraperla	0	0	0	0.012	0.002	0	0	0	0	0	0
| Family: Perlidae	0	0.049	0	0	0.002	0	0	0	0.004	0	0
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla	0	0.037	0	0	0	0	0	0	0.002	0	0
Hesperoperla pacifica	0.008	0	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	0.022	0.018	0.005	0.022	0.003	0.014	0.008	0.01	0.021	0.004	0.006
Isoperla	0	0	0	0	0	0	0	0	0	0	0
Megarcys	0.019	0	0.008	0.008	0.002	0.031	0.005	0	0.006	0.003	0.002
Skwala	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0.025	0	0	0.002	0	0.016	0	0	0	0
Taenionema	0.003	0	0	0	0	0.014	0	0	0	0	0.013
| Order: Trichoptera	0	0	0	0	0.002	0	0	0	0	0.001	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0.013
Allomyia	0	0	0	0	0	0	0	0	0	0	0
Apatania	0.006	0	0	0.007	0	0	0	0	0.002	0.061	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0.003	0.005	0	0	0	0	0.003	0	0	0
Brachycentrus	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0.014	0	0	0	0	0	0	0	0	0	0.002
Anagapetus	0	0	0	0	0	0	0	0	0	0.011	0
Glossosoma	0.019	0.016	0	0	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0.003	0.006	0.026	0	0.003	0	0	0.056
Arctopsyche	0	0	0	0	0	0	0	0	0	0	0
Arctopsyche grandis	0.006	0.003	0	0	0	0	0	0	0	0	0
Arctopsyche ladogensis	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	0	0	0
Parapsyche	0.006	0	0.027	0.002	0.012	0.043	0.025	0	0	0	0.009
Hydroptila	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0.003	0	0	0	0	0	0.003	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0.003	0	0	0	0.002	0.003	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0.003	0.025	0.003	0.004	0.002	0.006	0.003	0.005	0.027	0	0.004
Rhyacophila betteni group	0	0.009	0	0.003	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna g	0.003	0	0.003	0.001	0	0	0	0.005	0.01	0	0.002
Rhyacophila hyalinata group	0	0	0.008	0	0.002	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0.003	0	0	0	0
Rhyacophila atrata complex	0	0	0	0	0	0.003	0	0	0.01	0	0
Rhyacophila narvae	0	0	0.008	0.001	0	0	0	0	0.019	0	0
Neothremma	0	0	0	0.002	0	0	0	0	0	0	0
Oligophlebodes	0	0	0.008	0.022	0	0.09	0.033	0.005	0	0.024	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0.003	0	0	0.012	0	0	0	0	0.043	0	0
Heterlimnius	0	0	0.008	0.025	0	0	0	0	0.031	0	0
| Order: Diptera	0.003	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0.019	0	0	0	0	0	0	0	0.002	0	0
| Family: Chironomidae	0.058	0.009	0.041	0.009	0	0.003	0.008	0.021	0.021	0.022	0.063
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0
Pagastiella	0	0	0	0	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0.002	0	0.008	0	0	0	0
Constempellina sp. C	0	0.006	0	0	0	0	0	0	0	0	0
Micropsectra	0.103	0.028	0.027	0.01	0	0.003	0.038	0.041	0.025	0	0.05
Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0.002
Stempellinella	0	0	0	0	0	0	0	0	0	0	0
Sublettea coffmani	0	0	0	0	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0.012	0	0.005	0	0	0	0.006
Pagastia	0.019	0.006	0.019	0.011	0.054	0.011	0	0.039	0.062	0.001	0.013
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa	0	0	0.003	0	0.002	0.003	0.005	0	0	0.004	0
Brillia	0.003	0	0	0	0	0.006	0	0	0.002	0	0
Corynoneura	0	0	0	0	0	0	0	0	0.002	0.001	0.002
Cricotopus (*Nostococladius*)	0	0	0	0	0	0.02	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	0.011	0	0.025	0.002	0.073	0.006	0.003	0.005	0.006	0	0.002
Heleniella	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	0	0	0.003	0	0.002	0.011	0.049	0.003	0.004	0.038	0.058
Limnophyes	0	0	0	0	0	0	0	0	0.002	0	0
Metriocnemus	0	0	0	0	0	0	0	0	0	0	0

Table G.37: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed										
Area	**FOUKI**	**FRUL**	**HACKDS**	**HACKUP**	**LCUT**	**LC_DC1**	**LC_DCDS**	**LC_FRB**	**LC_FRUS**	**LI8**	**LIDSL**
Orthocladiinae RAI 004 (Like *Heleniella*)	0	0	0	0	0	0	0	0	0	0	0
Orthocladius complex	0.108	0.003	0.055	0.013	1	0	0	0.021	0.091	0.007	0.019
Parakiefferiella	0	0	0	0	0	0	0	0	0	0	0
Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0.008	0	0	0	0
Rheocricotopus	0	0	0.016	0.002	0.022	0	0	0	0.002	0.001	0.039
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0	0	0	0	0
Tvetenia	0.019	0.003	0.014	0.001	0.023	0.009	0	0	0.006	0.007	0.03
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0
Pentaneura	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0.003	0	0	0	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0.006	0	0	0	0	0	0	0.003	0.002	0	0.002
Chelifera/ Metachela	0.003	0.012	0	0.002	0	0.017	0	0.003	0.01	0	0
Clinocera	0	0	0	0	0	0	0	0	0.004	0	0
Neoplasta	0	0	0	0	0	0	0	0	0.01	0	0
Oreogeton	0	0	0	0	0	0	0	0	0	0	0.002
Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia	0	0.012	0	0	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0.058	0.021	0	0.044	0.002	0.011	0	0.005	0.008	0	0
| Family: Simuliidae	0	0	0	0	0	0.012	0.117	0	0	0	0
Prosimulium	0	0	0	0	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0.001	0	0	0	0	0	0	0
Simulium	0	0	0	0.004	0	0.023	0.098	0.003	0	0	0.004
Euparyphus	0	0	0	0	0	0	0	0	0	0	0
| Family: Syrphidae	0	0	0	0	0	0	0	0	0	0	0
Antocha	0	0	0.011	0	0	0	0	0	0.002	0	0
Dicranota	0	0.006	0	0.002	0	0	0	0	0	0	0
Gonomyodes	0	0	0	0	0	0	0	0	0	0	0
Hesperoconopa	0	0	0	0.001	0	0	0	0	0	0	0
Hexatoma	0.003	0	0	0.001	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	0.004	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0.019	0	0	0.003	0	0	0.004	0	0
Feltria	0	0	0.005	0	0.011	0	0	0	0.002	0	0.002
Protzia	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0.028	0	0	0	0.008	0.009	0.005	0.028	0.035	0	0.009
Sperchon	0.008	0	0	0	0.031	0	0	0	0	0.001	0.013
Sperchonopsis	0.003	0	0	0	0	0	0	0.003	0.006	0	0
Testudacarus	0	0.003	0	0	0	0	0	0	0	0	0
Torrenticola	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0.003	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0.025	0	0	0.002	0	0.006	0	0	0	0	0
Chaetogaster	0	0	0	0	0	0	0	0	0	0	0
Nais	0.003	0.003	0.066	0	0	0	0	0.026	0.008	0	0
Pristina	0	0	0	0	0	0	0	0	0	0	0
Tubifex	0	0	0	0	0	0	0	0	0	0	0
Hydra	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.37: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

	Mine-exposed				
Area	**LILC3**	**MI2**	**MI3**	**MIDCO**	**MIUCO**
| Order: Collembola	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0
Ameletus	0	0.003	0	0	0.006
| Family: Baetidae	0.003	0	0	0.003	0.006
Acentrella	0	0	0	0	0
Acentrella turbida	0	0	0	0	0
Baetis	0.006	0.054	0.086	0.011	0.078
Baetis tricaudatus group	0.002	0.062	0.052	0.016	0.018
Baetis bicaudatus	0	0	0	0	0
| Family: Ephemerellidae	0.003	0.07	0	0.011	0.2
Drunella	0	0	0	0	0
Drunella coloradensis	0	0	0.003	0	0
Drunella doddsii	0	0.051	0.018	0.005	0.03
Drunella spinifera	0.001	0.003	0.013	0.008	0.003
Ephemerella	0.001	0.024	0.075	0	0
| Family: Heptageniidae	0.01	0	0.068	0.005	0.111
Cinygmula	0	0	0	0	0
Epeorus	0	0.003	0	0	0
Rhithrogena	0	0.013	0.003	0	0.003
| Family: Leptophlebiidae	0	0	0	0	0.003
Neoleptophlebia	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0
| Family: Capniidae	0	0.003	0	0.021	0
| Family: Chloroperlidae	0.001	0	0.008	0	0.003
Suwallia	0	0	0	0	0
Sweltsa	0.006	0.108	0.008	0.003	0.012
| Family: Leuctridae	0	0	0	0.013	0.003
Despaxia augusta	0	0	0	0.005	0
| Family: Nemouridae	0	0	0	0	0
Visoka cataractae	0	0	0	0	0
Zapada	0.005	0	0.003	0.083	0.033
Zapada oregonensis group	0.012	0	0	0.005	0.003
Zapada cinctipes	0	0.005	0.008	0.064	0.021
Zapada columbiana	0.004	0.003	0	0	0
| Family: Peltoperlidae	0	0	0	0	0
Yoraperla	0	0	0	0.003	0
| Family: Perlidae	0	0	0	0	0.003
Calineuria californica	0	0	0	0.003	0
Hesperoperla	0	0	0	0	0
Hesperoperla pacifica	0	0	0	0	0
| Family: Perlodidae	0.001	0	0.003	0.011	0.042
Isoperla	0	0	0	0	0
Megarcys	0	0.003	0	0	0
Skwala	0	0.003	0.013	0	0
Pteronarcella	0	0	0	0	0
| Family: Taeniopterygidae	0	0.008	0	0.024	0
Taenionema	0	0	0.003	0.048	0.036
| Order: Trichoptera	0.001	0.003	0	0	0
| Family: Apataniidae	0	0	0	0.011	0
Allomyia	0	0	0	0.04	0.015
Apatania	0	0.118	0.099	0.013	0.06
Pedomoecus sierra	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0
Brachycentrus	0	0	0.003	0	0
Brachycentrus americanus	0	0	0	0	0
| Family: Glossosomatidae	0	0.005	0.088	0.005	0.003
Anagapetus	0	0	0	0	0
Glossosoma	0	0.1	0.112	0.005	0.003
| Family: Hydropsychidae	0.004	0	0	0.013	0.003
Arctopsyche	0	0	0	0	0
Arctopsyche grandis	0	0	0	0	0
Arctopsyche ladogensis	0	0	0	0	0
Hydropsyche	0	0	0	0.003	0
Parapsyche	0.008	0	0	0.013	0
Hydroptila	0	0	0	0	0
Lepidostoma	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0
| Family: Limnephilidae	0	0	0.003	0.005	0
Ecclisomyia	0	0	0	0	0
Rhyacophila	0.001	0	0	0.048	0.09
Rhyacophila betteni group	0	0	0	0	0.006
Rhyacophila brunnea/vemna g	0	0	0	0.003	0.006
Rhyacophila hyalinata group	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0.006
Rhyacophila atrata complex	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0
Neothremma	0	0	0	0	0
Oligophlebodes	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0
Stictotarsus	0	0	0	0	0
| Family: Elmidae	0	0	0.003	0.016	0.015
Heterlimnius	0	0.008	0.003	0.011	0.036
| Order: Diptera	0	0	0	0	0
Atherix	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0
Probezzia	0	0	0	0.005	0.003
| Family: Chironomidae	0	0.013	0.013	0.032	0
Microtendipes pedellus group	0	0	0	0	0
Pagastiella	0	0	0	0	0
Polypedilum	0.001	0.003	0.005	0	0
Constempellina sp. C	0	0	0	0	0
Micropsectra	0	0.013	0.013	0.005	0
Paratanytarsus	0	0	0	0	0
Rheotanytarsus	0.002	0	0	0	0
Stempellinella	0	0	0	0	0
Sublettea coffmani	0	0	0	0	0
Tanytarsus	0	0	0	0	0
Diamesa	0.014	0	0	0.016	0
Pagastia	0	0.003	0.008	0.043	0.015
Potthastia longimana group	0	0	0	0	0
Pseudodiamesa	0.002	0	0	0	0
Brillia	0	0	0	0	0
Corynoneura	0	0	0.003	0	0
Cricotopus (*Nostococladius*)	0.001	0	0	0	0.024
Diplocladius cultriger	0.002	0	0	0	0
Eukiefferiella	0	0.016	0	0.051	0
Heleniella	0	0	0	0	0
Hydrobaenus	0.005	0	0	0	0
Limnophyes	0	0	0	0	0
Metriocnemus	0	0	0	0	0

Table G.37: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Lowest Practical Level of Taxonomy, September 2016

Area	Mine-exposed				
	LILC3	MI2	MI3	MIDCO	MIUCO
Orthocladiinae RAI 004 (Like *Heleniella*)	0	0.003	0	0	0
Orthocladius complex	1	0.011	0.003	0	0
Parakiefferiella	0	0	0	0	0
Paraphaenocladius	0	0	0	0	0
Parorthocladius	0	0	0	0	0
Rheocricotopus	0	0.027	0.003	0	0
Synorthocladius	0	0	0	0	0
Thienemanniella	0	0	0	0	0
Tvetenia	0	0.011	0.003	0.005	0
| Subfamily: Tanypodinae	0	0	0	0	0
Zavrelimyia	0	0	0	0	0
Pentaneura	0	0	0	0	0
Thienemannimyia group	0	0	0.003	0.008	0.009
| Family: Dixidae	0	0	0	0	0
| Family: Empididae	0.001	0	0	0	0.003
Chelifera/ Metachela	0.001	0	0.003	0	0.012
Clinocera	0.001	0	0	0	0
Neoplasta	0	0.005	0	0	0
Oreogeton	0	0	0	0	0
Trichoclinocera	0	0	0	0	0
Wiedemannia	0	0	0.003	0	0
Limnophora	0	0	0	0	0
Pericoma/Telmatoscopus	0	0.005	0.034	0.011	0.06
| Family: Simuliidae	0	0	0	0	0
Prosimulium	0	0	0	0.011	0
Prosimulium/Helodon	0	0	0	0	0
Simulium	0	0	0	0	0
Euparyphus	0	0	0	0	0
| Family: Syrphidae	0	0	0	0	0
Antocha	0	0.003	0	0.024	0
Dicranota	0	0.005	0	0.005	0
Gonomyodes	0	0	0	0	0
Hesperoconopa	0	0	0	0	0
Hexatoma	0	0.011	0	0.003	0.003
Tipula	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0
Aturus	0	0	0	0	0
Feltria	0.004	0	0	0	0
Protzia	0	0	0	0	0
Atractides	0	0	0	0	0
Hygrobates	0	0	0	0.003	0.003
Lebertia	0.006	0.03	0.01	0.005	0.003
Sperchon	0.007	0	0.003	0.008	0.006
Sperchonopsis	0	0	0	0	0
Testudacarus	0	0	0.003	0	0
Torrenticola	0.001	0.008	0.005	0	0
| Order: Oribatida	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0
Enchytraeus	0	0.003	0	0.003	0
Chaetogaster	0	0	0	0.011	0
Nais	0	0.003	0.042	0.045	0.003
Pristina	0	0	0	0	0
Tubifex	0	0	0	0	0
Hydra	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.38: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Family Level of Taxonomy, September 2016

Area	Reference							Mine-exposed																	
	ALUSM	ELUGH	FO26	HENUP	LI24	MI25	SLINE	BOCK	CORCK	EL19	EL1	EL20	ELELKO	ELH93	ELUFE	FO23	FOBCP	FOBKS	FOBSC	FODHE	FODGH	FODPO	FOUEW	FOUKI	FRUL	HACKDS
Order: Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Ameletidae	0	60	0	10	160	140	70	0	0	13	25	0	120	0	0	0	0	0	0	120	0	20	0	8	0	40
Family: Baetidae	1,500	620	640	0	80	1,960	35	14	0	367	926	1,960	1,960	200	880	640	133	326	237	580	2,520	960	420	96	1,175	1,260
Family: Ephemerellidae	1,500	1,660	3,760	820	280	4,800	240	0	40	101	601	1,380	2,880	360	4,760	980	134	376	119	2,140	2,680	160	120	88	150	160
Family: Heptageniidae	280	1,540	5,100	2,950	240	1,240	545	0	40	233	1,200	1,200	2,940	320	840	540	160	976	112	4,680	2,760	540	580	320	217	560
Family: Leptophlebiidae	0	40	0	0	0	0	0	0	0	0	0	0	20	20	40	0	0	0	0	0	0	0	0	0	0	0
Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Capniidae	0	20	0	0	0	20	0	14	0	0	0	20	180	0	20	60	7	0	13	0	40	100	0	0	25	0
Family: Chloroperlidae	80	40	700	40	280	480	70	14	40	88	38	180	220	20	220	800	7	38	12	20	420	240	60	4	159	20
Family: Leuctridae	40	0	20	0	0	20	10	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	8	0
Family: Nemouridae	600	460	620	90	360	620	130	343	2,500	12	26	140	40	80	20	360	327	301	125	180	2,580	2,440	1,860	64	159	680
Family: Peltoperlidae	0	0	0	0	0	20	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Perlidae	0	320	0	0	0	0	0	0	0	63	88	180	140	0	340	140	0	25	13	20	40	20	0	12	233	0
Family: Perlodidae	40	300	780	20	280	340	45	14	20	8	13	600	920	40	440	160	327	301	157	640	720	1,300	100	60	50	100
Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	20	60	0	20	0	0	0	0	0	0	0	0	0	0	0
Family: Taeniopterygidae	60	220	920	380	40	540	50	14	0	13	0	180	140	40	0	160	20	50	19	220	520	740	20	4	67	0
Order: Trichoptera	0	0	0	0	0	0	0	157	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Apataniidae	20	0	0	0	0	160	0	0	0	4	0	0	0	0	0	20	0	0	0	0	0	0	0	8	0	0
Family: Brachycentridae	0	60	0	0	0	0	0	0	0	0	0	120	0	0	20	0	14	25	6	0	80	0	0	0	8	40
Family: Glossosomatidae	800	0	0	20	0	40	10	0	0	4	76	280	0	0	0	220	0	25	19	0	180	1,800	400	48	42	0
Family: Hydropsychidae	40	0	320	40	20	300	55	0	20	12	0	260	4,340	740	20	20	180	38	6	20	200	0	100	16	8	200
Family: Hydroptilidae	0	0	0	0	0	0	0	229	1,360	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	63	0	180	140	40	20	0	0	0	0	0	0	0	0	8	0
Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
Family: Limnephilidae	0	0	0	0	80	0	0	129	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	4	0	0
Family: Rhyacophilidae	260	0	220	20	20	320	50	14	600	8	0	40	0	0	20	220	168	327	207	0	720	540	380	8	92	160
Family: Uenoidae	0	20	540	0	0	0	120	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	20	0	0	60
Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Dytiscidae	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Elmidae	120	20	0	0	0	100	0	14	200	8	0	0	0	0	40	20	0	0	0	0	460	380	220	4	0	60
Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Family: Athericidae	0	0	0	0	0	0	0	0	0	0	13	0	0	0	80	0	0	0	0	0	0	0	0	0	0	0
Family: Ceratopogonidae	20	0	0	20	0	0	0	186	0	0	0	20	0	0	0	0	13	75	19	40	0	40	20	28	0	0
Family: Chironomidae	560	4,420	3,120	340	4,940	4,840	345	1,615	6,360	197	1,165	840	9,420	7,120	7,220	1,260	513	914	550	840	3,460	1,940	1,780	468	150	3,200
Family: Dixidae	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Empididae	60	80	20	50	0	120	10	114	480	67	26	100	0	0	240	100	0	0	38	0	340	120	180	12	66	0
Family: Muscidae	0	0	0	0	0	0	0	57	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Psychodidae	360	460	40	0	0	40	0	43	2,060	29	0	100	0	0	0	220	120	463	225	140	260	40	80	84	58	0
Family: Simuliidae	100	0	140	0	0	0	0	1,314	60	0	13	0	80	0	0	0	13	0	0	40	80	80	20	0	0	0
Family: Stratiomyidae	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Syrphidae	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Tipulidae	0	120	0	0	80	20	5	200	200	8	0	20	80	0	260	60	0	0	6	0	40	0	0	4	17	80
Order: Trombidiformes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	40	0	0	0
Family: Aturidae	0	0	0	0	0	20	0	0	460	0	0	0	0	40	0	0	0	0	0	0	20	0	40	0	0	140
Family: Feltriidae	0	0	0	0	0	0	0	0	80	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	40
Family: Hydryphantidae	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hygrobatidae	0	0	0	0	20	0	0	0	0	0	0	0	40	0	0	0	0	0	0	20	0	0	0	0	0	0
Family: Lebertiidae	20	100	120	10	20	20	15	57	60	54	0	40	400	60	820	320	13	38	88	40	360	140	140	40	0	0
Family: Sperchontidae	0	0	160	20	20	0	5	29	20	25	0	0	180	40	80	40	14	0	6	40	20	0	0	16	0	0
Family: Torrenticolidae	20	0	20	0	0	0	0	0	0	13	0	0	20	0	60	0	0	0	0	0	20	0	0	0	8	0
Order: Oribatida	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Family: Pisidiidae	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Family: Enchytraeidae	0	0	20	0	20	0	0	386	1,120	8	0	0	0	0	20	60	40	25	106	20	0	0	20	36	0	0
Family: Naididae	20	0	0	0	0	0	0	57	420	8	0	0	60	1,820	820	120	7	0	0	0	220	0	160	4	8	480
Family: Hydridae	0	0	0	0	0	0	0	14	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**6,500**	**10,560**	**17,280**	**4,830**	**6,960**	**16,160**	**1,815**	**5,127**	**16,180**	**1,347**	**4,273**	**7,740**	**24,540**	**11,060**	**17,340**	**6,620**	**2,210**	**4,323**	**2,083**	**9,800**	**18,740**	**11,620**	**6,760**	**1,440**	**2,708**	**7,280**

Table G.38: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Family Level of Taxonomy, September 2016

Area	Mine-exposed												
	HACKUP	LI8	LC_DC1	LC_DCDS	LC_FRB	LC_FRUS	LCUT	LIDSL	LILC3	MI2	MI3	MIDCO	MIUCO
Order: Collembola	20	0	0	0	0	0	0	0	0	0	0	0	0
Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Ameletidae	60	260	0	167	57	20	0	10	0	17	0	0	25
Family: Baetidae	2,160	860	213	0	2,785	1,720	400	960	380	716	1,060	220	425
Family: Ephemerellidae	5,100	740	488	1,134	257	660	40	190	140	917	2,200	180	976
Family: Heptageniidae	1,160	1,260	1,400	1,666	772	1,120	60	690	400	1,200	540	40	476
Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	0	13
Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Capniidae	0	40	0	0	0	20	0	0	0	17	0	160	0
Family: Chloroperlidae	140	20	88	133	72	100	60	130	240	667	120	20	63
Family: Leuctridae	20	0	0	0	0	0	0	0	0	0	0	140	13
Family: Nemouridae	4,360	1,300	538	333	299	1,240	320	680	780	50	80	1,140	239
Family: Peltoperlidae	220	0	0	0	0	0	20	0	0	0	0	20	0
Family: Perlidae	0	0	0	0	0	60	20	0	0	0	0	20	13
Family: Perlodidae	540	100	201	83	57	260	60	40	40	34	120	80	175
Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Taeniopterygidae	1,080	5,880	63	100	0	0	20	60	0	50	20	540	150
Order: Trichoptera	0	20	0	0	0	0	20	0	40	17	0	0	0
Family: Apataniidae	120	880	0	0	0	20	0	60	0	733	760	480	313
Family: Brachycentridae	0	0	0	0	14	0	0	0	0	0	20	0	0
Family: Glossosomatidae	0	160	0	0	0	0	0	10	0	650	1,540	80	26
Family: Hydropsychidae	100	0	301	150	14	0	240	300	440	0	0	220	13
Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Lepidostomatidae	0	0	0	0	14	0	0	0	0	0	0	0	0
Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Limnephilidae	0	0	13	0	0	0	20	0	0	0	20	40	0
Family: Rhyacophilidae	180	0	38	34	58	640	40	30	20	0	0	380	450
Family: Uenoidae	440	340	400	200	29	0	0	0	0	0	0	0	0
Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Elmidae	680	0	0	0	0	720	0	0	0	50	40	200	213
Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Ceratopogonidae	0	0	0	0	0	20	0	0	0	0	0	40	13
Family: Chironomidae	880	2,480	315	766	714	2,160	10,880	1,320	35,060	618	400	2,540	201
Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Empididae	40	0	75	0	28	260	0	20	100	33	40	0	63
Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Psychodidae	800	0	50	0	29	80	20	0	0	33	260	80	250
Family: Simuliidae	100	0	151	1,317	14	0	0	20	0	0	0	80	0
Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Tipulidae	80	0	0	0	0	20	0	0	0	117	0	240	13
Order: Trombidiformes	0	0	0	0	0	40	0	0	0	0	0	0	0
Family: Aturidae	0	0	13	0	0	40	0	0	0	0	0	0	0
Family: Feltriidae	0	0	0	0	0	20	140	10	140	0	0	0	0
Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	20	13
Family: Lebertiidae	0	0	38	33	157	340	100	40	240	183	80	40	13
Family: Sperchontidae	0	20	0	0	14	60	400	60	280	0	20	60	25
Family: Torrenticolidae	0	0	0	0	0	0	0	0	20	50	60	0	0
Order: Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hydrozetidae	0	0	13	0	0	0	0	0	0	0	0	0	0
Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Enchytraeidae	40	0	25	0	0	0	0	0	0	17	0	20	0
Family: Naididae	0	0	0	0	143	80	0	0	0	17	320	420	13
Family: Hydridae	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**18,320**	**14,360**	**4,423**	**6,116**	**5,527**	**9,700**	**12,860**	**4,630**	**38,320**	**6,186**	**7,700**	**7,500**	**4,187**

Table G.39: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Family Level of Taxonomy, September 2016

Area	Reference							Mine-exposed																	
	ALUSM	ELUGH	FO26	HENUP	LI24	MI25	SLINE	BOCK	CORCK	EL19	EL1	EL20	ELELKO	ELH93	ELUFE	FO23	FOBCP	FOBKS	FOBSC	FODHE	FODGH	FODPO	FOUEW	FOUKI	FRUL	HACKDS
Order: Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Ameletidae	0	0.006	0	0.002	0.023	0.009	0.039	0	0	0.01	0.006	0	0.005	0	0	0	0	0	0	0.012	0	0.002	0	0.006	0	0.005
Family: Baetidae	0	0.059	0.037	0	0.011	0	0.019	0.003	0	0.272	0.217	0	0	0.018	0.051	0.097	0.06	0.075	0.114	0.059	0	0.083	0.062	0.067	0	0
Family: Ephemerellidae	0	0	0	0.17	0.04	0	0.132	0	0.002	0.075	0.141	0	0	0.033	0	0.148	0.061	0.087	0.057	0	0	0.014	0.018	0.061	0.055	0.022
Family: Heptageniidae	0.043	0	0	1	0.034	0	0.3	0	0.002	0.173	0	0	0	0.029	0.048	0.082	0.072	0.226	0.054	0	0	0.046	0.086	0.222	0.08	0.077
Family: Leptophlebiidae	0	0.004	0	0	0	0	0	0	0	0	0	0	0.001	0.002	0.002	0	0	0	0	0	0	0	0	0	0	0
Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Capniidae	0	0.002	0	0	0	0.001	0	0.003	0	0	0	0.003	0.007	0	0.001	0.009	0.003	0	0.006	0	0.002	0.009	0	0	0.009	0
Family: Chloroperlidae	0.012	0.004	0.041	0.008	0.04	0.03	0.039	0.003	0.002	0.065	0.009	0.023	0.009	0.002	0.013	0.121	0.003	0.009	0.006	0.002	0.022	0.021	0.009	0.003	0.059	0.003
Family: Leuctridae	0.006	0	0.001	0	0	0.001	0.006	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0
Family: Nemouridae	0.092	0.044	0.036	0.019	0.052	0.038	0.072	0.067	0	0.009	0.006	0.018	0.002	0.007	0.001	0.054	0.148	0.07	0.06	0.018	0	0	0	0.044	0.059	0.093
Family: Peltoperlidae	0	0	0	0	0	0.001	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Perlidae	0	0.03	0	0	0	0	0	0	0	0.047	0.021	0.023	0.006	0	0.02	0.021	0	0.006	0.006	0.002	0.002	0.002	0	0.008	0.086	0
Family: Perlodidae	0.006	0.028	0.045	0.004	0.04	0.021	0.025	0.003	0.001	0.006	0.003	0.078	0.037	0.004	0.025	0.024	0.148	0.07	0.075	0.065	0.038	0	0.015	0.042	0.018	0.014
Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0.003	0.002	0	0.001	0	0	0	0	0	0	0	0	0	0	0
Family: Taeniopterygidae	0.009	0.021	0.053	0.079	0.006	0.033	0.028	0.003	0	0.01	0	0.023	0.006	0.004	0	0.024	0.009	0.012	0.009	0.022	0.028	0.064	0.003	0.003	0.025	0
Order: Trichoptera	0	0	0	0	0	0	0	0.031	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Apataniidae	0.003	0	0	0	0	0.01	0	0	0	0.003	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0.006	0	0
Family: Brachycentridae	0	0.006	0	0	0	0	0	0	0	0	0	0.016	0	0	0.001	0	0.006	0.006	0.003	0	0.004	0	0	0	0.003	0.005
Family: Glossosomatidae	0.123	0	0	0.004	0	0.002	0.006	0	0	0.003	0.018	0.036	0	0	0	0.033	0	0.006	0.009	0	0.01	0	0.059	0.033	0.016	0
Family: Hydropsychidae	0.006	0	0.019	0.008	0.003	0.019	0.03	0	0.001	0.009	0	0.034	0	0.067	0.001	0.003	0.081	0.009	0.003	0.002	0.011	0	0.015	0.011	0.003	0.027
Family: Hydroptilidae	0	0	0	0	0	0	0	0.045	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0.015	0	0.007	0.013	0.002	0.003	0	0	0	0	0	0	0	0	0.003	0
Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0
Family: Limnephilidae	0	0	0	0	0.011	0	0	0.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0.003	0	0
Family: Rhyacophilidae	0.04	0	0.013	0.004	0.003	0.02	0.028	0.003	0.037	0.006	0	0.005	0	0	0.001	0.033	0.076	0.076	0.099	0	0.038	0.046	0.056	0.006	0.034	0.022
Family: Uenoidae	0	0.002	0.031	0	0	0	0.066	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0.003	0	0	0.008
Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Dytiscidae	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Elmidae	0.018	0.002	0	0	0	0.006	0	0.003	0.012	0.006	0	0	0	0	0.002	0.003	0	0	0	0	0.025	0.033	0.033	0.003	0	0.008
Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0
Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0.005	0	0	0	0	0	0	0	0	0	0	0
Family: Ceratopogonidae	0.003	0	0	0.004	0	0	0	0.036	0	0	0	0.003	0	0	0	0	0.006	0.017	0.009	0.004	0	0.003	0.003	0.019	0	0
Family: Chironomidae	0.086	0	0	0.07	1	0	0.19	0	0	0.146	0	0.109	0	1	0	0	0.232	0.211	0.264	0.086	0	0	0	0.325	0.055	0
Family: Dixidae	0	0	0	0	0	0	0	0.008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Empididae	0.009	0.008	0.001	0.01	0	0.007	0.006	0.022	0.03	0.05	0.006	0.013	0	0	0.014	0.015	0	0	0.018	0	0.018	0.01	0.027	0.008	0.024	0
Family: Muscidae	0	0	0	0	0	0	0	0.011	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Psychodidae	0.055	0.044	0.002	0	0	0.002	0	0.008	0	0.022	0	0.013	0	0	0	0.033	0.054	0.107	0.108	0.014	0.014	0.003	0.012	0.058	0.021	0
Family: Simuliidae	0.015	0	0.008	0	0	0	0	0	0.004	0	0.003	0	0.003	0	0	0	0.006	0	0	0.004	0.004	0.007	0.003	0	0	0
Family: Stratiomyidae	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Syrphidae	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Tipulidae	0	0.011	0	0	0.011	0.001	0.003	0.039	0.012	0.006	0	0.003	0.003	0	0.015	0.009	0	0	0.003	0	0.002	0	0	0.003	0.006	0.011
Order: Trombidiformes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0.006	0	0	0
Family: Aturidae	0	0	0	0	0	0.001	0	0	0.028	0	0	0	0	0.004	0	0	0	0	0	0	0.001	0	0.006	0	0	0.019
Family: Feltriidae	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0.005
Family: Hydryphantidae	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hygrobatidae	0	0	0	0	0.003	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0.002	0	0	0	0	0	0
Family: Lebertiidae	0.003	0.009	0.007	0.002	0.003	0.001	0.008	0.011	0.004	0.04	0	0.005	0.016	0.005	0.047	0.048	0.006	0.009	0.042	0.004	0.019	0.012	0.021	0.028	0	0
Family: Sperchontidae	0	0	0.009	0.004	0.003	0	0.003	0.006	0.001	0.019	0	0	0.007	0.004	0.005	0.006	0.006	0	0.003	0.004	0.001	0	0	0.011	0	0
Family: Torrenticolidae	0.003	0	0.001	0	0	0	0	0	0	0.01	0	0	0.001	0	0.003	0	0	0	0	0	0.001	0	0	0	0.003	0
Order: Oribatida	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0
Family: Pisidiidae	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0
Family: Enchytraeidae	0	0	0.001	0	0.003	0	0	0.075	0	0.006	0	0	0	0	0.001	0.009	0.018	0.006	0.051	0.002	0	0	0.003	0.025	0	0
Family: Naididae	0.003	0	0	0	0	0	0	0.011	0.026	0.006	0	0	0.002	0	0.047	0.018	0.003	0	0	0	0.012	0	0.024	0.003	0.003	0.066
Family: Hydridae	0	0	0	0	0	0	0	0.003	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.39: Proportional Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference (n = 7) and Mine-exposed (n = 32) Areas based on Family Level of Taxonomy, September 2016

Area	Mine-exposed												
	HACKUP	LI8	LC_DC1	LC_DCDS	LC_FRB	LC_FRUS	LCUT	LIDSL	LILC3	MI2	MI3	MIDCO	MIUCO
Order: Collembola	0.001	0	0	0	0	0	0	0	0	0	0	0	0
Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Ameletidae	0.003	0.018	0	0.027	0.01	0.002	0	0.002	0	0.003	0	0	0.006
Family: Baetidae	0	0.06	0.048	0	1	0	0.031	0.207	0.01	0.116	0	0.029	0.102
Family: Ephemerellidae	0	0.052	0.11	0	0.046	0.068	0.003	0.041	0.004	0.148	0	0.024	0.233
Family: Heptageniidae	0	0	0	0	0.14	0	0.005	0.149	0.01	0	0.07	0.005	0.114
Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	0	0.003
Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Capniidae	0	0.003	0	0	0	0.002	0	0	0	0.003	0	0.021	0
Family: Chloroperlidae	0.008	0.001	0.02	0.022	0.013	0.01	0.005	0.028	0.006	0.108	0.016	0.003	0.015
Family: Leuctridae	0.001	0	0	0	0	0	0	0	0	0	0	0.019	0.003
Family: Nemouridae	0	0	0.122	0.054	0.054	0	0.025	0.147	0.02	0.008	0.01	0	0.057
Family: Peltoperlidae	0.012	0	0	0	0	0	0.002	0	0	0	0	0.003	0
Family: Perlidae	0	0	0	0	0	0.006	0.002	0	0	0	0	0.003	0.003
Family: Perlodidae	0.029	0.007	0.045	0.014	0.01	0.027	0.005	0.009	0.001	0.005	0.016	0.011	0.042
Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Taeniopterygidae	0	0	0.014	0.016	0	0	0.002	0.013	0	0.008	0.003	0.072	0.036
Order: Trichoptera	0	0.001	0	0	0	0	0.002	0	0.001	0.003	0	0	0
Family: Apataniidae	0.007	0.061	0	0	0	0.002	0	0.013	0	0.118	0.099	0.064	0.075
Family: Brachycentridae	0	0	0	0	0.003	0	0	0	0	0	0.003	0	0
Family: Glossosomatidae	0	0.011	0	0	0	0	0	0.002	0	0.105	0	0.011	0.006
Family: Hydropsychidae	0.005	0	0.068	0.025	0.003	0	0.019	0.065	0.011	0	0	0.029	0.003
Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Lepidostomatidae	0	0	0	0	0.003	0	0	0	0	0	0	0	0
Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Limnephilidae	0	0	0.003	0	0	0	0.002	0	0	0	0.003	0.005	0
Family: Rhyacophilidae	0.01	0	0.009	0.006	0.01	0.066	0.003	0.006	0.001	0	0	0.051	0.107
Family: Uenoidae	0.024	0.024	0.09	0.033	0.005	0	0	0	0	0	0	0	0
Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Elmidae	0.037	0	0	0	0	0.074	0	0	0	0.008	0.005	0.027	0.051
Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Ceratopogonidae	0	0	0	0	0	0.002	0	0	0	0	0	0.005	0.003
Family: Chironomidae	0.048	0	0.071	0.125	0.129	0	1	0	1	0.1	0.052	0	0.048
Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Empididae	0.002	0	0.017	0	0.005	0.027	0	0.004	0.003	0.005	0.005	0	0.015
Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Psychodidae	0.044	0	0.011	0	0.005	0.008	0.002	0	0	0.005	0.034	0.011	0.06
Family: Simuliidae	0.005	0	0.034	0	0.003	0	0	0.004	0	0	0	0.011	0
Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Tipulidae	0.004	0	0	0	0	0.002	0	0	0	0.019	0	0.032	0.003
Order: Trombidiformes	0	0	0	0	0	0.004	0	0	0	0	0	0	0
Family: Aturidae	0	0	0.003	0	0	0.004	0	0	0	0	0	0	0
Family: Feltriidae	0	0	0	0	0	0.002	0.011	0.002	0.004	0	0	0	0
Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0.003	0.003
Family: Lebertiidae	0	0	0.009	0.005	0.028	0.035	0.008	0.009	0.006	0.03	0.01	0.005	0.003
Family: Sperchontidae	0	0.001	0	0	0.003	0.006	0.031	0.013	0.007	0	0.003	0.008	0.006
Family: Torrenticolidae	0	0	0	0	0	0	0	0	0.001	0.008	0.008	0	0
Order: Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hydrozetidae	0	0	0.003	0	0	0	0	0	0	0	0	0	0
Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Enchytraeidae	0.002	0	0.006	0	0	0	0	0	0	0.003	0	0.003	0
Family: Naididae	0	0	0	0	0.026	0.008	0	0	0	0.003	0.042	0.056	0.003
Family: Hydridae	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**

Table G.40: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference and Mine-exposed Areas in the Fording River Based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Fording River Reference Streams							Fording River Main Stem Mine-exposed																		
	FO26	HENUP	CHCK	EWCK	LC_GRCK	LI24	SLINE	HENFO	FODHE	FOUNGD	FODNGD	MP1	FOUSH	FOUKI	FOBKS	FOBSC	FOBCP	FODPO	FO22	FOUEW	LC_FRUS	FO29	FODGH	FO9	FRUL	FO23
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	80	40	60	0	0	164	217	300	80	60	0	50	100	60	0	45	0	0	0	0	7	100	0	20	0	30
Family: Baetidae	0	0	40	0	0	0	33	0	40	0	0	0	0	0	0	0	0	0	20	0	7	0	0	0	0	0
Acentrella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acentrella turbida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis	1,280	80	200	300	240	0	0	180	1,000	500	680	233	1,140	250	363	164	150	0	80	40	87	500	440	280	218	210
Baetis bicaudatus	0	0	40	60	0	0	17	0	0	0	0	17	60	0	0	0	0	0	0	0	7	0	0	0	0	10
Baetis tricaudatus group	0	0	0	100	40	0	33	40	300	360	680	233	1,000	290	438	227	13	0	60	0	33	520	160	140	45	50
Family: Ephemerellidae	960	400	500	640	120	55	650	4,000	3,640	500	420	217	240	120	100	91	63	120	760	460	67	660	1,220	40	64	180
Caudatella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drunella doddsii	360	60	260	660	0	9	67	0	60	80	20	0	0	10	13	27	75	20	700	80	7	60	180	80	64	40
Drunella flavilinea	0	0	0	40	0	0	50	40	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0
Drunella grandis group	0	0	0	0	0	0	0	20	0	0	20	33	20	10	0	9	0	0	80	40	40	200	80	20	0	10
Drunella sp.	0	0	20	20	0	9	0	0	0	20	20	0	0	0	0	0	0	0	20	0	0	20	0	0	0	20
Drunella spinifera	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerella	0	0	0	20	0	0	0	0	0	0	0	0	0	50	13	0	0	0	20	0	0	0	0	0	0	0
Family: Heptageniidae	3,560	4,100	4,260	1,620	640	1,291	2,117	5,600	5,200	3,720	4,040	2,017	2,700	1,430	975	582	388	680	1,060	1,340	560	980	1,740	1,900	427	230
Cinygmula sp.	0	0	80	0	0	218	17	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epeorus	40	200	100	180	260	0	483	140	60	60	80	0	80	10	38	27	0	0	0	40	0	0	0	0	0	0
Rhithrogena	60	200	0	60	40	155	200	20	60	100	40	0	0	40	25	0	0	0	0	0	0	0	60	180	91	10
Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Capniidae	0	20	0	0	180	55	0	40	0	0	40	50	20	10	13	18	50	20	40	0	0	0	0	140	18	10
Capnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utacapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Chloroperlidae	40	0	0	120	80	36	0	0	0	0	0	0	0	0	13	0	0	20	40	0	0	0	0	0	45	10
Suwallia	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweltsa sp.	280	40	80	60	40	264	200	40	40	80	80	17	60	0	25	9	0	80	80	0	13	60	60	120	227	70
Family: Leuctridae	20	0	20	0	0	9	17	0	40	0	0	17	0	0	0	0	0	0	0	0	0	20	0	0	0	0
Despaxia augusta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleuctra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Nemouridae	0	0	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0
Amphinemura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zapada	100	80	0	240	960	36	117	180	1,720	240	240	350	80	20	25	73	400	1,200	1260+T104	320	53	780	1,780	320	45	490
Zapada cinctipes	0	0	20	20	40	0	100	20	0	0	20	50	200	60	50	18	250	0	0	20	60	120	120	60	155	40
Zapada columbiana	40	60	140	0	560	182	217	80	0	0	0	17	0	30	0	0	0	0	0	0	0	20	0	0	0	0
Zapada oregonensis group	180	20	300	80	60	0	67	60	0	20	0	0	0	10	0	0	0	60	80	300	80	60	120	20	9	30
Family: Peltoperlidae	0	0	0	20	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yoraperla sp.	0	0	20	0	20	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Perlidae	0	0	0	0	0	0	0	0	20	20	20	17	0	10	25	9	88	0	0	20	7	20	0	100	155	410
Calineuria californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Claassenia sabulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doroneuria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesperoperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	27	50
Family: Perlodidae	520	0	1,580	0	140	9	50	40	580	260	280	133	200	130	338	236	1,275	2,120	7,320	1,700	127	280	820	220	0	40
Isoperla sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megarcys sp.	180	40	280	80	0	36	217	20	120	100	20	67	100	10	25	55	75	140	100	100	7	0	80	0	0	0
Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taenionema	120	1,760	180	280	20	127	267	600	180	400	240	50	160	10	200	91	238	3,180	520	40	13	60	960	580	782	90
Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0
Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Brachycentridae	80	20	0	0	0	0	0	20	20	0	0	0	20	0	0	0	38	0	0	20	0	60	20	20	55	80
Brachycentrus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachycentrus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrasema	0	0	100	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Family: Glossosomatidae	20	0	0	0	160	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
Glossosoma	0	0	20	160	200	0	0	0	0	0	0	0	0	10	25	36	0	1,200	780	680	0	160	300	160	0	50
Family: Hydropsychidae	0	40	200	80	200	27	467	40	20	0	0	0	80	0	0	9	0	0	0	20	0	0	40	0	0	0
Arctopsyche sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63	0	13	0	0	0	0	0	0	20	0	10
Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapsyche sp.	20	20	60	20	0	0	17	20	20	0	0	33	0	10	13	9	25	0	0	0	20	20	20	0	0	0
Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.40: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference and Mine-exposed Areas in the Fording River Based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Fording River Reference Streams							Fording River Main Stem Mine-exposed																		
	FO26	HENUP	CHCK	EWCK	LC_GRCK	LI24	SLINE	HENFO	FODHE	FOUNGD	FODNGD	MP1	FOUSH	FOUKI	FOBKS	FOBSC	FOBCP	FODPO	FO22	FOUEW	LC_FRUS	FO29	FODGH	FO9	FRUL	FO23
Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	100	0	0	340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Limnephilidae	0	0	60	0	820	73	133	0	20	0	20	67	40	30	13	0	0	60	40	20	0	20	40	0	18	0
Clostoeca disjuncta	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicosmoecus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecclisomyia sp.	0	0	0	0	0	0	67	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0
Hesperophylax sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0	0	140	0	200	18	183	20	0	120	320	100	0	0	63	27	138	300	480	200	27	80	100	300	36	250
Rhyacophila brunnea/vemna group	0	0	60	0	0	0	17	0	0	20	60	33	0	0	13	27	0	60	240	40	87	20	260	100	0	40
Rhyacophila betteni group	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0
Rhyacophila hyalinata group	0	20	20	0	0	0	0	0	0	20	20	17	0	10	0	27	13	0	0	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neothremma sp.	0	0	0	0	1,160	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	33	0	0	20	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0
Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Agabus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Elmidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	1,040	40	7	20	20	0	0	0
Heterlimnius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0
Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optioservus sp.	0	0	0	0	20	0	0	0	0	0	0	17	0	10	0	0	0	20	1,460	80	0	120	60	0	9	20
Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ametor sp. (Adult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Diptera	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blepharicera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atrichopogon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	40	120	0	17	20	30	13	9	25	40	40	0	0	0	0	0	0	0
Forcipomyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Chironomidae	40	100	800	100	0	18	17	320	520	40	60	150	160	90	88	18	138	200	860	360	67	460	300	140	55	60
Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtendipes pedellus group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paratendipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	220	40	400	20	0	0	0	900	1,600	40	20	50	80	20	25	45	13	60	320	20	20	400	160	60	36	10
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stempellinella sp.	0	0	0	0	0	0	0	0	320	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0
Sublettea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribe: Boreoheptagyiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boreoheptagyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diamesa	20	0	0	20	0	0	0	40	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0
Pagastia	180	20	260	20	20	0	0	220	160	20	40	233	40	30	63	36	38	100	420	140	200	540	360	0	0	30
Potthastia longimana group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudodiamesa sp.	100	20	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subfamily: Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brillia sp.	20	0	0	20	280	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Eukiefferiella	60	0	280	40	0	0	0	20	60	20	20	100	40	0	13	0	75	20	160	100	27	140	0	0	0	80
Heleniella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0
Heterotrissocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius marcidus group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrobaenus	60	0	180	0	40	0	0	0	0	0	0	17	0	0	13	0	0	0	0	0	7	140	20	20	0	110
Krenosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophyes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthocladius	360	60	100	240	0	9	67	460	900	160	20	700	120	50	0	0	238	420	1,660	1,080	247	580	420	40	45	390

Table G.40: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference and Mine-exposed Areas in the Fording River Based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Fording River Reference Streams							Fording River Main Stem Mine-exposed																		
	FO26	HENUP	CHCK	EWCK	LC_GRCK	LI24	SLINE	HENFO	FODHE	FOUNGD	FODNGD	MP1	FOUSH	FOUKI	FOBKS	FOBSC	FOBCP	FODPO	FO22	FOUEW	LC_FRUS	FO29	FODGH	FO9	FRUL	FO23
Orthocladius lignicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parorthocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	80	40	420	180	20	64	33	40	20	0	0	17	40	0	0	0	0	0	80	0	0	120	20	0	9	70
Synorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	60	0	0	0	0
Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tvetenia bavarica group	0	0	300	20	60	27	17	80	100	0	0	17	40	0	0	0	150	60	380	0	7	120	0	20	9	10
Subfamily: Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontomesa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pentaneura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0
Tribe: Procladiini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Empididae	20	0	0	0	0	0	0	0	20	0	0	0	20	0	0	27	50	20	20	0	0	60	20	0	0	50
Chelifera/ Metachela	0	0	60	0	20	0	0	0	0	0	0	17	0	0	0	0	0	20	80	20	13	20	60	0	18	40
Clinocera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
Hemerodromia sp.	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreogeton sp.	0	0	0	0	0	0	183	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiedemannia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	0
Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnophora sp.	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glutops sp.	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Family: Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus sp.	20	0	1,000	0	0	0	0	20	40	40	100	150	240	480	963	664	100	20	220	80	47	380	480	1,320	145	150
Psychoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Simuliidae	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	100	0	0	0	0	0	9	0
Simulium	0	0	40	0	0	0	0	40	0	0	40	0	0	0	0	118	38	0	120	0	0	0	0	0	9	10
Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euparyphus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tabanus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Tipulidae	0	0	0	0	20	18	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0
Antocha sp.	0	0	0	0	0	0	0	0	0	0	40	0	20	10	0	0	0	0	20	0	7	0	0	0	0	50
Dicranota	140	20	0	20	0	36	0	0	0	60	60	50	20	10	0	0	13	20	200	20	0	20	100	20	0	10
Hesperoconopa sp.	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexatoma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0
Limnophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeshna sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Order: Trombidiformes	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	20	0	0	9	0
Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feltria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protzia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0

Table G.40: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference and Mine-exposed Areas in the Fording River Based on Lowest Practical Level of Taxonomy, September 2015

Organism Identification	Fording River Reference Streams							Fording River Main Stem Mine-exposed																		
	FO26	HENUP	CHCK	EWCK	LC_GRCK	LI24	SLINE	HENFO	FODHE	FOUNGD	FODNGD	MP1	FOUSH	FOUKI	FOBKS	FOBSC	FOBCP	FODPO	FO22	FOUEW	LC_FRUS	FO29	FODGH	FO9	FRUL	FO23
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	20	0	140	20	0	18	0	60	0	0	60	83	80	30	13	36	38	20	20	220	27	200	160	220	27	60
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mideopsis sp.	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	20	0	0	0	0	9	17	40	0	0	0	17	20	0	13	27	13	0	0	40	13	0	40	0	0	10
Sperchonopsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stygothrombium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testudacarus sp.	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	7	20	0	0	18	40
Torrenticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribatida	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	20	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fossaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	13	0	0	0	0	0	20	0	0	0
Rhynchelmis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	0	18	0	0	20	0	0	0	60	80	88	109	13	0	60	0	0	0	80	0	0	30
Fridericia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0
Nais	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	220	0	40	0	0
| Subfamily: Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**9,400**	**7,500**	**13,360**	**6,060**	**6,760**	**3,008**	**6,505**	**13,820**	**17,060**	**7,260**	**7,840**	**5,470**	**7,320**	**3,490**	**4,161**	**2,923**	**4,260**	**10,340**	**19,880**	**7,720**	**2,065**	**8,580**	**10,980**	**6,720**	**3,006**	**3,780**

Table G.41: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference and Mine-exposed Areas in the Fording River Based on Family Level of Taxonomy, September 2015

Organism Identification	Fording River Reference Streams							Fording River Main Stem Mine-exposed						
	FO26	HENUP	CHCK	EWCK	LC_GRCK	LI24	SLINE	HENFO	FODHE	FOUNGD	FODNGD	MP1	FOUSH	FOUKI
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	80	40	60	0	0	164	217	300	80	60	0	50	100	60
| Family: Baetidae	1,280	80	280	460	280	0	83	220	1,340	860	1,360	483	2,200	540
| Family: Ephemerellidae	1,320	460	820	1,380	120	73	767	4,060	3,700	600	480	250	260	190
| Family: Heptageniidae	3,660	4,500	4,440	1,860	940	1,664	2,817	5,780	5,340	3,900	4,160	2,017	2,780	1,480
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	0	20	0	0	180	55	0	40	0	0	40	50	20	10
| Family: Chloroperlidae	320	40	80	220	120	300	200	40	40	80	80	17	60	0
| Family: Leuctridae	20	0	20	0	0	9	17	0	40	0	0	17	0	0
| Family: Nemouridae	320	160	860	340	1,620	218	501	340	1,720	260	260	417	280	120
| Family: Peltoperlidae	0	0	20	20	100	0	67	0	0	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	0	0	0	20	20	20	17	0	10
| Family: Perlodidae	700	40	1,860	80	140	45	267	60	700	360	300	200	300	140
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	120	1,760	180	280	20	127	267	600	180	400	240	50	160	10
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	40	0	0	0	0	0	0
| Family: Brachycentridae	80	20	100	60	0	0	0	20	20	0	0	0	20	0
| Family: Glossosomatidae	20	0	20	160	360	0	0	0	0	0	0	0	0	10
| Family: Hydropsychidae	20	60	260	100	200	27	484	60	40	0	0	33	80	10
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	100	0	0	340	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	60	0	820	73	217	0	20	0	20	67	40	30
| Family: Rhyacophilidae	0	20	220	0	200	18	200	20	0	180	400	150	0	10
| Family: Uenoidae	0	0	0	0	1,160	18	33	0	0	20	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	20	0	0	0	0	0	0	17	0	10
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	17	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0	0	40	120	0	17	20	30
| Family: Chironomidae	1,140	280	2,740	700	420	118	151	2,080	3,680	280	160	1,284	520	200
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	20	0	60	20	20	0	183	0	20	0	0	17	20	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	20	0
| Family: Pelecorhynchidae	0	0	0	0	20	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	20	0	1,000	0	0	0	0	20	40	40	100	150	240	480
| Family: Simuliidae	0	0	60	0	0	0	0	40	0	0	40	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	140	20	0	20	20	54	0	0	0	80	120	50	40	20
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	60	0	0	0	0	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	20	0	140	20	0	18	0	60	0	0	60	83	80	30
| Family: Mideopsidae	0	0	0	0	0	0	0	0	20	0	0	0	0	0
| Family: Sperchontidae	20	0	0	0	0	9	17	40	0	0	0	17	20	0
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	17	0	0
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	20	0	0	0	0	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0	20
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	18	0	0	20	0	0	0	60	80
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**9,400**	**7,500**	**13,360**	**6,060**	**6,760**	**3,008**	**6,505**	**13,820**	**17,060**	**7,260**	**7,840**	**5,470**	**7,320**	**3,490**

Table G.41: Total Benthic Invertebrate Abundance in 3-Minute Travelling Kick Samples Collected at Reference and Mine-exposed Areas in the Fording River Based on Family Level of Taxonomy, September 2015

Organism Identification	Fording River Main Stem Mine-exposed											
	FOBKS	FOBSC	FOBCP	FODPO	FO22	FOUEW	LC_FRUS	FO29	FODGH	FO9	FRUL	FO23
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	45	0	0	0	0	7	100	0	20	0	30
| Family: Baetidae	801	391	163	0	160	40	134	1,020	600	420	263	270
| Family: Ephemerellidae	126	127	138	140	1,580	580	114	960	1,480	140	128	250
| Family: Heptageniidae	1,038	609	388	680	1,060	1,380	560	980	1,800	2,080	518	240
| Family: Leptophlebiidae	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Capniidae	13	18	50	20	40	0	0	0	0	140	18	10
| Family: Chloroperlidae	38	9	0	100	120	0	13	60	60	120	272	80
| Family: Leuctridae	0	0	0	0	0	0	0	20	0	0	0	0
| Family: Nemouridae	75	91	650	1,260	1,340	640	193	980	2,020	400	218	560
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Perlidae	25	9	88	0	0	20	20	20	0	100	182	460
| Family: Perlodidae	363	291	1,350	2,260	7,420	1,800	134	280	900	220	0	40
| Family: Pteronarcyidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	200	91	238	3,180	520	40	13	60	960	580	782	90
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	20	0	0
| Family: Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	38	0	0	20	0	60	20	20	55	90
| Family: Glossosomatidae	25	36	0	1,200	800	680	0	160	300	160	0	50
| Family: Hydropsychidae	76	18	38	0	0	20	20	20	60	20	0	10
| Family: Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	13	9	0	60	40	20	0	20	40	0	18	0
| Family: Rhyacophilidae	76	81	164	360	720	240	114	100	360	400	36	290
| Family: Uenoidae	0	0	0	0	40	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	10
| Family: Elmidae	0	0	0	40	2,500	120	20	140	80	0	9	20
| Family: Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	20	0	0	0	0	0	0	0
| Family: Athericidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Blephariceridae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ceratopogonidae	13	9	25	40	40	0	0	0	0	0	0	0
| Family: Chironomidae	202	108	652	860	3,880	1,720	575	2,580	1,280	280	163	790
| Family: Dixidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	27	50	40	100	20	13	80	80	0	82	120
| Family: Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	7	0	0	0	0	0
| Family: Psychodidae	963	664	100	20	220	80	47	380	480	1,320	145	150
| Family: Simuliidae	0	118	38	40	220	0	0	0	0	0	18	10
| Family: Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	13	20	220	20	7	20	120	20	45	70
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Odonata	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Aeshnidae	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Malacostraca	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	20	0	20	0	0	9	0
| Family: Aturidae	0	0	0	0	20	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	20	0	0	0
| Family: Lebertiidae	13	36	38	20	20	220	27	200	160	220	27	60
| Family: Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Sperchontidae	13	27	13	0	0	40	13	60	40	0	0	10
| Family: Stygothrombiidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	7	20	0	0	18	40
| Order: Oribatei	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Oribatidae	0	0	0	0	0	0	7	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	20	20	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Physidae	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	13	0	0	0	0	0	20	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	88	109	13	0	60	0	0	0	80	0	0	30
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	220	20	40	0	0
| Family: Tubificidae	0	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**4,161**	**2,923**	**4,260**	**10,340**	**21,140**	**7,720**	**2,065**	**8,580**	**10,980**	**6,720**	**3,006**	**3,780**

Table G.42a: Temporal Changes in Benthic Invertebrate Tissue Selenium for Lotic Mine-exposed Areas, 2006 - 2016

Management Unit	Main Watershed	Stream Type (M-main stem; T-tributary)	Biological Area Code	Years Included in the Analysis (20xx)	Data Transformation	Linear		Step after 2006		Step after 2009		Step after 2012		Step after 2015	
						P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]
1	Fording	T	HENFO	12, 15	none	0.782	-	ND	-	ND	-	ND	-	ND	-
			NGD1	12, 15	none	0.588	-	ND	-	ND	-	ND	-	ND	-
			KICK	12, 15	none	0.831	-	ND	-	ND	-	ND	-	ND	-
			SWCK	12, 15	none	0.821	-	ND	-	ND	-	ND	-	ND	-
			CATCK	12, 15	none	0.232	-	ND	-	ND	-	ND	-	ND	-
			POCK	12, 15	none	0.859	-	ND	-	ND	-	ND	-	ND	-
			FO10-SP1	6, 9, 12	log	0.410	-	0.902	-	0.164	-	ND	-	ND	-
			LC_DCDS	14, 15, 16	none	ND	-	ND	-	ND	-	ND	-	ND	-
			LC_DC1	12, 15, 16	log	0.330	-	ND	-	ND	-	0.452	-	0.243	-
			GHCKD	12, 15	none	0.466	-	ND	-	ND	-	ND	-	ND	-
			GHCKU	12, 15	none	0.829	-	ND	-	ND	-	ND	-	ND	-
		M	FODHE	12, 15	none	0.957	-	ND	-	ND	-	ND	-	ND	-
			FOUNGD	12, 15	none	0.950	-	ND	-	ND	-	ND	-	ND	-
			FODNGD	12, 15	none	0.929	-	ND	-	ND	-	ND	-	ND	-
			MP1	6, 9, 12, 15	none	0.535	-	0.311	-	0.486	-	0.801	-	ND	-
			FOUSH	12, 15	none	0.994	-	ND	-	ND	-	ND	-	ND	-
			FOUKI	12, 15, 16	log	0.736	-	ND	-	ND	-	0.858	-	0.545	-
			FOBKS	12, 15	none	0.923	-	ND	-	ND	-	ND	-	ND	-
			FOBSC	12, 15	none	0.945	-	ND	-	ND	-	ND	-	ND	-
			FOBCP	12, 15, 16	log	0.342	-	ND	-	ND	-	0.443	-	0.292	-
			FODPO	12, 15, 16	log	0.624	-	ND	-	ND	-	0.620	-	0.770	-
			FO22	6, 9, 12, 15	none	0.387	-	0.945	-	0.439	-	0.178	-	ND	-
			FOUEW	12, 15, 16	log	0.626	-	ND	-	ND	-	0.726	-	0.518	-
			LC_FRUS	12, 15, 16	log	0.456	-	ND	-	ND	-	0.587	-	0.334	-
			FO29	12, 15, 16	log	0.394	-	ND	-	ND	-	0.488	-	0.351	-
			FODGH	12, 15, 16	log	0.539	-	ND	-	ND	-	0.611	-	0.519	-
2	Fording	T	LILC3	12, 15, 16	log	0.040	515.8	ND	-	ND	-	0.077	-	0.040	331
			LIDSL	12, 15, 16	log	0.187	-	ND	-	ND	-	0.285	-	0.146	-
			LI8	6, 9, 12, 15, 16	none	0.522	-	0.479	-	0.748	-	0.088	-	0.088	-
		M	FO9	6, 9, 12, 15	none	0.987	-	0.650	-	0.831	-	0.865	-	ND	-
			FRUL	12, 15	none	0.929	-	ND	-	ND	-	ND	-	ND	-
			FO23	6, 9, 12, 15, 16	none	0.140	-	0.240	-	0.448	-	0.348	-	0.348	-
3	Elk	T	WOCK	12, 15	none	0.784	-	ND	-	ND	-	ND	-	ND	-
			THCK	12, 15	none	0.186	-	ND	-	ND	-	ND	-	ND	-
		M	EL20	6, 9, 12, 15, 16	none	0.988	-	0.169	-	0.932	-	0.069	-	0.069	-
			ELUEL	12, 15	none	0.876	-	ND	-	ND	-	ND	-	ND	-
			ELDEL	12, 15	none	0.999	-	ND	-	ND	-	ND	-	ND	-
			ELUFO	12, 15	none	0.915	-	ND	-	ND	-	ND	-	ND	-
4	Michel	T	CORCK	12, 15, 16	log	0.596	-	ND	-	ND	-	0.654	-	0.592	-
			BOCK	12, 15, 16	log	0.025	450.4	ND	-	ND	-	0.024	512.1	0.161	-
		M	MIUCO	12, 15, 16	log	0.739	-	ND	-	ND	-	0.827	-	0.619	-
			MIDCO	12, 15, 16	log	0.323	-	ND	-	ND	-	0.386	-	0.355	-
			MIDAG	12, 15	none	0.808	-	ND	-	ND	-	ND	-	ND	-
			MI5	6, 9, 12, 15	none	0.790	-	0.804	-	0.690	-	0.639	-	ND	-
			MI3	6, 9, 12, 15	none	0.252	-	0.552	-	0.269	-	0.264	-	ND	-
			MI2	6, 9, 12, 15, 16	none	0.136	-	0.042	-35	0.097	-	0.348	-	0.348	-
	Elk	T	HACKUS	12, 15, 16	log	0.457	-	ND	-	ND	-	0.585	-	0.336	-
			HACKDS	12, 15, 16	log	0.163	-	ND	-	ND	-	0.250	-	0.135	-
			GRCK	12, 15	none	0.994	-	ND	-	ND	-	ND	-	ND	-
			GRDS	12, 15	none	0.723	-	ND	-	ND	-	ND	-	ND	-
			OCNM	12, 15	none	0.695	-	ND	-	ND	-	ND	-	ND	-
		M	EL19	6, 9, 12, 15, 16	none	0.027	-69	0.041	-55	0.126	-	0.288	-	0.288	-
			ELDGR	12, 15	none	0.864	-	ND	-	ND	-	ND	-	ND	-
			ELUSP	12, 15	none	0.974	-	ND	-	ND	-	ND	-	ND	-
5	Elk	M	EL1	6, 9, 12, 15, 16	none	0.180	-	0.125	-	0.261	-	0.304	-	0.304	-
			ELDFE	12, 15	none	0.877	-	ND	-	ND	-	ND	-	ND	-
			ELUFE	12, 15, 16	log	0.377	-	ND	-	ND	-	0.487	-	0.307	-
			ELELKO	12, 15, 16	log	0.238	-	ND	-	ND	-	0.294	-	0.284	-
			ELH93	12, 15, 16	log	0.069	-	ND	-	ND	-	0.082	-	0.175	-

P-value < 0.05
Increase
Decrease

Notes: "ND" = Not determined due to insufficient data.

[a] Change in relative difference between mine-exposed and mean reference (from the first year to the last year included in the analysis) based on a linear trend

[b] Change in relative difference between mine-exposed and mean reference (step change)

Table G.42b: Temporal Changes in Benthic Invertebrate Tissue Selenium for Lentic Mine-exposed Areas, 2006 - 2012

Management Unit	Study Area	Biological Area Code	Years Included in the Analysis (20xx)	Data Transformation	Linear		Step after 2006		Step after 2009	
					P-value	Magnitude Change (%) [a]	P-value	Magnitude Change (%) [b]	P-value	Magnitude Change (%) [b]
1	Fording River Side Channel	FO10	6, 9, 12	log	0.214	-	0.182	-	0.414	-
4	Goddard Marsh	GO13	6, 9, 12	log	0.410	-	0.902	-	0.164	-
	Harmer Pond	HA7	6, 9, 12	log	0.803	-	0.125	-	0.159	-
	Michel Wetland	MI16	6, 9, 12	log	0.339	-	0.778	-	0.051	-

P-value < 0.05
Increase
Decrease

Notes: "ND" = Not determined due to insufficient data.

[a] Change in relative difference between mine-exposed and mean reference (from the first year to the last year included in the analysis) based on a linear trend

[b] Change in relative difference between mine-exposed and mean reference (step change)

Table G.42c: Linear Regression of Benthic Invertebrate Tissue Selenium (Log_{10}-transformed) for Lentic Reference and Mine-exposed Areas with at Least Two Years of Data, 2006 - 2015

Exposure Type	Management Unit	Study Area	Biological Area Code	Years Included in the Analysis (20xx)	Linear Regression	
					P-value	Magnitude Change (%) [a]
Reference	1	Fording River Wetland	FO15	6,9,12	0.858	-
	3	Unnamed Wetland near Elk River north of Elkford	REFF	12,15	0.543	-
	N/A	Elk Lakes	EL14	6,9,12,15	0.323	-
		Flathead Pond	FL17	6,9,12	0.501	-
Mine-exposed	1	Henretta Lake	HE27	9,12,15	0.809	-
		Fording River Side Channel	FO10	6,9,10,11,12,15	0.021	-60
		Fording River Lower Oxbow	FOXL	12,15	0.078	-
	3	Elk River Upper Oxbow	EROU	12,15	0.106	-
	4	Elk River Wetland Downstream of Grave Creek	ELWDGC	12,15	0.084	-
		Goddard Marsh	GO13	6,9,11,12,15	0.184	-
		Harmer Pond	HA7	6,9,12	0.510	-
		Otto Creek Ponds	OTTO	10,12,15	0.015	-78
		Michel Wetland	MI16	6,9,12,15	0.003	271
		Lower Michel Wetland	MIWW	12,15	0.231	-
	5	Elk River Lower Oxbow	EROL	12,15	0.005	265
		Elko Reservoir	ELKO	12,15	0.290	-

P-value < 0.05
Increase
Decrease

[a] Change in mean (from the first year to the last year included in the analysis) expressed as a percentage of the mean in the first year of the analysis

Table G.43: Selenium Concentrations in Benthic Invertebrate Composite Samples from Lotic Reference and Mine-exposed Areas Since 2006

Exposure Type	Management Unit	Main Watershed	Biological Area Code	Area Description	Approximate UTM (NAD83, 11U)		Selenium (mg/kg dw)									
					Easting	Northing	2006	2009		2010		2011	2012	2014	2015	2016
								Spring	Fall	Spring	Fall					
Reference	1	Fording	FO26	Fording u/s Henretta (u/s all mines)	653064	5569601	5.67	4.26	-	-	-	-	4.25 [a]	-	4.90	3.53
			HENUP	Henretta u/s all mine operations	655893	5567697	-	-	-	-	-	-	6.38	-	-	3.77
			CHCK	Chauncey Creek	655965	5552879	-	-	-	-	-	-	3.92	-	-	-
			EWCK	Ewin Creek	657222	5547631	-	-	-	-	-	-	6.22	-	-	-
	2	Fording	LC_GRCK	Grace Creek	654283	5540738	-	-	-	-	-	-	-	-	6.51	-
			LI24	Line Creek u/s LCO	661968	5538259	1.44	4.36	-	-	-	-	5.14	3.99	5.44	3.77
			SLINE	South Line Creek near mouth	660980	5531449	-	-	-	-	-	-	4.83	5.97	3.95	4.08
	3	Elk	ELUGH	Elk River u/s Branch	646497	5557523	4.01	-	6.11	6.48*	4.58*	4.53	6.12	-	4.20	4.35
	4	Elk	GRUHA	u/s Harmer Cr.	657125	5522471	-	-	-	-	-	-	6.98	-	-	-
		Michel	MI25	Michel u/s CMO influence	668209	5482832	6.01	3.27	-	-	-	-	4.55	-	4.61	4.47
			AGCK	Andy Good Creek	667551	5488669	-	-	-	-	-	-	4.87	-	-	-
			AL4	Alexander u/s Michel	664974	5509024	3.92	-	6.13	-	-	-	5.37	-	-	-
Mine-exposed	1	Fording	FODHE	Fording d/s Henretta	651305	5565503	-	-	-	-	-	-	8.88	-	6.55	-
			FODNGD	Fording u/s NGD	650993	5563529	-	-	-	-	-	-	8.15	-	6.21	-
			FOUNGD	Fording d/s NGD	650883	5563190	-	-	-	-	-	-	-	-	7.19	-
			MP1	Fording Multiplate d/s Eagle Ponds	651158	5562442	-	5.49	-	-	-	-	9.04	-	5.85	-
			FOUSH	Fording u/s Shandley Creek	650863	5560970	-	-	-	-	-	-	7.65	-	6.04	-
			FOUKI	Fording u/s Kilmarnock Creek	651861	5559872	-	-	-	-	-	-	8.55	-	5.13	5.24
			FOBKS	Fording between Kilmarnock & Swift	652065	5558691	-	-	-	-	-	-	8.84	-	6.00	-
			FOBSC	Fording d/s Swift, u/s Cataract	652342	5558207	-	-	-	-	-	-	8.40	-	7.51	-
			FOBCP	Fording between Cataract & Porter	652846	5557174	-	-	-	-	-	-	7.95	-	7.68	9.72
			FODPO	Fording d/s Porter, u/s Chauncey	653877	5555083	-	-	-	-	-	-	6.18	-	6.92	3.80
			FO22	Fording u/s Chauncey Creek	654794	5553614	9.70	-	11.83	-	7.06	7.74	12.40	-	7.08	-
			FOUEW	Fording d/s Chauncey, u/s Ewin	656363	5551875	-	-	-	-	-	-	8.28	-	6.05	5.84
			LC_FRUS	Fording River u/s Dry Creek	656301	5545255	-	-	-	-	-	-	9.20	7.44	7.01	9.14
			FO29	Fording d/s Dry, u/s GHO & Hwy Bridge	655522	5543915	-	-	-	-	-	-	7.94	6.12	7.54	8.52
			FODGH	Fording River d/s GHO	652942	5545635	-	-	-	-	-	-	9.26	-	8.36	7.25
			HENFO	Henretta u/s confluence with Fording	652236	5566472	-	-	-	-	-	-	8.06	-	9.62	-
			NGD1	Lower Lake Mountain Creek	650883	5563190	-	-	-	-	-	-	6.86	-	-	-
			KICK	Kilmarnock u/s road crossing near mouth	652878	5559847	-	-	-	-	-	-	4.61	-	0.4 [b]	-
			SWCK	Swift Creek near mouth	652062	5558541	-	-	-	-	-	17.90	17.60	-	18.54	-
			CATCK	Cataract Creek near mouth	652447	5557452	-	-	-	-	-	-	26.50	-	10.54	-
			POCK	Porter Creek near mouth	653596	5555208	-	-	-	-	-	18.04	5.20	-	5.59	-
			FO10-SP1	Fording River Oxbow	654245	5555299	-	-	-	-	-	-	-	-	7.13	-
			LC_DCDS	Dry Creek d/s sedimentation ponds	657719	5542179	-	-	-	-	-	-	-	5.92	5.68	7.53
			LC_DC1	Dry Creek near mouth	656454	5544727	-	-	-	-	-	-	5.89	4.87	5.17	7.72
			GHCKD	Greenhills Creek d/s of settling pond	657713	5542177	-	-	-	-	-	-	14.80	-	21.67	-
			GHCKU	Greenhills Creek u/s of pond	656503	5544668	-	-	-	-	-	-	9.97	-	10.81	-
	2	Fording	FO9	Fording d/s Josephine falls, u/s Grace & Line	651932	5540294	4.44	6.92	-	-	7.63	7.55	6.44	-	7.19	-
			FRUL	Fording d/s Grace, u/s Line	654530	5530162	-	-	-	-	-	-	7.95	-	7.29	-
			FO23	Fording d/s Line Creek	652995	5528937	10.00	5.76	9.68	5.01 [a]	5.87 [a]	8.77	7.47	-	6.37	6.73
			LILC3	Line d/s West Line, u/s South Line	659911	5531818	-	-	-	-	-	-	6.99	16.69	13.31	35.20
			LIDSL	Upper Line Creek, d/s South Line	659733	5531239	-	-	-	-	-	-	7.68	13.67	8.89	16.00
			LI8	Line Creek d/s LCO	655651	5528828	7.81	10.77	8.02	-	6.30	8.42	7.77	8.42	9.31	11.80
	3	Elk	EL20	Elk River d/s Thompson & GHO	649146	5548514	5.89	3.50	-	-	-	-	8.31	-	4.98	5.13
			ELUEL	Elk River u/s Elkford	649097	5544766	-	-	-	-	-	-	7.86	-	4.33	-
			ELDEL	Elk River d/s Elkford sewage ponds	649883	5539761	-	-	-	-	-	-	6.32	-	4.64	-
			ELUFO	Elk River just u/s Fording	652102	5528815	-	-	-	-	-	-	5.76	-	5.31	-
			WOCK	Wolfram d/s pond	648228	5552277	-	-	-	-	-	-	16.60	-	11.63	-
			THCK	Thompson d/s pond	648596	5550237	-	-	-	-	-	-	35.60	-	18.14	-
	4	Elk	EL19	Elk River d/s Fording, u/s Grave	653146	5525824	8.63	9.37	-	-	-	-	6.56	-	5.22	7.58
			ELDGR	Elk River d/s Grave	653185	5520978	-	-	-	-	-	-	9.78	-	6.06	-
			ELUSP	Elk d/s Otto, u/s Sparwood & Michel	652325	5512688	-	-	-	-	-	-	6.79	-	5.47	-
			HACKUS	Harmer Creek u/s Harmer Pond	658180	5520996	-	-	-	-	-	-	8.40	-	6.57	8.03
							-	-	-	-	-	-	-	-	-	6.99
							-	-	-	-	-	-	-	-	-	9.07
							-	-	-	-	-	-	-	-	-	6.74
							-	-	-	-	-	-	-	-	-	9.89
			HACKDS	Harmer d/s Pond near mouth at Grave	656969	5522171	-	-	-	-	-	-	6.53	-	8.04	15.25
							-	-	-	-	-	-	-	-	-	13.26
							-	-	-	-	-	-	-	-	-	13.19
							-	-	-	-	-	-	-	-	-	12.63
							-	-	-	-	-	-	-	-	-	12.51
			GRCK	Grave Creek d/s Harmer	656215	5522446	-	-	-	-	-	-	9.32	-	7.53	-
			GRDS	Grave Creek near mouth at Elk	654077	5523402	-	-	-	-	-	-	7.99	-	10.46	-
			OCNM	Otto Creek near mouth	652337	5512615	-	-	-	-	-	-	3.91	-	6.83	-
		Michel	MIUCO	Michel u/s Corbin Creek	668203	5486653	-	-	-	-	-	-	7.00	-	4.78	4.15
							-	-	-	-	-	-	-	-	-	3.97
			MIDCO	Michel d/s Corbin, u/s Andy Good	667757	5487611	-	-	-	-	-	-	3.6 [a]	-	4.38	4.35
							-	-	-	-	-	-	-	-	-	4.11
			MIDAG	Michel d/s Andy Good	665262	5489400	-	-	-	-	-	-	6.39	-	7.55	-
			MI5	Michel d/s CMO	659497	5496573	4.00	5.84	-	-	-	-	5.60	-	5.11	-
			MI3	Michel u/s Erickson Creek	660032	5505022	6.21	5.42	-	-	-	-	4.53	-	2.33	-
			MI2	Michel Creek d/s EVO	653672	5511222	6.69	10.89	8.38	-	6.54	5.25	5.97	-	6.61	7.79
			CORCK	Corbin Creek near Mouth	668563	5487395	-	-	-	-	-	-	3.89	-	3.48	2.72
			ERCK	Erickson at CPR main line near mouth	659931	5505119	-	-	-	-	-	7.75	6.28	-	-	-
			BOCK	Bodie Creek	655536	5509605	-	-	-	-	-	-	11.20	-	71.20	50.47
	5	Elk	EL1	Elk d/s Sparwood & Michel	651657	5508511	7.08	7.19	6.23	5.58*	5.53*	5.46	6.86 [a]	-	5.29	5.72
			ELUFE	Elk d/s Fernie	640097	5479596	-	-	-	-	-	-	6.45	-	5.79	7.36
			ELDFE	Elk u/s Fernie	644258	5490947	-	-	-	-	-	-	6.31	-	6.35	-
			ELELKO	Elk River u/s Elko	639433	5463291	-	-	-	-	-	-	6.34	-	8.88	9.50
			ELH93	Elk River u/s Hwy 93 Bridge	633578	5449043	-	-	-	-	-	-	-	-	12.40	12.14

[a] mean of triplicate samples

[b] Value is suspect due to low sample volume. Not included in analyses.

Value > Level 1 benchmark of 11 mg/kg dw for dietary effects to fish (Level 1 benchmark for effects to invertebrates is 13.0 mg/kg dw)

Value > upper limit of normal range of (7.79 mg/kg dw)

Table G.44: Selenium Concentrations in Mayfly Tissue Samples from Lotic Areas, 2009, 2014, 2015 and 2016

Exposure Type	Management Unit	Main Watershed	Stream Type (M-Main Stem; T-Tributary)	Biological Area Code	Selenium (mg/kg dry wt)			
					2009	2014	2015	2016
Reference	1	Fording	M	FO26	-	-	11.60	-
	2		T	LC_GRCK	-	-	13.03	-
		Line	M	LI24	-	8.61 *	7.31	7.14
				SLINE	-	10.58 *	7.88	6.72
	3	Elk	M	EL12	7.51 [a]	-	-	-
					7.37 [c]	-	-	-
				ELUGH	-	-	7.44	6.76
	4	Michel	M	MI25	-	-	7.00	-
Mine-exposed	1	Fording	T	LC_DCDS	-	12.47	6.12	15.50
				LC_DC1	-	11.64	-	10.30
			M	MP1	5.88 [d]	-	6.00	-
				LC_FRUS	-	-	6.84	8.50
				FO29	-	-	6.25	9.50
				FODGH	-	-	8.15	-
	2		T	LCUT	-	-	-	6.13
				LILC3	-	33.15	6.50	30.60
				LIDSL	-	16.82	7.12	13.90
				LI8	-	10.52	7.31	-
			M	FOUL	-	-	8.65	-
				FO23	4.58 [a]	-	7.34	10.51
					9.15 [a]	-	-	-
					8.93 [c]	-	-	-
	3	Elk	M	EL20	-	-	7.07	7.15
	4		T	HACKDS	-	-	8.08	-
			M	EL19	-	-	6.59	6.91
				MIDCO	-	-	6.03	-
				MI2	6.31 [a]	-	6.62	-
					9.64 [b]	-	-	-
					12.04 [c]	-	-	-
	5		M	EL1	5.88 [b]	-	7.85	-
					8.38 [a]	-	-	-
				ELUFE	-	-	8.32	7.24
				ELELKO	-	-	11.90	14.32
				ELH93	-	-	19.32	22.00

Notes: "-" = no data; '*' = means of triplicate samples.

[a] Heptagenidae

[b] Baetidae

[c] Ephemeroptera

[d] Isoaychia

Table G.45: Selenium Concentrations in *Rhyacophilidae* Tissue Samples from Lotic Areas, 2009, 2014, 2015, and 2016

Exposure Type	Management Unit	Main Watershed	Stream Type (M-Main Stem; T-Tributary)	Biological Area Code	Selenium (mg/kg dry wt)			
					2009	2014	2015	2016
Reference	1	Fording	T	HENUP	-	-	-	5.72
			M	FO26	-	-	-	4.59
	2	Line	M	LI24	-	4.09	0.73	4.00
				SLINE	-	3.92	6.79	-
	4	Michel	M	MI25	-	-	5.58	-
Mine-exposed	1	Fording	M	MP1	7.55	-	-	
				FOUKI	-	-	-	8.67
				FOBCP	-	-	-	12.7
				FODPO	-	-	8.48	5.48
				FOUEW	-	-	-	6.88
				FO28	-	-	-	8.7
				FO29	-	-	-	9.1
				FODGH	-	-	-	9.72
	2		T	LCUT	-	-	-	5.41
				LILC3	-	22.07	18.33	42.00
				LIDSL	-	20.67	29.14	24.20
				LI8	-	10.75	12.29	12.20
					14.18	-	-	-
			M	FO23	-	-	-	-
	4	Elk	M	MIDCO	-	-	4.76	4.65
				MI2	-	-	-	7.81
	5			EL1	-	-	-	7.28

Notes: "-" = no data

Table G.46: Selenium Concentrations in Stonefly Tissue Samples from Lotic Areas, 2009, 2014, 2015, and 2016

Exposure Type	Management Unit	Main Watershed	Stream Type (M-Main Stem; T-Tributary)	Biological Area Code	Selenium (mg/kg dry wt)			
					2009	2014	2015	2016
Reference	2	Fording	T	LC_GRCK	-	4.37	5.02	-
	3	Elk	M	EL12	4.25 [a]	-	-	-
Mine-exposed	1	Fording	T	LC_DCDS	-	3.90	4.12	6.90
				LC_DC1	-	4.19	3.53	5.40
			M	MP1	4.67 [b]	-	-	-
				LC_FRUS	-	4.86	-	5.00
				FO29	-	4.74	-	5.90
	2		T	LI8	6.52 [a]	-	-	-
			M	FO23	7.03 [c]	-	-	-
					7.57 [a]	-	-	-
	4	Elk	M	MI2	4.42 [b]	-	-	-
	5			EL1	5.98 [b]	-	-	-
					5.20 [a]	-	-	-
					6.85 [c]	-	-	-

Notes: "-" = no data

[a] Perlidae

[b] Perlodidae

[c] Chloroperlidae

Table G.47: Selenium Concentrations in Composite Benthic Invertebrate Tissue Samples from Lentic Areas, August 2015

Exposure Type	Management Unit	Study Area	Sample ID	% Moisture	Selenium (mg/kg dry weight)
Reference	1	Lake Mountain Lake	LML-BIT-1	89.9	5.26
			LML-BIT-2	91.2	3.51
			LML-BIT-3	90.7	5.44
	-	Elk Lakes	EL14-BIT-1	84.3	5.31
			EL14-BIT-2	85.8	0.61
			EL14-BIT-3	85.3	3.58
	3	Unnamed Wetland North of Elkford	REFF-BIT-1	86.4	4.34
			REFF-BIT-2	86.8	6.02
			REFF-BIT-3	83.8	6.36
	4	Leach Creek Oxbow	LCHO-BIT-1	81.0	17.85
			LCHO-BIT-2	85.1	13.47
			LCHO-BIT-3	82.8	13.15
	-	Flathead Wetland Side Channel	FLA1-BIT-1	88.5	2.10
			FLA1-BIT-2	87.5	3.88
			FLA1-BIT-3	84.7	5.01
Mine-exposed	1	Henretta Lake	HE27-BIT-1	90.7	12.04
			HE27-BIT-2	90.5	11.61
			HE27-BIT-3	84.7	7.24
		Fording River Side Channel	FO10-BIT-1	81.3	5.77
			FO10-BIT-2	85.4	6.59
			FO10-BIT-3	86.7	9.00
		Fording River Lower Oxbow	FOXL-BIT-1	86.4	1.15
			FOXL-BIT-2	84.9	1.29
			FOXL-BIT-3	86.7	2.02
		Fording Meadow Upstream of Chauncey Creek	FMUCK-BIT-1	83.3	12.97
			FMUCK-BIT-2	87.2	13.62
			FMUCK-BIT-3	77.5	11.50
		Fording Wetland Downstream of Ewin Creek	FWDEC-BIT-1	84.9	12.38
			FWDEC-BIT-2	90.3	22.31
			FWDEC-BIT-3	85.0	19.60
		Off Channel Area of Fording Downstream of Greenhills	R5-1-BIT-1	86.1	32.14
			R5-1-BIT-2	82.3	24.14
			R5-1-BIT-3	87.3	28.90
	2	Off Channel Area of Fording Downstream of Josephine Falls	R5-3-BIT-1	88.1	19.60
			R5-3-BIT-2	86.5	24.25
			R5-3-BIT-3	88.5	17.79
	3	Elk River Upper Ponds	ERUP-BIT-1	86.6	4.57
			ERUP-BIT-2	85.1	3.67
			ERUP-BIT-3	88.9	4.36
		Elk River Upper Oxbow	EROU-BIT-1	88.2	1.49
			EROU-BIT-2	88.7	2.06
			EROU-BIT-3	88.0	1.76
	4	Elk River Wetland Downstream of Grave Creek	ELWDGC-BIT-1	87.0	9.60
			ELWDGC-BIT-2	84.2	10.96
			ELWDGC-BIT-3	87.7	11.23
		Goddard Marsh	GO13-BIT-1	83.8	27.90
			GO13-BIT-2	79.8	48.66
			GO13-BIT-3	83.3	34.38
		Otto Creek Ponds	OTTO-BIT-1	88.7	13.81
			OTTO-BIT-2	85.8	8.67
			OTTO-BIT-3	85.0	2.79
		Michel Wetland	MI16-BIT-1	87.8	18.24
			MI16-BIT-2	84.2	21.42
			MI16-BIT-3	85.3	17.40
		Michel Creek Oxbow #2	MIC2-BIT-1	78.3	9.02
			MIC2-BIT-2	80.1	10.98
			MIC2-BIT-3	80.9	9.91
		Lower Michel Wetland	MIWW-BIT-1	84.9	16.85
			MIWW-BIT-2	85.3	13.49
			MIWW-BIT-3	84.1	8.65
	5	Stanford Pond	STPD-BIT-1	85.4	27.80
			STPD-BIT-2	85.2	23.10
			STPD-BIT-3	86.2	15.39
		Elk River Lower Oxbow	EROL-BIT-1	83.0	13.79
			EROL-BIT-2	86.6	13.93
			EROL-BIT-3	83.9	15.76
		Elko Reservoir	ELKO-BIT-1	83.7	9.82
			ELKO-BIT-2	81.1	12.29
			ELKO-BIT-3	78.9	8.40

Value > Level 1 benchmark of 11 µg/g dw for dietary effects to fish

Value > upper limit of normal range of (7.79 mg/kg dw)

Table G.48: Reference Tissue Selenium Concentrations for Composite Benthic Invertebrate Samples in the Elk Valley for Lentic and Lotic Habitats, 1996 - 2015 (After Outliers Have Been Removed)

Habitat Type	Sample Size	Units	Minimum	2.5th Percentile	25th Percentile	Median	75th Percentile	97.5th Percentile	Maximum	Mean	Standard Deviation	95% CI on the 97.5th percentile
Lentic	47	mg/kg dw	0.42	0.64	2.26	3.51	5.28	7.13	9.71	3.78	1.98	6.83 - 8.85 [a]
Lotic	129	mg/kg dw	1.39	2.08	3.89	4.91	6.01	7.86	9.22	4.92	1.48	7.42 - 8.31 [a]
All	176	mg/kg dw	0.42	1.41	3.56	4.78	5.90	7.82	9.71	4.62	1.70	-

[a] 95% confidence intervals on the 97.5th percentiles for lentic and lotic habitat overlap (there is no significant difference ($\alpha = 0.05$) between the 97.5th percentiles)

Estimate of reference area normal range

Table G.49: Reference Tissue Selenium Concentrations for Composite Benthic Invertebrate Samples in the Elk Valley, 1996 - 2015

Tissue Type	Year	Biological Area Code	Area Description	Habitat Type	Se (mg/kg dw)
Invertebrate	2013	GLM	GLM	Lentic	0.42
Invertebrate	2015	EL14	Elk Lakes	Lentic	0.61
Invertebrate	2012	GLM	Graves Lake Marsh	Lentic	0.78
Invertebrate	2012	GLM	Graves Lake Marsh	Lentic	0.78
Invertebrate	2012	SKUKO	Skookumchuck River	Lotic	1.39
Invertebrate	2006	LI24	Line Creek u/s LCO	Lotic	1.44
Invertebrate	2001	ELUQU	Elk River u/s Quarrie Creek	Lotic	1.50
Invertebrate	2009	FO15	Fording River Wetland	Lentic	1.76
Invertebrate	2009	LK01	Lake Koocanusa at Sand Creek	Lentic	1.85
Invertebrate	2013	MMCR	MMCR	Lotic	2.03
Invertebrate	2015	FLA1	Flathead Wetland Side Channel	Lentic	2.10
Invertebrate	2009	LK01	Lake Koocanusa at Sand Creek	Lentic	2.17
Invertebrate	2010	Fen	Fen in StormCat area	Lentic	2.17
Invertebrate	2010	Fen	Fen in StormCat area	Lentic	2.22
Invertebrate	2010	Fen	Fen in StormCat area	Lentic	2.24
Invertebrate	2010	Fen	Fen in StormCat area	Lentic	2.25
Invertebrate	2012	FO15	Fording River Wetland	Lentic	2.26
Invertebrate	2001	AL4	Alexander Creek	Lotic	2.30
Invertebrate	2009	LK01	Lake Koocanusa at Sand Creek	Lentic	2.32
Invertebrate	2012	CA1	Carbon Creek	Lotic	2.36
Invertebrate	2006	FO15	Fording River Wetland	Lentic	2.46
Invertebrate	2012	FI1	Fir Creek	Lotic	2.47
Invertebrate	2012	CA1	Carbon Creek	Lotic	2.50
Invertebrate	2010	Fen	Fen in StormCat area	Lentic	2.58
Invertebrate	2009	LK01	Lake Koocanusa at Sand Creek	Lentic	2.63
Invertebrate	2012	EL14	Elk Lakes	Lentic	2.63
Invertebrate	1996	ELUCA	Elk River u/s Cadorna Creek	Lotic	2.74
Invertebrate	2012	CA1	Carbon Creek	Lotic	2.75
Invertebrate	2012	CA1	Carbon Creek	Lotic	2.77
Invertebrate	2009	LK01	Lake Koocanusa at Sand Creek	Lentic	2.96
Invertebrate	2003	AC	Alexander Creek	Lotic	3.00
Invertebrate	2012	KOUCR	Kootenay River u/s Cross River	Lotic	3.02
Invertebrate	2006	FL17	Flathead Wetland	Lentic	3.03
Invertebrate	2012	FO15	Fording River Wetland	Lentic	3.03
Invertebrate	2012	AX1	Alexander Creek	Lotic	3.17
Invertebrate	2012	EL14	Elk Lakes	Lentic	3.24
Invertebrate	2006	BA6	Barnes Lake	Lentic	3.27
Invertebrate	2009	MI25	Michel Creek u/s CMO confluence	Lotic	3.27
Invertebrate	2013	CHCK	Chauncey Creek	Lotic	3.38
Invertebrate	2012	CADCK	Cadorna Creek u/s Elk River	Lotic	3.39
Invertebrate	2012	KODCR	Kootenay River d/s Cross River	Lotic	3.40
Invertebrate	2012	CA1	Carbon Creek	Lotic	3.42
Invertebrate	2012	DUCK	Dutch Creek	Lotic	3.47
Invertebrate	2015	LML	Lake Mountain Lake	Lentic	3.51
Invertebrate	2016	FO26	Fording u/s Henretta (u/s all mines)	Lotic	3.53
Invertebrate	2012	EL12	Elk River d/s Cadorna Creek	Lotic	3.57
Invertebrate	2015	EL14	Elk Lakes	Lentic	3.58
Invertebrate	2001	EWCK	Ewin Creek	Lotic	3.60
Invertebrate	2006	FO21	Upper Fording River (FO21)	Lotic	3.62
Invertebrate	2012	TRCK	Transmission Creek	Lotic	3.62
Invertebrate	2012	FO26	Upper Fording River (FO26)	Lotic	3.62
Invertebrate	2009	RL1	O'Rourke Lake	Lentic	3.63
Invertebrate	2011	FR4	Fording River u/s of Swift Project	Lotic	3.64
Invertebrate	2013	FO15	FO15	Lentic	3.64
Invertebrate	2012	VICK	Vicary Creek	Lotic	3.68
Invertebrate	2001	FO26	Upper Fording River (FO26)	Lotic	3.70
Invertebrate	2011	FR4	Fording River u/s of Swift Project	Lotic	3.73
Invertebrate	2016	HENUP	Henretta u/s all mine operations	Lotic	3.77
Invertebrate	2016	LI24	Line Creek u/s LCO	Lotic	3.77
Invertebrate	2011	FR4	Fording River u/s of Swift Project	Lotic	3.80
Invertebrate	2012	FI1	Fir Creek	Lotic	3.80
Invertebrate	2015	FLA1	Flathead Wetland Side Channel	Lentic	3.88
Invertebrate	2012	RACK	Racehorse Creek	Lotic	3.88
Invertebrate	2011	FR4	Fording River u/s of Swift Project	Lotic	3.89
Invertebrate	2012	FL17	Flathead Wetland	Lentic	3.91
Invertebrate	2006	AL4	Alexander Creek	Lotic	3.92
Invertebrate	2012	CHCK	Chauncey Creek	Lotic	3.92
Invertebrate	2015	SLINE	Tornado (Line) Creek	Lotic	3.95
Invertebrate	2006	ELUQU	Elk River u/s Quarrie Creek	Lotic	4.01
Invertebrate	2016	SLINE	South Line Creek near mouth	Lotic	4.08
Invertebrate	2002	Lynx Creek	Lynx Creek	Lotic	4.11
Invertebrate	2012	PAUKO	Palliser River d/s Kootenay River	Lotic	4.16
Invertebrate	2015	ELUGH	Elk River	Lotic	4.20
Invertebrate	2013	WWR	Wigwam River	Lotic	4.21
Invertebrate	2012	DACK	Daisy Creek	Lotic	4.21
Invertebrate	2012	FO26	Upper Fording River (FO26)	Lotic	4.21
Invertebrate	2012	WIHR	Wild Horse River	Lotic	4.22
Invertebrate	2009	FO26	Upper Fording River (FO26)	Lotic	4.26
Invertebrate	2011	FR4	Fording River u/s of Swift Project	Lotic	4.26
Invertebrate	2012	WH1	Wheeler Creek	Lotic	4.26
Invertebrate	2009	FL17	Flathead Wetland	Lentic	4.30
Invertebrate	2015	REFF	Unnamed Wetland North of Elkford	Lentic	4.34
Invertebrate	2016	ELUGH	Elk River u/s of GHO	Lotic	4.35
Invertebrate	2009	LI24	Line Creek u/s LCO	Lotic	4.36
Invertebrate	2012	FI1	Fir Creek	Lotic	4.36
Invertebrate	2006	EL14	Elk Lakes	Lentic	4.41
Invertebrate	2012	KOUVE	Kootenay River u/s Vermillion River	Lotic	4.45
Invertebrate	2012	WH1	Wheeler Creek	Lotic	4.47
Invertebrate	2016	MI25	Michel Creek u/s CMO confluence	Lotic	4.47
Invertebrate	2015	LC_UC	Unnamed Creek	Lotic	4.52
Invertebrate	2012	MI25	Michel Creek u/s CMO confluence	Lotic	4.55
Invertebrate	2009	FO21	Upper Fording River (FO21)	Lotic	4.61
Invertebrate	2015	MI25	Michel Creek	Lotic	4.61
Invertebrate	2002	Gold Creek	Gold Creek	Lotic	4.78
Invertebrate	2012	WH1	Wheeler Creek	Lotic	4.78
Invertebrate	2012	OLUP	Upper Oldman River	Lotic	4.78
Invertebrate	2012	SLINE	South Line Creek	Lotic	4.83
Invertebrate	2013	AL4	Alexander Creek	Lotic	4.84
Invertebrate	2012	TRCK	Transmission Creek	Lotic	4.87
Invertebrate	2012	AGCK	Andy Good Creek u/s CMO	Lotic	4.87
Invertebrate	2012	VEUP	Vermillion River Upper u/s Simpson River	Lotic	4.88
Invertebrate	2015	FO26	Fording River	Lotic	4.90
Invertebrate	2012	FO26	Upper Fording River (FO26)	Lotic	4.91
Invertebrate	2012	AX1	Alexander Creek	Lotic	4.92
Invertebrate	2012	AX1	Alexander Creek	Lotic	4.96

Outlier removed for estimation of summary statistics (below) and normal range

Notes: Q3+1.5(IQR) = 9.66 and 13.09 on the untransformed and log scale, respectfully

Table G.49: Reference Tissue Selenium Concentrations for Composite Benthic Invertebrate Samples in the Elk Valley, 1996 - 2015

Tissue Type	Year	Biological Area Code	Area Description	Habitat Type	Se (mg/kg dw)
Invertebrate	2012	FI1	Fir Creek	Lotic	4.97
Invertebrate	2012	SN1	Snowslide Creek	Lotic	4.99
Invertebrate	2015	FLA1	Flathead Wetland Side Channel	Lentic	5.01
Invertebrate	2012	LE1	Leach Creek	Lotic	5.12
Invertebrate	2012	LI24	Line Creek u/s LCO	Lotic	5.14
Invertebrate	2012	AX1	Alexander Creek	Lotic	5.15
Invertebrate	2012	LE1	Leach Creek	Lotic	5.15
Invertebrate	2013	CHCK	Chauncey Creek	Lotic	5.18
Invertebrate	2012	MC1	Mine Creek	Lotic	5.19
Invertebrate	2012	VEUKO	Vermillion River u/s Kootenay River, d/s Simpson	Lotic	5.23
Invertebrate	2012	OLDLOW	Lower Oldman River u/s Reservoir	Lotic	5.24
Invertebrate	2012	EL14	Elk Lakes	Lentic	5.25
Invertebrate	2015	LML	Lake Mountain Lake	Lentic	5.26
Invertebrate	2012	BUUQ	Bull River u/s Quinn Creek	Lotic	5.26
Invertebrate	2012	LE1	Leach Creek	Lotic	5.27
Invertebrate	2015	EL14	Elk Lakes	Lentic	5.31
Invertebrate	2012	CRUKO	Cross River u/s Kootenay	Lotic	5.32
Invertebrate	2013	DRCK	Dry Creek	Lotic	5.38
Invertebrate	2001	LI24	Line Creek u/s LCO	Lotic	5.40
Invertebrate	2012	ALB	Albert River u/s Palliser River	Lotic	5.42
Invertebrate	2015	LI24	South Line Creek	Lotic	5.44
Invertebrate	2015	LML	Lake Mountain Lake	Lentic	5.44
Invertebrate	2012	SN1	Snowslide Creek	Lotic	5.46
Invertebrate	2012	SN1	Snowslide Creek	Lotic	5.50
Invertebrate	2010	LkMtn2	Lake Mountain Lake	Lentic	5.54
Invertebrate	2012	AL4	Alexander Creek	Lotic	5.55
Invertebrate	2012	UM1	Unnamed Tributary to Michel Creek	Lotic	5.64
Invertebrate	2013	CHCK	Chauncey Creek	Lotic	5.65
Invertebrate	2006	FO26	Upper Fording River (FO26)	Lotic	5.67
Invertebrate	2012	OLDDU	Oldman River d/s Dutch Creek	Lotic	5.78
Invertebrate	2012	TRCK	Transmission Creek	Lotic	5.80
Invertebrate	2012	LE1	Leach Creek	Lotic	5.83
Invertebrate	2012	DRCK	Dry Creek	Lotic	5.89
Invertebrate	2012	WH1	Wheeler Creek	Lotic	5.95
Invertebrate	2012	SN1	Snowslide Creek	Lotic	5.96
Invertebrate	2006	MI25	Michel Creek u/s CMO confluence	Lotic	6.01
Invertebrate	2015	REFF	Unnamed Wetland North of Elkford	Lentic	6.02
Invertebrate	2012	SN1	Snowslide Creek	Lotic	6.05
Invertebrate	2010	LkMtn2	Lake Mountain Lake	Lentic	6.07
Invertebrate	2013	REFF	REFF	Lentic	6.08
Invertebrate	2012	UM1	Unnamed Tributary to Michel Creek	Lotic	6.09
Invertebrate	2012	MC1	Mine Creek	Lotic	6.10
Invertebrate	2009	ELUWE	Elk River u/s Weary Creek	Lotic	6.11
Invertebrate	2012	TRCK	Transmission Creek	Lotic	6.11
Invertebrate	2012	ELUGH	Elk River u/s Branch	Lotic	6.12
Invertebrate	2009	AL4	Alexander Creek	Lotic	6.13
Invertebrate	2012	LE1	Leach Creek	Lotic	6.15
Invertebrate	2012	EWCK	Ewin Creek	Lotic	6.22
Invertebrate	2012	BU40	Bull River 40 km Bridge	Lotic	6.30
Invertebrate	2012	AX1	Alexander Creek	Lotic	6.35
Invertebrate	2015	REFF	Unnamed Wetland North of Elkford	Lentic	6.36
Invertebrate	2012	HENUP	Henretta Creek u/s all mine operations	Lotic	6.38
Invertebrate	2002	Lynx Creek	Lynx Creek	Lotic	6.39
Invertebrate	2009	EL14	Elk Lakes	Lentic	6.40
Invertebrate	2010	LkMtn2	Lake Mountain Lake	Lentic	6.45
Invertebrate	2012	UM1	Unnamed Tributary to Michel Creek	Lotic	6.46
Invertebrate	2012	WWRL	Lower Wigwam River	Lotic	6.49
Invertebrate	2015	LC_GRCK	Grace Creek	Lotic	6.51
Invertebrate	2012	REFF	Unnamed Wetland near Elk River North of Elkford	Lentic	6.53
Invertebrate	2012	OLDLI	Oldman River d/s Livingstone Creek	Lotic	6.61
Invertebrate	2012	MC1	Mine Creek	Lotic	6.64
Invertebrate	2012	LE1	Leach Creek	Lotic	6.83
Invertebrate	1996	FO26	Upper Fording River (FO26)	Lotic	6.84
Invertebrate	2012	FI1	Fir Creek	Lotic	6.95
Invertebrate	2012	MC1	Mine Creek	Lotic	6.95
Invertebrate	2012	AX1	Alexander Creek	Lotic	6.96
Invertebrate	2012	GRUHA	Grave Creek u/s Harmer Creek	Lotic	6.98
Invertebrate	2012	UM1	Unnamed Tributary to Michel Creek	Lotic	6.98
Invertebrate	2012	UM1	Unnamed Tributary to Michel Creek	Lotic	7.09
Invertebrate	2010	LkMtn2	Lake Mountain Lake	Lentic	7.23
Invertebrate	2012	MC1	Mine Creek	Lotic	7.65
Invertebrate	2012	TRCK	Transmission Creek	Lotic	7.68
Invertebrate	2012	MC1	Mine Creek	Lotic	7.91
Invertebrate	2012	WH1	Wheeler Creek	Lotic	7.91
Invertebrate	2012	MC1	Mine Creek	Lotic	7.91
Invertebrate	2012	WH1	Wheeler Creek	Lotic	7.91
Invertebrate	2012	PADAL	Palliser River d/s Albert River	Lotic	8.23
Invertebrate	2002	Boivin Creek	Boivin Creek	Lotic	9.22
Invertebrate	2010	LkMtn2	Lake Mountain Lake	Lentic	9.71
Invertebrate	2015	LCHO	Leach Creek Oxbow	Lentic	13.15
Invertebrate	2015	LCHO	Leach Creek Oxbow	Lentic	13.47
Invertebrate	2015	LCHO	Leach Creek Oxbow	Lentic	17.85
Invertebrate	2013	WWR (Beaver Pond)	Wigwam River (Beaver Pond)	Lentic	33.00

Outlier removed for estimation of summary statistics (below) and normal range

Notes: Q3+1.5(IQR) = 9.66 and 13.09 on the untransformed and log scale, respectfully

Tissue Type	Year	Area	Summary Statistic (after oulier removal)	Habitat Type	Se (mg/kg dw)
Invertebrate	All	All Reference	Sample Size	All	182
Invertebrate	All	All Reference	Minimum	All	0.42
Invertebrate	All	All Reference	2.5^{th} Percentile	All	1.41
Invertebrate	All	All Reference	25^{th} Percentile	All	3.57
Invertebrate	All	All Reference	Median	All	4.58
Invertebrate	All	All Reference	75^{th} Percentile	All	5.82
Invertebrate	All	All Reference	97.5^{th} Percentile	All	7.79
Invertebrate	All	All Reference	Maximum	All	9.71
Invertebrate	All	All Reference	Mean	All	4.60
Invertebrate	All	All Reference	Standard Deviation	All	1.68

Estimate of reference area normal range

Table G.50: Normal Range Quotients and Hazard Quotients for Benthic Invertebrate Tissue Selenium in Lotic Areas, 2015 and 2016

Exposure Type	Management Unit	Main Watershed	Stream Type (M-Main Stem; T-Tributary)	Biological Area Code	2015					2016				
					Selenium (mg/kg dw)	Normal Range Quotient	Hazard Quotient[a]			Selenium (mg/kg dw)	Normal Range Quotient	Hazard Quotient[a]		
							Growth, Reproduction, and Survival	Dietary Effects to Juvenille Fish	Dietary Effects to Birds			Growth, Reproduction, and Survival	Dietary Effects to Juvenille Fish	Dietary Effects to Birds
				Benchmark	-	7.82	13	11	15	-	7.82	13	11	15
Reference	1	Fording	T	HENUP	-	-	-	-	-	3.77	0.5	0.3	0.3	0.3
			M	FO26	4.90	0.6	0.4	0.4	0.3	3.53	0.5	0.3	0.3	0.2
	2	Fording	T	LC_GRCK	6.51	0.8	0.5	0.6	0.4	-	-	-	-	-
				LI24	5.44	0.7	0.4	0.5	0.4	3.77	0.5	0.3	0.3	0.3
				SLINE	3.95	0.5	0.3	0.4	0.3	4.08	0.5	0.3	0.4	0.3
	3	Elk	M	ELUGH	4.20	0.5	0.3	0.4	0.3	4.35	0.6	0.3	0.4	0.3
	4	Michel	T	MI25	4.61	0.6	0.4	0.4	0.3	4.47	0.6	0.3	0.4	0.3
Mine-exposed	1	Fording	T	HENFO	9.62	1.2	0.7	0.9	0.6	-	-	-	-	-
				NGD1	11.54	1.5	0.9	1.0	0.8	-	-	-	-	-
				KICK	0.4*	0.1*	0.0*	0.0*	0.0*	-	-	-	-	-
				SWCK	18.54	2.4	1.4	1.7	1.2	-	-	-	-	-
				CATCK	10.54	1.3	0.8	1.0	0.7	-	-	-	-	-
				POCK	5.59	0.7	0.4	0.5	0.4	-	-	-	-	-
				FO10-SP1	7.13	0.9	0.5	0.6	0.5	-	-	-	-	-
				LC_DCDS	5.68	0.7	0.4	0.5	0.4	7.53	1.0	0.6	0.7	0.5
				LC_DC1	5.17	0.7	0.4	0.5	0.3	7.72	1.0	0.6	0.7	0.5
				GHCKD	21.67	2.8	1.7	2.0	1.4	-	-	-	-	-
				GHCKU	10.81	1.4	0.8	1.0	0.7	-	-	-	-	-
			M	FODHE	6.55	0.8	0.5	0.6	0.4	-	-	-	-	-
				FOUNGD	7.19	0.9	0.6	0.7	0.5	-	-	-	-	-
				FODNGD	6.21	0.8	0.5	0.6	0.4	-	-	-	-	-
				MP1	5.85	0.7	0.5	0.5	0.4	-	-	-	-	-
				FOUSH	6.04	0.8	0.5	0.5	0.4	-	-	-	-	-
				FOUKI	5.13	0.7	0.4	0.5	0.3	5.24	0.7	0.4	0.5	0.3
				FOBKS	6.00	0.8	0.5	0.5	0.4	-	-	-	-	-
				FOBSC	7.51	1.0	0.6	0.7	0.5	-	-	-	-	-
				FOBCP	7.68	1.0	0.6	0.7	0.5	9.72	1.2	0.7	0.9	0.6
				FODPO	6.92	0.9	0.5	0.6	0.5	3.80	0.5	0.3	0.3	0.3
				FO22	7.08	0.9	0.5	0.6	0.5	-	-	-	-	-
				FOUEW	6.05	0.8	0.5	0.6	0.4	5.84	0.7	0.4	0.5	0.4
				LC_FRUS	7.01	0.9	0.5	0.6	0.5	9.14	1.2	0.7	0.8	0.6
				FO29	7.54	1.0	0.6	0.7	0.5	8.52	1.1	0.7	0.8	0.6
				FODGH	8.36	1.1	0.6	0.8	0.6	7.25	0.9	0.6	0.7	0.5
	2	Fording	T	LCUT	-	-	-	-	-	6.22	0.80	0.48	0.57	0.41
				LILC3	13.31	1.7	1.0	1.2	0.9	35.20	4.5	2.7	3.2	2.3
				LIDSL	8.89	1.1	0.7	0.8	0.6	16.00	2.0	1.2	1.5	1.1
				LI8	9.31	1.2	0.7	0.8	0.6	11.80	1.5	0.9	1.1	0.8
			M	FO9	7.19	0.9	0.6	0.7	0.5	-	-	-	-	-
				FRUL	7.29	0.9	0.6	0.7	0.5	-	-	-	-	-
				FO23	6.37	0.8	0.5	0.6	0.4	6.73	0.9	0.5	0.6	0.4
	3	Elk	T	WOCK	11.63	1.5	0.9	1.1	0.8	-	-	-	-	-
				THCK	18.14	2.3	1.4	1.6	1.2	-	-	-	-	-
			M	EL20	4.98	0.6	0.4	0.5	0.3	5.13	0.7	0.4	0.5	0.3
				ELUEL	4.33	0.6	0.3	0.4	0.3	-	-	-	-	-
				ELDEL	4.64	0.6	0.4	0.4	0.3	-	-	-	-	-
				ELUFO	5.31	0.7	0.4	0.5	0.4	-	-	-	-	-
	4	Michel	T	CORCK	3.48	0.4	0.3	0.3	0.2	2.72	0.3	0.2	0.2	0.2
				BOCK	71.20	9.1	5.5	6.5	4.7	50.47	6.5	3.9	4.6	3.4
			M	MIUCO	4.78	0.6	0.4	0.4	0.3	4.15	0.5	0.3	0.4	0.3
				MIDCO	4.38	0.6	0.3	0.4	0.3	4.35	0.6	0.3	0.4	0.3
				MIDAG	7.55	1.0	0.6	0.7	0.5	-	-	-	-	-
				MI5	5.11	0.7	0.4	0.5	0.3	-	-	-	-	-
				MI3	2.33	0.3	0.2	0.2	0.2	-	-	-	-	-
				MI2	6.61	0.8	0.5	0.6	0.4	7.79	1.0	0.6	0.7	0.5
		Elk	T	HACKUS	6.57	0.8	0.5	0.6	0.4	9.89	1.3	0.8	0.9	0.7
				HACKDS	8.04	1.0	0.6	0.7	0.5	15.25	2.0	1.2	1.4	1.0
				GRCK	7.53	1.0	0.6	0.7	0.5	-	-	-	-	-
				GRDS	10.46	1.3	0.8	1.0	0.7	-	-	-	-	-
				OCNM	6.83	0.9	0.5	0.6	0.5	-	-	-	-	-
			M	EL19	5.22	0.7	0.4	0.5	0.3	7.58	1.0	0.6	0.7	0.5
				ELDGR	6.06	0.8	0.5	0.6	0.4	-	-	-	-	-
				ELUSP	5.47	0.7	0.4	0.5	0.4	-	-	-	-	-
	5	Elk	M	EL1	5.29	0.7	0.4	0.5	0.4	5.72	0.7	0.4	0.5	0.4
				ELDFE	6.35	0.8	0.5	0.6	0.4	-	-	-	-	-
				ELUFE	5.79	0.7	0.4	0.5	0.4	7.36	0.9	0.6	0.7	0.5
				ELELKO	8.88	1.1	0.7	0.8	0.6	9.50	1.2	0.7	0.9	0.6
				ELH93	12.40	1.6	1.0	1.1	0.8	12.14	1.6	0.9	1.1	0.8

Notes: "-" = not sampled

* Data are suspect due to low sample volume.

[a] Hazard quotient was calculated as tissue selenium concentration divided by the Level 1 Benchmark (Golder, 2014c): 13 mg/kg for growth, reproduction, and survival of benthic invertebrates; 11 mg/kg for dietary effects to juvenile fish; and 15 mg/kg for dietary effects to birds.

Maximum concentration reported from replicate samples

Good (Quotient < 0.7)

Marginal (Quotient between 0.7 and 1.0)

Poor (Quotient > 1.0)

Table G.51: Maximum Normal Range Quotients and Hazard Quotients (from 3 Replicate Samples) for Benthic Invertebrate Tissue Selenium in Lentic Habitats, 2015

Exposure Type	Management Unit	Study Area	Biological Area Code	Selenium (mg/kg dw)	Normal Range Quotient	Hazard Quotient[a]		
						Growth, Reproduction, and Survival	Dietary Effects to Juvenille Fish	Dietary Effects to Birds
			Benchmark	-	7.82	13	11	15
Reference	1	Lake Mountain Lake	LML	5.26	0.7	0.4	0.5	0.4
	N/A	Elk Lakes	EL14	5.31	0.7	0.4	0.5	0.4
	3	Unnamed Wetland North of Elkford	REFF	4.34	0.6	0.3	0.4	0.3
	4	Leach Creek Oxbow	LCHO	17.85	2.3	1.4	1.6	1.2
	N/A	Flathead Wetland Side Channel	FLA1	2.10	0.3	0.2	0.2	0.1
Mine-exposed	1	Henretta Lake	HE27	12.04	1.5	0.9	1.1	0.8
		Fording River Side Channel	FO10	5.77	0.7	0.4	0.5	0.4
		Fording River Lower Oxbow	FOXL	1.15	0.1	0.1	0.1	0.1
		Fording Meadow Upstream of Chauncey Creek	FMUCK	12.97	1.7	1.0	1.2	0.9
		Fording Wetland Downstream of Ewin Creek	FWDEC	12.38	1.6	1.0	1.1	0.8
		Off Channel Area of Fording Downstream of Greenhills	R5-1	32.14	4.1	2.5	2.9	2.1
	2	Off Channel Area of Fording Downstream of Josephine Falls	R5-3	19.60	2.5	1.5	1.8	1.3
	3	Elk River Upper Ponds	ERUP	4.57	0.6	0.4	0.4	0.3
		Elk River Upper Oxbow	EROU	1.49	0.2	0.1	0.1	0.1
	4	Elk River Wetland Downstream of Grave Creek	ELWDGC	9.60	1.2	0.7	0.9	0.6
		Goddard Marsh	GO13	27.90	3.6	2.1	2.5	1.9
		Otto Creek Ponds	OTTO	13.81	1.8	1.1	1.3	0.9
		Michel Wetland	MI16	18.24	2.3	1.4	1.7	1.2
		Michel Creek Oxbow #2	MIC2	9.02	1.2	0.7	0.8	0.6
		Lower Michel Wetland	MIWW	16.85	2.2	1.3	1.5	1.1
	5	Stanford Pond	STPD	27.80	3.6	2.1	2.5	1.9
		Elk River Lower Oxbow	EROL	13.79	1.8	1.1	1.3	0.9
		Elko Reservoir	ELKO	9.82	1.3	0.8	0.9	0.7

[a] Hazard quotient was calculated as tissue selenium concentration divided by the Level 1 Benchmark (Golder, 2014c): 13 mg/kg for growth, reproduction, and survival of benthic invertebrates; 11 mg/kg for dietary effects to juvenile fish; and 15 mg/kg for dietary effects to birds.

Good (Quotient < 0.7)

Marginal (Quotient between 0.7 and 1.0)

Poor (Quotient > 1.0)

Table G.52: Pearson Correlations for Overall Principal Components Analysis of Summary Variables, September 2015, Elk Valley

Variable		Transformation	PC-1		PC-2	
			r-value	P-value	r-value	P-value
Habitat Endpoint	Calcite Index	none	-0.774	<0.001	-0.228	0.031
	PC1 (Environmental Variables)	none	0.487	<0.001	-0.082	0.443
	PC2 (Environmental Variables)	none	-0.355	<0.001	0.437	<0.001
Benthic Invertabrate Endpoint	Abundance	log	-0.114	0.284	0.088	0.407
	LPL Richness	log	-0.007	0.944	0.849	<0.001
	NMDS Axis 1	none	0.861	<0.001	-0.261	0.013
	% EPT	none	0.761	<0.001	-0.398	<0.001
	%Ephemeroptera	none	0.765	<0.001	-0.253	0.016
Water Chemistry Summary Variables	Nitrate Hazard Quotient	log	-0.756	<0.001	-0.403	<0.001
	PC1 (Water Quality)	none	-0.926	<0.001	-0.110	0.302
	Sulphate Hazard Quotient	log	-0.930	<0.001	-0.153	0.150
	Selenium Hazard Quotient	log	-0.892	<0.001	-0.231	0.028

Shading indicates absolute r values greater than 0.6
Shading indicates P-values less than 0.05

Table G.53: Overall Principal Component Analysis of Key Univariate and Multivariate Concurrent Data (Excluding Tissue Selenium Data) Collected During Biologial Sampling in September, 2015, Elk Valley

Type		PC1	PC2
	Eigenvalue	5.97	1.52
	% Variance explained	49.8%	12.7%
	Monte Carlo P-value	0.0001	0.2001
Reference	AGCK	2.817	-1.419
	AL4	1.158	0.041
	ALUSM	0.966	1.090
	BU2	2.689	-0.824
	BU40	1.342	1.129
	BUUQ	2.072	0.040
	CADCK	2.237	-0.547
	CHCK	1.170	0.639
	DACK	1.041	1.448
	DUCK	0.361	3.141
	EL12	2.093	0.389
	ELUGH	2.571	-1.153
	EWCK	2.138	-0.175
	FLAD	0.882	3.034
	FLAU	1.346	1.399
	FLRU	1.595	1.780
	FO26	1.682	-0.274
	GRUHA	1.368	0.147
	HENUP	2.656	-1.777
	KOUCR	2.522	-0.025
	KOUVE	1.049	1.518
	LC_GRCK	1.378	-0.607
	LI24	2.324	-1.562
	MCCR	0.942	-1.698
	MI25	1.321	0.908
	OLDDU	1.227	2.112
	OLDLI	2.117	0.391
	OLDLOW	1.483	1.413
	PADAL	2.859	0.143
	PAUKO	2.676	0.050
	RACK	1.377	2.692
	VEUKO	2.967	-0.062
	VEUP	2.099	-0.272
	VICK	1.063	1.757
	WWRL	2.055	-0.448
	WWRU	2.631	-1.015
Mine-exposed	BOCK	-7.189	0.590
	CORCK	-4.459	1.772
	EL1	0.881	0.313
	EL19	-0.155	0.415
	EL20	1.979	-0.297
	ELDEL	2.209	-0.112
	ELDFE	0.698	0.290
	ELDGR	1.412	-0.561
	ELELKO	2.105	-1.683
	ELH93	0.02	-0.194
	ELUEL	1.680	-0.444
	ELUFE	0.461	0.409
	ELUSP	0.590	-0.796
	FO10-SP1	-2.101	-0.579
	FO22	-2.874	-0.101
	FO23	-1.522	0.944
	FO29	-1.343	0.674
	FO9	-0.855	-1.560
	FOBCP	-2.638	-1.149
	FOBKS	-0.863	-1.194
	FOBSC	-1.642	-1.055
	FODGH	-1.405	-0.851
	FODHE	0.6494	-0.8283
	FODNGD	-0.5766	-1.4837
	FODPO	-2.5343	-1.8255
	FOUEW	-2.1895	-1.407
	FOUKI	-0.7147	-0.5949
	FRUL	-0.5352	-1.1862
	FOUNGD	0.2419	-2.3922
	FOUSH	-0.4135	-1.188
	GHCKD	-4.9499	2.3921
	GHCKU	-5.4095	-0.941
	GRCK	0.1854	0.5145
	GRDS	-0.4207	0.187
	HACKDS	-1.1586	0.7146
	HACKUS	-0.9587	0.8317
	HENFO	0.8428	-0.8993
	KICK	-5.6384	-1.8948
	LC_DC1	2.008	-0.7813
	LC_DCDS	2.5196	-1.2247
	LC_FRUS	-1.25	-0.5595
	LIDSL	-1.34	-0.902
	LILC3	-3.2051	-0.862
	MI2	-0.0518	0.8626
	MI5	1.1904	-0.5555
	MIDAG	0.8883	0.7476
	MIDCO	-1.4275	1.0077
	MIUCO	1.0766	0.5918
	MP1	-0.9163	-0.2573
	OCNM	-1.7615	3.7234
	POCK	-4.3585	1.5171
	SWCK	-7.7554	-1.0269
	THCK	-5.3676	0.1842
	WOCK	-5.9272	-0.7033

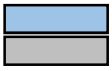
Table G.54: Summary Benthic Invertebrate, Water Quality, and Environmental Variables with Concurrent Samples Collected During Biological Sampling in September, 2015, Elk Valley, Used in the Overall Principal Components Analysis

Type	Biological Area Code	Multi-dimensional Summary Variables								Water Quality Summary Variables			
		Water Quality PC-1	NMDS Axis 1	Environmental Variable PC-1	Environmental Variable PC-2	Abundance	LPL Richness	EPT	Ephemeroptera	Nitrate Hazard Quotient	Sulphate Hazard Quotient	Selenium Hazard Quotient	Calcite Index
						orgs/3 min kick		%	%				
Transformation		none	none	none	none	log_{10}	none	none	none	log_{10}	log_{10}	log_{10}	none
Reference	AGCK	-5.7804	0.764	-1.417	-1.484	7,180	22	97	68	0.1	<0.1	<0.1	0
	AL4	-3.9116	-0.087	-0.893	-0.030	10,960	28	82	57	<0.1	<0.1	<0.1	0.98
	ALUSM	-3.1381	-0.093	0.224	-0.883	8,900	34	69	41	<0.1	<0.1	<0.1	0.76
	BU2	-2.3132	0.707	3.005	-2.525	1,515	28	92	54	<0.1	0.1	<0.1	0
	BU40	-3.8957	0.210	3.693	-0.779	3,440	34	60	35	<0.1	0.1	<0.1	0.57
	BUUQ	-3.4438	0.343	2.177	-1.451	3,070	29	83	40	<0.1	0.1	<0.1	0
	CADCK	-5.0422	0.631	0.216	-2.000	11,200	28	86	58	<0.1	0.1	<0.1	0.49
	CHCK	-4.2999	-0.086	-2.289	-2.215	13,360	32	69	42	<0.1	0.1	<0.1	0.54
	DACK	-0.6644	0.101	-1.845	1.511	9,840	34	83	53	<0.1	0.2	<0.1	0
	DUCK	-2.8583	-0.259	-0.541	2.630	5,951	37	45	23	<0.1	<0.1	<0.1	0
	EL12	-5.3333	0.192	1.692	-1.028	8,740	32	85	60	<0.1	<0.1	<0.1	0.41
	ELUGH	-4.209	0.776	2.787	-0.414	4,044	22	92	55	<0.1	<0.1	<0.1	0.08
	EWCK	-2.781	0.917	-1.410	-1.487	6,060	31	87	61	<0.1	0.1	<0.1	0.50
	FLAD	-6.084	-0.160	2.409	0.149	12,740	39	35	22	<0.1	<0.1	<0.1	0
	FLAU	-6.192	-0.291	0.873	0.384	6,520	31	63	37	<0.1	<0.1	<0.1	0
	FLRU	-7.191	-0.077	0.100	1.568	5,506	33	63	51	<0.1	<0.1	<0.1	0
	FO26	-3.278	0.613	-2.085	-0.510	9,400	29	86	67	<0.1	0.1	<0.1	0.93
	GRUHA	-1.702	0.747	-3.283	-0.434	4,891	32	96	45	<0.1	0.1	<0.1	0.97
	HENUP	-4.554	0.961	-2.246	-1.386	7,500	20	96	68	0.1	0.1	<0.1	0.14
	KOUCR	-5.316	0.428	4.033	-0.636	489	29	81	51	<0.1	<0.1	<0.1	0
	KOUVE	-7.154	-0.420	1.392	-0.116	2,276	30	38	30	<0.1	<0.1	<0.1	0
	LC_GRCK	-0.971	0.133	-4.158	-3.478	6,760	26	93	20	<0.1	0.1	<0.1	0
	LI24	-3.814	0.310	-2.958	-2.240	3,008	21	93	63	<0.1	0.1	<0.1	0
	MCCR	0.163	0.431	-2.565	-4.519	11,620	24	95	24	<0.1	0.2	<0.1	0.83
	MI25	-3.759	0.383	-4.592	1.052	7,140	31	84	47	<0.1	<0.1	<0.1	0.36
	OLDDU	-1.413	0.192	2.583	2.769	1,977	35	68	36	<0.1	0.1	<0.1	0
	OLDLI	-1.822	0.538	1.525	2.516	6,086	28	94	65	<0.1	0.1	<0.1	0
	OLDLOW	-1.240	0.374	3.894	4.150	3,523	30	83	39	<0.1	0.1	<0.1	0
	PADAL	-7.270	0.319	2.997	-2.117	557	33	93	52	<0.1	0.1	<0.1	0
	PAUKO	-6.672	0.425	3.120	-1.578	471	31	87	46	<0.1	0.1	<0.1	0
	RACK	-1.361	0.008	0.541	2.912	3,210	40	78	55	<0.1	0.1	<0.1	0
	VEUKO	-8.517	0.219	2.928	-1.118	705	30	84	71	<0.1	<0.1	<0.1	0
	VEUP	-9.639	0.189	-0.330	-2.083	756	25	64	34	<0.1	<0.1	<0.1	0
	VICK	-3.116	0.083	-2.012	2.153	8,520	32	69	40	<0.1	0.1	<0.1	0
	WWRL	-5.562	0.199	3.293	-0.429	4,856	23	78	41	<0.1	<0.1	<0.1	0
	WWRU	-7.059	0.424	1.766	-1.048	777	23	94	46	<0.1	<0.1	<0.1	0
	BOCK	14.373	-2.885	-4.726	2.570	8,140	26	7.6	0	2.6	1.8	1.3	0.96
	CORCK	9.526	-1.857	-3.333	-0.270	29,180	34	17	0	0.5	1.5	0.1	1.36
	EL1	0.626	0.369	4.941	0.435	7,720	32	70	54	0.3	0.2	0.1	0.46
	EL19	-0.316	-0.212	4.707	-0.170	3,240	32	60	29	0.4	0.2	0.1	1.00
Mine-exposed	EL20	-3.037	0.635	3.342	-0.257	6,218	29	92	55	0.1	0.1	<0.1	0.81
	ELDEL	-2.582	0.464	3.494	-0.053	7,740	28	87	61	0.1	0.1	<0.1	0.20
	ELDFE	0.865	0.186	5.713	0.607	17,160	33	73	65	0.3	0.2	0.1	0.92
	ELDGR	0.255	0.237	4.664	-0.067	1,288	30	89	64	0.4	0.2	0.1	0.25
	ELELKO	0.393	1.236	5.104	0.467	7,880	22	92	67	0.3	0.2	0.1	0
	ELH93	0.105	0.886	6.463	0.858	2,858	23	22	14	0.3	0.1	0.1	1.00
	ELUEL	-2.592	0.445	3.628	-0.145	5,135	27	82	55	0.1	0.1	<0.1	0.92
	ELUFE	0.492	0.292	6.128	0.863	11,000	32	61	54	0.3	0.2	0.1	0.94
	ELUSP	0.208	0.433	4.406	0.065	6,460	25	68	43	0.3	0.2	0.1	0.78
	FO10-SP1	4.096	-0.534	-0.301	-0.716	13,800	29	75	6.2	1.2	0.2	0.6	0.82
	FO22	4.737	-0.541	0.831	1.322	21,140	30	65	13	1.3	0.6	0.7	0.83
	FO23	3.255	-0.187	2.929	0.019	3,780	39	65	21	0.8	0.4	0.3	0.93
	FO29	2.238	-0.036	1.877	0.046	8,580	37	56	36	0.9	0.3	0.3	1.01
	FO9	2.463	0.380	2.500	0.345	6,720	24	72	40	0.9	0.4	0.3	0.82
	FOBCP	5.462	-0.396	0.208	0.290	4,260	27	78	16	0.8	0.7	0.6	1.30
	FOBKS	3.067	0.063	-0.034	0.422	4,161	25	69	47	0.8	0.3	0.2	0.92
	FOBSC	3.893	-0.167	0.286	0.511	2,923	26	62	40	0.8	0.4	0.3	1.16
	FODGH	2.442	-0.180	1.752	0.514	10,980	28	78	35	0.8	0.4	0.4	1.01
	FODHE	-1.686	0.583	-0.401	0.089	17,060	27	78	61	0.5	0.2	0.1	0.88
	FODNGD	1.939	0.055	-4.218	2.842	7,840	23	94	77	1.2	0.3	0.2	0.80
	FODPO	4.637	-0.437	0.070	0.590	10,340	22	90	7.9	1.3	0.6	0.7	0.89
	FOUEW	4.112	-0.329	0.642	0.020	7,720	25	71	26	1.1	0.5	0.6	0.98
	FOUKI	3.241	-0.138	-0.246	0.827	3,490	30	75	65	0.8	0.3	0.2	0.98
	FRUL	2.039	-0.250	2.047	-0.398	3,006	25	83	30	0.8	0.4	0.3	0
	FOUNGD	1.909	0.755	-0.959	-0.076	7,260	23	93	75	1.1	0.3	0.2	0.81
	FOUSH	2.286	0.005	-0.413	0.709	7,320	28	86	73	1	0.3	0.2	1.00
	GHCKD	8.166	-1.331	-4.888	1.347	10,560	40	21	6.4	0.3	1.6	0.8	1.41
	GHCKU	9.145	-0.818	-4.757	0.960	774	24	25	1.9	0.4	1.7	1	2.46
	GRCK	1.803	0.378	-1.742	0.483	7,740	33	87	44	0.1	0.4	0.2	0.48
	GRDS	1.266	0.360	-1.503	0.366	8,400	30	76	30	0.1	0.4	0.2	0.99
	HACKDS	2.842	0.429	-2.718	0.303	10,160	32	50	29	0.1	0.4	0.3	1.05
	HACKUS	2.472	0.076	-2.870	0.828	15,540	35	85	36	0.1	0.5	0.4	0.91
	HENFO	-1.399	0.548	-1.767	-0.526	13,820	29	84	75	0.5	0.2	0.1	0.94
	KICK	8.277	-1.376	-2.011	-0.779	497	22	16	0.40	3.3	0.8	1	2.34
	LC_DC1	-2.229	0.348	-2.825	-1.965	7,140	25	91	54	<0.1	<0.1	<0.1	0
	LC_DCDS	-4.148	0.452	-3.689	-5.023	7,640	27	91	60	<0.1	<0.1	<0.1	0
	LC_FRUS	2.264	-0.060	2.166	0.402	2,065	30	64	39	0.9	0.4	0.3	1.00
	LIDSL	5.418	0.063	-0.506	-1.064	6,980	30	74	38	0.8	0.5	0.4	0.60
	LILC3	7.225	-0.282	-0.686	-1.486	19,360	26	33	8.5	1	0.7	0.5	1.00
	MI2	1.891	0.026	2.422	1.058	6,119	33	73	30	0.3	0.3	0.1	0.43
	MI5	-1.290	0.306	1.091	0.707	7,120	22	87	30	0.1	0.1	<0.1	0.50
	MIDAG	-1.847	0.170	-0.555	-0.126	14,520	31	72	43	0.1	0.2	<0.1	0.36
	MIDCO	5.095	-0.210	-1.584	0.363	12,360	32	51	22	0.2	0.7	0.1	0.69
	MIUCO	-3.288	0.283	-2.739	0.041	7,820	31	72	53	<0.1	<0.1	<0.1	0.87
	MP1	1.954	-0.030	-0.281	0.427	5,470	32	70	51	1.1	0.3	0.2	0.98
	OCNM	5.309	-1.219	-9.003	1.366	1,373	40	34	2.1	<0.1	0.1	<0.1	0.38
	POCK	4.383	-1.422	-7.166	1.135	22,160	30	19	0.90	0.2	1	0.6	1.10
	SWCK	12.804	-2.089	-5.728	1.918	6,214	24	29	0	1.9	3.4	4.9	2.06
	THCK	8.452	-1.687	-5.795	1.595	2,412	25	17	1.1	0.8	1.6	0.9	0.99
	WOCK	13.524	-1.288	-6.595	-0.398	1,244	30	38	0.32	3.2	2.3	1.2	1.25

Notes:
Censored hazard quotients (ie.., <0.1), data were replaced with 1 × censored value (i.e., 0.1).

Table G.55: Pearson Correlations for Overall Principal Components Analysis, September 2015, Elk Valley

Variable		Transformation	PC-1		PC-2	
			r-value	P-value	r-value	P-value
Habitat Endpoints	Calcite Index	none	-0.714	<0.001	0.072	0.593
	PC1 (Environmental Variables)	none	0.481	<0.001	0.427	<0.001
	PC2 (Environmental Variables)	none	-0.498	<0.001	0.133	0.320
Benthic Invertebrate Endpoints	Tissue Selenium	log	-0.717	<0.001	0.178	0.181
	Abundance	log	0.091	0.499	-0.359	0.006
	NMDS Axis 1	none	0.889	<0.001	0.210	0.113
	LPL Richness	log	-0.114	0.393	-0.721	<0.001
	% EPT	none	0.812	<0.001	0.274	0.038
	%Ephemeroptera	none	0.778	<0.001	0.265	0.045
Water Chemistry Summary Variables	Nitrate Hazard Quotient	log	-0.634	<0.001	0.548	<0.001
	PC1 (Water Quality)	none	-0.958	<0.001	0.040	0.763
	Sulphate Hazard Quotient	log	-0.918	<0.001	0.054	0.690
	Selenium Hazard Quotient	log	-0.870	<0.001	0.218	0.100



Shading indicates absolute r values greater than 0.6

Shading indicates P-values less than 0.05

Table G.56: Overall Principal Component Analysis of Key Univariate and Multivariate Concurrent Data, Inlcuding Tissue Selenium Data, Collected During Biologial Sampling in September, 2015, Elk Valley

Type		PC1	PC2
	Eigenvalue	6.50	1.43
	% Variance explained	50.0%	11.0%
	Monte Carlo P-value	0.0001	0.9960
Reference	ELUGH	3.614	0.926
	FO26	2.665	-0.780
	LC_GRCK	2.492	-1.197
	LI24	3.378	0.553
	MI25	2.284	-1.390
Mine-exposed	BOCK	-7.394	0.607
	CORCK	-2.921	-2.913
	EL1	1.722	-0.124
	EL19	0.747	-0.131
	EL20	2.859	-0.119
	ELDEL	3.152	-0.168
	ELDFE	1.464	-0.261
	ELDGR	2.053	1.155
	ELELKO	2.667	1.959
	ELH93	0.346	1.319
	ELUEL	2.641	0.117
	ELUFE	1.247	-0.127
	ELUSP	1.505	0.759
	FO10-SP1	-0.964	-0.071
	FO22	-1.814	0.018
	FO23	-0.680	-0.498
	FO29	-0.520	-0.544
	FO9	0.033	1.571
	FOBCP	-1.745	0.945
	FOBKS	0.056	1.148
	FOBSC	-0.862	1.199
	FODGH	-0.556	0.691
	FODHE	1.578	0.172
	FODNGD	0.271	1.698
	FODPO	-1.400	1.566
	FOUEW	-1.056	1.063
	FOUKI	0.184	0.670
	FRUL	0.365	1.342
	FOUNGD	1.103	1.926
	FOUSH	0.483	0.968
	GHCKD	-4.648	-2.157
	GHCKU	-4.814	1.051
	GRCK	0.875	-1.010
	GRDS	0.141	-0.744
	HACKDS	-0.410	-1.413
	HACKUS	-0.080	-1.601
	HENFO	1.529	0.101
	LC_DC1	3.108	-0.522
	LC_DCDS	3.755	-1.117
	LC_FRUS	-0.494	0.990
	LIDSL	-0.51	0.287
	LILC3	-2.351	-0.026
	MI2	0.670	-0.519
	MI5	2.155	0.383
	MIDAG	1.684	-1.378
	MIDCO	-0.305	-1.680
	MIUCO	2.060	-1.328
	MP1	0.005	0.215
	OCNM	-1.141	-3.184
	POCK	-3.060	-2.434
	SWCK	-7.095	1.113
	THCK	-4.898	0.360
	WOCK	-5.171	0.564

Table G.57: Summary of Benthic Invertebrate, Water Quality, and Environmental Variables with Concurrent Samples Collected During Biological Sampling in September, 2015, Elk Valley, Used in the Overall Principal Components Analysis

Type	Biological Area Code	Multi-dimensional Summary Variables				Benthic Invertebrate Endpoints					Water Quality Summary Variables			
		Water Quality PC-1	NMDS Axis 1	Environmental Variable PC-1	Environmental Variable PC-2	Composite Tissue Selenium	Abundance	LPL Richness	EPT	Ephemeroptera	Nitrate Hazard Quotient	Sulphate Hazard Quotient	Selenium Hazard Quotient	Calcite Index
						µg/g dw	orgs/3 min kick		%	%				
Reference	ELUGH	-4.209	0.776	2.787	-0.414	4.20	4,044	22	92	55	<0.1	<0.1	<0.1	0.08
	FO26	-3.278	0.613	-2.085	-0.510	4.90	9,400	29	86	67	<0.1	0.1	<0.1	0.93
	LC_GRCK	-0.971	0.133	-4.158	-3.478	6.51	6,760	26	93	20	<0.1	0.1	<0.1	0
	LI24	-3.814	0.310	-2.958	-2.240	5.44	3,008	21	93	63	<0.1	0.1	<0.1	0
	MI25	-3.759	0.383	-4.592	1.052	4.61	7,140	31	84	47	<0.1	<0.1	<0.1	0.36
Mine-exposed	BOCK	14.373	-2.885	-4.726	2.570	71.20	8,140	26	7.6	0	2.6	1.8	1.3	0.96
	CORCK	9.526	-1.857	-3.333	-0.270	3.48	29,180	34	17	0	0.5	1.5	0.1	1.36
	EL1	0.626	0.369	4.941	0.435	5.29	7,720	32	70	54	0.3	0.2	0.1	0.46
	EL19	-0.316	-0.212	4.707	-0.170	5.22	3,240	32	60	29	0.4	0.2	0.1	1.00
	EL20	-3.037	0.635	3.342	-0.257	4.98	6,218	29	92	55	0.1	0.1	<0.1	0.81
	ELDEL	-2.582	0.464	3.494	-0.053	4.64	7,740	28	87	61	0.1	0.1	<0.1	0.20
	ELDFE	0.865	0.186	5.713	0.607	6.35	17,160	33	73	65	0.3	0.2	0.1	0.92
	ELDGR	0.255	0.237	4.664	-0.067	6.06	1,288	30	89	64	0.4	0.2	0.1	0.25
	ELELKO	0.393	1.236	5.104	0.467	8.88	7,880	22	92	67	0.3	0.2	0.1	0
	ELH93	0.105	0.886	6.463	0.858	12.40	2,858	23	22	14	0.3	0.1	0.1	1.00
	ELUEL	-2.592	0.445	3.628	-0.145	4.33	5,135	27	82	55	0.1	0.1	<0.1	0.92
	ELUFE	0.492	0.292	6.128	0.863	5.79	11,000	32	61	54	0.3	0.2	0.1	0.94
	ELUSP	0.208	0.433	4.406	0.065	5.47	6,460	25	68	43	0.3	0.2	0.1	0.78
	FO10-SP1	4.096	-0.534	-0.301	-0.716	7.13	13,800	29	75	6.2	1.2	0.2	0.6	0.82
	FO22	4.737	-0.541	0.831	1.322	7.08	21,140	30	65	13	1.3	0.6	0.7	0.83
	FO23	3.255	-0.187	2.929	0.019	6.37	3,780	39	65	21	0.8	0.4	0.3	0.93
	FO29	2.238	-0.036	1.877	0.046	7.54	8,580	37	56	36	0.9	0.3	0.3	1.01
	FO9	2.463	0.380	2.500	0.345	7.19	6,720	24	72	40	0.9	0.4	0.3	0.82
	FOBCP	5.462	-0.396	0.208	0.290	7.68	4,260	27	78	16	0.8	0.7	0.6	1.30
	FOBKS	3.067	0.063	-0.034	0.422	6.00	4,161	25	69	47	0.8	0.3	0.2	0.92
	FOBSC	3.893	-0.167	0.286	0.511	7.51	2,923	26	62	40	0.8	0.4	0.3	1.16
	FODGH	2.442	-0.180	1.752	0.514	8.36	10,980	28	78	35	0.8	0.4	0.4	1.01
	FODHE	-1.686	0.583	-0.401	0.089	6.55	17,060	27	78	61	0.5	0.2	0.1	0.88
	FODNGD	1.939	0.055	-4.218	2.842	6.21	7,840	23	94	77	1.2	0.3	0.2	0.80
	FODPO	4.637	-0.437	0.070	0.590	6.92	10,340	22	90	7.9	1.3	0.6	0.7	0.89
	FOUEW	4.112	-0.329	0.642	0.020	6.05	7,720	25	71	26	1.1	0.5	0.6	0.98
	FOUKI	3.241	-0.138	-0.246	0.827	5.13	3,490	30	75	65	0.8	0.3	0.2	0.98
	FRUL	2.039	-0.250	2.047	-0.398	7.29	3,006	25	83	30	0.8	0.4	0.3	0
	FOUNGD	1.909	0.755	-0.959	-0.076	7.19	7,260	23	93	75	1.1	0.3	0.2	0.81
	FOUSH	2.286	0.005	-0.413	0.709	6.04	7,320	28	86	73	1	0.3	0.2	1.00
	GHCKD	8.166	-1.331	-4.888	1.347	21.67	10,560	40	21	6.4	0.3	1.6	0.8	1.41
	GHCKU	9.145	-0.818	-4.757	0.960	10.81	774	24	25	1.9	0.4	1.7	1	2.46
	GRCK	1.803	0.378	-1.742	0.483	7.53	7,740	33	87	44	0.1	0.4	0.2	0.48
	GRDS	1.266	0.360	-1.503	0.366	10.46	8,400	30	76	30	0.1	0.4	0.2	0.99
	HACKDS	2.842	0.429	-2.718	0.303	8.04	10,160	32	50	29	0.1	0.4	0.3	1.05
	HACKUS	2.472	0.076	-2.870	0.828	6.57	15,540	35	85	36	0.1	0.5	0.4	0.91
	HENFO	-1.399	0.548	-1.767	-0.526	9.62	13,820	29	84	75	0.5	0.2	0.1	0.94
	LC_DC1	-2.229	0.348	-2.825	-1.965	5.17	7,140	25	91	54	<0.1	<0.1	<0.1	0
	LC_DCDS	-4.148	0.452	-3.689	-5.023	5.68	7,640	27	91	60	<0.1	<0.1	<0.1	0
	LC_FRUS	2.264	-0.060	2.166	0.402	7.01	2,065	30	64	39	0.9	0.4	0.3	1.00
	LIDSL	5.418	0.063	-0.506	-1.064	8.89	6,980	30	74	38	0.8	0.5	0.4	0.60
	LILC3	7.225	-0.282	-0.686	-1.486	13.31	19,360	26	33	8.5	1	0.7	0.5	1.00
	MI2	1.891	0.026	2.422	1.058	6.61	6,119	33	73	30	0.3	0.3	0.1	0.43
	MI5	-1.290	0.306	1.091	0.707	5.11	7,120	22	87	30	0.1	0.1	<0.1	0.50
	MIDAG	-1.847	0.170	-0.555	-0.126	7.55	14,520	31	72	43	0.1	0.2	<0.1	0.36
	MIDCO	5.095	-0.210	-1.584	0.363	4.38	12,360	32	51	22	0.2	0.7	0.1	0.69
	MIUCO	-3.288	0.283	-2.739	0.041	4.78	7,820	31	72	53	<0.1	<0.1	<0.1	0.87
	MP1	1.954	-0.030	-0.281	0.427	5.85	5,470	32	70	51	1.1	0.3	0.2	0.98
	OCNM	5.309	-1.219	-9.003	1.366	6.83	1,373	40	34	2.1	<0.1	0.1	<0.1	0.38
	POCK	4.383	-1.422	-7.166	1.135	5.59	22,160	30	19	0.90	0.2	1	0.6	1.10
	SWCK	12.804	-2.089	-5.728	1.918	18.54	6,214	24	29	0	1.9	3.4	4.9	2.06
	THCK	8.452	-1.687	-5.795	1.595	18.14	2,412	25	17	1.1	0.8	1.6	0.9	0.99
	WOCK	13.524	-1.288	-6.595	-0.398	11.63	1,244	30	38	0.32	3.2	2.3	1.2	1.25

Notes:

Censored hazard quotients (ie., <0.1), data were replaced with 1 × censored value (i.e., 0.1).

APPENDIX H
FISH

Longnose Sucker
Westslope Cutthroat Trout
Mountain Whitefish

FISH

Longnose Sucker

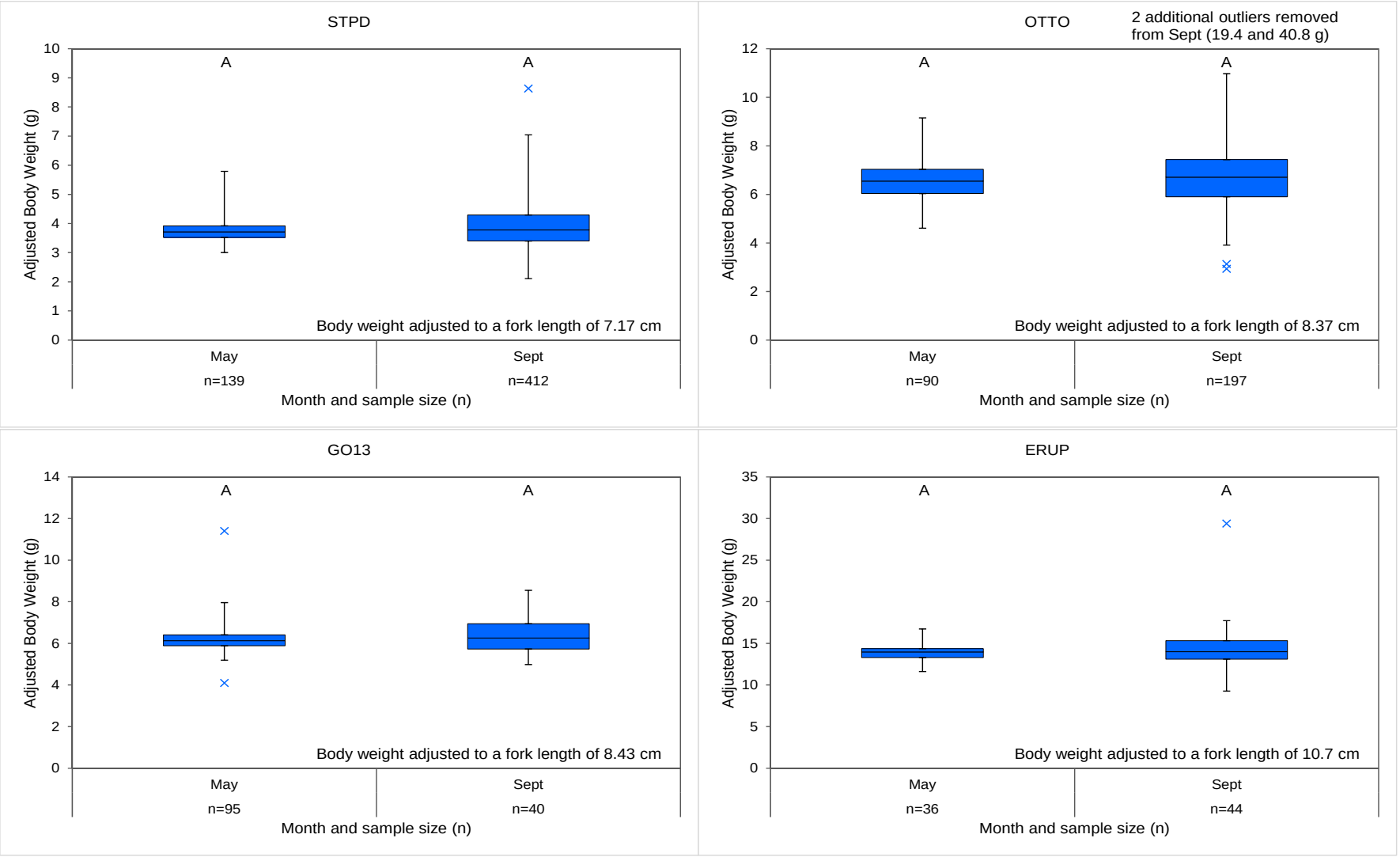


Figure HLSU.1: Boxplots of Condition (Body Weight Adjusted to the Mean Fork Length) from the Analysis of Covariance Model for Longnose Sucker Collected in May 2015 Compared to September 2015 by Area

Notes: Whiskers of the boxplots extend to the minimum and maximum values included in the statistical analyses. The outliers removed from statistical analyses are noted by an ×
Time periods that share a letter (A) are not significantly different (p-value > 0.05). Time periods that do not share a letter are significantly (p-value < 0.05) different. Results of statistical analyses are in Table HLSU.11.

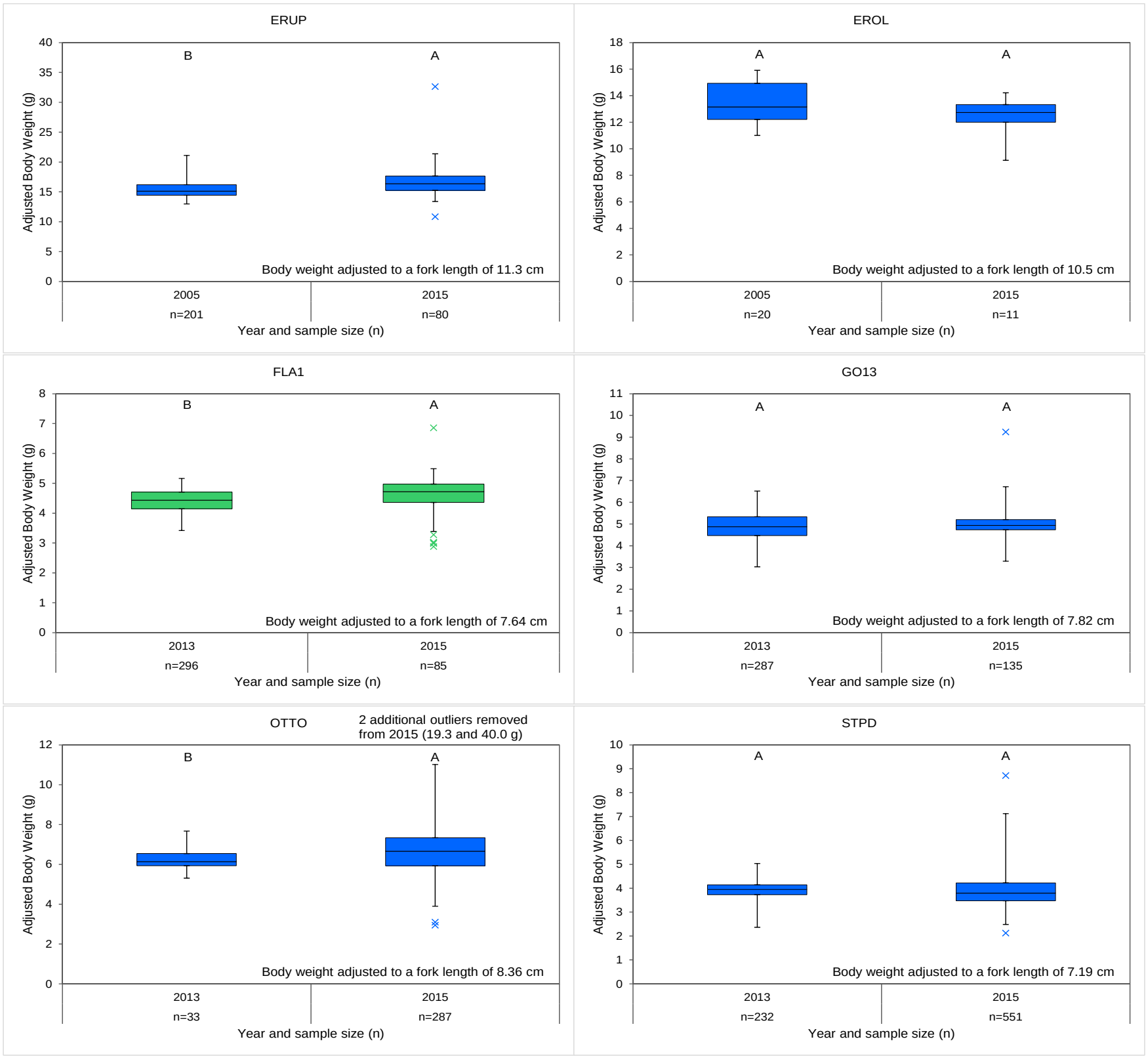
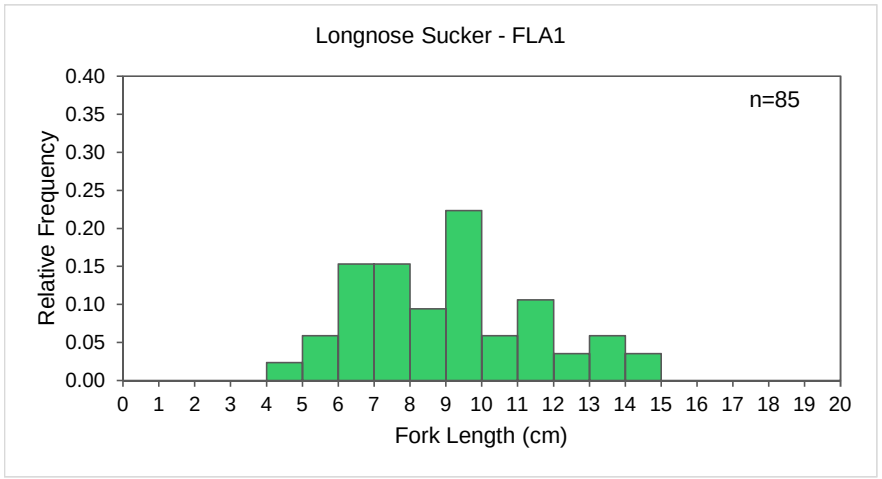
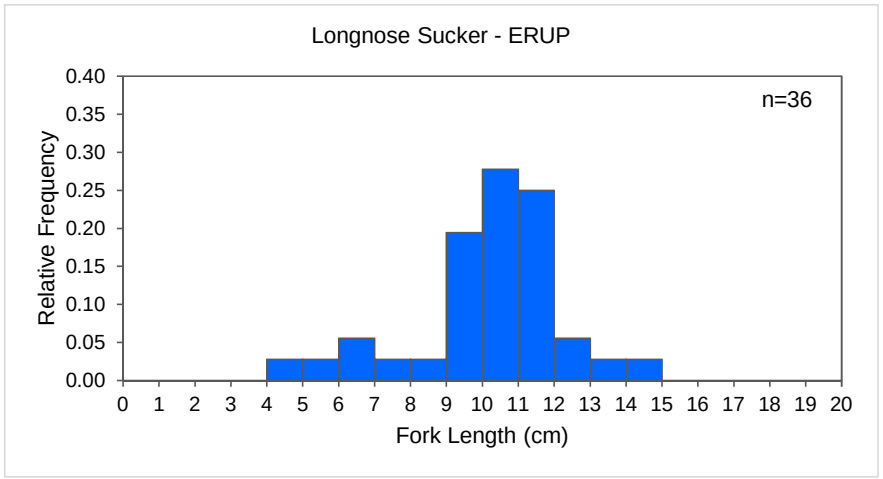
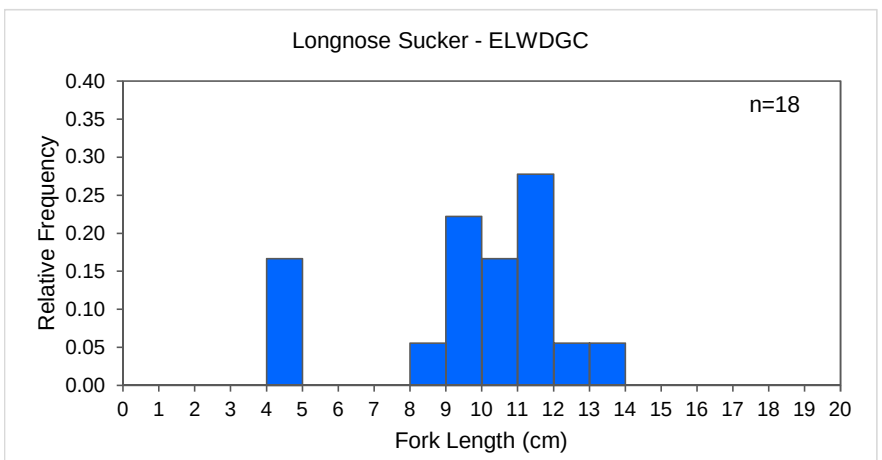


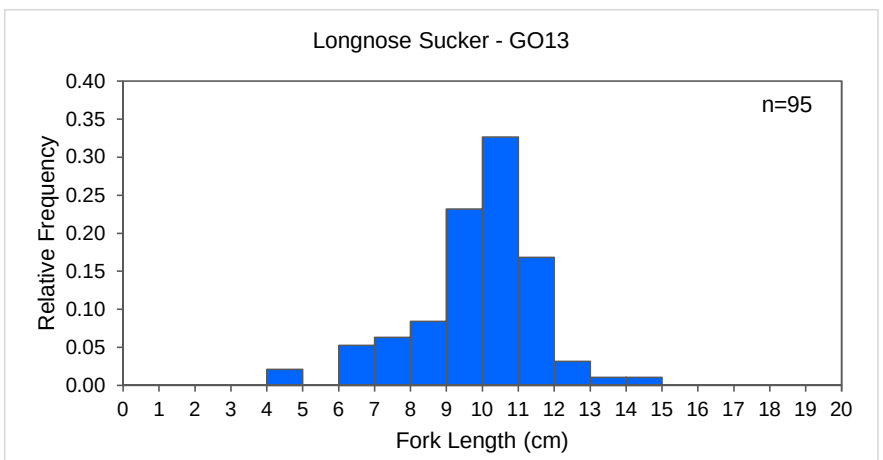
Figure HLSU.2: Boxplots of Body Weight Adjusted to the Mean Fork Length from the Analysis of Covariance Model for Longnose Sucker Collected in 2005 or 2013 Compared to 2015 by Area

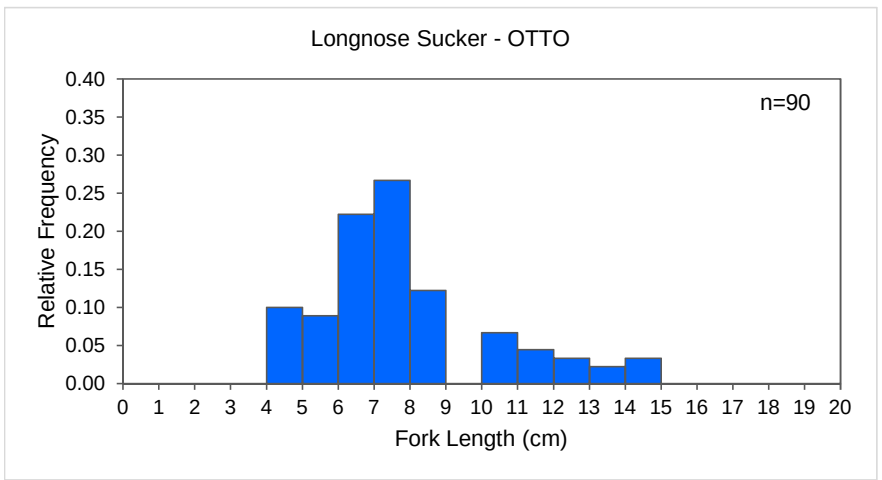
Notes: Whiskers of the boxplots extend to the minimum and maximum values included in the statistical analyses. The outliers removed from statistical analyses are noted by an ×
Years that share a letter (A) are not significantly different (p-value > 0.05). Years that do not share a letter are significantly (p-value < 0.05) different. Results of statistical analyses are in Table HLSU.12.

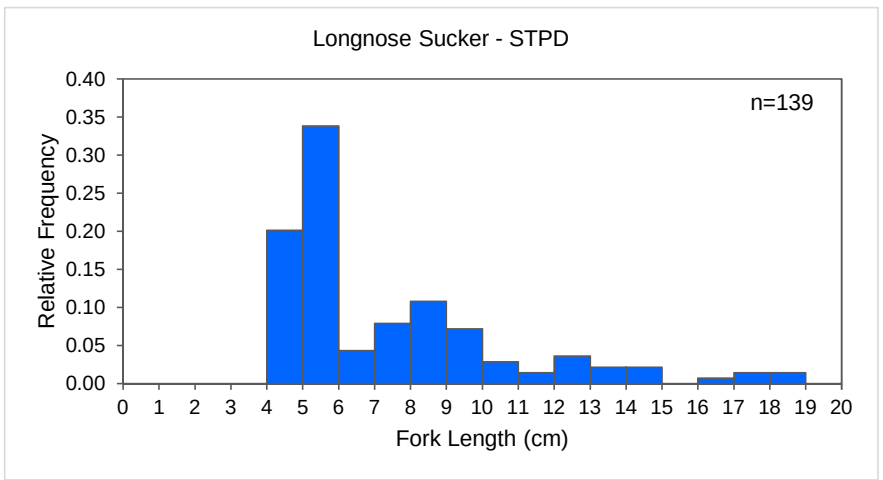


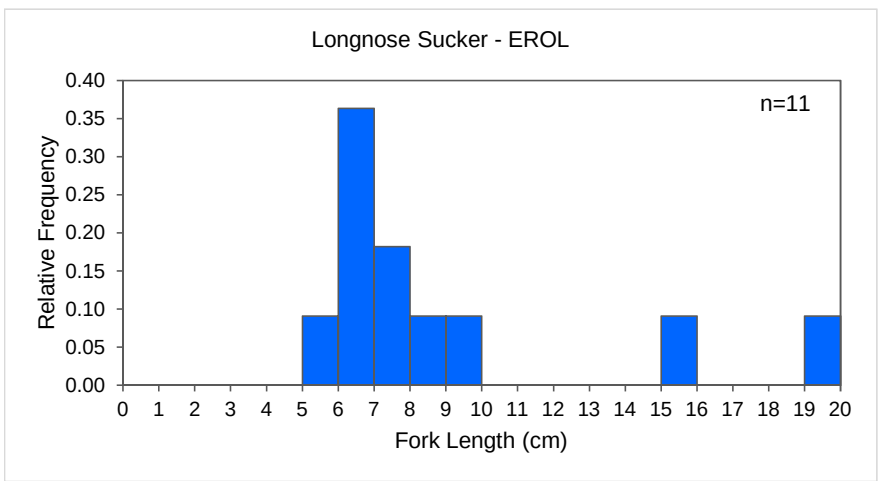












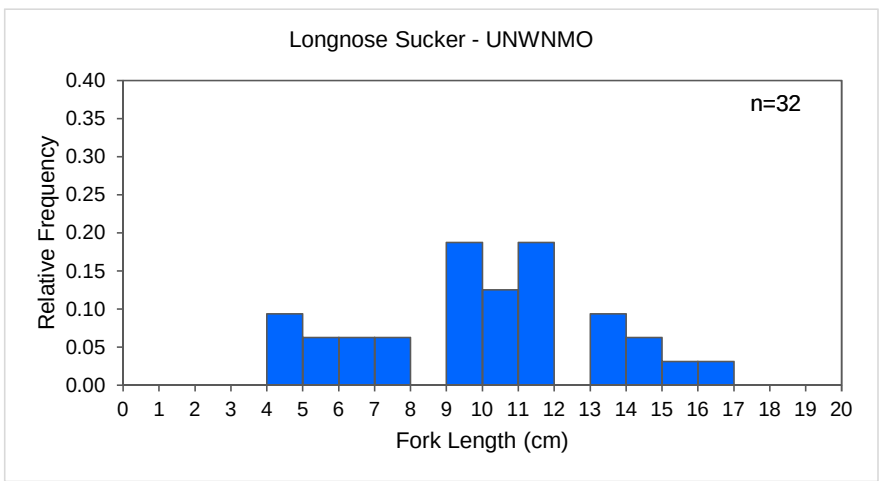
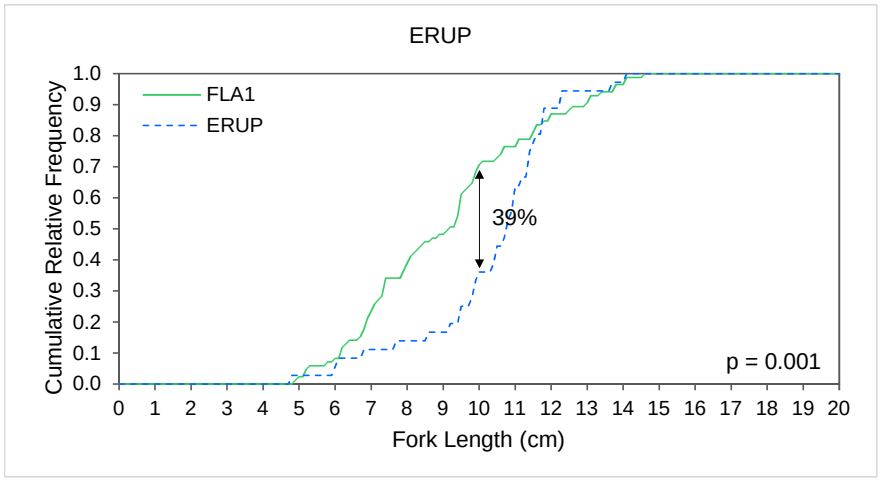
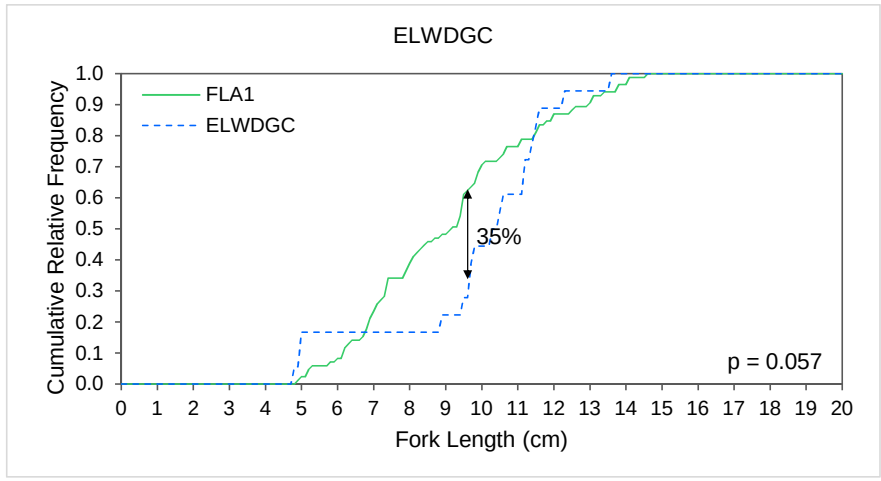
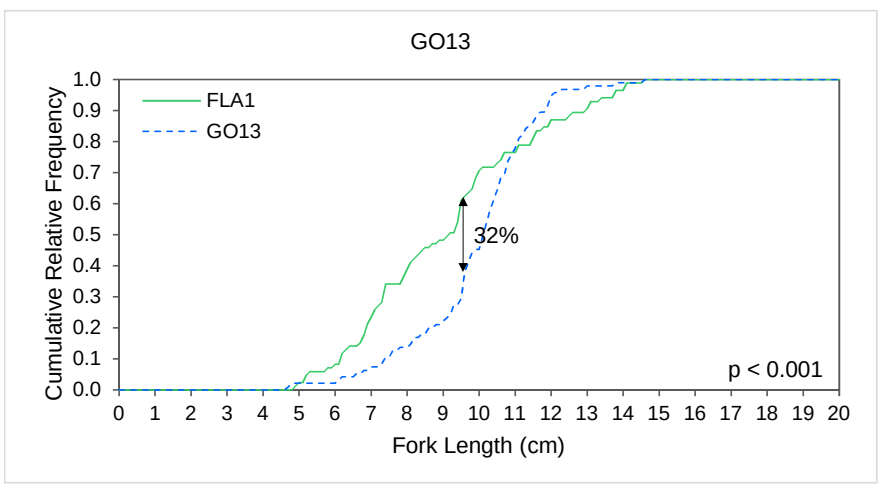
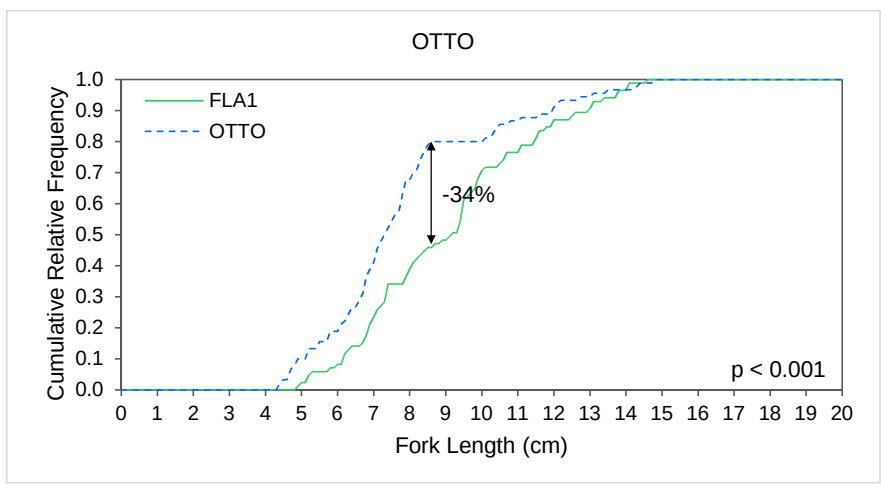


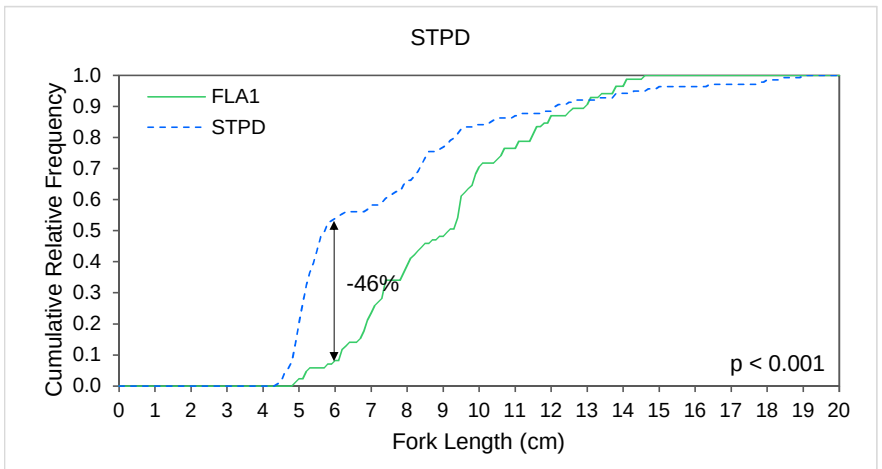
Figure HLSU.3: Length Frequency Distributions for Longnose Sucker Among Reference (Green) and Mine-exposed (Blue) Areas, May 2015

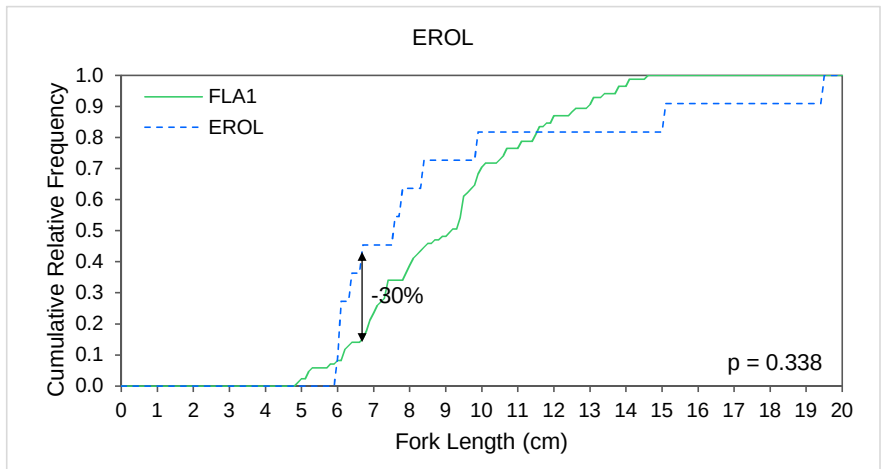












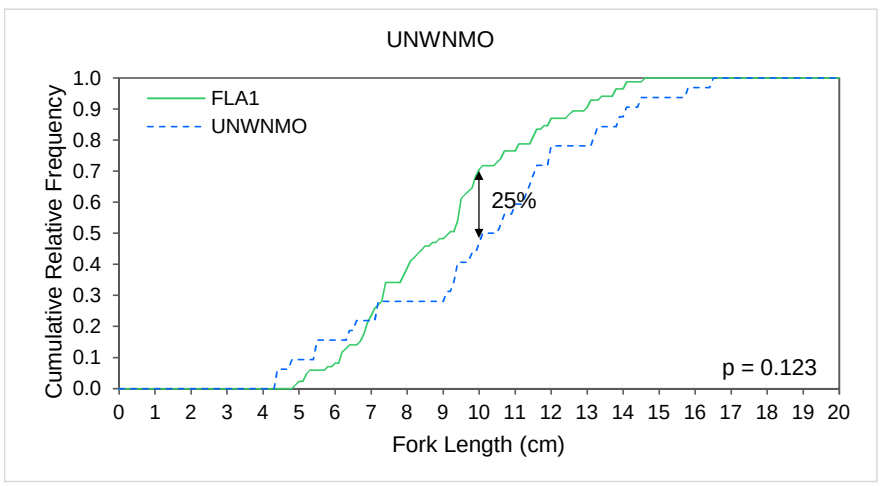


Figure HLSU.4: Cumulative Relative Frequency Distributions for Fork Length of Longnose Sucker for Areas Compared with the Two-sample Kolmogorov-Smirnov Test Between FLA-1 (Reference; Green) and Mine-exposed Areas (Blue), May 2015

Notes: Magnitude of difference = the maximum difference between the cumulative relative frequency distributions. P-value reported for the two-sample Kolmogorov-Smirnov test

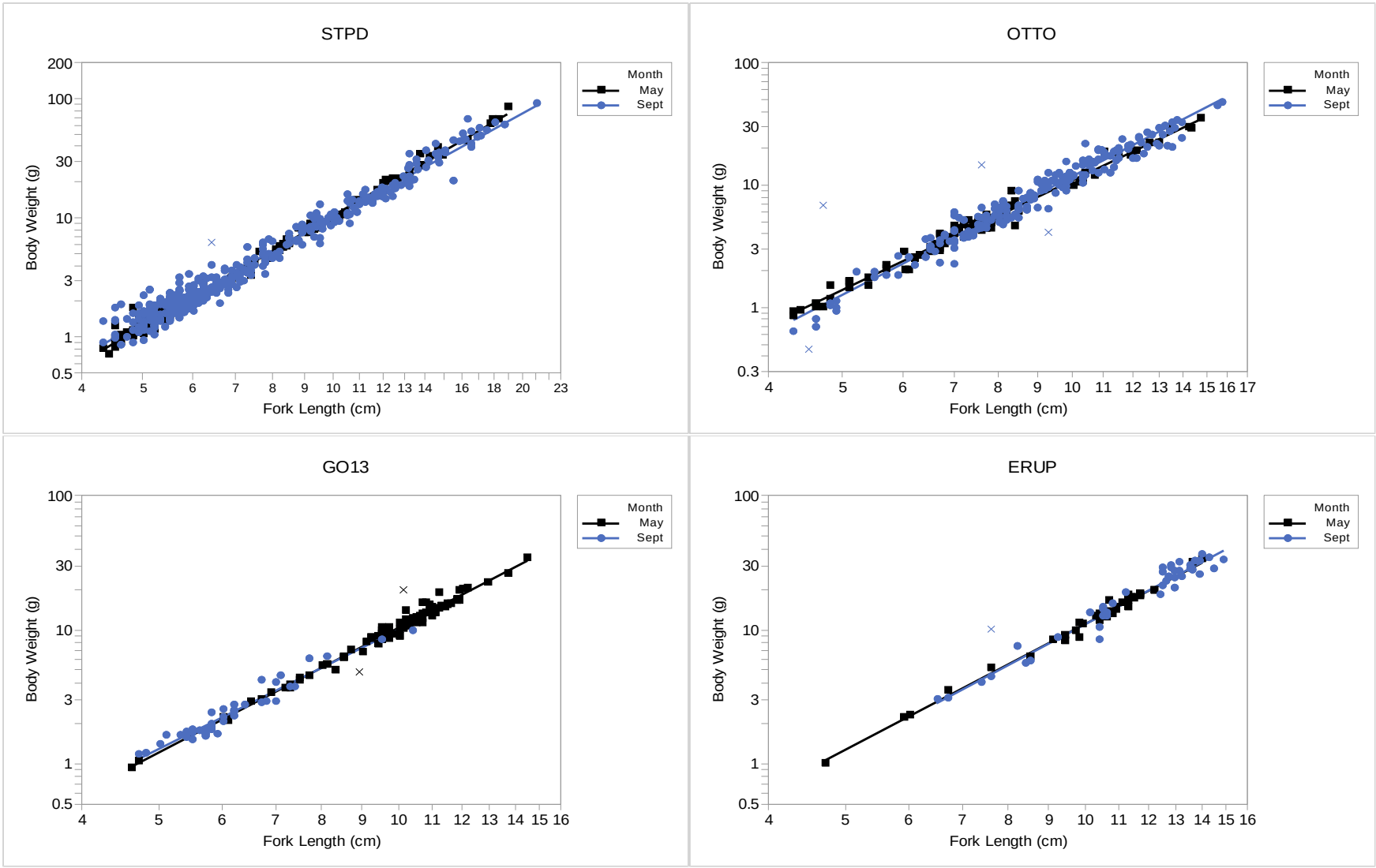
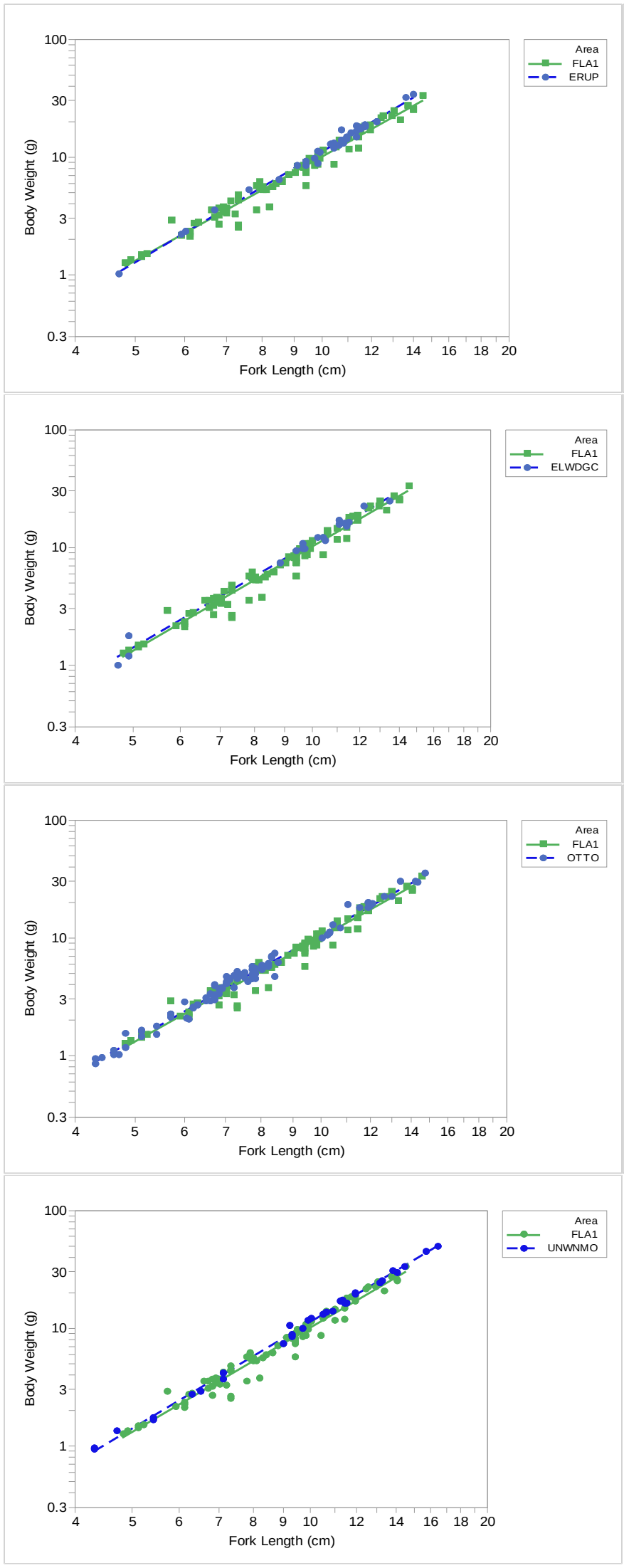


Figure HLSU.5: Scatterplots and Linear Regressions of Body Weight versus Fork Length for Longnose Sucker Collected in May and September, 2015 by Area

Notes: Outliers removed from statistical analyses are noted by an ×



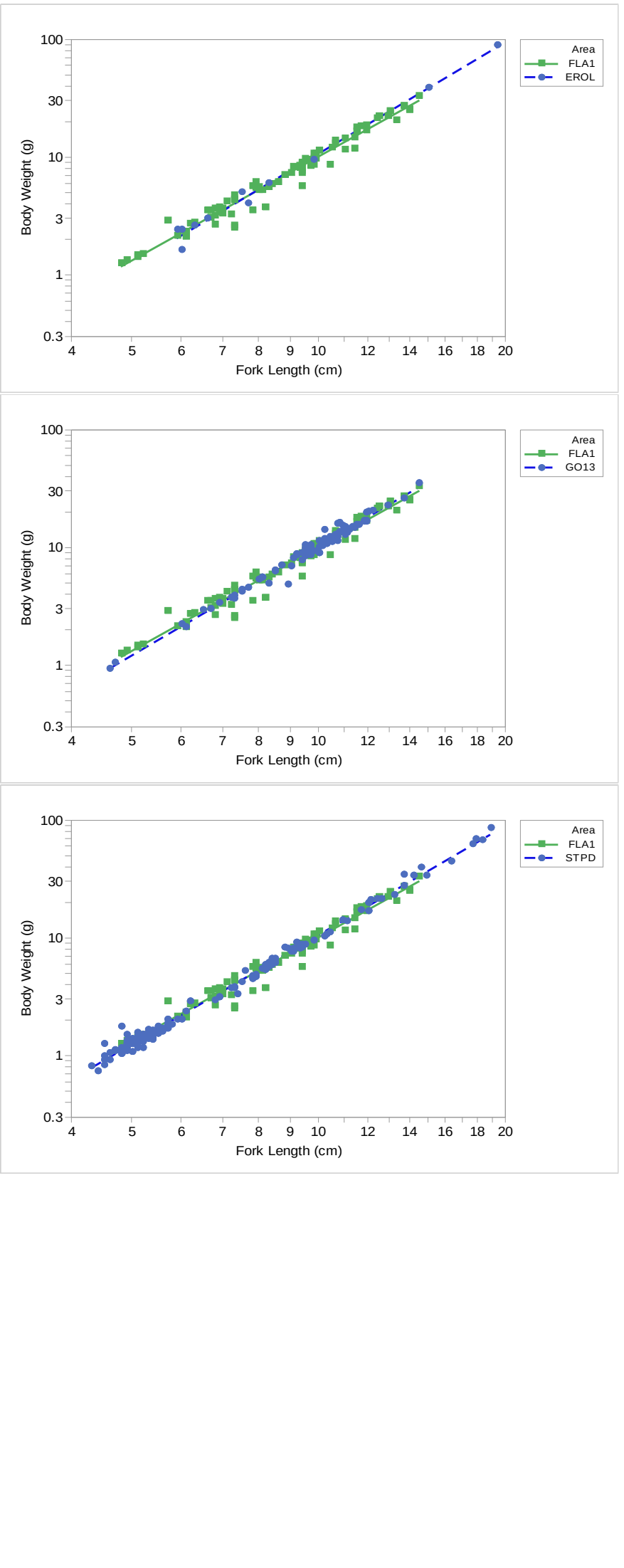


Figure HLSU.6: Scatterplots and Linear Regressions of Body Weight versus Fork Length from Each Mine-exposed Area (ERUP, EROL, ELWDGC, GO13, OTTO, STPD, UNWNMO) Relative to the the Reference Area (FLA1) for Longnose Sucker Collected in May, 2015

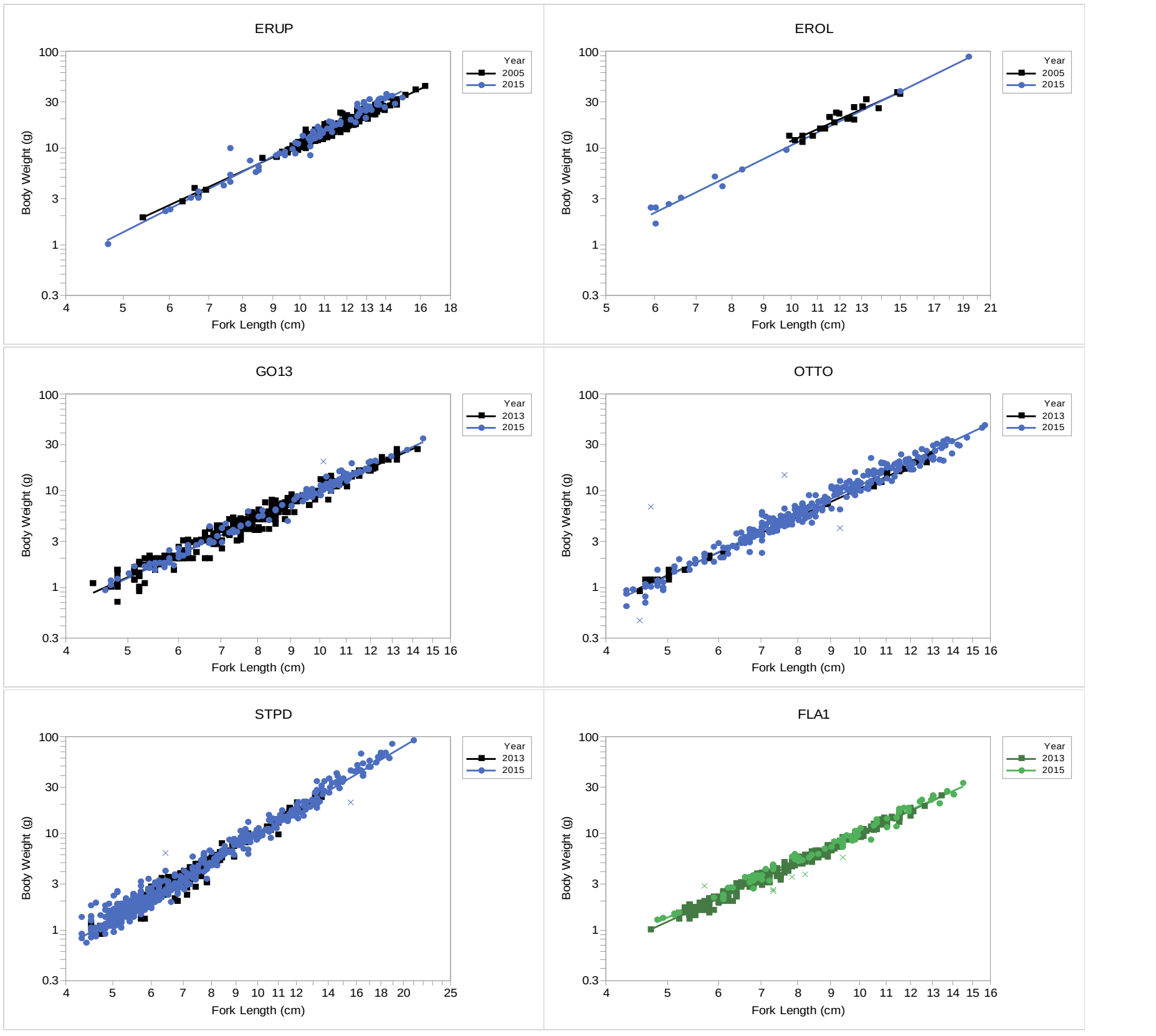
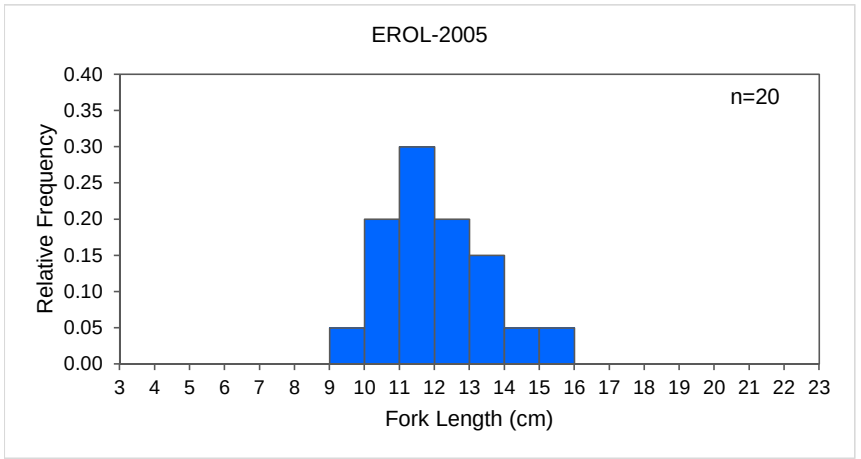
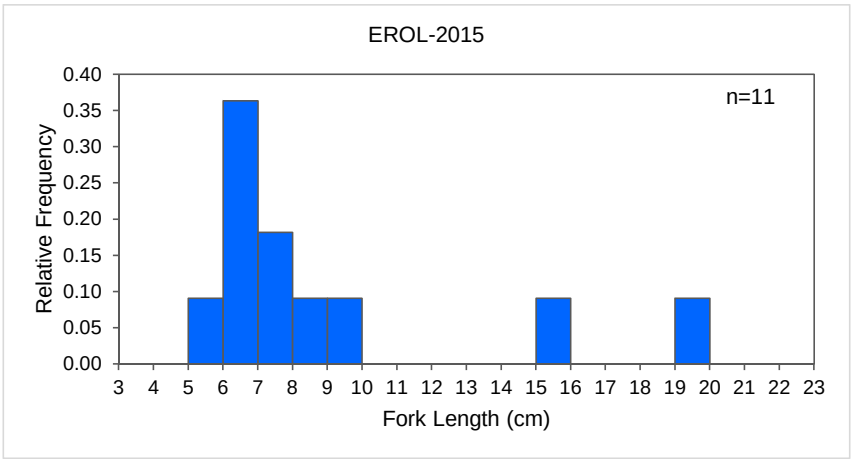
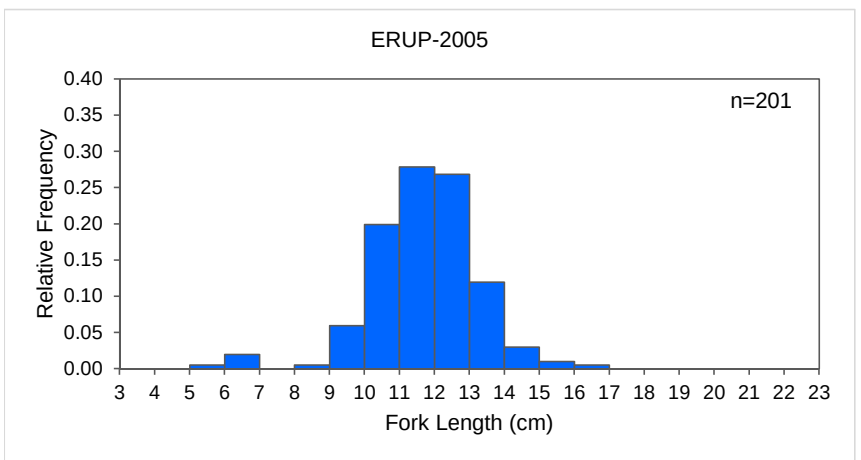


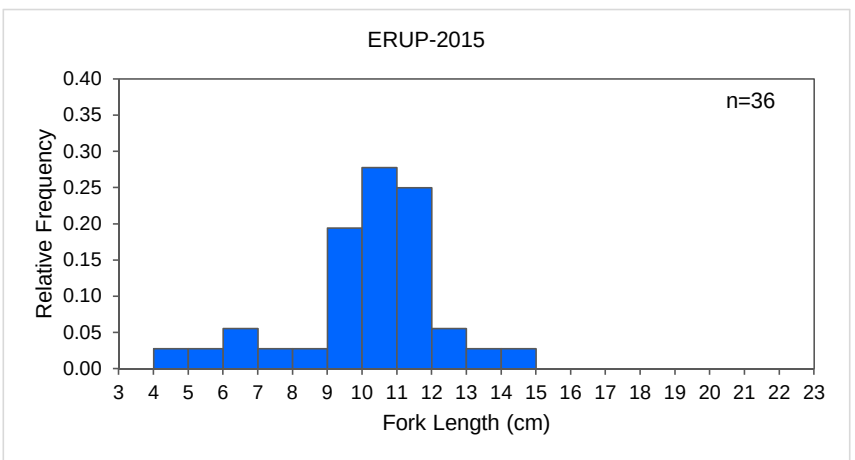
Figure HLSU.7: Scatterplots and Linear Regressions of Body Weight versus Fork Length for Longnose Sucker Collected in 2005 or 2013 Compared to 2015 by Area

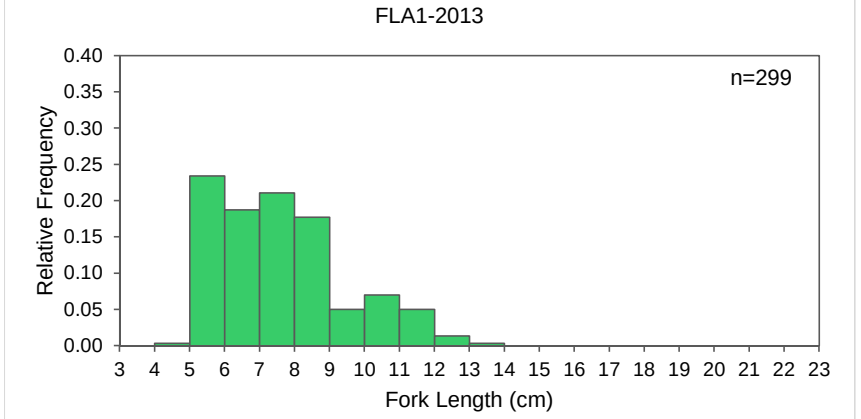
Notes: Outliers removed from statistical analyses are noted by an ×

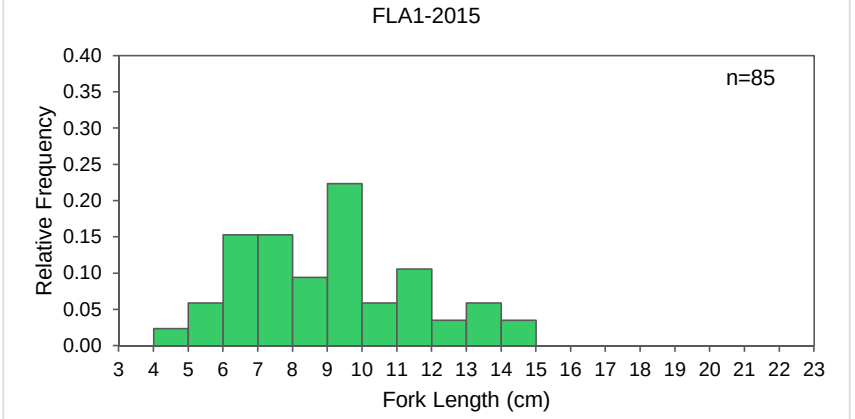


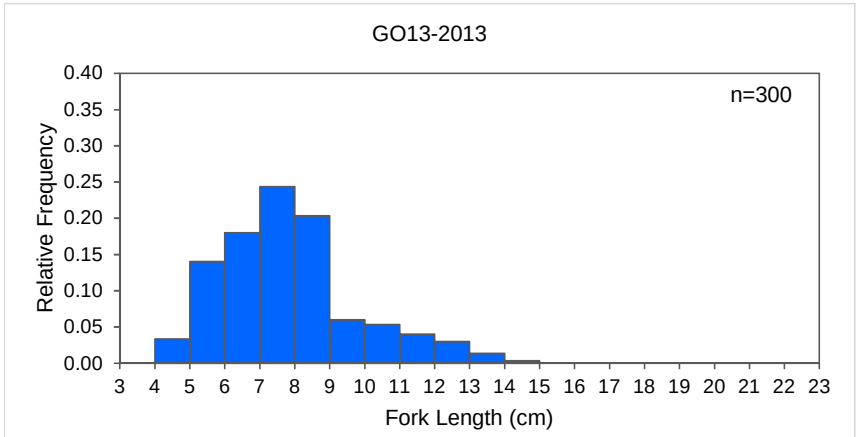


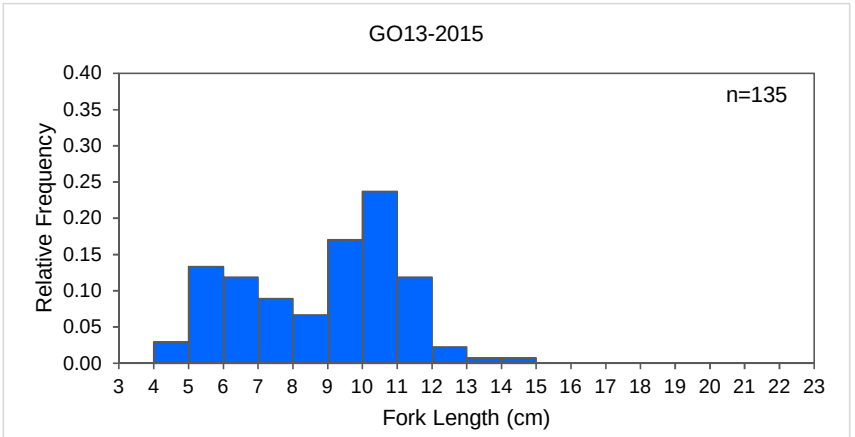


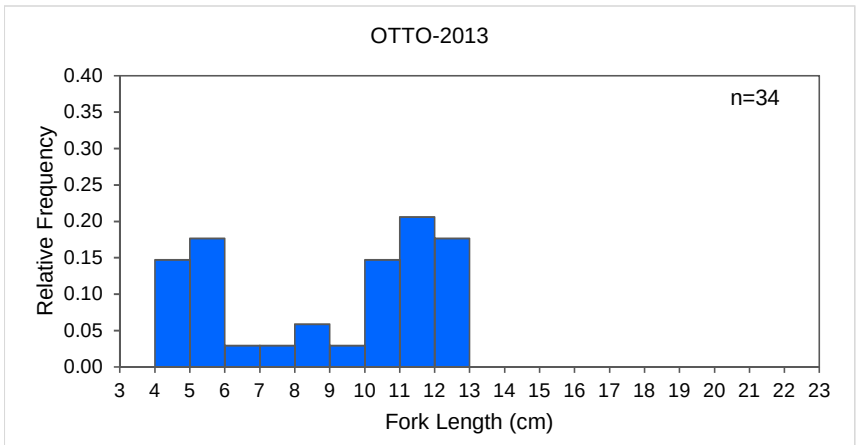


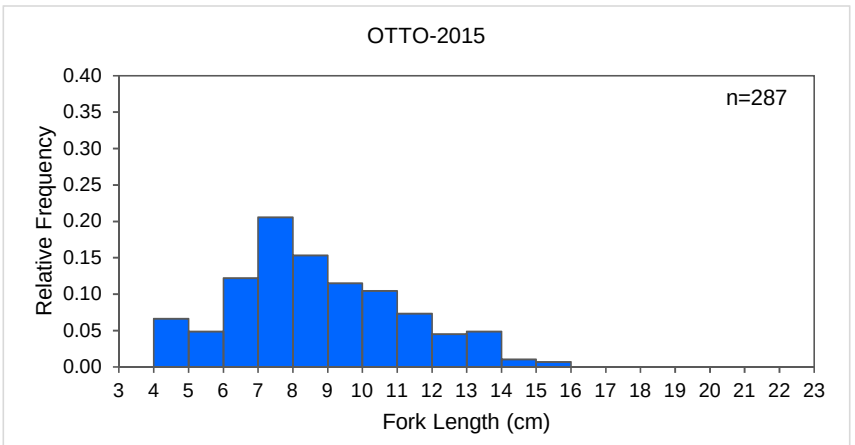


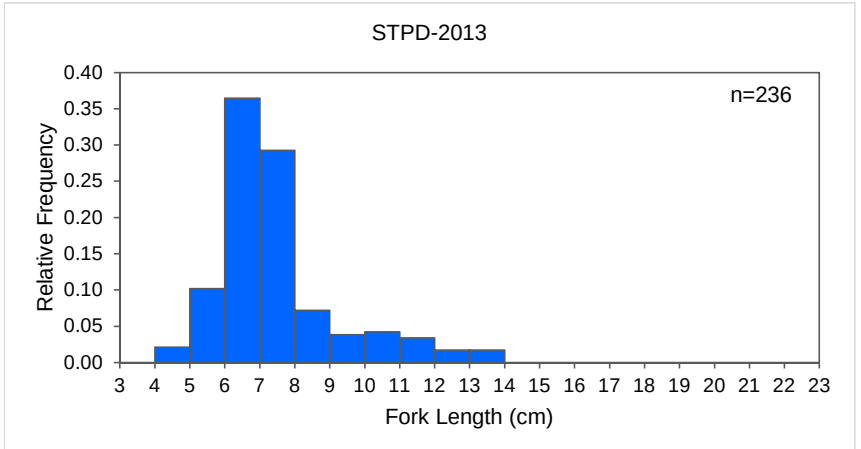












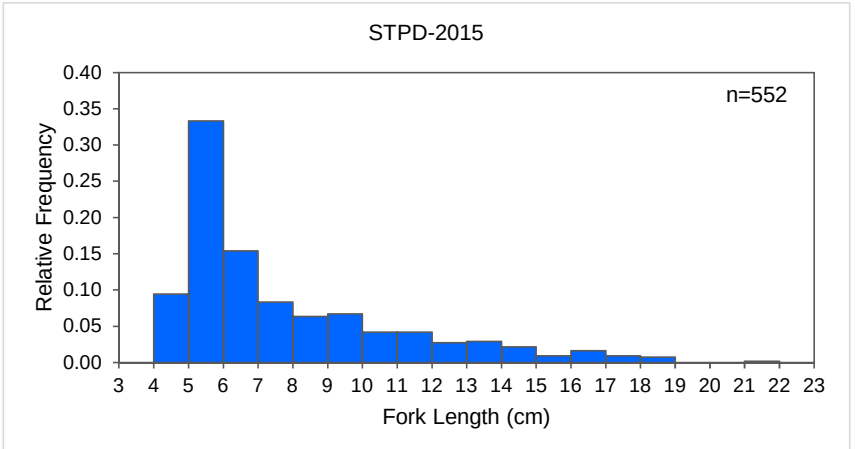
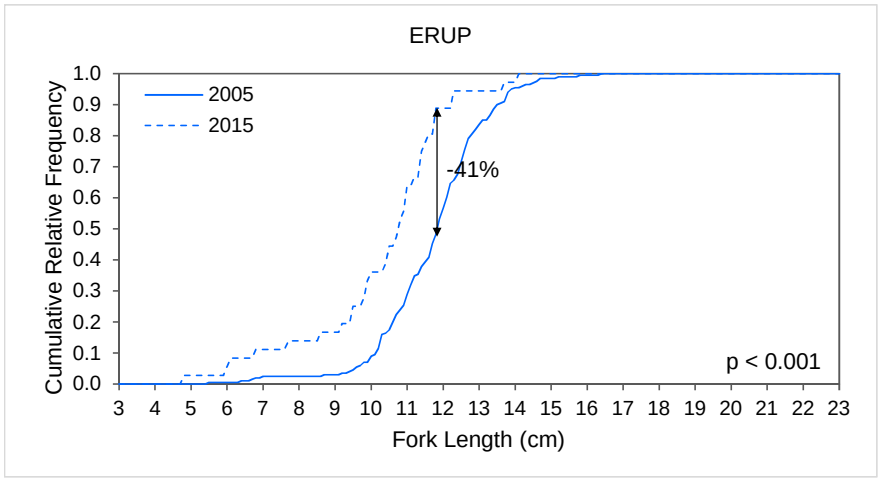
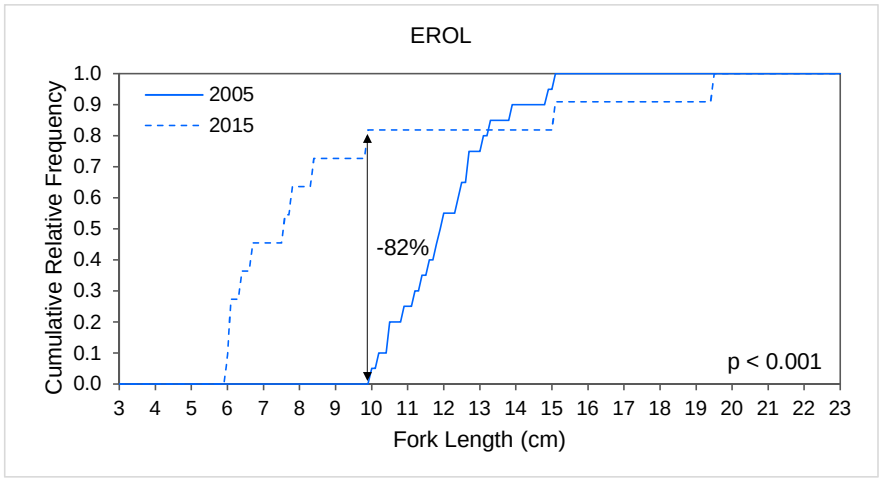
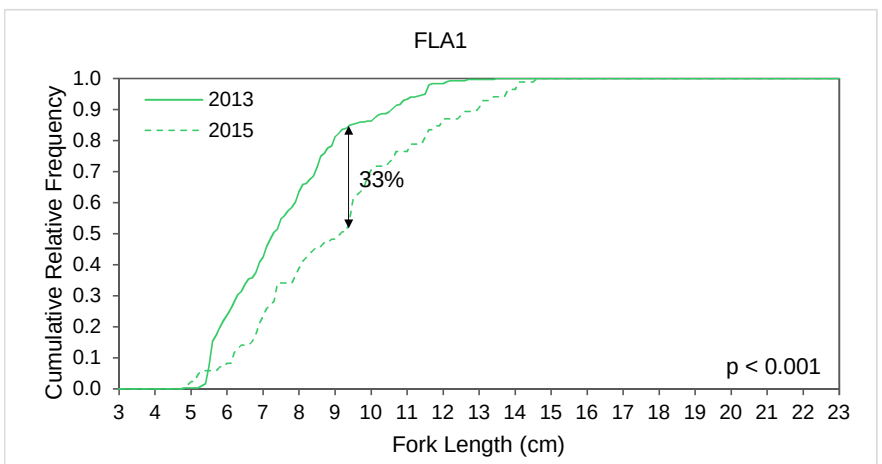
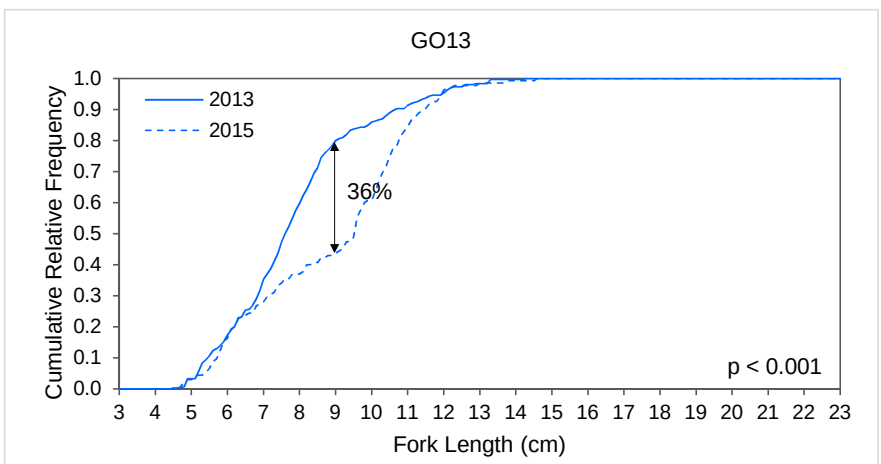


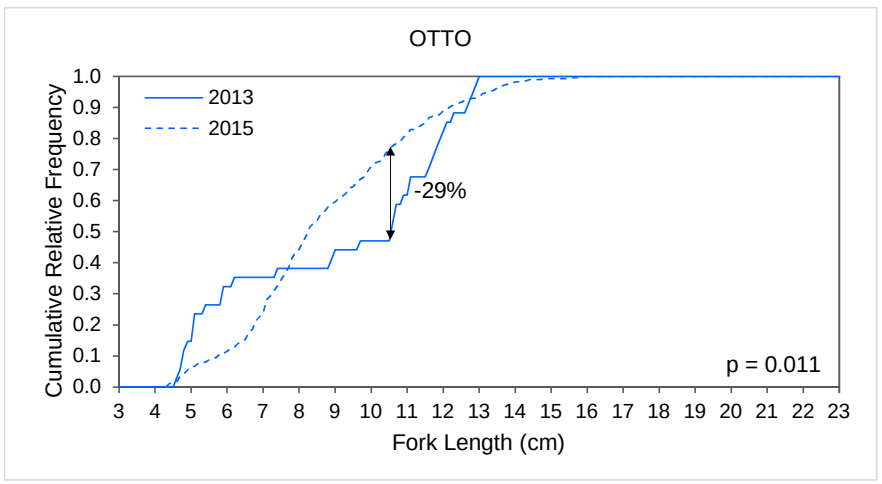
Figure HLSU.8: Length Frequency Distributions for Longnose Sucker by Area and Year for Areas with Two Years of Data (2005 or 2013) and 2015











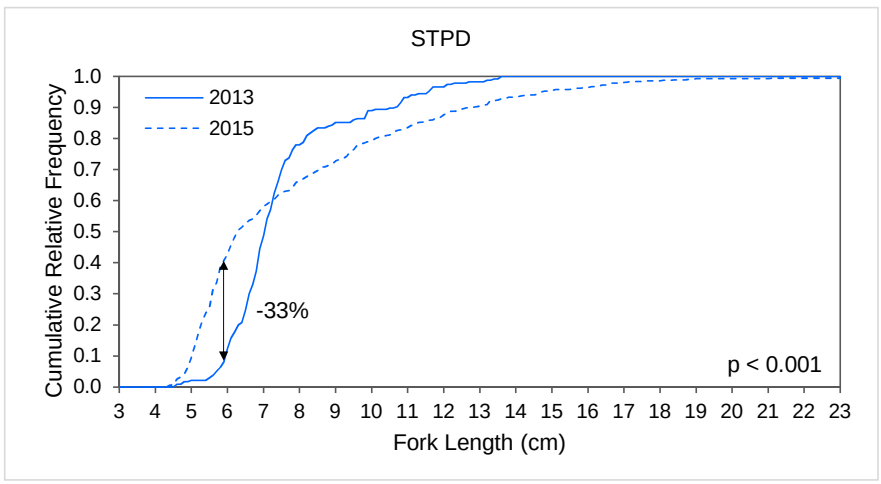


Figure HLSU.9: Cumulative Relative Frequency Distributions for Fork Length of Longnose Sucker for Areas with Two Years of Data Compared with the Two-sample Kolmogorov-Smirnov Test Between Years

Notes: Magnitude of difference = the maximum difference between the cumulative relative frequency distributions. P-value reported for the two-sample Kolmogorov-Smirnov test

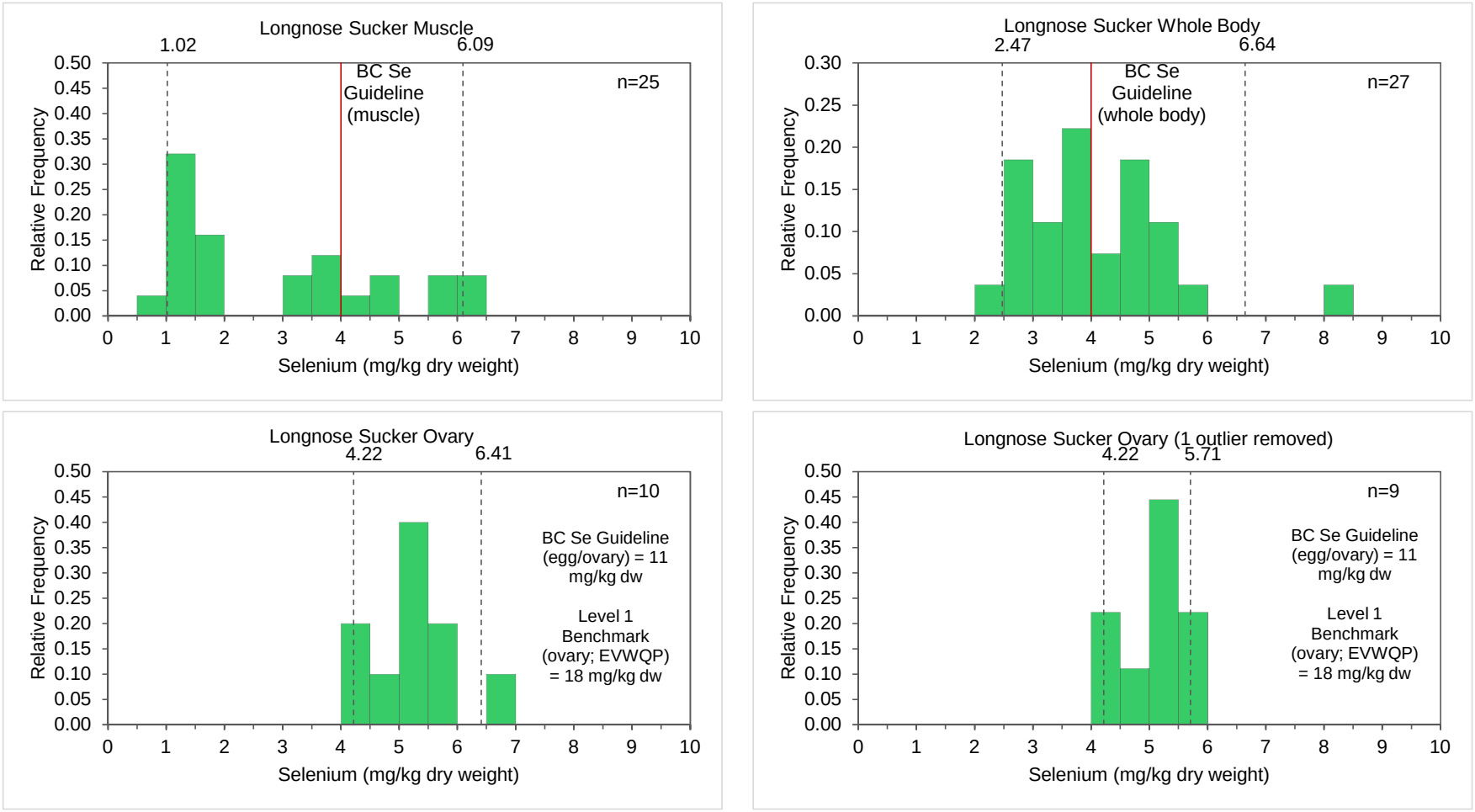
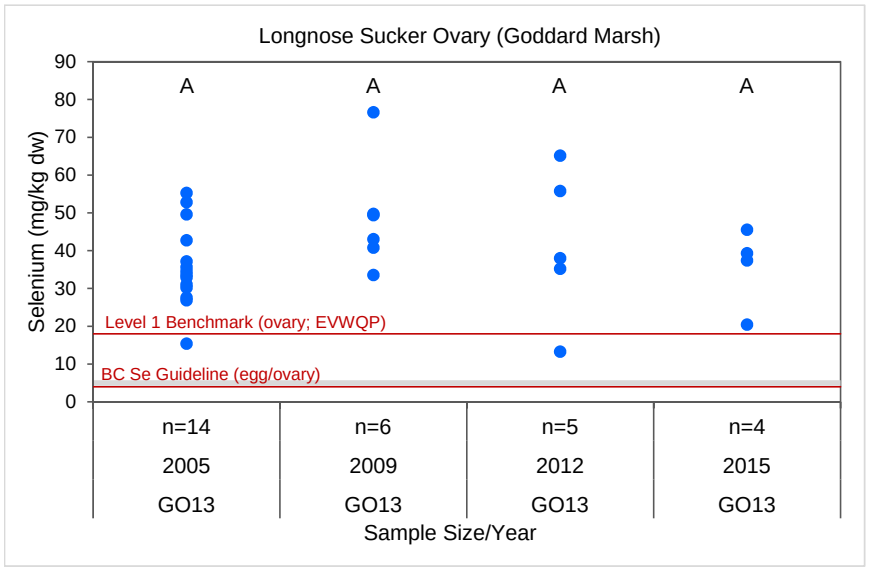
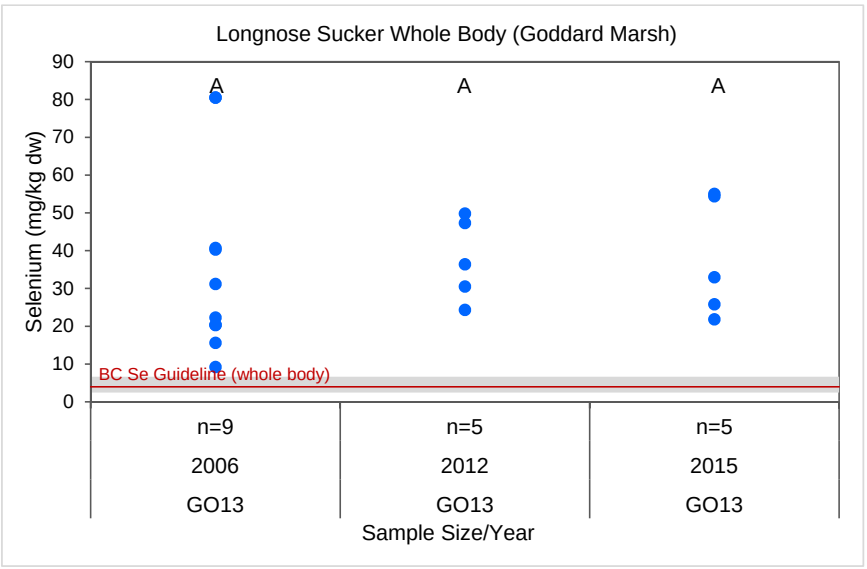
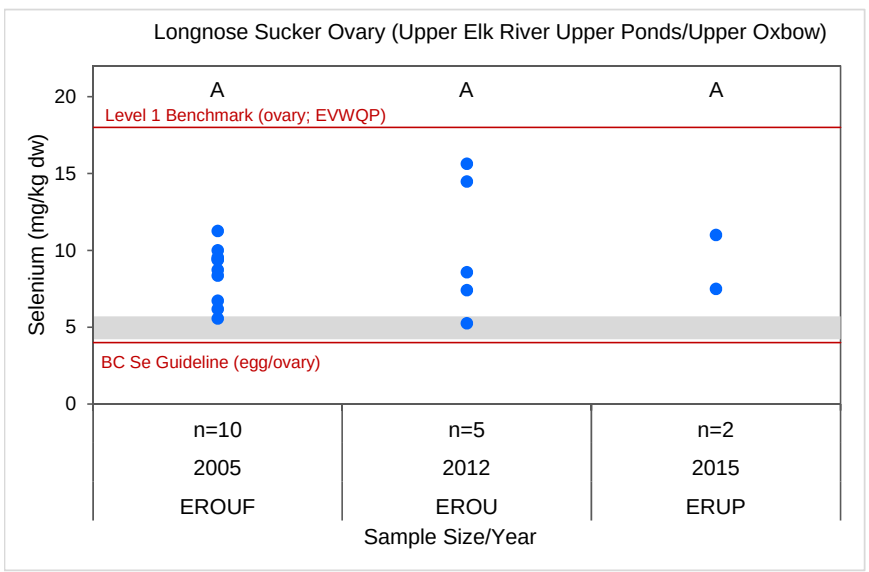


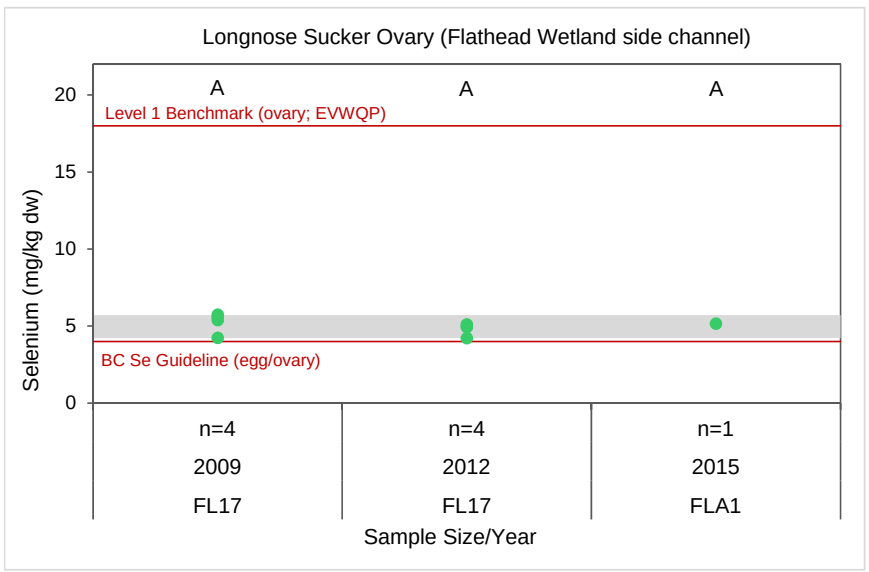
Figure HLSU.10: Distribution of Reference Area Data for Tissue Selenium Concentrations for Longnose Sucker (LSU) in the Elk Valley, 2002 - 2015

Notes: Dashed vertical lines represent the 2.5th and 97.5th percentiles









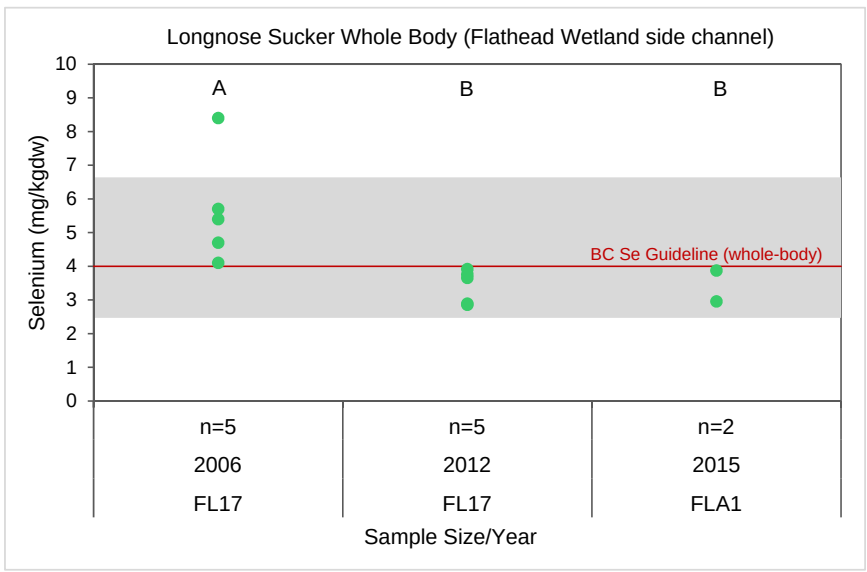
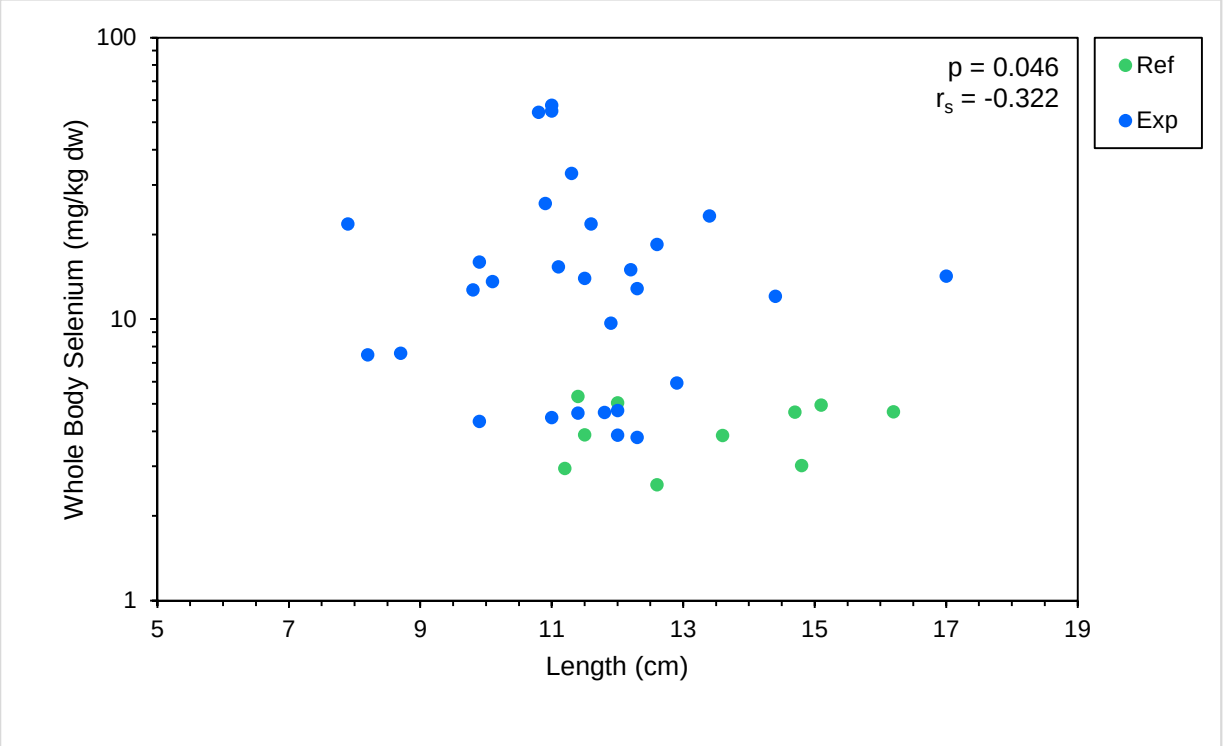


Figure HLSU.11: Individual Value Plot for Selenium Concentrations in Ovary and Whole Body of Longnose Sucker Over Time

Notes: Time periods that do not share a letter (A or B) are significantly different (p-value < 0.05); reference areas plotted with green symbols



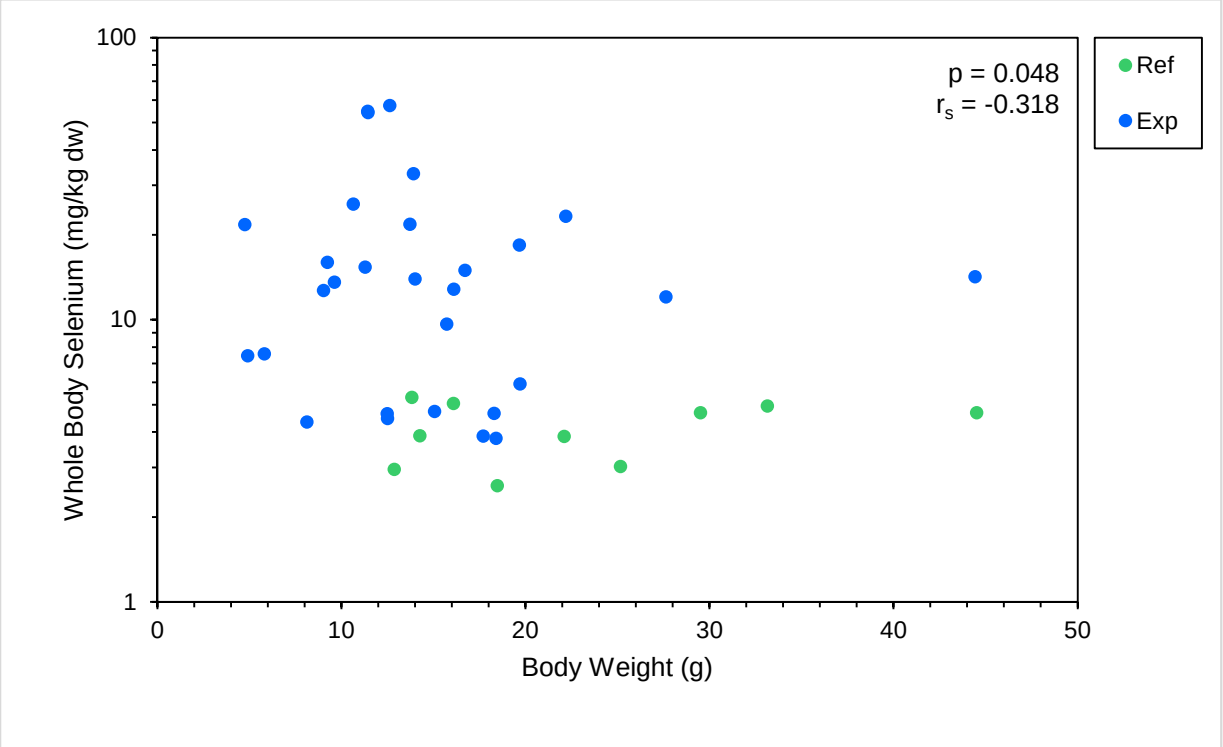


Figure HLSU.12: Spearman Correlations for Longnose Sucker Health Metrics (Length and Body Weight) and Whole Body Selenium Concentrations, 2015

Table HLSU.1: Longnose Sucker Tissue Sampling and Population Monitoring Areas in 2015, and Concordance with Location Codes used in Previous Regional Sampling Cycles

Exposure Type	Manage-ment Unit	2015	2012	2009	2006
		May	May-Jun	May-Jun	May
Reference	Not applic-able	Flathead side channel (FLA1)	Flathead Wetland (FL17)	Flathead Wetland (FL17)	Flathead Wetland (FL17)
	3	Elk River upstream GHO (EL2, REFF) - no data	-	-	-
Mine-exposed	3	Elk River Upper Ponds (ERUP)	Upper Elk River Oxbow (EROU)	Upper Elk River Oxbow (EROU)	-
	4	Elk River Wetland d/s Grave (ELWDGC)	-	-	-
	4	Goddard Marsh (GO13)	Goddard Marsh (GO13)	Goddard Marsh (GO13)	Goddard Marsh (GO13)
	4	Otto Creek (OTTO)	-	-	-
	4	Michel Creek Wetland (MI16)	-	-	-
	4	Michel Creek Oxbow #2 (MIC2)	-	-	-
	4	Lower Michel Wetland (MIWW)	-	-	-
	5	Stanford Pond (STPD)	-	-	-
	5	Lower Elk River Oxbow (EROL)	Lower Elk River Oxbow (EROL)	-	-
	5	Unnamed Wetland near Morrissey (UNWNMO)	-	-	-

Table HLSU.2: Summary Statistics for Longnose Sucker Morphometric Indices for Non-Lethally Sampled Fish, May 2015

Biological Area Code	Sex[a]	Analysis	Total Length (cm)	Fork Length (cm)	Weight (g)
UNWNMO	F	Sample Size	12	12	12
		Mean	11.5	10.9	16.67
		Median	10.8	10.3	12.42
		Minimum	9.4	8.9	7.41
		Maximum	17.2	16.3	50.2
	M	Sample Size	9	9	9
		Mean	13.3	12.7	24.11
		Median	13.7	13.1	23.77
		Minimum	11.2	10.6	13.55
		Maximum	16.1	15.5	45.2
	I	Sample Size	14	14	14
		Mean	5.9	5.6	2.14
		Median	5.6	5.4	1.675
		Minimum	4.5	4.3	0.77
		Maximum	7.5	7.2	4.07
GO13	F	Sample Size	35	35	35
		Mean	10.9	10.3	12.25
		Median	10.5	10.1	11.15
		Minimum	9.5	8.9	4.84
		Maximum	15.4	14.5	34.64
	M	Sample Size	28	28	28
		Mean	11.2	10.7	12.92
		Median	11.2	10.5	12.27
		Minimum	9.2	8.7	7.02
		Maximum	14.3	13.7	26.19
	I	Sample Size	17	17	17
		Mean	7.8	7.4	4.34
		Median	7.9	7.5	4.35
		Minimum	4.7	4.6	0.92
		Maximum	9.7	9.2	8.74
OTTO	F	Sample Size	7	7	7
		Mean	12.0	11.3	16.91
		Median	12.2	11.5	17.65
		Minimum	8.8	8.3	6.06
		Maximum	15.0	14.3	29.37
	M	Sample Size	16	16	16
		Mean	11.6	11.0	16
		Median	11.3	10.8	15.02
		Minimum	8.4	8.0	5.15
		Maximum	15.5	14.7	35.04
	I	Sample Size	65	65	65
		Mean	7.0	6.6	3.46
		Median	7.3	6.8	3.62
		Minimum	4.6	4.3	0.85
		Maximum	9.5	8.5	7.33
STPD	F	Sample Size	21	21	21
		Mean	11.1	10.6	13.92
		Median	10.2	9.8	9.50
		Minimum	8.6	8.1	5.33
		Maximum	15.9	15.1	34.53
	M	Sample Size	3	3	3
		Mean	12.7	12.2	20.36
		Median	12.5	12.0	16.67
		Minimum	10.6	10.4	11.06
		Maximum	15.0	14.2	33.34
	I	Sample Size	99	99	99
		Mean	6.2	6.0	3.03
		Median	5.5	5.3	1.53
		Minimum	4.6	4.3	0.73
		Maximum	19.4	18.3	67.81
ERUP	F	Sample Size	15	15	15
		Mean	11.3	10.7	14.11
		Median	11.4	10.7	13.03
		Minimum	9.5	9.1	8.35
		Maximum	14.2	13.6	31.89
	M	Sample Size	10	10	11
		Mean	11.7	11.0	15.14
		Median	11.7	11.2	15.81
		Minimum	9.7	9.1	8.32
		Maximum	13.6	12.8	19.86
	I	Sample Size	6	6	6
		Mean	6.9	6.6	3.43
		Median	6.7	6.4	2.90
		Minimum	4.9	4.7	1.00
		Maximum	8.9	8.5	6.34

[a] I - Immature, F - Female, M- Male, U - unknown

Table HLSU.2: Summary Statistics for Longnose Sucker Morphometric Indices for Non-Lethally Sampled Fish, May 2015

Biological Area Code	Sex[a]	Analysis	Total Length (cm)	Fork Length (cm)	Weight (g)
ELWDGC	F	Sample Size	2	2	2
		Mean	10.4	10.0	11.30
		Median	10.4	10.0	11.30
		Minimum	10.1	9.6	10.60
		Maximum	10.7	10.4	12.00
	I	Sample Size	3	3	3
		Mean	5.1	4.8	1.31
		Median	5.1	4.9	1.19
		Minimum	5.0	4.7	0.98
		Maximum	5.1	4.9	1.76
MIC2	F	Sample Size	2	2	2
		Mean	13.3	12.7	18.22
		Median	13.3	12.7	18.22
		Minimum	12.9	12.5	17.80
		Maximum	13.6	12.9	18.64
FLAI	F	Sample Size	8	8	8
		Mean	13.1	12.6	21.28
		Median	13.3	12.7	24.18
		Minimum	11.5	11.4	11.72
		Maximum	14.4	13.7	27.20
	M	Sample Size	18	18	18
		Mean	11.9	11.4	15.64
		Median	11.3	10.8	13.29
		Minimum	9.5	9.0	7.29
		Maximum	15.5	14.5	32.98
	I	Sample Size	29	29	29
		Mean	7.3	7.1	3.68
		Median	7.2	7.0	3.29
		Minimum	5.0	4.9	0.50
		Maximum	9.8	9.4	8.88
	U	Sample Size	19	19	19
		Mean	9.2	8.9	7.40
		Median	9.6	9.1	6.95
		Minimum	6.9	6.7	3.06
		Maximum	11.9	11.5	16.32
EROL	F	Sample Size	3	3	3
		Mean	15.4	14.7	45.71
		Median	15.7	15.0	38.74
		Minimum	10.3	9.8	9.41
		Maximum	20.3	19.4	88.98
	I	Sample Size	5	5	5
		Mean	6.9	6.6	3.09
		Median	6.3	6.0	2.39
		Minimum	6.1	5.9	1.62
		Maximum	8.0	7.7	5.02
	U	Sample Size	1	1	1
		Mean	8.5	8.3	6.02
		Median	8.5	8.3	6.02
		Minimum	8.5	8.3	6.02
		Maximum	8.5	8.3	6.02

[a] I - Immature, F - Female, M- Male, U - unknown

Table HLSU.3: Summary Statistics for Longnose Sucker Morphometric Indices for Lethally Sampled Fish, May 2015

Biological Area Code	Sex[a]	Analysis	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Liver Weight (g)	Female Carcass Weight (g)	Gonad Weight (g)	Age[b] (years)
UNWNMO	F	Sample Size	6	6	6	6	6	6	6	6
		Mean	12.0	11.3	19.10	1.16	0.421	16.88	1.390	3
		Median	11.4	10.6	14.26	1.17	0.352	13.63	0.161	2
		Minimum	9.5	9.0	7.27	1.00	0.137	6.69	0.017	2
		Maximum	17.3	16.4	49.28	1.33	0.992	40.15	7.603	5
	M	Sample Size	5	5	5	5	5	-	5	5
		Mean	13.9	13.3	27.42	1.10	0.599	-	1.217	3
		Median	14.7	14.0	29.51	1.09	0.625	-	1.161	3
		Minimum	11.4	10.9	13.82	1.07	0.264	-	0.264	2
		Maximum	16.2	15.7	44.51	1.15	1.148	-	2.050	5
	I	Sample Size	1	1	1	1	1	-	-	1
		Mean	6.7	6.3	2.70	1.08	0.069	-	-	1
		Median	6.7	6.3	2.70	1.08	0.069	-	-	1
		Minimum	6.7	6.3	2.70	1.08	0.069	-	-	1
		Maximum	6.7	6.3	2.70	1.08	0.069	-	-	1
ELWDGC	F	Sample Size	5	5	5	5	5	5	5	5
		Mean	11.1	10.5	13.20	1.10	0.297	12.01	0.835	3
		Median	10.8	10.2	11.93	1.06	0.349	12.46	0.233	3
		Minimum	9.3	8.8	7.24	1.01	0.116	6.41	0.095	1
		Maximum	12.8	12.2	22.20	1.22	0.463	18.35	3.461	4
	M	Sample Size	8	8	8	8	8	-	8	8
		Mean	11.7	11.0	14.86	1.09	0.327	-	0.607	3
		Median	11.8	11.1	15.62	1.09	0.313	-	0.535	3
		Minimum	9.9	9.4	9.24	0.97	0.186	-	0.274	3
		Maximum	14.3	13.5	24.67	1.22	0.620	-	1.413	5
MIWW	F	Sample Size	2	2	2	2	2	2	2	2
		Mean	11.6	11.0	15.98	1.18	0.506	13.73	1.935	2
		Median	11.6	11.0	15.98	1.18	0.506	13.73	1.935	2
		Minimum	10.6	10.0	12.21	1.14	0.381	10.68	1.229	2
		Maximum	12.5	12.0	19.75	1.22	0.630	16.77	2.640	2
	M	Sample Size	1	1	1	1	1	-	1	1
		Mean	11.9	11.2	15.72	1.12	0.285	-	0.719	2
		Median	11.9	11.2	15.72	1.12	0.285	-	0.719	2
		Minimum	11.9	11.2	15.72	1.12	0.285	-	0.719	2
		Maximum	11.9	11.2	15.72	1.12	0.285	-	0.719	2
MIC2	M	Sample Size	3	3	3	3	3	-	3	3
		Mean	11.1	10.5	11.90	1.00	0.216	-	0.445	2
		Median	11.4	10.8	12.50	0.99	0.250	-	0.505	3
		Minimum	9.9	9.4	8.13	0.98	0.136	-	0.229	1
		Maximum	12.0	11.4	15.06	1.02	0.261	-	0.600	3
EROL	I	Sample Size	2	2	2	2	2	-	-	2
		Mean	6.8	6.5	2.82	1.05	0.079	-	-	1
		Median	6.8	6.5	2.82	1.05	0.079	-	-	1
		Minimum	6.7	6.3	2.63	1.05	0.077	-	-	1
		Maximum	6.9	6.6	3.02	1.05	0.080	-	-	1
FLA1	F	Sample Size	6	6	6	6	6	6	6	6
		Mean	11.0	10.4	12.69	1.08	0.328	11.61	0.516	2
		Median	10.1	9.6	9.47	1.09	0.248	8.83	0.108	2
		Minimum	10.0	9.4	8.14	0.98	0.167	7.46	0.044	2
		Maximum	13.2	12.5	22.04	1.14	0.553	19.27	2.124	3
	M	Sample Size	5	5	5	5	5	-	5	5
		Mean	12.7	12.1	18.57	1.04	0.324	-	0.773	2
		Median	12.6	11.9	18.46	1.07	0.366	-	0.621	3
		Minimum	11.2	10.6	12.87	0.92	0.182	-	0.319	1
		Maximum	14.8	14.0	25.17	1.10	0.477	-	1.402	3
	I	Sample Size	9	9	9	9	9	-	-	8
		Mean	7.5	7.1	4.22	1.07	0.112	-	-	1
		Median	7.3	6.9	3.49	1.06	0.132	-	-	1
		Minimum	5.4	5.1	1.41	1.00	0.015	-	-	0
		Maximum	9.8	9.3	8.35	1.16	0.194	-	-	2
STPD	F	Sample Size	9	9	9	9	9	9	9	8
		Mean	15.1	14.3	39.13	1.14	0.922	33.49	4.170	6
		Median	15.6	14.6	33.80	1.14	0.851	30.08	2.321	5
		Minimum	9.8	9.2	9.02	1.02	0.261	7.97	0.089	2
		Maximum	19.9	18.9	85.01	1.27	2.002	67.83	13.356	12
	M	Sample Size	2	2	2	2	2	-	2	2
		Mean	15.7	15.0	36.03	1.05	0.644	-	1.443	5
		Median	15.7	15.0	36.03	1.05	0.644	-	1.443	5
		Minimum	14.4	13.7	27.63	1.03	0.535	-	0.987	3
		Maximum	17.0	16.3	44.43	1.07	0.752	-	1.898	7
	I	Sample Size	11	11	11	11	11	-	-	11
		Mean	6.7	6.4	3.12	1.01	0.059	-	-	2
		Median	6.5	6.1	2.37	1.02	0.050	-	-	2
		Minimum	5.2	5.0	1.06	0.85	0.018	-	-	1
		Maximum	8.8	8.5	6.59	1.18	0.130	-	-	2

[a] I - Immature, F - Female, M- Male.

[b] An age of 0 denotes fish hatched the previous season that are approaching but are not yet 1 year old.

Table HLSU.3: Summary Statistics for Longnose Sucker Morphometric Indices for Lethally Sampled Fish, May 2015

Biological Area Code	Sex[a]	Analysis	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Liver Weight (g)	Female Carcass Weight (g)	Gonad Weight (g)	Age[b] (years)
GO13	F	Sample Size	10	10	10	10	10	9	9	10
		Mean	11.6	11.0	15.08	1.11	0.371	13.58	0.955	2
		Median	11.5	10.9	15.19	1.10	0.373	13.71	0.409	2
		Minimum	10.3	9.7	10.18	0.99	0.188	9.58	0.165	2
		Maximum	12.8	12.2	20.57	1.30	0.630	17.30	2.618	4
	M	Sample Size	5	5	5	5	5	-	5	5
		Mean	10.7	10.1	11.20	1.08	0.210	-	0.312	2
		Median	10.9	10.3	11.42	1.05	0.205	-	0.349	2
		Minimum	9.7	9.2	8.57	0.97	0.141	-	0.019	1
		Maximum	11.3	10.5	13.91	1.31	0.301	-	0.598	2
	I	Sample Size	5	5	5	5	5	-	-	5
		Mean	7.0	6.6	3.16	1.01	0.092	-	-	1
		Median	6.9	6.5	2.93	1.00	0.089	-	-	1
		Minimum	4.9	4.7	1.04	0.93	0.027	-	-	0
		Maximum	8.5	8.1	5.49	1.07	0.207	-	-	1
OTTO	M	Sample Size	4	4	4	4	4	-	4	4
		Mean	10.3	9.8	11.38	1.08	0.203	-	0.286	1
		Median	9.9	9.3	9.22	1.08	0.212	-	0.286	1
		Minimum	8.2	7.8	4.91	1.03	0.084	-	0.089	1
		Maximum	13.4	12.6	22.19	1.12	0.306	-	0.483	2
	I	Sample Size	13	13	13	13	13	-	-	13
		Mean	7.4	7.0	4.27	1.15	0.106	-	-	1
		Median	7.5	7.2	4.53	1.07	0.113	-	-	1
		Minimum	4.5	4.3	0.84	0.93	0.011	-	-	0
		Maximum	8.8	8.3	8.93	1.56	0.240	-	-	2
ERUP	F	Sample Size	5	5	5	5	5	5	5	5
		Mean	12.1	11.4	17.90	1.14	0.362	15.87	1.542	3
		Median	11.5	10.9	14.26	1.13	0.331	13.86	0.190	3
		Minimum	10.4	9.9	10.93	1.10	0.177	10.19	0.139	2
		Maximum	14.9	14.0	33.56	1.22	0.723	27.46	4.767	3
	M	Sample Size	5	5	5	5	5	-	5	5
		Mean	12.0	11.4	17.32	1.15	0.457	-	0.596	3
		Median	12.0	11.4	18.29	1.15	0.476	-	0.629	3
		Minimum	11.0	10.6	12.50	1.05	0.359	-	0.058	2
		Maximum	12.9	12.2	19.71	1.27	0.508	-	1.038	3
	I	Sample Size	2	2	2	2	2	-	-	2
		Mean	10.4	10.1	10.70	1.04	0.272	-	-	2
		Median	10.4	10.1	10.70	1.04	0.272	-	-	2
		Minimum	10.6	10.3	12.64	1.16	0.342	-	-	2
		Maximum	10.2	9.8	8.76	0.93	0.201	-	-	2

[a] I - Immature, F - Female, M- Male.

[b] An age of 0 denotes fish hatched the previous season that are approaching but are not yet 1 year old.

Table HLSU.4: Summary Statistics for Longnose Sucker Morphometic Indicies for Fish Sampled in 2005 or 2013 and 2015

Area Code	Year[a]	Statistic	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)
FLA1	2013[a]	Count	299	296	296
		Mean	7.6	5.10	0.99
		Median	7.2	3.80	0.99
		Minimum	4.7	1.00	0.77
		Maximum	13.4	24.60	1.16
	2015 RAEMP	Count	85	85	85
		Mean	9.0	9.19	1.02
		Median	9.1	7.27	1.05
		Minimum	4.8	0.50	0.35
		Maximum	14.5	32.98	1.54
ERUP	2005[a]	Count	201	201	201
		Mean	11.7	17.60	1.06
		Median	11.8	17.20	1.04
		Minimum	5.4	1.88	0.89
		Maximum	16.3	43.44	1.46
	2015 RAEMP	Count	36	36	36
		Mean	10.2	13.42	1.12
		Median	10.7	13.39	1.12
		Minimum	4.7	1.00	0.93
		Maximum	14.0	33.56	1.36
GO13	2013[a]	Count	300	287	287
		Mean	7.8	5.86	1.02
		Median	7.6	4.40	1.02
		Minimum	4.4	0.70	0.63
		Maximum	14.2	27.00	1.36
	2015 RAEMP	Count	338	338	338
		Mean	7.4	5.55	1.02
		Median	6.4	2.63	0.99
		Minimum	4.4	0.70	0.49
		Maximum	14.5	34.64	4.02
STPD	2013[a]	Count	236	232	236
		Mean	7.4	5.09	1.03
		Median	7.0	3.60	1.06
		Minimum	4.5	0.90	0.00
		Maximum	13.5	26.50	1.36
	2015 RAEMP	Count	552	551	551
		Mean	7.7	7.80	1.06
		Median	6.2	2.50	1.02
		Minimum	4.3	0.73	0.55
		Maximum	21.0	90.98	2.35
OTTO	2013[a,b]	Count	34	33	33
		Mean	9.0	10.27	1.07
		Median	10.5	12.20	1.06
		Minimum	4.5	0.90	0.95
		Maximum	12.9	23.70	1.23
	2015 RAEMP	Count	286	286	286
		Mean	8.7	9.50	1.17
		Median	8.2	6.19	1.13
		Minimum	4.3	0.45	0.50
		Maximum	15.7	47.48	6.49
EROL	2005[a]	Count	20	20	20
		Mean	12.0	21.27	1.18
		Median	11.9	20.25	1.17
		Minimum	9.9	11.43	0.98
		Maximum	15.0	38.11	1.40
	2015 RAEMP	Count	11	11	11
		Mean	9.0	14.93	1.06
		Median	7.5	4.03	1.05
		Minimum	5.9	1.62	0.75
		Maximum	19.4	88.98	1.22

[a] 2005 data from LePage (2014) and 2013 data from Lotic (2014b).
[b] Side channel, in same vicinity of Otto Ponds was sampled.

Table HLSU.5: Longnose Sucker Morphometric Measurements, May 2015

Waterbody	Processing Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
UNWNMO	12-May-15	9.7	9.3	8.660	1.077	
	12-May-15	11.1	10.5	13.050	1.127	
	12-May-15	10.5	10.0	12.070	1.207	
	12-May-15	9.7	9.3	8.340	1.037	
	12-May-15	10.2	9.7	9.910	1.086	
	12-May-15	13.7	13.1	23.770	1.057	
	12-May-15	11.2	10.6	13.550	1.138	
	12-May-15	13.9	13.2	24.830	1.080	
	12-May-15	4.9	4.7	1.340	1.291	
	13-May-15	12.5	11.9	19.570	1.161	
	13-May-15	14.5	13.8	30.450	1.159	
	13-May-15	5.6	5.4	1.710	1.086	
	13-May-15	4.5	4.3	0.920	1.157	
	13-May-15	5.6	5.4	1.640	1.042	
	14-May-15	12.0	11.5	16.170	1.063	
	14-May-15	12.0	11.3	17.010	1.179	
	14-May-15	4.6	4.3	0.940	1.182	
	15-May-15	16.2	15.7	44.514	1.150	tubercules
	15-May-15	14.7	14.0	29.512	1.076	
	15-May-15	9.5	9.0	7.272	0.998	spent
	15-May-15	11.4	10.9	13.820	1.067	partially spent
	15-May-15	17.3	16.4	49.282	1.117	
	15-May-15	12.0	11.4	16.086	1.086	
	15-May-15	7.5	7.1	4.070	1.137	
	15-May-15	7.5	7.1	3.640	1.017	
	15-May-15	6.8	6.5	2.880	1.049	
	16-May-15	9.8	9.2	10.339	1.328	spent
	16-May-15	6.7	6.3	2.695	1.078	
	17-May-15	10.5	9.9	11.622	1.198	spent
	17-May-15	12.3	11.2	16.889	1.202	spent
	17-May-15	15.1	14.4	33.145	1.110	tubercules
	17-May-15	12.6	11.9	19.167	1.137	spent
ELWDGC	9-May-15	10.1	9.6	10.600	1.198	
	9-May-15	10.7	10.4	12.000	1.067	
	9-May-15	5.1	4.9	1.190	1.011	
	9-May-15	5.1	4.9	1.760	1.496	
	10-May-15	5.0	4.7	0.980	0.944	
	14-May-15	12.2	11.1	16.720	1.223	tubercules
	14-May-15	9.3	8.8	7.242	1.063	spent
	14-May-15	9.9	9.4	9.243	1.113	tubercules
	14-May-15	10.1	9.6	9.621	1.087	tubercules
	14-May-15	12.8	12.2	22.196	1.222	
	14-May-15	12.3	11.5	16.099	1.059	
	14-May-15	11.1	10.5	11.282	0.975	
	14-May-15	11.7	11.1	15.463	1.131	
	14-May-15	11.8	11.3	15.772	1.093	partially spent, tubercules
	14-May-15	14.3	13.5	24.668	1.003	tubercules
	17-May-15	10.8	10.2	11.933	1.124	spent
	17-May-15	10.3	9.7	9.684	1.061	spent
	18-May-15	12.1	11.4	14.926	1.007	spent
MIC2	13-May-15	13.6	12.9	18.635	0.868	
	13-May-15	12.9	12.5	17.795	0.911	missing top portion of caudal
EROL	9-May-15	15.7	15	38.74	1.15	
	9-May-15	20.3	19.4	88.98	1.22	
	9-May-15	8.5	8.3	6.02	1.05	
	9-May-15	6.1	5.9	2.39	1.16	
	9-May-15	7.9	7.5	5.02	1.19	
	10-May-15	6.3	6.0	2.39	1.11	
	11-May-15	10.3	9.8	9.41	1.00	
	11-May-15	8.0	7.7	4.03	0.88	
	12-May-15	6.2	6.0	1.62	0.75	
FLA1	9-May-15	14.0	13.7	27.048	1.052	
	9-May-15	14.4	13.7	27.204	1.058	
	9-May-15	10.2	9.9	9.573	0.987	
	9-May-15	14.5	14.0	25.421	0.926	
	9-May-15	11.0	10.6	13.799	1.159	
	9-May-15	10.5	10.0	11.328	1.133	
	9-May-15	12.9	12.4	21.376	1.121	
	9-May-15	12.5	11.5	17.830	1.172	
	9-May-15	10.6	9.9	10.630	1.096	
	9-May-15	7.2	7.0	3.288	0.959	
	9-May-15	5.0	4.8	1.257	1.137	
	9-May-15	7.0	6.8	3.677	1.169	
	9-May-15	7.8	7.3	4.734	1.217	
	9-May-15	6.0	5.7	2.856	1.542	
	9-May-15	7.5	7.3	4.325	1.112	
	9-May-15	6.0	5.9	2.156	1.050	
	9-May-15	8.1	7.9	5.373	1.090	
	9-May-15	7.4	6.9	3.694	1.124	
	9-May-15	8.1	7.8	5.664	1.194	
	9-May-15	9.8	9.4	8.883	1.069	
	9-May-15	6.9	6.6	3.477	1.209	
	9-May-15	9.7	9.3	8.364	1.040	

Table HLSU.5: Longnose Sucker Morphometric Measurements, May 2015

Waterbody	Processing Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
FLA1	9-May-15	8.3	8.1	5.244	0.987	
	9-May-15	8.5	8.3	5.564	0.973	
	9-May-15	11.9	11.5	16.322	1.073	
	9-May-15	8.3	7.9	6.063	1.230	
	9-May-15	8.3	8.0	5.163	1.008	
	9-May-15	7.5	7.2	3.229	0.865	
	9-May-15	7.2	7.0	3.668	1.069	
	9-May-15	6.9	6.7	3.063	1.018	
	9-May-15	8.9	8.6	6.124	0.963	
	9-May-15	9.6	9.1	8.240	1.093	
	9-May-15	7.3	7.1	4.223	1.180	
	9-May-15	8.3	8.0	5.569	1.088	
	9-May-15	11.0	10.5	12.091	1.044	
	9-May-15	10.1	9.8	10.569	1.123	
	9-May-15	11.6	11.0	11.448	0.860	
	10-May-15	13.7	13.0	24.332	1.108	
	10-May-15	12.0	11.4	14.494	0.978	
	10-May-15	11.5	11.4	11.723	0.791	
	10-May-15	13.6	13.0	24.511	1.116	
	10-May-15	10.2	9.8	9.551	1.015	
	10-May-15	10.5	9.8	8.538	0.907	
	10-May-15	10.6	10.4	8.517	0.757	
	10-May-15	13.6	13.3	20.371	0.866	
	10-May-15	9.7	9.3	8.129	1.011	
	10-May-15	15.5	14.5	32.981	1.082	
	10-May-15	9.8	9.4	5.616	0.676	
	10-May-15	9.9	9.4	7.272	0.876	
	10-May-15	10.3	9.7	8.432	0.924	
	10-May-15	9.7	9.4	7.669	0.923	
	10-May-15	7.1	6.8	3.198	1.017	
	10-May-15	6.5	6.2	2.703	1.134	
	10-May-15	6.3	6.1	2.074	0.914	
	10-May-15	5.2	4.9	1.334	1.134	
	10-May-15	8.7	8.2	3.723	0.675	
	10-May-15	7.6	7.3	2.516	0.647	
	10-May-15	7.7	7.3	2.605	0.670	
	10-May-15	5.5	5.2	0.497	0.353	
	10-May-15	8.0	7.8	3.487	0.735	
STPD	11-May-15	12.3	11.9	16.885	1.002	
	11-May-15	9.5	9.0	7.288	1.000	
	11-May-15	6.5	6.1	2.318	1.021	
	11-May-15	7.0	6.8	2.656	0.845	
	11-May-15	6.5	6.1	2.223	0.979	
	9-May-15	12.2	11.7	17.155	1.071	
	9-May-15	9.2	8.9	8.132	1.154	
	9-May-15	8.7	8.4	6.613	1.116	
	9-May-15	6.4	6.2	2.875	1.206	
	9-May-15	5.2	5.0	1.252	1.002	
	9-May-15	5.0	4.8	1.105	0.999	
	9-May-15	5.5	5.2	1.501	1.068	
	9-May-15	5.6	5.3	1.664	1.118	
	9-May-15	5.7	5.5	1.596	0.959	
	9-May-15	9.1	8.8	8.209	1.205	
	9-May-15	8.8	8.5	6.115	0.996	
	9-May-15	5.0	4.8	1.765	1.596	
	9-May-15	4.8	4.5	1.241	1.362	
	9-May-15	5.1	4.9	1.485	1.262	
	9-May-15	4.8	4.5	0.913	1.002	
	10-May-15	19.4	18.3	67.810	1.106	
	10-May-15	5.1	4.8	1.020	0.922	
	10-May-15	8.6	8.3	5.650	0.988	
	10-May-15	5.4	5.1	1.160	0.874	
	10-May-15	7.5	7.3	3.690	0.949	
	10-May-15	7.6	7.3	3.800	0.977	
	10-May-15	7.8	7.5	4.180	0.991	
	10-May-15	5.4	5.2	1.420	1.010	
	10-May-15	5.3	5.1	1.540	1.161	
	10-May-15	8.3	7.9	4.820	0.978	
	10-May-15	5.6	5.5	1.520	0.914	
	10-May-15	4.6	4.3	0.810	1.019	
	10-May-15	5.8	5.6	1.600	0.911	
	10-May-15	5.6	5.4	1.620	1.029	
	10-May-15	5.7	5.5	1.600	0.962	
	10-May-15	5.1	4.9	1.090	0.926	
	10-May-15	4.6	4.4	0.730	0.857	
	10-May-15	4.7	4.5	0.830	0.911	
	10-May-15	6.2	6.0	2.000	0.926	
	10-May-15	6.1	5.9	2.030	0.988	
	10-May-15	6.1	5.8	1.840	0.943	
	10-May-15	4.9	4.7	1.090	1.050	
	10-May-15	5.5	5.3	1.390	0.934	
	10-May-15	8.1	7.8	4.470	0.942	
	10-May-15	7.6	7.2	3.690	0.989	
	10-May-15	5.9	5.7	1.700	0.918	

Table HLSU.5: Longnose Sucker Morphometric Measurements, May 2015

Waterbody	Processing Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
STPD	10-May-15	5.1	4.9	1.110	0.943	
	10-May-15	4.7	4.5	0.990	1.086	
	10-May-15	4.8	4.6	0.910	0.935	
	10-May-15	5.3	5.2	1.310	0.932	
	11-May-15	9.9	9.5	8.780	1.024	
	11-May-15	9.6	9.1	8.130	1.079	
	11-May-15	14.4	13.7	34.530	1.343	
	11-May-15	13.2	12.4	21.220	1.113	
	11-May-15	12.8	12.1	20.770	1.172	
	11-May-15	10.7	10.3	10.740	0.983	
	11-May-15	11.6	11.1	13.890	1.016	
	11-May-15	9.7	9.3	7.990	0.993	
	11-May-15	9.9	9.4	8.740	1.052	
	11-May-15	10.7	10.2	10.220	0.963	
	11-May-15	9.9	9.4	8.250	0.993	
	11-May-15	13.9	13.2	23.250	1.011	wound on left side of body/tail
	11-May-15	10.2	9.8	9.500	1.009	
	11-May-15	9.5	9.0	7.590	1.041	
	11-May-15	9.7	9.3	8.640	1.074	
	11-May-15	10.6	10.4	11.060	0.983	
	11-May-15	15.0	14.2	33.340	1.164	
	11-May-15	12.5	12.0	16.670	0.965	
	11-May-15	4.9	4.8	1.150	1.040	
	11-May-15	8.6	8.2	5.280	0.958	
	11-May-15	8.6	8.2	5.860	1.063	
	11-May-15	8.7	8.3	5.870	1.027	
	11-May-15	8.4	8.1	5.440	1.024	
	11-May-15	5.8	5.6	1.700	0.968	
	11-May-15	8.2	7.8	4.750	1.001	
	11-May-15	5.2	4.9	1.250	1.062	
	11-May-15	5.8	5.5	1.760	1.058	
	11-May-15	9.4	9.1	7.560	1.003	
	11-May-15	8.7	8.5	6.150	1.001	
	11-May-15	8.5	8.1	5.380	1.012	
	11-May-15	5.5	5.3	1.530	1.028	
	11-May-15	8.6	8.3	6.120	1.070	
	11-May-15	8.9	8.4	6.190	1.044	
	11-May-15	5.2	5.5	1.720	1.034	
	11-May-15	5.2	4.9	1.270	1.079	
	11-May-15	7.7	7.4	3.330	0.822	
	11-May-15	7.3	6.9	3.110	0.947	
	11-May-15	5.6	5.4	1.590	1.010	
	11-May-15	6.0	5.7	1.740	0.940	
	11-May-15	6.0	5.7	2.020	1.091	
	11-May-15	5.7	5.5	1.530	0.920	
	11-May-15	5.1	4.9	1.200	1.020	
	11-May-15	4.9	4.7	1.100	1.059	
	11-May-15	5.2	5.0	1.260	1.008	
	11-May-15	5.3	5.0	1.250	1.000	
	11-May-15	5.6	5.4	1.540	0.978	
	12-May-15	8.3	7.9	4.610	0.935	
	12-May-15	5.0	4.9	1.150	0.977	
	12-May-15	5.0	4.8	1.070	0.968	
	12-May-15	5.0	4.8	1.110	1.004	
	12-May-15	5.2	5.0	1.250	1.000	
	12-May-15	5.0	4.8	1.090	0.986	
	12-May-15	5.0	4.8	1.030	0.931	
	12-May-15	5.9	5.7	1.850	0.999	
	12-May-15	5.4	5.1	1.430	1.078	
	12-May-15	4.9	4.7	1.090	1.050	very skinny compared to length
	12-May-15	5.1	5.0	1.320	1.056	
	12-May-15	5.1	4.9	1.250	1.062	
	12-May-15	5.4	5.2	1.160	0.825	
	12-May-15	5.4	5.2	1.320	0.939	
	12-May-15	5.3	5.1	1.250	0.942	
	12-May-15	5.2	5.0	1.060	0.848	
	12-May-15	4.7	4.6	1.040	1.068	
	12-May-15	5.6	5.4	1.420	0.902	
	12-May-15	7.1	6.8	2.940	0.935	
	12-May-15	5.4	5.3	1.560	1.048	
	12-May-15	5.3	5.1	1.410	1.063	
	12-May-15	5.3	5.2	1.490	1.060	
	12-May-15	5.1	4.9	1.330	1.130	
	12-May-15	5.6	5.4	1.360	0.864	
	12-May-15	5.3	5.0	1.390	1.112	
	12-May-15	5.3	5.1	1.360	1.025	

Table HLSU.5: Longnose Sucker Morphometric Measurements, May 2015

Waterbody	Processing Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
GO13	13-May-15	15.4	14.5	34.64	1.136	
	13-May-15	10.0	9.5	8.56	0.998	missing right pectoral fin; marked anal fin to distinguish
	13-May-15	10.5	10.0	9.99	0.999	
	13-May-15	11.5	10.9	15.23	1.176	
	13-May-15	9.5	9.1	8.09	1.074	
	13-May-15	10.6	10.1	10.35	1.005	
	13-May-15	10.8	10.4	12.2	1.085	
	13-May-15	11.4	10.9	13.73	1.060	
	13-May-15	10.0	9.5	10.45	1.219	light colouration
	13-May-15	11.8	11.2	14.41	1.026	
	13-May-15	10.9	10.4	11.66	1.037	
	13-May-15	10.0	9.5	9.33	1.088	
	13-May-15	10.5	10.1	19.85	1.927	
	13-May-15	10.5	10.0	8.93	0.893	
	13-May-15	12.4	11.8	16.44	1.001	
	13-May-15	11.5	11	12.60	0.947	wound near base of caudal fin
	13-May-15	11.8	11.3	15.02	1.041	
	13-May-15	12.5	11.8	16.89	1.028	
	13-May-15	12.2	11.6	15.54	0.996	
	13-May-15	10	9.5	9.21	1.074	
	13-May-15	10.9	10.3	11.33	1.037	
	13-May-15	10.1	9.6	9.56	1.081	
	13-May-15	10.9	10.5	11.45	0.989	
	13-May-15	10.1	9.5	9.81	1.144	
	13-May-15	11.2	10.6	12.62	1.060	
	13-May-15	10.1	9.6	9.16	1.035	
	13-May-15	10.7	10.2	11.15	1.051	
	13-May-15	10.2	9.7	8.60	0.942	
	13-May-15	11.7	11.2	19.04	1.355	
	13-May-15	8.9	8.5	6.330	1.031	
	13-May-15	8.4	8	5.360	1.047	
	13-May-15	8.5	8.1	5.510	1.037	
	13-May-15	7.5	7.2	3.690	0.989	
	13-May-15	7.7	7.3	3.640	0.936	
	13-May-15	7.0	6.7	3.020	1.004	
	14-May-15	9.5	8.9	4.84	0.687	
	14-May-15	9.5	9.0	6.86	0.941	
	14-May-15	10.3	9.8	9.32	0.990	
	14-May-15	10.0	9.4	8.98	1.081	
	14-May-15	10.9	10.4	11.78	1.047	
	14-May-15	14.3	13.7	26.19	1.019	
	14-May-15	12.5	11.9	16.93	1.005	
	14-May-15	12.5	11.9	16.52	0.980	
	14-May-15	11.2	10.7	12.25	1.000	
	14-May-15	10.3	9.7	9.83	1.077	
	14-May-15	10.8	10.2	11.85	1.117	
	14-May-15	9.2	8.7	7.02	1.066	
	14-May-15	9.0	8.5	6.200	1.010	
	14-May-15	7.3	6.9	3.380	1.029	
	14-May-15	6.4	6	2.210	1.023	
	14-May-15	4.7	4.6	0.920	0.945	
	14-May-15	8.1	7.7	4.570	1.001	
	15-May-15	12.0	11.5	15.47	1.017	
	15-May-15	11.3	10.7	11.34	0.926	
	15-May-15	10.5	10.0	11.22	1.122	
	15-May-15	10.7	10.2	11.32	1.067	
	15-May-15	13.6	12.9	22.62	1.054	
	15-May-15	11.1	10.5	11.15	0.963	
	15-May-15	10.1	9.5	8.78	1.024	
	15-May-15	10.3	9.6	8.83	0.998	
	15-May-15	9.7	9.2	8.72	1.120	
	15-May-15	11.4	10.7	13.04	1.064	
	15-May-15	9.9	9.4	7.74	0.932	
	15-May-15	12.5	11.9	19.6	1.163	
	15-May-15	10.0	9.5	8.36	0.975	
	15-May-15	10.1	9.5	8.93	1.042	
	15-May-15	10.5	10.0	8.94	0.894	
	15-May-15	11.7	11.1	13.34	0.975	
	15-May-15	11.2	10.5	12.29	1.062	
	15-May-15	10.6	10.1	10.52	1.021	missing 1/4 of caudal fin
	15-May-15	11.7	11	14.80	1.112	
	15-May-15	8.7	8.3	4.950	0.866	
	15-May-15	7.9	7.5	4.350	1.031	
	15-May-15	7.8	7.3	3.880	0.997	
	15-May-15	9.7	9.2	8.740	1.122	
	16-May-15	12.1	11.5	15.657	1.029	spent

Table HLSU.5: Longnose Sucker Morphometric Measurements, May 2015

Waterbody	Processing Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
	13-May-15	12.2	11.5	17.980	1.182	
	13-May-15	12.6	11.9	17.650	1.047	
	13-May-15	11.2	10.7	11.900	0.971	
	13-May-15	12.6	11.9	19.780	1.174	
	13-May-15	13.7	13.0	22.020	1.002	
	13-May-15	8.0	7.7	5.360	1.174	
	13-May-15	6.3	6.0	2.820	1.306	enlarged ventral area
	13-May-15	6.8	6.5	3.060	1.114	
	13-May-15	5.3	5.1	1.590	1.199	
	13-May-15	5.0	4.8	1.510	1.365	enlarged ventral area, damaged belly
	13-May-15	7.1	6.7	3.870	1.287	
	13-May-15	8.9	8.4	7.330	1.237	
	13-May-15	6.0	5.7	2.220	1.199	
	13-May-15	6.0	5.7	2.220	1.199	
	13-May-15	8.3	7.8	4.420	0.931	
	13-May-15	7.3	6.9	3.620	1.102	
	13-May-15	7.0	6.7	3.040	1.011	
	13-May-15	6.0	5.7	2.080	1.123	
	13-May-15	5.7	5.4	1.490	0.946	
	13-May-15	6.7	6.2	2.540	1.066	
	13-May-15	8.2	7.8	5.390	1.136	
	13-May-15	6.6	6.3	2.640	1.056	
	13-May-15	8.4	8.0	5.350	1.045	
	14-May-15	15.0	14.2	29.730	1.038	
	14-May-15	14.0	13.4	29.820	1.239	
	14-May-15	15.5	14.7	35.040	1.103	
	14-May-15	11.6	11.0	18.770	1.410	
	14-May-15	12.5	12.0	18.570	1.075	
	14-May-15	10.5	10.0	9.840	0.984	
	14-May-15	8.6	8.2	5.690	1.032	tubercules on small male; milting
	14-May-15	7.0	6.6	3.300	1.148	
	14-May-15	8.1	7.7	4.830	1.058	
	14-May-15	6.9	6.6	2.900	1.009	
	14-May-15	4.9	4.6	1.080	1.110	
	14-May-15	4.5	4.4	0.950	1.115	
OTTO	14-May-15	4.8	4.6	1.080	1.110	
	14-May-15	7.5	7.0	4.040	1.178	enlarged ventral area
	14-May-15	8.1	7.7	4.460	0.977	
	14-May-15	6.5	6.2	2.490	1.045	
	14-May-15	7.7	7.4	4.830	1.192	
	14-May-15	6.6	6.3	2.650	1.060	
	14-May-15	7.5	7.1	4.420	1.235	
	14-May-15	7.4	7.0	3.990	1.163	
	14-May-15	6.4	6.1	2.020	0.890	
	15-May-15	15.0	14.3	29.050	0.993	
	15-May-15	8.6	8.1	5.660	1.065	
	15-May-15	10.7	10.2	10.520	0.991	
	15-May-15	12.8	12.1	19.100	1.078	
	15-May-15	10.9	10.3	11.070	1.013	
	15-May-15	11.0	10.3	10.760	0.985	
	15-May-15	8.0	7.6	4.220	0.961	
	15-May-15	7.0	6.7	3.270	1.087	
	15-May-15	7.2	6.8	3.640	1.158	
	15-May-15	7.0	6.7	2.930	0.974	
	15-May-15	7.7	7.3	5.100	1.311	
	15-May-15	8.7	8.3	6.760	1.182	
	15-May-15	7.3	6.9	3.750	1.142	
	15-May-15	7.4	7.0	4.220	1.230	
	15-May-15	8.2	7.7	5.660	1.240	
	16-May-15	8.9	8.5	6.060	0.987	
	16-May-15	8.8	8.4	4.670	0.788	
	16-May-15	4.6	4.3	0.930	1.170	
	16-May-15	4.8	4.6	1.010	1.038	
	16-May-15	8.4	8.0	5.700	1.113	
	16-May-15	4.9	4.7	1.010	0.973	
	16-May-15	5.7	5.4	1.740	1.105	
	16-May-15	7.4	7.1	4.380	1.224	
	16-May-15	7.5	7.7	4.420	0.968	
	16-May-15	5.4	5.1	1.440	1.086	
	16-May-15	5.4	5.1	1.620	1.221	
	16-May-15	5.1	4.8	1.160	1.049	
	9-May-15	14.2	13.6	31.890	1.268	
	9-May-15	9.7	9.4	8.320	1.002	
	9-May-15	11.5	11.1	15.810	1.156	
	9-May-15	12.0	11.3	16.610	1.151	
	9-May-15	11.8	10.9	14.750	1.139	
	10-May-15	11.4	10.7	16.630	1.358	
ERUP	10-May-15	11.7	11.3	14.610	1.013	
	10-May-15	10.3	9.8	11.170	1.187	
	10-May-15	11.4	10.9	14.090	1.088	
	10-May-15	9.9	9.4	9.050	1.090	
	10-May-15	10.9	10.4	11.660	1.037	
	10-May-15	11.4	10.7	13.750	1.122	
	10-May-15	7.1	6.7	3.50	1.164	

Table HLSU.5: Longnose Sucker Morphometric Measurements, May 2015

Waterbody	Processing Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
ERUP	10-May-15	4.9	4.7	1.00	0.963	
	10-May-15	6.3	6.0	2.30	1.065	
	11-May-15	12.1	11.5	17.260	1.135	
	11-May-15	12.6	12.2	19.530	1.076	
	11-May-15	9.5	9.1	8.350	1.108	
	11-May-15	10.2	9.7	9.730	1.066	
	12-May-15	12.5	11.7	18.710	1.168	sac
	12-May-15	11.3	10.8	13.030	1.034	
	12-May-15	8.9	8.5	6.34	1.032	
	12-May-15	7.9	7.6	5.22	1.189	
	12-May-15	6.2	5.9	2.20	1.071	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
	15-Sep-15	5.7	5.4	1.729	1.098	
	15-Sep-15	6.4	6.0	2.205	1.021	
	15-Sep-15	7.1	6.8	2.882	0.917	
	15-Sep-15	11.0	10.4	9.851	0.876	Tumor on left side of caudle fin
	15-Sep-15	6.4	6.2	2.268	0.952	
	15-Sep-15	5.7	5.4	1.569	0.996	
	15-Sep-15	6.0	5.7	1.669	0.901	
	15-Sep-15	8.5	8.1	6.247	1.175	
	15-Sep-15	7.1	6.7	2.845	0.946	
	15-Sep-15	5.9	5.5	1.690	1.016	
	15-Sep-15	7.4	7.0	2.880	0.840	
	15-Sep-15	6.6	6.2	2.457	1.031	
	15-Sep-15	8.2	7.4	3.747	0.925	
	15-Sep-15	7.1	6.4	2.716	1.036	
	15-Sep-15	6.0	5.6	1.764	1.004	
	15-Sep-15	6.1	5.8	1.980	1.015	
	15-Sep-15	6.0	5.8	1.788	0.916	
	15-Sep-15	5.5	5.3	1.629	1.094	
	15-Sep-15	5.5	5.9	1.665	0.811	
	15-Sep-15	6.1	5.7	1.591	0.859	
	15-Sep-15	6.3	6.0	2.033	0.941	
	15-Sep-15	5.9	5.5	1.779	1.069	
	15-Sep-15	6.2	6.0	2.518	1.166	
	15-Sep-15	5.0	4.7	1.169	1.126	
	15-Sep-15	7.5	7.1	4.502	1.258	
	15-Sep-15	6.6	6.2	2.726	1.144	
	15-Sep-15	7.2	6.7	4.220	1.403	
	15-Sep-15	8.2	7.7	6.043	1.324	
	15-Sep-15	7.4	7.0	4.055	1.182	
	15-Sep-15	5.5	5.1	1.622	1.223	
	15-Sep-15	6.1	5.8	1.871	0.959	
	15-Sep-15	5.3	5.0	1.391	1.113	
	15-Sep-15	6.2	5.8	2.383	1.221	
	15-Sep-15	6.6	6.2	2.483	1.042	
	15-Sep-15	5.7	5.5	1.497	0.900	
	15-Sep-15	5.1	4.8	1.204	1.089	
	15-Sep-15	7.6	7.3	3.766	0.968	
	15-Sep-15	5.9	5.7	1.787	0.965	
	15-Sep-15	10.4	9.5	8.489	0.990	
	15-Sep-15	6.0	5.7	1.668	0.901	
	15-Sep-15	6.7	6.4	2.669	1.018	
	15-Sep-15	14.2	13.6	24.611	0.978	
	15-Sep-15	6.0	5.7	1.818	0.982	
	15-Sep-15	7.0	6.7	2.614	0.869	
GO13	15-Sep-15	5.0	4.5	0.711	0.780	
	15-Sep-15	5.6	5.5	3.624	2.178	
	15-Sep-15	11.7	11.1	13.697	1.002	
	15-Sep-15	5.5	5.2	1.394	0.991	
	15-Sep-15	5.2	4.8	1.082	0.978	
	15-Sep-15	6.2	5.9	2.441	1.189	
	15-Sep-15	7.0	6.6	8.332	2.898	
	15-Sep-15	6.8	6.5	2.779	1.012	
	15-Sep-15	6.5	6.1	2.111	0.930	
	15-Sep-15	6.8	6.4	3.800	1.450	
	15-Sep-15	7.0	6.5	2.733	0.995	
	15-Sep-15	4.8	4.6	1.021	1.049	
	15-Sep-15	5.5	5.2	1.654	1.176	
	15-Sep-15	9.9	9.5	7.527	0.878	
	15-Sep-15	5.0	4.6	1.107	1.137	
	15-Sep-15	7.1	6.6	2.974	1.034	
	15-Sep-15	8.1	7.7	9.388	2.056	
	15-Sep-15	7.5	7.2	3.367	0.902	
	15-Sep-15	7.4	7.1	4.005	1.119	
	15-Sep-15	5.7	5.3	1.875	1.259	
	15-Sep-15	6.8	6.5	2.807	1.022	
	15-Sep-15	6.1	5.7	2.233	1.206	
	15-Sep-15	5.6	5.2	1.275	0.907	
	15-Sep-15	6.5	6.1	2.625	1.156	
	15-Sep-15	8.5	8.1	10.844	2.040	
	15-Sep-15	6.0	5.7	2.058	1.111	
	15-Sep-15	6.5	6.1	2.290	1.009	
	15-Sep-15	6.5	6.1	2.345	1.033	
	15-Sep-15	7.0	6.7	3.174	1.055	
	15-Sep-15	5.9	5.7	2.109	1.139	
	15-Sep-15	6.2	5.8	1.969	1.009	
	15-Sep-15	5.6	5.3	1.742	1.170	
	15-Sep-15	5.9	5.6	1.705	0.971	
	15-Sep-15	5.2	5.0	1.351	1.081	
	15-Sep-15	5.6	5.3	2.177	1.462	
	15-Sep-15	5.4	5.2	1.667	1.186	
	15-Sep-15	6.9	6.5	2.881	1.049	
	15-Sep-15	5.8	5.6	1.623	0.924	
	15-Sep-15	7.0	6.6	2.745	0.955	
	15-Sep-15	5.8	5.5	1.643	0.988	
	15-Sep-15	6.1	5.8	1.970	1.010	
	15-Sep-15	5.6	5.5	1.636	0.983	
	15-Sep-15	4.8	4.7	1.213	1.168	
	15-Sep-15	5.2	4.9	1.340	1.139	
	15-Sep-15	5.8	5.6	1.941	1.105	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
	15-Sep-15	5.3	4.9	1.093	0.929	
	15-Sep-15	10.5	9.9	9.147	0.943	
	15-Sep-15	13.3	12.6	23.052	1.152	
	15-Sep-15	7.1	6.6	2.391	0.832	
	15-Sep-15	10.0	9.4	7.491	0.902	
	15-Sep-15	7.1	6.6	2.139	0.744	
	15-Sep-15	5.7	5.5	1.568	0.942	
	15-Sep-15	9.5	9.0	7.776	1.067	
	15-Sep-15	6.3	6.0	2.638	1.221	
	15-Sep-15	9.2	8.8	6.671	0.979	
	15-Sep-15	8.9	8.5	5.722	0.932	
	15-Sep-15	5.9	5.6	1.819	1.036	
	15-Sep-15	7.9	7.5	2.745	0.651	
	15-Sep-15	9.5	8.9	5.857	0.831	
	15-Sep-15	6.3	5.9	2.316	1.128	
	15-Sep-15	7.2	6.9	2.262	0.689	
	15-Sep-15	6.0	5.7	1.609	0.869	
	15-Sep-15	6.6	6.3	1.805	0.722	
	15-Sep-15	5.7	5.5	1.325	0.796	
	15-Sep-15	5.6	5.3	1.424	0.956	
	15-Sep-15	6.1	5.8	1.254	0.643	
	15-Sep-15	5.5	5.2	0.984	0.700	
	15-Sep-15	6.9	6.5	2.291	0.834	
	15-Sep-15	5.7	5.5	1.381	0.830	
	15-Sep-15	6.4	6.1	2.056	0.906	
	15-Sep-15	6.3	6.1	1.923	0.847	
	15-Sep-15	6.2	5.9	2.156	1.050	
	15-Sep-15	5.4	5.2	1.318	0.937	
	15-Sep-15	7.1	6.7	2.687	0.893	
	15-Sep-15	6.0	5.7	1.663	0.898	
	15-Sep-15	6.0	5.7	1.286	0.694	
	15-Sep-15	5.8	5.5	1.183	0.711	
	15-Sep-15	5.7	5.5	2.332	1.402	
	15-Sep-15	6.0	5.7	1.587	0.857	
	15-Sep-15	5.8	5.5	1.255	0.754	
	15-Sep-15	7.0	6.6	2.318	0.806	
	15-Sep-15	6.5	6.1	1.843	0.812	
	15-Sep-15	6.0	5.6	1.618	0.921	
	15-Sep-15	6.6	6.3	1.973	0.789	
	15-Sep-15	5.5	5.2	1.171	0.833	
	15-Sep-15	6.1	5.8	1.763	0.904	
	15-Sep-15	6.0	5.7	1.549	0.836	
	15-Sep-15	5.0	4.8	1.234	1.116	
	15-Sep-15	5.6	5.4	2.524	1.603	
GO13	15-Sep-15	5.1	4.8	0.702	0.635	
	15-Sep-15	5.5	5.2	0.893	0.635	
	15-Sep-15	5.8	5.5	1.433	0.861	
	15-Sep-15	6.0	5.7	1.456	0.786	
	15-Sep-15	6.0	5.7	1.627	0.879	
	15-Sep-15	5.3	5.1	1.270	0.957	
	16-Sep-15	5.7	5.5	1.454	0.874	
	16-Sep-15	6.5	6.2	2.359	0.990	
	16-Sep-15	5.9	5.7	1.905	1.029	
	16-Sep-15	6.1	5.7	1.612	0.870	
	16-Sep-15	5.7	5.5	1.573	0.945	
	16-Sep-15	7.6	7.2	4.059	1.087	
	16-Sep-15	6.6	6.3	2.461	0.984	caudal clip - Sept 2015 recap
	16-Sep-15	6.4	6.1	2.025	0.892	
	16-Sep-15	6.2	5.8	1.885	0.966	
	16-Sep-15	13.7	13.1	20.922	0.931	
	16-Sep-15	12.3	11.7	14.024	0.876	
	16-Sep-15	12.4	11.7	16.374	1.022	
	16-Sep-15	14.5	13.7	25.893	1.007	
	16-Sep-15	6.5	6.2	2.184	0.916	
	16-Sep-15	5.6	5.3	1.570	1.055	
	16-Sep-15	6.6	6.3	2.465	0.986	
	16-Sep-15	6.2	5.9	2.028	0.987	
	16-Sep-15	5.7	5.4	1.359	0.863	
	16-Sep-15	5.6	5.3	1.488	0.999	
	16-Sep-15	11.4	10.9	13.242	1.023	
	16-Sep-15	10.2	9.6	8.334	0.942	
	16-Sep-15	6.4	6.1	9.122	4.019	
	16-Sep-15	6.5	6.2	2.057	0.863	
	16-Sep-15	5.9	5.5	1.347	0.810	
	16-Sep-15	7.6	7.3	3.482	0.895	
	16-Sep-15	9.0	8.5	6.077	0.990	
	16-Sep-15	6.7	6.4	2.259	0.862	
	16-Sep-15	6.8	6.5	2.673	0.973	
	16-Sep-15	10.6	10.0	10.981	1.098	
	16-Sep-15	9.4	9.0	6.733	0.924	
	16-Sep-15	8.9	8.5	5.419	0.882	
	16-Sep-15	6.3	6.1	1.948	0.858	
	16-Sep-15	6.7	6.4	2.267	0.865	
	16-Sep-15	5.9	5.6	1.532	0.872	
	17-Sep-15	11.1	10.5	11.485	0.992	
	17-Sep-15	6.7	6.4	2.423	0.924	
	17-Sep-15	7.8	7.5	4.332	1.027	
	17-Sep-15	10.4	9.8	8.901	0.946	
	17-Sep-15	10.7	10.2	10.480	0.988	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
GO13	17-Sep-15	12.2	11.5	16.057	1.056	
	17-Sep-15	11.7	11.1	13.598	0.994	caudal clip - Sept 2015 recap
	17-Sep-15	7.2	6.9	4.461	1.358	
	17-Sep-15	5.7	5.4	1.432	0.909	
	17-Sep-15	7.1	6.6	2.855	0.993	
	17-Sep-15	7.6	7.1	3.371	0.942	
	17-Sep-15	6.5	6.2	2.234	0.937	
	17-Sep-15	6.6	6.2	2.773	1.164	
	17-Sep-15	6.0	5.7	2.387	1.289	
	17-Sep-15	6.9	6.6	2.819	0.981	
	17-Sep-15	6.6	6.2	2.623	1.101	
	17-Sep-15	6.6	6.3	2.427	0.971	
	17-Sep-15	6.6	6.3	2.154	0.861	
	17-Sep-15	8.7	8.1	5.375	1.011	
	17-Sep-15	6.1	5.8	1.580	0.810	
	17-Sep-15	6.0	5.7	1.514	0.818	
	17-Sep-15	5.5	5.3	1.452	0.975	
	17-Sep-15	6.2	5.8	1.761	0.903	
	17-Sep-15	6.0	5.8	1.729	0.886	
	17-Sep-15	6.4	6.1	2.022	0.891	
	17-Sep-15	7.0	6.6	2.328	0.810	
	17-Sep-15	5.4	5.1	1.305	0.984	
	17-Sep-15	6.1	5.7	1.820	0.983	
	17-Sep-15	6.5	6.2	2.007	0.842	
	17-Sep-15	5.9	5.6	1.675	0.954	
	17-Sep-15	5.8	5.5	1.642	0.987	
	17-Sep-15	6.5	6.2	2.337	0.981	
	17-Sep-15	5.9	5.6	1.606	0.914	
	17-Sep-15	6.5	6.1	2.324	1.024	
	17-Sep-15	6.3	6.0	2.143	0.992	
	17-Sep-15	5.2	4.9	1.193	1.014	
	17-Sep-15	6.2	5.9	2.115	1.030	
	17-Sep-15	6.2	5.9	1.802	0.877	
	17-Sep-15	6.2	5.9	1.726	0.840	
	17-Sep-15	5.5	5.2	1.209	0.860	
	17-Sep-15	5.5	5.2	1.379	0.981	
	17-Sep-15	5.8	5.5	1.656	0.995	
	17-Sep-15	9.7	9.2	6.611	0.849	
	17-Sep-15	6.1	5.8	2.761	1.415	
	17-Sep-15	6.9	6.6	2.561	0.891	
	17-Sep-15	6.9	6.6	2.731	0.950	
	17-Sep-15	11.6	11.1	12.979	0.949	
	17-Sep-15	9.3	8.9	6.443	0.914	
	17-Sep-15	5.8	5.5	1.550	0.932	
	17-Sep-15	6.0	5.7	1.591	0.859	
	17-Sep-15	5.9	5.7	0.904	0.488	
	17-Sep-15	12.1	11.5	15.125	0.994	
	17-Sep-15	6.0	5.7	1.509	0.815	
	18-Sep-15	8.2	7.8	4.305	0.907	
	18-Sep-15	6.3	6.0	1.747	0.809	
	18-Sep-15	6.5	6.2	2.205	0.925	
	18-Sep-15	5.5	5.2	1.232	0.876	
	18-Sep-15	9.7	9.2	6.897	0.886	
	18-Sep-15	7.7	7.3	3.251	0.836	
	18-Sep-15	5.9	5.5	1.698	1.021	
	18-Sep-15	6.4	6.2	2.355	0.988	
	18-Sep-15	5.3	5.0	1.389	1.111	
	18-Sep-15	4.6	4.4	1.429	1.678	
	18-Sep-15	5.5	5.4	1.526	0.969	
	18-Sep-15	5.9	5.6	1.481	0.843	caudal clip - Sept 2015 recap
	18-Sep-15	6.5	6.2	2.210	0.927	
	18-Sep-15	6.2	5.9	2.136	1.040	
	18-Sep-15	6.3	6.0	1.903	0.881	
	18-Sep-15	7.1	6.7	2.783	0.925	
	18-Sep-15	5.7	5.5	1.408	0.846	
OTTO	15-Sep-15	11.6	10.9	19.107	1.475	
	15-Sep-15	11.5	10.8	18.975	1.506	
	15-Sep-15	14.5	13.5	32.714	1.330	
	15-Sep-15	8.6	8.1	7.233	1.361	
	15-Sep-15	14.4	13.6	29.002	1.153	
	15-Sep-15	12.5	10.9	19.305	1.491	
	15-Sep-15	16.4	15.7	47.482	1.227	
	15-Sep-15	13.2	12.7	25.579	1.249	
	15-Sep-15	13.1	12.2	24.763	1.364	
	15-Sep-15	13.8	13.2	30.589	1.330	
	15-Sep-15	13.9	13.1	25.862	1.150	
	15-Sep-15	14.4	13.9	32.212	1.199	
	15-Sep-15	16.5	15.5	44.464	1.194	
	15-Sep-15	9.1	8.8	8.635	1.267	
	15-Sep-15	11.3	10.8	19.447	1.544	
	15-Sep-15	13.1	10.4	21.652	1.925	
	15-Sep-15	10.9	10.4	12.069	1.073	
	15-Sep-15	12.9	12.2	24.372	1.342	
	15-Sep-15	10.2	9.8	10.242	1.088	
	15-Sep-15	13.1	12.4	17.774	0.932	
	15-Sep-15	10.0	9.2	9.935	1.276	
	15-Sep-15	10.2	9.8	8.899	0.946	
	15-Sep-15	12.0	11.4	15.953	1.077	
	15-Sep-15	10.1	9.9	12.651	1.304	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
	15-Sep-15	7.3	6.4	2.530	0.965	
	15-Sep-15	10.2	9.6	10.305	1.165	
	15-Sep-15	8.5	8.1	7.234	1.361	
	15-Sep-15	8.1	7.6	6.501	1.481	
	15-Sep-15	12.0	11.5	19.224	1.264	
	15-Sep-15	11.5	10.8	12.474	0.990	
	15-Sep-15	11.3	10.7	15.278	1.247	
	15-Sep-15	9.6	9.1	10.211	1.355	
	15-Sep-15	9.0	8.5	8.952	1.458	
	15-Sep-15	11.0	10.5	16.127	1.393	
	15-Sep-15	10.2	9.8	9.678	1.028	
	15-Sep-15	13.1	12.5	20.179	1.033	
	15-Sep-15	9.8	9.4	10.804	1.301	
	15-Sep-15	10.3	9.7	11.603	1.271	
	15-Sep-15	10.0	9.3	9.564	1.189	
	15-Sep-15	8.6	8.1	6.603	1.242	
	15-Sep-15	14.1	13.3	21.000	0.893	
	15-Sep-15	9.2	8.7	6.641	1.008	
	15-Sep-15	7.3	7.0	3.332	0.971	
	15-Sep-15	11.2	10.6	13.025	1.094	
	15-Sep-15	11.5	11.2	12.544	0.893	
	15-Sep-15	8.5	8.0	6.485	1.267	
	15-Sep-15	11.7	11.4	19.095	1.289	
	15-Sep-15	10.2	9.7	9.425	1.033	
	15-Sep-15	6.6	6.2	2.210	0.927	
	15-Sep-15	7.0	6.6	2.849	0.991	
	15-Sep-15	9.7	9.3	10.365	1.289	
	15-Sep-15	7.3	7.0	4.152	1.210	
	15-Sep-15	6.7	6.5	3.680	1.340	
	16-Sep-15	11.0	10.5	15.242	1.317	
	16-Sep-15	14.1	13.0	29.545	1.345	
	16-Sep-15	14.6	13.7	34.015	1.323	
	16-Sep-15	9.6	9.2	9.206	1.182	
	16-Sep-15	10.0	9.5	10.603	1.237	
	16-Sep-15	8.5	8.0	6.061	1.184	
	16-Sep-15	5.9	5.5	1.925	1.157	
	16-Sep-15	7.9	7.4	3.901	0.963	
	16-Sep-15	9.6	9.3	6.362	0.791	
	16-Sep-15	6.2	5.9	1.801	0.877	
	16-Sep-15	8.6	8.2	5.153	0.935	
	16-Sep-15	7.3	6.8	3.800	1.209	
	16-Sep-15	4.9	4.6	0.803	0.825	
	16-Sep-15	5.2	4.9	0.921	0.783	
	16-Sep-15	4.5	4.3	0.629	0.791	
OTTO	16-Sep-15	7.0	6.7	2.306	0.767	
	16-Sep-15	4.9	4.6	0.689	0.708	
	16-Sep-15	4.7	4.5	0.452	0.496	
	16-Sep-15	7.4	7.0	3.516	1.025	
	16-Sep-15	11.9	11.0	13.256	0.996	
	16-Sep-15	7.7	7.4	3.802	0.938	
	16-Sep-15	8.0	7.6	5.381	1.226	
	16-Sep-15	7.9	7.5	4.304	1.020	
	16-Sep-15	7.4	7.0	3.403	0.992	
	16-Sep-15	9.1	8.5	6.212	1.012	
	16-Sep-15	13.9	12.9	21.786	1.015	
	16-Sep-15	7.7	7.3	3.701	0.951	
	16-Sep-15	7.2	7.0	2.240	0.653	
	16-Sep-15	12.2	11.5	16.619	1.093	
	16-Sep-15	7.4	7.0	4.222	1.231	
	16-Sep-15	8.5	8.1	4.731	0.890	
	16-Sep-15	12.0	11.3	14.004	0.971	
	16-Sep-15	11.9	11.3	18.605	1.289	
	16-Sep-15	9.2	8.7	6.172	0.937	
	16-Sep-15	8.7	8.3	5.409	0.946	
	16-Sep-15	8.0	7.7	4.444	0.973	
	16-Sep-15	7.1	6.7	3.301	1.098	
	16-Sep-15	8.4	8.0	5.450	1.064	
	16-Sep-15	8.3	7.9	6.896	1.399	
	16-Sep-15	8.7	8.5	5.362	0.873	
	16-Sep-15	7.5	7.2	3.941	1.056	
	16-Sep-15	5.1	4.8	1.029	0.930	
	16-Sep-15	5.1	4.8	1.062	0.960	
	16-Sep-15	11.6	11.0	17.174	1.290	
	16-Sep-15	9.2	8.7	6.411	0.974	
	16-Sep-15	8.9	8.5	6.835	1.113	
	16-Sep-15	8.3	7.9	6.340	1.286	
	16-Sep-15	5.3	4.9	1.117	0.949	
	16-Sep-15	9.3	8.9	7.650	1.085	
	16-Sep-15	8.4	8.0	5.057	0.988	
	16-Sep-15	7.6	7.2	3.667	0.982	
	16-Sep-15	8.0	7.6	4.425	1.008	
	16-Sep-15	8.6	8.2	5.501	0.998	
	16-Sep-15	7.2	6.8	3.892	1.238	
	16-Sep-15	8.0	7.7	5.164	1.131	
	16-Sep-15	7.8	7.5	4.734	1.122	
	16-Sep-15	5.5	5.2	1.927	1.370	
	16-Sep-15	6.4	6.1	2.536	1.117	
	17-Sep-15	13.7	13.0	20.962	0.954	
	17-Sep-15	10.9	10.3	10.325	0.945	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
OTTO	17-Sep-15	8.9	8.4	5.694	0.961	
	17-Sep-15	8.6	8.2	6.132	1.112	
	17-Sep-15	7.9	7.3	4.147	1.066	
	17-Sep-15	7.3	6.9	3.412	1.039	
	17-Sep-15	6.0	5.7	1.822	0.984	caudal clip - Sept 2015 recap
	17-Sep-15	5.9	5.5	1.760	1.058	
	17-Sep-15	5.1	4.9	0.985	0.837	
	17-Sep-15	6.8	6.5	2.931	1.067	
	17-Sep-15	9.7	9.3	4.083	0.508	
	17-Sep-15	8.2	7.8	5.154	1.086	
	17-Sep-15	10.3	9.9	10.960	1.130	
	17-Sep-15	7.2	7.0	3.027	0.883	
	17-Sep-15	6.2	5.9	2.630	1.281	
	17-Sep-15	10.6	10.0	11.724	1.172	
	17-Sep-15	12.3	11.5	18.647	1.226	caudal clip - Sept 2015 recap
	17-Sep-15	9.3	8.8	7.489	1.099	
	17-Sep-15	10.5	9.9	12.503	1.289	
	17-Sep-15	12.6	11.0	18.217	1.369	
	17-Sep-15	9.7	9.2	10.726	1.377	
	17-Sep-15	14.2	13.5	20.605	0.837	
	17-Sep-15	8.5	8.0	4.950	0.967	
	17-Sep-15	12.3	11.5	19.831	1.304	
	17-Sep-15	10.8	10.3	12.086	1.106	
	17-Sep-15	12.7	12.0	16.415	0.950	
	17-Sep-15	11.7	11.2	17.184	1.223	
	17-Sep-15	10.2	9.6	9.995	1.130	
	17-Sep-15	9.9	9.5	8.493	0.991	
	17-Sep-15	13.2	12.5	26.673	1.366	
	17-Sep-15	10.4	9.9	11.592	1.195	
	17-Sep-15	10.7	10.1	14.084	1.367	
	17-Sep-15	12.4	11.8	20.807	1.266	
	17-Sep-15	12.4	11.6	23.616	1.513	
	17-Sep-15	11.0	10.5	15.856	1.370	
	17-Sep-15	9.8	9.3	12.615	1.568	
	17-Sep-15	8.6	8.1	7.315	1.376	
	17-Sep-15	12.6	11.9	21.485	1.275	
	17-Sep-15	12.9	12.3	22.220	1.194	
	17-Sep-15	10.9	10.3	14.409	1.319	
	17-Sep-15	11.6	10.9	19.034	1.470	
	17-Sep-15	9.9	9.5	10.552	1.231	
	17-Sep-15	11.5	10.8	15.986	1.269	
	17-Sep-15	12.5	11.8	19.341	1.177	
	17-Sep-15	10.5	9.8	15.470	1.644	
	17-Sep-15	10.6	9.9	12.580	1.297	
	17-Sep-15	10.2	9.8	11.709	1.244	
	17-Sep-15	7.5	7.0	5.918	1.725	
	17-Sep-15	7.7	7.1	5.419	1.514	
	17-Sep-15	8.0	7.7	5.555	1.217	
	18-Sep-15	11.2	10.5	14.507	1.253	caudal clip - Sept 2015 recap
	18-Sep-15	14.4	13.9	24.309	0.905	
	18-Sep-15	9.6	9.0	11.074	1.519	
	18-Sep-15	12.6	12.1	16.470	0.930	
	18-Sep-15	8.3	7.6	4.618	1.052	caudal clip - Sept 2015 recap
	18-Sep-15	7.9	7.4	4.094	1.010	
	18-Sep-15	9.9	9.0	10.552	1.447	caudal clip - Sept 2015 recap
	18-Sep-15	10.2	9.6	12.415	1.403	
	18-Sep-15	10.0	9.5	11.983	1.398	
	18-Sep-15	11.1	10.3	15.648	1.432	caudal clip - Sept 2015 recap
	18-Sep-15	10.9	10.3	11.336	1.037	
	18-Sep-15	14.2	13.4	27.704	1.151	
	18-Sep-15	10.6	10.0	11.906	1.191	
	18-Sep-15	9.3	8.9	8.177	1.160	
	18-Sep-15	9.3	8.8	8.564	1.257	
	18-Sep-15	9.6	9.1	8.969	1.190	
	18-Sep-15	9.1	8.6	7.673	1.206	
	18-Sep-15	7.6	7.0	5.556	1.620	caudal clip - Sept 2015 recap
	18-Sep-15	11.3	10.6	15.527	1.304	caudal clip - Sept 2015 recap
	18-Sep-15	9.5	9.0	6.553	0.899	
	18-Sep-15	4.9	4.7	6.742	6.494	
	18-Sep-15	9.1	8.6	7.684	1.208	
	18-Sep-15	8.5	7.7	4.709	1.031	caudal clip - Sept 2015 recap
	18-Sep-15	8.5	8.2	6.570	1.192	
	18-Sep-15	6.6	6.4	3.561	1.358	caudal clip - Sept 2015 recap
	18-Sep-15	7.8	7.5	5.516	1.307	
	18-Sep-15	6.8	6.5	3.095	1.127	
	18-Sep-15	7.1	6.7	3.541	1.177	
	18-Sep-15	8.2	7.9	5.641	1.144	
	18-Sep-15	9.1	8.7	7.803	1.185	
	18-Sep-15	7.8	7.6	14.372	3.274	
	18-Sep-15	8.5	8.2	5.634	1.022	
	18-Sep-15	7.8	7.3	4.003	1.029	
	18-Sep-15	8.9	8.5	6.550	1.067	
	18-Sep-15	7.3	7.2	5.131	1.375	
	18-Sep-15	6.9	6.5	3.170	1.154	
ERUP	15-Sep-15	7.1	6.7	3.053	1.015	
	15-Sep-15	8.7	8.4	5.625	0.949	
	15-Sep-15	13.3	12.8	30.000	1.431	
	15-Sep-15	13.4	13.1	31.708	1.410	
	15-Sep-15	14.7	14.0	36.265	1.322	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
ERUP	15-Sep-15	13.1	12.7	24.658	1.204	
	15-Sep-15	12.4	11.2	18.896	1.345	
	15-Sep-15	14.2	13.2	24.646	1.072	
	15-Sep-15	13.2	12.7	24.812	1.211	
	15-Sep-15	15.5	13.9	32.683	1.217	
	15-Sep-15	11.1	10.4	8.423	0.749	
	15-Sep-15	15.1	14.3	34.385	1.176	
	15-Sep-15	13.7	12.9	24.328	1.133	
	15-Sep-15	11.2	10.5	14.798	1.278	
	15-Sep-15	15.6	14.9	33.015	0.998	
	15-Sep-15	13.5	12.8	28.835	1.375	
	15-Sep-15	13.7	12.9	27.281	1.271	
	15-Sep-15	11.7	10.6	13.298	1.117	
	15-Sep-15	14.2	13.7	32.598	1.268	
	15-Sep-15	13.3	12.5	21.349	1.093	
	15-Sep-15	14.7	13.9	26.052	0.970	
	15-Sep-15	14.9	13.6	28.000	1.113	
	15-Sep-15	13.1	12.5	26.934	1.379	
	15-Sep-15	14.7	13.5	28.273	1.149	
	15-Sep-15	11.3	10.5	12.560	1.085	
	15-Sep-15	13.2	12.6	22.844	1.142	
	15-Sep-15	13.0	12.5	28.752	1.472	
	15-Sep-15	11.2	10.5	14.103	1.218	
	15-Sep-15	13.7	13.1	27.145	1.207	
	15-Sep-15	8.5	7.6	9.941	2.265	
	15-Sep-15	11.3	10.8	15.573	1.236	
	15-Sep-15	8.6	8.2	7.446	1.350	
	15-Sep-15	14.2	13.5	30.052	1.221	
	15-Sep-15	8.1	7.6	4.451	1.014	
	16-Sep-15	8.9	8.5	5.794	0.943	
	16-Sep-15	15.6	14.5	28.387	0.931	
	16-Sep-15	6.9	6.5	3.000	1.092	
	17-Sep-15	13.6	12.9	20.476	0.954	
	17-Sep-15	11.7	10.6	12.684	1.065	caudal clip - Sept 2015 recap
	17-Sep-15	9.6	9.2	8.732	1.121	
	17-Sep-15	11.2	10.1	13.349	1.296	caudal clip - Sept 2015 recap
	17-Sep-15	10.6	10.4	10.404	0.925	
	17-Sep-15	13.0	12.4	18.269	0.958	
	18-Sep-15	7.7	7.4	4.050	0.999	
STPD	15-Sep-15	7.4	6.9	3.615	1.100	
	15-Sep-15	13.8	13.1	26.243	1.167	
	15-Sep-15	9.8	9.3	10.021	1.246	
	15-Sep-15	6.7	6.4	4.047	1.544	
	15-Sep-15	12.6	11.7	15.147	0.946	
	15-Sep-15	6.7	6.4	3.194	1.218	
	15-Sep-15	6.0	5.5	1.764	1.060	
	15-Sep-15	11.7	11.0	12.913	0.970	
	15-Sep-15	10.0	9.2	10.472	1.345	
	15-Sep-15	7.7	7.3	4.432	1.139	
	15-Sep-15	9.0	8.5	6.759	1.101	
	15-Sep-15	10.3	9.5	9.522	1.111	
	15-Sep-15	5.0	4.5	0.983	1.079	
	15-Sep-15	5.9	5.7	1.908	1.030	
	15-Sep-15	8.1	7.7	6.211	1.360	
	15-Sep-15	6.9	6.5	3.041	1.107	
	15-Sep-15	8.9	8.2	5.219	0.947	
	15-Sep-15	10.0	9.5	9.806	1.144	
	15-Sep-15	8.1	7.7	5.389	1.180	
	15-Sep-15	8.0	7.7	5.884	1.289	
	15-Sep-15	5.4	5.2	1.345	0.957	
	15-Sep-15	4.6	4.3	1.363	1.714	
	15-Sep-15	5.9	5.6	1.961	1.117	
	15-Sep-15	5.4	5.0	2.233	1.786	
	15-Sep-15	5.2	5.0	1.630	1.304	
	15-Sep-15	8.0	7.3	5.673	1.458	
	15-Sep-15	10.0	9.5	6.702	0.782	
	15-Sep-15	14.0	13.2	22.448	0.976	
	15-Sep-15	10.4	9.8	9.977	1.060	
	15-Sep-15	5.7	5.2	1.783	1.268	
	15-Sep-15	11.6	11.0	13.611	1.023	
	15-Sep-15	9.5	9.0	8.311	1.140	
	15-Sep-15	4.7	4.5	1.356	1.488	
	15-Sep-15	8.3	7.7	5.021	1.100	
	15-Sep-15	12.0	11.2	14.807	1.054	
	15-Sep-15	7.8	7.0	4.049	1.180	
	15-Sep-15	10.1	9.3	9.734	1.210	
	15-Sep-15	6.0	5.6	2.073	1.180	
	15-Sep-15	5.6	5.4	1.891	1.201	
	15-Sep-15	6.3	6.0	2.714	1.256	
	15-Sep-15	6.0	5.7	2.172	1.173	
	15-Sep-15	5.1	4.9	1.136	0.966	
	15-Sep-15	5.6	5.1	1.821	1.373	
	15-Sep-15	7.2	6.7	3.763	1.251	
	15-Sep-15	7.1	6.8	2.343	0.745	
	15-Sep-15	13.0	12.5	17.428	0.892	
	15-Sep-15	11.7	11.1	15.633	1.143	
	15-Sep-15	10.7	10.0	11.192	1.119	
	15-Sep-15	10.2	9.7	9.375	1.027	
	15-Sep-15	11.7	11.0	13.794	1.036	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
	15-Sep-15	6.7	6.3	2.351	0.940	
	15-Sep-15	6.2	5.9	1.957	0.953	
	15-Sep-15	7.0	6.5	3.147	1.146	
	15-Sep-15	5.1	4.9	1.410	1.198	
	15-Sep-15	5.5	5.1	1.604	1.209	
	15-Sep-15	6.4	6.1	2.387	1.052	
	15-Sep-15	5.2	5.0	1.286	1.029	
	15-Sep-15	5.9	5.6	1.876	1.068	
	15-Sep-15	5.8	5.5	1.963	1.180	
	15-Sep-15	5.9	5.4	1.961	1.245	
	15-Sep-15	5.7	5.5	1.952	1.173	
	15-Sep-15	6.0	5.5	2.313	1.390	
	15-Sep-15	6.2	5.7	2.432	1.313	
	15-Sep-15	6.1	5.6	2.216	1.262	
	15-Sep-15	5.9	5.7	1.726	0.932	
	15-Sep-15	5.4	5.0	1.339	1.071	
	15-Sep-15	5.3	4.9	1.583	1.346	
	15-Sep-15	6.3	5.9	1.817	0.885	
	15-Sep-15	6.2	5.7	1.764	0.953	
	15-Sep-15	5.3	5.0	1.237	0.990	
	15-Sep-15	6.7	6.3	3.128	1.251	
	15-Sep-15	6.5	6.1	2.162	0.953	
	15-Sep-15	6.7	6.2	2.723	1.143	
	15-Sep-15	5.6	5.3	2.003	1.345	
	15-Sep-15	6.3	5.9	3.396	1.654	
	15-Sep-15	7.2	6.9	2.766	0.842	
	15-Sep-15	6.5	5.9	2.191	1.067	
	15-Sep-15	8.0	7.5	4.623	1.096	
	15-Sep-15	6.1	5.5	1.767	1.062	
	15-Sep-15	6.0	5.5	1.537	0.924	
	15-Sep-15	6.7	6.1	3.092	1.362	
	15-Sep-15	6.6	5.9	2.664	1.297	
	15-Sep-15	6.4	6.0	2.270	1.051	
	15-Sep-15	6.0	5.5	1.863	1.120	
	15-Sep-15	6.0	5.6	2.175	1.238	
	15-Sep-15	6.5	6.0	2.634	1.219	
	15-Sep-15	8.0	7.7	3.953	0.866	
	15-Sep-15	6.3	6.1	2.410	1.062	
	15-Sep-15	6.1	5.5	1.897	1.140	
	15-Sep-15	5.3	5.0	1.551	1.241	
	15-Sep-15	7.5	7.0	3.450	1.006	
	15-Sep-15	5.0	4.8	1.597	1.444	
	15-Sep-15	6.5	6.2	2.490	1.045	
	15-Sep-15	6.0	5.7	2.445	1.320	
STPD	15-Sep-15	6.0	5.5	2.192	1.318	
	15-Sep-15	6.1	5.7	3.172	1.713	
	15-Sep-15	6.1	5.5	1.722	1.035	
	15-Sep-15	5.5	5.2	1.750	1.245	
	15-Sep-15	5.8	5.5	1.593	0.957	
	15-Sep-15	5.3	5.0	1.314	1.051	
	15-Sep-15	13.0	12.4	15.089	0.791	
	15-Sep-15	9.7	8.9	8.038	1.140	
	15-Sep-15	6.4	5.9	2.477	1.206	
	15-Sep-15	17.9	16.5	52.689	1.173	
	15-Sep-15	10.7	10.0	9.135	0.914	
	15-Sep-15	15.6	15.5	45.018	1.209	
	15-Sep-15	15.2	14.5	34.220	1.122	
	15-Sep-15	9.4	8.7	8.463	1.285	
	15-Sep-15	13.3	12.8	18.664	0.890	
	15-Sep-15	7.3	6.7	3.577	1.189	
	15-Sep-15	8.8	8.5	7.349	1.197	
	15-Sep-15	10.1	9.5	6.034	0.704	
	15-Sep-15	7.6	7.0	2.623	0.765	
	15-Sep-15	5.4	5.0	1.176	0.941	
	15-Sep-15	5.5	5.0	1.283	1.026	
	15-Sep-15	10.4	9.7	9.365	1.026	
	15-Sep-15	5.6	5.1	2.515	1.896	
	15-Sep-15	7.5	7.1	3.014	0.842	
	15-Sep-15	6.4	6.1	2.974	1.310	
	15-Sep-15	6.2	5.7	2.187	1.181	
	15-Sep-15	4.9	4.5	1.053	1.156	
	15-Sep-15	5.1	4.8	1.341	1.213	
	15-Sep-15	5.1	4.7	1.417	1.365	
	15-Sep-15	12.3	11.7	16.310	1.018	
	15-Sep-15	9.5	9.2	7.679	0.986	
	15-Sep-15	5.4	4.9	1.416	1.204	
	15-Sep-15	8.2	7.7	4.906	1.075	
	15-Sep-15	8.4	7.9	4.959	1.006	
	15-Sep-15	10.2	9.4	11.025	1.327	
	15-Sep-15	5.5	5.1	1.565	1.180	
	15-Sep-15	6.4	6.0	2.439	1.129	
	15-Sep-15	10.4	9.9	10.756	1.109	
	15-Sep-15	5.5	5.1	1.473	1.110	
	15-Sep-15	11.1	10.5	13.751	1.188	
	15-Sep-15	5.7	5.3	1.889	1.269	
	15-Sep-15	5.7	5.3	2.101	1.411	
	15-Sep-15	12.8	12.3	16.321	0.877	
	15-Sep-15	10.4	10.0	9.432	0.943	
	15-Sep-15	9.7	8.9	7.493	1.063	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
	15-Sep-15	5.7	5.5	1.756	1.055	
	15-Sep-15	5.6	5.2	1.850	1.316	
	15-Sep-15	6.2	5.5	2.326	1.398	
	15-Sep-15	5.7	5.3	1.983	1.332	
	15-Sep-15	13.9	13.5	28.543	1.160	
	15-Sep-15	17.0	16.0	44.307	1.082	
	15-Sep-15	17.3	16.5	39.000	0.868	
	15-Sep-15	13.7	13.2	28.011	1.218	
	15-Sep-15	6.5	5.7	2.814	1.519	
	15-Sep-15	11.2	10.6	13.353	1.121	
	15-Sep-15	12.6	11.9	17.881	1.061	
	15-Sep-15	9.3	8.9	8.705	1.235	
	15-Sep-15	8.4	7.9	6.633	1.345	
	15-Sep-15	9.2	8.9	5.935	0.842	
	15-Sep-15	12.3	11.2	17.091	1.217	
	15-Sep-15	10.3	9.4	10.180	1.226	
	15-Sep-15	10.0	9.5	9.758	1.138	
	15-Sep-15	9.7	9.3	8.475	1.054	
	15-Sep-15	9.0	8.0	6.333	1.237	
	15-Sep-15	11.3	10.7	14.303	1.168	
	15-Sep-15	5.7	5.5	1.763	1.060	
	15-Sep-15	6.4	6.0	2.345	1.086	
	15-Sep-15	5.3	4.9	1.857	1.578	
	15-Sep-15	5.4	5.0	1.622	1.298	
	15-Sep-15	15.3	14.0	37.016	1.349	
	15-Sep-15	7.0	6.5	2.908	1.059	
	15-Sep-15	5.3	4.9	1.103	0.938	
	15-Sep-15	12.7	11.6	15.785	1.011	
	15-Sep-15	11.3	10.5	15.616	1.349	
	15-Sep-15	5.7	5.3	1.551	1.042	
	15-Sep-15	6.0	5.7	1.991	1.075	
	15-Sep-15	6.1	5.7	2.014	1.088	
	15-Sep-15	9.2	8.7	6.540	0.993	
	15-Sep-15	5.7	5.5	1.373	0.825	
	15-Sep-15	5.5	5.2	1.550	1.102	
	15-Sep-15	17.8	16.9	48.178	0.998	
	15-Sep-15	5.6	5.1	1.593	1.201	
	15-Sep-15	5.2	4.9	1.554	1.321	
	15-Sep-15	5.0	4.3	0.905	1.138	
	15-Sep-15	5.4	5.1	1.416	1.067	
	15-Sep-15	5.4	5.2	1.620	1.152	
	15-Sep-15	6.0	5.7	1.952	1.054	
	15-Sep-15	7.7	7.1	3.837	1.072	
	15-Sep-15	6.0	5.5	2.130	1.280	
STPD	15-Sep-15	6.0	5.7	2.101	1.134	
	15-Sep-15	6.7	6.2	3.226	1.354	
	15-Sep-15	15.1	14.5	42.009	1.378	
	15-Sep-15	17.5	16.3	67.495	1.559	
	15-Sep-15	15.2	14.7	35.036	1.103	
	15-Sep-15	12.5	12.1	14.312	0.808	
	15-Sep-15	14.5	13.5	30.833	1.253	
	15-Sep-15	6.2	6.0	2.365	1.095	
	15-Sep-15	6.1	5.7	2.425	1.309	
	15-Sep-15	5.3	5.1	1.724	1.300	
	15-Sep-15	5.0	4.5	1.380	1.514	
	15-Sep-15	5.7	5.2	1.847	1.314	
	15-Sep-15	5.4	5.1	2.470	1.862	
	15-Sep-15	6.0	5.7	1.600	0.864	
	15-Sep-15	13.5	12.9	22.317	1.040	
	15-Sep-15	16.5	15.5	20.663	0.555	
	15-Sep-15	10.3	9.5	13.070	1.524	
	15-Sep-15	4.8	4.5	1.762	1.934	
	15-Sep-15	5.6	5.3	2.083	1.399	
	15-Sep-15	10.7	10.1	9.918	0.963	
	15-Sep-15	8.1	7.5	4.026	0.954	
	15-Sep-15	6.7	6.2	2.859	1.200	
	15-Sep-15	5.2	5.0	1.644	1.315	
	15-Sep-15	5.0	4.6	1.894	1.946	
	15-Sep-15	7.6	7.3	4.213	1.083	
	15-Sep-15	10.0	9.2	7.878	1.012	
	15-Sep-15	6.5	6.2	2.137	0.897	
	15-Sep-15	5.6	5.3	2.036	1.368	
	15-Sep-15	5.9	5.5	2.346	1.410	
	15-Sep-15	4.8	4.6	0.856	0.879	
	15-Sep-15	6.5	6.2	2.271	0.953	
	15-Sep-15	6.5	6.1	2.374	1.046	
	15-Sep-15	4.7	4.5	1.034	1.135	
	16-Sep-15	6.0	5.7	1.938	1.046	
	16-Sep-15	7.8	7.4	3.610	0.891	
	16-Sep-15	5.6	5.4	1.825	1.159	
	16-Sep-15	6.3	6.0	2.370	1.097	
	16-Sep-15	7.1	6.8	2.855	0.908	
	16-Sep-15	7.0	6.6	2.847	0.990	
	16-Sep-15	7.3	7.0	3.230	0.942	
	16-Sep-15	5.4	5.2	1.200	0.853	
	16-Sep-15	5.7	5.5	1.502	0.903	
	16-Sep-15	6.1	5.8	2.143	1.098	
	16-Sep-15	5.0	4.8	1.143	1.034	
	16-Sep-15	5.9	5.7	1.644	0.888	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
	16-Sep-15	16.9	16.0	51.143	1.249	
	16-Sep-15	6.1	5.8	1.955	1.002	
	16-Sep-15	5.3	5.0	1.549	1.239	
	16-Sep-15	6.4	6.1	2.312	1.019	
	16-Sep-15	5.1	4.9	1.213	1.031	
	16-Sep-15	18.4	17.5	54.619	1.019	
	16-Sep-15	8.9	8.4	5.992	1.011	
	16-Sep-15	6.1	5.9	1.932	0.941	
	16-Sep-15	5.3	5.1	1.128	0.850	
	16-Sep-15	5.8	5.6	1.580	0.900	
	16-Sep-15	5.9	5.7	1.896	1.024	
	16-Sep-15	17.2	16.5	42.248	0.940	
	16-Sep-15	13.7	13.2	34.721	1.510	
	16-Sep-15	6.1	5.7	2.495	1.347	
	16-Sep-15	6.5	6.2	2.201	0.924	
	16-Sep-15	14.1	13.2	18.373	0.799	
	16-Sep-15	6.0	5.5	1.829	1.099	
	16-Sep-15	12.4	12.1	17.607	0.994	
	16-Sep-15	12.5	12.0	16.031	0.928	
	16-Sep-15	13.7	13.0	19.805	0.901	
	16-Sep-15	14.7	14.0	26.310	0.959	
	16-Sep-15	6.4	6.0	2.116	0.980	
	16-Sep-15	6.8	6.4	2.459	0.938	caudal clip - Sept 2015 recap
	16-Sep-15	5.2	5.0	0.936	0.749	
	16-Sep-15	5.8	5.6	1.676	0.954	
	16-Sep-15	7.1	6.7	3.021	1.004	
	16-Sep-15	5.4	5.1	1.402	1.057	
	16-Sep-15	6.6	6.3	2.453	0.981	
	16-Sep-15	5.2	5.0	1.361	1.089	
	16-Sep-15	5.4	5.2	1.461	1.039	
	16-Sep-15	5.4	5.1	1.376	1.037	
	16-Sep-15	5.7	5.5	1.391	0.836	
	16-Sep-15	6.2	6.0	2.426	1.123	
	16-Sep-15	5.6	5.5	2.137	1.284	
	16-Sep-15	5.6	5.2	1.533	1.090	
	16-Sep-15	6.1	6.0	1.973	0.913	
	16-Sep-15	13.6	13.2	19.709	0.857	
	16-Sep-15	10.0	9.2	8.376	1.076	caudal clip - Sept 2015 recap
	16-Sep-15	17.0	16.2	45.594	1.072	
	16-Sep-15	14.4	13.2	27.320	1.188	caudal clip - Sept 2015 recap
	17-Sep-15	6.3	6.0	1.835	0.850	
	17-Sep-15	5.1	4.8	0.903	0.817	
	17-Sep-15	7.0	6.8	2.685	0.854	caudal clip - Sept 2015 recap
	17-Sep-15	7.6	7.1	3.071	0.858	
STPD	17-Sep-15	8.4	8.0	4.686	0.915	caudal clip - Sept 2015 recap
	17-Sep-15	6.1	5.7	1.852	1.000	
	17-Sep-15	8.2	7.8	4.267	0.899	
	17-Sep-15	6.8	6.4	2.609	0.995	
	17-Sep-15	6.0	5.7	1.873	1.011	
	17-Sep-15	7.6	7.3	3.447	0.886	
	17-Sep-15	6.8	6.4	6.167	2.353	
	17-Sep-15	7.7	7.2	3.710	0.994	
	17-Sep-15	5.8	5.5	1.749	1.051	
	17-Sep-15	6.1	5.8	1.637	0.839	
	17-Sep-15	7.3	6.9	3.176	0.967	
	17-Sep-15	6.4	6.2	2.115	0.887	
	17-Sep-15	7.7	7.3	3.626	0.932	
	17-Sep-15	6.4	6.1	1.932	0.851	
	17-Sep-15	5.6	5.3	1.412	0.948	
	17-Sep-15	7.7	7.4	3.310	0.817	
	17-Sep-15	6.4	6.1	2.223	0.979	
	17-Sep-15	6.0	5.7	1.834	0.990	
	17-Sep-15	7.1	6.8	2.471	0.786	
	17-Sep-15	6.2	5.9	1.722	0.838	
	17-Sep-15	6.9	6.6	2.567	0.893	
	17-Sep-15	5.5	5.2	1.235	0.878	
	17-Sep-15	6.1	5.8	1.612	0.826	
	17-Sep-15	6.1	5.8	1.833	0.939	
	17-Sep-15	7.2	6.8	2.902	0.923	
	17-Sep-15	5.9	5.6	1.636	0.932	
	17-Sep-15	5.4	5.2	1.238	0.880	
	17-Sep-15	6.3	6.0	2.118	0.981	
	17-Sep-15	5.8	5.5	1.702	1.023	
	17-Sep-15	6.2	6.0	1.658	0.768	
	17-Sep-15	15.9	15.0	35.295	1.046	
	17-Sep-15	13.6	13.0	20.907	0.952	
	17-Sep-15	12.5	11.9	15.165	0.900	
	17-Sep-15	5.6	5.4	1.569	0.996	
	17-Sep-15	12.0	11.4	14.923	1.007	
	17-Sep-15	11.3	10.5	11.013	0.951	
	17-Sep-15	6.7	6.4	2.377	0.907	caudal clip - Sept 2015 recap
	17-Sep-15	5.2	5.0	1.131	0.905	
	17-Sep-15	6.5	6.2	2.428	1.019	
	17-Sep-15	12.5	11.9	16.375	0.972	
	17-Sep-15	11.1	10.5	10.971	0.948	
	17-Sep-15	7.1	6.8	2.745	0.873	
	17-Sep-15	5.8	5.5	1.767	1.062	
	17-Sep-15	10.1	9.4	8.332	1.003	caudal clip - Sept 2015 recap
	17-Sep-15	5.7	5.5	1.352	0.813	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
	17-Sep-15	10.0	9.5	9.125	1.064	caudal clip - Sept 2015 recap
	17-Sep-15	15.5	14.6	33.905	1.089	caudal clip - Sept 2015 recap
	17-Sep-15	15.5	14.1	30.052	1.072	caudal clip - Sept 2015 recap
	17-Sep-15	12.0	11.5	13.332	0.877	caudal clip - Sept 2015 recap
	17-Sep-15	12.5	11.9	17.518	1.040	
	17-Sep-15	14.4	13.6	25.237	1.003	
	17-Sep-15	11.3	10.8	11.990	0.952	
	17-Sep-15	11.1	10.6	10.713	0.899	caudal clip - Sept 2015 recap
	17-Sep-15	13.1	12.4	18.934	0.993	caudal clip - Sept 2015 recap
	17-Sep-15	10.1	9.6	8.049	0.910	
	17-Sep-15	7.0	6.7	2.772	0.922	
	17-Sep-15	7.3	6.9	3.018	0.919	
	17-Sep-15	17.9	17.1	48.299	0.966	
	17-Sep-15	6.4	6.2	2.178	0.914	
	17-Sep-15	6.0	5.8	1.623	0.832	
	17-Sep-15	6.4	6.1	2.081	0.917	
	17-Sep-15	6.3	6.1	2.113	0.931	
	17-Sep-15	5.5	5.3	1.362	0.915	
	17-Sep-15	5.5	5.2	1.041	0.740	caudal clip - Sept 2015 recap
	17-Sep-15	5.3	5.1	1.866	1.407	
	17-Sep-15	6.1	5.8	2.104	1.078	
	17-Sep-15	4.9	4.7	0.996	0.959	
	17-Sep-15	5.5	5.3	1.383	0.929	
	17-Sep-15	6.5	6.2	2.021	0.848	
	17-Sep-15	8.6	8.1	4.734	0.891	
	17-Sep-15	9.3	8.7	6.390	0.970	
	17-Sep-15	11.5	10.8	12.129	0.963	
	17-Sep-15	7.5	7.1	2.918	0.815	
	17-Sep-15	12.3	11.9	15.035	0.892	
	17-Sep-15	6.2	6.0	1.833	0.849	caudal clip - Sept 2015 recap
	17-Sep-15	8.3	8.0	4.622	0.903	
	17-Sep-15	6.5	6.3	2.137	0.855	
	17-Sep-15	7.3	6.9	2.794	0.851	
	17-Sep-15	8.1	7.8	4.347	0.916	
	17-Sep-15	6.1	5.4	1.209	0.768	
	17-Sep-15	10.8	10.2	9.408	0.887	
	17-Sep-15	7.6	7.2	2.976	0.797	
	17-Sep-15	6.5	6.0	2.095	0.970	
	17-Sep-15	9.0	8.5	6.115	0.996	
	17-Sep-15	8.5	8.1	5.020	0.945	
	17-Sep-15	6.3	6.0	2.065	0.956	
	17-Sep-15	5.7	5.5	1.428	0.858	
	18-Sep-15	12.0	11.3	14.857	1.030	
	18-Sep-15	11.1	10.5	10.352	0.894	caudal clip - Sept 2015 recap
STPD	18-Sep-15	11.7	11.2	13.638	0.971	
	18-Sep-15	6.9	6.7	2.766	0.920	
	18-Sep-15	11.6	10.9	11.157	0.862	
	18-Sep-15	7.7	7.3	3.430	0.882	
	18-Sep-15	22.0	21.0	90.982	0.982	
	18-Sep-15	15.5	14.6	32.154	1.033	
	18-Sep-15	9.7	9.3	8.570	1.065	
	18-Sep-15	7.1	6.8	2.885	0.918	
	18-Sep-15	18.2	17.0	56.670	1.153	caudal clip - Sept 2015 recap
	18-Sep-15	14.1	13.4	21.120	0.878	
	18-Sep-15	15.6	14.7	29.134	0.917	
	18-Sep-15	8.1	7.8	4.236	0.893	
	18-Sep-15	16.0	15.0	36.982	1.096	
	18-Sep-15	19.0	18.0	62.726	1.076	
	18-Sep-15	9.3	8.9	7.557	1.072	
	18-Sep-15	6.3	6.1	2.109	0.929	
	18-Sep-15	16.5	15.8	43.967	1.115	
	18-Sep-15	8.5	8.2	4.612	0.836	
	18-Sep-15	6.6	6.3	2.224	0.889	
	18-Sep-15	6.2	5.9	1.753	0.854	
	18-Sep-15	12.1	11.5	13.801	0.907	
	18-Sep-15	10.5	9.9	8.526	0.879	
	18-Sep-15	6.7	6.5	2.314	0.843	
	18-Sep-15	10.6	10.0	9.961	0.996	
	18-Sep-15	19.4	18.7	60.150	0.920	
	18-Sep-15	6.2	5.8	1.856	0.951	
	18-Sep-15	6.4	6.1	2.334	1.028	
	18-Sep-15	6.2	5.9	2.224	1.083	
	18-Sep-15	9.2	8.8	6.472	0.950	
	18-Sep-15	5.9	5.7	1.438	0.776	
	18-Sep-15	6.8	6.5	2.648	0.964	
	18-Sep-15	11.1	10.6	8.959	0.752	
	18-Sep-15	11.6	11.0		-	
	18-Sep-15	13.1	12.5	19.655	1.006	caudal clip - Sept 2015 recap
	18-Sep-15	9.5	9.3	6.970	0.867	
	18-Sep-15	6.9	6.6	1.925	0.670	
	18-Sep-15	8.1	7.8	3.344	0.705	
	18-Sep-15	7.6	7.1	3.413	0.954	
	18-Sep-15	10.3	9.6	8.697	0.983	
	18-Sep-15	5.9	5.7	1.835	0.991	
	18-Sep-15	6.1	5.8	1.839	0.943	
	18-Sep-15	8.1	7.8	4.647	0.979	
	18-Sep-15	7.2	6.9	3.234	0.984	
	18-Sep-15	6.9	6.7	3.038	1.010	
	18-Sep-15	5.4	5.2	1.312	0.933	

Table HLSU.6: Longnose Sucker Morphometric Measurements, September 2015

Waterbody	Date	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Comments
STPD	18-Sep-15	6.0	5.8	1.790	0.917	
	18-Sep-15	5.9	5.7	1.513	0.817	
	18-Sep-15	12.3	11.7	15.522	0.969	
	18-Sep-15	6.7	6.4	2.531	0.965	
	18-Sep-15	5.7	5.5	1.452	0.873	
	18-Sep-15	10.8	10.1	9.813	0.952	
	18-Sep-15	7.8	7.4	3.972	0.980	

Table HLSU.7: Longnose Sucker Field Measures for all Waterbodies, Teck RAEMP, May 2015, Lethal Sampling

Waterbody	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Fulton's Condition Factor (K)	Female Carcass Weight (g)	Gonad Weight (g)	Liver Weight (g)	Age (years)	Comments	Tissue Collected
UNWNMO	15-May-15	UNWNMO-LSU-1	M	16.2	15.7	44.514	1.150	-	2.05	1.148	5	tubercules	oto, wb
	15-May-15	UNWNMO-LSU-2	M	14.7	14.0	29.512	1.076	-	1.161	0.629	3	-	oto, wb
	15-May-15	UNWNMO-LSU-3	F	9.5	9.0	7.272	0.998	6.692	0.017	0.137	2	spent	oto, c, o
	15-May-15	UNWNMO-LSU-4	M	11.4	10.9	13.820	1.067	-	0.264	0.264	2	partially spent	oto, wb
	15-May-15	UNWNMO-LSU-5	F	17.3	16.4	49.282	1.117	40.151	7.603	0.992	5	-	oto, c, o
	15-May-15	UNWNMO-LSU-6	M	12.0	11.4	16.086	1.086	-	0.61	0.331	2	-	oto, wb
	16-May-15	UNWNMO-LSU-7	F	9.8	9.2	10.339	1.328	9.229	0.07	0.328	2	spent	oto, ovo, c
	16-May-15	UNWNMO-LSU-8	I	6.7	6.3	2.695	1.078	-	-	0.069	1	-	oto
	17-May-15	UNWNMO-LSU-9	F	10.5	9.9	11.622	1.198	11.122	0.094	0.269	2	spent	oto, c, o
	17-May-15	UNWNMO-LSU-10	F	12.3	11.2	16.889	1.202	16.131	0.227	0.376	2	spent	oto, ovo, c
	17-May-15	UNWNMO-LSU-11	M	15.1	14.4	33.145	1.110	-	1.998	0.625	5	tubercules	oto, wb
	17-May-15	UNWNMO-LSU-12	F	12.6	11.9	19.167	1.137	17.970	0.328	0.425	2	spent	ovo, oto, c
ELWDGC	14-May-15	ELWDGC-LSU-1	M	12.2	11.1	16.720	1.223	-	0.469	0.316	3	tubercules	wb, oto
	14-May-15	ELWDGC-LSU-2	F	9.3	8.8	7.242	1.063	6.408	0.095	0.116	1	spent	ovo, oto, c
	14-May-15	ELWDGC-LSU-3	M	9.9	9.4	9.243	1.113	-	0.292	0.220	3	tubercules	wb, oto
	14-May-15	ELWDGC-LSU-4	M	10.1	9.6	9.621	1.087	-	0.274	0.186	3	tubercules	wb, oto
	14-May-15	ELWDGC-LSU-5	F	12.8	12.2	22.196	1.222	18.348	3.461	0.463	4	-	ovo, oto, c
	14-May-15	ELWDGC-LSU-6	M	12.3	11.5	16.099	1.059	-	0.653	0.329	4	-	wb, oto
	14-May-15	ELWDGC-LSU-7	M	11.1	10.5	11.282	0.975	-	0.472	0.310	3	-	wb, oto
	14-May-15	ELWDGC-LSU-8	M	11.7	11.1	15.463	1.131	-	0.684	0.322	3	-	wb, oto
	14-May-15	ELWDGC-LSU-9	M	11.8	11.3	15.772	1.093	-	0.597	0.310	3	partially spent, tubercules	oto
	14-May-15	ELWDGC-LSU-10	M	14.3	13.5	24.668	1.003	-	1.413	0.620	5	tubercules	oto
	17-May-15	ELWDGC-LSU-11	F	10.8	10.2	11.933	1.124	12.455	0.233	0.350	3	spent	ovo, oto, c
	17-May-15	ELWDGC-LSU-12	F	10.3	9.7	9.684	1.061	8.645	0.148	0.207	3	spent	o, oto, c
	18-May-15	ELWDGC-LSU-13	F	12.1	11.4	14.926	1.007	14.183	0.239	0.349	3	spent	o, oto, c
MIWW	16-May-15	MIWW-LSU-1	F	10.6	10	12.211	1.221	10.681	1.229	0.381	2	-	oto, ovo, c
	16-May-15	MIWW-LSU-2	F	12.5	12	19.750	1.143	16.772	2.640	0.630	2	-	oto, ovo, c
	18-May-15	MIWW-LSU-3	M	11.9	11.2	15.717	1.119	-	0.719	0.285	2	-	wb, oto
MIC2	18-May-15	MIC2-LSU-1	M	9.9	9.4	8.132	0.979	0.229	0.136	1	-	-	wb, oto
	18-May-15	MIC2-LSU-2	M	11.4	10.8	12.496	0.992	0.600	0.250	3	-	-	wb, oto
	18-May-15	MIC2-LSU-3	M	12.0	11.4	15.060	1.017	0.505	0.261	3	-	-	wb, oto
EROL	13-May-15	EROL-LSU-1	I	6.9	6.6	3.018	1.050	-	-	0.077	1	-	oto
	14-May-15	EROL-LSU-2	I	6.7	6.3	2.629	1.051	-	0.017	0.080	1	-	oto
FLA1	12-May-15	FLAI-LSU-1	I	6.5	6.3	2.740	1.096	-	0.018	0.067	1	-	oto
	12-May-15	FLAI-LSU-2	M	12.6	11.9	18.461	1.096	-	0.905	0.182	1	-	pf, wb
	12-May-15	FLAI-LSU-3	M	11.5	11.0	14.264	1.072	-	0.618	0.368	3	-	oto, pf, wb
	12-May-15	FLAI-LSU-4	F	13.2	12.5	22.039	1.128	19.272	2.124	0.540	3	-	oto, o, c
	12-May-15	FLAI-LSU-5	M	14.8	14.0	25.170	0.917	-	1.402	0.477	3	-	oto, wb
	12-May-15	FLAI-LSU-6	I	9.8	9.3	8.352	1.038	-	0.020	0.194	2	-	oto
	12-May-15	FLAI-LSU-7	I	8.7	8.4	5.922	0.999	-	too small	0.132	-	-	oto
	12-May-15	FLAI-LSU-8	I	9.3	8.8	6.950	1.020	-	too small	0.177	2	-	oto
	12-May-15	FLAI-LSU-9	M	13.6	12.9	22.103	1.030	-	0.621	0.366	3	-	oto, wb
	14-May-15	FLAI-LSU-10	I	5.5	5.1	1.410	1.063	-	-	0.052	0	-	oto
	14-May-15	FLAI-LSU-11	I	5.4	5.1	1.479	1.115	-	-	0.015	0	-	oto
	14-May-15	FLAI-LSU-12	I	7.2	6.7	3.486	1.159	-	0.032	0.135	1	-	oto
	14-May-15	FLAI-LSU-13	I	7.8	7.3	4.247	1.092	-	-	0.150	1	-	oto
	14-May-15	FLAI-LSU-14	I	7.3	6.9	3.401	1.035	-	0.027	0.089	1	-	oto
STPD	12-May-15	STPD-LSU-1	I	7.9	7.6	5.201	1.185	-	-	0.078	1	-	oto
	12-May-15	STPD-LSU-2	F	12.6	12.0	19.670	1.138	18.168	0.120	0.426	3	spent	oto, ovo, c
	12-May-15	STPD-LSU-3	I	8.0	7.8	4.553	0.959	-	-	0.061	2	-	oto
	12-May-15	STPD-LSU-4	I	8.7	8.5	6.594	1.074	-	-	0.130	2	-	oto
	12-May-15	STPD-LSU-5	F	15.6	14.9	33.801	1.022	30.082	2.321	0.851	12	-	oto, ovo, c
	13-May-15	STPD-LSU-6	I	5.3	5.1	1.389	1.047	-	-	0.018	1	-	oto
	13-May-15	STPD-LSU-7	I	5.2	5.0	1.310	1.048	-	-	0.036	2	-	oto
	13-May-15	STPD-LSU-8	I	5.6	5.4	1.603	1.018	-	-	0.043	2	-	oto
	13-May-15	STPD-LSU-9	I	5.3	5.1	1.273	0.960	-	-	0.025	1	-	oto
	14-May-15	STPD-LSU-10	I	5.2	5.0	1.063	0.850	-	-	0.030	1	-	oto
	14-May-15	STPD-LSU-11	M	17.0	16.3	44.428	1.026	-	1.898	0.752	7	-	wb, oto
	15-May-15	STPD-LSU-12	F	19.9	18.9	85.014	1.259	67.831	13.356	2.002	7	-	oto, ovo, c
	15-May-15	STPD-LSU-13	M	14.4	13.7	27.629	1.074	-	0.987	0.535	3	tubercules	wb, oto
STPD	15-May-15	STPD-LSU-14	I	8.8	8.4	5.865	0.990	-	-	0.103	2	-	oto
	15-May-15	STPD-LSU-15	I	7.2	6.9	3.134	0.954	-	-	0.074	2	-	oto
	15-May-15	STPD-LSU-16	I	6.5	6.1	2.366	1.042	-	-	0.050	1	-	oto
	16-May-15	STPD-LSU-17	F	11.5	10.9	14.001	1.081	13.497	0.178	0.311	3	spent	oto, ovo, c
	16-May-15	STPD-LSU-18	F	15.6	14.6	39.416	1.267	33.958	4.955	1.172	8	-	oto, ovo, c
	16-May-15	STPD-LSU-19	F	13.4	12.6	21.206	1.060	20.043	0.760	0.38	3	partially spent	oto, ovo, c
	17-May-15	STPD-LSU-20	F	18.6	17.7	61.949	1.117	51.069	7.656	1.418	7	-	oto, ovo, c
	17-May-15	STPD-LSU-21	F	9.8	9.2	9.022	1.159	7.970	0.089	0.261	2	spent	oto, ovo, c
	18-May-15	STPD-LSU-22	F	18.9	17.9	68.085	1.187	58.779	8.094	1.476	-	-	oto, ovo, c
GO13	16-May-15	GO13-LSU-1	F	11.4	10.8	16.054	1.274	14.321	1.442	0.432	2	-	ovo, oto, c
	16-May-15	GO13-LSU-2	F	12.1	11.5	15.657	1.029	15.144	0.303	0.418	2	spent	ovo, oto, c
	16-May-15	GO13-LSU-3	M	10.9	10.3	10.65	0.975	-	0.349	0.155	1	white worms, tubercules	oto, wb
	16-May-15	GO13-LSU-4	I	6.5	6.1	2.103	0.927	-	-	0.035	1	-	oto
	16-May-15	GO13-LSU-5	I	8.5	8.1	5.487	1.032	-	-	0.207	1	worm 0.675 (g)	-
	17-May-15	GO13-LSU-6	F	10.3	9.7	10.442	1.144	9.828	0.165	0.248	2	spent	ovo, oto, c
	17-May-15	GO13-LSU-7	F	11.4	10.8	13.43	1.066	12.251	0.814	0.348	2	-	ovo, oto, c
	17-May-15	GO13-LSU-8	F	11.6	11.0	13.716	1.031	12.976	0.394	0.277	2	spent	ovo, oto, c
	17-May-15	GO13-LSU-9	F	12.7	12.0	20.086	1.162	17.078	2.278	0.427	4	-	ovo, oto, c
	17-May-15	GO13-LSU-10	F	10.7	10.1	10.183	0.988	9.577	0.175	0.188	2	spent	ovo, oto, c
	17-May-15	GO13-LSU-11	F	12.0	11.4	14.716	0.993	13.710	0.409	0.379	2	spent	ovo, oto, c
	17-May-15	GO13-LSU-12	F	11.3	10.7	15.916	1.299	-	-	0.366	2	worm 1.944 (g)	oto, wb
	17-May-15	GO13-LSU-13	F	12.8	12.2	20.567	1.133	17.302	2.618	0.630	3	-	ovo, oto, c
	17-May-15	GO13-LSU-14	M	11.0	10.5	11.42	0.987	-	0.598	0.205	2	-	oto, wb
	17-May-15	GO13-LSU-15	I	4.9	4.7	1.042	1.004	-	-	0.027	0	-	oto
	17-May-15	GO13-LSU-16	M	11.3	10.2	13.91	1.311	-	0.163	0.301	2	worm 1.308 (g)	oto, wb
	17-May-15	GO13-LSU-17	M	9.7	9.2	8.57	1.100	-	0.019	0.141	2	spent	oto, wb
	17-May-15	GO13-LSU-18	M	10.8	10.3	11.45	1.047	-	0.43	0.247	2	tubercules	wb, oto
	17-May-15	GO13-LSU-19	I	6.9	6.5	2.927	1.066	-	-	0.100	1	-	oto
	17-May-15	GO13-LSU-20	I	8.0	7.5	4.225	1.001	-	-	0.089	1	-	oto

Table HLSU.7: Longnose Sucker Field Measures for all Waterbodies, Teck RAEMP, May 2015, Lethal Sampling

Waterbody	Processing Date	Fish ID	Sex	Total Length	Fork Length	Body Weight	Fulton's Condition Factor	Female Carcass Weight	Gonad Weight	Liver Weight	Age	Comments	Tissue Collected
				(cm)	(cm)	(g)	(K)	(g)	(g)	(g)	(years)		
OTTO	16-May-15	OTTO-LSU-1	M	11.0	10.4	12.634	1.123	-	0.475	0.306	2	tubercules	oto, wb
	16-May-15	OTTO-LSU-2	M	13.4	12.6	22.186	1.109	-	0.483	0.287	1	worm 0.236 (g), tubercules, partially spent	oto, wb
	16-May-15	OTTO-LSU-3	I	7.9	7.5	5.009	1.187	-	-	0.24	1	worm 0.180 (g)	oto
	16-May-15	OTTO-LSU-4	I	8.8	8.3	8.931	1.562	-	0.027	0.169	0	worm 0.180 (g)	oto
	16-May-15	OTTO-LSU-5	F	7.8	7.3	4.466	1.148	3.475	0.027	0.075	0	worm 0.576 (g)	ovo, oto, c
	16-May-15	OTTO-LSU-6	I	8.7	8.2	6.013	1.091	-	-	0.149	1	worm 0.071 (g)	oto
	16-May-15	OTTO-LSU-7	M	8.7	8.2	5.809	1.054	-	0.089	0.136	1	worm 0.017 (g)	oto, wb
	16-May-15	OTTO-LSU-8	M	8.2	7.8	4.906	1.034	-	0.096	0.084	1	partially spent	oto, wb
	16-May-15	OTTO-LSU-9	I	7.8	7.5	4.525	1.073	-	-	0.12	2	-	oto
	16-May-15	OTTO-LSU-10	F	7.9	7.4	4.743	1.170	4.212	0.027	0.068	0	spent	oto, ovo, c
	16-May-15	OTTO-LSU-11	I	6.3	6.0	2.042	0.927	-	-	0.033	1	worms 0.014 (g)	oto
	16-May-15	OTTO-LSU-12	I	7.4	7.0	4.603	1.342	-	-	0.122	0	worms 0.915 (g)	oto
	16-May-15	OTTO-LSU-13	I	7.0	6.7	3.954	1.315	-	-	0.052	1	worm 0.561 (g)	oto
	16-May-15	OTTO-LSU-14	I	7.2	6.8	3.289	1.046	-	-	0.051	1	-	oto
	16-May-15	OTTO-LSU-15	I	7.5	7.2	3.721	0.997	-	-	0.093	0	worm 0.030 (g)	oto
	16-May-15	OTTO-LSU-16	I	6.8	6.5	2.850	1.038	-	-	0.073	1	-	oto
	16-May-15	OTTO-LSU-17	I	4.5	4.3	0.842	1.059	-	-	0.011	0	worm 0.006 (g)	-
	17-May-15	OTTO-LSU-19	I	7.7	7.2	4.767	1.277	-	-	0.113	0	-	oto
	17-May-15	OTTO-LSU-20	I	8.2	7.8	4.944	1.042	-	-	0.148	0	worm 0.032 (g)	oto
ERUP	12-May-15	ERUP-LSU-1	M	12.9	12.2	19.706	1.085	-	1.038	0.508	3	-	oto, wb
	12-May-15	ERUP-LSU-2	F	10.4	9.9	10.930	1.126	10.187	0.139	0.177	3	possibly spent or under-developed female	oto, c, o
	12-May-15	ERUP-LSU-3	I	10.6	10.3	12.642	1.157	-	0.038	0.342	2	spent?	oto, wb
	12-May-15	ERUP-LSU-4	M	12.3	11.7	18.401	1.149	-	0.629	0.508	3	-	oto, wb
	12-May-15	ERUP-LSU-5	I	10.2	9.8	8.757	0.930	-	-	0.201	2	-	oto, wb
	12-May-15	ERUP-LSU-6	M	12.0	11.4	17.712	1.196	-	0.559	0.435	2	-	oto, wb
	12-May-15	ERUP-LSU-7	M	11.0	10.6	12.504	1.050	-	0.058	0.359	2	spent	oto, wb
	12-May-15	ERUP-LSU-8	M	11.8	11.3	18.294	1.268	-	0.695	0.476	3	-	oto, wb
ERUP	14-May-15	ERUP-LSU-9	F	11.1	10.4	13.017	1.157	12.188	0.190	0.184	2	spent	c, ovo, oto
	16-May-15	ERUP-LSU-10	F	11.5	10.9	14.264	1.101	13.858	0.190	0.331	2	spent	c, ovo, oto
	16-May-15	ERUP-LSU-11	F	14.9	14.0	33.558	1.223	27.460	4.767	0.723	3	-	oto, c, o
	16-May-15	ERUP-LSU-12	F	12.4	11.7	17.739	1.108	15.680	2.422	0.396	3	-	oto, c, o

Notes: F = Female; I= immature; M= Male; c = carcass ; o = operculum; oto = otolith; ovo = ovary; pf = pectoral fin; wb = whole body

Table HLSU.8: Statistical Comparisons for Longnose Sucker Endpoints Collected from One Reference Areas (FLA1) and Seven Mine-exposed Areas (ELWDGC, EROL, ERUP, GO13, OTTO, STPD, and UNWNMO) May, 2015

Indicator	Endpoint	Variables		Biological Area Code	Sample Size	Test	ANCOVA Statistics			Summary Statistics		Overall Test P-value	P-value Mine-exposed Area vs. FLA-1[a]	Magnitude of Difference (%)[b,c]
		Response	Covariate				Interaction Model	Parallel Slope Model	Covariate Value for Comparisons	Statistic	Value			
							Interaction P-value	Covariate P-value						
Survival/ Recruitment	Length Frequency Distribution	Fork Length (cm)	n/a	FLA1 (ref)	85	-	-	-	-	-	-	-	-	-
				ERUP	36	K-S	n/a	n/a	n/a	n/a	n/a	n/a	0.001	39
				ELWDGC	18	K-S							0.057	35
				GO13	95	K-S							<0.001	32
				OTTO	90	K-S							<0.001	-34
				STPD	139	K-S							<0.001	-46
				EROL	11	K-S							0.338	-30
				UNWNMO	32	K-S							0.123	25
Body Size	Fork Length	Fork Length (cm)	n/a	FLA1 (ref)	85	K-W	n/a	n/a	n/a	Median	9.1	<0.001	-	-
				ERUP	36						10.7		0.071	18
				ELWDGC	18						10.3		1.000	13
				GO13	95						10.1		0.126	11
				OTTO	90						7.3		0.009	-20
				STPD	139						5.7		<0.001	-37
				EROL	11						7.5		1.000	-18
				UNWNMO	32						10.3		1.000	13
	Body Weight	Body Weight (g)	n/a	FLA1 (ref)	85	K-W	n/a	n/a	n/a	Median	7.27	<0.001	-	-
				ERUP	36						13.4		0.020	84
				ELWDGC	18						11.6		0.886	60
				GO13	95						10.5		0.098	44
				OTTO	90						4.42		0.050	-39
				STPD	139						1.76		<0.001	-76
				EROL	11						4.03		1.000	-45
				UNWNMO	32						12.6		0.511	73
Energy Storage	Condition	Log_{10} [Body Weight (g)]	Log_{10} [Fork Length (cm)]	FLA1 (ref)	85	ANCOVA	0.010[d]	<0.001	8.19	Adjusted Mean (Geometric)	5.57	<0.001	-	-
				ERUP	36						6.07		<0.001	9.0
				ELWDGC	18						6.00		0.040	7.7
				GO13	95						5.64		0.979	1.1
				OTTO	90						6.05		<0.001	8.6
				STPD	139						5.64		0.945	1.3
				EROL	11						5.74		0.938	3.0
				UNWNMO	32						6.11		<0.001	9.7
				FLA1 (ref)	80[e]	ANCOVA	0.001[f]	<0.001	8.20	Adjusted Mean (Geometric)	5.69	<0.001	-	-
				ERUP	36						6.10		0.001	7.3
				ELWDGC	18						6.03		0.089	6.0
				GO13	94[e]						5.69		1.000	-0.026
				OTTO	90						6.09		<0.001	7.0
				STPD	138[e]						5.66		1.000	-0.51
				EROL	11						5.77		0.998	1.5
				UNWNMO	32						6.14		<0.001	8.0

Notes:

= P-value < 0.05 for ANCOVA interaction covariate term and and P-value < 0.1 for overall test and *post-hoc* comparisons.

n/a = not applicable

[a] Adjusted to preserve a family-wise error rate of 0.1 [Dunnett's method for comparison to a single control for ANOVA/ANCOVA, and Dunn's Test (with Bonferroni correction) for K-W test].

[b] Calculated as the difference in measure of central tendency (MCT) between areas (mine-exposed minus reference), expressed as a percentage of the reference area MCT (except for the K-S test; see footnote c)

[c] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD; see Appendix Figure HLSU.6) between areas. A negative difference implies that the mine-exposed area has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that the mine-exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

[d] The R^2 of the interaction model was 0.9903 and the R^2 of the parallel slope model was 0.9899 (difference of 0.04%) so the ANCOVA proceeded under the assumption that the slopes are practically parallel, as per Environment Canada (2012b) guidance.

[e] Outliers with a Studentized residual with magnitude greater than 4 were removed.

[f] The R^2 of the interaction model was 0.9927 and the R^2 of the parallel slope model was 0.9923 (difference of 0.04%) so the ANCOVA proceeded under the assumption that the slopes are practically parallel, as per Environment Canada (2012b) guidance.

Table HLSU.9: Temporal Comparison of Longnose Sucker Condition by Area for September 2015, Relative to May 2015

Endpoint	Variables		Biological Area Code	Sample Size		Test	ANCOVA Statistics								
							Interaction Model		Parallel Slope Model						
	Response	Covariate		May	Sept		Interaction P-value	R^2	Covariate P-value	R^2	Covariate Value for Comparisons [Fork Length (cm)]	Adjusted Mean [Body Weight (g)]		Month	
												May	Sept	P-value	% Difference Sept Relative to May
Condition	Log_{10} [Body Weight (g)]	Log_{10} [Fork Length (cm)]	STPD	139	411	ANCOVA	<0.001[a]	0.9784	<0.001	0.9778	7.17	3.75	3.84	0.132	2.4
			OTTO	90	193	ANCOVA	0.001[a]	0.9719	<0.001	0.9707	8.37	6.55	6.65	0.454	1.6
			GO13	93	40	ANCOVA	0.164	0.9878	<0.001	0.9876	8.43	6.18	6.29	0.486	1.9
			ERUP	36	43	ANCOVA	0.516	0.9642	<0.001	0.9763	10.72	13.87	13.91	0.934	0.23

[a] The difference in the coefficient of determination (R^2) between the interaction model and parallel slope model is <2% so the ANCOVA proceeded under the assumption that the slopes were equal

P-value < 0.05

Table HLSU.10: Temporal Comparison of Longnose Sucker Condition by Area for May and September 2015, Relative to 2005 or 2013

Endpoint	Variables		Baseline Year	Biological Area Code	Sample Size		Test	ANCOVA Statistics								
								Interaction Model		Parallel Slope Model						
	Response	Covariate			Baseline	2015		Interaction P-value	R^2	Covariate P-value	R^2	Covariate Value for Comparisons [Fork Length (cm)]	Adjusted Mean [Body Weight (g)]		Year	
													2005	2015	P-value	% Difference 2015 Relative to Baseline
Condition	Log_{10} [Body Weight (g)]	Log_{10} [Fork Length (cm)]	2005	ERUP	201	78	ANCOVA	<0.001[a]	0.9700	<0.001	0.9670	11.31	15.37	16.43	<0.001	6.8
				EROL	20	11	ANCOVA	0.275	0.9850	<0.001	0.9843	10.48	13.31	12.34	0.207	-7.3
			2013	FLA1	296	79	ANCOVA	0.067	0.9870	<0.001	0.9869	7.64	4.42	4.66	<0.001	5.4
				GO13	287	134	ANCOVA	0.141	0.9712	<0.001	0.9710	7.82	4.92	5.03	0.144	2.1
				OTTO	33	283	ANCOVA	0.073	0.9749	<0.001	0.9746	8.36	6.22	6.60	0.029	6.2
				STPD	232	549	ANCOVA	0.316	0.9762	<0.001	0.9762	7.19	3.88	3.87	0.893	-0.16

[a] The difference in the coefficient of determination (R^2) between the interaction model and parallel slope model is <2% so the ANCOVA proceeded under the assumption that the slopes were equal

P-value < 0.05

Table HLSU.11: Temporal Comparison of Longnose Sucker Length Frequency Distribution by Area for May and September 2015, Relative to 2005 or 2013

Endpoint	Variable	Baseline Year	Biological Area Code	Sample Size		Test	P-value	% Difference [a]
				Baseline	2015			
Length Frequency Distribution	Fork Length (cm)	2005	ERUP	201	78	K-S	<0.001	-41
			EROL	20	11	K-S	<0.001	-82
		2013	FLA1	296	79	K-S	<0.001	33
			GO13	287	134	K-S	<0.001	36
			OTTO	33	283	K-S	0.011	-29
			STPD	232	549	K-S	<0.001	-33

P-value < 0.05

[a] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD; see Appendix Figure HLSU.4) between areas. A negative difference implies that the mine-exposed area has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that the mine-exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

Table HLSU.12: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, May 2015

Biological Area Code	Station ID	UTM (NAD83, 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
		Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]
UNWNMO	UW-MT-01[a]	644982	5468245	11-May-15	12-May-15	16:05	19:02	26.95	1.123	0.30	1	0	0	0.89	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-02[a]	644989	5468250	11-May-15	12-May-15	16:06	19:02	26.93	1.122	1.50	6	0	0	5.35	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-03[a]	644971	5468229	11-May-15	12-May-15	16:06	19:01	26.92	1.122	0.70	2	0	0	1.78	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-04[a]	645020	5468278	11-May-15	12-May-15	16:03	19:00	26.95	1.123	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-05[a]	645071	5468322	11-May-15	12-May-15	16:10	19:00	26.83	1.118	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-06	644971	5468229	12-May-15	13-May-15	19:33	16:50	21.28	0.887	0.50	2	0	0	2.26	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-07	644982	5468245	12-May-15	13-May-15	19:34	16:56	21.37	0.890	0.70	1	0	0	1.12	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-08	644989	5468250	12-May-15	13-May-15	19:36	16:59	21.38	0.891	0.60	1	0	0	1.12	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-09	644985	5468254	12-May-15	13-May-15	19:37	17:02	21.42	0.892	1.00	1	0	0	1.12	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-10	644984	5468256	12-May-15	13-May-15	19:39	17:07	21.47	0.894	0.30	1	0	0	1.12	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-11	644983	5468245	13-May-15	14-May-15	17:16	15:58	22.70	0.946	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-12	645016	5468281	13-May-15	14-May-15	17:21	16:01	22.67	0.944	0.75	2	0	0	2.12	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-13	645027	5468293	13-May-15	14-May-15	17:20	16:13	22.88	0.953	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-14	645041	5468355	13-May-15	14-May-15	17:28	16:17	22.82	0.951	0.45	9	0	0	9.47	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-15	645081	5468370	13-May-15	14-May-15	17:31	16:32	23.02	0.959	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-16	645114	5468353	14-May-15	15-May-15	16:48	14:29	21.68	0.903	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-17	645095	5468329	14-May-15	15-May-15	16:52	14:28	21.60	0.900	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-18	645064	5468330	14-May-15	15-May-15	16:56	14:15	21.32	0.888	0.45	6	0	0	6.76	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-19	645046	5468268	14-May-15	15-May-15	17:04	14:10	21.10	0.879	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	UW-MT-20	644980	5468245	14-May-15	15-May-15	17:09	14:05	20.93	0.872	1.25	3	0	0	3.44	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**462.22**	**19.26**		**35**	**0**	**0**	**1.82**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
GO13	GO13-MT-01	653018	5514069	12-May-15	13-May-15	12:01	12:12	24.18	1.008	0.60	5	0	0	4.96	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-02	652965	5514066	12-May-15	13-May-15	12:16	12:31	24.25	1.010	0.35	4	0	0	3.96	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-03	653113	5514087	12-May-15	13-May-15	11:51	11:57	24.10	1.004	0.30	1	0	0	1.00	2	0	1.99	0	0	0	0	0	0	0	0	0
	GO13-MT-04	652956	5514045	12-May-15	13-May-15	12:10	12:45	24.58	1.024	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-05	653136	5514105	12-May-15	13-May-15	11:48	11:50	24.03	1.001	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-06	652964	5514073	12-May-15	13-May-15	12:18	12:25	24.12	1.005	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-07	652972	5514019	12-May-15	13-May-15	12:10	12:44	24.57	1.024	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-08	653000	5514022	12-May-15	13-May-15	12:13	12:42	24.48	1.020	0.50	25	0	0	24.51	0	0	0	4	0	3.92	1	0	0.98	0	0	0
	GO13-MT-09	653160	5514008	13-May-15	14-May-15	14:54	8:24	17.50	0.729	1.00	1	0	0	1.37	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-10	653048	5514367	13-May-15	14-May-15	14:37	8:12	17.58	0.733	0.30	2	0	0	2.73	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-11	653136	5514127	13-May-15	14-May-15	11:52	7:54	20.03	0.835	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-12	653092	5514078	13-May-15	14-May-15	12:07	8:01	19.90	0.829	0.30	5	0	0	6.03	0	0	0	1	0	1.21	0	0	0	0	0	0
	GO13-MT-13	652952	5514065	13-May-15	14-May-15	14:09	8:54	18.75	0.781	0.70	1	0	0	1.28	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-14	652991	5514076	13-May-15	14-May-15	12:16	8:21	20.08	0.837	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-15	653004	5514023	13-May-15	14-May-15	13:51	8:41	18.83	0.785	0.40	4	0	0	5.10	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-16	652977	5514044	13-May-15	14-May-15	14:17	8:45	18.47	0.769	0.30	3	1	0	5.20	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-17	653109	5514082	14-May-15	15-May-15	8:00	7:55	23.92	0.997	0.30	0	0	0	0	1	0	1.00	0	0	0	0	0	0	0	0	0
	GO13-MT-18	652949	5514067	14-May-15	15-May-15	9:05	8:34	23.48	0.978	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-19	652955	5514059	14-May-15	15-May-15	8:58	8:57	23.98	0.999	0.45	2	0	0	2.00	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-20	653087	5514075	14-May-15	15-May-15	8:10	8:06	23.93	0.997	0.50	4	0	0	4.01	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-21	653034	5514074	14-May-15	15-May-15	8:19	8:17	23.97	0.999	0.50	10	0	0	10.01	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-22	652981	5514041	14-May-15	15-May-15	8:48	8:45	23.95	0.998	0.60	7	0	0	7.01	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-23	653066	5514064	14-May-15	15-May-15	9:15	8:03	22.80	0.950	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-24	652994	5514077	14-May-15	15-May-15	9:11	8:28	23.28	0.970	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-25	652952	5514069	15-May-15	16-May-15	8:37	9:06	24.48	1.020	0.30	3	0	0	2.94	0	0	0	0	0	0	0	0	0	2	0	1.96
	GO13-MT-26	652929	5514085	15-May-15	16-May-15	8:40	9:16	24.60	1.025	0.40	1	0	0	0.98	0	0	0	1	0	0.98	0	0	0	0	0	0
	GO13-MT-27	653102	5514089	15-May-15	16-May-15	8:05	8:50	24.75	1.031	0.40	0	0	0	0	2	0	1.94	0	0	0	0	0	0	0	0	0
	GO13-MT-28	652982	5514031	15-May-15	16-May-15	8:55	9:01	24.10	1.004	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-29	652934	5514091	15-May-15	16-May-15	9:02	9:15	24.22	1.009	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-30	653077	5514067	15-May-15	16-May-15	8:14	8:54	24.67	1.028	0.50	1	0	0	0.97	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-31	652985	5514075	15-May-15	16-May-15	8:31	8:58	24.45	1.019	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GO13-MT-32	653137	5514078	15-May-15	16-May-15	7:59	8:45	24.77	1.032	0.30	0	0	0	0	1	0	0.97	0	0	0	0	0	0	0	0	0
	TOTAL							**730.82**	**30.45**		**79**	**1**	**0**	**2.63**	**6**	**0**	**0.20**	**6**	**0**	**0.20**	**1**	**0**	**0.03**	**2**	**0**	**0.07**

[a] UTM approximated from Google Earth ™

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.12: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, May 2015

Biological Area Code	Station ID	UTM (NAD83, 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
		Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]
Elk River Wetland Downstream of Grave Creek (ELWDGC)	ELWDGC-MT-01	653182	5521310	08-May-15	09-May-15	15:18	14:32	23.23	0.968	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-02	653177	5521325	08-May-15	09-May-15	15:22	14:34	23.20	0.967	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-03	653150	5521353	08-May-15	09-May-15	15:25	14:42	23.28	0.970	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-04	653174	5521301	08-May-15	09-May-15	15:17	14:15	22.97	0.957	0.70	3	0	0	3.13	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-05	653176	5521314	08-May-15	09-May-15	15:15	14:25	23.17	0.965	0.60	1	0	0	1.04	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-06	653179	5521310	09-May-15	10-May-15	14:23	12:44	22.35	0.931	0.35	1	0	0	1.07	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-07	653174	5521318	09-May-15	10-May-15	14:35	12:52	22.28	0.928	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-08	653176	5521326	09-May-15	10-May-15	14:37	12:55	22.30	0.929	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-09	653170	5521336	09-May-15	10-May-15	14:39	13:00	22.35	0.931	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-10	653151	5521352	09-May-15	10-May-15	14:44	13:04	22.33	0.931	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-11	653171	5521333	10-May-15	11-May-15	12:54	12:01	23.12	0.963	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-12	653164	5521360	10-May-15	11-May-15	13:02	12:02	23.00	0.958	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-13	653176	5521326	10-May-15	11-May-15	12:49	12:05	23.27	0.969	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-14	653177	5521324	10-May-15	11-May-15	12:56	11:59	23.05	0.960	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-15	653134	5521357	10-May-15	11-May-15	13:05	12:04	22.98	0.958	0.30	1	0	1	1.04	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-16	653175	5521315	11-May-15	12-May-15	12:14	17:32	29.30	1.221	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-17	653181	5521302	11-May-15	12-May-15	12:10	17:33	29.38	1.224	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-18	653169	5521329	11-May-15	12-May-15	12:17	17:33	29.27	1.219	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-19	653168	5521315	11-May-15	12-May-15	12:13	17:34	29.35	1.223	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ELWDGC-MT-20	653169	5521297	11-May-15	12-May-15	12:19	17:31	29.20	1.217	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**489.38**	**20.39**		**6**	**0**	**1**	**0.29**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Elk River Upper Ponds (ERUP)	ERUP-MT-01	651691	5530470	08-May-15	09-May-15	13:55	12:55	23.00	0.958	0.50	3	0	0	3.13	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-02	651683	5530458	08-May-15	09-May-15	13:52	13:10	23.30	0.971	0.35	1	0	0	1.03	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-03	651736	5530519	08-May-15	09-May-15	13:59	12:46	22.78	0.949	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-04	651651	5530578	08-May-15	09-May-15	14:11	12:20	22.15	0.923	0.35	1	0	0	1.08	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-05	651616	5530543	08-May-15	09-May-15	14:05	12:35	22.50	0.938	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-06	651718	5530439	08-May-15	09-May-15	13:45	12:05	22.33	0.931	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-07	651716	5530471	08-May-15	09-May-15	13:57	12:53	22.93	0.956	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-08	651714	5530581	08-May-15	09-May-15	14:14	12:14	22.00	0.917	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-09	651703	5530428	09-May-15	10-May-15	13:21	10:58	21.62	0.901	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-10	651729	5530564	09-May-15	10-May-15	12:16	11:28	23.20	0.967	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-11	651695	5530465	09-May-15	10-May-15	13:18	11:52	22.57	0.940	0.30	3	0	0	3.19	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-12	651640	5530583	09-May-15	10-May-15	12:30	11:35	23.08	0.962	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-13	651697	5530583	09-May-15	10-May-15	12:42	11:32	22.83	0.951	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-14	651745	5530483	09-May-15	10-May-15	13:25	11:14	21.82	0.909	0.60	5	0	0	5.50	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-15	651736	5530511	09-May-15	10-May-15	12:48	11:46	22.97	0.957	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-16	651751	5530484	09-May-15	10-May-15	12:08	11:05	22.95	0.956	0.50	2	0	0	2.09	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-17	651727	5530564	10-May-15	11-May-15	11:28	9:57	22.48	0.937	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-18	651658	5530575	10-May-15	11-May-15	11:34	10:04	22.50	0.938	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-19	651624	5530551	10-May-15	11-May-15	11:38	10:11	22.55	0.940	0.30	1	0	0	1.06	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-20	651730	5530498	10-May-15	11-May-15	11:49	10:24	22.58	0.941	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-21	651724	5530544	10-May-15	11-May-15	11:44	10:21	22.62	0.942	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-22	651731	5530457	10-May-15	11-May-15	11:11	9:45	22.57	0.940	0.50	1	0	0	1.06	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-23	651722	5530440	10-May-15	11-May-15	11:00	9:38	22.63	0.943	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-24	651687	5530459	10-May-15	11-May-15	11:58	10:44	22.77	0.949	0.30	2	0	0	2.11	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-25	651697	5530586	11-May-15	12-May-15	10:07	16:17	30.17	1.257	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-26	651636	5530551	11-May-15	12-May-15	10:15	16:20	30.08	1.253	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-27	651761	5530511	11-May-15	12-May-15	9:59	16:10	30.18	1.258	0.50	1	0	0	0.80	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-28	651727	5530462	11-May-15	12-May-15	9:50	16:07	30.28	1.262	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-29	651717	5530442	11-May-15	12-May-15	9:41	16:04	30.38	1.266	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-30	651684	5530456	11-May-15	12-May-15	10:49	16:30	29.68	1.237	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-31	651730	5530442	11-May-15	12-May-15	10:23	16:30	30.12	1.255	1.00	11	0	0	8.77	0	0	0	0	0	0	0	0	0	0	0	0
	ERUP-MT-32	651691	5530467	11-May-15	12-May-15	10:43	16:52	30.15	1.256	0.30	1	0	0	0.80	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**783.8**	**32.66**		**32**	**0**	**0**	**0.98**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

[a] UTM approximated from Google Earth ™

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.12: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, May 2015

Biological Area Code	Station ID	UTM (NAD83, 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
		Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]
Unnamed Wetland near Elk River north of Elkford (REFF)	REFF-MT-01	645818	5556240	08-May-15	09-May-15	10:29	9:35	23.10	0.963	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-02	645890	5556254	08-May-15	09-May-15	10:34	9:33	22.98	0.958	2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-03	645908	5556345	08-May-15	09-May-15	10:38	9:22	22.73	0.947	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-04	645854	5556325	08-May-15	09-May-15	10:43	9:46	23.05	0.960	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-05	645902	5556282	08-May-15	09-May-15	10:45	9:30	22.75	0.948	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-06	645818	5556270	08-May-15	09-May-15	10:49	9:38	22.82	0.951	3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-07	645868	5556288	08-May-15	09-May-15	10:55	9:40	22.75	0.948	5.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-08	645888	5556396	08-May-15	09-May-15	11:00	9:53	22.88	0.953	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-09	645871	5556278	08-May-15	09-May-15	11:04	9:44	22.67	0.944	4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-10	645915	5556377	08-May-15	09-May-15	11:15	9:19	22.07	0.919	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-11	645838	5556348	08-May-15	09-May-15	11:20	9:47	22.45	0.935	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-12	645901	5556358	08-May-15	09-May-15	11:09	9:25	22.27	0.928	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-13	645904	5556314	09-May-15	10-May-15	9:55	9:29	23.57	0.982	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-14	645919	5556378	09-May-15	10-May-15	9:58	9:20	23.37	0.974	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-15	645895	5556328	09-May-15	10-May-15	10:00	9:24	23.40	0.975	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-16	645894	5556310	09-May-15	10-May-15	10:02	9:26	23.40	0.975	3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-17	645895	5556299	09-May-15	10-May-15	10:09	9:30	23.35	0.973	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-18	645891	5556355	09-May-15	10-May-15	10:11	9:22	23.18	0.966	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-19	645852	5556334	09-May-15	10-May-15	10:14	9:42	23.47	0.978	1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-20	645905	5556250	09-May-15	10-May-15	10:17	9:34	23.28	0.970	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-21	645877	5556281	09-May-15	10-May-15	10:19	9:31	23.20	0.967	6.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-22	645913	5556385	09-May-15	10-May-15	10:30	9:19	22.82	0.951	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-23	645807	5556281	09-May-15	10-May-15	10:26	9:37	23.18	0.966	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	REFF-MT-24	645860	5556251	09-May-15	10-May-15	10:23	9:39	23.27	0.969	5.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**552.0**	**23.00**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Stanford Pond	STPD-MT-1	639883	5483097	08-May-15	09-May-15	17:44	17:25	23.68	0.987	0.40	5	0	0	5.07	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-2	639841	5483143	08-May-15	09-May-15	17:52	17:48	23.93	0.997	0.50	2	0	0	2.01	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-3	639840	5483156	08-May-15	09-May-15	17:54	17:50	23.93	0.997	2.00	2	0	0	2.01	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-4	639864	5483163	08-May-15	09-May-15	17:59	17:55	23.93	0.997	0.40	3	0	0	3.01	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-5	639856	5483173	08-May-15	09-May-15	18:02	18:10	24.13	1.006	0.60	3	0	0	2.98	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-6	639851	5483170	08-May-15	09-May-15	18:04	18:12	24.13	1.006	2.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-7	639878	5483106	09-May-15	10-May-15	17:30	15:41	22.18	0.924	0.50	3	0	0	3.25	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-8	639886	5483127	09-May-15	10-May-15	18:25	15:22	20.95	0.873	0.50	7	0	0	8.02	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-9	639843	5483128	09-May-15	10-May-15	18:26	14:19	19.88	0.828	0.40	4	0	0	4.83	0	0	0	2	0	2.41	0	0	0	0	0	0
	STPD-MT-10	639841	5483158	09-May-15	10-May-15	18:28	14:40	20.20	0.842	0.40	5	0	0	5.94	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-11	639886	5483082	09-May-15	10-May-15	18:29	15:10	20.68	0.862	0.40	2	0	0	2.32	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-12	639841	5483183	09-May-15	10-May-15	18:32	14:54	20.37	0.849	0.70	9	0	0	10.61	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-13	639884	5483158	10-May-15	11-May-15	15:18	15:04	23.77	0.990	1.50	5	0	0	5.05	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-14	639849	5483121	10-May-15	11-May-15	15:52	13:35	21.72	0.905	1.50	5	0	0	5.53	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-15	639894	5483080	10-May-15	11-May-15	15:47	14:08	22.35	0.931	2.50	3	0	0	3.22	0	0	0	1	0	1.07	0	0	0	0	0	0
	STPD-MT-16	639869	5483110	10-May-15	11-May-15	14:36	13:59	23.38	0.974	1.10	3	0	0	3.08	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-17	639888	5483145	10-May-15	11-May-15	15:37	14:21	22.73	0.947	2.00	28	0	0	29.56	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-18	639842	5483151	10-May-15	11-May-15	14:50	13:44	22.90	0.954	0.50	3	0	0	3.14	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-19	639890	5483099	11-May-15	12-May-15	14:17	13:49	23.53	0.981	0.70	5	0	0	5.10	0	0	0	1	0	1.02	0	0	0	0	0	0
	STPD-MT-20	639880	5483171	11-May-15	12-May-15	15:16	14:10	22.90	0.954	1.50	12	0	0	12.58	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-21	639839	5483187	11-May-15	12-May-15	15:22	14:29	23.12	0.963	0.40	5	0	0	5.19	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-22	639857	5483117	11-May-15	12-May-15	13:50	13:46	23.93	0.997	2.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-23	639867	5483169	11-May-15	12-May-15	15:20	14:29	23.15	0.965	3.00	7	0	0	7.26	0	0	0	0	0	0	0	0	0	0	0	0
	STPD-MT-24	639885	5483132	11-May-15	12-May-15	14:19	14:05	23.77	0.990	0.50	2	0	0	2.02	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**545.3**	**22.72**		**123**	**0**	**0**	**5.41**	**0**	**0**	**0**	**4**	**0**	**0.18**	**0**	**0**	**0**	**0**	**0**	**0**

[a] UTM approximated from Google Earth ™

[b] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.12: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, May 2015

Biological Area Code	Station ID	UTM (NAD83, 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
		Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]
Otto Ponds	OTTO-MT-01	653027	5513228	12-May-15	13-May-15	10:06	8:50	22.73	0.95	1.50	2	0	0	2.11	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-02	653023	5513260	12-May-15	13-May-15	10:30	9:10	22.67	0.94	1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-03	653093	5513305	12-May-15	13-May-15	10:17	9:12	22.92	0.95	0.40	5	0	0	5.24	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-04	652950	5513182	12-May-15	13-May-15	10:51	10:24	23.55	0.98	1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-05	652981	5513212	12-May-15	13-May-15	10:53	10:04	23.18	0.97	1.00	10	0	0	10.35	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-06	653062	5513218	12-May-15	13-May-15	10:11	8:58	22.78	0.95	0.45	3	0	0	3.16	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-07	652885	5513138	12-May-15	13-May-15	10:46	10:49	24.05	1.00	2.50	1	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-08	652909	5513160	12-May-15	13-May-15	10:48	10:48	24.00	1.00	1.50	2	0	0	2.00	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-09	653107	5513288	12-May-15	13-May-15	10:15	9:07	22.87	0.95	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-10	653055	5513291	12-May-15	13-May-15	10:26	9:24	22.97	0.96	2.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-11	652887	5513139	13-May-15	14-May-15	10:57	9:40	22.72	0.95	1.00	8	0	0	8.45	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-12	652952	5513185	13-May-15	14-May-15	10:25	10:10	23.75	0.99	0.45	1	0	0	1.01	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-13	652979	5513210	13-May-15	14-May-15	10:28	10:17	23.82	0.99	1.00	1	0	0	1.01	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-14	653017	5513242	13-May-15	14-May-15	9:40	10:46	25.10	1.05	0.50	4	0	0	3.82	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-15	653072	5513296	13-May-15	14-May-15	9:35	10:30	24.92	1.04	1.50	1	0	0	0.96	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-16	653008	5513235	13-May-15	14-May-15	9:44	10:25	24.68	1.03	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-17	653092	5513300	13-May-15	14-May-15	9:28	10:36	25.13	1.05	1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-18	652969	5513178	13-May-15	14-May-15	10:32	11:10	24.63	1.03	0.70	1	0	0	0.97	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-19	652883	5513136	13-May-15	14-May-15	9:53	10:00	24.12	1.00	0.40	5	0	0	4.98	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-20	653077	5513300	13-May-15	14-May-15	9:34	10:32	24.97	1.04	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-21	653071	5513300	14-May-15	15-May-15	10:37	10:02	23.42	0.98	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-22	652961	5513176	14-May-15	15-May-15	11:15	9:34	22.32	0.93	0.40	0	1	0	1.08	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-23	653122	5513240	14-May-15	15-May-15	11:00	9:53	22.88	0.95	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-24	653018	5513243	14-May-15	15-May-15	10:54	10:10	23.27	0.97	0.45	9	0	0	9.28	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-25	653106	5513279	14-May-15	15-May-15	10:40	9:55	23.25	0.97	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-26	653074	5513300	14-May-15	15-May-15	10:41	10:03	23.37	0.97	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-27	652963	5513193	14-May-15	15-May-15	10:16	9:38	23.37	0.97	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-28	652980	5513208	14-May-15	15-May-15	10:21	9:39	23.30	0.97	0.45	2	1	0	3.09	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-29	652910	5513154	14-May-15	15-May-15	10:07	9:27	23.33	0.97	0.80	1	1	0	2.06	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-30	653029	5513264	14-May-15	15-May-15	11:18	10:06	22.80	0.95	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-31	653014	5513240	15-May-15	16-May-15	10:24	10:18	23.90	1.00	1.50	4	0	0	4.02	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-32	652970	5513179	15-May-15	16-May-15	9:47	10:11	24.40	1.02	0.60	2	0	0	1.97	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-33	652934	5513172	15-May-15	16-May-15	9:33	10:05	24.53	1.02	0.50	3	0	0	2.93	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-34	653098	5513299	15-May-15	16-May-15	9:59	10:46	24.78	1.03	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-35	652915	5513179	15-May-15	16-May-15	10:28	9:56	23.47	0.98	1.00	6	0	0	6.14	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-36	653036	5513223	15-May-15	16-May-15	9:50	10:15	24.42	1.02	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-37	653042	5513272	15-May-15	16-May-15	10:07	10:26	24.32	1.01	0.60	10	0	0	9.87	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-38	653105	5513283	15-May-15	16-May-15	9:56	10:47	24.85	1.04	0.30	2	0	0	1.93	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-39	653073	5513298	15-May-15	16-May-15	10:04	10:43	24.65	1.03	0.40	2	0	0	1.95	0	0	0	0	0	0	0	0	0	0	0	0
	OTTO-MT-40	653028	5513264	15-May-15	16-May-15	10:09	10:24	24.25	1.01	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**950.42**	**39.60**		**85**	**3**	**0**	**2.15**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
MI16, Michel Wetland	MI16-MT-01	665105	5489432	12-May-15	13-May-15	18:32	12:38	18.10	0.75	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-02	665114	5489431	12-May-15	13-May-15	18:33	12:39	18.10	0.75	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-03	665080	5489387	12-May-15	13-May-15	18:35	12:50	18.25	0.76	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-04	665025	5489365	12-May-15	13-May-15	18:41	12:48	18.12	0.75	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-05	665008	5489380	12-May-15	13-May-15	18:44	12:49	18.08	0.75	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-06	665019	5489397	12-May-15	13-May-15	18:46	12:51	18.08	0.75	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-07	665064	5489433	13-May-15	14-May-15	12:44	16:38	27.90	1.16	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-08	665059	5489423	13-May-15	14-May-15	12:46	16:42	27.93	1.16	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-09	665075	5489411	13-May-15	14-May-15	13:05	16:44	27.65	1.15	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-10	665089	5489406	13-May-15	14-May-15	13:06	16:34	27.47	1.14	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-11	665087	5489389	13-May-15	14-May-15	12:51	16:25	27.57	1.15	0.25	0	0	0	0	1	0	0.87	0	0	0	0	0	0	0	0	0
	MI16-MT-12	665011	5489381	13-May-15	14-May-15	12:57	16:22	27.42	1.14	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-13	665025	5489403	14-May-15	15-May-15	16:23	14:30	22.12	0.92	0.40	0	0	0	0	1	0	1.09	0	0	0	0	0	0	0	0	0
	MI16-MT-14	665070	5489376	14-May-15	15-May-15	16:32	14:31	21.98	0.92	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-15	665077	5489391	14-May-15	15-May-15	16:35	14:33	21.97	0.92	1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-16	665109	5489417	14-May-15	15-May-15	16:44	14:36	21.87	0.91	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-17	665091	5489451	14-May-15	15-May-15	16:49	14:38	21.82	0.91	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MI16-MT-18	665076	5489434	14-May-15	15-May-15	16:46	14:39	21.88	0.91	0.25	0	0	0	0	2	0	2.19	0	0	0	0	0	0	0	0	0
	TOTAL							**406.30**	**16.93**		**0**	**0**	**0**	**0**	**4**	**0**	**0.24**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

[a] UTM approximated from Google Earth ™

[b] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.12: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, May 2015

Biological Area Code	Station ID	UTM (NAD83, 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
		Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]
MIWW	MIWW-MT-01	659710	5498477	12-May-15	13-May-15	16:39	9:27	16.80	0.70	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-02	659702	5498448	12-May-15	13-May-15	16:48	9:52	17.07	0.71	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-03	659678	5498465	12-May-15	13-May-15	16:51	9:48	16.95	0.71	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-04	659702	5498466	12-May-15	13-May-15	16:45	9:43	16.97	0.71	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-05	659710	5498538	12-May-15	13-May-15	16:59	9:38	16.65	0.69	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-06	659694	5498514	12-May-15	13-May-15	17:10	9:59	16.82	0.70	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-07	659696	5498545	12-May-15	13-May-15	17:05	10:04	16.98	0.71	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-08	659715	5498492	13-May-15	14-May-15	9:34	14:48	29.23	1.22	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-09	659705	5498492	13-May-15	14-May-15	9:41	14:46	29.08	1.21	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-10	659705	5498475	13-May-15	14-May-15	9:45	14:46	29.02	1.21	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-11	659698	5498444	13-May-15	14-May-15	9:49	14:41	28.87	1.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-12	659695	5498512	13-May-15	14-May-15	9:54	14:22	28.47	1.19	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-13	659704	5498518	13-May-15	14-May-15	10:02	14:19	28.28	1.18	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-14	659691	5498532	13-May-15	14-May-15	10:04	14:11	28.12	1.17	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-15	659698	5498516	14-May-15	15-May-15	14:21	13:38	23.28	0.97	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-16	659687	5498497	14-May-15	15-May-15	14:27	13:34	23.12	0.96	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-17	659683	5498480	14-May-15	15-May-15	14:30	13:30	23.00	0.96	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-18	659712	5498462	14-May-15	15-May-15	14:43	13:14	22.52	0.94	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-19	659705	5498485	14-May-15	15-May-15	14:54	13:17	22.38	0.93	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-20	659715	5498510	14-May-15	15-May-15	14:58	13:15	22.28	0.93	0.40	0	0	0	0	1	0	1.08	0	0	0	0	0	0	0	0	0
	MIWW-MT-21	659707	5498501	14-May-15	15-May-15	14:56	13:16	22.33	0.93	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-22	659707	5498501	15-May-15	16-May-15	13:15	9:58	20.72	0.86	0.25	1	0	0	1.16	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-23	659705	5498492	15-May-15	16-May-15	13:18	10:00	20.70	0.86	0.25	1	0	0	1.16	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-24	659703	5498479	15-May-15	16-May-15	13:19	9:59	20.67	0.86	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-25	659700	5498448	15-May-15	16-May-15	13:26	10:04	20.63	0.86	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-26	659684	5498481	15-May-15	16-May-15	13:31	10:08	20.62	0.86	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-27	659694	5498498	15-May-15	16-May-15	13:35	10:09	20.57	0.86	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIWW-MT-28	659711	5498535	15-May-15	16-May-15	13:40	10:15	20.58	0.86	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**622.70**	**26**		**2**	**0**	**0**	**0.003**	**1**	**0**	**0.04**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Michael Oxbow 2	MIC2-MT-01	659525	5496600	12-May-15	13-May-15	17:45	11:12	17.45	0.73	0.30	0	0	0	0	1	0	1.38	0	0	0	0	0	0	0	0	0
	MIC2-MT-02	659538	5496592	12-May-15	13-May-15	17:48	11:08	17.33	0.72	0.30	2	0	0	2.77	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-03	659527	5496557	12-May-15	13-May-15	17:49	11:00	17.18	0.72	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-04	659527	5496553	12-May-15	13-May-15	17:55	11:00	17.08	0.71	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-05	659532	5496541	12-May-15	13-May-15	17:52	10:54	17.03	0.71	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-06	659540	5496536	13-May-15	14-May-15	10:55	15:37	28.70	1.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-07	659527	5496553	13-May-15	14-May-15	11:02	15:40	28.63	1.19	0.30	0	0	0	0	0	0	0	1	0	0.84	0	0	0	0	0	0
	MIC2-MT-08	659528	5496550	13-May-15	14-May-15	11:04	15:45	28.68	1.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-09	659530	5496631	13-May-15	14-May-15	11:18	15:09	27.85	1.16	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-10	659536	5496629	13-May-15	14-May-15	11:18	15:11	27.88	1.16	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-11	659532	5496634	14-May-15	15-May-15	15:19	14:03	22.73	0.95	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-12	659537	5496634	14-May-15	15-May-15	15:20	14:05	22.75	0.95	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-13	659536	5496572	14-May-15	15-May-15	15:50	14:16	22.43	0.93	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-14	659550	5496557	14-May-15	15-May-15	15:44	14:15	22.52	0.94	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-15	659538	5496542	14-May-15	15-May-15	15:39	14:13	22.57	0.94	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-16	659534	5496631	15-May-15	16-May-15	14:05	10:30	20.42	0.85	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-17	659530	5496611	15-May-15	16-May-15	14:07	10:31	20.40	0.85	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-18	659529	5496572	15-May-15	16-May-15	14:13	10:33	20.33	0.85	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-19	659551	5496565	15-May-15	16-May-15	14:15	10:38	20.38	0.85	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIC2-MT-20	659530	5496544	15-May-15	16-May-15	14:14	10:39	20.42	0.85	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**442.78**	**18.45**		**2**	**0**	**0**	**0.11**	**1**	**0**	**0.05**	**1**	**0**	**0.05**	**0**	**0**	**0**	**0**	**0**	**0**

[a] UTM approximated from Google Earth ™

[b] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.12: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, May 2015

Biological Area Code	Station ID	UTM (NAD83, 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
		Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]
Elk River Lower Oxbow	EROL-MT-01	640916	5477986	08-May-15	09-May-15	16:11	14:57	22.77	0.95	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-02	640877	5478041	08-May-15	09-May-15	16:17	15:03	22.77	0.95	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-03	640847	5478072	08-May-15	09-May-15	16:23	15:07	22.73	0.947	7.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-04	640825	5478137	08-May-15	09-May-15	16:28	15:09	22.68	0.945	2.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-05	640820	5478129	08-May-15	09-May-15	16:34	15:12	22.63	0.94	0.50	0	0	0	0	0	0	0	3	0	3.18	0	0	0	0	0	0
	EROL-MT-06	640810	5478150	08-May-15	09-May-15	16:37	15:13	22.60	0.94	0.60	1	0	0	1.06	0	0	0	1	0	1.06	0	0	0	0	0	0
	EROL-MT-07	640825	5478174	08-May-15	09-May-15	16:41	15:15	22.57	0.940	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-08	640784	5478238	08-May-15	09-May-15	16:46	15:18	22.53	0.939	1.00	1	0	0	1.07	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-09	640782	5478287	08-May-15	09-May-15	16:48	15:21	22.55	0.94	0.60	1	0	0	1.06	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-10	640777	5478279	08-May-15	09-May-15	16:51	15:22	22.52	0.94	0.50	2	0	0	2.13	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-11	640775	5478255	09-May-15	10-May-15	16:15	12:53	20.63	0.500	0.40	1	0	0	2.00	0	0	0	2	0	4.00	0	0	0	0	0	0
	EROL-MT-12	640813	5478181	09-May-15	10-May-15	16:17	14:00	21.72	0.905	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-13	640820	5478140	09-May-15	10-May-15	16:20	14:02	21.70	0.90	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-14	640828	5478150	09-May-15	10-May-15	16:22	14:01	21.65	0.90	0.40	0	0	0	0	0	0	0	1	0	1.11	0	0	0	0	0	0
	EROL-MT-15	640832	5478135	09-May-15	10-May-15	16:25	14:03	21.63	0.901	0.50	0	0	0	0	0	0	0	2	0	2.22	0	0	0	0	0	0
	EROL-MT-16	640845	5478104	09-May-15	10-May-15	16:26	14:06	21.67	0.903	0.50	0	0	0	0	0	0	0	1	0	1.11	0	0	0	0	0	0
	EROL-MT-17	640847	5478082	09-May-15	10-May-15	16:28	14:07	21.65	0.90	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-18	640867	5478064	09-May-15	10-May-15	16:30	14:08	21.63	0.90	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-19	640880	5478033	09-May-15	10-May-15	16:33	14:10	21.62	0.901	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-20	640904	5477975	09-May-15	10-May-15	16:36	14:12	21.60	0.900	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-21	640782	5478248	10-May-15	11-May-15	14:51	14:30	23.65	0.99	0.60	1	0	0	1.01	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-22	640797	5478250	10-May-15	11-May-15	14:53	14:34	23.68	0.99	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-23	640806	5478220	10-May-15	11-May-15	14:55	14:36	23.68	0.987	0.40	1	0	0	1.01	0	0	0	2	0	2.03	0	0	0	0	0	0
	EROL-MT-24	640810	5478163	10-May-15	11-May-15	14:58	14:38	23.67	0.986	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-25	640830	5478146	10-May-15	11-May-15	14:59	14:40	23.68	0.99	0.40	0	0	0	0	0	0	0	1	0	1.01	0	0	0	0	0	0
	EROL-MT-26	640824	5478131	10-May-15	11-May-15	15:00	14:42	23.70	0.99	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-27	640843	5478091	10-May-15	11-May-15	15:01	14:43	23.70	0.987	2.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-28	640845	5478091	10-May-15	11-May-15	15:03	14:50	23.78	0.991	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-29	640879	5478031	10-May-15	11-May-15	15:08	14:47	23.65	0.99	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-30	640873	5478015	10-May-15	11-May-15	15:06	14:48	23.70	0.988	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-31	640865	5478019	11-May-15	12-May-15	14:50	14:13	23.38	0.974	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-32	640856	5478037	11-May-15	12-May-15	14:55	14:11	23.27	0.969	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-33	640853	5478051	11-May-15	12-May-15	15:01	14:09	23.13	0.964	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-34	640820	5478117	11-May-15	12-May-15	15:07	14:04	22.95	0.956	-	0	0	0	0	0	0	0	3	0	3.14	0	0	0	1	0	1.05
	EROL-MT-35	640812	5478148	11-May-15	12-May-15	15:10	14:00	22.83	0.951	0.50	0	0	0	0	0	0	0	3	0	3.15	0	0	0	0	0	0
	EROL-MT-36	640806	5478172	11-May-15	12-May-15	15:16	13:58	22.70	0.946	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-37	640815	5478178	11-May-15	12-May-15	15:19	13:57	22.63	0.943	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-38	640788	5478221	11-May-15	12-May-15	15:23	13:56	22.55	0.940	0.30	0	0	0	0	0	0	0	1	0	1.06	0	0	0	0	0	0
	EROL-MT-39	640787	5478239	11-May-15	12-May-15	15:25	13:53	22.47	0.936	2.00	1	0	1	1.07	0	0	0	0	0	0	0	0	0	0	0	0
	EROL-MT-40	640776	5478282	11-May-15	12-May-15	15:27	13:50	22.38	0.933	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**907.05**	**37.43**		**9**	**0**	**1**	**0.24**	**0**	**0**	**0**	**20**	**0**	**0.541**	**0**	**0**	**0**	**1**	**0**	**0.027**

[a] UTM approximated from Google Earth ™

[b] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.12: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, May 2015

Biological Area Code	Station ID	UTM (NAD83, 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
		Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]	Catch	Moralities /Sacrificed	CPUE[b]
Flathead Side Channel	FLA1-MT-01	681749	5443529	08-May-15	09-May-15	13:15	10:50	21.58	0.899	1.00	10	0	0	11.12	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-02	681755	5443556	08-May-15	09-May-15	13:24	12:20	22.93	0.956	1.50	26	0	0	27.21	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-03	681778	5443561	08-May-15	09-May-15	13:26	12:28	23.03	0.960	0.4	1	0	0	1.04	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-04	681839	5443636	08-May-15	09-May-15	13:34	12:30	22.93	0.956	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-05	681858	5443690	08-May-15	09-May-15	13:40	12:32	22.87	0.953	0.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-06	681865	5443710	08-May-15	09-May-15	13:44	12:34	22.83	0.951	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-07	681800	5443586	09-May-15	10-May-15	12:54	11:03	22.15	0.923	0.60	2	0	0	2.17	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-08	681817	5443611	09-May-15	10-May-15	12:57	11:01	22.07	0.919	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-09	681812	5443619	09-May-15	10-May-15	12:59	11:05	22.10	0.921	0.3	19	2	0	22.81	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-10	681842	5443642	09-May-15	10-May-15	13:01	10:59	21.97	0.915	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-11	681862	5443697	09-May-15	10-May-15	13:05	10:57	21.87	0.911	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-12	681875	5443714	09-May-15	10-May-15	13:08	10:55	21.78	0.908	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-13	681847	5443675	10-May-15	11-May-15	12:06	11:19	23.22	0.967	0.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-14	681838	5443630	10-May-15	11-May-15	12:09	11:21	23.20	0.967	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-15	681816	5443622	10-May-15	11-May-15	12:11	11:22	23.18	0.966	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-16	681786	5443585	10-May-15	11-May-15	12:14	11:24	23.17	0.965	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-17	681771	5443562	10-May-15	11-May-15	12:15	11:26	23.18	0.966	0.50	1	0	0	1.04	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-18	681762	5443572	10-May-15	11-May-15	12:17	11:27	23.17	0.965	0.30	4	0	0	4.14	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-19	681763	5443532	11-May-15	12-May-15	11:32	10:21	22.82	0.951	0.50	3	2	5	5.26	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-20	681788	5443588	11-May-15	12-May-15	11:36	10:20	22.73	0.947	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-21	681818	5443616	11-May-15	12-May-15	11:37	10:18	22.68	0.945	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-22	681810	5443622	11-May-15	12-May-15	11:39	10:17	22.63	0.943	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-23	681842	5443644	11-May-15	12-May-15	11:41	10:15	22.57	0.940	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FLA1-MT-24	681861	5443690	11-May-15	12-May-15	11:44	10:14	22.50	0.938	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL							**543.17**	**22.63**		**66**	**4**	**5**	**3.09**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

[a] UTM approximated from Google Earth ™

[b] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.13: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, September 2015

Biological Area Code	Area	Station ID	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
			Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]
GO13	K	GO13-MT-01	653000	5514072	14-Sep-15	15-Sep-15	11:45	14:38	26.88	1.120	0.40	47	0	0	41.96	0	0	0	0	0	0	3	0	2.68	0	0	0
	E	GO13-MT-02	653097	5514058	14-Sep-15	15-Sep-15	11:42	14:30	26.80	1.117	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.90
	R	GO13-MT-03	652938	5514088	14-Sep-15	15-Sep-15	11:47	13:21	25.57	1.065	0.60	32	0	0	30.04	0	0	0	0	0	0	0	0	0	1	0	0.94
	N	GO13-MT-04	652975	5514037	14-Sep-15	15-Sep-15	12:05	12:28	24.38	1.016	0.35	14	0	0	13.78	0	0	0	0	0	0	0	0	0	0	0	0
	C	GO13-MT-05	653124	5514069	14-Sep-15	15-Sep-15	12:16	14:35	26.32	1.097	0.30	0	0	0	0	0	0	0	0	0	0	2	0	1.82	0	0	0
	T	GO13-MT-06	652933	5514068	14-Sep-15	15-Sep-15	12:11	12:09	23.97	0.999	0.40	24	0	0	24.03	0	0	0	0	0	0	0	0	0	0	0	0
	Q	GO13-MT-07	652962	5514087	14-Sep-15	15-Sep-15	11:59	13:20	25.35	1.056	0.60	16	0	0	15.15	0	0	0	1	0	0.95	0	0	0	0	0	0
	O	GO13-MT-08	652977	5514054	14-Sep-15	15-Sep-15	12:02	12:44	24.70	1.029	0.60	3	0	0	2.91	0	0	0	0	0	0	0	0	0	0	0	0
	K	GO13-MT-09	653000	5514072	15-Sep-15	16-Sep-15	14:30	10:47	20.28	0.845	0.40	3	0	0	3.55	0	0	0	0	0	0	0	0	0	0	0	0
	I	GO13-MT-10	653031	5514068	15-Sep-15	16-Sep-15	14:35	10:54	20.32	0.847	0.30	1	0	0	1.18	0	0	0	0	0	0	0	0	0	0	0	0
	E	GO13-MT-11	653097	5514058	15-Sep-15	16-Sep-15	14:33	11:05	20.53	0.856	0.40	1	0	0	1.17	0	0	0	0	0	0	1	0	1.17	1	0	1.17
	N	GO13-MT-12	652975	5514037	15-Sep-15	16-Sep-15	12:41	10:22	21.68	0.903	0.50	3	1	0	4.43	0	0	0	0	0	0	0	0	0	0	0	0
	G	GO13-MT-13	653058	5514067	15-Sep-15	16-Sep-15	14:30	10:58	20.47	0.853	0.60	5	0	0	5.86	0	0	0	0	0	0	2	0	2.35	0	0	0
	S	GO13-MT-14	652938	5514069	15-Sep-15	16-Sep-15	12:24	10:06	21.70	0.904	0.40	5	0	0	5.53	0	0	0	0	0	0	0	0	0	1	0	1.11
	R	GO13-MT-15	652938	5514088	15-Sep-15	16-Sep-15	13:40	10:30	20.83	0.868	0.60	10	0	0	11.52	0	0	0	1	0	1.15	0	0	0	1	0	1.15
	C	GO13-MT-16	653124	5514069	15-Sep-15	16-Sep-15	14:40	11:11	20.52	0.855	0.30	5	0	0	5.85	0	0	0	0	0	0	0	0	0	0	0	0
	N	GO13-MT-17	652975	5514037	16-Sep-15	17-Sep-15	10:29	11:09	24.67	1.028	0.45	6	0	0	5.84	0	0	0	0	0	0	0	0	0	0	0	0
	L	GO13-MT-18	653049	5514015	16-Sep-15	17-Sep-15	10:20	11:15	24.92	1.038	0.20	2	0	0	1.93	0	0	0	0	0	0	0	0	0	0	0	0
	K	GO13-MT-19	653000	5514072	16-Sep-15	17-Sep-15	10:52	10:37	23.75	0.990	0.30	36	1	0	37.39	0	0	0	0	0	0	0	0	0	0	0	0
	G	GO13-MT-20	653058	5514067	16-Sep-15	17-Sep-15	11:00	10:31	23.52	0.980	0.30	2	0	0	2.04	0	0	0	0	0	0	0	0	0	1	0	1.02
	A	GO13-MT-21	653141	5514120	16-Sep-15	17-Sep-15	11:18	10:19	23.02	0.959	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	E	GO13-MT-22	653097	5514058	16-Sep-15	17-Sep-15	11:07	10:28	23.35	0.973	0.60	0	0	0	0	0	0	0	0	0	0	1	0	1.03	0	0	0
	Q	GO13-MT-23	652962	5514087	16-Sep-15	17-Sep-15	10:45	11:02	24.28	1.012	0.70	3	0	0	2.96	0	0	0	0	0	0	0	0	0	0	0	0
	B	GO13-MT-24	653134	5514093	16-Sep-15	17-Sep-15	11:22	10:21	22.98	0.958	0.30	3	0	0	3.13	0	0	0	0	0	0	3	0	3	0	0	0.00
	N	GO13-MT-25	652975	5514037	17-Sep-15	18-Sep-15	11:13	10:25	23.20	0.967	0.40	4	0	0	4.14	0	0	0	0	0	0	1	0	1	0	0	0.00
	L	GO13-MT-26	653049	5514015	17-Sep-15	18-Sep-15	11:19	10:22	23.05	0.960	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	K	GO13-MT-27	653000	5514072	17-Sep-15	18-Sep-15	10:58	10:39	23.68	0.987	0.35	2	1	0	3.04	0	0	0	0	0	0	0	0	0	0	0	0
	G	GO13-MT-28	653058	5514067	17-Sep-15	18-Sep-15	10:35	10:49	24.23	1.010	0.40	9	0	0	8.91	0	0	0	0	0	0	4	0	3.96	2	0	1.98
	P	GO13-MT-29	652963	5514074	17-Sep-15	18-Sep-15	11:01	10:32	23.52	0.980	0.30	4	0	0	4.08	0	0	0	0	0	0	0	0	0	0	0	0
	O	GO13-MT-30	652977	5514054	17-Sep-15	18-Sep-15	11:03	10:28	23.42	0.976	0.30	3	0	0	3.07	0	0	0	0	0	0	0	0	0	0	0	0
	Q	GO13-MT-31	652962	5514087	17-Sep-15	18-Sep-15	11:07	10:33	23.43	0.976	0.40	0	0	0	0	0	0	0	0	0	0	2	0	2.05	0	0	0
	B	GO13-MT-32	653134	5514093	17-Sep-15	18-Sep-15	10:26	10:47	24.35	1.015	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL								**749.67**	**31.24**		**243**	**3**	**0**	**7.88**	**0**	**0**	**0**	**2**	**0**	**0.06**	**19**	**0**	**0.61**	**8**	**0**	**0.26**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.13: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, September 2015

Biological Area Code	Area	Station ID	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
			Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]
Elk River Upper Ponds (ERUP)	M	ERUP-MT-01	651704	5530471	14-Sep-15	15-Sep-15	14:24	17:05	26.68	1.112	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	I	ERUP-MT-02	651752	5530511	14-Sep-15	15-Sep-15	14:03	16:31	26.47	1.103	0.60	30	0	0	27.20	0	0	0	0	0	0	0	0	0	0	0	0
	O	ERUP-MT-03	651684	5530457	14-Sep-15	15-Sep-15	14:24	17:06	26.70	1.113	0.30	1	0	0	0.90	0	0	0	0	0	0	0	0	0	0	0	0
	N	ERUP-MT-04	651705	5530448	14-Sep-15	15-Sep-15	13:56	15:51	25.92	1.080	0.35	1	0	0	0.93	0	0	0	0	0	0	0	0	0	0	0	0
	L	ERUP-MT-05	651725	5530455	14-Sep-15	15-Sep-15	14:00	15:59	25.98	1.083	0.60	1	0	0	0.92	0	0	0	0	0	0	0	0	0	0	0	0
	K	ERUP-MT-06	651741	5530479	14-Sep-15	15-Sep-15	13:59	16:05	26.10	1.088	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	B	ERUP-MT-07	651647	5530559	14-Sep-15	15-Sep-15	14:14	16:51	26.62	1.109	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	ERUP-MT-08	651682	5530582	14-Sep-15	15-Sep-15	14:09	16:45	26.60	1.108	0.30	1	0	0	0.90	0	0	0	0	0	0	0	0	0	0	0	0
	J	ERUP-MT-09	651725	5530476	15-Sep-15	16-Sep-15	17:12	13:22	20.17	0.840	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	O	ERUP-MT-10	651684	5530454	15-Sep-15	16-Sep-15	17:05	13:15	20.17	0.840	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	L	ERUP-MT-11	651724	5530456	15-Sep-15	16-Sep-15	16:02	13:04	21.03	0.876	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M	ERUP-MT-12	651704	5530469	15-Sep-15	16-Sep-15	17:07	13:07	20.00	0.833	0.60	1	0	0	1.20	0	0	0	0	0	0	0	0	0	0	0	0
	I	ERUP-MT-13	651751	5530513	15-Sep-15	16-Sep-15	16:34	13:04	20.50	0.854	1.00	1	0	0	1.17	0	0	0	0	0	0	0	0	0	0	0	0
	F	ERUP-MT-14	651725	5530547	15-Sep-15	16-Sep-15	16:59	13:27	20.47	0.853	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H	ERUP-MT-15	651741	5530513	15-Sep-15	16-Sep-15	17:02	14:15	21.22	0.884	0.30	1	0	0	1.13	0	0	0	0	0	0	0	0	0	0	0	0
	A	ERUP-MT-16	651617	5530541	15-Sep-15	16-Sep-15	16:57	13:56	20.98	0.874	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1.14
	K	ERUP-MT-17	651741	5530479	16-Sep-15	17-Sep-15	14:19	14:16	23.95	0.998	0.30	1	1	0	2.00	0	0	0	0	0	0	0	0	0	0	0	0
	H	ERUP-MT-18	651741	5530513	16-Sep-15	17-Sep-15	13:48	14:50	25.03	1.043	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	I	ERUP-MT-19	651752	5530511	16-Sep-15	17-Sep-15	14:00	14:20	24.33	1.014	0.60	1	1	0	1.97	0	0	0	0	0	0	0	0	0	0	0	0
	C	ERUP-MT-20	651682	5530582	16-Sep-15	17-Sep-15	14:03	14:34	24.52	1.022	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	B	ERUP-MT-21	651647	5530559	16-Sep-15	17-Sep-15	13:59	14:35	24.60	1.025	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M	ERUP-MT-22	651704	5530469	16-Sep-15	17-Sep-15	14:57	14:20	23.38	0.974	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	G	ERUP-MT-23	651737	5530548	16-Sep-15	17-Sep-15	14:09	14:25	24.27	1.011	0.30	2	0	0	1.98	0	0	0	0	0	0	0	0	0	0	0	0
	P	ERUP-MT-24	651685	5530434	16-Sep-15	17-Sep-15	13:11	15:02	25.85	1.077	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	E	ERUP-MT-25	651715	5530570	17-Sep-15	18-Sep-15	14:30	12:30	22.00	0.917	0.30	1	0	0	1.09	0	0	0	0	0	0	0	0	0	0	0	0
	B	ERUP-MT-26	651647	5530559	17-Sep-15	18-Sep-15	14:36	12:37	22.02	0.917	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A	ERUP-MT-27	651617	5530541	17-Sep-15	18-Sep-15	14:41	12:42	22.02	0.917	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	F	ERUP-MT-28	651725	5530547	17-Sep-15	18-Sep-15	14:49	12:52	22.05	0.919	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H	ERUP-MT-29	651741	5530513	17-Sep-15	18-Sep-15	14:52	12:54	22.03	0.918	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	J	ERUP-MT-30	651725	5530476	17-Sep-15	18-Sep-15	14:56	13:20	22.40	0.933	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M	ERUP-MT-31	651704	5530469	17-Sep-15	18-Sep-15	14:59	13:00	22.02	0.917	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	N	ERUP-MT-32	651705	5530448	17-Sep-15	18-Sep-15	15:04	12:26	21.37	0.890	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL								**747.4**	**31.14**		**42**	**2**	**0**	**1.35**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0.03**
Stanford Pond	I	STPD-MT-01	639885	5483128	14-Sep-15	15-Sep-15	8:17	18:49	34.53	1.439	1.00	5	0	0	3.47	0	0	0	0	0	0	0	0	0	0	0	0
	C	STPD-MT-02	639867	5483171	14-Sep-15	15-Sep-15	8:20	18:20	34.00	1.417	1.00	17	0	0	12.00	0	0	0	0	0	0	0	0	0	0	0	0
	H	STPD-MT-03	639851	5483127	14-Sep-15	15-Sep-15	8:15	18:07	33.87	1.411	1.50	60	0	0	42.52	0	0	0	0	0	0	0	0	0	0	0	0
	A	STPD-MT-04	639841	5483186	14-Sep-15	15-Sep-15	8:24	19:00	34.60	1.442	0.40	63	0	0	43.70	0	0	0	0	0	0	0	0	0	0	0	0
	E	STPD-MT-05	639880	5483157	14-Sep-15	15-Sep-15	8:19	18:56	34.62	1.442	1.50	48	0	0	33.28	0	0	0	0	0	0	0	0	0	0	0	0
	K	STPD-MT-06	639880	5483095	14-Sep-15	15-Sep-15	8:18	18:36	34.30	1.429	1.00	23	0	0	16.09	0	0	0	0	0	0	0	0	0	0	0	0
	D	STPD-MT-07	639843	5483157	15-Sep-15	16-Sep-15	19:56	16:00	20.07	0.836	0.50	11	0	0	13.16	0	0	0	0	0	0	0	0	0	0	0	0
	J	STPD-MT-08	639871	5483111	15-Sep-15	16-Sep-15	18:35	16:57	22.37	0.932	1.00	15	3	0	19.31	0	0	0	0	0	0	0	0	0	0	0	0
	H	STPD-MT-09	639851	5483127	15-Sep-15	16-Sep-15	18:36	16:24	21.80	0.908	1.00	5	0	0	5.50	0	0	0	0	0	0	0	0	0	0	0	0
	L	STPD-MT-10	639882	5483084	15-Sep-15	16-Sep-15	18:50	16:40	21.83	0.910	1.00	10	0	0	10.99	0	0	0	0	0	0	0	0	0	0	0	0
	F	STPD-MT-11	639843	5483142	15-Sep-15	16-Sep-15	19:55	16:15	20.33	0.847	0.30	7	0	0	8.26	0	0	0	0	0	0	0	0	0	0	0	0
	G	STPD-MT-12	639887	5483142	15-Sep-15	16-Sep-15	19:15	16:50	21.58	0.899	0.30	1	0	0	1.11	0	0	0	0	0	0	0	0	0	0	0	0
	D	STPD-MT-13	639843	5483157	16-Sep-15	17-Sep-15	16:15	16:08	23.88	0.995	0.30	32	2	0	34.17	0	0	0	0	0	0	1	0	1.00	0	0	0
	A	STPD-MT-14	639841	5483186	16-Sep-15	17-Sep-15	17:16	16:15	22.98	0.958	0.70	19	1	0	20.88	0	0	0	0	0	0	0	0	0	0	0	0
	J	STPD-MT-15	639871	5483111	16-Sep-15	17-Sep-15	17:18	16:46	23.47	0.978	0.30	5	1	0	6.14	0	0	0	1	0	1.02	0	0	0	0	0	0
	H	STPD-MT-16	639851	5483127	16-Sep-15	17-Sep-15	16:22	16:37	24.25	1.010	1.00	8	1	0	8.91	0	0	0	0	0	0	0	0	0	0	0	0
	K	STPD-MT-17	639880	5483095	16-Sep-15	17-Sep-15	16:52	16:59	24.12	1.005	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	STPD-MT-18	639867	5483171	16-Sep-15	17-Sep-15	17:16	17:02	23.77	0.990	1.00	15	7	0	22.22	0	0	0	0	0	0	0	0	0	0	0	0
	D	STPD-MT-19	639843	5483157	17-Sep-15	18-Sep-15	16:35	16:20	23.75	0.990	0.30	3	0	0	3.03	0	0	0	0	0	0	0	0	0	0	0	0
	F	STPD-MT-20	639843	5483142	17-Sep-15	18-Sep-15	16:46	16:25	23.65	0.985	0.30	5	1	0	6.09	0	0	0	0	0	0	0	0	0	0	0	0
	K	STPD-MT-21	639880	5483095	17-Sep-15	18-Sep-15	16:58	16:33	23.58	0.983	1.20	7	0	0	7.12	0	0	0	0	0	0	0	0	0	0	0	0
	E	STPD-MT-22	639880	5483157	17-Sep-15	18-Sep-15	17:01	15:55	22.90	0.954	0.40	6	0	0	6.29	0	0	0	0	0	0	0	0	0	0	0	0
	C	STPD-MT-23	639867	5483171	17-Sep-15	18-Sep-15	17:24	15:58	22.57	0.940	0.40	5	1	0	6.38	0	0	0	0	0	0	0	0	0	0	0	0
	B	STPD-MT-24	639841	5483172	17-Sep-15	18-Sep-15	17:37	16:01	22.40	0.933	1.00	25	1	0	27.86	0	0	0	1	0	1.07	0	0	0	0	0	0
	TOTAL								**615.2**	**25.63**		**395**	**18**	**0**	**15.41**	**0**	**0**	**0**	**2**	**0**	**0.08**	**1**	**0**	**0.04**	**0**	**0**	**0**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.13: Minnow Trap Records for Fish Collected for the RAEMP in Elk Valley, September 2015

Biological Area Code	Area	Station ID	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (Fishing days)	Set Depth (m)	Longnose Sucker				Cutthroat Trout			Redside Shiner			Mountain Whitefish			Longnose Dace		
			Easting	Northing								New Catch	Recaptured	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]	Catch	Moralities /Sacrificed	CPUE[a]
Otto Ponds	I	OTTO-MT-01	653032	5513256	14-Sep-15	15-Sep-15	11:12	9:55	22.72	0.95	1.00	23	0	0	24.30	0	0	0	0	0	0	0	0	0	0	0	0
	C	OTTO-MT-02	653071	5513299	14-Sep-15	15-Sep-15	11:17	9:20	22.05	0.92	0.40	3	0	0	3.27	0	0	0	0	0	0	0	0	0	0	0	0
	P	OTTO-MT-03	652944	5513182	14-Sep-15	15-Sep-15	10:55	11:19	24.40	1.02	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	G	OTTO-MT-04	653049	5513273	14-Sep-15	15-Sep-15	11:15	9:44	22.48	0.94	0.30	2	0	0	2.13	0	0	0	0	0	0	0	0	0	0	0	0
	H	OTTO-MT-05	653050	5513222	14-Sep-15	15-Sep-15	11:08	10:45	23.62	0.98	0.40	18	0	0	18.29	0	0	0	0	0	0	0	0	0	0	0	0
	Q	OTTO-MT-06	652919	5513188	14-Sep-15	15-Sep-15	11:02	10:55	23.88	1.00	0.50	3	0	0	3.01	0	0	0	0	0	0	0	0	0	0	0	0
	A	OTTO-MT-07	653081	5513309	14-Sep-15	15-Sep-15	11:20	9:15	21.92	0.91	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R	OTTO-MT-08	652906	5513152	14-Sep-15	15-Sep-15	10:54	11:34	24.67	1.03	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	O	OTTO-MT-09	652976	5513186	14-Sep-15	15-Sep-15	11:05	11:11	24.10	1.00	1.00	2	0	0	1.99	0	0	0	0	0	0	0	0	0	0	0	0
	J	OTTO-MT-10	653032	5513237	14-Sep-15	15-Sep-15	11:10	10:35	23.42	0.98	1.00	2	0	0	2.05	0	0	0	0	0	0	0	0	0	0	0	0
	G	OTTO-MT-11	653049	5513273	15-Sep-15	16-Sep-15	10:29	8:46	22.28	0.93	0.40	2	0	0	2.15	0	0	0	0	0	0	0	0	0	0	0	0
	R	OTTO-MT-12	652906	5513152	15-Sep-15	16-Sep-15	11:34	9:20	21.77	0.91	1.00	40	0	0	44.10	0	0	0	0	0	0	0	0	0	0	0	0
	L	OTTO-MT-13	652995	5513216	15-Sep-15	16-Sep-15	11:25	9:05	21.67	0.90	1.00	12	0	0	13.29	0	0	0	0	0	0	0	0	0	0	0	0
	N	OTTO-MT-14	652973	5513196	15-Sep-15	16-Sep-15	11:26	9:15	21.82	0.91	1.50	1	0	0	1.10	0	0	0	0	0	0	0	0	0	0	0	0
	C	OTTO-MT-15	653071	5513259	15-Sep-15	16-Sep-15	9:41	8:37	22.93	0.96	0.45	1	0	0	1.05	0	0	0	0	0	0	0	0	0	0	0	0
	B	OTTO-MT-16	653088	5513272	15-Sep-15	16-Sep-15	9:18	8:35	23.28	0.97	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	J	OTTO-MT-17	653032	5513237	15-Sep-15	16-Sep-15	10:41	8:50	22.15	0.92	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	E	OTTO-MT-18	653072	5513250	15-Sep-15	16-Sep-15	11:10	8:53	21.72	0.90	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	O	OTTO-MT-19	652976	5513186	15-Sep-15	16-Sep-15	11:18	8:58	21.67	0.90	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	D	OTTO-MT-20	653070	5513271	15-Sep-15	16-Sep-15	9:50	8:42	22.87	0.95	1.00	2	0	0	2.10	0	0	0	0	0	0	0	0	0	0	0	0
	C	OTTO-MT-21	653071	5513299	16-Sep-15	17-Sep-15	8:39	9:31	24.87	1.04	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	T	OTTO-MT-22	652885	5513143	16-Sep-15	17-Sep-15	9:45	8:52	23.12	0.96	0.30	5	0	0	5.19	0	0	0	0	0	0	0	0	0	0	0	0
	O	OTTO-MT-23	652976	5513186	16-Sep-15	17-Sep-15	8:58	9:06	24.13	1.01	1.50	2	0	0	1.99	0	0	0	0	0	0	0	0	0	0	0	0
	A	OTTO-MT-24	653081	5513309	16-Sep-15	17-Sep-15	8:36	9:36	25.00	1.04	0.45	31	0	0	29.76	0	0	0	0	0	0	0	0	0	0	0	0
	K	OTTO-MT-25	653008	5513232	16-Sep-15	17-Sep-15	8:56	9:12	24.27	1.01	0.35	6	0	0	5.93	0	0	0	0	0	0	0	0	0	0	0	0
	D	OTTO-MT-26	653070	5513271	16-Sep-15	17-Sep-15	8:44	9:28	24.73	1.03	0.75	1	0	0	0.97	0	0	0	0	0	0	0	0	0	0	0	0
	J	OTTO-MT-27	653032	5513237	16-Sep-15	17-Sep-15	8:50	9:21	24.52	1.02	1.00	2	1	0	2.94	0	0	0	0	0	0	0	0	0	0	0	0
	L	OTTO-MT-28	652995	5513216	16-Sep-15	17-Sep-15	9:14	9:01	23.78	0.99	1.00	0	1	0	1.01	0	0	0	0	0	0	0	0	0	0	0	0
	P	OTTO-MT-29	652944	5513182	16-Sep-15	17-Sep-15	9:19	8:57	23.63	0.98	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S	OTTO-MT-30	652889	5513156	16-Sep-15	17-Sep-15	9:46	8:45	22.98	0.96	0.50	1	0	0	1.04	0	0	0	0	0	0	0	0	0	0	0	0
	D	OTTO-MT-31	653070	5513271	17-Sep-15	18-Sep-15	9:30	8:50	23.33	0.97	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	B	OTTO-MT-32	653088	5513272	17-Sep-15	18-Sep-15	9:36	8:34	22.97	0.96	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R	OTTO-MT-33	652906	5513152	17-Sep-15	18-Sep-15	8:56	9:14	24.30	1.01	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	T	OTTO-MT-34	652885	5513143	17-Sep-15	18-Sep-15	8:54	9:15	24.35	1.01	1.00	6	0	0	5.91	0	0	0	0	0	0	0	0	0	0	0	0
	E	OTTO-MT-35	653072	5513250	17-Sep-15	18-Sep-15	9:12	8:56	23.73	0.99	0.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	L	OTTO-MT-36	652995	5513216	17-Sep-15	18-Sep-15	9:04	9:00	23.93	1.00	0.30	2	0	0	2.01	0	0	0	0	0	0	0	0	0	0	0	0
	P	OTTO-MT-37	652944	5513182	17-Sep-15	18-Sep-15	8:59	9:00	24.02	1.00	1.00	7	2	0	8.99	0	0	0	0	0	0	0	0	0	0	0	0
	A	OTTO-MT-38	653081	5513309	17-Sep-15	18-Sep-15	9:56	8:35	22.65	0.94	0.35	13	6	0	20.13	0	0	0	0	0	0	0	0	0	0	0	0
	I	OTTO-MT-39	653032	5513256	17-Sep-15	18-Sep-15	9:26	8:52	23.43	0.98	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H	OTTO-MT-40	653050	5513222	17-Sep-15	18-Sep-15	9:20	8:55	23.58	0.98	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL								**932.73**	**38.86**		**187**	**10**	**0**	**4.81**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Table HLSU.14: Reference Tissue Selenium Concentrations for Longnose Sucker Ovary in the Elk Valley, 2009 - 2015

Tissue Type	Tissue sub-type	Species	Year	Area Description	Biological Area Code	Selenium (mg/kg dw)
Fish	Ovary	LSU	2012	Flathead Pond	FL17	4.21
Fish	Ovary	LSU	2009	Flathead Pond	FL17	4.23
Fish	Ovary	LSU	2012	Flathead Pond	FL17	4.93
Fish	Ovary	LSU	2012	Flathead Pond	FL17	5.05
Fish	Ovary	LSU	2012	Flathead Pond	FL17	5.10
Fish	Ovary	LSU	2015	Flathead Wetland Side Channel	FLA1	5.16
Fish	Ovary	LSU	2009	Flathead Pond	FL17	5.38
Fish	Ovary	LSU	2009	Flathead Pond	FL17	5.56
Fish	Ovary	LSU	2009	Flathead Pond	FL17	5.74
Fish	Ovary	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	6.60

Outlier removed from estimation of summary statistics (below) and normal range

Notes: Q3+1.5(IQR) = 6.35 and 6.46 on the untransformed and log scale, respectfully

Tissue Type	Tissue sub-type	Species	Year	Summary Statistic	Biological Area Code	Selenium (mg/kg dw)
Fish	Ovary	LSU	All	Minimum	All Reference	4.21
Fish	Ovary	LSU	All	2.5th Percentile	All Reference	4.22
Fish	Ovary	LSU	All	25th Percentile	All Reference	4.93
Fish	Ovary	LSU	All	Median	All Reference	5.10
Fish	Ovary	LSU	All	75th Percentile	All Reference	5.38
Fish	Ovary	LSU	All	97.5th Percentile	All Reference	5.71
Fish	Ovary	LSU	All	Maximum	All Reference	5.74
Fish	Ovary	LSU	All	Mean	All Reference	5.04
Fish	Ovary	LSU	All	Standard Deviation	All Reference	0.53

Estimate of reference area normal range

Table HLSU.15: Reference Tissue Selenium Concentrations for Longnose Sucker Muscle in the Elk Valley, 2008 - 2015

Tissue Type	Tissue sub-type	Species	Year	Area Description	Biological Area Code	Selenium (mg/kg dw)
Fish	Muscle	LSU	2009	Flathead Lake	FHL	0.90
Fish	Muscle	LSU	2008	Flathead Lake	FHL	1.10
Fish	Muscle	LSU	2009	Flathead Lake	FHL	1.20
Fish	Muscle	LSU	2008	Flathead Lake	FHL	1.30
Fish	Muscle	LSU	2009	Flathead Lake	FHL	1.30
Fish	Muscle	LSU	2008	Flathead Lake	FHL	1.40
Fish	Muscle	LSU	2008	Flathead Lake	FHL	1.40
Fish	Muscle	LSU	2009	Flathead Lake	FHL	1.40
Fish	Muscle	LSU	2009	Flathead Lake	FHL	1.40
Fish	Muscle	LSU	2009	Flathead Lake	FHL	1.50
Fish	Muscle	LSU	2008	Flathead Lake	FHL	1.70
Fish	Muscle	LSU	2008	Flathead Lake	FHL	1.80
Fish	Muscle	LSU	2008	Flathead Lake	FHL	1.90
Fish	Muscle	LSU	2012	Flathead Pond	FL17	3.16
Fish	Muscle	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	3.46
Fish	Muscle	LSU	2012	Flathead Pond	FL17	3.67
Fish	Muscle	LSU	2012	Flathead Pond	FL17	3.76
Fish	Muscle	LSU	2015	Flathead Wetland Side Channel	FLA1	3.85
Fish	Muscle	LSU	2012	Flathead Pond	FL17	4.09
Fish	Muscle	LSU	2015	Flathead Wetland Side Channel	FLA1	4.61
Fish	Muscle	LSU	2015	Flathead Wetland Side Channel	FLA1	4.99
Fish	Muscle	LSU	2015	Flathead Wetland Side Channel	FLA1	5.84
Fish	Muscle	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	5.94
Fish	Muscle	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	6.03
Fish	Muscle	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	6.19

Notes: No outliers were identified. Q3+1.5(IQR) = 8.12 and 20.37 on the untransformed and log scale, respectfully

Tissue Type	Tissue sub-type	Species	Year	Summary Statistic	Biological Area Code	Selenium (mg/kg dw)
Fish	Muscle	LSU	All	Minimum	All Reference	0.90
Fish	Muscle	LSU	All	2.5th Percentile	All Reference	1.02
Fish	Muscle	LSU	All	25th Percentile	All Reference	1.40
Fish	Muscle	LSU	All	Median	All Reference	1.90
Fish	Muscle	LSU	All	75th Percentile	All Reference	4.09
Fish	Muscle	LSU	All	97.5th Percentile	All Reference	6.09
Fish	Muscle	LSU	All	Maximum	All Reference	6.19
Fish	Muscle	LSU	All	Mean	All Reference	2.96
Fish	Muscle	LSU	All	Standard Deviation	All Reference	1.82

Estimate of reference area normal range

Table HLSU.16: Reference Tissue Selenium Concentrations for Longnose Sucker Whole Body in the Elk Valley, 2002 - 2015

Tissue Type	Tissue sub-type	Species	Year	Area Description	Biological Area Code	Selenium (mg/kg dw)
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	2.26
Fish	Whole Body	LSU	2015	Flathead Wetland Side Channel	FLA1	2.59
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	2.86
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	2.89
Fish	Whole Body	LSU	2015	Flathead Wetland Side Channel	FLA1	2.96
Fish	Whole Body	LSU	2002	Flathead Pond	FL17	2.96
Fish	Whole Body	LSU	2015	Flathead Wetland Side Channel	FLA1	3.03
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	3.15
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	3.37
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	3.56
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	3.65
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	3.76
Fish	Whole Body	LSU	2015	Flathead Wetland Side Channel	FLA1	3.87
Fish	Whole Body	LSU	2015	Flathead Wetland Side Channel	FLA1	3.89
Fish	Whole Body	LSU	2012	Flathead Pond	FL17	3.92
Fish	Whole Body	LSU	2002	Flathead Pond	FL17	4.04
Fish	Whole Body	LSU	2006	Flathead Pond	FL17	4.10
Fish	Whole Body	LSU	2002	Flathead Pond	FL17	4.58
Fish	Whole Body	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	4.69
Fish	Whole Body	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	4.69
Fish	Whole Body	LSU	2006	Flathead Pond	FL17	4.70
Fish	Whole Body	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	4.96
Fish	Whole Body	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	5.06
Fish	Whole Body	LSU	2015	Unnamed Wetland Near Morrissey	UNWNMO	5.32
Fish	Whole Body	LSU	2006	Flathead Pond	FL17	5.40
Fish	Whole Body	LSU	2006	Flathead Pond	FL17	5.70
Fish	Whole Body	LSU	2006	Flathead Pond	FL17	8.40

Notes: No outliers were identified. Q3+1.5(IQR) = 7.11 and 8.81 on the untransformed and log scale, respectively

Tissue Type	Tissue sub-type	Species	Year	Summary Statistic	Biological Area Code	Selenium (mg/kg dw)
Fish	Whole Body	LSU	All	Minimum	All Reference	2.26
Fish	Whole Body	LSU	All	2.5th Percentile	All Reference	2.47
Fish	Whole Body	LSU	All	25th Percentile	All Reference	3.09
Fish	Whole Body	LSU	All	Median	All Reference	3.89
Fish	Whole Body	LSU	All	75th Percentile	All Reference	4.70
Fish	Whole Body	LSU	All	97.5th Percentile	All Reference	6.64
Fish	Whole Body	LSU	All	Maximum	All Reference	8.40
Fish	Whole Body	LSU	All	Mean	All Reference	4.09
Fish	Whole Body	LSU	All	Standard Deviation	All Reference	1.27

Estimate of reference area normal range

Table HLSU.17: Selenium Concentrations in Longnose Sucker Tissues, 2015

Exposure Type	Management Unit	Biological Area Code	Area Description	UTM (NAD83, 11U)		Year	Tissue Type	Sample ID	Selenium (mg/kg dw)
				Easting	Northing				
Reference	N/A	FLA1	Flathead Side Channel	681815	5443615	2015	Ovary	FLA1-LSU-4-O	5.2
							Muscle	FLA1-LSU-16-M	4.6
								FLA1-LSU-17-M	5.8
								FLA1-LSU-18-M	3.9
								FLA1-LSU-19-M	5.0
							Whole Body	FLA1-LSU-2-WB	2.6
								FLA1-LSU-3-WB	3.9
								FLA1-LSU-5-WB	3.0
								FLA1-LSU-9-WB	3.9
								FLA1-LSU-15-WB	3.0
Mine-exposed	3	ERUP	Elk River Upper Ponds	651742	5530538	2015	Ovary	ERUP-LSU-11-O	**7.5**
								ERUP-LSU-12-O	**11.0**
							Muscle	ERUP-LSU-2-M	**7.7**
								ERUP-LSU-9-M	5.1
								ERUP-LSU-10-M	5.0
							Whole Body	ERUP-LSU-1-WB	5.9
								ERUP-LSU-4-WB	3.8
								ERUP-LSU-6-WB	3.9
								ERUP-LSU-7-WB	4.5
								ERUP-LSU-8-WB	4.7
	4	ELWDGC	Elk River Wetland Downstream of Grave Creek	653175	5521300	2015	Ovary	ELWDGC-LSU-5-O	**12.8**
							Muscle	ELWDGC-LSU-2-M	**21.2**
								ELWDGC-LSU-11-M	**18.0**
								ELWDGC-LSU-12-M	**20.1**
								ELWDGC-LSU-13-M	**17.7**
							Whole Body	ELWDGC-LSU-1-WB	**15.0**
								ELWDGC-LSU-3-WB	**16.0**
								ELWDGC-LSU-4-WB	**13.6**
								ELWDGC-LSU-6-WB	**12.9**
								ELWDGC-LSU-7-WB	**15.4**
		GO13	Goddard Marsh (and lower Goddard Pond decant)	652955	5514065	2015	Ovary	GO13-LSU-1-O	**45.5**
								GO13-LSU-7-O	**39.3**
								GO13-LSU-9-O	**20.4**
								GO13-LSU-13-O	**37.4**
							Muscle	GO13-LSU-2-M	**83.6**
							Whole Body	GO13-LSU-3-WB	**25.8**
								GO13-LSU-8-WB	**21.8**
								GO13-LSU-14-WB	**55.0**
								GO13-LSU-16-WB	**33.0**
								GO13-LSU-18-WB	**54.4**
		OTTO	Otto Creek wetlands	652537	5512801	2015	Whole Body	OTTO-LSU-1-WB	**57.6**
								OTTO-LSU-2-WB	**23.3**
								OTTO-LSU-7-WB	**7.6**
								OTTO-LSU-8-WB	**7.5**
								OTTO-LSU-10-WB	**21.8**
		MIC2	Michel Oxbow #2	659533	5496626	2015	Whole Body	MIC2-LSU-1-WB	4.3
								MIC2-LSU-2-WB	4.7
								MIC2-LSU-3-WB	4.7
		MIWW	Lower Michel Wetland	659707	5498474	2015	Ovary	MIWW-LSU-1-O	**13.8**
								MIWW-LSU-2-O	**10.8**
							Whole Body	MIWW-LSU-3-WB	**9.7**
	5	UNWNMO	Unnamed Wetland near Morrissey	644982	5468245	2015	Ovary	UNWNMO-LSU-5-O	**6.6**
							Muscle	UNWNMO-LSU-7-M	**6.2**
								UNWNMO-LSU-9-M	6.0
								UNWNMO-LSU-10-M	3.5
								UNWNMO-LSU-12-M	5.9
							Whole Body	UNWNMO-LSU-1-WB	4.7
								UNWNMO-LSU-2-WB	4.7
								UNWNMO-LSU-4-WB	5.3
								UNWNMO-LSU-6-WB	5.1
								UNWNMO-LSU-11-WB	5.0
		STPD	Stanford Pond	639864	5483139	2015	Ovary	STPD-LSU-5-O	**17.0**
								STPD-LSU-12-O	**14.7**
								STPD-LSU-18-O	**22.0**
								STPD-LSU-20-O	**14.1**
								STPD-LSU-22-O	**16.7**
							Whole Body	STPD-LSU-2-WB	**18.5**
								STPD-LSU-11-WB	**14.2**
								STPD-LSU-13-WB	**12.1**
								STPD-LSU-17-WB	**14.0**
								STPD-LSU-21-WB	**12.7**

Notes:

Value > benchmark [Ovary: 18 mg/kg dw (Site-specific Level 1); Muscle: 18 mg/kg dw (Site-specific, based on relationship between selenium in muscle and ovary in LSU); Whole body: 4 mg/kg dw (BC Guideline)].

Bold: Value > upper limit of normal range (Ovary: 5.71 mg/kg dw; Muscle: 6.09 mg/kg dw; Whole Body: 6.64 mg/kg dw).

Table HLSU.18: Normal Range Quotients and Hazard Quotients for Longnose Sucker Tissue Selenium (Maximum Concentration by Area), 2015

Exposure Type	Management Unit	Main Watershed	Area Description	Biological Area Code	Muscle		Whole Body		Ovary		
					Max Concentration (mg/kg dw)	Max Normal Range Quotient	Max Concentration (mg/kg dw)	Max Normal Range Quotient	Max Concentration (mg/kg dw)	Max Normal Range Quotient	Max Hazard Quotient (LSU Survival)[a]
				Benchmark	**-**	**6.1**	**-**	**6.6**	**-**	**5.7**	**18**
Reference	5	Elk	Unnamed Wetland near Morrissey	UNWNMO	6.19	1.0	5.32	0.8	6.60	1.2	0.4
	N/A	Flathead	Flathead Side Channel	FLA1	5.84	1.0	3.87	0.6	5.16	0.9	0.3
Mine-exposed	3	Elk	Elk River Upper Ponds	ERUP	7.68	1.3	5.94	0.9	11.0	1.9	0.6
	4	Elk	Elk River Wetland Downstream of Grave Creek	ELWDGC	21.2	3.5	16.0	2.4	12.8	2.2	0.7
			Goddard Marsh	GO13	83.6	14	55.0	8.3	45.5	8.0	2.5
			Otto Creek wetlands	OTTO	-	-	57.6	8.7	-	-	-
			Michel Oxbow #2	MIC2	-	-	4.74	0.7	-	-	-
			Lower Michel Wetland	MIWW	-	-	9.69	1.5	13.8	2.4	0.8
	5	Elk	Stanford Pond	STPD	-	-	18.5	2.8	22.0	3.9	1.2

[a] Level 1 Benchmark (ovary; EVWQP)

Notes: "-" = not sampled

Good (Quotient < 0.7)

Marginal (Quotient between 0.7 and 1.0)

Poor (Quotient > 1.0)

Table HLSU.19: Results of the Temporal Analysis of Selenium Concentrations in Longnose Sucker Ovary and Whole Body Samples, 2005 - 2015

Tissue Type	Area Description	Area Code	Period	Statistic	n	Value	Test	P-value	Pairwise Comparisons [a]
Ovary	Upper Elk River Upper Ponds/Upper Oxbow	EROUF	2005	Mean	10	8.52	ANOVA	0.558	A
		EROU	2012		5	10.27			A
		ERUP	2015		2	9.25			A
	Flathead Wetland side channel	FL17	2009	Mean	4	5.23	ANOVA	0.609	A
		FL17	2012		4	4.82			A
		FLA1	2015		1	5.16			A
	Goddard Marsh	GO13	2005	Mean	14	36.11	ANOVA	0.453	A
		GO13	2009		6	48.85			A
		GO13	2012		5	41.48			A
		GO13	2015		4	35.67			A
Whole Body	Flathead Wetland side channel	FL17	2006	Median	5	5.40	K-W	0.009	A
		FL17	2012		5	3.65			B
		FLA1	2015		2	3.03			B
	Goddard Marsh	GO13	2006	Median	9	22.30	K-W	0.340	A
		GO13	2012		5	36.38			A
		GO13	2015		5	35.98			A

P-value < 0.05

Notes: "K-W" = Kruskal-Wallis test

[a] Time periods that share a letter are not significantly different from each other (Tukey's Honestly Significant Differences method for ANOVA and Dunn's test for the Kruskal-Wallis test)

Table HLSU.20: Spearman Correlation Between Longnose Sucker Health Endpoints and Tissue Selenium Concentrations, 2015

Species	Endpoint	Tissue Se Concentration								
		Ovary			Muscle			Whole Body		
		n	r_s	p	n	r_s	p	n	r_s	p
Longnose Sucker	Length	16	-0.184	0.495	16	-0.154	0.570	39	-0.322	0.046
	Body Weight	16	-0.176	0.513	16	-0.121	0.656	39	-0.318	0.048
	Fulton's Condition Factor (K)	16	0.150	0.579	16	-0.315	0.235	39	0.067	0.683
	Gonadosomatic Index (GSI)	16	0.150	0.579	16	-0.315	0.235	39	0.067	0.683
	Liversomatic Index (LSI)	16	-0.482	0.058	16	0.274	0.305	39	-0.219	0.181

P-value < 0.05

FISH

Westslope Cutthroat Trout

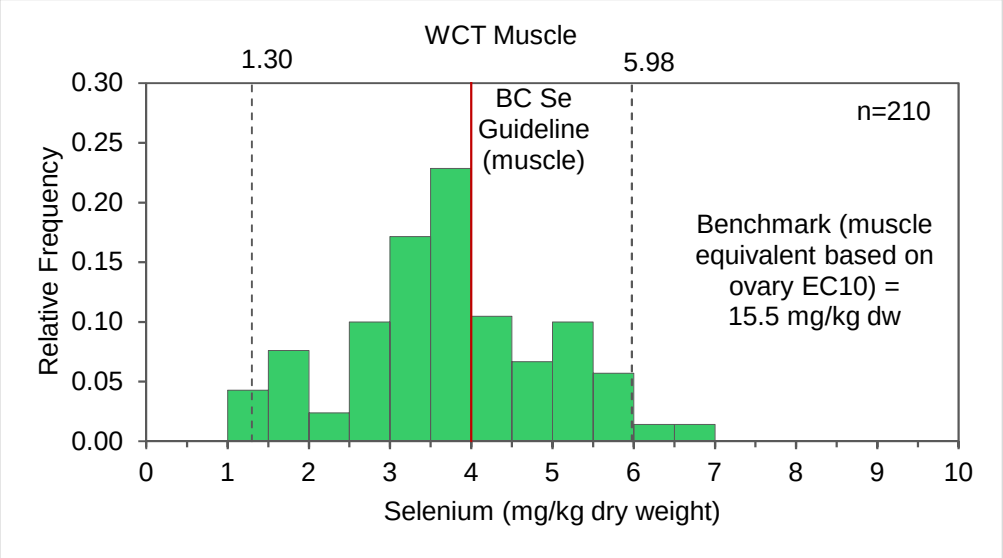
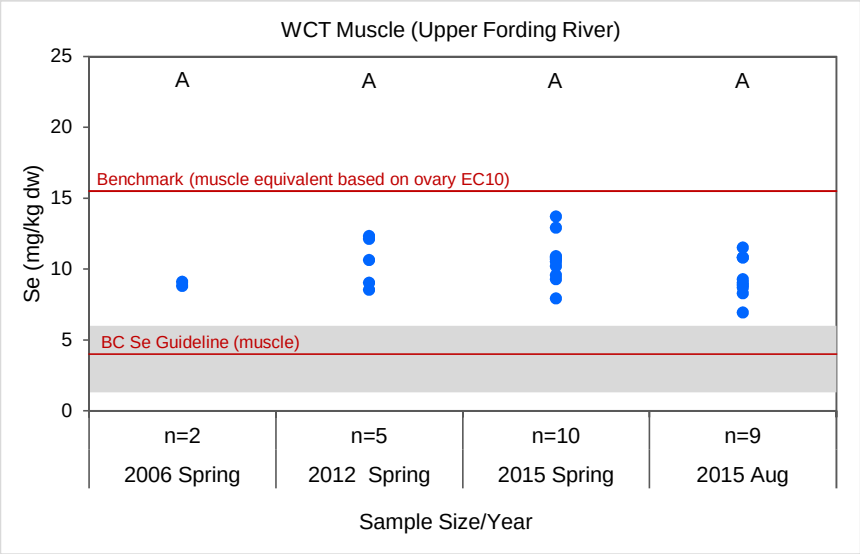
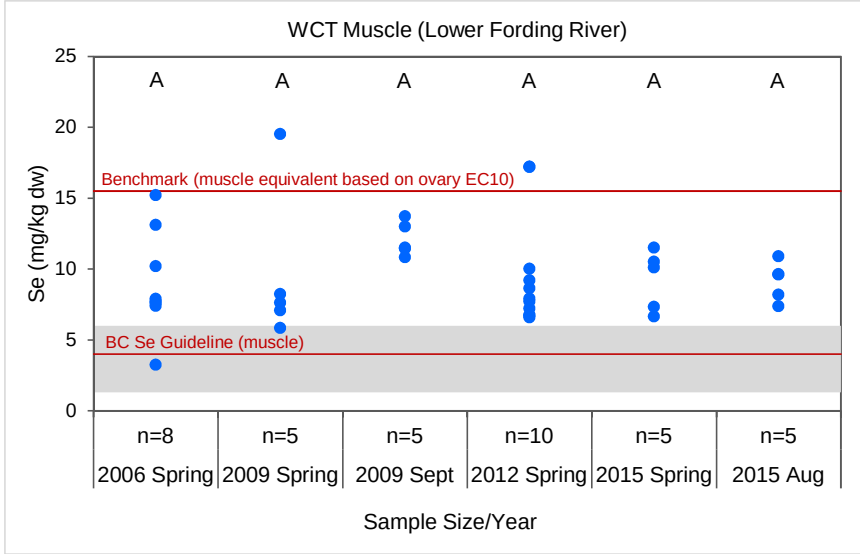
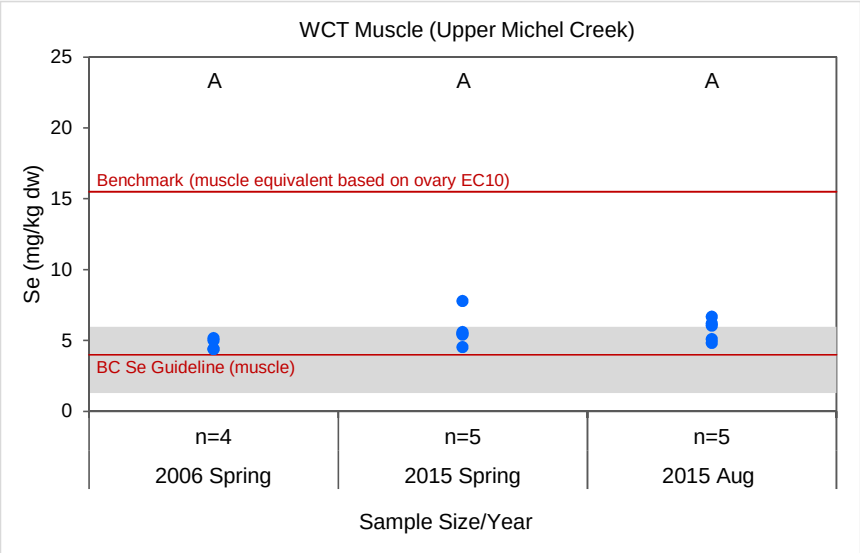


Figure HWCT.1: Distribution of Reference Area Data for Tissue Selenium Concentrations for Westslope Cutthroat Trout (WCT) in the Elk Valley, 1998 - 2015

Notes: Dashed vertical lines represent the 2.5th and 97.5th percentiles







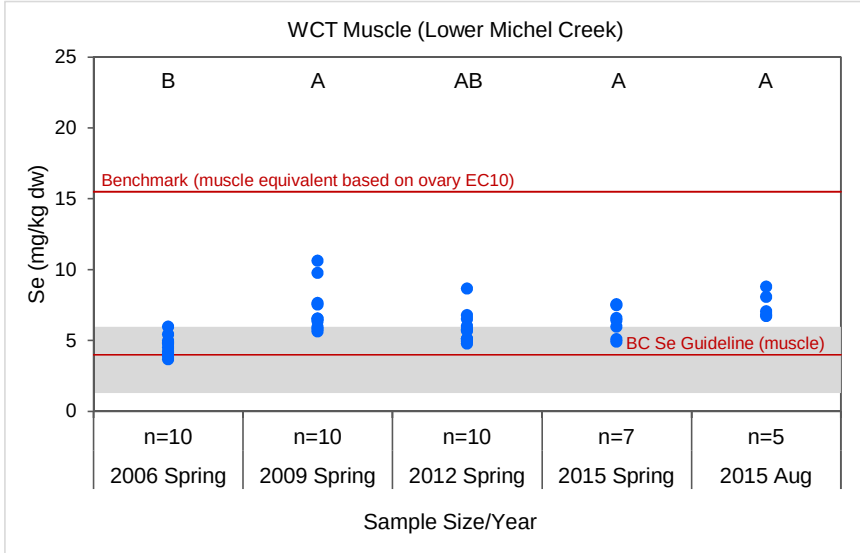
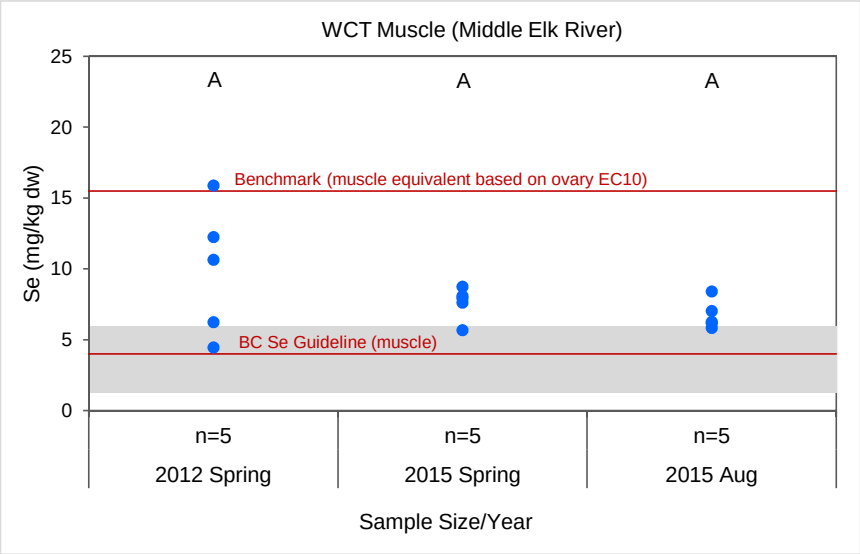
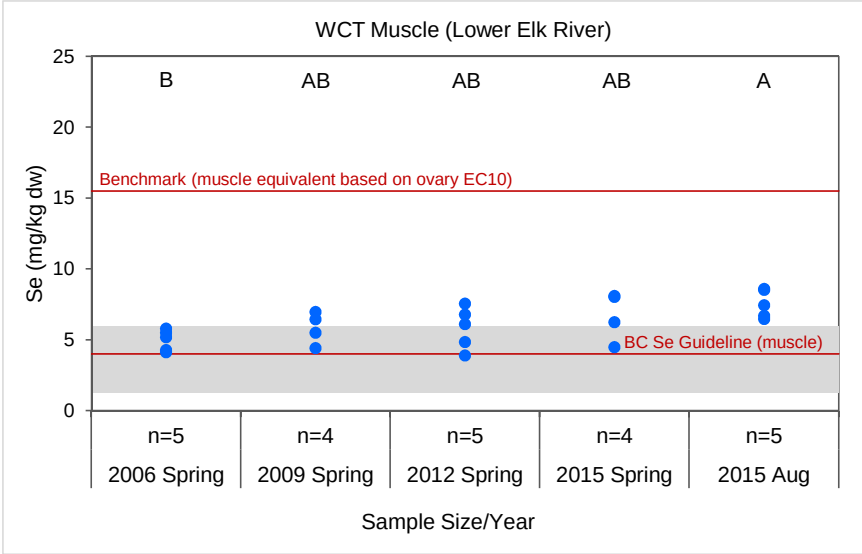


Figure HWCT.2: Boxplot/Individual Value Plot for Selenium Concentrations in Muscle of Westslope Cutthroat Trout Over Time

Notes: time periods that do not share a letter are significantly different (p-value < 0.1)





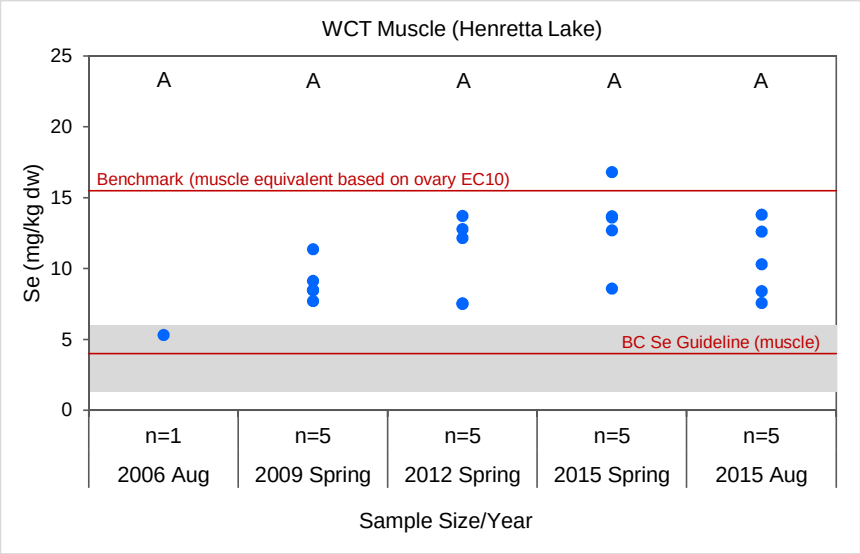


Figure HWCT.2: Boxplot/Individual Value Plot for Selenium Concentrations in Muscle of Westslope Cutthroat Trout Over Time

Notes: time periods that do not share a letter are significantly different (p-value < 0.1)

Table HWCT.1: Westslope Cutthroat Trout Tissue Sampling Areas in 2015, and Concordance with Location Codes used in Previous Regional Sampling Cycles

Habitat Type	Exposure Type	Manage-ment Unit	2015	2012	2009	2006
			May and August	**Spring (May-July)**	**Spring (April-June)**	**Spring (April-May)**
Lotic	Reference	Not applicable	none (sufficient historical data to characterize reference WCT tissue selenium concentrations)	Bull River (BU2)	-	Alexander Creek (AL4)
				McCool Creek (MMCR or MCCR)	-	-
	Mine-exposed	1	Upper Fording River (UFR) - u/s Josephine Falls	Multiplate (MP1)	Multiplate (MP1)	-
		2	Lower Fording River (LFR) - d/s Josephine Falls	Lower Fording River (FO23), Lower Line Creek (LI8)	Lower Fording River (FO23), Lower Line Creek (LI8)	Fording River downstream Josephine Falls (F09), Lower Fording River (FO23), Lower Line Creek (LI8)
		3	Upper Elk River (UER) - downstream from GHO, upstream from Fording River	-	-	-
		4	Middle Elk River (MER) - between Fording River and Michel Creek	EL19	-	-
		4	Upper Michel Creek (UMC) - upstream from Alexander Creek	-	-	MI5
		4	Lower Michel Creek (LMC) - downstream from Alexader Creek	Lower Michel Creek (MI2), Michel Creek near Alexander Creek (MI3)	Lower Michel Creek (MI2), Michel Creek near Alexander Creek (MI3)	Lower Michel Creek (MI2), Michel Creek near Alexander Creek (MI3)
		5	Lower Elk River (LER) - d/s from Sparwood (near Fernie)	EL1	EL1	EL1
Lentic	Reference	Not applicable	none (sufficient historical data to characterize reference WCT tissue concentrations)	Elk Lakes (EL14)	Elk Lakes (EL14)	Elk Lakes (EL14)
				Hartley Lake (HART)	-	-
				-	O'Rourke Lake (RL1)	-
				-	-	Barnes Lake (BA6)
	Mine-exposed	1	Henretta Lake (HE27)	HE27	HE27	HE27
		1	Fording River Oxbow (FRO)	-	FO10	FO10

Table HWCT.2: Angling Records for Westslope Cutthroat Trout Caught for the RAEMP in the Elk Valley, May 2015

Area	Station ID	UTM (NAD83, 11U)		Set Date	Date of Removal	Set Time	Removal Time	Angling Hours (hrs)	# of Lines	Effort (angling lines*days)	Westslope Cutthroat			Mountain Whitefish		
		Easting	Northing								Catch	Processed / Sacrificed	CPUE[a]	Catch	Processed / Sacrificed	CPUE[a]
Henretta Lake	HE27-AN-01	652588	5566323	6-May-15	6-May-15	9:30	12:00	2.50	4	0.42	1	0	2.40	0	0	0.00
	HE27-AN-02	652588	5566323	11-May-15	11-May-15	13:30	16:00	2.50	3	0.31	8	4/1	25.60	0	0	0.00
	TOTAL							**5.00**	**7**	**0.73**	**9**	**4/1**	**12.34**	**0**	**0**	**0.00**
Upper Fording River	UFR-AN-01	651200	5562441	6-May-15	6-May-15	12:00	12:45	0.75	4	0.13	0	0	0.00	0	0	0.00
	UFR-AN-02	652380	5558426	6-May-15	6-May-15	12:45	14:45	2.00	4	0.33	0	0	0.00	0	0	0.00
	UFR-AN-03	655314	5552947	11-May-15	11-May-15	8:45	9:30	0.75	1	0.03	5	5	160.00	0	0	0.00
	UFR-AN-04	650828	5563933	11-May-15	11-May-15	12:05	13:05	1.00	3	0.13	0	0	0.00	0	0	0.00
	UFR-AN-05	655314	5552947	12-May-15	12-May-15	8:45	9:50	1.08	3	0.14	0	0	0.00	0	0	0.00
	UFR-AN-06	654801	5553344	12-May-15	12-May-15	10:30	12:15	1.75	3	0.22	5	5	22.86	0	0	0.00
	TOTAL							**7.33**	**18**	**0.97**	10	**10**	**10.32**	**0**	**0**	**0.00**
Fording River Oxbow	FRO-AN-01	654291	5555364	11-May-15	11-May-15	9:50	11:15	1.42	3	0.18	0	0	0.00	0	0	0.00
	TOTAL							**1.42**	**3**	**0.18**	**0**	**0**	**0.00**	**0**	**0**	**0.00**
Lower Fording River	LFR-AN-01	652943	5528925	8-May-15	8-May-15	11:40	12:45	1.08	3	0.14	1	1	7.38	0	0	0.00
	LFR-AN-02	652866	5528400	8-May-15	8-May-15	13:00	14:45	1.75	3	0.22	1	1	4.57	0	0	0.00
	LFR-AN-03	653160	5525843	8-May-15	8-May-15	15:15	16:00	0.75	3	0.09	0	0	0.00	0	0	0.00
	LFR-AN-04	652943	5528925	9-May-15	9-May-15	9:05	10:00	0.92	3	0.11	0	0	0.00	6	0	52.36
	LFR-AN-05	654462	5530147	9-May-15	9-May-15	10:15	10:45	0.50	3	0.06	0	0	0.00	0	0	0.00
	LFR-AN-06	652943	5528925	9-May-15	9-May-15	11:00	12:10	1.17	3	0.15	1	1	6.86	0	0	0.00
	LFR-AN-07	652943	5528925	9-May-15	9-May-15	16:15	16:40	0.42	2	0.03	1	0	28.80	0	0	0.00
	LFR-AN-08	651857	5540476	10-May-15	10-May-15	13:15	14:55	1.67	3	0.21	1	1	4.80	0	0	0.00
	LFR-AN-09	653460	5538662	10-May-15	10-May-15	15:15	16:30	1.25	3	0.16	0	0	0.00	0	0	0.00
	LFR-AN-10	652943	5528925	12-May-15	12-May-15	12:55	13:45	0.83	2	0.07	2	1	28.80	0	0	0.00
	TOTAL							**10.33**	**28**	**1.24**	**7**	**5**	**5.65**	**6**	**0**	**4.84**
Upper Michel Creek	MCU-AN-01	659968	5501107	5-May-15	5-May-15	15:15	16:00	0.75	4	0.13	0	0	0.00	0	0	0.00
	MCU-AN-02	664566	5490007	5-May-15	5-May-15	16:10	16:40	0.50	4	0.08	0	0	0.00	0	0	0.00
	MCU-AN-03	659987	5501136	12-May-15	12-May-15	13:05	15:45	2.67	3	0.33	1	1	3.00	2	0	6.00
	MCU-AN-04	660611	5502901	12-May-15	12-May-15	16:00	16:30	0.50	3	0.06	0	0	0.00	0	0	0.00
	MCU-AN-05a	659987	5501136	13-May-15	13-May-15	8:50	10:30	1.67	2	0.14	1	1	7.20	2	0	14.40
	MCU-AN-05b	659892	5501035	13-May-15	13-May-15	8:50	10:30	1.67	1	0.07	1	1	14.40	1	0	14.40
	MCU-AN-06	666055	5488805	13-May-15	13-May-15	10:55	11:20	0.42	1	0.02	0	0	0.00	0	0	0.00
	MCU-AN-07	665240	5489328	13-May-15	13-May-15	11:30	11:50	0.33	3	0.04	0	0	0.00	1	0	24.00
	MCU-AN-08	660465	5493129	13-May-15	13-May-15	12:10	12:30	0.33	2	0.03	2	2	72.00	1	0	36.00
	TOTAL							**8.83**	**23**	**0.90**	**5**	**5**	**5.56**	**7**	**0**	**7.78**
Lower Michel Creek	LMC-AN-01	-	-	5-May-15	5-May-15	9:00	10:00	1.00	4	0.17	0	0	0.00	0	0	0.00
	LMC-AN-02	653526	5511322	5-May-15	5-May-15	10:30	13:00	2.50	4	0.42	4	0	9.60	0	0	0.00
	LMC-AN-03	659798	5505110	5-May-15	5-May-15	13:30	14:00	0.50	3	0.06	0	0	0.00	0	0	0.00
	LMC-AN-04	659476	5505207	5-May-15	5-May-15	14:15	15:00	0.75	4	0.13	0	0	0.00	0	0	0.00
	LMC-AN-05	659476	5505207	5-May-15	5-May-15	17:00	17:45	0.75	4	0.13	0	0	0.00	1	0	8.00
	LMC-AN-06	659477	5505204	7-May-15	7-May-15	14:45	15:55	1.17	4	0.19	2	0	10.29	2	0	10.29
	LMC-AN-07	659477	5505204	10-May-15	10-May-15	8:05	9:30	1.42	3	0.18	1	0	5.65	0	0	0.00
	TOTAL							**8.08**	**26**	**1.27**	**7**	**0**	**5.52**	**3**	**0**	**2.37**
Upper Elk River	UER-AN-01	648817	5549062	6-May-15	6-May-15	15:50	16:45	0.92	4	0.15	0	0	0.00	0	0	0.00
	UER-AN-02a	650159	5536414	9-May-15	9-May-15	13:15	16:00	2.75	2	0.23	1	0	4.36	3	0	13.09
	UER-AN-02b	650029	5536019	9-May-15	9-May-15	13:15	16:00	2.75	1	0.11	1	0	8.73	2	0	17.45
	UER-AN-03	649276	5542238	10-May-15	10-May-15	12:15	13:10	0.92	3	0.11	3	0	26.18	0	0	0.00
	TOTAL							**7.33**	**10**	**0.61**	**5**	**0**	**8.18**	**5**	**0**	**8.18**
Middle Elk River	MER-AN-01	652270	5518098	8-May-15	8-May-15	9:05	11:10	2.08	3	0.26	8	3	30.72	0	0	0.00
	MER-AN-02	652902	5520239	10-May-15	10-May-15	10:00	12:30	2.50	3	0.31	2	0	6.40	0	0	0.00
	TOTAL							**4.58**	**6**	**0.57**	**10**	**3**	**17.45**	**0**	**0**	**0.00**
Lower Elk River	LER-AN-01	637668	5462110	7-May-15	7-May-15	9:05	10:02	0.95	4	0.16	0	0	0.00	0	0	0.00
	LER-AN-02	639450	5463326	7-May-15	7-May-15	10:20	11:20	1.00	5	0.21	0	0	0.00	0	0	0.00
	LER-AN-03	644561	5469348	7-May-15	7-May-15	12:30	14:10	1.67	4	0.28	5	0	18.00	9	0	32.40
	TOTAL							**3.62**	**13**	**0.64**	**5**	**0**	**7.76**	**9**	**0**	**13.97**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table HWCT.3: Angling Records for Westslope Cutthroat Trout Caught for the RAEMP in the Elk Valley, August 2015

Area	Station ID	UTM (NAD83, 11U)		Start Date	End Date	Start Time	End Time	Angling Hours (hrs)	# of Lines	Effort (angling lines*days)	Westslope Cutthroat			Mountain Whitefish		
		Easting	Northing								Catch	Sampled	CPUE[a]	Catch	Sampled	CPUE[a]
Henretta Lake	HE27-AN-01	652517	5566309	20-Aug-15	20-Aug-15	10:00	12:10	2.17	3	0.27	23	1	84.92	0	0	0.00
	HE27-AN-02			25-Aug-15	25-Aug-15	11:55	13:05	1.17	3.5	0.17	11	4	64.65	0	0	0.00
	TOTAL							**3.33**	**7**	**0.44**	**34**	**5**	**77.10**	**0**	**0**	**0.00**
Upper Fording River	UFR-AN-01	651221	5562442	20-Aug-15	20-Aug-15	12:35	13:40	1.08	3	0.14	45	5	332.31	0	0	0.00
	UFR-AN-02	655310	5552877	20-Aug-15	20-Aug-15	14:20	16:30	2.17	3.5	0.32	5	3	15.82	0	0	0.00
	UFR-AN-03	655136	5543662	23-Aug-15	23-Aug-15	13:30	14:30	1.00	3	0.12	6	5	48.00	0	0	0.00
	UFR-AN-04	656060	5545175	23-Aug-15	23-Aug-15	14:50	16:00	1.17	3	0.15	3	2	20.57	0	0	0.00
	TOTAL							**2.17**	**13**	**0.27**	**59**	**15**	**217.85**	**0**	**0**	**0.00**
Lower Fording River	LFR-AN-01	652942	5528914	22-Aug-15	22-Aug-15	8:50	11:00	2.17	2	0.18	14	3	77.54	6	0	33.23
	LFR-AN-02			23-Aug-15	23-Aug-15	8:35	10:40	2.08	2	0.17	3	2	17.28	0	0	0.00
	TOTAL							**4.25**	**4**	**0.35**	**17**	**5**	**48.00**	**6**	**0**	**16.94**
Upper Michel Creek	MCU-AN-01	666072	5488722	21-Aug-15	21-Aug-15	10:15	11:00	0.75	2	0.06	1	0	16.00	0	0	0.00
	MCU-AN-02	660481	5493166	21-Aug-15	21-Aug-15	11:30	12:45	1.25	2	0.10	11	2	105.60	0	0	0.00
	MCU-AN-03	659892	5501043	21-Aug-15	21-Aug-15	13:20	14:30	1.17	2	0.10	12	3	123.43	0	0	0.00
	MCU-AN-04			25-Aug-15	25-Aug-15	8:55	9:35	0.67	3	0.08	4	1	48.00	0	0	0.00
	TOTAL							**3.83**	**9**	**0.35**	**28**	**6**	**80.64**	**0**	**0**	**0.00**
Lower Michel Creek	LMC-AN-01	656627	5507521	21-Aug-15	21-Aug-15	8:55	9:35	0.67	2	0.06	4	4	72.00	0	0	0.00
	LMC-AN-02	653512	5511315	25-Aug-15	25-Aug-15	10:00	10:20	0.33	2	0.03	2	2	72.00	0	0	0.00
	TOTAL							**1.00**	**4**	**0.08**	**6**	**6**	**72.00**	**0**	**0**	**0.00**
Upper Elk River	UER-AN-01	649294	5542281	22-Aug-15	22-Aug-15	11:30	13:00	1.50	2	0.13	2	0	16.00	2	0	16.00
	UER-AN-02	649364	5543315	22-Aug-15	22-Aug-15	13:15	13:40	0.42	2	0.03	1	0	28.80	0	0	0.00
	UER-AN-03			23-Aug-15	23-Aug-15	11:15	12:30	1.25	2	0.10	3	4	28.80	0	0	0.00
	UER-AN-04	649082	5548520	22-Aug-15	22-Aug-15	14:45	16:45	2.00	2	0.17	6	2	36.00	0	0	0.00
	TOTAL							**5.17**	**8**	**0.43**	**12**	**6**	**27.87**	**2**	**0**	**4.65**
Middle Elk River	MER-AN-01	652803	5527182	25-Aug-15	25-Aug-15	14:45	15:22	0.62	3	0.08	0	0	0.00	0	0	0.00
	MER-AN-02	653207	5526914	25-Aug-15	25-Aug-15	15:28	17:05	1.62	3	0.20	5	5	24.74	0	0	0.00
	TOTAL							**2.23**	**6**	**0.28**	**5**	**5**	**17.91**	**0**	**0**	**0.00**
Lower Elk River	LER-AN-01	639458	5463334	24-Aug-15	24-Aug-15	8:45	10:00	1.25	2	0.10	5	0	48.00	4	0	38.40
	LER-AN-02	644667	5469376	24-Aug-15	24-Aug-15	11:20	13:45	2.42	2	0.20	4	2	19.86	3	0	14.90
	LER-AN-03	646718	5494589	24-Aug-15	24-Aug-15	15:15	17:45	2.50	2	0.21	8	4	38.40	2	0	9.60
	TOTAL							**6.17**	**6**	**0.51**	**17**	**6**	**33.08**	**9**	**0**	**17.51**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table HWCT.4: Reference Tissue Selenium Concentrations for Westslope Cutthroat Trout Muscle in the Elk Valley, 1998 - 2012

Tissue Type	Tissue sub-type	Species	Year	Area Description	Lentic (e)	Biological Area Code	Selenium (mg/kg dw)
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.00
Fish	Muscle	WCT	2009	Flathead Lake	e	FHL	1.10
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.30
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.30
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.30
Fish	Muscle	WCT	2009	Flathead Lake	e	FHL	1.30
Fish	Muscle	WCT	2009	Flathead Lake	e	FHL	1.30
Fish	Muscle	WCT	2009	Flathead Lake	e	FHL	1.30
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	1.43
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	1.50
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	1.50
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.50
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.50
Fish	Muscle	WCT	2009	Flathead Lake	e	FHL	1.50
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	1.53
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.60
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.60
Fish	Muscle	WCT	2009	Flathead Lake	e	FHL	1.60
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	1.67
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.70
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.70
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.70
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	1.70
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	1.72
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	1.96
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	2.00
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	2.20
Fish	Muscle	WCT	2009	Elk Lakes	e	EL14	2.30
Fish	Muscle	WCT	2009	Elk Lakes	e	EL14	2.35
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	2.40
Fish	Muscle	WCT	2009	Elk Lakes	e	EL14	2.35
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	2.40
Fish	Muscle	WCT	2008	Flathead Lake	e	FHL	2.50
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	2.50
Fish	Muscle	WCT	2009	Pollock Creek		POL	2.50
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	2.54
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	2.60
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	2.60
Fish	Muscle	WCT	2009	Pollock Creek		POL	2.60
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	2.69
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	2.70
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	2.70
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	2.70
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	2.70
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	2.80
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	2.80
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	2.80
Fish	Muscle	WCT	2012	Bull River		BU2	2.83
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	2.90
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	2.90
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	2.90
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	2.90
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	2.98
Fish	Muscle	WCT	2006	Elk Lakes	e	EL14	3.00
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.00
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.00
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	3.00
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.00
Fish	Muscle	WCT	2009	Pollock Creek		POL	3.00
Fish	Muscle	WCT	2006	Alexander Creek		AL4	3.08
Fish	Muscle	WCT	2012	Bull River		BU2	3.10
Fish	Muscle	WCT	2008	Foisey Creek		FOI	3.10
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	3.10
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.10
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.10
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.10
Fish	Muscle	WCT	2009	Pollock Creek		POL	3.10
Fish	Muscle	WCT	1998	Connor Lake		Connor Lake	3.13
Fish	Muscle	WCT	2012	McCool Creek		MCCR	3.13
Fish	Muscle	WCT	2009	Cabin Creek		CAB	3.20
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.20
Fish	Muscle	WCT	2009	Cabin Creek		CAB	3.20
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.20
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	3.20
Fish	Muscle	WCT	2009	Pollock Creek		POL	3.20
Fish	Muscle	WCT	2009	Pollock Creek		POL	3.20
Fish	Muscle	WCT	2006	Alexander Creek		AL4	3.25
Fish	Muscle	WCT	2012	Elk Lakes	e	EL14	3.25
Fish	Muscle	WCT	2009	Howell Creek		HOW	3.30
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.30
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.30
Fish	Muscle	WCT	2009	Pollock Creek		POL	3.30
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	3.40
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	3.40
Fish	Muscle	WCT	2009	Howell Creek		HOW	3.40
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.40
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.40
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	3.40
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	3.40
Fish	Muscle	WCT	2009	Elk Lakes	e	EL14	3.40
Fish	Muscle	WCT	2012	Elk Lakes	e	EL14	3.42
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	3.50
Fish	Muscle	WCT	2006	Elk Lakes	e	EL14	3.50
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	3.50
Fish	Muscle	WCT	2009	Howell Creek		HOW	3.50
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.50
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.50

Notes: No outliers were identified. Q3+1.5(IQR) = 6.68 and 8.15 on the untransformed and log scale, respectfully

Table HWCT.4: Reference Tissue Selenium Concentrations for Westslope Cutthroat Trout Muscle in the Elk Valley, 1998 - 2012

Tissue Type	Tissue sub-type	Species	Year	Area Description	Lentic (e)	Biological Area Code	Selenium (mg/kg dw)
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.50
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	3.50
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	3.50
Fish	Muscle	WCT	2009	Middlepass Creek		MIP	3.50
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.50
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	3.53
Fish	Muscle	WCT	2009	Cabin Creek		CAB	3.60
Fish	Muscle	WCT	2009	Cabin Creek		CAB	3.60
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.60
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.60
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	3.60
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.60
Fish	Muscle	WCT	2009	Pollock Creek		POL	3.60
Fish	Muscle	WCT	2012	Bull River		BU2	3.65
Fish	Muscle	WCT	2006	Alexander Creek		AL4	3.69
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	3.70
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	3.70
Fish	Muscle	WCT	2009	Howell Creek		HOW	3.70
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.70
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.70
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	3.70
Fish	Muscle	WCT	2009	Pollock Creek		POL	3.70
Fish	Muscle	WCT	2012	McCool Creek		MCCR	3.74
Fish	Muscle	WCT	2006	Alexander Creek		AL4	3.75
Fish	Muscle	WCT	2006	Alexander Creek		AL4	3.79
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	3.80
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	3.80
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	3.80
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	3.80
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.80
Fish	Muscle	WCT	2009	Harvey Creek		HV	3.80
Fish	Muscle	WCT	2009	McEvoy Creek		MCE	3.80
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.80
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.80
Fish	Muscle	WCT	2009	Pollock Creek		POL	3.80
Fish	Muscle	WCT	2009	Elk Lakes	e	EL14	3.82
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	3.90
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	3.90
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.90
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	3.90
Fish	Muscle	WCT	1998	Connor Lake	e	Connor Lake	3.91
Fish	Muscle	WCT	2012	McCool Creek		MCCR	3.93
Fish	Muscle	WCT	2012	Elk Lakes	e	EL14	3.95
Fish	Muscle	WCT	2006	Elk Lakes	e	EL14	4.00
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	4.00
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	4.00
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	4.00
Fish	Muscle	WCT	2012	McCool Creek		MCCR	4.07
Fish	Muscle	WCT	2003	Alexander Creek		AC	4.09
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.10
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.10
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.10
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	4.10
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	4.10
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	4.10
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	4.10
Fish	Muscle	WCT	2012	Bull River		BU2	4.20
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.20
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.30
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	4.30
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	4.30
Fish	Muscle	WCT	2012	Bull River		BU2	4.40
Fish	Muscle	WCT	2006	Elk Lakes	e	EL14	4.40
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	4.40
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	4.40
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.50
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	4.50
Fish	Muscle	WCT	2009	Harvey Creek		HV	4.50
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.60
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.60
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.60
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.60
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	4.60
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	4.60
Fish	Muscle	WCT	2009	Harvey Creek		HV	4.60
Fish	Muscle	WCT	2012	McCool Creek		MCCR	4.77
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.80
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	4.80
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	4.80
Fish	Muscle	WCT	2008	Foisey Creek		FOI	4.90
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	4.90
Fish	Muscle	WCT	2006	Elk Lakes	e	EL14	5.00
Fish	Muscle	WCT	2008	Foisey Creek		FOI	5.00
Fish	Muscle	WCT	2008	Foisey Creek		FOI	5.00
Fish	Muscle	WCT	2008	Foisey Creek		FOI	5.00
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	5.00
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.00
Fish	Muscle	WCT	2003	Alexander Creek		AC	5.09
Fish	Muscle	WCT	2008	Foisey Creek		FOI	5.10
Fish	Muscle	WCT	2008	Foisey Creek		FOI	5.10
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	5.10
Fish	Muscle	WCT	2008	Foisey Creek		FOI	5.20
Fish	Muscle	WCT	2008	Foisey Creek		FOI	5.20
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.20
Fish	Muscle	WCT	2009	North Fork Flathead River		NFR	5.20
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.30

Notes: No outliers were identified. Q3+1.5(IQR) = 6.68 and 8.15 on the untransformed and log scale, respectfully

Table HWCT.4: Reference Tissue Selenium Concentrations for Westslope Cutthroat Trout Muscle in the Elk Valley, 1998 - 2012

Tissue Type	Tissue sub-type	Species	Year	Area Description	Lentic (e)	Biological Area Code	Selenium (mg/kg dw)
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.30
Fish	Muscle	WCT	2012	Alexander Creek		AX1	5.37
Fish	Muscle	WCT	2012	Elk Lakes	e	EL14	5.37
Fish	Muscle	WCT	2008	Foisey Creek		FOI	5.40
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.40
Fish	Muscle	WCT	2003	Alexander Creek		AC	5.41
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.50
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.50
Fish	Muscle	WCT	2009	McLatchie Creek		MCL	5.50
Fish	Muscle	WCT	2012	Alexander Creek		AX1	5.57
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.60
Fish	Muscle	WCT	2012	Alexander Creek		AX1	5.65
Fish	Muscle	WCT	2012	Alexander Creek		AX1	5.72
Fish	Muscle	WCT	2012	Elk Lakes	e	EL14	5.74
Fish	Muscle	WCT	2012	Hartley Lake		HART	5.80
Fish	Muscle	WCT	2012	Alexander Creek		AX1	5.81
Fish	Muscle	WCT	2012	Hartley Lake	e	HART	5.83
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	5.90
Fish	Muscle	WCT	2008	Foisey Creek		FOI	6.00
Fish	Muscle	WCT	2012	Hartley Lake		HART	6.33
Fish	Muscle	WCT	2008	Lodgepole Creek		LPO	6.40
Fish	Muscle	WCT	2008	Flathead River (BC)		FR	6.70
Fish	Muscle	WCT	2012	Hartley Lake	e	HART	6.78
Fish	Muscle	WCT	2012	Hartley Lake	e	HART	6.84

Notes: No outliers were identified. Q3+1.5(IQR) = 6.68 and 8.15 on the untransformed and log scale, respectfully

Tissue Type	Tissue sub-type	Species	Year	Summary Statistic		Biological Area Code	Se (mg/kg dw)
Fish	Muscle	WCT	All	Minimum		All Reference	1.00
Fish	Muscle	WCT	All	2.5th Percentile		All Reference	1.30
Fish	Muscle	WCT	All	25th Percentile		All Reference	3.00
Fish	Muscle	WCT	All	Median		All Reference	3.60
Fish	Muscle	WCT	All	75th Percentile		All Reference	4.48
Fish	Muscle	WCT	All	97.5th Percentile		All Reference	5.98
Fish	Muscle	WCT	All	Maximum		All Reference	6.84
Fish	Muscle	WCT	All	Mean		All Reference	3.67
Fish	Muscle	WCT	All	Standard Deviation		All Reference	1.25

Estimate of reference area normal range

Table HWCT.5: Reference Tissue Selenium Concentrations for Westslope Cutthroat Trout Muscle Samples in the Elk Valley for Lentic and Lotic Habitats, 1998 - 2012

Habitat Type	Sample Size	Units	Minimum	2.5th Percentile	25th Percentile	Median	75th Percentile	97.5th Percentile	Maximum	Mean	Standard Deviation	95% CI on the 97.5th percentile
Lentic	54	mg/kg dw	1.00	1.17	1.51	2.25	3.48	6.47	6.84	2.68	1.48	5.20 - 8.41 [a]
Lotic	156	mg/kg dw	2.50	2.60	3.30	3.80	4.64	5.91	6.70	4.02	0.94	5.78 - 6.55 [a]
All	210	mg/kg dw	1.00	1.30	3.00	3.60	4.48	5.98	6.84	3.67	1.25	-

Note: No Outliers were Identified.

[a] 95% confidence intervals on the 97.5th percentiles for lentic and lotic habitat overlap (there is no significant difference ($\alpha = 0.05$) between the 97.5th percentiles) assuming a log-normal distribution

Estimate of reference area normal range

Table HWCT.6: Selenium Concentrations in Westslope Cutthroat Trout Muscle Collected in the Elk River Valley in May and August 2015

Area	May		August	
	Sample ID	Selenium mg/kg dry wt		Sample ID
Henretta Lake	HE27-WCT-01	**8.6**	**8.4**	HE27-WCT-A1
	HE27-WCT-03	**12.7**	**7.6**	HE27-WCT-A2
	HE27-WCT-04	**13.6**	**13.8**	HE27-WCT-A3
	HE27-WCT-06	**13.7**	**12.6**	HE27-WCT-A4
	HE27-WCT-09	**16.8**	**10.3**	HE27-WCT-A5
	HE27-WCT-09 (ovary)	**27.5**	-	-
Upper Fording River	UFR-WCT-01	**12.9**	**10.8**	UFR-WCT-A2
	UFR-WCT-02	**10.8**	**8.7**	UFR-WCT-A7
	UFR-WCT-03	**7.9**	**9.3**	UFR-WCT-A8
	UFR-WCT-04	**10.9**	**8.3**	UFR-WCT-A9
	UFR-WCT-05	**9.6**	**10.8**	UFR-WCT-A10
	UFR-WCT-06	**13.7**	**11.5**	UFR-WCT-A12
	UFR-WCT-07	**10.7**	**6.9**	UFR-WCT-A13
	UFR-WCT-08	**10.5**	**9.0**	UFR-WCT-A14
	UFR-WCT-09	**10.2**	**8.9**	UFR-WCT-A15
	UFR-WCT-10	**9.3**	-	-
Lower Fording River	LFR-WCT-01	**10.5**	**7.4**	LFR-WCT-A1
	LFR-WCT-02	**10.1**	**8.2**	LFR-WCT-A2
	LFR-WCT-03	**11.5**	**9.6**	LFR-WCT-A3
	LFR-WCT-04	**7.3**	**10.9**	LFR-WCT-A4
	LFR-WCT-05	**6.7**	**9.6**	LFR-WCT-A5
Upper Elk River	UER-WCT-01	**6.2**	4.8	UER-WCT-A1
	UER-WCT-02	4.1	5.0	UER-WCT-A2
	UER-WCT-03	**6.0**	5.0	UER-WCT-A3
	UER-WCT-04	5.0	5.9	UER-WCT-A4
	UER-WCT-05	5.2	5.5	UER-WCT-A6
Middle Elk River	MER-WCT-1	**8.7**	**8.4**	MER-WCT-A1
	MER-WCT-2	**7.9**	**7.0**	MER-WCT-A2
	MER-WCT-3	**8.1**	**6.2**	MER-WCT-A3
	MER-WCT-4	**7.6**	**6.3**	MER-WCT-A4
	MER-WCT-5	5.7	5.8	MER-WCT-A5
Lower Elk River	LER-WCT-01	**8.0**	**8.6**	LER-WCT-A2
	LER-WCT-02	**8.1**	**7.4**	LER-WCT-A3
	LER-WCT-03	**6.3**	**6.5**	LER-WCT-A4
	LER-WCT-04	4.5	**8.5**	LER-WCT-A5
	LER-WCT-05[a]	-	**6.7**	LER-WCT-A6
Upper Michel Creek	MCU-WCT-01	4.5	**6.2**	MCU-WCT-A2
	MCU-WCT-02	5.5	**6.1**	MCU-WCT-A3
	MCU-WCT-03	5.6	4.8	MCU-WCT-A4
	MCU-WCT-04	5.4	5.1	MCU-WCT-A5
	MCU-WCT-05	**7.8**	**6.7**	MCU-WCT-A6
Lower Michel Creek	MCL-WCT-01	6.0	**6.7**	MCL-WCT-A1
	MCL-WCT-02	**6.6**	**7.1**	MCL-WCT-A2
	MCL-WCT-03	**6.4**	**6.8**	MCL-WCT-A4
	MCL-WCT-04	**7.5**	**8.1**	MCL-WCT-A5
	MCL-WCT-05	**7.6**	**8.8**	MCL-WCT-A6
	MCL-WCT-06	4.9	-	-
	MCL-WCT-07	5.1	-	-

Values > site-specific BM of 15.5 (Derived from ovary BM as shown in Table 2.3)

Bold Values > NR of 5.98

[a] LER-WCT-05 lost during freeze drying.

Table HWCT.7: Spearman Correlation Between Westslope Cutthroat Trout Health Endpoints and Tissue Selenium Concentrations, 2015

Species	Endpoint	Tissue Se Concentration								
		Ovary			Muscle			Whole Body		
		n	r_s	p	n	r_s	p	n	r_s	p
Westslope Cutthroat Trout	Length	-	-	-	90	0.101	0.346	-	-	-
	Body Weight	-	-	-	90	0.112	0.294	-	-	-
	Fulton's Condition Factor (K)	-	-	-	90	0.009	0.933	-	-	-

P-value < 0.05

Table HWCT.8: Results of the Temporal Analysis of Selenium Concentrations in Westslope Cutthroat Trout Muscle Samples, 2006 - 2015

Area	Period	Statistic	n	Value	Test	P-value	Pairwise Comparisons [a]
Henretta Lake	2006 Aug	Mean	1	5.32	ANOVA	0.071	A
	2009 Spring		5	9.03			A
	2012 Spring		5	10.74			A
	2015 Spring		5	13.08			A
	2015 Aug		5	10.54			A
Lower Elk River	2006 Spring	Mean	5	4.97	ANOVA	0.038	B
	2009 Spring		4	5.99			AB
	2012 Spring		5	5.84			AB
	2015 Spring		4	6.71			AB
	2015 Aug		5	7.55			A
Middle Elk River	2012 Spring	Median	5	10.65	K-W	0.482	A
	2015 Spring		5	6.26			A
	2015 Aug		5	7.93			A
Lower Michel Creek	2006 Spring	Mean	10	4.64	ANOVA	<0.001	B
	2009 Spring		10	7.14			A
	2012 Spring		10	5.94			AB
	2015 Spring		7	6.29			A
	2015 Aug		8	7.49			A
Upper Michel Creek	2006 Spring	Median	4	4.70	K-W	0.104	A
	2015 Spring		5	6.05			A
	2015 Aug		5	5.47			A
Lower Fording River	2006 Spring	Mean	8	9.04	ANOVA	0.575	A
	2009 Spring		5	9.66			A
	2009 Sept		5	12.10			A
	2012 Spring		10	8.79			A
	2015 Spring		5	9.21			A
	2015 Aug		5	9.13			A
Upper Fording River	2006 Spring	Median	2	8.93	K-W	0.283	A
	2012 Spring		5	10.62			A
	2015 Spring		10	10.60			A
	2015 Aug		9	9.02			A

P-value < 0.05

Notes: "K-W" = Kruskal-Wallis test

[a] Time periods that share a letter are not significantly different from each other (Tukey's Honestly Significant Differences method for ANOVA and Dunn's test for the Kruskal-Wallis test)

Table HWCT.9: ANOVA Table for the Temporal Analysis of log_{10}(Selenium) in Westslope Cutthroat Trout for the Lower Elk River Sampled in Spring 2006 - 2015

Source	DF	Adj SS	MS	F-Statistic	P-Value
Year	3	0.0336	0.0112	1.14	0.369
Error	14	0.138	0.00986		

P-value < 0.05

Table HWCT.10: Measurements for Westslope Cutthroat Trout Collected for the RAEMP in the Elk Valley, May 2015

Area	Processing Date	UTM (NAD83, 11U)		Fish ID	Total Length	Fork Length	Body Weight	Sex[a]	Fulton's Condition Factor	Abnormalities	Fate / Floy Tag Number	Tissue Collected
		Easting	Northing		(cm)	(cm)	(g)		(K)			
Henretta Lake	6-May-15	652588	5566323	HE27-WCT-01	50.0	47.7	1,210	U	1.11	-	released	muscle plug
	11-May-15	652588	5566323	HE27-WCT-02	44.0	42.0	1,060	U	1.43	growth on tail	140	muscle plug
	11-May-15	652588	5566323	HE27-WCT-03	44.2	42.8	1,040	U	1.33	-	released	muscle plug
	11-May-15	652588	5566323	HE27-WCT-04	39.2	37.5	790	U	1.50	-	released	muscle plug
	11-May-15	652588	5566323	HE27-WCT-05	43.5	41.9	1,090	M	1.48	scar on left side	0143, 0144	muscle plug
	11-May-15	652588	5566323	HE27-WCT-06	39.5	37.7	705	U	1.32	-	130	muscle plug
	11-May-15	652588	5566323	HE27-WCT-07	34.3	33.0	440	U	1.22	-	1077, 1078	-
	11-May-15	652588	5566323	HE27-WCT-08	40.0	38.7	830	U	1.43	-	256	-
	11-May-15	652588	5566323	HE27-WCT-09	33.0	32.1	405	U	1.22	-	retained	muscle plug, ovary
Upper Fording River	11-May-15	655314	5552947	UFR-WCT-01	36.4	34.8	545	U	1.29	-	released	muscle plug
	11-May-15	655314	5552947	UFR-WCT-02	34.2	32.8	410	U	1.16	-	released	muscle plug
	11-May-15	655314	5552947	UFR-WCT-03	35.4	34.0	455	U	1.16	-	released	muscle plug
	11-May-15	655314	5552947	UFR-WCT-04	33.9	32.2	385	U	1.15	-	released	muscle plug
	11-May-15	655314	5552947	UFR-WCT-05	32.1	30.3	315	M	1.13	-	released	muscle plug
	12-May-15	654801	5553344	UFR-WCT-06	33.5	31.8	385	U	1.20	-	released	muscle plug
	12-May-15	654801	5553344	UFR-WCT-07	37.5	36.1	550	U	1.17	-	released	muscle plug
	12-May-15	654801	5553344	UFR-WCT-08	36.6	34.8	505	M	1.20	-	released	muscle plug
	12-May-15	654801	5553344	UFR-WCT-09	38.7	37.3	640	U	1.23	-	released	muscle plug
	12-May-15	654801	5553344	UFR-WCT-10	35.8	34.2	507	U	1.27	-	released	muscle plug
Lower Fording River	8-May-15	652943	5528925	LFR-WCT-01	35.1	33.7	475	U	1.24	-	released	muscle plug
	8-May-15	652866	5528400	LFR-WCT-02	28.6	27.3	235	U	1.15	-	released	muscle plug
	9-May-15	652943	5528925	LFR-WCT-03	39.0	37.5	680	M	1.29	-	released	muscle plug
	10-May-15	651857	5540476	LFR-WCT-04	32.0	30.7	310	U	1.07	-	released	muscle plug
	12-May-15	652943	5528925	LFR-WCT-05	42.4	40.8	950	U	1.40	cut dorsal fin, abnormal jaw	released	muscle plug
Upper Michel Creek	12-May-15	659987	5501136	MCU-WCT-01	36.3	35.2	555	M	1.27	-	released	muscle plug
	13-May-15	659987	5501136	MCU-WCT-02	43.6	42.2	825	M	1.10	-	released	muscle plug
	13-May-15	659892	5501053	MCU-WCT-03	36.4	34.6	500	U	1.21	-	released	muscle plug
	13-May-15	660465	5493129	MCU-WCT-04	30.7	28.8	275	U	1.15	-	released	muscle plug
	13-May-15	660465	5493129	MCU-WCT-05	38.8	37.2	645	M	1.25	-	released	muscle plug
Lower Michel Creek	5-May-15	653526	5511322	MCL-WCT-01	34.8	33.6	490	U	1.29	short operculum	released	muscle plug
	5-May-15	653526	5511322	MCL-WCT-02	34.2	32.8	440	U	1.25	-	released	muscle plug
	5-May-15	653505	5511274	MCL-WCT-03	44.0	42.4	790	M	1.04	-	released	muscle plug
	5-May-15	653526	5511322	MCL-WCT-04	33.0	31.0	385	U	1.29	-	released	muscle plug
	7-May-15	659477	5505204	MCL-WCT-05	33.6	31.7	428	M	1.34	-	released	muscle plug
	7-May-15	659477	5505204	MCL-WCT-06	27.8	26.4	206	U	1.12	abnormal jaw	released	muscle plug
	7-May-15	659477	5505204	MCL-WCT-07	31.6	29.9	345	U	1.29	-	released	muscle plug
Upper Elk River	9-May-15	650159	5536414	UER-WCT-01	39.9	37.5	610	U	1.16	abnormal jaw	released	muscle plug
	9-May-15	650029	5536019	UER-WCT-02	41.3	39.2	710	U	1.18	abnormal jaw, gash on side	released	muscle plug
	10-May-15	649276	5542238	UER-WCT-03	36.9	35.2	555	U	1.27	-	released	muscle plug
	10-May-15	649276	5542238	UER-WCT-04	30.2	28.3	282	U	1.24	-	released	muscle plug
	10-May-15	649276	5542238	UER-WCT-05	32.0	29.9	300	U	1.12	nasal dent	released	muscle plug
Middle Elk River	8-May-15	652270	5518098	MER-WCT-01	34.5	32.3	415	U	1.23	-	released	muscle plug
	8-May-15	652270	5518098	MER-WCT-02	32.4	30.3	345	U	1.24	-	released	muscle plug
	8-May-15	652412	5518151	MER-WCT-03	35.3	33.6	475	U	1.25	-	released	muscle plug
	10-May-15	652902	5520239	MER-WCT-04	38.7	36.8	625	M	1.25	-	released	muscle plug
	10-May-15	652902	5520239	MER-WCT-05	45.4	43.2	1,025	M	1.27	-	released	muscle plug
Lower Elk River	7-May-15	644561	5469348	LER-WCT-01	26.1	24.4	190	U	1.31	-	released	muscle plug
	7-May-15	644561	5469348	LER-WCT-02	41.8	39.9	650	M	1.02	-	released	muscle plug
	7-May-15	644561	5469348	LER-WCT-03	39.6	37.4	720	U	1.38	abnormal jaw	released	muscle plug
	7-May-15	644561	5469348	LER-WCT-04	31.7	30.0	345	U	1.28	-	released	muscle plug
	7-May-15	644561	5469348	LER-WCT-05	37.1	34.6	525	U	1.27	-	released	muscle plug

[a] The majority of the fish were designated as U (unknown) sex as we could only confirm male (M) or female (F), if gametes were released with gentle pressure of the abdomen of the fish

Table HWCT.11: Measurements for Westslope Cutthroat Trout Collected for the RAEMP in the Elk Valley, August 2015

Area	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Sex[a]	Fulton's Condition Factor (K)	Abnormalities	Fate / Floy Tag Number	Tissue Collected
Henretta Lake	20-Aug-15	radiotagged	-	-	-	-	-	-	released	-
	20-Aug-15	0141	39.5	37.8	>600		-	Shortened operculum, red spot on head	released	-
	20-Aug-15	HE27-WCT-A1	38.5	37.3	610	U	1.18	-	released	muscle plug
	25-Aug-15	HE27-WCT-A2	33.0	32.0	415	U	1.27	-	released	muscle plug
	25-Aug-15	HE27-WCT-A3	36.1	34.3	640	U	1.59	-	released	muscle plug
	25-Aug-15	HE27-WCT-A4	40.4	39.0	815	U	1.37	-	released	muscle plug
	25-Aug-15	HE27-WCT-A5	40.0	38.3	770	U	1.37	shortened operculum	released	muscle plug
Upper Fording River	20-Aug-15	UFR-WCT-A1	27.6	26.3	210	U	1.15	-	released	muscle plug
	20-Aug-15	UFR-WCT-A2	30.0	28.2	270	U	1.20	-	released	muscle plug
	20-Aug-15	UFR-WCT-A3	25.4	24.2	160	U	1.13	-	released	muscle plug
	20-Aug-15	UFR-WCT-A4	28.4	27.0	225	U	1.14	-	released	muscle plug
	20-Aug-15	UFR-WCT-A5	26.5	25.5	205	U	1.24	-	released	muscle plug
	20-Aug-15	UFR-WCT-A6	27.0	25.8	215	U	1.25	shortened operculum	released	muscle plug
	20-Aug-15	UFR-WCT-A7	29.7	28.2	258	U	1.15	-	released	muscle plug
	20-Aug-15	UFR-WCT-A8	36.7	35.5	505	U	1.13	-	released	muscle plug
	23-Aug-15	UFR-WCT-A9	27.9	26.6	240	U	1.28	-	released	muscle plug
	23-Aug-15	UFR-WCT-A10	36.5	35.2	520	U	1.19	-	released	muscle plug
	23-Aug-15	UFR-WCT-A11	30.5	29.2	310	U	1.25	hook in mouth, got away (bait on hook)	released	-
	23-Aug-15	UFR-WCT-A12	31.3	30.2	335	U	1.22	-	released	muscle plug
	23-Aug-15	UFR-WCT-A13	38.5	37.6	700	U	1.32	tears in mouth from being hooked	released	muscle plug
	23-Aug-15	UFR-WCT-A14	34.2	33.4	510	U	1.37	shortened opercula, both sides	released	muscle plug
	23-Aug-15	UFR-WCT-A15	35.6	34.5	500	U	1.22	-	released, #0886	muscle plug
Lower Fording River	22-Aug-15	LFR-WCT-A1	43.0	41.1	930	U	1.34	-	released	muscle plug
	22-Aug-15	LFR-WCT-A2	33.3	32.0	385	U	1.17	messed up jaw	released	muscle plug
	22-Aug-15	LFR-WCT-A3	32.3	31.0	405	U	1.36	-	released	muscle plug
	23-Aug-15	LFR-WCT-A4	40.2	38.6	685	U	1.19	scar on corner of mouth	released	muscle plug
	23-Aug-15	LFR-WCT-A5	32.3	30.9	405	U	1.37	scar on mouth	released	muscle plug
Upper Michel Creek	21-Aug-15	MCU-WCT-A1	28.0	26.8	247	U	1.28	-	released	muscle plug
	21-Aug-15	MCU-WCT-A2	40.0	38.7	645	U	1.11	-	released	muscle plug
	21-Aug-15	MCU-WCT-A3	34.5	32.8	430	U	1.22	-	released	muscle plug
	21-Aug-15	MCU-WCT-A4	29.5	28.0	290	U	1.32	-	released	muscle plug
	21-Aug-15	MCU-WCT-A5	38.8	36.7	610	U	1.23	-	released	muscle plug
	25-Aug-15	MCU-WCT-A6	39.5	37.6	595	U	1.12	mangled jaw	released	muscle plug
Lower Michel Creek	21-Aug-15	MCL-WCT-A1	31.8	30.2	340	U	1.23	gash on mouth	released	muscle plug
	21-Aug-15	MCL-WCT-A2	34.7	33.2	490	U	1.34	-	released	muscle plug
	21-Aug-15	MCL-WCT-A3	27.2	25.8	222	U	1.29	-	released	muscle plug
	21-Aug-15	MCL-WCT-A4	33.7	32.3	405	U	1.20	-	released	muscle plug
	25-Aug-15	MCL-WCT-A5	33.6	32.2	455	U	1.36	-	released	muscle plug
	25-Aug-15	MCL-WCT-A6	34.3	32.8	450	U	1.28	slightly shortened operculum	released	muscle plug
Upper Elk River	22-Aug-15	UER-WCT-A1	31.6	30.0	365	U	1.35	-	released	muscle plug
	22-Aug-15	UER-WCT-A2	31.2	29.9	355	U	1.33	-	released	muscle plug
	23-Aug-15	UER-WCT-A3	33.4	31.4	400	U	1.29	-	released	muscle plug
	23-Aug-15	UER-WCT-A4	32.6	31.2	400	U	1.32	-	released	muscle plug
	23-Aug-15	UER-WCT-A5	33.5	32.0	390	U	1.19	-	released	muscle plug
	23-Aug-15	UER-WCT-A6	36.1	33.8	520	U	1.35	-	released	muscle plug
Middle Elk River	25-Aug-15	MER-WCT-A1	42.9	41.3	930	U	1.32	messed up jaw	released	muscle plug
	25-Aug-15	MER-WCT-A2	30.1	28.5	300	U	1.30	-	released	muscle plug
	25-Aug-15	MER-WCT-A3	37.0	35.2	550	U	1.26	-	released	muscle plug
	25-Aug-15	MER-WCT-A4	38.3	36.4	550	U	1.14	-	released	muscle plug
	25-Aug-15	MER-WCT-A5	37.0	35.2	580	U	1.33	-	released	muscle plug
Lower Elk River	24-Aug-15	LER-WCT-A1	29.8	27.9	240	U	1.11	-	released	muscle plug
	24-Aug-15	LER-WCT-A2	37.0	34.8	515	U	1.22	-	released	muscle plug
	24-Aug-15	LER-WCT-A3	43.7	41.7	890	U	1.23	-	released	muscle plug
	24-Aug-15	LER-WCT-A4	38.8	37.0	610	U	1.20	-	released	muscle plug
	24-Aug-15	LER-WCT-A5	33.4	31.6	380	U	1.20	-	released	muscle plug
	24-Aug-15	LER-WCT-A6	33.1	31.4	440	U	1.42	-	released	muscle plug

[a] The majority of the fish were designated as U (unknown) sex as we could only confirm male (M) or female (F), if gametes were released with gentle pressure of the abdomen of the fish

Table HWCT.12: Metal Concentrations in Westslope Cutthroat Trout Muscle Collected in the Elk River Valley in May 2015

Area	Sample ID	Total Dry Mass	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe
		(g)	(%)	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Henretta Lake	HE27-WCT-01	0.0131	81%	0.027	9.4	0.064	<0.19	1.5	<0.0079	0.00070	3,840	0.010	0.20	0.33	0.029	1.4	47
	HE27-WCT-03	0.0151	75%	<0.0016	1.8	0.10	<0.15	0.35	<0.0062	<0.00046	1,810	0.0045	0.21	0.43	0.038	1.1	23
	HE27-WCT-04	0.0088	75%	<0.0020	111	0.048	<0.18	2.5	<0.0077	0.00093	616	0.0089	0.23	0.31	0.045	1.2	41
	HE27-WCT-06	0.0101	74%	0.030	12	0.17	<0.21	1.3	<0.0089	0.0023	1,060	0.0078	0.27	0.92	0.039	1.4	90
	HE27-WCT-09	2.8955	76%	0.00033	3.5	0.044	<0.18	0.076	<0.0029	0.00029	313	0.0035	0.14	0.079	0.049	1.7	18
	HE27-WCT-09 (ovary)	15.0091	60%	0.012	0.46	0.043	<0.18	0.60	<0.0029	0.00018	1,410	0.0053	0.25	0.065	0.0083	4.1	36
Upper Fording River	UFR-WCT-01	0.0161	73%	<0.0014	2.1	0.14	<0.13	0.19	<0.0053	<0.00040	743	0.0057	0.083	0.42	0.0082	0.93	16
	UFR-WCT-02	0.0188	73%	<0.0012	2.5	0.20	<0.11	0.34	<0.0047	<0.00035	835	0.0053	0.093	0.19	0.010	1.6	18
	UFR-WCT-03	0.0166	74%	<0.0014	8.6	0.10	<0.12	0.27	<0.0052	<0.00039	1,250	0.0031	0.073	0.18	0.015	1.4	29
	UFR-WCT-04	0.0158	73%	<0.0014	0.94	0.20	<0.13	0.20	<0.0055	<0.00041	831	0.0048	0.069	0.16	0.016	1.4	16
	UFR-WCT-05	0.0096	71%	<0.0023	9.2	0.16	<0.21	0.19	<0.0089	<0.00066	379	0.0059	0.072	0.20	0.013	1.4	17
	UFR-WCT-06	0.0160	75%	<0.0014	8.4	0.17	<0.13	0.46	<0.0054	<0.00040	1,370	0.0057	0.041	0.38	0.012	1.3	18
	UFR-WCT-07	0.0131	69%	<0.0017	28	0.072	<0.16	0.59	<0.0066	<0.00050	1,250	0.0039	0.12	0.31	0.015	1.5	31
	UFR-WCT-08	0.0144	75%	<0.0016	6.8	0.061	<0.14	0.11	<0.0061	<0.00045	276	0.0049	0.064	0.12	0.0096	1.5	19
	UFR-WCT-09	0.0163	74%	<0.0014	13	0.046	<0.13	0.17	<0.0054	<0.00040	302	0.0040	0.088	0.12	0.011	1.5	19
	UFR-WCT-10	0.0131	71%	<0.0017	1.7	0.032	<0.16	0.22	<0.0066	<0.00049	1,000	0.0043	0.062	0.14	0.013	1.2	17
Lower Fording River	LFR-WCT-01	0.0067	75%	<0.0034	7.5	0.11	<0.31	0.17	<0.013	<0.00097	794	0.013	0.056	1.0	0.021	3.2	28
	LFR-WCT-02	0.0121	77%	<0.0019	7.3	0.087	<0.17	0.21	<0.0071	0.0013	735	0.0058	0.072	0.15	0.022	1.1	15
	LFR-WCT-03	0.0180	74%	0.0072	105	0.14	0.16	1.4	0.0049	0.00066	3,560	0.0058	0.079	0.27	0.028	1.3	66
	LFR-WCT-04	0.0158	78%	<0.0014	20	0.11	<0.13	0.68	<0.0055	0.00050	2,300	0.0084	0.050	0.70	0.020	1.3	32
	LFR-WCT-05	0.0130	79%	<0.0018	19	0.066	<0.16	1.0	<0.0067	<0.00050	2,430	0.0045	0.035	0.33	0.045	1.3	31
Upper Elk River	UER-WCT-01	0.0116	83%	<0.0020	6.8	0.37	<0.18	2.4	<0.0077	<0.00058	5,800	0.027	0.044	0.67	0.039	0.94	18
	UER-WCT-02	0.0093	79%	<0.0025	1.8	0.54	<0.23	0.76	<0.0096	<0.00072	2,980	0.0058	0.027	0.22	0.043	1.1	18
	UER-WCT-03	0.0101	75%	<0.0023	5.5	0.36	<0.20	0.69	<0.0086	<0.00064	3,150	0.0069	0.054	0.54	0.020	1.5	18
	UER-WCT-04	0.0066	77%	<0.0036	6.4	0.27	<0.33	0.44	<0.014	<0.0010	2,990	<0.0058	0.088	0.45	0.027	1.1	17
	UER-WCT-05	0.0099	73%	<0.0024	26	0.24	<0.22	0.86	<0.0092	0.00072	2,220	0.013	0.027	0.54	0.041	1.0	23
Middle Elk River	MER-WCT-1	0.0106	75%	<0.0021	8.1	0.26	<0.19	0.33	<0.0080	0.00060	1,280	0.0064	0.078	0.60	0.033	0.94	16
	MER-WCT-2	0.0166	76%	0.029	9.9	0.094	0.22	0.48	<0.0056	0.00065	3,000	0.0044	0.12	0.37	0.041	1.5	25
	MER-WCT-3	0.0152	75%	0.0084	67	0.24	<0.15	0.92	<0.0061	0.00076	1,960	0.013	0.083	0.46	0.035	2.0	53
	MER-WCT-4	0.0194	75%	<0.0013	1.9	0.15	<0.11	0.64	<0.0048	<0.00036	1,970	0.0045	0.033	0.79	0.025	1.3	20
	MER-WCT-5	0.0136	69%	<0.00085	9.7	0.24	<0.30	0.42	<0.0038	<0.00091	1,450	0.0077	0.048	0.28	0.020	1.2	20
Lower Elk River[a]	LER-WCT-01	0.0070	75%	<0.0036	5.1	0.070	<0.32	1.5	<0.014	<0.0010	5,850	<0.0057	0.050	0.81	0.011	0.97	15
	LER-WCT-02	0.0072	79%	0.0047	21	0.40	<0.31	1.3	<0.013	<0.00098	2,640	0.016	0.034	1.3	0.012	2.5	49
	LER-WCT-03	0.0140	72%	<0.0017	21	0.20	<0.16	0.43	<0.0066	0.00066	882	0.0067	0.032	0.75	0.013	1.3	23
	LER-WCT-04	0.0084	75%	<0.0027	29	0.085	<0.24	1.9	<0.010	<0.00076	4,070	0.010	0.039	0.18	0.014	0.63	17
Upper Michel Creek	MCU-WCT-01	0.0129	75%	<0.0018	0.70	0.11	<0.16	0.39	<0.0068	<0.00051	1,430	0.0046	0.035	0.34	0.017	1.3	16
	MCU-WCT-02	0.0120	80%	<0.0019	1.5	0.13	<0.17	0.044	<0.0073	<0.00054	305	0.010	0.044	0.27	0.022	1.0	24
	MCU-WCT-03	0.0140	76%	<0.0017	6.4	0.10	<0.15	0.70	<0.0063	<0.00047	2,570	0.0079	0.040	0.23	0.023	1.3	16
	MCU-WCT-04	0.0166	77%	<0.0014	0.84	0.17	<0.13	0.47	<0.0054	<0.00040	1,770	0.035	0.063	0.34	0.028	1.4	15
	MCU-WCT-05	0.0178	75%	<0.0013	1.8	0.12	<0.12	0.12	<0.0049	<0.00036	523	0.0037	0.13	0.17	0.020	1.3	27
Lower Michel Creek	MCL-WCT-01	0.0085	72%	<0.0028	3.8	0.065	<0.26	0.16	<0.011	<0.00080	823	0.0082	0.056	0.44	0.015	0.91	12
	MCL-WCT-02	0.0110	64%	<0.0021	5.6	0.053	<0.19	0.10	<0.0080	<0.00060	428	0.0091	0.040	0.97	0.026	1.3	25
	MCL-WCT-03	0.0106	82%	0.050	29	0.16	0.50	0.88	<0.0093	0.0016	990	0.013	0.11	0.57	0.038	1.7	44
	MCL-WCT-04	0.0265	51%	0.017	27	0.072	<0.17	0.49	<0.0069	0.00064	1,086	0.0075	0.060	0.73	0.018	1.9	29
	MCL-WCT-05	0.0152	71%	<0.0016	10	0.069	<0.14	0.33	<0.0060	<0.00045	907	0.019	0.053	0.29	0.019	1.5	18
	MCL-WCT-06	0.0055	66%	0.21	7.8	0.079	<0.37	0.65	<0.015	<0.0012	3,860	0.0078	0.070	1.3	0.016	1.0	19
	MCL-WCT-07	0.0149	76%	0.0074	1.8	0.11	<0.15	0.36	<0.0061	0.00056	1,010	0.0046	0.050	0.49	0.019	1.1	13

[a] LER-WCT-05 lost during freeze drying.

Table HWCT.12: Metal Concentrations in Westslope Cutthroat Trout Muscle Collected in the Elk River Valley in May 2015

Area	Sample ID	Ga	Hg	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Rb	Re	Sb	Se	Sn
		mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Henretta Lake	HE27-WCT-01	0.0049	0.064	13,500	0.15	898	1.6	0.048	2,080	1.0	10,900	0.049	5.6	<0.00039	0.0049	8.6	0.013
	HE27-WCT-03	0.0030	0.017	14,300	0.057	816	0.72	0.014	2,260	0.27	9,250	0.017	6.5	<0.00031	<0.0018	13	0.0023
	HE27-WCT-04	0.038	0.029	10,000	0.067	723	0.61	0.0099	1,520	0.40	6,760	0.12	6.7	<0.00038	0.0061	14	0.0069
	HE27-WCT-06	0.0073	0.027	15,000	0.13	872	2.4	0.080	2,680	0.56	9,140	1.4	8.3	<0.00044	0.064	14	0.0075
	HE27-WCT-09	0.0052	0.036	19,500	0.070	1,170	0.54	0.0058	755	0.047	10,700	0.017	9.5	<0.000084	0.0015	17	0.0034
	HE27-WCT-09 (ovary)	0.0049	0.0030	4,740	0.047	1,770	2.1	0.025	1,600	0.053	11,800	0.0039	3.2	<0.00083	0.0013	28	0.00072
Upper Fording River	UFR-WCT-01	0.0043	0.014	16,300	0.038	955	0.67	0.010	1,550	0.27	9,950	0.024	4.2	<0.00027	0.0023	13	0.0041
	UFR-WCT-02	0.013	0.0073	15,700	0.044	918	0.65	0.032	1,350	0.14	9,990	0.010	5.6	<0.00023	<0.0014	11	0.0021
	UFR-WCT-03	0.0085	0.026	16,600	0.099	891	0.88	0.0065	1,460	0.14	9,630	0.023	7.3	<0.00026	0.028	7.9	0.0051
	UFR-WCT-04	0.0048	0.011	15,800	0.033	977	0.54	0.021	1,400	0.11	10,200	0.015	6.4	<0.00027	<0.0016	11	0.0056
	UFR-WCT-05	0.0096	0.019	16,100	0.055	971	0.59	0.0061	1,800	0.14	9,000	0.025	5.8	<0.00044	<0.0026	9.6	0.0063
	UFR-WCT-06	0.0063	0.020	17,500	0.071	1,060	0.90	0.012	1,180	0.22	10,600	0.031	5.5	<0.00027	0.0035	14	0.0032
	UFR-WCT-07	0.014	0.013	15,800	0.11	959	1.1	0.0071	1,230	0.23	9,910	0.023	3.8	<0.00033	<0.0020	11	0.0043
	UFR-WCT-08	0.0063	0.012	14,600	0.070	952	0.61	0.0064	1,520	0.069	9,040	0.023	4.3	<0.00030	0.0037	11	0.0060
	UFR-WCT-09	0.0079	0.016	14,300	0.070	885	0.62	0.0075	1,630	0.095	8,860	0.022	4.6	<0.00027	0.0018	10	0.0056
	UFR-WCT-10	0.0047	0.014	15,400	0.081	958	0.71	0.0070	1,630	0.13	9,530	0.033	5.5	<0.00033	0.0026	9.3	0.0039
Lower Fording River	LFR-WCT-01	0.0068	0.043	16,100	0.093	942	0.87	0.026	2,460	1.7	8,470	0.046	5.8	<0.00065	0.0042	11	0.018
	LFR-WCT-02	0.0060	0.025	18,200	0.065	1,080	0.93	0.025	1,510	0.18	10,400	0.075	7.2	<0.00036	0.0053	10	0.012
	LFR-WCT-03	0.042	0.026	13,200	0.10	977	3.4	0.030	2,140	0.22	9,820	0.057	5.4	<0.00024	0.0054	12	0.0080
	LFR-WCT-04	0.011	0.035	15,000	0.062	1,010	3.4	0.017	2,210	0.32	9,990	0.043	5.7	<0.00027	0.0022	7.3	0.011
	LFR-WCT-05	0.0091	0.066	17,400	0.13	1,030	1.0	0.014	1,930	0.23	10,300	0.023	7.2	<0.00034	<0.0020	6.7	0.0077
Upper Elk River	UER-WCT-01	0.0067	0.054	15,400	0.034	1,020	2.3	0.015	2,110	0.45	11,200	0.072	5.1	<0.00039	0.0060	6.2	0.0081
	UER-WCT-02	0.0065	0.096	16,900	0.033	1,000	1.0	0.0077	2,090	0.16	10,100	0.039	7.1	<0.00048	0.0032	4.1	0.0065
	UER-WCT-03	0.0086	0.088	15,400	0.020	999	1.0	0.011	1,690	0.31	9,950	0.071	6.1	<0.00043	0.0046	6.0	0.0052
	UER-WCT-04	0.011	0.047	16,800	<0.027	1,140	1.4	0.011	2,170	0.28	10,700	0.034	6.5	<0.00068	<0.0040	5.0	0.0060
	UER-WCT-05	0.012	0.037	16,400	0.030	1,030	1.5	0.015	1,810	0.33	9,290	0.47	6.7	<0.00046	0.0056	5.2	0.014
Middle Elk River	MER-WCT-1	0.0036	0.026	16,700	0.033	1,040	0.88	0.013	2,150	0.39	9,220	0.048	6.5	<0.00040	0.0036	8.7	0.0086
	MER-WCT-2	0.0059	0.032	15,000	0.052	1,030	1.2	0.015	2,480	0.31	10,200	0.096	7.4	<0.00028	0.028	7.9	0.023
	MER-WCT-3	0.037	0.040	17,200	0.091	1,200	2.3	0.014	1,670	0.42	10,400	0.14	7.5	<0.00031	0.0082	8.1	0.044
	MER-WCT-4	0.0039	0.060	17,000	0.021	1,100	0.92	0.016	1,750	0.42	11,000	0.021	7.2	<0.00024	0.0039	7.6	0.0030
	MER-WCT-5	0.0074	0.039	13,100	0.023	898	0.90	0.015	2,990	0.24	8,510	0.13	5.9	<0.00017	0.0068	5.7	0.016
Lower Elk River[a]	LER-WCT-01	0.0081	0.018	14,400	0.047	1,040	2.0	0.025	2,560	0.60	10,600	0.085	4.9	<0.00068	0.0074	8.0	0.014
	LER-WCT-02	0.012	0.076	15,700	0.033	1,020	1.6	0.035	4,080	0.91	9,650	0.11	4.1	<0.00066	0.0046	8.1	0.11
	LER-WCT-03	0.012	0.023	16,400	0.031	1,050	1.4	0.022	1,070	0.48	9,710	0.061	5.6	<0.00033	0.0044	6.3	0.0094
	LER-WCT-04	0.016	0.031	12,300	0.055	836	1.6	0.024	1,660	0.29	8,600	0.032	4.4	<0.00051	<0.0030	4.5	0.0047
Upper Michel Creek	MCU-WCT-01	0.0044	0.033	13,500	<0.013	873	0.85	0.010	1,940	0.23	8,420	0.011	6.1	<0.00034	<0.0020	4.5	0.0030
	MCU-WCT-02	0.0057	0.056	19,100	<0.014	1,040	0.55	0.013	2,100	0.16	10,200	0.011	7.7	<0.00036	0.0035	5.5	0.0030
	MCU-WCT-03	0.0093	0.064	16,900	0.015	1,060	0.78	0.012	1,190	0.16	10,900	0.033	7.7	<0.00031	0.0046	5.6	0.0073
	MCU-WCT-04	0.0044	0.059	17,200	<0.010	1,110	0.77	0.011	1,320	0.24	11,000	0.017	7.6	<0.00027	<0.0016	5.4	0.0044
	MCU-WCT-05	0.0044	0.028	16,400	<0.0095	993	0.67	0.0049	1,050	0.14	9,500	0.014	7.9	<0.00024	0.0027	7.8	0.0045
Lower Michel Creek	MCL-WCT-01	<0.0037	0.021	15,000	<0.021	943	0.54	0.012	2,160	0.27	8,490	0.055	5.3	<0.00054	0.0054	6.0	0.0071
	MCL-WCT-02	0.0089	0.032	18,600	0.018	1,180	0.76	0.058	1,010	0.41	10,700	0.029	7.7	<0.00040	0.0061	6.6	0.012
	MCL-WCT-03	0.012	0.057	15,100	0.047	1,190	1.2	0.019	2,190	0.43	8,400	0.16	9.6	<0.00047	0.010	6.4	0.027
	MCL-WCT-04	0.012	0.047	16,900	0.035	1100	1.1	0.015	1905	0.37	9915	0.044	6.3	<0.00035	0.021	7.5	0.013
	MCL-WCT-05	0.0069	0.030	14,900	0.020	979	0.69	0.0099	1,750	0.98	9,110	0.081	6.4	<0.00030	0.0072	7.6	0.18
	MCL-WCT-06	0.0076	0.045	16,800	<0.030	1,020	1.2	0.031	2,480	0.73	10,600	0.035	6.4	<0.00077	0.0054	4.9	0.0086
	MCL-WCT-07	0.0040	0.019	14,800	0.015	944	0.64	0.013	2,260	0.53	8,590	0.10	6.5	<0.00031	0.010	5.1	0.0090

[a] LER-WCT-05 lost during freeze drying.

Table HWCT.12: Metal Concentrations in Westslope Cutthroat Trout Muscle Collected in the Elk River Valley in May 2015

Area	Sample ID	Sr	Th	Ti	Tl	U	V	Y	Zn	Zr
		mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Henretta Lake	HE27-WCT-01	1.4	0.0024	0.24	0.031	0.0069	0.032	0.0080	48	0.056
	HE27-WCT-03	0.57	<0.00065	0.090	0.032	0.00094	0.010	0.00080	18	0.050
	HE27-WCT-04	0.59	0.014	1.9	0.026	0.0042	0.31	0.034	13	0.11
	HE27-WCT-06	0.35	0.0024	0.40	0.028	0.0040	0.039	0.0070	21	0.048
	HE27-WCT-09	0.065	0.00066	0.15	0.043	0.00041	0.012	0.0016	12	0.014
	HE27-WCT-09 (ovary)	0.70	0.00017	0.049	0.0044	0.0042	0.018	0.0018	61	0.0031
Upper Fording River	UFR-WCT-01	0.19	<0.00057	0.14	0.018	0.00061	0.0092	0.00057	18	0.063
	UFR-WCT-02	0.45	0.053	0.19	0.025	0.0044	0.012	0.12	19	0.091
	UFR-WCT-03	0.39	0.0014	0.17	0.025	0.00059	0.024	0.0089	15	0.028
	UFR-WCT-04	0.21	<0.00058	0.19	0.024	0.00060	0.0056	<0.00045	16	0.034
	UFR-WCT-05	0.095	0.0024	0.30	0.030	0.00055	0.029	0.0069	13	0.025
	UFR-WCT-06	0.43	0.0032	0.27	0.034	0.0026	0.037	0.0093	15	0.020
	UFR-WCT-07	0.42	0.0072	0.53	0.023	0.0035	0.094	0.031	13	0.037
	UFR-WCT-08	0.069	0.0012	0.23	0.018	0.00044	0.018	0.0025	14	0.030
	UFR-WCT-09	0.14	0.0019	0.37	0.015	0.00079	0.032	0.0047	14	0.029
	UFR-WCT-10	0.24	<0.00070	0.18	0.020	0.00075	0.011	0.0013	13	0.020
Lower Fording River	LFR-WCT-01	0.26	0.0023	0.32	0.038	0.0011	0.029	0.0038	32	0.20
	LFR-WCT-02	0.29	0.0014	0.41	0.030	0.00063	0.017	0.0026	27	0.065
	LFR-WCT-03	1.8	0.029	2.8	0.030	0.011	0.26	0.097	25	0.14
	LFR-WCT-04	0.69	0.0042	0.39	0.023	0.0020	0.042	0.014	24	0.47
	LFR-WCT-05	1.5	0.0029	0.55	0.036	0.0025	0.059	0.0069	14	0.18
Upper Elk River	UER-WCT-01	5.7	0.0015	0.30	0.036	0.0061	0.029	0.0037	42	0.044
	UER-WCT-02	3.0	<0.0010	0.18	0.038	0.0016	0.017	0.0013	18	0.051
	UER-WCT-03	2.4	<0.00092	0.20	0.035	0.0017	0.012	0.00092	17	0.023
	UER-WCT-04	2.4	<0.0015	0.19	0.030	0.0012	0.026	0.0021	20	0.093
	UER-WCT-05	1.9	0.0049	0.68	0.027	0.062	0.079	0.013	19	0.13
Middle Elk River	MER-WCT-1	0.87	0.0017	0.30	0.027	0.0011	0.029	0.0047	33	0.035
	MER-WCT-2	1.9	0.0019	0.40	0.032	0.0012	0.031	0.0053	63	0.047
	MER-WCT-3	1.3	0.030	1.1	0.039	0.024	0.23	0.17	27	0.19
	MER-WCT-4	1.3	<0.00051	0.13	0.028	0.00095	0.0096	0.00068	16	0.015
	MER-WCT-5	0.98	<0.0017	0.40	0.027	0.0012	0.031	0.0043	22	0.025
Lower Elk River[a]	LER-WCT-01	4.1	<0.0014	0.20	0.022	0.0015	0.031	0.0025	44	0.037
	LER-WCT-02	1.9	0.0035	0.45	0.022	0.0020	0.059	0.011	23	0.053
	LER-WCT-03	0.63	0.0034	0.50	0.028	0.0013	0.061	0.0052	14	0.046
	LER-WCT-04	3.4	0.0046	0.30	0.020	0.0021	0.066	0.0092	28	0.031
Upper Michel Creek	MCU-WCT-01	0.70	<0.00072	0.086	0.045	0.00035	0.0068	<0.00057	12	0.020
	MCU-WCT-02	0.076	<0.00077	0.16	0.055	0.00015	0.011	0.0011	15	0.014
	MCU-WCT-03	1.4	0.0026	0.22	0.060	0.00098	0.022	0.0027	18	0.017
	MCU-WCT-04	0.84	<0.00057	0.11	0.080	0.00061	0.0055	0.00064	18	0.030
	MCU-WCT-05	0.23	0.00069	0.097	0.070	0.00028	0.0050	<0.00040	15	0.012
Lower Michel Creek	MCL-WCT-01	0.33	<0.0011	0.14	0.035	0.00044	0.015	0.0016	24	0.037
	MCL-WCT-02	0.18	0.0012	0.24	0.046	0.00039	0.040	0.0018	15	0.023
	MCL-WCT-03	1.3	0.0065	1.1	0.15	0.0030	0.086	0.012	34	0.065
	MCL-WCT-04	0.60	0.0038	0.67	0.044	0.0011	0.098	0.0069	27	0.042
	MCL-WCT-05	0.52	0.0012	0.27	0.042	0.00056	0.017	0.0027	21	0.043
	MCL-WCT-06	2.1	0.0022	0.26	0.046	0.0015	0.033	0.016	29	0.025
	MCL-WCT-07	0.43	<0.00065	0.19	0.040	0.00049	0.0077	0.0010	23	0.019

[a] LER-WCT-05 lost during freeze drying.

Table HWCT.13: Metal Concentrations in Muscle of Westslope Cutthroat Trout Sampled in the Elk River Valley in August 2015

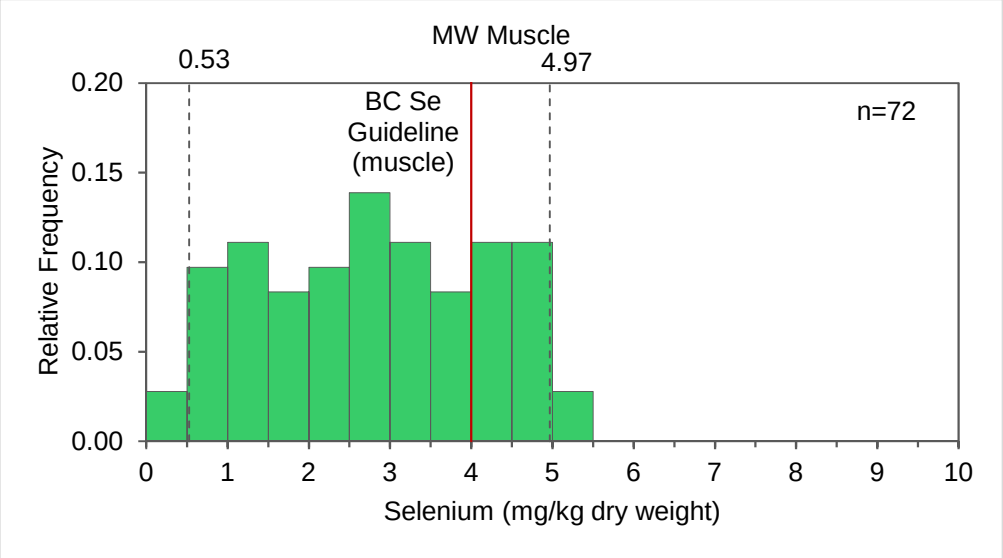
Area	Sample ID	Total Dry Mass	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe	Ga	Hg	K	Li
		(g)	(%)	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Henretta Lake	HE27-WCT-A1	0.0101	71%	0.0015	11.7	0.043	<0.42	0.123	<0.0053	0.00274	190	0.0052	0.0952	0.259	0.0337	1.44	15.4	0.0079	0.0185	14,900	0.0656
	HE27-WCT-A2	0.0173	77%	0.00075	2.73	0.0435	<0.25	0.149	<0.0032	0.00292	343	<0.0020	0.162	0.0788	0.0418	1.35	11.9	0.006	0.0216	12,600	0.0443
	HE27-WCT-A3	0.0120	70%	<0.0011	0.573	0.0463	<0.37	0.0751	<0.0047	0.00354	627	0.0044	0.175	0.133	0.0583	0.992	10.2	0.0069	0.0132	14,100	0.0367
	HE27-WCT-A4	0.0165	68%	0.00739	2.93	0.0994	<0.25	0.0367	<0.0033	0.00226	269	0.005	0.173	0.126	0.0467	1.01	17.3	0.0073	0.0182	16,700	0.0678
	HE27-WCT-A5	0.0166	64%	0.00104	52	0.0822	<0.26	0.973	<0.0034	0.00266	2,780	0.004	0.197	0.443	0.0419	1.01	36.1	0.0236	0.0286	13,200	0.083
Upper Fording River	UFR-WCT-A2	0.0169	74%	<0.00069	2.76	0.0476	<0.24	0.188	<0.0031	0.0012	720	0.008	0.0623	0.155	0.032	1.33	17.8	0.0079	0.0167	19,000	0.125
	UFR-WCT-A7	0.0107	60%	<0.0011	22	0.0739	<0.39	0.849	<0.0050	0.00347	2,640	0.0077	0.0893	0.305	0.0119	1.36	24.8	0.0159	0.0119	15,200	0.117
	UFR-WCT-A8	0.0163	77%	<0.00073	2.6	0.0612	<0.25	0.12	<0.0033	0.00218	481	0.0046	0.0577	0.186	0.0146	1.57	20.1	0.0061	0.0195	17,400	0.0362
	UFR-WCT-A9	0.0150	80%	<0.00086	2.7	0.0289	<0.30	0.243	<0.0039	0.00172	680	0.0066	0.0273	0.139	0.00948	2.18	10.2	0.0062	0.0176	16,100	0.0815
	UFR-WCT-A10	0.0165	78%	<0.00076	1.39	0.127	<0.26	0.162	<0.0034	0.00133	459	0.0056	0.0505	0.0926	0.00818	1.59	12.9	0.0059	0.0127	14,700	0.0604
	UFR-WCT-A12	0.0154	78%	<0.00080	1.61	0.0733	<0.28	0.167	<0.0036	0.0017	521	0.0059	0.0287	0.119	0.00704	1.9	10.8	0.0072	0.0131	15,700	0.0678
	UFR-WCT-A13	0.0175	80%	<0.00071	2.8	0.0588	<0.25	0.274	<0.0032	0.0018	408	0.0062	0.0362	0.72	0.0104	1.77	19.6	0.0073	0.0183	12,500	0.0692
	UFR-WCT-A14	0.0186	75%	<0.00064	0.877	0.162	<0.22	0.102	<0.0029	0.00112	259	0.0031	0.0403	0.228	0.0093	1.39	12.8	0.0065	0.015	15,100	0.0493
	UFR-WCT-A15	0.0115	85%	<0.0011	5.44	0.18	<0.38	1.34	<0.0048	0.0021	838	0.0113	0.0477	0.535	0.00469	2.32	18.3	0.0067	0.0153	8,660	0.0675
Lower Fording River	LFR-WCT-A1	0.0140	75%	<0.00087	5.3	0.0526	<0.30	0.583	<0.0039	0.00079	1,910	0.0054	0.0494	0.159	0.0304	1.17	23.2	0.0103	0.0699	14,900	0.139
	LFR-WCT-A2	0.0102	77%	<0.0012	2.57	0.0629	<0.41	0.186	<0.0053	0.00128	1,740	0.0058	0.0639	0.157	0.0181	1.05	9.58	0.0065	0.0272	18,100	0.0912
	LFR-WCT-A3	0.0128	75%	<0.00093	11.6	0.119	<0.32	0.231	<0.0042	0.00126	1,080	<0.0027	0.0545	0.0963	0.023	1.18	15	0.0073	0.0341	16,600	0.0931
	LFR-WCT-A4	0.0150	76%	<0.00079	1.56	0.154	<0.28	0.0927	<0.0035	<0.00065	281	<0.0023	0.0217	0.0838	0.0248	1.12	14.8	0.008	0.0367	19,000	0.0624
	LFR-WCT-A5	0.0131	74%	<0.00090	1.67	0.0504	<0.31	0.05	<0.0040	0.00087	326	<0.0026	0.0438	0.119	0.0207	1.23	13.2	0.0075	0.0389	18,600	0.0935
Upper Michel Creek	MCU-WCT-A2	0.0063	78%	<0.0019	2	0.213	<0.65	0.872	<0.0084	<0.0015	2,790	0.0054	0.238	0.128	0.0245	0.978	16.8	0.0052	0.0506	16,800	0.022
	MCU-WCT-A3	0.0092	69%	<0.0013	1.55	0.0324	<0.46	0.38	<0.0060	0.0019	2,650	<0.0038	0.0499	0.278	0.0163	1.07	12	0.0054	0.0357	15,900	0.0378
	MCU-WCT-A4	0.0113	70%	<0.0011	1.03	0.0541	<0.37	0.127	<0.0048	0.00132	972	0.0044	0.0708	0.139	0.0113	1	7.98	0.0038	0.0218	14,900	0.0376
	MCU-WCT-A5	0.0097	73%	<0.0012	0.638	0.111	<0.42	0.0586	<0.0054	0.0017	420	0.0036	0.0499	0.089	0.015	0.987	8.23	0.0057	0.0482	16,100	0.0347
	MCU-WCT-A6	0.0187	73%	<0.00065	15.6	0.0734	<0.23	0.163	<0.0029	0.00063	258	0.0056	0.08	0.15	0.0203	1.2	19	0.0114	0.0622	18,400	0.0318
Lower Michel Creek	MCL-WCT-A1	0.0074	76%	<0.0016	95.3	0.078	<0.57	1.49	<0.0073	0.0015	1,790	0.0118	0.0709	0.284	0.0222	0.939	131	0.0364	0.0356	17,100	0.073
	MCL-WCT-A2	0.0209	71%	<0.00056	299	0.0994	0.27	3.92	0.0115	0.00122	808	0.0106	0.0862	0.491	0.0414	1.1	193	0.097	0.025	13,600	0.17
	MCL-WCT-A4	0.0206	76%	<0.00059	5.59	0.0799	<0.20	0.356	<0.0026	<0.00048	1,980	0.0057	0.233	0.123	0.0212	1.23	14.6	0.0076	0.0364	18,500	0.0298
	MCL-WCT-A5	0.0203	75%	<0.00058	1.17	0.0223	<0.20	0.148	<0.0026	0.00057	1,020	<0.0017	0.0447	0.0822	0.0206	0.928	8.88	0.0066	0.0362	17,900	0.0229
	MCL-WCT-A6	0.0171	77%	<0.00070	0.585	0.0554	<0.24	0.0589	<0.0031	<0.00058	349	<0.0020	0.0363	0.0659	0.023	1.09	9.41	0.0055	0.0468	17,400	0.0297
Upper Elk River	UER-WCT-A1	0.0107	72%	0.0013	4.66	0.0845	<0.38	0.133	<0.0048	0.00091	1,410	0.0067	0.0227	0.101	0.014	1.24	10.8	0.008	0.0448	16,700	0.0212
	UER-WCT-A2	0.0125	75%	<0.00095	276	0.123	0.36	12.5	0.0059	0.00214	514	0.0075	0.125	0.335	0.0275	1.11	103	0.104	0.0405	17,900	0.109
	UER-WCT-A3	0.0107	82%	<0.0011	7.28	0.293	<0.39	0.245	<0.0050	0.00124	881	0.0095	0.0807	0.198	0.0116	2.02	13.8	0.0067	0.0533	13,900	0.0328
	UER-WCT-A4	0.0136	77%	<0.00088	0.483	0.155	<0.31	0.5	<0.0039	0.00125	425	0.0048	0.0454	0.0671	0.0162	1.65	8.49	0.0049	0.0576	15,800	0.0256
	UER-WCT-A6	0.0163	82%	<0.00072	0.739	0.152	<0.25	0.136	<0.0032	0.00064	435	0.0026	0.0619	0.218	0.023	1.71	16.6	0.0052	0.0654	15,200	0.018
Middle Elk River	MER-WCT-A1	0.0109	74%	<0.0011	1.77	0.135	<0.39	0.161	<0.0050	0.00097	1,060	<0.0032	0.0445	0.33	0.023	0.843	15.6	0.0077	0.0466	18,400	0.0205
	MER-WCT-A2	0.0123	76%	<0.00097	4.77	0.066	<0.34	0.136	<0.0043	<0.00080	381	0.0035	0.0454	0.0925	0.0191	1.13	12.1	0.0062	0.0384	18,400	0.019
	MER-WCT-A3	0.0157	74%	<0.00077	0.717	0.138	<0.27	0.0244	<0.0035	<0.00064	280	0.0044	0.0311	0.0984	0.0246	1.24	12.4	0.0049	0.0604	17,700	0.0118
	MER-WCT-A4	0.0102	73%	<0.0011	1.22	0.332	<0.40	0.337	<0.0052	<0.00095	1,200	<0.0033	0.0235	0.214	0.0596	1.13	19.1	0.0056	0.0536	20,200	0.0217
	MER-WCT-A5	0.0097	74%	<0.0012	2.11	0.0744	<0.42	0.0357	<0.0054	<0.00099	263	0.0037	0.0358	0.189	0.0186	1.19	9.73	0.0064	0.0436	17,800	0.0337
Lower Elk River	LER-WCT-A2	0.0191	75%	<0.00062	53	0.0922	<0.22	0.457	<0.0028	0.00081	801	0.0057	0.0561	0.158	0.0164	1.16	48.4	0.0194	0.0542	16,200	0.0694
	LER-WCT-A3 rep 1	0.0257	77%	<0.00090	14	0.11	<0.32	0.281	<0.0041	0.00225	998	0.0064	0.0569	0.716	0.021	1.36	24.3	0.0135	0.0429	17,700	0.0508
	LER-WCT-A3 rep 2	0.0257	77%	<0.00095	18.6	0.131	<0.33	0.289	<0.0042	0.00097	711	0.0087	0.0674	0.389	0.0188	1.75	29.8	0.0126	0.0372	16,100	0.0571
	LER-WCT-A3	0.0257	77%	<0.00093	16.3	0.121	<0.33	0.285	<0.0042	0.00161	855	0.0076	0.0622	0.553	0.0199	1.56	27.1	0.0131	0.0401	16,900	0.0540
	LER-WCT-A4	0.0117	67%	<0.0011	5.56	0.0265	<0.37	0.972	<0.0047	0.00108	309	<0.0030	0.0472	0.0791	0.0143	0.907	9.44	0.0061	0.0201	14,100	0.0373
	LER-WCT-A5	0.0120	75%	<0.0010	210	0.0759	<0.36	2.1	<0.0046	0.00139	1,020	0.0088	0.0718	0.415	0.0399	2.36	59.7	0.0772	0.0321	18,700	0.111
	LER-WCT-A6	0.0095	71%	0.0039	342	0.143	0.64	3	0.0061	0.0026	3,190	0.0193	0.11	0.731	0.0522	2.53	284	0.133	0.0239	14,700	0.207

Table HWCT.13: Metal Concentrations in Muscle of Westslope Cutthroat Trout Sampled in the Elk River Valley in August 2015

Area	Sample ID	Mg	Mn	Mo	Na	Ni	P	Pb	Rb	Re	Sb	Se	Sn	Sr	Th	Ti	Tl	U	V	Y	Zn	Zr
		mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Henretta Lake	HE27-WCT-A1	1,040	0.351	0.0242	1,300	0.399	9,250	0.0304	9.07	<0.00012	0.0144	8.41	0.0046	0.0732	0.00093	0.377	0.0274	0.00046	0.0525	<0.00081	12.9	0.0685
	HE27-WCT-A2	1,020	0.316	0.01	841	0.0634	8,240	0.0093	9.79	0.000157	0.00672	7.58	0.0066	0.255	0.00059	0.175	0.0285	0.00209	0.00992	0.0015	14.6	0.0294
	HE27-WCT-A3	1,090	0.298	0.0079	884	0.0865	9,600	0.00819	11	<0.00011	0.0034	13.8	0.0036	0.163	<0.00017	0.114	0.028	0.00035	0.00307	<0.00072	15.1	0.029
	HE27-WCT-A4	1,080	0.523	0.0116	1,190	0.0839	10,500	0.00875	11	0.000108	0.00169	12.6	0.0037	0.0724	0.00021	0.114	0.0274	0.00037	0.0133	0.00161	14.9	0.0149
	HE27-WCT-A5	921	0.79	0.0144	903	0.221	9,980	0.0387	8.56	0.00011	0.00742	10.3	0.0097	1.12	0.00683	0.485	0.0251	0.00464	0.245	0.0235	20.6	0.0283
Upper Fording River	UFR-WCT-A2	1,160	0.655	0.0092	1,080	0.217	11,900	0.0417	9	<0.000071	0.0027	10.8	0.0052	0.233	0.00046	0.172	0.0394	0.00114	0.00846	0.0008	15.7	0.117
	UFR-WCT-A7	1,180	1.88	0.0171	1,300	0.251	10,700	0.103	5.35	<0.00012	0.0045	8.68	0.0136	0.856	0.00303	0.429	0.0208	0.00287	0.0686	0.00889	20.1	0.0437
	UFR-WCT-A8	1,110	0.426	0.0227	1,260	0.0894	10,700	0.0639	5.93	0.000086	0.00548	9.26	0.0038	0.145	0.00025	0.187	0.0256	0.00079	0.00919	0.00065	15.1	0.0415
	UFR-WCT-A9	1,190	0.403	0.011	998	0.0692	10,200	0.0285	6.57	0.000118	0.00205	8.27	<0.0021	0.367	0.00032	0.129	0.0221	0.00193	0.0074	0.00061	20.2	0.024
	UFR-WCT-A10	1,020	0.399	0.0119	979	0.0573	9,280	0.0122	5.31	<0.000079	0.00741	10.8	<0.0018	0.291	<0.00012	0.126	0.0401	0.00166	0.0083	0.00061	16.6	0.0183
	UFR-WCT-A12	1,150	0.354	0.0121	1,030	0.0458	10,300	0.0378	5.25	<0.000083	0.00207	11.5	0.0028	0.263	0.00017	0.131	0.026	0.00174	0.00813	0.00058	14.6	0.029
	UFR-WCT-A13	998	0.329	0.0118	934	0.0794	8,220	0.0582	5.9	0.000094	0.00404	6.93	0.0057	0.353	0.00028	0.154	0.0334	0.00334	0.0103	0.00092	16.6	0.0552
	UFR-WCT-A14	1,030	0.363	0.0115	940	0.165	9,790	0.101	5.66	<0.000066	0.00455	9.02	<0.0016	0.147	0.00011	0.163	0.0253	0.00083	0.00447	0.00047	14	0.019
	UFR-WCT-A15	929	0.601	0.0105	747	0.128	6,560	0.044	3.42	0.00018	0.0214	8.87	0.008	0.798	0.00073	0.28	0.0376	0.00577	0.016	0.00238	29.4	0.121
Lower Fording River	LFR-WCT-A1	1,100	0.585	0.0114	1,930	0.131	10,400	0.0704	6.15	<0.000091	0.00628	7.36	0.0023	0.965	0.00033	0.342	0.0316	0.00125	0.0199	0.00157	28	0.0141
	LFR-WCT-A2	1,170	0.618	0.0097	1,760	0.112	10,800	0.222	6.51	<0.00012	0.0117	8.19	0.0047	0.745	0.00057	0.196	0.0257	0.00135	0.00997	0.00182	18.4	0.0395
	LFR-WCT-A3	1,130	0.542	0.0083	1,530	0.0608	10,600	0.0277	7.24	<0.000096	0.00583	9.6	0.0036	0.399	0.00161	0.283	0.0338	0.00091	0.0493	0.00502	16.1	0.0186
	LFR-WCT-A4	1,240	0.377	0.0066	1,450	0.0817	11,300	0.0155	7.22	<0.000082	0.00227	10.9	0.0023	0.0745	0.00076	0.113	0.039	0.00021	0.00647	0.00221	12.7	0.0178
	LFR-WCT-A5	1,230	0.398	0.0151	1,280	0.109	11,100	0.0093	7.08	<0.000093	0.00436	9.62	<0.0022	0.101	0.00031	0.137	0.0433	0.00039	0.00822	0.00076	12.8	0.0177
Upper Michel Creek	MCU-WCT-A2	1,250	0.752	0.0153	2,540	0.132	11,100	0.0387	8.4	<0.00019	0.005	6.19	<0.0045	1.57	0.00057	0.191	0.105	0.00163	0.0118	0.0017	17	0.0204
	MCU-WCT-A3	1,170	0.654	0.0097	1,590	0.167	11,000	0.0466	6.86	0.00018	0.0076	6.05	0.0051	1.41	0.00032	0.152	0.0477	0.00076	0.0114	<0.00091	20.7	0.0234
	MCU-WCT-A4	1,010	0.494	0.0101	1,350	0.073	9,300	0.0292	6.39	<0.00011	0.0101	4.81	0.0034	0.546	<0.00017	0.141	0.0434	0.00022	0.00713	<0.00073	18.8	0.0125
	MCU-WCT-A5	1,120	0.295	0.0062	1,460	0.0319	9,680	0.0176	6.35	<0.00012	0.0037	5.09	<0.0029	0.169	<0.00019	0.109	0.0498	<0.00020	0.00434	<0.00082	13.2	0.0167
	MCU-WCT-A6	1,200	0.435	0.0084	1,240	0.134	11,100	0.0243	7.33	<0.000067	0.00333	6.68	0.0056	0.16	0.00202	0.606	0.0846	0.00097	0.0655	0.00427	19	0.137
Lower Michel Creek	MCL-WCT-A1	1,230	1.9	0.0169	1,860	0.253	10,800	0.0946	6.54	<0.00017	0.0125	6.72	0.0088	1.04	0.0114	1.67	0.0464	0.0038	0.366	0.0273	17	0.142
	MCL-WCT-A2	975	1.08	0.0157	1,480	0.368	9,370	0.154	6.18	0.00011	0.0107	7.06	0.0104	0.548	0.0286	2.13	0.0427	0.00406	0.754	0.0428	16.2	0.151
	MCL-WCT-A4	1,190	0.657	0.0131	1,860	0.0664	12,100	0.0602	8.09	0.000088	0.00556	6.8	0.0032	0.967	0.000777	0.251	0.107	0.00095	0.015	0.00201	19.1	0.0331
	MCL-WCT-A5	1,160	0.467	0.0119	1,170	0.1	11,200	0.00769	8.41	0.000096	0.00154	8.08	0.0036	0.489	0.000221	0.107	0.0539	0.000436	0.00494	<0.00039	16.7	0.0201
	MCL-WCT-A6	1,180	0.351	0.0128	1,200	0.11	10,600	0.00807	8.73	<0.000073	0.00407	8.79	0.0038	0.164	<0.00011	0.117	0.0627	0.00073	0.00302	<0.00048	14.1	0.0235
Upper Elk River	UER-WCT-A1	1,110	0.623	0.0104	1,600	0.0685	10,500	0.0385	6.25	0.00019	0.0051	4.78	0.0043	1.03	0.00051	0.195	0.0244	0.00069	0.0111	0.00173	24.8	0.0325
	UER-WCT-A2	1,160	2.03	0.0116	1,730	0.271	10,600	0.0723	6.18	0.000311	0.0044	5.03	0.01	2.47	0.0473	1.4	0.0302	0.0168	0.774	0.133	18.4	0.0872
	UER-WCT-A3	931	0.638	0.0147	1,520	0.117	8,200	0.0793	4.99	0.0004	0.0048	4.95	0.0188	1.01	0.00183	0.328	0.025	0.0012	0.0219	0.00307	23.2	0.0572
	UER-WCT-A4	1,080	0.386	0.0085	1,260	0.0333	9,370	0.0271	6.29	0.000213	0.00207	5.88	0.0027	0.538	<0.00014	0.115	0.0381	0.00085	0.00349	<0.00060	20.3	0.0308
	UER-WCT-A6	1,040	0.454	0.0133	1,140	0.128	9,320	0.0172	7.27	0.000242	0.00299	5.52	0.0049	0.798	0.00013	0.186	0.0499	0.00131	0.00683	0.00122	14.1	0.03
Middle Elk River	MER-WCT-A1	1,120	0.545	0.0114	972	0.279	11,200	0.0104	6.93	0.00016	0.0037	8.41	0.006	0.658	<0.00018	0.162	0.0315	0.00056	0.011	0.00121	15	0.008
	MER-WCT-A2	1,240	0.556	0.0133	1,250	0.0824	11,000	0.0167	6.46	<0.00010	0.0011	7.04	0.0055	0.22	0.00076	0.206	0.0292	0.00075	0.0176	0.00102	14.1	0.013
	MER-WCT-A3	1,120	0.409	0.0103	974	0.042	10,900	0.00546	6.85	0.000102	0.00209	6.18	0.0033	0.0946	<0.00012	0.094	0.0284	0.00026	0.00337	<0.00053	14.4	0.0141
	MER-WCT-A4	1,270	0.625	0.0114	1,830	0.201	12,200	0.0134	8.29	<0.00012	0.0017	6.26	0.0042	0.72	<0.00018	0.228	0.0443	0.0006	0.0086	<0.00079	15	0.0284
	MER-WCT-A5	1,150	0.429	0.0095	1,200	0.0991	10,700	0.0133	6.47	<0.00013	0.0036	5.84	<0.0029	0.107	0.00112	0.143	0.0242	0.00031	0.00566	<0.00082	13.8	0.022
Lower Elk River	LER-WCT-A2	1,100	0.615	0.0134	1,370	0.101	10,100	0.0505	5.51	0.000116	0.00629	8.6	0.0046	0.591	0.00887	0.754	0.0359	0.00205	0.187	0.0168	13.8	0.032
	LER-WCT-A3 rep 1	1,220	0.642	0.0212	1,980	0.334	10,600	0.301	7.09	0.000107	0.00412	7.49	0.003	0.757	0.00239	0.336	0.039	0.00364	0.0696	0.0151	14.6	0.0282
	LER-WCT-A3 rep 2	1,020	0.75	0.0211	1,780	0.304	9,650	0.0762	6.38	<0.000098	0.00398	7.4	0.0046	0.474	0.00282	0.37	0.0352	0.00169	0.0738	0.00999	15.3	0.0205
	LER-WCT-A3	1,120	0.696	0.0212	1,880	0.319	10,125	0.189	6.74	0.000103	0.00405	7.45	0.0038	0.616	0.00261	0.353	0.0371	0.00267	0.0717	0.0125	15.0	0.0244
	LER-WCT-A4	991	0.419	0.0101	997	0.0244	8,740	0.0132	5.05	0.00016	0.002	6.47	<0.0026	0.182	0.00139	0.215	0.0259	0.00027	0.0118	0.00128	13.6	0.0192
	LER-WCT-A5	1,240	1.25	0.0139	1,380	0.118	11,200	0.101	6.99	<0.00011	0.0047	8.53	0.0068	1.22	0.0413	1.69	0.0375	0.0172	1.23	0.131	17.7	0.091
	LER-WCT-A6	1,410	6.27	0.0367	1,260	0.446	9,250	0.228	6.03	0.00015	0.0114	6.69	0.0145	3.56	0.0512	5.06	0.0329	0.0225	1.11	0.185	16	0.161

FISH

Mountain Whitefish



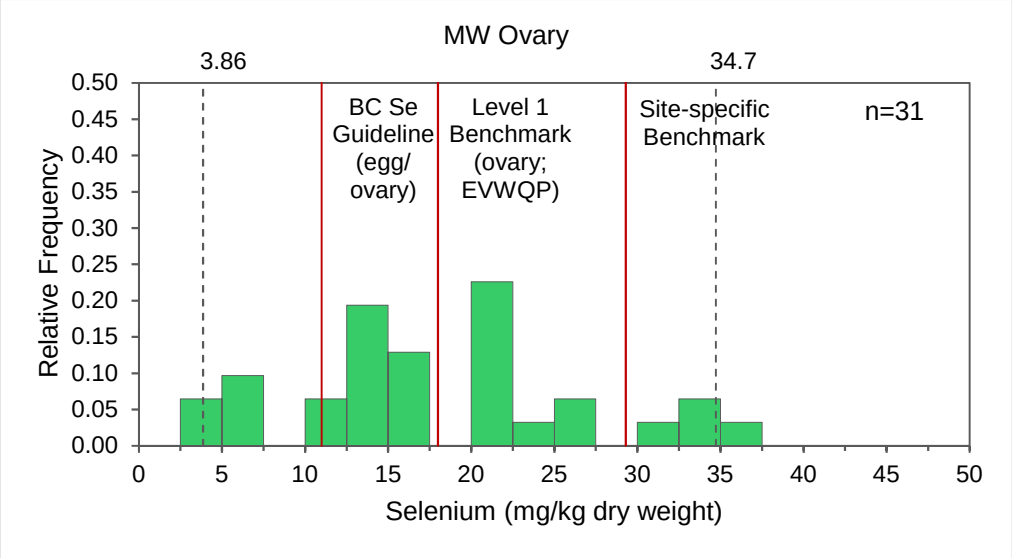


Figure HMW.1: Distribution of Reference Area Data for Tissue Selenium Concentrations for Mountain Whitefish (MW) in the Elk Valley, 2008 - 2015

Notes: Dashed vertical lines represent the 2.5th and 97.5th percentiles

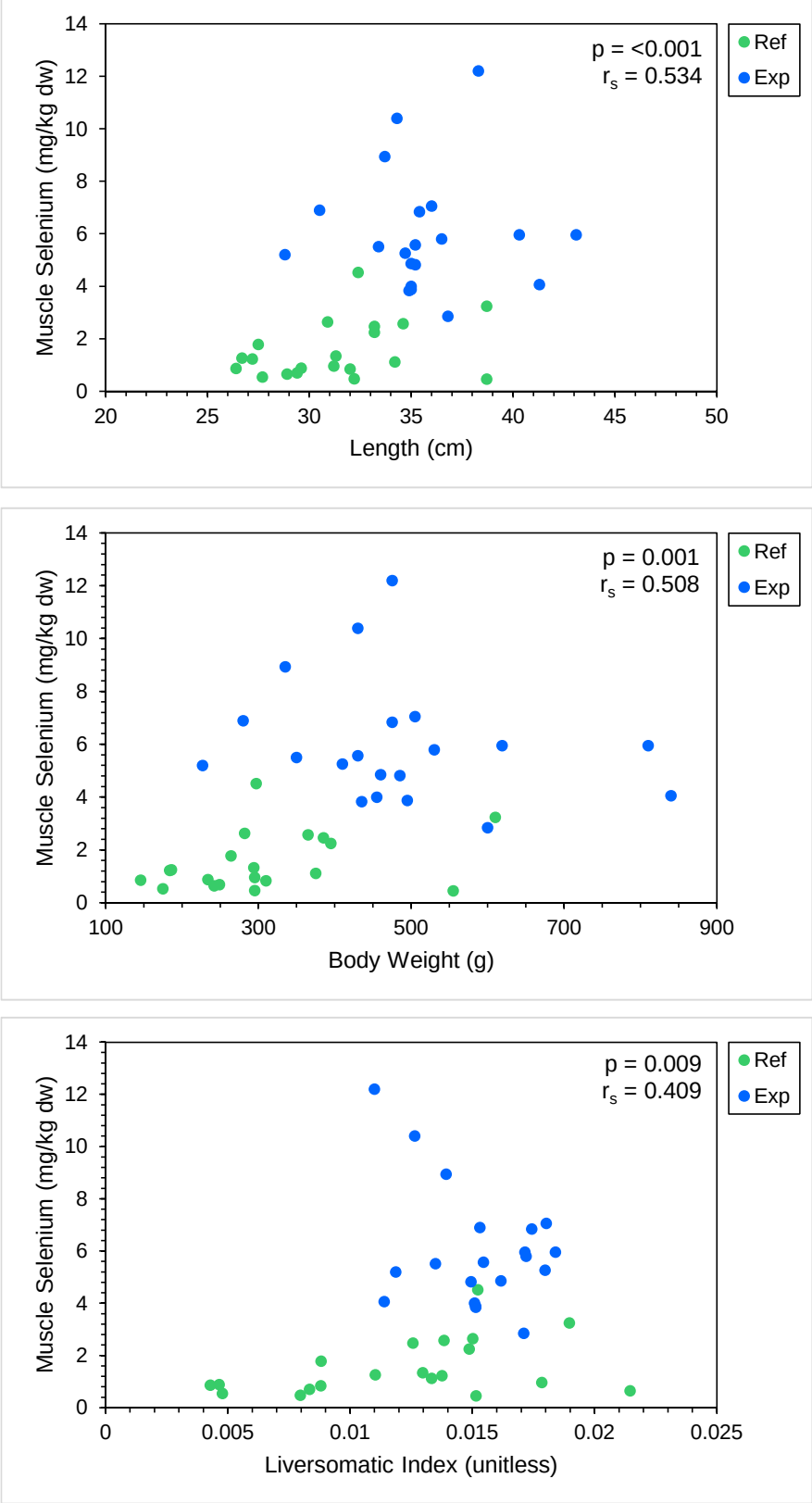
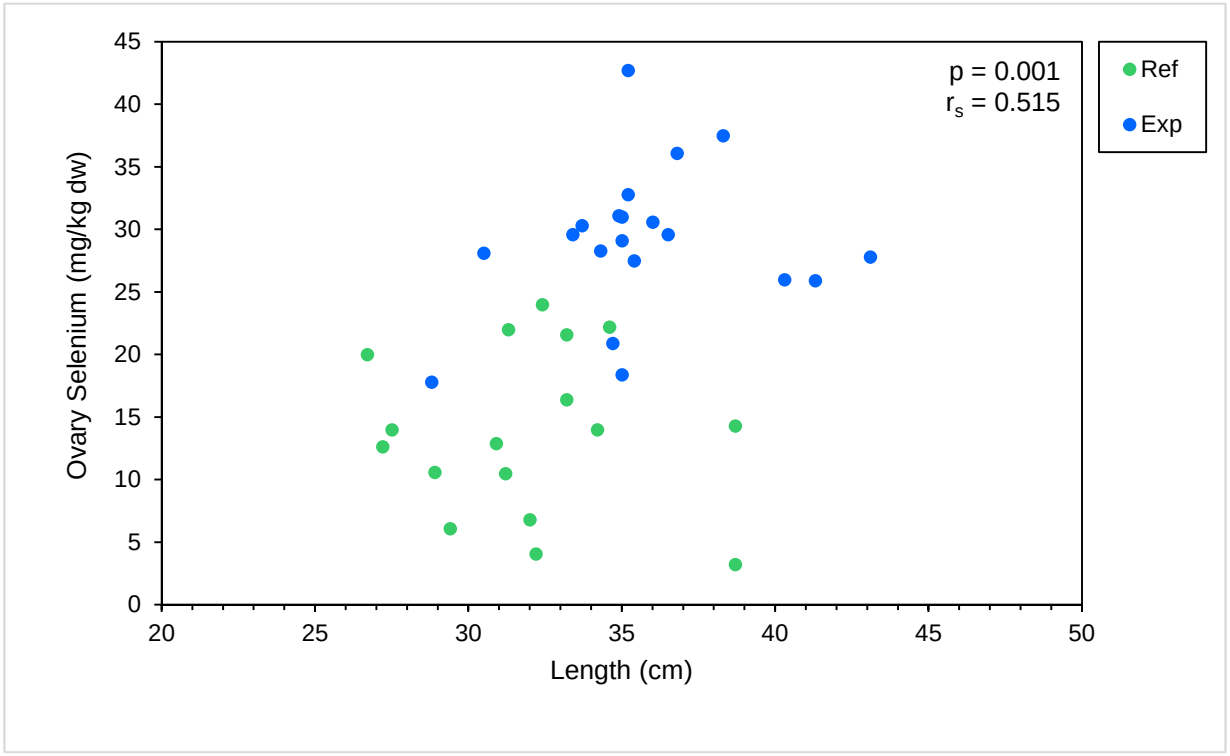


Figure HMW.2: Spearman Correlations for Mountain Whitefish Health Metrics (Length, Body Weight, and Liversomatic Index) and Muscle Selenium Concentrations, 2015



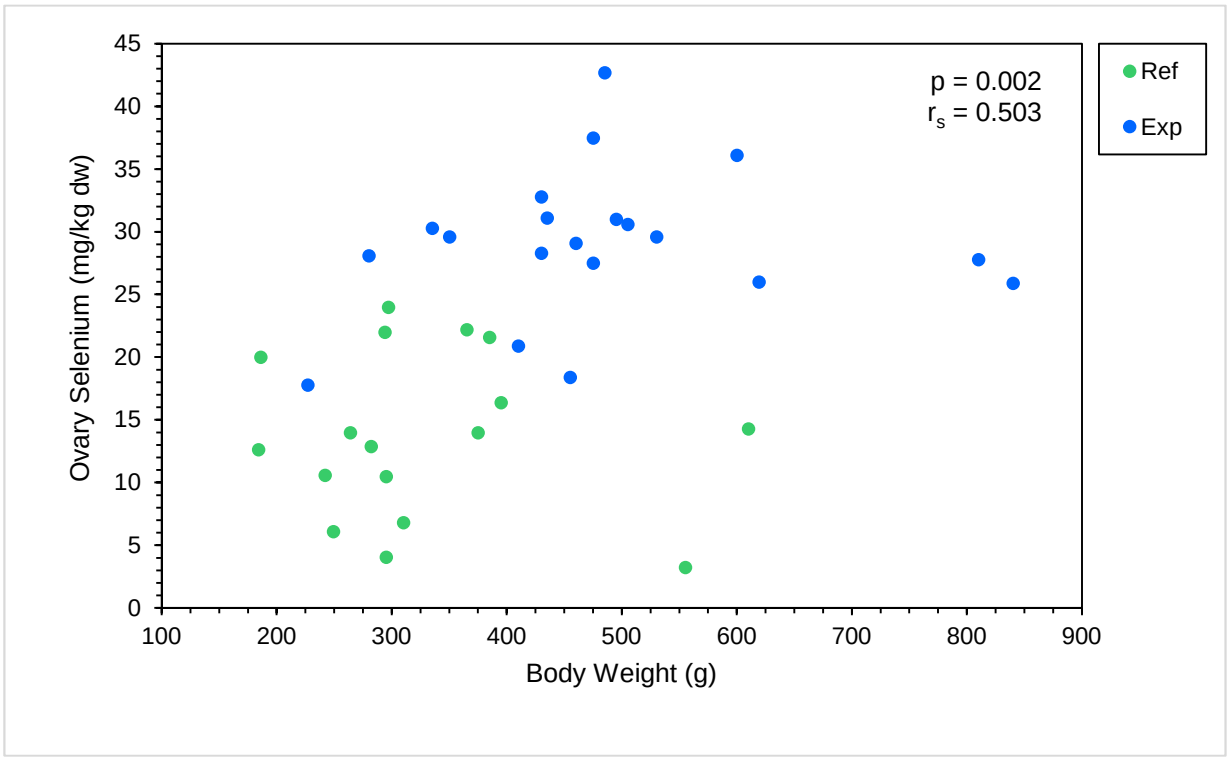


Figure HMW.3: Spearman Correlations for Mountain Whitefish Health Metrics (Length and Body Weight) and Ovary Selenium Concentrations, 2015

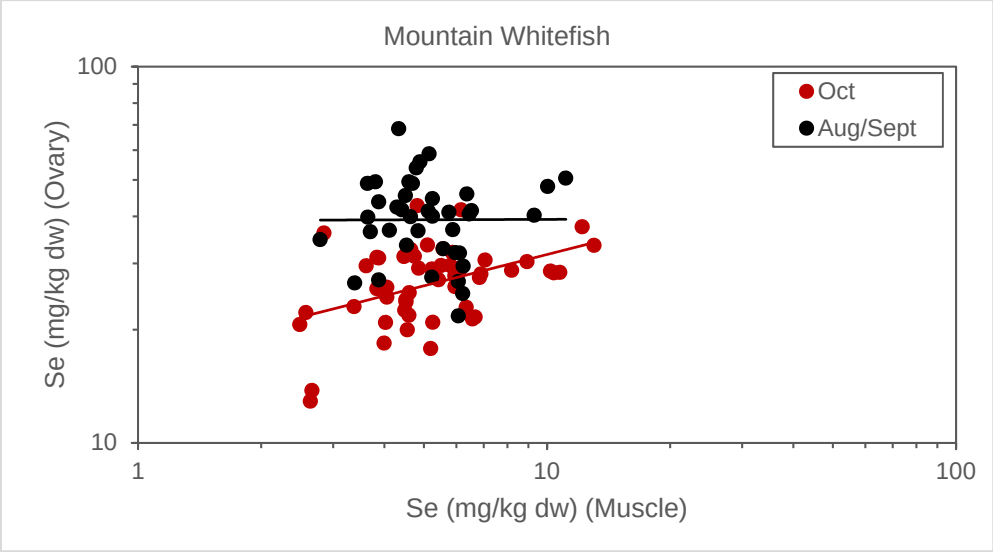


Figure HMW.4: Scatterplot and Linear Regression of Selenium Concentrations in Ovary versus Selenium Concentrations in Muscle for Mountain Whitefish Sampled August and Early September (2006, 2009), and October (2012, 2015)

Notes: Observations with small values of Se (< 2 mg/kg dw) in muscle were removed from the Oct data set to provide equal spread of values muscle Se concentrations between groups; one outlier (3.88, 6.81) was also removed from the Oct group. Slopes are not significantly different ($p = 0.086$); intercepts are significantly different ($p < 0.001$).

Table HMW.1: Mountain Whitefish Tissue Sampling Areas in 2015, and Concordance with Location Codes in Previous Regional Sampling Cycles

Exposure Type	Manage-ment Unit	2015	2012	2009	2006
		October	October	Aug-Sept	Aug-Sept
Reference	Not applic-able	Bull River (BR)	Bull River (BU40)	-	-
		Flathead Creek (FC)	-	-	-
		Kootenay River (KR)	Kootenay River (K01)	-	-
		St. Mary's River (MR)	-	-	-
		Moyie River (MOR)	-	-	-
Mine-exposed	2	Lower Fording River (LFR) - d/s Josephine Falls	FO23	FO23	FO23
	3	Upper Elk River (UER) - downstream from GHO, upstream from Fording River	-	-	-
	4	Lower Michel Creek (LMC)	MI2	MI2	MI2, MI3
	5	Lower Elk River (LER) - downstream from Sparwood (near Fernie)	EL1, ELKO	EL1	EL1

Table HMW.2: Reference Selenium Concentrations for Mountain Whitefish Muscle in the Elk Valley, 2008 - 2015

Tissue Type	Tissue sub-type	Species	Year	Area Description	Biological Area Code	Selenium (mg/kg dw)
Fish	Muscle	MW	2015	St. Mary's River	MR	0.46
Fish	Muscle	MW	2015	St. Mary's River	MR	0.47
Fish	Muscle	MW	2015	St. Mary's River	MR	0.54
Fish	Muscle	MW	2015	Kootenay River	KR	0.65
Fish	Muscle	MW	2015	Kootenay River	KR	0.70
Fish	Muscle	MW	2015	Bull River	BR	0.84
Fish	Muscle	MW	2015	St. Mary's River	MR	0.87
Fish	Muscle	MW	2015	St. Mary's River	MR	0.88
Fish	Muscle	MW	2015	Kootenay River	KR	0.96
Fish	Muscle	MW	2015	Bull River	BR	1.12
Fish	Muscle	MW	2015	Bull River	BR	1.23
Fish	Muscle	MW	2015	Kootenay River	KR	1.26
Fish	Muscle	MW	2008	Flathead Lake	FHL	1.30
Fish	Muscle	MW	2009	Flathead Lake	FHL	1.30
Fish	Muscle	MW	2015	Flathead River	FC	1.34
Fish	Muscle	MW	2008	Flathead Lake	FHL	1.40
Fish	Muscle	MW	2009	Flathead Lake	FHL	1.40
Fish	Muscle	MW	2008	Flathead Lake	FHL	1.50
Fish	Muscle	MW	2008	Flathead Lake	FHL	1.50
Fish	Muscle	MW	2009	Flathead Lake	FHL	1.50
Fish	Muscle	MW	2012	Bull River 40 km Bridge	BU40	1.63
Fish	Muscle	MW	2015	Flathead River	FC	1.78
Fish	Muscle	MW	2012	Bull River 40 km Bridge	BU40	1.88
Fish	Muscle	MW	2008	Flathead Lake	FHL	2.10
Fish	Muscle	MW	2012	Bull River 40 km Bridge	BU40	2.13
Fish	Muscle	MW	2012	Bull River 40 km Bridge	BU40	2.24
Fish	Muscle	MW	2015	Flathead River	FC	2.25
Fish	Muscle	MW	2015	Flathead River	FC	2.47
Fish	Muscle	MW	2012	Bull River 40 km Bridge	BU40	2.49
Fish	Muscle	MW	2015	Kootenay River	KR	2.49
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	2.50
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	2.50
Fish	Muscle	MW	2015	Kootenay River	KR	2.50
Fish	Muscle	MW	2015	Bull River	BR	2.64
Fish	Muscle	MW	2015	Kootenay River	KR	2.66
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	2.70
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	2.70
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	2.80
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	2.90
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	2.90
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.00
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.10
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	3.10
Fish	Muscle	MW	2015	Flathead River	FC	3.24
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.30
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.30
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.40
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	3.40
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.50
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.80
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	3.80
Fish	Muscle	MW	2012	Kootenay River	K01	3.88
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.90
Fish	Muscle	MW	2008	Flathead River (BC)	FR	3.90
Fish	Muscle	MW	2008	Flathead River (BC)	FR	4.00
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.10
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.20
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.20
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.20
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.20
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.30
Fish	Muscle	MW	2008	Flathead River (BC)	FR	4.40
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.40
Fish	Muscle	MW	2008	Flathead River (BC)	FR	4.50
Fish	Muscle	MW	2015	Bull River	BR	4.52
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.70
Fish	Muscle	MW	2008	Flathead River (BC)	FR	4.80
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.80
Fish	Muscle	MW	2008	Flathead River (BC)	FR	4.90
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	4.90
Fish	Muscle	MW	2009	Elk River u/s Weary Creek	ELUWE	4.96
Fish	Muscle	MW	2009	North Fork Flathead River	NFR	5.00
Fish	Muscle	MW	2008	Flathead River (BC)	FR	5.20

Notes: No outliers were identified. Q3+1.5(IQR) = 7.56 and 16.61 on the untransformed and log scale, respectfully

Tissue Type	Tissue sub-type	Species	Year	Summary Statistic	Biological Area Code	Selenium (mg/kg dw)
Fish	Muscle	MW	All	Minimum	All Reference	0.46
Fish	Muscle	MW	All	2.5th Percentile	All Reference	0.53
Fish	Muscle	MW	All	25th Percentile	All Reference	1.50
Fish	Muscle	MW	All	Median	All Reference	2.70
Fish	Muscle	MW	All	75th Percentile	All Reference	3.93
Fish	Muscle	MW	All	97.5th Percentile	All Reference	4.97
Fish	Muscle	MW	All	Maximum	All Reference	5.20
Fish	Muscle	MW	All	Mean	All Reference	2.78
Fish	Muscle	MW	All	Standard Deviation	All Reference	1.37

Estimate of reference area normal range

Table HMW.3: Reference Selenium Concentrations for Mountain Whitefish Ovary in the Elk Valley, 2009 - 2015

Tissue Type	Tissue sub-type	Species	Year	Area Description	Biological Area Code	Selenium (mg/kg dw)
Fish	Ovary	MW	2015	St. Mary's River	MR	3.24
Fish	Ovary	MW	2015	St. Mary's River	MR	4.07
Fish	Ovary	MW	2015	Kootenay River	KR	6.10
Fish	Ovary	MW	2012	Kootenay River	K01	6.81
Fish	Ovary	MW	2015	Bull River	BR	6.82
Fish	Ovary	MW	2015	Kootenay River	KR	10.50
Fish	Ovary	MW	2015	Kootenay River	KR	10.60
Fish	Ovary	MW	2015	Bull River	BR	12.65
Fish	Ovary	MW	2015	Bull River	BR	12.90
Fish	Ovary	MW	2015	Bull River	BR	14.00
Fish	Ovary	MW	2015	Flathead River	FC	14.00
Fish	Ovary	MW	2015	Flathead River	FC	14.30
Fish	Ovary	MW	2012	Bull River 40 km Bridge	BU40	14.68
Fish	Ovary	MW	2012	Bull River 40 km Bridge	BU40	15.78
Fish	Ovary	MW	2015	Flathead River	FC	16.40
Fish	Ovary	MW	2012	Bull River 40 km Bridge	BU40	17.06
Fish	Ovary	MW	2012	Bull River 40 km Bridge	BU40	17.24
Fish	Ovary	MW	2015	Kootenay River	KR	20.00
Fish	Ovary	MW	2012	Bull River 40 km Bridge	BU40	20.63
Fish	Ovary	MW	2009	North Fork Flathead River	NFR	20.80
Fish	Ovary	MW	2015	Flathead River	FC	21.60
Fish	Ovary	MW	2015	Flathead River	FC	22.00
Fish	Ovary	MW	2009	North Fork Flathead River	NFR	22.10
Fish	Ovary	MW	2015	Kootenay River	KR	22.20
Fish	Ovary	MW	2015	Bull River	BR	24.00
Fish	Ovary	MW	2009	North Fork Flathead River	NFR	25.80
Fish	Ovary	MW	2009	North Fork Flathead River	NFR	27.30
Fish	Ovary	MW	2009	North Fork Flathead River	NFR	30.60
Fish	Ovary	MW	2009	North Fork Flathead River	NFR	34.10
Fish	Ovary	MW	2009	North Fork Flathead River	NFR	34.20
Fish	Ovary	MW	2009	North Fork Flathead River	NFR	36.30

Notes: No outliers were identified. Q3+1.5(IQR) = 36.21 and 50.57 on the untransformed and log scale, respectfully

Tissue Type	Tissue sub-type	Species	Year	Summary Statistic	Biological Area Code	Selenium (mg/kg dw)
Fish	Ovary	MW	All	Minimum	All Reference	3.24
Fish	Ovary	MW	All	2.5th Percentile	All Reference	3.86
Fish	Ovary	MW	All	25th Percentile	All Reference	12.78
Fish	Ovary	MW	All	Median	All Reference	17.06
Fish	Ovary	MW	All	75th Percentile	All Reference	22.15
Fish	Ovary	MW	All	97.5th Percentile	All Reference	34.73
Fish	Ovary	MW	All	Maximum	All Reference	36.30
Fish	Ovary	MW	All	Mean	All Reference	18.02
Fish	Ovary	MW	All	Standard Deviation	All Reference	8.79

Estimate of reference area normal range

Table HMW.4: Selenium Concentrations in Mountain Whitefish Muscle and Ovaries, October 2015

Area	Sample ID	Selenium mg/kg dw	
		Muscle	Ovaries
Lower Fording River	LFR-MW-02	7.06	30.6
	LFR-MW-03	5.96	-
	LFR-MW-04	6.84	-
	LFR-MW-05	5.96	26.0
	LFR-MW-06	4.86	29.1
Upper Elk River	UER-MW-06	5.26	20.9
	UER-MW-07	6.90	28.1
	UER-MW-08	4.00	18.4
	UER-MW-09	5.51	-
	UER-MW-10	5.20	-
Michel Creek	MC-MW-02	3.84	31.1
	MC-MW-03	2.85	36.1
	MC-MW-04	4.06	36.1
	MC-MW-05	3.88	-
	MC-MW-06	4.82	-
Lower Elk River	LER-MW-02	8.94	30.3
	LER-MW-03	5.57	32.8
	LER-MW-04	12.2	37.5
	LER-MW-05	5.80	29.6
	LER-MW-06	10.4	28.3
Bull River (reference)	BR-MW-03	4.52	24.0
	BR-MW-04	1.23	12.7
	BR-MW-05	2.64	12.9
	BR-MW-06	0.841	6.82
	BR-MW-07	1.12	14.0
Kootenay River (reference)	KR-MW-08	0.648	10.6
	KR-MW-09	0.701	-
	KR-MW-10	1.26	-
	KR-MW-11	2.58	22.2
	KR-MW-12	0.961	10.5
Flathead River (reference)	FC-MW-05	1.78	14.0
	FC-MW-06	2.25	16.4
	FC-MW-07	2.47	21.6
	FC-MW-08	3.24	14.3
	FC-MW-09	1.34	22.0
St. Mary's River (reference)	MR-MW-01	0.457	3.24
	MR-MW-02	0.474	4.07
	MR-MW-03	0.881	-
	MR-MW-04	0.543	-
	MR-MW-05	0.865	-

Table HMW.5: Results of the Temporal Analysis of Selenium Concentrations in Mountain Whitefish Muscle and Ovary Samples, 2006 - 2015

Tissue Type	Area	Period	Statistic	n	Value	Test	P-value	Pairwise Comparisons [a]
Muscle	Lower Elk River	2006 Aug	Median	5	4.34	K-W	0.012	B
		2009 Aug		5	4.79			B
		2012 Oct		1	6.51			AB
		2015 Oct		5	8.94			A
	Lower Michel Creek	2006 Aug	Mean	10	4.12	ANOVA	0.004	B
		2009 Aug		5	6.41			A
		2012 Oct		5	4.77			AB
		2015 Oct		5	3.89			B
	Lower Fording River	2006 Aug	Median	5	5.13	K-W	0.035	B
		2009 Aug/Sept		10	6.23			A
		2012 Oct		5	5.95			AB
		2015 Oct		5	5.96			AB
Ovary	Lower Elk River	2006 Aug	Mean	5	42.22	ANOVA	0.001	AB
		2009 Aug		5	47.32			A
		2012 Oct		10	31.70			C
		2015 Oct		5	27.38			BC
	Lower Michel Creek	2006 Aug	Mean	10	40.54	ANOVA	<0.001	AB
		2009 Aug		5	47.74			A
		2012 Oct		5	26.23			C
		2015 Oct		5	33.36			BC
	Lower Fording River	2006 Aug	Median	5	36.60	K-W	0.072	A
		2009 Aug/Sept		10	30.71			A
		2012 Oct		5	28.95			A
		2015 Oct		5	27.80			A

P-value < 0.05

Notes: "K-W" = Kruskal-Wallis test

[a] Time periods that share a letter are not significantly different from each other (Tukey's Honestly Significant Differences method for ANOVA and Dunn's test for the Kruskal-Wallis test)

Table HMW.6: Spearman Correlation Between Mountain Whitefish Health Endpoints and Tissue Selenium Concentrations, 2015

Species	Endpoint	Tissue Se Concentration								
		Ovary			Muscle			Whole Body		
		n	r_s	p	n	r_s	p	n	r_s	p
Mountain Whitefish	Length	37	0.515	0.001	40	0.534	<0.001	-	-	-
	Body Weight	37	0.503	0.002	40	0.508	0.001	-	-	-
	Fulton's Condition Factor (K)	37	0.210	0.213	40	0.178	0.273	-	-	-
	Gonadosomatic Index (GSI)	37	0.005	0.978	40	0.062	0.704	-	-	-
	Liversomatic Index (LSI)	37	0.239	0.154	40	0.409	0.009	-	-	-

P-value < 0.05

Table HMW.7: **Metal Concentrations in Mountain Whitefish Muscle, October 2015**

Area	Sample ID	Total Dry Mass	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe	Ga	Hg	K	Li	Mg
		(g)	(%)	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Lower Fording River	LFR-MW-02M	2.3645	77%	<0.00030	1.13	0.0767	<0.18	0.0218	<0.0029	<0.00018	483	0.008	0.0465	0.0604	0.0267	1.5	15.3	0.0036	0.0762	18,700	0.307	1,280
	LFR-MW-03M	1.8923	78%	0.00032	1.09	0.0588	<0.080	0.284	<0.0026	<0.00020	3,718	0.0102	0.0353	0.0669	0.0334	1.43	16.2	0.0070	0.126	20,450	0.219	1,180
	LFR-MW-04M	1.1088	79%	0.00074	1.05	0.0529	0.097	0.0628	<0.0026	<0.00020	530	0.00678	0.0379	0.0683	0.0424	1.61	21	0.0052	0.103	21,600	0.171	1,210
	LFR-MW-05M	0.9853	79%	0.00049	0.93	0.0331	0.106	0.0276	<0.0023	<0.00018	427	0.00784	0.03	0.125	0.0368	0.907	11.9	0.0056	0.103	22,700	0.189	1,260
	LFR-MW-06M	1.8762	77%	0.00069	1.88	0.0519	<0.074	0.0311	<0.0024	<0.00018	431	0.00386	0.0279	0.0669	0.0297	1.03	11.3	0.0061	0.0551	21,400	0.163	1,300
Upper Elk River	UER-MW-06M	1.5672	79%	0.0004	1.12	0.053	<0.12	0.0937	<0.0016	<0.00029	1,280	0.0058	0.0678	0.0671	0.0391	1.13	17.3	0.0088	0.0792	21,600	0.0372	1,250
	UER-MW-07M	2.6284	77%	0.00076	8.16	0.0794	<0.12	0.325	<0.0015	0.00055	2,825	0.00906	0.0404	0.0921	0.0232	1.04	18.8	0.0107	0.0857	21,700	0.0246	1,290
	UER-MW-08M	1.1029	80%	0.00062	3.17	0.0472	<0.12	0.197	<0.0015	<0.00028	3,260	0.00736	0.0357	0.0829	0.0284	1.36	19	0.00913	0.204	24,800	0.0459	1,370
	UER-MW-09M	1.0395	78%	0.00081	1.75	0.122	<0.12	0.0509	<0.0016	<0.00029	516	0.0082	0.0245	0.0624	0.245	1.24	13.5	0.00754	0.0697	23,200	0.0473	1,230
	UER-MW-10M	0.8762	77%	0.00068	0.595	0.0644	<0.12	0.0218	<0.0016	<0.00029	481	0.0059	0.0389	0.0601	0.0196	1.14	10.9	0.00711	0.0849	23,200	0.0355	1,370
Michel Creek	MC-MW-02M	1.5524	77%	0.0005	3.41	0.113	0.13	0.0676	<0.0014	<0.00026	398	0.0144	0.0936	0.0831	0.0314	1.27	13.6	0.00844	0.0776	22,000	0.0435	1,250
	MC-MW-03M	2.6048	77%	0.00076	1.62	0.220	<0.12	0.141	<0.0016	<0.00029	2,012	0.00904	0.0694	0.0879	0.0386	1.11	14.2	0.00732	0.0584	21,800	0.0167	1,285
	MC-MW-04M	1.7725	77%	<0.00028	7.15	0.221	<0.16	0.0678	<0.0026	<0.00017	419	0.0162	0.157	0.0788	0.0462	0.924	16.5	0.0071	0.113	21,100	0.0532	1,260
	MC-MW-05M	1.4879	77%	<0.00029	1.74	0.067	0.18	0.054	<0.0027	0.00045	527	0.0076	0.0887	0.0539	0.0292	1.35	13.5	0.0056	0.0744	21,600	0.0206	1,350
	MC-MW-06M	1.9472	77%	0.00515	1.22	0.0949	<0.18	0.371	<0.0029	0.00076	2,690	0.0054	0.0724	0.103	0.0289	1.19	12.1	0.0068	0.0562	19,700	0.0543	1,430
Lower Elk River	LER-MW-02M	1.2914	79%	0.00072	1.4	0.0515	<0.12	0.202	<0.0015	0.00084	2,660	0.0112	0.0284	0.0628	0.0286	1.23	7.5	0.00903	0.159	22,800	0.0521	1,350
	LER-MW-03M	1.3253	80%	0.00038	0.387	0.0681	<0.12	0.0138	<0.0016	<0.00029	447	0.0055	0.0183	0.0583	0.0221	1.12	13.9	0.00622	0.114	21,400	0.0852	1,290
	LER-MW-04M	1.6037	80%	0.00055	0.684	0.073	<0.11	0.64	<0.0015	0.0013	5,240	0.0113	0.0188	0.0591	0.0174	0.688	13.4	0.00816	0.123	20,800	0.0914	1,280
	LER-MW-05M	2.0434	79%	0.00039	0.448	0.0463	<0.11	0.157	<0.0014	<0.00026	2,260	0.00829	0.0264	0.0628	0.019	1.21	17.7	0.00685	0.179	20,500	0.0549	1,220
	LER-MW-06M	1.2729	78%	0.00036	1.04	0.0563	<0.12	0.0209	<0.0016	0.00082	467	0.0053	0.0219	0.0648	0.0206	0.835	15.1	0.00889	0.0932	22,700	0.0782	1,270
Bull River (reference)	BR-MW-03M	1.3187	79%	0.00068	2.48	0.158	0.254	0.161	<0.0025	0.00066	1,090	0.00587	0.0404	0.195	0.0537	1	15.6	0.0052	0.261	23,300	0.0332	1,360
	BR-MW-04M	1.1093	78%	0.00026	0.438	0.0516	0.089	0.109	<0.0023	0.00032	1,900	0.00274	0.0432	0.0682	0.0883	0.968	10.9	0.0058	0.136	22,600	0.0336	1,260
	BR-MW-05M	1.2398	77%	0.00036	1.26	0.101	0.089	0.0706	<0.0025	0.00072	1,010	<0.00074	0.0166	0.197	0.103	1.03	12.2	0.0059	0.409	22,500	0.0619	1,280
	BR-MW-06M	0.7208	78%	0.00036	0.706	0.0832	<0.070	0.0259	<0.0023	0.00068	450	0.0035	0.0336	0.0709	0.204	0.98	9.48	0.0057	0.235	24,000	0.0494	1,190
	BR-MW-07M	1.3247	79%	0.00042	1.31	0.0468	0.113	0.186	<0.0026	0.00067	1,990	0.00322	0.0734	0.0873	0.165	0.744	14.8	0.0068	0.204	24,000	0.0277	1,290
Kootenay River (reference)	KR-MW-08M	1.0761	79%	0.00056	1.05	0.0989	0.109	0.0588	<0.0027	0.00049	669	0.00242	0.0666	0.0693	0.231	1.01	9.67	0.0052	0.0781	24,500	0.0102	1,240
	KR-MW-09M	0.5991	78%	<0.00025	1.21	0.0641	0.11	0.0339	<0.0024	0.00079	424	0.00307	0.0276	0.0668	0.282	0.942	12.8	0.0043	0.156	21,600	0.0135	1,090
	KR-MW-10M	0.8196	77%	0.00032	1.98	0.0909	0.16	0.153	<0.0025	0.00239	2,520	<0.00076	0.0289	0.0744	0.0831	0.777	7.7	0.0068	0.175	22,500	0.0108	1,270
	KR-MW-11M	1.2830	79%	0.000705	3.11	0.0751	0.117	0.101	<0.0025	0.000245	768	0.00185	0.0251	0.0667	0.0555	0.804	14.7	0.0060	0.157	23,650	0.0103	1,200
	KR-MW-12M	1.2356	79%	0.00048	1.07	0.107	0.107	0.163	<0.0026	0.00053	1,990	0.00528	0.0296	0.0648	0.217	0.646	9.56	0.0079	0.127	23,100	0.0138	1,250
Flathead River (reference)	FC-MW-05M	0.8556	77%	0.00058	0.726	0.132	0.109	0.295	<0.0025	0.00142	1,990	0.00419	0.0183	0.0609	0.0171	0.857	8.49	0.0067	0.19	22,600	0.0114	1,260
	FC-MW-06M	1.1377	78%	0.00265	6.82	0.17	<0.076	0.0847	<0.0025	<0.00019	499	0.00414	0.0308	0.0678	0.0287	1.02	15	0.007	0.188	23,100	0.0159	1,240
	FC-MW-07M	1.1624	77%	<0.00028	0.317	0.0794	0.09	0.00802	<0.0027	<0.00020	357	0.00781	0.019	0.0621	0.041	1.09	16.3	0.0049	0.377	20,800	0.0142	1,030
	FC-MW-08M	1.0158	78%	0.0005	0.987	0.0954	0.09	0.0829	<0.0025	<0.00019	537	0.0101	0.0339	0.0757	0.0163	1.6	21.8	0.0055	0.264	21,100	0.0147	1,160
	FC-MW-09M	1.5103	76%	0.0007	1.02	0.137	<0.075	0.281	<0.0024	<0.00018	2,280	0.00405	0.0205	0.0698	0.0205	1.49	15.6	0.0056	0.183	18,900	0.0138	1,040
St. Mary's River (reference)	MR-MW-01M	1.9471	77%	0.00064	1.81	0.0839	0.164	0.204	<0.0026	0.00037	2,260	0.00776	0.0483	0.148	0.631	0.811	9.3	0.0054	0.148	21,200	0.0255	1,210
	MR-MW-02M	1.4377	78%	0.00046	0.843	0.0551	<0.077	0.254	<0.0025	0.00025	3,470	0.0034	0.0306	0.0764	0.397	0.789	8.27	0.0071	0.124	22,000	0.0184	1,250
	MR-MW-03M	1.3203	76%	0.00098	0.388	0.0733	<0.075	0.0165	<0.0025	0.00039	502	0.00489	0.0469	0.0716	0.616	0.793	8.84	0.0056	0.189	20,000	0.0133	1,150
	MR-MW-04M	0.9971	77%	0.00047	2.35	0.0595	<0.075	0.0798	<0.0025	0.00022	637	0.00189	0.0251	0.074	0.291	0.897	9.16	0.0066	0.0962	21,900	0.0095	1,250
	MR-MW-05M	0.6854	77%	0.00136	1.03	0.0675	<0.079	0.0729	<0.0026	0.0004	1,060	0.00342	0.0541	0.0818	0.486	0.873	10.4	0.0052	0.125	21,100	0.0182	1,220

Table HMW.7: **Metal Concentrations in Mountain Whitefish Muscle, October 2015**

Area	Sample ID	Mn	Mo	Na	Ni	P	Pb	Rb	Re	Sb	Se	Sn	Sr	Th	Ti	Tl	U	V	Y	Zn	Zr
		mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Lower Fording River	LFR-MW-02M	0.566	0.0085	1,960	0.0209	10,600	0.0169	6.15	<0.000052	0.00112	7.06	0.002	0.107	0.000133	0.116	0.0568	0.000134	0.00436	0.00044	14.3	0.0046
	LFR-MW-03M	0.723	0.0136	1,455	0.0248	12,650	0.0112	5.39	0.0000217	<0.0012	5.96	0.00125	1.82	0.000285	0.122	0.0959	0.00129	0.00694	0.00056	12.7	0.00423
	LFR-MW-04M	0.662	0.0086	1,890	0.0165	11,500	0.00645	7.93	0.0000164	<0.0012	6.84	0.0016	0.0961	0.000175	0.088	0.0849	0.00036	0.00422	0.00063	12.4	0.00733
	LFR-MW-05M	0.704	0.0096	1,580	0.0255	11,900	0.0106	5.8	0.0000899	0.0013	5.96	0.0024	0.101	0.000135	0.146	0.0652	0.000246	0.0054	0.00035	12	0.00616
	LFR-MW-06M	0.519	0.0084	879	0.0175	11,500	0.0101	5.5	0.0000325	0.002	4.86	0.0255	0.0561	0.000317	0.119	0.0505	0.000284	0.00715	0.00076	12.7	0.00636
Upper Elk River	UER-MW-06M	0.879	0.0137	1,850	0.0221	11,200	0.0058	6.72	0.000079	0.00067	5.26	0.00234	0.689	0.000163	0.119	0.0767	0.000533	0.0092	0.00098	13	0.00554
	UER-MW-07M	1.34	0.0142	1,240	0.0281	12,200	0.0103	4.98	0.000035	0.00124	6.90	0.00225	1.68	0.00174	0.287	0.0379	0.00143	0.0390	0.00725	14.3	0.00885
	UER-MW-08M	1.01	0.0171	1,240	0.0256	13,400	0.00538	4.54	0.000081	0.00084	4	0.00352	1.95	0.000668	0.118	0.117	0.00111	0.0192	0.00261	12.7	0.0132
	UER-MW-09M	0.733	0.0098	999	0.0228	11,300	0.00887	9.17	0.000106	0.00073	5.51	0.0029	0.199	0.000367	0.13	0.0595	0.000257	0.0073	0.00093	11.6	0.00361
	UER-MW-10M	0.631	0.0114	780	0.00998	11,500	0.00305	5.88	0.000059	0.0005	5.2	0.00151	0.148	<0.000056	0.086	0.0639	0.000071	0.00344	0.00033	11.5	0.00174
Michel Creek	MC-MW-02M	0.477	0.0138	1,210	0.03	11,400	0.0141	7.63	<0.000033	0.0011	3.84	0.00394	0.101	0.000701	0.159	0.129	0.000354	0.0129	0.00087	14.4	0.00494
	MC-MW-03M	0.734	0.00837	959	0.0294	11,700	0.0112	9.65	<0.000036	0.00149	2.85	0.00185	0.830	0.000255	0.105	0.190	0.000628	0.00908	0.00063	13.5	0.00432
	MC-MW-04M	0.536	0.0063	1,480	0.0493	11,500	0.0118	11.3	<0.000048	0.00127	4.06	0.00202	0.134	0.000845	0.233	0.231	0.000674	0.0255	0.00619	10.4	0.0101
	MC-MW-05M	0.745	0.007	1,370	0.0188	12,200	0.00615	6.53	<0.000049	<0.00072	3.88	0.00108	0.152	0.000174	0.107	0.158	0.000205	0.00688	0.00061	12	0.00447
	MC-MW-06M	1.05	0.0089	1,680	0.0595	12,600	0.0239	6.2	<0.000053	0.00085	4.82	0.00899	1.34	0.000178	0.122	0.0638	0.000566	0.00799	0.00042	14.3	0.00676
Lower Elk River	LER-MW-02M	1.05	0.00783	1,640	0.0202	12,300	0.00774	7.79	0.000047	0.00058	8.94	0.00344	1.71	0.000241	0.124	0.0388	0.000853	0.00824	0.00083	13.3	0.00955
	LER-MW-03M	0.684	0.012	1,830	0.0121	10,700	0.00288	5.16	<0.000037	0.00139	5.57	0.00097	0.119	<0.000057	0.0915	0.0642	0.000085	0.00267	<0.00024	12	0.00485
	LER-MW-04M	0.871	0.0157	2,120	0.0265	13,300	0.00983	4.71	0.000047	0.0009	12.2	0.00148	2.91	0.000132	0.103	0.0305	0.0013	0.012	0.00039	13.5	0.00536
	LER-MW-05M	0.769	0.015	1,980	0.0178	11,400	0.00441	4.45	0.000046	0.00087	5.8	<0.00076	1.27	0.000111	0.0893	0.0589	0.000403	0.00433	<0.00021	15.7	0.0045
	LER-MW-06M	0.586	0.0139	1,900	0.0153	11,500	0.00247	5.06	0.000063	0.0004	10.4	0.00118	0.137	0.0004	0.0986	0.0439	0.000159	0.0054	0.00049	11.6	0.00438
Bull River (reference)	BR-MW-03M	0.642	0.0091	1,230	0.0352	12,700	0.0694	7.67	0.0000989	0.0049	4.52	0.0097	0.502	0.000503	0.19	0.0535	0.000933	0.0108	0.00136	11.7	0.0103
	BR-MW-04M	0.993	0.0096	960	0.014	12,600	0.0237	6.52	0.0000391	0.0023	1.23	0.00303	1.03	0.000127	0.0726	0.0238	0.000562	0.00329	0.00033	12.2	0.00665
	BR-MW-05M	0.496	0.01	825	0.0174	12,400	0.0303	12.2	0.0000487	0.0017	2.64	0.0051	0.371	0.00015	0.122	0.0193	0.000253	0.00632	0.00048	11.2	0.00475
	BR-MW-06M	0.511	0.0079	1,160	0.0188	12,400	0.0337	17.6	0.0000225	0.0022	0.841	0.00513	0.127	0.000085	0.0983	0.0208	0.000558	0.0047	0.00025	11.5	0.0106
	BR-MW-07M	1.08	0.0106	970	0.032	13,100	0.0343	10.8	0.0000261	<0.0012	1.12	0.0043	1.34	0.00024	0.102	0.0293	0.000881	0.00601	0.00047	11.7	0.00551
Kootenay River (reference)	KR-MW-08M	0.863	0.0128	888	0.0225	12,600	0.0528	18.2	0.0000092	0.0018	0.648	0.0033	0.298	0.000243	0.091	0.0253	0.00128	0.00375	0.00032	12	0.00446
	KR-MW-09M	0.604	0.0114	1,140	0.014	11,000	0.0214	18.6	0.000024	<0.0011	0.701	0.00267	0.191	0.000211	0.104	0.0169	0.000595	0.00459	0.00046	11.5	0.00248
	KR-MW-10M	1.08	0.0113	810	0.0193	12,600	0.0235	7.71	0.0000179	<0.0012	1.26	0.0023	1.47	0.00032	0.162	0.018	0.000417	0.00643	0.00061	13.1	0.00432
	KR-MW-11M	0.595	0.0095	1,125	0.0601	11,950	0.0100	9.88	0.0000278	<0.0012	2.58	0.00591	0.226	0.000878	0.120	0.0391	0.000275	0.00401	0.00074	11.1	0.00382
	KR-MW-12M	1.1	0.0078	1,120	0.051	12,800	0.0226	15.9	<0.000004	<0.0012	0.961	0.0021	1.41	0.000498	0.097	0.0213	0.00401	0.00403	0.00048	14.2	0.00355
Flathead River (reference)	FC-MW-05M	0.825	0.0086	948	0.0141	12,800	0.00429	5.99	0.000068	<0.0012	1.78	<0.0010	0.4	0.00032	0.091	0.0799	0.000356	0.00685	0.00043	11.1	0.00597
	FC-MW-06M	0.61	0.0102	1,210	0.0082	12,200	0.00248	7.03	0.0000332	<0.0011	2.25	<0.0010	0.0701	0.00113	0.177	0.14	0.00021	0.0262	0.00157	10.9	0.00333
	FC-MW-07M	0.396	0.0097	1,420	0.0048	10,800	0.00078	9.07	0.0000331	<0.0012	2.47	<0.0011	0.0504	0.000075	0.065	0.114	<0.000051	0.00265	<0.00025	10.3	0.00122
	FC-MW-08M	0.72	0.0108	1,350	0.0139	11,300	0.0061	3.97	0.0000644	<0.0012	3.24	<0.0010	0.0876	0.000178	0.097	0.142	0.000163	0.00866	0.00049	12.6	0.00217
	FC-MW-09M	0.94	0.0102	1,140	0.0136	11,300	0.00456	6.03	0.0000949	<0.0011	1.34	0.00106	0.651	0.000204	0.102	0.0898	0.000312	0.00659	0.00062	22.4	0.00285
St. Mary's River (reference)	MR-MW-01M	1.11	0.0144	1,000	0.0325	11,900	0.0606	32.3	0.0000061	<0.0012	0.457	0.0049	1.37	0.000437	0.132	0.0331	0.0255	0.00791	0.00057	13.5	0.0036
	MR-MW-02M	1.24	0.0075	1,310	0.0248	12,900	0.0236	27.8	0.000009	<0.0012	0.474	0.0021	2.59	0.000227	0.099	0.0266	0.00907	0.00526	0.00048	12.5	0.0285
	MR-MW-03M	0.566	0.0081	1,360	0.0124	10,600	0.00717	29.9	0.000031	<0.0011	0.881	<0.0010	0.191	0.000045	0.083	0.0254	0.00147	0.00308	<0.00023	11.3	0.0163
	MR-MW-04M	0.799	0.0096	1,200	0.0173	11,500	0.0113	25.7	0.0000168	<0.0011	0.543	0.00325	0.375	0.000344	0.145	0.0219	0.00127	0.00771	0.0008	12.1	0.0134
	MR-MW-05M	0.906	0.0123	1,180	0.0238	11,400	0.016	28.3	0.0000239	<0.0012	0.865	0.0024	0.684	0.000199	0.092	0.034	0.00378	0.00591	0.0008	12.4	0.00825

Table HMW.8: **Metal Concentrations in Mountain Whitefish Ovaries, October 2015**

Area	Sample ID	Total Dry Mass	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe	Ga	Hg	K	Li	Mg
		(g)	(%)	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Lower Fording River	LFR-MW-02G	14.8542	64%	0.00942	0.524	0.0464	<0.081	0.162	<0.0027	<0.00020	998	0.0324	0.132	0.0721	0.0059	2.24	30.1	0.0047	0.00528	6,410	0.118	1,040
	LFR-MW-03G	25.8063	63%	0.00813	0.47	0.0338	<0.069	0.135	<0.0023	<0.00017	993	0.0293	0.0819	0.0683	0.00487	2.03	29.6	0.0047	0.00863	6,000	0.126	966
	LFR-MW-04G	15.7717	63%	0.008	0.311	0.0432	<0.080	0.144	<0.0026	<0.00020	1,120	0.0139	0.088	0.0692	0.00687	1.87	28.7	0.0046	0.00505	5,760	0.0811	973
	LFR-MW-05G	20.7233	64%	0.0106	2.58	0.0173	<0.080	0.482	<0.0026	0.00056	1,320	0.0259	0.0931	0.0791	0.00467	1.92	40.4	0.0064	0.00915	5,520	0.143	1,090
	LFR-MW-06G	26.8235	64%	0.0132	1.97	0.0386	<0.080	0.184	<0.0026	<0.00020	1,070	0.0129	0.109	0.0851	0.00433	1.85	33.5	0.0051	0.00329	5,550	0.113	1,000
Upper Elk River	UER-MW-06G	23.0115	62%	0.0141	18.2	0.0459	0.108	0.423	<0.0024	0.00023	1,220	0.0515	0.14	0.0942	0.00991	2.02	57.6	0.0113	0.00806	5,470	0.0423	1,060
	UER-MW-07G	12.0693	61%	0.0234	6.08	0.0501	0.129	0.485	<0.0023	0.00047	973	0.0292	0.163	0.0733	0.00396	2.11	39.6	0.0075	0.00678	6,360	0.0191	976
	UER-MW-08G	24.5912	62%	0.0178	2.07	0.0285	0.077	0.217	<0.0024	<0.00018	1,050	0.0259	0.0753	0.0647	0.00236	2.07	35.2	0.0064	0.0117	5,290	0.0359	1,040
	UER-MW-09G	17.9807	64%	0.0111	0.496	0.0578	<0.080	0.212	<0.0026	<0.00020	964	0.0232	0.114	0.0661	0.0239	1.85	28.1	0.0052	0.00347	5,190	0.0377	928
	UER-MW-10G	5.5612	64%	0.0185	0.47	0.0691	0.081	0.443	<0.0024	<0.00018	907	0.011	0.152	0.0628	0.00284	1.98	35.6	0.0067	0.00409	6,030	0.0183	992
Michel Creek	MC-MW-02G	27.1863	63%	0.0146	3.7	0.0862	0.138	0.698	<0.0026	<0.00020	1,140	0.109	0.23	0.0739	0.00406	1.86	34	0.006	0.00401	5,340	0.0313	942
	MC-MW-03G	20.8112	64%	0.0132	0.527	0.14	0.103	0.64	<0.0025	<0.00019	1,020	0.0316	0.272	0.0646	0.00481	2.01	35.2	0.0049	0.00441	5,620	0.0279	986
	MC-MW-04G	10.7584	63%	0.00958	2.25	0.0914	<0.080	0.369	<0.0027	<0.00020	944	0.0297	0.304	0.0710	0.00540	2.02	24.0	0.0062	0.00539	5,305	0.0335	968
	MC-MW-05G	10.2104	64%	0.00931	1.91	0.0857	<0.067	0.76	<0.0022	0.00043	1,040	0.0235	0.231	0.0742	0.00399	1.91	29.7	0.0053	0.00338	5,480	0.0157	959
	MC-MW-06G	24.9632	62%	0.00993	0.854	0.106	0.096	1.59	<0.0026	<0.00020	928	0.0515	0.18	0.0816	0.00493	1.98	35.8	0.0058	0.00442	6,120	0.0217	848
Lower Elk River	LER-MW-02G	12.1909	64%	0.0116	0.445	0.0214	<0.074	0.159	<0.0024	0.00057	1,190	0.0426	0.139	0.0681	0.00446	2.19	44.3	0.0050	0.0200	5,655	0.0346	1,007
	LER-MW-03G	24.3380	63%	0.0122	0.441	0.0469	<0.075	0.253	<0.0025	<0.00018	1,020	0.0196	0.0589	0.0819	0.00378	2.2	39.8	0.0054	0.00937	5,690	0.0507	967
	LER-MW-04G	21.0853	64%	0.0267	0.514	0.0321	<0.075	0.222	<0.0025	0.00054	1,010	0.0288	0.163	0.0668	0.00291	2.17	38.9	0.0054	0.0105	5,510	0.0431	956
	LER-MW-05G	20.8785	63%	0.00878	0.343	0.0280	0.107	0.188	<0.0025	<0.00019	991	0.0178	0.0668	0.0640	0.00310	2.20	33.3	0.0054	0.0117	5,725	0.0401	980
	LER-MW-06G	21.3458	64%	0.0229	0.255	0.0297	<0.078	0.193	<0.0026	0.00044	1,020	0.0258	0.136	0.0646	0.00329	1.78	33.3	0.0036	0.00546	5,070	0.0501	1,090
Bull River (reference)	BR-MW-03G	7.5837	66%	0.0147	1.14	0.0965	0.122	0.208	<0.0026	<0.00020	1,080	0.019	0.238	0.072	0.00665	2.38	106	0.0063	0.0235	5,700	0.0143	1,080
	BR-MW-04G	7.1153	65%	0.00704	0.909	0.0959	0.130	0.226	<0.0025	<0.00019	1,844	0.00453	0.204	0.0938	0.00901	2.21	44.3	0.0056	0.0116	5,355	0.0213	929
	BR-MW-05G	12.4118	64%	0.00488	0.481	0.0778	0.137	0.178	<0.0026	<0.00020	961	0.00225	0.151	0.0638	0.01	2.03	39.6	0.0044	0.0265	5,280	0.0421	974
	BR-MW-06G	17.5797	64%	0.00764	0.558	0.044	0.091	0.292	<0.0026	<0.00020	1,040	0.00747	0.137	0.063	0.0229	1.78	35.2	0.0042	0.0144	5,640	0.0342	918
	BR-MW-07G	20.1939	64%	0.0074	0.417	0.0292	0.14	0.183	<0.0025	0.00033	963	0.0046	0.223	0.0651	0.0157	2.2	38.8	0.0054	0.0168	5,160	0.0214	1,080
Kootenay River (reference)	KR-MW-08G	11.1394	64%	0.00639	5.34	0.134	0.088	0.429	<0.0026	0.00023	1,270	0.00458	0.243	0.0778	0.0252	2.15	39.4	0.007	0.00723	5,370	0.0089	954
	KR-MW-09G	6.8223	64%	0.00818	0.719	0.0615	0.086	0.404	<0.0024	0.00037	1,070	0.00405	0.0727	0.0646	0.0308	2.06	28.8	0.0056	0.00934	5,150	0.0095	892
	KR-MW-10G	7.8019	62%	0.00641	2.04	0.105	0.093	0.215	<0.0025	0.00033	1,100	0.00192	0.149	0.0672	0.0126	2.32	32.8	0.0054	0.0111	5,340	0.0076	926
	KR-MW-11G	9.6377	63%	0.00436	0.22	0.062	0.076	0.352	<0.0022	<0.00017	1,010	0.00484	0.0776	0.0626	0.00606	1.94	25.3	0.0044	0.00935	5,390	0.0087	945
	KR-MW-12G	6.2383	63%	0.00883	0.404	0.0779	<0.077	0.258	<0.0025	0.00019	995	0.00895	0.131	0.0614	0.0248	2.07	36.7	0.0059	0.0102	4,870	0.0068	916
Flathead River (reference)	FC-MW-05G	8.9570	64%	0.0111	0.361	0.0943	<0.17	0.505	<0.0028	0.00058	966	0.00865	0.111	0.0600	0.00274	2.23	28.7	0.0063	0.0115	6,085	0.0152	1,000
	FC-MW-06G	8.9255	63%	0.0124	0.92	0.0856	<0.18	0.327	<0.0030	<0.00019	1,050	0.0152	0.127	0.122	0.00312	2.28	29.3	0.0054	0.00929	5,540	0.0168	1,080
	FC-MW-07G	6.6511	63%	0.0116	0.451	0.0426	<0.17	0.311	<0.0028	<0.00018	1,020	0.0197	0.0925	0.0678	0.0053	2.1	39	0.0042	0.0289	5,570	0.0149	1,090
	FC-MW-08G	8.2128	63%	0.012	1.69	0.0479	<0.18	0.836	<0.0029	<0.00019	991	0.0318	0.124	0.0681	0.00197	2.23	46.6	0.0049	0.0246	5,450	0.0225	1,180
	FC-MW-09G	8.6206	63%	0.0161	77.7	0.084	<0.17	0.435	<0.0027	0.00021	1,020	0.0111	0.113	0.122	0.00599	2.22	94.1	0.0302	0.0164	5,460	0.501	1,130
St. Mary's River (ref)	MR-MW-01G	10.1919	63%	0.0128	9.84	0.0897	<0.17	0.244	<0.0028	0.00026	958	0.0357	0.221	0.0709	0.0916	2.99	57	0.0085	0.0183	5,440	0.0163	1,030
	MR-MW-02G	7.4431	64%	0.0226	0.534	0.0562	<0.18	0.265	<0.0029	<0.00018	888	0.0087	0.108	0.0629	0.0669	2.19	31.1	0.0052	0.0125	6,800	0.0135	1,070

Table HMW.8: **Metal Concentrations in Mountain Whitefish Ovaries, October 2015**

Area	Sample ID	Mn	Mo	Na	Ni	P	Pb	Rb	Re	Sb	Se	Sn	Sr	Th	Ti	Tl	U	V	Y	Zn	Zr
		mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw	mg/kg dw
Lower Fording River	LFR-MW-02G	10	0.02	2,540	0.0637	9,460	0.00356	2.33	0.00157	<0.0012	30.6	<0.0011	0.681	0.000154	0.088	0.00767	0.00137	0.00755	0.00164	71.3	0.00205
	LFR-MW-03G	6.16	0.0127	2,360	0.0435	9,020	0.00292	1.7	0.00178	<0.0010	27.8	<0.00091	0.59	0.000099	0.0654	0.00704	0.00195	0.00855	0.00101	67.3	0.0321
	LFR-MW-04G	6.83	0.0186	2,570	0.0503	9,100	0.00278	2.44	0.00128	<0.0012	27.5	<0.0011	0.548	0.000055	0.066	0.0046	0.00163	0.00553	0.00095	62	0.0148
	LFR-MW-05G	10.9	0.0187	2,770	0.113	9,320	0.00457	1.43	0.00197	<0.0012	26	<0.0011	1.25	0.000651	0.117	0.00737	0.00463	0.0264	0.0102	73.3	0.0114
	LFR-MW-06G	7.77	0.0122	2,970	0.0294	9,100	0.00434	1.8	0.00209	<0.0012	29.1	<0.0011	0.62	0.00031	0.083	0.00353	0.00138	0.0128	0.00185	60.8	0.0157
Upper Elk River	UER-MW-06G	13.8	0.0253	2,170	0.0752	9,300	0.00957	1.85	0.0028	0.0019	20.9	0.00282	1.3	0.00468	0.474	0.00987	0.00451	0.0781	0.0126	63.5	0.0142
	UER-MW-07G	14.6	0.02	1,900	0.0679	9,750	0.00735	1.64	0.00314	<0.0011	28.1	<0.00094	1.26	0.00172	0.181	0.00499	0.00363	0.041	0.00765	53.5	0.00849
	UER-MW-08G	12.3	0.0247	2,390	0.026	9,050	0.00267	0.976	0.0049	<0.0011	18.4	0.00128	1.1	0.000881	0.0931	0.00915	0.00245	0.0201	0.00366	51.9	0.00416
	UER-MW-09G	9.26	0.0161	2,670	0.0154	9,130	0.00147	2.37	0.00391	<0.0012	29.6	<0.0011	1.45	0.000353	0.065	0.0034	0.00191	0.0114	0.00231	56.1	0.00206
	UER-MW-10G	16.1	0.0282	2,220	0.0216	9,760	0.00163	1.79	0.00887	<0.0011	17.8	<0.00096	1.44	0.000395	0.0686	0.00881	0.00143	0.0139	0.00419	54	0.00206
Michel Creek	MC-MW-02G	10.1	0.0214	2,690	0.0575	8,820	0.00898	2	0.00165	<0.0012	31.1	0.0013	0.883	0.000886	0.162	0.00932	0.00241	0.0257	0.00432	65.2	0.00446
	MC-MW-03G	10.9	0.0184	3,020	0.0588	9,380	0.00667	2.8	0.00156	<0.0012	36.1	0.0013	0.927	0.000241	0.081	0.0145	0.00193	0.00996	0.00174	66.3	0.00251
	MC-MW-04G	7.86	0.0152	2,930	0.0604	8,805	0.00484	2.89	0.000948	<0.0012	25.9	<0.0011	0.773	0.000504	0.093	0.0157	0.00194	0.0134	0.00223	56.9	0.00593
	MC-MW-05G	11.3	0.0182	3,080	0.0676	9,040	0.00466	1.85	0.00109	<0.0010	31	<0.00088	0.847	0.000481	0.0815	0.00963	0.00205	0.0193	0.00215	58.1	0.00251
	MC-MW-06G	15.6	0.0196	2,130	0.0578	9,170	0.00922	2.17	0.00219	<0.0012	42.7	<0.0011	1.01	0.000361	0.073	0.0114	0.00283	0.0188	0.00275	61.6	0.00384
Lower Elk River	LER-MW-02G	7.70	0.0145	2,325	0.0226	9,240	0.00257	2.19	0.00244	<0.0012	30.3	<0.00097	0.993	0.000208	0.0757	0.00951	0.00435	0.0127	0.00540	57.1	0.00498
	LER-MW-03G	12.6	0.0207	2,220	0.0422	8,850	0.00219	1.37	0.00236	<0.0011	32.8	<0.00099	0.852	0.000135	0.0844	0.00878	0.00151	0.00853	0.00216	59.8	0.0133
	LER-MW-04G	7.59	0.0112	2,280	0.0303	9,310	0.00266	1.22	0.00272	<0.0011	37.5	<0.0010	0.758	0.000241	0.083	0.00415	0.00371	0.0177	0.0038	67.6	0.0068
	LER-MW-05G	13.1	0.0199	2,310	0.0259	8,845	0.00160	1.18	0.00176	<0.0012	29.6	<0.0010	0.854	9.75E-05	0.0643	0.00463	0.00148	0.00754	0.00178	73.0	0.00335
	LER-MW-06G	10.2	0.0153	2,240	0.0375	8,340	0.00139	1.13	0.00185	<0.0012	28.3	<0.0010	0.84	0.000268	0.057	0.00411	0.00276	0.0119	0.00248	65.4	0.00398
Bull River (reference)	BR-MW-03G	13.7	0.0218	2,810	0.031	9,430	0.0118	2.21	0.00448	<0.0012	24	0.0023	0.978	0.00104	0.084	0.0119	0.00412	0.031	0.023	69.6	0.0131
	BR-MW-04G	9.07	0.0204	3,030	0.0192	9,350	0.00952	1.78	0.00191	<0.0012	12.7	<0.0016	1.46	0.000802	0.0925	0.00281	0.00144	0.0110	0.00441	73.5	0.00444
	BR-MW-05G	7.15	0.0114	2,790	0.0124	8,750	0.00393	3.38	0.00226	<0.0012	12.9	<0.0010	0.759	0.000452	0.057	0.000917	0.000814	0.016	0.00187	68.5	0.00293
	BR-MW-06G	10	0.0189	3,090	0.017	8,600	0.0115	4.5	0.00158	<0.0012	6.82	<0.0011	1.1	0.000262	0.073	0.000779	0.0236	0.0242	0.00309	61.8	0.00345
	BR-MW-07G	13.7	0.0145	3,020	0.0187	8,760	0.00702	2.27	0.000794	<0.0012	14	<0.0010	0.999	0.000723	0.058	0.00262	0.00277	0.0192	0.00569	74.9	0.00347
Kootenay River (reference)	KR-MW-08G	17.1	0.0227	2,900	0.0164	9,450	0.0138	4.25	0.000166	<0.0012	10.6	0.0012	1.64	0.00172	0.105	0.00199	0.00691	0.0159	0.00677	67.6	0.00487
	KR-MW-09G	17.2	0.0237	2,760	0.0097	8,590	0.00796	4.85	0.000591	<0.0011	6.1	<0.00097	1.28	0.000374	0.0513	0.0015	0.0188	0.0142	0.00447	72	0.00276
	KR-MW-10G	17.7	0.0339	2,740	0.0169	9,140	0.0063	2.04	0.000526	<0.0011	20	<0.00099	1.26	0.000643	0.08	0.00144	0.000905	0.00918	0.00233	68.2	0.00226
	KR-MW-11G	11.2	0.0225	2,620	0.0082	9,100	0.00384	2.21	0.00208	<0.0010	22.2	<0.00089	0.642	0.000341	0.0519	0.00199	0.00174	0.00589	0.00327	56.5	0.00171
	KR-MW-12G	14.2	0.0276	2,520	0.0134	8,970	0.00703	3.31	0.000148	<0.0012	10.5	<0.0010	1.28	0.000341	0.056	0.00246	0.00961	0.00913	0.00428	74.1	0.00292
Flathead River (reference)	FC-MW-05G	12.4	0.0191	3,615	0.0146	8,885	0.00119	1.96	0.00187	<0.00106	14.0	<0.00058	0.384	9.65E-05	0.0580	0.00503	0.000562	0.0124	0.00384	53.6	0.00435
	FC-MW-06G	11.5	0.0245	3,520	0.0505	8,860	0.00191	1.89	0.00307	0.0008	16.4	<0.00062	0.434	0.000181	0.065	0.006	0.00082	0.0135	0.00362	63.2	0.0065
	FC-MW-07G	13.2	0.0335	3,230	0.0108	8,770	0.00171	2.77	0.00375	<0.00075	21.6	<0.00059	0.687	<0.000078	0.065	0.00989	0.000643	0.012	0.00269	61.9	0.00542
	FC-MW-08G	11.2	0.0229	3,140	0.0123	9,180	0.00262	1.04	0.00367	0.00092	14.3	<0.00061	0.447	0.00037	0.09	0.00605	0.00176	0.029	0.00428	59.9	0.0076
	FC-MW-09G	12.7	0.0243	3,180	0.0557	8,910	0.00713	2.08	0.0029	<0.00072	22	0.00156	0.554	0.00667	0.31	0.00719	0.0012	0.0781	0.0159	62.9	0.0167
St. Mary's River (ref)	MR-MW-01G	18.2	0.0302	3,120	0.0294	8,800	0.0331	9.06	0.000338	0.00157	3.24	0.00349	0.927	0.00261	0.366	0.00279	0.0594	0.0339	0.00963	76.3	0.00948
	MR-MW-02G	22.9	0.0535	2,990	0.0204	8,960	0.00435	8.94	0.000341	<0.00076	4.07	<0.00061	1.24	0.000167	0.054	0.00335	0.034	0.0108	0.00392	67.3	0.00313

Table HMW.9: Angling Records for Mountain Whitefish Caught for the RAEMP in the Elk Valley, October 2015

Area		Station ID	UTM (NAD83, 11U)		Start Date	Start Time	End Time	Angling Hours (hrs)	# of Lines	Effort (angling lines*days)	Mountain Whitefish			Westslope Cutthroat			Bull Trout			Rainbow Trout		
			Easting	Northing							Catch	Processed/ sacrificed	CPUE[a]	Catch	mortalities/ sacrificed	CPUE[a]	Catch	mortalities/ sacrificed	CPUE[a]	Catch	mortalities/ sacrificed	CPUE[a]
Reference	Bull River	BR-AN-01	612054	5481095	5-Oct-15	11:30	14:30	3.00	2	0.25	8	5/6	32.00	3	0	12.00	0	0	0	1	0	4.00
		TOTAL						**3.00**	**2**	**0.25**	**8**	**5**	**32.00**	**3**	**0**	**12.00**	**0**	**0**	**0**	**1**	**0**	**4.00**
	Flathead Creek	FC-AN-01	679444	5454300	9-Oct-15	13:00	13:30	0.50	2	0.04	9	5	216.00	0	0	0	0	0	0	0	0	0
		TOTAL						**0.50**	**2**	**0.04**	**9**	**5**	**216.00**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Kootenay River	KR-AN-01	598655	5496461	5-Oct-15	8:30	9:45	1.25	2	0.10	0	0	0	0	0	0	0	0	0	0	0	0
		KR-AN-02	598583	5497673	5-Oct-15	15:45	18:30	2.75	2	0.23	12	5	52.36	0	0	0	0	0	0	0	0	0
		TOTAL						**4.00**	**4**	**0.33**	**12**	**5**	**36.00**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	St. Mary's River	MR-AN-01	572839	5498198	11-Oct-15	14:30	18:30	4.00	2	0.33	5	5	15.00	0	0	0	0	0	0	0	0	0
		TOTAL						**4.00**	**2**	**0.33**	**5**	**5**	**15.00**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Moyie River	MOR-AN-01	579494	5453035	4-Oct-15	16:45	17:45	1.00	2	0.08	0	0	0	1	0	12.00	0	0	0	0	0	0
		MOR-AN-02	558702	5428749	11-Oct-15	11:30	12:00	0.50	2	0.04	0	0	0	0	0	0	0	0	0	0	0	0
		MOR-AN-03	560657	5431348	11-Oct-15	12:15	13:15	1.00	2	0.08	0	0	0	4	0	48.00	0	0	0	1	0	12.00
		TOTAL						**2.50**	**6**	**0.21**	**0**	**0**	**0**	**5**	**0**	**24.00**	**0**	**0**	**0**	**1**	**0**	**4.80**
Mine-exposed	Lower Elk River	LER-AN-01	644388	5469404	7-Oct-15	9:45	12:30	2.75	3	0.34	3	2	8.73	17	0	49.45	1	0	2.91	0	0	0
		LER-AN-02	639565	5463620	7-Oct-15	13:15	15:20	2.08	3	0.26	4	2	15.36	1	0	3.84	1	0	3.84	0	0	0
		LER-AN-03	644388	5469404	8-Oct-15	15:00	16:30	1.50	2	0.13	1	1	8.00	0	0	0	0	0	0	0	0	0
		TOTAL						**6.33**	**8**	**0.73**	**8**	**5**	**10.97**	**18**	**0**	**24.69**	**2**	**0**	**2.74**	**0**	**0**	**0**
	Upper Elk River	UER-AN-01	649920	5535885	7-Oct-15	17:30	19:30	2.00	2	0.17	5	2	30.00	0	0	0	0	0	0	0	0	0
		UER-AN-02	647269	5552032	9-Oct-15	16:00	17:30	1.50	2	0.13	0	0	0	3	0	24.00	0	0	0	0	0	0
		UER-AN-03	649260	5543632	9-Oct-15	17:30	19:00	1.50	2	0.13	2	1	16.00	0	0	0	0	0	0	0	0	0
		UER-AN-04	649260	5543632	10-Oct-15	13:30	15:05	1.58	2	0.13	2	2	15.16	2	0	15.16	0	0	0	0	0	0
		UER-AN-05	649428	5543279	10-Oct-15	12:30	13:00	0.50	2	0.04	0	0	0	1	0	24.00	0	0	0	0	0	0
		UER-AN-06	649920	5535885	10-Oct-15	10:15	12:05	1.83	2	0.15	4	0	26.18	2	0	13.09	0	0	0	0	0	0
		TOTAL						**8.92**	**12**	**0.15**	**13**	**5**	**85.09**	**8**	**0**	**52.36**	**0**	**0**	**0**	**0**	**0**	**0**
	Lower Fording River	LFR-AN-01	652944	5528924	6-Oct-15	16:30	19:00	2.50	2	0.21	3	2	14.40	5	0	0.35	0	0	0	0	0	0
		LFR-AN-02	652944	5528924	8-Oct-15	9:05	12:15	3.17	2	0.26	2	2	7.58	0	0	0	0	0	0	0	0	0
		LFR-AN-03	652944	5528924	10-Oct-15	8:30	9:00	0.50	2	0.04	1	1	24.00	0	0	0	0	0	0	0	0	0
		TOTAL						**6.17**	**6**	**0.51**	**6**	**5**	**11.68**	**5**	**0**	**9.73**	**0**	**0**	**0**	**0**	**0**	**0**
	Michel Creek	MC-AN-01	653509	5511298	6-Oct-15	11:30	12:45	1.25	2	0.10	0	0	0	16	0	153.60	0	0	0	0	0	0
		MC-AN-02	659946	5501100	6-Oct-15	13:45	14:15	0.50	2	0.04	0	0	0	4	0	96.00	0	0	0	0	0	0
		MC-AN-03	660478	5493151	6-Oct-15	14:30	15:20	0.83	2	0.07	4	3	57.60	0	0	0	0	0	0	0	0	0
		MC-AN-04	660612	5502880	6-Oct-15	15:30	16:05	0.58	2	0.05	2	2	41.14	3	0	61.71	0	0	0	0	0	0
		TOTAL						**3.17**	**8**	**0.26**	**6**	**5**	**22.74**	**23**	**0**	**87.16**	**0**	**0**	**0**	**0**	**0**	**0**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table HMW.10: Measurements for Mountain Whitefish Collected for the RAEMP in the Elk Valley, October 2015

Area		Sample Date	UTM (NAD83, 11U)		Fish ID	Total Length	Fork Length	Body Weight	Age Structure Collected[1]	Age	Sex	Gonad Weight[2]	Carcass in Bag Weight[3]	Liver Weight	Fulton's Condition Factor	Abnormalities/ Fate	Muscle Weight	Tissue Collected
			Easting	Northing		(cm)	(cm)	(g)				(g)	(g)	(g)	(K)		(g)	
Reference	Bull River	5-Oct-15	612054	5481095	BR-MW-01	30.1	27.5	232	-	-	M	-	-	-	1.12	none/ released	-	-
					BR-MW-02	29.5	27.1	184	-	-	M	-	-	-	0.92	none/ released	-	-
					BR-MW-03	32.4	29.7	297	PFR, Oto	11	F	27.713	279	4.453	1.13	none/ sacrificed	6.734	muscle, ovaries
					BR-MW-04	27.2	24.6	184	PFR, Oto	6	F	23.922	168	2.497	1.24	none/ sacrificed	5.506	muscle, ovaries
					BR-MW-05	30.9	28.1	282	PFR, Oto	6	F	41.840	244	4.171	1.27	none/ sacrificed	6.207	muscle, ovaries
					BR-MW-06	32.0	29.3	310	PFR, Oto	6	F	58.415	259	2.705	1.23	none/ sacrificed	3.638	muscle, ovaries
					BR-MW-07	34.2	31.2	375	PFR, Oto	9	F	62.268	310	4.933	1.23	none/ sacrificed	6.590	muscle, ovaries
					BR-MW-08	24.5	21.9	118	-	-	iM	-	-	-	1.12	none/ sacrificed	-	-
	Flathead Creek	9-Oct-15	679444	5454300	FC-MW-01	35.6	32.8	405	-	-	M	-	-	-	1.15	none/ released	-	-
					FC-MW-02	33.9	31.1	340	-	-	M	-	-	-	1.13	none/ released	-	-
					FC-MW-03	33.0	28.8	295	-	-	M	-	-	-	1.23	none/ released	-	-
					FC-MW-04	38.2	35.4	505	-	-	M	-	-	-	1.14	none/ released	-	-
					FC-MW-05	27.5	24.5	264	PFR, Oto	6	F	49.270	222	2.305	1.80	none/ sacrificed	4.074	muscle, ovaries
					FC-MW-06	33.2	30.6	395	PFR, Oto	8	F	88.330 (45.727)	348	5.791	1.38	none/ sacrificed	5.647	muscle, ovaries
					FC-MW-07	33.2	30.7	385	PFR, Oto	9	F	86.627 (44.389)	345	4.779	1.33	none/ sacrificed	5.364	muscle, ovaries
					FC-MW-08	38.7	36.1	610	PFR, Oto	11	F	134.279 (71.935)	535	11.355	1.30	none/ sacrificed	4.964	muscle, ovaries
					FC-MW-09	31.3	28.9	294	PFR, Oto	5	F	47.742	248	3.765	1.22	none/ sacrificed	6.739	muscle, ovaries
	Kootenay River	5-Oct-15	598583	5497673	KR-MW-01	29.2	26.6	218	-	-	M	-	-	-	1.16	none/ released	-	muscle, ovaries
					KR-MW-02	29.9	27.7	205	-	-	M	-	-	-	0.96	none/ released	-	muscle, ovaries
					KR-MW-03	29.1	26.7	192	-	-	M	-	-	-	1.01	none/ released	-	muscle, ovaries
					KR-MW-04	20.2	18.4	58	-	-	i	-	-	-	0.93	none/ released	-	muscle, ovaries
					KR-MW-05	24.6	22.5	138	-	-	M	-	-	-	1.21	none/ released	-	muscle, ovaries
					KR-MW-06	28.9	26.0	205	-	-	M	-	-	-	1.17	none/ released	-	muscle, ovaries
					KR-MW-07	35.3	32.4	395	-	-	M	-	-	-	1.16	none/ released	-	muscle, ovaries
					KR-MW-08	28.9	26.4	242	PFR, Oto	5	F	33.678	212	5.082	1.32	none/ sacrificed	5.438	muscle, ovaries
					KR-MW-09	29.4	27.0	249	PFR, Oto	7	F	37.741	221	2.060	1.27	none/ sacrificed	3.294	muscle, ovaries
					KR-MW-10	26.7	24.4	186	PFR, Oto	3	F	25.124	170	2.030	1.28	none/ sacrificed	3.933	muscle, ovaries
					KR-MW-11	34.6	31.5	365	PFR, Oto	6	F	63.522	305	4.982	1.17	none/ sacrificed	6.232	muscle, ovaries
					KR-MW-12	31.2	28.5	295	PFR, Oto	7	F	38.413	264	5.172	1.27	none/ sacrificed	5.997	muscle, ovaries
	St. Mary's River	11-Oct-15	572839	5498198	MR-MW-01	38.7	35.8	555	PFR, Oto	11	F	98.165	445	8.284	1.21	none/ sacrificed	9.039	muscle, ovaries
					MR-MW-02	32.2	29.5	295	PFR, Oto	6	F	49.118	253	2.330	1.15	none/ sacrificed	6.967	muscle, ovaries
					MR-MW-03	29.6	27.0	234	PFR, Oto	6	M	16.465	239	1.082	1.19	none/ sacrificed	6.06	muscle
					MR-MW-04	27.7	25.3	175	PFR, Oto	5	M	8.202	182	0.833	1.08	none/ sacrificed	4.934	muscle
					MR-MW-05	26.4	24.0	146	PFR, Oto	3	M	5.271	152	0.622	1.06	none/ sacrificed	3.436	muscle
Mine-exposed	Lower Elk River	7-Oct-15	639565	5463620	LER-MW-01	40.7	37.4	570	-	-	M	-	-	-	1.09	none/ released	-	-
					LER-MW-02	33.7	31.5	335	PFR, Oto	10	F	35.565	298	4.601	1.07	none/ sacrificed	6.663	muscle, ovaries
					LER-MW-03	35.2	32.7	430	PFR, Oto	6	F	37.659	365	6.543	1.23	none/ sacrificed	6.835	muscle, ovaries
			644388	5469404	LER-MW-04	38.3	35.3	475	PFR, Oto	12	F	31.270	408	5.164	1.08	none/ sacrificed	8.692	muscle, ovaries
					LER-MW-05	36.5	33.8	530	PFR, Oto	9	F	112.697 (58.800)	473	8.963	1.37	none/ sacrificed	10.208	muscle, ovaries
		8-Oct-15			LER-MW-06	34.3	31.5	430	PFR, Oto	9	F	63.496	365	5.371	1.38	none/ sacrificed	6.328	muscle, ovaries
	Upper Elk River	9-Oct-15	649260	5543632	UER-MW-01	34.2	31.5	340	-	-	M	-	-	-	1.09	none/ released	-	-
		10-Oct-15	649920	5535885	UER-MW-02	38.0	35.2	460	-	-	M	-	-	-	1.05	none/ released	-	-
		10-Oct-15			UER-MW-03	29.1	26.7	210	-	-	M	-	-	-	1.10	none/ released	-	-
		10-Oct-15			UER-MW-04	29.6	27.5	241	-	-	M	-	-	-	1.16	none/ released	-	-
		10-Oct-15			UER-MW-05	29.9	27.7	257	-	-	M	-	-	-	1.21	none/ released	-	-
		7-Oct-15			UER-MW-06	34.7	31.8	410	PFR, Oto	7	F	63.830	345	7.242	1.27	none/ sacrificed	7.837	muscle, ovaries
		7-Oct-15			UER-MW-07	30.5	28.0	280	PFR, Oto	5	F	32.464	247	4.222	1.28	none/ sacrificed	12.189	muscle, ovaries
		9-Oct-15	649260	5543632	UER-MW-08	35.0	32.7	455	PFR, Oto	9	F	70.878	385	6.765	1.30	none/ sacrificed	5.603	muscle, ovaries
		10-Oct-15			UER-MW-09	33.4	31.0	350	PFR, Oto	6	F	52.272	300	4.660	1.17	none/ sacrificed	5.135	muscle, ovaries
		10-Oct-15			UER-MW-10	28.8	26.4	227	PFR, Oto	4	F	15.944	218	2.663	1.23	none/ sacrificed	4.332	muscle, ovaries
	Lower Fording River	6-Oct-15	652944	5528924	LFR-MW-01	32.4	29.9	320	-	-	M	-	-	-	1.20	none/ released	-	-
					LFR-MW-02	36.0	33.4	505	PFR, Oto	6	F	93.500 (47.330)	450	8.942	1.36	none/ sacrificed	11.407	muscle, ovaries
					LFR-MW-03	43.1	40.0	810	PFR, Oto	13	F	167.827 (82.020)	720	14.638	1.27	none/ sacrificed	9.083	muscle, ovaries
		8-Oct-15			LFR-MW-04	35.4	32.6	475	PFR, Oto	8	F	105.097 (48.720)	420	8.140	1.37	none/ sacrificed	5.713	muscle, ovaries
					LFR-MW-05	40.3	37.2	619	PFR, Oto	11	F	126.360 (63.920)	565	10.440	1.20	none/ sacrificed	4.847	muscle, ovaries
		10-Oct-15			LFR-MW-06	35.0	32.1	460	PFR, Oto	5	F	79.208	385	7.320	1.39	none/ sacrificed	8.701	muscle, ovaries
	Michel Creek	6-Oct-15	660478	5493151	MC-MW-01	38.1	35.5	545	-	-	M	-	-	-	1.22	none/ released	-	-
					MC-MW-02	34.9	31.8	435	PFR, Oto	5	F	79.505	355	6.489	1.35	none/ sacrificed	7.181	muscle, ovaries
					MC-MW-03	36.8	33.9	600	PFR, Oto	6	F	122.420 (62.492)	535	10.089	1.54	none/ sacrificed	11.378	muscle, ovaries
					MC-MW-04	41.3	37.6	840	PFR, Oto	11	F	243.090 (36.752)	800	9.460	1.58	deformed dorsal/ sacrificed	8.199	muscle, ovaries
			660612	5502880	MC-MW-05	35.0	32.4	495	PFR, Oto	5	F	120.353 (33.078)	475	7.380	1.46	none/ sacrificed	7.121	muscle, ovaries
					MC-MW-06	35.2	32.7	485	PFR, Oto	5	F	73.199	405	7.140	1.39	none/ sacrificed	8.887	muscle, ovaries

[1] PFR - pectoral fin-rays; Oto - otoliths

[2] Whole and (subsample) gonad mass, if gonad was subsampled, the remainder of gonad became part of the carcass weight

[3] Weight of the bag with the carcass: 15.631 g

APPENDIX I
COVARIATE ADJUSTED NORMAL RANGES

APPENDIX I: EVALUATION OF POTENTIAL COVARIATE-ADJUSTED NORMAL RANGES FOR BENTHIC INVERTEBRATE AND PERIPHYTON COMMUNITIES

This appendix presents results for the evaluation of habitat variables as covariates for benthic invertebrate and periphyton community endpoints associated with the 2015 monitoring cycle of Teck's regional aquatic effects monitoring program (RAEMP). This analysis was requested by the EMC.

The evaluation involved selecting habitat variables and conducting multiple linear regressions for key benthic invertebrate and periphyton endpoint (response) and a number of habitat variables (predictors) to derive habitat covariate-adjusted normal ranges. This was done to assess how much variability among reference areas could be explained by natural habitat variation. Community endpoints for mine-exposed areas were compared to the (unadjusted) normal range (defined as the 2.5th and 97.5th percentiles of the pooled (2012 and 2015) reference area data distribution) and the 2.5th and 97.5th percentiles of the residuals from the multiple linear regression (i.e. the covariate-adjusted normal range) to assess whether the addition of one or more covariates increased the sensitivity to detect community differences among mine-exposed areas relative to reference areas. The following bullets briefly explain the series of tables and figures presented in this Appendix I:

- A PCA was conducted with the habitat variables shown in Appendix Table I.1 for all reference areas (n = 36) sampled in 2015[1]. A single habitat variable that was highly correlated with each of the first two principle components was selected to include in the evaluation (Appendix Table I.1). Preference was given to GIS variables, variables that are continuous, and those that do not strongly vary seasonally.
- Appendix Table I.2 shows the multiple regression model statistics for the key benthic invertebrate endpoints with four habitat variables as predictors (two variables identified from the PCA and the squared terms for the two variables) for all reference areas (n = 36) with habitat data in 2015. The squared terms were included to account for non-linearity in the response-covariate relationships. Key benthic invertebrate and

[1] A PCA that included habitat data for mine-exposed gave similar results (Appendix A).

periphyton endpoints were those identified as being correlated with PC-1 for WQ and those identified by the EMC as being important. Variables were log_{10}-transformed when required to meet assumptions of normality of residuals. The model residuals were plotted versus the fitted values to assess homogeneity of variances and outliers (Appendix Figure I.1). Histograms of residuals were assessed (not shown) with model output for a bell-shaped distribution (all distributions appeared approximately bell-shaped).

- Covariate-adjusted normal ranges for each endpoint were defined as 2.5th and 97.5th percentiles of the residuals of the regression models for endpoints that had a significant regression model. The residuals for the mine-exposed areas were calculated using the reference area regression coefficients and compared to the normal range of the reference area regression residuals. Appendix Table I.3 shows the number of mine-exposed areas outside of the reference normal range for each endpoint.
- Appendix Table I.4 shows how strongly (or not) each of the endpoints (model residuals) correlated with the first Principal Component (PC-1) for water quality, which reflected a gradient of mine-related influence. Appendix Table I.4 includes three new versions of PCA: (1) PCA based on (1) hazard quotients (HQ) for all WQ variables with a benchmark and calcite index, (2) PCA based on concentrations of only selenium, nitrate, and sulphate in water and calcite index; and (3) PCA based on hazard quotients (HQ) for selenium, nitrate, sulphate, and calcite (PCA details are in Appendix Table G.6).
- Appendix Table I.5 presents a summary of the normal range comparisons based on (1) 2.5th and 97.5th percentiles of model residuals; (2) the 2.5th and 97.5th percentiles of the pooled (2012 and 2015) reference area data distribution with all observations; and (3) the 2.5th and 97.5th percentiles of the pooled (2012 and 2015) reference area data distribution with outliers removed (see Appendices F and G). In general the two methods identified similar areas being outside of normal. Some differences were observed for LPL Richness (11 additional areas identified < the lower limit of the normal range) and % *Achnanthidium* (6 additional areas identified above the upper limit of the normal range) but these do not appear to be related to mining (lack of correlation with PC-1 and comparisons to other endpoints in Table I.3).
- Appendix Table I.6 shows a subset of the endpoints from Appendix Table I.5 (those endpoints that are significantly correlated with PC-1 for water quality (Appendix Table I.4) as well as hazard quotients for key mine related water quality variables. The objective here was to assess whether the additional mine-exposed areas that are outside of the normal range for %EPT were areas that may be predicted to be affected

(based on hazard quotients), which they were not (HQs near or below 1 for these areas).

- It is difficult to visualize the regression residual approach to define the NR because the relationship between a single benthic invertebrate endpoint and six predictor variables cannot be plotted.
- Overall, the evaluation indicated that covariate-adjusting normal ranges yields insufficient benefit to warrant applying such a complex method. After discussion of results with the EMC it was agreed that normal ranges will be defined without covariate adjustment.

Table I.1: Pearson Correlations Between Environmental Variables and Principcal Components from a PCA of Select Environmental Variable Data (Log-Transformed) Collected During Biological Sampling at 36 Reference Areas, September 2015, Elk Valley

Variable		Transformation	PC1 (43.5%)		PC2 (16.5%)	
			r	P-value	r	P-value
GIS	Stream order	log	0.864	<0.001	-0.002	0.990
	Station elevation	log	-0.667	<0.001	-0.342	0.041
	Source elevation	log	0.059	0.731	0.531	<0.001
	Area of catchment > 30% slope	log	0.962	<0.001	0.200	0.242
	Percentage of catchment > 30% slope	log	-0.128	0.456	0.936	<0.001
	Percentage of catchment < 30% slope	log	0.213	0.213	-0.884	<0.001
	Station gradient	log(x+0.01)	-0.542	<0.001	0.144	0.403
	Distance to source	log	0.967	<0.001	0.000	0.998
	Stream density of watershed	log	0.111	0.518	0.734	<0.001
	Average upstream gradient from station to source	log	-0.901	<0.001	0.299	0.077
	Watershed area	log	0.986	<0.001	-0.016	0.928
	Watershed perimeter	log	0.982	<0.001	0.014	0.936
	Watershed stream length	log	0.976	<0.001	0.125	0.468
Field	Intermediate axis length - Wolman Mean	log	0.111	0.518	-0.324	0.054
	Embeddedness	log(x+0.01)	-0.098	0.569	0.467	0.004
	Canopy Coverage	log(x+0.1)	-0.272	0.109	0.418	0.011
	Periphyton Coverage	log	-0.408	0.013	-0.320	0.057
	Bankfull Width	log	0.811	<0.001	-0.138	0.422
	Wetted Width	log	0.936	<0.001	0.059	0.734
	Bankfull-Wetted Depth	log(x+0.1)	0.046	0.789	-0.127	0.461
	Gradient	log	-0.671	<0.001	0.108	0.531
	Mean Transect Velocity	log	0.443	0.007	0.457	0.005

r > 0.6 or r < -0.6

P-value < 0.05

Table I.2: Multiple Regression Model Statistics for Key Benthic Invertebrate and Periphyton Endpoints with Habitat Predictor Variables for 2015 Reference Area Data (n = 36)

Group	Variable	Model P-value	Predictor Variable P-value				Model R^2
			log(WatAre)	PeLT30	[log(WatAre)]²	(PeLT30)²	
Benthic Invertebrate Endpoints	Simpson's Diversity (Family)	0.241	0.151	0.847	0.161	0.671	0.142
	Evenness (Family)	0.986	0.842	0.941	0.855	0.976	0.010
	Simpson's Diversity (LPL)	0.083	0.385	0.405	0.389	0.671	0.205
	Evenness (LPL)	0.693	0.754	0.634	0.773	0.793	0.060
	log(Total Abundance)	<0.001	0.496	0.394	0.377	0.628	0.494
	Family Richness	0.034	0.112	0.635	0.123	0.386	0.252
	LPL Richness	0.002	0.043	0.667	0.045	0.877	0.376
	% EPT	0.028	0.106	0.411	0.117	0.643	0.261
	% Ephemeroptera	0.060	0.062	0.010	0.062	0.009	0.222
	% Diptera	0.041	0.121	0.359	0.129	0.570	0.242
	NMDS Axis 1 (Family-level ordination: relative abundance/fourth root transformed)	0.065	0.053	0.951	0.055	0.691	0.218
	NMDS Axis 1 (LPL-level ordination: relative abundance/fourth root transformed)	0.015	0.107	0.307	0.105	0.578	0.290
Periphyton Endpoints	Green Density[a]	0.021	0.486	0.123	0.450	0.238	-
	log(Diatom Density)	0.709	0.834	0.424	0.857	0.532	0.058
	Green Biovolume	See Green Density					
	log(Achnanthaceae Density)	0.877	0.641	0.495	0.660	0.558	0.033
	log(Achnanthidium Density)	0.823	0.499	0.343	0.516	0.335	0.041
	log(Fragilariaceae Density+1)[b]	0.253	0.600	0.524	0.616	0.752	0.142
	% Achnanthidium	0.034	0.455	0.381	0.406	0.618	0.252

P-value < 0.05

Notes: WatAre = Watershed area (m²); PeLT30 = Percentage of catchment < 30% slope (%)

"-" r^2 not reported for binary logisitic regression

[a] Regression conducted as a binary logistic regression for presence = 1 and absense = 0

[b] One outlier removed (a value of zero)

Table I.3: **Comparison of Habitat Covariate Adjusted (Residual from Model) to Unadjusted (Value) Results for Benthic Invertebrate and Periphyton Endpoints for 59 Mine-exposed Areas, September 2015 and Comparisons to Normal Ranges**

Exposure Type	Management Unit	Main Watershed	Type (M-Main Stem; T-Tributary)	Biological Area Code	log_{10}(Total Abundance)		Total Abundance	Family Richness		LPL Richness			% EPT			% Diptera		NMDS Axis 1 LPL[a]		% Achnanthidium	
					Residual	Value	Value	Residual	Value	Residual	Value	Value	Residual	Value	Value	Residual	Value	Residual	Value	Residual	Value
				$P_{2.5}$	-0.55	2.7	1,005	-4.0	14	-6.2	21	20	-33	38	63	-14	2.5	-0.86	-1.2	-26	2.3
				$P_{97.5}$	0.47	4.1	13,221	3.9	24	6.4	39	38	17	97	97	24	48	0.69	0.41	27	58
Mine-exposed	1	Fording	T	HENFO	0.27	4.1	13,820	-0.95	18	-0.018	29	29	3.0	84	84	-1.2	15	0.095	-0.25	43	65
				NGD1	-	4.0	9,760	-	15	-	27	27	-	60	60	-	39	-	1.1	-	-
				KICK	-1.2	2.7	497	-1.8	17	-6.6	22	22	-66	16	16	61	77	1.7	1.3	-2.7	19
				SWCK	-0.43	3.8	6,214	-4.0	15	-4.2	24	24	-65	29	29	62	69	2.6	2.1	26	41
				CATCK	-0.58	3.6	4,030	-7.1	10	-7.8	18	18	-84	12	12	75	81	3.5	2.9	-4.2	12
				POCK	0.11	4.3	22,160	6.1	23	5.6	30	30	-85	19	19	74	74	2.0	1.2	28	45
				LC_DCDS	0.16	3.9	7,640	3.2	19	6.4	27	27	-17	91	91	13	8.1	0.58	-0.59	-35	3.3
				LC_DC1	0.0058	3.9	7,140	0.19	18	-1.4	25	25	2.5	91	91	-3.0	7.6	0.19	-0.39	-18	8.4
				GHCKD	-0.14	4.0	10,560	7.8	28	9.0	40	40	-62	21	21	39	54	1.8	1.5	34	46
				GHCKU	-1.3	2.9	774	-5.2	15	-6.9	24	24	-58	25	25	60	74	1.3	0.98	67	80
			M	FODHE	0.42	4.2	17,060	-0.73	19	-3.5	27	27	1.2	78	78	2.3	22	-0.080	-0.32	32	53
				FOUNGD	0.036	3.9	7,260	-5.2	15	-8.3	23	23	18	93	93	-14	7.2	-0.31	-0.49	29	48
				FODNGD	-0.29	3.9	7,840	-5.7	16	-9.4	23	23	9.8	94	94	-8.1	5.4	0.17	-0.11	25	37
				MP1	-0.094	3.7	5,470	2.4	23	-0.12	32	32	-2.9	70	70	5.2	28	0.29	0.17	43	61
				FOUSH	0.030	3.9	7,320	0.17	21	-4.5	28	28	14	86	86	-11	12	0.15	0.046	49	67
				FOUKI	-0.29	3.5	3,490	0.063	21	-2.7	30	30	3.4	75	75	-2.3	21	0.053	-0.042	34	52
				FOBKS	-0.14	3.6	4,161	-1.8	19	-7.4	25	25	-2.5	69	69	5.0	28	-0.12	-0.24	35	54
				FOBSC	-0.29	3.5	2,923	1.1	22	-6.5	26	26	-8.8	62	62	8.2	32	0.19	0.075	24	44
				FOBCP	-0.12	3.6	4,260	0.039	21	-5.6	27	27	6.6	78	78	-3.0	21	0.53	0.42	15	35
				FODPO	0.27	4.0	10,340	-3.0	18	-11	22	22	19	90	90	-14	9.9	0.51	0.40	57	77
				FO10-SP1	0.54	4.1	13,800	-0.80	19	-0.96	29	29	-1.6	75	75	3.8	23	0.77	0.44	48	75
				FO22	0.59	4.3	21,140	1.0	22	-2.6	30	30	-5.3	65	65	-1.5	22	0.44	0.33	58	77
				FOUEW	0.21	3.9	7,720	-1.8	19	-7.2	25	25	-0.30	71	71	0.46	24	0.42	0.27	66	88
				LC_FRUS	-0.26	3.3	2,065	1.5	22	-1.4	30	30	-8.4	64	64	9.0	31	0.50	0.28	50	75
				FO29	0.39	3.9	8,580	4.6	25	5.7	37	37	-16	56	56	13	36	0.51	0.28	50	76
				FODGH	0.50	4.0	10,980	2.5	23	-3.4	28	28	6.0	78	78	-4.6	18	0.28	0.061	67	93
	2	Fording	T	LILC3	0.57	4.3	19,360	-0.91	18	-2.1	26	26	-50	33	33	48	63	0.70	0.23	54	81
				LIDSL	0.15	3.8	6,980	2.5	22	0.53	30	30	-4.1	74	74	4.0	22	0.25	-0.10	40	65
				LI8	-0.13	3.5	3,390	1.4	21	-0.69	29	29	9.0	87	87	-10	8.3	0.091	-0.25	-16	9.9
			M	FO9	0.29	3.8	6,720	-1.5	19	-7.5	24	24	-0.21	72	72	1.6	24	0.046	-0.17	55	81
				FRUL	-0.032	3.5	3,006	-1.5	19	-6.2	25	25	10	83	83	-7.1	15	0.23	-0.0075	15	42
				FO23	0.14	3.6	3,780	4.7	25	8.3	39	39	-8.2	65	65	8.8	30	0.41	0.11	20	49
	3	Elk	T	WOCK	-1.1	3.1	1,244	3.0	20	5.0	30	30	-61	38	38	48	51	2.2	1.5	20	36
				THCK	-0.82	3.4	2,412	-2.0	18	-5.1	25	25	-70	17	17	45	56	2.6	2.2	-12	0.80
			M	EL20	0.47	3.8	6,218	-1.0	19	-0.98	29	29	17	92	92	-12	7.8	0.050	-0.32	12	44
				ELUEL	0.39	3.7	5,135	0.94	21	-3.1	27	27	7.7	82	82	-4.7	16	0.21	-0.15	49	81
				ELDEL	0.59	3.9	7,740	1.0	21	-1.9	28	28	11	87	87	-7.3	13	0.14	-0.24	0.44	33
				ELUFO	0.70	4.0	8,980	3.1	23	4.5	34	34	-36	40	40	33	53	1.2	0.75	30	64

Normal range after outlier removal process
Value > upper limit of the normal range
Value < lower limit of the normal range

[a] 3-D Ordination (relative abundance/fourth root transformed)

Table I.3: **Comparison of Habitat Covariate Adjusted (Residual from Model) to Unadjusted (Value) Results for Benthic Invertebrate and Periphyton Endpoints for 59 Mine-exposed Areas, September 2015 and Comparisons to Normal Ranges**

Exposure Type	Management Unit	Main Watershed	Type (M-Main Stem; T-Tributary)	Biological Area Code	log_{10}(Total Abundance)		Total Abundance	Family Richness		LPL Richness			% EPT			% Diptera		NMDS Axis 1 LPL[a]		% Achnanthidium	
					Residual	Value	Value	Residual	Value	Residual	Value	Value	Residual	Value	Value	Residual	Value	Residual	Value	Residual	Value
				$P_{2.5}$	-0.55	2.7	1,005	-4.0	14	-6.2	21	20	-33	38	63	-14	2.5	-0.86	-1.2	-26	2.3
				$P_{97.5}$	0.47	4.1	13,221	3.9	24	6.4	39	38	17	97	97	24	48	0.69	0.41	27	58
Mine-exposed	4	Michel	T	CORCK	0.49	4.5	29,180	3.4	22	5.4	34	34	-66	17	17	63	78	2.0	1.7	4.1	23
				BOCK	-0.28	3.9	8,140	-4.5	14	-2.0	26	26	-83	7.6	7.6	66	75	3.2	2.8	22	36
			M	MIUCO	-0.13	3.9	7,820	-1.8	18	0.14	31	31	-5.9	72	72	4.4	23	-0.14	-0.34	-8.1	6.9
				MIDCO	0.18	4.1	12,360	0.93	21	0.70	32	32	-24	51	51	24	45	0.49	0.31	49	66
				MIDAG	0.38	4.2	14,520	-0.97	19	0.12	31	31	-2.9	72	72	5.2	26	-0.13	-0.35	24	45
				MI5	0.20	3.9	7,120	-1.9	19	-10	22	22	16	87	87	-14	9.6	-0.87	-1.0	25	48
				MI3	0.38	3.9	7,660	0.14	21	-6.0	26	26	9.2	80	80	-6.2	17	-0.65	-0.85	20	46
				MI2	0.31	3.8	6,119	2.2	23	1.3	33	33	1.7	73	73	2.5	25	0.23	0.015	60	87
		Elk	T	HACKUS	0.19	4.2	15,540	3.3	23	4.4	35	35	6.2	85	85	-6.1	12	0.19	-0.032	47	63
				HACKDS	0.029	4.0	10,160	-1.6	18	1.6	32	32	-28	50	50	22	40	0.44	0.21	46	62
				GRCK	-0.0084	3.9	7,740	2.1	22	2.0	33	33	12	87	87	-9.8	11	-0.050	-0.24	41	59
				GRDS	0.057	3.9	8,400	1.9	22	-1.3	30	30	0.84	76	76	-0.062	21	0.0013	-0.18	30	49
				OCNM	-1.1	3.1	1,373	14	29	19	40	40	-75	34	34	26	22	2.5	1.6	7.0	27
			M	EL19	0.37	3.5	3,240	3.4	23	3.2	32	32	-18	60	60	19	37	0.69	0.19	9.2	47
				ELDGR	-0.017	3.1	1,288	4.4	24	1.3	30	30	11	89	89	-8.3	9.6	0.32	-0.18	8.8	47
				ELUSP	0.71	3.8	6,460	0.54	20	-3.4	25	25	-9.9	68	68	11	28	0.29	-0.25	-8.3	31
	5	Elk	M	EL1	0.86	3.9	7,720	2.7	22	4.0	32	32	-9.2	70	70	12	29	0.19	-0.39	45	86
				ELDFE	1.2	4.2	17,160	1.8	21	5.4	33	33	-7.2	73	73	4.1	20	0.66	0.042	27	69
				ELUFE	1.0	4.0	11,000	0.78	20	4.2	32	32	-19	61	61	10	27	0.67	0.066	29	71
				ELELKO	0.93	3.9	7,880	-3.1	16	-5.4	22	22	11	92	92	-7.2	8.1	-0.29	-0.93	12	55
				ELH93	0.56	3.5	2,858	-4.8	14	-3.7	23	23	-60	22	22	41	54	1.0	0.30	31	76

Normal range after outlier removal process
Value > upper limit of the normal range
Value < lower limit of the normal range

[a] 3-D Ordination (relative abundance/fourth root transformed)

Table I.4: Pearson Correlation Coefficients for Residuals from Regression of Benthic Invertebrate Community and Periphyton Endpoints on Habitat Variables for Reference (n = 40) and Mine-exposed (n = 58) Areas Versus the First Principal Component (PC-1) Calculated from Four Different PCAs for Water Quality Measured at the Same Areas, September 2015

Group	Covariate Adjusted Variables	All Water Quality Variables (concentration) PC-1		All Water Quality Variables (HQ) and Calcite Index PC-1		Key Water Quality Variables (concentration) and Calcite Index PC-1		Key Water Quality Variables (HQ) and Calcite Index PC-1	
		r	P-value	r	P-value	r	P-value	r	P-value
Benthic Invertebrate Endpoints	log(Total Abundance)	0.194	0.055	-0.065	0.526	-0.110	0.278	-0.063	0.534
	Family Richness	0.006	0.955	-0.128	0.210	-0.117	0.250	-0.135	0.184
	LPL Richness	0.073	0.476	-0.259	0.010	-0.223	0.026	-0.265	0.008
	% EPT	0.598	<0.001	-0.388	<0.001	-0.453	<0.001	-0.386	<0.001
	% Diptera	-0.616	<0.001	0.443	<0.001	0.510	<0.001	0.444	<0.001
	NMDS Axis 1 (LPL-level ordination: relative abundance/fourth root transformed)	-0.724	<0.001	0.510	<0.001	0.564	<0.001	0.504	<0.001
Periphyton Endpoints	% Achnanthidium	-0.013	0.898	0.129	0.205	0.127	0.209	0.136	0.180

r ≥ 0.6 or r ≤ -0.6.

P-value < 0.05.

Notes: Habitat data not collected for NGD1

Table I.5: Comparison of the Number and Percentage of Mine-exposed Areas (n = 58) Falling Above and Below the Limits of the Normal Range

Comaprison to NR	log_{10}(Total Abundance)		Total Abundance	Family Richness		LPL Richness			% EPT			% Diptera		NMDS Axis 1 LPL[a]		% Achnanthidium	
	Residual	Value	Value	Residual	Value	Residual	Value	Value	Residual	Value	Value	Residual	Value	Residual	Value	Residual	Value
n > NR	14	10	10	6.0	4.0	4.0	2.0	3.0	2.0	0	0	15	13	16	14	31	25
n < NR	6.0	0	2.0	6.0	1.0	12	1.0	1.0	14	12	21	1.0	0	1.0	0	1.0	1.0
% > NR	24	17	17	10	6.9	6.9	3.4	5.2	3.4	0	0	26	22	28	24	53	43
% < NR	10	0	3.4	10	1.7	21	1.7	1.7	24	21	36	1.7	0	1.7	0	1.7	1.7

% of values captured above or below normal range limits exceeds 10% for covariate adjusted normal range compared to unadjusted/outlier removed normal ranges

Comparison with rormal ranges after outlier removal process

[a] 3-D Ordination (relative abundance/fourth root transformed)

Note: NGD1 excluded due to mising habitat data

Table I.6: Comparison of Habitat Covariate Adjusted (residual from model) to Unadjusted (value) Results for Key Benthic Invertebrate Endpoints having a Correlation (r > 0.6 or r < -0.6) with PC-1 for all Water Quality Variables for 59 Mine-exposed Areas, September 2015

Management Unit	Main Watershed	Type (M-Main Stem; T-Tributary)	Biological Area Code	% Diptera		NMDS Axis 1 LPL [a]		Calcite Index	Ratio of $[SO_4]$:$[SO_4$ Benchmark]	Ratio of $[NO_3]$:$[NO_3$ Benchmark]	Ratio of [Se]:[Se Benchmark]
				Residual	Value	Residual	Value				
1	Fording	T	HENFO	-1.2	15	0.095	-0.25	0.94	0.23	0.54	0.13
			NGD1	-	39	-	1.1	0.80	-	-	-
			KICK	61	77	1.7	1.3	2.3	0.76	3.3	1.0
			SWCK	62	69	2.6	2.1	2.1	3.4	1.9	4.9
			CATCK	75	81	3.5	2.9	3.0	4.3	2.3	5.3
			POCK	74	74	2.0	1.2	1.1	1.0	0.20	0.62
			LC_DCDS	13	8.1	0.58	-0.59	0	0.029	0	0.014
			LC_DC1	-3.0	7.6	0.19	-0.39	0	0.021	0	0.013
			GHCKD	39	54	1.8	1.5	1.4	1.6	0.32	0.83
			GHCKU	60	74	1.3	0.98	2.5	1.7	0.42	1.0
		M	FODHE	2.3	22	-0.080	-0.32	0.88	0.20	0.45	0.094
			FOUNGD	-14	7.2	-0.31	-0.49	0.81	0.27	1.1	0.23
			FODNGD	-8.1	5.4	0.17	-0.11	0.80	0.28	1.2	0.23
			MP1	5.2	28	0.29	0.17	0.98	0.29	1.1	0.22
			FOUSH	-11	12	0.15	0.046	1.0	0.30	1.0	0.25
			FOUKI	-2.3	21	0.053	-0.042	0.98	0.35	0.84	0.22
			FOBKS	5.0	28	-0.12	-0.24	0.92	0.35	0.85	0.23
			FOBSC	8.2	32	0.19	0.075	1.2	0.43	0.82	0.33
			FOBCP	-3.0	21	0.53	0.42	1.3	0.66	0.78	0.61
			FODPO	-14	10	0.51	0.40	0.89	0.62	1.3	0.66
			FO10-SP1	3.8	23	0.77	0.44	0.82	0.18	1.2	0.58
			FO22	-1.5	22	0.44	0.33	0.83	0.61	1.3	0.65
			FOUEW	0.46	24	0.42	0.27	0.98	0.54	1.1	0.57
			LC_FRUS	9.0	31	0.50	0.28	1.0	0.36	0.88	0.33
			FO29	13	36	0.51	0.28	1.0	0.34	0.86	0.33
			FODGH	-4.6	18	0.28	0.061	1.0	0.41	0.78	0.36
2	Fording	T	LILC3	48	63	0.70	0.23	1.0	0.65	1.0	0.49
			LIDSL	4.0	22	0.25	-0.10	0.60	0.49	0.78	0.36
			LI8	-10	8.3	0.091	-0.25	0.040	0.43	0.72	0.31
		M	FO9	1.6	24	0.046	-0.17	0.82	0.37	0.88	0.32
			FRUL	-7.1	15	0.23	-0.007	0	0.37	0.82	0.33
			FO23	8.8	30	0.41	0.11	0.93	0.38	0.78	0.33
3	Elk	T	WOCK	48	51	2.2	1.5	1.3	2.3	3.2	1.2
			THCK	45	56	2.6	2.2	0.99	1.6	0.81	0.94
		M	EL20	-12	7.8	0.050	-0.32	0.81	0.067	0.057	0.012
			ELUEL	-4.7	16	0.21	-0.15	0.92	0.067	0.053	0.013
			ELDEL	-7.3	13	0.14	-0.24	0.20	0.073	0.052	0.012
			ELUFO	33	53	1.2	0.75	0.99	0.076	0.045	0.012
4	Michel	T	CORCK	63	78	2.0	1.7	1.4	1.5	0.53	0.14
			BOCK	66	75	3.2	2.8	0.96	1.8	2.6	1.3
		M	MIUCO	4.4	23	-0.14	-0.34	0.87	0.047	0	0
			MIDCO	24	45	0.49	0.31	0.69	0.67	0.21	0.055
			MIDAG	5.2	26	-0.13	-0.35	0.36	0.17	0.12	0.023
			MI5	-14	10	-0.87	-1.0	0.50	0.15	0.086	0.020
			MI3	-6.2	17	-0.65	-0.85	0.42	0.14	0.062	0.017
			MI2	2.5	25	0.23	0.015	0.43	0.28	0.34	0.13
	Elk	T	HACKUS	-6.1	12	0.19	-0.032	0.91	0.49	0.092	0.38
			HACKDS	22	40	0.44	0.21	1.1	0.45	0.082	0.34
			GRCK	-10	11	-0.050	-0.24	0.48	0.36	0.073	0.24
			GRDS	-0.062	21	0	-0.18	0.99	0.35	0.083	0.22
			OCNM	26	22	2.5	1.6	0.38	0.052	0	0
		M	EL19	19	37	0.69	0.19	1.0	0.16	0.39	0.095
			ELDGR	-8.3	10	0.32	-0.18	0.25	0.17	0.40	0.10
			ELUSP	11	28	0.29	-0.25	0.78	0.16	0.34	0.090
5	Elk	M	EL1	12	29	0.19	-0.39	0.46	0.18	0.34	0.10
			ELDFE	4.1	20	0.66	0.042	0.92	0.17	0.30	0.085
			ELUFE	10	27	0.67	0.066	0.94	0.18	0.32	0.090
			ELELKO	-7.2	8.1	-0.29	-0.93	0	0.16	0.28	0.083
			ELH93	41	54	1.0	0.30	1.0	0.14	0.27	0.075

value > upper limit of the normal range

value < lower limit of the normal range

[a] 3-D Ordination (relative abundance/fourth root transformed)

APPENDIX J
KOOCANUSA RESERVOIR MONITORING REPORT

Koocanusa Reservoir Monitoring Report, 2014 to 2016

Prepared for:
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Koocanusa Reservoir Monitoring Report, 2014 to 2016

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EXECUTIVE SUMMARY

Background

Teck Resources Limited (Teck) owns and operates five metallurgical coal mines within the Elk River watershed in southeastern British Columbia (BC). Mine discharges report to the Elk River which flows into Koocanusa Reservoir. Koocanusa Reservoir was created when the Libby Dam (Montana) was constructed in 1972, and is operated by the United States Army Corps of Engineers to provide flood control, hydroelectric power, and recreational opportunities. The reservoir straddles the border between Canada and United States, and lies within the traditional territory of the Ktunaxa First Nation. At full pool, about 68 km of the total 155 km length of the reservoir is in BC. Three Canadian rivers, the Kootenay (62% of mean annual inflow), Elk (26%), and Bull (11%), supply most of the reservoir's inflow. Water levels are managed at the Libby Dam, and are generally lowest in late winter or early spring and highest in summer/early fall. Normal annual pool fluctuation is about 35 m. At maximum drawdown, the reservoir volume is reduced by up to 85%, mean depth by 51%, surface area by 69%, and total length by 53%, with the largest relative changes occurring in the Canadian portion of the reservoir. Mean residence time is 0.55 years.

Discharges from Teck's metallurgical coal mines to the Elk River watershed are authorized by the BC Ministry of Environment (MOE) through permits that are issued under provisions of the *Environmental Management Act.* Permit 107517, which specifies the terms and conditions associated with those discharges, was issued November 19, 2015 and was recently amended on June 5, 2017, which included requirements for monitoring in Koocanusa Reservoir. A three-year study was implemented from 2014 to 2016 to characterize and compare chemical and biological conditions in the reservoir downstream from the Elk River compared to upstream. This report presents results of the monitoring completed within the Canadian portion of the reservoir.

Water Quality

In situ profiles taken in February, April, and/or August showed only limited temperature, oxygen, pH, and conductivity gradients with depth. Most of the water column was oxygenated with slightly alkaline pH. A previous study concluded that waters in the Canadian portion of the reservoir remain relatively well-mixed, even during periods of maximum water elevation (May-November), as a result of basin morphometry, continual movement of water from river inputs and reservoir operations, and exposure to strong prevailing winds.

As the purpose of this study was to identify potential influences on Koocanusa Reservoir related to metallurgical coal mining inputs to the Elk River, the evaluation of water quality focused on

substances associated with metallurgical coal mining: nitrate, selenium, and sulphate. Statistical tests showed that concentrations of these substances were similar in water samples collected at middle and bottom depths at all downstream sample locations, but differed from concentrations measured in samples collected at the surface. At the stations in the reservoir downstream from the Elk River, nitrate, selenium, and sulphate concentrations were typically lower at surface sampling depths. Differences between upstream and downstream concentrations were greater in 2016 than 2015 for both nitrate and selenium, but mean concentrations at the downstream areas in 2016 were similar to or less than those observed in 2015. Sulphate concentrations did not differ significantly between Koocanusa Reservoir stations located downstream versus upstream of the Elk River in any years.

With the exception of aluminum (one sample at RG_DSELK in 2015), iron (one sample at RG_GRASMERE in 2015 and one sample at RG_DSELK in 2016), and mercury (5 samples at RG_DSELK in 2016), water quality guidelines were not exceeded in water samples collected at stations throughout the reservoir as part of Teck's routine water quality monitoring program. Site performance objectives for nitrate, selenium, sulphate, and dissolved cadmium were consistently met at the station downstream from the Elk River.

Sediment Quality

Sediment samples collected in the reservoir both downstream and upstream from the Elk River were mostly silt (≥60%), with sand and clay comprising smaller fractions. Sediments collected along a transect upstream from the Elk River (T2/TN) were significantly sandier (annual means of 2-10%) with less clay (means of 17-19%) than those collected at a downstream transect (T4; means of <1% for sand and 26-30% for clay). This may be related to the shallower depths and more fluvial nature of the reservoir at T2/TN (i.e., greater seasonal scour resulting in finer particles accumulating in sediments farther downstream). Total organic carbon content was consistent at both areas, ranging from 0.9 to 1.7%.

Concentrations of most metals and polycyclic aromatic hydrocarbons (PAHs) in sediment were higher in sediments collected downstream from the Elk River compared to upstream, but did not increase over the three year study. Concentrations of some metals (upstream and downstream) and PAHs (downstream only) in sediments were above the lower provincial sediment quality guidelines, but none exceeded the higher guidelines. The general pattern of higher concentrations in sediment downstream from the Elk River compared to upstream may be related to a greater proportion of fine sediment particles in the downstream area, providing more surface area for adsorption than larger particles.

Plankton and Productivity

The reservoir is considered to be phosphorus limited. Low concentrations of phosphorus and chlorophyll-a, along with low seston and zooplankton biomass, all indicated that the reservoir is oligotrophic. Phytoplankton communities in the reservoir were numerically dominated by diatoms (algae with cell walls of hydrated silica), and to a lesser extent with Chrysophytes (golden algae). There were no significant differences in overall phytoplankton density, biomass, or richness between downstream and upstream areas over the three years. Community structure was similar between upstream and downstream areas, except for greater Cyanophyte (blue-green algae) biomass at the downstream area, which was considered to have low ecological significance because this group represented <1% of the community. Large year-to-year variation in the percent composition of major algal groups was reported in a previous study based on data collected from 1975 to 1988. Previous study authors concluded that the dominant influence on primary production in Koocanusa Reservoir was light quantity, which is influenced by: a) thermal structure which allows phytoplankton to be circulated out of the euphotic zone, b) turbidity in the inflows during spring runoff (freshet), and c) seasonal and meteorological variations in incident solar radiation.

The zooplankton community in Koocanusa Reservoir was numerically dominated by rotifers and copepods, with relatively low numbers of cladocerans. No consistent differences were observed between downstream and upstream areas in overall zooplankton density, biomass, or richness, or in absolute or relative density or biomass of copepods or rotifers, over the three year study. Abundance and biomass of cladocerans tended to be lower downstream from the Elk River compared to upstream. However, the smaller size of rotifers resulted in a considerably lower relative biomass compared to copepods and cladocerans. Overall community structure, indicated no consistent differences downstream compared to upstream from the Elk River over the three years. Selenium concentrations in zooplankton were similar between downstream and upstream areas in all three years.

Benthic Invertebrates

Benthic invertebrate communities sampled in Koocanusa Reservoir upstream (T2/TN) and downstream (T4) from the Elk River were primarily composed of oligochaetes (mostly immature Tubificinae), insects (various species of chironomids), and ostracods in all three sample years. Total community density ranged from 984 to 3,533 organisms/m^2, which may be low compared to some reservoirs, but comparable to results reported in previous studies for Koocanusa Reservoir. Overall community density and richness did not differ significantly between upstream and downstream areas in any of the three study years. However, community structure differed between areas, particularly with respect to ostracods, which had higher average density at the

downstream area (means ranging from 849 to 1,686 per m^2) compared to the upstream area (means of 38 to 333 per m^2) over the three years of study. Densities of oligochaetes were also significantly higher at the downstream area (range of 1,194 to 1,449 per m^2) compared to the upstream area (range of 418 to 1,194 per m^2). Greater abundance of these organisms downstream from the Elk River compared to upstream may be associated with preference for greater depths and finer sediment texture, and/or avoidance of coarser, compacted sediments in the upstream area that dry out during low pool.

Mean benthic invertebrate tissue selenium concentrations were significantly higher at the downstream area (6.9 µg/g dw) than the upstream area (5.0 µg/g dw), and were greater than the BC interim chronic dietary guideline of 4 µg/g dw, but were consistently less than the Level 1 benchmarks (based on <10% effect) developed in the Elk Valley Water Quality Plan for growth and reproductive effects to benthic invertebrates (13 mg/kg dw) and for dietary effects to fish (11 mg/kg dw).

Fish

Largescale sucker, northern pikeminnow, peamouth chub, redside shiner, and yellow perch were consistently captured in highest numbers at all three study areas (i.e., Sand Creek, Elk River, and Gold Creek) in Koocanusa Reservoir in 2014 to 2016. Other species that were captured included bull trout, burbot, kokanee, longnose sucker, mountain whitefish, pumpkinseed, rainbow trout, slimy sculpin, and westslope cutthroat trout.

Following technical guidance developed by Environment Canada, fish surveys were conducted in April of each study year at three areas (two downstream from the Elk River [Elk River and Gold Creek] and one upstream from the Elk River [Sand Creek]) to assess endpoints indicative of fish survival (mean age), growth (body size-at-age), reproduction (relative gonad weight) and energy storage (relative liver weight and overall condition). Peamouth chub were targeted in 2014 but additional species (northern pikeminnow, redside shiner, yellow perch, and largescale sucker) were also evaluated in subsequent years. Results were statistically compared between the downstream areas and the upstream area. No consistent patterns were observed among fish species, sexes, or sampling years that were indicative of influence from the Elk River.

Tissue samples were collected for analysis of metals from fish species captured in the April surveys, as well as fish collected in February and/or August of each year. Some fish had muscle or whole body concentrations of selenium greater than the BC tissue guidelines of 4 µg/g dw for both tissue types. All muscle and whole body samples were less than the United States Environmental Protection Agency (USEPA) criterion of 11.3 µg/g dw in muscle and 8.5 µg/g dw in whole bodies, except for a single yellow perch with a muscle selenium concentration of 15.0 µg/g dw. Similarly, ovary selenium concentrations were frequently greater

than the BC chronic guideline of 11 µg/g dw (particularly in peamouth chub, redside shiner, and northern pikeminnow). All species except redside shiner and northern pikeminnow had mean ovary selenium concentrations less than the Level 1 benchmark for reproductive effects to fish (18 mg/kg dw), and the 2016 USEPA guideline of 15.1 µg/g dw. Northern pikeminnow had mean ovary selenium concentrations above the Level 1 benchmark at the Elk River area in only one of the three years they were sampled (2014), when ovaries were relatively undeveloped. Mean redside shiner ovary concentrations were above the Level 1 benchmark at both the Elk River and the Sand Creek areas in both years sampled. Exceedances of tissue selenium benchmarks or guidelines does not necessarily mean that effects will occur as fish species show a range of sensitivities to selenium.

Next Steps

These data will be used as the basis for future study design development for a long-term monitoring program.

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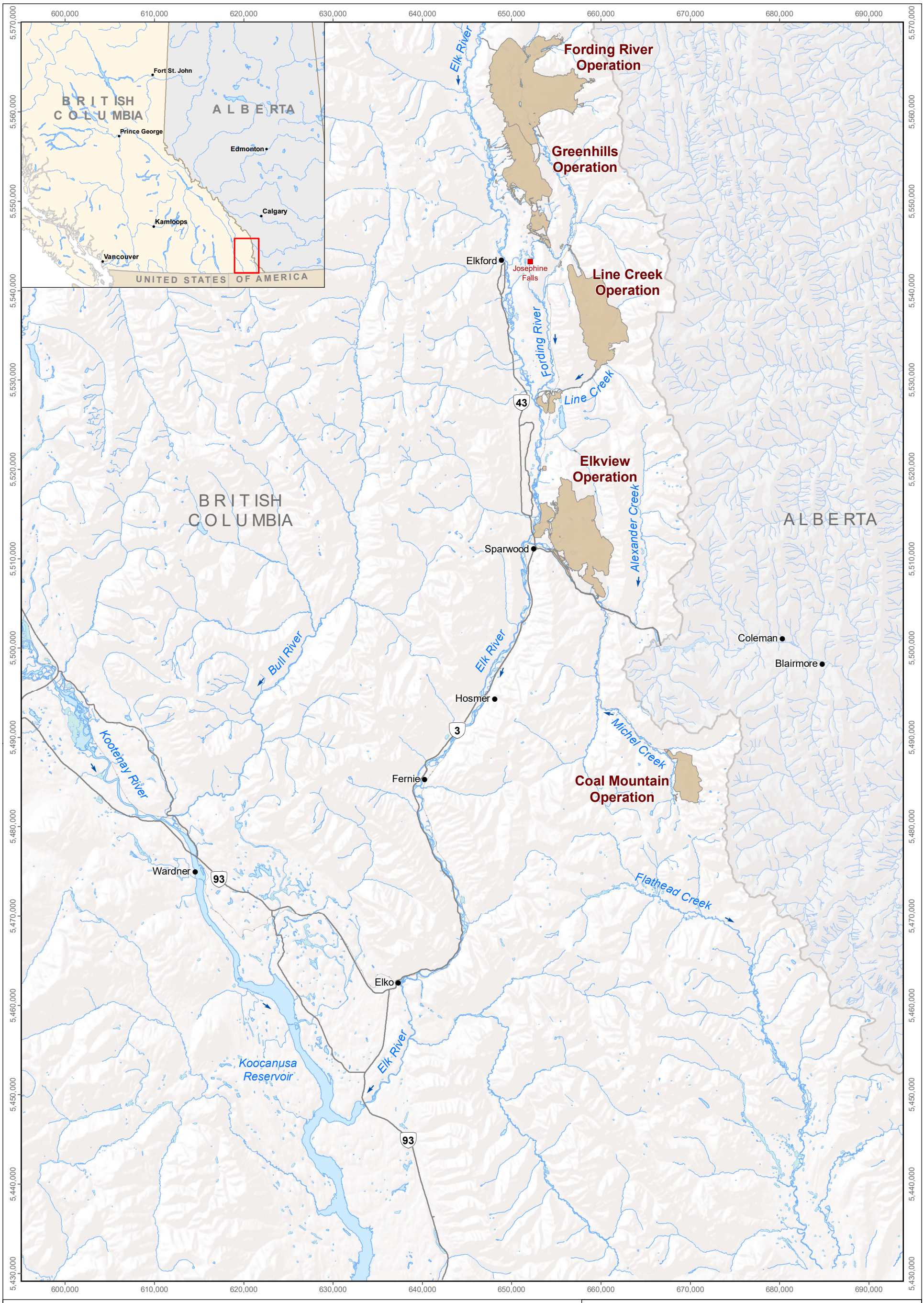
1 INTRODUCTION

1.1 Background

Teck Resources Limited (Teck) owns and operates five metallurgical coal mines within the Elk River watershed in southeastern British Columbia (BC; Figure 1.1). Mine discharges report to the Elk River which flows into Koocanusa Reservoir.

Koocanusa Reservoir was created when the Libby Dam (Montana) was constructed in 1972 to provide flood protection, hydroelectric power, and recreation benefits (Storm et al. 1982). The reservoir is operated by the United States Army Corps of Engineers (USACE) and reached full pool in June 1974 (Storm et al. 1982). At full pool, the reservoir is 155 km in length and straddles the border between Canada (about 68 km in length) and United States (87 km in length; Hamilton et al. 1990). The reservoir (at full pool) has a volume of 7.2 km^3, average surface area of 188 km^2, mean depth of 38 m, and maximum depth of 107 m (which occurs in Montana; the maximum depth at the border is about 46 m). Drawdown to minimum operational pool reduces the total length of the reservoir to 68 km, the volume to 1.1 km^3, and surface area to 59 km^2 (Woods and Falter 1982). At maximum drawdown, this equates to a reduction in reservoir volume of up to 85%, mean depth by 51%, surface area by 69% and total length by 53%, with the largest relative changes occurring in the Canadian portion of the reservoir (Hamilton et al. 1990). Three Canadian rivers, the Kootenay (62% of mean annual inflow), Elk (26%), and Bull (11%), supply most of the reservoir's inflow and, therefore, exert a major influence on the limnology of Koocanusa Reservoir (Woods 1982; Hamilton et al. 1990). Water levels within Koocanusa Reservoir are generally lowest in February through April and highest in summer/early fall (Figure 1.2). Normal annual pool fluctuation is about 35 m and mean residence time is 0.55 years (range 0.14 to 0.73 years) (Storm et al. 1982; Woods and Falter 1982; Hamilton et al. 1990). Since 2008, the USACE have adopted a variable flood control procedure, which improved the chance of refill and provided more normative flow, by drawing the reservoir down less in the winter and releasing more water out in the spring (USACE 2016).

The Ktunaxa First Nation has occupied lands adjacent to, and including, the Kootenay and Columbia Rivers and the Arrow Lakes of BC for more than 10,000 years (KNC 2005). Rivers and streams of the region provide culturally important sources of fish and plants. The Ktunaxa Territory is divided into traditional land districts historically associated with key actors in the Ktunaxa creation story, but also with specific key resources and with specific Ktunaxa individuals or lineages that held particular authority and responsibility for stewardship of resources in those areas (Robertson 2010).



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Teck Coal Mine Operation

Location of Teck's Coal Mine Operations Relative to the Elk River Watershed and Koocanusa Reservoir

0 5 10 20
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
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Figure 1.1

Document Path: S:\Projects\167202\167202.0049 - Teck Koocanusa 2016\GIS Mapping\2014-2016Report\16-49 Fig 1.1 Teck Coal Limited Operation.mxd

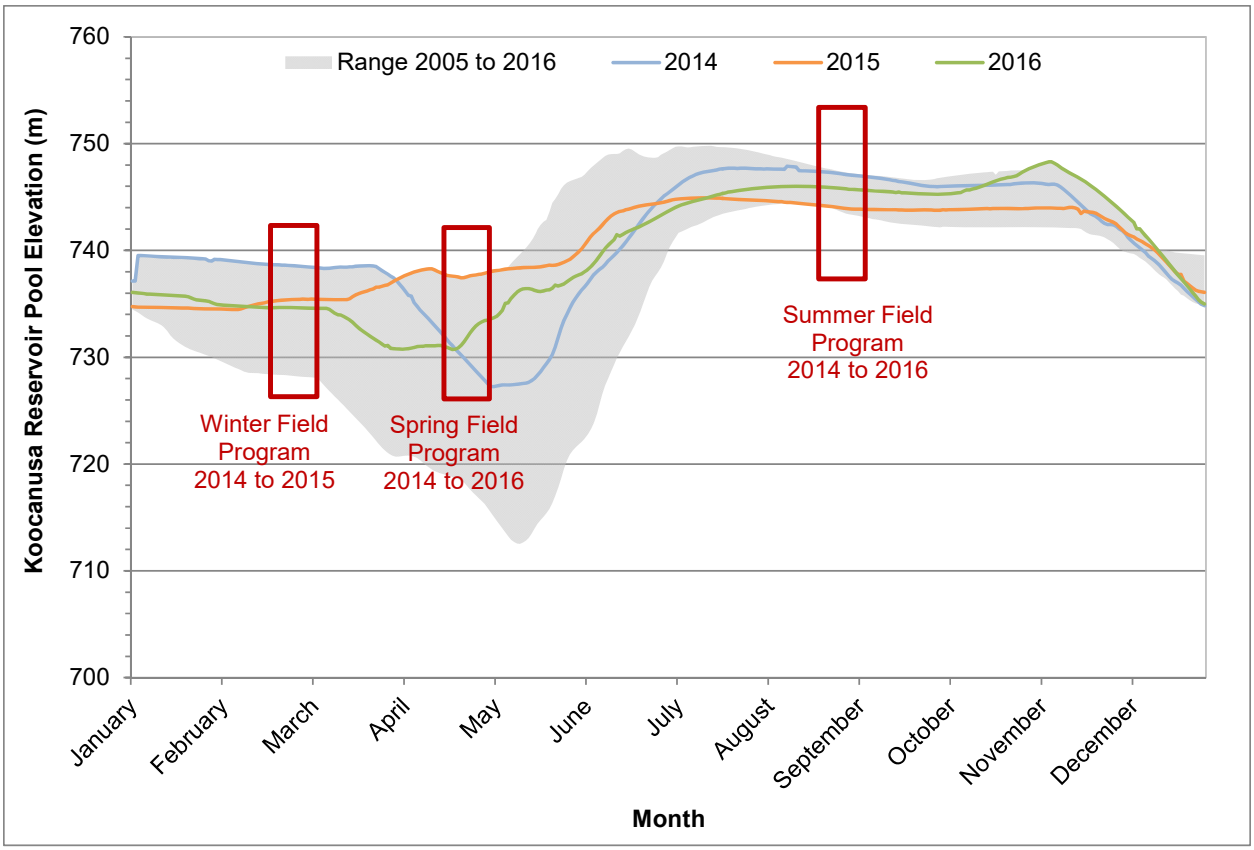


Figure 1.2: Koocanusa Reservoir Water Surface (Pool) Elevation, 2014 to 2016

Note: Shaded area is the historical daily range of water levels from 2005 to 2016. Data from United States Army Corps of Engineers (USACE 2017).

Based on concerns about rising mine-related concentrations of selenium and other constituents of interest within the Elk River basin, Teck initiated monitoring of chemical and biological conditions in the Koocanusa Reservoir in 2013[1]. In the same year (April 2013), the British Columbia (BC) Minister of Environment (MOE) issued a Ministerial Order (Number M113) requiring Teck to develop a plan for the Designated Area[2] to achieve the following outcomes:

- protection of aquatic ecosystem health;

[1] For purposes of this study, Koocanusa Reservoir refers to lands and waters wholly contained within Canada. The first study in the reservoir undertaken by Teck was an evaluation of sediment quality (Minnow 2014a) and water quality.

[2] The Designated Area as defined by Ministerial Order M113 and Permit 107517 is: "a portion of southeastern British Columbia that contains the Elk Valley Watershed and the portion of Lake Koocanusa within Canada. References to the Elk Valley are references to the Designated Area."

- management of bioaccumulation of contaminants in the receiving environment (including fish tissue);
- protection of human health; and
- protection of groundwater.

In response, Teck developed the Elk Valley Water Quality Plan (EVWQP), with input from the public, First Nations, governments, technical experts, and other stakeholders, to guide efforts to ensure the health of the watershed, while allowing for mining to continue (Teck 2014). The EVWQP was approved by the BC Minister of Environment on November 18, 2014.

Discharges from Teck's coal mines to the Elk River watershed are authorized by the BC Ministry of Environment (MOE) through permits that are issued under provisions of the *Environmental Management Act.* Permit 107517, which specifies the terms and conditions associated with those discharges, was issued November 19, 2015 following completion of the EVWQP, and was recently amended on June 5, 2017. The relevant permit requirement for this report is:

> (Section 10.8) ***"****The Permittee must prepare on an annual basis a report summarizing activities and monitoring results. The report must be submitted to the Lake Koocanusa Monitoring and Research Working Group (Lake Koocanusa Working Group)*[3] *and the EMC by June 30 of each year."*

A three-year monitoring program was initiated in 2014 to characterize and compare chemical and biological conditions in the reservoir downstream from the Elk River compared to upstream. Results of monitoring completed in 2014 and 2015 were reported by Minnow (2015b, 2016a). This report presents the 2016 monitoring results in accordance with the annual reporting requirement as per Section 10.8 of the permit, along with the combined results of all three years of study completed (2014 to 2016), a summary of water monitoring results, results from the burbot study (Minnow 2015a), and results from the initial sediment quality study completed in 2013 (Minnow 2014a, mentioned in footnote #2, above).

1.2 Objectives

The overall objective of the Koocanusa Reservoir (Canadian portion) monitoring program conducted in 2014 to 2016 was to assess conditions in the reservoir near and downstream from

[3] The Permit specifies that the Working Group will be established under the BC & Montana government to government Memorandum of Understanding. The Permittee (Teck) is required to participate fully in the Koocanusa Reservoir Monitoring and Research Working Group.

the Elk River compared to upstream, to identify differences that may be attributable to influences from the Elk River. The types of data that were collected included:

- Water, sediment, and tissues of zooplankton, benthic invertebrates, and fish for chemical analysis;
- Phytoplankton, zooplankton, and benthic invertebrates for analysis of community structure;
- Fish measurements related to survival, growth, reproduction, and energy storage as indicators of fish health and population status; and
- Chlorophyll-a in water and seston biomass for analysis of productivity.

Measurement endpoints specific to each sample type were statistically evaluated to identify differences downstream compared to upstream from the Elk River, and for endpoints that differed among areas to determine if they were consistent among years or suggested an increasing or decreasing pattern.

The fluctuations of water levels within the reservoir (Figure 1.2) result in large seasonal and annual variation in water volume (Photo 1.1) and flow characteristics, as well as annual dewatering of large littoral (shallow shoreline) areas. These hydraulic factors are anticipated to influence chemical and biological characteristics within the reservoir and must be considered in the evaluation of potential influences from the Elk River.

1.3 Linkage to the Adaptive Management Plan

As required in Permit 107517 Section 11, Teck has developed an Adaptive Management Plan (AMP; Teck 2016a) to support implementation of the EVWQP, to achieve water quality and calcite targets, ensure that human health and the environment are protected, and where necessary, restored, and to facilitate continual improvement of water quality management in the Elk Valley. The AMP was submitted to the Environmental Monitoring Committee (EMC)[4] and MOE Director July 31, 2016 as required by the Permit. Study designs for many programs were established before the AMP was submitted. The AMP is currently under review, and Teck is working to incorporate input received from the EMC. Teck will work to embed elements of the AMP within each program through reviews of monitoring programs at the study design and

[4] EMC refers to the Environmental Monitoring Committee, which Teck was required to form as a requirement of Permit 107517. The EMC consists of representatives from the MOE, the Ministry of Energy and Mines, Environment Canada, the Ktunaxa Nation, Interior Health Authority, and the Permittee. The EMC reviews submissions and provides technical advice to Teck and the MOE Director regarding monitoring programs.

Photo 1.1: Photos Showing Sunshine Houseboats & Marina Docks within Gold Bay of Koocanusa Reservoir, in April of 2014, 2015, and 2016

report stages through implementation of the AMP. Data from the aquatic monitoring programs will feed into the adaptive management process to specifically address Big Questions #5 (Does monitoring for mine-related effects indicate that the aquatic ecosystem is healthy?) and #2 (Will aquatic ecosystem health be protected by meeting the long-term site performance objectives?). Following an adaptive management framework, evaluation of data collected in the Canadian portion of Koocanusa Reservoir will be used to inform adjustments to the future monitoring design within the reservoir.

2 METHODS

2.1 Overview

Annual study designs for the sampling conducted in the Canadian portion of the Koocanusa Reservoir in 2014 to 2016 were reviewed by the EMC and advice from the EMC was considered in updates to the study designs prior to implementation of field sampling (Minnow 2014b, Minnow 2015c, Minnow 2016b). Data analysis and presentation of results also reflects input provided by the EMC.

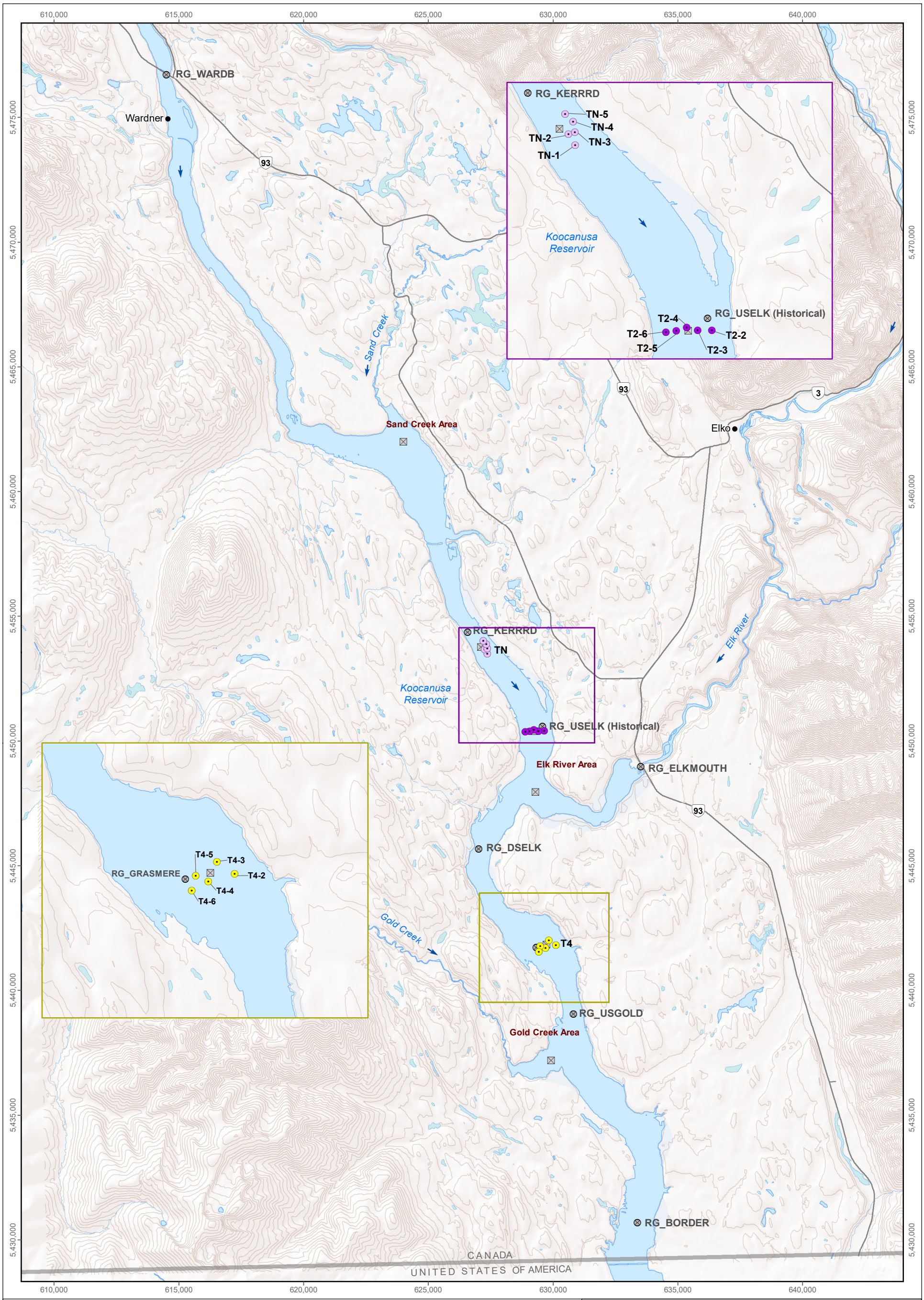
Two areas were sampled for sediment, plankton, and benthic invertebrates in Koocanusa Reservoir (upstream and downstream from the Elk River; Figure 2.1). The downstream area was maintained in the same location for all study years (i.e., Area T4), whereas the upstream area (Area T2) was moved 3.5 kilometres (km) further upstream in 2015 (relative to 2014). The area was moved as a result of the EMC's recommendation to relocate Teck's upstream water sampling station (RG_KERRRD, previously RG_USELK), to ensure that it was sufficiently distant from any potential influence of the Elk River (Figure 2.1). The new area was referred to as TN. Areas in the vicinity of the mouths of Sand Creek, Elk River, and Gold Creek were sampled for fish in all three years (Figure 2.2).

In February 2014 and 2015 (sampling was not conducted in February 2016), the following samples/measures were collected at the fish sampling areas identified on Figure 2.2 (with the exception of near the mouth of Gold Creek in 2015, where thin ice conditions presented a safety hazard) (Table 2.1):

- *In situ* water quality profiles (one per fishing area); and
- Fish tissue samples (target included 10 female burbot [*Lota lota*] and rainbow trout [*Oncorhynchus mykiss*], others such as bull trout [*Salvelinus confluentus*] were sampled opportunistically).

In April of 2014, 2015 and 2016, the following samples/measures were collected from the areas identified on Figures 2.1 and 2.2 (Table 2.1):

- *In situ* water quality profiles (one in the middle of each benthic invertebrate tissue sampling area [T2/TN and T4], and one in each fish sampling area);
- Benthic invertebrate tissue samples (one composite sample at each of the areas upstream and downstream from the Elk River [T2/TN and T4]);
- Fish tissue samples (up to 10 each of the following species: burbot, largescale sucker [*Catostomus macrocheilus*], peamouth chub [*Mylocheilus caurinus*], northern



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- Benthic Invertebrate Tissue Sampling Area (August 2015 and April/August 2016) and Sediment, Benthic Invertebrate and Plankton Sampling Location (August 2015 and 2016)
- Benthic Invertebrate Tissue Sampling Area (April/August 2014 and April 2015) and Sediment, Benthic Invertebrate and Plankton Sampling Location (August 2014)
- Sediment, Benthic Invertebrate (both Community and Tissue) and Plankton Sampling Location (April/August 2014, 2015 and 2016)
- Water Quality Station
- *In Situ* Water Quality Station

Water Quality, Sediment, Benthic Invertebrate and Plankton Sampling Stations in Koocanusa Reservoir, 2014 to 2016

0 2.5 5 10
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

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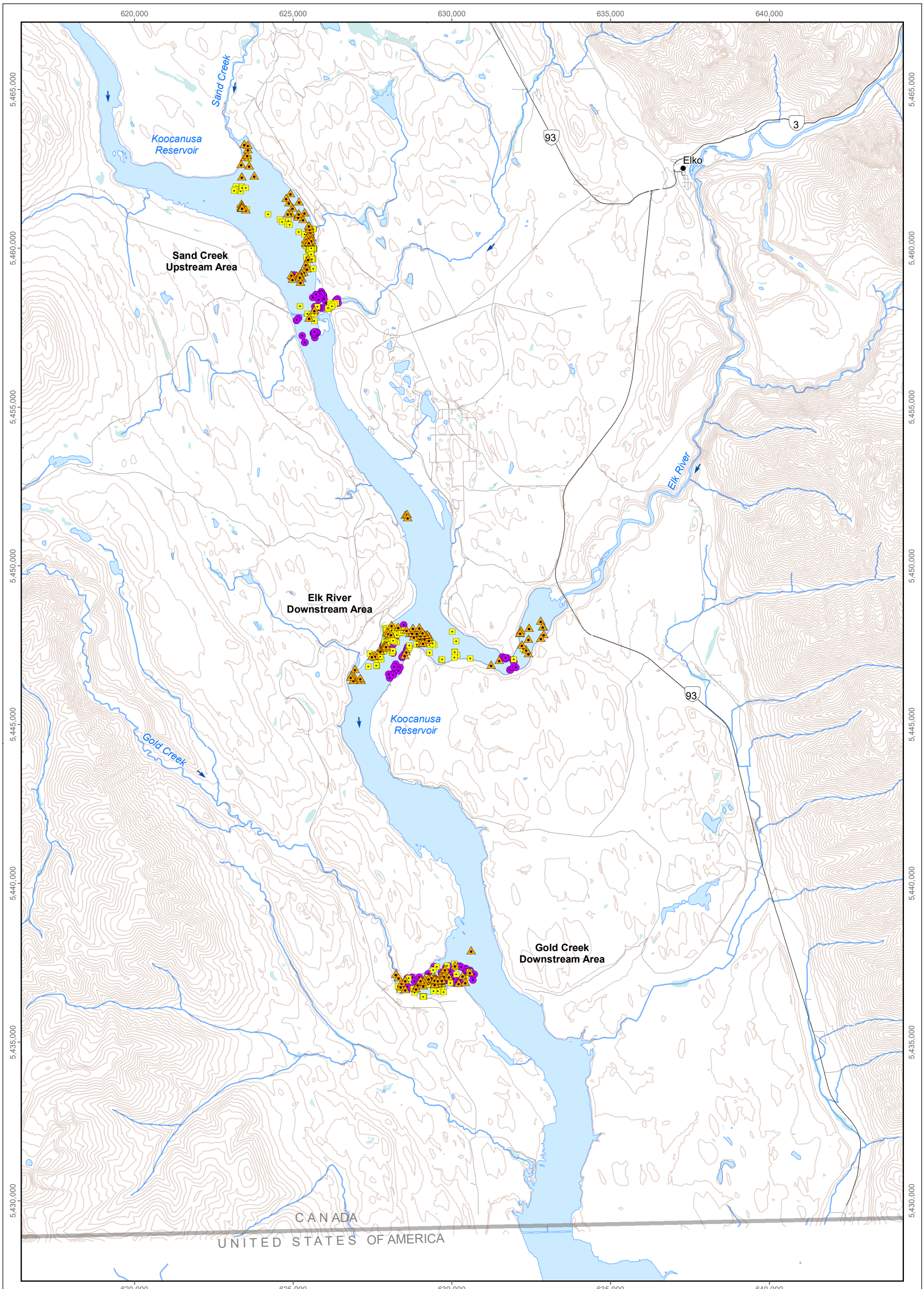
Figure 2.1

Document Path: S:\Projects\167202\167202.0049 - Teck Koocanusa 2016\GIS Mapping\2014-2016Report\16-49 Fig 2.1 BI Sampling.mxd



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- Fish Sampling Location 2014
- Fish Sampling Location 2015
- Fish Sampling Location 2016

Fish Sampling Locations in Koocanusa Reservoir, 2014 to 2016

0 1.75 3.5 7
km

N
W E
S

Map Projection: UTM Zone 11 NAD 1983
Data Source: Reproduced under licence from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada, GeoBase and BCGov, GeoBC. All rights reserved.

Date: January 2018
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minnow environmental inc.

Figure 2.2

Document Path: S:\Projects\167202\167202.0049 - Teck Koocanusa 2016\GIS Mapping\2014-2016Report\16-49 Fig 2.2 Fish Sampling Locations.mxd

Table 2.1: Samples Collected During Field Programs on Koocanusa Reservoir, 2014 to 2016

Year	Month	Sample Collected								
		In Situ Water Quality	Sediment Chemistry	Plankton			Benthic Invertebrate		Fish	
				Phytoplankton Community	Zooplankton Community	Zooplankton Tissue	Community	Tissue	Fish Health and Population	Tissue Metals Analysis
2014	February	✓ (in fishing areas[a])	-	-	-	-	-	-	-	✓ [d]
	April	✓ (in fishing areas[a] and in the middle of each transect, T2 and T4[b])	-	-	-	-	-	✓ (in the middle of each transect, T2 and T4[b])	✓ (peamouth chub)	✓ [d]
	August	✓ (in fishing areas[a] and at each station of transect, T2 and T4[b])	✓ (at each station of transect, T2 and T4[b])	✓ (at each station of transect, T2 and T4[b])	✓ (at each station of transect, T2 and T4[b])	✓ (at each station of transect, T2 and T4[b])	✓ (at each station of transect, T2 and T4[b])	✓ (at each station of transect, T2 and T4[b])	-	✓ [d]
2015	February	✓ (in fishing areas[ac])	-	-	-	-	-	-	-	✓ [cd]
	April	✓ (in fishing areas[a] and in the middle of each transect, T2 and T4[b])	-	-	-	-	-	✓ (in the middle of each transect, T2 and T4[b])	✓ (largescale sucker, northern pikeminnow, peamouth chub, and yellow perch)	✓ [d]
	August	✓ (in fishing areas[a] and at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	-	✓ [d]
2016	April	✓ (in fishing areas[a] and in the middle of each transect, TN and T4[b])	-	-	-	-	-	✓ (in the middle of each transect, TN and T4[b])	✓ (largescale sucker, northern pikeminnow, peamouth chub, redside shiner, and yellow perch)	✓ [d]
	August	✓ (in fishing areas[a] and at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	✓ (at each station of transect, TN and T4[b])	-	✓ [d]

[a] Sand Creek fishing area is upstream of the Elk River confluence, while the Elk River and Gold Creek fishing areas are downstream of the Elk River.

[b] T2/TN were located upstream of the Elk River confluence, while T4 was downstream of the Elk River. The upstream location, T2, was relocated further upstream from the mouth of the Elk River for the August 2015 and subsequent field programs.

[c] Gold Creek area was not sampled in February 2015 where thin ice conditions presented a safety hazard.

[d] Species sampled included one or more of the following: bull trout, burbot, kokanee, largescale sucker, mountain whitefish, northern pikeminnow, peamouth chub, rainbow trout, redside shiner, westslope cutthroat trout, yellow perch.

pikeminnow [*Ptychocheilus oregonensis*], redside shiner [*Richardsonius balteatus*], yellow perch [*Perca flavescens*], bull trout, rainbow trout, westslope cutthroat trout [*O. clarki lewisi*], and mountain whitefish [*Prosopium williamsoni*]; and

- Peamouth chub (2014, 2015 and 2016), northern pikeminnow, yellow perch, largescale sucker, and redside shiner (2015 and 2016) for the fish health assessment (e.g., 20 males and 20 females per fish sampling area).

In August of 2014, 2015, and 2016, the following samples/measures were collected from the areas identified on Figure 2.1 (Table 2.1):

- *In situ* water quality profiles (one at each benthic invertebrate/plankton sampling station [n = 5 per area], and one at each fish sampling area);
- Sediment chemistry, phytoplankton community, zooplankton community, zooplankton tissue, benthic invertebrate community, chlorophyll-a, and seston biomass (five samples each, at each upstream and downstream area);
- Benthic invertebrate tissue samples (one composite sample from each of the areas upstream and downstream from the Elk River); and
- Fish tissue samples (target species included up to 10 rainbow trout [in 2014], 10 northern pikeminnow [in 2015 and 2016], 10 kokanee [*O. nerka*; 2014, 2015 and 2016], and any sport fish collected opportunistically in 2016).

An assessment of the quality of analytical data collected during the three-year sampling program is provided in Appendix A. Details related to sampling activities described above are provided in the sections that follow.

2.2 Water Quality

2.2.1 *In Situ* Water Quality

In association with biological sampling for the current study, *in situ* measurements of water quality were completed in February, April, and/or August, 2014 to 2016. *In situ* water temperature, dissolved oxygen (DO), pH, and specific conductance (i.e., temperature-standardized measurement of conductivity) were measured as vertical profiles at one meter intervals starting just below the water surface. The *in situ* water quality measurements were taken using a calibrated YSI 556 MDS (Multiparameter Display System) meter equipped with a YSI 6820 Sonde (YSI Inc., Yellow Springs, OH), or similar portable multi-parameter unit. Additional water quality information collected to support the interpretation of biological data included Secchi depth, and observations of water colour and clarity (Appendix B).

2.2.2 Routine Water Quality

Routine water quality monitoring was conducted in accordance with Teck's Regional Water Monitoring Plan (Teck 2016b, 2017). Permit 107517 requires the collection of water samples at five stations that are located within the Canadian portion of the reservoir (Figure 2.1). Four of the stations are referred to as receiving water sampling sites (RG_KERRRD, RG_DSELK, RG_GRASMERE, RG_USGOLD), while the fifth station (RG_DSELK) is an Order station, mandated by the MOE, for which site performance objectives (SPOs) have been established. The SPOs for RG_DSELK are 2 µg/L for total selenium (equivalent to the BC water quality guideline), 3 mg/L for nitrate-nitrogen (equivalent to the BC water quality guideline; hereafter referred to as nitrate), 308 mg/L for sulphate (consistent with the BC water quality guideline of 309 mg/L for moderately soft/hard to hard waters [i.e., 76 – 180 mg/L hardness]), and hardness based for dissolved cadmium[5] (functionally equivalent to the long-term BC water quality guideline).

In addition to the five water quality monitoring locations described above, water quality was also assessed on the lower Kootenay River at Wardner Bridge (RG_ WARDB), and the lower Elk River (RG_ELKMOUTH). Flow data from Environment Canada's (2017) closest hydrometric stations (i.e., Kootenay River in Fort Steele [station no. 08NG065] and Elk River in Fernie [station no. 08NK002]) on each river were also downloaded to determine an approximate ratio of flow from the Elk River compared to the Kootenay River into Koocanusa Reservoir. The respective watershed areas between the location where the hydrometric station was situated and Teck's river monitoring stations were also considered when determining the approximate ratio of flow from the Elk River compared to the Kootenay River.

The surface water monitoring program for Koocanusa Reservoir (Canadian portion) and the two river monitoring stations included the collection and/or analysis of multiple parameters on a monthly basis, except from April 1st to July 15th, when samples were collected weekly. Initially at the water quality stations on Koocanusa Reservoir, a profile of the water was conducted and if there was a thermocline (change of 1°C over 1 m change in depth), the water column was considered stratified. If stratified, a composite sample formed from three evenly spaced grab samples was collected throughout the epilimnion, and another composite from the hypolimnion. If the water was not stratified, a sample was collected at 3 m from the surface, 3 m from the substrate, and at the mid-point of the water column. Field parameters for the reservoir and river stations included water temperature, DO, specific conductance, pH, and Secchi depth (in

[5] Dissolved cadmium SPO is hardness dependent based on the following formula:

Dissolved cadmium (in µg/L) = $10^{0.83\log10(\text{hardness})-2.53}$ where hardness is in mg/L of $CaCO_3$

reservoir only). Conventional parameters included specific conductance, total dissolved solids (TDS), total suspended solids (TSS), hardness, alkalinity, dissolved organic carbon (DOC), total organic carbon (TOC), and turbidity. Major ions included bromide, fluoride, calcium, chloride, magnesium, potassium, sodium, and sulphate. Nutrients included ammonia, nitrate, nitrite, total Kjeldahl nitrogen (TKN), orthophosphate, and total phosphorous. Total and dissolved metals analysis included aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc (Teck 2016b, 2017). Chlorophyll-a samples were also collected within the reservoir for laboratory analysis starting in April 2015.

2.2.3 Data Analysis

Vertical water quality profiles that were completed in conjunction with biological sampling were plotted to determine if any stratification or gradients in temperature, DO, pH, and/or conductivity were occurring in any of the sampling areas. Data collected from areas downstream from the Elk River were also compared to data collected upstream.

Statistical analysis of water quality data focused on monthly mean concentrations for the Order constituents (i.e., nitrate, selenium, and sulphate; cadmium was excluded as most samples [90%] were less than the method detection limits [<0.00001 mg/L in 2014 and <0.000005 in 2015 and 2016] at areas both upstream and downstream of the Elk River. Samples were generally collected at the surface, middle, and bottom depths during each sampling event (i.e., as conditions in the reservoir were unstratified). Pairwise statistical comparisons of monthly mean concentrations between depths (surface vs. middle, surface vs. bottom, and middle vs. bottom) were conducted by station (RG_KERRRD, RG_USELK, RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER) using a paired t-test. When the assumption of normality (Shapiro-Wilks' test with significance level [α] = 0.05) was not met, the non-parametric Wilcoxon signed rank test was used. A Bonferroni-adjusted α of 0.1/3 = 0.033 was used for paired t-test and Wilcoxon signed rank tests to control the Type I error rate for the n = 3 pairwise comparisons for each station. Results of these analyses were used to determine whether the depths should be analyzed separately or pooled in the analyses described below.

Statistical comparisons of nitrate, selenium, and sulphate concentrations between downstream stations (i.e., RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER) and upstream stations (RG_USELK in 2014 and RG_KERRRD in 2015 and 2016) were conducted to assess differences among years and between stations. The statistical comparisons were conducted on the differences (downstream of the Elk River – upstream of the Elk River) in monthly mean concentrations to remove the influence of season using a method analogous to a two-way

ANOVA with factors *Area* and *Year*. The differences in monthly mean concentrations between areas were tested using ANOVA (or the Kruskal-Wallis test when assumptions of normality and homogeneity of variances were not met) with factor *Year* (equivalent to testing the *Area*×*Year* interaction in a two-way ANOVA) according to the following hypothesis:

$$H_{01}: \mu_{d\_2014} = \mu_{d\_2015} = \mu_{d\_2016}$$

where μ_{d_2014} represents the mean of the differences in monthly mean concentrations between upstream and downstream stations.

When a difference was detected, pairwise comparisons among years were conducted using Tukey's Honestly Significant Differences method or the Mann-Whitney test ($\alpha = 0.1$). The upstream and downstream station comparisons were conducted by testing whether differences in monthly mean concentrations between stations were different from zero using a one-sample t-test (or Wilcoxon signed rank test when assumptions of normality were not met) by testing the hypothesis:

$$H_{02}: \mu_d = 0$$

The tests for H_{02} were conducted by pooling all years of data when the differences in monthly mean concentrations between stations were not significantly different among years (i.e., H_{01} was not rejected) and were conducted by year when the differences in monthly mean concentrations between stations were significantly different among years (i.e., H_{01} was rejected). An example table showing the results of the analyses is provided in Table 2.2.

The magnitude of difference (MOD) between stations was calculated when a significant difference was detected between stations as:

$$\text{MOD} = \frac{(MCT_{DS} - MCT_{US})}{MCT_{US}} \times 100\%$$

where MCT_{DS} and MCT_{US} are the measure of central tendency for the downstream and upstream stations, respectfully (i.e., mean or median depending on whether the statistical comparison was conducted using a parametric or non-parametric method, respectively). The statistical analyses were conducted using R statistical software (R Core Team 2015).

2.3 Sediment Quality

2.3.1 Sample Collection

Sampling of sediment in the three-year (2014 to 2016) Koocanusa Reservoir monitoring program focused on two transects (i.e., T2/TN and T4). As noted in Section 2.1, the upstream transect (T2) was re-located 3.5 km farther upstream in 2015 (TN) to avoid potential influence

Table 2.2: Description of Two-way ANOVA Statistical Approach Applied to the Evaluation of Spatial and Temporal Differences in Aqueous Parameter Concentrations in Koocanusa Reservoir at Stations Downstream from the Elk River Relative to Upstream Station(s) Using Data Collected in 2014 to 2016

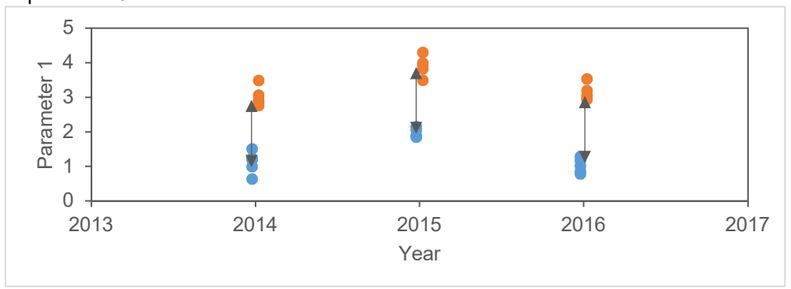
Mean concentrations are reported by station and year. The mean reported here represents the mean of monthly mean concentrations by station.

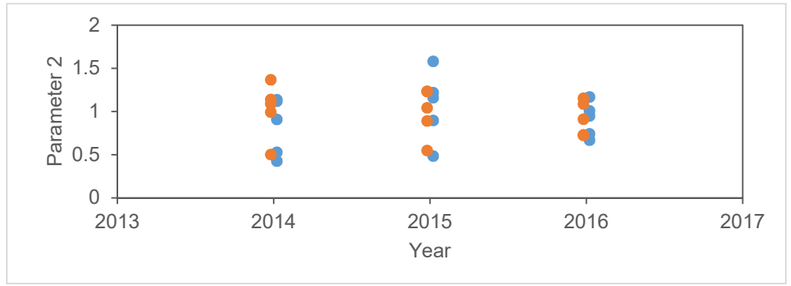
The test here is for whether the relative difference between downstream of Elk River and upstream of Elk River is the same in each year (i.e., are the lengths of the arrows between station means the same in each year in the figure below?). If there is a significant difference among years, then pairwise comparisons are conducted between years to determine which year(s) is(are) different (Tukey's Honestly Significant Differences or Mann-Whitney tests; α=0.1).

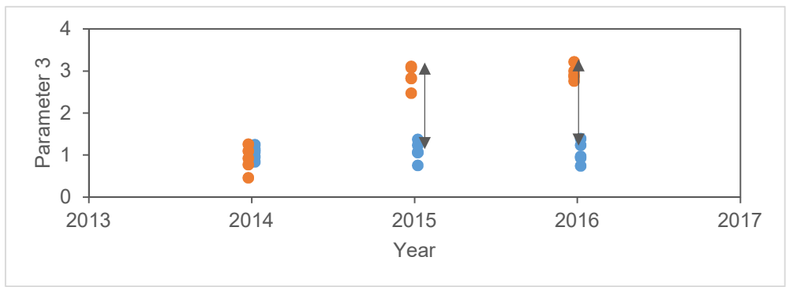
The test here is whether there is a difference downstream of Elk River compared to upstream of Elk River. The hypothesis is tested by comparing the mean relative difference between downstream of Elk River and upstream of Elk River to zero (i.e. are the two stations significantly different from each other?). When the relative difference between stations is similar among years (overall p-value from H_{01}>0.1) then the downstream of Elk River vs upstream of Elk River comparison is conducted by pooling data from all years (and not separated by year).

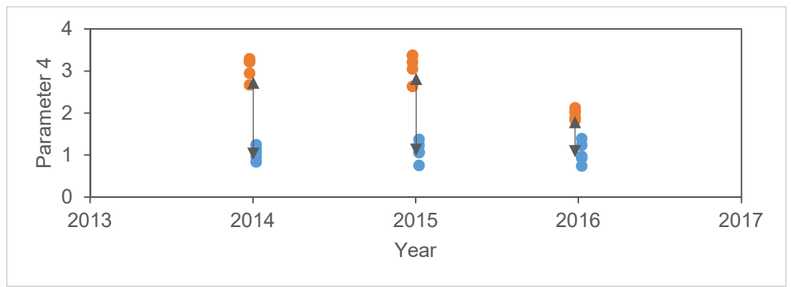
Parameter	Mean Concentration (mass/volume)						H_{01}: Is the difference between the downstream concentration and upstream concentration equal in all years? Test for Relative Difference Between Areas (Downstream of Elk River - Upstream of Elk River) Among Years					H_{02}: Is the downstream concentration equal to the upstream concentration? Test for Relative Difference Between Areas (Downstream of Elk River - Upstream of Elk River) = 0					Magnitude of Difference (Downstream of Elk River - Upstream of Elk River) / Upstream of Elk River (mean or median)				
	2014		2015		2016		Test	P-value				Test	P-value					%			
								All years	Year				All years	Year				Year			
	Downstream of Elk River	Upstream of Elk River	Downstream of Elk River	Upstream of Elk River	Downstream of Elk River	Upstream of Elk River			2015-2014	2016-2014	2016-2015			2014	2015	2016		2014	2015	2016
Parameter 1	3.0	1.1	3.9	2.0	3.1	1.0	ANOVA	>0.1	-			ANOVA	<0.1	-				200%		
Parameter 2	1.0	0.82	1.0	1.1	0.92	0.91	ANOVA	>0.1	-			ANOVA	>0.1	-				-		
Parameter 3	0.90	1.1	2.9	1.1	2.9	1.1	ANOVA	<0.1	<0.1	<0.1	>0.1	ANOVA	-	>0.1	<0.1	<0.1		-	200%	200%
Parameter 4	3.1	1.0	3.1	1.0	2.0	0.94	ANOVA	<0.1	>0.1	<0.1	<0.1	ANOVA	-	<0.1	<0.1	<0.1		200%	200%	90%

= p-value < 0.1









from the Elk River (Figure 2.1). Sediment samples were collected in August in each of the three years from five stations along each transect (Figure 2.1).

Sediment samples for physical and chemical characterization were collected using a stainless steel Petite Ponar (0.023 m^2 sampling area). At each transect (T2 and T4 in 2014, TN and T4 in 2015 and 2016; Figure 2.1), three grabs were collected at each of the five stations to create a composite sediment sample consisting of the top three centimetres (cm) of sediment [i.e., the sediment fraction in which most benthic fauna generally reside (Kirchner 1975)]. Following retrieval of each sediment grab, the ponar was gently opened and lifted to release the collected sediment into a clean plastic tub. If the grab was not complete to each edge of the ponar, or lacked an intact sediment-water surface layer, it was discarded and a new grab was collected. If the grab was acceptable, the top 3 cm were removed and placed into a separate plastic tub. The procedure was repeated until three acceptable grabs were obtained, after which the sample was homogenized using a stainless steel spoon. The homogenized sediment was then transferred to a glass jar [for analysis of polycyclic aromatic hydrocarbons (PAHs)] and a large labelled Ziploc® bag (for all other analyses described in the paragraph below). Sediments were not collected for PAH analysis in 2014 (i.e., only in 2015 and 2016). Samples were subsequently placed in a cooler with ice and transferred to a refrigerator later in the day.

At each sediment sampling station, supporting information was recorded on field sheets, including average Ponar fullness, station depth (m), the presence of algae or macrophytes in samples, sediment texture, and Universal Transverse Mercator (UTM) coordinates (Appendix C).

2.3.2 Laboratory Analysis

Sediment samples (whole sample not sieved) were sent to ALS Environmental in Calgary, Alberta for analysis of PAHs, moisture content, particle size, TOC, and metals/metalloids (hereafter collectively referred to as metals) in the <1 mm fraction (sieved in the lab). For the metals analysis, the <1 mm fraction was representative of whole sediments because samples were collected from depositional areas dominated by fine-grained sediments (i.e., results of particle size analysis indicated that grain size of whole sediment was <1 mm at all sampling locations during the 2014 to 2016 study). This approach is also consistent with previous sampling methodology. Screening at <1 mm ensured that the small sub-sample analyzed by the laboratory did not contain any large grains of sand or gravel that would not be considered representative of the sample as a whole and could bias chemical concentrations expressed relative to sample mass. Sediment sampling quality assurance/quality control (QA/QC) included the collection and analysis of one field duplicate split sample in each sampling event, as well as

assessment of laboratory duplicates, method blanks, and recovery of certified reference materials.

2.3.3 Data Analysis

Sediment particle size distribution and TOC were plotted to aid in the interpretation of the sediment chemistry results. Sediment chemistry data were compared to applicable BC Working Sediment Quality Guidelines (WSQGs) and parameters that exceeded the lowest effect level WSQG (and selenium) were plotted. The lower sediment quality guidelines (i.e., lowest effect level/threshold effect level – LEL/TEL) represent concentrations below which adverse biological effects would not be expected to occur (BCMOE 2017b). In contrast, the highest sediment quality guidelines (i.e., probable effect level/severe effect level – PEL/SEL) represent concentrations above which effects may be observed (BCMOE 2017b).

A two-way ANOVA with factors *Area* and *Year* were used to compare areas located downstream versus upstream of the Elk River over three study years (2014 to 2016; Table 2.3). When the interaction between *Area* and *Year* was significant ($\alpha = 0.1$), the conclusion was that there was a difference between areas, but the difference depended on the year. Comparisons were then conducted between areas separately by year using the contrasts package (Kuhn et al. 2016) in R (R Core Team 2015). When the interaction between *Area* and *Year* was not significant, the significance of the *Area* term in the two-way ANOVA model was assessed and the conclusion was that the differences between areas were similar in each year. An example results table for the two-way ANOVA is provided in Table 2.3. Assumptions of normality and homogeneity of variances were tested on the residuals of the two-way ANOVA using the Shapiro-Wilks' and Levene's tests, respectfully. Data were $\log_{10}$-transformed as required to meet assumptions. When the assumptions could not be met, a rank transformation was used. A more liberal α of 0.01 was used for testing the assumptions, to limit the use of the rank transformation to those instances where assumptions were violated.

At the request of the EMC, the magnitude of difference was calculated in two ways. First, a magnitude of difference was reported for the comparisons between areas (either pooled across years or separately by year) as a standardized difference in terms of the number of within-area/year standard deviations as:

$$\text{MOD} = \frac{(\bar{X}_{DS} - \bar{X}_{US})}{S_r}$$

where $\bar{X}_{DS}$ is the mean for the downstream area, $\bar{X}_{US}$ is the mean for the upstream area, and S_r is the pooled standard deviation of the residuals (i.e., the within-area/year standard deviation) of the two-way ANOVA model.

Table 2.3: Example of Two-way ANOVA Statistical Approach with Factors Area and Year used for Comparisons between Koocanusa Reservoir Areas Located Downstream versus Upstream of the Elk River from 2014 to 2016

Data transformation to meet assumption of normality (S-W test α=0.01) and homogeneity of variance (Levene's test α=0.01). If assumptions could not be met using a log [or log(x+1) when zeros were present] transformation, then the ANOVA was conducted on ranked data. A 0.1 instead of 0.5 significance level was used for testing assumptions to limit the use of the rank transformation to extreme deviation of normality or heterogeneity of variances.

The measure of central tendency was reported to support the statistical comparison. The mean is reported for no transformation, the back-transformed mean on the log scale (i.e. geometric mean) when a log transformation was used, and the median when the rank transformation was used.

P-values for the two-way ANOVA. When there was an interaction between Area and Year, it was interpreted as a difference between areas, but the difference depended on which years were compared. When there was an interaction, the Area and Year p-values were not shown and contrasts were conducted to compare the areas separately by year.

ANOVA contrasts (p-values) were conducted only when there was an interaction between Area and Year.

The magnitude of difference (MOD) was calculated as (downstream of Elk River-Upstream of Elk River)/Upstream of Elk River*100 and was reported when the difference was significant. The MOD was reported by year when there was an interaction between Area and Year, and reported for all years when there was no interaction between Area and Year.

The MOD was also reported in terms of the number of standard deviations (this is the pooled standard deviation from the ANOVA table).

Endpoint	Trans-formation	Measure of Central Tendency (Mean, Geometric Mean, or Median)[a]						Model P-values			P-values for Contrasts Area×Year			Significant Differences and Magnitudes of Difference (%)			Significant Differences and Magnitudes of Difference (number of SD)		
		2014		2015		2016		Area×Year	Area	Year	Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)		
		T4	T2	T4	TN	T4	TN				2014	2015	2016	2014	2015	2016	2014	2015	2016
Endpoint A	none	2,631	3,224	3,533	984	3,295	2,547	0.170	0.184	0.641	-	-	-	-			-		
Endpoint B	log	1,394	947	1,194	418	1,449	1,034	0.633	0.092	0.360	-	-	-	* (81%)			* (0.64 SD)		
Endpoint C	log(X+1)	0.51	4.7	0.42	1.6	0.33	0.29	0.086	-	-	0.004	0.161	0.955	* (-89%)	-	-	* (-3.4 SD)	-	-

p-value < 0.1

* indicates a significant difference between the two areas at an α of 0.1.

[a] The measure of central tendency reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for $\log_{10}$-transformation; and, median for rank-transformation.

Second, a magnitude of difference was also reported for the comparisons between areas (either pooled across years or separately by year) as a percentage difference in the measure of central tendency between areas relative to the upstream area as:

$$\text{MOD} = \frac{(MCT_{DS} - MCT_{US})}{MCT_{US}} \times 100\%$$

where MCT_{DS} and MCT_{US} are the measures of central tendency for the downstream and upstream areas. The measures of central tendency were reported in the original data units as:

- means when no transformation was used;
- geometric means when a $\log_{10}$-transfomation was used; and
- medians when a rank transformation was used.

The two-way ANOVA with a rank transformation actually compares mean ranks (and not medians). A percent difference between two mean ranks does not provide an estimate of the magnitude of difference between two areas. A percent difference between two medians does provide an estimate of the magnitude of difference; however it is possible to detect a significant difference between mean ranks when the area medians are equal.

2.4 Plankton

2.4.1 Productivity

2.4.1.1 Sample Collection

Productivity was measured based on data collected during Teck's routine water quality monitoring (i.e., for nitrate, phosphorus, orthophosphate, chlorophyll-a, and Secchi depth, as described in Section 2.2.2) and data collected during biological sampling (described below).

Chlorophyll-a samples associated with biological monitoring were collected as depth-integrated samples through the top 10 m of the water column at each of five stations upstream and downstream from the Elk River (i.e., transects T2/TN and T4; Figure 2.1) in August of each sample year. Depth-integrated water samples were collected by lowering a 1 cm inside-diameter plastic tube, equipped with a weight, to a depth of 10 m and, after crimping the tube to ensure no water loss upon retrieval, the tube was pulled to the surface and the water inside the tube was emptied directly into a clean pail. A total of three grabs were composited to form the sample, which was then mixed and split for analysis of chlorophyll-a and phytoplankton community (see Section 2.4.2.1, below). Composite water samples were filtered in the field through a 0.45 µm sterile cellulose acetate membrane filter assisted by a vacuum pump. Following filtration of one litre of water, the membrane filter was removed from the filter

apparatus, folded within a piece of aluminum foil, and placed into a pre-labelled polyethylene (Whirl-Pak™) bag. Samples were stored frozen until shipped to ALS Environmental for analysis.

Chlorophyll-a was also measured *in situ* in 2015 to investigate variability in concentrations at 1 m depth intervals and to test the accuracy of the method by comparing average *in situ* concentrations over the top 10 m to those reported by the laboratory for the 10-m depth-integrated samples. The 2015 *in situ* chlorophyll-a concentrations were measured using a YSI multi-parameter field meter. The meter was fitted with a total algae sensor, which provides separate measurements for both chlorophyll-a and blue-green algae. Measurements were conducted at one meter intervals starting just below the water surface. Collection of chlorophyll-a data using the traditional field filtering and laboratory analysis methods showed that *in situ* measurements underestimated chlorophyll-a concentrations; therefore, *in situ* chlorophyll-a measurements were not collected in 2016.

Seston biomass samples were also collected as a measure of productivity during biological sampling. Samples were collected at the same time and from the same locations as the field filtered chlorophyll-a samples described above. Samples were collected by hauling a 60 µm plankton net through the top 10 m of the water column at each station five times. Samples were transferred to plastic collection jars and preserved with 5% formalin solution. Samples were later filtered and residual material dried and weighed as described by Wetzel and Likens (2000) to provide an estimate of total seston productivity (i.e., total seston weight per unit volume of water).

2.4.2 Community Composition

2.4.2.1 Sample Collection

Samples for analysis of phytoplankton community structure were collected as depth-integrated samples through the top 10 m of the water column from five stations in each transect (T2 and T4 in 2014, TN and T4 in 2015 and 2016; Figure 2.1), as described in Section 2.4.1.1. Immediately following collection of the 100 mL sample, Lugol's solution was added to the sample for preservation (enough volume to darken the solution to a weak tea colour). The sample was mixed with the Lugol's solution by gently tipping the jar twice. Samples were maintained at room temperature until shipment to the laboratory (Plankton R Us, Winnipeg, Manitoba).

Samples for analysis of zooplankton community composition were collected using a 19 cm diameter, fine mesh (i.e., 60 µm) plankton net, vertically hauled through the top 10 m of the water column at each sampling station, based on methods described by BCMWLAP (2003). A

total of three vertical hauls were collected and composited to form a single community sample at each of the sampling stations (T2 and T4 in 2014, TN and T4 in 2015 and 2016; Figure 2.1). Each sample was carefully transferred into a pre-labelled plastic sampling jar, and preserved to a level of 10% buffered formalin. Samples were maintained at room temperature until shipment to Plankton R Us. At each plankton sampling station, supporting information was recorded on field sheets, including weather conditions, Secchi depth, and UTM coordinates (Appendix D).

2.4.2.2 Laboratory Analysis

Phytoplankton and zooplankton samples collected for community analysis were sent to Plankton R Us Inc. (Winnipeg, MB) for taxonomic identification.

For phytoplankton samples, 10 mL aliquots of preserved sample were gravity settled for 24 hours. Cell counts were then performed using the Ütermohl technique as modified by Nauwerck (1963), using an inverted microscope at magnifications of 125X, 400X, and 1200X with phase contrast illumination. Specimens were identified to the lowest taxonomic level possible. Cell counts were converted to wet weight biomass by approximating cell volume. Estimates of cell volume for each species were obtained by measuring up to 50 cells of an individual species and applying the geometric formula best fitted to the shape of the cell (Vollenweider 1968; Rott 1981). A specific gravity of 1 was assumed for cellular mass.

Zooplankton samples were brought to a standard volume by settling the sample for 24 hours and then decanting the upper liquid. The decanted liquid was microscopically viewed to ensure no animals were lost. For cladocerans and copepods, sub-sampling was performed (using an automatic pipette) on samples that contained large numbers of specimens. All samples were sub-sampled (using an automatic pipette) for rotifer enumeration. One millilitre sub-samples (to a maximum of ¼ of the sample) were allowed to settle in a Sedgwick-Rafter counting chamber. Rotifers were enumerated by counting the entire counting chamber (9.6 cm^2). All enumerations and identifications were conducted using a Zeiss compound research microscope equipped with a phase-contrast condenser at magnifications ranging from 98X to 250X. Specimens were identified to the lowest taxonomic level possible. Once numbers of organisms within each sample were established, these values were converted to densities per litre. This was accomplished by dividing the number of organisms per volume of sample by the total volume of lake water filtered in the field (i.e., net mouth area × depth of haul × number of hauls).

The biomass of major taxonomic groups within each zooplankton sample was also determined. To calculate biomass, literature values from published length-weight regression equations were applied (list of references provided at the end of Appendix D). Biomass for each taxonomic group was calculated by multiplying the number enumerated for that sample by the mean individual weight.

For both phytoplankton and zooplankton community samples, sub-sampling accuracy was assessed by performing replicate counts on 10% of samples (in this case, one sample each year). Replicate samples were chosen at random and processed at different times from the original sample to reduce bias.

2.4.3 Tissue Chemistry

Zooplankton were collected for analysis of tissue chemistry using an 80 µm mesh net (30 cm diameter) vertically hauled through the top 10 m of the water column. A slightly larger mesh size was used for tissue collection to ensure the sample mostly consisted of zooplankton (and was not confounded by the presence of phytoplankton). A total of 10 vertical hauls were collected at each station, composited and filtered through the net a second time (to remove as much water as possible) to ensure sufficient sample weight for analysis. Samples were then transferred to sterile cryovials and frozen, pending shipment to the University of Missouri Research Reactor Center (MURR) for freeze-drying and analysis of metals (including mercury) using high-resolution Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

2.4.4 Data Analysis

Based on input from the EMC, further understanding of the trophic status of the lake was requested so a literature search was conducted to find criteria for determining the trophic status in lakes and reservoirs. Representative criteria were chosen based on their relevance, as well as to give a representation of jurisdictional differences in criteria. Criteria were then grouped together by variable (total phosphorus, chlorophyll-a, Secchi depth and total nitrogen) into six trophic classifications, where possible (Table 2.4). These classifications are Ultra-oligotrophic, Oligotrophic, Mesotrophic, Meso-Eutrophic, Eutrophic and Hyper-Eutrophic. The trophic classification used in British Columbia (Nordin 1985) was selected for screening against monthly averages for total phosphorus, chlorophyll-a, and Secchi depth from the reservoir station upstream of the Elk River (RG_KERRRD) and the four stations downstream of the Elk River (RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER).

Phytoplankton and zooplankton communities were evaluated between areas and over time using primary metrics of mean taxonomic richness [as identified to lowest practical level (LPL)], mean organism density (average number of cells or organisms per litre), and mean biomass (mass of cells or organisms per litre). Comparisons were made based on absolute and relative density as well as absolute and relative biomass. Relative density and relative biomass were calculated as the density or biomass of each respective taxa and group relative to the total number of cells or organisms in the sample for dominant taxa and groups. Dominant taxa were defined as taxa representing at least 5% of the total cell or organism density at one or more

Table 2.4: Available Criteria for Trophic Status Classification

Variable	Source	Ultra-Oligotrophic	Oligotrophic	Mesotrophic	Meso-Eutrophic	Eutrophic	Hyper-Eutrophic
Total Phosphorus (µg/L)	OECD[a,h]	<4	<10	10 - 35	-	35 -1 00	>100
	Environment Canada[b]	<4	4 - 10	10 - 20	20 - 35	35 - 100	>100
	Quebec[a]	-	4 - 10	10 - 30	-	30 - 100	-
	Sweden[a]	-	<15	15 - 25	-	25 - 100	>100
	Carlson TSI[c,d]	<6	6 - 12	12 - 24	-	24 - 96	>96
	Nordin (BC Criteria)[e]	-	1 - 10	10 - 30	-	>30	-
	Nürnberg[a,f]	-	<10	10 - 30	-	31 - 100	<100
	Vollenweider and Karekes[g]	-	3 - 18	11 - 96	-	16 - 390	-
Chlorophyll-a (µg/L)	OECD	<1	<2.5	2.5 - 8	-	8 - 25	>25
	Environment Canada	<1	<2.5	2.5 - 8	-	8 - 25	>25
	Quebec	-	1 - 3	3 - 8	-	8 - 25	-
	Sweden	-	>3	3 - 7	-	7 - 40	>40
	Carlson TSI	<0.95	0.95 - 2.6	2.6 - 7.3	-	7.3 - 56	>56
	Nordin (BC Criteria)	-	0 - 2	2 - 7	-	>7	-
	Nürnberg	-	<3.5	3.5 - 9	-	9.1 - 25	>25
	Vollenweider and Karekes	-	0.3 - 4.5	3 - 11	-	2.7 - 78	-
Secchi Depth (m)	OECD	>12	>6	3 - 6	-	1.5 - 3	<1.5
	Environment Canada	>12	>6	3 - 6	-	1.5 - 3	<1.5
	Quebec	-	5 - 12	2.5 - 5	-	1 - 2.5	-
	Sweden	-	>3.96	2.43 - 3.96	-	0.91-2.43	<0.91
	Carlson TSI	>8	4 - 8	2 - 4	-	0.5 - 2	<0.25
	Nordin (BC Criteria)	-	>6	3 - 6	-	<3	-
	Nürnberg	-	-	-	-	-	-
	Vollenweider and Karekes	-	5.4 - 28	1.5 - 8.1	-	0.8 - 7	-
Total Nitrogen (µg/L)	OECD	-	-	-	-	-	-
	Environment Canada	-	-	-	-	-	-
	Quebec	-	-	-	-	-	-
	Sweden	-	<400	400 - 600	-	600 - 1,500	>1,500
	Carlson TSI	-	-	-	-	-	-
	Nordin (BC Criteria)	-	<100	100 - 500	-	500 - 1000	-
	Nürnberg	-	<350	350 - 650	-	651 - 1,200	>1,200
	Vollenweider and Karekes	-	310 - 1,600	360 - 1,400	-	390 - 6,100	-

[a] Summarized in Galvez-Cloutier and Sanchez 2007

[b] Environment Canada 2004

[c] Carlson 1977

[d] Values converted from Trophic Status Index (TSI) for comparison to other classifications

[e] Nordin 1985, Criteria used in British Columbia

[f] Nürnberg 2001

[g] Vollenweider and Kerekes 1980

[h] Organisation for Economic Co-operation and Development

stations. For zooplankton, males and females belonging to the same taxa were combined for analysis. Zooplankton eggs were omitted from analyses (viability was not determined). All community endpoints were summarized by reporting the minimum, maximum, mean, median, standard deviation (SD), and sample size for each sampling area and year. Statistical comparisons were based on differences in major taxonomic groups. A two-way ANOVA was used to assess spatial and temporal differences in plankton community endpoints in the area downstream from the Elk River (T4) compared to the upstream area (T2/TN) in 2014 to 2016, as described in Section 2.3.3.

Non-metric multi-dimensional scaling (NMDS) was used to separately reduce the phytoplankton and zooplankton taxonomic data matrices to fewer dimensions. NMDS is a method to visualize the level of similarity of samples based on the rank of the similarities (Clarke 1993). The NMDS takes the N-dimensional (here N = number of taxa) coordinates of each sample (i.e., station in a given area/year) and defines a set of new n-dimensional coordinates that reflect the locations (rank distances) among samples. The n = 2 dimension is frequently used because the sample stations can be plotted on a 2-dimensional scatterplot.

The Bray-Curtis distance was used as the measure of relative community similarity or dissimilarity using PC-ORD© (McCune and Mefford 2011). Taxa occurring in two or fewer of the 30 samples were removed from the dataset as their exclusion from multivariate analyses reduces 'noise' (Bailey et al. 2004). The 'slow and through' option, which uses the following settings, was applied: maximum iterations = 400, instability criterion = 0.00001, number of real runs = 40, and number of randomized runs = 50 (McCune and Grace 2002). All NMDS ordinations were evaluated for solution stability, final stress <0.2, and Monte Carlo randomized determination of interpretable axes of $p < 0.05$ (McCune and Grace 2002).

NMDS of non-transformed data often results in "shallow interpretation in which only the pattern of a few, very common species is represented" (Clarke 1993). Thus, a suite of transformations was applied (log_{10}, square root, 4th root, power 2, and power 4) which assigned different weights to the rarer taxa, relative to abundant taxa (Clarke 1993). All transformations were evaluated because it was not known *a priori* which transformation would best explain the differences in community structure (i.e., the appropriate weight to assign to rare taxa relative to abundant taxa). Results were reported for the transformation that had mean skew and kurtosis values closest to zero. The NMDS analyses were conducted using absolute abundance taxa data matrices at LPL. The 2- or 3-dimensional ordination was selected based on PC-ORD© decision criteria (final stress less than 0.2, randomization test with $p < 0.05$, and a reduction of at least 5 points of stress with each additional axis). The NMDS Axis 1 scores were used to

describe the community matrix because it explained most of the variability in the community matrix.

Selenium concentrations in zooplankton were plotted and compared statistically between the downstream area (T4) and the upstream area (T2/TN) from 2014 to 2016 using a two-way ANOVA as described in Section 2.3.3. Data were compared to the interim BC guideline for benthic invertebrate tissue (4 µg/g dw), EVWQP Level 1 benchmarks for effects to benthic invertebrates (13 µg/g dw), and dietary effects to juvenile fish (11 µg/g dw).

2.5 Benthic Invertebrates

2.5.1 Community

2.5.1.1 Sample Collection

Benthic invertebrate community sampling was completed at each of five stations upstream and downstream from the Elk River (i.e., transects T2/TN and T4; Figure 2.1) in August of each sampling year (2014 to 2016), when water levels are most stable and benthic invertebrate communities are at peak biomass and diversity (BCMOE 2006). Benthic invertebrate community samples were collected using a stainless steel petite-Ponar sampler. A single sample, consisting of a composite of five petite-Ponar grabs (i.e., 0.116 m^2 total sampling area) was collected at each station. Care was taken to ensure that each grab captured the surface material and was full to each edge of the ponar sampler, with any incomplete grabs discarded. Each acceptable grab was field-sieved using 500 µm mesh, with the retained material carefully transferred to a plastic jar containing both external and internal station identification labels. Samples were preserved to a level of 10% buffered formalin in ambient water. At each benthic invertebrate sampling station, supporting information was recorded, including substrate description, sampler fullness, sampling depth, Secchi depth, and UTM coordinates (Appendix E).

2.5.1.2 Laboratory Analysis

Benthic invertebrate community samples were submitted to ZEAS Inc. (Nobleton, ON) for analysis following standard sorting methods which incorporated recommended Environment Canada QA/QC procedures for assessing sub-sampling error and sorting recovery checks (i.e., Environment Canada 2012). Upon arrival at the laboratory, a biological stain was added to each benthic invertebrate community sample to facilitate sorting accuracy. Samples were washed free of formalin in a 500 µm sieve and the remaining sample material examined under a stereomicroscope at a magnification of at least ten times. Benthic invertebrates were removed from the sample debris and placed into vials containing a 70% ethanol solution according to major taxonomic groups (e.g., phyla, orders). A senior taxonomist enumerated and identified

benthic organisms to LPL (typically to genus or species) using the most current taxonomic keys (Appendix Table E.1). Following identification, representative specimens of each taxa were preserved in a 75% ethanol-3% glycerol solution in separately labelled vials to create a voucher collection.

2.5.2 Tissue Chemistry

2.5.2.1 Sample Collection

Composite benthic invertebrate tissue samples were collected upstream and downstream from the Elk River in both April and August in 2014, 2015, and 2016 (Figure 2.1). A total of 20 petite-Ponar grabs (four from each of the five sampling stations identified on Figure 2.1) were collected to obtain a single sample from each area during each sampling event. Each full grab was placed into a 500 µm mesh sieve bag and sieved free of material less than 500 µm in size. The remaining material was then transferred to a white enamel tray for removal of benthic organisms using tweezers. All visible organisms were removed from the debris/sediment, rinsed clean using ambient water, and placed into a sterile cryovial.

2.5.2.2 Laboratory Analysis

Samples were stored frozen, pending shipment to MURR for determination of moisture content (by freeze drying) and analysis of metals (including mercury) using high-resolution ICP-MS.

2.5.3 Data Analysis

Benthic invertebrate communities were evaluated between areas and over time similar to plankton communities (Section 2.4.4). Primary metrics of mean taxonomic richness (as identified to LPL) and mean organism density (average number of organisms per m^2) were calculated. Absolute and relative density (calculated as the density of each respective taxa and group relative to the total number of organisms in the sample) for dominant taxa and groups were also calculated. Dominant taxa were defined as those species representing at least 5% of the total organism density at one or more stations. Immature Tubificinae (with and without hair chaetae) were combined for analysis. All community endpoints were summarized by reporting the mean, median, minimum, maximum, SD, and sample size for each sampling area and year.

A two-way ANOVA was used to assess spatial and temporal differences in benthic invertebrate community endpoints using methods described in Section 2.3.3. Benthic invertebrate communities were also assessed using NMDS as described in Section 2.4.4.

Selenium concentrations in benthic invertebrates were compared between the downstream areas (T4) and the upstream area (T2/TN) from 2014 to 2016 using a two-way ANOVA as described in Section 2.3.3. Selenium concentrations in benthic invertebrates were also plotted

and compared to the BCMOE interim guideline of 4 µg/g dw and the Level 1 benchmarks (Teck 2014) for the EVWQP (i.e., 13 and 11 µg/g dw for effects on benthic invertebrate reproduction and for dietary effects to fish, respectively).

2.6 Fish

2.6.1 Sample Collection

Fish for the health assessment and evaluation of tissue chemistry were targeted in three study areas in Koocanusa Reservoir – two downstream from the Elk River (Elk River and Gold Creek), and one upstream from the Elk River (Sand Creek) (Figure 2.2). Fish sampling employed a number of standard techniques, including angling, burbot traps, gill nets, hoop nets, minnow traps, and/or seining, which varied according to study year based on provincial fish collection permit conditions.

Angling was used to catch fish in February 2014 and 2015, April 2014, 2015 and 2016, and April 2016. In February 2014, angling was conducted through a hole bored in the ice using a baited (e.g., worms, squid, or salted salmon row) hook. Angling in April (2014 to 2016) and August (2015) was conducted from a boat using a single hook baited with salted salmon roe or worms. In August 2014, when rainbow trout were specifically targeted for tissue sampling, downrigging was conducted from a trolling boat. Downrigging was largely unsuccessful and was discontinued in subsequent monitoring years (i.e., 2015 and 2016).

Burbot traps were used to target burbot in February and April of 2015. Traps were set and retrieved by boat. Bait (i.e., salmon roe) was placed into bait bags in each trap, and the traps were slowly lowered to the bottom of the reservoir, ensuring that there was enough rope to allow the buoy to float at the surface. Burbot traps were left overnight and checked the following day (approximately 24 hour period).

Three foot-diameter hoop nets were used to collect fish in February, April, and August 2014, April and August 2015, and in April 2016. Leads were attached to the opening of each net, and the nets were typically set perpendicular to shore. In strong flow areas, the mouth of the net was directed downstream to minimize clogging from debris. The lead and net were secured with anchors, and floats were attached to the net to mark its location on the water surface. Hoop nets were left to fish overnight (i.e., approximately 24 hours).

Gill nets were used as the main method to capture fish in April and August of 2016. Nets of varying lengths (i.e., 75’ to 150’) and mesh sizes (1”, 1.5”, 2”, 2.5”, 3”, 4”, and 5”) were deployed. Gill nets were typically set for a maximum of 2 hours (often less) to minimize bycatch mortalities.

Minnow traps were used during the April 2015 sampling program to target redside shiner. Traps were baited with cat food, which was placed in a screened (<1 mm mesh) 250 mL container, to ensure that fish did not have access to the food. Minnow traps were set on the reservoir bottom in shallow areas, or suspended at various depths in the water column from docks or woody debris near the shore. After approximately 24 hours, traps were checked and re-set, as necessary.

Seining (using a 15 m by 0.9 m net with a 0.3 cm mesh size) was also used to characterize the small-bodied fish community in each of the study areas in August 2014.

Angling, burbot trapping, hoop netting, gill netting, minnow trapping, and seining locations were marked using a handheld Global Positioning System (GPS) with coordinates recorded in UTMs. The date and time of deployment and the date and time of retrieval, were recorded on field sheets. All fish captured were identified and enumerated, and released at the point of capture or sampled as described below (Appendix F).

2.6.2 Field Processing

Fish retained for the assessment of health endpoints were transported to a dedicated field laboratory for processing as soon as possible following capture (i.e., within hours). If not already dead, fish were sacrificed by a decisive blow to the head. Fork and total lengths were measured to the nearest millimeter using a standard measuring board. Weights were measured using appropriately-sized spring scales (e.g., 50 g, 100 g, 300 g). Each fish was opened and the sex and/or sexual maturity recorded. Whole gonads and livers were removed from each sexually mature fish and weighed to the nearest milligram (0.001 g) using an analytical balance with a surrounding draft shield. Whole ovaries from each sexually mature female were then placed in a labelled polyethylene (Whirl-Pak®) bag. A skinless, boneless muscle fillet sample was collected from each female fish and placed into a separate Whirl-Pak® bag. Following these measures, age structures (i.e., otoliths, dorso-lateral scales, and/or dorsal spines) were removed from all fish. Each age structure was wrapped separately in waxed paper and placed inside a labelled envelope. Whole bodies of male fish (i.e., carcasses and all associated internal organs previously removed for weighing) were placed into a Whirl-Pak® bag. Any internal or external parasites, deformities, erosions (fin and gill), lesions, or tumours observed during processing (i.e., DELT survey; Sanders et al. 1999) were recorded on field sheets.

Fish retained for lethal tissue sampling were similarly transported to a dedicated field laboratory for processing as soon as possible following capture. Each fish was weighed using an analytical balance (0.001 g) or appropriately-sized spring scale (e.g., 50 - 2000 g) and fork and total lengths were measured using a measuring board equipped with a metre stick (± 1 mm). Each fish was then opened and the sex and/or sexual maturity recorded (if obvious). Ovaries

were removed from mature female fish and placed in a labelled Whirl-Pak® bag. A skinless, boneless muscle fillet (minimum of 25 g) was also collected from each fish and placed into a separate Whirl-Pak® bag. Age structures (i.e., otoliths and dorso-lateral scales) were removed from each fish, wrapped separately in waxed paper, and placed inside a labelled envelope. Any internal or external parasites, deformities, erosions (fin and gill), lesions, or tumours observed during processing (i.e., DELT survey; Sanders et al. 1999) were recorded on field sheets.

Fish collected for non-lethal tissue sampling or body measurements were processed in the field. Weights and lengths were measured using spring scales and a measuring board, respectively. External fish condition, including the presence of any parasites, deformities, lesions, or parasites, was documented. A muscle sample was collected from each fish using a biopsy punch (4 mm acu-punch). Following extraction of the biopsy sample, skin was removed from the sample using a scalpel and the remaining muscle placed into a sterile Nalgene cryovial. Samples were kept in a cooler on ice until transfer to a freezer later in the day. The fish was then released near its capture location.

All samples collected (i.e., eggs, ovaries, muscle, age structures, and whole bodies) were stored frozen pending shipment to the respective laboratory for analysis immediately following completion of field sampling.

2.6.3 Laboratory Analysis

Fish tissues collected for age analysis (i.e., otoliths, scales, and/or dorsal spines) were submitted to North Shore Environmental Services in Thunder Bay, Ontario. Otoliths were prepared using a “crack and burn” method which involves cracking the otoliths in half and then lightly burning the otolith to make the annuli visible. Dorsal spines were cleaned, embedded in epoxy resin and, after the epoxy hardened, sectioned using a low-speed isomet diamond saw. Each otolith, dorsal spine, or scale sample was then mounted on a glass slide using a mounting medium and examined under a compound microscope using transmitted light to determine fish age. For each structure, the age and edge condition was recorded along with a confidence rating for the age determination.

Tissue samples for chemical analysis were submitted to MURR. Samples were first freeze-dried for determination of moisture content and then analyzed for metals (including mercury) using high-resolution ICP-MS. Results were reported on a dry weight (dw) basis, along with moisture content (based on the difference between wet and freeze-dried sample weights) to allow conversion to wet-weight values, as required.

2.6.4 Data Analysis

2.6.4.1 Fish Health Assessment

Fish health endpoints representing five response categories including survival (mean age), energy use - growth (weight-at-age and length-at-age), energy use - reproduction (relative gonad weight), and energy storage (condition and relative liver weight) were plotted and evaluated separately for male and female fish (Table 2.5). These endpoints are recognized as indicators of fish health by Environment Canada, and are consistent with those required for fish health monitoring under the national Environmental Effects Monitoring (EEM) program for mines (Environment Canada 2012). Statistical analyses of fish health endpoints were consistent with procedures outlined in the EEM technical guidance document (Environment Canada 2012), but adapted to accommodate multiple years of data using two-way analyses of variance and two-way analyses of covariance (Table 2.6).

Table 2.5: Effect Indicators and Endpoints for the Fish Population Health Study (Environment Canada 2012)

Effect Indicators[a]	Effect Endpoints
Survival	Age
Growth (energy use)	Size-at-age (body weight relative to age)
	Size-at-age (length relative to age)[b]
Reproduction (energy use)	Relative gonad size (gonad weight against body weight)
Energy storage	Condition (body weight against length)
	Relative liver size (liver weight against body weight)

[a] Endpoints to be used for determining "effects" as designated by statistically significant differences between exposed and reference areas (Environment Canada 2012).

[b] This analysis is for informational purposes only, and significant differences between exposed and reference areas are not necessarily used to designate an effect (Environment Canada 2012).

Analyses of the fish health endpoints were conducted separately by sex. Fish with a gonadosomatic index (GSI = gonad weight/body weight × 100%) less than 1% (i.e., non-developed fish) were removed from the analysis of the reproduction endpoint (i.e., relative gonad weight), with one exception. If the majority of fish captured were non-developed, the developed fish and non-developed fish were analyzed separately. Fish that had tapeworms in the body cavity were similarly removed from the evaluation of the reproductive endpoint

Table 2.6: Description of Two-way ANCOVA Statistical Approach Applied to the Evaluation of Changes in Fish Health Endpoints in Koocanusa Reservoir Downstream (Elk River and Gold Creek) Study Areas Relative to Changes at the Upstream (Sand Creek) Study Area Over Time using Data Collected in 2014 to 2016

A two-way ANCOVA was used to compare endpoints between Elk River and Sand Creek study areas, and between Gold Creek and Sand Creek study areas. The model varied depending on data set properties and null hypotheses (H), as follows:

$Y=\beta0 + \beta1Cov + \beta2Area + \beta3Year + \beta4Area\times Year + \beta5Cov\times Area + \beta6Cov\times Year + \beta7Cov\times Area\times Year + \varepsilon$

H1: $\beta7=0$ (regression slopes are not dependent on area and year)
If $\beta7\neq0$ then regression slopes are dependent on area and year so ANCOVA conducted separately by year
If $\beta7=0$ then the Cov×Area×Year term was removed from the model and fit again.

$Y=\beta0 + \beta1Cov + \beta2Area + \beta3Year + \beta4Area\times Year + \beta5Cov\times Area + \beta6Cov\times Year + \varepsilon$

H2a: $\beta6=0$ (regression slopes are not dependent on year)
H2b: $\beta5=0$ (regression slopes are not dependent on area)
If $\beta5\neq0$ or $\beta6\neq0$ then regression slopes are dependent on area or year so ANCOVA conducted separately by year
If $\beta5=0$ and $\beta6=0$ then the Cov×Area and Cov×Year terms were removed from the model and fit again.

$Y=\beta0 + \beta1Cov + \beta2Area + \beta3Year + \beta4Area\times Year + \varepsilon$ (parallel slope model with Area×Year interaction)

H3: $\beta4=0$ (differences between areas in the covariate adjusted response are not dependent on year)
If $\beta4\neq0$ ANCOVA conducted separately by year
If $\beta4=0$ then Area×Year term was removed from the model and fit again.

$Y=\beta0 + \beta1Cov + \beta2Area + \beta3Year + \varepsilon$ (parallel slope model with no interaction)

H4: $\beta2=0$ (no difference between areas in the covariate adjusted response)
If $\beta2\neq0$ significant difference between areas (consistent difference among years)
If $\beta2=0$ no significant difference between areas (consistent difference among years)

ANCOVA conducted separately by year:

$Y=\theta0 + \theta1Cov + \theta2Area + \theta3Cov\times Area + \varepsilon$

H1: $\theta3=0$ (regression slopes are not dependent on year)
If $\theta3\neq0$ then regression slopes are dependent on area. Magnitude of difference reported for the minimum and maximum values of the overlap of covariate values
If $\theta3=0$ then Cov×Area term was removed from the model and fit again.

$Y=\theta0 + \theta1Cov + \theta2Area + \varepsilon$
H4: $\theta2=0$ (no difference between areas in the covariate adjusted response)

When a significant interaction was detected in the two-way ANCOVA model, then a one-way ANCOVA was conducted by year.

A significant Cov×Area×Year term implies that the regression slopes are dependent on area and year.

A significant Cov×Area term implies that the regression slopes are dependent on area.

A significant Cov×Year term implies that the regression slopes are dependent on year.

A significant Area×Year term implies that the difference between areas in the covariate adjusted response is dependent on year.

When none of these interaction terms are significant then the two-way ANCOVA can proceed and the area p-value is reported from the parallel slope model with no interaction.

* = significantly different at $\alpha = 0.1$
Magnitude of difference calculated as (downstream area-upstream area)/upstream area*100%

Results here are reported for all years together when there were no significant interactions.

Results are reported by year when there was a significant interaction.

When results were reported by year and regression slopes were significantly different between areas, results were reported as significant (*) and the magnitude of difference was estimated from predicted values of the regression at the minimum and maximum values of the range of overlap between areas.

Species	Sex	Response	Covariate	Significant Interactions[a]		Area P-value (Parallel Slope Model with No Interaction)	Elk River vs Sand Creek Area Comparisons[b]						Significant Interactions[a]		Area P-value (Parallel Slope Model with No Interaction)	Gold Creek vs Sand Creek Area Comparisons[b]					
							2014		2015		2016					2014		2015		2016	
				Term	P-value		Min Cov[c]	Max Cov[c]	Min Cov[c]	Max Cov[c]	Min Cov[c]	Max Cov[c]	Term	P-value		Min Cov[c]	Max Cov[c]	Min Cov[c]	Max Cov[c]	Min Cov[c]	Max Cov[c]
Peamouth Chub	M	log_{10}(Adjusted Body Weight)	log_{10}(Age)	Cov×Area×Year	0.047	-	* (19%)		* (-34%)	* (4.3%)	-		Cov×Year	0.012	-	* (30%)		-		* (-23%)	
Northern Pikeminnow	M	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	Cov×Area,Cov×Year	<0.001,<0.001	-	N/A		* (-5.1%)	* (13%)	-		Cov×Area×Year	<0.001	-	N/A		-		-	
Peamouth Chub	F	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	Cov×Area	0.003	-	* (78%)	* (-14%)	-		-		Cov×Area×Year	0.029	-	* (26%)		-		-	
Peamouth Chub	M	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	Cov×Year	0.008	-	-		-		* (17%)		Cov×Year	0.027	-	* (15%)	* (-2.2%)	-		* (42%)	* (-14%)
Peamouth Chub	F	log_{10}(Fork Length)	log_{10}(Age)	Area×Year	0.040	-	* (3.6%)		* (0.43%)		* (-1.9%)		Cov×Area×Year	<0.001	-	* (3.4%)		-		* (-2.9%)	
Peamouth Chub	F	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	-	-	0.748	-						Area	-	0.006	* (-3.2%)					

[a] Significance of interaction terms assessed using $\alpha = 0.05$.
[b] Significance of Area comparisons assessed using $\alpha = 0.1$.
[c] Comparison of magnitude of difference conducted at the minimum and maximum values of the range of overvap of covariate values between areas when the regression slopes between areas within a year were not parallel.
* = significant difference (α=0.1) between areas (or a significant difference in regression slopes when a magnitude of difference is reported for the Min Cov and Max Cov)
N/A = no data

because the presence of worms has been shown to influence gonad development (Carter et al. 2005).

Data used to calculate fish health endpoints were plotted using scatterplots of the response variable versus the covariate, and using boxplots of the summary endpoints listed in Table 2.5. Statistical comparisons of fish health endpoints were conducted using a two-way ANOVA (as described in Section 2.2.3) for age, and using a two-way ANCOVA for the other endpoints.

The two-way ANCOVA was conducted with factors *Area* and *Year* when data were available for at least two years. For simplicity, comparisons were conducted separately for the Elk River downstream area relative to the Sand Creek upstream area, and for the Gold Creek downstream area relative to Sand Creek. The ANCOVA model varied depending on the comparisons of regression slopes between areas and among years. The ANCOVA analyses were conducted as described below.

A full interaction model was fit:

$$Y=\beta_0 + \beta_1 X + \beta_2 Area + \beta_3 Year + \beta_4 Area \times Year + \beta_5 X \times Area + \beta_6 X \times Year + \beta_7 X \times Area \times Year + \varepsilon$$

where Y is the response variable, X is the covariate, *Area* is a categorical variable for area, *Year* is a categorical variable for year, ε is the error term, and β_1 is the regression coefficient. The first hypothesis to test was whether the regression slopes were dependent on area and year:

H_{01}: $\beta_7=0$ (regression slopes were not dependent on area and year)

If the hypothesis H_{01} was rejected (i.e. $\beta_7 \neq 0$), then the regression slopes were dependent on area and year and the ANCOVA was conducted separately by year using a one-way ANCOVA. If the hypothesis H_{01} was not rejected (i.e. $\beta_7=0$) then the $X \times Area \times Year$ term was removed from the model and fit again:

$$Y=\beta_0 + \beta_1 X + \beta_2 Area + \beta_3 Year + \beta_4 Area \times Year + \beta_5 X \times Area + \beta_6 X \times Year + \varepsilon$$

The next hypotheses tested were whether regression slopes were dependent on area or dependent on year:

H_{02a}: $\beta_6=0$ (regression slopes were not dependent on year)
H_{02b}: $\beta_5=0$ (regression slopes were not dependent on area)

If hypothesis H_{02a} was rejected (i.e. $\beta_6 \neq 0$) then regression slopes were dependent on year and the ANCOVA was conducted separately by year using a one-way ANCOVA. If hypothesis H_{02b} was rejected (i.e. $\beta_5 \neq 0$) then regression slopes were dependent on area. With no differences between year, the interaction between the covariate and area could be evaluated by pooling years; however, for simplicity, the ANCOVA was conducted separately by year using a one-way ANCOVA when H_{02b} was rejected.

If hypotheses H_{02a} and H_{02b} were not rejected (i.e. $\beta_5=0$ and $\beta_6=0$) then the *X*×*Area* and *X*×*Year* terms were removed from the model and fit again:

$$Y=\beta_0 + \beta_1 X + \beta_2 Area + \beta_3 Year + \beta_4 Area \times Year + \varepsilon$$

The next hypothesis tested was whether differences between areas (in the covariate-adjusted response) were dependent on year:

H_{03}: $\beta_4=0$ (differences between areas in the covariate adjusted response were not dependent on year)

If hypothesis H_{03} was rejected (i.e. $\beta_4\neq0$), then differences in the covariate-adjusted response between areas was dependent on year, and the ANCOVA was conducted separately by year using a one-way ANCOVA. If hypothesis H_{03} was rejected (i.e. $\beta_4\neq0$) then the *Area*×*Year* term was removed from the model and fit again:

$$Y=\beta_0 + \beta_1 X + \beta_2 Area + \beta_3 Year + \varepsilon$$

The next hypothesis tested was whether there were differences between areas (in the covariate-adjusted response):

H_{04}: $\beta_2=0$ (no difference between areas in the covariate-adjusted response)

If hypothesis H_{04} was rejected (i.e. $\beta_2\neq0$), then differences in the covariate-adjusted response between areas was significantly different (and the magnitude consistent among years).

Two-way ANCOVAs were conducted using R (R Core Team 2015). When only a single year of data was available, analyses were conducted using ANOVA (for age) or ANCOVA with all three areas using Minitab 17 (Minitab 2015). When the overall ANOVA/ANCOVA was significant, comparisons of each downstream area to the upstream area were conducted using Dunnett's method.

All response variables and covariates were $\log_{10}$-transformed prior to conducting analyses. Outliers (i.e., observations with Studentized residuals with magnitude 4 or greater) were removed from analyses. Influential points (evaluated using the Cook's distance statistic) were removed from ANCOVA analyses when they caused significant interactions (Environment Canada 2012). Outliers and influential points are plotted in the scatterplots (Appendix F) as open symbols with an '×' through them. When a significant interaction was detected between the covariate and the *Area* term, but the coefficient of determination R^2 value of both the parallel regression model (interaction term) and full regression model were greater than 0.8 and within 0.02 units in value (Environment Canada 2012), slopes were considered practically parallel and the ANCOVA proceeded.

The magnitude of difference for the fish health endpoints was calculated as:

$$\text{MOD} = \frac{(\bar{X}_{DS} - \bar{X}_{US})}{\bar{X}_{US}} \times 100\%$$

where the $\bar{X}_{DS}$ and $\bar{X}_{US}$ are the means of the downstream area and upstream area, respectfully. The means used in the calculation for ANCOVA were least squares means from the ANCOVA model, back transformed (i.e. anti-logged) to the original data units. When a significant interaction between the covariate and the *Area* term was detected (i.e., the regression slopes between areas were different), the magnitude of difference was calculated for small fish and big fish (at the minimum and maximum values of the overlap of the range of covariate values between areas). Means used in the calculation of the magnitude of difference were the predicted values of the response variable at the minimum and the maximum values of the covariate overlap based on the regression lines for each area (Environment Canada 2012).

2.6.4.2 Tissue Chemistry

Metal toxicity is usually assessed on the basis of measured waterborne exposure concentrations, sometimes by also taking into account environmental factors that affect metal interaction with biological tissues (e.g., biotic ligand models; DiToro et al. 2001), or by assessment of effects in direct or simulated exposure scenarios (e.g., *in situ* or laboratory bioassays, field studies) (Chapman et al. 1998; Environment Canada 2012). With few exceptions (e.g., mercury, selenium), the potential for toxicity to biota related to metal exposure in aquatic environments is not well predicted by concentrations measured in their tissues (Chapman and Wang 2000, McGeer et al. 2003, Deforest et al. 2007, Meador et al. 2010, Adams et al. 2011). Therefore, for most metals, concentrations in tissues are of limited utility in evaluating effects on the biota from which the tissues are collected. Results of a recent screening-level risk assessment also concluded that from the nine constituents evaluated, selenium was the only known mine-related substance of potential concern with respect to the Elk River watershed (Windward 2015). For these reasons, the tissue chemistry assessment focuses on selenium. Evaluation of differences in mercury concentrations in fish tissues among sampling areas was also included. The remainder of tissue metals data are provided in Appendix G, but are not discussed within this report.

Selenium concentrations in fish tissues were statistically compared between the downstream areas (Elk River and Gold Creek) and the upstream area (Sand Creek) from 2014 to 2016. Selenium concentration data were combined for muscle collected from a species within a given year, while whole body and ovary selenium concentrations were only collected in April. Selenium concentrations in fish tissues were also plotted and compared to the BCMOE guidelines (for muscle, ovary, and whole body), the 2016 United States Environmental Protection Agency (USEPA) guidelines (for muscle, ovary, and whole body), and the EVWQP

Level 1 benchmark for reproductive effects (ovary tissues only). Mercury concentrations in fish muscle relative to length were tested using linear regression (data from all study areas and years combined for each species) and compared to the BC tissue residue guideline for the protection of wildlife (BCMOE 2017a).

3 WATER QUALITY

3.1 Overview

In accordance with Permit 107517, water quality is monitored weekly (March 15th to July 15th) or monthly (remainder of the time when reservoir access is not restricted by safety concerns related to ice cover and flowing water) by Teck at five stations within the reservoir, including one situated upstream from the Elk River (initially at RG_USELK and then moved farther upstream to RG_KERRRD in April 2015) and four downstream from the Elk River (RG_DSELK, RG_GRASMERE, RG_USGOLD, RG_BORDER; Figure 2.1). At each station, water temperature, DO, pH, specific conductance, and Secchi depth are measured *in situ*, and samples are collected for laboratory analysis of nutrients, major ions, metals, TSS, turbidity, and other conventional parameters. Depth permitting, three samples (surface, mid-column and bottom) were collected under un-stratified conditions[6], one at 3 m from the surface, one 3 m from the substrate, and one at the mid-point of the water column. If the water was too shallow to allow for the collection of three samples, a single surface sample, or both a surface and bottom sample were collected. Data are reported annually (e.g., Teck 2016b, 2017). Station RG_DSELK is an Order station, at which SPO for cadmium, nitrate, selenium, and sulphate apply.

In association with biological sampling for the current study, *in situ* measurements of water quality were completed in February, April, and August, 2014 to 2016. Measurements were made at two transects, one each located upstream versus downstream of the Elk River where sediment, plankton, and benthic invertebrate samples were collected (T2/TN[7] and T4, respectively, five stations per transect sampled in August), and at three areas where fish were collected (near Sand Creek, Elk River and Gold Creek, sampled in February, April, and August).

3.2 *In Situ* Water Quality Profiles

Within-year water temperature profiles in August (i.e., maximum annual water depths) were similar between the areas downstream versus upstream of the Elk River (Figure 3.1). Greater variation was observed among years, but a decreasing gradient in water temperature was observed at depths below 6-10 m from the surface in all years. Profiles completed in February and April, when water levels were lower (Figure 1.2), showed very little change in temperature

[6] Under stratified conditions, different sampling instructions would apply but the associated condition was not encountered.

[7] As noted in Section 2.1, transect T2 was moved farther upstream to TN in August 2015 to correspond with the relocation of water station RG_USELK to RG_KERRRD, thereby avoiding influence from the Elk River.

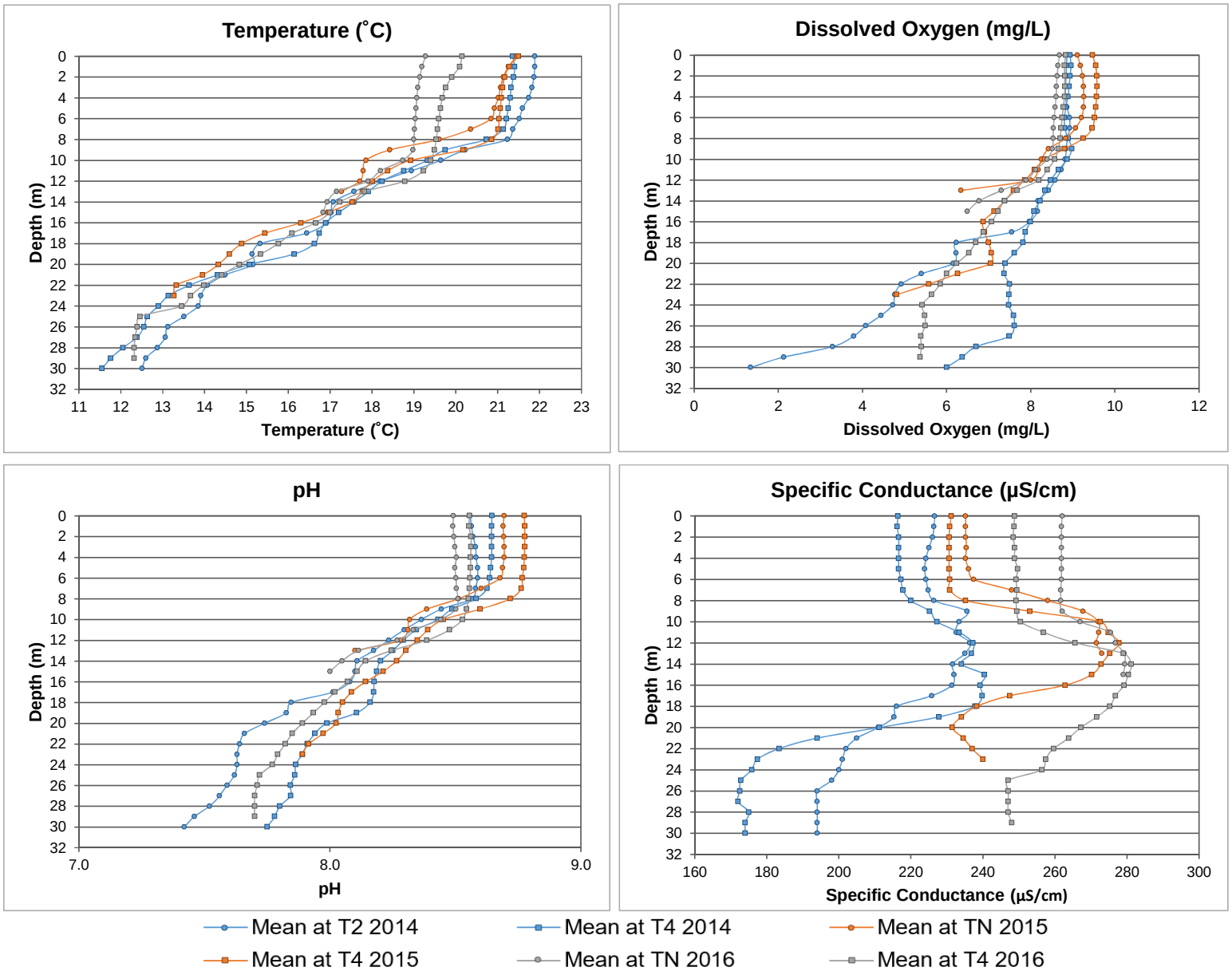


Figure 3.1: Mean (n=5 Stations per Area) *In Situ* Water Quality Profiles Measured at Stations Downstream (T4) and Upstream (T2/TN) of the Elk River in Koocanusa Reservoir, August 2014, 2015, 2016

with depth (Appendix Figures B.1 to B.3 and Tables B.1 to B.3). Surface water temperatures were higher at all stations in April 2015 compared to April 2014 and 2016 (Appendix Figure B.2).

A decreasing concentration gradient with depth, beginning 8-10 m below the surface, was also observed for DO, with similar profiles in August between the upstream and downstream areas, except in 2014. In August 2014, the DO concentrations were lower at the upstream transect (e.g., 4.1 mg/L at 26 m [at station T2-2]) compared to downstream (mean 7.6 mg/L at 26 m) (Figure 3.1). Therefore, although some values were less than the BC long-term water quality guideline for protection of aquatic life (8.0 mg/L) and some were also less than the instantaneous minimum value (5.0 mg/L), this did not occur as a result of influence from the Elk River. February and April profiles indicated DO concentrations of 10 mg/L or more at all areas, except at the deepest part (i.e., 10 to 12 m below surface) of the upstream Sand Creek area in February 2014, where concentrations as low as 4.5 mg/L were observed (Appendix Figures B.1 and B.2).

Aqueous pH was slightly alkaline (range of 7.2 to 8.8) in all sampling areas and at all depths (Figure 3.1; Appendix Figures B.1 to B.3 and Tables B.1 to B.3). As observed for temperature, a gradient of decreasing pH was evident in August at depths of more than 8 to 10 m below the surface and varied little among areas or years (Figure 3.1). Aqueous pH was consistently within the BC water quality guideline range of 6.5 to 9.0 (Appendix Tables B.1 to B.3).

Specific conductivity (i.e., conductivity standardized to a temperature of 25°C) varied among depths, sampling areas, and years (Figures 3.1; Appendix Figures B.1 to B.3 and Tables B.1 to B.3). August profiles taken at transects both upstream (T2/TN) and downstream (T4) of the Elk River showed increasing conductivity mid-water-column (e.g., 6-16 m) and then decreasing values at greater depths (Figure 3.1). At reservoir areas closer to Sand Creek, Elk River, and Gold Creek mouths (i.e., fish collection areas), the August profiles indicated an increase with depth (Appendix Figure B.3). Within years, specific conductivity in August was consistently lower downstream compared to upstream in the upper part of the water column, but values overlapped in deeper waters (>10 m). Profiles in February and April showed little change in specific conductance with depth, except for lower values within the top 1 m in February (Appendix Figure B.2). Elk River has greater specific conductivity (annual mean of 342 µS/cm at RG_ELKMOUTH) than the lower Kootenay River (annual mean of 264 µS/cm at RG_WARDB) (Appendix Tables B.10 and B.11). Previous studies have reported that inflow temperatures from the Elk and Kootenay River correspond best with temperatures at mid to bottom depths of the reservoir, so this is where densities would be most similar and river inflows would thus be expected to occur during most of the year (Hamilton et al. 1990). The same authors reported that the Canadian portion of the reservoir remains mixed even during full pool,

as a result of basin morphometry, continual movement of water from dam operations and exposure to strong prevailing winds. More recent water sampling at Teck's five stations within the reservoir showed no instances of stratification in 2016, some stratification (i.e., one time at RG_BORDER and RG_USGOLD) in August 2015, and multiple times from June 25th to September 3rd in 2014 (i.e., four times at RG_GRASMERE, three times at RG_USELK, RG_DSELK, and RG_EASTARM, and two times at RG_BORDER).

3.3 Water Quality Based on Laboratory Sample Analyses

3.3.1 Statistical Evaluations

Plots of Order constituents nitrate, selenium, and sulphate suggested that aqueous concentrations may differ between surface, middle, and bottom layers sampled in the latter half of the year when reservoir water levels are highest (Appendix Figures B.4 to B.6). Dissolved cadmium (also an Order constituent) was omitted from the analysis, as most concentrations were less than the method detection limits as discussed in Section 2.2.3 (Appendix Tables B.4 to B.9).

Statistical tests identified significant differences in aqueous concentrations of nitrate, selenium, and/or sulphate between samples collected at the surface compared to lower depths at most stations (Table 3.1). However, concentrations were not significantly different between samples collected at the middle versus bottom depths at any stations, except for a small difference (2.5%) for sulphate at the upstream RG_KERRRD station. At stations downstream from the Elk River, nitrate, selenium, and sulphate concentrations were typically lower at the surface, but there was some variation in patterns among years (Table 3.1 and Figures 3.2 to 3.4).

Based on the results of Table 3.1, data for middle and bottom samples were averaged within months, and annual means were statistically compared among areas for middle-bottom samples separately from surface samples. Nitrate concentrations at both surface and middle-bottom depths of the water column were significantly higher at stations downstream from the Elk River compared to upstream in 2015 and 2016 (Table 3.2). Results were less consistent in 2014 when the upstream station was situated closer to the Elk River. The difference between upstream and downstream concentrations was greater in 2016 than 2015 for both nitrate and selenium, but mean concentrations at downstream areas in 2016 were similar to or less than those observed in 2015 (Table 3.2). Sulphate concentrations did not differ significantly between Koocanusa Reservoir stations located downstream versus upstream of the Elk River in any years (Table 3.2).

Table 3.1: Statistical Summary of Differences in Nitrate-Nitrogen, Total Selenium and Sulphate Concentrations between Surface and Middle, Surface and Bottom, and Middle and Bottom Depths in the Water Column at Individual Koocanusa Reservoir Stations Based on Routine Water Quality Monitoring Samples Collected in 2014 to 2016 (all years combined)

Station		Nitrate-N			Total Selenium			Sulphate		
		Surface versus Middle	Surface versus Bottom	Middle versus Bottom	Surface versus Middle	Surface versus Bottom	Middle versus Bottom	Surface versus Middle	Surface versus Bottom	Middle versus Bottom
Upstream of Elk River	RG_KERRRD	* (7.3%)	-	-	* (33%)	-	-	* (-0.42%)	* (-7.1%)	* (-2.5%)
	RG_USELK	-	-	-	-	-	-	-	-	-
Downstream of Elk River	RG_DSELK	-	* (-34%)	-	-	-	-	* (-5.1%)	* (-13%)	-
	RG_GRASMERE	* (-18%)	* (-37%)	-	* (-5.8%)	* (-8.1%)	-	* (-1.3%)	* (-6.4%)	-
	RG_USGOLD	* (-4.1%)	* (-37%)	-	-	* (-11%)	-	-	* (-11%)	-
	RG_BORDER	* (-13%)	* (-19%)	-	-	-	-	-	* (-7%)	-

* indicates a significant difference between the two areas at a Bonferroni adjusted $\alpha = 0.1/3 = 0.033$ (for the 3 pairwise comparisons)

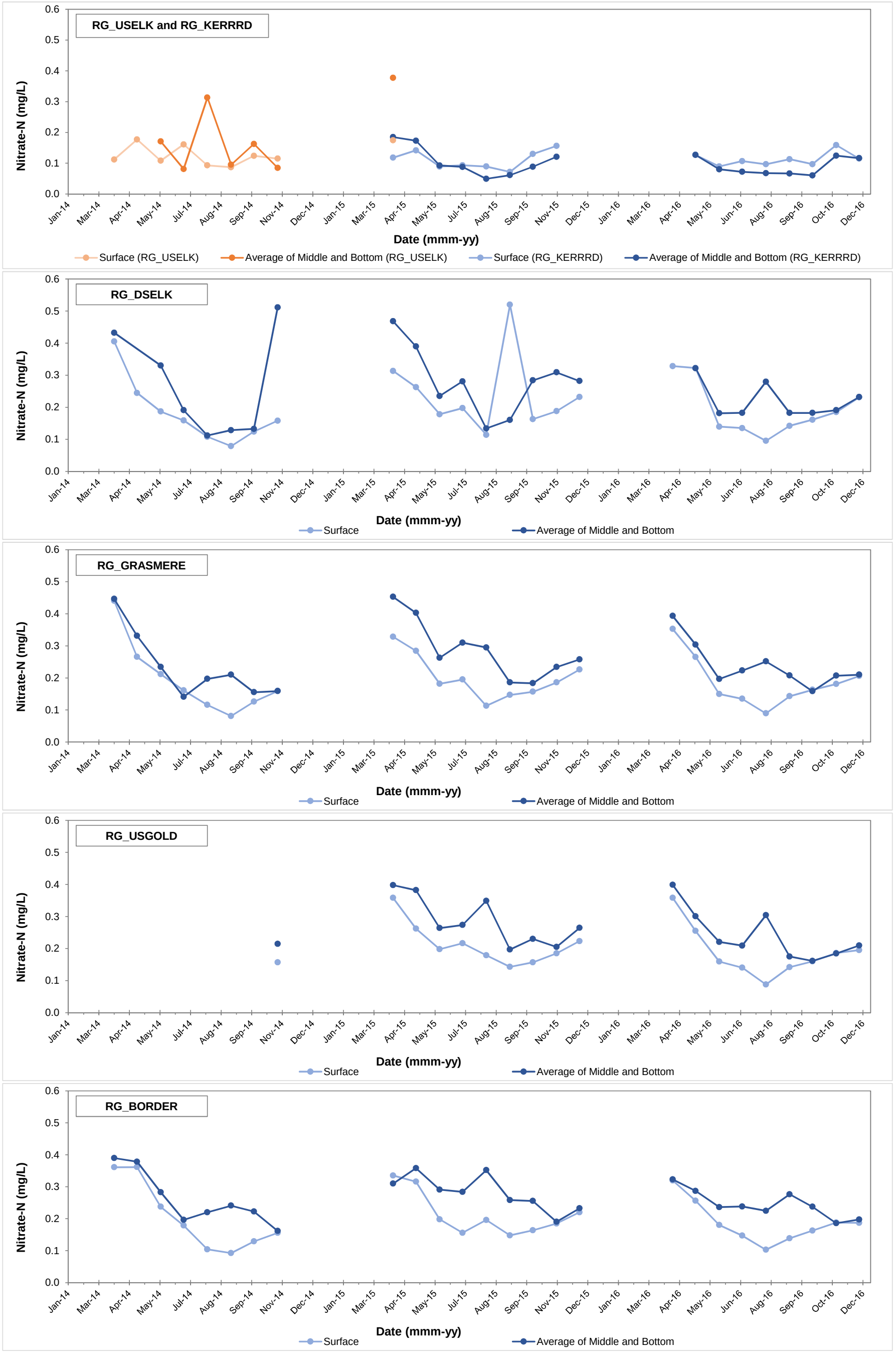


Figure 3.2: Mean Monthly Aqueous Nitrate-Nitrogen Concentrations in Koocanusa Reservoir, 2014 to 2016

Notes: Stations RG_USELK and RG_KERRRD are located upstream of the Elk River and stations RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER are located downstream. RG_USELK was only sampled in 2014, as the station was moved further upstream for the 2015 sampling program to RG_KERRRD.

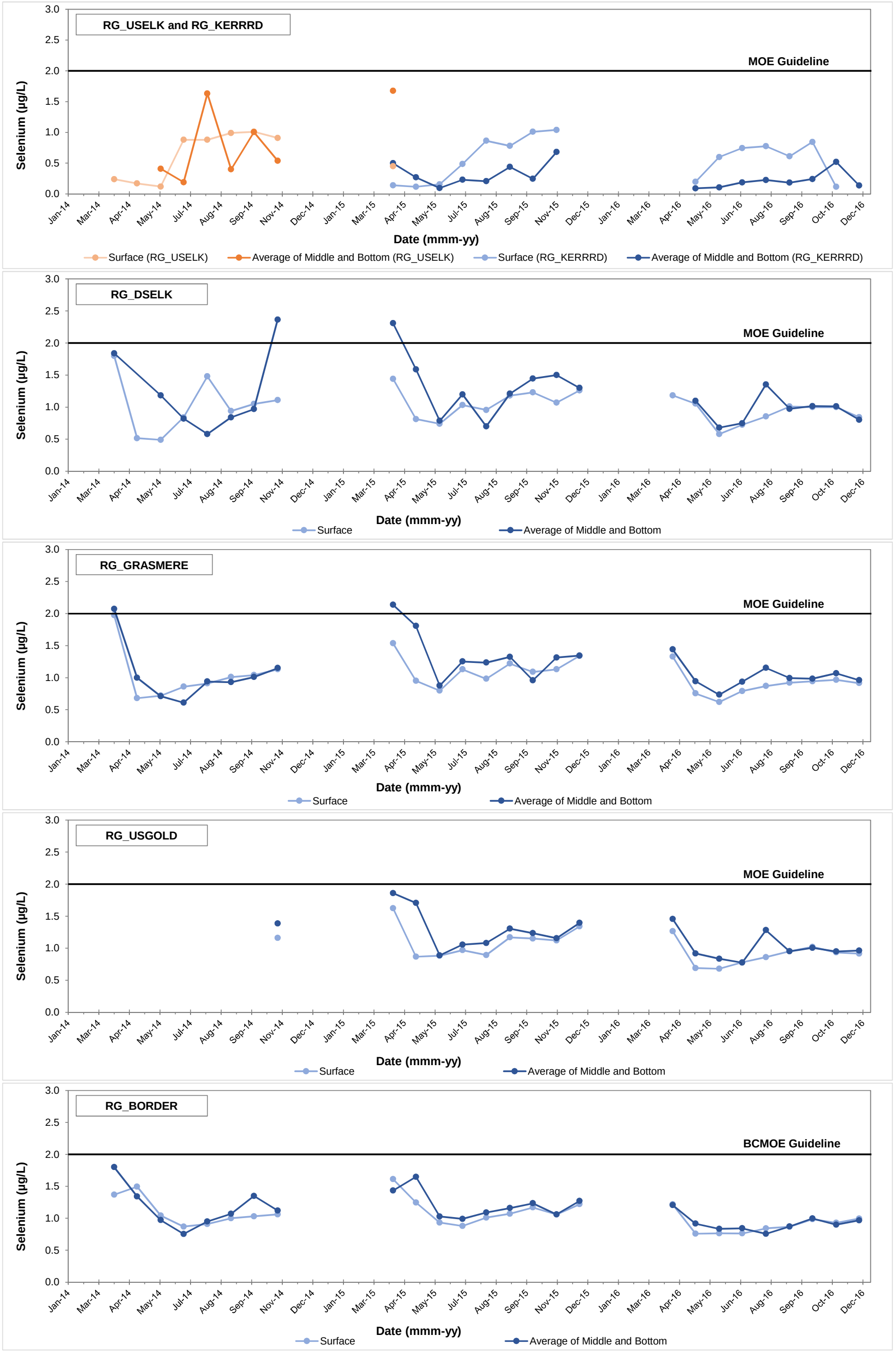


Figure 3.3: Mean Monthly Aqueous Selenium Concentrations in Koocanusa Reservoir, 2014 to 2016

Notes: Stations RG_USELK and RG_KERRRD are located upstream of the Elk River and stations RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER are located downstream. RG_USELK was only sampled in 2014, as the station was moved further upstream for the 2015 sampling program to RG_KERRRD.

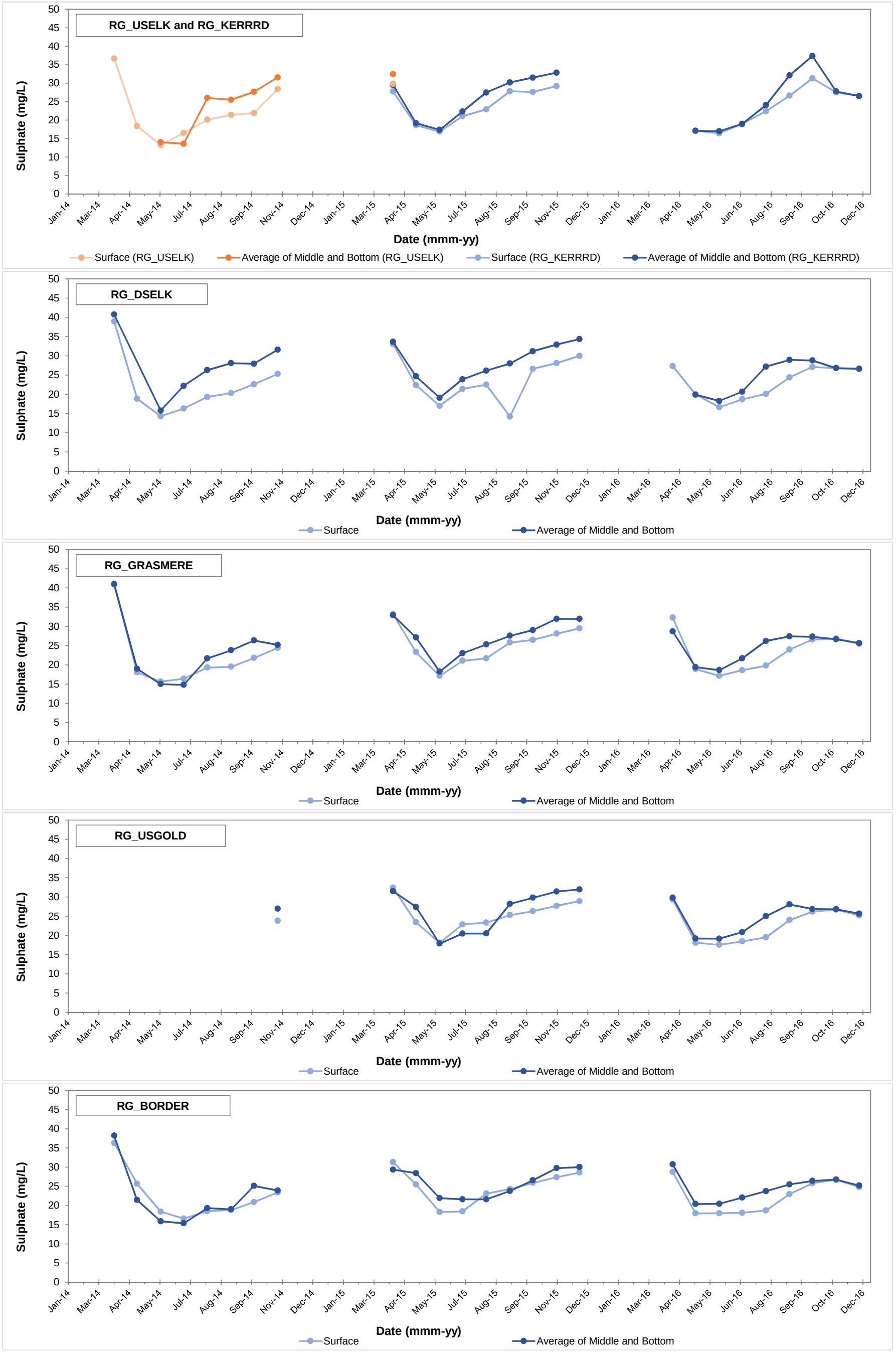


Figure 3.4: Mean Monthly Aqueous Sulphate Concentrations in Koocanusa Reservoir, 2014 to 2016

Notes: Stations RG_USELK and RG_KERRRD are located upstream of the Elk River and stations RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER are located downstream. RG_USELK was only sampled in 2014, as the station was moved further upstream for the 2015 sampling program to RG_KERRRD. MOE guideline is 309 mg/L based on a conservative water hardness between 76 and 180 mg/L for Koocanusa Reservoir.

Table 3.2: Statistical Comparisons of Aqueous Nitrate, Total Selenium, and Sulphate Concentrations between Stations Located in Koocanusa Reservoir Downstream from the Elk River (RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BPRDER) versus Upstream (USELK in 2014 and KERRRD in 2015 and 2016), 2014 to 2016

Parameter	Depth	Station Down-stream of Elk River	Mean or Median[a] Concentration (mg/L or µg/L[b])						H_{01}: Is the difference between the downstream concentration and upstream concentration equal in all years?					H_{02}: Is the downstream concentration equal to the upstream concentration?					Magnitude of Difference (Downstream of Elk River-Upstream of Elk River / Upstream of Elk River) (mean or median)		
									Test for Relative Difference Between Areas (Downstream of Elk River-Upstream of Elk River) Among Years					Test for Relative Difference Between Areas (Downstream of Elk River-Upstream of Elk River) = 0							
			2014		2015		2016		Test	P-value				Test	P-value				%		
										All years	Year				All years	Year			Year		
			Downstream of Elk River	Upstream of Elk River	Downstream of Elk River	Upstream of Elk River	Downstream of Elk River	Upstream of Elk River			2015-2014	2016-2014	2016-2015			2014	2015	2016	2014	2015	2016
Nitrate	Surface	RG_DSELK	0.16	0.11	0.20	0.12	0.14	0.11	K-W	0.093	0.003	0.002	<0.001	WSRT	-	0.076	0.009	0.026	40	99	56
		RG_GRASMERE	0.16	0.11	0.19	0.12	0.15	0.11	K-W	0.311	-			M-W	<0.001	-			45		
		RG_USGOLD	NA	0.12	0.23	0.12	0.17	0.11	ANOVA	0.141	NA		-	t-test	<0.001	NA	-		NA	62	
		RG_BORDER	0.20	0.12	0.23	0.12	0.17	0.11	ANOVA	0.415	-			t-test	<0.001	-			66		
	Combined Middle and Bottom	RG_DSELK	0.17	0.15	0.31	0.13	0.22	0.09	ANOVA	0.002	0.001	0.020	0.303	t-test	-	0.668	<0.001	<0.001	-	128	146
		RG_GRASMERE	0.18	0.15	0.32	0.13	0.22	0.09	ANOVA	<0.001	<0.001	0.019	0.127	t-test	-	0.375	<0.001	<0.001	-	135	146
		RG_USGOLD	NA	0.15	0.29	0.13	0.22	0.09	ANOVA	0.312	NA		-	t-test	<0.001	NA	-		NA	108	
		RG_BORDER	0.22	0.15	0.29	0.13	0.24	0.09	ANOVA	0.047	0.052	0.107	0.843	t-test	-	0.099	<0.001	<0.001	47	113	165
Total Selenium	Surface	RG_DSELK	1.0	0.65	1.0	0.52	0.88	0.50	ANOVA	0.712	-			t-test	<0.001	-			75		
		RG_GRASMERE	1.1	0.65	1.1	0.52	0.85	0.50	ANOVA	0.541	-			WSRT	<0.001	-			78		
		RG_USGOLD	NA	0.65	1.1	0.52	0.85	0.50	ANOVA	0.443	NA		-	t-test	<0.001	NA	-		NA	71	
		RG_BORDER	1.1	0.65	1.1	0.52	0.86	0.50	ANOVA	0.566	-			WSRT	<0.001	-			62		
	Combined Middle and Bottom	RG_DSELK	0.80	0.73	1.4	0.44	0.97	0.21	ANOVA	0.001	0.001	0.013	0.352	t-test	-	0.738	0.002	<0.001	-	220	357
		RG_GRASMERE	0.90	0.73	1.5	0.44	0.97	0.21	ANOVA	<0.001	-			t-test	-	0.421	0.001	<0.001	-	230	359
		RG_USGOLD	NA	0.73	1.3	0.44	0.96	0.21	ANOVA	0.346	NA		-	t-test	<0.001	NA	-		NA	157	
		RG_BORDER	1.0	0.73	1.2	0.44	0.89	0.21	ANOVA	0.034	0.030	0.153	0.549	WSRT	-	0.438	0.001	<0.001	-	177	318
Sulphate	Surface	RG_DSELK	22	22	24	23	23	23	ANOVA	0.775	-			t-test	0.648	-			-		
		RG_GRASMERE	22	22	25	23	22	23	ANOVA	0.234	-			t-test	0.919	-			-		
		RG_USGOLD	NA	22	25	23	22	23	ANOVA	0.040	NA		0.095	t-test	-	NA	0.219	0.104	NA	-	-
		RG_BORDER	22	22	24	23	22	23	ANOVA	0.345	-			t-test	0.691	-			-		
	Combined Middle and Bottom	RG_DSELK	22	23	27	26	25	25	ANOVA	0.351	-			t-test	0.791	-			-		
		RG_GRASMERE	21	23	27	26	24	25	ANOVA	0.259	-			t-test	0.618	-			-		
		RG_USGOLD	NA	23	26	26	24	25	ANOVA	0.488	NA		-	t-test	0.544	NA	-		NA	-	
		RG_BORDER	20	23	26	26	24	25	ANOVA	0.456	-			t-test	0.220	-			-		

= p-value < 0.1

[a] means reported when the test for H_{01} was ANOVA and median reported when the test for H_{01} was the K-W test

[b] units for nitrate and sulphate concentrations are mg/L; units for selenium concentrations are µg/L

K-W = Kruskal-Wallis test; WSRT = Wilcoxon signed rank test; t-test = one sample t-test; M-W = Mann Whitney test; ANOVA = Analysis of Variance.

NA= not applicable (no data for RG_USGOLD in 2014)

3.3.2 Comparisons to Guidelines and SPOs

Annual water quality results for samples collected in Koocanusa Reservoir in 2015 and 2016[8] identified very few exceedances of the MOE guidelines for protection of aquatic life (Teck 2016b, 2017). Guideline exceedances were reported for aluminum (one sample at RG_DSELK in 2015), iron (one sample at RG_GRASMERE in 2015 and one sample at RG_DSELK in 2016), and mercury[9] (5 samples at RG_DSELK in 2016). Concentrations of nitrate, selenium, sulphate, and dissolved cadmium were consistently below SPOs at RG_DSELK in both years (Figure 3.5).

[8] No annual report was provided for 2014 because Permit 107517 was not in effect until late November 2015. As such, water quality reporting was completed under previous mine operational permits.

[9] The BC water quality guideline for mercury is based on the percent of methyl mercury present and, in the absence of methyl mercury data for all stations, Teck has applied the most stringent mercury guideline (which assumes that a large proportion of total mercury is present as methyl mercury). Teck recently began sampling for methyl mercury, and 48 methyl mercury samples collected in 2016 throughout the Elk Valley had methyl mercury concentrations less than the method detection limit of < 0.000050 µg/L. Assuming continued monitoring corroborates these results, it is expected that future water quality evaluations will confirm no mine-related exceedances of the appropriate mercury guideline, and metallurgical coal mining is not a source of mercury to the receiving environment.

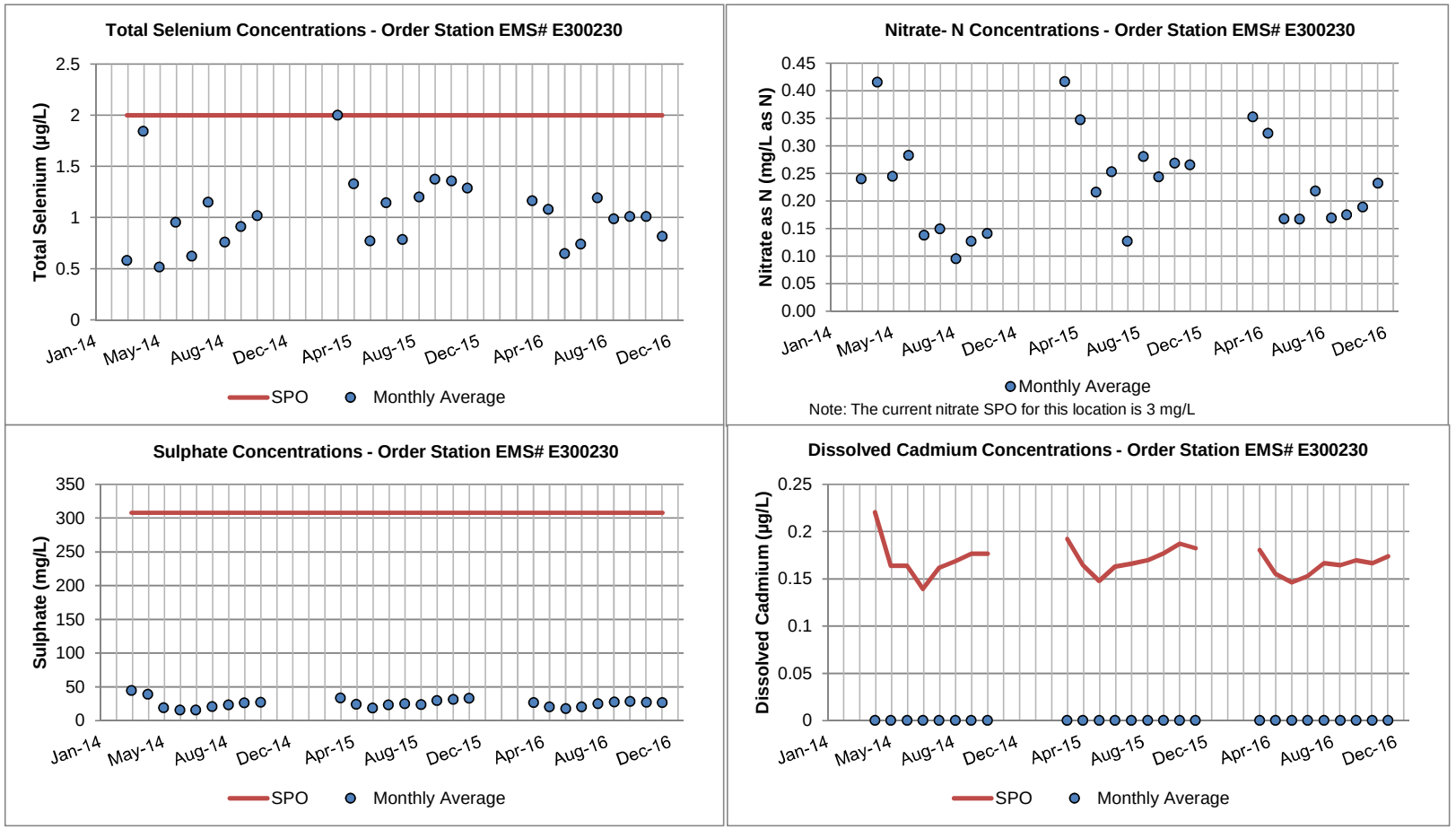


Figure 3.5: Monthly Average Concentrations of Order Constituents Relative to Site Performance Objectives Recorded at Order Station RG_DSELK, Koocanusa Reservoir, 2014 to 2016

4 SEDIMENT QUALITY

4.1 Overview

Sediment samples were initially collected in Koocanusa Reservoir in April 2013, when seven transects were sampled across the Canadian portion of the reservoir, two upstream and five downstream of the Elk River confluence (Minnow 2014a). In August 2013, following record flooding in the Elk River watershed in June 2013, Transects T2 and T4 were re-sampled to further characterize sediment quality. Subsequent sampling of sediment, plankton, and benthic invertebrates in the three-year (2014 to 2016) Koocanusa Reservoir monitoring program (described herein) focused on two transects (i.e., T2 and T4). As noted in Section 3.1, the upstream transect (T2) was re-located 3.5 km farther upstream in August 2015 (TN) to avoid influence from the Elk River (Figure 2.1). Sediment samples were collected in August of all three years from five stations along each transect (Appendix Tables C.1 to C.3).

4.2 Results

Sediment samples collected in the reservoir downstream and upstream from the Elk River were mostly silt (60-82%), with sand and clay comprising smaller fractions (Figure 4.1; Appendix Tables C.4 to C.6). Sediments collected along the transect upstream from the Elk River (T2/TN) were consistently significantly sandier (annual means of 2-10%) with less clay (means of 17-19%), than those collected downstream at transect T4 (means of <1% for sand and 26-30% for clay), which may be related to the shallower depths and more fluvial nature of the reservoir at T2/TN (i.e., greater seasonal scour resulting in finer particles accumulating in sediments farther downstream) (Table 4.1). TOC content ranged from 0.9 to 1.7%, comparable to a mean TOC of 1.1% reported for Koocanusa Reservoir sediments by Iskandar and Shukla (1981), which was considered low and indicative of oligotrophy. A small difference in sediment TOC was observed between areas in 2015 (i.e., 1.6% versus 1.2% downstream compared to upstream) but TOC concentrations were not different between areas in 2014 or 2016 (Appendix Table C.7).

Concentrations of most metals and PAHs were significantly higher in sediments collected downstream from the Elk River compared to upstream (Table 4.1; Figure 4.2; Appendix Table C.7). Larger downstream-to-upstream differences in selenium and mercury concentrations were observed in 2016 compared to previous years, but only selenium showed a slight increase in concentrations over the three-year period. Downstream of the Elk River, all analytes other than selenium were found at similar or lower mean concentrations in 2016 compared to 2015. Even for selenium, the change in mean concentration over the three years was small (0.52, 0.66, and 0.68 mg/kg dw in 2014 to 2016 respectively), and mean

Figure 4.1: Sediment Particle Size and Total Organic Carbon (TOC) Content at Stations in Koocanusa Reservoir, 2014 to 2016

Table 4.1: Statistical Summary of Spatial and Temporal Differences in Sediment Quality in Koocanusa Reservoir Downstream from the Elk River (T4) Compared to Upstream (T2/TN), 2014 to 2016

Selected Analytes[a]	BC Sediment Quality Guidelines	Units	Transformation	Measure of Central Tendency (Mean, Geometric Mean, or Median)[b,c]						Model P-values			Downstream of Elk River (T4) vs Upstream of Elk River (TN/T2)					
													Contrasts			Magnitudes of Significant Differences		
				2014		2015		2016		Area x Year	Area	Year	Area × Year			%		
				T4	T2	T4	TN	T4	TN				2014	2015	2016	2014	2015	2016
Metals (< 1mm fraction)																		
Arsenic (As)	5.9/17 [d]	mg/kg dw	none	5.9	5.6	**7.3**	**6.5**	**6.3**	5.4	0.089	-	-	0.209	<0.001	<0.001	-	* (12)	* (16)
Cadmium (Cd)	0.6/3.5 [d]	mg/kg dw	none	0.53	0.22	0.58	0.19	0.55	0.19	0.302	<0.001	0.827	-	-	-	* (182)		
Iron (Fe)	21,200/43,766 [e]	mg/kg dw	none	20,200	20,760	**22,970**	**22,600**	20,240	19,980	0.393	0.938	<0.001	-	-	-	-		
Manganese (Mn)	460/1,100 [e]	mg/kg dw	none	**521**	429	**605**	**464**	**544**	399	0.177	<0.001	<0.001	-	-	-	* (29)		
Nickel (Ni)	16/75 [e]	mg/kg dw	none	**22**	**20**	**25**	**21**	**22**	**19**	0.185	<0.001	<0.001	-	-	-	* (13)		
Selenium (Se)	2	mg/kg dw	log	0.52	0.23	0.66	0.22	0.68	0.20	<0.001	-	-	<0.001	<0.001	<0.001	* (128)	* (203)	* (241)
Polycyclic Aromatic Hydrocarbons																		
2-Methylnaphthalene	0.0202/0.201 [d]	mg/kg dw	rank	-	-	**0.059**	0.010	**0.054**	0.010	0.770	<0.001	0.770	-	-	-	NA	* (465)	
Phenanthrene	0.0419/0.515 [d]	mg/kg dw	rank	-	-	**0.060**	0.010	**0.046**	0.010	0.487	<0.001	0.487	-	-	-	NA	* (405)	

* indicates a significant difference between the two areas at an α of 0.1.

[a] Data are summarized for analytes that had mean concentration greater than the low BC Sediment Quality Guideline in at least one area and year (plus selenium). See Appendix Table C.7 for results for all other analytes.

[b] The measure of central tendency reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for $\log_{10}$-transformation; and, median for rank-transformation.

[c] The bolded values are above BC Sediment Quality Guidelines lowest effect level.

[d] Interim Sediment Quality Guideline (ISQG; or Threshold Effect Level [LEL])/ Probable Effect Level (PEL)

[e] Lowest Effect Level (LEL)/ Severe Effect Level (SEL).

p-value < 0.1.

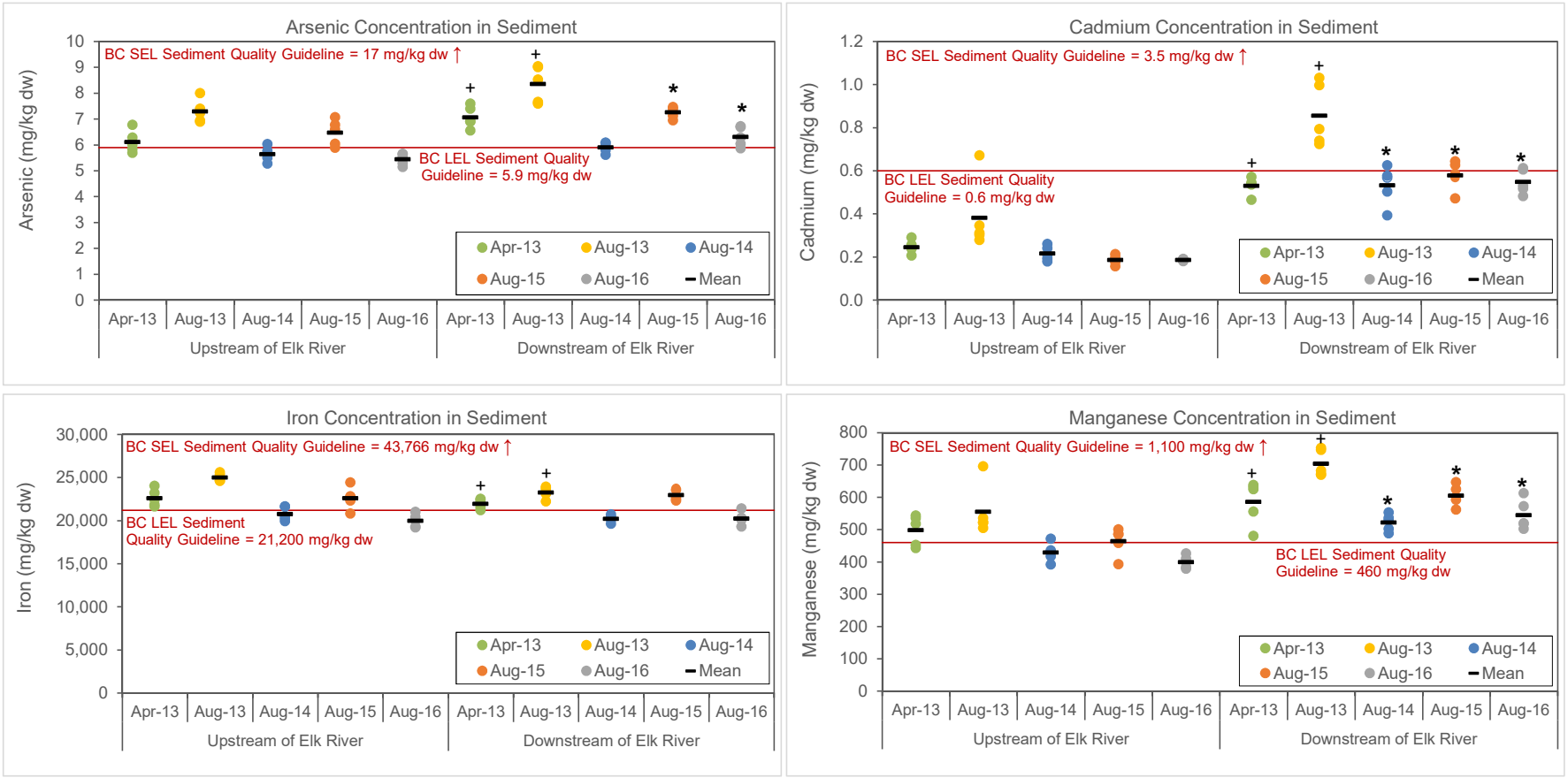


Figure 4.2: Concentrations of Selected Parameters in Sediment Samples from Koocanusa Reservoir, 2013 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016. Concentrations below the MDL are plotted as open symbols (associated number indicates number of samples with parameter concentrations below MDL) at the MDL concentration.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.
' + ' indicates that no statistical analysis was not completed with these data (i.e., sediment collected in 2013).

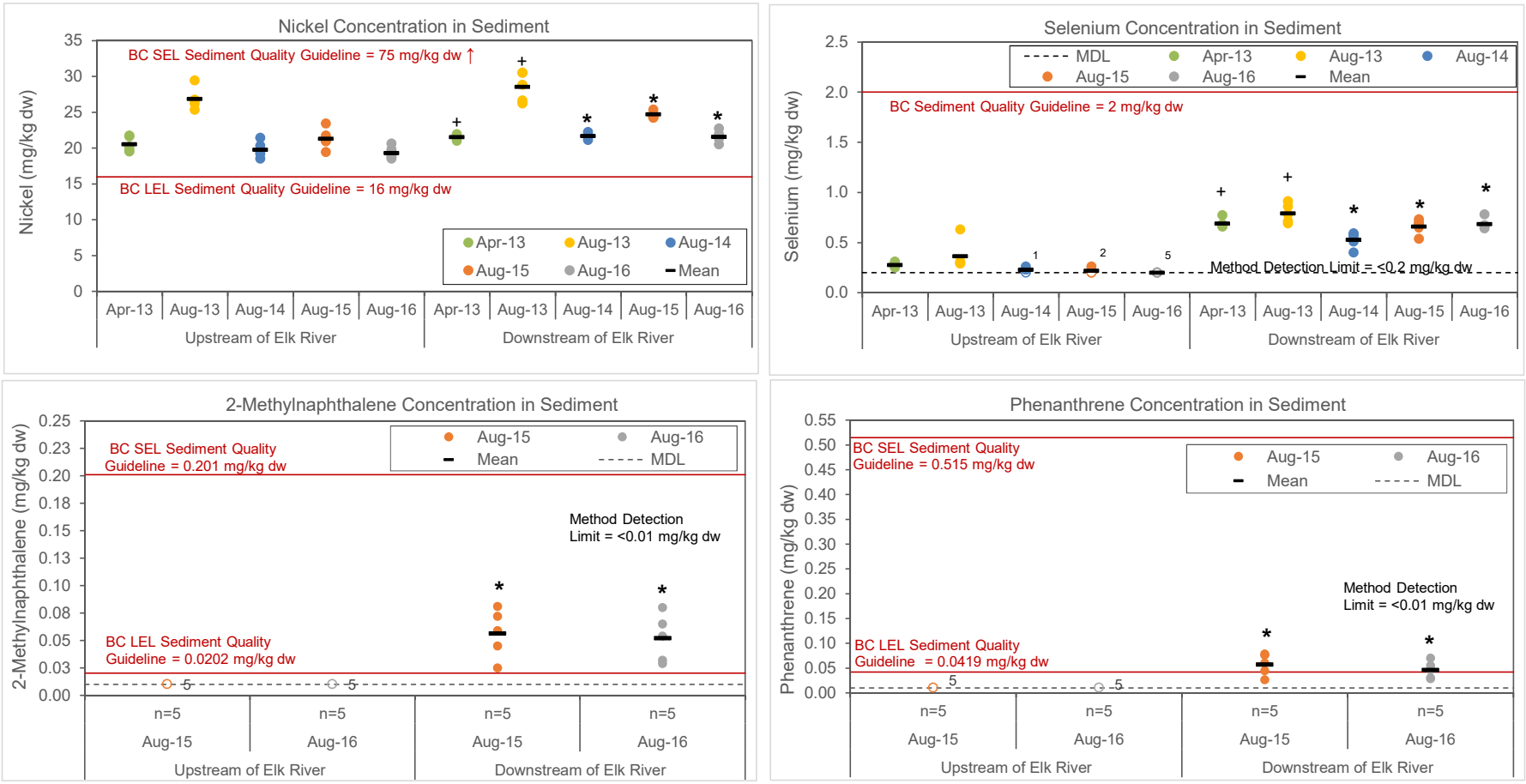


Figure 4.2: Concentrations of Selected Parameters in Sediment Samples from Koocanusa Reservoir, 2013 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016. Concentrations below the MDL are plotted as open symbols (associated number indicates number of samples with parameter concentrations below MDL) at the MDL concentration.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.
' + ' indicates that no statistical analysis was not completed with these data (i.e., sediment collected in 2013).

concentrations observed at the downstream area in 2014 to 2016 were less than those measured in 2013 (Figure 4.2). Concentrations of some metals and PAHs in sediments were above the corresponding low sediment quality guideline, but none exceeded the high guideline (Appendix Tables C.4 to C.7). Concentrations of all PAHs in sediment were less than the method detection limit at stations in the upstream (TN) sampling area (Appendix Tables C.5 to C.6). Average concentrations of 2-methylnaphthalene and phenanthrene were greater than the low sediment guideline downstream of the Elk River, but were well below the high sediment quality guidelines (Figure 4.2). In addition, mean concentrations of Order constituents[10] cadmium and selenium were less than the sediment quality guidelines (Table 4.1; Figure 4.2).

Mean concentrations of arsenic, iron, manganese, and nickel in sediment were also above the low, but not high, sediment quality guidelines in at least one of the three monitoring years, including the upstream area (Table 4.1; Figure 4.2). The general pattern observed of higher concentrations of metals in sediment downstream of the Elk River in comparison to upstream may be related to the greater proportion of fine sediment particles in the downstream area. This point is also supported by data for samples collected in August 2013, when the percentage of fine particles and also the concentrations of many metals increased downstream from the Elk River relative to samples collected in April of that year as a result of sediment transport and deposition during record storm in June 2013 (Figure 4.2; Minnow 2014a). Fine particles provide more surface area relative to volume than larger particles, so sediments having finer particles are more likely to have elevated concentrations of chemicals that adsorb to particle surfaces than areas with larger particles (Horowitz and Elrick 1987; Blanton et al. 1995).

[10] See section 1.2 for explanation of the Provincial Order and associated constituents of concern.

5 PLANKTON AND PRODUCTIVITY

5.1 Overview

Nitrogen species (nitrate, nitrite, ammonia), phosphorus species (total phosphorus, ortho-phosphate), chlorophyll-a, and Secchi depth are measured as part of Teck's routine water quality monitoring at stations in Koocanusa Reservoir based on grab samples collected at surface, middle, and bottom depths (Section 2.2.1). The data were summarized to evaluate trophic status (productivity).

Chlorophyll-a concentrations were also measured along the same transects where sediment samples were collected, along with seston biomass (another indicator of plankton productivity) in August of each of the three study years. These were based on depth-integrated samples collected from the top 10 m of the water column to provide an average value for each station along each transect (n=5 samples per transect). Chlorophyll-a was also measured *in situ* in 2015 to investigate variability in concentrations at 1 m depth intervals and to test the accuracy of the method by comparing average *in situ* concentrations over the top 10 m to those reported by the laboratory for the 10 m depth-integrated samples.

Phytoplankton and zooplankton community structure, and zooplankton tissue selenium concentrations, were also assessed based on samples collected from the same areas in August of each year.

5.2 Productivity

5.2.1 This Study

Ratios of total nitrogen to total phosphorus concentrations (N:P) greater than 15 indicate that phosphorus is the limiting nutrient based on categories defined by McDowell et al. (2009) for mass concentrations:

- N:P < 7 Nitrogen-limited
- 7 < N:P < 15 Co-limited (nitrogen and phosphorus)
- N:P > 15 Phosphorus-limited.

Based on concentrations measured in Koocanusa Reservoir as part of Teck's water quality monitoring program, median ratios were found to be 15 or more (Figure 5.1), which suggests that phosphorus is limiting, especially at stations downstream from the Elk River. Phosphorus was also concluded to be the limiting nutrient in previous studies of the reservoir (Hamilton et al. 1990; Richards 1997).

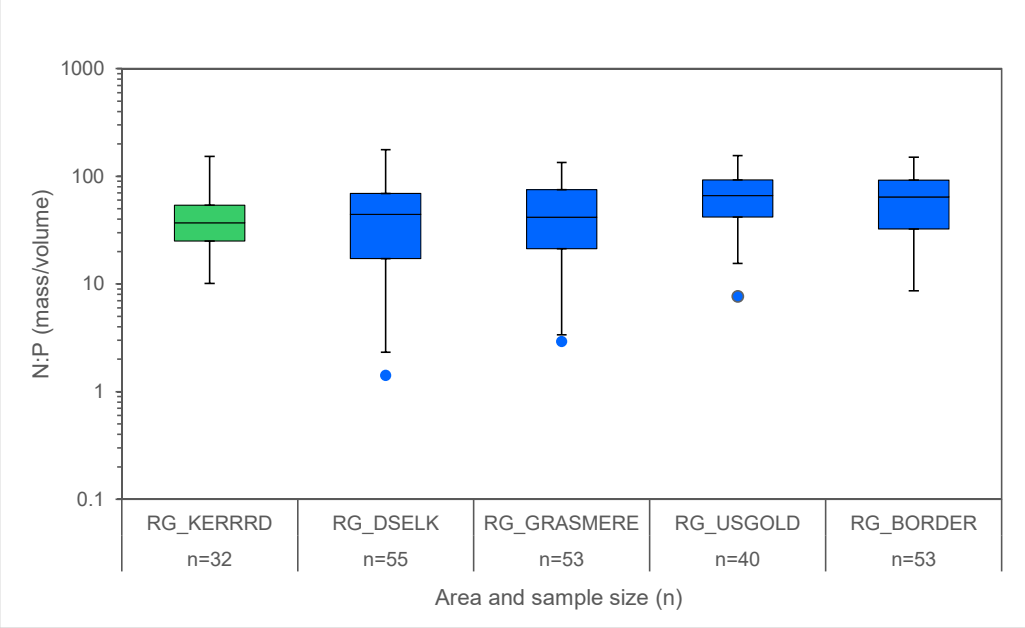


Figure 5.1: Boxplot of Ratios of Nitrate to Total Phosphorus Mass Concentrations for Samples Collected in Koocanusa Reservoir, 2014 to 2016

Note: The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set.

Phosphorus concentrations measured in the lower Elk River (RG_ELKMOUTH) were similar to those measured in the lower Kootenay River (RG_WARDB) (Appendix Tables B.10 and B.11), as was reported by Hamilton et al. (1990). However, flows in the Kootenay River are about three times higher, on average, than those in the Elk River (Appendix Figures B.13 and Table B.12; Hamilton et al. 1990).

Concentrations of total phosphorus and ortho-phosphate were highest in early spring and generally decreased through the remainder of the year, with ortho-phosphate concentrations usually undetectable (<0.0010 mg/L) in the latter part of the year (Appendix Figures B.7 and B.8). Secchi depths generally increased during the ice-free period (Appendix Figure B.9), which is contrary to the expected relationship of decreasing Secchi depth with increasing biological productivity in warmer months (Tilzer 1988). Low spring Secchi depths were likely related to high concentrations of TSS associated with freshet (Appendix Figure B.11) causing reduced water transparency (Tilzer 1988; Wetzel 2001). Concentrations of chlorophyll-a varied seasonally, with minima typically occurring in April or early May, consistent with low water levels, cooler temperatures, and high turbidity/TSS. This was followed by an increase in chlorophyll-a through the summer months. Secchi depths increased as water level rose and

TSS concentrations declined, but sometimes dipped again in July or August (Appendix Figure B.9), likely corresponding with peak primary productivity (Tilzer 1988). Finally, Secchi depth increased again toward November as both water temperatures and productivity decreased. As would be expected, chlorophyll-a concentrations were typically higher in samples collected at the surface compared to deeper samples (Appendix Figure B.10).

Chlorophyll-a concentrations measured *in situ* in August 2015 varied little with depth, except near Gold Creek where maxima were observed at 7-8 m in both April and August, and near Sand Creek in August only (maximum concentration at 4 m; Appendix Figure D.1). Profiles confirmed that depth-integrated water samples collected over the top 10 m captured most of the variation in chlorophyll-a concentrations among areas. However, *in situ* measurements of chlorophyll-a were consistently lower than concentrations reported by the laboratory (Appendix Figure D.2), so *in situ* measurements were not continued in 2016.

Chlorophyll-a concentrations reported by the laboratory for depth-integrated samples were significantly higher downstream from the Elk River than upstream in all three years, and the magnitude of difference increased slightly each year (Table 5.1, Figure 5.2, Appendix Table D.1 and Figure D.2). However, mean chlorophyll-a concentrations in depth-integrated samples were consistently low (see categories in Table 2.5), ranging between 1.7 and 3.0 µg/L among areas and years (Table 5.1). Chlorophyll-a concentrations measured in surface and middle-bottom samples as part of Teck's routine water quality monitoring were similarly low (i.e., usually < 3 µg/L; Appendix Figure B.10 and Tables B.5 to B.9).

Total seston biomass in depth-integrated samples collected in August of each year was significantly higher (35%) downstream (T4) of the Elk River compared to upstream (TN) in 2016, but did not differ significantly between areas in either 2014 or 2015 (Table 5.1; Appendix Table D.1). Mean seston biomass was lowest at both areas in 2015 (Figure 5.2).

5.2.2 Comparison to Previous Studies

Previous studies of limnological processes in Koocanusa Reservoir reported a weak thermal structure leading to a hypothesis that phytoplankton was circulated out of the euphotic zone. Such circulation was verified by a study of chlorophyll-a distribution, which revealed that more than one-half of the reservoir's phytoplankton was located beneath the euphotic zone (Woods 1982).

The post-impoundment primary productivity levels have been characterized as ultra-oligotrophic to mesotrophic as a result of the impoundment as well as channelization, diking, and pollution abatement measures in the watershed (Woods 1982, Woods and Falter 1982, Richards 1997). The low chlorophyll-a concentrations and seston biomass observed in this study were

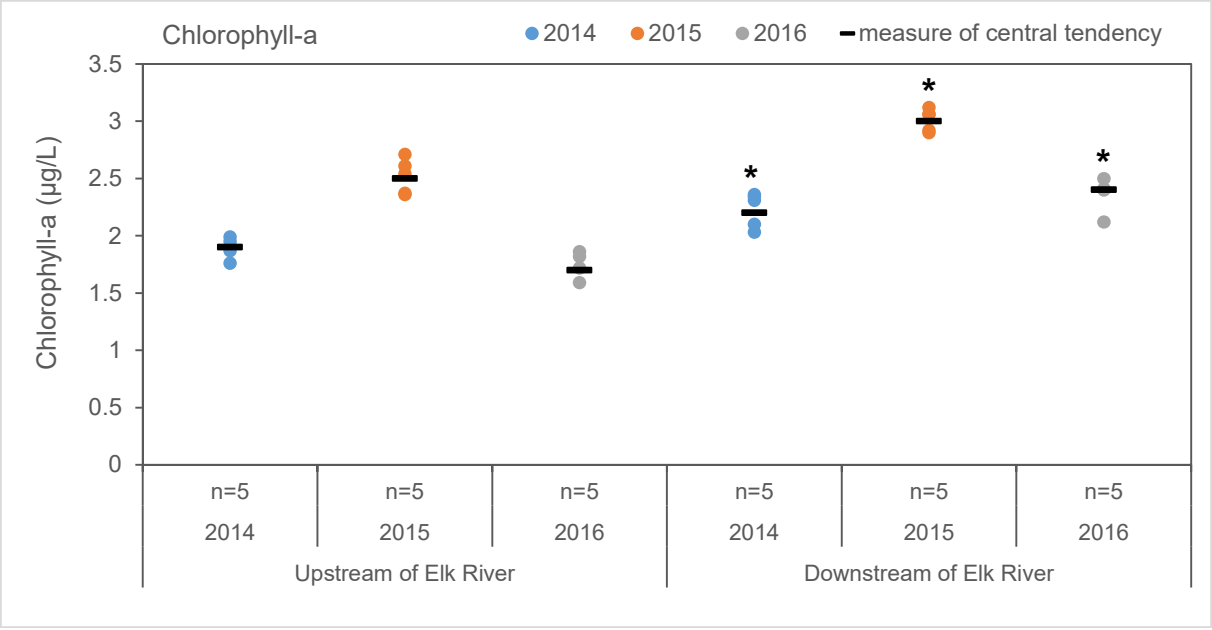
Table 5.1: Statistical Summary of Spatial and Temporal Differences in Seston Biomass and Chlorophyll-a Concentrations in Koocanusa Reservoir in the Area Downstream from the Elk River (T4) Compared to the Upstream Area (T2/TN), 2014 to 2016

Parameter	Trans-formation	Measure of Central Tendency (Mean, Geometric Mean, or Median)[a]						Model P-values			Contrasts			Significant Differences and Magnitudes of Difference (%)		
		2014		2015		2016					Area × Year					
								Area × Year	Area	Year	Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)		
		T4	T2	T4	TN	T4	TN				2014	2015	2016	2014	2015	2016
Chlorophyll-a (µg/L)	none	2.2	1.9	3.0	2.5	2.4	1.7	0.046	-	-	<0.001	<0.001	<0.001	* (18)	* (20)	* (37)
Seston Biomass (mg/L dw)	none	0.035	0.034	0.0022	0.0093	0.033	0.025	0.058	-	-	0.802	0.122	0.059	-	-	* (35)

p-value < 0.1.

* indicates a significant difference between the two areas at an α of 0.1.

[a] The measure of central tendancy reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for log $_{10}$-transformation; and, median for rank-transformation.



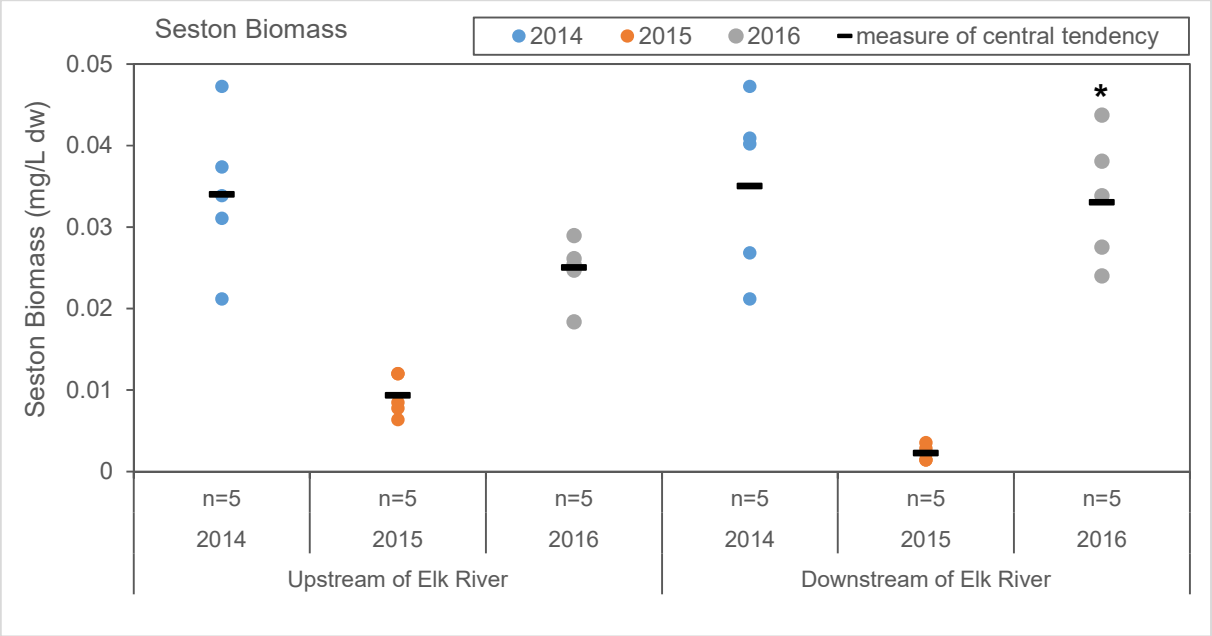


Figure 5.2: Seston Chlorophyll-a (µg/L) and Seston Biomass (mg/L dw) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

consistent with observations from the 1980s (1.0-2.0 µg/L for chlorophyll-a and < 0.1 mg/L for biomass; Hamilton et al. 1990). Although shallow Secchi depths observed in recent monitoring suggested a higher trophic classification, phosphorus and chlorophyll-a concentrations support

an oligotrophic classification (Table 5.2), consistent with the conclusions of Woods (1982) and Richards (1997). As noted above, the pattern of lowest Secchi depths in spring months is attributable to greater concentrations of TSS during freshet (Appendix Figure B.11), rather than elevated biological productivity. Highest biological productivity in the reservoir occurs in July and August when surface water is warmest and the euphotic zone is maximal (Hamilton et al. 1990, Richards 1997). Woods (1979) concluded that the dominant influence on primary production in Koocanusa Reservoir was light quantity, which is controlled by at least three factors: thermal structure which allows phytoplankton to be circulated out of the euphotic zone, elevated turbidity during spring runoff (freshet), and seasonal and meteorological variations in incident solar radiation.

5.3 Phytoplankton Community Structure

Phytoplankton communities in Koocanusa Reservoir both upstream (T2/TN) and downstream (T4) of the Elk River were numerically dominated by diatoms (algae with cell walls of hydrated silica) in all study years, with chrysophytes (golden algae) also being relatively abundant at both areas in 2014 and 2016 (Table 5.3, Figure 5.3; Appendix Tables D.2 to D.28 and Figures D.3 to D.6). Density and biomass of all other groups were variable, typically comprising 0-5% of the community (Table 5.3).

At the species level, the centric diatom *Cyclotella pseudostelligera* dominated the phytoplankton communities both upstream and downstream of the Elk River in all three years in terms of absolute and relative density and biomass (Figure 5.4; Appendix Tables D.1 to D.25). The predominance of *C. pseudostelligera* in Koocanusa Reservoir in August potentially reflects flow from the tributaries near each sampling area, which may provide the upwelling necessary to prevent individual organisms from sinking out of the photic zone and supplying the silica/silicon/silicates for frustule formation (H. Larratt, pers. comm. 2016). In addition, the relatively low nutrient concentrations within Koocanusa Reservoir (Section 5.2) may prevent *C. pseudostelligera* from being outcompeted by other organisms such as blue-green algae, which prefer higher concentrations of nitrogen and phosphorus (i.e., more eutrophic conditions; H. Larratt, pers. comm. 2016).

No significant differences in overall phytoplankton density, biomass, or richness were indicated between downstream and upstream areas over the three years (Table 5.3; Figure 5.5). In addition, there were no consistent downstream-to-upstream differences in abundance or relative biomass of major phytoplankton groups (i.e., Chlorophyte, Chrysophyte, Diatom, Cryptophyte, Dinoflagellate) among years. The exception was Cyanophyte biomass which was consistently higher at the downstream area compared to the upstream area in all three years. This group represented a very small proportion of the community (<1%; Table 5.3) suggesting low

Table 5.2: **Monthly Means for Total Phosphorus, Chlorophyll-a, and Secchi Depth in Koocanusa Reservoir, Compared to Trophic Status Criteria for British Columbia (Nordin 1985)**

Month	Total Phosphorus (µg/L)					Chlorophyll-a (µg/L)					Secchi depth (m)				
	RG_KERRRD	RG_DSELK	RG_GRASMERE	RG_USGOLD	RG_BORDER	RG_KERRRD	RG_DSELK	RG_GRASMERE	RG_USGOLD	RG_BORDER	RG_KERRRD	RG_DSELK	RG_GRASMERE	RG_USGOLD	RG_BORDER
Jan-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr-15	9.5	7.5	7.2	6.6	5.6	0.19	0.46	0.47	1.0	0.85	0.70	1.0	1.3	1.5	2.8
May-15	11	8.1	7.5	7.1	5.7	0.25	0.49	0.42	0.56	0.34	0.60	0.84	1.0	1.2	2.0
Jun-15	7.6	5.0	5.6	4.0	3.6	0.50	1.1	1.3	1.4	1.3	1.2	2.4	2.7	2.6	2.5
Jul-15	3.3	2.8	2.4	3.7	3.0	0.90	1.4	1.1	0.54	0.87	4.0	3.6	3.7	3.6	3.6
Aug-15	4.5	2.4	2.1	3.5	6.8	1.5	1.7	1.4	1.7	1.4	1.9	2.0	2.4	-	-
Sep-15	2.7	3.6	4.1	36	2.7	1.5	2.6	1.6	1.5	1.8	3.0	3.3	-	3.7	3.7
Oct-15	2.3	3.0	2.6	2.2	2.4	1.3	1.2	1.6	1.6	1.6	6.3	4.6	4.7	4.0	3.9
Nov-15	2.0	2.0	2.3	2.0	2.0	1.9	1.7	2.0	1.7	1.9	3.5	3.0	3.0	3.3	3.0
Dec-15	-	8.0	3.8	2.9	3.3	-	0.82	1.9	1.3	0.90	-	4.0	4.0	4.0	4.0
Jan-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr-16	-	31	22	19	12	-	0.98	1.2	2.0	2.0	-	0.36	0.59	0.81	1.2
May-16	9.7	11	9.9	11	10	0.24	0.41	0.51	0.92	1.7	0.74	0.85	1.4	1.6	1.8
Jun-16	8.4	8.2	8.5	6.1	6.4	0.94	3.1	3.2	3.5	3.9	2.3	2.6	2.9	2.5	2.5
Jul-16	4.1	4.5	5.3	5.5	3.9	3.5	3.1	3.2	2.8	2.2	2.6	3.2	3.1	3.5	3.1
Aug-16	3.9	4.8	3.1	2.8	2.0	1.4	2.2	1.8	2.2	1.7	1.3	2.5	2.8	2.3	2.6
Sep-16	3.9	8.5	3.1	6.0	3.0	1.5	1.8	2.0	1.9	1.9	4.6	4.1	4.2	3.9	3.5
Oct-16	4.1	4.0	5.8	2.9	2.5	1.1	1.4	1.6	1.4	1.2	5.3	5.8	4.9	5.1	3.2
Nov-16	4.7	2.0	2.9	2.0	3.1	1.0	1.7	1.6	1.3	1.3	4.0	4.0	4.0	4.3	4.1
Dec-16	3.8	3.8	3.8	2.8	2.2	0.77	0.56	2.1	2.0	0.18	3.5	4.1	4.0	4.0	4.0
Mean	**5.3**	**15**	**9.3**	**6.7**	**6.0**	**1.2**	**1.5**	**1.6**	**1.6**	**1.5**	**2.9**	**2.9**	**3.0**	**3.0**	**3.0**
Median	**4.1**	**4.8**	**4.7**	**3.7**	**3.5**	**1.1**	**1.4**	**1.6**	**1.6**	**1.5**	**2.8**	**3.1**	**3.0**	**3.5**	**3.1**
Minimum	**2.0**	**2.0**	**2.1**	**2.0**	**2.0**	**0.19**	**0.41**	**0.42**	**0.54**	**0.18**	**0.60**	**0.36**	**0.59**	**0.81**	**1.2**
Maximum	**11**	**163**	**60**	**36**	**29**	**3.5**	**3.1**	**3.2**	**3.5**	**3.9**	**6.3**	**5.8**	**4.9**	**5.1**	**4.1**
SD	**2.8**	**32**	**13**	**8.1**	**5.9**	**0.81**	**0.85**	**0.77**	**0.72**	**0.83**	**1.7**	**1.5**	**1.3**	**1.2**	**0.84**

Oligotrophic
Mesotrophic
Eutrophic

Note: Station RG_KERRRD is located upstream of the Elk River and stations RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER are located downstream.
SD = Standard Deviation

Table 5.3: Statistical Summary of Spatial and Temporal Differences in Phytoplankton Community Endpoints in Koocanusa Reservoir in the Area Downstream from the Elk River (T4) Compared to the Upstream Area (T2/TN), 2014 to 2016

Endpoint		Trans-formation	Measure of Central Tendency (Mean, Geometric Mean, or Median)[a]						Model P-values			Contrasts Area × Year			Significant Differences and Magnitudes of Difference (%)			Significant Differences and Magnitudes of Difference (number of SD)		
			2014		2015		2016		Area × Year	Area	Year	Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)		
			T4	T2	T4	TN	T4	TN				2014	2015	2016	2014	2015	2016	2014	2015	2016
Density (# cells/L)		log	4,403,235	4,246,195	14,877,257	12,544,803	2,329,525	3,319,527	0.381	0.757	<0.001	-	-	-	-			-		
Biomass (µg/L dw)		log	946	904	4,259	3,117	463	627	0.265	0.905	<0.001	-	-	-	-			-		
Richness		none	25	25	19	18	23	25	0.519	0.631	<0.001	-	-	-	-			-		
Major Group Density (cells/L)	Cyanophyte	log(X+1)	34	39	410	153	348	0	0.249	0.154	0.365	-	-	-	-			-		
	Chlorophyte	log	46,957	73,083	253,756	195,201	31,152	90,544	0.224	0.185	0.001	-	-	-	-			-		
	Chrysophyte	rank	592,088	683,280	396,830	317,664	387,936	581,904	0.003	-	-	0.579	0.094	0.001	-	* (25%)	* (-33%)	-	* (0.079 SD)	* (-0.19 SD)
	Diatom	none	3,787,276	3,549,904	13,529,517	11,876,080	2,123,555	2,433,347	0.431	0.408	<0.001	-	-	-	-			-		
	Cryptophyte	none	167,027	165,122	574,235	263,588	132,765	159,834	0.041	-	-	0.985	0.004	0.785	-	* (118%)	-	-	* (2 SD)	-
	Dinoflagellate	log(X+1)	2,740	2,848	16,788	3,232	447	1,672	0.235	0.890	0.058	-	-	-	-			-		
Major Groups Relative Density (%)	Cyanophyte	rank	0	0	0.0014	0.0039	0.068	0	0.223	0.165	0.547	-	-	-	-			-		
	Chlorophyte	none	1.2	1.8	2.3	1.9	1.5	3.1	0.212	0.183	0.349	-	-	-	-			-		
	Chrysophyte	none	22	16	2.7	2.4	18	20	0.412	0.651	<0.001	-	-	-	-			-		
	Diatom	none	74	78	91	93	74	72	0.597	0.592	<0.001	-	-	-	-			-		
	Cryptophyte	none	3.1	3.7	3.8	2.1	5.7	4.7	0.327	0.284	0.015	-	-	-	-			-		
	Dinoflagellate	rank	0.042	0.044	0.28	0.027	0.068	0.042	0.519	0.449	0.869	-	-	-	-			-		
Major Group Biomass (µg/L dw)	Cyanophyte	log(X+1)	0.32	0.27	1.3	0.59	1.7	0	0.274	0.059	0.407	-	-	-	* (283%)			* (2.1 SD)		
	Chlorophyte	log	2.3	4.4	10	7.4	2.2	5.4	0.327	0.243	0.045	-	-	-	-			-		
	Chrysophyte	rank	63	43	38	45	28	44	0.071	-	-	0.155	0.836	0.060	-	-	* (-36%)	-	-	* (-0.17 SD)
	Diatom	none	889	835	4,099	3,049	457	517	0.016	-	-	0.845	<0.001	0.831	-	* (34%)	-	-	* (2.4 SD)	-
	Cryptophyte	rank	16	17	111	37	33	39	0.076	-	-	0.780	0.024	0.355	-	* (204%)	-	-	* (3.1 SD)	-
	Dinoflagellate	none	31	34	22	18	21	28	0.820	0.735	0.335	-	-	-	-			-		
Major Groups Relative Biomass (%)	Cyanophyte	rank	0	0	0.012	0.025	0.074	0	0.197	0.150	0.560	-	-	-	-			-		
	Chlorophyte	log	0.24	0.48	0.24	0.24	0.47	0.86	0.653	0.205	0.062	-	-	-	-			-		
	Chrysophyte	log	10	5.5	0.88	1.1	6.7	8.0	0.075	-	-	0.040	0.380	0.532	* (83%)	-	-	* (1.4 SD)	-	-
	Diatom	rank	82	88	96	97	79	81	0.297	0.252	<0.001	-	-	-	-			-		
	Cryptophyte	rank	2.1	2.2	2.2	1.3	8.2	5.9	0.075	-	-	0.604	0.026	0.534	-	* (75%)	-	-	* (0.38 SD)	-
	Dinoflagellate	none	4.4	3.6	0.49	0.55	5.2	4.7	0.954	0.735	0.014	-	-	-	-			-		
NMDS Axis 1[b]		none	0.93	0.81	-0.90	-0.70	-0.20	0.061	0.374	0.349	<0.001	-	-	-	NA			-		

p-value < 0.1.

* indicates a significant difference between the two areas at an α of 0.1.

[a] The measure of central tendency reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for $\log_{10}$-transformation; and, median for rank-transformation.

[b] NMDS conducted using $\log_{10}$-transformed LPL taxonomy abundance matrix.

NA indicates not applicable as the calculation of percent differences is not appropriate for variables with both positive and negative scores.

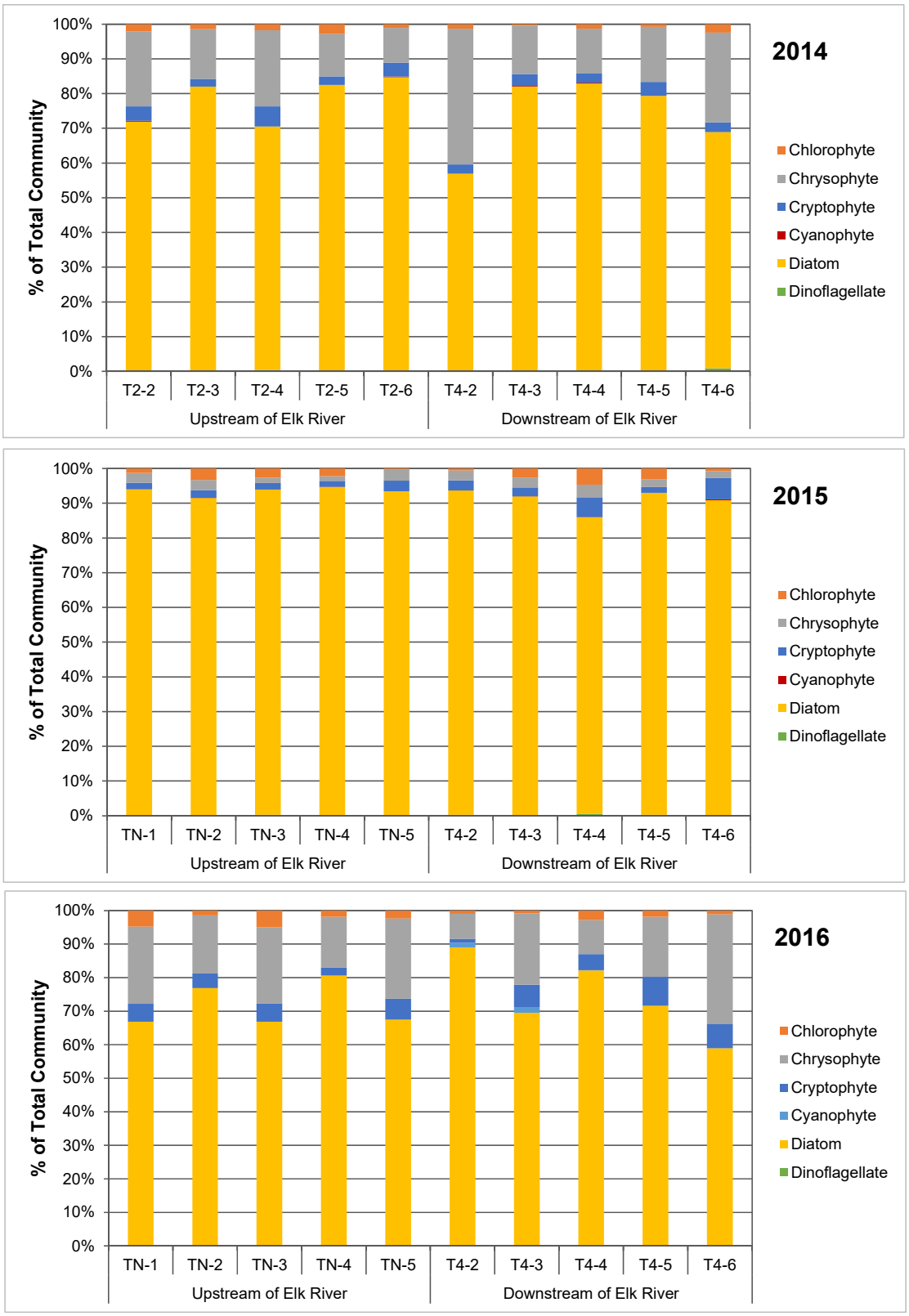


Figure 5.3: Relative Density of Major Phytoplankton Groups in Koocanusa Reservoir, August 2014, 2015, and 2016

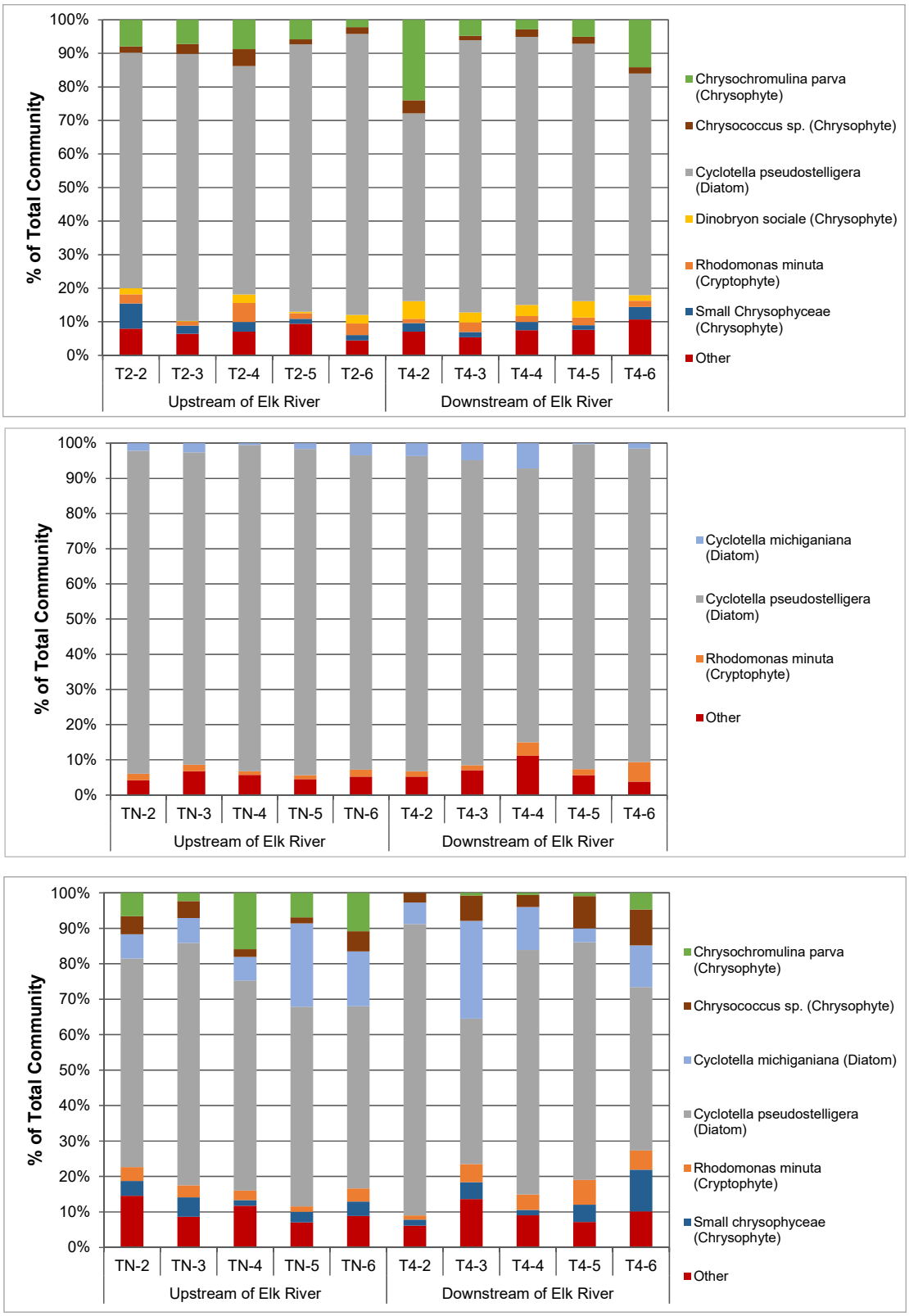


Figure 5.4: Relative Density of Phytoplankton Taxa in Koocanusa Reservoir, August 2014, 2015, and 2016

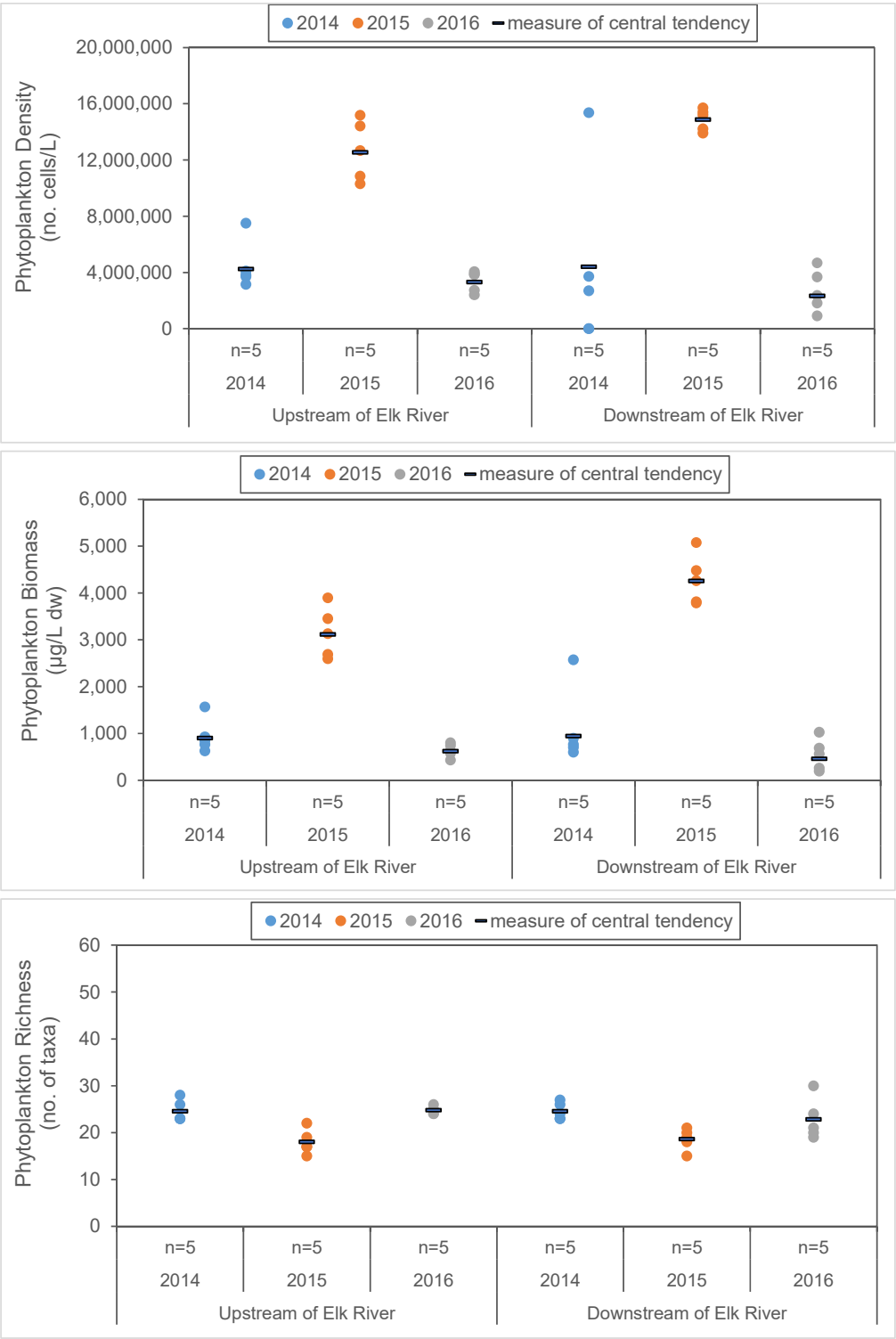


Figure 5.5: Phytoplankton Density (no. cells/L), Biomass (µg/L dw), and Richness (no. of taxa) in Koocanusa Reservoir, August 2014, 2015, and 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

ecological relevance. Overall phytoplankton community composition, as summarized by NMDS, did not differ between upstream and downstream areas within each of the three years, but varied among years (Figure 5.6; Table 5.3, Appendix Tables D.26 to D.28. Large year-to-year variation in the percent composition of major algal groups was observed from 1975 to 1988 (Hamilton et al. 1990).

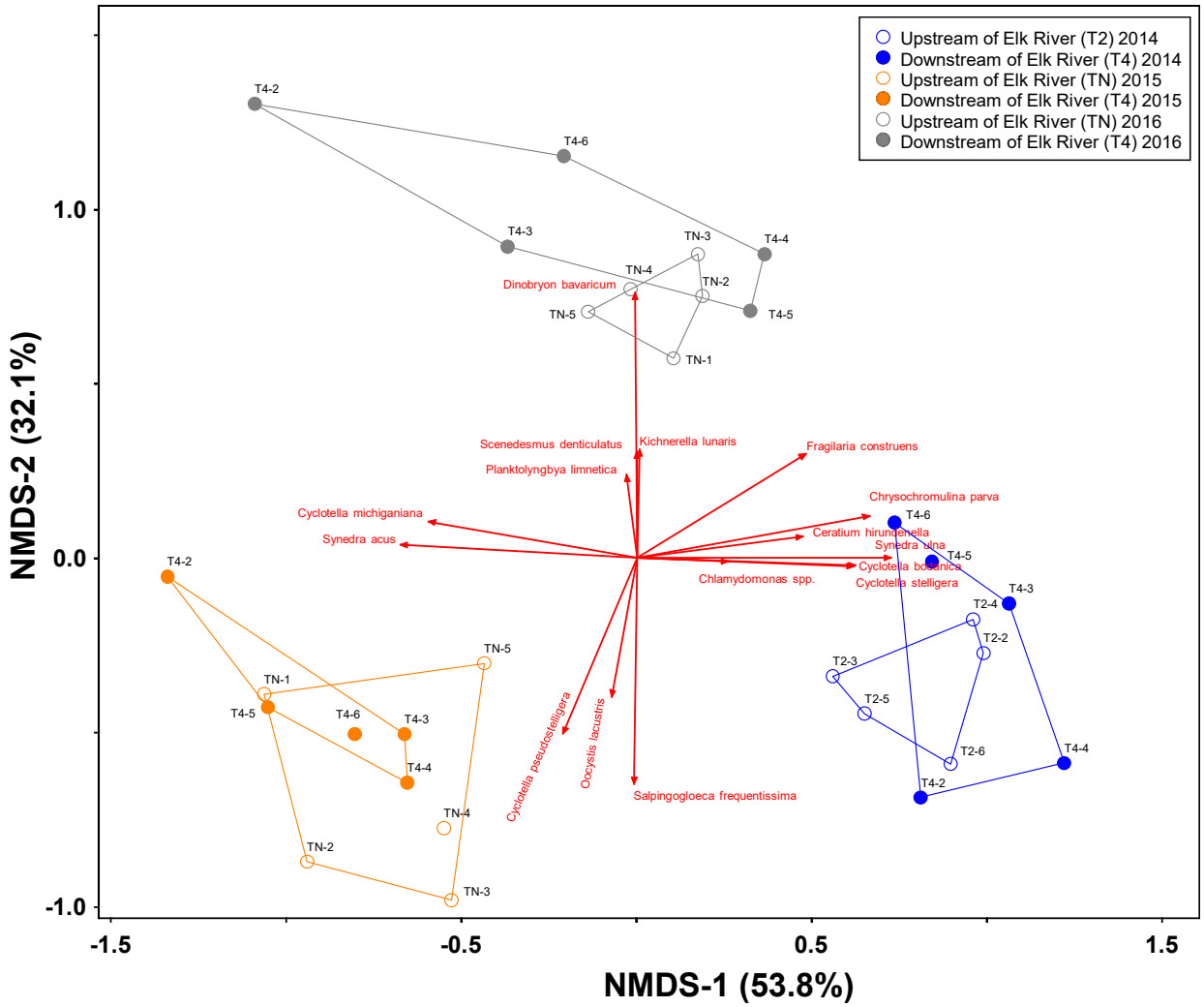


Figure 5.6: Phytoplankton Community Structure (Lowest Practical Level of Taxonomy) in Koocanusa Reservoir as Summarized by NMDS, 2014 to 2016

Notes: Data (n=5 per area and year) were assessed using $\log_{10}$ transformed absolute density and the Bray-Curtis distance measure. Displayed vectors reflect significant ($p < 0.05$) absolute Pearson correlation coefficients (r-value) greater than 0.5.

NMDS - Non-Metric Multidimensional Scaling.

5.4 Zooplankton

5.4.1 Community Structure

The zooplankton community in Koocanusa Reservoir was numerically dominated by rotifers and copepods, with relatively low numbers of cladocerans (Table 5.4, Figure 5.7; Appendix Tables D.29 to D.55 and Figures D.7 to D.10). However, the smaller size of rotifers resulted in a considerably lower relative biomass compared to copepods. Consequently, copepods dominated the zooplankton community biomass both upstream and downstream from the Elk River in all three years, except at the upstream area in 2016, when cladocera were dominant (Table 5.4). The numerically dominant taxa (i.e., those representing >5% of the community at one or more stations in each year) were similar between areas in each year, but varied among years (Figure 5.8). No consistent differences were observed between downstream and upstream areas in overall zooplankton density, biomass, or richness, or in absolute or relative density or biomass of copepods or rotifers, over the three years of study (Table 5.4; Figure 5.9). Absolute and relative cladoceran density and biomass were lower at the downstream area compared to upstream in all three years (absolute density and biomass), or in the latter two years (relative density and biomass). Some cladocerans are predacious, but most species are herbivorous and feed on phytoplankton, organic matter, and bacteria. As described in Sections 5.2 and 5.3, phytoplankton density and biomass were similar between downstream and upstream areas; and chlorophyll-a was higher downstream compared to upstream, suggesting that fewer cladocerans downstream of the Elk River was likely not due to food limitations.

Most variability in overall zooplankton community structure was captured on NMDS-Axis 1 (91.7%) and organisms contributing to the separation of areas along Axis-1 included a variety of copepods, cladocerans, and rotifers (Figure 5.10; Appendix Tables D.53 to D.55). Stations at the downstream area had more positive scores on NMDS-Axis 1 in 2014 and 2015 and more negative scores in 2016, compared to the upstream area, indicating that community differences between upstream and downstream areas were likely not associated with influence from the Elk River. The largest changes in community structure were associated with sampling year with no overlap in community structure between any of the three years on NMDS-Axis 1 (Figure 5.10). Differences between the downstream and upstream areas of the Elk River in 2015 and 2016 were significant; but in opposite directions, as noted above (Table 5.4; Figure 5.10).

Studies that examined zooplankton data collected from 1973 to 1988 reported that species composition was generally consistent among years (Hamilton et al. 1990; Richards 1997). The predominant genera of zooplankton collected were *Daphnia*, *Diaptomus*, and *Cyclops*. Total zooplankton biomass was considered low, consistent with an oligotrophic system

Table 5.4: Statistical Summary of Spatial and Temporal Differences in Zooplankton Community Endpoints in Koocanusa Reservoir in the Area Downstream from the Elk River (T4) Compared to the Upstream Area (T2/TN), 2014 to 2016

Endpoint		Transformation	Measure of Central Tendency (Mean, Geometric Mean, or Median)[a]						Model P-values			Contrasts			Significant Differences and Magnitudes of Difference (%)			Significant Differences and Magnitudes of Difference (number of SD)		
			2014		2015		2016					Area × Year								
									Area×Year	Area	Year	Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)		
			T4	T2	T4	TN	T4	TN				2014	2015	2016	2014	2015	2016	2014	2015	2016
Density (# organisms/L)		none	73	93	3.5	6.4	33	26	0.013	-	-	0.003	0.631	0.232	* (-22%)	-	-	* (-2.1 SD)	-	-
Biomass (µg/L dw)		none	88	91	2.7	6.1	61	53	0.734	0.955	<0.001	-	-	-		-			-	
Richness (# taxa)		none	20	21	14	17	17	17	0.064	-	-	0.670	0.001	0.397	-	* (-20%)	-	-	* (-2.3 SD)	-
Major Group Density (organisms/L)	Copepod	none	23	25	0.81	1.4	11	5.8	0.110	0.519	<0.001	-	-	-		-			-	
	Cladocera	rank	1.6	2.1	0.11	0.42	1.4	3.2	0.351	0.003	<0.001	-	-	-		* (-35%)			* (-0.87 SD)	
	Rotifera	none	49	66	2.6	4.5	20	16	0.005	-	-	<0.001	0.663	0.379	* (-27%)	-	-	* (-2.6 SD)	-	-
Major Group Relative Density (%)	Copepod	none	31	26	23	23	32	23	0.064	-	-	0.092	0.993	0.002	* (18%)	-	* (42%)	* (1.1 SD)	-	* (2.2 SD)
	Cladocera	none	2.1	2.1	3.4	7.8	6.1	14	0.002	-	-	1.000	0.004	<0.001	-	* (-57%)	* (-56%)	-	* (-2 SD)	* (-3.5 SD)
	Rotifera	none	67	71	73	69	62	64	0.136	0.722	0.002	-	-	-		-			-	
Major Group Biomass (µg/L dw)	Copepod	log	66	70	2.2	4.1	37	16	<0.001	-	-	0.832	0.011	0.001	-	* (-47%)	* (130%)	-	* (-1.8 SD)	* (2.3 SD)
	Cladocera	rank	13	16	0.16	1.3	14	33	0.413	0.005	<0.001	-	-	-		* (-20%)			* (-0.38 SD)	
	Rotifera	log	3.1	4.2	0.12	0.19	0.98	1.00	0.208	0.016	<0.001	-	-	-		* (-24%)			* (-0.95 SD)	
Major Group Relative Biomass (%)	Copepod	log	80	78	89	71	65	31	<0.001	-	-	0.808	0.022	<0.001	-	* (25%)	* (113%)	-	* (1.5 SD)	* (5.2 SD)
	Cladocera	rank	16	18	6.0	24	34	64	0.027	-	-	0.952	<0.001	0.009	-	* (-75%)	* (-47%)	-	* (-2.0 SD)	* (-3.4 SD)
	Rotifera	none	3.8	4.7	5.1	3.4	1.8	2.0	0.046	-	-	0.215	0.026	0.850	-	* (49%)	-	-	* (1.5 SD)	-
NMDS Axis 1[b]		none	-0.81	-0.98	1.5	0.79	-0.36	-0.15	<0.001	-	-	0.151	<0.001	0.083	NA	NA	NA	-	* (3.9 SD)	* (-1.1 SD)

p-value < 0.1.

* indicates a significant difference between the two areas at an α of 0.1.

[a] The measure of central tendency reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for $\log_{10}$-transformation; and, median for rank-transformation.

[b] NMDS conducted using fouth-root transformed LPL taxanomy abundance matrix.

NA indicates not applicable as the calculation of percent differences is not appropriate for variables with both positive and negative scores.

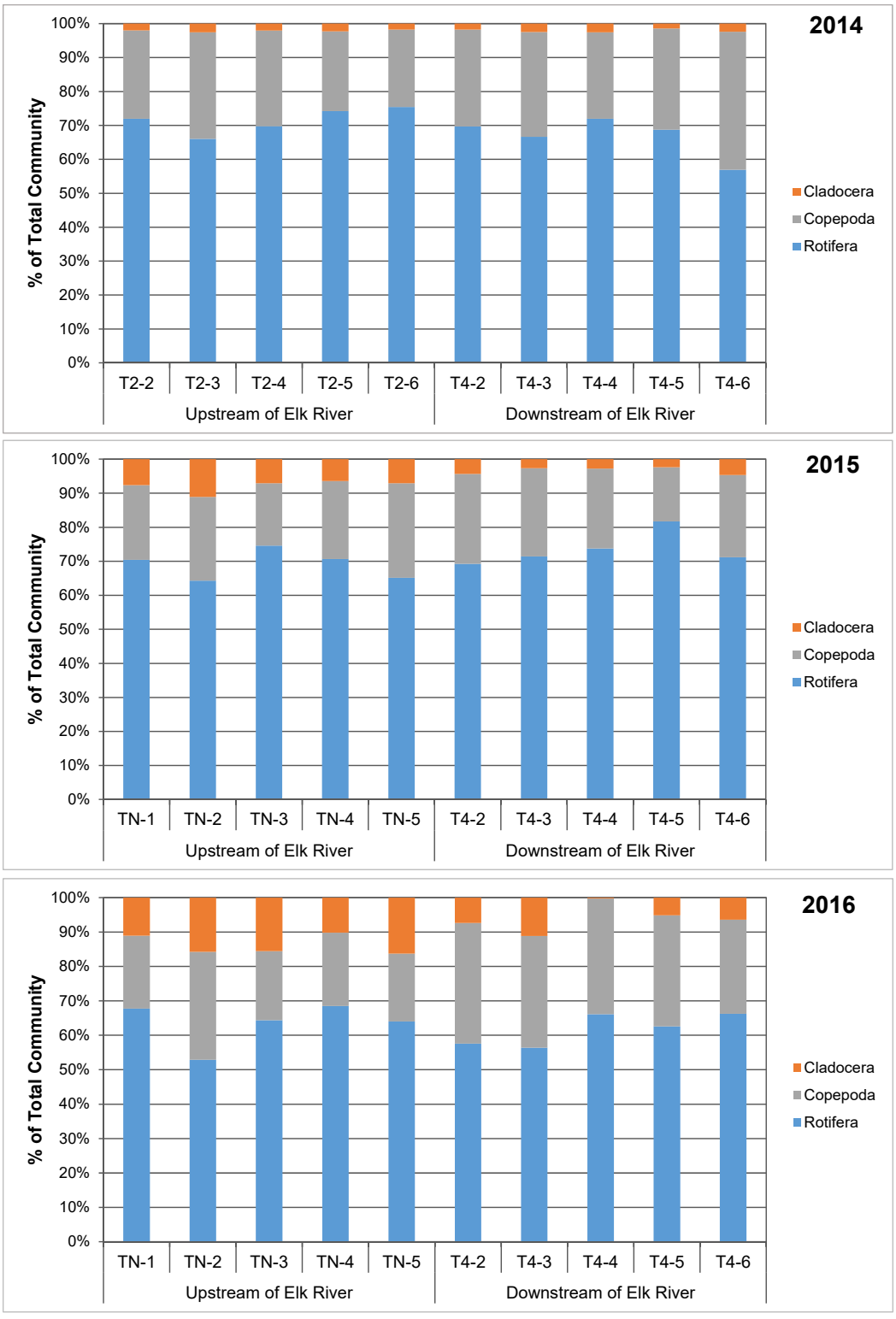


Figure 5.7: Relative Density of Major Zooplankton Groups in Koocanusa Reservoir, August 2014, 2015, and 2016

Note: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.

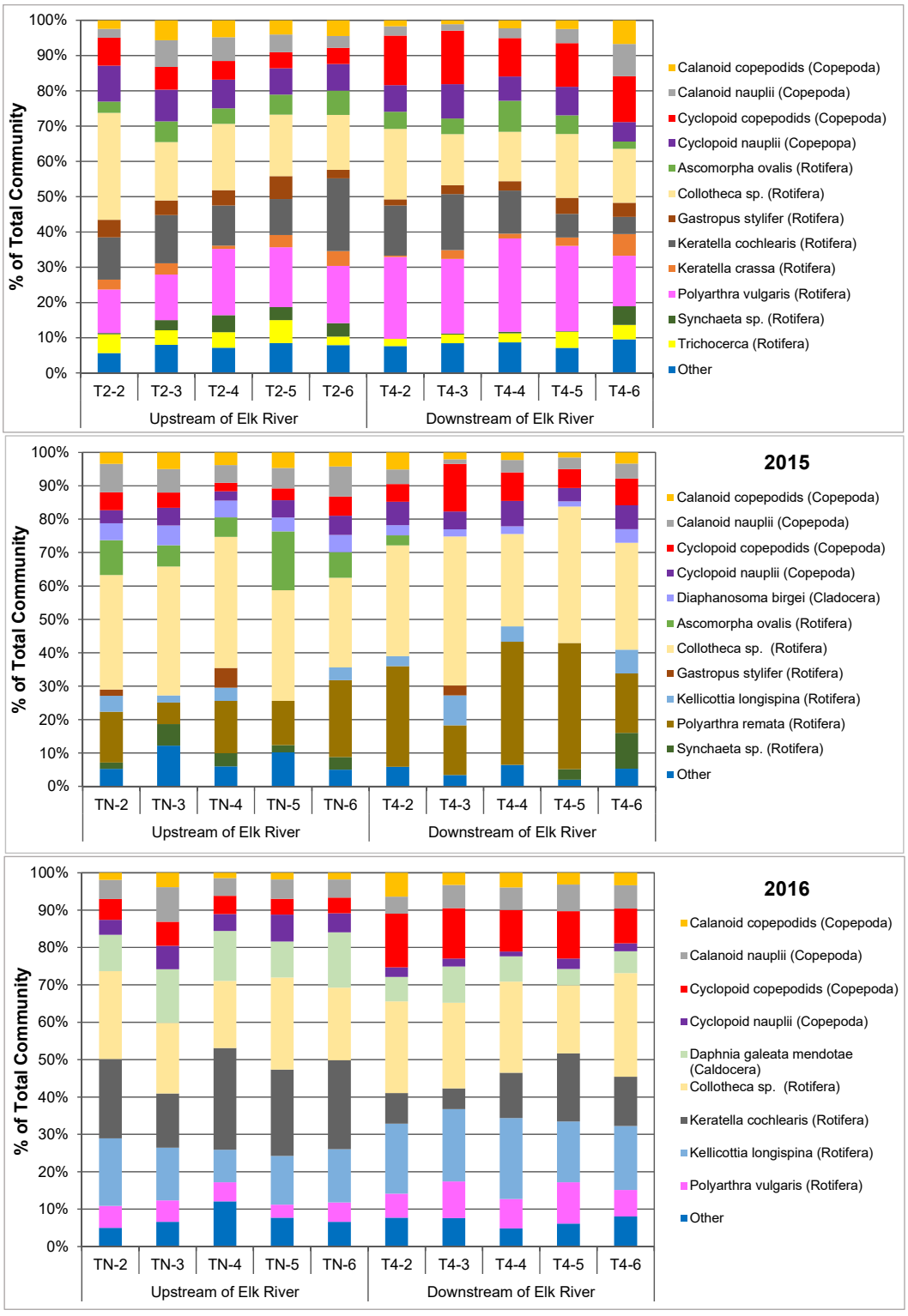


Figure 5.8: Relative Density of Major Zooplankton Groups in Koocanusa Reservoir, August 2014, 2015, to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016. Only taxa comprising at least 5% of the total number of cells at one or more stations are depicted individually.

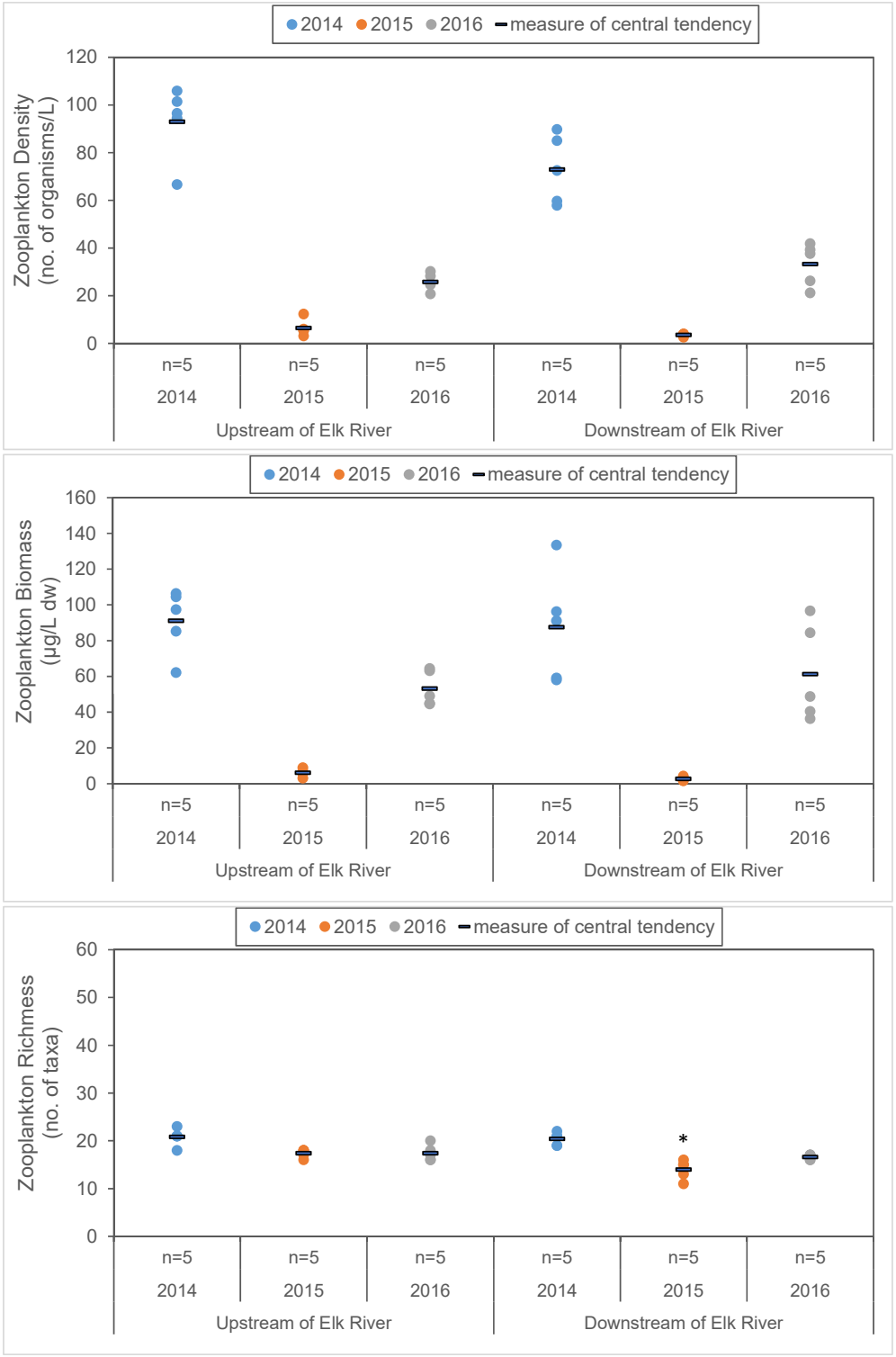


Figure 5.9: Relative Density of Zooplankton Taxa in Koocanusa Reservoir, August 2014, 2015, to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

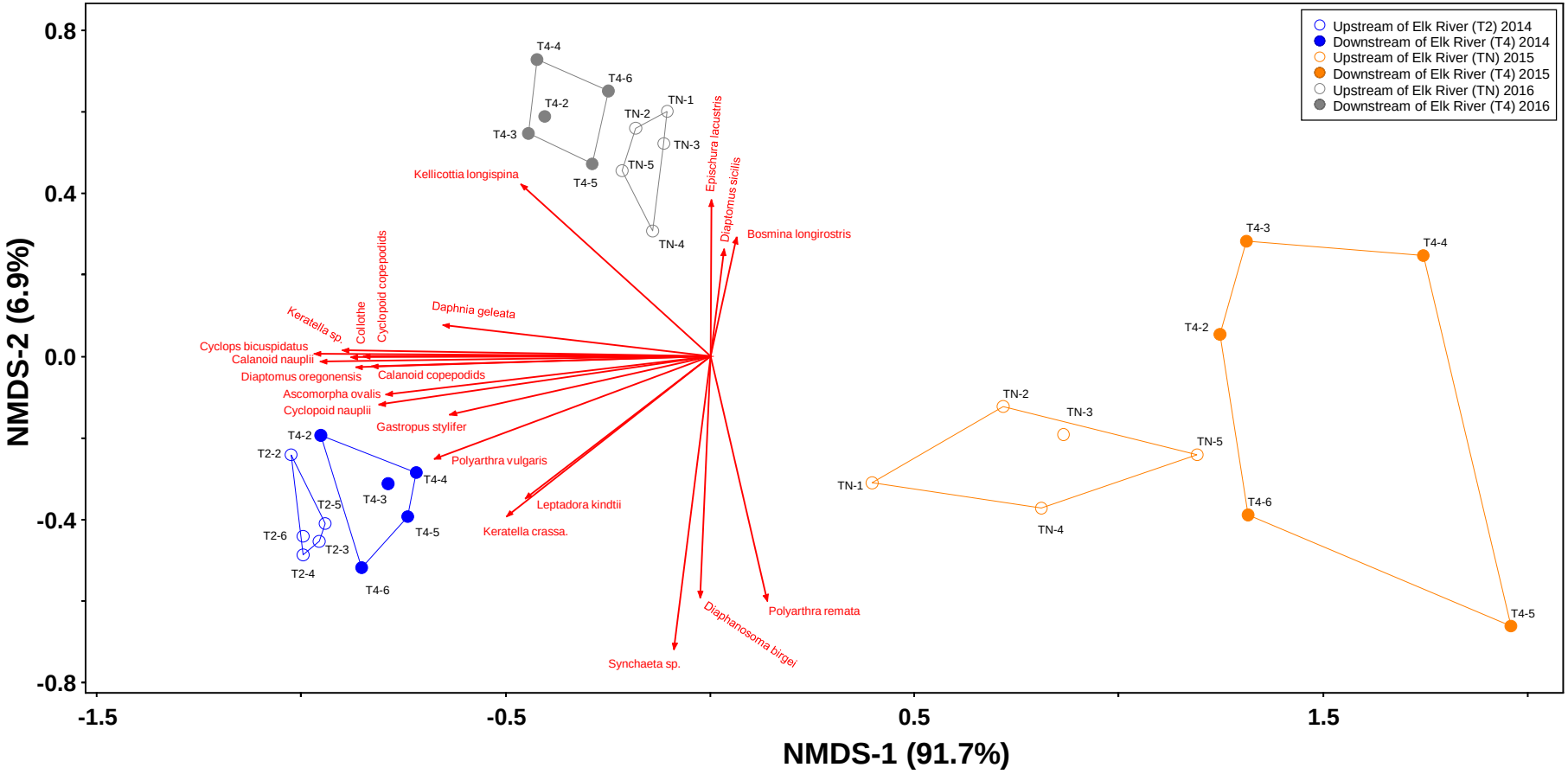


Figure 5.10: Zooplankton Community Structure (Lowest Practical Level of Taxonomy) in Koocanusa Reservoir as Summarized by NMDS, 2014 to 2016

Note: Data (n=5 per area and year) were assessed using fourth root transformed absolute density data and the Bray-Curtis distance measure. Displayed vectors reflect significant ($p < 0.05$) absolute Pearson correlation coefficients (r-value) greater than 0.5.
NMDS - Non-Metric Multidimensional Scaling.

(Hamilton et al. 1990). Inverse correlations between *Cyclops* and *Diaptomus* densities, and *Daphnia* and *Bosmina* densities, were considered potentially indicative of a cyclic kokanee population and size-selective fish predation in Koocanusa Reservoir (Dalbey et al. 1998).

5.4.2 Tissue Selenium Concentrations

Selenium concentrations in zooplankton in Koocanusa Reservoir did not differ significantly between downstream and upstream areas in any of the three sampling years (Figure 5.11; Table 5.5). The BC interim guideline for invertebrates (4 µg/g dw), EVWQP Level 1 benchmarks for potential effects to benthic invertebrates (13 µg/g dw) and for dietary effects to juvenile fish (11 µg/g dw) are presented as a basis of comparison. Mean selenium concentrations measured in zooplankton were above the BC interim guideline for invertebrates in 2015 only, and were below the Level 1 benchmarks in all study years both upstream and downstream from the Elk River (Figure 5.11; Appendix Table G.1).

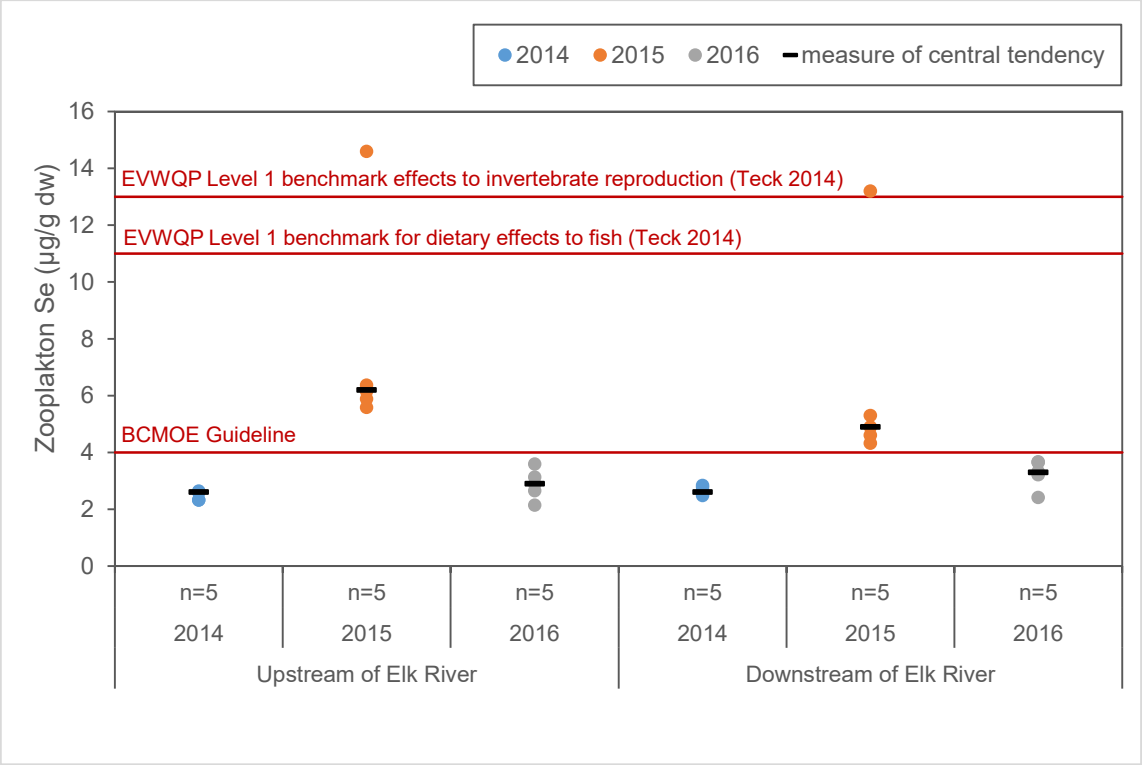


Figure 5.11: Selenium Concentrations (µg/g dw) in Zooplankton in Koocanusa Reservoir, August 2014 to 2016

Note: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

Table 5.5: Statistical Summary of Spatial and Temporal Differences in Zooplankton Selenium Concentrations in Koocanusa Reservoir in the Area Downstream from the Elk River (T4) Compared to the Upstream Area (T2/TN), 2014 to 2016

Tissue	Trans-formation	Measure of Central Tendency (Median)						Model P-values			Contrasts			Significant Differences and Magnitudes of Difference (%)		
											Area × Year					
		2014		2015		2016		Area×Year	Area	Year	Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)		
		T4	T2	T4	TN	T4	TN				2014	2015	2016	2014	2015	2016
Zooplankton Selenium (µg/g dw)	rank	2.6	2.6	4.9	6.2	3.3	2.9	0.188	0.549	<0.001	-	-	-	-		

p-value < 0.1.

* indicates a significant difference between the two areas at an α of 0.1.

6 BENTHIC INVERTEBRATES

6.1 Overview

Benthic invertebrate community samples were collected in Koocanusa Reservoir in areas both upstream (T2/TN) and downstream (T4) from the Elk River in all three monitoring years (2014 to 2016) (Appendix Tables E.1 to E.16). Sampling occurred in August, when water levels are most stable (Figure 1.2) and benthic invertebrate communities are at or near maximum biomass and diversity (BCMOE 2006). Composite-taxa benthic invertebrate tissue samples were collected upstream (T2/TN) and downstream (T4) of the Elk River in both April and August for selenium and metals analysis.

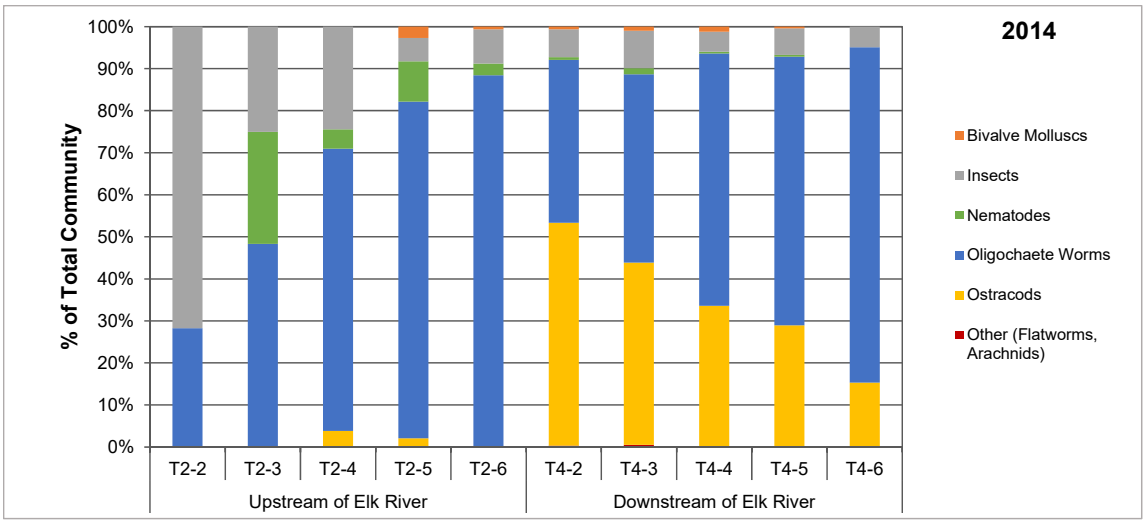
6.2 Community Structure

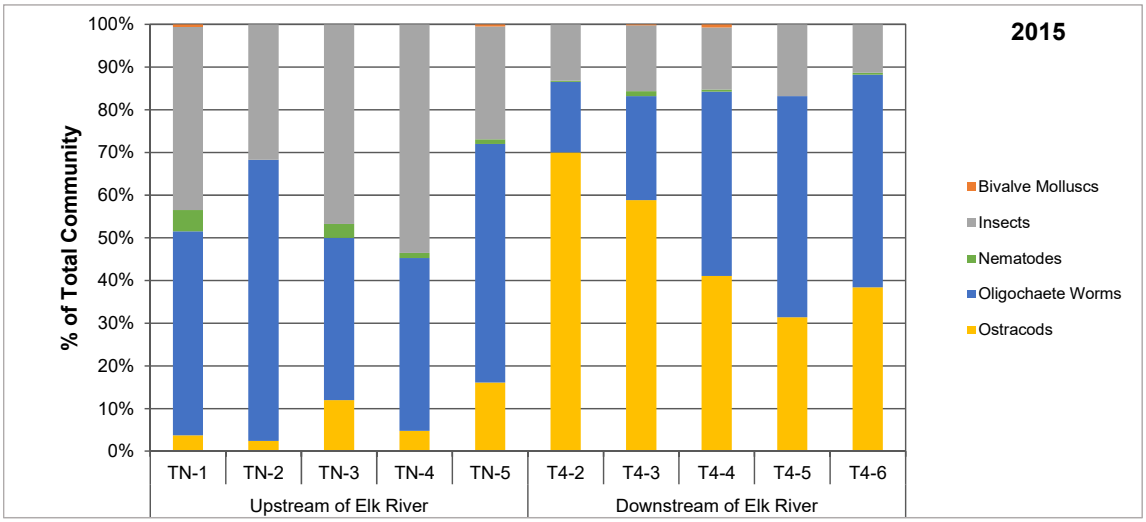
Benthic invertebrate communities sampled in Koocanusa Reservoir upstream (T2/TN) and downstream (T4) of the Elk River were primarily composed of oligochaetes (mostly immature Tubificinae), insects (various species of chironomids), and ostracods in all three sample years (Figure 6.1; Appendix Tables E.1 to E.16). Total community density ranged from 984 to 3,533 organisms/m^2, which may be low compared to some reservoirs (e.g., Cowell and Hudson 1968), but brackets the value of 1,100 organisms/m^2 that Chisholm et al (1989) reported for samples collected in permanently wetted areas of Koocanusa Reservoir from 1983 to 1987.

Overall community density and richness did not differ significantly between upstream and downstream areas in any of the three study years (Table 6.1; Figure 6.2). However, community structure differed between areas, particularly with respect to ostracods, which were higher in density at the downstream area (range of 849 to 1,686 per m^2) compared to the upstream area (range of 38 to 333 per m^2) over the three years of study (Table 6.1). Absolute densities of oligochaetes were also significantly higher at the downstream area (range of 1,194 to 1,449 per m^2) compared to the upstream area (range of 418 to 1,194 per m^2; Table 6.1).

Beginning in 2015[11], ostracods were identified to species and *Cyntherissa lacustris* was found to be relatively abundant downstream and sparse upstream (Figure 6.3). *C. lacustris* is reputedly tolerant of a broad range in temperature (Danielopol et al. 1990; Külköylüoglu 2004), deep water (>40 m deep; Griffiths et al. 2002; Li et al. 2010), and DO concentrations as low as approximately 3 mg/L (Ruiz et al. 2013). The greater abundance of ostracods downstream of

[11] Ostracods were only identified to order in 2014 based on the guidelines for sampling benthic invertebrates in BC streams (BCMOE 2006); however, after recognizing that they represented a large proportion of the community, ostracods were identified to species in 2015 and 2016.





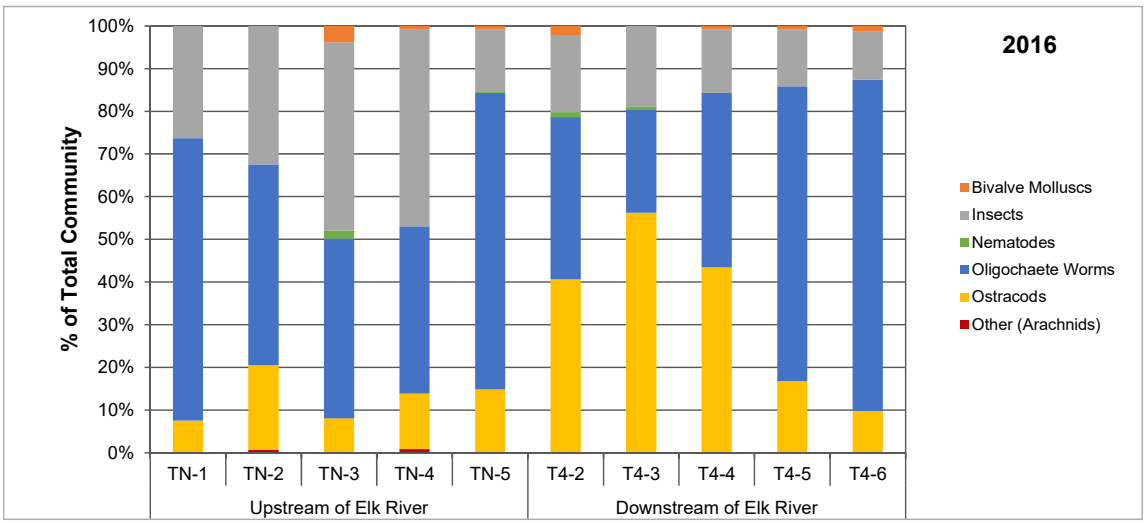


Figure 6.1: Relative Density of Major Benthic Invertebrate Community Groups in Koocanusa Reservoir, August 2014 to 2016

Note: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.

Table 6.1: Statistical Summary of Spatial and Temporal Differences in Benthic Invertebrate Community Endpoints in Koocanusa Reservoir, 2014 to 2016

Endpoint		Trans-formation	Measure of Central Tendency (Mean, Geometric Mean, or Median)[a]						Model P-values			P-values for Contrasts			Magnitudes of Significant Differences					
			2014		2015		2016					Area×Year			%			Standard Deviations (SD)		
			T4	T2	T4	TN	T4	TN	Area×Year	Area	Year	Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)		
												2014	2015	2016	2014	2015	2016	2014	2015	2016
Density (no. of organisms/m²)		none	2,631	3,224	3,533	984	3,295	2,547	0.170	0.184	0.641	-	-	-	-			-		
Richness (no. of taxa)		none	10	10	10	11	13	13	0.859	0.536	0.024	-	-	-	-			-		
Major Group Density (no. of organisms/m²)	Nematа	log(X+1)	7.6	62	10	12	3.4	2.8	0.386	0.320	0.121	-	-	-	-			-		
	Oligochaetes	log	1,394	947	1,194	418	1,449	1,034	0.633	0.092	0.360	-	-	-	* (81%)			* (0.64 SD)		
	Ostracods	none	849	38	1,686	91	1,241	333	0.152	<0.001	0.110	-	-	-	* (717%)			* (2.3 SD)		
	Chironomids	none	158	327	502	381	522	658	0.170	0.363	0.001	-	-	-	-			-		
	Bivalve Molluscs	log(X+1)	8.8	5.2	2.0	1.5	16.2	7.6	0.956	0.500	0.188	-	-	-	-			-		
Major Group Relative Density (%)	Nematа	log(X+1)	0.51	4.7	0.42	1.6	0.33	0.29	0.086	-	-	0.004	0.161	0.955	* (-89%)	-	-	* (-3.4 SD)	-	-
	Oligochaetes	none	57	62	37	50	50	53	0.822	0.313	0.142	-	-	-	-			-		
	Ostracods	none	35	1.2	48	7.8	33	13	0.217	<0.001	0.219	-	-	-	* (437%)			* (2.6 SD)		
	Chironomids	log	6.1	18	14	39	15	30	0.661	<0.001	0.002	-	-	-	* (-61%)			* (-1.9 SD)		
	Bivalve Molluscs	log(X+1)	0.58	0.44	0.16	0.20	0.86	0.75	0.943	0.792	0.108	-	-	-	-			-		
NMDS Axis 1[b]		-	0.51	-0.30	-0.12	-0.84	0.75	-0.0044	0.972	<0.001	0.001	-	-	-	NA			* (1.6 SD)		

= p-value < 0.1

* indicates a significant difference between the two areas at an α of 0.1.

[a] The measure of central tendency reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for $\log_{10}$-transformation; and, median for rank-transformation.

[b] NMDS conducted using $\log_{10}$-transformed LPL taxonomy abundance matrix.

NA indicates not applicable as the calculation of percent differences is not appropriate for variables with both positive and negative scores.

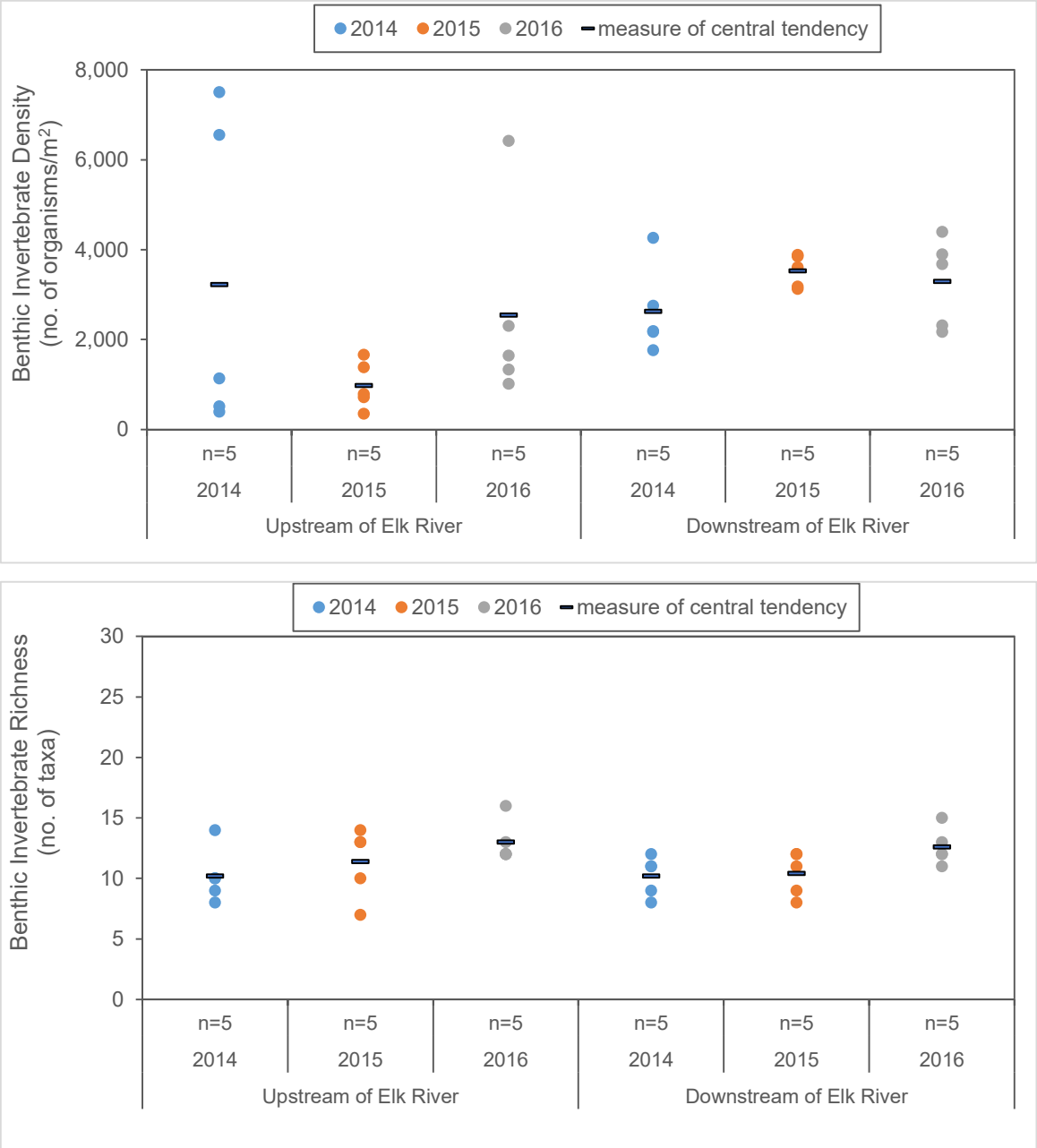
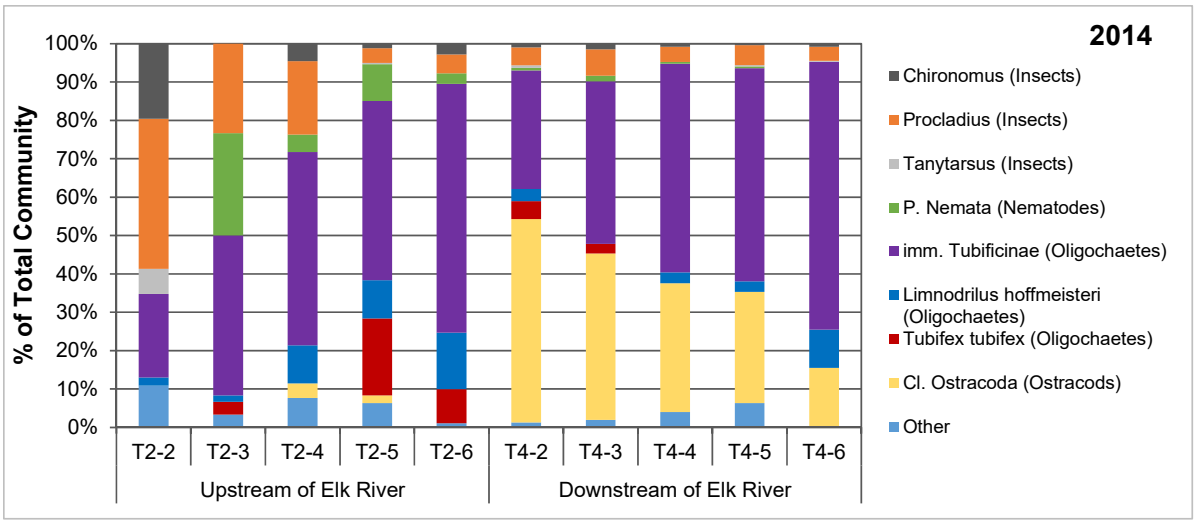
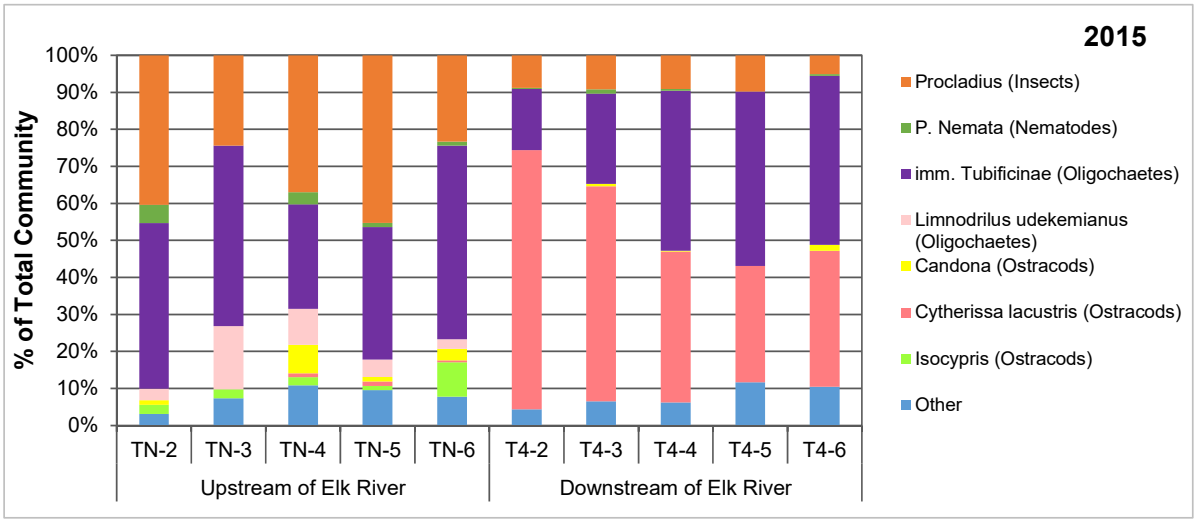


Figure 6.2: Benthic Invertebrate Density (No. Organisms/m^2) and Richness (No. of Taxa) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016

' * ' indicates the downstream area was significantly different from the upstream area in the same year.





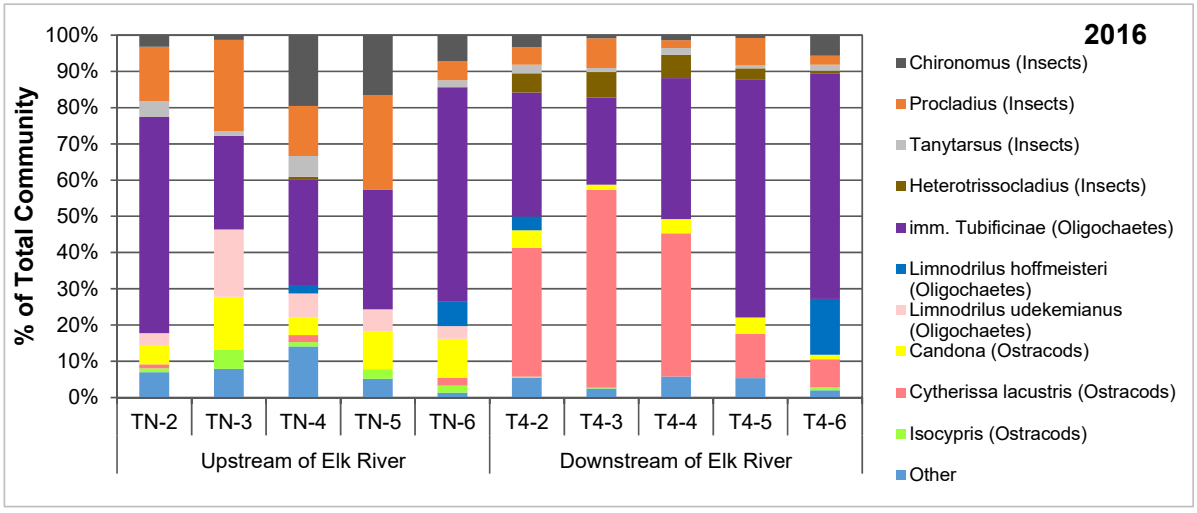


Figure 6.3: Relative Density of Benthic Invertebrate Taxa in Koocanusa Reservoir, August 2014 to 2016

Note: Only taxa comprising at least 5% of the total number of individuals at one or more stations are depicted individually.

the Elk River compared to upstream may be associated with greater depths (Appendix Tables B.1 to B.3), and/or lower bottom water velocities, which are favorable for the development of these microcrustaceans (Ruiz et al. 2013). Also, portions of the upper reservoir dry out during low pool, and Curry (2003) reported fewer ostracods in lakes that went dry.

Overall benthic invertebrate community structure, as summarized by NMDS-Axis 1 scores (explaining 53% of variability in community structure between areas), differed significantly between the downstream and the upstream study area, with a similar magnitude of difference among years (i.e., 1.6 SD; Table 6.1; Appendix Tables E.17 to E.19). In particular, the downstream area had higher Axis 1 scores in all three years with the difference mainly associated with a greater density of ostracods, and *Heterotrissocladius* and *Tanytarsus* midges (Figure 6.4), as identified in Table 6.1.

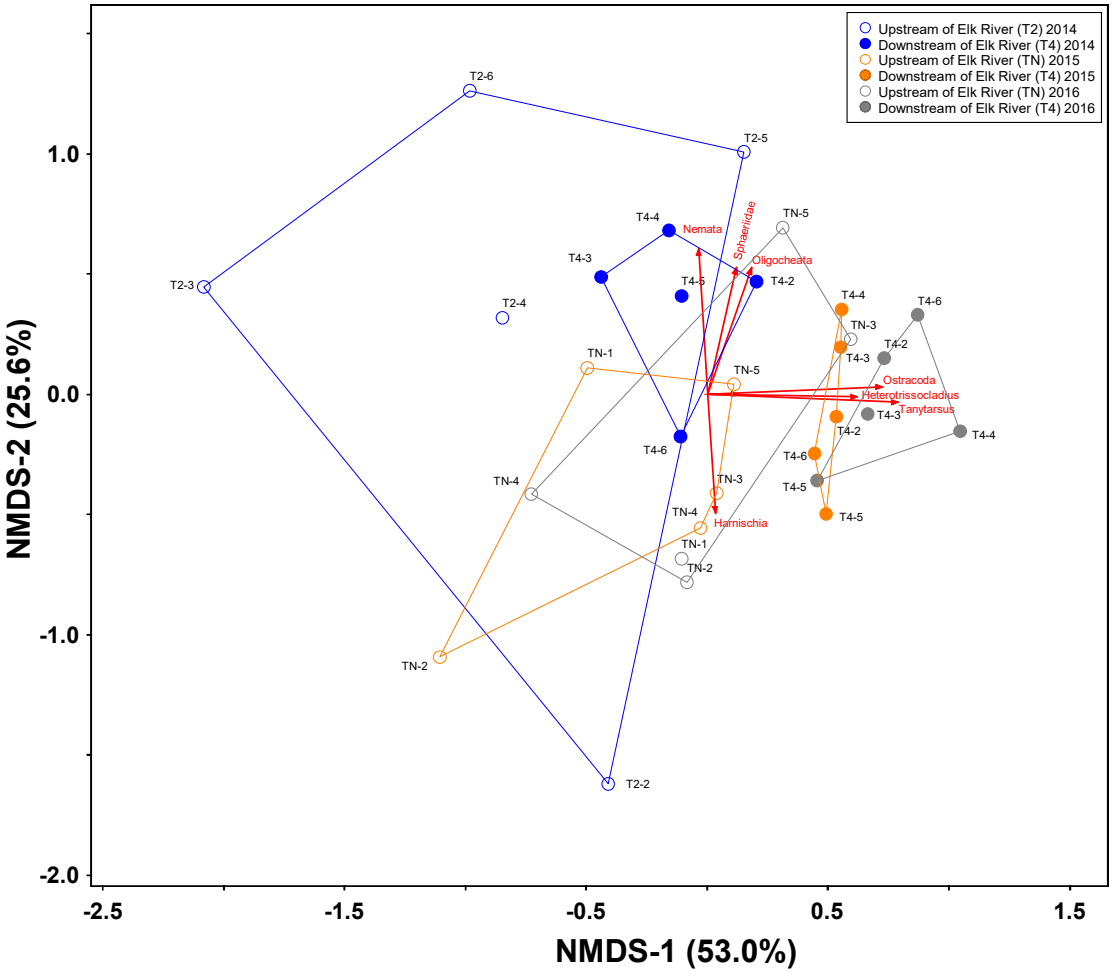


Figure 6.4: Benthic Invertebrate Community Structure (Lowest Practical Level of Taxonomy) in Koocanusa Reservoir as Summarized by NMDS, 2014 to 2016

Notes: Data (n=5 per area and year) were assessed using $\log_{10}$ transformed absolute density and the Bray-Curtis distance measure. Displayed vectors reflect significant ($p < 0.05$) absolute Pearson correlation coefficients (r-value) greater than 0.5. NMDS - Non-Metric Multidimensional Scaling.

6.3 Tissue Selenium Concentrations

Composite-taxa benthic invertebrate tissue samples collected in April and August consisted mainly of chironomids with some oligochaetes. Low densities resulted in very little tissue mass relative to the amount of area sampled at each location and time period (e.g., about 0.4 g wet weight in April 2015 from a total of 20 Petite Ponar grabs; Appendix Table G.1). Consequently, only a single tissue sample was obtained per area during each sampling event.

Benthic invertebrate selenium concentrations were 29% greater, on average, at the downstream area compared to the upstream area over the three years of study (Table 6.2). The difference in tissue concentrations between areas did not increase after the upstream station was moved farther upstream in early 2015, suggesting limited influence from the Elk River on tissue chemistry at the upstream station in 2014. Selenium concentrations at the downstream area ranged from 5.3 to 9.7 µg/g dw, compared to 2.0 to 7.8 µg/g dw at the upstream area over the three years of study (Figure 6.5; Appendix Table G.1;). Eleven of 12 samples collected between the two areas had tissue selenium concentrations above the interim BCMOE guideline of 4 µg/g dw (except the August sample for the upstream area in 2015). Concentrations in all samples were less than the EVWQP Level 1 benchmarks for potential effects to invertebrates (13 µg/g dw) and for dietary effects to fish (11 µg/g dw) (Figure 6.5).

Table 6.2: Statistical Summary of Spatial and Temporal Differences in Benthic Invertebrate Tissue Selenium Concentrations in Koocanusa Reservoir, 2014 to 2016

Tissue	Trans-formation	Measure of Central Tendency (Median)[a]						Model P-values			Contrasts			Magnitudes of Significant Differences		
											Area×Year			%		
		2014		2015		2016		Area×Year	Area	Year	Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)		
		T4	T2	T4	TN	T4	TN				2014	2015	2016	2014	2015	2016
Benthic Invertebrate Selenium (µg/g dw)	rank	6.8	4.4	6.1	3.9	7.9	6.6	0.541	0.087	0.272	-	-	-	* (29%)		

p-value < 0.1.

* indicates a significant difference between the two areas at an α of 0.1.

[a] Each value only represents two sample results, so the median and the mean are equivalent.

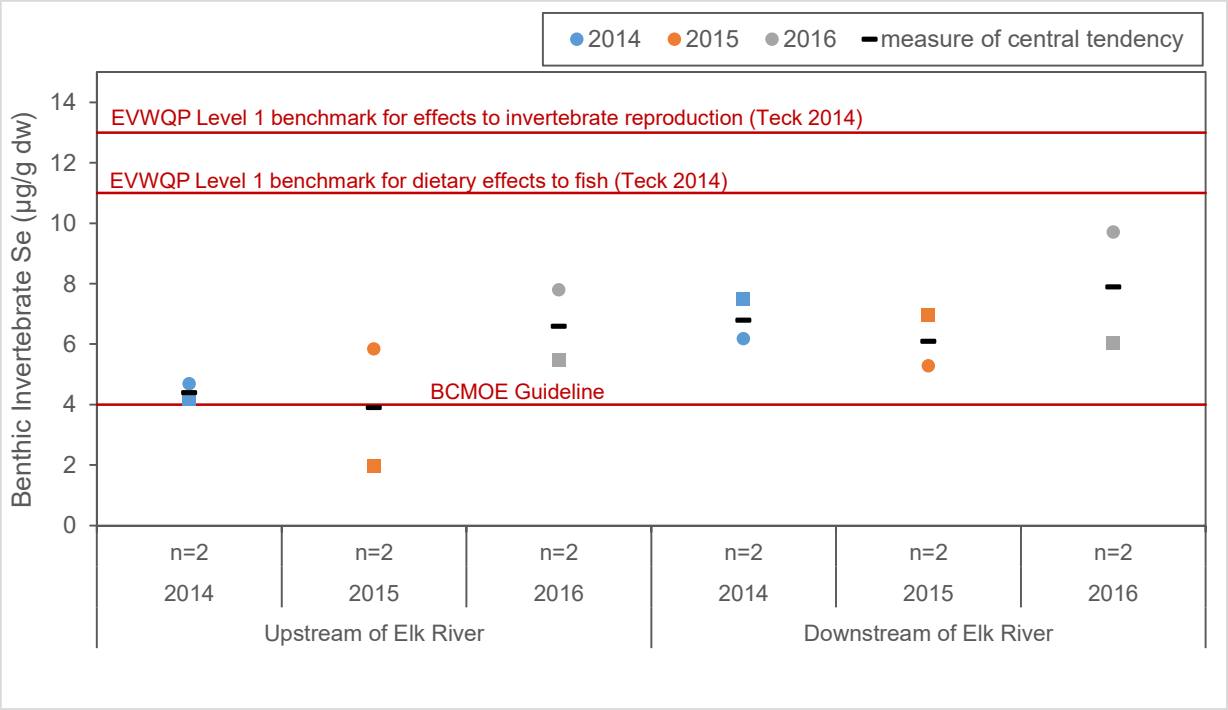


Figure 6.5: Selenium Concentrations (µg/g dw) in Composite Benthic Invertebrate Tissue Samples Collected in Koocanusa Reservoir, April and August, 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

7 FISH

7.1 Overview

Fish were sampled in the Canadian portion of the Koocanusa Reservoir to evaluate endpoints indicative of individual and population health as well as tissue chemistry. Three areas were sampled in the reservoir, two downstream from the Elk River (Elk River and Gold Creek), and one upstream from the Elk River (Sand Creek) (Figure 2.2).

For the fish health surveys, peamouth chub were targeted in April of the first year of study (Minnow 2014b). Additional species were targeted in 2015 and/or 2016 based on ease of capture using the sampling gear permitted under the provincially issued scientific collection permit, and reproductive maturity observed during April sampling (northern pikeminnow, redside shiner, yellow perch, largescale sucker) (Minnow 2015c, 2016b). Endpoints associated with fish survival (mean age), growth (body size-at-age), reproduction (relative gonad weight) and energy storage (relative liver weight and overall condition) were statistically compared between the downstream areas and the upstream area. Magnitudes of difference were interpreted relative to commonly accepted Critical Effect Sizes (CES; Munkittrick et al. 2009; Environment Canada 2012).

Tissues were collected for analysis of selenium and mercury from species sampled for the fish health surveys (April each year), and from other species, including sport fish (February, April, August). Tissue concentrations were statistically compared between the downstream areas and the upstream area and were also compared to available provincial guidelines (BCMOE 2017a), US EPA criteria (USEPA 2016), and Level 1 benchmarks developed in the EVWQP (Teck 2014). Although a formal fish community evaluation was not an objective of the fish survey, the abundances of different species captured were summarized to provide indication of the fish community composition. Based on cultural importance to the Ktunaxa First Nation, a separate study of burbot was completed in 2014 to 2015 (Minnow 2015a) and results are also summarized in this report.

7.2 Fish Community

7.2.1 Previous Studies

Prior to construction of the Libby Dam, the sportfish fishery in the Kootenay River (which was later impounded to form the reservoir) consisted primarily of westslope cutthroat trout, rainbow trout, mountain whitefish, and burbot (Hamilton et al. 1990). Shortly following impoundment, an increase in nutrients due to the inundation of substrates was hypothesized to account for a substantial increase in total fish biomass, including several native species such as westslope

cutthroat and rainbow trout, mountain whitefish, peamouth chub, northern pikeminnow, and sucker species (Hamilton et al. 1990; Richards 1997). Among game species, westslope cutthroat trout, bull trout, mountain whitefish, and burbot were initially most common, whereas longnose sucker and invasive yellow perch were initially the most common non-cyprinid, non-game species (Richards 1997). Kokanee were released into the reservoir from the Kootenay Trout Hatchery in BC in 1979, and yellow perch may have inadvertently colonized the reservoir through emigration from Murphy Lake in Montana (Huston et al. 1984; Hamilton et al. 1990).

Following the initial increase in total fish biomass within the reservoir, numbers of native westslope cutthroat trout and rainbow trout (i.e., *Oncorhynchus* spp.) declined, while kokanee numbers increased, potentially as a result of competition for available food, changes in available spawning and rearing habitat due to deep drawdown levels and flushing of nutrients from the reservoir (Dalbey et al. 1998). The numbers of native *Oncorhynchus* spp. captured in gill nets declined independent of number and size of hatchery fish stocked into the reservoir over time. Mountain whitefish and redside shiners captured in gill nets showed similar declining trends as shown for the *Oncorhynchus* spp., which was hypothesized to reflect a loss of spawning and rearing habitat, and competition with kokanee for plankton food resources (Dalbey et al. 1998).

7.2.2 Koocanusa Reservoir 2014 – 2016

Fish communities at the Sand Creek, Elk River, and Gold Creek study areas in 2014 to 2016 were represented by a total of 14, 12, and 13 species, respectively (Table 7.1). Largescale sucker, northern pikeminnow, peamouth chub, redside shiner, and yellow perch were consistently captured in highest numbers at all three study areas (Table 7.1). Variability in the diversity and abundance of fish captured among years was likely due to annual differences in collection gear and sampling effort (i.e., angling, burbot trapping, gill netting, hoop netting, minnow trapping and/or seine netting; Appendix Tables F.1 to F.44).

7.2.3 Burbot

Burbot are one of the few Canadian freshwater fish species that spawn in midwinter (Scott and Crossman 1998). In Canada, burbot spawning typically occurs under-ice from January to March in nearshore waters or shallow offshore shoals at depths of approximately 1 – 3 m (Ford et al. 1995; Scott and Crossman 1998; Spence 1999). Preferred spawning locations in lakes appear to be associated with tributary confluences or groundwater upwelling (Ford et al. 1995; Spence and Neufeld 2002). Burbot eggs hatch in about 30 days (at 6 °C), and larvae typically appear in late February to June (Scott and Crossman 1998). Once the eggs hatch, larvae spend several days resting on the bottom before becoming free-swimming and planktonic. Young-of-the-year burbot are frequently found in rocky shorelines and sometimes in

Table 7.1: Summary of Fish Catches at the Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, 2014 to 2016

Year	Area	Total Caught of Each Fish Species														Total Caught by Area	Total Number of Species
		Bull Trout	Burbot	Kokanee	Largescale Sucker	Longnose Sucker	Mountain Whitefish	Northern Pikeminnow	Peamouth Chub	Pumpkinseed	Rainbow Trout	Redside Shiner	Slimy Sculpin	Westslope Cutthroat Trout	Yellow Perch		
2014[b]	Sand Creek[a]	6	11	28	334	0	15	106	68	3	4	151	1	1	27	**755**	**13**
	Elk River	1	2	26	277	2	2	109	69	0	0	310	0	1	3	**802**	**11**
	Gold Creek	1	0	9	78	0	1	129	75	1	3	702	0	0	27	**1,026**	**10**
	Total	**8**	**13**	**63**	**689**	**2**	**18**	**344**	**212**	**4**	**7**	**1,163**	**1**	**2**	**57**	**-**	**-**
2015[c]	Sand Creek	4	5	12	43	6	0	195	81	0	0	9	0	1	34	**390**	**10**
	Elk River	1	3	12	54	3	0	178	191	0	0	23	0	0	42	**507**	**9**
	Gold Creek	2	1	0	25	0	1	119	140	0	1	10	0	0	39	**338**	**9**
	Total	**7**	**9**	**24**	**122**	**9**	**1**	**492**	**412**	**0**	**1**	**42**	**0**	**1**	**115**	**-**	**-**
2016[d]	Sand Creek	23	10	5	292	13	6	164	608	0	4	83	1	3	45	**1,257**	**13**
	Elk River	16	11	14	199	5	12	167	212	0	2	76	0	2	33	**749**	**12**
	Gold Creek	8	0	0	243	1	2	125	271	0	4	62	0	3	71	**790**	**10**
	Total	**47**	**21**	**19**	**734**	**19**	**20**	**456**	**1,091**	**0**	**10**	**221**	**1**	**8**	**149**	**-**	**-**

[a] Includes fish collected from Oestreich Road.

[b] Fish captured in 2014 by angling, hoop netting and/or seining.

[c] Fish captured in 2015 by angling, burbot trapping, hoop netting, and/or minnow trapping.

[d] Fish captured in 2016 by angling, gill netting, and/or hoop netting.

weedy areas of tributary streams (Scott and Crossman 1998). In contrast, adult burbot prefer deeper water and, after spawning, move to hypolimnic habitat (Scott and Crossman 1998). Burbot are voracious predators that commonly feed at night. Young burbot (<500 mm in length) feed mainly on aquatic insects, while burbot over 500 mm in length feed almost exclusively on fish, including kokanee, peamouth chub and northern pikeminnow, among others (Scott and Crossman 1998).

Historically, burbot supported a productive fishery in the lakes and streams of southeastern Kootenay region (Prince 2007). In recent years, however, the lower Kootenay burbot populations were designated as critically imperiled and red-listed, meaning potentially extirpated, endangered, or threatened (BCMOE 2015). Gill netting surveys completed by Montana Fish, Wildlife and Parks in the lower Koocanusa Reservoir, beginning in 1975, indicated that the relative abundance of burbot increased until the late 1980s, followed by continual decline to current low levels (Dunnigan 2015).

Limited information exists regarding the life history and spawning distribution of burbot within Koocanusa Reservoir (Dunnigan and Sinclair 2008). Recent investigation of the movement patterns of burbot in Koocanusa Reservoir suggested that burbot exhibited pre-spawning migratory behavior, with movement up to 64.3 km in a season, but movement was more limited in other seasons, similar to studies in other areas (Paragamian and Wakkinen 2008, Gardner and Stewart 1987). Burbot in the Koocanusa Reservoir demonstrated strong fidelity to a particular side, implying limited mixing of fish from opposite shorelines (Dunnigan and Sinclair 2008). In addition, burbot showed affinity for the former Kootenay River channel within the reservoir, presumably because it is the deepest and coolest portion of the reservoir. Overall, the mean 50%, 75%, and 90% home range sizes for burbot in the reservoir were estimated to be 14.6, 22.6, and 32.3 km^2, respectively, which is substantially larger than most fish species in lake environments (Minns 1995; Dunnigan and Sinclair 2008). Minns (1995) speculated that aside from ecological differences between species, fish residing in larger habitats with lower productivity would require larger home ranges to obtain food. In Koocanusa Reservoir, kokanee are a key prey item for burbot, and their pelagic and transient nature could in part explain the larger home range (Dunnigan and Sinclair 2008).

Based on concerns about burbot abundance, and the cultural importance of this fish species to the Ktunaxa First Nation, a study of burbot tissue selenium concentrations was undertaken in 2014 and 2015 (Minnow 2015a). The objective was to measure tissue selenium concentrations in pre-spawning females, if possible. Conditions in the fish collection permit required that samples be taken non-lethally (i.e., expressed eggs, if ripe females were caught, and muscle plugs). However, the combined catch of burbot in February of 2014 and 2015 totaled eight

individuals, despite considerable effort (i.e., 148 angling hours and 122.6 hoop net days; Appendix Tables F.1, F.4, F.8 and F.13). Although burbot were not targeted in 2016, any individuals caught opportunistically were also sampled non-lethally for tissue selenium analysis in 2016. In total, 43 burbot were captured among the three study areas in Koocanusa Reservoir from 2014 to 2016 (Table 7.1; Figure 7.1) with the majority (31 burbot) collected through hoop netting[12] in the April field programs (Appendix Tables F.37 to F.44). The tissue selenium concentrations are presented and discussed in Section 7.4.

The suspected link between burbot productivity and reservoir operations has also made burbot a species of concern elsewhere, such as the Kinbasket Reservoir on the Columbia River (Warnock et al. 2014; Kang et al. 2015). Winter drawdown of the Kinbasket Reservoir (impounded by the Mica Dam in 1973) causes water elevations to vary typically by about 35 m, similar to Koocanusa Reservoir. This exposes large areas of littoral habitat which is suspected to cause dewatering of burbot eggs and/or larvae, with commensurate reduction of recruitment (Warnock et al 2014). A study was initiated by the Canadian Columbia River Inter-Tribal Fisheries Commission (CCRIFC) involving capture and surgical implantation of burbot in Kinbasket Reservoir with acoustic-radio transmitters to determine shallow reservoir and tributary habitat use during the spawning season (Warnock et al 2014). Given the comparable fluctuations in water elevations between the two reservoirs, it is possible similar effects could be expected on burbot in Koocanusa Reservoir.

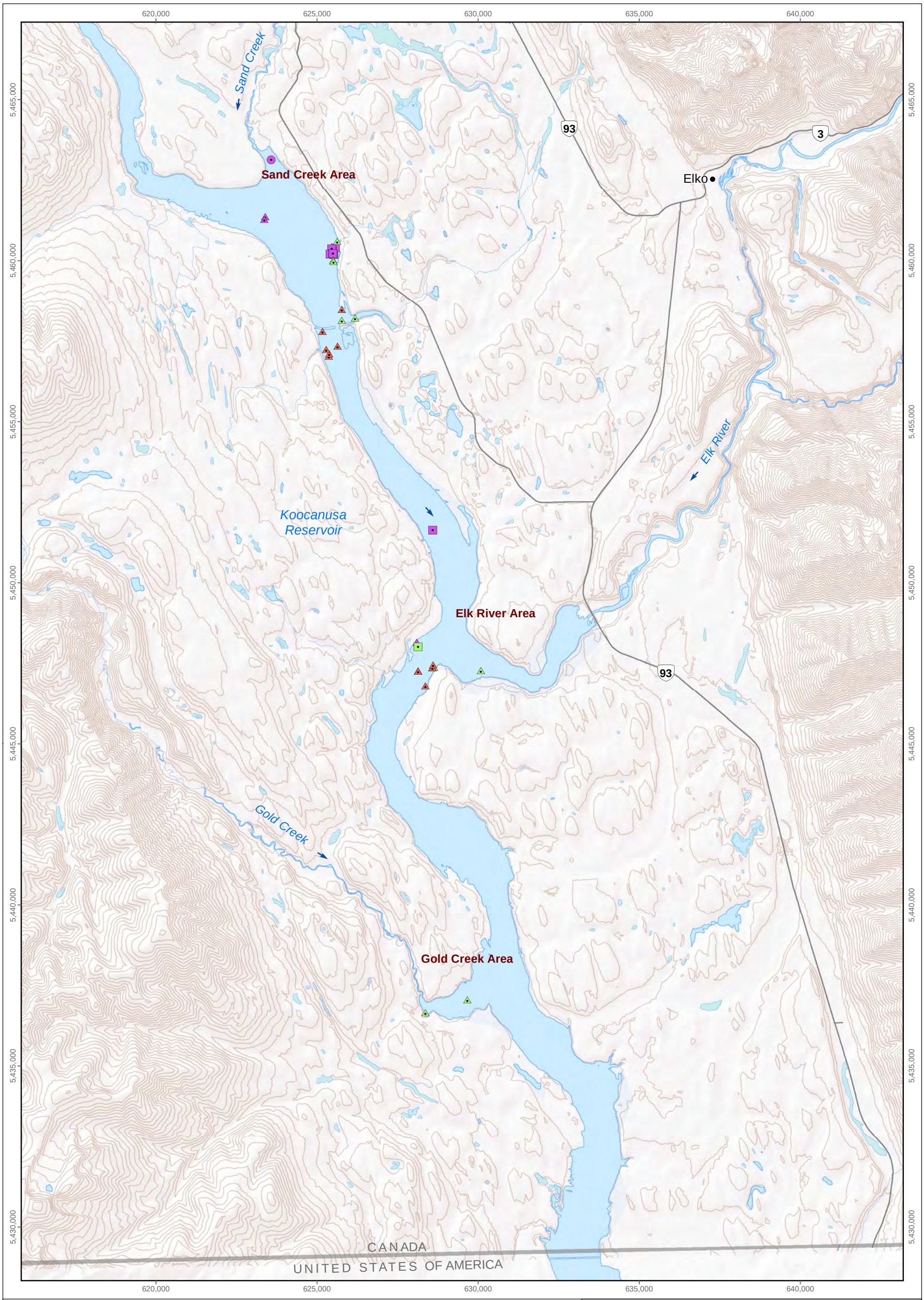
7.3 Fish Health and Population Assessment

7.3.1 Largescale Sucker

7.3.1.1 General Biology

Largescale suckers spawn in the spring over a variety of substrate types at lake inlets and outlets (McEvoy 1998). Although some individuals may migrate in excess of 100 km during the spawning period and return to within 0.2 km of their original home range following spawning, other individuals may not migrate far to spawn (McEvoy 1998). Largescale sucker eggs typically hatch within 14 days and fry generally remain closely associated with the substrate for the first few weeks until the yolk sac is absorbed and the mouth becomes terminal, at which point they become pelagic (Scott and Crossman 1998). Growth of fry is slow, and as fish grow larger, fry move toward the bottom and into deeper water. Adult largescale sucker inhabit large rivers and lakes, and are usually found at a depth of a few meters in weedy shore areas of

[12] Hoop netting with a lead could not be effectively used in February because the reservoir was frozen (as in 2014) or there were ice flows that entangled gear (as in 2015).



Burbot

- Winter
- Spring
- Summer
- Winter
- Spring
- Spring

Seasonal Burbot Collection in Koocanusa Reservoir, 2014 to 2016

0 2 4 8
km

N
W E
S

Projection: North American Datum 1983 UTM Zone 11

Date: January 2018
Project 167202.0049

minnow environmental inc.

Figure 7.1

Document Path: S:\Projects\167202\167202.0049 - Teck Koocanusa 2016\GIS Mapping\2014-2016Report\16-49 Fig 7.1 Burbot Collection.mxd

lakes, in backwaters, and at stream mouths (Scott and Crossman 1998). Outside of spawning migration, largescale suckers do not move significantly during the summer, fall, or winter, and in river environments, often reside within one pool-riffle sequence with net upstream-downstream movement limited to 200 to 300 m (McEvoy 1998). Adult largescale sucker feed almost exclusively on benthic-dwelling invertebrates, including ostracods, copepods, amphipods, Trichoptera (caddisflies), Chironomidae (midges) and molluscs (Scott and Crossman 1998). Following the spawning of various salmonids, largescale sucker are also known to feed on fish eggs deposited on bottom substrates (Scott and Crossman 1998).

7.3.1.2 Health Assessment

The largescale sucker health assessment was only conducted on females collected in 2015 and 2016 and males in 2016 (i.e., sample size for males in 2015 was too small [n = 1, 5, and 5 for Sand Creek, Elk River, and Gold Creek, respectively; Appendix Table F.23 and Figures F.1, F.2, and F.11]). Male and female largescale sucker captured among the three study areas ranged in age from 7 to 18 years (Figure 7.2 and 7.3). Mean age of female and male largescale sucker did not differ significantly between study areas located downstream versus upstream of the Elk River (Table 7.2). In addition, there were no consistent downstream to upstream differences between years or sexes for endpoints indicative of largescale sucker growth (size relative to age), energy storage (body weight relative to length, liver weight relative to body weight), or reproduction (gonad size relative to body size) (Table 7.3). Males sampled at both downstream areas in 2016 showed a similar pattern of reduced condition among small individuals and increased condition among larger individuals; but the magnitudes of difference at the Elk River area were less than the CES of 10%, and smaller than observed at the Gold Creek area. Internal body cavity tapeworms were the most common abnormality observed in all fish species during the fish health assessment (Table 7.4; Appendix Tables F.45 to F.47). No tapeworms were observed in largescale suckers captured at the Elk River study area, whereas approximately 8% and 3% of largescale suckers from the Gold Creek and Sand Creek study areas, respectively contained tapeworms (Table 7.4; Appendix Tables F.23 and F.24).

7.3.2 Northern Pikeminnow

7.3.2.1 General Biology

Northern pikeminnow spawn from late May to early August, often congregating in large numbers to spawn on gravelly lake shallows either along the shoreline or near a tributary (Scott and Crossman 1998; Gadomski et al. 2001; Gray and Dauble 2001). They reach maturity between 4 (males) and 5 (females) years (around a 300 mm length), and exhibit multiple spawning episodes within the spawning season (Scott and Crossman 1998). Eggs hatch in approximately

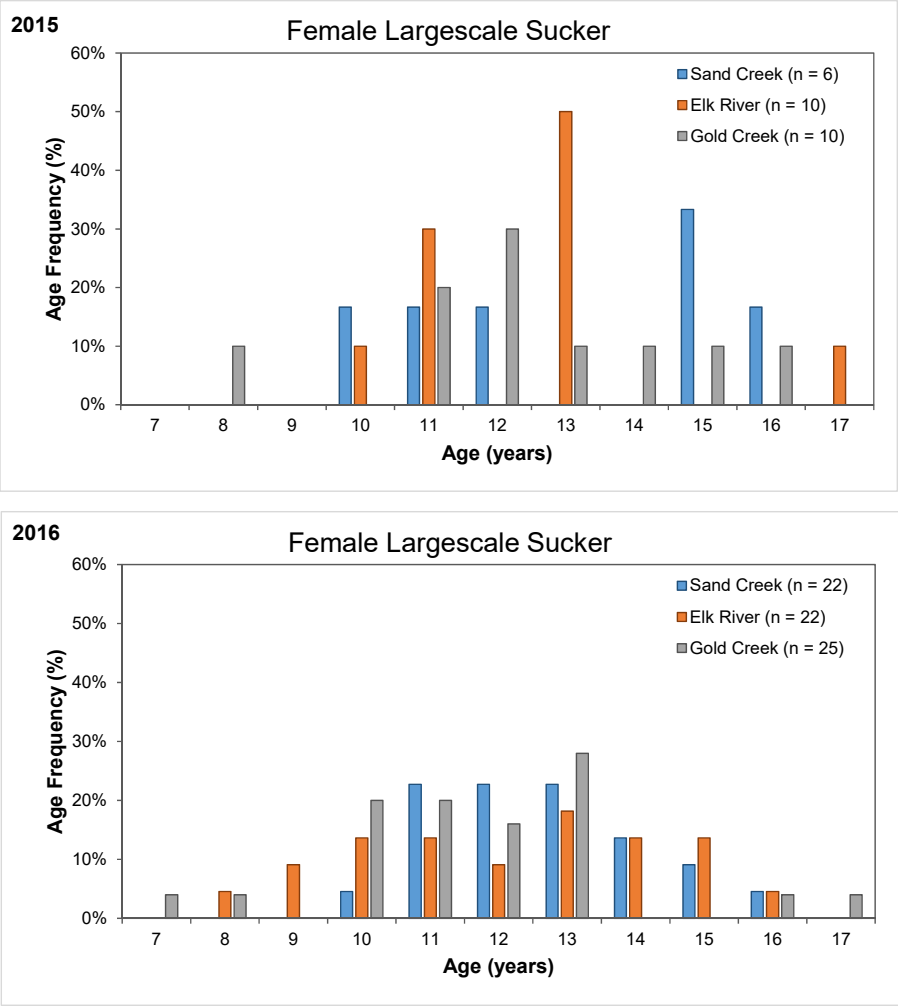


Figure 7.2: Relative Age Distribution of Female Largescale Sucker in Koocanusa Reservoir, April 2015, and 2016

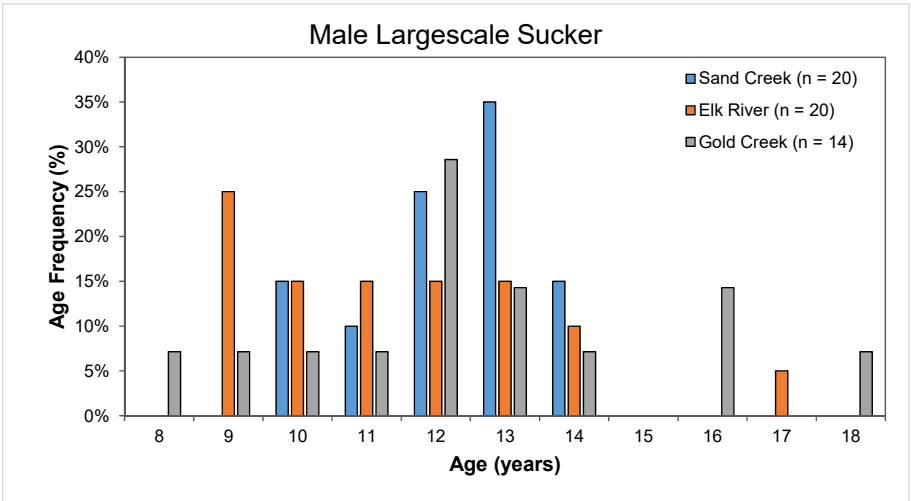


Figure 7.3: Relative Age Distribution of Male Largescale Sucker in Koocanusa Reservoir, April 2016

7 days, with the young fish generally remaining inshore in the summer and moving offshore in the fall and winter. Larger individuals reside predominately in lakes and tend to remain offshore (Gray and Dauble 2001; Scott and Crossman 1998). Northern pikeminnow feed predominately on small fish (shiners, stickleback), terrestrial insects and plankton in the summer, and during fall and winter diet generally shifts to fish in the offshore areas (Scott and Crossman 1998). In Koocanusa Reservoir, northern pikeminnow appear to be opportunistic feeders, consuming a variety of organisms, but primarily relying upon fish (Lotic 2017). Seven different species of fish were consumed by northern pikeminnow in the reservoir, with kokanee and peamouth chub being most common (Lotic 2017).

7.3.2.2 Health Assessment

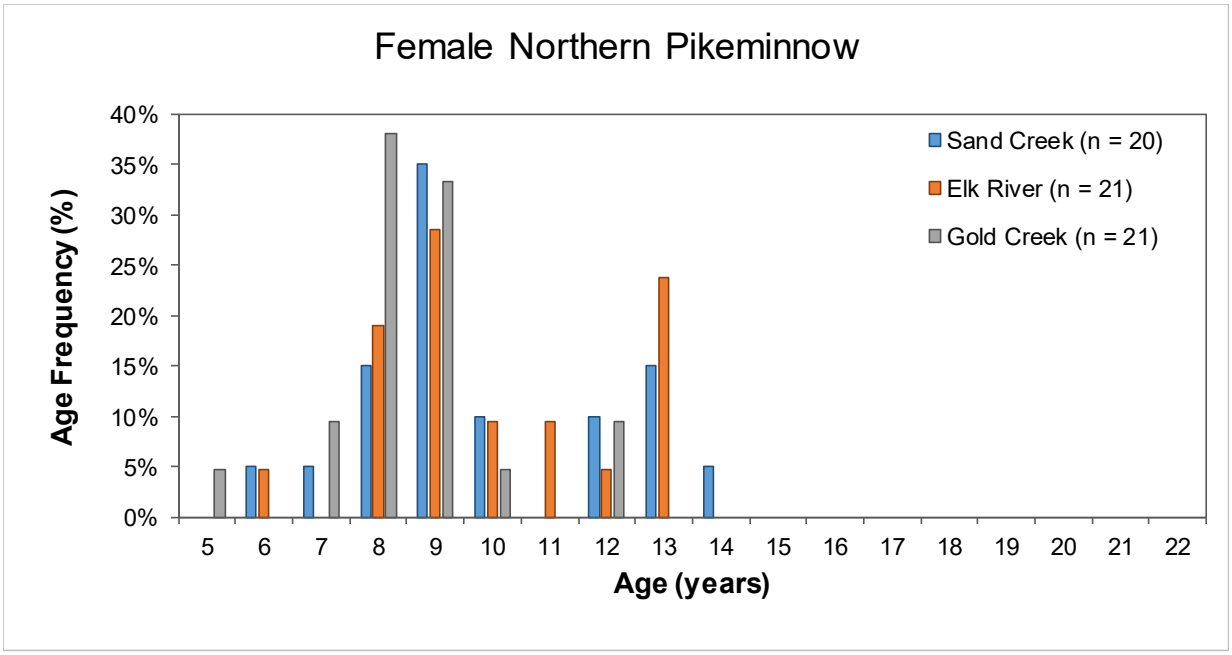
Female northern pikeminnow captured in Koocanusa Reservoir ranged in age from 5 to 22 years and male northern pikeminnow generally ranged in age from 6 to 16 years (with two individuals documented at 25 and 26 years of age[13]; Figures 7.4 and 7.5; Appendix Figures F.3, F.4, F.12, and F.13 and Table F.26). The large range in northern pikeminnow ages likely reflected the wide variety of fish collection methods used between the two years. No differences were observed between the downstream and upstream areas that would be indicative of influence from the Elk River (Tables 7.2 and 7.3). For example, most significant differences were associated with pikeminnow collected at the Gold Creek area compared to Sand Creek. Very few abnormalities were observed in northern pikeminnow, and no tapeworms were observed in any individuals collected in 2015 (Appendix Tables F.45 to F.47). Only 2%, 3% and 8% of individuals collected at the Elk River, Gold Creek and Sand Creek study areas, respectively, had tapeworms in 2016 (Table 7.4).

7.3.3 Peamouth Chub

7.3.3.1 General Biology

Peamouth chub spawn in large groups in late spring in the shallow shoreline habitat of lakes (Scott and Crossman 1998). Newly hatched young remain in schools along the shore and move into deeper water in late summer. Generally, peamouth chub inhabit the weedy shallows of lakes and rivers for most of the year where they tend to form schools (Scott and Crossman 1998), although adults appear to move offshore by mid-summer (Gray and Dauble 2001). Peamouth chub are mainly insectivorous, feeding on a wide variety of aquatic insects

[13]Confidence around ages (using otoliths) decreased beyond 17-19 years (zones) and ages provided are best estimates (Appendix H).



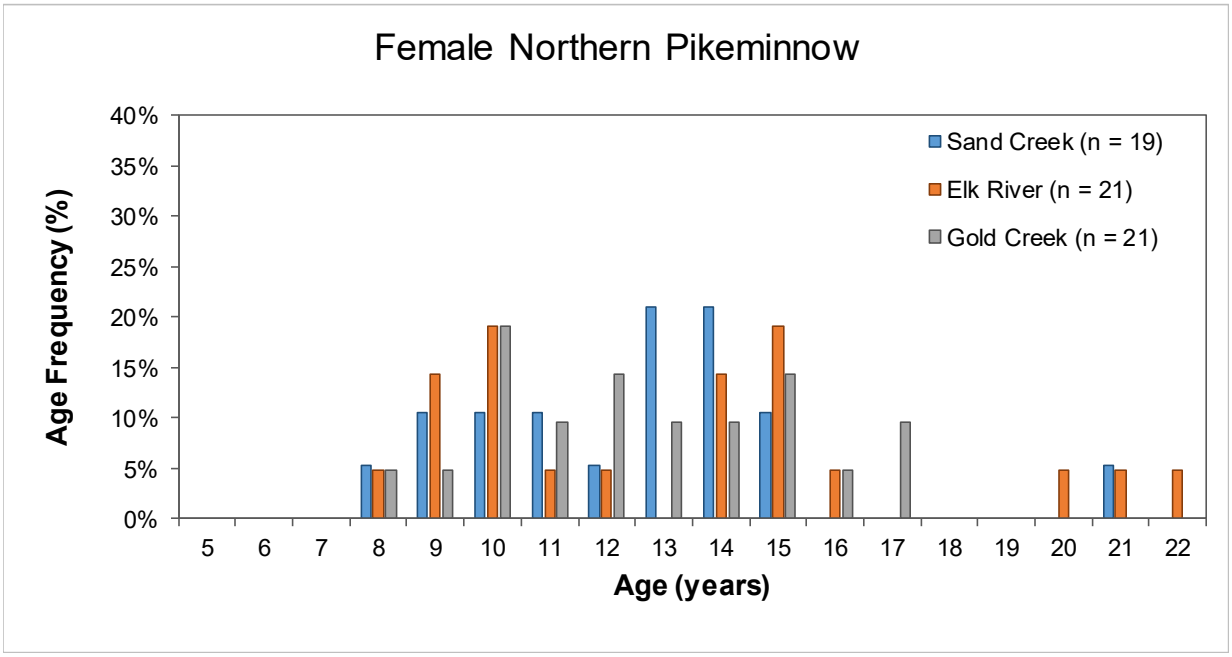
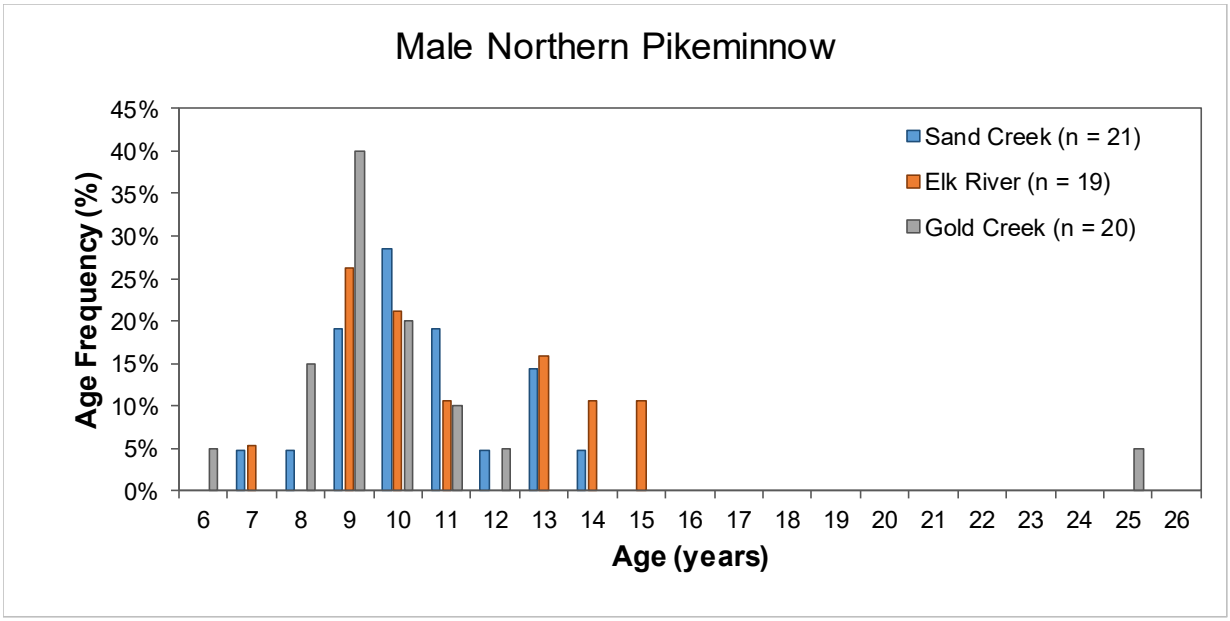


Figure 7.4: Relative Age Distribution of Female Northern Pikeminnow in Koocanusa Reservoir, April 2015 and 2016



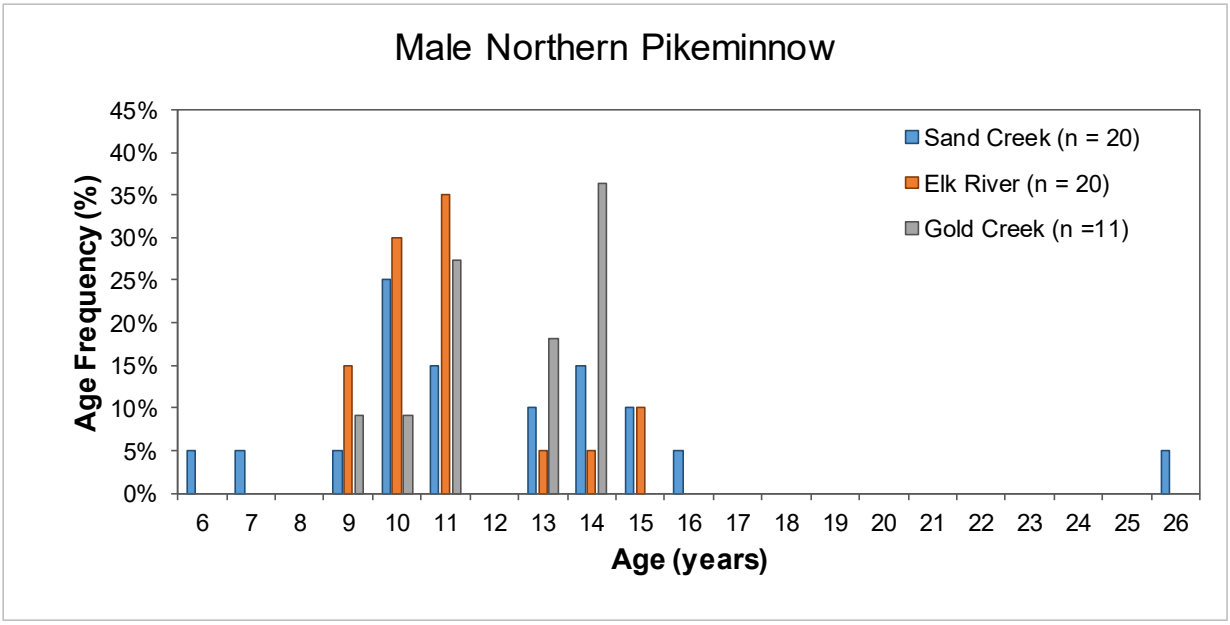


Figure 7.5: Relative Age Distribution of Male Northern Pikeminnow in Koocanusa Reservoir, April 2015 and 2016

Table 7.2: Statistical Summary of Spatial and Temporal Differences in Fish Age at the Downstream Areas (Elk River and Gold Creek) Compared to the Upstream Area (Sand Creek) in Koocanusa Reservoir using a Two-way ANOVA (at Least Two Years of Data) or ANOVA/Kruskal-Wallis Test (One Year of Data), 2014, 2015 and/or 2016

Fish Species	Sex	Response	Trans-formation or Test[a]	Measure of Central Tendency (Mean, Geometric Mean, or Median)[b]									Model P-values			Contrasts									Significant Differences and Magnitude of Differences (% Difference in Measure of Central Tendency Relative to Refererence)					
				2014			2015			2016						Area		Area×Year						Area×Year					
				Elk River	Gold Creek	Sand Creek	Elk River	Gold Creek	Sand Creek	Elk River	Gold Creek	Sand Creek	Area×Year	Area	Year	Elk River vs Sand Creek	Gold Creek vs Sand Creek	Elk River vs Sand Creek			Gold Creek vs Sand Creek			Elk River vs Sand Creek			Gold Creek vs Sand Creek		
																		2014	2015	2016	2014	2015	2016	2014	2015	2016	2014	2015	2016
Largescale Sucker	F	Age	none	NA			12.5	12.4	13.2	12.2	12.0	12.6	0.983	0.478	0.404	-	-	NA	-		NA	-		NA	-		NA	-	
	M	Age	K-W	NA			NA			11.0	12.5	12.5	NA	0.197	NA	-	-	NA							NA		-	NA		-
Northern Pikeminnow	F	Age	log	NA			9.8	8.4	9.6	12.7	12.3	12.3	0.354	0.173	<0.001	-	-	NA	-		NA	-		NA	-		NA	-	
	M	Age	rank	NA			10	9	10	11	13	11	0.027	-	-	-	-	NA	0.459	0.437	NA	0.055	0.490	NA	-	-	NA	* (-10%)	-
Peamouth Chub	F	Age	log	13.7	8.6	9.6	13.3	12.4	11.8	7.9	6.3	9.5	0.002	-	-	-	-	0.003	0.364	0.364	0.369	0.701	<0.001	* (43%)	-	-	-	-	* (-34%)
	M	Age	log	7.6	6.2	5.8	7.4	6.7	7.7	6.0	4.7	6.1	0.201	0.013	<0.001	0.268	0.101	-			-			-			-		
Redside Shiner	F	Age	K-W	NA			NA			3	3	3	NA	0.820	NA	-	-	NA							NA		-	NA		-
	M	Age	K-W	NA			NA			3	3	3	NA	0.276	NA	-	-	NA							NA		-	NA		-
Yellow Perch	F	Age	rank	NA			3	4	2.5	3	3	3	0.084	-	-	-	-	NA	0.006	0.546	NA	0.002	0.498	NA	* (20%)	-	NA	* (60%)	-
	M	Age	rank	NA			2	2	2	3	3	3	0.632	0.011	<0.001	0.001	0.064	NA	-		NA	-		NA	* (-33%) [c]		NA	* (0%) [c]	

p-value < 0.1.

* indicates a significant difference between the two areas at an α of 0.1.

[a] Transformation reported for two-way ANOVA when more than one year of data were analyzed; Test (ANOVA or K-W = Kruskal-Wallis) reported for when one year of data was analyzed.

[b] The measure of central tendancy reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for log_{10}-transformation; and, median for rank-transformation.

[c] The significant p-value is based on the average rank and the % difference is based on medians for the 2015 and 2016 population as a whole.

NA = not applicable as no data were collected for this species/sex in the given year.

Table 7.3: Statistical Summary of Spatial and Temporal Differences in Fish Morphometric Endpoints at the Downstream Areas (Elk River and Gold Creek) Compared to the Upstream Area (Sand Creek) in Koocanusa Reservoir, 2014, 2015, and/or 2016

Fish Species	Sex	Response	Covariate (Cov)	Elk River Area in Comparison to Sand Creek Area								Gold Creek Area in Comparison to Sand Creek Area							
				Significant Interactions[a]		Area P-value (Parallel Slope Model with No Interaction)	Area Comparisons[b]					Significant Interactions[a]		Area P-value (Parallel Slope Model with No Interaction)	Area Comparisons[b]				
				Term	P-value		2014		2015		2016	Term	P-value		2014		2015		2016	
							Min Cov[c]	Max Cov[c]	Min Cov[c]	Max Cov[c]	Min Cov[c]	Max Cov[c]				Min Cov[c]	Max Cov[c]	Min Cov[c]	Max Cov[c]	Min Cov[c]	Max Cov[c]
Largescale Sucker	F	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	Cov×Area×Year	<0.001	-			NA[f]			Cov×Area×Year	<0.001	-			NA[f]			
	F	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	-	-	0.550			-			Area×Year	<0.001	-			* (-22%)		* (49%)	
	F	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	Area×Year	0.040	-			* (-4.5%)		* (6%)	Cov×Area	0.023	-			-		* (12%)	
	F	log_{10}(Fork Length)	log_{10}(Age)	-	-	0.653			-			-	-	0.249			-			
	F	log_{10}(Adjusted Body Weight)	log_{10}(Age)	-	-	0.648			-			Area×Year	0.018	-			* (-6.8%)		* (22%)	
	M	Gonad Weight	-[g]	-	-	0.833					-	-	-	0.706					-	
	M	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	-	-	0.463					-	-	-	0.463					-	
	M	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	Cov×Area	0.010	-					* (-4.2%) | * (8.9%)	Cov×Area	0.010	-					* (-1.1%) | * (23%)	
	M	log_{10}(Fork Length)	log_{10}(Age)	-	-	0.464					-	-	-	0.221					-	
	M	log_{10}(Adjusted Body Weight)	log_{10}(Age)	Cov×Area	0.002	-					* (-6.7%) | * (3.0%)	Cov×Area	0.002	-					* (4.4%) | * (38%)	
Northern Pikeminnow	F	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	Cov×Year	<0.001	-			-		-	Cov×Year	<0.001	-			-		-	
	F	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	Cov×Year	<0.001	-			-		-	Cov×Area×Year	0.007	-			* (80%) | * (-52%)		-	
	F	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	-	-	0.165			-			-	-	0.002			* (-4.9%)			
	F	log_{10}(Fork Length)	log_{10}(Age)	Cov×Year	0.020	-			* (-6.9%)		-	Cov×Year	0.010	-			-		* (8.7%)	
	F	log_{10}(Adjusted Body Weight)	log_{10}(Age)	Cov×Year	0.011	-			-		-	Cov×Year	0.023	-			-		-	
	M	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	Cov×Year	<0.001	-			-		-	Cov×Area×Year	0.001	-			-		-	
	M	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	-	-	0.608			-			-	-	<0.001			* (-31%)			
	M	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	Cov×Area×Year	0.040	-			-		-	-	-	0.064			-			
	M	log_{10}(Fork Length)	log_{10}(Age)	Cov×Area×Year	0.005	-			-		* (5.5%) | * (-6.9%)	-	-	0.013			* (4.8%)			
	M	log_{10}(Adjusted Body Weight)	log_{10}(Age)	Cov×Year	0.050	-			-		-	-	-	0.039			* (13%)			
Peamouth Chub	F	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	-	-	0.965			-			Area×Year	0.015	-	* (17%)		* (-17%)		* (6.5%)	
	F	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	Cov×Area	0.042	-	-		-		* (25%)	Cov×Area	0.022	-	* (18%)		* (-17%)		* (34%)	
	F	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	-	-	0.748			-			-	-	0.006			* (-3.2%)			
	F	log_{10}(Fork Length)	log_{10}(Age)	Area×Year	0.040	-	* (3.6%)		* (0.43%)		* (-1.9%)	Cov×Area×Year	<0.001	-	-		-		* (-11%)	* (7.2%)
	F	log_{10}(Adjusted Body Weight)	log_{10}(Age)	-	-	0.777			-			Cov×Area×Year	<0.001	-	-		-		* (-32%)	* (20%)
	M	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	Cov×Year	0.045	-	-		-		-	Cov×Year	0.009	-	* (15%)[d]	* (-2.2%)[d]	-		-	
	M	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	Cov×Year	0.023	-	-		-		-	-	-	0.801			-			
	M	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	Cov×Area	0.038	-	-		-		-	-	-	0.006			* (-4.4%)			
	M	log_{10}(Fork Length)	log_{10}(Age)	Area×Year	0.007	-	* (9.3%)		* (-4.7%)		* (3.2%)	Cov×Year	0.001	-	* (10%)		-		-	
	M	log_{10}(Adjusted Body Weight)	log_{10}(Age)	Cov×Area×Year	0.047	-	-		* (-34%)	* (4.3%)	-	Cov×Year	0.012	-	* (30%)		-		* (-23%)	
Redside Shiner	F	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	-	-	0.515					-	-	-	0.515					-	
	F	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	-	-	0.001					* (67%)	-	-	0.004					* (35%)	
	F	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	-	-	0.572					-	-	-	0.572					-	
	F	Fork Length	-[h]	-	-	0.240					-	-	-	0.240					-	
	F	Adjusted Body Weight	-[h]	-	-	0.215					-	-	-	0.215					-	
	M	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	-	-	0.519					-	-	-	0.519					-	
	M	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	-	-	0.183					-	-	-	0.049					* (26%)	
	M	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	-	-	0.031					* (-5.7%)	-	-	0.998					-	
	M	Fork Length	-[h]	-	-	0.111					-	-	-	0.111					-	
	M	Adjusted Body Weight	-[h]	-	-	0.310					-	-	-	0.310					-	
Yellow Perch	F	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	Area×Year	0.046	-			NA[e]		* (3.4%)	Cov×Year	0.036	-			NA[e]		-	
	F	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	-	-	0.134			-			-	-	0.007			* (15%)			
	F	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	-	-	0.268			-			-	-	0.033			* (-5.2%)			
	M	log_{10}(Gonad Weight)	log_{10}(Adjusted Body Weight)	-	-	0.466[d]			-			-	-	0.919[d]			-			
	M	log_{10}(Liver Weight)	log_{10}(Adjusted Body Weight)	Cov×Area	0.029	-[d]			-		-	-	-	0.357[d]			-			
	M	log_{10}(Adjusted Body Weight)	log_{10}(Fork Length)	-	-	0.124[d]			-			-	-	0.702[d]			-			

[a] Significance of interaction terms assessed using $\alpha = 0.05$.
[b] Significance of Area comparisons assessed using $\alpha = 0.1$.
[c] Comparison of magnitude of difference conducted at the minimum and maximum values of the range of overlap of covariate values between areas when the regression slopes between areas within a year were not parallel.
[d] There is little or no overlap in covariate values. Results should be interpreted with caution.
[e] NA = Not analyzed; insuffient sample size (n = 3 for Sand Creek).
[f] NA = Not analyzed; few fish had developping gonads (the majority of fish had GSI < 1%; see Figure F.8 in Appendix F).
[g] Conducted as a t-test because the covariate was not significant in the ANCOVA model.
[h] Conducted as an ANOVA on age 3 fish.
* Indicates significant difference (α=0.1) between areas (or a significant difference in regression slopes when a magnitude of difference is reported for the Min Cov and Max Cov).
p-value < α

Table 7.4: Summary of Body Cavity Tapeworms at Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, 2014 to 2016

Fish Species (Collection Month)	Study Area	Parasites (body cavity tapeworm)			
		2014	2015	2016	Mean Annual
Largescale Sucker (April)	Sand Creek	-	0%	6.3%	3.1%
	Elk River	-	0%	0%	0%
	Gold Creek	-	0%	16%	8.0%
Northern Pikeminnow (April)	Sand Creek	-	0%	7.7%	3.8%
	Elk River	-	0%	2.4%	1.2%
	Gold Creek	-	0%	3.1%	1.6%
Peamouth Chub (April)	Sand Creek	19%	10%	38%	22%
	Elk River	9.1%	1.9%	23%	11%
	Gold Creek	35%	5.3%	23%	21%
Redside Shiner (April)	Sand Creek	-	11%	30%	21%
	Elk River	-	46%	38%	42%
	Gold Creek	-	83%	37%	60%
Yellow Perch (April)	Sand Creek	-	0.038%	2.9%	1.5%
	Elk River	-	3.0%	20%	12%
	Gold Creek	-	2.9%	7.1%	5.0%
All Other Fish Species (February, April, August)	Sand Creek	0%	0%	0%	0%
	Elk River[a]	0%	0%	0%	0%
	Gold Creek[b]	1.6%	0%	0%	0.53%

[a] Includes fish caught from the Oestreich Road sampling location in February 2014.
[b] Includes fish caught from the Englishman Creek sampling location in February 2014.

and larvae as well as terrestrial insects (Scott and Crossman 1998). In Koocanusa Reservoir, peamouth chub fed mainly on aquatic insects (i.e. Diptera larvae and pupae) and zooplankton (e.g., *Daphnia* spp.), with terrestrial insects constituting a smaller, but important, portion of prey items (Lotic 2017).

7.3.3.2 Health Assessment

Female peamouth chub ranged in age from 3 to 27 years, whereas males ranged from 3 to 14 years over the 2014 to 2016 sampling program (Figures 7.6 and 7.7; Appendix Figures F.5, F.6, F.14, and F.15 and Table F.28). There were no differences in mean age (Table 7.2) or differences among the other endpoints (Table 7.3) that could be considered indicative of influence from the Elk River. For example, lower condition among females (3.2%) and males (4.4%) captured at Gold Creek compared to Sand Creek was not observed at the Elk River sampling area compared to Sand Creek. Peamouth chub showed a relatively high incidence of tapeworms at all study areas, ranging from 2% to 38% of individuals within a study area from 2014 to 2016 (Table 7.4). Peamouth chub gonad development appeared to be inhibited by the presence of tapeworms, which is consistent with typical responses of cyprinids shown in the literature (Carter et al. 2005).

7.3.4 Redside Shiner

7.3.4.1 General Biology

Redside shiners generally spawn between May and July in groups of 30 to 40 fish, both in streams and in lakes when water temperatures reach approximately 10°C, and show a strong affinity for natal spawning grounds (Scott and Crossman 1998). Eggs tend to hatch 3 to 15 days post-spawning, depending on water temperature. Redside shiners usually reach sexual maturity by their third year. They occur in schools of thousands in large lakes, ponds, and moderately fast-moving streams, tolerating a wide variety of temperatures and trophic conditions. In lakes, smaller individuals tend to remain in the upper water column and/or close to shore. Other than during spawning migration, redside shiners exhibit very little directed movement aside from movements on and off shoals in lake environments related to changes in water temperature (Scott and Crossman 1998). Redside shiner fry feed mainly on plankton and demersal crustaceans while larger fish are mainly insectivorous, but feed on fish eggs opportunistically. Egg predation by redside shiners can have large influences on trout populations in cases where accidental releases have occurred to lakes previously utilized solely by trout (Scott and Crossman 1998).

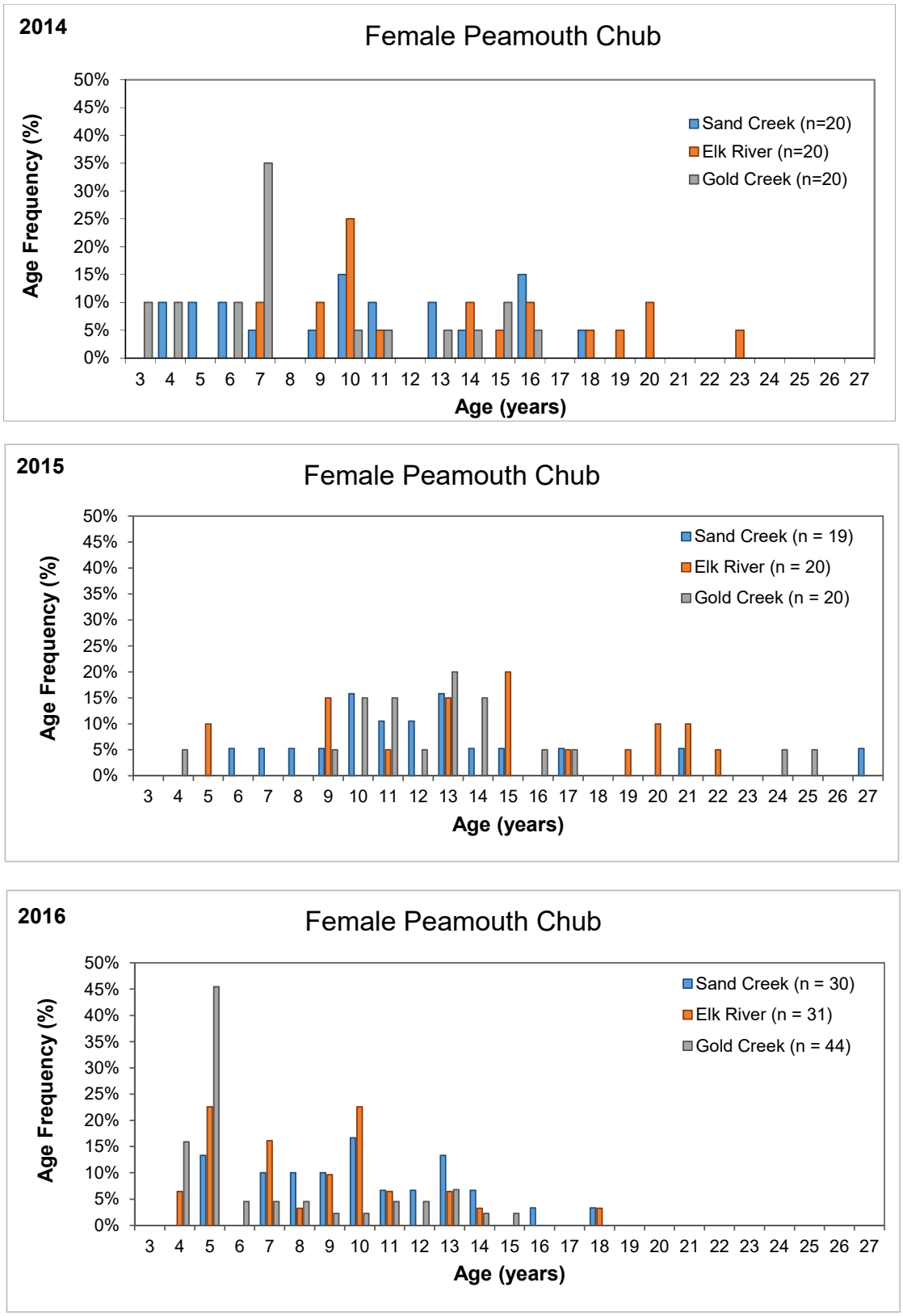
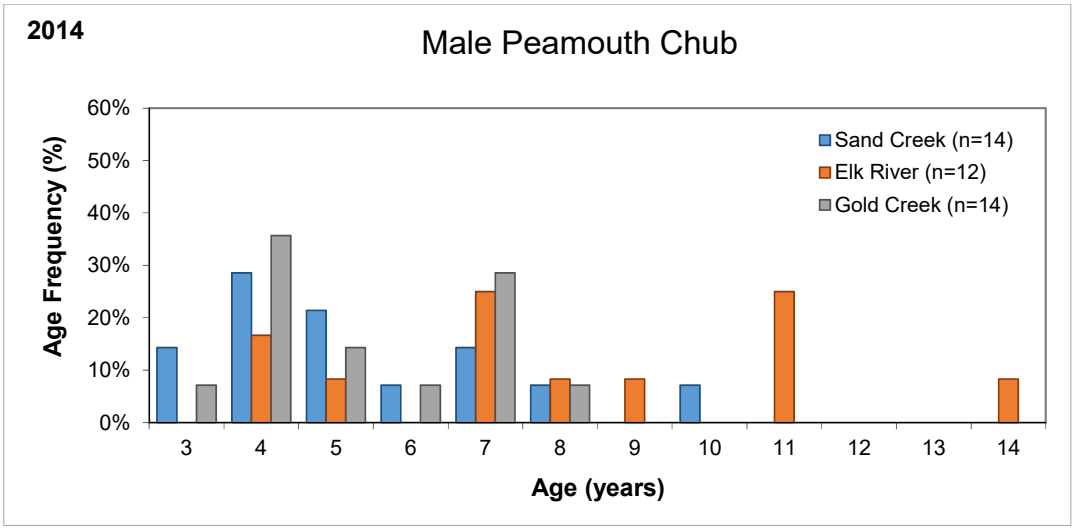
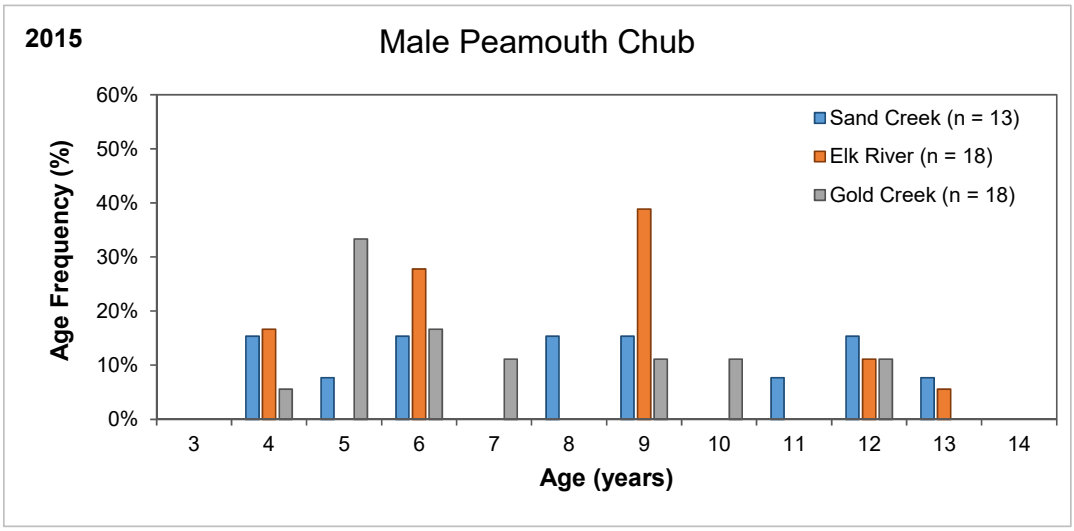


Figure 7.6: Relative Age Distribution of Female Peamouth Chub in Koocanusa Reservoir, 2014 to 2016





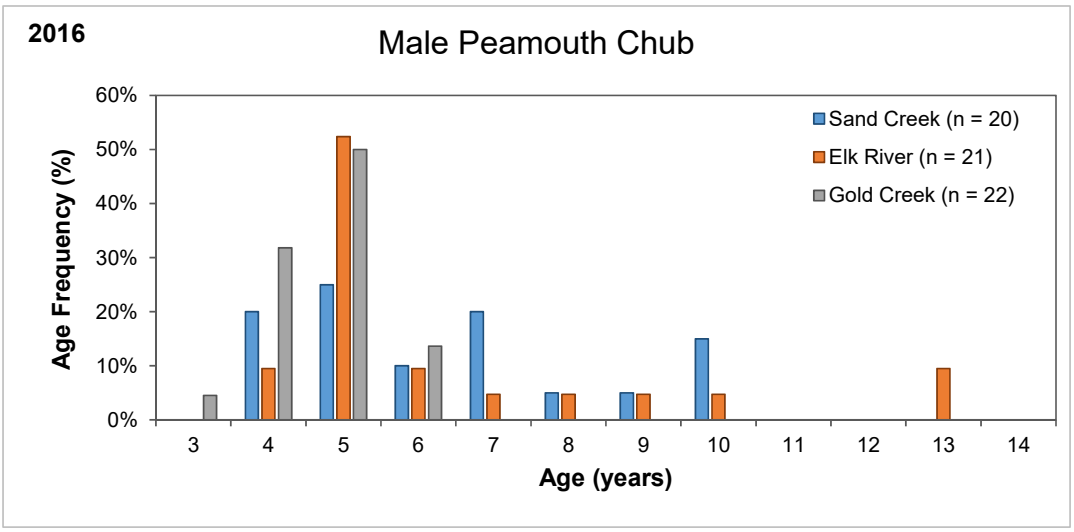


Figure 7.7: Relative Age Distribution of Male Peamouth Chub in Koocanusa Reservoir, 2014 to 2016

7.3.4.2 Health Assessment

Redside shiner health were only assessed in 2016 due to limited sample sizes of fish with sufficient gonad development to determine sex in 2015 (Appendix Table F.31 and Figures F.7 and F.8). Overall catch yields were greater in 2016 when gill nets were permitted for use (Appendix Tables F.40 to F.44), but a large proportion of individuals in both years had unripe gonads (Appendix Table F.31). Lack of gonad development may have been related to the high proportion (21 to 60%) of tapeworms infections in this species, particularly at the downstream areas (42 to 60%; Table 7.4). The tapeworm *Ligula intestinalis* has been shown to inhibit gonad development in various cyprinid species (Carter et al. 2005). Female redside shiners ranged in age from 3 to 5 years, whereas males ranged from 2 to 4 years in 2016 (Figure 7.8). Liver sizes of female redside shiner were greater at both downstream areas than at Sand Creek, but males showed a difference in liver size only at the Gold Creek area (Table 7.3). Other than greater liver weight at the Gold Creek area compared to Sand Creek, no other differences in endpoints were observed for redside shiner between the downstream and upstream areas in 2016.

7.3.5 Yellow Perch

7.3.5.1 General Biology

As a result of their commercial and recreational importance, a considerable amount of information is available regarding various aspects of the life history of the yellow perch (Scott and Crossman 1998). In lakes and large rivers, adult yellow perch migrate towards the shore, or into tributaries, to spawn. Spawning usually takes place at night and early morning, often near or on rooted vegetation and/or woody debris. Eggs usually hatch within 8 to 10 days of spawning, and juveniles grow relatively rapidly, with sexual maturity usually reached by age 3 in males and age 4 in females (Scott and Crossman 1998). Yellow perch exploit a wide variety of warm to cool water habitats from large lakes to ponds and quiet rivers, although they are typically most abundant in the open waters of lakes. Young-of-the-year yellow perch are often seen in large compact schools, while adults are often found moving in a loose aggregation of 50 to 500 individuals. They are considered shallow water fish, not typically found below 9 m, but exhibit a seasonal vertical movement in order to maintain a roughly 20°C isotherm (Scott and Crossman 1998). Studies in the Great Lakes have suggested that during the summer months, yellow perch movement is relatively limited, but that during cooler months, greater distances may be travelled (Glover et al. 2008). Although some studies suggest that yellow perch may travel from 13 km to over 100 km through the year, tagging studies generally indicate a high degree of site fidelity and most often travel is limited to the lower end of this range (Glover et al. 2008). Minns (1995) characterized the home range size for yellow perch to be

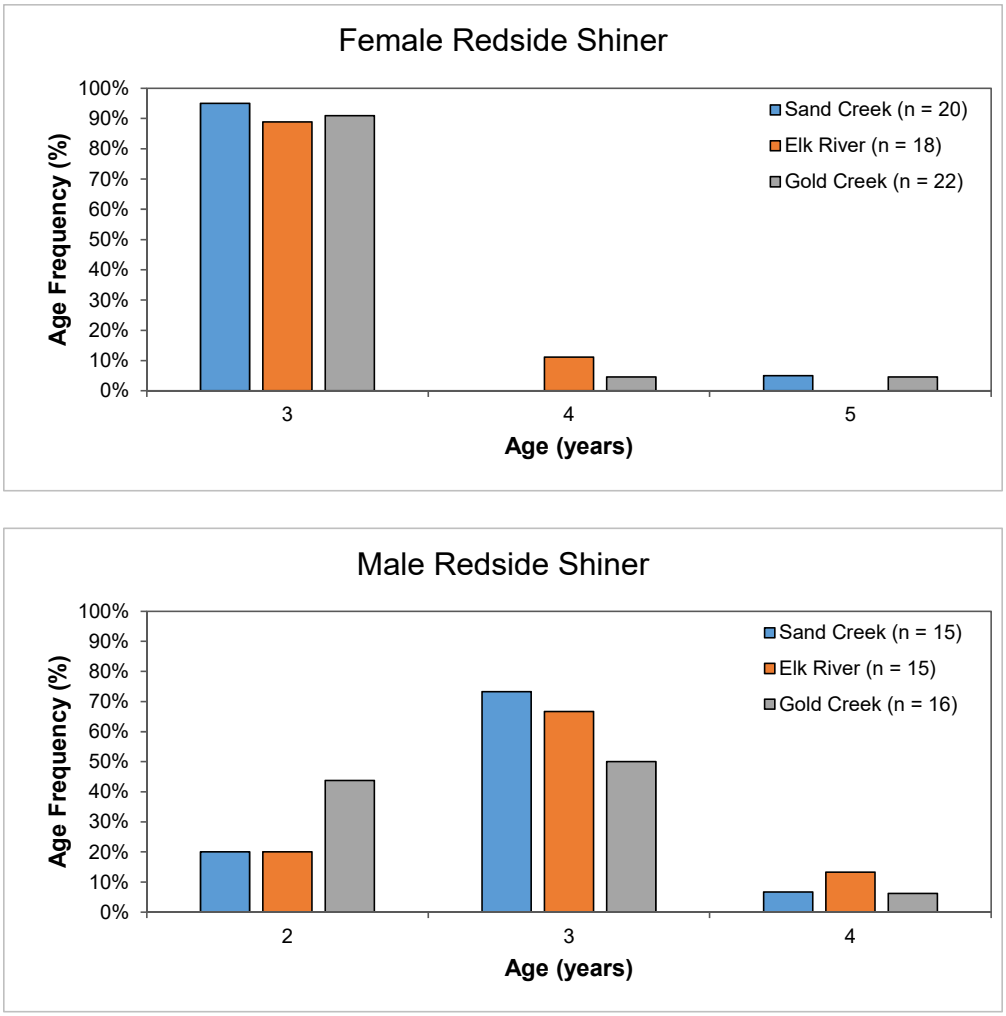


Figure 7.8: Relative Age Distribution of Male and Female Redside Shiner in Koocanusa Reservoir, April 2016

relatively small, from approximately 0.007 to 0.011 km^2. The diet of yellow perch largely consists of immature insects, larger invertebrates, and fishes taken from both the open water and the substrate. In Koocanusa Reservoir, yellow perch relied heavily on aquatic insects (mainly Diptera spp. larvae) with redside shiner comprising the remainder of the diet, although the sample size supporting these observations was small (six; Lotic 2017).

7.3.5.2 Health Assessment

Female and male yellow perch ranged from 2 to 8 years of age in 2015 and 2016 (Figures 7.9 and 7.10; Appendix Figures F.9, F.10, F.16, and F.17 and Table F.35). No consistent significant differences were found between the downstream study areas and the Sand Creek study area to indicate influence from the Elk River (Tables 7.2 and 7.3). Yellow perch abnormalities, including

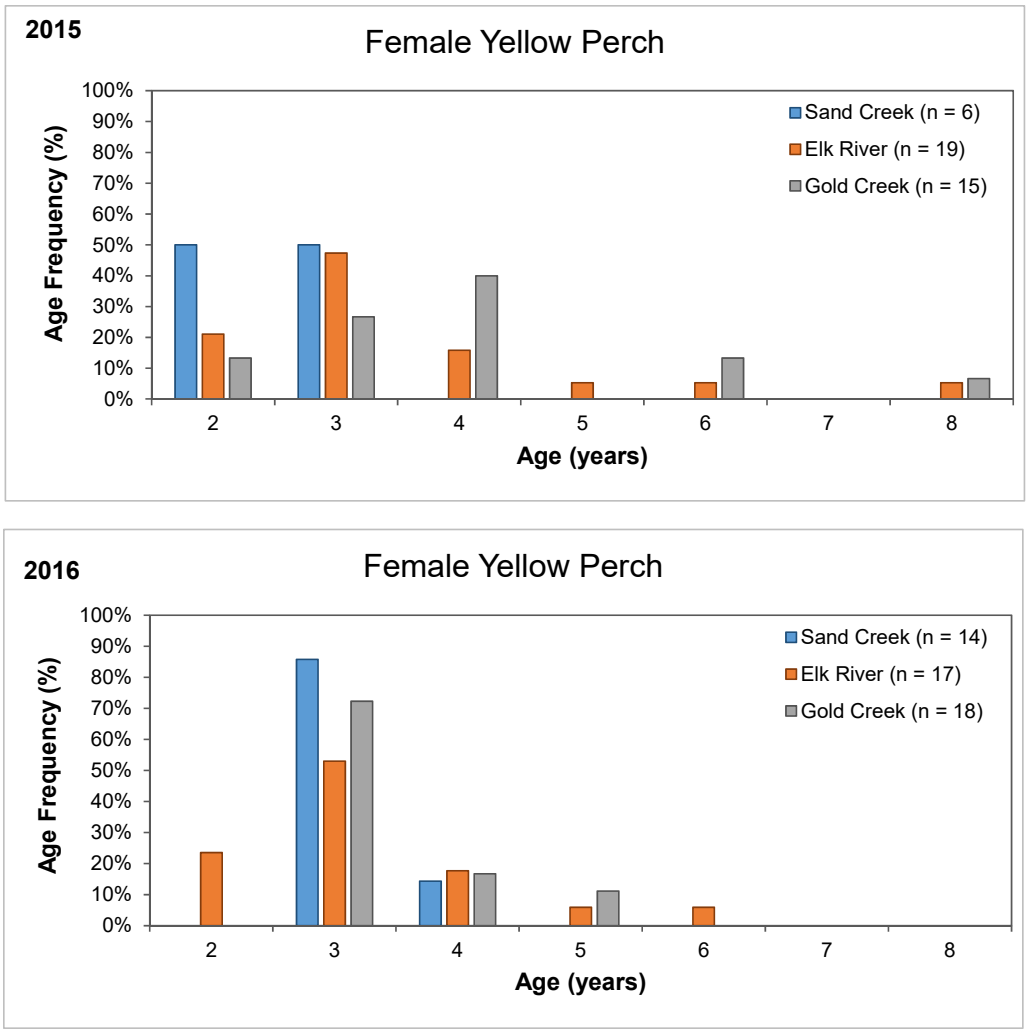


Figure 7.9: Relative Age Distribution of Female Yellow Perch in Koocanusa Reservoir, April 2015 and 2016

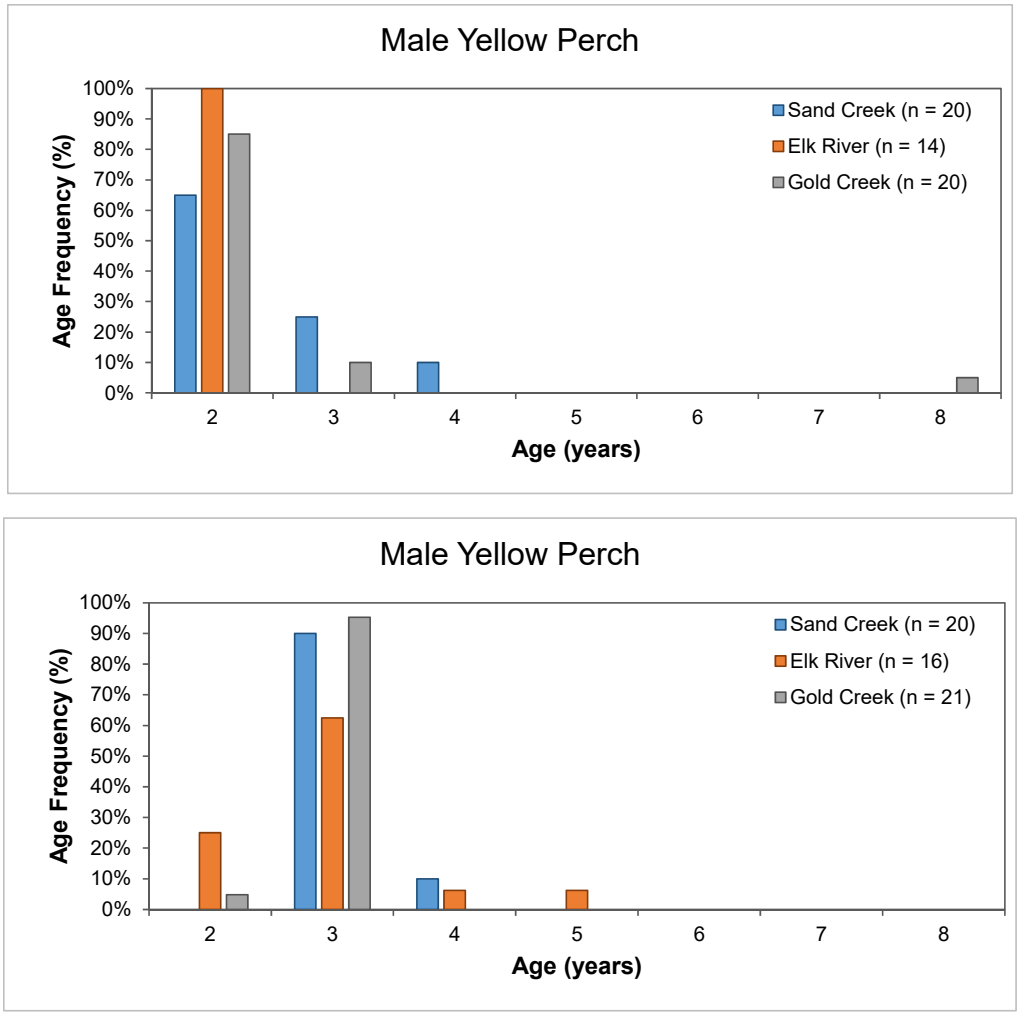


Figure 7.10: Relative Age Distribution of Male Yellow Perch in Koocanusa Reservoir, April 2015 and 2016

the incidence of internal tapeworms, were comparable among all three study areas in 2015 (i.e., ≤ 3%), but were more prevalent at the Elk River and Gold Creek study areas (20% and 7% of total individuals, respectively) in 2016 (Table 7.4 and Appendix Tables F.45 to F.47).

7.4 Tissue Selenium Concentrations

7.4.1 Muscle

Muscle selenium concentrations in largescale sucker, peamouth chub, yellow perch, and redside shiner from the Elk River downstream area were consistently greater than those in fish from the upstream Sand Creek area (Table 7.5; Appendix Figures F.18 to F.28). Selenium concentrations in northern pikeminnow muscle were also greater at the Elk River area compared to Sand Creek in 2014 and 2015, but were lower than at Sand Creek in 2016

Table 7.5: **Statistical Summary of Spatial and Temporal Differences in Fish Tissue Selenium Concentrations at the Downstream Areas (Elk River and Gold Creek) Compared to the Upstream Area (Sand Creek) in Koocanusa Reservoir using a Two-way ANOVA (at Least Two Years of Data) or ANOVA/Kruskal-Wallis Test (One Year of Data), 2014, 2015 and/or 2016**

Fish Species	Tissue Type	Trans-formation	Measure of Central Tendency (Mean, Geometric Mean, or Median)[a]									Model P-values			Contrasts									Significant Differences and Magnitude of Differences (%)					
			2014			2015			2016						Area		Area×Year						Area×Year					
			Elk River	Gold Creek	Sand Creek	Elk River	Gold Creek	Sand Creek	Elk River	Gold Creek	Sand Creek	Area×Year	Area	Year	Elk River vs Sand Creek	Gold Creek vs Sand Creek	Elk River vs Sand Creek			Gold Creek vs Sand Creek			Elk River vs Sand Creek			Gold Creek vs Sand Creek		
																	2014	2015	2016	2014	2015	2016	2014	2015	2016	2014	2015	2016
Largescale Sucker	Muscle	none	5.8	3.5	2.1	4.9	3.1	2.2	4.8	1.9	3.6	0.283	<0.001	0.200	<0.001	0.732	-	-	-	-	-	-	* (139%)			-		
Northern Pikeminnow	Muscle	rank	5.0	2.2	1.7	2.8	2.3	2.4	1.6	1.8	1.8	<0.001	-	-	-	-	<0.001	0.001	0.001	0.015	0.946	0.356	* (187%)	* (16%)	* (-9.2%)	* (27%)	-	-
	Ovary	log	18	7.5	13	8.6	6.9	9.1	5.9	5.4	7.1	0.493	0.076	0.001	0.865	0.068	-	-	-	-	-	-	-			* (-28%)		
Peamouth Chub	Muscle	log	2.9	2.4	1.7	3.6	2.4	2.5	3.8	3.7	2.6	0.380	<0.001	<0.001	<0.001	0.022	-	-	-	-	-	-	* (51%)			* (26%)		
	Ovary	log	7.0	7.3	5.7	13	10	12	13	11	13	0.298	0.468	<0.001	-	-	-	-	-	-	-	-	-			-		
	Whole Body	none	1.8	2.3	1.6	3.4	2.6	2.9	3.2	3.1	2.5	0.238	0.142	<0.001	-	-	-	-	-	-	-	-	-			-		
Redside Shiner	Muscle	log	NA			2.4	1.8	1.8	2.7	2.2	1.6	0.376	0.001	0.440	<0.001	0.249	NA	-	-	NA	-	-	NA	* (51%)		NA	-	
	Ovary	log	NA			17	10	20	20	15	21	0.598	0.014	0.098	0.480	0.003	NA	-	-	NA	-	-	NA	-		NA	* (-39%)	
	Whole Body	none	NA			NA			4.1	3.7	3.1	NA	0.620	NA	-	-	NA						NA		-	NA		-
Yellow Perch	Muscle	rank	NA	NA	NA	3.8	2.7	2.7	3.9	3.0	1.8	0.002	-	-	-	-	NA	0.005	<0.001	NA	0.535	<0.001	NA	* (41%)	* (121%)	NA	-	* (71%)
	Ovary	rank	NA	NA	NA	4.0	3.3	2.9	4.4	4.0	2.1	0.004	-	-	-	-	NA	0.002	<0.001	NA	0.687	<0.001	NA	* (39%)	* (108%)	NA	-	* (90%)

p-value < 0.1.

* indicates a significant difference between the two areas at an α of 0.1.

[a] The measure of central tendency reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for $\log_{10}$-transformation; and, median for rank-transformation.

NA indicates not applicable as no data were collected for this species in the given year.

(Table 7.5). Selenium concentrations in the muscle of peamouth chub (all study years) and yellow perch (2016 only) from the Gold Creek study area were also higher than those from Sand Creek (Table 7.5).

Fish muscle selenium concentrations were below the USEPA (2016) criteria of 11.3 µg/g dw at all study areas, with the exception of one yellow perch collected at the Elk River downstream study area in April 2015 (Figure 7.11). Four of the eleven species sampled (largescale sucker, mountain whitefish, northern pikeminnow, and yellow perch) had mean muscle selenium concentrations greater than the BCMOE guideline (4 µg/g dw) at the downstream Elk River area (Figure 7.11). The single burbot and westslope cutthroat trout collected from the Elk River area in April 2015 and 2016, respectively, also had muscle selenium concentrations above the BCMOE guideline. The mean selenium concentration in mountain whitefish muscle was also above the BCMOE guideline at the upstream Sand Creek area (Figure 7.11). However, it should be noted that these comparisons of individual fish to the BCMOE guideline are potentially misleading, as the BCMOE guidelines for tissue concentrations are intended to be compared to the mean of at least 8 fish. As further data becomes available from future monitoring programs, muscle selenium concentrations comparisons to the BCMOE guidelines will be updated.

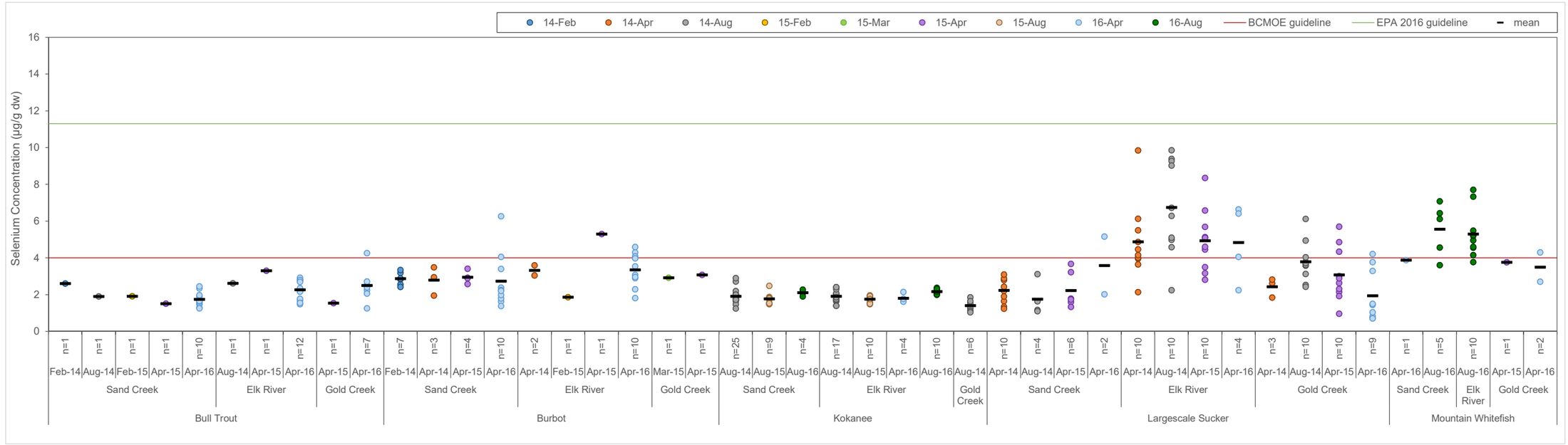
A temporal comparison (April versus August) of selenium concentrations in muscle of northern pikeminnow was completed using three-way ANOVA. There were no significant interactions between Month and Area or between Month and Year indicating that differences in selenium concentrations between months (April and August) did not depend on area (Sand Creek, Elk River, and Gold Creek) or year (2014 to 2016). Differences between months could therefore be evaluated after combining data among years and areas for each month. The mean muscle selenium concentration in northern pikeminnow was significantly greater (7.7%) in August compared to April (Figure 7.12).

7.4.2 Whole Body

No differences were found between whole body peamouth chub selenium concentrations from the downstream areas (Elk River and Gold Creek) relative to the upstream area (Sand Creek; Table 7.5). All whole body selenium concentrations for peamouth chub and redside shiner were less than the USEPA (2016) criteria of 8.5 µg/g dw and mean values were at or below the BCMOE guideline of 4 µg/g dw in all study areas in all three years (Figure 7.13).

7.4.3 Ovary

In contrast to results for muscle selenium concentrations which typically indicated higher concentrations downstream compared to upstream from the Elk River, yellow perch was the



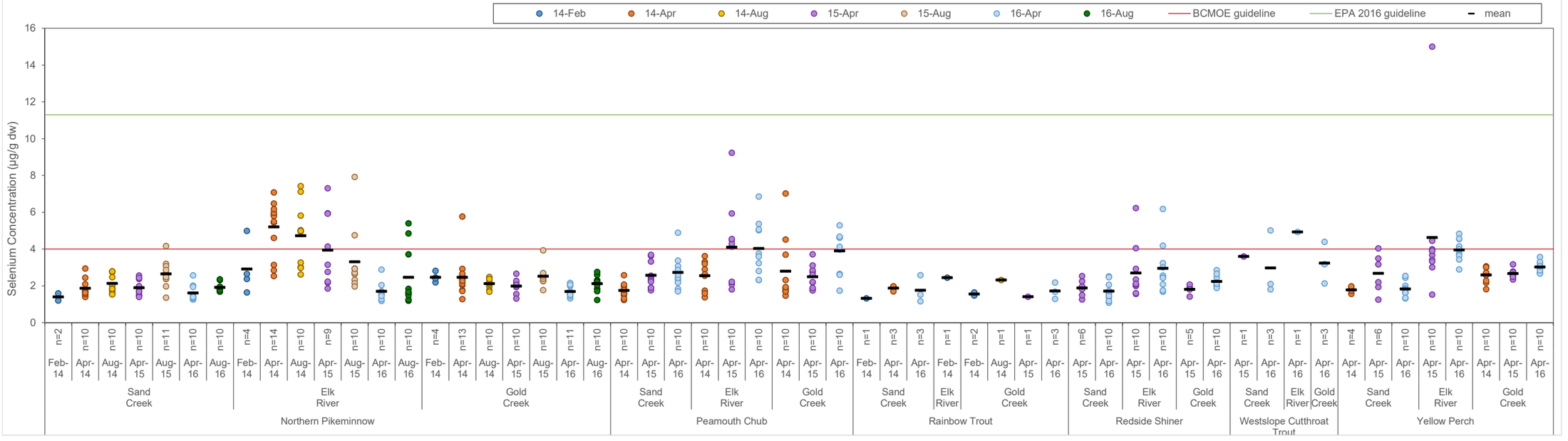


Figure 7.11: Fish Muscle Selenium Concentrations (µg/g dw) in Koocanusa Reservoir, 2014 to 2016

Note: Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River.

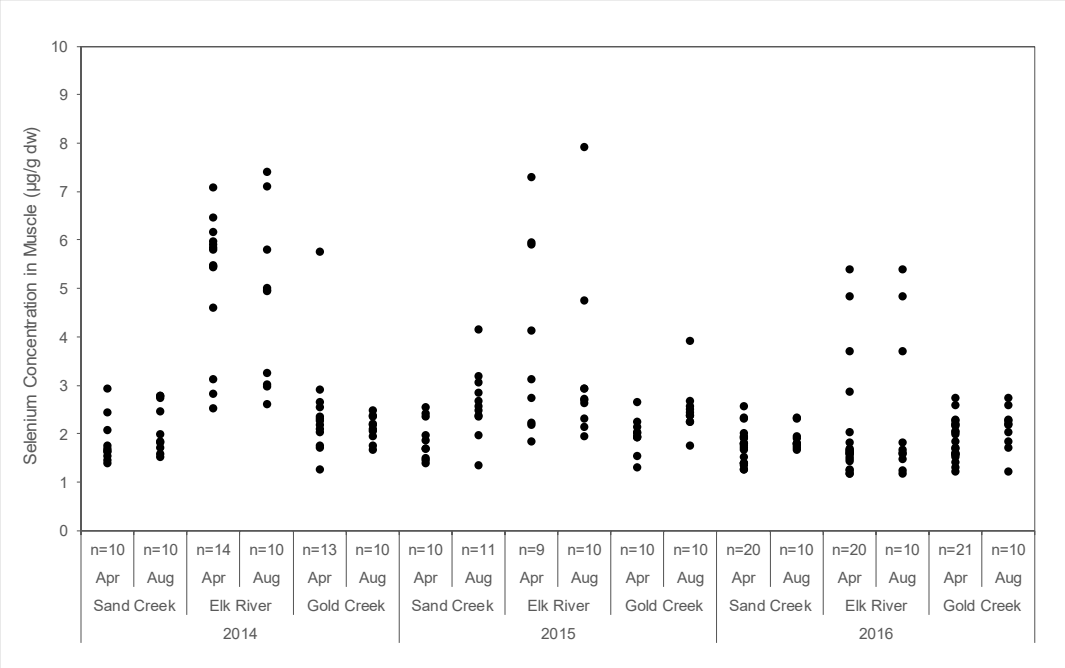


Figure 7.12: Selenium Concentrations (µg/g dw) in Muscle of Northern Pikeminnow Collected in Koocanusa Reservoir, 2014 to 2016

Note: Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River.

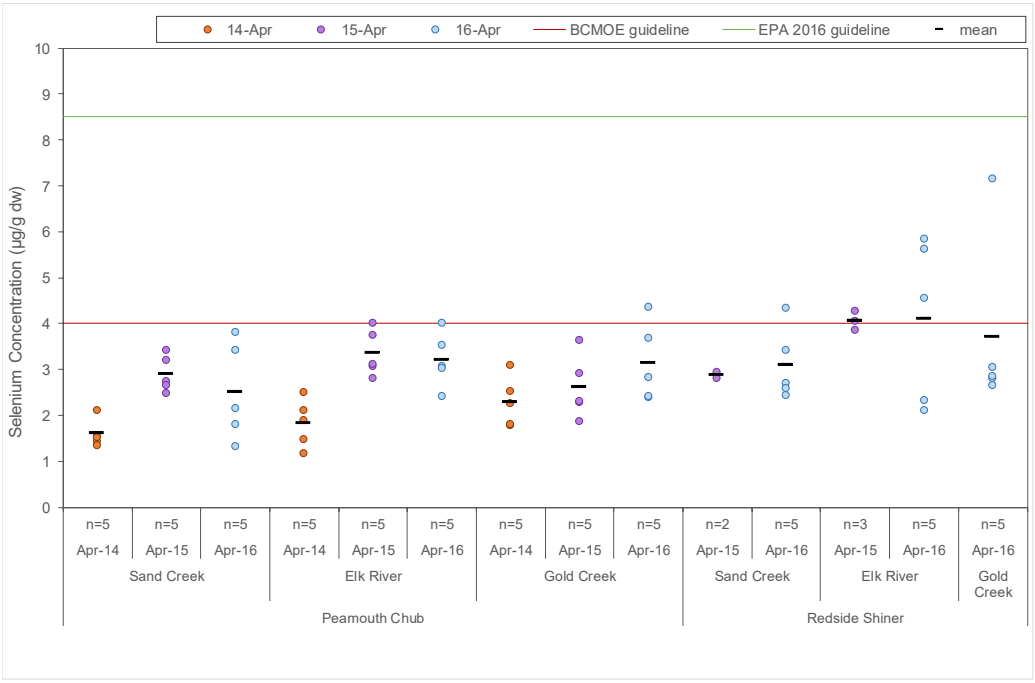


Figure 7.13: Fish Whole Body Selenium Concentrations (µg/g dw) in Koocanusa Reservoir, 2014 to 2016

Note: Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River.

only fish species that had higher ovary selenium concentrations at the Elk River study area compared to the upstream area (Table 7.5). Yellow perch from the Gold Creek study area also had higher ovary selenium concentrations than those at Sand Creek in 2016, but no difference was observed in 2015. No differences in ovary selenium concentration were evident between downstream and upstream areas for peamouth chub. Selenium concentrations in the ovaries of northern pikeminnow and redside shiners were significantly lower at the Gold Creek area than at the Sand Creek area, while no differences were observed for either of these species between the Elk River and Sand Creek areas (Table 7.5).

With the exception of redside shiner and northern pikeminnow all mean ovary selenium concentrations were below the EVWQP Level 1 benchmark for reproductive effects to fish (18 mg/kg dw) and the 2016 USEPA criteria of 15.1 µg/g dw (Figure 7.14). Redside shiner ovary concentrations were above the Level 1 benchmark at both the Elk River and Sand Creek areas in both years they were sampled. Northern pikeminnow had mean ovary selenium concentrations above the Level 1 benchmark only at the Elk River area in one of the three years they were sampled (2014), when ovaries were relatively undeveloped (Appendix Table F.27). Mean selenium concentrations in ovaries of peamouth chub from all areas, particularly in 2015 and 2016, also exceeded the BCMOE guideline of 11 µg/g dw (Figure 7.14). While the mean selenium concentration in ovaries of rainbow trout from Gold Creek in 2016 exceeded the BCMOE guideline, it was based on a sample size of only two, whereas the guideline is intended to be applied to a mean of eight or more samples. Exceedances of tissue selenium benchmarks or guidelines does not necessarily mean that effects will occur as fish species show a range of sensitivities to selenium (USEPA 2016).

7.4.4 Muscle to Ovary Selenium Concentration Ratio

Selenium concentrations were generally highest in ovaries, compared to muscle and whole body samples, which is a common inter-tissue selenium concentration pattern among fish species (i.e., fish ovary-to-muscle selenium concentrations typically range from 1:1 to 7:1 among species; Table 7.6; Appendix Figure F.29). Selenium concentrations in fish ovaries were compared to muscle selenium concentrations for seven species collected in Koocanusa Reservoir[14]. Redside shiners had the highest ovary to muscle selenium concentration ratio at 7.7, while yellow perch had the lowest (1.1; Table 7.6). Except for redside shiner, the ratios observed for species collected in Koocanusa Reservoir spanned the range of those previously documented for other fish species (Table 7.6; Appendix Figure F.29).

[14] Based on only individuals with GSI > 1%, which is considered indicative of active reproductive investment development (Environment Canada 2012).

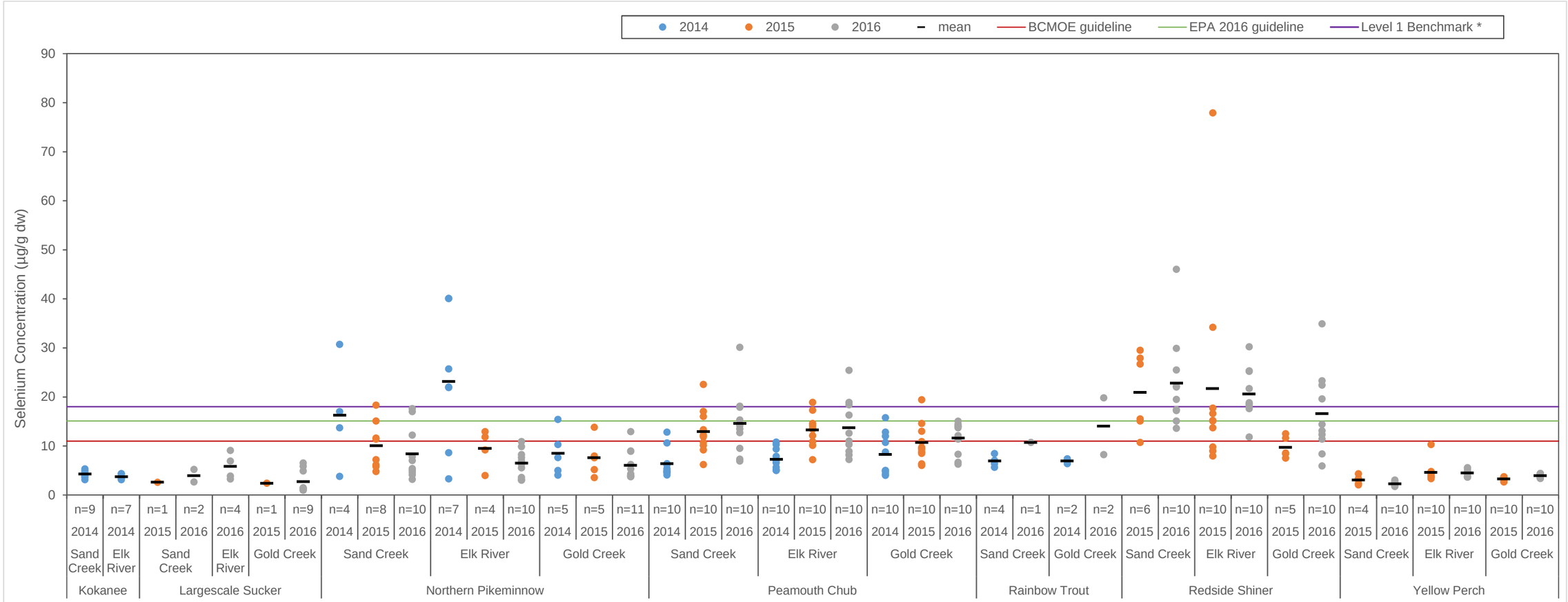


Figure 7.14: Fish Ovary Selenium Concentrations (µg/g dw) in Koocanusa Reservoir, 2014 to 2016

Note: Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River.
* Level 1 benchmark for effects to fish reproduction (Teck 2014)

Table 7.6: Ovary to Muscle Selenium Relationships for Different Fish Species in the Elk Valley and Various Locations in the Literature

Location	Source	Common Name	Scientific Name	Ovary to Muscle Concentration Ratios[a]				Regression[b]	
				n	Min	Max	Median	p	r^2
Elk Valley	Koocanusa Reservoir	Kokanee	*Oncorhynchus nerka*	16	1.6	3.1	2.1	0.61	-
		Largescale Sucker	*Catostomus macrocheilus*	17	0.78	2.5	1.4	<0.001	0.89
		Northern Pikeminnow	*Ptychocheilus oregonensis*	64	2.0	10	3.6	<0.001	0.55
		Peamouth Chub	*Mylocheilus caurinus*	90	1.1	7.8	3.3	<0.001	0.43
		Rainbow Trout	*Oncorhynchus mykiss*	9	3.2	12	4.3	0.81	-
		Redside Shiner	*Richardsonius balteatus*	51	2.8	15	7.3	<0.001	0.42
		Yellow Perch	*Perca flavescens*	54	1.1	1.5	1.2	<0.001	0.78
	RAEMP, in prep	Longnose Sucker	*Catostomus catostomus*	19	0.64	2.1	1.1	<0.001	0.96
		Mountain Whitefish	*Prosopium williamsoni*	106	1.8	16	6.5	<0.001	0.52
	Nautilus and IR (2011)	Westslope Cutthroat Trout	*Oncorhynchus clarki lewisi*	>100	0.5[c]	6[c]	2[c]	<0.001	0.82
Various	USEPA (2016)	Black Bullhead	*Ameiurus melas*	10	3.4	19	6.8	0.25	-
		Bluegill	*Lepomis macrochirus*	29	0.14	2.4	1.4	<0.001	0.65
		Bluehead Sucker	*Catostomus discobolus*	7	0.94	1.8	1.5	<0.001	0.91
		Brook Trout	*Salvelinus fontinalis*	17	0.54	2.3	1.1	<0.001	0.91
		Brown Trout	*Salmo trutta*	4	0.38	11	7.0	0.71	-
		Channel Catfish	*Ictaluris punctatus*	4	3.7	8.7	5.8	0.67	-
		Common Carp	*Cyprinus carpio*	6	0.39	1.5	1.1	0.007	0.84
		Cutthroat Trout	*Oncorhynchus clarkii*	69	1.0	11	1.8	<0.001	0.82
		Dolly Varden	*Salvelinus malma*	17	0.71	3.6	1.3	<0.001	0.90
		Flannelmouth Sucker	*Catostomus latipinnis*	7	0.85	1.4	1.1	0.036	0.58
		Green Sunfish	*Lepomis cyanellus*	38	0.79	1.8	1.2	<0.001	0.89
		Largemouth Bass	*Micropterus salmoides*	13	0.77	1.8	1.1	0.22	-
		Mountain Whitefish	*Prosopium williamsoni*	27	3.5	8.2	5.8	<0.001	0.33
		Northern Pike	*Esox lucius*	14	1.0	3.9	1.9	<0.001	0.83
		Rainbow Trout	*Oncorhynchus mykiss*	47	0.040	4.4	1.9	<0.001	0.96
		Razorback Sucker	*Xyrauchen texanus*	34	1.1	5.2	2.3	<0.001	0.80
		Roundtail Chub	*Gila robusta*	7	1.5	2.5	2.0	0.026	0.62
		Smallmouth Bass	*Micropterus dolomieu*	6	0.94	1.6	1.2	0.006	0.85
		White Sturgeon	*Acipenser transmontanus*	6	1.6	21	1.3	0.006	0.86
		White Sucker	*Catostomus commersonii*	40	0.47	2.1	1.0	<0.001	0.59

[a] Ratio of ovary to muscle for individual fish as listed by USEPA (2016)

[b] r^2 presented for significant relationships ($p<0.05$)

[c] Estimated from a figure in Nautilus (2011)

7.5 Mercury Concentrations in Muscle

Elevated mercury concentrations are often observed in predatory fish species in northern lakes due to naturally high mercury levels, atmospheric deposition of mercury, and biogeochemical conditions that favour mercury methylation (Evers et al. 2011). Methylated mercury is bioaccumulated and biomagnified through the food chain resulting in elevated concentrations in larger, older, and more predatory fish (such as burbot and bull trout). Consistent with mercury's known ability to bioaccumulate, concentrations in the muscle of fish from Koocanusa Reservoir were typically higher in larger fish (Appendix Figures F.30 to F.40). Muscle mercury concentrations were consistently higher than the BCMOE guideline for the protection of wildlife (0.033 µg/g ww), assuming all mercury is present as methylmercury (CCME 2000). The only exception was mountain whitefish, where muscle mercury concentrations in most individuals were below the guideline (Appendix Figure F.34). As indicated in the footnote of Section 3.3.2, the metallurgical coal mines in the Elk River watershed are not considered to be a source of mercury.

8 SUMMARY

A three-year study characterizing and comparing chemical and biological conditions in the Canadian portion of Koocanusa Reservoir downstream from the Elk River compared to upstream was completed over the 2014 to 2016 period.

Water quality profiles conducted during biological sampling indicated that the water column was oxygenated with slightly alkaline pH. Concentrations of nitrate, selenium, and sulphate were similar in water samples collected at middle and bottom depths at all downstream sample locations, but were typically lower in samples collected at the surface. Differences between upstream and downstream concentrations were greater in 2016 than 2015 for both nitrate and selenium, but mean concentrations at the downstream areas in 2016 were similar to or less than those observed in 2015. Sulphate concentrations did not differ significantly downstream versus upstream of the Elk River in any years. SPOs for nitrate, selenium, sulphate, and dissolved cadmium were consistently met at the Order station downstream from the Elk River.

Sediment samples collected in the reservoir both downstream and upstream from the Elk River were mostly silt (≥60%), with sand and clay comprising smaller fractions, and TOC concentrations ranging from 0.9 to 1.7%. Concentrations of most metals and PAHs in sediment were higher downstream from the Elk River compared to upstream, but did not increase over the three year study. Concentrations of some metals (upstream and downstream) and PAHs (downstream only) in sediments were also above the lower provincial sediment quality guidelines (i.e., thresholds, below which, aquatic life is protected from adverse effects), but none exceeded the higher guidelines (i.e., thresholds, above which, severe effects to aquatic life are likely to occur).

Low concentrations of phosphorus and chlorophyll-a, along with low seston and zooplankton biomass, all indicated that the reservoir is oligotrophic. Phytoplankton communities in the reservoir were numerically dominated by diatoms, and to a lesser extent, Chrysophytes. There were no significant differences in overall phytoplankton density, biomass, or richness between downstream and upstream areas over the three years. The only difference in community structure was greater Cyanophyte biomass at the downstream area, which was considered to have low ecological significance because this group represented <1% of the community.

The zooplankton community was numerically dominated by rotifers and copepods, with relatively low numbers of cladocerans. No consistent differences were observed between downstream and upstream areas in overall zooplankton density, biomass, richness, or in absolute or relative density or biomass of copepods or rotifers, over the three year study.

Abundance and biomass of cladocerans tended to be lower downstream from the Elk River compared to upstream.

Benthic invertebrate communities were primarily composed of oligochaetes (mostly immature Tubificinae), insects (various species of chironomids), and ostracods in all three sample years. Overall community density and richness did not differ significantly between upstream and downstream areas in any of the three study years. However, community structure differed between areas, particularly with respect to ostracods, which had higher average density at the downstream area (means ranging from 849 to 1,686 per m^2) compared to the upstream area (means of 38 to 333 per m^2) over the three years of study. Densities of oligochaetes were also significantly higher at the downstream area (range of 1,194 to 1,449 per m^2) compared to the upstream area (range of 418 to 1,194 per m^2). Greater abundance of these organisms downstream from the Elk River compared to upstream may be associated with preference for greater depths and finer sediment texture, and/or avoidance of coarser, compacted sediments in the upstream area that dry out during low pool.

Largescale sucker, northern pikeminnow, peamouth chub, redside shiner, and yellow perch were the most commonly captured species all three study areas (i.e., Sand Creek, Elk River, and Gold Creek), with other less-commonly captured species including bull trout, burbot, kokanee, longnose sucker, mountain whitefish, pumpkinseed, rainbow trout, slimy sculpin, and westslope cutthroat trout. Fish health surveys, which focused on endpoints indicative of fish survival (mean age), growth (body size-at-age), reproduction (relative gonad weight) and energy storage (relative liver weight and overall condition), showed no consistent patterns among fish species, sexes, or sampling years that were indicative of influence from the Elk River.

Selenium concentrations in zooplankton were similar between downstream and upstream areas in all three years. In contrast, mean benthic invertebrate tissue selenium concentrations were significantly higher at the downstream area than the upstream area. Concentrations were also greater than the BC interim chronic dietary guideline of 4 µg/g dw, but lower than the Level 1 benchmarks for effects to benthic invertebrates (13 mg/kg dw) and for dietary effects to fish (11 mg/kg dw). Some fish had muscle or whole body concentrations of selenium greater than the BC guideline of 4 µg/g dw, but all were less than the USEPA criterion of 11.3 µg/g dw in muscle and 8.5 µg/g dw in whole bodies (except for a single yellow perch with a muscle selenium concentration of 15.0 µg/g dw). Ovary selenium concentrations were frequently greater than the BC chronic guideline of 11 µg/g dw, but all species except redside shiner and northern pikeminnow had mean ovary selenium concentrations less than the Level 1 benchmark for reproductive effects to fish (18 mg/kg dw), and the 2016 USEPA criterion of 15.1 µg/g dw. Northern pikeminnow had mean ovary selenium concentrations above the Level 1 benchmark at

the Elk River area in only one of the three years they were sampled (2014), when ovaries were relatively undeveloped. Mean redside shiner ovary concentrations were above the Level 1 benchmark at both the Elk River and the Sand Creek areas in both years sampled.

Overall, the data collected during this study will be used as the basis for future study design development for a long-term monitoring program.

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APPENDIX A
DATA QUALITY ASSESSMENT

APPENDIX A DATA QUALITY ASSESSMENT

A1 INTRODUCTION

A Data Quality Assessment (DQA) was conducted on data collected for the Koocanusa Reservoir 2014 to 2016 monitoring program. The objective of the DQA is to define the overall quality of the data presented in the report, and, by extension, the confidence with which the data can be used to derive conclusions.

A1.1 Background

A variety of factors can influence the chemical and biological measurements made in an environmental study and thus affect the accuracy and/or precision of the data. Inconsistencies in sampling or laboratory methods, use of instruments that are inadequately calibrated or which cannot measure to the desired level of accuracy or precision, and contamination of samples in the field or laboratory are just some of the potential factors that can lead to the reporting of data that do not accurately reflect environmental conditions. Depending on the magnitude of the problem, inaccuracy or imprecision have the potential to affect the reliability of conclusions made from the data. Therefore, it is important to ensure that monitoring programs incorporate appropriate steps to control the non-natural sources of data variability (i.e., minimize the variability that does not reflect natural spatial and temporal variability in the environment) and thus assure the quality of the data.

Data quality as a concept is meaningful only when it relates to the intended use of the data. That is, one must know the context in which the data will be interpreted in order to establish a relevant basis for judging whether or not the data set is adequate. DQA involves comparison of actual field and laboratory measurement performance to data quality objectives (DQOs) established for a particular study, such as evaluation of method detection limits, blank sample data, data precision (based on field and laboratory duplicate samples), and data accuracy (based on matrix spike recoveries and/or analysis of standards or certified reference materials).

DQOs were established at the outset of the project that reflect reasonable and achievable performance expectations (Table A.1). Programs involving a large amount of samples and analytes usually have some results that exceed the DQOs. This is particularly so for multi-element scans (e.g., ICP scans for metals) since the analytical conditions are not necessarily optimal for every element included in the scan. Generally, scan results may be considered acceptable if no more than 20% of the analytes fail to meet the DQOs. Overall, the intent of comparing data to DQOs was not to reject any measurement that did not meet the DQO, but to ensure any questionable data received more scrutiny to determine what effect, if any, this had on interpretation of results within the context of this project.

A1.2 Types of Quality Control Samples

Several types of quality control (QC) samples were assessed based on samples collected (or prepared) in the field and laboratory. These samples, and a description of each, include the following:

- **Blanks** are samples of de-ionized water and/or appropriate reagent(s) that are handled and analyzed the same way as regular samples. These samples will reflect any contamination of samples occurring in the field (in the case of field or trip blanks) or the laboratory (in the case of laboratory or method blanks). Concentrations of analytes should not be detectable, although a DQO of twice the method detection limit allows for slight "noise" around the detection limit.
- **Field Duplicates** are replicate samples split from a larger homogenized sample that was collected at a randomly selected field station. Data from split samples provides a measure of potential contamination or variability introduced after sampling through analysis.
- **Laboratory Duplicates** are replicate sub-samples created in the laboratory from randomly selected field samples which are sub-sampled and then analyzed independently using identical analytical methods. The laboratory duplicate sample results reflect any variability introduced during laboratory sample handling and analysis and thus provide a measure of laboratory precision.
- **Spike Recovery Samples** are created in the laboratory by adding a known amount/concentration of a given analyte (or mixture of analytes) to a randomly selected test sample previously divided to create two sub-samples. The spiked and regular sub-samples are then analyzed in an identical manner. The spike recovery represents the difference between the measured spike amounts (total amount in spiked sample minus amount in original sample) relative to the known spike amount (as a percentage). The analysis of spiked samples provides an indication of the accuracy of analytical results.
- **Certified Reference Materials** are samples containing known chemical concentrations that are processed and analyzed along with batches of environmental samples. The sample results are then compared to target results to provide a measure of analytical accuracy. The results are reported as the percent of the known amount that was recovered in the analysis.

Two additional types of QC, specific to benthic invertebrate or plankton community samples, include:

- **Organism Recovery Checks** for benthic invertebrate community samples. This involves the re-processing of previously sorted material from a randomly selected sample to determine the number of invertebrates that were not recovered during the original sample processing. The reprocessing is conducted by an analyst not involved during the original processing to reduce bias. This check allows the determination of accuracy through assessment of recovery efficiency.
- **Sub-Sampling Error** is assessed for studies in which benthic invertebrate or plankton community samples require sub-sampling (due to large sample volume and/or organism density). By comparing the numbers of organisms recovered between at least two sub-samples, this measure provides an estimate of laboratory precision. Therefore, sub-sampling error provides a measure of analytical accuracy and precision. The processing of an entire benthic invertebrate community sample in representative fractions also allows an evaluation of sub-sampling accuracy.

A2 WATER SAMPLES

Water chemistry samples collected from 2014 to 2016 were taken in accordance with Teck's Annual Water Quality Monitoring Report (Teck 2016b, 2017). Associated QC measures were taken by the analytical laboratory and the field crew and the results from the DQA were included in the aforementioned reports.

A3 SEDIMENT SAMPLES

Sediment chemistry samples collected from 2014 to 2016 were analyzed by ALS Environmental (Calgary, Alberta).

A3.1 Method Detection Limits

MDLs achieved for sediment sample analyses were at or below the target concentrations, with few exceptions. In all three years (2014 to 2016), the MDL was above target concentrations for bismuth, magnesium, phosphorus, strontium, and tin (Table A.2). Additionally, with the analysis of polycyclic aromatic hydrocarbons in 2015 and 2016, targets MDLs were not achieved for acenaphthene, acenaphthylene, and diebnz(a,h)anthracene. However, MDLs for all analytes were below the corresponding guidelines for protection of aquatic health so the reported results can still be evaluated relative to guidelines.

A3.1.1 Method Blanks

Laboratory blank samples were analyzed and reported along with sediment samples in all three samples years. Concentrations of all analytes were reported as being less than the MDL, indicating no inadvertent sample contamination (Table A.3).

A3.2 Data Precision

A3.2.1 Precision Associated with Field Duplicate (Split) Samples

One sediment sample was split in the field in each of the three years to create field duplicates. There was good agreement (<40% RPD) in analyte concentrations for each set of duplicate results (Table A.4). Exceptions were sodium and tin measurements made in 2014, but neither substance has a sediment quality guideline or is considered a mine-related constituent of concern. Overall, the data suggest that reported results were reasonably precise representations of conditions at the time of sampling.

A3.2.2 Laboratory Precision

Close agreement was achieved between laboratory duplicate samples for all three years of analysis, providing further evidence that reported sample results were associated with good analytical precision (Table A.5).

A3.3 Laboratory Accuracy

Recoveries of certified reference materials were all within the target ranges (Table A.6), indicating excellent analytical accuracy.

A4 PLANKTON SAMPLES

Tissue chemistry of zooplankton samples was analyzed by the University of Missouri-Columbia Research Reactor Center (MURR; Columbia, Missouri). Phytoplankton and zooplankton community samples were analyzed by Plankton R Us (Winnipeg, Manitoba).

A4.1 Method Detection Limits for Zooplankton Tissue Chemistry

Method detection limits for analytes measured in zooplankton tissue samples were variable over the three year study (2014 to 2016; Table A.7), but were sufficiently low to report quantifiable tissue concentrations of all analytes (Table G.1).

A4.2 Laboratory Accuracy of Zooplankton Tissue Chemistry Analysis

Accuracy of tissue chemistry data was determined based on recoveries of analytes in liver samples analyzed concurrently with the zooplankton tissue samples (i.e., SRM 1577 bovine liver from National Institute of Standards and Technology, and CRM DOLT-4 and DOLT-5 dogfish liver from the National Research Council). The DQO was recovery of 70 – 130% of the certified value in each sample. Some elements listed on the certificates of analysis are lower-confidence values or unconfirmed results presented for informational purposes, rather than certified values (i.e., the target value may not be accurate). These values were also provided for comparison purposes, but were not used to judge acceptability of data.

Over the three year study, recoveries of metals from CRMs almost all metals met the DQO of 70 to 130% (Table A.8a to c). In particular, reported selenium concentrations were consistently within the certified range of concentrations. Selenium is the tissue constituent of greatest relevance to the project. The results indicated good analytical accuracy associated with analysis of zooplankton tissue samples.

A4.3 Laboratory Precision for Zooplankton Tissue Chemistry Analysis

One set of laboratory duplicate samples was completed for zooplankton tissue analysis. All The DQO of RPD ≤30% was met for all analytes (Table A.9). As such, laboratory precision associated with analysis of zooplankton tissue samples was considered good.

A4.4 Laboratory Precision for Plankton Community Analyses

One zooplankton sample collected during each of the August field programs in 2014, 2015 and 2016 was randomly selected by the laboratory for duplicate analysis of community structure (Plankton R Us). The relative percent difference between replicates was computed at the species and group level, and compared to the DQO (Tables A.10 and A.11). Results indicated

fairly consistent findings at the lowest practical level (LPL) throughout the three year study, although RPDs for the densities of some organisms, particularly those present in low abundance, exceeded the DQO (Table A.10). Comparisons at group level showed good agreement between the duplicate samples, with the exception of the rotifers in 2015 (Table A.11). The results indicate adequate laboratory precision for the purposes of this project, because statistical comparisons among areas and years focused on major group densities.

One phytoplankton sample collected during each of the August field programs in 2014, 2015 and 2016 was randomly selected by the laboratory for duplicate analysis of community structure. The relative percent difference between duplicates was computed at the species and group level and compared to the DQO. Very few replicates met the DQO at the species level (Table A.12). At the major group level, the DQO was met for five of the seven groups in 2014 and 2016, while duplicate results for only three of seven groups met the DQO in 2015 (Table A.13). Poor agreement between duplicate results indicates relatively large sub-sampling error, especially at more detailed levels of taxonomy. This may be due to incomplete homogenization of the sample prior to subsampling, and/or because only a very small portion of a collected sample is assessed (e.g., 10 mL aliquots), so between-sub-sample differences in counts (especially for rarer taxa) become exaggerated once multiplied up to a per-litre density basis. Similar QC issues were recently reported for laboratory analyses of periphyton samples (Minnow and Larratt 2016).

A5 BENTHIC INVERTEBRATE SAMPLES

Benthic invertebrate tissue chemistry samples were analyzed by MURR (Columbia, Missouri). Benthic invertebrate community samples were analyzed by ZEAS Inc. (Bolton, Ontario).

A5.1 Method Detection Limits for Benthic invertebrate Tissue Chemistry Analysis

Method detection limits for analytes measured in benthic invertebrate tissue samples were variable over the three year study (2014 to 2016) (Table A.14), but were sufficiently low to quantify concentrations of all analytes (Table G.1).

A5.2 Laboratory Precision and Accuracy for Benthic Invertebrate Tissue Chemistry Analysis

Benthic invertebrate tissue samples were analyzed at the same time as the fish tissue samples, so the QA/QC results reported in Sections A5.2 and A.5.3 apply to benthic invertebrate samples.

A5.3 Laboratory Precision and Accuracy for Benthic Invertebrate Community Analyses

Percent recovery of organisms was excellent in all three study years, ranging from 95% to 100% among samples, and all values were well above the corresponding DQO of ≥ 90% (Table A.15a).

Sub-sampling error was not estimated in 2014 or 2015 because all samples were sorted and enumerated in their entirety. In 2016, subsampling error was estimated for 1 of the 10 samples. Subsample precision and accuracy were excellent based on good agreement between the two sub-samples for organism abundance (Table A.15b).

A6 FISH SAMPLES

Metal concentrations were analyzed in fish tissues (i.e., bull trout [BT], burbot [BB], kokanee [KO], largescale sucker [CSU], mountain whitefish [MW], northern pikeminnow [NSC], peamouth chub [PCC], rainbow trout [RT], redside shiner [RSC], westslope cutthroat trout [WCT], yellow perch [YP]) were analyzed in 2014, 2015 and/or 2016 by MURR (Columbia, MO). The benthic invertebrate tissue were analyzed at the same time, so the QA/QC applies, as well. Resulting QA/QC is discussed collectively in the following sections.

A6.1 Method Detection Limits

MDLs for elements measured in fish tissue samples were variable, but were typically very low (Table A.16). Selenium, which was the main tissue constituent of interest for this project, had sufficiently low MDLs to results in quantifiable concentrations in fish tissue samples and allow for comparison to tissue guidelines and site-specific benchmarks (Tables G.2 to G.11).

A6.2 Laboratory Precision

Replicate digestions of several fish muscle, ovary, and whole body samples were prepared for analysis in all three study years (2014 to 2016; Table 17a,b,c, Table 18a,b,c and Table 19). Fish muscle and ovary samples were homogenized within their freeze drying vessels using a combination of pre-cleaned plastic lab spatulas and glass stir rods. This homogenization technique may not have been entirely adequate for the fish muscle samples as small flakes of connective tissue were still visible in the muscle powder. This is most likely the cause of some inconsistency of the replicate results for a few elements in fish muscle (Table A.17a,b,c). However, duplicate results for were comparable for most analytes, and showed consistently good agreement for selenium concentrations (Tables A.17a,b,c and A.18a,b,c). Therefore, the precision of tissue chemistry results for fish and benthic invertebrates was considered acceptable.

Replicate digestions of nine whole body fish samples were prepared from 2014 to 2016. Whole-bodied fish samples were homogenized using a cryogenic mixer mill, which effectively pulverized the samples into a fine, frozen powder. This resulted in very homogenous samples, which is reflected in the fact that very few substances exceeded the DQO by only a minor amount in replicate analyses (Table A.19). There was good agreement in selenium concentrations between duplicate samples. Overall, the results of replicate analyses indicated acceptable precision of analyses.

A6.3 Laboratory Accuracy

Accuracy of tissue chemistry data was determined based on recoveries of analytes in liver samples analyzed concurrently with the fish tissue samples (i.e., SRM 1577 bovine liver from National Institute of Standards and Technology, and CRM DOLT-4 and DOLT-5 dogfish liver from the National Research Council). The DQO was recovery of 70 – 130% of the certified value in each sample. Some elements listed on the certificates of analysis are lower-confidence values or unconfirmed results presented for informational purposes, rather than certified values (i.e., the target value may not be accurate). These values were also provided for comparison purposes, but were not used to judge acceptability of data.

Matrix spikes using approximately 3 ppm of two multi-element solutions (together containing many, but not all, analytes) were also performed on muscle fillet, ovary and whole body samples, but could not be performed on muscle plug samples based on their small size.

Results for chromium and mercury in SRM 1577 exceeded the DQO in most instances compared to certified values in all three study years (Table A.20,a,b,c). However, results for chromium and mercury in DOLT-4 and DOLT-5 were within the acceptable range relative to certified or informational values (Table A.20,a,b,c). All other elements met the DQO for all analyses, with a few minor exceptions where recovery was just outside of the acceptable range. Selenium concentrations, which were of particular relevance in this project, met the DQO except for a small proportion of instances in which the reported concentrations slightly overestimated the actual sample amount. This means that, if anything, sample concentrations associated with the project may slightly overestimate actual tissue concentrations and the project results will be conservative in terms of estimating potential selenium-related risks to fish or their consumers.

Matrix spike recoveries almost always met the DQO of 70-130%, with the exception of zirconium where the recovery was often not completely recovered in all three years of the study (Table A.21a,b,c). Spike recovery results for some elements were omitted by MURR because the high or variable level of the element in the unspiked sample precluded accurate measurement of percent recovery (Table A.21a,b,c). Recoveries of selenium in matrix spikes were consistently good. Overall, the results for analysis of matrix spikes and certified reference materials indicated acceptable analytical accuracy for fish tissue samples.

A7 DATA QUALITY STATEMENT

The quality of the data collected for this project was considered acceptable to serve the project objectives, except that phytoplankton community results should be interpreted with caution based on poor agreement on taxon densities between laboratory subsamples.

Table A.1: Data Quality Objectives for Samples Collected in Koocanusa Reservoir, 2014 to 2016

Quality Control Measure	Quality Control Sample Type	Study Component			
		Sediment Quality	**Phytoplankton and Zooplankton Community**	**Benthic Invertebrate Community**	**Tissue Chemistry**
Method Detection Limits (MDL)	Comparison of actual MDL versus target MDL	MDL for each parameter should be at least as low as applicable guidelines, ideally ≤1/2 the LEL guideline value[a]	NA	NA	NA
Blank Analysis	Laboratory Blank	Within target range of ≤2x the MDL	NA	NA	NA
Field Precision	Field Duplicates (split samples)	≤40% RPD[b]	NA	NA	NA
Laboratory Precision	Laboratory Duplicates	≤35% RPD[b]	≤30% RPD[b]	≤20% RPD[b]	≤30% RPD[b]
Accuracy	Recovery of Matrix Spikes	NA	NA	NA	70-130%
	Recovery of Certified Reference Material, QC Standards	Within laboratory target range of 70-130%[c]	NA	NA	70-130%
	Sub-Sampling Accuracy	NA	NA	Sub-sample estimate is within 80% to 120% of total sample abundance	NA
	Organism Recovery	NA	NA	≥90%	NA

[a] or should meet target MDLs provided by the laboratory, if a guideline does not exist for the substance.

[b] RPD - Relative Percent Difference

[c] some variations occur with the DQO, which are indicated on Appendix Table A.6.

NA - Not Applicable

Table A.2: Laboratory Method Detection Limits (MDLs) for Sediment Samples Relative to Targets and Sediment Quality Guidelines

	Analyte	Units	BCSQG[a]	Method Detection Limit			
				Target	Achieved (2014)	Achieved (2015)	Achieved (2016)
Non-metals	Moisture	%	-	0.25	0.25	0.25	0.25
	pH (1:2 soil:water)	pH	-	0.1	0.1	0.1	0.1
	% Gravel	%	-	0.1	0.1	0.1	0.1
	% Sand	%	-	0.1	0.1	0.1	0.1
	% Silt	%	-	0.1	0.1	0.1	0.1
	% Clay	%	-	0.1	0.1	0.1	0.1
	Total Organic Carbon	%	-	0.1	0.1	0.1	1.0
Total Metals	Aluminum (Al)	mg/kg dw	-	50	50	50	50
	Antimony (Sb)	mg/kg dw	-	0.10	0.10	0.10	0.10
	Arsenic (As)	mg/kg dw	5.9/17 [b]	2.95	0.05	0.100	0.10
	Barium (Ba)	mg/kg dw	-	0.50	0.50	0.50	0.50
	Beryllium (Be)	mg/kg dw	-	0.10	0.20	0.10	0.10
	Bismuth (Bi)	mg/kg dw	-	0.10	0.20	0.20	0.20
	Boron (B)	mg/kg dw	-	-	-	5.00	5.0
	Cadmium (Cd)	mg/kg dw	0.6/3.5 [b]	0.30	0.05	0.02	0.02
	Calcium (Ca)	mg/kg dw	-	50	50	50	50
	Chromium (Cr)	mg/kg dw	37.3/90 [b]	18.7	0.50	0.50	0.50
	Cobalt (Co)	mg/kg dw	-	0.10	0.10	0.10	0.10
	Copper (Cu)	mg/kg dw	35.7/197 [b]	17.9	0.50	0.50	0.50
	Iron (Fe)	mg/kg dw	21,200/43,766 [c]	10,600	50	50	50
	Lead (Pb)	mg/kg dw	35/91 [b]	17.5	0.50	0.50	0.50
	Lithium (Li)	mg/kg dw	-	5.0	5.0	2.0	2.0
	Magnesium (Mg)	mg/kg dw	-	10	20	20	20
	Manganese (Mn)	mg/kg dw	460/1,100 [c]	230	1	1	1
	Mercury (Hg)	mg/kg dw	0.170/0.486 [b]	0.085	0.005	0.005	0.005
	Molybdenum (Mo)	mg/kg dw	-	0.10	0.50	0.10	0.10
	Nickel (Ni)	mg/kg dw	16/75 [c]	8	0.50	0.50	0.50
	Phosphorus (P)	mg/kg dw	-	20	50	50	50
	Potassium (K)	mg/kg dw	-	100	100	100	100
	Selenium (Se)	mg/kg dw	2	1	0.2	0.2	0.2
	Silver (Ag)	mg/kg dw	0.5	0.25	0.10	0.10	0.10
	Sodium (Na)	mg/kg dw	-	100	100	50	50
	Strontium (Sr)	mg/kg dw	-	0.10	0.50	0.50	0.50
	Thallium (Tl)	mg/kg dw	-	0.050	0.050	0.050	0.050
	Tin (Sn)	mg/kg dw	-	0.20	2.00	2.00	2.00
	Titanium (Ti)	mg/kg dw	-	1.0	1.0	1.0	1.0
	Uranium (U)	mg/kg dw	-	0.050	0.050	0.050	0.050
	Vanadium (V)	mg/kg dw	-	0.20	0.20	0.20	0.20
	Zinc (Zn)	mg/kg dw	123/315 [b]	61.5	1.0	2.0	2.0
	Zirconium (Zr)	mg/kg dw	-	-	-	1.0	1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene	mg/kg dw	0.00671/0.0889 [c]	0.003	-	0.005	0.005
	Acenaphthylene	mg/kg dw	0.00587/0.128 [c]	0.003	-	0.005	0.005
	Anthracene	mg/kg dw	0.0469/0.245 [c]	0.023	-	0.004	0.004
	Benz(a)anthracene	mg/kg dw	0.0317/0.385 [c]	0.016	-	0.01	0.01
	Benzo(a)pyrene	mg/kg dw	0.0319/0.782 [c]	0.016	-	0.01	0.01
	Benzo(b&j)fluoranthene	mg/kg dw	-	-	-	0.01	0.01
	Benzo(b+j+k)fluoranthene	mg/kg dw	-	-	-	0.015	0.015
	Benzo(g,h,i)perylene	mg/kg dw	0.17/3.2 [c]	0.09	-	0.01	0.01
	Benzo(k)fluoranthene	mg/kg dw	0.24/13.4 [c]	0.12	-	0.01	0.01
	Chrysene	mg/kg dw	0.0571/0.862 [c]	0.03	-	0.01	0.01
	Dibenz(a,h)anthracene	mg/kg dw	0.00622/0.135 [c]	0.003	-	0.005	0.005
	Fluoranthene	mg/kg dw	0.111/2.355 [c]	0.06	-	0.01	0.01
	Fluorene	mg/kg dw	0.021/0.144 [c]	0.01	-	0.01	0.01
	Indeno(1,2,3-c,d)pyrene	mg/kg dw	0.2/3.2 [c]	0.10	-	0.01	0.01
	2-Methylnaphthalene	mg/kg dw	0.0202/0.201 [c]	0.01	-	0.01	0.01
	Naphthalene	mg/kg dw	0.0346/0.391 [c]	0.02	-	0.01	0.01
	Phenanthrene	mg/kg dw	0.0419/0.515 [c]	0.02	-	0.01	0.01
	Pyrene	mg/kg dw	0.053/0.875 [c]	0.03	-	0.01	0.01

Note: Highlighted values indicate when achieved MDLs exceeded target MDLs.

[a] Working guidelines for whole sediment (BCMOE 2006).

[b] Interim Sediment Quality Guideline (ISQG; or Threshold Effect Level [LEL]) / Probable Effect Level (PEL).

[c] Lowest Effect Level (LEL) / Severe Effect Level (SEL).

Table A.3: Laboratory Blank Results Associated with Analysis of Sediment Samples

Analyte		Units	2014		2015		2016	
			MDL	Result	MDL	Result	MDL	Result
Physical Test	Moisture	%	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Organic Carbon	Total Organic Carbon	%	-	-	<0.10	<0.10	-	-
Total Metals	Aluminum (Al)	mg/kg	<50	<50	<50	<50	<50	<50
	Antimony (Sb)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Arsenic (As)	mg/kg	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10
	Barium (Ba)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Beryllium (Be)	mg/kg	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10
	Bismuth (Bi)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)	mg/kg	-	-	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd)	mg/kg	<0.050	<0.050	<0.020	<0.020	<0.020	<0.020
	Calcium (Ca)	mg/kg	<50	<50	<50	<50	-	-
	Chromium (Cr)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Cobalt (Co)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Iron (Fe)	mg/kg	<50	<50	<50	<50	<50	<50
	Lead (Pb)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Lithium (Li)	mg/kg	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0
	Magnesium (Mg)	mg/kg	<20	<20	<20	<20	<20	<20
	Manganese (Mn)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Mercury (Hg)	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Molybdenum (Mo)	mg/kg	<0.50	<0.50	<0.10	<0.10	<0.10	<0.10
	Nickel (Ni)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Phosphorus (P)	mg/kg	<50	<50	<50	<50	<50	<50
	Potassium (K)	mg/kg	<100	<100	<100	<100	<100	<100
	Selenium (Se)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na)	mg/kg	<100	<100	<50	<50	<50	<50
	Strontium (Sr)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Thallium (Tl)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Uranium (U)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Vanadium (V)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Zinc (Zn)	mg/kg	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0
	Zirconium (Zr)	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0
Polycyclic Aromatic Hydrocarbon	Acenaphthene	mg/kg	-	-	<0.0050	<0.0050	<0.0050	<0.0050
	Acenaphthylene	mg/kg	-	-	<0.0050	<0.0050	<0.0050	<0.0050
	Anthracene	mg/kg	-	-	<0.0040	<0.0040	<0.0040	<0.0040
	Benz(a)anthracene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Benzo(b&j)fluoranthene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Benzo(g,h,i)perylene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Chrysene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene	mg/kg	-	-	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Fluorene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	2-Methylnaphthalene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Naphthalene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Phenanthrene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010
	Pyrene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010

Table A.4: Field Duplicate (Split Sample) Results

	Analyte	Units	T4-2 (2014)			T4-6 (2015)			TN-5 (2016)		
			T4-2	TX-D	RPD	T4-6	T4-X	RPD	TN-5	T-XSed	RPD
Physical Tests	Moisture	%	38	43	11%	45	42	7%	38	38	2%
	pH (1:10 soil:water)	pH	8.17	8.08	1%	8.13	8	2%	8.02	8.2	2%
Particle Size	% Gravel (>2mm)	%	<0.10	<0.10	0%	<0.10	<0.10	0%	<0.10	<0.10	0%
	% Sand (2.00mm - 1.00mm)	%	<0.10	<0.10	0%	<0.10	<0.10	0%	<0.10	<0.10	0%
	% Sand (1.00mm - 0.50mm)	%	<0.10	<0.10	0%	<0.10	<0.10	0%	<0.10	<0.13	26%
	% Sand (0.50mm - 0.25mm)	%	<0.10	<0.10	0%	<0.10	<0.10	0%	<0.47	<0.41	14%
	% Sand (0.25mm - 0.125mm)	%	<0.10	<0.10	0%	<0.10	<0.10	0%	<4.49	<4.88	8%
	% Sand (0.125mm - 0.063mm)	%	<0.10	<0.10	0%	<0.10	<0.10	0%	<9.84	<10.80	9%
	% Silt (0.063mm - 0.0312mm)	%	8.33	8.61	3%	9.92	10.40	5%	27.00	25.50	6%
	% Silt (0.0312mm - 0.004mm)	%	61.7	62.0	0%	63.5	63.0	1%	47.1	46.3	2%
	% Clay (<4um)	%	30	29	2%	27	27	0%	11	12	10%
	Texture	-	Silt loam	Silt loam	-	Silt loam	Silt loam	-	Silt loam	Silt loam	-
Organic Carbon	Total Organic Carbon	%	1.26	1.32	5%	1.53	1.51	1%	1.23	1.28	4%
Total Metals	Aluminum (Al)	mg/kg	13,600	12,900	5%	13,900	12,000	15%	10,800	10,100	7%
	Antimony (Sb)	mg/kg	0.44	0.45	2%	0.46	0.43	7%	0.26	0.26	0%
	Arsenic (As)	mg/kg	6.08	5.99	1%	7.37	6.51	12%	5.28	5.05	4%
	Barium (Ba)	mg/kg	155	155	0%	151	136	10%	061	060	2%
	Beryllium (Be)	mg/kg	0.60	0.57	5%	0.56	0.52	7%	0.38	0.38	0%
	Bismuth (Bi)	mg/kg	0.21	0.20	5%	0.21	<0.20	5%	<0.20	<0.20	0%
	Boron (B)	mg/kg	-	-	-	5.40	<5.0	8%	<5.00	<5.00	0%
	Cadmium (Cd)	mg/kg	0.576	0.592	3%	0.500	0.442	12%	0.184	0.191	4%
	Calcium (Ca)	mg/kg	100,000	100,000	0%	120,000	110,000	9%	102,000	101,000	1%
	Chromium (Cr)	mg/kg	20.1	19.3	4%	22.0	19.8	11%	15.2	14.5	5%
	Cobalt (Co)	mg/kg	8.20	8.11	1%	10.10	8.83	13%	7.67	7.57	1%
	Copper (Cu)	mg/kg	15.1	15.4	2%	18.6	16.6	11%	17.9	14.8	19%
	Iron (Fe)	mg/kg	20,400	20,400	0%	24,800	22,300	11%	19,200	19,200	0%
	Lead (Pb)	mg/kg	14.7	17.3	16%	15.1	13.3	13%	13.7	14.5	6%
	Lithium (Li)	mg/kg	23.6	23.3	1%	26.3	23.9	10%	23.9	24.1	1%
	Magnesium (Mg)	mg/kg	19,100	19,100	0%	24,600	22,000	11%	20,500	20,000	2%
	Manganese (Mn)	mg/kg	552	551	0%	596	527	12%	378	379	0%
	Mercury (Hg)	mg/kg	0.0334	0.0349	4%	0.0417	0.0380	9%	0.0163	0.0223	31%
	Molybdenum (Mo)	mg/kg	1.03	1.02	1%	0.98	0.89	10%	0.60	0.57	5%
	Nickel (Ni)	mg/kg	22.2	22.4	1%	25.7	22.8	12%	18.7	17.7	5%
	Phosphorus (P)	mg/kg	615	651	6%	819	707	15%	506	524	3%
	Potassium (K)	mg/kg	2,220	1,950	13%	1,810	1,510	18%	740	610	19%
	Selenium (Se)	mg/kg	0.59	0.53	11%	0.58	0.49	17%	<0.20	<0.20	0%
	Silver (Ag)	mg/kg	0.12	0.12	0%	0.10	<0.10	0%	<0.10	<0.10	0%
	Sodium (Na)	mg/kg	190	120	45%	124	110	12%	083	073	13%
	Strontium (Sr)	mg/kg	183	184	1%	241	222	8%	226	236	4%
	Thallium (Tl)	mg/kg	0.203	0.184	10%	0.155	0.140	10%	0.077	0.077	0%
	Tin (Sn)	mg/kg	2.2	4.0	58%	<2.0	<2.0	0%	<2.0	<2.0	0%
	Titanium (Ti)	mg/kg	97.0	78.3	21%	108	89	19%	92	71	26%
	Uranium (U)	mg/kg	0.926	0.896	3%	0.842	0.762	10%	0.633	0.702	10%
	Vanadium (V)	mg/kg	24.5	23.2	5%	23.3	20.3	14%	12.3	11.1	10%
	Zinc (Zn)	mg/kg	80.9	82.8	2%	84.4	75.6	11%	64.7	63.5	2%
	Zirconium (Zr)	mg/kg	-	-	-	1.3	1.2	8%	1.1	1.1	0%
Polycyclic Aromatic Hydrocarbons	Acenaphthene	mg/kg	-	-	-	<0.0050	<0.0050	0%	<0.01	<0.01	0%
	Acenaphthylene	mg/kg	-	-	-	<0.0050	<0.0050	0%	<0.01	<0.01	0%
	Anthracene	mg/kg	-	-	-	<0.0040	<0.0040	0%	<0.00	<0.00	0%
	Benz(a)anthracene	mg/kg	-	-	-	0.01	0.011	10%	<0.01	<0.01	0%
	Benzo(a)pyrene	mg/kg	-	-	-	<0.010	<0.010	0%	<0.01	<0.01	0%
	Benzo(b&j)fluoranthene	mg/kg	-	-	-	0.017	0.017	0%	<0.01	<0.01	0%
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	-	0.017	0.017	0%	<0.02	<0.02	0%
	Benzo(g,h,i)perylene	mg/kg	-	-	-	<0.010	<0.010	0%	<0.01	<0.01	0%
	Benzo(k)fluoranthene	mg/kg	-	-	-	<0.010	<0.010	0%	<0.01	<0.01	0%
	Chrysene	mg/kg	-	-	-	0.018	0.018	0%	<0.01	<0.01	0%
	Dibenz(a,h)anthracene	mg/kg	-	-	-	<0.0050	<0.0050	0%	<0.01	<0.01	0%
	Fluoranthene	mg/kg	-	-	-	0.014	0.014	0%	<0.01	<0.01	0%
	Fluorene	mg/kg	-	-	-	<0.010	<0.010	0%	<0.01	<0.01	0%
	Indeno(1,2,3-c,d)pyrene	mg/kg	-	-	-	<0.010	<0.010	0%	<0.01	<0.01	0%
	2-Methylnaphthalene	mg/kg	-	-	-	0.05	0.04	22%	<0.01	<0.01	0%
	Naphthalene	mg/kg	-	-	-	0.025	0.019	27%	<0.01	<0.01	0%
	Phenanthrene	mg/kg	-	-	-	0.046	0.043	7%	<0.01	<0.01	0%
	Pyrene	mg/kg	-	-	-	0.013	0.012	8%	<0.01	<0.01	0%

Note: Highlighted values did not meet the data quality objective of ≤40% relative percent difference (RPD).

Table A.5: Laboratory Duplicate Results for Sediment Sample Analyses

	Analyte	Units	2014			2015															2016					
			Rep 1	Rep 2	RPD	T4-X Rep 1	T4-X Rep 2	RPD	T4-2 Rep 1	T4-2 Rep 2	RPD	T4-4 Rep 1	T4-4 Rep 2	RPD	T4-6 Rep 1	T4-6 Rep 2	RPD	TN-1 Rep 1	TN-1 Rep 2	RPD	TN-1 Rep 1	TN-1 Rep 2	RPD	T4-2 Rep 1	T4-2 Rep 2	RPD
Physical Tests	Moisture	%	36.2	36.1	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.9	34.1	1%	-	-	-
	pH (1:10 soil:water)	pH	8.04	8.22	2%	-	-	-	-	-	-	-	-	-	8.13	8.08	1%	-	-	-	8.28	8.24	0%	-	-	-
Particle Size	% Gravel (>2mm)	%	<0.10	<0.10	0%	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	<0.10	0%	-	-	-	<0.10	<0.10	0%
	% Sand (2.00mm - 1.00mm)	%	<0.10	<0.10	0%	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	<0.10	0%	-	-	-	<0.10	<0.10	0%
	% Sand (1.00mm - 0.50mm)	%	<0.10	<0.10	0%	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	<0.10	0%	-	-	-	<0.10	<0.10	0%
	% Sand (0.50mm - 0.25mm)	%	<0.10	0.13	26%	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	<0.10	0%	-	-	-	<0.10	<0.10	0%
	% Sand (0.25mm - 0.125mm)	%	0.36	0.36	0%	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	0.1	10%	-	-	-	<0.10	<0.10	0%
	% Sand (0.125mm - 0.063mm)	%	3.64	3.62	1%	-	-	-	-	-	-	-	-	-	-	-	-	1.6	2.1	30%	-	-	-	<0.10	<0.10	0%
	% Silt (0.063mm - 0.0312mm)	%	27.3	28.1	3%	-	-	-	-	-	-	-	-	-	-	-	-	20.4	17.7	14%	-	-	-	5.6	6.46	14%
	% Silt (0.0312mm - 0.004mm)	%	54	54	0%	-	-	-	-	-	-	-	-	-	-	-	-	57.8	59.7	3%	-	-	-	63.1	60	5%
	% Clay (<4µm)	%	14.6	13.6	7%	-	-	-	-	-	-	-	-	-	-	-	-	20.2	20.3	0%	-	-	-	31.3	33.5	7%
Organic Carbon	Total Organic Carbon	mg/kg	1.69	1.68	1%	-	-	-	1.43	1.42	1%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals	Aluminum (Al)	mg/kg	11,800	11,500	3%	12,000	13,000	8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Antimony (Sb)	mg/kg	0.34	0.33	3%	0.43	0.44	2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Arsenic (As)	mg/kg	5.50	5.37	2%	6.51	6.9	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Barium (Ba)	mg/kg	91.9	89.2	3%	136	142	4%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beryllium (Be)	mg/kg	0.40	0.40	0%	0.52	0.56	7%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bismuth (Bi)	mg/kg	<0.2	<0.2	0%	<0.2	<0.2	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Boron (B)	mg/kg	-	-	-	<5.0	<5.0	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cadmium (Cd)	mg/kg	0.259	0.269	4%	0.442	0.49	10%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Calcium (Ca)	mg/kg	117,000	113,000	3%	110,000	117,000	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chromium (Cr)	mg/kg	17.2	16.6	4%	19.8	21	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt (Co)	mg/kg	8.14	7.65	6%	8.83	9.61	8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Copper (Cu)	mg/kg	13.3	12.8	4%	16.6	17.7	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Iron (Fe)	mg/kg	20,200	19,500	4%	22,300	23,500	5%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lead (Pb)	mg/kg	14.4	14	3%	13.3	13.9	4%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lithium (Li)	mg/kg	21.9	21.1	4%	23.9	25.2	5%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Magnesium (Mg)	mg/kg	21,500	20,800	3%	22,000	23,900	8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese (Mn)	mg/kg	435	413	5%	527	571	8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mercury (Hg)	mg/kg	0.0224	0.0215	4%	0.038	0.0365	4%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	mg/kg	0.69	0.64	8%	0.89	0.96	8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nickel (Ni)	mg/kg	19.2	18.2	5%	22.8	24.6	8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phosphorus (P)	mg/kg	461	477	3%	707	744	5%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Potassium (K)	mg/kg	1350	1260	7%	1,510	1,600	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Selenium (Se)	mg/kg	0.26	0.26	0%	0.49	0.48	2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Silver (Ag)	mg/kg	<0.1	<0.1	0%	<0.1	<0.1	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sodium (Na)	mg/kg	120	170	34%	110	120	9%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Strontium (Sr)	mg/kg	246	237	4%	222	236	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Tl)	mg/kg	0.129	0.127	2%	0.14	0.152	8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tin (Sn)	mg/kg	<2.0	<2.0	0%	<2.0	<2.0	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Titanium (Ti)	mg/kg	134	150	11%	89	94.3	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uranium (U)	mg/kg	0.802	0.785	2%	0.762	0.824	8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vanadium (V)	mg/kg	16.9	16.3	4%	20.3	21.5	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc (Zn)	mg/kg	70.9	67.3	5%	75.6	81.2	7%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zirconium (Zr)	mg/kg	-	-	-	1.2	1	18%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons	Acenaphthene	mg/kg	-	-	-	-	-	-	-	-	-	<0.005	<0.005	0%	-	-	-	-	-	-	<0.005	<0.005	0%	-	-	-
	Acenaphthylene	mg/kg	-	-	-	-	-	-	-	-	-	<0.005	<0.005	0%	-	-	-	-	-	-	<0.005	<0.005	0%	-	-	-
	Anthracene	mg/kg	-	-	-	-	-	-	-	-	-	0.004	<0.004	0%	-	-	-	-	-	-	<0.004	<0.004	0%	-	-	-
	Benz(a)anthracene	mg/kg	-	-	-	-	-	-	-	-	-	0.016	0.014	13%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Benzo(a)pyrene	mg/kg	-	-	-	-	-	-	-	-	-	0.011	0.012	9%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Benzo(b&j)fluoranthene	mg/kg	-	-	-	-	-	-	-	-	-	0.025	0.023	8%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Benzo(g,h,i)perylene	mg/kg	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Benzo(k)fluoranthene	mg/kg	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Chrysene	mg/kg	-	-	-	-	-	-	-	-	-	0.026	0.019	31%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Dibenz(a,h)anthracene	mg/kg	-	-	-	-	-	-	-	-	-	<0.005	<0.005	0%	-	-	-	-	-	-	<0.005	<0.005	0%	-	-	-
	Fluoranthene	mg/kg	-	-	-	-	-	-	-	-	-	0.021	0.018	15%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Fluorene	mg/kg	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	2-Methylnaphthalene	mg/kg	-	-	-	-	-	-	-	-	-	0.059	0.048	21%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Naphthalene	mg/kg	-	-	-	-	-	-	-	-	-	0.029	0.022	27%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Phenanthrene	mg/kg	-	-	-	-	-	-	-	-	-	0.06	0.05	24%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-
	Pyrene	mg/kg	-	-	-	-	-	-	-	-	-	0.018	0.015	18%	-	-	-	-	-	-	<0.010	<0.010	0%	-	-	-

Table A.6: Laboratory Certified Reference Materials (CRM) Relative to Laboratory-specified Targets and Sediment Quality Guidelines

	Analyte	BCSQG[a]	2014								2015				2016			
			WG1940990-4				WG1940990-5				WG2168078-2				WG2383942-3			
			Target	Achieved	Recovery	Limits	Target	Achieved	Recovery	Limits	Target	Achieved	Recovery	Limits	Target	Achieved	Recovery	Limits
			(mg/kg)		%		(mg/kg)		%		(mg/kg)		%		(mg/kg)		%	
Total Metals	Aluminum (Al)	-	11,100	11,700	105	70-130	18,200	17,700	97.4	70-130	18,200	18,300	101	70-130	18,200	18,900	104	70-130
	Antimony (Sb)	-	2.13	2.17	102	70-130	6.27	6.53	104	70-130	6.27	6.89	110	70-130	6.27	6.88	110	70-130
	Arsenic (As)	5.9/17 [b]	19.6	20.0	103	70-130	15.4	15.9	104	70-130	15.4	18.0	117	70-130	15.4	17.3	112	70-130
	Barium (Ba)	-	273	274	100	70-130	80.6	83.3	103	70-130	80.6	84.7	105	70-130	80.6	82.7	103	70-130
	Beryllium (Be)	-	0.40	0.40	101	70-130	0.54	0.50	0.5*	0.34-0.74*	0.54	0.53	97.8	70-130	0.54	0.56	103	70-130
	Bismuth (Bi)	-	0.43	0.48	112	70-130	1.92	1.90	99.2	70-130	1.92	1.78	92.9	70-130	2.00	1.92	96.2	70-130
	Boron (B)	-	-	-	-	-	-	-	-	-	3.01	5.00	98.9	70-130	4.27	< 5.0	89.5	50-150
	Cadmium (Cd)	0.6/3.5 [b]	0.890	0.884	99.3	70-130	0.217	0.215	98.8	70-130	0.217	0.229	106	70-130	0.231	0.228	98.6	70-130
	Calcium (Ca)	-	15,400	15,800	103	70-130	3320	3640	110	70-130	3,320	3,550	107	70-130	3,320	3,520	106	70-130
	Chromium (Cr)	37.3/90 [b]	26.9	27.5	102	70-130	27.2	28.2	104	70-130	27.2	29.9	110	70-130	27.2	28.8	106	70-130
	Cobalt (Co)	-	13.5	13.4	100	70-130	12.5	12.3	98.0	70-130	12.5	13.3	107	70-130	12.5	12.8	102	70-130
	Copper (Cu)	35.7/197 [b]	33.1	32.8	99	70-130	44.9	41.9	93.4	70-130	44.9	47.4	106	70-130	44.9	46.8	104	70-130
	Iron (Fe)	21,200/43,766 [c]	32,900	33,500	102	70-130	33300	32000	96.1	70-130	33,300	34,200	103	70-130	33,300	33,100	99.5	70-130
	Lead (Pb)	35/91 [b]	32.4	34.3	106	70-130	14.4	13.2	92	70-130	14.4	13.3	92.3	70-130	14.4	13.8	95.8	70-130
	Lithium (Li)	-	8.3	8.1	97.6	70-130	10	10	99.1	70-130	10	10	99.8	70-130	10	11	111	70-130
	Magnesium (Mg)	-	7,500	7,620	102	70-130	5,830	5,710	97.9	70-130	5,830	6,120	105	70-130	5,830	5,900	101	70-130
	Manganese (Mn)	460/1,100 [c]	3440	3,590	104	70-130	1,100	1,080	98.1	70-130	1,100	1,150	104	70-130	1,100	1,080	97.8	70-130
	Molybdenum (Mo)	-	0.98	1.0	105	70-130	0.74	0.66	0.66*	0.24-1.24*	0.74	0.72	96.9	70-130	0.74	0.73	98.5	70-130
	Nickel (Ni)	16/75 [c]	19.7	20.5	104	70-130	17.4	17.2	98.8	70-130	17.4	19.1	110	70-130	17.4	18.8	108	70-130
	Phosphorus (P)	-	1,410	1,370	97.1	70-130	796	723	90.9	70-130	796	900	113	70-130	796	826	104	70-130
	Potassium (K)	-	790	840	107	70-130	620	710	114	70-130	619	690	112	70-130	619	600	96.9	70-130
	Selenium (Se)	2	1.5	1.6	103	70-130	0.32	0.33	0.33*	0.12-0.52*	0.32	0.30	0.3*	0.12-0.52*	0.32	0.28	87.5	70-130
	Silver (Ag)	0.5	0.31	0.33	106	70-130	0.22	0.21	0.21*	0.12-0.32*	0.22	0.23	105	70-130	0.22	0.26	117	70-130
	Sodium (Na)	-	280	310	111	70-130	340	410	122	70-130	340	391	115	70-130	340	367	108	70-130
	Strontium (Sr)	-	28.5	29.8	105	70-130	11.6	12.7	110	70-130	11.6	11.7	101	70-130	11.6	11.8	102	70-130
	Thallium (Tl)	-	0.240	0.251	105	70-130	0.125	0.133	0.133*	0.075-0.175*	0.125	0.119	94.8	70-130	0.125	0.115	91.7	70-130
	Tin (Sn)	-	1.7	< 2.0	106	70-130	1.1	< 2.0	1.0*	0-3*	1.1	2.0	95.7	70-130	1.1	< 2.0	97.9	70-130
	Titanium (Ti)	-	312	354	113	70-130	874	971	111	70-130	874	994	114	70-130	874	805	92.1	70-130
	Uranium (U)	-	-	-	-	-	0.80	0.87	109	70-130	0.80	0.79	98.2	70-130	0.80	0.86	107	70-130
	Vanadium (V)	-	45.7	47.3	104	70-130	54.9	57.3	104	70-130	54.9	62.4	114	70-130	54.9	58.9	107	70-130
	Zinc (Zn)	-	153	155	102	70-130	67.5	66.3	98.3	70-130	67.5	71.4	106	70-130	67.5	70	104	70-130

* Laboratory results presented in mg/kg.

[a] Working guidelines for whole sediment (BCMOE 2006).

[b] Interim Sediment Quality Guideline (ISQG; or Threshold Effect Level [LEL]) / Probable Effect Level (PEL).

[c] Lowest Effect Level (LEL) / Severe Effect Level (SEL).

Table A.7: Laboratory Method Detection Limits (MDLs) for Chemical Analysis of Zooplankton Tissue Samples

Analyte	Units	2014	2015	2016
Aluminum (Al)	µg/g dw	0.0041 - 0.02	0.056 - 0.52	0.012 - 0.027
Antimony (Sb)	µg/g dw	0.00053 - 0.0026	0.0057 - 0.053	0.0021 - 0.0048
Arsenic (As)	µg/g dw	0.0074 - 0.037	0.033 - 0.3	0.0086 - 0.019
Barium (Ba)	µg/g dw	0.00075 - 0.0037	0.008 - 0.074	0.0027 - 0.006
Beryllium (Be)	µg/g dw	0.0027 - 0.013	0.022 - 0.2	0.007 - 0.016
Bismuth (Bi)	µg/g dw	0.000096 - 0.00048	0.0014 - 0.013	0.00012 - 0.00027
Boron (B)	µg/g dw	0.27 - 1.3	1.3 - 12	0.28 - 0.64
Cadmium (Cd)	µg/g dw	0.001 - 0.0049	0.016 - 0.15	0.0037 - 0.0084
Calcium (Ca)	µg/g dw	0.96 - 4.8	13 - 120	5.5 - 12
Cesium (Cs)	µg/g dw	0.000064 - 0.00032	0.00043 - 0.0039	0.00028 - 0.00062
Chromium (Cr)	µg/g dw	0.0038 - 0.0190	0.0200 - 0.1800	0.0110 - 0.0240
Cobalt (Co)	µg/g dw	0.00052 - 0.0026	0.0032 - 0.029	0.0013 - 0.003
Copper (Cu)	µg/g dw	0.00200 - 0.01000	0.01500 - 0.14000	0.00510 - 0.01100
Gallium (Ga)	µg/g dw	0.00062 - 0.0031	0.0098 - 0.091	0.0032 - 0.0072
Iron (Fe)	µg/g dw	0.04 - 0.2	0.34 - 3.2	0.15 - 0.34
Lead (Pb)	µg/g dw	0.00042 - 0.0021	0.0026 - 0.024	0.00049 - 0.0011
Lithium (Li)	µg/g dw	0.0037 - 0.019	0.02 - 0.18	0.014 - 0.031
Magnesium (Mg)	µg/g dw	0.063 - 0.31	0.51 - 4.7	0.022 - 0.051
Manganese (Mn)	µg/g dw	0.004 - 0.021	0.067 - 0.62	0.19 - 0.43
Mercury (Hg)	µg/g dw	0.002 - 0.0054	0.0041 - 0.038	0.0013 - 0.003
Molybdenum (Mo)	µg/g dw	0.00059 - 0.0029	0.01 - 0.096	0.0021 - 0.0047
Nickel (Ni)	µg/g dw	0.0028 - 0.014	0.019 - 0.18	0.0049 - 0.011
Phosphorus (P)	µg/g dw	4.1 - 20	44 - 400	20 - 44
Potassium (K)	µg/g dw	0.74 - 3.7	8.7 - 81	2.8 - 6.2
Rhenium (Re)	µg/g dw	0.000058 - 0.00029	0.00039 - 0.0036	0.00013 - 0.00029
Rubidium (Rb)	µg/g dw	0.0012 - 0.0059	0.0045 - 0.042	0.0031 - 0.007
Selenium (Se)	µg/g dw	0.07 - 0.34	0.39 - 3.60	0.28 - 0.63
Silver (Ag)	µg/g dw	0.00037 - 0.0018	0.0023 - 0.021	0.00075 - 0.0017
Sodium (Na)	µg/g dw	0.13 - 0.66	0.99 - 9.2	0.8 - 1.8
Strontium (Sr)	µg/g dw	0.00014 - 0.00068	0.0025 - 0.023	0.00089 - 0.002
Thallium (Tl)	µg/g dw	0.000078 - 0.00039	0.00051 - 0.0047	0.00016 - 0.00036
Thorium (Th)	µg/g dw	0.000051 - 0.00025	0.0006 - 0.0055	0.00016 - 0.00036
Tin (Sn)	µg/g dw	0.00056 - 0.0028	0.0046 - 0.042	0.0012 - 0.0027
Titanium (Ti)	µg/g dw	0.0093 - 0.046	0.1 - 0.92	0.045 - 0.1
Uranium (U)	µg/g dw	0.00022 - 0.0011	0.00018 - 0.0017	0.00022 - 0.0005
Vanadium (V)	µg/g dw	0.00029 - 0.0014	0.0035 - 0.032	0.00097 - 0.0022
Yttrium (Y)	µg/g dw	0.000091 - 0.00045	0.00084 - 0.0077	0.00052 - 0.0012
Zinc (Zn)	µg/g dw	0.00380 - 0.01900	0.06300 - 0.58000	0.01100 - 0.02500
Zirconium (Zr)	µg/g dw	0.00041 - 0.002	0.0041 - 0.038	0.0033 - 0.0073

Table A.8a: Laboratory Analyses of Certified Reference Materials for Zooplankton Tissue Chemistry Samples

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Aluminum (Al)	µg/g dw	-	1.2 (0.7 - 1.7)	1.1	Yes	-	92%	30A SRM 1577 Bovine Liver
		-	200	86	-	-	43%	31A CRM DOLT-4
Antimony (Sb)	µg/g dw	-	0.009 (0.004 - 0.014)	0.006	Yes	-	70%	30A SRM 1577 Bovine Liver
		-	-	0.010	-	-	-	31A CRM DOLT-4
Arsenic (As)	µg/g dw	0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.058	Yes	105%	107%	30A SRM 1577 Bovine Liver
		9.66 (9.04 - 10.28)	-	8.34	No	86%	-	31A CRM DOLT-4
Cadmium (Cd)	µg/g dw	0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.283	Yes	105%	100%	30A SRM 1577 Bovine Liver
		24.3 (23.5 - 25.1)	-	21.2	No	87%	-	31A CRM DOLT-4
Calcium (Ca)	µg/g dw	124 (118 - 130)	121 (107 - 135)	116	No	94%	96%	30A SRM 1577 Bovine Liver
		-	680	657	-	-	97%	31A CRM DOLT-4
Cesium (Cs)	µg/g dw	-	0.015 (0.011 - 0.019)	0.012	Yes	-	80%	30A SRM 1577 Bovine Liver
		-	-	0.098	-	-	-	31A CRM DOLT-4
Chromium (Cr)	µg/g dw	0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.13	No	148%	118%	30A SRM 1577 Bovine Liver
		-	1.4	1.2	-	-	84%	31A CRM DOLT-4
Cobalt (Co)	µg/g dw	-	0.22 (0.18 - 0.26)	0.23	Yes	-	105%	30A SRM 1577 Bovine Liver
		-	0.25	0.21	-	-	84%	31A CRM DOLT-4
Copper (Cu)	µg/g dw	193 (183 - 203)	190 (180 - 200)	165	No	85%	87%	30A SRM 1577 Bovine Liver
		31.2 (30.1 - 32.3)	-	26.3	No	84%	-	31A CRM DOLT-4
Iron (Fe)	µg/g dw	268 (260 - 276)	263 (241 - 285)	253	No	94%	96%	30A SRM 1577 Bovine Liver
		1,833 (1,758 - 1,908)	-	1,670	No	91%	-	31A CRM DOLT-4
Lead (Pb)	µg/g dw	0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.31	Yes	91%	91%	30A SRM 1577 Bovine Liver
		0.16 (0.12 - 0.20)	-	0.11	No	69%	-	31A CRM DOLT-4
Magnesium (Mg)	µg/g dw	604 (595 - 613)	608 (577 - 639)	597	Yes	99%	98%	30A SRM 1577 Bovine Liver
		-	1,500	1,290	-	-	86%	31A CRM DOLT-4
Manganese (Mn)	µg/g dw	10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	9.9	Yes	96%	97%	30A SRM 1577 Bovine Liver
		-	-	9.1	-	-	-	31A CRM DOLT-4
Mercury (Hg)	µg/g dw	0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	138%	138%	30A SRM 1577 Bovine Liver
		2.58 (2.36 - 2.80)	-	2.2	No	85%	-	31A CRM DOLT-4
Molybdenum (Mo)	µg/g dw	-	3.2 (2.8 - 3.6)	3.6	Yes	-	113%	30A SRM 1577 Bovine Liver
		-	1.0	1.0	-	-	100%	31A CRM DOLT-4
Nickel (Ni)	µg/g dw	-	0.18 (0.10 - 0.26)	0.04	No	-	22%	30A SRM 1577 Bovine Liver
		0.97 (0.86 - 1.08)	-	0.86	Yes	89%	-	31A CRM DOLT-4
Phosphorus (P)	µg/g dw	-	11,200 (10,100 - 12,300)	12,100	Yes	-	108%	30A SRM 1577 Bovine Liver
		-	-	12,200	-	-	-	31A CRM DOLT-4
Potassium (K)	µg/g dw	9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,800	No	111%	111%	30A SRM 1577 Bovine Liver
		-	9,800	9,570	-	-	98%	31A CRM DOLT-4
Rubidium (Rb)	µg/g dw	18.3 (17.3 - 19.3)	18.2 (16.9 - 19.5)	18.6	Yes	102%	102%	30A SRM 1577 Bovine Liver
		-	-	3.15	-	-	-	31A CRM DOLT-4
Selenium (Se)	µg/g dw	1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.00	Yes	91%	92%	30A SRM 1577 Bovine Liver
		8.30 (6.96 - 9.64)	-	7.60	Yes	92%	-	31A CRM DOLT-4
Silver (Ag)	µg/g dw	-	0.062 (0.051 - 0.073)	0.055	Yes	-	89%	30A SRM 1577 Bovine Liver
		0.93 (0.86 - 1.00)	-	0.80	No	86%	-	31A CRM DOLT-4
Sodium (Na)	µg/g dw	2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,300	Yes	95%	96%	30A SRM 1577 Bovine Liver
		-	6,800	6,150	-	-	90%	31A CRM DOLT-4
Strontium (Sr)	µg/g dw	-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	30A SRM 1577 Bovine Liver
		-	5.5	5.1	-	-	93%	31A CRM DOLT-4
Tin (Sn)	µg/g dw	-	0.016 (0.012 - 0.020)	0.019	Yes	-	119%	30A SRM 1577 Bovine Liver
		-	0.17	0.15	-	-	88%	31A CRM DOLT-4
Vanadium (V)	µg/g dw	-	0.058 (0.052 - 0.064)	0.060	Yes	-	103%	30A SRM 1577 Bovine Liver
		-	0.6	0.56	-	-	93%	31A CRM DOLT-4
Zinc (Zn)	µg/g dw	130 (117 - 143)	131 (123 - 139)	121	Yes	93%	92%	30A SRM 1577 Bovine Liver
		116 (110 - 122)	-	101	No	87%	-	31A CRM DOLT-4

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values, 2014.

[1]If both a certified and an informational value, only compared measured value to certified range.

Table A.8b: Laboratory Analyses of Certified Reference Materials for Zooplankton Tissue Chemistry Samples

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Aluminum (Al)	µg/g dw	-	31.7 (27.5 - 35.7)	15.4	No	-	49%	17B CRM DOLT-5
Antimony (Sb)	µg/g dw	-	0.013	0.012	-	-	88%	17B CRM DOLT-5
Arsenic (As)	µg/g dw	34.6 (32.2 - 37.0)	-	31.6	No	91%	-	17B CRM DOLT-5
Cadmium (Cd)	µg/g dw	14.5 (13.9 - 15.1)	-	13.1	No	90%	-	17B CRM DOLT-5
Calcium (Ca)	µg/g dw	550 (470 - 630)	-	560	Yes	102%	-	17B CRM DOLT-5
Cesium (Cs)	µg/g dw	-	-	0.069	-	-	-	17B CRM DOLT-5
Chromium (Cr)	µg/g dw	-	2.35 (1.77 - 2.93)	2.13	Yes	-	91%	17B CRM DOLT-5
Cobalt (Co)	µg/g dw	0.267 (0.241 - 0.293)	-	0.240	No	90%	-	17B CRM DOLT-5
Copper (Cu)	µg/g dw	35.0 (32.6 - 37.4)	-	29.9	No	85%	-	17B CRM DOLT-5
Iron (Fe)	µg/g dw	1,070 (990 - 1,150)	-	1,040	Yes	97%	-	17B CRM DOLT-5
Lead (Pb)	µg/g dw	0.162 (0.130 - 0.194)	-	0.156	Yes	98%	-	17B CRM DOLT-5
Magnesium (Mg)	µg/g dw	940 (840 - 1,040)	-	868	Yes	92%	-	17B CRM DOLT-5
Manganese (Mn)	µg/g dw	-	8.91 (8.21 - 9.61)	8.93	Yes	-	100%	17B CRM DOLT-5
Mercury (Hg)	µg/g dw	0.44 (0.26 - 0.62)	-	0.41	Yes	92%	-	17B CRM DOLT-5
Molybdenum (Mo)	µg/g dw	1.41 (1.19 - 1.63)	-	1.37	Yes	97%	-	17B CRM DOLT-5
Nickel (Ni)	µg/g dw	-	1.71 (1.15 - 2.27)	1.39	Yes	-	81%	17B CRM DOLT-5
Phosphorus (P)	µg/g dw	-	11,500	11,400	-	-	99%	17B CRM DOLT-5
Potassium (K)	µg/g dw	14,400 (11,400 - 17,400)	-	15,000	Yes	104%	-	17B CRM DOLT-5
Rubidium (Rb)	µg/g dw	-	-	5.0	-	-	-	17B CRM DOLT-5
Selenium (Se)	µg/g dw	8.3 (6.5 - 10.1)	-	7.7	Yes	92%	-	17B CRM DOLT-5
Silver (Ag)	µg/g dw	2.05 (1.97 - 2.13)	-	1.75	No	85%	-	17B CRM DOLT-5
Sodium (Na)	µg/g dw	9,900 (8,300 - 11,500)	-	10,300	Yes	104%	-	17B CRM DOLT-5
Strontium (Sr)	µg/g dw	3.73 (3.47 - 3.99)	-	3.71	Yes	99%	-	17B CRM DOLT-5
Tin (Sn)	µg/g dw	0.069 (0.033 - 0.105)	-	0.061	Yes	88%	-	17B CRM DOLT-5
Vanadium (V)	µg/g dw	0.51 (0.45 - 0.57)	-	0.49	Yes	96%	-	17B CRM DOLT-5
Zinc (Zn)	µg/g dw	105.3 (99.9 - 110.7)	-	93.6	No	89%	-	17B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values, 2015.

Table A.8c: Laboratory Analyses of Certified Reference Materials for Zooplankton Tissue Chemistry Samples

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Aluminum (Al)	µg/g dw	-	1.2 (0.7 - 1.7)	1.2	Yes	-	96%	01B SRM 1577
		-	1.2 (0.7 - 1.7)	1.1	Yes	-	88%	04B SRM 1577
		-	31.7 (27.5 - 35.7)	14	No	-	43%	02B CRM DOLT-5
		-	31.7 (27.5 - 35.7)	13	No	-	40%	05B CRM DOLT-5
Antimony (Sb)	µg/g dw	-	0.009 (0.004 - 0.014)	0.008	Yes	-	88%	01B SRM 1577
		-	0.009 (0.004 - 0.014)	0.006	Yes	-	68%	04B SRM 1577
		-	0.013	0.012	-	-	134%	02B CRM DOLT-5
		-	0.013	0.017	-	-	189%	05B CRM DOLT-5
Arsenic (As)	µg/g dw	0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.055	Yes	101%	103%	01B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.061	No	110%	112%	04B SRM 1577
		34.6 (32.2 - 37)	-	32.3	Yes	93%	-	02B CRM DOLT-5
		34.6 (32.2 - 37)	-	35.7	Yes	103%	-	05B CRM DOLT-5
Cadmium (Cd)	µg/g dw	0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.28	Yes	104%	99%	01B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.30	Yes	111%	106%	04B SRM 1577
		14.5 (13.9 - 15.1)	-	13.0	No	90%	-	02B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	14.9	Yes	103%	-	05B CRM DOLT-5
Calcium (Ca)	µg/g dw	124 (118 - 130)	121 (107 - 135)	126	Yes	102%	104%	01B SRM 1577
		124 (118 - 130)	121 (107 - 135)	111	No	90%	92%	04B SRM 1577
		550 (470 - 630)	-	554	Yes	101%	-	02B CRM DOLT-5
		550 (470 - 630)	-	540	Yes	98%	-	05B CRM DOLT-5
Cesium (Cs)	µg/g dw	-	0.015 (0.011 - 0.019)	0.013	Yes	-	84%	01B SRM 1577
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	81%	04B SRM 1577
		-	-	0.07	-	-	-	02B CRM DOLT-5
		-	-	0.07	-	-	-	05B CRM DOLT-5
Chromium (Cr)	µg/g dw	0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.116	No	132%	105%	01B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.127	No	144%	115%	04B SRM 1577
		-	2.35 (1.77 - 2.93)	2.21	Yes	-	94%	02B CRM DOLT-5
		-	2.35 (1.77 - 2.93)	1.82	Yes	-	77%	05B CRM DOLT-5
Cobalt (Co)	µg/g dw	-	0.22 (0.18 - 0.26)	0.23	Yes	-	105%	01B SRM 1577
		-	0.22 (0.18 - 0.26)	0.25	Yes	-	113%	04B SRM 1577
		0.267 (0.241 - 0.293)	-	0.229	No	86%	-	02B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.266	Yes	100%	-	05B CRM DOLT-5
Copper (Cu)	µg/g dw	193 (183 - 203)	190 (180 - 200)	168	No	87%	88%	01B SRM 1577
		193 (183 - 203)	190 (180 - 200)	172	No	89%	91%	04B SRM 1577
		35.0 (32.6 - 37.4)	-	29.5	No	84%	-	02B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	33.8	Yes	97%	-	05B CRM DOLT-5
Iron (Fe)	µg/g dw	268 (260 - 276)	263 (241 - 285)	258	No	96%	98%	01B SRM 1577
		268 (260 - 276)	263 (241 - 285)	266	Yes	99%	101%	04B SRM 1577
		1,070 (990 - 1,150)	-	995	Yes	93%	-	02B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,110	Yes	104%	-	05B CRM DOLT-5
Lead (Pb)	µg/g dw	0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.33	Yes	97%	97%	01B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.38	Yes	111%	111%	04B SRM 1577
		0.162 (0.130 - 0.194)	-	0.147	Yes	91%	-	02B CRM DOLT-5
		0.162 (0.130 - 0.194)	-	0.167	Yes	103%	-	05B CRM DOLT-5
Magnesium (Mg)	µg/g dw	604 (595 - 613)	608 (577 - 639)	577	No	96%	95%	01B SRM 1577
		604 (595 - 613)	608 (577 - 639)	593	No	98%	98%	04B SRM 1577
		940 (840 - 1,040)	-	815	No	87%	-	02B CRM DOLT-5
		940 (840 - 1,040)	-	947	Yes	101%	-	05B CRM DOLT-5
Manganese (Mn)	µg/g dw	10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.5	Yes	102%	103%	01B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.6	Yes	103%	104%	04B SRM 1577
		-	8.91 (8.21 - 9.61)	8.84	Yes	-	99%	02B CRM DOLT-5
		-	8.91 (8.21 - 9.61)	9.50	Yes	-	107%	05B CRM DOLT-5
Mercury (Hg)	µg/g dw	0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.024	No	149%	149%	01B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.025	No	154%	154%	04B SRM 1577
		0.44 (0.26 - 0.62)	-	0.39	Yes	88%	-	02B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.42	Yes	96%	-	05B CRM DOLT-5
Molybdenum (Mo)	µg/g dw	-	3.2 (2.8 - 3.6)	3.5	Yes	-	109%	01B SRM 1577
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	112%	04B SRM 1577
		1.41 (1.19 - 1.63)	-	1.35	Yes	96%	-	02B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.40	Yes	99%	-	05B CRM DOLT-5
Nickel (Ni)	µg/g dw	-	0.18 (0.10 - 0.26)	0.04	No	-	20%	01B SRM 1577
		-	0.18 (0.10 - 0.26)	0.04	No	-	23%	04B SRM 1577
		-	1.71 (1.15 - 2.27)	1.4	No	-	82%	02B CRM DOLT-5
		-	1.71 (1.15 - 2.27)	1.2	No	-	69%	05B CRM DOLT-5
Phosphorus (P)	µg/g dw	-	11,200 (10,100 - 12,300)	11,100	Yes	-	99%	01B SRM 1577
		-	11,200 (10,100 - 12,300)	11,500	Yes	-	103%	04B SRM 1577
		-	11,500	10,600	-	-	-	02B CRM DOLT-5
		-	11,500	12,600	-	-	-	05B CRM DOLT-5
Potassium (K)	µg/g dw	9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,200	Yes	105%	105%	01B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	9,870	Yes	102%	102%	04B SRM 1577
		14,400 (11,400 - 17,400)	-	14,500	Yes	101%	-	02B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	15,500	Yes	108%	-	05B CRM DOLT-5
Rubidium (Rb)	µg/g dw	-	18.3 (17.3 - 19.3)	18.4	Yes	-	101%	01B SRM 1577
		-	18.3 (17.3 - 19.3)	18.5	Yes	-	101%	04B SRM 1577
		-	-	4.9	-	-	-	02B CRM DOLT-5
		-	-	5.2	-	-	-	05B CRM DOLT-5
Selenium (Se)	µg/g dw	1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	107%	108%	01B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	105%	106%	04B SRM 1577
		8.3 (6.5 - 10.1)	-	7.34	Yes	88%	-	02B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	8.55	Yes	103%	-	05B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values, 2016.

[1]If both a certified and an informational value, only compared measured value to certified range.

Table A.8c: Laboratory Analyses of Certified Reference Materials for Zooplankton Tissue Chemistry Samples

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Silver (Ag)	µg/g dw	-	0.062 (0.051 - 0.073)	0.056	Yes	-	90%	01B SRM 1577
		-	0.062 (0.051 - 0.073)	0.057	Yes	-	92%	04B SRM 1577
		2.05 (1.97 - 2.13)	-	1.79	No	87%	-	02B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.99	Yes	97%	-	05B CRM DOLT-5
Sodium (Na)	µg/g dw	2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,230	No	92%	93%	01B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,290	No	94%	96%	04B SRM 1577
		9,900 (8,300 - 11,500)	-	9,380	Yes	95%	-	02B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	10,600	Yes	107%	-	05B CRM DOLT-5
Strontium (Sr)	µg/g dw	-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	01B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	04B SRM 1577
		3.73 (3.47 - 3.99)	-	3.66	Yes	98%	-	02B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.79	Yes	102%	-	05B CRM DOLT-5
Tin (Sn)	µg/g dw	-	0.016 (0.012 - 0.020)	0.009	No	-	57%	01B SRM 1577
		-	0.016 (0.012 - 0.020)	0.012	Yes	-	72%	04B SRM 1577
		0.069 (0.033 n- 0.105)	-	0.059	Yes	85%	-	02B CRM DOLT-5
		0.069 (0.033 n- 0.105)	-	0.052	Yes	75%	-	05B CRM DOLT-5
Vanadium (V)	µg/g dw	-	0.058 (0.052 - 0.064)	0.057	Yes	-	99%	01B SRM 1577
		-	0.058 (0.052 - 0.064)	0.061	Yes	-	105%	04B SRM 1577
		0.51 (0.45 - 0.57)	-	0.46	Yes	89%	-	02B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.50	Yes	98%	-	05B CRM DOLT-5
Zinc (Zn)	µg/g dw	130 (117 - 143)	131 (123 - 139)	121	Yes	93%	92%	01B SRM 1577
		130 (117 - 143)	131 (123 - 139)	126	Yes	97%	96%	04B SRM 1577
		105.3 (99.9 - 110.7)	-	93	No	89%	-	02B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	114	Yes	108%	-	05B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values, 2016.

[1]If both a certified and an informational value, only compared measured value to certified range.

Table A.9: Laboratory Duplicate Results for Zooplankton Chemical Analyses, 2014

Analyte	Units	T2-6 Rep 1	T2-6 Rep 2	RPD (%)
Aluminum (Al)	µg/g dw	1,330	1,170	13%
Antimony (Sb)	µg/g dw	0.0148	0.0122	19%
Arsenic (As)	µg/g dw	3.6	3.6	0%
Barium (Ba)	µg/g dw	31.7	28.0	12%
Beryllium (Be)	µg/g dw	0.056	0.050	11%
Bismuth (Bi)	µg/g dw	0.0127	0.0126	1%
Boron (B)	µg/g dw	1.69	1.61	5%
Cadmium (Cd)	µg/g dw	1.04	1.01	3%
Calcium (Ca)	µg/g dw	16,900	17,300	2%
Cesium (Cs)	µg/g dw	0.16	0.14	13%
Chromium (Cr)	µg/g dw	1.58	1.49	6%
Cobalt (Co)	µg/g dw	0.559	0.572	2%
Copper (Cu)	µg/g dw	6.71	7.45	10%
Gallium (Ga)	µg/g dw	0.387	0.377	3%
Iron (Fe)	µg/g dw	797	827	4%
Lead (Pb)	µg/g dw	1.15	1.06	8%
Lithium (Li)	µg/g dw	1.37	1.31	4%
Magnesium (Mg)	µg/g dw	2,620	2,820	7%
Manganese (Mn)	µg/g dw	58.8	57.9	2%
Mercury (Hg)	µg/g dw	0.0319	0.0322	1%
Molybdenum (Mo)	µg/g dw	0.3	0.3	5%
Nickel (Ni)	µg/g dw	1.58	1.64	4%
Phosphorus (P)	µg/g dw	9,660	9,560	1%
Potassium (K)	µg/g dw	7,430	7,630	3%
Rhenium (Re)	µg/g dw	0.00099	0.00097	2%
Rubidium (Rb)	µg/g dw	12.2	12.2	0%
Selenium (Se)	µg/g dw	2.64	2.63	0%
Silver (Ag)	µg/g dw	0.0397	0.0376	5%
Sodium (Na)	µg/g dw	2,900	3,160	9%
Strontium (Sr)	µg/g dw	57.8	54.2	6%
Thallium (Tl)	µg/g dw	0.0748	0.0743	1%
Thorium (Th)	µg/g dw	0.237	0.221	7%
Tin (Sn)	µg/g dw	0.146	0.147	1%
Titanium (Ti)	µg/g dw	10.1	13.3	27%
Uranium (U)	µg/g dw	0.182	0.165	10%
Vanadium (V)	µg/g dw	1.44	1.29	11%
Yttrium (Y)	µg/g dw	0.475	0.449	6%
Zinc (Zn)	µg/g dw	64.8	65.5	1%
Zirconium (Zr)	µg/g dw	1.46	1.30	12%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.10: Laboratory Duplicate Results for Analysis of Zooplankton Cell Densities (no. of organisms/L) by Species

Group	Species	Sex	2014			2015			2016		
			T2-5	T2-5Q	RPD	TN-3	TN-3X	RPD	TN-1	TN-1 Recount	RPD
Copepoda	Calanoid nauplii	na	3.9	3.6	7%	0.19	0.15	28%	0.76	0.81	6%
	Calanoid nauplii	na	0.87	0.89	3%	0.12	0.14	9%	0.58	0.49	15%
	Calanoid copepodids	na	2.0	2.3	17%	0.12	0.12	0%	0.36	0.26	34%
	Calanoid copepodids	na	1.9	1.6	16%	0.11	0.088	24%	0.13	0.15	17%
	Cyclopoid nauplii	na	3.5	4.1	16%	0.094	0.10	6%	0.72	0.85	17%
	Cyclopoid nauplii	na	3.5	3.2	8%	0.071	0.094	29%	0.34	0.31	11%
	Cyclopoid copepodids	na	3.2	3.2	1%	0.11	0.11	0%	0.86	0.86	0%
	Cyclopoid copepodids	na	1.1	1.0	9%	0.047	0.059	22%	0.58	0.67	15%
	Diaptomus sicilis	M/F	0.035	0.012	100%	0.090	0.10	11%	0.12	0.035	108%
	Diaptomus oregonensis	M/F	0.96	0.90	6%	0.080	0.090	12%	0.094	0.11	12%
	Epischura lacustris	M/F	0.024	0.012	67%	0.020	0.040	67%	0.035	0.035	0%
	Cyclops bicuspidatus thomasi	M/F	1.3	1.2	5%	0.040	0.020	67%	0.65	0.53	20%
	Tropocyclops sp.	F	-	-	-	0.0059	0	200%	-	-	-
Cladocera	*Daphnia galeata mendotae*	F	1.6	1.2	24%	0.094	0.076	21%	2.5	2.6	3%
	Bosmina longirostris	F	0	0.047	200%	0.029	0.041	33%	0.11	0.094	12%
	Diaphanosoma birgei	F	0.56	0.52	9%	0.30	0.20	40%	0.059	0.082	33%
	Leptadora kindtii	na	0.024	0.024	0%	0	0.0059	200%	-	-	-
Rotifera	*Keratella cochlearis*	na	9.6	13	29%	-	-	-	5.5	6.1	10%
	Kellicottia longispina	na	2.8	1.4	67%	0.24	0.24	0%	4.7	3.8	22%
	Polyarthra remata	na	3.0	2.0	40%	8.0	6.0	29%	-	-	-
	Polyarthra vulgaris	na	16	13	18%	0	0.066	200%	1.5	2.2	38%
	Gastropus stylifer	na	6.1	3.8	48%	0.35	0.12	100%	-	0.24	-
	Keratella crassa	na	3.3	3.5	7%	-	-	-	-	-	-
	Ascomorpha ovalis	na	5.4	5.2	4%	0.35	0.12	100%	0.24	0.47	67%
	Collotheca	na	16	17	3%	2.4	1.2	67%	6.1	5.6	8%
	Synchaeta sp.	na	3.5	3.5	0%	0.24	0	200%	-	-	-

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.11: Laboratory Duplicate Results for Analysis of Zooplankton Group Densities (No. of Organisms/L)

Zooplankton Density (no. of organisms/L)	2014			2015			2016		
	T2-5	T2-5X	RPD	TN-3	TN-3X	RPD	TN-1	TN-1 Recount	RPD
Copepoda	22	22	1%	1.1	1.1	1%	5.2	5.1	2%
Cladocera	2.2	1.8	17%	0.42	0.32	27%	2.70	2.80	3%
Rotifera	66	63	6%	12	7.7	40%	18	18	2%
Total	**91**	**87**	**5%**	**13**	**9.1**	**35%**	**26**	**26**	**1%**

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.12: Laboratory Duplicate Results for Analysis of Phytoplankton Cell Densities (No. of Cells/L) by Species

Group	Species	2014			2015			2016		
		T2-6	T2-6Q	RPD	TN-3	TN-3R	RPD	T4-3	T4-3R	RPD
Cyanophyte	*Aphanocapsa delicatissima*	-	-	-	600	400	40%	-	-	-
	Aphanothece sp.	14,368	0	200%	-	-	-	-	-	-
	Planktolyngbya limnetica	-	-	-	-	-	-	31,200	26,200	17%
Chlorophyte	*Chlamydomonas* spp.	14,368	7,184	67%	39,683	79,366	67%	14,368	7,184	67%
	Ankistrodesmus spiralis Lemmermann	-	-	-	-	-	-		7,184	-
	Oocystis lacustris	64,656	100,576	43%	317,464	158,732	67%	-	-	-
	Collodictyon sp	-	-	-	39,683	39,683	0%	-	-	-
Chyrsophyte	*Small chrysophyceae*	122,128	143,680	16%	39,683	39,683	0%	86,208	107,760	22%
	Large chrysophyceae	14,368	7,184	67%	39,683	0	200%	35,920	-	-
	Chrysostephanospaera globulifera	-	-	-	39,683	79,366	67%	-	-	-
	Chrysochromulina parva	165,232	136,496	19%	-	-	-	14,368	14,368	0%
	Chrysococcus sp.	150,864	136,496	10%	-	-	-	129,312	179,600	33%
	Kephyrion sp.	50,288	35,920	33%	0	39,683	200%	50,288	35,920	33%
	Mallomonas crassisquama	-	-	-	600	200	100%	-	-	-
	Dinobryon bavaricum	-	-	-	-	-	-	50,288	64,656	25%
	Dinobryon sertularia	15,168	36,320	82%	0	79,366	200%	-	-	-
	Dinobryon sociale	194,168	180,200	7%	79,366	79,366	0%	21,552	14,368	40%
	Bitrichia chodatii	-	-	-	-	-	-	-	14,368	-
	Chrysochromulina laurentiana	7,184	14,368	67%	-	-	-	-	-	-
	Stichogloea sp.	28,736	43,104	40%	-	-	-	-	-	-
	Salpingoeca frequentissima	7,184	14,368	67%	39,683	119,049	100%	-	-	-
Diatom	*Cyclotella stelligera*	39,600	40,800	3%	2,000	1,600	22%	1,200	1,000	18%
	Cyclotella pseudostelligera	6,286,000	6,343,472	1%	14,087,465	13,135,073	7%	747,136	761,504	2%
	Cyclotella ocellata	14,368	7,184	67%	-	-	-	-	-	-
	Rhizosolenia eriense	-	-	-	39,683	39,683	0%	-	-	-
	Tabellaria fenestrata	-	-	-	-	-	-	200	800	120%
	Tabellaria flocculsa	-	-	-	-	-	-	200	-	-
	Fragliaria construens	200	800	120%	-	-	-	6,400	7,200	12%
	Synedra acus	-	-	-	25,400	29,200	14%	8,200	7,200	13%
	Synedra ulna	8,400	7,800	7%	400	800	67%	-	-	-
	Cyclotella bodanica	8,400	7,800	7%	-	-	-	-	-	-
	Cyclotella michiganiana	-	-	-	79,366	39,683	67%	502,880	359,200	33%
Cryptophyte	*Rhodomonas minuta*	258,624	237,072	9%	158,732	79,366	67%	93,392	71,840	26%
	Cryptomonas erosa	3,200	2,400	29%	2,800	2,200	24%	6,800	5,000	31%
	Cryptomonas reflexa	400	800	67%	-	-	-	-	-	-
	Cryptomonas rostratiformis	-	-	-	200	400	67%	-	-	-
	Katablepharis ovalis	35,920	14,368	86%	119,049	158,732	29%	21,552	7,184	100%
Dinoflagellate	*Gymnodinium* sp.	1,000	800	22%	40,083	0	200%	-	-	-
	Ceratium hirundenella	400	600	40%	-	-	-	-	200	-
	Peridinium pusillum	1,800	1,400	25%	3,600	3,400	6%	600	200	100%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.13: Laboratory Duplicate Results for Analysis of Phytoplankton Group Densities (No. of Cells/L)

Algal Density (no. of cells/L)	2014			2015			2016		
	T2-6	T2-6Q	RPD	TN-3	TN-3R	RPD	T4-3	T4-3R	RPD
Cyanophyte	14,368	0	200%	600	400	40%	31,200	26,200	17%
Chlorophyte	79,024	107,760	31%	396,830	277,781	35%	14,368	14,368	0%
Chrysophyte	755,320	748,136	1%	238,698	436,713	59%	387,936	431,040	11%
Diatom	6,358,968	6,409,656	1%	14,234,314	13,246,039	7%	1,266,216	1,136,904	11%
Cryptophyte	298,144	254,640	16%	280,781	240,698	15%	121,744	84,024	37%
Dinoflagellate	3,200	2,800	13%	43,683	3,400	171%	600	400	40%
Total	**7,509,024**	**7,522,992**	**0%**	**15,194,906**	**14,205,031**	**7%**	**1,822,064**	**1,692,936**	**7%**

Note: Highlighted values did not meet the data quality objective of ≤ 30% relative percent difference (RPD).

Table A.14: Laboratory Method Detection Limits (MDLs) for Chemical Analysis of Benthic Invertebrate Tissue Samples

Analyte	Units	2014	2015	2016
Aluminum (Al)	µg/g dw	0.0049 - 0.097	0.022 - 0.083	0.021 - 0.068
Antimony (Sb)	µg/g dw	0.00023 - 0.012	0.0022 - 0.0085	0.0038 - 0.0089
Arsenic (As)	µg/g dw	0.0047 - 0.18	0.013 - 0.048	0.015 - 0.049
Barium (Ba)	µg/g dw	0.00065 - 0.018	0.0031 - 0.012	0.0033 - 0.0084
Beryllium (Be)	µg/g dw	0.0032 - 0.065	0.0084 - 0.032	0.012 - 0.029
Bismuth (Bi)	µg/g dw	0.000042 - 0.0023	0.00053 - 0.002	0.00021 - 0.00048
Boron (B)	µg/g dw	0.095 - 6.3	0.52 - 2	0.38 - 0.89
Cadmium (Cd)	µg/g dw	0.00085 - 0.024	0.0061 - 0.023	0.0067 - 0.021
Calcium (Ca)	µg/g dw	0.94 - 23	4.9 - 19	8.8 - 19
Cesium (Cs)	µg/g dw	0.000076 - 0.0015	0.00016 - 0.00063	0.00049 - 0.0015
Chromium (Cr)	µg/g dw	0.0028 - 0.091	0.0077 - 0.029	0.0190 - 0.041
Cobalt (Co)	µg/g dw	0.00062 - 0.012	0.0012 - 0.0047	0.0011 - 0.0042
Copper (Cu)	µg/g dw	0.00110 - 0.048	0.00580 - 0.022	0.00780 - 0.017
Gallium (Ga)	µg/g dw	0.00052 - 0.015	0.0038 - 0.015	0.0032 - 0.01
Iron (Fe)	µg/g dw	0.047 - 0.95	0.13 - 0.51	0.2 - 0.47
Lead (Pb)	µg/g dw	0.00025 - 0.01	0.00099 - 0.0038	0.00088 - 0.0025
Lithium (Li)	µg/g dw	0.0044 - 0.089	0.0076 - 0.029	0.017 - 0.043
Magnesium (Mg)	µg/g dw	0.039 - 1.5	0.2 - 0.76	0.22 - 0.61
Manganese (Mn)	µg/g dw	0.0041 - 0.1	0.026 - 0.099	0.038 - 0.084
Mercury (Hg)	µg/g dw	0.0023 - 0.047	0.0016 - 0.0061	0.0023 - 0.0066
Molybdenum (Mo)	µg/g dw	0.0068 - 0.014	0.004 - 0.015	0.0037 - 0.013
Nickel (Ni)	µg/g dw	0.0012 - 0.067	0.0074 - 0.028	0.0088 - 0.021
Phosphorus (P)	µg/g dw	3.2 - 99	17 - 65	26 - 62
Potassium (K)	µg/g dw	0.59 - 18	3.4 - 13	4.4 - 9.7
Rhenium (Re)	µg/g dw	0.000069 - 0.0014	0.00015 - 0.00058	0.00021 - 0.00046
Rubidium (Rb)	µg/g dw	0.0014 - 0.028	0.0017 - 0.0066	0.0036 - 0.0098
Selenium (Se)	µg/g dw	0.05 - 1.7	0.15 - 0.57	0.50 - 1.4
Silver (Ag)	µg/g dw	0.00042 - 0.0088	0.00089 - 0.0034	0.0013 - 0.0078
Sodium (Na)	µg/g dw	0.072 - 3.2	0.38 - 1.5	0.61 - 2.5
Strontium (Sr)	µg/g dw	0.00016 - 0.0033	0.00095 - 0.0036	0.0016 - 0.004
Thallium (Tl)	µg/g dw	0.000077 - 0.0066	0.0002 - 0.00075	0.00028 - 0.00076
Thorium (Th)	µg/g dw	0.000033 - 0.0012	0.00023 - 0.00088	0.00028 - 0.00084
Tin (Sn)	µg/g dw	0.00064 - 0.013	0.0018 - 0.0067	0.0021 - 0.011
Titanium (Ti)	µg/g dw	0.011 - 0.22	0.039 - 0.15	0.04 - 0.14
Uranium (U)	µg/g dw	0.00015 - 0.0053	0.000071 - 0.00027	0.00019 - 0.00069
Vanadium (V)	µg/g dw	0.00035 - 0.007	0.0014 - 0.0052	0.0017 - 0.0043
Yttrium (Y)	µg/g dw	0.00011 - 0.0022	0.00032 - 0.0012	0.00036 - 0.0016
Zinc (Zn)	µg/g dw	0.00370 - 0.09	0.02400 - 0.093	0.01900 - 0.042
Zirconium (Zr)	µg/g dw	0.00048 - 0.0097	0.0016 - 0.0061	0.0018 - 0.01

Table A.15a: Benthic Invertebrate Community Organism Recoveries

Station ID	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
2014			
T2-4	130	130	100.0%
T4-6	487	491	99.2%
		Average % Recovery	99.6%
2015			
TN-3	87	92	94.6%
T4-2	361	363	99.4%
		Average % Recovery	97.0%
2016			
TN-1	184	186	98.9%
T4-4	488	497	98.2%
		Average % Recovery	98.6%

Note: Highlighted values did not meet the data quality objective of ≥90% recovery.

Table A.15b: Calculation of Subsampling Error for Benthic Macroinvertebrate Samples

Station	Whole Organisms	Number of Organisms in Fraction 1	Number of Organisms in Fraction 2	Number of Organisms in Fraction 3	Number of Organisms in Fraction 4	Actual Density*	Precision % RPD range)		Accuracy %	
							min [a]	max [b]	min	max
T4-4	-	242	255	-	-	-	NA	5.1	97.4	103.0

Note: Highlighted values did not meet the data quality objectives of ≤20% for precision or within 80% to 120% for accuracy.

* whole large organisms excluded in calculations.

[a] min = minimum absolute % error.

[b] max = maximum absolute % error.

Table A.15c: Sample Fractions Sorted from Koocanusa Reservoir, 2016

Station	Fraction Sorted	Station	Fraction Sorted
TN-1	Whole	T4-2	Whole
TN-2	Whole	T4-3	Whole
TN-3	Whole	T4-4	Whole [c]
TN-4	Whole	T4-5	Whole
TN-5	1/2	T4-6	Whole

[c] two halves sorted for subsampling error calculations.

QA/QC Notes

Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group.
Immatures were not counted toward total number of taxa unless they were the sole representative of their taxa group.
Correction to 2015 data based on 2016 reference listed below
All *Cyprinotus* are *Isocypris*
All *Limnocythere* are *Cytherissa lacustris*
All *Ilyocypris* are *Limnocythere*
Keys to Nearctic Fauna 2016.
Edited by James H. Thorp and Christopher Rogers
Fourth Edition. Academic Press.

Table A.16: Laboratory Method Detection Limits (MDLs) Associated with Fish Tissue Chemical Analysis

Analyte	Units	2014				2015			
		Muscle Fillet	Muscle Plug	Egg and Ovary	Whole Body	Muscle Fillet	Muscle Plug	Egg and Ovary	Whole Body
Aluminum (Al)	µg/g dw	0.0027 - 0.0088	0.0069 - 0.17	0.004 - 0.019	0.0033 - 0.0042	0.0023 - 0.02	0.009 - 0.13	0.0033 - 0.032	0.0048 - 0.0076
Antimony (Sb)	µg/g dw	0.00025 - 0.00098	0.00064 - 0.012	0.0002 - 0.0015	0.00043 - 0.00053	0.00032 - 0.0061	0.00028 - 0.004	0.00041 - 0.0096	0.00055 - 0.00078
Arsenic (As)	µg/g dw	0.003 - 0.013	0.0052 - 0.093	0.015 - 0.002	0.006 - 0.0075	0.0023 - 0.024	0.0033 - 0.047	0.0039 - 0.038	0.0037 - 0.011
Barium (Ba)	µg/g dw	0.0007 - 0.0058	0.0011 - 0.025	0.0005 - 0.0038	0.00061 - 0.00077	0.0004 - 0.0078	0.00043 - 0.0061	0.00041 - 0.004	0.00056 - 0.0011
Beryllium (Be)	µg/g dw	0.0021 - 0.0067	0.0048 - 0.054	0.0024 - 0.0095	0.0022 - 0.0027	0.0021 - 0.014	0.0051 - 0.072	0.0021 - 0.022	0.0023 - 0.0029
Bismuth (Bi)	µg/g dw	0.00003 - 0.00014	0.000092 - 0.0011	0.00003 - 0.00015	0.000078 - 0.000098	0.000076 - 0.00069	0.000092 - 0.0013	0.000099 - 0.00096	0.000078 - 0.00019
Boron (B)	µg/g dw	0.07 - 0.23	0.11 - 2.4	0.051 - 0.44	0.22 - 0.27	0.066 - 0.74	0.095 - 1.3	0.1 - 1.2	0.15 - 0.25
Cadmium (Cd)	µg/g dw	0.0006 - 0.0016	0.0012 - 0.019	0.001 - 0.004	0.0008 - 0.001	0.00099 - 0.0092	0.00088 - 0.012	0.0015 - 0.015	0.0018 - 0.0023
Calcium (Ca)	µg/g dw	0.56 - 3	1.9 - 23	0.83 - 3.3	0.78 - 0.98	0.73 - 5.4	0.95 - 14	0.74 - 7.2	0.85 - 1.7
Cesium (Cs)	µg/g dw	0.00005 - 0.0003	0.000086 - 0.002	0.00004 - 0.0003	0.000052 - 0.000065	0.000055 - 0.00057	0.000077 - 0.0011	0.000052 - 0.00091	0.000049 - 0.00014
Chromium (Cr)	µg/g dw	0.0018 - 0.0064	0.0047 - 0.057	0.0029 - 0.012	0.0031 - 0.0039	0.0015 - 0.014	0.0025 - 0.036	0.0022 - 0.022	0.0019 - 0.0027
Cobalt (Co)	µg/g dw	0.0003 - 0.0014	0.00076 - 0.013	0.0002 - 0.0023	0.00042 - 0.00053	0.00017 - 0.0018	0.00022 - 0.0031	0.00024 - 0.0039	0.00018 - 0.00043
Copper (Cu)	µg/g dw	0.0013 - 0.0087	0.0018 - 0.021	0.0011 - 0.0071	0.0017 - 0.0021	0.001 - 0.01	0.0014 - 0.019	0.0012 - 0.016	0.0017 - 0.002
Gallium (Ga)	µg/g dw	0.0005 - 0.003	0.0011 - 0.04	0.0005 - 0.0021	0.0005 - 0.00063	0.00042 - 0.0054	0.00056 - 0.0079	0.00066 - 0.0086	0.00078 - 0.0013
Iron (Fe)	µg/g dw	0.026 - 0.2	0.069 - 0.86	0.03 - 0.18	0.032 - 0.04	0.025 - 0.3	0.037 - 0.53	0.021 - 0.47	0.039 - 0.05
Lead (Pb)	µg/g dw	0.0002 - 0.0014	0.00046 - 0.0069	0.00024 - 0.0016	0.00034 - 0.00043	0.00024 - 0.0021	0.00012 - 0.0016	0.00034 - 0.0033	0.00025 - 0.00035
Lithium (Li)	µg/g dw	0.0041 - 0.016	0.012 - 0.17	0.0046 - 0.018	0.003 - 0.0038	0.0011 - 0.035	0.0042 - 0.06	0.0019 - 0.045	0.0012 - 0.0027
Magnesium (Mg)	µg/g dw	0.033 - 0.16	0.067 - 1.3	0.034 - 0.19	0.051 - 0.064	0.035 - 0.23	0.031 - 0.44	0.038 - 0.37	0.045 - 0.069
Manganese (Mn)	µg/g dw	0.003 - 0.01	0.0099 - 0.19	0.004 - 0.016	0.0035 - 0.0044	0.0034 - 0.032	0.0049 - 0.07	0.0044 - 0.051	0.0041 - 0.0091
Mercury (Hg)	µg/g dw	0.0016 - 0.0028	0.0051 - 0.049	0.0019 - 0.0087	0.0016 - 0.002	0.00076 - 0.0073	0.00043 - 0.0061	0.00062 - 0.0075	0.00047 - 0.00073
Molybdenum (Mo)	µg/g dw	0.0005 - 0.0017	0.0014 - 0.015	0.0006 - 0.0023	0.00048 - 0.0006	0.0007 - 0.0065	0.00043 - 0.0061	0.00066 - 0.01	0.0012 - 0.0015
Nickel (Ni)	µg/g dw	0.0014 - 0.0051	0.0043 - 0.068	0.0012 - 0.0088	0.0023 - 0.0029	0.00092 - 0.013	0.0014 - 0.019	0.0013 - 0.021	0.0022 - 0.0028
Phosphorus (P)	µg/g dw	2.9 - 11	9.7 - 120	5.9 - 23	3.4 - 4.2	3.4 - 28	6.2 - 88	3.2 - 44	5 - 6.8
Potassium (K)	µg/g dw	0.5 - 2.9	2 - 24	0.98 - 3.9	0.6 - 0.75	0.61 - 6.1	0.89 - 13	0.89 - 9.7	0.64 - 1.2
Rhenium (Re)	µg/g dw	0.00004 - 0.0006	0.00011 - 0.0036	0.00004 - 0.00015	0.000047 - 0.000059	2.6E-06 - 0.00015	0.00018 - 0.0026	3.5E-06 - 0.00015	2.7E-06 - 0.000053
Rubidium (Rb)	µg/g dw	0.0005 - 0.0018	0.0001 - 0.018	0.0004 - 0.0023	0.00097 - 0.0012	0.00031 - 0.0037	0.00074 - 0.011	0.00034 - 0.0059	0.00052 - 0.00078
Selenium (Se)	µg/g dw	0.05 - 0.17	0.077 - 1.3	0.04 - 0.29	0.057 - 0.071	0.039 - 0.39	0.094 - 1.3	0.064 - 0.62	0.044 - 0.098
Silver (Ag)	µg/g dw	0.0005 - 0.0016	0.00078 - 0.018	0.0003 - 0.0018	0.0003 - 0.0004	0.0002 - 0.0025	0.00026 - 0.0036	0.00032 - 0.0031	0.00021 - 0.00031
Sodium (Na)	µg/g dw	0.057 - 0.18	0.098 - 1.7	0.07 - 0.33	0.11 - 0.14	0.045 - 0.39	0.091 - 1.3	0.046 - 0.62	0.046 - 0.13
Strontium (Sr)	µg/g dw	0.00016 - 0.00043	0.0004 - 0.0063	0.0002 - 0.0011	0.00011 - 0.00014	0.00017 - 0.0019	0.00015 - 0.0021	0.00017 - 0.0018	0.00028 - 0.0006
Thallium (Tl)	µg/g dw	0.00004 - 0.00015	0.000079 - 0.0013	0.00006 - 0.0004	0.000063 - 0.000079	0.000042 - 0.00081	0.00017 - 0.0024	0.00004 - 0.0013	0.000048 - 0.000069
Thorium (Th)	µg/g dw	0.00003 - 0.00012	0.00011 - 0.0012	0.00005 - 0.00025	0.000042 - 0.000052	0.000039 - 0.002	0.00041 - 0.0058	0.000046 - 0.00069	0.000069 - 0.000094
Tin (Sn)	µg/g dw	0.0005 - 0.0012	0.00076 - 0.018	0.0004 - 0.0034	0.00046 - 0.00057	0.00047 - 0.0062	0.0006 - 0.0086	0.00054 - 0.0098	0.00048 - 0.00062
Titanium (Ti)	µg/g dw	0.006 - 0.019	0.01 - 0.18	0.0051 - 0.061	0.0076 - 0.0095	0.0054 - 0.049	0.0062 - 0.088	0.0077 - 0.078	0.0067 - 0.013
Uranium (U)	µg/g dw	0.0001 - 0.00091	0.00022 - 0.0063	0.0001 - 0.001	0.00018 - 0.00023	0.000014 - 0.0011	0.000028 - 0.0004	0.000067 - 0.00083	0.000015 - 0.000025
Vanadium (V)	µg/g dw	0.00019 - 0.00087	0.00045 - 0.011	0.00023 - 0.0013	0.00024 - 0.0003	0.00013 - 0.0023	0.00021 - 0.003	0.00038 - 0.0037	0.0004 - 0.0005
Yttrium (Y)	µg/g dw	0.00013 - 0.0005	0.00025 - 0.0028	0.0001 - 0.0006	0.000074 - 0.000092	0.00016 - 0.001	0.00014 - 0.002	0.00016 - 0.0016	0.000096 - 0.00019
Zinc (Zn)	µg/g dw	0.0031 - 0.014	0.0086 - 0.11	0.0053 - 0.032	0.0031 - 0.0038	0.0026 - 0.026	0.0079 - 0.11	0.0025 - 0.039	0.0052 - 0.0086
Zirconium (Zr)	µg/g dw	0.00038 - 0.0016	0.0009 - 0.011	0.0004 - 0.0028	0.00033 - 0.00041	0.00049 - 0.0039	0.00083 - 0.012	0.00044 - 0.0062	0.00047 - 0.00061

Table A.16: Laboratory Method Detection Limits (MDLs) Associated with Fish Tissue Chemical Analysis

Analyte	Units	2016			
		Muscle Fillet	Muscle Plug	Egg and Ovary	Whole Body
Aluminum (Al)	µg/g dw	0.002 - 0.022	0.0041 - 0.14	0.0031 - 0.019	0.0056 - 0.0075
Antimony (Sb)	µg/g dw	0.00034 - 0.0032	0.00035 - 0.018	0.00033 - 0.0024	0.00059 - 0.00099
Arsenic (As)	µg/g dw	0.0025 - 0.02	0.0047 - 0.1	0.0024 - 0.015	0.0044 - 0.0054
Barium (Ba)	µg/g dw	0.00056 - 0.0082	0.00057 - 0.015	0.00056 - 0.0071	0.00062 - 0.00079
Beryllium (Be)	µg/g dw	0.0022 - 0.014	0.0024 - 0.058	0.0023 - 0.027	0.0027 - 0.0035
Bismuth (Bi)	µg/g dw	0.000044 - 0.00032	0.000076 - 0.00096	0.000045 - 0.00046	0.000045 - 0.000068
Boron (B)	µg/g dw	0.038 - 0.36	0.079 - 1.7	0.037 - 0.79	0.079 - 0.093
Cadmium (Cd)	µg/g dw	0.00079 - 0.0062	0.0012 - 0.043	0.0011 - 0.0074	0.0012 - 0.0024
Calcium (Ca)	µg/g dw	0.99 - 11	1 - 39	1.1 - 7.6	1.3 - 2.1
Cesium (Cs)	µg/g dw	0.000061 - 0.00076	0.000062 - 0.0031	0.00006 - 0.0015	0.00014 - 0.00017
Chromium (Cr)	µg/g dw	0.0026 - 0.017	0.0026 - 0.083	0.0025 - 0.084	0.0037 - 0.0045
Cobalt (Co)	µg/g dw	0.00017 - 0.0059	0.00031 - 0.01	0.00019 - 0.0039	0.00024 - 0.00055
Copper (Cu)	µg/g dw	0.00096 - 0.015	0.0015 - 0.035	0.0013 - 0.012	0.0013 - 0.0019
Gallium (Ga)	µg/g dw	0.00053 - 0.012	0.00063 - 0.02	0.00062 - 0.0041	0.00066 - 0.0012
Iron (Fe)	µg/g dw	0.039 - 0.24	0.045 - 0.88	0.028 - 0.24	0.027 - 0.048
Lead (Pb)	µg/g dw	0.00014 - 0.0015	0.00014 - 0.0052	0.00014 - 0.0031	0.00014 - 0.00028
Lithium (Li)	µg/g dw	0.0032 - 0.04	0.0031 - 0.074	0.0032 - 0.036	0.0034 - 0.0041
Magnesium (Mg)	µg/g dw	0.032 - 0.19	0.033 - 0.97	0.032 - 0.45	0.045 - 0.066
Manganese (Mn)	µg/g dw	0.0033 - 0.045	0.0039 - 0.17	0.0033 - 0.025	0.0054 - 0.0093
Mercury (Hg)	µg/g dw	0.00042 - 0.0042	0.00058 - 0.013	0.00059 - 0.0069	0.00062 - 0.001
Molybdenum (Mo)	µg/g dw	0.00046 - 0.008	0.0012 - 0.027	0.00079 - 0.0052	0.0011 - 0.0015
Nickel (Ni)	µg/g dw	0.00086 - 0.0094	0.0015 - 0.043	0.0012 - 0.01	0.0014 - 0.0023
Phosphorus (P)	µg/g dw	3.1 - 37	5.5 - 110	3.3 - 20	5.3 - 7.9
Potassium (K)	µg/g dw	0.62 - 5	0.74 - 20	0.72 - 6	0.91 - 2.1
Rhenium (Re)	µg/g dw	3.6E-06 - 0.0003	0.000028 - 0.00093	0.000027 - 0.00056	0.000043 - 0.00017
Rubidium (Rb)	µg/g dw	0.0006 - 0.0099	0.00061 - 0.017	0.00059 - 0.0073	0.00074 - 0.0011
Selenium (Se)	µg/g dw	0.024 - 0.62	0.025 - 2.9	0.024 - 0.41	0.079 - 0.16
Silver (Ag)	µg/g dw	0.00025 - 0.004	0.00038 - 0.016	0.00026 - 0.0019	0.00034 - 0.00086
Sodium (Na)	µg/g dw	0.048 - 0.86	0.05 - 2.7	0.07 - 0.79	0.13 - 0.2
Strontium (Sr)	µg/g dw	0.00022 - 0.0024	0.00031 - 0.0081	0.00024 - 0.0024	0.00028 - 0.00044
Thallium (Tl)	µg/g dw	0.000056 - 0.00047	0.000073 - 0.0015	0.000045 - 0.0011	0.000045 - 0.000084
Thorium (Th)	µg/g dw	0.00004 - 0.0004	0.00004 - 0.0017	0.000037 - 0.00035	0.000052 - 0.000093
Tin (Sn)	µg/g dw	0.0004 - 0.0048	0.0007 - 0.023	0.00041 - 0.003	0.00055 - 0.0013
Titanium (Ti)	µg/g dw	0.0054 - 0.07	0.0055 - 0.18	0.0053 - 0.053	0.0082 - 0.011
Uranium (U)	µg/g dw	0.000055 - 0.0012	0.000059 - 0.0032	0.000039 - 0.0033	0.000038 - 0.00024
Vanadium (V)	µg/g dw	0.0002 - 0.002	0.00033 - 0.0087	0.00031 - 0.0029	0.0004 - 0.0008
Yttrium (Y)	µg/g dw	0.00012 - 0.0012	0.00021 - 0.0021	0.000074 - 0.001	0.000073 - 0.00035
Zinc (Zn)	µg/g dw	0.0021 - 0.026	0.0042 - 0.085	0.0028 - 0.018	0.0039 - 0.0054
Zirconium (Zr)	µg/g dw	0.00069 - 0.0084	0.00073 - 0.015	0.00037 - 0.0051	0.00037 - 0.00071

Table A.17a: Laboratory Duplicate Results for Fish Muscle Samples, 2014

Analyte	Unit	SC-PC-04M Rep 1	SC-PC-04M Rep 2	RPD	ER-PC-08M Rep 1	ER-PC-08M Rep 2	RPD	GC-KO-1 Rep 1	GC-KO-1 Rep 2	RPD	GC-YP-5 Rep 1	GC-YP-5 Rep 2	RPD	GC-PM-3 Rep 1	GC-PM-3 Rep 2	RPD	SC-PM-1 Rep 1	SC-PM-1 Rep 2	RPD
Aluminum (Al)	µg/g dw	32.2	18.6	54%	13.1	6.7	65%	0.447	0.319	33%	0.952	0.952	0%	5.21	5.24	1%	2.76	2.76	0%
Antimony (Sb)	µg/g dw	0.00193	0.00182	6%	0.00134	0.00142	6%	<0.00054	0.00068	23%	<0.00040	<0.00042	5%	0.0132	0.0147	11%	0.00285	0.00187	42%
Arsenic (As)	µg/g dw	0.19	0.157	19%	0.0744	0.0632	16%	0.0944	0.0872	8%	0.0194	0.0181	7%	0.0361	0.0392	8%	0.027	0.0168	47%
Barium (Ba)	µg/g dw	1.21	1.72	35%	1.81	2.52	33%	0.128	0.14	9%	0.0274	0.204	153%	0.658	0.938	35%	0.403	0.527	27%
Beryllium (Be)	µg/g dw	<0.0026	<0.0023	12%	<0.0027	<0.0024	12%	<0.0025	<0.0022	13%	<0.0027	<0.0029	7%	<0.0030	<0.0030	0%	<0.0038	<0.0039	3%
Bismuth (Bi)	µg/g dw	0.0127	0.00272	129%	0.008	0.00763	5%	0.000108	0.000105	3%	0.00504	0.00505	0%	0.00245	0.00253	3%	0.0018	0.00184	2%
Boron (B)	µg/g dw	0.147	0.086	52%	0.161	0.166	3%	<0.11	<0.097	13%	<0.070	<0.075	7%	<0.076	<0.078	3%	<0.12	<0.12	0%
Cadmium (Cd)	µg/g dw	0.0029	0.00367	23%	0.0054	0.0043	23%	0.00121	0.00086	34%	<0.00065	0.00106	48%	0.0109	0.0116	6%	0.00906	0.00753	18%
Calcium (Ca)	µg/g dw	2480	4100	49%	3180	4940	43%	828	1020	21%	382	2350	144%	1120	1850	49%	1060	1980	61%
Cesium (Cs)	µg/g dw	0.0882	0.0844	4%	0.0773	0.0729	6%	0.0469	0.0471	0%	0.0787	0.0828	5%	0.0723	0.0739	2%	0.131	0.13	1%
Chromium (Cr)	µg/g dw	0.125	0.111	12%	0.0828	0.092	11%	0.0604	0.0671	11%	0.0619	0.07	12%	0.0932	0.0885	5%	0.0873	0.13	39%
Cobalt (Co)	µg/g dw	0.0178	0.0143	22%	0.00886	0.00977	10%	0.0146	0.012	20%	0.00561	0.00571	2%	0.0065	0.0069	6%	0.007	0.0059	17%
Copper (Cu)	µg/g dw	0.612	0.539	13%	0.657	0.53	21%	0.967	0.89	8%	0.422	0.396	6%	0.877	0.918	5%	0.683	0.641	6%
Gallium (Ga)	µg/g dw	0.0181	0.0191	5%	0.014	0.0119	16%	0.0068	0.0074	8%	0.0123	0.00892	32%	0.00754	0.00797	6%	0.00971	0.0088	10%
Iron (Fe)	µg/g dw	26.2	20.9	23%	13.7	11.3	19%	9.58	8.61	11%	5.32	5.37	1%	10.6	11.4	7%	12	10.5	13%
Lead (Pb)	µg/g dw	0.0366	0.0412	12%	0.0319	0.0466	37%	0.00906	0.00778	15%	0.00283	0.00431	41%	0.261	0.31	17%	0.0314	0.0256	20%
Lithium (Li)	µg/g dw	0.0266	0.0155	53%	0.0191	0.0196	3%	0.0361	0.0344	5%	0.0191	0.0234	20%	0.0131	0.0143	9%	0.0113	0.0123	8%
Magnesium (Mg)	µg/g dw	1330	1270	5%	1290	1300	1%	1240	1260	2%	1230	1330	8%	1320	1360	3%	1310	1300	1%
Manganese (Mn)	µg/g dw	1.26	1.62	25%	1.4	1.87	29%	0.291	0.33	13%	0.472	0.622	27%	0.881	1.21	31%	0.716	0.845	17%
Mercury (Hg)	µg/g dw	0.866	0.759	13%	1.54	1.49	3%	0.184	0.218	17%	0.666	0.648	3%	0.793	0.786	1%	1.18	1.2	2%
Molybdenum (Mo)	µg/g dw	0.00525	0.00387	30%	0.004	0.00314	24%	0.00813	0.00684	17%	0.00374	0.00367	2%	0.00413	0.00452	9%	0.0036	0.0041	13%
Nickel (Ni)	µg/g dw	0.0638	0.0594	7%	0.0391	0.0419	7%	0.0122	0.0108	12%	0.0218	0.023	5%	0.198	0.204	3%	0.0603	0.0598	1%
Phosphorus (P)	µg/g dw	10500	10800	3%	11500	11900	3%	11000	11600	5%	10700	12100	12%	10500	10800	3%	9860	10400	5%
Potassium (K)	µg/g dw	21100	20000	5%	23300	22100	5%	19100	19200	1%	22900	23200	1%	20600	20500	0%	20200	20900	3%
Rhenium (Re)	µg/g dw	<0.000054	<0.000053	2%	<0.000056	<0.000049	13%	0.00015	<0.00012	22%	<0.00024	<0.00026	8%	<0.00027	<0.00027	0%	<0.00011	<0.00011	0%
Rubidium (Rb)	µg/g dw	17.5	16.9	3%	13.6	13.1	4%	9.89	10	1%	25	25.8	3%	18.6	18.1	3%	20.9	20.8	0%
Selenium (Se)	µg/g dw	1.41	1.05	29%	2.69	2.4	11%	1.77	1.95	10%	2.6	2.57	1%	2.42	2.35	3%	1.64	1.81	10%
Silver (Ag)	µg/g dw	<0.00066	<0.00036	59%	<0.00068	<0.00060	13%	<0.00047	<0.00040	16%	<0.00066	<0.00070	6%	<0.00071	<0.00073	3%	<0.00077	<0.00079	3%
Sodium (Na)	µg/g dw	998	1070	7%	1030	978	5%	1010	1040	3%	944	977	3%	1500	1490	1%	1290	1310	2%
Strontium (Sr)	µg/g dw	3.43	5.69	50%	3.77	6.2	49%	0.577	0.726	23%	0.0659	1.01	175%	0.635	1.21	62%	0.602	1.3	73%
Thallium (Tl)	µg/g dw	0.0111	0.00914	19%	0.00761	0.00712	7%	0.0581	0.061	5%	0.0363	0.041	12%	0.00474	0.00487	3%	0.00503	0.00508	1%
Thorium (Th)	µg/g dw	0.0048	0.00337	35%	0.00198	0.00123	47%	<0.000070	<0.000060	15%	0.000097	0.00011	13%	0.000633	0.000654	3%	0.000754	0.000625	19%
Tin (Sn)	µg/g dw	0.0198	0.0193	3%	0.00626	0.00435	36%	0.00113	0.00065	54%	0.00141	0.00153	8%	0.0194	0.0223	14%	0.0208	0.0156	29%
Titanium (Ti)	µg/g dw	0.521	0.384	30%	0.279	0.221	23%	0.083	0.092	10%	0.113	0.146	25%	0.224	0.289	25%	0.279	0.188	39%
Uranium (U)	µg/g dw	0.00186	0.00225	19%	0.00316	0.00481	41%	<0.00083	<0.00071	16%	<0.00037	<0.00039	5%	<0.00040	0.00068	52%	0.00045	0.00054	18%
Vanadium (V)	µg/g dw	0.0399	0.0307	26%	0.0187	0.0166	12%	0.00178	0.0019	7%	0.00209	0.00313	40%	0.0105	0.0124	17%	0.0103	0.00916	12%
Yttrium (Y)	µg/g dw	0.0091	0.00697	27%	0.00397	0.00224	56%	<0.00020	<0.00017	16%	0.00092	0.00092	0%	0.00172	0.00202	16%	0.00148	0.00148	0%
Zinc (Zn)	µg/g dw	20.1	18.5	8%	20.2	15.3	28%	16.6	16.9	2%	20.3	19.8	2%	22.6	23.1	2%	20	21	5%
Zirconium (Zr)	µg/g dw	0.0249	0.0134	60%	0.0166	0.0138	18%	0.00343	0.00256	29%	0.0066	0.00272	83%	0.0144	0.0119	19%	0.0231	0.0124	60%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17a: Laboratory Duplicate Results for Fish Muscle Samples, 2014

Analyte	Unit	SC-PM-6 Rep 1	SC-PM-6 Rep 2	RPD	SC-KO-10 Rep 1	SC-KO-10 Rep 2	RPD	SC-KO-20 Rep 1	SC-KO-20 Rep 2	RPD	ER-PM-2 Rep 1	ER-PM-2 Rep 2	RPD	ER-PM-6 Rep 1	ER-PM-6 Rep 2	RPD	SCPM-01M Rep 1	SCPM-01M Rep 2	RPD
Aluminum (Al)	µg/g dw	2.86	2.86	0%	1.16	1.16	0%	1.37	1.37	0%	2.72	2.72	0%	1.99	1.99	0%	6.61	6.61	0%
Antimony (Sb)	µg/g dw	0.00084	0.00085	1%	<0.00039	<0.00041	5%	0.00065	0.00071	9%	0.00073	0.00113	43%	0.00179	0.00188	5%	0.00177	0.00097	58%
Arsenic (As)	µg/g dw	0.0213	0.0236	10%	0.149	0.17	13%	0.0968	0.0909	6%	0.02	0.0181	10%	0.0259	0.02	26%	0.0216	0.0169	24%
Barium (Ba)	µg/g dw	0.611	0.553	10%	0.159	0.0721	75%	0.177	0.117	41%	0.532	0.395	30%	0.248	0.156	46%	0.428	0.624	37%
Beryllium (Be)	µg/g dw	<0.0039	<0.0039	0%	<0.0036	<0.0038	5%	<0.0036	<0.0039	8%	<0.0024	<0.0023	4%	<0.0023	<0.0024	4%	<0.0022	<0.0024	9%
Bismuth (Bi)	µg/g dw	0.00177	0.00175	1%	0.000087	0.000086	1%	0.000051	0.000076	39%	0.000745	0.000841	12%	0.00205	0.00172	18%	0.00182	0.00171	6%
Boron (B)	µg/g dw	<0.12	<0.12	0%	<0.11	<0.12	9%	<0.11	<0.12	9%	<0.086	<0.083	4%	<0.081	<0.085	5%	<0.080	<0.088	10%
Cadmium (Cd)	µg/g dw	0.00209	0.00197	6%	0.00085	0.001	16%	0.00124	0.00106	16%	0.00322	0.00449	33%	0.00384	0.00282	31%	0.00117	0.00104	12%
Calcium (Ca)	µg/g dw	2050	2190	7%	1260	601	71%	1110	599	60%	1470	929	45%	546	456	18%	1770	3040	53%
Cesium (Cs)	µg/g dw	0.0888	0.0881	1%	0.0406	0.04	1%	0.0632	0.0657	4%	0.0564	0.0585	4%	0.177	0.148	18%	0.17	0.175	3%
Chromium (Cr)	µg/g dw	0.398	0.0708	140%	0.0697	0.0812	15%	0.0715	0.0696	3%	0.0943	0.0748	23%	0.0848	0.0701	19%	0.0727	0.0788	8%
Cobalt (Co)	µg/g dw	0.0072	0.0064	12%	0.0127	0.0117	8%	0.012	0.0114	5%	0.0051	0.00481	6%	0.00532	0.00444	18%	0.00768	0.00646	17%
Copper (Cu)	µg/g dw	0.629	0.63	0%	0.929	0.929	0%	1.09	1.1	1%	0.871	0.984	12%	0.735	0.605	19%	0.731	0.581	23%
Gallium (Ga)	µg/g dw	0.0102	0.00957	6%	0.0101	0.00794	24%	0.00891	0.00836	6%	0.00915	0.00805	13%	0.0099	0.00826	18%	0.0116	0.00685	51%
Iron (Fe)	µg/g dw	13.1	9.65	30%	9.47	9.05	5%	8.41	8.4	0%	11.1	11.6	4%	8.24	5.81	35%	18	14.9	19%
Lead (Pb)	µg/g dw	0.0252	0.0163	43%	0.00691	0.00571	19%	0.0191	0.0164	15%	0.0313	0.017	59%	0.0259	0.0176	38%	0.0219	0.0153	35%
Lithium (Li)	µg/g dw	0.0106	0.0076	33%	0.0211	0.0218	3%	0.0465	0.0412	12%	0.0148	0.0149	1%	0.0184	0.0151	20%	0.0114	0.0116	2%
Magnesium (Mg)	µg/g dw	1450	1410	3%	1110	1110	0%	1190	1210	2%	1460	1460	0%	1370	1140	18%	1260	1290	2%
Manganese (Mn)	µg/g dw	1.18	1.19	1%	0.46	0.22	71%	0.461	0.264	54%	0.752	0.671	11%	0.331	0.253	27%	0.717	0.939	27%
Mercury (Hg)	µg/g dw	0.461	0.465	1%	0.196	0.197	1%	0.213	0.218	2%	0.647	0.654	1%	4.66	3.86	19%	1.3	1.29	1%
Molybdenum (Mo)	µg/g dw	0.006	0.0055	9%	0.0082	0.0088	7%	0.0088	0.0098	11%	0.00244	0.00209	15%	0.00286	0.00181	45%	0.00225	0.00543	83%
Nickel (Ni)	µg/g dw	0.0456	0.0369	21%	0.015	0.0094	46%	0.0184	0.017	8%	0.0497	0.0349	35%	0.0305	0.0218	33%	0.0627	0.0514	20%
Phosphorus (P)	µg/g dw	10600	10900	3%	10400	10100	3%	10900	10800	1%	11200	10500	6%	11900	9720	20%	9720	10400	7%
Potassium (K)	µg/g dw	20800	21300	2%	17000	17500	3%	19000	19400	2%	22000	21100	4%	24900	20300	20%	19500	19700	1%
Rhenium (Re)	µg/g dw	<0.00011	<0.00011	0%	0.00014	<0.00011	24%	<0.00010	<0.00011	10%	<0.000049	<0.000048	2%	<0.000046	<0.000048	4%	<0.000046	<0.000050	8%
Rubidium (Rb)	µg/g dw	16.7	16.7	0%	7.6	7.56	1%	12.1	12.5	3%	10.5	10.6	1%	19.7	16.4	18%	18	17.9	1%
Selenium (Se)	µg/g dw	2.39	2.54	6%	1.9	1.79	6%	1.91	1.94	2%	7.47	7.37	1%	2.86	2.38	18%	2.97	2.91	2%
Silver (Ag)	µg/g dw	<0.00080	<0.00079	1%	<0.00073	<0.00077	5%	<0.00073	<0.00078	7%	<0.00081	<0.00078	4%	<0.00076	<0.00080	5%	<0.00075	<0.00083	10%
Sodium (Na)	µg/g dw	1320	1330	1%	982	1020	4%	1450	1500	3%	1670	1610	4%	1330	1100	19%	990	1000	1%
Strontium (Sr)	µg/g dw	1.51	1.65	9%	0.975	0.441	75%	0.824	0.427	63%	0.819	0.466	55%	0.163	0.134	20%	1.33	2.45	59%
Thallium (Tl)	µg/g dw	0.00701	0.00695	1%	0.0434	0.0422	3%	0.0445	0.0454	2%	0.0109	0.0109	0%	0.00551	0.00482	13%	0.00981	0.0102	4%
Thorium (Th)	µg/g dw	0.000732	0.000513	35%	<0.000075	<0.00008	6%	0.000177	0.000138	25%	0.000461	0.00106	79%	0.000493	0.000401	21%	0.0019	0.00165	14%
Tin (Sn)	µg/g dw	0.00785	0.0119	41%	0.00071	0.00088	21%	0.00236	0.00222	6%	0.00387	0.00428	10%	0.00511	0.00404	23%	0.00869	0.00918	5%
Titanium (Ti)	µg/g dw	0.208	0.157	28%	0.0822	0.0951	15%	0.173	0.118	38%	0.152	0.17	11%	0.235	0.142	49%	0.266	0.196	30%
Uranium (U)	µg/g dw	0.00038	0.00038	0%	0.00021	<0.00022	5%	<0.00021	<0.00022	5%	0.00025	0.00013	63%	0.00031	0.00023	30%	0.00068	0.00108	45%
Vanadium (V)	µg/g dw	0.0131	0.00739	56%	0.00282	0.00189	39%	0.00423	0.00355	17%	0.00653	0.00622	5%	0.0114	0.00745	42%	0.0148	0.0124	18%
Yttrium (Y)	µg/g dw	0.00147	0.00106	32%	<0.00026	<0.00026	0%	0.00109	0.00027	121%	0.00142	0.00142	0%	0.00058	0.00058	0%	0.00241	0.00241	0%
Zinc (Zn)	µg/g dw	30.6	30	2%	22.8	20.1	13%	14.6	14	4%	24.8	23.9	4%	17.4	14.5	18%	24.8	20.7	18%
Zirconium (Zr)	µg/g dw	0.00512	0.00333	42%	0.00667	0.00199	108%	0.00401	0.0121	100%	0.00668	0.00956	35%	0.0106	0.00514	69%	0.0125	0.00499	86%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17a: Laboratory Duplicate Results for Fish Muscle Samples, 2014

Analyte	Unit	SCPM-05M Rep 1	SCPM-05M Rep 2	RPD	ERPM-7M Rep 1	ERPM-7M Rep 2	RPD	GCPM-04M Rep 1	GCPM-04M Rep 2	RPD	GCPM-07M Rep 1	GCPM-07M Rep 2	RPD	KOSC1-PM-10M Rep 1	KOSC1-PM-10M Rep 2	RPD	KOSC1-RT1M Rep 1	KOSC1-RT1M Rep 2	RPD
Aluminum (Al)	µg/g dw	12.9	12.9	0%	6.31	6.31	0%	11.5	11.5	0%	3.32	3.32	0%	1.97	1.97	0%	3.6	0.941	117%
Antimony (Sb)	µg/g dw	0.0006	0.00064	6%	0.00245	0.00284	15%	0.00142	0.00261	59%	0.00074	0.00053	33%	0.00391	0.00548	33%	0.0024	0.00139	53%
Arsenic (As)	µg/g dw	0.0121	0.0127	5%	0.0229	0.0227	1%	0.0421	0.0413	2%	0.0329	0.0334	2%	0.0371	0.0305	20%	0.0629	0.0626	0%
Barium (Ba)	µg/g dw	0.228	0.688	100%	1.35	0.586	79%	0.511	0.357	35%	0.446	0.385	15%	0.0934	0.171	59%	0.023	0.0222	4%
Beryllium (Be)	µg/g dw	<0.0023	<0.0024	4%	<0.0026	<0.0027	4%	<0.0026	<0.0027	4%	<0.0027	<0.0026	4%	<0.0026	<0.0025	4%	<0.0025	<0.0026	4%
Bismuth (Bi)	µg/g dw	0.00112	0.00118	5%	0.00195	0.002	3%	0.00119	0.00122	2%	0.000974	0.00104	7%	0.00102	0.00111	8%	0.00155	0.00161	4%
Boron (B)	µg/g dw	<0.085	<0.085	0%	<0.17	<0.17	0%	0.35	0.41	16%	<0.17	<0.17	0%	<0.17	<0.16	6%	<0.055	<0.057	4%
Cadmium (Cd)	µg/g dw	0.00114	0.00092	21%	0.003	0.0017	55%	0.0011	0.0012	9%	0.0017	0.0016	6%	0.002	0.00228	13%	<0.0010	<0.0010	0%
Calcium (Ca)	µg/g dw	510	1570	102%	4750	1720	94%	535	532	1%	529	549	4%	482	621	25%	386	527	31%
Cesium (Cs)	µg/g dw	0.241	0.245	2%	0.0856	0.0816	5%	0.139	0.141	1%	0.0937	0.0952	2%	0.17	0.169	1%	0.211	0.211	0%
Chromium (Cr)	µg/g dw	0.0665	0.0807	19%	0.0788	0.0753	5%	0.0837	0.0722	15%	0.0744	0.0735	1%	0.0764	0.0811	6%	0.0715	0.0864	19%
Cobalt (Co)	µg/g dw	0.00719	0.00833	15%	0.0077	0.0069	11%	0.00869	0.0078	11%	0.0075	0.0066	13%	0.0038	0.0035	8%	0.0166	0.0165	1%
Copper (Cu)	µg/g dw	0.646	0.665	3%	0.639	0.617	4%	1.01	0.938	7%	0.851	0.779	9%	1.06	0.971	9%	1.11	1.07	4%
Gallium (Ga)	µg/g dw	0.0098	0.0107	9%	0.0152	0.0111	31%	0.013	0.0106	20%	0.0079	0.0073	8%	0.0077	0.0076	1%	0.0122	0.0115	6%
Iron (Fe)	µg/g dw	18.7	20.1	7%	18	15.5	15%	21.5	19.3	11%	20.9	15.8	28%	9.17	9.12	1%	10.1	9.75	4%
Lead (Pb)	µg/g dw	0.00988	0.0132	29%	0.00994	0.00576	53%	0.0197	0.0163	19%	0.0137	0.00958	35%	0.0243	0.0285	16%	0.0346	0.0218	45%
Lithium (Li)	µg/g dw	0.0113	0.0168	39%	0.026	0.015	54%	0.012	<0.011	9%	<0.010	<0.010	0%	<0.010	<0.0098	2%	<0.0061	<0.0063	3%
Magnesium (Mg)	µg/g dw	1180	1260	7%	1280	1140	12%	1160	1180	2%	1190	1160	3%	1240	1210	2%	1140	1110	3%
Manganese (Mn)	µg/g dw	0.607	0.832	31%	1.41	0.771	59%	0.563	0.525	7%	0.527	0.493	7%	0.26	0.286	10%	0.542	0.565	4%
Mercury (Hg)	µg/g dw	2.33	2.62	12%	1.09	1.08	1%	2.79	2.84	2%	3.57	3.6	1%	1.40	1.41	1%	0.717	0.714	0%
Molybdenum (Mo)	µg/g dw	0.00298	0.00296	1%	0.00237	0.00185	25%	0.00315	0.00272	15%	0.00143	0.00109	27%	0.0023	0.0016	36%	0.00517	0.0049	5%
Nickel (Ni)	µg/g dw	0.0309	0.0339	9%	0.0431	0.0292	38%	0.0339	0.0266	24%	0.0213	0.0392	59%	0.0339	0.0303	11%	0.0164	0.0137	18%
Phosphorus (P)	µg/g dw	9650	10400	7%	11800	10100	16%	9630	10100	5%	9160	9200	0%	9540	9580	0%	9880	9720	2%
Potassium (K)	µg/g dw	21200	21900	3%	20300	20500	1%	19300	20400	6%	20100	20400	1%	20100	19300	4%	19500	19400	1%
Rhenium (Re)	µg/g dw	<0.000048	<0.000049	2%	<0.00011	<0.00012	9%	<0.00011	<0.00012	9%	<0.00012	<0.00011	9%	<0.00011	<0.00011	0%	0.000225	0.000183	21%
Rubidium (Rb)	µg/g dw	21.5	22	2%	15.8	15.7	1%	22	22.8	4%	20	20.4	2%	24.9	24.9	0%	22.5	22.5	0%
Selenium (Se)	µg/g dw	1.39	1.55	11%	4.56	4.64	2%	1.77	1.74	2%	1.32	1.23	7%	1.21	1.18	3%	1.37	1.26	8%
Silver (Ag)	µg/g dw	<0.00080	<0.00080	0%	<0.00094	<0.00098	4%	<0.00094	<0.00097	3%	<0.00097	<0.00096	1%	<0.00096	<0.00091	5%	<0.00040	<0.00042	5%
Sodium (Na)	µg/g dw	1060	1110	5%	952	963	1%	1110	1180	6%	1080	1120	4%	875	864	1%	970	931	4%
Strontium (Sr)	µg/g dw	0.249	1.2	131%	3.5	1.11	104%	0.264	0.257	3%	0.199	0.193	3%	0.216	0.41	62%	0.0747	0.163	74%
Thallium (Tl)	µg/g dw	0.00946	0.00958	1%	0.0137	0.0129	6%	0.00801	0.00795	1%	0.0104	0.00995	4%	0.00942	0.00956	1%	0.0317	0.0318	0%
Thorium (Th)	µg/g dw	0.00221	0.00235	6%	0.00189	0.0016	17%	0.00491	0.00188	89%	0.00111	0.000525	72%	0.000244	0.000322	28%	0.000218	0.000173	23%
Tin (Sn)	µg/g dw	0.00349	0.00391	11%	0.00171	0.00125	31%	0.00365	0.00285	25%	0.00324	0.0016	68%	0.0095	0.00998	5%	0.00241	0.00149	47%
Titanium (Ti)	µg/g dw	0.261	0.36	32%	0.362	0.22	49%	0.504	0.431	16%	0.265	0.164	47%	0.187	0.162	14%	0.124	0.116	7%
Uranium (U)	µg/g dw	0.00048	0.00084	55%	0.00106	0.0005	72%	0.00059	0.00042	34%	<0.00033	<0.00032	3%	<0.00032	<0.00031	3%	<0.00012	<0.00012	0%
Vanadium (V)	µg/g dw	0.0151	0.0219	37%	0.0337	0.0178	62%	0.027	0.0203	28%	0.0139	0.00802	54%	0.00491	0.00413	17%	0.0031	0.00314	1%
Yttrium (Y)	µg/g dw	0.0044	0.00423	4%	0.00245	0.00245	0%	0.00397	0.00397	0%	0.00116	0.00116	0%	0.00082	0.00069	17%	0.00089	0.00033	92%
Zinc (Zn)	µg/g dw	16.9	19.3	13%	21.9	19.8	10%	26.2	20.3	25%	17.7	16.2	9%	16.2	16.4	1%	11.9	11	8%
Zirconium (Zr)	µg/g dw	0.00779	0.00716	8%	0.0112	0.00465	83%	0.00993	0.0072	32%	0.00687	0.0031	76%	0.00458	0.0124	92%	0.00398	0.0016	85%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17b: **Laboratory Duplicate Results for Fish Muscle Samples, 2015**

Analyte	Unit	SC-CSU-02-APR rep 1	SC-CSU-02-APR rep 2	RPD	SC-NSC-13-APR rep 1	SC-NSC-13-APR rep 2	RPD	SC-NSC-46-APR rep 1	SC-NSC-46-APR rep 2	RPD	SC-PCC-05-APR rep 1	SC-PCC-05-APR rep 2	RPD	GC-YP-06-APR rep 1	GC-YP-06-APR rep 2	RPD	GC-NSC-02-APR rep 1	GC-NSC-02-APR rep 2	RPD
Aluminum (Al)	µg/g dw	11.900	11.900	0%	0.908	1.01	11%	2.910	2.890	1%	2.740	1.760	44%	1.590	1.480	7%	1.620	8.930	139%
Antimony (Sb)	µg/g dw	0.0016	0.0016	0%	0.0014	0.0022	44%	<0.0012	<0.0011	9%	0.0014	<0.0012	15%	<0.0012	<0.0011	9%	<0.0011	<0.0011	0%
Arsenic (As)	µg/g dw	0.2390	0.2310	3%	0.0074	0.0096	26%	0.0106	0.0105	1%	0.1700	0.1520	11%	0.0202	0.0172	16%	0.0165	0.0162	2%
Barium (Ba)	µg/g dw	1.120	0.815	32%	0.37	0.172	73%	0.262	0.155	51%	2.180	1.560	33%	0.172	0.148	15%	0.573	0.586	2%
Beryllium (Be)	µg/g dw	<0.0022	<0.0024	9%	<0.0028	<0.0025	11%	<0.0025	<0.0024	4%	<0.0024	<0.0025	4%	<0.0025	<0.0025	0%	<0.0023	<0.0025	8%
Bismuth (Bi)	µg/g dw	0.00863	0.00856	1%	0.0025	0.00328	27%	0.00254	0.00271	6%	0.00486	0.00512	5%	0.00560	0.00602	7%	0.00176	0.00198	12%
Boron (B)	µg/g dw	<0.071	<0.077	8%	<0.088	<0.078	12%	<0.079	<0.077	3%	0.121	0.160	28%	<0.080	<0.079	1%	<0.072	0.090	22%
Cadmium (Cd)	µg/g dw	0.0053	0.0047	12%	<0.0016	<0.0015	6%	0.0048	0.0060	22%	0.0051	0.0039	27%	0.0041	0.0056	31%	<0.0013	<0.0015	14%
Calcium (Ca)	µg/g dw	4,290	2,650	47%	2620	2580	2%	909	618	38%	3,310	3,340	1%	2,320	1,600	37%	2,320	2,050	12%
Cesium (Cs)	µg/g dw	0.1940	0.1860	4%	0.157	0.163	4%	0.1500	0.1530	2%	0.0661	0.0711	7%	0.1290	0.1370	6%	0.0671	0.0698	4%
Chromium (Cr)	µg/g dw	0.0752	0.0649	15%	0.0478	0.0579	19%	0.0608	0.0667	9%	0.0585	0.0688	16%	0.0532	0.1450	93%	0.0564	0.1440	87%
Cobalt (Co)	µg/g dw	0.04020	0.03700	8%	0.00311	0.00565	58%	0.00623	0.00587	6%	0.02350	0.01860	23%	0.02090	0.02110	1%	0.00453	0.00662	37%
Copper (Cu)	µg/g dw	0.962	1.020	6%	0.64	0.76	17%	0.857	0.875	2%	1.430	1.010	34%	0.753	0.689	9%	0.596	0.580	3%
Gallium (Ga)	µg/g dw	0.01430	0.01160	21%	0.00451	0.00617	31%	0.00688	0.00590	15%	0.00683	0.00680	0%	0.00664	0.00657	1%	0.00528	0.00904	53%
Iron (Fe)	µg/g dw	24.4	17.6	32%	7.58	9.24	20%	10.6	10.6	0%	22.1	13.6	48%	14.6	15.5	6%	7.0	12.4	55%
Lead (Pb)	µg/g dw	0.05940	0.03920	41%	0.00498	0.00798	46%	0.0223	0.0224	0%	0.0250	0.0203	21%	0.0054	0.0066	20%	0.00661	0.01210	59%
Lithium (Li)	µg/g dw	0.0194	0.0095	69%	<0.0078	0.0117	40%	<0.0070	<0.0068	3%	0.0077	<0.0070	10%	0.0238	0.0211	12%	<0.0064	0.0118	59%
Magnesium (Mg)	µg/g dw	1,380	1,310	5%	1220	1230	1%	1,170	1,220	4%	1,300	1,390	7%	1,180	1,290	9%	1,220	1,210	1%
Manganese (Mn)	µg/g dw	3.200	2.130	40%	0.835	0.904	8%	0.578	0.508	13%	1.320	1.260	5%	0.841	0.889	6%	0.922	0.864	6%
Mercury (Hg)	µg/g dw	1.000	1.030	3%	1.240	1.120	10%	1.920	2.100	9%	0.804	0.876	9%	1.190	1.220	2%	0.684	0.676	1%
Molybdenum (Mo)	µg/g dw	0.0086	0.0103	18%	0.0038	0.0079	70%	0.0060	0.0051	16%	0.0070	0.0053	28%	0.0077	0.0080	4%	0.0063	0.0071	12%
Nickel (Ni)	µg/g dw	0.0418	0.0317	27%	0.0101	0.0558	139%	0.0118	0.0119	1%	0.0246	0.0222	10%	0.0139	0.0129	7%	0.0130	0.0568	126%
Phosphorus (P)	µg/g dw	12,900	11,500	11%	10000	10500	5%	9,550	9,700	2%	10,800	11,500	6%	11,400	11,300	1%	9,550	9,260	3%
Potassium (K)	µg/g dw	24,500	23,400	5%	20400	21200	4%	21,100	22,400	6%	21,300	22,900	7%	24,400	24,900	2%	20,700	20,300	2%
Rhenium (Re)	µg/g dw	<0.000026	<0.000028	7%	<0.000032	<0.000028	13%	<0.000029	<0.000028	4%	<0.000027	<0.000029	7%	<0.000029	<0.000029	0%	<0.000026	<0.000028	7%
Rubidium (Ru)	µg/g dw	21.7	20.8	4%	21.4	24.5	14%	27.3	28.5	4%	12.3	13.1	6%	29.4	30.7	4%	20.3	20.8	2%
Selenium (Se)	µg/g dw	1.19	1.3	9%	1.34	1.68	23%	1.58	1.8	13%	2.58	2.51	3%	2.33	2.36	1%	1.99	2.02	1%
Silver (Ag)	µg/g dw	<0.00044	<0.00048	9%	<0.00054	<0.00048	12%	<0.00049	<0.00047	4%	<0.00046	<0.00049	6%	<0.00049	<0.00048	2%	<0.00044	<0.00048	9%
Sodium (Na)	µg/g dw	1,320	1,310	1%	774	926	18%	958	998	4%	881	955	8%	1,660	1,810	9%	926	898	3%
Strontium (Sr)	µg/g dw	4.63	2.79	50%	1.99	1.34	39%	0.54	0.25	73%	4.79	4.69	2%	1.01	0.71	35%	1.58	1.36	15%
Thallium (Tl)	µg/g dw	0.0210	0.0210	0%	0.0114	0.0209	59%	0.0056	0.0060	6%	0.0109	0.0089	21%	0.0230	0.0242	5%	0.0081	0.0084	3%
Thorium (Th)	µg/g dw	0.00511	0.00622	20%	<0.00045	<0.00039	14%	0.00056	0.00068	19%	0.00056	0.00050	11%	<0.00040	<0.00040	0%	<0.00036	0.00117	106%
Tin (Sn)	µg/g dw	0.00209	0.00165	24%	0.00197	0.00084	80%	0.00081	0.00117	36%	0.00086	0.00075	14%	0.00139	0.00168	19%	0.00132	0.00120	10%
Titanium (Ti)	µg/g dw	0.4870	0.2790	54%	0.0972	0.118	19%	0.1440	0.1450	1%	0.1210	0.1100	10%	0.1330	0.1430	7%	0.1540	0.1590	3%
Uranium (U)	µg/g dw	0.00255	0.00216	17%	0.00057	0.00025	78%	0.00038	<0.00022	53%	0.00259	0.00193	29%	0.00056	0.00048	15%	0.00039	0.00039	0%
Vanadium (V)	µg/g dw	0.03280	0.01930	52%	0.00244	0.00425	54%	0.00736	0.00763	4%	0.01000	0.00663	41%	0.00577	0.00498	15%	0.00599	0.01310	74%
Yttrium (Y)	µg/g dw	0.00522	0.00522	0%	0.00029	0.00033	13%	0.00093	0.00139	40%	0.00119	0.00048	85%	0.00159	0.00101	45%	0.00057	0.00094	49%
Zinc (Zn)	µg/g dw	31.0	34.7	11%	17.4	21.1	19%	17.4	17.4	0%	49.0	36.0	31%	26.3	24.9	5%	27.5	18.8	38%
Zirconium (Zr)	µg/g dw	0.0335	0.0217	43%	0.0263	0.0234	12%	0.0088	0.0062	35%	0.0177	0.0142	22%	0.0303	0.0102	99%	0.0163	0.0124	27%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17b: **Laboratory Duplicate Results for Fish Muscle Samples, 2015**

Analyte	Unit	GC-NSC-49-APR rep 1	GC-NSC-49-APR rep 2	RPD	GC-CSU-10-APR rep 1	GC-CSU-10-APR rep 2	RPD	GC-PCC-05-APR rep 1	GC-PCC-05-APR rep 2	RPD	ER-CSU-02-APR rep 1	ER-CSU-02-APR rep 2	RPD	ER-CSU-09-APR rep 1	ER-CSU-09-APR rep 2	RPD	ER-CSU-17-APR rep 1	ER-CSU-17-APR rep 2	RPD
Aluminum (Al)	µg/g dw	1.100	1.100	0%	2.00	2.60	26%	3.130	3.130	0%	2.01	1.84	9%	2.68	2.68	0%	5.88	5.88	0%
Antimony (Sb)	µg/g dw	0.0014	0.0008	49%	0.0020	0.0016	19%	0.0012	0.0016	24%	0.0008	0.0016	71%	0.0020	0.0016	22%	0.0030	0.0027	10%
Arsenic (As)	µg/g dw	0.0919	0.0801	14%	0.0845	0.0834	1%	0.0842	0.0777	8%	0.1060	0.1210	13%	0.0981	0.0989	1%	0.0407	0.0366	11%
Barium (Ba)	µg/g dw	0.207	0.135	42%	1.330	1.440	8%	1.930	1.330	37%	1.220	1.450	17%	3.490	3.730	7%	1.130	1.730	42%
Beryllium (Be)	µg/g dw	<0.0024	<0.0024	0%	<0.0026	<0.0025	4%	<0.0023	<0.0026	12%	<0.0023	<0.0025	8%	<0.0022	<0.0027	20%	<0.0027	<0.0026	4%
Bismuth (Bi)	µg/g dw	0.00060	0.00046	26%	0.00462	0.00475	3%	0.00375	0.00351	7%	0.00249	0.00246	1%	0.00408	0.00396	3%	0.00961	0.00936	3%
Boron (B)	µg/g dw	<0.095	<0.097	2%	<0.100	0.110	10%	<0.093	<0.100	7%	0.104	0.170	48%	<0.120	<0.140	15%	<0.110	<0.110	0%
Cadmium (Cd)	µg/g dw	<0.0010	<0.0011	10%	0.0063	0.0054	15%	0.0033	0.0050	41%	0.0040	0.0035	13%	0.0047	0.0032	38%	0.0072	0.0074	3%
Calcium (Ca)	µg/g dw	662	469	34%	2,070	2,600	23%	4,350	2,420	57%	3,280	4,160	24%	7,460	8,230	10%	2,800	4,890	54%
Cesium (Cs)	µg/g dw	0.1110	0.1090	2%	0.0259	0.0273	5%	0.0677	0.0688	2%	0.1130	0.1160	3%	0.0839	0.0787	6%	0.0546	0.0553	1%
Chromium (Cr)	µg/g dw	0.0638	0.0724	13%	0.0590	0.0727	21%	0.0556	0.0634	13%	0.0493	0.0540	9%	0.0579	0.0587	1%	0.0608	0.0603	1%
Cobalt (Co)	µg/g dw	0.00453	0.00415	9%	0.02860	0.02440	16%	0.01130	0.01180	4%	0.03260	0.03570	9%	0.01790	0.02000	11%	0.03970	0.02940	30%
Copper (Cu)	µg/g dw	1.310	1.390	6%	1.230	1.170	5%	0.876	1.050	18%	1.030	1.150	11%	0.695	0.747	7%	1.260	1.030	20%
Gallium (Ga)	µg/g dw	0.00476	0.00485	2%	0.00660	0.00719	9%	0.00778	0.00789	1%	0.00637	0.00727	13%	0.01060	0.00880	19%	0.00980	0.00821	18%
Iron (Fe)	µg/g dw	13.9	9.7	36%	16.5	16.0	3%	14.4	17.6	20%	13.9	15.9	13%	9.8	10.7	9%	28.8	21.2	30%
Lead (Pb)	µg/g dw	0.02110	0.01400	40%	0.02180	0.02700	21%	0.02460	0.01520	47%	0.02380	0.03200	29%	0.06250	0.07020	12%	0.03400	0.05570	48%
Lithium (Li)	µg/g dw	<0.0060	<0.0061	2%	0.0116	0.0135	15%	0.0082	<0.0065	23%	0.0217	0.0207	5%	0.0197	0.0209	6%	0.0323	0.0237	31%
Magnesium (Mg)	µg/g dw	1,060	1,070	1%	1,170	1,250	7%	1,330	1,390	4%	1,180	1,280	8%	1,300	1,260	3%	1,150	1,250	8%
Manganese (Mn)	µg/g dw	0.294	0.232	24%	1.600	2.090	27%	2.000	1.240	47%	2.150	2.700	23%	5.410	5.480	1%	2.080	3.390	48%
Mercury (Hg)	µg/g dw	0.839	0.870	4%	3.020	3.090	2%	0.763	0.752	1%	0.676	0.647	4%	0.841	0.789	6%	1.290	1.280	1%
Molybdenum (Mo)	µg/g dw	0.0062	0.0039	46%	0.0105	0.0111	6%	0.0076	0.0078	3%	0.0094	0.0093	1%	0.0110	0.0112	2%	0.0104	0.0096	8%
Nickel (Ni)	µg/g dw	0.0074	0.0046	46%	0.0391	0.0442	12%	0.0251	0.0179	33%	0.0319	0.0366	14%	0.0569	0.0570	0%	0.0530	0.0421	23%
Phosphorus (P)	µg/g dw	8,980	9,030	1%	12,500	13,100	5%	11,900	11,100	7%	11,900	12,500	5%	14,200	14,300	1%	11,900	12,900	8%
Potassium (K)	µg/g dw	16,900	16,800	1%	25,100	26,100	4%	21,200	22,200	5%	23,900	23,600	1%	23,000	22,500	2%	23,900	24,000	0%
Rhenium (Re)	µg/g dw	<0.000030	<0.000030	0%	<0.000033	<0.000032	3%	<0.000029	<0.000032	10%	<0.000029	<0.000031	7%	<0.000034	<0.000041	19%	<0.000033	<0.000033	0%
Rubidium (Ru)	µg/g dw	19.5	18.9	3%	11.9	12.6	6%	18.8	19.4	3%	17.1	17.3	1%	11.5	10.9	5%	7.9	8.1	2%
Selenium (Se)	µg/g dw	1.39	1.23	12%	0.99	0.94	5%	1.88	1.8	4%	3.11	3.22	3%	4.54	4.37	4%	8.61	8.09	6%
Silver (Ag)	µg/g dw	0.00125	0.00094	28%	0.00250	0.00208	18%	0.00035	0.00061	54%	0.00086	0.00090	5%	0.00071	0.00047	41%	0.00050	0.00049	2%
Sodium (Na)	µg/g dw	817	838	3%	1,590	1,630	2%	1,000	1,010	1%	1,340	1,370	2%	1,090	1,070	2%	1,530	1,550	1%
Strontium (Sr)	µg/g dw	0.35	0.19	58%	1.48	1.68	13%	6.06	3.13	64%	3.20	3.96	21%	7.08	7.48	5%	2.49	4.30	53%
Thallium (Tl)	µg/g dw	0.0254	0.0253	0%	0.0080	0.0084	5%	0.0054	0.0052	5%	0.0308	0.0334	8%	0.0287	0.0284	1%	0.0216	0.0222	3%
Thorium (Th)	µg/g dw	0.000322	0.000596	60%	0.00030	0.00040	28%	0.000455	0.000508	11%	0.00031	0.00028	8%	0.00043	0.00059	33%	0.00119	0.00144	19%
Tin (Sn)	µg/g dw	0.00084	0.00065	26%	0.00226	0.00295	26%	0.00620	0.00199	103%	0.00119	0.00162	31%	0.00203	0.00140	37%	0.00203	0.00140	37%
Titanium (Ti)	µg/g dw	0.1220	0.0880	32%	0.1070	0.1540	36%	0.157	0.205	27%	0.130	0.128	2%	0.111	0.114	3%	0.573	0.355	47%
Uranium (U)	µg/g dw	<0.00015	<0.00015	0%	0.00137	0.00214	44%	0.00264	0.00141	61%	0.00090	0.00122	30%	0.00139	0.00153	10%	0.00096	0.00186	64%
Vanadium (V)	µg/g dw	0.00559	0.00410	31%	0.00447	0.00704	45%	0.00858	0.00962	11%	0.00884	0.01060	18%	0.00832	0.01150	32%	0.02010	0.01630	21%
Yttrium (Y)	µg/g dw	0.00074	0.00058	24%	0.00101	0.00141	33%	0.00167	0.00153	9%	0.00097	0.00137	34%	0.00243	0.00164	39%	0.00352	0.00444	23%
Zinc (Zn)	µg/g dw	19.5	18.6	5%	26.0	26.5	2%	30.0	30.7	2%	30.1	31.8	5%	38.8	39.0	1%	36.1	30.5	17%
Zirconium (Zr)	µg/g dw	0.0071	0.0041	53%	0.0056	0.0070	22%	0.0074	0.0082	10%	0.0064	0.0058	11%	0.0078	0.0100	24%	0.0088	0.0079	11%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17b: **Laboratory Duplicate Results for Fish Muscle Samples, 2015**

Analyte	Unit	ER-PCC-10-APR rep 1	ER-PCC-10-APR rep 2	RPD	ER-YP-08-APR rep 1	ER-YP-08-APR rep 2	RPD	ER-NSC-13-APR rep 1	ER-NSC-13-APR rep 2	RPD	ER-NSC-03 rep 1	ER-NSC-03 rep 2	RPD	SC-KO-02 rep 1	SC-KO-02 rep 2	RPD	GC-NSC-02 rep 1	GC-NSC-02 rep 2	RPD
Aluminum (Al)	µg/g dw	4.400	4.950	12%	1.560	1.340	15%	1.080	0.577	61%	21.3	38.4	57%	1.78	4.61	89%	0.552	0.552	0%
Antimony (Sb)	µg/g dw	0.0036	0.0020	57%	<0.0011	<0.0011	0%	<0.0010	0.0016	46%	0.00068	0.00146	73%	<0.00063	0.00087	32%	0.00128	0.0008	46%
Arsenic (As)	µg/g dw	0.1430	0.1500	5%	0.0181	0.0239	28%	0.0389	0.0421	8%	0.0271	0.033	20%	0.347	0.266	26%	0.0277	0.0268	3%
Barium (Ba)	µg/g dw	2.490	2.230	11%	0.052	0.100	63%	0.828	0.267	102%	0.827	0.897	8%	0.356	0.315	12%	0.297	0.311	5%
Beryllium (Be)	µg/g dw	<0.0026	<0.0026	0%	<0.0025	<0.0025	0%	<0.0023	<0.0026	12%	<0.0024	<0.0026	8%	<0.0026	<0.0024	8%	<0.0024	<0.0024	0%
Bismuth (Bi)	µg/g dw	0.00726	0.00736	1%	0.00884	0.00911	3%	0.00201	0.00214	6%	0.00283	0.00283	0%	<0.000090	<0.000085	6%	0.00499	0.0041	20%
Boron (B)	µg/g dw	<0.100	0.160	46%	<0.140	<0.140	0%	<0.120	<0.140	15%	0.23	0.35	41%	<0.24	<0.22	9%	<0.22	<0.22	0%
Cadmium (Cd)	µg/g dw	0.0078	0.0082	5%	0.0050	0.0049	2%	<0.0015	<0.0018	18%	0.0148	0.0187	23%	0.0072	0.0048	40%	<0.0021	0.0023	9%
Calcium (Ca)	µg/g dw	4,980	4,570	9%	606	1,320	74%	4,290	1,230	111%	971	1,410	37%	1,920	1,550	21%	546	523	4%
Cesium (Cs)	µg/g dw	0.0307	0.0338	10%	0.2980	0.3050	2%	0.0954	0.0961	1%	0.137	0.145	6%	0.054	0.0567	5%	0.081	0.0794	2%
Chromium (Cr)	µg/g dw	0.0599	0.0663	10%	0.0577	0.1180	69%	0.0485	0.0595	20%	0.0675	0.115	52%	0.062	0.0666	7%	0.0567	0.0622	9%
Cobalt (Co)	µg/g dw	0.01880	0.01690	11%	0.01510	0.01450	4%	0.00249	0.00229	8%	0.00995	0.0125	23%	0.019	0.0171	11%	0.00588	0.00571	3%
Copper (Cu)	µg/g dw	0.957	0.833	14%	0.441	0.460	4%	0.525	0.547	4%	1.3	1.33	2%	1.42	1.21	16%	0.871	0.855	2%
Gallium (Ga)	µg/g dw	0.00766	0.00667	14%	0.00684	0.00748	9%	0.00754	0.00540	33%	0.012	0.0174	37%	0.00532	0.00615	14%	0.0128	0.00594	73%
Iron (Fe)	µg/g dw	18.9	16.4	14%	7.1	7.7	8%	6.7	6.8	1%	26.5	41.1	43%	18.8	18.1	4%	20	12.9	43%
Lead (Pb)	µg/g dw	0.02600	0.02340	11%	0.01860	0.01820	2%	0.01260	0.01130	11%	0.0163	0.0986	143%	0.00422	0.00469	11%	0.00452	0.00236	63%
Lithium (Li)	µg/g dw	0.0157	0.0177	12%	0.0226	0.0252	11%	0.0101	<0.0054	61%	0.0117	0.0417	112%	0.022	0.0218	1%	0.0055	0.0044	22%
Magnesium (Mg)	µg/g dw	1,210	1,300	7%	1,170	1,190	2%	1,170	1,140	3%	1260	1500	17%	1,060	1,100	4%	1280	1260	2%
Manganese (Mn)	µg/g dw	1.260	1.210	4%	0.569	0.698	20%	1.220	0.478	87%	0.917	1.61	55%	0.532	0.571	7%	0.65	0.476	31%
Mercury (Hg)	µg/g dw	0.834	0.835	0%	1.680	1.660	1%	0.931	0.949	2%	1.38	1.48	7%	0.128	0.138	8%	1.73	1.7	2%
Molybdenum (Mo)	µg/g dw	0.0097	0.0097	0%	0.0112	0.0121	8%	0.0061	0.0054	12%	0.019	0.0197	4%	0.0173	0.0203	16%	0.0105	0.0105	0%
Nickel (Ni)	µg/g dw	0.0482	0.0489	1%	0.0187	0.0194	4%	0.0164	0.0101	48%	0.0423	0.0466	10%	0.0235	0.0218	8%	0.0119	0.0061	64%
Phosphorus (P)	µg/g dw	12,800	12,800	0%	12,300	12,500	2%	11,200	9,350	18%	10,200	10,700	5%	11,200	11,400	2%	10,400	10,400	0%
Potassium (K)	µg/g dw	24,100	24,400	1%	24,600	24,500	0%	20,800	20,400	2%	22,400	22,900	2%	17,700	18,700	5%	21,800	21,800	0%
Rhenium (Re)	µg/g dw	<0.000033	<0.000032	3%	<0.000039	0.0000103	116%	0.00002	0.0000215	7%	0.0000038	0.000017	127%	0.000454	0.000429	6%	0.0000236	0.0000094	86%
Rubidium (Ru)	µg/g dw	8.8	9.3	5%	38.1	38.0	0%	19.6	19.7	1%	24.5	25.3	3%	16.4	17.4	6%	24.5	24.2	1%
Selenium (Se)	µg/g dw	9.35	9.11	3%	3.28	3.54	8%	5.83	6.06	4%	2.68	2.59	3%	1.75	1.8	3%	2.34	2.17	8%
Silver (Ag)	µg/g dw	0.00085	0.00089	5%	<0.00036	0.00122	109%	<0.00032	<0.00037	14%	0.00159	0.00187	16%	0.00031	0.00032	3%	<0.00023	<0.00022	4%
Sodium (Na)	µg/g dw	1,370	1,390	1%	2,430	2,330	4%	747	723	3%	1,320	1,360	3%	872	916	5%	1,200	1,180	2%
Strontium (Sr)	µg/g dw	6.17	5.71	8%	0.20	0.58	97%	2.89	0.63	129%	0.707	0.977	32%	1.4	1.13	21%	0.316	0.105	100%
Thallium (Tl)	µg/g dw	0.0081	0.0083	3%	0.0377	0.0393	4%	0.0150	0.0133	12%	0.00952	0.0105	10%	0.0482	0.0501	4%	0.00376	0.00405	7%
Thorium (Th)	µg/g dw	0.00139	0.000903	42%	0.000223	0.000296	28%	0.000163	<0.000083	65%	0.00305	0.00623	69%	0.000124	0.000094	28%	0.00105	0.000108	163%
Tin (Sn)	µg/g dw	0.00257	0.00325	23%	0.00300	0.00160	61%	0.00110	<0.0012	9%	0.00378	0.0037	2%	0.00226	0.00167	30%	0.00298	0.00217	31%
Titanium (Ti)	µg/g dw	0.193	0.186	4%	0.114	0.116	2%	0.0800	0.0711	12%	0.292	0.564	64%	0.0793	0.0951	18%	0.126	0.0789	46%
Uranium (U)	µg/g dw	0.00200	0.00187	7%	0.00023	0.00026	13%	0.00064	0.00012	138%	0.000944	0.00457	132%	0.000947	0.00083	13%	0.00073	<0.000016	191%
Vanadium (V)	µg/g dw	0.01850	0.01750	6%	0.00562	0.00695	21%	0.01080	0.00394	93%	0.018	0.0765	124%	0.00467	0.00753	47%	0.0275	0.00292	162%
Yttrium (Y)	µg/g dw	0.00188	0.00228	19%	0.00049	0.00112	78%	0.00040	0.00033	19%	0.0071	0.0302	124%	0.00066	0.00055	18%	0.00022	0.00022	0%
Zinc (Zn)	µg/g dw	24.8	21.9	12%	25.5	30.2	17%	17.6	18.3	4%	39.6	35.7	10%	26.4	24.5	7%	29.6	30.7	4%
Zirconium (Zr)	µg/g dw	0.0075	0.0065	15%	0.0047	0.0042	12%	0.0024	0.0050	71%	0.019	0.0352	60%	0.00635	0.00571	11%	0.00808	0.00486	50%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17b: Laboratory Duplicate Results for Fish Muscle Samples, 2015

Analyte	Unit	ER-KO-01 rep 1	ER-KO-01 rep 2	RPD	SC-NSC-06 rep 1	SC-NSC-06 rep 2	RPD	SC-NSC-11 rep 1	SC-NSC-11 rep 2	RPD
Aluminum (Al)	µg/g dw	0.459	0.459	0%	1.33	1.33	0%	1.1	1.10	0%
Antimony (Sb)	µg/g dw	<0.00061	<0.00061	0%	0.00215	0.00092	80%	0.00081	0.00065	22%
Arsenic (As)	µg/g dw	0.22	0.181	19%	0.036	0.034	6%	0.0425	0.0377	12%
Barium (Ba)	µg/g dw	0.159	0.0777	69%	0.742	0.792	7%	0.188	0.110	52%
Beryllium (Be)	µg/g dw	<0.0025	<0.0025	0%	<0.0026	<0.0025	4%	<0.0022	<0.0023	4%
Bismuth (Bi)	µg/g dw	<0.000088	0.000277	104%	0.00106	0.00103	3%	0.00088	0.000718	20%
Boron (B)	µg/g dw	<0.23	<0.23	0%	<0.24	<0.23	4%	<0.20	<0.21	5%
Cadmium (Cd)	µg/g dw	<0.0022	<0.0022	0%	0.003	0.0028	7%	0.002	<0.0020	0%
Calcium (Ca)	µg/g dw	1,130	670	51%	565	597	6%	839	523	46%
Cesium (Cs)	µg/g dw	0.0451	0.0466	3%	0.148	0.146	1%	0.526	0.513	3%
Chromium (Cr)	µg/g dw	0.0593	0.0614	3%	0.068	0.0763	12%	0.0704	0.0681	3%
Cobalt (Co)	µg/g dw	0.0146	0.0142	3%	0.00592	0.00646	9%	0.00367	0.00304	19%
Copper (Cu)	µg/g dw	1.25	1.09	14%	0.978	1.01	3%	0.776	0.766	1%
Gallium (Ga)	µg/g dw	0.00611	0.00491	22%	0.0124	0.00603	69%	0.00508	0.00416	20%
Iron (Fe)	µg/g dw	15.7	13.9	12%	16.7	18	7%	25.9	24.3	6%
Lead (Pb)	µg/g dw	0.00189	0.00341	57%	0.048	0.0105	128%	0.00711	0.00573	21%
Lithium (Li)	µg/g dw	0.123	0.122	1%	0.0052	0.0087	50%	0.0039	0.0032	20%
Magnesium (Mg)	µg/g dw	1,120	1,180	5%	1210	1220	1%	1320	1310	1%
Manganese (Mn)	µg/g dw	0.372	0.284	27%	0.51	0.514	1%	0.471	0.392	18%
Mercury (Hg)	µg/g dw	0.122	0.127	4%	1.35	1.34	1%	0.858	0.889	4%
Molybdenum (Mo)	µg/g dw	0.0113	0.0144	24%	0.0072	0.0085	17%	0.0097	0.0118	20%
Nickel (Ni)	µg/g dw	0.0068	0.0066	3%	0.0375	0.0181	70%	0.0306	0.0242	23%
Phosphorus (P)	µg/g dw	11,200	11,400	2%	10,400	10,600	2%	10,800	10,700	1%
Potassium (K)	µg/g dw	20,000	21,200	6%	21,700	21,300	2%	20,900	21,100	1%
Rhenium (Re)	µg/g dw	0.0000679	0.0000904	28%	<0.0000031	<0.0000030	3%	<0.0000026	<0.0000027	4%
Rubidium (Ru)	µg/g dw	16	16.8	5%	20.6	20.2	2%	35.6	35.3	1%
Selenium (Se)	µg/g dw	1.94	1.91	2%	2.72	2.66	2%	1.34	1.37	2%
Silver (Ag)	µg/g dw	<0.00024	<0.00023	4%	0.000570	0.000240	81%	0.00031	0.00033	6%
Sodium (Na)	µg/g dw	1,360	1,440	6%	1,340	1,370	2%	955	976	2%
Strontium (Sr)	µg/g dw	0.761	0.412	60%	0.122	0.149	20%	0.45	0.178	87%
Thallium (Tl)	µg/g dw	0.0491	0.0473	4%	0.00712	0.00678	5%	0.00716	0.00706	1%
Thorium (Th)	µg/g dw	<0.000089	<0.000088	1%	0.00044	0.000548	22%	0.000751	0.000198	117%
Tin (Sn)	µg/g dw	0.00241	0.00209	14%	0.0177	0.0216	20%	0.002	0.00163	20%
Titanium (Ti)	µg/g dw	0.0736	0.0958	26%	0.124	0.124	0%	0.125	0.111	12%
Uranium (U)	µg/g dw	0.000141	0.000098	36%	0.000108	0.000083	26%	0.000443	0.000281	45%
Vanadium (V)	µg/g dw	0.00296	0.00226	27%	0.00525	0.00544	4%	0.00429	0.0025	53%
Yttrium (Y)	µg/g dw	0.00019	0.00019	0%	0.0006	0.00060	0%	0.00046	0.00046	0%
Zinc (Zn)	µg/g dw	22.1	21.5	3%	31.6	34.5	9%	20.1	18.8	7%
Zirconium (Zr)	µg/g dw	0.0213	0.0134	46%	0.0195	0.00975	67%	0.0118	0.009	27%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17c: Laboratory Duplicate Results for Fish Muscle Samples, 2016

Analyte	Unit	ER-PCC-01 M rep 1	ER-PCC-01 M rep 2	RPD	ER-BT-04 M rep 1	ER-BT-04 M rep 2	RPD	SC-PCC-06 M rep 1	SC-PCC-06 M rep 2	RPD	SC-RT-01 M rep 1	SC-RT-01 M rep 2	RPD	GC-BT-02 M rep 1	GC-BT-02 M rep 2	RPD	GC-BT-04 M rep 1	GC-BT-04 M rep 2	RPD
Aluminum (Al)	µg/g dw	-	0.885	-	-	2.88	-	-	2.65	-	-	0.721	-	-	1.73	-	-	1.47	-
Antimony (Sb)	µg/g dw	0.0028	0.0019	38%	0.0019	0.0014	30%	0.0015	0.0014	7%	<0.0011	<0.0012	9%	0.00121	0.00076	46%	0.0007	0.00073	4%
Arsenic (As)	µg/g dw	0.134	0.131	2%	0.0997	0.0987	1%	0.181	0.191	5%	0.0858	0.0837	2%	0.0333	0.0389	16%	0.0361	0.035	3%
Barium (Ba)	µg/g dw	1.99	1.93	3%	0.0569	0.0422	30%	0.825	1.48	57%	0.341	0.0393	159%	0.029	0.0246	16%	0.0691	0.0733	6%
Beryllium (Be)	µg/g dw	<0.0054	<0.0053	2%	<0.0053	<0.0050	6%	<0.0053	<0.0056	6%	<0.0054	<0.0056	4%	<0.0026	<0.0026	0%	<0.0026	<0.0024	8%
Bismuth (Bi)	µg/g dw	0.00542	0.00593	9%	0.0004	0.00046	14%	0.0112	0.0103	8%	0.000289	0.000316	9%	0.0017	0.00203	18%	0.00617	0.00573	7%
Boron (B)	µg/g dw	<0.0860	<0.0840	2%	0.089	0.112	23%	0.127	<0.0880	36%	<0.0850	0.165	64%	<0.1000	<0.1000	0%	<0.0990	0.166	51%
Cadmium (Cd)	µg/g dw	0.0056	0.0047	17%	<0.0024	<0.0023	4%	0.0043	0.0034	23%	<0.0024	<0.0025	4%	<0.0013	<0.0013	0%	<0.0012	<0.0012	0%
Calcium (Ca)	µg/g dw	2,520	3,250	25%	302	292	3%	1,740	3,100	56%	4,530	678	148%	400	405	1%	987	1100	11%
Cesium (Cs)	µg/g dw	0.0286	0.0297	4%	0.113	0.113	0%	0.0756	0.0693	9%	0.0357	0.0364	2%	0.111	0.121	9%	0.0826	0.081	2%
Chromium (Cr)	µg/g dw	0.0681	0.0505	30%	0.0645	0.0606	6%	0.71	0.365	64%	0.0455	0.0471	3%	0.0638	0.0798	22%	0.0786	0.0842	7%
Cobalt (Co)	µg/g dw	0.0191	0.016	18%	0.00949	0.00918	3%	0.0191	0.0234	20%	0.0125	0.0118	6%	0.0107	0.011	3%	0.0178	0.0165	8%
Copper (Cu)	µg/g dw	1.93	1.48	26%	1.13	1.12	1%	1.19	1.92	47%	1.02	1.1	8%	0.894	1	11%	1.07	1.04	3%
Gallium (Ga)	µg/g dw	0.0043	0.0045	5%	0.0069	0.0035	65%	0.0038	0.0047	21%	0.0062	0.0038	48%	0.00807	0.00701	14%	0.014	0.00819	52%
Iron (Fe)	µg/g dw	31.2	22.2	34%	13.9	13.7	1%	24	28.5	17%	13.7	14.2	4%	8.61	9.52	10%	9.97	9.56	4%
Lead (Pb)	µg/g dw	0.0147	0.0154	5%	0.0217	0.0108	67%	0.0202	0.0241	18%	0.00516	0.00198	89%	0.00146	0.00284	64%	0.0102	0.0103	1%
Lithium (Li)	µg/g dw	0.0071	0.0116	48%	0.0047	<0.0033	35%	0.0086	0.0071	19%	0.0132	0.0104	24%	<0.0034	<0.0033	3%	0.0051	0.0072	34%
Magnesium (Mg)	µg/g dw	1,300	1,390	7%	1,020	994	3%	1,350	1,270	6%	1,380	1,300	6%	1,180	1,280	8%	1,360	1,320	3%
Manganese (Mn)	µg/g dw	0.872	0.947	8%	0.371	0.386	4%	0.9	1.38	42%	0.972	0.367	90%	0.43	0.458	6%	0.48	0.443	8%
Mercury (Hg)	µg/g dw	0.439	0.476	8%	1.02	1.01	1%	1.06	0.946	11%	0.164	0.162	1%	0.641	0.71	10%	0.0248	0.0231	7%
Molybdenum (Mo)	µg/g dw	<0.0030	<0.0030	0%	<0.0029	<0.0028	4%	0.0068	0.0062	9%	<0.0030	<0.0031	3%	0.006	0.0067	11%	0.0071	0.0067	6%
Nickel (Ni)	µg/g dw	0.0559	0.0394	35%	0.029	0.0203	35%	0.0386	0.0337	14%	0.024	0.0141	52%	0.016	0.0113	34%	0.046	0.0214	73%
Phosphorus (P)	µg/g dw	12,400	13,600	9%	9,870	9,950	1%	11,100	11,500	4%	15,400	13,300	15%	10,100	10,900	8%	12,200	11,700	4%
Potassium (K)	µg/g dw	21,200	22,700	7%	17,500	17,100	2%	20,900	19,500	7%	24,300	24,000	1%	19,700	21,400	8%	23,100	21,800	6%
Rhenium (Re)	µg/g dw	<0.0000	<0.0000	2%	0.000114	0.000117	3%	<0.0000	<0.0000	7%	0.000067	<0.0000	41%	0.00006	0.000057	5%	0.000057	0.000098	53%
Rubidium (Rb)	µg/g dw	4.86	5.13	5%	22	21.9	0%	8.6	8.05	7%	9.96	9.97	0%	24.5	26.7	9%	23.9	24	0%
Selenium (Se)	µg/g dw	4.85	5.2	7%	2.29	2.07	10%	3.02	3.12	3%	1.42	1.63	14%	2.2	2.32	5%	2.73	2.71	1%
Silver (Ag)	µg/g dw	<0.0005	<0.0005	2%	<0.0005	<0.0005	4%	<0.0005	<0.0005	6%	<0.0005	<0.0005	4%	<0.0004	<0.0004	2%	0.00149	0.0021	34%
Sodium (Na)	µg/g dw	955	1,030	8%	886	886	0%	842	796	6%	1,290	1,240	4%	756	811	7%	928	894	4%
Strontium (Sr)	µg/g dw	3.14	4.04	25%	0.0856	0.0812	5%	1.64	3.32	68%	3.26	0.359	160%	0.074	0.0679	9%	0.4	0.483	19%
Thallium (Tl)	µg/g dw	0.0401	0.0262	42%	0.0292	0.0289	1%	0.00636	0.00802	23%	0.0116	0.0106	9%	0.0312	0.0346	10%	0.0338	0.0336	1%
Thorium (Th)	µg/g dw	0.000151	0.000106	35%	0.000633	0.000715	12%	0.000927	0.000416	76%	0.00008	<0.0001	46%	0.000182	0.000212	15%	0.000217	0.000221	2%
Tin (Sn)	µg/g dw	<0.0011	<0.0010	10%	0.0048	0.00502	4%	0.0048	0.0038	23%	<0.0010	0.0016	46%	0.00105	<0.0008	33%	0.00146	0.00147	1%
Titanium (Ti)	µg/g dw	0.109	0.114	4%	0.164	0.11	39%	0.169	0.0988	52%	0.0738	0.0706	4%	0.229	0.135	52%	0.117	0.116	1%
Uranium (U)	µg/g dw	0.00139	0.00151	8%	0.000309	0.000299	3%	0.00212	0.00371	55%	0.000356	0.000137	89%	<0.0001	<0.0001	3%	0.000271	0.000163	50%
Vanadium (V)	µg/g dw	0.0115	0.00965	17%	0.0104	0.00705	38%	0.0147	0.0109	30%	0.00297	0.00213	33%	0.00832	0.0038	75%	0.00329	0.00246	29%
Yttrium (Y)	µg/g dw	-	0.00042	-	-	0.00134	-	-	0.00065	-	-	<0.0002	-	-	0.00066	-	-	0.00065	-
Zinc (Zn)	µg/g dw	36.4	33.4	9%	12.3	12.2	1%	31.9	45.2	35%	21	17.6	18%	12.3	13.7	11%	14.6	14.6	0%
Zirconium (Zr)	µg/g dw	0.00676	0.00638	6%	0.012	0.00571	71%	0.00703	0.00953	30%	0.00646	0.00414	44%	0.00632	0.0029	74%	0.0189	0.0105	57%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17c: Laboratory Duplicate Results for Fish Muscle Samples, 2016

Analyte	Unit	ER-YP-02 M rep 1	ER-YP-02 M rep 2	RPD	ER-RSC-13 M rep 1	ER-RSC-13 M rep 2	RPD	ER-CSU-04 M rep 1	ER-CSU-04 M rep 2	RPD	ER-CSU-34 M rep 1	ER-CSU-34 M rep 2	RPD	ER-NSC-28 M rep 1	ER-NSC-28 M rep 2	RPD	GC-CSU-04 M rep 1	GC-CSU-04 M rep 2	RPD
Aluminum (Al)	µg/g dw	3.21	4.09	24%	1.86	1.59	16%	3.87	3.72	4%	-	5.34	-	0.682	0.818	18%	9.38	7.17	27%
Antimony (Sb)	µg/g dw	0.00067	<0.0006	9%	0.00107	<0.0010	7%	0.0015	0.00165	10%	0.00268	0.00353	27%	<0.0006	<0.0006	3%	0.00094	0.00066	35%
Arsenic (As)	µg/g dw	0.0099	0.0112	12%	0.0525	0.0356	38%	0.136	0.139	2%	0.213	0.237	11%	0.0719	0.0644	11%	0.0961	0.0915	5%
Barium (Ba)	µg/g dw	0.115	0.409	112%	1.25	0.897	33%	1.38	1.48	7%	0.627	0.738	16%	0.451	0.162	94%	0.459	0.236	64%
Beryllium (Be)	µg/g dw	<0.0026	<0.0027	4%	<0.0046	<0.0049	6%	<0.0024	<0.0023	4%	<0.0026	<0.0026	0%	<0.0026	<0.0027	4%	<0.0025	<0.0022	13%
Bismuth (Bi)	µg/g dw	0.00505	0.00464	8%	0.00081	0.00077	5%	0.00331	0.00319	4%	0.00711	0.00733	3%	0.00046	0.000376	20%	0.00144	0.00131	9%
Boron (B)	µg/g dw	0.157	0.124	23%	0.35	0.33	6%	0.128	0.24	61%	0.111	<0.0650	52%	0.105	0.34	106%	0.096	0.244	87%
Cadmium (Cd)	µg/g dw	0.0041	0.0054	27%	0.0121	0.0147	19%	0.002	0.0025	22%	0.0092	0.0082	11%	<0.0011	0.0014	24%	<0.0009	0.00203	76%
Calcium (Ca)	µg/g dw	1,090	4,440	121%	3,140	2,730	14%	3,320	3,490	5%	1,100	1,910	54%	2,420	699	110%	1,600	870	59%
Cesium (Cs)	µg/g dw	0.2	0.203	1%	0.0433	0.0456	5%	0.0583	0.0605	4%	0.0542	0.0563	4%	0.14	0.137	2%	0.234	0.238	2%
Chromium (Cr)	µg/g dw	0.102	0.127	22%	0.0841	0.0464	58%	0.058	0.0605	4%	0.0758	0.0677	11%	0.0651	0.0993	42%	0.0607	0.0618	2%
Cobalt (Co)	µg/g dw	0.01	0.0118	17%	0.0117	0.0112	4%	0.0157	0.0147	7%	0.0452	0.035	25%	0.003	0.0031	3%	0.0245	0.0228	7%
Copper (Cu)	µg/g dw	0.623	0.804	25%	1.58	1.05	40%	0.867	0.814	6%	1.9	1.09	54%	0.703	0.785	11%	1.01	0.895	12%
Gallium (Ga)	µg/g dw	0.008	0.0078	3%	0.0076	0.0061	22%	0.0072	0.0081	12%	0.0116	0.0087	29%	0.0048	0.0042	13%	0.00961	0.0089	8%
Iron (Fe)	µg/g dw	10.5	12.8	20%	20.1	15.1	28%	11.9	11.4	4%	51.9	24.4	72%	5.94	6.85	14%	15.7	12.8	20%
Lead (Pb)	µg/g dw	0.029	0.0499	53%	0.00932	0.00877	6%	0.0156	0.0211	30%	0.0133	0.0125	6%	0.00354	0.0022	47%	0.0151	0.00905	50%
Lithium (Li)	µg/g dw	0.0898	0.102	13%	0.013	0.015	14%	0.013	0.0162	22%	0.0118	0.0087	30%	<0.0074	<0.0076	3%	0.0097	0.0063	43%
Magnesium (Mg)	µg/g dw	1,250	1,330	6%	1,360	1,370	1%	1,290	1,310	2%	1,070	1,190	11%	1,130	1,090	4%	1,400	1,410	1%
Manganese (Mn)	µg/g dw	0.709	1.16	48%	2.22	2.35	6%	2.31	2.65	14%	0.884	1.12	24%	0.379	0.209	58%	1.85	1.12	49%
Mercury (Hg)	µg/g dw	1.08	1.06	2%	0.312	0.306	2%	0.39	0.381	2%	0.731	0.848	15%	1.61	1.66	3%	0.358	0.365	2%
Molybdenum (Mo)	µg/g dw	0.0039	0.0044	12%	0.00777	0.0058	29%	0.0035	0.0034	3%	0.0072	0.0033	74%	0.0016	0.002	22%	0.00364	0.00328	10%
Nickel (Ni)	µg/g dw	0.0254	0.033	26%	0.0475	0.0493	4%	0.0192	0.0208	8%	0.0386	0.0345	11%	0.0079	0.042	137%	0.0256	0.0225	13%
Phosphorus (P)	µg/g dw	11,800	13,700	15%	12,000	11,400	5%	12,400	12,600	2%	10,800	11,700	8%	9,510	8,590	10%	11,500	11,100	4%
Potassium (K)	µg/g dw	24,600	25,100	2%	17,800	17,900	1%	24,000	23,800	1%	21,200	23,100	9%	16,100	15,500	4%	21,400	21,800	2%
Rhenium (Re)	µg/g dw	<0.0001	<0.0001	2%	<0.0002	<0.0002	6%	<0.0000	<0.0000	4%	<0.0000	<0.0001	2%	<0.0000	<0.0001	4%	<0.0001	<0.0001	13%
Rubidium (Rb)	µg/g dw	35.1	35.6	1%	9.57	9.73	2%	12.3	12.5	2%	8.6	9.45	9%	19.5	19.5	0%	16	16.4	2%
Selenium (Se)	µg/g dw	3.66	3.91	7%	5.63	6.72	18%	4.07	4.04	1%	6.34	6.49	2%	1.57	1.76	11%	0.73	0.71	3%
Silver (Ag)	µg/g dw	<0.0007	<0.0008	3%	<0.0012	<0.0013	8%	<0.0007	<0.0007	3%	0.00253	0.00187	30%	<0.0007	<0.0008	3%	<0.0007	<0.0006	11%
Sodium (Na)	µg/g dw	2,070	2,110	2%	1,090	1,060	3%	998	989	1%	1,180	1,260	7%	846	848	0%	1,080	1,060	2%
Strontium (Sr)	µg/g dw	0.534	2.57	131%	3.52	2.98	17%	2.92	3.22	10%	0.849	1.62	62%	1.91	0.485	119%	1.36	0.609	76%
Thallium (Tl)	µg/g dw	0.028	0.0307	9%	0.0196	0.0174	12%	0.0146	0.0149	2%	0.0238	0.0229	4%	0.00741	0.00787	6%	0.0065	0.00635	2%
Thorium (Th)	µg/g dw	0.000675	0.000812	18%	0.0004	<0.0002	50%	0.000638	0.000485	27%	0.00215	0.00116	60%	0.000117	0.000341	98%	0.00172	0.00161	7%
Tin (Sn)	µg/g dw	0.00174	0.0023	28%	0.0029	0.0021	32%	<0.0008	<0.0008	4%	0.00112	0.00102	9%	<0.0009	<0.0009	3%	0.00157	0.00142	10%
Titanium (Ti)	µg/g dw	0.171	0.206	19%	0.141	0.108	27%	0.152	0.173	13%	0.305	0.167	58%	0.09	0.126	33%	0.288	0.206	33%
Uranium (U)	µg/g dw	0.00076	0.00072	5%	0.00058	0.00043	30%	0.00081	0.0008	1%	0.00085	0.00092	8%	0.00039	<0.0002	56%	0.00086	0.00054	46%
Vanadium (V)	µg/g dw	0.00862	0.0126	38%	0.00627	0.00418	40%	0.0112	0.0106	6%	0.0365	0.0185	65%	0.00499	0.00299	50%	0.0107	0.00961	11%
Yttrium (Y)	µg/g dw	0.00137	0.00164	18%	-	0.00058	-	-	0.00162	-	-	0.00287	-	0.0004	0.00033	19%	0.00424	0.0037	14%
Zinc (Zn)	µg/g dw	28.2	34.2	19%	60.9	37.4	48%	24.5	24.5	0%	27.7	23	19%	13.8	13	6%	18.9	17.5	8%
Zirconium (Zr)	µg/g dw	0.007	0.0092	27%	0.014	0.0108	26%	0.0063	0.0049	25%	0.0082	0.0079	4%	0.0043	0.0027	46%	0.0347	0.0172	67%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17c: Laboratory Duplicate Results for Fish Muscle Samples, 2016

Analyte	Unit	GC-CSU-09 M rep 1	GC-CSU-09 M rep 2	RPD	SC-CSU-36 M rep 1	SC-CSU-36 M rep 2	RPD	SC-NSC-25 M rep 1	SC-NSC-25 M rep 2	RPD	SC-NSC-34 M rep 1	SC-NSC-34 M rep 2	RPD	GC-YP-31 M rep 1	GC-YP-31 M rep 2	RPD	GC-NSC-01 M rep 1	GC-NSC-01 M rep 2	RPD
Aluminum (Al)	µg/g dw	1.4	1.59	13%	-	2.2	-	-	0.195	-	-	6.84	-	-	1.39	-	-	1.4	-
Antimony (Sb)	µg/g dw	<0.0005	0.0011	72%	0.00134	0.00122	9%	<0.0005	<0.0005	8%	0.00092	0.0008	14%	0.0007	<0.0006	19%	0.00078	0.00055	35%
Arsenic (As)	µg/g dw	0.139	0.144	4%	0.0834	0.0751	10%	0.0184	0.0144	24%	0.0399	0.0319	22%	0.0094	0.0084	11%	0.0222	0.0236	6%
Barium (Ba)	µg/g dw	1.16	0.44	90%	0.166	0.154	8%	0.354	0.265	29%	0.301	0.12	86%	0.0711	0.0573	21%	2.26	0.318	151%
Beryllium (Be)	µg/g dw	<0.0024	<0.0024	0%	<0.0028	<0.0027	4%	<0.0026	<0.0025	4%	<0.0028	<0.0028	0%	<0.0027	<0.0028	4%	<0.0049	<0.0046	6%
Bismuth (Bi)	µg/g dw	0.00229	0.00259	12%	0.00591	0.00538	9%	0.00124	0.00118	5%	0.000868	0.000939	8%	0.0085	0.00854	0%	0.00141	0.00163	14%
Boron (B)	µg/g dw	0.094	<0.0790	17%	<0.1600	<0.1500	6%	0.17	0.22	26%	<0.1600	<0.1500	6%	<0.1500	0.28	60%	0.102	0.068	40%
Cadmium (Cd)	µg/g dw	0.00164	0.00111	39%	0.0069	0.0047	38%	<0.0014	<0.0013	7%	<0.0014	<0.0014	0%	<0.0014	<0.0015	7%	0.0012	<0.0011	9%
Calcium (Ca)	µg/g dw	3,180	1,210	90%	454	454	0%	2,200	1,520	37%	2,110	860	84%	397	412	4%	6,680	571	169%
Cesium (Cs)	µg/g dw	0.27	0.276	2%	0.0674	0.0639	5%	0.394	0.403	2%	0.167	0.173	4%	0.204	0.198	3%	0.0817	0.0868	6%
Chromium (Cr)	µg/g dw	0.0595	0.0625	5%	0.0571	0.0583	2%	0.0564	0.0569	1%	0.0667	0.11	49%	0.0823	0.059	33%	0.063	0.069	9%
Cobalt (Co)	µg/g dw	0.0364	0.0345	5%	0.0249	0.0246	1%	0.00653	0.00553	17%	0.00396	0.00281	34%	0.00993	0.00547	58%	0.0062	0.00512	19%
Copper (Cu)	µg/g dw	0.956	0.97	1%	1.1	1.13	3%	1.26	1.01	22%	0.794	0.674	16%	1.18	0.513	79%	0.799	0.845	6%
Gallium (Ga)	µg/g dw	0.00627	0.00601	4%	0.00772	0.00715	8%	0.00757	0.00645	16%	0.00812	0.00639	24%	0.00771	0.00682	12%	0.00702	0.00566	21%
Iron (Fe)	µg/g dw	9.04	9.53	5%	17.2	18.6	8%	16.7	13.7	20%	10.1	8.14	21%	14	6.81	69%	11	10.5	5%
Lead (Pb)	µg/g dw	0.0376	0.00951	119%	0.00651	0.00638	2%	0.00232	0.00162	36%	0.00725	0.00356	68%	0.0065	0.00592	9%	0.00861	0.00362	82%
Lithium (Li)	µg/g dw	0.0062	<0.0053	16%	<0.0072	<0.0070	3%	<0.0067	<0.0063	6%	0.0084	<0.0070	18%	0.0552	0.0467	17%	0.0088	<0.0063	33%
Magnesium (Mg)	µg/g dw	1,310	1,300	1%	1,230	1,220	1%	1,310	1,330	2%	1,240	1,210	2%	1,200	1,180	2%	1,220	1,190	2%
Manganese (Mn)	µg/g dw	3.99	1.73	79%	0.506	0.486	4%	0.969	0.659	38%	0.41	0.245	50%	0.424	0.393	8%	1.51	0.373	121%
Mercury (Hg)	µg/g dw	0.517	0.549	6%	1.13	1.08	5%	0.684	0.722	5%	1.21	1.22	1%	1.19	1.23	3%	1.16	1.33	14%
Molybdenum (Mo)	µg/g dw	0.00531	0.00423	23%	0.0028	0.0037	28%	0.0031	0.0023	30%	0.0016	<0.0013	21%	0.0035	0.0017	69%	0.00143	0.00222	43%
Nickel (Ni)	µg/g dw	0.0285	0.0238	18%	0.0184	0.0182	1%	0.012	0.00866	32%	0.0142	0.0104	31%	0.0139	0.0138	1%	0.0273	0.0152	57%
Phosphorus (P)	µg/g dw	11,500	10,800	6%	11,000	10,700	3%	11,000	10,900	1%	10,500	9,710	8%	11,100	10,300	7%	12,500	9,850	24%
Potassium (K)	µg/g dw	20,100	20,500	2%	24,500	23,000	6%	20,100	20,400	1%	20,200	20,200	0%	23,100	23,200	0%	18,200	19,400	6%
Rhenium (Re)	µg/g dw	<0.0001	<0.0001	0%	<0.0000	0.0000062	36%	0.0000202	0.0000308	42%	<0.0000	0.0000127	101%	0.0000211	<0.0000	132%	<0.0001	<0.0001	2%
Rubidium (Rb)	µg/g dw	16.5	17	3%	9.44	8.62	9%	21.9	22.3	2%	24.5	25.1	2%	35.9	34.9	3%	23.3	24.6	5%
Selenium (Se)	µg/g dw	0.67	0.97	37%	5.55	4.78	15%	2.41	2.72	12%	1.4	1.29	8%	2.69	2.64	2%	1.49	1.64	10%
Silver (Ag)	µg/g dw	<0.0006	<0.0006	0%	0.00079	0.00084	6%	<0.0007	<0.0006	8%	<0.0007	<0.0007	1%	<0.0007	<0.0007	4%	<0.0003	<0.0003	3%
Sodium (Na)	µg/g dw	1,140	1,130	1%	1,420	1,420	0%	1,270	1,290	2%	928	906	2%	1,690	1,600	5%	909	924	2%
Strontium (Sr)	µg/g dw	3.01	1.05	97%	0.124	0.119	4%	1.95	1.17	50%	1.62	0.546	99%	0.136	0.124	9%	4.62	0.224	182%
Thallium (Tl)	µg/g dw	0.00752	0.0076	1%	0.00983	0.0096	2%	0.0105	0.00978	7%	0.0104	0.00962	8%	0.0276	0.0242	13%	0.0125	0.0109	14%
Thorium (Th)	µg/g dw	0.00015	0.00047	103%	0.00093	0.00046	68%	<0.0001	<0.0001	0%	0.00082	0.00135	49%	0.00042	0.00025	51%	0.000112	0.000145	26%
Tin (Sn)	µg/g dw	0.00149	0.00091	48%	0.00088	0.00084	5%	<0.0006	<0.0006	7%	0.00072	0.00076	5%	0.00256	0.00214	18%	0.00081	0.00101	22%
Titanium (Ti)	µg/g dw	0.125	0.134	7%	0.118	0.119	1%	0.086	0.069	22%	0.14	0.132	6%	0.136	0.111	20%	0.0951	0.101	6%
Uranium (U)	µg/g dw	0.00171	0.0004	124%	0.00027	0.00027	0%	0.00095	0.00043	75%	0.00041	0.00033	22%	0.00027	<0.0002	30%	0.00138	<0.0006	82%
Vanadium (V)	µg/g dw	0.00341	0.00315	8%	0.00462	0.00408	12%	0.00276	0.00181	42%	0.00716	0.00653	9%	0.00385	0.00282	31%	0.0102	0.00353	97%
Yttrium (Y)	µg/g dw	0.00065	0.00195	100%	0.0008	0.00112	33%	-	<0.0001	-	-	0.00164	-	-	0.00058	-	-	0.00044	-
Zinc (Zn)	µg/g dw	16.5	16.1	2%	27.5	24.7	11%	17.3	15.8	9%	14.6	12.8	13%	30.1	22.2	30%	21.5	17.4	21%
Zirconium (Zr)	µg/g dw	0.00606	0.00482	23%	0.0043	0.00422	2%	0.00332	0.00196	52%	0.00931	0.00873	6%	0.00755	0.00481	44%	0.00434	0.00378	14%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17c: Laboratory Duplicate Results for Fish Muscle Samples, 2016

Analyte	Unit	GC-NSC-26 M rep 1	GC-NSC-26 M rep 2	RPD	SC-NSC-01A rep 1	SC-NSC-01A rep 2	RPD	GC-NSC-01A rep 1	GC-NSC-01A rep 2	RPD	ER-NSC-01A rep 1	ER-NSC-01A rep 2	RPD	ER-NSC-02A rep 1	ER-NSC-02A rep 2	RPD	ER-NSC-04A rep 1	ER-NSC-04A rep 2	RPD
Aluminum (Al)	µg/g dw	-	0.719	-	-	6.13	-	-	8.99	-	1.37	1.58	14%	1.3	1.12	15%	-	1.27	-
Antimony (Sb)	µg/g dw	0.00236	<0.0004	138%	0.00239	0.0021	13%	0.00531	0.00519	2%	0.0008	0.00125	44%	0.00079	<0.0008	1%	0.00102	0.00152	39%
Arsenic (As)	µg/g dw	0.0599	0.0536	11%	0.0354	0.0215	49%	0.0552	0.0567	3%	0.269	0.258	4%	0.353	0.326	8%	0.123	0.113	8%
Barium (Ba)	µg/g dw	0.124	0.13	5%	1.09	1.03	6%	0.592	0.421	34%	0.134	0.142	6%	0.198	0.123	47%	0.127	0.241	62%
Beryllium (Be)	µg/g dw	<0.0044	<0.0048	9%	<0.0025	<0.0026	4%	<0.0025	<0.0026	4%	<0.0026	<0.0026	0%	<0.0026	<0.0026	0%	<0.0026	<0.0026	0%
Bismuth (Bi)	µg/g dw	0.000853	0.00077	10%	0.00201	0.0025	22%	0.00362	0.00361	0%	0.00047	0.00054	14%	0.000563	0.000648	14%	0.00055	0.00041	29%
Boron (B)	µg/g dw	0.142	0.296	70%	0.109	<0.0640	52%	0.21	0.303	36%	0.13	<0.0630	69%	0.16	<0.1000	46%	0.133	0.328	85%
Cadmium (Cd)	µg/g dw	<0.0011	<0.0012	9%	0.0019	0.0024	23%	0.005	0.0041	20%	<0.0012	0.0014	15%	<0.0014	<0.0014	0%	<0.0011	0.0026	81%
Calcium (Ca)	µg/g dw	500	522	4%	1,990	2,330	16%	1,420	941	41%	286	311	8%	710	282	86%	498	812	48%
Cesium (Cs)	µg/g dw	0.118	0.121	3%	0.167	0.179	7%	0.0793	0.078	2%	0.102	0.108	6%	0.106	0.106	0%	0.126	0.132	5%
Chromium (Cr)	µg/g dw	0.06	0.064	6%	0.0745	0.0793	6%	0.126	0.166	27%	0.0766	0.0932	20%	0.0713	0.0765	7%	0.067	0.0771	14%
Cobalt (Co)	µg/g dw	0.00378	0.0036	5%	0.0101	0.00911	10%	0.00759	0.00782	3%	0.00656	0.00744	13%	0.00602	0.00585	3%	0.00474	0.00463	2%
Copper (Cu)	µg/g dw	0.826	0.771	7%	1.3	1.03	23%	0.93	1.13	19%	1.34	1.37	2%	1.21	0.978	21%	1.1	0.85	26%
Gallium (Ga)	µg/g dw	0.00566	0.00503	12%	0.0072	0.0059	20%	0.0111	0.0074	40%	0.0034	0.0036	6%	0.0037	0.0034	8%	0.0046	0.003	42%
Iron (Fe)	µg/g dw	8.7	7.16	19%	22.1	18.2	19%	17.4	19.3	10%	15	18	18%	12.5	10.1	21%	13.2	11.8	11%
Lead (Pb)	µg/g dw	0.00163	0.00152	7%	0.0362	0.0399	10%	0.175	0.0916	63%	0.0143	0.0207	37%	0.0105	0.0145	32%	0.00795	0.0103	26%
Lithium (Li)	µg/g dw	<0.0059	<0.0065	10%	0.013	0.0126	3%	0.0236	0.0186	24%	<0.0085	<0.0083	2%	0.0056	0.0085	41%	0.0124	<0.0083	40%
Magnesium (Mg)	µg/g dw	1,130	1,140	1%	1,230	1,310	6%	1,250	1,210	3%	720	745	3%	864	896	4%	988	1,060	7%
Manganese (Mn)	µg/g dw	0.198	0.191	4%	0.83	0.866	4%	0.666	0.593	12%	0.153	0.199	26%	0.188	0.174	8%	0.16	0.188	16%
Mercury (Hg)	µg/g dw	1.53	1.57	3%	1.17	1.29	10%	1.25	1.2	4%	1.55	1.48	5%	1.89	1.93	2%	1.39	1.44	4%
Molybdenum (Mo)	µg/g dw	0.00181	0.0014	26%	0.0048	0.0048	0%	0.0055	0.0047	16%	0.0028	0.0035	22%	0.00203	0.00212	4%	0.0024	0.002	18%
Nickel (Ni)	µg/g dw	0.0069	0.0099	36%	0.0339	0.037	9%	0.0607	0.0571	6%	0.0129	0.0171	28%	0.0077	0.0094	20%	0.013	0.0256	65%
Phosphorus (P)	µg/g dw	8,790	8,800	0%	9,830	10,600	8%	10,400	10,000	4%	6,690	7,080	6%	7,540	7,530	0%	8,960	9,360	4%
Potassium (K)	µg/g dw	15,700	16,000	2%	17,800	18,700	5%	19,700	18,600	6%	11,900	12,800	7%	13,100	13,600	4%	16,300	17,100	5%
Rhenium (Re)	µg/g dw	<0.0001	<0.0001	7%	<0.00005	<0.00005	4%	<0.00005	<0.00005	4%	<0.00005	<0.00005	2%	<0.00005	<0.00005	0%	<0.00005	<0.00005	0%
Rubidium (Rb)	µg/g dw	21.9	22.2	1%	25.1	26.6	6%	23.2	23	1%	15.9	16.2	2%	16.2	16.2	0%	20.5	21.1	3%
Selenium (Se)	µg/g dw	1.5	1.54	3%	1.83	1.79	2%	2.3	2.31	0%	1.12	1.26	12%	1.23	1.27	3%	1.58	1.62	3%
Silver (Ag)	µg/g dw	<0.0003	<0.0003	9%	<0.0003	0.00077	93%	0.00192	0.00174	10%	0.00039	0.00038	3%	<0.0003	<0.0003	0%	<0.0003	<0.0003	0%
Sodium (Na)	µg/g dw	797	794	0%	1,260	1,320	5%	1,310	1,260	4%	738	789	7%	910	943	4%	1,120	1,160	4%
Strontium (Sr)	µg/g dw	0.249	0.262	5%	1.54	1.79	15%	1.03	0.653	45%	0.165	0.17	3%	0.463	0.107	125%	0.292	0.594	68%
Thallium (Tl)	µg/g dw	0.0151	0.0151	0%	0.00537	0.00494	8%	0.00287	0.00316	10%	0.00982	0.0102	4%	0.00727	0.00661	10%	0.00924	0.00904	2%
Thorium (Th)	µg/g dw	0.00132	0.000094	173%	0.00076	0.00078	3%	0.00518	0.00465	11%	0.00045	0.00038	17%	0.000158	0.000144	9%	0.00021	<0.0001	55%
Tin (Sn)	µg/g dw	0.00057	0.00084	38%	0.00669	0.00772	14%	0.0227	0.0207	9%	0.00191	0.00287	40%	0.00133	0.00184	32%	0.00098	0.00173	55%
Titanium (Ti)	µg/g dw	0.103	0.0856	18%	0.306	0.394	25%	0.509	0.483	5%	0.106	0.094	12%	0.086	0.083	4%	0.106	0.134	23%
Uranium (U)	µg/g dw	<0.0006	<0.0006	9%	0.000994	0.00112	12%	0.00207	0.00208	0%	0.00034	0.000378	11%	0.000232	0.000164	34%	0.00022	0.000237	7%
Vanadium (V)	µg/g dw	0.00355	0.0022	47%	0.0183	0.0188	3%	0.0199	0.0199	0%	0.00418	0.00481	14%	0.00569	0.00442	25%	0.00708	0.00454	44%
Yttrium (Y)	µg/g dw	-	0.0004	-	-	0.00208	-	0.00412	0.00402	2%	0.00038	0.00097	87%	0.00087	0.00025	111%	-	0.00038	-
Zinc (Zn)	µg/g dw	14.5	14.5	0%	30.7	27	13%	24.7	26.7	8%	14.2	14	1%	15.3	13.4	13%	15.3	15.7	3%
Zirconium (Zr)	µg/g dw	0.0101	0.00561	57%	0.0259	0.028	8%	0.0469	0.0483	3%	0.00637	0.00854	29%	0.0149	0.005	99%	0.00438	0.00476	8%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.17c: Laboratory Duplicate Results for Fish Muscle Samples, 2016

Analyte	Unit	ER-MW-03A rep 1	ER-MW-03A rep 2	RPD	SC-MW-02A rep 1	SC-MW-02A rep 2	RPD
Aluminum (Al)	µg/g dw	-	1.53	-	-	2.22	-
Antimony (Sb)	µg/g dw	<0.0019	<0.0016	17%	0.0023	<0.0015	42%
Arsenic (As)	µg/g dw	0.102	0.11	8%	0.229	0.217	5%
Barium (Ba)	µg/g dw	0.217	0.0576	116%	0.0811	0.0573	34%
Beryllium (Be)	µg/g dw	<0.0064	<0.0052	21%	<0.0055	<0.0051	8%
Bismuth (Bi)	µg/g dw	0.00027	0.000325	18%	0.000246	0.000287	15%
Boron (B)	µg/g dw	<0.2600	<0.2100	21%	<0.2200	<0.2000	10%
Cadmium (Cd)	µg/g dw	0.0035	<0.0028	22%	0.0137	0.0127	8%
Calcium (Ca)	µg/g dw	239	236	1%	342	374	9%
Cesium (Cs)	µg/g dw	0.0417	0.0425	2%	0.0428	0.0467	9%
Chromium (Cr)	µg/g dw	1.36	3.82	95%	1.41	1.59	12%
Cobalt (Co)	µg/g dw	0.0536	0.0458	16%	0.0421	0.0332	24%
Copper (Cu)	µg/g dw	1	0.889	12%	2.07	1.72	18%
Gallium (Ga)	µg/g dw	0.0064	0.0047	31%	0.0047	0.0049	4%
Iron (Fe)	µg/g dw	37.8	44.4	16%	25.2	26	3%
Lead (Pb)	µg/g dw	0.0344	0.00859	120%	0.0249	0.0154	47%
Lithium (Li)	µg/g dw	0.208	0.219	5%	0.089	0.0818	8%
Magnesium (Mg)	µg/g dw	1,110	1,180	6%	1,320	1,380	4%
Manganese (Mn)	µg/g dw	0.47	0.53	12%	0.682	0.658	4%
Mercury (Hg)	µg/g dw	0.0699	0.0692	1%	0.106	0.113	6%
Molybdenum (Mo)	µg/g dw	0.0115	0.0178	43%	0.0187	0.0164	13%
Nickel (Ni)	µg/g dw	0.184	0.207	12%	0.628	0.36	54%
Phosphorus (P)	µg/g dw	9,140	9,870	8%	11,300	12,200	8%
Potassium (K)	µg/g dw	14,200	15,000	5%	17,500	18,500	6%
Rhenium (Re)	µg/g dw	<0.0001	<0.0001	22%	<0.0001	0.000186	60%
Rubidium (Rb)	µg/g dw	7.85	8.27	5%	10.2	11	8%
Selenium (Se)	µg/g dw	4.45	4.76	7%	3.48	3.73	7%
Silver (Ag)	µg/g dw	<0.0007	<0.0006	21%	<0.0006	<0.0006	9%
Sodium (Na)	µg/g dw	929	971	4%	1,100	1,150	4%
Strontium (Sr)	µg/g dw	0.0813	0.0618	27%	0.069	0.0635	8%
Thallium (Tl)	µg/g dw	0.127	0.139	9%	0.0359	0.039	8%
Thorium (Th)	µg/g dw	0.00186	0.00017	167%	0.00097	0.0011	13%
Tin (Sn)	µg/g dw	0.0089	0.00445	67%	0.016	0.00874	59%
Titanium (Ti)	µg/g dw	0.337	0.08	123%	0.146	0.146	0%
Uranium (U)	µg/g dw	0.0179	0.00688	89%	0.00381	0.00288	28%
Vanadium (V)	µg/g dw	0.0391	0.0192	68%	0.013	0.0132	2%
Yttrium (Y)	µg/g dw	-	0.00099	-	-	0.00122	-
Zinc (Zn)	µg/g dw	21.7	16.8	25%	19.1	18.1	5%
Zirconium (Zr)	µg/g dw	0.0149	0.008	60%	0.0067	0.0072	7%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.18a: Laboratory Duplicate Results for Fish Ovary Samples, 2014

Analyte	Unit	SC-KO-7 Ovary Rep 1	SC-KO-7 Ovary Rep 2	SC-KO-7 Ovary Rep 3	RSD	SC-KO-24 Ovary Rep 1	SC-KO-24 Ovary Rep 2	RPD	KOER3-PM-6G Rep 1	KOER3-PM-6G Rep 2	RPD	KOSC1-PM-10G Rep 1	KOSC1-PM-10G Rep 2	KOSC1-PM-10G Rep 3	RSD	SC-PC-02G Rep 1	SC-PC-02G Rep 2	RPD
Aluminum (Al)	µg/g dw	1.03	1.03	0.609	27%	0.253	0.224	12%	4.3	5.78	29%	1.96	1.96	2.49	14%	36.8	87.4	81%
Antimony (Sb)	µg/g dw	0.00079	0.00059	0.00073	15%	<0.00058	<0.00055	5%	0.00215	0.00248	14%	0.00198	0.00299	0.00363	29%	0.00218	0.00296	30%
Arsenic (As)	µg/g dw	0.228	0.215	0.211	4%	0.224	0.214	5%	0.0516	0.0562	9%	0.112	0.0905	0.11	11%	0.139	0.197	35%
Barium (Ba)	µg/g dw	0.431	0.436	0.43	1%	0.395	0.385	3%	0.52	0.554	6%	0.0517	0.0571	0.071	17%	1.58	2.3	37%
Beryllium (Be)	µg/g dw	<0.0034	<0.0038	<0.0039	7%	<0.0040	<0.0038	5%	<0.0037	<0.0037	0%	<0.0039	<0.0037	<0.0036	4%	<0.0026	<0.0027	4%
Bismuth (Bi)	µg/g dw	<0.000098	<0.00011	<0.00011	7%	<0.00011	<0.00011	0%	0.0004	0.00053	28%	0.00024	0.00019	0.00032	26%	0.00203	0.00277	31%
Boron (B)	µg/g dw	<0.070	<0.079	<0.080	7%	<0.082	<0.078	5%	<0.077	<0.076	1%	<0.080	<0.077	<0.075	3%	<0.12	<0.13	8%
Cadmium (Cd)	µg/g dw	0.0083	0.0069	0.0056	19%	0.0042	0.0031	30%	0.0119	0.012	1%	0.0023	0.0025	0.0032	18%	0.0259	0.0254	2%
Calcium (Ca)	µg/g dw	1,140	1,210	1,200	3%	1,340	1,360	1%	2,050	2,180	6%	1,070	1,280	1,170	9%	434	688	45%
Cesium (Cs)	µg/g dw	0.012	0.013	0.013	5%	0.0154	0.0164	6%	0.0477	0.0461	3%	0.102	0.114	0.111	6%	0.0198	0.0257	26%
Chromium (Cr)	µg/g dw	0.0774	0.0892	0.0984	12%	0.0745	0.0761	2%	0.0866	0.0831	4%	0.0701	0.0767	0.0891	12%	0.12	0.228	62%
Cobalt (Co)	µg/g dw	0.0603	0.0591	0.0601	1%	0.0429	0.0402	6%	0.0539	0.0527	2%	0.0418	0.0507	0.0477	10%	0.0841	0.116	32%
Copper (Cu)	µg/g dw	50.8	50.2	48.7	2%	27.5	27	2%	2.41	2.3	5%	2.72	2.96	2.87	4%	3.66	3.7	1%
Gallium (Ga)	µg/g dw	0.00819	0.0078	0.0076	4%	0.00783	0.00698	11%	0.0103	0.0109	6%	0.00868	0.00824	0.00877	3%	0.0236	0.0453	63%
Iron (Fe)	µg/g dw	82.9	76.1	76	5%	52.6	44.7	16%	125	132	5%	102	109	117	7%	79	160	68%
Lead (Pb)	µg/g dw	0.0541	0.0475	0.0503	7%	0.00492	0.00361	31%	0.0511	0.0856	50%	0.0114	0.0107	0.014	14%	0.0447	0.0871	64%
Lithium (Li)	µg/g dw	0.0278	0.0365	0.0301	14%	0.0365	0.0407	11%	0.0138	0.0148	7%	<0.0073	<0.0070	<0.0068	4%	0.0304	0.101	107%
Magnesium (Mg)	µg/g dw	1,420	1,480	1,460	2%	1,150	1,180	3%	898	872	3%	801	895	844	6%	820	881	7%
Manganese (Mn)	µg/g dw	4.14	4.27	4.26	2%	3.04	3.16	4%	3.99	4.11	3%	1.42	1.64	1.56	7%	9.69	11.0	13%
Mercury (Hg)	µg/g dw	0.0214	0.0212	0.0191	6%	0.0179	0.0181	1%	0.0366	0.0344	6%	0.0565	0.0632	0.0672	9%	0.0218	0.024	10%
Molybdenum (Mo)	µg/g dw	0.0467	0.0456	0.0443	3%	0.0445	0.044	1%	0.146	0.153	5%	0.102	0.129	0.12	12%	0.109	0.114	4%
Nickel (Ni)	µg/g dw	0.018	0.0147	0.0145	12%	0.0082	0.0081	1%	0.0443	0.0518	16%	0.023	0.0214	0.031	20%	0.0943	0.165	55%
Phosphorus (P)	µg/g dw	9,230	9,590	9,570	2%	9,230	9,640	4%	11,000	10,900	1%	8,390	9,370	8,850	6%	11,400	11,300	1%
Potassium (K)	µg/g dw	5,410	5,810	5,680	4%	5,450	5,640	3%	13,100	12,500	5%	10,100	11,600	10,900	7%	7,860	7,810	1%
Rhenium (Re)	µg/g dw	0.00231	0.00241	0.00245	3%	0.00127	0.00128	1%	<0.000074	<0.000074	0%	<0.000077	<0.000074	<0.000073	3%	0.000074	0.000114	43%
Rubidium (Rb)	µg/g dw	3.66	3.82	3.78	2%	3.43	3.45	1%	8.61	8.34	3%	15.4	17.6	17	7%	5.87	5.81	1%
Selenium (Se)	µg/g dw	5.01	4.88	4.91	1%	3.86	3.88	1%	41.4	38.7	7%	3.52	3.84	4.01	7%	4.49	4.56	2%
Silver (Ag)	µg/g dw	0.174	0.177	0.168	3%	0.103	0.101	2%	0.00355	0.00376	6%	0.00428	0.00493	0.00508	9%	0.0141	0.014	1%
Sodium (Na)	µg/g dw	1,550	1,630	1,580	3%	2,430	2,510	3%	2,510	2,400	4%	1,680	2,080	1,990	11%	1,640	1,540	6%
Strontium (Sr)	µg/g dw	1.55	1.59	1.6	2%	2.03	2	1%	0.846	0.902	6%	0.299	0.355	0.327	9%	0.529	1.04	65%
Thallium (Tl)	µg/g dw	0.00856	0.00907	0.00836	4%	0.00371	0.00387	4%	0.0261	0.0257	2%	0.0195	0.0227	0.0226	8%	0.0095	0.0108	13%
Thorium (Th)	µg/g dw	0.000143	0.00011	0.000106	17%	<0.000062	<0.000059	5%	0.000706	0.00196	94%	0.000763	0.000282	0.000552	45%	0.00626	0.0308	132%
Tin (Sn)	µg/g dw	0.00107	0.00098	0.00094	7%	<0.00088	<0.00083	6%	0.00895	0.0105	16%	0.00623	0.00571	0.00938	28%	0.0229	0.0224	2%
Titanium (Ti)	µg/g dw	0.0741	0.0857	0.0682	12%	0.0674	0.0683	1%	0.253	0.263	4%	0.104	0.123	0.147	17%	0.654	1.32	67%
Uranium (U)	µg/g dw	0.00032	0.00036	0.00031	8%	0.00035	0.0004	13%	0.00131	0.00198	41%	0.00041	0.00046	0.00052	12%	0.00476	0.00955	67%
Vanadium (V)	µg/g dw	0.00573	0.00683	0.00617	9%	0.00416	0.00401	4%	0.0327	0.0369	12%	0.0203	0.0197	0.0236	10%	0.0622	0.136	74%
Yttrium (Y)	µg/g dw	Note 1	0.00087	0.00072	13%	0.00037	0.00042	13%	0.00223	0.00984	126%	0.00243	0.00203	0.00242	10%	0.0119	0.0357	100%
Zinc (Zn)	µg/g dw	89.8	90.4	88.8	1%	88.2	87.3	1%	185	188	2%	134	146	146	5%	126	135	7%
Zirconium (Zr)	µg/g dw	0.00211	0.00133	0.00134	28%	0.00153	0.00084	58%	0.00529	0.00938	56%	0.00369	0.00184	0.0026	34%	0.0669	0.11	49%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD) or relative standard deviation (RSD).

Table A.18a: Laboratory Duplicate Results for Fish Ovary Samples, 2014

Analyte	Unit	SC-RT-01G Rep 1	SC-RT-01G Rep 2	RPD	GC-PC-15G Rep 1	GC-PC-15G Rep 2	RPD	ML-08G Rep 1	ML-08G Rep 2	RPD	KOSCB6G Rep 1	KOSCB6G Rep 2	RPD
Aluminum (Al)	µg/g dw	3.24	1.84	55%	3.05	1.56	65%	0.357	0.31	14%	0.949	0.864	9%
Antimony (Sb)	µg/g dw	0.00049	<0.00034	36%	0.00078	0.00085	9%	0.00122	0.00155	24%	0.00552	0.00382	36%
Arsenic (As)	µg/g dw	0.086	0.08	7%	0.143	0.139	3%	0.403	0.384	5%	0.584	0.475	21%
Barium (Ba)	µg/g dw	0.235	0.253	7%	1.31	1.24	5%	0.398	0.395	1%	0.058	0.0527	10%
Beryllium (Be)	µg/g dw	<0.0028	<0.0025	11%	<0.0027	<0.0027	0%	<0.0025	<0.0025	0%	<0.0025	<0.0025	0%
Bismuth (Bi)	µg/g dw	0.000133	0.00181	173%	0.0015	0.00144	4%	0.00147	0.00157	7%	0.00631	0.00491	25%
Boron (B)	µg/g dw	<0.13	<0.056	80%	0.14	<0.13	7%	<0.051	<0.051	0%	<0.052	<0.054	4%
Cadmium (Cd)	µg/g dw	<0.0012	<0.0010	18%	0.0252	0.0242	4%	<0.0012	<0.0012	0%	0.0045	0.00494	9%
Calcium (Ca)	µg/g dw	1,300	1,400	7%	709	673	5%	375	403	7%	364	404	10%
Cesium (Cs)	µg/g dw	0.028	0.0282	1%	0.0104	0.0103	1%	0.0604	0.0592	2%	0.185	0.188	2%
Chromium (Cr)	µg/g dw	0.073	0.0871	18%	0.0758	0.0971	25%	0.0738	0.107	37%	0.0797	0.0818	3%
Cobalt (Co)	µg/g dw	0.0794	0.0782	2%	0.124	0.12	3%	0.0478	0.047	2%	0.131	0.126	4%
Copper (Cu)	µg/g dw	12.3	10.8	13%	3.62	3.46	5%	2.58	2.46	5%	2.39	2.37	1%
Gallium (Ga)	µg/g dw	0.00811	0.012	39%	0.0114	0.0118	3%	0.00939	0.00898	4%	0.0118	0.0188	46%
Iron (Fe)	µg/g dw	62.3	62.2	0%	110	104	6%	30	28.9	4%	60.3	54.4	10%
Lead (Pb)	µg/g dw	0.00169	0.00182	7%	0.0137	0.0115	17%	0.00189	0.00324	53%	0.0175	0.0105	50%
Lithium (Li)	µg/g dw	0.0055	<0.0062	12%	0.0065	<0.0051	24%	<0.0055	<0.0055	0%	<0.0056	<0.0059	5%
Magnesium (Mg)	µg/g dw	1,440	1,450	1%	1,240	1,190	4%	404	402	0%	780	804	3%
Manganese (Mn)	µg/g dw	3.02	3.06	1%	28.3	26.7	6%	1.01	0.994	2%	1.48	1.61	8%
Mercury (Hg)	µg/g dw	0.0207	0.0222	7%	0.0537	0.0473	13%	0.322	0.312	3%	0.342	0.337	1%
Molybdenum (Mo)	µg/g dw	0.0142	0.0147	3%	0.196	0.194	1%	0.0236	0.0237	0%	0.122	0.122	0%
Nickel (Ni)	µg/g dw	0.0103	0.0111	7%	0.0392	0.0352	11%	0.0055	0.0049	12%	0.0314	0.0303	4%
Phosphorus (P)	µg/g dw	10,900	10,200	7%	10,600	10,100	5%	10,900	10,500	4%	15,200	16,000	5%
Potassium (K)	µg/g dw	4,860	5,200	7%	10,600	10,300	3%	15,000	14,600	3%	17,500	17,400	1%
Rhenium (Re)	µg/g dw	0.00755	0.00723	4%	<0.000040	<0.000040	0%	<0.000051	<0.000051	0%	0.000462	0.000378	20%
Rubidium (Rb)	µg/g dw	8.32	8.88	7%	8.87	8.93	1%	20.8	20.7	0%	28.5	28	2%
Selenium (Se)	µg/g dw	5.85	5.44	7%	16.1	15.4	4%	2.59	2.57	1%	4.56	4.1	11%
Silver (Ag)	µg/g dw	0.0629	0.0592	6%	0.0141	0.0126	11%	0.00191	0.00169	12%	<0.00064	0.0005	25%
Sodium (Na)	µg/g dw	1,550	1,770	13%	2,680	2,590	3%	4,090	4,010	2%	6,650	6,690	1%
Strontium (Sr)	µg/g dw	1.03	1.1	7%	0.451	0.451	0%	0.434	0.449	3%	0.578	0.59	2%
Thallium (Tl)	µg/g dw	0.00527	0.00467	12%	0.0132	0.0125	5%	0.0179	0.0177	1%	0.0543	0.0507	7%
Thorium (Th)	µg/g dw	0.000402	0.000234	53%	0.000833	0.000498	50%	<0.000052	<0.000052	0%	0.0002	0.000158	23%
Tin (Sn)	µg/g dw	0.00141	0.0015	6%	0.00329	0.00242	30%	0.00103	0.00101	2%	0.00693	0.00581	18%
Titanium (Ti)	µg/g dw	0.102	0.105	3%	0.138	0.117	16%	0.077	0.065	17%	0.117	0.112	4%
Uranium (U)	µg/g dw	0.00028	0.00025	11%	0.0042	0.00388	8%	0.00038	0.00043	12%	0.0005	0.00061	20%
Vanadium (V)	µg/g dw	0.00635	0.00678	7%	0.0273	0.0248	10%	0.016	0.0175	9%	0.015	0.0144	4%
Yttrium (Y)	µg/g dw	0.00188	0.00129	37%	0.00731	0.00708	3%	0.00599	0.00612	2%	0.00144	0.00105	31%
Zinc (Zn)	µg/g dw	79.6	71.3	11%	118	111	6%	53.8	50.4	7%	144	137	5%
Zirconium (Zr)	µg/g dw	0.00281	0.00139	68%	0.016	0.0174	8%	0.00131	0.00145	10%	0.0217	0.00869	86%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD) or relative standard deviation (RSD).

Table A.18b: Laboratory Duplicate Results for Fish Ovary Samples, 2015

Analyte	Unit	SC-CSU-05-APR rep 1	SC-CSU-05-APR rep 2	SC-CSU-05-APR rep 3	RSD	SC-YP-17-APR rep 1	SC-YP-17-APR rep 2	RPD	SC-YP-19-APR rep 1	SC-YP-19-APR rep 2	RPD	SC-NSC-46-APR rep 1	SC-NSC-46-APR rep 2	RPD	SC-PCC-05-APR rep 1	SC-PCC-05-APR rep 2	RPD	SC-PCC-08-APR rep 1	SC-PCC-08-APR rep 2	RPD
Aluminum (Al)	µg/g dw	8.88	9.31	5.75	24%	0.512	1.08	71%	0.579	0.84	37%	2.03	2.03	0%	4.12	9.47	79%	2.91	2.91	0%
Antimony (Sb)	µg/g dw	0.002	<0.00099	<0.0010	44%	0.0013	<0.0012	8%	<0.0011	<0.0010	10%	<0.0011	<0.0011	0%	0.0015	0.0013	14%	0.00192	0.00176	9%
Arsenic (As)	µg/g dw	0.211	0.229	0.208	5%	0.0733	0.0787	7%	0.0392	0.0364	7%	0.0344	0.032	7%	0.128	0.125	2%	0.118	0.0886	28%
Barium (Ba)	µg/g dw	0.57	0.785	0.49	25%	0.153	0.162	6%	0.221	0.226	2%	0.103	0.0896	14%	1.39	1.5	8%	1.66	1.38	18%
Beryllium (Be)	µg/g dw	<0.0024	<0.0022	<0.0023	4%	<0.0026	<0.0026	0%	<0.0025	<0.0023	8%	<0.0026	<0.0026	0%	<0.0024	<0.0026	8%	<0.0025	<0.0026	4%
Bismuth (Bi)	µg/g dw	0.00049	0.000434	0.000595	16%	0.00095	0.00091	4%	0.00067	0.00057	16%	0.00093	0.00072	25%	0.00093	0.00092	1%	0.00219	0.00194	12%
Boron (B)	µg/g dw	<0.13	<0.12	<0.12	5%	<0.14	<0.14	0%	<0.14	<0.13	7%	<0.14	<0.14	0%	<0.13	<0.14	7%	<0.11	<0.12	9%
Cadmium (Cd)	µg/g dw	0.0104	0.0104	0.0101	2%	<0.0018	0.002	11%	<0.0017	0.0028	49%	0.0103	0.0074	33%	0.0105	0.0119	13%	0.02	0.018	11%
Calcium (Ca)	µg/g dw	773	1,440	668	44%	1,020	999	2%	1,080	1,160	7%	1,360	1,330	2%	299	307	3%	419	398	5%
Cesium (Cs)	µg/g dw	0.0244	0.0248	0.0241	1%	0.0442	0.0425	4%	0.031	0.0303	2%	0.0835	0.0835	0%	0.0169	0.0179	6%	0.0157	0.0164	4%
Chromium (Cr)	µg/g dw	0.0613	0.0777	0.067	12%	0.0561	0.0677	19%	0.0568	0.063	10%	0.0602	0.0673	11%	0.0614	0.0698	13%	0.113	0.0718	45%
Cobalt (Co)	µg/g dw	0.19	0.189	0.187	1%	0.0434	0.0451	4%	0.0437	0.0413	6%	0.0415	0.0411	1%	0.0931	0.0925	1%	0.0706	0.0668	6%
Copper (Cu)	µg/g dw	5.62	5.59	5.74	1%	2.08	2.12	2%	1.98	1.94	2%	2.57	2.38	8%	3.4	3.47	2%	3.16	3.22	2%
Gallium (Ga)	µg/g dw	0.00973	0.0109	0.0105	6%	0.0056	0.0047	17%	0.00635	0.00583	9%	0.0064	0.0062	3%	0.00632	0.0113	57%	0.0134	0.00718	60%
Iron (Fe)	µg/g dw	81.6	78.9	76.7	3%	31.3	35.4	12%	29.9	38.7	26%	103	101	2%	56.2	60.1	7%	84.9	80.5	5%
Lead (Pb)	µg/g dw	0.0127	0.0169	0.00852	33%	0.0029	0.00402	32%	0.00515	0.00531	3%	0.0288	0.0235	20%	0.0111	0.0136	20%	0.0155	0.0128	19%
Lithium (Li)	µg/g dw	0.0063	0.0089	0.0047	32%	0.119	0.12	1%	0.0937	0.0812	14%	0.0068	0.0055	21%	<0.0050	0.0096	63%	0.0046	0.0056	20%
Magnesium (Mg)	µg/g dw	826	834	832	1%	1,080	1,090	1%	1,140	1,090	4%	989	969	2%	820	843	3%	946	966	2%
Manganese (Mn)	µg/g dw	23.1	24.2	23.5	2%	2.11	2.17	3%	2.27	2.28	0%	5.44	5.45	0%	9.56	9.72	2%	6.99	6.97	0%
Mercury (Hg)	µg/g dw	0.0201	0.0177	0.0182	7%	0.0162	0.0147	10%	0.0137	0.0146	6%	0.123	0.12	2%	0.0373	0.0352	6%	0.0504	0.0496	2%
Molybdenum (Mo)	µg/g dw	0.137	0.143	0.143	2%	0.0385	0.041	6%	0.0431	0.0451	5%	0.154	0.146	5%	0.107	0.108	1%	0.133	0.128	4%
Nickel (Ni)	µg/g dw	0.0416	0.0445	0.0382	8%	0.008	0.0134	50%	0.0117	0.0104	12%	0.0164	0.0138	17%	0.0329	0.0381	15%	0.0558	0.0342	48%
Phosphorus (P)	µg/g dw	10,400	10,800	10,700	2%	8,010	7,960	1%	9,150	8,920	3%	9,740	9,660	1%	10,300	10,400	1%	11,300	11,800	4%
Potassium (K)	µg/g dw	8,190	8,080	8,200	1%	7,590	7,300	4%	9,290	9,020	3%	13,400	13,200	2%	7,310	7,460	2%	8,670	8,900	3%
Rhenium (Re)	µg/g dw	0.0000327	0.0000107	0.0000414	56%	<0.0000040	0.0000084	71%	0.000028	<0.0000036	154%	<0.000004	<0.000004	0%	<0.0000037	<0.0000040	8%	<0.000036	<0.000037	3%
Rubidium (Rb)	µg/g dw	8.01	7.92	8.07	1%	16.6	16.4	1%	16	15.3	4%	22.8	22.9	0%	5.92	6.12	3%	5.07	5.04	1%
Selenium (Se)	µg/g dw	2.55	2.6	2.64	2%	2.25	2.46	9%	3.46	3.24	7%	5.84	5.8	1%	17.2	16.9	2%	22.5	22.6	0%
Silver (Ag)	µg/g dw	0.027	0.0267	0.0272	1%	0.00152	0.00185	20%	0.0018	0.00175	3%	0.00665	0.00654	2%	0.0181	0.0182	1%	0.0155	0.0154	1%
Sodium (Na)	µg/g dw	1,810	1,830	1,790	1%	12,200	12,400	2%	13,600	13,700	1%	2,110	2,070	2%	1,290	1,340	4%	1,490	1,520	2%
Strontium (Sr)	µg/g dw	0.654	1.43	0.578	53%	1.49	1.46	2%	1.66	1.67	1%	0.358	0.356	1%	0.35	0.378	8%	0.28	0.261	7%
Thallium (Tl)	µg/g dw	0.0129	0.0135	0.0135	3%	0.0193	0.0201	4%	0.0119	0.0117	2%	0.012	0.0118	2%	0.00625	0.00669	7%	0.00474	0.0044	7%
Thorium (Th)	µg/g dw	0.00208	0.00333	0.00157	39%	0.000699	0.000624	11%	0.000324	0.000254	24%	0.000564	0.000417	30%	0.00192	0.00537	95%	0.000982	0.00114	15%
Tin (Sn)	µg/g dw	0.0011	<0.0010	<0.0010	6%	<0.0012	<0.0012	0%	0.0014	<0.0010	33%	0.0012	0.0018	40%	<0.0011	<0.0012	9%	<0.00060	<0.00063	5%
Titanium (Ti)	µg/g dw	0.16	0.182	0.128	17%	0.0911	0.0884	3%	0.079	0.0871	10%	0.115	0.11	4%	0.108	0.171	45%	0.145	0.12	19%
Uranium (U)	µg/g dw	0.00633	0.00654	0.00615	3%	0.000179	0.000193	8%	0.000335	0.000289	15%	0.000667	0.000587	13%	0.00568	0.00596	5%	0.0127	0.0115	10%
Vanadium (V)	µg/g dw	0.0138	0.0131	0.00976	18%	0.0146	0.0181	21%	0.0169	0.0165	2%	0.0366	0.0357	2%	0.0166	0.0215	26%	0.0301	0.027	11%
Yttrium (Y)	µg/g dw	0.00992	0.00923	0.00867	7%	0.00083	0.00122	38%	0.0009	0.00091	1%	0.00276	0.00274	1%	0.00248	0.00448	57%	0.00472	0.00472	0%
Zinc (Zn)	µg/g dw	113	109	111	2%	68.6	66.3	3%	71.5	66.8	7%	155	154	1%	91.2	90.4	1%	108	106	2%
Zirconium (Zr)	µg/g dw	0.00974	0.00893	0.00708	16%	0.00554	0.00621	11%	0.00684	0.00695	2%	0.00768	0.00621	21%	0.00866	0.0107	21%	0.0216	0.0143	41%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD) or relative standard deviation (RSD).

Table A.18b: Laboratory Duplicate Results for Fish Ovary Samples, 2015

Analyte	Unit	GC-YP-06-APR rep 1	GC-YP-06-APR rep 2	RPD	GC-NSC-49-APR rep 1	GC-NSC-49-APR rep 2	RPD	GC-PCC-08-APR rep 1	GC-PCC-08-APR rep 2	RPD	ER-PCC-02-APR rep 1	ER-PCC-02-APR rep 2	RPD	ER-YP-01-APR rep 1	ER-YP-01-APR rep 2	RPD	ER-YP-02-APR rep 1	ER-YP-02-APR rep 2	RPD	ER-YP-11-APR rep 1	ER-YP-11-APR rep 2	RPD
Aluminum (Al)	µg/g dw	0.435	0.256	52%	1.52	1.52	0%	0.789	1.01	25%	4.79	4.79	0%	34.3	27.2	23%	3.09	3.3	7%	0.953	0.443	73%
Antimony (Sb)	µg/g dw	<0.00055	<0.00060	9%	0.00071	<0.00061	15%	0.00132	0.0008	49%	0.00663	0.00524	23%	0.00089	0.00174	65%	0.00129	0.00072	57%	0.00071	0.00062	14%
Arsenic (As)	µg/g dw	0.0369	0.0385	4%	0.0881	0.0934	6%	0.244	0.3	21%	0.0638	0.0679	6%	0.0861	0.0923	7%	0.035	0.0412	16%	0.0405	0.036	12%
Barium (Ba)	µg/g dw	0.438	0.432	1%	0.0766	0.044	54%	1.26	1.91	41%	1.83	1.72	6%	0.784	0.83	6%	0.315	0.315	0%	0.675	0.663	2%
Beryllium (Be)	µg/g dw	<0.0024	<0.0026	8%	<0.0026	<0.0026	0%	<0.0027	<0.0027	0%	<0.0023	<0.0024	4%	<0.0024	<0.0022	9%	<0.0022	<0.0025	13%	<0.0024	<0.0023	4%
Bismuth (Bi)	µg/g dw	0.00065	0.00073	12%	0.00017	<0.00016	6%	<0.00016	<0.00016	0%	0.00358	0.00418	15%	0.00091	0.00091	0%	0.0012	0.00108	11%	0.00072	0.00096	29%
Boron (B)	µg/g dw	<0.11	0.14	24%	<0.12	<0.12	0%	<0.12	0.14	15%	0.23	0.23	0%	<0.12	0.14	15%	<0.11	<0.12	9%	<0.12	<0.12	0%
Cadmium (Cd)	µg/g dw	0.0044	0.0038	15%	0.0019	0.0023	19%	0.0083	0.01	19%	0.0394	0.0392	1%	0.0184	0.0227	21%	0.0026	0.004	42%	0.004	0.0035	13%
Calcium (Ca)	µg/g dw	1,170	1,200	3%	1,180	1,120	5%	319	489	42%	657	678	3%	1,020	2,030	66%	1,030	1,020	1%	844	840	0%
Cesium (Cs)	µg/g dw	0.0301	0.0299	1%	0.072	0.0735	2%	0.0159	0.0153	4%	0.0173	0.0175	1%	0.0244	0.024	2%	0.0189	0.0191	1%	0.0233	0.0241	3%
Chromium (Cr)	µg/g dw	0.0523	0.0545	4%	0.0592	0.0767	26%	0.062	0.0833	29%	0.0793	0.0865	9%	0.233	0.119	65%	0.0619	0.0749	19%	0.0621	0.0657	6%
Cobalt (Co)	µg/g dw	0.0905	0.0891	2%	0.0411	0.0413	0%	0.0657	0.0641	2%	0.0868	0.0854	2%	0.0632	0.0597	6%	0.0507	0.0491	3%	0.0722	0.0719	0%
Copper (Cu)	µg/g dw	1.97	1.97	0%	2.94	3.06	4%	4.6	4.51	2%	2.39	2.43	2%	2.13	2.03	5%	2.29	2.27	1%	2.16	2.18	1%
Gallium (Ga)	µg/g dw	0.00432	0.00462	7%	0.00536	0.00464	14%	0.00611	0.0056	9%	0.00933	0.0099	6%	0.0178	0.0131	30%	0.00432	0.0061	34%	0.00546	0.00381	36%
Iron (Fe)	µg/g dw	33.5	33.6	0%	91.3	93.8	3%	50.8	50.7	0%	229	228	0%	57.7	50.5	13%	34.1	33.8	1%	34.7	34.9	1%
Lead (Pb)	µg/g dw	0.00176	0.00181	3%	0.0124	0.00923	29%	0.00471	0.0059	22%	0.101	0.092	9%	0.0214	0.0192	11%	0.0113	0.0108	5%	0.00372	0.00358	4%
Lithium (Li)	µg/g dw	0.115	0.108	6%	0.0062	0.0074	18%	0.0056	0.0056	0%	0.0137	0.0116	17%	0.259	0.238	8%	0.235	0.223	5%	0.292	0.291	0%
Magnesium (Mg)	µg/g dw	1,260	1,280	2%	853	875	3%	908	889	2%	1,230	1,250	2%	1,220	1,160	5%	1,300	1,270	2%	1,160	1,180	2%
Manganese (Mn)	µg/g dw	2.9	2.96	2%	0.902	0.881	2%	9.49	10	5%	9.14	9.44	3%	4.84	4.75	2%	3.17	3.1	2%	3.13	3.21	3%
Mercury (Hg)	µg/g dw	0.0653	0.0654	0%	0.0603	0.0619	3%	0.0119	0.0109	9%	0.138	0.141	2%	0.0184	0.0168	9%	0.0176	0.0174	1%	0.0127	0.0128	1%
Molybdenum (Mo)	µg/g dw	0.0388	0.0377	3%	0.127	0.131	3%	0.133	0.135	1%	0.232	0.222	4%	0.0403	0.0373	8%	0.0366	0.0367	0%	0.0472	0.0478	1%
Nickel (Ni)	µg/g dw	0.0081	0.0084	4%	0.0094	0.0079	17%	0.0163	0.0182	11%	0.138	0.118	16%	0.0576	0.0526	9%	0.0147	0.017	15%	0.0206	0.0223	8%
Phosphorus (P)	µg/g dw	10,100	10,100	0%	8,990	9,220	3%	9,620	9,570	1%	11,300	11,400	1%	9,590	9,700	1%	8,890	8,750	2%	8,840	9,240	4%
Potassium (K)	µg/g dw	8,970	9,040	1%	11,200	11,600	4%	8,290	8,000	4%	10,900	11,000	1%	8,000	7,650	4%	7,270	7,130	2%	7,600	7,740	2%
Rhenium (Re)	µg/g dw	0.000052	0.000049	6%	<0.000037	<0.000038	3%	<0.000038	<0.000038	0%	<0.000035	<0.000036	3%	0.000043	0.000057	28%	<0.000033	<0.000037	11%	0.000058	<0.000035	49%
Rubidium (Rb)	µg/g dw	13.4	13.3	1%	16.4	16.8	2%	10.7	10.5	2%	4.34	4.37	1%	12.2	11.5	6%	12	12	0%	12	11.9	1%
Selenium (Se)	µg/g dw	3.01	3.17	5%	3.42	3.64	6%	8.62	8.33	3%	13.2	13.6	3%	3.91	3.59	9%	4.16	4.55	9%	4.18	4.57	9%
Silver (Ag)	µg/g dw	0.00235	0.00221	6%	0.00305	0.00337	10%	0.0248	0.0243	2%	0.00878	0.00876	0%	0.00324	0.00317	2%	0.0038	0.00434	13%	0.00392	0.00348	12%
Sodium (Na)	µg/g dw	15,000	14,700	2%	1,770	1,820	3%	1,660	1,640	1%	2,480	2,550	3%	11,500	10,800	6%	11,600	11,200	4%	9,310	9,590	3%
Strontium (Sr)	µg/g dw	1.39	1.4	1%	0.338	0.264	25%	0.303	0.500	49%	0.386	0.401	4%	1.67	2.24	29%	1.39	1.38	1%	1.37	1.37	0%
Thallium (Tl)	µg/g dw	0.0194	0.0189	3%	0.0547	0.0567	4%	0.0217	0.0217	0%	0.00522	0.00553	6%	0.0465	0.0454	2%	0.0299	0.0296	1%	0.037	0.0365	1%
Thorium (Th)	µg/g dw	0.00011	0.000105	5%	0.000319	0.000279	13%	0.000163	0.000242	39%	0.0023	0.00136	51%	0.00844	0.00602	33%	0.000557	0.000511	9%	0.000159	0.000196	21%
Tin (Sn)	µg/g dw	<0.00057	0.00070	20%	<0.00063	<0.00063	0%	<0.00064	0.00118	59%	0.00957	0.00647	39%	0.00257	0.00189	30%	<0.00058	0.00112	64%	<0.00064	<0.00062	3%
Titanium (Ti)	µg/g dw	0.084	0.0858	2%	0.101	0.0721	33%	0.0574	0.052	10%	0.189	0.181	4%	0.68	0.499	31%	0.155	0.129	18%	0.084	0.062	30%
Uranium (U)	µg/g dw	0.000916	0.000953	4%	0.00029	0.000223	26%	0.000837	0.00086	3%	0.00877	0.00899	2%	0.0027	0.00242	11%	0.00057	0.00044	26%	0.00082	0.00077	6%
Vanadium (V)	µg/g dw	0.0202	0.0203	0%	0.0178	0.0182	2%	0.0153	0.0178	15%	0.0979	0.0936	4%	0.089	0.075	17%	0.0317	0.0334	5%	0.0255	0.0261	2%
Yttrium (Y)	µg/g dw	0.00212	0.00195	8%	0.00239	0.00207	14%	0.00184	0.0018	2%	0.00957	0.00946	1%	0.0175	0.015	15%	0.00286	0.0023	22%	0.00189	0.00156	19%
Zinc (Zn)	µg/g dw	80.6	79.4	1%	133	135	1%	114	118	3%	154	151	2%	75.8	71.5	6%	74.9	75.3	1%	71.1	71.6	1%
Zirconium (Zr)	µg/g dw	0.00354	0.00282	23%	0.00379	0.00493	26%	0.00755	0.00723	4%	0.0359	0.0344	4%	0.0206	0.0151	31%	0.0041	0.0051	22%	0.0036	0.0041	13%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD) or relative standard deviation (RSD).

Table A.18c: Laboratory Duplicate Results for Fish Ovary Samples, 2016

Analyte	Unit	SC-RT-04 O rep 1	SC-RT-04 O rep 2	RSD	GC-PCC-90 O rep 1	GC-PCC-90 O rep 2	RPD	ER-PCC-06 O rep 1	ER-PCC-06 O rep 2	RPD	SC-PCC-12 O rep 1	SC-PCC-12 O rep 2	RPD	GC-YP-33 O rep 1	GC-YP-33 O rep 2	RPD	GC-CSU-04 O rep 1	GC-CSU-04 O rep 2	RPD
Aluminum (Al)	µg/g dw	0.701	0.621	9%	10.4	7.09	38%	-	4.45	-	-	3.21	-	0.584	0.512	13%	-	2.05	-
Antimony (Sb)	µg/g dw	0.00214	<0.0004	97%	0.00122	0.00121	1%	<0.0010	<0.0010	1%	0.0022	0.00134	49%	0.00449	0.00128	111%	0.00067	0.00042	46%
Arsenic (As)	µg/g dw	0.205	0.205	0%	0.104	0.109	5%	0.2	0.186	7%	0.139	0.116	18%	0.0772	0.0672	14%	0.11	0.0953	14%
Barium (Ba)	µg/g dw	0.255	0.256	0%	1.17	1.23	5%	0.866	0.802	8%	1.7	1.58	7%	0.323	0.315	3%	0.377	0.339	11%
Beryllium (Be)	µg/g dw	<0.0026	<0.0027	3%	<0.0026	<0.0027	4%	<0.0031	<0.0032	3%	<0.0030	<0.0030	0%	<0.0046	<0.0050	8%	<0.0050	<0.0045	11%
Bismuth (Bi)	µg/g dw	<0.0001	<0.0001	6%	0.00182	0.00176	3%	0.000403	0.000454	12%	0.00189	0.00187	1%	0.000825	0.000762	8%	0.000232	0.000226	3%
Boron (B)	µg/g dw	<0.0980	<0.1000	1%	<0.1000	0.2	67%	0.165	0.117	34%	0.099	0.202	68%	0.128	0.111	14%	0.144	0.297	69%
Cadmium (Cd)	µg/g dw	0.0019	0.0016	12%	0.0115	0.0119	3%	0.0061	0.0074	19%	0.0112	0.0097	14%	0.0032	0.002	46%	0.0028	0.0014	67%
Calcium (Ca)	µg/g dw	1,230	1,200	2%	258	257	0%	182	177	3%	414	372	11%	1,070	1,090	2%	370	365	1%
Cesium (Cs)	µg/g dw	0.0416	0.0414	0%	0.00819	0.00859	5%	0.0184	0.0165	11%	0.0149	0.0153	3%	0.0195	0.0182	7%	0.0254	0.0243	4%
Chromium (Cr)	µg/g dw	0.0729	0.0865	12%	0.0787	0.0762	3%	0.0855	0.0928	8%	0.0742	0.0794	7%	0.059	0.065	10%	0.065	0.068	5%
Cobalt (Co)	µg/g dw	0.081	0.0804	1%	0.0742	0.0735	1%	0.0509	0.0485	5%	0.0692	0.069	0%	0.0763	0.0791	4%	0.103	0.103	0%
Copper (Cu)	µg/g dw	17.6	16.7	4%	3.25	3.2	2%	3.82	3.54	8%	3.68	3.82	4%	1.93	1.86	4%	3.48	3.43	1%
Gallium (Ga)	µg/g dw	0.00596	0.00586	1%	0.00893	0.0104	15%	0.00869	0.00802	8%	0.00789	0.0077	2%	0.00453	0.00482	6%	0.00829	0.00865	4%
Iron (Fe)	µg/g dw	63.1	58.5	5%	76	78.2	3%	42.7	41	4%	73.9	71.9	3%	29.8	28.3	5%	29.3	27.4	7%
Lead (Pb)	µg/g dw	0.00247	0.00207	12%	0.0124	0.0151	20%	0.00848	0.00924	9%	0.012	0.0117	3%	0.00376	0.00326	14%	0.00578	0.00564	2%
Lithium (Li)	µg/g dw	<0.0033	<0.0035	4%	0.0076	0.0065	16%	0.0085	0.0047	58%	0.0097	0.0109	12%	0.091	0.0933	2%	<0.0068	<0.0061	11%
Magnesium (Mg)	µg/g dw	1,480	1,460	1%	748	733	2%	749	702	6%	879	898	2%	1,150	1,130	2%	532	526	1%
Manganese (Mn)	µg/g dw	1.57	1.58	0%	4.75	4.77	0%	6.97	6.62	5%	11.7	11.7	0%	1.94	1.96	1%	19.8	19.4	2%
Mercury (Hg)	µg/g dw	0.0248	0.0231	5%	0.0244	0.0256	5%	0.0107	0.00988	8%	0.0262	0.0275	5%	0.0238	0.0218	9%	0.0087	0.0075	15%
Molybdenum (Mo)	µg/g dw	0.0192	0.019	1%	0.101	0.104	3%	0.095	0.0871	9%	0.124	0.121	2%	0.0348	0.0331	5%	0.0594	0.0563	5%
Nickel (Ni)	µg/g dw	0.0094	0.0092	2%	0.0497	0.0479	4%	0.0242	0.0233	4%	0.038	0.0314	19%	0.0287	0.0305	6%	0.0312	0.0321	3%
Phosphorus (P)	µg/g dw	10,200	10,200	0%	10,400	10,000	4%	11,200	10,500	6%	10,900	11,100	2%	8,650	8,580	1%	11,000	11,100	1%
Potassium (K)	µg/g dw	5,330	5,150	2%	6,790	6,550	4%	6,560	6,270	5%	7,160	7,360	3%	8,460	8,160	4%	6,800	6,580	3%
Rhenium (Re)	µg/g dw	0.00564	0.00526	5%	<0.00003	<0.00003	3%	<0.0001	<0.0001	0%	<0.00005	<0.00005	0%	<0.0001	<0.0001	4%	<0.0001	<0.0001	16%
Rubidium (Rb)	µg/g dw	11.3	11.4	1%	2.89	2.94	2%	7.23	6.92	4%	3.85	3.94	2%	13.5	13.3	1%	5.31	5.37	1%
Selenium (Se)	µg/g dw	10.7	10.7	0%	15.1	15	1%	8.55	7.75	10%	14	14.3	2%	4.29	4.49	5%	0.951	0.972	2%
Silver (Ag)	µg/g dw	0.0571	0.0541	4%	0.0354	0.0361	2%	0.0304	0.0303	0%	0.0169	0.0169	0%	0.00224	0.00213	5%	0.0201	0.0214	6%
Sodium (Na)	µg/g dw	1,700	1,700	0%	1,210	1,190	2%	1,180	1,120	5%	1,290	1,290	0%	12,500	12,300	2%	1,390	1,320	5%
Strontium (Sr)	µg/g dw	1.01	1	1%	0.19	0.209	10%	0.236	0.22	7%	0.334	0.287	15%	1.75	1.74	1%	0.306	0.293	4%
Thallium (Tl)	µg/g dw	0.0166	0.0163	1%	0.00491	0.00467	5%	0.0213	0.0201	6%	0.00668	0.00631	6%	0.0186	0.017	9%	0.00387	0.00349	10%
Thorium (Th)	µg/g dw	0.000111	0.000075	27%	0.00159	0.00318	67%	0.000808	0.00102	23%	0.00124	0.000824	40%	0.000126	0.000132	5%	0.000666	0.000368	58%
Tin (Sn)	µg/g dw	<0.0007	<0.0008	5%	<0.0008	<0.0008	4%	0.0035	0.0019	59%	<0.0012	<0.0012	0%	0.00125	0.00106	16%	0.00088	<0.0090	164%
Titanium (Ti)	µg/g dw	0.074	0.0621	12%	0.204	0.202	1%	0.163	0.155	5%	0.143	0.101	34%	0.0724	0.083	14%	0.176	0.0955	59%
Uranium (U)	µg/g dw	0.000322	0.000301	5%	0.003	0.00303	1%	0.00249	0.00201	21%	0.0481	0.00447	166%	<0.0006	<0.0006	10%	0.00157	0.00157	0%
Vanadium (V)	µg/g dw	0.00367	0.00426	11%	0.0239	0.0241	1%	0.0196	0.0188	4%	0.0214	0.0202	6%	0.0213	0.021	1%	0.00747	0.00457	48%
Yttrium (Y)	µg/g dw	0.00067	0.00074	7%	0.00624	0.00746	18%	-	0.00261	-	-	0.003	-	0.00144	0.00167	15%	-	0.00237	-
Zinc (Zn)	µg/g dw	87.2	87.2	0%	72.1	71.6	1%	92.9	88.8	5%	105	107	2%	74.2	74.6	1%	91.7	75	20%
Zirconium (Zr)	µg/g dw	0.00337	0.00853	61%	0.0113	0.00888	24%	0.00725	0.00537	30%	0.00844	0.00748	12%	0.0039	0.00488	22%	0.0066	0.00479	32%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD) or relative standard deviation (RSD).

Table A.18c: Laboratory Duplicate Results for Fish Ovary Samples, 2016

Analyte	Unit	GC-CSU-31 O rep 1	GC-CSU-31 O rep 2	RPD	GC-NSC-13 O rep 1	GC-NSC-13 O rep 2	RPD	ER-YP-05 O rep 1	ER-YP-05 O rep 2	RPD	ER-CSU-03 O rep 1	ER-CSU-03 O rep 2	RPD	ER-CSU-04 O rep 1	ER-CSU-04 O rep 2	RPD	ER-NSC-27 O rep 1	ER-NSC-27 O rep 2	RPD
Aluminum (Al)	µg/g dw	-	1.25	-	-	3.46	-	-	1.43	-	1.61	3.8	81%	-	0.626	-	-	1.3	-
Antimony (Sb)	µg/g dw	0.00194	0.00203	5%	0.00109	<0.0004	87%	0.0023	0.00248	8%	0.00266	0.00341	25%	0.0013	0.00064	68%	0.00077	0.00129	50%
Arsenic (As)	µg/g dw	0.0759	0.0523	37%	0.0805	0.0738	9%	0.0595	0.0638	7%	0.113	0.14	21%	0.148	0.144	3%	0.177	0.178	1%
Barium (Ba)	µg/g dw	0.788	0.613	25%	0.111	0.123	10%	0.374	0.351	6%	0.693	0.949	31%	0.53	0.531	0%	0.138	0.0653	72%
Beryllium (Be)	µg/g dw	<0.0035	<0.0035	0%	<0.0034	<0.0034	0%	<0.0035	<0.0034	3%	<0.0034	<0.0032	6%	<0.0023	<0.0027	16%	<0.0023	<0.0025	8%
Bismuth (Bi)	µg/g dw	0.00572	0.00553	3%	0.000111	0.000167	40%	0.000348	0.000289	19%	0.00289	0.00262	10%	0.000386	0.0005	26%	0.000543	0.000394	32%
Boron (B)	µg/g dw	<0.1200	<0.1200	0%	0.16	0.32	67%	0.18	0.15	18%	0.22	0.41	60%	<0.1500	<0.1800	18%	<0.1500	0.34	78%
Cadmium (Cd)	µg/g dw	0.0032	0.0041	25%	<0.0013	0.0017	27%	0.0038	0.0046	19%	0.0103	0.0107	4%	0.0049	0.0049	0%	0.0041	0.0047	14%
Calcium (Ca)	µg/g dw	949	933	2%	499	489	2%	1,080	922	16%	614	625	2%	454	464	2%	1,390	1,020	31%
Cesium (Cs)	µg/g dw	0.00845	0.00798	6%	0.0478	0.0462	3%	0.028	0.0258	8%	0.0067	0.00668	0%	0.00757	0.00806	6%	0.0981	0.0989	1%
Chromium (Cr)	µg/g dw	0.0641	0.0653	2%	0.0616	0.0734	17%	0.0644	0.0632	2%	0.0627	0.0745	17%	0.0663	0.0724	9%	0.0693	0.0677	2%
Cobalt (Co)	µg/g dw	0.128	0.126	2%	0.0262	0.026	1%	0.0728	0.0697	4%	0.213	0.213	0%	0.0658	0.0656	0%	0.0322	0.0337	5%
Copper (Cu)	µg/g dw	3.02	3.1	3%	3.21	3.21	0%	2.05	2.06	0%	5.37	5.3	1%	3.42	3.43	0%	2.4	2.66	10%
Gallium (Ga)	µg/g dw	0.00763	0.00697	9%	0.00518	0.00555	7%	0.00592	0.00375	45%	0.00707	0.00753	6%	0.00655	0.00634	3%	0.00515	0.00509	1%
Iron (Fe)	µg/g dw	56	56.7	1%	78.3	83.4	6%	40.9	42.3	3%	90.5	90.2	0%	33.9	35.2	4%	96	101	5%
Lead (Pb)	µg/g dw	0.00675	0.00463	37%	0.00743	0.0051	37%	0.00621	0.00665	7%	0.00728	0.0113	43%	0.00388	0.00448	14%	0.0302	0.0265	13%
Lithium (Li)	µg/g dw	<0.0120	<0.0120	0%	<0.0120	<0.0120	0%	0.203	0.196	4%	0.013	0.017	27%	0.0105	0.0115	9%	<0.0063	<0.0069	9%
Magnesium (Mg)	µg/g dw	1,020	1,020	0%	614	601	2%	1,140	1,090	4%	773	778	1%	674	680	1%	810	835	3%
Manganese (Mn)	µg/g dw	40.3	40.5	0%	0.634	0.645	2%	2.38	2.28	4%	17.7	17.6	1%	15.8	15.6	1%	1.46	1.42	3%
Mercury (Hg)	µg/g dw	0.0285	0.029	2%	0.0686	0.0691	1%	0.0186	0.0187	1%	0.0125	0.0121	3%	0.00608	0.0055	10%	0.0375	0.0399	6%
Molybdenum (Mo)	µg/g dw	0.174	0.174	0%	0.0708	0.0658	7%	0.0367	0.035	5%	0.109	0.105	4%	0.074	0.0804	8%	0.111	0.115	4%
Nickel (Ni)	µg/g dw	0.0421	0.0382	10%	0.0114	0.0133	15%	0.025	0.0258	3%	0.114	0.12	5%	0.0381	0.0397	4%	0.0158	0.0158	0%
Phosphorus (P)	µg/g dw	9,650	10,100	5%	10,400	10,200	2%	9,170	8,920	3%	9,930	9,780	2%	10,600	10,300	3%	8,240	8,450	3%
Potassium (K)	µg/g dw	7,700	7,740	1%	7,760	7,550	3%	8,150	7,870	3%	6,930	6,950	0%	6,340	6,150	3%	9,970	10,200	2%
Rhenium (Re)	µg/g dw	<0.0001	<0.0001	0%	<0.0001	<0.0001	9%	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%	<0.0001	<0.0001	17%	<0.0001	<0.0001	9%
Rubidium (Rb)	µg/g dw	5.06	5.03	1%	12.2	11.8	3%	16	15.4	4%	2.47	2.41	2%	3.81	3.83	1%	18.7	18.8	1%
Selenium (Se)	µg/g dw	5.59	6.1	9%	3.55	3.88	9%	4.67	4.76	2%	9.21	8.93	3%	3.9	3.79	3%	7.34	7.89	7%
Silver (Ag)	µg/g dw	0.0212	0.0207	2%	0.00631	0.00629	0%	0.00345	0.00401	15%	0.086	0.083	4%	0.0291	0.0289	1%	0.00329	0.0034	3%
Sodium (Na)	µg/g dw	1,920	1,940	1%	1,650	1,640	1%	13,000	12,500	4%	1,950	1,970	1%	1,490	1,460	2%	1,930	1,980	3%
Strontium (Sr)	µg/g dw	0.45	0.434	4%	0.218	0.219	0%	1.86	1.71	8%	0.344	0.349	1%	0.279	0.271	3%	0.81	0.289	95%
Thallium (Tl)	µg/g dw	0.00625	0.006	4%	0.00806	0.00743	8%	0.0189	0.0174	8%	0.00825	0.00781	5%	0.00961	0.0101	5%	0.0218	0.0215	1%
Thorium (Th)	µg/g dw	0.000587	0.000432	30%	0.000438	0.000641	38%	0.0002	0.000345	53%	0.000491	0.000745	41%	0.000352	0.000156	77%	0.000267	0.000299	11%
Tin (Sn)	µg/g dw	0.00072	<0.0120	177%	0.0011	0.00161	38%	<0.0120	0.00085	174%	0.00114	0.00249	74%	<0.0067	<0.0079	16%	0.00116	0.00142	20%
Titanium (Ti)	µg/g dw	0.096	0.083	15%	0.074	0.103	33%	0.085	0.096	12%	0.082	0.14	52%	0.0648	0.0726	11%	0.0985	0.0765	25%
Uranium (U)	µg/g dw	0.00168	0.0018	7%	0.00222	0.00295	28%	0.00082	0.0008	2%	0.00227	0.00227	0%	0.00093	0.00095	2%	0.0006	0.00051	16%
Vanadium (V)	µg/g dw	0.00674	0.00561	18%	0.0435	0.0524	19%	0.061	0.0581	5%	0.00773	0.0132	52%	0.00474	0.00432	9%	0.0149	0.0167	11%
Yttrium (Y)	µg/g dw	0.00757	0.0074	2%	0.00217	0.00242	11%	0.00196	0.00162	19%	0.00947	0.0106	11%	0.00285	0.00235	19%	0.00183	0.0016	13%
Zinc (Zn)	µg/g dw	154	137	12%	154	155	1%	77.1	76.3	1%	98.9	131	28%	71.4	73.9	3%	126	127	1%
Zirconium (Zr)	µg/g dw	0.00529	0.00445	17%	0.0056	0.00535	5%	0.0032	0.0032	0%	0.0065	0.00841	26%	0.00206	0.00252	20%	0.0109	0.0116	6%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD) or relative standard deviation (RSD).

Table A.18c: Laboratory Duplicate Results for Fish Ovary Samples, 2016

Analyte	Unit	SC-YP-10 O rep 1	SC-YP-10 O rep 2	RPD	SC-CSU-08 O rep 1	SC-CSU-08 O rep 2	RPD	SC-NSC-09 O rep 1	SC-NSC-09 O rep 2	RPD
Aluminum (Al)	µg/g dw	-	1.3	-	-	1.22	-	-	6.27	-
Antimony (Sb)	µg/g dw	0.00089	0.00077	14%	0.0025	0.00271	8%	0.00099	0.00097	2%
Arsenic (As)	µg/g dw	0.06	0.0587	2%	0.0798	0.0789	1%	0.141	0.148	5%
Barium (Ba)	µg/g dw	0.227	0.16	35%	0.362	0.388	7%	0.234	0.227	3%
Beryllium (Be)	µg/g dw	<0.0025	<0.0026	4%	<0.0026	<0.0026	0%	<0.0035	<0.0035	0%
Bismuth (Bi)	µg/g dw	0.000608	0.00059	3%	0.00251	0.00267	6%	0.000395	0.000563	35%
Boron (B)	µg/g dw	<0.1700	<0.1700	0%	0.2	0.33	49%	0.136	0.089	42%
Cadmium (Cd)	µg/g dw	0.0017	0.002	16%	0.0119	0.0103	14%	0.0238	0.0215	10%
Calcium (Ca)	µg/g dw	1,850	903	69%	629	609	3%	899	824	9%
Cesium (Cs)	µg/g dw	0.0455	0.0475	4%	0.0116	0.0112	4%	0.0718	0.0667	7%
Chromium (Cr)	µg/g dw	0.0561	0.0671	18%	0.0593	0.0651	9%	0.0881	0.113	25%
Cobalt (Co)	µg/g dw	0.1	0.0985	2%	0.105	0.105	0%	0.036	0.0341	5%
Copper (Cu)	µg/g dw	2.64	2.7	2%	4.98	4.77	4%	2.39	2.24	6%
Gallium (Ga)	µg/g dw	0.00558	0.00471	17%	0.00834	0.0077	8%	0.0087	0.0083	5%
Iron (Fe)	µg/g dw	33.2	32.7	2%	51.9	54.7	5%	202	215	6%
Lead (Pb)	µg/g dw	0.00662	0.00659	0%	0.00843	0.00852	1%	0.00711	0.0079	11%
Lithium (Li)	µg/g dw	0.2	0.206	3%	<0.0070	<0.0071	1%	0.0112	0.0132	16%
Magnesium (Mg)	µg/g dw	1,180	1,160	2%	834	827	1%	694	642	8%
Manganese (Mn)	µg/g dw	3.3	3.18	4%	26.1	26	0%	2.51	2.39	5%
Mercury (Hg)	µg/g dw	0.0147	0.0157	7%	0.0205	0.0208	1%	0.0578	0.0566	2%
Molybdenum (Mo)	µg/g dw	0.0409	0.044	7%	0.0876	0.0871	1%	0.104	0.101	3%
Nickel (Ni)	µg/g dw	0.0193	0.0168	14%	0.0289	0.0287	1%	0.0242	0.023	5%
Phosphorus (P)	µg/g dw	8,980	8,670	4%	11,200	10,500	6%	9,140	8,410	8%
Potassium (K)	µg/g dw	7,620	7,750	2%	7,590	7,200	5%	10,200	9,490	7%
Rhenium (Re)	µg/g dw	<0.0001	<0.0001	1%	<0.0001	<0.0001	2%	<0.0002	<0.0002	0%
Rubidium (Rb)	µg/g dw	17.7	17.7	0%	5.54	5.53	0%	13.6	12.7	7%
Selenium (Se)	µg/g dw	2.05	2.14	4%	2.66	2.62	2%	17.8	17.4	2%
Silver (Ag)	µg/g dw	0.00257	0.00336	27%	0.0329	0.0324	2%	0.0047	0.00465	1%
Sodium (Na)	µg/g dw	15,400	15,600	1%	1,860	1,760	6%	1,370	1,280	7%
Strontium (Sr)	µg/g dw	2.03	1.49	31%	0.358	0.373	4%	0.293	0.282	4%
Thallium (Tl)	µg/g dw	0.0437	0.0436	0%	0.00322	0.00319	1%	0.0227	0.0211	7%
Thorium (Th)	µg/g dw	0.000709	0.000368	63%	0.000677	0.000628	8%	0.00147	0.0018	20%
Tin (Sn)	µg/g dw	<0.0075	<0.0075	0%	0.0009	0.00086	5%	0.00136	0.00193	35%
Titanium (Ti)	µg/g dw	0.121	0.0959	23%	0.0674	0.0939	33%	0.174	0.14	22%
Uranium (U)	µg/g dw	0.00057	0.00044	26%	0.00763	0.00707	8%	0.0042	0.00421	0%
Vanadium (V)	µg/g dw	0.0188	0.0163	14%	0.00638	0.00721	12%	0.0607	0.0638	5%
Yttrium (Y)	µg/g dw	0.00207	0.00213	3%	0.00882	0.00771	13%	0.00904	0.00983	8%
Zinc (Zn)	µg/g dw	71.5	74	3%	95.2	99.4	4%	183	172	6%
Zirconium (Zr)	µg/g dw	0.00588	0.00349	51%	0.00842	0.00746	12%	0.0101	0.00701	36%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD) or relative standard deviation (RSD).

Table A.19: Laboratory Duplicate Results for Peamouth Chub Whole Body Samples, 2014 to 2016

Analyte	Units	2014									2015					
		SC-PC-01W Rep 1	SC-PC-01W Rep 2	RPD	GC-PC-16W Rep 1	GC-PC-16W Rep 2	RPD	ER-PC-23W Rep 1	ER-PC-23W Rep 2	RPD	SC-PCC-12-APR Rep 1	SC-PCC-12-APR Rep 2	RPD	ER-PCC-27-APR Rep 1	ER-PCC-27-APR Rep 2	RPD
Aluminum (Al)	µg/g dw	44.4	23.4	62%	17.2	16.4	5%	20.4	20.7	1%	212	170	22%	5.95	5.29	12%
Antimony (Sb)	µg/g dw	0.0045	0.0041	10%	0.0018	0.0021	14%	0.0034	0.0035	5%	0.00395	0.00445	12%	0.00286	0.00249	14%
Arsenic (As)	µg/g dw	0.234	0.193	19%	0.213	0.204	4%	0.121	0.114	6%	0.161	0.139	15%	0.35	0.312	11%
Barium (Ba)	µg/g dw	8.31	12.8	43%	7.33	6.87	6%	12.1	11.7	3%	15	13.8	8%	8.27	7.26	13%
Beryllium (Be)	µg/g dw	<0.0027	<0.0025	8%	<0.0026	<0.0023	12%	<0.0023	<0.0025	8%	0.0058	0.0033	55%	<0.0028	<0.0025	11%
Bismuth (Bi)	µg/g dw	0.0023	0.0018	26%	0.0018	0.0019	6%	0.0065	0.006	8%	0.00393	0.00377	4%	0.00129	0.00153	17%
Boron (B)	µg/g dw	0.27	0.25	8%	0.25	0.23	8%	0.23	0.24	4%	0.98	0.9	9%	<0.1700	0.16	6%
Cadmium (Cd)	µg/g dw	0.106	0.086	21%	0.092	0.088	3%	0.098	0.102	4%	0.181	0.177	2%	0.156	0.165	6%
Calcium (Ca)	µg/g dw	36,400	70,700	64%	39,500	36,100	9%	66,100	55,200	18%	44,100	61,000	32%	30,000	25,300	17%
Cesium (Cs)	µg/g dw	0.0659	0.0571	14%	0.0203	0.0201	1%	0.0411	0.0424	3%	0.0473	0.0434	9%	0.0497	0.052	5%
Chromium (Cr)	µg/g dw	0.112	0.092	19%	0.098	0.099	1%	0.1	0.104	4%	0.335	0.308	8%	0.217	0.151	36%
Cobalt (Co)	µg/g dw	0.165	0.131	23%	0.113	0.11	3%	0.078	0.079	2%	0.141	0.128	10%	0.0661	0.0636	4%
Copper (Cu)	µg/g dw	2.59	2.02	25%	2.06	1.93	7%	1.73	1.82	5%	1.79	1.51	17%	2.17	1.91	13%
Gallium (Ga)	µg/g dw	0.036	0.045	22%	0.03	0.03	1%	0.046	0.041	12%	0.074	0.0655	12%	0.0113	0.0129	13%
Iron (Fe)	µg/g dw	81.2	61	28%	48.3	46	5%	73.4	75.3	3%	184	160	14%	72.8	74.2	2%
Lead (Pb)	µg/g dw	0.135	0.15	11%	0.03	0.029	2%	0.108	0.1	8%	0.253	0.23	10%	0.165	0.209	24%
Lithium (Li)	µg/g dw	0.077	0.09	16%	0.074	0.057	26%	0.11	0.113	3%	0.28	0.3	7%	0.101	0.0911	10%
Magnesium (Mg)	µg/g dw	2,070	2,260	9%	1,900	1,770	7%	1,690	1,620	4%	1,550	1,740	12%	1,360	1,320	3%
Manganese (Mn)	µg/g dw	7.03	10	35%	7	6.3	11%	10.3	9.27	11%	8.96	9.56	6%	6.37	6.37	0%
Mercury (Hg)	µg/g dw	0.514	0.423	19%	0.182	0.176	3%	0.334	0.348	4%	0.681	0.7	3%	0.779	0.807	4%
Molybdenum (Mo)	µg/g dw	0.04	0.037	8%	0.031	0.029	6%	0.042	0.044	5%	0.0426	0.0437	3%	0.0535	0.0563	5%
Nickel (Ni)	µg/g dw	0.213	0.329	43%	0.203	0.184	10%	0.343	0.302	13%	0.277	0.303	9%	0.163	0.121	30%
Phosphorus (P)	µg/g dw	27,200	43,400	46%	29,200	26,800	9%	42,700	37,100	14%	30,700	38,700	23%	24,600	23,100	6%
Potassium (K)	µg/g dw	12,700	11,500	10%	13,400	12,500	7%	14,400	14,500	1%	13,500	13,500	0%	16,200	16,300	1%
Rhenium (Re)	µg/g dw	<0.000059	<0.000054	9%	<0.000055	<0.000050	10%	<0.000135	<0.000090	40%	0.000056	<0.00005	11%	<0.00005	<0.00005	10%
Rubidium (Rb)	µg/g dw	10.6	9.32	13%	11.3	11	3%	10.8	11.2	4%	11.7	11.8	1%	11.4	11.6	2%
Selenium (Se)	µg/g dw	1.5	1.4	13%	1.8	1.8	2%	1.4	1.5	4%	3.19	3.21	1%	2.62	2.99	13%
Silver (Ag)	µg/g dw	0.0058	0.0041	35%	0.0058	0.0056	4%	0.003	0.0027	12%	0.0025	0.00194	25%	0.00192	0.00275	36%
Sodium (Na)	µg/g dw	3,370	3,590	6%	2,990	2,800	7%	4,080	4,110	1%	4,220	4,450	5%	4,080	4,000	2%
Strontium (Sr)	µg/g dw	50.8	98	63%	48.7	45	8%	91.4	79	15%	57.7	75	26%	37.9	31.7	18%
Thallium (Tl)	µg/g dw	0.0207	0.0195	6%	0.0178	0.0171	4%	0.00836	0.00855	2%	0.0144	0.0139	4%	0.0119	0.0115	3%
Thorium (Th)	µg/g dw	0.0083	0.005	49%	0.0044	0.0065	40%	0.0037	0.004	6%	0.0383	0.0332	14%	0.000763	0.000946	21%
Tin (Sn)	µg/g dw	0.0532	0.0488	9%	0.0041	0.0038	7%	0.0072	0.0067	8%	0.00993	0.0077	25%	0.00387	0.00451	15%
Titanium (Ti)	µg/g dw	0.746	0.49	41%	0.463	0.481	4%	0.447	0.473	6%	3.49	2.79	22%	0.185	0.195	5%
Uranium (U)	µg/g dw	0.0105	0.0161	42%	0.005	0.0047	7%	0.0175	0.0175	0%	0.018	0.0196	9%	0.00556	0.00509	9%
Vanadium (V)	µg/g dw	0.084	0.074	13%	0.063	0.057	10%	0.08	0.079	1%	0.301	0.263	13%	0.0398	0.0422	6%
Yttrium (Y)	µg/g dw	0.0154	0.0102	41%	0.019	0.0181	5%	0.0159	0.0139	13%	0.0768	0.0643	18%	0.0294	0.0258	13%
Zinc (Zn)	µg/g dw	107	92.9	14%	66	63	6%	108	113	5%	136	94.4	36%	122	110	10%
Zirconium (Zr)	µg/g dw	0.095	0.068	33%	0.111	0.099	12%	0.068	0.058	15%	0.296	0.235	23%	0.334	0.274	20%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.19: Laboratory Duplicate Results for Peamouth Chub Whole Body Samples, 2014 to 2016

Analyte	Units	2016											
		ER-PCC-13 WB rep 1	ER-PCC-13 WB rep 2	RPD	GC-PCC-27 WB A rep 1	GC-PCC-27 WB A rep 2	RPD	ER-RSC-01 WB rep 1	ER-RSC-01 WB rep 2	RPD	SC-RSC-18 WB rep 1	SC-RSC-18 WB rep 2	RPD
Aluminum (Al)	µg/g dw	24	21.3	12%	17.1	11	43%	63.3	63.4	0%	71.6	67	7%
Antimony (Sb)	µg/g dw	0.00204	0.00216	6%	0.00145	0.00207	35%	0.00323	0.00256	23%	0.00263	0.00321	20%
Arsenic (As)	µg/g dw	0.161	0.187	15%	0.355	0.332	7%	0.218	0.228	4%	0.4	0.444	10%
Barium (Ba)	µg/g dw	10.2	12.9	23%	8.04	8.89	10%	5.67	5.42	5%	7.53	6.29	18%
Beryllium (Be)	µg/g dw	0.0032	<0.0031	3%	<0.0027	<0.0030	11%	<0.0033	<0.0034	3%	<0.0033	0.0035	6%
Bismuth (Bi)	µg/g dw	0.00124	0.00138	11%	0.00254	0.00257	1%	0.000934	0.00106	13%	0.00238	0.00254	7%
Boron (B)	µg/g dw	0.421	0.42	0%	0.143	0.318	76%	0.755	0.842	11%	0.183	0.204	11%
Cadmium (Cd)	µg/g dw	0.0466	0.0469	1%	0.0662	0.0804	19%	0.0551	0.0551	0%	0.0915	0.106	15%
Calcium (Ca)	µg/g dw	48800	66700	31%	25500	38100	40%	36500	35700	2%	58900	41800	34%
Cesium (Cs)	µg/g dw	0.0608	0.067	10%	0.0386	0.0345	11%	0.0736	0.0741	1%	0.0622	0.0665	7%
Chromium (Cr)	µg/g dw	0.312	0.125	86%	0.137	0.147	7%	0.176	0.161	9%	0.152	0.156	3%
Cobalt (Co)	µg/g dw	0.0616	0.0656	6%	0.0853	0.0993	15%	0.0737	0.0733	1%	0.199	0.214	7%
Copper (Cu)	µg/g dw	2.22	2.21	0%	2.01	1.87	7%	1.62	1.69	4%	2.38	2.75	14%
Gallium (Ga)	µg/g dw	0.0282	0.0279	1%	0.0176	0.0166	6%	0.0319	0.032	0%	0.0402	0.034	17%
Iron (Fe)	µg/g dw	56.4	60.2	7%	60.9	55	10%	82.1	85.6	4%	90.6	97	7%
Lead (Pb)	µg/g dw	0.119	0.0853	33%	0.0537	0.0557	4%	0.0972	0.0917	6%	0.0569	0.0529	7%
Lithium (Li)	µg/g dw	0.0738	0.1	30%	0.0571	0.0717	23%	0.109	0.118	8%	0.135	0.124	8%
Magnesium (Mg)	µg/g dw	1,580	1,970	22%	1,290	1,390	7%	1,430	1,380	4%	1,520	1,400	8%
Manganese (Mn)	µg/g dw	6.26	8.76	33%	3.77	4.65	21%	9.46	9.39	1%	13.1	10.6	21%
Mercury (Hg)	µg/g dw	0.186	0.201	8%	0.187	0.162	14%	0.192	0.2	4%	0.193	0.212	9%
Molybdenum (Mo)	µg/g dw	0.0407	0.0347	16%	0.0315	0.0327	4%	0.0446	0.0447	0%	0.0513	0.0518	1%
Nickel (Ni)	µg/g dw	0.394	0.345	13%	0.203	0.225	10%	0.151	0.149	1%	0.208	0.176	17%
Phosphorus (P)	µg/g dw	34,200	45,000	27%	22,000	27,700	23%	25,700	25,000	3%	36,000	28,600	23%
Potassium (K)	µg/g dw	12,300	13,500	9%	11,500	11,200	3%	12,800	12,400	3%	11,100	12,000	8%
Rhenium (Re)	µg/g dw	<0.00005	<0.00005	8%	<0.00004	<0.00005	11%	<0.0002	<0.0002	6%	<0.0002	<0.0002	0%
Rubidium (Rb)	µg/g dw	11.5	12.5	8%	8.45	7.84	7%	11.2	11.1	1%	8.43	9.02	7%
Selenium (Se)	µg/g dw	2.76	3.4	21%	3.82	3.56	7%	2.15	2.07	4%	3.25	3.61	10%
Silver (Ag)	µg/g dw	0.00541	0.00572	6%	0.00507	0.00474	7%	0.00219	0.00198	10%	0.00345	0.00361	5%
Sodium (Na)	µg/g dw	3,480	3,890	11%	2,620	2,630	0%	3,090	3,020	2%	2,890	2,880	0%
Strontium (Sr)	µg/g dw	62.9	81.8	26%	32.3	44.6	32%	45.8	44.9	2%	70.1	49.8	34%
Thallium (Tl)	µg/g dw	0.0297	0.0342	14%	0.0269	0.0281	4%	0.0134	0.0148	10%	0.0176	0.0177	1%
Thorium (Th)	µg/g dw	0.00405	0.00422	4%	0.00317	0.00267	17%	0.0112	0.0117	4%	0.0146	0.0155	6%
Tin (Sn)	µg/g dw	0.0033	0.0036	9%	0.0028	0.0021	29%	0.00501	0.00561	11%	0.00431	0.00534	21%
Titanium (Ti)	µg/g dw	0.649	0.567	13%	0.375	0.3	22%	1.15	1.06	8%	1.12	1.12	0%
Uranium (U)	µg/g dw	0.0067	0.00733	9%	0.00522	0.00586	12%	0.00469	0.00493	5%	0.00653	0.00574	13%
Vanadium (V)	µg/g dw	0.0785	0.0876	11%	0.0489	0.0545	11%	0.128	0.128	0%	0.0932	0.0928	0%
Yttrium (Y)	µg/g dw	0.026	0.0182	35%	0.0126	0.0101	22%	0.0269	0.0303	12%	0.0383	0.0388	1%
Zinc (Zn)	µg/g dw	118	128	8%	76.7	76.7	0%	108	110	2%	126	125	1%
Zirconium (Zr)	µg/g dw	0.129	0.105	21%	0.0982	0.101	3%	0.0825	0.0801	3%	0.143	0.13	10%

Note: Highlighted values did not meet the data quality objective of ≤30% relative percent difference (RPD).

Table A.20a: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2014

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Aluminum (Al)	µg/g dw	-	1.2 (0.7 - 1.7)	1.3	Yes	-	104%	01B SRM 1577
		-	1.2 (0.7 - 1.7)	1.4	Yes	-	113%	03B SRM 1577 (Set 18)
		-	1.2 (0.7 - 1.7)	1.3	Yes	-	106%	03B SRM 1577 (Set 19)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	102%	05B SRM 1577
		-	1.2 (0.7 - 1.7)	1.4	Yes	-	113%	06B SRM 1577
		-	1.2 (0.7 - 1.7)	1.1	Yes	-	94%	07B SRM 1577 (Set 18)
		-	1.2 (0.7 - 1.7)	1.4	Yes	-	113%	07B SRM 1577 (Set 19)
		-	1.2 (0.7 - 1.7)	1.3	Yes	-	105%	09B SRM 1577
		-	1.2 (0.7 - 1.7)	1.5	Yes	-	123%	11B SRM 1577
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	97%	13B SRM 1577
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	96%	15B SRM 1577
		-	200	74	-	-	37%	02B CRM DOLT-4
		-	200	99	-	-	50%	04B CRM DOLT-4 (Set 18)
		-	200	53	-	-	27%	04B CRM DOLT-4 (Set 19)
		-	200	58	-	-	29%	06B CRM DOLT-4
		-	200	86	-	-	43%	08B CRM DOLT-4 (Set 18)
		-	200	57	-	-	29%	08B CRM DOLT-4 (Set 19)
		-	200	46	-	-	23%	10B CRM DOLT-4
		-	200	57	-	-	28%	12B CRM DOLT-4
		-	200	46	-	-	23%	14B CRM DOLT-4
		-	200	67	-	-	34%	16B CRM DOLT-4
Antimony (Sb)	µg/g dw	-	0.009 (0.004 - 0.014)	0.007	Yes	-	76%	01B SRM 1577
		-	0.009 (0.004 - 0.014)	0.011	Yes	-	117%	03B SRM 1577 (Set 18)
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	77%	03B SRM 1577 (Set 19)
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	74%	05B SRM 1577
		-	0.009 (0.004 - 0.014)	0.009	Yes	-	98%	06B SRM 1577
		-	0.009 (0.004 - 0.014)	0.006	Yes	-	70%	07B SRM 1577 (Set 18)
		-	0.009 (0.004 - 0.014)	0.006	Yes	-	64%	07B SRM 1577 (Set 19)
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	83%	09B SRM 1577
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	74%	11B SRM 1577
		-	0.009 (0.004 - 0.014)	0.009	Yes	-	99%	13B SRM 1577
		-	0.009 (0.004 - 0.014)	0.014	Yes	-	157%	15B SRM 1577
		-	-	0.018	-	-	-	02B CRM DOLT-4
		-	-	0.011	-	-	-	04B CRM DOLT-4 (Set 18)
		-	-	0.011	-	-	-	04B CRM DOLT-4 (Set 19)
		-	-	0.012	-	-	-	06B CRM DOLT-4
		-	-	0.010	-	-	-	08B CRM DOLT-4 (Set 18)
		-	-	0.016	-	-	-	08B CRM DOLT-4 (Set 19)
		-	-	0.013	-	-	-	10B CRM DOLT-4
		-	-	0.013	-	-	-	12B CRM DOLT-4
		-	-	0.014	-	-	-	14B CRM DOLT-4
		-	-	0.011	-	-	-	16B CRM DOLT-4
Arsenic (As)	µg/g dw	0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.051	Yes	93%	95%	01B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.055	Yes	100%	102%	03B SRM 1577 (Set 18)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.047	No	85%	86%	03B SRM 1577 (Set 19)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.056	Yes	102%	104%	05B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.059	Yes	107%	109%	06B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.058	Yes	106%	108%	07B SRM 1577 (Set 18)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.049	No	90%	91%	07B SRM 1577 (Set 19)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.047	No	86%	88%	09B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.054	Yes	97%	99%	11B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.068	No	124%	126%	13B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.076	No	138%	141%	15B SRM 1577
		9.66 (9.04 - 10.28)	-	8.3	No	85%	-	02B CRM DOLT-4
		9.66 (9.04 - 10.28)	-	8.3	No	86%	-	04B CRM DOLT-4 (Set 18)
		9.66 (9.04 - 10.28)	-	7.7	No	80%	-	04B CRM DOLT-4 (Set 19)
		9.66 (9.04 - 10.28)	-	8.3	No	86%	-	06B CRM DOLT-4
		9.66 (9.04 - 10.28)	-	8.3	No	86%	-	08B CRM DOLT-4 (Set 18)
		9.66 (9.04 - 10.28)	-	8.1	No	84%	-	08B CRM DOLT-4 (Set 19)
		9.66 (9.04 - 10.28)	-	8.4	No	87%	-	10B CRM DOLT-4
		9.66 (9.04 - 10.28)	-	8.1	No	84%	-	12B CRM DOLT-4
		9.66 (9.04 - 10.28)	-	9.3	Yes	96%	-	14B CRM DOLT-4
		9.66 (9.04 - 10.28)	-	8.4	No	87%	-	16B CRM DOLT-4
Cadmium (Cd)	µg/g dw	0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.30	Yes	111%	106%	01B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.29	Yes	106%	101%	03B SRM 1577 (Set 18)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.30	Yes	110%	105%	03B SRM 1577 (Set 19)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.29	Yes	106%	101%	05B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.36	No	132%	126%	06B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.28	Yes	105%	100%	07B SRM 1577 (Set 18)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.29	Yes	109%	104%	07B SRM 1577 (Set 19)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.30	Yes	110%	105%	09B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.30	Yes	111%	106%	11B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.34	No	124%	118%	13B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.34	No	126%	120%	15B SRM 1577
		24.3 (23.5 - 25.1)	-	22.0	No	91%	-	02B CRM DOLT-4
		24.3 (23.5 - 25.1)	-	22.6	No	93%	-	04B CRM DOLT-4 (Set 18)
		24.3 (23.5 - 25.1)	-	21.3	No	88%	-	04B CRM DOLT-4 (Set 19)
		24.3 (23.5 - 25.1)	-	21.6	No	89%	-	06B CRM DOLT-4
		24.3 (23.5 - 25.1)	-	21.2	No	87%	-	08B CRM DOLT-4 (Set 18)
		24.3 (23.5 - 25.1)	-	21.6	No	89%	-	08B CRM DOLT-4 (Set 19)
		24.3 (23.5 - 25.1)	-	21.9	No	90%	-	10B CRM DOLT-4
		24.3 (23.5 - 25.1)	-	21.6	No	89%	-	12B CRM DOLT-4
		24.3 (23.5 - 25.1)	-	24.1	Yes	99%	-	14B CRM DOLT-4
		24.3 (23.5 - 25.1)	-	22.1	No	91%	-	16B CRM DOLT-4

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20a: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2014

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Calcium (Ca)	µg/g dw	124 (118 - 130)	121 (107 - 135)	123	Yes	99%	102%	01B SRM 1577
		124 (118 - 130)	121 (107 - 135)	125	Yes	101%	103%	03B SRM 1577 (Set 18)
		124 (118 - 130)	121 (107 - 135)	132	Yes	106%	109%	03B SRM 1577 (Set 19)
		124 (118 - 130)	121 (107 - 135)	124	Yes	100%	102%	05B SRM 1577
		124 (118 - 130)	121 (107 - 135)	149	Yes	120%	123%	06B SRM 1577
		124 (118 - 130)	121 (107 - 135)	116	No	94%	96%	07B SRM 1577 (Set 18)
		124 (118 - 130)	121 (107 - 135)	121	Yes	98%	100%	07B SRM 1577 (Set 19)
		124 (118 - 130)	121 (107 - 135)	121	Yes	98%	100%	09B SRM 1577
		124 (118 - 130)	121 (107 - 135)	126	Yes	102%	104%	11B SRM 1577
		124 (118 - 130)	121 (107 - 135)	122	Yes	98%	101%	13B SRM 1577
		124 (118 - 130)	121 (107 - 135)	130	Yes	105%	107%	15B SRM 1577
		-	680	632	-	-	93%	02B CRM DOLT-4
		-	680	710	-	-	104%	04B CRM DOLT-4 (Set 18)
		-	680	665	-	-	98%	04B CRM DOLT-4 (Set 19)
		-	680	638	-	-	94%	06B CRM DOLT-4
		-	680	657	-	-	97%	08B CRM DOLT-4 (Set 18)
		-	680	660	-	-	97%	08B CRM DOLT-4 (Set 19)
		-	680	645	-	-	95%	10B CRM DOLT-4
		-	680	629	-	-	93%	12B CRM DOLT-4
		-	680	628	-	-	92%	14B CRM DOLT-4
		-	680	671	-	-	99%	16B CRM DOLT-4
Cesium (Cs)	µg/g dw	-	0.015 (0.011 - 0.019)	0.012	Yes	-	83%	01B SRM 1577
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	87%	03B SRM 1577 (Set 18)
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	83%	03B SRM 1577 (Set 19)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	83%	05B SRM 1577
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	83%	05B SRM 1577
		-	0.015 (0.011 - 0.019)	0.015	Yes	-	102%	06B SRM 1577
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	83%	07B SRM 1577 (Set 18)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	82%	07B SRM 1577 (Set 19)
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	85%	09B SRM 1577
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	82%	11B SRM 1577
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	82%	13B SRM 1577
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	86%	15B SRM 1577
		-	-	0.098	-	-	-	02B CRM DOLT-4
		-	-	0.106	-	-	-	04B CRM DOLT-4 (Set 18)
		-	-	0.103	-	-	-	04B CRM DOLT-4 (Set 19)
		-	-	0.099	-	-	-	06B CRM DOLT-4
		-	-	0.098	-	-	-	08B CRM DOLT-4 (Set 18)
		-	-	0.098	-	-	-	08B CRM DOLT-4 (Set 19)
		-	-	0.098	-	-	-	10B CRM DOLT-4
		-	-	0.098	-	-	-	12B CRM DOLT-4
		-	-	0.093	-	-	-	14B CRM DOLT-4
		-	-	0.096	-	-	-	16B CRM DOLT-4
Chromium (Cr)	µg/g dw	0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.23	No	260%	208%	01B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.13	No	142%	114%	03B SRM 1577 (Set 18)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.18	No	207%	165%	03B SRM 1577 (Set 19)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.14	No	155%	124%	05B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.16	No	183%	146%	06B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.13	No	150%	120%	07B SRM 1577 (Set 18)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.11	No	126%	101%	07B SRM 1577 (Set 19)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.11	No	127%	102%	09B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.13	No	147%	117%	11B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.11	No	126%	101%	13B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.37	No	418%	335%	15B SRM 1577
		-	1.40	1.36	-	-	97%	02B CRM DOLT-4
		-	1.40	1.24	-	-	89%	04B CRM DOLT-4 (Set 18)
		-	1.40	1.19	-	-	85%	04B CRM DOLT-4 (Set 19)
		-	1.40	1.09	-	-	78%	06B CRM DOLT-4
		-	1.40	1.17	-	-	84%	08B CRM DOLT-4 (Set 18)
		-	1.40	1.10	-	-	79%	08B CRM DOLT-4 (Set 19)
		-	1.40	1.07	-	-	76%	10B CRM DOLT-4
		-	1.40	1.31	-	-	94%	12B CRM DOLT-4
		-	1.40	1.09	-	-	78%	14B CRM DOLT-4
		-	1.40	1.10	-	-	79%	16B CRM DOLT-4
Cobalt (Co)	µg/g dw	-	0.22 (0.18 - 0.26)	0.25	Yes	-	113%	01B SRM 1577
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	110%	03B SRM 1577 (Set 18)
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	107%	03B SRM 1577 (Set 19)
		-	0.22 (0.18 - 0.26)	0.23	Yes	-	105%	05B SRM 1577
		-	0.22 (0.18 - 0.26)	0.28	No	-	129%	06B SRM 1577
		-	0.22 (0.18 - 0.26)	0.23	Yes	-	105%	07B SRM 1577 (Set 18)
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	109%	07B SRM 1577 (Set 19)
		-	0.22 (0.18 - 0.26)	0.23	Yes	-	106%	09B SRM 1577
		-	0.22 (0.18 - 0.26)	0.25	Yes	-	113%	11B SRM 1577
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	111%	13B SRM 1577
		-	0.22 (0.18 - 0.26)	0.25	Yes	-	115%	15B SRM 1577
		-	0.25	0.22	-	-	86%	02B CRM DOLT-4
		-	0.25	0.22	-	-	88%	04B CRM DOLT-4 (Set 18)
		-	0.25	0.20	-	-	78%	04B CRM DOLT-4 (Set 19)
		-	0.25	0.20	-	-	80%	06B CRM DOLT-4
		-	0.25	0.21	-	-	83%	08B CRM DOLT-4 (Set 18)
		-	0.25	0.21	-	-	83%	08B CRM DOLT-4 (Set 19)
		-	0.25	0.20	-	-	79%	10B CRM DOLT-4
		-	0.25	0.21	-	-	84%	12B CRM DOLT-4
		-	0.25	0.20	-	-	81%	14B CRM DOLT-4
		-	0.25	0.21	-	-	86%	16B CRM DOLT-4

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20a: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2014

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Copper (Cu)	µg/g dw	193 (183 - 203)	190 (180 - 200)	177	No	92%	93%	01B SRM 1577
		193 (183 - 203)	190 (180 - 200)	172	No	89%	91%	03B SRM 1577 (Set 18)
		193 (183 - 203)	190 (180 - 200)	169	No	88%	89%	03B SRM 1577 (Set 19)
		193 (183 - 203)	190 (180 - 200)	172	No	89%	91%	05B SRM 1577
		193 (183 - 203)	190 (180 - 200)	207	No	107%	109%	06B SRM 1577
		193 (183 - 203)	190 (180 - 200)	165	No	85%	87%	07B SRM 1577 (Set 18)
		193 (183 - 203)	190 (180 - 200)	169	No	88%	89%	07B SRM 1577 (Set 19)
		193 (183 - 203)	190 (180 - 200)	174	No	90%	92%	09B SRM 1577
		193 (183 - 203)	190 (180 - 200)	178	No	92%	94%	11B SRM 1577
		193 (183 - 203)	190 (180 - 200)	180	No	93%	95%	13B SRM 1577
		193 (183 - 203)	190 (180 - 200)	187	Yes	97%	98%	15B SRM 1577
		31.2 (30.1 - 32.3)	-	27.9	No	89%	-	02B CRM DOLT-4
		31.2 (30.1 - 32.3)	-	27.4	No	88%	-	04B CRM DOLT-4 (Set 18)
		31.2 (30.1 - 32.3)	-	25.7	No	82%	-	04B CRM DOLT-4 (Set 19)
		31.2 (30.1 - 32.3)	-	26.9	No	86%	-	06B CRM DOLT-4
		31.2 (30.1 - 32.3)	-	26.3	No	84%	-	08B CRM DOLT-4 (Set 18)
		31.2 (30.1 - 32.3)	-	27.4	No	88%	-	08B CRM DOLT-4 (Set 19)
		31.2 (30.1 - 32.3)	-	28.0	No	90%	-	10B CRM DOLT-4
		31.2 (30.1 - 32.3)	-	27.8	No	89%	-	12B CRM DOLT-4
		31.2 (30.1 - 32.3)	-	28.9	No	93%	-	14B CRM DOLT-4
		31.2 (30.1 - 32.3)	-	28.1	No	90%	-	16B CRM DOLT-4
Iron (Fe)	µg/g dw	268 (260 - 276)	263 (241 - 285)	273	Yes	102%	104%	01B SRM 1577
		268 (260 - 276)	263 (241 - 285)	266	Yes	99%	101%	03B SRM 1577 (Set 18)
		268 (260 - 276)	263 (241 - 285)	275	Yes	103%	105%	03B SRM 1577 (Set 19)
		268 (260 - 276)	263 (241 - 285)	259	No	97%	98%	05B SRM 1577
		268 (260 - 276)	263 (241 - 285)	335	No	125%	127%	06B SRM 1577
		268 (260 - 276)	263 (241 - 285)	253	No	94%	96%	07B SRM 1577 (Set 18)
		268 (260 - 276)	263 (241 - 285)	261	Yes	97%	99%	07B SRM 1577 (Set 19)
		268 (260 - 276)	263 (241 - 285)	268	Yes	100%	102%	09B SRM 1577
		268 (260 - 276)	263 (241 - 285)	270	Yes	101%	103%	11B SRM 1577
		268 (260 - 276)	263 (241 - 285)	264	Yes	99%	100%	13B SRM 1577
		268 (260 - 276)	263 (241 - 285)	278	No	104%	106%	15B SRM 1577
		1,833 (1,758 - 1,908)	-	1,790	Yes	98%	-	02B CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,810	Yes	99%	-	04B CRM DOLT-4 (Set 18)
		1,833 (1,758 - 1,908)	-	1,710	No	93%	-	04B CRM DOLT-4 (Set 19)
		1,833 (1,758 - 1,908)	-	1,660	No	91%	-	06B CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,670	No	91%	-	08B CRM DOLT-4 (Set 18)
		1,833 (1,758 - 1,908)	-	1,710	No	93%	-	08B CRM DOLT-4 (Set 19)
		1,833 (1,758 - 1,908)	-	1,730	No	94%	-	10B CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,720	No	94%	-	12B CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,670	No	91%	-	14B CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,730	No	94%	-	16B CRM DOLT-4
Lead (Pb)	µg/g dw	0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.37	Yes	110%	110%	01B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.36	Yes	105%	105%	03B SRM 1577 (Set 18)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.33	Yes	97%	97%	03B SRM 1577 (Set 19)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.35	Yes	101%	101%	05B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.48	No	140%	140%	06B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.31	Yes	91%	91%	07B SRM 1577 (Set 18)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.34	Yes	100%	100%	07B SRM 1577 (Set 19)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.35	Yes	102%	102%	09B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.35	Yes	102%	102%	11B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.36	Yes	105%	105%	13B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.38	Yes	111%	111%	15B SRM 1577
		0.16 (0.12 - 0.20)	-	0.23	Yes	141%	-	02B CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.14	Yes	86%	-	04B CRM DOLT-4 (Set 18)
		0.16 (0.12 - 0.20)	-	0.12	Yes	73%	-	04B CRM DOLT-4 (Set 19)
		0.16 (0.12 - 0.20)	-	0.12	Yes	73%	-	06B CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.11	No	69%	-	08B CRM DOLT-4 (Set 18)
		0.16 (0.12 - 0.20)	-	0.15	Yes	94%	-	08B CRM DOLT-4 (Set 19)
		0.16 (0.12 - 0.20)	-	0.15	Yes	91%	-	10B CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.13	Yes	83%	-	12B CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.11	No	71%	-	14B CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.14	Yes	85%	-	16B CRM DOLT-4
Magnesium (Mg)	µg/g dw	604 (595 - 613)	608 (577 - 639)	582	No	96%	96%	01B SRM 1577
		604 (595 - 613)	608 (577 - 639)	586	No	97%	96%	03B SRM 1577 (Set 18)
		604 (595 - 613)	608 (577 - 639)	612	Yes	101%	101%	03B SRM 1577 (Set 19)
		604 (595 - 613)	608 (577 - 639)	581	No	96%	96%	05B SRM 1577
		604 (595 - 613)	608 (577 - 639)	755	No	125%	124%	06B SRM 1577
		604 (595 - 613)	608 (577 - 639)	597	Yes	99%	98%	07B SRM 1577 (Set 18)
		604 (595 - 613)	608 (577 - 639)	588	No	97%	97%	07B SRM 1577 (Set 19)
		604 (595 - 613)	608 (577 - 639)	613	Yes	101%	101%	09B SRM 1577
		604 (595 - 613)	608 (577 - 639)	615	No	102%	101%	11B SRM 1577
		604 (595 - 613)	608 (577 - 639)	631	No	104%	104%	13B SRM 1577
		604 (595 - 613)	608 (577 - 639)	648	No	107%	107%	15B SRM 1577
		-	1,500	1,290	-	-	86%	02B CRM DOLT-4
		-	1,500	1,340	-	-	89%	04B CRM DOLT-4 (Set 18)
		-	1,500	1,310	-	-	87%	04B CRM DOLT-4 (Set 19)
		-	1,500	1,260	-	-	84%	06B CRM DOLT-4
		-	1,500	1,290	-	-	86%	08B CRM DOLT-4 (Set 18)
		-	1,500	1,300	-	-	87%	08B CRM DOLT-4 (Set 19)
		-	1,500	1,360	-	-	91%	10B CRM DOLT-4
		-	1,500	1,340	-	-	89%	12B CRM DOLT-4
		-	1,500	1,380	-	-	92%	14B CRM DOLT-4
		-	1,500	1,340	-	-	89%	16B CRM DOLT-4

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20a: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2014

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Manganese (Mn)	µg/g dw	10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.6	Yes	103%	104%	01B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.4	Yes	101%	102%	03B SRM 1577 (Set 18)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.8	Yes	105%	106%	03B SRM 1577 (Set 19)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	9.9	Yes	96%	97%	05B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	13.0	No	126%	127%	06B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	9.9	Yes	96%	97%	07B SRM 1577 (Set 18)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.2	Yes	99%	100%	07B SRM 1577 (Set 19)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.3	Yes	100%	101%	09B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.2	Yes	99%	100%	11B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	9.9	Yes	96%	97%	13B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.9	Yes	106%	107%	15B SRM 1577
		-	-	9.9	-	-	-	02B CRM DOLT-4
		-	-	10.4	-	-	-	04B CRM DOLT-4 (Set 18)
		-	-	9.5	-	-	-	04B CRM DOLT-4 (Set 19)
		-	-	9.1	-	-	-	06B CRM DOLT-4
		-	-	9.1	-	-	-	08B CRM DOLT-4 (Set 18)
		-	-	9.4	-	-	-	08B CRM DOLT-4 (Set 19)
		-	-	9.2	-	-	-	10B CRM DOLT-4
		-	-	9.4	-	-	-	12B CRM DOLT-4
		-	-	8.8	-	-	-	14B CRM DOLT-4
		-	-	9.4	-	-	-	16B CRM DOLT-4
Mercury (Hg)	µg/g dw	0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.020	No	128%	128%	01B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	136%	136%	03B SRM 1577 (Set 18)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.021	No	133%	133%	03B SRM 1577 (Set 19)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.023	No	143%	143%	05B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.026	No	159%	159%	06B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	138%	138%	07B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.019	No	118%	118%	09B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.020	No	126%	126%	11B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.005	No	33%	33%	13B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.011	No	69%	69%	15B SRM 1577
		2.58 (2.36 - 2.80)	-	2.37	Yes	92%	-	02B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.52	Yes	98%	-	04B CRM DOLT-4 (Set 18)
		2.58 (2.36 - 2.80)	-	2.47	Yes	96%	-	04B CRM DOLT-4 (Set 19)
		2.58 (2.36 - 2.80)	-	2.45	Yes	95%	-	06B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.44	Yes	95%	-	08B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.43	Yes	94%	-	10B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.49	Yes	97%	-	12B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.41	Yes	93%	-	14B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.44	Yes	95%	-	16B CRM DOLT-4
Molybdenum (Mo)	µg/g dw	-	3.2 (2.8 - 3.6)	3.6	Yes	-	113%	01B SRM 1577
		-	3.2 (2.8 - 3.6)	3.7	No	-	117%	03B SRM 1577 (Set 18)
		-	3.2 (2.8 - 3.6)	3.5	Yes	-	110%	03B SRM 1577 (Set 19)
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	111%	05B SRM 1577
		-	3.2 (2.8 - 3.6)	4.2	No	-	130%	06B SRM 1577
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	111%	07B SRM 1577 (Set 18)
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	112%	07B SRM 1577 (Set 19)
		-	3.2 (2.8 - 3.6)	3.5	Yes	-	110%	09B SRM 1577
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	113%	11B SRM 1577
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	112%	13B SRM 1577
		-	3.2 (2.8 - 3.6)	3.8	No	-	118%	15B SRM 1577
		-	1.00	1.04	-	-	104%	02B CRM DOLT-4
		-	1.00	1.07	-	-	107%	04B CRM DOLT-4 (Set 18)
		-	1.00	1.00	-	-	100%	04B CRM DOLT-4 (Set 19)
		-	1.00	1.01	-	-	101%	06B CRM DOLT-4
		-	1.00	1.04	-	-	104%	08B CRM DOLT-4 (Set 18)
		-	1.00	1.03	-	-	103%	08B CRM DOLT-4 (Set 19)
		-	1.00	1.02	-	-	102%	10B CRM DOLT-4
		-	1.00	1.04	-	-	104%	12B CRM DOLT-4
		-	1.00	1.00	-	-	100%	14B CRM DOLT-4
		-	1.00	1.02	-	-	102%	16B CRM DOLT-4
Nickel (Ni)	µg/g dw	-	0.18 (0.10 - 0.26)	0.10	Yes	-	57%	01B SRM 1577
		-	0.18 (0.10 - 0.26)	0.04	No	-	23%	03B SRM 1577 (Set 18)
		-	0.18 (0.10 - 0.26)	0.07	No	-	38%	03B SRM 1577 (Set 19)
		-	0.18 (0.10 - 0.26)	0.07	No	-	39%	05B SRM 1577
		-	0.18 (0.10 - 0.26)	0.19	Yes	-	107%	06B SRM 1577
		-	0.18 (0.10 - 0.26)	0.04	No	-	22%	07B SRM 1577 (Set 18)
		-	0.18 (0.10 - 0.26)	0.03	No	-	19%	07B SRM 1577 (Set 19)
		-	0.18 (0.10 - 0.26)	0.03	No	-	17%	09B SRM 1577
		-	0.18 (0.10 - 0.26)	0.04	No	-	21%	11B SRM 1577
		-	0.18 (0.10 - 0.26)	0.04	No	-	25%	13B SRM 1577
		-	0.18 (0.10 - 0.26)	0.18	Yes	-	98%	15B SRM 1577
		0.97 (0.86 - 1.08)	-	1.30	No	134%	-	02B CRM DOLT-4
		0.97 (0.86 - 1.08)	-	0.85	No	88%	-	04B CRM DOLT-4 (Set 18)
		0.97 (0.86 - 1.08)	-	0.80	No	83%	-	04B CRM DOLT-4 (Set 19)
		0.97 (0.86 - 1.08)	-	0.71	No	73%	-	06B CRM DOLT-4
		0.97 (0.86 - 1.08)	-	0.86	Yes	89%	-	08B CRM DOLT-4 (Set 18)
		0.97 (0.86 - 1.08)	-	0.74	Yes	76%	-	08B CRM DOLT-4 (Set 19)
		0.97 (0.86 - 1.08)	-	0.84	No	86%	-	10B CRM DOLT-4
		0.97 (0.86 - 1.08)	-	0.90	Yes	92%	-	12B CRM DOLT-4
		0.97 (0.86 - 1.08)	-	0.82	No	84%	-	14B CRM DOLT-4
		0.97 (0.86 - 1.08)	-	0.84	No	86%	-	16B CRM DOLT-4

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20a: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2014

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Phosphorus (P)	µg/g dw	-	11,200 (10,100 - 12,300)	11,700	Yes	-	104%	01B SRM 1577
		-	11,200 (10,100 - 12,300)	11,300	Yes	-	101%	03B SRM 1577 (Set 18)
		-	11,200 (10,100 - 12,300)	11,400	Yes	-	102%	03B SRM 1577 (Set 19)
		-	11,200 (10,100 - 12,300)	11,400	Yes	-	102%	05B SRM 1577
		-	11,200 (10,100 - 12,300)	15,200	No	-	136%	06B SRM 1577
		-	11,200 (10,100 - 12,300)	12,100	Yes	-	108%	07B SRM 1577 (Set 18)
		-	11,200 (10,100 - 12,300)	11,000	Yes	-	98%	07B SRM 1577 (Set 19)
		-	11,200 (10,100 - 12,300)	11,400	Yes	-	102%	09B SRM 1577
		-	11,200 (10,100 - 12,300)	11,900	Yes	-	106%	11B SRM 1577
		-	11,200 (10,100 - 12,300)	13,300	No	-	119%	13B SRM 1577
		-	11,200 (10,100 - 12,300)	13,800	No	-	123%	15B SRM 1577
		-	-	12,100	-	-	-	02B CRM DOLT-4
		-	-	11,800	-	-	-	04B CRM DOLT-4 (Set 18)
		-	-	11,400	-	-	-	04B CRM DOLT-4 (Set 19)
		-	-	11,300	-	-	-	06B CRM DOLT-4
		-	-	12,200	-	-	-	08B CRM DOLT-4 (Set 18)
		-	-	11,900	-	-	-	08B CRM DOLT-4 (Set 19)
		-	-	12,100	-	-	-	10B CRM DOLT-4
		-	-	12,100	-	-	-	12B CRM DOLT-4
		-	-	13,200	-	-	-	14B CRM DOLT-4
		-	-	12,300	-	-	-	16B CRM DOLT-4
Potassium (K)	µg/g dw	9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,900	No	112%	112%	01B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,600	No	109%	109%	03B SRM 1577 (Set 18)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,600	No	109%	109%	03B SRM 1577 (Set 19)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,600	No	109%	109%	05B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	13,100	No	135%	135%	06B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,800	No	111%	111%	07B SRM 1577 (Set 18)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,600	No	109%	109%	07B SRM 1577 (Set 19)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,800	No	111%	111%	09B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,600	No	109%	109%	11B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,300	Yes	106%	106%	13B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,600	No	109%	109%	15B SRM 1577
		-	9,800	9,180	-	-	94%	02B CRM DOLT-4
		-	9,800	9,520	-	-	97%	04B CRM DOLT-4 (Set 18)
		-	9,800	9,590	-	-	98%	04B CRM DOLT-4 (Set 19)
		-	9,800	8,950	-	-	91%	06B CRM DOLT-4
		-	9,800	9,570	-	-	98%	08B CRM DOLT-4 (Set 18)
		-	9,800	9,760	-	-	100%	08B CRM DOLT-4 (Set 19)
		-	9,800	10,000	-	-	102%	10B CRM DOLT-4
		-	9,800	9,160	-	-	93%	12B CRM DOLT-4
		-	9,800	9,270	-	-	95%	14B CRM DOLT-4
		-	9,800	9,300	-	-	95%	16B CRM DOLT-4
Rubidium (Rb)	µg/g dw	-	18.3 (17.3 - 19.3)	19.0	Yes	-	104%	01B SRM 1577
		-	18.3 (17.3 - 19.3)	18.8	Yes	-	103%	03B SRM 1577 (Set 18)
		-	18.3 (17.3 - 19.3)	18.9	Yes	-	103%	03B SRM 1577 (Set 19)
		-	18.3 (17.3 - 19.3)	18.4	Yes	-	101%	05B SRM 1577
		-	18.3 (17.3 - 19.3)	23.1	No	-	126%	06B SRM 1577
		-	18.3 (17.3 - 19.3)	18.6	Yes	-	102%	07B SRM 1577 (Set 18)
		-	18.3 (17.3 - 19.3)	18.4	Yes	-	101%	07B SRM 1577 (Set 19)
		-	18.3 (17.3 - 19.3)	18.4	Yes	-	101%	09B SRM 1577
		-	18.3 (17.3 - 19.3)	18.7	Yes	-	102%	11B SRM 1577
		-	18.3 (17.3 - 19.3)	18.8	Yes	-	103%	13B SRM 1577
		-	18.3 (17.3 - 19.3)	19.5	No	-	107%	15B SRM 1577
		-	-	3.2	-	-	-	02B CRM DOLT-4
		-	-	3.2	-	-	-	04B CRM DOLT-4 (Set 18)
		-	-	3.1	-	-	-	04B CRM DOLT-4 (Set 19)
		-	-	3.1	-	-	-	06B CRM DOLT-4
		-	-	3.2	-	-	-	08B CRM DOLT-4 (Set 18)
		-	-	3.1	-	-	-	08B CRM DOLT-4 (Set 19)
		-	-	3.1	-	-	-	10B CRM DOLT-4
		-	-	3.1	-	-	-	12B CRM DOLT-4
		-	-	3.0	-	-	-	14B CRM DOLT-4
		-	-	3.2	-	-	-	16B CRM DOLT-4
Selenium (Se)	µg/g dw	1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.12	Yes	102%	103%	01B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.15	Yes	105%	106%	03B SRM 1577 (Set 18)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.04	Yes	95%	95%	03B SRM 1577 (Set 19)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.14	Yes	104%	105%	05B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.55	No	141%	142%	06B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.00	Yes	91%	92%	07B SRM 1577 (Set 18)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.15	Yes	105%	106%	07B SRM 1577 (Set 19)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	0.98	No	89%	90%	09B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.16	Yes	105%	106%	11B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.42	No	129%	130%	13B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.54	No	140%	141%	15B SRM 1577
		8.30 (6.96 - 9.64)	-	7.56	Yes	91%	-	02B CRM DOLT-4
		8.30 (6.96 - 9.64)	-	7.39	Yes	89%	-	04B CRM DOLT-4 (Set 18)
		8.30 (6.96 - 9.64)	-	7.29	Yes	88%	-	04B CRM DOLT-4 (Set 19)
		8.30 (6.96 - 9.64)	-	7.62	Yes	92%	-	06B CRM DOLT-4
		8.30 (6.96 - 9.64)	-	7.60	Yes	92%	-	08B CRM DOLT-4 (Set 18)
		8.30 (6.96 - 9.64)	-	7.32	Yes	88%	-	08B CRM DOLT-4 (Set 19)
		8.30 (6.96 - 9.64)	-	7.48	Yes	90%	-	10B CRM DOLT-4
		8.30 (6.96 - 9.64)	-	7.49	Yes	90%	-	12B CRM DOLT-4
		8.30 (6.96 - 9.64)	-	8.98	Yes	108%	-	14B CRM DOLT-4
		8.30 (6.96 - 9.64)	-	7.99	Yes	96%	-	16B CRM DOLT-4

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20a: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2014

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Silver (Ag)	µg/g dw	-	0.062 (0.051 - 0.073)	0.055	Yes	-	89%	01B SRM 1577
		-	0.062 (0.051 - 0.073)	0.058	Yes	-	94%	03B SRM 1577 (Set 18)
		-	0.062 (0.051 - 0.073)	0.058	Yes	-	93%	03B SRM 1577 (Set 19)
		-	0.062 (0.051 - 0.073)	0.055	Yes	-	88%	05B SRM 1577
		-	0.062 (0.051 - 0.073)	0.068	Yes	-	110%	06B SRM 1577
		-	0.062 (0.051 - 0.073)	0.055	Yes	-	89%	07B SRM 1577 (Set 18)
		-	0.062 (0.051 - 0.073)	0.054	Yes	-	87%	07B SRM 1577 (Set 19)
		-	0.062 (0.051 - 0.073)	0.054	Yes	-	87%	09B SRM 1577
		-	0.062 (0.051 - 0.073)	0.056	Yes	-	90%	11B SRM 1577
		-	0.062 (0.051 - 0.073)	0.057	Yes	-	92%	13B SRM 1577
		-	0.062 (0.051 - 0.073)	0.061	Yes	-	99%	15B SRM 1577
		0.93 (0.86 - 1.00)	-	0.81	No	87%	-	02B CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.84	No	91%	-	04B CRM DOLT-4 (Set 18)
		0.93 (0.86 - 1.00)	-	0.80	No	86%	-	04B CRM DOLT-4 (Set 19)
		0.93 (0.86 - 1.00)	-	0.81	No	87%	-	06B CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.80	No	86%	-	08B CRM DOLT-4 (Set 18)
		0.93 (0.86 - 1.00)	-	0.81	No	88%	-	08B CRM DOLT-4 (Set 19)
		0.93 (0.86 - 1.00)	-	0.81	No	87%	-	10B CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.82	No	88%	-	12B CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.84	No	91%	-	14B CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.83	No	89%	-	16B CRM DOLT-4
Sodium (Na)	µg/g dw	2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,300	Yes	95%	96%	01B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,150	No	88%	90%	03B SRM 1577 (Set 18)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,130	No	88%	89%	03B SRM 1577 (Set 19)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,260	No	93%	95%	05B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,740	No	113%	115%	06B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,300	Yes	95%	96%	07B SRM 1577 (Set 18)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,290	No	94%	96%	07B SRM 1577 (Set 19)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,400	Yes	99%	100%	09B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,270	No	93%	95%	11B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,210	No	91%	92%	13B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,240	No	92%	94%	15B SRM 1577
		-	6,800	6,170	-	-	91%	02B CRM DOLT-4
		-	6,800	6,490	-	-	95%	04B CRM DOLT-4 (Set 18)
		-	6,800	6,130	-	-	90%	04B CRM DOLT-4 (Set 19)
		-	6,800	6,000	-	-	88%	06B CRM DOLT-4
		-	6,800	6,150	-	-	90%	08B CRM DOLT-4 (Set 18)
		-	6,800	6,250	-	-	92%	08B CRM DOLT-4 (Set 19)
		-	6,800	6,520	-	-	96%	10B CRM DOLT-4
		-	6,800	6,350	-	-	93%	12B CRM DOLT-4
		-	6,800	6,270	-	-	92%	14B CRM DOLT-4
		-	6,800	6,350	-	-	93%	16B CRM DOLT-4
Strontium (Sr)	µg/g dw	-	0.16 (0.13 - 0.19)	0.14	Yes	-	89%	01B SRM 1577
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	94%	03B SRM 1577 (Set 18)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	90%	03B SRM 1577 (Set 19)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	89%	05B SRM 1577
		-	0.16 (0.13 - 0.19)	0.17	Yes	-	108%	06B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	07B SRM 1577 (Set 18)
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	91%	07B SRM 1577 (Set 19)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	89%	09B SRM 1577
		-	0.16 (0.13 - 0.19)	0.16	Yes	-	100%	11B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	87%	13B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	90%	15B SRM 1577
		-	5.5	5.1	-	-	93%	02B CRM DOLT-4
		-	5.5	5.5	-	-	100%	04B CRM DOLT-4 (Set 18)
		-	5.5	4.8	-	-	87%	04B CRM DOLT-4 (Set 19)
		-	5.5	5.0	-	-	91%	06B CRM DOLT-4
		-	5.5	5.1	-	-	93%	08B CRM DOLT-4 (Set 18)
		-	5.5	5.1	-	-	92%	08B CRM DOLT-4 (Set 19)
		-	5.5	4.8	-	-	88%	10B CRM DOLT-4
		-	5.5	4.9	-	-	89%	12B CRM DOLT-4
		-	5.5	4.7	-	-	86%	14B CRM DOLT-4
		-	5.5	5.1	-	-	93%	16B CRM DOLT-4
Tin (Sn)	µg/g dw	-	0.016 (0.012 - 0.020)	0.013	Yes	-	82%	01B SRM 1577
		-	0.016 (0.012 - 0.020)	0.011	No	-	70%	03B SRM 1577 (Set 18)
		-	0.016 (0.012 - 0.020)	0.012	Yes	-	77%	03B SRM 1577 (Set 19)
		-	0.016 (0.012 - 0.020)	0.009	No	-	55%	05B SRM 1577
		-	0.016 (0.012 - 0.020)	0.051	No	-	316%	06B SRM 1577
		-	0.016 (0.012 - 0.020)	0.019	Yes	-	121%	07B SRM 1577 (Set 18)
		-	0.016 (0.012 - 0.020)	0.009	No	-	58%	07B SRM 1577 (Set 19)
		-	0.016 (0.012 - 0.020)	0.009	No	-	56%	09B SRM 1577
		-	0.016 (0.012 - 0.020)	0.008	No	-	53%	11B SRM 1577
		-	0.016 (0.012 - 0.020)	0.015	Yes	-	94%	13B SRM 1577
		-	0.016 (0.012 - 0.020)	0.012	Yes	-	77%	15B SRM 1577
		-	0.17	0.19	-	-	111%	02B CRM DOLT-4
		-	0.17	0.16	-	-	92%	04B CRM DOLT-4 (Set 18)
		-	0.17	0.16	-	-	92%	04B CRM DOLT-4 (Set 19)
		-	0.17	0.15	-	-	88%	06B CRM DOLT-4
		-	0.17	0.15	-	-	86%	08B CRM DOLT-4 (Set 18)
		-	0.17	0.11	-	-	65%	08B CRM DOLT-4 (Set 19)
		-	0.17	0.15	-	-	90%	10B CRM DOLT-4
		-	0.17	0.16	-	-	91%	12B CRM DOLT-4
		-	0.17	0.15	-	-	91%	14B CRM DOLT-4
		-	0.17	0.16	-	-	95%	16B CRM DOLT-4

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20a: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2014

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Vanadium (V)	µg/g dw	-	0.058 (0.052 - 0.064)	0.061	Yes	-	105%	01B SRM 1577
		-	0.058 (0.052 - 0.064)	0.061	Yes	-	104%	03B SRM 1577 (Set 18)
		-	0.058 (0.052 - 0.064)	0.058	Yes	-	100%	03B SRM 1577 (Set 19)
		-	0.058 (0.052 - 0.064)	0.062	Yes	-	106%	05B SRM 1577
		-	0.058 (0.052 - 0.064)	0.070	No	-	120%	06B SRM 1577
		-	0.058 (0.052 - 0.064)	0.060	Yes	-	104%	07B SRM 1577 (Set 18)
		-	0.058 (0.052 - 0.064)	0.060	Yes	-	104%	07B SRM 1577 (Set 19)
		-	0.058 (0.052 - 0.064)	0.059	Yes	-	101%	09B SRM 1577
		-	0.058 (0.052 - 0.064)	0.061	Yes	-	105%	11B SRM 1577
		-	0.058 (0.052 - 0.064)	0.056	Yes	-	97%	13B SRM 1577
		-	0.058 (0.052 - 0.064)	0.065	No	-	113%	15B SRM 1577
		-	0.60	0.57	-	-	95%	02B CRM DOLT-4
		-	0.60	0.58	-	-	97%	04B CRM DOLT-4 (Set 18)
		-	0.60	0.47	-	-	78%	04B CRM DOLT-4 (Set 19)
		-	0.60	0.48	-	-	80%	06B CRM DOLT-4
		-	0.60	0.56	-	-	94%	08B CRM DOLT-4 (Set 18)
		-	0.60	0.54	-	-	90%	08B CRM DOLT-4 (Set 19)
		-	0.60	0.44	-	-	73%	10B CRM DOLT-4
		-	0.60	0.49	-	-	81%	12B CRM DOLT-4
		-	0.60	0.43	-	-	71%	14B CRM DOLT-4
		-	0.60	0.53	-	-	88%	16B CRM DOLT-4
Zinc (Zn)	µg/g dw	130 (117 - 143)	131 (123 - 139)	122	Yes	94%	93%	01B SRM 1577
		130 (117 - 143)	131 (123 - 139)	123	Yes	95%	94%	03B SRM 1577 (Set 18)
		130 (117 - 143)	131 (123 - 139)	119	Yes	92%	91%	03B SRM 1577 (Set 19)
		130 (117 - 143)	131 (123 - 139)	122	Yes	94%	93%	05B SRM 1577
		130 (117 - 143)	131 (123 - 139)	161	No	124%	123%	06B SRM 1577
		130 (117 - 143)	131 (123 - 139)	121	Yes	93%	92%	07B SRM 1577 (Set 18)
		130 (117 - 143)	131 (123 - 139)	121	Yes	93%	92%	07B SRM 1577 (Set 19)
		130 (117 - 143)	131 (123 - 139)	121	Yes	93%	92%	09B SRM 1577
		130 (117 - 143)	131 (123 - 139)	130	Yes	100%	99%	11B SRM 1577
		130 (117 - 143)	131 (123 - 139)	156	No	120%	119%	13B SRM 1577
		130 (117 - 143)	131 (123 - 139)	164	No	126%	125%	15B SRM 1577
		116 (110 - 122)	-	103	No	89%	-	02B CRM DOLT-4
		116 (110 - 122)	-	101	No	87%	-	04B CRM DOLT-4 (Set 18)
		116 (110 - 122)	-	95	No	82%	-	04B CRM DOLT-4 (Set 19)
		116 (110 - 122)	-	101	No	87%	-	06B CRM DOLT-4
		116 (110 - 122)	-	101	No	87%	-	08B CRM DOLT-4 (Set 18)
		116 (110 - 122)	-	99	No	86%	-	08B CRM DOLT-4 (Set 19)
		116 (110 - 122)	-	103	No	89%	-	10B CRM DOLT-4
		116 (110 - 122)	-	104	No	90%	-	12B CRM DOLT-4
		116 (110 - 122)	-	123	No	106%	-	14B CRM DOLT-4
		116 (110 - 122)	-	108	No	93%	-	16B CRM DOLT-4

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20b: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2015

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Aluminum (Al)	µg/g dw	-	1.2 (0.7 - 1.7)	1.2	Yes	-	101%	01B SRM 1577 (Set 21)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	100%	05B SRM 1577
		-	1.2 (0.7 - 1.7)	1.3	Yes	-	109%	07B SRM 1577
		-	1.2 (0.7 - 1.7)	1.4	Yes	-	118%	09B SRM 1577
		-	1.2 (0.7 - 1.7)	1.6	Yes	-	133%	11B SRM 1577
		-	1.2 (0.7 - 1.7)	1.5	Yes	-	122%	01B SRM 1577 (Set 26)
		-	1.2 (0.7 - 1.7)	1.3	Yes	-	106%	03B SRM 1577
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	103%	13B SRM 1577
		-	1.2 (0.7 - 1.7)	1.5	Yes	-	122%	15B SRM 1577
		-	200	130	-	-	65%	01B CRM DOLT-4
		-	200	57	-	-	29%	02A CRM DOLT-4
		-	200	49	-	-	25%	04B CRM DOLT-4
		-	200	48	-	-	24%	06B CRM DOLT-4
		-	200	48	-	-	24%	08B CRM DOLT-4
		-	-	13	-	-	-	02B CRM DOLT-5
		-	-	16	-	-	-	12B CRM DOLT-5
		-	-	14	-	-	-	14B CRM DOLT-5
		-	-	14	-	-	-	16B CRM DOLT-5
		-	-	18	-	-	-	04B CRM DOLT-5
		-	-	16	-	-	-	06B CRM DOLT-5
		-	-	14	-	-	-	08B CRM DOLT-5
		-	-	14	-	-	-	10B CRM DOLT-5
		-	-	15	-	-	-	17B CRM DOLT-5
Antimony (Sb)	µg/g dw	-	0.009 (0.004 - 0.014)	0.008	Yes	-	93%	01B SRM 1577 (Set 21)
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	73%	05B SRM 1577
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	76%	07B SRM 1577
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	76%	09B SRM 1577
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	76%	09B SRM 1577
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	74%	11B SRM 1577
		-	0.009 (0.004 - 0.014)	0.008	Yes	-	85%	01B SRM 1577 (Set 26)
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	76%	03B SRM 1577
		-	0.009 (0.004 - 0.014)	0.008	Yes	-	84%	13B SRM 1577
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	77%	15B SRM 1577
		-	-	0.014	-	-	-	01B CRM DOLT-4
		-	-	0.011	-	-	-	02A CRM DOLT-4
		-	-	0.012	-	-	-	04B CRM DOLT-4
		-	-	0.010	-	-	-	06B CRM DOLT-4
		-	-	0.014	-	-	-	08B CRM DOLT-4
		-	0.013	0.012	-	-	89%	02B CRM DOLT-5
		-	0.013	0.017	-	-	132%	12B CRM DOLT-5
		-	0.013	0.013	-	-	98%	14B CRM DOLT-5
		-	0.013	0.019	-	-	144%	16B CRM DOLT-5
		-	0.013	0.011	-	-	85%	04B CRM DOLT-5
		-	0.013	0.013	-	-	97%	06B CRM DOLT-5
		-	0.013	0.013	-	-	103%	08B CRM DOLT-5
		-	0.013	0.012	-	-	89%	10B CRM DOLT-5
		-	0.013	0.012	-	-	88%	17B CRM DOLT-5
Arsenic (As)	µg/g dw	0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.067	No	121%	123%	01B SRM 1577 (Set 21)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.050	Yes	91%	93%	05B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.057	Yes	104%	106%	07B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.061	No	110%	112%	09B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.050	Yes	92%	93%	11B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.049	No	89%	91%	01B SRM 1577 (Set 26)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.040	No	73%	74%	03B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.057	Yes	103%	105%	13B SRM 1577
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.050	Yes	90%	92%	15B SRM 1577
		9.66 (9.04 - 10.28)	-	9.03	No	93%	-	01B CRM DOLT-4
		9.66 (9.04 - 10.28)	-	8.92	No	92%	-	02A CRM DOLT-4
		9.66 (9.04 - 10.28)	-	8.77	No	91%	-	04B CRM DOLT-4
		9.66 (9.04 - 10.28)	-	8.81	No	91%	-	06B CRM DOLT-4
		9.66 (9.04 - 10.28)	-	8.70	No	90%	-	08B CRM DOLT-4
		34.6 (32.2 - 37.0)	-	31.4	No	91%	-	02B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	31.8	No	92%	-	12B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	32.9	Yes	95%	-	14B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	31.1	No	90%	-	16B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	32.9	Yes	95%	-	04B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	32.3	Yes	93%	-	06B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	32.4	Yes	94%	-	08B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	33.9	Yes	98%	-	10B CRM DOLT-5
		34.6 (32.2 - 37.0)	-	31.6	No	91%	-	17B CRM DOLT-5
Cadmium (Cd)	µg/g dw	0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.343	No	127%	121%	01B SRM 1577 (Set 21)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.295	Yes	109%	104%	05B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.305	Yes	113%	108%	07B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.288	Yes	107%	102%	09B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.276	Yes	102%	98%	11B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.295	Yes	109%	104%	01B SRM 1577 (Set 26)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.301	Yes	111%	106%	03B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.296	Yes	110%	105%	13B SRM 1577
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.283	Yes	105%	100%	15B SRM 1577
		24.3 (23.5 - 25.1)	-	23.3	No	96%	-	01B CRM DOLT-4
		24.3 (23.5 - 25.1)	-	22.8	No	94%	-	02A CRM DOLT-4
		24.3 (23.5 - 25.1)	-	22.2	No	91%	-	04B CRM DOLT-4
		24.3 (23.5 - 25.1)	-	22.2	No	91%	-	06B CRM DOLT-4
		24.3 (23.5 - 25.1)	-	22.7	No	93%	-	08B CRM DOLT-4
		14.5 (13.9 - 15.1)	-	13.0	No	90%	-	02B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	12.7	No	88%	-	12B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.3	No	92%	-	14B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.0	No	90%	-	16B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.3	No	92%	-	04B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.0	No	90%	-	06B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.6	No	94%	-	08B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.1	No	90%	-	10B CRM DOLT-5
		14.5 (13.9 - 15.1)	-	13.1	No	90%	-	17B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20b: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2015

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Calcium (Ca)	µg/g dw	124 (118 - 130)	121 (107 - 135)	127	Yes	102%	105%	01B SRM 1577 (Set 21)
		124 (118 - 130)	121 (107 - 135)	120	Yes	97%	99%	05B SRM 1577
		124 (118 - 130)	121 (107 - 135)	130	Yes	105%	107%	07B SRM 1577
		124 (118 - 130)	121 (107 - 135)	120	Yes	97%	99%	09B SRM 1577
		124 (118 - 130)	121 (107 - 135)	127	Yes	102%	105%	11B SRM 1577
		124 (118 - 130)	121 (107 - 135)	129	Yes	104%	107%	01B SRM 1577 (Set 26)
		124 (118 - 130)	121 (107 - 135)	124	Yes	100%	102%	03B SRM 1577
		124 (118 - 130)	121 (107 - 135)	122	Yes	98%	101%	13B SRM 1577
		124 (118 - 130)	121 (107 - 135)	118	Yes	95%	98%	15B SRM 1577
		-	680	710	-	-	104%	01B CRM DOLT-4
		-	680	625	-	-	92%	02A CRM DOLT-4
		-	680	632	-	-	93%	04B CRM DOLT-4
		-	680	638	-	-	94%	06B CRM DOLT-4
		-	680	641	-	-	94%	08B CRM DOLT-4
		550 (470 - 630)	-	612	Yes	111%	-	02B CRM DOLT-5
		550 (470 - 630)	-	598	Yes	109%	-	12B CRM DOLT-5
		550 (470 - 630)	-	646	No	117%	-	14B CRM DOLT-5
		550 (470 - 630)	-	569	Yes	103%	-	16B CRM DOLT-5
		550 (470 - 630)	-	527	Yes	96%	-	04B CRM DOLT-5
		550 (470 - 630)	-	548	Yes	100%	-	06B CRM DOLT-5
		550 (470 - 630)	-	548	Yes	100%	-	08B CRM DOLT-5
		550 (470 - 630)	-	590	Yes	107%	-	10B CRM DOLT-5
		550 (470 - 630)	-	560	Yes	102%	-	17B CRM DOLT-5
Cesium (Cs)	µg/g dw	-	0.015 (0.011 - 0.019)	0.013	Yes	-	83%	01B SRM 1577 (Set 21)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	82%	05B SRM 1577
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	87%	07B SRM 1577
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	87%	09B SRM 1577
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	87%	09B SRM 1577
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	80%	11B SRM 1577
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	88%	01B SRM 1577 (Set 26)
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	89%	03B SRM 1577
		-	0.015 (0.011 - 0.019)	0.014	Yes	-	91%	13B SRM 1577
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	86%	15B SRM 1577
		-	-	0.090	-	-	-	01B CRM DOLT-4
		-	-	0.100	-	-	-	02A CRM DOLT-4
		-	-	0.099	-	-	-	04B CRM DOLT-4
		-	-	0.101	-	-	-	06B CRM DOLT-4
		-	-	0.105	-	-	-	08B CRM DOLT-4
		-	-	0.074	-	-	-	02B CRM DOLT-5
		-	-	0.071	-	-	-	12B CRM DOLT-5
		-	-	0.075	-	-	-	14B CRM DOLT-5
		-	-	0.074	-	-	-	16B CRM DOLT-5
		-	-	0.073	-	-	-	04B CRM DOLT-5
		-	-	0.072	-	-	-	06B CRM DOLT-5
		-	-	0.072	-	-	-	08B CRM DOLT-5
		-	-	0.072	-	-	-	10B CRM DOLT-5
		-	-	0.069	-	-	-	17B CRM DOLT-5
Chromium (Cr)	µg/g dw	0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.17	No	194%	155%	01B SRM 1577 (Set 21)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.15	No	173%	138%	05B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.11	No	124%	99%	07B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.13	No	144%	115%	09B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.14	No	164%	131%	11B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.13	No	149%	119%	01B SRM 1577 (Set 26)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.09	Yes	107%	86%	03B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.12	No	134%	107%	13B SRM 1577
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.11	No	124%	99%	15B SRM 1577
		-	1.40	1.05	-	-	75%	01B CRM DOLT-4
		-	1.40	1.54	-	-	110%	02A CRM DOLT-4
		-	1.40	1.13	-	-	81%	04B CRM DOLT-4
		-	1.40	1.22	-	-	87%	06B CRM DOLT-4
		-	1.40	1.08	-	-	77%	08B CRM DOLT-4
		-	-	1.80	-	-	-	02B CRM DOLT-5
		-	-	3.03	-	-	-	12B CRM DOLT-5
		-	-	1.89	-	-	-	14B CRM DOLT-5
		-	-	1.96	-	-	-	16B CRM DOLT-5
		-	-	2.34	-	-	-	04B CRM DOLT-5
		-	-	1.90	-	-	-	06B CRM DOLT-5
		-	-	2.10	-	-	-	08B CRM DOLT-5
		-	-	2.04	-	-	-	10B CRM DOLT-5
		-	-	2.13	-	-	-	17B CRM DOLT-5
Cobalt (Co)	µg/g dw	-	0.22 (0.18 - 0.26)	0.24	Yes	-	110%	01B SRM 1577 (Set 21)
		-	0.22 (0.18 - 0.26)	0.25	Yes	-	114%	05B SRM 1577
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	111%	07B SRM 1577
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	110%	09B SRM 1577
		-	0.22 (0.18 - 0.26)	0.23	Yes	-	106%	11B SRM 1577
		-	0.22 (0.18 - 0.26)	0.22	Yes	-	100%	01B SRM 1577 (Set 26)
		-	0.22 (0.18 - 0.26)	0.22	Yes	-	101%	03B SRM 1577
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	107%	13B SRM 1577
		-	0.22 (0.18 - 0.26)	0.22	Yes	-	102%	15B SRM 1577
		-	0.25	0.20	-	-	80%	01B CRM DOLT-4
		-	0.25	0.21	-	-	86%	02A CRM DOLT-4
		-	0.25	0.22	-	-	86%	04B CRM DOLT-4
		-	0.25	0.21	-	-	86%	06B CRM DOLT-4
		-	0.25	0.21	-	-	83%	08B CRM DOLT-4
		0.267 (0.241 - 0.293)	-	0.22	No	84%	-	02B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.25	Yes	94%	-	12B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.25	Yes	94%	-	14B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.23	No	87%	-	16B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.26	Yes	98%	-	04B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.26	Yes	96%	-	06B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.25	Yes	93%	-	08B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.24	Yes	91%	-	10B CRM DOLT-5
		0.267 (0.241 - 0.293)	-	0.24	Yes	90%	-	17B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20b: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2015

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Copper (Cu)	µg/g dw	193 (183 - 203)	190 (180 - 200)	185	Yes	96%	97%	01B SRM 1577 (Set 21)
		193 (183 - 203)	190 (180 - 200)	187	Yes	97%	98%	05B SRM 1577
		193 (183 - 203)	190 (180 - 200)	174	No	90%	92%	07B SRM 1577
		193 (183 - 203)	190 (180 - 200)	176	No	91%	93%	09B SRM 1577
		193 (183 - 203)	190 (180 - 200)	169	No	88%	89%	11B SRM 1577
		193 (183 - 203)	190 (180 - 200)	164	No	85%	86%	01B SRM 1577 (Set 26)
		193 (183 - 203)	190 (180 - 200)	166	No	86%	87%	03B SRM 1577
		193 (183 - 203)	190 (180 - 200)	175	No	91%	92%	13B SRM 1577
		193 (183 - 203)	190 (180 - 200)	175	No	91%	92%	15B SRM 1577
		31.2 (30.1 - 32.3)	-	28.2	No	90%	-	01B CRM DOLT-4
		31.2 (30.1 - 32.3)	-	28.3	No	91%	-	02A CRM DOLT-4
		31.2 (30.1 - 32.3)	-	29.5	No	95%	-	04B CRM DOLT-4
		31.2 (30.1 - 32.3)	-	29.2	No	94%	-	06B CRM DOLT-4
		31.2 (30.1 - 32.3)	-	28.9	No	93%	-	08B CRM DOLT-4
		35.0 (32.6 - 37.4)	-	28.5	No	81%	-	02B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	28.7	No	82%	-	12B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	32.3	No	92%	-	14B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	30.8	No	88%	-	16B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	31.7	No	91%	-	04B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	32.2	No	92%	-	06B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	31	No	89%	-	08B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	30.1	No	86%	-	10B CRM DOLT-5
		35.0 (32.6 - 37.4)	-	29.9	No	85%	-	17B CRM DOLT-5
Iron (Fe)	µg/g dw	268 (260 - 276)	263 (241 - 285)	266	Yes	99%	101%	01B SRM 1577 (Set 21)
		268 (260 - 276)	263 (241 - 285)	266	Yes	99%	101%	05B SRM 1577
		268 (260 - 276)	263 (241 - 285)	251	No	94%	95%	07B SRM 1577
		268 (260 - 276)	263 (241 - 285)	253	No	94%	96%	09B SRM 1577
		268 (260 - 276)	263 (241 - 285)	248	No	93%	94%	11B SRM 1577
		268 (260 - 276)	263 (241 - 285)	250	No	93%	95%	01B SRM 1577 (Set 26)
		268 (260 - 276)	263 (241 - 285)	249	No	93%	95%	03B SRM 1577
		268 (260 - 276)	263 (241 - 285)	262	Yes	98%	100%	13B SRM 1577
		268 (260 - 276)	263 (241 - 285)	252	No	94%	96%	15B SRM 1577
		1,833 (1,758 - 1,908)	-	1,670	No	91%	-	01B CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,700	No	93%	-	02A CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,730	No	94%	-	04B CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,740	No	95%	-	06B CRM DOLT-4
		1,833 (1,758 - 1,908)	-	1,700	No	93%	-	08B CRM DOLT-4
		1,070 (990 - 1,150)	-	991	Yes	93%	-	02B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,020	Yes	95%	-	12B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,090	Yes	102%	-	14B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,010	Yes	94%	-	16B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,080	Yes	101%	-	04B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,110	Yes	104%	-	06B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,060	Yes	99%	-	08B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,040	Yes	97%	-	10B CRM DOLT-5
		1,070 (990 - 1,150)	-	1,040	Yes	97%	-	17B CRM DOLT-5
Lead (Pb)	µg/g dw	0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.36	Yes	105%	105%	01B SRM 1577 (Set 21)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.46	No	136%	136%	05B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.33	Yes	97%	97%	07B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.34	Yes	99%	99%	09B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.36	Yes	106%	106%	11B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.37	Yes	107%	107%	01B SRM 1577 (Set 26)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.37	Yes	108%	108%	03B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.39	Yes	114%	114%	13B SRM 1577
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.38	Yes	112%	112%	15B SRM 1577
		0.16 (0.12 - 0.20)	-	0.13	Yes	81%	-	01B CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.12	Yes	77%	-	02A CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.15	Yes	91%	-	04B CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.14	Yes	88%	-	06B CRM DOLT-4
		0.16 (0.12 - 0.20)	-	0.12	Yes	73%	-	08B CRM DOLT-4
		0.16 (0.13 - 0.19)	-	0.15	Yes	96%	-	02B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.29	No	183%	-	12B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.21	No	133%	-	14B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.16	Yes	101%	-	16B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.20	No	125%	-	04B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.16	Yes	100%	-	06B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.16	Yes	101%	-	08B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.16	Yes	100%	-	10B CRM DOLT-5
		0.16 (0.13 - 0.19)	-	0.16	Yes	98%	-	17B CRM DOLT-5
Magnesium (Mg)	µg/g dw	604 (595 - 613)	608 (577 - 639)	625	No	103%	103%	01B SRM 1577 (Set 21)
		604 (595 - 613)	608 (577 - 639)	591	No	98%	97%	05B SRM 1577
		604 (595 - 613)	608 (577 - 639)	580	No	96%	95%	07B SRM 1577
		604 (595 - 613)	608 (577 - 639)	594	No	98%	98%	09B SRM 1577
		604 (595 - 613)	608 (577 - 639)	585	No	97%	96%	11B SRM 1577
		604 (595 - 613)	608 (577 - 639)	570	No	94%	94%	01B SRM 1577 (Set 26)
		604 (595 - 613)	608 (577 - 639)	573	No	95%	94%	03B SRM 1577
		604 (595 - 613)	608 (577 - 639)	596	Yes	99%	98%	13B SRM 1577
		604 (595 - 613)	608 (577 - 639)	572	No	95%	94%	15B SRM 1577
		-	1,500	1,270	-	-	85%	01B CRM DOLT-4
		-	1,500	1,310	-	-	87%	02A CRM DOLT-4
		-	1,500	1,300	-	-	87%	04B CRM DOLT-4
		-	1,500	1,290	-	-	86%	06B CRM DOLT-4
		-	1,500	1,330	-	-	89%	08B CRM DOLT-4
		940 (840 - 1,040)	-	845	Yes	90%	-	02B CRM DOLT-5
		940 (840 - 1,040)	-	843	Yes	90%	-	12B CRM DOLT-5
		940 (840 - 1,040)	-	941	Yes	100%	-	14B CRM DOLT-5
		940 (840 - 1,040)	-	840	Yes	89%	-	16B CRM DOLT-5
		940 (840 - 1,040)	-	868	Yes	92%	-	04B CRM DOLT-5
		940 (840 - 1,040)	-	887	Yes	94%	-	06B CRM DOLT-5
		940 (840 - 1,040)	-	885	Yes	94%	-	08B CRM DOLT-5
		940 (840 - 1,040)	-	877	Yes	93%	-	10B CRM DOLT-5
		940 (840 - 1,040)	-	868	Yes	92%	-	17B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20b: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2015

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Manganese (Mn)	µg/g dw	10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.3	Yes	100%	101%	01B SRM 1577 (Set 21)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.2	Yes	99%	100%	05B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	9.8	Yes	95%	96%	07B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	9.9	Yes	96%	97%	09B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.3	Yes	100%	101%	11B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.4	Yes	101%	102%	01B SRM 1577 (Set 26)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.5	Yes	102%	103%	03B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.3	Yes	100%	101%	13B SRM 1577
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.1	Yes	98%	99%	15B SRM 1577
		-	-	10.6	-	-	-	01B CRM DOLT-4
		-	-	9.3	-	-	-	02A CRM DOLT-4
		-	-	9.1	-	-	-	04B CRM DOLT-4
		-	-	9.1	-	-	-	06B CRM DOLT-4
		-	-	9.0	-	-	-	08B CRM DOLT-4
		-	-	8.9	-	-	-	02B CRM DOLT-5
		-	-	9.5	-	-	-	12B CRM DOLT-5
		-	-	9.3	-	-	-	14B CRM DOLT-5
		-	-	8.6	-	-	-	16B CRM DOLT-5
		-	-	8.5	-	-	-	04B CRM DOLT-5
		-	-	8.7	-	-	-	06B CRM DOLT-5
		-	-	8.4	-	-	-	08B CRM DOLT-5
		-	-	8.9	-	-	-	10B CRM DOLT-5
		-	-	8.9	-	-	-	17B CRM DOLT-5
Mercury (Hg)	µg/g dw	0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.031	No	194%	194%	01B SRM 1577 (Set 21)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.025	No	153%	153%	05B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.023	No	143%	143%	07B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	138%	138%	09B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	137%	137%	11B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.025	No	158%	158%	01B SRM 1577 (Set 26)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.023	No	143%	143%	03B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	138%	138%	13B SRM 1577
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	134%	134%	15B SRM 1577
		2.58 (2.36 - 2.80)	-	2.51	Yes	97%	-	01B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.45	Yes	95%	-	02A CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.63	Yes	102%	-	04B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.55	Yes	99%	-	06B CRM DOLT-4
		2.58 (2.36 - 2.80)	-	2.55	Yes	99%	-	08B CRM DOLT-4
		0.44 (0.26 - 0.62)	-	0.38	Yes	87%	-	02B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.40	Yes	92%	-	12B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.40	Yes	91%	-	14B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.39	Yes	89%	-	16B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.39	Yes	88%	-	04B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.42	Yes	96%	-	06B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.40	Yes	92%	-	08B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.38	Yes	87%	-	10B CRM DOLT-5
		0.44 (0.26 - 0.62)	-	0.41	Yes	92%	-	17B CRM DOLT-5
Molybdenum (Mo)	µg/g dw	-	3.2 (2.8 - 3.6)	3.7	No	-	116%	01B SRM 1577 (Set 21)
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	113%	05B SRM 1577
		-	3.2 (2.8 - 3.6)	3.7	No	-	117%	07B SRM 1577
		-	3.2 (2.8 - 3.6)	3.8	No	-	117%	09B SRM 1577
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	112%	11B SRM 1577
		-	3.2 (2.8 - 3.6)	3.5	Yes	-	110%	01B SRM 1577 (Set 26)
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	111%	03B SRM 1577
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	114%	13B SRM 1577
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	112%	15B SRM 1577
		-	1	1.0	-	-	101%	01B CRM DOLT-4
		-	1	1.1	-	-	110%	02A CRM DOLT-4
		-	1	1.1	-	-	107%	04B CRM DOLT-4
		-	1	1.1	-	-	108%	06B CRM DOLT-4
		-	1	1.1	-	-	110%	08B CRM DOLT-4
		1.41 (1.19 - 1.63)	-	1.4	Yes	98%	-	02B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.5	Yes	108%	-	12B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.4	Yes	101%	-	14B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.4	Yes	99%	-	16B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.4	Yes	102%	-	04B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.4	Yes	101%	-	06B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.5	Yes	106%	-	08B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.4	Yes	101%	-	10B CRM DOLT-5
		1.41 (1.19 - 1.63)	-	1.4	Yes	97%	-	17B CRM DOLT-5
Nickel (Ni)	µg/g dw	-	0.18 (0.10 - 0.26)	0.08	No	-	43%	01B SRM 1577 (Set 21)
		-	0.18 (0.10 - 0.26)	0.05	No	-	30%	05B SRM 1577
		-	0.18 (0.10 - 0.26)	0.03	No	-	17%	07B SRM 1577
		-	0.18 (0.10 - 0.26)	0.03	No	-	17%	09B SRM 1577
		-	0.18 (0.10 - 0.26)	0.04	No	-	25%	11B SRM 1577
		-	0.18 (0.10 - 0.26)	0.03	No	-	17%	01B SRM 1577 (Set 26)
		-	0.18 (0.10 - 0.26)	0.03	No	-	18%	03B SRM 1577
		-	0.18 (0.10 - 0.26)	0.04	No	-	21%	13B SRM 1577
		-	0.18 (0.10 - 0.26)	0.03	No	-	18%	15B SRM 1577
		0.97 (0.86 - 1.08)	-	0.71	No	73%	-	01B CRM DOLT-4
		0.97 (0.86 - 1.08)	-	1.10	No	113%	-	02A CRM DOLT-4
		0.97 (0.86 - 1.08)	-	0.90	Yes	92%	-	04B CRM DOLT-4
		0.97 (0.86 - 1.08)	-	0.87	Yes	89%	-	06B CRM DOLT-4
		0.97 (0.86 - 1.08)	-	0.98	Yes	101%	-	08B CRM DOLT-4
		-	-	1.18	-	-	-	02B CRM DOLT-5
		-	-	1.71	-	-	-	12B CRM DOLT-5
		-	-	1.32	-	-	-	14B CRM DOLT-5
		-	-	1.31	-	-	-	16B CRM DOLT-5
		-	-	1.61	-	-	-	04B CRM DOLT-5
		-	-	1.35	-	-	-	06B CRM DOLT-5
		-	-	1.43	-	-	-	08B CRM DOLT-5
		-	-	1.34	-	-	-	10B CRM DOLT-5
		-	-	1.39	-	-	-	17B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20b: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2015

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Phosphorus (P)	µg/g dw	-	11,200 (10,100 - 12,300)	13,600	No	-	121%	01B SRM 1577 (Set 21)
		-	11,200 (10,100 - 12,300)	11,100	Yes	-	99%	05B SRM 1577
		-	11,200 (10,100 - 12,300)	11,700	Yes	-	104%	07B SRM 1577
		-	11,200 (10,100 - 12,300)	11,400	Yes	-	102%	09B SRM 1577
		-	11,200 (10,100 - 12,300)	11,600	Yes	-	104%	11B SRM 1577
		-	11,200 (10,100 - 12,300)	12,000	Yes	-	107%	01B SRM 1577 (Set 26)
		-	11,200 (10,100 - 12,300)	11,800	Yes	-	105%	03B SRM 1577
		-	11,200 (10,100 - 12,300)	11,900	Yes	-	106%	13B SRM 1577
		-	11,200 (10,100 - 12,300)	11,800	Yes	-	105%	15B SRM 1577
		-	-	12,800	-	-	-	01B CRM DOLT-4
		-	-	12,100	-	-	-	02A CRM DOLT-4
		-	-	11,700	-	-	-	04B CRM DOLT-4
		-	-	11,400	-	-	-	06B CRM DOLT-4
		-	-	12,300	-	-	-	08B CRM DOLT-4
		-	11,500	11,200	-	-	97%	02B CRM DOLT-5
		-	11,500	11,500	-	-	100%	12B CRM DOLT-5
		-	11,500	12,000	-	-	104%	14B CRM DOLT-5
		-	11,500	11,700	-	-	102%	16B CRM DOLT-5
		-	11,500	11,000	-	-	96%	04B CRM DOLT-5
		-	11,500	10,700	-	-	93%	06B CRM DOLT-5
		-	11,500	11,400	-	-	99%	08B CRM DOLT-5
		-	11,500	12,100	-	-	105%	10B CRM DOLT-5
		-	11,500	11,400	-	-	99%	17B CRM DOLT-5
Potassium (K)	µg/g dw	9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,400	No	107%	107%	01B SRM 1577 (Set 21)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,400	No	107%	107%	05B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,100	Yes	104%	104%	07B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,200	Yes	105%	105%	09B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,500	No	108%	108%	11B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,600	No	109%	109%	01B SRM 1577 (Set 26)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,400	No	107%	107%	03B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,900	No	112%	112%	13B SRM 1577
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,300	Yes	106%	106%	15B SRM 1577
		-	9,800	8,610	-	-	88%	01B CRM DOLT-4
		-	9,800	9,200	-	-	94%	02A CRM DOLT-4
		-	9,800	9,430	-	-	96%	04B CRM DOLT-4
		-	9,800	9,320	-	-	95%	06B CRM DOLT-4
		-	9,800	9,580	-	-	98%	08B CRM DOLT-4
		14,400 (11,400 - 17,400)	-	15,000	Yes	104%	-	02B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	15,800	Yes	110%	-	12B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	16,900	Yes	117%	-	14B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	15,800	Yes	110%	-	16B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	16,200	Yes	113%	-	04B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	16,100	Yes	112%	-	06B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	15,500	Yes	108%	-	08B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	16,600	Yes	115%	-	10B CRM DOLT-5
		14,400 (11,400 - 17,400)	-	15,000	Yes	104%	-	17B CRM DOLT-5
Rubidium (Rb)	µg/g dw	-	18.3 (17.3 - 19.3)	19.2	Yes	-	105%	01B SRM 1577 (Set 21)
		-	18.3 (17.3 - 19.3)	19.2	Yes	-	105%	05B SRM 1577
		-	18.3 (17.3 - 19.3)	18.8	Yes	-	103%	07B SRM 1577
		-	18.3 (17.3 - 19.3)	18.9	Yes	-	103%	09B SRM 1577
		-	18.3 (17.3 - 19.3)	19.0	Yes	-	104%	11B SRM 1577
		-	18.3 (17.3 - 19.3)	18.6	Yes	-	102%	01B SRM 1577 (Set 26)
		-	18.3 (17.3 - 19.3)	18.7	Yes	-	102%	03B SRM 1577
		-	18.3 (17.3 - 19.3)	19.3	Yes	-	105%	13B SRM 1577
		-	18.3 (17.3 - 19.3)	18.7	Yes	-	102%	15B SRM 1577
		-	-	2.9	-	-	-	01B CRM DOLT-4
		-	-	3.2	-	-	-	02A CRM DOLT-4
		-	-	3.3	-	-	-	04B CRM DOLT-4
		-	-	3.3	-	-	-	06B CRM DOLT-4
		-	-	3.2	-	-	-	08B CRM DOLT-4
		-	-	4.9	-	-	-	02B CRM DOLT-5
		-	-	5.1	-	-	-	12B CRM DOLT-5
		-	-	5.3	-	-	-	14B CRM DOLT-5
		-	-	5.0	-	-	-	16B CRM DOLT-5
		-	-	5.2	-	-	-	04B CRM DOLT-5
		-	-	5.1	-	-	-	06B CRM DOLT-5
		-	-	5.2	-	-	-	08B CRM DOLT-5
		-	-	5.2	-	-	-	10B CRM DOLT-5
		-	-	5.2	-	-	-	08B CRM DOLT-5
		-	-	5.2	-	-	-	10B CRM DOLT-5
		-	-	5.0	-	-	-	17B CRM DOLT-5
Selenium (Se)	µg/g dw	1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.5	No	133%	134%	01B SRM 1577 (Set 21)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	111%	112%	05B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.1	Yes	100%	101%	07B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	109%	110%	09B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.0	Yes	95%	95%	11B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.3	No	114%	115%	01B SRM 1577 (Set 26)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.0	No	87%	88%	03B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.1	Yes	95%	96%	13B SRM 1577
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.0	Yes	91%	92%	15B SRM 1577
		8.30 (6.96 - 9.64)	-	9.15	Yes	110%	-	01B CRM DOLT-4
		8.30 (6.96 - 9.64)	-	8.34	Yes	100%	-	02A CRM DOLT-4
		8.30 (6.96 - 9.64)	-	7.92	Yes	95%	-	04B CRM DOLT-4
		8.30 (6.96 - 9.64)	-	7.62	Yes	92%	-	06B CRM DOLT-4
		8.30 (6.96 - 9.64)	-	8.00	Yes	96%	-	08B CRM DOLT-4
		8.3 (6.5 - 10.1)	-	6.8	Yes	82%	-	02B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.1	Yes	85%	-	12B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.2	Yes	87%	-	14B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.3	Yes	87%	-	16B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.3	Yes	88%	-	04B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.1	Yes	86%	-	06B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.5	Yes	91%	-	08B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	8.2	Yes	98%	-	10B CRM DOLT-5
		8.3 (6.5 - 10.1)	-	7.7	Yes	92%	-	17B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20b: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2015

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Silver (Ag)	µg/g dw	-	0.062 (0.051 - 0.073)	0.058	Yes	-	93%	01B SRM 1577 (Set 21)
		-	0.062 (0.051 - 0.073)	0.057	Yes	-	91%	05B SRM 1577
		-	0.062 (0.051 - 0.073)	0.057	Yes	-	92%	07B SRM 1577
		-	0.062 (0.051 - 0.073)	0.058	Yes	-	94%	09B SRM 1577
		-	0.062 (0.051 - 0.073)	0.058	Yes	-	93%	11B SRM 1577
		-	0.062 (0.051 - 0.073)	0.057	Yes	-	92%	01B SRM 1577 (Set 26)
		-	0.062 (0.051 - 0.073)	0.056	Yes	-	91%	03B SRM 1577
		-	0.062 (0.051 - 0.073)	0.058	Yes	-	94%	13B SRM 1577
		-	0.062 (0.051 - 0.073)	0.058	Yes	-	94%	15B SRM 1577
		0.93 (0.86 - 1.00)	-	0.781	No	84%	-	01B CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.827	No	89%	-	02A CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.827	No	89%	-	04B CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.825	No	89%	-	06B CRM DOLT-4
		0.93 (0.86 - 1.00)	-	0.853	No	92%	-	08B CRM DOLT-4
		2.05 (1.97 - 2.13)	-	1.820	No	89%	-	02B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.830	No	89%	-	12B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.860	No	91%	-	14B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.830	No	89%	-	16B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.690	No	82%	-	04B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.550	No	76%	-	06B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.910	No	93%	-	08B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	0.109	No	5%	-	10B CRM DOLT-5
		2.05 (1.97 - 2.13)	-	1.750	No	85%	-	17B CRM DOLT-5
Sodium (Na)	µg/g dw	2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,240	No	92%	94%	01B SRM 1577 (Set 21)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,090	No	86%	87%	05B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,030	No	84%	85%	07B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,020	No	83%	85%	09B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,020	No	83%	85%	11B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	1,870	No	77%	78%	01B SRM 1577 (Set 26)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	1,850	No	76%	77%	03B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,020	No	83%	85%	13B SRM 1577
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	1,900	No	78%	79%	15B SRM 1577
		-	6,800	5,480	-	-	81%	01B CRM DOLT-4
		-	6,800	6,290	-	-	93%	02A CRM DOLT-4
		-	6,800	6,240	-	-	92%	04B CRM DOLT-4
		-	6,800	6,240	-	-	92%	06B CRM DOLT-4
		-	6,800	6,180	-	-	91%	08B CRM DOLT-4
		9,900 (8,300 - 11,500)	-	8,970	Yes	91%	-	02B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	9,120	Yes	92%	-	12B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	10,300	Yes	104%	-	14B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	9,230	Yes	93%	-	16B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	9,640	Yes	97%	-	04B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	9,930	Yes	100%	-	06B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	9,820	Yes	99%	-	08B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	9,530	Yes	96%	-	10B CRM DOLT-5
		9,900 (8,300 - 11,500)	-	10,300	Yes	104%	-	17B CRM DOLT-5
Strontium (Sr)	µg/g dw	-	0.16 (0.13 - 0.19)	0.16	Yes	-	98%	01B SRM 1577 (Set 21)
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	91%	05B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	90%	07B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	89%	09B SRM 1577
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	91%	11B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	01B SRM 1577 (Set 26)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	89%	03B SRM 1577
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	91%	13B SRM 1577
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	86%	15B SRM 1577
		-	5.5	5.8	-	-	106%	01B CRM DOLT-4
		-	5.5	5.2	-	-	95%	02A CRM DOLT-4
		-	5.5	5.2	-	-	95%	04B CRM DOLT-4
		-	5.5	5.2	-	-	95%	06B CRM DOLT-4
		-	5.5	5.1	-	-	92%	08B CRM DOLT-4
		3.73 (3.47 - 3.99)	-	3.7	Yes	100%	-	02B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.9	Yes	106%	-	12B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	4.0	No	108%	-	14B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.6	Yes	97%	-	16B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.8	Yes	101%	-	04B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.8	Yes	101%	-	06B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.7	Yes	99%	-	08B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.9	Yes	105%	-	10B CRM DOLT-5
		3.73 (3.47 - 3.99)	-	3.7	Yes	99%	-	17B CRM DOLT-5
Tin (Sn)	µg/g dw	-	0.016 (0.012 - 0.020)	0.019	Yes	-	116%	01B SRM 1577 (Set 21)
		-	0.016 (0.012 - 0.020)	0.065	No	-	405%	05B SRM 1577
		-	0.016 (0.012 - 0.020)	0.009	No	-	57%	07B SRM 1577
		-	0.016 (0.012 - 0.020)	0.029	No	-	182%	09B SRM 1577
		-	0.016 (0.012 - 0.020)	0.010	No	-	64%	11B SRM 1577
		-	0.016 (0.012 - 0.020)	0.008	No	-	49%	01B SRM 1577 (Set 26)
		-	0.016 (0.012 - 0.020)	0.010	No	-	59%	03B SRM 1577
		-	0.016 (0.012 - 0.020)	0.013	Yes	-	79%	13B SRM 1577
		-	0.016 (0.012 - 0.020)	0.009	No	-	59%	15B SRM 1577
		-	0.17	0.16	-	-	95%	01B CRM DOLT-4
		-	0.17	0.16	-	-	92%	02A CRM DOLT-4
		-	0.17	0.15	-	-	90%	04B CRM DOLT-4
		-	0.17	0.15	-	-	91%	06B CRM DOLT-4
		-	0.17	0.16	-	-	96%	08B CRM DOLT-4
		0.069 (0.033 - 0.105)	-	0.07	Yes	98%	-	02B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	84%	-	12B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	82%	-	14B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	88%	-	16B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.07	Yes	96%	-	04B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	92%	-	06B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	89%	-	08B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	82%	-	10B CRM DOLT-5
		0.069 (0.033 - 0.105)	-	0.06	Yes	88%	-	17B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20b: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2015

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Vanadium (V)	µg/g dw	-	0.058 (0.052 - 0.064)	0.061	Yes	-	105%	01B SRM 1577 (Set 21)
		-	0.058 (0.052 - 0.064)	0.060	Yes	-	104%	05B SRM 1577
		-	0.058 (0.052 - 0.064)	0.060	Yes	-	103%	07B SRM 1577
		-	0.058 (0.052 - 0.064)	0.059	Yes	-	101%	09B SRM 1577
		-	0.058 (0.052 - 0.064)	0.063	Yes	-	108%	11B SRM 1577
		-	0.058 (0.052 - 0.064)	0.054	Yes	-	94%	01B SRM 1577 (Set 26)
		-	0.058 (0.052 - 0.064)	0.060	Yes	-	103%	03B SRM 1577
		-	0.058 (0.052 - 0.064)	0.059	Yes	-	102%	13B SRM 1577
		-	0.058 (0.052 - 0.064)	0.055	Yes	-	95%	15B SRM 1577
		-	0.6	0.662	-	-	110%	01B CRM DOLT-4
		-	0.6	0.476	-	-	79%	02A CRM DOLT-4
		-	0.6	0.459	-	-	77%	04B CRM DOLT-4
		-	0.6	0.469	-	-	78%	06B CRM DOLT-4
		-	0.6	0.441	-	-	74%	08B CRM DOLT-4
		0.51 (0.45 - 0.57)	-	0.461	Yes	90%	-	02B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.499	Yes	98%	-	12B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.496	Yes	97%	-	14B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.468	Yes	92%	-	16B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.517	Yes	101%	-	04B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.496	Yes	97%	-	06B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.488	Yes	96%	-	08B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.500	Yes	98%	-	10B CRM DOLT-5
		0.51 (0.45 - 0.57)	-	0.490	Yes	96%	-	17B CRM DOLT-5
Zinc (Zn)	µg/g dw	130 (117 - 143)	131 (123 - 139)	157	No	121%	120%	01B SRM 1577 (Set 21)
		130 (117 - 143)	131 (123 - 139)	125	Yes	96%	95%	05B SRM 1577
		130 (117 - 143)	131 (123 - 139)	123	Yes	95%	94%	07B SRM 1577
		130 (117 - 143)	131 (123 - 139)	120	Yes	92%	92%	09B SRM 1577
		130 (117 - 143)	131 (123 - 139)	118	Yes	91%	90%	11B SRM 1577
		130 (117 - 143)	131 (123 - 139)	123	Yes	95%	94%	01B SRM 1577 (Set 26)
		130 (117 - 143)	131 (123 - 139)	119	Yes	92%	91%	03B SRM 1577
		130 (117 - 143)	131 (123 - 139)	120	Yes	92%	92%	13B SRM 1577
		130 (117 - 143)	131 (123 - 139)	120	Yes	92%	92%	15B SRM 1577
		116 (110 - 122)	-	121	Yes	104%	-	01B CRM DOLT-4
		116 (110 - 122)	-	106	No	91%	-	02A CRM DOLT-4
		116 (110 - 122)	-	108	No	93%	-	04B CRM DOLT-4
		116 (110 - 122)	-	104	No	90%	-	06B CRM DOLT-4
		116 (110 - 122)	-	102	No	88%	-	08B CRM DOLT-4
		105.3 (99.9 - 110.7)	-	88	No	84%	-	02B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	95	No	91%	-	12B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	92	No	88%	-	14B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	92	No	87%	-	16B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	95	No	90%	-	04B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	92	No	87%	-	06B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	91	No	87%	-	08B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	101	Yes	96%	-	10B CRM DOLT-5
		105.3 (99.9 - 110.7)	-	94	No	89%	-	17B CRM DOLT-5

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20c: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2016

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Aluminum (Al)	µg/g dw	-	1.2 (0.7 - 1.7)	1.3	Yes	-	104%	01B SRM 1577 (Set 33)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	103%	03B SRM 1577 (Set 33)
		-	1.2 (0.7 - 1.7)	2.1	No	-	173%	05B SRM 1577 (Set 33)
		-	1.2 (0.7 - 1.7)	1.0	Yes	-	83%	08B SRM 1577 (Set 33)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	103%	10B SRM 1577 (Set 33)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	100%	14B SRM 1577 (Set 33)
		-	31.7 (27.5 - 35.7)	14	No	-	43%	02B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	16	No	-	50%	04B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	17	No	-	54%	06B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	14	No	-	44%	07B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	14	No	-	44%	09B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	15	No	-	48%	11B CRM DOLT-5 (Set 33)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	102%	12B SRM 1577 (Set 33)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	98%	16B SRM 1577 (Set 33)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	97%	18B SRM 1577 (Set 33)
		-	1.2 (0.7 - 1.7)	1.4	Yes	-	117%	20B SRM 1577 (Set 33)
		-	31.7 (27.5 - 35.7)	17	No	-	53%	13B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	17	No	-	53%	15B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	45	No	-	140%	17B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	14	No	-	44%	19B CRM DOLT-5 (Set 33)
		-	31.7 (27.5 - 35.7)	15	No	-	46%	21B CRM DOLT-5 (Set 33)
		-	1.2 (0.7 - 1.7)	1.2	Yes	-	96%	01B SRM 1577 (Set 34)
		-	1.2 (0.7 - 1.7)	1.1	Yes	-	88%	04B SRM 1577 (Set 34)
		-	31.7 (27.5 - 35.7)	14	No	-	43%	02B CRM DOLT-5 (Set 34)
		-	31.7 (27.5 - 35.7)	13	No	-	40%	05B CRM DOLT-5 (Set 34)
Antimony (Sb)	µg/g dw	-	0.009 (0.004 - 0.014)	0.006	Yes	-	69%	01B SRM 1577 (Set 33)
		-	0.009 (0.004 - 0.014)	0.008	Yes	-	85%	03B SRM 1577 (Set 33)
		-	0.009 (0.004 - 0.014)	0.008	Yes	-	91%	05B SRM 1577 (Set 33)
		-	0.009 (0.004 - 0.014)	0.006	Yes	-	71%	08B SRM 1577 (Set 33)
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	73%	10B SRM 1577 (Set 33)
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	74%	14B SRM 1577 (Set 33)
		-	0.013	0.013	-	-	99%	02B CRM DOLT-5 (Set 33)
		-	0.013	0.012	-	-	92%	04B CRM DOLT-5 (Set 33)
		-	0.013	0.014	-	-	105%	06B CRM DOLT-5 (Set 33)
		-	0.013	0.011	-	-	86%	07B CRM DOLT-5 (Set 33)
		-	0.013	0.012	-	-	88%	09B CRM DOLT-5 (Set 33)
		-	0.013	0.011	-	-	86%	11B CRM DOLT-5 (Set 33)
		-	0.009 (0.004 - 0.014)	0.008	Yes	-	85%	12B SRM 1577 (Set 33)
		-	0.009 (0.004 - 0.014)	0.008	Yes	-	85%	16B SRM 1577 (Set 33)
		-	0.009 (0.004 - 0.014)	0.006	Yes	-	69%	18B SRM 1577 (Set 33)
		-	0.009 (0.004 - 0.014)	0.007	Yes	-	75%	20B SRM 1577 (Set 33)
		-	0.013	0.011	-	-	87%	13B CRM DOLT-5 (Set 33)
		-	0.013	0.014	-	-	105%	15B CRM DOLT-5 (Set 33)
		-	0.013	0.013	-	-	98%	17B CRM DOLT-5 (Set 33)
		-	0.013	0.011	-	-	87%	19B CRM DOLT-5 (Set 33)
		-	0.013	0.012	-	-	95%	21B CRM DOLT-5 (Set 33)
		-	0.009 (0.004 - 0.014)	0.008	Yes	-	88%	01B SRM 1577 (Set 34)
		-	0.009 (0.004 - 0.014)	0.006	Yes	-	68%	04B SRM 1577 (Set 34)
		-	0.013	0.012	-	-	134%	02B CRM DOLT-5 (Set 34)
		-	0.013	0.017	-	-	189%	05B CRM DOLT-5 (Set 34)
Arsenic (As)	µg/g dw	0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.056	Yes	101%	103%	01B SRM 1577 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.057	Yes	103%	105%	03B SRM 1577 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.062	No	112%	114%	05B SRM 1577 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.074	No	134%	137%	08B SRM 1577 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.050	Yes	91%	93%	10B SRM 1577 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.052	Yes	94%	96%	14B SRM 1577 (Set 33)
		34.6 (32.2 - 37)	-	33.1	Yes	96%	-	02B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	30.7	No	89%	-	04B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	30.3	No	88%	-	06B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	33.0	Yes	95%	-	07B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	34.7	Yes	100%	-	09B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	31.6	No	91%	-	11B CRM DOLT-5 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.058	Yes	105%	107%	12B SRM 1577 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.052	Yes	95%	97%	16B SRM 1577 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.044	No	80%	81%	18B SRM 1577 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.055	Yes	100%	101%	20B SRM 1577 (Set 33)
		34.6 (32.2 - 37)	-	30.9	No	89%	-	13B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	31.6	No	91%	-	15B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	30.9	No	89%	-	17B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	30.9	No	89%	-	19B CRM DOLT-5 (Set 33)
		34.6 (32.2 - 37)	-	31.1	No	90%	-	21B CRM DOLT-5 (Set 33)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.055	Yes	101%	103%	01B SRM 1577 (Set 34)
		0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.061	No	110%	112%	04B SRM 1577 (Set 34)
		34.6 (32.2 - 37)	-	32.3	Yes	93%	-	02B CRM DOLT-5 (Set 34)
		34.6 (32.2 - 37)	-	35.7	Yes	103%	-	05B CRM DOLT-5 (Set 34)
Cadmium (Cd)	µg/g dw	0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.30	Yes	112%	107%	01B SRM 1577 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.29	Yes	106%	101%	03B SRM 1577 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.31	Yes	114%	108%	05B SRM 1577 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.32	No	119%	114%	08B SRM 1577 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.31	Yes	114%	108%	10B SRM 1577 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.29	Yes	109%	104%	14B SRM 1577 (Set 33)
		14.5 (13.9 - 15.1)	-	13.9	Yes	96%	-	02B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	13.2	No	91%	-	04B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	12.8	No	88%	-	06B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	14.0	Yes	97%	-	07B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	14.1	Yes	97%	-	09B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	12.9	No	89%	-	11B CRM DOLT-5 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.29	Yes	106%	101%	12B SRM 1577 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.29	Yes	106%	101%	16B SRM 1577 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.27	Yes	100%	95%	18B SRM 1577 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.30	Yes	109%	104%	20B SRM 1577 (Set 33)
		14.5 (13.9 - 15.1)	-	12.7	No	88%	-	13B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	12.9	No	89%	-	15B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	12.9	No	89%	-	17B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	12.8	No	88%	-	19B CRM DOLT-5 (Set 33)
		14.5 (13.9 - 15.1)	-	12.8	No	88%	-	21B CRM DOLT-5 (Set 33)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.28	Yes	104%	99%	01B SRM 1577 (Set 34)
		0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.30	Yes	111%	106%	04B SRM 1577 (Set 34)
		14.5 (13.9 - 15.1)	-	13.0	No	90%	-	02B CRM DOLT-5 (Set 34)
		14.5 (13.9 - 15.1)	-	14.9	Yes	103%	-	05B CRM DOLT-5 (Set 34)

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20c: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2016

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Calcium (Ca)	µg/g dw	124 (118 - 130)	121 (107 - 135)	119	Yes	96%	98%	01B SRM 1577 (Set 33)
		124 (118 - 130)	121 (107 - 135)	124	Yes	100%	102%	03B SRM 1577 (Set 33)
		124 (118 - 130)	121 (107 - 135)	126	Yes	102%	104%	05B SRM 1577 (Set 33)
		124 (118 - 130)	121 (107 - 135)	119	Yes	96%	98%	08B SRM 1577 (Set 33)
		124 (118 - 130)	121 (107 - 135)	116	No	94%	96%	10B SRM 1577 (Set 33)
		124 (118 - 130)	121 (107 - 135)	115	No	93%	95%	14B SRM 1577 (Set 33)
		550 (470 - 630)	-	519	Yes	94%	-	02B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	581	Yes	106%	-	04B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	619	Yes	113%	-	06B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	514	Yes	93%	-	07B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	551	Yes	100%	-	09B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	551	Yes	100%	-	11B CRM DOLT-5 (Set 33)
		124 (118 - 130)	121 (107 - 135)	127	Yes	102%	105%	12B SRM 1577 (Set 33)
		124 (118 - 130)	121 (107 - 135)	126	Yes	102%	104%	16B SRM 1577 (Set 33)
		124 (118 - 130)	121 (107 - 135)	114	No	92%	94%	18B SRM 1577 (Set 33)
		124 (118 - 130)	121 (107 - 135)	117	No	94%	97%	20B SRM 1577 (Set 33)
		550 (470 - 630)	-	568	Yes	103%	-	13B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	542	Yes	99%	-	15B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	544	Yes	99%	-	17B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	554	Yes	101%	-	19B CRM DOLT-5 (Set 33)
		550 (470 - 630)	-	593	Yes	108%	-	21B CRM DOLT-5 (Set 33)
		124 (118 - 130)	121 (107 - 135)	126	Yes	102%	104%	01B SRM 1577 (Set 34)
		124 (118 - 130)	121 (107 - 135)	111	No	90%	92%	04B SRM 1577 (Set 34)
		550 (470 - 630)	-	554	Yes	101%	-	02B CRM DOLT-5 (Set 34)
		550 (470 - 630)	-	540	Yes	98%	-	05B CRM DOLT-5 (Set 34)
Cesium (Cs)	µg/g dw	-	0.015 (0.011 - 0.019)	0.012	Yes	-	82%	01B SRM 1577 (Set 33)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	83%	03B SRM 1577 (Set 33)
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	88%	05B SRM 1577 (Set 33)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	79%	08B SRM 1577 (Set 33)
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	87%	10B SRM 1577 (Set 33)
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	86%	14B SRM 1577 (Set 33)
		-	-	0.07	-	-	-	02B CRM DOLT-5 (Set 33)
		-	-	0.07	-	-	-	04B CRM DOLT-5 (Set 33)
		-	-	0.07	-	-	-	06B CRM DOLT-5 (Set 33)
		-	-	0.07	-	-	-	07B CRM DOLT-5 (Set 33)
		-	-	0.07	-	-	-	09B CRM DOLT-5 (Set 33)
		-	-	0.07	-	-	-	11B CRM DOLT-5 (Set 33)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	81%	12B SRM 1577 (Set 33)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	79%	16B SRM 1577 (Set 33)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	81%	18B SRM 1577 (Set 33)
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	86%	20B SRM 1577 (Set 33)
		-	-	0.07	-	-	-	13B CRM DOLT-5 (Set 33)
		-	-	0.07	-	-	-	15B CRM DOLT-5 (Set 33)
		-	-	0.07	-	-	-	17B CRM DOLT-5 (Set 33)
		-	-	0.07	-	-	-	19B CRM DOLT-5 (Set 33)
		-	-	0.06	-	-	-	21B CRM DOLT-5 (Set 33)
		-	0.015 (0.011 - 0.019)	0.013	Yes	-	84%	01B SRM 1577 (Set 34)
		-	0.015 (0.011 - 0.019)	0.012	Yes	-	81%	04B SRM 1577 (Set 34)
		-	-	0.07	-	-	-	02B CRM DOLT-5 (Set 34)
		-	-	0.07	-	-	-	05B CRM DOLT-5 (Set 34)
Chromium (Cr)	µg/g dw	0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.099	Yes	112%	90%	01B SRM 1577 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.165	No	188%	150%	03B SRM 1577 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.133	No	151%	121%	05B SRM 1577 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.124	No	141%	113%	08B SRM 1577 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.108	No	123%	98%	10B SRM 1577 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.122	No	139%	111%	14B SRM 1577 (Set 33)
		-	2.35 (1.77 - 2.93)	2.05	Yes	-	87%	02B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	2.39	Yes	-	102%	04B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	2.16	Yes	-	92%	06B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	1.68	No	-	71%	07B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	1.81	Yes	-	77%	09B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	2.66	Yes	-	113%	11B CRM DOLT-5 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.109	No	124%	99%	12B SRM 1577 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.113	No	128%	103%	16B SRM 1577 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.191	No	217%	174%	18B SRM 1577 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.111	No	126%	101%	20B SRM 1577 (Set 33)
		-	2.35 (1.77 - 2.93)	1.78	Yes	-	76%	13B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	1.92	Yes	-	82%	15B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	2.16	Yes	-	92%	17B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	2.08	Yes	-	89%	19B CRM DOLT-5 (Set 33)
		-	2.35 (1.77 - 2.93)	2.01	Yes	-	86%	21B CRM DOLT-5 (Set 33)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.116	No	132%	105%	01B SRM 1577 (Set 34)
		0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.127	No	144%	115%	04B SRM 1577 (Set 34)
		-	2.35 (1.77 - 2.93)	2.21	Yes	-	94%	02B CRM DOLT-5 (Set 34)
		-	2.35 (1.77 - 2.93)	1.82	Yes	-	77%	05B CRM DOLT-5 (Set 34)
Cobalt (Co)	µg/g dw	-	0.22 (0.18 - 0.26)	0.25	Yes	-	112%	01B SRM 1577 (Set 33)
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	111%	03B SRM 1577 (Set 33)
		-	0.22 (0.18 - 0.26)	0.26	Yes	-	118%	05B SRM 1577 (Set 33)
		-	0.22 (0.18 - 0.26)	0.25	Yes	-	113%	08B SRM 1577 (Set 33)
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	110%	10B SRM 1577 (Set 33)
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	109%	14B SRM 1577 (Set 33)
		0.267 (0.241 - 0.293)	-	0.248	Yes	93%	-	02B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.248	Yes	93%	-	04B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.254	Yes	95%	-	06B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.254	Yes	95%	-	07B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.250	Yes	94%	-	09B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.249	Yes	93%	-	11B CRM DOLT-5 (Set 33)
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	107%	12B SRM 1577 (Set 33)
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	109%	16B SRM 1577 (Set 33)
		-	0.22 (0.18 - 0.26)	0.23	Yes	-	105%	18B SRM 1577 (Set 33)
		-	0.22 (0.18 - 0.26)	0.24	Yes	-	110%	20B SRM 1577 (Set 33)
		0.267 (0.241 - 0.293)	-	0.242	Yes	91%	-	13B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.241	Yes	90%	-	15B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.251	Yes	94%	-	17B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.241	Yes	90%	-	19B CRM DOLT-5 (Set 33)
		0.267 (0.241 - 0.293)	-	0.245	Yes	92%	-	21B CRM DOLT-5 (Set 33)
		-	0.22 (0.18 - 0.26)	0.23	Yes	-	105%	01B SRM 1577 (Set 34)
		-	0.22 (0.18 - 0.26)	0.25	Yes	-	113%	04B SRM 1577 (Set 34)
		0.267 (0.241 - 0.293)	-	0.229	No	86%	-	02B CRM DOLT-5 (Set 34)
		0.267 (0.241 - 0.293)	-	0.266	Yes	100%	-	05B CRM DOLT-5 (Set 34)

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20c: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2016

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Copper (Cu)	µg/g dw	193 (183 - 203)	190 (180 - 200)	180	No	93%	95%	01B SRM 1577 (Set 33)
		193 (183 - 203)	190 (180 - 200)	173	No	90%	91%	03B SRM 1577 (Set 33)
		193 (183 - 203)	190 (180 - 200)	188	Yes	97%	99%	05B SRM 1577 (Set 33)
		193 (183 - 203)	190 (180 - 200)	184	Yes	95%	97%	08B SRM 1577 (Set 33)
		193 (183 - 203)	190 (180 - 200)	176	No	91%	93%	10B SRM 1577 (Set 33)
		193 (183 - 203)	190 (180 - 200)	175	No	91%	92%	14B SRM 1577 (Set 33)
		35.0 (32.6 - 37.4)	-	31.6	No	90%	-	02B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	30.2	No	86%	-	04B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	31.8	No	91%	-	06B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	33.0	Yes	94%	-	07B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	33.2	Yes	95%	-	09B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	31.0	No	89%	-	11B CRM DOLT-5 (Set 33)
		193 (183 - 203)	190 (180 - 200)	169	No	88%	89%	12B SRM 1577 (Set 33)
		193 (183 - 203)	190 (180 - 200)	167	No	87%	88%	16B SRM 1577 (Set 33)
		193 (183 - 203)	190 (180 - 200)	163	No	84%	86%	18B SRM 1577 (Set 33)
		193 (183 - 203)	190 (180 - 200)	177	No	92%	93%	20B SRM 1577 (Set 33)
		35.0 (32.6 - 37.4)	-	29.3	No	84%	-	13B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	29.8	No	85%	-	15B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	30.0	No	86%	-	17B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	30.0	No	86%	-	19B CRM DOLT-5 (Set 33)
		35.0 (32.6 - 37.4)	-	30.6	No	87%	-	21B CRM DOLT-5 (Set 33)
		193 (183 - 203)	190 (180 - 200)	168	No	87%	88%	01B SRM 1577 (Set 34)
		193 (183 - 203)	190 (180 - 200)	172	No	89%	91%	04B SRM 1577 (Set 34)
		35.0 (32.6 - 37.4)	-	29.5	No	84%	-	02B CRM DOLT-5 (Set 34)
		35.0 (32.6 - 37.4)	-	33.8	Yes	97%	-	05B CRM DOLT-5 (Set 34)
Iron (Fe)	µg/g dw	268 (260 - 276)	263 (241 - 285)	252	No	94%	96%	01B SRM 1577 (Set 33)
		268 (260 - 276)	263 (241 - 285)	260	Yes	97%	99%	03B SRM 1577 (Set 33)
		268 (260 - 276)	263 (241 - 285)	283	No	106%	108%	05B SRM 1577 (Set 33)
		268 (260 - 276)	263 (241 - 285)	262	Yes	98%	100%	08B SRM 1577 (Set 33)
		268 (260 - 276)	263 (241 - 285)	253	No	94%	96%	10B SRM 1577 (Set 33)
		268 (260 - 276)	263 (241 - 285)	261	Yes	97%	99%	14B SRM 1577 (Set 33)
		1,070 (990 - 1,150)	-	1,020	Yes	95%	-	02B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	1,060	Yes	99%	-	04B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	961	No	90%	-	06B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	1,010	Yes	94%	-	07B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	1,060	Yes	99%	-	09B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	995	Yes	93%	-	11B CRM DOLT-5 (Set 33)
		268 (260 - 276)	263 (241 - 285)	260	Yes	97%	99%	12B SRM 1577 (Set 33)
		268 (260 - 276)	263 (241 - 285)	260	Yes	97%	99%	16B SRM 1577 (Set 33)
		268 (260 - 276)	263 (241 - 285)	254	No	95%	97%	18B SRM 1577 (Set 33)
		268 (260 - 276)	263 (241 - 285)	265	Yes	99%	101%	20B SRM 1577 (Set 33)
		1,070 (990 - 1,150)	-	1,010	Yes	94%	-	13B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	1,020	Yes	95%	-	15B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	1,010	Yes	94%	-	17B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	1,000	Yes	93%	-	19B CRM DOLT-5 (Set 33)
		1,070 (990 - 1,150)	-	1,050	Yes	98%	-	21B CRM DOLT-5 (Set 33)
		268 (260 - 276)	263 (241 - 285)	258	No	96%	98%	01B SRM 1577 (Set 34)
		268 (260 - 276)	263 (241 - 285)	266	Yes	99%	101%	04B SRM 1577 (Set 34)
		1,070 (990 - 1,150)	-	995	Yes	93%	-	02B CRM DOLT-5 (Set 34)
		1,070 (990 - 1,150)	-	1,110	Yes	104%	-	05B CRM DOLT-5 (Set 34)
Lead (Pb)	µg/g dw	0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.34	Yes	101%	101%	01B SRM 1577 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.34	Yes	99%	99%	03B SRM 1577 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.39	Yes	114%	114%	05B SRM 1577 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.36	Yes	104%	104%	08B SRM 1577 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.36	Yes	106%	106%	10B SRM 1577 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.35	Yes	104%	104%	14B SRM 1577 (Set 33)
		0.162 (0.130 - 0.194)	-	0.155	Yes	96%	-	02B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.140	Yes	86%	-	04B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.253	No	156%	-	06B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.162	Yes	100%	-	07B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.135	Yes	83%	-	09B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.179	Yes	110%	-	11B CRM DOLT-5 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.34	Yes	99%	99%	12B SRM 1577 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.33	Yes	98%	98%	16B SRM 1577 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.32	Yes	93%	93%	18B SRM 1577 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.34	Yes	101%	101%	20B SRM 1577 (Set 33)
		0.162 (0.130 - 0.194)	-	0.130	Yes	80%	-	13B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.164	Yes	101%	-	15B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.142	Yes	88%	-	17B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.154	Yes	95%	-	19B CRM DOLT-5 (Set 33)
		0.162 (0.130 - 0.194)	-	0.151	Yes	93%	-	21B CRM DOLT-5 (Set 33)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.33	Yes	97%	97%	01B SRM 1577 (Set 34)
		0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.38	Yes	111%	111%	04B SRM 1577 (Set 34)
		0.162 (0.130 - 0.194)	-	0.147	Yes	91%	-	02B CRM DOLT-5 (Set 34)
		0.162 (0.130 - 0.194)	-	0.167	Yes	103%	-	05B CRM DOLT-5 (Set 34)
Magnesium (Mg)	µg/g dw	604 (595 - 613)	608 (577 - 639)	569	No	94%	94%	01B SRM 1577 (Set 33)
		604 (595 - 613)	608 (577 - 639)	579	No	96%	95%	03B SRM 1577 (Set 33)
		604 (595 - 613)	608 (577 - 639)	647	No	107%	106%	05B SRM 1577 (Set 33)
		604 (595 - 613)	608 (577 - 639)	622	No	103%	102%	08B SRM 1577 (Set 33)
		604 (595 - 613)	608 (577 - 639)	596	Yes	99%	98%	10B SRM 1577 (Set 33)
		604 (595 - 613)	608 (577 - 639)	594	No	98%	98%	14B SRM 1577 (Set 33)
		940 (840 - 1,040)	-	828	No	88%	-	02B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	852	Yes	91%	-	04B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	879	Yes	94%	-	06B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	875	Yes	93%	-	07B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	909	Yes	97%	-	09B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	883	Yes	94%	-	11B CRM DOLT-5 (Set 33)
		604 (595 - 613)	608 (577 - 639)	605	Yes	100%	100%	12B SRM 1577 (Set 33)
		604 (595 - 613)	608 (577 - 639)	580	No	96%	95%	16B SRM 1577 (Set 33)
		604 (595 - 613)	608 (577 - 639)	554	No	92%	91%	18B SRM 1577 (Set 33)
		604 (595 - 613)	608 (577 - 639)	617	No	102%	101%	20B SRM 1577 (Set 33)
		940 (840 - 1,040)	-	866	Yes	92%	-	13B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	857	Yes	91%	-	15B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	819	No	87%	-	17B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	871	Yes	93%	-	19B CRM DOLT-5 (Set 33)
		940 (840 - 1,040)	-	869	Yes	92%	-	21B CRM DOLT-5 (Set 33)
		604 (595 - 613)	608 (577 - 639)	577	No	96%	95%	01B SRM 1577 (Set 34)
		604 (595 - 613)	608 (577 - 639)	593	No	98%	98%	04B SRM 1577 (Set 34)
		940 (840 - 1,040)	-	815	No	87%	-	02B CRM DOLT-5 (Set 34)
		940 (840 - 1,040)	-	947	Yes	101%	-	05B CRM DOLT-5 (Set 34)

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20c: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2016

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Manganese (Mn)	µg/g dw	10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.1	Yes	98%	99%	01B SRM 1577 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.2	Yes	99%	100%	03B SRM 1577 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	11.6	No	113%	114%	05B SRM 1577 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.2	Yes	99%	100%	08B SRM 1577 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.0	Yes	97%	98%	10B SRM 1577 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.4	Yes	101%	102%	14B SRM 1577 (Set 33)
		-	8.91 (8.21 - 9.61)	8.52	Yes	-	96%	02B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	8.63	Yes	-	97%	04B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	8.88	Yes	-	100%	06B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	9.25	Yes	-	104%	07B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	9.11	Yes	-	102%	09B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	8.65	Yes	-	97%	11B CRM DOLT-5 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.4	Yes	101%	102%	12B SRM 1577 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.1	Yes	98%	99%	16B SRM 1577 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	9.93	Yes	96%	97%	18B SRM 1577 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.5	Yes	102%	103%	20B SRM 1577 (Set 33)
		-	8.91 (8.21 - 9.61)	8.70	Yes	-	98%	13B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	8.82	Yes	-	99%	15B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	9.26	Yes	-	104%	17B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	8.76	Yes	-	98%	19B CRM DOLT-5 (Set 33)
		-	8.91 (8.21 - 9.61)	8.94	Yes	-	100%	21B CRM DOLT-5 (Set 33)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.5	Yes	102%	103%	01B SRM 1577 (Set 34)
		10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	10.6	Yes	103%	104%	04B SRM 1577 (Set 34)
		-	8.91 (8.21 - 9.61)	8.84	Yes	-	99%	02B CRM DOLT-5 (Set 34)
		-	8.91 (8.21 - 9.61)	9.50	Yes	-	107%	05B CRM DOLT-5 (Set 34)
Mercury (Hg)	µg/g dw	0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	135%	135%	01B SRM 1577 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.023	No	141%	141%	03B SRM 1577 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.024	No	148%	148%	05B SRM 1577 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.023	No	144%	144%	08B SRM 1577 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.024	No	147%	147%	10B SRM 1577 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	139%	139%	14B SRM 1577 (Set 33)
		0.44 (0.26 - 0.62)	-	0.37	Yes	84%	-	02B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.38	Yes	85%	-	04B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.34	Yes	78%	-	06B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.40	Yes	90%	-	07B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.40	Yes	91%	-	09B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.38	Yes	87%	-	11B CRM DOLT-5 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	138%	138%	12B SRM 1577 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.021	No	130%	130%	16B SRM 1577 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.022	No	139%	139%	18B SRM 1577 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.023	No	142%	142%	20B SRM 1577 (Set 33)
		0.44 (0.26 - 0.62)	-	0.41	Yes	92%	-	13B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.39	Yes	88%	-	15B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.40	Yes	90%	-	17B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.38	Yes	87%	-	19B CRM DOLT-5 (Set 33)
		0.44 (0.26 - 0.62)	-	0.38	Yes	86%	-	21B CRM DOLT-5 (Set 33)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.024	No	149%	149%	01B SRM 1577 (Set 34)
		0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.025	No	154%	154%	04B SRM 1577 (Set 34)
		0.44 (0.26 - 0.62)	-	0.39	Yes	88%	-	02B CRM DOLT-5 (Set 34)
		0.44 (0.26 - 0.62)	-	0.42	Yes	96%	-	05B CRM DOLT-5 (Set 34)
Molybdenum (Mo)	µg/g dw	-	3.2 (2.8 - 3.6)	3.7	No	-	116%	01B SRM 1577 (Set 33)
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	111%	03B SRM 1577 (Set 33)
		-	3.2 (2.8 - 3.6)	3.7	No	-	114%	05B SRM 1577 (Set 33)
		-	3.2 (2.8 - 3.6)	3.7	No	-	115%	08B SRM 1577 (Set 33)
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	113%	10B SRM 1577 (Set 33)
		-	3.2 (2.8 - 3.6)	3.5	Yes	-	110%	14B SRM 1577 (Set 33)
		1.41 (1.19 - 1.63)	-	1.42	Yes	101%	-	02B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.43	Yes	101%	-	04B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.31	Yes	93%	-	06B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.33	Yes	94%	-	07B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.37	Yes	97%	-	09B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.42	Yes	101%	-	11B CRM DOLT-5 (Set 33)
		-	3.2 (2.8 - 3.6)	3.5	Yes	-	108%	12B SRM 1577 (Set 33)
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	113%	16B SRM 1577 (Set 33)
		-	3.2 (2.8 - 3.6)	3.3	Yes	-	104%	18B SRM 1577 (Set 33)
		-	3.2 (2.8 - 3.6)	3.7	No	-	114%	20B SRM 1577 (Set 33)
		1.41 (1.19 - 1.63)	-	1.35	Yes	96%	-	13B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.33	Yes	94%	-	15B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.37	Yes	97%	-	17B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.40	Yes	99%	-	19B CRM DOLT-5 (Set 33)
		1.41 (1.19 - 1.63)	-	1.35	Yes	96%	-	21B CRM DOLT-5 (Set 33)
		-	3.2 (2.8 - 3.6)	3.5	Yes	-	109%	01B SRM 1577 (Set 34)
		-	3.2 (2.8 - 3.6)	3.6	Yes	-	112%	04B SRM 1577 (Set 34)
		1.41 (1.19 - 1.63)	-	1.35	Yes	96%	-	02B CRM DOLT-5 (Set 34)
		1.41 (1.19 - 1.63)	-	1.40	Yes	99%	-	05B CRM DOLT-5 (Set 34)
Nickel (Ni)	µg/g dw	-	0.18 (0.10 - 0.26)	0.04	No	-	20%	01B SRM 1577 (Set 33)
		-	0.18 (0.10 - 0.26)	0.06	No	-	32%	03B SRM 1577 (Set 33)
		-	0.18 (0.10 - 0.26)	0.04	No	-	22%	05B SRM 1577 (Set 33)
		-	0.18 (0.10 - 0.26)	0.05	No	-	26%	08B SRM 1577 (Set 33)
		-	0.18 (0.10 - 0.26)	0.03	No	-	19%	10B SRM 1577 (Set 33)
		-	0.18 (0.10 - 0.26)	0.04	No	-	23%	14B SRM 1577 (Set 33)
		-	1.71 (1.15 - 2.27)	1.42	Yes	-	83%	02B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.46	Yes	-	85%	04B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.43	Yes	-	84%	06B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.42	Yes	-	83%	07B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.30	Yes	-	76%	09B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.76	Yes	-	103%	11B CRM DOLT-5 (Set 33)
		-	0.18 (0.10 - 0.26)	0.04	No	-	20%	12B SRM 1577 (Set 33)
		-	0.18 (0.10 - 0.26)	0.04	No	-	21%	16B SRM 1577 (Set 33)
		-	0.18 (0.10 - 0.26)	0.03	No	-	17%	18B SRM 1577 (Set 33)
		-	0.18 (0.10 - 0.26)	0.03	No	-	16%	20B SRM 1577 (Set 33)
		-	1.71 (1.15 - 2.27)	1.18	Yes	-	69%	13B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.27	Yes	-	74%	15B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.57	Yes	-	92%	17B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.62	Yes	-	95%	19B CRM DOLT-5 (Set 33)
		-	1.71 (1.15 - 2.27)	1.41	Yes	-	82%	21B CRM DOLT-5 (Set 33)
		-	0.18 (0.10 - 0.26)	0.04	No	-	20%	01B SRM 1577 (Set 34)
		-	0.18 (0.10 - 0.26)	0.04	No	-	23%	04B SRM 1577 (Set 34)
		-	1.71 (1.15 - 2.27)	1.40	Yes	-	82%	02B CRM DOLT-5 (Set 34)
		-	1.71 (1.15 - 2.27)	1.18	Yes	-	69%	05B CRM DOLT-5 (Set 34)

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20c: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2016

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Phosphorus (P)	µg/g dw	-	11,200 (10,100 - 12,300)	12,000	Yes	-	107%	01B SRM 1577 (Set 33)
		-	11,200 (10,100 - 12,300)	11,000	Yes	-	98%	03B SRM 1577 (Set 33)
		-	11,200 (10,100 - 12,300)	12,500	No	-	112%	05B SRM 1577 (Set 33)
		-	11,200 (10,100 - 12,300)	12,700	No	-	113%	08B SRM 1577 (Set 33)
		-	11,200 (10,100 - 12,300)	11,300	Yes	-	101%	10B SRM 1577 (Set 33)
		-	11,200 (10,100 - 12,300)	11,300	Yes	-	101%	14B SRM 1577 (Set 33)
		-	11,500	11,300	-	-	98%	02B CRM DOLT-5 (Set 33)
		-	11,500	10,500	-	-	91%	04B CRM DOLT-5 (Set 33)
		-	11,500	10,900	-	-	95%	06B CRM DOLT-5 (Set 33)
		-	11,500	11,900	-	-	103%	07B CRM DOLT-5 (Set 33)
		-	11,500	12,100	-	-	105%	09B CRM DOLT-5 (Set 33)
		-	11,500	10,700	-	-	93%	11B CRM DOLT-5 (Set 33)
		-	11,200 (10,100 - 12,300)	11,600	Yes	-	104%	12B SRM 1577 (Set 33)
		-	11,200 (10,100 - 12,300)	11,500	Yes	-	103%	16B SRM 1577 (Set 33)
		-	11,200 (10,100 - 12,300)	11,000	Yes	-	98%	18B SRM 1577 (Set 33)
		-	11,200 (10,100 - 12,300)	11,900	Yes	-	106%	20B SRM 1577 (Set 33)
		-	11,500	10,500	-	-	91%	13B CRM DOLT-5 (Set 33)
		-	11,500	10,500	-	-	91%	15B CRM DOLT-5 (Set 33)
		-	11,500	10,500	-	-	91%	17B CRM DOLT-5 (Set 33)
		-	11,500	10,600	-	-	92%	19B CRM DOLT-5 (Set 33)
		-	11,500	10,800	-	-	94%	21B CRM DOLT-5 (Set 33)
		-	11,200 (10,100 - 12,300)	11,100	Yes	-	99%	01B SRM 1577 (Set 34)
		-	11,200 (10,100 - 12,300)	11,500	Yes	-	103%	04B SRM 1577 (Set 34)
		-	11,500	10,600	-	-	92%	02B CRM DOLT-5 (Set 34)
		-	11,500	12,600	-	-	110%	05B CRM DOLT-5 (Set 34)
Potassium (K)	µg/g dw	9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,100	Yes	104%	104%	01B SRM 1577 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,700	No	110%	110%	03B SRM 1577 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,400	No	107%	107%	05B SRM 1577 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,200	Yes	105%	105%	08B SRM 1577 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	9,880	Yes	102%	102%	10B SRM 1577 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,200	Yes	105%	105%	14B SRM 1577 (Set 33)
		14,400 (11,400 - 17,400)	-	14,600	Yes	101%	-	02B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	15,300	Yes	106%	-	04B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	13,400	Yes	93%	-	06B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	13,900	Yes	97%	-	07B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	15,300	Yes	106%	-	09B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	14,500	Yes	101%	-	11B CRM DOLT-5 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,500	No	108%	108%	12B SRM 1577 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,100	Yes	104%	104%	16B SRM 1577 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	9,530	Yes	98%	98%	18B SRM 1577 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,400	No	107%	107%	20B SRM 1577 (Set 33)
		14,400 (11,400 - 17,400)	-	14,700	Yes	102%	-	13B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	14,500	Yes	101%	-	15B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	13,800	Yes	96%	-	17B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	14,400	Yes	100%	-	19B CRM DOLT-5 (Set 33)
		14,400 (11,400 - 17,400)	-	14,300	Yes	99%	-	21B CRM DOLT-5 (Set 33)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	10,200	Yes	105%	105%	01B SRM 1577 (Set 34)
		9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	9,870	Yes	102%	102%	04B SRM 1577 (Set 34)
		14,400 (11,400 - 17,400)	-	14,500	Yes	101%	-	02B CRM DOLT-5 (Set 34)
		14,400 (11,400 - 17,400)	-	15,500	Yes	108%	-	05B CRM DOLT-5 (Set 34)
Rubidium (Rb)	µg/g dw	-	18.3 (17.3 - 19.3)	19.1	Yes	-	104%	01B SRM 1577 (Set 33)
		-	18.3 (17.3 - 19.3)	18.5	Yes	-	101%	03B SRM 1577 (Set 33)
		-	18.3 (17.3 - 19.3)	18.9	Yes	-	103%	05B SRM 1577 (Set 33)
		-	18.3 (17.3 - 19.3)	18.9	Yes	-	103%	08B SRM 1577 (Set 33)
		-	18.3 (17.3 - 19.3)	18.8	Yes	-	103%	10B SRM 1577 (Set 33)
		-	18.3 (17.3 - 19.3)	18.7	Yes	-	102%	14B SRM 1577 (Set 33)
		-	-	5.0	-	-	-	02B CRM DOLT-5 (Set 33)
		-	-	4.8	-	-	-	04B CRM DOLT-5 (Set 33)
		-	-	4.7	-	-	-	06B CRM DOLT-5 (Set 33)
		-	-	4.8	-	-	-	07B CRM DOLT-5 (Set 33)
		-	-	5.0	-	-	-	09B CRM DOLT-5 (Set 33)
		-	-	4.9	-	-	-	11B CRM DOLT-5 (Set 33)
		-	18.3 (17.3 - 19.3)	18.7	Yes	-	102%	12B SRM 1577 (Set 33)
		-	18.3 (17.3 - 19.3)	18.6	Yes	-	102%	16B SRM 1577 (Set 33)
		-	18.3 (17.3 - 19.3)	17.7	Yes	-	97%	18B SRM 1577 (Set 33)
		-	18.3 (17.3 - 19.3)	19.1	Yes	-	104%	20B SRM 1577 (Set 33)
		-	-	5.0	-	-	-	13B CRM DOLT-5 (Set 33)
		-	-	5.0	-	-	-	15B CRM DOLT-5 (Set 33)
		-	-	4.9	-	-	-	17B CRM DOLT-5 (Set 33)
		-	-	5.0	-	-	-	19B CRM DOLT-5 (Set 33)
		-	-	4.8	-	-	-	21B CRM DOLT-5 (Set 33)
		-	18.3 (17.3 - 19.3)	18.4	Yes	-	101%	01B SRM 1577 (Set 34)
		-	18.3 (17.3 - 19.3)	18.5	Yes	-	101%	04B SRM 1577 (Set 34)
		-	-	4.9	-	-	-	02B CRM DOLT-5 (Set 34)
		-	-	5.2	-	-	-	05B CRM DOLT-5 (Set 34)
Selenium (Se)	µg/g dw	1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	112%	113%	01B SRM 1577 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.1	Yes	97%	98%	03B SRM 1577 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	105%	106%	05B SRM 1577 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.3	No	120%	121%	08B SRM 1577 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	108%	109%	10B SRM 1577 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.0	Yes	93%	94%	14B SRM 1577 (Set 33)
		8.3 (6.5 - 10.1)	-	8.78	Yes	106%	-	02B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	6.71	Yes	81%	-	04B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	7.38	Yes	89%	-	06B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	8.13	Yes	98%	-	07B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	8.82	Yes	106%	-	09B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	7.56	Yes	91%	-	11B CRM DOLT-5 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	111%	112%	12B SRM 1577 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	112%	113%	16B SRM 1577 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.1	Yes	98%	99%	18B SRM 1577 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.0	Yes	95%	95%	20B SRM 1577 (Set 33)
		8.3 (6.5 - 10.1)	-	7.48	Yes	90%	-	13B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	7.04	Yes	85%	-	15B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	7.30	Yes	88%	-	17B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	7.00	Yes	84%	-	19B CRM DOLT-5 (Set 33)
		8.3 (6.5 - 10.1)	-	7.41	Yes	89%	-	21B CRM DOLT-5 (Set 33)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	107%	108%	01B SRM 1577 (Set 34)
		1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.2	Yes	105%	106%	04B SRM 1577 (Set 34)
		8.3 (6.5 - 10.1)	-	7.34	Yes	88%	-	02B CRM DOLT-5 (Set 34)
		8.3 (6.5 - 10.1)	-	8.55	Yes	103%	-	05B CRM DOLT-5 (Set 34)

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20c: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2016

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Silver (Ag)	µg/g dw	-	0.062 (0.051 - 0.073)	0.056	Yes	-	91%	01B SRM 1577 (Set 33)
		-	0.062 (0.051 - 0.073)	0.055	Yes	-	88%	03B SRM 1577 (Set 33)
		-	0.062 (0.051 - 0.073)	0.059	Yes	-	95%	05B SRM 1577 (Set 33)
		-	0.062 (0.051 - 0.073)	0.059	Yes	-	95%	08B SRM 1577 (Set 33)
		-	0.062 (0.051 - 0.073)	0.058	Yes	-	94%	10B SRM 1577 (Set 33)
		-	0.062 (0.051 - 0.073)	0.056	Yes	-	90%	14B SRM 1577 (Set 33)
		2.05 (1.97 - 2.13)	-	1.83	No	89%	-	02B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.78	No	87%	-	04B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.79	No	87%	-	06B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.92	No	94%	-	07B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.90	No	93%	-	09B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.82	No	89%	-	11B CRM DOLT-5 (Set 33)
		-	0.062 (0.051 - 0.073)	0.056	Yes	-	90%	12B SRM 1577 (Set 33)
		-	0.062 (0.051 - 0.073)	0.056	Yes	-	91%	16B SRM 1577 (Set 33)
		-	0.062 (0.051 - 0.073)	0.053	Yes	-	85%	18B SRM 1577 (Set 33)
		-	0.062 (0.051 - 0.073)	0.057	Yes	-	93%	20B SRM 1577 (Set 33)
		2.05 (1.97 - 2.13)	-	1.80	No	88%	-	13B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.74	No	85%	-	15B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.76	No	86%	-	17B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.76	No	86%	-	19B CRM DOLT-5 (Set 33)
		2.05 (1.97 - 2.13)	-	1.78	No	87%	-	21B CRM DOLT-5 (Set 33)
		-	0.062 (0.051 - 0.073)	0.056	Yes	-	90%	01B SRM 1577 (Set 34)
		-	0.062 (0.051 - 0.073)	0.057	Yes	-	92%	04B SRM 1577 (Set 34)
		2.05 (1.97 - 2.13)	-	1.79	No	87%	-	02B CRM DOLT-5 (Set 34)
		2.05 (1.97 - 2.13)	-	1.99	Yes	97%	-	05B CRM DOLT-5 (Set 34)
Sodium (Na)	µg/g dw	2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,030	No	84%	85%	01B SRM 1577 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,290	No	94%	96%	03B SRM 1577 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,490	Yes	102%	104%	05B SRM 1577 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,340	Yes	96%	98%	08B SRM 1577 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,270	No	93%	95%	10B SRM 1577 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,320	Yes	95%	97%	14B SRM 1577 (Set 33)
		9,900 (8,300 - 11,500)	-	9,370	Yes	95%	-	02B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	9,750	Yes	98%	-	04B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	9,840	Yes	99%	-	06B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	9,640	Yes	97%	-	07B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	10,100	Yes	102%	-	09B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	9,990	Yes	101%	-	11B CRM DOLT-5 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,340	Yes	96%	98%	12B SRM 1577 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,200	No	91%	92%	16B SRM 1577 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,150	No	88%	90%	18B SRM 1577 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,420	Yes	100%	101%	20B SRM 1577 (Set 33)
		9,900 (8,300 - 11,500)	-	10,200	Yes	103%	-	13B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	9,820	Yes	99%	-	15B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	9,620	Yes	97%	-	17B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	10,300	Yes	104%	-	19B CRM DOLT-5 (Set 33)
		9,900 (8,300 - 11,500)	-	10,100	Yes	102%	-	21B CRM DOLT-5 (Set 33)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,230	No	92%	93%	01B SRM 1577 (Set 34)
		2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,290	No	94%	96%	04B SRM 1577 (Set 34)
		9,900 (8,300 - 11,500)	-	9,380	Yes	95%	-	02B CRM DOLT-5 (Set 34)
		9,900 (8,300 - 11,500)	-	10,600	Yes	107%	-	05B CRM DOLT-5 (Set 34)
Strontium (Sr)	µg/g dw	-	0.16 (0.13 - 0.19)	0.15	Yes	-	91%	01B SRM 1577 (Set 33)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	03B SRM 1577 (Set 33)
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	92%	05B SRM 1577 (Set 33)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	08B SRM 1577 (Set 33)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	89%	10B SRM 1577 (Set 33)
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	91%	14B SRM 1577 (Set 33)
		3.73 (3.47 - 3.99)	-	3.79	Yes	102%	-	02B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	3.74	Yes	100%	-	04B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	4.22	No	113%	-	06B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	3.53	Yes	95%	-	07B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	3.54	Yes	95%	-	09B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	3.69	Yes	99%	-	11B CRM DOLT-5 (Set 33)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	12B SRM 1577 (Set 33)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	16B SRM 1577 (Set 33)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	85%	18B SRM 1577 (Set 33)
		-	0.16 (0.13 - 0.19)	0.15	Yes	-	91%	20B SRM 1577 (Set 33)
		3.73 (3.47 - 3.99)	-	3.78	Yes	101%	-	13B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	3.68	Yes	99%	-	15B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	3.72	Yes	100%	-	17B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	3.67	Yes	98%	-	19B CRM DOLT-5 (Set 33)
		3.73 (3.47 - 3.99)	-	3.85	Yes	103%	-	21B CRM DOLT-5 (Set 33)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	01B SRM 1577 (Set 34)
		-	0.16 (0.13 - 0.19)	0.14	Yes	-	88%	04B SRM 1577 (Set 34)
		3.73 (3.47 - 3.99)	-	3.66	Yes	98%	-	02B CRM DOLT-5 (Set 34)
		3.73 (3.47 - 3.99)	-	3.79	Yes	102%	-	05B CRM DOLT-5 (Set 34)
Tin (Sn)	µg/g dw	-	0.016 (0.012 - 0.020)	0.010	No	-	64%	01B SRM 1577 (Set 33)
		-	0.016 (0.012 - 0.020)	0.008	No	-	51%	03B SRM 1577 (Set 33)
		-	0.016 (0.012 - 0.020)	0.010	No	-	61%	05B SRM 1577 (Set 33)
		-	0.016 (0.012 - 0.020)	0.011	No	-	69%	08B SRM 1577 (Set 33)
		-	0.016 (0.012 - 0.020)	0.014	Yes	-	88%	10B SRM 1577 (Set 33)
		-	0.016 (0.012 - 0.020)	0.017	Yes	-	104%	14B SRM 1577 (Set 33)
		0.069 (0.033 - 0.105)	-	0.061	Yes	89%	-	02B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.059	Yes	85%	-	04B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.058	Yes	84%	-	06B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.070	Yes	101%	-	07B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.050	Yes	72%	-	09B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.067	Yes	97%	-	11B CRM DOLT-5 (Set 33)
		-	0.016 (0.012 - 0.020)	0.015	Yes	-	91%	12B SRM 1577 (Set 33)
		-	0.016 (0.012 - 0.020)	0.012	Yes	-	74%	16B SRM 1577 (Set 33)
		-	0.016 (0.012 - 0.020)	0.009	No	-	53%	18B SRM 1577 (Set 33)
		-	0.016 (0.012 - 0.020)	0.009	No	-	54%	20B SRM 1577 (Set 33)
		0.069 (0.033 - 0.105)	-	0.056	Yes	81%	-	13B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.058	Yes	84%	-	15B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.068	Yes	99%	-	17B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.067	Yes	98%	-	19B CRM DOLT-5 (Set 33)
		0.069 (0.033 - 0.105)	-	0.064	Yes	92%	-	21B CRM DOLT-5 (Set 33)
		-	0.016 (0.012 - 0.020)	0.009	No	-	57%	01B SRM 1577 (Set 34)
		-	0.016 (0.012 - 0.020)	0.012	Yes	-	72%	04B SRM 1577 (Set 34)
		0.069 (0.033 - 0.105)	-	0.059	Yes	85%	-	02B CRM DOLT-5 (Set 34)
		0.069 (0.033 - 0.105)	-	0.052	Yes	75%	-	05B CRM DOLT-5 (Set 34)

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.20c: Laboratory Analyses of Certified Reference Materials Associated with Fish and Benthic Invertebrate Tissue Chemistry Samples, 2016

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?[1]	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Vanadium (V)	µg/g dw	-	0.058 (0.052 - 0.064)	0.062	Yes	-	106%	01B SRM 1577 (Set 33)
		-	0.058 (0.052 - 0.064)	0.061	Yes	-	105%	03B SRM 1577 (Set 33)
		-	0.058 (0.052 - 0.064)	0.063	Yes	-	108%	05B SRM 1577 (Set 33)
		-	0.058 (0.052 - 0.064)	0.058	Yes	-	100%	08B SRM 1577 (Set 33)
		-	0.058 (0.052 - 0.064)	0.060	Yes	-	103%	10B SRM 1577 (Set 33)
		-	0.058 (0.052 - 0.064)	0.058	Yes	-	99%	14B SRM 1577 (Set 33)
		0.51 (0.45 - 0.57)	-	0.49	Yes	95%	-	02B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.49	Yes	96%	-	04B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.48	Yes	95%	-	06B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.47	Yes	93%	-	07B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.47	Yes	92%	-	09B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.49	Yes	95%	-	11B CRM DOLT-5 (Set 33)
		-	0.058 (0.052 - 0.064)	0.057	Yes	-	99%	12B SRM 1577 (Set 33)
		-	0.058 (0.052 - 0.064)	0.058	Yes	-	100%	16B SRM 1577 (Set 33)
		-	0.058 (0.052 - 0.064)	0.058	Yes	-	99%	18B SRM 1577 (Set 33)
		-	0.058 (0.052 - 0.064)	0.061	Yes	-	106%	20B SRM 1577 (Set 33)
		0.51 (0.45 - 0.57)	-	0.47	Yes	92%	-	13B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.49	Yes	95%	-	15B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.50	Yes	99%	-	17B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.48	Yes	93%	-	19B CRM DOLT-5 (Set 33)
		0.51 (0.45 - 0.57)	-	0.49	Yes	97%	-	21B CRM DOLT-5 (Set 33)
		-	0.058 (0.052 - 0.064)	0.057	Yes	-	99%	01B SRM 1577 (Set 34)
		-	0.058 (0.052 - 0.064)	0.061	Yes	-	105%	04B SRM 1577 (Set 34)
		0.51 (0.45 - 0.57)	-	0.46	Yes	89%	-	02B CRM DOLT-5 (Set 34)
		0.51 (0.45 - 0.57)	-	0.50	Yes	98%	-	05B CRM DOLT-5 (Set 34)
Zinc (Zn)	µg/g dw	130 (117 - 143)	131 (123 - 139)	136	Yes	105%	104%	01B SRM 1577 (Set 33)
		130 (117 - 143)	131 (123 - 139)	120	Yes	92%	92%	03B SRM 1577 (Set 33)
		130 (117 - 143)	131 (123 - 139)	135	Yes	104%	103%	05B SRM 1577 (Set 33)
		130 (117 - 143)	131 (123 - 139)	150	No	115%	115%	08B SRM 1577 (Set 33)
		130 (117 - 143)	131 (123 - 139)	127	Yes	98%	97%	10B SRM 1577 (Set 33)
		130 (117 - 143)	131 (123 - 139)	123	Yes	95%	94%	14B SRM 1577 (Set 33)
		105.3 (99.9 - 110.7)	-	101.0	Yes	96%	-	02B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	92.5	No	88%	-	04B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	92.0	No	87%	-	06B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	104.0	Yes	99%	-	07B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	111.0	No	105%	-	09B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	91.2	No	87%	-	11B CRM DOLT-5 (Set 33)
		130 (117 - 143)	131 (123 - 139)	119	Yes	92%	91%	12B SRM 1577 (Set 33)
		130 (117 - 143)	131 (123 - 139)	121	Yes	93%	92%	16B SRM 1577 (Set 33)
		130 (117 - 143)	131 (123 - 139)	115	Yes	88%	88%	18B SRM 1577 (Set 33)
		130 (117 - 143)	131 (123 - 139)	123	Yes	95%	94%	20B SRM 1577 (Set 33)
		105.3 (99.9 - 110.7)	-	85.9	No	82%	-	13B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	93.0	No	88%	-	15B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	92.9	No	88%	-	17B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	87.8	No	83%	-	19B CRM DOLT-5 (Set 33)
		105.3 (99.9 - 110.7)	-	91.3	No	87%	-	21B CRM DOLT-5 (Set 33)
		130 (117 - 143)	131 (123 - 139)	121	Yes	93%	92%	01B SRM 1577 (Set 34)
		130 (117 - 143)	131 (123 - 139)	126	Yes	97%	96%	04B SRM 1577 (Set 34)
		105.3 (99.9 - 110.7)	-	93	No	89%	-	02B CRM DOLT-5 (Set 34)
		105.3 (99.9 - 110.7)	-	114	No	108%	-	05B CRM DOLT-5 (Set 34)

Note: Highlighted values did not achieve the data quality objective of recovery between 70% and 130% of certified values.

[1]If both a certified and an informational value, only compaired measured value to certified range.

Table A.21a: Laboratory Matrix Spike Recoveries Associated with Fish Tissue Samples, 2014

Analyte	Units	Matrix Spike (% Recovery)															
		Whole Body	Ovary					Muscle									
		SC-PC-01W	SC-PC-02G	GC-PC-15G	ML-08G	SC-KO-7 Ovary	KOSC1-PM-10G	ER-PC-08M	KOSC1-RT1M	GC-KO-1	GC-YP-5	SC-PM-1	SC-KO-10	ER-PM-6	SCPM-01M	ERPM-7M	GCPM-07M
Aluminum (Al)	µg/g dw	†	†	51%	103%	§	§	†	‡	97%	§	§	§	§	§	§	§
Antimony (Sb)	µg/g dw	92%	99%	96%	104%	99%	98%	102%	98%	97%	95%	98%	99%	100%	97%	98%	95%
Arsenic (As)	µg/g dw	99%	97%	93%	105%	96%	91%	97%	93%	98%	95%	97%	96%	98%	95%	99%	95%
Barium (Ba)	µg/g dw	†	83%	97%	111%	108%	109%	108%	114%	98%	101%	106%	103%	104%	93%	107%	103%
Beryllium (Be)	µg/g dw	94%	83%	81%	90%	78%	71%	86%	71%	86%	86%	87%	86%	95%	88%	86%	86%
Bismuth (Bi)	µg/g dw	89%	106%	104%	105%	95%	93%	104%	91%	100%	94%	96%	98%	101%	99%	99%	98%
Boron (B)	µg/g dw	97%	82%	78%	87%	75%	72%	79%	78%	80%	86%	85%	86%	86%	85%	85%	85%
Cadmium (Cd)	µg/g dw	92%	99%	95%	101%	96%	94%	99%	95%	96%	94%	95%	96%	97%	95%	96%	94%
Calcium (Ca)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cesium (Cs)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Chromium (Cr)	µg/g dw	92%	98%	95%	101%	95%	91%	96%	91%	93%	93%	93%	93%	95%	94%	97%	96%
Cobalt (Co)	µg/g dw	93%	102%	97%	100%	96%	91%	94%	94%	94%	94%	93%	93%	93%	92%	97%	95%
Copper (Cu)	µg/g dw	84%	100%	87%	91%	†	87%	83%	84%	89%	86%	88%	85%	87%	82%	88%	88%
Gallium (Ga)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Iron (Fe)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Lead (Pb)	µg/g dw	94%	108%	107%	108%	97%	95%	109%	95%	103%	97%	100%	102%	104%	103%	102%	101%
Lithium (Li)	µg/g dw	102%	89%	90%	97%	84%	80%	89%	78%	95%	95%	91%	93%	94%	94%	94%	94%
Magnesium (Mg)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Manganese (Mn)	µg/g dw	†	†	†	104%	110%	107%	105%	107%	91%	96%	101%	95%	101%	93%	106%	100%
Molybdenum (Mo)	µg/g dw	105%	103%	98%	108%	98%	98%	107%	104%	101%	101%	100%	101%	102%	100%	102%	99%
Nickel (Ni)	µg/g dw	84%	96%	93%	97%	92%	89%	91%	89%	94%	91%	91%	91%	91%	91%	94%	92%
Phosphorus (P)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Potassium (K)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Rhenium (Re)	µg/g dw	109%	110%	107%	113%	101%	100%	115%	110%	106%	103%	103%	105%	109%	107%	111%	109%
Rubidium (Rb)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Selenium (Se)	µg/g dw	93%	97%	†	120%	†	93%	90%	92%	101%	91%	101%	107%	86%	85%	97%	98%
Silver (Ag)	µg/g dw	88%	98%	93%	100%	95%	94%	95%	95%	95%	92%	92%	94%	93%	91%	94%	93%
Sodium (Na)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Strontium (Sr)	µg/g dw	†	92%	102%	108%	102%	101%	†	110%	80%	96%	98%	95%	98%	63%	‡	98%
Thallium (Tl)	µg/g dw	99%	110%	108%	110%	99%	98%	110%	99%	103%	99%	101%	104%	105%	104%	104%	104%
Thorium (Th)	µg/g dw	94%	104%	104%	114%	102%	96%	118%	93%	108%	100%	103%	107%	110%	107%	108%	106%
Tin (Sn)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Titanium (Ti)	µg/g dw	97%	81%	103%	107%	102%	97%	102%	110%	102%	99%	98%	98%	97%	97%	97%	90%
Uranium (U)	µg/g dw	108%	114%	113%	117%	106%	106%	120%	104%	109%	104%	107%	110%	112%	110%	111%	110%
Vanadium (V)	µg/g dw	101%	101%	100%	106%	100%	96%	102%	98%	98%	99%	99%	99%	98%	97%	101%	98%
Yttrium (Y)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Zinc (Zn)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Zirconium (Zr)	µg/g dw	66%	142%	122%	162%	70%	63%	112%	95%	77%	83%	79%	84%	81%	76%	67%	82%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

* Not spiked (the element was not included in the multi-element spike solution).
† Spike too small (the concentration of the element spiked into sample was less than 50% of the average concentration measured in the replicates).
‡ High variability in replicates (the spike level was less than 2x the standard deviation of replicates).
§ Only one unspiked replicate was used for this element because the second replicate was digested in a vessel with known, significantly high background levels of this element. Thus the standard deviation of the replicates could not be accurately determined.

Table A.21b: **Laboratory Matrix Spike Recoveries Associated with Fish Tissue Samples, 2015**

Analyte	Units	Matrix Spike (% Recovery)															
		Whole Body	Ovary					Muscle									
		SC-PCC-12-APR	SC-NSC-46-APR	SC-PCC-08-APR	GC-NSC-49-APR	ER-PCC-02-APR	ER-YP-02-APR	SC-CSU-02-APR	SC-NSC-46-APR-1	SC-NSC-46-APR-2	SC-PCC-08-APR	SC-NSC-06	GC-YP-06-APR	GC-NSC-49-APR-1	GC-NSC-49-APR-2	GC-PCC-05-APR	GC-NSC-02
Aluminum (Al)	µg/g dw	†	§	§	§	§	105%	†	109%	§	§	§	77%	121%	§	78%	§
Antimony (Sb)	µg/g dw	85%	101%	98%	98%	96%	100%	98%	101%	101%	98%	108%	96%	100%	98%	98%	104%
Arsenic (As)	µg/g dw	96%	107%	100%	100%	96%	98%	102%	103%	107%	100%	103%	100%	103%	100%	99%	99%
Barium (Ba)	µg/g dw	†	114%	108%	111%	220%	113%	88%	107%	114%	108%	129%	123%	110%	111%	94%	115%
Beryllium (Be)	µg/g dw	87%	75%	72%	72%	70%	74%	76%	78%	75%	72%	78%	78%	79%	72%	76%	74%
Bismuth (Bi)	µg/g dw	85%	110%	108%	108%	106%	106%	103%	107%	110%	108%	102%	101%	98%	108%	94%	104%
Boron (B)	µg/g dw	90%	78%	78%	77%	77%	76%	75%	78%	78%	78%	74%	79%	85%	77%	81%	72%
Cadmium (Cd)	µg/g dw	91%	99%	95%	95%	93%	93%	96%	98%	99%	95%	99%	94%	98%	95%	95%	96%
Calcium (Ca)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cesium (Cs)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Chromium (Cr)	µg/g dw	95%	95%	93%	94%	92%	91%	96%	97%	95%	93%	93%	93%	95%	94%	92%	89%
Cobalt (Co)	µg/g dw	90%	98%	96%	96%	90%	90%	98%	102%	98%	96%	91%	98%	97%	96%	95%	89%
Copper (Cu)	µg/g dw	70%	86%	90%	95%	95%	84%	90%	95%	86%	90%	96%	90%	81%	95%	88%	77%
Gallium (Ga)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Iron (Fe)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Lead (Pb)	µg/g dw	95%	111%	111%	111%	112%	110%	108%	113%	111%	111%	104%	107%	100%	111%	98%	106%
Lithium (Li)	µg/g dw	101%	73%	74%	74%	75%	74%	85%	90%	73%	74%	76%	88%	81%	74%	80%	71%
Magnesium (Mg)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Manganese (Mn)	µg/g dw	†	†	†	104%	†	98%	54%	98%	†	†	109%	119%	95%	104%	80%	97%
Molybdenum (Mo)	µg/g dw	102%	106%	102%	103%	97%	100%	103%	104%	106%	102%	102%	104%	105%	103%	105%	101%
Nickel (Ni)	µg/g dw	85%	95%	94%	93%	102%	85%	94%	97%	95%	94%	87%	94%	94%	93%	91%	86%
Phosphorus (P)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Potassium (K)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Rhenium (Re)	µg/g dw	104%	118%	113%	114%	113%	117%	114%	114%	118%	113%	110%	114%	106%	114%	104%	112%
Rubidium (Rb)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Selenium (Se)	µg/g dw	75%	†	†	90%	†	93%	99%	98%	†	†	108%	92%	101%	90%	98%	96%
Silver (Ag)	µg/g dw	80%	98%	96%	88%	91%	91%	92%	96%	98%	96%	75%	92%	88%	88%	93%	93%
Sodium (Na)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Strontium (Sr)	µg/g dw	†	109%	104%	104%	149%	100%	28%	103%	109%	104%	110%	206%	115%	104%	‡	101%
Thallium (Tl)	µg/g dw	97%	114%	111%	112%	110%	110%	110%	113%	114%	111%	105%	109%	101%	112%	98%	107%
Thorium (Th)	µg/g dw	104%	119%	114%	112%	114%	119%	116%	119%	119%	114%	115%	116%	107%	112%	106%	116%
Tin (Sn)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Titanium (Ti)	µg/g dw	107%	99%	95%	94%	114%	97%	97%	103%	99%	95%	93%	103%	97%	94%	94%	93%
Uranium (U)	µg/g dw	104%	123%	118%	120%	121%	125%	120%	122%	123%	118%	115%	119%	114%	120%	112%	117%
Vanadium (V)	µg/g dw	102%	104%	100%	100%	98%	96%	101%	103%	104%	100%	99%	101%	100%	100%	98%	98%
Yttrium (Y)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Zinc (Zn)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Zirconium (Zr)	µg/g dw	96%	57%	66%	62%	64%	61%	142%	148%	57%	66%	59%	120%	86%	62%	64%	76%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

* Not spiked (the element was not included in the multi-element spike solution).
† Spike too small (the concentration of the element spiked into sample was less than 50% of the average concentration measured in the replicates).
‡ High variability in replicates (the spike level was less than 2x the standard deviation of replicates).
§ Only one unspiked replicate was used for this element because the second replicate was digested in a vessel with known, significantly high background levels of this element. Thus the standard deviation of the replicates could not be accurately determined.

Table A.21b: Laboratory Matrix Spike Recoveries Associated with Fish Tissue Samples, 2015

Analyte	Units	Matrix Spike (% Recovery)					
		Muscle					
		ER-CSU-17-APR	ER-CSU-09-APR	ER-NSC-13-APR	ER-PCC-02-APR	ER-YP-02-APR	ER-NSC-03
Aluminum (Al)	µg/g dw	†	§	92%	§	105%	†
Antimony (Sb)	µg/g dw	97%	99%	96%	96%	100%	103%
Arsenic (As)	µg/g dw	101%	105%	100%	96%	98%	100%
Barium (Ba)	µg/g dw	63%	23%	87%	220%	113%	113%
Beryllium (Be)	µg/g dw	79%	70%	68%	70%	74%	70%
Bismuth (Bi)	µg/g dw	94%	106%	100%	106%	106%	103%
Boron (B)	µg/g dw	82%	74%	73%	77%	76%	71%
Cadmium (Cd)	µg/g dw	97%	96%	91%	93%	93%	95%
Calcium (Ca)	µg/g dw	*	*	*	*	*	*
Cesium (Cs)	µg/g dw	*	*	*	*	*	*
Chromium (Cr)	µg/g dw	93%	93%	89%	92%	91%	87%
Cobalt (Co)	µg/g dw	94%	94%	90%	90%	90%	87%
Copper (Cu)	µg/g dw	81%	88%	83%	95%	84%	81%
Gallium (Ga)	µg/g dw	*	*	*	*	*	*
Iron (Fe)	µg/g dw	†	†	†	†	†	†
Lead (Pb)	µg/g dw	97%	108%	103%	112%	110%	104%
Lithium (Li)	µg/g dw	79%	69%	66%	75%	74%	71%
Magnesium (Mg)	µg/g dw	†	†	†	†	†	†
Manganese (Mn)	µg/g dw	20%	†	76%	†	98%	86%
Molybdenum (Mo)	µg/g dw	106%	104%	99%	97%	100%	98%
Nickel (Ni)	µg/g dw	91%	90%	88%	102%	85%	83%
Phosphorus (P)	µg/g dw	†	†	†	†	†	†
Potassium (K)	µg/g dw	*	*	*	*	*	*
Rhenium (Re)	µg/g dw	104%	117%	112%	113%	117%	112%
Rubidium (Rb)	µg/g dw	*	*	*	*	*	*
Selenium (Se)	µg/g dw	†	102%	†	†	93%	99%
Silver (Ag)	µg/g dw	50%	70%	89%	91%	91%	94%
Sodium (Na)	µg/g dw	†	†	†	†	†	†
Strontium (Sr)	µg/g dw	-4%	†	‡	149%	100%	99%
Thallium (Tl)	µg/g dw	98%	111%	105%	110%	110%	107%
Thorium (Th)	µg/g dw	107%	122%	116%	114%	119%	113%
Tin (Sn)	µg/g dw	*	*	*	*	*	*
Titanium (Ti)	µg/g dw	83%	98%	98%	114%	97%	83%
Uranium (U)	µg/g dw	111%	123%	115%	121%	125%	117%
Vanadium (V)	µg/g dw	99%	102%	98%	98%	96%	93%
Yttrium (Y)	µg/g dw	*	*	*	*	*	*
Zinc (Zn)	µg/g dw	†	†	†	†	†	†
Zirconium (Zr)	µg/g dw	68%	73%	77%	64%	61%	74%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

* Not spiked (the element was not included in the multi-element spike solution).
† Spike too small (the concentration of the element spiked into sample was less than 50% of the average concentration measured in the replicates).
‡ High variability in replicates (the spike level was less than 2x the standard deviation of replicates).
§ Only one unspiked replicate was used for this element because the second replicate was digested in a vessel with known, significantly high background levels of this element. Thus the standard deviation of the replicates could not be accurately determined.

Table A.21c: Laboratory Matrix Spike Recoveries Associated with fish Tissue Samples, 2016

Analyte	Units	Matrix Spike (% Recovery)															
		Whole Body		Ovary								Muscle					
		SC-RSC-18	ER-PCC-13	GC-YP-33	GC-CSU-31	ER-YP-05	ER-CSU-04	SC-YP-10	SC-NSC-09	SC-RT-04	ER-PCC-06	SC-NSC-01A	ER-PCC-01	SC-PCC-06	GC-BT-02	ER-YP-02	ER-CSU-34
Aluminum (Al)	µg/g dw	†	†	96%	§	§	§	§	§	96%	§	§	§	§	§	109%	§
Antimony (Sb)	µg/g dw	94%	90%	98%	96%	95%	98%	99%	96%	96%	105%	97%	99%	101%	98%	99%	102%
Arsenic (As)	µg/g dw	100%	95%	98%	99%	97%	97%	100%	104%	99%	110%	98%	106%	105%	98%	97%	102%
Barium (Ba)	µg/g dw	†	†	108%	96%	101%	106%	107%	111%	104%	118%	95%	122%	94%	105%	102%	109%
Beryllium (Be)	µg/g dw	90%	77%	79%	93%	86%	93%	87%	92%	85%	97%	89%	89%	90%	85%	82%	85%
Bismuth (Bi)	µg/g dw	91%	100%	96%	100%	95%	100%	97%	99%	100%	116%	92%	100%	101%	96%	98%	102%
Boron (B)	µg/g dw	85%	76%	79%	95%	93%	96%	87%	88%	83%	101%	98%	83%	78%	86%	78%	83%
Cadmium (Cd)	µg/g dw	93%	88%	94%	95%	95%	96%	96%	96%	98%	108%	92%	102%	101%	97%	95%	96%
Calcium (Ca)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cesium (Cs)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Chromium (Cr)	µg/g dw	95%	84%	92%	98%	96%	95%	91%	100%	96%	105%	88%	97%	94%	95%	99%	95%
Cobalt (Co)	µg/g dw	94%	89%	95%	100%	98%	97%	93%	100%	98%	109%	90%	97%	98%	96%	92%	96%
Copper (Cu)	µg/g dw	86%	66%	86%	100%	89%	95%	87%	86%	†	121%	79%	69%	111%	89%	94%	74%
Gallium (Ga)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Iron (Fe)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Lead (Pb)	µg/g dw	97%	101%	100%	103%	101%	101%	101%	100%	103%	115%	94%	103%	103%	100%	102%	106%
Lithium (Li)	µg/g dw	96%	80%	84%	100%	99%	96%	88%	95%	92%	100%	98%	90%	89%	92%	84%	89%
Magnesium (Mg)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Manganese (Mn)	µg/g dw	†	†	96%	†	105%	†	97%	92%	101%	†	94%	112%	90%	95%	94%	105%
Molybdenum (Mo)	µg/g dw	103%	95%	103%	99%	101%	102%	102%	102%	102%	108%	97%	105%	105%	104%	101%	106%
Nickel (Ni)	µg/g dw	87%	78%	90%	96%	93%	93%	87%	100%	92%	105%	88%	95%	94%	91%	89%	93%
Phosphorus (P)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Potassium (K)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Rhenium (Re)	µg/g dw	103%	114%	105%	106%	107%	103%	107%	102%	103%	119%	99%	110%	108%	107%	107%	111%
Rubidium (Rb)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Selenium (Se)	µg/g dw	101%	83%	98%	†	94%	91%	91%	†	†	†	86%	115%	111%	93%	101%	†
Silver (Ag)	µg/g dw	88%	83%	55%	101%	90%	89%	90%	96%	91%	83%	90%	90%	95%	93%	90%	95%
Sodium (Na)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Strontium (Sr)	µg/g dw	†	†	103%	102%	104%	105%	93%	104%	101%	110%	82%	206%	63%	100%	‡	106%
Thallium (Tl)	µg/g dw	101%	107%	101%	104%	102%	103%	102%	101%	103%	117%	96%	104%	104%	101%	103%	108%
Thorium (Th)	µg/g dw	107%	108%	107%	103%	105%	106%	109%	102%	104%	112%	102%	104%	104%	103%	106%	113%
Tin (Sn)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Titanium (Ti)	µg/g dw	81%	81%	97%	101%	97%	101%	98%	96%	97%	105%	98%	94%	96%	96%	93%	93%
Uranium (U)	µg/g dw	108%	114%	111%	105%	106%	110%	112%	106%	107%	122%	105%	110%	108%	107%	113%	117%
Vanadium (V)	µg/g dw	100%	94%	97%	103%	102%	102%	99%	105%	101%	108%	94%	101%	101%	100%	96%	101%
Yttrium (Y)	µg/g dw	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Zinc (Zn)	µg/g dw	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†
Zirconium (Zr)	µg/g dw	64%	66%	71%	70%	73%	75%	76%	61%	49%	88%	81%	67%	54%	76%	67%	50%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

* Not spiked (the element was not included in the multi-element spike solution).
† Spike too small (the concentration of the element spiked into sample was less than 50% of the average concentration measured in the replicates).
‡ High variability in replicates (the spike level was less than 2x the standard deviation of replicates).
§ Only one unspiked replicate was used for this element because the second replicate was digested in a vessel with known, significantly high background levels of this element. Thus the standard deviation of the replicates could not be accurately determined.

Table A.21c: Laboratory Matrix Spike Recoveries Associated with fish Tissue Samples, 2016

Analyte	Units	Matrix Spike (% Recovery)					
		Muscle					
		GC-CSU-09	ER-NSC-01A	ER-NSC-02A	SC-CSU-36	SC-NSC-34	GC-NSC-01
Aluminum (Al)	µg/g dw	84%	86%	80%	§	§	§
Antimony (Sb)	µg/g dw	78%	102%	101%	97%	97%	101%
Arsenic (As)	µg/g dw	77%	106%	97%	97%	99%	104%
Barium (Ba)	µg/g dw	†	107%	101%	106%	108%	‡
Beryllium (Be)	µg/g dw	†	93%	93%	78%	77%	86%
Bismuth (Bi)	µg/g dw	111%	99%	100%	94%	97%	100%
Boron (B)	µg/g dw	†	97%	92%	82%	81%	83%
Cadmium (Cd)	µg/g dw	*	94%	98%	96%	97%	98%
Calcium (Ca)	µg/g dw	*	*	*	*	*	*
Cesium (Cs)	µg/g dw	100%	*	*	*	*	*
Chromium (Cr)	µg/g dw	99%	90%	95%	95%	93%	96%
Cobalt (Co)	µg/g dw	95%	93%	99%	95%	96%	97%
Copper (Cu)	µg/g dw	‡	112%	85%	89%	87%	158%
Gallium (Ga)	µg/g dw	†	*	*	*	*	*
Iron (Fe)	µg/g dw	99%	†	†	†	†	†
Lead (Pb)	µg/g dw	95%	99%	105%	98%	100%	101%
Lithium (Li)	µg/g dw	94%	101%	95%	85%	84%	88%
Magnesium (Mg)	µg/g dw	†	†	†	†	†	†
Manganese (Mn)	µg/g dw	*	105%	107%	103%	105%	80%
Molybdenum (Mo)	µg/g dw	101%	99%	102%	103%	101%	103%
Nickel (Ni)	µg/g dw	98%	92%	96%	92%	91%	93%
Phosphorus (P)	µg/g dw	*	†	†	†	†	†
Potassium (K)	µg/g dw	‡	*	*	*	*	*
Rhenium (Re)	µg/g dw	*	100%	105%	104%	106%	105%
Rubidium (Rb)	µg/g dw	54%	*	*	*	*	*
Selenium (Se)	µg/g dw	104%	105%	124%	108%	104%	103%
Silver (Ag)	µg/g dw	96%	93%	96%	94%	95%	85%
Sodium (Na)	µg/g dw	97%	†	†	†	†	†
Strontium (Sr)	µg/g dw	*	100%	97%	104%	126%	‡
Thallium (Tl)	µg/g dw	100%	102%	105%	100%	102%	103%
Thorium (Th)	µg/g dw	*	107%	109%	101%	102%	106%
Tin (Sn)	µg/g dw	82%	*	*	*	*	*
Titanium (Ti)	µg/g dw	109%	100%	95%	100%	93%	98%
Uranium (U)	µg/g dw	106%	108%	110%	108%	108%	111%
Vanadium (V)	µg/g dw	105%	96%	99%	99%	97%	101%
Yttrium (Y)	µg/g dw	102%	*	*	*	*	*
Zinc (Zn)	µg/g dw	111%	†	†	†	†	†
Zirconium (Zr)	µg/g dw	115%	86%	92%	76%	56%	64%

Note: Highlighted values did not meet the data quality objective of 70 - 130% recovery.

* Not spiked (the element was not included in the multi-element spike solution).
† Spike too small (the concentration of the element spiked into sample was less than 50% of the average concentration measured in the replicates).
‡ High variability in replicates (the spike level was less than 2x the standard deviation of replicates).
§ Only one unspiked replicate was used for this element because the second replicate was digested in a vessel with known, significantly high background levels of this element. Thus the standard deviation of the replicates could not be accurately determined.

APPENDIX B
WATER QUALITY DATA

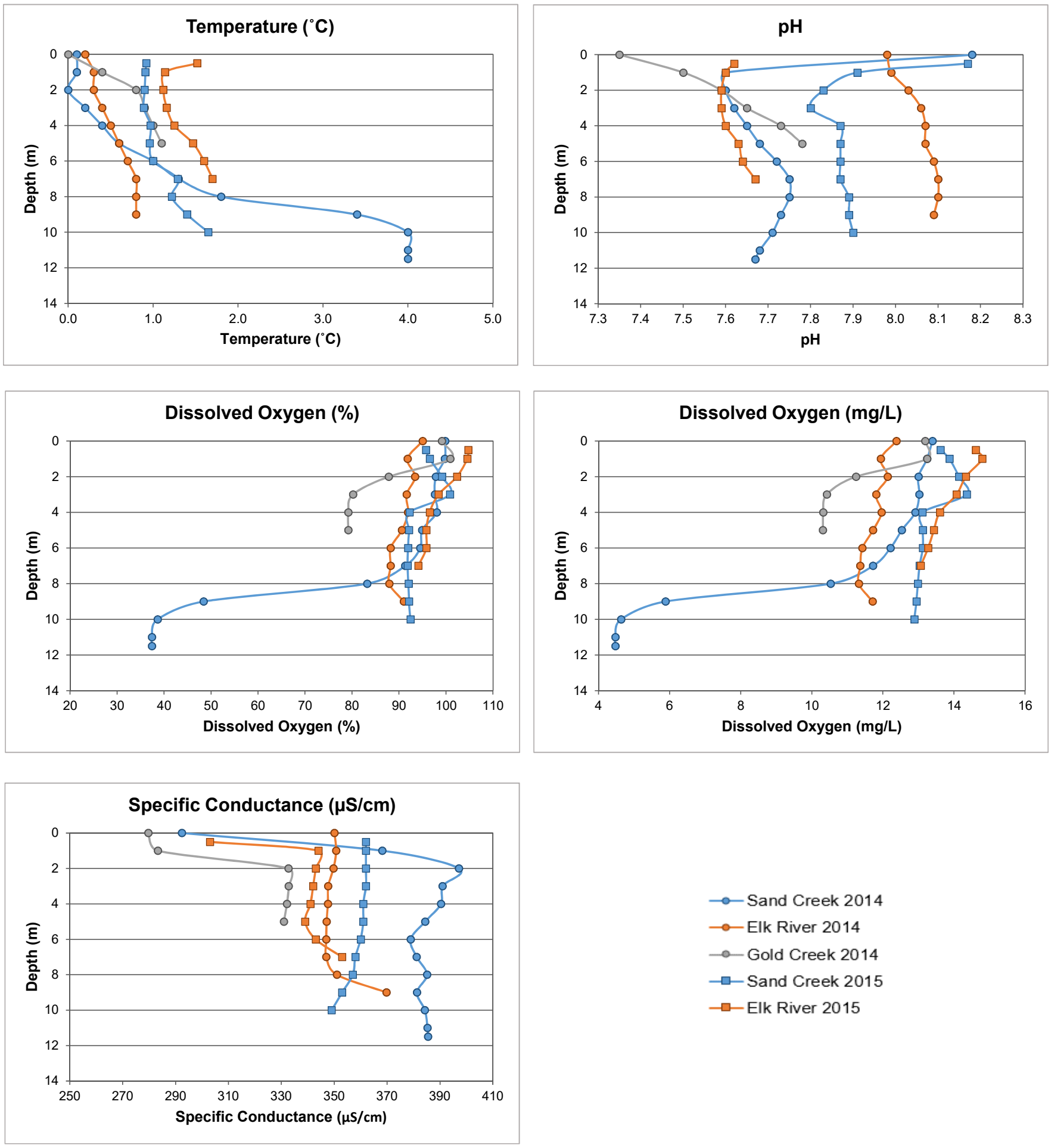
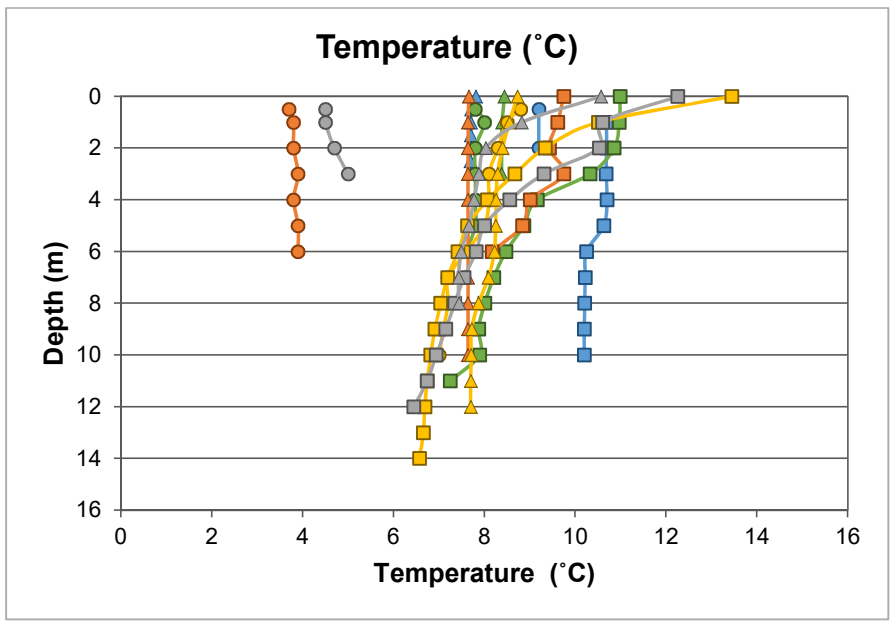
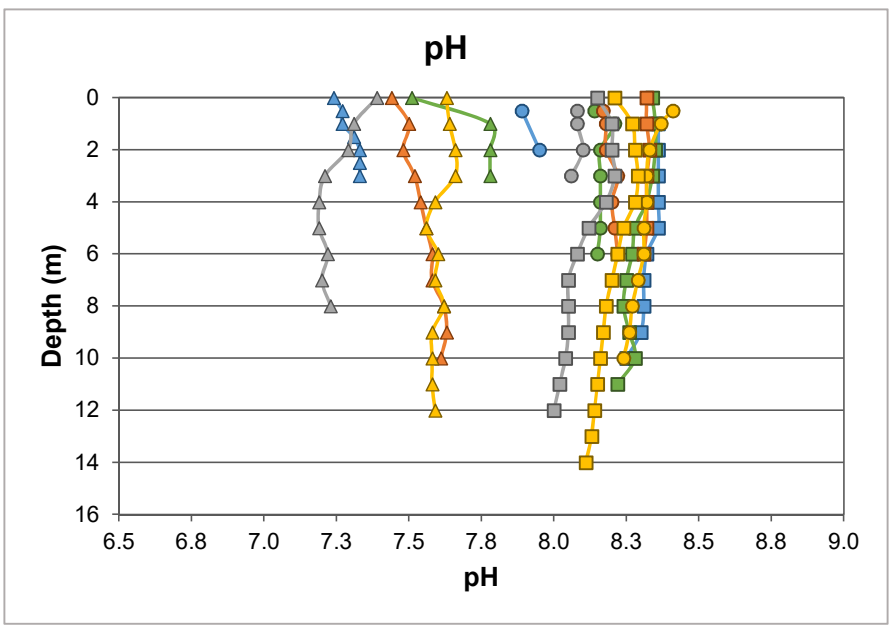
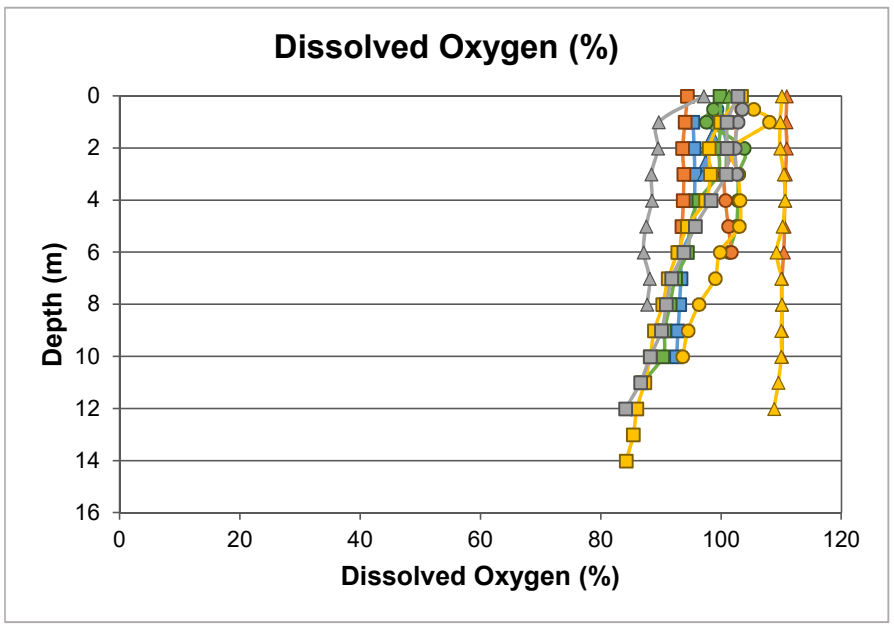
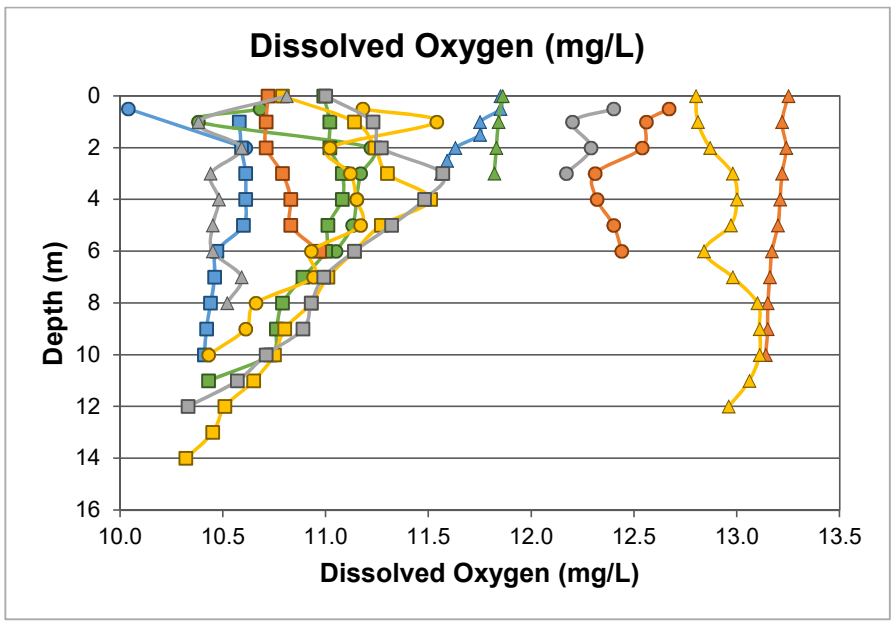


Figure B.1: ***In situ*** **Water Quality Profiles Conducted at Sand Creek, Elk River, and Gold Creek Areas in Koocanusa Reservoir, February 2014 and 2015**









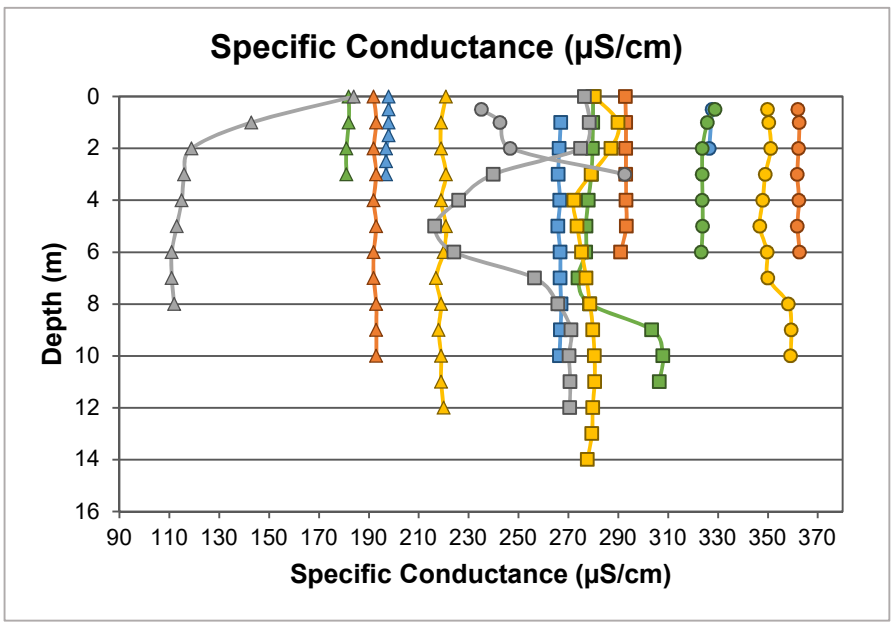
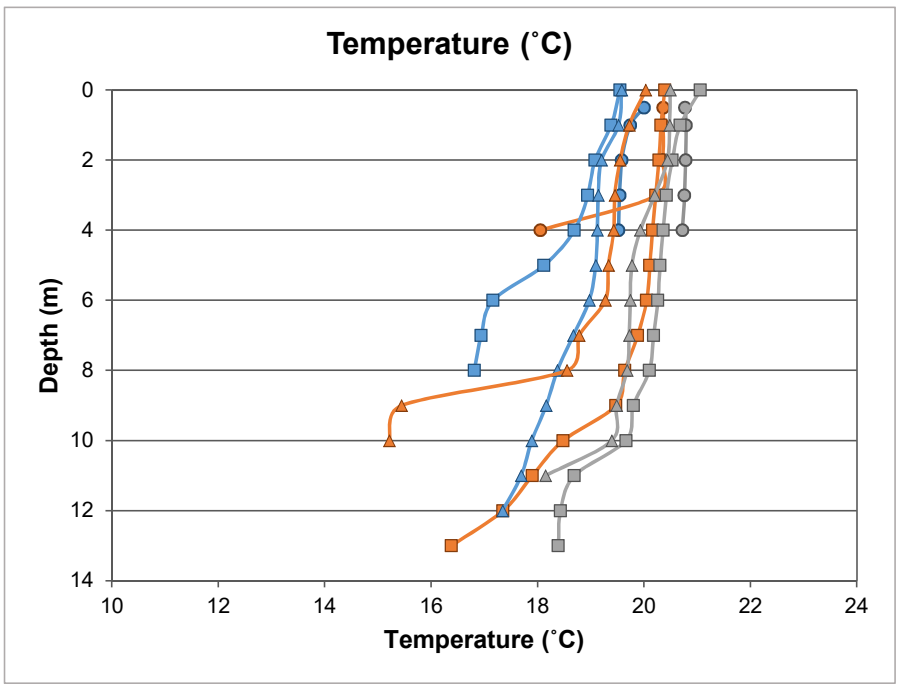
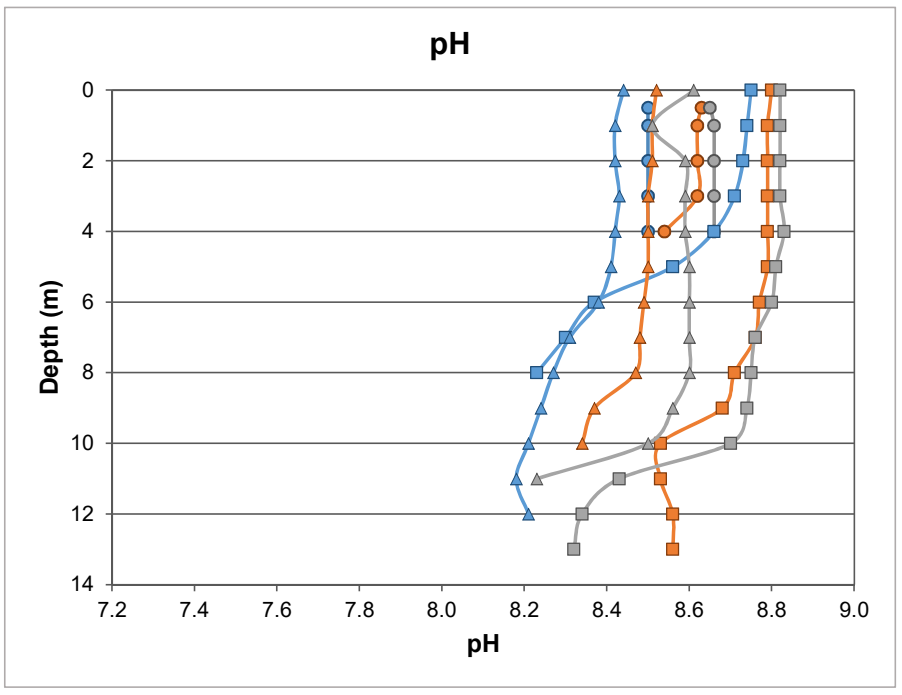
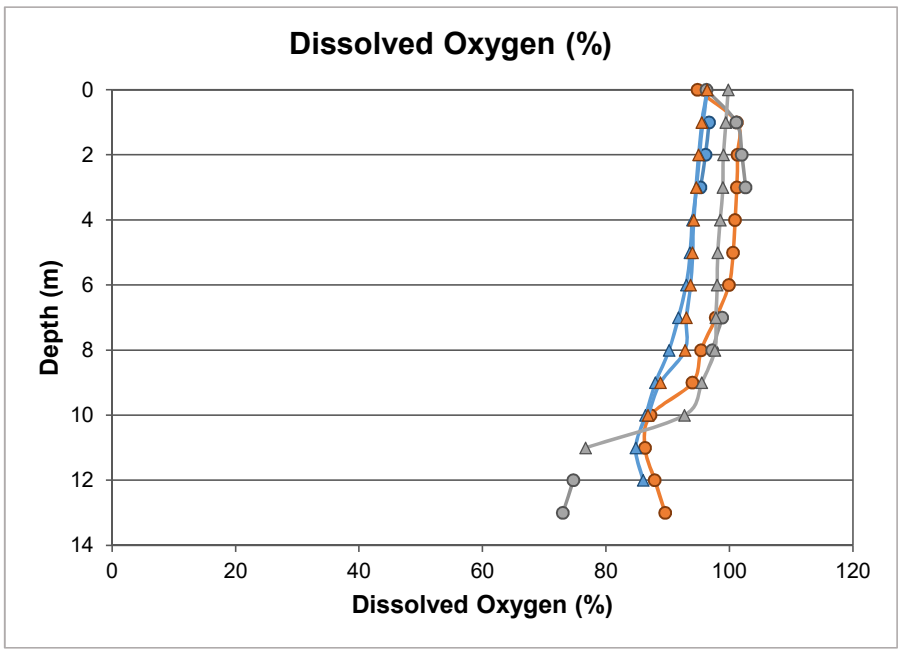
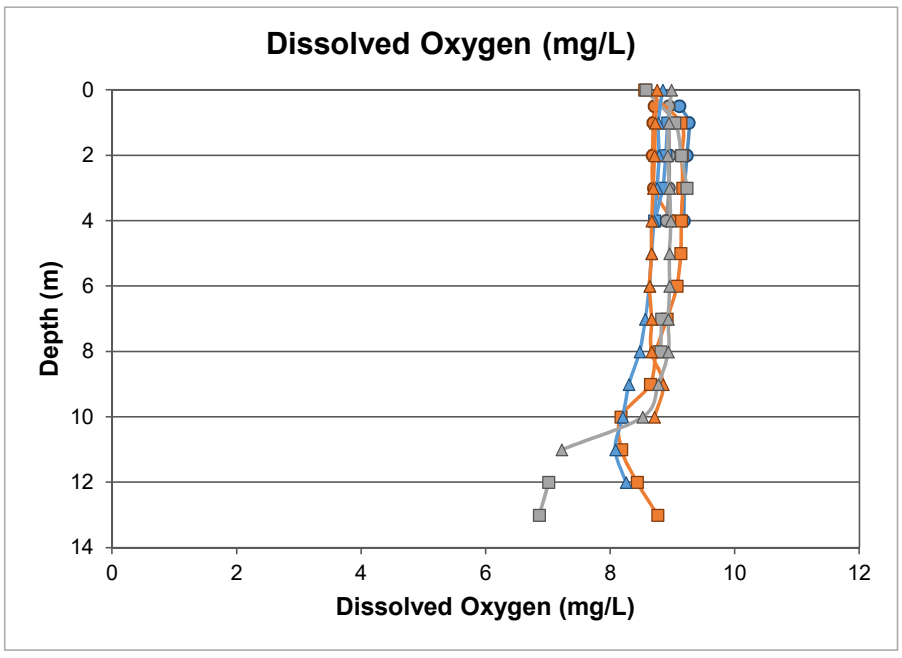


Figure B.2: ***In situ W*** **ater Quality Profiles Conducted at Sand Creek, Elk River, and Gold Creek Areas and at the Upstream (T2/TN) and Downstream (T4) Sampling Stations in Koocanusa Reservoir, April 2014, 2015 and 2016**









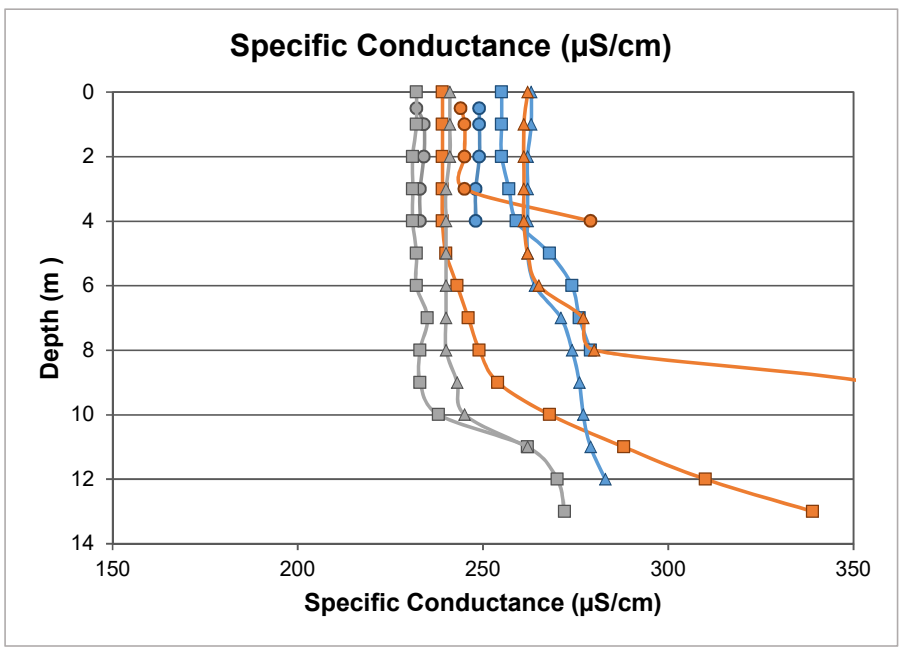
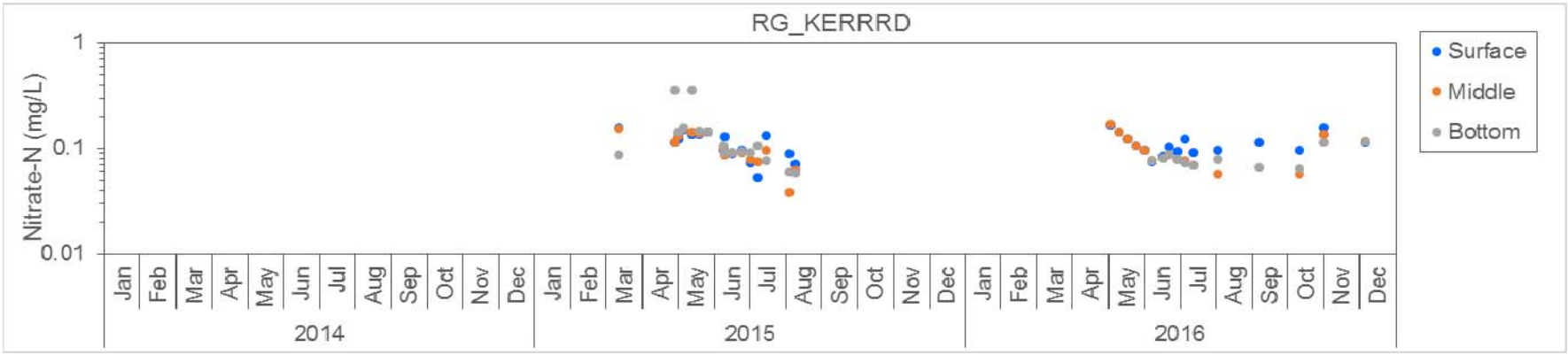
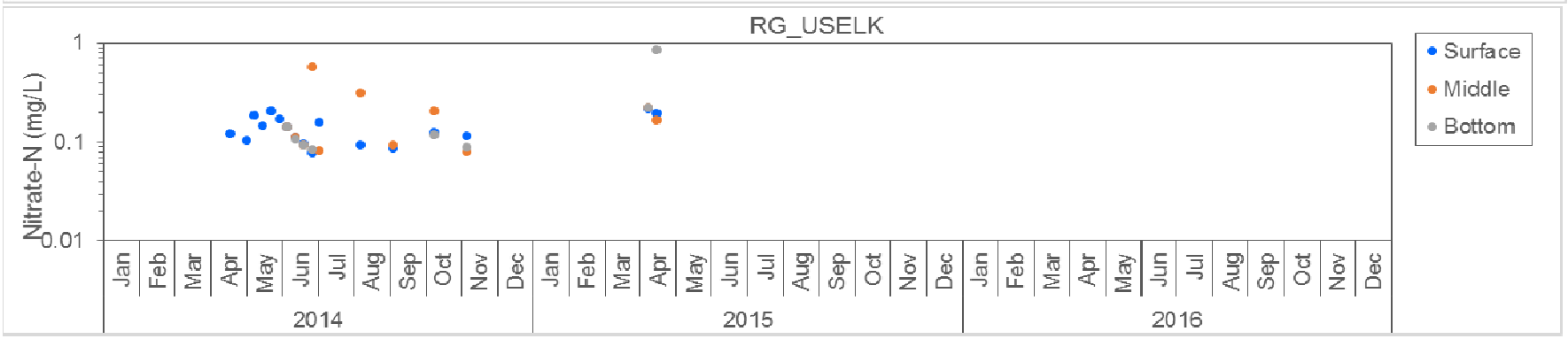
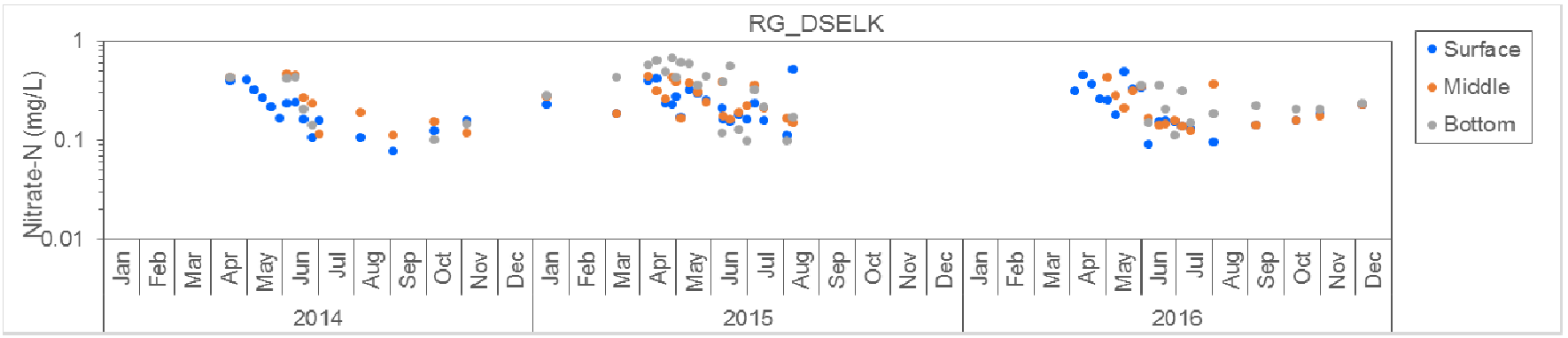
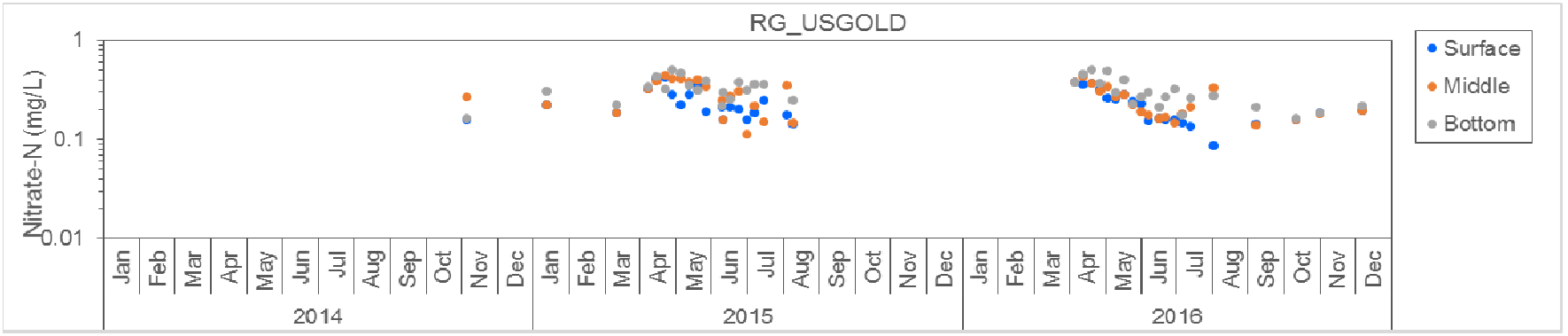


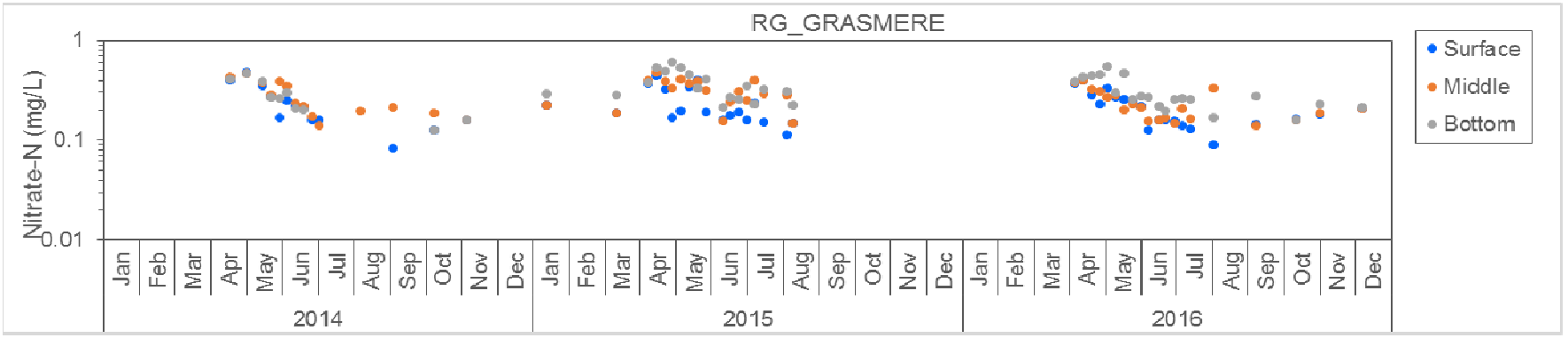
Figure B.3: ***In situ*** **Water Quality Profiles Conducted at Sand Creek, Elk River, and Gold Creek Areas in Koocanusa Reservoir, August 2014, 2015 and 2016**











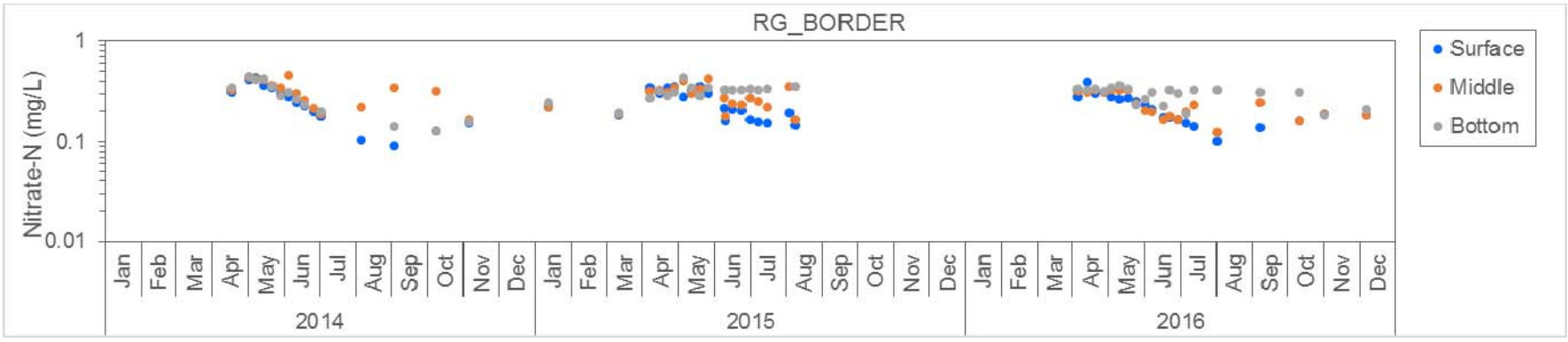


Figure B.4: Aqueous Nitrate-Nitrogen Concentrations at the Surface, Middle and Bottom of the Water Column in Koocanusa Reservoir, 2014 to 2016

Note: Stations RG_KERRRD and RG_USELK are upstream of the Elk River. Stations RG_DSELK, RG_USGOLD, RG_GRASMERE, and RG_BORDER are downstream of the Elk River.

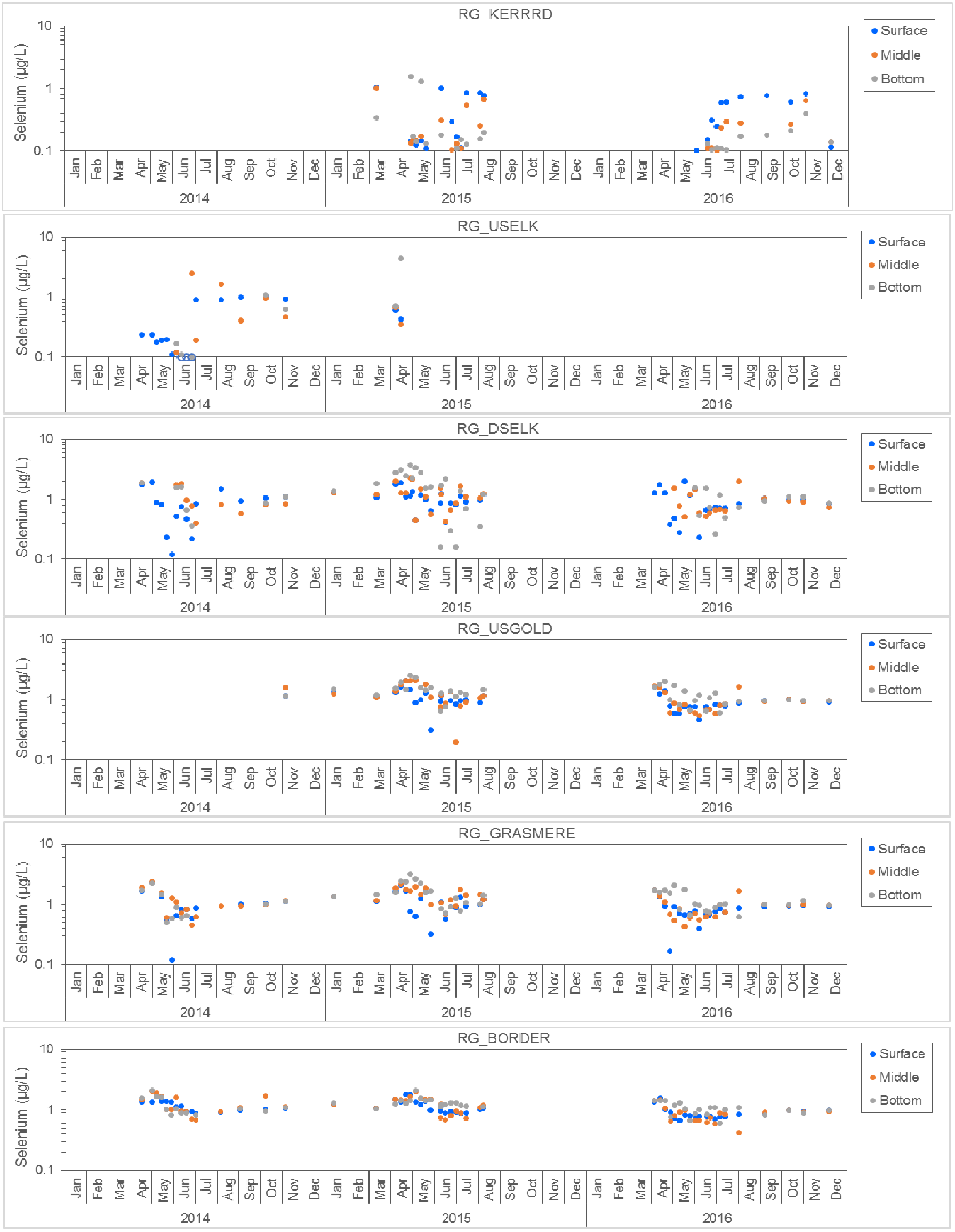


Figure B.5: Aqueous Total Selenium Concentrations at the Surface, Middle and Bottom of the Water Column in Koocanusa Reservoir, 2014 to 2016

Note: Stations RG_KERRRD and RG_USELK are upstream of the Elk River. Stations RG_DSELK, RG_USGOLD, RG_GRASMERE, and RG_BORDER are downstream of the Elk River.

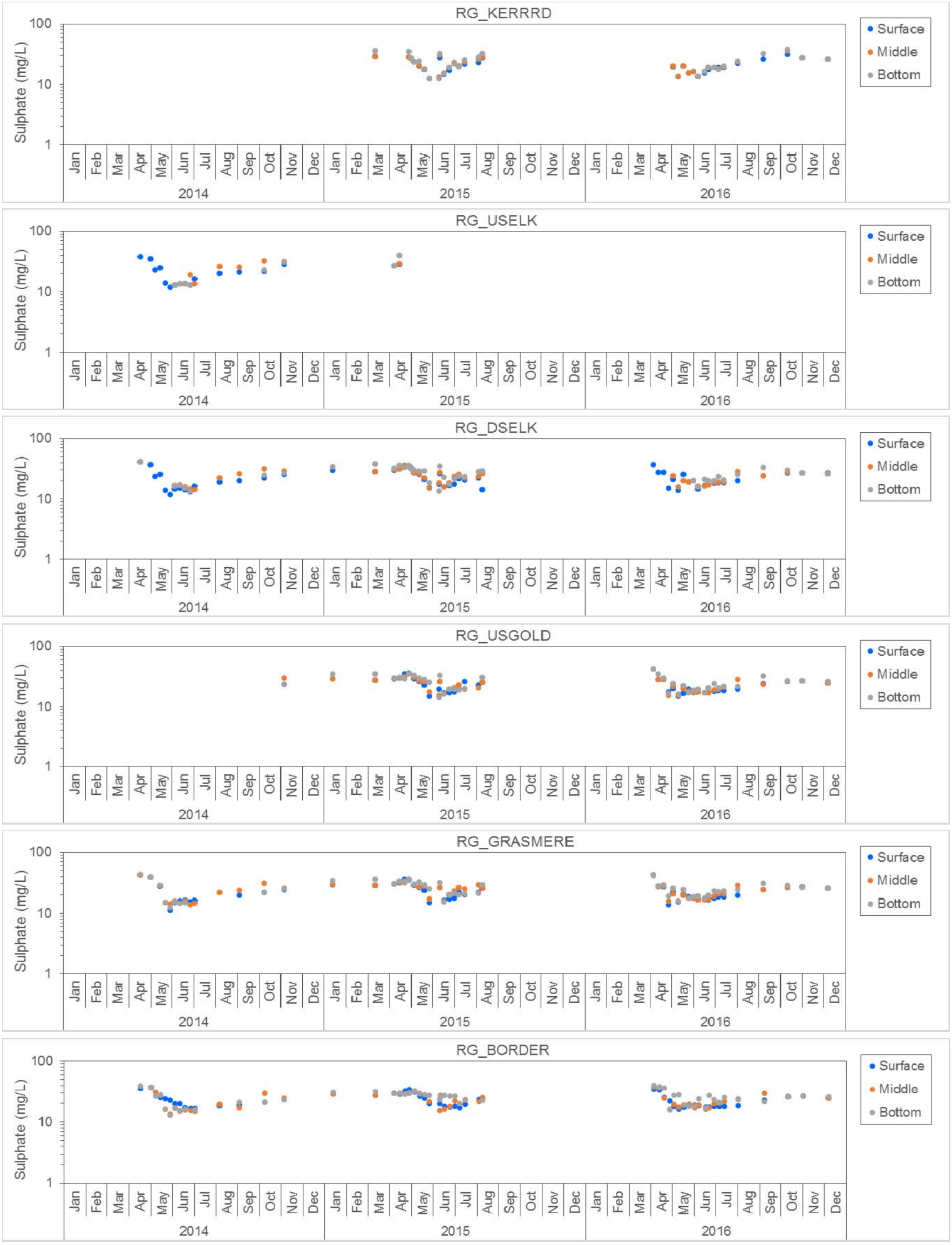
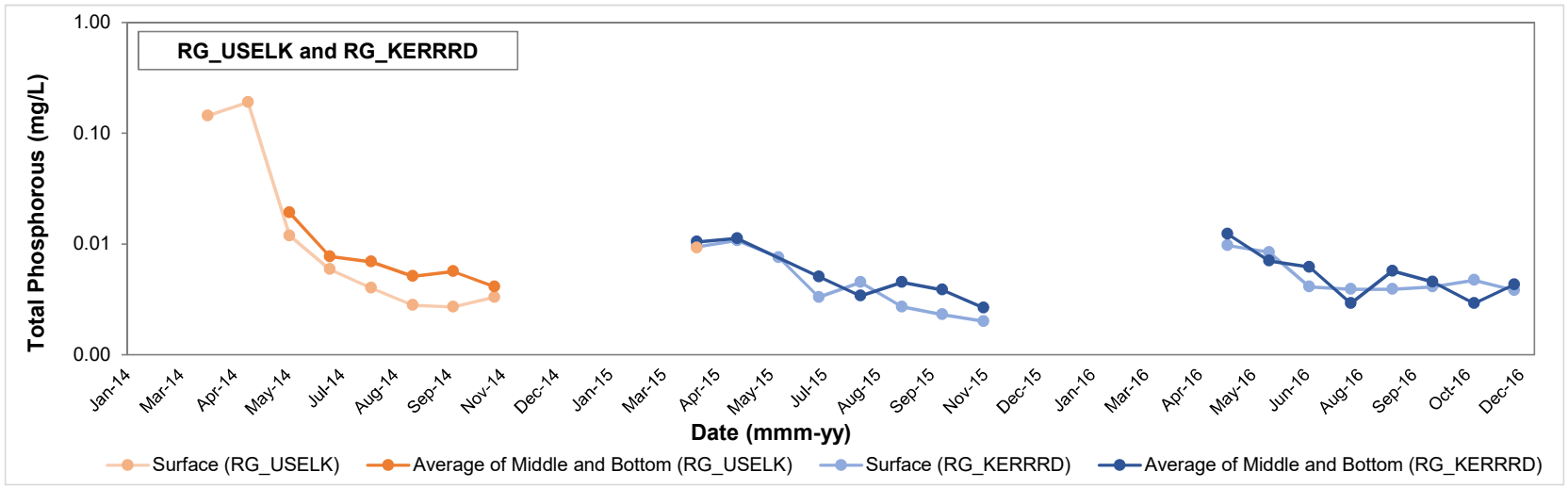
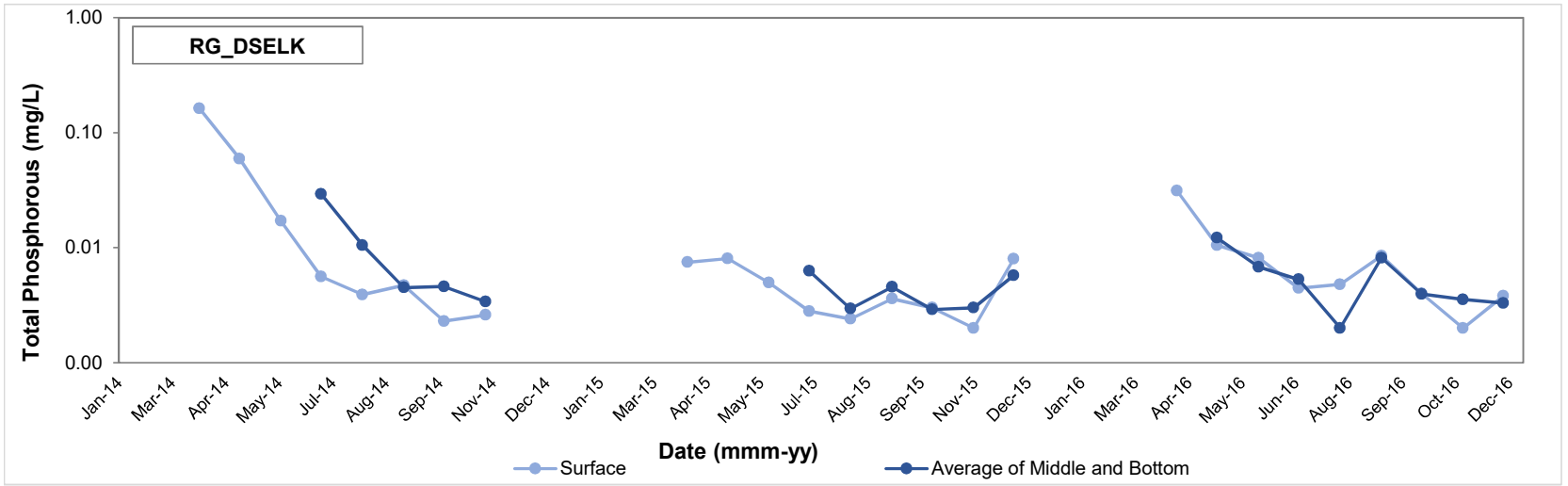
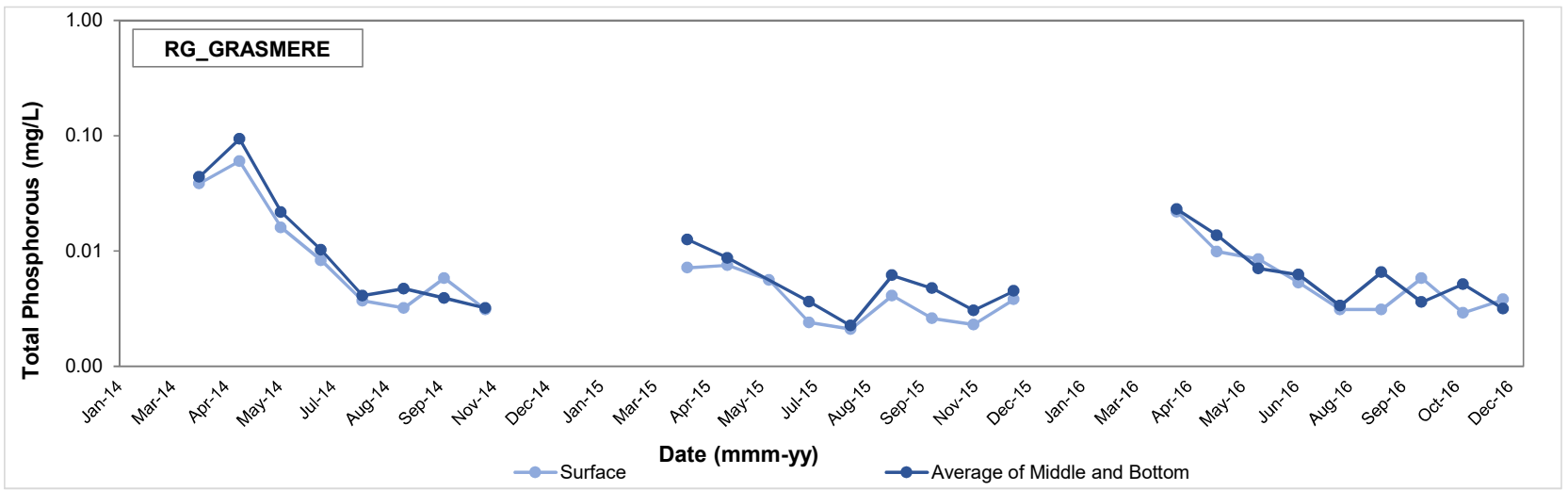


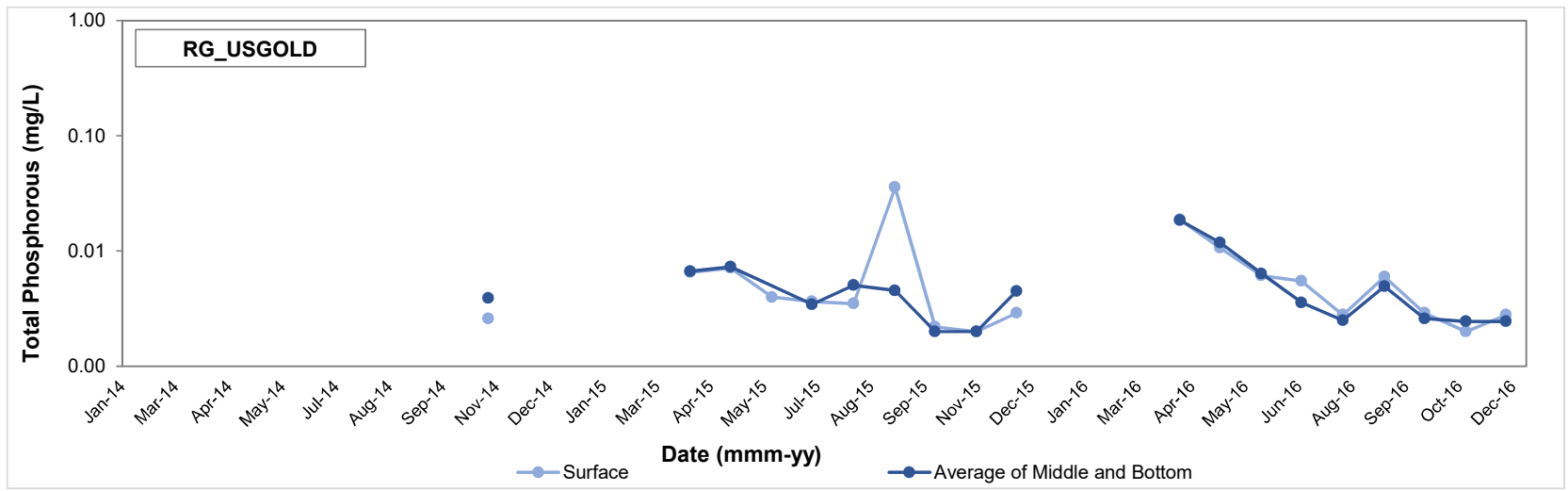
Figure B.6: Aqueous Sulphate Concentrations at the Surface, Middle and Bottom of the Water Column in Koocanusa Reservoir, 2014 to 2016

Note: Stations RG_KERRRD and RG_USELK are upstream of the Elk River. Stations RG_DSELK, RG_USGOLD, RG_GRASMERE, and RG_BORDER are downstream of the Elk River.









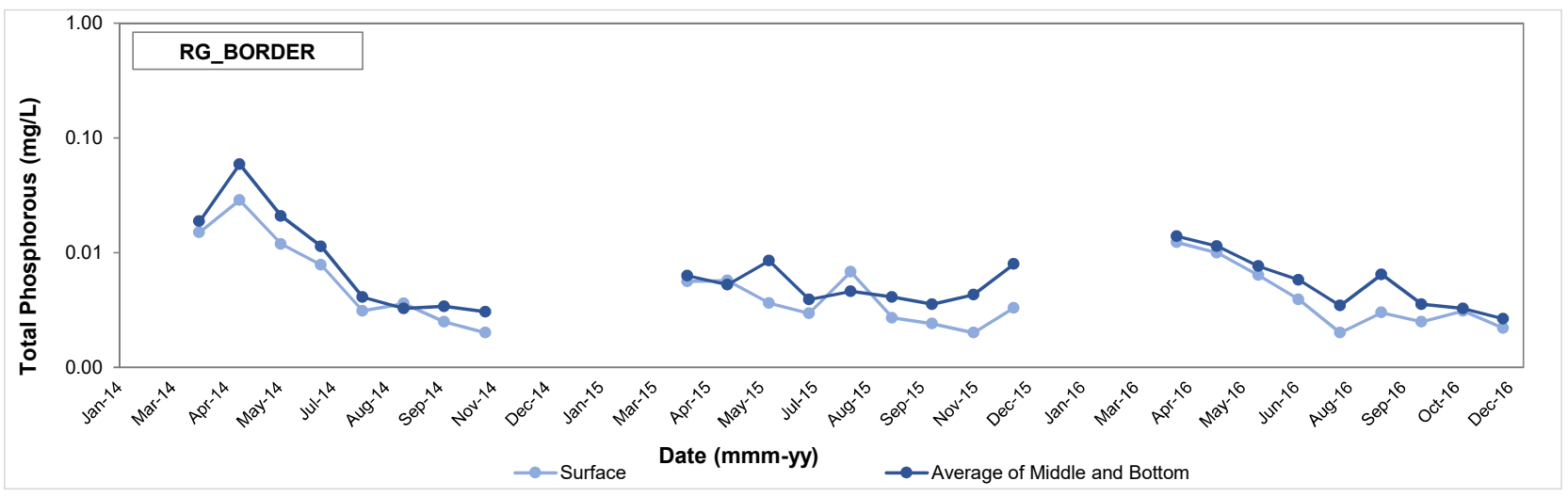


Figure B.7: Mean Monthly Total Phosphorous Concentrations in Koocanusa Reservoir, 2014 to 2016

Notes: Stations RG_USELK and RG_KERRRD are located upstream of the Elk River and stations RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER are located downstream. RG_USELK was only sampled in 2014, as the station was moved further upstream for the 2015 sampling program to RG_KERRRD.

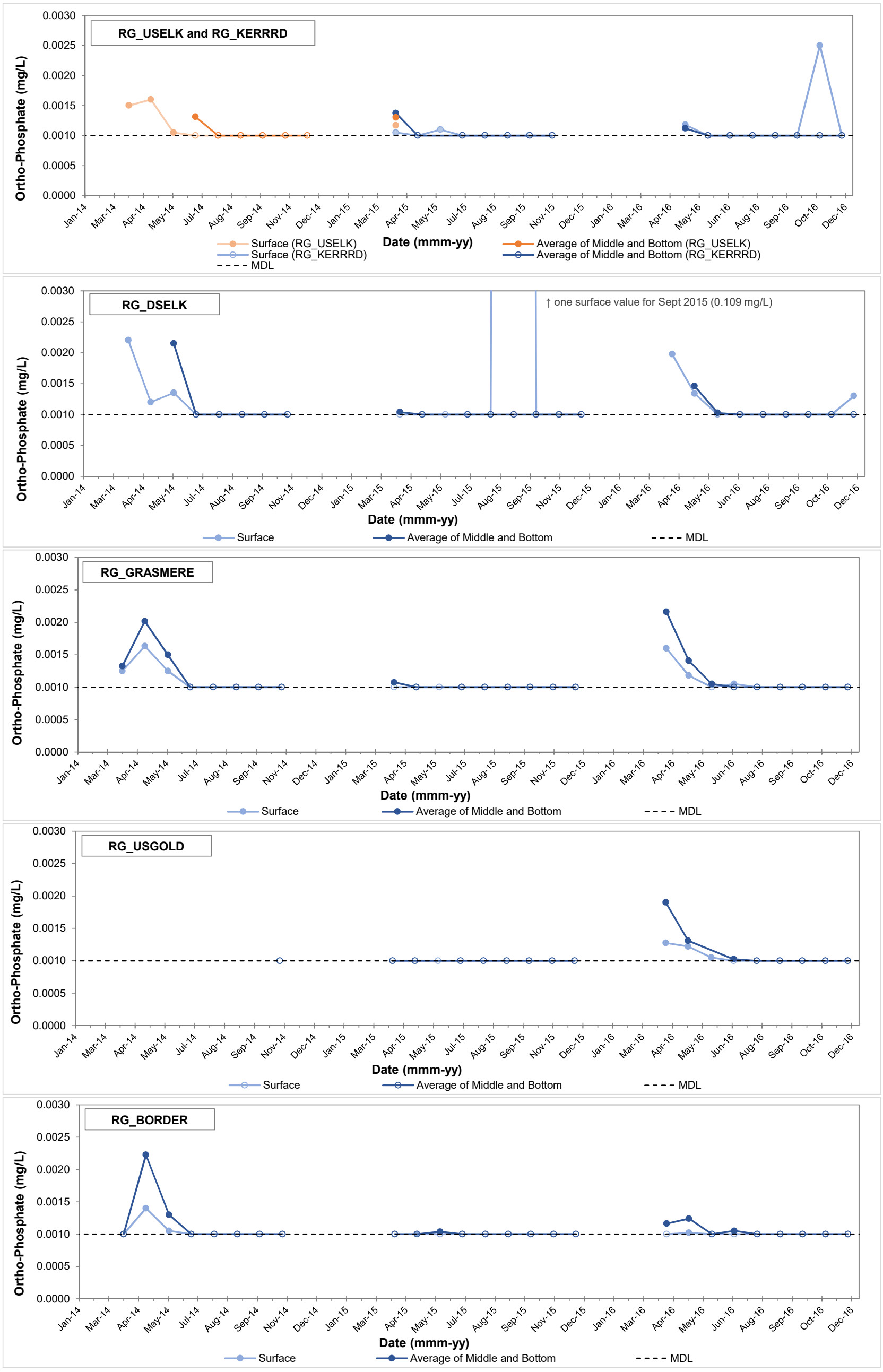
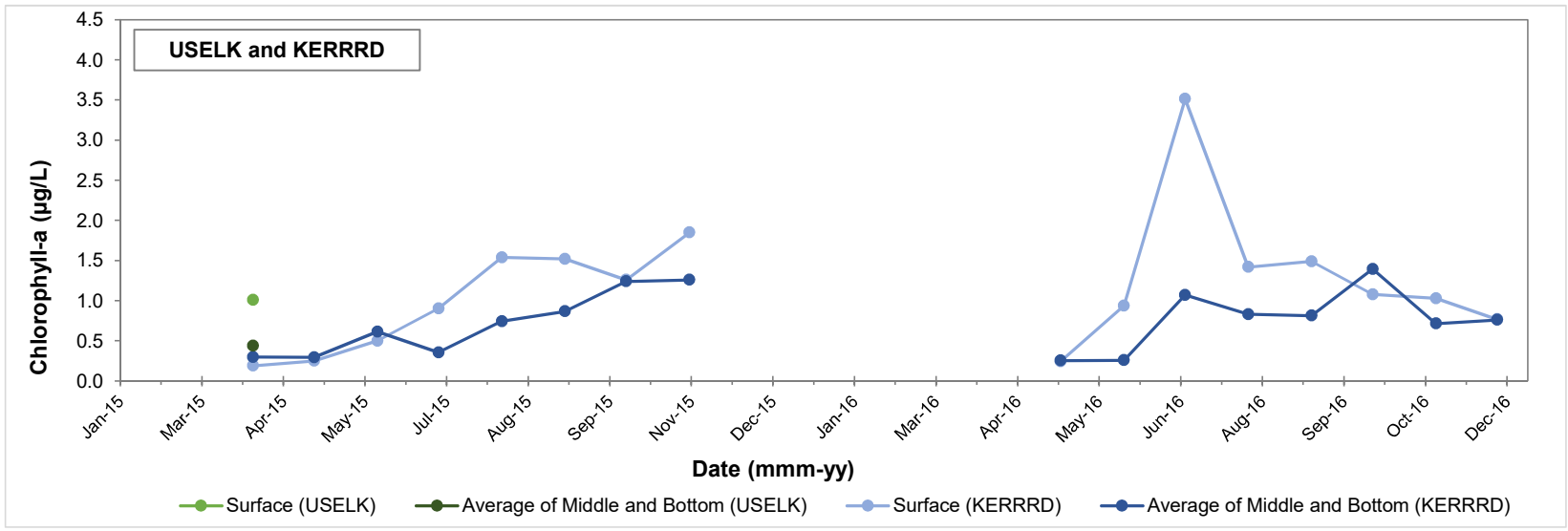


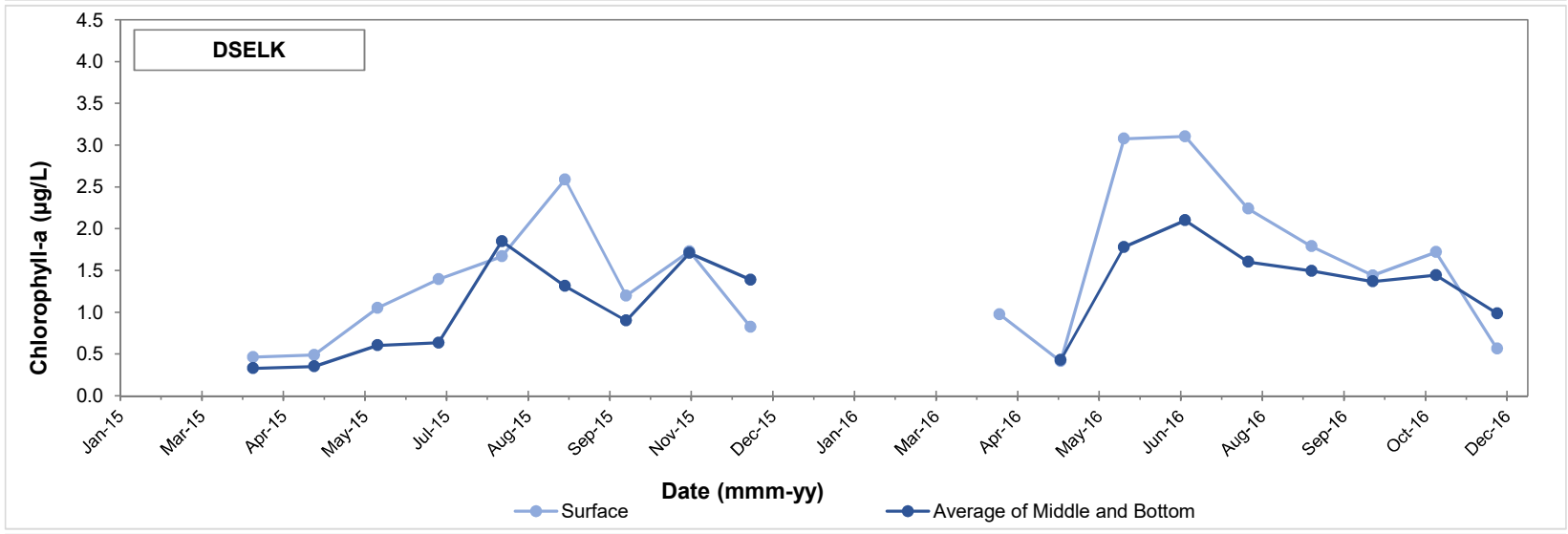
Figure B.8: Mean Monthly Ortho-Phosphate Concentrations in Koocanusa Reservoir, 2014 to 2016

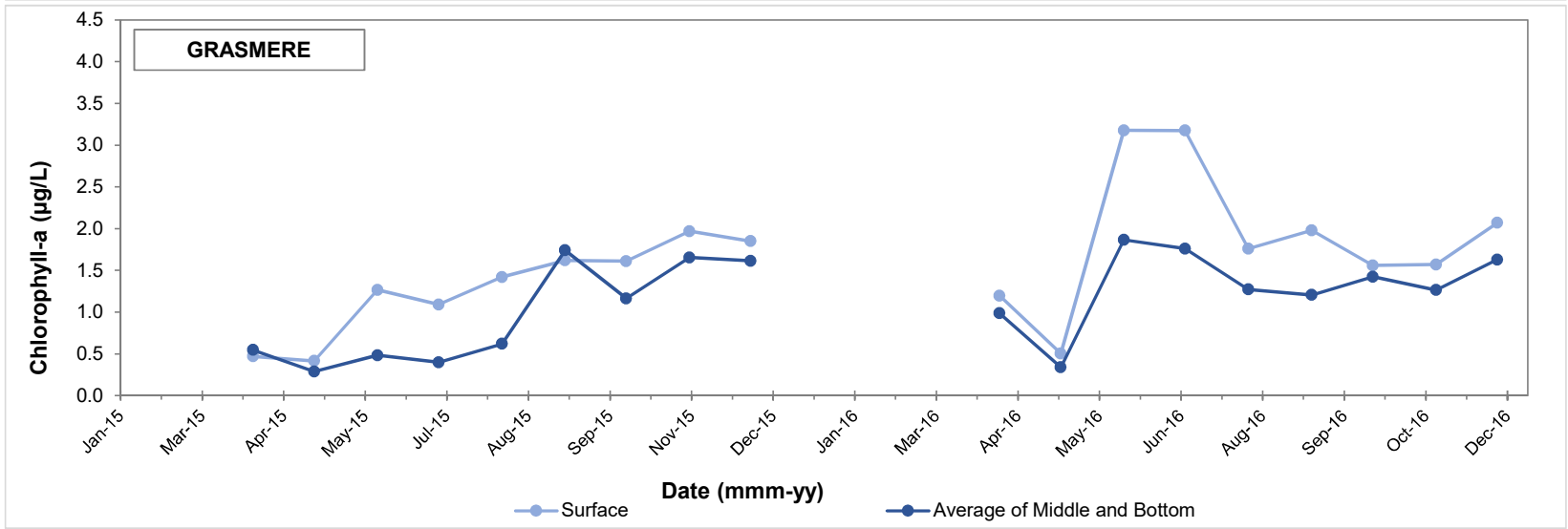
Notes: Stations RG_USELK and RG_KERRRD are located upstream of the Elk River and stations RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER are located downstream. RG_USELK was only sampled in 2014, as the station was moved further upstream for the 2015 sampling program to RG_KERRRD.
Open markers represent values at the method detection limit (MDL).

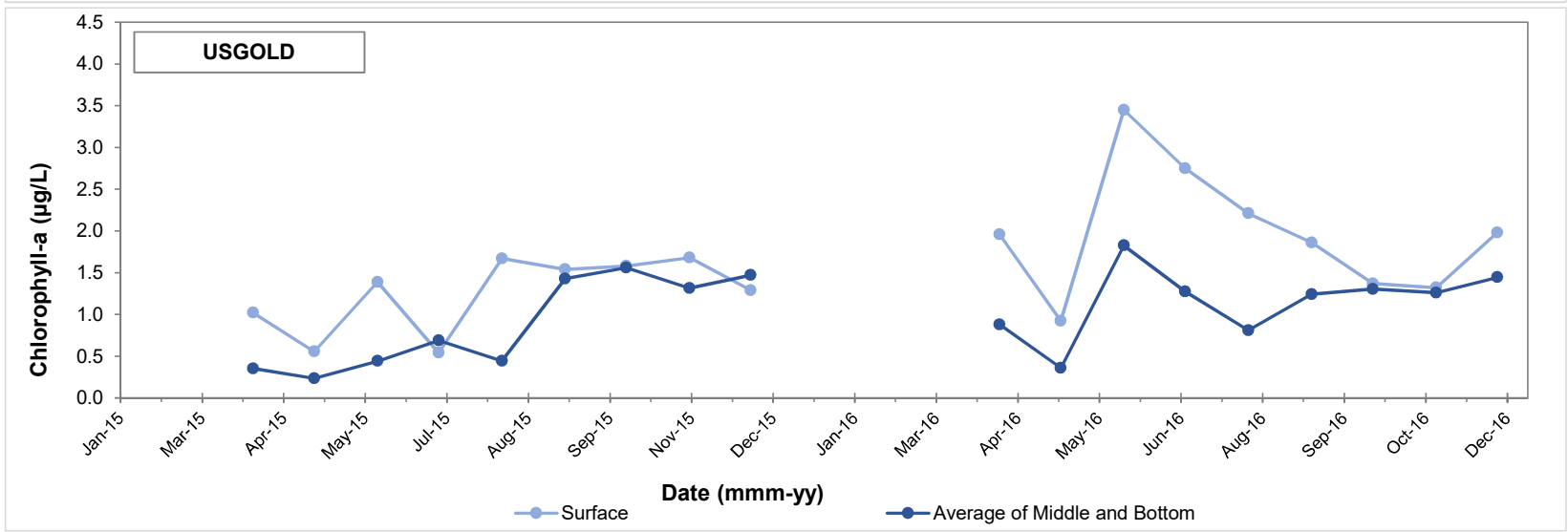
Figure B.9: Mean Monthly Secchi Depths in Koocanusa Reservoir, 2015 to 2016

Notes: No data for Secchi depth were collected in 2014. RG_KERRRD is located upstream of the Elk River and stations RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER are located downstream.









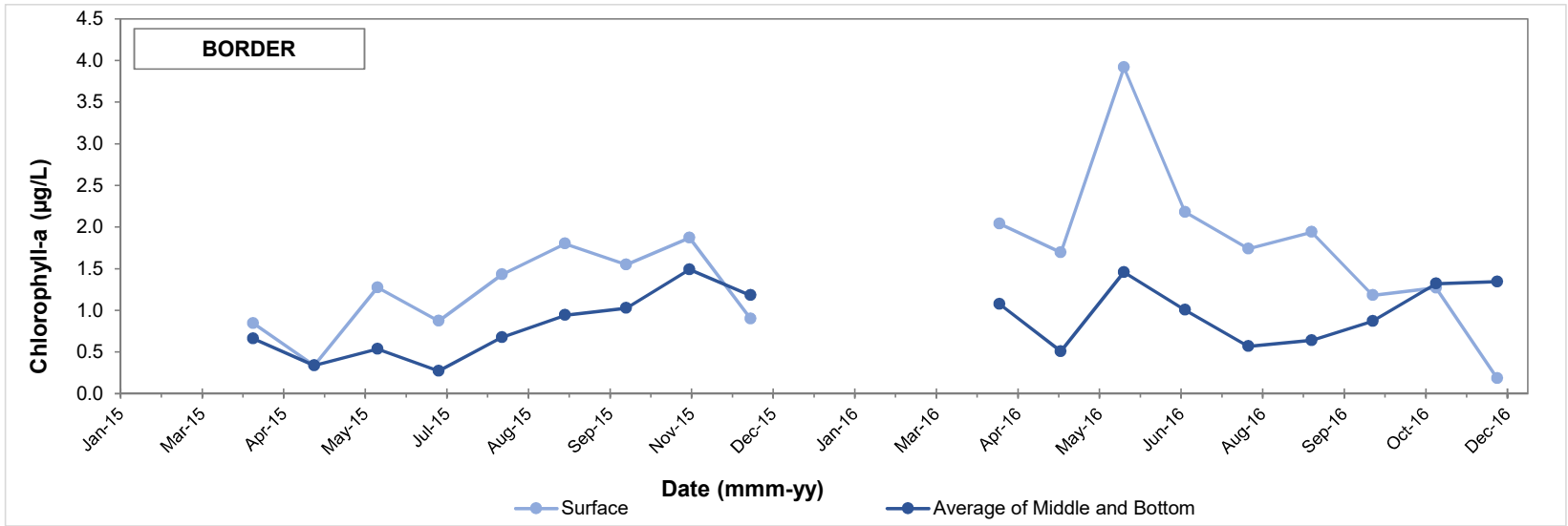
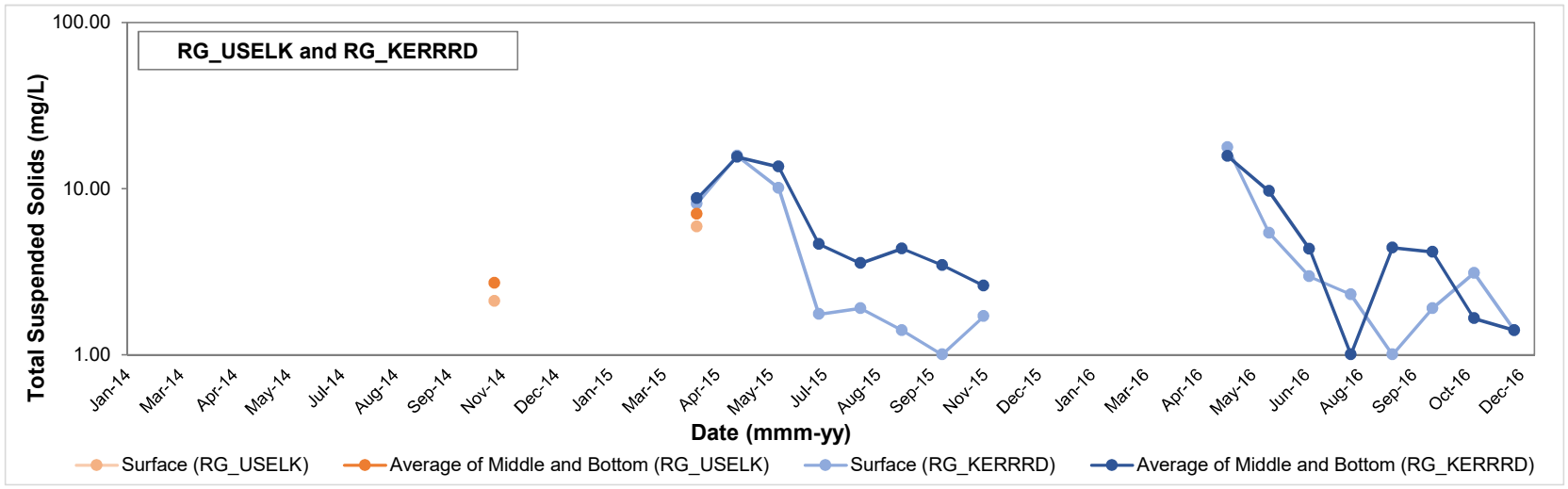
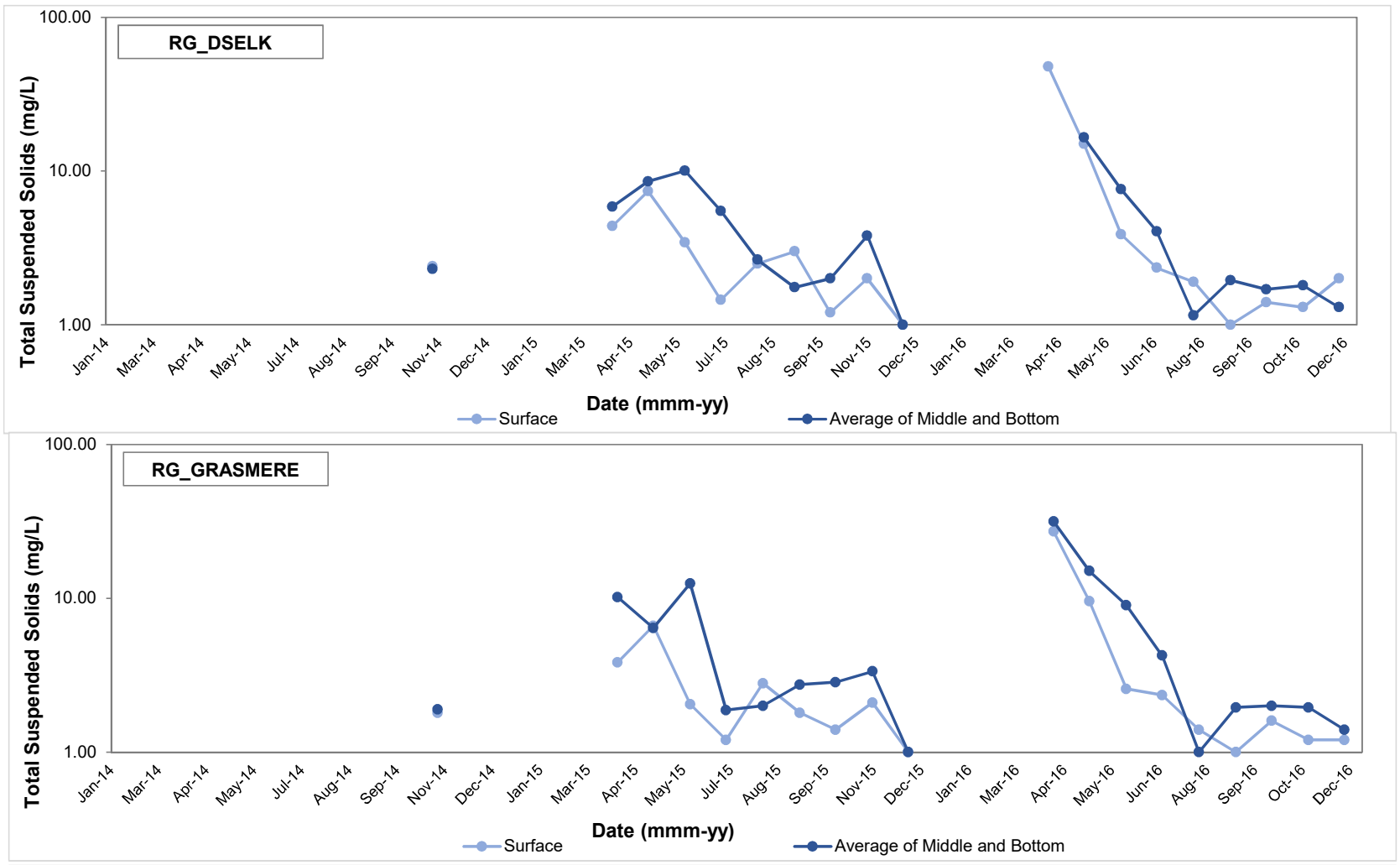


Figure B.10: Chlorophyll-a Concentrations (in µg/L) at Water Quality Monitoring Stations in Koocanusa Reservoir Upstream (USELK and KERRRD) and Downstream (DSELK, GRASMERE, USGOLD, BORDER) from the Elk River, 2015 and 2016

Note: Chlorophyll-a was not monitored in 2014.





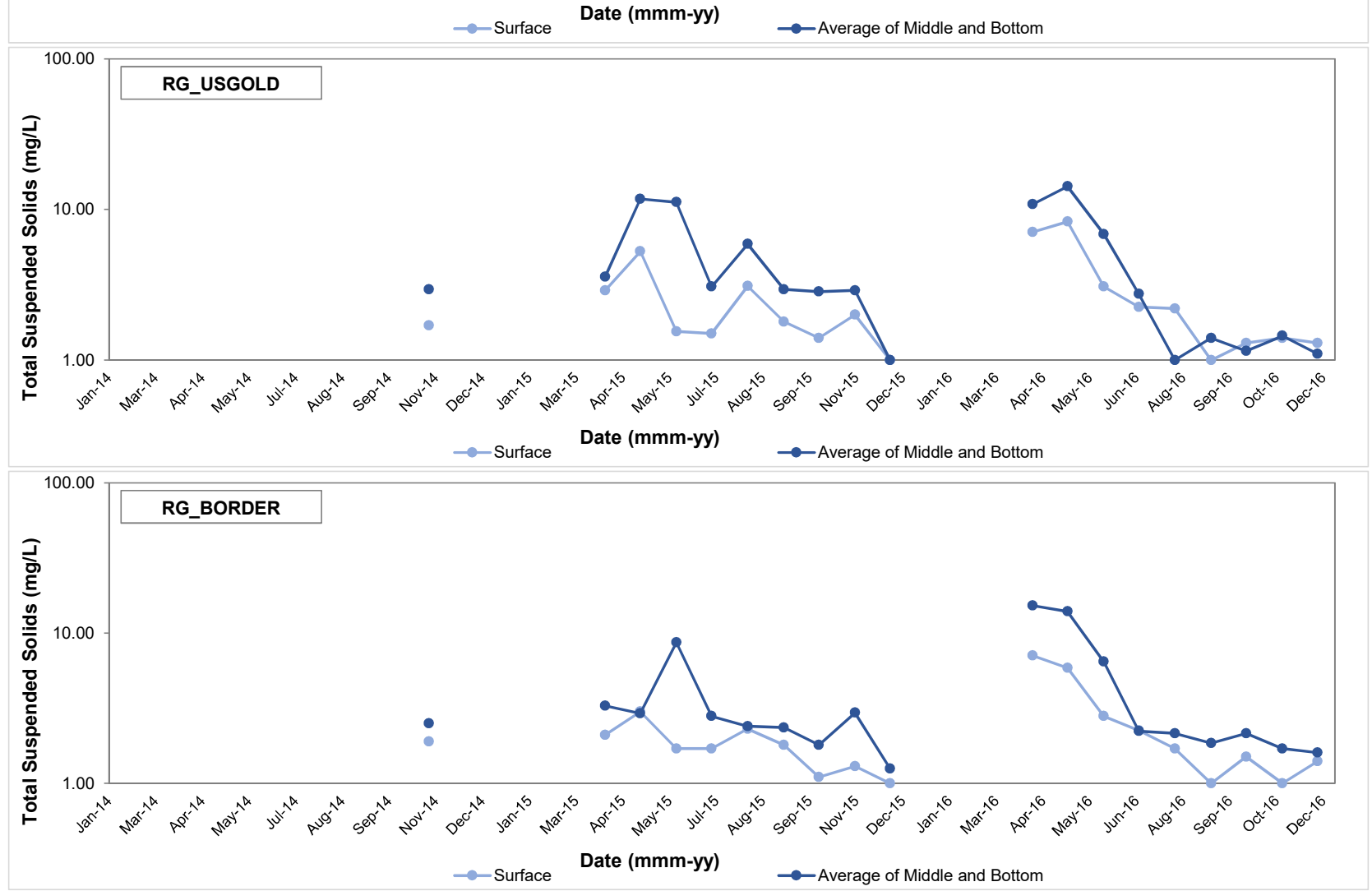
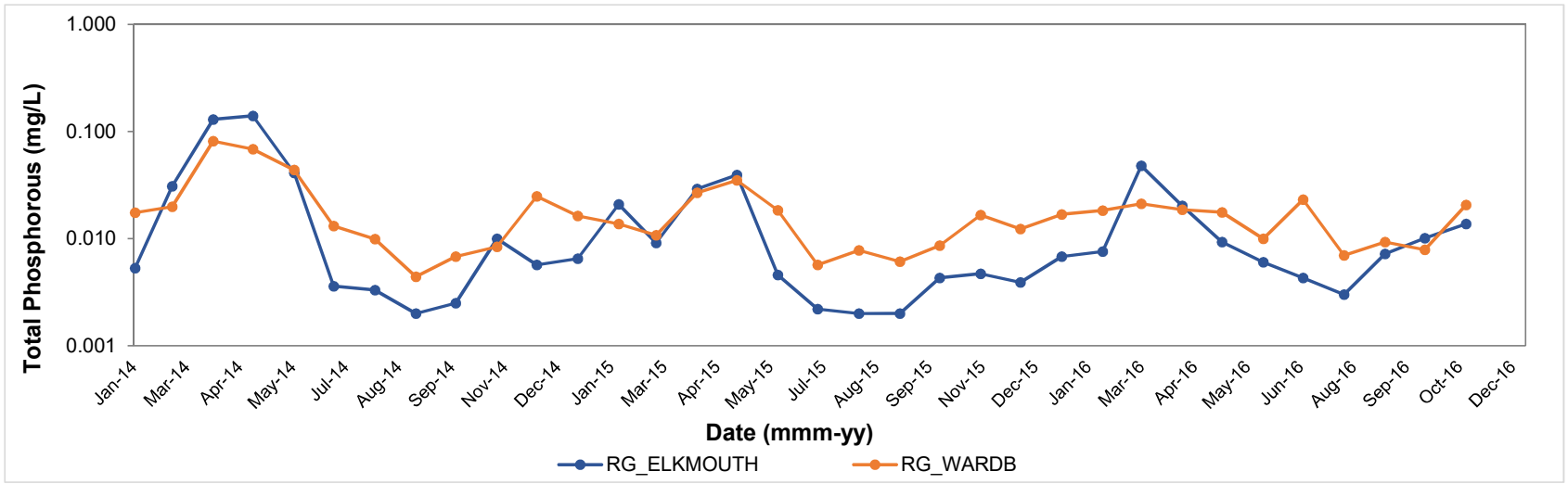
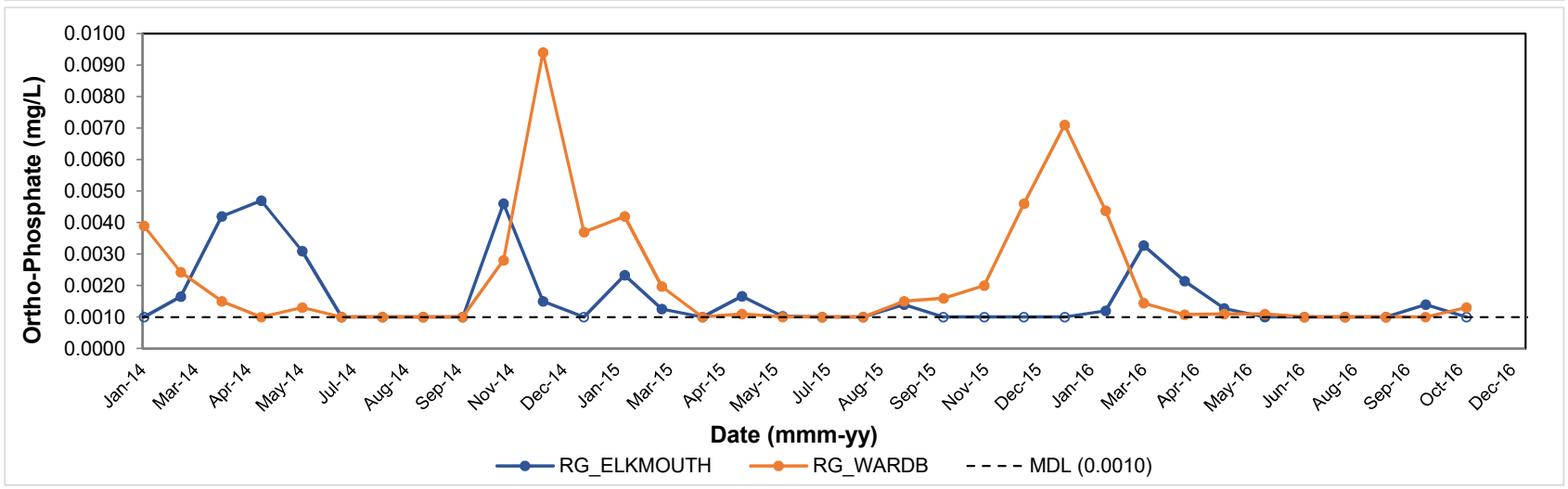
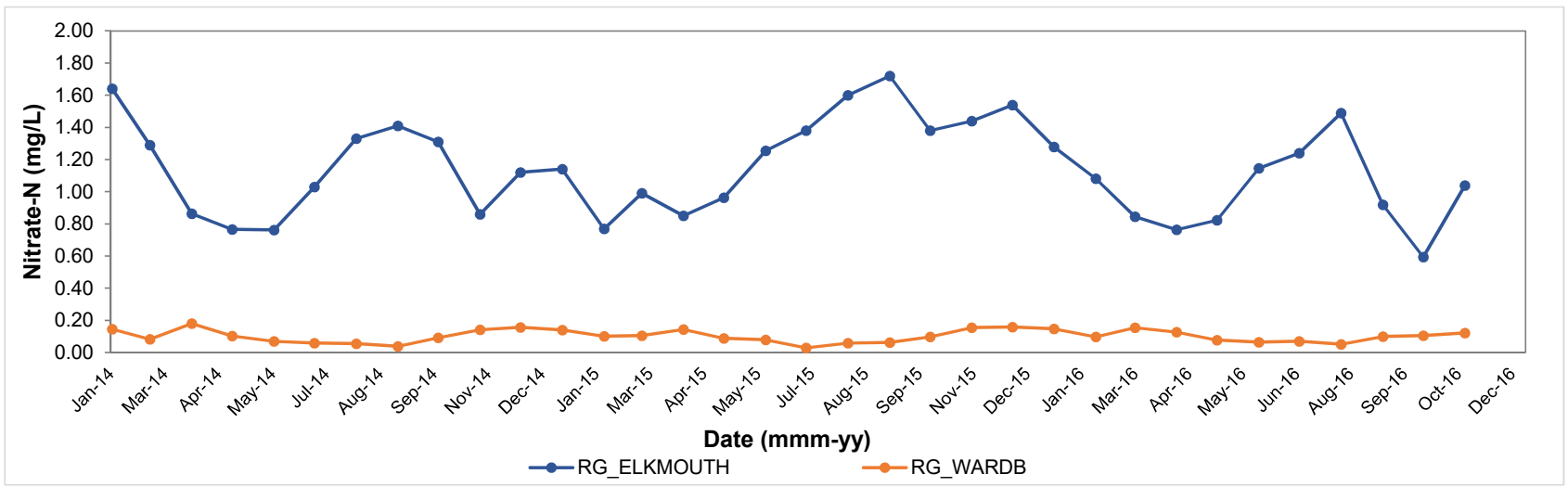


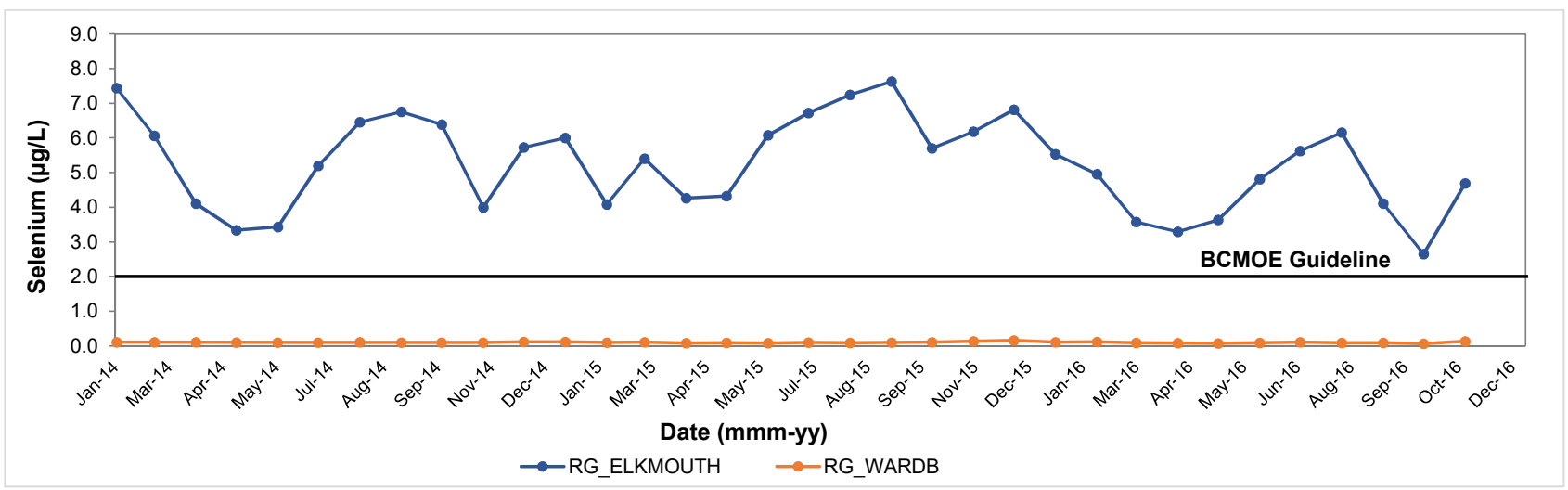
Figure B.11: Mean Monthly Total Suspended Solids Concentrations in Koocanusa Reservoir, 2014 to 2016

Notes: Stations RG_USELK and RG_KERRRD are located upstream of the Elk River and stations RG_DSELK, RG_GRASMERE, RG_USGOLD, and RG_BORDER are located downstream. RG_USELK was only sampled in 2014, as the station was moved further upstream for the 2015 sampling program to RG_KERRRD.









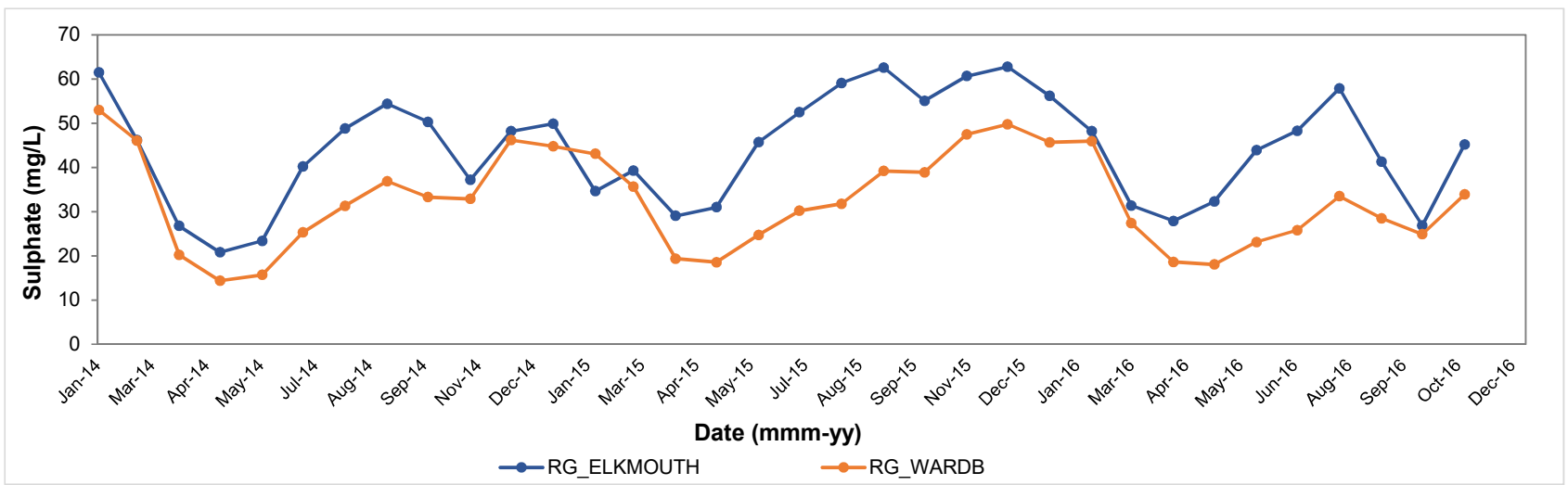


Figure B.12: Mean Monthly Total Phosphorous, Ortho-Phosphate, Nitrate-Nitrogen, Selenium, and Sulphate Concentrations in the Kootenay River (RG_WARDB) and the Elk River (RG_ELKMOUTH), 2014 to 2016

Note: Open markers represent values at the method detection limit (MDL).

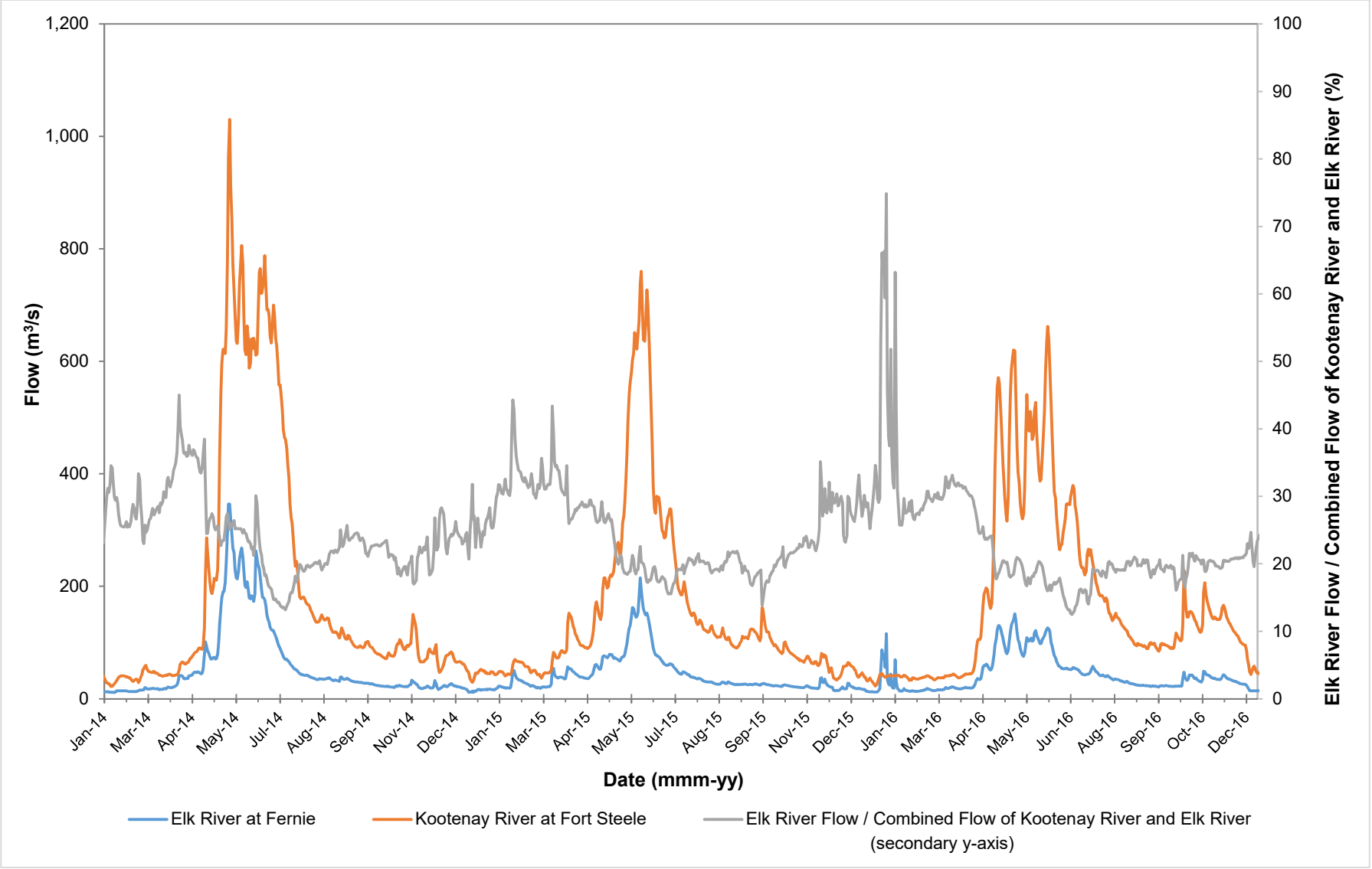


Figure B.13: Flow Measurements at the Elk River (Station No. 08NK002) and Kootenay River (Station No. 08NG065) Water Survey of Canada Stations, 2014 to 2016

Table B.1: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2014

Station	Sampling Date	Location (11U, NAD83)		Weather Notes	Station Depth (m)	Depth (m)	Temperature (°C)	Dissolved oxygen		pH	Specific conductivity (µS/cm)	Comments
		Easting	Northing					(mg/L)	(%)			
Sand Creek	14-Feb-14	625570	5460281	sunny, 1°C	11.8	surface	0.1	13.4	99.8	8.18	292	first measurement taken at bottom of ice augered hole, reservoir was ice covered (at least 20 cm thick)
						1	0.1	13.2	99.7	7.60	368	
						2	0.0	13.0	97.8	7.60	397	
						3	0.2	13.0	97.6	7.62	391	
						4	0.4	12.9	98.0	7.65	390	
						5	0.6	12.5	94.9	7.68	384	
						6	1.0	12.2	94.5	7.72	379	
						7	1.3	11.7	91.3	7.75	381	
						8	1.8	10.5	83.2	7.75	385	
						9	3.4	5.88	48.4	7.73	381	
						10	4.0	4.63	38.6	7.71	384	
						11	4.0	4.47	37.4	7.68	385	
						11.5	4.0	4.47	37.4	7.67	386	
	11-Apr-14	625306	5460936	clear, 10°C	2.2	0.5	9.2	10.0	99.3	7.89	328	measurement taken at SC-SH-6
						2	9.2	10.6	101	7.95	327	
	23-Aug-14	623651	5462816	sunny, 10% cloud cover	4.0	0.5	20.0	9.11	100	8.50	249	-
						1	19.7	9.26	101	8.50	249	-
						2	19.6	9.23	101	8.50	249	-
						3	19.5	9.19	100	8.50	248	-
						4	19.5	9.18	100	8.50	248	-
T-2	15-Apr-14	629295	5450863	clear, 8°C	6.0	0.5	7.8	10.7	98.7	8.14	329	taken at transect 2, upstream of the Elk River inlet in Koocanusa Reservoir
						1	8.0	10.4	97.5	8.21	326	
						2	7.8	11.2	104	8.16	324	
						3	7.8	11.2	103	8.16	324	
						4	7.8	11.2	103	8.16	324	
						5	7.8	11.1	103	8.16	324	
						6	7.6	11.1	101	8.15	323	
T2-2	19-Aug-14	629650	5450400	windy, sunny with intermittent cloudy periods, 50% cloud cover	30.1	0.5	22.0	8.73	99.9	8.54	240	-
						1	22.0	8.74	100	8.55	239	-
						2	21.9	8.75	100	8.55	237	-
						3	21.8	8.79	100	8.58	235	-
						4	21.8	8.77	100	8.57	236	-
						5	21.8	8.75	99.7	8.57	237	-
						6	21.6	8.93	101	8.58	237	-
						7	21.4	8.94	101	8.57	240	-
						8	21.3	8.83	99.7	8.55	244	-
						9	20.8	8.77	98.2	8.50	255	-
						10	20.3	8.86	98.2	8.42	257	-
						11	20.1	8.78	96.8	8.37	252	-
						12	18.2	8.66	92.1	8.25	275	-
						13	17.7	8.50	89.2	8.19	272	-
						14	17.0	8.18	84.8	8.08	264	-
						15	17.0	8.46	87.9	8.10	269	-
						16	16.7	8.21	84.5	8.05	271	-
						17	16.3	7.72	78.7	7.98	266	-
						18	16.1	7.41	75.2	7.94	263	-
						19	15.6	6.94	69.8	7.88	260	-
						20	15.2	6.16	61.3	7.74	259	-
						21	14.5	5.40	53.2	7.66	257	-
						22	14.1	4.92	47.8	7.64	255	-
						23	13.9	4.77	46.3	7.63	255	-
						24	13.9	4.72	45.7	7.63	254	-
						25	13.5	4.44	42.9	7.62	254	-
						26	13.1	4.08	38.9	7.59	251	-
						27	13.1	3.79	36.1	7.56	251	-
						28	12.9	3.29	31.2	7.52	252	-
						29	12.6	2.13	20.0	7.46	253	-
						30	12.5	1.34	12.6	7.42	254	-
T2-3	19-Aug-14	629417	5450394	some wind, light drizzle, 90% cloud cover	19.2	0	22.1	9.12	105	8.54	242	-
						1	22.1	9.03	104	8.54	242	-
						2	22.1	8.99	103	8.55	242	-
						3	22.0	8.94	102	8.56	241	-
						4	21.8	9.00	103	8.58	239	-
						5	21.6	9.09	103	8.58	241	-
						6	21.5	9.11	103	8.58	241	-
						7	21.3	9.11	103	8.56	244	-
						8	21.2	9.03	102	8.54	247	-
						9	20.7	8.95	99.9	8.48	258	-
						10	20.0	8.99	98.9	8.38	258	-
						11	19.0	8.93	96.4	8.31	267	-
						12	18.5	8.75	93.5	8.26	273	-
						13	17.9	8.56	90.4	8.19	274	-
						14	17.0	8.18	84.6	8.09	276	-
						15	16.9	8.08	83.6	8.07	276	-
						16	16.8	7.96	82.1	8.05	275	-
						17	15.9	6.78	68.7	7.91	268	-
						18	15.0	6.32	62.9	7.85	272	-
						19	15.0	6.04	59.9	7.80	272	-
T2-4	19-Aug-14	629237	5450445	sun and 50% cloud cover	19.5	0	22.1	8.82	101	8.57	241	-
						1	22.1	8.81	101	8.57	241	-
						2	22.1	8.80	101	8.58	241	-
						3	22.1	8.78	101	8.58	241	-
						4	22.0	8.79	101	8.58	240	-
						5	21.7	8.87	101	8.60	239	-
						6	21.6	8.97	102	8.59	241	-
						7	21.5	8.98	102	8.59	242	-
						8	21.4	8.97	101	8.58	243	-
						9	21.0	8.90	99.9	8.51	257	-
						10	20.0	8.91	97.9	8.41	261	-
						11	19.4	8.79	95.5	8.34	260	-
						12	18.5	8.61	92.0	8.26	268	-
						13	17.7	8.41	88.2	8.18	275	-
						14	17.1	8.17	84.7	8.11	277	-
						15	17.0	8.02	83.1	8.09	276	-
						16	17.0	8.01	82.9	8.09	276	-
						17	16.8	7.88	81.2	8.07	275	-
						18	14.8	4.54	44.2	7.73	264	-

Table B.1: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2014

Station	Sampling Date	Location (11U, NAD83)		Weather Notes	Station Depth (m)	Depth (m)	Temperature (°C)	Dissolved oxygen		pH	Specific conductivity (µS/cm)	Comments
		Easting	Northing					(mg/L)	(%)			
T2-5	19-Aug-14	629059	5450389	sun, rain, and 70% cloud cover	20.0	0	22.2	8.85	102	8.55	240	-
						1	22.2	8.77	101	8.56	240	-
						2	22.2	8.71	100	8.57	240	-
						3	22.1	8.67	99.5	8.57	240	-
						4	22.0	8.66	99.2	8.58	239	-
						5	21.9	8.70	99.4	8.59	239	-
						6	21.9	8.73	99.3	8.59	240	-
						7	21.6	8.74	99.2	8.59	241	-
						8	21.5	8.70	98.5	8.58	241	-
						9	21.0	8.79	98.5	8.52	252	-
						10	20.5	8.75	97.3	8.43	251	-
						11	18.9	8.64	93.2	8.30	264	-
						12	18.4	8.49	90.7	8.25	270	-
						13	17.4	8.26	86.5	8.16	275	-
						14	17.2	8.07	83.9	8.12	275	-
						15	17.1	8.00	83.0	8.11	275	-
						16	17.1	7.49	82.4	8.09	275	-
						17	17.0	7.85	81.4	8.08	275	-
						18	15.7	7.00	70.5	7.90	262	-
						19	14.8	5.70	58.4	7.80	264	-
T2-6	21-Aug-14	628883	5450370	13°C, cool, 90% cloud cover	18.3	0	21.0	8.77	98.5	8.59	241	-
						1	21.0	8.91	100	8.60	241	-
						2	21.0	8.94	100	8.60	241	-
						3	21.0	8.94	100	8.61	241	-
						4	21.0	8.92	100	8.60	241	-
						5	21.0	8.90	99.9	8.60	241	-
						6	21.0	8.87	99.5	8.60	241	-
						7	21.0	8.85	99.3	8.59	242	-
						8	20.9	8.85	99.0	8.58	244	-
						9	17.7	8.81	92.4	8.21	273	-
						10	17.5	8.58	89.8	8.18	272	-
						11	17.3	8.50	88.6	8.16	274	-
						12	17.2	8.40	87.4	8.15	273	-
						13	17.2	8.37	87.0	8.15	274	-
						14	17.1	8.28	86.0	8.14	273	-
						15	17.1	8.24	85.5	8.13	272	-
						16	17.0	8.18	84.7	8.12	272	-
						17	16.3	7.50	76.5	8.02	268	-
						18	15.1	5.89	58.5	7.81	262	-
Elk River	12-Feb-14	627746	5447354	warmer, south wind, 5°C	9.2	surface	0.2	12.4	95.0	7.98	350	first measurement taken at bottom of ice augered hole, reservoir was ice covered (at least 30 cm thick)
						1	0.3	11.9	91.8	7.99	351	
						2	0.3	12.1	93.4	8.03	350	
						3	0.4	11.8	91.6	8.06	348	
						4	0.5	12.0	91.9	8.07	348	
						5	0.6	11.7	90.6	8.07	347	
						6	0.7	11.4	88.2	8.09	347	
						7	0.8	11.4	88.2	8.10	347	
						8	0.8	11.3	87.9	8.10	351	
						9	0.8	11.7	91.0	8.09	370	
	13-Apr-14	628997	5447711	sunny, clear, 3°C	6.0	0.5	3.7	12.7	103	8.17	362	did not have an anchor so had to move the boat slightly during measurements to remain positioned correctly
						1	3.8	12.6	103	8.18	363	
						2	3.8	12.5	102	8.18	362	
						3	3.9	12.3	101	8.22	362	
						4	3.8	12.3	101	8.20	363	
						5	3.9	12.4	101	8.21	362	
						6	3.9	12.4	102	8.22	363	
	22-Aug-14	632036	5447159	cloudy with intermittent rain, 100% cloud cover	4.2	0.5	20.4	8.71	96.5	8.63	244	-
						1	20.4	8.69	96.4	8.62	245	-
						2	20.4	8.68	96.2	8.62	245	-
						3	20.2	8.70	96.2	8.62	245	-
						4	18.1	8.99	95.5	8.54	279	-
T-4	16-Apr-14	629318	5442130	cloudy with sunny periods, 6°C	10.2	0.5	8.8	11.2	105	8.41	350	taken at transect 4, downstream of the Elk River inlet in Koocanusa Reservoir
						1	8.5	11.5	108	8.37	350	
						2	8.3	11.0	102	8.33	351	
						3	8.1	11.1	103	8.32	349	
						4	8.1	11.2	103	8.32	348	
						5	8.0	11.2	103	8.31	347	
						6	7.6	10.9	99.8	8.31	350	
						7	7.2	10.9	99.0	8.29	350	
						8	7.2	10.7	96.3	8.27	358	
						9	7.1	10.6	94.5	8.26	359	
						10	7.0	10.4	93.6	8.24	359	
T4-2	20-Aug-14	630076	5441806	cool, very little wind, 100% cloud cover	27.8	0	21.3	8.91	101	8.66	231	-
						1	21.3	9.10	103	8.67	231	-
						2	21.3	9.10	103	8.67	231	-
						3	21.3	9.10	103	8.67	231	-
						4	21.3	9.08	103	8.67	231	-
						5	21.2	9.02	102	8.66	232	-
						6	21.2	9.02	102	8.66	232	-
						7	21.2	9.01	102	8.65	232	-
						8	20.9	9.03	102	8.62	235	-
						9	20.0	9.20	101	8.52	247	-
						10	19.6	9.17	100	8.48	248	-
						11	18.9	8.87	95.6	8.37	262	-
						12	18.5	8.74	93.3	8.32	273	-
						13	18.0	8.53	90.1	8.26	272	-
						14	17.7	8.42	88.4	8.21	272	-
						15	17.1	8.21	85.1	8.15	273	-
						16	16.9	8.16	84.3	8.21	289	-
						17	16.7	8.00	82.3	8.15	277	-
						18	16.6	7.94	81.7	8.14	278	-
						19	16.0	7.73	78.3	8.08	270	-
						20	15.1	7.50	74.6	7.97	254	-
						21	14.7	7.55	74.4	7.95	246	-
						22	13.7	7.85	75.7	7.93	229	-
						23	13.3	7.90	75.6	7.91	227	-
						24	13.0	7.83	74.4	7.89	227	-
						25	12.6	7.90	74.4	7.87	224	-
						26	12.4	7.80	73.2	7.82	225	-
						27	12.4	7.76	72.6	7.84	225	-

Table B.1: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2014

Station	Sampling Date	Location (11U, NAD83)		Weather Notes	Station Depth (m)	Depth (m)	Temperature (°C)	Dissolved oxygen		pH	Specific conductivity (µS/cm)	Comments
		Easting	Northing					(mg/L)	(%)			
T4-3	20-Aug-14	629798	5441984	breezy, 100% cloud cover	27.4	0	21.3	8.98	101	8.66	231	-
						1	21.3	9.06	102	8.65	231	-
						2	21.2	9.03	101	8.65	231	-
						3	21.2	8.99	101	8.64	232	-
						4	21.1	8.95	101	8.64	232	-
						5	21.1	8.85	99.6	8.64	233	-
						6	21.1	8.87	99.6	8.63	233	-
						7	21.0	8.85	99.5	8.63	233	-
						8	20.2	9.09	100	8.54	241	-
						9	19.8	8.97	98.6	8.50	246	-
						10	19.2	8.86	96.0	8.41	252	-
						11	18.8	8.69	93.3	8.35	263	-
						12	18.6	8.55	91.6	8.34	267	-
						13	18.3	8.52	90.7	8.30	275	-
						14	17.9	8.41	88.7	8.23	270	-
						15	17.4	8.22	85.6	8.26	292	-
						16	16.9	8.14	84.1	8.18	282	-
						17	16.9	7.99	82.5	8.20	288	-
						18	16.9	7.94	82.0	8.18	284	-
						19	16.4	7.70	78.6	8.13	279	-
						20	15.6	7.63	76.5	8.05	278	-
						21	15.5	7.37	74.0	8.00	257	-
						22	14.7	7.27	71.8	7.94	247	-
						23	13.7	7.46	71.9	7.92	233	-
						24	13.3	7.52	71.9	7.88	230	-
						25	12.9	7.61	72.1	7.87	226	-
						26	12.9	7.65	72.4	7.86	226	-
						27	12.5	7.71	72.5	7.86	224	-
T4-4	20-Aug-14	629703	5441675	sunny, 75% cloud cover	26.4	0	21.4	9.04	102	8.65	231	-
						1	21.4	8.96	101	8.65	231	-
						2	21.3	8.94	101	8.65	232	-
						3	21.2	8.93	101	8.65	232	-
						4	21.2	8.91	100	8.65	232	-
						5	21.2	8.88	99.8	8.64	232	-
						6	21.0	8.85	99.3	8.63	233	-
						7	20.8	8.89	99.4	8.60	237	-
						8	20.4	8.99	99.7	8.56	242	-
						9	19.7	8.91	97.5	8.48	249	-
						10	19.1	8.78	94.7	8.41	256	-
						11	18.8	8.61	92.5	8.33	267	-
						12	18.5	8.50	90.8	8.31	271	-
						13	18.2	8.38	88.9	8.27	272	-
						14	17.8	8.28	87.0	8.23	271	-
						15	17.4	8.22	85.8	8.22	295	-
						16	16.8	8.02	82.8	8.19	282	-
						17	16.7	7.85	80.7	8.19	288	-
						18	16.6	7.80	79.9	8.16	281	-
						19	16.2	7.63	77.6	8.12	273	-
						20	15.3	7.21	72.0	7.97	256	-
						21	14.2	7.40	72.3	7.93	241	-
						22	13.5	7.54	72.4	7.90	232	-
						23	13.0	7.59	72.1	7.87	228	-
						24	12.9	7.60	72.0	7.86	227	-
						25	12.6	7.69	72.3	7.86	226	-
						26	12.5	7.67	71.9	7.85	226	-
T4-5	20-Aug-14	629487	5441751	sunny, 70% cloud cover	25.8	0	21.1	9.08	103	8.62	235	-
						1	21.4	9.04	102	8.62	235	-
						2	21.4	9.00	102	8.62	235	-
						3	21.3	8.97	101	8.63	234	-
						4	21.3	8.94	101	8.63	234	-
						5	21.3	8.86	99.9	8.63	234	-
						6	21.2	8.74	98.6	8.63	234	-
						7	21.2	8.74	98.5	8.63	235	-
						8	20.8	8.84	98.8	8.58	240	-
						9	19.5	8.96	97.6	8.44	256	-
						10	19.2	8.81	95.4	8.40	259	-
						11	18.9	8.64	93.0	8.35	263	-
						12	18.0	8.45	89.0	8.27	276	-
						13	17.6	8.26	86.6	8.22	273	-
						14	17.2	8.11	84.3	8.17	276	-
						15	16.9	7.91	81.8	8.14	278	-
						16	16.8	7.84	80.9	8.15	282	-
						17	16.7	7.81	80.4	8.17	288	-
						18	16.6	7.76	79.4	8.16	286	-
						19	16.2	7.54	76.4	8.11	276	-
						20	14.6	7.36	72.4	7.98	253	-
						21	13.4	7.30	69.6	7.89	235	-
						22	12.9	7.49	70.9	7.88	229	-
						23	12.7	7.59	71.6	7.88	227	-
						24	12.6	7.57	71.1	7.86	227	-
						25	12.5	7.49	70.2	7.85	227	-
T4-6	20-Aug-14	629403	5441477	rain, 100% cloud cover	30.5	0	21.7	8.66	98.4	8.63	235	-
						1	21.7	8.61	97.9	8.63	235	-
						2	21.7	8.59	97.7	8.63	235	-
						3	21.6	8.57	97.4	8.63	236	-
						4	21.6	8.54	97.0	8.63	236	-
						5	21.5	8.56	97.0	8.63	237	-
						6	21.5	8.55	96.9	8.63	237	-
						7	21.4	8.54	96.6	8.62	238	-
						8	21.3	8.51	96.0	8.61	239	-
						9	19.7	8.83	96.6	8.49	253	-
						10	19.4	8.72	94.7	8.45	257	-
						11	18.5	8.48	90.5	8.32	268	-
						12	17.6	8.12	85.3	8.22	273	-
						13	17.5	8.01	83.7	8.20	277	-
						14	17.3	7.89	82.2	8.17	273	-
						15	17.2	7.81	81.2	8.16	274	-
						16	17.0	7.79	80.5	8.15	278	-
						17	16.7	7.70	79.3	8.16	283	-
						18	16.5	7.63	78.3	8.16	286	-

Table B.1: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2014

Station	Sampling Date	Location (11U, NAD83)		Weather Notes	Station Depth (m)	Depth (m)	Temperature (°C)	Dissolved oxygen		pH	Specific conductivity (µS/cm)	Comments
		Easting	Northing					(mg/L)	(%)			
T4-6	20-Aug-14	629403	5441477	rain, 100% cloud cover	30.5	19	16.0	7.46	75.6	8.09	273	-
						20	14.8	7.24	71.0	7.97	254	-
						21	13.8	7.21	69.8	7.93	238	-
						22	13.4	7.33	70.2	7.90	233	-
						23	13.0	6.88	65.2	7.87	234	-
						24	12.8	6.86	64.9	7.83	232	-
						25	12.6	7.25	68.4	7.85	228	-
						26	12.4	7.31	68.5	7.84	230	-
						27	12.3	7.00	65.4	7.83	230	-
						28	12.1	6.70	62.2	7.80	232	-
						29	11.8	6.37	58.5	7.78	233	-
						30	11.6	6.00	55.1	7.75	234	-
Gold Creek	11-Feb-14	629438	5436997	cool, -7°C, sunny periods	5.3	surface	0.0	13.2	99.1	7.35	280	first measurement taken at bottom of ice augered hole, reservoir was ice covered (at least 20 cm thick)
						1	0.4	13.2	101	7.50	283	
						2	0.8	11.2	87.8	7.59	333	
						3	0.9	10.4	80.2	7.65	333	
						4	1.0	10.3	79.2	7.73	332	
						5	1.1	10.3	79.2	7.78	331	
	13-Apr-14	629715	5437011	sunny, clear, cool (7°C)	3.1	0.5	4.5	12.4	104	8.08	235	did not have an anchor but wind was very light, so the boat remained in the same position
						1	4.5	12.2	103	8.08	243	
						2	4.7	12.3	102	8.10	247	
						3	5.0	12.2	103	8.06	293	
	22-Aug-14	628556	5436916	cloudy, light rain, 100% cloud cover	4.6	0.5	20.8	8.94	99.8	8.65	232	-
						1	20.8	8.94	100	8.66	234	-
						2	20.8	8.95	100	8.66	234	-
						3	20.8	8.94	99.9	8.66	233	-
						4	20.7	8.90	99.5	8.66	233	-

Table B.2: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2015

Station	Sampling Date	Location (11U, NAD83)		Time	Weather Notes	Total Depth	Secchi Depth	Depth	Temperature	Dissolved Oxygen		pH	Specific Conductivity	Chlorophyll-a	BGA-PC*
		Easting	Northing			(m)	(m)	(m)	(˚C)	(mg/L)	(% sat)	(pH units)	(µS/cm)	(µg/L)	(µg/L)
Sand Creek	27-Feb-15	625561	5460052	11:50	sunny, clear, (-5˚C)	10.6	-	surface	0.92	13.6	95.7	8.17	362	-	-
								1	0.91	13.9	96.5	7.91	362	-	-
								2	0.90	14.1	99.1	7.83	362	-	-
								3	0.89	14.4	101	7.80	362	-	-
								4	0.97	13.1	92.2	7.87	361	-	-
								5	0.96	13.1	92.1	7.87	361	-	-
								6	1.00	13.1	91.9	7.87	360	-	-
								7	1.29	13.0	91.8	7.87	358	-	-
								8	1.22	13.0	92.0	7.89	357	-	-
								9	1.40	12.9	92.1	7.89	353	-	-
								10	1.65	12.9	92.4	7.90	349	-	-
	1-Apr-15	625582	5459794	-	-	-	-	1	10.7	10.6	95.3	8.36	267	0.35	0.25
								2	10.7	10.6	95.5	8.36	266	0.52	0.020
								3	10.7	10.6	95.6	8.36	266	0.55	0.020
								4	10.7	10.6	95.6	8.36	267	0.60	0.020
								5	10.6	10.6	95.4	8.36	266	0.65	0.020
								6	10.3	10.5	93.5	8.32	267	0.57	0.030
								7	10.2	10.5	93.3	8.31	267	0.67	0.030
								8	10.2	10.4	93.1	8.31	267	0.61	0.030
								9	10.2	10.4	92.8	8.30	267	0.79	0.070
								10	10.2	10.4	92.6	8.25	267	0.79	0.080
	1-Aug-15	624284	5461692	-	-	-	2.60	0	19.6	NR	NR	8.75	255	14.6	-
								1	19.4	8.92	96.7	8.74	255	23.2	-
								2	19.1	8.89	96.1	8.73	255	52.1	-
								3	18.9	8.84	95.3	8.71	257	21.5	-
								4	18.7	8.71	NR	8.66	259	74.2	-
								5	18.1	NR	NR	8.56	268	14.3	-
								6	17.2	NR	NR	8.37	274	1.80	-
								7	16.9	NR	NR	8.30	276	6.80	-
								8	16.8	NR	NR	8.23	279	4.30	-
T2	1-Apr-15	629295	5450863	-	-	-	-	0	11.0	11.0	99.8	8.34	280	0.10	0.030
								1	11.0	11.0	99.9	8.35	280	0.14	0.020
								2	10.9	11.0	99.6	8.35	280	0.24	0.020
								3	10.3	11.1	99.5	8.34	279	0.35	0.010
								4	9.17	11.1	96.3	8.32	278	1.07	0.030
								5	8.87	11.0	94.8	8.28	277	0.76	0.040
								6	8.48	11.0	94.4	8.27	277	1.21	0.030
								7	8.21	10.9	92.4	8.25	274	1.42	0.020
								8	8.01	10.8	91.5	8.24	279	0.85	0.020
								9	7.87	10.8	90.6	8.26	304	0.33	0.040
								10	7.90	10.7	90.3	8.28	308	0.31	0.020
								11	7.25	10.4	86.9	8.22	307	0.29	0.030
TN-1	1-Aug-15	626912	5453999	-	-	-	2.15	0	21.1	9.15	103	8.71	236	0.90	-
								1	21.1	9.18	103	8.70	236	0.10	-
								2	21.0	9.20	103	8.70	236	0.60	-
								3	21.0	9.21	103	8.70	236	1.20	-
								4	20.9	9.22	103	8.70	235	0.80	-
								5	20.9	9.21	103	8.69	236	1.70	-
								6	20.9	9.20	103	8.69	236	2.40	-
								7	20.2	9.00	99.4	8.60	251	1.30	-
								8	19.3	8.68	94.1	8.47	265	1.10	-
								9	18.3	8.41	89.4	8.38	271	0.60	-
								10	17.9	8.24	86.8	8.32	273	0.30	-
								11	17.8	8.18	86.0	8.32	273	1.10	-
TN-2	1-Aug-15	627088	5454009	-	-	-	2.20	0	21.2	9.15	113	8.71	235	0.70	-
								1	21.2	9.17	103	8.71	235	0.30	-
								2	21.1	9.21	103	8.70	235	0.50	-
								3	21.0	9.23	104	8.70	235	1.70	-
								4	20.9	9.23	103	8.70	235	0.70	-
								5	20.8	9.24	103	8.69	235	2.10	-
								6	20.8	9.21	103	8.69	237	2.30	-
								7	20.2	9.03	99.7	8.59	250	1.70	-
								8	19.4	8.67	94.2	8.49	262	1.30	-
								9	18.9	8.47	91.2	8.44	266	2.00	-
								10	17.9	8.29	87.3	8.33	272	0.60	-
								11	17.8	8.20	86.1	8.32	273	0.30	-
								12	17.7	8.04	84.5	8.30	273	0.60	-
TN-3	1-Aug-15	627281	5453928	-	-	-	2.05	0	21.5	9.08	103	8.68	235	0.30	-
								1	21.3	9.16	103	8.67	235	0.30	-
								2	21.2	9.23	104	8.68	235	0.40	-
								3	21.1	9.26	104	8.68	235	0.70	-
								4	21.0	9.27	104	8.68	235	1.30	-
								5	20.9	9.22	103	8.67	237	2.20	-
								6	20.7	9.11	102	8.64	241	1.10	-
								7	20.3	9.04	100	8.58	248	1.50	-
								8	19.7	8.92	97.8	8.52	255	1.40	-
								9	18.6	8.50	91.0	8.40	265	0.80	-
								10	17.9	8.26	87.0	8.31	272	0.00	-
								11	17.8	8.14	85.7	8.30	272	0.00	-
								12	17.7	7.94	83.3	8.28	271	0.30	-
TN-4	1-Aug-15	627477	5453664	-	-	-	2.20	0	21.6	9.06	103	8.68	235	0.00	-
								1	21.3	9.17	104	8.68	235	0.00	-
								2	21.2	9.24	104	8.69	235	0.20	-
								3	21.1	9.26	104	8.69	235	0.30	-
								4	21.1	9.28	104	8.69	235	0.70	-
								5	21.0	9.28	104	8.69	236	0.50	-
								6	20.9	9.21	103	8.68	237	1.60	-
								7	20.5	9.09	101	8.61	245	1.60	-
								8	19.8	8.92	97.8	8.54	254	1.80	-
								9	18.2	8.34	88.5	8.35	267	0.60	-
								10	17.8	8.22	86.5	8.31	271	0.50	-
								11	17.7	8.16	85.8	8.30	271	0.20	-
								12	17.6	7.91	83.0	8.26	270	0.20	-
								13	17.3	6.34	66.5	8.10	273	0.50	-

[1] Gold Creek was not sampled in February 2015, as ice was too thin to traverse safely.
* BGA-PC - blue-green algae phycocyanin - a measurement of the amount of cyanobacteria in the water column.
* NR - Readings were not reliable (NR), as oxygen optical probe was malfunctioning. Manufacturer indicated that values provided by meter were reliable and representative of the conditions, as malfunction was related to water fowling of internal components and would not impede the accuracy of the readings.

Table B.2: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2015

Station	Sampling Date	Location (11U, NAD83)		Time	Weather Notes	Total Depth	Secchi Depth	Depth	Temperature	Dissolved Oxygen		pH	Specific Conductivity	Chlorophyll-a	BGA-PC*
		Easting	Northing			(m)	(m)	(m)	(˚C)	(mg/L)	(% sat)	(pH units)	(µS/cm)	(µg/L)	(µg/L)
TN-5	1-Aug-15	627398	5453506	-	-	-	2.25	0	21.9	9.09	104	8.69	235	0.00	-
								1	21.4	9.23	104	8.69	235	0.00	-
								2	21.3	9.28	105	8.69	235	0.40	-
								3	21.2	9.30	105	8.70	236	0.30	-
								4	21.2	9.31	105	8.70	236	0.90	-
								5	21.0	9.32	105	8.70	236	1.30	-
								6	20.9	9.30	104	8.69	236	1.80	-
								7	20.6	9.17	102	8.63	246	1.30	-
								8	19.8	8.94	98.0	8.54	254	1.90	-
								9	18.2	8.39	89.1	8.36	270	1.10	-
								10	17.9	8.25	87.0	8.32	272	1.10	-
								11	17.8	8.21	86.4	8.31	272	0.40	-
								12	17.8	8.11	85.3	8.29	272	0.20	-
Elk River	26-Feb-15	628299	5447798	13:15	mainly sunny, light clouds (2.0˚C)	7.2	-	surface	1.52	14.6	105	7.62	303	-	-
								1	1.14	14.8	105	7.60	344	-	-
								2	1.12	14.3	102	7.59	343	-	-
								3	1.16	14.1	98.4	7.59	342	-	-
								4	1.25	13.6	96.5	7.60	341	-	-
								5	1.47	13.4	95.8	7.63	339	-	-
								6	1.60	13.3	95.8	7.64	343	-	-
								7	1.70	13.1	94.1	7.67	353	-	-
	1-Apr-15	629172	5447826	-	-	-	-	0	9.75	10.7	94.4	8.32	293	0.11	0.020
								1	9.61	10.7	94.0	8.32	293	0.14	0.040
								2	9.43	10.7	93.6	8.33	293	0.21	0.030
								3	9.75	10.8	93.8	8.32	293	0.31	0.020
								4	9.01	10.8	93.7	8.32	293	0.36	0.020
								5	8.84	10.8	93.5	8.32	293	0.38	0.010
								6	8.17	11.0	93.2	8.31	291	0.50	0.030
	1-Aug-15	628458	5447973	-	-	-	2.08	0	20.4	8.55	94.8	8.80	239	0.30	-
								1	20.3	9.13	101	8.79	239	0.80	-
								2	20.3	9.15	101	8.79	239	0.80	-
								3	20.2	9.16	101	8.79	239	0.90	-
								4	20.2	9.14	101	8.79	239	1.80	-
								5	20.1	9.13	101	8.79	240	2.10	-
								6	20.1	9.07	99.9	8.77	243	2.70	-
								7	19.9	8.91	97.8	8.76	246	3.40	-
								8	19.6	8.73	95.4	8.71	249	1.80	-
								9	19.5	8.64	94.0	8.68	254	1.90	-
								10	18.5	8.17	87.2	8.53	268	1.40	-
								11	17.9	8.18	86.3	8.53	288	0.70	-
								12	17.4	8.43	87.9	8.56	310	1.40	-
								13	16.4	8.76	89.6	8.56	339	2.50	-
T4	1-Apr-15	630241	5441285	-	-	-	-	0	13.5	10.8	103	8.21	281	0.09	0.00
								1	10.5	11.1	99.9	8.27	290	0.27	0.010
								2	9.34	11.2	98.0	8.28	287	0.88	0.020
								3	8.67	11.3	98.2	8.29	279	2.45	0.050
								4	8.07	11.5	97.4	8.28	272	2.74	0.040
								5	7.63	11.3	94.4	8.24	274	2.63	0.050
								6	7.42	11.1	92.8	8.22	275	2.07	0.040
								7	7.19	11.0	91.2	8.20	277	1.15	0.040
								8	7.04	10.9	90.3	8.18	279	0.85	0.040
								9	6.91	10.8	88.9	8.17	280	0.62	0.040
								10	6.82	10.8	88.2	8.16	281	0.51	0.040
								11	6.74	10.7	87.3	8.15	281	0.40	0.030
								12	6.69	10.5	86.0	8.14	280	0.41	0.020
								13	6.66	10.5	85.4	8.13	280	0.38	0.040
								14	6.57	10.3	84.2	8.11	278	0.28	0.010
T4-2	1-Aug-15	629591	5441618	-	-	-	2.05	0	21.2	9.45	106	8.78	231	1.00	-
								1	21.1	9.48	107	8.77	231	0.90	-
								2	21.1	9.47	107	8.77	231	1.50	-
								3	21.1	9.46	107	8.77	231	1.50	-
								4	21.1	9.45	106	8.76	231	1.60	-
								5	21.1	9.42	106	8.76	231	1.90	-
								6	21.1	9.39	106	8.75	232	2.10	-
								7	21.0	9.39	106	8.75	231	2.00	-
								8	21.0	9.33	105	8.74	233	1.90	-
								9	20.2	8.88	97.7	8.61	253	0.90	-
								10	18.7	8.28	88.6	8.43	276	0.90	-
								11	18.2	8.07	85.6	8.38	278	0.40	-
								12	18.0	7.90	83.4	8.36	280	0.80	-
								13	17.8	7.68	80.4	8.31	277	0.40	-
								14	17.6	7.41	77.6	8.27	273	0.60	-
								15	17.2	7.23	75.0	8.24	272	0.00	-
								16	16.7	6.90	70.5	8.17	268	0.70	-
								17	15.5	6.74	67.6	8.08	250	1.00	-
								18	14.8	6.96	68.7	8.05	237	0.00	-
								19	14.5	7.16	70.4	8.04	231	0.70	-
								20	14.3	7.18	70.2	8.04	230	0.20	-
								21	13.8	6.42	61.3	7.98	235	1.80	-
T4-3	1-Aug-15	629542	5441747	-	-	-	2.05	0	21.2	9.40	106	8.77	232	1.40	-
								1	21.3	9.47	107	8.78	231	1.40	-
								2	21.1	9.49	107	8.77	231	1.20	-
								3	21.1	9.48	107	8.77	231	1.40	-
								4	21.1	9.47	106	8.77	231	0.40	-
								5	21.0	9.43	106	8.76	231	2.40	-
								6	21.0	9.42	106	8.76	231	2.10	-
								7	21.0	9.40	106	8.76	231	2.40	-
								8	21.0	9.37	105	8.76	232	2.20	-
								9	20.1	8.80	97.0	8.62	249	1.70	-
								10	18.5	8.30	88.5	8.43	279	0.30	-
								11	18.2	8.14	86.4	8.36	277	2.00	-
								12	18.1	8.02	84.9	8.39	283	1.10	-
								13	17.7	7.57	79.3	8.29	276	0.00	-
								14	17.5	7.37	77.0	8.27	273	0.00	-
								15	17.1	7.15	74.2	8.23	272	0.80	-
								16	16.6	7.02	72.0	8.19	269	0.50	-
								17	15.5	6.98	69.9	8.10	247	0.70	-
								18	14.8	7.01	69.2	8.05	237	0.00	-
								19	14.5	7.08	69.4	8.04	232	0.20	-
								20	14.2	6.97	67.8	8.02	231	0.00	-
								21	13.9	6.14	59.9	7.98	235	0.30	-

[1] Gold Creek was not sampled in February 2015, as ice was too thin to traverse safely.

* BGA-PC - blue-green algae phycocyanin - a measurement of the amount of cyanobacteria in the water column.

* NR - Readings were not reliable (NR), as oxygen optical probe was malfunctioning. Manufacturer indicated that values provided by meter were reliable and representative of the conditions, as malfunction was related to water fowling of internal components and would not impede the accuracy of the readings.

Table B.2: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2015

Station	Sampling Date	Location (11U, NAD83)		Time	Weather Notes	Total Depth	Secchi Depth	Depth	Temperature	Dissolved Oxygen		pH	Specific Conductivity	Chlorophyll-a	BGA-PC*
		Easting	Northing			(m)	(m)	(m)	(˚C)	(mg/L)	(% sat)	(pH units)	(µS/cm)	(µg/L)	(µg/L)
T4-4	1-Aug-15	629749	5441822	-	-	-	2.10	0	21.5	9.38	106	8.76	231	0.00	-
								1	21.3	9.50	107	8.76	231	0.00	-
								2	21.2	9.51	107	8.76	231	0.60	-
								3	21.1	9.52	107	8.76	231	0.60	-
								4	21.1	9.53	107	8.76	231	0.90	-
								5	21.1	9.54	107	8.76	231	2.00	-
								6	21.0	9.54	107	8.76	231	2.20	-
								7	21.0	9.49	107	8.76	231	2.00	-
								8	20.8	9.20	103	8.70	237	2.60	-
								9	20.2	8.78	97.0	8.59	253	2.30	-
								10	18.8	8.22	88.4	8.41	273	0.90	-
								11	18.5	8.04	85.8	8.38	273	1.20	-
								12	18.0	7.74	81.7	8.32	275	0.60	-
								13	17.8	7.55	79.6	8.30	275	1.00	-
								14	17.5	7.37	77.2	8.26	273	0.00	-
								15	17.2	7.14	74.2	8.22	272	0.70	-
								16	16.1	6.75	68.6	8.11	260	0.10	-
								17	15.2	7.00	69.7	8.07	243	0.50	-
								18	14.9	7.05	69.8	8.05	239	0.30	-
								19	14.6	7.06	69.4	8.04	235	0.80	-
								20	14.3	7.10	69.4	8.02	231	0.60	-
								21	14.0	6.12	59.7	7.98	234	0.90	-
								22	13.4	5.18	49.9	7.90	239	1.10	-
								23	13.3	4.81	45.9	7.89	240	1.80	-
T4-5	1-Aug-15	629840	5441937	-	-	-	2.15	0	21.7	9.57	109	8.77	231	0.90	-
								1	21.3	9.60	108	8.78	231	0.90	-
								2	21.2	9.64	109	8.79	230	1.60	-
								3	21.1	9.68	109	8.79	230	0.20	-
								4	21.1	9.66	109	8.79	230	1.20	-
								5	21.1	9.65	108	8.79	230	1.80	-
								6	21.0	9.61	108	8.78	230	1.70	-
								7	21.0	9.58	107	8.78	230	2.20	-
								8	20.8	9.22	103	8.72	234	2.60	-
								9	20.1	8.75	96.5	8.58	256	1.60	-
								10	19.2	8.38	90.7	8.48	270	0.70	-
								11	18.5	8.10	86.7	8.42	272	0.20	-
								12	17.9	7.79	82.7	8.33	275	0.70	-
								13	17.7	7.56	79.6	8.30	274	0.40	-
								14	17.5	7.43	77.8	8.27	272	1.00	-
								15	17.0	7.07	73.2	8.21	271	0.40	-
								16	16.1	6.72	68.4	8.12	260	0.00	-
								17	15.5	6.75	67.8	8.08	249	0.90	-
								18	15.1	6.97	69.1	8.05	240	0.00	-
								19	14.8	6.95	68.8	8.01	238	0.40	-
								20	14.5	6.94	68.2	8.02	234	0.40	-
								21	14.0	6.37	61.8	7.95	234	1.20	-
								22	13.3	5.97	57.6	7.93	235	1.60	-
T4-6	1-Aug-15	630002	5441956	-	-	-	2.25	0	22.0	9.53	109	8.79	231	0.90	-
								1	21.4	9.66	109	8.79	230	0.00	-
								2	21.2	9.73	110	8.79	230	1.00	-
								3	21.2	9.73	110	8.79	230	0.50	-
								4	21.1	9.70	109	8.79	230	1.30	-
								5	21.1	9.68	109	8.79	230	1.40	-
								6	21.0	9.61	108	8.78	230	2.10	-
								7	21.0	9.45	106	8.76	231	2.10	-
								8	20.7	9.12	102	8.67	240	2.30	-
								9	20.2	8.77	96.9	8.59	254	1.50	-
								10	19.5	8.48	92.4	8.51	265	1.60	-
								11	18.5	8.10	86.5	8.41	274	0.90	-
								12	18.1	7.84	83.4	8.34	276	0.30	-
								13	17.8	7.59	79.8	8.31	274	0.80	-
								14	17.5	7.32	76.5	8.26	273	0.70	-
								15	16.3	7.06	72.1	8.16	264	0.50	-
								16	16.1	6.95	70.5	8.12	257	0.70	-
								17	15.6	7.03	70.6	8.10	248	0.00	-
Gold Creek [1]	1-Apr-15	630503	5437033	-	-	-	-	0	12.3	11.0	103	8.15	277	0.44	0.00
								1	10.6	11.2	101	8.20	279	0.87	0.020
								2	10.5	11.3	101	8.20	275	1.19	0.030
								3	9.31	11.6	101	8.21	240	2.60	0.050
								4	8.56	11.5	98.3	8.18	226	3.80	0.070
								5	8.00	11.3	95.7	8.12	217	3.49	0.050
								6	7.82	11.1	93.8	8.08	224	2.65	0.030
								7	7.55	11.0	91.8	8.05	257	1.89	0.050
								8	7.35	10.9	90.9	8.05	266	1.45	0.050
								9	7.15	10.9	90.1	8.05	271	1.16	0.040
								10	6.94	10.7	88.2	8.04	270	0.85	0.020
								11	6.74	10.6	86.6	8.02	271	0.76	0.030
								12	6.45	10.3	84.1	8.00	271	0.60	0.040
	1-Aug-15	629852	5437292	-	-	-	1.95	0	21.1	8.57	96.3	8.82	232	0.10	-
								1	20.7	9.03	101	8.82	232	0.00	-
								2	20.5	9.14	102	8.82	231	3.40	-
								3	20.4	9.23	103	8.82	231	4.30	-
								4	20.4	NR	NR	8.83	231	1.20	-
								5	20.3	NR	NR	8.81	232	11.1	-
								6	20.3	NR	NR	8.80	232	7.10	-
								7	20.2	8.82	98.8	8.76	235	32.1	-
								8	20.1	8.81	97.2	8.75	233	37.0	-
								9	19.8	NR	NR	8.74	233	12.3	-
								10	19.7	NR	NR	8.70	238	12.5	-
								11	18.7	NR	NR	8.43	262	11.4	-
								12	18.4	7.01	74.7	8.34	270	10.5	-
								13	18.4	6.86	73.0	8.32	272	2.80	-

[1] Gold Creek was not sampled in February 2015, as ice was too thin to traverse safely.
* BGA-PC - blue-green algae phycocyanin - a measurement of the amount of cyanobacteria in the water column.
* NR - Readings were not reliable (NR), as oxygen optical probe was malfunctioning. Manufacturer indicated that values provided by meter were reliable and representative of the conditions, as malfunction was related to water fowling of internal components and would not impede the accuracy of the readings.

Table B.3: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2016

Station	Sampling Date	Location (11U, NAD83)		Secchi Depth	Depth	Temperature	pH	Dissolved Oxygen		Specific Conductivity
		Easting	Northing	(m)	(m)	(˚C)		(mg/L)	(%)	(µS/cm)
Sand Creek	1-Apr-16	625736	5458469	-	0	7.81	7.24	11.9	99.9	198
					0.5	7.71	7.27	11.9	99.4	198
					1.0	7.70	7.27	11.8	98.6	198
					1.5	7.70	7.31	11.8	98.5	198
					2.0	7.68	7.33	11.6	97.5	197
					2.5	7.69	7.33	11.6	97.4	197
					3.0	7.69	7.33	11.6	97.1	197
	1-Aug-16	625899	5458194	-	0	19.6	8.44	8.84	96.4	263
					1	19.5	8.42	8.77	95.7	263
					2	19.2	8.42	8.78	95.1	262
					3	19.1	8.43	8.75	94.7	262
					4	19.1	8.42	8.70	94.0	262
					5	19.1	8.41	8.66	93.6	262
					6	19.0	8.38	8.63	93.0	264
					7	18.7	8.31	8.56	91.7	271
					8	18.4	8.27	8.47	90.2	274
					9	18.2	8.24	8.30	88.0	276
					10	17.9	8.21	8.20	86.4	277
					11	17.7	8.18	8.08	84.8	279
					12	17.3	8.21	8.25	86.0	283
TN-1	1-Apr-16	627377	5453471	-	0	8.44	7.51	11.9	101	182
					1	8.39	7.78	11.8	101	182
					2	8.38	7.78	11.8	101	181
					3	8.38	7.78	11.8	101	181
	1-Aug-16	627369	5453492	4.9	0	19.0	8.51	8.62	93.1	262
					1	19.0	8.52	8.57	92.6	262
					2	19.1	8.52	8.56	92.5	262
					3	19.0	8.53	8.55	92.3	262
					4	19.0	8.54	8.56	92.3	262
					5	19.0	8.53	8.56	92.3	262
					6	19.0	8.53	8.55	92.2	262
					7	19.0	8.53	8.54	92.2	262
					8	19.0	8.54	8.54	92.2	262
					9	19.0	8.53	8.53	92.0	262
					10	18.8	8.48	8.43	90.8	264
					11	18.0	8.33	8.02	84.8	276
					12	17.9	8.28	7.93	83.7	276
					13	17.2	8.15	7.47	77.6	279
					14	17.1	8.08	6.96	72.2	279
					15	16.8	8.00	6.49	66.9	279
TN-2	1-Aug-16	627256	5453672	5.3	0	19.1	8.49	8.60	93.0	262
					1	19.1	8.49	8.58	92.8	262
					2	19.1	8.49	8.56	92.6	262
					3	19.1	8.49	8.56	92.6	262
					4	19.1	8.49	8.55	92.4	262
					5	19.1	8.49	8.54	92.3	262
					6	19.1	8.50	8.52	92.0	262
					7	19.0	8.51	8.51	91.9	261
					8	19.0	8.52	8.52	92.0	261
					9	19.0	8.50	8.49	91.4	263
					10	18.7	8.45	8.36	89.7	268
					11	18.4	8.38	8.21	87.5	274
					12	17.6	8.24	7.61	79.7	278
					13	17.1	8.12	7.26	75.3	279
					14	16.9	8.06	6.55	67.7	280
TN-3	1-Aug-16	627367	5453710	5.0	0	19.2	8.49	8.60	93.1	262
					1	19.2	8.49	8.56	92.7	262
					2	19.1	8.49	8.54	92.4	262
					3	19.1	8.50	8.52	92.1	262
					4	19.1	8.51	8.53	92.1	262
					5	19.0	8.51	8.51	91.9	262
					6	19.0	8.52	8.50	91.7	262
					7	19.0	8.52	8.47	91.4	262
					8	19.0	8.52	8.45	91.2	262
					9	19.0	8.52	8.44	91.0	262
					10	18.7	8.43	8.29	88.8	268
					11	18.1	8.33	8.05	85.3	276
					12	18.0	8.30	7.89	83.3	277
					13	17.2	8.10	7.06	73.2	279
					14	16.9	8.04	6.63	68.4	279
TN-4	1-Aug-16	627333	5453882	4.9	0	19.4	8.48	8.69	94.6	262
					1	19.3	8.48	8.64	93.7	262
					2	19.1	8.50	8.62	93.3	262
					3	19.1	8.50	8.61	93.0	262
					4	19.1	8.50	8.58	92.7	262
					5	19.0	8.49	8.54	92.2	262
					6	19.0	8.49	8.52	91.9	262
					7	19.0	8.49	8.50	91.7	262
					8	19.0	8.50	8.50	91.6	262
					9	19.0	8.50	8.48	91.4	262
					10	18.6	8.42	8.30	88.8	271
					11	18.2	8.32	8.08	85.7	276
					12	18.1	8.29	7.97	84.4	277
					13	17.3	8.13	7.29	76.0	279
					14	16.9	8.06	6.82	70.5	280

Table B.3: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2016

Station	Sampling Date	Location (11U, NAD83)		Secchi Depth	Depth	Temperature	pH	Dissolved Oxygen		Specific Conductivity
		Easting	Northing	(m)	(m)	(˚C)		(mg/L)	(%)	(µS/cm)
TN-5	1-Aug-16	627200	5454005	4.9	0	19.6	8.49	8.92	97.4	262
					1	19.3	8.47	8.89	96.5	261
					2	19.2	8.47	8.85	95.8	261
					3	19.1	8.47	8.81	95.4	261
					4	19.1	8.48	8.79	95.0	261
					5	19.1	8.47	8.75	94.6	261
					6	19.0	8.47	8.69	93.8	261
					7	19.0	8.47	8.67	96.6	261
					8	19.0	8.47	8.65	93.3	261
					9	19.0	8.46	8.62	93.0	261
					10	18.9	8.43	8.57	92.2	264
					11	18.3	8.30	8.23	87.5	275
					12	18.0	8.23	8.05	85.0	276
					13	17.0	8.07	7.42	76.8	280
					14	16.9	8.00	6.90	71.3	279
Elk River	1-Apr-16	628044	5447695	-	0	7.66	7.44	13.3	111	192
					1	7.64	7.50	13.2	111	193
					2	7.64	7.48	13.2	111	192
					3	7.64	7.52	13.2	111	193
					4	7.64	7.54	13.2	111	192
					5	7.64	7.56	13.2	111	193
					6	7.64	7.58	13.2	110	192
					7	7.64	7.58	13.2	110	192
					8	7.64	7.62	13.2	110	193
					9	7.64	7.63	13.2	110	193
					10	7.64	7.61	13.1	110	193
	1-Aug-16	630434	5447592	-	0	20.0	8.52	8.75	96.4	262
					1	19.7	8.51	8.72	95.5	261
					2	19.6	8.51	8.71	95.0	261
					3	19.5	8.50	8.69	94.6	261
					4	19.4	8.50	8.66	94.2	261
					5	19.3	8.50	8.66	94.0	262
					6	19.3	8.49	8.63	93.7	265
					7	18.8	8.48	8.66	93.0	277
					8	18.6	8.47	8.66	92.8	280
					9	15.4	8.37	8.85	88.8	354
					10	15.2	8.34	8.71	86.8	362
T4-4	1-Apr-16	629716	5441648	-	0	8.73	7.63	12.8	110	221
					1	8.55	7.64	12.8	110	219
					2	8.40	7.66	12.9	110	219
					3	8.29	7.66	13.0	110	221
					4	8.26	7.59	13.0	111	219
					5	8.25	7.56	13.0	110	221
					6	8.22	7.60	12.8	109	220
					7	8.09	7.59	13.0	110	217
					8	7.87	7.62	13.1	110	219
					9	7.72	7.58	13.1	110	218
					10	7.71	7.58	13.1	110	219
					11	7.70	7.58	13.1	110	219
					12	7.70	7.59	13.0	109	220
T4-2	1-Aug-16	630115	5441812	4.4	0	20.3	8.54	8.74	96.6	247
					1	20.2	8.54	8.73	96.4	246
					2	19.8	8.56	8.80	96.5	246
					3	19.7	8.56	8.81	96.4	246
					4	19.7	8.55	8.80	96.2	246
					5	19.6	8.55	8.76	95.8	247
					6	19.6	8.54	8.73	95.4	246
					7	19.6	8.55	8.71	95.1	246
					8	19.5	8.55	8.70	94.9	246
					9	19.5	8.55	8.69	94.7	246
					10	19.5	8.55	8.65	94.2	245
					11	19.3	8.50	8.50	92.3	250
					12	19.0	8.41	8.28	89.4	258
					13	18.2	8.28	7.93	84.3	271
					14	17.5	8.18	7.47	78.1	282
					15	17.2	8.14	7.35	76.4	280
					16	16.7	8.08	7.17	73.8	279
					17	16.4	8.05	6.99	71.6	278
					18	16.2	8.02	6.88	70.2	277
					19	16.0	7.99	6.75	68.4	276
					20	15.0	7.91	6.44	63.9	267
					21	14.6	7.87	6.26	61.6	264
					22	14.2	7.83	6.08	59.2	260
					23	13.9	7.81	5.91	57.1	257
T4-3	1-Aug-16	629831	5442006	4.3	0	20.2	8.56	8.86	97.8	248
					1	20.1	8.56	8.83	97.4	248
					2	20.0	8.57	8.81	97.3	248
					3	19.8	8.57	8.86	97.1	249
					4	19.7	8.56	8.87	97.0	250
					5	19.6	8.56	8.84	96.6	250
					6	19.6	8.56	8.82	96.3	250
					7	19.6	8.55	8.77	95.7	250
					8	19.5	8.55	8.78	95.7	249
					9	19.5	8.57	8.78	95.6	247
					10	19.4	8.55	8.73	94.9	249
					11	19.3	8.49	8.47	91.9	253
					12	18.9	8.41	8.31	89.6	262
					13	17.9	8.27	7.80	82.2	281
					14	17.2	8.17	7.33	76.2	282
					15	17.1	8.13	7.29	75.6	281
					16	16.6	8.08	7.12	73.2	281
					17	16.3	8.05	7.00	71.4	280
					18	16.1	8.02	6.87	69.7	279
					19	15.8	7.98	6.68	67.4	277
					20	15.3	7.96	6.56	65.6	273
					21	14.5	7.91	6.35	62.6	264
					22	14.1	7.87	6.21	60.4	261
					23	13.8	7.83	5.93	57.3	259
					24	13.7	7.81	5.72	55.2	259

Table B.3: *In situ* Water Quality Measurements in Koocanusa Reservoir, 2016

Station	Sampling Date	Location (11U, NAD83)		Secchi Depth	Depth	Temperature	pH	Dissolved Oxygen		Specific Conductivity
		Easting	Northing	(m)	(m)	(˚C)		(mg/L)	(%)	(µS/cm)
T4-4	1-Aug-16	629695	5441699	4.2	0	20.1	8.58	8.79	96.8	246
					1	20.1	8.58	8.76	96.5	246
					2	20.0	8.58	8.75	96.3	246
					3	19.9	8.58	8.77	96.3	247
					4	19.7	8.59	8.78	96.2	247
					5	19.7	8.58	8.78	96.0	248
					6	19.6	8.58	8.75	95.6	248
					7	19.6	8.57	8.72	95.3	248
					8	19.5	8.56	8.68	94.6	248
					9	19.5	8.57	8.65	94.3	246
					10	19.5	8.55	8.59	93.6	248
					11	19.4	8.52	8.46	92.0	250
					12	19.2	8.46	8.37	90.6	260
					13	18.3	8.33	7.92	84.2	275
					14	17.4	8.19	7.50	78.2	282
					15	17.2	8.16	7.32	76.1	283
					16	17.0	8.14	7.21	74.7	280
					17	16.6	8.10	7.09	72.8	278
					18	16.0	8.04	6.85	69.4	276
					19	14.8	7.94	6.53	64.4	264
					20	14.7	7.91	6.28	62.1	264
					21	14.5	7.87	5.93	58.2	264
					22	14.2	7.86	5.94	58.0	261
					23	13.8	7.82	5.62	54.3	259
					24	13.6	7.78	5.11	49.2	258
T4-5	1-Aug-16	629494	5441783	4.8	0	20.1	8.58	8.90	98.2	250
					1	20.1	8.57	8.86	97.5	250
					2	20.0	8.57	8.84	97.2	249
					3	19.9	8.57	8.81	96.7	248
					4	19.7	8.57	8.82	96.5	248
					5	19.7	8.57	8.80	96.3	249
					6	19.6	8.57	8.78	95.9	248
					7	19.6	8.57	8.74	95.5	249
					8	19.6	8.56	8.68	94.8	249
					9	19.5	8.50	8.48	92.4	254
					10	19.5	8.49	8.39	91.3	253
					11	19.2	8.45	8.32	90.1	262
					12	18.1	8.29	7.94	84.0	278
					13	17.4	8.17	7.38	77.2	285
					14	17.0	8.08	7.37	76.5	280
					15	16.8	8.06	7.14	73.6	278
					16	16.4	8.03	6.96	71.4	277
					17	15.1	7.95	6.67	66.4	271
					18	14.9	7.89	6.40	63.4	269
					19	14.8	7.86	6.25	61.7	269
					20	14.6	7.82	5.87	57.7	266
					21	14.3	7.80	5.62	55.0	265
					22	13.8	7.77	5.26	51.0	259
					23	13.6	7.74	5.03	48.6	258
T4-6	1-Aug-16	629430	5441547	5.0	0	20.1	8.52	8.86	97.8	253
					1	20.0	8.52	8.82	97.1	253
					2	19.7	8.53	8.84	96.6	253
					3	19.6	8.53	8.79	96.0	254
					4	19.6	8.53	8.74	95.4	253
					5	19.5	8.54	8.68	94.7	254
					6	19.5	8.54	8.65	94.3	254
					7	19.5	8.54	8.66	94.3	254
					8	19.5	8.54	8.66	94.3	254
					9	19.5	8.53	8.65	94.1	254
					10	19.2	8.50	8.49	92.0	257
					11	18.9	8.42	8.22	88.5	269
					12	18.6	8.36	8.05	86.2	270
					13	17.4	8.17	7.34	76.5	283
					14	17.0	8.09	7.21	74.6	280
					15	16.8	8.05	7.01	72.3	280
					16	16.5	8.02	6.90	70.7	279
					17	15.9	7.95	6.62	67.1	277
					18	15.6	7.92	6.45	64.8	275
					19	15.3	7.90	6.42	64.0	272
					20	14.6	7.85	6.05	59.5	266
					21	14.1	7.80	5.83	56.7	262
					22	13.7	7.78	5.76	55.5	257
					23	13.3	7.76	5.71	54.6	254
					24	13.0	7.72	5.43	51.5	252
					25	12.5	7.72	5.48	51.4	247
					26	12.4	7.71	5.49	51.4	247
					27	12.3	7.70	5.39	50.5	247
					28	12.3	7.70	5.40	50.5	247
					29	12.3	7.70	5.37	50.2	248
Gold Creek	1-Apr-16	630332	5437062	-	0	10.6	7.39	10.8	97.1	184
					1	8.82	7.31	10.4	89.6	143
					2	8.03	7.29	10.6	89.5	119
					3	7.88	7.21	10.4	88.4	116
					4	7.77	7.19	10.5	88.5	115
					5	7.66	7.19	10.5	87.5	113
					6	7.49	7.22	10.5	87.1	111
					7	7.43	7.20	10.6	88.1	111
					8	7.44	7.23	10.5	87.7	112
	1-Aug-16	629404	5437115	-	0	20.5	8.61	8.98	99.8	241
					1	20.5	8.51	8.94	99.4	241
					2	20.4	8.59	8.92	99.0	241
					3	20.2	8.59	8.95	98.9	240
					4	19.9	8.59	8.97	98.5	240
					5	19.8	8.60	8.95	98.1	240
					6	19.7	8.60	8.95	98.0	240
					7	19.7	8.60	8.93	97.8	240
					8	19.7	8.60	8.93	97.6	240
					9	19.5	8.56	8.77	95.5	243
					10	19.4	8.50	8.52	92.7	245
					11	18.2	8.23	7.22	76.7	262

Table B.4: Selected Water Quality Data for the RG_USELK Water Quality Monitoring Station in Koocanusa Reservoir Upstream of the Elk River, 2014 and 2015

Date		Dissolved Oxygen				pH (Lab)		Specific Conductivity (25 °C)		Total Hardness ($CaCO_3$)		Total Suspended Solids		Turbidity (Lab)		Total Phosphorus		Ortho-phosphate		Dissolved Cadmium (Cd)		Nitrate-Nitrogen (NO_3)		Nitrite-Nitrogen (NO_2)		Ammonia-Nitrogen (NO_3)	
		mg/L		%		pH units		µS/cm		mg/L		mg/L		NTU		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom
2014	16-Apr-14	-	-	-	-	8.34	-	-	-	171	-	-	-	56.0	-	0.027	-	< 0.0010	-	< 0.000010	-	0.12	-	-	-	-	-
	30-Apr-14	-	-	-	-	8.19	-	-	-	159	-	-	-	233	-	0.26	-	0.0020	-	< 0.000010	-	0.10	-	-	-	-	-
	7-May-14	-	-	-	-	8.24	-	-	-	118	-	-	-	149	-	0.38	-	< 0.0011	-	< 0.000010	-	0.18	-	-	-	-	-
	14-May-14	-	-	-	-	8.21	-	-	-	132	-	-	-	89.4	-	0.088	-	0.0015	-	< 0.000010	-	0.15	-	-	-	-	-
	21-May-14	-	-	-	-	8.19	-	-	-	112	-	-	-	172	-	0.24	-	0.0025	-	< 0.000010	-	0.21	-	-	-	-	-
	28-May-14	-	-	-	-	8.13	-	-	-	103	-	-	-	120	-	0.056	-	0.0013	-	< 0.000010	-	0.17	-	-	-	-	-
	4-Jun-14	-	-	-	-	8.16	8.16	-	-	109	109	-	-	24.1	53.3	0.012	0.023	< 0.0011	0.0013	< 0.000010	< 0.000013	0.14	0.14	-	-	-	-
	11-Jun-14	-	-	-	-	8.24	8.25	-	-	105	102	-	-	17.8	18.3	0.014	0.016	< 0.0010	0.0010	< 0.000010	< 0.000010	0.11	0.11	-	-	-	-
	18-Jun-14	-	-	-	-	8.23	8.22	-	-	96.3	102	-	-	9.05	14.3	0.011	0.013	0.0011	< 0.0010	< 0.000010	< 0.000010	0.096	0.094	-	-	-	-
	25-Jun-14	-	-	-	-	8.20	8.25	-	-	93.4	113	-	-	23.2	31.6	0.011	0.024	< 0.0010	0.0020	< 0.000010	< 0.000010	0.079	0.33	-	-	-	-
	2-Jul-14	-	-	-	-	8.21	8.13	-	-	113	100	-	-	2.03	12.5	0.0059	0.0077	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.16	0.081	-	-	-	-
	6-Aug-14	-	-	-	-	8.36	8.33	-	-	121	140	-	-	0.79	1.26	0.0040	0.0069	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.093	0.31	-	-	-	-
	3-Sep-14	-	-	-	-	8.26	8.30	-	-	128	136	-	-	1.26	2.92	0.0028	0.0051	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.087	0.095	-	-	-	-
	8-Oct-14	-	-	-	-	8.15	8.27	-	-	131	142	-	-	0.96	2.42	0.0027	0.0057	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.12	0.16	-	-	-	-
	5-Nov-14	-	-	-	-	8.32	8.31	-	-	142	142	2.1	2.7	1.27	1.99	0.0033	0.0041	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.12	0.085	0.0020	0.0014	< 0.0050	0.0081
2015	7-Apr-15	11.7	10.3	95.0	84.1	8.23	8.29	272	273	133	131	10.2	9.9	13.1	14.4	0.011	0.010	0.0015	0.0018	0.00024	0.0000065	0.22	0.22	< 0.0010	< 0.0010	0.0092	0.0058
	14-Apr-15	-	-	-	-	8.21	8.29	-	-	139	161	4.9	7.7	6.25	6.48	0.0094	0.010	< 0.0010	0.0012	< 0.0000050	0.0000064	0.20	0.51	< 0.0010	0.0012	< 0.0050	0.0056
	21-Apr-15	10.0	9.21	89.7	78.0	8.34	8.33	306	314	151	164	2.6	3.6	5.11	5.51	0.0068	0.0061	< 0.0010	< 0.0010	< 0.0000050	0.0000064	0.11	0.40	0.0013	0.0014	< 0.0050	0.0071

Note: Monitoring was discontinued at this station in 2015 because it was found to be influenced by inflow from the Elk River. Upstream monitoring was moved to RG_KERRRD, farther upstream, in April 2015.

Table B.4: Selected Water Quality Data for the RG_USELK Water Quality Monitoring Station in Koocanusa Reservoir Upstream of the Elk River, 2014 and 2015

Date		Total Kjeldahl Nitrogen		Total Selenium (Se)		Sulphate (SO_4)	
		mg/L		mg/L		mg/L	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom
2014	16-Apr-14	-	-	0.24	-	38.1	-
	30-Apr-14	-	-	0.24	-	35.2	-
	7-May-14	-	-	0.18	-	23.1	-
	14-May-14	-	-	0.19	-	24.7	-
	21-May-14	-	-	0.20	-	13.8	-
	28-May-14	-	-	0.11	-	11.9	-
	4-Jun-14	-	-	0.12	0.15	12.9	12.9
	11-Jun-14	-	-	0.10	0.11	13.7	13.7
	18-Jun-14	-	-	0.10	0.10	13.5	13.6
	25-Jun-14	-	-	0.10	1.29	12.8	15.9
	2-Jul-14	-	-	0.88	0.19	16.5	13.6
	6-Aug-14	-	-	0.88	1.63	20.1	26.0
	3-Sep-14	-	-	0.99	0.40	21.4	25.5
	8-Oct-14	-	-	1.01	1.01	21.9	27.7
	5-Nov-14	< 0.050	0.058	0.91	0.54	28.4	31.6
2015	7-Apr-15	0.30	0.14	0.61	0.69	26.8	27.1
	14-Apr-15	0.11	0.11	0.43	2.39	28.6	34.8
	21-Apr-15	0.11	0.13	0.32	1.95	34.1	35.5

Note: Monitoring was discontinued at this station in 2015 because it was found to be influenced by inflow from the Elk River. Upstream monitoring was moved to RG_KERRRD, farther upstream, in April 2015.

Table B.5: **Selected Water Quality Data for the RG_KERRRD Water Quality Monitoring Station in Koocanusa Reservoir Upstream of the Elk River, 2015 and 2016**

	Date	Temperature (Field)		Dissolved Oxygen		Dissolved Oxygen		pH (Field)		Conductivity		Specific Conductivity (25 °C)		Total Hardness ($CaCO_3$)		Total Suspended Solids		Turbidity (Lab)		Secchi Depth	Chlorophyll-a	
		°C		mg/L		%		pH units		µS/cm		µS/cm		mg/L		mg/L		NTU		m	µg/L	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Surface	Average of Middle and Bottom
2015	14-Apr-15	-	-	10.1	10.3	81.0	85.2	8.35	8.23	-	-	349	1,524*	-	-	-	-	-	-	-	-	-
	27-Apr-15	-	-	10.5	10.3	94.2	89.0	7.94	8.06	260	291	274	291	129	140	8.8	9.8	6.45	6.26	0.70	0.37	0.46
	30-Apr-15	-	-	-	-	-	-	-	-	250	253	-	-	132	135	7.4	7.7	8.78	9.74	-	< 0.010	0.14
	5-May-15	-	-	11.0	11.0	99.1	98.0	8.32	8.32	237	246	247	247	116	118	8.2	8.7	10.6	13.0	0.70	0.16	0.40
	12-May-15	-	-	11.0	10.9	98.7	100	8.36	8.38	228	236	251	233	115	122	9.3	7.5	6.65	5.33	0.70	0.25	0.21
	19-May-15	-	-	10.1	10.0	93.4	91.7	8.16	8.14	187	181	215	212	105	105	11.1	11.4	3.66	8.13	0.70	0.20	0.24
	26-May-15	-	-	9.71	9.63	89.2	88.7	8.21	8.21	187	186	182	182	89.1	90.2	34.4	34.5	35.8	34.4	0.30	0.39	0.33
	2-Jun-15	-	-	10.0	9.88	90.9	89.2	8.26	8.24	-	-	172	173	-	-	-	-	-	-	0.30	-	-
	9-Jun-15	-	-	180	176	97.6	88.5	8.22	8.23	188	186	180	176	89.4	86.6	27.8	29.1	21.8	26.6	0.35	0.057	0.098
	16-Jun-15	-	-	11.6	11.3	110	108	8.18	8.18	171	171	183	182	91.3	91.8	7.1	12.2	17.6	24.7	0.75	0.075	0.12
	23-Jun-15	-	-	-	-	-	-	-	-	213	217	-	-	107	112	2.3	8.7	3.81	9.33	-	1.28	1.57
	30-Jun-15	-	-	9.49	9.48	104	98.7	8.18	8.10	230	230	220	221	111	113	3.1	4.3	2.73	4.17	3.50	0.59	0.68
	7-Jul-15	-	-	-	-	-	-	-	-	216	220	-	-	110	113	1.7	4.5	2.70	4.48	-	0.27	0.25
	15-Jul-15	-	-	8.37	8.07	96.3	89.3	8.56	8.32	223	236	229	240	118	120	1.8	4.8	0.68	2.79	4.00	1.54	0.46
	4-Aug-15	-	-	8.92	8.58	102	93.6	8.75	8.45	232	255	239	259	119	131	1.9	3.6	1.65	4.14	1.90	1.54	0.74
	8-Sep-15	16.4	15.3	8.72	8.75	-	-	8.52	8.44	260	274	262	275	131	138	1.4	4.4	1.23	3.81	3.00	1.52	0.87
	6-Oct-15	14.2	12.7	10.5	10.7	102	101	8.55	8.42	264	285	263	274	136	144	< 1	3.5	0.59	2.15	6.30	1.26	1.24
	3-Nov-15	-	-	10.1	10.5	91.2	92.2	8.49	8.42	270	288	269	287	143	151	1.7	2.6	1.04	1.82	3.50	1.85	1.26
2016	3-May-16	10.7	10.4	10.5	10.3	95.0	92.2	8.13	8.16	229	227	228	229	120	120	12.6	9.4	6.39	5.96	0.90	0.21	0.23
	10-May-16	8.90	8.90	11.7	11.6	101	99.6	8.18	8.21	180	180	180	180	92.9	94.1	40.6	33.4	19.9	26.4	0.30	0.37	0.33
	17-May-16	11.5	-	10.9	-	100	-	8.15	-	211	215	217	-	113	114	8.1	9.6	6.83	6.83	1.00	0.20	0.19
	24-May-16	8.50	8.30	11.1	11.1	95.4	95.8	8.21	8.16	182	182	181	181	87.8	87.7	16.4	16.9	13.1	9.12	0.60	0.26	0.26
	31-May-16	10.6	10.3	10.9	10.6	98.0	95.3	8.21	8.22	200	201	199	199	103	103	10.8	9.1	8.81	6.33	0.90	0.19	0.24
	7-Jun-16	15.1	11.2	10.3	9.59	103	87.9	8.02	7.94	174	174	216	237	88.4	89.7	10.8	10.7	6.13	6.65	4.25	0.23	0.26
	16-Jun-16	12.1	11.6	9.84	9.83	91.5	90.2	8.14	8.14	189	194	193	196	102	106	5.1	11.8	6.58	12.3	0.80	1.00	0.26
	21-Jun-16	14.2	11.8	9.79	10.1	95.4	94.0	8.22	8.13	209	219	208	244	107	111	3.3	8.9	3.82	6.84	1.40	1.20	0.25
	28-Jun-16	16.3	12.7	10.4	10.9	106	101	8.25	8.20	214	206	216	208	112	107	2.4	7.3	2.32	6.48	2.90	1.33	0.27
	5-Jul-16	19.5	16.7	8.95	8.94	98.0	92.0	8.54	8.29	215	201	218	204	112	106	2.6	4.2	1.75	4.02	2.50	3.10	0.81
	12-Jul-16	19.2	16.2	9.23	9.55	98.8	97.5	8.60	8.35	215	215	216	216	114	114	3.3	4.5	1.55	2.80	2.75	3.93	1.34
	2-Aug-16	21.3	17.9	8.79	8.76	98.5	98.2	8.51	8.28	235	243	237	247	121	124	2.3	< 1	5.22	3.02	1.30	1.42	0.83
	7-Sep-16	18.3	17.4	8.90	8.61	94.6	89.7	8.50	8.33	256	287	260	276	124	135	< 1	4.4	0.57	2.73	4.60	1.49	0.81
	11-Oct-16	12.6	11.8	8.37	8.99	87.9	90.9	8.42	8.36	270	287	277	290	135	143	1.9	4.2	0.69	2.14	5.30	1.08	1.40
	1-Nov-16	5.70	4.90	13.3	13.8	106	109	8.40	8.35	238	240	294	293	129	129	3.1	1.7	1.15	1.38	4.00	1.03	0.72
	6-Dec-16	1.80	1.80	11.9	11.7	85.5	84.9	8.08	8.06	268	269	270	271	133	135	1.4	1.4	1.31	1.11	3.50	0.77	0.76

Note: Monitoring upstream of the Elk River began in 2014 at RG_USELK and then was moved to RG_KERRRD, farther upstream, in April 2015.

* Suspect value, not included in summary tables or plots.

Table B.5: Selected Water Quality Data for the RG_KERRRD Water Quality Monitoring Station in Koocanusa Reservoir Upstream of the Elk River, 2015 and 2016

	Date	Total Phosphorus		Orthophosphate		Dissolved Cadmium (Cd)		Nitrate-Nitrogen (NO_3)		Nitrite-Nitrogen (NO_2)		Ammonia-Nitrogen (NH_3)		Total Kjeldahl Nitrogen		Total Selenium (Se)		Sulphate (SO_4)	
		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom
2016	14-Apr-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27-Apr-15	0.010	0.012	< 0.0010	0.0015	< 0.0000050	< 0.0000050	0.11	0.23	< 0.0010	0.0012	< 0.0050	0.0092	0.10	0.090	0.14	0.84	28.4	31.8
	30-Apr-15	0.0086	0.0089	0.0011	0.0013	< 0.0000050	< 0.0000050	0.12	0.14	< 0.0010	0.0017	< 0.0050	< 0.0050	0.093	0.12	0.14	0.16	27.1	27.3
	5-May-15	0.0075	0.0084	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.15	0.16	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.076	0.076	0.13	0.14	23.6	23.8
	12-May-15	0.0084	0.0082	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.25	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.14	0.14	0.15	0.74	20.4	22.4
	19-May-15	0.0086	0.0091	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.14	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.11	0.11	0.11	0.12	17.9	18.0
	26-May-15	0.018	0.019	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.14	< 0.0010	< 0.0010	0.0078	0.0079	0.13	0.13	0.083	0.085	12.5	12.5
	2-Jun-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-Jun-15	0.014	0.016	0.0014	0.0017	< 0.0000050	< 0.0000050	0.096	0.10	< 0.0010	< 0.0010	< 0.0050	0.0052	0.096	0.11	0.080	0.092	13.3	12.9
	16-Jun-15	0.0082	0.0097	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.089	0.091	< 0.0010	< 0.0010	< 0.0050	0.0050	0.081	0.067	0.079	0.073	14.8	15.2
	23-Jun-15	0.0044	0.0060	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.097	0.092	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.092	0.077	0.30	0.094	17.2	19.2
	30-Jun-15	0.0040	0.0044	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.074	0.086	0.0013	0.0011	< 0.0050	0.0054	0.081	0.072	0.17	0.12	22.3	22.3
	7-Jul-15	0.0046	0.0060	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.054	0.090	< 0.0010	< 0.0010	< 0.0050	0.010	0.11	0.11	0.11	0.13	20.4	19.9
	15-Jul-15	0.0020	0.0042	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.13	0.086	0.0019	0.0014	< 0.0050	0.0058	0.086	0.070	0.86	0.33	21.7	24.8
	4-Aug-15	0.0045	0.0034	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.089	0.049	0.0021	0.0013	< 0.0050	0.0055	0.11	0.097	0.86	0.21	22.9	27.5
	8-Sep-15	0.0027	0.0045	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.072	0.061	0.0015	< 0.0010	0.0054	0.0068	0.11	0.087	0.78	0.44	27.8	30.2
	6-Oct-15	0.0023	0.0039	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.13	0.088	0.0017	0.0011	0.014	0.0055	0.10	0.089	1.01	0.25	27.6	31.5
	3-Nov-15	0.0020	0.0027	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.12	0.0021	0.0016	0.0054	0.0061	0.14	0.13	1.04	0.68	29.2	32.9
	3-May-16	0.0065	0.0076	0.0014	0.0016	< 0.0000050	< 0.0000050	0.17	0.17	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.062	0.062	0.17	0.094	19.9	20.0
	10-May-16	0.022	0.028	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.14	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.072	0.098	0.14	0.091	13.5	13.4
	17-May-16	0.0070	0.011	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.12	0.12	< 0.0010	< 0.0010	< 0.0050	< 0.0050	< 0.050	0.053	0.12	0.090	20.1	20.2
	24-May-16	0.0068	0.0085	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.11	0.11	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.060	0.058	0.11	0.085	15.5	15.5
	31-May-16	0.0064	0.0063	0.0015	< 0.0010	< 0.0000050	< 0.0000050	0.096	0.096	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.054	0.056	0.096	0.097	16.4	16.4
	7-Jun-16	0.011	0.0082	< 0.0010	< 0.0010	< 0.0000055	< 0.0000050	0.076	0.076	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.083	0.083	0.076	0.088	13.4	13.4
	16-Jun-16	0.0073	0.0076	< 0.0010	< 0.0010	< 0.0000050	0.0000092	0.085	0.081	< 0.0010	< 0.0010	< 0.0050	0.0059	0.059	0.070	0.081	0.12	15.3	16.3
	21-Jun-16	0.0074	0.0068	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.10	0.086	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.097	0.067	0.086	0.11	17.7	19.3
	28-Jun-16	0.0080	0.0056	< 0.0010	< 0.0010	< 0.0000050	0.0000064	0.093	0.078	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.21	0.053	0.078	0.11	19.2	18.9
	5-Jul-16	0.0057	0.0070	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.12	0.075	0.0012	< 0.0010	< 0.0050	< 0.0050	0.12	0.084	0.074	0.17	19.1	18.0
	12-Jul-16	0.0025	0.0054	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.091	0.070	0.0013	< 0.0010	< 0.0050	< 0.0050	0.069	< 0.050	0.069	0.20	18.9	20.0
	2-Aug-16	0.0039	0.0029	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.097	0.068	0.0015	0.0011	< 0.0050	0.0077	0.10	0.073	0.073	0.23	22.4	24.1
	7-Sep-16	0.0039	0.0057	< 0.0010	0.0010	< 0.0000050	< 0.0000050	0.11	0.067	0.0015	0.0012	< 0.0050	0.012	0.10	0.096	0.067	0.18	26.6	32.1
	11-Oct-16	0.0041	0.0046	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.097	0.060	0.0010	< 0.0010	0.0084	0.0075	0.13	0.068	0.062	0.24	31.3	37.4
	1-Nov-16	0.0047	0.0029	0.0025	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.12	0.0021	0.0015	0.0053	0.0074	0.10	0.091	0.12	0.52	27.5	27.8
	6-Dec-16	0.0038	0.0043	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.12	0.12	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.079	0.074	0.12	0.14	26.5	26.5

Note: Monitoring upstream of the Elk River began in 2014 at RG_USELK and then was moved to RG_KERRRD, farther upstream, in April 2015.

* Suspect value, not included in summary tables or plots.

Table B.6: Selected Water Quality Data for the RG_DSELK Water Quality Monitoring Station in Koocanusa Reservoir Downstream of the Elk River, 2014 to 2016

	Date	Temperature (Field)		Dissolved Oxygen		Dissolved Oxygen		pH (Field)		Conductivity		Specific Conductivity (25 °C)		Total Hardness ($CaCO_3$)		Total Suspended Solids		Turbidity (Lab)		Secchi Depth	Chlorophyll-a	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Surface	Average of Middle and Bottom
		°C		mg/L		%		pH units		µS/cm		µS/cm		mg/L		mg/L		NTU		m	µg/L	
2014	16-Apr-14	-	-	-	-	-	-	-	-	343	346	-	-	176	177	-	-	44.7	53.5	-	-	-
	30-Apr-14	-	-	-	-	-	-	-	-	340	-	-	-	185	-	-	-	347	-	-	-	-
	7-May-14	-	-	-	-	-	-	-	-	300	-	-	-	149	-	-	-	78.8	-	-	-	-
	14-May-14	-	-	-	-	-	-	-	-	277	-	-	-	140	-	-	-	40.6	-	-	-	-
	14-May-14	-	-	-	-	-	-	-	-	181	-	-	-	102	-	-	-	110	-	-	-	-
	21-May-14	-	-	-	-	-	-	-	-	208	-	-	-	115	-	-	-	138	-	-	-	-
	4-Jun-14	-	-	-	-	-	-	-	-	206	222	-	-	114	124	-	-	43.2	67.1	-	-	-
	11-Jun-14	-	-	-	-	-	-	-	-	204	222	-	-	109	121	-	-	30.3	44.9	-	-	-
	18-Jun-14	-	-	-	-	-	-	-	-	195	201	-	-	106	111	-	-	17.9	10.5	-	-	-
	25-Jun-14	-	-	-	-	-	-	-	-	185	195	-	-	102	105	-	-	20.8	22.1	-	-	-
	2-Jul-14	-	-	-	-	-	-	-	-	215	196	-	-	108	100	-	-	1.75	9.06	-	-	-
	6-Aug-14	-	-	-	-	-	-	-	-	223	238	-	-	121	128	-	-	0.86	1.61	-	-	-
	3-Sep-14	-	-	-	-	-	-	-	-	232	261	-	-	126	136	-	-	0.88	2.37	-	-	-
	8-Oct-14	-	-	-	-	-	-	-	-	247	274	-	-	130	143	-	-	0.99	1.68	-	-	-
	5-Nov-14	-	-	-	-	-	-	-	-	261	270	-	-	134	141	2.4	2.3	1.05	1.31	-	-	-
2015	7-Apr-15	-	-	11.6	11.6	94.4	93.7	8.27	8.29	295	305	293	305	156	154	6.3	7.4	11.0	11.5	-	-	-
	14-Apr-15	-	-	9.29	10.1	76.4	84.5	8.27	8.27	296	290	320	294	149	158	5.3	8.5	5.10	6.60	-	-	-
	21-Apr-15	-	-	9.72	9.25	88.3	78.9	8.05	8.02	298	298	309	320	152	154	2.5	2.6	6.13	4.91	1.00	0.78	0.49
	27-Apr-15	-	-	10.5	10.9	94.5	94.4	8.40	8.36	308	309	306	315	147	154	3.9	5.6	3.18	4.47	1.00	0.11	0.25
	30-Apr-15	-	-	-	-	-	-	-	-	281	282	-	-	149	154	3.9	5.2	4.31	6.28	-	0.50	0.25
	5-May-15	-	-	10.9	11.2	99.8	100.2	8.37	8.41	265	279	265	278	130	136	4.0	3.5	6.21	7.21	1.05	0.81	0.39
	12-May-15	-	-	10.7	10.8	98.2	97.5	8.38	8.38	249	265	255	267	127	137	4.3	5.0	3.47	3.99	1.00	0.38	0.32
	19-May-15	-	-	10.1	10.2	92.4	90.1	8.16	8.10	210	260	238	260	120	134	5.0	5.4	4.72	4.69	0.90	< 0.01	0.20
	26-May-15	-	-	9.60	9.75	91.0	90.8	8.21	8.21	205	215	202	206	104	114	16.3	20.4	20.8	22.9	0.40	0.28	0.50
	2-Jun-15	-	-	9.43	9.62	91.3	87.7	8.25	8.24	-	-	205	189	-	-	-	-	-	-	0.85	-	-
	9-Jun-15	-	-	221	225	98.8	91.9	8.49	8.29	226	213	221	225	111	103	3.7	23.0	2.60	14.5	2.50	0.57	0.12
	16-Jun-15	-	-	11.5	11.0	109	110	8.22	8.23	180	205	256	190	101	118	7.1	8.1	10.6	13.8	1.20	0.99	0.19
	23-Jun-15	-	-	-	-	-	-	-	-	219	222	-	-	113	114	1.4	6.0	1.84	7.39	-	1.25	1.46
	30-Jun-15	-	-	8.66	9.79	99.7	101.0	8.34	8.09	224	235	215	227	111	118	1.5	3.1	1.09	3.66	5.20	1.39	0.66
	7-Jul-15	-	-	-	-	-	-	-	-	238	254	-	-	123	134	< 1	6.7	0.89	4.71	-	1.34	0.41
	15-Jul-15	-	-	8.52	7.93	96.1	86.3	8.58	8.31	223	235	229	239	120	122	1.9	4.3	0.79	1.98	3.60	1.45	0.87
	4-Aug-15	-	-	8.81	8.57	102	92.7	8.73	8.52	228	255	238	255	122	132	2.5	2.7	1.66	2.82	2.00	1.67	1.85
	8-Sep-15	17.2	16.8	8.46	8.31	-	-	8.54	8.51	140	258	255	263	129	134	< 3	1.8	1.77	1.65	3.30	2.59	1.32
	6-Oct-15	15.0	13.6	10.1	10.5	100	101	8.52	8.42	261	284	259	282	135	141	1.2	2.0	0.60	1.19	4.60	1.20	0.90
	3-Nov-15	-	-	9.86	10.2	91.6	92.1	8.50	8.39	266	286	266	287	142	152	2.0	3.8	1.37	3.81	3.00	1.73	1.71
	1-Dec-15	-	-	10.1	10.4	79.0	78.7	8.45	8.41	270	291	277	299	137	148	< 1	< 1	1.15	1.80	4.00	0.82	1.39
2016	5-Apr-16	7.90	-	9.70	-	81.8	-	8.21	-	320	-	324	-	-	-	33.2	-	36.8	-	0.40	1.27	-
	12-Apr-16	8.00	-	10.5	-	88.4	-	8.17	-	259	-	268	-	-	-	53.2	-	41.1	-	0.25	0.95	-
	19-Apr-16	9.60	-	10.8	-	95.5	-	8.21	-	278	-	271	-	-	-	41.4	-	31.3	-	0.50	0.91	-
	26-Apr-16	8.50	-	11.3	-	96.7	-	8.02	-	209	-	200	-	-	-	63.3	-	50.9	-	0.30	0.78	-
	3-May-16	9.90	9.30	10.3	10.3	91.5	89.9	8.14	8.16	235	251	231	246	-	135	16.6	19.7	14.0	13.0	0.75	0.38	0.43
	10-May-16	9.40	8.40	11.5	11.6	101	99.6	8.16	8.19	184	197	186	203	-	108	29.2	24.1	12.5	25.5	0.30	0.42	0.53
	17-May-16	10.8	-	10.7	-	97.2	-	8.16	-	247	218	235	-	-	116	6.6	16.0	5.82	10.6	0.80	0.23	0.23
	24-May-16	8.20	9.35	11.2	10.7	98.4	93.9	8.17	8.23	219	221	214	221	228	116	16.5	14.6	13.0	9.46	0.60	0.59	0.48
	31-May-16	10.9	11.6	10.4	10.4	94.1	95.6	8.27	8.22	224	212	222	226	227	112	6.3	8.1	5.41	6.85	1.80	0.46	0.36
	7-Jun-16	15.7	12.4	10.1	10.0	102	93.9	8.15	8.18	183	213	211	202	200	116	5.6	9.7	3.24	7.03	2.20	0.26	0.56
	16-Jun-16	16.1	13.8	9.30	-	95.0	-	8.42	-	204	-	208	-	224	-	3.8	6.7	2.91	-	2.10	4.66	2.32
	21-Jun-16	16.1	14.5	9.72	-	98.6	-	8.42	-	207	-	210	-	225	-	3.4	8.8	1.57	-	3.00	3.49	3.34
	28-Jun-16	17.0	15.7	10.5	-	107	-	8.51	-	212	-	214	-	-	-	2.7	5.3	1.39	-	3.15	3.90	2.45
	5-Jul-16	19.5	17.8	8.77	-	96.5	-	8.56	-	217	-	218	-	247	-	2.3	4.4	1.62	-	2.70	3.50	1.95
	12-Jul-16	19.1	16.7	9.35	9.35	99.8	96.3	8.55	8.36	218	217	220	223	227	116	2.4	3.8	0.89	1.98	3.65	2.71	2.25
	2-Aug-16	21.5	18.2	8.69	8.51	99.2	98.1	8.65	8.39	221	258	228	245	263	136	1.9	1.2	1.67	2.21	2.50	2.24	1.60
	7-Sep-16	18.6	18.4	8.76	8.85	93.7	94.3	8.52	8.51	245	268	249	255	260	130	< 1	2.0	0.70	1.37	4.10	1.79	1.50
	11-Oct-16	14.1	13.5	8.73	8.48	88.7	87.9	8.45	8.44	247	259	260	268	273	133	1.4	1.7	0.62	1.17	5.80	1.44	1.37
	1-Nov-16	8.70	5.55	11.5	13.6	97.0	107.8	8.39	8.33	234	234	281	251	209	129	1.3	1.8	1.00	1.28	4.00	1.72	1.45
	6-Dec-16	3.10	3.15	11.6	11.1	88.8	82.3	8.06	8.09	271	271	271	269	269	139	2.0	1.3	1.00	1.02	4.10	0.56	0.99

Table B.6: Selected Water Quality Data for the RG_DSELK Water Quality Monitoring Station in Koocanusa Reservoir Downstream of the Elk River, 2014 to 2016

Date		Total Phosphorus		Ortho-phosphate		Dissolved Cadmium (Cd)		Nitrate-Nitrogen (NO_3)		Nitrite-Nitrogen (NO_2)		Ammonia-Nitrogen (NH_3)		Total Kjeldahl Nitrogen		Total Selenium (Se)		Sulphate (SO_4)	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom
		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
2014	16-Apr-14	0.036	0.045	0.0015	0.0016	< 0.000010	< 0.000010	0.40	0.43	-	-	-	-	-	-	1.71	1.84	40.7	40.8
	30-Apr-14	0.29	-	0.0029	-	< 0.000010	-	0.41	-	-	-	-	-	-	-	1.89	-	37.2	-
	7-May-14	0.071	-	< 0.0010	-	< 0.000014	-	0.33	-	-	-	-	-	-	-	0.88	-	23.8	-
	14-May-14	0.033	-	< 0.0010	-	< 0.000010	-	0.27	-	-	-	-	-	-	-	0.83	-	25.8	-
	14-May-14	0.038	-	< 0.0010	-	< 0.000010	-	0.17	-	-	-	-	-	-	-	0.12	-	11.8	-
	21-May-14	0.095	-	0.0018	-	< 0.000010	-	0.22	-	-	-	-	-	-	-	0.23	-	14.0	-
	4-Jun-14	0.020	0.047	0.0016	0.0032	< 0.000010	< 0.000010	0.24	0.45	-	-	-	-	-	-	0.52	1.64	14.7	16.6
	11-Jun-14	0.022	0.036	0.0018	0.0029	< 0.000010	< 0.000010	0.24	0.44	-	-	-	-	-	-	0.75	1.72	14.9	17.1
	18-Jun-14	0.013	0.015	< 0.0010	0.0013	< 0.000010	< 0.000010	0.16	0.24	-	-	-	-	-	-	0.47	0.82	14.5	15.4
	25-Jun-14	0.014	0.019	< 0.0010	< 0.0013	< 0.000010	< 0.000010	0.11	0.19	-	-	-	-	-	-	0.22	0.57	13.1	14.1
	2-Jul-14	0.0056	0.011	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.16	0.12	-	-	-	-	-	-	0.84	0.40	16.3	14.5
	6-Aug-14	0.0039	0.0045	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.11	0.19	-	-	-	-	-	-	1.48	0.82	19.3	22.2
	3-Sep-14	0.0047	0.0046	< 0.0010	< 0.0010	< 0.000010	0.000097	0.079	0.11	-	-	-	-	-	-	0.94	0.58	20.3	26.3
	8-Oct-14	0.0023	0.0034	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.12	0.13	-	-	-	-	-	-	1.05	0.84	22.6	28.1
	5-Nov-14	0.0026	0.0040	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.16	0.13	0.0025	0.0023	< 0.0050	< 0.0050	0.11	0.10	1.11	0.97	25.3	28.0
2015	7-Apr-15	0.0083	0.0089	< 0.0010	0.0011	0.000010	0.0000063	0.40	0.51	0.0013	0.0014	< 0.0050	< 0.0050	0.16	0.16	1.79	2.37	29.9	31.6
	14-Apr-15	0.0093	0.0094	< 0.0010	< 0.0012	0.0000051	0.0000059	0.42	0.48	0.0012	0.0013	< 0.0050	0.0055	0.085	0.12	1.84	2.18	31.9	33.8
	21-Apr-15	0.0060	0.0050	< 0.0010	< 0.0010	< 0.0000050	0.0000058	0.24	0.38	0.0012	0.0014	< 0.0050	0.0056	0.11	0.14	1.11	1.86	35.9	34.4
	27-Apr-15	0.0078	0.0084	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.23	0.55	0.0011	0.0011	< 0.0050	< 0.0050	0.093	0.083	1.14	2.97	34.9	36.1
	30-Apr-15	0.0059	0.0080	< 0.0010	< 0.0010	< 0.0000050	0.0000056	0.28	0.41	< 0.0010	0.0011	< 0.0050	< 0.0050	0.075	0.094	1.33	2.18	32.8	32.4
	5-May-15	0.0060	0.0063	< 0.0010	< 0.0010	< 0.0000050	0.0000076	0.17	0.39	< 0.0010	0.0012	< 0.0050	< 0.0050	0.086	0.11	0.45	1.87	27.3	28.4
	12-May-15	0.0066	0.0067	< 0.0010	< 0.0010	0.0000052	0.0000060	0.32	0.49	0.0010	0.0012	< 0.0050	< 0.0050	0.43	0.17	1.17	2.12	25.3	27.8
	19-May-15	0.0064	0.0065	< 0.0010	< 0.0010	0.0000086	0.0000077	0.30	0.33	0.0011	0.0016	< 0.0050	0.012	0.11	0.11	0.98	1.30	21.5	25.8
	26-May-15	0.013	0.017	< 0.0010	< 0.0010	< 0.0000050	0.0000058	0.26	0.34	< 0.0010	0.0011	0.0083	0.0092	0.10	0.13	0.66	1.07	15.5	16.8
	2-Jun-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-Jun-15	0.0061	0.016	< 0.0010	< 0.0013	< 0.0000050	< 0.0000050	0.21	0.26	0.0019	< 0.0010	< 0.0050	0.0050	0.16	0.12	0.86	0.83	17.8	16.1
	16-Jun-15	0.0071	0.0087	< 0.0010	< 0.0011	< 0.0000050	< 0.0000050	0.16	0.36	< 0.0010	0.0011	< 0.0050	0.0067	0.13	0.084	0.42	1.32	15.7	19.5
	23-Jun-15	0.0034	0.0059	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.18	0.16	0.0016	< 0.0010	< 0.0050	< 0.0050	0.10	0.085	0.87	0.48	16.8	18.3
	30-Jun-15	0.0032	0.0043	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.17	0.16	0.0019	< 0.0010	< 0.0050	< 0.0050	0.12	0.082	0.82	0.51	17.8	22.5
	7-Jul-15	0.0035	0.0081	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.24	0.34	0.0017	0.0018	< 0.0050	0.012	0.11	0.11	1.14	1.49	21.9	24.6
	15-Jul-15	0.0021	0.0045	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.22	0.0017	0.0029	< 0.0050	0.0076	0.070	0.060	0.93	0.91	20.9	23.3
	4-Aug-15	0.0024	0.0030	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.11	0.13	0.0021	0.0019	< 0.0050	0.0066	0.11	0.090	0.96	0.70	22.5	26.2
	8-Sep-15	0.0036	0.0046	0.11	< 0.0010	< 0.0000050	< 0.0000050	0.52	0.16	0.0027	0.0021	0.0051	0.0060	0.11	0.15	1.18	1.21	14.2	28.0
	6-Oct-15	0.0030	0.0029	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.28	0.0022	0.0019	0.0082	0.012	0.22	0.12	1.23	1.45	26.6	31.2
	3-Nov-15	0.0020	0.0030	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.31	0.0026	0.0021	< 0.0050	0.0071	0.13	0.13	1.07	1.50	28.1	32.9
	1-Dec-15	0.0080	0.0058	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.23	0.28	0.0024	0.0017	0.0057	0.0063	0.13	0.10	1.26	1.30	30.0	34.4
2016	5-Apr-16	0.028	-	0.0025	-	< 0.0000080	-	0.32	-	0.0015	-	0.026	-	0.15	-	1.26	-	36.6	-
	12-Apr-16	0.032	-	0.0025	-	< 0.0000050	-	0.46	-	0.0013	-	0.011	-	0.18	-	1.74	-	27.4	-
	19-Apr-16	0.025	-	< 0.0016	-	< 0.0000050	-	0.37	-	< 0.0010	-	0.0074	-	0.20	-	1.27	-	27.6	-
	26-Apr-16	0.040	-	< 0.0013	-	< 0.0000050	-	0.27	-	0.0013	-	0.0061	-	0.15	-	0.38	-	15.0	-
	3-May-16	0.011	0.012	0.0019	< 0.0023	< 0.0000050	< 0.0000050	0.26	0.44	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.069	0.076	0.48	1.51	21.1	24.0
	10-May-16	0.017	0.021	< 0.0011	< 0.0017	< 0.0000050	< 0.0000050	0.18	0.28	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.066	0.076	0.28	0.79	13.8	15.8
	17-May-16	0.0076	0.010	< 0.0011	< 0.0012	< 0.0000050	< 0.0000050	0.49	0.21	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.061	0.058	1.94	0.52	25.5	20.3
	24-May-16	0.011	0.0094	< 0.0016	< 0.0011	< 0.0000050	0.0000085	0.34	0.34	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.087	0.083	1.15	1.37	19.3	19.7
	31-May-16	0.0066	0.0082	< 0.0010	< 0.0010	< 0.0000050	0.0000057	0.34	0.25	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.077	0.073	1.42	0.99	20.2	18.2
	7-Jun-16	0.0038	0.0067	< 0.0010	< 0.0010	< 0.0000050	0.000013	0.091	0.27	< 0.0010	< 0.0010	< 0.0050	< 0.0050	< 0.050	0.068	0.23	1.05	14.7	18.9
	16-Jun-16	0.0053	0.0069	< 0.0010	< 0.0011	< 0.0000050	< 0.0000050	0.15	0.18	0.0010	0.0010	< 0.0050	0.0055	0.098	0.076	0.67	0.63	16.8	18.3
	21-Jun-16	0.018	0.0072	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.15	0.0011	< 0.0010	0.0052	0.0058	0.13	0.084	0.69	0.60	17.0	17.0
	28-Jun-16	0.0055	0.0066	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.14	0.0015	0.0013	< 0.0050	< 0.0050	0.12	0.094	0.73	0.47	18.0	19.5
	5-Jul-16	0.0048	0.0073	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.23	0.0013	0.0016	< 0.0050	0.0054	0.17	0.095	0.72	0.92	18.6	21.4
	12-Jul-16	0.0041	0.0034	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.13	0.14	0.0012	0.0013	< 0.0050	0.0065	0.095	0.072	0.73	0.57	18.8	20.0
	2-Aug-16	0.0048	-	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.095	0.28	0.0018	0.0019	< 0.0050	0.0091	0.10	0.085	0.85	1.35	20.1	27.2
	7-Sep-16	0.0085	0.0082	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.18	0.0014	0.0021	< 0.0050	0.010	0.11	0.10	1.01	0.97	24.4	29.0
	11-Oct-16	0.0040	0.0040	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.18	0.0016	0.0015	< 0.0050	0.0061	0.11	0.11	1.00	1.02	27.1	28.8
	1-Nov-16	< 0.0020	0.0036	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.19	0.0026	0.0022	< 0.0050	< 0.0050	0.093	0.10	1.00	1.01	26.8	26.8
	6-Dec-16	0.0038	0.0033	< 0.0013	< 0.0010	< 0.0000050	< 0.0000050	0.23	0.23	0.0015	0.0012	0.0069	0.0066	0.085	0.11	0.84	0.80	26.7	26.6

Table B.7: Selected Water Quality Data for the Grasmere (RG_GRASMERE) Water Quality Monitoring Station in Koocanusa Reservoir Downstream of the Elk River, 2014 to 2016

	Date	Temperature (Field)		Dissolved Oxygen		Dissolved Oxygen		pH (Field)		Conductivity		Specific Conductivity (25 °C)		Total Hardness ($CaCO_3$)		Total Suspended Solids		Turbidity (Lab)		Secchi Depth	Chlorophyll-a	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Surface	Average of Middle and Bottom
		°C		mg/L		%		pH units		µS/cm		µS/cm		mg/L		mg/L		NTU		m	µg/L	
2014	16-Apr-14	-	-	-	-	-	-	-	-	358	357	-	-	190	190	-	-	25.3	32.8	-	-	-
	30-Apr-14	-	-	-	-	-	-	-	-	325	314	-	-	168	168	-	-	61.9	63.9	-	-	-
	14-May-14	-	-	-	-	-	-	-	-	276	278	-	-	143	146	-	-	45.5	105	-	-	-
	21-May-14	-	-	-	-	-	-	-	-	212	212	-	-	117	116	-	-	94.5	111	-	-	-
	28-May-14	-	-	-	-	-	-	-	-	186	206	-	-	106	113	-	-	108	127	-	-	-
	4-Jun-14	-	-	-	-	-	-	-	-	209	215	-	-	115	120	-	-	47.1	55.1	-	-	-
	11-Jun-14	-	-	-	-	-	-	-	-	213	205	-	-	116	110	-	-	13.2	32.7	-	-	-
	18-Jun-14	-	-	-	-	-	-	-	-	214	205	-	-	115	111	-	-	4.95	9.81	-	-	-
	25-Jun-14	-	-	-	-	-	-	-	-	204	193	-	-	108	102	-	-	5.06	24.5	-	-	-
	2-Jul-14	-	-	-	-	-	-	-	-	215	200	-	-	112	105	-	-	2.21	10.6	-	-	-
	6-Aug-14	-	-	-	-	-	-	-	-	219	235	-	-	119	127	-	-	0.72	1.26	-	-	-
	3-Sep-14	-	-	-	-	-	-	-	-	230	253	-	-	121	133	-	-	0.87	2.49	-	-	-
	8-Oct-14	-	-	-	-	-	-	-	-	245	268	-	-	129	139	-	-	1.01	2.00	-	-	-
	5-Nov-14	-	-	-	-	-	-	-	-	257	259	-	-	137	137	1.8	1.9	0.85	0.97	-	-	-
2015	7-Apr-15	-	-	10.9	10.9	91.8	90.2	8.27	8.23	297	301	297	301	143	140	5.2	27.0	8.67	25.0	-	-	-
	14-Apr-15	-	-	10.5	10.4	87.6	85.7	8.25	8.24	295	303	298	304	150	154	5.0	6.7	5.10	5.95	-	-	-
	21-Apr-15	-	-	8.40	9.58	83.7	74.7	8.00	7.96	303	296	311	305	156	154	2.3	2.7	5.01	4.73	1.30	0.62	0.66
	27-Apr-15	-	-	11.2	10.7	103	94.0	8.41	8.36	309	314	311	312	146	151	2.8	4.4	3.06	3.84	1.30	0.33	0.44
	5-May-15	-	-	10.9	10.3	102	92.4	8.38	8.30	280	289	275	293	131	138	3.6	4.8	5.48	8.19	1.20	0.82	0.39
	12-May-15	-	-	10.8	10.6	98.6	93.9	8.38	8.25	251	273	259	281	129	140	3.1	3.5	3.62	2.88	1.10	0.37	0.20
	19-May-15	-	-	10.1	10.2	91.3	87.6	8.15	8.04	253	289	251	284	129	142	5.2	4.6	4.32	5.02	1.10	0.21	0.18
	26-May-15	-	-	9.52	9.74	90.2	88.9	8.19	8.17	200	242	198	241	100	122	14.6	12.9	18.2	16.0	0.65	0.26	0.39
	2-Jun-15	-	-	9.02	9.86	90.7	90.9	8.32	8.24	-	-	213	200	-	-	-	-	-	-	1.30	-	-
	9-Jun-15	-	-	217	197	99.0	93.7	8.48	8.26	226	205	217	197	110	97.9	2.7	28.9	1.53	20.9	2.90	1.02	0.15
	16-Jun-15	-	-	12.1	10.5	110	105	8.07	8.29	186	188	208	209	102	105	3.1	12.2	6.43	19.3	1.60	0.49	0.25
	23-Jun-15	-	-	-	-	-	-	-	-	225	235	-	-	116	123	1.2	6.1	1.70	7.06	-	2.42	0.94
	30-Jun-15	-	-	8.89	9.82	103	97.6	8.38	8.15	221	241	216	231	111	122	1.2	2.8	0.97	3.87	5.10	1.14	0.60
	7-Jul-15	-	-	-	-	-	-	-	-	239	244	-	-	125	128	1.0	1.8	1.08	1.56	-	0.42	0.35
	15-Jul-15	-	-	8.30	8.06	93.0	84.4	8.61	8.29	222	236	228	230	117	126	1.4	2.0	0.72	1.38	3.70	1.76	0.45
	4-Aug-15	-	-	8.87	7.21	103	74.3	8.74	8.24	228	247	236	253	121	132	2.8	2.0	1.91	1.01	2.40	1.42	0.62
	8-Sep-15	-	16.8	-	8.20	-	-	-	8.47	254	262	-	264	129	134	1.8	2.8	1.21	1.93	-	1.62	1.74
	6-Oct-15	15.1	14.0	9.68	10.0	95.7	96.7	8.51	8.40	261	274	258	270	130	137	1.4	2.9	0.62	1.91	4.70	1.61	1.17
	3-Nov-15	-	-	9.85	9.92	91.8	90.3	8.47	8.42	265	281	266	282	142	150	2.1	3.4	1.35	2.00	3.00	1.97	1.66
	1-Dec-15	-	-	9.76	9.93	78.0	77.5	8.46	8.43	268	281	274	286	138	144	< 1	< 1	1.00	1.73	4.00	1.85	1.62
2016	5-Apr-16	9.70	9.60	9.88	9.78	87.1	85.6	8.36	8.34	366	362	356	356	183	181	9.5	13.1	8.00	10.1	0.90	2.73	1.87
	12-Apr-16	8.80	8.80	10.3	10.2	88.5	88.4	8.14	8.14	265	265	268	270	148	150	33.0	40.1	30.6	38.3	0.30	0.89	0.87
	19-Apr-16	10.0	9.80	10.3	10.2	91.0	91.1	8.23	8.22	277	284	279	276	140	144	17.8	20.5	18.4	19.3	1.05	0.57	0.43
	26-Apr-16	8.60	8.00	11.2	11.2	96.2	95.1	7.99	8.01	205	227	196	214	107	121	48.5	52.7	48.7	48.5	0.10	0.60	0.77
	3-May-16	10.0	9.60	10.3	10.0	91.8	88.9	8.14	8.16	241	248	240	239	129	133	9.9	12.8	8.68	9.25	1.00	0.53	0.23
	10-May-16	9.70	10.2	11.2	10.0	98.7	90.9	8.16	8.08	196	198	198	200	107	109	20.6	26.6	22.9	28.0	0.40	0.45	0.55
	17-May-16	9.90	10.6	10.4	11.0	91.6	99.4	8.16	8.10	217	232	245	221	118	125	6.7	10.5	8.10	9.49	0.80	0.20	0.18
	24-May-16	10.0	9.10	10.6	11.1	94.0	97.6	8.23	8.20	201	204	206	200	106	104	8.6	14.8	6.64	11.3	1.10	0.75	0.43
	31-May-16	13.0	11.3	10.1	10.3	95.8	94.4	8.28	8.23	215	210	213	209	109	108	2.1	10.8	1.73	7.99	3.60	0.60	0.30
	7-Jun-16	16.3	13.3	9.61	10.5	98.2	101	8.21	8.19	200	205	206	218	106	113	2.9	10.9	3.46	6.42	3.10	0.92	0.22
	16-Jun-16	15.8	15.5	9.24	9.28	94.6	94.7	8.39	8.35	206	205	209	208	114	113	2.8	9.7	2.46	8.13	2.30	4.28	2.63
	21-Jun-16	16.4	13.7	9.62	9.75	98.1	93.5	8.43	8.30	212	215	211	213	109	111	2.2	10.4	1.37	6.73	2.90	3.76	2.47
	28-Jun-16	16.7	14.5	10.7	10.5	105	103	8.47	8.34	211	228	216	230	111	120	2.4	5.2	1.29	5.04	3.20	3.75	2.15
	5-Jul-16	19.4	17.2	8.68	8.93	95.4	92.8	8.57	8.36	215	227	219	231	112	119	2.6	4.9	1.54	3.43	2.70	3.54	1.79
	12-Jul-16	18.9	16.4	9.17	9.30	98.8	95.7	8.55	8.34	218	227	220	228	119	122	2.1	3.6	0.94	2.03	3.40	2.81	1.73
	2-Aug-16	21.7	16.8	8.41	8.58	96.8	96.4	8.62	8.23	217	250	226	260	117	131	1.4	< 1	1.63	2.48	2.80	1.76	1.27
	7-Sep-16	18.6	17.5	8.95	8.78	96.0	91.7	8.51	8.38	241	262	248	273	119	128	< 1	2.0	0.60	1.32	4.20	1.98	1.21
	11-Oct-16	14.2	14.1	8.87	8.36	89.5	87.3	8.44	8.43	251	254	259	263	130	128	1.6	2.0	0.79	1.07	4.90	1.56	1.43
	1-Nov-16	10.8	11.2	9.73	9.11	87.8	83.1	8.37	8.38	232	239	264	266	130	130	1.2	2.0	0.75	1.51	4.00	1.57	1.27
	6-Dec-16	5.60	5.45	10.2	10.9	81.4	86.2	8.12	8.10	262	262	257	261	131	131	1.2	1.4	0.82	0.90	4.00	2.07	1.63

Table B.7: Selected Water Quality Data for the Grasmere (RG_GRASMERE) Water Quality Monitoring Station in Koocanusa Reservoir Downstream of the Elk River, 2014 to 2016

Date		Total Phosphorus		Ortho-phosphate		Dissolved Cadmium (Cd)		Nitrate-Nitrogen (NO_3)		Nitrite-Nitrogen (NO_2)		Ammonia-Nitrogen (NH_3)		Total Kjeldahl Nitrogen		Total Selenium (Se)		Sulphate (SO_4)	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom
		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
2014	16-Apr-14	0.025	0.028	< 0.0010	0.0013	< 0.000010	< 0.000010	0.40	0.42	-	-	-	-	-	-	1.67	1.82	42.8	42.9
	30-Apr-14	0.052	0.060	0.0015	0.0014	< 0.000010	< 0.000010	0.48	0.47	-	-	-	-	-	-	2.28	2.33	39.3	39.0
	14-May-14	0.037	0.083	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.35	0.39	-	-	-	-	-	-	1.34	1.51	27.9	28.4
	21-May-14	0.094	0.11	0.0028	0.0030	< 0.000010	< 0.000010	0.28	0.28	-	-	-	-	-	-	0.58	0.55	14.9	15.1
	28-May-14	0.050	0.084	0.0011	0.0021	< 0.000010	< 0.000010	0.17	0.33	-	-	-	-	-	-	0.12	0.94	11.4	13.6
	4-Jun-14	0.028	0.033	0.0016	0.0024	< 0.000010	< 0.000010	0.25	0.33	-	-	-	-	-	-	0.64	1.00	14.9	15.6
	11-Jun-14	0.017	0.024	< 0.0010	0.0012	< 0.000010	< 0.000010	0.23	0.22	-	-	-	-	-	-	0.82	0.66	15.8	14.8
	18-Jun-14	0.010	0.014	0.0014	0.0012	< 0.000010	< 0.000010	0.21	0.21	-	-	-	-	-	-	0.83	0.74	16.5	15.6
	25-Jun-14	0.0087	0.016	< 0.0010	0.0013	< 0.000010	< 0.000010	0.16	0.17	-	-	-	-	-	-	0.59	0.45	15.4	14.1
	2-Jul-14	0.0083	0.010	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.16	0.14	-	-	-	-	-	-	0.86	0.61	16.4	14.8
	6-Aug-14	0.0037	0.0041	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.12	0.20	-	-	-	-	-	-	0.91	0.94	19.3	21.7
	3-Sep-14	0.0032	0.0047	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.081	0.21	-	-	-	-	-	-	1.01	0.93	19.5	23.8
	8-Oct-14	0.0058	0.0039	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.13	0.16	-	-	-	-	-	-	1.04	1.01	21.8	26.4
	5-Nov-14	0.0031	0.0032	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.16	0.16	0.0024	0.0023	< 0.0050	< 0.0050	0.066	0.059	1.13	1.15	24.4	25.2
2015	7-Apr-15	0.0085	0.028	< 0.0010	0.0013	0.000012	0.0000066	0.37	0.39	-	-	-	-	-	-	1.65	1.74	29.9	30.1
	14-Apr-15	0.0078	0.0086	< 0.0010	< 0.0010	0.0000086	0.0000064	0.45	0.51	-	-	-	-	-	-	2.07	2.31	31.4	32.5
	21-Apr-15	0.0055	0.0055	< 0.0010	< 0.0010	0.0000076	< 0.0000050	0.32	0.44	-	-	-	-	-	-	1.66	2.09	36.0	34.6
	27-Apr-15	0.0068	0.0078	< 0.0010	< 0.0010	< 0.0000050	0.0000055	0.17	0.47	-	-	-	-	-	-	0.77	2.42	35.4	35.7
	5-May-15	0.0066	0.011	< 0.0010	< 0.0010	< 0.0000050	0.0000062	0.20	0.47	< 0.0010	0.0011	< 0.0050	0.0057	0.11	0.34	0.64	2.31	28.2	29.1
	12-May-15	0.0060	0.0059	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.35	0.41	0.0011	0.0015	< 0.0050	0.0088	0.17	0.16	1.26	1.87	26.2	29.2
	19-May-15	0.0065	0.0059	< 0.0010	< 0.0010	0.0000068	< 0.0000050	0.40	0.36	0.0011	0.0021	< 0.0050	0.014	0.099	0.11	1.59	1.72	23.9	26.5
	26-May-15	0.011	0.013	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.36	< 0.0010	0.0016	0.0073	0.011	0.12	0.13	0.32	1.33	14.9	20.1
	2-Jun-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-Jun-15	0.0050	0.018	< 0.0010	0.0014	< 0.0000050	< 0.0000050	0.20	0.22	0.0018	< 0.0010	< 0.0050	< 0.0050	0.13	0.12	0.82	0.64	17.5	16.4
	16-Jun-15	0.0063	0.011	< 0.0010	0.0012	< 0.0000050	< 0.0000050	0.18	0.26	0.0011	0.0012	< 0.0050	0.0063	0.077	0.084	0.57	0.70	16.2	15.9
	23-Jun-15	0.0088	0.0067	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.28	0.0017	0.0012	< 0.0050	< 0.0050	0.18	0.083	0.92	1.05	17.1	18.4
	30-Jun-15	0.0023	0.0045	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.30	0.0016	0.0026	< 0.0050	0.0052	0.12	0.088	0.88	1.11	17.7	19.4
	7-Jul-15	0.0028	0.0039	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.24	0.31	0.0016	0.0022	< 0.0050	0.010	0.099	0.11	1.32	1.26	21.9	21.1
	15-Jul-15	< 0.0020	0.0034	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.15	0.31	0.0019	0.0022	< 0.0050	0.0066	0.081	0.076	0.94	1.25	20.2	20.6
	4-Aug-15	0.0021	0.0023	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.11	0.30	0.0022	0.0017	< 0.0050	0.0069	0.095	0.066	0.98	1.24	21.7	21.5
	8-Sep-15	0.0041	0.0062	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.15	0.19	0.0029	0.0025	0.0061	0.0073	0.15	0.14	1.22	1.33	25.8	27.6
	6-Oct-15	0.0026	0.0048	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.18	0.0026	0.0018	0.0063	0.0089	0.14	0.086	1.09	0.96	26.5	29.1
	3-Nov-15	0.0023	0.0031	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.23	0.0025	0.0020	< 0.0050	0.0070	0.12	0.13	1.13	1.32	28.1	31.9
	1-Dec-15	0.0038	0.0045	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.23	0.26	0.0024	0.0023	< 0.0050	0.0055	0.12	0.093	1.34	1.35	29.5	31.9
2016	5-Apr-16	0.018	0.013	< 0.0010	< 0.0010	0.0000054	0.0000056	0.37	0.38	0.0020	0.0021	0.0066	0.010	0.16	0.14	1.71	1.73	41.8	41.4
	12-Apr-16	0.026	0.030	0.0031	0.0033	< 0.0000050	0.0000053	0.40	0.42	0.0014	0.0015	0.012	0.013	0.14	0.23	1.35	1.51	27.7	27.4
	19-Apr-16	0.014	0.016	0.0013	0.0015	< 0.0000050	< 0.0000050	0.29	0.38	< 0.0010	0.0011	0.0059	0.0067	0.16	0.16	0.93	1.42	27.3	28.7
	26-Apr-16	0.030	0.033	0.0010	0.0030	< 0.0000050	< 0.0000050	0.23	0.38	< 0.0010	< 0.0010	0.0068	0.0069	0.14	0.15	0.17	1.11	13.9	17.5
	3-May-16	0.0070	0.0092	0.0014	0.0019	< 0.0000050	0.0000056	0.33	0.41	< 0.0010	< 0.0010	< 0.0050	0.0053	0.069	0.081	0.91	1.31	22.1	23.3
	10-May-16	0.018	0.031	0.0014	0.0019	< 0.0000050	< 0.0000050	0.27	0.29	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.079	0.097	0.71	0.84	15.4	15.8
	17-May-16	0.0092	0.010	< 0.0010	0.0013	< 0.0000050	< 0.0000050	0.26	0.34	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.055	0.064	0.67	1.09	20.2	22.1
	24-May-16	0.0063	0.0092	< 0.0010	0.0010	< 0.0000050	< 0.0000050	0.25	0.24	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.076	0.077	0.70	0.63	18.5	17.8
	31-May-16	0.0088	0.0088	0.0011	< 0.0010	< 0.0000050	< 0.0000050	0.22	0.25	0.0014	< 0.0010	0.0083	< 0.0050	0.14	0.072	0.78	0.86	18.3	18.2
	7-Jun-16	0.0033	0.0090	< 0.0010	0.0012	< 0.0000050	< 0.0000050	0.13	0.21	< 0.0010	< 0.0010	< 0.0050	0.0051	< 0.050	0.064	0.40	0.76	16.9	17.9
	16-Jun-16	0.0082	0.0059	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.19	0.0013	0.0012	< 0.0050	0.0050	0.098	0.087	0.66	0.70	17.0	17.3
	21-Jun-16	0.017	0.0077	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.18	< 0.0010	< 0.0010	< 0.0050	0.0059	0.15	0.10	0.66	0.73	16.9	18.3
	28-Jun-16	0.0055	0.0057	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.15	0.20	0.0013	0.0013	< 0.0050	0.0057	0.10	0.091	0.76	0.75	17.8	21.1
	5-Jul-16	0.0076	0.0067	0.0011	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.24	0.0017	0.0019	< 0.0050	0.0061	0.10	0.11	0.83	0.99	18.5	21.6
	12-Jul-16	0.0030	0.0058	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.13	0.21	0.0013	0.0014	< 0.0050	0.0083	0.071	0.090	0.75	0.88	18.7	21.8
	2-Aug-16	0.0031	0.0034	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.090	0.25	0.0016	0.0025	< 0.0050	0.015	0.15	0.073	0.87	1.15	19.8	26.2
	7-Sep-16	0.0031	0.0066	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.21	0.0019	0.0035	< 0.0050	0.0090	0.092	0.10	0.92	0.99	24.0	27.4
	11-Oct-16	0.0058	0.0036	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.16	0.0018	0.0019	< 0.0050	< 0.0050	0.14	0.13	0.94	0.98	26.6	27.3
	1-Nov-16	0.0029	0.0052	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.18	0.21	0.0023	0.0022	< 0.0050	0.0055	0.080	0.092	0.97	1.07	26.8	26.7
	6-Dec-16	0.0038	0.0032	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.21	0.21	0.0029	0.0031	0.0051	0.0069	0.11	0.097	0.92	0.96	25.5	25.7

Table B.8: Selected Water Quality Data for the RG_USGOLD Water Quality Monitoring Station in Koocanusa Reservoir Upstream of the Elk River, 2014 to 2016

	Date	Temperature (Field)		Dissolved Oxygen		Dissolved Oxygen		pH (Field)		Conductivity		Specific Conductivity (25 °C)		Total Hardness ($CaCO_3$)		Total Suspended Solids		Turbidity (Lab)		Secchi Depth	Chlorophyll-a	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Surface	Average of Middle and Bottom
		°C		mg/L		%		pH units		µS/cm		µS/cm		mg/L		mg/L		NTU		m	µg/L	
2014	5-Nov-14	-	-	-	-	-	-	8.31	8.31	254	267	-	-	132	139	1.7	2.95	0.91	1.37	-	-	-
2015	7-Apr-15	-	-	11.6	11.7	98.8	96.1	8.27	8.25	297	299	294	296	137	140	2.9	4.3	7.51	7.88	-	-	-
	14-Apr-15	-	-	9.85	10.4	82.5	86.2	8.18	8.21	292	294	298	294	149	148	3.5	4.9	4.48	5.98	-	-	-
	21-Apr-15	-	-	9.30	9.08	85.0	82.6	8.01	7.89	301	286	309	299	158	150	2.5	3.1	3.87	5.77	1.50	1.44	0.52
	27-Apr-15	-	-	11.4	10.9	102	95.5	8.45	8.34	297	311	311	310	149	150	2.7	2.1	2.88	1.91	1.40	0.60	0.19
	5-May-15	-	-	10.1	10.3	95.0	92.8	8.37	8.24	283	303	275	300	134	146	3.2	2.2	4.56	3.94	1.20	1.15	0.32
	12-May-15	-	-	10.6	10.8	98.1	95.9	8.34	8.29	248	271	258	280	128	140	2.5	2.6	2.59	2.17	1.60	0.37	0.28
	19-May-15	-	-	10.0	10.2	91.1	87.5	8.16	8.05	249	254	246	279	124	140	4.3	31.0	3.54	19.1	1.10	0.32	0.10
	26-May-15	-	-	9.57	9.87	91.3	89.3	8.19	8.17	193	216	200	245	100	124	11.1	11.3	16.6	13.7	0.70	0.33	0.25
	2-Jun-15	-	-	8.51	9.79	86.2	91.6	8.33	8.26	-	-	221	192	-	-	-	-	-	-	1.30	-	-
	9-Jun-15	-	-	233	194	101	88.5	8.51	8.27	244	202	233	194	117	102	2.4	26.8	1.39	20.0	2.60	0.62	0.18
	16-Jun-15	-	-	11.8	11.0	110	113	8.15	8.29	196	193	200	202	107	107	1.3	10.2	4.08	6.87	1.70	1.12	0.16
	23-Jun-15	-	-	-	-	-	-	-	-	229	241	-	-	118	124	1.1	5.7	1.46	6.67	-	2.19	0.82
	30-Jun-15	-	-	9.72	9.84	107	95.6	8.43	8.04	220	230	213	226	110	115	1.4	2.1	1.14	2.94	4.70	1.63	0.61
	7-Jul-15	-	-	-	-	-	-	-	-	230	237	-	-	122	124	< 1	4.3	0.70	2.49	-	0.66	0.42
	15-Jul-15	-	-	7.72	7.87	88.6	79.5	8.62	8.09	244	227	226	247	130	121	2	1.9	2.28	1.11	3.60	0.43	0.95
	4-Aug-15	-	16.8	-	7.99	-	-	-	8.43	239	254	-	266	126	131	3.1	5.9	0.93	2.47	-	1.67	0.67
	8-Sep-15	17.5	15.2	8.34	8.59	-	85.9	8.53	8.43	251	274	252	271	128	139	1.8	3.0	0.75	1.44	3.70	1.54	1.96
	6-Oct-15	15.1	15.0	10.2	9.24	101	87.7	8.53	8.42	266	266	258	276	131	131	1.4	2.9	0.75	0.70	4.00	1.58	1.56
	3-Nov-15	-	-	9.63	9.27	89.5	86.1	8.45	8.44	262	279	265	264	140	147	2	2.9	1.01	1.68	3.30	1.68	1.32
	1-Dec-15	-	-	9.62	9.57	78.1	74.6	8.47	8.40	268	278	271	283	139	146	< 1	< 1	0.92	1.39	4.00	1.29	1.47
2016	5-Apr-16	9.50	8.70	9.49	9.71	83.3	83.9	8.31	8.31	368	370	352	359	183	183	10.6	10.3	10.1	10.6	1.50	2.30	1.58
	12-Apr-16	9.20	8.30	9.94	9.76	86.0	83.3	8.09	8.07	275	287	278	292	156	164	27	28.4	30.1	28.5	0.30	1.07	0.85
	19-Apr-16	10.5	9.30	10.2	10.1	91.6	88.1	8.28	8.20	285	289	279	282	144	147	7.1	15.0	9.30	15.2	0.85	2.22	0.41
	26-Apr-16	9.40	8.15	11.2	11.3	98.2	95.9	8.02	8.07	226	216	219	211	119	117	31.4	52.8	33.6	51.0	0.60	1.70	0.69
	3-May-16	10.8	9.10	10.1	10.5	92.0	90.9	8.12	8.12	233	249	232	252	124	134	7.7	11.5	7.49	10.8	1.10	0.80	0.23
	10-May-16	10.0	10.2	10.8	11.0	96.0	98.7	8.13	7.99	195	200	197	204	107	113	21.2	26.3	25.0	24.9	0.40	0.42	0.51
	17-May-16	11.0	10.0	10.7	11.1	97.0	98.7	8.15	8.02	206	226	207	228	109	124	6.1	9.2	7.28	7.80	0.90	1.07	0.19
	24-May-16	11.8	10.0	9.93	10.7	91.2	95.0	8.23	8.21	218	202	216	201	112	103	5	13.2	3.58	9.79	1.40	1.31	0.50
	31-May-16	13.2	11.4	10.0	10.2	95.1	95.2	8.31	8.25	218	210	218	209	113	109	1.5	11.0	1.39	7.88	4.10	1.02	0.37
	7-Jun-16	15.0	13.4	9.82	10.2	97.7	97.9	8.15	8.18	202	210	189	211	111	116	2.5	6.8	2.26	4.54	1.10	1.45	0.35
	16-Jun-16	15.9	14.1	9.32	9.42	94.5	93.5	8.39	8.30	208	204	211	211	114	111	3.3	7.4	2.71	7.07	2.20	4.33	2.60
	21-Jun-16	15.6	13.4	9.72	9.76	99.7	94.0	8.41	8.23	210	222	210	219	108	112	3.8	9.0	1.37	5.35	3.10	4.10	2.25
	28-Jun-16	16.4	14.3	10.2	10.2	102	101	8.51	8.25	210	235	216	234	113	122	2.7	4.3	1.71	5.12	3.60	3.92	2.11
	5-Jul-16	19.0	16.0	8.91	9.20	96.4	93.8	8.56	8.33	213	220	218	222	114	117	2.2	3.5	1.65	2.95	3.10	3.15	1.63
	12-Jul-16	18.7	14.2	9.22	9.50	98.6	96.4	8.55	8.17	218	231	220	240	116	125	2.3	2.0	0.88	1.62	3.90	2.35	0.92
	2-Aug-16	21.7	15.2	8.67	8.48	98.8	95.4	8.60	8.11	219	248	222	255	117	131	2.2	< 1	1.82	1.55	2.30	2.21	0.81
	7-Sep-16	18.6	17.9	8.75	8.55	93.4	90.2	8.50	8.43	243	263	247	261	119	128	< 1	1.4	0.74	1.22	3.90	1.86	1.24
	11-Oct-16	14.4	13.5	8.59	8.51	87.1	83.9	8.41	8.33	251	251	258	275	128	129	1.3	1.2	0.67	0.66	5.10	1.37	1.31
	1-Nov-16	12.0	11.1	8.85	9.03	81.8	82.5	8.31	8.23	232	238	258	259	129	130	1.4	1.5	0.91	0.98	4.30	1.32	1.26
	6-Dec-16	6.10	5.55	10.2	10.1	82.3	80.9	8.11	8.03	257	260	256	258	128	133	1.3	1.1	1.08	0.89	4.00	1.98	1.45

Table B.8: Selected Water Quality Data for the RG_USGOLD Water Quality Monitoring Station in Koocanusa Reservoir Upstream of the Elk River, 2014 to 2016

	Date	Total Phosphorus		Ortho-phosphate		Dissolved Cadmium (Cd)		Nitrate-Nitrogen (NO_3)		Nitrite-Nitrogen (NO_2)		Ammonia-Nitrogen (NH_3)		Total Kjeldahl Nitrogen		Total Selenium (Se)		Sulphate (SO_4)	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom
		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
2014	5-Nov-14	0.0026	0.0039	< 0.0010	-	< 0.000010	-	0.16	0.21	0.0027	0.0025	< 0.0050	0.0062	< 0.050	0.051	1.16	1.39	23.8	27.0
2015	7-Apr-15	0.0066	0.0072	< 0.0010	< 0.0010	< 0.000008	< 0.0000050	0.32	0.33	0.0012	0.0011	< 0.0050	0.0094	0.11	0.15	1.32	1.48	29.5	29.8
	14-Apr-15	0.0080	0.0078	< 0.0010	< 0.0010	0.0000072	0.0000055	0.41	0.41	0.0012	0.0015	< 0.0050	0.0073	0.13	0.097	1.64	1.86	29.7	30.5
	21-Apr-15	0.0058	0.0064	< 0.0010	< 0.0010	< 0.0000050	0.0000065	0.42	0.39	0.0016	0.0014	< 0.0050	0.010	0.12	0.13	2.07	1.78	34.8	30.4
	27-Apr-15	0.0058	0.0054	< 0.0010	< 0.0010	< 0.0000050	0.0000055	0.28	0.46	0.0012	0.0013	< 0.0050	0.0065	0.092	0.078	1.47	2.32	35.6	35.3
	5-May-15	0.0059	0.0049	< 0.0010	< 0.0010	< 0.0000050	0.0000080	0.22	0.44	0.0011	0.0013	< 0.0050	0.0080	0.13	0.18	0.89	2.26	29.0	32.1
	12-May-15	0.0057	0.0065	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.28	0.37	0.0011	0.0012	< 0.0050	0.0083	0.13	0.16	0.98	1.61	26.3	28.3
	19-May-15	0.0063	0.0075	< 0.0010	< 0.0010	< 0.0000050	0.0000060	0.35	0.35	0.0012	0.0021	< 0.0050	0.013	0.14	0.13	1.29	1.62	23.3	27.5
	26-May-15	0.011	0.010	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.37	< 0.0010	0.0015	0.0060	0.010	0.11	0.12	0.31	1.35	15.2	21.8
	2-Jun-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-Jun-15	0.0037	0.017	< 0.0010	0.0016	< 0.0000050	< 0.0000050	0.21	0.23	0.0022	< 0.0010	< 0.0050	< 0.0050	0.12	0.11	0.93	0.70	19.9	14.9
	16-Jun-15	0.0052	0.010	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.22	0.27	0.0015	0.0016	< 0.0050	0.0061	0.096	0.14	0.78	0.82	17.4	16.7
	23-Jun-15	0.0035	0.0077	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.20	0.34	0.0016	0.0024	< 0.0050	0.0059	0.11	0.092	0.97	1.36	17.4	19.8
	30-Jun-15	0.0035	0.0045	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.21	0.0013	0.0014	< 0.0050	< 0.0050	0.10	0.088	0.84	0.67	17.5	20.1
	7-Jul-15	0.0031	0.0046	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.29	0.0018	0.0026	< 0.0050	0.0069	0.11	0.097	0.96	1.05	19.5	20.9
	15-Jul-15	0.0042	0.0024	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.25	0.26	0.0019	0.0016	0.0098	< 0.0050	0.053	0.058	0.98	1.06	26.2	20.1
	4-Aug-15	0.0035	0.0051	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.18	0.30	0.0028	0.0024	0.014	0.0082	0.35	0.23	0.89	1.27	23.3	25.8
	8-Sep-15	0.036	0.0046	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.22	0.0029	0.0039	0.0089	0.010	0.12	0.12	1.17	1.22	25.3	29.3
	6-Oct-15	0.0022	< 0.0020	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.16	0.0025	0.0019	0.0053	0.0099	0.097	0.11	1.15	1.18	26.3	26.5
	3-Nov-15	< 0.0020	< 0.0020	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.21	0.0025	0.0020	< 0.0050	0.0074	0.11	0.15	1.12	1.16	27.7	31.4
	1-Dec-15	0.0029	0.0045	< 0.0010	< 0.0010	< 0.0000050	0.0000065	0.22	0.26	0.0030	0.0025	< 0.0050	0.0054	0.094	0.11	1.34	1.40	28.9	32.0
2016	5-Apr-16	0.013	0.012	< 0.0010	< 0.0010	< 0.0000050	0.0000055	0.38	0.38	0.0020	0.0020	0.0085	0.0080	0.13	0.12	1.62	1.67	42.3	42.5
	12-Apr-16	0.027	0.021	0.0021	0.0029	< 0.0000050	0.0000055	0.36	0.44	0.0013	0.0019	0.013	0.016	0.21	0.22	1.26	1.70	28.5	31.5
	19-Apr-16	0.011	0.013	< 0.0010	0.0012	< 0.0000050	< 0.0000050	0.37	0.44	0.0017	0.0011	< 0.0050	0.0064	0.11	0.14	1.41	1.67	28.7	29.2
	26-Apr-16	0.025	0.029	< 0.0010	0.0026	< 0.0000050	< 0.0000050	0.32	0.34	< 0.0010	< 0.0010	0.012	0.0072	0.16	0.15	0.77	0.80	17.8	16.2
	3-May-16	0.0062	0.0091	0.0011	0.0022	< 0.0000050	< 0.0000050	0.26	0.42	< 0.0010	< 0.0010	< 0.0050	0.0060	0.080	0.074	0.58	1.29	20.3	23.0
	10-May-16	0.022	0.022	0.0016	0.0013	< 0.0000050	0.0000070	0.26	0.28	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.079	0.083	0.59	0.75	15.2	15.9
	17-May-16	0.012	0.0095	0.0014	0.0011	< 0.0000050	0.0000055	0.28	0.34	< 0.0010	< 0.0010	< 0.0050	< 0.0050	0.080	0.063	0.76	1.11	16.7	21.4
	24-May-16	0.0050	0.0094	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.24	0.23	0.0010	< 0.0010	< 0.0050	< 0.0050	0.075	0.071	0.77	0.66	19.6	17.8
	31-May-16	0.0083	0.0097	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.23	0.23	0.0014	< 0.0010	0.0060	< 0.0050	0.078	0.083	0.75	0.78	18.7	17.9
	7-Jun-16	0.0090	0.0066	0.0012	< 0.0010	< 0.0000050	< 0.0000050	0.15	0.24	< 0.0010	< 0.0010	< 0.0050	0.0058	0.067	0.10	0.46	0.86	17.9	18.7
	16-Jun-16	0.0033	0.0065	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.19	0.0014	0.0011	< 0.0050	0.0052	0.14	0.11	0.76	0.66	17.2	17.2
	21-Jun-16	0.0043	0.0068	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.22	< 0.0010	< 0.0010	0.0052	0.0067	0.12	0.10	0.69	0.88	17.0	19.0
	28-Jun-16	0.0079	0.0057	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.24	0.0015	0.0015	< 0.0050	0.0057	0.093	0.11	0.81	0.94	18.1	21.7
	5-Jul-16	0.0071	0.0049	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.15	0.18	0.0014	0.0014	< 0.0050	0.0053	0.19	0.10	0.79	0.70	18.4	20.0
	12-Jul-16	0.0039	0.0023	< 0.0010	0.0010	< 0.0000050	< 0.0000050	0.13	0.24	0.0013	0.0029	< 0.0050	0.0088	0.076	< 0.050	0.77	0.85	18.5	21.7
	2-Aug-16	0.0028	0.0025	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.088	0.30	0.0016	0.0016	< 0.0050	0.0092	0.098	0.067	0.86	1.28	19.5	25.0
	7-Sep-16	0.0060	0.0050	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.14	0.18	0.0013	0.0021	< 0.0050	0.0079	0.11	0.099	0.95	0.95	24.0	28.1
	11-Oct-16	0.0029	0.0026	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.16	0.16	0.0019	0.0018	< 0.0050	< 0.0050	0.12	0.12	1.02	1.01	26.2	26.9
	1-Nov-16	< 0.0020	0.0025	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.19	0.18	0.0027	0.0027	< 0.0050	< 0.0050	0.10	0.090	0.93	0.95	26.7	26.8
	6-Dec-16	0.0028	0.0025	< 0.0010	< 0.0010	< 0.0000050	< 0.0000050	0.20	0.21	0.0032	0.0028	< 0.0050	0.0062	0.11	0.11	0.92	0.96	25.2	25.7

Table B.9: Selected Water Quality Data for the RG_BORDER Water Quality Monitoring Station in Koocanusa Reservoir, 2014 to 2016

	Date	Temperature (Field)		Dissolved Oxygen		Dissolved Oxygen		pH (Field)		Conductivity		Specific Conductivity (25 °C)		Total Hardness ($CaCO_3$)		Total Suspended Solids		Turbidity (Lab)		Secchi Depth	Chlorophyll-a	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Surface	Average of Middle and Bottom
		°C		mg/L		%		pH units		µS/cm		µS/cm		mg/L		mg/L		NTU		m	µg/L	
2014	16-Apr-14	-	-	-	-	-	-	-	-	321	331	-	-	170	181	-	-	5.08	9.41	-	-	-
	30-Apr-14	-	-	-	-	-	-	-	-	307	347	-	-	171	173	-	-	11.3	20.7	-	-	-
	7-May-14	-	-	-	-	-	-	-	-	295	284	-	-	159	152	-	-	59.9	69.2	-	-	-
	14-May-14	-	-	-	-	-	-	-	-	262	271	-	-	133	136	-	-	22.1	30.3	-	-	-
	21-May-14	-	-	-	-	-	-	-	-	258	216	-	-	137	114	-	-	22.3	116	-	-	-
	28-May-14	-	-	-	-	-	-	-	-	248	197	-	-	135	110	-	-	12.1	131	-	-	-
	4-Jun-14	-	-	-	-	-	-	-	-	234	222	-	-	127	120	-	-	10.6	41.1	-	-	-
	11-Jun-14	-	-	-	-	-	-	-	-	239	208	-	-	126	111	-	-	4.50	26.0	-	-	-
	18-Jun-14	-	-	-	-	-	-	-	-	219	209	-	-	117	113	-	-	5.38	11.7	-	-	-
	25-Jun-14	-	-	-	-	-	-	-	-	218	201	-	-	117	108	-	-	2.46	18.4	-	-	-
	2-Jul-14	-	-	-	-	-	-	-	-	216	203	-	-	113	106	-	-	3.02	12.7	-	-	-
	6-Aug-14	-	-	-	-	-	-	-	-	222	226	-	-	118	119	-	-	0.65	1.13	-	-	-
	3-Sep-14	-	-	-	-	-	-	-	-	227	231	-	-	121	123	-	-	1.22	0.93	-	-	-
	8-Oct-14	-	-	-	-	-	-	-	-	238	262	-	-	126	138	-	-	1.17	2.06	-	-	-
	5-Nov-14	-	-	-	-	-	-	-	-	250	255	-	-	133	135	1.9	2.5	1.07	1.13	-	-	-
2015	7-Apr-15	-	-	11.6	11.9	100	93.3	8.28	8.28	279	255	292	294	140	138	2.1	2.8	4.64	3.98	-	-	-
	14-Apr-15	-	-	9.61	10.6	78.5	86.7	6.72	7.89	290	288	307	293	149	148	2.6	3.0	2.04	3.19	-	-	-
	21-Apr-15	-	-	9.83	10.2	10.1	6.25	7.95	7.83	289	281	307	294	153	147	1.6	3.4	3.23	5.50	1.90	0.91	0.98
	27-Apr-15	-	-	10.9	11.2	100	94.4	8.44	8.28	308	297	312	295	149	143	2.1	4.0	2.04	3.43	3.70	0.78	0.35
	5-May-15	-	-	10.6	10.8	97.9	92.8	8.28	8.03	288	288	289	299	139	147	1.9	2.6	3.41	3.85	1.70	0.64	0.55
	12-May-15	-	-	10.7	11.3	98.2	95.6	8.27	8.19	252	282	260	289	130	145	3.1	2.6	2.80	1.79	2.00	0.54	0.42
	19-May-15	-	-	10.4	10.7	94.4	90.4	8.03	8.02	259	284	257	282	126	142	3	2.4	2.07	2.24	2.40	0.13	0.15
	26-May-15	-	-	9.39	10.0	91.5	89.8	7.60	8.15	224	260	236	261	118	134	4	4.2	5.60	5.90	1.80	0.35	0.24
	2-Jun-15	-	-	9.00	8.84	91.3	80.0	8.30	7.90	-	-	237	243	-	-	-	-	-	-	2.00	-	-
	9-Jun-15	-	-	232	226	86.4	83.7	8.46	7.87	239	237	232	226	118	119	2.1	17.4	1.55	12.0	2.30	0.74	0.13
	16-Jun-15	-	-	9.18	11.0	79.2	109	7.80	8.25	204	226	282	214	109	121	2.5	8.6	1.60	5.85	2.10	0.99	0.17
	23-Jun-15	-	-	-	-	-	-	-	-	230	255	-	-	117	132	1	5.3	1.63	7.54	-	1.86	0.98
	30-Jun-15	-	-	8.88	9.40	101	85.5	8.37	7.63	226	265	217	255	114	133	1.2	3.5	1.22	4.30	3.60	1.50	0.87
	7-Jul-15	-	-	-	-	-	-	-	-	223	240	-	-	117	126	1.5	2.8	0.86	3.16	-	0.71	0.35
	15-Jul-15	-	-	8.48	8.54	96.4	80.2	8.44	7.74	225	242	226	247	118	130	1.9	2.9	0.70	1.92	3.60	1.03	0.19
	4-Aug-15	-	-	-	-	-	-	-	-	235	243	-	-	127	130	2.3	2.4	0.76	2.00	-	1.43	0.68
	8-Sep-15	17.6	14.9	8.30	6.41	-	-	8.51	8.17	248	252	249	252	126	129	1.8	2.4	0.94	1.48	3.70	1.80	0.94
	6-Oct-15	15.2	13.1	8.85	7.35	88.4	70.7	8.36	8.15	259	270	257	266	134	139	1.1	1.8	0.81	1.11	3.90	1.55	1.03
	3-Nov-15	-	-	9.43	9.40	88.7	86.7	8.41	8.40	267	273	264	272	138	144	1.3	3.0	1.04	1.93	3.00	1.87	1.49
	1-Dec-15	-	-	9.45	9.73	78.7	79.3	8.15	8.19	266	276	271	278	138	142	< 1	1.3	0.85	0.83	4.00	0.90	1.18
2016	5-Apr-16	6.90	6.65	10.7	10.0	88.1	81.8	8.23	8.09	328	355	318	344	167	181	2.2	4.7	2.23	4.74	2.20	2.63	1.85
	12-Apr-16	10.0	6.50	10.1	10.2	88.1	84.3	7.96	7.99	295	328	301	338	166	183	9.8	3.4	11.6	3.43	0.50	1.22	0.94
	19-Apr-16	9.20	7.75	9.93	9.42	87.0	80.9	8.03	7.53	272	303	262	297	136	153	6.3	12.6	8.85	15.3	1.25	1.74	0.59
	26-Apr-16	10.8	8.95	10.3	11.2	94.3	97.6	7.99	7.54	247	215	239	207	128	113	10	40.4	13.4	44.8	1.00	2.57	0.93
	3-May-16	9.90	8.25	10.3	10.3	90.6	87.6	8.13	7.51	226	257	223	259	119	135	3.7	16.6	6.09	16.8	1.90	2.37	0.42
	10-May-16	11.3	9.75	10.9	10.5	99.4	92.7	8.12	7.82	200	245	205	244	112	136	12.9	13.2	15.4	14.3	0.60	0.50	0.44
	17-May-16	12.1	9.45	9.34	10.3	86.8	91.2	8.07	6.99	211	218	213	224	115	118	6	15.1	5.92	15.1	1.30	2.46	0.26
	24-May-16	12.2	11.3	9.35	10.5	90.2	96.3	7.86	8.21	219	207	220	208	113	106	5.7	16.0	5.04	13.5	1.30	2.12	0.79
	31-May-16	13.4	11.3	9.84	9.86	95.6	94.1	8.09	8.14	219	214	218	212	114	110	< 1	8.9	1.34	6.91	3.90	1.04	0.64
	7-Jun-16	14.1	14.0	10.1	10.0	97.8	98.1	8.12	8.13	210	231	178	178	113	123	3.6	11.4	1.10	8.72	0.80	3.84	0.52
	16-Jun-16	15.6	13.6	9.37	9.37	94.3	90.6	8.16	8.15	213	200	215	202	119	112	2.6	6.8	2.13	7.12	2.80	4.52	2.13
	21-Jun-16	15.5	11.3	9.71	9.42	97.5	93.1	8.22	7.99	215	245	215	241	110	123	2.9	4.3	1.73	4.07	3.30	3.85	1.74
	28-Jun-16	16.3	12.0	9.63	10.3	100	101	8.14	8.05	203	237	216	244	114	123	2.1	3.4	1.84	3.61	3.25	3.46	1.45
	5-Jul-16	17.4	14.2	9.17	9.06	95.6	88.3	8.51	7.75	213	224	216	230	114	118	2.6	2.3	2.07	2.68	2.80	2.78	1.57
	12-Jul-16	18.1	12.5	9.22	9.37	97.7	96.6	7.93	7.99	215	245	218	245	118	131	1.9	2.2	1.09	2.55	3.35	1.58	0.44
	2-Aug-16	21.5	12.7	8.52	8.57	98.1	97.6	8.04	7.84	219	249	222	252	111	128	1.7	2.2	2.50	3.13	2.60	1.74	0.57
	7-Sep-16	18.4	17.5	8.57	8.31	91.5	86.8	8.40	8.29	238	254	243	274	118	124	< 1	1.9	0.85	1.28	3.50	1.94	0.64
	11-Oct-16	14.5	12.9	8.46	8.71	86.1	89.5	7.88	8.02	249	255	255	261	123	127	1.5	2.2	0.71	1.19	3.20	1.18	0.87
	1-Nov-16	12.2	11.7	8.71	8.73	81.5	81.8	8.08	7.32	231	234	259	259	128	122	1	1.7	0.94	1.32	4.10	1.27	1.32
	6-Dec-16	7.80	6.45	10.4	10.4	86.3	84.7	7.98	6.85	255	260	254	258	130	133	1.4	1.6	1.10	1.58	4.00	0.18	1.35

Table B.9: Selected Water Quality Data for the RG_BORDER Water Quality Monitoring Station in Koocanusa Reservoir, 2014 to 2016

Date		Total Phosphorus		Ortho-phosphate		Dissolved Cadmium (Cd)		Nitrate-Nitrogen (NO_3)		Nitrite-Nitrogen (NO_2)		Ammonia-Nitrogen (NH_3)		Total Kjeldahl Nitrogen		Total Selenium (Se)		Sulphate (SO_4)	
		Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom	Surface	Average of Middle and Bottom
		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
2014	16-Apr-14	0.016	0.014	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.31	0.34	-	-	-	-	-	-	1.37	1.52	35.5	39.0
	30-Apr-14	0.015	0.024	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.41	0.44	-	-	-	-	-	-	1.37	2.08	37.1	37.4
	7-May-14	0.051	0.054	0.0022	0.0027	0.000014	< 0.000010	0.44	0.42	-	-	-	-	-	-	1.87	1.77	30.7	28.8
	14-May-14	0.018	0.024	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.37	0.42	-	-	-	-	-	-	1.39	1.65	25.2	27.6
	21-May-14	0.029	0.081	0.0014	0.0032	< 0.000010	< 0.000010	0.34	0.36	-	-	-	-	-	-	1.38	1.02	24.0	16.3
	28-May-14	0.017	0.078	< 0.0010	0.0021	< 0.000010	< 0.000010	0.30	0.32	-	-	-	-	-	-	1.34	0.93	22.8	13.2
	4-Jun-14	0.013	0.027	< 0.0010	0.0020	0.000012	< 0.000010	0.28	0.38	-	-	-	-	-	-	1.13	1.33	20.0	17.0
	11-Jun-14	0.013	0.023	< 0.0010	0.0013	< 0.000010	< 0.000010	0.25	0.28	-	-	-	-	-	-	1.17	0.93	19.9	15.2
	18-Jun-14	0.0099	0.016	0.0012	< 0.0010	< 0.000010	< 0.000010	0.23	0.25	-	-	-	-	-	-	0.93	0.92	16.9	16.1
	25-Jun-14	0.012	0.017	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.20	0.22	-	-	-	-	-	-	0.94	0.71	16.8	15.3
	2-Jul-14	0.0078	0.011	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.18	0.20	-	-	-	-	-	-	0.87	0.76	16.6	15.4
	6-Aug-14	0.0031	0.0041	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.10	0.22	-	-	-	-	-	-	0.91	0.95	18.5	19.3
	3-Sep-14	0.0036	0.0033	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.093	0.24	-	-	-	-	-	-	1.00	1.07	18.8	19.0
	8-Oct-14	0.0025	0.0034	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.13	0.22	-	-	-	-	-	-	1.03	1.35	20.9	25.1
	5-Nov-14	< 0.0020	0.0031	< 0.0010	< 0.0010	< 0.000010	< 0.000010	0.16	0.16	0.0028	0.0027	< 0.0050	0.0051	< 0.050	0.11	1.06	1.12	23.4	23.9
2015	7-Apr-15	0.0061	0.0054	< 0.0010	< 0.0010	0.0000065	< 0.000050	0.34	0.30	0.0012	< 0.0010	0.0054	0.0052	0.15	0.13	1.50	1.38	29.2	29.4
	14-Apr-15	0.0051	0.0059	< 0.0010	< 0.0010	0.0000057	0.0000058	0.30	0.32	0.0011	0.0013	< 0.0050	0.0083	0.17	0.096	1.34	1.45	29.0	29.3
	21-Apr-15	0.0054	0.0072	< 0.0010	< 0.0010	0.0000066	< 0.000050	0.35	0.30	0.0017	0.0012	< 0.0050	0.0084	0.13	0.13	1.80	1.37	32.4	28.8
	27-Apr-15	0.0058	0.0068	< 0.0010	< 0.0010	0.0000054	< 0.000050	0.35	0.33	0.0013	0.0013	< 0.0050	0.0079	0.12	0.090	1.81	1.54	34.6	30.1
	5-May-15	0.0065	0.0051	< 0.0010	< 0.0010	0.0000052	0.000028	0.28	0.42	0.0013	0.0015	< 0.0050	0.0099	0.20	0.15	1.36	2.08	31.2	32.2
	12-May-15	0.0059	0.0051	< 0.0010	< 0.0010	< 0.0000050	< 0.000050	0.33	0.32	< 0.0010	0.0014	< 0.0050	0.013	0.36	0.15	1.23	1.57	26.4	29.2
	19-May-15	0.0047	0.0047	< 0.0010	< 0.0010	0.0000057	0.000029	0.36	0.31	0.0013	0.0017	0.0051	0.014	0.12	0.14	1.40	1.47	24.6	28.1
	26-May-15	0.0057	0.0063	< 0.0010	< 0.0010	< 0.0000050	< 0.000050	0.30	0.38	0.0014	0.0018	< 0.0050	0.011	0.096	0.10	1.00	1.49	19.8	24.3
	2-Jun-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9-Jun-15	0.0046	0.016	< 0.0010	0.0012	< 0.000050	0.000028	0.21	0.30	0.0021	0.0030	< 0.0050	0.0074	0.11	0.10	0.96	0.94	19.8	19.3
	16-Jun-15	0.0042	0.0092	< 0.0010	< 0.0010	< 0.000050	0.000029	0.21	0.28	0.0018	0.0030	< 0.0050	0.0070	0.13	0.091	0.90	0.95	18.0	21.8
	23-Jun-15	0.0030	0.0046	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.20	0.28	0.0016	< 0.0010	< 0.0050	0.0052	0.097	0.10	0.94	1.07	17.6	22.4
	30-Jun-15	0.0027	0.0046	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.17	0.30	0.0019	0.0013	< 0.0050	0.0054	0.12	0.099	0.93	1.15	17.8	24.4
	7-Jul-15	0.0032	0.0058	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.16	0.29	0.0016	0.0017	0.0057	0.0056	0.13	0.12	0.86	1.04	17.2	20.1
	15-Jul-15	0.0027	< 0.0020	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.16	0.28	0.0022	0.0020	< 0.0050	0.0080	0.071	0.17	0.90	0.94	19.7	23.2
	4-Aug-15	0.0068	0.0046	< 0.0010	< 0.0010	0.0000079	0.0000080	0.20	0.35	0.0027	0.0024	0.0094	0.015	0.22	0.17	1.01	1.09	23.1	21.6
	8-Sep-15	0.0027	0.0041	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.15	0.26	0.0023	0.0026	< 0.0050	0.0068	0.088	0.11	1.07	1.16	24.3	23.8
	6-Oct-15	0.0024	0.0036	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.16	0.26	0.0024	0.0026	0.0053	0.0065	0.13	0.093	1.17	1.24	25.9	26.6
	3-Nov-15	< 0.0020	0.0032	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.19	0.19	0.0027	0.0024	< 0.0050	0.0066	0.11	0.13	1.06	1.06	27.4	29.8
	1-Dec-15	0.0033	0.0080	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.22	0.23	0.0033	0.0027	< 0.0050	0.0064	0.097	0.15	1.22	1.27	28.6	30.0
2016	5-Apr-16	0.012	0.010	< 0.0010	< 0.0010	< 0.000050	0.000029	0.28	0.33	0.0014	0.0017	< 0.0050	0.0084	0.10	0.14	1.36	1.43	34.5	38.9
	12-Apr-16	0.014	0.0053	< 0.0010	< 0.0010	0.0000069	0.000029	0.39	0.32	0.0016	0.0020	< 0.0050	0.012	0.19	0.15	1.58	1.45	33.2	37.6
	19-Apr-16	0.010	0.014	< 0.0010	0.0012	< 0.000050	0.000028	0.30	0.33	0.0012	0.0018	< 0.0050	0.017	0.14	0.15	1.01	1.24	25.4	30.4
	26-Apr-16	0.013	0.026	< 0.0010	0.0015	< 0.000050	< 0.000050	0.31	0.31	0.0015	0.0011	< 0.0050	0.011	0.14	0.16	0.92	0.71	21.9	16.1
	3-May-16	0.0069	0.013	0.0011	0.0019	< 0.000050	< 0.000050	0.28	0.34	< 0.0010	0.0018	< 0.0050	0.012	0.095	0.090	0.73	1.00	18.0	23.4
	10-May-16	0.020	0.015	< 0.0010	0.0011	< 0.000050	< 0.000050	0.27	0.34	< 0.0010	0.0017	< 0.0050	0.011	0.072	0.073	0.67	1.12	16.1	22.9
	17-May-16	0.0059	0.013	< 0.0010	0.0013	< 0.000050	< 0.000050	0.27	0.33	< 0.0010	< 0.0010	< 0.0050	0.0056	0.077	0.065	0.82	1.03	17.4	19.2
	24-May-16	0.0037	0.0076	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.25	0.24	0.0011	< 0.0010	< 0.0050	< 0.0050	0.072	0.070	0.81	0.67	19.5	18.7
	31-May-16	0.014	0.0085	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.23	0.24	0.0011	< 0.0010	< 0.0050	< 0.0050	0.085	0.083	0.73	0.77	18.8	17.8
	7-Jun-16	0.0047	0.0087	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.21	0.26	0.0010	0.0034	0.0053	0.0079	0.099	0.12	0.79	0.85	18.4	21.5
	16-Jun-16	0.0070	0.010	< 0.0010	< 0.0010	< 0.000050	0.000028	0.17	0.20	0.0015	0.0013	0.0052	0.0058	0.22	0.096	0.78	0.73	17.7	16.7
	21-Jun-16	0.0056	0.0070	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.17	0.26	< 0.0010	< 0.0010	< 0.0050	0.0062	0.11	0.087	0.78	0.91	17.6	22.0
	28-Jun-16	0.0081	0.0048	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.17	0.24	0.0014	0.0015	< 0.0050	< 0.0050	0.090	0.076	0.71	0.84	18.2	21.7
	5-Jul-16	0.0047	0.0055	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.15	0.20	0.0012	0.0013	< 0.0050	0.0063	0.098	0.089	0.77	0.75	18.1	20.6
	12-Jul-16	0.0031	0.0061	< 0.0010	0.0011	< 0.000050	< 0.000050	0.14	0.28	0.0013	0.0016	< 0.0050	0.011	0.052	0.084	0.76	0.94	18.1	23.6
	2-Aug-16	< 0.0020	0.0035	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.10	0.22	0.0015	0.0018	< 0.0050	0.0081	0.095	0.055	0.84	0.76	18.7	23.8
	7-Sep-16	0.0030	0.0065	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.14	0.28	0.0018	0.0040	< 0.0050	0.0062	0.13	0.071	0.87	0.87	23.0	25.5
	11-Oct-16	0.0025	0.0036	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.16	0.24	0.0022	0.0015	< 0.0050	< 0.0050	0.11	0.066	0.99	1.00	25.8	26.4
	1-Nov-16	0.0031	0.0033	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.19	0.19	0.0028	0.0031	< 0.0050	< 0.0050	0.090	0.090	0.93	0.90	26.7	26.8
	6-Dec-16	0.0022	0.0027	< 0.0010	< 0.0010	< 0.000050	< 0.000050	0.19	0.20	0.0037	0.0034	< 0.0050	0.0070	0.092	0.084	1.00	0.97	24.8	25.2

Table B.10: Selected Water Quality Data for the Elk River (RG_ELKMOUTH) Water Quality Monitoring Station, 2014 to 2016

Date		Temperature (Field)	Dissolved Oxygen	pH (Field)	Conductivity (Field)	Specific Conductivity (25 °C)	Total Hardness ($CaCO_3$)	Turbidity (Lab)	Total Phosphorus	Ortho-phosphate	Dissolved Cadmium (Cd)	Nitrate-Nitrogen (NO_3)	Total Selenium (Se)	Sulphate (SO_4)
		°C	mg/L	-	µS/cm	µS/cm	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2014	7-Jan-14	-	-	-	-	-	255	1.8	0.0051	0.0019	< 0.01	1.7	7.6	59
	4-Feb-14	-	-	-	-	-	266	1.3	0.0022	0.0038	< 0.01	1.7	8.0	66
	4-Mar-14	-	-	-	-	-	225	1.7	0.0053	< 0.001	< 0.01	1.6	7.4	62
	1-Apr-14	-	-	-	-	-	227	7.8	0.018	0.0022	< 0.01	1.4	6.2	50
	15-Apr-14	-	-	-	-	-	201	7.7	0.022	< 0.001	0.027	1.3	5.8	44
	22-Apr-14	-	-	-	-	-	200	10	0.030	0.0019	< 0.01	1.2	5.6	43
	29-Apr-14	-	-	-	-	-	198	6.8	0.054	0.0015	0.011	1.3	6.6	48
	13-May-14	-	-	-	-	-	181	7.8	0.016	0.0011	0.012	1.1	5.5	38
	20-May-14	-	-	-	-	-	146	112	0.26	0.0046	0.017	0.78	3.6	24
	27-May-14	-	-	-	-	-	133	229	0.12	0.0069	< 0.01	0.75	3.2	19
	3-Jun-14	-	-	-	-	-	131	108	0.20	0.0060	0.012	0.83	3.5	20
	10-Jun-14	-	-	-	-	-	135	60	0.17	0.0050	0.010	0.77	3.2	20
	17-Jun-14	-	-	-	-	-	139	28	0.073	0.0032	< 0.01	0.76	3.4	22
	24-Jun-14	-	-	-	-	-	142	46	0.11	0.0046	0.011	0.71	3.3	21
	1-Jul-14	-	-	-	-	-	148	16	0.041	0.0031	0.014	0.76	3.4	23
	5-Aug-14	-	-	-	-	-	197	1.1	0.0036	< 0.001	< 0.01	1.0	5.2	40
	2-Sep-14	-	-	-	-	-	216	1.8	0.0033	< 0.001	< 0.01	1.3	6.5	49
	7-Oct-14	10	8.9	8.4	275	383	220	0.93	< 0.002	< 0.001	< 0.01	1.4	6.8	54
	4-Nov-14	6.0	11	8.4	238	373	212	1.3	0.0025	< 0.001	< 0.01	1.3	6.4	50
	2-Dec-14	-0.1	13	8.0	157	302	197	3.8	0.010	0.0046	0.011	0.86	4.0	37
n		**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
minimum		**-0.1**	**8.9**	**8.0**	**157**	**302**	**137**	**0.93**	**0.0020**	**0.001**	**0.010**	**0.76**	**3.3**	**21**
median		**6.0**	**11**	**8.4**	**238**	**373**	**209**	**1.8**	**0.0052**	**0.0018**	**0.010**	**1.3**	**6.2**	**48**
maximum		**10**	**13**	**8.4**	**275**	**383**	**266**	**116**	**0.14**	**0.0047**	**0.015**	**1.7**	**8.0**	**66**
mean		**5.4**	**11**	**8.3**	**223**	**353**	**203**	**18**	**0.031**	**0.0024**	**0.011**	**1.2**	**5.7**	**45**
standard deviation		**5.2**	**2.3**	**0.25**	**60**	**44**	**40**	**35**	**0.050**	**0.0016**	**0.0017**	**0.37**	**1.7**	**15**
2015	6-Jan-15	0	15	8.2	200	382	209	2.7	0.0057	0.0015	< 0.01	1.1	5.7	48
	3-Feb-15	1.1	13	8.2	205	378	213	0.89	0.0065	< 0.001	< 0.01	1.1	6.0	50
	3-Mar-15	0	14	8.3	209	401	204	0.81	0.0034	< 0.001	< 0.01	0.92	5.3	46
	17-Mar-15	-	13	8.3	-	273	140	28	0.039	0.0041	0.012	0.56	2.9	24
	24-Mar-15	-	13	8.4	-	325	169	7.9	0.020	0.0019	0.011	0.83	4.1	33
	1-Apr-15	-	13	8.3	-	312	171	11	0.026	0.0023	0.011	0.86	4.3	33
	7-Apr-15	-	13	8.6	208	347	184	3.5	0.0029	< 0.001	0.0097	1.1	5.6	41
	14-Apr-15	-	12	8.7	-	364	193	2.0	0.0041	< 0.001	0.012	1.0	5.8	44
	21-Apr-15	-	11	8.6	224	324	176	3.0	0.0066	< 0.001	0.013	0.99	5.5	39
	27-Apr-15	-	12	8.5	224	332	166	1.8	0.0065	< 0.001	0.011	1.0	5.8	40
	5-May-15	-	11	8.5	280	192	148	7.7	0.012	< 0.001	0.012	0.79	4.4	30
	12-May-15	-	12	8.5	305	201	161	2.5	0.0092	< 0.001	0.010	0.98	5.0	34
	19-May-15	-	11	8.6	270	189	152	3.9	0.0098	< 0.001	0.010	0.84	4.3	29
	26-May-15	-	11	8.3	244	170	142	40	0.085	< 0.001	0.0081	0.79	3.4	24
	2-Jun-15	-	11	8.4	165	235	139	47	0.084	0.0017	0.011	0.71	2.9	22
	9-Jun-15	-	10	8.4	182	239	149	12	0.056	0.0028	0.0094	0.78	3.1	24
	16-Jun-15	-	11	8.5	223	298	174	2.4	0.015	0.0018	0.0099	1.1	4.1	34
	23-Jun-15	-	10	8.5	245	316	189	5.1	0.035	< 0.001	0.0068	1.1	5.3	37
	30-Jun-15	-	9.9	8.5	256	319	184	1.6	0.0066	< 0.001	0.013	1.1	6.2	39
	7-Jul-15	-	-	-	-	-	196	1.2	0.0046	< 0.001	0.0092	1.2	5.5	41
	15-Jul-15	-	11	8.6	277	342	209	2.3	0.0069	< 0.001	0.0071	1.2	6.1	45
	21-Jul-15	-	10	8.5	-	375	215	0.81	0.0039	< 0.001	0.0064	1.3	6.3	47
	28-Jul-15	-	10	8.6	274	348	202	1.2	0.0029	0.0011	0.0067	1.4	6.4	51
	4-Aug-15	-	9.5	8.6	308	361	209	0.59	0.0022	< 0.001	0.0077	1.4	6.7	53
	8-Sep-15	-	11	8.5	271	383	230	0.42	< 0.002	< 0.001	0.0081	1.6	7.3	59
	6-Oct-15	-	11	8.6	273	394	224	0.42	< 0.002	0.0014	0.0079	1.7	7.6	63
	3-Nov-15	-	12	8.5	229	366	224	2.5	0.0043	< 0.001	0.010	1.4	5.7	55
	1-Dec-15	-	14	8.5	218	418	244	0.98	0.0047	< 0.001	0.0074	1.4	6.2	61
n		**3.0**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
minimum		**0**	**9.5**	**8.2**	**200**	**188**	**151**	**0.42**	**0.0020**	**0.0010**	**0.0074**	**0.77**	**4.1**	**29**
median		**0**	**12**	**8.5**	**224**	**364**	**209**	**1.9**	**0.0052**	**0.0010**	**0.010**	**1.2**	**5.9**	**49**
maximum		**1.1**	**15**	**8.6**	**308**	**418**	**244**	**14**	**0.039**	**0.0023**	**0.011**	**1.7**	**7.6**	**63**
mean		**0.37**	**12**	**8.5**	**241**	**348**	**202**	**4.4**	**0.011**	**0.0013**	**0.0092**	**1.2**	**5.8**	**47**
standard deviation		**0.64**	**1.6**	**0.14**	**36**	**61**	**29**	**5.3**	**0.012**	**0.00041**	**0.0014**	**0.30**	**1.1**	**12**
2016	7-Jan-16	-	16	8.4	-	434	236	1.1	0.0039	0.0010	0.0073	1.5	6.8	63
	2-Feb-16	-	11	8.5	-	418	231	1.4	0.0068	0.0010	0.012	1.3	5.5	56
	3-Mar-16	4.1	11	8.4	-	404	221	2.5	0.0081	0.0010	0.0093	1.2	5.2	52
	15-Mar-16	3.6	12	8.4	-	374	206	3.4	0.0085	0.0011	0.0084	0.94	4.3	43
	22-Mar-16	5.0	11	8.5	-	390	220	2.5	0.0061	0.0017	0.011	1.1	5.1	48
	29-Mar-16	5.0	13	8.5	-	391	216	2.3	0.0077	0.0010	0.0084	1.1	5.2	50
	5-Apr-16	4.9	12	8.4	-	268	161	22	0.062	0.0015	0.0098	0.85	3.5	35
	12-Apr-16	6.2	12	8.3	-	251	159	20	0.038	0.0045	0.014	0.93	3.8	32
	19-Apr-16	6.8	12	8.4	-	253	156	13	0.025	0.0021	0.013	0.88	3.7	32
	26-Apr-16	6.7	12	8.3	-	229	145	31	0.067	0.0050	0.015	0.73	3.3	26
	3-May-16	8.2	11	8.4	-	247	155	8.7	0.017	0.0029	0.012	0.86	3.7	30
	10-May-16	6.3	11	7.8	-	227	146	21	0.040	0.0038	0.012	0.71	2.7	25
	17-May-16	9.0	10	8.4	-	260	164	2.2	0.014	0.0013	0.0095	0.92	4.2	33
	24-May-16	7.6	12	8.4	-	225	136	7.7	0.020	0.0017	0.0094	0.65	2.8	25
	31-May-16	9.0	12	8.4	-	239	150	3.1	0.010	0.0010	0.010	0.68	3.1	27
	7-Jun-16	12	11	8.4	-	216	141	7.2	0.018	0.0015	0.011	0.62	2.7	24
	14-Jun-16	9.9	11	8.5	-	136	167	2.1	0.0069	0.0016	0.0080	0.84	3.6	33
	21-Jun-16	11	10	8.5	-	278	174	1.7	0.0073	0.0010	0.0082	0.91	4.2	36
	28-Jun-16	14	10	8.5	-	281	177	1.0	0.0048	0.0010	< 0.005	0.92	4.1	37
	5-Jul-16	12	11	8.6	-	291	181	1.2	0.0061	0.0010	0.0087	0.99	4.0	39
	12-Jul-16	14	11	8.5	-	302	192	1.0	0.0044	0.0010	0.0077	1.1	4.3	42
	26-Jul-16	15	10	8.5	-	367	187	3.5	0.0097	0.0010	0.0073	1.4	5.7	48
	26-Jul-16	15	10	8.4	-	364	191	1.6	0.0039	0.0010	0.0060	1.2	5.2	46
	2-Aug-16	15	10	8.6	-	323	211	1.2	0.0043	0.0010	0.0079	1.2	5.6	48
	6-Sep-16	12	11	8.5	-	348	220	0.38	0.0030	0.0010	< 0.005	1.5	6.2	58
	11-Oct-16	5.0	12	6.2	-	264	166	4.0	0.0072	0.0010	0.0092	0.92	4.1	41
	1-Nov-16	6.0	12	8.1	291	-	145	7.0	0.010	0.0014	0.0085	0.60	2.7	27
	6-Dec-16	0.10	14	8.3	-	342	200	0.69	0.014	0.0010	0.0071	1.0	4.7	45
n		**10**	**12**	**12**	**1.0**	**11**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
minimum		**0.10**	**10**	**6.2**	**291**	**228**	**145**	**0.38**	**0.0030**	**0.0010**	**0.0050**	**0.60**	**2.7**	**27**
median		**7.1**	**11**	**8.4**	**291**	**331**	**194**	**2.2**	**0.0074**	**0.0010**	**0.0083**	**1.1**	**4.8**	**45**
maximum		**15**	**16**	**8.6**	**291**	**434**	**236**	**21**	**0.048**	**0.0033**	**0.013**	**1.5**	**6.8**	**63**
mean		**8.2**	**12**	**8.2**	**291**	**324**	**190**	**4.4**	**0.012**	**0.0014**	**0.0087**	**1.1**	**4.7**	**44**
standard deviation		**4.7**	**1.6**	**0.64**	**0**	**72**	**33**	**5.9**	**0.012**	**0.00069**	**0.0021**	**0.29**	**1.2**	**12**

Note: Annual summary statistics based on monthly means.

Table B.11: Selected Water Quality Data for the Kootenay River (RG_WARDB) Water Quality Monitoring Station, 2014 to 2016

Date		Temperature (Field)	Dissolved Oxygen		pH (Field)	Conductivity (Field)	Specific Conductivity (25 °C)	Total Hardness ($CaCO_3$)	Turbidity (Lab)	Total Phosphorus	Ortho-phosphate	Dissolved Cadmium (Cd)	Nitrate-Nitrogen (NO_3)	Total Selenium (Se)	Sulphate (SO_4)
		°C	mg/L	%	-	µS/cm	µS/cm	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2014	7-Jan-14	-	-	-	-	-	-	182	2.3	0.010	0.0028	< 0.000010	0.14	0.13	44
	4-Feb-14	-	-	-	-	-	-	191	3.1	0.015	0.0039	< 0.000010	0.13	0.14	49
	4-Mar-14	-	-	-	-	-	-	174	2.2	0.018	0.0039	< 0.000010	0.15	0.11	53
	1-Apr-14	-	-	-	-	-	-	181	7.4	0.026	0.0044	0.000013	0.11	0.12	54
	15-Apr-14	-	-	-	-	-	-	143	4.0	0.018	0.0019	< 0.000010	0.085	< 0.10	45
	22-Apr-14	-	-	-	-	-	-	154	4.2	0.019	0.0013	< 0.000010	0.066	< 0.10	44
	29-Apr-14	-	-	-	-	-	-	142	6.2	0.018	0.0021	0.000011	0.069	< 0.10	42
	6-May-14	-	-	-	-	-	-	105	25	0.039	0.0016	0.000036	0.21	< 0.10	24
	13-May-14	-	-	-	-	-	-	123	17	0.017	< 0.0010	< 0.000010	0.15	< 0.10	29
	20-May-14	-	-	-	-	-	-	95	178	0.25	0.0022	< 0.000010	0.21	0.13	15
	27-May-14	-	-	-	-	-	-	90	200	0.022	0.0012	< 0.000010	0.16	0.11	12
	3-Jun-14	-	-	-	-	-	-	91	101	0.076	< 0.0010	< 0.000010	0.14	0.11	14
	10-Jun-14	-	-	-	-	-	-	91	59	0.076	< 0.0010	< 0.000010	0.11	< 0.10	14
	17-Jun-14	-	-	-	-	-	-	91	91	0.060	< 0.0010	< 0.000010	0.092	< 0.10	15
	24-Jun-14	-	-	-	-	-	-	91	103	0.062	< 0.0010	< 0.000010	0.077	< 0.10	14
	1-Jul-14	-	-	-	-	-	-	95	53	0.044	0.0013	< 0.000010	0.069	< 0.10	16
	5-Aug-14	-	-	-	-	-	-	129	12	0.013	< 0.0010	< 0.000010	0.060	< 0.10	25
	2-Sep-14	-	-	-	-	-	-	139	8.3	0.010	< 0.0010	< 0.000010	0.056	0.11	31
	7-Oct-14	10	9.5	85	8.5	212	293	151	1.4	0.0044	< 0.0010	< 0.000010	0.038	< 0.10	37
	4-Nov-14	6.4	9.9	80	8.3	171	265	133	2.1	0.0068	< 0.0010	< 0.000010	0.091	< 0.10	33
	2-Dec-14	-0.10	14	94	7.8	147	282	142	3.6	0.0084	0.0028	< 0.000010	0.14	< 0.10	33
n		**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
minimum		**-0.10**	**9.5**	**80**	**7.8**	**147**	**265**	**91**	**1.4**	**0.0044**	**0.0010**	**0.000010**	**0.038**	**0.10**	**14**
median		**6.4**	**10**	**85**	**8.3**	**171**	**282**	**141**	**4.5**	**0.014**	**0.0014**	**0.000010**	**0.097**	**0.10**	**33**
maximum		**10**	**14**	**94**	**8.5**	**212**	**293**	**191**	**105**	**0.081**	**0.0039**	**0.000017**	**0.18**	**0.14**	**53**
mean		**5.6**	**11**	**86**	**8.2**	**177**	**280**	**140**	**24**	**0.025**	**0.0020**	**0.000011**	**0.10**	**0.11**	**34**
standard deviation		**5.3**	**2.3**	**7.0**	**0.35**	**33**	**14**	**33**	**37**	**0.026**	**0.0011**	**0.0000019**	**0.044**	**0.013**	**13**
2015	6-Jan-15	0.10	14	93	7.9	180	343	159	4.8	0.025	0.0094	< 0.000010	0.16	0.12	46
	3-Feb-15	1.2	13	90	8.0	180	331	150	2.4	0.016	0.0037	< 0.000010	0.14	0.12	45
	3-Mar-15	1.2	13	90	8.2	183	337	154	3.1	0.014	0.0042	< 0.000010	0.10	< 0.10	43
	7-Apr-15	-	-	-	-	-	-	137	4.4	0.010	0.0030	0.0000073	0.12	0.10	35
	7-Apr-15	-	12	95	8.4	177	278	-	-	-	-	-	-	-	-
	14-Apr-15	-	12	97	8.5	-	302	142	4.1	0.012	0.0029	0.0000061	0.095	0.081	39
	21-Apr-15	-	10	96	8.6	292	282	144	4.1	0.010	< 0.0010	0.0000064	0.075	0.12	37
	27-Apr-15	-	11	99	8.4	177	250	120	3.9	0.011	< 0.0010	< 0.0000050	0.13	0.11	31
	5-May-15	-	11	97	8.4	237	173	108	8.5	0.012	< 0.0010	< 0.0000050	0.14	0.096	27
	12-May-15	-	10	95	8.3	203	148	99	13	0.017	0.0010	< 0.0000050	0.14	0.061	21
	19-May-15	-	10	95	8.3	180	131	92	25	0.020	< 0.0010	< 0.0000050	0.15	0.093	18
	26-May-15	-	10	91	8.3	159	114	83	92	0.059	< 0.0010	< 0.0000050	0.14	0.075	13
	2-Jun-15	-	-	-	-	-	-	81	101	0.077	0.0011	< 0.0000050	0.11	0.097	13
	2-Jun-15	-	10	91	8.3	98	136	-	-	-	-	-	-	-	-
	9-Jun-15	-	9.7	92	8.3	111	144	79	62	0.034	0.0014	< 0.0000050	0.087	0.10	14
	16-Jun-15	-	9.9	93	8.2	145	192	103	5.1	0.015	< 0.0010	0.0000050	0.094	0.087	21
	23-Jun-15	-	9.5	93	8.2	148	187	108	15	0.020	0.0010	< 0.0000050	0.084	0.075	23
	30-Jun-15	-	8.9	92	8.2	155	184	96	22	0.029	< 0.0010	< 0.0000050	0.073	0.085	22
	7-Jul-15	-	-	-	-	-	-	118	6.9	0.011	< 0.0010	< 0.0000050	0.078	0.089	26
	15-Jul-15	-	9.7	100	8.3	176	209	122	17	0.026	< 0.0010	< 0.0000050	0.082	0.076	24
	28-Jul-15	-	9.7	96	8.5	196	241	-	-	-	-	-	-	-	-
	4-Aug-15	-	9.2	99	8.6	220	252	136	2.8	0.0057	< 0.0010	< 0.0000050	0.029	0.10	30
	8-Sep-15	-	11	96	8.5	183	252	142	2.4	0.0078	< 0.0010	0.0000069	0.059	0.091	32
	6-Oct-15	-	11	101	8.6	210	290	153	2.2	0.0061	0.0015	< 0.0000050	0.063	0.10	39
	3-Nov-15	-	12	95	8.6	181	285	158	2.1	0.0086	0.0016	0.0000060	0.099	0.11	39
	1-Dec-15	-	13	88	8.3	183	349	178	2.2	0.017	0.0020	0.0000080	0.16	0.14	48
n		**3.0**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
minimum		**0.10**	**9.2**	**88**	**7.9**	**131**	**142**	**93**	**2.1**	**0.0057**	**0.0010**	**0.0000050**	**0.029**	**0.081**	**19**
median		**1.2**	**11**	**95**	**8.4**	**183**	**282**	**146**	**2.9**	**0.015**	**0.0016**	**0.0000061**	**0.10**	**0.10**	**37**
maximum		**1.2**	**14**	**101**	**8.6**	**220**	**349**	**178**	**41**	**0.035**	**0.0094**	**0.000010**	**0.16**	**0.14**	**48**
mean		**0.83**	**11**	**94**	**8.3**	**187**	**271**	**140**	**9.4**	**0.016**	**0.0025**	**0.0000068**	**0.10**	**0.10**	**35**
standard deviation		**0.64**	**1.5**	**3.8**	**0.23**	**23**	**67**	**26**	**14**	**0.0092**	**0.0024**	**0.0000021**	**0.041**	**0.017**	**10**
2016	7-Jan-16	-	-	-	-	-	-	182	1.2	0.012	0.0046	< 0.0000050	0.16	0.16	50
	7-Jan-16	-	15	106	7.9	-	369	-	-	-	-	-	-	-	-
	2-Feb-16	-	12	85	8.4	-	344	167	2.2	0.017	0.0071	0.0000064	0.15	0.11	46
	3-Mar-16	4.7	12	90	8.3	-	350	173	4.2	0.022	0.0056	< 0.0000050	0.11	0.13	48
	15-Mar-16	5.1	11	84	8.3	-	340	171	4.7	0.018	0.0049	0.0000066	0.11	0.11	44
	22-Mar-16	-	-	-	-	-	-	171	4.2	0.017	0.0044	< 0.0000050	0.091	0.12	46
	22-Mar-16	6.4	10	85	8.6	-	350	172	3.6	0.018	0.0032	0.0000077	0.090	0.13	46
	29-Mar-16	6.3	12	99	8.4	-	339	164	2.7	0.018	0.0038	< 0.0000050	0.091	0.10	45
	5-Apr-16	7.6	11	93	8.4	-	243	136	11	0.018	0.0022	< 0.0000050	0.11	0.11	39
	12-Apr-16	8.6	10	90	8.2	-	196	114	14	0.020	0.0016	< 0.0000050	0.17	0.088	26
	19-Apr-16	11	11	99	8.4	-	205	119	11	0.012	< 0.0010	< 0.0000050	0.13	0.080	28
	26-Apr-16	8.2	11	90	8.2	-	165	102	68	0.034	< 0.0010	< 0.0000050	0.21	0.092	16
	3-May-16	10	10	93	8.2	-	190	114	14	0.011	0.0014	< 0.0000050	0.17	0.093	22
	10-May-16	8.2	9.9	84	7.5	-	148	88	0.80	0.048	< 0.0010	< 0.0000050	0.14	0.071	14
	17-May-16	11	9.3	85	8.2	-	181	100	4.5	0.011	< 0.0010	< 0.0000050	0.13	0.076	22
	24-May-16	8.4	11	92	8.2	-	152	84	16	0.011	< 0.0010	< 0.0000050	0.11	0.064	17
	31-May-16	11	11	97	8.1	-	174	99	11	0.012	< 0.0010	< 0.0000050	0.095	0.10	19
	7-Jun-16	13	9.7	93	8.2	-	141	81	46	0.033	< 0.0010	< 0.0000050	0.076	0.061	13
	14-Jun-16	10	9.9	89	8.0	-	146	97	19	0.019	0.0014	< 0.0000050	0.085	0.082	19
	21-Jun-16	12	9.8	91	8.3	-	192	111	5.6	0.0095	< 0.0010	< 0.0000050	0.084	0.094	21
	28-Jun-16	14	9.9	97	8.3	-	175	98	6.8	0.0090	< 0.0010	< 0.0000050	0.068	0.070	19
	5-Jul-16	14	9.8	94	8.4	-	173	96	6.4	0.012	< 0.0010	< 0.0000050	0.068	0.11	20
	12-Jul-16	16	9.6	97	8.4	-	198	114	2.1	0.0068	0.0014	< 0.0000050	0.058	0.085	23
	19-Jul-16	-	-	-	-	-	-	111	14	0.012	0.0010	< 0.0000050	0.068	0.070	24
	26-Jul-16	14	10	100	8.1	-	231	122	6.5	0.0091	< 0.0010	< 0.0000050	0.063	0.092	26
	26-Jul-16	17	8.5	86	8.2	-	244	-	-	-	-	-	-	-	-
	2-Aug-16	17	8.8	91	8.4	-	212	112	37	0.023	< 0.0010	< 0.0000050	0.071	0.11	26
	6-Sep-16	13	9.9	95	8.5	-	233	145	2.5	0.0070	< 0.0010	< 0.0000050	0.052	0.092	34
	11-Oct-16	7.6	11	93	6.3	-	164	94	7.0	0.0093	< 0.0010	< 0.0000050	0.099	0.094	29
	1-Nov-16	6.5	11	90	8.2	238	-	107	2.5	0.0079	< 0.0010	< 0.0000050	0.11	0.066	25
	6-Dec-16	0.90	13	90	-	-	-	140	1.2	0.021	0.0013	< 0.0000050	0.12	0.13	34
n		**10**	**12**	**12**	**11**	**1.0**	**10**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
minimum		**0.90**	**8.8**	**85**	**6.3**	**238**	**163**	**94**	**1.2**	**0.0070**	**0.0010**	**0.0000050**	**0.052**	**0.066**	**18**
median		**9.3**	**11**	**92**	**8.3**	**238**	**212**	**115**	**5.5**	**0.017**	**0.0011**	**0.0000050**	**0.10**	**0.093**	**28**
maximum		**17**	**15**	**106**	**8.5**	**238**	**369**	**182**	**37**	**0.023**	**0.0071**	**0.0000064**	**0.16**	**0.16**	**50**
mean		**9.7**	**11**	**92**	**8.1**	**238**	**241**	**128**	**10**	**0.015**	**0.0022**	**0.0000052**	**0.11**	**0.10**	**31**
standard deviation		**4.9**	**1.8**	**5.0**	**0.62**	**-**	**80**	**31**	**12**	**0.0056**	**0.0020**	**0.00000045**	**0.036**	**0.027**	**11**

Note: Annual summary statistics based on monthly means.

Table B.12: Average Flow of the Elk River (Fernie) and the Kootenay River (Fort Steele), 2014 to 2016

Year	Elk River (Station No. 08NK002)	Kootenay River (Station No. 08NG065)
	m^3/s	m^3/s
2014	55	188
2015	41	144
2016	42	170

APPENDIX C
SEDIMENT QUALITY DATA

Table C.1: Sediment, Benthic, and Plankton Sampling Locations in Koocanusa Reservoir, August 2014

Station		UTM (NAD 83, Zone 11U)		Station Depth	Average Ponar Fullness	Sample Texture	Macrophytes in Sample	Algae in Sample	Comments
		Easting	Northing		% Fullness				
Upstream of Elk River	T2-2	629650	5450400	30.1	25%	100% sand and finer	sparse organic matter	No	mostly clay, hard packed on bottom
	T2-3	629417	5450394	19.2	33%	100% sand and finer	minimal organic matter	No	hard packed clay with minimal material on top
	T2-4	629235	5450445	19.5	33%	100% sand and finer	minimal organic matter	No	-
	T2-5	629059	5450389	20.0	75%	100% sand and finer, more organics than T2-2-4	some dead organic matter	No	-
	T2-6	628883	5450370	18.3	100%	100% sand and finer	dead organic matter common	No	-
Downstream of Elk River	T4-2	630076	5441806	27.8	100%	100% sand and finer	No	No	-
	T4-3	629798	5441984	27.4	100%	100% sand and finer	No	No	-
	T4-4	629703	5441675	26.4	100%	100% sand and finer	No	No	-
	T4-5	629487	5441751	25.8	100%	100% sand and finer	No	No	-
	T4-6	629403	5441477	30.5	100%	100% sand and finer	No	No	-

Table C.2: Sediment Sampling Locations in Koocanusa Reservoir, August 2015

Station		UTM (NAD 83, Zone 11U)		Station Depth (m)	Average Ponar Fullness (%)	Sample Texture	Macrophytes in Sample	Algae in Sample
		Easting	Northing					
Upstream of Elk River	TN-1	627377	5453471	13.5	75%	90% sand and finer, 10% organics	No	No
	TN-2	627270	5453644	12.4	75%	90% sand and finer, 10% organics	No	No
	TN-3	627341	5453711	13.2	100%	90% sand and finer, 10% organics	No	No
	TN-4	627329	5453862	12.9	75%	90% sand and finer, 10% organics	No	No
	TN-5	627211	5453978	13.4	100%	90% sand and finer, 10% organics	No	No
Downstream of Elk River	T4-2	630082	5441810	24.2	100%	90% sand and finer, 10% organics	No	No
	T4-3	629825	5442010	22.8	100%	90% sand and finer, 10% organics	No	No
	T4-4	629715	5441648	22.7	100%	90% sand and finer, 10% organics	No	No
	T4-5	629500	5441738	22.2	100%	90% sand and finer, 10% organics	No	No
	T4-6	629511	5441551	23.2	100%	90% sand and finer, 10% organics	No	No

Table C.3: Benthic Sampling Locations in Koocanusa Reservoir, August 2016

Station		UTM (NAD 83, Zone 11U)		Station Depth (m)	Average Ponar Fullness (%)	Sample Texture	Macrophytes in Sample	Algae in Sample
		Easting	Northing					
Upstream of Elk River	TN-1	627369	5453492	15	50%	100% sand and finer, minimal organics	No	Sparse
	TN-2	627256	5453672	14	75% - 100%	100% sand and finer, minimal organics	No	Sparse
	TN-3	627367	5453710	15	75% - 100%	100% sand and finer, 10% organics	No	Sparse
	TN-4	627333	5453882	15	75% - 100%	100% sand and finer, minimal organics	No	Sparse
	TN-5	627200	5454005	15	75% - 100%	100% sand and finer, minimal organics	No	Sparse
Downstream of Elk River	T4-2	630115	5441812	24	100%	100% sand and finer	No	No
	T4-3	629831	5442006	25	100%	100% sand and finer	No	No
	T4-4	629695	5441699	25	100%	100% sand and finer	No	No
	T4-5	629494	5441783	24	100%	100% sand and finer, minimal organics	No	Sparse
	T4-6	629430	5441547	25	100%	100% sand and finer	No	No

Table C.4: Sediment Quality in Koocanusa Reservoir, August 2014

Analytes	Units	BC Sediment Quality Guidelines [a]	Upstream of Elk River					Downstream of Elk River				
			T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Non-metals												
Moisture	%	-	34.2	40.0	36.2	36.2	43.2	38.4	40.1	44.1	43.3	43.8
pH (1:2 soil:water)	pH	-	8.04	8.13	8.08	8.02	7.89	8.17	8.08	8.04	8.03	8.06
Particle size												
% Gravel	%	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand	%	-	14.2	4.9	9.6	15.9	4.0	<0.10	<0.10	<0.10	<0.10	<0.10
% Silt	%	-	67.5	69.1	72.3	72.2	81.3	70.0	68.3	72.7	77.4	75.9
% Clay	%	-	18.1	26.0	18.0	11.9	14.6	30.0	31.7	27.3	22.6	24.1
Carbon												
TOC	%	-	0.97	0.87	1.74	1.69	1.47	1.26	1.45	1.51	1.22	1.22
Metals (< 1mm fraction)												
Aluminum (Al)	mg/kg dw	-	11,800	13,600	11,900	10,500	12,100	13,600	13,000	12,600	12,600	12,600
Antimony (Sb)	mg/kg dw	-	0.34	0.32	0.31	0.31	0.30	0.44	0.46	0.44	0.39	0.36
Arsenic (As)	mg/kg dw	5.9/17 [b]	5.50	6.02	5.27	5.64	5.76	6.08	6.07	5.94	5.79	5.61
Barium (Ba)	mg/kg dw	-	91.9	99.8	80.7	70.5	81.2	155	152	156	140	121
Beryllium (Be)	mg/kg dw	-	0.40	0.49	0.39	0.37	0.43	0.60	0.57	0.63	0.55	0.53
Bismuth (Bi)	mg/kg dw	-	<0.20	0.23	0.22	0.23	0.23	0.21	0.21	0.21	0.22	0.21
Cadmium (Cd)	mg/kg dw	0.6/3.5 [b]	0.259	0.240	0.178	0.209	0.193	0.576	0.567	0.624	0.502	0.392
Calcium (Ca)	mg/kg dw	-	117,000	110,000	113,000	99,900	106,000	100,000	98,500	102,000	104,000	110,000
Chromium (Cr)	mg/kg dw	37.3/90 [b]	17.2	18.7	17.0	15.5	17.7	20.1	19.5	19.3	18.6	18.7
Cobalt (Co)	mg/kg dw	-	8.14	9.02	8.24	8.27	8.90	8.20	8.15	7.89	8.09	8.33
Copper (Cu)	mg/kg dw	35.7/197 [b]	13.3	15.5	14.6	15.9	16.2	15.1	15.3	15.1	15.4	15.2
Iron (Fe)	mg/kg dw	21,200/43,766 [c]	20,200	21,600	20,500	19,900	21,600	20,400	20,200	19,600	20,100	20,700
Lead (Pb)	mg/kg dw	35/91 [b]	14.4	14.8	15.0	17.2	16.9	14.7	13.5	13.0	14.1	14.1
Lithium (Li)	mg/kg dw	-	21.9	25.3	23.7	21.9	25.4	23.6	23.8	22.9	23.3	24.0
Magnesium (Mg)	mg/kg dw	-	21,500	21,200	22,000	21,100	21,700	19,100	18,800	19,400	20,400	20,700
Manganese (Mn)	mg/kg dw	460/1,100 [c]	435	471	417	391	429	552	536	529	502	488
Mercury (Hg)	mg/kg dw	0.170/0.486 [b]	0.0224	0.0239	0.0205	0.0217	0.0232	0.0334	0.0328	0.0333	0.0315	0.0270
Molybdenum (Mo)	mg/kg dw	-	0.69	0.75	0.61	0.57	0.66	1.03	1.06	1.08	0.93	0.87
Nickel (Ni)	mg/kg dw	16/75 [c]	19.2	21.4	19.5	18.5	20.3	22.2	21.8	21.6	21.6	21.1
Phosphorus (P)	mg/kg dw	-	461	513	493	509	495	615	630	671	681	535
Potassium (K)	mg/kg dw	-	1,350	1,600	1,160	780	1,080	2,220	2,080	2,070	1,780	1,540
Selenium (Se)	mg/kg dw	2	0.26	0.23	0.20	0.23	0.23	0.59	0.58	0.56	0.51	0.40
Silver (Ag)	mg/kg dw	0.5	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	0.11	0.12	0.11	<0.10
Sodium (Na)	mg/kg dw	-	120	250	130	110	140	190	130	130	130	130
Strontium (Sr)	mg/kg dw	-	246	231	239	210	230	183	181	184	199	219
Thallium (Tl)	mg/kg dw	-	0.129	0.141	0.106	0.092	0.117	0.203	0.210	0.210	0.179	0.157
Tin (Sn)	mg/kg dw	-	<2.0	<2.0	<2.0	<2.0	<2.0	2.2	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg dw	-	134	173	137	115	147	97.0	98.2	105	98.2	95.5
Uranium (U)	mg/kg dw	-	0.802	0.836	0.832	1.00	0.981	0.926	0.935	0.958	0.959	0.887
Vanadium (V)	mg/kg dw	-	16.9	16.6	14.4	12.8	14.7	24.5	24.1	24.4	21.6	19.0
Zinc (Zn)	mg/kg dw	123/315 [b]	70.9	70.4	67.8	69.9	72.7	80.9	81.3	80.3	78.6	74.5

Note: Shaded values were above the lower guidelines (ISQG [b] or LEL[c]). No values exceeded the upper (PEL [b] or SEL[c]) guidelines.

[a] Working sediment quality guidelines (BC MOE 2015).

[b] Interim Sediment Quality Guideline (ISQG; or Threshold Effect Level [LEL])/ Probable Effect Level (PEL)

[c] Lowest Effect Level (LEL)/ Severe Effect Level (SEL).

[d] Gravel = >2.0mm; Sand = 0.063-2.0 mm; Silt = 0.004-0.063 mm; Clay = <0.004mm

[e] TOC = Total Organic Carbon

Table C.5: Sediment Quality in Koocanusa Reservoir, August 2015

Analytes	Units	BC Sediment Quality Guidelines [a]	Upstream of Elk River					Downstream of Elk River				
			TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Non-metals												
Moisture	%	-	45.7	47.4	40.2	42.6	36.6	44.0	44.6	44.4	42.7	43.2
pH (1:2 soil:water)	pH	-	8.03	8.09	8.12	8.14	8.12	8.07	8.10	8.13	8.16	8.07
Particle size[d]												
% Gravel	%	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand	%	-	1.7	1.5	1.9	12.1	28.4	<0.10	<0.10	<0.10	<0.10	<0.10
% Silt	%	-	78.2	74.9	79.0	66.6	59.6	63.4	64.8	71.8	74.3	73.4
% Clay	%	-	20.2	23.6	19.2	21.3	12.0	36.5	35.2	28.1	25.7	26.6
Carbon												
TOC[e]	%	-	1.23	1.01	1.28	1.04	1.33	1.43	1.57	1.64	1.70	1.52
Metals (< 1mm fraction)												
Aluminum (Al)	mg/kg dw	-	13,400	12,100	12,100	12,100	10,600	13,400	13,200	13,000	13,300	12,950
Antimony (Sb)	mg/kg dw	-	0.35	0.32	0.31	0.33	0.32	0.53	0.52	0.47	0.51	0.45
Arsenic (As)	mg/kg dw	5.9/17 [b]	7.06	6.03	6.59	6.77	5.88	7.46	7.39	7.12	7.36	6.94
Barium (Ba)	mg/kg dw	-	88.9	84.6	81.0	82.5	66.1	175	178	166	163	144
Beryllium (Be)	mg/kg dw	-	0.46	0.43	0.41	0.42	0.37	0.63	0.66	0.58	0.60	0.54
Bismuth (Bi)	mg/kg dw	-	0.21	<0.20	<0.20	<0.20	<0.20	0.21	<0.20	<0.20	0.21	0.21
Boron (B)	mg/kg dw	-	<5.0	<5.0	<5.0	<5.0	<5.0	6.8	7.1	6.2	5.8	5.2
Cadmium (Cd)	mg/kg dw	0.6/3.5 [b]	0.212	0.176	0.187	0.197	0.156	0.625	0.642	0.584	0.567	0.471
Calcium (Ca)	mg/kg dw	-	117,000	118,000	110,000	113,000	102,000	103,000	101,000	106,000	112,000	115,000
Chromium (Cr)	mg/kg dw	37.3/90 [b]	20.1	18.3	18.8	17.9	16.0	21.2	21.3	20.8	21.4	20.9
Cobalt (Co)	mg/kg dw	-	10.2	9.11	9.27	9.25	8.27	9.34	8.85	9.11	9.64	9.47
Copper (Cu)	mg/kg dw	35.7/197 [b]	17.4	14.7	15.7	15.1	13.2	17.4	17.1	17.4	18.2	17.6
Iron (Fe)	mg/kg dw	21,200/43,766 [c]	24,400	22,300	22,800	22,700	20,800	22,800	22,300	22,500	23,700	23,550
Lead (Pb)	mg/kg dw	35/91 [b]	15.9	14.5	14.9	15.6	14.4	13.8	13.3	14.0	14.6	14.2
Lithium (Li)	mg/kg dw	-	27.1	25.6	25.4	24.9	23.1	25.1	24.3	23.9	25.2	25.1
Magnesium (Mg)	mg/kg dw	-	25,500	23,100	23,900	24,300	22,800	20,500	20,100	22,700	23,600	23,300
Manganese (Mn)	mg/kg dw	460/1,100 [c]	500	485	458	485	392	646	624	592	602	562
Mercury (Hg)	mg/kg dw	0.170/0.486 [b]	0.0376	0.0249	0.0237	0.0305	0.0186	0.0487	0.0524	0.0425	0.0446	0.03985
Molybdenum (Mo)	mg/kg dw	-	0.66	0.65	0.61	0.66	0.54	1.15	1.10	0.97	1.04	0.94
Nickel (Ni)	mg/kg dw	16/75 [c]	23.4	20.9	21.7	21.0	19.4	25.3	24.2	24.3	25.4	24.3
Phosphorus (P)	mg/kg dw	-	615	566	576	587	570	747	790	817	810	763
Potassium (K)	mg/kg dw	-	1,260	1,160	1,080	1,090	870	2,160	2,250	2,010	1,880	1,660
Selenium (Se)	mg/kg dw	2	0.26	0.22	<0.20	0.21	<0.20	0.69	0.73	0.70	0.64	0.54
Silver (Ag)	mg/kg dw	0.5	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	0.12	0.12	0.12	0.10
Sodium (Na)	mg/kg dw	-	116	108	103	110	96	125	127	122	123	117
Strontium (Sr)	mg/kg dw	-	260	262	238	247	218	188	184	203	218	232
Thallium (Tl)	mg/kg dw	-	0.102	0.087	0.092	0.089	0.077	0.190	0.187	0.169	0.170	0.148
Tin (Sn)	mg/kg dw	-	<2.0	2.1	<2.0	3.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg dw	-	149	116	128	122	127	82.2	79.8	91.5	94.6	98.5
Uranium (U)	mg/kg dw	-	0.737	0.645	0.673	0.623	0.576	0.814	0.814	0.809	0.854	0.802
Vanadium (V)	mg/kg dw	-	16.8	14.8	15.1	15.1	13.5	26.2	26.6	25.1	24.5	21.8
Zinc (Zn)	mg/kg dw	123/315 [b]	77.7	66.9	70.8	69.5	65.6	86.3	84.7	83.2	85.4	80.0
Zirconium (Zr)	mg/kg dw	-	1.7	1.3	1.3	1.3	1.4	1.1	1.0	1.1	1.2	1.3
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	mg/kg dw	0.00671/0.0889 [b]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	<0.0050	<0.0050	<0.0050	<0.0050
Acenaphthylene	mg/kg dw	0.00587/0.128 [b]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Anthracene	mg/kg dw	0.0469/0.245 [b]	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0044	0.0040	<0.0040	<0.0040
Benz(a)anthracene	mg/kg dw	0.0317/0.385 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.017	0.016	<0.010	0.011
Benzo(a)pyrene	mg/kg dw	0.0319/0.782 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	0.011	<0.010	<0.010
Benzo(b&j)fluoranthene	mg/kg dw	-	<0.010	<0.010	<0.010	<0.010	<0.010	0.027	0.031	0.025	0.014	0.017
Benzo(b+j+k)fluoranthene	mg/kg dw	-	<0.015	<0.015	<0.015	<0.015	<0.015	0.027	0.031	0.025	<0.015	0.017
Benzo(g,h,i)perylene	mg/kg dw	0.17/3.2 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	0.014	<0.010	<0.010	<0.010
Benzo(k)fluoranthene	mg/kg dw	0.24/13.4 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg dw	0.0571/0.862 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.027	0.034	0.026	0.011	0.018
Dibenz(a,h)anthracene	mg/kg dw	0.00622/0.135 [b]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.01	<0.0050	<0.0050	<0.0050
Fluoranthene	mg/kg dw	0.111/2.355 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.021	0.024	0.021	0.013	0.014
Fluorene	mg/kg dw	0.021/0.144 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene	mg/kg dw	0.2/3.2 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Methylnaphthalene	mg/kg dw	0.0202/0.201 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.081	0.072	0.059	0.025	0.045
Naphthalene	mg/kg dw	0.0346/0.391 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.033	0.030	0.029	0.013	0.022
Phenanthrene	mg/kg dw	0.0419/0.515 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.078	0.076	0.060	0.026	0.045
Pyrene	mg/kg dw	0.053/0.875 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.020	0.022	0.018	0.010	0.013

Note: Shaded values were above the lower guidelines (ISQG[b] or LEL[c]). No values exceeded the upper (PEL[b] or SEL[c]) guidelines.

[a] Working sediment quality guidelines (BC MOE 2015).
[b] Interim Sediment Quality Guideline (ISQG; or Threshold Effect Level [LEL])/ Probable Effect Level (PEL)
[c] Lowest Effect Level (LEL)/ Severe Effect Level (SEL).
[d] Gravel = >2.0 mm; Sand = 0.063-2.0 mm; Silt = 0.004-0.063 mm; Clay = <0.004 mm
[e] TOC = Total Organic Carbon

Table C.6: Sediment quality in Koocanusa Reservoir, August 2016

Analytes	Units	BC Sediment Quality Guidelines [a]	Upstream of Elk River					Downstream of Elk River				
			TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Non-metals												
Moisture	%	-	33.9	35.6	39.2	38.2	37.5	42.5	45.9	42.5	41.9	44.8
pH (1:2 soil:water)	pH	-	8.28	8.25	8.09	8.03	8.02	8.18	8.01	7.99	8.17	8.11
Particle size[d]												
% Gravel	%	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand	%	-	13.8	2.1	1.8	7.3	14.9	<0.10	<0.10	<0.10	<0.10	<0.10
% Silt	%	-	68.6	73.1	82.1	76.5	74.1	68.7	70.6	77.0	77.1	75.6
% Clay	%	-	17.5	24.8	16.1	16.2	10.9	31.3	29.4	22.9	22.9	24.3
Carbon												
TOC[e]	%	-	1.19	<0.96	1.4	1.2	1.23	1.11	1.21	1.2	1.2	1.3
Metals (< 1mm fraction)												
Aluminum (Al)	mg/kg dw	-	11,200	12,300	11,200	10,900	10,800	12,700	12,600	11,600	11,900	12,500
Antimony (Sb)	mg/kg dw	-	0.25	0.27	0.27	0.25	0.26	0.42	0.41	0.38	0.39	0.37
Arsenic (As)	mg/kg dw	5.9/17 [b]	5.14	5.64	5.64	5.52	5.28	6.71	6.68	5.86	6.03	6.27
Barium (Ba)	mg/kg dw	-	67.4	80.4	71.3	67.5	61.2	144	157	133	129	121
Beryllium (Be)	mg/kg dw	-	0.40	0.47	0.42	0.39	0.38	0.62	0.61	0.55	0.60	0.57
Bismuth (Bi)	mg/kg dw	-	<0.20	0.20	<0.20	<0.20	<0.20	0.21	<0.20	<0.20	<0.20	0.21
Boron (B)	mg/kg dw	-	<5.0	<5.0	<5.0	<5.0	<5.0	6.1	6.1	5.7	5.1	<5.0
Cadmium (Cd)	mg/kg dw	0.6/3.5 [b]	0.179	0.190	0.189	0.187	0.184	0.604	0.611	0.528	0.515	0.481
Calcium (Ca)	mg/kg dw	-	102,000	102,000	105,000	99,900	102,000	91,600	94,000	95,200	99,700	100,000
Chromium (Cr)	mg/kg dw	37.3/90 [b]	15.8	17.0	15.7	15.3	15.2	18.2	17.8	16.6	17.0	17.5
Cobalt (Co)	mg/kg dw	-	7.82	8.61	8.02	7.85	7.67	8.18	8.02	7.57	7.96	8.36
Copper (Cu)	mg/kg dw	35.7/197 [b]	19.1	19.2	32.7	27.9	17.9	21.9	29.7	21.3	17.5	21.5
Iron (Fe)	mg/kg dw	21,200/43,766 [c]	19,300	21,000	20,400	20,000	19,200	20,300	20,100	19,300	20,100	21,400
Lead (Pb)	mg/kg dw	35/91 [b]	13.6	14.4	14.8	13.6	13.7	13.5	13.1	12.7	13.2	14.3
Lithium (Li)	mg/kg dw	-	24.9	26.8	24.9	24.1	23.9	24.7	23.5	22.7	24.9	26.0
Magnesium (Mg)	mg/kg dw	-	19,700	19,600	19,500	19,800	20,500	16,600	18,300	17,700	18,300	19,200
Manganese (Mn)	mg/kg dw	460/1,100 [c]	383	425	410	398	378	572	612	502	518	518
Mercury (Hg)	mg/kg dw	0.170/0.486 [b]	0.0172	0.0143	0.0167	0.0191	0.0163	0.0303	0.0339	0.0290	0.0284	0.0289
Molybdenum (Mo)	mg/kg dw	-	0.59	0.67	0.65	0.64	0.60	1.06	0.97	0.90	0.92	0.86
Nickel (Ni)	mg/kg dw	16/75 [c]	18.5	20.6	19.8	18.9	18.7	22.7	21.9	20.5	21.3	21.5
Phosphorus (P)	mg/kg dw	-	465	474	491	527	506	739	708	676	606	621
Potassium (K)	mg/kg dw	-	850	1,050	790	740	740	1,760	1,680	1,370	1,380	1,330
Selenium (Se)	mg/kg dw	2	<0.20	<0.20	<0.20	<0.20	<0.20	0.67	0.78	0.66	0.67	0.64
Silver (Ag)	mg/kg dw	0.5	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	0.12	0.11	0.12	0.10
Sodium (Na)	mg/kg dw	-	109	102	91	84	83	106	121	126	111	107
Strontium (Sr)	mg/kg dw	-	221	230	242	228	226	179	179	193	211	215
Thallium (Tl)	mg/kg dw	-	0.087	0.099	0.084	0.076	0.077	0.181	0.162	0.149	0.145	0.137
Tin (Sn)	mg/kg dw	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg dw	-	93.8	91.9	81.1	77.8	91.9	57.0	55.2	60.1	63.6	70.8
Uranium (U)	mg/kg dw	-	0.701	0.724	0.722	0.644	0.633	0.856	0.799	0.783	0.825	0.789
Vanadium (V)	mg/kg dw	-	13.1	13.7	12.3	12.1	12.3	22.8	22.0	19.0	19.4	18.1
Zinc (Zn)	mg/kg dw	123/315 [b]	65.4	65.7	67.8	66.5	64.7	82.2	83.1	74.9	76.0	78.1
Zirconium (Zr)	mg/kg dw	-	1.5	1.3	1.2	1.2	1.1	<1.0	<1.0	<1.0	<1.0	1.1
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	mg/kg dw	0.00671/0.0889 [b]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acenaphthylene	mg/kg dw	0.00587/0.128 [b]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Anthracene	mg/kg dw	0.0469/0.245 [b]	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Benz(a)anthracene	mg/kg dw	0.0317/0.385 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	0.014	0.012	0.010	<0.010
Benzo(a)pyrene	mg/kg dw	0.0319/0.782 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	<0.010	<0.010
Benzo(b&j)fluoranthene	mg/kg dw	-	<0.010	<0.010	<0.010	<0.010	<0.010	0.018	0.023	0.019	0.016	0.013
Benzo(b+j+k)fluoranthene	mg/kg dw	-	<0.015	<0.015	<0.015	<0.015	<0.015	0.018	0.023	0.019	0.016	<0.015
Benzo(g,h,i)perylene	mg/kg dw	0.17/3.2 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(k)fluoranthene	mg/kg dw	0.24/13.4 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg dw	0.0571/0.862 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.027	0.032	0.025	0.018	0.018
Dibenz(a,h)anthracene	mg/kg dw	0.00622/0.135 [b]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene	mg/kg dw	0.111/2.355 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	0.021	0.017	0.014	0.011
Fluorene	mg/kg dw	0.021/0.144 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene	mg/kg dw	0.2/3.2 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Methylnaphthalene	mg/kg dw	0.0202/0.201 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.065	0.080	0.054	0.029	0.032
Naphthalene	mg/kg dw	0.0346/0.391 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.023	0.029	0.021	0.013	0.012
Phenanthrene	mg/kg dw	0.0419/0.515 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.055	0.070	0.046	0.028	0.030
Pyrene	mg/kg dw	0.053/0.875 [b]	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.019	0.014	0.012	<0.010

Note: Shaded values were above the lower guidelines (ISQG[b] or LEL[c]). No values exceeded the upper (PEL[b] or SEL[c]) guidelines.

[a] Working sediment quality guidelines (BC MOE 2015).
[b] Interim Sediment Quality Guideline (ISQG; or Threshold Effect Level [LEL])/ Probable Effect Level (PEL)
[c] Lowest Effect Level (LEL)/ Severe Effect Level (SEL).
[d] Gravel = >2.0 mm; Sand = 0.063-2.0 mm; Silt = 0.004-0.063 mm; Clay = <0.004 mm
[e] TOC = Total Organic Carbon

Table C.7: Statistical Summary of Spatial and Temporal Differences in Sediment Quality in Koocanusa Reservoir in the Area Downstream from the Elk River (T4) Compared to the Upstream Area (T2/TN) in 2014, 2015, and 2016

Analytes	Units	Transformation	Measure of Central Tendency (Mean, Geometric Mean, or Median)[a,b]						Model P-values			Downstream of Elk River (T4) vs Upstream of Elk River (T2/TN)					
												Contrasts			Magnitudes of Significant Differences		
			2014		2015		2016		Area x Year	Area	Year	Area × Year			%		
			T4	T2	T4	TN	T4	TN				2014	2015	2016	2014	2015	2016
Non-metals																	
Moisture	%	none	42	38	44	43	44	37	0.119	<0.001	0.030	-	-	-	* (10)		
pH (1:2 soil:water)	pH	none	8.1	8.0	8.1	8.1	8.1	8.1	0.487	0.927	0.224	-	-	-	-		
Particle size[c]																	
% Gravel	%	rank	0.10	0.10	0.10	0.10	0.10	0.10	0.383	0.327	0.383	-	-	-	-		
% Sand	%	rank	0.10	9.6	0.10	1.9	0.10	7.3	0.555	<0.001	0.555	-	-	-	* (-99)		
% Silt	%	none	73	72	70	72	74	75	0.876	0.641	0.324	-	-	-	-		
% Clay	%	none	27	18	30	19	26	17	0.863	<0.001	0.288	-	-	-	* (55)		
Carbon																	
Total Organic Carbon	%	none	1.3	1.3	1.6	1.2	1.2	1.2	0.056	-	-	0.901	0.005	0.951	-	* (33)	-
Metals (< 1mm fraction)																	
Aluminum (Al)	mg/kg dw	none	12,880	11,980	13,170	12,060	12,260	11,280	0.946	<0.001	0.034	-	-	-	* (8.5)		
Antimony (Sb)	mg/kg dw	none	0.42	0.32	0.50	0.33	0.39	0.26	0.022	-	-	<0.001	<0.001	<0.001	* (32)	* (52)	* (52)
Arsenic (As)	mg/kg dw	none	5.9	5.6	**7.3**	**6.5**	**6.3**	5.4	0.089	-	-	0.209	<0.001	<0.001	-	* (12)	* (16)
Barium (Ba)	mg/kg dw	none	145	85	165	81	137	70	0.078	-	-	<0.001	<0.001	<0.001	* (71)	* (105)	* (97)
Beryllium (Be)	mg/kg dw	none	0.58	0.42	0.60	0.42	0.59	0.41	0.775	<0.001	0.720	-	-	-	* (42)		
Bismuth (Bi)	mg/kg dw	rank	0.21	0.23	0.21	0.20	0.20	0.20	0.282	0.272	<0.001	-	-	-	-		
Boron (B)	mg/kg dw	rank	-	-	6.2	5.0	5.7	5.0	0.107	<0.001	0.107	-	-	-	NA	* (19)	
Cadmium (Cd)	mg/kg dw	none	0.53	0.22	0.58	0.19	0.55	0.19	0.302	<0.001	0.827	-	-	-	* (182)		
Calcium (Ca)	mg/kg dw	none	102,900	109,180	107,400	112,000	96,100	102,180	0.923	0.006	<0.001	-	-	-	* (-5.2)		
Chromium (Cr)	mg/kg dw	none	19	17	21	18	17	16	0.291	<0.001	<0.001	-	-	-	* (13)		
Cobalt (Co)	mg/kg dw	none	8.1	8.5	9.3	9.2	8.0	8.0	0.410	0.511	<0.001	-	-	-	-		
Copper (Cu)	mg/kg dw	rank	15	16	17	15	22	19	0.015	-	-	0.773	0.001	1.000	-	* (15)	-
Iron (Fe)	mg/kg dw	none	20,200	20,760	**22,970**	**22,600**	20,240	19,980	0.393	0.938	<0.001	-	-	-	-		
Lead (Pb)	mg/kg dw	none	14	16	14	15	13	14	0.266	<0.001	0.010	-	-	-	* (-7.9)		
Lithium (Li)	mg/kg dw	none	24	24	25	25	24	25	0.905	0.376	0.040	-	-	-	-		
Magnesium (Mg)	mg/kg dw	none	19,680	21,500	22,040	23,920	18,020	19,820	0.995	<0.001	<0.001	-	-	-	* (-8.4)		
Manganese (Mn)	mg/kg dw	none	**521**	429	**605**	**464**	**544**	399	0.177	<0.001	<0.001	-	-	-	* (29)		
Mercury (Hg)	mg/kg dw	none	0.032	0.022	0.046	0.027	0.030	0.017	0.048	-	-	0.001	<0.001	<0.001	* (41)	* (69)	* (80)
Molybdenum (Mo)	mg/kg dw	none	0.99	0.66	1.0	0.62	0.94	0.63	0.255	<0.001	0.315	-	-	-	* (56)		
Nickel (Ni)	mg/kg dw	none	**22**	**20**	**25**	**21**	**22**	**19**	0.185	<0.001	<0.001	-	-	-	* (13)		
Phosphorus (P)	mg/kg dw	none	626	494	785	583	670	493	0.138	<0.001	<0.001	-	-	-	* (33)		
Potassium (K)	mg/kg dw	none	1,938	1,194	1,992	1,092	1,504	834	0.512	<0.001	<0.001	-	-	-	* (74)		
Selenium (Se)	mg/kg dw	log	0.52	0.23	0.66	0.22	0.68	0.20	<0.001	-	-	<0.001	<0.001	<0.001	* (128)	* (203)	* (241)
Silver (Ag)	mg/kg dw	rank	0.11	0.10	0.12	0.10	0.12	0.10	0.868	<0.001	0.868	-	-	-	* (20)		
Sodium (Na)	mg/kg dw	rank	130	130	123	108	111	91	0.313	<0.001	<0.001	-	-	-	* (15)		
Strontium (Sr)	mg/kg dw	none	193	231	205	245	195	229	0.913	<0.001	0.143	-	-	-	* (-16)		
Thallium (Tl)	mg/kg dw	none	0.19	0.12	0.17	0.089	0.15	0.085	0.670	<0.001	<0.001	-	-	-	* (78)		
Tin (Sn)	mg/kg dw	rank	2.0	2.0	2.0	2.0	2.0	2.0	0.082	-	-	0.285	0.039	1.00	-	* (0)	-
Titanium (Ti)	mg/kg dw	none	99	141	89	128	61	87	0.251	<0.001	<0.001	-	-	-	* (-30)		
Uranium (U)	mg/kg dw	none	0.93	0.89	0.82	0.65	0.81	0.68	0.039	-	-	0.206	<0.001	<0.001	-	* (26)	* (18)
Vanadium (V)	mg/kg dw	none	23	15	25	15	20	13	0.288	<0.001	<0.001	-	-	-	* (58)		
Zinc (Zn)	mg/kg dw	none	79	70	84	70	79	66	0.160	<0.001	0.009	-	-	-	* (17)		
Zirconium (Zr)	mg/kg dw	none	-	-	1.1	1.4	1.0	1.3	0.866	<0.001	0.040	-	-	-	NA	* (-19)	
Polycyclic Aromatic Hydrocarbons																	
Acenaphthene	mg/kg dw	rank	-	-	0.0050	0.0050	0.0050	0.0050	0.332	0.332	0.332	-	-	-	NA	-	
Acenaphthylene	mg/kg dw	rank	-	-	0.0050	0.0050	0.0050	0.0050	0.332	0.332	0.332	-	-	-	NA	-	
Anthracene	mg/kg dw	rank	-	-	0.0040	0.0040	0.0040	0.0040	0.332	0.332	0.332	-	-	-	NA	-	
Benz(a)anthracene	mg/kg dw	none	-	-	0.014	0.010	0.011	0.010	0.177	0.006	0.177	-	-	-	NA	* (26)	
Benzo(a)pyrene	mg/kg dw	rank	-	-	0.010	0.010	0.010	0.010	0.123	0.123	0.123	-	-	-	NA	-	
Benzo(b&j)-fluoranthene	mg/kg dw	none	-	-	0.023	0.010	0.018	0.010	0.181	<0.001	0.181	-	-	-	NA	* (103)	
Benzo(b+j+k)-fluoranthene	mg/kg dw	rank	-	-	0.025	0.015	0.018	0.015	0.528	<0.001	0.528	-	-	-	NA	* (23)	
Benzo(g,h,i)-perylene	mg/kg dw	rank	-	-	0.010	0.010	0.010	0.010	0.123	0.123	0.123	-	-	-	NA	-	
Benzo(k)fluoranthene	mg/kg dw	rank	-	-	0.010	0.010	0.010	0.010	0.332	0.332	0.332	-	-	-	NA	-	
Chrysene	mg/kg dw	none	-	-	0.023	0.010	0.024	0.010	0.870	<0.001	0.870	-	-	-	NA	* (136)	
Dibenz(a,h)-anthracene	mg/kg dw	rank	-	-	0.0050	0.0050	0.0050	0.0050	0.332	0.332	0.332	-	-	-	NA	-	
Fluoranthene	mg/kg dw	log	-	-	0.018	0.010	0.015	0.010	0.349	<0.001	0.349	-	-	-	NA	* (67)	
Fluorene	mg/kg dw	rank	-	-	0.010	0.010	0.010	0.010	0.332	0.332	0.332	-	-	-	NA	-	
Indeno(1,2,3-c,d)-pyrene	mg/kg dw	rank	-	-	0.010	0.010	0.010	0.010	0.332	0.332	0.332	-	-	-	NA	-	
2-Methylnaphthalene	mg/kg dw	rank	-	-	**0.059**	0.010	**0.054**	0.010	0.770	<0.001	0.770	-	-	-	NA	* (465)	
Naphthalene	mg/kg dw	none	-	-	0.025	0.010	0.020	0.010	0.244	<0.001	0.244	-	-	-	NA	* (125)	
Phenanthrene	mg/kg dw	rank	-	-	**0.060**	0.010	**0.046**	0.010	0.487	<0.001	0.487	-	-	-	NA	* (405)	
Pyrene	mg/kg dw	rank	-	-	0.018	0.010	0.014	0.010	0.616	<0.001	0.616	-	-	-	NA	* (45)	

* indicates a significant difference between the two areas at an α of 0.1.

[a] The measure of central tendency reported is based on the applied data-transformation, as follows: mean for no transformation; geometric mean for log_{10}-transformation; and, median for rank-transformation.

[b] The bolded values are above the BC Sediment Quality Guidelines lowest effect level.

P-value < 0.1.

APPENDIX D
PLANKTON DATA

Phytoplankton
Zooplankton

Reference List of Published Literature Values for Length-weight Regression Equations

Bottrell, H.H., A. Duncan, Z.M. Gliwicz, E. Grygierczyk, A. Herzig, A. Hillbricht-Ilkowska, H. Kurasawa, P. Larson, and T. Weglenska. 1976. A review of some problems in zooplankton production studies. Norwegian Journal of Zoology 24:419-456

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Downing, J.A., and F.A. Rigler. 1984. A manual on methods for the assessment of secondary productivity in fresh waters. 2nd edition. Blackwell Scientific Publications, Boston, Massachusetts. 495 p.

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Phytoplankton

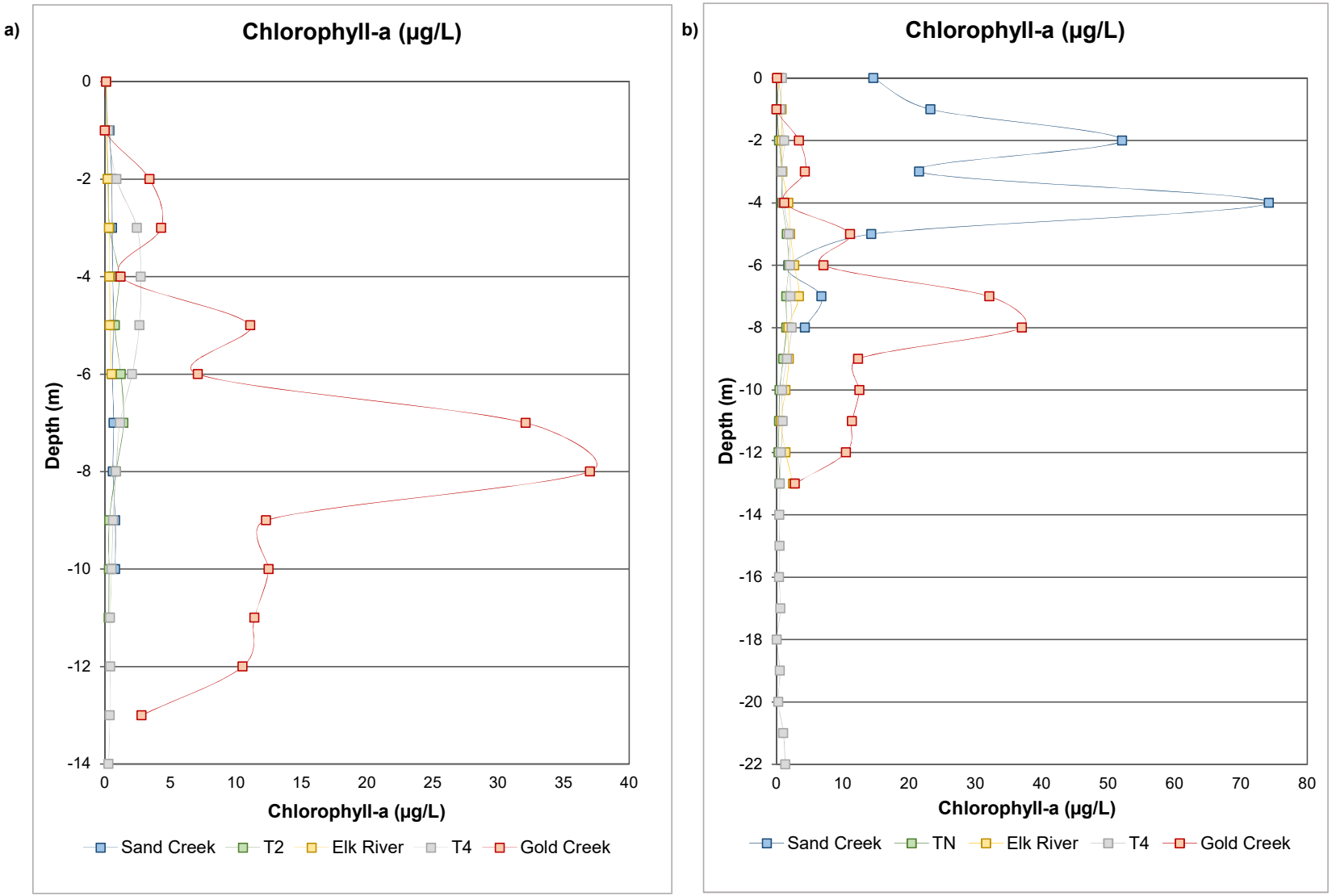

Figure D.1: Chlorophyll-a Concentration (µg/L) from *In Situ* Water Quality Profiles in Koocanusa Reservoir in a) April and b) August 2015

Notes: Sand Creek and T2/TN areas are located downstream of the Elk River confluence while Elk River, T4, and Gold Creek areas are located downstream.
The upstream location (T2) was relocated further upstream (TN) from the mouth of the Elk River after the April sampling in 2015.

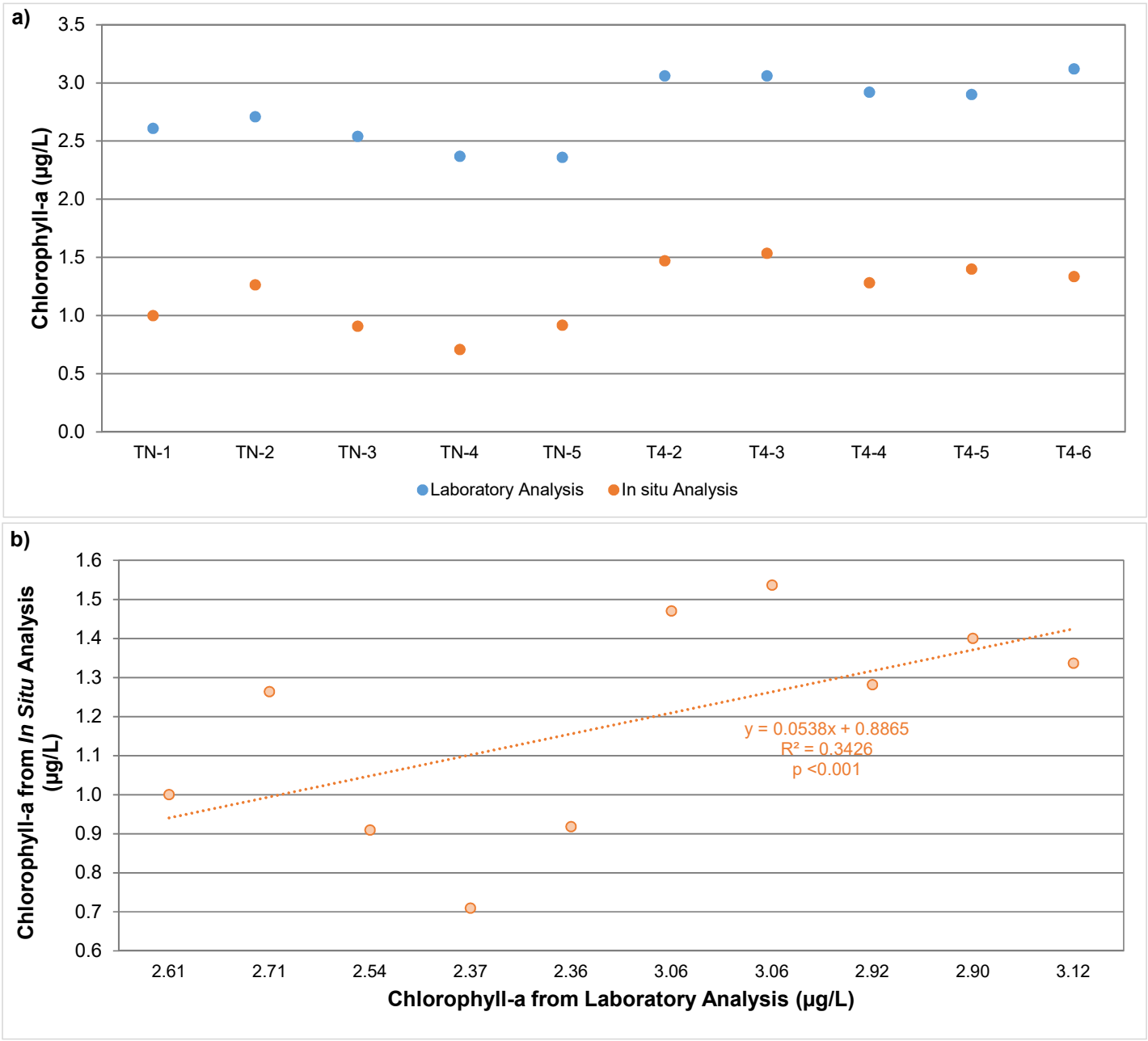

Figure D.2: a) Chlorophyll-a Concentrations in the Top 10 m of the Water Column Upstream (TN) and Downstream (T4) from the Elk River as Measured *In Situ* and in the Laboratory, August 2015
b) Regression Relationship Between the Chlorophyll-a Analyses

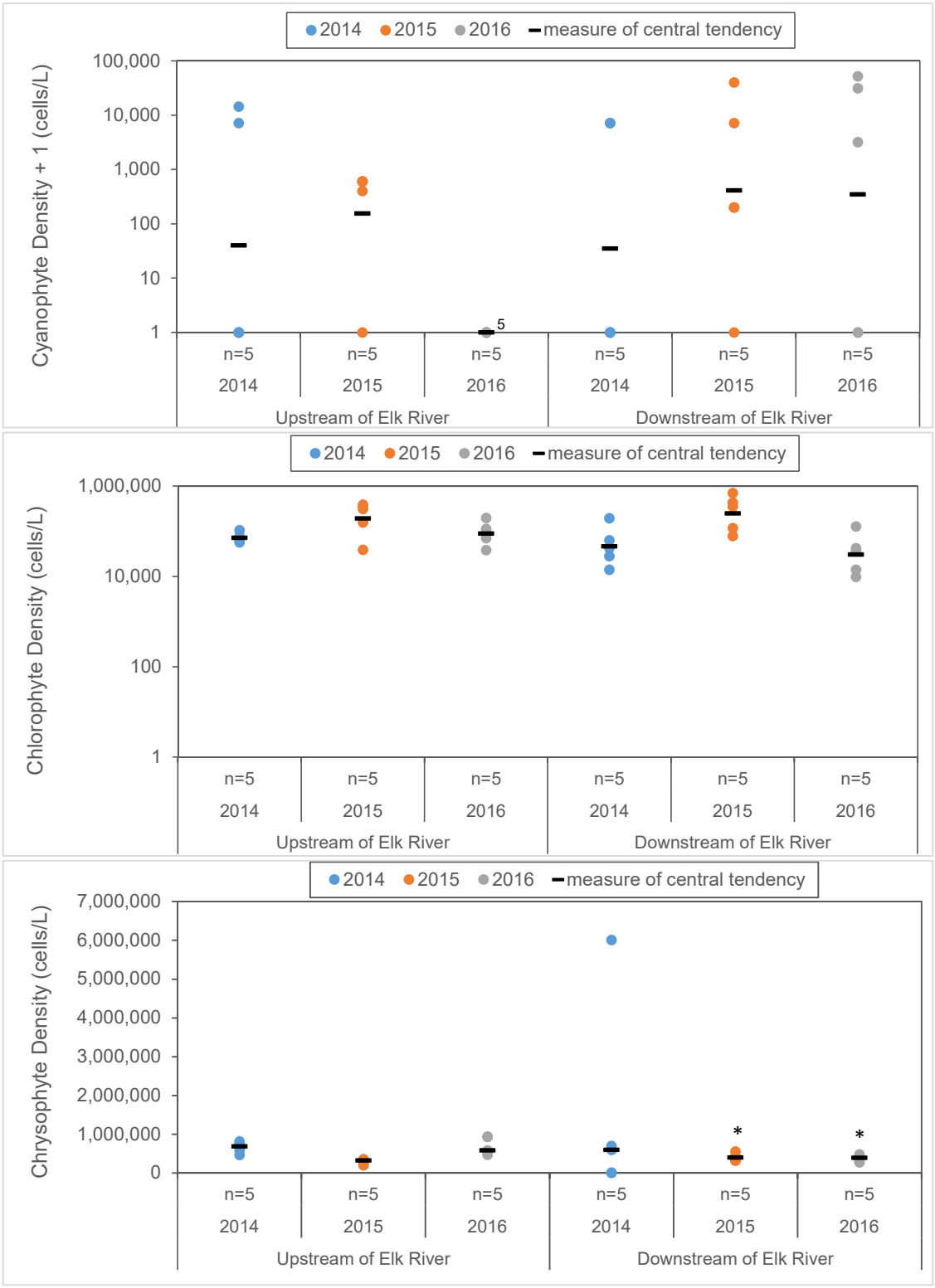

Figure D.3: Cyanophyte, Chlorophyte, Chrysophyte, Diatom, Cryptophyte, and Dinoflagellate Density (cells/L) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

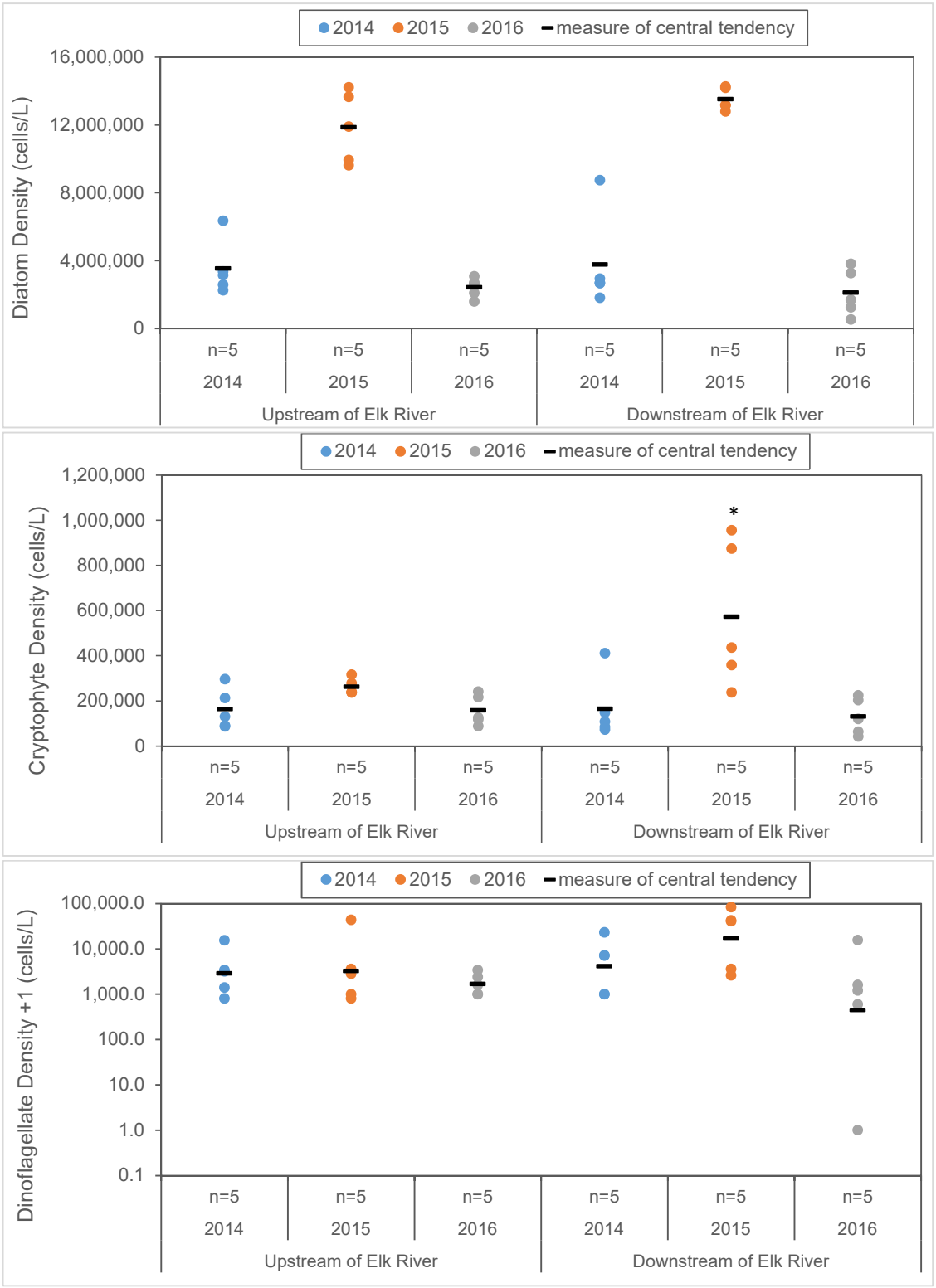

Figure D.3: Cyanophyte, Chlorophyte, Chrysophyte, Diatom, Cryptophyte, and Dinoflagellate Density (cells/L) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

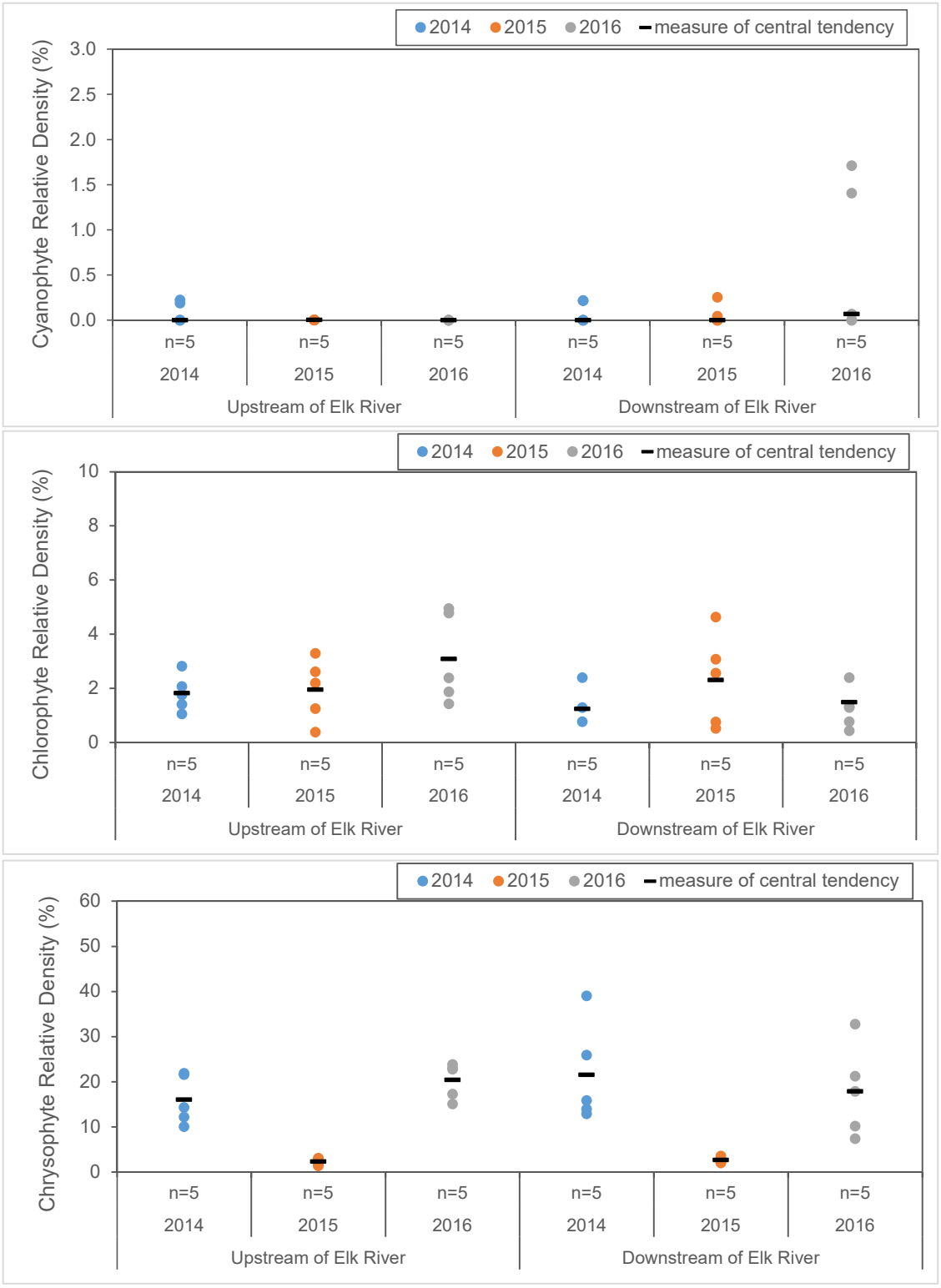

Figure D.4: Cyanophyte, Chlorophyte, Chrysophyte, Diatom, Cryptophyte, and Dinoflagellate Relative Density (%) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

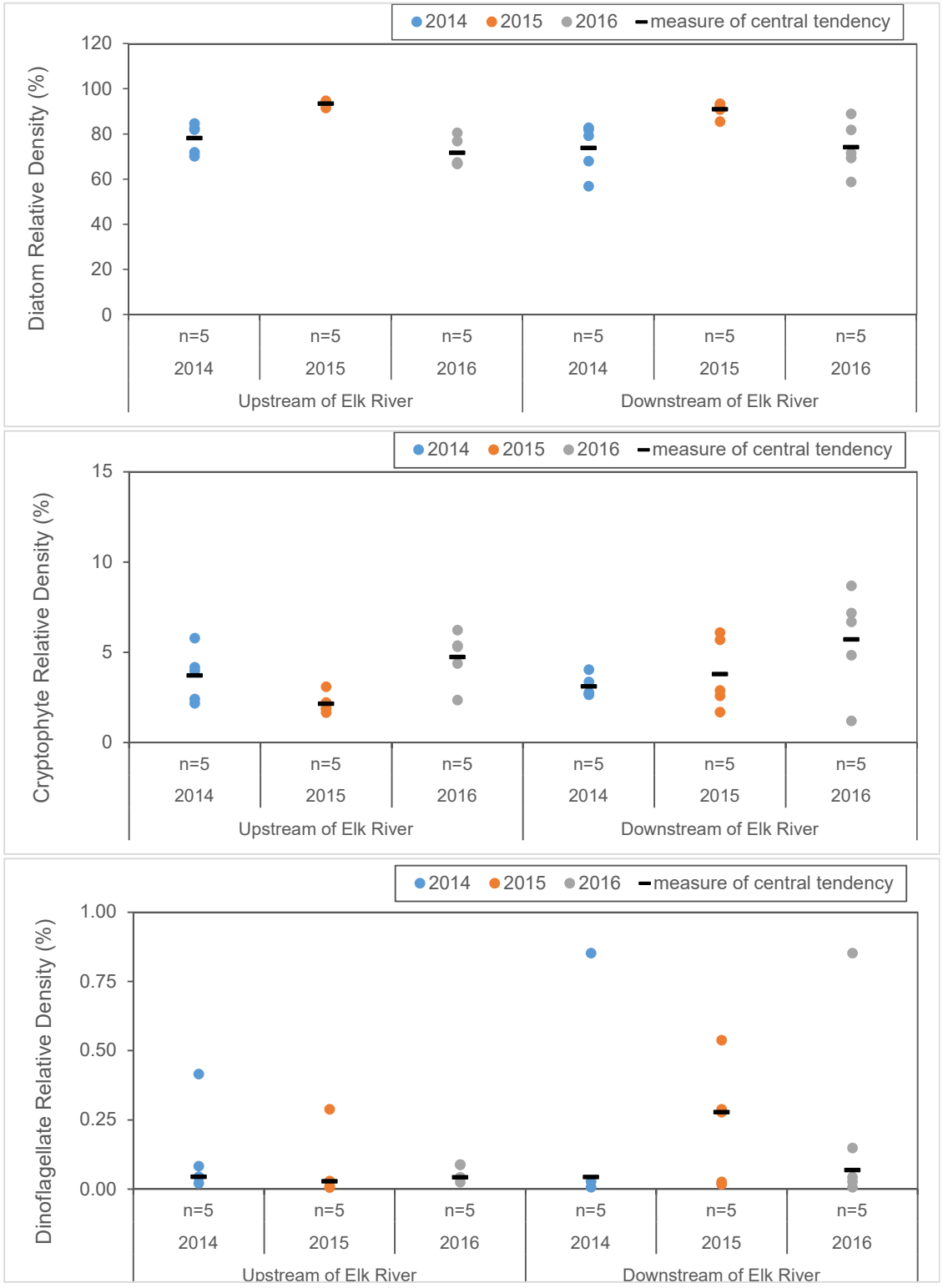

Figure D.4: Cyanophyte, Chlorophyte, Chrysophyte, Diatom, Cryptophyte, and Dinoflagellate Relative Density (%) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

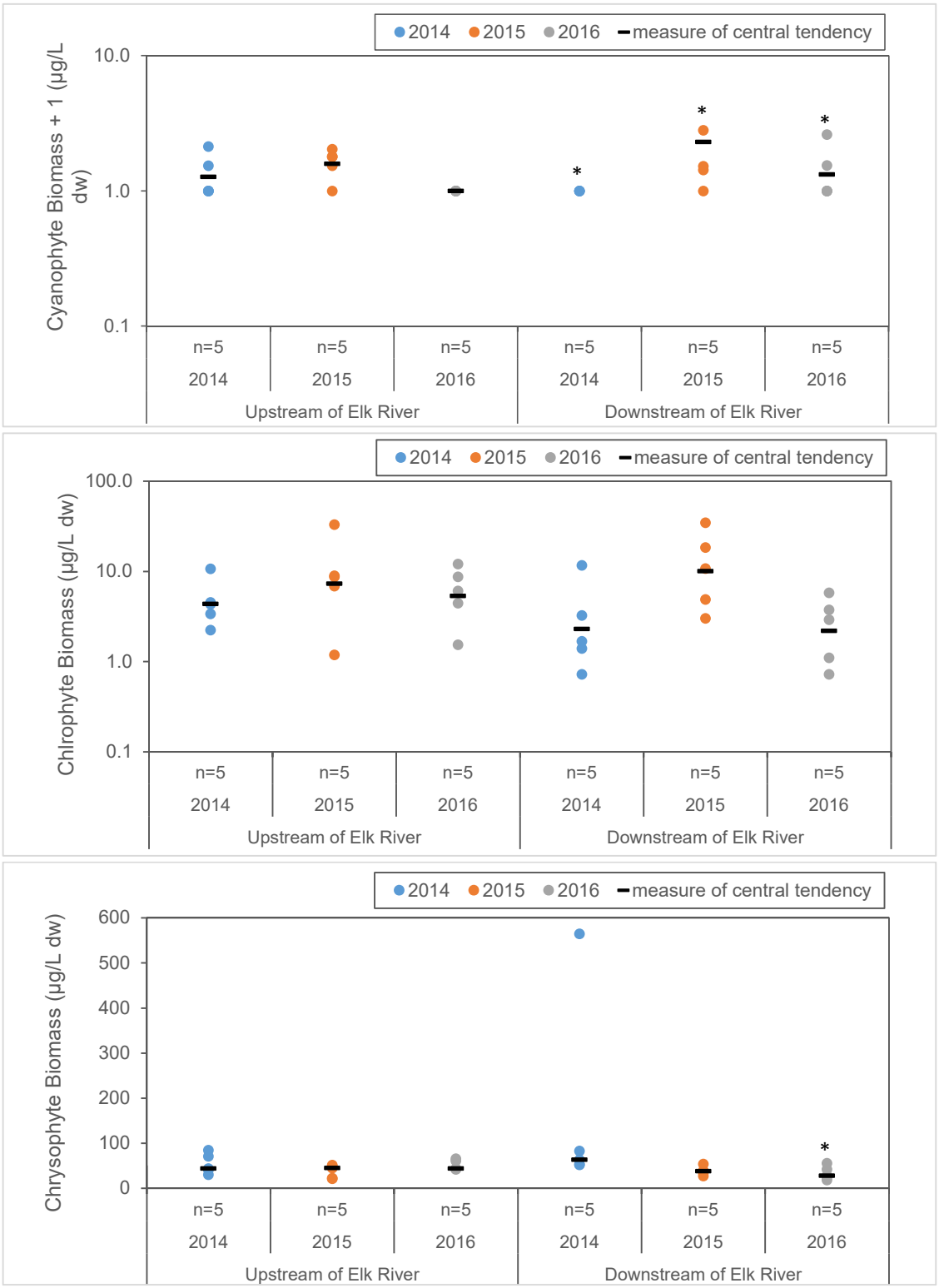

Figure D.5: Cyanophyte, Chlorophyte, Chrysophyte, Diatom, Cryptophyte, and Dinoflagellate Biomass (µg/L) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

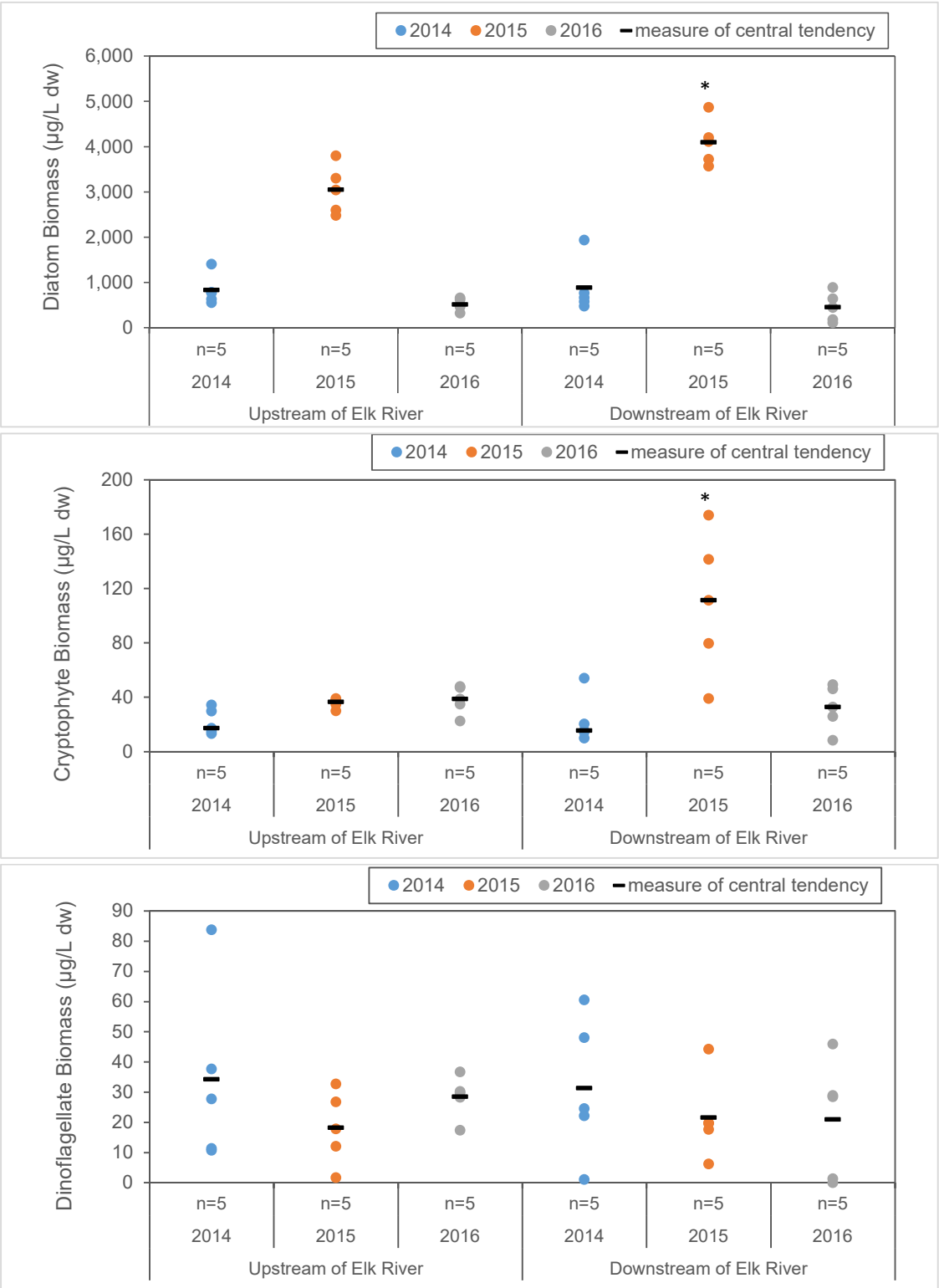

Figure D.5: Cyanophyte, Chlorophyte, Chrysophyte, Diatom, Cryptophyte, and Dinoflagellate Biomass (µg/L) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

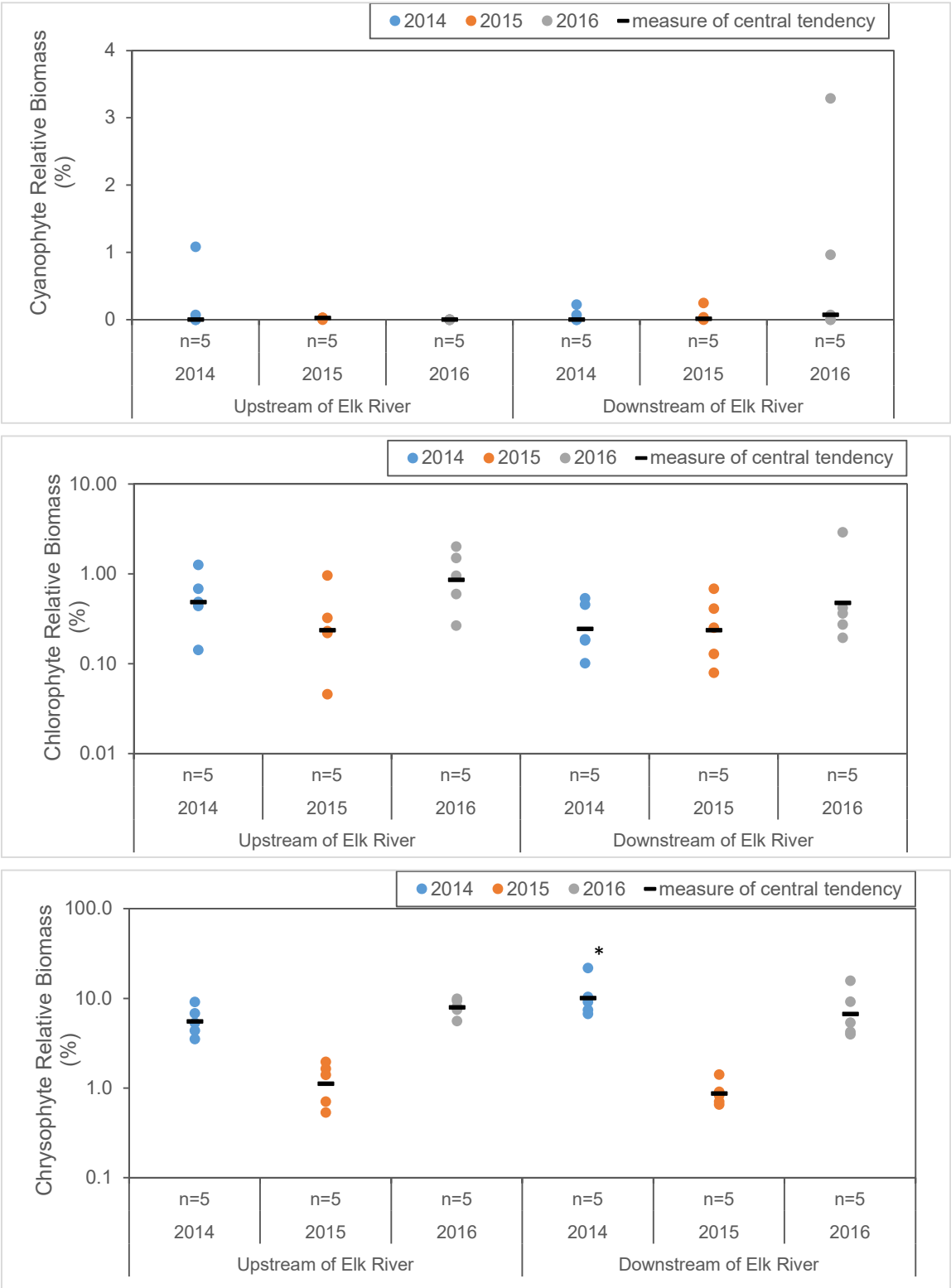

Figure D.6: Cyanophyte, Chlorophyte, Chrysophyte, Diatom, Cryptophyte, and Dinoflagellate Relative Biomass (%) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

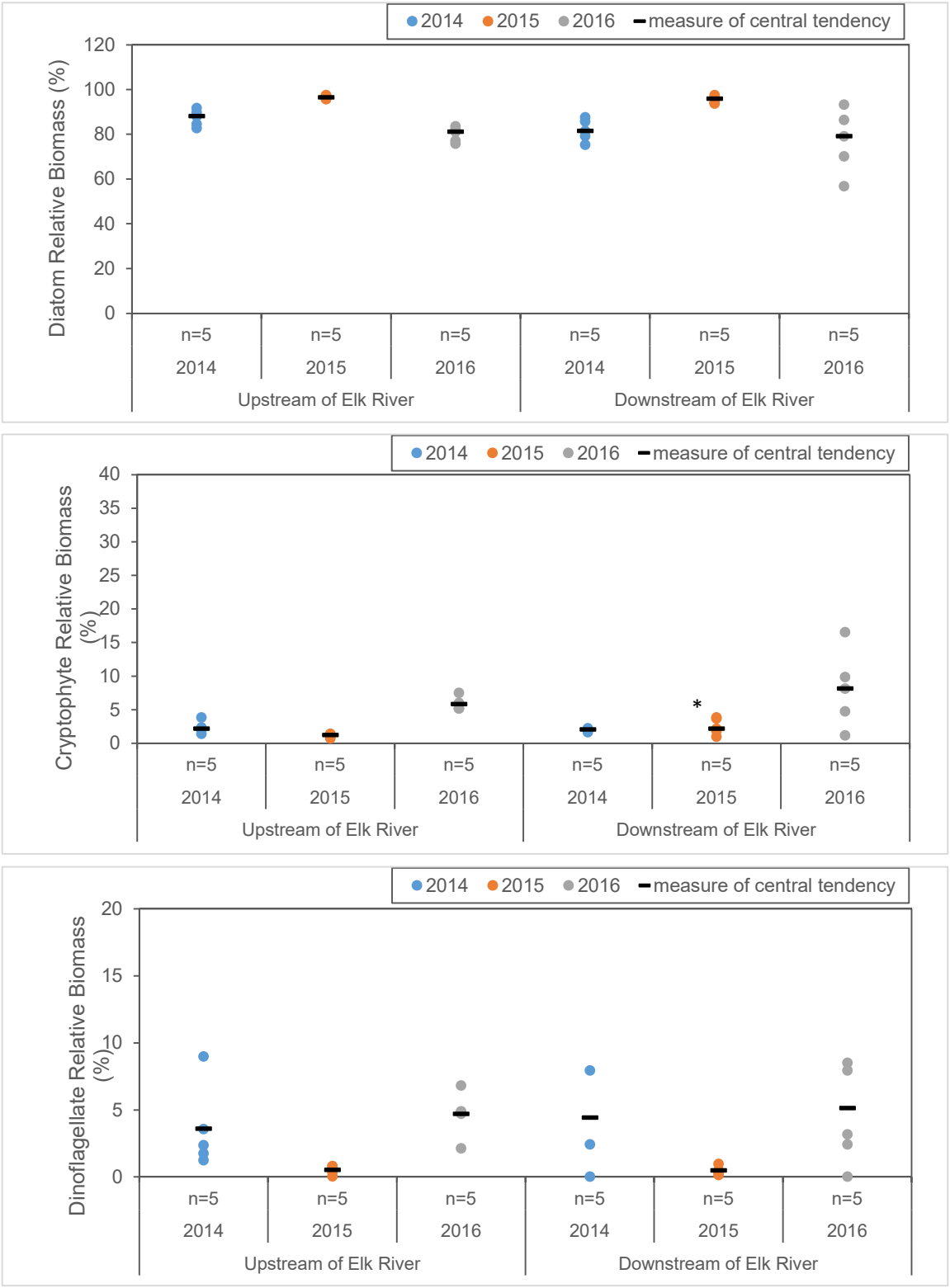

Figure D.6: Cyanophyte, Chlorophyte, Chrysophyte, Diatom, Cryptophyte, and Dinoflagellate Relative Biomass (%) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

Table D.1: Chlorophyll-a and Seston Biomass Concentrations in Water, August 2014 to 2016

Area	Sample ID	Chlorophyll-a (µg/L)			Seston Biomass (mg/L dw)		
		2014	2015	2016	2014	2015	2016
Upstream of Elk River	TN-1 CHL/SES or T2-2 CHL/SES	1.90	2.61	1.86	0.0212	0.0120	0.0247
	TN-2 CHL/SES or T2-3 CHL/SES	1.95	2.71	1.82	0.0472	0.0120	0.0261
	TN-3 CHL/SES or T2-4 CHL/SES	1.99	2.54	1.67	0.0374	0.0085	0.0254
	TN-4 CHL/SES or T2-5 CHL/SES	1.87	2.37	1.72	0.0310	0.0078	0.0289
	TN-5 CHL/SES or T2-6 CHL/SES	1.76	2.36	1.59	0.0339	0.0063	0.0183
Downstream of Elk River	T4-2 CHL/SES	2.36	3.06	2.40	0.0402	0.0014	0.0437
	T4-3 CHL/SES	2.34	3.06	2.40	0.0409	0.0028	0.0381
	T4-4 CHL/SES	2.03	2.92	2.50	0.0268	0.0035	0.0339
	T4-5 CHL/SES	2.31	2.90	2.41	0.0212	0.0014	0.0240
	T4-6 CHL/SES	2.10	3.12	2.12	0.0472	0.0021	0.0275

Table D.2: Koocanusa Reservoir Station Coordinates, Depth and Secchi Depth, August 2014

Station Identifier		UTM (NAD 83, Zone 11U)		Station Depth (m)	Secchi Depth (m)
		Easting	Northing		
Upstream of Elk River	T2-2	629650	5450400	30.1	3.2
	T2-3	629417	5450394	19.2	3.8
	T2-4	629235	5450445	19.5	3.1
	T2-5	629059	5450389	20.0	3.2
	T2-6	628883	5450370	18.3	2.9
Downstream of Elk River	T4-2	630076	5441806	27.8	3.4
	T4-3	629798	5441984	27.4	3.0
	T4-4	629703	5441675	26.4	2.7
	T4-5	629487	5441751	25.8	3.3
	T4-6	629403	5441477	30.5	3.2

Table D.3: **Koocanusa Reservoir Station Coordinates, Depth and Secchi Depth, August 2015**

Station Identifier		UTM (NAD 83, Zone 11U)		Station Depth (m)	Secchi Depth (m)
		Easting	Northing		
Upstream of Elk River	TN-1	627377	5453471	13.5	2.2
	TN-2	627270	5453644	12.4	2.2
	TN-3	627341	5453711	13.2	2.1
	TN-4	627329	5453862	12.9	2.2
	TN-5	627211	5453978	13.4	2.3
Downstream of Elk River	T4-2	630082	5441810	24.2	2.1
	T4-3	629825	5442010	22.8	2.0
	T4-4	629715	5441648	22.7	2.1
	T4-5	629500	5441738	22.2	2.2
	T4-6	629511	5441551	23.2	2.3

Table D.4: Koocanusa Reservoir Station Coordinates, Depth and Secchi Depth, August 2016

Station Identifier		UTM (NAD 83, Zone 11U)		Station Depth (m)	Secchi Depth (m)
		Easting	Northing		
Upstream of Elk River	TN-1	627369	5453492	15	4.9
	TN-2	627256	5453672	14	5.3
	TN-3	627367	5453710	15	5.0
	TN-4	627333	5453882	15	4.9
	TN-5	627200	5454005	15	4.9
Downstream of Elk River	T4-2	630115	5441812	24	4.4
	T4-3	629831	5442006	25	4.3
	T4-4	629695	5441699	25	4.2
	T4-5	629494	5441783	24	4.8
	T4-6	629430	5441547	25	4.2

Table D.5: Density (no. of cells/L) of Phytoplankton Species, August 2014

Species		Upstream of Elk River					Downstream of Elk River				
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Cyano-phyte	*Aphanothece* sp.	7,184	-	-	-	14,368	-	7,184	7,184	-	-
Chlorophyte	*Botryococcus braunii*	600	-	200	-	-	-	-	-	-	-
	Chlamydomonas spp.	64,656	21,552	64,656	7,184	14,368	39,683	14,368	14,368	28,736	64,656
	Coelastrum cambricum	-	200	-	-	-	-	-	-	-	-
	Oocystis lacustris	-	35,920	-	100,576	64,656	158,732	-	28,736	-	-
	Paulschulzia pseudovolvox	200	-	-	-	-	-	-	-	-	-
Chrysophyte	*Bitrichia chodatii*	7,184	-	7,184	-	-	-	21,552	-	14,368	-
	Chrysochromulina laurentiana	-	-	-	-	7,184	39,683	-	7,184	-	-
	Chrysochromulina parva	251,440	294,544	323,280	222,704	165,232	3,690,519	158,048	93,392	186,784	380,752
	Chrysococcus sp.	57,472	122,128	186,784	57,472	150,864	595,245	43,104	71,840	79,024	50,288
	Chrysolkos skuja	-	-	-	-	-	-	7,184	-	-	-
	Chrysostephanospaera globulifera	-	-	14,368	-	-	39,683	7,184	-	-	7,184
	Large chrysophyceae	7,184	-	7,184	7,184	14,368	-	7,184	14,368	28,736	14,368
	Small chrysophyceae	237,072	100,576	107,760	57,472	122,128	396,830	50,288	79,024	50,288	100,576
	Dinobryon mucronutom	-	-	-	-	-	-	21,552	-	-	-
	Dinobryon sertularia	-	28,936	400	-	15,168	1,000	7,184	7,584	7,184	-
	Dinobryon sociale	57,872	7,784	93,392	14,568	194,168	804,660	101,376	108,960	182,400	44,304
	Kephyrion sp.	28,736	21,552	57,472	14,368	50,288	198,415	14,368	-	43,104	100,576
	Mallomonas crassisquama	400	-	200	200	-	5,000	-	800	200	1,200
	Mallomonas duerrschmidtiae	-	-	-	-	-	-	200	-	-	-
	Salpingoeca frequentissima	35,920	14,368	14,368	93,392	7,184	79,366	21,552	7,184	-	-
	Stichogloea spp.	-	-	-	-	28,736	158,732	-	28,736	-	-
Diatom	*Asterionella formosa*	-	-	-	-	-	-	-	200	-	-
	Cyclotella bodanica	6,800	8,400	5,400	8,000	10,400	16,000	5,200	5,200	11,600	10,000
	Cyclotella ocellata	-	-	7,184	-	14,368	-	-	7,184	-	-
	Cyclotella pseudostelligera	2,219,856	3,268,720	2,521,584	3,046,016	6,286,000	8,611,211	2,672,448	2,593,424	2,859,232	1,781,632
	Cyclotella stelligera	30,400	36,000	45,600	44,200	39,600	61,000	3,000	48,800	56,200	24,800
	Fragilaria construens	6,200	4,600	3,000	5,400	200	24,000	16,200	26,600	12,600	5,200
	Gyrosigma sp.	-	-	-	-	-	-	-	-	200	-
	Rhizosolenia eriense	-	43,104	7,184	43,104	-	39,683	-	-	7,184	7,184
	Synedra ulna	9,600	7,000	5,400	7,400	8,400	3,000	5,200	5,800	9,400	5,800
	Tabellaria fenestrata	-	-	400	-	-	-	-	800	-	400
Cryptophyte	*Cryptomonas erosa*	2,600	3,200	5,600	5,600	3,200	17,000	2,400	6,600	6,200	2,200
	Cryptomonas pusilla	-	7,184	-	7,184	-	-	-	-	-	-
	Cryptomonas reflexa	-	-	-	200	400	-	-	400	-	-
	Cryptomonas rostratiformis	-	-	200	-	-	-	400	-	400	400
	Katablepharis ovalis	43,104	28,736	-	14,368	35,920	198,415	14,368	21,552	57,472	21,552
	Rhodomonas minuta	86,208	50,288	208,336	64,656	258,624	198,415	93,392	57,472	86,208	50,288
Dino-flagellate	*Ceratium hirundenella*	200	1,600	400	200	400	-	1,200	600	400	800
	Gymnodinium sp.	-	200	14,368	-	1,000	-	-	-	200	21,552
	Peridinium pusillum	1,200	1,600	400	600	1,800	1,000	200	4,200	400	600
	Peridinium wisconsiense	-	-	200	-	-	-	-	-	-	-
Total number of cells		**3,162,088**	**4,108,192**	**3,702,504**	**3,822,048**	**7,509,024**	**15,377,272**	**3,296,336**	**3,248,192**	**3,728,520**	**2,696,312**
Total number of taxa		**23**	**23**	**28**	**23**	**26**	**23**	**26**	**27**	**24**	**23**

Table D.6: Density (no. of cells/L) of Phytoplankton Species, August 2015

	Species	Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	*Aphanocapsa delicatissima*	600	600	600	400	-	-	-	-	-	600
	Aphanothece sp.	-	-	-	-	-	-	-	7,184	-	-
	Phormidium autumnale	-	-	-	-	-	200	-	-	-	-
	Pseudoanabaena sp.	-	-	-	-	-	-	-	-	-	39,683
	Woronichinia compacta	-	-	-	-	-	-	200	-	-	-
Chlorophyte	*Ankyra judai*	39,683	-	-	-	-	-	-	-	-	-
	Chlamydomonas spp.	-	-	39,683	79,366	-	39,683	79,366	39,683	-	-
	Collodictyon sp.	-	-	39,683	-	-	39,683	-	-	-	-
	Dictyosphaerium simplex	-	-	-	-	-	-	-	-	317,464	-
	Oocystis lacustris	119,049	357,147	317,464	238,098	39,683	-	277,781	674,611	119,049	119,049
Chrysophyte	*Chrysococcus* sp.	119,049	39,683	-	-	79,366	198,415	119,049	198,415	79,366	79,366
	Chrysostephanospaera globulifera	-	39,683	39,683	-	-	-	-	-	-	39,683
	Large chrysophyceae	-	-	39,683	-	-	39,683	-	-	-	-
	Small chrysophyceae	-	79,366	39,683	-	-	-	39,683	39,683	-	-
	Dinobryon sertularia	-	-	-	-	39,683	-	119,049	79,366	-	-
	Dinobryon sociale	39,683	79,366	79,366	79,366	158,732	-	-	-	79,366	79,366
	Kephyrion sp.	119,049	-	-	79,366	39,683	119,049	39,683	198,415	119,049	79,366
	Mallomonas crassisquama	-	200	600	-	200	-	-	-	-	200
	Mallomonas duerrschmidtiae	-	-	-	-	-	200	-	-	-	-
	Salpingoeca frequentissima	79,366	79,366	39,683	39,683	-	79,366	79,366	39,683	39,683	39,683
Diatom	*Cyclotella bodanica*	-	-	-	200	-	-	-	-	-	-
	Cyclotella michiganiana	277,781	277,781	79,366	238,098	357,147	555,562	674,611	1,111,124	39,683	238,098
	Cyclotella pseudostelligera	11,627,119	9,642,969	14,087,465	13,373,171	9,206,456	13,611,269	12,063,632	11,984,266	13,135,073	14,008,099
	Cyclotella stelligera	1,600	1,200	2,000	600	400	600	1,000	800	400	1,400
	Fragilaria crotonensis	-	-	-	-	1,600	-	-	-	-	-
	Rhizosolenia eriense	-	-	39,683	39,683	39,683	-	39,683	39,683	-	-
	Synedra acus	6,600	17,400	25,400	17,800	18,800	35,400	24,200	36,800	9,400	36,200
	Synedra ulna	-	-	400	-	-	-	-	-	-	-
	Tabellaria flocculsa	-	-	-	-	-	600	-	-	-	-
Cryptophyte	*Cryptomonas erosa*	1,600	1,800	2,800	800	200	1,400	3,000	2,800	800	4,200
	Cryptomonas pusilla	-	-	-	-	-	198,415	119,049	198,415	-	-
	Cryptomonas reflexa	-	-	-	-	400	-	-	-	-	-
	Cryptomonas rostratiformis	-	600	200	-	-	-	200	800	400	400
	Katablepharis ovalis	-	39,683	119,049	79,366	119,049	-	39,683	79,366	-	79,366
	Rhodomonas minuta	238,098	198,415	158,732	158,732	198,415	238,098	198,415	595,245	238,098	873,026
Dinoflagellate	*Ceratium hirundenella*	-	-	-	600	200	-	-	-	-	-
	Gymnodinium helveticum	-	-	-	-	-	-	200	-	-	-
	Gymnodinium sp.	1,000	-	40,083	200	600	39,883	1,200	80,966	40,483	400
	Peridinium pusillum	2,600	1,000	3,600	-	2,000	2,200	2,200	1,800	400	2,200
Total number of cells		**12,672,877**	**10,856,259**	**15,194,906**	**14,425,529**	**10,302,297**	**15,199,706**	**13,921,250**	**15,409,105**	**14,218,714**	**15,720,385**
Total number of taxa		**15**	**17**	**22**	**17**	**19**	**18**	**21**	**20**	**15**	**19**

Table D.7: Density (no. of cells/L) of Phytoplankton Species, August 2016

Species		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	*Chroococcus limneticus*	-	-	-	-	-	28,736	-	-	-	-
	Planktolyngbya limnetica	-	-	-	-	-	23,200	31,200	3,200	-	-
Chlorophyte	*Chlamydomonas* sp.	57,472	7,184	71,840	14,368	-	-	14,368	7,184	14,368	-
	Pediastrum duplex	-	3,200	-	-	-	-	-	-	-	2,800
	Oocystis lacustris	14,368	-	-	43,104	14,368	-	-	-	-	-
	Paulschulzia pseudovolvox	-	-	-	200	-	-	-	200	-	-
	Scenedesmus denticulatus	28,736	14,368	50,288	-	-	14,368	-	14,368	-	-
	Kichnerella lunaris	-	14,368	71,840	14,368	64,656	-	-	107,760	28,736	-
	Spondylosium planum	-	-	-	-	-	14,368	-	-	-	-
	Botryococcus braunii	-	-	-	-	-	600	-	400	-	-
	Collodictyon sp.	7,184	-	7,184	-	7,184	-	-	-	-	-
	Bambusina brebissonii	-	-	-	-	-	-	-	-	-	7,184
	Ankistrodesmus spiralis	7,184	-	-	-	7,184	7,184	-	-	-	-
Chrysophyte	*Small chrysophyceae*	100,576	150,864	64,656	114,944	158,048	64,656	86,208	71,840	114,944	107,760
	Large chrysophyceae	28,736	21,552	7,184	43,104	43,104	-	35,920	7,184	43,104	14,368
	Chrysochromulina parva	158,048	64,656	646,560	265,808	423,856	-	14,368	28,736	21,552	43,104
	Chrysococcus sp.	122,128	129,312	86,208	64,656	222,704	100,576	129,312	158,048	215,520	93,392
	Chrysostephanospaera globulifera	-	14,368	7,184	-	14,368	-	-	-	-	-
	Kephyrion sp.	50,288	35,920	71,840	43,104	64,656	21,552	50,288	14,368	-	21,552
	Dinobryon mucronutom	-	-	-	-	-	-	-	-	7,184	-
	Dinobryon bavaricum	800	57,472	43,104	43,104	7,184	50,288	50,288	2,600	14,368	21,552
	Dinobryon sertularia	-	-	-	-	-	-	-	57,472	-	-
	Dinobryon sociale	71,840	-	-	-	-	35,920	21,552	86,208	7,184	-
	Chrysolkos skuja	-	-	-	7,184	-	-	-	7,184	-	-
	Bitrichia chodatii	-	-	-	-	-	-	-	35,920	-	-
	Bicoeca lacustris	21,552	-	-	-	-	-	-	7,184	-	-
Diatom	*Cyclotella stelligera*	3,400	1,600	2,600	4,200	1,800	1,600	1,200	1,200	3,000	2,400
	Cyclotella pseudostelligera	1,415,248	1,875,024	2,406,640	2,162,384	2,011,520	3,031,648	747,136	3,232,800	1,587,664	423,856
	Rhizosolenia eriense	-	14,368	21,552	-	14,368	-	-	-	-	-
	Tabellaria fenestrata	200	-	-	-	-	400	200	-	800	200
	Tabellaria flocculsa	-	-	-	200	-	-	200	-	-	-
	Fragilaria crotonensis	18,800	21,200	8,800	15,400	3,200	4,800	6,400	4,600	4,800	5,800
	Synedra acus	2,600	1,600	3,200	5,600	4,000	20,800	8,200	26,800	3,200	400
	Synedra ulna	1,800	400	600	2,400	600	-	-	800	1,000	-
	Cyclotella michiganiana	165,232	193,968	272,992	905,184	603,456	222,704	502,880	567,536	93,392	107,760
	Cyclotella bodanica	400	200	-	-	-	-	-	-	1,000	600
Cryptophyte	*Rhodomonas minuta*	93,392	93,392	107,760	57,472	143,680	43,104	93,392	201,152	165,232	50,288
	Cryptomonas erosa	5,400	12,200	16,200	18,600	13,600	1,200	6,800	10,000	11,200	15,200
	Cryptomonas rostratiformis	-	-	400	-	-	-	-	800	400	400
	Katablepharis ovalis	28,736	14,368	93,392	14,368	86,208	-	21,552	14,368	28,736	-
Dinoflagellate	*Gymnodinium* sp.	600	1,000	600	1,200	600	-	-	14,368	200	800
	Peridinium pusillum	-	1200	200	1800	600	-	600	800	600	200
	Ceratium hirundenella	400	200	200	400	400	-	-	400	800	200
Total number of cells		**2,405,120**	**2,743,984**	**4,063,024**	**3,843,152**	**3,911,344**	**3,687,704**	**1,822,064**	**4,685,480**	**2,368,984**	**919,816**
Total number of taxa		**26**	**25**	**25**	**24**	**24**	**19**	**20**	**30**	**24**	**21**

Table D.8: Density (no. of cells/L) of Phytoplankton Species by Major Groups, August 2014

Group	Upstream of the Elk River					Downstream of the Elk River				
	T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	7,184	0	0	0	14,368	0	7,184	7,184	0	0
Chlorophyte	65,456	57,672	64,856	107,760	79,024	198,415	14,368	43,104	28,736	64,656
Chrysophyte	683,280	589,888	812,392	467,360	755,320	6,009,133	460,776	419,072	592,088	699,248
Diatom	2,272,856	3,367,824	2,595,752	3,154,120	6,358,968	8,754,894	2,702,048	2,688,008	2,956,416	1,835,016
Cryptophyte	131,912	89,408	214,136	92,008	298,144	413,830	110,560	86,024	150,280	74,440
Dinoflagellates	1,400	3,400	15,368	800	3,200	1,000	1,400	4,800	1,000	22,952
Total number of cells	**3,162,088**	**4,108,192**	**3,702,504**	**3,822,048**	**7,509,024**	**15,377,272**	**3,296,336**	**3,248,192**	**3,728,520**	**2,696,312**
Total number of groups	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**

Table D.9: Density (no. of cells/L) of Phytoplankton Species by Major Groups, August 2015

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	600	600	600	400	0	200	200	7,184	0	40,283
Chlorophyte	158,732	357,147	396,830	317,464	39,683	79,366	357,147	714,294	436,513	119,049
Chrysophyte	357,147	317,664	238,698	198,415	317,664	436,713	396,830	555,562	317,464	317,664
Diatom	11,913,100	9,939,350	14,234,314	13,669,552	9,624,086	14,203,431	12,803,126	13,172,673	13,184,556	14,283,797
Cryptophyte	239,698	240,498	280,781	238,898	318,064	437,913	360,347	876,626	239,298	956,992
Dinoflagellate	3,600	1,000	43,683	800	2,800	42,083	3,600	82,766	40,883	2,600
Total number of cells	**12,672,877**	**10,856,259**	**15,194,906**	**14,425,529**	**10,302,297**	**15,199,706**	**13,921,250**	**15,409,105**	**14,218,714**	**15,720,385**
Total number of groups	**6**	**6**	**6**	**6**	**5**	**6**	**6**	**6**	**5**	**6**

Table D.10: Density (no. of cells/L) of Phytoplankton Species by Major Groups, August 2016

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	0	0	0	0	0	51,936	31,200	3,200	0	0
Chlorophyte	114,944	39,120	201,152	72,040	93,392	36,520	14,368	129,912	43,104	9,984
Chrysophyte	553,968	474,144	926,736	581,904	933,920	272,992	387,936	476,744	423,856	301,728
Diatom	1,607,680	2,108,360	2,716,384	3,095,368	2,638,944	3,281,952	1,266,216	3,833,736	1,694,856	541,016
Cryptophyte	127,528	119,960	217,752	90,440	243,488	44,304	121,744	226,320	205,568	65,888
Dinoflagellate	1,000	2,400	1,000	3,400	1,600	0	600	15,568	1,600	1,200
Total number of cells	**2,405,120**	**2,743,984**	**4,063,024**	**3,843,152**	**3,911,344**	**3,687,704**	**1,822,064**	**4,685,480**	**2,368,984**	**919,816**
Total number of groups	**5**	**5**	**5**	**5**	**5**	**5**	**6**	**6**	**5**	**5**

Table D.11: Relative Densities (%) of Phytoplankton Species, August 2014

	Species	Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6	T2	T4	T2	T4	T2	T4	T2	T4	T2	T4
Cyano-phyte	*Aphanothece* sp.	0.23	0	0	0	0.19	0	0.22	0.22	0	0	0	0	0	0	0.23	0.22	0.084	0.088	0.12	0.12
Chlorophyte	*Botryococcus braunii*	0.019	0	0.0054	0	0	0	0	0	0	0	0	0	0	0	0.019	0	0.0049	0	0.0082	0
	Chlamydomonas spp.	2.0	0.52	1.7	0.19	0.19	0.26	0.44	0.44	0.77	2.4	0.19	0.26	0.52	0.44	2.0	2.4	0.94	0.86	0.89	0.88
	Coelastrum cambricum	0	0.0049	0	0	0	0	0	0	0	0	0	0	0	0	0.0049	0	0.0010	0	0.0022	0
	Oocystis lacustris	0	0.87	0	2.6	0.86	1.0	0	0.88	0	0	0	0	1	0	2.6	1.0	0.87	0.38	1.1	0.53
	Paulschulzia pseudovolvox	0.0063	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0063	0	0.0013	0	0.0028	0
Chrysophyte	*Bitrichia chodatii*	0.23	0	0.19	0	0	0	0.65	0	0.39	0	0	0	0	0	0.23	0.65	0.084	0.21	0.12	0.30
	Chrysochromulina laurentiana	0	0	0	0	0.096	0.26	0	0.22	0	0	0	0	0	0	0.10	0.26	0.019	0.096	0.043	0.13
	Chrysochromulina parva	8.0	7.2	8.7	5.8	2.2	24	4.8	2.9	5.0	14	2.2	2.9	7.2	5.0	8.7	24	6.4	10.2	2.6	8.9
	***Chrysococcus* sp.**	1.8	3.0	5.0	1.5	2.0	3.9	1.3	2.2	2.1	1.9	1.5	1.3	2.0	2.1	5.0	3.9	2.7	2.3	1.4	0.96
	Chrysolkos skuja	0	0	0	0	0	0	0.22	0	0	0	0	0	0	0	0	0.22	0	0.044	0	0.097
	Chrysostephanospaera globulifera	0	0	0.39	0	0	0.26	0.22	0	0	0.27	0	0	0	0.22	0.39	0.27	0.078	0.15	0.17	0.14
	Large chrysophyceae	0.23	0	0.19	0.19	0.19	0	0.22	0.44	0.77	0.53	0	0	0.19	0.44	0.23	0.77	0.16	0.39	0.091	0.30
	Small chrysophyceae	7.5	2.4	2.9	1.5	1.6	2.6	1.5	2.4	1.3	3.7	1.5	1.3	2.45	2.43	7.5	3.7	3.20	2.32	2.47	0.95
	Dinobryon mucronutom	0	0	0	0	0	0	0.65	0	0	0	0	0	0	0	0	0.65	0	0.13	0	0.29
	Dinobryon sertularia	0	0.70	0.011	0	0.20	0.0065	0.22	0.23	0.19	0	0	0	0.01	0.19	0.70	0.23	0.18	0.13	0.30	0.12
	Dinobryon sociale	1.8	0.19	2.5	0.38	2.6	5.2	3.1	3.4	4.9	1.6	0.19	1.6	1.8	3.4	2.6	5.2	1.5	3.6	1.2	1.5
	Kephyrion sp.	0.91	0.52	1.6	0.38	0.67	1.3	0.44	0	1.2	3.7	0.38	0	0.67	1.2	1.6	3.7	0.81	1.3	0.46	1.4
	Mallomonas crassisquama	0.013	0	0.0054	0.0052	0	0.033	0	0.025	0.0054	0.045	0	0	0.0052	0.025	0.013	0.045	0.0047	0.021	0.0052	0.019
	Mallomonas duerrschmidtiae	0	0	0	0	0	0	0.0061	0	0	0	0	0	0	0	0	0.0061	0	0.0012	0	0.0027
	Salpingoeca frequentissima	1.1	0.35	0.39	2.4	0.096	0.52	0.65	0.22	0	0	0.096	0	0.39	0.22	2.4	0.65	0.88	0.28	0.96	0.30
	Stichogloea spp.	0	0	0	0	0.38	1.0	0	0.88	0	0	0	0	0	0	0.38	1.0	0.077	0.38	0.17	0.53
Diatom	*Asterionella formosa*	0	0	0	0	0	0	0	0.0062	0	0	0	0	0	0	0	0.0062	0	0.0012	0	0.0028
	Cyclotella bodanica	0.22	0.20	0.15	0.21	0.14	0.10	0.16	0.16	0.31	0.37	0.14	0.10	0.20	0.16	0.22	0.37	0.18	0.22	0.037	0.11
	Cyclotella ocellata	0	0	0.19	0	0.19	0	0	0.22	0	0	0	0	0	0	0.19	0.22	0.077	0.044	0.11	0.099
	Cyclotella pseudostelligera	70	80	68	80	84	56	81	80	77	66	68	56	80	77	84	81	76	72	6.7	11
	Cyclotella stelligera	0.96	0.88	1.2	1.2	0.53	0.40	0.091	1.5	1.5	0.92	0.53	0.091	0.96	0.92	1.2	1.5	0.95	0.88	0.28	0.64
	Fragilaria construens	0.20	0.11	0.081	0.14	0.0027	0.16	0.49	0.82	0.34	0.19	0.0027	0.16	0.11	0.34	0.20	0.82	0.11	0.40	0.072	0.27
	Gyrosigma sp.	0	0	0	0	0	0	0	0	0.0054	0	0	0	0	0	0	0.0054	0	0.0011	0	0.0024
	Rhizosolenia eriense	0	1.0	0.19	1.1	0	0.26	0	0	0.19	0.27	0	0	0.19	0.19	1.1	0.27	0.47	0.14	0.57	0.13
	Synedra ulna	0.30	0.17	0.15	0.19	0.11	0.020	0.16	0.18	0.25	0.22	0.11	0.020	0.17	0.18	0.30	0.25	0.19	0.16	0.073	0.09
	Tabellaria fenestrata	0	0	0.011	0	0	0	0	0.025	0	0.015	0	0	0	0	0.011	0.025	0.0022	0.0079	0.0048	0.011
Cryptophyte	*Cryptomonas erosa*	0.082	0.078	0.15	0.15	0.043	0.11	0.073	0.20	0.17	0.082	0.043	0.073	0.082	0.11	0.15	0.20	0.10	0.13	0.047	0.056
	Cryptomonas pusilla	0	0.17	0	0.19	0	0	0	0	0	0	0	0	0	0	0.19	0	0.073	0	0.099	0
	Cryptomonas reflexa	0	0	0	0.0052	0.0053	0	0	0.012	0	0	0	0	0	0	0.0053	0.012	0.0021	0.0025	0.0029	0.0055
	Cryptomonas rostratiformis	0	0	0.0054	0	0	0	0.012	0	0.011	0.015	0	0	0	0.011	0.0054	0.015	0.0011	0.0075	0.0024	0.0070
	Katablepharis ovalis	1.4	0.70	0	0.38	0.48	1.3	0.44	0.66	1.5	0.80	0	0.44	0.48	0.80	1.4	1.5	0.58	0.95	0.50	0.46
	Rhodomonas minuta	2.7	1.2	5.6	1.7	3.4	1.3	2.8	1.8	2.3	1.9	1.2	1.3	2.7	1.9	5.6	2.8	2.9	2.0	1.7	0.58
Dino-flagellate	*Ceratium hirundenella*	0.0063	0.039	0.011	0.0052	0.0053	0	0.036	0.018	0.011	0.030	0.0052	0	0.0063	0.018	0.039	0.036	0.013	0.019	0.015	0.015
	Gymnodinium sp.	0	0.0049	0.39	0	0.013	0	0	0	0.0054	0.80	0	0	0	0	0.39	0.80	0.081	0.16	0.17	0.36
	Peridinium pusillum	0.038	0.039	0.011	0.016	0.024	0.0065	0.0061	0.13	0.011	0.022	0.011	0.0061	0.024	0.011	0.039	0.13	0.025	0.035	0.013	0.053
	Peridinium wisconsiense	0	0	0.0054	0	0	0	0	0	0	0	0	0	0	0	0.0054	0	0.0011	0	0.0024	0

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of cells at one or more stations within an area (as shown in Figure 5.4).

Table D.12: Relative Densities (%) of Phytoplankton Species, August 2015

	Species	Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6	TN	T4	TN	T4	TN	T4	TN	T4	TN	T4
Cyanophyte	*Aphanocapsa delicatissima*	0.0047	0.0055	0.0039	0.0028	0	0	0	0	0	0.0038	0	0	0.0039	0	0.0055	0.0038	0.0034	0.00076	0.0022	0.0017
	Aphanothece sp.	0	0	0	0	0	0	0	0.047	0	0	0	0	0	0	0	0.047	0	0.0093	0	0.0208
	Phormidium autumnale	0	0	0	0	0	0.0013	0	0	0	0	0	0	0	0	0	0.0013	0	0.00026	0	0.0006
	Pseudoanabaena sp.	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0.25	0	0.050	0	0.1129
	Woronichinia compacta	0	0	0	0	0	0	0.0014	0	0	0	0	0	0	0	0	0.0014	0	0.00029	0	0.0006
Chlorophyte	*Ankyra judai*	0.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0.31	0	0.063	0	0.1400	0
	Chlamydomonas spp.	0	0	0.26	0.55	0	0.26	0.57	0.26	0	0	0	0	0	0.26	0.55	0.57	0.1623	0.2177	0.2446	0.2358
	Collodictyon sp.	0	0	0.26	0	0	0.26	0	0	0	0	0	0	0	0	0.26	0.26	0.052	0.052	0.1168	0.1168
	Dictyosphaerium simplex	0	0	0	0	0	0	0	0	2.2	0	0	0	0	0	0	2.2	0	0.4465	0	0.9985
	Oocystis lacustris	0.94	3.3	2.1	1.7	0.39	0	2.0	4.4	0.84	0.76	0.39	0	1.7	0.84	3.3	4.4	1.7	1.6	1.1163	1.7121
Chrysophyte	*Chrysococcus* sp.	0.94	0.37	0	0	0.77	1.3	0.86	1.3	0.56	0.50	0	0.50	0.37	0.86	0.94	1.3	0.4151	0.9022	0.4325	0.3839
	Chrysostephanospaera globulifera	0	0.37	0.26	0	0	0	0	0	0	0.25	0	0	0	0	0.37	0.25	0.1253	0.050	0.1755	0.1129
	Large chrysophyceae	0	0	0.26	0	0	0.26	0	0	0	0	0	0	0	0	0.26	0.26	0.052	0.052	0.12	0.12
	Small chrysophyceae	0	0.73	0.26	0	0	0	0.29	0.26	0	0	0	0	0	0	0.73	0.29	0.20	0.11	0.32	0.15
	Dinobryon sertularia	0	0	0	0	0.39	0	0.86	0.52	0	0	0	0	0	0	0.39	0.86	0.077	0.27	0.17	0.39
	Dinobryon sociale	0.31	0.73	0.52	0.55	1.5	0	0	0	0.56	0.50	0.31	0	0.55	0	1.5	0.56	0.73	0.21	0.48	0.29
	Kephyrion sp.	0.94	0	0	0.55	0.39	0.78	0.29	1.3	0.84	0.50	0	0.29	0.39	0.78	0.94	1.3	0.37	0.74	0.40	0.38
	Mallomonas crassisquama	0	0.0018	0.0039	0	0.0019	0	0	0	0	0.0013	0	0	0.0018	0	0.0039	0.0013	0.0015	0.00025	0.0016	0.00057
	Mallomonas duerrschmidtiae	0	0	0	0	0	0.0013	0	0	0	0	0	0	0	0	0	0.0013	0	0.00026	0	0.00059
	Salpingoeca frequentissima	0.63	0.73	0.26	0.28	0	0.52	0.57	0.26	0.28	0.25	0	0.25	0.28	0.28	0.73	0.57	0.38	0.38	0.30	0.16
Diatom	*Cyclotella bodanica*	0	0	0	0.0014	0	0	0	0	0	0	0	0	0	0	0.0014	0	0.00028	0	0.00062	0
	Cyclotella michiganiana	2.2	2.6	0.52	1.7	3.5	3.7	4.8	7.2	0.28	1.5	0.52	0.28	2.2	3.7	3.5	7.2	2.1	3.5	1.1	2.7
	Cyclotella pseudostelligera	92	89	93	93	89	90	87	78	92	89	89	78	92	89	93	92	91	87	1.9	5.6
	Cyclotella stelligera	0.013	0.011	0.013	0.0042	0.0039	0.0039	0.0072	0.0052	0.0028	0.0089	0.0039	0.0028	0.011	0.0052	0.013	0.0089	0.0090	0.0056	0.0046	0.0025
	Fragilaria crotonensis	0	0	0	0	0.016	0	0	0	0	0	0	0	0	0	0.016	0	0.0031	0	0.0069	0
	Rhizosolenia eriense	0	0	0.26	0.28	0.39	0	0.29	0.26	0	0	0	0	0.26	0	0.39	0.29	0.18	0.11	0.17	0.15
	Synedra acus	0.052	0.16	0.17	0.12	0.18	0.23	0.17	0.24	0.066	0.23	0.052	0.066	0.16	0.23	0.18	0.24	0.14	0.19	0.052	0.073
	Synedra ulna	0	0	0.0026	0	0	0	0	0	0	0	0	0	0	0	0.0026	0	0.0005	0	0.0012	0
	Tabellaria flocculsa	0	0	0	0	0	0.0039	0	0	0	0	0	0	0	0	0	0.0039	0	0.00079	0	0.0018
Cryptophyte	*Cryptomonas erosa*	0.013	0.017	0.018	0.0055	0.0019	0.0092	0.022	0.018	0.0056	0.027	0.0019	0.0056	0.013	0.018	0.018	0.0267	0.011	0.016	0.0071	0.0087
	Cryptomonas pusilla	0	0	0	0	0	1.3	0.86	1.3	0	0	0	0	0	0.86	0	1.3	0	0.69	0	0.65
	Cryptomonas reflexa	0	0	0	0	0.0039	0	0	0	0	0	0	0	0	0	0.0039	0	0.00078	0	0.0017	0
	Cryptomonas rostratiformis	0	0.0055	0.0013	0	0	0	0.0014	0.0052	0.0028	0.0025	0	0	0	0.0025	0.0055	0.0052	0.0014	0.0024	0.0024	0.0019
	Katablepharis ovalis	0	0.37	0.78	0.55	1.2	0	0.29	0.52	0	0.50	0	0	0.55	0.29	1.2	0.52	0.57	0.26	0.43	0.26
	Rhodomonas minuta	1.9	1.8	1.0	1.1	1.9	1.6	1.4	3.9	1.7	5.6	1.0	1.4	1.8	1.7	1.9	5.6	1.6	2.8	0.44	1.8
Dino-flagellate	*Ceratium hirundenella*	0	0	0	0.0042	0.0019	0	0	0	0	0	0	0	0	0	0.0042	0	0.0012	0	0.0018	0
	Gymnodinium helveticum	0	0	0	0	0	0	0.0014	0	0	0	0	0	0	0	0	0.0014	0	0.0003	0	0.00064
	Gymnodinium sp.	0.0079	0	0.26	0.0014	0.0058	0.26	0.0086	0.53	0.28	0.0025	0	0.0025	0.0058	0.26	0.26	0.53	0.056	0.22	0.12	0.22
	Peridinium pusillum	0.021	0.0092	0.024	0	0.019	0.014	0.016	0.012	0.0028	0.014	0	0.0028	0.019	0.014	0.024	0.016	0.015	0.012	0.0098	0.0052

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of cells at one or more stations within an area (as shown in Figure 5.4).

Table D.13: Relative Densities (%) of Phytoplankton Species, August 2016

	Species	Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6	TN	T4	TN	T4	TN	T4	TN	T4	TN	T4
Cyano-phyte	*Chroococcus limneticus*	0	0	0	0	0	0.78	0	0	0	0	0	0	0	0	0	0.78	0	0.16	0	0.35
	Planktolyngbya limnetica	0	0	0	0	0	0.63	1.7	0.068	0	0	0	0	0	0.068	0	1.7	0	0.48	0	0.74
Chlorophyte	*Chlamydomonas* sp.	2.4	0.26	1.8	0.37	0	0	0.79	0.15	0.61	0	0	0	0.37	0.15	2.4	0.79	0.96	0.31	1.1	0.37
	Pediastrum duplex	0	0.12	0	0	0	0	0	0	0	0.30	0	0	0	0	0.12	0.30	0.023	0.061	0.052	0.14
	Oocystis lacustris	0.60	0	0	1.1	0.37	0	0	0	0	0	0	0	0.37	0	1.1	0	0.42	0	0.47	0
	Paulschulzia pseudovolvox	0	0	0	0.0052	0	0	0	0.0043	0	0	0	0	0	0	0.0052	0.0043	0.0010	0.00085	0.0023	0.0019
	Scenedesmus denticulatus	1.2	0.52	1.2	0	0	0.39	0	0.31	0	0	0	0	0.52	0	1.2	0.39	0.59	0.14	0.61	0.19
	Kichnerella lunaris	0	0.52	1.8	0.37	1.7	0	0	2.3	1.2	0	0	0	0.52	0	1.8	2.3	0.86	0.70	0.80	1.0
	Spondylosium planum	0	0	0	0	0	0.39	0	0	0	0	0	0	0	0	0	0.39	0	0.078	0	0.17
	Botryococcus braunii	0	0	0	0	0	0.016	0	0.0085	0	0	0	0	0	0	0	0.016	0	0.0050	0	0.0073
	Collodictyon sp.	0.30	0	0.18	0	0.18	0	0	0	0	0	0	0	0.18	0	0.30	0	0.13	0	0.13	0
	Bambusina brebissonii	0	0	0	0	0	0	0	0	0	0.78	0	0	0	0	0	0.78	0	0.16	0	0.35
	Ankistrodesmus spiralis	0.30	0	0	0	0.18	0.19	0	0	0	0	0	0	0	0	0.30	0.19	0.096	0.039	0.14	0.087
Chrysophyte	***Small chrysophyceae***	4.2	5.5	1.6	3.0	4.0	1.8	4.7	1.5	4.9	12	1.6	1.5	4.0	4.7	5.5	12	3.7	4.9	1.5	4.1
	Large chrysophyceae	1.2	0.79	0.18	1.1	1.1	0	2.0	0.15	1.8	1.6	0.18	0	1.1	1.6	1.2	2.0	0.88	1.1	0.42	0.95
	Chrysochromulina parva	6.6	2.4	16	6.9	11	0	0.79	0.61	0.91	4.7	2.4	0	6.9	0.79	16	4.7	8.5	1.4	5.1	1.9
	***Chrysococcus* sp.**	5.1	4.7	2.1	1.7	5.7	2.7	7.1	3.4	9.1	10	1.7	2.7	4.7	7.1	5.7	10	3.9	6.5	1.8	3.3
	Chrysostephanospaera globulifera	0	0.52	0.18	0	0.37	0	0	0	0	0	0	0	0.177	0	0.52	0	0.21	0	0.23	0
	Kephyrion sp.	2.1	1.3	1.8	1.1	1.7	0.58	2.8	0.31	0	2.3	1.1	0	1.7	0.58	2.1	2.8	1.6	1.2	0.38	1.3
	Dinobryon mucronutom	0	0	0	0	0	0	0	0	0.30	0	0	0	0	0	0	0.30	0	0.061	0	0.14
	Dinobryon bavaricum	0.033	2.1	1.1	1.1	0.18	spe	2.8	0.055	0.61	2.3	0.033	0.055	1.1	1.5	2.1	2.8	0.90	1.4	0.83	1.3
	Dinobryon sertularia	0	0	0	0	0	0	0	1.2	0	0	0	0	0	0	0	1.2	0	0.25	0	0.55
	Dinobryon sociale	3.0	0	0	0	0	0.97	1.2	1.8	0.30	0	0	0	0	0.97	3.0	1.8	0.60	0.86	1.3	0.73
	Chrysolkos skuja	0	0	0	0.19	0	0	0	0.15	0	0	0	0	0	0	0.19	0.15	0.037	0.031	0.084	0.069
	Bitrichia chodatii	0	0	0	0	0	0	0	0.77	0	0	0	0	0	0	0	0.77	0	0.15	0	0.34
	Bicoeca lacustris	0.90	0	0	0	0	0	0	0.15	0	0	0	0	0	0	0.90	0.15	0.18	0.031	0.40	0.069
Diatom	*Cyclotella stelligera*	0.14	0.058	0.064	0.11	0.046	0.043	0.066	0.026	0.13	0.26	0.046	0.026	0.064	0.066	0.14	0.26	0.084	0.10	0.040	0.095
	Cyclotella pseudostelligera	59	68	59	56	51	82	41	69	67	46	51	41	59	67	68	82	59	61	6.2	17
	Rhizosolenia eriense	0	0.52	0.53	0	0.37	0	0	0	0	0	0	0	0.37	0	0.53	0	0.28	0	0.27	0
	Tabellaria fenestrata	0.0083	0	0	0	0	0.011	0.011	0	0.034	0.022	0	0	0	0.011	0.0083	0.034	0.0017	0.015	0.0037	0.013
	Tabellaria flocculsa	0	0	0	0.0052	0	0	0.011	0	0	0	0	0	0	0	0.0052	0.011	0.0010	0.0022	0.0023	0.0049
	Fragilaria crotonensis	0.78	0.77	0.22	0.40	0.082	0.13	0.35	0.10	0.20	0.63	0.082	0.098	0.40	0.20	0.78	0.63	0.45	0.28	0.32	0.22
	Synedra acus	0.11	0.058	0.079	0.15	0.10	0.56	0.45	0.57	0.14	0.043	0.058	0.043	0.10	0.45	0.15	0.57	0.099	0.35	0.033	0.25
	Synedra ulna	0.075	0.015	0.015	0.062	0.015	0	0	0.017	0.042	0	0.015	0	0.015	0	0.075	0.042	0.036	0.012	0.030	0.019
	Cyclotella michiganiana	6.9	7.1	6.7	24	15	6.0	28	12	3.9	12	6.7	3.9	7.1	12	24	28	12	12	7.5	9.3
	Cyclotella bodanica	0.017	0.0073	0	0	0	0	0	0	0.042	0.065	0	0	0	0	0.017	0.065	0.0048	0.0215	0.0073	0.031
Crypto-phyte	***Rhodomonas minuta***	3.9	3.4	2.7	1.5	3.7	1.2	5.1	4.3	7.0	5.5	1.5	1.2	3.4	5.1	3.9	7.0	3.0	4.6	0.97	2.2
	Cryptomonas erosa	0.22	0.44	0.40	0.48	0.35	0.033	0.37	0.21	0.47	1.7	0.22	0.033	0.40	0.37	0.48	1.7	0.38	0.55	0.10	0.64
	Cryptomonas rostratiformis	0	0	0.010	0	0	0	0	0.017	0.017	0.043	0	0	0	0.017	0.0098	0.043	0.0020	0.015	0.0044	0.018
	Katablepharis ovalis	1.2	0.52	2.3	0.37	2.2	0	1.2	0.31	1.2	0	0.37	0	1.2	0.31	2.3	1.2	1.3	0.54	0.91	0.61
Dino-flagellate	*Gymnodinium* sp.	0.025	0.036	0.015	0.031	0.015	0	0	0.31	0.0084	0.087	0.015	0	0.025	0.0084	0.036	0.31	0.025	0.080	0.0096	0.13
	Peridinium pusillum	0	0.044	0.0049	0.047	0.015	0	0.033	0.017	0.025	0.022	0	0	0.015	0.022	0.047	0.033	0.022	0.019	0.022	0.012
	Ceratium hirundenella	0.017	0.0073	0.0049	0.010	0.010	0	0	0.0085	0.034	0.022	0.0049	0	0.010	0.0085	0.017	0.034	0.0099	0.013	0.0044	0.015

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of cells at one or more stations within an area (as shown in Figure 5.4).

Table D.14: Biomass (µg/L dw) of Phytoplankton Species, August 2014

	Species	Upstream of Elk River					Downstream of Elk River				
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Cyano-phyte	*Aphanothece* sp.	0.54	-	-	-	1.1	-	1.6	0.55	-	-
Chlorophyte	*Botryococcus braunii*	0.54	-	0.14	-	-	-	-	-	-	-
	Chlamydomonas spp.	3.3	1.1	3.3	0.20	0.72	1.1	0.72	0.72	1.7	3.3
	Coelastrum cambricum	-	1.1	-	-	-	-	-	-	-	-
	Oocystis lacustris	-	2.4	-	11	1.5	11	-	0.68	-	-
	Paulschulzia pseudovolvox	0.54	-	-	-	-	-	-	-	-	-
Chrysophyte	*Bitrichia chodatii*	0.36	-	0.36	-	-	-	1.1	-	0.72	-
	Chrysochromulina laurentiana	-	-	-	-	2.9	16	-	2.8	-	-
	Chrysochromulina parva	16	19	21	15	11	241	10	6.1	12	25
	Chrysococcus sp.	3.8	8.0	12	3.8	9.9	39	2.8	4.7	5.2	3.3
	Chrysolkos skuja	-	-	-	-	-	-	0.25	-	-	-
	Chrysostephanospaera globulifera	-	-	7.5	-	-	21	3.8	-	-	3.8
	Large chrysophyceae	2.7	-	2.7	2.7	5.5	-	2.7	2.9	11	5.5
	Small chrysophyceae	3.3	1.4	1.5	0.81	1.7	5.6	0.71	1.1	0.71	1.4
	Dinobryon mucronutom	-	-	-	-	-	-	2.7	-	-	-
	Dinobryon sertularia	-	7.5	2.0	-	6.2	5.1	1.6	3.1	1.6	-
	Dinobryon sociale	14	3.7	21	3.9	45	217	25	28	50	14
	Kephyrion sp.	0.70	0.53	1.4	0.35	1.2	3.4	0.73	-	1.1	9.3
	Mallomonas crassisquama	0.44	-	0.21	0.22	-	5.6	-	0.88	0.21	1.3
	Mallomonas duerrschmidtiae	-	-	-	-	-	-	0.17	-	-	-
	Salpingoeca frequentissima	1.2	0.49	0.49	3.6	0.25	2.7	0.74	0.25	-	-
	Stichogloea spp.	-	-	-	-	1.4	8.0	-	1.4	-	-
Diatom	*Asterionella formosa*	-	-	-	-	-	-	-	0.02	-	-
	Cyclotella bodanica	46	57	37	54	75	109	35	35	77	68
	Cyclotella ocellata	-	-	1.9	-	3.8	-	-	1.9	-	-
	Cyclotella pseudostelligera	436	642	495	598	1,234	1,690	525	509	561	350
	Cyclotella stelligera	64	75	95	92	83	128	6.3	102	117	52
	Fragilaria construens	2.6	1.9	1.2	2.3	0.083	10	6.8	11	5.3	2.2
	Gyrosigma sp.	-	-	-	-	-	-	-	-	0.45	-
	Rhizosolenia eriense	-	3.7	0.99	17	-	2.5	-	-	0.81	0.46
	Synedra ulna	10	7.6	5.9	14	16	3.3	5.7	11	10	6.3
	Tabellaria fenestrata	-	-	0.29	-	-	-	-	0.60	-	0.31
Cryptophyte	*Cryptomonas erosa*	3.1	3.9	6.8	6.8	3.9	21	2.9	8.0	7.5	2.7
	Cryptomonas pusilla	-	2.6	-	2.6	-	-	-	-	-	-
	Cryptomonas reflexa	-	-	-	0.14	0.28	-	-	0.27	-	-
	Cryptomonas rostratiformis	-	-	0.41	-	-	-	0.82	-	0.82	0.82
	Katablepharis ovalis	2.6	1.6	-	0.83	2.1	12	0.71	1.1	2.8	1.2
	Rhodomonas minuta	9.4	5.5	23	7.1	28	22	10	6.3	9.4	5.5
Dino-flagellate	*Ceratium hirundenella*	10	80	20	10	20	-	60	20	20	40
	Gymnodinium sp.	-	1.6	5.3	-	16	-	-	-	1.6	7.2
	Peridinium pusillum	1.3	1.7	0.42	0.63	2.0	1.1	0.21	4.4	0.41	0.63
	Peridinium wisconsiense	-	-	1.9	-	-	-	-	-	-	-
Total biomass of cells		**633**	**930**	**769**	**847**	**1,572**	**2,574**	**709**	**765**	**900**	**604**
Total number of taxa		**23**	**23**	**28**	**23**	**26**	**23**	**26**	**27**	**24**	**23**

Table D.15: Biomass (µg/L dw) of Phytoplankton Species, August 2015

	Species	Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	*Aphanocapsa delicatissima*	0.80	0.80	1.0	0.54	-	-	-	-	-	0.87
	Aphanothece sp.	-	-	-	-	-	-	-	0.52	-	-
	Phormidium autumnale	-	-	-	-	-	1.8	-	-	-	-
	Pseudoanabaena sp.	-	-	-	-	-	-	-	-	-	8.7
	Woronichinia compacta	-	-	-	-	-	-	0.43	-	-	-
Chlorophyte	*Ankyra judai*	4.0	-	-	-	-	-	-	-	-	-
	Chlamydomonas spp.	-	-	2.0	1.9	-	2.3	4.0	2.0	-	-
	Collodictyon sp.	-	-	23	-	-	32	-	-	-	-
	Dictyosphaerium simplex	-	-	-	-	-	-	-	-	1.8	-
	Oocystis lacustris	2.9	8.8	7.8	7.1	1.2	-	6.8	17	3.1	3.0
Chrysophyte	*Chrysococcus* sp.	7.8	2.6	-	-	5.2	13	7.8	13	5.2	4.9
	Chrysostephanospaera globulifera	-	20	21	-	-	-	-	-	-	28
	Large chrysophyceae	-	-	7.1	-	-	15	-	-	-	-
	Small chrysophyceae	-	1.4	0.56	-	-	-	0.56	0.56	-	-
	Dinobryon sertularia	-	-	-	-	9.0	-	27	18	-	-
	Dinobryon sociale	9.0	18	18	18	36	-	-	-	18	18
	Kephyrion sp.	2.9	-	-	1.8	0.89	2.9	0.97	4.8	2.9	1.9
	Mallomonas crassisquama	-	0.21	0.65	-	0.21	-	-	-	-	0.22
	Mallomonas duerrschmidtiae	-	-	-	-	-	0.12	-	-	-	-
	Salpingoeca frequentissima	2.6	2.4	1.2	1.3	-	2.3	2.8	1.2	1.2	1.3
Diatom	*Cyclotella bodanica*	-	-	-	1.5	-	-	-	-	-	-
	Cyclotella michiganiana	6.8	6.8	2.0	5.8	8.3	14	17	29	0.97	4.5
	Cyclotella pseudostelligera	3,038	2,589	3,295	3,789	2,472	4,852	4,093	4,168	3,721	3,562
	Cyclotella stelligera	3.0	2.2	3.6	1.1	0.74	1.2	2.0	1.6	0.75	2.5
	Fragilaria crotonensis	-	-	-	-	0.62	-	-	-	-	-
	Rhizosolenia eriense	-	-	3.1	3.1	3.1	-	3.1	3.1	-	-
	Synedra acus	0.76	1.9	2.8	2.1	2.1	4.1	2.9	4.6	1.1	4.2
	Synedra ulna	-	-	1.7	-	-	-	-	-	-	-
	Tabellaria flocculsa	-	-	-	-	-	0.80	-	-	-	-
Cryptophyte	*Cryptomonas erosa*	1.9	2.1	3.4	0.97	0.24	1.7	3.5	3.3	0.95	4.9
	Cryptomonas pusilla	-	-	-	-	-	71	43	71	-	-
	Cryptomonas reflexa	-	-	-	-	0.27	-	-	-	-	-
	Cryptomonas rostratiformis	-	1.2	0.41	-	-	-	0.41	1.7	0.82	0.88
	Katablepharis ovalis	-	2.2	6.1	4.2	6.1	-	2.0	4.1	-	4.3
	Rhodomonas minuta	37	31	25	25	31	39	31	94	37	132
Dinoflagellate	*Ceratium hirundenella*	-	-	-	31	11	-	-	-	-	-
	Gymnodinium helveticum	-	-	-	-	-	-	5.0	-	-	-
	Gymnodinium sp.	7.8	-	21	2.1	3.6	16	9.0	41	19	2.6
	Peridinium pusillum	4.3	1.6	5.9	-	3.3	3.6	3.6	3.0	0.6	3.6
Total biomass of cells		**3,130**	**2,693**	**3,453**	**3,896**	**2,595**	**5,074**	**4,265**	**4,481**	**3,815**	**3,788**
Total number of taxa		**15**	**17**	**22**	**17**	**19**	**18**	**21**	**20**	**15**	**19**

Table D.16: Biomass (µg/L dw) of Phytoplankton Species, August 2016

	Species	Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyano-phyte	*Chroococcus limneticus*	-	-	-	-	-	1.0	-	-	-	-
	Planktolyngbya limnetica	-	-	-	-	-	5.7	8.7	0.76	-	-
Chlorophyte	*Chlamydomonas* sp.	2.9	0.36	5.4	0.84	-	-	0.72	0.36	0.72	-
	Pediastrum duplex	-	0.38	-	-	-	-	-	-	-	0.33
	Oocystis lacustris	0.37	-	-	2.9	0.72	-	-	-	-	-
	Paulschulzia pseudovolvox	-	-	-	0.54	-	-	-	0.54	-	-
	Scenedesmus denticulatus	1.3	0.59	2.3	-	-	1.1	-	0.72	-	-
	Kichnerella lunaris	-	0.22	1.1	0.19	0.86	-	-	1.6	0.38	-
	Spondylosium planum	-	-	-	-	-	0.54	-	-	-	-
	Botryococcus braunii	-	-	-	-	-	0.86	-	0.57	-	-
	Collodictyon sp.	3.8	-	3.3	-	4.1	-	-	-	-	-
	Bambusina brebissonii	-	-	-	-	-	-	-	-	-	5.5
	Ankistrodesmus spiralis	0.42	-	-	-	0.42	0.39	-	-	-	-
Chrysophyte	*Small chrysophyceae*	0.93	2.1	0.59	1.6	2.2	1.3	1.3	1.0	1.8	1.5
	Large chrysophyceae	5.2	8.2	2.7	7.7	7.7	-	14	2.7	1.1	2.6
	Chrysochromulina parva	10	4.2	42	17	28	-	0.89	1.9	1.4	2.8
	Chrysococcus sp.	6.2	8.5	5.6	4.2	15	6.6	8.5	10	14	6.1
	Chrysostephanospaera globulifera	-	6.7	2.5	-	5.3	-	-	-	-	-
	Kephyrion sp.	1.2	0.88	2.2	1.1	1.6	0.37	1.0	0.35	-	0.53
	Dinobryon mucronutom	-	-	-	-	-	-	-	-	0.87	-
	Dinobryon bavaricum	1.6	13	9.8	9.8	1.6	11	11	5.2	3.3	4.9
	Dinobryon sertularia	-	-	-	-	-	-	-	13	-	-
	Dinobryon sociale	16	-	-	-	-	8.1	4.9	20	1.6	-
	Chrysolkos skuja	-	-	-	0.18	-	-	-	0.22	-	-
	Bitrichia chodatii	-	-	-	-	-	-	-	0.95	-	-
	Bicoeca lacustris	1.5	-	-	-	-	-	-	0.50	-	-
Diatom	*Cyclotella stelligera*	7.1	2.9	5.4	8.9	3.4	4.0	2.9	2.2	5.9	4.4
	Cyclotella pseudostelligera	304	451	646	581	470	632	165	868	426	99
	Rhizosolenia eriense	-	1.1	1.4	-	0.91	-	-	-	-	-
	Tabellaria fenestrata	0.35	-	-	-	-	0.34	0.15	-	0.69	0.15
	Tabellaria flocculsa	-	-	-	0.16	-	-	0.26	-	-	-
	Fragilaria crotonensis	7.2	7.8	3.0	5.5	1.2	2.1	2.7	1.8	1.8	2.3
	Synedra acus	0.31	0.17	0.34	0.65	0.43	2.4	1.0	3.1	0.37	0.05
	Synedra ulna	4.2	1.0	1.5	6.3	1.6	-	-	2.1	2.6	-
	Cyclotella michiganiana	4.3	5.4	6.7	22	15	5.8	13	15	2.4	2.3
	Cyclotella bodanica	3.3	1.2	-	-	-	-	-	-	8.9	4.6
Crypto-phyte	*Rhodomonas minuta*	12	14	17	8.7	22	6.5	14	30	25	7.6
	Cryptomonas erosa	9.2	20	26	30	22	1.9	11	17	19	25
	Cryptomonas rostratiformis	-	-	0.85	-	-	-	-	1.7	0.88	0.85
	Katablepharis ovalis	1.2	0.66	4.2	0.64	3.9	-	1.2	0.80	1.7	-
Dino-flagellate	*Gymnodinium sp.*	9.4	16	6.9	12	8.5	-	-	5.3	3.1	18
	Peridinium pusillum	-	2.0	0.43	3.4	1.3	-	1.4	1.8	1.9	0.31
	Ceratium hirundenella	20	11	10	21	20	-	-	22	41	10
Total biomass of cells		**435**	**579**	**807**	**746**	**638**	**692**	**264**	**1,031**	**566**	**199**
Total number of taxa		**26**	**25**	**25**	**24**	**24**	**19**	**20**	**30**	**24**	**21**

Table D.17: Biomass (µg/L dw) of Phytoplankton Species by Group, August 2014

Group	Upstream of Elk River					Downstream of Elk River				
	T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	0.54	0	0	0	1.14	0	1.62	0.55	0	0
Chlorophyte	4.33	4.54	3.39	10.7	2.25	11.8	0.72	1.40	1.68	3.25
Chrysophyte	43.4	40.9	70.8	30.0	84.4	564	53.1	51.8	82.8	63.2
Diatom	559	787	637	778	1,411	1,943	579	671	773	479
Cryptophyte	15.1	13.5	30.0	17.4	34.5	54.3	14.7	15.6	20.6	10.1
Dinoflagellates	11.3	83.8	27.7	10.7	37.7	1.06	60.5	24.5	22.2	48.1
Total biomass of cells	**633**	**930**	**769**	**847**	**1,572**	**2,574**	**709**	**765**	**900**	**604**
Total number of groups	**6**	**5**	**5**	**5**	**6**	**6**	**6**	**6**	**5**	**5**

Table D.18: Biomass (µg/L dw) of Phytoplankton Species by Group, August 2015

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	0.80	0.80	1.0	0.54	0	1.8	0.43	0.52	0	9.5
Chlorophyte	6.9	8.8	33	9.0	1.2	35	11	19	4.9	3.0
Chrysophyte	22	45	49	21	51	33	39	38	27	54
Diatom	3,049	2,600	3,308	3,802	2,487	4,873	4,118	4,206	3,724	3,574
Cryptophyte	39	37	35	30	38	111	80	174	39	142
Dinoflagellate	12	1.6	27	33	18	20	18	44	20	6.2
Total biomass of cells	**3,130**	**2,693**	**3,453**	**3,896**	**2,595**	**5,074**	**4,265**	**4,481**	**3,815**	**3,788**
Total number of groups	**6**	**6**	**6**	**6**	**5**	**6**	**6**	**6**	**5**	**6**

Table D.19: Biomass (µg/L dw) of Phytoplankton Species by Group, August 2016

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	0	0	0	0	0	6.7	8.68	0.76	0	0
Chlorophyte	8.8	1.5	12	4.5	6.1	2.9	0.7	3.8	1.1	5.8
Chrysophyte	43	44	66	42	61	28	42	56	24	18
Diatom	330	470	665	624	493	646	185	892	449	113
Cryptophyte	23	35	47	39	48	8.4	26	49	46	33
Dinoflagellate	30	28	17	37	30	0	1	29	46	28
Total biomass of cells	**435**	**579**	**807**	**746**	**638**	**692**	**264**	**1,031**	**566**	**199**
Total number of groups	**5**	**5**	**5**	**5**	**5**	**5**	**6**	**6**	**5**	**5**

Table D.20: Relative Biomass (%) of Phytoplankton, August 2014

Species		Upstream of Elk River					Downstream of Elk River				
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Cyano-phyte	*Aphanothece* sp.	0.085	0	0	0	0.072	0	0.23	0.071	0	0
Chlorophyte	*Botryococcus braunii*	0.086	0	0.018	0	0	0	0	0	0	0
	Chlamydomonas spp.	0.51	0.12	0.42	0.024	0.046	0.044	0.10	0.094	0.19	0.54
	Coelastrum cambricum	0	0.11	0	0	0	0	0	0	0	0
	Oocystis lacustris	0	0.26	0	1.2	0.10	0.41	0	0.089	0	0
	Paulschulzia pseudovolvox	0.085	0	0	0	0	0	0	0	0	0
Chrysophyte	*Bitrichia chodatii*	0.057	0	0.047	0	0	0	0.15	0	0.080	0
	Chrysochromulina laurentiana	0	0	0	0	0.19	0.63	0	0.37	0	0
	Chrysochromulina parva	2.6	2.1	2.7	1.7	0.69	9.4	1.5	0.80	1.4	4.1
	Chrysococcus sp.	0.59	0.86	1.6	0.44	0.63	1.5	0.40	0.61	0.57	0.54
	Chrysolkos skuja	0	0	0	0	0	0	0.035	0	0	0
	Chrysostephanospaera globulifera	0	0	1.0	0	0	0.81	0.53	0	0	0.62
	Large chrysophyceae	0.43	0	0.36	0.32	0.35	0	0.39	0.38	1.2	0.91
	Small chrysophyceae	0.53	0.15	0.20	0.10	0.11	0.22	0.10	0.15	0.079	0.23
	Dinobryon mucronutom	0	0	0	0	0	0	0.38	0	0	0
	Dinobryon sertularia	0	0.81	0.26	0	0.39	0.20	0.23	0.40	0.18	0
	Dinobryon sociale	2.3	0.39	2.7	0.46	2.8	8.4	3.6	3.7	5.6	2.3
	Kephyrion sp.	0.11	0.057	0.18	0.041	0.078	0.13	0.10	0	0.12	1.5
	Mallomonas crassisquama	0.069	0	0.028	0.026	0	0.22	0	0.11	0.023	0.22
	Mallomonas duerrschmidtiae	0	0	0	0	0	0	0.024	0	0	0
	Salpingoeca frequentissima	0.19	0.053	0.064	0.42	0.016	0.11	0.10	0.032	0	0
	Stichogloea spp.	0	0	0	0	0.092	0.31	0	0.19	0	0
Diatom	*Asterionella formosa*	0	0	0	0	0	0	0	0.0025	0	0
	Cyclotella bodanica	7.3	6.1	4.8	6.4	4.8	4.2	5.0	4.6	8.6	11
	Cyclotella ocellata	0	0	0.24	0	0.24	0	0	0.25	0	0
	Cyclotella pseudostelligera	69	69	64	71	79	66	74	67	62	58
	Cyclotella stelligera	10	8.1	12	11	5.3	5.0	0.88	13	13	8.6
	Fragilaria construens	0.41	0.21	0.16	0.27	0.0053	0.39	1.0	1.5	0.59	0.36
	Gyrosigma sp.	0	0	0	0	0	0	0	0	0.050	0
	Rhizosolenia eriense	0	0.39	0.13	2.0	0	0.10	0	0	0.090	0.076
	Synedra ulna	1.7	0.82	0.76	1.7	1.0	0.13	0.80	1.5	1.1	1.0
	Tabellaria fenestrata	0	0	0.037	0	0	0	0	0.079	0	0.051
Cryptophyte	*Cryptomonas erosa*	0.50	0.42	0.88	0.80	0.25	0.80	0.41	1.0	0.83	0.44
	Cryptomonas pusilla	0	0.28	0	0.30	0	0	0	0	0	0
	Cryptomonas reflexa	0	0	0	0.016	0.018	0	0	0.035	0	0
	Cryptomonas rostratiformis	0	0	0.053	0	0	0	0.12	0	0.091	0.14
	Katablepharis ovalis	0.40	0.17	0	0.10	0.13	0.47	0.10	0.14	0.31	0.19
	Rhodomonas minuta	1.5	0.59	3.0	0.84	1.8	0.84	1.4	0.82	1.0	0.91
Dino-flagellate	*Ceratium hirundenella*	1.6	8.6	2.6	1.2	1.3	0	8.5	2.6	2.2	6.7
	Gymnodinium sp.	0	0.18	0.69	0	1.0	0	0	0	0.18	1.2
	Peridinium pusillum	0.20	0.18	0.055	0.075	0.13	0.041	0.030	0.58	0.046	0.10
	Peridinium wisconsiense	0	0	0.24	0	0	0	0	0	0	0

Table D.21: Relative Biomass (%) of Phytoplankton, August 2015

	Species	Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyanophyte	*Aphanocapsa delicatissima*	0.025	0.030	0.030	0.014	-	-	-	-	-	0.023
	Aphanothece sp.	-	-	-	-	-	-	-	0.012	-	-
	Phormidium autumnale	-	-	-	-	-	0.036	-	-	-	-
	Pseudoanabaena sp.	-	-	-	-	-	-	-	-	-	0.23
	Woronichinia compacta	-	-	-	-	-	-	0.010	-	-	-
Chlorophyte	*Ankyra judai*	0.13	-	-	-	-	-	-	-	-	-
	Chlamydomonas spp.	-	-	0.058	0.048	-	0.046	0.094	0.045	-	-
	Collodictyon sp.	-	-	0.68	-	-	0.64	-	-	-	-
	Dictyosphaerium simplex	-	-	-	-	-	-	-	-	0.047	-
	Oocystis lacustris	0.093	0.32	0.23	0.18	0.046	-	0.16	0.37	0.082	0.080
Chrysophyte	*Chrysococcus* sp.	0.25	0.096	-	-	0.20	0.26	0.18	0.29	0.14	0.13
	Chrysostephanospaera globulifera	-	0.75	0.62	-	-	-	-	-	-	0.73
	Large chrysophyceae	-	-	0.21	-	-	0.30	-	-	-	-
	Small chrysophyceae	-	0.051	0.016	-	-	-	0.013	0.012	-	-
	Dinobryon sertularia	-	-	-	-	0.35	-	0.63	0.40	-	-
	Dinobryon sociale	0.29	0.67	0.52	0.46	1.4	-	-	-	0.47	0.47
	Kephyrion sp.	0.093	-	-	0.046	0.034	0.057	0.023	0.11	0.076	0.051
	Mallomonas crassisquama	-	0.0079	0.019	-	0.0082	-	-	-	-	0.0057
	Mallomonas duerrschmidtiae	-	-	-	-	-	0.0023	-	-	-	-
	Salpingoeca frequentissima	0.082	0.088	0.034	0.032	-	0.045	0.066	0.027	0.031	0.034
Diatom	*Cyclotella bodanica*	-	-	-	0.037	-	-	-	-	-	-
	Cyclotella michiganiana	0.22	0.25	0.058	0.15	0.32	0.28	0.39	0.64	0.025	0.12
	Cyclotella pseudostelligera	97	96	95	97	95	96	96	93	98	94
	Cyclotella stelligera	0.096	0.081	0.11	0.028	0.028	0.023	0.046	0.035	0.020	0.067
	Fragilaria crotonensis	-	-	-	-	0.024	-	-	-	-	-
	Rhizosolenia eriense	-	-	0.089	0.079	0.12	-	0.072	0.069	-	-
	Synedra acus	0.024	0.069	0.082	0.054	0.079	0.081	0.067	0.10	0.028	0.11
	Synedra ulna	-	-	0.049	-	-	-	-	-	-	-
	Tabellaria flocculsa	-	-	-	-	-	0.016	-	-	-	-
Cryptophyte	*Cryptomonas erosa*	0.061	0.079	0.098	0.025	0.0091	0.033	0.081	0.074	0.025	0.13
	Cryptomonas pusilla	-	-	-	-	-	1.4	1.0	1.6	-	-
	Cryptomonas reflexa	-	-	-	-	0.010	-	-	-	-	-
	Cryptomonas rostratiformis	-	0.046	0.012	-	-	-	0.0096	0.038	0.022	0.023
	Katablepharis ovalis	-	0.080	0.18	0.11	0.24	-	0.048	0.091	-	0.11
	Rhodomonas minuta	1.2	1.2	0.72	0.64	1.2	0.77	0.74	2.1	0.98	3.5
Dinoflagellate	*Ceratium hirundenella*	-	-	-	0.79	0.42	-	-	-	-	-
	Gymnodinium helveticum	-	-	-	-	-	-	0.12	-	-	-
	Gymnodinium sp.	0.25	-	0.60	0.053	0.14	0.32	0.21	0.92	0.50	0.069
	Peridinium pusillum	0.14	0.061	0.17	-	0.13	0.071	0.085	0.066	0.017	0.095

Table D.22: Relative Biomass (%) of Phytoplankton, August 2016

Species		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Cyano-phyte	*Cyanophyte*	0	0	0	0	0	0.15	0	0	0	0
	Planktolyngbya limnetica	0	0	0	0	0	0.82	3.3	0.074	0	0
Chlorophyte	*Chlamydomonas* sp.	0.66	0.062	0.67	0.11	0	0	0.27	0.035	0.13	0
	Pediastrum duplex	0	0.065	0	0	0	0	0	0	0	0.17
	Oocystis lacustris	0.086	0	0	0.39	0.11	0	0	0	0	0
	Paulschulzia pseudovolvox	0	0	0	0.072	0	0	0	0.052	0	0
	Scenedesmus denticulatus	0.30	0.10	0.29	0	0	0.16	0	0.070	0	0
	Kichnerella lunaris	0	0.038	0.14	0.026	0.13	0	0	0.15	0.067	0
	Spondylosium planum	0	0	0	0	0	0.078	0	0	0	0
	Botryococcus braunii	0	0	0	0	0	0.12	0	0.056	0	0
	Collodictyon sp.	0.86	0	0.41	0	0.64	0	0	0	0	0
	Bambusina brebissonii	0	0	0	0	0	0	0	0	0	2.75
	Ankistrodesmus spiralis	0.10	0	0	0	0.066	0.056	0	0	0	0
Chrysophyte	*Small chrysophyceae*	0.21	0.37	0.074	0.22	0.35	0.19	0.51	0.10	0.32	0.76
	Large chrysophyceae	1.2	1.4	0.34	1.0	1.2	0	5.2	0.27	0.19	1.3
	Chrysochromulina parva	2.4	0.73	5.2	2.3	4.3	0	0.34	0.18	0.25	1.4
	Chrysococcus sp.	1.4	1.5	0.70	0.57	2.3	1.0	3.2	1.0	2.5	3.1
	Chrysostephanospaera globulifera	0	1.1	0.31	0	0.83	0	0	0	0	0
	Kephyrion sp.	0.28	0.15	0.28	0.14	0.25	0.054	0.39	0.034	0	0.26
	Dinobryon mucronutom	0	0	0	0	0	0	0	0	0.15	0
	Dinobryon bavaricum	0.37	2.2	1.2	1.3	0.25	1.6	4.3	0.50	0.57	2.5
	Dinobryon sertularia	0	0	0	0	0	0	0	1.3	0	0
	Dinobryon sociale	3.7	0	0	0	0	1.2	1.8	1.9	0.29	0
	Chrysolkos skuja	0	0	0	0.024	0	0	0	0.021	0	0
	Bitrichia chodatii	0	0	0	0	0	0	0	0.092	0	0
	Bicoeca lacustris	0.34	0	0	0	0	0	0	0.048	0	0
Diatom	*Cyclotella stelligera*	1.6	0.50	0.67	1.2	0.54	0.58	1.1	0.21	1.0	2.2
	Cyclotella pseudostelligera	70	78	80	78	74	91	63	84	75	50
	Rhizosolenia eriense	0	0.19	0.17	0	0.14	0	0	0	0	0
	Tabellaria fenestrata	0.079	0	0	0	0	0.050	0.059	0	0.12	0.077
	Tabellaria flocculsa	0	0	0	0.021	0	0	0.10	0	0	0
	Fragilaria crotonensis	1.6	1.3	0.37	0.74	0.18	0.31	1.0	0.18	0.32	1.2
	Synedra acus	0.072	0.029	0.042	0.086	0.068	0.35	0.38	0.30	0.065	0.023
	Synedra ulna	1.0	0.17	0.19	0.85	0.25	0	0	0.20	0.47	0
	Cyclotella michiganiana	1.0	0.92	0.83	3.0	2.3	0.84	5.0	1.4	0.43	1.2
	Cyclotella bodanica	0.75	0.21	0	0	0	0	0	0	1.6	2.3
Crypto-phyte	*Rhodomonas minuta*	2.8	2.5	2.1	1.2	3.4	0.94	5.3	2.9	4.4	3.8
	Cryptomonas erosa	2.1	3.5	3.2	4.0	3.5	0.28	4.1	1.6	3.3	12
	Cryptomonas rostratiformis	0	0	0.11	0	0	0	0	0.16	0.15	0.43
	Katablepharis ovalis	0.27	0.11	0.52	0.086	0.62	0	0.46	0.078	0.30	0
Dino-flagellate	*Gymnodinium* sp.	2.2	2.7	0.85	1.6	1.3	0	0	0.51	0.55	9.0
	Peridinium pusillum	0	0.34	0.053	0.45	0.21	0	0.52	0.18	0.34	0.15
	Ceratium hirundenella	4.7	1.9	1.2	2.8	3.2	0	0	2.1	7.2	5.1

Table D.23: Descriptive Statistics for Phytoplankton in Koocanusa Reservoir Upstream (T2) and Downstream (T4) of the Elk River, August 2014

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of cells/L)		T2	5	3,162,088	3,822,048	7,509,024	4,460,771	1,738,223
		T4	5	2,696,312	3,296,336	15,377,272	5,669,326	5,439,272
Richness (no. of taxa)		T2	5	23	23	28	25	2.3
		T4	5	23	24	27	25	1.8
Biomass (µg/L dw)		T2	5	633	847	1,572	950	364
		T4	5	604	765	2,574	1,111	825
Major Group Density (no. of cells/L)	Cyanophyte	T2	5	0	0	14,368	4,310	6,426
		T4	5	0	0	7,184	2,874	3,935
	Chlorophyte	T2	5	57,672	65,456	107,760	74,954	19,898
		T4	5	14,368	43,104	198,415	69,856	74,229
	Chrysophyte	T2	5	467,360	683,280	812,392	661,648	136,806
		T4	5	419,072	592,088	6,009,133	1,636,063	2,447,121
	Diatom	T2	5	2,272,856	3,154,120	6,358,968	3,549,904	1,629,563
		T4	5	1,835,016	2,702,048	8,754,894	3,787,276	2,809,136
	Cryptophyte	T2	5	89,408	131,912	298,144	165,122	89,831
		T4	5	74,440	110,560	413,830	167,027	140,992
	Dinoflagellate	T2	5	800	3,200	15,368	4,834	5,995
		T4	5	1,000	1,400	22,952	6,230	9,483
Major Groups Relative Density (%)	Cyanophyte	T2	5	0	0	0.23	0.084	0.12
		T4	5	0	0	0.22	0.088	0.12
	Chlorophyte	T2	5	1.1	1.8	2.8	1.8	0.68
		T4	5	0.44	1.3	2.4	1.2	0.75
	Chrysophyte	T2	5	10	14	22	16	5.5
		T4	5	13	16	39	22	11
	Diatom	T2	5	70	82	85	78	6.7
		T4	5	57	79	83	74	11
	Cryptophyte	T2	5	2.2	4.0	5.8	3.7	1.5
		T4	5	2.7	2.8	4.0	3.1	0.60
	Dinoflagellate	T2	5	0.021	0.044	0.42	0.12	0.17
		T4	5	0.007	0.043	0.85	0.22	0.36
Major Group Biomass (µg/L dw)	Cyanophyte	T2	5	0	0	1.1	0.34	0.51
		T4	5	0	0	1.6	0.43	0.70
	Chlorophyte	T2	5	2.3	4.3	11	5.1	3.3
		T4	5	0.72	1.7	12	3.8	4.6
	Chrysophyte	T2	5	30	43	84	54	23
		T4	5	52	63	564	163	225
	Diatom	T2	5	559	778	1,411	835	337
		T4	5	479	671	1,943	889	599
	Cryptophyte	T2	5	14	17	35	22	9.5
		T4	5	10	16	54	23	18
	Dinoflagellate	T2	5	11	28	84	34	30
		T4	5	1.1	25	61	31	23
Major Groups Relative Biomass (%)	Cyanophyte	T2	5	0	0	0.085	0.032	0.043
		T4	5	0	0	0.23	0.060	0.10
	Chlorophyte	T2	5	0.14	0.49	1.3	0.61	0.42
		T4	5	0.10	0.19	0.54	0.29	0.19
	Chrysophyte	T2	5	3.5	5.4	9.2	5.9	2.2
		T4	5	6.8	9.2	22	11	6.2
	Diatom	T2	5	83	88	92	88	3.7
		T4	5	76	82	88	82	4.9
	Cryptophyte	T2	5	1.5	2.2	3.9	2.4	0.91
		T4	5	1.7	2.1	2.3	2.0	0.22
	Dinoflagellate	T2	5	1.3	2.4	9.0	3.6	3.1
		T4	5	0.041	3.2	8.5	4.4	3.7

Table D.24: Descriptive Statistics for Phytoplankton in Koocanusa Reservoir Upstream (TN) and Downstream (T4) of the Elk River, August 2015

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of cells/L)		TN	5	10,302,297	12,672,877	15,194,906	12,690,374	2,141,882
		T4	5	13,921,250	15,199,706	15,720,385	14,893,832	781,658
Richness (no. of taxa)		TN	5	15	17	22	18	2.7
		T4	5	15	19	21	19	2.3
Biomass (µg/L dw)		TN	5	2,595	3,130	3,896	3,153	540
		T4	5	3,788	4,265	5,074	4,285	531
Major Group Density (no. of cells/L)	Cyanophyte	TN	5	0	600	600	440	261
		T4	5	0	200	40,283	9,573	17,437
	Chlorophyte	TN	5	39,683	317,464	396,830	253,971	150,063
		T4	5	79,366	357,147	714,294	341,274	258,092
	Chrysophyte	TN	5	198,415	317,664	357,147	285,918	65,145
		T4	5	317,464	396,830	555,562	404,847	98,782
	Diatom	TN	5	9,624,086	11,913,100	14,234,314	11,876,080	2,097,712
		T4	5	12,803,126	13,184,556	14,283,797	13,529,517	670,276
	Cryptophyte	TN	5	238,898	240,498	318,064	263,588	35,273
		T4	5	239,298	437,913	956,992	574,235	321,892
	Dinoflagellate	TN	5	800	2,800	43,683	10,377	18,657
		T4	5	2,600	40,883	82,766	34,386	33,167
Major Groups Relative Density (%)	Cyanophyte	TN	5	0	0.0040	0.0055	0.0034	0.0022
		T4	5	0	0.0014	0.26	0.061	0.11
	Chlorophyte	TN	5	0.39	2.2	3.3	2.0	1.1
		T4	5	0.52	2.6	4.6	2.3	1.7
	Chrysophyte	TN	5	1.4	2.8	3.1	2.4	0.81
		T4	5	2.0	2.9	3.6	2.7	0.62
	Diatom	TN	5	92	94	95	94	1.2
		T4	5	86	92	93	91	3.2
	Cryptophyte	TN	5	1.7	1.9	3.1	2.1	0.57
		T4	5	1.7	2.9	6.1	3.8	2.0
	Dinoflagellate	TN	5	0.0056	0.027	0.29	0.072	0.12
		T4	5	0.017	0.28	0.54	0.23	0.22
Major Group Biomass (µg/L dw)	Cyanophyte	TN	5	0	0.80	1.0	0.63	0.40
		T4	5	0	0.52	9.5	2.5	4.0
	Chlorophyte	TN	5	1.2	8.8	33	12	12
		T4	5	3.0	11	35	14	13
	Chrysophyte	TN	5	21	45	51	38	15
		T4	5	27	38	54	38	9.9
	Diatom	TN	5	2,487	3,049	3,802	3,049	537
		T4	5	3,574	4,118	4,873	4,099	507
	Cryptophyte	TN	5	30	37	39	36	3.6
		T4	5	39	111	174	109	53
	Dinoflagellate	TN	5	1.6	18	33	18	12
		T4	5	6.2	20	44	22	14
Major Groups Relative Biomass (%)	Cyanophyte	TN	5	0	0.025	0.030	0.020	0.013
		T4	5	0	0.012	0.25	0.062	0.11
	Chlorophyte	TN	5	0.046	0.23	0.96	0.36	0.35
		T4	5	0.080	0.25	0.69	0.31	0.25
	Chrysophyte	TN	5	0.54	1.4	2.0	1.3	0.62
		T4	5	0.66	0.84	1.4	0.91	0.30
	Diatom	TN	5	96	97	98	97	0.84
		T4	5	94	96	98	96	1.6
	Cryptophyte	TN	5	0.77	1.3	1.5	1.2	0.28
		T4	5	1.0	2.2	3.9	2.6	1.2
	Dinoflagellate	TN	5	0.061	0.69	0.84	0.55	0.32
		T4	5	0.16	0.41	0.99	0.49	0.30

Table D.25: Descriptive Statistics for Phytoplankton in Koocanusa Reservoir Upstream (TN) and Downstream (T4) of the Elk River, August 2016

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of cells/L)		TN	5	2,405,120	3,843,152	4,063,024	3,393,325	761,147
		T4	5	919,816	2,368,984	4,685,480	2,696,810	1,497,251
Richness (no. of taxa)		TN	5	24	25	26	25	0.84
		T4	5	19	21	30	23	4.4
Biomass (µg/L dw)		TN	5	435	638	807	641	146
		T4	5	199	566	1,031	550	338
Major Group Density (no. of cells/L)	Cyanophyte	TN	5	0	0	0	0	0
		T4	5	0	3,200	51,936	17,267	23,400
	Chlorophyte	TN	5	39,120	93,392	201,152	104,130	61,036
		T4	5	9,984	36,520	129,912	46,778	48,565
	Chrysophyte	TN	5	474,144	581,904	933,920	694,134	219,225
		T4	5	272,992	387,936	476,744	372,651	84,636
	Diatom	TN	5	1,607,680	2,638,944	3,095,368	2,433,347	580,516
		T4	5	541,016	1,694,856	3,833,736	2,123,555	1,386,529
	Cryptophyte	TN	5	90,440	127,528	243,488	159,834	66,711
		T4	5	44,304	121,744	226,320	132,765	81,351
	Dinoflagellate	TN	5	1,000	1,600	3,400	1,880	1,026
		T4	5	0	1,200	15,568	3,794	6,610
Major Groups Relative Density (%)	Cyanophyte	TN	5	0	0	0	0	0
		T4	5	0	0.068	1.7	0.64	0.85
	Chlorophyte	TN	5	1.4	2.4	5.0	3.1	1.7
		T4	5	0.79	1.1	2.8	1.5	0.82
	Chrysophyte	TN	5	15	23	24	20	3.9
		T4	5	7.4	18	33	18	10
	Diatom	TN	5	67	68	81	72	6.5
		T4	5	59	72	89	74	12
	Cryptophyte	TN	5	2.4	5.3	6.2	4.7	1.5
		T4	5	1.2	6.7	8.7	5.7	2.9
	Dinoflagellate	TN	5	0.025	0.042	0.089	0.057	0.029
		T4	5	0	0.068	0.33	0.11	0.13
Major Group Biomass (µg/L dw)	Cyanophyte	TN	5	0	0	0	0	0
		T4	5	0	0.76	8.7	3.2	4.2
	Chlorophyte	TN	5	1.5	6.1	12	6.6	4.1
		T4	5	0.72	2.9	5.8	2.9	2.1
	Chrysophyte	TN	5	42	44	66	51	11
		T4	5	18	28	56	34	15
	Diatom	TN	5	330	493	665	517	133
		T4	5	113	449	892	457	323
	Cryptophyte	TN	5	23	39	48	38	10
		T4	5	8.4	33	50	33	17
	Dinoflagellate	TN	5	17	30	37	29	7.0
		T4	5	0	29	46	21	20
Major Groups Relative Biomass (%)	Cyanophyte	TN	5	0	0	0	0	0
		T4	5	0	0.074	3.3	0.87	1.4
	Chlorophyte	TN	5	0.27	0.96	2.0	1.1	0.70
		T4	5	0.20	0.37	2.9	0.84	1.2
	Chrysophyte	TN	5	5.6	8.1	9.9	8.2	1.7
		T4	5	4.0	5.4	16	7.8	5.0
	Diatom	TN	5	76	81	84	80	3.3
		T4	5	57	79	93	77	14
	Cryptophyte	TN	5	5.2	5.9	7.5	6.0	0.95
		T4	5	1.2	8.2	17	8.1	5.8
	Dinoflagellate	TN	5	2.2	4.9	6.9	4.7	1.7
		T4	5	0	2.8	14	5.2	6.1

Table D.26: Mean Skewness and Kurtosis Values of Phytoplankton Lowest Practical Level Density Matrix by Transformation for the Area Upstream and Downstream of the Elk River Sampled in 2014, 2015, and 2016 (n= 30)

Transformation	Endpoint	Skewness (mean)	Kurtosis (mean)
None	Area\Row	6.218	39.562
	Taxa\Col	2.427	7.145
Log_{10}	Area\Row	0.491	-1.319
	Taxa\Col	0.665	1.402
Square root	Area\Row	4.857	27.055
	Taxa\Col	1.560	3.018
Fourth root	Area\Row	2.175	6.653
	Taxa\Col	0.974	1.585
Power 2	Area\Row	6.488	42.278
	Taxa\Col	3.296	12.580
Power 4	Area\Row	6.545	42.872
	Taxa\Col	3.940	17.119

- mean skewness and kurtosis values closest to zero.

Table D.27: Non-Metric Multidimensional Scaling (NMDS) Results for Phytoplankton Community Data (Lowest Practical Level) Displaying Percent Variance Explained by Each Axis, Monte Carlo Randomization p-values of Axis Significance, and Axis Scores for Areas Upstream and Downstream of the Elk River Sampled in 2014, 2015, and 2016

Year	Station Identifier		Log_{10} Transformation		Non-transformed	
			NMDS-1	NMDS-2	NMDS-1	NMDS-2[a]
2014	Upstream of Elk River	T2-2	0.99	-0.27	0.62	-
		T2-3	0.56	-0.34	0.29	-
		T2-4	0.96	-0.18	0.50	-
		T2-5	0.65	-0.45	0.31	-
		T2-6	0.90	-0.59	-0.49	-
	Downstream of Elk River	T4-2	0.81	-0.69	-1.02	-
		T4-3	1.06	-0.13	0.46	-
		T4-4	1.22	-0.59	0.48	-
		T4-5	0.84	-0.01	0.40	-
		T4-6	0.73	0.10	0.84	-
2015	Upstream of Elk River	TN-1	-1.07	-0.39	-1.12	-
		TN-2	-0.94	-0.87	-0.97	-
		TN-3	-0.53	-0.98	-1.33	-
		TN-4	-0.55	-0.78	-1.25	-
		TN-5	-0.44	-0.30	-0.90	-
	Downstream of Elk River	T4-2	-1.34	-0.05	-1.27	-
		T4-3	-0.66	-0.50	-1.15	-
		T4-4	-0.66	-0.64	-1.23	-
		T4-5	-1.05	-0.43	-1.24	-
		T4-6	-0.81	-0.50	-1.31	-
2016	Upstream of Elk River	TN-1	0.10	0.57	1.02	-
		TN-2	0.19	0.75	0.80	-
		TN-3	0.17	0.87	0.56	-
		TN-4	-0.02	0.77	0.67	-
		TN-5	-0.14	0.71	0.71	-
	Downstream of Elk River	T4-2	-1.09	1.30	0.37	-
		T4-3	-0.37	0.89	1.75	-
		T4-4	0.36	0.87	0.23	-
		T4-5	0.32	0.71	0.96	-
		T4-6	-0.21	1.15	2.33	-
Final Stress			**13.81**		**7.31**	
% Variance explained			**53.8**	**32.1**	**92.5**	**-**
Monte Carlo p-value			**0.004**	**0.004**	**0.012**	**-**

[a] A one dimensional (axis) solution was obtained because a two dimensional solution did not reduce stress by at least 5 units, which indicates that an additional axis does little to improve the monotonic relationship between the original dimensional space and the reduced dimensional space (McCune and Grace 2002).

Table D.28: Pearson Correlations Non-Metric Multidimensional Scaling (NMDS) Axis Scores, using Three Years (2014, 2015, 2016) of Phytoplankton Community Data from the Upstream and Downstream Areas of the Elk River with Relative Benthic Invertebrate Taxon Density

Taxa	Log_{10} Transformation				Non-transformed			
	NMDS-1 (53.8%)		NMDS-2 (32.1%)		NMDS-1 (92.5%)		NMDS-2 [a]	
	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value
Aphanocapsa delicatissima	-0.466	0.009	-0.476	0.008	-0.527	0.003	-	-
Aphanothece sp.	0.420	0.021	-0.303	0.104	-0.045	0.815	-	-
Planktolyngbya limnetica	-0.184	0.331	0.517	0.003	0.311	0.095	-	-
Chlamydomonas spp.	0.541	0.002	-0.113	0.553	-0.095	0.618	-	-
Oocystis lacustris	-0.284	0.129	-0.667	0.000	-0.624	0.000	-	-
Paulschulzia pseudovolvox	0.198	0.295	0.230	0.221	0.168	0.375	-	-
Scenedesmus denticulatus	-0.027	0.888	0.587	0.001	0.239	0.203	-	-
Kichnerella lunaris	0.100	0.599	0.589	0.001	0.209	0.267	-	-
Collodictyon sp.	0.020	0.915	0.361	0.050	0.254	0.176	-	-
Ankistrodesmus spiralis	-0.167	0.378	0.433	0.017	0.232	0.216	-	-
Bitrichia chodatii	0.495	0.005	0.053	0.782	0.137	0.472	-	-
Chrysochromulina laurentiana	0.427	0.019	-0.314	0.091	-0.186	0.324	-	-
Chrysochromulina parva	0.860	0.000	0.365	0.048	-0.084	0.659	-	-
Chrysococcus sp.	0.182	0.335	0.363	0.049	-0.079	0.679	-	-
Chrysolkos skuja	0.208	0.270	0.254	0.176	0.151	0.427	-	-
Chrysostephanospaera globulifera	0.111	0.558	-0.137	0.472	-0.352	0.057	-	-
Kephyrion sp.	-0.071	0.711	0.188	0.320	-0.440	0.015	-	-
Dinobryon bavaricum	-0.084	0.658	0.921	0.000	0.504	0.005	-	-
Dinobryon sertularia	0.358	0.052	-0.306	0.101	-0.304	0.103	-	-
Dinobryon sociale	0.287	0.124	-0.395	0.031	-0.262	0.162	-	-
Mallomonas crassisquama	0.362	0.050	-0.495	0.005	-0.170	0.369	-	-
Salpingoeca frequentissima	-0.106	0.578	-0.851	0.000	-0.657	0.000	-	-
Stichogloea spp.	0.428	0.018	-0.314	0.091	-0.186	0.324	-	-
Cyclotella bodanica	0.835	0.000	-0.157	0.408	0.082	0.666	-	-
Cyclotella michiganiana	-0.815	0.000	0.340	0.066	-0.182	0.336	-	-
Cyclotella ocellata	0.454	0.012	-0.230	0.222	0.000	0.998	-	-
Cyclotella pseudostelligera	-0.488	0.006	-0.751	0.000	-0.942	0.000	-	-
Cyclotella stelligera	0.831	0.000	-0.168	0.376	0.104	0.584	-	-
Fragilaria construens	0.734	0.000	0.577	0.001	0.423	0.020	-	-
Rhizosolenia eriense	0.142	0.453	-0.278	0.137	-0.389	0.034	-	-
Synedra acus	-0.869	0.000	0.205	0.276	-0.629	0.000	-	-
Synedra ulna	0.900	0.000	0.031	0.870	0.256	0.172	-	-
Tabellaria fenestrata	0.193	0.307	0.423	0.020	0.427	0.019	-	-
Tabellaria flocculsa	-0.276	0.139	0.250	0.182	-0.079	0.678	-	-
Cryptomonas erosa	0.437	0.016	0.466	0.009	0.498	0.005	-	-
Cryptomonas pusilla	-0.234	0.214	-0.265	0.157	-0.396	0.030	-	-
Cryptomonas reflexa	0.303	0.104	-0.286	0.125	-0.082	0.668	-	-
Cryptomonas rostratiformis	-0.042	0.826	-0.039	0.836	-0.078	0.683	-	-
Katablepharis ovalis	0.371	0.043	-0.233	0.216	-0.398	0.029	-	-
Rhodomonas minuta	-0.400	0.028	-0.463	0.010	-0.571	0.001	-	-
Ceratium hirundenella	0.728	0.000	0.263	0.160	0.348	0.060	-	-
Gymnodinium sp.	-0.297	0.111	-0.007	0.969	-0.409	0.025	-	-
Peridinium pusillum	0.115	0.544	-0.344	0.063	-0.444	0.014	-	-

- Pearson correlation coefficients greater than an absolute value of 0.5.
- Pearson correlation with p-value less than 0.05.

[a] A one dimensional (axis) solution was obtained because a two dimensional solution did not reduce stress by at least 5 units, which indicates that an additional axis does little to improve the monotonic relationship between the original dimensional space and the reduced dimensional space (McCune and Grace 2002).

Zooplankton

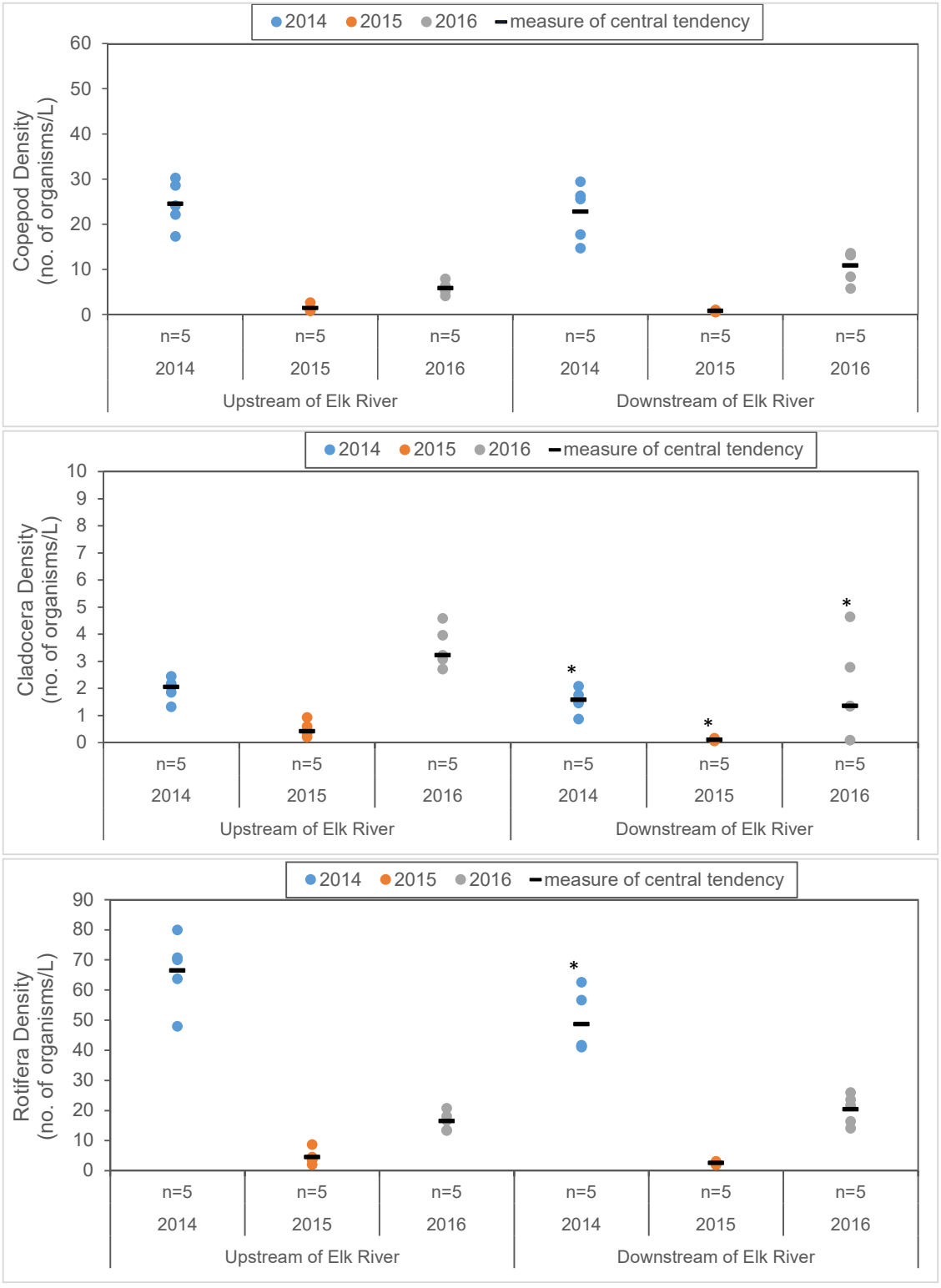

Figure D.7: Copepod Density, Cladocera Density, and Rotifera Density in Koocanusa Reservoir, August 2014, 2015, and 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

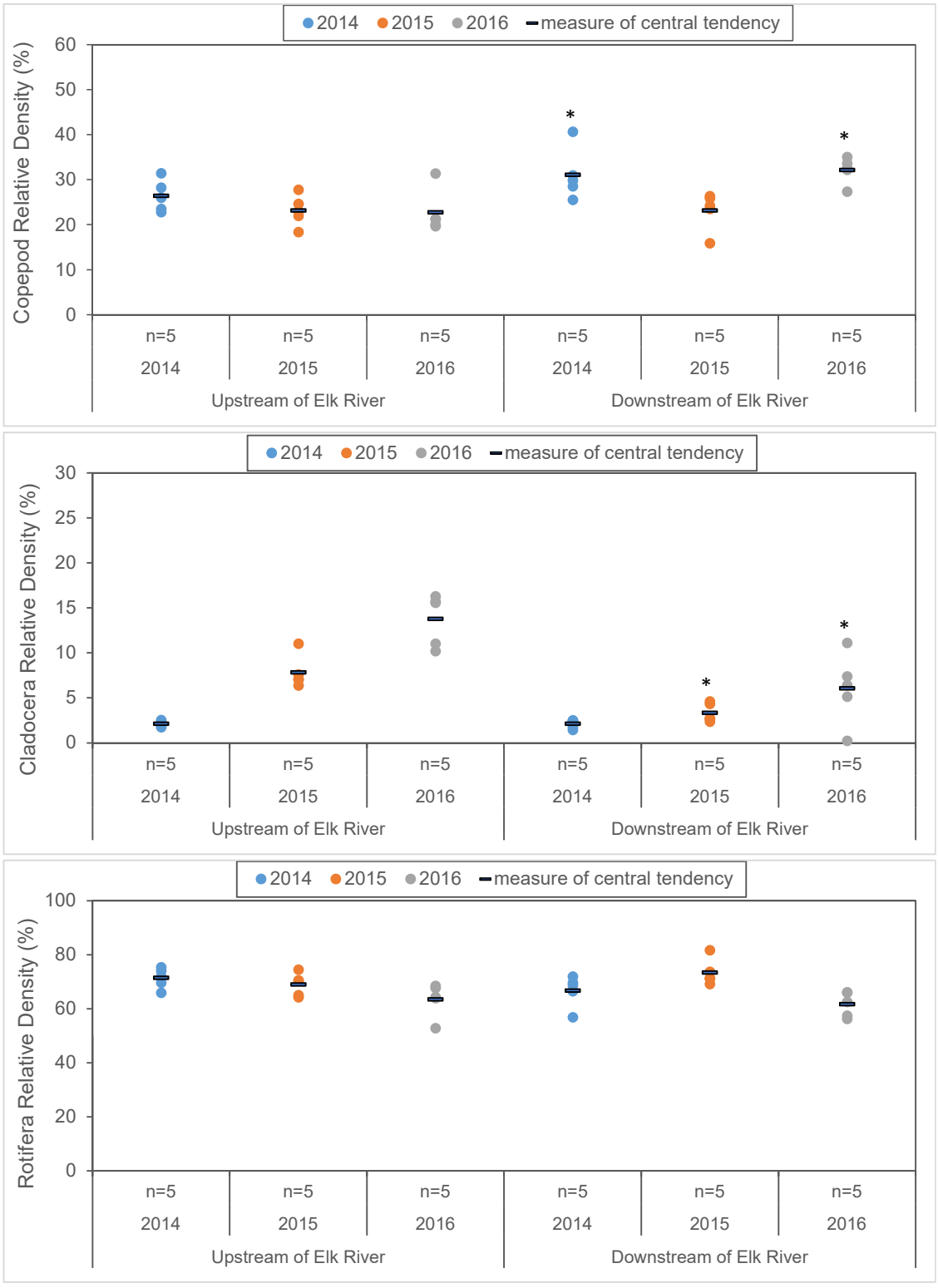

Figure D.8: Copepod Relative Density, Cladocera Relative Density, and Rotifera Relative Density in Koocanusa Reservoir, August 2014, 2015, and 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

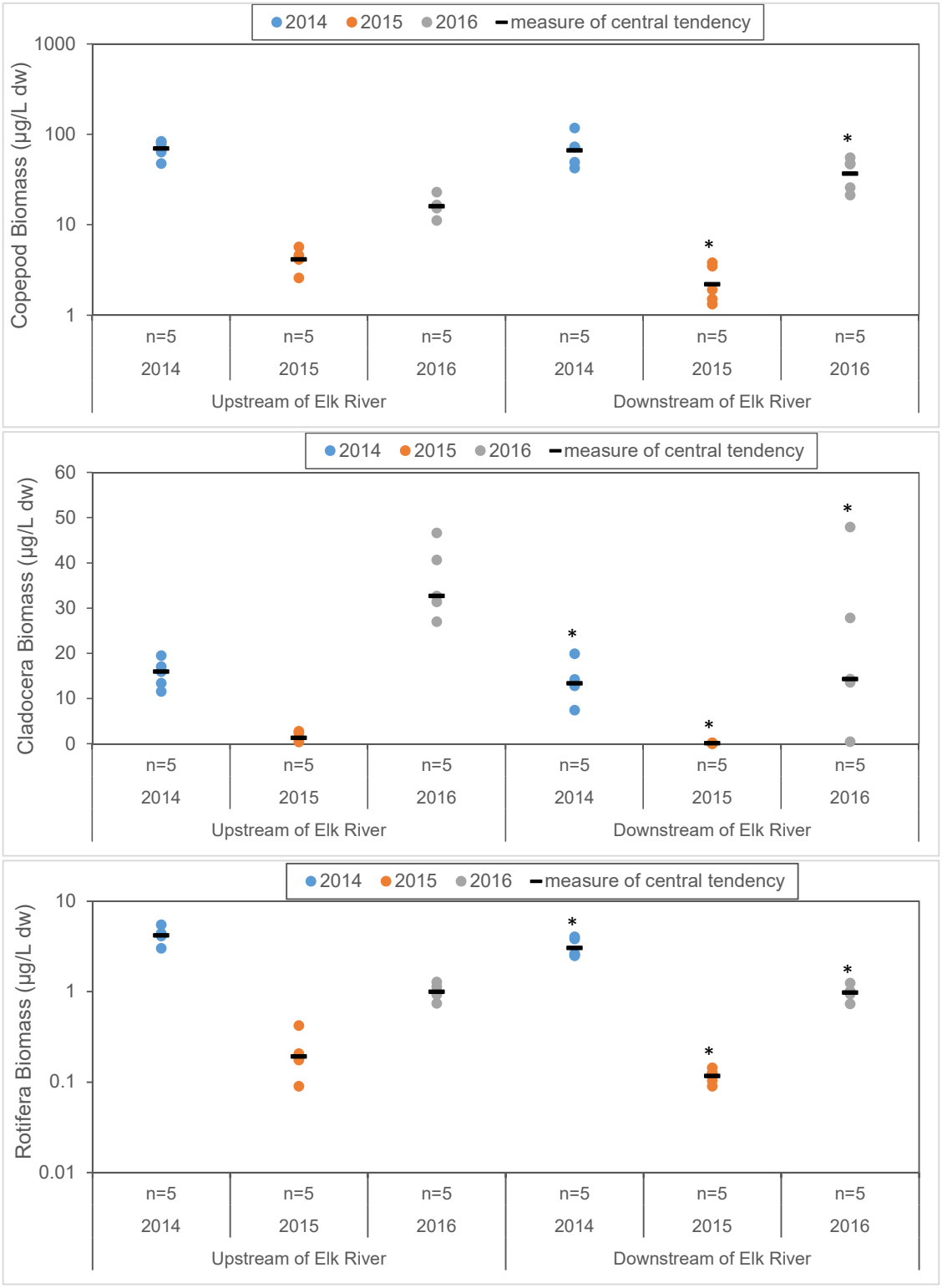

Figure D.9: Copepod Biomass, Cladocera Biomass, and Rotifera Biomass in Koocanusa Reservoir, August 2014, 2015, and 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

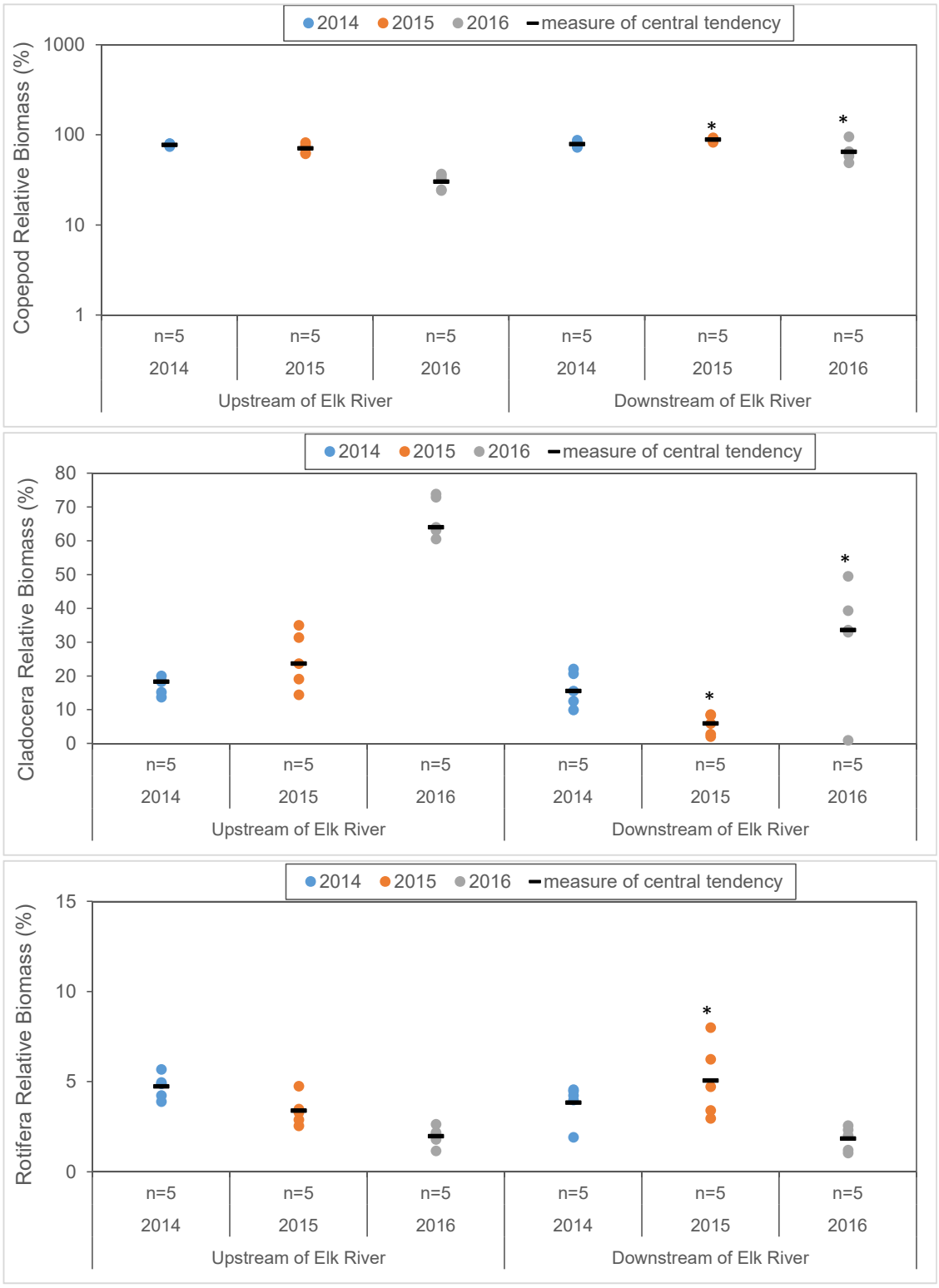

Figure D.10: Copepod Relative Biomass, Cladocera Relative Biomass, and Rotifera Relative Biomass in Koocanusa Reservoir, August 2014, 2015, and 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016.
' * ' indicates the downstream area was significantly different from the upstream area in the same year.

Table D.29: Zooplankton Community and Biomass Results as Provided by the Analytical Laboratory, August 2014

Species	Sex	Upstream of Elk River										Downstream of Elk River									
		T2-2		T2-3		T2-4		T2-5		T2-6		T4-2		T4-3		T4-4		T4-5		T4-6	
		density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass
		#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw
Calanoid nauplii	-	1.1	0.083	5.6	0.41	4.8	0.35	3.9	0.28	2.8	0.21	1.8	0.13	1.2	0.086	1.3	0.093	1.8	0.13	4.6	0.33
Calanoid nauplii	-	0.52	0.37	1.7	1.2	2.1	1.5	0.87	0.62	0.73	0.52	0.56	0.40	0.40	0.28	0.35	0.25	0.59	0.42	2.1	1.5
Calanoid copepodids	-	0.61	2.9	2.6	12	2.7	13	2.0	9.4	2.3	11	0.68	3.3	0.26	1.2	0.56	2.7	0.61	2.9	1.7	8.4
Calanoid copepodids	-	0.99	7.9	2.8	23	2.1	17	1.9	15	2.4	19	0.80	6.4	0.66	5.3	0.73	5.9	0.87	7.0	3.1	25
Cyclopoid nauplii	-	3.3	0.19	4.2	0.25	4.5	0.27	3.5	0.20	3.9	0.23	3.2	0.19	3.9	0.23	2.4	0.14	2.7	0.16	2.5	0.15
Cyclopoid nauplii	-	3.5	0.55	4.5	0.70	3.7	0.58	3.5	0.55	4.1	0.64	3.6	0.56	4.4	0.69	1.6	0.25	2.1	0.33	1.5	0.23
Cyclopoid copepodids	-	3.6	7.3	4.7	9.7	4.0	8.1	3.2	6.6	3.9	7.9	7.6	16	8.3	17	4.6	9.3	5.6	11	4.9	9.9
Cyclopoid copepodids	-	1.7	7.1	1.5	6.1	1.4	5.6	1.1	4.6	0.99	4.1	5.0	21	4.6	19	1.7	7.1	1.8	7.4	4.5	19
Diaptomus sicilis	M	0	0	0	0	0.024	0.25	0.035	0.37	0.012	0.12	0	0	0.012	0.12	0	0	0.024	0.25	0.024	0.25
Diaptomus oregonensis	M	0.25	2.8	0.68	7.9	0.87	10	0.55	6.4	0.95	11	0.63	7.3	0.67	7.7	0.31	3.5	0.49	5.7	1.7	19
Diaptomus oregonensis	F	0.25	3.6	0.45	6.5	0.61	8.9	0.41	6.0	0.61	8.9	0.21	3.1	0.28	4.1	0.24	3.4	0.35	5.2	0.75	11
Diaptomus oregonensis	eggs	0.13	0	0.61	0	0.19	0	0	0	0	0	0.28	0	0.18	0	0	0	0.12	0	0.14	0
Total Calanoid loose eggs	eggs	0.094	0	0	0	2.1	0	2.1	0	1.9	0	0.75	0	0.38	0	0	0	0.16	0	1.3	0
Epischura lacustris	M	0	0	0	0	0	0	0.012	0.10	0.012	0.10	0	0	0.024	0.20	0	0	0	0	0	0
Epischura lacustris	F	0	0	0.012	0.010	0	0	0.012	0.10	0	0	0	0	0	0	0	0	0	0	0	0
Cyclops bicuspidatus thomasi	M	0.58	4.0	0.66	4.6	0.61	4.2	0.38	2.6	0.47	3.3	0.47	3.3	0.55	3.8	0.38	2.6	0.40	2.8	0.40	2.8
Cyclops bicuspidatus thomasi	F	0.90	11	0.82	9.7	1.2	14	0.93	11	0.95	11	1.0	12	1.1	13	0.61	7.2	0.47	5.5	1.7	20
Cyclops bicuspidatus thomasi	eggs	0.40	0	1.6	0	1.3	0	0.28	0	0.48	0	0.85	0	0.45	0	0.11	0	0.035	0	0.024	0
Orthocyclops modestus	F	0	0	0.024	0.28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cyclopoid loose eggs	eggs	1.4	0	3.1	0	1.7	0	0.61	0	1.1	0	0.28	0	0.000	0.000	0.071	0	0.16	0	0.31	0
Total Copepod Biomass	-	-	**48**	-	**83**	-	**84**	-	**64**	-	**78**	-	**62**	-	**72**	-	**43**	-	**49**	-	**118**
Daphnia galeata mendotae	F	1.1	11	1.8	19	1.5	16	1.6	17	1.2	13	1.3	14	1.9	20	1.2	13	0.69	7.4	1.2	13
Daphnia galeata mendotae	eggs	0.15	0	0.35	0	0.21	0	0.39	0	0.34	0	0.28	0	0.18	0	0.012	0	0.059	0	0.13	0
Bosmina longirostris	F	0	0	0.024	0.0086	0	0	0	0	0	0	0.047	0.017	0.024	0.0086	0.024	0.0086	0	0	0.047	0.017
Bosmina longirostris	eggs	0	0	0	0	0	0	0	0	0	0	0.012	0	0.012	0	0.012	0	0	0	0.024	0
Diaphanosoma birgei	F	0.22	0.10	0.56	0.25	0.54	0.24	0.56	0.25	0.63	0.29	0.19	0.085	0.14	0.063	0.24	0.11	0.16	0.074	0.46	0.21
Diaphanosoma birgei	eggs	0.012	0	0	0	0.12	0	0	0	0.035	0	0.024	0	0	0	0.024	0	0	0	0.024	0
Leptadora kindtii	-	0.012	0.014	0.071	0.082	0.024	0.027	0.024	0.027	0.035	0.041	0.047	0.055	0.024	0.027	0	0	0.024	0.027	0.059	0.069
Total Cladocera loose eggs	eggs	0.024	0	0.26	0	0.12	0	0.16	0	0.16	0	0.047	0	0.12	0	0.047	0	0.047	0	0.19	0
Total Cladocera Biomass	-	-	**12**	-	**20**	-	**16**	-	**17**	-	**13**	-	**14**	-	**20**	-	**13**	-	**7.5**	-	**13**
Keratella cochlearis (large)	-	0	0	0	0	0	0	0	0	0.47	0.11	0	0	0	0	0	0	0	0	0	0
Keratella cochlearis (large)	eggs	0	0	0	0	0	0	0	0	0.24	0	0	0	0	0	0	0	0	0	0	0
Keratella cochlearis	-	8.0	0.82	13	1.4	12	1.2	9.6	0.99	21	2.2	13	1.3	14	1.4	7.1	0.73	4.0	0.41	3.5	0.36
Keratella cochlearis	eggs	0.94	0	1.2	0	0.71	0	0.47	0	1.9	0	0.35	0	0.35	0	0.12	0	0	0	0.12	0
Kellicottia longispina	-	0.47	0.0071	1.4	0.021	0.94	0.014	2.8	0.042	2.8	0.042	2.7	0.041	2.0	0.030	1.6	0.025	0.94	0.014	0.47	0.0071
Kellicottia longispina	eggs	0	0	0.24	0	0	0	0.71	0	0.47	0	0.12	0	0.12	0	0	0	0	0	0	0
Polyarthra remata	-	0	0	0.94	0.040	0.71	0.030	0.71	0.030	0.71	0.030	0.24	0.010	0.47	0.020	0.35	0.015	0.59	0.025	0.12	0.0050
Polyarthra vulgaris	-	8.2	0.54	12	0.82	19	1.3	16	1.1	17	1.1	21	1.4	18	1.2	15	1.0	14	0.95	10	0.68
Polyarthra vulgaris	eggs	0	0	0	0	0.24	0	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0
Keratella taurocephala	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.12	0.019	0	0
Trichocerca sp. (sp 1)	-	0.24	0.039	0	0	0	0	0	0	0	0	0.24	0.039	0	0	0	0	0	0	0	0
Trichocerca (sp 2)	-	0.24	0.039	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropus stylifer	-	3.3	0.14	4.0	0.18	4.5	0.20	6.1	0.27	2.6	0.11	1.6	0.072	2.1	0.093	1.5	0.067	2.7	0.12	2.9	0.13
Keratella crassa	-	1.9	0.18	3.1	0.29	0.94	0.088	3.3	0.31	4.5	0.42	0.35	0.033	2.1	0.20	0.82	0.077	1.4	0.13	4.5	0.42
Keratella crassa	eggs	0	0	0.71	0	0.24	0	0.24	0	1.2	0	0.12	0	0.12	0	0	0	0.12	0	0.35	0
Ascomorpha ovalis	-	2.1	0.096	5.6	0.26	4.5	0.20	5.4	0.24	7.3	0.33	4.3	0.20	3.8	0.17	5.1	0.23	3.2	0.14	1.5	0.069
Collotheca	-	20	1.1	16	0.83	19	0.99	16	0.86	16	0.86	18	0.93	12	0.64	8.1	0.42	11	0.56	11	0.57
Collotheca sp.(eggs)	eggs	8.2	0	6.8	0	6.6	0	6.6	0	8.2	0	0	0	4.9	0	2.5	0	2.4	0	3.2	0
Synchaeta sp.	-	0.24	0.011	2.8	0.13	4.9	0.22	3.5	0.16	4.0	0.18	0	0	0.24	0.011	0.24	0.011	0.12	0.0053	3.9	0.17
Keratella sp. (Large)	-	0	0	0.24	0.047	0.24	0.047	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Rotifer Biomass	-	-	**2.9**	-	**4.0**	-	**4.2**	-	**4.0**	-	**5.4**	-	**4.0**	-	**3.7**	-	**2.6**	-	**2.4**	-	**2.4**
Total Biomass (µg/L)			**62**	**-**	**106**	**-**	**104**	**-**	**85**	**-**	**97**	**-**	**81**	**-**	**96**	**-**	**58**	**-**	**59**	**-**	**133**

Table D.30: Zooplankton Community and Biomass Results as Provided by the Analytical Laboratory, August 2015

Species	Sex	Upstream of Elk River										Downstream of Elk River									
		TN-1		TN-2		TN-3		TN-4		TN-5		T4-2		T4-3		T4-4		T4-5		T4-6	
		density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass
		#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw
Calanoid nauplii	-	0.73	0.053	0.24	0.02	0.19	0.014	0.24	0.017	0.16	0.012	0.082	0.006	0.041	0.0030	0.029	0.0021	0.053	0.0039	0.035	0.0026
Calanoid nauplii	-	0.33	0.23	0.14	0.10	0.12	0.088	0.094	0.067	0.11	0.079	0.088	0.063	0.012	0.0083	0.065	0.046	0.076	0.054	0.11	0.079
Calanoid copepodids	-	0.26	1.2	0.12	0.59	0.12	0.57	0.12	0.59	0.065	0.31	0.088	0.42	0.029	0.14	0.059	0.28	0.053	0.25	0.076	0.37
Calanoid copepodids	-	0.16	1.3	0.15	1.2	0.11	0.90	0.12	0.99	0.065	0.52	0.11	0.90	0.053	0.42	0	0	0.0059	0.047	0.035	0.28
Cyclopoid nauplii	-	0.25	0.015	0.16	0.0094	0.094	0.0056	0.11	0.0066	0.12	0.0069	0.13	0.0076	0.059	0.0035	0.047	0.0028	0.059	0.0035	0.053	0.0031
Cyclopoid nauplii	-	0.24	0.037	0.13	0.020	0.071	0.011	0.16	0.026	0.059	0.0091	0.15	0.023	0.15	0.024	0.15	0.023	0.088	0.014	0.18	0.028
Cyclopoid copepodids	-	0.51	1.0	0.15	0.31	0.11	0.22	0.15	0.31	0.10	0.20	0.14	0.29	0.35	0.71	0.15	0.30	0.11	0.23	0.16	0.32
Cyclopoid copepodids	-	0.15	0.63	0.10	0.41	0.047	0.19	0.035	0.15	0.076	0.32	0.065	0.27	0.22	0.90	0.071	0.29	0.10	0.41	0.11	0.44
Diaptomus sicilis	M	0	0	0.012	0.12	0.047	0.49	0.024	0.25	0.012	0.12	0.047	0.49	0.012	0.12	0.012	0.12	0.024	0.25	0.012	0.12
Diaptomus sicilis	F	0	0	0.012	0.12	0.035	0.37	0.047	0.49	0	0	0.012	0.12	0.012	0.12	0.012	0.12	0.024	0.25	0	0
Diaptomus sicilis	eggs	0	0	0.076	0	0.071	0	0	0	0	0	0	0	0	0	0.053	0	0.065	0	0	0
Diaptomus oregonensis	M	0.047	0.54	0	0	0.024	0.27	0.024	0.27	0.024	0.27	0.024	0.27	0.012	0.14	0.0059	0.068	0	0	0	0
Diaptomus oregonensis	F	0.024	0.34	0.035	0.52	0.059	0.86	0.029	0.43	0.029	0.43	0.012	0.17	0.024	0.34	0	0	0	0	0.0059	0.086
Diaptomus oregonensis	eggs	0	0	0.047	0	0.11	0	0.17	0	0.15	0	0.071	0	0.065	0	0	0	0	0	0	0
Epischura lacustris	M	0.012	0.10	0.024	0.20	0.012	0.10	0.012	0.10	0	0	0.0059	0.051	0.0059	0.051	0	0	0	0	0.0059	0.051
Epischura lacustris	F	0	0	0.029	0.25	0.012	0.10	0.012	0.10	0.0059	0.051	0.035	0.31	0.0059	0.051	0	0	0	0	0.0059	0.051
Total Calanoid loose eggs	eggs	0	0	0	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclops bicuspidatus thomasi	M	0	0	0.024	0.17	0.018	0.13	0.018	0.13	0.0059	0.042	0.012	0.084	0.0059	0.042	0	0	0	0	0.012	0.084
Cyclops bicuspidatus thomasi	F	0.012	0.14	0.018	0.21	0.024	0.28	0.018	0.21	0.018	0.21	0.029	0.35	0.035	0.42	0.0059	0.069	0	0	0	0
Cyclops bicuspidatus thomasi	eggs	0	0	0.11	0	0.047	0	0.088	0	0	0	0.11	0	0.14	0	0	0	0	0	0	0
Tropocyclops sp.	F	0	0	0	0	0.0059	0.029	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cyclopoid loose eggs	eggs	0	0	0	0	0	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0
Total Copepod Biomass	-	-	**5.7**	-	**4.3**	-	**4.6**	-	**4.1**	-	**2.6**	-	**3.8**	-	**3.5**	-	**1.3**	-	**1.5**	-	**1.9**
Daphnia galeata mendotae	F	0.24	2.5	0.21	2.2	0.094	1.0	0.12	1.2	0.035	0.37	0.018	0.19	0.0059	0.062	0	0	0.012	0.12	0.012	0.12
Daphnia galeata mendotae	eggs	0.15	0	0.094	0	0.065	0	0.076	0	0.018	0	0.012	0	0	0	0	0	0	0	0.018	0
Bosmina longirostris	F	0.082	0.030	0.071	0.026	0.029	0.011	0.0059	0.0022	0.024	0.0086	0.035	0.013	0.018	0.0065	0.012	0.0043	0.018	0.0065	0.0059	0.0022
Bosmina longirostris	eggs	0.047	0	0.0059	0	0	0	0	0	0.018	0	0	0	0	0	0.0059	0	0	0	0	0
Diaphanosoma birgei	F	0.62	0.28	0.32	0.15	0.30	0.13	0.22	0.098	0.16	0.071	0.12	0.053	0.082	0.037	0.059	0.026	0.059	0.026	0.14	0.061
Diaphanosoma birgei	eggs	0.082	0	0.0059	0	0.029	0	0.0059	0	0.012	0	0.076	0	0	0	0	0	0	0	0.018	0
Total Cladocera loose eggs	eggs	0.12	0	0.13	0	0.14	0	0.059	0	0.13	0	0.082	0	0.059	0	0	0	0	0	0	0
Total Cladocera Biomass	-	-	**2.8**	-	**2.4**	-	**1.1**	-	**1.3**	-	**0.45**	-	**0.25**	-	**0.11**	-	**0.031**	-	**0.16**	-	**0.19**
Keratella cochlearis	-	0.12	0.012	0.12	0.012	0	0	0.12	0.012	0	0	0	0	0	0	0.12	0.012	0	0	0	0
Keratella cochlearis	eggs	0	0	0	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0
Kellicottia longispina	-	0.59	0.0088	0.12	0.0018	0.24	0.0035	0	0	0.12	0.0018	0.12	0.0018	0.35	0.0053	0.12	0.0018	0	0	0.24	0.0035
Kellicottia longispina	eggs	0.12	0	0	0	0	0	0	0	0	0	0	0	0.47	0	0	0	0	0	0	0
Polyarthra remata	-	2	0.08	0.4	0.02	0.94	0.040	0.71	0.030	0.71	0.030	1.2	0.050	0.59	0.025	0.94	0.040	1.4	0.060	0.59	0.025
Polyarthra remata	eggs	0.12	0	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polyarthra vulgaris	-	0	0	0.118	0.0050	0	0	0.12	0.0050	0	0	0	0	0	0	0	0	0	0	0.12	0.0050
Gastropus stylifer	-	0.24	0.010	0	0	0.35	0.016	0	0	0	0	0	0	0.12	0.0052	0	0	0	0	0	0
Ascomorpha ovalis	-	1.3	0.058	0.35	0.016	0.35	0.016	0.94	0.043	0.24	0.011	0.12	0.0053	0	0	0	0	0	0	0	0
Collotheca	-	4.2	0.22	2.1	0.11	2.4	0.12	1.8	0.092	0.82	0.043	1.3	0.067	1.8	0.092	0.71	0.037	1.5	0.079	1.1	0.055
Collotheca sp.	eggs	1.8	0	0.35	0	0.82	0	0.71	0	0.12	0	0.24	0	0.59	0	0.47	0	0.82	0	0.59	0
Synchaeta sp.	-	0.24	0.011	0.35	0.016	0.24	0.011	0.12	0.0053	0.12	0.0053	0	0	0	0	0	0	0.12	0.0053	0.35	0.016
Keratella sp.	-	0.12	0.024	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Rotifer Biomass	-	-	**0.42**	-	**0.18**	-	**0.21**	-	**0.19**	-	**0.091**	-	**0.12**	-	**0.13**	-	**0.091**	-	**0.14**	-	**0.10**
Total Biomass (µg/L)			**8.9**	**-**	**6.9**	**-**	**6.0**	**-**	**5.7**	**-**	**3.1**	**-**	**4.2**	**-**	**3.7**	**-**	**1.5**	**-**	**1.8**	**-**	**2.2**

Table D.31: Zooplankton Community and Biomass Results as Provided by the Analytical Laboratory, August 2016

Species	Sex	Upstream of Elk River										Downstream of Elk River									
		TN-1		TN-2		TN-3		TN-4		TN-5		T4-2		T4-3		T4-4		T4-5		T4-6	
		density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass	density	Biomass
		#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw	#/L	µg/L dw
Calanoid nauplii	-	0.76	0.056	1.6	0.12	0.71	0.052	0.93	0.068	0.90	0.066	1.1	0.083	2.0	0.15	1.8	0.13	1.2	0.086	1.1	0.077
Calanoid nauplii	-	0.58	0.41	0.82	0.58	0.38	0.27	0.65	0.46	0.53	0.38	0.71	0.50	0.89	0.63	1.3	0.93	0.94	0.67	0.40	0.28
Calanoid copepodids	-	0.36	1.8	0.78	3.7	0.31	1.5	0.35	1.7	0.36	1.8	1.2	5.8	0.82	4.0	1.2	5.5	0.56	2.7	0.45	2.1
Calanoid copepodids	-	0.13	1.0	0.26	2.1	0.024	0.19	0.20	1.6	0.16	1.3	1.4	11	0.71	5.7	0.89	7.2	0.38	3.0	0.33	2.6
Cyclopoid nauplii	-	0.72	0.042	1.1	0.064	0.73	0.043	1.4	0.083	1.1	0.065	0.66	0.039	0.73	0.043	0.38	0.022	0.42	0.025	0.35	0.021
Cyclopoid nauplii	-	0.34	0.053	0.59	0.091	0.31	0.048	0.78	0.12	0.43	0.068	0.38	0.058	0.28	0.044	0.31	0.048	0.40	0.062	0.14	0.022
Cyclopoid copepodids	-	0.86	1.7	0.94	1.9	0.72	1.5	0.83	1.7	0.85	1.7	3.2	6.5	3.7	7.5	3.7	7.6	2.4	4.9	1.5	3.0
Cyclopoid copepodids	-	0.58	2.4	0.78	3.2	0.40	1.7	0.47	1.9	0.40	1.7	2.6	11	2.6	11	2.0	8.5	1.3	5.5	0.68	2.8
Diaptomus sicilis	M	0.047	0.49	0.071	0.74	0	0	0	0	0	0	0.12	1.2	0.21	2.2	0.12	1.2	0.071	0.74	0.047	0.49
Diaptomus sicilis	F	0.071	0.74	0.16	1.7	0	0	0.024	0.25	0.035	0.37	0.15	1.6	0.094	0.98	0.19	2.0	0.024	0.25	0.071	0.74
Diaptomus sicilis	eggs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diaptomus oregonensis	M	0.035	0.41	0.094	1.1	0.024	0.27	0.035	0.41	0.071	0.81	0.22	2.6	0.16	1.9	0.31	3.5	0.21	2.4	0.21	2.4
Diaptomus oregonensis	F	0.059	0.86	0.071	1.0	0.024	0.34	0.035	0.52	0.094	1.4	0.26	3.8	0.14	2.1	0.19	2.7	0.082	1.2	0.18	2.6
Diaptomus oregonensis	eggs	0	0	0	0	0	0	0	0	0.11	0	0	0	0	0	0	0	0	0	0	0
Epischura lacustris	M	0.035	0.31	0.047	0.41	0.012	0.10	0.024	0.20	0.012	0.10	0.13	1.1	0.12	1.0	0.071	0.61	0	0	0.035	0.31
Epischura lacustris	F	0	0	0	0	0.012	0.10	0.035	0.31	0	0	0.059	0.51	0	0	0.024	0.20	0.012	0.10	0.035	0.31
Total Calanoid loose eggs	eggs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclops bicuspidatus thomasi	M	0.28	2.0	0.16	1.2	0.20	1.4	0.14	1.0	0.31	2.2	0.53	3.8	0.61	4.4	0.16	1.2	0.13	0.92	0.13	0.92
Cyclops bicuspidatus thomasi	F	0.36	4.3	0.42	5.0	0.32	3.7	0.51	6.0	0.29	3.5	0.53	6.2	0.54	6.4	0.47	5.5	0.27	3.2	0.21	2.5
Cyclops bicuspidatus thomasi	eggs	0	0	0	0	0.11	0	0	0	0	0	0	0	0	0	0.14	0	0	0	0	0
Tropocyclops sp.	F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cyclopoid loose eggs	eggs	0	0	0	0	1.1	0	0.26	0	0	0	0	0	0.35	0	0.47	0	0.24	0	0.47	0
Total Copepod Biomass	-	-	**17**	-	**23**	-	**11**	-	**16**	-	**15**	-	**55**	-	**48**	-	**47**	-	**26**	-	**21**
Daphnia galeata mendotae	F	2.5	27	3.8	41	3.1	33	2.9	31	4.4	47	2.6	28	4.5	48	0.047	0.50	1.3	14	1.4	14
Daphnia galeata mendotae	eggs	0.024	0	0.024	0	0.24	0	0.012	0	0.012	0	0	0	0	0	0	0	0	0	0	0
Bosmina longirostris	F	0.11	0.039	0.024	0.0086	0.094	0.034	0.071	0.026	0.047	0.017	0.11	0.039	0.12	0.043	0.047	0.017	0.035	0.013	0.012	0.0043
Bosmina longirostris	eggs	0.012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diaphanosoma birgei	F	0.059	0.026	0.12	0.053	0.059	0.026	0.047	0.021	0.13	0.058	0.047	0.021	0.024	0.011	0	0	0.035	0.016	0	0
Diaphanosoma birgei	eggs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cladocera loose eggs	eggs	0.35	0	2.5	0	0.66	0	1.6	0	1.6	0	0.80	0	1.9	0	1.3	0	0.24	0	0.94	0
Ceriodaphnia sp.	-	0.012	0.034	0	0	0	0	0.012	0.034	0	0	0	0	0	0	0	0	0	0	0	0
Leptadora kindtii	-	0	0	0	0	0	0	0	0	0.035	0.041	0	0	0	0	0	0	0	0	0	0
Scapholeberis sp.	F	0	0	0	0	0	0	0	0	0	0	0.012	0.0050	0	0	0	0	0	0	0	0
Total Cladocera Biomass	-	-	**27**	-	**41**	-	**33**	-	**31**	-	**47**	-	**28**	-	**48**	-	**0.52**	-	**14**	-	**14**
Keratella cochlearis (large)	-	0	0	0	0	0	0	0.12	0.024	0	0	0	0	0	0	0	0	0	0	0	0
Keratella cochlearis	-	5.5	0.57	3.9	0.40	6.2	0.64	7.1	0.73	7.1	0.73	3.3	0.34	2.6	0.27	6.3	0.65	5.4	0.56	3.1	0.31
Keratella cochlearis	eggs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kellicottia longispina	-	4.7	0.071	3.8	0.056	2.0	0.030	4.0	0.060	4.2	0.063	7.5	0.11	9.0	0.14	11	0.17	4.8	0.072	4.0	0.060
Kellicottia longispina	eggs	0.12	0	0.35	0	0.24	0	0.47	0	0.12	0	0.35	0	0.35	0	1.1	0	0.12	0	0.12	0
Polyarthra remata	-	0	0	0	0	0	0	1.0	0.043	0	0	0	0	0	0	0	0	0	0	0	0
Polyarthra remata	eggs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polyarthra vulgaris	-	0.066	0	0.066	0.0028	0.066	0.0028	0.066	0.0028	0.066	0.0028	0.066	0.0028	0.066	0.0028	0.066	0.0028	0.066	0.0028	0.066	0.0028
Gastropus stylifer	-	0	0	0	0	0.12	0.0052	0.35	0.016	0.24	0.010	0	0	0.47	0.021	0.12	0.0052	0.35	0.016	0.24	0.010
Ascomorpha ovalis	-	0.24	0.011	0.59	0.027	0.82	0.037	0.47	0.021	0.71	0.032	0.94	0.043	0.71	0.032	0.35	0.016	0.35	0.016	0.24	0.011
Collotheca	-	6.1	0.32	5.1	0.26	4.1	0.21	7.5	0.39	5.8	0.30	9.9	0.51	11	0.56	7.8	0.40	5.4	0.28	6.5	0.34
Collotheca sp.	eggs	3.2	0	2.9	0	2.4	0	3.3	0	3.1	0	3.9	0	5.8	0	5.8	0	3.2	0	3.5	0
Synchaeta sp.	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Keratella sp.	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monostyla sp.	-	0	0	0	0	0	0	0.12	0.0061	0	0	0	0	0	0	0	0	0	0	0	0
Total Rotifer Biomass	-	-	**0.97**	-	**0.75**	-	**0.93**	-	**1.3**	-	**1.1**	-	**0.67**	-	**1.0**	-	**1.2**	-	**0.94**	-	**0.73**
Total Biomass (µg/L)	-	-	**45**	-	**64**	-	**45**	-	**49**	-	**63**	-	**84**	-	**97**	-	**49**	-	**40**	-	**36**

Table D.32: Zooplankton Community Density Data (no. of organisms/L), August 2014

	Species	Upstream of the Elk River					Downstream of the Elk River				
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	*Calanoid copepodids*	1.6	5.4	4.8	3.8	4.7	1.5	0.92	1.3	1.5	4.8
	Calanoid nauplii	1.7	7.3	6.9	4.7	3.6	2.4	1.6	1.6	2.4	6.7
	Cyclopoid copepodids	5.3	6.2	5.4	4.3	4.9	13	13	6.3	7.4	9.4
	Cyclopoid nauplii	6.8	8.7	8.2	7.0	8.0	6.8	8.3	4.0	4.8	4.0
	Cyclops bicuspidatus thomasi	1.5	1.5	1.8	1.3	1.4	1.5	1.7	0.99	0.87	2.1
	Diaptomus oregonensis	0.50	1.1	1.5	0.96	1.6	0.84	0.95	0.55	0.84	2.5
	Diaptomus sicilis	0	0	0.024	0.035	0.012	0	0.012	0	0.024	0.024
	Epischura lacustris	0	0.012	0	0.024	0.012	0	0.024	0	0	0
	Orthocyclops modestus	0	0.024	0	0	0	0	0	0	0	0
Cladocera	*Bosmina longirostris*	0	0.024	0	0	0	0.047	0.024	0.024	0	0.047
	Daphnia galeata mendotae	1.1	1.8	1.5	1.6	1.2	1.3	1.9	1.2	0.69	1.2
	Diaphanosoma birgei	0.22	0.56	0.54	0.56	0.63	0.19	0.14	0.24	0.16	0.46
	Leptadora kindtii	0.012	0.071	0.024	0.024	0.035	0.047	0.024	0	0.024	0.059
Rotifera	*Ascomorpha ovalis*	2.1	5.6	4.5	5.4	7.3	4.3	3.8	5.1	3.2	1.5
	Collotheca sp.	20	16	19	16	16	18	12	8.1	11	11
	Gastropus stylifer	3.3	4.0	4.5	6.1	2.6	1.6	2.1	1.5	2.7	2.9
	Kellicottia longispina	0.47	1.4	0.94	2.8	2.8	2.7	2.0	1.6	0.94	0.47
	Keratella cochlearis	8.0	13	12	9.6	22	13	14	7.1	4.0	3.5
	Keratella crassa	1.9	3.1	0.94	3.3	4.5	0.35	2.1	0.82	1.4	4.5
	Keratella sp. (Large)	0	0.24	0.24	0	0	0	0	0	0	0
	Keratella taurocephala	0	0	0	0	0	0	0	0	0.12	0
	Polyarthra remata	0	0.94	0.71	0.71	0.71	0.24	0.47	0.35	0.59	0.12
	Polyarthra vulgaris	8.2	12	19	16	17	21	18	15	14	10
	Synchaeta sp.	0.24	2.8	4.9	3.5	4.0	0	0.24	0.24	0.12	3.9
	Trichocerca	3.5	4.0	4.5	6.1	2.6	1.9	2.1	1.5	2.7	2.9
Total number of organisms/L		**67**	**96**	**101**	**94**	**106**	**90**	**85**	**58**	**60**	**72**
Total number of taxa		**18**	**23**	**21**	**21**	**21**	**19**	**22**	**19**	**21**	**21**

Table D.33: Zooplankton Community Density Data (no. of organisms/L), August 2015

Species		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	Calanoid copepodids	0.42	0.28	0.23	0.25	0.13	0.20	0.082	0.059	0.059	0.11
	Calanoid nauplii	1.1	0.38	0.32	0.33	0.28	0.17	0.053	0.094	0.13	0.15
	Cyclopoid copepodids	0.66	0.25	0.15	0.19	0.18	0.21	0.56	0.22	0.21	0.26
	Cyclopoid nauplii	0.48	0.29	0.16	0.28	0.18	0.28	0.21	0.19	0.15	0.24
	Cyclops bicuspidatus thomasi	0.012	0.041	0.041	0.035	0.024	0.041	0.041	0.0059	0	0.012
	Diaptomus oregonensis	0.071	0.035	0.082	0.053	0.053	0.035	0.035	0.0059	0	0.0059
	Diaptomus sicilis	0	0.024	0.082	0.071	0.012	0.059	0.024	0.024	0.047	0.012
	Epischura lacustris	0.012	0.053	0.024	0.024	0.0059	0.041	0.012	0	0	0.012
	Tropocyclops sp.	0	0	0.0059	0	0	0	0	0	0	0
Cladocera	*Bosmina longirostris*	0.082	0.071	0.029	0.0059	0.024	0.035	0.018	0.012	0.018	0.0059
	Daphnia galeata mendotae	0.24	0.21	0.094	0.12	0.035	0.018	0.0059	0	0.012	0.012
	Diaphanosoma birgei	0.62	0.32	0.30	0.22	0.16	0.12	0.082	0.059	0.059	0.14
Rotifera	*Ascomorpha ovalis*	1.3	0.35	0.35	0.94	0.24	0.12	0	0	0	0
	Collotheca sp.	4.2	2.1	2.4	1.8	0.82	1.3	1.8	0.71	1.5	1.1
	Gastropus stylifer	0.24	0	0.35	0	0	0	0.12	0	0	0
	Kellicottia longispina	0.59	0.12	0.24	0	0.12	0.12	0.35	0.12	0	0.24
	Keratella cochlearis	0.12	0.12	0	0.12	0	0	0	0.12	0	0
	Keratella sp.	0.12	0	0	0	0	0	0	0	0	0
	Polyarthra remata	1.9	0.35	0.94	0.71	0.71	1.2	0.59	0.94	1.4	0.59
	Polyarthra vulgaris	0	0.12	0	0.12	0	0	0	0	0	0.12
	Synchaeta sp.	0.24	0.35	0.24	0.12	0.12	0	0	0	0.12	0.35
Total number of organisms/L		**12**	**5.5**	**6.0**	**5.3**	**3.1**	**3.9**	**3.9**	**2.5**	**3.7**	**3.3**
Total number of taxa		**18**	**18**	**18**	**17**	**16**	**15**	**15**	**13**	**11**	**16**

Table D.34: Zooplankton Community Density Data (no. of organisms/L), August 2016

Species		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	Calanoid nauplii	1.3	2.5	1.1	1.6	1.4	1.8	2.9	3.1	2.1	1.5
	Calanoid copepodids	0.49	1.0	0.33	0.55	0.53	2.6	1.5	2.0	0.94	0.78
	Cyclopoid nauplii	1.1	1.7	1.0	2.2	1.5	1.0	1.0	0.68	0.82	0.49
	Cyclopoid copepodids	1.4	1.7	1.1	1.3	1.2	5.8	6.3	5.8	3.8	2.2
	Diaptomus sicilis	0.12	0.24	0	0.024	0.035	0.27	0.31	0.31	0.094	0.12
	Diaptomus oregonensis	0.094	0.16	0.047	0.071	0.16	0.48	0.31	0.49	0.29	0.39
	Epischura lacustris	0.035	0.047	0.024	0.059	0.012	0.19	0.12	0.094	0.012	0.071
	Cyclops bicuspidatus thomasi	0.65	0.59	0.52	0.65	0.60	1.1	1.2	0.63	0.40	0.34
Caldocera	*Daphnia galeata mendotae*	2.5	3.8	3.1	2.9	4.4	2.6	4.5	0.047	1.3	1.4
	Bosmina longirostris	0.11	0.024	0.094	0.071	0.047	0.11	0.12	0.047	0.035	0.012
	Diaphanosoma birgei	0.059	0.12	0.059	0.047	0.13	0.047	0.024	0	0.035	0
	Ceriodaphnia sp.	0.012	0	0	0.012	0	0	0	0	0	0
	Leptadora kindtii	0	0	0	0	0.035	0	0	0	0	0
	Scapholeberis sp.	0	0	0	0	0	0.012	0	0	0	0
Rotifera	*Keratella cochlearis*	5.5	3.9	6.2	7.2	7.1	3.3	2.6	6.3	5.4	3.1
	Kellicottia longispina	4.7	3.8	2.0	4.0	4.2	7.5	9.0	11	4.8	4.0
	Polyarthra remata	0.066	0	0	1.0	0	0	0	0	0	0
	Polyarthra vulgaris	0	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066
	Gastropus stylifer	0	0	0.12	0.35	0.24	0	0.47	0.12	0.35	0.24
	Ascomorpha ovalis	0.24	0.59	0.82	0.47	0.71	0.94	0.71	0.35	0.35	0.24
	Collotheca sp.	6.1	5.1	4.1	7.5	5.8	9.9	11	7.8	5.4	6.5
	Monostyla sp.	0	0	0	0.12	0	0	0	0	0	0
Total number of organisms/L		**25**	**25**	**21**	**30**	**28**	**38**	**42**	**39**	**26**	**21**
Total number of taxa		**17**	**16**	**16**	**20**	**18**	**17**	**17**	**16**	**17**	**16**

Table D.35: Zooplankton Density (no. of organisms/L) Organized by Major Groups, August 2014

Group	Upstream of Elk River					Downstream of Elk River				
	T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	17	30	29	22	24	26	26	15	18	29
Cladocera	1.3	2.5	2.1	2.2	1.9	1.6	2.1	1.5	0.87	1.8
Rotifera	48	64	71	70	80	63	57	42	41	41
Total number of organisms/L	**67**	**96**	**101**	**94**	**106**	**90**	**85**	**58**	**60**	**72**
Total number of groups	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Table D.36: Zooplankton Density (no. of organisms/L) Organized by Major Groups, August 2015

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-1	T4-2	T4-3	T4-4	T4-5
Copepoda	2.7	1.4	1.1	1.2	0.85	1.0	1.0	0.60	0.59	0.80
Cladocera	0.94	0.61	0.42	0.34	0.22	0.17	0.11	0.071	0.088	0.15
Rotifera	8.7	3.5	4.5	3.8	2.0	2.7	2.8	1.9	3.1	2.4
Total number of organisms/L	**12**	**5.5**	**6.0**	**5.3**	**3.1**	**3.9**	**3.9**	**2.5**	**3.7**	**3.3**
Total number of groups	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Table D.37: Zooplankton Density (no. of organisms/L) Organized by Major Groups, August 2016

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	5.2	7.9	4.1	6.4	5.5	13	14	13	8.4	5.8
Cladocera	2.7	4.0	3.2	3.1	4.6	2.8	4.7	0.094	1.4	1.4
Rotifera	17	13	13	21	18	22	24	26	16	14
Total number of organisms/L	**25**	**25**	**21**	**30**	**28**	**38**	**42**	**39**	**26**	**21**
Total number of groups	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Table D.38: Relative Density (%) of Zooplankton Species, August 2014

	Species	Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6	T2	T4	T2	T4	T2	T4	T2	T4	T2	T4
Copepoda	***Calanoid copepodids***	2.4	5.6	4.8	4.1	4.4	1.7	1.1	2.2	2.5	6.7	2.4	1.1	4.4	2.2	5.6	6.7	4.3	2.8	1.2	2.2
	Calanoid nauplii	2.5	7.6	6.8	5.0	3.4	2.7	1.8	2.8	4.0	9.2	2.5	1.8	5.0	2.8	7.6	9.2	5.0	4.1	2.2	2.9
	Cyclopoid copepodids	8.0	6.4	5.3	4.6	4.6	14	15	11	12	13	4.6	11	5.3	13	8.0	15.2	5.8	13	1.4	1.6
	Cyclopoid nauplii	10	9.0	8.1	7.4	7.6	7.6	9.8	6.9	8.0	5.5	7.4	5.5	8.1	7.6	10	9.8	8.5	7.6	1.2	1.6
	Cyclops bicuspidatus thomasi	2.2	1.5	1.8	1.4	1.3	1.6	1.9	1.7	1.5	2.9	1.3	1.5	1.5	1.7	2.2	2.9	1.7	1.9	0.36	0.57
	Diaptomus oregonensis	0.75	1.2	1.5	1.0	1.5	0.94	1.1	0.95	1.4	3.4	0.75	0.94	1.2	1.1	1.5	3.4	1.2	1.6	0.31	1.0
	Diaptomus sicilis	0	0	0.024	0.037	0.011	0	0.014	0	0.040	0.033	0	0	0.011	0.014	0.037	0.0	0.014	0.017	0.016	0.019
	Epischura lacustris	0	0.012	0	0.025	0.011	0	0.028	0	0	0	0	0	0.011	0	0.025	0.0	0.0098	0.0056	0.011	0.013
	Orthocyclops modestus	0	0.025	0	0	0	0	0	0	0	0	0	0	0	0	0.025	0.0	0.0050	0	0.011	0
Cladocera	*Bosmina longirostris*	0	0.025	0	0	0	0.052	0.028	0.042	0	0.065	0	0	0	0.042	0.025	0.1	0.0050	0.037	0.011	0.025
	Daphnia galeata mendotae	1.7	1.9	1.5	1.7	1.1	1.4	2.2	2.1	1.2	1.7	1.1	1.2	1.7	1.7	1.9	2.2	1.6	1.7	0.28	0.44
	Diaphanosoma birgei	0.33	0.58	0.53	0.59	0.59	0.21	0.16	0.42	0.27	0.63	0.33	0.16	0.58	0.27	0.59	0.6	0.53	0.34	0.11	0.19
	Leptadora kindtii	0.018	0.074	0.024	0.025	0.033	0.052	0.028	0	0.040	0.081	0.018	0	0.025	0.040	0.074	0.1	0.035	0.040	0.022	0.03
Rotifera	***Ascomorpha ovalis***	3.2	5.8	4.4	5.7	6.9	4.8	4.4	8.7	5.3	2.1	3.2	2.1	5.7	4.8	6.9	8.7	5.2	5.1	1.4	2.4
	***Collotheca* sp.**	30	17	19	17	16	20	15	14	18	15	16	14	17	15	30	19.9	20	16	6.1	2.5
	Gastropus stylifer	4.9	4.1	4.4	6.5	2.4	1.8	2.5	2.6	4.5	4.1	2.4	1.8	4.4	2.6	6.5	4.5	4.5	3.1	1.5	1.1
	Kellicottia longispina	0.71	1.5	0.93	3.0	2.7	3.0	2.3	2.8	1.6	0.65	0.71	0.65	1.5	2.3	3.0	3.0	1.7	2.1	1.0	0.98
	Keratella cochlearis	12	14	11	10	21	14	16	12	6.7	4.9	10	4.9	12	12	21	15.9	14	11	4.1	4.8
	Keratella crassa	2.8	3.2	0.93	3.5	4.2	0.39	2.5	1.4	2.4	6.2	0.93	0.39	3.2	2.4	4.2	6.2	2.9	2.6	1.2	2.2
	Keratella sp. (Large)	0	0.24	0.23	0	0	0	0	0	0	0	0	0	0	0	0.24	0.0	0.095	0	0.13	0
	Keratella taurocephala	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0	0	0.2	0	0.039	0	0.088
	Polyarthra remata	0	1.0	0.7	0.7	0.7	0.3	0.6	0.61	1.0	0.2	0	0.16	0.70	0.55	0.97	1.0	0.62	0.51	0.37	0.32
	Polyarthra vulgaris	12	13	19	17	16	23	21	26	24	14	12	14	16	23	19	26.4	15	22	2.7	4.6
	Synchaeta sp.	0.35	2.9	4.9	3.7	3.8	0	0.28	0.41	0.20	5.4	0.35	0	3.7	0.28	4.9	5.4	3.1	1.2	1.7	2.3
	***Trichocerca* sp.**	5.29	4	4	6	2	2	2	3	5	4	2.4	2.1	4.4	2.6	6.5	4.5	4.6	3.2	1.5	1.1

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of organisms at one or more stations within an area (as shown in Figure 5.8).

Table D.39: **Relative Density (%) of Zooplankton Species, August 2015**

	Species	Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6	TN	T4	TN	T4	TN	T4	TN	T4	TN	T4
Copepoda	**Calanoid copepodids**	3.4	5.0	3.8	4.6	4.2	5.1	2.08	2.30	1.57	3.4	3.4	1.6	4.2	2.3	5.0	5.1	4.2	2.9	0.64	1.4
	Calanoid nauplii	8.6	7.0	5.3	6.2	9.0	4.4	1.3	3.69	3.46	4.4	5.3	1.3	7.0	3.7	9.0	4.4	7.2	3.5	1.6	1.3
	Cyclopoid copepodids	5.3	4.6	2.6	3.5	5.7	5.3	14.3	8.5	5.7	8.0	2.6	5.3	4.6	8.0	5.7	14	4.4	8.3	1.3	3.6
	Cyclopoid nauplii	3.9	5.3	2.7	5.2	5.7	7.1	5.4	7.6	3.9	7.1	2.7	3.9	5.2	7.1	5.7	7.6	4.6	6.2	1.2	1.5
	Cyclops bicuspidatus thomasi	0.095	0.75	0.69	0.66	0.77	1.05	1.04	0.230	0	0.36	0.10	0	0.69	0.36	0.77	1.1	0.59	0.54	0.28	0.48
	Diaptomus oregonensis	0.57	0.64	1.37	0.99	1.72	0.90	0.89	0.230	0	0.178	0.57	0	1.0	0.23	1.7	0.90	1.1	0.44	0.49	0.43
	Diaptomus sicilis	0	0.43	1.37	1.32	0.38	1.51	0.60	0.92	1.26	0.36	0	0.36	0.43	0.92	1.4	1.5	0.70	0.93	0.61	0.47
	Epischura lacustris	0.095	0.96	0.39	0.44	0.192	1.05	0.30	0	0	0.36	0.095	0	0.39	0.30	1.0	1.1	0.42	0.34	0.34	0.43
	Tropocyclops sp.	0	0	0.098	0	0	0	0	0	0	0	0	0	0	0	0.10	0	0.020	0	0.044	0
Cladocera	*Bosmina longirostris*	0.67	1.29	0.49	0.110	0.77	0.90	0.45	0.46	0.47	0.178	0.11	0.18	0.67	0.46	1.3	0.90	0.66	0.49	0.43	0.26
	Daphnia galeata mendotae	1.90	3.9	1.57	2.2	1.15	0.45	0.149	0	0.314	0.36	1.1	0	1.9	0.31	3.9	0.45	2.1	0.25	1.0	0.18
	Diaphanosoma birgei	5.0	5.9	5.0	4.1	5.2	3.01	2.08	2.30	1.57	4.1	4.1	1.6	5.0	2.3	5.9	4.1	5.0	2.6	0.64	1.0
Rotifera	***Ascomorpha ovalis***	10.5	6.4	5.9	17.7	7.7	3.01	0	0	0	0	5.9	0	7.7	0	18	3.0	9.6	0.60	4.8	1.3
	***Collotheca* sp.**	34	39	39	33	26.8	33	45	27.6	41	32	27	28	34	33	39	45	34	36	5.0	6.9
	Gastropus stylifer	1.90	0	5.9	0	0	0	3.0	0	0	0	0	0	0	0	5.9	3.0	1.6	0.60	2.6	1.3
	Kellicottia longispina	4.8	2.1	3.9	0	3.8	3.01	8.9	4.6	0	7.1	0	0	3.8	4.6	4.8	8.9	2.9	4.7	1.9	3.5
	Keratella cochlearis	0.95	2.1	0	2.2	0	0	0	4.6	0	0	0	0	1.0	0	2.2	4.6	1.1	0.92	1.1	2.1
	Keratella sp.	0.95	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.95	0	0.19	0	0.43	0
	Polyarthra remata	15	6.4	16	13	23	30	15	37	38	18	6.4	15	15	30	23	38	15	27	5.9	11
	Polyarthra vulgaris	0	2.14	0	2.21	0	0	0	0	0	3.56	0	0	0	0	2.2	3.6	0.87	0.71	1.2	1.6
	***Synchaeta* sp.**	1.90	6.4	3.9	2.2	3.8	0	0	0	3.14	10.7	1.9	0	3.8	0	6.4	11	3.7	2.8	1.8	4.6

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of organisms at one or more stations within an area (as shown in Figure 5.8).

Table D.40: **Relative Density (%) of Zooplankton Species, August 2016**

	Species	Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6	TN	T4	TN	T4	TN	T4	TN	T4	TN	T4
Copepoda	Calanoid nauplii	5.5	9.8	5.2	5.2	5.1	4.9	6.9	8.0	8.1	6.9	5.1	4.9	5.2	6.9	9.8	8.1	6.2	7.0	2.0	1.3
	Calanoid copepodids	2.0	4.1	1.6	1.8	1.9	6.8	3.7	5.2	3.6	3.7	1.6	3.6	1.9	3.7	4.1	6.8	2.3	4.6	1.0	1.4
	Cyclopoid nauplii	4.3	6.6	5.0	7.2	5.4	2.7	2.4	1.7	3.1	2.3	4.3	1.7	5.4	2.4	7.2	3.1	5.7	2.5	1.2	0.52
	Cyclopoid copepodids	5.8	6.8	5.4	4.3	4.4	15	15	15	14	10	4.3	10	5.4	15	6.8	15	5.4	14	1.0	2.1
	Diaptomus sicilis	0.48	0.93	0	0.078	0.13	0.72	0.73	0.78	0.36	0.55	0	0.36	0.13	0.72	0.93	0.78	0.32	0.63	0.39	0.17
	Diaptomus oregonensis	0.38	0.65	0.23	0.23	0.58	1.3	0.73	1.3	1.1	1.8	0.23	0.73	0.38	1.3	0.65	1.8	0.42	1.2	0.20	0.39
	Epischura lacustris	0.14	0.19	0.113	0.195	0.042	0.50	0.28	0.24	0.045	0.33	0.042	0.045	0.14	0.28	0.19	0.50	0.14	0.28	0.06	0.16
	Cyclops bicuspidatus thomasi	2.6	2.3	2.5	2.1	2.1	2.8	2.8	1.6	1.5	1.6	2.1	1.5	2.3	1.6	2.6	2.8	2.3	2.1	0.22	0.66
Caldocera	*Daphnia galeata mendotae*	10	15	15	10	16	7.0	11	0.12	4.9	6.4	9.8	0.12	15	6.4	16	11	13	5.8	2.8	3.9
	Bosmina longirostris	0.43	0.093	0.45	0.23	0.17	0.28	0.28	0.12	0.13	0.055	0.093	0.055	0.23	0.13	0.45	0.28	0.28	0.17	0.16	0.10
	Diaphanosoma birgei	0.24	0.47	0.28	0.16	0.46	0.12	0.056	0	0.13	0	0.16	0	0.28	0.056	0.47	0.13	0.32	0.063	0.14	0.065
	Ceriodaphnia sp.	0.048	0	0	0.039	0	0	0	0	0	0	0	0	0	0	0.048	0	0.017	0	0.024	0
	Leptadora kindtii	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0	0.13	0	0.025	0	0.056	0
	Scapholeberis sp.	0	0	0	0	0	0.031	0	0	0	0	0	0	0	0	0	0.031	0	0.0062	0	0.014
Rotifera	*Keratella cochlearis*	22	15	30	24	25	8.7	6.2	16	21	14	15	6.2	24	14	30	21	23	13	5.3	5.8
	Kellicottia longispina	19	15	9.6	13	15	20	22	29	18	19	9.6	18	15	20	19	29	14	22	3.4	4.2
	Polyarthra remata	0.27	0	0	3.3	0	0	0	0	0	0	0	0	0	0	3.3	0	0.7	0	1.5	0
	Polyarthra vulgaris	0	0.26	0.32	0.22	0.23	0.18	0.16	0.17	0.25	0.31	0	0.16	0.23	0.18	0.32	0.31	0.21	0.21	0.12	0.066
	Gastropus stylifer	0	0	0.57	1.2	0.83	0	1.1	0.30	1.3	1.1	0	0	0.57	1.1	1.2	1.3	0.51	0.78	0.52	0.59
	Ascomorpha ovalis	0.96	2.3	4.0	1.6	2.5	2.5	1.7	0.90	1.3	1.1	1.0	0.90	2.3	1.3	4.0	2.5	2.3	1.5	1.1	0.62
	Collotheca sp.	25	20	20	25	20	26	26	20	21	30	20	20	20	26	25	30	22	25	2.6	4.4
	Monostyla sp.	0	0	0	0.39	0	0	0	0	0	0	0	0	0	0	0.39	0	0.08	0	0.17	0

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of organisms at one or more stations within an area (as shown in Figure 5.8).

Table D.41: Zooplankton Community Biomass Data (µg/L dw), August 2014

Species		Upstream of Elk River					Downstream of Elk River				
		T2-2	**T2-3**	**T2-4**	**T2-5**	**T2-6**	**T4-2**	**T4-3**	**T4-4**	**T4-5**	**T4-6**
Copepoda	Calanoid copepodids	11	35	30	24	30	9.7	6.5	8.6	9.9	33
	Calanoid nauplii	0.45	1.6	1.8	0.90	0.72	0.53	0.37	0.34	0.55	1.8
	Cyclopoid copepodids	14	16	14	11	12	36	36	16	19	29
	Cyclopoid nauplii	0.74	0.95	0.85	0.75	0.87	0.75	0.91	0.40	0.49	0.38
	Cyclops bicuspidatus thomasi	15	14	18	14	14	15	16	9.8	8.3	23
	Diaptomus oregonensis	6.5	14	19	12	20	10	12	7.0	11	30
	Diaptomus sicilis	0	0	0.25	0.37	0.12	0	0.12	0	0.25	0.25
	Epischura lacustris	0	0.010	0	0.20	0.10	0	0.20	0	0	0
	Orthocyclops modestus	0	0.28	0	0	0	0	0	0	0	0
Cladocera	*Bosmina longirostris*	0	0.0086	0	0	0	0.017	0.0086	0.0086	0	0.017
	Daphnia galeata mendotae	11	19	16	17	13	14	20	13	7.4	13
	Diaphanosoma birgei	0.10	0.25	0.24	0.25	0.29	0.085	0.063	0.11	0.074	0.21
	Leptadora kindtii	0.014	0.082	0.027	0.027	0.041	0.055	0.027	0	0.027	0.069
Rotifer	*Ascomorpha ovalis*	0.10	0.26	0.20	0.24	0.33	0.20	0.17	0.23	0.14	0.07
	Collotheca sp.	1.1	0.83	0.99	0.86	0.86	0.93	0.64	0.42	0.56	0.57
	Gastropus stylifer	0.14	0.18	0.20	0.27	0.11	0.07	0.09	0.07	0.12	0.13
	Kellicottia longispina	0.0071	0.021	0.014	0.042	0.042	0.041	0.030	0.025	0.014	0.0071
	Keratella cochlearis	0.82	1.4	1.2	0.99	2.3	1.3	1.4	0.73	0.41	0.36
	Keratella crassa	0.18	0.29	0.09	0.31	0.42	0.033	0.20	0.08	0.13	0.42
	Keratella sp. (Large)	0	0.047	0.047	0	0	0	0	0	0	0
	Keratella taurocephala	0	0	0	0	0	0	0	0	0.019	0
	Polyarthra remata	0	0.040	0.030	0.030	0.030	0.010	0.020	0.015	0.025	0.0050
	Polyarthra vulgaris	0.54	0.82	1.3	1.1	1.1	1.4	1.2	1.0	0.95	0.68
	Synchaeta sp.	0.011	0.13	0.22	0.16	0.18	0	0.011	0.011	0.0053	0.17
	Trichocerca	0.18	0.18	0.20	0.27	0.11	0.11	0.09	0.07	0.12	0.13
Total biomass (µg/L dw)		**62**	**106**	**104**	**85**	**97**	**91**	**96**	**58**	**59**	**133**
Total number of taxa		**18**	**23**	**21**	**21**	**21**	**19**	**22**	**19**	**21**	**21**

Table D.42: Zooplankton Community Biomass Data (µg/L dw), August 2015

Species		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-1	T4-2	T4-3	T4-4	T4-5
Copepoda	Calanoid copepodids	2.6	1.8	1.5	1.6	0.83	1.3	0.57	0.28	0.30	0.65
	Calanoid nauplii	0.29	0.12	0.10	0.084	0.091	0.069	0.011	0.048	0.058	0.082
	Cyclopoid copepodids	1.7	0.72	0.41	0.46	0.52	0.55	1.6	0.59	0.64	0.76
	Cyclopoid nauplii	0.051	0.029	0.017	0.032	0.016	0.030	0.027	0.026	0.017	0.031
	Cyclops bicuspidatus thomasi	0.14	0.38	0.40	0.33	0.25	0.43	0.46	0.069	0	0.084
	Diaptomus oregonensis	0.89	0.52	1.1	0.70	0.70	0.44	0.48	0.068	0	0.086
	Diaptomus sicilis	0	0.25	0.86	0.74	0.12	0.61	0.25	0.25	0.49	0.12
	Epischura lacustris	0.10	0.46	0.20	0.20	0.051	0.36	0.10	0	0	0.10
	Tropocyclops sp.	0	0	0.029	0	0	0	0	0	0	0
Cladocera	*Bosmina longirostris*	0.030	0.026	0.011	0.0022	0.0086	0.013	0.0065	0.0043	0.0065	0.0022
	Daphnia galeata mendotae	2.5	2.2	1.0	1.2	0.37	0.19	0.062	0	0.12	0.12
	Diaphanosoma birgei	0.28	0.15	0.13	0.098	0.071	0.053	0.037	0.026	0.026	0.061
Rotifera	*Ascomorpha ovalis*	0.058	0.016	0.016	0.043	0.011	0.0053	0	0	0	0
	Collotheca sp.	0.22	0.11	0.12	0.092	0.043	0.067	0.092	0.037	0.079	0.055
	Gastropus stylifer	0.010	0	0.016	0	0	0	0.0052	0	0	0
	Kellicottia longispina	0.0088	0.0018	0.0035	0	0.0018	0.0018	0.0053	0.0018	0	0.0035
	Keratella cochlearis	0.012	0.012	0	0.012	0	0	0	0.012	0	0
	Keratella sp.	0.024	0	0	0	0	0	0	0	0	0
	Polyarthra remata	0.080	0.015	0.040	0.030	0.030	0.050	0.025	0.040	0.060	0.025
	Polyarthra vulgaris	0	0.0050	0	0.0050	0	0	0	0	0	0.0050
	Synchaeta sp.	0.011	0.016	0.011	0.0053	0.0053	0	0	0	0.0053	0.016
Total biomass (µg/L dw)		**8.9**	**6.9**	**6.0**	**5.7**	**3.1**	**4.2**	**3.7**	**1.5**	**1.8**	**2.2**
Total number of taxa		**18**	**18**	**18**	**17**	**16**	**15**	**15**	**13**	**11**	**16**

Table D.43: Zooplankton Community Biomass Data (µg/L dw), August 2016

Species		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	Calanoid nauplii	0.46	0.70	0.32	0.53	0.44	0.58	0.78	1.1	0.75	0.36
	Calanoid copepodids	2.8	5.8	1.7	3.3	3.1	17	9.6	13	5.7	4.8
	Cyclopoid nauplii	0.095	0.16	0.091	0.20	0.13	0.097	0.087	0.070	0.087	0.043
	Cyclopoid copepodids	4.1	5.1	3.1	3.6	3.4	17	18	16	10	5.8
	Diaptomus sicilis	1.2	2.5	0	0.25	0.37	2.8	3.2	3.2	0.98	1.2
	Diaptomus oregonensis	1.3	2.1	0.61	0.92	2.2	6.4	4.0	6.3	3.6	5.0
	Epischura lacustris	0.31	0.41	0.20	0.51	0.10	1.6	1.0	0.81	0.10	0.61
	Cyclops bicuspidatus thomasi	6.3	6.2	5.2	7.0	5.6	10	11	6.7	4.1	3.4
Caldocera	*Daphnia galeata mendotae*	27	41	33	31	47	28	48	0.50	14	14
	Bosmina longirostris	0.039	0.0086	0.034	0.026	0.017	0.039	0.043	0.017	0.013	0.0043
	Diaphanosoma birgei	0.026	0.053	0.026	0.021	0.058	0.021	0.011	0	0.016	0
	Ceriodaphnia sp.	0.034	0	0	0.034	0	0	0	0	0	0
	Leptadora kindtii	0	0	0	0	0.041	0	0	0	0	0
	Scapholeberis sp.	0	0	0	0	0	0.0050	0	0	0	0
Rotifera	*Keratella cochlearis*	0.57	0.40	0.64	0.75	0.73	0.34	0.27	0.65	0.56	0.31
	Kellicottia longispina	0.071	0.056	0.030	0.060	0.063	0.11	0.14	0.17	0.072	0.060
	Polyarthra remata	0.0028	0	0	0.043	0	0	0	0	0	0
	Polyarthra vulgaris	0	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028
	Gastropus stylifer	0	0	0.0052	0.016	0.010	0	0.021	0.0052	0.016	0.010
	Ascomorpha ovalis	0.011	0.027	0.037	0.021	0.032	0.043	0.032	0.016	0.016	0.011
	Collotheca sp.	0.32	0.26	0.21	0.39	0.30	0.51	0.56	0.40	0.28	0.34
	Monostyla sp.	0	0	0	0.0061	0	0	0	0	0	0
Total biomass (µg/L dw)		**45**	**64**	**45**	**49**	**63**	**84**	**97**	**49**	**40**	**36**
Total number of taxa		**17**	**16**	**16**	**20**	**18**	**17**	**17**	**16**	**17**	**16**

Table D.44: Biomass (µg/L dw) of Zooplankton by Group, August 2014

Group	Upstream of Elk River					Downstream of Elk River				
	T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	48	83	84	64	78	73	72	43	49	118
Cladocera	12	20	16	17	13	14	20	13	7.5	13
Rotifer	3.0	4.1	4.4	4.2	5.5	4.1	3.8	2.6	2.5	2.6
Total biomass (µg/L dw)	**62**	**106**	**104**	**85**	**97**	**91**	**96**	**58**	**59**	**133**
Total number of groups	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Table D.45: Biomass (µg/L dw) of Zooplankton by Group, August 2015

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	5.7	4.3	4.6	4.1	2.6	3.8	3.5	1.3	1.5	1.9
Cladocera	2.8	2.4	1.1	1.3	0.45	0.25	0.11	0.031	0.16	0.19
Rotifer	0.42	0.18	0.21	0.19	0.091	0.12	0.13	0.091	0.14	0.10
Total biomass (µg/L dw)	**8.9**	**6.9**	**6.0**	**5.7**	**3.1**	**4.2**	**3.7**	**1.5**	**1.8**	**2.2**
Total number of groups	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Table D.46: Biomass (µg/L dw) of Zooplankton by Group, August 2016

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	17	23	11	16	15	55	48	47	26	21
Cladocera	27	41	33	31	47	28	48	0.52	14	14
Rotifera	0.97	0.75	0.93	1.3	1.1	1.0	1.0	1.2	0.94	0.73
Total biomass (µg/L dw)	**45**	**64**	**45**	**49**	**63**	**84**	**97**	**49**	**40**	**36**
Total number of groups	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Table D.47: Relative Biomass (%) of Zooplankton Species, August 2014

Species		Upstream of Elk River					Downstream of Elk River				
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Copopoda	Calanoid copepodids	17	33	29	29	31	11	6.8	15	17	25
	Calanoid nauplii	0.72	1.5	1.7	1.1	0.74	0.59	0.38	0.59	0.93	1.4
	Cyclopoid copepodids	23	15	13	13	12	40	37	28	32	21
	Cyclopoid nauplii	1.19	0.89	0.81	0.88	0.89	0.82	0.95	0.68	0.83	0.28
	Cyclops bicuspidatus thomasi	24	13	18	16	15	17	17	17	14	17
	Diaptomus oregonensis	10	14	18	15	20	11	12	12	18	23
	Diaptomus sicilis	0	0	0.23	0.43	0.13	0	0.13	0	0.42	0.18
	Epischura lacustris	0	0.010	0	0.24	0.10	0	0.21	0	0	0
	Orthocyclops modestus	0	0.26	0	0	0	0	0	0	0	0
Cladocera	*Bosmina longirostris*	0	0.0081	0	0	0	0.019	0.0089	0.015	0	0.013
	Daphnia galeata mendotae	18	18	15	20	13	15	21	22	12	9.8
	Diaphanosoma birgei	0.16	0.24	0.23	0.30	0.29	0.09	0.066	0.18	0.13	0.15
	Leptadora kindtii	0.022	0.078	0.026	0.032	0.042	0.060	0.029	0	0.047	0.052
Rotifera	*Ascomorpha ovalis*	0.15	0.24	0.19	0.29	0.34	0.22	0.18	0.39	0.24	0.052
	Collotheca sp.	1.7	0.78	0.95	1.0	0.88	1.0	0.67	0.73	0.95	0.43
	Gastropus stylifer	0.23	0.17	0.19	0.32	0.12	0.079	0.097	0.12	0.20	0.097
	Kellicottia longispina	0.011	0.020	0.013	0.050	0.043	0.045	0.031	0.043	0.024	0.0053
	Keratella cochlearis	1.3	1.3	1.1	1.2	2.4	1.4	1.4	1.3	0.70	0.27
	Keratella crassa	0.28	0.27	0.084	0.36	0.43	0.036	0.21	0.13	0.22	0.31
	Keratella sp. (Large)	0	0.044	0.045	0	0	0	0	0	0	0
	Keratella taurocephala	0	0	0	0	0	0	0	0	0.03	0
	Polyarthra remata	0	0.04	0.03	0.04	0.03	0.011	0.02	0.026	0.04	0.004
	Polyarthra vulgaris	0.87	0.77	1.2	1.2	1.2	1.5	1.2	1.7	1.6	0.51
	Synchaeta sp.	0.017	0.12	0.21	0.19	0.18	0	0.011	0.018	0.0089	0.13
	Trichocerca	0.30	0	0	0	0	0.122	0	0	0	0

Table D.48: Relative Biomass (%) of Zooplankton Species, August 2015

Species		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-1	T4-2	T4-3	T4-4	T4-5
Copepoda	Calanoid copepodids	29	26	25	28	27	31	15	19	17	29
	Calanoid nauplii	3.2	1.7	1.7	1.5	2.9	1.6	0.30	3.3	3.2	3.7
	Cyclopoid copepodids	19	11	6.9	8.1	17	13	43	41	35	34
	Cyclopoid nauplii	0.57	0.43	0.28	0.57	0.51	0.73	0.73	1.8	0.95	1.4
	Cyclops bicuspidatus thomasi	1.6	5.5	6.7	5.9	8.0	10	12	4.8	0	3.8
	Diaptomus oregonensis	9.9	7.5	19	12	22	11	13	4.7	0	3.9
	Diaptomus sicilis	0	3.6	14	13	3.9	15	6.6	17	27	5.5
	Epischura lacustris	1.1	6.7	3.4	3.6	1.6	8.5	2.7	0	0	4.6
	Tropocyclops sp.	0	0	0.49	0	0	0	0	0	0	0
Cladocera	*Bosmina longirostris*	0.34	0.38	0.18	0.038	0.28	0.31	0.17	0.30	0.36	0.097
	Daphnia galeata mendotae	28	33	17	22	12	4.5	1.7	0	6.9	5.6
	Diaphanosoma birgei	3.1	2.1	2.3	1.7	2.3	1.3	0.99	1.8	1.5	2.8
Rotifera	*Ascomorpha ovalis*	0.66	0.23	0.26	0.75	0.34	0.13	0	0	0	0
	Collotheca sp.	2.5	1.6	2.0	1.6	1.4	1.6	2.5	2.5	4.4	2.5
	Gastropus stylifer	0.12	0	0.26	0	0	0	0.14	0	0	0
	Kellicottia longispina	0.099	0.026	0.059	0	0.056	0.042	0.14	0.12	0	0.16
	Keratella cochlearis	0.14	0.18	0	0.21	0	0	0	0.83	0	0
	Keratella sp.	0.26	0	0	0	0	0	0	0	0	0
	Polyarthra remata	0.90	0.22	0.67	0.53	1.0	1.2	0.67	2.8	3.3	1.1
	Polyarthra vulgaris	0	0.073	0	0.088	0	0	0	0	0	0.23
	Synchaeta sp.	0.12	0.23	0.18	0.093	0.17	0	0	0	0.29	0.72

Table D.49: Relative Biomass (%) of Zooplankton Species, August 2016

Species		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Copepoda	*Calanoid nauplii*	1.0	1.1	0.71	1.1	0.70	0.69	0.81	2.2	1.9	1.0
	Calanoid copepodids	6.3	9.0	3.7	6.7	4.9	20	10	26	14	13
	Cyclopoid nauplii	0.21	0.24	0.20	0.42	0.21	0.12	0.090	0.14	0.22	0.12
	Cyclopoid copepodids	9.3	8.0	6.9	7.4	5.4	20	19	33	26	16
	Diaptomus sicilis	2.8	3.8	0	0.50	0.58	3.3	3.3	6.6	2.4	3.4
	Diaptomus oregonensis	2.8	3.3	1.4	1.9	3.5	7.5	4.1	13	9.0	14
	Epischura lacustris	0.68	0.63	0.45	1.0	0.16	1.9	1.1	1.7	0.25	1.7
	Cyclops bicuspidatus thomasi	14	9.6	12	14	8.9	12	11	14	10	9.4
Caldocera	*Daphnia galeata mendotae*	60	63	73	64	74	33	50	1.0	34	39
	Bosmina longirostris	0.087	0.013	0.077	0.053	0.027	0.046	0.044	0.035	0.032	0.012
	Diaphanosoma birgei	0.059	0.082	0.059	0.043	0.092	0.025	0.011	0	0.039	0
	Ceriodaphnia sp.	0.075	0	0	0.068	0	0	0	0	0	0
	Leptadora kindtii	0	0	0	0	0.065	0	0	0	0	0
	Scapholeberis sp.	0	0	0	0	0	0.0059	0	0	0	0
Rotifera	*Keratella cochlearis*	1.3	0.62	1.4	1.5	1.2	0.40	0.28	1.3	1.4	0.86
	Kellicottia longispina	0.16	0.088	0.067	0.12	0.10	0.13	0.14	0.35	0.18	0.16
	Polyarthra remata	0.0063	0	0	0.087	0	0	0	0	0	0
	Polyarthra vulgaris	0	0.0044	0.0063	0.0057	0.0045	0.0033	0.0029	0.0058	0.0070	0.0077
	Gastropus stylifer	0	0	0.012	0.032	0.016	0	0.021	0.011	0.038	0.028
	Ascomorpha ovalis	0.024	0.041	0.083	0.043	0.051	0.050	0.033	0.033	0.039	0.029
	Collotheca sp.	0.71	0.41	0.48	0.80	0.47	0.61	0.58	0.83	0.69	0.92
	Monostyla sp.	0	0	0	0.012	0	0	0	0	0	0

Table D.50: Descriptive Statistics for Zooplankton from Koocanusa Reservoir Upstream (T2) and Downstream (T4) of the Elk River, August 2014

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of organisms/L)		T2	5	66.6	96.5	106	93.0	15.4
		T4	5	57.8	72.5	89.7	72.9	14.4
Biomass (µg/L dw)		T2	5	62.2	97.3	106	91.1	18.2
		T4	5	58.0	91.1	133	87.6	31.1
Richness (no. of taxa)		T2	5	18.0	21.0	23.0	20.8	1.79
		T4	5	19.0	21.0	22.0	20.4	1.34
Major Group Density (no. of organisms/L)	Copepod	T2	5	17.3	24.1	30.3	24.5	5.19
		T4	5	14.8	25.6	29.5	22.8	6.22
	Cladocera	T2	5	1.33	2.06	2.46	1.98	0.421
		T4	5	0.87	1.58	2.09	1.56	0.448
	Rotifera	T2	5	47.9	70.0	79.9	66.5	11.9
		T4	5	41.0	41.6	62.5	48.6	10.2
Major Group Relative Density (%)	Copepod	T2	5	22.8	26	31.4	26.4	3.54
		T4	5	25.5	29.8	40.7	31.1	5.720
	Cladocera	T2	5	1.76	2.04	2.55	2.13	0.303
		T4	5	1.46	2.44	2.53	2.13	0.484
	Rotifera	T2	5	66.0	72.0	75.5	71.5	3.74
		T4	5	56.9	68.7	72.0	66.8	5.84
Major Group Biomass (µg/L dw)	Copepod	T2	5	47.6	78.3	84.0	71.3	15.5
		T4	5	42.5	72.4	118	70.9	29.4
	Cladocera	T2	5	11.6	16.0	19.5	15.5	3.12
		T4	5	7.46	13.4	19.9	13.6	4.44
	Rotifera	T2	5	3.03	4.22	5.53	4.27	0.889
		T4	5	2.50	2.65	4.07	3.12	0.765
Major Group Relative Biomass (%)	Copepod	T2	5	74.9	77.7	80.5	78.0	2.46
		T4	5	73.3	79.9	88.1	79.9	5.95
	Cladocera	T2	5	13.8	18.4	20.1	17.2	2.60
		T4	5	10.0	15.6	22.1	16.2	5.17
	Rotifera	T2	5	3.89	4.88	5.69	4.73	0.695
		T4	5	1.91	4.24	4.56	3.83	1.10

Table D.51: Descriptive Statistics for Zooplankton from Koocanusa Reservoir Upstream (T2) and Downstream (T4) of the Elk River, August 2015

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of organisms/L)		TN	5	3.07	5.48	12.4	6.44	3.49
		T4	5	2.55	3.74	3.95	3.49	0.583
Biomass (µg/L dw)		TN	5	3.13	5.96	8.92	6.11	2.10
		T4	5	1.45	2.21	4.19	2.68	1.21
Richness (no. of taxa)		TN	5	16.0	18.0	18.0	17.4	0.894
		T4	5	11.0	15.0	16.0	14.0	2.00
Major Group Density (no. of organisms/L)	Copepod	TN	5	0.852	1.22	2.71	1.45	0.732
		T4	5	0.593	0.799	1.03	0.808	0.215
	Cladocera	TN	5	0.217	0.423	0.94	0.505	0.281
		T4	5	0.071	0.106	0.17	0.118	0.043
	Rotifera	TN	5	2.00	3.76	8.70	4.49	2.52
		T4	5	1.88	2.70	3.06	2.56	0.458
Major Group Relative Density (%)	Copepod	TN	5	18.4	23.0	27.8	23.1	3.47
		T4	5	15.9	24.2	26.4	23.2	4.24
	Cladocera	TN	5	6.40	7.09	11	7.84	1.84
		T4	5	2.36	2.76	4.63	3.36	1.05
	Rotifera	TN	5	64.3	70.4	74.6	69.0	4.27
		T4	5	69.3	71.4	81.8	73.5	4.89
Major Group Biomass (µg/L dw)	Copepod	TN	5	2.58	4.29	5.69	4.26	1.12
		T4	5	1.33	1.92	3.82	2.41	1.16
	Cladocera	TN	5	0.454	1.35	2.80	1.63	0.961
		T4	5	0.031	0.158	0.253	0.147	0.084
	Rotifera	TN	5	0.091	0.187	0.424	0.217	0.124
		T4	5	0.091	0.124	0.145	0.118	0.021
Major Group Relative Biomass (%)	Copepod	TN	5	62.3	72.9	82.6	71.8	8.69
		T4	5	83.3	91.0	93.7	89.3	4.20
	Cladocera	TN	5	14.5	23.8	35.1	24.8	8.50
		T4	5	2.12	6.03	8.70	5.64	3.08
	Rotifera	TN	5	2.55	3.29	4.75	3.40	0.84
		T4	5	2.97	4.72	8.00	5.07	2.08

Table D.52: Descriptive Statistics for Zooplankton from Koocanusa Reservoir Upstream (T2) and Downstream (T4) of the Elk River, August 2016

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of organisms/L)		TN	5	20.7	25.2	30.2	25.8	3.62
		T4	5	21.2	37.7	41.8	33.2	8.99
Biomass (µg/L dw)		TN	5	44.6	49.0	64.4	53.2	9.81
		T4	5	36.4	48.7	96.7	61.3	27.4
Richness (no. of taxa)		TN	5	16.0	17.0	20.0	17.4	1.67
		T4	5	16.0	17.0	17.0	16.6	0.548
Major Group Density (no. of organisms/L)	Copepod	TN	5	4.15	5.6	7.92	5.85	1.41
		T4	5	5.80	13.2	13.6	10.8	3.53
	Cladocera	TN	5	2.71	3.23	4.59	3.52	0.756
		T4	5	0.094	1.36	4.65	2.05	1.74
	Rotifera	TN	5	13.3	16.6	20.7	16.4	3.16
		T4	5	14	21.7	25.9	20.3	4.96
Major Group Relative Density (%)	Copepod	TN	5	19.7	21.2	31.4	22.7	4.90
		T4	5	27.4	32.5	35.1	32.2	2.90
	Cladocera	TN	5	10.2	15.6	16.3	13.8	2.90
		T4	5	0.24	6.42	11.1	6.07	3.94
	Rotifera	TN	5	52.9	64.4	68.5	63.5	6.27
		T4	5	56.3	62.6	66.2	61.8	4.65
Major Group Biomass (µg/L dw)	Copepod	TN	5	11.20	16.3	22.9	16.5	4.22
		T4	5	21.3	46.9	55.4	39.4	14.9
	Cladocera	TN	5	27.0	32.7	46.6	35.7	7.86
		T4	5	0.516	14.3	47.9	20.9	18.0
	Rotifera	TN	5	0.748	0.97	1.29	1.01	0.206
		T4	5	0.734	1.01	1.25	0.99	0.184
Major Group Relative Biomass (%)	Copepod	TN	5	24.3	33.3	37.2	31.1	6.06
		T4	5	49.4	64.0	96.4	66.8	17.7
	Cladocera	TN	5	60.6	64.1	73.9	67.0	6.07
		T4	5	1.06	33.7	49.6	31.4	18.2
	Rotifera	TN	5	1.16	2.08	2.63	1.97	0.542
		T4	5	1.05	2.02	2.57	1.83	0.679

Table D.53: Mean Skewness and Kurtosis Values of Zooplankton Lowest Practical Level Density Matrix by Transformation for the Area Upstream and Downstream of the Elk River Sampled in 2014, 2015, and 2016 (n= 30)

Transformation	Endpoint	Skewness (mean)	Kurtosis (mean)
None	Area\Row	2.191	5.009
	Taxa\Col	1.342	1.244
Log_{10}	Area\Row	1.315	1.811
	Taxa\Col	0.778	-0.104
Square root	Area\Row	1.050	0.819
	Taxa\Col	0.526	-0.613
Fourth root	Area\Row	-0.096	-0.620
	Taxa\Col	-0.164	-0.707
Power 2	Area\Row	3.082	9.968
	Taxa\Col	2.380	6.052
Power 4	Area\Row	3.695	14.178
	Taxa\Col	3.443	13.158

- mean skewness and kurtosis values closest to zero.

Table D.54: Non-Metric Multidimensional Scaling (NMDS) Results for Zooplankton Community Data (Lowest Practical Level) Displaying Percent Variance Explained by Each Axis, Monte Carlo Randomization p-values of Axis Significance, and Axis Scores for Areas Upstream and Downstream of the Elk River Sampled in 2014 to 2016

Year	Station Identifier		4th Root Transformation		Non-transformed	
			NMDS-1	NMDS-2	NMDS-1	NMDS-2[a]
2014	Upstream of Elk River	T2-2	-1.03	-0.24	0.94	-
		T2-3	-0.96	-0.45	1.09	-
		T2-4	-1.00	-0.49	1.15	-
		T2-5	-0.94	-0.41	1.06	-
		T2-6	-1.00	-0.44	1.17	-
	Downstream of Elk River	T4-2	-0.95	-0.19	1.11	-
		T4-3	-0.79	-0.31	1.05	-
		T4-4	-0.72	-0.29	0.81	-
		T4-5	-0.74	-0.39	0.84	-
		T4-6	-0.85	-0.52	0.99	-
2015	Upstream of Elk River	TN-1	0.39	-0.31	-0.56	-
		TN-2	0.72	-0.12	-1.08	-
		TN-3	0.86	-0.19	-1.10	-
		TN-4	0.81	-0.37	-1.15	-
		TN-5	1.19	-0.24	-1.57	-
	Downstream of Elk RIver	T4-2	1.25	0.05	-1.46	-
		T4-3	1.31	0.28	-1.30	-
		T4-4	1.74	0.25	-1.79	-
		T4-5	1.96	-0.66	-1.59	-
		T4-6	1.32	-0.39	-1.52	-
2016	Upstream of Elk RIver	TN-1	-0.11	0.60	0.21	-
		TN-2	-0.18	0.56	0.20	-
		TN-3	-0.11	0.52	0.07	-
		TN-4	-0.14	0.31	0.24	-
		TN-5	-0.22	0.46	0.25	-
	Downstream of Elk River	T4-2	-0.40	0.59	0.48	-
		T4-3	-0.45	0.55	0.52	-
		T4-4	-0.42	0.73	0.49	-
		T4-5	-0.29	0.47	0.28	-
		T4-6	-0.25	0.65	0.15	-
Final Stress			**4.48**		**5.75**	
% Variance explained			**91.7**	**6.9**	**90.7**	**-**
Monte Carlo p-value			**0.004**	**0.004**	**0.004**	**-**

[a] A one dimensional (axis) solution was obtained because a two dimensional solution did not reduce stress by at least 5 units, which indicates that an additional axis does little to improve the monotonic relationship between the original dimensional space and the reduced dimensional space (McCune and Grace 2002).

Table D.55: Pearson Correlations for Non-Metric Multidimensional Scaling (NMDS) Axis Scores, using Three Years (2014, 2015, 2016) of Zooplankton Community Data from the Upstream and Downstream Areas of the Elk River with Relative Zooplankton Taxon Density

Taxa	4th Root Transformation				Non-transformed			
	NMDS-1 (91.7%)		NMDS-2 (6.9%)		NMDS-1 (90.7%)		NMDS-2 [a]	
	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value
Calanoid nauplii	-0.916	0.000	-0.050	0.794	0.740	0.000	-	-
Calanoid copepodids	-0.890	0.000	-0.157	0.408	0.709	0.000	-	-
Cyclopoid nauplii	-0.880	0.000	-0.337	0.069	0.774	0.000	-	-
Cyclopoid copepodids	-0.899	0.000	-0.035	0.853	0.781	0.000	-	-
Diaptomus sicilis	0.182	0.336	0.502	0.005	0.087	0.647	-	-
Diaptomus oregonensis	-0.910	0.000	-0.165	0.385	0.711	0.000	-	-
Epischura lacustris	0.048	0.802	0.606	0.000	0.084	0.657	-	-
Cyclops bicuspidatus	-0.961	0.000	0.077	0.685	0.893	0.000	-	-
Daphnia galeata	-0.791	0.000	0.272	0.146	0.523	0.003	-	-
Bosmina longirostris	0.251	0.182	0.530	0.003	0.046	0.811	-	-
Diaphanosoma birgei	-0.155	0.414	-0.752	0.000	0.316	0.089	-	-
Leptadora kindtii	-0.658	0.000	-0.578	0.001	0.589	0.001	-	-
Keratella sp.	-0.927	0.000	0.121	0.524	0.793	0.000	-	-
Kellicottia longispina	-0.666	0.000	0.635	0.000	0.414	0.023	-	-
Polyarthra remata	0.366	0.047	-0.758	0.000	-0.439	0.015	-	-
Polyarthra vulgaris	-0.803	0.000	-0.490	0.006	0.703	0.000	-	-
Gastropus stylifer	-0.781	0.000	-0.369	0.045	0.670	0.000	-	-
Keratella crassa	-0.690	0.000	-0.613	0.000	0.589	0.001	-	-
Ascomorpha ovalis	-0.871	0.000	-0.301	0.106	0.698	0.000	-	-
Collotheca sp.	-0.954	0.000	-0.110	0.562	0.880	0.000	-	-
Synchaeta sp.	-0.293	0.116	-0.828	0.000	0.468	0.009	-	-

Pearson correlation coefficients greater than an absolute value of 0.5.

Pearson correlation with p-value less than 0.05.

[a] A one dimensional (axis) solution was obtained because a two dimensional solution did not reduce stress by at least 5 units, which indicates that an additional axis does little to improve the monotonic relationship between the original dimensional space and the reduced dimensional space (McCune and Grace 2002).

APPENDIX E
BENTHIC INVERTEBRATE DATA

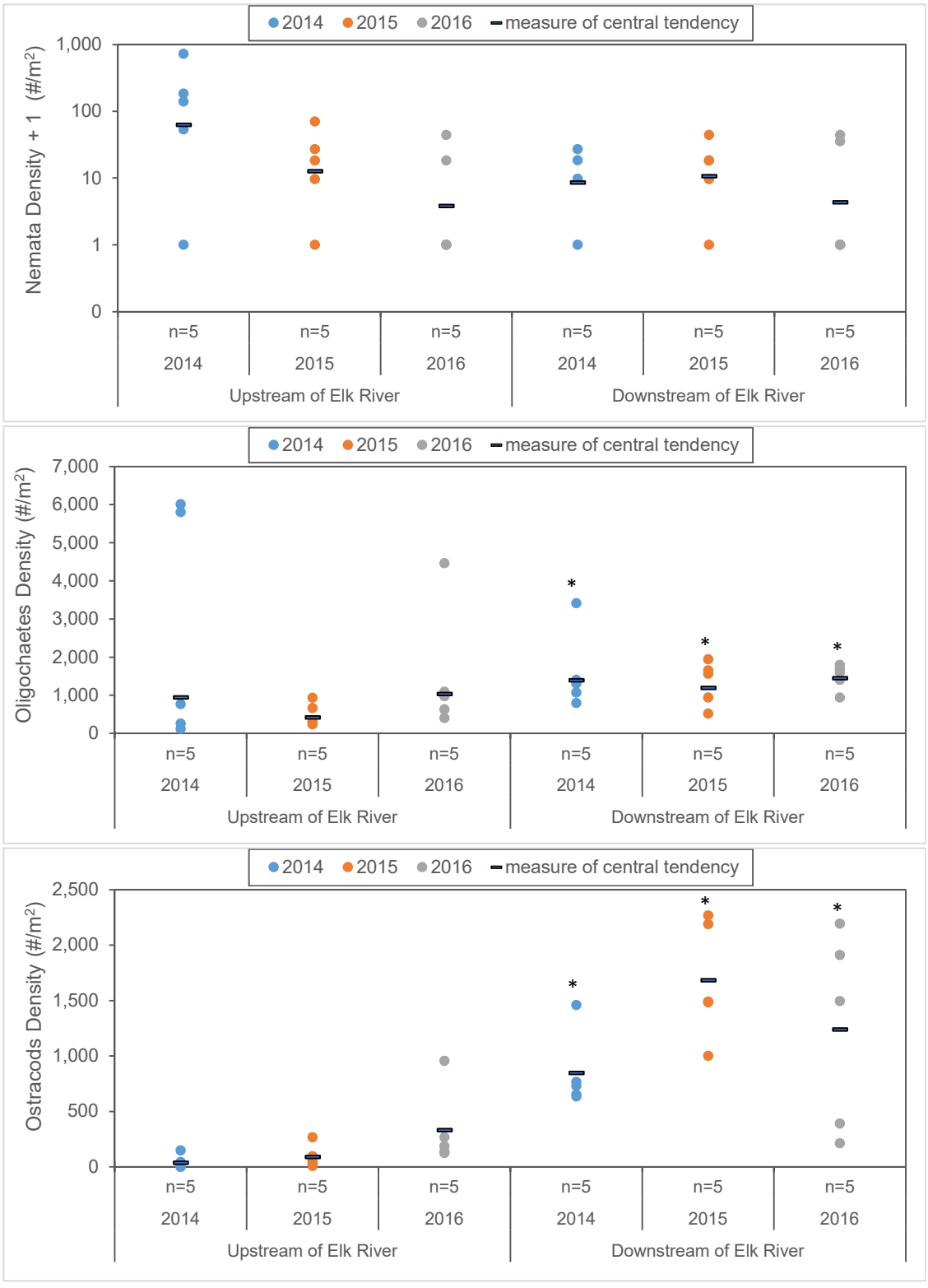

Figure E.1: Nemata, Oligochaetes, Ostracods, Chironomids, and Bivalve Molluscs Density (No. of Organisms/m^2) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

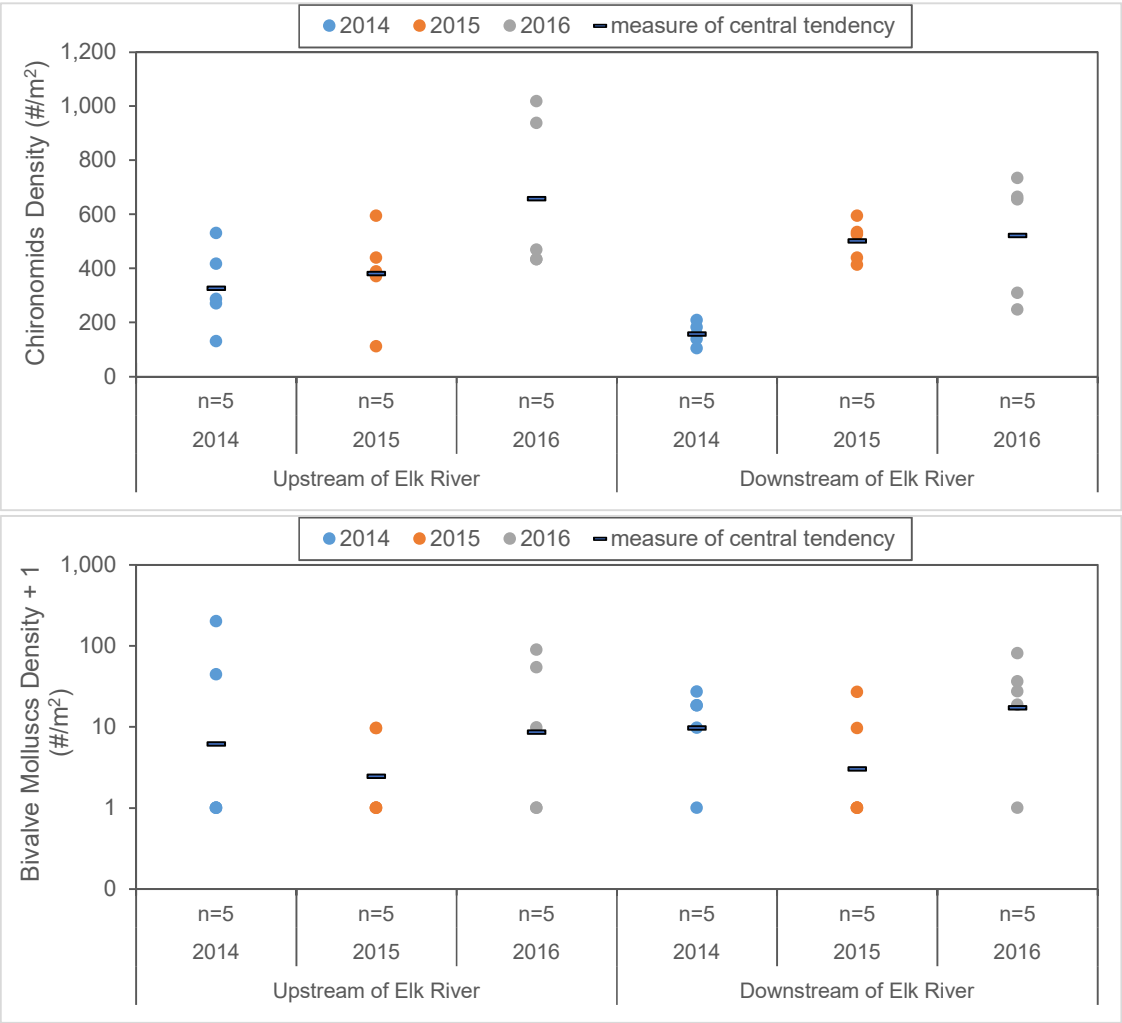

Figure E.1: Nemata, Oligochaetes, Ostracods, Chironomids, and Bivalve Molluscs Density (No. of Organisms/m^2) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

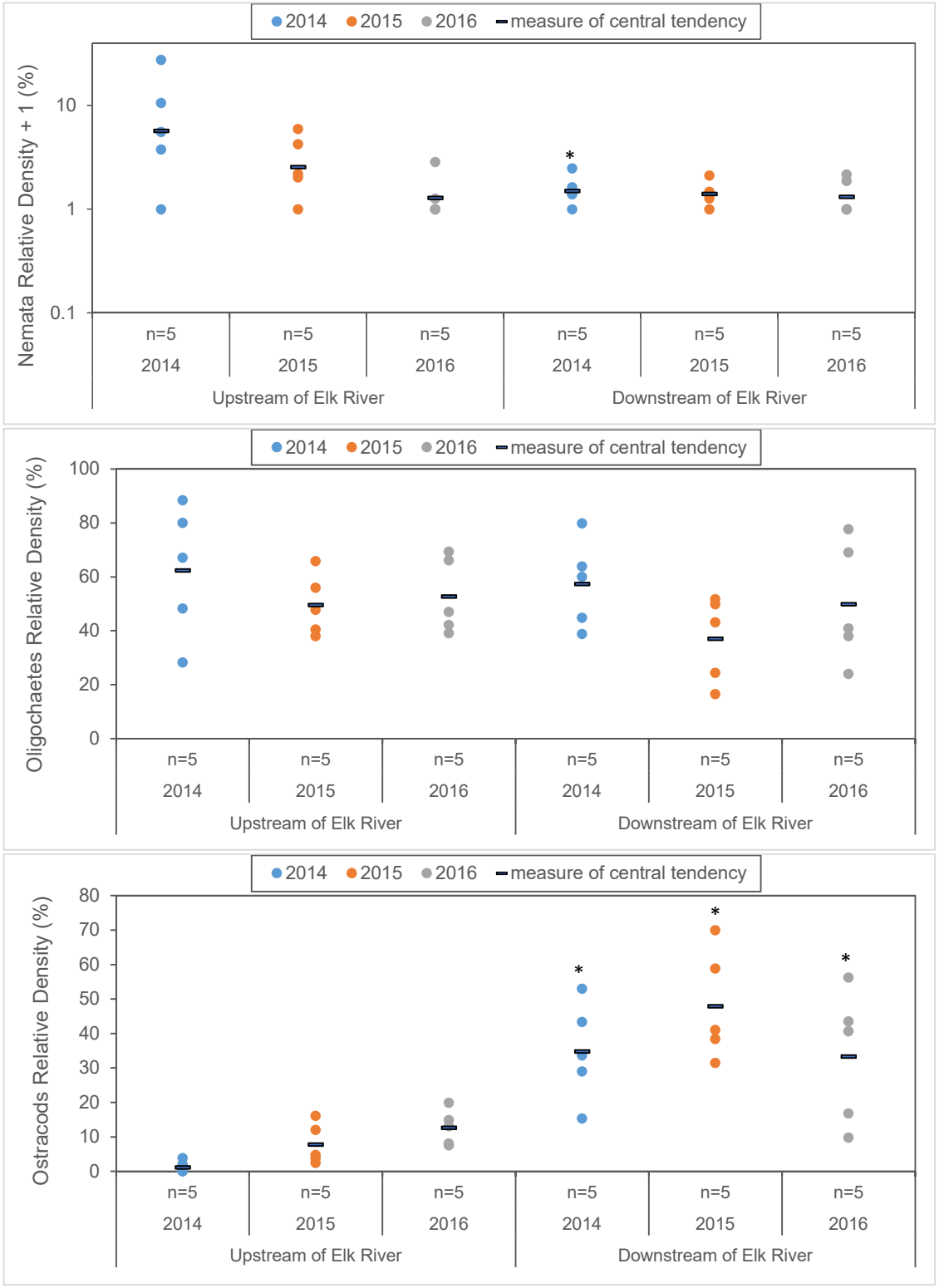

Figure E.2: Nemata, Oligochaetes, Ostracods, Chironomids, and Bivalve Molluscs Relative Density (%) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

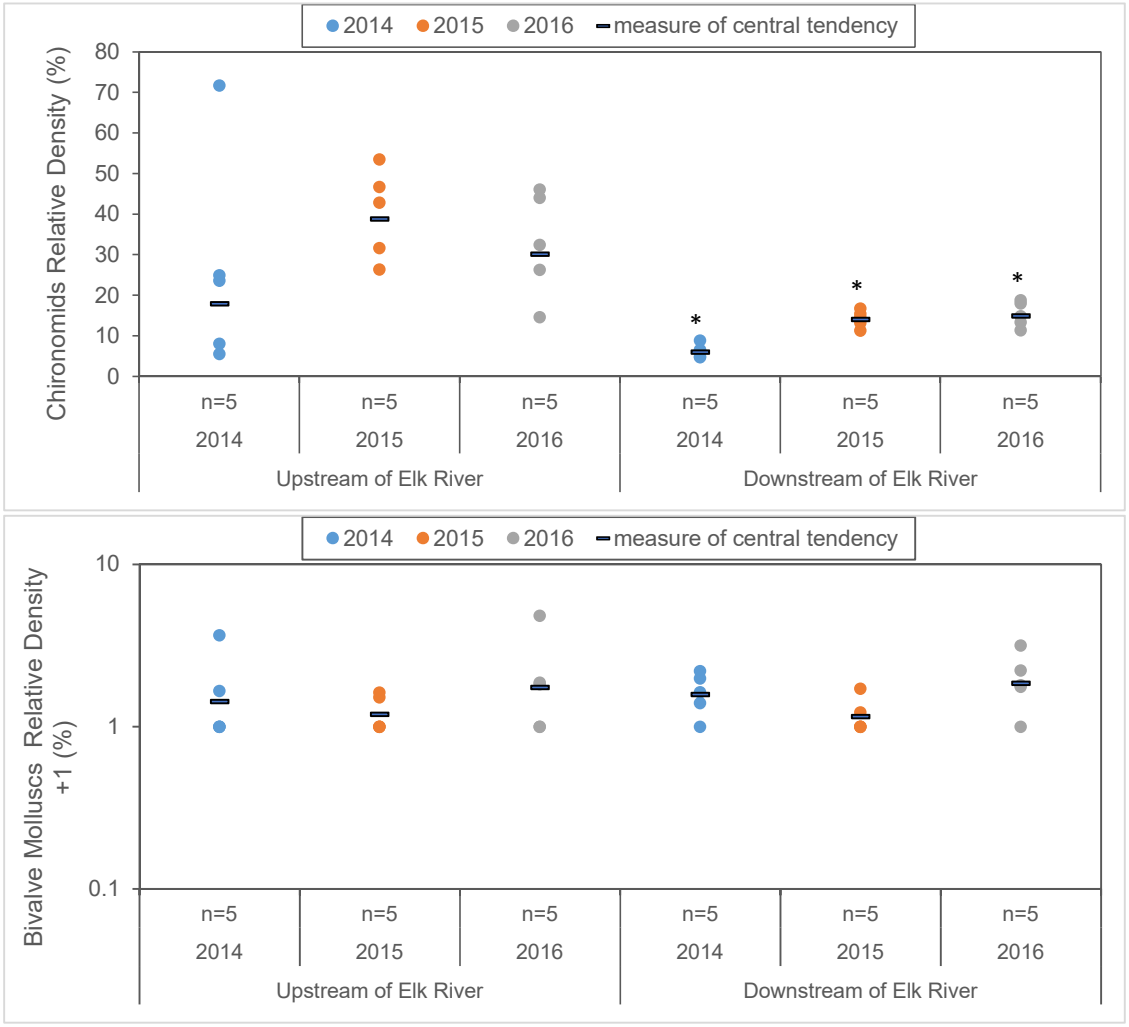

Figure E.2: Nemata, Oligochaetes, Ostracods, Chironomids, and Bivalve Molluscs Relative Density (%) in Koocanusa Reservoir, August 2014 to 2016

Notes: The upstream location was relocated further upstream from the mouth of the Elk River in August 2015 and 2016

' * ' indicates the downstream area was significantly different from the upstream area in the same year.

Table E.1: Benthic Sampling Locations in Koocanusa Reservoir, August 2014

Station Identifier		UTM (NAD 83, Zone 11U)		Station Depth (m)	Average Ponar Fullness	Sample Texture	Macrophytes in Sample	Algae in Sample	Comments
		Easting	Northing		% Fullness				
Upstream of Elk River	T2-2	629650	5450400	30.1	25%	100% sand and finer	sparce organic matter	No	mostly clay, hard packed on bottom
	T2-3	629417	5450394	19.2	33%	100% sand and finer	minimal organic matter	No	hard packed clay with minimal material on top
	T2-4	629235	5450445	19.5	33%	100% sand and finer	minimal organic matter	No	-
	T2-5	629059	5450389	20.0	75%	100% sand and finer, more organics than T2-2-4	some dead organic matter	No	-
	T2-6	628883	5450370	18.3	100%	100% sand and finer	dead organic matter common	No	-
Downstream of Elk River	T4-2	630076	5441806	27.8	100%	100% sand and finer	No	No	-
	T4-3	629798	5441984	27.4	100%	100% sand and finer	No	No	-
	T4-4	629703	5441675	26.4	100%	100% sand and finer	No	No	-
	T4-5	629487	5441751	25.8	100%	100% sand and finer	No	No	-
	T4-6	629403	5441477	30.5	100%	100% sand and finer	No	No	-

Table E.2: Benthic Sampling Locations in Koocanusa Reservoir, August 2015

Station Identifier		UTM (NAD 83, Zone 11U)		Station Depth (m)	Average Ponar Fullness (%)	Sample Texture	Macrophytes in Sample	Algae in Sample
		Easting	Northing					
Upstream of Elk River	TN-1	627377	5453471	13.5	75%	90% sand and finer, 10% organics	No	No
	TN-2	627270	5453644	12.4	75%	90% sand and finer, 10% organics	No	No
	TN-3	627341	5453711	13.2	100%	90% sand and finer, 10% organics	No	No
	TN-4	627329	5453862	12.9	75%	90% sand and finer, 10% organics	No	No
	TN-5	627211	5453978	13.4	100%	90% sand and finer, 10% organics	No	No
Downstream of Elk River	T4-2	630082	5441810	24.2	100%	90% sand and finer, 10% organics	No	No
	T4-3	629825	5442010	22.8	100%	90% sand and finer, 10% organics	No	No
	T4-4	629715	5441648	22.7	100%	90% sand and finer, 10% organics	No	No
	T4-5	629500	5441738	22.2	100%	90% sand and finer, 10% organics	No	No
	T4-6	629511	5441551	23.2	100%	90% sand and finer, 10% organics	No	No

Table E.3: Benthic Sampling Locations in Koocanusa Reservoir, August 2016

Station Identifier		UTM (NAD 83, Zone 11U)		Station Depth (m)	Average Ponar Fullness (%)	Sample Texture	Macrophytes in Sample	Algae in Sample
		Easting	Northing					
Upstream of Elk River	TN-1	627369	5453492	15	50%	100% sand and finer, minimal organics	No	Sparse
	TN-2	627256	5453672	14	75% - 100%	100% sand and finer, minimal organics	No	Sparse
	TN-3	627367	5453710	15	75% - 100%	100% sand and finer, 10% organics	No	Sparse
	TN-4	627333	5453882	15	75% - 100%	100% sand and finer, minimal organics	No	Sparse
	TN-5	627200	5454005	15	75% - 100%	100% sand and finer, minimal organics	No	Sparse
Downstream of Elk River	T4-2	630115	5441812	24	100%	100% sand and finer	No	No
	T4-3	629831	5442006	25	100%	100% sand and finer	No	No
	T4-4	629695	5441699	25	100%	100% sand and finer	No	No
	T4-5	629494	5441783	24	100%	100% sand and finer, minimal organics	No	Sparse
	T4-6	629430	5441547	25	100%	100% sand and finer	No	No

Table E.4: Taxonomic Level and Primary Taxonomic References used by ZEAS Inc. for Identification of Benthic Macroinvertebrates

TAXON	LEVEL	REFERENCE
FLATWORMS	class/family/species	Pennak 1989
NEMATODES/	phylum	Pennak 1989
NEMERTEANS	phylum	Pennak 1989
Hydra	genus	Pennak 1989
ANNELIDS		
Oligochaeta/Polychaete	species	Wetzel et al. 2000; Kathman and Brinkhurst 1999; Brinkhurst 1986
Leeches	species	Klemm 1991
ARTHROPODS		
Mites	Genus/family/order	Pennak 1989; Thorp and Covich 1991
Crustaceans Isopods Harpacticoids Ostracods	 genus order class	Pennak 1989; Thorp and Covich 1991
Crayfish	species	Crocker & Barr 1968; Thorp and Covich 1991
Amphipods *Gammarus* *Hyalella*	Genus/species species genus	Bousfield 1967; Thorp and Covich 1991 Holsinger 1976; Bousfield 1967 Bousfield 1967
INSECTS	genus	Merritt et al. 2008; Hilsenhoff 1995
Beetles *Elmidae* *Dytiscidae*	genus species genus/species	Merritt et al. 2008; Archangelsky 1997 Hilsenhoff & Schmude 1992; Brown 1972 Larson et al. 2000
Caddisflies Hydropsyche	genus species	Wiggins 1996; Merritt et al. 2008 Schefter & Wiggins 1986; Schuster & Etnier 1978
Dragonflies/damselflies	genus/species	Needham et al. 2014; Walker & Corbet 1978; Westfall & May 1996; Walker 1953, 1958; Hilsenhoff 1995
Mayflies Baetidae *Ephemerella* Ephemeridae *Eurylophella* *Stenonema*	genus genus/species species species species species	Edmunds et al. 1976; Merrit et al. 2008 McCafferty 2000; McCafferty & Waltz 1990; Waltz 1994; Ide 1937 McCafferty & Waltz 1990; Morihara & McCafferty 1979 Allen & Edwards 1965 McCafferty 1976 Allen & Edmunds 1963 Bednarik & McCafferty 1979
Stoneflies *Isoperla* Leuctridae Nemouridae Perlidae Taeniopterygidae	genus species species species species species	Merrit et al. 2008; Stewart & Stark 2002, 1988 Hitchcock 1974 Harper & Hynes 1971a Harper & Hynes 1971b Hitchcock 1974 Fullington & Stewart 1980; Harper & Hynes 1971c
True Flies Chironomidae Simuliidae	genus genus/species family/genus	Andersen et al. 2013; Merritt et al. 2008; Hilsenhoff 1995 Epler 2001, Maschwitz and Cook. 2000; Oliver and Dillon 1990; Oliver and Roussel 1983; Simpson et al. 1983; Wiederholm 1983; Simpson and Adler et al., 2004; Bode 1980;Jackson 1976 Merritt et al. 2008
MOLLUSCS		
Snails	genus/species	Frest and Johannes 1999; Jokinen 1992; Clarke 1981; Burch 1989
Clams *Cyclocalyx* *Sphaerium*	genus species	Clarke 1981 Clarke 1981; Mackie and Huggins 1983;Lee and Foighil 2003.

Table E.4: Taxonomic Level and Primary Taxonomic References used by ZEAS Inc. for Identification of Benthic Macroinvertebrates

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Table E.5: Benthic Invertebrate (LPL) Density (No. of Organisms per m^2) in Koocanusa Reservoir, August 2014

Organism		Upstream of Elk River					Downstream of Elk River				
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6
Nematodes	P. Nemata	0	139	52	722	183	17	26	8.7	8.7	0
Oligochaetes	S.F. Naidinae										
	Dero digitata	17	0	0	0	0	0	0	0	0	0
	Uncinais uncinata	0	0	0	0	0	0	0	0	61	0
	S.F. Tubificinae										
	Aulodrilus limnobius	0	0	0	0	0	0	0	61	61	0
	Limnodrilus hoffmeisteri	8.7	8.7	113	748	965	87	0	61	61	426
	Limnodrilus udekemianus	0	8.7	78	252	0	0	0	0	0	0
	Tubifex tubifex	0	17	0	1,504	583	130	43	0	0	0
	immatures with hair chaetae[a]	52	174	461	1,252	2,704	765	626	983	974	1,991
	immatures without hair chaetae[a]	35	43	113	2,252	1548	87	122	200	243	991
Ostracods	Cl. Ostracoda	0	0	43	148	0	1,461	765	730	635	652
Insects	F. Ceratopogonidae	0	0	9.0	0	0	0	0	0	0	0
	F. Chironomidae										
	Chironomid pupae[b]	0	0	0	0	**8.7**	0	0	0	**8.7**	0
	S.F. Chironominae										
	Chironomus	78	0	52	87	183	26	26	17	8.7	35
	Harnischia	8.7	0	0	0	0	0	0	0	0	0
	Phaenopsectra	8.7	0	0	17	0	0	0	0	0	0
	Tanytarsus	26	0	0	26	0	17	0	0	8.7	8.7
	S.F. Diamesinae										
	Protanypus	0	0	0	0	0	8.7	0	0	0	0
	S.F. Prodiamesinae										
	Monodiamesa	8.7	8.7	0	0	17	0	8.7	0	0	8.7
	S.F. Tanypodinae										
	Procladius	157	122	217	287	322	130	122	87	113	157
Bivalve Mollusc	F. Sphaeriidae										
	Cyclocalyx	0	0	0	52	26	0	8.7	26	8.7	0
	Cyclocalyx/Neopisidium	0	0	0	148	17	17	8.7	0	0	0
Other	Cl. Turbellaria	0	0	0	8.7	0	0	0	0	0	0
	Cl. Arachnida	0	0	0	0	0	9.0	9.0	0	0	0
Total Number of Organisms		**400**	**522**	**1,139**	**7,504**	**6,557**	**2,757**	**1,766**	**2,174**	**2,191**	**4,270**
Total Number of Taxa		**10**	**8**	**9**	**14**	**10**	**12**	**11**	**9**	**11**	**8**

[a] Immature Tubificinae were combined for data analyses

[b] Bold entries excluded from taxon count

Table E.6: Benthic Invertebrate (LPL) Density (No. of Organisms per m^2) in Koocanusa Reservoir, August 2015

Organism		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Nematodes	P. Nemata	68.97	-	26	8.6	17	8.6	43	17	-	17
Oligochaetes	S.F. Naidinae										
	Dero digitata	-	-	-	-	17	-	-	-	-	-
	S.F. Tubificinae										
	Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	146.6	163.8
	Limnodrilus udekemianus	43	60	78	34	43	-	-	-	-	-
	immatures with hair chaetae[a]	603.4	155.2	181	198.3	594.8	258.6	629.3	870.7	1,276	1,052
	immatures without hair chaetae[a]	17	17	43	60	276	258.6	310.3	689.7	224.1	724.1
Ostracods	F. Candonidae										
	Candona	17	-	60	8.6	52	-	26	8.6	-	60
	F. Cyprididae										
	Isocypris	34	8.6	17	8.6	155	-	-	-	-	-
	F. Cytherideidae										
	Cytherissa lacustris	-	-	8.6	8.6	8.6	2,190	2,241	1,474	1,000	1,431
	F. Limnocytheridae										
	Limnocythere	-	-	8.6	8.6	52	-	-	-	-	-
Insects	F. Chironomidae										
	chironomid pupae[b]	-	-	-	-	**17**	-	-	**17**	**17**	**17**
	S.F. Chironominae										
	Chironomus	-	8.6	17	8.6	-	34	103	52	26	17
	Harnischia	26	17	17	17	8.6	-	8.6	-	17	17
	Phaenopsectra	-	-	-	-	-	-	26	-	-	-
	Tanytarsus	8.6	-	34	17	8.6	26	78	103	147	164
	S.F. Diamesinae										
	Protanypus	-	-	-	-	-	-	-	8.6	-	-
	S.F. Orthocladiinae										
	Heterotrissocladius	-	-	8.6	17	17	78	26	17	17	26
	S.F. Tanypodinae										
	Procladius	560	86	293	328	388	276	353	328	310	198
Bivalve Molluscs	F. Sphaeriidae										
	Cyclocalyx	8.6	-	-	-	8.6	-	8.6	8.6	-	-
	Cyclocalyx/Neopisidium	-	-	-	-	-	-	-	17	-	-
Total Number of Organisms		**1,388**	**353**	**793**	**724**	**1,664**	**3,129**	**3,853**	**3,612**	**3,181**	**3,888**
Total Number of Taxa		**10**	**7**	**13**	**13**	**14**	**8**	**12**	**12**	**9**	**11**

[a] Immature Tubificinae were combined for data analyses

[b] Bold entries excluded from taxon count

Table E.7: Benthic Invertebrate (LPL) Density (No. of Organisms per m^2) in Koocanusa Reservoir, August 2016

Organism		Upstream of Elk River					Downstream of Elk River				
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Nematodes	P. Nemata	0	0	43	0	17	43	34	0	0	0
Oligochaetes	S.F. Tubificinae										
	Aulodrilus limnobius	53	0	97	0	0	0	0	88	80	0
	Limnodrilus hoffmeisteri	0	0	53	0	442	142	0	0	0	336
	Limnodrilus udekemianus	53	248	150	62	221	0	0	0	0	0
	Tubifex tubifex	0	35	0	0	0	0	0	0	0	0
	immatures with hair chaetae[a]	876	345	531	319	3,124	628	796	770	1,204	504
	immatures without hair chae[a]	106	0	142	18	673	628	142	938	319	850
Ostracods	F. Candonidae										
	Candona	88	195	115	106	690	177	53	177	106	27
	F. Cyprididae										
	Isocypris	18	71	27	27	124	8.8	8.8	0	0	18
	F. Cytherideidae										
	Cytherissa lacustris	18	0	44	0	142	1,310	2,133	1,735	283	168
Insects	F. Chironomidae										
	chironomid pupae[b]	**8.8**	**8.8**	**35**	**0**	**18**	**44**	**44**	**62**	**8.8**	**8.8**
	S.F. Chironominae										
	Chironomus	53	18	451	168	460	124	35	62	18	124
	Cryptotendipes	27	0	0	8.8	0	0	0	0	0	0
	Harnischia	18	35	18	18	0	18	0	62	18	0
	Phaenopsectra	0	0	44	0	0	8.8	0	8.8	0	0
	Tanytarsus	71	18	133	0	124	88	44	80	18	35
	S.F. Diamesinae										
	Protanypus	0	8.8	0	0	0	0	8.8	0	0	8.8
	S.F. Orthocladiinae										
	Heterotrissocladius	0	0	18	0	0	195	274	283	71	18
	S.F. Prodiamesinae										
	Monodiamesa	8.8	8.8	0	8.8	0	8.8	8.8	0	0	0
	S.F. Tanypodinae										
	Procladius	248	336	319	265	336	177	319	97	177	53
Bivalve Molluscs	F. Sphaeriidae										
	Cyclocalyx	0	0	88	8.8	0	80	0	8.8	0	0
	Cyclocalyx/Neopisidium	0	0	0	0	53	0	0	27	18	27
Arachnida	F. Lebertiidae										
	Lebertia	0	8.8	0	8.8	0	0	0	0	0	0
Total Number of Organisms		**1,646**	**1,327**	**2,309**	**1,009**	**6,424**	**3,680**	**3,902**	**4,398**	**2,319**	**2,177**
Total Number of Taxa		**13**	**11**	**16**	**11**	**12**	**15**	**12**	**13**	**11**	**12**

[a] Immature Tubificinae were combined for data analyses

[b] Bold entries excluded from taxon count

Table E.8: Densities (No. of Organisms per m^2) of Major Benthic Invertebrate Groups, August 2014

Group	Upstream of Elk River					Downstream of Elk River				
	T2-2	**T2-3**	**T2-4**	**T2-5**	**T2-6**	**T4-2**	**T4-3**	**T4-4**	**T4-5**	**T4-6**
Nematodes	0	139	52	722	183	17	26	9	9	0
Oligochaetes	113	252	765	6,009	5,800	1,070	791	1,304	1,400	3,409
Ostracods	0	0	43	148	0	1,461	765	730	635	652
Insects	287	130	279	417	530	183	157	104	139	209
Bivalve Molluscs	0	0	0	200	43	17	17	26	9	0
Other (Flatworms, Arachnids)	0	0	0	9	0	9	9	0	0	0
Total Number of Organisms	**400**	**522**	**1,139**	**7,504**	**6,557**	**2,757**	**1,766**	**2,174**	**2,191**	**4,270**
Total Number of Groups	**2**	**3**	**4**	**6**	**4**	**6**	**6**	**5**	**5**	**3**

Table E.9: Densities (No. of Organisms per m^2) of Major Benthic Invertebrate Community Groups, August 2015

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	**TN-2**	**TN-3**	**TN-4**	**TN-5**	**T4-2**	**T4-3**	**T4-4**	**T4-5**	**T4-6**
Nematodes	69	0	26	9	17	9	43	17	0	17
Oligochaetes	664	233	302	293	931	517	940	1,560	1,647	1,940
Ostracods	52	9	95	34	267	2,190	2,267	1,483	1,000	1,491
Insects	595	112	371	388	440	414	595	526	534	440
Bivalve Molluscs	9	0	0	0	9	0	9	26	0	0
Total Number of Organisms	**1,388**	**353**	**793**	**724**	**1,664**	**3,129**	**3,853**	**3,612**	**3,181**	**3,888**
Total Number of Groups	**5**	**3**	**4**	**4**	**5**	**4**	**5**	**5**	**3**	**4**

Table E.10: Densities (No. of Organisms per m^2) of Major Benthic Invertebrate Groups, August 2016

Group	Upstream of Elk River					Downstream of Elk River				
	TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6
Nematodes	0	0	43	0	17	43	34	0	0	0
Oligochaetes	1,088	628	973	398	4,460	1,398	938	1,796	1,602	1,690
Ostracods	124	265	186	133	956	1,496	2,195	1,912	389	212
Insects	434	434	1,018	469	938	664	735	655	310	248
Bivalve Molluscs	0	0	88	9	53	80	0	35	18	27
Arachnida	0	8.8	0	8.8	0	0	0	0	0	0
Total Number of Organisms	**1,646**	**1,327**	**2,309**	**1,009**	**6,424**	**3,680**	**3,902**	**4,398**	**2,319**	**2,177**
Total Number of Groups	**3**	**3**	**5**	**4**	**5**	**5**	**4**	**4**	**4**	**4**

Table E.11: **Relative Densities (%) of Benthic Invertebrates (LPL), August 2014**

	Organism	Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		T2-2	T2-3	T2-4	T2-5	T2-6	T4-2	T4-3	T4-4	T4-5	T4-6	T2	T4	T2	T4	T2	T4	T2	T4	T2	T4
Nematodes	**P. Nemata**	0	27	4.6	10	2.8	0.63	1.5	0.40	0.40	0	0	0	27	1.5	27	1.5	8.7	0.58	11	0.55
Oligochaetes	*Dero digitata*	4.3	0	0	0	0	0	0	0	0	0	0	0	4.3	0	4.3	0	0.87	0	1.9	0
	Uncinais uncinata	0	0	0	0	0	0	0	0	2.8	0	0	0	0	2.8	0	2.8	0	0.56	0	1.2
	Aulodrilus limnobius	0	0	0	0	0	0	0	2.8	2.8	0	0	0	0	2.8	0	2.8	0	1.1	0	1.5
	Limnodrilus hoffmeisteri	2.2	1.7	10	10	15	3.2	0	2.8	2.8	10	1.7	0	15	10.0	15	10.0	7.7	3.7	5.6	3.7
	Limnodrilus udekemianus	0	1.7	6.9	3.4	0	0	0	0	0	0	0	0	6.9	0	6.9	0	2.4	0	2.9	0
	Tubifex tubifex	0	3.3	0	20	8.9	4.7	2.5	0	0	0	0	0	20	4.7	20	4.7	6.5	1.4	8.4	2.1
	immatures with hair chaetae	13	33	40	17	41	28	35	45	44	47	13	28	41	47	41	47	29	40	13	8.1
	immatures without hair chaetae	8.7	8.3	9.9	30	24	3.2	6.9	9.2	11	23	8.3	3.2	30	23	30	23	16	11	10	7.6
Ostracods	Cl. Ostracoda	0	0	3.8	2.0	0	53	43	34	29	15	0	15	3.8	53	3.8	53	1.2	35	1.7	14
Insects	F. Ceratopogonidae	0	0	0.79	0	0	0	0	0	0	0	0	0	0.79	0	0.79	0	0.16	0	0.35	0
	Chironomid pupae	0	0	0	0	0.13	0	0	0	0.40	0	0	0	0.13	0.40	0.13	0.40	0.027	0.079	0.059	0.18
	Chironomus	20	0	4.6	1.2	2.8	0.95	1.5	0.80	0	0.81	0	0.40	20	1.5	20	1.5	5.6	0.89	8.0	0.39
	Harnischia	2.2	0	0	0	0	0	0	0	0	0	0	0	2.2	0	2.2	0	0.43	0	0.97	0
	Phaenopsectra	2.2	0	0	0.23	0	0	0	0	0	0	0	0	2.2	0	2.2	0	0.48	0	0.95	0
	Tanytarsus	6.5	0	0	0.35	0	0.63	0	0	0.40	0.20	0	0	6.5	0.63	6.5	0.63	1.4	0.25	2.9	0.27
	Protanypus	0	0	0	0	0	0.32	0	0	0	0	0	0	0	0.32	0	0.32	0	0.063	0	0.14
	Monodiamesa	2.2	1.7	0	0	0.27	0	0.49	0	0	0.20	0	0	2.2	0.49	2.2	0.49	0.82	0.14	1.0	0.22
	Procladius	39	23	19	3.8	4.9	4.7	6.9	4.0	5.2	3.7	3.8	3.7	39	6.9	39	6.9	18	4.9	15	1.3
Bivalve Molluscs	*Cyclocalyx*	0	0	0	0.70	0.40	0	0.49	1.2	0.40	0	0	0	0.70	1.2	0.70	1.2	0.22	0.42	0.32	0.49
	Cyclocalyx/Neopisidium	0	0	0	2.0	0.27	0.63	0.49	0	0	0	0	0	2.0	0.63	2.0	0.63	0.45	0.22	0.86	0.31
Other	Cl. Turbellaria	0	0	0	0.12	0	0	0	0	0	0	0	0	0.12	0	0.12	0	0.023	0	0.052	0
	Cl. Arachnida	0	0	0	0	0	0.33	0.51	0	0	0	0	0	0	0.51	0	0.51	0	0.17	0	0.24

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of organisms at one or more stations within an area (as shown in Figure 6.3).

Table E.12: Relative Densities (%) of Benthic Invertebrates (LPL), August 2015

	Organism	Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6	T2	T4	T2	T4	T2	T4	T2	T4	T2	T4
Nematodes	**P. Nemata**	5.0	0	3.3	1.2	1.0	0.28	1.1	0.48	0	0.44	0	0	5.0	1.1	5.0	1.1	2.1	0.46	2.0	0.41
Oligochaetes	S.F. Naidinae																				
	Dero digitata	0	0	0	0	1.0	0	0	0	0	0	0	0	1.0	0	1.0	0	0.21	0	0.46	0
	S.F. Tubificinae																				
	Limnodrilus hoffmeisteri	0	0	0	0	0	0	0	0	4.6	4.2	0	0	0	4.6	0	4.6	0	1.8	0	2.4
	Limnodrilus udekemianus	3.1	17	9.8	4.8	2.6	0	0	0	0	0	2.6	0	17	0	17	0	7.5	0	6.1	0
	immatures with hair chaetae[a]	43	44	23	27	36	8.3	16	24	40	27	23	8.3	44	40	44	40	35	23	9.5	12
	immatures without hair chaetae[a]	1.2	4.9	5.4	8.3	17	8.3	8.1	19	7.0	19	1.2	7.0	17	19	17	19	7.3	12	5.8	6.1
Ostracods	F. Candonidae																				
	Candona	1.2	0	7.6	1.2	3.1	0	0.67	0.24	0	1.6	0	0	7.6	1.6	7.6	1.6	2.6	0.49	3.0	0.65
	F. Cyprididae																				
	Isocypris	2.5	2.4	2.2	1.2	9.3	0	0	0	0	0	1.2	0	9.3	0	9.3	0	3.5	0	3.3	0
	F. Cytherideidae																				
	Cytherissa lacustris	0	0	1.1	1.2	0.52	70	58	41	31	37	0	31	1.2	70	1.2	70	0.56	47	0.57	16
	F. Limnocytheridae																				
	Limnocythere	0	0	1.1	1.2	3.1	0	0	0	0	0	0	0	3.1	0	3.1	0	1.1	0	1.3	0
Insects	F. Chironomidae																				
	chironomid pupae	0	0	0	0	1.0	0	0	0.48	0.54	0.44	0	0	1.0	0.54	1.0	0.54	0.21	0.29	0.46	0.27
	S.F. Chironominae																				
	Chironomus	0	2.4	2.2	1.2	0	1.1	2.7	1.4	0.81	0.44	0	0.44	2.4	2.7	2.4	2.7	1.2	1.3	1.2	0.86
	Harnischia	1.9	4.9	2.2	2.4	0.52	0	0.22	0	0.54	0.44	0.52	0	4.9	0.54	4.9	0.54	2.4	0.24	1.6	0.25
	Phaenopsectra	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0.67	0	0.67	0	0.13	0	0.30
	Tanytarsus	0.62	0	4.3	2.4	0.52	0.83	2.0	2.9	4.6	4.2	0	0.83	4.3	4.6	4.3	4.6	1.6	2.9	1.8	1.6
	S.F. Diamesinae																				
	Protanypus	0	0	0	0	0	0	0	0.24	0	0	0	0	0	0.24	0	0.24	0	0.048	0	0.11
	S.F. Orthocladiinae																				
	Heterotrissocladius	0	0	1.1	2.4	1.0	2.5	0.67	0.48	0.54	0.67	0	0.48	2.4	2.5	2.4	2.5	0.90	0.97	0.98	0.85
	S.F. Tanypodinae																				
	Procladius	40	24	37	45	23	8.8	9.2	9.1	9.8	5.1	23	5.1	45	9.8	45	9.8	34	8.4	9.8	1.9
Bivalve Molluscs	F. Sphaeriidae																				
	Cyclocalyx	0.62	0	0	0	0.52	0	0.22	0.24	0	0	0	0	0.62	0.24	0.62	0.24	0.23	0.092	0.31	0.13
	Cyclocalyx/Neopisidium	0	0	0	0	0	0	0	0.48	0	0	0	0	0	0.48	0	0.48	0	0.095	0	0.21

[a] Immature Tubificinae were combined for data analyses

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of organisms at one or more stations within an area (as shown in Figure 6.3).

Table E.13: Relative Densities (%) of Benthic Invertebrates (LPL), August 2016

Organism		Upstream of Elk River					Downstream of Elk River					Summary Statistics									
												Minimum		Median		Maximum		Mean		SD	
		TN-1	TN-2	TN-3	TN-4	TN-5	T4-2	T4-3	T4-4	T4-5	T4-6	T2	T4	T2	T4	T2	T4	T2	T4	T2	T4
Nematodes	P. Nemata	0	0	1.9	0	0.27	1.2	0.88	0	0	0	0	0	1.9	1.2	1.9	1.2	0.43	0.41	0.81	0.57
Oligochaetes	S.F. Tubificinae																				
	Aulodrilus limnobius	3.2	0	4.2	0	0	0	0	2.0	3.4	0	0	0	4.2	3.4	4.2	3.4	1.5	1.1	2.1	1.6
	Limnodrilus hoffmeisteri	0	0	2.3	0	6.9	3.8	0	0	0	15	0	0	6.9	15	6.9	15	1.8	3.9	3.0	6.7
	Limnodrilus udekemianus	3.2	19	6.5	6.1	3.4	0	0	0	0	0	3.2	0	19	0	19	0	7.6	0	6.4	0
	Tubifex tubifex	0	2.7	0	0	0	0	0	0	0	0	0	0	2.7	0	2.7	0	0.53	0	1.2	0
	immatures with hair chaetae	53	26	23	32	49	17	20	18	52	23	23	17	53	52	53	52	36	26	14	15
	immatures without hair chaetae	6.5	0	6.1	1.8	10	17	3.6	21	14	39	0	3.6	10	39	10	39	5.0	19	4.1	13
Ostracods	F. Candonidae																				
	Candona	5.4	15	5.0	11	11	4.8	1.4	4.0	4.6	1.2	5.0	1.2	15	4.8	15	4.8	9.3	3.2	4.1	1.8
	F. Cyprididae																				
	Isocypris	1.1	5.3	1.1	2.6	1.9	0.24	0.23	0	0	0.81	1.1	0	5.3	0.81	5.3	0.81	2.4	0.26	1.7	0.33
	F. Cytherideidae																				
	Cytherissa lacustris	1.1	0	1.9	0	2.2	36	55	39	12	7.7	0	7.7	2.2	55	2.2	55	1.0	30	1.0	20
Insects	F. Chironomidae																				
	chironomid pupae	0.54	0.67	1.5	0	0.28	1.2	1.1	1.4	0.38	0.41	0	0.38	1.5	1.4	1.5	1.4	0.60	0.91	0.58	0.48
	S.F. Chironominae																				
	Chironomus	3.2	1.3	20	17	7.2	3.4	0.91	1.4	0.76	5.7	1.3	0.76	20	5.7	20	5.7	9.6	2.4	8.1	2.1
	Cryptotendipes	1.6	0	0	0.88	0	0	0	0	0	0	0	0	1.6	0	1.6	0	0.50	0	0.73	0
	Harnischia	1.1	2.7	0.77	1.8	0	0.48	0	1.4	0.76	0	0	0	2.7	1.4	2.7	1.4	1.3	0.53	1.0	0.59
	Phaenopsectra	0	0	1.9	0	0	0.24	0	0.20	0	0	0	0	1.9	0.24	1.9	0.24	0.38	0.088	0.86	0.12
	Tanytarsus	4.3	1.3	5.7	0	1.9	2.4	1.1	1.8	0.76	1.6	0	0.76	5.7	2.4	5.7	2.4	2.7	1.5	2.3	0.63
	S.F. Diamesinae																				
	Protanypus	0	0.67	0	0	0	0	0.23	0	0	0.41	0	0	0.67	0.41	0.67	0.41	0.13	0.13	0.30	0.18
	S.F. Orthocladiinae																				
	Heterotrissocladius	0	0	0.77	0	0	5.3	7.0	6.4	3.1	0.81	0	0.81	0.77	7.0	0.77	7.0	0.15	4.53	0.34	2.6
	S.F. Prodiamesinae																				
	Monodiamesa	0.54	0.67	0	0.88	0	0.24	0.23	0	0	0	0	0	0.88	0.24	0.88	0.24	0.42	0.09	0.40	0.13
	S.F. Tanypodinae																				
	Procladius	15	25	14	26	5.2	4.8	8.2	2.2	7.6	2.4	5.2	2.2	26	8.2	26	8.2	17	5.1	8.8	2.8
Bivalve Molluscs	F. Sphaeriidae																				
	Cyclocalyx	0	0	3.8	0.88	0	2.2	0	0.20	0	0	0	0	3.8	2.2	3.8	2.2	0.94	0.47	1.7	0.95
	Cyclocalyx/Neopisidium	0	0	0	0	0.83	0	0	0.60	0.76	1.2	0	0	0.83	1.2	0.83	1.2	0.17	0.52	0.37	0.52
Arachnida	F. Lebertiidae																				
	Lebertia	0	0.67	0	0.88	0	0	0	0	0	0	0	0	0.88	0	0.88	0	0.31	0	0.43	0

[a] Immature Tubificinae were combined for data analyses

Note: Summary statistics were provided to determine taxa (bolded) that comprise at least 5% of the total number of organisms at one or more stations within an area (as shown in Figure 6.3).

Table E.14: Descriptive Statistics for Benthic Invertebrate Communities Sampled in Koocanusa Reservoir, August 2014

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of organisms/m²)		T2	5	400	1,139	7,504	3,224	3,502
		T4	5	1,766	2,191	4,270	2,631	981
Richness (no. of taxa)		T2	5	8.0	10	14	10	2.3
		T4	5	8.0	11	12	10	1.6
Major Group Density (no. of organisms/m^2)	Nematodes	T2	5	0	139	722	219	290
		T4	5	0	8.7	26	12	9.9
	Oligochaetes	T2	5	113	765	6,009	2,588	3,038
		T4	5	791	1,304	3,409	1,595	1,041
	Ostracods	T2	5	0	0	148	38	64
		T4	5	635	730	1,461	849	346
	Chironomids	T2	5	130	287	530	327	153
		T4	5	104	157	209	158	40
	Bivalve Molluscs	T2	5	0	0	200	49	87
		T4	5	0	17	26	14	9.9
Major Group Relative Density (%)	Nematodes	T2	5	0	4.6	27	8.7	11
		T4	5	0	0.40	1.5	0.58	0.55
	Oligochaetes	T2	5	28	67	89	63	24
		T4	5	39	60	80	58	16
	Ostracods	T2	5	0	0	3.8	1.2	1.7
		T4	5	15	34	53	35	14
	Chironomids	T2	5	5.6	24	72	27	27
		T4	5	4.8	6.4	8.9	6.3	1.7
	Bivalve Molluscs	T2	5	0	0	2.7	0.67	1.2
		T4	5	0	0.63	1.2	0.64	0.48

Table E.15: Descriptive Statistics for Benthic Invertebrate Communities Sampled in Koocanusa Reservoir, August 2015

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of organisms/m²)		TN	5	353	793	1,664	984	531
		T4	5	3,129	3,612	3,888	3,533	361
Richness (no. of taxa)		TN	5	7.0	13	14	11	2.9
		T4	5	8.0	11	12	10	1.8
Major Group Density (no. of organisms/m^2)	Nematodes	TN	5	0	17	69	24	27
		T4	5	0	17	43	17	16
	Oligochaetes	TN	5	233	302	931	484	302
		T4	5	517	1,560	1,940	1,321	578
	Ostracods	TN	5	8.6	52	267	91	103
		T4	5	1,000	1,491	2,267	1,686	534
	Chironomids	TN	5	112	388	595	381	174
		T4	5	414	526	595	502	74
	Bivalve Molluscs	TN	5	0	0	8.6	3.5	4.7
		T4	5	0	0	26	6.9	11
Major Group Relative Density (%)	Nematodes	TN	5	0	1.2	5.0	2.1	2.0
		T4	5	0	0.44	1.1	0.46	0.41
	Oligochaetes	TN	5	38	48	66	50	12
		T4	5	17	43	52	37	16
	Ostracods	TN	5	2.4	4.8	16	7.8	5.9
		T4	5	31	41	70	48	16
	Chironomids	TN	5	26	43	54	40	11
		T4	5	11	15	17	14	2.1
	Bivalve Molluscs	TN	5	0	0	0.62	0.23	0.31
		T4	5	0	0	0.72	0.19	0.31

Table E.16: Descriptive Statistics for Benthic Invertebrate Communities Sampled in Koocanusa Reservoir, August 2016

Endpoint		Area	Summary Statistics					
			n	Minimum	Median	Maximum	Mean	SD
Density (no. of organisms/m²)		TN	5	1,018	1,646	6,424	2,547	2,220
		T4	5	2,177	3,680	4,398	3,295	992
Richness (no. of taxa)		TN	5	12	12	16	13	1.7
		T4	5	11	12	15	13	1.5
Major Group Density (no. of organisms/m^2)	Nematodes	TN	5	0	0	43	12	19
		T4	5	0	0	43	16	22
	Oligochaetes	TN	5	398	973	4,460	1,510	1,672
		T4	5	938	1,602	1,796	1,485	339
	Ostracods	TN	5	124	186	956	333	353
		T4	5	212	1,496	2,195	1,241	895
	Chironomids	TN	5	434	469	1,018	658	293
		T4	5	248	655	735	522	225
	Bivalve Molluscs	TN	5	0	8.9	89	30	39
		T4	5	0	27	80	32	30
Major Group Relative Density (%)	Nematodes	TN	5	0	0	1.9	0.43	0.81
		T4	5	0	0	1.2	0.41	0.57
	Oligochaetes	TN	5	39	47	69	53	14
		T4	5	24	41	78	50	23
	Ostracods	TN	5	7.5	13	20	13	5.1
		T4	5	10	41	56	33	19
	Chironomids	TN	5	15	33	46	33	13
		T4	5	11	15	19	15	3.1
	Bivalve Molluscs	TN	5	0	0.83	3.8	1.1	1.6
		T4	5	0	0.81	2.2	0.99	0.79

Table E.17: Mean Skewness and Kurtosis Values of Benthic Invertebrate (LPL) Density Matrix by Transformation, 2014 to 2016 (n = 30)

Transformation	Endpoint	Skewness (mean)	Kurtosis (mean)
None	Area\Row	2.607	6.738
	Taxa\Col	2.181	5.796
Log_{10}	Area\Row	0.485	-0.859
	Taxa\Col	0.334	0.053
Square root	Area\Row	1.885	3.297
	Taxa\Col	1.208	1.473
Fourth root	Area\Row	0.790	-0.055
	Taxa\Col	0.472	0.004
Power 2	Area\Row	3.019	9.179
	Taxa\Col	3.210	11.981
Power 4	Area\Row	3.019	9.179
	Taxa\Col	3.210	11.981

- mean skewness and kurtosis values closest to zero.

Table E.18: Non-Metric Multidimensional Scaling (NMDS) Results for Benthic Invertebrate Community Data (LPL) Displaying Percent Variance Explained by Each Axis, Monte Carlo Randomization p-values of Axis Significance, and Axis Scores, 2014 to 2016

Year	Area		Log_{10} Transformation		4th Root Transformation		Non-Transformed	
			NMDS-1	NMDS-2	NMDS-1	NMDS-2	NMDS-1	NMDS-2
2014	Upstream of Elk River	T2-2	-0.41	-1.62	0.92	1.45	-1.80	0.80
		T2-3	-2.09	0.45	1.92	-0.96	-1.75	-0.19
		T2-4	-0.85	0.32	0.77	-0.48	-0.54	0.10
		T2-5	0.15	1.01	-0.37	-0.96	1.25	1.11
		T2-6	-0.98	1.26	0.56	-1.50	1.16	1.14
	Downstream of Elk River	T4-2	0.20	0.47	-0.38	-0.39	0.42	-0.46
		T4-3	-0.44	0.49	0.25	-0.59	-0.01	-0.42
		T4-4	-0.16	0.68	-0.03	-0.68	0.36	-0.09
		T4-5	-0.11	0.41	-0.07	-0.37	0.32	-0.05
		T4-6	-0.11	-0.17	0.05	0.05	0.97	0.38
2015	Upstream of Elk River	TN-1	-0.50	0.11	0.44	-0.15	-0.71	-0.22
		TN-2	-1.11	-1.09	1.33	0.83	-1.85	0.15
		TN-3	0.04	-0.41	0.13	0.48	-1.11	0.02
		TN-4	-0.03	-0.56	0.22	0.59	-1.25	0.00
		TN-5	0.11	0.04	-0.06	0.03	-0.23	-0.04
	Downstream of Elk River	T4-2	0.53	-0.09	-0.56	0.28	0.31	-1.00
		T4-3	0.55	0.19	-0.56	0.04	0.45	-0.71
		T4-4	0.55	0.35	-0.61	-0.20	0.57	-0.27
		T4-5	0.49	-0.50	-0.41	0.58	0.51	-0.08
		T4-6	0.44	-0.25	-0.47	0.34	0.76	-0.23
2016	Upstream of Elk River	TN-1	-0.11	-0.68	0.29	0.54	-0.17	0.15
		TN-2	-0.09	-0.78	0.34	0.70	-0.49	-0.14
		TN-3	0.59	0.23	-0.51	-0.04	-0.11	0.35
		TN-4	-0.73	-0.41	0.84	0.27	-0.87	0.29
		TN-5	0.31	0.69	-0.49	-0.66	1.17	0.41
	Downstream of Elk River	T4-2	0.73	0.15	-0.72	-0.02	0.61	-0.34
		T4-3	0.66	-0.08	-0.63	0.22	0.48	-0.75
		T4-4	1.04	-0.15	-0.99	0.34	0.89	-0.44
		T4-5	0.45	-0.36	-0.30	0.43	0.30	0.16
		T4-6	0.87	0.33	-0.88	-0.17	0.37	0.36
Final Stress			**13.05**		**12.95**		**7.37**	
% Variance explained			**50.3**	**28.2**	**53.0**	**25.6**	**76.5**	**15.9**
Monte Carlo p-value			**0.004**	**0.008**	**0.008**	**0.004**	**0.004**	**0.004**

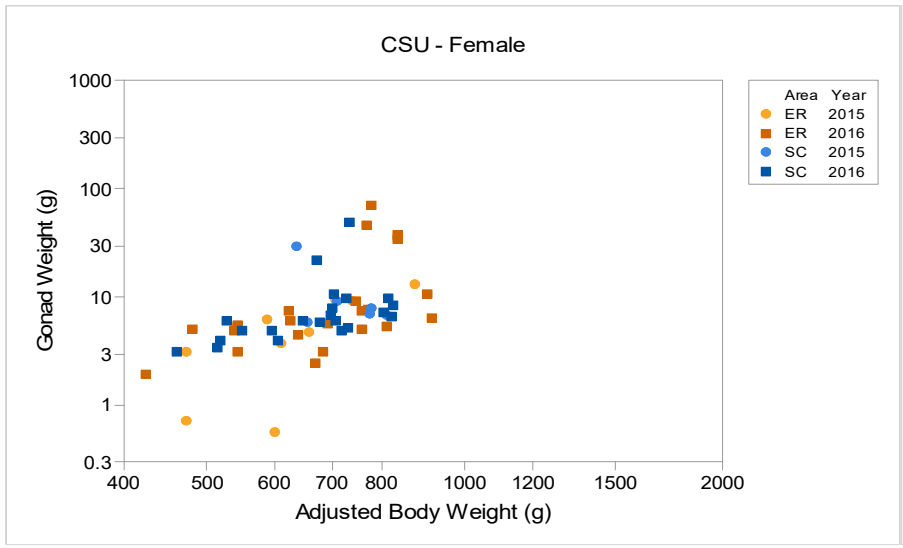
Table E.19: Pearson Correlations of Non-Metric Multidimensional Scaling (NMDS) Axis Scores, using Three Years (2014 to 2016) of Benthic Invertebrate Community Data from the Upstream and Downstream Areas of the Elk River with Relative Benthic Invertebrate Taxon Density

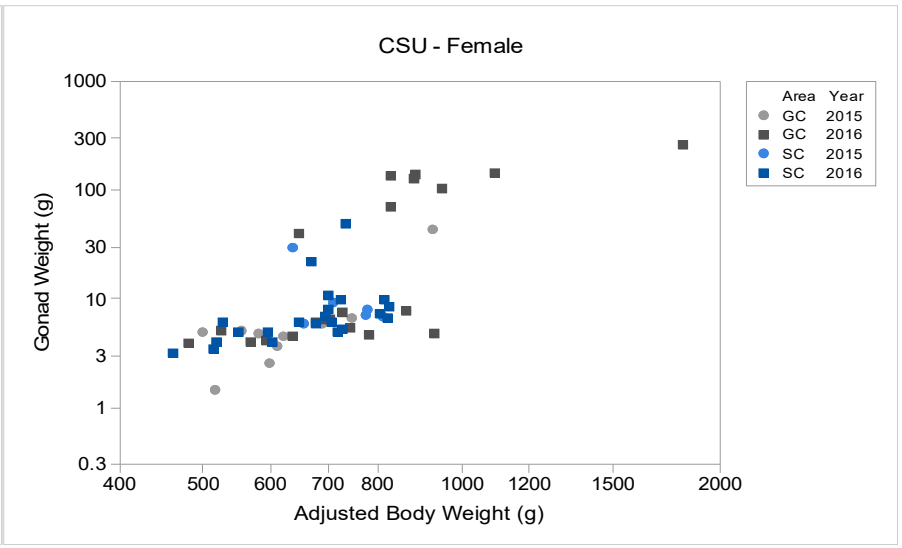
Taxa		Log_{10} Transformation				4th Root Transformation				Non-transformed			
		NMDS-1 (50.3%)		NMDS-2 (28.2%)		NMDS-1 (53.0%)		NMDS-2 (25.6%)		NMDS-1 (76.5%)		NMDS-2 (15.9%)	
		Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value	Pearson r-value	Pearson p-value
Nematodes	Nemata	-0.177	0.350	0.710	0.000	-0.003	0.989	-0.711	0.000	0.250	0.182	0.471	0.009
Oligochaetes	Oligocheata	0.393	0.032	0.663	0.000	-0.499	0.005	-0.581	0.001	0.719	0.000	0.592	0.001
Ostracods	Ostracoda	0.778	0.000	0.159	0.400	-0.811	0.000	0.048	0.801	0.536	0.002	-0.719	0.000
Insects	Chironomus sp.	0.403	0.027	0.151	0.425	-0.402	0.028	-0.077	0.684	0.270	0.150	0.364	0.048
	Harnischia sp.	0.172	0.364	-0.646	0.000	0.017	0.929	0.685	0.000	-0.138	0.468	-0.147	0.438
	Phaenopsectra sp.	0.330	0.075	0.036	0.851	-0.288	0.123	0.070	0.713	0.104	0.585	0.122	0.522
	Tanytarsus sp.	0.811	0.000	-0.171	0.366	-0.733	0.000	0.363	0.049	0.402	0.028	-0.131	0.491
	Protanypus sp.	0.295	0.113	0.042	0.826	-0.290	0.121	0.025	0.896	0.137	0.472	-0.234	0.213
	Heterotrissocladius sp.	0.721	0.000	-0.108	0.570	-0.661	0.000	0.296	0.112	0.287	0.125	-0.445	0.014
	Monodiamesa sp.	-0.393	0.032	-0.122	0.522	0.406	0.026	-0.015	0.938	-0.050	0.794	0.259	0.166
	Procladius sp.	0.082	0.668	0.009	0.962	-0.074	0.696	0.029	0.878	0.031	0.873	-0.021	0.911
Bivalve Molluscs	Sphaeriidae	0.318	0.086	0.664	0.000	-0.442	0.015	-0.561	0.001	0.444	0.014	0.457	0.011
Other	Arachnida	-0.155	0.414	-0.038	0.843	0.153	0.419	-0.002	0.990	-0.105	0.582	-0.149	0.432

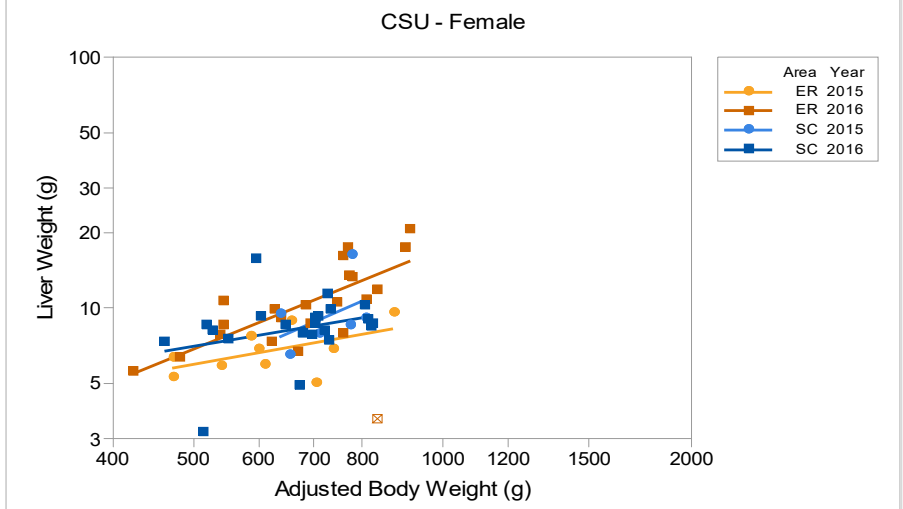
- Pearson correlation coefficients greater than an absolute value of 0.5.
- Pearson correlation with p-value less than 0.05.

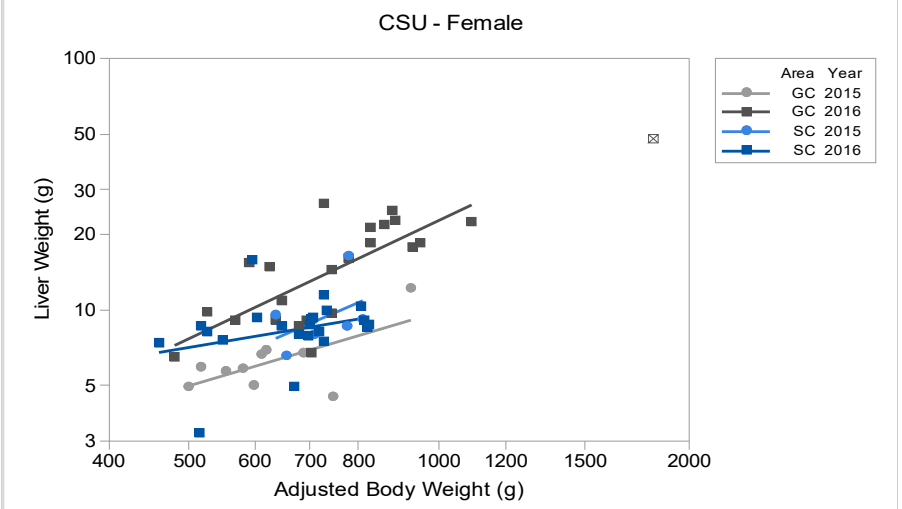
APPENDIX F
FISH DATA

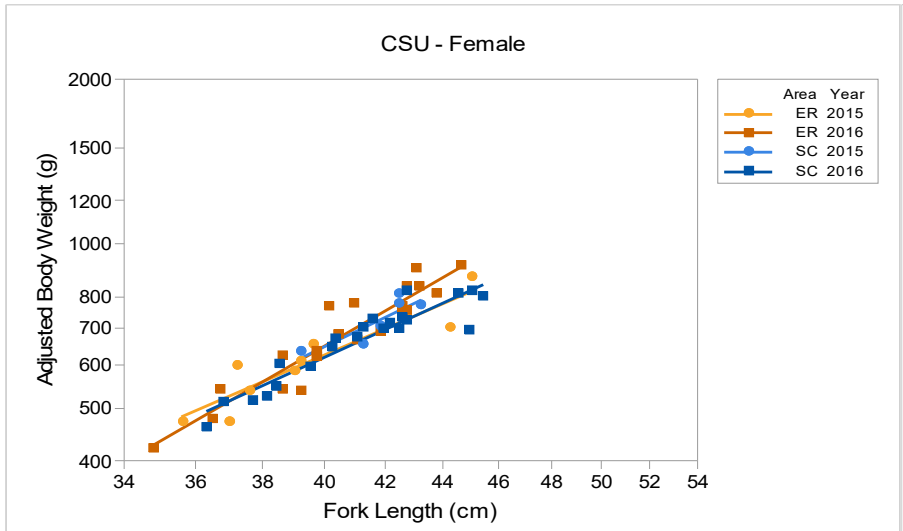
Angling
Burbot Trap
Gill Net
Hoop Net
Minnow Trap

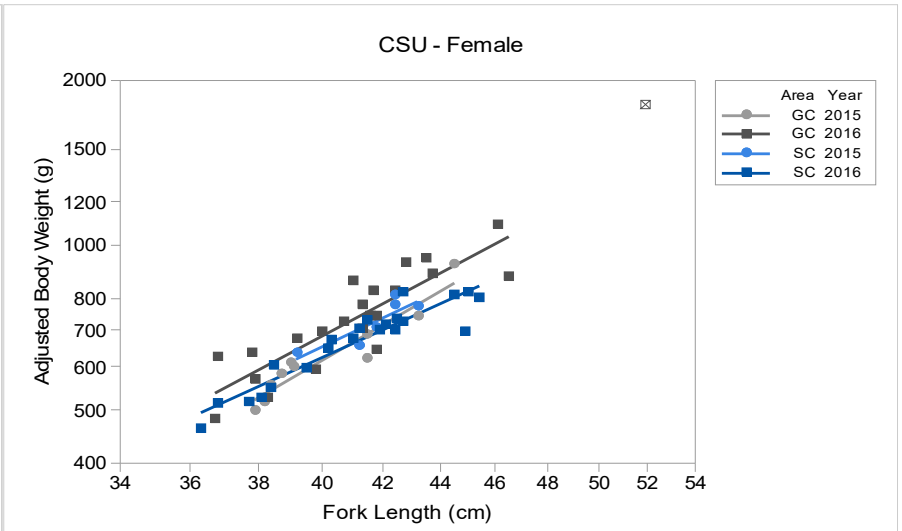


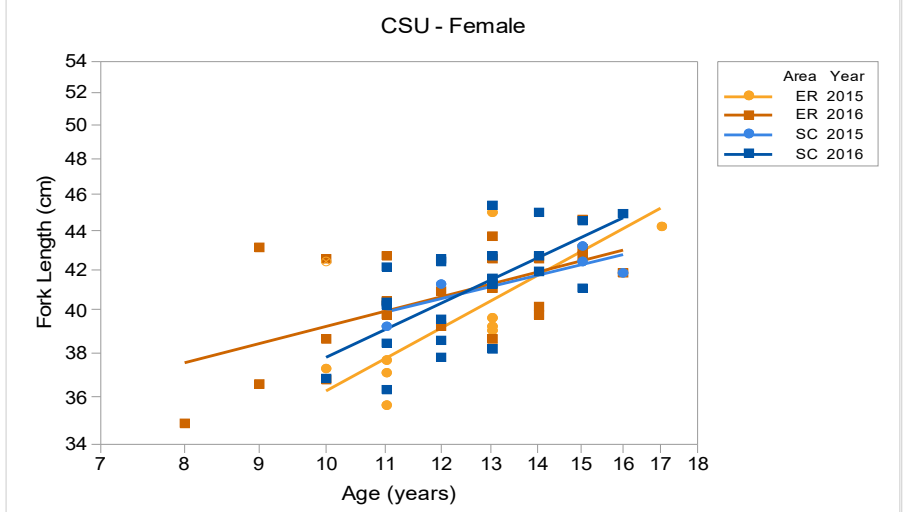


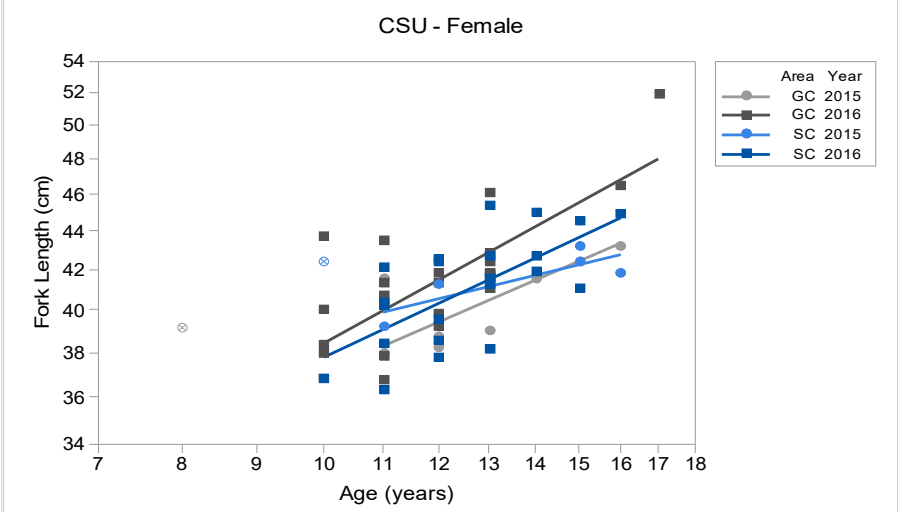


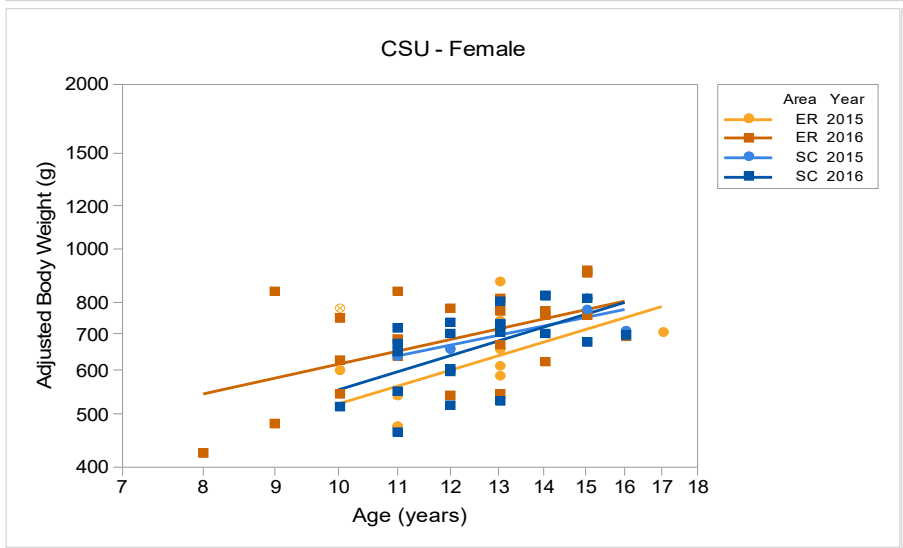












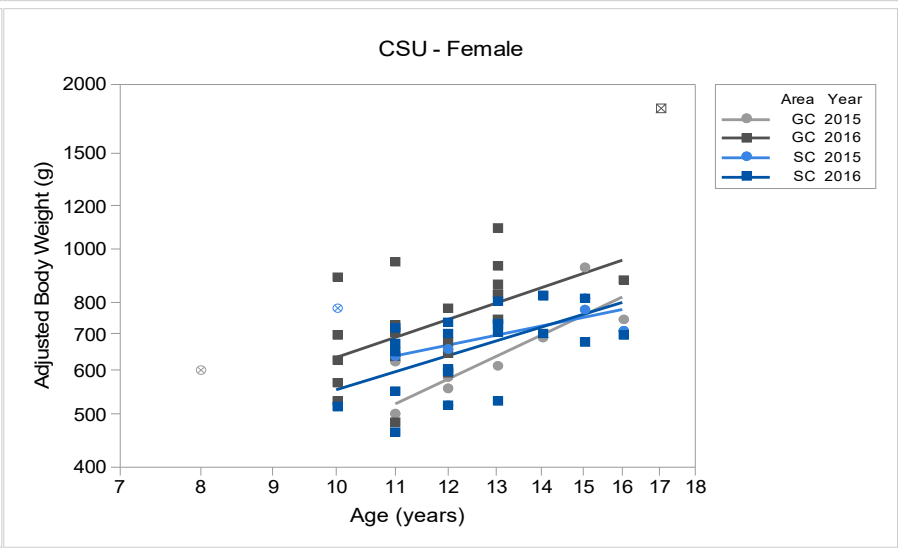


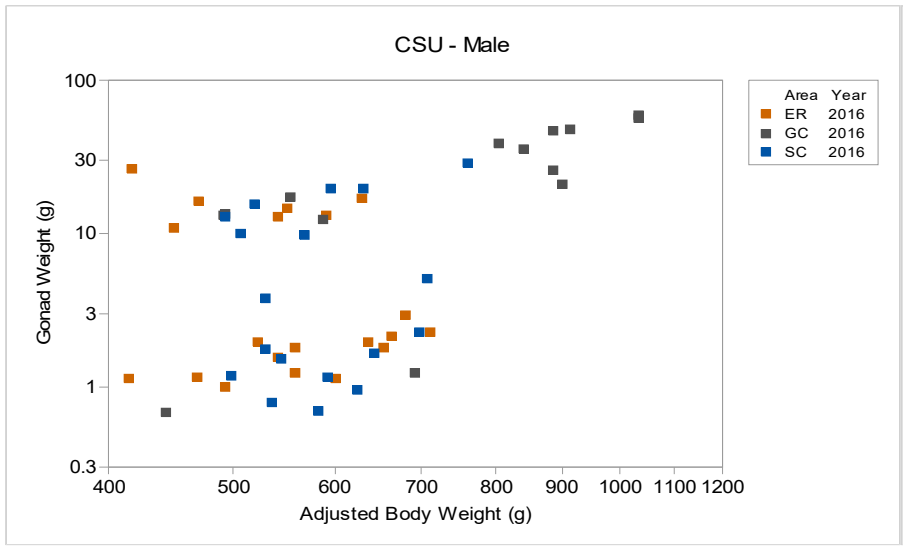
Figure F.1: Scatterplots and Linear Regressions for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2015 and 2016 for Female Largescale Sucker (CSU)

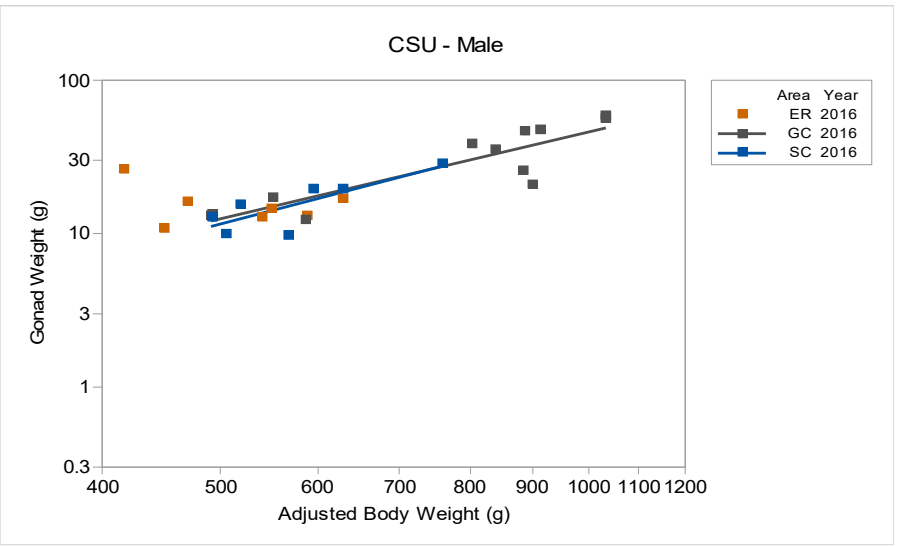
Notes:

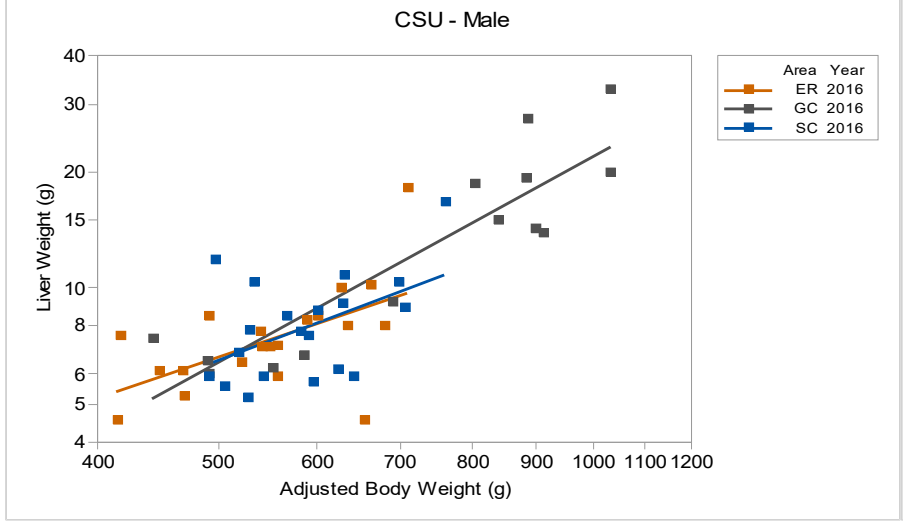
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

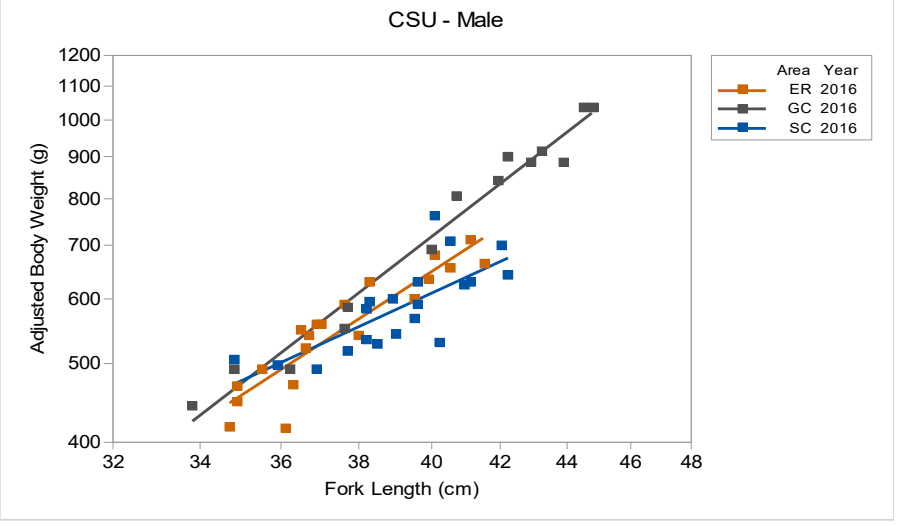
Fish with worms were excluded from the gonad weight comparisons.

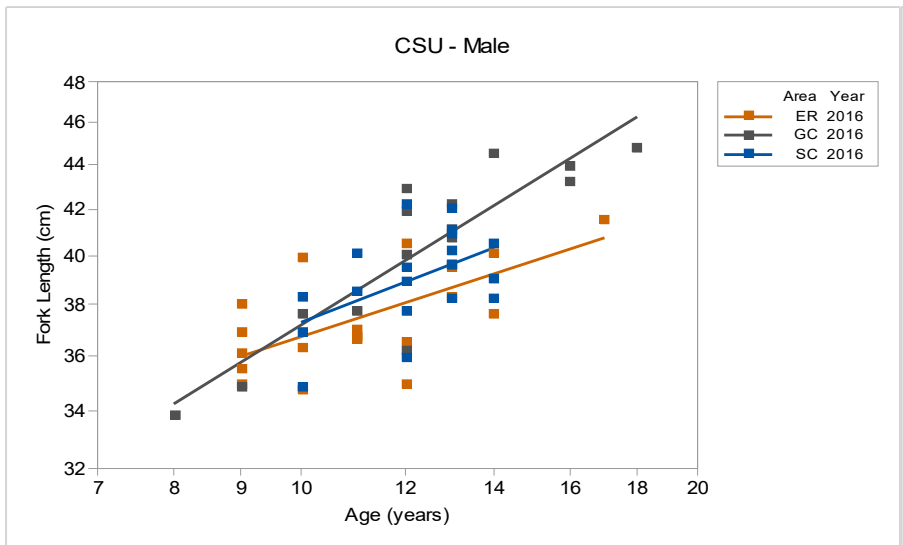
Statistical analyses were not conducted for relative gonad weight because few fish had developping gonads (the majority of fish had GSI < 1%; see Appendix Figure F.11).











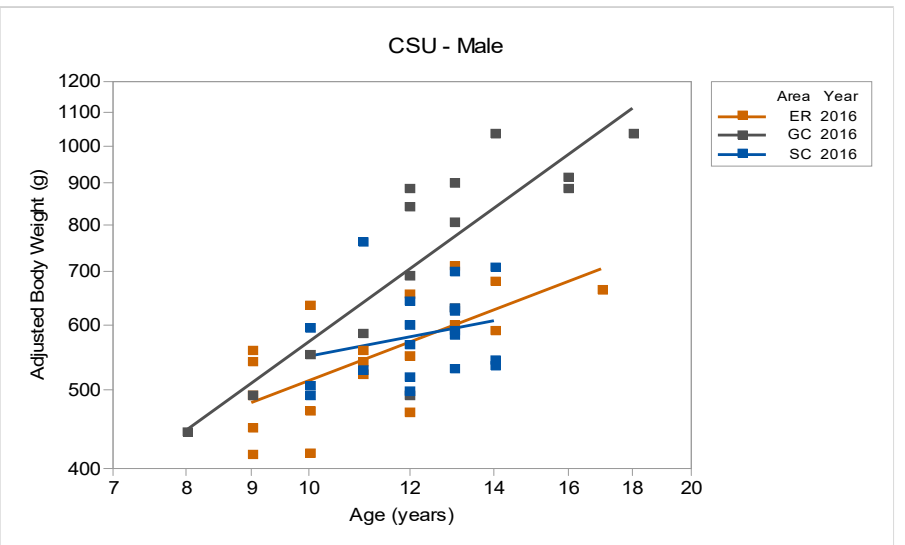


Figure F.2: Scatterplots and Linear Regressions for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2016 for Male Largescale Sucker (CSU)

Notes:

Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

Fish with worms were excluded from the gonad weight comparisons.

Statistical analyses were conducted for relative gonad weight using on fish with developping gonads (the majority of fish had GSI < 1%) using ANOVA for ER vs SC and ANCOVA for GC vs SC.

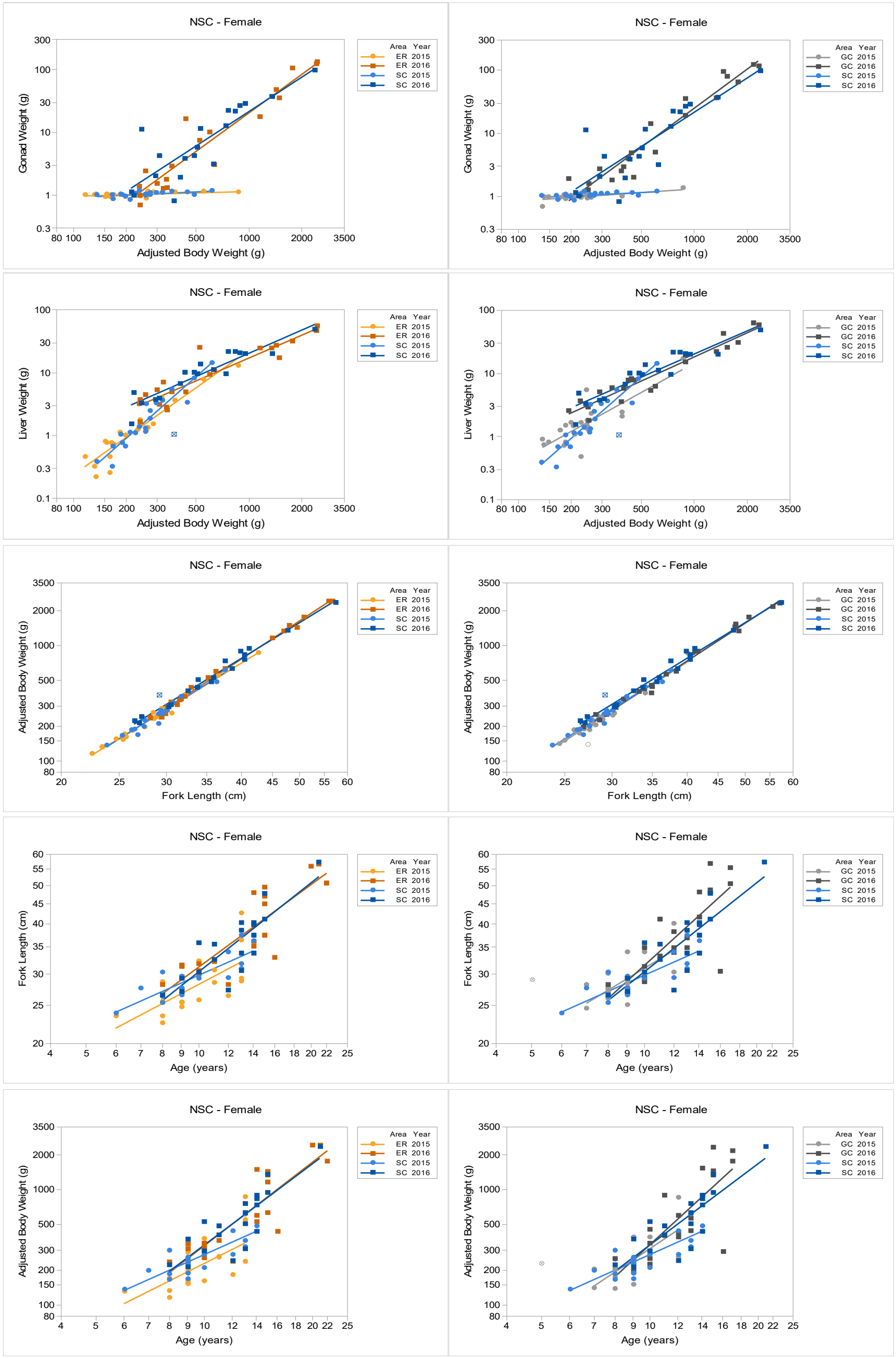
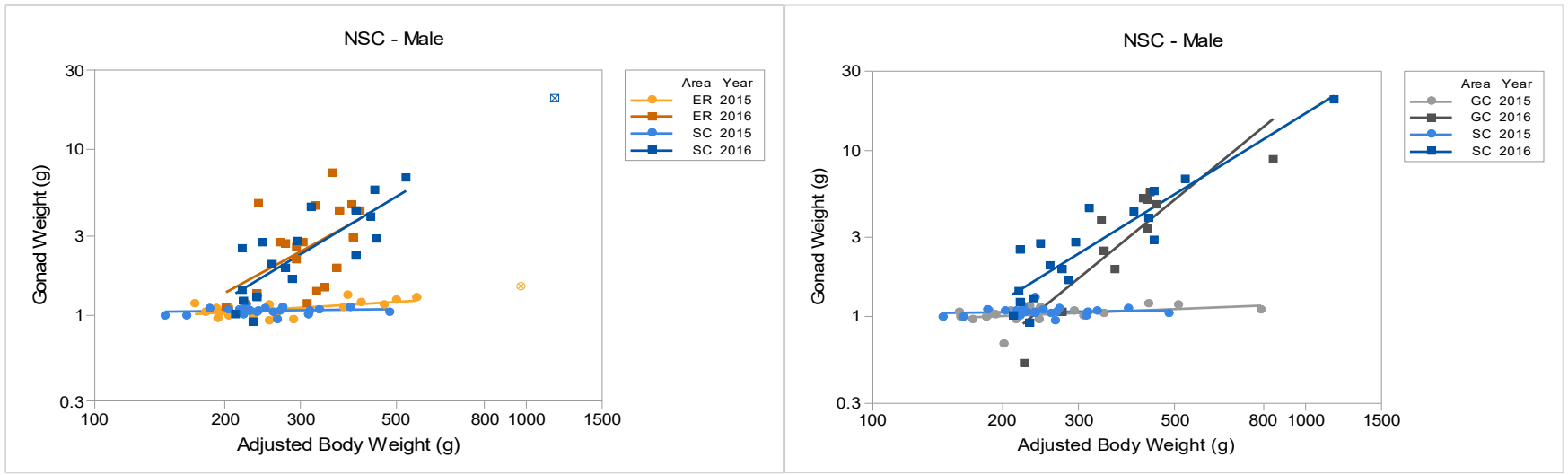


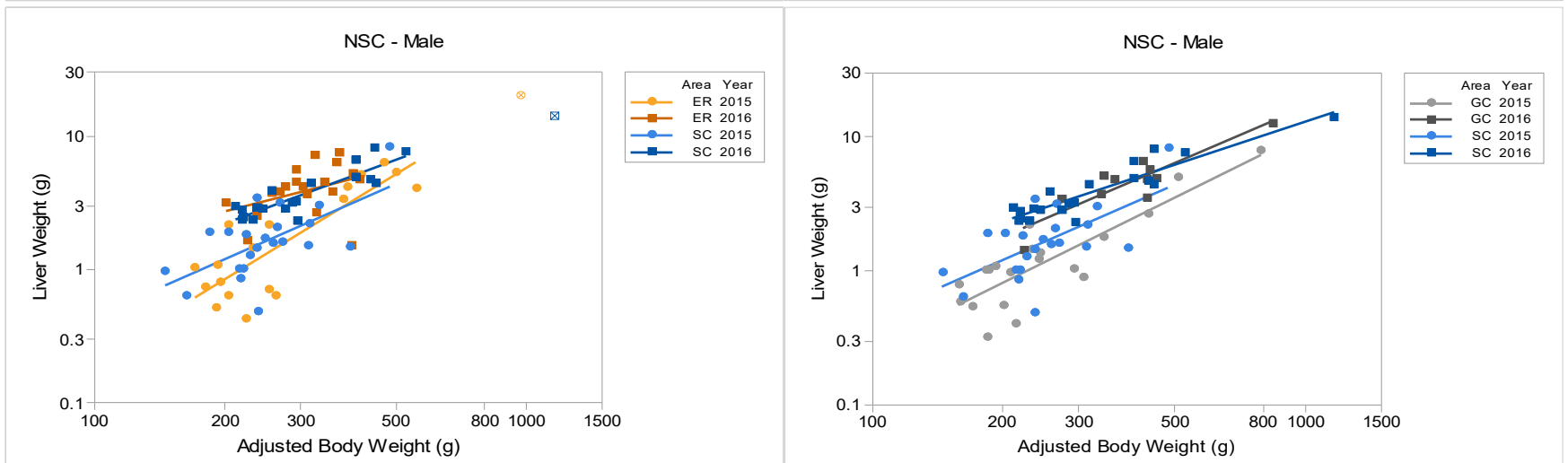
Figure F.3: Scatterplots and Linear Regressions for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2015 and 2016 for Female Northern Pikeminnow (NSC)

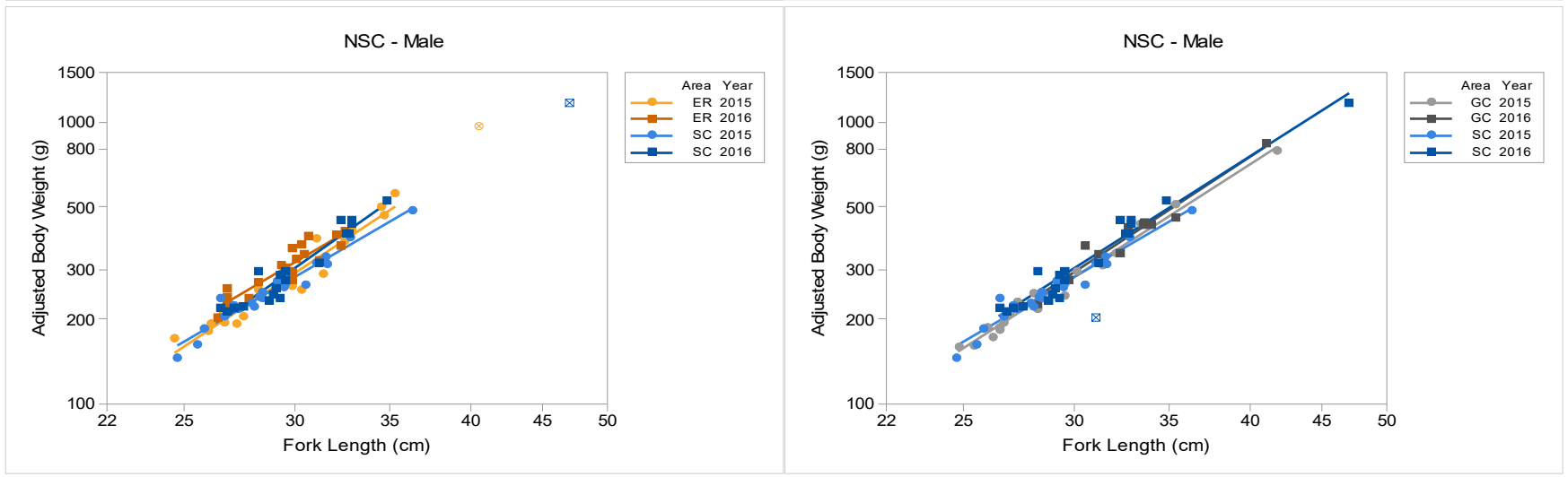
Notes:

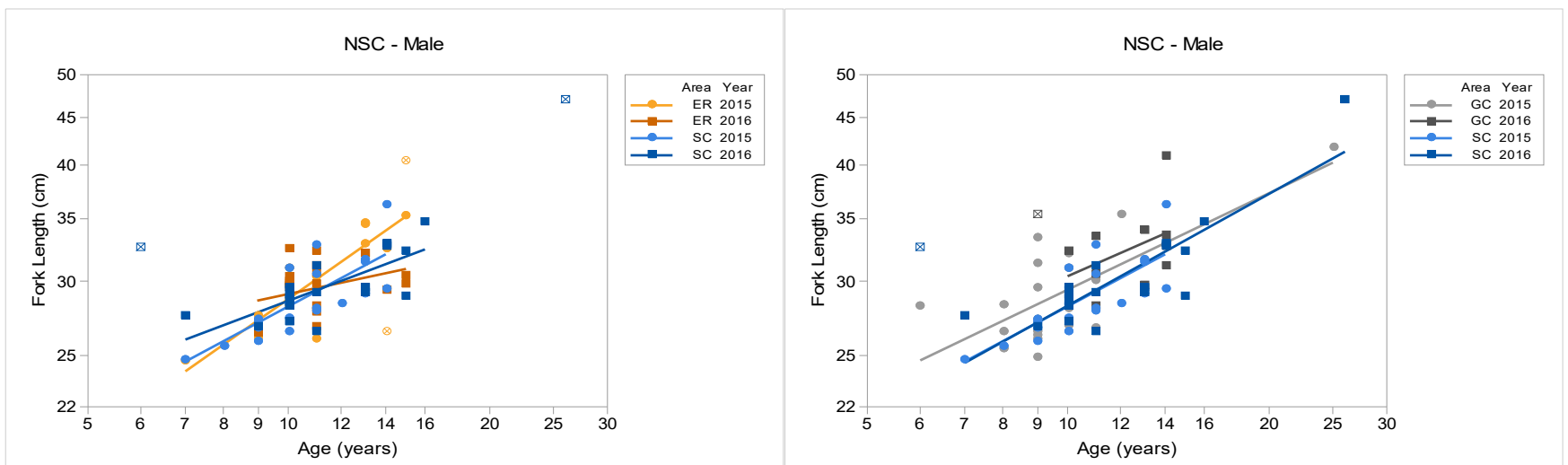
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

Fish with worms were excluded from the gonad weight comparisons









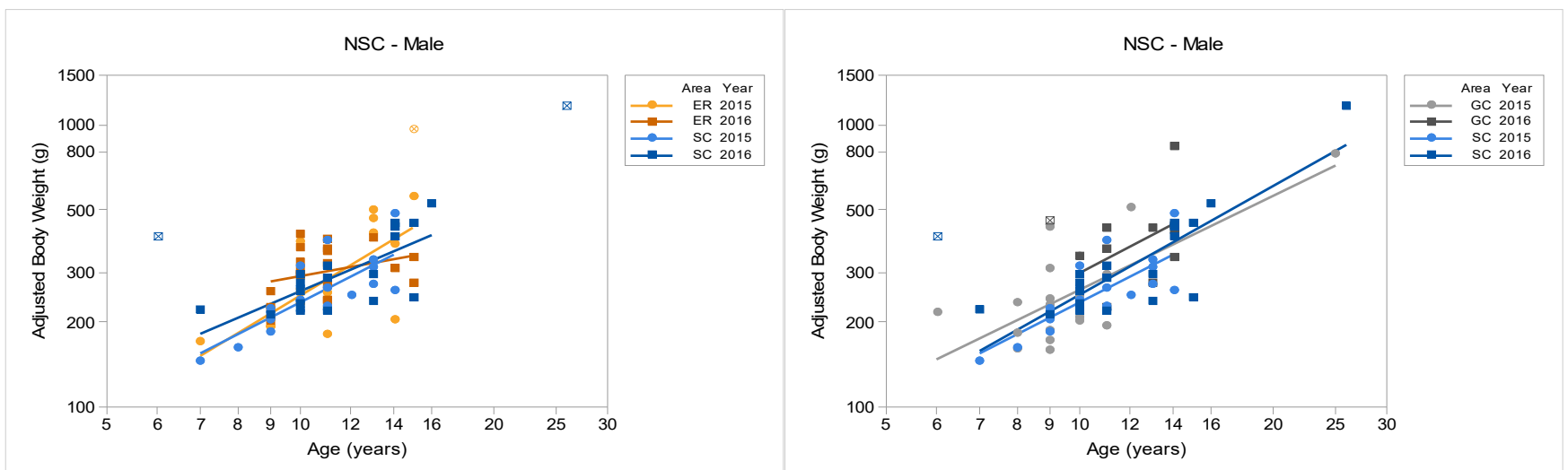
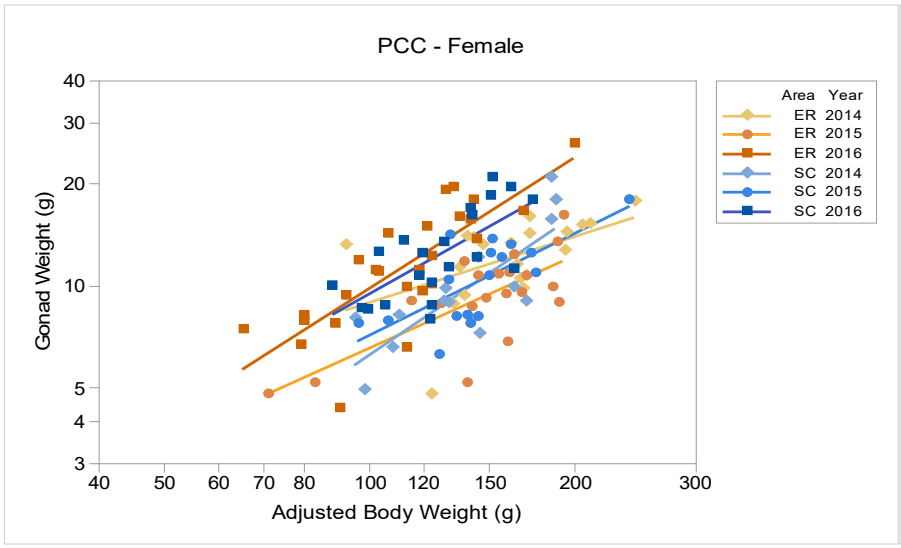


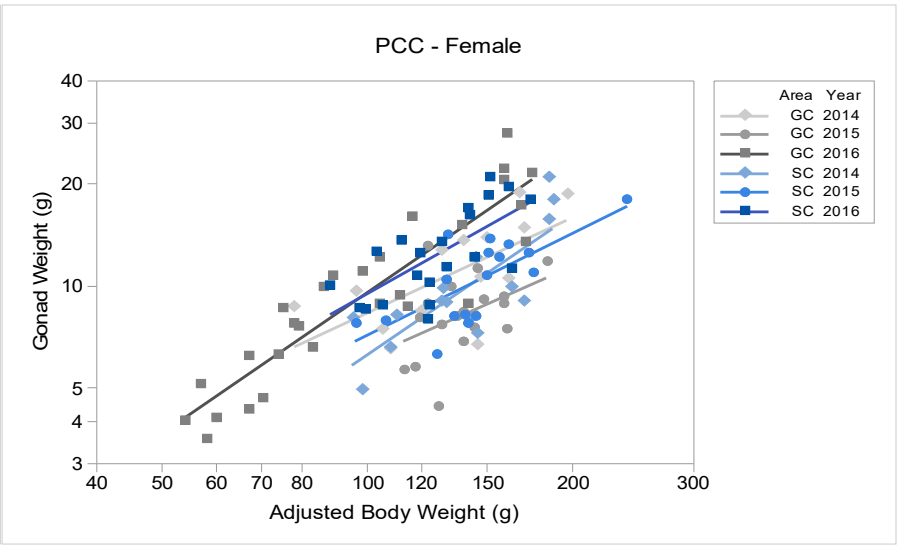
Figure F.4: Scatterplots and Linear Regressions for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2015 and 2016 for Male Northern Pikeminnow (NSC)

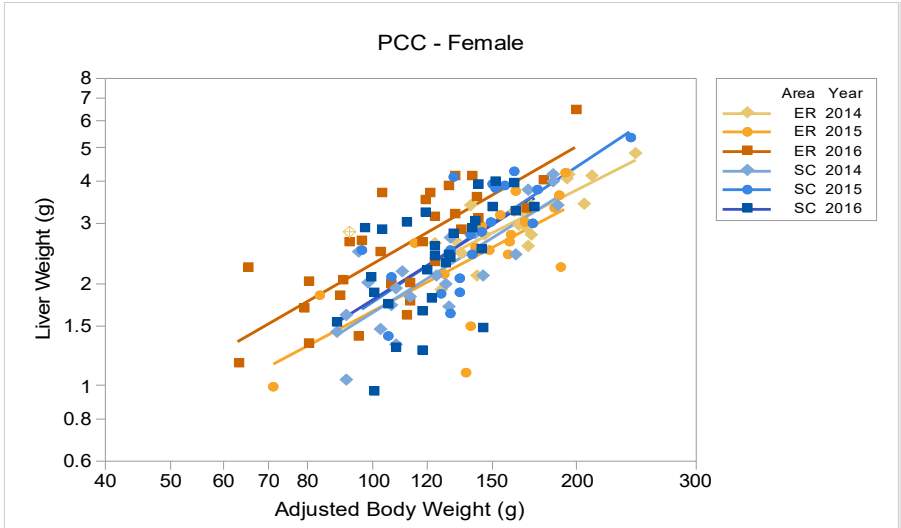
Notes:

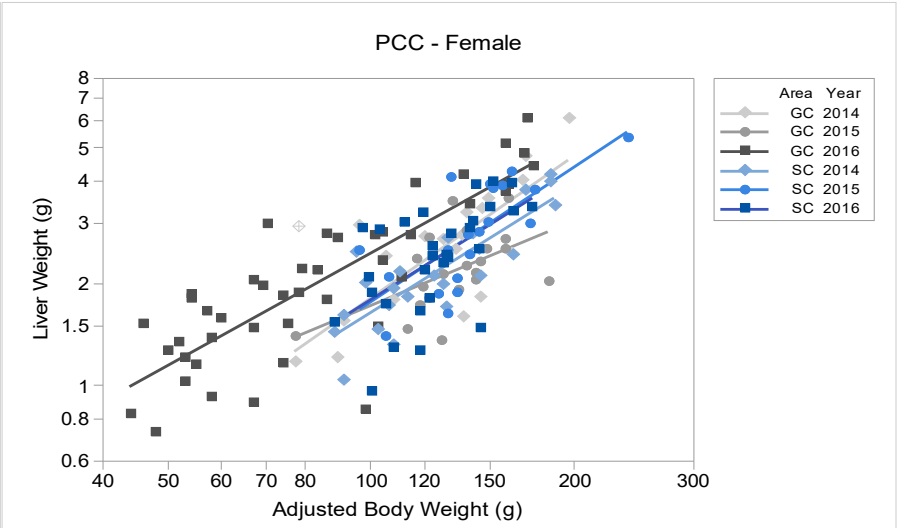
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

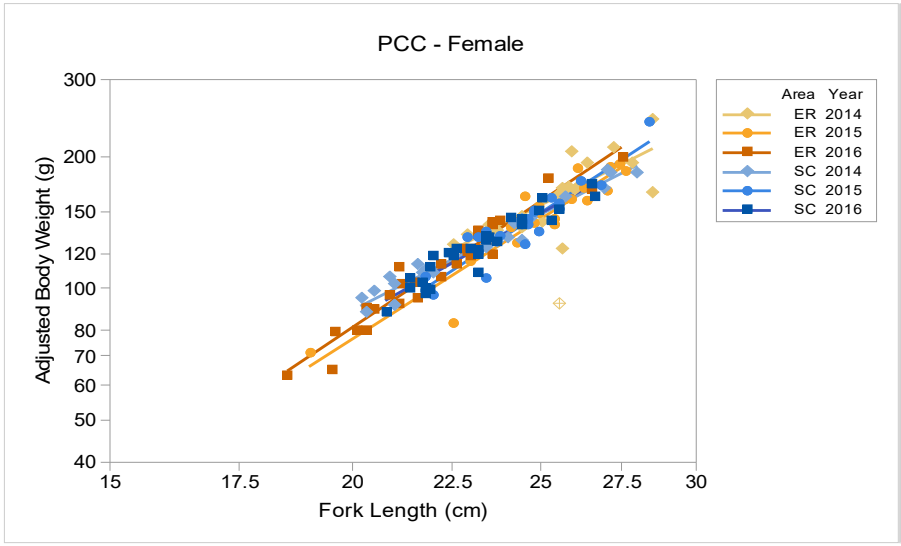
Fish with worms were excluded from the gonad weight comparisons

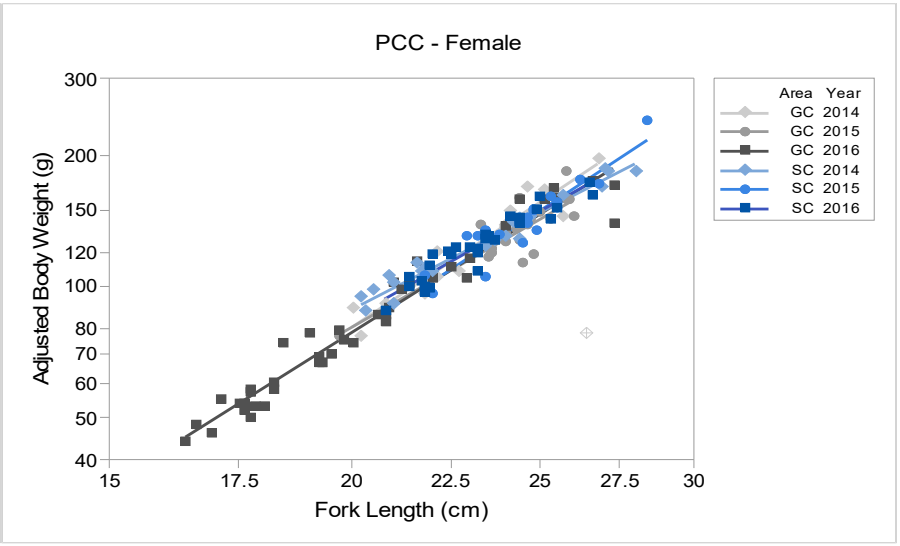


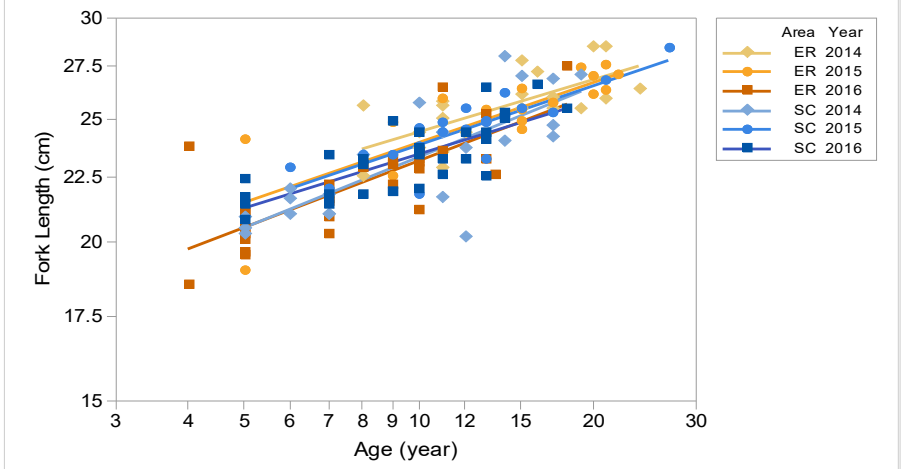


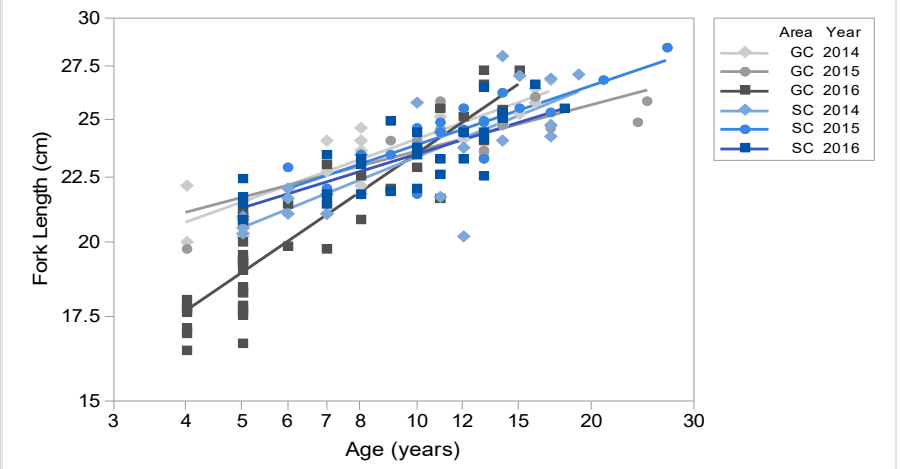


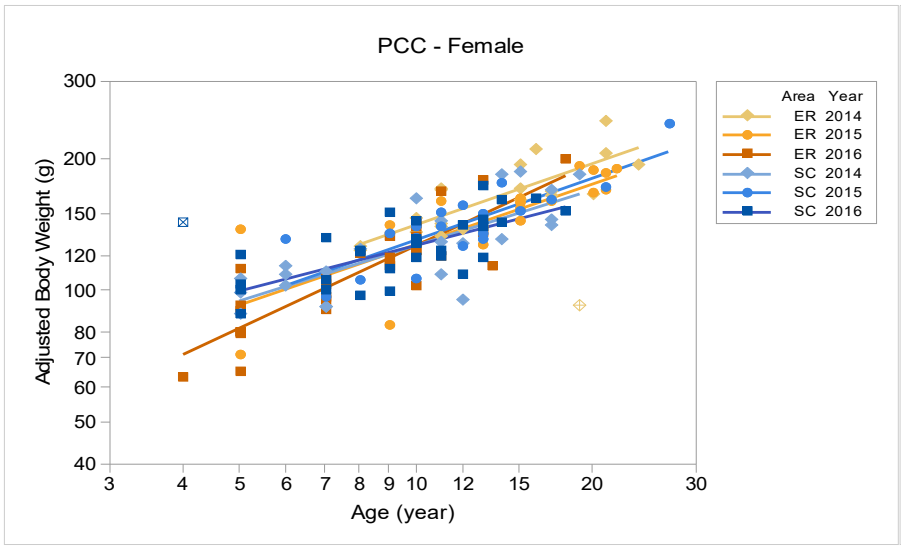












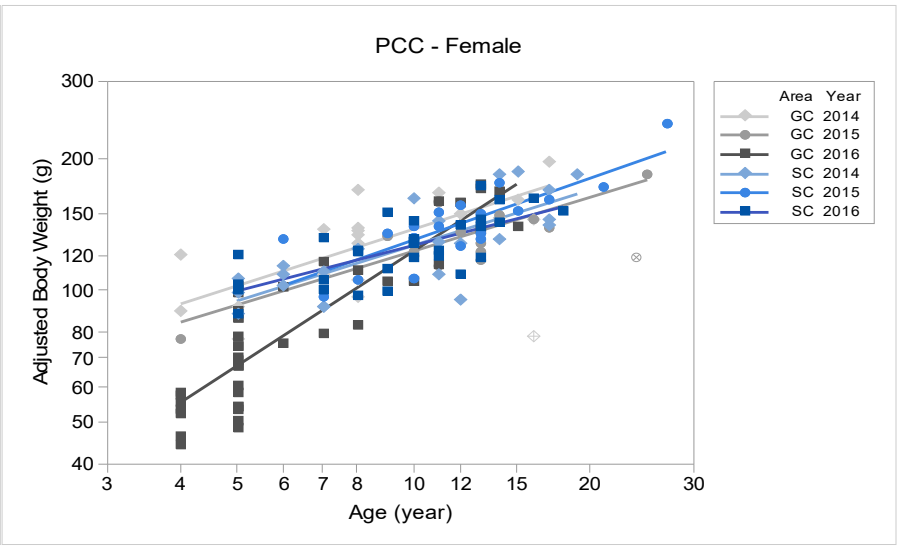
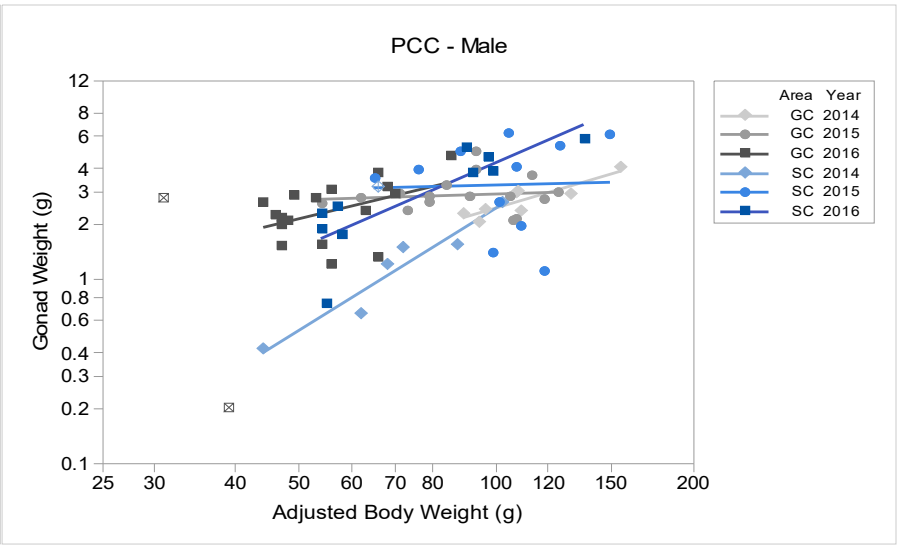


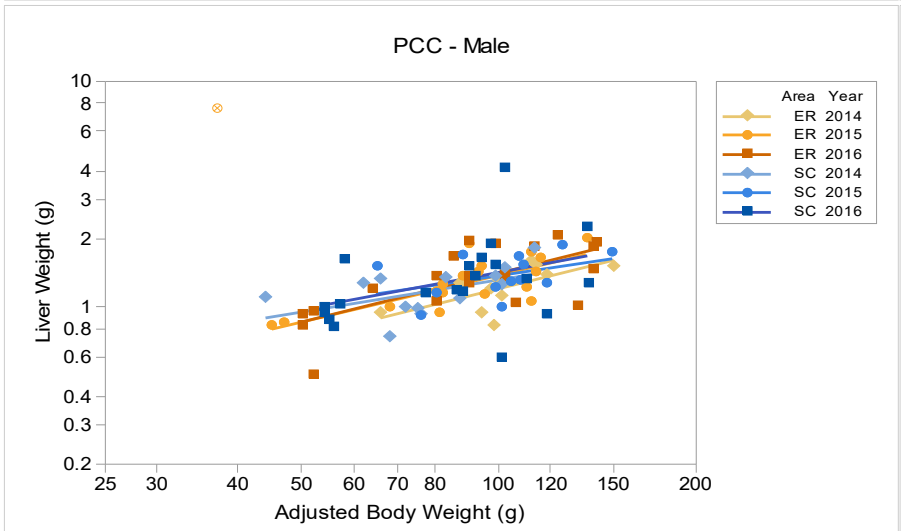
Figure F.5: Scatterplots and Linear Regressions for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2014 to 2016 for Female Peamouth Chub (PCC)

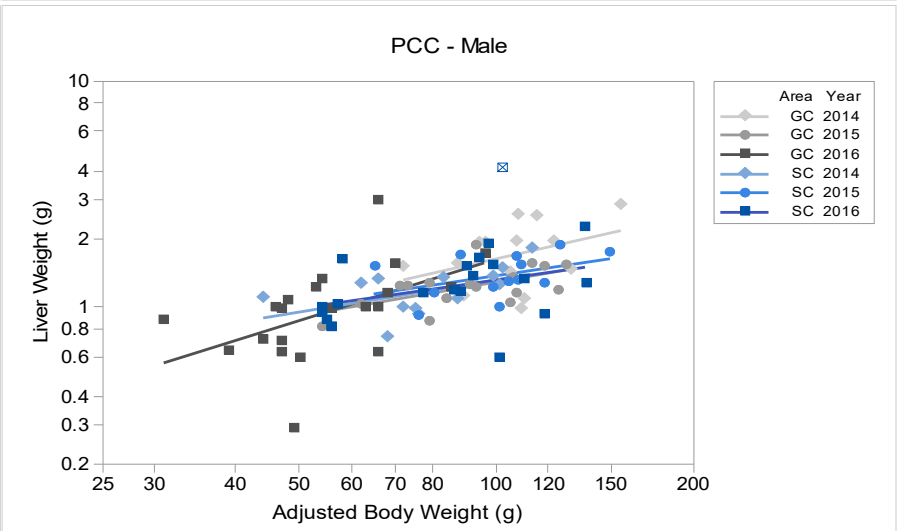
Notes:

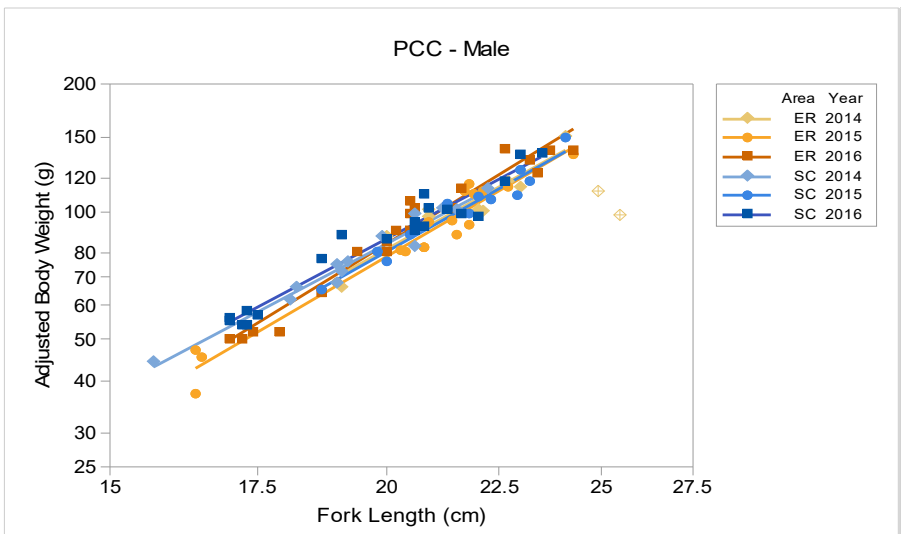
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

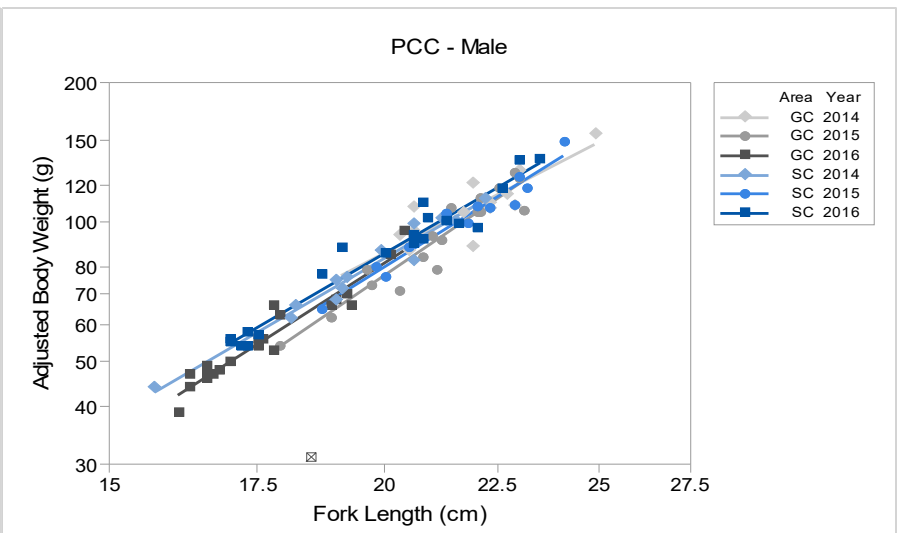
Fish with worms were excluded from the gonad weight comparisons

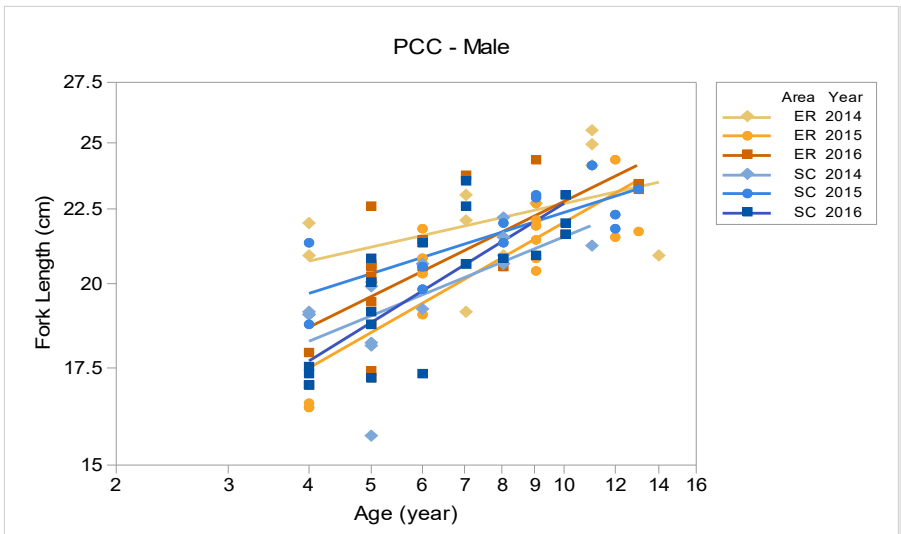


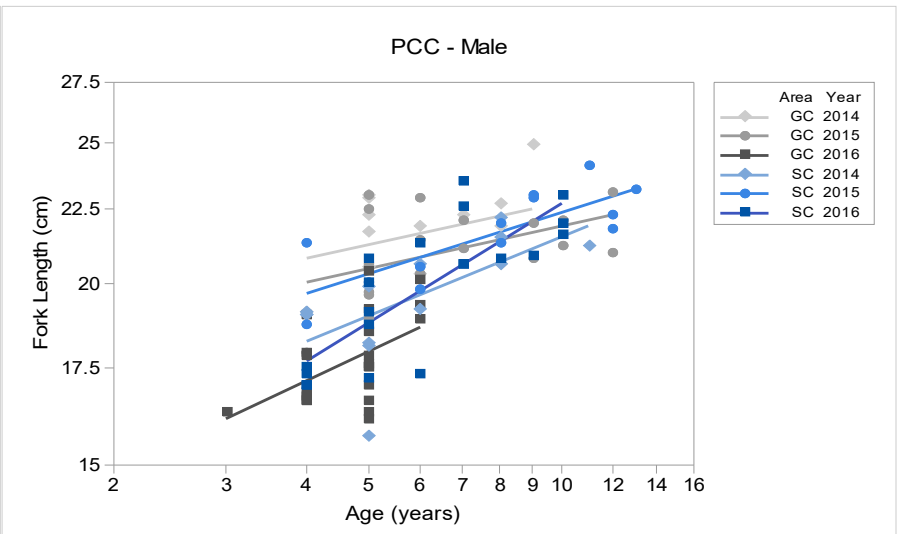


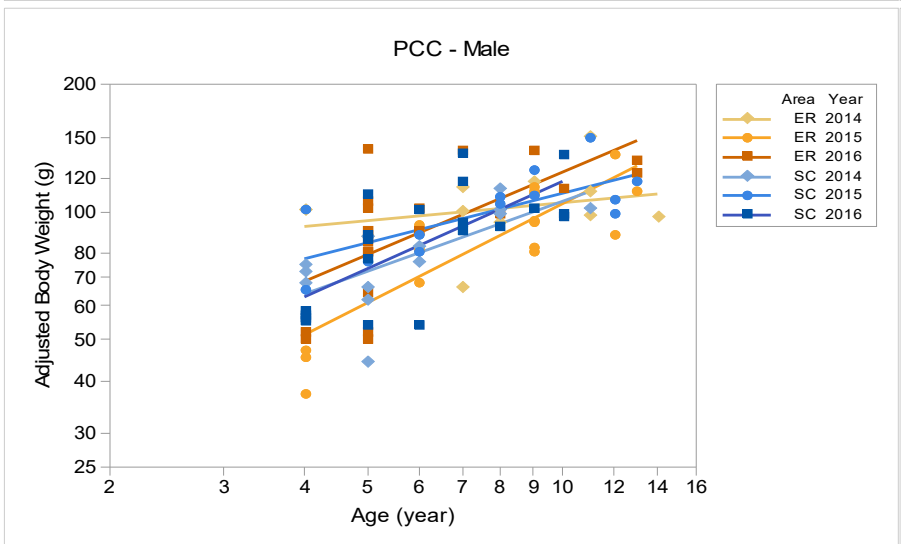












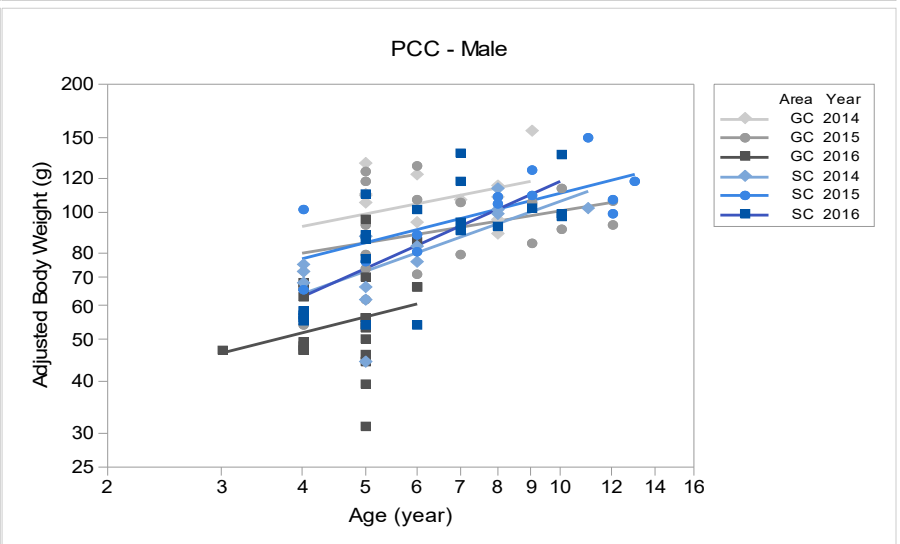
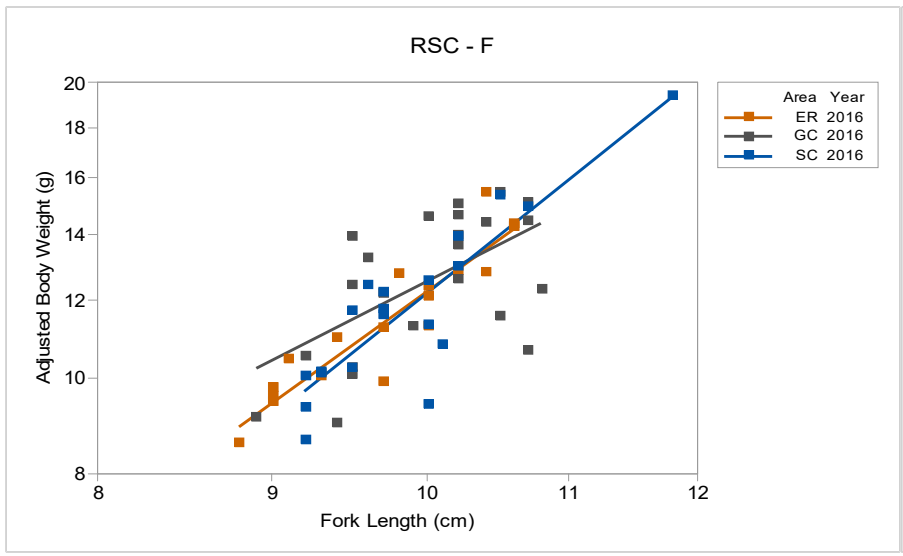


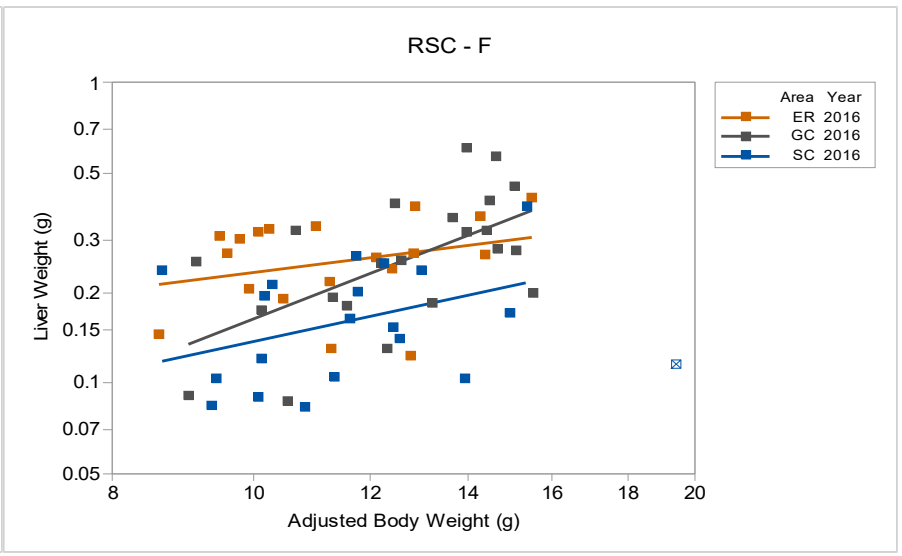
Figure F.6: Scatterplots and Linear Regressions for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2014 to 2016 for Male Peamouth Chub (PCC)

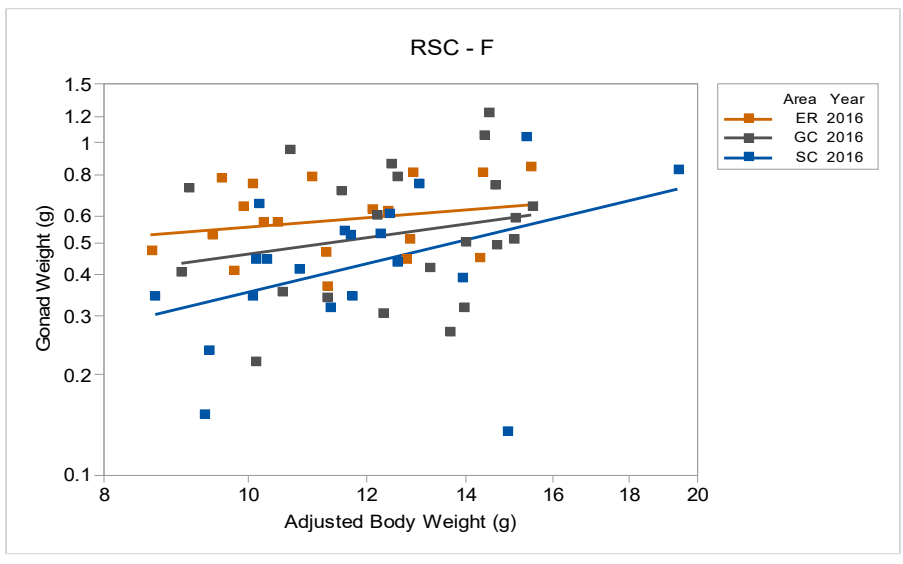
Notes:

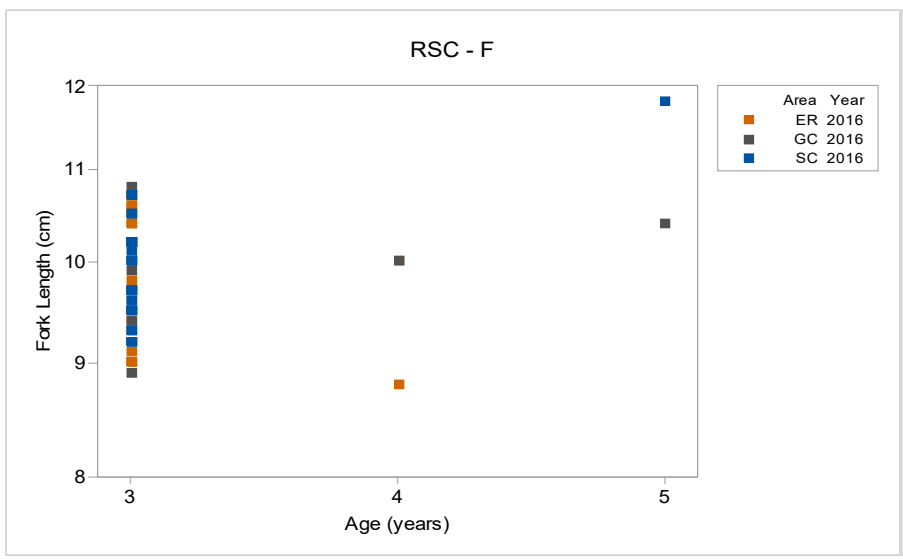
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

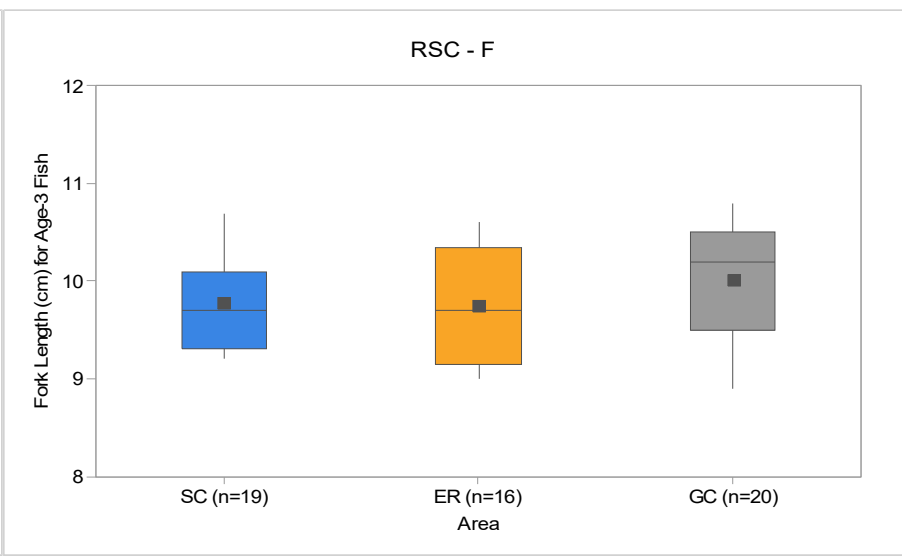
Fish with worms were excluded from the gonad weight comparisons

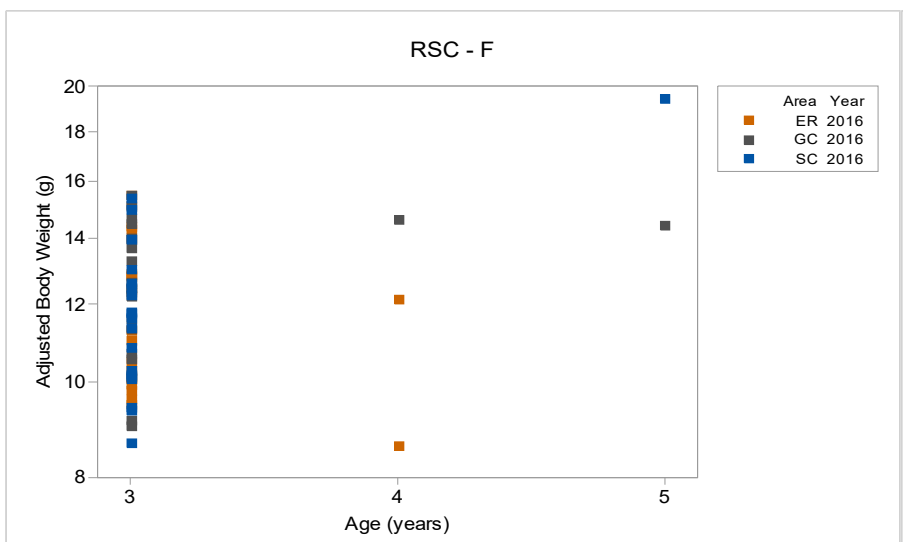












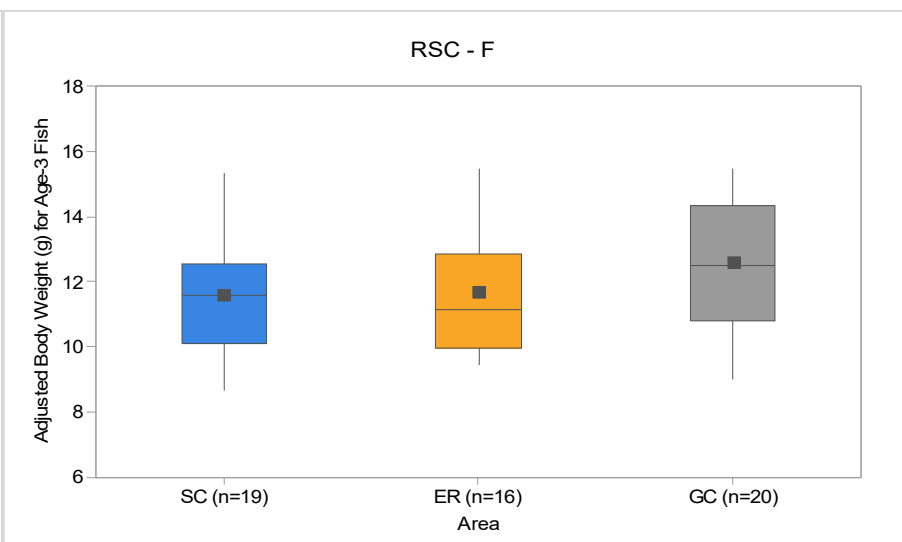


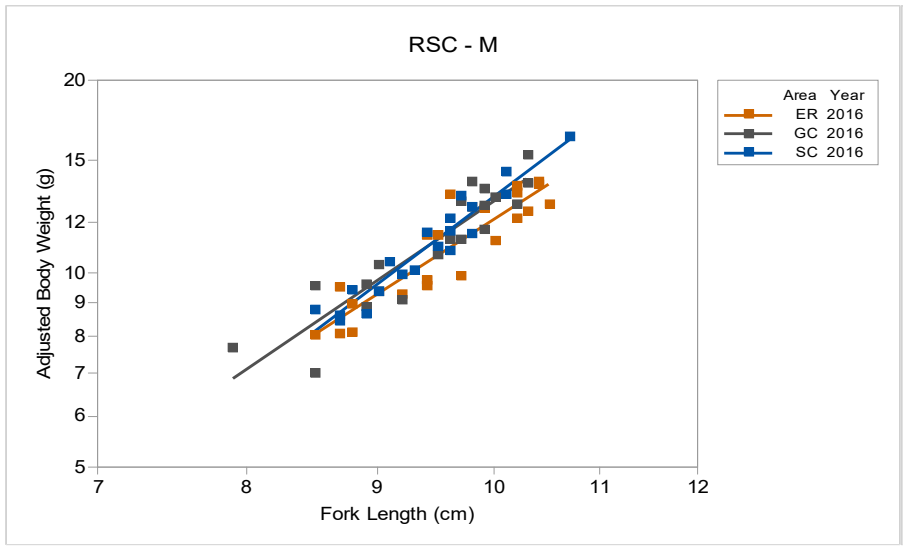
Figure F.7: Scatterplots and Linear Regressions or Boxplots for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2016 for Female Redside Shiner (RSC)

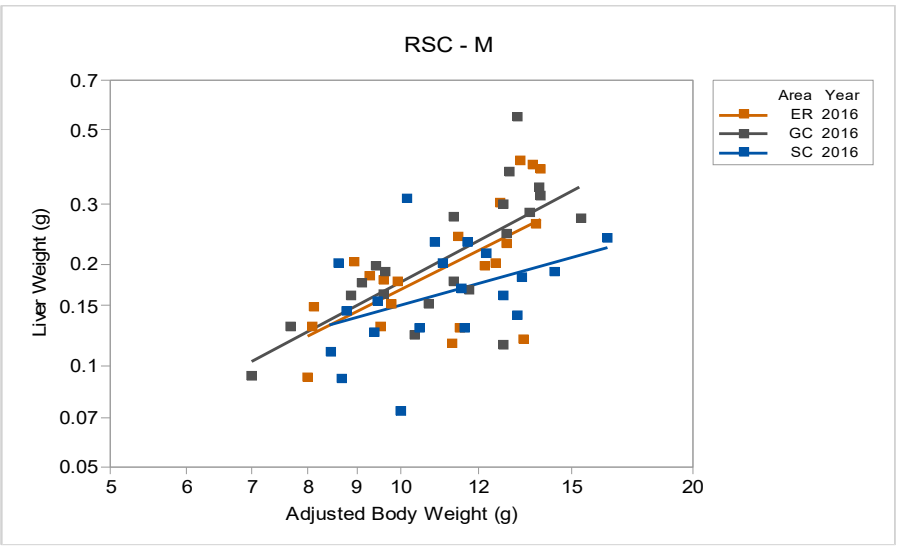
Notes:

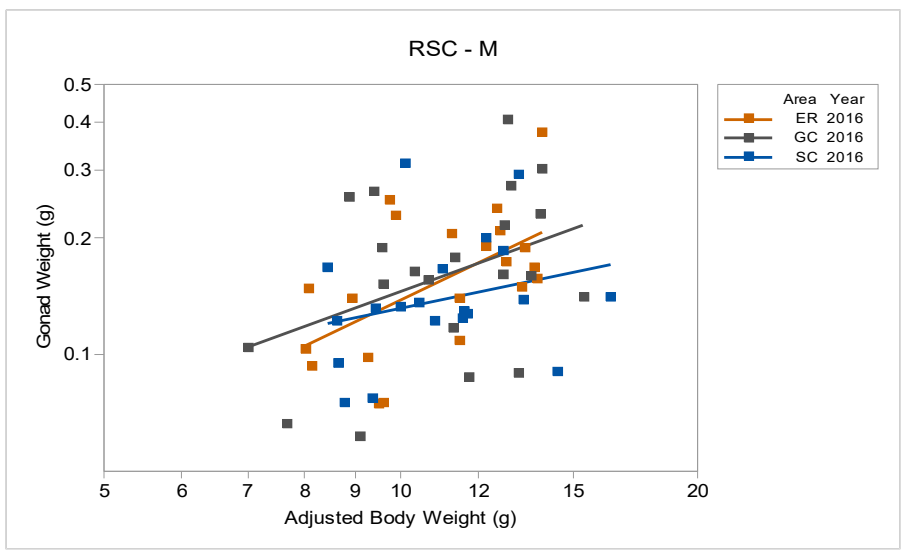
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

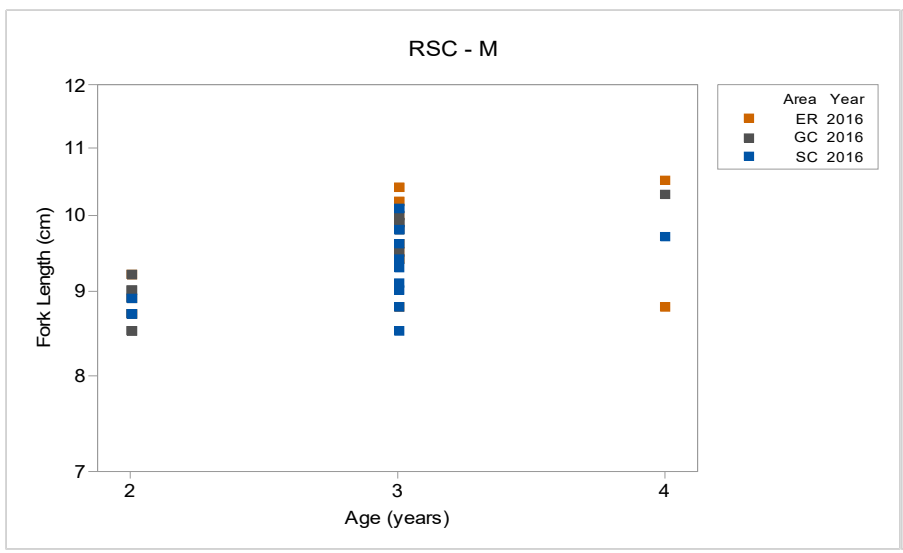
Weight-at-age and Length-at-age were assessed statisiticall as the weight and length of age-3 fish

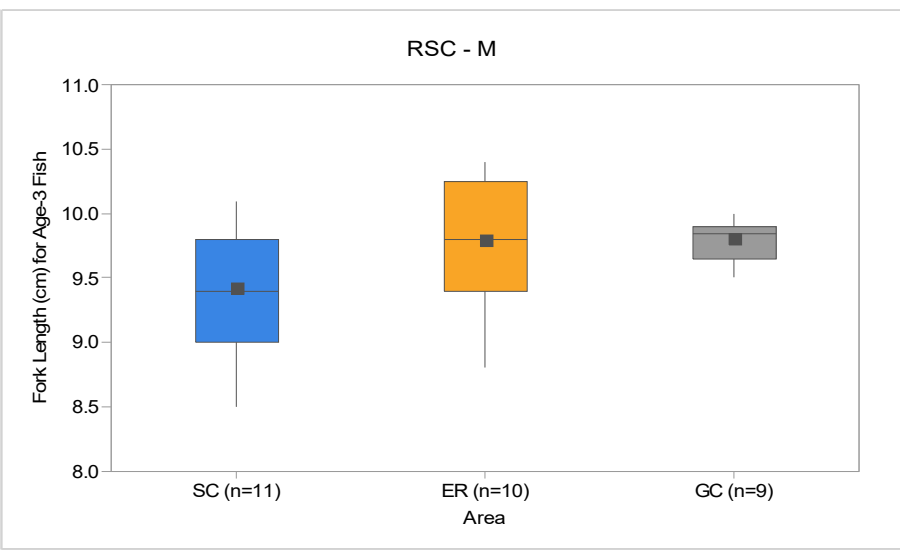
Boxplots: The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a square symbol.

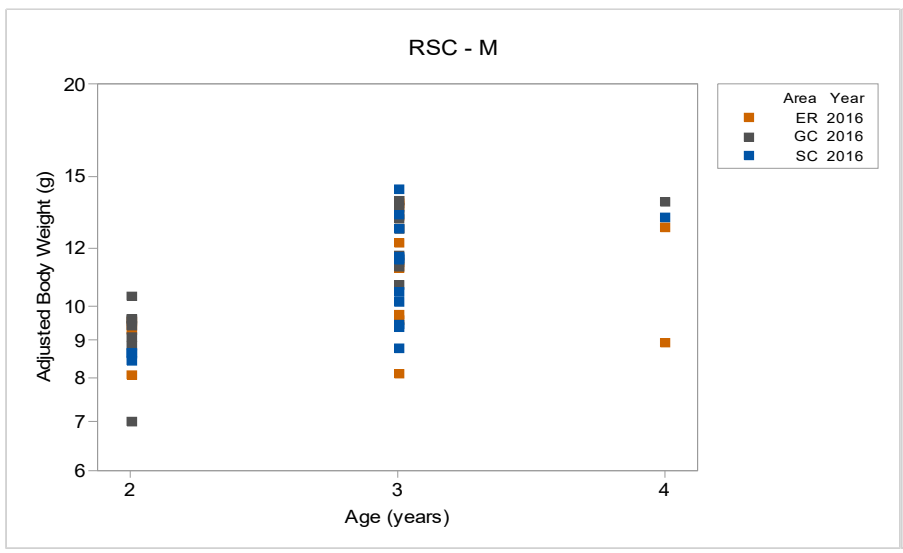












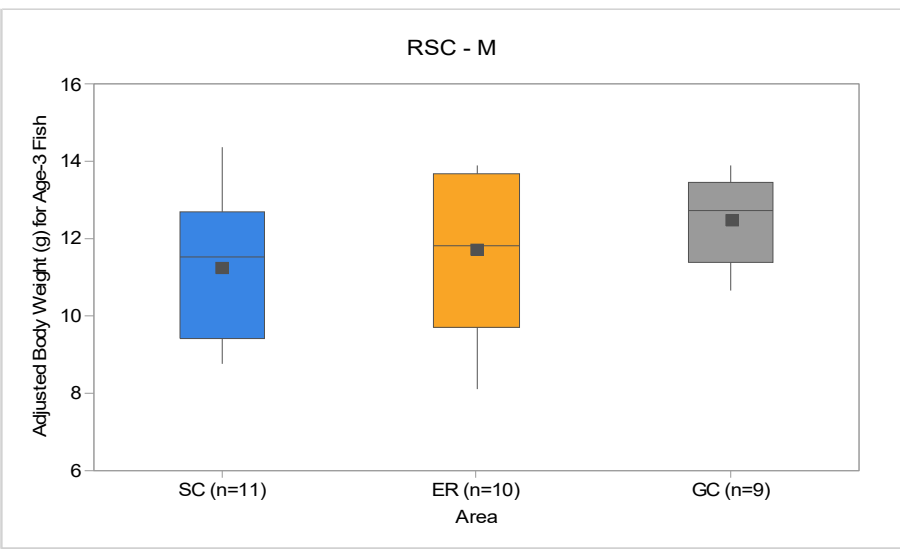


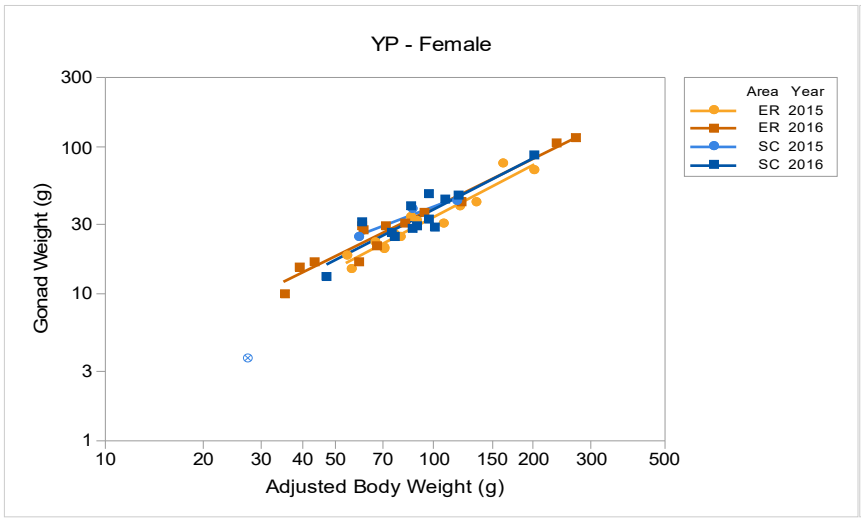
Figure F.8: Scatterplots and Linear Regressions or Boxplots for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2016 for Male Redside Shiner (RSC)

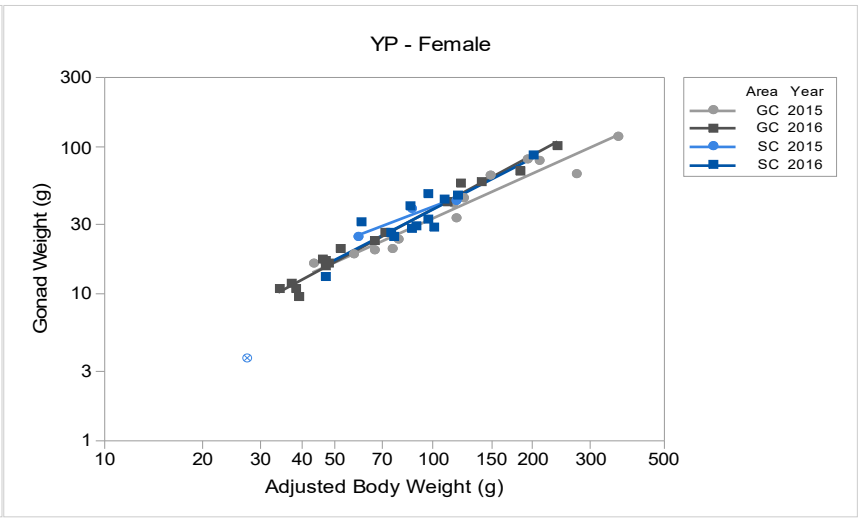
Notes:

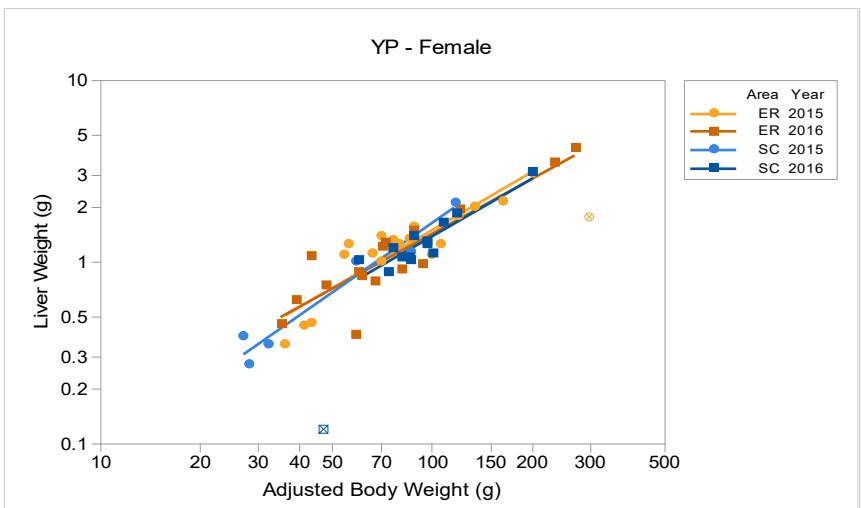
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

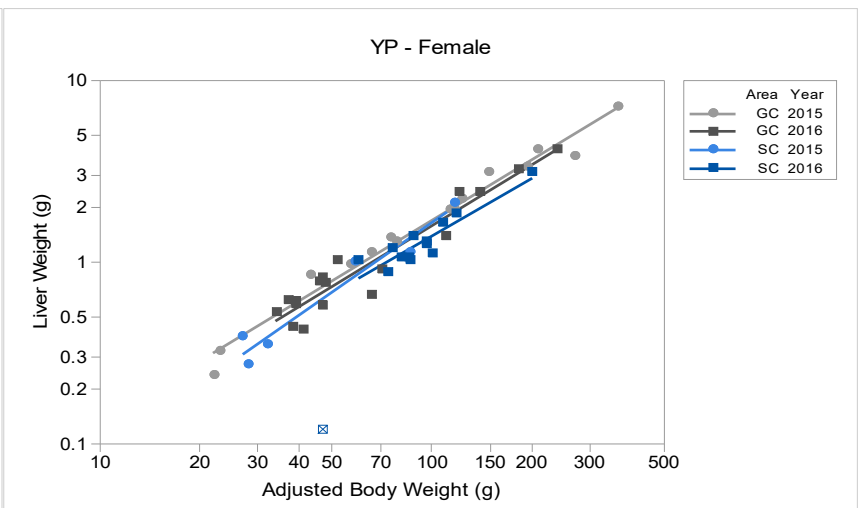
Weight-at-age and Length-at-age were assessed statisiticall as the weight and length of age-3 fish

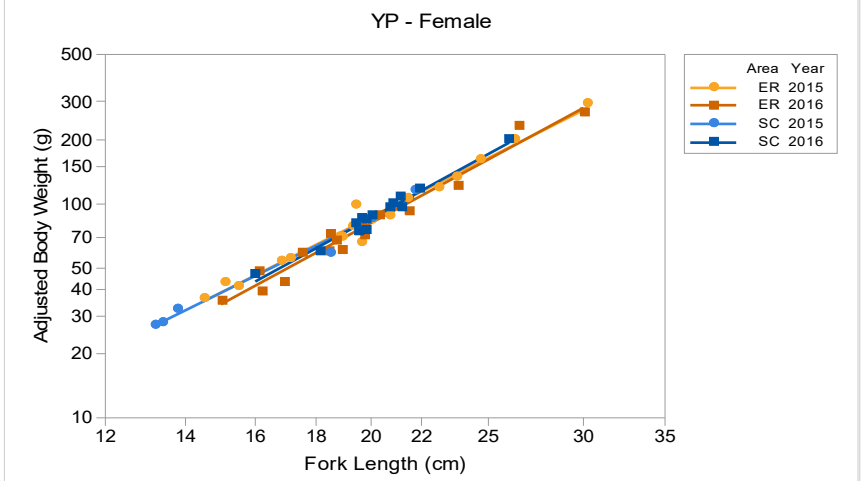
Boxplots: The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25 th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a square symbol.

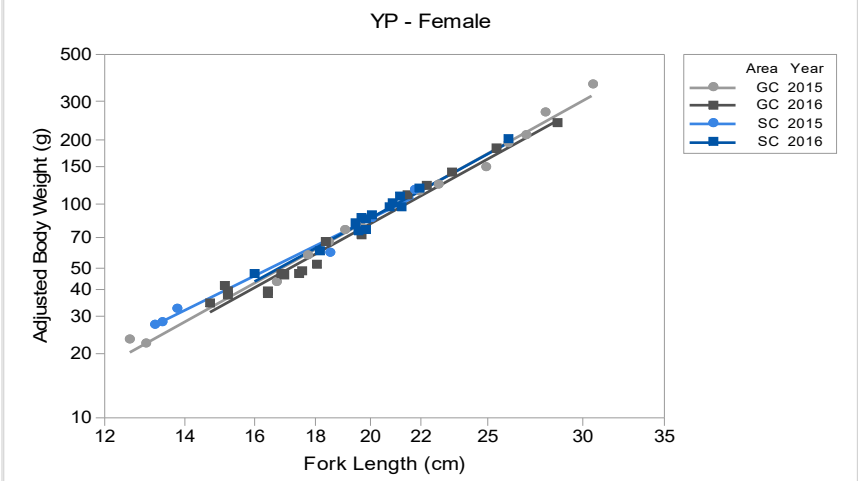


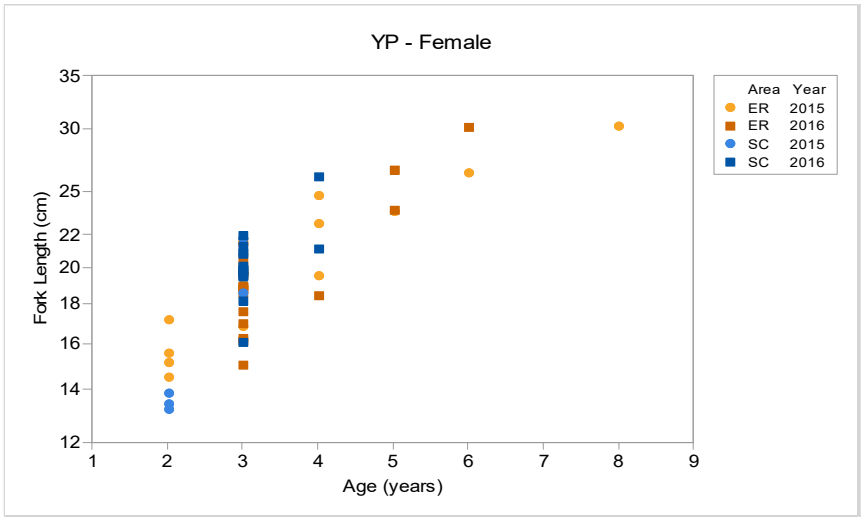


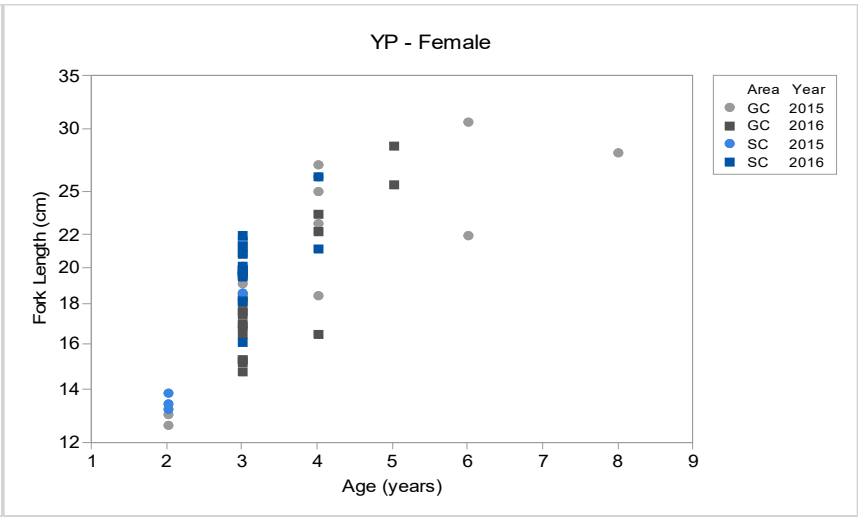


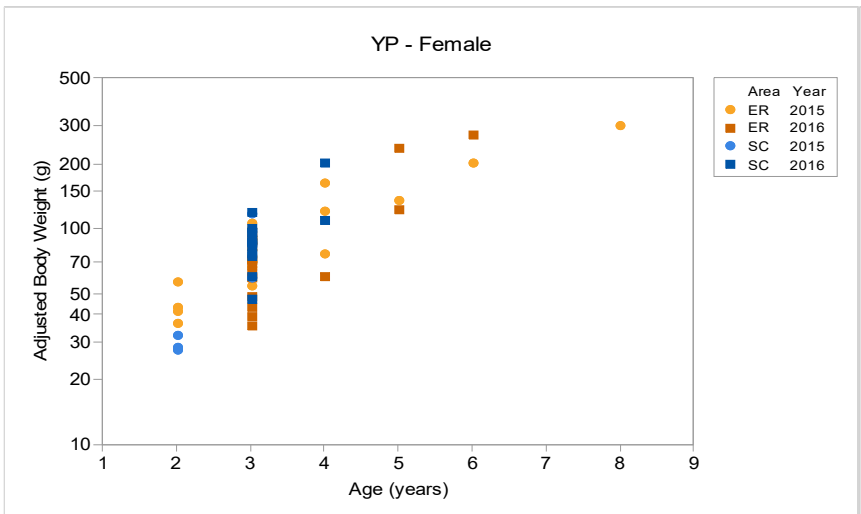












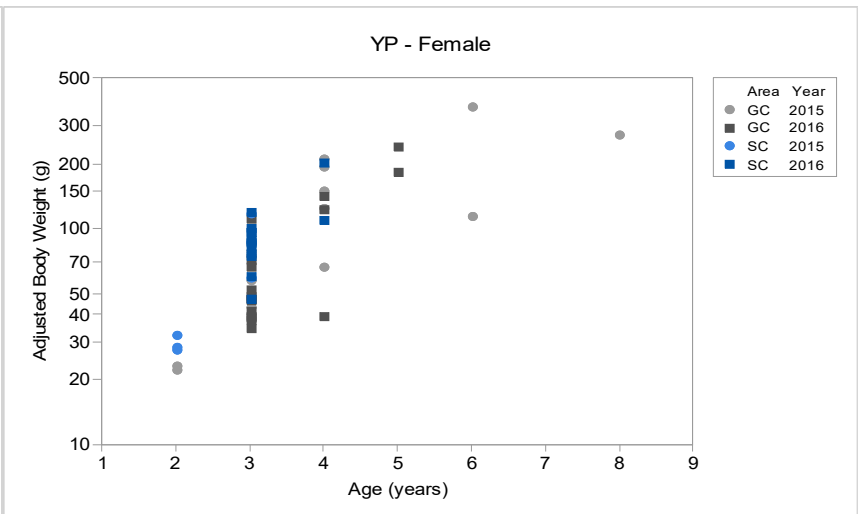


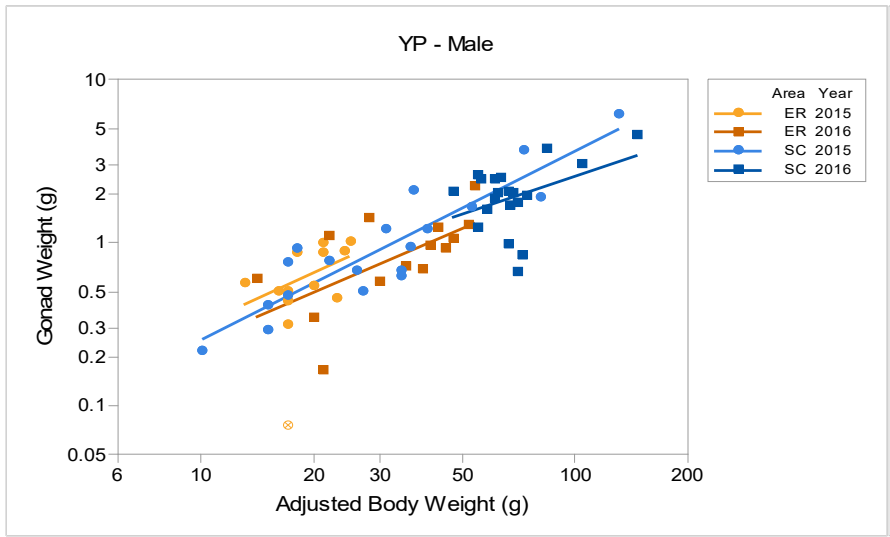
Figure F.9: Scatterplots and Linear Regressions for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2015 and 2016 for Female Yellow Perch (YP)

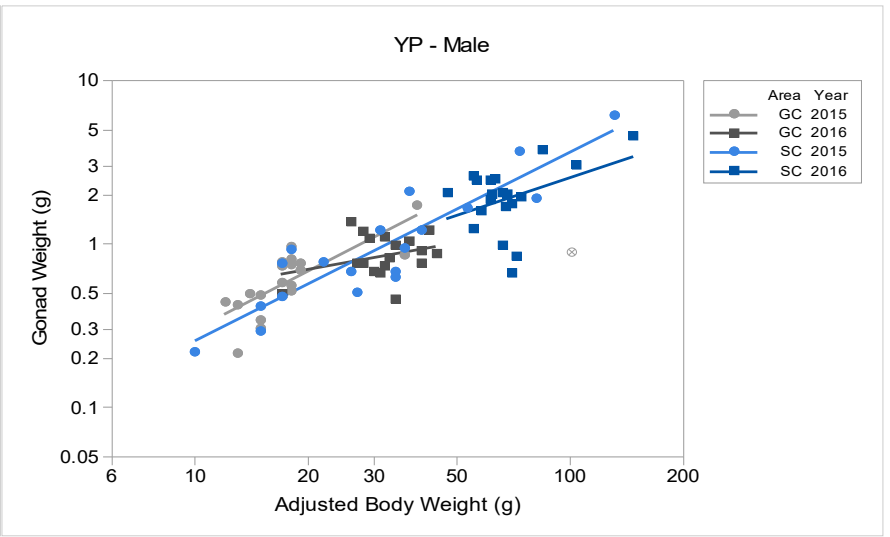
Notes:

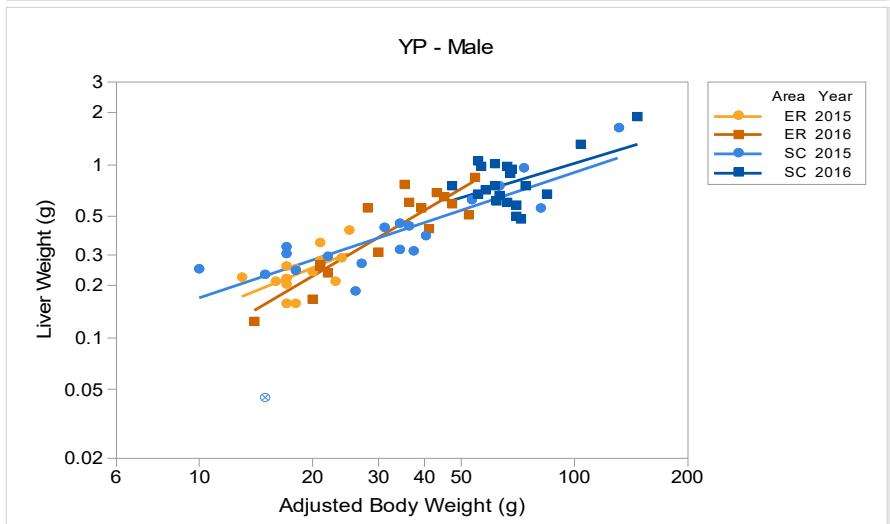
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

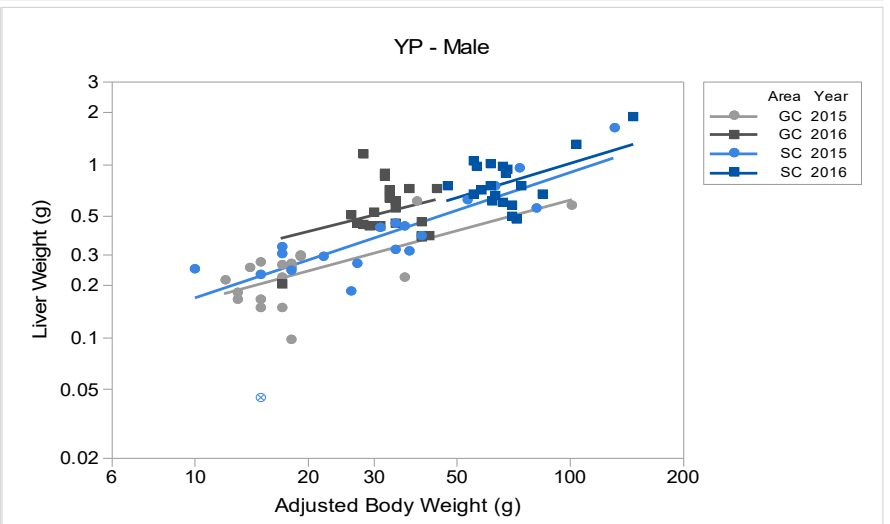
Fish with worms were excluded from the gonad weight comparisons

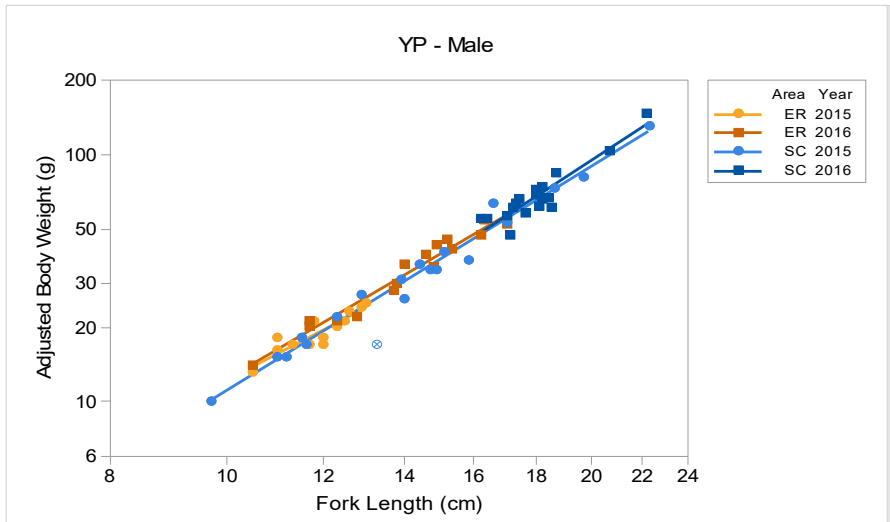
Statistical analyses were not conducted for weight-at-age and length-at-age due to a limited range of ages observed and little overlap in ages between years

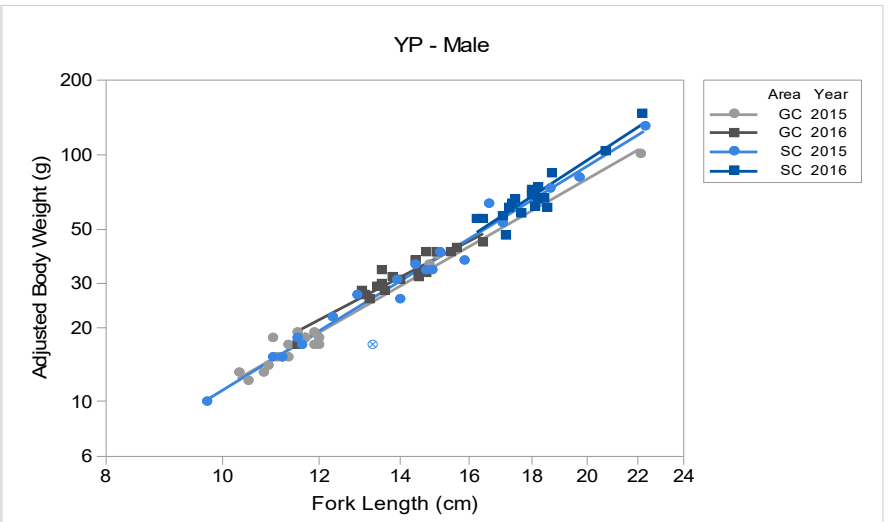


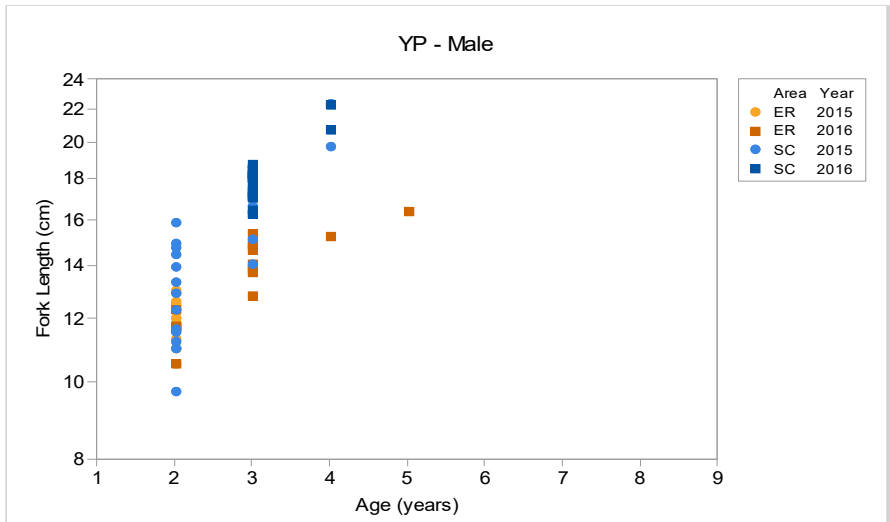


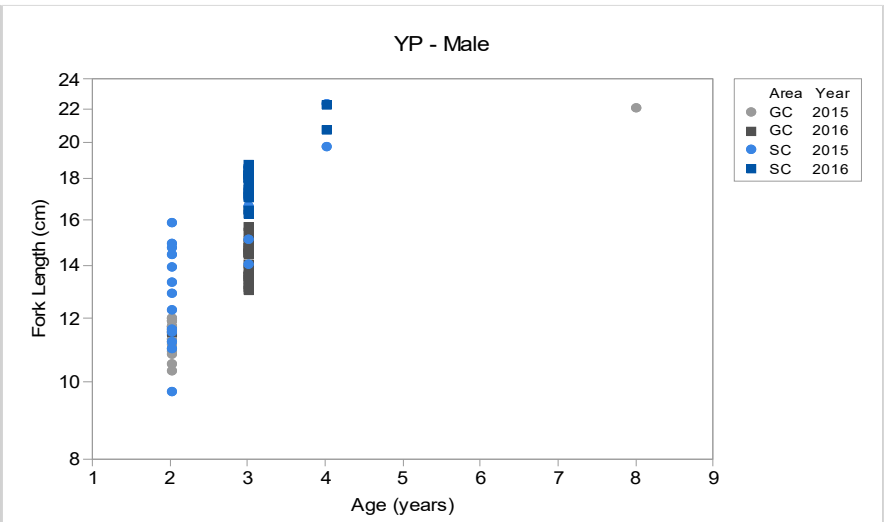


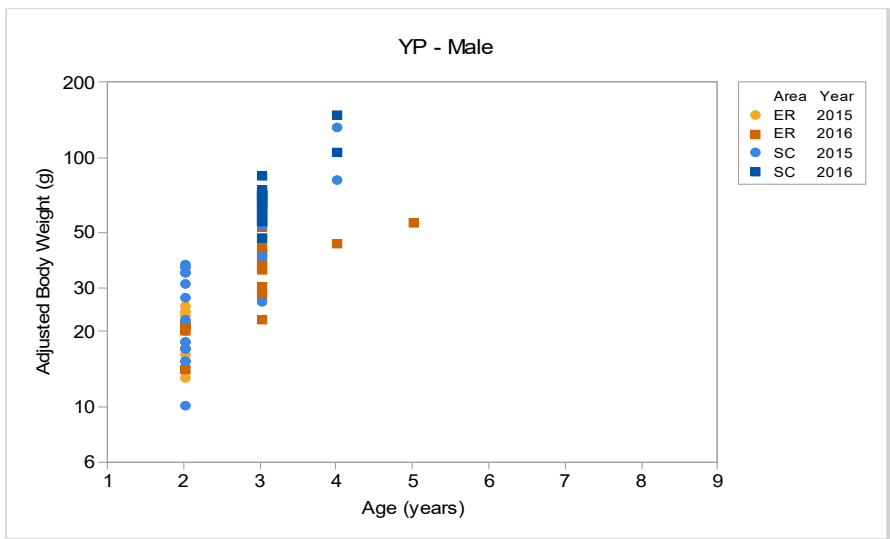












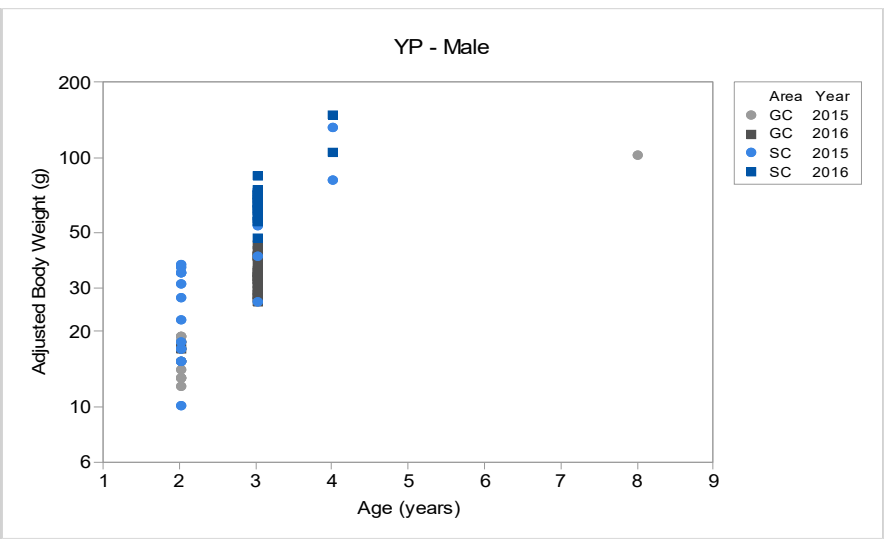


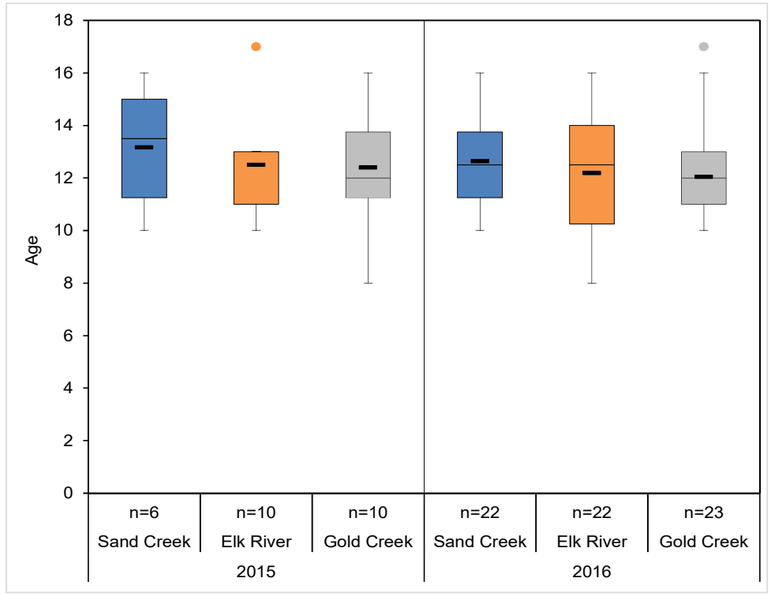
Figure F.10: Scatterplots and Linear Regressions for Fish Morphometric Endpoints at the Downstream Areas (ER = Elk River and GC = Gold Creek) Compared to the Upstream Area (SC = Sand Creek) in Koocanusa Reservoir Based on Data Collected in 2015 and 2016 for Male Yellow Perch (YP)

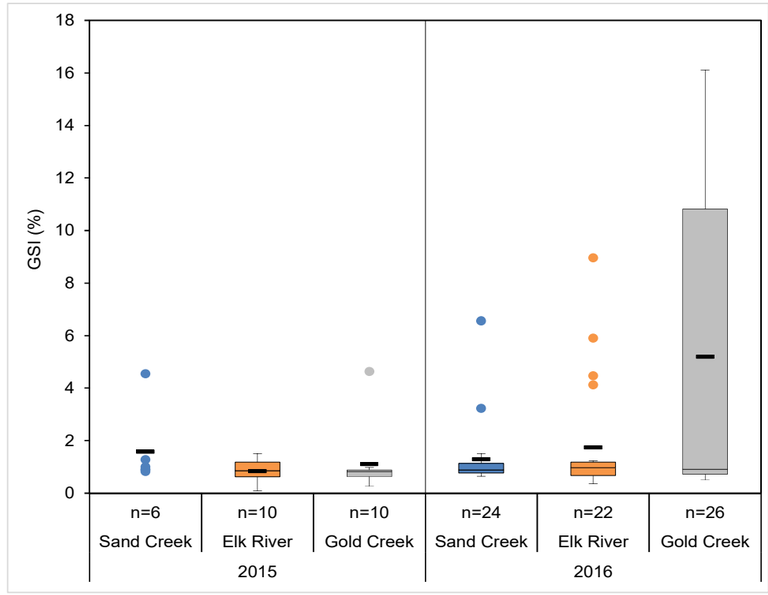
Notes:

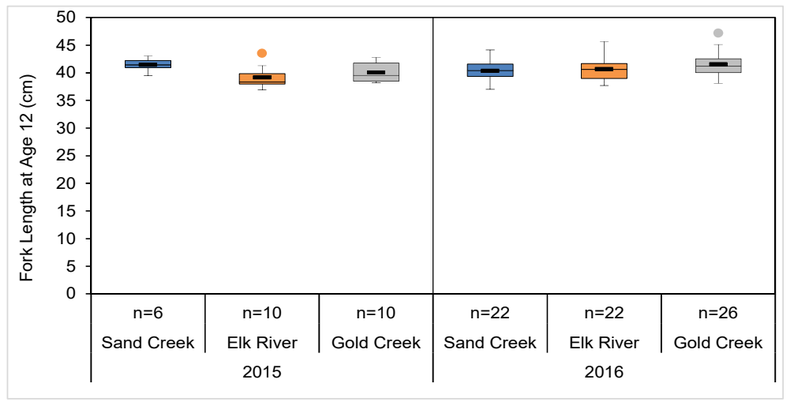
Outliers (Studentized residuals with magnitude > 4) and influential observations that were excluded from the statistical comparisons are plotted with open symbols with an × through them.

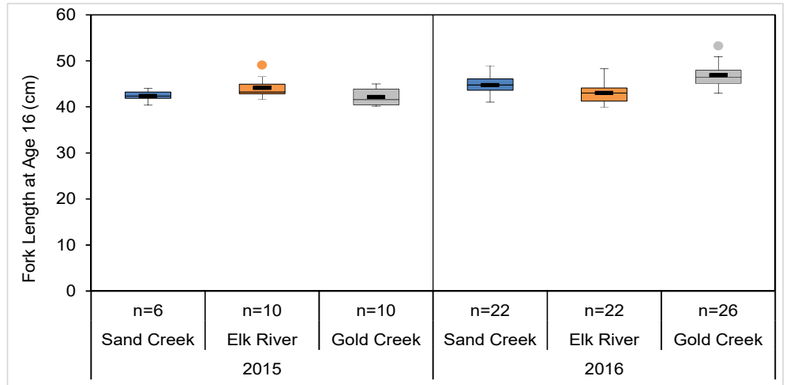
Fish with worms were excluded from the gonad weight comparisons

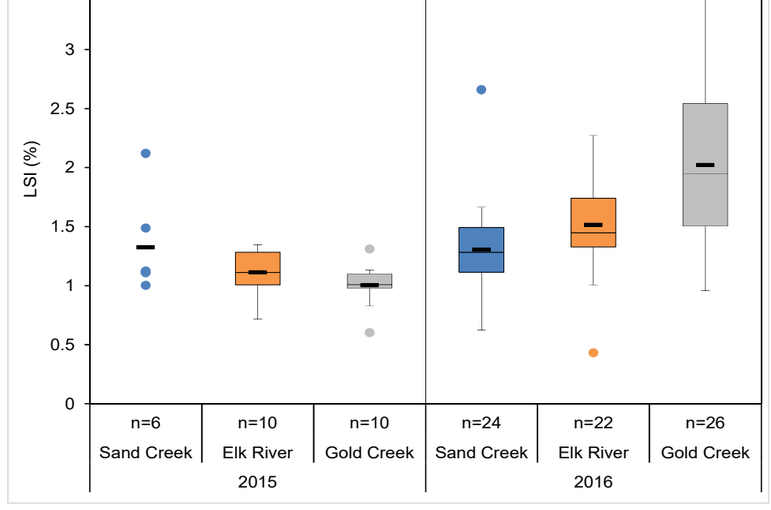
Statistical analyses were not conducted for weight-at-age and length-at-age due to a limited range of ages observed and little overlap in ages between years











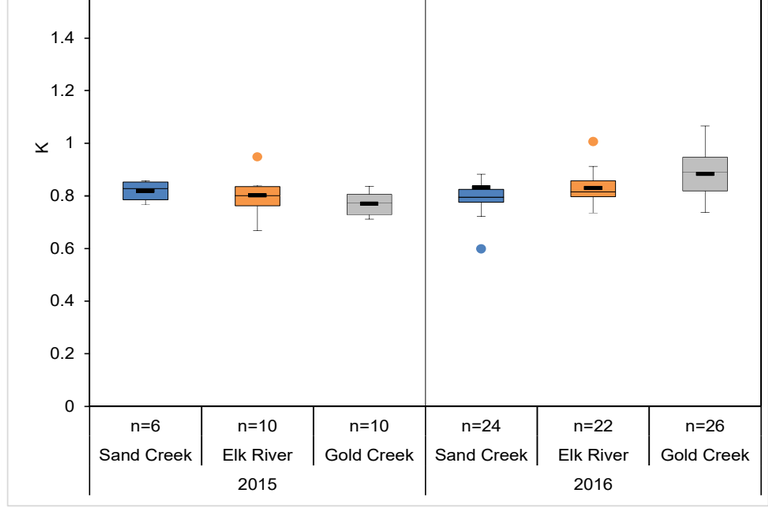


Figure F.11: Age (years), GSI (%), LSI (%), K, and Fork Length (cm)-at-Age (12 and 16 Years) for Female Largescale Sucker Collected in Koocanusa Reservoir, 2015 to 2016

Note: GSI - Gonadosomatic Index ([Gonad Weight / Adjusted Body Weight] x 100%); LSI - Liver Somatic Index ([Liver Weight / Adjusted Body Weight] x 100%); K - Condition Factor ([Adjusted Body Weight / (Total Length) ^{3}] x 100). Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River. The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a dash.

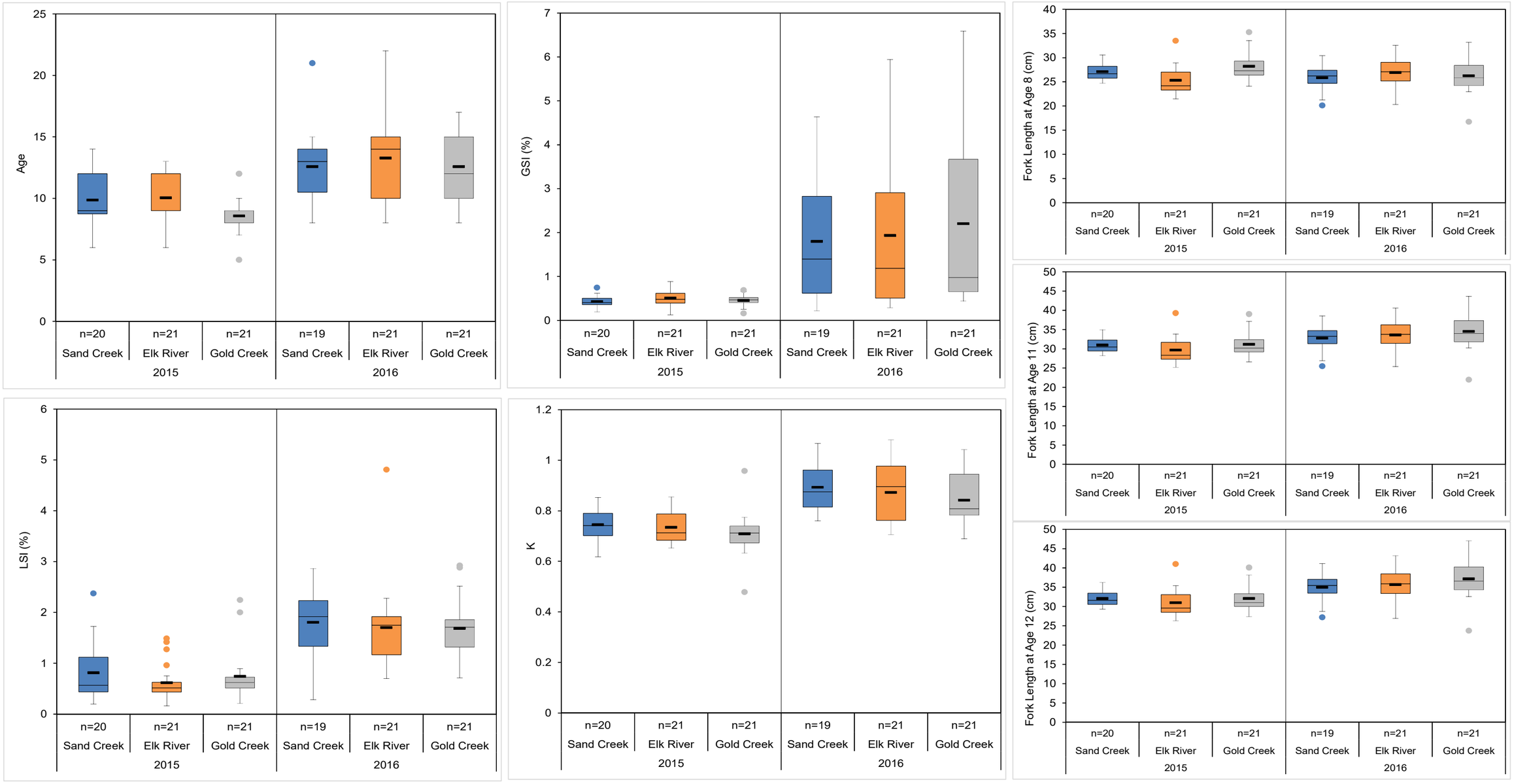
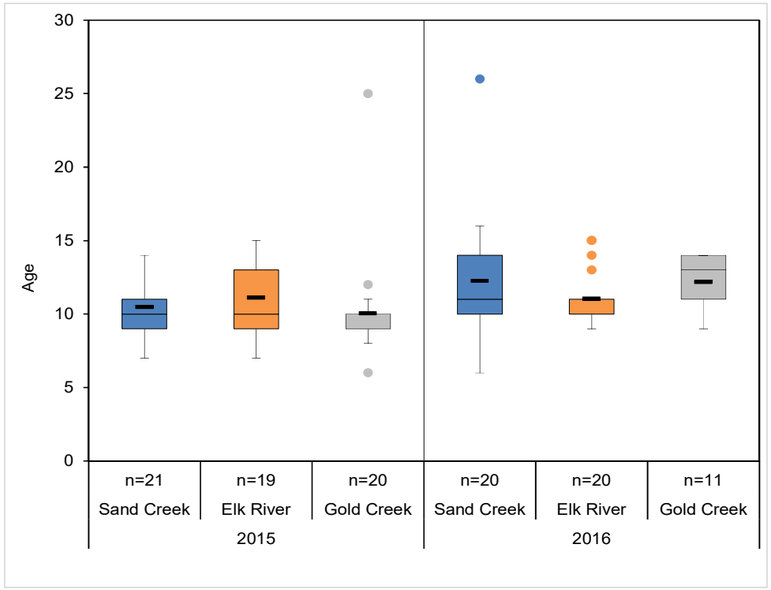
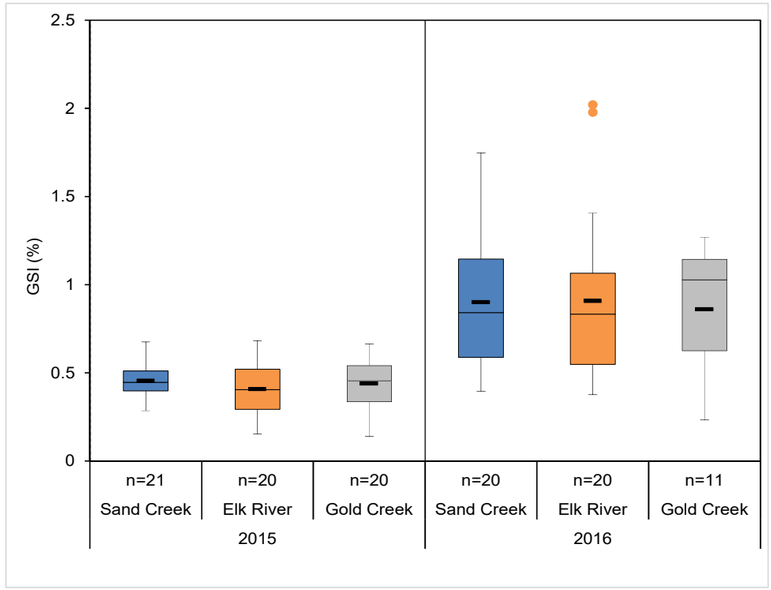
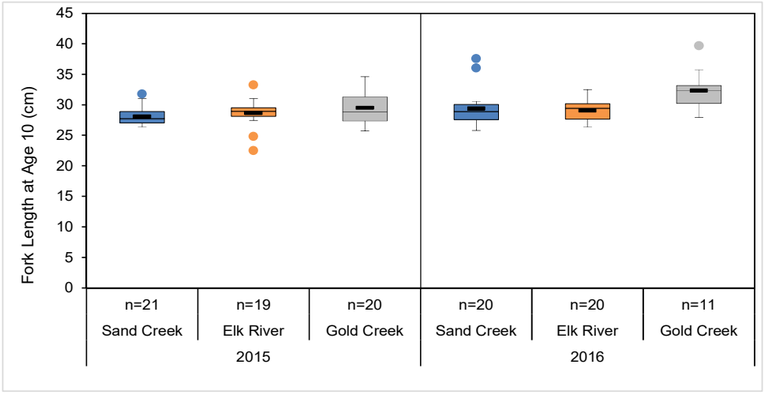


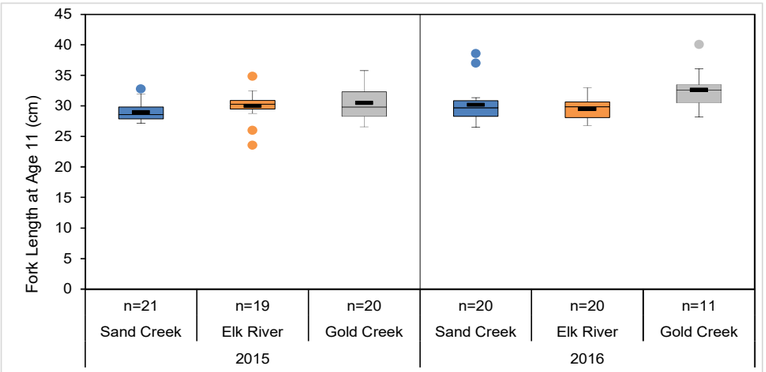
Figure F.12: Age (years), GSI (%), LSI (%), K, and Fork Length (cm)-at-Age (8, 11, and 12 Years) for Female Northern Pikeminnow Collected in Koocanusa Reservoir, 2015 to 2016

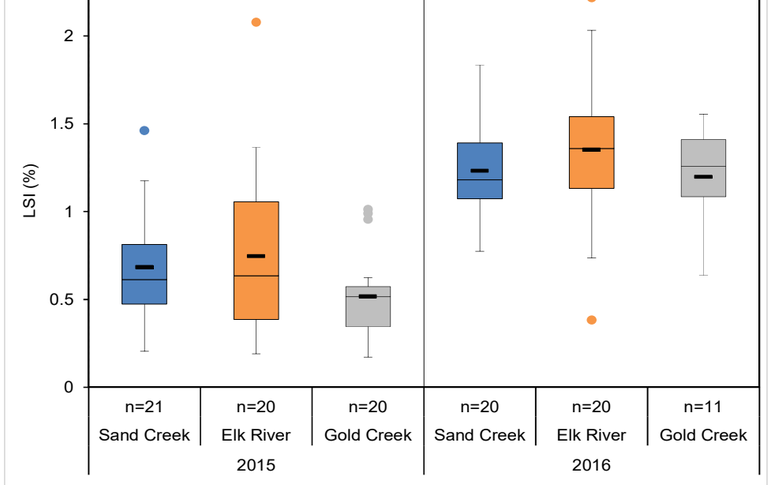
Note: GSI - Gonadosomatic Index ([Gonad Weight / Adjusted Body Weight] x 100%); LSI - Liver Somatic Index ([Liver Weight / Adjusted Body Weight] x 100%); K - Condition Factor ([Adjusted Body Weight / (Total Length) ^{3}] x 100). Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River. The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a dash.

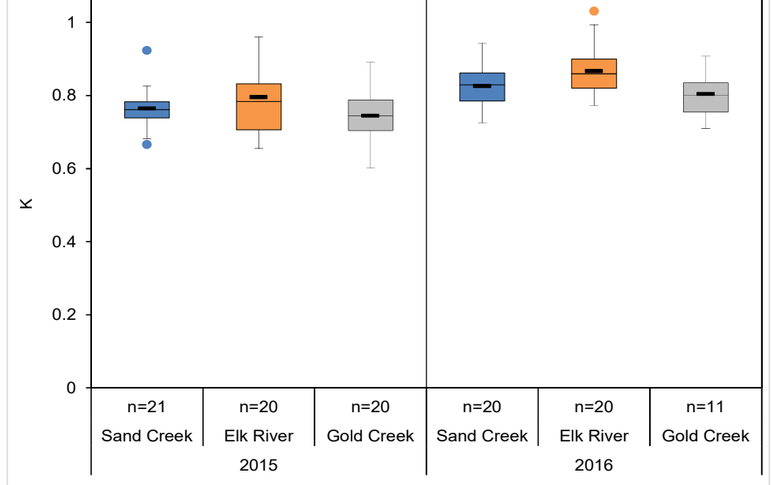












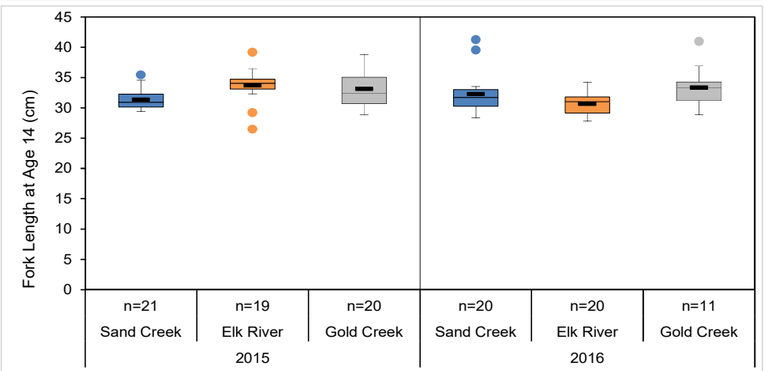


Figure F.13: Age (years), GSI (%), LSI (%), K, and Fork Length (cm)-at-Age (10, 11, and 14 Years) for Male Northern Pikeminnow Collected in Koocanusa Reservoir, 2015 to 2016

Note: GSI - Gonadosomatic Index ([Gonad Weight / Adjusted Body Weight] x 100%); LSI - Liver Somatic Index ([Liver Weight / Adjusted Body Weight] x 100%); K - Condition Factor ([Adjusted Body Weight / (Total Length)^3] x 100). Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River. The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a dash.

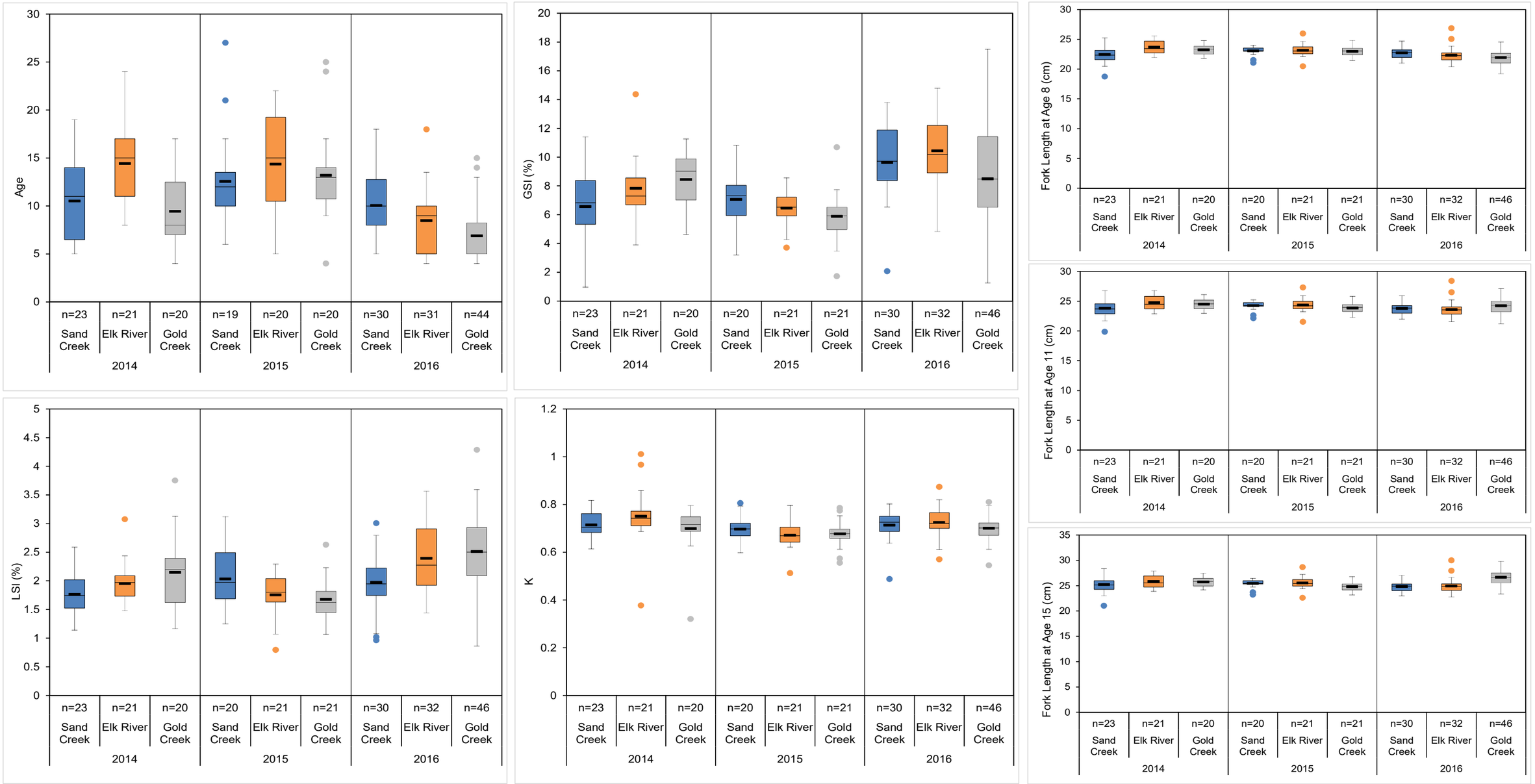
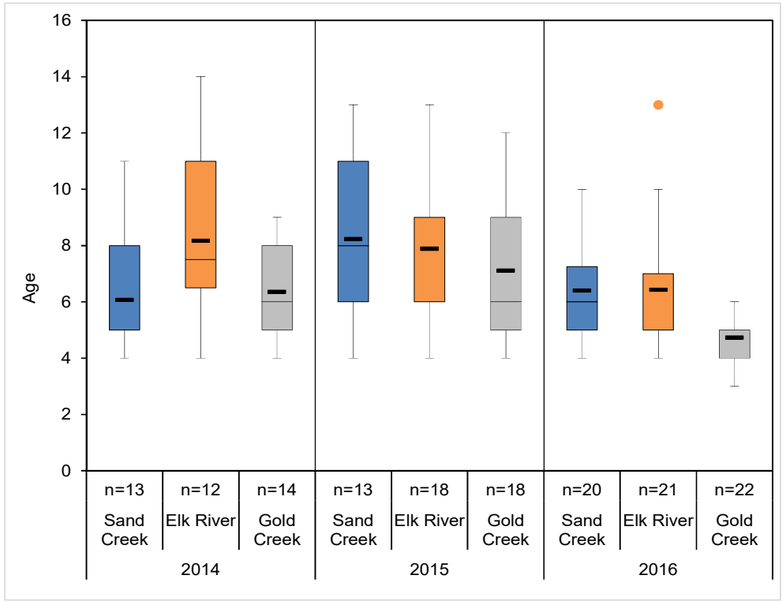
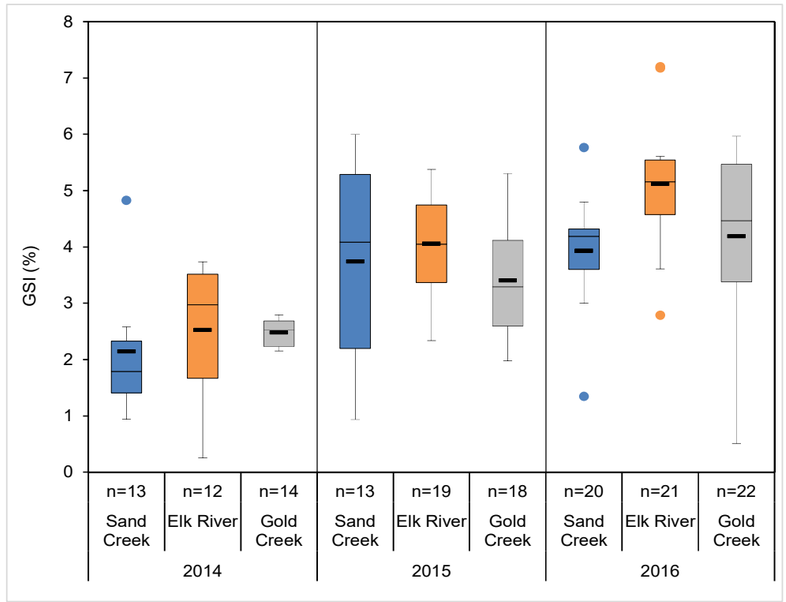
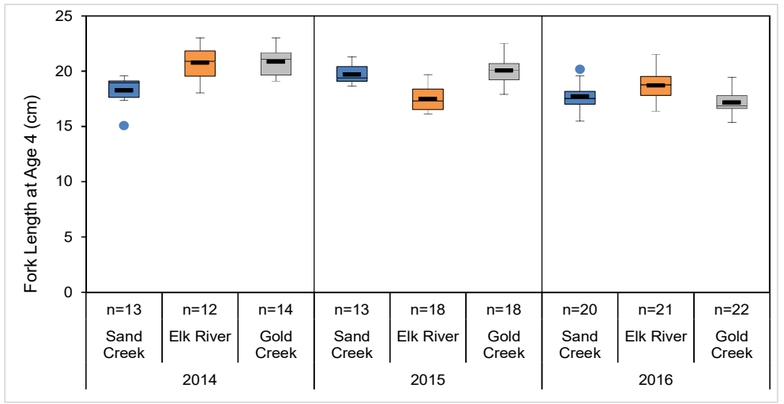


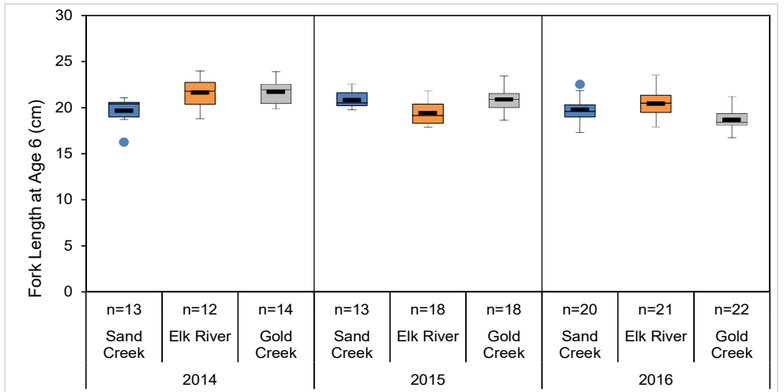
Figure F.14: Age (years), GSI (%), LSI (%), K, and Fork Length (cm)-at-Age (8, 11, and 15 Years) for Female Peamouth Chub Collected in Koocanusa Reservoir, 2014 to 2016

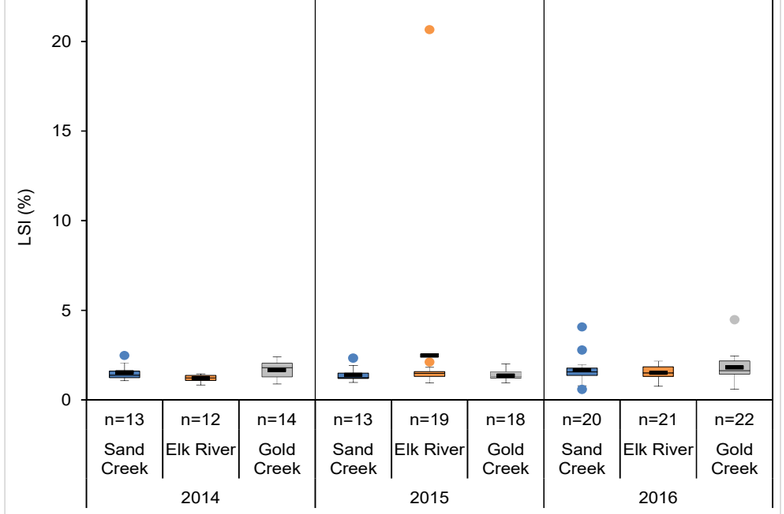
Note: GSI - Gonadosomatic Index ([Gonad Weight / Adjusted Body Weight] x 100%); LSI - Liver Somatic Index ([Liver Weight / Adjusted Body Weight] x 100%); K - Condition Factor ([Adjusted Body Weight / (Total Length) ^{3}] x 100). Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River. The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a dash.

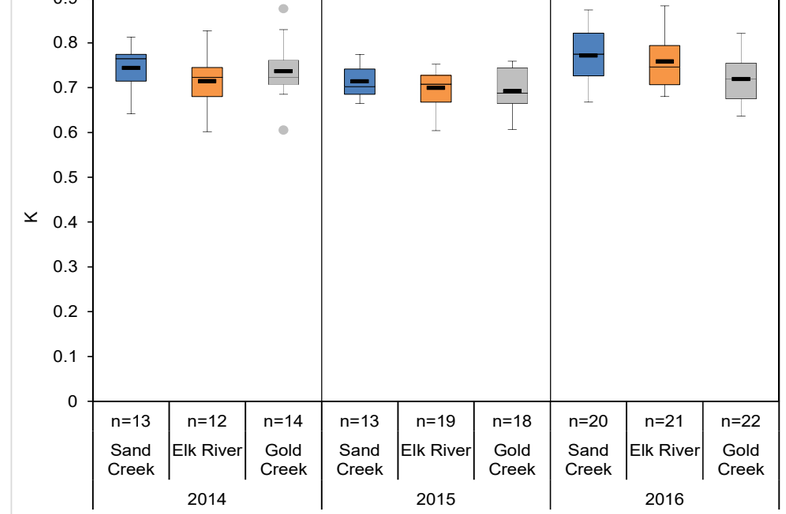












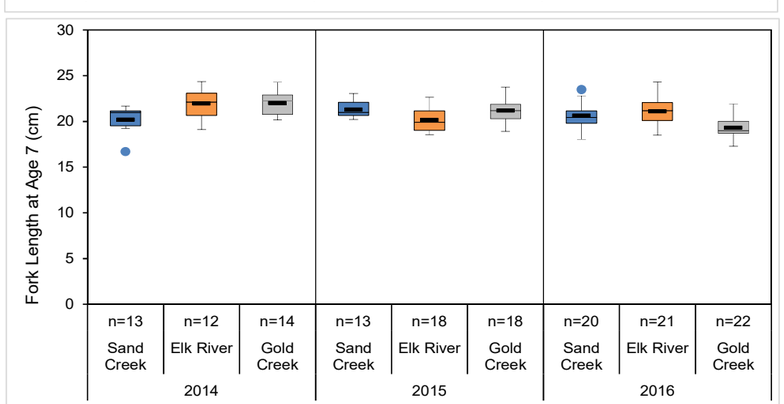
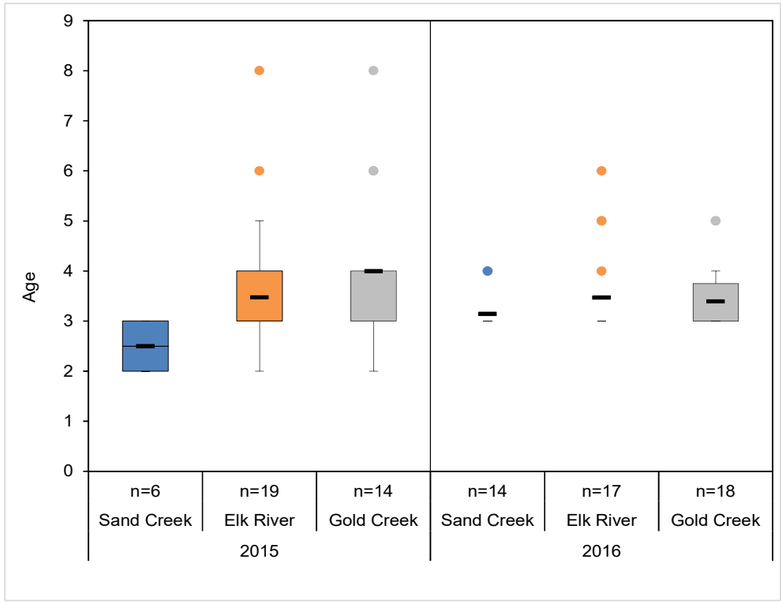
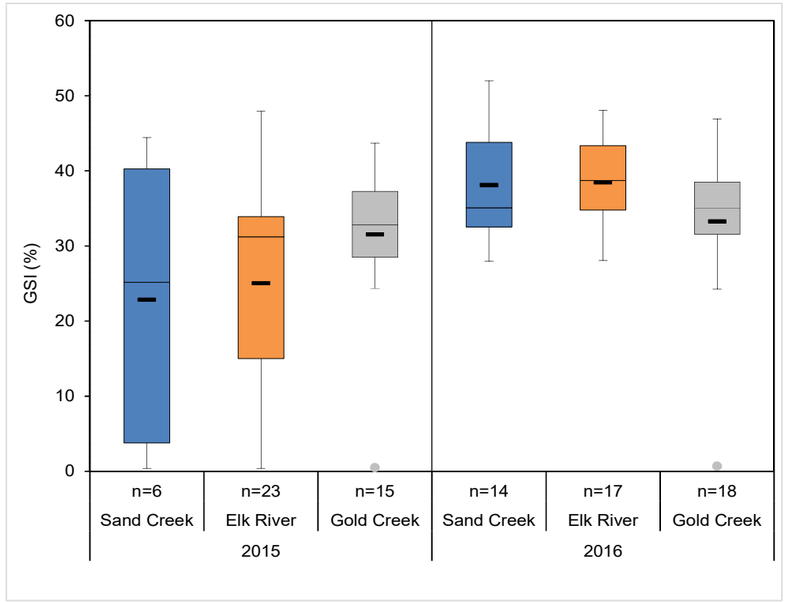
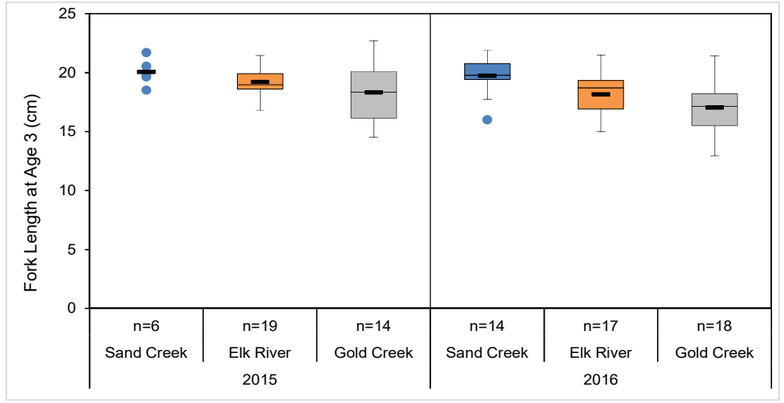


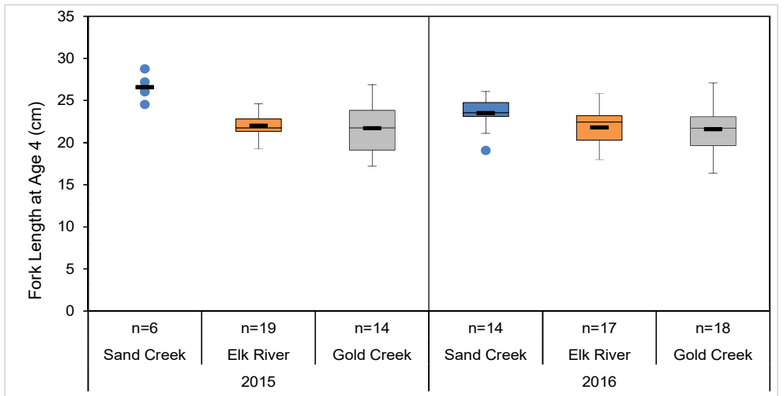
Figure F.15: Age (years), GSI (%), LSI (%), K, and Fork Length (cm)-at-Age (4, 6, and 7 Years) for Male Peamouth Chub Collected in Koocanusa Reservoir, 2014 to 2016

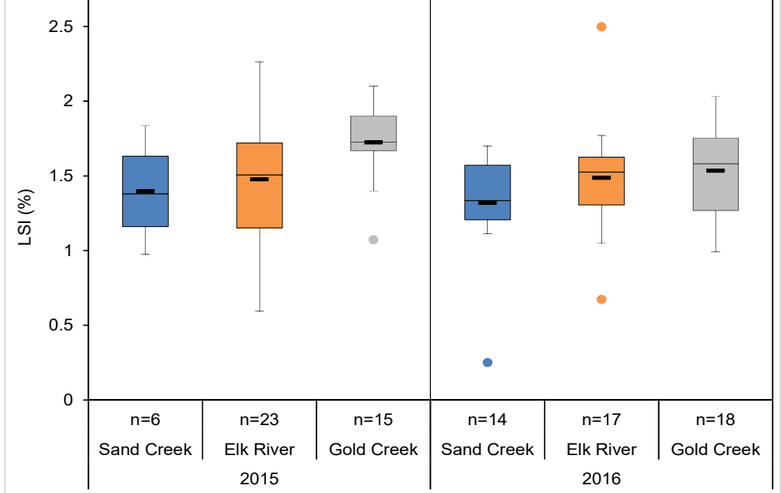
Note: GSI - Gonadosomatic Index ([Gonad Weight / Adjusted Body Weight] x 100%); LSI - Liver Somatic Index ([Liver Weight / Adjusted Body Weight] x 100%); K - Condition Factor ([Adjusted Body Weight / (Total Length) ^{3}] x 100). Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River. The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a dash.











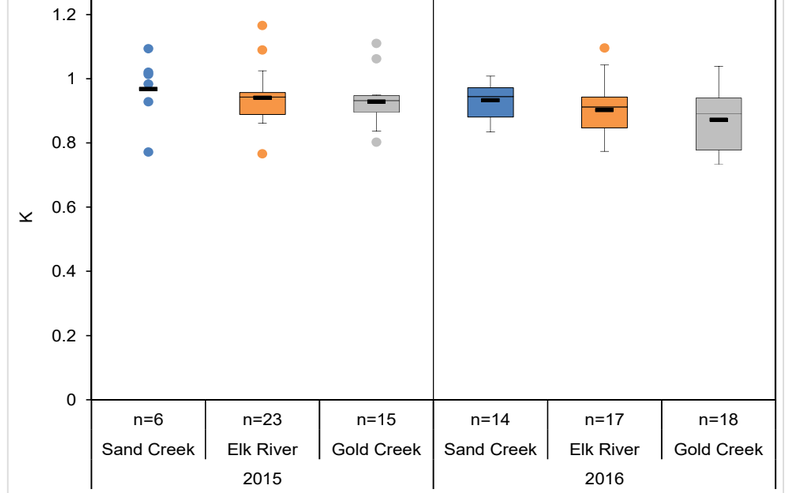
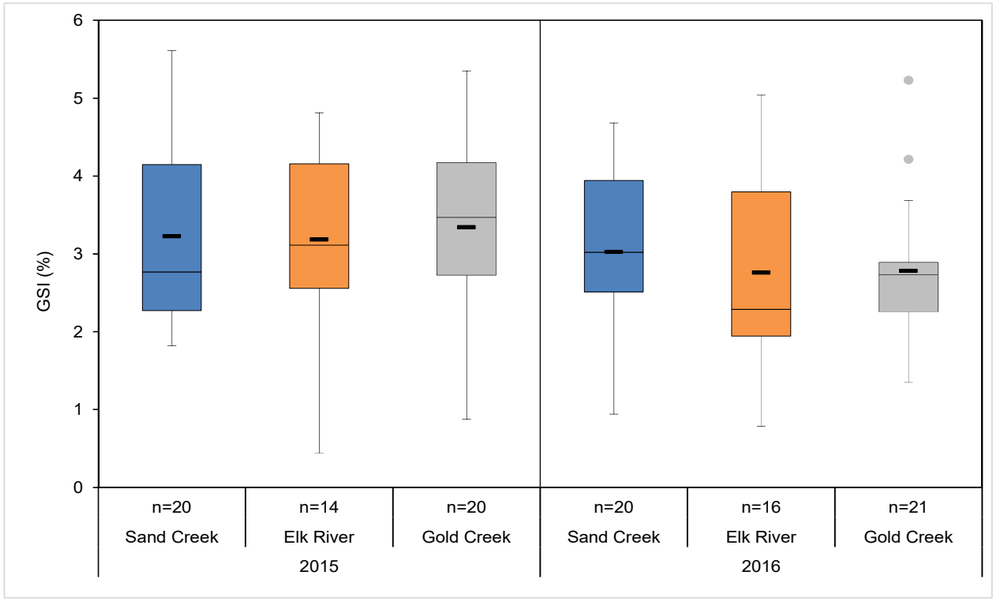
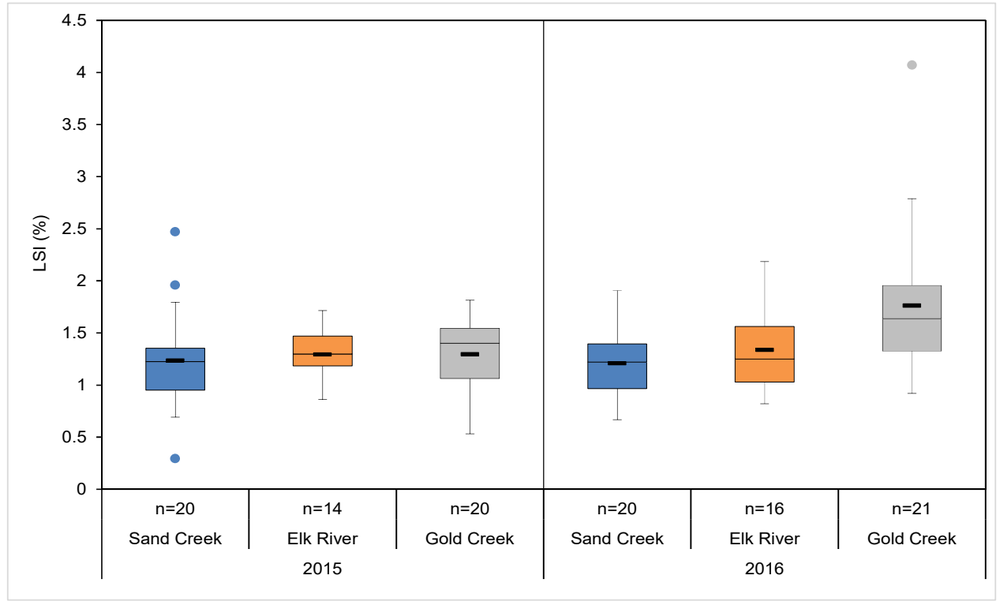


Figure F.16: Age (years), GSI (%), LSI (%), K, and Fork Length (cm)-at-Age (3 and 4 Years) for Female Yellow Perch Collected in Koocanusa Reservoir, 2015 to 2016

Note: GSI - Gonadosomatic Index ([Gonad Weight / Adjusted Body Weight] x 100%); LSI - Liver Somatic Index ([Liver Weight / Adjusted Body Weight] x 100%); K - Condition Factor ([Adjusted Body Weight / (Total Length) ^{3}] x 100). Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River. The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a dash.





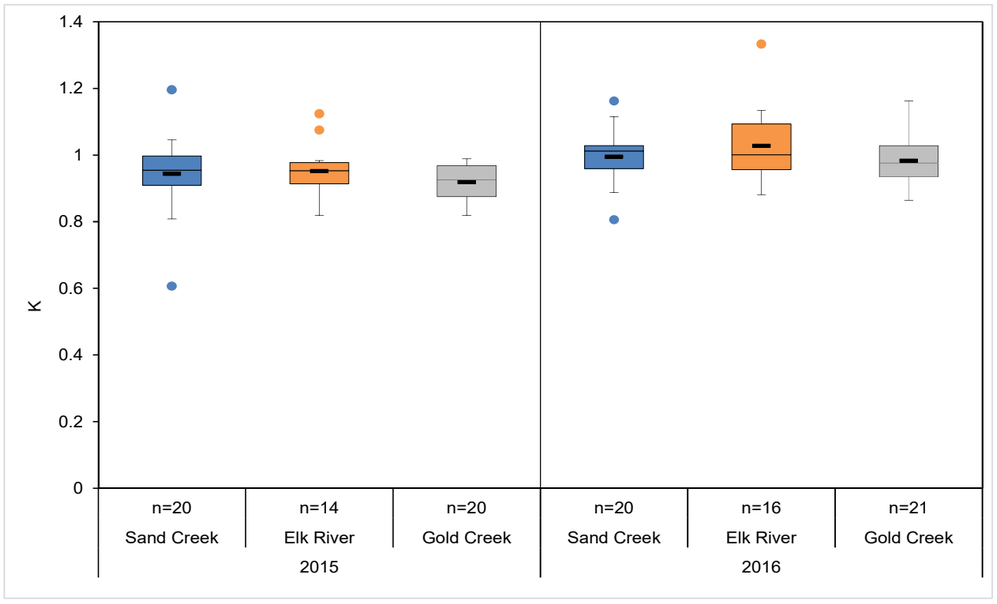


Figure F.17: Age (years), GSI (%), LSI (%), and K for Male Yellow Perch Collected in Koocanusa Reservoir, 2015 to 2016

Note: GSI - Gonadosomatic Index ([Gonad Weight / Adjusted Body Weight] x 100%); LSI - Liver Somatic Index ([Liver Weight / Adjusted Body Weight] x 100%); K - Condition Factor ([Adjusted Body Weight / (Total Length) ^{3}] x 100). Sand Creek study area is upstream of the Elk River confluence, while the Elk River and Gold Creek study areas are downstream of the Elk River. The box represents the 25th percentile, median, and 75th percentile and the whiskers represent the minimum and maximum values; however, values 1.5 times the height of the box beyond the 25th and 75th percentiles are plotted as individual values in which case the whisker is truncated to the next value in the data set. The mean is plotted as a dash.

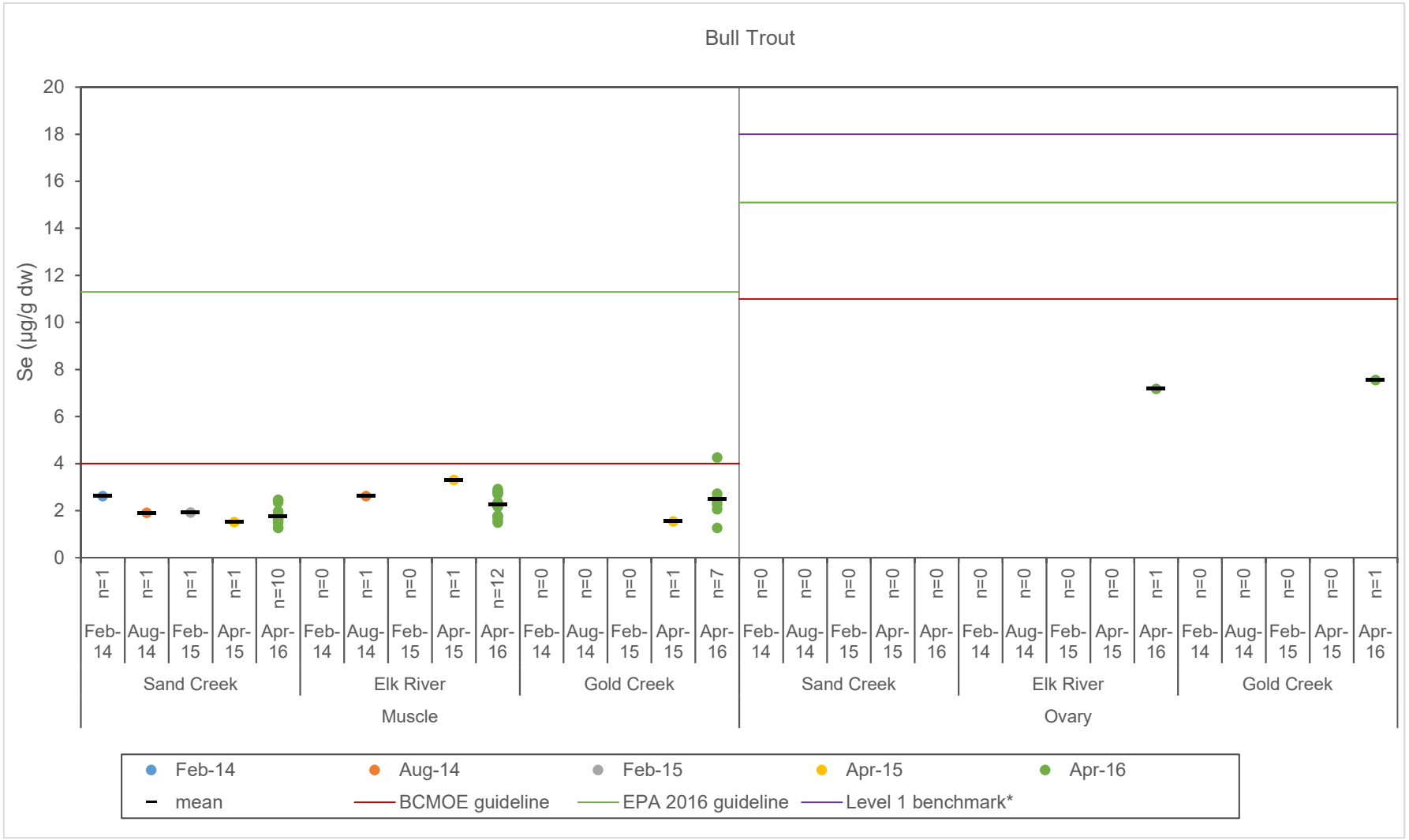


Figure F.18: Muscle and Ovary Tissue Selenium Concentrations (µg/g dw) in Bull Trout Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, February 2014, 2015, April 2015, 2016, and August 2014

Notes: * Level 1 benchmark for effects to fish reproduction (Teck 2014). Bull trout collected near Oestreich Road (OR-BT-01M-Feb-14) was added to the bull trout collected at Sand Creek

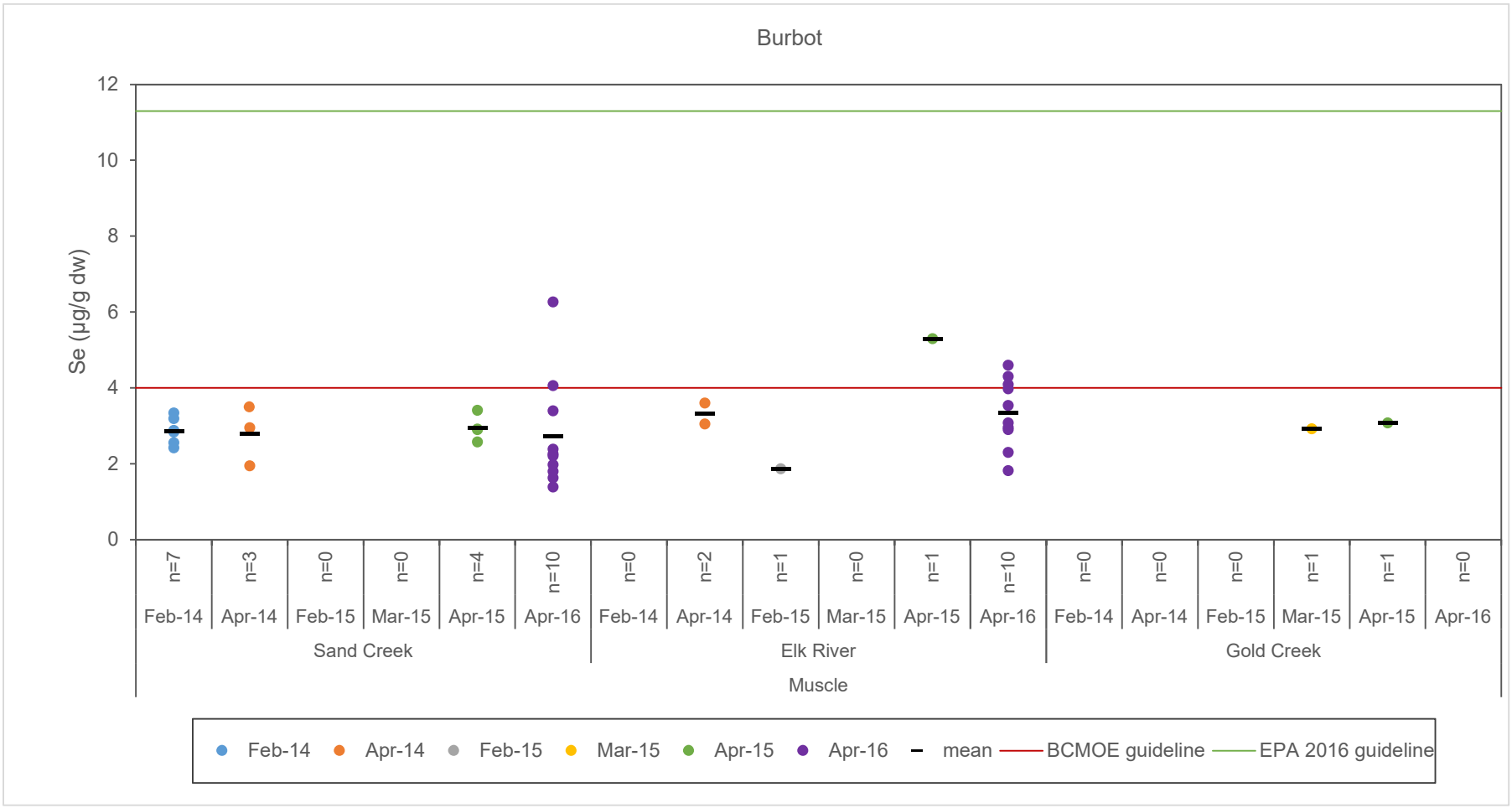


Figure F.19: Muscle Tissue Selenium Concentrations (µg/g dw) in Burbot Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, February 2014, 2015, March 2015, and April 2014, 2015, 2016

Note: Burbot collected near Oestreich Road (OR-BT-01M-Feb-14) was added to the burbot collected at Sand Creek

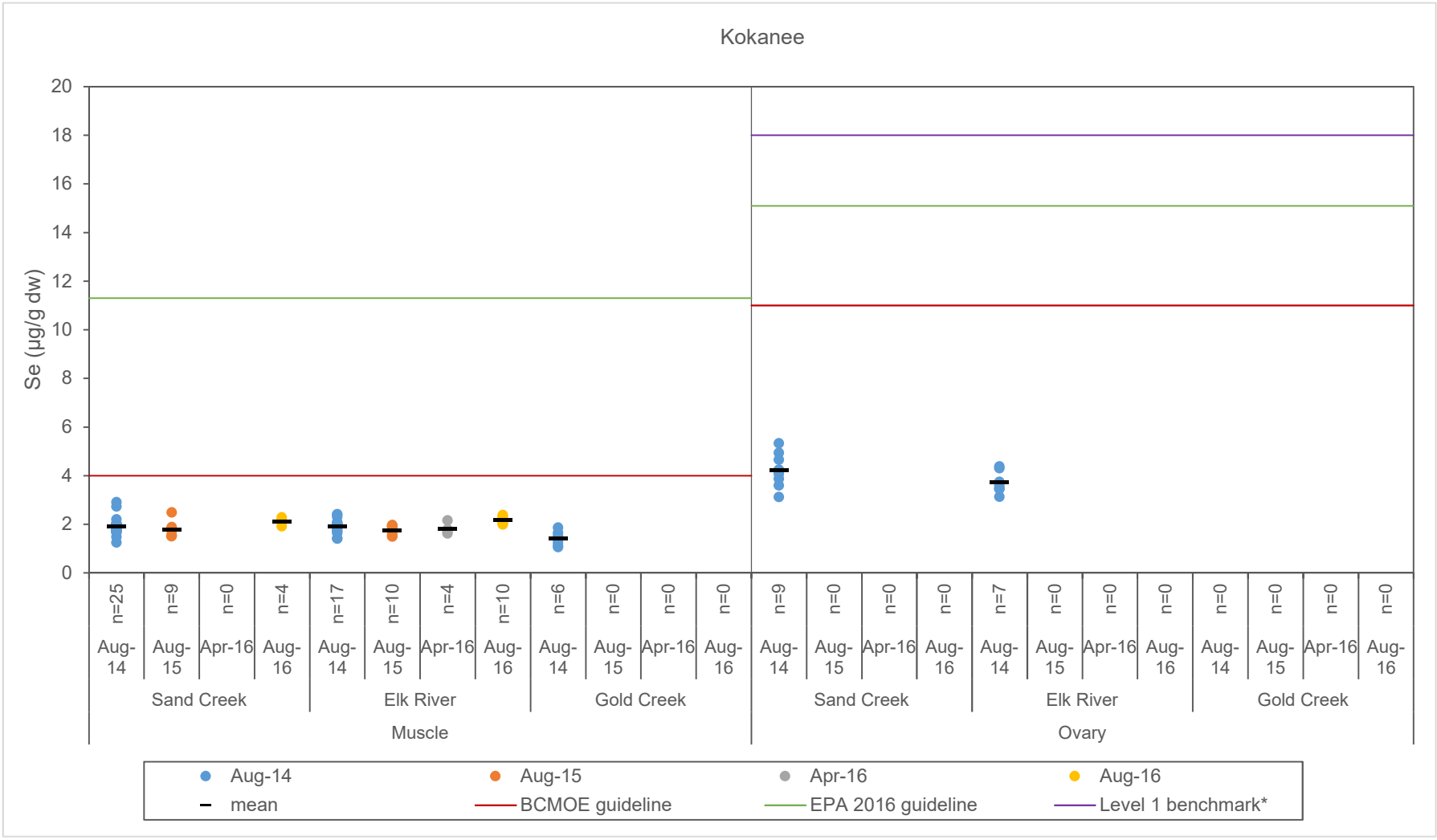


Figure F.20: Muscle and Ovary Tissue Selenium Concentrations (µg/g dw) in Kokanee Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, in August 2014, 2015, 2016 and April 2016

Note: * Level 1 benchmark for effects to fish reproduction (Teck 2014)

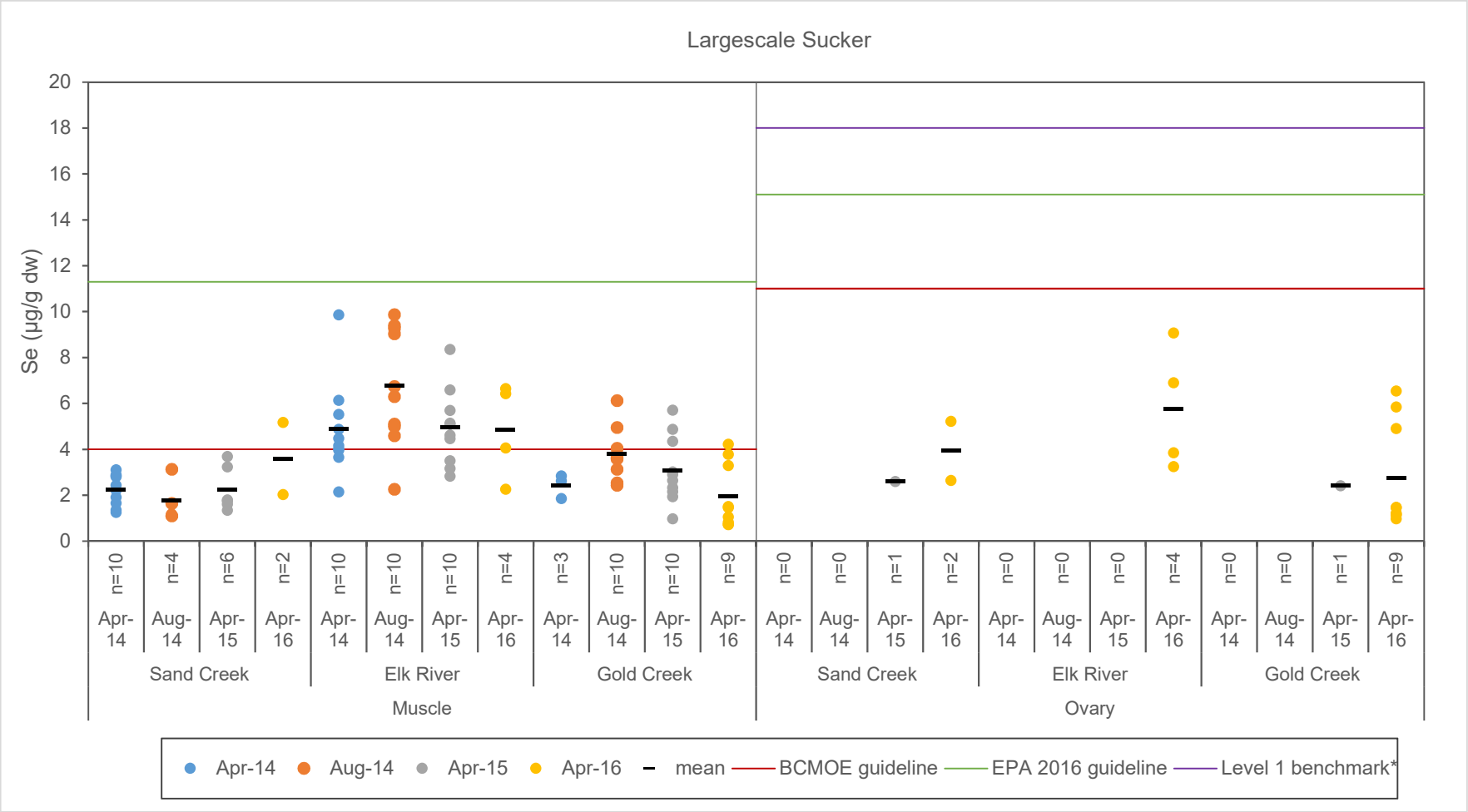


Figure F.21: Muscle and Ovary Tissue Selenium Concentrations (µg/g dw) in Largescale Sucker Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, April 2014, 2015, 2016, and August 2014

Note: * Level 1 benchmark for effects to fish reproduction (Teck 2014)

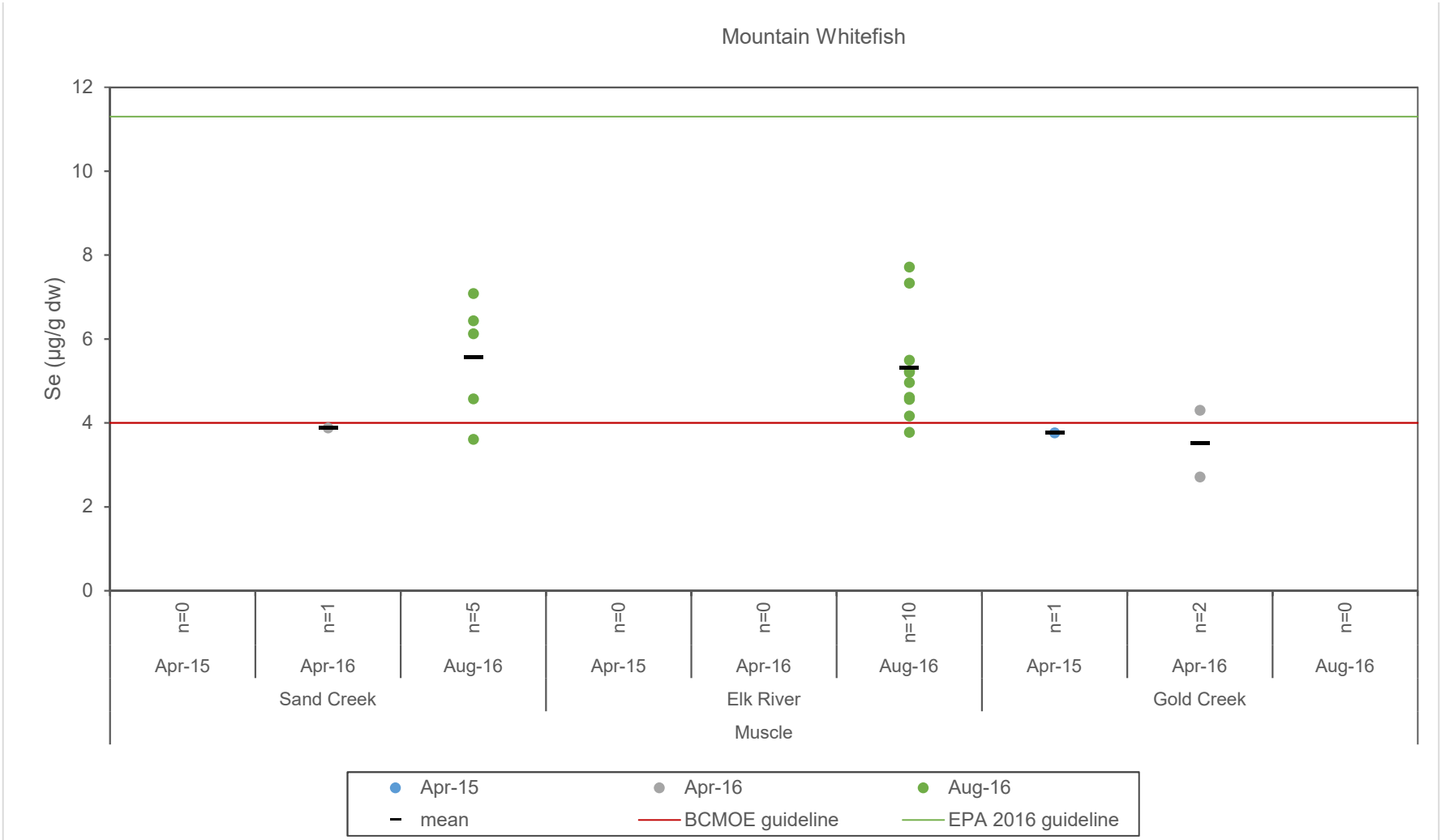


Figure F.22: Muscle Tissue Selenium Concentrations (µg/g dw) in Mountain Whitefish Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, April 2015, 2016, and August 2016

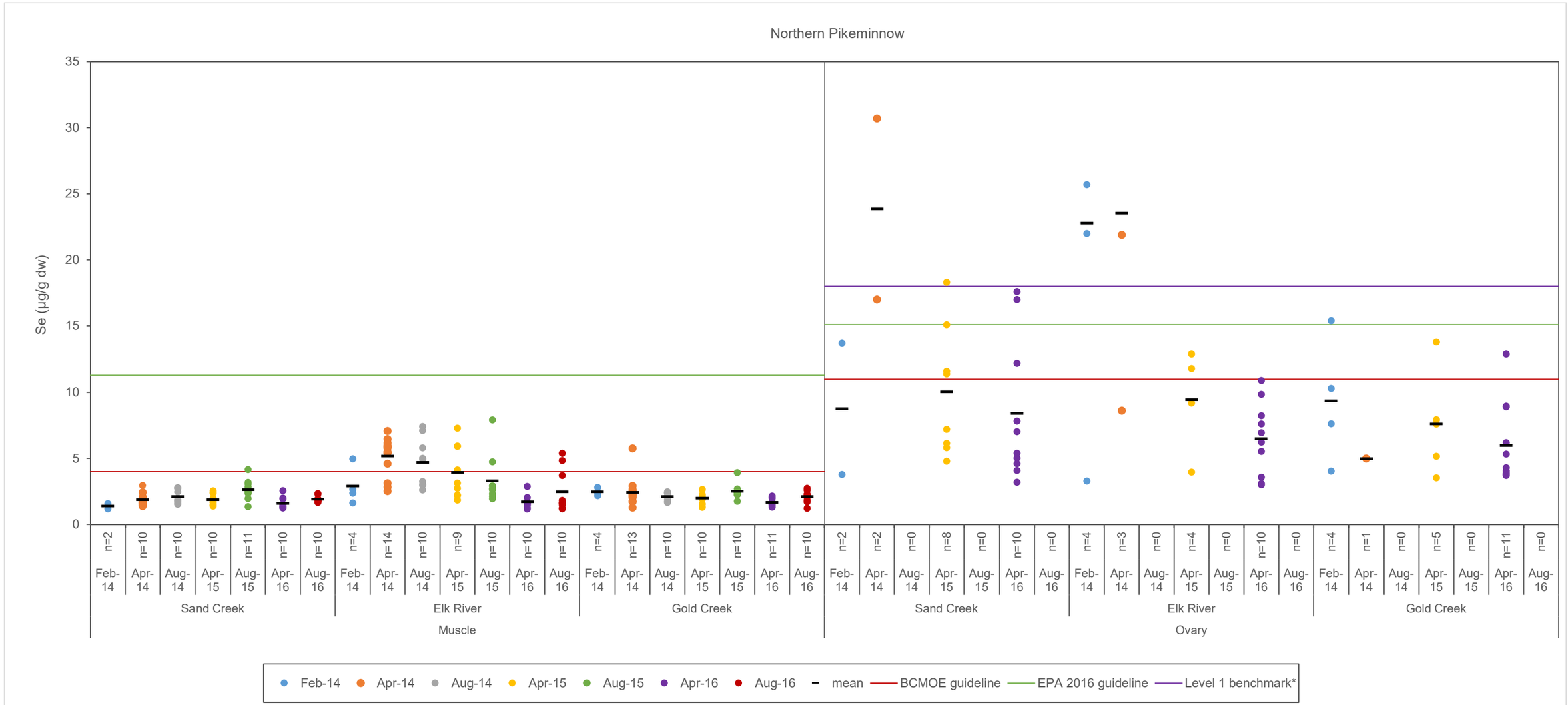


Figure F.23: Muscle and Ovary Tissue Selenium Concentrations (µg/g dw) in Northern Pikeminnow Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, February 2014, April 2014, 2015, 2016, and August 2014, 2015 and 2016

Note: * Level 1 benchmark for effects to fish reproduction (Teck 2014)

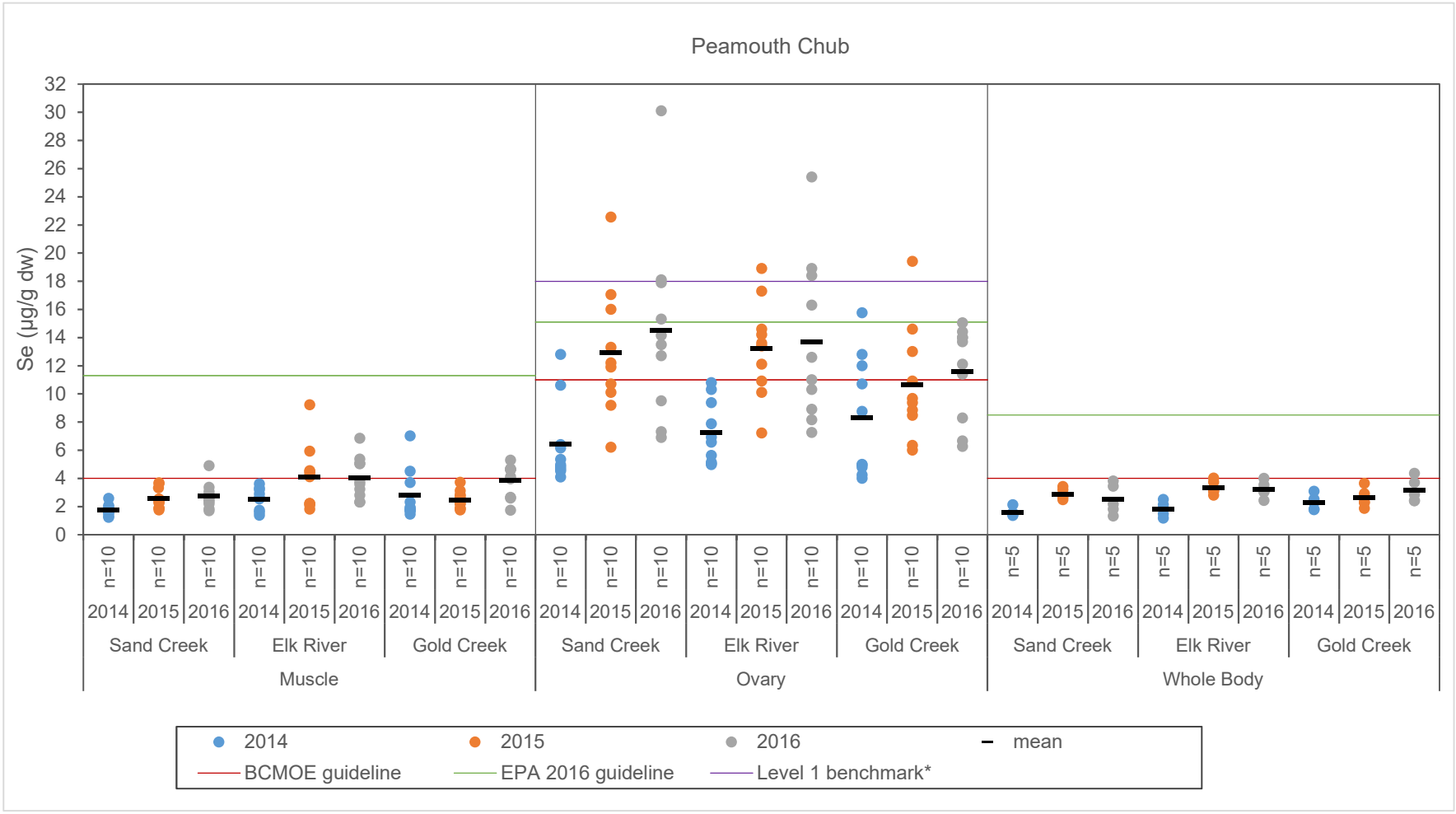


Figure F.24: Muscle, Ovary and Whole Body Tissue Selenium Concentrations (µg/g dw) in Peamouth Chub Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, April 2014, 2015 and 2016

Note: * Level 1 benchmark for effects to fish reproduction (Teck 2014)

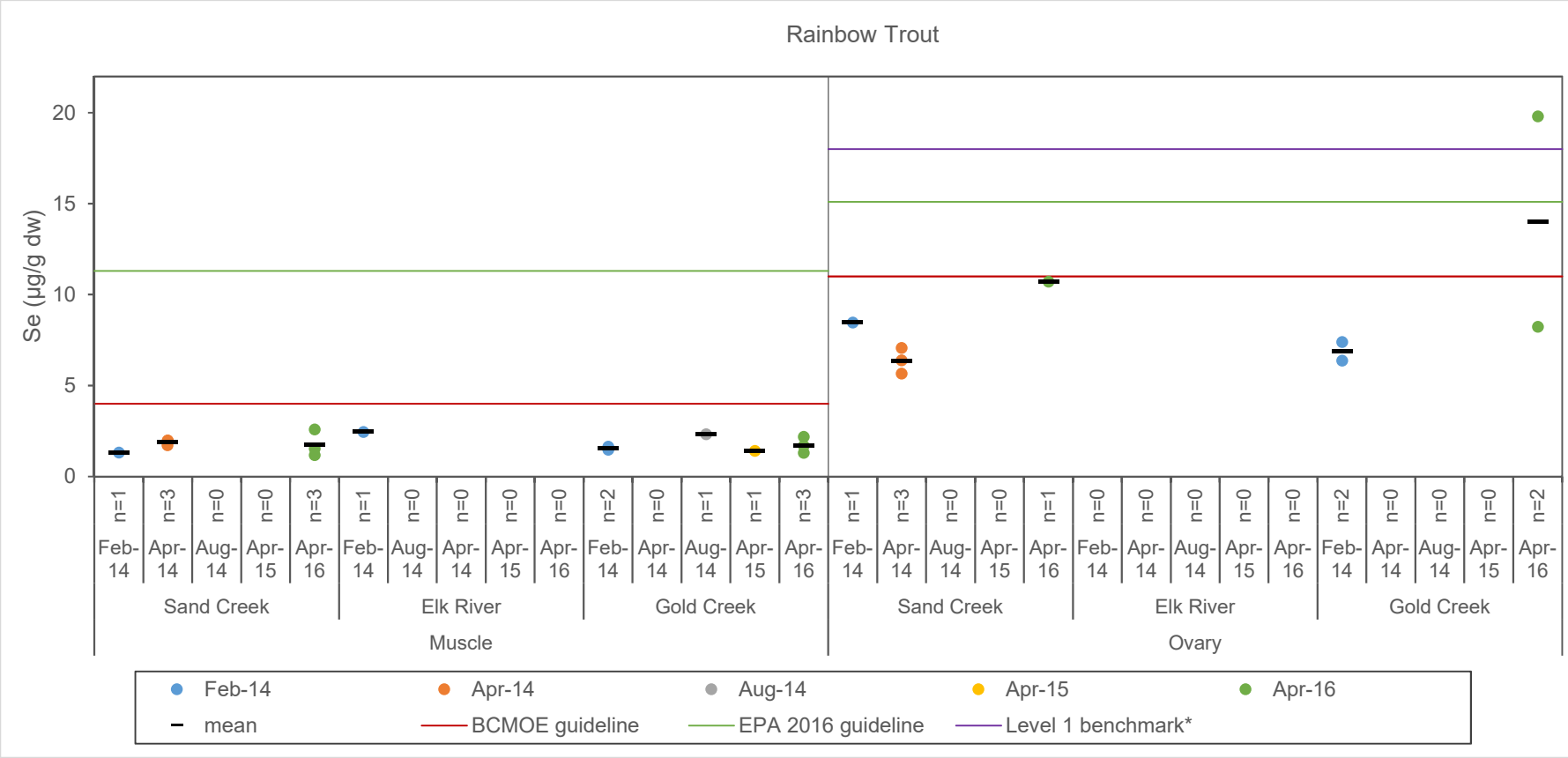


Figure F.25: Muscle and Ovary Tissue Selenium Concentrations (µg/g dw) in Rainbow Trout Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, in February, April, and August 2014, April 2015, and April 2016

Note: * Level 1 benchmark for effects to fish reproduction (Teck 2014)

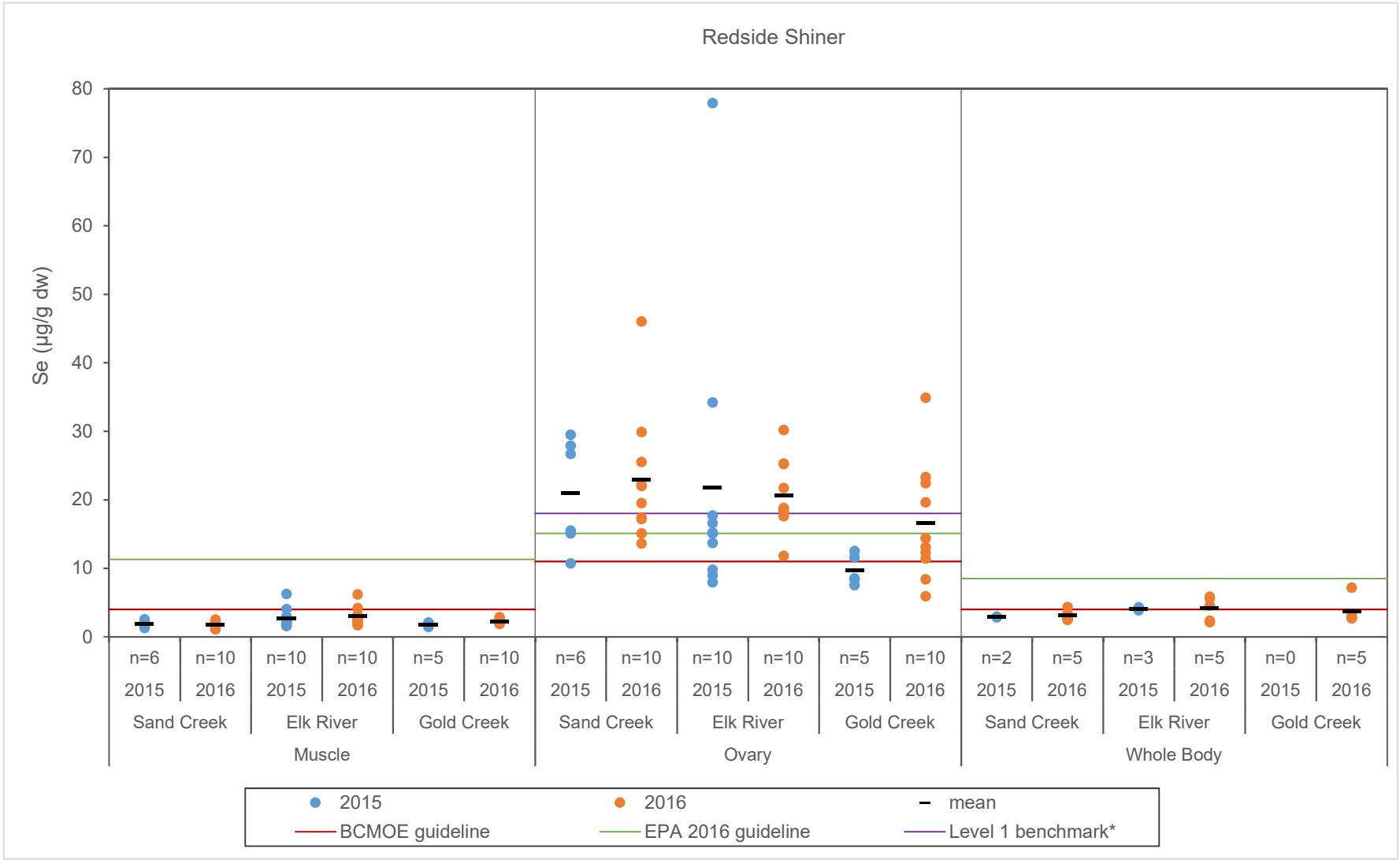


Figure F.26: Muscle, Ovary and Whole Body Tissue Selenium Concentrations (µg/g dw) in Redside Shiner Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, April 2015 and 2016

Note: * Level 1 benchmark for effects to fish reproduction (Teck 2014)

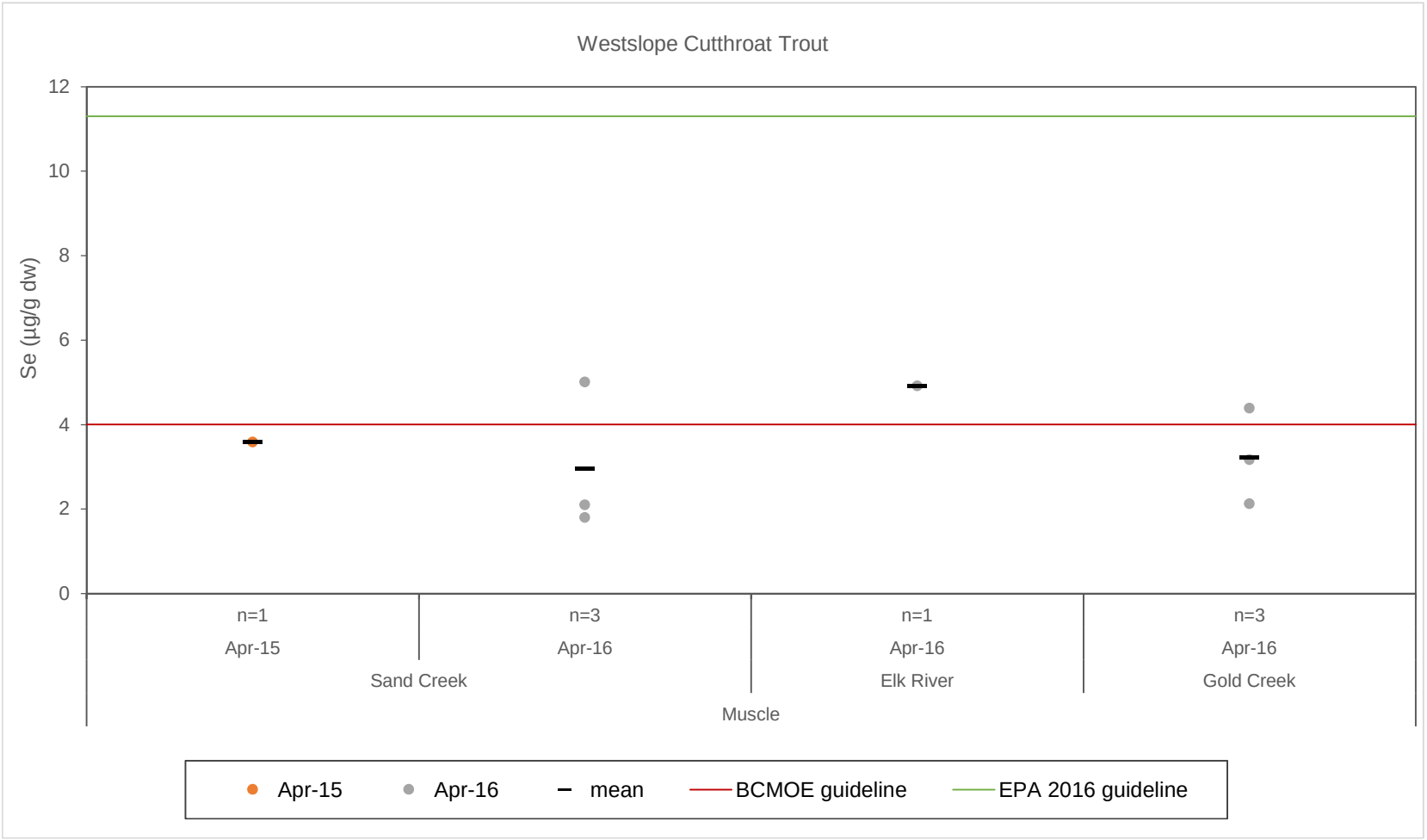


Figure F.27: Muscle Tissue Selenium Concentrations (µg/g dw) in Westslope Cutthroat Trout Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, April 2015 and 2016

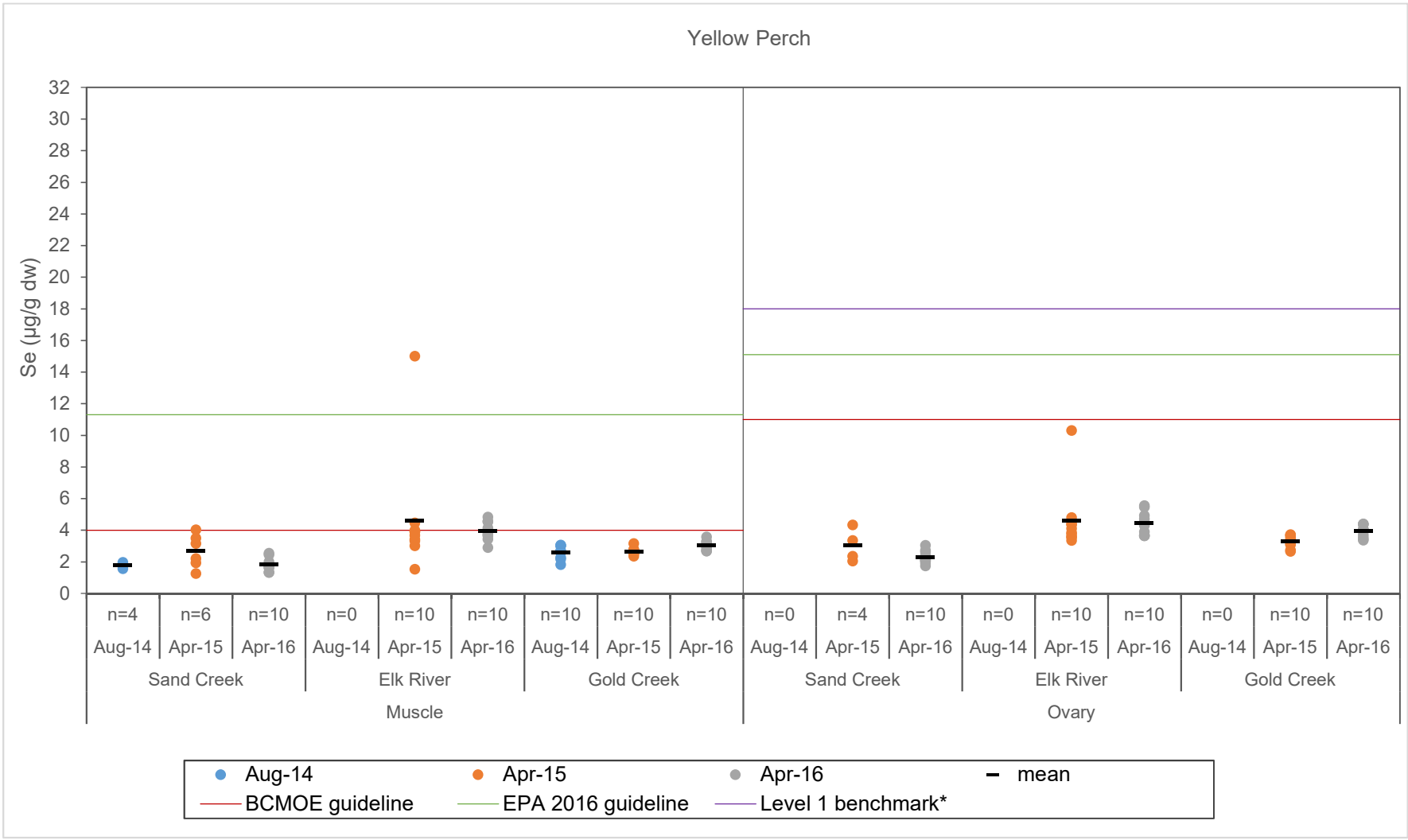


Figure F.28: Muscle and Ovary Tissue Selenium Concentrations (µg/g dw) in Yellow Perch Collected Downstream (Elk River and Gold Creek) and Upstream (Sand Creek) of the Elk River in Koocanusa Reservoir, April 2014, 2015 and 2016

Note: * Level 1 benchmark for effects to fish reproduction (Teck 2014)

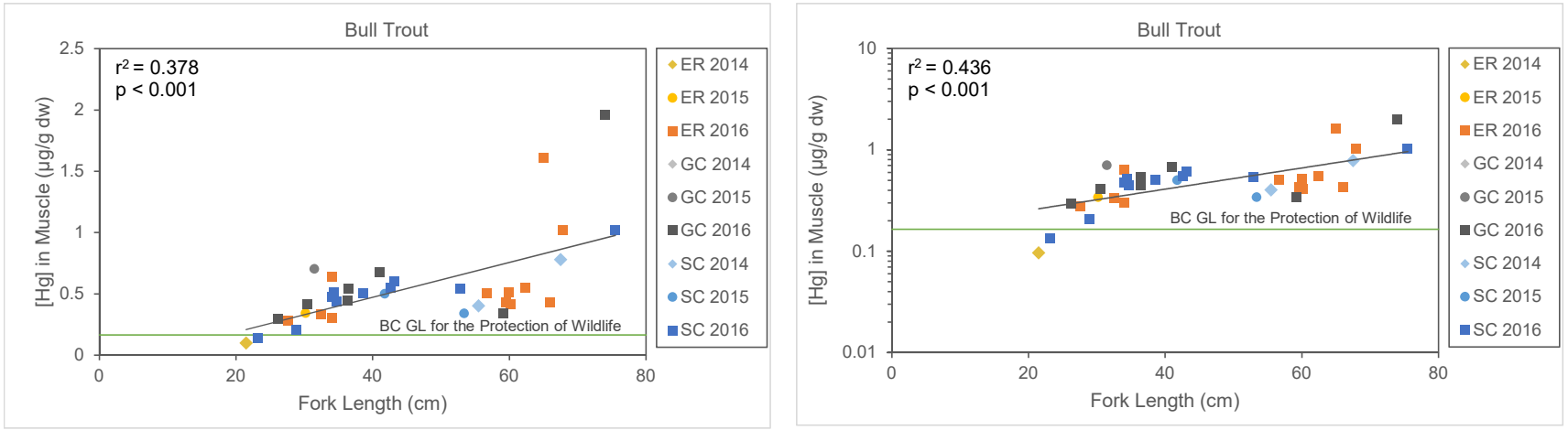


Figure F.29: Mercury Concentrations (µg/g dw) in Bull Trout Muscle Relative to Fork Length (cm) in Koocanusa Reservoir, April 2014 to 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

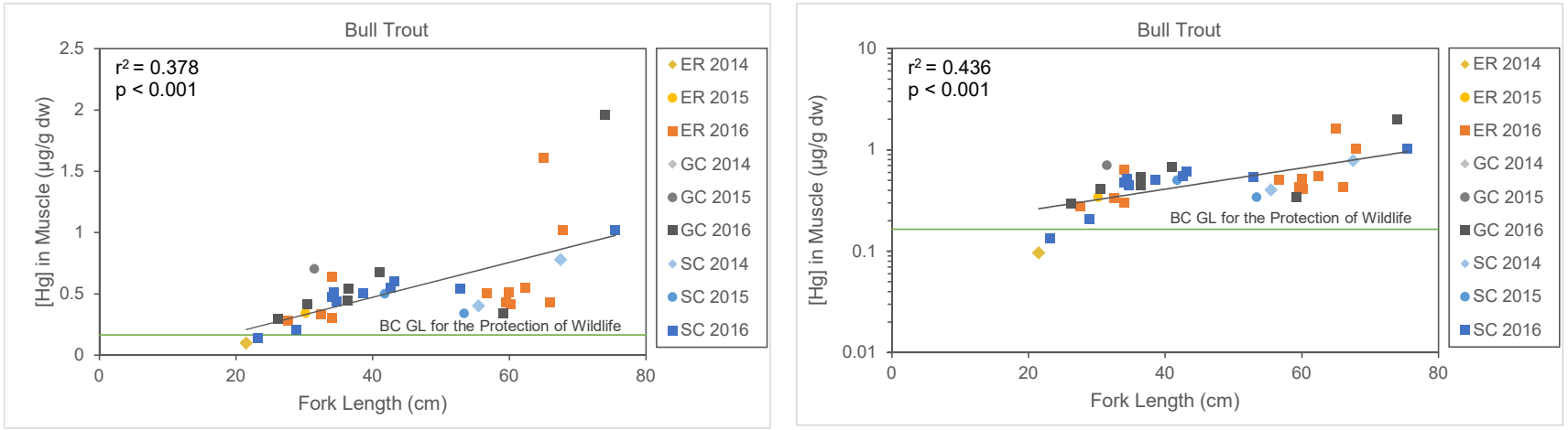


Figure F.30: Mercury Concentrations (µg/g dw) in Bull Trout Muscle Relative to Fork Length (cm) in Koocanusa Reservoir, April 2014 to 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

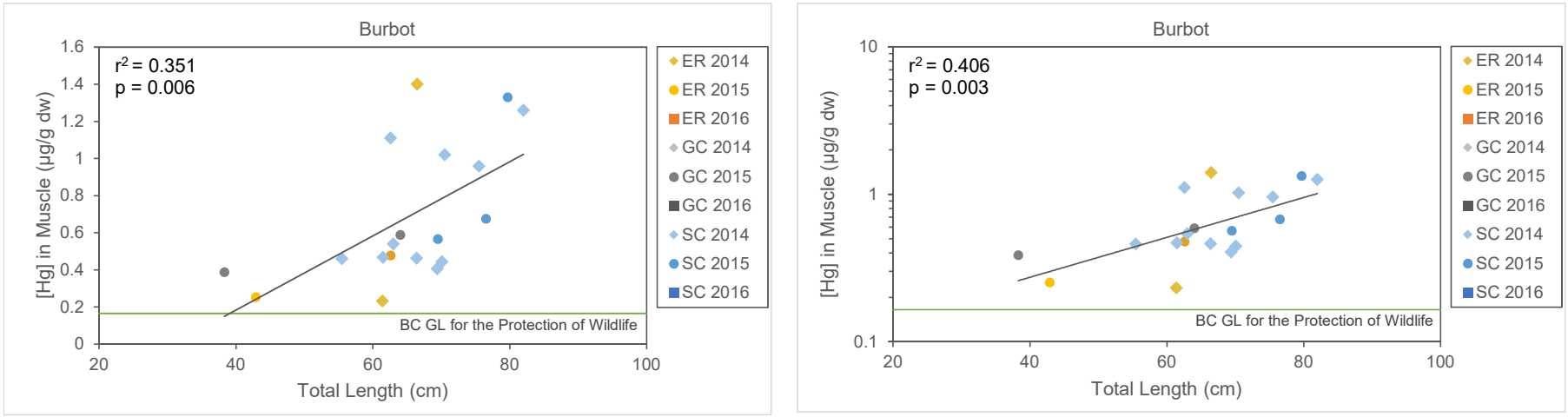


Figure F.31: Mercury Concentrations (µg/g dw) in Burbot Muscle Relative to Total Length (cm) in Koocanusa Reservoir, 2014 - 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

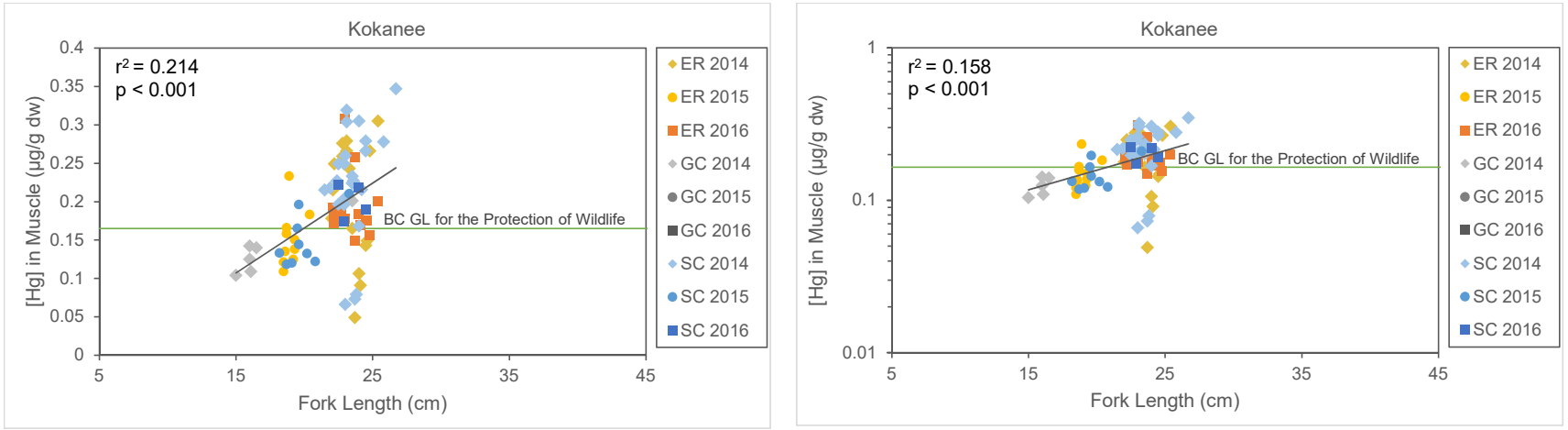


Figure F.32: Mercury Concentrations in Kokanee Muscle Relative to Fork Length (cm) in Koocanusa Reservoir, 2014 to 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

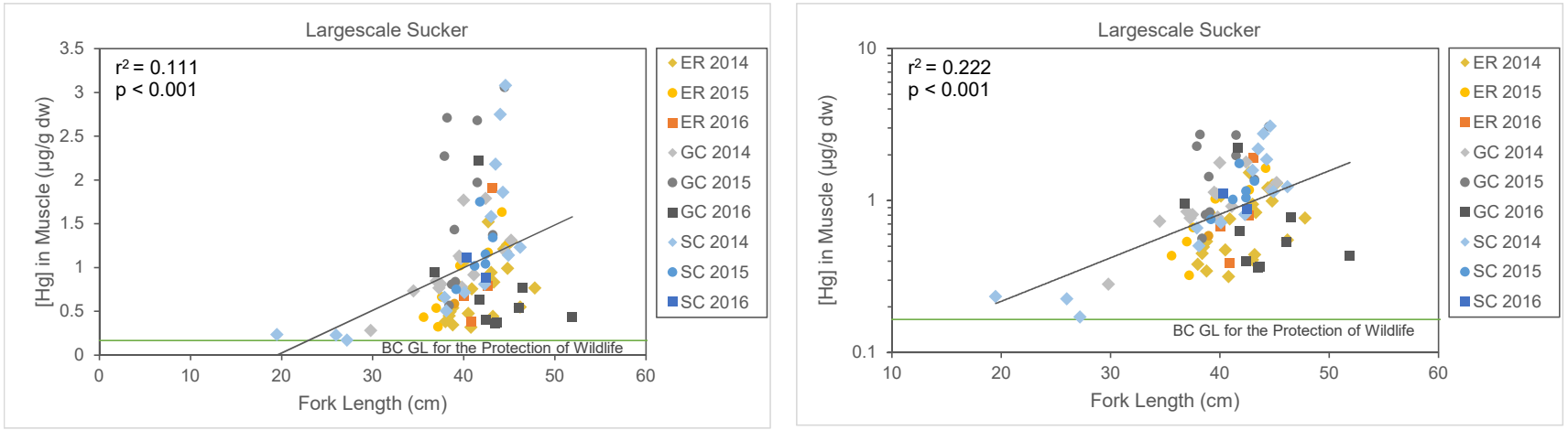


Figure F.33: Mercury Concentrations in Largescale Sucker Muscle Relative to Fork Length (cm) in Koocanusa Reservoir, 2014 to 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

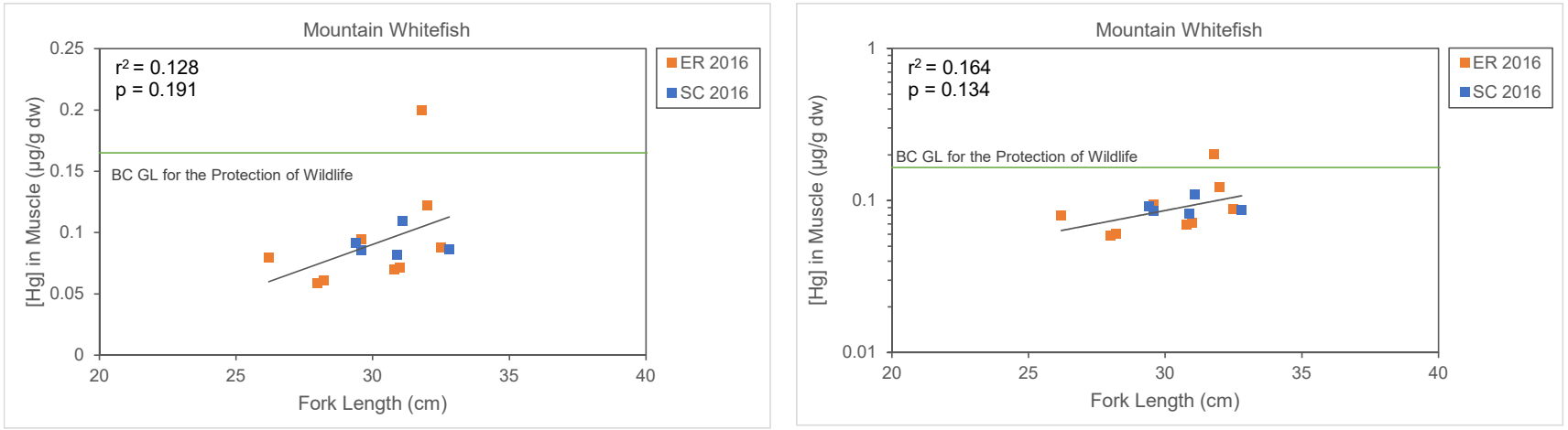


Figure F.34: Mercury Concentrations (µg/g dw) in Mountain Whitefish Muscle Relative to Fork Length (cm) in Koocanusa Reservoir, August, 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

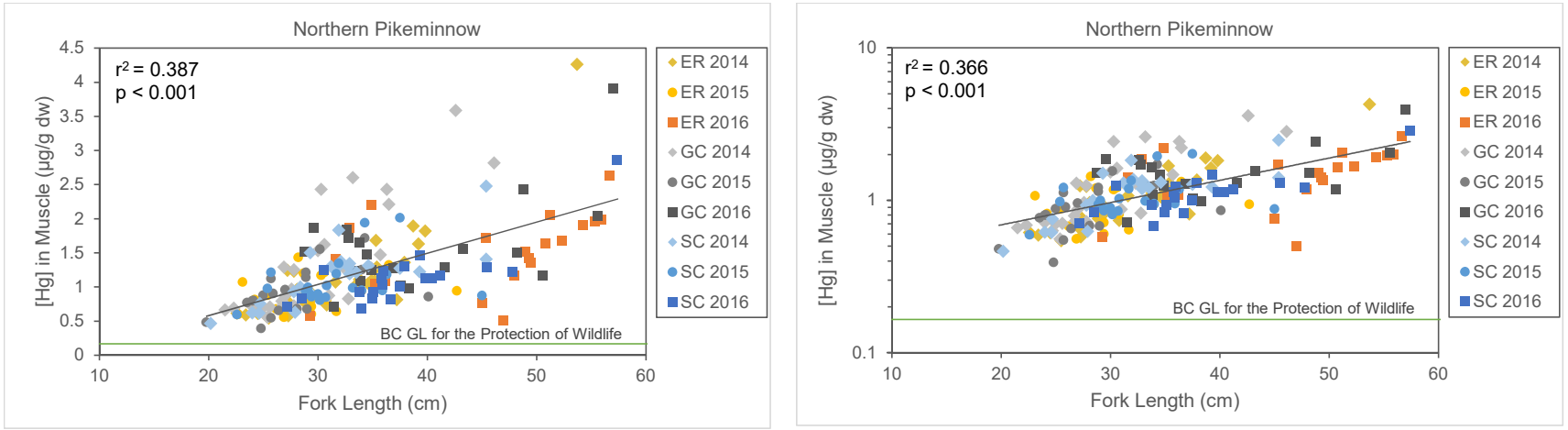


Figure F.35: Mercury Concentrations in Northern Pikeminnow Muscle Relative to Fork Length (cm) in Koocanusa Reservoir, 2014 to 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

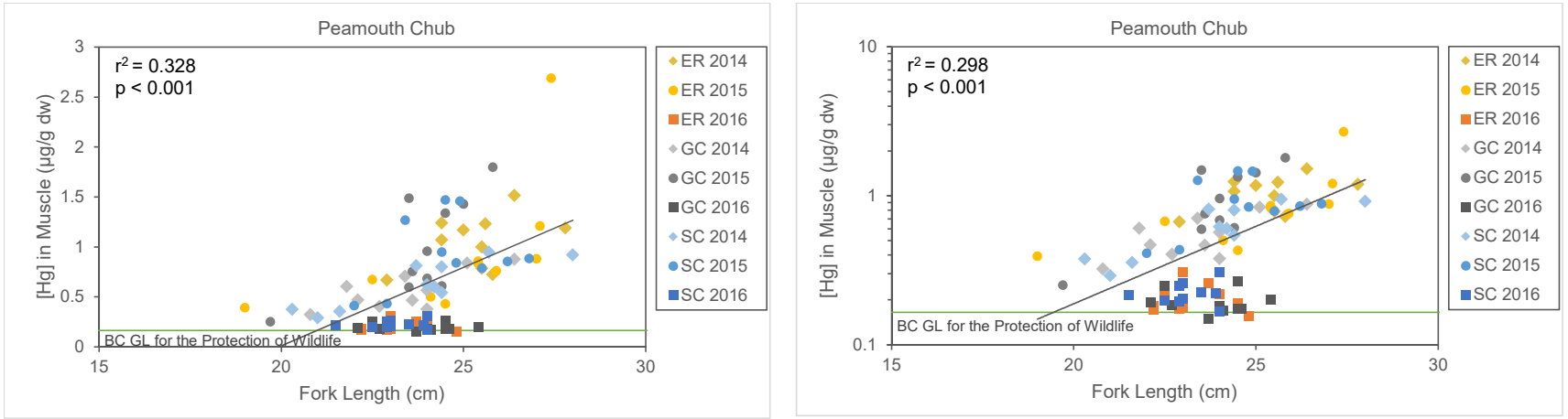


Figure F.36: Mercury Concentrations (µg/g dw) in Peamouth Chub Muscle Relative to Fork Length (cm) in Koocanusa Reservoir, April, 2014, 2015, and 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

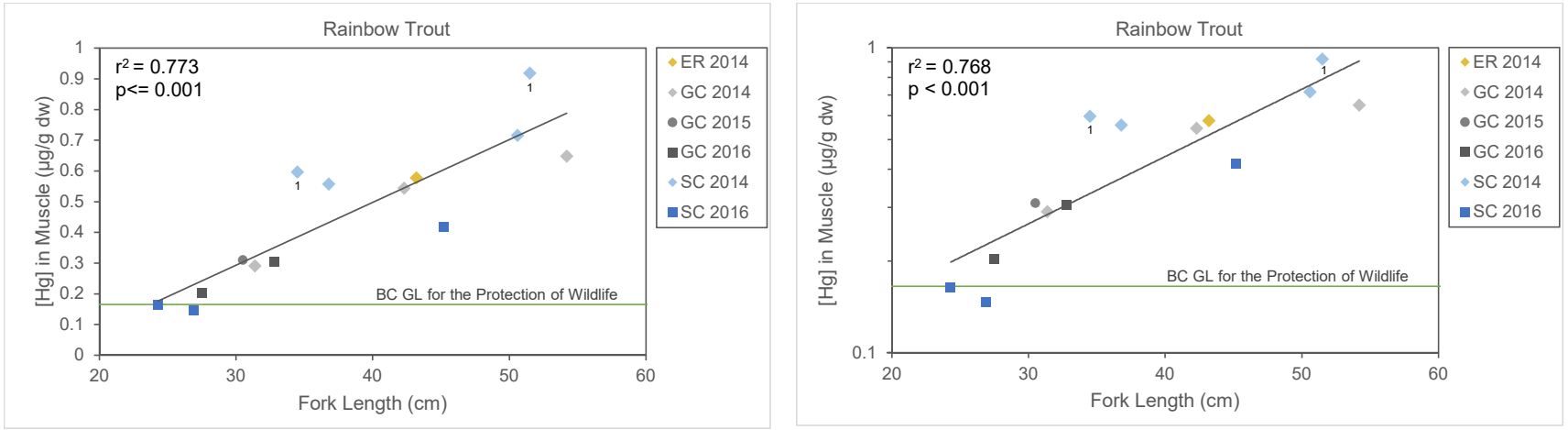


Figure F.37: Mercury Concentrations (µg/g dw) in Rainbow Trout Muscle Relative to Fork Length (cm) in the Koocanusa Reservoir, February 2014, April 2014 to 2016, and August 2014

[1] indicates that Total Length was used.

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

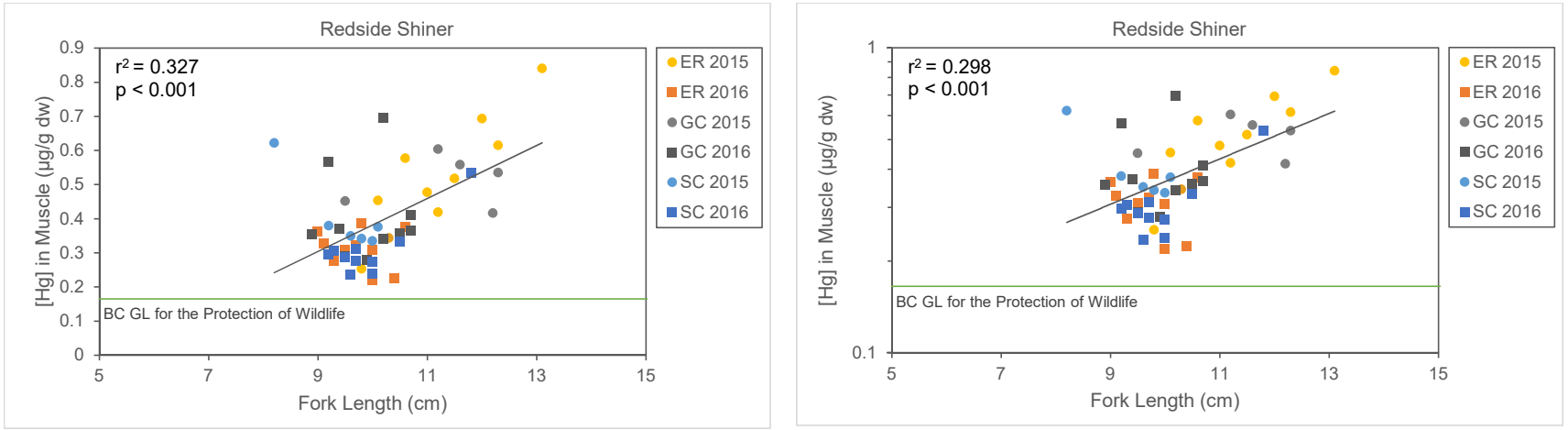
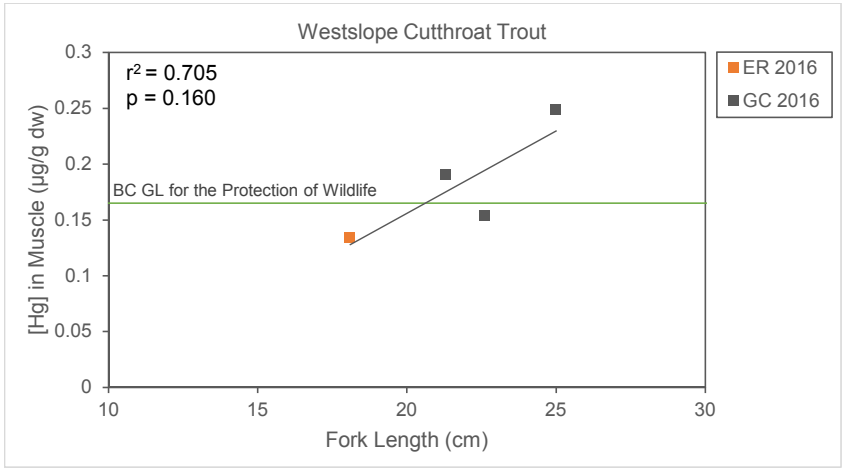


Figure F.38: Mercury Concentrations (µg/g dw) in Redside Shiner Muscle Relative to Fork Length (cm) in the Koocanusa Reservoir, April 2015 to 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%. No data was available for redside shiners, so golden shiners were used for comparative purpose.



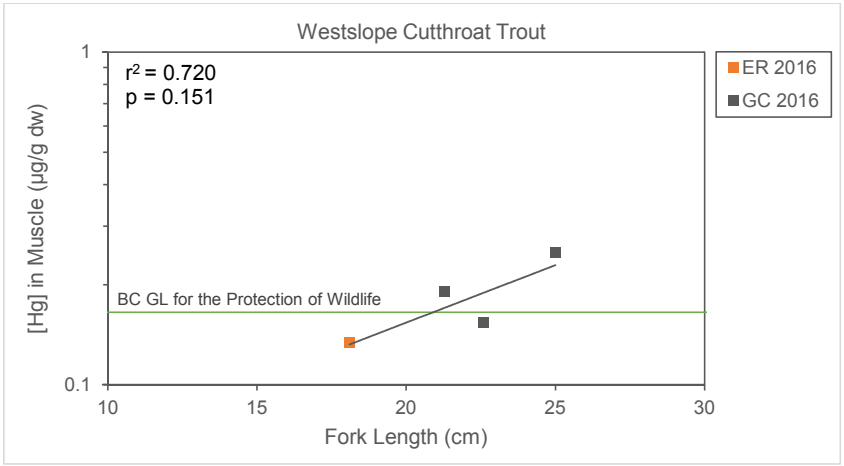


Figure F.39: Mercury Concentrations (µg/g dw) in Westslope Cutthroat Trout Muscle Relative to Fork Length (cm) in the Koocanusa Reservoir, April 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

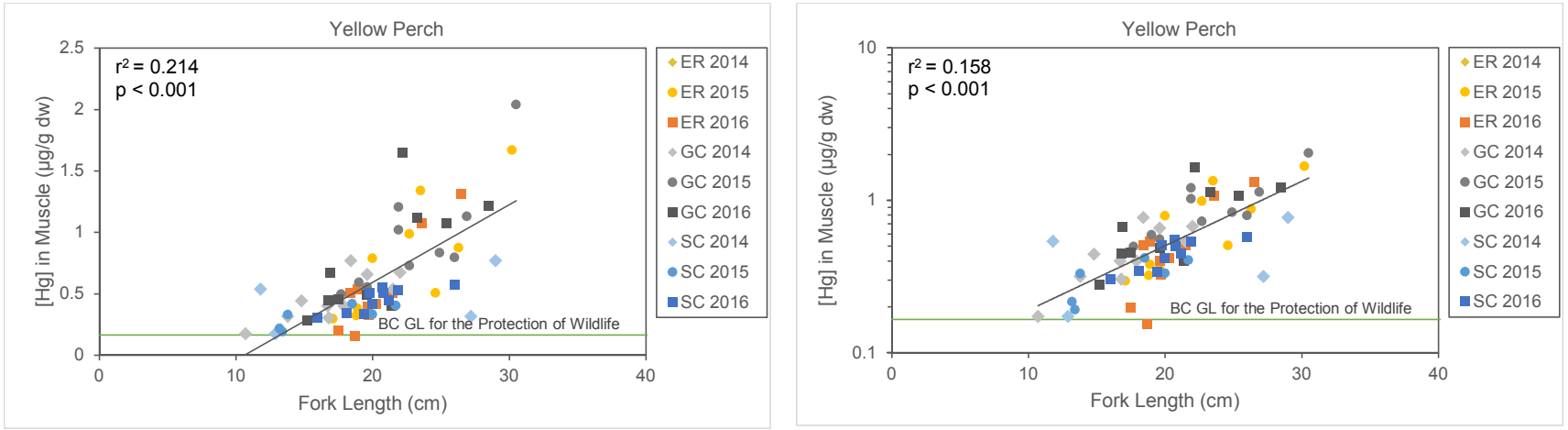


Figure F.40: Mercury Concentrations (µg/g dw) in Yellow Perch Muscle Relative to Fork Length (cm) in the Koocanusa Reservoir, April 2014 to 2016

Notes: Sand Creek (SC) study area is located upstream of the Elk River, while Elk River (ER) and Gold Creek (GC) study areas are located downstream of the Elk River confluence. Assuming all mercury is present as methyl-mercury (CCME 2000). The BC guideline for the protection of wildlife (0.033 µg/g ww) was converted to dry weight based on an average moisture content in fish muscle in Koocanusa Reservoir of approximately 80%.

Angling

Table F.1: Angling Records for Fish Caught in Koocanusa Reservoir, February 2014

Area	Station	Location (11U, NAD83)		Multiple Attempts at Same Locations	Set Date	Date of Removal	Set Time	Removal Time	Angling Hours (hrs)	Depth Range (m)		# of Lines	Effort (angling lines*days)	Bull Trout			Burbot			Largescale Sucker			Northern Pikeminnow			Peamouth Chub			Rainbow Trout		
		Easting	Northing											Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Sand Creek	SC-AN1	625568	5460392	-	14-Feb-14	14-Feb-14	9:30	11:00	1.50	5.8	6.4	2	0.13	0	0	0.00	1	0	8.00	0	0	0.00	2	1	16.00	0	0	0.00	1	1	8.00
	SC-AN2	625512	5460401	-	14-Feb-14	14-Feb-14	11:00	12:30	1.50	9.2	9.3	2	0.13	0	0	0.00	0	0	0.00	0	0	0.00	1	1	8.00	0	0	0.00	0	0	0.00
	SC-AN3	625457	5460374	-	14-Feb-14	14-Feb-14	12:45	14:10	1.42	9.7	10.2	2	0.12	0	0	0.00	1	0	8.47	0	0	0.00	1	0	8.47	0	0	0.00	0	0	0.00
	SC-AN4	625408	5460320	-	14-Feb-14	14-Feb-14	14:30	16:55	2.42	6.5	7.8	2	0.20	0	0	0.00	0	0	0.00	0	0	0.00	1	0	4.97	0	0	0.00	0	0	0.00
	SC-AN5	625409	5460209	-	15-Feb-14	15-Feb-14	9:05	10:30	1.42	4.6	4.8	2	0.12	0	0	0.00	1	0	8.47	0	0	0.00	1	0	8.47	0	0	0.00	0	0	0.00
	SC-AN6	625496	5460224	-	15-Feb-14	15-Feb-14	10:40	12:30	1.83	7.6	7.9	2	0.15	0	0	0.00	1	0	6.55	0	0	0.00	1	0	6.55	0	0	0.00	0	0	0.00
	SC-AN7	625574	5460281	-	15-Feb-14	15-Feb-14	12:40	13:05	0.42	6.9	11.8	2	0.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN8	625496	5460224	-	15-Feb-14	15-Feb-14	13:25	17:05	3.67	7.6	7.9	2	0.31	0	0	0.00	1	0	3.27	0	0	0.00	1	1	3.27	0	0	0.00	0	0	0.00
	TOTAL								**14.17**	**-**	**-**	**16**	**1.18**	**0**	**0**	**0.00**	**5**	**0**	**4.24**	**0**	**0**	**0.00**	**8**	**3**	**6.78**	**0**	**0**	**0.00**	**1**	**1**	**0.85**
Elk River	ER-AN1	627746	5447354	1a	17-Feb-14	17-Feb-14	9:10	11:05	1.92	9.2	2.5	2	0.16	0	0	0.00	0	0	0.00	0	0	0.00	3	0	18.78	0	0	0.00	0	0	0.00
				1b	18-Feb-14	18-Feb-14	9:25	11:30	2.08	9.2	2.5	2	0.17	0	0	0.00	0	0	0.00	0	0	0.00	1	1	5.76	0	0	0.00	0	0	0.00
				1c	20-Feb-14	20-Feb-14	12:50	13:55	1.08	9.2	2.5	2	0.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-AN2	627826	5447449	2a	17-Feb-14	17-Feb-14	11:15	12:45	1.50	8.3	3.2	2	0.13	1	0	8.00	0	0	0.00	0	0	0.00	1	1	8.00	1	0	8.00	0	0	0.00
				2b	18-Feb-14	18-Feb-14	11:45	13:05	1.33	8.3	3.2	2	0.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				2c	20-Feb-14	20-Feb-14	14:05	15:30	1.42	8.3	3.2	2	0.12	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-AN3	627898	5447536	-	17-Feb-14	17-Feb-14	13:00	16:45	3.75	4.0	12.2	2	0.31	1	0	3.20	0	0	0.00	0	0	0.00	4	2	12.80	0	0	0.00	1	1	3.20
	ER-AN4	627889	5447474	-	18-Feb-14	18-Feb-14	13:30	15:00	1.50	11.4	11.5	2	0.13	0	0	0.00	0	0	0.00	0	0	0.00	1	1	8.00	0	0	0.00	0	0	0.00
	ER-AN5	627930	5447457	-	18-Feb-14	18-Feb-14	15:35	17:30	1.92	10.8	11.2	2	0.16	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-AN6	627920	5447498	-	20-Feb-14	20-Feb-14	15:40	17:30	1.83	11.4	11.6	2	0.15	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**18.33**	**-**	**-**	**20**	**1.53**	**2**	**0**	**1.31**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**10**	**5**	**6.55**	**1**	**0**	**0.65**	**1**	**1**	**0.65**
Gold Creek	GC-AN1	629355	5436958	1a	11-Feb-14	11-Feb-14	9:30	13:00	3.50	3.5	3.2	2	0.29	0	0	0.00	0	0	0.00	0	0	0.00	4	0	13.71	0	0	0.00	1	1	3.43
				1b	12-Feb-14	12-Feb-14	9:15	10:20	1.08	3.5	3.2	2	0.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-AN2	629438	5436997	2a	11-Feb-14	11-Feb-14	13:05	14:45	1.67	5.0	4.8	2	0.14	1	0	7.20	0	0	0.00	0	0	0.00	3	0	21.60	0	0	0.00	1	1	7.20
				2b	12-Feb-14	12-Feb-14	10:30	12:20	1.83	5.0	4.8	2	0.15	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-AN3	629451	5437078	-	12-Feb-14	12-Feb-14	12:45	13:50	1.08	5.2	5.0	2	0.09	0	0	0.00	0	0	0.00	0	0	0.00	3	1	33.23	0	0	0.00	0	0	0.00
	GC-AN4	629354	5437061	-	16-Feb-14	16-Feb-14	9:45	11:55	2.17	4.7	4.5	2	0.18	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-AN5	629265	5437036	-	12-Feb-14	12-Feb-14	13:55	15:00	1.08	3.3	3.2	2	0.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-AN6	629136	5437013	6a	11-Feb-14	11-Feb-14	14:55	18:00	3.08	1.2	1.0	2	0.26	0	0	0.00	0	0	0.00	1	0	3.89	8	3	31.14	0	0	0.00	0	0	0.00
				6b	12-Feb-14	12-Feb-14	15:05	16:05	1.00	1.2	1.0	2	0.08	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				6c	16-Feb-14	16-Feb-14	12:25	14:20	1.92	1.2	1.0	2	0.16	0	0	0.00	0	0	0.00	0	0	0.00	3	3	18.78	0	0	0.00	0	0	0.00
	GC-AN7	629111	5436941	-	16-Feb-14	16-Feb-14	14:30	15:30	1.00	3.0	2.2	2	0.08	0	0	0.00	0	0	0.00	0	0	0.00	2	0	24.00	0	0	0.00	0	0	0.00
	GC-AN8	629455	5437021	8a	12-Feb-14	12-Feb-14	16:40	18:10	1.50	6.2	5.4	2	0.13	0	0	0.00	0	0	0.00	0	0	0.00	3	1	24.00	0	0	0.00	0	0	0.00
				8b	16-Feb-14	16-Feb-14	15:35	16:55	1.33	6.2	5.4	2	0.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-AN9	629016	5436983	-	20-Feb-14	20-Feb-14	8:30	10:50	2.33	1.2	0.8	2	0.19	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-AN10	629461	5436861	-	20-Feb-14	20-Feb-14	10:55	12:40	1.75	4.7	4.2	2	0.15	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**26.33**	**-**	**-**	**30**	**2.19**	**1**	**0**	**0.46**	**0**	**0**	**0.00**	**1**	**0**	**0.46**	**26**	**8**	**11.85**	**0**	**0**	**0.00**	**2**	**2**	**0.91**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table F.2: Angling Records for Fish Caught in Koocanusa Reservoir, April 2014

Area	Station	Location (11U, NAD83)		Set Date	Date of Removal	Set Time	Removal Time	Angling Hours (hrs)	Depth Range (m)		# of Lines	Effort (angling lines*days)	Mountain Whitefish		
		Easting	Northing										Catch	Mortalities/ Sacrificed	CPUE*
Sand Creek	SC-AN1	624826	5461123	10-Apr-14	10-Apr-14	15:30	16:30	1.00	0.5	2.0	2	0.08	0	0	0.00
	SC-AN2	623391	5461316	11-Apr-14	11-Apr-14	14:00	15:00	1.00	1.0	2.0	2	0.08	0	0	0.00
	SC-AN3	625665	5458082	16-Apr-14	16-Apr-14	13:45	15:45	2.00	1.0	3.0	2	0.17	1	0	6.00
	TOTAL							**4.00**	**-**	**-**	**6**	**0.33**	**1**	**0**	**3.00**
Elk River	ER-AN1	629076	5447937	11-Apr-14	11-Apr-14	12:00	13:00	1.00	3.0	6.0	2	0.08	0	0	0.00
	TOTAL							**1.00**	**-**	**-**	**2**	**0.08**	**0**	**0**	**0.00**
Gold Creek	GC-AN1	630602	5437926	11-Apr-14	11-Apr-14	13:15	13:45	0.50	1.5	8.0	2	0.04	0	0	0.00
	GC-AN2	629455	5436996	11-Apr-14	11-Apr-14	14:30	15:00	0.50	0.5	1.5	2	0.04	0	0	0.00
	GC-AN3	629551	5436990	14-Apr-14	15-Apr-14	10:20	11:00	24.67	0.5	1.0	2	2.06	0	0	0.00
	TOTAL							**25.67**	**-**	**-**	**6**	**2.14**	**0**	**0**	**0.00**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table F.3: Angling Records for Fish Caught in Koocanusa Reservoir, August 2014

Area	Station	Location[b] (NAD 83, Zone 11U)				Set Date	Date of Removal	Start Time	End Time	Angling Hours (hrs)	Depth Range (m)		# of Lines	Effort (angling lines*days)	Kokanee			Northern Pikeminnow			Rainbow Trout		
		Start Easting	Start Northing	End Easting	End Northing										Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]
Sand Creek	SC-AN1	625507	5457828	626557	5458377	21-Aug-14	21-Aug-14	14:00	15:30	1.50	17.0	-	4	0.25	0	0	0.0	0	0	0.0	0	0	0.0
	TOTAL									**1.50**	**-**	**-**	**4**	**0.25**	**0**	**0**	**0.0**	**0**	**0**	**0.0**	**0**	**0**	**0.0**
Elk River	ER-AN1	627144	5446434	627111	5444962	20-Aug-14	20-Aug-14	15:45	17:00	1.25	22.4	10.6	4	0.21	0	0	0.0	0	0	0.0	0	0	0.0
	ER-AN2	627112	5446484	626971	5446843	21-Aug-14	21-Aug-14	15:45	17:00	1.25	21.1	-	4	0.21	2	2	9.6	0	0	0.0	0	0	0.0
	ER-AN3	626812	5446531	626992	5445507	24-Aug-14	24-Aug-14	16:00	17:30	1.50	23.1	29.1	4	0.25	0	0	0.0	0	0	0.0	0	0	0.0
	TOTAL									**4.00**	**-**	**-**	**12**	**0.67**	**2**	**2**	**3.0**	**0**	**0**	**0.0**	**0**	**0**	**0.0**
Gold Creek	GC-AN1	630340	5437123	630357	5436999	25-Aug-14	25-Aug-14	14:45	17:30	2.75	20.2	-	4	0.46	5	5	10.9	2	0	4.4	0	0	0.0
	GC-AN2	630424	5436918	630365	5437418	26-Aug-14	26-Aug-14	9:30	11:10	1.67	25.2	-	4	0.28	4	1	14.4	0	0	0.0	1	0	3.6
	TOTAL									**4.42**	**-**	**-**	**8**	**0.74**	**9**	**6**	**12.2**	**2**	**0**	**2.7**	**1**	**0**	**1.4**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

[b] Angling completed by downrigging, so start and end coordinates were included.

Table F.4: Angling Records for Fish Caught in Koocanusa Reservoir, February 2015

Area	Station	Location (11U, NAD83)		Date	Start Time	End Time	Angling Hours (hrs)	Depth (m)	# of Lines	Effort (angling lines*day)	Northern Pikeminnow			Peamouth Chub		
		Easting	Northing								Catch	Mortalities / Sacrificed	CPUE[a]	Catch	Mortalities / Sacrificed	CPUE[a]
Sand Creek	SC-AN-01	625664	5457717	27-Feb-15	15:15	15:45	0.50	8.0	2	0.04	0	0	0.00	0	0	0.00
	SC-AN-02	625593	5457919	27-Feb-15	15:50	16:00	0.08	5.6	2	0.01	0	0	0.00	0	0	0.00
	SC-AN-03	625572	5460007	28-Feb-15	13:55	14:40	0.75	11.1	2	0.06	3	2	48.00	0	0	0.00
	SC-AN-04	625667	5457940	27-Feb-15	15:28	16:05	0.63	9.3	2	0.05	0	0	0.00	0	0	0.00
	SC-AN-05	625588	5459659	28-Feb-15	14:55	15:30	0.58	8.7	2	0.05	0	0	0.00	2	0	41.38
	Total								**10**	**0.21**	**3**	**2**	**14.17**	**2**	**0**	**9.45**
Elk River	ER-AN-01	628264	5447815	25-Feb-15	12:28	12:45	0.28	7.4	2	0.02	0	0	0.00	0	0	0.00
	ER-AN-02	628004	5447777	25-Feb-15	13:00	13:55	0.92	9.1	2	0.08	2	0	26.09	0	0	0.00
	ER-AN-03	627999	5447715	25-Feb-15	14:00	14:25	0.42	9.0	2	0.04	0	0	0.00	0	0	0.00
	ER-AN-04	628023	5447632	25-Feb-15	14:25	14:35	0.17	11.8	2	0.01	0	0	0.00	0	0	0.00
	ER-AN-05	627955	5447598	25-Feb-15	14:45	15:15	0.33	7.7	2	0.03	0	0	0.00	0	0	0.00
	ER-AN-06	628135	5447318	25-Feb-15	15:20	16:00	0.67	8.0	2	0.06	0	0	0.00	0	0	0.00
	ER-AN-07	628403	5447898	26-Feb-15	10:15	10:50	0.58	6.1	2	0.05	0	0	0.00	0	0	0.00
	ER-AN-08	627367	5446821	26-Feb-15	11:00	11:28	0.47	7.6	2	0.04	0	0	0.00	0	0	0.00
	ER-AN-09	628026	5447752	26-Feb-15	11:34	12:15	0.68	13.9	2	0.06	1	1	17.65	0	0	0.00
	ER-AN-10	628085	5447701	26-Feb-15	15:02	16:03	1.02	11.3	2	0.09	1	0	11.76	0	0	0.00
	ER-AN-11	627739	5447144	25-Feb-15	12:25	13:10	0.75	9.0	2	0.06	0	0	0.00	0	0	0.00
	ER-AN-12	628037	5447767	25-Feb-15	13:15	14:40	1.42	17.1	2	0.12	5	0	42.25	0	0	0.00
	ER-AN-13	628093	5447713	25-Feb-15	14:44	15:07	0.38	10.1	2	0.03	0	0	0.00	0	0	0.00
	ER-AN-14	627853	5447475	25-Feb-15	15:15	15:40	0.42	8.2	2	0.04	0	0	0.00	0	0	0.00
	ER-AN-15	627619	5446850	25-Feb-15	15:45	16:00	0.25	11.1	2	0.02	0	0	0.00	0	0	0.00
	ER-AN-16	628009	5447807	26-Feb-15	10:10	12:00	1.83	15.5	2	0.15	5	0	32.79	1	0	6.56
	ER-AN-17	628486	5447969	26-Feb-15	13:51	14:35	0.73	5.5	2	0.06	0	0	0.00	0	0	0.00
	ER-AN-18	628142	5447640	26-Feb-15	14:42	16:00	1.30	7.2	2	0.11	0	0	0.00	0	0	0.00
	Total								**36**	**1.05**	**14**	**1**	**13.31**	**1**	**0**	**0.95**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table F.5: **Angling Records for Fish Caught in Koocanusa Reservoir, April 2015**

Area	Station	Location (11U, NAD83)		Set Date	Date of Removal	Set Time	Removal Time	Angling Hours (hrs)	Depth (m)	# of Lines	Effort (angling lines*days)	Bull Trout			Kokanee			Northern Pikeminnow			Peamouth Chub			Rainbow Trout			Westslope Cutthroat Trout		
		Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]
Sand Creek	SC-AN-01	626157	5458225	21-Apr-15	21-Apr-15	15:24	16:00	0.60	3.1	2	0.05	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-02	625558	5459677	21-Apr-15	21-Apr-15	16:13	16:30	0.28	9.7	2	0.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-03	625572	5459797	24-Apr-15	24-Apr-15	10:00	10:30	0.50	11.8	2	0.04	0	0	0.00	0	0	0.00	1	1	24.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-04	625586	5460100	24-Apr-15	24-Apr-15	10:32	10:48	0.27	10.0	2	0.02	0	0	0.00	0	0	0.00	1	0	45.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-05	625530	5460095	24-Apr-15	24-Apr-15	11:20	11:50	0.50	8.0	2	0.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-06	625530	5460095	24-Apr-15	24-Apr-15	12:00	13:00	1.00	2.0	2	0.08	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-07	625672	5457982	24-Apr-15	24-Apr-15	13:00	14:00	1.00	7.1	2	0.08	0	0	0.00	0	0	0.00	15	10	180.00	7	7	84.00	0	0	0.00	0	0	0.00
	SC-AN-08	625682	5457986	27-Apr-15	27-Apr-15	12:15	13:25	1.17	7.1	2	0.10	0	0	0.00	0	0	0.00	12	8	123.43	8	8	82.29	0	0	0.00	0	0	0.00
	SC-AN-09	625672	5457982	28-Apr-15	28-Apr-15	12:00	13:00	1.00	7.1	2	0.08	0	0	0.00	0	0	0.00	7	1	84.00	3	3	36.00	0	0	0.00	0	0	0.00
	SC-AN-10	626088	5458109	28-Apr-15	28-Apr-15	13:04	13:30	0.43	5.0	2	0.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-11	625672	5457985	28-Apr-15	28-Apr-15	13:33	14:03	0.50	6.9	2	0.04	0	0	0.00	0	0	0.00	4	0	96.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-12	625496	5459952	28-Apr-15	28-Apr-15	14:14	14:40	0.43	7.1	2	0.04	0	0	0.00	0	0	0.00	0	0	0.00	3	2	83.08	0	0	0.00	0	0	0.00
	SC-AN-13	625596	5459952	28-Apr-15	28-Apr-15	14:45	15:00	0.25	7.5	2	0.02	0	0	0.00	0	0	0.00	4	0	192.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-AN-14	625768	5458158	30-Apr-15	30-Apr-15	10:50	14:30	3.67	8.0	4	0.61	1	0	1.64	1	0	1.64	28	0	45.82	21	20	34.36	0	0	0.00	1	0	1.64
	TOTAL							**11.60**	**-**	**30**	**1.27**	**1**	**0**	**0.79**	**1**	**0**	**0.79**	**72**	**20**	**56.59**	**42**	**40**	**33.01**	**0**	**0**	**0.00**	**1**	**0**	**0.79**
Elk River	ER-AN-01	630086	5447278	21-Apr-15	21-Apr-15	16:15	16:45	0.50	3.3	2	0.04	0	0	0.00	0	0	0.00	4	4	96.00	2	2	48.00	0	0	0.00	0	0	0.00
	ER-AN-02	627966	5447846	22-Apr-15	22-Apr-15	2:30	3:15	0.75	14.3	2	0.06	0	0	0.00	0	0	0.00	6	6	96.00	5	5	80.00	0	0	0.00	0	0	0.00
	ER-AN-03	628008	5447765	23-Apr-15	23-Apr-15	12:00	13:35	1.58	10.8	2	0.13	0	0	0.00	0	0	0.00	13	12	98.53	2	2	15.16	0	0	0.00	0	0	0.00
	ER-AN-04	628091	5448031	26-Apr-15	26-Apr-15	13:30	14:00	0.50	11.7	2	0.04	0	0	0.00	0	0	0.00	0	0	0.00	2	2	48.00	0	0	0.00	0	0	0.00
	ER-AN-05	628001	5447719	27-Apr-15	27-Apr-15	11:25	14:00	2.58	9.1	2	0.22	0	0	0.00	0	0	0.00	14	8	65.03	4	4	18.58	0	0	0.00	0	0	0.00
	ER-AN-06	629693	5447046	28-Apr-15	28-Apr-15	11:00	15:45	4.75	4.5	2	0.40	0	0	0.00	0	0	0.00	0	0	0.00	72	44	181.89	0	0	0.00	0	0	0.00
	ER-AN-07	629296	5447268	29-Apr-15	29-Apr-15	10:50	13:00	2.17	4.1	2	0.18	0	0	0.00	1	0	5.54	5	2	27.69	26	17	144.00	0	0	0.00	0	0	0.00
	ER-AN-08	627940	5447831	29-Apr-15	29-Apr-15	13:30	14:00	0.50	5.1	2	0.04	0	0	0.00	0	0	0.00	3	2	72.00	1	0	24.00	0	0	0.00	0	0	0.00
	TOTAL							**13.33**		**16**	**1.11**	**0**	**0**	**0.00**	**1**	**0**	**0.90**	**45**	**34**	**40.50**	**114**	**76**	**102.60**	**0**	**0**	**0.00**	**0**	**0**	**0.00**
Gold Creek	GC-AN-01	628366	5436651	22-Apr-15	22-Apr-15	-	-	3.50	-	2	0.29	0	0	0.00	0	0	0.00	11	7	37.71	2	2	6.86	0	0	0.00	0	0	0.00
	GC-AN-02	628366	5436651	23-Apr-15	23-Apr-15	-	-	2.50	-	2	0.21	0	0	0.00	0	0	0.00	7	7	33.60	6	6	28.80	0	0	0.00	0	0	0.00
	GC-AN-03	628366	5436651	24-Apr-15	24-Apr-15	-	-	0.15	-	2	0.01	0	0	0.00	0	0	0.00	1	1	80.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-AN-04	628366	5436651	25-Apr-15	25-Apr-15	-	-	2.50	-	2	0.21	0	0	0.00	0	0	0.00	4	4	19.20	23	23	110.40	0	0	0.00	0	0	0.00
	GC-AN-05	628366	5436651	26-Apr-15	26-Apr-15	-	-	3.50	-	2	0.29	1	0	3.43	0	0	0.00	14	7	48.00	20	5	68.57	0	0	0.00	0	0	0.00
	GC-AN-06	628366	5436651	27-Apr-15	27-Apr-15	-	-	3.00	-	2	0.25	0	0	0.00	0	0	0.00	2	2	8.00	24	8	96.00	0	0	0.00	0	0	0.00
	GC-AN-07	628366	5436651	29-Apr-15	29-Apr-15	-	-	2.00	-	2	0.17	0	0	0.00	0	0	0.00	12	6	72.00	9	4	54.00	0	0	0.00	0	0	0.00
	GC-AN-08	628366	5436651	30-Apr-15	30-Apr-15	-	-	2.00	-	2	0.17	0	0	0.00	0	0	0.00	10	5	60.00	8	3	48.00	1	0	6.00	0	0	0.00
	TOTAL							**19.15**	**-**	**16**	**1.60**	**1**	**0**	**0.63**	**0**	**0**	**0.00**	**61**	**39**	**38.22**	**92**	**51**	**57.65**	**1**	**0**	**0.05**	**0**	**0**	**0.00**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table F.6: Angling Records for Fish Caught in Koocanusa Reservoir, August 2015

Area	Station	Location (11U, NAD83)		Set Date	Date of Removal	Set Time	Removal Time	Angling Hours (hrs)	Depth (m)	# of Lines	Effort (angling lines*days)	Northern Pikeminnow			Peamouth Chub		
		Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
Sand Creek	SC-AN-01	625682	5457999	21-Aug-15	21-Aug-15	12:00	13:00	1.00	8.0	3	0.12	0	0	0.00	0	0	0.00
	SC-AN-02	626095	5458104	21-Aug-15	21-Aug-15	13:00	13:35	0.58	11.0	3	0.07	0	0	0.00	0	0	0.00
	SC-AN-03	625441	5457931	21-Aug-15	21-Aug-15	13:45	14:30	0.75	4.0	3	0.09	0	0	0.00	0	0	0.00
	TOTAL							**2.33**	**-**	**9**	**0.29**	**0**	**0**	**0.00**	**0**	**0**	**0.00**
Elk River	ER-AN-01	631946	5447054	23-Aug-15	23-Aug-15	11:30	12:20	0.83	2.5	3	0.10	0	0	0.00	1	0	9.60
	ER-AN-02	627989	5447769	23-Aug-15	23-Aug-15	13:00	15:00	2.00	14.3	3	0.25	20	10	80.00	1	0	4.00
	TOTAL							**2.83**	**-**	**6**	**0.35**	**20**	**10**	**56.47**	**2**	**0**	**5.65**
Gold Creek	GC-AN-01	629080	5436438	24-Aug-15	24-Aug-15	17:00	17:20	0.33	5.0	3	0.04	3	2	72.00	0	0	0.00
	GC-AN-02	629125	5436442	24-Aug-15	24-Aug-15	16:30	16:45	0.25	9.0	3	0.03	0	0	0.00	0	0	0.00
	GC-AN-03	629080	5436438	25-Aug-15	25-Aug-15	12:00	14:30	2.50	5.0	1	0.10	7	2	67.20	0	0	0.00
	GC-AN-04	629738	5436579	25-Aug-15	25-Aug-15	14:30	15:30	1.00	7.5	3	0.13	8	2	64.00	0	0	0.00
	GC-AN-05	629125	5436442	25-Aug-15	25-Aug-15	15:30	16:00	0.50	9.0	3	0.06	1	1	16.00	0	0	0.00
	GC-AN-06	629080	5436438	25-Aug-15	25-Aug-15	16:00	16:30	0.50	5.0	3	0.06	0	0	0.00	0	0	0.00
	TOTAL							**5.08**	**-**	**16**	**0.43**	**19**	**7**	**44.49**	**0**	**0**	**0.00**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table F.7: Angling Records for Fish Caught in Koocanusa Reservoir, April 2016

Area	Station	Location (11U, NAD83)		Set Date	Date of Removal	Set Time	Removal Time	Angling Hours (hrs)	Depth (m)	# of Lines	Effort (angling lines*days)	Bull Trout			Northern Pikeminnow			Peamouth Chub		
		Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
Sand Creek	SC-AN-01	625685	5458167	21-Apr-16	21-Apr-16	12:35	13:50	1.3	2.0	2	0.10	1	0	9.6	0	0	0	4	3	38
	SC-AN-02	625687	5457183	23-Apr-16	23-Apr-16	12:25	13:30	1.1	2.5	2	0.09	0	0	0	0	0	0	0	0	0
	SC-AN-03	625809	5458141	25-Apr-16	25-Apr-16	11:38	12:20	0.70	2.2	2	0.06	0	0	0	0	0	0	0	0	0
	SC-AN-04	625774	5458453	26-Apr-16	26-Apr-16	10:55	11:32	0.62	2.2	2	0.05	0	0	0	0	0	0	0	0	0
	TOTAL							**3.7**	**-**	**8**	**0.30**	**1**	**0**	**3.3**	**0**	**0**	**0**	**4**	**3**	**13**
Elk River	ER-AN-01	628214	5447728	19-Apr-16	19-Apr-16	15:00	17:00	2.0	1.4	2	0.17	2	0	12	2	1	12	14	14	84
	ER-AN-02	628214	5447728	22-Apr-16	22-Apr-16	10:50	11:15	0.42	2.1	2	0.03	0	0	0	0	0	0	0	0	0
	ER-AN-03	628175	5446621	25-Apr-16	25-Apr-16	11:15	12:10	0.92	2.1	2	0.08	0	0	0	0	0	0	0	0	0
	TOTAL							**2.4**	**-**	**4**	**0.20**	**2**	**0**	**9.9**	**2**	**1**	**9.9**	**14**	**14**	**70**
Gold Creek	GC-AN-01	630438	5437311	19-Apr-16	19-Apr-16	13:10	15:10	2.0	2.0 - 4.0	3	0.25	0	0	0	5	3	20	0	0	0
	GC-AN-02	629909	5437050	20-Apr-16	20-Apr-16	11:00	12:15	1.2	2.5	3	0.16	0	0	0	1	1	6.4	1	1	6.4
	GC-AN-03	629997	5436957	21-Apr-16	21-Apr-16	10:15	11:15	1.0	3.0	3	0.12	0	0	0	0	0	0	4	4	32
	GC-AN-04	629675	5437202	22-Apr-16	22-Apr-16	12:20	13:00	0.67	2.6	2	0.06	0	0	0	0	0	0	0	0	0
	GC-AN-05	630135	5436998	25-Apr-16	25-Apr-16	12:15	13:00	0.75	1.8	2	0.06	0	0	0	0	0	0	0	0	0
	GC-AN-06	630582	5437252	27-Apr-16	27-Apr-16	13:40	14:05	0.42	1.4	2	0.03	0	0	0	0	0	0	0	0	0
	GC-AN-07	630347	5436979	27-Apr-16	27-Apr-16	13:50	14:15	0.42	9.1	2	0.03	0	0	0	0	0	0	0	0	0
	GC-AN-08	629792	5436940	27-Apr-16	27-Apr-16	14:20	15:15	0.92	2.6	2	0.08	0	0	0	1	1	13	9	0	118
				27-Apr-16	27-Apr-16	15:45	16:10	0.42		2	0.03	0	0	0	0	0	0	14	0	403
	TOTAL							**7.8**	**-**	**21**	**0.83**	**0**	**0**	**0**	**7**	**5**	**8.4**	**28**	**5**	**34**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Burbot Trap

Table F.8: Burbot Trap Records for Fish Caught in Koocanusa Reservoir, February 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth (m)	Effort (fishing days)	Bull Trout			Burbot			Northern Pikeminnow			Peamouth Chub			Redside Shiner		
		Easting	Northing								Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]
Sand Creek	SC-TS-01	625496	5460224	27-Feb-15	28-Feb-15	13:50	12:02	23.20	5.8	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	12:02	16:15	28.26		1.18	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-02	625525	5460063	27-Feb-15	28-Feb-15	13:58	11:55	21.95	10.6	0.91	1	0	1.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	11:55	16:20	16.42		0.68	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-03	624214	5461070	27-Feb-15	28-Feb-15	14:20	11:15	20.92	7.0	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	11:15	16:45	29.50		1.23	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-04	624587	5460913	27-Feb-15	28-Feb-15	14:30	11:00	20.50	6.5	0.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	11:00	16:50	29.38		1.22	0	0	0.00	0	0	0.00	0	0	0.00	6	0	4.90	0	0	0.00
	SC-TS-05	625563	5460313	27-Feb-15	28-Feb-15	14:45	11:50	21.08	8.6	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	11:50	16:20	28.50		1.19	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-06	623320	5461268	27-Feb-15	28-Feb-15	14:02	10:00	20.68	6.8	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		624654	5460835	28-Feb-15	28-Feb-15	10:43	14:30	3.78		0.16	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		625576	5459960	28-Feb-15	1-Mar-15	14:30	14:05	23.58	12.5	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-07	623531	5461219	27-Feb-15	28-Feb-15	14:07	10:18	20.75	6.0	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		624832	5460760	28-Feb-15	28-Feb-15	10:52	14:30	3.37	6.1	0.14	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		625557	5459812	28-Feb-15	1-Mar-15	14:30	17:00	26.50	10.0	1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-08	624881	5460734	27-Feb-15	28-Feb-15	14:39	11:34	20.92	6.1	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	11:34	16:40	29.10		1.21	0	0	0.00	0	0	0.00	2	0	1.65	0	0	0.00	0	0	0.00
	SC-TS-09	625180	5460511	27-Feb-15	28-Feb-15	14:44	11:42	20.97	6.7	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	11:42	16:50	29.20		1.22	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-10	625355	5460439	27-Feb-15	28-Feb-15	14:56	11:46	20.83	7.1	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	11:46	16:25	28.48		1.19	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL							**487.9**	**-**	**20.3**	**1**	**0**	**0.05**	**0**	**0**	**0.00**	**2**	**0**	**0.10**	**6**	**0**	**0.30**	**0**	**0**	**0.00**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the burbot trap sets in one area.

Table F.8: Burbot Trap Records for Fish Caught in Koocanusa Reservoir, February 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth (m)	Effort (fishing days)	Bull Trout			Burbot			Northern Pikeminnow			Peamouth Chub			Redside Shiner		
		Easting	Northing								Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]
Elk River	ER-TS-01	628245	5448001	24-Feb-15	25-Feb-15	14:05	9:30	19.42	6.5	0.81	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.24	0	0	0.00
		627948	5447976	25-Feb-15	26-Feb-15	9:30	9:20	23.83	6.0	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:20	10:10	23.83		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-02	628143	5448014	24-Feb-15	25-Feb-15	14:30	9:35	19.08	8.5	0.80	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	26-Feb-15	9:35	9:05	23.50		0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.02
				26-Feb-15	27-Feb-15	9:05	9:35	24.50		1.02	0	0	0.00	1	0	0.98	0	0	0.00	0	0	0.00	0	0	0.00
				27-Feb-15	28-Feb-15	9:35	9:25	28.83		1.20	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	9:25	9:30	24.08		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-03	628086	5448023	24-Feb-15	25-Feb-15	14:45	9:35	18.83	9.9	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	26-Feb-15	9:35	9:10	23.67	7.5	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		628360	5447878	26-Feb-15	27-Feb-15	9:10	9:25	24.25		1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-04	628019	5448045	24-Feb-15	25-Feb-15	14:50	9:40	18.83	11.5	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	26-Feb-15	9:40	9:15	23.42		0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:15	10:05	24.83		1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-05	628128	5447850	24-Feb-15	25-Feb-15	15:05	9:45	18.67	7.9	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		628051	5447896	25-Feb-15	26-Feb-15	9:45	9:25	23.67	10.3	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:25	10:20	24.92		1.04	0	0	0.00	0	0	0.00	1	1	0.96	0	0	0.00	0	0	0.00
	ER-TS-06	628073	5447854	24-Feb-15	25-Feb-15	15:15	9:50	18.58	10.1	0.77	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.58
				25-Feb-15	26-Feb-15	9:50	9:30	23.67		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		628191	5447609	26-Feb-15	27-Feb-15	9:30	10:15	24.75	6.0	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-07	627980	5447838	24-Feb-15	25-Feb-15	15:35	9:55	18.33	12.8	0.76	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	26-Feb-15	9:55	9:35	11.67		0.49	0	0	0.00	0	0	0.00	0	0	0.00	1	0	2.06	0	0	0.00
				26-Feb-15	27-Feb-15	9:35	10:30	24.92		1.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-08	628013	5447754	24-Feb-15	25-Feb-15	15:40	10:00	18.33	11.6	0.76	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	26-Feb-15	10:00	9:40	24.67		1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:40	10:32	24.87		1.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-09	627986	5447704	24-Feb-15	25-Feb-15	16:00	10:05	18.08	7.6	0.75	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	26-Feb-15	10:05	9:45	23.67		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		628119	5447263	26-Feb-15	27-Feb-15	9:45	10:30	24.75	10.0	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-10	627634	5446839	24-Feb-15	25-Feb-15	14:23	9:55	19.53	10.1	0.81	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		627537	5447111	25-Feb-15	26-Feb-15	10:50	9:07	22.28	6.7	0.93	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.08	0	0	0.00
				26-Feb-15	27-Feb-15	9:07	9:29	24.37		1.02	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.98	1	0	0.98
	ER-TS-11	627650	5447055	24-Feb-15	25-Feb-15	14:52	10:11	19.32	9.0	0.81	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	25-Feb-15	10:11	11:00	0.82		0.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		627582	5447186	25-Feb-15	26-Feb-15	11:00	9:14	22.23	6.5	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:14	9:31	24.12		1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the burbot trap sets in one area.

Table F.8: Burbot Trap Records for Fish Caught in Koocanusa Reservoir, February 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth (m)	Effort (fishing days)	Bull Trout			Burbot			Northern Pikeminnow			Peamouth Chub			Redside Shiner		
		Easting	Northing								Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]	Catch	Mortalities / Sacrificed	CPUE [a]
Elk River	ER-TS-12	627770	5447055	24-Feb-15	25-Feb-15	14:57	10:19	19.37	9.9	0.81	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	25-Feb-15	10:19	11:05	0.76		0.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		627623	5447211	25-Feb-15	26-Feb-15	11:05	9:18	22.22		0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:18	9:56	24.63		1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-13	627842	5447297	24-Feb-15	25-Feb-15	15:19	10:24	19.08	9.2	0.80	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	25-Feb-15	10:24	11:13	0.82		0.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		627764	5447335	25-Feb-15	26-Feb-15	11:13	9:24	22.18	7.8	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:24	10:00	24.40		1.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-14	628049	5447339	24-Feb-15	25-Feb-15	15:31	10:20	18.82	11.2	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	25-Feb-15	10:20	11:26	1.10		0.05	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		627950	5447591	25-Feb-15	26-Feb-15	11:26	9:31	22.08	8.3	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:31	10:15	24.73		1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-15	627977	5447558	24-Feb-15	25-Feb-15	15:47	10:15	18.47	9.6	0.77	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				25-Feb-15	25-Feb-15	10:15	11:31	1.60		0.07	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
		627881	5447591	25-Feb-15	26-Feb-15	11:31	9:37	21.77	7.9	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Feb-15	27-Feb-15	9:37	10:19	24.70		1.03	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.97	0	0	0.00
	ER-TS-16	628185	5448034	27-Feb-15	28-Feb-15	11:05	9:10	22.08	8.2	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-17	628168	5447967	27-Feb-15	28-Feb-15	11:05	9:20	22.25	7.4	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	9:20	9:35	24.25		1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-18	628099	5448009	27-Feb-15	28-Feb-15	11:15	9:15	22.00	9.6	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	9:15	9:40	25.42		1.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-19	628103	5447969	27-Feb-15	28-Feb-15	11:23	9:05	21.73	9.1	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Feb-15	1-Mar-15	9:05	9:25	24.33		1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL							**1,206**	**-**	**50.2**	**0**	**0**	**0.00**	**1**	**0**	**0.02**	**1**	**1**	**0.02**	**5**	**0**	**0.10**	**4**	**0**	**0.08**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the burbot trap sets in one area.

Table F.9: Burbot Trap Records for Fish Caught in Koocanusa Reservoir, April 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth (m)	Effort (fishing days)	Bull Trout			Burbot			Kokanee			Largescale Sucker			Northern Pikeminnow			Peamouth Chub			Redside Shiner			Yellow Perch		
		Easting	Northing								Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
Sand Creek	SC-TS-01	625547	5460109	21-Apr-15	22-Apr-15	13:58	14:05	24.12	11.0	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-02	625534	5460259	21-Apr-15	22-Apr-15	14:03	13:58	23.92	10.0	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-03	625356	5460119	21-Apr-15	22-Apr-15	14:14	13:48	23.57	3.5	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.02	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-04	623509	5461906	21-Apr-15	22-Apr-15	14:30	11:40	21.17	1.7	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-05	625567	5459677	21-Apr-15	22-Apr-15	14:51	14:12	23.35	10.0	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-06	625480	5460604	22-Apr-15	23-Apr-15	11:50	10:35	22.75	4.0	0.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.05	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-07	625356	5460119	22-Apr-15	23-Apr-15	13:50	10:40	20.83	3.5	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.30	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-08	625423	5460460	22-Apr-15	23-Apr-15	14:00	10:43	20.72	8.4	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-09	625595	5459980	22-Apr-15	23-Apr-15	14:09	10:52	20.72	7.9	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-10	625444	5459481	22-Apr-15	23-Apr-15	14:18	11:05	20.78	7.1	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-11	625480	5460601	23-Apr-15	24-Apr-15	11:50	9:23	21.55	4.0	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-12	625356	5460119	23-Apr-15	25-Apr-15	10:41	9:15	46.57	8.4	1.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.52	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-13	625408	5460112	23-Apr-15	24-Apr-15	10:47	9:30	22.72	3.5	0.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	3	3.17	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-14	625587	5459676	23-Apr-15	24-Apr-15	11:00	9:00	22.00	8.6	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.09	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-15	625631	5459348	23-Apr-15	24-Apr-15	11:12	9:45	22.55	6.5	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-16	625621	5459678	24-Apr-15	26-Apr-15	9:05	12:22	51.28	-	2.14	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.47	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-17	625632	5460602	25-Apr-15	26-Apr-15	9:15	12:08	26.88	1.4	1.12	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.79	0	0	0.00	0	0	0.00	1	1	0.89	0	0	0.00
	SC-TS-18	625408	5460112	24-Apr-15	26-Apr-15	9:32	12:18	50.77	3.5	2.12	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	5	2	2.36	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-19	625408	5460072	24-Apr-15	26-Apr-15	9:40	12:15	50.58	3.6	2.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-20	625633	5459979	24-Apr-15	26-Apr-15	9:55	12:18	50.38	3.6	2.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-21	625632	5460602	26-Apr-15	27-Apr-15	12:08	11:00	22.87	1.4	0.95	0	0	0.00	1	0	1.05	0	0	0.00	0	0	0.00	3	3	3.15	3	3	3.15	0	0	0.00	0	0	0.00
	SC-TS-22	625408	5460112	26-Apr-15	27-Apr-15	12:13	11:11	22.97	3.5	0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-23	625408	5460072	26-Apr-15	27-Apr-15	12:15	11:17	23.03	3.6	0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-24	625633	5459979	26-Apr-15	27-Apr-15	12:18	11:22	23.07	3.6	0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	1	2.08	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-25	625621	5459678	26-Apr-15	27-Apr-15	12:22	11:29	23.12	2.1	0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-26	625624	5460600	27-Apr-15	28-Apr-15	11:06	9:43	22.62	1.7	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-27	625494	5460052	27-Apr-15	28-Apr-15	11:15	9:47	22.53	3.7	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-28	625487	5459992	27-Apr-15	28-Apr-15	11:20	9:52	22.53	3.6	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-29	625649	5459969	27-Apr-15	28-Apr-15	11:25	9:56	22.52	3.4	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.07	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-30	626355	5458286	27-Apr-15	28-Apr-15	12:10	10:07	21.95	2.9	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-31	625621	5459678	28-Apr-15	29-Apr-15	9:44	9:23	23.65	1.7	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	0	3.04	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-32	625501	5460017	28-Apr-15	29-Apr-15	9:49	9:39	23.83	4.0	0.99	0	0	0.00	1	0	1.01	0	0	0.00	0	0	0.00	1	0	1.01	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-33	625487	5459925	28-Apr-15	29-Apr-15	9:53	10:02	24.15	3.5	1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-34	625649	5459969	28-Apr-15	29-Apr-15	9:57	9:55	23.97	3.1	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-35	626298	5458238	28-Apr-15	29-Apr-15	10:10	10:20	24.17	1.6	1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-36	625628	5460608	29-Apr-15	30-Apr-15	9:35	9:20	23.75	1.8	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.02	2	2	2.02	0	0	0.00	1	1	1.01
	SC-TS-37	625480	5460041	29-Apr-15	30-Apr-15	9:52	9:30	23.63	4.0	0.98	0	0	0.00	0	0	0.00	1	0	1.02	0	0	0.00	1	0	1.02	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-38	625626	5459990	29-Apr-15	30-Apr-15	10:00	9:39	23.65	2.4	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-39	625514	5459938	29-Apr-15	30-Apr-15	10:05	9:43	23.63	-	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.02	0	0	0.00
	SC-TS-40	626218	5458182	29-Apr-15	30-Apr-15	10:20	9:52	23.53	2.5	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.02	0	0	0.00	0	0	0.00
	SC-TS-41	625628	5460608	30-Apr-15	1-May-15	9:22	9:10	23.80	1.7	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-42	625469	5460028	30-Apr-15	1-May-15	9:35	9:15	23.67	3.8	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-43	625495	5459961	30-Apr-15	1-May-15	9:41	9:17	23.60	3.7	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.03	0	0	0.00	0	0	0.00	1	1	1.02
	SC-TS-44	625514	5459959	30-Apr-15	1-May-15	9:44	9:20	23.60	5.5	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-TS-45	625218	5458182	30-Apr-15	1-May-15	9:53	9:44	23.85	2.5	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	4	0	4.03	2	0	2.01	0	0	0.00	0	0	0.00
	TOTAL							**1,170.88**	**-**	**48.79**	**0**	**0**	**0.00**	**2**	**0**	**0.04**	**1**	**0**	**0.02**	**2**	**0**	**0.04**	**34**	**14**	**0.70**	**8**	**6**	**0.16**	**2**	**2**	**0.04**	**2**	**2**	**0.04**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the burbot trap sets in one area.

Table F.9: Burbot Trap Records for Fish Caught in Koocanusa Reservoir, April 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth (m)	Effort (fishing days)	Bull Trout			Burbot			Kokanee			Largescale Sucker			Northern Pikeminnow			Peamouth Chub			Redside Shiner			Yellow Perch		
		Easting	Northing								Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
Elk River	ER-TS-01	628091	5448031	21-Apr-15	22-Apr-15	11:55	9:55	22.00	11.7	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	8	4	8.73	13	13	14.18	0	0	0.00	0	0	0.00
				22-Apr-15	23-Apr-15	9:35	9:20	23.75		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.02	3	3	3.03	0	0	0.00	0	0	0.00
				23-Apr-15	24-Apr-15	9:20	9:00	23.67		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	0	3.04	0	0	0.00	0	0	0.00	0	0	0.00
				24-Apr-15	26-Apr-15	9:00	9:15	48.25		2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	4	2	1.99	12	9	5.97	0	0	0.00	0	0	0.00
				26-Apr-15	27-Apr-15	9:15	9:15	24.00		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	1	2.00	5	5	5.00	0	0	0.00	0	0	0.00
				27-Apr-15	28-Apr-15	9:15	9:00	23.75		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.01	0	0	0.00
				28-Apr-15	29-Apr-15	9:00	9:00	24.00		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	9	2	9.00	3	1	3.00	0	0	0.00	0	0	0.00
				29-Apr-15	30-Apr-15	9:00	8:50	23.83		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.01	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	8:50	8:35	23.75		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.02	1	0	1.01	0	0	0.00	0	0	0.00
	ER-TS-2	627995	5447702	21-Apr-15	22-Apr-15	12:00	9:35	21.58	12.0	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-3	628657	5447489	21-Apr-15	22-Apr-15	12:16	10:05	21.82	6.5	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.10	0	0	0.00	0	0	0.00	0	0	0.00
				22-Apr-15	23-Apr-15	10:05	9:30	23.42		0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.02	3	3	3.07	0	0	0.00	0	0	0.00
				23-Apr-15	24-Apr-15	9:30	9:05	23.58		0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				24-Apr-15	25-Apr-15	9:05	9:31	24.43		1.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.98	0	0	0.00	0	0	0.00
				25-Apr-15	27-Apr-15	9:31	9:20	47.82		1.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	1	1.51	2	2	1.00	0	0	0.00	0	0	0.00
				27-Apr-15	28-Apr-15	9:20	9:13	23.88		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Apr-15	29-Apr-15	9:13	9:15	24.03		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	6	2	5.99	0	0	0.00	0	0	0.00	0	0	0.00
				29-Apr-15	30-Apr-15	9:15	9:00	23.75		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	9:00	8:50	23.83		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-4	629172	5447671	21-Apr-15	22-Apr-15	12:25	10:10	21.75	6.0	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-5	629390	5447553	21-Apr-15	22-Apr-15	13:30	10:15	20.75	4.0	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-6	628103	5448006	22-Apr-15	23-Apr-15	11:35	9:22	21.78	11.6	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				23-Apr-15	24-Apr-15	9:22	9:00	23.63		0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				24-Apr-15	26-Apr-15	9:00	9:10	48.17		2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.50	0	0	0.00	0	0	0.00	0	0	0.00
				26-Apr-15	27-Apr-15	9:10	9:00	23.83		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-7	628044	5447991	22-Apr-15	23-Apr-15	11:40	9:10	21.50	11.6	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				23-Apr-15	24-Apr-15	9:10	8:50	23.67		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-8	627967	5447868	22-Apr-15	23-Apr-15	11:50	9:05	21.25	11.2	0.89	1	0	1.13	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				23-Apr-15	24-Apr-15	9:05	8:45	23.67		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.03	0	0	0.00	0	0	0.00	0	0	0.00
				24-Apr-15	26-Apr-15	8:45	9:05	48.33		2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	3	1.49	0	0	0.00
				26-Apr-15	27-Apr-15	9:05	9:05	24.00		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.00	0	0	0.00	0	0	0.00
				27-Apr-15	28-Apr-15	9:05	8:50	23.75		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				28-Apr-15	29-Apr-15	8:50	8:51	24.02		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				29-Apr-15	30-Apr-15	8:51	8:45	23.90		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	8:45	8:35	23.83		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-9	627914	5447802	25-Apr-15	26-Apr-15	10:45	9:00	22.25	1.6	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				26-Apr-15	27-Apr-15	9:00	8:55	23.92		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-10	628157	5448080	27-Apr-15	28-Apr-15	10:45	9:05	22.33	7.9	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.07	0	0	0.00	0	0	0.00
				28-Apr-15	29-Apr-15	9:05	9:05	24.00		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				29-Apr-15	30-Apr-15	9:05	8:50	23.75		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	8:50	8:40	23.83		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-TS-11	628256	5447600	27-Apr-15	28-Apr-15	10:50	9:15	22.42	7.9	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.07	0	0	0.00	0	0	0.00	0	0	0.00
				28-Apr-15	29-Apr-15	9:15	9:10	23.92		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				29-Apr-15	30-Apr-15	9:10	8:55	23.75		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	8:55	8:50	23.92		1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL							**1,147.07**	**-**	**47.79**	**1**	**0**	**0.02**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**48**	**17**	**1.00**	**45**	**37**	**0.94**	**4**	**4**	**0.08**	**0**	**0**	**0.00**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the burbot trap sets in one area.

Table F.9: Burbot Trap Records for Fish Caught in Koocanusa Reservoir, April 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth (m)	Effort (fishing days)	Bull Trout			Burbot			Kokanee			Largescale Sucker			Northern Pikeminnow			Peamouth Chub			Redside Shiner			Yellow Perch		
		Easting	Northing								Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
Gold Creek	GC-TS-01	630547	5437203	21-Apr-15	22-Apr-15	13:20	8:00	18.67	13.0	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				22-Apr-15	23-Apr-15	8:00	8:40	24.67		1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-02	630428	5437026	21-Apr-15	22-Apr-15	13:25	8:05	18.67	12.0	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-03	630112	5437359	21-Apr-15	22-Apr-15	13:30	8:15	18.75	11.0	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-04	629677	5436738	21-Apr-15	22-Apr-15	13:35	8:20	18.75	6.0	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-05	629950	5436858	21-Apr-15	22-Apr-15	13:40	8:30	18.83	8.0	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.27	1	1	1.27	0	0	0.00
				22-Apr-15	23-Apr-15	8:35	9:20	24.75		1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				24-Apr-15	26-Apr-15	9:55	10:00	48.08		2.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.50
				26-Apr-15	27-Apr-15	10:00	9:50	23.83		0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.01
				27-Apr-15	29-Apr-15	9:55	9:45	47.83		1.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-06	630129	5437143	22-Apr-15	23-Apr-15	8:10	8:55	24.75	10.0	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.97	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-07	630077	5437468	22-Apr-15	23-Apr-15	8:17	9:05	24.80	4.0	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-08	629779	5437137	22-Apr-15	23-Apr-15	8:25	9:15	24.83	6.5	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-09	629842	5437399	23-Apr-15	24-Apr-15	8:50	10:15	25.42	3.5	1.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.94	0	0	0.00	0	0	0.00
				24-Apr-15	26-Apr-15	10:15	9:55	47.67	4.0	1.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-10	629553	5436652	23-Apr-15	24-Apr-15	8:55	9:50	24.92	4.1	1.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-11	629527	5437373	23-Apr-15	24-Apr-15	9:10	10:05	24.92	4.7	1.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	5	5	4.82	5	5	4.82	0	0	0.00	0	0	0.00
				24-Apr-15	25-Apr-15	10:10	9:45	23.58		0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-12	629326	5436845	23-Apr-15	24-Apr-15	9:45	9:20	24.42	1.4	1.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	6	6	5.90	6	6	5.90	0	0	0.00	0	0	0.00
				24-Apr-15	26-Apr-15	9:45	9:30	47.75		1.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.50	0	0	0.00	0	0	0.00
	GC-TS-13	629514	5436620	24-Apr-15	26-Apr-15	9:50	10:05	48.25	4.0	2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-14	629264	5436804	26-Apr-15	27-Apr-15	9:40	9:20	23.67	21.0	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				27-Apr-15	29-Apr-15	9:20	9:50	48.50		2.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-15	629410	5437267	26-Apr-15	27-Apr-15	9:50	9:25	23.58	3.0	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				27-Apr-15	29-Apr-15	9:25	9:30	48.08		2.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-16	629666	5437055	26-Apr-15	27-Apr-15	10:00	9:30	23.50	6.0	0.98	0	0	0.00	1	0	1.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				27-Apr-15	29-Apr-15	9:35	9:40	48.08		2.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-17	629554	5436597	26-Apr-15	27-Apr-15	10:05	9:55	23.83	3.0	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	12	6	12.08	3	1	3.02	0	0	0.00	0	0	0.00
				27-Apr-15	29-Apr-15	10:00	10:00	48.00		2.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-18	629791	5437209	29-Apr-15	30-Apr-15	9:35	9:45	24.17	7.0	1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	4	1	3.97	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	9:45	9:05	23.33		0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-19	629690	5437033	29-Apr-15	30-Apr-15	9:40	9:50	24.17	6.6	1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	9:50	9:10	23.33		0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-20	629646	5436845	29-Apr-15	30-Apr-15	9:50	9:55	24.08	5.1	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	9:55	9:15	23.33		0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-21	629270	5436820	29-Apr-15	30-Apr-15	9:55	9:35	23.67	1.4	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	4	4	4.06
				30-Apr-15	1-May-15	9:35	8:55	23.33		0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-TS-22	629422	5436610	29-Apr-15	30-Apr-15	10:00	10:05	24.08	3.0	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				30-Apr-15	1-May-15	10:05	9:20	23.25		0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.03
	TOTAL							**1,128.13**	**-**	**47.01**	**0**	**0**	**0.00**	**1**	**0**	**0.02**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**30**	**18**	**0.64**	**17**	**14**	**0.36**	**1**	**1**	**0.02**	**7**	**7**	**0.15**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the burbot trap sets in one area.

Gill Net

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Bull Trout									Kokanee				
													Catch							Mortalities/ Sacrificed	CPUE [a]	Catch			Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"	5"			1"	1.5"	2"		
Sand Creek	SC-GN-01	625783	5458145	60.96	19-Apr-16	19-Apr-16	11:45	15:00	3.2	1.98	0.5	1.5	-	-	0	-	-	-	-	0	0	-	-	0	0	0
	SC-GN-02	625372	5457031	22.86	19-Apr-16	19-Apr-16	12:35	15:10	2.6	0.59	1.0	1.0	1	-	-	-	-	-	-	0	1.7	0	-	-	0	0
	SC-GN-03	625531	5460425	45.72	19-Apr-16	19-Apr-16	14:00	15:55	1.9	0.88	0.5	1.5	-	-	-	-	0	1	0	0	1.1	-	-	-	-	-
	SC-GN-04	625685	5457327	30.48	22-Apr-16	22-Apr-16	9:55	11:45	1.8	0.56	1.0	1.5	0	-	-	-	-	-	-	0	0	0	-	-	0	0
				30.48	22-Apr-16	22-Apr-16	12:10	14:39	2.5	0.76			0	-	-	-	-	-	-	0	0	-	-	-	-	-
	SC-GN-05	625751	5457345	30.48	22-Apr-16	22-Apr-16	11:15	13:28	2.2	0.68	0.3	0.8	0	-	-	-	-	-	-	0	0	0	-	-	0	0
				30.48	22-Apr-16	22-Apr-16	13:45	14:54	1.2	0.35	0.5	0.8	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	SC-GN-06	625028	5459161	30.48	22-Apr-16	22-Apr-16	11:45	13:58	2.2	0.68	1.0	1.2	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	SC-GN-07	625660	5457294	60.96	23-Apr-16	23-Apr-16	8:51	10:41	1.8	1.12	1.0	1.5	-	-	0	-	-	-	-	0	0	-	-	1	0	0.89
				60.96	23-Apr-16	23-Apr-16	11:22	13:33	2.2	1.33			-	-	0	-	-	-	-	0	0	-	-	0	0	0
	SC-GN-08	625654	5457314	30.48	23-Apr-16	23-Apr-16	8:57	11:17	2.3	0.71	1.0	1.2	0	-	-	-	-	-	-	0	0	0	-	-	0	0
				30.48	23-Apr-16	23-Apr-16	11:34	14:21	2.8	0.85			0	-	-	-	-	-	-	0	0	0	-	-	0	0
	SC-GN-09	625758	5457348	30.48	23-Apr-16	23-Apr-16	9:11	11:40	2.5	0.76	0.5	1.0	1	-	-	-	-	-	-	0	1.3	0	-	-	0	0
				30.48	23-Apr-16	23-Apr-16	11:51	14:28	2.6	0.80			0	-	-	-	-	-	-	0	0	0	-	-	0	0
	SC-GN-10	625739	5457355	30.48	24-Apr-16	24-Apr-16	8:58	11:36	2.6	0.80	1.0	1.5	1	-	-	-	-	-	-	0	1.2	0	-	-	0	0
	SC-GN-11	625681	5457360	30.48	24-Apr-16	24-Apr-16	9:05	11:57	2.9	0.87	1.0	1.5	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	SC-GN-12	625660	5457309	45.72	24-Apr-16	24-Apr-16	9:57	11:20	1.4	0.63	1.0	2.0	-	-	-	-	0	0	1	0	1.6	-	-	-	-	-
				45.72	24-Apr-16	24-Apr-16	11:25	12:10	0.75	0.34			-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	24-Apr-16	24-Apr-16	12:15	13:26	1.2	0.54			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	SC-GN-13	625674	5457326	22.86	24-Apr-16	24-Apr-16	10:02	11:26	1.4	0.32	1.0	1.5	-	0	-	-	-	-	-	0	0	-	0	-	0	0
	SC-GN-14	625681	5457360	30.48	24-Apr-16	24-Apr-16	12:05	14:46	2.7	0.82	1.0	2.0	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	SC-GN-15	625794	5458453	30.48	24-Apr-16	24-Apr-16	13:09	15:25	2.3	0.69	1.0	1.7	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	SC-GN-16	625114	5457743	45.72	24-Apr-16	24-Apr-16	13:43	15:44	2.0	0.92	1.2	1.8	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	SC-GN-17	625827	5458455	45.72	25-Apr-16	25-Apr-16	9:18	10:08	0.83	0.38	0.8	2.9	-	-	-	-	1	0	0	0	2.6	-	-	-	-	-
				45.72	25-Apr-16	25-Apr-16	10:13	11:18	1.1	0.50			-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	25-Apr-16	25-Apr-16	11:23	12:42	1.3	0.60			-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	25-Apr-16	25-Apr-16	12:47	13:58	1.2	0.54			-	-	-	-	1	0	0	0	1.8	-	-	-	-	-
	SC-GN-18	625728	5458540	45.72	25-Apr-16	25-Apr-16	9:44	11:06	1.4	0.62	1.0	2.4	-	-	-	-	0	0	1	0	1.6	-	-	-	-	-
				45.72	25-Apr-16	25-Apr-16	11:11	12:32	1.4	0.62			-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	25-Apr-16	25-Apr-16	12:35	12:57	0.37	0.17			-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	25-Apr-16	25-Apr-16	13:02	13:50	0.80	0.37			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	SC-GN-19	625622	5458456	60.96	26-Apr-16	26-Apr-16	12:05	12:44	0.65	0.40	1.0	2.3	-	-	0	-	-	-	-	0	0	-	-	0	0	0
	SC-GN-20	625725	5458539	22.86	26-Apr-16	26-Apr-16	12:10	13:06	0.93	0.21	0.0	2.8	-	0	-	-	-	-	-	0	0	-	0	-	0	0
	SC-GN-21	625802	5458384	60.96	26-Apr-16	26-Apr-16	13:07	13:42	0.58	0.36	2.2	3.0	-	-	0	-	-	-	-	0	0	-	-	0	0	0
	TOTAL								**60**	**22.73**	**-**	**-**	**3**	**0**	**0**	**0**	**2**	**1**	**2**	**0**	**0.38**	**0**	**0**	**1**	**0**	**0.045**
Elk River	ER-GN-01	628295	5447959	45.72	19-Apr-16	19-Apr-16	11:20	14:30	3.2	1.45	1.5	1.6	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-02	628238	5447790	45.72	19-Apr-16	19-Apr-16	11:30	14:40	3.2	1.45	1.6	1.8	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72			14:40	17:15	2.6	1.18			-	-	-	-	0	1	0	1	0.85	-	-	-	-	-
	ER-GN-03	628016	5447693	30.48	19-Apr-16	19-Apr-16	11:45	14:55	3.2	0.97	4.8	10.2	-	-	-	0	-	-	-	0	0	-	-	-	-	-
	ER-GN-04	627973	5447966	30.48	19-Apr-16	19-Apr-16	11:55	15:15	3.3	1.02	4.5	3.2	0	-	-	-	-	-	-	0	0	0	-	-	-	0
	ER-GN-05	628112	5447595	30.48	19-Apr-16	19-Apr-16	12:10	15:20	3.2	0.97	1.8	4.8	0	-	-	-	-	-	-	0	0	0	-	-	-	0
	ER-GN-06	627974	5447832	30.48	19-Apr-16	19-Apr-16	15:15	16:25	1.2	0.36	3.3	6.8	-	-	-	1	-	-	-	0	2.8	-	-	-	-	-
	ER-GN-07	628142	5447702	45.72	20-Apr-16	20-Apr-16	9:05	12:00	2.9	1.33	2.0	2.1	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-08	628077	5447436	30.48	20-Apr-16	20-Apr-16	9:15	12:15	3.0	0.91	4.6	6.7	0	-	-	-	-	-	-	0	0	0	-	-	-	0
	ER-GN-09	628104	5447315	30.48	20-Apr-16	20-Apr-16	9:25	12:25	3.0	0.91	3.2	6.2	-	-	-	0	-	-	-	0	0	-	-	-	-	-
	ER-GN-10	627865	5447460	30.48	20-Apr-16	20-Apr-16	9:45	12:40	2.9	0.89	1.9	3.7	0	-	-	-	-	-	-	0	0	0	-	-	-	0
	ER-GN-11	627988	5447682	45.72	20-Apr-16	20-Apr-16	9:50	13:00	3.2	1.45	2.8	7.2	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-12	627957	5447866	45.72	21-Apr-16	21-Apr-16	9:00	11:35	2.6	1.18	4.5	4.3	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-13	627836	5447470	30.48	21-Apr-16	21-Apr-16	9:15	11:45	2.5	0.76	1.4	2.0	0	-	-	-	-	-	-	0	0	0	-	-	-	0
	ER-GN-14	627514	5447123	30.48	21-Apr-16	21-Apr-16	9:20	12:00	2.7	0.81	1.8	2.1	0	-	-	-	-	-	-	0	0	0	-	-	-	0
	ER-GN-15	628503	5447217	30.48	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.81	1.1	2.0	-	-	-	2	-	-	-	1	2.5	-	-	-	-	-
	ER-GN-16	627730	5447290	45.72	21-Apr-16	21-Apr-16	9:45	12:45	3.0	1.37	2.1	1.9	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-17	627874	5447466	45.72	22-Apr-16	22-Apr-16	8:55	11:15	2.3	1.07	1.6	4.2	-	-	-	-	0	1	0	1	0.94	-	-	-	-	-
	ER-GN-18	628238	5446900	60.96	22-Apr-16	22-Apr-16	9:10	11:30	2.3	1.42	0.8	2.1	-	-	2	-	-	-	-	0	1.4	-	-	4	4	2.8

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Bull Trout									Kokanee				
													Catch							Mortalities/ Sacrificed	CPUE [a]	Catch			Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"	5"			1"	1.5"	2"		
Elk River	ER-GN-19	628012	5446581	45.72	22-Apr-16	22-Apr-16	9:20	12:30	3.2	1.45	1.4	5.8	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-20	628321	5446690	30.48	22-Apr-16	22-Apr-16	9:20	12:45	3.4	1.04	1.8	3.0	-	-	-	0	-	-	-	0	0	-	-	-	-	-
	ER-GN-21	628145	5447522	45.72	23-Apr-16	23-Apr-16	9:00	11:05	2.1	0.95	1.2	2.1	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-22	627842	5447463	30.48	23-Apr-16	23-Apr-16	9:10	11:20	2.2	0.66	1.9	3.9	-	-	-	0	-	-	-	0	0	-	-	-	-	-
	ER-GN-23	628186	5446813	45.72	23-Apr-16	23-Apr-16	9:20	11:45	2.4	1.10	1.4	3.9	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-24	628485	5447166	45.72	24-Apr-16	24-Apr-16	9:10	11:00	1.8	0.84	2.0	2.4	-	-	-	-	0	1	1	1	2.4	-	-	-	-	-
	ER-GN-25	628146	5446559	45.72	24-Apr-16	24-Apr-16	9:15	10:20	1.1	0.50	0.8	4.1	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	ER-GN-26	627836	5447486	30.48	25-Apr-16	25-Apr-16	12:30	13:10	0.67	0.20	1.5	2.9	1	-	-	-	-	-	-	0	4.9	0	-	-	0.0	0
	ER-GN-27	628450	5447156	22.86	25-Apr-16	25-Apr-16	12:45	13:50	1.1	0.25	1.1	3.4	-	1	-	-	-	-	-	0	4.0	-	0	-	0	0
	ER-GN-28	628595	5447346	22.86	26-Apr-16	26-Apr-16	9:10	9:50	0.67	0.15	2.3	2.3	-	2	-	-	-	-	-	0	13	-	0	-	0	0
	TOTAL								**71**	**27.45**	**-**	**-**	**1**	**3**	**2**	**3**	**0**	**3**	**1**	**4**	**1.1**	**0**	**0**	**4**	**4**	**0.28**
Gold Creek	GC-GN-01	630004	5437333	45.72	19-Apr-16	19-Apr-16	10:45	13:00	2.3	1.03	3.2	3.1	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	19-Apr-16	19-Apr-16	13:05	15:25	2.3	1.07			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-02	630484	5437202	45.72	19-Apr-16	19-Apr-16	11:10	15:10	4.0	1.83	6.2	6.3	-	-	-	-	0	0	0	0	0	-	-	-	0	0
	GC-GN-03	629920	5437070	22.86	19-Apr-16	19-Apr-16	11:25	15:40	4.3	0.97	2.0	2.1	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-04	629943	5437079	22.86	19-Apr-16	19-Apr-16	11:40	15:45	4.1	0.93	2.3	2.5	-	0	-	-	-	-	-	0	0	-	0	-	0	0
	GC-GN-05	629909	5437049	45.72	20-Apr-16	20-Apr-16	9:50	11:50	2.0	0.91	2.3	2.7	-	-	-	-	1	0	1	1	2.2	-	-	-	-	-
				45.72	20-Apr-16	20-Apr-16	12:15	14:10	1.9	0.88			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-06	630147	5436926	45.72	20-Apr-16	20-Apr-16	9:55	13:00	3.1	1.41	4.1	4.3	-	-	-	-	0	1	0	1	0.71	-	-	-	-	-
				45.72	21-Apr-16	21-Apr-16	11:45	13:40	1.9	0.88			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-07	630468	5437262	22.86	20-Apr-16	20-Apr-16	10:00	13:40	3.7	0.84	2.5	6.5	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-08	630499	5437243	22.86	20-Apr-16	20-Apr-16	10:05	14:00	3.9	0.90	2.5	6.5	-	1	-	-	-	-	-	1	1.1	-	0	-	0	0
	GC-GN-09	630028	5437022	45.72	21-Apr-16	21-Apr-16	9:20	11:20	2.0	0.91	2.9	3.5	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-10	630258	5436950	45.72	21-Apr-16	21-Apr-16	9:25	11:50	2.4	1.10	3.5	6.0	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	21-Apr-16	21-Apr-16	12:00	13:45	1.7	0.80			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-11	630520	5437231	22.86	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.61	5.0	6.5	0	-	-	-	-	-	-	0	0	0	-	-	0	0
				22.86	21-Apr-16	21-Apr-16	12:15	13:55	1.7	0.38			0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-12	630463	5437277	22.86	21-Apr-16	21-Apr-16	9:35	12:20	2.8	0.63	5.5	6.3	-	0	-	-	-	-	-	0	0	-	0	-	0	0
				22.86	21-Apr-16	21-Apr-16	12:25	14:05	1.7	0.38			-	0	-	-	-	-	-	0	0	-	0	-	0	0
	GC-GN-13	629984	5437073	45.72	22-Apr-16	22-Apr-16	9:20	10:30	1.2	0.53	2.7	3.3	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	22-Apr-16	22-Apr-16	10:35	12:00	1.4	0.65			-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	22-Apr-16	22-Apr-16	12:05	13:15	1.2	0.53			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-14	630009	5437026	45.72	22-Apr-16	22-Apr-16	9:25	10:35	1.2	0.53	2.8	3.5	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-15	630069	5437092	45.72	22-Apr-16	22-Apr-16	10:40	12:15	1.6	0.72	4.0	3.0	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-16	630149	5436978	45.72	22-Apr-16	22-Apr-16	12:20	13:30	1.2	0.53	4.0	4.9	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-17	630486	5437262	22.86	22-Apr-16	22-Apr-16	9:30	11:00	1.5	0.34	4.0	6.7	-	0	-	-	-	-	-	0	0	-	0	-	0	0
				22.86	22-Apr-16	22-Apr-16	11:10	13:10	2.0	0.46			-	0	-	-	-	-	-	0	0	-	0	-	0	0
	GC-GN-18	630460	5437287	22.86	22-Apr-16	22-Apr-16	9:40	11:40	2.0	0.46	4.0	6.5	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-19	630665	5436958	45.72	23-Apr-16	23-Apr-16	9:30	11:30	2.0	0.91	4.0	8.5	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-20	630541	5437190	45.72	23-Apr-16	23-Apr-16	11:50	14:00	2.2	0.99	4.0	8.0	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-21	630656	5437117	22.86	23-Apr-16	23-Apr-16	9:40	11:45	2.1	0.48	3.0	7.5	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-22	630161	5436918	22.86	23-Apr-16	23-Apr-16	9:45	12:00	2.3	0.51	1.5	5.0	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-23	629888	5437089	45.72	23-Apr-16	23-Apr-16	10:10	12:30	2.3	1.07	3.5	1.8	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	23-Apr-16	23-Apr-16	12:35	14:35	2.0	0.91			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-24	630257	5437394	22.86	23-Apr-16	23-Apr-16	10:25	13:00	2.6	0.59	2.0	6.2	-	0	-	-	-	-	-	0	0	-	0	-	0	0
	GC-GN-25	630144	5436893	22.86	23-Apr-16	23-Apr-16	12:10	14:05	1.9	0.44	1.2	2.5	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-26	629827	5437340	22.86	23-Apr-16	23-Apr-16	12:15	14:25	2.2	0.50	2.0	2.4	0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-27	630144	5436881	22.86	24-Apr-16	24-Apr-16	9:30	11:45	2.3	0.51	1.3	2.3	0	-	-	-	-	-	-	0	0	0	-	-	0	0
				22.86	24-Apr-16	24-Apr-16	11:50	13:30	1.7	0.38			0	-	-	-	-	-	-	0	0	0	-	-	0	0
	GC-GN-28	629902	5437132	45.72	24-Apr-16	24-Apr-16	9:20	11:10	1.8	0.84	3.4	2.0	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	24-Apr-16	24-Apr-16	11:15	13:10	1.9	0.88			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-29	630036	5437104	45.72	24-Apr-16	24-Apr-16	9:25	11:00	1.6	0.72	4.0	3.5	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	24-Apr-16	24-Apr-16	11:05	13:20	2.3	1.03			-	-	-	-	0	0	0	0	0	-	-	-	-	-

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Bull Trout									Kokanee				
													Catch							Mortalities/ Sacrificed	CPUE [a]	Catch			Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"	5"			1"	1.5"	2"		
Gold Creek	GC-GN-30	630110	5436878	22.86	24-Apr-16	24-Apr-16	9:35	11:15	1.7	0.38	1.8	2.3	0	-	-	-	-	-	-	0	0	0	-	-	0	0
				22.86	24-Apr-16	24-Apr-16	11:20	13:50	2.5	0.57			1	-	-	-	-	-	-	1	1.7	0	-	-	0	0
	GC-GN-31	630298	5437358	22.86	24-Apr-16	24-Apr-16	9:40	12:00	2.3	0.53	2.5	6.3	-	-	-	0	-	-	-	0	0	-	-	-	-	-
	GC-GN-32	629824	5437340	22.86	24-Apr-16	24-Apr-16	12:15	14:15	2.0	0.46	2.0	2.5	-	-	-	2	-	-	-	2	4.4	-	-	-	-	-
	GC-GN-33	629829	5437312	22.86	25-Apr-16	25-Apr-16	9:35	10:45	1.2	0.27	2.5	3.0	-	-	-	0	-	-	-	0	0	-	-	-	-	-
				22.86	25-Apr-16	25-Apr-16	10:55	12:05	1.2	0.27			-	-	-	0	-	-	-	0	0	-	-	-	-	-
				22.86	25-Apr-16	25-Apr-16	12:10	13:20	1.2	0.27			-	-	-	0	-	-	-	0	0	-	-	-	-	-
	GC-GN-34	630014	5437330	60.96	25-Apr-16	25-Apr-16	9:40	10:40	1.0	0.61	4.0	4.6	-	-	0	-	-	-	-	0	0	-	-	0	0	0
				60.96	25-Apr-16	25-Apr-16	10:55	11:50	0.92	0.56			-	-	0	-	-	-	-	0	0	-	-	0	0	0
				60.96	25-Apr-16	25-Apr-16	11:55	13:00	1.1	0.66			-	-	0	-	-	-	-	0	0	-	-	0	0	0
	GC-GN-35	629824	5437090	45.72	25-Apr-16	25-Apr-16	9:45	11:05	1.3	0.61	2.0	3.0	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	25-Apr-16	25-Apr-16	11:10	13:05	1.9	0.88			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-36	629826	5436965	45.72	25-Apr-16	25-Apr-16	9:50	11:15	1.4	0.65	3.5	2.5	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	25-Apr-16	25-Apr-16	11:20	13:15	1.9	0.88			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-37	629814	5437364	22.86	26-Apr-16	26-Apr-16	9:30	10:40	1.2	0.27	3.6	3.3	-	-	-	0	-	-	-	0	0	-	-	-	-	-
				22.86	26-Apr-16	26-Apr-16	10:45	12:30	1.8	0.40			-	-	-	0	-	-	-	0	0	-	-	-	-	-
				22.86	26-Apr-16	26-Apr-16	12:35	14:10	1.6	0.36			-	-	-	0	-	-	-	0	0	-	-	-	-	-
	GC-GN-38	629874	5436986	45.72	26-Apr-16	26-Apr-16	9:40	12:15	2.6	1.18	3.0	3.8	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-39	629964	5436935	45.72	26-Apr-16	26-Apr-16	12:20	14:05	1.7	0.80	3.0	4.0	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-40	630108	5436880	45.72	26-Apr-16	26-Apr-16	9:45	12:00	2.3	1.03	2.7	5.6	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	26-Apr-16	26-Apr-16	12:05	14:00	1.9	0.88			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-41	629906	5437398	22.86	27-Apr-16	27-Apr-16	9:25	10:15	0.83	0.19	3.7	4.8	-	-	-	0	-	-	-	0	0	-	-	-	-	-
	GC-GN-42	629438	5437371	22.86	27-Apr-16	27-Apr-16	10:30	12:15	1.7	0.40	2.0	4.2	-	-	-	0	-	-	-	0	0	-	-	-	-	-
	GC-GN-43	629813	5437215	22.86	27-Apr-16	27-Apr-16	12:20	13:30	1.2	0.27	2.3	2.4	-	-	-	0	-	-	-	0	0	-	-	-	-	-
				22.86	27-Apr-16	27-Apr-16	13:35	14:45	1.2	0.27			-	-	-	0	-	-	-	0	0	-	-	-	-	-
	GC-GN-44	629950	5437225	45.72	27-Apr-16	27-Apr-16	9:30	10:30	1.0	0.46	3.8	3.2	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-45	629910	5437404	45.72	27-Apr-16	27-Apr-16	10:55	12:30	1.6	0.72	2.8	5.4	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	27-Apr-16	27-Apr-16	12:40	14:20	1.7	0.76			-	-	-	-	0	1	0	1	1.3	-	-	-	-	-
	GC-GN-46	630143	5436876	45.72	27-Apr-16	27-Apr-16	9:35	11:00	1.4	0.65	3.7	6.6	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-47	630050	5436990	45.72	27-Apr-16	27-Apr-16	11:05	13:15	2.2	0.99	5.9	5.3	-	-	-	-	0	0	0	0	0	-	-	-	-	-
				45.72	27-Apr-16	27-Apr-16	13:20	14:35	1.3	0.57			-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-48	630698	5437142	45.72	27-Apr-16	27-Apr-16	13:45	15:20	1.6	0.72	1.4	2.0	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	GC-GN-49	630126	5437420	45.72	27-Apr-16	27-Apr-16	14:05	15:45	1.7	0.76	1.2	6.6	-	-	-	-	0	0	0	0	0	-	-	-	-	-
	TOTAL								**144**	**51.24**	**-**	**-**	**1**	**1**	**0**	**2**	**1**	**2**	**1**	**7**	**0.15**	**0**	**0**	**0**	**0**	**0**

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Largescale Sucker									Mountain Whitefish				
													Catch							Mortalities/ Sacrificed	CPUE [a]	Catch			Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"	5"			2"	2.5"	3"		
Sand Creek	SC-GN-01	625783	5458145	60.96	19-Apr-16	19-Apr-16	11:45	15:00	3.2	1.98	0.5	1.5	-	-	1	-	-	-	-	1	0.50	0	-	-	0	0
	SC-GN-02	625372	5457031	22.86	19-Apr-16	19-Apr-16	12:35	15:10	2.6	0.59	1.0	1.0	1	-	-	-	-	-	-	0	1.7	-	-	-	-	-
	SC-GN-03	625531	5460425	45.72	19-Apr-16	19-Apr-16	14:00	15:55	1.9	0.88	0.5	1.5	-	-	-	-	1	2	0	3	3.4	-	-	0	0	0
	SC-GN-04	625685	5457327	30.48	22-Apr-16	22-Apr-16	9:55	11:45	1.8	0.56	1.0	1.5	2	-	-	-	-	-	-	0	3.6	-	-	-	-	-
				30.48	22-Apr-16	22-Apr-16	12:10	14:39	2.5	0.76			1	-	-	-	-	-	-	0	1.3	-	-	-	-	-
	SC-GN-05	625751	5457345	30.48	22-Apr-16	22-Apr-16	11:15	13:28	2.2	0.68	0.3	0.8	11	-	-	-	-	-	-	0	16	-	-	-	-	-
				30.48	22-Apr-16	22-Apr-16	13:45	14:54	1.2	0.35	0.5	0.8	2	-	-	-	-	-	-	0	5.7	-	-	-	-	-
	SC-GN-06	625028	5459161	30.48	22-Apr-16	22-Apr-16	11:45	13:58	2.2	0.68	1.0	1.2	2	-	-	-	-	-	-	1	3.0	-	-	-	-	-
	SC-GN-07	625660	5457294	60.96	23-Apr-16	23-Apr-16	8:51	10:41	1.8	1.12	1.0	1.5	-	-	3	-	-	-	-	0	2.7	0	-	-	0	0
				60.96	23-Apr-16	23-Apr-16	11:22	13:33	2.2	1.33			-	-	5	-	-	-	-	0	3.8	0	-	-	0	0
	SC-GN-08	625654	5457314	30.48	23-Apr-16	23-Apr-16	8:57	11:17	2.3	0.71	1.0	1.2	1	-	-	-	-	-	-	0	1.4	-	-	-	-	-
				30.48	23-Apr-16	23-Apr-16	11:34	14:21	2.8	0.85			1	-	-	-	-	-	-	0	1.2	-	-	-	-	-
	SC-GN-09	625758	5457348	30.48	23-Apr-16	23-Apr-16	9:11	11:40	2.5	0.76	0.5	1.0	3	-	-	-	-	-	-	0	4.0	-	-	-	-	-
				30.48	23-Apr-16	23-Apr-16	11:51	14:28	2.6	0.80			3	-	-	-	-	-	-	0	3.8	-	-	-	-	-
	SC-GN-10	625739	5457355	30.48	24-Apr-16	24-Apr-16	8:58	11:36	2.6	0.80	1.0	1.5	2	-	-	-	-	-	-	0	2.5	-	-	-	-	-
	SC-GN-11	625681	5457360	30.48	24-Apr-16	24-Apr-16	9:05	11:57	2.9	0.87	1.0	1.5	3	-	-	-	-	-	-	0	3.4	-	-	-	-	-
	SC-GN-12	625660	5457309	45.72	24-Apr-16	24-Apr-16	9:57	11:20	1.4	0.63	1.0	2.0	-	-	-	-	0	0	0	0	0	-	-	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:25	12:10	0.75	0.34			-	-	-	-	0	0	0	0	0	-	-	0	0	0
				45.72	24-Apr-16	24-Apr-16	12:15	13:26	1.2	0.54			-	-	-	-	1	0	0	0	1.8	-	-	0	0	0
	SC-GN-13	625674	5457326	22.86	24-Apr-16	24-Apr-16	10:02	11:26	1.4	0.32	1.0	1.5	-	1	-	-	-	-	-	0	3.1	-	-	-	-	-
	SC-GN-14	625681	5457360	30.48	24-Apr-16	24-Apr-16	12:05	14:46	2.7	0.82	1.0	2.0	3	-	-	-	-	-	-	0	3.7	-	-	-	-	-
	SC-GN-15	625794	5458453	30.48	24-Apr-16	24-Apr-16	13:09	15:25	2.3	0.69	1.0	1.7	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	SC-GN-16	625114	5457743	45.72	24-Apr-16	24-Apr-16	13:43	15:44	2.0	0.92	1.2	1.8	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	SC-GN-17	625827	5458455	45.72	25-Apr-16	25-Apr-16	9:18	10:08	0.83	0.38	0.8	2.9	-	-	-	-	0	0	0	0	0	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	10:13	11:18	1.1	0.50			-	-	-	-	0	0	0	0	0	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:23	12:42	1.3	0.60			-	-	-	-	0	0	0	0	0	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	12:47	13:58	1.2	0.54			-	-	-	-	0	0	0	0	0	-	-	0	0	0
	SC-GN-18	625728	5458540	45.72	25-Apr-16	25-Apr-16	9:44	11:06	1.4	0.62	1.0	2.4	-	-	-	-	1	0	0	0	1.6	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:11	12:32	1.4	0.62			-	-	-	-	0	1	0	0	1.6	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	12:35	12:57	0.37	0.17			-	-	-	-	0	0	0	0	0	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	13:02	13:50	0.80	0.37			-	-	-	-	0	0	0	0	0	-	-	0	0	0
	SC-GN-19	625622	5458456	60.96	26-Apr-16	26-Apr-16	12:05	12:44	0.65	0.40	1.0	2.3	-	-	1	-	-	-	-	0	2.5	0	-	-	0	0
	SC-GN-20	625725	5458539	22.86	26-Apr-16	26-Apr-16	12:10	13:06	0.93	0.21	0.0	2.8	-	1	-	-	-	-	-	0	4.7	-	-	-	-	-
	SC-GN-21	625802	5458384	60.96	26-Apr-16	26-Apr-16	13:07	13:42	0.58	0.36	2.2	3.0	-	-	2	-	-	-	-	0	5.6	0	-	-	0	0
	TOTAL								**60**	**22.73**	**-**	**-**	**35**	**2**	**12**	**0**	**3**	**3**	**0**	**5**	**2.4**	**0**	**0**	**0**	**0**	**0**
Elk River	ER-GN-01	628295	5447959	45.72	19-Apr-16	19-Apr-16	11:20	14:30	3.2	1.45	1.5	1.6	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	ER-GN-02	628238	5447790	45.72	19-Apr-16	19-Apr-16	11:30	14:40	3.2	1.45	1.6	1.8	-	-	-	-	1	2	0	3	2.1	-	-	0	0	0
				45.72			14:40	17:15	2.6	1.18			-	-	-	-	2	0	0	2	1.7	-	-	0	0	0
	ER-GN-03	628016	5447693	30.48	19-Apr-16	19-Apr-16	11:45	14:55	3.2	0.97	4.8	10.2	-	-	-	0	-	-	-	0	0	-	0	-	0	0
	ER-GN-04	627973	5447966	30.48	19-Apr-16	19-Apr-16	11:55	15:15	3.3	1.02	4.5	3.2	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	ER-GN-05	628112	5447595	30.48	19-Apr-16	19-Apr-16	12:10	15:20	3.2	0.97	1.8	4.8	1	-	-	-	-	-	-	0	1.0	-	-	-	-	-
	ER-GN-06	627974	5447832	30.48	19-Apr-16	19-Apr-16	15:15	16:25	1.2	0.36	3.3	6.8	-	-	-	0	-	-	-	0	0	-	0	-	0	0
	ER-GN-07	628142	5447702	45.72	20-Apr-16	20-Apr-16	9:05	12:00	2.9	1.33	2.0	2.1	-	-	-	-	1	0	0	1	0.75	-	-	0	0	0
	ER-GN-08	628077	5447436	30.48	20-Apr-16	20-Apr-16	9:15	12:15	3.0	0.91	4.6	6.7	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	ER-GN-09	628104	5447315	30.48	20-Apr-16	20-Apr-16	9:25	12:25	3.0	0.91	3.2	6.2	-	-	-	0	-	-	-	0	0	-	0	-	0	0
	ER-GN-10	627865	5447460	30.48	20-Apr-16	20-Apr-16	9:45	12:40	2.9	0.89	1.9	3.7	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	ER-GN-11	627988	5447682	45.72	20-Apr-16	20-Apr-16	9:50	13:00	3.2	1.45	2.8	7.2	-	-	-	-	1	0	0	1	0.69	-	-	0	0	0
	ER-GN-12	627957	5447866	45.72	21-Apr-16	21-Apr-16	9:00	11:35	2.6	1.18	4.5	4.3	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	ER-GN-13	627836	5447470	30.48	21-Apr-16	21-Apr-16	9:15	11:45	2.5	0.76	1.4	2.0	1	-	-	-	-	-	-	0	1.3	-	-	-	-	-
	ER-GN-14	627514	5447123	30.48	21-Apr-16	21-Apr-16	9:20	12:00	2.7	0.81	1.8	2.1	2	-	-	-	-	-	-	1	2.5	-	-	-	-	-
	ER-GN-15	628503	5447217	30.48	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.81	1.1	2.0	-	-	-	0	-	-	-	0	0	-	0	-	0	0
	ER-GN-16	627730	5447290	45.72	21-Apr-16	21-Apr-16	9:45	12:45	3.0	1.37	2.1	1.9	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	ER-GN-17	627874	5447466	45.72	22-Apr-16	22-Apr-16	8:55	11:15	2.3	1.07	1.6	4.2	-	-	-	-	1	0	0	0	0.94	-	-	0	0	0
	ER-GN-18	628238	5446900	60.96	22-Apr-16	22-Apr-16	9:10	11:30	2.3	1.42	0.8	2.1	-	-	13	-	-	-	-	0	9.1	0	-	-	0	0

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: Gill Net Catch Records from Koocanusa Reservoir, April 2016

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Largescale Sucker									Mountain Whitefish				
													Catch							Mortalities/ Sacrificed	CPUE [a]	Catch			Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"	5"			2"	2.5"	3"		
Elk River	ER-GN-19	628012	5446581	45.72	22-Apr-16	22-Apr-16	9:20	12:30	3.2	1.45	1.4	5.8	-	-	-	-	2	1	0	3	2.1	-	-	0	0	0
	ER-GN-20	628321	5446690	30.48	22-Apr-16	22-Apr-16	9:20	12:45	3.4	1.04	1.8	3.0	-	-	-	0	-	-	-	0	0	-	0	-	0	0
	ER-GN-21	628145	5447522	45.72	23-Apr-16	23-Apr-16	9:00	11:05	2.1	0.95	1.2	2.1	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	ER-GN-22	627842	5447463	30.48	23-Apr-16	23-Apr-16	9:10	11:20	2.2	0.66	1.9	3.9	-	-	-	0	-	-	-	0	0	-	0	-	0	0
	ER-GN-23	628186	5446813	45.72	23-Apr-16	23-Apr-16	9:20	11:45	2.4	1.10	1.4	3.9	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	ER-GN-24	628485	5447166	45.72	24-Apr-16	24-Apr-16	9:10	11:00	1.8	0.84	2.0	2.4	-	-	-	-	0	1	0	0	1.2	-	-	0	0	0
	ER-GN-25	628146	5446559	45.72	24-Apr-16	24-Apr-16	9:15	10:20	1.1	0.50	0.8	4.1	-	-	-	-	0	1	0	0	2.0	-	-	0	0	0
	ER-GN-26	627836	5447486	30.48	25-Apr-16	25-Apr-16	12:30	13:10	0.67	0.20	1.5	2.9	6	-	-	-	-	-	-	0	30	-	-	-	-	-
	ER-GN-27	628450	5447156	22.86	25-Apr-16	25-Apr-16	12:45	13:50	1.1	0.25	1.1	3.4	-	1	-	-	-	-	-	0	4.0	-	-	-	-	-
	ER-GN-28	628595	5447346	22.86	26-Apr-16	26-Apr-16	9:10	9:50	0.67	0.15	2.3	2.3	-	1	-	-	-	-	-	0	6.6	-	-	-	-	-
	TOTAL								**71**	**27.45**	**-**	**-**	**10**	**2**	**13**	**0**	**8**	**5**	**0**	**11**	**2.3**	**0**	**0**	**0**	**0**	**0**
Gold Creek	GC-GN-01	630004	5437333	45.72	19-Apr-16	19-Apr-16	10:45	13:00	2.3	1.03	3.2	3.1	-	-	-	-	0	0	0	0	0	-	-	0	0	0
				45.72	19-Apr-16	19-Apr-16	13:05	15:25	2.3	1.07			-	-	-	-	2	0	0	1	1.9	-	-	0	0	0
	GC-GN-02	630484	5437202	45.72	19-Apr-16	19-Apr-16	11:10	15:10	4.0	1.83	6.2	6.3	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	GC-GN-03	629920	5437070	22.86	19-Apr-16	19-Apr-16	11:25	15:40	4.3	0.97	2.0	2.1	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-04	629943	5437079	22.86	19-Apr-16	19-Apr-16	11:40	15:45	4.1	0.93	2.3	2.5	-	0	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-05	629909	5437049	45.72	20-Apr-16	20-Apr-16	9:50	11:50	2.0	0.91	2.3	2.7	-	-	-	-	2	2	0	2	4.4	-	-	0	0	0
				45.72	20-Apr-16	20-Apr-16	12:15	14:10	1.9	0.88			-	-	-	-	1	0	0	0	1.1	-	-	0	0	0
	GC-GN-06	630147	5436926	45.72	20-Apr-16	20-Apr-16	9:55	13:00	3.1	1.41	4.1	4.3	-	-	-	-	1	6	0	7	5.0	-	-	0	0	0
				45.72	21-Apr-16	21-Apr-16	11:45	13:40	1.9	0.88			-	-	-	-	0	0	0	0	0	-	-	0	0	0
	GC-GN-07	630468	5437262	22.86	20-Apr-16	20-Apr-16	10:00	13:40	3.7	0.84	2.5	6.5	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-08	630499	5437243	22.86	20-Apr-16	20-Apr-16	10:05	14:00	3.9	0.90	2.5	6.5	-	3	-	-	-	-	-	0	3.4	-	-	-	-	-
	GC-GN-09	630028	5437022	45.72	21-Apr-16	21-Apr-16	9:20	11:20	2.0	0.91	2.9	3.5	-	-	-	-	7	2	0	2	9.8	-	-	1	0	1.1
	GC-GN-10	630258	5436950	45.72	21-Apr-16	21-Apr-16	9:25	11:50	2.4	1.10	3.5	6.0	-	-	-	-	6	0	0	1	5.4	-	-	0	0	0
				45.72	21-Apr-16	21-Apr-16	12:00	13:45	1.7	0.80			-	-	-	-	1	0	0	0	1.2	-	-	0	0	0
	GC-GN-11	630520	5437231	22.86	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.61	5.0	6.5	0	-	-	-	-	-	-	0	0	-	-	-	-	-
				22.86	21-Apr-16	21-Apr-16	12:15	13:55	1.7	0.38			0	-	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-12	630463	5437277	22.86	21-Apr-16	21-Apr-16	9:35	12:20	2.8	0.63	5.5	6.3	-	2	-	-	-	-	-	0	3.2	-	-	-	-	-
				22.86	21-Apr-16	21-Apr-16	12:25	14:05	1.7	0.38			-	3	-	-	-	-	-	0	7.9	-	-	-	-	-
	GC-GN-13	629984	5437073	45.72	22-Apr-16	22-Apr-16	9:20	10:30	1.2	0.53	2.7	3.3	-	-	-	-	7	0	0	2	13	-	-	0	0	0
				45.72	22-Apr-16	22-Apr-16	10:35	12:00	1.4	0.65			-	-	-	-	4	1	0	3	7.7	-	-	0	0	0
				45.72	22-Apr-16	22-Apr-16	12:05	13:15	1.2	0.53			-	-	-	-	0	1	0	1	1.9	-	-	0	0	0
	GC-GN-14	630009	5437026	45.72	22-Apr-16	22-Apr-16	9:25	10:35	1.2	0.53	2.8	3.5	-	-	-	-	2	0	0	1	3.7	-	-	0	0	0
	GC-GN-15	630069	5437092	45.72	22-Apr-16	22-Apr-16	10:40	12:15	1.6	0.72	4.0	3.0	-	-	-	-	4	0	0	0	5.5	-	-	0	0	0
	GC-GN-16	630149	5436978	45.72	22-Apr-16	22-Apr-16	12:20	13:30	1.2	0.53	4.0	4.9	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	GC-GN-17	630486	5437262	22.86	22-Apr-16	22-Apr-16	9:30	11:00	1.5	0.34	4.0	6.7	-	5	-	-	-	-	-	0	15	-	-	-	-	-
				22.86	22-Apr-16	22-Apr-16	11:10	13:10	2.0	0.46			-	5	-	-	-	-	-	0	11	-	-	-	-	-
	GC-GN-18	630460	5437287	22.86	22-Apr-16	22-Apr-16	9:40	11:40	2.0	0.46	4.0	6.5	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-19	630665	5436958	45.72	23-Apr-16	23-Apr-16	9:30	11:30	2.0	0.91	4.0	8.5	-	-	-	-	0	1	0	1	1.1	-	-	0	0	0
	GC-GN-20	630541	5437190	45.72	23-Apr-16	23-Apr-16	11:50	14:00	2.2	0.99	4.0	8.0	-	-	-	-	0	1	0	1	1.0	-	-	0	0	0
	GC-GN-21	630656	5437117	22.86	23-Apr-16	23-Apr-16	9:40	11:45	2.1	0.48	3.0	7.5	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-22	630161	5436918	22.86	23-Apr-16	23-Apr-16	9:45	12:00	2.3	0.51	1.5	5.0	1	-	-	-	-	-	-	0	1.9	-	-	-	-	-
	GC-GN-23	629888	5437089	45.72	23-Apr-16	23-Apr-16	10:10	12:30	2.3	1.07	3.5	1.8	-	-	-	-	1	2	0	2	2.8	-	-	0	0	0
				45.72	23-Apr-16	23-Apr-16	12:35	14:35	2.0	0.91			-	-	-	-	0	4	0	4	4.4	-	-	0	0	0
	GC-GN-24	630257	5437394	22.86	23-Apr-16	23-Apr-16	10:25	13:00	2.6	0.59	2.0	6.2	-	3	-	-	-	-	-	0	5.1	-	-	-	-	-
	GC-GN-25	630144	5436893	22.86	23-Apr-16	23-Apr-16	12:10	14:05	1.9	0.44	1.2	2.5	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-26	629827	5437340	22.86	23-Apr-16	23-Apr-16	12:15	14:25	2.2	0.50	2.0	2.4	0	-	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-27	630144	5436881	22.86	24-Apr-16	24-Apr-16	9:30	11:45	2.3	0.51	1.3	2.3	0	-	-	-	-	-	-	0	0	-	-	-	-	-
				22.86	24-Apr-16	24-Apr-16	11:50	13:30	1.7	0.38			0	-	-	-	-	-	-	0	0	-	-	-	-	-
	GC-GN-28	629902	5437132	45.72	24-Apr-16	24-Apr-16	9:20	11:10	1.8	0.84	3.4	2.0	-	-	-	-	0	1	0	1	1.2	-	-	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:15	13:10	1.9	0.88			-	-	-	-	2	0	0	1	2.3	-	-	0	0	0
	GC-GN-29	630036	5437104	45.72	24-Apr-16	24-Apr-16	9:25	11:00	1.6	0.72	4.0	3.5	-	-	-	-	0	0	0	0	0	-	-	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:05	13:20	2.3	1.03			-	-	-	-	1	1	0	1	1.9	-	-	0	0	0

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: Gill Net Catch Records from Koocanusa Reservoir, April 2016

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Largescale Sucker									Mountain Whitefish				
													Catch							Mortalities/ Sacrificed	CPUE [a]	Catch			Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"	5"			2"	2.5"	3"		
Gold Creek	GC-GN-30	630110	5436878	22.86	24-Apr-16	24-Apr-16	9:35	11:15	1.7	0.38	1.8	2.3	0	-	-	-	-	-	-	0	0	-	-	-	-	-
				22.86	24-Apr-16	24-Apr-16	11:20	13:50	2.5	0.57			1	-	-	-	-	-	-	0	1.7	-	-	-	-	-
	GC-GN-31	630298	5437358	22.86	24-Apr-16	24-Apr-16	9:40	12:00	2.3	0.53	2.5	6.3	-	-	-	1	-	-	-	0	1.9	-	0	-	0	0
	GC-GN-32	629824	5437340	22.86	24-Apr-16	24-Apr-16	12:15	14:15	2.0	0.46	2.0	2.5	-	-	-	1	-	-	-	0	2.2	-	0	-	0	0
	GC-GN-33	629829	5437312	22.86	25-Apr-16	25-Apr-16	9:35	10:45	1.2	0.27	2.5	3.0	-	-	-	0	-	-	-	0	0	-	0	-	0	0
				22.86	25-Apr-16	25-Apr-16	10:55	12:05	1.2	0.27			-	-	-	0	-	-	-	0	0	-	0	-	0	0
				22.86	25-Apr-16	25-Apr-16	12:10	13:20	1.2	0.27			-	-	-	0	-	-	-	0	0	-	0	-	0	0
	GC-GN-34	630014	5437330	60.96	25-Apr-16	25-Apr-16	9:40	10:40	1.0	0.61	4.0	4.6	-	-	2	-	-	-	-	0	3.3	0	-	-	0	0
				60.96	25-Apr-16	25-Apr-16	10:55	11:50	0.92	0.56			-	-	4	-	-	-	-	0	7.2	1	-	-	1	1.8
				60.96	25-Apr-16	25-Apr-16	11:55	13:00	1.1	0.66			-	-	7	-	-	-	-	0	11	0	-	-	0	0
	GC-GN-35	629824	5437090	45.72	25-Apr-16	25-Apr-16	9:45	11:05	1.3	0.61	2.0	3.0	-	-	-	-	0	2	0	2	3.3	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:10	13:05	1.9	0.88			-	-	-	-	0	0	0	0	0	-	-	0	0	0
	GC-GN-36	629826	5436965	45.72	25-Apr-16	25-Apr-16	9:50	11:15	1.4	0.65	3.5	2.5	-	-	-	-	0	1	0	1	1.5	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:20	13:15	1.9	0.88			-	-	-	-	1	0	0	0	1.1	-	-	0	0	0
	GC-GN-37	629814	5437364	22.86	26-Apr-16	26-Apr-16	9:30	10:40	1.2	0.27	3.6	3.3	-	-	-	1	-	-	-	0	3.7	-	0	-	0	0
				22.86	26-Apr-16	26-Apr-16	10:45	12:30	1.8	0.40			-	-	-	4	-	-	-	0	10	-	0	-	0	0
				22.86	26-Apr-16	26-Apr-16	12:35	14:10	1.6	0.36			-	-	-	1	-	-	-	0	2.8	-	0	-	0	0
	GC-GN-38	629874	5436986	45.72	26-Apr-16	26-Apr-16	9:40	12:15	2.6	1.18	3.0	3.8	-	-	-	-	3	0	0	1	2.5	-	-	0	0	0
	GC-GN-39	629964	5436935	45.72	26-Apr-16	26-Apr-16	12:20	14:05	1.7	0.80	3.0	4.0	-	-	-	-	1	0	0	0	1.2	-	-	0	0	0
	GC-GN-40	630108	5436880	45.72	26-Apr-16	26-Apr-16	9:45	12:00	2.3	1.03	2.7	5.6	-	-	-	-	5	0	0	2	4.9	-	-	0	0	0
				45.72	26-Apr-16	26-Apr-16	12:05	14:00	1.9	0.88			-	-	-	-	0	2	0	2	2.3	-	-	0	0	0
	GC-GN-41	629906	5437398	22.86	27-Apr-16	27-Apr-16	9:25	10:15	0.83	0.19	3.7	4.8	-	-	-	3	-	-	-	0	16	-	0	-	0	0
	GC-GN-42	629438	5437371	22.86	27-Apr-16	27-Apr-16	10:30	12:15	1.7	0.40	2.0	4.2	-	-	-	8	-	-	-	0	20	-	0	-	0	0
	GC-GN-43	629813	5437215	22.86	27-Apr-16	27-Apr-16	12:20	13:30	1.2	0.27	2.3	2.4	-	-	-	4	-	-	-	0	15	-	0	-	0	0
				22.86	27-Apr-16	27-Apr-16	13:35	14:45	1.2	0.27			-	-	-	2	-	-	-	0	7.5	-	0	-	0	0
	GC-GN-44	629950	5437225	45.72	27-Apr-16	27-Apr-16	9:30	10:30	1.0	0.46	3.8	3.2	-	-	-	-	1	0	0	0	2.2	-	-	0	0	0
	GC-GN-45	629910	5437404	45.72	27-Apr-16	27-Apr-16	10:55	12:30	1.6	0.72	2.8	5.4	-	-	-	-	1	0	0	0	1.4	-	-	0	0	0
				45.72	27-Apr-16	27-Apr-16	12:40	14:20	1.7	0.76			-	-	-	-	0	0	0	0	0	-	-	0	0	0
	GC-GN-46	630143	5436876	45.72	27-Apr-16	27-Apr-16	9:35	11:00	1.4	0.65	3.7	6.6	-	-	-	-	0	0	0	0	0	-	-	0	0	0
	GC-GN-47	630050	5436990	45.72	27-Apr-16	27-Apr-16	11:05	13:15	2.2	0.99	5.9	5.3	-	-	-	-	0	2	0	0	2.0	-	-	0	0	0
				45.72	27-Apr-16	27-Apr-16	13:20	14:35	1.3	0.57			-	-	-	-	1	0	0	0	1.7	-	-	0	0	0
	GC-GN-48	630698	5437142	45.72	27-Apr-16	27-Apr-16	13:45	15:20	1.6	0.72	1.4	2.0	-	-	-	-	2	0	0	0	2.8	-	-	0	0	0
	GC-GN-49	630126	5437420	45.72	27-Apr-16	27-Apr-16	14:05	15:45	1.7	0.76	1.2	6.6	-	-	-	-	3	2	1	1	6.6	-	-	0	0	0
	TOTAL								**144**	**51.24**	**-**	**-**	**2**	**21**	**13**	**25**	**59**	**31**	**1**	**40**	**3.4**	**1**	**0**	**1**	**1**	**0.052**

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Longnose Sucker			Northern Pikeminnow								
													Catch	Mortalities/ Sacrificed	CPUE [a]	Catch							Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										4"			1"	1.5"	2"	2.5"	3"	4"	5"		
Sand Creek	SC-GN-01	625783	5458145	60.96	19-Apr-16	19-Apr-16	11:45	15:00	3.2	1.98	0.5	1.5	-	-	-	-	-	0	-	-	-	-	0	0
	SC-GN-02	625372	5457031	22.86	19-Apr-16	19-Apr-16	12:35	15:10	2.6	0.59	1.0	1.0	-	-	-	0	-	-	-	-	-	-	0	0
	SC-GN-03	625531	5460425	45.72	19-Apr-16	19-Apr-16	14:00	15:55	1.9	0.88	0.5	1.5	1	0	1.1	-	-	-	-	0	1	1	2	2.3
	SC-GN-04	625685	5457327	30.48	22-Apr-16	22-Apr-16	9:55	11:45	1.8	0.56	1.0	1.5	-	-	-	0	-	-	-	-	-	-	0	0
				30.48	22-Apr-16	22-Apr-16	12:10	14:39	2.5	0.76			-	-	-	1	-	-	-	-	-	-	1	1.3
	SC-GN-05	625751	5457345	30.48	22-Apr-16	22-Apr-16	11:15	13:28	2.2	0.68	0.3	0.8	-	-	-	0	-	-	-	-	-	-	0	0
				30.48	22-Apr-16	22-Apr-16	13:45	14:54	1.2	0.35	0.5	0.8	-	-	-	0	-	-	-	-	-	-	0	0
	SC-GN-06	625028	5459161	30.48	22-Apr-16	22-Apr-16	11:45	13:58	2.2	0.68	1.0	1.2	-	-	-	0	-	-	-	-	-	-	0	0
	SC-GN-07	625660	5457294	60.96	23-Apr-16	23-Apr-16	8:51	10:41	1.8	1.12	1.0	1.5	-	-	-	-	-	24	-	-	-	-	5	21
				60.96	23-Apr-16	23-Apr-16	11:22	13:33	2.2	1.33			-	-	-	-	-	13	-	-	-	-	2	9.8
	SC-GN-08	625654	5457314	30.48	23-Apr-16	23-Apr-16	8:57	11:17	2.3	0.71	1.0	1.2	-	-	-	0	-	-	-	-	-	-	0	0
				30.48	23-Apr-16	23-Apr-16	11:34	14:21	2.8	0.85			-	-	-	0	-	-	-	-	-	-	0	0
	SC-GN-09	625758	5457348	30.48	23-Apr-16	23-Apr-16	9:11	11:40	2.5	0.76	0.5	1.0	-	-	-	0	-	-	-	-	-	-	0	0
				30.48	23-Apr-16	23-Apr-16	11:51	14:28	2.6	0.80			-	-	-	2	-	-	-	-	-	-	0	2.5
	SC-GN-10	625739	5457355	30.48	24-Apr-16	24-Apr-16	8:58	11:36	2.6	0.80	1.0	1.5	-	-	-	1	-	-	-	-	-	-	0	1.2
	SC-GN-11	625681	5457360	30.48	24-Apr-16	24-Apr-16	9:05	11:57	2.9	0.87	1.0	1.5	-	-	-	1	-	-	-	-	-	-	0	1.1
	SC-GN-12	625660	5457309	45.72	24-Apr-16	24-Apr-16	9:57	11:20	1.4	0.63	1.0	2.0	0	0	0	-	-	-	-	0	0	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:25	12:10	0.75	0.34			0	0	0	-	-	-	-	0	0	0	0	0
				45.72	24-Apr-16	24-Apr-16	12:15	13:26	1.2	0.54			0	0	0	-	-	-	-	0	0	0	0	0
	SC-GN-13	625674	5457326	22.86	24-Apr-16	24-Apr-16	10:02	11:26	1.4	0.32	1.0	1.5	-	-	-	-	4	-	-	-	-	-	0	12
	SC-GN-14	625681	5457360	30.48	24-Apr-16	24-Apr-16	12:05	14:46	2.7	0.82	1.0	2.0	-	-	-	2	-	-	-	-	-	-	0	2.4
	SC-GN-15	625794	5458453	30.48	24-Apr-16	24-Apr-16	13:09	15:25	2.3	0.69	1.0	1.7	-	-	-	0	-	-	-	-	-	-	0	0
	SC-GN-16	625114	5457743	45.72	24-Apr-16	24-Apr-16	13:43	15:44	2.0	0.92	1.2	1.8	0	0	0	-	-	-	-	1	0	0	1	1.1
	SC-GN-17	625827	5458455	45.72	25-Apr-16	25-Apr-16	9:18	10:08	0.83	0.38	0.8	2.9	0	0	0	-	-	-	-	3	1	0	4	10
				45.72	25-Apr-16	25-Apr-16	10:13	11:18	1.1	0.50			0	0	0	-	-	-	-	0	2	0	2	4.0
				45.72	25-Apr-16	25-Apr-16	11:23	12:42	1.3	0.60			0	0	0	-	-	-	-	0	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	12:47	13:58	1.2	0.54			0	0	0	-	-	-	-	0	0	0	0	0
	SC-GN-18	625728	5458540	45.72	25-Apr-16	25-Apr-16	9:44	11:06	1.4	0.62	1.0	2.4	0	0	0	-	-	-	-	2	0	1	3	4.8
				45.72	25-Apr-16	25-Apr-16	11:11	12:32	1.4	0.62			0	0	0	-	-	-	-	3	0	0	3	4.9
				45.72	25-Apr-16	25-Apr-16	12:35	12:57	0.37	0.17			0	0	0	-	-	-	-	1	0	0	1	6.0
				45.72	25-Apr-16	25-Apr-16	13:02	13:50	0.80	0.37			0	0	0	-	-	-	-	3	1	0	3	11
	SC-GN-19	625622	5458456	60.96	26-Apr-16	26-Apr-16	12:05	12:44	0.65	0.40	1.0	2.3	-	-	-	-	-	3	-	-	-	-	0	7.6
	SC-GN-20	625725	5458539	22.86	26-Apr-16	26-Apr-16	12:10	13:06	0.93	0.21	0.0	2.8	-	-	-	-	2	-	-	-	-	-	0	9.4
	SC-GN-21	625802	5458384	60.96	26-Apr-16	26-Apr-16	13:07	13:42	0.58	0.36	2.2	3.0	-	-	-	-	-	11	-	-	-	-	0	31
	TOTAL								**60**	**22.73**	**-**	**-**	**1**	**0**	**0.09**	**7**	**6**	**51**	**0**	**13**	**5**	**2**	**27**	**4.3**
Elk River	ER-GN-01	628295	5447959	45.72	19-Apr-16	19-Apr-16	11:20	14:30	3.2	1.45	1.5	1.6	0	-	0	-	-	-	-	0	0	0	0	0
	ER-GN-02	628238	5447790	45.72	19-Apr-16	19-Apr-16	11:30	14:40	3.2	1.45	1.6	1.8	0	-	0	-	-	-	-	0	0	0	0	0
				45.72			14:40	17:15	2.6	1.18			0	-	0	-	-	-	-	1	1	0	2	1.7
	ER-GN-03	628016	5447693	30.48	19-Apr-16	19-Apr-16	11:45	14:55	3.2	0.97	4.8	10.2	-	-	-	-	-	-	3	-	-	-	3	3.1
	ER-GN-04	627973	5447966	30.48	19-Apr-16	19-Apr-16	11:55	15:15	3.3	1.02	4.5	3.2	-	-	-	0	-	-	-	-	-	-	0	0
	ER-GN-05	628112	5447595	30.48	19-Apr-16	19-Apr-16	12:10	15:20	3.2	0.97	1.8	4.8	-	-	-	0	-	-	-	-	-	-	0	0
	ER-GN-06	627974	5447832	30.48	19-Apr-16	19-Apr-16	15:15	16:25	1.2	0.36	3.3	6.8	-	-	-	-	-	-	9	-	-	-	9	25
	ER-GN-07	628142	5447702	45.72	20-Apr-16	20-Apr-16	9:05	12:00	2.9	1.33	2.0	2.1	0	-	0	-	-	-	-	0	0	0	0	0
	ER-GN-08	628077	5447436	30.48	20-Apr-16	20-Apr-16	9:15	12:15	3.0	0.91	4.6	6.7	-	-	-	0	-	-	-	-	-	-	0	0
	ER-GN-09	628104	5447315	30.48	20-Apr-16	20-Apr-16	9:25	12:25	3.0	0.91	3.2	6.2	-	-	-	-	-	-	0	-	-	-	0	0
	ER-GN-10	627865	5447460	30.48	20-Apr-16	20-Apr-16	9:45	12:40	2.9	0.89	1.9	3.7	-	-	-	6	-	-	-	-	-	-	2	6.7
	ER-GN-11	627988	5447682	45.72	20-Apr-16	20-Apr-16	9:50	13:00	3.2	1.45	2.8	7.2	0	-	0	-	-	-	-	2	1	1	4	2.8
	ER-GN-12	627957	5447866	45.72	21-Apr-16	21-Apr-16	9:00	11:35	2.6	1.18	4.5	4.3	0	-	0	-	-	-	-	0	0	0	0	0
	ER-GN-13	627836	5447470	30.48	21-Apr-16	21-Apr-16	9:15	11:45	2.5	0.76	1.4	2.0	-	-	-	8	-	-	-	-	-	-	0	10
	ER-GN-14	627514	5447123	30.48	21-Apr-16	21-Apr-16	9:20	12:00	2.7	0.81	1.8	2.1	-	-	-	4	-	-	-	-	-	-	0	4.9
	ER-GN-15	628503	5447217	30.48	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.81	1.1	2.0	-	-	-	-	-	-	3	-	-	-	3	3.7
	ER-GN-16	627730	5447290	45.72	21-Apr-16	21-Apr-16	9:45	12:45	3.0	1.37	2.1	1.9	0	-	0	-	-	-	-	3	0	0	3	2.2
	ER-GN-17	627874	5447466	45.72	22-Apr-16	22-Apr-16	8:55	11:15	2.3	1.07	1.6	4.2	0	-	0	-	-	-	-	3	3	0	0	5.6
	ER-GN-18	628238	5446900	60.96	22-Apr-16	22-Apr-16	9:10	11:30	2.3	1.42	0.8	2.1	-	-	-	-	-	13	-	-	-	-	3	9.1

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Longnose Sucker			Northern Pikeminnow									
													Catch	Mortalities/ Sacrificed	CPUE [a]	Catch								Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										4"			1"	1.5"	2"	2.5"	3"	4"	5"		
Elk River	ER-GN-19	628012	5446581	45.72	22-Apr-16	22-Apr-16	9:20	12:30	3.2	1.45	1.4	5.8	0	-	0	-	-	-	-	5	1	2	8	5.5
	ER-GN-20	628321	5446690	30.48	22-Apr-16	22-Apr-16	9:20	12:45	3.4	1.04	1.8	3.0	-	-	-	-	-	-	9	-	-	-	9	8.6
	ER-GN-21	628145	5447522	45.72	23-Apr-16	23-Apr-16	9:00	11:05	2.1	0.95	1.2	2.1	0	-	0	-	-	-	-	0	0	0	0	0
	ER-GN-22	627842	5447463	30.48	23-Apr-16	23-Apr-16	9:10	11:20	2.2	0.66	1.9	3.9	-	-	-	-	-	-	17	-	-	-	8	26
	ER-GN-23	628186	5446813	45.72	23-Apr-16	23-Apr-16	9:20	11:45	2.4	1.10	1.4	3.9	0	-	0	-	-	-	-	4	0	1	0	4.5
	ER-GN-24	628485	5447166	45.72	24-Apr-16	24-Apr-16	9:10	11:00	1.8	0.84	2.0	2.4	0	-	0	-	-	-	-	1	0	0	0	1.2
	ER-GN-25	628146	5446559	45.72	24-Apr-16	24-Apr-16	9:15	10:20	1.1	0.50	0.8	4.1	0	-	0	-	-	-	-	3	2	0	0	10
	ER-GN-26	627836	5447486	30.48	25-Apr-16	25-Apr-16	12:30	13:10	0.67	0.20	1.5	2.9	-	-	-	8	-	-	-	-	-	-	0	39
	ER-GN-27	628450	5447156	22.86	25-Apr-16	25-Apr-16	12:45	13:50	1.1	0.25	1.1	3.4	-	-	-	-	9	-	-	-	-	-	0	36
	ER-GN-28	628595	5447346	22.86	26-Apr-16	26-Apr-16	9:10	9:50	0.67	0.15	2.3	2.3	-	-	-	-	14	-	-	-	-	-	1	92
	TOTAL								**71**	**27.45**	**-**	**-**	**0**	**0**	**0**	**26**	**23**	**13**	**41**	**22**	**8**	**4**	**55**	**10**
Gold Creek	GC-GN-01	630004	5437333	45.72	19-Apr-16	19-Apr-16	10:45	13:00	2.3	1.03	3.2	3.1	0	0	0	-	-	-	-	0	0	0	0	0
				45.72	19-Apr-16	19-Apr-16	13:05	15:25	2.3	1.07			0	0	0	-	-	-	-	2	0	0	2	1.9
	GC-GN-02	630484	5437202	45.72	19-Apr-16	19-Apr-16	11:10	15:10	4.0	1.83	6.2	6.3	0	0	0	-	-	-	-	0	0	0	0	0
	GC-GN-03	629920	5437070	22.86	19-Apr-16	19-Apr-16	11:25	15:40	4.3	0.97	2.0	2.1	-	-	-	0	-	-	-	-	-	-	0	0
	GC-GN-04	629943	5437079	22.86	19-Apr-16	19-Apr-16	11:40	15:45	4.1	0.93	2.3	2.5	-	-	-	-	4	-	-	-	-	-	0	4.3
	GC-GN-05	629909	5437049	45.72	20-Apr-16	20-Apr-16	9:50	11:50	2.0	0.91	2.3	2.7	0	-	0	-	-	-	-	1	1	1	3	3.3
				45.72	20-Apr-16	20-Apr-16	12:15	14:10	1.9	0.88			0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-06	630147	5436926	45.72	20-Apr-16	20-Apr-16	9:55	13:00	3.1	1.41	4.1	4.3	0	-	0	-	-	-	-	0	0	0	0	0
				45.72	21-Apr-16	21-Apr-16	11:45	13:40	1.9	0.88			0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-07	630468	5437262	22.86	20-Apr-16	20-Apr-16	10:00	13:40	3.7	0.84	2.5	6.5	-	-	-	4	-	-	-	-	-	-	0	4.8
	GC-GN-08	630499	5437243	22.86	20-Apr-16	20-Apr-16	10:05	14:00	3.9	0.90	2.5	6.5	-	-	-	-	11	-	-	-	-	-	0	12
	GC-GN-09	630028	5437022	45.72	21-Apr-16	21-Apr-16	9:20	11:20	2.0	0.91	2.9	3.5	0	-	0	-	-	-	-	0	1	0	1	1.1
	GC-GN-10	630258	5436950	45.72	21-Apr-16	21-Apr-16	9:25	11:50	2.4	1.10	3.5	6.0	0	-	0	-	-	-	-	2	0	0	2	1.8
				45.72	21-Apr-16	21-Apr-16	12:00	13:45	1.7	0.80			0	-	0	-	-	-	-	1	0	0	1	1.2
	GC-GN-11	630520	5437231	22.86	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.61	5.0	6.5	-	-	-	3	-	-	-	-	-	-	0	4.9
				22.86	21-Apr-16	21-Apr-16	12:15	13:55	1.7	0.38			-	-	-	7	-	-	-	-	-	-	0	18
	GC-GN-12	630463	5437277	22.86	21-Apr-16	21-Apr-16	9:35	12:20	2.8	0.63	5.5	6.3	-	-	-	-	4	-	-	-	-	-	0	6.4
				22.86	21-Apr-16	21-Apr-16	12:25	14:05	1.7	0.38			-	-	-	-	3	-	-	-	-	-	0	7.9
	GC-GN-13	629984	5437073	45.72	22-Apr-16	22-Apr-16	9:20	10:30	1.2	0.53	2.7	3.3	0	-	0	-	-	-	-	0	0	0	0	0
				45.72	22-Apr-16	22-Apr-16	10:35	12:00	1.4	0.65			0	-	0	-	-	-	-	0	0	1	1	1.5
				45.72	22-Apr-16	22-Apr-16	12:05	13:15	1.2	0.53			0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-14	630009	5437026	45.72	22-Apr-16	22-Apr-16	9:25	10:35	1.2	0.53	2.8	3.5	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-15	630069	5437092	45.72	22-Apr-16	22-Apr-16	10:40	12:15	1.6	0.72	4.0	3.0	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-16	630149	5436978	45.72	22-Apr-16	22-Apr-16	12:20	13:30	1.2	0.53	4.0	4.9	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-17	630486	5437262	22.86	22-Apr-16	22-Apr-16	9:30	11:00	1.5	0.34	4.0	6.7	-	-	-	-	4	-	-	-	-	-	0	12
				22.86	22-Apr-16	22-Apr-16	11:10	13:10	2.0	0.46			-	-	-	-	3	-	-	-	-	-	0	6.6
	GC-GN-18	630460	5437287	22.86	22-Apr-16	22-Apr-16	9:40	11:40	2.0	0.46	4.0	6.5	-	-	-	2	-	-	-	-	-	-	0	4.4
	GC-GN-19	630665	5436958	45.72	23-Apr-16	23-Apr-16	9:30	11:30	2.0	0.91	4.0	8.5	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-20	630541	5437190	45.72	23-Apr-16	23-Apr-16	11:50	14:00	2.2	0.99	4.0	8.0	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-21	630656	5437117	22.86	23-Apr-16	23-Apr-16	9:40	11:45	2.1	0.48	3.0	7.5	-	-	-	2	-	-	-	-	-	-	0	4.2
	GC-GN-22	630161	5436918	22.86	23-Apr-16	23-Apr-16	9:45	12:00	2.3	0.51	1.5	5.0	-	-	-	1	-	-	-	-	-	-	0	1.9
	GC-GN-23	629888	5437089	45.72	23-Apr-16	23-Apr-16	10:10	12:30	2.3	1.07	3.5	1.8	0	-	0	-	-	-	-	4	0	1	5	4.7
				45.72	23-Apr-16	23-Apr-16	12:35	14:35	2.0	0.91			0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-24	630257	5437394	22.86	23-Apr-16	23-Apr-16	10:25	13:00	2.6	0.59	2.0	6.2	-	-	-	-	5	-	-	-	-	-	0	8.5
	GC-GN-25	630144	5436893	22.86	23-Apr-16	23-Apr-16	12:10	14:05	1.9	0.44	1.2	2.5	-	-	-	0	-	-	-	-	-	-	0	0
	GC-GN-26	629827	5437340	22.86	23-Apr-16	23-Apr-16	12:15	14:25	2.2	0.50	2.0	2.4	-	-	-	0	-	-	-	-	-	-	0	0
	GC-GN-27	630144	5436881	22.86	24-Apr-16	24-Apr-16	9:30	11:45	2.3	0.51	1.3	2.3	-	-	-	0	-	-	-	-	-	-	0	0
				22.86	24-Apr-16	24-Apr-16	11:50	13:30	1.7	0.38			-	-	-	0	-	-	-	-	-	-	0	0
	GC-GN-28	629902	5437132	45.72	24-Apr-16	24-Apr-16	9:20	11:10	1.8	0.84	3.4	2.0	0	-	0	-	-	-	-	0	1	0	1	1.2
				45.72	24-Apr-16	24-Apr-16	11:15	13:10	1.9	0.88			0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-29	630036	5437104	45.72	24-Apr-16	24-Apr-16	9:25	11:00	1.6	0.72	4.0	3.5	0	-	0	-	-	-	-	0	0	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:05	13:20	2.3	1.03			0	-	0	-	-	-	-	0	0	0	0	0

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Longnose Sucker			Northern Pikeminnow								
													Catch	Mortalities/ Sacrificed	CPUE [a]	Catch							Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										4"			1"	1.5"	2"	2.5"	3"	4"	5"		
Gold Creek	GC-GN-30	630110	5436878	22.86	24-Apr-16	24-Apr-16	9:35	11:15	1.7	0.38	1.8	2.3	-	-	-	0	-	-	-	-	-	-	0	0
				22.86	24-Apr-16	24-Apr-16	11:20	13:50	2.5	0.57			-	-	-	0	-	-	-	-	-	-	0	0
	GC-GN-31	630298	5437358	22.86	24-Apr-16	24-Apr-16	9:40	12:00	2.3	0.53	2.5	6.3	-	-	-	-	-	-	2	-	-	-	2	3.7
	GC-GN-32	629824	5437340	22.86	24-Apr-16	24-Apr-16	12:15	14:15	2.0	0.46	2.0	2.5	-	-	-	-	-	-	2	-	-	-	2	4.4
	GC-GN-33	629829	5437312	22.86	25-Apr-16	25-Apr-16	9:35	10:45	1.2	0.27	2.5	3.0	-	-	-	-	-	-	2	-	-	-	2	7.5
				22.86	25-Apr-16	25-Apr-16	10:55	12:05	1.2	0.27			-	-	-	-	-	-	2	-	-	-	2	7.5
				22.86	25-Apr-16	25-Apr-16	12:10	13:20	1.2	0.27			-	-	-	-	-	-	2	-	-	-	2	7.5
	GC-GN-34	630014	5437330	60.96	25-Apr-16	25-Apr-16	9:40	10:40	1.0	0.61	4.0	4.6	-	-	-	-	-	7	-	-	-	-	1	11
				60.96	25-Apr-16	25-Apr-16	10:55	11:50	0.92	0.56			-	-	-	-	-	1	-	-	-	-	0	1.8
				60.96	25-Apr-16	25-Apr-16	11:55	13:00	1.1	0.66			-	-	-	-	-	1	-	-	-	-	0	1.5
	GC-GN-35	629824	5437090	45.72	25-Apr-16	25-Apr-16	9:45	11:05	1.3	0.61	2.0	3.0	0	-	0	-	-	-	-	0	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:10	13:05	1.9	0.88			0	-	0	-	-	-	-	1	0	0	1	1.1
	GC-GN-36	629826	5436965	45.72	25-Apr-16	25-Apr-16	9:50	11:15	1.4	0.65	3.5	2.5	0	-	0	-	-	-	-	0	0	1	1	1.5
				45.72	25-Apr-16	25-Apr-16	11:20	13:15	1.9	0.88			0	-	0	-	-	-	-	1	0	1	2	2.3
	GC-GN-37	629814	5437364	22.86	26-Apr-16	26-Apr-16	9:30	10:40	1.2	0.27	3.6	3.3	-	-	-	-	-	-	2	-	-	-	2	7.5
				22.86	26-Apr-16	26-Apr-16	10:45	12:30	1.8	0.40			-	-	-	-	-	-	4	-	-	-	4	10
				22.86	26-Apr-16	26-Apr-16	12:35	14:10	1.6	0.36			-	-	-	-	-	-	0	-	-	-	0	0
	GC-GN-38	629874	5436986	45.72	26-Apr-16	26-Apr-16	9:40	12:15	2.6	1.18	3.0	3.8	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-39	629964	5436935	45.72	26-Apr-16	26-Apr-16	12:20	14:05	1.7	0.80	3.0	4.0	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-40	630108	5436880	45.72	26-Apr-16	26-Apr-16	9:45	12:00	2.3	1.03	2.7	5.6	0	-	0	-	-	-	-	1	1	1	1	2.9
				45.72	26-Apr-16	26-Apr-16	12:05	14:00	1.9	0.88			0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-41	629906	5437398	22.86	27-Apr-16	27-Apr-16	9:25	10:15	0.83	0.19	3.7	4.8	-	-	-	-	-	-	0	-	-	-	0	0
	GC-GN-42	629438	5437371	22.86	27-Apr-16	27-Apr-16	10:30	12:15	1.7	0.40	2.0	4.2	-	-	-	-	-	-	0	-	-	-	0	0
	GC-GN-43	629813	5437215	22.86	27-Apr-16	27-Apr-16	12:20	13:30	1.2	0.27	2.3	2.4	-	-	-	-	-	-	1	-	-	-	1	3.7
				22.86	27-Apr-16	27-Apr-16	13:35	14:45	1.2	0.27			-	-	-	-	-	-	0	-	-	-	0	0
	GC-GN-44	629950	5437225	45.72	27-Apr-16	27-Apr-16	9:30	10:30	1.0	0.46	3.8	3.2	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-45	629910	5437404	45.72	27-Apr-16	27-Apr-16	10:55	12:30	1.6	0.72	2.8	5.4	0	-	0	-	-	-	-	1	0	0	1	1.4
				45.72	27-Apr-16	27-Apr-16	12:40	14:20	1.7	0.76			0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-46	630143	5436876	45.72	27-Apr-16	27-Apr-16	9:35	11:00	1.4	0.65	3.7	6.6	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-47	630050	5436990	45.72	27-Apr-16	27-Apr-16	11:05	13:15	2.2	0.99	5.9	5.3	0	-	0	-	-	-	-	0	0	0	0	0
				45.72	27-Apr-16	27-Apr-16	13:20	14:35	1.3	0.57			0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-48	630698	5437142	45.72	27-Apr-16	27-Apr-16	13:45	15:20	1.6	0.72	1.4	2.0	0	-	0	-	-	-	-	0	0	0	0	0
	GC-GN-49	630126	5437420	45.72	27-Apr-16	27-Apr-16	14:05	15:45	1.7	0.76	1.2	6.6	0	-	0	-	-	-	-	0	1	1	1	2.6
	TOTAL								**144**	**51.24**	**-**	**-**	**0**	**0**	**0**	**19**	**34**	**9**	**17**	**14**	**5**	**7**	**41**	**2.6**

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Peamouth Chub								Rainbow Trout							
													Catch						Mortalities/ Sacrificed	CPUE [a]	Catch						Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"			1"	1.5"	2"	2.5"	3"	4"		
Sand Creek	SC-GN-01	625783	5458145	60.96	19-Apr-16	19-Apr-16	11:45	15:00	3.2	1.98	0.5	1.5	-	-	4	-	-	-	4	2.0	-	-	2	-	-	-	2	1.0
	SC-GN-02	625372	5457031	22.86	19-Apr-16	19-Apr-16	12:35	15:10	2.6	0.59	1.0	1.0	10	-	-	-	-	-	0	17	0	-	-	-	-	-	0	0
	SC-GN-03	625531	5460425	45.72	19-Apr-16	19-Apr-16	14:00	15:55	1.9	0.88	0.5	1.5	-	-	-	-	1	0	1	1.1	-	-	-	-	0	0	0	0
	SC-GN-04	625685	5457327	30.48	22-Apr-16	22-Apr-16	9:55	11:45	1.8	0.56	1.0	1.5	5	-	-	-	-	-	1	8.9	0	-	-	-	-	-	0	0
				30.48	22-Apr-16	22-Apr-16	12:10	14:39	2.5	0.76			3	-	-	-	-	-	0	4.0	0	-	-	-	-	-	0	0
	SC-GN-05	625751	5457345	30.48	22-Apr-16	22-Apr-16	11:15	13:28	2.2	0.68	0.3	0.8	16	-	-	-	-	-	0	24	0	-	-	-	-	-	0	0
				30.48	22-Apr-16	22-Apr-16	13:45	14:54	1.2	0.35	0.5	0.8	5	-	-	-	-	-	0	14	0	-	-	-	-	-	0	0
	SC-GN-06	625028	5459161	30.48	22-Apr-16	22-Apr-16	11:45	13:58	2.2	0.68	1.0	1.2	1	-	-	-	-	-	0	1.5	0	-	-	-	-	-	0	0
	SC-GN-07	625660	5457294	60.96	23-Apr-16	23-Apr-16	8:51	10:41	1.8	1.12	1.0	1.5	-	-	29	-	-	-	22	26	-	-	0	-	-	-	0	0
				60.96	23-Apr-16	23-Apr-16	11:22	13:33	2.2	1.33			-	-	23	-	-	-	15	17	-	-	0	-	-	-	0	0
	SC-GN-08	625654	5457314	30.48	23-Apr-16	23-Apr-16	8:57	11:17	2.3	0.71	1.0	1.2	0	-	-	-	-	-	0	0	0	-	-	-	-	-	0	0
				30.48	23-Apr-16	23-Apr-16	11:34	14:21	2.8	0.85			4	-	-	-	-	-	0	4.7	0	-	-	-	-	-	0	0
	SC-GN-09	625758	5457348	30.48	23-Apr-16	23-Apr-16	9:11	11:40	2.5	0.76	0.5	1.0	16	-	-	-	-	-	0	21	0	-	-	-	-	-	0	0
				30.48	23-Apr-16	23-Apr-16	11:51	14:28	2.6	0.80			11	-	-	-	-	-	0	14	0	-	-	-	-	-	0	0
	SC-GN-10	625739	5457355	30.48	24-Apr-16	24-Apr-16	8:58	11:36	2.6	0.80	1.0	1.5	39	-	-	-	-	-	0	49	0	-	-	-	-	-	0	0
	SC-GN-11	625681	5457360	30.48	24-Apr-16	24-Apr-16	9:05	11:57	2.9	0.87	1.0	1.5	4	-	-	-	-	-	0	4.6	0	-	-	-	-	-	0	0
	SC-GN-12	625660	5457309	45.72	24-Apr-16	24-Apr-16	9:57	11:20	1.4	0.63	1.0	2.0	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:25	12:10	0.75	0.34			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	24-Apr-16	24-Apr-16	12:15	13:26	1.2	0.54			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	SC-GN-13	625674	5457326	22.86	24-Apr-16	24-Apr-16	10:02	11:26	1.4	0.32	1.0	1.5	-	25	-	-	-	-	25	78	-	0	-	-	-	-	0	0
	SC-GN-14	625681	5457360	30.48	24-Apr-16	24-Apr-16	12:05	14:46	2.7	0.82	1.0	2.0	52	-	-	-	-	-	0	64	0	-	-	-	-	-	0	0
	SC-GN-15	625794	5458453	30.48	24-Apr-16	24-Apr-16	13:09	15:25	2.3	0.69	1.0	1.7	0	-	-	-	-	-	0	0	0	-	-	-	-	-	0	0
	SC-GN-16	625114	5457743	45.72	24-Apr-16	24-Apr-16	13:43	15:44	2.0	0.92	1.2	1.8	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	SC-GN-17	625827	5458455	45.72	25-Apr-16	25-Apr-16	9:18	10:08	0.83	0.38	0.8	2.9	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	10:13	11:18	1.1	0.50			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:23	12:42	1.3	0.60			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	12:47	13:58	1.2	0.54			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	SC-GN-18	625728	5458540	45.72	25-Apr-16	25-Apr-16	9:44	11:06	1.4	0.62	1.0	2.4	-	-	-	-	0	0	0	0	-	-	-	-	0	1	1	1.6
				45.72	25-Apr-16	25-Apr-16	11:11	12:32	1.4	0.62			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	12:35	12:57	0.37	0.17			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	13:02	13:50	0.80	0.37			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	SC-GN-19	625622	5458456	60.96	26-Apr-16	26-Apr-16	12:05	12:44	0.65	0.40	1.0	2.3	-	-	63	-	-	-	0	159	-	-	1	-	-	-	0	2.5
	SC-GN-20	625725	5458539	22.86	26-Apr-16	26-Apr-16	12:10	13:06	0.93	0.21	0.0	2.8	-	187	-	-	-	-	0	876	-	0	-	-	-	-	0	0
	SC-GN-21	625802	5458384	60.96	26-Apr-16	26-Apr-16	13:07	13:42	0.58	0.36	2.2	3.0	-	-	69	-	-	-	0	194	-	-	0	-	-	-	0	0
	TOTAL								**60**	**22.73**	**-**	**-**	**166**	**212**	**188**	**0**	**1**	**0**	**68**	**46**	**0**	**0**	**3**	**0**	**0**	**1**	**3**	**0.15**
Elk River	ER-GN-01	628295	5447959	45.72	19-Apr-16	19-Apr-16	11:20	14:30	3.2	1.45	1.5	1.6	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-02	628238	5447790	45.72	19-Apr-16	19-Apr-16	11:30	14:40	3.2	1.45	1.6	1.8	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72			14:40	17:15	2.6	1.18			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-03	628016	5447693	30.48	19-Apr-16	19-Apr-16	11:45	14:55	3.2	0.97	4.8	10.2	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	ER-GN-04	627973	5447966	30.48	19-Apr-16	19-Apr-16	11:55	15:15	3.3	1.02	4.5	3.2	0	-	-	-	-	-	0	0	0	-	-	-	-	-	0	0
	ER-GN-05	628112	5447595	30.48	19-Apr-16	19-Apr-16	12:10	15:20	3.2	0.97	1.8	4.8	0	-	-	-	-	-	0	0	0	-	-	-	-	-	0	0
	ER-GN-06	627974	5447832	30.48	19-Apr-16	19-Apr-16	15:15	16:25	1.2	0.36	3.3	6.8	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	ER-GN-07	628142	5447702	45.72	20-Apr-16	20-Apr-16	9:05	12:00	2.9	1.33	2.0	2.1	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-08	628077	5447436	30.48	20-Apr-16	20-Apr-16	9:15	12:15	3.0	0.91	4.6	6.7	0	-	-	-	-	-	0	0	0	-	-	-	-	-	0	0
	ER-GN-09	628104	5447315	30.48	20-Apr-16	20-Apr-16	9:25	12:25	3.0	0.91	3.2	6.2	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	ER-GN-10	627865	5447460	30.48	20-Apr-16	20-Apr-16	9:45	12:40	2.9	0.89	1.9	3.7	6	-	-	-	-	-	3	6.7	0	-	-	-	-	-	0	0
	ER-GN-11	627988	5447682	45.72	20-Apr-16	20-Apr-16	9:50	13:00	3.2	1.45	2.8	7.2	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-12	627957	5447866	45.72	21-Apr-16	21-Apr-16	9:00	11:35	2.6	1.18	4.5	4.3	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-13	627836	5447470	30.48	21-Apr-16	21-Apr-16	9:15	11:45	2.5	0.76	1.4	2.0	16	-	-	-	-	-	1	21	0	-	-	-	-	-	0	0
	ER-GN-14	627514	5447123	30.48	21-Apr-16	21-Apr-16	9:20	12:00	2.7	0.81	1.8	2.1	3	-	-	-	-	-	1	3.7	0	-	-	-	-	-	0	0
	ER-GN-15	628503	5447217	30.48	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.81	1.1	2.0	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	ER-GN-16	627730	5447290	45.72	21-Apr-16	21-Apr-16	9:45	12:45	3.0	1.37	2.1	1.9	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-17	627874	5447466	45.72	22-Apr-16	22-Apr-16	8:55	11:15	2.3	1.07	1.6	4.2	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-18	628238	5446900	60.96	22-Apr-16	22-Apr-16	9:10	11:30	2.3	1.42	0.8	2.1	-	-	57	-	-	-	57	40	-	-	1	-	-	-	0	0.70

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: Gill Net Catch Records from Koocanusa Reservoir, April 2016

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Peamouth Chub								Rainbow Trout							
													Catch						Mortalities/ Sacrificed	CPUE [a]	Catch						Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"			1"	1.5"	2"	2.5"	3"	4"		
Elk River	ER-GN-19	628012	5446581	45.72	22-Apr-16	22-Apr-16	9:20	12:30	3.2	1.45	1.4	5.8	-	-	-	-	1	1	2	1.4	-	-	-	-	0	0	0	0
	ER-GN-20	628321	5446690	30.48	22-Apr-16	22-Apr-16	9:20	12:45	3.4	1.04	1.8	3.0	-	-	-	0	-	-	0	0	-	-	-	1	-	-	0	0.96
	ER-GN-21	628145	5447522	45.72	23-Apr-16	23-Apr-16	9:00	11:05	2.1	0.95	1.2	2.1	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-22	627842	5447463	30.48	23-Apr-16	23-Apr-16	9:10	11:20	2.2	0.66	1.9	3.9	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	ER-GN-23	628186	5446813	45.72	23-Apr-16	23-Apr-16	9:20	11:45	2.4	1.10	1.4	3.9	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-24	628485	5447166	45.72	24-Apr-16	24-Apr-16	9:10	11:00	1.8	0.84	2.0	2.4	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-25	628146	5446559	45.72	24-Apr-16	24-Apr-16	9:15	10:20	1.1	0.50	0.8	4.1	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-26	627836	5447486	30.48	25-Apr-16	25-Apr-16	12:30	13:10	0.67	0.20	1.5	2.9	6	-	-	-	-	-	0	30	0	-	-	-	-	-	0	0
	ER-GN-27	628450	5447156	22.86	25-Apr-16	25-Apr-16	12:45	13:50	1.1	0.25	1.1	3.4	-	46	-	-	-	-	9	186	-	0	-	-	-	-	0	0
	ER-GN-28	628595	5447346	22.86	26-Apr-16	26-Apr-16	9:10	9:50	0.67	0.15	2.3	2.3	-	41	-	-	-	-	0	269	-	0	-	-	-	-	0	0
	TOTAL								**71**	**27.45**	**-**	**-**	**31**	**87**	**57**	**0**	**1**	**1**	**73**	**19**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0.057**
Gold Creek	GC-GN-01	630004	5437333	45.72	19-Apr-16	19-Apr-16	10:45	13:00	2.3	1.03	3.2	3.1	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	19-Apr-16	19-Apr-16	13:05	15:25	2.3	1.07			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-02	630484	5437202	45.72	19-Apr-16	19-Apr-16	11:10	15:10	4.0	1.83	6.2	6.3	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-03	629920	5437070	22.86	19-Apr-16	19-Apr-16	11:25	15:40	4.3	0.97	2.0	2.1	0	-	-	-	-	-	0	0	0	-	-	-	-	-	0	0
	GC-GN-04	629943	5437079	22.86	19-Apr-16	19-Apr-16	11:40	15:45	4.1	0.93	2.3	2.5	-	24	-	-	-	-	24	26	-	-	-	-	-	-	0	0
	GC-GN-05	629909	5437049	45.72	20-Apr-16	20-Apr-16	9:50	11:50	2.0	0.91	2.3	2.7	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	20-Apr-16	20-Apr-16	12:15	14:10	1.9	0.88			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-06	630147	5436926	45.72	20-Apr-16	20-Apr-16	9:55	13:00	3.1	1.41	4.1	4.3	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	21-Apr-16	21-Apr-16	11:45	13:40	1.9	0.88			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-07	630468	5437262	22.86	20-Apr-16	20-Apr-16	10:00	13:40	3.7	0.84	2.5	6.5	6	-	-	-	-	-	0	7.2	0	-	-	-	-	-	0	0
	GC-GN-08	630499	5437243	22.86	20-Apr-16	20-Apr-16	10:05	14:00	3.9	0.90	2.5	6.5	-	12	-	-	-	-	12	13	-	0	-	-	-	-	0	0
	GC-GN-09	630028	5437022	45.72	21-Apr-16	21-Apr-16	9:20	11:20	2.0	0.91	2.9	3.5	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-10	630258	5436950	45.72	21-Apr-16	21-Apr-16	9:25	11:50	2.4	1.10	3.5	6.0	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	21-Apr-16	21-Apr-16	12:00	13:45	1.7	0.80			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-11	630520	5437231	22.86	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.61	5.0	6.5	2	-	-	-	-	-	1	3.3	0	-	-	-	-	-	0	0
				22.86	21-Apr-16	21-Apr-16	12:15	13:55	1.7	0.38			6	-	-	-	-	-	0	16	0	-	-	-	-	-	0	0
	GC-GN-12	630463	5437277	22.86	21-Apr-16	21-Apr-16	9:35	12:20	2.8	0.63	5.5	6.3	-	6	-	-	-	-	6	9.5	-	0	-	-	-	-	0	0
				22.86	21-Apr-16	21-Apr-16	12:25	14:05	1.7	0.38			-	4	-	-	-	-	4	10	-	0	-	-	-	-	0	0
	GC-GN-13	629984	5437073	45.72	22-Apr-16	22-Apr-16	9:20	10:30	1.2	0.53	2.7	3.3	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	22-Apr-16	22-Apr-16	10:35	12:00	1.4	0.65			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	22-Apr-16	22-Apr-16	12:05	13:15	1.2	0.53			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-14	630009	5437026	45.72	22-Apr-16	22-Apr-16	9:25	10:35	1.2	0.53	2.8	3.5	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-15	630069	5437092	45.72	22-Apr-16	22-Apr-16	10:40	12:15	1.6	0.72	4.0	3.0	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-16	630149	5436978	45.72	22-Apr-16	22-Apr-16	12:20	13:30	1.2	0.53	4.0	4.9	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-17	630486	5437262	22.86	22-Apr-16	22-Apr-16	9:30	11:00	1.5	0.34	4.0	6.7	-	14	-	-	-	-	14	41	-	0	-	-	-	-	0	0
				22.86	22-Apr-16	22-Apr-16	11:10	13:10	2.0	0.46			-	8	-	-	-	-	8	17	-	0	-	-	-	-	0	0
	GC-GN-18	630460	5437287	22.86	22-Apr-16	22-Apr-16	9:40	11:40	2.0	0.46	4.0	6.5	26	-	-	-	-	-	0	57	0	-	-	-	-	-	0	0
	GC-GN-19	630665	5436958	45.72	23-Apr-16	23-Apr-16	9:30	11:30	2.0	0.91	4.0	8.5	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-20	630541	5437190	45.72	23-Apr-16	23-Apr-16	11:50	14:00	2.2	0.99	4.0	8.0	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-21	630656	5437117	22.86	23-Apr-16	23-Apr-16	9:40	11:45	2.1	0.48	3.0	7.5	3	-	-	-	-	-	1	6.3	0	-	-	-	-	-	0	0
	GC-GN-22	630161	5436918	22.86	23-Apr-16	23-Apr-16	9:45	12:00	2.3	0.51	1.5	5.0	8	-	-	-	-	-	0	16	0	-	-	-	-	-	0	0
	GC-GN-23	629888	5437089	45.72	23-Apr-16	23-Apr-16	10:10	12:30	2.3	1.07	3.5	1.8	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	23-Apr-16	23-Apr-16	12:35	14:35	2.0	0.91			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-24	630257	5437394	22.86	23-Apr-16	23-Apr-16	10:25	13:00	2.6	0.59	2.0	6.2	-	23	-	-	-	-	17	39	-	0	-	-	-	-	0	0
	GC-GN-25	630144	5436893	22.86	23-Apr-16	23-Apr-16	12:10	14:05	1.9	0.44	1.2	2.5	19	-	-	-	-	-	1	43	1	-	-	-	-	-	1	2.3
	GC-GN-26	629827	5437340	22.86	23-Apr-16	23-Apr-16	12:15	14:25	2.2	0.50	2.0	2.4	13	-	-	-	-	-	1	26	0	-	-	-	-	-	0	0
	GC-GN-27	630144	5436881	22.86	24-Apr-16	24-Apr-16	9:30	11:45	2.3	0.51	1.3	2.3	1	-	-	-	-	-	0	1.9	0	-	-	-	-	-	0	0
				22.86	24-Apr-16	24-Apr-16	11:50	13:30	1.7	0.38			14	-	-	-	-	-	0	37	1	-	-	-	-	-	1	2.6
	GC-GN-28	629902	5437132	45.72	24-Apr-16	24-Apr-16	9:20	11:10	1.8	0.84	3.4	2.0	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:15	13:10	1.9	0.88			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-29	630036	5437104	45.72	24-Apr-16	24-Apr-16	9:25	11:00	1.6	0.72	4.0	3.5	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:05	13:20	2.3	1.03			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: Gill Net Catch Records from Koocanusa Reservoir, April 2016

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Peamouth Chub								Rainbow Trout							
													Catch						Mortalities/ Sacrificed	CPUE [a]	Catch						Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	1.5"	2"	2.5"	3"	4"			1"	1.5"	2"	2.5"	3"	4"		
Gold Creek	GC-GN-30	630110	5436878	22.86	24-Apr-16	24-Apr-16	9:35	11:15	1.7	0.38	1.8	2.3	4	-	-	-	-	-	0	10	0	-	-	-	-	-	0	0
				22.86	24-Apr-16	24-Apr-16	11:20	13:50	2.5	0.57			23	-	-	-	-	-	0	40	1	-	-	-	-	-	1	1.7
	GC-GN-31	630298	5437358	22.86	24-Apr-16	24-Apr-16	9:40	12:00	2.3	0.53	2.5	6.3	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	GC-GN-32	629824	5437340	22.86	24-Apr-16	24-Apr-16	12:15	14:15	2.0	0.46	2.0	2.5	-	-	-	0	-	-	0	0	-	-	-	1	-	-	1	2.2
	GC-GN-33	629829	5437312	22.86	25-Apr-16	25-Apr-16	9:35	10:45	1.2	0.27	2.5	3.0	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
				22.86	25-Apr-16	25-Apr-16	10:55	12:05	1.2	0.27			-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
				22.86	25-Apr-16	25-Apr-16	12:10	13:20	1.2	0.27			-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	GC-GN-34	630014	5437330	60.96	25-Apr-16	25-Apr-16	9:40	10:40	1.0	0.61	4.0	4.6	-	-	13	-	-	-	13	21	-	-	0	-	-	-	0	0
				60.96	25-Apr-16	25-Apr-16	10:55	11:50	0.92	0.56			-	-	5	-	-	-	4	8.9	-	-	0	-	-	-	0	0
				60.96	25-Apr-16	25-Apr-16	11:55	13:00	1.1	0.66			-	-	7	-	-	-	0	11	-	-	0	-	-	-	0	0
	GC-GN-35	629824	5437090	45.72	25-Apr-16	25-Apr-16	9:45	11:05	1.3	0.61	2.0	3.0	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:10	13:05	1.9	0.88			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-36	629826	5436965	45.72	25-Apr-16	25-Apr-16	9:50	11:15	1.4	0.65	3.5	2.5	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:20	13:15	1.9	0.88			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-37	629814	5437364	22.86	26-Apr-16	26-Apr-16	9:30	10:40	1.2	0.27	3.6	3.3	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
				22.86	26-Apr-16	26-Apr-16	10:45	12:30	1.8	0.40			-	-	-	1	-	-	0	2.5	-	-	-	0	-	-	0	0
				22.86	26-Apr-16	26-Apr-16	12:35	14:10	1.6	0.36			-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	GC-GN-38	629874	5436986	45.72	26-Apr-16	26-Apr-16	9:40	12:15	2.6	1.18	3.0	3.8	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-39	629964	5436935	45.72	26-Apr-16	26-Apr-16	12:20	14:05	1.7	0.80	3.0	4.0	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-40	630108	5436880	45.72	26-Apr-16	26-Apr-16	9:45	12:00	2.3	1.03	2.7	5.6	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	26-Apr-16	26-Apr-16	12:05	14:00	1.9	0.88			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-41	629906	5437398	22.86	27-Apr-16	27-Apr-16	9:25	10:15	0.83	0.19	3.7	4.8	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	GC-GN-42	629438	5437371	22.86	27-Apr-16	27-Apr-16	10:30	12:15	1.7	0.40	2.0	4.2	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	GC-GN-43	629813	5437215	22.86	27-Apr-16	27-Apr-16	12:20	13:30	1.2	0.27	2.3	2.4	-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
				22.86	27-Apr-16	27-Apr-16	13:35	14:45	1.2	0.27			-	-	-	0	-	-	0	0	-	-	-	0	-	-	0	0
	GC-GN-44	629950	5437225	45.72	27-Apr-16	27-Apr-16	9:30	10:30	1.0	0.46	3.8	3.2	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-45	629910	5437404	45.72	27-Apr-16	27-Apr-16	10:55	12:30	1.6	0.72	2.8	5.4	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	27-Apr-16	27-Apr-16	12:40	14:20	1.7	0.76			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-46	630143	5436876	45.72	27-Apr-16	27-Apr-16	9:35	11:00	1.4	0.65	3.7	6.6	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-47	630050	5436990	45.72	27-Apr-16	27-Apr-16	11:05	13:15	2.2	0.99	5.9	5.3	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
				45.72	27-Apr-16	27-Apr-16	13:20	14:35	1.3	0.57			-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-48	630698	5437142	45.72	27-Apr-16	27-Apr-16	13:45	15:20	1.6	0.72	1.4	2.0	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	GC-GN-49	630126	5437420	45.72	27-Apr-16	27-Apr-16	14:05	15:45	1.7	0.76	1.2	6.6	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0	0
	TOTAL								**144**	**51.24**	**-**	**-**	**125**	**91**	**25**	**1**	**0**	**0**	**106**	**6.2**	**3**	**0**	**0**	**1**	**0**	**0**	**4**	**0.12**

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Redside Shiner			Westslope Cutthroat Trout							Yellow Perch						
													Catch	Mortalities/ Sacrificed	CPUE*	Catch					Mortalities/ Sacrificed	CPUE [a]	Catch					Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"			1"	1.5"	2"	2.5"	3"			1"	1.5"	2"	2.5"	3"		
Sand Creek	SC-GN-01	625783	5458145	60.96	19-Apr-16	19-Apr-16	11:45	15:00	3.2	1.98	0.5	1.5	-	-	-	-	-	1	-	-	1	0.50	-	-	0	-	-	0	0
	SC-GN-02	625372	5457031	22.86	19-Apr-16	19-Apr-16	12:35	15:10	2.6	0.59	1.0	1.0	1	0	1.7	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-03	625531	5460425	45.72	19-Apr-16	19-Apr-16	14:00	15:55	1.9	0.88	0.5	1.5	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	SC-GN-04	625685	5457327	30.48	22-Apr-16	22-Apr-16	9:55	11:45	1.8	0.56	1.0	1.5	6	6	11	0	-	-	-	-	0	0	0	-	-	-	-	0	0
				30.48	22-Apr-16	22-Apr-16	12:10	14:39	2.5	0.76			1	1	1.3	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-05	625751	5457345	30.48	22-Apr-16	22-Apr-16	11:15	13:28	2.2	0.68	0.3	0.8	5	5	7.4	0	-	-	-	-	0	0	0	-	-	-	-	0	0
				30.48	22-Apr-16	22-Apr-16	13:45	14:54	1.2	0.35	0.5	0.8	10	10	29	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-06	625028	5459161	30.48	22-Apr-16	22-Apr-16	11:45	13:58	2.2	0.68	1.0	1.2	0	0	0	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-07	625660	5457294	60.96	23-Apr-16	23-Apr-16	8:51	10:41	1.8	1.12	1.0	1.5	-	-	-	-	-	0	-	-	0	0	-	-	0	-	-	0	0
				60.96	23-Apr-16	23-Apr-16	11:22	13:33	2.2	1.33			-	-	-	-	-	0	-	-	0	0	-	-	4	-	-	4	3.0
	SC-GN-08	625654	5457314	30.48	23-Apr-16	23-Apr-16	8:57	11:17	2.3	0.71	1.0	1.2	4	4	5.6	0	-	-	-	-	0	0	0	-	-	-	-	0	0
				30.48	23-Apr-16	23-Apr-16	11:34	14:21	2.8	0.85			0	0	0	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-09	625758	5457348	30.48	23-Apr-16	23-Apr-16	9:11	11:40	2.5	0.76	0.5	1.0	2	2	2.6	0	-	-	-	-	0	0	0	-	-	-	-	0	0
				30.48	23-Apr-16	23-Apr-16	11:51	14:28	2.6	0.80			3	3	3.8	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-10	625739	5457355	30.48	24-Apr-16	24-Apr-16	8:58	11:36	2.6	0.80	1.0	1.5	4	4	5.0	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-11	625681	5457360	30.48	24-Apr-16	24-Apr-16	9:05	11:57	2.9	0.87	1.0	1.5	1	1	1.1	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-12	625660	5457309	45.72	24-Apr-16	24-Apr-16	9:57	11:20	1.4	0.63	1.0	2.0	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:25	12:10	0.75	0.34			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	24-Apr-16	24-Apr-16	12:15	13:26	1.2	0.54			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	SC-GN-13	625674	5457326	22.86	24-Apr-16	24-Apr-16	10:02	11:26	1.4	0.32	1.0	1.5	0	0	0	-	0	-	-	-	0	0	-	0	-	-	-	0	0
	SC-GN-14	625681	5457360	30.48	24-Apr-16	24-Apr-16	12:05	14:46	2.7	0.82	1.0	2.0	6	6	7.3	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-15	625794	5458453	30.48	24-Apr-16	24-Apr-16	13:09	15:25	2.3	0.69	1.0	1.7	46	46	67	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	SC-GN-16	625114	5457743	45.72	24-Apr-16	24-Apr-16	13:43	15:44	2.0	0.92	1.2	1.8	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	SC-GN-17	625827	5458455	45.72	25-Apr-16	25-Apr-16	9:18	10:08	0.83	0.38	0.8	2.9	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	10:13	11:18	1.1	0.50			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:23	12:42	1.3	0.60			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	12:47	13:58	1.2	0.54			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	SC-GN-18	625728	5458540	45.72	25-Apr-16	25-Apr-16	9:44	11:06	1.4	0.62	1.0	2.4	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:11	12:32	1.4	0.62			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	12:35	12:57	0.37	0.17			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	13:02	13:50	0.80	0.37			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	SC-GN-19	625622	5458456	60.96	26-Apr-16	26-Apr-16	12:05	12:44	0.65	0.40	1.0	2.3	-	-	-	-	-	0	-	-	0	0	-	-	0	-	-	0	0
	SC-GN-20	625725	5458539	22.86	26-Apr-16	26-Apr-16	12:10	13:06	0.93	0.21	0.0	2.8	-	-	-	-	0	-	-	-	0	0	-	0	-	-	-	0	0
	SC-GN-21	625802	5458384	60.96	26-Apr-16	26-Apr-16	13:07	13:42	0.58	0.36	2.2	3.0	-	-	-	-	-	0	-	-	0	0	-	-	0	-	-	0	0
	TOTAL								**60**	**22.73**	**-**	**-**	**89**	**88**	**9.5**	**0**	**0**	**1**	**0**	**0**	**1**	**0.015**	**0**	**0**	**4**	**0**	**0**	**4**	**0.088**
Elk River	ER-GN-01	628295	5447959	45.72	19-Apr-16	19-Apr-16	11:20	14:30	3.2	1.45	1.5	1.6	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0.0	0
	ER-GN-02	628238	5447790	45.72	19-Apr-16	19-Apr-16	11:30	14:40	3.2	1.45	1.6	1.8	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72			14:40	17:15	2.6	1.18			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	ER-GN-03	628016	5447693	30.48	19-Apr-16	19-Apr-16	11:45	14:55	3.2	0.97	4.8	10.2	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	ER-GN-04	627973	5447966	30.48	19-Apr-16	19-Apr-16	11:55	15:15	3.3	1.02	4.5	3.2	-	-	-	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	ER-GN-05	628112	5447595	30.48	19-Apr-16	19-Apr-16	12:10	15:20	3.2	0.97	1.8	4.8	3	3	3.1	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	ER-GN-06	627974	5447832	30.48	19-Apr-16	19-Apr-16	15:15	16:25	1.2	0.36	3.3	6.8	-	-	-	-	-	-	0	-	0	0	-	-	-	1	-	1	2.8
	ER-GN-07	628142	5447702	45.72	20-Apr-16	20-Apr-16	9:05	12:00	2.9	1.33	2.0	2.1	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	ER-GN-08	628077	5447436	30.48	20-Apr-16	20-Apr-16	9:15	12:15	3.0	0.91	4.6	6.7	1	1	1.1	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	ER-GN-09	628104	5447315	30.48	20-Apr-16	20-Apr-16	9:25	12:25	3.0	0.91	3.2	6.2	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	ER-GN-10	627865	5447460	30.48	20-Apr-16	20-Apr-16	9:45	12:40	2.9	0.89	1.9	3.7	3	3	3.4	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	ER-GN-11	627988	5447682	45.72	20-Apr-16	20-Apr-16	9:50	13:00	3.2	1.45	2.8	7.2	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	ER-GN-12	627957	5447866	45.72	21-Apr-16	21-Apr-16	9:00	11:35	2.6	1.18	4.5	4.3	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	ER-GN-13	627836	5447470	30.48	21-Apr-16	21-Apr-16	9:15	11:45	2.5	0.76	1.4	2.0	31	31	41	1	-	-	-	-	1	1.3	0	-	-	-	-	0	0
	ER-GN-14	627514	5447123	30.48	21-Apr-16	21-Apr-16	9:20	12:00	2.7	0.81	1.8	2.1	5	5	6.2	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	ER-GN-15	628503	5447217	30.48	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.81	1.1	2.0	-	-	-	-	-	-	0	-	0	0	-	-	-	1	-	1	1.2
	ER-GN-16	627730	5447290	45.72	21-Apr-16	21-Apr-16	9:45	12:45	3.0	1.37	2.1	1.9	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	ER-GN-17	627874	5447466	45.72	22-Apr-16	22-Apr-16	8:55	11:15	2.3	1.07	1.6	4.2	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	ER-GN-18	628238	5446900	60.96	22-Apr-16	22-Apr-16	9:10	11:30	2.3	1.42	0.8	2.1	-	-	-	-	-	0	-	-	0	0	-	-	1	-	-	1	0.70

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: **Gill Net Catch Records from Koocanusa Reservoir, April 2016**

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Redside Shiner			Westslope Cutthroat Trout							Yellow Perch						
													Catch			Catch					Mortalities/ Sacrificed	CPUE [a]	Catch					Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"	Mortalities/ Sacrificed	CPUE*	1"	1.5"	2"	2.5"	3"			1"	1.5"	2"	2.5"	3"		
Elk River	ER-GN-19	628012	5446581	45.72	22-Apr-16	22-Apr-16	9:20	12:30	3.2	1.45	1.4	5.8	-	-	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0
	ER-GN-20	628321	5446690	30.48	22-Apr-16	22-Apr-16	9:20	12:45	3.4	1.04	1.8	3.0	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	ER-GN-21	628145	5447522	45.72	23-Apr-16	23-Apr-16	9:00	11:05	2.1	0.95	1.2	2.1	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	ER-GN-22	627842	5447463	30.48	23-Apr-16	23-Apr-16	9:10	11:20	2.2	0.66	1.9	3.9	-	-	-	-	-	0	-	0	0	0	-	-	-	0	-	0	0
	ER-GN-23	628186	5446813	45.72	23-Apr-16	23-Apr-16	9:20	11:45	2.4	1.10	1.4	3.9	-	-	-	-	-	-	0	0	0	0	-	-	-	-	0	0	0
	ER-GN-24	628485	5447166	45.72	24-Apr-16	24-Apr-16	9:10	11:00	1.8	0.84	2.0	2.4	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	ER-GN-25	628146	5446559	45.72	24-Apr-16	24-Apr-16	9:15	10:20	1.1	0.50	0.8	4.1	-	-	-	-	-	-	-	1	0	2.0	-	-	-	-	0	0	0
	ER-GN-26	627836	5447486	30.48	25-Apr-16	25-Apr-16	12:30	13:10	0.67	0.20	1.5	2.9	30	2	148	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	ER-GN-27	628450	5447156	22.86	25-Apr-16	25-Apr-16	12:45	13:50	1.1	0.25	1.1	3.4	-	-	-	-	0	-	-	-	0	0	-	0	-	-	-	0	0
	ER-GN-28	628595	5447346	22.86	26-Apr-16	26-Apr-16	9:10	9:50	0.67	0.15	2.3	2.3	-	-	-	-	0	-	-	-	0	0	-	0	-	-	-	0	0
	TOTAL								**71**	**27.45**	**-**	**-**	**73**	**45**	**34**	**1**	**0**	**0**	**0**	**1**	**1**	**0.11**	**0**	**0**	**1**	**2**	**0**	**3**	**0.16**
Gold Creek	GC-GN-01	630004	5437333	45.72	19-Apr-16	19-Apr-16	10:45	13:00	2.3	1.03	3.2	3.1	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	19-Apr-16	19-Apr-16	13:05	15:25	2.3	1.07			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-02	630484	5437202	45.72	19-Apr-16	19-Apr-16	11:10	15:10	4.0	1.83	6.2	6.3	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-03	629920	5437070	22.86	19-Apr-16	19-Apr-16	11:25	15:40	4.3	0.97	2.0	2.1	0	0	0	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-04	629943	5437079	22.86	19-Apr-16	19-Apr-16	11:40	15:45	4.1	0.93	2.3	2.5	-	-	-	-	-	-	-	-	0	0	-	0	-	-	-	0	0
	GC-GN-05	629909	5437049	45.72	20-Apr-16	20-Apr-16	9:50	11:50	2.0	0.91	2.3	2.7	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	20-Apr-16	20-Apr-16	12:15	14:10	1.9	0.88			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-06	630147	5436926	45.72	20-Apr-16	20-Apr-16	9:55	13:00	3.1	1.41	4.1	4.3	-	-	-	-	-	-	-	1	0	0.71	-	-	-	-	0	0	0
				45.72	21-Apr-16	21-Apr-16	11:45	13:40	1.9	0.88			-	-	-	-	-	-	-	0	0	0	-	-	-	-	1	1	1.1
	GC-GN-07	630468	5437262	22.86	20-Apr-16	20-Apr-16	10:00	13:40	3.7	0.84	2.5	6.5	2	2	2.4	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-08	630499	5437243	22.86	20-Apr-16	20-Apr-16	10:05	14:00	3.9	0.90	2.5	6.5	-	-	-	-	0	-	-	-	0	0	-	4	-	-	-	4	4.5
	GC-GN-09	630028	5437022	45.72	21-Apr-16	21-Apr-16	9:20	11:20	2.0	0.91	2.9	3.5	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-10	630258	5436950	45.72	21-Apr-16	21-Apr-16	9:25	11:50	2.4	1.10	3.5	6.0	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	21-Apr-16	21-Apr-16	12:00	13:45	1.7	0.80			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-11	630520	5437231	22.86	21-Apr-16	21-Apr-16	9:30	12:10	2.7	0.61	5.0	6.5	2	2	3.3	0	-	-	-	-	0	0	0	-	-	-	-	0	0
				22.86	21-Apr-16	21-Apr-16	12:15	13:55	1.7	0.38			1	1	2.6	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-12	630463	5437277	22.86	21-Apr-16	21-Apr-16	9:35	12:20	2.8	0.63	5.5	6.3	-	-	-	-	0	-	-	-	0	0	-	5	-	-	-	5	8.0
				22.86	21-Apr-16	21-Apr-16	12:25	14:05	1.7	0.38			-	-	-	-	0	-	-	-	0	0	-	5	-	-	-	5	13
	GC-GN-13	629984	5437073	45.72	22-Apr-16	22-Apr-16	9:20	10:30	1.2	0.53	2.7	3.3	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	22-Apr-16	22-Apr-16	10:35	12:00	1.4	0.65			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	22-Apr-16	22-Apr-16	12:05	13:15	1.2	0.53			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-14	630009	5437026	45.72	22-Apr-16	22-Apr-16	9:25	10:35	1.2	0.53	2.8	3.5	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-15	630069	5437092	45.72	22-Apr-16	22-Apr-16	10:40	12:15	1.6	0.72	4.0	3.0	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-16	630149	5436978	45.72	22-Apr-16	22-Apr-16	12:20	13:30	1.2	0.53	4.0	4.9	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-17	630486	5437262	22.86	22-Apr-16	22-Apr-16	9:30	11:00	1.5	0.34	4.0	6.7	-	-	-	-	0	-	-	-	0	0	-	2	-	-	-	0	5.8
				22.86	22-Apr-16	22-Apr-16	11:10	13:10	2.0	0.46			-	-	-	-	0	-	-	-	0	0	-	8	-	-	-	1	17
	GC-GN-18	630460	5437287	22.86	22-Apr-16	22-Apr-16	9:40	11:40	2.0	0.46	4.0	6.5	0	0	0	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-19	630665	5436958	45.72	23-Apr-16	23-Apr-16	9:30	11:30	2.0	0.91	4.0	8.5	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-20	630541	5437190	45.72	23-Apr-16	23-Apr-16	11:50	14:00	2.2	0.99	4.0	8.0	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-21	630656	5437117	22.86	23-Apr-16	23-Apr-16	9:40	11:45	2.1	0.48	3.0	7.5	0	0	0	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-22	630161	5436918	22.86	23-Apr-16	23-Apr-16	9:45	12:00	2.3	0.51	1.5	5.0	3	3	5.8	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-23	629888	5437089	45.72	23-Apr-16	23-Apr-16	10:10	12:30	2.3	1.07	3.5	1.8	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	23-Apr-16	23-Apr-16	12:35	14:35	2.0	0.91			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-24	630257	5437394	22.86	23-Apr-16	23-Apr-16	10:25	13:00	2.6	0.59	2.0	6.2	-	-	-	-	0	-	-	-	0	0	-	3	-	-	-	1	5.1
	GC-GN-25	630144	5436893	22.86	23-Apr-16	23-Apr-16	12:10	14:05	1.9	0.44	1.2	2.5	10	10	23	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-26	629827	5437340	22.86	23-Apr-16	23-Apr-16	12:15	14:25	2.2	0.50	2.0	2.4	3	3	6.1	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-27	630144	5436881	22.86	24-Apr-16	24-Apr-16	9:30	11:45	2.3	0.51	1.3	2.3	11	11	21	0	-	-	-	-	0	0	1	-	-	-	-	0	1.9
				22.86	24-Apr-16	24-Apr-16	11:50	13:30	1.7	0.38			13	13	34	0	-	-	-	-	0	0	0	-	-	-	-	0	0
	GC-GN-28	629902	5437132	45.72	24-Apr-16	24-Apr-16	9:20	11:10	1.8	0.84	3.4	2.0	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:15	13:10	1.9	0.88			-	-	-	-	-	-	-	0	0	0	-	-	-	-	1	1	1.1
	GC-GN-29	630036	5437104	45.72	24-Apr-16	24-Apr-16	9:25	11:00	1.6	0.72	4.0	3.5	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	24-Apr-16	24-Apr-16	11:05	13:20	2.3	1.03			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.10: Gill Net Catch Records from Koocanusa Reservoir, April 2016

Area	Station	Location (11U, NAD83)		Net Length (m)	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Redside Shiner			Westslope Cutthroat Trout							Yellow Perch						
													Catch	Mortalities/ Sacrificed	CPUE*	Catch					Mortalities/ Sacrificed	CPUE [a]	Catch					Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										1"			1"	1.5"	2"	2.5"	3"			1"	1.5"	2"	2.5"	3"		
Gold Creek	GC-GN-30	630110	5436878	22.86	24-Apr-16	24-Apr-16	9:35	11:15	1.7	0.38	1.8	2.3	0	0	0	0	-	-	-	-	0	0	0	-	-	-	-	0	0
				22.86	24-Apr-16	24-Apr-16	11:20	13:50	2.5	0.57			17	17	30	2	-	-	-	-	0	3.5	0	-	-	-	-	0	0
	GC-GN-31	630298	5437358	22.86	24-Apr-16	24-Apr-16	9:40	12:00	2.3	0.53	2.5	6.3	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	GC-GN-32	629824	5437340	22.86	24-Apr-16	24-Apr-16	12:15	14:15	2.0	0.46	2.0	2.5	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	GC-GN-33	629829	5437312	22.86	25-Apr-16	25-Apr-16	9:35	10:45	1.2	0.27	2.5	3.0	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
				22.86	25-Apr-16	25-Apr-16	10:55	12:05	1.2	0.27			-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
				22.86	25-Apr-16	25-Apr-16	12:10	13:20	1.2	0.27			-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	GC-GN-34	630014	5437330	60.96	25-Apr-16	25-Apr-16	9:40	10:40	1.0	0.61	4.0	4.6	-	-	-	-	-	0	-	-	0	0	-	-	2	-	-	2	3.3
				60.96	25-Apr-16	25-Apr-16	10:55	11:50	0.92	0.56			-	-	-	-	-	0	-	-	0	0	-	-	2	-	-	2	3.6
				60.96	25-Apr-16	25-Apr-16	11:55	13:00	1.1	0.66			-	-	-	-	-	0	-	-	0	0	-	-	0	-	-	0	0
	GC-GN-35	629824	5437090	45.72	25-Apr-16	25-Apr-16	9:45	11:05	1.3	0.61	2.0	3.0	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:10	13:05	1.9	0.88			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-36	629826	5436965	45.72	25-Apr-16	25-Apr-16	9:50	11:15	1.4	0.65	3.5	2.5	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	25-Apr-16	25-Apr-16	11:20	13:15	1.9	0.88			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-37	629814	5437364	22.86	26-Apr-16	26-Apr-16	9:30	10:40	1.2	0.27	3.6	3.3	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
				22.86	26-Apr-16	26-Apr-16	10:45	12:30	1.8	0.40			-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
				22.86	26-Apr-16	26-Apr-16	12:35	14:10	1.6	0.36			-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	GC-GN-38	629874	5436986	45.72	26-Apr-16	26-Apr-16	9:40	12:15	2.6	1.18	3.0	3.8	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-39	629964	5436935	45.72	26-Apr-16	26-Apr-16	12:20	14:05	1.7	0.80	3.0	4.0	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-40	630108	5436880	45.72	26-Apr-16	26-Apr-16	9:45	12:00	2.3	1.03	2.7	5.6	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	26-Apr-16	26-Apr-16	12:05	14:00	1.9	0.88			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-41	629906	5437398	22.86	27-Apr-16	27-Apr-16	9:25	10:15	0.83	0.19	3.7	4.8	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	GC-GN-42	629438	5437371	22.86	27-Apr-16	27-Apr-16	10:30	12:15	1.7	0.40	2.0	4.2	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	GC-GN-43	629813	5437215	22.86	27-Apr-16	27-Apr-16	12:20	13:30	1.2	0.27	2.3	2.4	-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
				22.86	27-Apr-16	27-Apr-16	13:35	14:45	1.2	0.27			-	-	-	-	-	-	0	-	0	0	-	-	-	0	-	0	0
	GC-GN-44	629950	5437225	45.72	27-Apr-16	27-Apr-16	9:30	10:30	1.0	0.46	3.8	3.2	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-45	629910	5437404	45.72	27-Apr-16	27-Apr-16	10:55	12:30	1.6	0.72	2.8	5.4	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	27-Apr-16	27-Apr-16	12:40	14:20	1.7	0.76			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-46	630143	5436876	45.72	27-Apr-16	27-Apr-16	9:35	11:00	1.4	0.65	3.7	6.6	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-47	630050	5436990	45.72	27-Apr-16	27-Apr-16	11:05	13:15	2.2	0.99	5.9	5.3	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
				45.72	27-Apr-16	27-Apr-16	13:20	14:35	1.3	0.57			-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-48	630698	5437142	45.72	27-Apr-16	27-Apr-16	13:45	15:20	1.6	0.72	1.4	2.0	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	GC-GN-49	630126	5437420	45.72	27-Apr-16	27-Apr-16	14:05	15:45	1.7	0.76	1.2	6.6	-	-	-	-	-	-	-	0	0	0	-	-	-	-	0	0	0
	TOTAL								**144**	**51.24**	**-**	**-**	**62**	**62**	**9.9**	**2**	**0**	**0**	**0**	**1**	**0**	**0.056**	**1**	**27**	**4**	**0**	**2**	**22**	**0.87**

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.11: **Gill Net Catch Records from Koocanusa Reservoir, August 2016**

Area	Station	Location (11U, NAD83)		Net Length	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Kokanee						Largescale Sucker						Mountain Whitefish						Northern Pikeminnow						Yellow Perch			
													Catch				Mortalities/ Sacrificed	CPUE [a]	Catch				Mortalities/ Sacrificed	CPUE [a]	Catch				Mortalities/ Sacrificed	CPUE [a]	Catch				Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										2.5"	3"	4"	5"			2.5"	3"	4"	5"			2.5"	3"	4"	5"			2.5"	3"	4"	5"			2.5"		
Sand Creek	SC-GN-01	626142	5458143	45.72	24-Aug-16	24-Aug-16	9:10	10:00	0.83	0.38	4.5	12.0	-	0	0	0	0	0	-	1	0	0	0	2.6	-	1	0	0	0	2.6	-	0	0	0	0	0	-	-	-
	SC-GN-02	625900	5458121	45.72	24-Aug-16	24-Aug-16	10:05	10:50	0.75	0.34	4.5	12.0	-	0	0	0	0	0	-	0	0	0	0	0	-	1	0	0	0	2.9	-	0	0	0	0	0	-	-	-
	SC-GN-03	625885	5458560	45.72	24-Aug-16	24-Aug-16	10:55	11:35	0.67	0.30	5.0	7.5	-	0	0	0	0	0	-	2	0	0	0	6.6	-	0	0	0	0	0	-	1	0	0	1	3.3	-	-	-
				45.72	24-Aug-16	24-Aug-16	11:40	12:25	0.75	0.34			-	0	0	0	0	0	-	1	0	0	0	2.9	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-04	625877	5458475	45.72	24-Aug-16	24-Aug-16	12:35	13:25	0.83	0.38	1.5	8.0	-	0	0	0	0	0	-	0	2	0	0	5.2	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-05	625887	5458629	45.72	24-Aug-16	24-Aug-16	13:30	14:15	0.75	0.34	3.5	6.0	-	0	0	0	0	0	-	0	2	0	0	5.8	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-06	625885	5458560	45.72	24-Aug-16	24-Aug-16	14:20	15:00	0.67	0.30	5.0	7.5	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
				45.72	24-Aug-16	24-Aug-16	15:05	15:40	0.58	0.27			-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-07	626163	5458248	45.72	24-Aug-16	24-Aug-16	9:15	10:15	1.0	0.46	4.0	11.0	-	0	0	0	0	0	-	0	1	0	0	2.2	-	0	0	0	0	0	-	1	0	0	1	2.2	-	-	-
				45.72	24-Aug-16	24-Aug-16	10:20	11:00	0.67	0.30			-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-08	626421	5458271	45.72	24-Aug-16	24-Aug-16	11:15	12:00	0.75	0.34	6.0	10.0	-	2	0	0	2	5.8	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-09	625951	5458529	45.72	24-Aug-16	24-Aug-16	12:05	12:50	0.75	0.34	3.5	9.0	-	0	0	0	0	0	-	3	1	0	0	12	-	0	0	0	0	0	-	2	0	0	2	5.8	-	-	-
				45.72	24-Aug-16	24-Aug-16	12:55	13:40	0.75	0.34			-	0	0	0	0	0	-	2	0	0	0	5.8	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
				45.72	24-Aug-16	24-Aug-16	13:45	14:30	0.75	0.34			-	0	0	0	0	0	-	9	2	0	0	32	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-10	626048	5458269	45.72	24-Aug-16	24-Aug-16	14:40	15:25	0.75	0.34	4.0	13.0	-	0	0	0	0	0	-	1	0	0	0	2.9	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-11	626352	5458367	22.86	24-Aug-16	24-Aug-16	9:20	10:20	1.0	0.23	4.0	7.6	0	-	-	-	0	0	3	-	-	-	0	13	1	-	-	-	0	4.4	0	-	-	-	0	0	0	0	0
				22.86	24-Aug-16	24-Aug-16	10:25	11:20	0.92	0.21			0	-	-	-	0	0	1	-	-	-	0	4.8	0	-	-	-	0	0	1	-	-	-	1	4.8	0	0	0
	SC-GN-12	626403	5458405	22.86	24-Aug-16	24-Aug-16	11:25	12:10	0.75	0.17	1.5	3.0	0	-	-	-	0	0	0	-	-	-	0	0	0	-	-	-	0	0	0	-	-	-	0	0	0	0	0
	SC-GN-13	626352	5458367	22.86	24-Aug-16	24-Aug-16	12:15	13:00	0.75	0.17	4.0	7.6	1	-	-	-	1	6	2	-	-	-	0	12	0	-	-	-	0	0	0	-	-	-	0	0	0	0	0
	SC-GN-14	625912	5458589	22.86	24-Aug-16	24-Aug-16	13:10	14:00	0.83	0.19	2.5	6.4	0	-	-	-	0	0	2	-	-	-	0	10	0	-	-	-	0	0	0	-	-	-	0	0	2	0	10
	SC-GN-15	625959	5458511	22.86	24-Aug-16	24-Aug-16	14:00	14:45	0.75	0.17	3.0	5.5	0	-	-	-	0	0	1	-	-	-	0	5.8	0	-	-	-	0	0	1	-	-	-	1	5.8	0	0	0
				22.86	24-Aug-16	24-Aug-16	14:50	15:35	0.75	0.17			0	-	-	-	0	0	2	-	-	-	0	12	0	-	-	-	0	0	1	-	-	-	1	5.8	1	0	5.8
	SC-GN-16	625954	5458493	45.72	28-Aug-16	28-Aug-16	13:10	14:00	0.83	0.38	3.0	5.5	-	0	0	0	0	0	-	1	1	0	0	5.2	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
				45.72	28-Aug-16	28-Aug-16	14:00	14:50	0.83	0.38			-	0	0	0	0	0	-	0	1	0	0	2.6	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
				45.72	28-Aug-16	28-Aug-16	15:05	15:50	0.75	0.34			-	0	0	0	0	0	-	1	0	0	0	2.9	-	0	0	0	0	0	-	0	1	0	1	2.9	-	-	-
	SC-GN-17	625929	5458559	45.72	28-Aug-16	28-Aug-16	13:05	13:50	0.75	0.34	4.0	6.0	-	0	0	0	0	0	-	7	1	0	0	23	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
				45.72	28-Aug-16	28-Aug-16	13:55	14:40	0.75	0.34			-	0	0	0	0	0	-	2	0	0	0	5.8	-	0	0	0	0	0	-	1	0	0	1	2.9	-	-	-
	SC-GN-18	625948	5458526	22.86	28-Aug-16	28-Aug-16	13:15	14:10	0.92	0.21	3.0	5.0	0	-	-	-	0	0	2	-	-	-	0	9.5	2	-	-	-	0	9.5	1	-	-	-	1	4.8	0	0	0
				22.86	28-Aug-16	28-Aug-16	14:15	14:55	0.67	0.15			0	-	-	-	0	0	0	-	-	-	0	0	0	-	-	-	0	0	0	-	-	-	0	0	0	0	0
				22.86	28-Aug-16	28-Aug-16	15:05	15:45	0.67	0.15			1	-	-	-	1	7	0	-	-	-	0	0	0	-	-	-	0	0	0	-	-	-	0	0	0	0	0
	SC-GN-19	625974	5458415	45.72	28-Aug-16	28-Aug-16	13:15	14:05	0.83	0.38	4.0	6.5	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	SC-GN-20	625889	5458523	45.72	28-Aug-16	28-Aug-16	14:15	15:00	0.75	0.34	3.0	5.5	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
				45.72	28-Aug-16	28-Aug-16	15:00	15:40	0.67	0.30			-	0	0	0	0	0	-	3	1	0	0	13	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	TOTAL								**25**	**9.8**	**-**	**-**	**2**	**2**	**0**	**0**	**4**	**0.55**	**13**	**33**	**12**	**0**	**0**	**6.0**	**3**	**2**	**0**	**0**	**0**	**0.59**	**4**	**5**	**1**	**0**	**10**	**1.2**	**3**	**0**	**1.6**
Elk River	ER-GN-01	631833	5446730	45.72	23-Aug-16	23-Aug-16	10:55	11:25	0.50	0.23	5.0	6.0	-	0	0	0	0	0	-	0	1	0	0	4.4	-	0	0	0	0	0	-	1	0	0	1	4.4	-	-	-
				45.72	23-Aug-16	23-Aug-16	11:35	12:20	0.75	0.34			-	0	0	0	0	0	-	0	1	0	0	2.9	-	1	0	0	0	2.9	-	0	0	1	1	2.9	-	-	-
				45.72	23-Aug-16	23-Aug-16	12:30	13:20	0.83	0.38			-	0	0	0	0	0	-	0	0	0	0	0	-	3	0	0	0	7.9	-	0	0	2	2	5.2	-	-	-
				45.72	23-Aug-16	23-Aug-16	13:35	14:05	0.50	0.23			-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	ER-GN-02	631684	5447068	45.72	23-Aug-16	23-Aug-16	11:05	11:40	0.58	0.27	4.0	6.0	-	0	0	0	0	0	-	1	1	0	0	7.5	-	1	0	0	0	3.7	-	1	0	1	2	7.5	-	-	-
				45.72	23-Aug-16	23-Aug-16	11:55	12:10	0.25	0.11			-	0	0	0	0	0	-	0	0	0	0	0.0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	ER-GN-03	631854	5446715	45.72	23-Aug-16	23-Aug-16	12:15	12:55	0.67	0.30	4.0	5.5	-	0	0	0	0	0	-	0	3	0	0	9.8	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	ER-GN-04	631915	5447052	45.72	23-Aug-16	23-Aug-16	13:00	13:45	0.75	0.34	5.0	6.0	-	0	0	0	0	0	-	0	0	0	0	0.0	-	1	0	0	0	2.9	-	0	0	0	0	0	-	-	-
	ER-GN-05	631942	5446804	22.86	23-Aug-16	23-Aug-16	11:10	12:00	0.83	0.19	6.0	5.0	1	-	-	-	1	5.2	3	-	-	-	0	16	1	-	-	-	0	5.2	1	-	-	-	1	5.2	0	0	0
				22.86	23-Aug-16	23-Aug-16	12:10	12:40	0.50	0.11			1	-	-	-	1	8.7	0	-	-	-	0	0	0	-	-	-	-	0	0	0	-	-	-	-	0	0	0	0
	ER-GN-06	632019	5446804	22.86	23-Aug-16	23-Aug-16	12:50	13:40	0.83	0.19	6.0	5.5	0	-	-	-	0	0	0	-	-	-	0	0	0	-	-	-	0	0	0	-	-	-	0	0	0	0	0
	ER-GN-07	631959	5446964	22.86	23-Aug-16	23-Aug-16	13:45	14:35	0.83	0.19	3.7	4.0	0	-	-	-	0	0	13	-	-	-	0	68	0	-	-	-	0	0	0	-	-	-	0	0	0	0	0
	ER-GN-08	631592	5447131	45.72	28-Aug-16	28-Aug-16	16:30	17:05	0.58	0.27	5.0	6.5	-	0	0	0	0	0	-	1	0	0	0	3.7	-	1	0	0	0	3.7	-	0	0	0	0	0	-	-	-
	ER-GN-09	631660	5447099	45.72	28-Aug-16	28-Aug-16	16:30	17:15	0.75	0.34	3.5	4.0	-	0	0	0	0	0	-	0	0	0	0	0	-	1	0	0	0	2.9	-	0	1	0	1	2.9	-	-	-
	ER-GN-10	631732	5447102	45.72	28-Aug-16	28-Aug-16	16:35	17:35	1.0	0.46	4.0	5.0	-	0	0	0	0	0	-	0	2	0	0	4.4	-	1	0	0	0	2.2	-	0	0	1	1	2.2	-	-	-
	ER-GN-11	631696	5447094	22.86	28-Aug-16	28-Aug-16	16:35	17:25	0.83	0.19	5.5	6.5	8	-	-	-	8	42	0	-	-	-	0	0	1	-	-	-	0	5.2	1	-	-	-	1	5.2	0	0	0
	TOTAL								**11**	**4.2**	**-**	**-**	**10**	**0**	**0**	**0**	**10**	**3.5**	**16**	**2**	**8**	**0**	**0**	**7.3**	**2**	**9**	**0**	**0**	**0**	**2.3**	**2**	**2**	**1**	**5**	**10**	**2.2**	**0**	**0**	**0**

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.11: Gill Net Catch Records from Koocanusa Reservoir, August 2016

Area	Station	Location (11U, NAD83)		Net Length	Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (m*hrs/ 100 m)	Depth Range (m)		Kokanee						Largescale Sucker						Mountain Whitefish						Northern Pikeminnow						Yellow Perch			
													Catch				Mortalities/ Sacrificed	CPUE [a]	Catch				Mortalities/ Sacrificed	CPUE [a]	Catch				Mortalities/ Sacrificed	CPUE [a]	Catch				Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
		Easting	Northing										2.5"	3"	4"	5"			2.5"	3"	4"	5"			2.5"	3"	4"	5"			2.5"	3"	4"	5"			2.5"		
Gold Creek	GC-GN-01	629257	5437156	45.72	23-Aug-16	23-Aug-16	15:50	16:25	0.58	0.27	4.5	8.3	-	0	0	0	0	0	-	1	0	0	0	3.7	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	GC-GN-02	628979	5437054	45.72	23-Aug-16	23-Aug-16	16:00	16:40	0.67	0.30	6.0	7.5	-	0	0	0	0	0	-	2	0	0	0	6.6	-	0	0	0	0	0	-	1	0	0	1	3.3	-	-	-
	GC-GN-03	628742	5437043	45.72	28-Aug-16	28-Aug-16	8:25	9:00	0.58	0.27	3.5	4.0	-	0	0	0	0	0	-	1	0	0	0	3.7	-	0	0	0	0	0	-	1	0	0	1	3.7	-	-	-
				45.72	28-Aug-16	28-Aug-16	9:05	9:55	0.83	0.38			-	0	0	0	0	0	-	1	0	0	0	2.6	-	0	0	0	0	0	-	1	0	0	1	2.6	-	-	-
				45.72	28-Aug-16	28-Aug-16	10:00	10:40	0.67	0.30			-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
				45.72	28-Aug-16	28-Aug-16	10:45	11:25	0.67	0.30			-	0	0	0	0	0	-	0	1	0	0	3.3	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	GC-GN-04	628826	5436907	45.72	28-Aug-16	28-Aug-16	8:30	9:25	0.92	0.42	6.3	5.2	-	0	0	0	0	0	-	1	0	0	0	2.4	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	GC-GN-05	628603	5437015	45.72	28-Aug-16	28-Aug-16	9:30	10:15	0.75	0.34	3.0	4.0	-	0	0	0	0	0	-	0	1	0	0	2.9	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	GC-GN-06	628565	5436733	45.72	28-Aug-16	28-Aug-16	10:20	11:00	0.67	0.30	3.0	4.0	-	0	0	0	0	0	-	2	0	0	0	6.6	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
				45.72	28-Aug-16	28-Aug-16	11:05	11:45	0.67	0.30			-	0	0	0	0	0	-	8	0	0	0	26	-	0	0	0	0	0	-	1	1	0	2	6.6	-	-	-
	GC-GN-07	628604	5436745	22.86	28-Aug-16	28-Aug-16	8:35	9:35	1.0	0.23	3.0	4.0	0	-	-	-	0	0	17	-	-	-	0	74	0	-	-	-	0	0	3	-	-	-	3	13	0	0	0
				22.86	28-Aug-16	28-Aug-16	11:05	12:00	0.92	0.21			0	-	-	-	0	0	8	-	-	-	0	38	0	-	-	-	0	0	2	-	-	-	2	9.5	0	0	0
	GC-GN-08	628711	5436693	45.72	28-Aug-16	28-Aug-16	8:50	9:45	0.92	0.42	4.0	5.0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	GC-GN-09	628604	5436745	45.72	28-Aug-16	28-Aug-16	9:50	10:30	0.67	0.30	3.5	4.5	-	0	0	0	0	0	-	3	0	1	0	13.1	-	0	0	0	0	0	-	1	0	0	1	3.3	-	-	-
				45.72	28-Aug-16	28-Aug-16	10:40	11:15	0.58	0.27			-	0	0	0	0	0	-	0	1	0	0	3.7	-	0	0	0	0	0	-	0	0	0	0	0	-	-	-
	TOTAL								**11.1**	**4.6**	**-**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**19**	**3**	**1**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**5**	**1**	**0**	**11**	**2.8**	**0**	**0**	**0**

[a] CPUE = # of fish caught / effort used, expressed as # of fish per 100m hr.

Table F.12: Gill Net Catch Records from Koocanusa Reservoir, April and August 2016

Area	Date	Fishing Hours (hrs)	Effort (m*hrs /100 m)	All Species			Bull Trout			Kokanee [b]			Largescale Sucker [b]			Longnose Sucker			Mountain Whitefish			Northern Pikeminnow [b]			Peamouth Chub [b]			Rainbow Trout [b]			Redside Shiner [b]			Westslope Cutthroat Trout			Yellow Perch [b]		
				Total Caught	Mortalities [c]	Percent Mortalities (%)	Total Caught	Mortalities [c]	CPUE [a]	Total Caught	Sacrificed	CPUE [a]	Total Caught	Sacrificed	CPUE [a]	Total Caught	Mortalities [c]	CPUE [a]	Total Caught	Mortalities [c]	CPUE [a]	Total Caught	Sacrificed	CPUE [a]	Total Caught	Sacrificed	CPUE [a]	Total Caught	Sacrificed	CPUE [a]	Total Caught	Sacrificed	CPUE*	Total Caught	Mortalities [c]	CPUE [a]	Total Caught	Sacrificed	CPUE [a]
Sand Creek	Apr-16	60	23	814	1	0.12	8	0	0.38	1	0	0.045	55	5	2.4	1	0	0.088	0	0	0	84	27	4.3	567	68	46	4	3	0.15	89	88	9.5	1	1	0.015	4	4	0.088
	Aug-16	25	9.8	80	0	0	-	-	-	4	4	0.55	58	0	6.0	-	-	-	5	0	0.59	10	10	1.2	-	-	-	-	-	-	-	-	-	-	-	-	3	0	1.6
Elk River	Apr-16	71	27	449	5	1.1	13	4	1.1	4	4	0.28	38	11	2.3	0	0	0	0	0	0	137	55	10	177	73	19	2	0	0.057	73	45	34	2	1	0.11	3	3	0.16
	Aug-16	11	4.2	57	0	0	-	-	-	10	10	3.5	26	0	7.3	-	-	-	11	0	2.3	10	10	2.2	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
Gold Creek	Apr-16	144	51	612	8	1.3	8	7	0.15	0	0	0	152	40	3.4	0	0	0	2	1	0.052	105	41	2.6	242	106	6.2	4	4	0.12	62	62	9.9	3	0	0.056	34	22	0.87
	Aug-16	11	4.6	59	0	0	-	-	-	0	0	0	48	0	12	-	-	-	0	0	0	11	11	2.8	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
Total		**323**	**120**	**2,071**	**14**	**0.68**	**29**	**11**	**0.56**	**19**	**18**	**0.73**	**377**	**56**	**5.6**	**1**	**0**	**0.029**	**18**	**1**	**0.49**	**357**	**154**	**3.9**	**986**	**247**	**24**	**10**	**7**	**0.11**	**224**	**195**	**18**	**6**	**2**	**0.062**	**44**	**29**	**0.45**

[a] Total catch-per-unit-effort (CPUE) is the number of fish caught / effort used, expressed as number of fish per 100 m hr.

[b] Sacrificed for lethal sampling program.

[c] Mortalities are only the fish that died by accident (incidental mortalities)

Hoop Net

Table F.13: Hoop Net Records for Fish Caught in Koocanusa Reservoir, February 2014

Area	Station	Size	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Bull Trout			Burbot			Northern Pikeminnow			Peamouth Chub			Pumpkinseed			Redside Shiner			Yellow Perch		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Sand Creek	SC-HN1	medium	625534	5460432	17-Feb-14	18-Feb-14	9:00	16:30	31.50	6.8	-	1.31	0	0	0.00	0	0	0.00	1	0	0.76	2	0	1.52	0	0	0.00	0	0	0.00	0	0	0.00
					18-Feb-14	20-Feb-14	16:30	15:00	46.50			1.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN2	medium	625510	5460337	17-Feb-14	18-Feb-14	9:20	16:45	31.42	10.3	-	1.31	0	0	0.00	0	0	0.00	3	2	2.29	8	0	6.11	1	0	0.76	0	0	0.00	0	0	0.00
					18-Feb-14	20-Feb-14	16:45	14:45	46.00			1.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN3	medium	625520	5460194	17-Feb-14	18-Feb-14	9:30	17:00	31.50	8.3	-	1.31	0	0	0.00	1	0	0.76	0	0	0.00	1	0	0.76	0	0	0.00	1	0	0.76	0	0	0.00
					18-Feb-14	20-Feb-14	17:00	14:30	45.50			1.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**232.42**	**-**	**-**	**9.68**	**0**	**0**	**0.00**	**1**	**0**	**0.10**	**4**	**2**	**0.41**	**11**	**0**	**1.14**	**1**	**0**	**0.10**	**1**	**0**	**0.10**	**0**	**0**	**0.00**
Oestriech Road	OR-HN1	small	628537	5451617	15-Feb-14	17-Feb-14	10:15	10:00	47.75	10.7	10.8	1.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	10:00	14:20	28.33			1.18	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	OR-HN2	small	628593	5451638	15-Feb-14	17-Feb-14	22:30	10:10	35.67	8.1	-	1.49	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	10:10	14:25	28.25			1.18	1	0	0.85	1	0	0.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	OR-HN3	small	628610	5451540	15-Feb-14	17-Feb-14	11:00	10:20	47.33	11.5	-	1.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	10:20	14:45	28.42			1.18	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**215.75**	**-**	**-**	**8.99**	**1**	**0**	**0.11**	**1**	**0**	**0.11**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**
Elk River	EC-HN1	small	626905	5446409	16-Feb-14	17-Feb-14	11:00	16:45	29.75	13.2	-	1.24	0	0	0.00	0	0	0.00	1	1	0.81	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	16:45	13:45	21.00			0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Feb-14	20-Feb-14	13:45	12:00	46.25			1.93	0	0	0.00	0	0	0.00	3	0	1.56	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	EC-HN2	small	626935	5446527	16-Feb-14	17-Feb-14	11:25	16:55	29.50	12.0	-	1.23	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	16:55	13:30	20.58			0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Feb-14	20-Feb-14	13:30	12:20	46.83			1.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	EC-HN3	small	626905	5446409	16-Feb-14	17-Feb-14	11:45	17:00	29.25	16.3	-	1.22	0	0	0.00	0	0	0.00	1	1	0.82	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	17:00	13:25	20.42			0.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Feb-14	20-Feb-14	13:25	12:35	47.17			1.97	0	0	0.00	0	0	0.00	1	0	0.51	1	0	0.51	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN1	small	627953	5447921	15-Feb-14	17-Feb-14	9:05	16:15	55.17	12.7	-	2.30	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	16:15	12:30	20.25			0.84	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN2	small	628001	5447898	15-Feb-14	17-Feb-14	9:35	16:10	54.58	8.1	-	2.27	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	16:10	12:30	20.33			0.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN3	small	628080	5447857	15-Feb-14	17-Feb-14	9:50	16:30	54.67	12.6	12.7	2.28	0	0	0.00	0	0	0.00	1	0	0.44	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Feb-14	18-Feb-14	16:30	12:40	20.17			0.84	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					23-Feb-14	24-Feb-14	9:00	17:15	32.25			1.34	0	0	0.00	0	0	0.00	1	0	0.74	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**548.17**	**-**	**-**	**22.84**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**8**	**2**	**0.35**	**1**	**0**	**0.04**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**
Gold Creek	GC-HN1	medium	629332	5436966	17-Feb-14	18-Feb-14	12:00	10:00	22.00	3.8	4.0	0.92	0	0	0.00	0	0	0.00	1	0	1.09	1	0	1.09	0	0	0.00	0	0	0.00	0	0	0.00
					18-Feb-14	20-Feb-14	10:00	11:00	49.00			2.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN2	medium	629452	5436997	17-Feb-14	18-Feb-14	12:30	9:30	21.00	5.5	5.8	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Feb-14	20-Feb-14	9:30	11:10	49.67			2.07	0	0	0.00	0	0	0.00	0	0	0.00	13	0	6.28	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN3	medium	629461	5436861	17-Feb-14	18-Feb-14	1:00	9:45	32.75	4.5	4.7	1.36	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Feb-14	20-Feb-14	9:45	11:15	49.50			2.06	0	0	0.00	0	0	0.00	3	0	1.45	9	0	4.36	0	0	0.00	0	0	0.00	1	0	0.48
					23-Feb-14	24-Feb-14	10:30	15:20	28.83			1.20	0	0	0.00	0	0	0.00	1	0	0.83	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**252.75**	**-**	**-**	**10.53**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**5**	**0**	**0.47**	**23**	**0**	**2.18**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**1**	**0**	**0.09**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.14: **Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2014**

Area	Station	Size	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Bull Trout			Burbot			Juvenile Trout			Largescale Sucker			Mountain Whitefish			Northern Pikeminnow			Peamouth Chub		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Sand Creek	SC-SH1	small	625363	5461138	10-Apr-14	11-Apr-14	14:00	12:10	22.17	1.5	-	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.08
					11-Apr-14	12-Apr-14	12:10	10:30	22.33			0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.07
	SC-SH2	small	625147	5461056	10-Apr-14	11-Apr-14	14:05	12:05	22.00	1.5	-	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.09
					11-Apr-14	12-Apr-14	12:05	10:45	22.67			0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.06
	SC-SH3	small	625183	5461486	10-Apr-14	11-Apr-14	14:15	10:55	20.67	1.5	-	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.16	2	2	2.32
					11-Apr-14	12-Apr-14	10:55	10:35	23.67			0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.01
	SC-SH4	small	624918	5461748	10-Apr-14	11-Apr-14	14:20	11:00	20.67	1.0	-	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH5	small	624979	5461292	10-Apr-14	11-Apr-14	14:35	11:40	21.08	0.8	-	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.28
	SC-SH6	small	625306	5460936	11-Apr-14	12-Apr-14	12:30	11:00	22.50	1.0	-	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.07
	SC-SH7	small	625160	5461020	11-Apr-14	12-Apr-14	12:35	10:50	22.25	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH8	small	625529	5460486	12-Apr-14	14-Apr-14	13:25	11:30	46.08	1.0	-	1.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.52
	SC-SH9	small	625544	546055	12-Apr-14	13-Apr-14	13:30	12:28	22.97	1.5	-	0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:28	11:15	22.78			0.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH10	small	625523	5460626	12-Apr-14	13-Apr-14	13:35	12:25	22.83	1.0	-	0.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.05	1	1	1.05
					13-Apr-14	14-Apr-14	12:25	10:42	22.28			0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH11	small	625516	5460704	12-Apr-14	13-Apr-14	13:50	12:22	22.53	1.0	-	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:22	10:40	22.30			0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH12	small	625492	5460750	12-Apr-14	13-Apr-14	13:55	12:20	22.42	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.07
					13-Apr-14	14-Apr-14	12:20	10:35	22.25			0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH13	small	625472	5459686	14-Apr-14	15-Apr-14	10:55	10:20	23.42	1.0	-	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.05
	SC-SH14	small	625395	5459525	14-Apr-14	15-Apr-14	11:00	10:18	23.30	1.8	-	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.03
					15-Apr-14	16-Apr-14	10:18	10:25	24.12			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH15	small	625251	5459247	14-Apr-14	15-Apr-14	11:05	10:15	23.17	1.0	-	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	10:15	10:20	24.08			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH16	small	625432	5459386	14-Apr-14	15-Apr-14	11:45	10:10	22.42	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.07
					15-Apr-14	16-Apr-14	10:10	10:17	24.12			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH17	small	625341	5459269	14-Apr-14	15-Apr-14	11:50	10:13	22.38	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.07
					15-Apr-14	16-Apr-14	10:13	10:15	24.03			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH18	small	624984	5459134	16-Apr-14	17-Apr-14	12:20	10:05	21.75	1.0	-	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.10
					17-Apr-14	18-Apr-14	10:05	10:00	23.92			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH19	small	624943	5459179	16-Apr-14	17-Apr-14	12:25	10:05	21.67	1.0	-	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.11
					17-Apr-14	18-Apr-14	10:05	10:05	24.00			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH20	small	625261	5459240	16-Apr-14	17-Apr-14	12:35	9:30	20.92	1.0	-	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.15
					17-Apr-14	18-Apr-14	9:30	9:50	24.33			1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH21	small	625120	5459166	16-Apr-14	17-Apr-14	12:45	9:55	21.17	1.0	-	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH22	small	625201	5459180	17-Apr-14	18-Apr-14	9:50	9:35	23.75	1.0	-	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH23	small	624980	5459058	17-Apr-14	18-Apr-14	10:00	9:45	23.75	1.0	-	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH1	large	624869	5461458	10-Apr-14	11-Apr-14	12:35	11:45	23.17	1.0	-	0.97	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.04	0	0	0.00	1	1	1.04	1	1	1.04
	SC-LH2	large	624781	5461605	10-Apr-14	11-Apr-14	12:45	11:10	22.42	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	5	5	5.35
	SC-LH3	large	624925	5461123	11-Apr-14	12-Apr-14	11:30	11:10	23.67	1.0	-	0.99	1	0	1.01	0	0	0.00	0	0	0.00	3	0	3.04	2	0	2.03	0	0	0.00	2	2	2.03
	SC-LH4	large	625180	5461115	11-Apr-14	12-Apr-14	12:00	12:00	24.00	1.0	-	1.00	0	0	0.00	0	0	0.00	0	0	0.00	3	0	3.00	0	0	0.00	1	0	1.00	2	0	2.00
	SC-LH5	large	623376	5461418	12-Apr-14	13-Apr-14	12:45	10:45	22.00	1.0	-	0.92	1	0	1.09	0	0	0.00	0	0	0.00	21	0	22.91	2	0	2.18	0	0	0.00	0	0	0.00
	SC-LH6	large	623398	5461375	12-Apr-14	13-Apr-14	13:00	12:00	23.00	1.0	-	0.96	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.04	1	1	1.04	2	2	2.09	0	0	0.00
					13-Apr-14	14-Apr-14	12:00	12:05	24.08			1.00	1	0	1.00	1	0	1.00	0	0	0.00	10	0	9.97	6	0	5.98	1	0	1.00	13	0	12.96
	SC-LH7	large	623369	5461325	13-Apr-14	14-Apr-14	11:50	12:50	25.00	2.5	-	1.04	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.96	1	0	0.96	0	0	0.00	0	0	0.00
	SC-LH8	large	623391	5461316	14-Apr-14	15-Apr-14	12:45	10:35	21.83	2.5	-	0.91	0	0	0.00	0	0	0.00	0	0	0.00	4	0	4.40	1	0	1.10	0	0	0.00	1	1	1.10
	SC-LH9	large	623367	5461287	14-Apr-14	15-Apr-14	13:05	10:50	21.75	2.5	-	0.91	0	0	0.00	0	0	0.00	1	0	1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	10:50	10:05	23.25			0.97	1	0	1.03	2	0	2.06	0	0	0.00	19	0	19.61	0	0	0.00	0	0	0.00	3	3	3.10
	SC-LH10	large	623511	5461235	15-Apr-14	16-Apr-14	11:05	11:05	24.00	2.5	-	1.00	0	0	0.00	0	0	0.00	0	0	0.00	3	0	3.00	1	0	1.00	0	0	0.00	0	0	0.00
	SC-LH11	large	625271	5459077	16-Apr-14	17-Apr-14	11:50	9:20	21.50	2.5	-	0.90	0	0	0.00	0	0	0.00	0	0	0.00	7	0	7.81	0	0	0.00	2	2	2.23	0	0	0.00
	SC-LH12	large	625218	5459123	16-Apr-14	17-Apr-14	12:00	9:25	21.42	1.0	-	0.89	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.12	5	5	5.60
					17-Apr-14	18-Apr-14	9:25	10:00	24.58			1.02	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.95	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH13	large	625230	5458960	17-Apr-14	18-Apr-14	10:20	9:40	23.33	1.5	-	0.97	0	0	0.00	0	0	0.00	0	0	0.00	9	0	9.26	0	0	0.00	1	0	1.03	1	1	1.03
	TOTAL								**1,231.73**	-	-	**51.32**	**4**	**0**	**0.08**	**3**	**0**	**0.06**	**1**	**0**	**0.02**	**84**	**1**	**1.64**	**14**	**1**	**0.27**	**11**	**8**	**0.21**	**54**	**37**	**1.05**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.14: **Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2014**

Area	Station	Size	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Bull Trout			Burbot			Juvenile Trout			Largescale Sucker			Mountain Whitefish			Northern Pikeminnow			Peamouth Chub		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Elk River	ER-SH1	small	629277	5447686	10-Apr-14	11-Apr-14	15:00	10:15	19.25	1.5	2.0	0.80	0	0	0.00	0	0	0.00	0	0	0.00	6	0	7.48	0	0	0.00	1	1	1.25	1	1	1.25
					11-Apr-14	12-Apr-14	10:15	12:35	26.33			1.10	0	0	0.00	0	0	0.00	0	0	0.00	5	0	4.56	0	0	0.00	1	1	0.91	3	3	2.73
					12-Apr-14	13-Apr-14	12:35	9:25	20.83			1.10	0	0	0.00	0	0	0.00	0	0	0.00	6	0	7.65	0	0	0.00	0	0	0.00	1	0	1.27
					13-Apr-14	14-Apr-14	9:25	13:15	27.83			0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.15
	ER-SH2	small	629267	5447798	10-Apr-14	11-Apr-14	15:30	10:20	18.83	1.0	1.2	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.27
					11-Apr-14	12-Apr-14	10:20	12:50	26.50			1.10	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.91	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH3	small	629098	5447797	11-Apr-14	12-Apr-14	9:45	12:20	26.58	2.5	3.0	1.11	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.90	0	0	0.00	0	0	0.00	4	4	3.61
					12-Apr-14	13-Apr-14	12:20	9:15	20.92			0.87	0	0	0.00	0	0	0.00	0	0	0.00	6	0	6.88	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	9:15	12:15	27.00			1.13	0	0	0.00	0	0	0.00	0	0	0.00	7	0	6.22	0	0	0.00	0	0	0.00	0	0	0.00
					14-Apr-14	15-Apr-14	12:15	9:15	21.00			0.88	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.29	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH4	small	629222	5447837	12-Apr-14	13-Apr-14	12:45	9:30	20.75	0.5	1.0	0.86	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.16	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	9:30	13:10	27.67			1.15	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH5	small	629009	5447756	14-Apr-14	15-Apr-14	13:10	9:30	20.33	1.3	1.5	0.85	0	0	0.00	0	0	0.00	0	0	0.00	3	0	3.54	0	0	0.00	0	0	0.00	2	2	2.36
					15-Apr-14	16-Apr-14	9:30	14:45	29.25			1.22	0	0	0.00	0	0	0.00	0	0	0.00	9	0	7.38	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH6	small	629129	5447736	14-Apr-14	15-Apr-14	13:25	9:30	20.08	1.6	2.0	0.84	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.39	0	0	0.00	0	0	0.00	6	6	7.17
					15-Apr-14	16-Apr-14	9:30	15:00	29.50			1.23	1	0	0.81	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH7	small	629014	5447587	15-Apr-14	16-Apr-14	10:30	14:20	27.83	2.2	2.5	1.16	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH8	small	628829	5447887	16-Apr-14	17-Apr-14	14:30	12:50	22.33	1.3	1.5	0.93	0	0	0.00	0	0	0.00	0	0	0.00	5	0	5.37	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH9	small	628892	5447832	16-Apr-14	18-Apr-14	15:00	15:15	48.25	1.5	1.6	2.01	0	0	0.00	0	0	0.00	0	0	0.00	4	0	1.99	0	0	0.00	1	0	0.50	1	0	0.50
	ER-SH10	small	628671	5447901	16-Apr-14	17-Apr-14	15:10	15:30	24.33	1.6	1.7	1.01	0	0	0.00	0	0	0.00	0	0	0.00	4	0	3.95	0	0	0.00	0	0	0.00	0	0	0.00
					17-Apr-14	18-Apr-14	15:30	14:35	23.08			0.96	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.04	0	0	0.00	0	0	0.00	0	0	0.00
					18-Apr-14	19-Apr-14	14:35	8:55	18.33			0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.04
	ER-SH11	small	628311	5448090	17-Apr-14	18-Apr-14	12:55	14:15	25.33	3.2	3.4	0.76	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.31	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH12	small	626954	5446764	17-Apr-14	18-Apr-14	14:00	13:00	23.00	1.8	1.6	1.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	1	1.89	0	0	0.00
	ER-SH13	small	627582	5447191	17-Apr-14	18-Apr-14	16:30	13:40	21.17	1.8	2.1	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	3	3.40	0	0	0.00
					18-Apr-14	19-Apr-14	13:40	10:30	20.83			0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	3	3.46
	ER-SH15	small	628097	5448156	18-Apr-14	19-Apr-14	14:30	10:00	19.50	2.0	2.2	0.81	0	0	0.00	2	0	2.46	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH16	small	628511	5447210	18-Apr-14	19-Apr-14	14:50	9:50	19.00	1.5	2.0	0.79	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.26	0	0	0.00	0	0	0.00	2	2	2.53
	ER-LH1	medium	629285	5447787	10-Apr-14	11-Apr-14	15:45	10:45	19.00	2.0	2.5	0.79	0	0	0.00	0	0	0.00	0	0	0.00	21	0	26.53	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH2	medium	629160	5447834	10-Apr-14	11-Apr-14	16:00	11:15	19.25	2.5	3.0	0.80	0	0	0.00	0	0	0.00	0	0	0.00	79	0	98.49	0	0	0.00	0	0	0.00	5	5	6.23
	ER-LH3	medium	629226	5447858	11-Apr-14	12-Apr-14	11:00	11:45	24.75	2.0	2.5	1.03	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.97	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH4	medium	629152	5447857	12-Apr-14	13-Apr-14	12:00	9:35	21.58	1.8	2.5	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	9:35	12:30	26.92			1.12	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.89
	ER-LH5	medium	629018	5447850	12-Apr-14	13-Apr-14	12:15	9:50	21.58	1.5	1.0	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.11	0	0	0.00
	ER-LH6	medium	629089	5447606	13-Apr-14	14-Apr-14	10:15	13:30	27.25	1.6	1.9	1.14	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH7	medium	628902	5447916	14-Apr-14	15-Apr-14	12:45	9:45	21.00	2.8	3.2	0.88	0	0	0.00	0	0	0.00	0	0	0.00	8	0	9.14	0	0	0.00	3	3	3.43	6	6	6.86
					15-Apr-14	16-Apr-14	9:45	15:15	29.50			1.23	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.81	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH8	medium	628802	5447795	14-Apr-14	15-Apr-14	13:45	9:50	20.08	2.0	2.5	0.84	0	0	0.00	0	0	0.00	0	0	0.00	9	0	10.76	0	0	0.00	1	1	1.20	0	0	0.00
	ER-LH9	medium	628756	5447918	15-Apr-14	16-Apr-14	10:05	15:30	29.42	2.0	2.5	1.23	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.82	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH10	medium	628776	5448056	16-Apr-14	17-Apr-14	15:25	15:20	23.92	1.8	1.9	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH11	medium	628574	5448003	16-Apr-14	17-Apr-14	15:40	13:30	21.83	2.1	2.2	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH12	medium	628561	5447327	17-Apr-14	18-Apr-14	12:30	14:45	26.25	1.6	1.8	1.09	0	0	0.00	0	0	0.00	0	0	0.00	17	0	15.54	2	0	1.83	1	0	0.91	2	2	1.83
					18-Apr-14	19-Apr-14	14:45	9:45	19.00			0.79	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	1	2.53	15	15	18.95
	ER-LH13	medium	628979	5448091	17-Apr-14	18-Apr-14	13:35	14:25	24.83	1.1	1.3	1.03	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.93	0	0	0.00	5	5	4.83	4	3	3.87
					18-Apr-14	19-Apr-14	14:25	8:45	18.33			0.76	0	0	0.00	0	0	0.00	0	0	0.00	10	0	13.09	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH14	medium	626842	5446575	17-Apr-14	18-Apr-14	14:15	13:10	22.92	2.4	2.8	0.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Apr-14	19-Apr-14	13:10	10:45	21.58			0.90	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.11	0	0	0.00	1	0	1.11	1	1	1.11
	ER-LH15	medium	627479	5447170	17-Apr-14	18-Apr-14	14:47	10:30	19.72	1.5	2.0	0.82	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.22	0	0	0.00
					18-Apr-14	19-Apr-14	10:30	13:40	27.17			1.13	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.77	0	0	0.00	0	0	0.00	4	4	3.53
	TOTAL								**1,162**	**-**	**-**	**48.34**	**1**	**0**	**0.02**	**2**	**0**	**0.04**	**0**	**0**	**0.00**	**217**	**0**	**4.49**	**2**	**0**	**0.04**	**23**	**16**	**0.48**	**64**	**59**	**1.32**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.14: Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2014

Area	Station	Size	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Bull Trout			Burbot			Juvenile Trout			Largescale Sucker			Mountain Whitefish			Northern Pikeminnow			Peamouth Chub		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Gold Creek	GC-SH1	small	629513	5436991	10-Apr-14	11-Apr-14	12:00	14:30	26.50	1.2	1.5	1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.91
					11-Apr-14	12-Apr-14	14:30	10:05	19.58			0.82	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.23	1	1	1.23
					12-Apr-14	13-Apr-14	10:05	11:45	25.67			1.07	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.94	0	0	0.00
	GC-SH2	small	629508	5437016	10-Apr-14	11-Apr-14	12:15	14:40	26.42	1.0	1.3	1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					11-Apr-14	12-Apr-14	14:40	10:15	19.58			0.82	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.23	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH3	small	629687	5436889	12-Apr-14	13-Apr-14	10:30	11:50	25.33	1.5	2.2	1.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.95
					13-Apr-14	14-Apr-14	11:50	9:20	21.50			0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH4	small	629715	5437265	13-Apr-14	14-Apr-14	12:30	9:30	21.00	2.2	2.3	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.29	1	1	1.14
					14-Apr-14	15-Apr-14	9:30	12:15	26.75			1.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	1.79	1	1	0.90
					15-Apr-14	16-Apr-14	12:15	9:45	21.50			0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.12	0	0	0.00
	GC-SH5	small	629784	5437319	14-Apr-14	15-Apr-14	9:30	11:45	26.25	2.0	2.5	1.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.91	0	0	0.00
	GC-SH6	small	629751	5437113	15-Apr-14	16-Apr-14	12:20	10:30	22.17	2.3	2.5	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH7	small	630094	5437441	16-Apr-14	17-Apr-14	9:50	10:15	24.42	2.2	2.5	1.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	1	2.95	0	0	0.00
	GC-SH8	small	630214	5436886	16-Apr-14	17-Apr-14	10:00	10:45	24.75	5.7	6.0	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.94	0	0	0.00
	GC-LH1	medium	629607	5437033	10-Apr-14	11-Apr-14	12:30	2:15	13.75	1.8	2.0	0.57	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-LH2	medium	629670	5437071	10-Apr-14	11-Apr-14	12:45	13:45	25.00	3.5	4.2	1.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	1.92
	GC-LH3	medium	629646	5436958	11-Apr-14	12-Apr-14	14:00	10:00	20.00	2.0	2.8	0.83	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.40	12	12	14.40
					12-Apr-14	13-Apr-14	10:00	12:00	26.00			1.08	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.92	1	1	0.92
					13-Apr-14	14-Apr-14	12:00	9:45	21.75			0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.10	9	9	9.93
					14-Apr-14	15-Apr-14	9:45	12:00	26.25			1.09	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.91	0	0	0.00	2	2	1.83	3	3	2.74
					15-Apr-14	16-Apr-14	12:00	9:30	21.50			0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-LH4	medium	629637	5436976	12-Apr-14	13-Apr-14	9:45	12:15	26.50	2.0	2.5	1.10	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.91	0	0	0.00	2	0	1.81	2	2	1.81
					13-Apr-14	14-Apr-14	12:15	10:00	21.75			0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.21	3	2	3.31
	GC-LH5	medium	629691	5436982	14-Apr-14	15-Apr-14	10:15	11:50	25.58	2.0	2.5	1.07	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.94
					15-Apr-14	16-Apr-14	11:50	10:00	22.17			0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.08	0	0	0.00
	GC-LH6	medium	629903	5437095	16-Apr-14	17-Apr-14	9:38	10:00	24.37	2.5	2.9	1.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.98	0	0	0.00
	GC-LH7	medium	630568	5437240	16-Apr-14	17-Apr-14	11:00	10:00	23.00	4.5	6.0	0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**629.03**	**-**	**-**	**26.21**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**3**	**0**	**0.11**	**0**	**0**	**0.00**	**25**	**13**	**0.95**	**38**	**37**	**1.45**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.14: Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2014

Area	Station	Size	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Pumpkinseed			Rainbow Trout			Redside Shiner			Slimy Sculpin			Westslope Cutthroat Trout			Yellow Perch		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Sand Creek	SC-SH1	small	625363	5461138	10-Apr-14	11-Apr-14	14:00	12:10	22.17	1.5	-	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					11-Apr-14	12-Apr-14	12:10	10:30	22.33			0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH2	small	625147	5461056	10-Apr-14	11-Apr-14	14:05	12:05	22.00	1.5	-	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					11-Apr-14	12-Apr-14	12:05	10:45	22.67			0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH3	small	625183	5461486	10-Apr-14	11-Apr-14	14:15	10:55	20.67	1.5	-	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.16
					11-Apr-14	12-Apr-14	10:55	10:35	23.67			0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH4	small	624918	5461748	10-Apr-14	11-Apr-14	14:20	11:00	20.67	1.0	-	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH5	small	624979	5461292	10-Apr-14	11-Apr-14	14:35	11:40	21.08	0.8	-	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH6	small	625306	5460936	11-Apr-14	12-Apr-14	12:30	11:00	22.50	1.0	-	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH7	small	625160	5461020	11-Apr-14	12-Apr-14	12:35	10:50	22.25	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH8	small	625529	5460486	12-Apr-14	14-Apr-14	13:25	11:30	46.08	1.0	-	1.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH9	small	625544	546055	12-Apr-14	13-Apr-14	13:30	12:28	22.97	1.5	-	0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:28	11:15	22.78			0.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH10	small	625523	5460626	12-Apr-14	13-Apr-14	13:35	12:25	22.83	1.0	-	0.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:25	10:42	22.28			0.93	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.08	0	0	0.00	0	0	0.00
	SC-SH11	small	625516	5460704	12-Apr-14	13-Apr-14	13:50	12:22	22.53	1.0	-	0.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:22	10:40	22.30			0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH12	small	625492	5460750	12-Apr-14	13-Apr-14	13:55	12:20	22.42	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:20	10:35	22.25			0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH13	small	625472	5459686	14-Apr-14	15-Apr-14	10:55	10:20	23.42	1.0	-	0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH14	small	625395	5459525	14-Apr-14	15-Apr-14	11:00	10:18	23.30	1.8	-	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	10:18	10:25	24.12			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH15	small	625251	5459247	14-Apr-14	15-Apr-14	11:05	10:15	23.17	1.0	-	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	10:15	10:20	24.08			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH16	small	625432	5459386	14-Apr-14	15-Apr-14	11:45	10:10	22.42	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	10:10	10:17	24.12			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH17	small	625341	5459269	14-Apr-14	15-Apr-14	11:50	10:13	22.38	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	10:13	10:15	24.03			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH18	small	624984	5459134	16-Apr-14	17-Apr-14	12:20	10:05	21.75	1.0	-	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Apr-14	18-Apr-14	10:05	10:00	23.92			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH19	small	624943	5459179	16-Apr-14	17-Apr-14	12:25	10:05	21.67	1.0	-	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Apr-14	18-Apr-14	10:05	10:05	24.00			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH20	small	625261	5459240	16-Apr-14	17-Apr-14	12:35	9:30	20.92	1.0	-	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Apr-14	18-Apr-14	9:30	9:50	24.33			1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH21	small	625120	5459166	16-Apr-14	17-Apr-14	12:45	9:55	21.17	1.0	-	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH22	small	625201	5459180	17-Apr-14	18-Apr-14	9:50	9:35	23.75	1.0	-	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-SH23	small	624980	5459058	17-Apr-14	18-Apr-14	10:00	9:45	23.75	1.0	-	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH1	large	624869	5461458	10-Apr-14	11-Apr-14	12:35	11:45	23.17	1.0	-	0.97	1	0	1.04	0	0	0.00	2	0	2.07	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH2	large	624781	5461605	10-Apr-14	11-Apr-14	12:45	11:10	22.42	1.0	-	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH3	large	624925	5461123	11-Apr-14	12-Apr-14	11:30	11:10	23.67	1.0	-	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.03
	SC-LH4	large	625180	5461115	11-Apr-14	12-Apr-14	12:00	12:00	24.00	1.0	-	1.00	0	0	0.00	0	0	0.00	2	0	2.00	0	0	0.00	0	0	0.00	7	0	7.00
	SC-LH5	large	623376	5461418	12-Apr-14	13-Apr-14	12:45	10:45	22.00	1.0	-	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH6	large	623398	5461375	12-Apr-14	13-Apr-14	13:00	12:00	23.00	1.0	-	0.96	0	0	0.00	0	0	0.00	1	1	1.04	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:00	12:05	24.08			1.00	0	0	0.00	0	0	0.00	5	0	4.98	0	0	0.00	1	0	1.00	0	0	0.00
	SC-LH7	large	623369	5461325	13-Apr-14	14-Apr-14	11:50	12:50	25.00	2.5	-	1.04	0	0	0.00	1	0	0.96	1	0	0.96	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH8	large	623391	5461316	14-Apr-14	15-Apr-14	12:45	10:35	21.83	2.5	-	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH9	large	623367	5461287	14-Apr-14	15-Apr-14	13:05	10:50	21.75	2.5	-	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	10:50	10:05	23.25			0.97	0	0	0.00	2	2	2.06	1	0	1.03	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH10	large	623511	5461235	15-Apr-14	16-Apr-14	11:05	11:05	24.00	2.5	-	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH11	large	625271	5459077	16-Apr-14	17-Apr-14	11:50	9:20	21.50	2.5	-	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH12	large	625218	5459123	16-Apr-14	17-Apr-14	12:00	9:25	21.42	1.0	-	0.89	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Apr-14	18-Apr-14	9:25	10:00	24.58			1.02	0	0	0.00	0	0	0.00	1	0	0.98	0	0	0.00	0	0	0.00	0	0	0.00
	SC-LH13	large	625230	5458960	17-Apr-14	18-Apr-14	10:20	9:40	23.33	1.5	-	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**1,231.73**	**-**	**-**	**51.32**	**1**	**0**	**0.02**	**3**	**2**	**0.06**	**13**	**1**	**0.25**	**1**	**0**	**0.02**	**1**	**0**	**0.02**	**10**	**0**	**0.19**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.14: Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2014

Area	Station	Size	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Pumpkinseed			Rainbow Trout			Redside Shiner			Slimy Sculpin			Westslope Cutthroat Trout			Yellow Perch		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Elk River	ER-SH1	small	629277	5447686	10-Apr-14	11-Apr-14	15:00	10:15	19.25	1.5	2.0	0.80	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					11-Apr-14	12-Apr-14	10:15	12:35	26.33			1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					12-Apr-14	13-Apr-14	12:35	9:25	20.83			1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	9:25	13:15	27.83			0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH2	small	629267	5447798	10-Apr-14	11-Apr-14	15:30	10:20	18.83	1.0	1.2	0.78	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					11-Apr-14	12-Apr-14	10:20	12:50	26.50			1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH3	small	629098	5447797	11-Apr-14	12-Apr-14	9:45	12:20	26.58	2.5	3.0	1.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					12-Apr-14	13-Apr-14	12:20	9:15	20.92			0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	9:15	12:15	27.00			1.13	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					14-Apr-14	15-Apr-14	12:15	9:15	21.00			0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH4	small	629222	5447837	12-Apr-14	13-Apr-14	12:45	9:30	20.75	0.5	1.0	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	9:30	13:10	27.67			1.15	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH5	small	629009	5447756	14-Apr-14	15-Apr-14	13:10	9:30	20.33	1.3	1.5	0.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	9:30	14:45	29.25			1.22	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH6	small	629129	5447736	14-Apr-14	15-Apr-14	13:25	9:30	20.08	1.6	2.0	0.84	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	9:30	15:00	29.50			1.23	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH7	small	629014	5447587	15-Apr-14	16-Apr-14	10:30	14:20	27.83	2.2	2.5	1.16	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH8	small	628829	5447887	16-Apr-14	17-Apr-14	14:30	12:50	22.33	1.3	1.5	0.93	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH9	small	628892	5447832	16-Apr-14	18-Apr-14	15:00	15:15	48.25	1.5	1.6	2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH10	small	628671	5447901	16-Apr-14	17-Apr-14	15:10	15:30	24.33	1.6	1.7	1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					17-Apr-14	18-Apr-14	15:30	14:35	23.08			0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Apr-14	19-Apr-14	14:35	8:55	18.33			0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH11	small	628311	5448090	17-Apr-14	18-Apr-14	12:55	14:15	25.33	3.2	3.4	0.76	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH12	small	626954	5446764	17-Apr-14	18-Apr-14	14:00	13:00	23.00	1.8	1.6	1.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.95
	ER-SH13	small	627582	5447191	17-Apr-14	18-Apr-14	16:30	13:40	21.17	1.8	2.1	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.13
					18-Apr-14	19-Apr-14	13:40	10:30	20.83			0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH15	small	628097	5448156	18-Apr-14	19-Apr-14	14:30	10:00	19.50	2.0	2.2	0.81	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-SH16	small	628511	5447210	18-Apr-14	19-Apr-14	14:50	9:50	19.00	1.5	2.0	0.79	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH1	medium	629285	5447787	10-Apr-14	11-Apr-14	15:45	10:45	19.00	2.0	2.5	0.79	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH2	medium	629160	5447834	10-Apr-14	11-Apr-14	16:00	11:15	19.25	2.5	3.0	0.80	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH3	medium	629226	5447858	11-Apr-14	12-Apr-14	11:00	11:45	24.75	2.0	2.5	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH4	medium	629152	5447857	12-Apr-14	13-Apr-14	12:00	9:35	21.58	1.8	2.5	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	9:35	12:30	26.92			1.12	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH5	medium	629018	5447850	12-Apr-14	13-Apr-14	12:15	9:50	21.58	1.5	1.0	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH6	medium	629089	5447606	13-Apr-14	14-Apr-14	10:15	13:30	27.25	1.6	1.9	1.14	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH7	medium	628902	5447916	14-Apr-14	15-Apr-14	12:45	9:45	21.00	2.8	3.2	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	9:45	15:15	29.50			1.23	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH8	medium	628802	5447795	14-Apr-14	15-Apr-14	13:45	9:50	20.08	2.0	2.5	0.84	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH9	medium	628756	5447918	15-Apr-14	16-Apr-14	10:05	15:30	29.42	2.0	2.5	1.23	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH10	medium	628776	5448056	16-Apr-14	17-Apr-14	15:25	15:20	23.92	1.8	1.9	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH11	medium	628574	5448003	16-Apr-14	17-Apr-14	15:40	13:30	21.83	2.1	2.2	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH12	medium	628561	5447327	17-Apr-14	18-Apr-14	12:30	14:45	26.25	1.6	1.8	1.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Apr-14	19-Apr-14	14:45	9:45	19.00			0.79	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH13	medium	628979	5448091	17-Apr-14	18-Apr-14	13:35	14:25	24.83	1.1	1.3	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Apr-14	19-Apr-14	14:25	8:45	18.33			0.76	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH14	medium	626842	5446575	17-Apr-14	18-Apr-14	14:15	13:10	22.92	2.4	2.8	0.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Apr-14	19-Apr-14	13:10	10:45	21.58			0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-LH15	medium	627479	5447170	17-Apr-14	18-Apr-14	14:47	10:30	19.72	1.5	2.0	0.82	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					18-Apr-14	19-Apr-14	10:30	13:40	27.17			1.13	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.88
	TOTAL								**1,162**	**-**	**-**	**48.34**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**3**	**0**	**0.06**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.14: Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2014

Area	Station	Size	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Pumpkinseed			Rainbow Trout			Redside Shiner			Slimy Sculpin			Westslope Cutthroat Trout			Yellow Perch		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Gold Creek	GC-SH1	small	629513	5436991	10-Apr-14	11-Apr-14	12:00	14:30	26.50	1.2	1.5	1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					11-Apr-14	12-Apr-14	14:30	10:05	19.58			0.82	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					12-Apr-14	13-Apr-14	10:05	11:45	25.67			1.07	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH2	small	629508	5437016	10-Apr-14	11-Apr-14	12:15	14:40	26.42	1.0	1.3	1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					11-Apr-14	12-Apr-14	14:40	10:15	19.58			0.82	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH3	small	629687	5436889	12-Apr-14	13-Apr-14	10:30	11:50	25.33	1.5	2.2	1.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	11:50	9:20	21.50			0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH4	small	629715	5437265	13-Apr-14	14-Apr-14	12:30	9:30	21.00	2.2	2.3	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					14-Apr-14	15-Apr-14	9:30	12:15	26.75			1.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	12:15	9:45	21.50			0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH5	small	629784	5437319	14-Apr-14	15-Apr-14	9:30	11:45	26.25	2.0	2.5	1.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH6	small	629751	5437113	15-Apr-14	16-Apr-14	12:20	10:30	22.17	2.3	2.5	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH7	small	630094	5437441	16-Apr-14	17-Apr-14	9:50	10:15	24.42	2.2	2.5	1.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-SH8	small	630214	5436886	16-Apr-14	17-Apr-14	10:00	10:45	24.75	5.7	6.0	1.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.97
	GC-LH1	medium	629607	5437033	10-Apr-14	11-Apr-14	12:30	2:15	13.75	1.8	2.0	0.57	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-LH2	medium	629670	5437071	10-Apr-14	11-Apr-14	12:45	13:45	25.00	3.5	4.2	1.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-LH3	medium	629646	5436958	11-Apr-14	12-Apr-14	14:00	10:00	20.00	2.0	2.8	0.83	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					12-Apr-14	13-Apr-14	10:00	12:00	26.00			1.08	0	0	0.00	0	0	0.00	1	0	0.92	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:00	9:45	21.75			0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					14-Apr-14	15-Apr-14	9:45	12:00	26.25			1.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	12:00	9:30	21.50			0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-LH4	medium	629637	5436976	12-Apr-14	13-Apr-14	9:45	12:15	26.50	2.0	2.5	1.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					13-Apr-14	14-Apr-14	12:15	10:00	21.75			0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.10
	GC-LH5	medium	629691	5436982	14-Apr-14	15-Apr-14	10:15	11:50	25.58	2.0	2.5	1.07	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					15-Apr-14	16-Apr-14	11:50	10:00	22.17			0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-LH6	medium	629903	5437095	16-Apr-14	17-Apr-14	9:38	10:00	24.37	2.5	2.9	1.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.97
	GC-LH7	medium	630568	5437240	16-Apr-14	17-Apr-14	11:00	10:00	23.00	4.5	6.0	0.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**629.03**	**-**	**-**	**26.21**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**1**	**0**	**0.04**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**4**	**1**	**0.15**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.15: Hoop Net Records for Fish Caught in Koocanusa Reservoir, August 2014

Area	Station	Size	Location (NAD 83, Zone 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Bull Trout			Burbot			Kokanee			Largescale Sucker			Longnose Sucker			Mountain Whitefish		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Sand Creek	SC-HN1	small	623366	5462663	18-Aug-14	19-Aug-14	16:30	14:20	21.83	3.2	-	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	21-Aug-14	14:20	10:40	44.33			1.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN2	medium	623480	5462896	18-Aug-14	19-Aug-14	16:45	14:30	21.75	3.0	-	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	21-Aug-14	14:30	11:00	44.50			1.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN3	small	623558	5462945	18-Aug-14	19-Aug-14	17:00	15:00	22.00	2.7	2.8	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	21-Aug-14	15:00	11:50	44.83			1.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN4	medium	623573	5463141	19-Aug-14	21-Aug-14	15:20	12:30	45.17	1.8	-	1.88	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.53	0	0	0.00	0	0	0.00
					21-Aug-14	23-Aug-14	12:30	12:30	48.00			2.00	1	0	0.50	0	0	0.00	13	8	6.50	3	0	1.50	0	0	0.00	0	0	0.00
					23-Aug-14	25-Aug-14	12:30	10:00	45.50			1.90	0	0	0.00	1	0	0.53	13	7	6.86	22	1	11.60	0	0	0.00	0	0	0.00
	SC-HN5	small	623383	5462284	21-Aug-14	23-Aug-14	10:45	11:45	49.00	8.2	-	1.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN6	medium	623775	5462302	21-Aug-14	23-Aug-14	11:30	12:00	48.50	7.7	-	2.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN7	small	623610	5462630	21-Aug-14	23-Aug-14	12:00	12:00	48.00	6.6	-	2.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN8	medium	623461	5463290	23-Aug-14	25-Aug-14	14:30	10:45	44.25	0.7	1.4	2.00	0	0	0.00	0	0	0.00	2	1	1.00	24	0	12.00	0	0	0.00	0	0	0.00
	TOTAL								**527.67**	**-**	**-**	**22.04**	**1**	**0**	**0.05**	**1**	**0**	**0.05**	**28**	**16**	**1.27**	**50**	**1**	**2.27**	**0**	**0**	**0.00**	**0**	**0**	**0.00**
Elk River	ER-HN1	medium	632410	5447264	18-Aug-14	19-Aug-14	15:30	12:25	20.92	3.8	4.2	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	20-Aug-14	12:25	12:45	24.33			1.01	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.99	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	12:45	15:15	50.50			1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN2	small	632342	5447380	18-Aug-14	19-Aug-14	15:45	12:45	21.00	3.6	-	2.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN3	medium	632208	5447533	18-Aug-14	19-Aug-14	16:00	13:00	21.00	2.7	-	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN4	small	632413	5447714	19-Aug-14	20-Aug-14	11:15	13:50	26.58	2.0	-	1.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	21-Aug-14	13:50	13:00	23.17			0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN5	medium	632137	5447900	19-Aug-14	20-Aug-14	13:00	14:15	25.25	2.0	2.5	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN6	small	632426	5448062	19-Aug-14	20-Aug-14	13:30	13:45	24.25	3.2	-	1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	13:45	13:15	47.50			1.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN7	medium	632171	5447985	20-Aug-14	22-Aug-14	14:20	13:00	46.67	1.7	-	1.94	1	0	0.51	0	0	0.00	2	2	1.03	10	0	5.14	0	0	0.00	0	0	0.00
					22-Aug-14	24-Aug-14	13:00	14:00	49.00			2.04	0	0	0.00	0	0	0.00	1	1	0.49	4	0	1.96	0	0	0.00	0	0	0.00
	ER-HN8	small	631489	5447050	22-Aug-14	24-Aug-14	13:30	13:40	48.17	6.5	-	2.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN9	small	631232	5446891	22-Aug-14	24-Aug-14	13:30	13:45	48.25	10.8	-	2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN10	medium	632872	5448101	22-Aug-14	24-Aug-14	15:30	2:55	35.42	0.7	1.2	2.01	0	0	0.00	0	0	0.00	0	0	0.00	17	0	8.46	0	0	0.00	0	0	0.00
	ER-HN11	medium	632800	5448283	24-Aug-14	25-Aug-14	15:00	12:05	21.08	1.2	1.5	1.48	0	0	0.00	0	0	0.00	0	0	0.00	3	0	2.03	0	0	0.00	0	0	0.00
	ER-HN12	medium	632888	5447862	24-Aug-14	25-Aug-14	15:20	12:50	21.50	1.4	0.8	0.90	0	0	0.00	0	0	0.00	8	3	8.93	2	0	2.23	0	0	0.00	0	0	0.00
					25-Aug-14	26-Aug-14	12:50	12:00	23.17			0.97	0	0	0.00	0	0	0.00	4	3	4.14	12	0	12.43	0	0	0.00	0	0	0.00
	ER-HN13	medium	632801	5447746	25-Aug-14	26-Aug-14	13:00	12:15	23.25	1.7	1.5	0.97	0	0	0.00	0	0	0.00	8	0	8.29	7	0	7.25	0	0	0.00	0	0	0.00
	ER-HN14	medium	632150	5447920	25-Aug-14	26-Aug-14	13:30	12:50	23.33	1.9	2.7	0.97	0	0	0.00	0	0	0.00	1	1	1.03	4	0	4.13	2	0	2.06	0	0	0.00
	TOTAL								**624.33**	**-**	**-**	**27.22**	**1**	**0**	**0.04**	**0**	**0**	**0.00**	**24**	**10**	**0.88**	**60**	**0**	**2.20**	**2**	**0**	**0.07**	**0**	**0**	**0.00**
Gold Creek	GC-HN1	small	628534	5436696	18-Aug-14	19-Aug-14	13:45	10:30	20.75	3.7	-	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	20-Aug-14	10:30	10:00	23.50			0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	10:00	10:00	48.00			2.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN2	small	628392	5436772	18-Aug-14	19-Aug-14	14:00	10:45	20.75	2.5	-	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	20-Aug-14	10:45	10:45	24.00			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	10:45	10:15	47.50			1.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN3	medium	628414	5436887	18-Aug-14	19-Aug-14	14:30	11:00	20.50	2.8	-	0.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	20-Aug-14	11:00	11:00	24.00			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	11:00	11:30	48.50			2.02	0	0	0.00	0	0	0.00	0	0	0.00	19	0	9.40	0	0	0.00	0	0	0.00
					22-Aug-14	24-Aug-14	11:30	11:30	48.00			2.00	0	0	0.00	0	0	0.00	0	0	0.00	11	0	5.50	0	0	0.00	1	0	0.50
					24-Aug-14	26-Aug-14	11:30	15:15	51.75			2.16	0	0	0.00	0	0	0.00	0	0	0.00	8	0	3.71	0	0	0.00	0	0	0.00
	GC-HN4	medium	628531	5436964	19-Aug-14	20-Aug-14	11:15	10:30	23.25	3.3	-	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	10:30	10:40	48.17			2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN5	small	628914	5436830	22-Aug-14	24-Aug-14	10:00	9:45	47.75	7.7	-	2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN6	small	628874	5436705	22-Aug-14	24-Aug-14	10:30	10:00	47.50	6.4	-	1.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN7	medium	629101	5436792	22-Aug-14	24-Aug-14	10:45	10:15	47.50	9.0	10.0	1.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN8	medium	628233	5437172	24-Aug-14	25-Aug-14	11:00	14:15	27.25	1.2	1.5	1.14	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.76	0	0	0.00	0	0	0.00
					25-Aug-14	26-Aug-14	14:15	14:45	24.50			1.02	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.98	0	0	0.00	0	0	0.00
	GC-HN9	medium	628316	5437057	25-Aug-14	26-Aug-14	14:00	15:30	25.50	1.4	2.2	1.06	0	0	0.00	0	0	0.00	0	0	0.00	4	0	3.76	0	0	0.00	0	0	0.00
	TOTAL								**668.67**	**-**	**-**	**27.89**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**45**	**0**	**1.61**	**0**	**0**	**0.00**	**1**	**0**	**0.04**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.15: Hoop Net Records for Fish Caught in Koocanusa Reservoir, August 2014

Area	Station	Size	Location (NAD 83, Zone 11U)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Depth Range (m)		Effort (Fishing days)	Northern Pikeminnow			Peamouth Chub			Pumpkinseed			Redside Shiner			Westslope Cutthroat Trout			Yellow Perch		
			Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*	Catch	Mortalities/ Sacrificed	CPUE*
Sand Creek	SC-HN1	small	623366	5462663	18-Aug-14	19-Aug-14	16:30	14:20	21.83	3.2	-	0.91	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	21-Aug-14	14:20	10:40	44.33			1.85	2	2	1.08	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN2	medium	623480	5462896	18-Aug-14	19-Aug-14	16:45	14:30	21.75	3.0	-	0.91	6	6	6.62	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	21-Aug-14	14:30	11:00	44.50			1.85	14	5	7.55	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.54
	SC-HN3	small	623558	5462945	18-Aug-14	19-Aug-14	17:00	15:00	22.00	2.7	2.8	0.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	21-Aug-14	15:00	11:50	44.83			1.87	1	0	0.54	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN4	medium	623573	5463141	19-Aug-14	21-Aug-14	15:20	12:30	45.17	1.8	-	1.88	5	0	2.66	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					21-Aug-14	23-Aug-14	12:30	12:30	48.00			2.00	2	0	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.50
					23-Aug-14	25-Aug-14	12:30	10:00	45.50			1.90	4	0	2.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN5	small	623383	5462284	21-Aug-14	23-Aug-14	10:45	11:45	49.00	8.2	-	1.90	1	0	0.53	2	2	1.05	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN6	medium	623775	5462302	21-Aug-14	23-Aug-14	11:30	12:00	48.50	7.7	-	2.04	1	0	0.49	1	1	0.49	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN7	small	623610	5462630	21-Aug-14	23-Aug-14	12:00	12:00	48.00	6.6	-	2.02	1	0	0.49	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN8	medium	623461	5463290	23-Aug-14	25-Aug-14	14:30	10:45	44.25	0.7	1.4	2.00	6	1	3.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**527.67**	**-**	**-**	**22.04**	**43**	**14**	**1.95**	**3**	**3**	**0.14**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**2**	**1**	**0.09**
Elk River	ER-HN1	medium	632410	5447264	18-Aug-14	19-Aug-14	15:30	12:25	20.92	3.8	4.2	0.87	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	20-Aug-14	12:25	12:45	24.33			1.01	4	4	3.95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	12:45	15:15	50.50			1.01	1	0	0.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN2	small	632342	5447380	18-Aug-14	19-Aug-14	15:45	12:45	21.00	3.6	-	2.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN3	medium	632208	5447533	18-Aug-14	19-Aug-14	16:00	13:00	21.00	2.7	-	0.88	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN4	small	632413	5447714	19-Aug-14	20-Aug-14	11:15	13:50	26.58	2.0	-	1.11	1	0	0.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	21-Aug-14	13:50	13:00	23.17			0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN5	medium	632137	5447900	19-Aug-14	20-Aug-14	13:00	14:15	25.25	2.0	2.5	0.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN6	small	632426	5448062	19-Aug-14	20-Aug-14	13:30	13:45	24.25	3.2	-	1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	13:45	13:15	47.50			1.98	1	1	0.51	1	1	0.51	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN7	medium	632171	5447985	20-Aug-14	22-Aug-14	14:20	13:00	46.67	1.7	-	1.94	33	5	16.97	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					22-Aug-14	24-Aug-14	13:00	14:00	49.00			2.04	6	0	2.94	0	0	0.00	0	0	0.00	4	0	1.96	0	0	0.00	0	0	0.00
	ER-HN8	small	631489	5447050	22-Aug-14	24-Aug-14	13:30	13:40	48.17	6.5	-	2.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN9	small	631232	5446891	22-Aug-14	24-Aug-14	13:30	13:45	48.25	10.8	-	2.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN10	medium	632872	5448101	22-Aug-14	24-Aug-14	15:30	2:55	35.42	0.7	1.2	2.01	14	1	6.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN11	medium	632800	5448283	24-Aug-14	25-Aug-14	15:00	12:05	21.08	1.2	1.5	1.48	7	0	4.74	0	0	0.00	0	0	0.00	4	4	2.71	1	0	0.68	0	0	0.00
	ER-HN12	medium	632888	5447862	24-Aug-14	25-Aug-14	15:20	12:50	21.50	1.4	0.8	0.90	2	0	2.23	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					25-Aug-14	26-Aug-14	12:50	12:00	23.17			0.97	2	0	2.07	3	1	3.11	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN13	medium	632801	5447746	25-Aug-14	26-Aug-14	13:00	12:15	23.25	1.7	1.5	0.97	2	0	2.07	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN14	medium	632150	5447920	25-Aug-14	26-Aug-14	13:30	12:50	23.33	1.9	2.7	0.97	0	0	0.00	0	0	0.00	0	0	0.00	2	0	2.06	0	0	0.00	0	0	0.00
	TOTAL								**624.33**	**-**	**-**	**27.22**	**73**	**11**	**2.68**	**4**	**2**	**0.15**	**0**	**0**	**0.00**	**10**	**4**	**0.37**	**1**	**0**	**0.04**	**0**	**0**	**0.00**
Gold Creek	GC-HN1	small	628534	5436696	18-Aug-14	19-Aug-14	13:45	10:30	20.75	3.7	-	0.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	20-Aug-14	10:30	10:00	23.50			0.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.02
					20-Aug-14	22-Aug-14	10:00	10:00	48.00			2.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN2	small	628392	5436772	18-Aug-14	19-Aug-14	14:00	10:45	20.75	2.5	-	0.86	2	2	2.31	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					19-Aug-14	20-Aug-14	10:45	10:45	24.00			1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.00
					20-Aug-14	22-Aug-14	10:45	10:15	47.50			1.98	1	0	0.51	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN3	medium	628414	5436887	18-Aug-14	19-Aug-14	14:30	11:00	20.50	2.8	-	0.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.34
					19-Aug-14	20-Aug-14	11:00	11:00	24.00			1.00	2	0	2.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	11:00	11:30	48.50			2.02	11	0	5.44	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	23	7	11.38
					22-Aug-14	24-Aug-14	11:30	11:30	48.00			2.00	5	0	2.50	1	0	0.50	1	1	0.50	0	0	0.00	0	0	0.00	5	0	2.50
					24-Aug-14	26-Aug-14	11:30	15:15	51.75			2.16	18	0	8.35	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.46	17	0	7.88
	GC-HN4	medium	628531	5436964	19-Aug-14	20-Aug-14	11:15	10:30	23.25	3.3	-	0.97	9	8	9.29	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
					20-Aug-14	22-Aug-14	10:30	10:40	48.17			2.01	3	0	1.49	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN5	small	628914	5436830	22-Aug-14	24-Aug-14	10:00	9:45	47.75	7.7	-	2.01	5	2	2.49	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	1	1.49
	GC-HN6	small	628874	5436705	22-Aug-14	24-Aug-14	10:30	10:00	47.50	6.4	-	1.99	2	0	1.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN7	medium	629101	5436792	22-Aug-14	24-Aug-14	10:45	10:15	47.50	9.0	10.0	1.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.51
	GC-HN8	medium	628233	5437172	24-Aug-14	25-Aug-14	11:00	14:15	27.25	1.2	1.5	1.14	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.88	1	0	0.88	0	0	0.00
					25-Aug-14	26-Aug-14	14:15	14:45	24.50			1.02	6	0	5.88	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.98	0	0	0.00
	GC-HN9	medium	628316	5437057	25-Aug-14	26-Aug-14	14:00	15:30	25.50	1.4	2.2	1.06	4	0	3.76	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL								**668.67**	**-**	**-**	**27.89**	**68**	**12**	**2.44**	**1**	**0**	**0.04**	**1**	**1**	**0.04**	**1**	**0**	**0.04**	**3**	**0**	**0.11**	**53**	**12**	**1.90**

* Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.16: Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (fishing days)	Depth Range (m)		Bull Trout			Burbot			Largescale Sucker			Longnose Sucker			Mountain Whitefish			Northern Pikeminnow			Peamouth Chub			Redside Shiner			Yellow Perch		
		Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
Sand Creek	SC-HN-01	624847	5460861	21-Apr-15	22-Apr-15	12:23	10:30	22.12	0.92	3.0	3.2	0	0	0.00	0	0	0.00	3	3	3.26	2	0	2.17	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.17	0	0	0.00
	SC-HN-02	625519	5460391	21-Apr-15	22-Apr-15	13:00	9:28	20.47	0.85	5.3	8.5	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN-03	623200	5461954	22-Apr-15	23-Apr-15	10:10	9:50	23.67	0.99	0.9	1.3	0	0	0.00	0	0	0.00	1	0	1.01	1	0	1.01	0	0	0.00	0	0	0.00	1	1	1.01	0	0	0.00	1	1	1.01
	SC-HN-04	623344	5461788	22-Apr-15	23-Apr-15	10:50	9:25	22.58	0.94	1.9	2.0	1	0	1.06	0	0	0.00	1	0	1.06	1	0	1.06	0	0	0.00	1	1	1.06	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN-05	623178	5461858	23-Apr-15	24-Apr-15	9:40	8:53	23.22	0.97	0.9	1.1	0	0	0.00	0	0	0.00	1	1	1.03	1	1	1.03	0	0	0.00	0	0	0.00	1	1	1.03	1	1	1.03	0	0	0.00
	SC-HN-06	623380	5461954	23-Apr-15	24-Apr-15	10:15	9:15	23.00	0.96	0.9	1.7	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN-07	623144	5461817	24-Apr-15	25-Apr-15	9:05	10:00	24.92	1.04	1.4	1.5	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN-08	623387	5461895	24-Apr-15	25-Apr-15	9:28	10:15	24.78	1.03	2.0	2.1	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.97	1	1	0.97	0	0	0.00	0	0	0.00
	SC-HN-09	625500	5460013	25-Apr-15	27-Apr-15	11:35	9:20	45.75	1.91	3.9	4.3	0	0	0.00	0	0	0.00	1	1	0.52	0	0	0.00	0	0	0.00	2	1	1.05	0	0	0.00	1	1	0.52	4	4	2.10
	SC-HN-10	625421	5459714	25-Apr-15	27-Apr-15	11:50	9:49	45.98	1.92	3.9	4.3	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN-11	626117	5458112	26-Apr-15	27-Apr-15	11:55	10:15	22.33	0.93	3.9	4.1	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	9	4	9.67	8	8	8.60	0	0	0.00	0	0	0.00
	SC-HN-12	625502	5460026	27-Apr-15	28-Apr-15	9:44	9:50	24.10	1.00	4.2	-	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.99	0	0	0.00	0	0	0.00	1	1	1.00
	SC-HN-13	626181	5458221	27-Apr-15	28-Apr-15	10:10	10:15	24.08	1.00	2.9	3.2	0	0	0.00	1	0	1.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.00	2	2	1.99	0	0	0.00	0	0	0.00
	SC-HN-14	626140	5458120	27-Apr-15	28-Apr-15	10:30	10:47	24.28	1.01	2.9	3.7	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	11	5	10.87	2	2	1.98	0	0	0.00	6	6	5.93
	SC-HN-15	625509	5459989	28-Apr-15	29-Apr-15	9:30	9:09	23.65	0.99	3.7	3.8	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN-16	626161	5458231	28-Apr-15	29-Apr-15	10:37	10:30	23.88	1.00	2.4	3.0	1	0	1.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.00	0	0	0.00	1	1	1.00
	SC-HN-17	626161	5458130	28-Apr-15	29-Apr-15	11:00	10:43	23.72	0.99	2.7	3.1	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	4	0	4.05	0	0	0.00	0	0	0.00	1	1	1.01
	SC-HN-18	625517	5459978	29-Apr-15	30-Apr-15	9:15	9:00	23.75	0.99	3.8	4.1	0	0	0.00	2	0	2.02	0	0	0.00	1	0	1.01	0	0	0.00	6	0	6.06	1	1	1.01	1	1	1.01	2	2	2.02
	SC-HN-19	626247	5458220	29-Apr-15	30-Apr-15	10:35	10:00	23.42	0.98	2.2	2.9	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN-20	626146	5458120	29-Apr-15	30-Apr-15	10:48	10:03	23.25	0.97	1.9	3.0	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	SC-HN-21	625476	5460007	30-Apr-15	1-May-15	9:00	9:25	24.42	1.02	3.8	-	0	0	0.00	0	0	0.00	1	1	0.98	0	0	0.00	0	0	0.00	1	0	0.98	0	0	0.00	1	1	0.98	1	1	0.98
	SC-HN-22	626164	5458276	30-Apr-15	1-May-15	10:20	9:56	23.60	0.98	2.9	4.1	0	0	0.00	0	0	0.00	1	1	1.02	0	0	0.00	0	0	0.00	2	0	2.03	0	0	0.00	1	1	1.02	3	3	3.05
	SC-HN-23	626090	5458091	30-Apr-15	1-May-15	10:38	10:00	23.37	0.97	4.1	5.2	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	4	0	4.11	1	0	1.03	0	0	0.00	10	10	10.27
	TOTAL							**584.33**	**24.35**	**-**	**-**	**2**	**0**	**0.08**	**3**	**0**	**0.12**	**9**	**7**	**0.37**	**6**	**1**	**0.25**	**0**	**0**	**0.00**	**44**	**13**	**1.81**	**18**	**17**	**0.74**	**7**	**7**	**0.29**	**30**	**30**	**1.23**
Elk River	ER-HN-01	630161	5447179	21-Apr-15	22-Apr-15	14:50	10:40	19.83	0.83	2.7	2.8	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN-02	630086	5447284	21-Apr-15	22-Apr-15	16:10	11:10	19.00	0.79	3.3	3.4	0	0	0.00	0	0	0.00	5	5	6.32	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
				22-Apr-15	23-Apr-15	11:10	10:15	23.08	0.96			0	0	0.00	1	0	1.04	1	1	1.04	0	0	0.00	0	0	0.00	2	2	2.08	1	1	1.04	0	0	0.00	0	0	0.00
	ER-HN-03	629673	5447033	22-Apr-15	23-Apr-15	11:00	9:55	22.92	0.95	2.3	3.6	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	7	7	7.33	2	2	2.09	3	3	3.14	3	3	3.14
				23-Apr-15	24-Apr-15	9:55	9:45	23.83	0.99			0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.01	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN-04	628886	5447522	23-Apr-15	24-Apr-15	10:45	9:15	22.50	0.94	2.4	3.7	0	0	0.00	0	0	0.00	1	1	1.07	0	0	0.00	0	0	0.00	1	1	1.07	0	0	0.00	1	1	1.07	0	0	0.00
	ER-HN-05	629436	5447496	24-Apr-15	26-Apr-15	9:35	9:39	48.07	2.00	3.4	5.2	0	0	0.00	0	0	0.00	1	1	0.50	0	0	0.00	0	0	0.00	4	4	2.00	0	0	0.00	0	0	0.00	1	1	0.50
	ER-HN-06	630134	5447622	24-Apr-15	26-Apr-15	10:10	10:10	48.00	2.00	2.9	3.8	0	0	0.00	0	0	0.00	4	4	2.00	0	0	0.00	0	0	0.00	5	2	2.50	1	1	0.50	1	1	0.50	0	0	0.00
				26-Apr-15	27-Apr-15	10:10	9:50	23.67	0.99			0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	4	4	4.06	0	0	0.00	2	2	2.03
				27-Apr-15	28-Apr-15	9:50	10:00	24.17	1.01			0	0	0.00	0	0	0.00	2	2	1.99	0	0	0.00	0	0	0.00	0	0	0.00	2	1	1.99	3	3	2.98	0	0	0.00
				28-Apr-15	29-Apr-15	10:00	9:50	23.83	0.99			0	0	0.00	0	0	0.00	2	1	2.01	0	0	0.00	0	0	0.00	1	1	1.01	4	2	4.03	0	0	0.00	0	0	0.00
	ER-HN-07	629296	5447502	26-Apr-15	27-Apr-15	9:55	10:10	24.25	1.01	5.8	5.9	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	ER-HN-08	628633	5447383	27-Apr-15	28-Apr-15	10:25	9:30	23.08	0.96	2.5	4.3	0	0	0.00	0	0	0.00	7	2	7.28	1	1	1.04	0	0	0.00	15	2	15.60	5	3	5.20	0	0	0.00	1	1	1.04
				28-Apr-15	29-Apr-15	9:30	9:30	24.00	1.00			0	0	0.00	1	0	1.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	1.00	0	0	0.00	0	0	0.00	10	10	10.00
				29-Apr-15	30-Apr-15	9:30	9:05	23.58	0.98			0	0	0.00	0	0	0.00	4	0	4.07	2	0	2.04	0	0	0.00	4	0	4.07	2	0	2.04	1	0	1.02	16	16	16.28
				30-Apr-15	1-May-15	9:05	9:02	23.95	1.00			0	0	0.00	0	0	0.00	2	0	2.00	0	0	0.00	0	0	0.00	3	0	3.01	0	0	0.00	0	0	0.00	9	5	9.02
	ER-HN-09	630006	5447930	29-Apr-15	30-Apr-15	9:55	9:30	23.58	0.98	3.2	3.2	0	0	0.00	0	0	0.00	14	10	14.25	0	0	0.00	0	0	0.00	1	0	1.02	2	0	2.04	2	2	2.04	0	0	0.00
				30-Apr-15	1-May-15	9:30	9:15	23.75	0.99			0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	TOTAL							**465.10**	**19.38**	**-**	**-**	**0**	**0**	**0.00**	**2**	**0**	**0.10**	**43**	**27**	**2.22**	**3**	**1**	**0.15**	**0**	**0**	**0.00**	**45**	**20**	**2.32**	**23**	**14**	**1.19**	**11**	**10**	**0.57**	**42**	**38**	**2.17**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.16: Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (fishing days)	Depth Range (m)		Bull Trout			Burbot			Largescale Sucker			Longnose Sucker			Mountain Whitefish			Northern Pikeminnow			Peamouth Chub			Redside Shiner			Yellow Perch		
		Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
Gold Creek	GC-HN-01	629265	5436908	21-Apr-15	22-Apr-15	12:00	8:45	20.75	0.86	1.3	1.5	0	0	0.00	0	0	0.00	5	3	5.78	0	0	0.00	0	0	0.00	1	1	1.16	2	2	2.31	0	0	0.00	2	2	2.31
				22-Apr-15	23-Apr-15	9:00	9:30	24.50	1.02			0	0	0.00	0	0	0.00	3	3	2.94	0	0	0.00	1	1	0.98	0	0	0.00	6	6	5.88	1	1	0.98	3	3	2.94
				23-Apr-15	24-Apr-15	9:40	9:20	23.67	0.99			0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	GC-HN-02	629207	5437023	21-Apr-15	22-Apr-15	12:25	9:05	20.67	0.86	0.5	1.0	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	2	2.32	0	0	0.00
	GC-HN-03	629182	5436976	22-Apr-15	23-Apr-15	9:15	9:45	24.50	1.02	1.5	2.0	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.98
	GC-HN-04	629257	5436902	23-Apr-15	24-Apr-15	10:10	9:00	22.83	0.95	1.5	1.5	0	0	0.00	0	0	0.00	1	1	1.05	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.05	1	1	1.05	1	1	1.05
				24-Apr-15	25-Apr-15	9:05	9:15	24.17	1.01			0	0	0.00	0	0	0.00	4	4	3.97	0	0	0.00	0	0	0.00	3	3	2.98	3	3	2.98	0	0	0.00	2	2	1.99
	GC-HN-05	629242	5436945	24-Apr-15	25-Apr-15	9:30	8:55	23.42	0.98	1.0	2.0	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	1	1.02	0	0	0.00	0	0	0.00	4	4	4.10
	GC-HN-06	629264	5436804	25-Apr-15	26-Apr-15	9:10	10:15	25.08	1.05	1.0	1.0	0	0	0.00	0	0	0.00	1	1	0.96	0	0	0.00	0	0	0.00	0	0	0.00	5	5	4.78	1	1	0.96	4	4	3.83
				26-Apr-15	27-Apr-15	10:20	9:10	22.83	0.95			0	0	0.00	0	0	0.00	1	1	1.05	0	0	0.00	0	0	0.00	2	1	2.10	1	0	1.05	4	4	4.20	2	2	2.10
				27-Apr-15	29-Apr-15	9:15	9:10	47.92	2.00			1	0	0.50	0	0	0.00	3	3	1.50	0	0	0.00	0	0	0.00	5	3	2.50	2	0	1.00	0	0	0.00	6	6	3.01
				29-Apr-15	30-Apr-15	9:25	9:30	24.08	1.00			0	0	0.00	0	0	0.00	1	1	1.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	1.99	0	0	0.00	2	2	1.99
				30-Apr-15	1-May-15	9:35	8:50	23.25	0.97			0	0	0.00	0	0	0.00	4	2	4.13	0	0	0.00	0	0	0.00	3	0	3.10	8	6	8.26	0	0	0.00	5	5	5.16
	TOTAL							**327.67**	**13.65**	**-**	**-**	**1**	**0**	**0.07**	**0**	**0**	**0.00**	**23**	**19**	**1.68**	**0**	**0**	**0.00**	**1**	**1**	**0.07**	**15**	**9**	**1.10**	**30**	**23**	**2.20**	**9**	**9**	**0.66**	**32**	**32**	**2.34**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

Table F.17: Hoop Net Records for Fish Caught in Koocanusa Reservoir, August 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (fishing days)	Depth Range (m)		Kokanee			Largescale Sucker			Northern Pikeminnow			Peamouth Chub			Yellow Perch		
		Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
Sand Creek	SC-HN-01	623577	5462815	21-Aug-15	22-Aug-15	10:30	12:48	26.30	1.10	1.0	1.0	0	0	0.00	11	0	10.04	11	10	10.04	1	1	0.91	1	0	0.91
	SC-HN-02	623587	5462851	22-Aug-15	24-Aug-15	12:30	10:37	46.12	1.92	0.8	1.0	9	9	4.68	8	0	4.16	20	1	10.41	0	0	0.00	0	0	0.00
	SC-HN-03	623577	5462817	22-Aug-15	24-Aug-15	12:50	10:55	46.08	1.92	1.0	1.1	1	1	0.52	13	0	6.77	9	0	4.69	4	0	2.08	1	0	0.52
	TOTAL							**118.50**	**4.94**	**-**	**-**	**10**	**10**	**2.03**	**32**	**0**	**6.48**	**40**	**11**	**8.10**	**5**	**1**	**1.01**	**2**	**0**	**0.41**
Elk River	ER-HN-01	632240	5447389	23-Aug-15	24-Aug-15	11:15	9:56	22.68	0.95	1.6	2.0	11	10	11.64	11	0	11.64	5	0	5.29	1	0	1.06	0	0	0.00
	TOTAL							**22.68**	**0.95**	**-**	**-**	**11**	**10**	**11.64**	**11**	**0**	**11.64**	**5**	**0**	**5.29**	**1**	**0**	**1.06**	**0**	**0**	**0.00**
Gold Creek	GC-HN-01	628634	5437018	23-Aug-15	24-Aug-15	9:35	14:40	29.08	1.21	1.0	1.5	0	0	0.00	1	0	0.83	3	2	2.48	0	0	0.00	0	0	0.00
	GC-HN-02	628634	5437018	24-Aug-15	25-Aug-15	14:45	15:30	24.75	1.03	1.0	1.5	0	0	0.00	1	0	0.97	0	0	0.00	1	0	0.97	0	0	0.00
	GC-HN-03	628780	5436677	25-Aug-15	26-Aug-15	15:45	8:45	17.00	0.71	3.0	3.2	0	0	0.00	0	0	0.00	1	1	1.41	0	0	0.00	0	0	0.00
	TOTAL							**70.83**	**2.95**	**-**	**-**	**0**	**0**	**0.00**	**2**	**0**	**0.68**	**4**	**3**	**1.36**	**1**	**0**	**0.34**	**0**	**0**	**0.00**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total angling effort in one area.

Table F.18: Hoop Net Records for Fish Caught in Koocanusa Reservoir, April 2016

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (fishing days)	Depth Range (m)		Bull Trout			Burbot			Westslope Cutthroat			Largescale Sucker			Longnose Sucker			Mountain Whitefish			Northern Pikeminnow			Peamouth Chub			Redside Shiner			Yellow Perch			Slimy Sculpin		
		Easting	Northing									Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]	Catch	Mortalities/ Sacrificed	CPUE[a]
Sand Creek	SC-HN-01	625372	5457031	19-Apr-16	20-Apr-16	17:30	9:05	16	0.65	1.0	1.2	1	0	1.5	0	0	0	0	0	0	3	3	4.6	3	0	4.6	0	0	0	2	0	3.1	7	1	11	1	1	1.5	2	2	3.1	1	0	1.5
				20-Apr-16	21-Apr-16	10:45	9:05	22	0.93			0	0	0	2	0	2.1	0	0	0	0	0	0	1	0	1.1	0	0	0	2	1	2.1	1	1	1.1	0	0	0	1	1	1.1	0	0	0
	SC-HN-02	625780	5458144	19-Apr-16	20-Apr-16	16:05	11:10	19	0.80	1.0	1.5	2	0	2.5	0	0	0	0	0	0	37	37	47	0	0	0	1	1	1.3	2	2	2.5	2	1	2.5	0	0	0	0	0	0	0	0	0
				20-Apr-16	21-Apr-16	11:30	10:10	23	0.94			4	0	4.2	0	0	0	2	0	2.1	19	13	20	0	0	0	0	0	0	9	6	9.5	5	5	5.3	0	0	0	1	1	1.1	0	0	0
	SC-HN-03	625378	5457114	21-Apr-16	22-Apr-16	9:35	9:46	24	1.01	1.0	1.5	0	0	0	2	0	2.0	0	0	0	9	7	8.9	1	0	0.99	0	0	0	7	6	6.9	2	1	2.0	0	0	0	0	0	0	0	0	0
	SC-HN-04	625652	5457316	21-Apr-16	22-Apr-16	12:19	8:49	20	0.85	1.0	2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.2	0	0	0
	SC-HN-05	625759	5458154	22-Apr-16	23-Apr-16	9:25	10:10	25	1.03	1.1	2.0	2	0	1.9	0	0	0	0	0	0	4	0	3.9	1	0	0.97	0	0	0	6	4	5.8	0	0	0	0	0	0	1	1	0.97	0	0	0
	SC-HN-06	625290	5457248	22-Apr-16	23-Apr-16	13:13	9:35	20	0.85	1.0	2.0	0	0	0	1	0	1.2	0	0	0	30	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SC-HN-07 [b]	625773	5458160	23-Apr-16	24-Apr-16	10:35	-	-	-	1.5	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SC-HN-08	625642	5457345	23-Apr-16	24-Apr-16	15:04	11:35	21	0.85	1.0	2.5	0	0	0	2	0	2.3	0	0	0	1	0	1.2	0	0	0	0	0	0	1	0	1.2	7	6	8.2	0	0	0	3	3	3.5	0	0	0
	SC-HN-09	625776	5458492	24-Apr-16	25-Apr-16	10:45	10:25	24	0.99	1.5	2.2	0	0	0	0	0	0	0	0	0	18	0	18	1	0	1.0	0	0	0	15	15	15	2	0	2.0	0	0	0	0	0	0	0	0	0
	SC-HN-10	625104	5457733	24-Apr-16	25-Apr-16	14:33	11:25	21	0.87	1.0	1.5	0	0	0	0	0	0	0	0	0	10	0	12	0	0	0	0	0	0	3	3	3.5	0	0	0	0	0	0	1	1	1.2	0	0	0
	SC-HN-11	625770	5458490	25-Apr-16	26-Apr-16	9:58	8:44	23	0.95	1.0	2.2	1	0	1.1	1	0	1.1	0	0	0	12	0	13	2	0	2.1	0	0	0	5	1	5.3	4	0	4.2	0	0	0	1	1	1.1	0	0	0
	SC-HN-12	625849	5458439	25-Apr-16	26-Apr-16	13:40	9:28	20	0.82	1.1	2.0	0	0	0	0	0	0	0	0	0	9	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SC-HN-13	625775	5458149	26-Apr-16	27-Apr-16	9:19	9:50	25	1.02	1.6	2.8	3	0	2.9	0	0	0	0	0	0	5	0	4.9	0	0	0	0	0	0	4	0	3.9	2	0	2.0	0	0	0	0	0	0	0	0	0
	SC-HN-14	625771	5458495	26-Apr-16	27-Apr-16	9:36	9:15	24	0.99	1.9	2.2	1	0	1.0	0	0	0	0	0	0	12	0	12	2	0	2.0	0	0	0	3	0	3.0	1	0	1.0	0	0	0	9	9	9.1	0	0	0
	SC-HN-15	625802	5458426	26-Apr-16	27-Apr-16	12:34	9:30	21	0.87	2.0	2.6	0	0	0	0	0	0	0	0	0	1	0	1.1	0	0	0	0	0	0	1	0	1.1	1	0	1.1	0	0	0	3	3	3.4	0	0	0
	SC-HN-16	625172	5457807	26-Apr-16	27-Apr-16	12:05	8:45	21	0.86	1.7	2.5	0	0	0	2	0	2.3	0	0	0	9	0	10	1	0	1.2	0	0	0	10	0	12	3	0	3.5	0	0	0	11	11	13	0	0	0
	TOTAL							**367**	**15.29**	**-**	**-**	**14**	**0**	**0.92**	**10**	**0**	**0.65**	**2**	**0**	**0.13**	**179**	**60**	**12**	**12**	**0**	**0.79**	**1**	**1**	**0.065**	**70**	**38**	**4.6**	**37**	**15**	**2.4**	**1**	**1**	**0.065**	**34**	**34**	**2.2**	**1**	**0**	**0.065**
Elk River	ER-HN-01	628483	5448148	19-Apr-16	20-Apr-16	13:20	10:00	21	0.86	2.1	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ER-HN-02	628208	5447661	19-Apr-16	20-Apr-16	13:30	10:10	21	0.86	1.3	-	0	0	0	0	0	0	0	0	0	2	2	2.3	0	0	0	0	0	0	1	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0
	ER-HN-03	628439	5447128	20-Apr-16	21-Apr-16	10:30	11:00	25	1.02	1.4	1.6	0	0	0	0	0	0	0	0	0	1	1	0.98	0	0	0	0	0	0	1	1	0.98	1	0	0.98	0	0	0	4	4	3.9	0	0	0
				21-Apr-16	22-Apr-16	11:00	10:30	23	0.98			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	0	0	0	0	0	0	3	3	3.1	0	0	0
	ER-HN-04	628143	5447259	20-Apr-16	21-Apr-16	11:20	10:20	23	0.96	0.7	4.1	0	0	0	6	0	6.3	0	0	0	12	8	13	1	0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3.1	0	0	0
				21-Apr-16	22-Apr-16	10:20	10:05	24	0.99			0	0	0	1	0	1.0	0	0	0	17	7	17	0	0	0	0	0	0	3	2	3.0	1	0	1.0	0	0	0	1	1	1.0	0	0	0
				22-Apr-16	23-Apr-16	10:05	9:30	23	0.98			0	0	0	0	0	0	0	0	0	53	53	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ER-HN-05	628117	5446590	22-Apr-16	23-Apr-16	10:45	10:00	23	0.97	1.4	1.8	0	0	0	0	0	0	0	0	0	0	0	0	3	1	3.1	0	0	0	1	1	1.0	1	1	1.0	0	0	0	3	3	3.1	0	0	0
	ER-HN-06	628581	5447362	23-Apr-16	24-Apr-16	10:00	10:00	24	1.00	1.8	1.1	0	0	0	1	0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6.0	0	0	0
				24-Apr-16	25-Apr-16	10:00	12:45	27	1.11			0	0	0	0	0	0	0	0	0	17	1	15	1	1	0.90	1	0	0.90	3	0	2.7	6	0	5.4	0	0	0	3	3	2.7	0	0	0
				25-Apr-16	26-Apr-16	12:45	10:45	22	0.92			0	0	0	1	0	1.1	0	0	0	13	1	14	0	0	0	0	0	0	2	0	2.2	7	0	7.6	0	0	0	2	2	2.2	0	0	0
	ER-HN-07	628037	5446473	23-Apr-16	24-Apr-16	10:20	10:05	24	0.99	0.8	3.1	0	0	0	0	0	0	0	0	0	2	0	2.0	0	0	0	0	0	0	1	0	1.0	0	0	0	0	0	0	0	0	0	0	0	0
	ER-HN-08	628608	5447450	24-Apr-16	25-Apr-16	10:15	2:30	16	0.68	0.9	1.1	1	0	1.5	1	0	1.5	0	0	0	15	0	22	0	0	0	0	0	0	5	0	7.4	5	0	7.4	3	0	4.4	0	0	0	0	0	0
	ER-HN-09	628369	5446805	25-Apr-16	26-Apr-16	15:00	9:30	19	0.77	0.8	3.3	0	0	0	1	0	1.3	0	0	0	4	0	5.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	6.5	0	0	0
	TOTAL							**314**	**13.08**	**-**	**-**	**1**	**0**	**0.076**	**11**	**0**	**0.84**	**0**	**0**	**0**	**136**	**73**	**10**	**5**	**2**	**0.38**	**1**	**0**	**0.076**	**18**	**5**	**1.4**	**21**	**1**	**1.6**	**3**	**0**	**0.23**	**30**	**30**	**2.3**	**0**	**0**	**0**
Gold Creek	GC-HN-01	629858	5437042	19-Apr-16	20-Apr-16	12:15	10:15	22	0.92	2.0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.1	0	0	0
	GC-HN-02	629926	5436941	20-Apr-16	21-Apr-16	10:45	9:45	23	0.96	2.0	2.5	0	0	0	0	0	0	0	0	0	4	0	4.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5.2	0	0	0
	GC-HN-03	630000	5437027	21-Apr-16	21-Apr-16	9:55	12:35	2.7	0.11	2.5	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GC-HN-04	630141	5436892	21-Apr-16	22-Apr-16	13:05	9:45	21	0.86	3.0	1.0	0	0	0	0	0	0	0	0	0	1	0	1.2	0	0	0	0	0	0	1	0	1.2	0	0	0	0	0	0	7	7	8.1	0	0	0
	GC-HN-05	630394	5437328	22-Apr-16	23-Apr-16	10:15	10:00	24	0.99	6.2	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	6	17	0	0	0
				23-Apr-16	24-Apr-16	10:15	9:45	23	0.98	6.3	-	0	0	0	0	0	0	0	0	0	3	3	3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5.1	0	0	0
	GC-HN-06	630017	5436857	24-Apr-16	25-Apr-16	10:15	10:00	24	0.99	2.5	-	0	0	0	0	0	0	0	0	0	30	6	30	1	0	1.0	0	0	0	1	1	1.0	1	1	1.0	0	0	0	0	0	0	0	0	0
				25-Apr-16	26-Apr-16	10:15	10:10	24	1.00	3.5	-	0	0	0	0	0	0	0	0	0	3	1	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GC-HN-07	629841	5436970	26-Apr-16	27-Apr-16	10:30	9:45	23	0.97	3.0	-	0	0	0	0	0	0	0	0	0	2	0	2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2.1	0	0	0
	TOTAL							**186**	**7.77**	**-**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**43**	**10**	**5.5**	**1**	**0**	**0.13**	**0**	**0**	**0**	**2**	**1**	**0.26**	**1**	**1**	**0.13**	**0**	**0**	**0**	**37**	**21**	**4.8**	**0**	**0**	**0**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the hoop net sets in one area.

[b] Net was found on April 24, 2016 on shoreline and spoke with a conservation officer.

Minnow Trap

Table F.19: Minnow Trap Catch Records from Koocanusa Reservoir, April 2015

Area	Station	Location (11U, NAD83)		Set Date	Removal Date	Set Time	Removal Time	Fishing Hours (hrs)	Effort (fishing days)	Depth (m)	Redside Shiner		
		Easting	Northing								Catch	Mortalities/ Sacrificed	CPUE [a]
Sand Creek	SC-MT-01	625558	5459677	22-Apr-15	23-Apr-15	12:00	11:15	23.25	0.97	1.3	0	0	0.00
	SC-MT-02	625558	5459677	22-Apr-15	23-Apr-15	12:00	11:15	23.25	0.97	2.2	0	0	0.00
	SC-MT-03	625648	5459984	22-Apr-15	23-Apr-15	13:41	11:50	22.15	0.92	3.5	0	0	0.00
	SC-MT-04	625648	5459984	22-Apr-15	23-Apr-15	13:41	11:50	22.15	0.92	3.3	0	0	0.00
	SC-MT-05	625648	5459984	22-Apr-15	23-Apr-15	13:41	11:50	22.15	0.92	2.6	0	0	0.00
	SC-MT-06	625558	5459677	23-Apr-15	24-Apr-15	11:15	14:56	27.68	1.15	1.3	0	0	0.00
	SC-MT-07	625558	5459677	23-Apr-15	24-Apr-15	11:15	14:56	27.68	1.15	2.2	0	0	0.00
	SC-MT-08	625648	5459984	23-Apr-15	24-Apr-15	11:50	15:02	27.20	1.13	3.5	0	0	0.00
	SC-MT-09	625648	5459984	23-Apr-15	24-Apr-15	11:50	15:02	27.20	1.13	3.3	0	0	0.00
	SC-MT-10	625648	5459984	23-Apr-15	24-Apr-15	11:50	15:05	27.25	1.14	2.6	0	0	0.00
	TOTAL							**249.97**	**10.42**	**-**	**0**	**0**	**0.00**
Elk River	ER-MT-01	627418	5447234	21-Apr-15	22-Apr-15	13:45	9:45	20.00	0.83	1.9	1	1	1.20
				22-Apr-15	23-Apr-15	9:45	11:45	26.00	1.08		0	0	0.00
	ER-MT-02	627892	5448032	21-Apr-15	22-Apr-15	13:55	9:15	19.33	0.81	0.9	0	0	0.00
				22-Apr-15	23-Apr-15	9:15	8:45	23.50	0.98		1	1	1.02
				23-Apr-15	24-Apr-15	8:45	8:45	24.00	1.00		1	1	1.00
	ER-MT-03	628663	5447421	21-Apr-15	22-Apr-15	14:00	10:10	20.17	0.84	2.0	0	0	0.00
				22-Apr-15	23-Apr-15	10:10	9:35	23.42	0.98		1	0	1.02
	ER-MT-04	630080	5447112	21-Apr-15	22-Apr-15	14:10	10:20	20.17	0.84	2.1	0	0	0.00
				22-Apr-15	23-Apr-15	10:20	10:10	23.83	0.99		0	0	0.00
				23-Apr-15	24-Apr-15	10:10	12:20	26.17	1.09		0	0	0.00
	ER-MT-05	630575	5447086	21-Apr-15	22-Apr-15	14:30	10:25	19.92	0.83	1.5	0	0	0.00
	ER-MT-06	627943	5448011	22-Apr-15	23-Apr-15	12:00	9:10	21.17	0.88	2.3	0	0	0.00
				23-Apr-15	24-Apr-15	9:10	9:45	24.58	1.02		0	0	0.00
	TOTAL							**292.25**	**12.18**	**-**	**4**	**3**	**0.33**
Gold Creek	GC-MT-01	628304	5436757	21-Apr-15	23-Apr-15	14:45	15:15	48.50	2.02	2.6	0	0	0.00
				23-Apr-15	25-Apr-15	15:15	9:20	42.08	1.75	2.2	0	0	0.00
	GC-MT-02	629095	5436430	22-Apr-15	24-Apr-15	10:35	14:15	51.67	2.15	3.8	0	0	0.00
	GC-MT-03	628820	5436565	22-Apr-15	25-Apr-15	10:45	15:05	76.33	3.18	1.5	0	0	0.00
	TOTAL							**218.58**	**9.11**	**-**	**0**	**0**	**0.00**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total minnow trap effort in one area.

Seine Net

Table F.20: Seine Catch Records for Fish Caught in Koocanusa Reservoir, August 2014

Area	Seining Station	Date	Time	Location (NAD 83, Zone 11U)		Length (m)	Distance (m)	# of Hauls	Area Seined (m^2)	Largescale Sucker			Northern Pikeminnow			Peamouth Chub			Pumpkinseed			Redside Shiner (adult)			Redside Shiner			Yellow Perch		
				Easting	Northing					Catch	Mortalities/ Sacrificed	CPUE [b]	Catch	Mortalities/ Sacrificed	CPUE	Catch	Mortalities/ Sacrificed	CPUE	Catch	Mortalities/ Sacrificed	CPUE	Catch	Mortalities/ Sacrificed	CPUE	Catch	Mortalities/ Sacrificed	CPUE	Catch	Mortalities/ Sacrificed	CPUE
Sand Creek	SC-SN-1	21-Aug-14	13:30	623571	5463284	15.24	7.62	1	116	200	5	1.72	40	5	0.34	0	0	0.00	1	0	0.01	75	15	0.65	62	15	0.53	15	5	0.13
Elk River	ER-SN-1	20-Aug-14	15:15	632866	5448122	15.24	1.52	1	23	5	5	0.22	5	5	0.22	0	0	0.00	0	0	0.00	50	10	2.16	250	20	10.79	0	0	0.00
Gold Creek	GC-SN-1	20-Aug-14	11:45	628534	5436696	15.24	3.05	1	46	29	5	0.62	3	3	0.06	13	5	0.28	0	0	0.00	200	10	4.30	500	20	10.76	22	5	0.47

[a] Fish were juveniles unless otherwise specified in the table as adults.
[b] Total catch-per-unit-effort (CPUE; number of fish / m^2) calculated as the number of fish caught over the area seined.

Table F.21: Summary Statistics for Bull Trout Meristic Data Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structures Collected[a]	Age	Sex	Abnormalities	Tissue Collected
Sand Creek	2014	17-Feb-14	OR-BT-01-Feb-14 [b]	64.5	67.5	-	-	-	-	-	-
		12-Apr-14	SC-BT-01-Apr-14	38.5	36.2	500	-	-	-	-	-
		13-Apr-14	SC-BT-02-Apr-14	49.8	48.0	1,100	-	-	-	-	-
		14-Apr-14	SC-BT-03-Apr-14	55.2	53.3	1,450	-	-	-	-	-
		16-Apr-14	SC-BT-04-Apr-14	56.5	55.0	1,550	-	-	-	-	-
		23-Aug-14	SC-BT-01-Aug-14	58.0	55.5	1,600	sc, pf	8	-	-	muscle plug
	2015	28-Feb-15	SC-BT-01-Feb-15	42.8	41.8	740	-	-		-	muscle plug
		30-Apr-15	SC-BT-01-Apr-15	56.7	53.4	1,725	-	-	-	-	muscle plug
	2016	19-Apr-16	SC-BT-01-Apr-16	24.5	23.2	110	-	-	-	-	muscle plug
		19-Apr-16	SC-BT-02-Apr-16	44.2	42.7	650	sc	4	-	-	muscle plug
		20-Apr-16	SC-BT-03-Apr-16	78.5	75.5	4,700	-	-	-	-	muscle plug
		20-Apr-16	SC-BT-04-Apr-16	36.0	34.1	400	sc	4	-	-	muscle plug
		20-Apr-16	SC-BT-05-Apr-16	45.7	43.2	840	sc	4	-	-	muscle plug
		21-Apr-16	SC-BT-06-Apr-16	55.6	52.9	1,800	sc	4	-	-	muscle plug
		21-Apr-16	SC-BT-07-Apr-16	41.4	38.6	605	sc	4	-	-	muscle plug
		21-Apr-16	SC-BT-08-Apr-16	37.0	34.4	385	sc	3	-	-	muscle plug
		21-Apr-16	SC-BT-09-Apr-16	30.1	28.9	215	sc	2	-	-	muscle plug
		21-Apr-16	SC-BT-10-Apr-16	36.7	34.7	375	sc	3	-	-	muscle plug
		23-Apr-16	SC-BT-11-Apr-16	33.7	31.9	300	-	-	-	-	-
		23-Apr-16	SC-BT-12-Apr-16	34.5	32.6	350	-	-	-	-	-
total sample size				**20**	**20**	**19**	**-**	**9**	**-**	**-**	**-**
average				**46**	**44**	**1,021**	**-**	**4**	**-**	**-**	**-**
median				**44**	**42**	**650**	**-**	**4**	**-**	**-**	**-**
standard deviation				**13**	**13**	**1,049**	**-**	**1.7**	**-**	**-**	**-**
standard error				**3.0**	**3.0**	**241**	**-**	**0.55**	**-**	**-**	**-**
minimum				**25**	**23**	**110**	**-**	**2**	**-**	**-**	**-**
maximum				**79**	**76**	**4,700**	**-**	**8**	**-**	**-**	**-**
Elk River	2014	13-Feb-14	ER-BT-01-Feb-14	63.3	60.1	2,500	-	-	-	-	-
		16-Feb-14	ER-BT-02-Feb-14	77.2	73.9	4,100	-	-	-	-	-
		16-Apr-14	ER-BT-01-Apr-14	24.2	22.5	113	-	-	-	-	-
		22-Aug-14	ER-BT-01-Aug-14	22.6	21.5	100	sc, oto	3	-	-	muscle
	2015	23-Apr-15	ER-BT-01-Apr-15	17.4	16.4	34	-	-	-	shortened operculum	-
		28-Apr-15	ER-BT-02-Apr-15	32.0	30.2	165	-	-	-	-	muscle plug
	2016	19-Apr-16	ER-BT-01-Apr-16	34.7	32.5	355	sc	4	-	-	muscle plug
		19-Apr-16	ER-BT-02-Apr-16	29.7	27.6	195	sc	4	-	-	muscle plug
		19-Apr-16	ER-BT-03-Apr-16	36.5	34.1	355	sc	4	-	-	muscle plug
		19-Apr-16	ER-BT-04-Apr-16	70.9	67.9	3,700	-	-	-	-	muscle
		21-Apr-16	ER-BT-05-Apr-16	62.7	59.6	2,540	-	-	-	-	muscle plug
		21-Apr-16	ER-BT-06-Apr-16	58.8	56.7	2,004	oto	4	F	-	muscle, ovaries
		22-Apr-16	ER-BT-07-Apr-16	62.5	60.2	2,600	-	-	-	-	muscle plug
		22-Apr-16	ER-BT-08-Apr-16	35.2	34.0	355	-	-	-	previous muscle plug	muscle plug
		24-Apr-16	ER-BT-09-Apr-16	63.2	60.0	2,490	sc	5	-	-	muscle plug
		24-Apr-16	ER-BT-10-Apr-16	64.8	62.4	2,850	sc	6	-	-	muscle plug
		25-Apr-16	ER-BT-11-Apr-16	69.5	65.0	3,000	-	-	-	-	muscle plug
		25-Apr-16	ER-BT-12-Apr-16	68.7	66.0	3,100	-	-	-	-	muscle plug
		22-Apr-16	ER-BT-13-Apr-16	28.2	26.6	140	-	-	-	-	none (juvenile)
total sample size				**19**	**19**	**19**	**-**	**7**	**-**	**-**	**-**
average				**49**	**46**	**1,616**	**-**	**4**	**-**	**-**	**-**
median				**59**	**57**	**2,004**	**-**	**4**	**-**	**-**	**-**
standard deviation				**20**	**19**	**1,449**	**-**	**0.95**	**-**	**-**	**-**
standard error				**4.6**	**4.4**	**332**	**-**	**0.36**	**-**	**-**	**-**
minimum				**17**	**16**	**34**	**-**	**3**	**-**	**-**	**-**
maximum				**77**	**74**	**4,100**	**-**	**6**	**-**	**-**	**-**
Gold Creek	2014	12-Feb-14	GC-BT-01-Feb-14	78.7	75.6	4,000[c]	-	-	-	-	-
	2015	26-Apr-15	GC-BT-01-Apr-15	33.5	31.5	310	sc	4	-	-	muscle plug
	2016	20-Apr-16	GC-BT-01-Apr-16	76.3	74.0	4,100	-	-	-	tumour on head	muscle plug
		20-Apr-16	GC-BT-02-Apr-16	43.5	41.0	810	sc, oto	5	-	-	muscle
		20-Apr-16	GC-BT-03-Apr-16	32.0	30.5	285	sc, oto	4	-	-	muscle
		24-Apr-16	GC-BT-04-Apr-16	38.7	36.5	510	sc, oto	5	-	-	muscle
		24-Apr-16	GC-BT-05-Apr-16	38.9	36.4	460	sc, oto	5	-	-	muscle
		24-Apr-16	GC-BT-06-Apr-16	27.9	26.2	164	oto	5	-	-	muscle
		27-Apr-16	GC-BT-07-Apr-16	62.4	59.2	2,490	sc, oto	5	F	-	muscle, ovaries
total sample size				**9**	**9**	**8**	**-**	**7**	**-**	**-**	**-**
average				**48**	**46**	**1,141**	**-**	**5**	**-**	**-**	**-**
median				**39**	**37**	**485**	**-**	**5**	**-**	**-**	**-**
standard deviation				**19**	**19**	**1,410**	**-**	**0.49**	**-**	**-**	**-**
standard error				**6.5**	**6.3**	**499**	**-**	**0.18**	**-**	**-**	**-**
minimum				**28**	**26**	**164**	**-**	**4**	**-**	**-**	**-**
maximum				**79**	**76**	**4,100**	**-**	**5**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths pf - pectoral fin-ray.

[b] Fish Collected at Oestreich Road and grouped with the Sand Creek summary statistics.

[c] Body weight is a field approximation as it was slightly larger than the maximum pesola (3,500 g).

Table F.22: Summary Statistics for Burbot Meristic Data Collected near Sand Creek, Elk River, Gold Creek, and Big Springs in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Abnormalities	Tissue Collected
Sand Creek	2014	17-Feb-14	OR-BB-01-Feb-14[b]	61.5	1,399	-	-	-	-	muscle plug
		15-Feb-14	SC-BB-01-Feb-14	69.4	2,120	-	-	-	-	muscle plug
		18-Feb-14	SC-BB-02-Feb-14	70.5	1,850	-	-	-	-	muscle plug
		18-Feb-14	SC-BB-03-Feb-14	63.0	1,510	-	-	-	-	muscle plug
		18-Feb-14	SC-BB-04-Feb-14	66.4	2,050	-	-	-	-	muscle plug
		18-Feb-14	SC-BB-05-Feb-14	70.1	2,150	-	-	-	-	muscle plug
		18-Feb-14	SC-BB-06-Feb-14	62.6	1,500	oto	6	F	-	muscle plug, muscle, ovaries
		14-Apr-14	SC-BB-01-Apr-14	82.0	3,150	-	-	-	-	muscle plug
		16-Apr-14	SC-BB-02-Apr-14	75.5	2,700	-	-	-	-	muscle plug
		16-Apr-14	SC-BB-03-Apr-14	55.5	1,200	-	-	-	-	muscle plug
		25-Aug-14	SC-BB-01-Aug-14	34.5	183	sc	-	-	-	muscle plug
	2015	27-Apr-15	SC-BB-01-Apr-15	63.0	1,780	-	-	-	-	muscle plug
		28-Apr-15	SC-BB-02-Apr-15	79.7	3,100	-	-	-	-	muscle plug
		29-Apr-15	SC-BB-03-Apr-15	69.5	2,480	-	-	-	-	muscle plug
		30-Apr-15	SC-BB-04-Apr-15	76.5	3,000	-	-	-	-	muscle plug
		30-Apr-15	SC-BB-05-Apr-15	33.5	280	-	-	-	-	none, too small
	2016	20-Apr-16	SC-BB-01-Apr-16	47.8	690	-	-	-	-	muscle plug
		21-Apr-16	SC-BB-02-Apr-16	39.1	285	-	-	-	-	muscle plug
		21-Apr-16	SC-BB-03-Apr-16	47.2	715	-	-	-	-	muscle plug
		22-Apr-16	SC-BB-04-Apr-16	48.9	755	-	-	-	-	muscle plug
		22-Apr-16	SC-BB-05-Apr-16	50.7	895	-	-	-	-	muscle plug
		23-Apr-16	SC-BB-06-Apr-16	40.8	435	-	-	-	-	muscle plug
		24-Apr-16	SC-BB-07-Apr-16	59.2	1,160	-	-	-	-	muscle plug
		24-Apr-16	SC-BB-08-Apr-16	43.8	580	-	-	-	-	muscle plug
		26-Apr-16	SC-BB-09-Apr-16	49.9	810	-	-	-	-	muscle plug
		27-Apr-16	SC-BB-10-Apr-16	40.6	465	-	-	-	Fish had been plugged before (although area had healed over)	muscle plug
		27-Apr-16	SC-BB-11-Apr-16	34.7	218	-	-	-	-	none (juvenile)
			total sample size	**27**	**27**	**-**	**-**	**-**	**-**	**-**
			average	**57**	**1,387**	**-**	**-**	**-**	**-**	**-**
			median	**59**	**1,200**	**-**	**-**	**-**	**-**	**-**
			standard deviation	**15**	**944**	**-**	**-**	**-**	**-**	**-**
			standard error	**2.8**	**182**	**-**	**-**	**-**	**-**	**-**
			minimum	**34**	**183**	**-**	**-**	**-**	**-**	**-**
			maximum	**82**	**3,150**	**-**	**-**	**-**	**-**	**-**
Elk River	2014	19-Apr-14	ER-BB-01-Apr-14	61.4	1,400	-	-	-	-	muscle plug
		19-Apr-14	ER-BB-02-Apr-14	66.5	1,560	-	-	-	-	muscle plug
	2015	27-Feb-15	ER-BB-01-Feb-15	62.6	1,340	-	-	-	-	muscle plug
		23-Apr-15	ER-BB-01-Apr-15	24.4	86	-	-	-	-	none, too small
		29-Apr-15	ER-BB-02-Apr-15	42.9	410	-	-	-	-	muscle plug
	2016	21-Apr-16	ER-BB-01-Apr-16	42.7	490	-	-	-	-	muscle plug
		21-Apr-16	ER-BB-02-Apr-16	47.3	660	-	-	-	-	muscle plug
		21-Apr-16	ER-BB-03-Apr-16	42.3	460	-	-	-	-	muscle plug
		21-Apr-16	ER-BB-04-Apr-16	44.7	590	-	-	-	-	muscle plug
		21-Apr-16	ER-BB-05-Apr-16	47.1	670	-	-	-	-	muscle plug
		21-Apr-16	ER-BB-06-Apr-16	42.2	510	-	-	-	-	muscle plug
		22-Apr-16	ER-BB-07-Apr-16	50.7	690	-	-	-	-	muscle plug
		24-Apr-16	ER-BB-08-Apr-16	51.5	1,040	-	-	-	-	muscle plug
		25-Apr-16	ER-BB-09-Apr-16	42.0	515	-	-	-	-	muscle plug
		25-Apr-16	ER-BB-10-Apr-16	44.3	605	-	-	-	-	muscle plug
		26-Apr-16	ER-BB-11-Apr-16	36.2	195	-	-	-	-	none (juvenile)
			total sample size	**16**	**16**	**-**	**-**	**-**	**-**	**-**
			average	**47**	**701**	**-**	**-**	**-**	**-**	**-**
			median	**45**	**598**	**-**	**-**	**-**	**-**	**-**
			standard deviation	**10**	**422**	**-**	**-**	**-**	**-**	**-**
			standard error	**2.6**	**105**	**-**	**-**	**-**	**-**	**-**
			minimum	**24**	**86**	**-**	**-**	**-**	**-**	**-**
			maximum	**67**	**1,560**	**-**	**-**	**-**	**-**	**-**
Gold Creek	2015	04-Mar-15	GC-BB-01-Mar-15[c]	64.0	1,530	oto	-	M	-	muscle
		27-Apr-15	GC-BB-01-Apr-15	38.3	285	-	-	-	-	muscle plug
Big Springs	2016	24-Jan-16	BS-BB-01-Jan-16[c]	63.3	2,600	oto	6	-	-	muscle
			total sample size	**3**	**3**	**-**	**-**	**-**	**-**	**-**
			average	**55**	**1,472**	**-**	**-**	**-**	**-**	**-**
			median	**63**	**1,530**	**-**	**-**	**-**	**-**	**-**
			standard deviation	**15**	**1,159**	**-**	**-**	**-**	**-**	**-**
			standard error	**8.5**	**669**	**-**	**-**	**-**	**-**	**-**
			minimum	**38**	**285**	**-**	**-**	**-**	**-**	**-**
			maximum	**64**	**2,600**	**-**	**-**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Fish Collected at Oestreich Road and grouped with the Sand Creek summary statistics.

[c] Burbot captured by a member of the Tobacco Plains Indian Band.

Table F.23: Summary Statistics for Largescale Sucker Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected	Comments
Sand Creek	2015	22-Apr-15	SC-CSU-02-Apr-15	F	44.0	41.2	665	sc, pf	12	5.893	6.536	653	-	-	muscle, ovaries	spent female
		22-Apr-15	SC-CSU-03-Apr-15	F	45.0	42.4	800	sc, pf	10	7.758	16.445	776	-	-	muscle, ovaries	spent female
		24-Apr-15	SC-CSU-04-Apr-15	F	46.3	43.2	790	sc, pf	15	6.921	8.592	774	regenerated scales	-	muscle, ovaries	-
		27-Apr-15	SC-CSU-05-Apr-15	F	42.0	39.2	673	sc, pf	11	28.882	9.436	635	-	-	muscle, ovaries	-
		1-May-15	SC-CSU-06-Apr-15	F	44.5	41.8	725	sc, pf	16	9.022	7.871	708	-	-	muscle, ovaries	spent female
		1-May-15	SC-CSU-07-Apr-15	F	45.6	42.4	825	sc, pf	15	6.701	9.081	809	-	-	muscle, ovaries	spent female
		total sample size		**-**	**6**	**6**	**6**	**-**	**6**	**6**	**6**	**6**	**-**	**-**	**-**	**-**
		average		**-**	**45**	**42**	**746**	**-**	**13**	**11**	**9.7**	**726**	**-**	**-**	**-**	**-**
		median		**-**	**45**	**42**	**758**	**-**	**14**	**7.3**	**8.8**	**741**	**-**	**-**	**-**	**-**
		standard deviation		**-**	**1.5**	**1.4**	**68**	**-**	**2.5**	**8.9**	**3.5**	**72**	**-**	**-**	**-**	**-**
		standard error		**-**	**0.61**	**0.57**	**28**	**-**	**1.0**	**3.6**	**1.4**	**29**	**-**	**-**	**-**	**-**
		minimum		**-**	**42**	**39**	**665**	**-**	**10**	**5.9**	**6.5**	**635**	**-**	**-**	**-**	**-**
		maximum		**-**	**46**	**43**	**825**	**-**	**16**	**29**	**16**	**809**	**-**	**-**	**-**	**-**
	2016	19-Apr-16	SC-CSU-04-Apr-16	F	44.6	41.5	740	sc, pf	13	5.126	7.376	727	-	-	muscle	-
		20-Apr-16	SC-CSU-05-Apr-16	F	45.2	42.7	745	sc, pf	13	9.732	11.336	724	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-08-Apr-16	F	45.2	42.5	790	sc, pf	12	48.020	9.848	732	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-10-Apr-16	F	42.1	39.5	615	sc, pf	12	4.874	15.798	594	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-12-Apr-16	F	48.8	44.9	710	sc, pf	16	6.710	7.851	695	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-13-Apr-16	F	41.0	38.1	540	sc, pf	13	6.012	8.170	526	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-14-Apr-16	F	48.1	45.4	820	sc, pf	13	7.141	10.193	803	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-16-Apr-16	F	40.9	38.4	560	sc, pf	11	4.799	7.551	548	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-17-Apr-16	F	43.0	40.2	660	sc, pf	11	5.920	8.536	646	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-18-Apr-16	F	44.6	41.9	715	sc, pf	14	7.755	8.635	699	-	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-20-Apr-16	F	44.6	42.4	720	sc, pf	12	10.599	9.084	700	-	-	muscle	-
		20-Apr-16	SC-CSU-21-Apr-16	F	35.2	42.1	730	sc, pf	11	4.854	8.098	717	-	-	muscle	-
		20-Apr-16	SC-CSU-23-Apr-16	F	45.3	42.7	835	sc, pf	14	6.460	8.484	820	-	-	muscle	-
		20-Apr-16	SC-CSU-25-Apr-16	F	44.2	41.2	720	sc, pf	13	5.941	9.228	705	-	-	-	-
		20-Apr-16	SC-CSU-27-Apr-16	F	43.4	41.0	690	sc, pf	15	5.857	7.900	676	-	-	-	-
		20-Apr-16	SC-CSU-28-Apr-16	F	47.5	45.0	840	sc, pf	14	8.439	8.625	823	-	-	-	-
		20-Apr-16	SC-CSU-34-Apr-16	F	41.2	38.5	615	sc, pf	12	3.889	9.215	602	-	-	-	-
		20-Apr-16	SC-CSU-36-Apr-16	F	43.0	40.3	695	sc, pf	11	21.582	4.896	669	half of caudal fin missing	-	muscle, ovaries	-
		20-Apr-16	SC-CSU-37-Apr-16	F	47.5	44.5	830	sc, pf	15	9.717	9.002	811	-	-	-	-
		20-Apr-16	SC-CSU-39-Apr-16	F	39.0	36.8	520	sc, pf	10	3.417	3.203	513	-	-	-	-
		20-Apr-16	SC-CSU-40-Apr-16	F	40.6	37.7	530	sc, pf	12	3.982	8.610	517	-	-	-	-
		20-Apr-16	SC-CSU-42-Apr-16	F	38.7	36.3	470	sc, pf	11	3.109	7.330	460	-	-	-	-
		20-Apr-16	SC-CSU-43-Apr-16	F	39.4	37.0	530	-	-	-	-	-	-	-	-	-
		21-Apr-16	SC-CSU-44-Apr-16	F	46.6	43.5	820	-	-	-	-	-	-	-	-	-
		total sample size		**-**	**24**	**24**	**24**	**-**	**22**	**22**	**22**	**22**	**-**	**-**	**-**	**-**
		average		**-**	**43**	**41**	**685**	**-**	**13**	**8.8**	**8.6**	**669**	**-**	**-**	**-**	**-**
		median		**-**	**44**	**41**	**713**	**-**	**13**	**6.0**	**8.6**	**697**	**-**	**-**	**-**	**-**
		standard deviation		**-**	**3.4**	**2.7**	**114**	**-**	**1.6**	**9.6**	**2.3**	**106**	**-**	**-**	**-**	**-**
		standard error		**-**	**0.69**	**0.56**	**23**	**-**	**0.33**	**2.0**	**0.49**	**23**	**-**	**-**	**-**	**-**
		minimum		**-**	**35**	**36**	**470**	**-**	**10**	**3.1**	**3.2**	**460**	**-**	**-**	**-**	**-**
		maximum		**-**	**49**	**45**	**840**	**-**	**16**	**48**	**16**	**823**	**-**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, pf - pectoral fin-ray.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

[c] Confidence around provided ages was low (i.e., at or below 50% confidence).

Table F.23: Summary Statistics for Largescale Sucker Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected	Comments
Sand Creek	2015	22-Apr-15	SC-CSU-01-Apr-15	M	41.6	38.8	650	sc, pf	13	3.131	7.199	640	-	-	muscle	spent male
	2016	19-Apr-16	SC-CSU-02-Apr-16	M	37.9	34.8	520	sc, pf	10	9.854	5.561	505	-	-	muscle	-
		19-Apr-16	SC-CSU-03-Apr-16	M	42.9	40.1	805	sc, pf	11	28.380	16.748	760	-	-	muscle	-
		20-Apr-16	SC-CSU-15-Apr-16	M	41.8	38.2	590	sc, pf	13	0.681	7.707	582	-	-	muscle	-
		20-Apr-16	SC-CSU-19-Apr-16	M	43.7	40.9	630	sc, pf	13	0.951	6.160	623	-	-	muscle	-
		20-Apr-16	SC-CSU-22-Apr-16	M	41.8	39.5	585	sc, pf	12	9.616	8.467	567	-	-	muscle	-
		20-Apr-16	SC-CSU-24-Apr-16	M	45.5	42.2	650	sc, pf	12	1.633	5.893	642	-	-	muscle	-
		20-Apr-16	SC-CSU-31-Apr-16	M	41.6	39.0	550	sc, pf	14	1.499	5.894	543	inconsistent scale pattern	-	-	-
		20-Apr-16	SC-CSU-32-Apr-16	M	42.5	39.6	600	sc, pf	13	1.133	7.530	591	-	-	-	-
		20-Apr-16	SC-CSU-33-Apr-16	M	44.2	41.1	640	sc, pf	13	2.179	9.112	629	worms	0.606	-	-
		20-Apr-16	SC-CSU-35-Apr-16	M	41.5	38.5	535	sc, pf	11	1.742	5.208	528	-	-	-	-
		20-Apr-16	SC-CSU-38-Apr-16	M	40.1	37.7	540	sc, pf	12	15.555	6.768	518	-	-	-	-
		20-Apr-16	SC-CSU-41-Apr-16	M	40.5	38.2	545	sc, pf	14	0.787	10.352	534	-	-	-	-
		21-Apr-16	SC-CSU-45-Apr-16	M	43.9	40.5	720	sc, pf	14	4.991	8.917	706	-	-	-	-
		21-Apr-16	SC-CSU-46-Apr-16	M	42.0	38.9	610	sc, pf	12	1.507	8.769	600	worms	0.026	-	-
		21-Apr-16	SC-CSU-47-Apr-16	M	42.4	39.6	660	sc, pf	13	19.744	10.744	630	-	-	-	-
		21-Apr-16	SC-CSU-48-Apr-16	M	41.1	38.3	620	sc, pf	10	19.578	5.685	595	-	-	-	-
		22-Apr-16	SC-CSU-49-Apr-16	M	44.6	42.0	710	sc, pf	13	2.232	10.318	697	-	-	-	-
		22-Apr-16	SC-CSU-50-Apr-16	M	39.9	36.9	510	sc, pf	10	12.809	5.902	491	-	-	-	-
		22-Apr-16	SC-CSU-51-Apr-16	M	43.0	40.2	540	sc, pf	13	3.724	7.738	529	regenerated scale pattern	-	-	-
		22-Apr-16	SC-CSU-52-Apr-16	M	38.3	35.9	510	sc, pf	12	1.157	11.844	497	-	-	-	-
		total sample size		-	**20**	**20**	**20**	-	**20**	**20**	**20**	**20**	-	**2**	-	-
		average		-	**42**	**39**	**604**	-	**12**	**7.0**	**8.3**	**588**	-	**0.32**	-	-
		median		-	**42**	**39**	**595**	-	**13**	**2.2**	**7.7**	**586**	-	**0.32**	-	-
		standard deviation		-	**2.0**	**1.9**	**79**	-	**1.3**	**8.1**	**2.8**	**74**	-	**0.41**	-	-
		standard error		-	**0.44**	**0.42**	**18**	-	**0.29**	**1.8**	**0.63**	**17**	-	**0.29**	-	-
		minimum		-	**38**	**35**	**510**	-	**10**	**0.68**	**5.2**	**491**	-	**0.026**	-	-
		maximum		-	**46**	**42**	**805**	-	**14**	**28**	**17**	**760**	-	**0.61**	-	-
Elk River	2015	22-Apr-15	ER-CSU-01-Apr-15	F	41.9	39.0	600	sc, pf	13	6.095	7.764	586	-	-	muscle, ovaries	-
		22-Apr-15	ER-CSU-02-Apr-15	F	40.6	37.6	550	sc, pf	11	5.345	5.909	539	-	-	muscle, ovaries	-
		22-Apr-15	ER-CSU-04-Apr-15	F	47.2	44.2	718	sc, pf	17	9.507	5.033	703	-	-	muscle, ovaries	spent female
		22-Apr-15	ER-CSU-05-Apr-15	F	38.3	35.6	480	sc, pf	11	3.066	5.303	472	-	-	muscle, ovaries	spent female
		26-Apr-15	ER-CSU-08-Apr-15	F	46.0	42.7	755	sc, pf	13	9.078	6.909	739	-	-	muscle, ovaries	spent female
		26-Apr-15	ER-CSU-09-Apr-15	F	41.8	39.2	618	sc, pf	13	3.721	5.947	608	-	-	muscle, ovaries	spent female
		26-Apr-15	ER-CSU-10-Apr-15	F	39.8	37.2	605	sc, pf	10	0.569	6.908	598	-	-	muscle, ovaries	spent female
		26-Apr-15	ER-CSU-11-Apr-15	F	39.6	37.0	478	sc, pf	11	0.719	6.334	471	-	-	muscle, ovaries	spent female
		28-Apr-15	ER-CSU-12-Apr-15	F	42.8	39.6	670	sc, pf	13	4.704	8.840	656	-	-	muscle, ovaries	spent female
		30-Apr-15	ER-CSU-17-Apr-15	F	48.3	45.0	895	sc, pf	13	13.144	9.605	872	-	-	muscle, ovaries	spent female
		total sample size		-	**10**	**10**	**10**	-	**10**	**10**	**10**	**10**	-	-	-	-
		average		-	**43**	**40**	**637**	-	**13**	**5.6**	**6.9**	**624**	-	-	-	-
		median		-	**42**	**39**	**612**	-	**13**	**5.0**	**6.6**	**603**	-	-	-	-
		standard deviation		-	**3.4**	**3.2**	**128**	-	**2.0**	**4.0**	**1.5**	**124**	-	-	-	-
		standard error		-	**1.1**	**1.0**	**41**	-	**0.62**	**1.3**	**0.47**	**39**	-	-	-	-
		minimum		-	**38**	**36**	**478**	-	**10**	**0.57**	**5.0**	**471**	-	-	-	-
		maximum		-	**48**	**45**	**895**	-	**17**	**13**	**9.6**	**872**	-	-	-	-

[a] Age structures collected: sc - scales, pf - pectoral fin-ray.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

[c] Confidence around provided ages was low (i.e., at or below 50% confidence).

Table F.23: Summary Statistics for Largescale Sucker Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected	Comments
Elk River	2016	19-Apr-16	ER-CSU-02-Apr-16	F	42.8	39.7	635	sc, pf	14	7.292	7.333	620	-	-	muscle	-
		19-Apr-16	ER-CSU-03-Apr-16	F	42.4	40.1	830	sc, pf	14	45.237	17.422	767	-	-	muscle, ovaries	-
		19-Apr-16	ER-CSU-04-Apr-16	F	44.0	40.9	860	sc, pf	12	69.616	13.278	777	-	-	muscle, ovaries	-
		20-Apr-16	ER-CSU-05-Apr-16	F	43.6	41.0	675	sc, pf	13	2.445	6.686	666	-	-	-	-
		21-Apr-16	ER-CSU-07-Apr-16[c]	F	45.3	42.5	765	sc, pf	10	9.126	10.477	745	-	-	muscle, ovaries	-
		21-Apr-16	ER-CSU-08-Apr-16	F	43.3	40.4	695	sc, pf	11	3.144	10.252	682	-	-	muscle, ovaries	-
		21-Apr-16	ER-CSU-11-Apr-16	F	40.9	38.6	555	sc, pf	13	5.513	8.611	541	-	-	muscle, ovaries	-
		21-Apr-16	ER-CSU-13-Apr-16	F	42.8	38.6	640	sc, pf	10	5.984	9.811	624	-	-	muscle, ovaries	-
		21-Apr-16	ER-CSU-15-Apr-16	F	37.2	34.8	430	sc, pf	8	1.910	5.608	422	-	-	muscle	-
		22-Apr-16	ER-CSU-16-Apr-16	F	46.9	43.0	930	sc, pf	15	10.688	17.321	902	-	-	muscle, ovaries	-
		22-Apr-16	ER-CSU-17-Apr-16	F	42.8	39.7	650	sc, pf	11	4.393	9.150	636	-	-	-	-
		22-Apr-16	ER-CSU-19-Apr-16	F	47.4	44.6	940	sc, pf	15	6.422	20.723	913	-	-	-	-
		22-Apr-16	ER-CSU-20-Apr-16	F	45.2	42.5	780	sc, pf	14	7.387	16.184	756	-	-	muscle, ovaries	-
		22-Apr-16	ER-CSU-21-Apr-16	F	45.2	42.5	790	sc, pf	13	7.661	13.467	769	-	-	-	-
		22-Apr-16	ER-CSU-22-Apr-16	F	39.6	36.7	555	sc, pf	10	3.121	10.601	541	-	-	-	-
		22-Apr-16	ER-CSU-23-Apr-16	F	46.4	43.7	825	sc, pf	13	5.375	10.774	809	-	-	-	-
		22-Apr-16	ER-CSU-24-Apr-16	F	39.0	36.5	490	sc, pf	9	4.940	6.380	479	-	-	-	-
		23-Apr-16	ER-CSU-26-Apr-16	F	41.8	39.2	550	sc, pf	12	4.815	7.824	537	-	-	-	-
		23-Apr-16	ER-CSU-27-Apr-16	F	45.7	42.7	770	sc, pf	15	5.034	7.867	757	-	-	-	-
		23-Apr-16	ER-CSU-29-Apr-16	F	45.0	41.8	705	sc, pf	16	5.665	8.720	691	-	-	-	-
		23-Apr-16	ER-CSU-34-Apr-16	F	45.7	42.7	875	sc, pf	11	37.258	3.597	834	-	-	muscle, ovaries	-
		23-Apr-16	ER-CSU-45-Apr-16	F	46.0	43.1	880	sc, pf	9	34.402	11.847	834	-	-	muscle, ovaries	-
		total sample size		-	**22**	**22**	**22**	-	**22**	**22**	**22**	**22**	-	-	-	-
		average		-	**44**	**41**	**719**	-	**12**	**13**	**11**	**696**	-	-	-	-
		median		-	**44**	**41**	**735**	-	**13**	**5.8**	**10**	**718**	-	-	-	-
		standard deviation		-	**2.7**	**2.5**	**145**	-	**2.3**	**17**	**4.3**	**134**	-	-	-	-
		standard error		-	**0.57**	**0.54**	**31**	-	**0.48**	**3.7**	**0.91**	**29**	-	-	-	-
		minimum		-	**37**	**35**	**430**	-	**8**	**1.9**	**3.6**	**422**	-	-	-	-
		maximum		-	**47**	**45**	**940**	-	**16**	**70**	**21**	**913**	-	-	-	-
	2015	23-Apr-15	ER-CSU-06-Apr-15	M	36.6	34.0	420	-	8	-	4.408	-	-	-	muscle	spent male
		28-Apr-15	ER-CSU-13-Apr-15	M	41.8	39.1	620	sc, pf	13	14.614	6.697	599	-	-	-	-
		29-Apr-15	ER-CSU-16-Apr-15	M	38.2	35.4	490	sc, pf	9	0.783	6.025	483	-	-	-	spent male
		30-Apr-15	ER-CSU-18-Apr-15	M	38.3	35.8	525	sc, pf	14	12.867	4.975	507	-	-	-	-
		30-Apr-15	ER-CSU-19-Apr-15	M	40.5	37.8	575	sc, pf	10	17.591	6.085	551	-	-	-	-
		total sample size		-	**5**	**5**	**5**	-	**5**	**4**	**5**	**4**	-	-	-	-
		average		-	**39**	**36**	**526**	-	**11**	**11**	**5.6**	**535**	-	-	-	-
		median		-	**38**	**36**	**525**	-	**10**	**14**	**6.0**	**529**	-	-	-	-
		standard deviation		-	**2.1**	**2.0**	**77**	-	**2.6**	**7.4**	**0.93**	**51**	-	-	-	-
		standard error		-	**0.92**	**0.90**	**34**	-	**1.2**	**3.7**	**0.41**	**25**	-	-	-	-
		minimum		-	**37**	**34**	**420**	-	**8**	**0.78**	**4.4**	**483**	-	-	-	-
		maximum		-	**42**	**39**	**620**	-	**14**	**18**	**6.7**	**599**	-	-	-	-

[a] Age structures collected: sc - scales, pf - pectoral fin-ray.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

[c] Confidence around provided ages was low (i.e., at or below 50% confidence).

Table F.23: **Summary Statistics for Largescale Sucker Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016**

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected	Comments
Elk River	2016	20-Apr-16	ER-CSU-06-Apr-16	M	39.7	36.9	565	sc, pf	9	1.225	7.098	557	-	-	-	-
		21-Apr-16	ER-CSU-09-Apr-16	M	36.8	34.7	450	sc, pf	10	26.550	7.481	416	-	-	-	-
		21-Apr-16	ER-CSU-10-Apr-16	M	38.0	35.5	500	sc, pf	9	0.984	8.420	491	-	-	-	-
		22-Apr-16	ER-CSU-25-Apr-16	M	39.2	36.6	530	sc, pf	11	1.932	6.413	522	-	-	-	-
		23-Apr-16	ER-CSU-28-Apr-16	M	43.4	40.5	660	sc, pf	12	1.773	4.551	654	-	-	-	-
		23-Apr-16	ER-CSU-30-Apr-16	M	40.0	37.0	565	sc, pf	11	1.790	5.907	557	-	-	-	-
		23-Apr-16	ER-CSU-31-Apr-16	M	42.4	39.5	610	sc, pf	13	1.123	8.451	600	-	-	-	-
		23-Apr-16	ER-CSU-32-Apr-16	M	39.1	36.5	570	sc, pf	12	14.375	7.037	549	-	-	-	-
		23-Apr-16	ER-CSU-33-Apr-16	M	42.7	39.9	645	sc, pf	10	1.921	7.995	635	-	-	-	-
		23-Apr-16	ER-CSU-35-Apr-16	M	38.7	36.3	490	sc, pf	10	16.067	5.224	469	-	-	-	-
		23-Apr-16	ER-CSU-36-Apr-16	M	37.8	34.9	475	sc, pf	12	1.143	6.074	468	-	-	-	-
		23-Apr-16	ER-CSU-37-Apr-16	M	40.5	37.6	610	sc, pf	14	13.172	8.262	589	-	-	-	-
		23-Apr-16	ER-CSU-38-Apr-16	M	43.0	40.1	690	sc, pf	14	2.921	7.935	679	-	-	-	-
		23-Apr-16	ER-CSU-39-Apr-16	M	39.1	36.7	560	sc, pf	11	12.739	7.731	540	-	-	-	-
		23-Apr-16	ER-CSU-40-Apr-16	M	37.6	34.9	465	sc, pf	9	10.821	6.102	448	-	-	-	-
		23-Apr-16	ER-CSU-41-Apr-16	M	38.8	36.1	420	sc, pf	9	1.111	4.553	414	-	-	-	-
		23-Apr-16	ER-CSU-42-Apr-16	M	43.2	40.1	715	-	-	-	-	-	-	-	-	unable to process accurately (overly decomposed)
		23-Apr-16	ER-CSU-43-Apr-16	M	44.1	41.5	675	sc, pf	17	2.095	10.203	663	-	-	-	-
		23-Apr-16	ER-CSU-44-Apr-16	M	41.3	38.0	550	sc, pf	9	1.529	7.046	541	-	-	-	-
		25-Apr-16	ER-CSU-46-Apr-16	M	43.7	41.1	730	sc, pf	13	2.239	18.231	710	-	-	-	-
		26-Apr-16	ER-CSU-47-Apr-16	M	40.6	38.3	655	sc, pf	13	16.992	9.989	628	-	-	-	-
		total sample size		**-**	**21**	**21**	**21**	**-**	**20**	**20**	**20**	**20**	**-**	**-**	**-**	**-**
		average		**-**	**40**	**38**	**578**	**-**	**11**	**6.6**	**7.7**	**556**	**-**	**-**	**-**	**-**
		median		**-**	**40**	**37**	**565**	**-**	**11**	**2.0**	**7.3**	**553**	**-**	**-**	**-**	**-**
		standard deviation		**-**	**2.3**	**2.2**	**91**	**-**	**2.2**	**7.5**	**2.9**	**88**	**-**	**-**	**-**	**-**
		standard error		**-**	**0.49**	**0.47**	**20**	**-**	**0.48**	**1.7**	**0.65**	**20**	**-**	**-**	**-**	**-**
		minimum		**-**	**37**	**35**	**420**	**-**	**9**	**0.98**	**4.6**	**414**	**-**	**-**	**-**	**-**
		maximum		**-**	**44**	**42**	**730**	**-**	**17**	**27**	**18**	**710**	**-**	**-**	**-**	**-**
Gold Creek	2015	22-Apr-15	GC-CSU-02-Apr-15	F	41.7	38.7	590	sc, pf	12	4.679	5.812	580	-	-	muscle, ovaries	-
		25-Apr-15	GC-CSU-08-Apr-15	F	44.3	41.5	630	sc, pf	11	4.424	6.842	619	-	-	muscle, ovaries	spent female
		25-Apr-15	GC-CSU-09-Apr-15	F	46.7	43.2	755	sc, pf	16	6.609	4.486	744	-	-	muscle, ovaries	spent female
		25-Apr-15	GC-CSU-10-Apr-15	F	48.0	44.5	980	sc, pf	15	42.843	12.110	925	recently attacked by osprey	-	muscle, ovaries	-
		25-Apr-15	GC-CSU-11-Apr-15	F	42.0	39.0	620	sc, pf	13	3.637	6.577	610	-	-	muscle, ovaries	spent female
		27-Apr-15	GC-CSU-13-Apr-15	F	41.4	38.2	523	sc, pf	12	1.404	5.845	516	-	-	muscle, ovaries	spent female
		29-Apr-15	GC-CSU-14-Apr-15	F	41.4	38.4	565	sc, pf	12	4.935	5.626	554	-	-	muscle, ovaries	spent female
		29-Apr-15	GC-CSU-15-Apr-15	F	44.8	41.5	700	sc, pf	14	5.827	6.709	687	-	-	muscle, ovaries	spent female
		30-Apr-15	GC-CSU-17-Apr-15	F	41.0	37.9	508	sc, pf	11	4.891	4.910	498	-	-	muscle, ovaries	-
		1-May-15	GC-CSU-18-Apr-15	F	42.0	39.1	605	sc, pf	8	2.505	4.952	598	-	-	muscle	spent female
		total sample size		**-**	**10**	**10**	**10**	**-**	**10**	**10**	**10**	**10**	**-**	**-**	**-**	**-**
		average		**-**	**43**	**40**	**648**	**-**	**12**	**8.2**	**6.4**	**633**	**-**	**-**	**-**	**-**
		median		**-**	**42**	**39**	**613**	**-**	**12**	**4.8**	**5.8**	**604**	**-**	**-**	**-**	**-**
		standard deviation		**-**	**2.5**	**2.3**	**139**	**-**	**2.3**	**12**	**2.2**	**126**	**-**	**-**	**-**	**-**
		standard error		**-**	**0.78**	**0.73**	**44**	**-**	**0.72**	**3.9**	**0.68**	**40**	**-**	**-**	**-**	**-**
		minimum		**-**	**41**	**38**	**508**	**-**	**8**	**1.4**	**4.5**	**498**	**-**	**-**	**-**	**-**
		maximum		**-**	**48**	**45**	**980**	**-**	**16**	**43**	**12**	**925**	**-**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, pf - pectoral fin-ray.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

[c] Confidence around provided ages was low (i.e., at or below 50% confidence).

Table F.23: Summary Statistics for Largescale Sucker Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected	Comments
Gold Creek	2016	20-Apr-16	GC-CSU-02-Apr-16	F	44.2	41.0	890	sc, pf	13	7.693	21.845	860	-	-	muscle, ovaries	-
		20-Apr-16	GC-CSU-03-Apr-16	F	43.2	40.0	708	sc, pf	10	6.302	9.032	693	-	-	muscle, ovaries	-
		20-Apr-16	GC-CSU-04-Apr-16	F	46.5	43.5	1,070	sc, pf	11	102.620	18.351	949	-	-	muscle, ovaries	-
		20-Apr-16	GC-CSU-05-Apr-16	F	44.5	41.7	915	sc, pf	13	69.584	18.466	827	worms	-	muscle, ovaries	-
		20-Apr-16	GC-CSU-06-Apr-16	F	41.0	37.9	580	sc, pf	10	3.954	9.000	567	undeveloped	-	-	-
		20-Apr-16	GC-CSU-07-Apr-16	F	44.4	41.3	800	sc, pf	12	4.581	15.978	779	undeveloped	-	-	-
		20-Apr-16	GC-CSU-08-Apr-16	F	41.1	38.3	540	sc, pf	10	5.028	9.689	525	undeveloped	-	-	-
		20-Apr-16	GC-CSU-09-Apr-16	F	48.5	46.1	1,260	sc, pf	13	143.923	22.329	1,094	-	-	muscle, ovaries	-
		21-Apr-16	GC-CSU-11-Apr-16	F	44.5	41.6	755	sc, pf	13	5.358	9.573	740	-	-	-	-
		22-Apr-16	GC-CSU-16-Apr-16	F	46.0	42.8	950	sc, pf	13	4.698	17.727	928	-	-	-	-
		22-Apr-16	GC-CSU-17-Apr-16	F	42.0	39.8	610	sc, pf	12	3.999	15.224	591	undeveloped	-	-	-
		22-Apr-16	GC-CSU-19-Apr-16	F	38.9	36.7	490	sc, pf	11	3.820	6.470	480	-	-	-	-
		23-Apr-16	GC-CSU-20-Apr-16	F	43.2	40.7	760	sc, pf	11	7.489	26.231	726	worms	-	muscle, ovaries	-
		23-Apr-16	GC-CSU-23-Apr-16	F	44.4	41.3	715	sc, pf	11	6.383	6.726	702	-	-	-	-
		23-Apr-16	GC-CSU-26-Apr-16[c]	F	46.6	43.7	1,045	sc, pf	10	137.690	22.543	885	-	-	muscle, ovaries	-
		23-Apr-16	GC-CSU-27-Apr-16	F	44.8	42.4	980	sc, pf	13	133.029	21.199	826	-	-	muscle, ovaries	-
		24-Apr-16	GC-CSU-29-Apr-16	F	40.6	37.8	650	sc, pf	11	4.499	9.038	636	-	-	-	-
		24-Apr-16	GC-CSU-30-Apr-16	F	44.7	41.8	760	sc, pf	13	4.361	14.427	741	worms	2.072	-	-
		24-Apr-16	GC-CSU-31-Apr-16	F	39.5	36.8	670	sc, pf	10	32.161	14.749	623	worms	0.453	muscle, ovaries	-
		24-Apr-16	GC-CSU-32-Apr-16	F	42.1	39.2	690	sc, pf	12	5.917	8.581	676	-	-	-	-
		24-Apr-16	GC-CSU-33-Apr-16	F	41.1	38.2	615	-	-	-	-	-	-	-	-	-
		25-Apr-16	GC-CSU-34-Apr-16	F	49.2	46.5	1,028	sc, pf	16	124.980	24.771	878	-	-	muscle, ovaries	-
		25-Apr-16	GC-CSU-37-Apr-16	F	44.1	41.8	695	sc, pf	12	39.278	10.855	645	-	-	muscle, ovaries	-
		27-Apr-16	GC-CSU-43-Apr-16	F	55.4	51.9	2,120	sc, pf	17	260.711	47.601	1,812	-	-	muscle, ovaries	-
		total sample size		**-**	**24**	**24**	**24**	**-**	**23**	**23**	**23**	**23**	**-**	**2**	**-**	**-**
		average		**-**	**44**	**41**	**846**	**-**	**12**	**49**	**17**	**791**	**-**	**1.3**	**-**	**-**
		median		**-**	**44**	**41**	**758**	**-**	**12**	**6.4**	**15**	**740**	**-**	**1.3**	**-**	**-**
		standard deviation		**-**	**3.5**	**3.4**	**332**	**-**	**1.8**	**69**	**9.1**	**267**	**-**	**1.1**	**-**	**-**
		standard error		**-**	**0.72**	**0.70**	**68**	**-**	**0.38**	**14**	**1.9**	**56**	**-**	**0.81**	**-**	**-**
		minimum		**-**	**39**	**37**	**490**	**-**	**10**	**3.8**	**6.5**	**480**	**-**	**0.45**	**-**	**-**
		maximum		**-**	**55**	**52**	**2,120**	**-**	**17**	**261**	**48**	**1,812**	**-**	**2.1**	**-**	**-**
	2015	22-Apr-15	GC-CSU-03-Apr-15	M	41.1	38.2	560	sc, pf	10	1.634	6.041	552	-	-	muscle	-
		23-Apr-15	GC-CSU-04-Apr-15	M	39.0	36.3	520	sc, pf	10	15.912	4.527	500	-	-	-	-
		23-Apr-15	GC-CSU-05-Apr-15	M	39.5	36.8	540	sc, pf	12	14.970	4.900	520	-	-	-	-
		24-Apr-15	GC-CSU-07-Apr-15	M	38.6	35.8	490	sc, pf	10	9.316	5.675	475	-	-	-	-
		29-Apr-15	GC-CSU-16-Apr-15	M	40.2	37.5	540	sc, pf	11	10.056	6.370	524	-	-	-	-
		total sample size		**-**	**5**	**5**	**5**	**-**	**5**	**5**	**5**	**5**	**-**	**-**	**-**	**-**
		average		**-**	**40**	**37**	**530**	**-**	**11**	**10**	**5.5**	**514**	**-**	**-**	**-**	**-**
		median		**-**	**40**	**37**	**540**	**-**	**10**	**10**	**5.7**	**520**	**-**	**-**	**-**	**-**
		standard deviation		**-**	**0.99**	**0.95**	**26**	**-**	**0.89**	**5.7**	**0.77**	**29**	**-**	**-**	**-**	**-**
		standard error		**-**	**0.44**	**0.43**	**12**	**-**	**0.40**	**2.5**	**0.35**	**13**	**-**	**-**	**-**	**-**
		minimum		**-**	**39**	**36**	**490**	**-**	**10**	**1.6**	**4.5**	**475**	**-**	**-**	**-**	**-**
		maximum		**-**	**41**	**38**	**560**	**-**	**12**	**16**	**6.4**	**552**	**-**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, pf - pectoral fin-ray.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

[c] Confidence around provided ages was low (i.e., at or below 50% confidence).

Table F.23: Summary Statistics for Largescale Sucker Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected	Comments
Gold Creek	2016	21-Apr-16	GC-CSU-10-Apr-16	M	43.6	40.7	860	sc, pf	13	38.801	18.578	803	-	-	-	-
		22-Apr-16	GC-CSU-14-Apr-16	M	38.6	36.2	510	sc, pf	12	13.066	6.445	490	-	-	-	-
		23-Apr-16	GC-CSU-21-Apr-16	M	45.7	42.9	960	sc, pf	12	46.645	27.423	886	-	-	-	-
		23-Apr-16	GC-CSU-22-Apr-16	M	45.9	43.2	975	sc, pf	16	48.089	13.850	913	-	-	-	-
		23-Apr-16	GC-CSU-24-Apr-16	M	47.2	44.5	1,125	sc, pf	14	58.927	32.669	1,033	worms (in operculum)	-	-	-
		23-Apr-16	GC-CSU-25-Apr-16	M	48.0	44.8	1,110	sc, pf	18	56.575	19.993	1,033	-	-	-	-
		24-Apr-16	GC-CSU-28-Apr-16	M	47.4	43.9	930	sc, pf	16	25.603	19.307	885	worms	-	-	-
		25-Apr-16	GC-CSU-35-Apr-16	M	44.1	41.9	890	sc, pf	12	35.268	14.973	840	-	-	-	-
		25-Apr-16	GC-CSU-36-Apr-16	M	43.2	40.0	700	sc, pf	12	1.215	9.211	690	-	-	-	-
		25-Apr-16	GC-CSU-38-Apr-16	M	40.4	37.6	575	sc, pf	10	17.270	6.214	552	-	-	-	-
		26-Apr-16	GC-CSU-39-Apr-16	M	44.9	42.2	935	sc, pf	13	21.032	14.250	900	-	-	-	-
		26-Apr-16	GC-CSU-40-Apr-16	M	44.4	37.7	605	sc, pf	11	12.303	6.677	586	-	-	-	-
		26-Apr-16	GC-CSU-41-Apr-16	M	36.5	33.8	450	sc, pf	8	0.678	7.360	442	-	-	-	-
		26-Apr-16	GC-CSU-42-Apr-16	M	37.4	34.8	510	sc, pf	9	13.423	5.979	491	-	-	-	-
		total sample size		**-**	**14**	**14**	**14**	**-**	**14**	**14**	**14**	**14**	**-**	**-**	**-**	**-**
		average		**-**	**43**	**40**	**795**	**-**	**13**	**28**	**14**	**753**	**-**	**-**	**-**	**-**
		median		**-**	**44**	**41**	**875**	**-**	**12**	**23**	**14**	**821**	**-**	**-**	**-**	**-**
		standard deviation		**-**	**3.7**	**3.7**	**231**	**-**	**2.8**	**20**	**8.4**	**207**	**-**	**-**	**-**	**-**
		standard error		**-**	**1.0**	**0.98**	**62**	**-**	**0.74**	**5.2**	**2.2**	**55**	**-**	**-**	**-**	**-**
		minimum		**-**	**37**	**34**	**450**	**-**	**8**	**0.68**	**6.0**	**442**	**-**	**-**	**-**	**-**
		maximum		**-**	**48**	**45**	**1,125**	**-**	**18**	**59**	**33**	**1,033**	**-**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, pf - pectoral fin-ray.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

[c] Confidence around provided ages was low (i.e., at or below 50% confidence).

Table F.24: Summary Statistics for Largescale Sucker Meristic Data Not Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Abnormalities	Tissue Collected
Sand Creek	2014	12-Apr-14	SC-CSU-01-Apr-14	29.0	27.2	210	sc	-	-	-	muscle plug
		12-Apr-14	SC-CSU-02-Apr-14	20.7	19.5	90	sc	-	-	-	muscle plug
		12-Apr-14	SC-CSU-03-Apr-14	28.0	26.0	160	sc	-	-	-	muscle plug
		12-Apr-14	SC-CSU-04-Apr-14	47.2	43.5	700	sc	-	-	-	muscle plug
		12-Apr-14	SC-CSU-05-Apr-14	17.5	16.0	50	sc	-	-	-	-
		12-Apr-14	SC-CSU-06-Apr-14	14.0	13.1	24	sc	-	-	-	-
		13-Apr-14	SC-CSU-07-Apr-14	45.2	43.0	510	sc	-	-	-	muscle plug
		13-Apr-14	SC-CSU-08-Apr-14	45.1	42.3	515	sc	-	-	-	muscle plug
		13-Apr-14	SC-CSU-09-Apr-14	47.5	44.3	520	sc	-	-	-	muscle plug
		13-Apr-14	SC-CSU-10-Apr-14	47.8	44.6	710	sc	-	-	-	muscle plug
		13-Apr-14	SC-CSU-11-Apr-14	47.3	44.0	435	sc	-	-	-	muscle plug
		13-Apr-14	SC-CSU-12-Apr-14	40.7	37.9	590	sc	-	-	-	muscle plug
		13-Apr-14	SC-CSU-13-Apr-14	43.3	40.0	720	sc	-	-	-	-
		13-Apr-14	SC-CSU-14-Apr-14	46.7	42.6	750	sc	-	-	-	-
		13-Apr-14	SC-CSU-15-Apr-14	46.0	43.5	800	sc	-	-	-	-
		13-Apr-14	SC-CSU-16-Apr-14	48.7	46.1	820	sc	-	-	-	-
		13-Apr-14	SC-CSU-17-Apr-14	41.0	38.3	520	sc	-	-	-	-
		13-Apr-14	SC-CSU-18-Apr-14	44.8	41.5	720	sc	-	-	-	-
		13-Apr-14	SC-CSU-19-Apr-14	52.0	48.2	950	sc	-	-	-	-
		13-Apr-14	SC-CSU-20-Apr-14	44.0	41.1	690	sc	-	-	-	-
		21-Aug-14	SC-CSU-01-Aug-14	41.0	38.1	550	sc	8	-	-	muscle plug
		23-Aug-14	SC-CSU-02-Aug-14	47.9	44.9	850	sc	9	-	-	muscle plug
		23-Aug-14	SC-CSU-03-Aug-14	49.2	46.2	1,000	sc	12	-	-	muscle plug
		23-Aug-14	SC-CSU-04-Aug-14	43.0	40.1	600	sc	8	-	-	muscle plug
		21-Aug-14	SC-CSUj-01-Aug-14	8.8	8.0	6	-	-	-	-	whole body
		21-Aug-14	SC-CSUj-02-Aug-14	9.6	8.9	8	-	-	-	-	whole body
		21-Aug-14	SC-CSUj-03-Aug-14	8.8	7.9	6	-	-	-	-	whole body
		21-Aug-14	SC-CSUj-04-Aug-14	9.1	8.2	7	-	-	-	-	whole body
		21-Aug-14	SC-CSUj-05-Aug-14	10.0	9.2	9	-	-	-	-	whole body
	2016	19-Apr-16	SC-CSU-01-Apr-16	39.2	36.0	510	-	-	-	-	-
		20-Apr-16	SC-CSU-06-Apr-16	42.7	40.4	640	-	-	I	-	-
		20-Apr-16	SC-CSU-07-Apr-16	44.9	42.1	650	-	-	I	-	-
		20-Apr-16	SC-CSU-09-Apr-16	42.4	39.2	585	-	-	I	-	-
		20-Apr-16	SC-CSU-11-Apr-16	41.3	38.6	575	-	-	I	-	-
		20-Apr-16	SC-CSU-26-Apr-16	40.2	37.8	570	-	-	I	-	-
		20-Apr-16	SC-CSU-29-Apr-16	38.5	36.2	490	-	-	I	-	-
		20-Apr-16	SC-CSU-30-Apr-16	42.7	39.6	600	-	-	I	-	-
total sample size				**37**	**37**	**37**	**-**	**4**	**-**	**-**	**-**
average				**37**	**34**	**490**	**-**	**9**	**-**	**-**	**-**
median				**43**	**40**	**570**	**-**	**9**	**-**	**-**	**-**
standard deviation				**14**	**13**	**296**	**-**	**2**	**-**	**-**	**-**
standard error				**2.3**	**2.1**	**49**	**-**	**0.95**	**-**	**-**	**-**
minimum				**8.8**	**7.9**	**5.8**	**-**	**8.0**	**-**	**-**	**-**
maximum				**52**	**48**	**1,000**	**-**	**12**	**-**	**-**	**-**
Elk River	2014	11-Apr-14	ER-CSU-01-Apr-14	45.7	42.9	720	-	-	-	-	-
		11-Apr-14	ER-CSU-02-Apr-14	40.4	38.2	520	-	-	-	-	-
		11-Apr-14	ER-CSU-03-Apr-14	39.2	36.8	590	-	-	-	-	-
		11-Apr-14	ER-CSU-04-Apr-14	45.7	42.8	660	-	-	-	-	-
		11-Apr-14	ER-CSU-05-Apr-14	39.9	37.3	540	-	-	-	-	-
		11-Apr-14	ER-CSU-06-Apr-14	41.3	38.5	600	-	-	-	-	-
		11-Apr-14	ER-CSU-07-Apr-14	40.8	38.1	600	-	-	-	-	-
		11-Apr-14	ER-CSU-08-Apr-14	46.2	43.0	820	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-09-Apr-14	43.4	40.5	660	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-10-Apr-14	46.3	43.2	720	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-11-Apr-14	50.9	47.8	1,010	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-12-Apr-14	49.1	46.2	980	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-13-Apr-14	41.5	38.4	580	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-14-Apr-14	43.6	40.9	600	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-15-Apr-14	41.8	38.8	620	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-16-Apr-14	43.4	40.8	740	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-17-Apr-14	46.0	43.3	810	-	-	-	-	muscle plug
		11-Apr-14	ER-CSU-18-Apr-14	42.1	39.3	420	-	-	-	-	-
		11-Apr-14	ER-CSU-19-Apr-14	44.5	41.5	740	-	-	-	-	-
		11-Apr-14	ER-CSU-20-Apr-14	42.0	39.7	610	-	-	-	-	-
		20-Aug-14	ER-CSU-01-Aug-14	40.5	38.0	450	sc	8	-	-	muscle plug
		22-Aug-14	ER-CSU-02-Aug-14	40.8	38.5	560	sc	9	-	-	muscle plug
		22-Aug-14	ER-CSU-03-Aug-14	41.5	38.8	595	sc	9	-	-	muscle plug
		22-Aug-14	ER-CSU-04-Aug-14	48.6	45.2	870	sc	12	-	-	muscle plug
		22-Aug-14	ER-CSU-05-Aug-14	47.0	44.8	815	sc	12	-	-	muscle plug
		22-Aug-14	ER-CSU-06-Aug-14	44.0	42.7	770	sc	8	-	-	muscle plug
		22-Aug-14	ER-CSU-07-Aug-14	43.1	40.1	550	sc	8	-	missing eye	muscle plug
		22-Aug-14	ER-CSU-08-Aug-14	45.8	43.0	665	sc	7	-	-	muscle plug
		22-Aug-14	ER-CSU-09-Aug-14	48.0	44.8	825	sc	8	-	-	muscle plug
		24-Aug-14	ER-CSU-10-Aug-14	47.5	44.4	820	sc	10	-	-	muscle plug
		20-Aug-14	ER-CSUj-01-Aug-14	9.6	9.0	10	-	-	-	-	whole body
		20-Aug-14	ER-CSUj-02-Aug-14	8.5	7.8	6	-	-	-	-	whole body
		20-Aug-14	ER-CSUj-03-Aug-14	7.1	6.5	3	-	-	-	-	whole body
	2015	22-Apr-15	ER-CSU-03-Apr-15	39.9	36.9	500	-	-	-	-	-
		24-Apr-15	ER-CSU-07-Apr-15	34.5	32.1	350	-	-	-	-	-
		28-Apr-15	ER-CSU-14-Apr-15	37.9	35.1	490	sc, pf	8	-	-	muscle
		28-Apr-15	ER-CSU-15-Apr-15	39.2	36.5	550	sc, pf	9	-	-	muscle
	2016	19-Apr-16	ER-CSU-01-Apr-16	33.5	30.9	365	-	-	-	-	-
		21-Apr-16	ER-CSU-12-Apr-16	42.2	39.5	640	-	-	-	-	-
		21-Apr-16	ER-CSU-14-Apr-16	38.0	35.5	430	-	-	-	-	-
		22-Apr-16	ER-CSU-18-Apr-16	37.3	35.0	452	-	-	-	-	-
total sample size				**41**	**41**	**41**	**-**	**12**	**-**	**-**	**-**
average				**40**	**38**	**592**	**-**	**9**	**-**	**-**	**-**
median				**42**	**39**	**600**	**-**	**9**	**-**	**-**	**-**
standard deviation				**9.8**	**9.3**	**226**	**-**	**2**	**-**	**-**	**-**
standard error				**1.5**	**1.4**	**35**	**-**	**0.46**	**-**	**-**	**-**
minimum				**7.1**	**6.5**	**3.2**	**-**	**7**	**-**	**-**	**-**
maximum				**51**	**48**	**1,010**	**-**	**12**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, pf - pectoral fin-ray.

Table F.24: Summary Statistics for Largescale Sucker Meristic Data Not Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Abnormalities	Tissue Collected
Gold Creek	2014	17-Feb-14	GC-CSU-01-Feb-14	42.1	40.1	690		-		-	-
		12-Apr-14	GC-CSU-01-Apr-14	42.3	39.5	600	-	-	-	-	muscle plug
		13-Apr-14	GC-CSU-02-Apr-14	48.7	45.2	840	-	-	-	-	muscle plug
		15-Apr-14	GC-CSU-03-Apr-14	39.9	37.3	525	-	-	-	-	muscle plug
		22-Aug-14	GC-CSU-01-Aug-14	46.0	42.4	720	sc	8	-	-	muscle plug
		22-Aug-14	GC-CSU-02-Aug-14	42.4	39.8	600	sc	9	-	-	muscle plug
		22-Aug-14	GC-CSU-03-Aug-14	48.0	44.6	910	sc	8	-	lesion near anal fin	muscle plug
		22-Aug-14	GC-CSU-04-Aug-14	42.8	40.0	570	sc	8	-	caudal fin half missing	muscle plug
		22-Aug-14	GC-CSU-05-Aug-14	40.7	37.5	560	sc	8	-	-	muscle plug
		22-Aug-14	GC-CSU-06-Aug-14	37.0	34.5	430	sc	5	-	-	muscle plug
		22-Aug-14	GC-CSU-07-Aug-14	39.7	37.0	560	sc	8	-	-	muscle plug
		22-Aug-14	GC-CSU-08-Aug-14	43.3	39.7	570	sc	8	-	-	muscle plug
		22-Aug-14	GC-CSU-09-Aug-14	43.9	41.1	590	sc	9	-	small scar on both sides	muscle plug
		22-Aug-14	GC-CSU-10-Aug-14	32.2	29.8	270	sc	5	-	-	muscle plug
		20-Aug-14	GC-CSUj-01-Aug-14	9.0	8.1	6	-	-	-	-	whole body
		20-Aug-14	GC-CSUj-02-Aug-14	11.1	10.1	12	-	-	-	-	whole body
		20-Aug-14	GC-CSUj-03-Aug-14	9.0	8.2	6	-	-	-	-	whole body
		20-Aug-14	GC-CSUj-04-Aug-14	9.8	9.0	9	-	-	-	-	whole body
		20-Aug-14	GC-CSUj-05-Aug-14	9.3	8.5	7	-	-	-	-	whole body
	2015	22-Apr-15	GC-CSU-01-Apr-15	40.3	37.6	560	sc, pf	12	-	-	muscle
		23-Apr-15	GC-CSU-06-Apr-15	38.3	35.8	470	-	-	-	-	-
		26-Apr-15	GC-CSU-12-Apr-15	38.0	35.6	500	-	-	-	-	-
	2016	19-Apr-16	GC-CSU-01-Apr-16	35.7	33.0	410	-	-	-	-	-
		21-Apr-16	GC-CSU-12-Apr-16	37.5	35.3	455	sc, pf	7	I	-	-
		22-Apr-16	GC-CSU-13-Apr-16	37.7	35.1	485	sc, pf	8	I	undeveloped	-
		22-Apr-16	GC-CSU-15-Apr-16	36.2	33.6	420	-	-	-	-	-
		22-Apr-16	GC-CSU-18-Apr-16	37.8	35.5	480	-	-	-	-	-
total sample size				**27**	**27**	**27**	**-**	**13**	**-**	**-**	**-**
average				**35**	**32**	**454**	**-**	**8**	**-**	**-**	**-**
median				**38**	**36**	**500**	**-**	**8**	**-**	**-**	**-**
standard deviation				**13**	**12**	**252**	**-**	**1.8**	**-**	**-**	**-**
standard error				**2.5**	**2.3**	**48.4**	**-**	**0.49**	**-**	**-**	**-**
minimum				**9.0**	**8.1**	**6.2**	**-**	**5.0**	**-**	**-**	**-**
maximum				**49**	**45**	**910**	**-**	**12**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, pf - pectoral fin-ray.

Table F.25: Summary Statistics for Kokanee Meristic Data Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age[b]	Sex	Abnormalities	Tissue Collected
Sand Creek	2014	23-Aug-14	SC-KO-01-Aug-14	24.6	22.5	134	sc	-	M	-	muscle plug
		23-Aug-14	SC-KO-02-Aug-14	26.7	24.5	170	sc	-	M	-	muscle plug
		23-Aug-14	SC-KO-03-Aug-14	26.0	22.9	150	sc	-	M	-	muscle plug
		23-Aug-14	SC-KO-04-Aug-14	26.0	24.0	162	sc	-	M	-	muscle plug
		23-Aug-14	SC-KO-05-Aug-14	23.8	21.5	120	sc	-	M	-	muscle plug
		23-Aug-14	SC-KO-06-Aug-14	25.5	23.0	148	sc	2	M	-	muscle
		23-Aug-14	SC-KO-07-Aug-14	25.3	23.5	132	sc, oto	2	F	-	muscle, ovaries
		23-Aug-14	SC-KO-08-Aug-14	24.8	23.0	134	sc, oto	2	F	-	muscle, ovaries
		23-Aug-14	SC-KO-09-Aug-14	26.5	24.0	143	sc, oto	2	M	-	muscle
		23-Aug-14	SC-KO-10-Aug-14	25.0	22.5	125	sc, oto	2	M	-	muscle
		23-Aug-14	SC-KO-11-Aug-14	25.8	23.9	140	sc, oto	2	F	-	muscle, ovaries
		23-Aug-14	SC-KO-12-Aug-14	24.8	22.9	127	sc, oto	2	F	white spots on ovaries	muscle, ovaries
		23-Aug-14	SC-KO-13-Aug-14	25.0	23.1	128	sc, oto	2	F	-	muscle, ovaries
		25-Aug-14	SC-KO-14-Aug-14	25.0	23.0	132	sc	-	M	-	muscle plug
		25-Aug-14	SC-KO-15-Aug-14	25.5	23.7	170	sc	-	M	-	muscle plug
		25-Aug-14	SC-KO-16-Aug-14	26.1	23.8	168	sc	-	M	-	muscle plug
		25-Aug-14	SC-KO-17-Aug-14	26.0	23.6	154	sc, oto	2	M	-	muscle
		25-Aug-14	SC-KO-18-Aug-14	24.4	21.9	126	sc, oto	2	M	-	muscle
		25-Aug-14	SC-KO-19-Aug-14	25.2	23.5	150	sc, oto	2	F	-	muscle, ovaries
		25-Aug-14	SC-KO-20-Aug-14	26.3	24.2	150	sc, oto	2	M	-	muscle
		25-Aug-14	SC-KO-21-Aug-14	28.9	26.7	185	sc, oto	2	F	light orange spots in ovaries	muscle, ovaries
		25-Aug-14	SC-KO-22-Aug-14	24.7	22.4	185	sc, oto	2	M	-	muscle
		25-Aug-14	SC-KO-23-Aug-14	28.5	25.8	201	sc, oto	2	M	spots on liver	muscle
		25-Aug-14	SC-KO-24-Aug-14	26.1	24.5	154	sc, oto	2	F	-	muscle, ovaries
		25-Aug-14	SC-KO-25-Aug-14	25.2	23.1	136	sc, oto	3	F	-	muscle, ovaries
	2015	30-Apr-15	SC-KO-01-Apr-15	22.8	20.0	78	-	-	-	-	-
		24-Aug-15	SC-KO-01-Aug-15	25.6	23.3	128	sc	2	M	-	muscle
		24-Aug-15	SC-KO-02-Aug-15	20.3	18.2	68	oto	2	M	-	muscle
		24-Aug-15	SC-KO-03-Aug-15	22.4	20.2	90	oto	2	M	-	muscle
		24-Aug-15	SC-KO-04-Aug-15	22.8	20.8	100	oto	2	M	-	muscle
		24-Aug-15	SC-KO-05-Aug-15	21.1	19.1	79	oto	2	M	-	muscle
		24-Aug-15	SC-KO-06-Aug-15	21.5	19.6	79	oto	2	M	-	muscle
		24-Aug-15	SC-KO-07-Aug-15	21.5	19.6	78	oto	2	M	-	muscle
		24-Aug-15	SC-KO-08-Aug-15	20.5	18.7	68	oto	2	M	-	muscle
		24-Aug-15	SC-KO-09-Aug-15	21.5	19.5	75	oto	2	M	-	muscle
	2016	24-Aug-16	SC-KO-01A-Aug-16	26.8	24.7	225	sc, oto	3	M	-	muscle
		24-Aug-16	SC-KO-02A-Aug-16	26.4	24.2	215	sc, oto	2	M	-	muscle
		24-Aug-16	SC-KO-03A-Aug-16	29.7	26.5	250	sc, oto	2	M	-	muscle
		28-Aug-16	SC-KO-04A-Aug-16	28.0	25.8	233	sc, oto	2	M	-	muscle
total sample size				**39**	**39**	**39**	**-**	**30**	**-**	**-**	**-**
average				**25**	**23**	**141**	**-**	**2**	**-**	**-**	**-**
median				**25**	**23**	**136**	**-**	**2**	**-**	**-**	**-**
standard deviation				**2.2**	**2.1**	**46**	**-**	**0.25**	**-**	**-**	**-**
standard error				**0.36**	**0.34**	**7**	**-**	**0.046**	**-**	**-**	**-**
minimum				**20**	**18**	**68**	**-**	**2**	**-**	**-**	**-**
maximum				**30**	**27**	**250**	**-**	**3**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Aging specialist was unable to age kokanee accurately using only scales.

Table F.25: Summary Statistics for Kokanee Meristic Data Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age[b]	Sex	Abnormalities	Tissue Collected
Elk River	2014	21-Aug-14	ER-KO-01-Aug-14	24.2	22.2	110	sc, oto	3	F	-	muscle, ovaries
		21-Aug-14	ER-KO-02-Aug-14	27.7	24.8	163	sc, oto	4	M	-	muscle
		22-Aug-14	ER-KO-03-Aug-14	25.1	22.7	120	sc, oto	3	M	-	muscle
		22-Aug-14	ER-KO-04-Aug-14	27.5	25.4	156	sc, oto	2	F	-	muscle, ovaries
		24-Aug-14	ER-KO-05-Aug-14	24.0	22.1	109	sc, oto	3	F	-	muscle, ovaries
		25-Aug-14	ER-KO-06-Aug-14	26.3	23.7	160	sc	-	M	-	muscle plug
		25-Aug-14	ER-KO-07-Aug-14	26.0	24.0	152	sc	-	M	-	muscle plug
		25-Aug-14	ER-KO-08-Aug-14	26.5	24.6	160	sc	-	M	-	muscle plug
		25-Aug-14	ER-KO-09-Aug-14	27.1	24.5	175	sc	-	M	-	muscle plug
		25-Aug-14	ER-KO-10-Aug-14	26.1	24.1	166	sc	-	M	-	muscle plug
		25-Aug-14	ER-KO-11-Aug-14	24.8	23.1	122	sc, oto	2	F	-	muscle, ovaries
		25-Aug-14	ER-KO-12-Aug-14	25.2	23.5	143	sc, oto	2	F	-	muscle, ovaries
		25-Aug-14	ER-KO-13-Aug-14	25.1	22.8	153	sc, oto	3	M	-	muscle
		26-Aug-14	ER-KO-14-Aug-14	24.3	22.0	116	sc, oto	3	M	-	muscle
		26-Aug-14	ER-KO-15-Aug-14	24.6	22.8	122	sc, oto	3	F	-	muscle, ovaries
		26-Aug-14	ER-KO-16-Aug-14	25.2	23.3	130	sc, oto	2	F	-	muscle, ovaries
		26-Aug-14	ER-KO-17-Aug-14	25.3	23.1	140	sc, oto	2	M	-	muscle
	2015	25-Aug-15	ER-KO-01-Aug-15	21.0	19.2	76	oto	2	M	-	muscle
		25-Aug-15	ER-KO-02-Aug-15	20.5	18.5	76	oto	2	M	-	muscle
		25-Aug-15	ER-KO-03-Aug-15	21.0	18.7	72	oto	2	M	-	muscle
		25-Aug-15	ER-KO-04-Aug-15	21.0	18.7	69	oto	2	M	-	muscle
		25-Aug-15	ER-KO-05-Aug-15	22.4	20.4	80	oto	2	F	-	muscle
		25-Aug-15	ER-KO-06-Aug-15	21.1	19.3	78	oto	2	F	-	muscle
		25-Aug-15	ER-KO-07-Aug-15	20.1	18.6	76	oto	2	M	-	muscle
		25-Aug-15	ER-KO-08-Aug-15	20.4	18.5	69	oto	2	M	-	muscle
		25-Aug-15	ER-KO-09-Aug-15	21.1	19.3	79	-	-	M	-	muscle
		25-Aug-15	ER-KO-10-Aug-15	20.8	18.9	64	oto	2	F	-	muscle
	2016	22-Apr-16	ER-KO-01-Apr-16	23.6	22.2	98	-	3	-	-	muscle
		22-Apr-16	ER-KO-02-Apr-16	25.4	23.0	118	-	4	-	-	muscle
		22-Apr-16	ER-KO-03-Apr-16	25.2	23.0	120	-	5	-	-	muscle
		22-Apr-16	ER-KO-04-Apr-16	26.1	23.7	134	-	5	-	-	muscle
		23-Aug-16	ER-KO-01A-Aug-16	25.0	23.0	157	sc, oto	3	M	-	muscle
		23-Aug-16	ER-KO-02A-Aug-16	25.2	22.9	162	sc, oto	3	M	-	muscle
		28-Aug-16	ER-KO-03A-Aug-16	26.9	24.6	195	sc, oto	3	M	-	muscle
		28-Aug-16	ER-KO-04A-Aug-16	24.5	22.6	161	sc, oto	3	M	-	muscle
		28-Aug-16	ER-KO-05A-Aug-16	25.6	23.4	173	sc, oto	3	M	-	muscle
		28-Aug-16	ER-KO-06A-Aug-16	26.0	23.7	180	sc, oto	3	M	-	muscle
		28-Aug-16	ER-KO-07A-Aug-16	25.0	22.5	162	sc, oto	3	M	-	muscle
		28-Aug-16	ER-KO-08A-Aug-16	25.0	22.8	165	sc, oto	3	M	-	muscle
		28-Aug-16	ER-KO-09A-Aug-16	24.2	22.2	158	sc, oto	3	M	-	muscle
		28-Aug-16	ER-KO-10A-Aug-16	25.9	23.5	185	sc, oto	3	M	-	muscle
total sample size				**41**	**41**	**41**	**-**	**35**	**-**	**-**	**-**
average				**24**	**22**	**129**	**-**	**3**	**-**	**-**	**-**
median				**25**	**23**	**134**	**-**	**3**	**-**	**-**	**-**
standard deviation				**2.2**	**2.0**	**39**	**-**	**0.81**	**-**	**-**	**-**
standard error				**0.34**	**0.32**	**6**	**-**	**0.14**	**-**	**-**	**-**
minimum				**20**	**19**	**64**	**-**	**2**	**-**	**-**	**-**
maximum				**28**	**25**	**195**	**-**	**5**	**-**	**-**	**-**
Gold Creek	2014	25-Aug-14	GC-KO-01-Aug-14	25.9	23.5	145	sc, oto	2	M	-	muscle
		25-Aug-14	GC-KO-02-Aug-14	17.8	16.0	46	sc, oto	1	M	-	muscle
		25-Aug-14	GC-KO-03-Aug-14	17.9	16.1	47	sc, oto	2	M	-	muscle
		25-Aug-14	GC-KO-04-Aug-14	17.7	16.0	41	sc, oto	1	M	-	muscle
		25-Aug-14	GC-KO-05-Aug-14	16.6	15.0	38	sc, oto	1	M	-	muscle
		26-Aug-14	GC-KO-06-Aug-14	18.5	16.5	48	sc, oto	1	M	-	muscle
total sample size				**6**	**6**	**6**	**-**	**6**	**-**	**-**	**-**
average				**19**	**17**	**61**	**-**	**1**	**-**	**-**	**-**
median				**18**	**16**	**47**	**-**	**1**	**-**	**-**	**-**
standard deviation				**3.4**	**3.1**	**41**	**-**	**0.52**	**-**	**-**	**-**
standard error				**1.4**	**1.3**	**17**	**-**	**0.21**	**-**	**-**	**-**
minimum				**17**	**15**	**38**	**-**	**1**	**-**	**-**	**-**
maximum				**26**	**24**	**145**	**-**	**2**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Aging specialist was unable to age kokanee accurately using only scales.

Table F.26: Summary Statistics for Northern Pikeminnow Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Sand Creek	2015	25-Apr-15	SC-NSC-13-Apr-15	F	40.0	36.3	492	sc, oto	14	1.029	8.327	483	-	-	muscle, ovaries
		25-Apr-15	SC-NSC-22-Apr-15	F	32.7	29.5	257	sc, oto	9	1.001	1.141	255	-	-	muscle, ovaries
		25-Apr-15	SC-NSC-23-Apr-15	F	33.3	29.1	258	sc, oto	9	1.047	1.300	256	-	-	muscle, ovaries
		25-Apr-15	SC-NSC-28-Apr-15	F	32.1	29.3	275	sc, oto	12	1.093	1.897	272	-	-	muscle, ovaries
		25-Apr-15	SC-NSC-32-Apr-15	F	31.7	29.1	210	sc, oto	10	0.852	1.124	208	-	-	muscle, ovaries
		25-Apr-15	SC-NSC-33-Apr-15	F	34.0	30.2	300	sc, oto	8	1.089	3.298	296	-	-	muscle, ovaries
		25-Apr-15	SC-NSC-34-Apr-15	F	26.3	23.8	136	sc, oto	6	1.009	0.391	135	-	-	muscle, ovaries
		26-Apr-15	SC-NSC-35-Apr-15	F	30.8	27.6	226	sc, oto	9	1.075	1.085	224	-	-	muscle, ovaries
		26-Apr-15	SC-NSC-36-Apr-15	F	33.5	30.0	275	sc, oto	10	1.019	2.513	271	-	-	muscle, ovaries
		27-Apr-15	SC-NSC-37-Apr-15	F	32.6	29.4	261	sc, oto	9	1.027	3.218	257	-	-	muscle, ovaries
		27-Apr-15	SC-NSC-38-Apr-15	F	30.6	27.5	199	sc, oto	7	0.957	0.682	197	-	-	-
		27-Apr-15	SC-NSC-39-Apr-15	F	38.0	34.0	445	sc, oto	12	1.132	3.338	441	-	-	muscle, ovaries
		27-Apr-15	SC-NSC-40-Apr-15	F	29.8	26.2	187	sc, oto	8	1.040	1.033	185	-	-	-
		27-Apr-15	SC-NSC-41-Apr-15	F	30.6	27.3	239	sc, oto	9	1.175	1.366	236	-	-	-
		27-Apr-15	SC-NSC-42-Apr-15	F	28.4	25.3	166	sc, oto	8	1.025	0.325	165	-	-	-
		27-Apr-15	SC-NSC-43-Apr-15	F	29.9	26.5	190	sc, oto	9	1.021	0.767	188	-	-	-
		27-Apr-15	SC-NSC-44-Apr-15	F	35.2	31.7	370	sc, oto	13	1.162	5.489	363	-	-	muscle, ovaries
		27-Apr-15	SC-NSC-45-Apr-15	F	30.0	26.8	169	sc, oto	9	0.878	0.676	167	-	-	-
		28-Apr-15	SC-NSC-46-Apr-15	F	41.6	37.5	630	sc, oto	13	1.195	14.581	614	-	-	muscle, ovaries
		28-Apr-15	SC-NSC-47-Apr-15	F	34.4	30.8	325	sc, oto	13	1.112	3.661	320	-	-	muscle, ovaries
		total sample size		-	**20**	**20**	**20**	-	**20**	**20**	**20**	**20**	-	-	-
		average		-	**33**	**29**	**281**	-	**10**	**1.0**	**2.8**	**277**	-	-	-
		median		-	**32**	**29**	**258**	-	**9**	**1.0**	**1.3**	**255**	-	-	-
		standard deviation		-	**3.8**	**3.5**	**123**	-	**2.2**	**0.088**	**3.4**	**119**	-	-	-
		standard error		-	**0.84**	**0.77**	**27**	-	**0.50**	**0.020**	**0.76**	**27**	-	-	-
		minimum		-	**26**	**24**	**136**	-	**6**	**0.85**	**0.33**	**135**	-	-	-
		maximum		-	**42**	**38**	**630**	-	**14**	**1.2**	**15**	**614**	-	-	-
	2016	19-Apr-16	SC-NSC-03-Apr-16	F	41.5	37.5	760	sc, oto	14	12.743	9.496	738	-	-	muscle, ovaries
		21-Apr-16	SC-NSC-09-Apr-16	F	34.1	30.5	315	sc, oto	13	4.289	3.971	307	-	-	muscle, ovaries
		22-Apr-16	SC-NSC-13-Apr-16	F	30.0	26.5	226	sc, oto	8	0.998	4.783	220	-	-	-
		23-Apr-16	SC-NSC-19-Apr-16	F	36.2	32.5	415	sc, oto	11	1.944	6.792	406	-	-	-
		23-Apr-16	SC-NSC-21-Apr-16	F	37.6	33.8	520	sc, oto	13	5.772	9.690	505	-	-	muscle, ovaries
		23-Apr-16	SC-NSC-23-Apr-16	F	32.7	29.2	375	sc, oto	9	0.812	1.055	373	-	-	-
		23-Apr-16	SC-NSC-25-Apr-16	F	30.1	27.2	257	sc, oto	12	11.222	3.319	242	-	-	muscle, ovaries
		23-Apr-16	SC-NSC-26-Apr-16	F	30.0	27.0	215	sc, oto	9	1.139	1.539	212	-	-	-
		24-Apr-16	SC-NSC-29-Apr-16	F	39.7	35.9	550	sc, oto	10	11.391	13.651	525	-	-	muscle, ovaries
		25-Apr-16	SC-NSC-32-Apr-16	F	45.5	41.2	996	sc, oto	15	28.832	20.282	947	-	-	muscle, ovaries
		25-Apr-16	SC-NSC-33-Apr-16	F	62.6	57.4	2,530	sc, oto	21	97.351	48.716	2,384	-	-	muscle, ovaries
		25-Apr-16	SC-NSC-34-Apr-16	F	52.5	47.8	1,420	sc, oto	15	36.771	19.819	1,363	-	-	muscle, ovaries
		25-Apr-16	SC-NSC-35-Apr-16	F	44.4	39.8	935	sc, oto	14	26.759	20.354	888	-	-	muscle, ovaries
		25-Apr-16	SC-NSC-36-Apr-16	F	44.7	40.4	875	sc, oto	14	21.707	21.843	831	-	-	muscle, ovaries
		25-Apr-16	SC-NSC-37-Apr-16	F	39.4	35.6	500	sc, oto	11	4.218	10.053	486	-	-	-
		25-Apr-16	SC-NSC-38-Apr-16	F	42.5	38.6	640	sc, oto	13	3.139	11.200	626	-	-	-
		25-Apr-16	SC-NSC-40-Apr-16	F	33.7	30.2	297	sc, oto	10	2.041	3.772	291	-	-	-
		25-Apr-16	SC-NSC-41-Apr-16	F	44.2	40.4	800	sc, oto	13	22.375	21.652	756	-	-	-
		25-Apr-16	SC-NSC-42-Apr-16	F	36.9	33.7	445	sc, oto	14	3.838	10.197	431	-	-	-
		total sample size		-	**19**	**19**	**19**	-	**19**	**19**	**19**	**19**	-	-	-
		average		-	**40**	**36**	**688**	-	**13**	**16**	**13**	**660**	-	-	-
		median		-	**39**	**36**	**520**	-	**13**	**5.8**	**10**	**505**	-	-	-
		standard deviation		-	**8.2**	**7.7**	**546**	-	**2.9**	**23**	**11**	**514**	-	-	-
		standard error		-	**1.9**	**1.8**	**125**	-	**0.68**	**5.2**	**2.6**	**118**	-	-	-
		minimum		-	**30**	**27**	**215**	-	**8**	**0.81**	**1.1**	**212**	-	-	-
		maximum		-	**63**	**57**	**2,530**	-	**21**	**97**	**49**	**2,384**	-	-	-

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.26: Summary Statistics for Northern Pikeminnow Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Sand Creek	2015	22-Apr-15	SC-NSC-01-Apr-15	M	27.7	24.7	147	sc, oto	7	0.98	0.980	145	-	-	muscle
		23-Apr-15	SC-NSC-03-Apr-15	M	31.0	27.9	230	sc, oto	11	1.06	1.274	228	-	-	muscle
		23-Apr-15	SC-NSC-04-Apr-15	M	31.0	28.0	222	sc, oto	11	1.01	1.021	220	-	-	muscle
		24-Apr-15	SC-NSC-06-Apr-15	M	31.5	28.3	240	sc, oto	10	1.06	0.488	238	-	-	muscle
		24-Apr-15	SC-NSC-07-Apr-15	M	28.5	25.5	164	sc, oto	8	0.99	0.640	162	-	-	muscle
		25-Apr-15	SC-NSC-09-Apr-15	M	34.9	31.5	335	sc, oto	13	1.07	3.055	331	-	-	muscle
		25-Apr-15	SC-NSC-10-Apr-15	M	32.8	29.4	262	sc, oto	14	1.03	1.560	259	-	-	muscle
		25-Apr-15	SC-NSC-11-Apr-15	M	35.0	31.6	315	sc, oto	13	1.00	1.518	312	-	-	muscle
		25-Apr-15	SC-NSC-12-Apr-15	M	36.5	32.8	393	sc, oto	11	1.11	1.475	390	-	-	muscle
		25-Apr-15	SC-NSC-15-Apr-15	M	32.3	29.1	274	sc, oto	13	1.11	1.602	271	-	-	muscle
		25-Apr-15	SC-NSC-16-Apr-15	M	32.2	29.5	271	sc, oto	10	1.06	3.141	267	-	-	-
		25-Apr-15	SC-NSC-17-Apr-15	M	31.6	28.4	239	sc, oto	10	1.04	1.452	237	-	-	-
		25-Apr-15	SC-NSC-18-Apr-15	M	30.0	27.1	226	sc, oto	9	1.14	1.815	223	-	-	-
		25-Apr-15	SC-NSC-19-Apr-15	M	34.1	30.5	267	sc, oto	11	0.94	2.052	264	-	-	-
		25-Apr-15	SC-NSC-21-Apr-15	M	30.6	27.4	219	sc, oto	10	1.06	0.857	217	-	-	-
		25-Apr-15	SC-NSC-25-Apr-15	M	34.4	31.0	317	sc, oto	10	1.06	2.218	314	-	-	-
		25-Apr-15	SC-NSC-26-Apr-15	M	29.5	26.5	242	sc, oto	10	1.30	3.463	237	-	-	-
		25-Apr-15	SC-NSC-27-Apr-15	M	31.8	28.4	251	sc, oto	12	1.10	1.714	248	-	-	-
		25-Apr-15	SC-NSC-29-Apr-15	M	30.5	27.3	217	sc, oto	9	1.07	1.020	215	-	-	-
		25-Apr-15	SC-NSC-30-Apr-15	M	29.0	25.8	187	sc, oto	9	1.09	1.895	184	-	-	-
		25-Apr-15	SC-NSC-31-Apr-15	M	29.6	26.7	206	sc, oto	9	1.08	1.922	203	-	-	-
		total sample size		-	**21**	**21**	**21**	-	**21**	**21**	**21**	**21**	-	-	-
		average		-	**32**	**28**	**249**	-	**10**	**1.1**	**1.7**	**246**	-	-	-
		median		-	**32**	**28**	**240**	-	**10**	**1.1**	**1.6**	**237**	-	-	-
		standard deviation		-	**2.3**	**2.2**	**57**	-	**1.8**	**0.072**	**0.79**	**57**	-	-	-
		standard error		-	**0.51**	**0.47**	**13**	-	**0.39**	**0.016**	**0.17**	**12**	-	-	-
		minimum		-	**28**	**25**	**147**	-	**7**	**0.94**	**0.49**	**145**	-	-	-
		maximum		-	**37**	**33**	**393**	-	**14**	**1.3**	**3.5**	**390**	-	-	-
	2016	19-Apr-16	SC-NSC-01-Apr-16	M	51.2	47.0	1,200	sc, oto	26	20.357	13.928	1,166	constricted pupil	-	muscle
		20-Apr-16	SC-NSC-04-Apr-16	M	31.5	28.9	250	sc, oto	15	2.747	2.853	244	-	-	-
		20-Apr-16	SC-NSC-05-Apr-16	M	32.7	29.5	280	sc, oto	10	1.910	2.833	275	-	-	-
		21-Apr-16	SC-NSC-06-Apr-16	M	32.9	29.5	300	sc, oto	13	3.310	3.253	293	worms	0.015	-
		21-Apr-16	SC-NSC-07-Apr-16	M	30.2	27.5	224	sc	7	1.214	2.464	220	-	-	-
		21-Apr-16	SC-NSC-08-Apr-16	M	31.9	29.2	240	sc, oto	13	1.280	2.900	236	-	-	-
		21-Apr-16	SC-NSC-10-Apr-16	M	34.2	31.2	325	sc, oto	11	4.507	4.392	316	-	-	-
		21-Apr-16	SC-NSC-11-Apr-16	M	37.5	32.9	455	sc, oto	14	2.858	4.429	448	-	-	-
		22-Apr-16	SC-NSC-15-Apr-16	M	38.2	34.8	540	sc, oto	16	6.678	7.694	526	-	-	-
		22-Apr-16	SC-NSC-16-Apr-16	M	32.3	29.2	290	sc, oto	11	1.631	3.160	285	-	-	-
		22-Apr-16	SC-NSC-17-Apr-16	M	32.4	29.0	262	sc, oto	10	2.002	3.901	256	-	-	-
		22-Apr-16	SC-NSC-18-Apr-16	M	32.5	28.2	300	sc, oto	10	2.795	2.284	295	-	-	-
		23-Apr-16	SC-NSC-20-Apr-16	M	36.6	32.9	445	sc, oto	14	3.920	4.661	436	-	-	-
		23-Apr-16	SC-NSC-22-Apr-16	M	36.1	32.6	410	sc	6	4.285	4.940	401	worms	-	-
		23-Apr-16	SC-NSC-24-Apr-16	M	31.7	28.7	234	sc, oto	10	0.913	2.358	231	-	-	-
		23-Apr-16	SC-NSC-27-Apr-16	M	29.7	26.5	224	sc, oto	11	2.522	2.792	219	-	-	-
		23-Apr-16	SC-NSC-28-Apr-16	M	30.0	26.8	215	sc, oto	9	0.996	2.950	211	-	-	-
		25-Apr-16	SC-NSC-30-Apr-16	M	29.9	27.1	222	sc, oto	10	1.409	2.346	218	-	-	-
		25-Apr-16	SC-NSC-31-Apr-16	M	35.7	32.7	410	sc, oto	14	2.252	6.557	401	worms	1.379	-
		25-Apr-16	SC-NSC-39-Apr-16	M	36.6	32.3	460	sc, oto	15	5.662	8.183	446	-	-	-
		total sample size		-	**20**	**20**	**20**	-	**20**	**20**	**20**	**20**	-	**2**	-
		average		-	**34**	**31**	**364**	-	**12**	**3.7**	**4.4**	**356**	-	**0.70**	-
		median		-	**33**	**29**	**295**	-	**11**	**2.6**	**3.2**	**289**	-	**0.70**	-
		standard deviation		-	**4.8**	**4.5**	**220**	-	**4.2**	**4.2**	**2.8**	**213**	-	**0.96**	-
		standard error		-	**1.1**	**1.0**	**49**	-	**0.94**	**0.95**	**0.63**	**48**	-	**0.68**	-
		minimum		-	**30**	**27**	**215**	-	**6**	**0.91**	**2.3**	**211**	-	**0.015**	-
		maximum		-	**51**	**47**	**1,200**	-	**26**	**20**	**14**	**1,166**	-	**1.4**	-

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.26: Summary Statistics for Northern Pikeminnow Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Elk River	2015	23-Apr-15	ER-NSC-05-Apr-15	F	35.8	32.3	380	sc, oto	10	1.128	3.599	375	-	-	muscle, ovaries
		23-Apr-15	ER-NSC-06-Apr-15	F	33.9	30.6	260	sc, oto	11	0.907	1.204	258	-	-	muscle, ovaries
		23-Apr-15	ER-NSC-08-Apr-15	F	32.0	28.6	232	sc, oto	8	0.992	1.263	230	-	-	muscle, ovaries
		23-Apr-15	ER-NSC-10-Apr-15	F	26.6	23.4	134	sc, oto	8	1.046	0.223	133	-	-	muscle, ovaries
		23-Apr-15	ER-NSC-13-Apr-15	F	46.7	42.7	885	sc, oto	13	1.137	12.965	871	-	-	muscle, ovaries
		23-Apr-15	ER-NSC-14-Apr-15	F	31.6	28.7	240	sc, oto	13	1.015	1.466	238	-	-	muscle, ovaries
		23-Apr-15	ER-NSC-15-Apr-15	F	28.8	25.5	171	sc, oto	8	1.031	0.733	169	-	-	muscle, ovaries
		23-Apr-15	ER-NSC-17-Apr-15	F	28.5	25.4	153	sc, oto	9	0.934	0.801	151	-	-	muscle, ovaries
		23-Apr-15	ER-NSC-19-Apr-15	F	32.0	28.5	265	sc, oto	11	1.145	1.344	263	-	-	muscle, ovaries
		24-Apr-15	ER-NSC-25-Apr-15	F	40.4	36.5	560	sc, oto	13	1.152	7.807	551	-	-	muscle, ovaries
		26-Apr-15	ER-NSC-28-Apr-15	F	31.0	27.6	198	sc, oto	9	0.942	1.008	196	-	-	-
		26-Apr-15	ER-NSC-29-Apr-15	F	32.5	29.4	286	sc, oto	9	1.125	1.527	283	-	-	muscle, ovaries
		26-Apr-15	ER-NSC-31-Apr-15	F	28.6	25.7	161	sc, oto	10	0.948	0.467	160	-	-	-
		26-Apr-15	ER-NSC-33-Apr-15	F	29.5	26.3	185	sc, oto	12	1.017	1.140	183	-	-	-
		26-Apr-15	ER-NSC-34-Apr-15	F	28.6	25.4	161	sc, oto	9	0.982	0.258	160	-	-	-
		27-Apr-15	ER-NSC-35-Apr-15	F	28.3	25.3	165	sc, oto	9	1.019	0.778	163	-	-	-
		27-Apr-15	ER-NSC-36-Apr-15	F	26.1	23.4	131	sc, oto	6	1.022	0.323	130	small ovaries, hard to distinguish	-	-
		27-Apr-15	ER-NSC-37-Apr-15	F	25.8	22.5	116	sc, oto	8	1.018	0.466	115	tail deformed	-	-
		27-Apr-15	ER-NSC-38-Apr-15	F	27.2	24.7	156	sc, oto	9	1.035	0.759	154	-	-	-
		27-Apr-15	ER-NSC-40-Apr-15	F	32.4	29.2	241	sc, oto	13	0.968	1.789	238	-	-	-
		28-Apr-15	ER-NSC-43-Apr-15	F	34.2	30.8	320	sc, oto	13	1.095	4.013	315	-	-	muscle, ovaries
		total sample size		-	**21**	**21**	**21**	-	**21**	**21**	**21**	**21**	-	-	-
		average		-	**31**	**28**	**257**	-	**10**	**1.0**	**2.1**	**254**	-	-	-
		median		-	**31**	**28**	**198**	-	**9**	**1.0**	**1.1**	**196**	-	-	-
		standard deviation		-	**5.0**	**4.7**	**176**	-	**2.1**	**0.074**	**3.0**	**173**	-	-	-
		standard error		-	**1.1**	**1.0**	**38**	-	**0.46**	**0.016**	**0.66**	**38**	-	-	-
		minimum		-	**26**	**23**	**116**	-	**6**	**0.91**	**0.22**	**115**	-	-	-
		maximum		-	**47**	**43**	**885**	-	**13**	**1.2**	**13**	**871**	-	-	-
	2016	19-Apr-16	ER-NSC-02-Apr-16	F	34.8	31.5	340	sc, oto	9	1.786	2.843	335	-	-	muscle, ovaries
		19-Apr-16	ER-NSC-03-Apr-16	F	32.3	29.4	240	sc, oto	9	0.696	1.667	238	-	-	muscle, ovaries
		19-Apr-16	ER-NSC-04-Apr-16	F	31.6	28.1	240	sc, oto	8	1.401	3.240	235	-	-	muscle
		19-Apr-16	ER-NSC-05-Apr-16	F	31.5	28.1	243	sc, oto	12	0.986	3.727	238	-	-	muscle
		19-Apr-16	ER-NSC-06-Apr-16	F	33.0	29.9	262	sc, oto	10	2.442	4.460	255	-	-	muscle, ovaries
		19-Apr-16	ER-NSC-08-Apr-16	F	34.6	31.2	310	sc, oto	9	0.633	3.147	306	worms	8.438	muscle
		19-Apr-16	ER-NSC-09-Apr-16[b]	F	54.1	49.5	1,500	sc, oto	15	47.722	27.351	1,425	-	-	muscle, ovaries
		19-Apr-16	ER-NSC-10-Apr-16	F	41.3	37.5	645	sc, oto	15	3.073	11.045	631	-	-	muscle, ovaries
		19-Apr-16	ER-NSC-11-Apr-16	F	35.5	31.7	345	sc, oto	10	1.323	2.515	341	-	-	muscle
		19-Apr-16	ER-NSC-14-Apr-16	F	34.1	30.5	330	sc, oto	10	1.289	7.107	322	-	-	muscle
		20-Apr-16	ER-NSC-15-Apr-16	F	60.8	55.9	2,600	sc, oto	20	124.333	46.894	2,429	-	-	muscle, ovaries
		20-Apr-16	ER-NSC-16-Apr-16	F	53.4	48.0	1,540	sc, oto	14	35.537	17.351	1,487	-	-	muscle, ovaries
		20-Apr-16	ER-NSC-17-Apr-16	F	40.2	36.2	615	sc, oto	14	10.160	9.284	596	-	-	muscle, ovaries
		21-Apr-16	ER-NSC-19-Apr-16	F	38.6	35.2	555	sc, oto	14	7.386	25.115	522	-	-	muscle, ovaries
		21-Apr-16	ER-NSC-20-Apr-16	F	34.8	32.2	370	sc, oto	11	2.882	4.983	362	-	-	muscle, ovaries
		21-Apr-16	ER-NSC-21-Apr-16	F	36.1	32.9	455	sc, oto	16	16.376	4.996	434	-	-	muscle, ovaries
		22-Apr-16	ER-NSC-27-Apr-16	F	49.1	45.0	1,200	sc, oto	15	17.618	24.420	1,158	-	-	muscle, ovaries
		22-Apr-16	ER-NSC-28-Apr-16	F	56.3	50.8	1,900	sc, oto	22	104.773	31.825	1,763	-	-	muscle, ovaries
		22-Apr-16	ER-NSC-29-Apr-16	F	61.5	56.7	2,640	sc, oto	21	131.999	55.866	2,452	-	-	muscle, ovaries
		22-Apr-16	ER-NSC-30-Apr-16	F	33.3	30.0	305	sc, oto	10	1.537	5.314	298	-	-	
		22-Apr-16	ER-NSC-38-Apr-16	F	51.1	47.0	1,400	sc, oto	15	36.948	24.668	1,338	-	-	muscle, ovaries
		total sample size		-	**21**	**21**	**21**	-	**21**	**21**	**21**	**21**	-	-	-
		average		-	**42**	**38**	**859**	-	**13**	**26**	**15**	**817**	-	-	-
		median		-	**36**	**33**	**455**	-	**14**	**3.1**	**7.1**	**434**	-	-	-
		standard deviation		-	**10**	**9.6**	**778**	-	**4.1**	**42**	**16**	**723**	-	-	-
		standard error		-	**2.3**	**2.1**	**170**	-	**0.89**	**9.1**	**3.4**	**158**	-	-	-
		minimum		-	**32**	**28**	**240**	-	**8**	**0.63**	**1.7**	**235**	-	-	-
		maximum		-	**62**	**57**	**2,640**	-	**22**	**132**	**56**	**2,452**	-	-	-

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.26: Summary Statistics for Northern Pikeminnow Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Elk River	2015	22-Apr-15	ER-NSC-01-Apr-15	M	34.4	31.4	291	sc	-	0.94	1.873	288	-	-	muscle
		22-Apr-15	ER-NSC-02-Apr-15	M	36.5	32.9	420	sc, oto	13	1.18	5.094	414	-	-	muscle
		22-Apr-15	ER-NSC-03-Apr-15	M	32.2	28.7	234	sc, oto	10	0.99	1.435	232	-	-	muscle
		23-Apr-15	ER-NSC-04-Apr-15	M	36.2	32.5	380	sc, oto	14	1.11	3.392	376	-	-	muscle
		23-Apr-15	ER-NSC-07-Apr-15	M	33.4	29.8	264	sc, oto	10	1.00	0.631	262	-	-	muscle
		23-Apr-15	ER-NSC-09-Apr-15	M	33.8	30.3	255	sc, oto	11	0.92	0.705	253	-	-	muscle
		23-Apr-15	ER-NSC-11-Apr-15	M	29.4	26.1	193	sc, oto	9	1.09	0.518	191	-	-	muscle
		23-Apr-15	ER-NSC-12-Apr-15	M	44.7	40.5	990	sc, oto	15	1.49	20.113	968	-	-	muscle
		23-Apr-15	ER-NSC-16-Apr-15	M	29.0	26.0	182	sc, oto	11	1.04	0.736	180	-	-	muscle
		23-Apr-15	ER-NSC-21-Apr-15	M	30.1	26.9	226	sc, oto	9	1.16	0.427	224	-	-	muscle
		23-Apr-15	ER-NSC-23-Apr-15	M	38.2	34.5	505	sc, oto	13	1.23	5.314	498	-	-	-
		24-Apr-15	ER-NSC-24-Apr-15	M	30.3	27.2	194	sc, oto	9	0.96	1.079	192	-	-	-
		26-Apr-15	ER-NSC-27-Apr-15	M	38.5	34.7	475	sc, oto	13	1.14	6.375	467	-	-	-
		26-Apr-15	ER-NSC-30-Apr-15	M	31.3	28.2	256	sc, oto	10	1.14	2.169	253	-	-	-
		26-Apr-15	ER-NSC-32-Apr-15	M	29.8	26.7	196	sc, oto	9	1.03	0.804	194	-	-	-
		27-Apr-15	ER-NSC-39-Apr-15	M	31.1	27.5	205	sc, oto	9	0.99	0.638	203	-	-	-
		28-Apr-15	ER-NSC-41-Apr-15[b]	M	39.3	35.3	560	sc, oto	>15	1.27	4.095	555	-	-	-
		28-Apr-15	ER-NSC-42-Apr-15	M	29.7	26.5	206	sc, oto	14	1.11	2.139	203	-	-	-
		29-Apr-15	ER-NSC-44-Apr-15	M	34.2	31.0	390	sc, oto	10	1.31	4.192	384	-	-	-
		29-Apr-15	ER-NSC-45-Apr-15	M	27.5	24.6	172	sc, oto	7	1.16	1.025	170	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**19**	**20**	**20**	**20**	**-**	**-**	**-**
		average		**-**	**33**	**30**	**330**	**-**	**11**	**1.1**	**3.1**	**325**	**-**	**-**	**-**
		median		**-**	**33**	**29**	**256**	**-**	**10**	**1.1**	**1.7**	**253**	**-**	**-**	**-**
		standard deviation		**-**	**4.3**	**4.0**	**195**	**-**	**2.4**	**0.14**	**4.4**	**191**	**-**	**-**	**-**
		standard error		**-**	**0.97**	**0.90**	**44**	**-**	**0.55**	**0.032**	**0.98**	**43**	**-**	**-**	**-**
		minimum		**-**	**28**	**25**	**172**	**-**	**7**	**0.92**	**0.43**	**170**	**-**	**-**	**-**
		maximum		**-**	**45**	**41**	**990**	**-**	**15**	**1.5**	**20**	**968**	**-**	**-**	**-**
	2016	19-Apr-16	ER-NSC-01-Apr-16	M	33.5	30.4	345	sc, oto	15	1.448	4.554	339	-	-	muscle
		19-Apr-16	ER-NSC-07-Apr-16	M	35.4	32.1	405	sc, oto	13	2.906	5.250	397	-	-	muscle
		19-Apr-16	ER-NSC-12-Apr-16	M	33.0	29.5	310	sc, oto	10	2.742	4.169	303	-	-	muscle
		19-Apr-16	ER-NSC-13-Apr-16	M	36.0	32.5	420	sc, oto	10	4.260	4.743	411	-	-	muscle
		20-Apr-16	ER-NSC-18-Apr-16	M	32.8	29.3	315	sc, oto	14	1.165	3.631	310	-	-	-
		21-Apr-16	ER-NSC-22-Apr-16	M	35.2	32.3	370	sc, oto	11	1.922	6.287	362	-	-	muscle
		21-Apr-16	ER-NSC-23-Apr-16	M	31.0	28.2	275	sc, oto	11	2.728	3.837	268	-	-	-
		21-Apr-16	ER-NSC-25-Apr-16	M	34.5	31.2	335	sc, oto	11	4.543	7.160	323	-	-	-
		21-Apr-16	ER-NSC-26-Apr-16	M	29.4	26.4	205	sc, oto	9	1.111	3.139	201	-	-	-
		22-Apr-16	ER-NSC-31-Apr-16	M	32.9	29.8	282	sc, oto	15	2.682	4.114	275	-	-	-
		22-Apr-16	ER-NSC-33-Apr-16	M	30.1	26.8	262	sc, oto	9	2.029	3.746	256	-	-	-
		22-Apr-16	ER-NSC-34-Apr-16	M	33.5	29.8	300	sc, oto	10	2.165	5.604	292	-	-	-
		22-Apr-16	ER-NSC-35-Apr-16	M	31.1	27.8	240	sc, oto	11	1.333	2.527	236	-	-	-
		22-Apr-16	ER-NSC-36-Apr-16	M	32.5	29.7	300	sc, oto	10	2.562	4.491	293	-	-	-
		22-Apr-16	ER-NSC-37-Apr-16	M	32.5	29.8	365	sc, oto	11	7.151	3.787	354	-	-	-
		22-Apr-16	ER-NSC-39-Apr-16	M	34.0	30.3	380	sc, oto	10	4.245	7.477	368	-	-	-
		22-Apr-16	ER-NSC-40-Apr-16	M	30.5	26.8	246	sc, oto	11	4.705	2.916	238	-	-	-
		23-Apr-16	ER-NSC-41-Apr-16	M	34.1	30.6	400	sc, oto	11	4.632	1.508	394	-	-	-
		23-Apr-16	ER-NSC-42-Apr-16	M	33.5	30.0	330	sc, oto	10	1.383	2.675	326	-	-	-
		23-Apr-16	ER-NSC-43-Apr-16	M	30.0	26.8	228	sc, oto	9	1.062	1.656	225	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**20**	**20**	**20**	**20**	**-**	**-**	**-**
		average		**-**	**33**	**30**	**316**	**-**	**11**	**2.8**	**4.2**	**309**	**-**	**-**	**-**
		median		**-**	**33**	**30**	**313**	**-**	**11**	**2.6**	**4.0**	**307**	**-**	**-**	**-**
		standard deviation		**-**	**1.9**	**1.9**	**62**	**-**	**1.8**	**1.6**	**1.6**	**61**	**-**	**-**	**-**
		standard error		**-**	**0.42**	**0.42**	**14**	**-**	**0.41**	**0.36**	**0.36**	**14**	**-**	**-**	**-**
		minimum		**-**	**29**	**26**	**205**	**-**	**9**	**1.1**	**1.5**	**201**	**-**	**-**	**-**
		maximum		**-**	**36**	**33**	**420**	**-**	**15**	**7.2**	**7.5**	**411**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.26: Summary Statistics for Northern Pikeminnow Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2015	22-Apr-15	GC-NSC-02-Apr-15	F	31.0	28.1	207	sc, oto	7	0.933	1.443	205	-	-	muscle, ovaries
		22-Apr-15	GC-NSC-04-Apr-15	F	28.8	25.9	188	sc, oto	8	1.082	1.472	185	-	-	muscle, ovaries
		23-Apr-15	GC-NSC-10-Apr-15	F	28.1	25.0	151	sc, oto	9	0.966	0.809	149	-	-	muscle, ovaries
		24-Apr-15	GC-NSC-13-Apr-15	F	32.1	28.9	252	sc, oto	9	1.044	5.499	245	-	-	muscle, ovaries
		24-Apr-15	GC-NSC-20-Apr-15	F	29.7	26.4	175	sc, oto	8	0.951	1.244	173	-	-	muscle, ovaries
		24-Apr-15	GC-NSC-22-Apr-15	F	30.2	26.9	188	sc, oto	9	0.966	0.742	186	-	-	muscle, ovaries
		25-Apr-15	GC-NSC-31-Apr-15	F	33.0	30.2	261	sc, oto	12	0.948	2.304	258	-	-	muscle, ovaries
		26-Apr-15	GC-NSC-33-Apr-15	F	37.4	34.0	390	sc, oto	10	0.992	2.407	387	-	-	muscle, ovaries
		26-Apr-15	GC-NSC-34-Apr-15	F	37.5	34.0	390	sc, oto	9	0.992	2.099	387	-	-	muscle, ovaries
		26-Apr-15	GC-NSC-36-Apr-15	F	29.4	26.0	183	sc, oto	8	1.041	0.703	181	-	-	-
		26-Apr-15	GC-NSC-37-Apr-15	F	30.3	27.0	203	sc, oto	8	1.031	1.635	200	-	-	muscle, ovaries
		27-Apr-15	GC-NSC-38-Apr-15	F	30.7	27.8	212	sc, oto	8	0.987	1.068	210	-	-	-
		27-Apr-15	GC-NSC-40-Apr-15	F	30.6	27.3	139	sc, oto	8	0.683	0.899	137	-	-	-
		27-Apr-15	GC-NSC-42-Apr-15	F	31.3	27.7	231	sc, oto	9	1.087	1.655	228	-	-	-
		27-Apr-15	GC-NSC-43-Apr-15[b]	F	32.2	28.9	229	sc	5	0.949	0.478	228	-	-	-
		29-Apr-15	GC-NSC-44-Apr-15	F	32.7	29.1	251	sc, oto	9	1.019	1.279	249	yellow grub	-	-
		29-Apr-15	GC-NSC-45-Apr-15	F	33.2	30.0	248	sc, oto	8	0.919	1.445	246	-	-	-
		29-Apr-15	GC-NSC-46-Apr-15	F	31.8	28.3	249	sc, oto	9	1.099	1.781	246	-	-	-
		29-Apr-15	GC-NSC-47-Apr-15	F	27.5	24.5	142	sc, oto	7	0.966	0.721	140	-	-	-
		29-Apr-15	GC-NSC-48-Apr-15	F	30.8	27.5	187	sc, oto	8	0.899	0.805	185	-	-	-
		30-Apr-15	GC-NSC-49-Apr-15	F	44.8	40.1	880	sc, oto	12	1.365	17.220	861	-	-	muscle, ovaries
		total sample size		**-**	**21**	**21**	**21**	**-**	**21**	**21**	**21**	**21**	**-**	**-**	**-**
		average		**-**	**32**	**29**	**255**	**-**	**9**	**1.0**	**2.3**	**252**	**-**	**-**	**-**
		median		**-**	**31**	**28**	**212**	**-**	**8**	**0.99**	**1.4**	**210**	**-**	**-**	**-**
		standard deviation		**-**	**3.9**	**3.6**	**158**	**-**	**1.5**	**0.12**	**3.6**	**154**	**-**	**-**	**-**
		standard error		**-**	**0.84**	**0.78**	**34**	**-**	**0.34**	**0.026**	**0.78**	**34**	**-**	**-**	**-**
		minimum		**-**	**28**	**25**	**139**	**-**	**5**	**0.68**	**0.48**	**137**	**-**	**-**	**-**
		maximum		**-**	**45**	**40**	**880**	**-**	**12**	**1.4**	**17**	**861**	**-**	**-**	**-**
	2016	19-Apr-16	GC-NSC-01-Apr-16	F	38.2	34.9	450	sc, oto	13	4.851	8.314	437	-	-	muscle, ovaries
		20-Apr-16	GC-NSC-05-Apr-16[b]	F	62.2	57.0	2,500	sc, oto	15	117.790	58.547	2,324	-	-	muscle, ovaries
		20-Apr-16	GC-NSC-06-Apr-16	F	54.5	48.8	1,400	sc, oto	15	35.725	22.150	1,342	-	-	muscle, ovaries
		21-Apr-16	GC-NSC-08-Apr-16	F	55.8	50.6	1,870	sc, oto	17	65.069	30.611	1,774	-	-	muscle, ovaries
		22-Apr-16	GC-NSC-12-Apr-16	F	45.5	41.6	940	sc, oto	14	35.102	15.207	890	-	-	muscle, ovaries
		23-Apr-16	GC-NSC-13-Apr-16	F	60.8	55.6	2,360	sc, oto	17	124.236	62.559	2,173	-	-	muscle, ovaries
		23-Apr-16	GC-NSC-14-Apr-16	F	40.9	36.9	585	sc, oto	13	14.056	5.363	566	-	-	muscle, ovaries
		23-Apr-16	GC-NSC-15-Apr-16	F	36.7	33.2	405	sc, oto	11	2.913	5.822	396	-	-	-
		23-Apr-16	GC-NSC-16-Apr-16	F	42.0	38.3	610	sc, oto	12	4.990	6.279	599	-	-	muscle, ovaries
		23-Apr-16	GC-NSC-17-Apr-16	F	37.6	33.9	435	sc, oto	12	3.960	7.856	423	-	-	muscle, ovaries
		24-Apr-16	GC-NSC-18-Apr-16	F	38.6	34.8	460	sc, oto	10	1.972	7.797	450	deep fork length	-	-
		24-Apr-16	GC-NSC-20-Apr-16	F	31.4	28.1	254	sc, oto	8	1.238	2.889	250	-	-	-
		24-Apr-16	GC-NSC-21-Apr-16	F	32.7	29.3	254	sc, oto	10	1.576	1.791	251	-	-	-
		24-Apr-16	GC-NSC-22-Apr-16	F	29.9	26.8	198	sc, oto	9	1.896	2.562	194	-	-	-
		25-Apr-16	GC-NSC-24-Apr-16	F	52.8	48.2	1,640	sc, oto	14	80.260	25.921	1,534	-	-	muscle, ovaries
		25-Apr-16	GC-NSC-25-Apr-16	F	45.6	41.1	930	sc, oto	11	19.358	19.448	891	-	-	-
		25-Apr-16	GC-NSC-26-Apr-16	F	53.5	48.0	1,600	sc, oto	15	96.212	42.725	1,461	worms	-	muscle, ovaries
		25-Apr-16	GC-NSC-28-Apr-16	F	34.8	31.3	350	sc, oto	10	1.764	5.854	342	-	-	-
		25-Apr-16	GC-NSC-30-Apr-16	F	33.5	30.4	298	sc, oto	16	2.655	5.118	290	-	-	-
		25-Apr-16	GC-NSC-31-Apr-16	F	38.2	34.8	390	sc, oto	12	2.507	3.506	384	-	-	-
		25-Apr-16	GC-NSC-32-Apr-16	F	31.9	28.6	230	sc, oto	10	1.053	3.628	225	-	-	-
		total sample size		**-**	**21**	**21**	**21**	**-**	**21**	**21**	**21**	**21**	**-**	**-**	**-**
		average		**-**	**43**	**39**	**865**	**-**	**13**	**29**	**16**	**819**	**-**	**-**	**-**
		median		**-**	**39**	**35**	**460**	**-**	**12**	**4.9**	**7.8**	**450**	**-**	**-**	**-**
		standard deviation		**-**	**10**	**9.3**	**729**	**-**	**2.6**	**41**	**18**	**672**	**-**	**-**	**-**
		standard error		**-**	**2.2**	**2.0**	**159**	**-**	**0.58**	**9.0**	**4.0**	**147**	**-**	**-**	**-**
		minimum		**-**	**30**	**27**	**198**	**-**	**8**	**1.1**	**1.8**	**194**	**-**	**-**	**-**
		maximum		**-**	**62**	**57**	**2,500**	**-**	**17**	**124**	**63**	**2,324**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.26: Summary Statistics for Northern Pikeminnow Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2015	22-Apr-15	GC-NSC-01-Apr-15[b]	M	46.1	41.8	800	sc, oto	25	1.10	8.010	791	-	-	muscle
		22-Apr-15	GC-NSC-03-Apr-15	M	32.2	31.0	202	sc, oto	10	0.68	0.553	201	-	-	muscle
		22-Apr-15	GC-NSC-05-Apr-15	M	29.3	26.2	172	sc, oto	9	0.96	0.534	171	-	-	muscle
		22-Apr-15	GC-NSC-06-Apr-15	M	28.3	25.4	162	sc, oto	8	0.99	0.586	160	-	-	muscle
		24-Apr-15	GC-NSC-14-Apr-15	M	33.4	30.1	295	sc, oto	11	1.08	1.042	293	-	-	muscle
		24-Apr-15	GC-NSC-15-Apr-15	M	32.8	29.5	244	sc, oto	9	0.95	1.220	242	-	-	muscle
		24-Apr-15	GC-NSC-16-Apr-15	M	35.7	32.1	345	sc, oto	10	1.04	1.806	342	-	-	muscle
		24-Apr-15	GC-NSC-17-Apr-15	M	30.0	26.9	210	sc, oto	10	1.08	0.961	208	-	-	muscle
		24-Apr-15	GC-NSC-18-Apr-15	M	31.4	28.0	247	sc, oto	10	1.13	1.371	245	-	-	muscle
		24-Apr-15	GC-NSC-19-Apr-15	M	29.1	26.5	186	sc, oto	9	1.00	0.318	185	-	-	muscle
		24-Apr-15	GC-NSC-21-Apr-15	M	31.6	28.2	216	sc, oto	6	0.96	0.403	215	-	-	muscle
		24-Apr-15	GC-NSC-23-Apr-15	M	29.3	26.0	188	sc, oto	9	1.07	1.009	186	-	-	muscle
		25-Apr-15	GC-NSC-26-Apr-15	M	29.8	26.7	195	sc, oto	11	1.02	1.085	193	-	-	muscle
		25-Apr-15	GC-NSC-27-Apr-15	M	28.0	24.8	160	sc, oto	9	1.05	0.786	158	-	-	muscle
		25-Apr-15	GC-NSC-28-Apr-15	M	31.5	28.3	237	sc, oto	8	1.05	1.460	234	-	-	-
		25-Apr-15	GC-NSC-30-Apr-15	M	35.1	31.4	310	sc, oto	9	1.00	0.885	308	-	-	-
		25-Apr-15	GC-NSC-32-Apr-15	M	38.5	35.4	515	sc, oto	12	1.16	5.033	509	-	-	-
		26-Apr-15	GC-NSC-35-Apr-15	M	29.7	26.5	185	sc, oto	8	0.99	1.003	183	-	-	-
		27-Apr-15	GC-NSC-39-Apr-15	M	30.7	27.3	233	sc, oto	9	1.15	2.198	230	-	-	-
		27-Apr-15	GC-NSC-41-Apr-15	M	37.3	33.4	440	sc, oto	9	1.18	2.654	436	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**20**	**20**	**20**	**20**	**-**	**-**	**-**
		average		**-**	**32**	**29**	**277**	**-**	**10**	**1.0**	**1.6**	**274**	**-**	**-**	**-**
		median		**-**	**31**	**28**	**225**	**-**	**9**	**1.0**	**1.0**	**222**	**-**	**-**	**-**
		standard deviation		**-**	**4.4**	**4.1**	**154**	**-**	**3.7**	**0.11**	**1.8**	**152**	**-**	**-**	**-**
		standard error		**-**	**0.97**	**0.91**	**34**	**-**	**0.84**	**0.024**	**0.41**	**34**	**-**	**-**	**-**
		minimum		**-**	**28**	**25**	**160**	**-**	**6**	**0.68**	**0.32**	**158**	**-**	**-**	**-**
		maximum		**-**	**46**	**42**	**800**	**-**	**25**	**1.2**	**8.0**	**791**	**-**	**-**	**-**
	2016	19-Apr-16	GC-NSC-02-Apr-16	M	34.5	31.2	345	sc, oto	14	3.771	3.699	338	-	-	muscle
		19-Apr-16	GC-NSC-03-Apr-16	M	37.8	34.0	440	sc, oto	13	3.344	4.782	432	-	-	muscle
		20-Apr-16	GC-NSC-07-Apr-16	M	37.2	33.5	440	sc, oto	11	5.050	3.503	431	-	-	-
		21-Apr-16	GC-NSC-09-Apr-16	M	36.2	32.7	435	sc, oto	14	5.101	6.578	423	-	-	-
		21-Apr-16	GC-NSC-10-Apr-16	M	39.5	35.4	465	sc, oto	9	4.673	4.897	455	-	-	-
		21-Apr-16	GC-NSC-11-Apr-16	M	35.5	32.3	350	sc, oto	10	2.476	5.170	342	-	-	-
		24-Apr-16	GC-NSC-19-Apr-16	M	35.7	30.5	370	sc, oto	11	1.906	4.775	363	-	-	-
		24-Apr-16	GC-NSC-23-Apr-16	M	45.3	41.0	865	sc, oto	14	8.752	12.709	844	-	-	-
		25-Apr-16	GC-NSC-27-Apr-16	M	37.5	33.6	450	sc, oto	14	5.564	5.726	439	-	-	-
		25-Apr-16	GC-NSC-29-Apr-16	M	31.6	28.2	226	sc, oto	11	0.521	1.430	224	-	-	-
		26-Apr-16	GC-NSC-33-Apr-16	M	33.3	29.7	280	sc, oto	13	1.058	3.461	275	-	-	-
		total sample size		**-**	**11**	**11**	**11**	**-**	**11**	**11**	**11**	**11**	**-**	**-**	**-**
		average		**-**	**37**	**33**	**424**	**-**	**12**	**3.8**	**5.2**	**415**	**-**	**-**	**-**
		median		**-**	**36**	**33**	**435**	**-**	**13**	**3.8**	**4.8**	**423**	**-**	**-**	**-**
		standard deviation		**-**	**3.6**	**3.4**	**165**	**-**	**1.8**	**2.4**	**2.9**	**160**	**-**	**-**	**-**
		standard error		**-**	**1.1**	**1.0**	**50**	**-**	**0.55**	**0.71**	**0.86**	**48**	**-**	**-**	**-**
		minimum		**-**	**32**	**28**	**226**	**-**	**9**	**0.52**	**1.4**	**224**	**-**	**-**	**-**
		maximum		**-**	**45**	**41**	**865**	**-**	**14**	**8.8**	**13**	**844**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.27: Summary Statistics for Northern Pikeminnow Meristic Data Not Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Gonad Weight (g)	Abnormalities	Tissue Collected
Sand Creek	2014	15-Feb-14	SC-NSC-01-Feb-14	30.4	27.3	235	-	-	-	-	-	-
		15-Feb-14	SC-NSC-02-Feb-14	36.7	32.9	450	-	-	-	-	-	-
		15-Feb-14	SC-NSC-03-Feb-14	51.1	46.5	1,120	-	-	-	-	-	-
		15-Feb-14	SC-NSC-04-Feb-14	55.4	51.0	1,360	-	-	-	-	-	-
		17-Feb-14	SC-NSC-05-Feb-14	35.5	32.1	320	sc,oto	-	F	-	-	muscle, ovaries
		18-Feb-14	SC-NSC-07-Feb-14	25.4	22.9	125	-	-	-	-	-	-
		18-Feb-14	SC-NSC-08-Feb-14	26.8	24.2	140	-	-	-	-	-	-
		18-Feb-14	SC-NSC-09-Feb-14	35.9	32.4	350	-	-	M	-	-	-
		19-Feb-14	SC-NSC-10-Feb-14	49.9	45.4	1,200	sc,oto	-	F	-	-	muscle, ovaries
		19-Feb-14	SC-NSC-11-Feb-14	31.5	28.2	235	-	-	M	-	-	-
		20-Feb-14	SC-NSC-12-Feb-14	26.7	25.1	180	-	-	-	-	-	-
		20-Feb-14	SC-NSC-13-Feb-14	39.6	35.8	435	-	-	M	-	-	-
		11-Apr-14	SC-NSC-01-Apr-14	36.1	32.8	355	sc	-	F	6.194	-	muscle, ovaries
		11-Apr-14	SC-NSC-02-Apr-14	35.0	31.8	320	sc, oto	-	M	-	-	muscle
		12-Apr-14	SC-NSC-03-Apr-14	40.8	37.5	570	sc, oto	-	M	-	-	muscle
		13-Apr-14	SC-NSC-04-Apr-14	32.5	29.3	274	sc, oto	-	M	-	-	muscle
		13-Apr-14	SC-NSC-05-Apr-14	50.3	45.4	900	sc, oto	-	M	-	-	muscle
		13-Apr-14	SC-NSC-06-Apr-14	43.5	39.3	720	sc, oto	-	M	-	-	muscle
		13-Apr-14	SC-NSC-07-Apr-14	35.3	31.9	362	sc, oto	-	M	-	-	muscle
		17-Apr-14	SC-NSC-08-Apr-14	31.4	28.4	249	sc, oto	-	M	-	-	muscle
		17-Apr-14	SC-NSC-09-Apr-14	27.2	24.0	152	sc, oto	-	M	-	-	muscle
		17-Apr-14	SC-NSC-10-Apr-14	34.4	31.2	300	sc, oto	-	F	1.839	-	muscle, ovaries
		19-Aug-14	SC-NSC-01-Aug-14	35.9	32.9	320	sc, oto	12	-	-	-	muscle
		19-Aug-14	SC-NSC-02-Aug-14	30.9	27.9	202	sc, oto	8	-	-	-	muscle
		19-Aug-14	SC-NSC-03-Aug-14	27.6	24.7	152	sc, oto	7	-	-	-	muscle
		19-Aug-14	SC-NSC-04-Aug-14	32.1	29.3	229	sc, oto	9	-	-	-	muscle
		19-Aug-14	SC-NSC-05-Aug-14	31.7	27.8	220	sc, oto	9	-	-	-	muscle
		19-Aug-14	SC-NSC-06-Aug-14	22.7	20.2	66	sc, oto	4	-	-	tail split to body	muscle
		21-Aug-14	SC-NSC-07-Aug-14	36.5	33.5	335	sc, oto	11	-	-	-	muscle
		21-Aug-14	SC-NSC-08-Aug-14	36.0	32.9	335	sc, oto	11	-	-	-	muscle
		21-Aug-14	SC-NSC-09-Aug-14	38.7	34.6	440	sc, oto	12	F	-	-	muscle
		21-Aug-14	SC-NSC-10-Aug-14	27.1	24.6	146	sc, oto	6	-	-	-	muscle
	2015	23-Apr-15	SC-NSC-02-Apr-15	27.0	24.6	158	-	-	-	1.061	-	-
		23-Apr-15	SC-NSC-05-Apr-15	28.2	25.2	167	-	-	-	1.044	-	-
		24-Apr-15	SC-NSC-08-Apr-15	26.1	23.4	119	-	-	-	0.929	worms	-
		25-Apr-15	SC-NSC-14-Apr-15	30.0	26.8	195	-	-	-	1.013	-	-
		25-Apr-15	SC-NSC-20-Apr-15	28.8	26.0	187	-	-	-	1.064	-	-
		25-Apr-15	SC-NSC-24-Apr-15	33.7	30.4	265	-	-	-	0.943	-	-
		22-Aug-15	SC-NSC-01-Aug-15	39.6	35.9	485	oto	14	-	-	-	muscle
		22-Aug-15	SC-NSC-02-Aug-15	38.1	34.3	425	oto	13	-	-	-	muscle
		22-Aug-15	SC-NSC-03-Aug-15	26.3	22.6	119	oto	6	-	-	-	muscle
		22-Aug-15	SC-NSC-04-Aug-15	32.2	29.2	289	oto	11	-	-	-	muscle
		22-Aug-15	SC-NSC-05-Aug-15	28.4	25.7	148	oto	9	-	-	missing eye	muscle
		22-Aug-15	SC-NSC-06-Aug-15	35.6	31.9	310	oto	13	-	-	-	muscle
		22-Aug-15	SC-NSC-07-Aug-15	33.4	30.7	262	oto	8	-	-	-	muscle
		22-Aug-15	SC-NSC-08-Aug-15	31.8	28.9	218	oto	9	-	-	-	muscle
		22-Aug-15	SC-NSC-09-Aug-15	28.9	25.4	175	oto	8	-	-	-	muscle
		22-Aug-15	SC-NSC-10-Aug-15	37.0	33.2	350	oto	10	-	-	-	muscle
		24-Aug-15	SC-NSC-11-Aug-15	48.3	45.0	1,170	oto	13	-	-	-	muscle
	2016	19-Apr-16	SC-NSC-02-Apr-16	23.2	20.4	89	-	-	-	-	-	-
		21-Apr-16	SC-NSC-12-Apr-16	28.5	26.4	178	-	-	-	-	-	-
		22-Apr-16	SC-NSC-14-Apr-16	30.1	27.2	210	-	-	-	-	-	-
		24-Aug-16	SC-NSC-01A-Aug-16	39.6	36.0	480	sc, oto	12	-	-	-	muscle
		24-Aug-16	SC-NSC-02A-Aug-16	41.4	37.9	550	sc, oto	11	-	-	-	muscle
		24-Aug-16	SC-NSC-03A-Aug-16	37.7	34.0	423	sc, oto	9	-	-	-	muscle
		24-Aug-16	SC-NSC-04A-Aug-16	39.1	35.1	580	sc, oto	11	-	-	-	muscle
		24-Aug-16	SC-NSC-05A-Aug-16	40.5	36.7	535	sc, oto	13	-	-	-	muscle
		24-Aug-16	SC-NSC-06A-Aug-16	31.9	28.5	260	sc, oto	9	-	-	-	muscle
		24-Aug-16	SC-NSC-07A-Aug-16	43.5	39.3	750	sc, oto	14	-	-	-	muscle
		28-Aug-16	SC-NSC-08A-Aug-16	39.5	35.8	450	sc, oto	10	-	-	-	muscle
		28-Aug-16	SC-NSC-09A-Aug-16	49.5	45.5	1,100	sc, oto	15	-	-	-	muscle
		28-Aug-16	SC-NSC-10A-Aug-16	38.5	35.0	450	sc, oto	12	-	-	-	muscle
total sample size				**62**	**62**	**62**	**-**	**31**	**-**	**8**	**-**	**-**
average				**35**	**32**	**385**	**-**	**10**	**-**	**1.761**	**-**	**-**
median				**35**	**32**	**305**	**-**	**11**	**-**	**1.052**	**-**	**-**
standard deviation				**7.3**	**6.8**	**293**	**-**	**2.6**	**-**	**1.815**	**-**	**-**
standard error				**0.92**	**0.86**	**37**	**-**	**0.47**	**-**	**0.642**	**-**	**-**
minimum				**23**	**20**	**66**	**-**	**4**	**-**	**0.929**	**-**	**-**
maximum				**55**	**51**	**1,360**	**-**	**15**	**-**	**6.194**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.
[b] Fish collected at Englishman Creek were grouped with the Elk River summary statistics.

Table F.27: Summary Statistics for Northern Pikeminnow Meristic Data Not Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Gonad Weight (g)	Abnormalities	Tissue Collected
Elk River	2014	17-Feb-14	EC-NSC-01-Feb-14	37.9	34.6	405	sc,oto	-	F	-	-	muscle, ovaries
		17-Feb-14	EC-NSC-02-Feb-14	24.4	22.1	84	-	-	-	-	-	-
		20-Feb-14	EC-NSC-03-Feb-14	29.2	26.5	180	-	-	-	-	-	-
		20-Feb-14	EC-NSC-04-Feb-14	27.8	24.8	160	-	-	-	-	-	-
		20-Feb-14	EC-NSC-05-Feb-14	26.7	24.2	146	-	-	-	-	-	-
		20-Feb-14	EC-NSC-06-Feb-14	26.0	23.1	132	-	-	-	-	-	-
		13-Feb-14	ER-NSC-01-Feb-14	39.0	35.9	440	-	-	-	-	-	-
		14-Feb-14	ER-NSC-02-Feb-14	40.0	36.3	225	-	-	-	-	-	-
		14-Feb-14	ER-NSC-03-Feb-14	37.2	33.8	380	-	-	-	-	-	-
		14-Feb-14	ER-NSC-04-Feb-14	49.3	44.8	1,140	-	-	-	-	-	-
		14-Feb-14	ER-NSC-05-Feb-14	41.8	38.4	575	-	-	-	-	-	-
		16-Feb-14	ER-NSC-06-Feb-14	41.0	37.2	505	sc	-	F	-	-	muscle, ovaries
		17-Feb-14	ER-NSC-07-Feb-14	32.1	28.5	240	-	-	M	-	-	-
		17-Feb-14	ER-NSC-08-Feb-14	35.2	31.0	320	-	-	M	-	-	-
		18-Feb-14	ER-NSC-09-Feb-14	38.2	34.9	465	sc,oto	-	F	-	-	muscle, ovaries
		19-Feb-14	ER-NSC-10-Feb-14	33.1	29.5	250	-	-	M	-	-	-
		17-Feb-14	ER-NSC-11-Feb-14	26.3	23.3	135	-	-	M	-	-	-
		24-Feb-14	ER-NSC-12-Feb-14	29.5	27.2	316	-	-	F	-	-	muscle, ovaries
		11-Apr-14	ER-NSC-01-Apr-14	31.1	28.1	232	sc	-	M	-	-	-
		12-Apr-14	ER-NSC-02-Apr-14	32.0	28.9	265	sc	-	M	-	-	muscle
		13-Apr-14	ER-NSC-03-Apr-14	43.5	39.2	650	sc, oto	-	M	-	-	muscle
		15-Apr-14	ER-NSC-04-Apr-14	28.7	25.5	182	sc, oto	-	M	-	-	-
		15-Apr-14	ER-NSC-05-Apr-14	30.1	27.3	209	sc, oto	-	M	-	-	-
		15-Apr-14	ER-NSC-06-Apr-14	27.5	24.5	168	sc, oto	-	M	-	-	-
		15-Apr-14	ER-NSC-07-Apr-14	39.3	35.2	440	-	-	F	-	-	-
		18-Apr-14	ER-NSC-08-Apr-14	42.8	38.7	748	sc, oto	-	M	-	-	muscle
		18-Apr-14	ER-NSC-09-Apr-14	43.7	39.8	670	sc, oto	-	M	-	-	muscle
		18-Apr-14	ER-NSC-10-Apr-14	42.1	37.9	594	sc, oto	-	M	-	-	muscle
		18-Apr-14	ER-NSC-11-Apr-14	37.3	33.5	438	sc, oto	-	F	4.512	-	muscle, ovaries
		18-Apr-14	ER-NSC-12-Apr-14	39.0	35.3	460	sc, oto	-	M	-	-	muscle
		18-Apr-14	ER-NSC-13-Apr-14	35.0	31.6	364	sc, oto	-	M	-	-	muscle
		18-Apr-14	ER-NSC-14-Apr-14	34.1	30.8	312	sc, oto	-	F	3.360	-	muscle, ovaries
		20-Aug-14	ER-NSC-01-Aug-14	26.5	23.4	124	sc, oto	5	-	-	-	muscle
		20-Aug-14	ER-NSC-02-Aug-14	30.4	27.2	218	sc, oto	9	-	-	-	muscle
		20-Aug-14	ER-NSC-03-Aug-14	25.2	22.6	111	sc, oto	5	-	-	-	muscle
		20-Aug-14	ER-NSC-04-Aug-14	29.9	27.4	172	sc, oto	7	-	-	-	muscle
		20-Aug-14	ER-NSC-05-Aug-14	32.8	29.5	260	sc, oto	10	-	-	-	muscle
		22-Aug-14	ER-NSC-06-Aug-14	58.4	53.7	1,560	sc, oto	25	F	-	-	muscle
		22-Aug-14	ER-NSC-07-Aug-14	32.5	29.2	242	sc, oto	9	-	-	-	muscle
		22-Aug-14	ER-NSC-08-Aug-14	37.5	33.8	405	sc, oto	12	-	-	-	muscle
		22-Aug-14	ER-NSC-09-Aug-14	39.2	35.4	442	sc, oto	12	-	-	-	muscle
		22-Aug-14	ER-NSC-10-Aug-14	30.7	27.8	230	sc, oto	11	-	-	-	muscle
	2015	23-Apr-15	ER-NSC-18-Apr-15	29.1	25.6	166	-	-	I	0.989	-	-
		23-Apr-15	ER-NSC-20-Apr-15	27.1	24.2	-	-	-	I	-	-	-
		23-Apr-15	ER-NSC-22-Apr-15	27.0	24.0	128	-	-	I	0.926	-	-
		24-Apr-15	ER-NSC-26-Apr-15	25.2	22.7	107	-	-	I	0.915	-	-
		23-Aug-15	ER-NSC-01-Aug-15	28.9	26.2	158	oto	6	-	-	-	muscle
		23-Aug-15	ER-NSC-02-Aug-15	35.3	31.7	330	oto	8	-	-	-	muscle
		23-Aug-15	ER-NSC-03-Aug-15	30.9	28.2	244	oto	13	-	-	-	muscle
		23-Aug-15	ER-NSC-04-Aug-15	33.6	30.3	278	oto	12	-	-	-	muscle
		23-Aug-15	ER-NSC-05-Aug-15	31.4	29.4	244	oto	8	-	-	-	muscle
		23-Aug-15	ER-NSC-06-Aug-15	29.9	26.9	212	oto	6	-	-	-	muscle
		23-Aug-15	ER-NSC-07-Aug-15	27.0	24.2	144	oto	8	-	-	-	muscle
		23-Aug-15	ER-NSC-08-Aug-15	25.7	23.1	126	oto	9	-	-	-	muscle
		23-Aug-15	ER-NSC-09-Aug-15	25.3	22.7	106	oto	6	-	-	-	muscle
		23-Aug-15	ER-NSC-10-Aug-15	30.3	27.2	177	oto	9	-	-	-	muscle
	2016	21-Apr-16	ER-NSC-24-Apr-16	34.9	31.4	365	-	-	-	-	-	
		22-Apr-16	ER-NSC-32-Apr-16	43.7	40.1	690	-	-	-	-	-	
		23-Aug-16	ER-NSC-01A-Aug-16	54.1	49.0	1,500	sc, oto	18	-	-	-	muscle
		23-Aug-16	ER-NSC-02A-Aug-16	59.3	54.3	2,120	sc, oto	15	-	-	-	muscle
		23-Aug-16	ER-NSC-03A-Aug-16	55.8	51.2	1,380	sc, oto	17	-	-	-	muscle
		23-Aug-16	ER-NSC-04A-Aug-16	54.7	49.3	1,775	sc, oto	18	-	-	-	muscle
		23-Aug-16	ER-NSC-05A-Aug-16	39.0	34.9	510	sc, oto	14	-	-	-	muscle
		23-Aug-16	ER-NSC-06A-Aug-16	35.0	31.6	355	sc, oto	10	-	-	-	muscle
		23-Aug-16	ER-NSC-07A-Aug-16	32.9	29.3	270	sc, oto	8	-	-	-	muscle
		28-Aug-16	ER-NSC-08A-Aug-16	57.5	52.3	1,660	sc, oto	17	-	-	-	muscle
		28-Aug-16	ER-NSC-09A-Aug-16	61.0	55.3	2,340	sc, oto	20	-	-	-	muscle
		28-Aug-16	ER-NSC-10A-Aug-16	50.0	45.4	1,080	sc, oto	14	-	-	-	muscle
total sample size				**68**	**68**	**67**	**-**	**30**	**-**	**5**	**-**	**-**
average				**36**	**33**	**478**	**-**	**11**	**-**	**2.140**	**-**	**-**
median				**33**	**30**	**278**	**-**	**10**	**-**	**0.989**	**-**	**-**
standard deviation				**9.4**	**8.7**	**499**	**-**	**5**	**-**	**1.689**	**-**	**-**
standard error				**1.1**	**1.1**	**61**	**-**	**1**	**-**	**0.755**	**-**	**-**
minimum				**24**	**22**	**84**	**-**	**5**	**-**	**0.915**	**-**	**-**
maximum				**61**	**55**	**2,340**	**-**	**25**	**-**	**4.512**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Fish collected at Englishman Creek were grouped with the Elk River summary statistics.

Table F.27: Summary Statistics for Northern Pikeminnow Meristic Data Not Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Gonad Weight (g)	Abnormalities	Tissue Collected
Gold Creek	2014	12-Feb-14	GC-NSC-01-Feb-14	37.3	34.0	365	-	-	-	-	-	-
		13-Feb-14	GC-NSC-02-Feb-14	48.7	44.5	1,000	-	-	-	-	-	-
		13-Feb-14	GC-NSC-03-Feb-14	42.8	39.2	710	-	-	-	-	-	-
		13-Feb-14	GC-NSC-04-Feb-14	41.5	37.2	510	-	-	-	-	-	-
		14-Feb-14	GC-NSC-05-Feb-14	43.4	39.5	730	-	-	-	-	-	-
		14-Feb-14	GC-NSC-06-Feb-14	29.6	26.4	200	-	-	-	-	-	-
		14-Feb-14	GC-NSC-07-Feb-14	30.3	27.2	195	-	-	-	-	-	-
		14-Feb-14	GC-NSC-08-Feb-14	43.1	39.6	590	-	-	-	-	-	-
		15-Feb-14	GC-NSC-09-Feb-14	62.9	57.4	2,100	-	-	-	-	-	-
		15-Feb-14	GC-NSC-10-Feb-14	43.4	38.5	720	-	-	-	-	-	-
		15-Feb-14	GC-NSC-11-Feb-14	33.7	30.9	300	-	-	-	-	-	-
		15-Feb-14	GC-NSC-12-Feb-14	53.8	49.1	1,500	-	-	-	-	-	-
		15-Feb-14	GC-NSC-13-Feb-14	50.6	46.4	1,200	-	-	-	-	-	-
		15-Feb-14	GC-NSC-14-Feb-14	30.4	27.6	230	-	-	-	-	-	-
		15-Feb-14	GC-NSC-15-Feb-14	39.7	36.0	550	-	-	-	-	-	-
		15-Feb-14	GC-NSC-16-Feb-14	50.7	46.2	1,150	-	-	-	-	-	-
		16-Feb-14	GC-NSC-17-Feb-14	58.5	52.8	1,800	-	-	-	-	-	-
		16-Feb-14	GC-NSC-18-Feb-14	46.3	42.4	810	-	-	-	-	-	-
		16-Feb-14	GC-NSC-19-Feb-14	37.3	33.1	355	-	-	-	-	-	-
		16-Feb-14	GC-NSC-20-Feb-14	39.2	35.6	475	-	-	-	-	-	-
		17-Feb-14	GC-NSC-21-Feb-14	35.7	32.3	345	-	-	M	-	-	-
		18-Feb-14	GC-NSC-22-Feb-14	27.9	25.3	155	-	-	-	-	-	-
		18-Feb-14	GC-NSC-23-Feb-14	39.3	35.7	495	sc,oto	-	F	-	-	muscle, ovaries
		19-Feb-14	GC-NSC-24-Feb-14	31.5	28.0	185	-	-	-	-	-	-
		19-Feb-14	GC-NSC-25-Feb-14	33.0	30.1	295	-	-	M	-	-	-
		20-Feb-14	GC-NSC-26-Feb-14	29.8	26.8	190	-	-	-	-	-	-
		20-Feb-14	GC-NSC-27-Feb-14	20.8	18.7	50	-	-	-	-	-	-
		20-Feb-14	GC-NSC-28-Feb-14	35.5	32.3	360	sc,oto	-	F	-	-	muscle
		20-Feb-14	GC-NSC-29-Feb-14	38.6	34.9	500	sc,oto	-	F	-	-	muscle
		18-Feb-14	GC-NSC-30-Feb-14	15.2	13.4	21	-	-	-	-	-	-
		24-Feb-14	GC-NSC-31-Feb-14	38.0	-	580	-	-	F	-	-	muscle, ovaries
		12-Apr-14	GC-NSC-01-Apr-14	27.2	24.0	144	sc, oto	-	I	-	-	muscle
		12-Apr-14	GC-NSC-02-Apr-14	28.5	25.4	173	sc, oto	-	M	-	-	muscle
		12-Apr-14	GC-NSC-03-Apr-14	27.9	24.7	155	sc, oto	-	M	-	-	muscle
		13-Apr-14	GC-NSC-04-Apr-14	50.4	46.1	1,090	sc, oto	-	M	-	-	muscle
		13-Apr-14	GC-NSC-05-Apr-14	28.2	25.0	158	sc, oto	-	M	-	-	muscle
		13-Apr-14	GC-NSC-06-Apr-14	33.5	30.3	320	sc, oto	-	M	-	-	muscle
		13-Apr-14	GC-NSC-07-Apr-14	47.0	42.6	840	sc	-	M	-	damaged left eye	muscle
		14-Apr-14	GC-NSC-08-Apr-14	31.2	27.8	156	sc, oto	-	M	-	-	muscle
		14-Apr-14	GC-NSC-09-Apr-14	30.9	27.6	215	sc, oto	-	M	-	-	muscle
		14-Apr-14	GC-NSC-10-Apr-14	40.4	36.5	522	sc, oto	-	F	4.343	-	muscle, ovaries
		14-Apr-14	GC-NSC-11-Apr-14	24.5	21.5	94	sc, oto	-	I	-	-	muscle
		14-Apr-14	GC-NSC-12-Apr-14	40.0	36.3	550	sc, oto	-	M	-	-	muscle
		15-Apr-14	GC-NSC-13-Apr-14	28.7	25.6	162	sc, oto	-	M	-	-	muscle
		19-Aug-14	GC-NSC-01-Aug-14	30.1	26.8	191	sc, oto	8	-	-	-	muscle
		19-Aug-14	GC-NSC-02-Aug-14	24.8	22.3	124	sc, oto	6	-	-	-	muscle
		20-Aug-14	GC-NSC-03-Aug-14	30.2	26.7	184	sc, oto	8	-	-	-	muscle
		20-Aug-14	GC-NSC-04-Aug-14	33.8	30.6	290	sc, oto	8	-	-	-	muscle
		20-Aug-14	GC-NSC-05-Aug-14	30.6	27.8	212	sc, oto	7	-	-	-	muscle
		20-Aug-14	GC-NSC-06-Aug-14	34.7	31.0	286	sc, oto	10	-	-	-	muscle
		20-Aug-14	GC-NSC-07-Aug-14	30.0	26.9	178	sc, oto	9	-	-	-	muscle
		20-Aug-14	GC-NSC-08-Aug-14	30.0	27.0	208	sc, oto	7	-	-	-	muscle
		20-Aug-14	GC-NSC-09-Aug-14	33.3	30.0	294	sc, oto	10	-	-	-	muscle
		20-Aug-14	GC-NSC-10-Aug-14	36.7	33.2	364	sc, oto	12	-	-	-	muscle
	2015	23-Apr-15	GC-NSC-07-Apr-15	28.5	25.4	159	-	-	-	0.970	-	-
		23-Apr-15	GC-NSC-08-Apr-15	30.8	27.5	211	-	-	-	1.015	-	-
		23-Apr-15	GC-NSC-09-Apr-15	28.8	25.8	172	-	-	-	1.002	-	-
		23-Apr-15	GC-NSC-11-Apr-15	27.4	24.4	125	-	-	-	0.860	-	-
		23-Apr-15	GC-NSC-12-Apr-15	28.0	25.2	150	-	-	-	0.937	-	-
		24-Apr-15	GC-NSC-24-Apr-15	27.6	24.6	144	-	-	-	0.967	-	-
		24-Apr-15	GC-NSC-25-Apr-15	29.2	26.0	149	-	-	-	0.848	-	-
		25-Apr-15	GC-NSC-29-Apr-15	30.2	26.8	180	-	-	-	0.935	-	-
		24-Aug-15	GC-NSC-01-Aug-15	28.7	25.7	149	oto	7	-	-	-	muscle
		24-Aug-15	GC-NSC-02-Aug-15	37.3	34.3	360	oto	12	-	-	-	muscle
		24-Aug-15	GC-NSC-03-Aug-15	26.8	24.1	131	oto	6	-	-	-	muscle
		24-Aug-15	GC-NSC-04-Aug-15	26.9	24.0	122	oto	6	-	-	-	muscle
		25-Aug-15	GC-NSC-05-Aug-15	29.0	25.7	166	oto	6	-	-	-	muscle
		25-Aug-15	GC-NSC-06-Aug-15	32.2	29.0	230	oto	6	-	-	-	muscle
		25-Aug-15	GC-NSC-07-Aug-15	27.5	24.8	142	oto	6	-	-	-	muscle
		25-Aug-15	GC-NSC-08-Aug-15	26.4	23.5	120	oto	6	-	-	-	muscle
		25-Aug-15	GC-NSC-09-Aug-15	22.2	19.8	71	oto	4	-	-	-	muscle
		26-Aug-15	GC-NSC-10-Aug-15	31.7	28.9	225	oto	9	-	-	-	muscle
	2016	19-Apr-16	GC-NSC-04-Apr-16	29.5	26.6	174	-	-	-	-	-	-
		23-Aug-16	GC-NSC-01A-Aug-16	37.0	33.3	440	sc, oto	10	-	-	-	muscle
		28-Aug-16	GC-NSC-02A-Aug-16	47.6	43.3	1,040	sc, oto	14	-	-	-	muscle
		28-Aug-16	GC-NSC-03A-Aug-16	34.8	31.5	365	sc, oto	13	-	-	-	muscle
		28-Aug-16	GC-NSC-04A-Aug-16	37.3	33.8	410	sc, oto	13	-	-	-	muscle
		28-Aug-16	GC-NSC-05A-Aug-16	32.0	28.8	236	sc, oto	10	-	-	-	muscle
		28-Aug-16	GC-NSC-06A-Aug-16	41.3	37.6	575	sc, oto	9	-	-	-	muscle
		28-Aug-16	GC-NSC-07A-Aug-16	37.7	34.5	505	sc, oto	12	-	-	-	muscle
		28-Aug-16	GC-NSC-08A-Aug-16	36.2	32.6	400	sc, oto	12	-	-	-	muscle
		28-Aug-16	GC-NSC-09A-Aug-16	36.0	32.8	350	sc, oto	11	-	-	-	muscle
		28-Aug-16	GC-NSC-10A-Aug-16	33.0	29.6	290	sc, oto	14	-	-	-	muscle
total sample size				**83**	**82**	**83**	**-**	**30**	**-**	**9**	**-**	**-**
average				**35**	**31**	**402**	**-**	**9**	**-**	**1.320**	**-**	**-**
median				**33**	**29**	**286**	**-**	**9**	**-**	**0.967**	**-**	**-**
standard deviation				**8.4**	**7.9**	**381**	**-**	**2.8**	**-**	**1.135**	**-**	**-**
standard error				**0.92**	**0.87**	**42**	**-**	**0.51**	**-**	**0.378**	**-**	**-**
minimum				**15**	**13**	**21**	**-**	**4**	**-**	**0.848**	**-**	**-**
maximum				**63**	**57**	**2,100**	**-**	**14**	**-**	**4.343**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Fish collected at Englishman Creek were grouped with the Elk River summary statistics.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Sand Creek	2014	11-Apr-14	SC-PCC-02-Apr-14	F	27.6	24.4	140	sc, oto	11	9.772	1.708	129	-	-	-
		11-Apr-14	SC-PCC-03-Apr-14	F	30.9	28.0	204	sc, oto	14	15.667	4.160	184	-	-	-
		11-Apr-14	SC-PCC-04-Apr-14	F	26.6	23.7	139	sc, oto	12	9.041	1.983	128	-	-	-
		11-Apr-14	SC-PCC-06-Apr-14	F	27.2	24.2	152	sc, oto	17	7.929	2.805	141	-	-	-
		11-Apr-14	SC-PCC-07-Apr-14	F	23.2	20.3	90	sc	5	0.841	1.428	88	-	-	-
		11-Apr-14	SC-PCC-10-Apr-14	F	23.4	21.0	96	sc, oto	7	3.215	1.600	91	worms	2.940	-
		11-Apr-14	SC-PCC-11-Apr-14	F	24.0	21.6	118	sc, oto	6	3.134	1.827	113	worms	5.323	-
		12-Apr-14	SC-PCC-12-Apr-14	F	28.6	25.7	174	sc, oto	10	9.899	2.427	162	-	-	-
		12-Apr-14	SC-PCC-14-Apr-14	F	26.5	24.0	142	sc, oto	14	8.892	2.705	130	-	-	-
		12-Apr-14	SC-PCC-15-Apr-14	F	26.7	24.4	159	sc, oto	11	12.055	2.510	144	-	-	-
		12-Apr-14	SC-PCC-16-Apr-14	F	23.6	21.0	106	sc, oto	6	2.339	1.458	102	-	-	-
		12-Apr-14	SC-PCC-17-Apr-14	F	23.4	21.0	93	sc, oto	7	0.583	1.036	91	worms	5.470	-
		12-Apr-14	SC-PCC-18-Apr-14	F	24.1	21.7	116	sc, oto	11	6.580	1.920	108	-	-	-
		12-Apr-14	SC-PCC-20-Apr-14	F	29.2	26.9	182	sc, oto	17	8.999	3.770	169	-	-	-
		13-Apr-14	SC-PCC-21-Apr-14	F	28.2	24.7	154	sc, oto	17	7.197	2.103	145	-	-	-
		14-Apr-14	SC-PCC-23-Apr-14	F	22.7	20.2	106	sc, oto	12	8.057	2.461	95	blood in liver	-	-
		14-Apr-14	SC-PCC-24-Apr-14	F	24.6	22.0	110	sc, oto	6	1.099	1.313	108	worms, very small ovaries, underdeveloped	11.577	-
		14-Apr-14	SC-PCC-27-Apr-14	F	24.5	21.8	120	sc, oto	7	8.208	2.161	110	-	-	-
		14-Apr-14	SC-PCC-29-Apr-14	F	24.0	20.9	109	sc, oto	5	1.088	1.711	106	worms	10.511	-
		14-Apr-14	SC-PCC-31-Apr-14	F	23.3	20.5	105	sc, oto	5	4.924	2.007	98	-	-	-
		14-Apr-14	SC-PCC-32-Apr-14	F	30.4	27.1	209	sc, oto	19	20.982	3.980	184	-	-	-
		14-Apr-14	SC-PCC-36-Apr-14	F	26.2	23.4	133	sc, oto	8	6.859	2.094	124	worms	2.375	-
		15-Apr-14	SC-PCC-38-Apr-14	F	30.1	27.0	208	sc, oto	15	17.977	3.375	187	-	-	-
		total sample size		**-**	**23**	**23**	**23**	**-**	**23**	**23**	**23**	**23**	**-**	**6**	**-**
		average		**-**	**26.0**	**23.3**	**138**	**-**	**11**	**7.623**	**2.284**	**128**	**-**	**6.366**	**-**
		median		**-**	**26.2**	**23.4**	**133**	**-**	**11**	**7.929**	**2.094**	**124**	**-**	**5.397**	**-**
		standard deviation		**-**	**2.6**	**2.5**	**37**	**-**	**4.5**	**5.408**	**0.852**	**32**	**-**	**3.844**	**-**
		standard error		**-**	**0.5**	**0.5**	**8**	**-**	**0.94**	**1.128**	**0.178**	**7**	**-**	**1.569**	**-**
		minimum		**-**	**22.7**	**20.2**	**90**	**-**	**5**	**0.583**	**1.036**	**88**	**-**	**2.375**	**-**
		maximum			**30.9**	**28.0**	**209**	**-**	**19**	**20.982**	**4.160**	**187**	**-**	**11.577**	**-**
	2015	24-Apr-15	SC-PCC-01-Apr-15	F	24.5	22.0	106	sc, oto	7	7.743	2.485	96	-	-	muscle, ovaries
		25-Apr-15	SC-PCC-02-Apr-15	F	25.4	22.9	134	sc, oto	6	2.383	1.622	130	worms	20.682	muscle, ovaries
		25-Apr-15	SC-PCC-04-Apr-15	F	26.0	23.4	110	sc, oto	8	3.355	1.387	105	-	-	muscle, ovaries
		25-Apr-15	SC-PCC-05-Apr-15	F	27.7	24.8	166	sc, oto	11	12.497	3.924	150	-	-	muscle, ovaries
		25-Apr-15	SC-PCC-06-Apr-15	F	27.0	24.5	134	sc, oto	12	6.259	1.855	126	-	-	muscle, ovaries
		25-Apr-15	SC-PCC-08-Apr-15	F	29.3	26.2	190	sc, oto	14	10.901	3.766	175	-	-	muscle, ovaries
		26-Apr-15	SC-PCC-10-Apr-15	F	27.6	24.9	144	sc, oto	13	8.117	2.065	134	-	-	muscle, ovaries
		26-Apr-15	SC-PCC-13-Apr-15	F	28.5	25.5	172	sc, oto	12	12.149	3.878	156	-	-	muscle, ovaries
		26-Apr-15	SC-PCC-14-Apr-15	F	29.7	26.8	187	sc, oto	21	12.451	3.001	172	excess connective tissue around organs	-	muscle, ovaries
		26-Apr-15	SC-PCC-15-Apr-15	F	27.2	24.4	150	sc, oto	11	8.195	2.763	139	-	-	muscle, ovaries
		27-Apr-15	SC-PCC-16-Apr-15	F	28.3	25.3	178	sc, oto	17	13.187	4.244	161	-	-	-
		27-Apr-15	SC-PCC-17-Apr-15	F	27.7	24.8	163	sc, oto	13	10.674	3.007	149	-	-	-
		27-Apr-15	SC-PCC-18-Apr-15	F	31.0	28.4	263	sc, oto	27	17.973	5.340	240	-	-	-
		27-Apr-15	SC-PCC-20-Apr-15	F	26.2	23.4	142	sc, oto	9	5.829	1.874	134	worms	11.734	-
		27-Apr-15	SC-PCC-21-Apr-15	F	26.5	23.8	149	sc, oto	10	14.169	4.089	131	-	-	-
		27-Apr-15	SC-PCC-22-Apr-15	F	24.5	21.8	116	sc, oto	10	7.862	2.075	106	-	-	-
		27-Apr-15	SC-PCC-24-Apr-15	F	27.5	24.6	150	sc, oto	10	7.763	2.431	140	-	-	-
		27-Apr-15	SC-PCC-25-Apr-15	F	27.1	24.6	155	sc, oto	-	8.086	2.811	144	-	-	-
		27-Apr-15	SC-PCC-26-Apr-15	F	26.2	23.2	143	sc, oto	13	10.390	2.488	130	-	-	-
		27-Apr-15	SC-PCC-27-Apr-15	F	28.1	25.5	169	sc, oto	15	13.747	3.800	151	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**19**	**20**	**20**	**20**	**-**	**2**	**-**
		average		**-**	**27.3**	**24.5**	**156**	**-**	**13**	**9.687**	**2.945**	**143**	**-**	**16.208**	**-**
		median		**-**	**27.4**	**24.6**	**150**	**-**	**12**	**9.293**	**2.787**	**139**	**-**	**16.208**	**-**
		standard deviation		**-**	**1.6**	**1.6**	**34**	**-**	**4.9**	**3.840**	**1.045**	**31**	**-**	**6.327**	**-**
		standard error		**-**	**0.4**	**0.4**	**8**	**-**	**1.1**	**0.859**	**0.234**	**7**	**-**	**4.474**	**-**
		minimum		**-**	**24.5**	**21.8**	**106**	**-**	**6**	**2.383**	**1.387**	**96**	**-**	**11.734**	**-**
		maximum			**31.0**	**28.4**	**263**	**-**	**27**	**17.973**	**5.340**	**240**	**-**	**20.682**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Sand Creek	2016	19-Apr-16	SC-PCC-01-Apr-16	F	26.5	23.4	136	sc, oto	10	4.916	2.413	129	worms	9.843	muscle, ovaries
		20-Apr-16	SC-PCC-06-Apr-16	F	26.7	24.4	160	sc, oto	13	16.845	2.906	140	-	-	muscle, ovaries
		20-Apr-16	SC-PCC-08-Apr-16	F	23.7	21.4	105	sc, oto	5	2.994	1.875	100	worms	13.700	muscle, ovaries
		21-Apr-16	SC-PCC-10-Apr-16	F	24.2	21.8	102	sc, oto	7	1.185	0.962	100	worms	7.912	-
		21-Apr-16	SC-PCC-11-Apr-16	F	26.7	24.1	152	sc, oto	13	5.502	1.479	145	worms	9.276	muscle, ovaries
		21-Apr-16	SC-PCC-12-Apr-16	F	25.2	22.5	130	sc, oto	13	10.740	1.659	118	-	-	muscle, ovaries
		21-Apr-16	SC-PCC-16-Apr-16	F	25.0	22.6	134	sc, oto	11	8.736	2.403	123	-	-	muscle, ovaries
		21-Apr-16	SC-PCC-17-Apr-16	F	24.5	22.0	132	sc, oto	10	12.741	1.269	118	worms	8.223	muscle, ovaries
		23-Apr-16	SC-PCC-18-Apr-16	F	27.9	24.4	160	sc, oto	12	16.156	3.049	141	-	-	muscle, ovaries
		23-Apr-16	SC-PCC-19-Apr-16	F	29.4	26.6	176	sc, oto	16	11.168	3.253	162	-	-	muscle, ovaries
		23-Apr-16	SC-PCC-20-Apr-16	F	27.8	25.0	185	sc, oto	14	19.574	3.942	161	-	-	muscle, ovaries
		23-Apr-16	SC-PCC-21-Apr-16	F	28.1	25.3	159	sc, oto	14	12.146	3.910	143	-	-	muscle, ovaries
		23-Apr-16	SC-PCC-22-Apr-16	F	29.0	23.2	135	sc, oto	11	12.456	3.215	119	-	-	muscle, ovaries
		23-Apr-16	SC-PCC-26-Apr-16	F	27.8	24.9	172	sc, oto	9	18.396	3.363	150	-	-	-
		23-Apr-16	SC-PCC-27-Apr-16	F	25.7	23.0	136	sc, oto	8	10.245	2.572	123	-	-	-
		23-Apr-16	SC-PCC-28-Apr-16	F	24.1	21.7	118	sc, oto	5	12.601	2.878	103	-	-	-
		23-Apr-16	SC-PCC-29-Apr-16	F	26.9	24.4	150	sc, oto	10	3.809	2.508	144	worms	15.382	-
		23-Apr-16	SC-PCC-30-Apr-16	F	23.9	21.4	115	sc, oto	7	8.728	1.737	105	-	-	-
		23-Apr-16	SC-PCC-31-Apr-16	F	29.1	26.5	194	sc, oto	13	17.874	3.366	173	-	-	-
		23-Apr-16	SC-PCC-32-Apr-16	F	24.3	21.9	129	sc, oto	9	13.620	3.019	112	-	-	-
		23-Apr-16	SC-PCC-33-Apr-16	F	24.7	23.2	112	sc, oto	12	2.236	1.290	108	-	-	-
		23-Apr-16	SC-PCC-34-Apr-16	F	25.6	23.2	132	sc, oto	8	7.981	1.808	122	-	-	-
		23-Apr-16	SC-PCC-35-Apr-16	F	26.7	23.7	144	sc, oto	10	13.412	2.295	128	-	-	-
		23-Apr-16	SC-PCC-36-Apr-16	F	28.4	25.5	176	sc, oto	18	20.830	3.975	151	-	-	-
		23-Apr-16	SC-PCC-37-Apr-16	F	24.2	21.8	108	sc, oto	8	8.578	2.918	97	-	-	-
		23-Apr-16	SC-PCC-40-Apr-16	F	23.2	20.8	100	sc, oto	5	10.023	1.537	88	worms	-	-
		23-Apr-16	SC-PCC-41-Apr-16	F	26.1	23.5	144	sc, oto	10	11.358	2.377	130	-	-	-
		23-Apr-16	SC-PCC-42-Apr-16	F	24.9	22.4	126	sc, oto	5	3.445	2.186	120	worms	16.480	-
		23-Apr-16	SC-PCC-43-Apr-16	F	25.9	23.4	140	sc, oto	7	6.146	2.794	131	worms	0.694	-
		23-Apr-16	SC-PCC-44-Apr-16	F	24.5	21.9	110	sc, oto	9	8.509	2.076	99	-	-	-
		total sample size		**-**	**30**	**30**	**30**	**-**	**30**	**30**	**30**	**30**	**-**	**8**	**-**
		average		**-**	**26.0**	**23.3**	**139**	**-**	**10**	**10.432**	**2.501**	**126**	**-**	**10.189**	**-**
		median		**-**	**25.8**	**23.2**	**136**	**-**	**10**	**10.493**	**2.461**	**123**	**-**	**9.560**	**-**
		standard deviation		**-**	**1.8**	**1.5**	**25**	**-**	**3.3**	**5.301**	**0.826**	**22**	**-**	**5.057**	**-**
		standard error		**-**	**0.3**	**0.3**	**5**	**-**	**0.61**	**0.968**	**0.151**	**4**	**-**	**1.788**	**-**
		minimum		**-**	**23.2**	**20.8**	**100**	**-**	**5**	**1.185**	**0.962**	**88**	**-**	**0.694**	**-**
		maximum			**29.4**	**26.6**	**194**	**-**	**18**	**20.830**	**3.975**	**173**	**-**	**16.480**	**-**
	2014	11-Apr-14	SC-PCC-01-Apr-14	M	23.6	21.5	104	sc, oto	8	1.731	1.247	101	worms	10.061	-
		11-Apr-14	SC-PCC-05-Apr-14	M	21.5	19.1	74	sc	4	1.496	0.990	72	-	-	-
		11-Apr-14	SC-PCC-08-Apr-14	M	22.4	19.9	90	sc, oto	5	1.555	1.080	87	-	-	-
		12-Apr-14	SC-PCC-13-Apr-14	M	23.3	20.6	102	sc, oto	8	1.544	1.366	99	small worms	0.049	-
		13-Apr-14	SC-PCC-22-Apr-14	M	21.5	19.2	78	sc, oto	6	0.699	0.930	76	worms	6.600	-
		14-Apr-14	SC-PCC-26-Apr-14	M	22.8	20.6	86	sc, oto	6	2.092	1.337	83	worms	0.082	-
		14-Apr-14	SC-PCC-30-Apr-14	M	21.2	19.0	76	sc, oto	4	0.375	0.984	75	worms	9.441	-
		14-Apr-14	SC-PCC-33-Apr-14	M	20.1	18.2	71	sc, oto	5	3.185	1.320	66	-	-	-
		14-Apr-14	SC-PCC-34-Apr-14	M	21.4	19.0	70	sc, oto	4	1.201	0.730	68	-	-	-
		14-Apr-14	SC-PCC-35-Apr-14	M	21.3	18.1	64	sc, oto	5	0.650	1.278	62	-	-	-
		14-Apr-14	SC-PCC-37-Apr-14	M	17.9	15.7	46	sc, oto	5	0.415	1.092	44	-	-	-
		17-Apr-14	SC-PCC-39-Apr-14	M	24.0	21.2	106	sc, oto	11	2.627	1.484	102	-	-	-
		18-Apr-14	SC-PCC-40-Apr-14	M	25.1	22.2	118	sc, oto	8	3.064	1.813	113	worms	4.394	-
		total sample size		**-**	**13**	**13**	**13**	**-**	**13**	**13**	**13**	**13**	**-**	**6**	**-**
		average		**-**	**22.0**	**19.6**	**83**	**-**	**6**	**1.587**	**1.204**	**81**	**-**	**5.105**	**-**
		median		**-**	**21.5**	**19.2**	**78**	**-**	**5**	**1.544**	**1.247**	**76**	**-**	**5.497**	**-**
		standard deviation		**-**	**1.8**	**1.7**	**20**	**-**	**2.1**	**0.947**	**0.279**	**19**	**-**	**4.402**	**-**
		standard error		**-**	**0.5**	**0.5**	**6**	**-**	**0.58**	**0.263**	**0.077**	**5**	**-**	**1.797**	**-**
		minimum		**-**	**17.9**	**15.7**	**46**	**-**	**4**	**0.375**	**0.730**	**44**	**-**	**0.049**	**-**
		maximum			**25.1**	**22.2**	**118**	**-**	**11**	**3.185**	**1.813**	**113**	**-**	**10.061**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Sand Creek	2015	25-Apr-15	SC-PCC-03-Apr-15	M	24.4	22.0	111	sc, oto	8	2.047	1.304	108	worms	4.658	whole body
		25-Apr-15	SC-PCC-07-Apr-15	M	25.3	22.9	112	sc, oto	9	1.959	1.533	109	-	-	whole body
		26-Apr-15	SC-PCC-09-Apr-15	M	25.7	23.0	132	sc, oto	9	5.326	1.877	125	-	-	whole body
		26-Apr-15	SC-PCC-11-Apr-15	M	23.3	20.5	95	sc, oto	6	4.994	1.688	88	-	-	whole body
		26-Apr-15	SC-PCC-12-Apr-15	M	24.6	21.8	102	sc, oto	12	1.390	1.213	99	-	-	whole body
		27-Apr-15	SC-PCC-19-Apr-15	M	26.8	24.1	157	sc, oto	11	6.088	1.747	149	one large testes	-	-
		27-Apr-15	SC-PCC-23-Apr-15	M	25.9	23.2	120	sc, oto	13	1.106	1.266	118	-	-	-
		28-Apr-15	SC-PCC-28-Apr-15	M	24.1	21.3	105	sc, oto	4	2.624	0.988	101	-	-	-
		28-Apr-15	SC-PCC-29-Apr-15	M	24.9	22.3	113	sc, oto	12	4.055	1.670	107	-	-	-
		30-Apr-15	SC-PCC-30-Apr-15	M	21.0	18.7	70	sc, oto	4	3.516	1.516	65	-	-	-
		30-Apr-15	SC-PCC-31-Apr-15	M	22.3	20.0	81	sc, oto	5	3.927	0.905	76	-	-	-
		30-Apr-15	SC-PCC-32-Apr-15	M	22.1	19.8	83	sc, oto	6	0.868	1.140	80	worms	8.446	-
		30-Apr-15	SC-PCC-33-Apr-15	M	23.8	21.3	112	sc, oto	8	6.236	1.290	104	-	-	-
		total sample size		**-**	**13**	**13**	**13**	**-**	**13**	**13**	**13**	**13**	**-**	**2**	**-**
		average		**-**	**24.2**	**21.6**	**107**	**-**	**8**	**3.395**	**1.395**	**102**	**-**	**6.552**	**-**
		median		**-**	**24.4**	**21.8**	**111**	**-**	**8**	**3.516**	**1.304**	**104**	**-**	**6.552**	**-**
		standard deviation		**-**	**1.7**	**1.5**	**23**	**-**	**3.1**	**1.881**	**0.302**	**22**	**-**	**2.679**	**-**
		standard error		**-**	**0.5**	**0.4**	**6**	**-**	**0.86**	**0.522**	**0.084**	**6**	**-**	**1.894**	**-**
		minimum		**-**	**21.0**	**18.7**	**70**	**-**	**4**	**0.868**	**0.905**	**65**	**-**	**4.658**	**-**
		maximum			**26.8**	**24.1**	**157**	**-**	**13**	**6.236**	**1.877**	**149**	**-**	**8.446**	**-**
	2016	20-Apr-16	SC-PCC-07-Apr-16	M	25.4	22.6	120	sc, oto	7	1.366	0.926	118	worms	9.191	whole body
		21-Apr-16	SC-PCC-09-Apr-16	M	23.1	20.9	108	sc, oto	9	1.951	4.156	102	worms	8.636	whole body
		21-Apr-16	SC-PCC-14-Apr-16	M	26.0	23.5	140	sc, oto	7	1.519	1.278	137	worms	8.174	whole body
		23-Apr-16	SC-PCC-23-Apr-16	M	23.2	20.6	97	sc, oto	7	5.188	1.502	90	-	-	whole body
		23-Apr-16	SC-PCC-24-Apr-16	M	23.7	21.3	102	sc, oto	6	0.800	0.592	101	worms	8.157	whole body
		23-Apr-16	SC-PCC-25-Apr-16	M	23.0	20.6	96	sc, oto	7	0.682	1.656	94	worms	16.028	-
		23-Apr-16	SC-PCC-38-Apr-16	M	24.4	22.0	104	sc, oto	10	4.657	1.912	97	-	-	-
		23-Apr-16	SC-PCC-39-Apr-16	M	24.3	21.6	104	sc, oto	10	3.890	1.523	99	-	-	-
		23-Apr-16	SC-PCC-45-Apr-16	M	21.6	19.1	90	sc, oto	5	0.767	1.172	88	worms	11.287	-
		23-Apr-16	SC-PCC-46-Apr-16	M	22.7	20.0	88	sc, oto	5	0.773	1.184	86	worms	9.277	-
		23-Apr-16	SC-PCC-47-Apr-16	M	23.6	20.8	112	sc, oto	5	0.963	1.332	110	worms	23.631	-
		23-Apr-16	SC-PCC-48-Apr-16	M	25.5	23.0	144	sc, oto	10	5.799	2.267	136	-	-	-
		23-Apr-16	SC-PCC-49-Apr-16	M	23.1	20.8	97	sc, oto	8	3.803	1.365	92	-	-	-
		24-Apr-16	SC-PCC-50-Apr-16	M	19.5	17.3	57	sc, oto	6	2.291	0.937	54	-	-	-
		24-Apr-16	SC-PCC-51-Apr-16	M	19.2	17.0	57	sc, oto	4	0.742	0.877	55	-	-	-
		24-Apr-16	SC-PCC-52-Apr-16	M	19.8	17.2	57	sc, oto	5	1.885	0.998	54	-	-	-
		24-Apr-16	SC-PCC-53-Apr-16	M	19.2	17.3	61	sc, oto	4	1.741	1.615	58	-	-	-
		24-Apr-16	SC-PCC-54-Apr-16	M	19.0	17.5	60	sc, oto	4	2.473	1.022	57	-	-	-
		24-Apr-16	SC-PCC-55-Apr-16	M	19.1	17.0	57	sc, oto	4	0.539	0.815	56	worms	1.008	-
		24-Apr-16	SC-PCC-56-Apr-16	M	21.0	18.7	80	sc, oto	5	2.358	1.141	77	worms	0.067	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**20**	**20**	**20**	**20**	**-**	**10**	**-**
		average		**-**	**22.3**	**19.9**	**92**	**-**	**6**	**2.209**	**1.414**	**88**	**-**	**9.546**	**-**
		median		**-**	**23.1**	**20.6**	**97**	**-**	**6**	**1.813**	**1.231**	**91**	**-**	**8.914**	**-**
		standard deviation		**-**	**2.4**	**2.2**	**27**	**-**	**2.1**	**1.618**	**0.759**	**26**	**-**	**6.758**	**-**
		standard error		**-**	**0.5**	**0.5**	**6**	**-**	**0.47**	**0.362**	**0.170**	**6**	**-**	**2.137**	**-**
		minimum		**-**	**19.0**	**17.0**	**57**	**-**	**4**	**0.539**	**0.592**	**54**	**-**	**0.067**	**-**
		maximum			**26.0**	**23.5**	**144**	**-**	**10**	**5.799**	**4.156**	**137**	**-**	**23.631**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Elk River	2014	11-Apr-14	ER-PCC-01-Apr-14	F	25.9	22.9	144	sc, oto	11	8.872	2.655	132	-	-	-
		11-Apr-14	ER-PCC-02-Apr-14	F	27.7	25.5	178	sc, oto	17	11.507	2.964	164	-	-	-
		11-Apr-14	ER-PCC-04-Apr-14	F	26.9	24.4	162	sc, oto	10	13.242	2.781	146	-	-	-
		11-Apr-14	ER-PCC-05-Apr-14	F	28.7	25.8	189	sc, oto	11	14.312	3.395	171	-	-	-
		11-Apr-14	ER-PCC-06-Apr-14	F	27.3	25.0	158	sc, oto	11	13.841	2.099	142	-	-	-
		11-Apr-14	ER-PCC-07-Apr-14	F	28.5	25.6	182	sc, oto	11	10.666	2.568	169	-	-	-
		12-Apr-14	ER-PCC-08-Apr-14	F	29.3	26.4	212	sc, oto	24	14.330	4.160	194	-	-	-
		12-Apr-14	ER-PCC-09-Apr-14	F	27.1	24.4	149	sc, oto	12	9.397	2.862	137	-	-	-
		12-Apr-14	ER-PCC-10-Apr-14	F	29.0	25.5	108	sc, oto	19	13.217	2.830	92	-	-	-
		12-Apr-14	ER-PCC-11-Apr-14	F	30.3	27.8	210	sc, oto	15	12.694	4.075	193	-	-	-
		12-Apr-14	ER-PCC-12-Apr-14	F	28.7	26.0	181	sc, oto	17	9.771	2.914	168	-	-	-
		12-Apr-14	ER-PCC-13-Apr-14	F	23.0	25.6	130	sc, oto	8	4.805	2.623	123	blood in liver	-	-
		12-Apr-14	ER-PCC-14-Apr-14	F	31.5	28.5	266	sc, oto	21	17.671	4.825	244	-	-	-
		14-Apr-14	ER-PCC-16-Apr-14	F	25.7	22.5	132	sc, oto	8	4.461	1.907	126	worms	12.924	-
		14-Apr-14	ER-PCC-17-Apr-14	F	26.3	23.7	149	sc, oto	10	11.308	2.447	135	-	-	-
		15-Apr-14	ER-PCC-18-Apr-14	F	28.8	25.9	223	sc, oto	21	15.019	3.430	205	-	-	-
		15-Apr-14	ER-PCC-19-Apr-14	F	28.1	25.5	178	sc, oto	15	13.387	3.247	161	-	-	-
		15-Apr-14	ER-PCC-20-Apr-14	F	25.7	23.5	156	sc, oto	11	14.003	3.385	139	-	-	-
		15-Apr-14	ER-PCC-21-Apr-14	F	30.1	27.2	229	sc, oto	16	15.257	4.141	210	-	-	-
		15-Apr-14	ER-PCC-22-Apr-14	F	25.8	28.5	180	sc, oto	20	10.528	3.269	166	-	-	-
		18-Apr-14	ER-PCC-25-Apr-14[b]	F	29.2	26.1	190	sc, oto	>15	15.978	2.763	171	-	-	-
		total sample size		**-**	**21**	**21**	**21**	**-**	**20**	**21**	**21**	**21**	**-**	**-**	**-**
		average		**-**	**27.8**	**25.5**	**176**	**-**	**14**	**12.108**	**3.111**	**161**	**-**	**-**	**-**
		median		**-**	**28.1**	**25.6**	**178**	**-**	**14**	**13.217**	**2.914**	**164**	**-**	**-**	**-**
		standard deviation		**-**	**2.0**	**1.6**	**37**	**-**	**4.8**	**3.361**	**0.722**	**35**	**-**	**-**	**-**
		standard error		**-**	**0.4**	**0.4**	**8**	**-**	**1.1**	**0.733**	**0.157**	**8**	**-**	**-**	**-**
		minimum		**-**	**23.0**	**22.5**	**108**	**-**	**8**	**4.461**	**1.907**	**92**	**-**	**-**	**-**
		maximum			**31.5**	**28.5**	**266**	**-**	**24**	**17.671**	**4.825**	**244**	**-**	**-**	**-**
	2015	22-Apr-15	ER-PCC-01-Apr-15	F	26.7	24.1	150	sc	5	11.736	1.088	137	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-02-Apr-15	F	30.0	27.1	200	sc, oto	22	8.879	2.226	189	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-03-Apr-15	F	30.7	27.6	198	sc, oto	21	9.947	3.333	185	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-04-Apr-15	F	29.2	25.9	174	sc, oto	11	10.882	2.767	160	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-05-Apr-15	F	27.3	24.5	178	sc, oto	15	12.307	3.720	162	gill cysts	-	muscle, ovaries
		22-Apr-15	ER-PCC-06-Apr-15	F	28.1	25.4	158	sc, oto	15	10.681	2.938	144	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-07-Apr-15	F	21.4	19.0	77	sc, oto	5	4.790	0.989	71	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-08-Apr-15	F	25.3	22.5	90.5	sc, oto	9	5.160	1.844	83	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-10-Apr-15	F	28.1	25.4	146	sc, oto	13	5.149	1.489	139	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-11-Apr-15	F	29.7	27.0	180	sc, oto	20	9.550	3.025	167	-	-	muscle, ovaries
		22-Apr-15	ER-PCC-12-Apr-15	F	30.9	27.4	212	sc, oto	19	16.073	4.221	192	caudal deformed	-	muscle, ovaries
		22-Apr-15	ER-PCC-13-Apr-15	F	28.0	24.9	160	sc, oto	13	9.203	2.500	148	-	-	muscle, ovaries
		23-Apr-15	ER-PCC-14-Apr-15	F	29.2	26.1	205	sc, oto	20	13.447	3.606	188	-	-	muscle, ovaries
		23-Apr-15	ER-PCC-15-Apr-15	F	29.4	26.3	183	sc, oto	21	10.653	3.301	169	-	-	muscle, ovaries
		23-Apr-15	ER-PCC-16-Apr-15	F	25.7	23.0	127	sc, oto	9	9.022	2.605	115	-	-	-
		23-Apr-15	ER-PCC-18-Apr-15	F	27.6	24.9	168	sc, oto	15	10.748	3.153	154	-	-	-
		23-Apr-15	ER-PCC-20-Apr-15	F	29.4	26.4	170	sc, oto	15	9.449	2.430	158	-	-	-
		23-Apr-15	ER-PCC-21-Apr-15	F	27.5	24.8	152	sc, oto	9	8.702	2.538	141	-	-	-
		23-Apr-15	ER-PCC-22-Apr-15	F	28.7	25.7	168	sc, oto	17	6.808	2.637	159	-	-	-
		23-Apr-15	ER-PCC-23-Apr-15	F	27.0	24.3	138	sc, oto	13	8.824	2.123	127	-	-	-
		28-Apr-15	ER-PCC-34-Apr-15	F	23.6	21.4	93	-	-	-	-	-	-	-	-
		total sample size		**-**	**21**	**21**	**21**	**-**	**20**	**20**	**20**	**20**	**-**	**-**	**-**
		average		**-**	**27.8**	**24.9**	**158**	**-**	**14**	**9.601**	**2.627**	**149**	**-**	**-**	**-**
		median		**-**	**28.1**	**25.4**	**168**	**-**	**15**	**9.500**	**2.621**	**156**	**-**	**-**	**-**
		standard deviation		**-**	**2.3**	**2.1**	**37**	**-**	**5.2**	**2.780**	**0.847**	**32**	**-**	**-**	**-**
		standard error		**-**	**0.5**	**0.5**	**8**	**-**	**1.2**	**0.622**	**0.189**	**7**	**-**	**-**	**-**
		minimum		**-**	**21.4**	**19.0**	**77**	**-**	**5**	**4.790**	**0.989**	**71**	**-**	**-**	**-**
		maximum			**30.9**	**27.6**	**212**	**-**	**22**	**16.073**	**4.221**	**192**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Elk River	2016	19-Apr-16	ER-PCC-01-Apr-16	F	27.1	23.8	160	sc	4	13.767	3.102	143	-	-	muscle, ovaries
		19-Apr-16	ER-PCC-02-Apr-16	F	22.5	19.5	75	sc, oto	5	7.473	2.222	65	-	-	muscle, ovaries
		19-Apr-16	ER-PCC-03-Apr-16	F	23.5	20.3	96	sc, oto	7	4.350	2.049	90	-	-	muscle, ovaries
		19-Apr-16	ER-PCC-04-Apr-16	F	23.4	21.3	84	-	-	-	-	-	-	-	-
		19-Apr-16	ER-PCC-05-Apr-16	F	22.2	19.6	87	sc, oto	5	6.665	1.679	79	-	-	muscle, ovaries
		19-Apr-16	ER-PCC-06-Apr-16	F	22.5	20.1	89	sc, oto	5	7.875	1.328	80	-	-	muscle, ovaries
		19-Apr-16	ER-PCC-07-Apr-16	F	25.6	22.9	140	sc, oto	8	14.949	3.695	121	-	-	muscle, ovaries
		19-Apr-16	ER-PCC-08-Apr-16	F	24.5	22.2	125	sc, oto	9	9.874	1.769	113	-	-	muscle, ovaries
		19-Apr-16	ER-PCC-09-Apr-16	F	20.7	18.5	66	sc, oto	4	1.933	1.162	63	worms	3.500	muscle, ovaries
		19-Apr-16	ER-PCC-10-Apr-16	F	25.5	23.2	144	sc, oto	9	8.747	3.185	132	worms	1.123	muscle, ovaries
		19-Apr-16	ER-PCC-11-Apr-16	F	24.5	21.6	100	sc, oto	7	3.487	1.393	95	worms	4.893	muscle, ovaries
		19-Apr-16	ER-PCC-14-Apr-16	F	22.5	20.3	90	sc, oto	5	8.152	2.027	80	-	-	muscle, ovaries
		20-Apr-16	ER-PCC-15-Apr-16	F	23.5	20.9	110	sc, oto	7	11.829	2.662	96	-	-	muscle, ovaries
		22-Apr-16	ER-PCC-16-Apr-16	F	25.5	22.6	122	sc, oto	13.5	6.591	1.993	113	-	-	-
		22-Apr-16	ER-PCC-17-Apr-16	F	30.4	27.5	232	sc, oto	18	26.184	6.495	199	-	-	-
		22-Apr-16	ER-PCC-18-Apr-16	F	26.1	23.4	152	sc, oto	10	19.077	3.880	129	-	-	-
		22-Apr-16	ER-PCC-19-Apr-16	F	25.6	23.2	156	sc, oto	10	19.472	4.119	132	-	-	-
		22-Apr-16	ER-PCC-20-Apr-16	F	25.7	23.1	138	sc, oto	10	12.278	2.313	123	-	-	-
		22-Apr-16	ER-PCC-22-Apr-16	F	26.5	23.6	160	sc, oto	10	15.665	4.118	140	-	-	-
		22-Apr-16	ER-PCC-23-Apr-16	F	24.5	21.5	118	sc, oto	7	10.972	3.672	103	-	-	-
		22-Apr-16	ER-PCC-25-Apr-16	F	23.4	21.1	114	sc, oto	5	0.828	1.612	112	worms	17.527	-
		22-Apr-16	ER-PCC-29-Apr-16[b]	F	24.8	22.8	136	sc, oto	10	10.056	3.131	123	-	-	-
		22-Apr-16	ER-PCC-30-Apr-16	F	25.7	23.0	132	sc, oto	9	11.083	2.651	118	-	-	-
		22-Apr-16	ER-PCC-31-Apr-16	F	26.0	23.2	154	sc, oto	13	15.995	2.881	135	-	-	-
		22-Apr-16	ER-PCC-32-Apr-16	F	29.5	26.5	188	sc, oto	11	16.571	3.306	168	-	-	-
		22-Apr-16	ER-PCC-38-Apr-16	F	24.7	22.2	122	sc, oto	7	14.272	1.982	106	-	-	-
		22-Apr-16	ER-PCC-39-Apr-16	F	26.9	23.6	132	sc, oto	11	9.589	3.503	119	-	-	-
		22-Apr-16	ER-PCC-40-Apr-16	F	27.9	25.2	196	sc, oto	13	14.115	4.034	178	worms	22.541	-
		22-Apr-16	ER-PCC-41-Apr-16	F	26.5	23.6	164	sc, oto	10	17.972	3.594	142	-	-	-
		22-Apr-16	ER-PCC-42-Apr-16	F	23.6	21.1	104	sc, oto	5	9.394	2.648	92	-	-	-
		22-Apr-16	ER-PCC-43-Apr-16	F	23.0	20.5	99	sc, oto	5	7.762	1.842	89	-	-	-
		22-Apr-16	ER-PCC-44-Apr-16	F	23.5	21.2	116	sc, oto	10	11.071	2.475	102	-	-	-
		total sample size		**-**	**32**	**32**	**32**	**-**	**31**	**31**	**31**	**31**	**-**	**5**	**-**
		average		**-**	**24.9**	**22.3**	**128**	**-**	**8**	**11.227**	**2.791**	**116**	**-**	**9.917**	**-**
		median		**-**	**24.8**	**22.4**	**124**	**-**	**9**	**10.972**	**2.651**	**113**	**-**	**4.893**	**-**
		standard deviation		**-**	**2.1**	**2.0**	**37**	**-**	**3.3**	**5.524**	**1.123**	**31**	**-**	**9.500**	**-**
		standard error		**-**	**0.4**	**0.3**	**7**	**-**	**0.59**	**0.992**	**0.202**	**6**	**-**	**4.249**	**-**
		minimum		**-**	**20.7**	**18.5**	**66**	**-**	**4**	**0.828**	**1.162**	**63**	**-**	**1.123**	**-**
		maximum			**30.4**	**27.5**	**232**	**-**	**18**	**26.184**	**6.495**	**199**	**-**	**22.541**	**-**
	2014	11-Apr-14	ER-PCC-03-Apr-14	M	23.6	20.9	100	sc, oto	14	1.528	1.191	97	-	-	-
		13-Apr-14	ER-PCC-15-Apr-14	M	22.8	20.0	91	sc, oto	5	2.746	1.267	87	-	-	-
		15-Apr-14	ER-PCC-23-Apr-14	M	21.9	19.1	67	sc, oto	7	0.170	0.941	66	-	-	-
		15-Apr-14	ER-PCC-24-Apr-14	M	23.8	20.9	103	sc, oto	4	0.788	1.119	101	worms	14.144	-
		19-Apr-14	ER-PCC-26-Apr-14	M	24.3	22.0	104	sc, oto	4	1.355	1.254	101	worms	6.483	-
		19-Apr-14	ER-PCC-27-Apr-14	M	25.6	23.0	120	sc, oto	7	4.258	1.528	114	-	-	-
		19-Apr-14	ER-PCC-28-Apr-14	M	25.5	22.7	123	sc, oto	9	3.970	1.392	118	-	-	-
		19-Apr-14	ER-PCC-29-Apr-14	M	26.8	24.1	157	sc, oto	11	5.348	1.515	150	-	-	-
		19-Apr-14	ER-PCC-30-Apr-14	M	26.5	24.9	115	sc, oto	11	1.379	1.592	112	damaged caudal fin	-	-
		19-Apr-14	ER-PCC-31-Apr-14	M	24.5	22.1	105	sc, oto	7	3.647	1.312	100	-	-	-
		19-Apr-14	ER-PCC-32-Apr-14	M	23.3	20.9	98	sc, oto	8	2.627	0.933	94	-	-	-
		19-Apr-14	ER-PCC-33-Apr-14	M	22.8	25.5	101	sc, oto	11	1.908	0.826	98	-	-	-
		total sample size		**-**	**12**	**12**	**12**	**-**	**12**	**12**	**12**	**12**	**-**	**2**	**-**
		average		**-**	**24.3**	**22.2**	**107**	**-**	**8**	**2.477**	**1.239**	**103**	**-**	**10.314**	**-**
		median		**-**	**24.1**	**22.1**	**104**	**-**	**8**	**2.268**	**1.261**	**101**	**-**	**10.314**	**-**
		standard deviation		**-**	**1.5**	**2.0**	**21**	**-**	**3.1**	**1.566**	**0.249**	**20**	**-**	**5.417**	**-**
		standard error		**-**	**0.4**	**0.6**	**6**	**-**	**0.90**	**0.452**	**0.072**	**6**	**-**	**3.831**	**-**
		minimum		**-**	**21.9**	**19.1**	**67**	**-**	**4**	**0.170**	**0.826**	**66**	**-**	**6.483**	**-**
		maximum			**26.8**	**25.5**	**157**	**-**	**14**	**5.348**	**1.592**	**150**	**-**	**14.144**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Elk River	2015	26-Apr-15	ER-PCC-24-Apr-15	M	18.6	16.4	50	sc, oto	4	1.866	0.851	47	-	-	whole body
		26-Apr-15	ER-PCC-25-Apr-15	M	23.5	20.9	100	sc, oto	9	4.467	1.512	94	-	-	whole body
		27-Apr-15	ER-PCC-26-Apr-15	M	24.0	21.4	99	sc, oto	9	3.019	1.132	95	-	-	whole body
		27-Apr-15	ER-PCC-27-Apr-15	M	27.1	24.3	144	sc, oto	12	6.216	2.023	136	-	-	whole body
		28-Apr-15	ER-PCC-28-Apr-15	M	23.3	20.8	86	sc, oto	6	2.742	1.249	82	-	-	whole body
		28-Apr-15	ER-PCC-29-Apr-15	M	25.2	21.8	121	sc, oto	-	3.731	1.649	116	-	-	-
		28-Apr-15	ER-PCC-30-Apr-15	M	23.0	20.3	83	sc, oto	6	1.412	0.931	81	worms	6.593	-
		28-Apr-15	ER-PCC-31-Apr-15	M	24.6	22.1	118	sc, oto	9	4.021	1.750	112	-	-	-
		28-Apr-15	ER-PCC-32-Apr-15	M	21.0	19.0	71	sc, oto	6	2.262	0.997	68	-	-	-
		28-Apr-15	ER-PCC-33-Apr-15	M	23.6	21.5	91	sc, oto	12	2.058	1.370	88	-	-	-
		28-Apr-15	ER-PCC-35-Apr-15	M	24.5	21.9	117	sc, oto	9	5.327	1.222	110	-	-	-
		28-Apr-15	ER-PCC-36-Apr-15	M	24.6	21.7	118	sc, oto	13	4.867	1.055	112	-	-	-
		29-Apr-15	ER-PCC-37-Apr-15	M	23.2	20.6	96	sc, oto	6	4.255	1.894	90	-	-	-
		29-Apr-15	ER-PCC-38-Apr-15	M	23.2	20.8	87	sc, oto	9	3.924	1.141	82	-	-	-
		29-Apr-15	ER-PCC-39-Apr-15	M	23.6	21.8	98	sc, oto	6	3.843	1.423	93	-	-	-
		29-Apr-15	ER-PCC-40-Apr-15	M	22.9	20.4	85	sc, oto	9	4.145	1.170	80	-	-	-
		29-Apr-15	ER-PCC-41-Apr-15	M	18.5	16.5	47	sc, oto	4	1.543	0.818	45	-	-	-
		29-Apr-15	ER-PCC-42-Apr-15	M	25.3	22.7	120	sc, oto	9	4.525	1.419	114	-	-	-
		29-Apr-15	ER-PCC-43-Apr-15	M	18.3	16.4	47	sc, oto	4	1.989	7.643	37	-	-	-
		total sample size		**-**	**19**	**19**	**19**	**-**	**18**	**19**	**19**	**19**	**-**	**-**	**-**
		average		**-**	**23.1**	**20.6**	**94**	**-**	**8**	**3.485**	**1.645**	**88**	**-**	**-**	**-**
		median		**-**	**23.5**	**20.9**	**96**	**-**	**9**	**3.843**	**1.249**	**90**	**-**	**-**	**-**
		standard deviation		**-**	**2.4**	**2.1**	**27**	**-**	**2.8**	**1.369**	**1.492**	**26**	**-**	**-**	**-**
		standard error		**-**	**0.5**	**0.5**	**6**	**-**	**0.66**	**0.314**	**0.342**	**6**	**-**	**-**	**-**
		minimum		**-**	**18.3**	**16.4**	**47**	**-**	**4**	**1.412**	**0.818**	**37**	**-**	**-**	**-**
		maximum			**27.1**	**24.3**	**144**	**-**	**13**	**6.216**	**7.643**	**136**	**-**	**-**	**-**
	2016	19-Apr-16	ER-PCC-12-Apr-16	M	19.4	17.0	52	sc, oto	4	1.395	0.927	50	-	-	whole body
		19-Apr-16	ER-PCC-13-Apr-16	M	19.7	17.9	54	sc, oto	4	1.420	0.500	52	worms	0.107	whole body
		22-Apr-16	ER-PCC-21-Apr-16	M	23.1	20.5	108	sc, oto	8	7.103	1.904	99	-	-	whole body
		22-Apr-16	ER-PCC-26-Apr-16	M	22.2	20.0	86	sc, oto	5	4.484	1.356	80	-	-	whole body
		22-Apr-16	ER-PCC-27-Apr-16	M	27.2	24.3	148	sc, oto	9	6.943	1.839	139	-	-	whole body
		22-Apr-16	ER-PCC-28-Apr-16	M	22.6	20.2	96	sc, oto	5	5.030	1.275	90	-	-	-
		22-Apr-16	ER-PCC-33-Apr-16	M	23.1	20.5	98	sc, oto	5	6.482	1.944	90	-	-	-
		22-Apr-16	ER-PCC-34-Apr-16	M	25.6	23.2	140	sc, oto	13	6.914	1.010	132	dorsal tumour	-	-
		22-Apr-16	ER-PCC-36-Apr-16	M	23.1	20.6	104	sc, oto	5	0.617	1.413	102	worms	15.272	-
		22-Apr-16	ER-PCC-45-Apr-16	M	23.7	21.4	104	sc, oto	6	0.455	1.341	102	worms	8.731	-
		22-Apr-16	ER-PCC-46-Apr-16	M	24.1	21.6	116	sc, oto	10	1.363	1.837	113	worms	15.266	-
		22-Apr-16	ER-PCC-48-Apr-16	M	25.2	22.6	144	sc, oto	5	1.219	1.930	141	worms	26.642	-
		22-Apr-16	ER-PCC-49-Apr-16	M	25.5	23.4	130	sc, oto	13	5.208	2.087	123	-	-	-
		22-Apr-16	ER-PCC-50-Apr-16	M	21.6	19.4	85	sc, oto	5	4.060	1.052	80	-	-	-
		22-Apr-16	ER-PCC-51-Apr-16	M	26.4	23.7	142	sc, oto	7	1.084	1.467	139	worms	23.828	-
		22-Apr-16	ER-PCC-52-Apr-16	M	22.5	20.0	91	sc, oto	5	4.487	1.668	85	-	-	-
		22-Apr-16	ER-PCC-53-Apr-16	M	23.1	20.5	96	sc, oto	6	4.865	1.366	90	-	-	-
		22-Apr-16	ER-PCC-54-Apr-16	M	22.9	20.5	108	sc, oto	5	0.796	1.037	106	worms	15.512	-
		25-Apr-16	ER-PCC-55-Apr-16	M	20.9	18.7	68	sc, oto	5	3.207	1.201	64	-	-	-
		25-Apr-16	ER-PCC-56-Apr-16	M	19.5	17.4	55	sc, oto	5	2.307	0.957	52	-	-	-
		25-Apr-16	ER-PCC-57-Apr-16	M	19.2	17.2	53	sc, oto	5	1.806	0.819	50	-	-	-
		total sample size		**-**	**21**	**21**	**21**	**-**	**21**	**21**	**21**	**21**	**-**	**7**	**-**
		average		**-**	**22.9**	**20.5**	**99**	**-**	**6**	**3.393**	**1.378**	**94**	**-**	**15.051**	**-**
		median		**-**	**23.1**	**20.5**	**98**	**-**	**5**	**3.207**	**1.356**	**90**	**-**	**15.272**	**-**
		standard deviation		**-**	**2.3**	**2.1**	**31**	**-**	**2.7**	**2.325**	**0.435**	**30**	**-**	**8.897**	**-**
		standard error		**-**	**0.5**	**0.5**	**7**	**-**	**0.58**	**0.507**	**0.095**	**7**	**-**	**3.363**	**-**
		minimum		**-**	**19.2**	**17.0**	**52**	**-**	**4**	**0.455**	**0.500**	**50**	**-**	**0.107**	**-**
		maximum			**27.2**	**24.3**	**148**	**-**	**13**	**7.103**	**2.087**	**141**	**-**	**26.642**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2014	11-Apr-14	GC-PCC-01-Apr-14	F	26.4	24.0	140	sc, oto	7	1.531	1.595	137	worms	7.927	-
		11-Apr-14	GC-PCC-02-Apr-14	F	24.2	22.7	116	sc, oto	7	6.506	1.787	108	-	-	-
		12-Apr-14	GC-PCC-05-Apr-14	F	24.5	21.8	109	sc, oto	8	9.606	2.951	96	-	-	-
		12-Apr-14	GC-PCC-06-Apr-14	F	29.0	26.4	90	sc, oto	16	8.65	2.926	78	-	-	-
		12-Apr-14	GC-PCC-07-Apr-14	F	23.5	20.8	94	sc, oto	5	1.079	1.550	91	worms	5.700	-
		12-Apr-14	GC-PCC-09-Apr-14	F	28.3	25.2	174	sc, oto	15	10.444	2.446	161	-	-	-
		12-Apr-14	GC-PCC-10-Apr-14	F	27.7	24.7	160	sc, oto	14	10.559	3.335	146	-	-	-
		12-Apr-14	GC-PCC-11-Apr-14	F	28.2	25.1	190	sc, oto	11	18.807	4.015	167	-	-	-
		12-Apr-14	GC-PCC-13-Apr-14	F	26.5	23.6	143	sc, oto	8	12.678	2.703	128	-	-	-
		12-Apr-14	GC-PCC-15-Apr-14	F	26.2	23.4	142	sc, oto	8	6.187	2.505	133	worms	7.100	-
		13-Apr-14	GC-PCC-18-Apr-14	F	26.7	24.0	144	sc, oto	8	5.03	2.776	136	worms	9.598	-
		13-Apr-14	GC-PCC-19-Apr-14	F	25.1	22.1	131	sc, oto	4	8.39	2.743	120	-	-	-
		13-Apr-14	GC-PCC-21-Apr-14	F	27.0	24.1	166	sc, oto	12	13.904	3.565	149	-	-	-
		13-Apr-14	GC-PCC-22-Apr-14	F	22.7	20.0	91	sc, oto	4	1.071	1.206	89	worms	8.960	-
		14-Apr-14	GC-PCC-23-Apr-14	F	26.8	24.0	155	sc, oto	8	13.555	3.242	138	-	-	-
		14-Apr-14	GC-PCC-26-Apr-14	F	22.6	20.2	79	sc, oto	5	0.624	1.176	77	worms	4.679	-
		14-Apr-14	GC-PCC-30-Apr-14	F	29.8	26.8	221	sc, oto	17	18.673	6.134	196	-	-	-
		14-Apr-14	GC-PCC-33-Apr-14	F	27.7	24.6	188	sc, oto	8	14.749	4.740	169	-	-	-
		15-Apr-14	GC-PCC-35-Apr-14	F	24.7	22.1	115	sc, oto	8	7.456	2.403	105	-	-	-
		15-Apr-14	GC-PCC-36-Apr-14	F	28.5	25.7	154	sc, oto	16	6.717	1.827	145	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**20**	**20**	**20**	**20**	**-**	**6**	**-**
		average		**-**	**26.3**	**23.6**	**140**	**-**	**9**	**8.811**	**2.781**	**129**	**-**	**7.327**	**-**
		median		**-**	**26.6**	**24.0**	**143**	**-**	**8**	**8.520**	**2.723**	**135**	**-**	**7.514**	**-**
		standard deviation		**-**	**2.1**	**1.9**	**38**	**-**	**4.2**	**5.500**	**1.214**	**33**	**-**	**1.892**	**-**
		standard error		**-**	**0.5**	**0.4**	**8**	**-**	**0.93**	**1.230**	**0.271**	**7**	**-**	**0.772**	**-**
		minimum		**-**	**22.6**	**20.0**	**79**	**-**	**4**	**0.624**	**1.176**	**77**	**-**	**4.679**	**-**
		maximum			**29.8**	**26.8**	**221**	**-**	**17**	**18.807**	**6.134**	**196**	**-**	**9.598**	**-**
	2015	22-Apr-15	GC-PCC-01-Apr-15	F	26.2	23.5	133	sc, oto	10	8.852	1.795	122	-	-	muscle, ovaries
		22-Apr-15	GC-PCC-02-Apr-15	F	27.0	24.5	120	sc, oto	11	5.622	1.457	113	-	-	muscle, ovaries
		22-Apr-15	GC-PCC-03-Apr-15	F	26.7	24.0	133	sc, oto	10	4.404	1.354	127	-	-	muscle, ovaries
		22-Apr-15	GC-PCC-04-Apr-15	F	27.0	24.4	138	sc, oto	13	7.686	2.119	128	-	-	muscle, ovaries
		22-Apr-15	GC-PCC-05-Apr-15	F	26.0	23.6	138	sc, oto	13	13.034	2.718	122	-	-	muscle, ovaries
		23-Apr-15	GC-PCC-06-Apr-15	F	28.7	25.8	197	sc, oto	25	11.773	2.013	183	-	-	muscle, ovaries
		23-Apr-15	GC-PCC-07-Apr-15	F	26.6	24.0	145	sc, oto	9	9.919	3.473	132	-	-	muscle, ovaries
		23-Apr-15	GC-PCC-08-Apr-15	F	22.2	19.7	82	sc, oto	4	4.089	1.398	77	worms	0.553	muscle, ovaries
		23-Apr-15	GC-PCC-09-Apr-15	F	27.7	25.0	160	sc, oto	14	9.126	2.510	148	-	-	muscle, ovaries
		23-Apr-15	GC-PCC-10-Apr-15	F	26.1	23.5	125	sc, oto	13	5.747	2.349	117	-	-	muscle, ovaries
		23-Apr-15	GC-PCC-11-Apr-15	F	26.9	24.3	145	sc, oto	12	8.125	1.901	135	-	-	-
		23-Apr-15	GC-PCC-13-Apr-15	F	27.7	24.8	122	sc, oto	24	2.036	1.709	118	small, abnormal ovary	-	-
		23-Apr-15	GC-PCC-14-Apr-15	F	28.8	25.9	170	sc, oto	-	9.223	2.689	158	-	-	-
		24-Apr-15	GC-PCC-15-Apr-15	F	27.5	24.6	149	sc, oto	17	8.338	2.862	138	-	-	-
		24-Apr-15	GC-PCC-19-Apr-15	F	26.0	23.3	147	sc, oto	13	6.802	2.238	138	-	-	-
		24-Apr-15	GC-PCC-22-Apr-15	F	26.0	23.6	129	sc, oto	10	8.062	1.942	119	-	-	-
		24-Apr-15	GC-PCC-23-Apr-15	F	27.4	24.7	153	sc, oto	14	7.510	2.035	143	-	-	-
		24-Apr-15	GC-PCC-24-Apr-15	F	28.1	25.3	153	sc, oto	14	8.162	2.149	143	-	-	-
		24-Apr-15	GC-PCC-25-Apr-15	F	28.7	26.0	159	sc, oto	16	11.211	2.315	145	-	-	-
		24-Apr-15	GC-PCC-26-Apr-15	F	27.7	24.4	171	sc, oto	11	7.467	3.564	160	-	-	-
		24-Apr-15	GC-PCC-27-Apr-15	F	28.6	25.8	169	sc, oto	11	8.859	2.521	158	-	-	-
		total sample size		**-**	**21**	**21**	**21**	**-**	**20**	**21**	**21**	**21**	**-**	**-**	**-**
		average		**-**	**27.0**	**24.3**	**145**	**-**	**13**	**7.907**	**2.243**	**135**	**-**	**-**	**-**
		median		**-**	**27.0**	**24.4**	**145**	**-**	**13**	**8.125**	**2.149**	**135**	**-**	**-**	**-**
		standard deviation		**-**	**1.5**	**1.4**	**24**	**-**	**4.8**	**2.592**	**0.599**	**22**	**-**	**-**	**-**
		standard error		**-**	**0.3**	**0.3**	**5**	**-**	**1.1**	**0.566**	**0.131**	**5**	**-**	**-**	**-**
		minimum		**-**	**22.2**	**19.7**	**82**	**-**	**4**	**2.036**	**1.354**	**77**	**-**	**-**	**-**
		maximum			**28.8**	**26.0**	**197**	**-**	**25**	**13.034**	**3.564**	**183**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2016	19-Apr-16	GC-PCC-01-Apr-16	F	20.9	18.4	76	sc, oto	5	0.692	1.157	74	worms	8.200	muscle
		19-Apr-16	GC-PCC-05-Apr-16	F	19.8	17.7	53	sc, oto	5	1.699	1.268	50	worms	0.084	muscle, ovaries
		19-Apr-16	GC-PCC-18-Apr-16	F	20.0	17.6	55	sc, oto	4	1.868	1.345	52	-	-	muscle, ovaries
		19-Apr-16	GC-PCC-21-Apr-16	F	21.7	19.2	71	sc, oto	5	2.887	1.473	67	worms	0.255	muscle, ovaries
		20-Apr-16	GC-PCC-25-Apr-16	F	21.4	19.0	88	sc, oto	5	7.753	1.863	78	-	-	muscle, ovaries
		20-Apr-16	GC-PCC-26-Apr-16	F	28.1	25.4	190	sc, oto	14	17.219	4.813	168	-	-	muscle, ovaries
		20-Apr-16	GC-PCC-28-Apr-16	F	21.4	19.2	75	-	-	-	-	-	worms	-	-
		20-Apr-16	GC-PCC-30-Apr-16	F	21.6	19.5	78	sc, oto	5	4.669	3.002	70	-	-	muscle, ovaries
		20-Apr-16	GC-PCC-33-Apr-16	F	20.5	18.2	63	sc, oto	5	3.537	1.380	58	-	-	muscle, ovaries
		20-Apr-16	GC-PCC-34-Apr-16	F	20.3	18.2	66	sc, oto	5	4.084	1.570	60	-	-	muscle, ovaries
		21-Apr-16	GC-PCC-40-Apr-16	F	22.0	19.3	72	sc, oto	5	4.327	0.892	67	-	-	muscle, ovaries
		21-Apr-16	GC-PCC-42-Apr-16	F	19.5	17.1	58	sc, oto	4	2.246	1.152	55	worms	1.952	muscle, ovaries
		21-Apr-16	GC-PCC-43-Apr-16	F	21.2	18.9	72	-	-	-	-	-	worms	-	-
		21-Apr-16	GC-PCC-44-Apr-16	F	24.4	21.6	125	sc, oto	11	8.659	2.774	114	-	-	muscle, ovaries
		21-Apr-16	GC-PCC-45-Apr-16	F	30.0	27.3	190	sc, oto	13	13.469	6.111	170	-	-	muscle, ovaries
		21-Apr-16	GC-PCC-46-Apr-16	F	22.4	19.7	89	sc, oto	7	7.546	2.193	79	-	-	-
		21-Apr-16	GC-PCC-50-Apr-16	F	20.0	17.7	64	sc, oto	4	5.125	1.651	57	-	-	-
		21-Apr-16	GC-PCC-51-Apr-16	F	22.8	20.8	92	sc, oto	8	6.582	2.189	83	-	-	-
		22-Apr-16	GC-PCC-52-Apr-16	F	20.0	17.8	55	sc, oto	5	0.957	1.202	53	-	-	-
		22-Apr-16	GC-PCC-53-Apr-16	F	19.8	17.5	60	sc, oto	5	4.014	1.795	54	-	-	-
		22-Apr-16	GC-PCC-54-Apr-16	F	18.9	16.6	49	sc, oto	5	0.598	0.724	48	-	-	-
		22-Apr-16	GC-PCC-55-Apr-16	F	23.7	21.2	110	sc, oto	5	11.043	0.844	98	-	-	-
		22-Apr-16	GC-PCC-59-Apr-16	F	21.4	19.2	73	sc, oto	5	2.299	1.957	69	worms	0.132	-
		22-Apr-16	GC-PCC-67-Apr-16	F	20.0	18.0	55	sc, oto	4	0.990	1.029	53	-	-	-
		22-Apr-16	GC-PCC-69-Apr-16	F	22.5	20.0	82	sc, oto	5	6.281	1.832	74	-	-	-
		22-Apr-16	GC-PCC-73-Apr-16	F	20.1	17.7	60	sc, oto	4	1.234	0.923	58	worms	0.501	-
		23-Apr-16	GC-PCC-75-Apr-16	F	22.1	19.8	85	sc, oto	6	8.615	1.520	75	-	-	-
		23-Apr-16	GC-PCC-76-Apr-16	F	19.7	17.6	59	sc, oto	5	3.030	1.849	54	worms	0.123	-
		23-Apr-16	GC-PCC-77-Apr-16	F	23.0	20.9	102	sc, oto	5	10.645	2.715	89	-	-	-
		23-Apr-16	GC-PCC-78-Apr-16	F	18.9	16.9	49	sc, oto	4	1.195	1.522	46	-	-	-
		23-Apr-16	GC-PCC-79-Apr-16	F	18.6	16.4	46	sc, oto	4	0.692	0.823	44	-	-	-
		23-Apr-16	GC-PCC-80-Apr-16	F	21.6	19.3	75	sc, oto	5	6.211	2.042	67	-	-	-
		25-Apr-16	GC-PCC-81-Apr-16	F	27.2	24.4	185	sc, oto	12	22.169	5.160	158	-	-	muscle, ovaries
		25-Apr-16	GC-PCC-82-Apr-16	F	28.2	25.5	192	sc, oto	11	28.014	3.897	160	-	-	muscle, ovaries
		25-Apr-16	GC-PCC-83-Apr-16	F	25.8	23.0	136	sc, oto	7	16.000	3.943	116	-	-	-
		25-Apr-16	GC-PCC-84-Apr-16	F	28.0	25.1	182	sc, oto	12	20.415	3.707	158	-	-	-
		25-Apr-16	GC-PCC-86-Apr-16	F	29.5	26.6	200	sc, oto	13	21.462	4.438	174	-	-	muscle, ovaries
		25-Apr-16	GC-PCC-87-Apr-16[b]	F	29.5	27.3	152	sc, oto	15	8.862	3.407	140	-	-	-
		25-Apr-16	GC-PCC-88-Apr-16	F	23.5	21.0	108	sc, oto	5	4.482	1.486	102	worms	6.213	-
		25-Apr-16	GC-PCC-89-Apr-16	F	24.5	22.0	116	sc, oto	9	8.805	2.823	104	-	-	-
		25-Apr-16	GC-PCC-90-Apr-16	F	26.4	24.0	156	sc, oto	13	15.133	4.160	137	-	-	muscle, ovaries
		25-Apr-16	GC-PCC-91-Apr-16	F	25.7	22.9	118	sc, oto	10	12.156	2.322	104	-	-	-
		25-Apr-16	GC-PCC-92-Apr-16	F	25.2	22.5	122	sc, oto	8	9.331	2.070	111	-	-	muscle, ovaries
		25-Apr-16	GC-PCC-93-Apr-16	F	23.1	20.6	99	sc, oto	5	9.872	2.804	86	-	-	-
		25-Apr-16	GC-PCC-94-Apr-16	F	23.0	20.8	94	sc, oto	5	5.785	1.792	86	worms	1.429	-
		25-Apr-16	GC-PCC-95-Apr-16	F	23.9	21.4	110	sc, oto	6	5.961	2.768	101	worms	0.278	-
		total sample size		**-**	**46**	**46**	**46**	**-**	**44**	**44**	**44**	**44**	**-**	**10**	**-**
		average		**-**	**22.9**	**20.5**	**98**	**-**	**7**	**7.696**	**2.282**	**89**	**-**	**1.917**	**-**
		median		**-**	**22.1**	**19.6**	**84**	**-**	**5**	**6.086**	**1.856**	**77**	**-**	**0.390**	**-**
		standard deviation		**-**	**3.1**	**3.0**	**45**	**-**	**3.3**	**6.583**	**1.285**	**38**	**-**	**2.894**	**-**
		standard error		**-**	**0.5**	**0.4**	**7**	**-**	**0.49**	**0.992**	**0.194**	**6**	**-**	**0.915**	**-**
		minimum		**-**	**18.6**	**16.4**	**46**	**-**	**4**	**0.598**	**0.724**	**44**	**-**	**0.084**	**-**
		maximum			**30.0**	**27.3**	**200**	**-**	**15**	**28.014**	**6.111**	**174**	**-**	**8.200**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2014	11-Apr-14	GC-PCC-04-Apr-14	M	24.5	21.9	125	sc, oto	6	0.963	1.950	122	worms	13.486	-
		12-Apr-14	GC-PCC-08-Apr-14	M	27.8	24.9	162	sc, oto	9	4.118	2.842	155	-	-	-
		12-Apr-14	GC-PCC-12-Apr-14	M	23.1	20.3	98	sc, oto	6	2.042	1.924	94	-	-	-
		12-Apr-14	GC-PCC-14-Apr-14	M	23.1	20.6	100	sc, oto	8	2.395	1.942	96	-	-	-
		12-Apr-14	GC-PCC-16-Apr-14	M	23.1	20.5	90	sc, oto	5	1.828	1.559	87	worms	7.554	-
		12-Apr-14	GC-PCC-17-Apr-14	M	21.5	19.1	75	sc, oto	4	1.202	1.514	72	worms	0.261	-
		13-Apr-14	GC-PCC-20-Apr-14	M	23.1	20.6	114	sc, oto	8	3.004	2.585	108	-	-	-
		14-Apr-14	GC-PCC-24-Apr-14	M	25.8	23.0	134	sc, oto	5	2.924	1.462	130	-	-	-
		14-Apr-14	GC-PCC-25-Apr-14	M	24.8	22.3	112	sc, oto	5	0.954	1.080	110	worms	12.440	-
		14-Apr-14	GC-PCC-28-Apr-14	M	24.5	21.9	92	sc, oto	8	2.272	1.117	89	-	-	-
		14-Apr-14	GC-PCC-29-Apr-14	M	24.2	21.7	108	sc, oto	5	1.467	1.426	105	worms	8.894	-
		14-Apr-14	GC-PCC-32-Apr-14	M	25.6	22.7	120	sc, oto	8	2.131	2.520	115	worms	18.594	-
		15-Apr-14	GC-PCC-34-Apr-14	M	25.1	22.9	112	sc, oto	5	2.346	0.973	109	-	-	-
		15-Apr-14	GC-PCC-37-Apr-14	M	24.7	22.3	112	sc, oto	7	2.987	1.955	107	-	-	-
		total sample size		**-**	**14**	**14**	**14**	**-**	**14**	**14**	**14**	**14**	**-**	**6**	**-**
		average		**-**	**24.4**	**21.8**	**111**	**-**	**6**	**2.188**	**1.775**	**107**	**-**	**10.205**	**-**
		median		**-**	**24.5**	**21.9**	**112**	**-**	**6**	**2.202**	**1.742**	**108**	**-**	**10.667**	**-**
		standard deviation		**-**	**1.5**	**1.5**	**21**	**-**	**1.6**	**0.891**	**0.579**	**20**	**-**	**6.225**	**-**
		standard error		**-**	**0.4**	**0.4**	**6**	**-**	**0.43**	**0.238**	**0.155**	**5**	**-**	**2.541**	**-**
		minimum		**-**	**21.5**	**19.1**	**75**	**-**	**4**	**0.954**	**0.973**	**72**	**-**	**0.261**	**-**
		maximum			**27.8**	**24.9**	**162**	**-**	**9**	**4.118**	**2.842**	**155**	**-**	**18.594**	**-**
	2015	23-Apr-15	GC-PCC-12-Apr-15	M	25.8	23.0	128	sc, oto	5	2.967	1.188	124	-	-	whole body
		24-Apr-15	GC-PCC-16-Apr-15	M	23.9	21.2	95	sc, oto	10	2.832	1.258	91	-	-	whole body
		24-Apr-15	GC-PCC-17-Apr-15	M	23.2	20.6	100	sc, oto	5	4.931	1.865	93	-	-	whole body
		24-Apr-15	GC-PCC-18-Apr-15	M	24.7	22.0	109	sc, oto	9	2.796	1.324	105	-	-	whole body
		24-Apr-15	GC-PCC-20-Apr-15	M	25.7	22.9	131	sc, oto	6	1.674	1.539	128	worms	19.149	whole body
		24-Apr-15	GC-PCC-21-Apr-15	M	24.6	22.1	118	sc, oto	10	3.695	1.544	113	-	-	whole body
		24-Apr-15	GC-PCC-28-Apr-15	M	25.7	23.1	109	sc, oto	12	2.094	1.335	106	-	-	-
		25-Apr-15	GC-PCC-29-Apr-15	M	20.9	18.9	66	sc, oto	5	2.753	1.024	62	-	-	-
		26-Apr-15	GC-PCC-30-Apr-15	M	22.1	19.7	77	sc, oto	5	2.350	1.236	73	-	-	-
		26-Apr-15	GC-PCC-31-Apr-15	M	23.6	21.0	98	sc, oto	12	3.931	1.223	93	-	-	-
		26-Apr-15	GC-PCC-32-Apr-15	M	23.2	20.8	88	sc, oto	9	3.250	1.077	84	-	-	-
		26-Apr-15	GC-PCC-33-Apr-15	M	24.2	21.4	110	sc, oto	6	2.139	1.145	107	-	-	-
		27-Apr-15	GC-PCC-34-Apr-15	M	25.1	22.1	108	sc, oto	7	1.504	1.038	105	worms	4.062	-
		27-Apr-15	GC-PCC-35-Apr-15	M	22.0	19.6	83	sc, oto	5	2.795	1.263	79	-	-	-
		27-Apr-15	GC-PCC-36-Apr-15	M	25.0	22.5	122	sc, oto	5	2.713	1.519	118	-	-	-
		29-Apr-15	GC-PCC-37-Apr-15	M	23.5	21.1	82	sc, oto	7	2.620	0.862	79	-	-	-
		1-May-15	GC-PCC-38-Apr-15	M	22.7	20.3	76	sc, oto	6	2.895	1.226	71	-	-	-
		1-May-15	GC-PCC-39-Apr-15	M	20.5	17.9	58	sc, oto	4	2.582	0.817	54	-	-	-
		total sample size		**-**	**18**	**18**	**18**	**-**	**18**	**18**	**18**	**18**	**-**	**2**	**-**
		average		**-**	**23.7**	**21.1**	**98**	**-**	**7**	**2.807**	**1.249**	**94**	**-**	**11.606**	**-**
		median		**-**	**23.8**	**21.2**	**99**	**-**	**6**	**2.774**	**1.231**	**93**	**-**	**11.606**	**-**
		standard deviation		**-**	**1.6**	**1.5**	**21**	**-**	**2.6**	**0.806**	**0.256**	**21**	**-**	**10.668**	**-**
		standard error		**-**	**0.4**	**0.3**	**5**	**-**	**0.60**	**0.190**	**0.060**	**5**	**-**	**7.544**	**-**
		minimum		**-**	**20.5**	**17.9**	**58**	**-**	**4**	**1.504**	**0.817**	**54**	**-**	**4.062**	**-**
		maximum			**25.8**	**23.1**	**131**	**-**	**12**	**4.931**	**1.865**	**128**	**-**	**19.149**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.28: Summary Statistics for Peamouth Chub Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[c]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2016	19-Apr-16	GC-PCC-13-Apr-16	M	20.0	17.5	58	sc, oto	5	1.199	0.809	56	-	-	whole body
		19-Apr-16	GC-PCC-16-Apr-16	M	21.5	18.9	68	sc, oto	6	1.330	0.622	66	-	-	whole body
		19-Apr-16	GC-PCC-22-Apr-16	M	19.3	17.0	51	sc, oto	5	0.135	0.588	50	worms	5.134	-
		20-Apr-16	GC-PCC-27-Apr-16	M	20.6	18.5	35	sc, oto	5	2.752	0.873	31	-	-	whole body
		20-Apr-16	GC-PCC-31-Apr-16	M	21.0	19.2	74	sc, oto	5	2.914	1.552	70	-	-	whole body
		20-Apr-16	GC-PCC-36-Apr-16	M	18.5	16.7	50	sc, oto	4	2.165	0.983	47	-	-	whole body
		20-Apr-16	GC-PCC-37-Apr-16	M	20.0	17.9	66	sc, oto	4	2.371	0.999	63	-	-	-
		20-Apr-16	GC-PCC-38-Apr-16	M	18.8	16.8	51	sc, oto	4	2.077	1.072	48	-	-	-
		21-Apr-16	GC-PCC-39-Apr-16	M	20.2	17.8	68	sc, oto	4	0.790	0.994	66	worms	3.566	-
		21-Apr-16	GC-PCC-41-Apr-16	M	22.7	20.4	98	sc, oto	5	0.762	1.714	96	worms	12.597	-
		21-Apr-16	GC-PCC-47-Apr-16	M	18.7	16.6	52	sc, oto	4	2.872	0.288	49	small liver	-	-
		21-Apr-16	GC-PCC-48-Apr-16	M	19.5	17.6	60	sc, oto	5	3.099	0.985	56	-	-	-
		22-Apr-16	GC-PCC-56-Apr-16	M	21.8	19.3	73	sc, oto	6	3.818	2.957	66	-	-	-
		22-Apr-16	GC-PCC-58-Apr-16	M	18.2	16.1	40	sc, oto	5	0.199	0.639	39	-	-	-
		22-Apr-16	GC-PCC-61-Apr-16	M	22.5	20.1	91	sc, oto	6	4.734	1.215	85	-	-	-
		22-Apr-16	GC-PCC-63-Apr-16	M	20.0	17.5	57	sc, oto	5	1.548	1.324	54	-	-	-
		22-Apr-16	GC-PCC-64-Apr-16	M	21.2	19.0	72	sc, oto	4	3.195	1.151	68	-	-	-
		22-Apr-16	GC-PCC-65-Apr-16	M	18.4	16.3	50	sc, oto	3	1.997	0.630	47	-	-	-
		22-Apr-16	GC-PCC-66-Apr-16	M	18.5	16.3	47	sc, oto	5	2.626	0.709	44	-	-	-
		22-Apr-16	GC-PCC-68-Apr-16	M	18.7	16.6	49	sc, oto	4	1.529	0.704	47	-	-	-
		22-Apr-16	GC-PCC-70-Apr-16	M	20.1	17.8	57	sc, oto	5	2.790	1.215	53	-	-	-
		22-Apr-16	GC-PCC-74-Apr-16	M	19.0	16.6	49	sc, oto	5	2.249	0.999	46	-	-	-
		total sample size		**-**	**22**	**22**	**22**	**-**	**22**	**22**	**22**	**22**	**-**	**3**	**-**
		average		**-**	**20.0**	**17.8**	**60**	**-**	**5**	**2.143**	**1.046**	**57**	**-**	**7.099**	**-**
		median		**-**	**20.0**	**17.6**	**57**	**-**	**5**	**2.207**	**0.990**	**54**	**-**	**5.134**	**-**
		standard deviation		**-**	**1.4**	**1.3**	**15**	**-**	**0.77**	**1.147**	**0.540**	**15**	**-**	**4.826**	**-**
		standard error		**-**	**0.3**	**0.3**	**3**	**-**	**0.16**	**0.244**	**0.115**	**3**	**-**	**2.786**	**-**
		minimum		**-**	**18.2**	**16.1**	**35**	**-**	**3**	**0.135**	**0.288**	**31**	**-**	**3.566**	**-**
		maximum			**22.7**	**20.4**	**98**	**-**	**6**	**4.734**	**2.957**	**96**	**-**	**12.597**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

[b] Confidence around provided age was low (i.e., at or below 50% confidence).

[c] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.29: Summary Statistics for Peamouth Chub Meristic Data Not Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, Englishman Creek, and Gold Creek in Koocanusa Reservoir, 2014 and 2015

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Abnormalities	Tissue Collected
Sand Creek	2014	18-Feb-14	SC-PCC-01-Feb-14	28.0	25.3	145	-	-	-	-	-
		18-Feb-14	SC-PCC-02-Feb-14	24.9	22.5	108	-	-	-	-	-
		18-Feb-14	SC-PCC-03-Feb-14	30.0	27.0	200	-	-	-	-	-
		18-Feb-14	SC-PCC-04-Feb-14	31.8	28.6	225	-	-	-	-	-
		18-Feb-14	SC-PCC-05-Feb-14	26.9	24.1	155	-	-	-	-	-
		18-Feb-14	SC-PCC-06-Feb-14	28.1	26.3	145	-	-	-	-	-
		18-Feb-14	SC-PCC-07-Feb-14	25.5	22.8	110	-	-	-	-	-
		18-Feb-14	SC-PCC-08-Feb-14	27.0	24.2	150	-	-	-	-	-
		18-Feb-14	SC-PCC-09-Feb-14	24.0	21.4	90	-	-	-	-	-
		18-Feb-14	SC-PCC-10-Feb-14	25.3	22.8	115	-	-	-	-	-
		20-Feb-14	SC-PCC-11-Feb-14	24.2	21.6	90	-	-	-	-	-
		14-Apr-16	SC-PCC-25-Apr-14	24.7	21.9	114	sc, oto	6	-	worms	muscle, ovaries
		14-Apr-16	SC-PCC-28-Apr-14	20.0	17.8	56	sc, oto	5	-	-	muscle
		23-Aug-14	SC-PCC-01-Aug-14	28.6	26.0	145	sc, oto	11	F	-	muscle
		23-Aug-14	SC-PCC-02-Aug-14	27.1	24.3	130	sc, oto	11	F	-	muscle
total sample size				**15**	**15**	**15**	**-**	**4**	**-**	**-**	-
average				**26**	**24**	**132**	**-**	**8**	**-**	**-**	-
median				**27**	**24**	**130**	**-**	**9**	**-**	**-**	-
standard deviation				**2.8**	**2.7**	**43**	**-**	**3.2**	**-**	**-**	-
standard error				**0.73**	**0.69**	**11**	**-**	**1.6**	**-**	**-**	-
minimum				**20**	**18**	**56**	**-**	**5**	**-**	**-**	-
maximum				**32**	**29**	**225**	**-**	**11**	**-**	**-**	-
Elk River	2014	17-Feb-14	ER-PCC-01-Feb-14	30.4	27.3	220	-	-	-	-	-
		22-Aug-14	ER-PCC-01-Aug-14	26.7	24.4	124	sc, oto	10	-	-	muscle
		22-Aug-14	ER-PCC-02-Aug-14	25.7	22.8	105	sc, oto	9	-	-	muscle
		24-Aug-14	ER-PCC-03-Aug-14	29.5	26.7	165	sc, oto	17	-	-	muscle
		26-Aug-14	ER-PCC-04-Aug-14	26.1	23.5	120	sc, oto	9	F	-	muscle
	2015	22-Apr-15	ER-PCC-09-Apr-15	28.7	25.7	141	sc, oto	17	-	-	muscle, ovaries
		23-Apr-15	ER-PCC-17-Apr-15	28.1	25.3	158	-	-	-	-	-
		23-Apr-15	ER-PCC-19-Apr-15	26.7	24.0	115	-	-	-	-	-
total sample size				**8**	**8**	**8**	**-**	**-**	**-**	**-**	-
average				**28**	**25**	**144**	**-**	**-**	**-**	**-**	-
median				**27**	**25**	**133**	**-**	**-**	**-**	**-**	-
standard deviation				**1.7**	**1.6**	**37**	**-**	**-**	**-**	**-**	-
standard error				**0.60**	**0.55**	**13**	**-**	**-**	**-**	**-**	-
minimum				**26**	**23**	**105**	**-**	**-**	**-**	**-**	-
maximum				**30**	**27**	**220**	**-**	**-**	**-**	**-**	-
Englishman Creek	2014	20-Feb-14	EC-PCC-01-Feb-14	25.6	23.4	115	-	-	-	-	-
Gold Creek	2014	18-Feb-14	GC-PCC-01-Feb-14	17.1	15.3	39	-	-	-	-	-
		20-Feb-14	GC-PCC-02-Feb-14	25.9	23.3	120	-	-	-	-	-
		20-Feb-14	GC-PCC-03-Feb-14	27.0	24.4	155	-	-	-	-	-
		20-Feb-14	GC-PCC-04-Feb-14	26.5	23.7	135	-	-	-	-	-
		20-Feb-14	GC-PCC-05-Feb-14	23.4	21.4	95	-	-	-	-	-
		20-Feb-14	GC-PCC-06-Feb-14	19.3	17.3	50	-	-	-	-	-
		20-Feb-14	GC-PCC-07-Feb-14	25.9	24.1	125	-	-	-	damaged caudal fin	-
		20-Feb-14	GC-PCC-08-Feb-14	17.4	15.5	25	-	-	-	-	-
		20-Feb-14	GC-PCC-09-Feb-14	26.5	23.8	135	-	-	-	-	-
		20-Feb-14	GC-PCC-10-Feb-14	20.8	18.6	45	-	-	-	-	-
		20-Feb-14	GC-PCC-11-Feb-14	26.5	24.7	165	-	-	-	-	-
		20-Feb-14	GC-PCC-12-Feb-14	25.3	22.2	95	-	-	-	-	-
		20-Feb-14	GC-PCC-13-Feb-14	22.0	18.6	76	-	-	-	-	-
		20-Feb-14	GC-PCC-14-Feb-14	24.3	21.5	98	-	-	-	-	-
		20-Feb-14	GC-PCC-15-Feb-14	20.5	18.2	50	-	-	-	-	-
		20-Feb-14	GC-PCC-16-Feb-14	24.7	22.1	110	-	-	-	-	-
		20-Feb-14	GC-PCC-17-Feb-14	24.0	21.2	90	-	-	-	-	-
		20-Feb-14	GC-PCC-18-Feb-14	22.4	20.0	80	-	-	-	-	-
		20-Feb-14	GC-PCC-19-Feb-14	25.8	23.2	128	-	-	-	-	-
		20-Feb-14	GC-PCC-20-Feb-14	25.0	22.4	115	-	-	-	-	-
		20-Feb-14	GC-PCC-21-Feb-14	24.1	21.7	100	-	-	-	-	-
		20-Feb-14	GC-PCC-22-Feb-14	22.9	20.5	76	-	-	-	-	-
		20-Feb-14	GC-PCC-23-Feb-14	16.8	14.7	30	-	-	-	-	-
		11-Apr-14	GC-PCC-03-Apr-14	25.0	22.5	116	sc, oto	7	-	worms	muscle, ovaries
		14-Apr-14	GC-PCC-27-Apr-14	18.8	16.5	54	sc, oto	3	-	worms	muscle
		14-Apr-14	GC-PCC-31-Apr-14	20.4	18.0	58	sc, oto	4	-	worms	muscle
		22-Aug-14	GC-PCC-01-Aug-14	23.6	21.2	105	sc, oto	5	-	worms	muscle
total sample size				**27**	**27**	**27**	**-**	**4**	**-**	**-**	-
average				**23**	**21**	**91**	**-**	**5**	**-**	**-**	-
median				**24**	**21**	**95**	**-**	**5**	**-**	**-**	-
standard deviation				**3.1**	**3.0**	**38**	**-**	**1.7**	**-**	**-**	-
standard error				**0.60**	**0.57**	**7.4**	**-**	**0.85**	**-**	**-**	-
minimum				**17**	**15**	**25**	**-**	**3**	**-**	**-**	-
maximum				**27**	**25**	**165**	**-**	**7**	**-**	**-**	-

[a] Age structures collected: sc - scales, oto - otoliths.

[a] Fish collected at Englishman Creek was grouped with the Elk River summary statistics.

Table F.30: Summary Statistics for Rainbow Trout Meristic Data Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Abnormalities	Tissue Collected
Sand Creek	2014	15-Feb-14	SC-RB-01-Feb-14	53.5	50.6	1,350	sc, oto	5	F	-	muscle, ovaries
		14-Apr-14	SC-RB-01-Apr-14	39.8	36.8	525	sc, oto	4	F	-	muscle, ovaries
		15-Apr-14	SC-RB-02-Apr-14	34.5	-	470	sc, oto	4	F	-	muscle, ovaries
		15-Apr-14	SC-RB-03-Apr-14	51.5	-	1,620	sc, oto	5	F	-	muscle, ovaries
	2016	19-Apr-16	SC-RB-01-Apr-16	26.1	24.3	146	sc,oto	3	-	-	muscle
		19-Apr-16	SC-RB-02-Apr-16	28.8	26.9	195	sc,oto	4	-	-	muscle
		24-Apr-16	SC-RB-03-Apr-16	44.0	41.7	620	-	-	-	-	muscle plug
		24-Apr-16	SC-RB-04-Apr-16	48.7	45.2	1,018	sc,oto	4	F	-	muscle, ovaries
total sample size				**8**	**6**	**8**	**-**	**7**	**-**	**-**	-
average				**41**	**38**	**743**	**-**	**4**	**-**	**-**	-
median				**42**	**39**	**573**	**-**	**4**	**-**	**-**	-
standard deviation				**10**	**10**	**535**	**-**	**0.69**	**-**	**-**	-
standard error				**3.7**	**4.2**	**189**	**-**	**0.26**	**-**	**-**	-
minimum				**26**	**24**	**146**	**-**	**3**	**-**	**-**	-
maximum				**54**	**51**	**1,620**	**-**	**5**	**-**	**-**	-
Elk River	2014	15-Feb-14	ER-RB-01-Feb-14	46.0	43.2	855	sc, oto	4	M	-	muscle
	2016	22-Apr-16	ER-RB-01-Apr-16	26.5	24.7	135	-	-	-	-	muscle plug
		22-Apr-16	ER-RB-02-Apr-16	34.8	32.1	315	-	-	-	-	muscle plug
total sample size				**3**	**3**	**3**	**-**	**-**	**-**	**-**	-
average				**36**	**33**	**435**	**-**	**-**	**-**	**-**	-
median				**35**	**32**	**315**	**-**	**-**	**-**	**-**	-
standard deviation				**9.8**	**9.3**	**375**	**-**	**-**	**-**	**-**	-
standard error				**5.6**	**5.4**	**216**	**-**	**-**	**-**	**-**	-
minimum				**27**	**25**	**135**	**-**	**-**	**-**	**-**	-
maximum				**46**	**43**	**855**	**-**	**-**	**-**	**-**	-
Gold Creek	2014	14-Feb-14	GC-RB-01-Feb-14	57.0	54.2	1,500	sc	5	F	-	muscle, ovaries
		16-Feb-14	GC-RB-02-Feb-14	33.5	31.4	260	sc, oto	3	F	-	muscle, ovaries
		26-Aug-14	GC-RB-01-Aug-14	45.9	42.3	545	sc	5	-	-	muscle plug
	2015	30-Apr-15	GC-RB-01-Apr-15	33.2	30.5	337	sc, oto	4	-	-	muscle
	2016	23-Apr-16	GC-RB-01-Apr-16	33.8	31.4	315	sc, oto	3	F	-	muscle, ovaries
		24-Apr-16	GC-RB-02-Apr-16	29.7	27.5	194	sc, oto	3	-	-	muscle
		24-Apr-16	GC-RB-03-Apr-16	35.2	32.8	320	sc, oto	3	F	-	muscle, ovaries
total sample size				**7**	**7**	**7**	**-**	**7**	**-**	**-**	**-**
average				**38**	**36**	**496**	**-**	**4**	**-**	**-**	**-**
median				**34**	**31**	**320**	**-**	**3**	**-**	**-**	**-**
standard deviation				**9.7**	**9.4**	**456**	**-**	**1.0**	**-**	**-**	**-**
standard error				**3.7**	**3.5**	**172**	**-**	**0.36**	**-**	**-**	**-**
minimum				**30**	**28**	**194**	**-**	**3**	**-**	**-**	**-**
maximum				**57**	**54**	**1,500**	**-**	**5**	**-**	**-**	**-**

[a] Age structures collected: sc - scales, oto - otoliths.

Table F.31: Summary Statistics for Redside Shiner Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Sand Creek	2015	25-Apr-15	SC-RSC-03-Apr-15	F	11.0	9.6	13	oto	3	0.376	0.130	12	worms	1.199	muscle, ovaries
		26-Apr-15	SC-RSC-04-Apr-15	F	11.5	10.1	13	oto	4	0.594	0.240	13	-	-	muscle, ovaries
		28-Apr-15	SC-RSC-06-Apr-15	F	10.6	9.2	11	oto	3	0.501	0.187	10	-	-	muscle, ovaries
		30-Apr-15	SC-RSC-07-Apr-15	F	11.3	10.0	13	oto	3	0.594	0.199	12	-	-	muscle, ovaries
		30-Apr-15	SC-RSC-08-Apr-15	F	9.5	8.2	6	oto	3	0.165	0.068	6	-	-	muscle, ovaries
		1-May-15	SC-RSC-09-Apr-15	F	11.3	9.8	12	oto	3	0.705	0.181	11	-	-	muscle, ovaries
		total sample size		**-**	**6**	**6**	**6**	**-**	**6**	**6**	**6**	**6**	**-**	**-**	**-**
		average		**-**	**11**	**9.5**	**11**	**-**	**3**	**0.49**	**0.17**	**11**	**-**	**-**	**-**
		median		**-**	**11**	**9.7**	**12**	**-**	**3**	**0.55**	**0.18**	**12**	**-**	**-**	**-**
		standard deviation		**-**	**0.74**	**0.71**	**2.6**	**-**	**0.41**	**0.19**	**0.060**	**2.4**	**-**	**-**	**-**
		standard error		**-**	**0.30**	**0.29**	**1.1**	**-**	**0.17**	**0.079**	**0.025**	**1.0**	**-**	**-**	**-**
		minimum		**-**	**9.5**	**8.2**	**6.2**	**-**	**3**	**0.17**	**0.068**	**6.0**	**-**	**-**	**-**
		maximum		**-**	**12**	**10**	**13**	**-**	**4**	**0.71**	**0.24**	**13**	**-**	**-**	**-**
	2016	20-Apr-16	SC-RSC-01-Apr-16	F	13.6	11.8	20	oto	5	0.826	0.115	19	worms	0.136	muscle, ovaries
		22-Apr-16	SC-RSC-06-Apr-16	F	11.1	9.6	13	oto	3	0.610	0.152	12	-	-	muscle, ovaries
		22-Apr-16	SC-RSC-07-Apr-16	F	11.3	9.7	12	oto	3	0.542	0.162	12	-	-	muscle, ovaries
		22-Apr-16	SC-RSC-08-Apr-16	F	11.2	10.0	13	oto	3	0.436	0.140	13	worms	0.525	-
		22-Apr-16	SC-RSC-09-Apr-16	F	11.0	9.5	13	oto	3	0.527	0.264	12	-	-	muscle, ovaries
		22-Apr-16	SC-RSC-10-Apr-16	F	10.8	9.2	10	oto	3	0.344	0.089	10	-	-	muscle, ovaries
		22-Apr-16	SC-RSC-11-Apr-16	F	11.1	9.7	12	oto	3	0.345	0.200	12	worms	0.851	-
		22-Apr-16	SC-RSC-12-Apr-16	F	12.0	10.5	17	oto	3	1.042	0.385	15	-	-	muscle, ovaries
		22-Apr-16	SC-RSC-15-Apr-16	F	11.2	9.7	13	oto	3	0.530	0.249	12	-	-	muscle, ovaries
		22-Apr-16	SC-RSC-16-Apr-16	F	10.8	9.5	11	oto	3	0.443	0.212	10	-	-	-
		22-Apr-16	SC-RSC-19-Apr-16	F	10.5	9.2	10	oto	3	0.151	0.084	9	worms	0.284	-
		22-Apr-16	SC-RSC-22-Apr-16	F	11.0	10.0	10	oto	3	0.237	0.103	9	-	-	muscle, ovaries
		23-Apr-16	SC-RSC-23-Apr-16	F	12.3	10.7	15	oto	3	0.134	0.171	15	worms	0.407	-
		23-Apr-16	SC-RSC-24-Apr-16	F	11.4	10.0	12	oto	3	0.318	0.104	11	worms	0.005	muscle, ovaries
		23-Apr-16	SC-RSC-25-Apr-16	F	10.7	9.3	11	oto	3	0.444	0.120	10	-	-	muscle, ovaries
		23-Apr-16	SC-RSC-27-Apr-16	F	11.4	10.1	11	oto	3	0.416	0.083	11	worms	0.083	-
		23-Apr-16	SC-RSC-31-Apr-16	F	10.4	9.2	9	oto	3	0.344	0.236	9	-	-	-
		24-Apr-16	SC-RSC-32-Apr-16	F	11.5	10.2	14	oto	3	0.750	0.235	13	-	-	-
		24-Apr-16	SC-RSC-33-Apr-16	F	11.7	10.2	14	oto	3	0.391	0.103	14	worms	0.084	-
		24-Apr-16	SC-RSC-35-Apr-16	F	10.7	9.3	11	oto	3	0.657	0.195	10	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**20**	**20**	**20**	**20**	**-**	**8**	**-**
		average		**-**	**11**	**9.9**	**13**	**-**	**3**	**0.47**	**0.17**	**12**	**-**	**0.30**	**-**
		median		**-**	**11**	**9.7**	**12**	**-**	**3**	**0.44**	**0.16**	**12**	**-**	**0.21**	**-**
		standard deviation		**-**	**0.72**	**0.63**	**2.7**	**-**	**0.45**	**0.22**	**0.078**	**2.5**	**-**	**0.29**	**-**
		standard error		**-**	**0.16**	**0.14**	**0.60**	**-**	**0.10**	**0.050**	**0.017**	**0.56**	**-**	**0.10**	**-**
		minimum		**-**	**10**	**9.2**	**9.2**	**-**	**3**	**0.13**	**0.083**	**8.6**	**-**	**0.0050**	**-**
		maximum		**-**	**14**	**12**	**20**	**-**	**5**	**1.0**	**0.39**	**19**	**-**	**0.85**	**-**
	2015	22-Apr-15	SC-RSC-01-Apr-15	M	10.7	7.9	10	oto	2	0.201	0.183	10	-	-	whole body
		27-Apr-15	SC-RSC-05-Apr-15	M	9.1	7.9	6	oto	-	0.132	0.126	6	-	-	whole body
		total sample size		**-**	**2**	**2**	**2**	**-**	**-**	**2**	**2**	**2**	**-**	**-**	**-**
		average		**-**	**9.9**	**7.9**	**8.4**	**-**	**-**	**0.17**	**0.15**	**8.1**	**-**	**-**	**-**
		median		**-**	**9.9**	**7.9**	**8.4**	**-**	**-**	**0.17**	**0.15**	**8.1**	**-**	**-**	**-**
		standard deviation		**-**	**1.1**	**0**	**2.8**	**-**	**-**	**0.049**	**0.040**	**2.7**	**-**	**-**	**-**
		standard error		**-**	**0.80**	**0**	**2.0**	**-**	**-**	**0.035**	**0.029**	**1.9**	**-**	**-**	**-**
		minimum		**-**	**9.1**	**7.9**	**6.5**	**-**	**-**	**0.13**	**0.13**	**6.2**	**-**	**-**	**-**
		maximum		**-**	**11**	**7.9**	**10**	**-**	**-**	**0.20**	**0.18**	**10**	**-**	**-**	**-**
	2016	22-Apr-16	SC-RSC-03-Apr-16	M	11.2	9.8	12	oto	3	0.124	0.169	12	-	-	-
		22-Apr-16	SC-RSC-04-Apr-16	M	10.9	9.6	11	-	-	0.122	0.232	11	-	-	whole body
		22-Apr-16	SC-RSC-05-Apr-16	M	10.6	9.2	10	-	-	0.133	0.073	10	-	-	whole body
		22-Apr-16	SC-RSC-14-Apr-16	M	11.0	9.5	11	-	-	0.166	0.201	11	-	-	whole body
		22-Apr-16	SC-RSC-17-Apr-16	M	11.6	10.7	17	-	-	0.141	0.238	16	worms	1.360	whole body
		22-Apr-16	SC-RSC-18-Apr-16	M	11.0	9.6	13	-	-	0.200	0.214	12	-	-	whole body
		22-Apr-16	SC-RSC-20-Apr-16	M	11.0	9.1	11	oto	3	0.136	0.128	10	-	-	-
		22-Apr-16	SC-RSC-21-Apr-16	M	10.1	9.0	10	oto	3	0.077	0.125	9	-	-	-
		23-Apr-16	SC-RSC-28-Apr-16	M	10.6	9.3	11	oto	3	0.313	0.312	10	-	-	-
		23-Apr-16	SC-RSC-29-Apr-16	M	10.1	8.9	9	oto	2	0.095	0.091	9	-	-	-
		23-Apr-16	SC-RSC-30-Apr-16	M	10.9	9.4	12	oto	3	0.129	0.129	12	-	-	-
		24-Apr-16	SC-RSC-34-Apr-16	M	11.6	10.1	14	oto	3	0.138	0.182	13	-	-	-
		24-Apr-16	SC-RSC-36-Apr-16	M	10.0	8.5	9	oto	3	0.075	0.144	9	-	-	-
		24-Apr-16	SC-RSC-37-Apr-16	M	10.2	8.7	9	oto	2	0.122	0.201	9	-	-	-
		24-Apr-16	SC-RSC-38-Apr-16	M	11.4	9.8	13	oto	3	0.185	0.160	13	-	-	-
		24-Apr-16	SC-RSC-39-Apr-16	M	11.0	9.6	12	oto	3	0.127	0.232	12	worms	0.014	-
		24-Apr-16	SC-RSC-40-Apr-16	M	11.6	10.1	15	oto	3	0.090	0.188	14	-	-	-
		24-Apr-16	SC-RSC-41-Apr-16	M	10.0	8.7	9	oto	2	0.167	0.109	8	-	-	-
		24-Apr-16	SC-RSC-42-Apr-16	M	10.3	8.8	10	oto	3	0.131	0.155	9	-	-	-
		24-Apr-16	SC-RSC-43-Apr-16	M	11.3	9.7	14	oto	4	0.291	0.140	13	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**15**	**20**	**20**	**20**	**-**	**2**	**-**
		average		**-**	**11**	**9.4**	**11**	**-**	**3**	**0.15**	**0.17**	**11**	**-**	**0.69**	**-**
		median		**-**	**11**	**9.5**	**11**	**-**	**3**	**0.13**	**0.16**	**11**	**-**	**0.69**	**-**
		standard deviation		**-**	**0.55**	**0.56**	**2.2**	**-**	**0.52**	**0.062**	**0.058**	**2.1**	**-**	**0.95**	**-**
		standard error		**-**	**0.12**	**0.12**	**0.48**	**-**	**0.13**	**0.014**	**0.013**	**0.47**	**-**	**0.67**	**-**
		minimum		**-**	**10**	**8.5**	**8.7**	**-**	**2**	**0.075**	**0.073**	**8.4**	**-**	**0.014**	**-**
		maximum		**-**	**12**	**11**	**17**	**-**	**4**	**0.31**	**0.31**	**16**	**-**	**1.4**	**-**
Elk River	2015	23-Apr-15	ER-RSC-02-Apr-15	F	12.2	10.6	16	oto	4	0.486	0.100	15	worms	0.997	muscle, ovaries
		23-Apr-15	ER-RSC-04-Apr-15	F	11.1	9.8	11	oto	3	0.492	0.147	10	-	-	muscle, ovaries
		24-Apr-15	ER-RSC-07-Apr-15	F	13.0	11.2	23	oto	4	0.721	0.137	22	worms	3.355	muscle, ovaries
		26-Apr-15	ER-RSC-08-Apr-15	F	13.0	11.5	24	oto	4	0.602	0.294	23	worms	5.769	muscle, ovaries
		26-Apr-15	ER-RSC-09-Apr-15	F	14.1	12.3	26	oto	4	0.540	0.327	25	worms	1.661	muscle, ovaries
		26-Apr-15	ER-RSC-10-Apr-15	F	14.5	13.1	18	oto	5	0.942	0.293	17	-	-	muscle, ovaries
		28-Apr-15	ER-RSC-11-Apr-15	F	12.7	11.0	15	oto	4	0.401	0.173	15	worms	0.371	muscle, ovaries
		29-Apr-15	ER-RSC-13-Apr-15	F	13.6	12.0	20	oto	4	0.858	0.251	18	-	-	muscle, ovaries
		30-Apr-15	ER-RSC-15-Apr-15	F	11.5	10.1	13	oto	3	0.580	0.202	12	-	-	muscle, ovaries
		30-Apr-15	ER-RSC-16-Apr-15	F	12.0	10.3	15	oto	-	0.406	0.170	14	worms	1.48	muscle, ovaries
		total sample size		**-**	**10**	**10**	**10**	**-**	**9**	**10**	**10**	**10**	**-**	**6**	**-**
		average		**-**	**13**	**11**	**18**	**-**	**4**	**0.60**	**0.21**	**17**	**-**	**2.3**	**-**
		median		**-**	**13**	**11**	**17**	**-**	**4**	**0.56**	**0.19**	**16**	**-**	**1.6**	**-**
		standard deviation		**-**	**1.1**	**1.1**	**4.8**	**-**	**0.60**	**0.18**	**0.077**	**4.7**	**-**	**2.0**	**-**
		standard error		**-**	**0.35**	**0.33**	**1.5**	**-**	**0.20**	**0.058**	**0.024**	**1.5**	**-**	**0.81**	**-**
		minimum		**-**	**11**	**9.8**	**11**	**-**	**3**	**0.40**	**0.10**	**10**	**-**	**0.37**	**-**
		maximum		**-**	**15**	**13**	**26**	**-**	**5**	**0.94**	**0.33**	**25**	**-**	**5.8**	**-**

[a] Age structures collected: oto - otoliths.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.31: Summary Statistics for Redside Shiner Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Elk River	2016	20-Apr-16	ER-RSC-04-Apr-16	F	11.3	10.0	12	-	-	0.368	0.130	11	-	-	muscle, ovaries
		21-Apr-16	ER-RSC-05-Apr-16	F	10.0	9.0	11	oto	3	0.785	0.268	10	-	-	muscle, ovaries
		21-Apr-16	ER-RSC-06-Apr-16	F	12.1	10.4	17	oto	3	0.843	0.411	15	-	-	muscle, ovaries
		21-Apr-16	ER-RSC-07-Apr-16	F	11.1	9.8	13	oto	3	0.445	0.123	13	worms	1.220	muscle, ovaries
		21-Apr-16	ER-RSC-09-Apr-16	F	10.7	9.3	11	oto	3	0.751	0.317	10	-	-	muscle, ovaries
		21-Apr-16	ER-RSC-11-Apr-16	F	11.0	9.7	11	oto	3	0.639	0.205	10	-	-	muscle, ovaries
		21-Apr-16	ER-RSC-13-Apr-16	F	10.7	9.5	11	oto	3	0.575	0.326	10	-	-	muscle, ovaries
		21-Apr-16	ER-RSC-14-Apr-16	F	11.7	10.6	15	oto	3	0.447	0.359	14	-	-	muscle, ovaries
		21-Apr-16	ER-RSC-15-Apr-16	F	10.6	9.1	11	oto	3	0.573	0.189	10	worms	0.017	muscle, ovaries
		21-Apr-16	ER-RSC-16-Apr-16	F	11.3	10.0	13	oto	3	0.625	0.238	12	-	-	muscle, ovaries
		21-Apr-16	ER-RSC-22-Apr-16	F	10.0	8.8	9	oto	4	0.471	0.145	9	-	-	-
		21-Apr-16	ER-RSC-23-Apr-16	F	11.1	9.7	12	oto	3	0.468	0.216	11	worms	0.025	-
		21-Apr-16	ER-RSC-24-Apr-16	F	10.0	9.0	10	oto	3	0.412	0.300	10	worms	0.019	-
		21-Apr-16	ER-RSC-28-Apr-16	F	10.3	9.0	10	oto	3	0.527	0.307	9	-	-	-
		21-Apr-16	ER-RSC-29-Apr-16	F	11.7	10.6	15	oto	3	0.812	0.265	14	-	-	-
		21-Apr-16	ER-RSC-30-Apr-16	F	11.8	10.4	14	oto	3	0.509	0.270	13	-	-	-
		21-Apr-16	ER-RSC-31-Apr-16	F	11.4	10.2	14	oto	3	0.810	0.387	13	-	-	-
		21-Apr-16	ER-RSC-32-Apr-16	F	10.6	9.4	12	oto	3	0.786	0.332	11	-	-	-
		21-Apr-16	ER-RSC-34-Apr-16	F	11.5	10.0	13	oto	4	0.628	0.260	12	-	-	-
		total sample size		-	**19**	**19**	**19**	-	**18**	**19**	**19**	**19**	-	**4**	-
		average		-	**11**	**9.7**	**12**	-	**3**	**0.60**	**0.27**	**12**	-	**0.32**	-
		median		-	**11**	**9.7**	**12**	-	**3**	**0.58**	**0.27**	**11**	-	**0.022**	-
		standard deviation		-	**0.64**	**0.58**	**2.0**	-	**0.32**	**0.15**	**0.083**	**1.9**	-	**0.60**	-
		standard error		-	**0.15**	**0.13**	**0.46**	-	**0.076**	**0.035**	**0.019**	**0.44**	-	**0.30**	-
		minimum		-	**10**	**8.8**	**9.2**	-	**3**	**0.37**	**0.12**	**8.6**	-	**0.017**	-
		maximum		-	**12**	**11**	**17**	-	**4**	**0.84**	**0.41**	**15**	-	**1.2**	-
	2015	23-Apr-15	ER-RSC-05-Apr-15	M	10.7	9.4	10	oto	3	0.121	0.093	10	-	-	whole body
		28-Apr-15	ER-RSC-12-Apr-15	M	11.2	9.8	11	-	-	0.103	0.082	11	-	-	whole body
		30-Apr-15	ER-RSC-14-Apr-15	M	12.8	11.3	19	-	-	0.268	3.460	15	-	-	whole body
		total sample size		-	**3**	**3**	**3**	-	-	**3**	**3**	**3**	-	-	-
		average		-	**12**	**10**	**13**	-	-	**0.16**	**1.2**	**12**	-	-	-
		median		-	**11**	**9.8**	**11**	-	-	**0.12**	**0.093**	**11**	-	-	-
		standard deviation		-	**1.1**	**1.0**	**5.1**	-	-	**0.091**	**1.9**	**3.1**	-	-	-
		standard error		-	**0.63**	**0.58**	**3.0**	-	-	**0.052**	**1.1**	**1.8**	-	-	-
		minimum		-	**11**	**9.4**	**9.8**	-	-	**0.10**	**0.082**	**9.5**	-	-	-
		maximum		-	**13**	**11**	**19**	-	-	**0.27**	**3.5**	**15**	-	-	-
	2016	20-Apr-16	ER-RSC-01-Apr-16	M	12.0	10.2	14	-	-	0.189	0.119	13	-	-	whole body
		20-Apr-16	ER-RSC-02-Apr-16	M	9.8	8.5	8	-	-	0.103	0.092	8	-	-	whole body
		20-Apr-16	ER-RSC-03-Apr-16	M	10.9	9.4	12	-	-	0.108	0.128	11	-	-	whole body
		21-Apr-16	ER-RSC-08-Apr-16	M	11.4	9.9	13	-	-	0.209	0.304	13	-	-	whole body
		21-Apr-16	ER-RSC-10-Apr-16	M	11.0	9.7	10	-	-	0.228	0.177	10	-	-	whole body
		21-Apr-16	ER-RSC-12-Apr-16	M	11.4	10.3	13	-	-	0.238	0.200	13	-	-	whole body
		21-Apr-16	ER-RSC-17-Apr-16	M	10.0	8.7	10	oto	2	0.074	0.130	9	-	-	-
		21-Apr-16	ER-RSC-18-Apr-16	M	10.0	8.8	9	oto	4	0.139	0.203	9	-	-	-
		21-Apr-16	ER-RSC-19-Apr-16	M	9.7	8.8	8	oto	3	0.093	0.149	8	damaged caudal fin	-	-
		21-Apr-16	ER-RSC-21-Apr-16	M	11.9	10.4	15	oto	3	0.376	0.383	14	-	-	-
		21-Apr-16	ER-RSC-26-Apr-16	M	11.8	10.4	14	oto	3	0.157	0.263	14	worms	0.163	-
		21-Apr-16	ER-RSC-27-Apr-16	M	11.9	10.2	14	oto	3	0.168	0.393	14	-	-	-
		21-Apr-16	ER-RSC-33-Apr-16	M	11.0	9.6	14	oto	3	0.149	0.403	13	-	-	-
		21-Apr-16	ER-RSC-36-Apr-16	M	10.7	9.4	10	oto	3	0.075	0.179	10	-	-	-
		21-Apr-16	ER-RSC-37-Apr-16	M	9.9	8.7	8	oto	2	0.148	0.130	8	-	-	-
		21-Apr-16	ER-RSC-38-Apr-16	M	10.7	9.5	12	oto	3	0.139	0.240	11	-	-	-
		21-Apr-16	ER-RSC-39-Apr-16	M	10.2	9.2	10	oto	2	0.098	0.184	9	-	-	-
		21-Apr-16	ER-RSC-40-Apr-16	M	11.8	10.5	13	oto	4	0.174	0.228	13	-	-	-
		25-Apr-16	ER-RSC-41-Apr-16	M	11.5	10.2	13	oto	3	0.191	0.197	12	-	-	-
		25-Apr-16	ER-RSC-42-Apr-16	M	10.8	9.4	10	oto	3	0.251	0.152	10	-	-	-
		25-Apr-16	ER-RSC-43-Apr-16	M	10.8	10.0	12	oto	3	0.206	0.116	11	damaged caudal fin	-	-
		total sample size		-	**21**	**21**	**21**	-	**15**	**21**	**21**	**21**	-	-	-
		average		-	**11**	**9.6**	**11**	-	**3**	**0.17**	**0.21**	**11**	-	-	-
		median		-	**11**	**9.6**	**12**	-	**3**	**0.16**	**0.18**	**11**	-	-	-
		standard deviation		-	**0.76**	**0.64**	**2.2**	-	**0.59**	**0.071**	**0.093**	**2.1**	-	-	-
		standard error		-	**0.17**	**0.14**	**0.47**	-	**0.15**	**0.016**	**0.020**	**0.45**	-	-	-
		minimum		-	**9.7**	**8.5**	**8.2**	-	**2**	**0.074**	**0.092**	**8.0**	-	-	-
		maximum		-	**12**	**11**	**15**	-	**4**	**0.38**	**0.40**	**14**	-	-	-
Gold Creek	2015	22-Apr-15	GC-RSC-01-Apr-15	F	11.0	9.5	11	oto	3	0.579	0.104	10	-	-	muscle, ovaries
		24-Apr-15	GC-RSC-05-Apr-15	F	12.0	11.2	14	oto	3	0.406	0.150	14	worms	3.243	muscle, ovaries
		27-Apr-15	GC-RSC-07-Apr-15	F	14.0	12.2	26	oto	4	0.303	0.295	25	worms	4.555	muscle, ovaries
		27-Apr-15	GC-RSC-08-Apr-15	F	13.5	11.6	26	oto	4	1.225	0.332	24	worms	3.257	muscle, ovaries
		27-Apr-15	GC-RSC-09-Apr-15	F	12.0	10.4	16	oto	3	0.080	0.168	16	worms	2.211	muscle, ovaries
		27-Apr-15	GC-RSC-10-Apr-15	F	14.1	12.3	25	oto	4	0.680	0.380	23	worms	1.872	muscle, ovaries
		total sample size		-	**6**	**6**	**6**	-	**6**	**6**	**6**	**6**	-	**5**	-
		average		-	**13**	**11**	**20**	-	**4**	**0.55**	**0.24**	**19**	-	**3.0**	-
		median		-	**13**	**11**	**20**	-	**4**	**0.49**	**0.23**	**20**	-	**3.2**	-
		standard deviation		-	**1.3**	**1.1**	**6.5**	-	**0.55**	**0.39**	**0.11**	**6.3**	-	**1.1**	-
		standard error		-	**0.52**	**0.44**	**2.7**	-	**0.22**	**0.16**	**0.046**	**2.6**	-	**0.47**	-
		minimum		-	**11**	**9.5**	**11**	-	**3**	**0.080**	**0.10**	**10**	-	**1.9**	-
		maximum		-	**14**	**12**	**26**	-	**4**	**1.2**	**0.38**	**25**	-	**4.6**	-

[a] Age structures collected: oto - otoliths.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.31: Summary Statistics for Redside Shiner Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 2016

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2016	21-Apr-16	GC-RSC-03-Apr-16	F	10.7	9.4	10	oto	3	0.407	0.090	9	-	-	muscle, ovaries
		23-Apr-16	GC-RSC-07-Apr-16	F	11.4	10.2	15	oto	3	0.489	0.277	15	worms	0.907	muscle, ovaries
		23-Apr-16	GC-RSC-08-Apr-16	F	11.0	9.9	12	oto	3	0.339	0.191	11	-	-	muscle, ovaries
		23-Apr-16	GC-RSC-09-Apr-16	F	10.1	9.5	10	oto	3	0.218	0.174	10	worms	0.800	muscle, ovaries
		23-Apr-16	GC-RSC-10-Apr-16	F	12.1	10.7	16	oto	3	0.592	0.276	15	worms	0.475	muscle, ovaries
		23-Apr-16	GC-RSC-11-Apr-16	F	10.8	9.2	11	oto	3	0.354	0.086	11	worms	0.360	muscle, ovaries
		23-Apr-16	GC-RSC-12-Apr-16	F	11.0	10.5	12	oto	3	0.712	0.179	12	-	-	muscle, ovaries
		23-Apr-16	GC-RSC-13-Apr-16	F	11.2	10.7	12	oto	3	0.949	0.321	11	-	-	muscle, ovaries
		23-Apr-16	GC-RSC-14-Apr-16	F	10.1	8.9	10	oto	3	0.730	0.252	9	-	-	muscle, ovaries
		23-Apr-16	GC-RSC-16-Apr-16	F	11.8	10.2	16	oto	3	0.510	0.452	15	worms	0.224	muscle, ovaries
		23-Apr-16	GC-RSC-20-Apr-16	F	11.5	10.2	15	oto	3	0.503	0.317	14	-	-	-
		24-Apr-16	GC-RSC-22-Apr-16	F	12.2	10.7	16	oto	3	1.231	0.404	14	-	-	-
		24-Apr-16	GC-RSC-23-Apr-16	F	12.1	10.4	16	oto	5	1.049	0.320	14	-	-	-
		24-Apr-16	GC-RSC-24-Apr-16	F	11.6	10.2	14	oto	3	0.270	0.352	14	worms	0.306	-
		24-Apr-16	GC-RSC-28-Apr-16	F	11.5	10.0	16	oto	4	0.742	0.568	15	worms	0.016	-
		24-Apr-16	GC-RSC-29-Apr-16	F	12.1	10.5	16	oto	3	0.638	0.198	15	-	-	-
		24-Apr-16	GC-RSC-30-Apr-16	F	10.9	9.5	14	oto	3	0.866	0.394	12	-	-	-
		24-Apr-16	GC-RSC-31-Apr-16	F	11.8	10.2	14	oto	3	0.788	0.256	13	worms	-	-
		24-Apr-16	GC-RSC-32-Apr-16	F	11.1	9.6	14	oto	3	0.418	0.183	13	-	-	-
		24-Apr-16	GC-RSC-34-Apr-16	F	11.1	9.5	15	oto	3	0.318	0.604	14	worms	1.515	-
		24-Apr-16	GC-RSC-35-Apr-16	F	11.1	10.8	13	oto	3	0.306	0.130	12	-	-	-
		24-Apr-16	GC-RSC-36-Apr-16	F	11.2	9.7	13	oto	3	0.603	0.250	12	worms	0.080	-
		total sample size		-	**22**	**22**	**22**	-	**22**	**22**	**22**	**22**	-	**9**	-
		average		-	**11**	**10**	**14**	-	**3**	**0.59**	**0.29**	**13**	-	**0.52**	-
		median		-	**11**	**10**	**14**	-	**3**	**0.55**	**0.27**	**13**	-	**0.36**	-
		standard deviation		-	**0.59**	**0.54**	**2.1**	-	**0.47**	**0.27**	**0.14**	**2.0**	-	**0.48**	-
		standard error		-	**0.13**	**0.12**	**0.46**	-	**0.10**	**0.057**	**0.029**	**0.42**	-	**0.16**	-
		minimum		-	**10**	**8.9**	**9.5**	-	**3**	**0.22**	**0.086**	**9.0**	-	**0.016**	-
		maximum		-	**12**	**11**	**16**	-	**5**	**1.2**	**0.60**	**15**	-	**1.5**	-
	2016	20-Apr-16	GC-RSC-01-Apr-16	M	11.5	10.2	13	-	-	0.406	0.245	13	-	-	whole body
		20-Apr-16	GC-RSC-02-Apr-16	M	11.2	9.7	12	-	-	0.178	0.176	11	-	-	whole body
		21-Apr-16	GC-RSC-04-Apr-16	M	11.8	10.3	16	-	-	0.140	0.273	15	-	-	whole body
		21-Apr-16	GC-RSC-05-Apr-16	M	9.7	7.9	8	-	-	0.066	0.130	8	-	-	whole body
		23-Apr-16	GC-RSC-15-Apr-16	M	11.3	9.7	14	-	-	0.272	0.374	13	-	-	whole body
		23-Apr-16	GC-RSC-17-Apr-16	M	10.2	8.9	9	oto	2	0.255	0.160	9	-	-	-
		23-Apr-16	GC-RSC-18-Apr-16	M	10.7	9.5	11	oto	3	0.155	0.151	11	-	-	-
		23-Apr-16	GC-RSC-19-Apr-16	M	10.5	9.2	9	oto	2	0.061	0.175	9	worms	0.139	-
		23-Apr-16	GC-RSC-21-Apr-16	M	11.2	9.9	12	oto	3	0.087	0.167	12	-	-	-
		24-Apr-16	GC-RSC-25-Apr-16	M	11.5	9.9	13	oto	3	0.215	0.115	13	worms	0.102	-
		24-Apr-16	GC-RSC-26-Apr-16	M	11.1	9.6	12	oto	3	0.117	0.276	11	-	-	-
		24-Apr-16	GC-RSC-27-Apr-16	M	10.3	9.0	10	oto	2	0.263	0.197	9	-	-	-
		24-Apr-16	GC-RSC-33-Apr-16	M	11.7	9.9	14	oto	3	0.159	0.284	14	worms	0.196	-
		24-Apr-16	GC-RSC-37-Apr-16	M	11.3	10.0	14	oto	3	0.089	0.544	13	worms	0.886	-
		24-Apr-16	GC-RSC-38-Apr-16	M	11.6	10.3	14	oto	4	0.231	0.338	14	worms	0.040	-
		24-Apr-16	GC-RSC-39-Apr-16	M	10.1	8.5	10	oto	2	0.189	0.162	10	-	-	-
		24-Apr-16	GC-RSC-40-Apr-16	M	11.2	9.8	13	oto	3	0.161	0.301	13	worms	0.075	-
		24-Apr-16	GC-RSC-41-Apr-16	M	10.1	8.9	10	oto	2	0.151	0.188	10	-	-	-
		24-Apr-16	GC-RSC-42-Apr-16	M	9.2	8.5	7	oto	2	0.104	0.093	7	-	-	-
		24-Apr-16	GC-RSC-43-Apr-16	M	10.4	9.0	11	oto	2	0.164	0.122	10	-	-	-
		24-Apr-16	GC-RSC-44-Apr-16	M	11.2	9.8	15	oto	3	0.302	0.319	14	-	-	-
		total sample size		-	**21**	**21**	**21**	-	**16**	**21**	**21**	**21**	-	**6**	-
		average		-	**11**	**9.5**	**12**	-	**3**	**0.18**	**0.23**	**11**	-	**0.24**	-
		median		-	**11**	**9.7**	**12**	-	**3**	**0.16**	**0.19**	**11**	-	**0.12**	-
		standard deviation		-	**0.72**	**0.66**	**2.3**	-	**0.62**	**0.086**	**0.11**	**2.2**	-	**0.32**	-
		standard error		-	**0.16**	**0.14**	**0.51**	-	**0.15**	**0.019**	**0.024**	**0.49**	-	**0.13**	-
		minimum		-	**9.2**	**7.9**	**7.2**	-	**2**	**0.061**	**0.093**	**7.0**	-	**0.040**	-
		maximum		-	**12**	**10**	**16**	-	**4**	**0.41**	**0.54**	**15**	-	**0.89**	-

[a] Age structures collected: oto - otoliths.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.32: Summary Statistics for Redside Shiner Meristic Data Not Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Year	Area	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities	Tissue Collected
Sand Creek	2014	15-Feb-14	SC-RSC-01-Feb-14	11.7	10.4	12	-	-
		21-Aug-14	SC-RSC-01-Aug-14	7.9	6.9	4	-	whole body
		21-Aug-14	SC-RSC-02-Aug-14	6.2	5.5	2	-	whole body
		21-Aug-14	SC-RSC-03-Aug-14	6.5	6.0	2	-	whole body
		21-Aug-14	SC-RSC-04-Aug-14	5.6	5.0	2	-	whole body
		21-Aug-14	SC-RSC-05-Aug-14	5.7	5.0	1	-	whole body
	2015	24-Apr-15	SC-RSC-02-Apr-15	11.0	9.6	12	-	-
	2016	22-Apr-16	SC-RSC-02-Apr-16	11.8	10.3	15	worms	-
		22-Apr-16	SC-RSC-13-Apr-16	10.8	9.3	12	worms	-
		23-Apr-16	SC-RSC-26-Apr-16	11.2	9.5	11	worms	-
total sample size				**10**	**10**	**10**	**-**	**-**
average				**8.8**	**7.8**	**7.4**	**-**	**-**
median				**9.4**	**8.1**	**7.5**	**-**	**-**
standard deviation				**2.7**	**2.3**	**5.4**	**-**	**-**
standard error				**0.85**	**0.72**	**1.7**	**-**	**-**
minimum				**5.6**	**5.0**	**1.5**	**-**	**-**
maximum				**12**	**10**	**15**	**-**	**-**
Elk River	2014	20-Aug-14	ER-RSC-01-Aug-14	8.3	7.3	5	-	whole body
		20-Aug-14	ER-RSC-02-Aug-14	8.7	7.6	5	-	whole body
		20-Aug-14	ER-RSC-03-Aug-14	7.0	6.1	3	-	whole body
		20-Aug-14	ER-RSC-04-Aug-14	6.6	5.5	2	-	whole body
		20-Aug-14	ER-RSC-05-Aug-14	6.1	5.4	2	-	whole body
	2015	22-Apr-15	ER-RSC-01-Apr-15	11.2	9.6	13	-	-
		23-Apr-15	ER-RSC-03-Apr-15	11.3	10.0	13	-	-
		24-Apr-15	ER-RSC-06-Apr-15	11.6	10.0	15	-	-
	2016	21-Apr-16	ER-RSC-20-Apr-16	11.1	9.8	11	worms	-
		21-Apr-16	ER-RSC-25-Apr-16	9.6	8.7	9	-	-
total sample size				**10**	**10**	**10**	**-**	**-**
average				**9.2**	**8.0**	**7.6**	**-**	**-**
median				**9.2**	**8.2**	**7.0**	**-**	**-**
standard deviation				**2.1**	**1.9**	**4.9**	**-**	**-**
standard error				**0.67**	**0.59**	**1.6**	**-**	**-**
minimum				**6.1**	**5.4**	**1.7**	**-**	**-**
maximum				**12**	**10**	**15**	**-**	**-**
Gold Creek	2014	20-Aug-14	GC-RSC-01-Aug-14	8.7	7.7	6	-	whole body
		20-Aug-14	GC-RSC-02-Aug-14	6.6	5.7	2	-	whole body
		20-Aug-14	GC-RSC-03-Aug-14	8.1	7.0	4	-	whole body
		20-Aug-14	GC-RSC-04-Aug-14	10.1	8.7	8	-	whole body
		20-Aug-14	GC-RSC-05-Aug-14	7.7	6.9	4	-	whole body
	2015	22-Apr-15	GC-RSC-02-Apr-15	11.5	10.2	15	-	-
		22-Apr-15	GC-RSC-03-Apr-15	10.5	9.0	9	-	-
		23-Apr-15	GC-RSC-04-Apr-15	12.1	10.5	14	-	-
		26-Apr-15	GC-RSC-06-Apr-15	12.5	10.7	19	-	-
	2016	23-Apr-16	GC-RSC-06-Apr-16	12.0	10.7	15	-	-
total sample size				**10**	**10**	**10**	**-**	**-**
average				**10**	**8.7**	**10**	**-**	**-**
median				**10**	**8.9**	**8.3**	**-**	**-**
standard deviation				**2.1**	**1.8**	**5.8**	**-**	**-**
standard error				**0.66**	**0.57**	**1.8**	**-**	**-**
minimum				**6.6**	**5.7**	**2.2**	**-**	**-**
maximum				**13**	**11**	**19**	**-**	**-**

Table F.33: Summary Statistics for Mountain Whitefish Meristic Data Collected near Sand Creek and Elk River in Koocanusa Reservoir, 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Tissue Collected
Sand Creek	2016	24-Aug-16	SC-MW-01A-Aug-16	35.4	32.8	440	muscle plug
		24-Aug-16	SC-MW-02A-Aug-16	33.5	31.1	400	muscle plug
		24-Aug-16	SC-MW-03A-Aug-16	33.1	30.9	380	muscle plug
		28-Aug-16	SC-MW-04A-Aug-16	32.7	29.6	315	muscle plug
		28-Aug-16	SC-MW-05A-Aug-16	32.0	29.4	310	muscle plug
			total sample size	**5**	**5**	**5**	**-**
			average	**33**	**31**	**369**	**-**
			median	**33**	**31**	**380**	**-**
			standard deviation	**1.3**	**1.4**	**56**	**-**
			standard error	**0.57**	**0.61**	**25**	**-**
			minimum	**32**	**29**	**310**	**-**
			maximum	**35**	**33**	**440**	**-**
Elk River	2016	23-Aug-16	ER-MW-01A-Aug-16	33.6	31.0	395	muscle plug
		23-Aug-16	ER-MW-02A-Aug-16	28.5	26.2	203	muscle plug
		23-Aug-16	ER-MW-03A-Aug-16	33.5	30.8	370	muscle plug
		23-Aug-16	ER-MW-04A-Aug-16	35.6	32.5	435	muscle plug
		23-Aug-16	ER-MW-05A-Aug-16	34.0	31.8	390	muscle plug
		23-Aug-16	ER-MW-06A-Aug-16	30.6	28.2	325	muscle plug
		23-Aug-16	ER-MW-07A-Aug-16	30.2	28.0	295	muscle plug
		28-Aug-16	ER-MW-08A-Aug-16	32.0	29.6	325	muscle plug
		28-Aug-16	ER-MW-09A-Aug-16	32.2	29.8	265	muscle plug
		28-Aug-16	ER-MW-10A-Aug-16	34.1	32.0	470	muscle plug
			total sample size	**10**	**10**	**10**	**-**
			average	**32**	**30**	**347**	**-**
			median	**33**	**30**	**348**	**-**
			standard deviation	**2.2**	**2.0**	**81**	**-**
			standard error	**0.68**	**0.64**	**26**	**-**
			minimum	**34**	**31**	**395**	**-**
			maximum	**36**	**33**	**470**	**-**

Table F.34: Summary Statistics for Westslope Cutthroat Trout Meristic Data Collected near Elk River and Gold Creek in Koocanusa Reservoir, 2014

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age
Elk River	2014	25-Aug-14	ER-WCT-01-Aug-14	19.0	18.1	71	sc	2
Gold Creek	2014	25-Aug-14	GC-WCT-01-Aug-14	24.0	22.6	132	sc	2
		26-Aug-14	GC-WCT-02-Aug-14	26.5	25.0	172	sc	3
		26-Aug-14	GC-WCT-03-Aug-14	22.3	21.3	102	sc	2
total sample size		**-**	**-**	**3**	**3**	**3**	**-**	**3**
average		**-**	**-**	**24**	**23**	**135**	**-**	**2**
median		**-**	**-**	**24**	**23**	**132**	**-**	**2**
standard deviation		**-**	**-**	**2.1**	**1.9**	**35**	**-**	**0.58**
standard error		**-**	**-**	**1.2**	**1.1**	**20**	**-**	**0.33**
minimum		**-**	**-**	**22**	**21**	**102**	**-**	**2**
maximum		**-**	**-**	**27**	**25**	**172**	**-**	**3**

[a] Age structures collected: sc - scales.

Table F.35: Summary Statistics for Yellow Perch Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 201

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Sand Creek	2015	23-Apr-15	SC-YP-01-Apr-15	F	14.0	13.2	31	ds	2	3.635	0.387	27	-	-	muscle, ovaries
		28-Apr-15	SC-YP-10-Apr-15	F	19.7	18.5	84	ds	3	24.432	1.002	59	-	-	muscle, ovaries
		30-Apr-15	SC-YP-15-Apr-15	F	14.3	13.8	33	ds	2	0.118	0.353	32	-	-	muscle, ovaries
		30-Apr-15	SC-YP-17-Apr-15	F	22.6	21.7	162	ds	3	43.150	2.148	117	-	-	muscle, ovaries
		1-May-15	SC-YP-19-Apr-15	F	21.0	20.0	125	ds	3	38.215	1.141	86	-	-	muscle, ovaries
		1-May-15	SC-YP-25-Apr-15	F	14.0	13.4	29	ds	2	0.157	0.273	28	-	-	muscle
		total sample size		**-**	**6**	**6**	**6**	**-**	**6**	**6**	**6**	**6**	**-**	**-**	**-**
		average		**-**	**18**	**17**	**77**	**-**	**3**	**18**	**0.88**	**58**	**-**	**-**	**-**
		median		**-**	**17**	**16**	**58**	**-**	**3**	**14**	**0.69**	**45**	**-**	**-**	**-**
		standard deviation		**-**	**3.9**	**3.8**	**57**	**-**	**0.55**	**20**	**0.72**	**37**	**-**	**-**	**-**
		standard error		**-**	**1.6**	**1.5**	**23**	**-**	**0.22**	**8.0**	**0.29**	**15**	**-**	**-**	**-**
		minimum		**-**	**14**	**13**	**29**	**-**	**2**	**0.12**	**0.27**	**27**	**-**	**-**	**-**
		maximum		**-**	**23**	**22**	**162**	**-**	**3**	**43**	**2.1**	**117**	**-**	**-**	**-**
	2016	20-Apr-16	SC-YP-01-Apr-16	F	21.5	20.8	130	ds	3	28.454	1.112	100	-	-	muscle, ovaries
		21-Apr-16	SC-YP-03-Apr-16	F	20.6	19.8	102	ds	3	24.722	1.203	76	-	-	muscle, ovaries
		22-Apr-16	SC-YP-05-Apr-16	F	17.0	16.0	60	ds	3	13.149	0.118	47	-	-	muscle, ovaries
		23-Apr-16	SC-YP-06-Apr-16	F	27.2	26.0	292	ds	4	88.003	3.127	201	-	-	muscle, ovaries
		23-Apr-16	SC-YP-09-Apr-16	F	19.2	18.1	92	ds	3	31.202	1.020	60	-	-	muscle, ovaries
		23-Apr-16	SC-YP-10-Apr-16	F	20.6	19.4	107	ds	3	24.893	1.056	81	worms	1.219	muscle, ovaries
		25-Apr-16	SC-YP-14-Apr-16	F	21.7	20.7	130	ds	3	32.565	1.296	96	-	-	muscle, ovaries
		27-Apr-16	SC-YP-17-Apr-16	F	22.7	21.9	166	ds	3	46.599	1.866	118	-	-	muscle, ovaries
		27-Apr-16	SC-YP-18-Apr-16	F	22.3	21.2	145	ds	3	48.150	1.268	96	-	-	muscle, ovaries
		27-Apr-16	SC-YP-19-Apr-16	F	21.0	20.0	118	ds	3	28.934	1.386	88	-	-	muscle, ovaries
		27-Apr-16	SC-YP-20-Apr-16	F	21.0	19.8	126	ds	3	39.494	1.062	85	-	-	-
		27-Apr-16	SC-YP-21-Apr-16	F	22.3	21.1	154	ds	4	43.992	1.641	108	-	-	-
		27-Apr-16	SC-YP-22-Apr-16	F	20.7	19.5	101	ds	3	25.961	0.881	74	-	-	-
		27-Apr-16	SC-YP-24-Apr-16	F	20.7	19.6	115	ds	3	27.804	1.021	86	-	-	-
		total sample size		**-**	**14**	**14**	**14**	**-**	**14**	**14**	**14**	**14**	**-**	**-**	**-**
		average		**-**	**21**	**20**	**131**	**-**	**3**	**36**	**1.3**	**94**	**-**	**-**	**-**
		median		**-**	**21**	**20**	**122**	**-**	**3**	**30**	**1.2**	**87**	**-**	**-**	**-**
		standard deviation		**-**	**2.2**	**2.2**	**53**	**-**	**0.36**	**18**	**0.66**	**36**	**-**	**-**	**-**
		standard error		**-**	**0.59**	**0.59**	**14**	**-**	**0.10**	**4.8**	**0.18**	**9.6**	**-**	**-**	**-**
		minimum		**-**	**17**	**16**	**60**	**-**	**3**	**13**	**0.12**	**47**	**-**	**-**	**-**
		maximum		**-**	**27**	**26**	**292**	**-**	**4**	**88**	**3.1**	**201**	**-**	**-**	**-**

[a] Age structures collected: ds - dorsal spine.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight, and was used for statistical analyses.

Table F.35: Summary Statistics for Yellow Perch Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 201

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Sand Creek	2015	27-Apr-15	SC-YP-03-Apr-15	M	15.1	14.4	37	ds	2	0.930	0.439	36	-	-	-
		27-Apr-15	SC-YP-04-Apr-15	M	12.2	11.6	18	ds	2	0.471	0.305	17	-	-	-
		27-Apr-15	SC-YP-05-Apr-15	M	10.2	9.7	11	ds	2	0.218	0.247	10	-	-	-
		28-Apr-15	SC-YP-06-Apr-15	M	17.4	16.6	66	ds	3	2.115	0.746	63	worms	1.312	-
		28-Apr-15	SC-YP-07-Apr-15	M	14.6	13.9	33	ds	2	1.203	0.433	31	-	-	-
		28-Apr-15	SC-YP-08-Apr-15	M	19.5	18.6	78	ds	3	3.711	0.950	73	-	-	-
		28-Apr-15	SC-YP-09-Apr-15	M	23.5	22.3	139	ds	4	6.138	1.617	131	-	-	-
		28-Apr-15	SC-YP-11-Apr-15	M	13.0	12.3	23	ds	2	0.777	0.294	22	-	-	-
		28-Apr-15	SC-YP-12-Apr-15	M	13.9	12.9	27	ds	2	0.507	0.266	27	-	-	-
		29-Apr-15	SC-YP-13-Apr-15	M	15.6	14.7	35	ds	2	0.619	0.455	34	-	-	-
		29-Apr-15	SC-YP-14-Apr-15	M	14.1	13.3	19	ds	2	0.750	0.333	17	-	-	-
		30-Apr-15	SC-YP-16-Apr-15	M	11.7	11.2	15	ds	2	0.412	0.229	15	-	-	-
		1-May-15	SC-YP-18-Apr-15	M	17.8	17.0	56	ds	3	1.651	0.620	53	-	-	-
		1-May-15	SC-YP-20-Apr-15	M	20.7	19.7	83	ds	4	1.914	0.560	81	-	-	-
		1-May-15	SC-YP-21-Apr-15	M	15.9	15.1	42	ds	3	1.215	0.382	40	-	-	-
		1-May-15	SC-YP-22-Apr-15	M	12.3	11.5	19	ds	2	0.928	0.241	18	-	-	-
		1-May-15	SC-YP-23-Apr-15	M	14.7	14.0	27	ds	3	0.674	0.183	26	-	-	-
		1-May-15	SC-YP-24-Apr-15	M	16.6	15.8	39	ds	2	2.076	0.315	37	-	-	-
		1-May-15	SC-YP-26-Apr-15	M	11.5	11.0	16	ds	2	0.288	0.044	15	-	-	-
		1-May-15	SC-YP-27-Apr-15	M	15.7	14.9	35	ds	2	0.672	0.318	34	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**20**	**20**	**20**	**20**	**-**	**-**	**-**
		average		**-**	**15**	**15**	**41**	**-**	**2**	**1.4**	**0.45**	**39**	**-**	**-**	**-**
		median		**-**	**15**	**14**	**34**	**-**	**2**	**0.85**	**0.33**	**32**	**-**	**-**	**-**
		standard deviation		**-**	**3.3**	**3.2**	**31**	**-**	**0.69**	**1.4**	**0.34**	**29**	**-**	**-**	**-**
		standard error		**-**	**0.74**	**0.71**	**6.9**	**-**	**0.15**	**0.31**	**0.077**	**6.6**	**-**	**-**	**-**
		minimum		**-**	**10**	**9.7**	**11**	**-**	**2**	**0.22**	**0.044**	**10**	**-**	**-**	**-**
		maximum		**-**	**24**	**22**	**139**	**-**	**4**	**6.1**	**1.6**	**131**	**-**	**-**	**-**
	2016	20-Apr-16	SC-YP-02-Apr-16	M	19.0	18.4	70	ds	3	1.686	0.886	67	-	-	-
		21-Apr-16	SC-YP-04-Apr-16	M	17.6	17.0	59	ds	3	2.460	0.973	56	-	-	-
		23-Apr-16	SC-YP-07-Apr-16	M	18.7	17.6	60	ds	3	1.600	0.705	58	-	-	-
		23-Apr-16	SC-YP-08-Apr-16	M	19.1	18.0	72	ds	3	1.746	0.502	70	-	-	-
		23-Apr-16	SC-YP-11-Apr-16	M	18.0	17.1	50	ds	3	2.057	0.753	47	-	-	-
		24-Apr-16	SC-YP-12-Apr-16	M	18.9	18.0	71	ds	3	2.027	0.933	68	-	-	-
		24-Apr-16	SC-YP-13-Apr-16	M	19.7	18.2	77	ds	3	1.939	0.753	74	-	-	-
		26-Apr-16	SC-YP-15-Apr-16	M	19.0	18.1	65	ds	3	2.009	0.612	62	-	-	-
		27-Apr-16	SC-YP-16-Apr-16	M	19.1	18.0	73	ds	3	0.843	0.481	72	-	-	-
		27-Apr-16	SC-YP-23-Apr-16	M	19.0	18.5	64	ds	3	2.427	0.747	61	-	-	-
		27-Apr-16	SC-YP-25-Apr-16	M	17.3	16.2	59	ds	3	2.575	1.049	55	-	-	-
		27-Apr-16	SC-YP-26-Apr-16	M	21.7	20.7	108	ds	4	3.024	1.294	104	-	-	-
		27-Apr-16	SC-YP-27-Apr-16	M	23.3	22.2	153	ds	4	4.567	1.877	147	-	-	-
		27-Apr-16	SC-YP-28-Apr-16	M	19.2	18.2	68	ds	3	0.974	0.595	66	-	-	-
		27-Apr-16	SC-YP-29-Apr-16	M	18.3	17.3	66	ds	3	2.477	0.653	63	-	-	-
		27-Apr-16	SC-YP-30-Apr-16	M	18.6	17.4	69	ds	3	2.064	0.969	66	-	-	-
		27-Apr-16	SC-YP-31-Apr-16	M	19.6	18.7	88	ds	3	3.781	0.672	84	-	-	-
		27-Apr-16	SC-YP-32-Apr-16	M	18.1	17.2	64	ds	3	1.867	1.012	61	-	-	-
		27-Apr-16	SC-YP-33-Apr-16	M	19.2	18.1	71	ds	3	0.660	0.579	70	-	-	-
		27-Apr-16	SC-YP-34-Apr-16	M	17.5	16.4	57	ds	3	1.244	0.669	55	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**20**	**20**	**20**	**20**	**-**	**-**	**-**
		average		**-**	**19**	**18**	**73**	**-**	**3**	**2.1**	**0.84**	**70**	**-**	**-**	**-**
		median		**-**	**19**	**18**	**69**	**-**	**3**	**2.0**	**0.75**	**66**	**-**	**-**	**-**
		standard deviation		**-**	**1.4**	**1.4**	**22**	**-**	**0.31**	**0.94**	**0.32**	**22**	**-**	**-**	**-**
		standard error		**-**	**0.31**	**0.30**	**5.0**	**-**	**0.07**	**0.21**	**0.072**	**4.8**	**-**	**-**	**-**
		minimum		**-**	**17**	**16**	**50**	**-**	**3**	**0.66**	**0.48**	**47**	**-**	**-**	**-**
		maximum		**-**	**23**	**22**	**153**	**-**	**4**	**4.6**	**1.9**	**147**	**-**	**-**	**-**

[a] Age structures collected: ds - dorsal spine.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight, and was used for statistical analyses.

Table F.35: Summary Statistics for Yellow Perch Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 201

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Elk River	2015	23-Apr-15	ER-YP-01-Apr-15	F	19.9	18.9	91	ds	3	20.385	1.003	70	-	-	muscle, ovaries
		23-Apr-15	ER-YP-02-Apr-15	F	20.5	19.6	90	ds	3	22.615	1.122	66	-	-	muscle, ovaries
		26-Apr-15	ER-YP-04-Apr-15	F	23.8	22.7	161	ds	4	39.529	1.803	120	-	-	muscle, ovaries
		27-Apr-15	ER-YP-05-Apr-15	F	20.7	20.0	120	ds	3	33.906	1.353	85	-	-	muscle, ovaries
		27-Apr-15	ER-YP-06-Apr-15	F	20.4	19.4	102	ds	3	1.401	1.105	99	-	-	muscle, ovaries
		28-Apr-15	ER-YP-07-Apr-15	F	27.4	26.3	275	ds	6	70.664	3.098	201	-	-	muscle, ovaries
		29-Apr-15	ER-YP-08-Apr-15	F	31.7	30.2	310	ds	8	10.843	1.766	297	-	-	muscle, ovaries
		29-Apr-15	ER-YP-09-Apr-15	F	19.7	18.8	92	ds	3	20.535	1.392	70	-	-	muscle, ovaries
		29-Apr-15	ER-YP-10-Apr-15	F	25.7	24.6	242	ds	4	77.645	2.151	162	-	-	muscle, ovaries
		29-Apr-15	ER-YP-11-Apr-15	F	18.1	17.1	72	ds	2	14.750	1.267	56	-	-	muscle, ovaries
		29-Apr-15	ER-YP-12-Apr-15	F	24.6	23.5	178	ds	5	42.309	2.019	134	-	-	muscle, ovaries
		29-Apr-15	ER-YP-13-Apr-15	F	16.7	15.5	42	ds	2	0.188	0.445	41	-	-	-
		29-Apr-15	ER-YP-14-Apr-15	F	17.8	16.8	73	ds	3	18.115	1.097	54	-	-	-
		29-Apr-15	ER-YP-15-Apr-15	F	22.4	21.4	138	ds	3	30.426	1.261	106	-	-	-
		30-Apr-15	ER-YP-21-Apr-15	F	15.8	15.1	44	ds	2	0.157	0.465	43	-	-	-
		30-Apr-15	ER-YP-22-Apr-15	F	15.2	14.5	36	ds	2	0.174	0.353	36	-	-	-
		30-Apr-15	ER-YP-25-Apr-15	F	20.5	19.5	103	ds	4	25.417	1.322	76	-	-	-
		30-Apr-15	ER-YP-27-Apr-15	F	20.3	19.3	105	ds	3	24.679	1.256	79	-	-	-
		30-Apr-15	ER-YP-28-Apr-15	F	21.7	20.7	121	ds	3	31.649	1.581	88	-	-	-
		30-Apr-15	ER-YP-32-Apr-15	F	14.6	13.9	29	-	-	-	-	-	-	-	-
		30-Apr-15	ER-YP-33-Apr-15	F	14.2	13.4	29	-	-	-	-	-	-	-	-
		1-May-15	ER-YP-37-Apr-15	F	14.2	13.5	29	ds	-	-	-	-	-	-	-
		1-May-15	ER-YP-38-Apr-15	F	15.4	14.7	36	ds	-	-	-	-	-	-	-
		total sample size		**-**	**23**	**23**	**23**	**-**	**19**	**19**	**19**	**19**	**-**	**-**	**-**
		average		**-**	**20**	**19**	**110**	**-**	**3**	**26**	**1.4**	**99**	**-**	**-**	**-**
		median		**-**	**20**	**19**	**92**	**-**	**3**	**23**	**1.3**	**79**	**-**	**-**	**-**
		standard deviation		**-**	**4.5**	**4.4**	**79**	**-**	**1.5**	**22**	**0.65**	**64**	**-**	**-**	**-**
		standard error		**-**	**0.94**	**0.91**	**16**	**-**	**0.35**	**4.9**	**0.15**	**15**	**-**	**-**	**-**
		minimum		**-**	**14**	**13**	**29**	**-**	**2**	**0.16**	**0.35**	**36**	**-**	**-**	**-**
		maximum		**-**	**32**	**30**	**310**	**-**	**8**	**78**	**3.1**	**297**	**-**	**-**	**-**
	2016	19-Apr-16	ER-YP-01-Apr-16	F	20.1	18.9	120	ds	3	29.420	1.357	89	worms	2.484	muscle, ovaries
		19-Apr-16	ER-YP-02-Apr-16	F	24.2	23.6	165	ds	5	42.111	1.967	121	-	-	muscle, ovaries
		19-Apr-16	ER-YP-03-Apr-16	F	18.1	17.5	76	ds	3	16.548	0.397	59	-	-	muscle, ovaries
		19-Apr-16	ER-YP-04-Apr-16	F	19.3	18.5	93	ds	3	19.390	1.275	72	worms	1.822	muscle, ovaries
		19-Apr-16	ER-YP-05-Apr-16	F	20.3	19.7	101	ds	3	29.170	1.219	71	-	-	muscle, ovaries
		19-Apr-16	ER-YP-06-Apr-16	F	19.4	18.7	89	ds	3	21.115	0.787	67	-	-	muscle, ovaries
		19-Apr-16	ER-YP-07-Apr-16	F	21.1	20.3	115	ds	3	25.706	1.503	88	worms	1.470	muscle, ovaries
		19-Apr-16	ER-YP-09-Apr-16	F	22.2	21.5	130	ds	3	36.004	0.974	93	-	-	muscle, ovaries
		19-Apr-16	ER-YP-10-Apr-16	F	19.2	18.4	90	ds	4	28.850	0.882	60	-	-	muscle, ovaries
		22-Apr-16	ER-YP-11-Apr-16	F	20.7	19.6	112	ds	3	30.573	0.904	81	-	-	muscle, ovaries
		22-Apr-16	ER-YP-12-Apr-16	F	15.6	15.0	45	ds	3	9.941	0.457	35	-	-	-
		23-Apr-16	ER-YP-16-Apr-16	F	28.2	26.5	345	ds	5	107.203	3.556	234	-	-	muscle, ovaries
		23-Apr-16	ER-YP-17-Apr-16	F	17.1	16.2	55	ds	3	15.154	0.619	39	-	-	-
		24-Apr-16	ER-YP-22-Apr-16	F	17.7	16.9	61	ds	3	16.463	1.074	43	-	-	-
		24-Apr-16	ER-YP-24-Apr-16	F	31.7	30.0	390	ds	6	116.654	4.311	269	-	-	-
		25-Apr-16	ER-YP-25-Apr-16	F	17.2	16.1	61	ds	3	12.740	0.742	48	worms	1.596	-
		26-Apr-16	ER-YP-29-Apr-16	F	19.9	18.9	89	ds	3	27.468	0.843	61	-	-	-
		total sample size		**-**	**17**	**17**	**17**	**-**	**17**	**17**	**17**	**17**	**-**	**4**	**-**
		average		**-**	**21**	**20**	**126**	**-**	**3**	**34**	**1.3**	**90**	**-**	**1.8**	**-**
		median		**-**	**20**	**19**	**93**	**-**	**3**	**27**	**0.97**	**71**	**-**	**1.7**	**-**
		standard deviation		**-**	**4.1**	**3.8**	**96**	**-**	**0.94**	**30**	**1.1**	**65**	**-**	**0.45**	**-**
		standard error		**-**	**0.99**	**0.93**	**23**	**-**	**0.23**	**7.4**	**0.26**	**16**	**-**	**0.23**	**-**
		minimum		**-**	**16**	**15**	**45**	**-**	**3**	**9.9**	**0.40**	**35**	**-**	**1.5**	**-**
		maximum		**-**	**32**	**30**	**390**	**-**	**6**	**117**	**4.3**	**269**	**-**	**2.5**	**-**

[a] Age structures collected: ds - dorsal spine.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight, and was used for statistical analyses.

Table F.35: Summary Statistics for Yellow Perch Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 201

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Elk River	2015	23-Apr-15	ER-YP-03-Apr-15	M	12.5	11.8	23	ds	2	0.991	0.354	21	-	-	muscle
		29-Apr-15	ER-YP-16-Apr-15	M	13.3	12.6	24	ds	2	0.459	0.209	23	-	-	-
		29-Apr-15	ER-YP-17-Apr-15	M	11.7	11.0	18	ds	2	0.085	0.155	18	worms	0.525	-
		30-Apr-15	ER-YP-19-Apr-15	M	12.3	11.6	18	ds	2	0.314	0.155	17	-	-	-
		30-Apr-15	ER-YP-20-Apr-15	M	13.5	12.9	25	ds	2	0.878	0.289	24	-	-	-
		30-Apr-15	ER-YP-23-Apr-15	M	11.0	10.5	14	ds	2	0.561	0.223	13	-	-	-
		30-Apr-15	ER-YP-24-Apr-15	M	12.7	12.0	18	ds	2	0.507	0.218	17	-	-	-
		30-Apr-15	ER-YP-26-Apr-15	M	12.5	11.0	17	ds	2	0.498	0.210	16	-	-	-
		30-Apr-15	ER-YP-29-Apr-15	M	13.1	12.5	22	ds	2	0.873	0.278	21	-	-	-
		30-Apr-15	ER-YP-30-Apr-15	M	12.3	11.7	17	ds	2	0.435	0.201	17	-	-	-
		30-Apr-15	ER-YP-31-Apr-15	M	12.9	12.3	21	ds	2	0.546	0.237	20	-	-	-
		1-May-15	ER-YP-34-Apr-15	M	13.7	13.0	27	ds	2	1.018	0.416	25	-	-	-
		1-May-15	ER-YP-35-Apr-15	M	12.0	11.3	17	ds	2	0.075	0.255	17	-	-	-
		1-May-15	ER-YP-36-Apr-15	M	12.6	12.0	20	ds	2	0.866	0.248	18	-	-	-
		total sample size		**-**	**14**	**14**	**14**	**-**	**14**	**14**	**14**	**14**	**-**	**-**	**-**
		average		**-**	**13**	**12**	**20**	**-**	**2**	**0.58**	**0.25**	**19**	**-**	**-**	**-**
		median		**-**	**13**	**12**	**19**	**-**	**2**	**0.53**	**0.23**	**18**	**-**	**-**	**-**
		standard deviation		**-**	**0.72**	**0.75**	**3.7**	**-**	**0**	**0.31**	**0.071**	**3.4**	**-**	**-**	**-**
		standard error		**-**	**0.19**	**0.20**	**0.98**	**-**	**0**	**0.082**	**0.019**	**0.91**	**-**	**-**	**-**
		minimum		**-**	**11**	**11**	**14**	**-**	**2**	**0.075**	**0.16**	**13**	**-**	**-**	**-**
		maximum		**-**	**14**	**13**	**27**	**-**	**2**	**1.0**	**0.42**	**25**	**-**	**-**	**-**
	2016	19-Apr-16	ER-YP-08-Apr-16	M	12.3	11.7	22	ds	2	0.385	0.258	21	worms	0.947	-
		22-Apr-16	ER-YP-13-Apr-16	M	12.2	11.7	21	ds	2	0.344	0.164	20	-	-	-
		22-Apr-16	ER-YP-14-Apr-16	M	13.0	12.3	21	ds	2	0.165	0.262	21	-	-	-
		22-Apr-16	ER-YP-15-Apr-16	M	14.4	13.8	31	ds	3	0.573	0.309	30	-	-	-
		23-Apr-16	ER-YP-18-Apr-16	M	14.7	13.7	30	ds	3	1.411	0.561	28	-	-	-
		24-Apr-16	ER-YP-19-Apr-16	M	17.9	17.0	54	ds	3	1.282	0.510	52	-	-	-
		24-Apr-16	ER-YP-20-Apr-16	M	15.5	14.6	40	ds	3	0.680	0.559	39	-	-	-
		24-Apr-16	ER-YP-21-Apr-16	M	17.3	16.2	49	ds	3	1.051	0.588	47	-	-	-
		24-Apr-16	ER-YP-23-Apr-16	M	17.2	16.3	57	ds	5	2.214	0.841	54	-	-	-
		25-Apr-16	ER-YP-26-Apr-16	M	16.1	15.3	42	ds	3	0.959	0.420	41	-	-	-
		25-Apr-16	ER-YP-27-Apr-16	M	13.2	12.8	23	ds	3	1.102	0.236	22	-	-	-
		26-Apr-16	ER-YP-28-Apr-16	M	15.0	15.2	47	ds	4	0.922	0.646	45	-	-	-
		26-Apr-16	ER-YP-30-Apr-16	M	14.7	14.0	38	ds	3	1.063	0.597	36	worms	0.545	-
		26-Apr-16	ER-YP-33-Apr-16	M	15.4	14.8	36	ds	3	0.714	0.765	35	-	-	-
		26-Apr-16	ER-YP-34-Apr-16	M	15.8	14.9	45	ds	3	1.243	0.678	43	-	-	-
		26-Apr-16	ER-YP-35-Apr-16	M	11.2	10.5	15	ds	2	0.601	0.123	14	-	-	-
		total sample size		**-**	**16**	**16**	**16**	**-**	**16**	**16**	**16**	**16**	**-**	**2**	**-**
		average		**-**	**15**	**14**	**36**	**-**	**3**	**0.92**	**0.47**	**34**	**-**	**0.75**	**-**
		median		**-**	**15**	**14**	**37**	**-**	**3**	**0.94**	**0.53**	**35**	**-**	**0.75**	**-**
		standard deviation		**-**	**2.0**	**1.8**	**13**	**-**	**0.77**	**0.50**	**0.22**	**12**	**-**	**0.28**	**-**
		standard error		**-**	**0.49**	**0.46**	**3.2**	**-**	**0.19**	**0.12**	**0.055**	**3.1**	**-**	**0.20**	**-**
		minimum		**-**	**11**	**11**	**15**	**-**	**2**	**0.17**	**0.12**	**14**	**-**	**0.55**	**-**
		maximum		**-**	**18**	**17**	**57**	**-**	**5**	**2.2**	**0.84**	**54**	**-**	**0.95**	**-**

[a] Age structures collected: ds - dorsal spine.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.35: Summary Statistics for Yellow Perch Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 201

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2015	22-Apr-15	GC-YP-01-Apr-15	F	23.1	21.9	152	ds	4	32.744	1.962	117	-	-	muscle, ovaries
		22-Apr-15	GC-YP-02-Apr-15	F	20.0	19.0	96	ds	3	20.077	1.371	75	-	-	muscle, ovaries
		23-Apr-15	GC-YP-03-Apr-15	F	18.6	17.7	77	ds	3	18.806	0.968	57	-	-	muscle, ovaries
		23-Apr-15	GC-YP-04-Apr-15	F	26.1	24.9	217	ds	4	65.083	3.131	149	-	-	muscle, ovaries
		23-Apr-15	GC-YP-05-Apr-15	F	20.5	19.6	103	ds	3	23.730	1.297	78	-	-	muscle, ovaries
		23-Apr-15	GC-YP-06-Apr-15	F	23.1	21.9	157	ds	6	41.461	1.967	114	-	-	muscle, ovaries
		24-Apr-15	GC-YP-07-Apr-15	F	27.3	26.0	279	ds	4	82.471	3.399	193	-	-	muscle, ovaries
		25-Apr-15	GC-YP-08-Apr-15	F	28.1	26.9	295	ds	4	81.350	4.170	209	-	-	muscle, ovaries
		25-Apr-15	GC-YP-09-Apr-15	F	32.0	30.5	490	ds	6	118.545	7.216	364	-	-	muscle, ovaries
		25-Apr-15	GC-YP-10-Apr-15	F	23.5	22.7	170	ds	4	44.819	2.227	123	-	-	muscle, ovaries
		25-Apr-15	GC-YP-11-Apr-15	F	29.4	27.9	340	ds	8	65.761	3.880	270	-	-	-
		25-Apr-15	GC-YP-12-Apr-15	F	19.2	18.4	87	ds	4	19.834	1.140	66	-	-	-
		26-Apr-15	GC-YP-18-Apr-15	F	17.5	16.7	60	ds	3	16.142	0.850	43	-	-	-
		29-Apr-15	GC-YP-22-Apr-15	F	13.6	12.6	23	ds	2	0.108	0.322	23	-	-	-
		1-May-15	GC-YP-36-Apr-15	F	13.8	13.0	27	ds	2	5.007	0.236	22	worms	0.897	-
		total sample size		**-**	**15**	**15**	**15**	**-**	**15**	**15**	**15**	**15**	**-**	**-**	**-**
		average		**-**	**22**	**21**	**172**	**-**	**4**	**42**	**2.3**	**127**	**-**	**-**	**-**
		median		**-**	**23**	**22**	**152**	**-**	**4**	**33**	**2.0**	**114**	**-**	**-**	**-**
		standard deviation		**-**	**5.5**	**5.3**	**131**	**-**	**1.6**	**34**	**1.8**	**97**	**-**	**-**	**-**
		standard error		**-**	**1.4**	**1.4**	**34**	**-**	**0.41**	**8.7**	**0.48**	**25**	**-**	**-**	**-**
		minimum		**-**	**14**	**13**	**23**	**-**	**2**	**0.11**	**0.24**	**22**	**-**	**-**	**-**
		maximum		**-**	**32**	**31**	**490**	**-**	**8**	**119**	**7.2**	**364**	**-**	**-**	**-**
	2016	20-Apr-16	GC-YP-01-Apr-16	F	15.8	15.1	42	ds	3	0.277	0.426	41	undeveloped	-	-
		21-Apr-16	GC-YP-06-Apr-16	F	23.6	22.2	180	ds	4	56.784	2.457	121	-	-	muscle, ovaries
		21-Apr-16	GC-YP-07-Apr-16	F	16.3	15.2	49	ds	3	9.454	0.584	39	-	-	muscle, ovaries
		21-Apr-16	GC-YP-09-Apr-16	F	16.0	15.2	49	ds	3	11.639	0.614	37	-	-	muscle, ovaries
		21-Apr-16	GC-YP-21-Apr-16	F	17.6	16.9	64	ds	3	17.267	0.788	46	-	-	muscle, ovaries
		22-Apr-16	GC-YP-23-Apr-16	F	26.4	25.4	254	ds	5	69.116	3.241	182	-	-	muscle, ovaries
		22-Apr-16	GC-YP-24-Apr-16	F	22.5	21.4	154	ds	3	42.550	1.388	110	-	-	muscle, ovaries
		23-Apr-16	GC-YP-31-Apr-16	F	30.0	28.5	345	ds	5	102.777	4.238	238	-	-	muscle, ovaries
		23-Apr-16	GC-YP-32-Apr-16	F	18.4	17.5	65	ds	3	15.972	0.767	48	-	-	muscle, ovaries
		23-Apr-16	GC-YP-33-Apr-16	F	17.7	16.8	64	ds	3	16.673	0.577	47	-	-	muscle, ovaries
		23-Apr-16	GC-YP-35-Apr-16	F	20.7	19.6	98	ds	3	25.879	0.915	71	-	-	muscle, ovaries
		23-Apr-16	GC-YP-36-Apr-16	F	17.2	16.4	49	ds	4	9.549	0.602	39	-	-	muscle, ovaries
		24-Apr-16	GC-YP-37-Apr-16	F	24.8	23.3	200	ds	4	58.030	2.427	140	-	-	muscle, ovaries
		25-Apr-16	GC-YP-38-Apr-16	F	15.2	14.7	45	ds	3	10.845	0.532	34	-	-	-
		25-Apr-16	GC-YP-39-Apr-16	F	19.0	18.0	73	ds	3	20.440	1.034	52	-	-	-
		25-Apr-16	GC-YP-40-Apr-16	F	19.1	18.3	89	ds	3	22.781	0.656	66	-	-	-
		25-Apr-16	GC-YP-41-Apr-16	F	18.4	17.4	63	ds	3	15.365	0.827	47	-	-	-
		27-Apr-16	GC-YP-42-Apr-16	F	17.3	16.4	49	ds	3	10.837	0.437	38	-	-	-
		total sample size		**-**	**18**	**18**	**18**	**-**	**18**	**18**	**18**	**18**	**-**	**-**	**-**
		average		**-**	**20**	**19**	**107**	**-**	**3**	**29**	**1.3**	**77**	**-**	**-**	**-**
		median		**-**	**18**	**17**	**65**	**-**	**3**	**17**	**0.78**	**48**	**-**	**-**	**-**
		standard deviation		**-**	**4.1**	**3.9**	**86**	**-**	**0.70**	**27**	**1.1**	**58**	**-**	**-**	**-**
		standard error		**-**	**0.97**	**0.92**	**20**	**-**	**0.16**	**6.3**	**0.26**	**14**	**-**	**-**	**-**
		minimum		**-**	**15**	**15**	**42**	**-**	**3**	**0.28**	**0.43**	**34**	**-**	**-**	**-**
		maximum		**-**	**30**	**29**	**345**	**-**	**5**	**103**	**4.2**	**238**	**-**	**-**	**-**

[a] Age structures collected: ds - dorsal spine.

[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.35: Summary Statistics for Yellow Perch Meristic Data Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2015 and 201

Area	Year	Processing Date	Fish ID	Sex	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Gonad Weight (g)	Liver Weight (g)	Adjusted Body Weight (g)[b]	Abnormalities	Worm Weight (g)	Tissue Collected
Gold Creek	2015	26-Apr-15	GC-YP-14-Apr-15	M	11.8	11.2	16	ds	2	0.302	0.270	15	-	-	-
		26-Apr-15	GC-YP-15-Apr-15	M	12.0	11.3	16	ds	2	0.340	0.164	15	-	-	-
		26-Apr-15	GC-YP-16-Apr-15	M	11.7	11.1	16	ds	2	0.484	0.146	15	-	-	-
		26-Apr-15	GC-YP-17-Apr-15	M	12.3	11.7	19	ds	2	0.963	0.253	18	-	-	-
		27-Apr-15	GC-YP-19-Apr-15	M	12.0	11.3	18	ds	2	0.770	0.220	17	-	-	-
		27-Apr-15	GC-YP-20-Apr-15	M	12.8	12.0	18	ds	2	0.512	0.096	18	-	-	-
		27-Apr-15	GC-YP-21-Apr-15	M	11.1	10.5	13	ds	2	0.435	0.212	12	-	-	-
		29-Apr-15	GC-YP-23-Apr-15	M	12.5	11.5	20	ds	2	0.756	0.292	19	-	-	-
		29-Apr-15	GC-YP-24-Apr-15	M	11.6	10.9	15	ds	2	0.497	0.254	14	-	-	-
		29-Apr-15	GC-YP-25-Apr-15	M	11.0	10.3	13	ds	2	0.418	0.164	13	-	-	-
		29-Apr-15	GC-YP-26-Apr-15	M	12.3	11.7	19	ds	2	0.557	0.265	18	-	-	-
		29-Apr-15	GC-YP-27-Apr-15	M	11.4	10.8	13	ds	2	0.211	0.182	13	-	-	-
		30-Apr-15	GC-YP-28-Apr-15	M	12.7	11.0	19	ds	2	0.803	0.261	18	-	-	-
		30-Apr-15	GC-YP-29-Apr-15	M	12.6	11.9	18	ds	2	0.730	0.259	17	-	-	-
		1-May-15	GC-YP-30-Apr-15	M	15.5	14.8	38	ds	3	0.854	0.221	36	-	-	-
		1-May-15	GC-YP-31-Apr-15	M	23.1	22.1	102	ds	8	0.886	0.584	101	-	-	-
		1-May-15	GC-YP-32-Apr-15	M	12.5	11.9	20	ds	2	0.689	0.298	19	-	-	-
		1-May-15	GC-YP-33-Apr-15	M	15.8	15.0	41	ds	3	1.727	0.613	39	-	-	-
		1-May-15	GC-YP-34-Apr-15	M	12.3	11.7	19	ds	2	0.744	0.251	18	-	-	-
		1-May-15	GC-YP-35-Apr-15	M	12.7	12.0	18	ds	2	0.576	0.147	17	-	-	-
		total sample size		**-**	**20**	**20**	**20**	**-**	**20**	**20**	**20**	**20**	**-**	**-**	**-**
		average		**-**	**13**	**12**	**24**	**-**	**2**	**0.66**	**0.26**	**23**	**-**	**-**	**-**
		median		**-**	**12**	**12**	**18**	**-**	**2**	**0.63**	**0.25**	**17**	**-**	**-**	**-**
		standard deviation		**-**	**2.7**	**2.6**	**20**	**-**	**1.4**	**0.33**	**0.13**	**20**	**-**	**-**	**-**
		standard error		**-**	**0.60**	**0.58**	**4.4**	**-**	**0.30**	**0.073**	**0.029**	**4.4**	**-**	**-**	**-**
		minimum		**-**	**11**	**10**	**13**	**-**	**2**	**0.21**	**0.096**	**12**	**-**	**-**	**-**
		maximum		**-**	**23**	**22**	**102**	**-**	**8**	**1.7**	**0.61**	**101**	**-**	**-**	**-**
	2016	20-Apr-16	GC-YP-02-Apr-16	M	15.8	15.0	41	ds	3	0.760	0.463	40	-	-	-
		20-Apr-16	GC-YP-03-Apr-16	M	15.5	14.7	35	ds	3	1.075	0.635	33	worms	0.780	-
		20-Apr-16	GC-YP-04-Apr-16	M	14.5	13.6	30	ds	3	1.180	0.448	28	-	-	-
		20-Apr-16	GC-YP-05-Apr-16	M	15.4	14.6	35	ds	3	0.967	0.451	34	-	-	-
		21-Apr-16	GC-YP-10-Apr-16	M	15.1	14.5	35	ds	3	0.459	0.609	34	-	-	-
		21-Apr-16	GC-YP-11-Apr-16	M	15.4	14.5	34	ds	3	1.096	0.848	32	-	-	-
		21-Apr-16	GC-YP-12-Apr-16	M	15.4	14.7	41	ds	3	0.686	0.384	40	worms	0.805	-
		21-Apr-16	GC-YP-13-Apr-16	M	15.3	14.4	39	ds	3	1.032	0.724	37	-	-	-
		21-Apr-16	GC-YP-14-Apr-16	M	14.6	13.8	34	ds	3	0.731	0.892	32	-	-	-
		21-Apr-16	GC-YP-15-Apr-16	M	12.1	11.5	18	ds	2	0.489	0.202	17	-	-	-
		21-Apr-16	GC-YP-16-Apr-16	M	14.3	13.5	36	ds	3	1.182	0.555	34	worms	0.369	-
		21-Apr-16	GC-YP-18-Apr-16	M	13.9	13.0	30	ds	3	0.750	1.140	28	-	-	-
		21-Apr-16	GC-YP-19-Apr-16	M	15.2	14.5	35	ds	3	0.818	0.709	33	-	-	-
		21-Apr-16	GC-YP-20-Apr-16	M	14.1	13.5	31	ds	3	0.675	0.523	30	-	-	-
		21-Apr-16	GC-YP-22-Apr-16	M	14.8	14.0	32	ds	3	0.666	0.440	31	-	-	-
		22-Apr-16	GC-YP-25-Apr-16	M	14.2	13.4	31	ds	3	1.069	0.441	29	-	-	-
		22-Apr-16	GC-YP-26-Apr-16	M	16.5	15.6	44	ds	3	1.216	0.387	42	-	-	-
		22-Apr-16	GC-YP-27-Apr-16	M	16.0	15.4	41	ds	3	0.910	0.375	40	-	-	-
		22-Apr-16	GC-YP-28-Apr-16	M	14.0	13.2	28	ds	3	1.360	0.509	26	-	-	-
		22-Apr-16	GC-YP-29-Apr-16	M	13.9	13.1	28	ds	3	0.761	0.458	27	-	-	-
		22-Apr-16	GC-YP-30-Apr-16	M	17.2	16.4	46	ds	3	0.861	0.721	44	-	-	-
		total sample size		**-**	**21**	**21**	**21**	**-**	**21**	**21**	**21**	**21**	**-**	**3**	**-**
		average		**-**	**15**	**14**	**34**	**-**	**3**	**0.89**	**0.57**	**33**	**-**	**0.65**	**-**
		median		**-**	**15**	**14**	**35**	**-**	**3**	**0.86**	**0.51**	**33**	**-**	**0.78**	**-**
		standard deviation		**-**	**1.1**	**1.1**	**6.3**	**-**	**0.22**	**0.25**	**0.21**	**6.3**	**-**	**0.24**	**-**
		standard error		**-**	**0.24**	**0.23**	**1.4**	**-**	**0.048**	**0.053**	**0.047**	**1.4**	**-**	**0.14**	**-**
		minimum		**-**	**12**	**12**	**18**	**-**	**2**	**0.46**	**0.20**	**17**	**-**	**0.37**	**-**
		maximum		**-**	**17**	**16**	**46**	**-**	**3**	**1.4**	**1.1**	**44**	**-**	**0.81**	**-**

[a] Age structures collected: ds - dorsal spine.
[b] Adjusted body weight represents whole body weight less the liver weight and gonad weight and used for statistical analyses.

Table F.36: Summary Statistics for Yellow Perch Meristic Data Not Used for the Fish Health Assessment and Collected near Sand Creek, Elk River, and Gold Creek in Koocanusa Reservoir, 2014 to 2016

Area	Year	Processing Date	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected[a]	Age	Sex	Abnormalities	Tissue Collected
Sand Creek	2014	12-Apr-14	SC-YP-01-Apr-14	26.0	24.5	238	sc	-	-	-	-
		12-Apr-14	SC-YP-02-Apr-14	14.7	14.3	40	sc	-	-	-	-
		12-Apr-14	SC-YP-03-Apr-14	32.0	31.3	450	sc	-	-	-	-
		12-Apr-14	SC-YP-04-Apr-14	16.0	15.1	42	sc	-	-	-	-
		12-Apr-14	SC-YP-05-Apr-14	17.6	16.9	54	sc	-	-	-	-
		12-Apr-14	SC-YP-06-Apr-14	14.5	13.6	36	sc	-	-	-	-
		12-Apr-14	SC-YP-07-Apr-14	17.7	16.6	64	sc	-	-	-	-
		12-Apr-14	SC-YP-08-Apr-14	14.1	13.0	32	sc	-	-	-	-
		12-Apr-14	SC-YP-09-Apr-14	14.6	14.0	44	sc	-	-	-	-
		21-Aug-14	SC-YP-01-Aug-14	29.0	27.2	233	oto, ds	11	-	-	muscle
		21-Aug-14	SC-YP-02-Aug-14	13.6	12.9	35	oto, ds	1	-	-	muscle
		21-Aug-14	SC-YP-03-Aug-14	12.1	11.8	26	oto, ds	2	-	-	muscle
		23-Aug-14	SC-YP-04-Aug-14	30.1	29.0	310	oto, ds	11	-	-	muscle
	2015	27-Apr-15	SC-YP-02-Apr-15	30.0	28.4	303	-	-	-	-	-
			total sample size	**14**	**14**	**14**	**-**	**4**	**-**	**-**	-
			average	**20**	**19**	**136**	**-**	**6**	**-**	**-**	-
			median	**17**	**16**	**49**	**-**	**7**	**-**	**-**	-
			standard deviation	**7.4**	**7.1**	**141**	**-**	**5.5**	**-**	**-**	-
			standard error	**2.0**	**1.9**	**38**	**-**	**2.8**	**-**	**-**	-
			minimum	**12**	**12**	**26**	**-**	**1**	**-**	**-**	-
			maximum	**32**	**31**	**450**	**-**	**11**	**-**	**-**	-
Elk River	2015	30-Apr-15	ER-YP-18-Apr-15	14.1	13.1	27	-	-	-	-	-
	2016	26-Apr-16	ER-YP-31-Apr-16	16.0	15.4	37	-	-	I	-	-
		26-Apr-16	ER-YP-32-Apr-16	13.8	13.2	32	-	-	I	worms	-
			total sample size	**3**	**3**	**3**	**-**	**-**	**-**	**-**	-
			average	**15**	**14**	**32**	**-**	**-**	**-**	**-**	-
			median	**14**	**13**	**32**	**-**	**-**	**-**	**-**	-
			standard deviation	**1.2**	**1.3**	**5**	**-**	**-**	**-**	**-**	-
			standard error	**0.69**	**0.75**	**3**	**-**	**-**	**-**	**-**	-
			minimum	**14**	**13**	**27**	**-**	**-**	**-**	**-**	-
			maximum	**16**	**15**	**37**	**-**	**-**	**-**	**-**	-
Gold Creek	2014	20-Feb-14	GC-YP-01-Feb-14	23.0	22.0	110	-	-	-	-	-
		19-Aug-14	GC-YP-01-Aug-14	14.3	13.8	35	oto, ds	2	-	-	muscle
		19-Aug-14	GC-YP-02-Aug-14	11.1	10.7	16	oto, ds	1	-	-	muscle
		20-Aug-14	GC-YP-03-Aug-14	22.6	21.5	144	oto, ds	3	F	-	muscle
		20-Aug-14	GC-YP-04-Aug-14	19.3	18.4	75	oto, ds	3	-	-	muscle
		22-Aug-14	GC-YP-05-Aug-14	20.5	19.6	91	oto, ds	3	F	worms	muscle
		22-Aug-14	GC-YP-06-Aug-14	17.3	16.7	53	ds	2	F	-	muscle
		22-Aug-14	GC-YP-07-Aug-14	22.7	22.0	135	oto, ds	3	F	-	muscle
		22-Aug-14	GC-YP-08-Aug-14	17.5	16.8	62	oto, ds	2	F	-	muscle
		22-Aug-14	GC-YP-09-Aug-14	18.8	17.9	63	oto, ds	2	-	-	muscle
		22-Aug-14	GC-YP-10-Aug-14	15.7	14.8	42	oto, ds	2	F	-	muscle
	2015	25-Apr-15	GC-YP-13-Apr-15	11.4	10.2	14	-	-	IF	-	-
	2016	21-Apr-16	GC-YP-08-Apr-16	15.5	14.6	39	-	-	-	-	-
		21-Apr-16	GC-YP-17-Apr-16	14.9	14.2	35	-	-	-	-	-
		23-Apr-16	GC-YP-34-Apr-16	15.7	14.8	39	-	-	-	-	-
			total sample size	**15**	**15**	**15**	**-**	**10**	**-**	**-**	-
			average	**17**	**17**	**63**	**-**	**2**	**-**	**-**	-
			median	**17**	**17**	**53**	**-**	**2**	**-**	**-**	-
			standard deviation	**3.8**	**3.7**	**40**	**-**	**0.67**	**-**	**-**	-
			standard error	**1.0**	**1.0**	**10**	**-**	**0.21**	**-**	**-**	-
			minimum	**11**	**10**	**14**	**-**	**1**	**-**	**-**	-
			maximum	**23**	**22**	**144**	**-**	**3**	**-**	**-**	-

[a] Age structures collected: sc - scales, oto - otoliths, ds - dorsal spines.

Table F.37: Summary of Fish Catches at Sand Creek, Oestreich Road, Elk River, Gold Creek Study Areas, February 2014

Study Area	Fishing Method	Summary Statistic	Fish Species										Total by Fishing Method	Total No. Species (all methods)
			Bull Trout	Burbot	Largescale Sucker	Northern Pikeminnow	Peamouth Chub	Pumpkin-seed	Rainbow Trout	Redside Shiner	White Sucker	Yellow Perch		
Sand Creek	Hoop Netting	Total Caught	0	1	0	4	11	1	0	1	0	0	**18**	**6**
		CPUE[a]	0	0.10	0	0.41	1.1	0.10	0	0.10	0	0	**1.9**	
	Angling	Total Caught	0	5	0	8	0	0	1	0	0	0	**14**	
		CPUE[a]	0	4.2	0	6.8	0	0	0.85	0	0	0	**12**	
Oestreich Road	Hoop Netting	Total Caught	1	1	0	0	0	0	0	0	0	0	**2**	**2**
		CPUE[a]	0.11	0.11	0	0	0	0	0	0	0	0	**0.22**	
	Angling	Total Caught	-	-	-	-	-	-	-	-	-	-	**0**	
		CPUE[a]	-	-	-	-	-	-	-	-	-	-	**0**	
Elk River	Hoop Netting	Total Caught	0	0	0	8	1	0	0	0	0	0	**9**	**4**
		CPUE[a]	0	0	0	0.35	0.044	0	0	0	0	0	**0.39**	
	Angling	Total Caught	2	0	0	10	1	0	1	0	0	0	**14**	
		CPUE[a]	1.3	0	0	6.5	0.65	0	0.65	0	0	0	**9.2**	
Gold Creek	Hoop Netting	Total Caught	0	0	0	5	23	0	0	0	0	1	**29**	**6**
		CPUE[a]	0	0	0	0.47	2.2	0	0	0	0	0.095	**2.8**	
	Angling	Total Caught	1	0	1	26	0	0	2	0	0	0	**30**	
		CPUE[a]	0.46	0	0.46	12	0	0	0.91	0	0	0	**14**	

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for a fishing method in a study area.

Table F.38: Summary of Fish Catches at the Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, April 2014

Study Area	Fishing Method	Summary Statistic	Fish Species													Total by Fishing Method	Total No. Species (all methods)
			Bull Trout	Burbot	Juvenile Trout	Largescale Sucker	Mountain Whitefish	Northern Pikeminnow	Peamouth Chub	Pumpkin-seed	Rainbow Trout	Redside Shiner	Slimy Sculpin	Westslope Cutthroat Trout	Yellow Perch		
Sand Creek	Hoop Netting	Total Caught	4	3	1	84	14	11	54	1	3	13	1	1	10	**200**	**13**
		CPUE[a]	0.078	0.058	0.019	1.6	0.27	0.21	1.1	0.019	0.058	0.25	0.019	0.019	0.19	**3.9**	
	Angling	Total Caught	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**	
		CPUE[a]	0	0	0	0	3.0	0	0	0	0	0	0	0	0	**3.0**	
Elk River	Hoop Netting	Total Caught	1	2	0	217	2	23	64	0	0	0	0	0	3	**312**	**7**
		CPUE[a]	0.021	0.041	0	4.5	0.041	0.48	1.3	0	0	0	0	0	0.062	**6.5**	
	Angling	Total Caught	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
		CPUE[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
Gold Creek	Hoop Netting	Total Caught	0	0	0	3	0	25	38	0	0	1	0	0	4	**71**	**5**
		CPUE[a]	0	0	0	0.11	0	0.95	1.4	0	0	0.038	0	0	0.15	**2.7**	
	Angling	Total Caught	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
		CPUE[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for a fishing method in a study area.

Table F.39: **Summary of Fish Catches at the Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, August 2014**

Study Area	Fishing Method	Summary Statistic	Fish Species														Total by Fishing Method	Total No. Species (all methods)
			Bull Trout	Burbot	Kokanee	Largescale Sucker	Longnose Sucker	Mountain Whitefish	Northern Pikeminnow	Peamouth Chub	Pumpkinseed	Rainbow Trout	Redside Shiner (adult)	Redside Shiner (juvenile)	Westslope Cutthroat Trout	Yellow Perch		
Sand Creek	Hoop Netting	Total Caught	1	1	28	50	0	0	43	3	0	0	0	0	0	2	**128**	**9**
		CPUE[a]	0.045	0.045	1.3	2.3	0	0	2.0	0.14	0	0	0	0	0	0.091	**5.8**	
	Angling	Total Caught	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
		CPUE[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
	Seining	Total Caught	0	0	0	200	0	0	40	0	1	0	75	62	0	15	**393**	
		CPUE[a]	0	0	0	1.7	0	0	0.34	0	0.0086	0	0.65	0.53	0	0.13	**3.4**	
Elk River	Hoop Netting	Total Caught	1	0	24	60	2	0	73	4	0	0	10	0	1	0	**175**	**8**
		CPUE[a]	0.037	0	0.88	2.2	0.073	0	2.7	0.15	0	0	0.37	0	0.037	0	**6.4**	
	Angling	Total Caught	0	0	2	0	0	0	0	0	0	0	0	0	0	0	**2**	
		CPUE[a]	0	0	3.0	0	0	0	0	0	0	0	0	0	0	0	**3.0**	
	Seining	Total Caught	0	0	0	5	0	0	5	0	0	0	50	250	0	0	**310**	
		CPUE[a]	0	0	0	0.22	0	0	0.22	0	0	0	2.2	11	0	0	**13**	
Gold Creek	Hoop Netting	Total Caught	0	0	0	45	0	1	68	1	1	0	1	0	3	53	**173**	**10**
		CPUE[a]	0	0	0	1.6	0	0.036	2.4	0.036	0.036	0	0.036	0	0.11	1.9	**6.2**	
	Angling	Total Caught	0	0	9	0	0	0	2	0	0	1	0	0	0	0	**12**	
		CPUE[a]	0	0	12	0	0	0	2.7	0	0	1.4	0	0	0	0	**16**	
	Seining	Total Caught	0	0	0	29	0	0	3	13	0	0	200	500	0	22	**767**	
		CPUE[a]	0	0	0	0.62	0	0	0.065	0.28	0	0	4.3	11	0	0.47	**17**	

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for a fishing method in a study area.

Table F.40: Summary of Fish Catches at Sand Creek and Elk River study areas in Koocanusa Reservoir, February 2015[a]

Study Area	Fishing Method	Summary Statistic	Fish Species					Total by Fishing Method	Total No. Species (all methods)
			Bull Trout	Burbot	Northern Pikeminnow	Peamouth Chub	Redside Shiner		
Sand Creek	Burbot Trap	Total Caught	1	0	2	6	0	**9**	**3**
		CPUE[b]	0.049	0	0.10	0.30	0	**0.44**	
	Angling	Total Caught	0	0	3	2	0	**5**	
		CPUE[b]	0	0	14	9.4	0	**24**	
Elk River	Burbot Trap	Total Caught	0	1	1	5	4	**11**	**4**
		CPUE[b]	0	0.020	0.020	0.10	0.08	**0.22**	
	Angling	Total Caught	0	0	14	1	0	**15**	
		CPUE[b]	0	0	13	0.95	0	**14**	

[a] Gold Creek was not sampled as the ice at Gold Creek mouth was too thin, which presented a risk to health and safety.

[b] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for a fishing method in a study area (i.e., number of fish per angler per 24 hour period, number of fish per burbot trap per 24 hour period).

Table F.41: Summary of Fish Catches at the Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, April 2015

Study Area	Fishing Method	Summary Statistic	Fish Species												Total by Fishing Method	Total No. Species (all methods)
			Bull Trout	Burbot	Kokanee	Longnose Sucker	Largescale Sucker	Mountain Whitefish	Northern Pikeminnow	Peamouth Chub	Rainbow Trout	Redside Shiner	Westslope Cutthroat Trout	Yellow Perch		
Sand Creek	Angling	Total Caught	1	0	1	0	0	0	72	42	0	0	1	0	**117**	**10**
		CPUE[a]	0.79	0	0.79	0	0	0	74	43	0	0	0.79	0	**120**	
	Burbot Trapping	Total Caught	0	2	1	0	2	0	34	8	0	2	0	2	**51**	
		CPUE[a]	0	0.041	0.020	0	0.041	0	0.70	0.16	0	0.041	0	0.041	**1.0**	
	Hoop Netting	Total Caught	2	3	0	6	9	0	44	18	0	7	0	30	**119**	
		CPUE[a]	0.082	0.12	0	0.25	0.37	0	1.8	0.74	0	0.29	0	1.2	**4.9**	
	Minnow Trapping	Total Caught	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
		CPUE[a]	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
Elk River	Angling	Total Caught	0	0	1	0	0	0	45	114	0	0	0	0	**160**	**9**
		CPUE[a]	0	0	0.90	0	0	0	41	103	0	0	0	0	**144**	
	Burbot Trapping	Total Caught	1	0	0	0	0	0	48	45	0	4	0	0	**98**	
		CPUE[a]	0.021	0	0	0	0	0	1.0	0.94	0	0.084	0	0	**2.1**	
	Hoop Netting	Total Caught	0	2	0	3	43	0	45	23	0	11	0	42	**169**	
		CPUE[a]	0	0.10	0	0.15	2.2	0	2.3	1.2	0	0.57	0	2.2	**8.7**	
	Minnow Trapping	Total Caught	0	0	0	0	0	0	0	0	0	4	0	0	**4**	
		CPUE[a]	0	0	0	0	0	0	0	0	0	0.33	0	0	**0.33**	
Gold Creek	Angling	Total Caught	1	0	0	0	0	0	61	92	1	0	0	0	**155**	**9**
		CPUE[a]	0.63	0	0	0	0	0	38	58	0.63	0	0	0	**97**	
	Burbot Trapping	Total Caught	0	1	0	0	0	0	30	17	0	1	0	7	**56**	
		CPUE[a]	0	0.021	0	0	0	0	0.64	0.36	0	0.02	0	0.15	**1.2**	
	Hoop Netting	Total Caught	1	0	0	0	23	1	15	30	0	9	0	32	**111**	
		CPUE[a]	0.073	0	0	0	1.7	0.073	1.1	2.2	0	0.66	0	2.3	**8.1**	
	Minnow Trapping	Total Caught	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
		CPUE[a]	0	0	0	0	0	0	0	0	0	0	0	0	**0**	

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for a fishing method in a study area (i.e., number of fish per angler per 24 hour period, number of fish per trap or hoop net per 24 hour period).

Table F.42: Summary of Fish Catches at the Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, August 2015

Study Area	Fishing Method	Summary Statistic	Fish Species					Total by Fishing Method	Total No. Species (all methods)
			Kokanee	Largescale Sucker	Northern Pikeminnow	Peamouth Chub	Yellow Perch		
Sand Creek	Angling	Total Caught	0	0	0	0	0	**0**	**5**
		CPUE[a]	0	0	0	0	0	**0**	
	Hoop Netting	Total Caught	10	32	40	5	2	**89**	
		CPUE[a]	2.0	6.5	8.1	1.0	0.41	**18**	
Elk River	Angling	Total Caught	0	0	20	2	0	**22**	**4**
		CPUE[a]	0	0	56	5.6	0	**62**	
	Hoop Netting	Total Caught	11	11	5	1	0	**28**	
		CPUE[a]	12	12	5.3	1.1	0	**30**	
Gold Creek	Angling	Total Caught	0	0	19	0	0	**19**	**3**
		CPUE[a]	0	0	44	0	0	**44**	
	Hoop Netting	Total Caught	0	2	4	1	0	**7**	
		CPUE[a]	0	0.68	1.4	0.34	0	**2.4**	

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for a fishing method in a study area (i.e., number of fish per angler per 24 hour period, number of fish per hoop net per 24 hour period).

Table F.43: **Summary of Fish Catches at the Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, April 2016**

Study Area	Fishing Method	Summary Statistic	Fish Species													Total by Fishing Method	Total No. Species (all methods)
			Bull Trout	Burbot	Kokanee	Largescale Sucker	Longnose Sucker	Mountain Whitefish	Northern Pikeminnow	Peamouth Chub	Rainbow Trout	Redside Shiner	Sculpin	Westslope Cutthroat Trout	Yellow Perch		
Sand Creek	Angling	Total Caught	1	0	0	0	0	0	0	4	0	0	0	0	0	**5**	**13**
		CPUE[a]	3.3	0	0	0	0	0	0	13	0	0	0	0	0	**16**	
	Gill Netting	Total Caught	8	0	1	55	1	0	84	567	4	89	0	1	4	**814**	
		CPUE[a]	0.35	0	0.40	2.4	0.40	0	3.7	25	0.18	3.9	0	0.40	0.18	**37**	
	Hoop Netting	Total Caught	14	10	0	179	12	1	70	37	0	1	1	2	34	**361**	
		CPUE[a]	0.92	0.65	0	12	0.79	0.065	4.6	2.4	0	0.065	0.065	0.13	2.2	**24**	
Elk River	Angling	Total Caught	2	0	0	0	0	0	2	14	0	0	0	0	0	**18**	**12**
		CPUE[a]	9.9	0	0	0	0	0	9.9	70	0	0	0	0	0	**89**	
	Gill Netting	Total Caught	13	0	4	38	0	0	137	177	2	73	0	2	3	**449**	
		CPUE[a]	0.47	0	0.15	1.4	0	0	5.0	6.4	0.70	2.7	0	0.070	0.11	**17**	
	Hoop Netting	Total Caught	1	11	0	136	5	1	18	21	0	3	0	0	30	**226**	
		CPUE[a]	0.076	0.84	0	10	0.38	0.076	1.4	1.6	0	0.23	0	0	2.3	**17**	
Gold Creek	Angling	Total Caught	0	0	0	0	0	0	7	28	0	0	0	0	0	**35**	**10**
		CPUE[a]	0	0	0	0	0	0	8.4	34	0	0	0	0	0	**42**	
	Gill Netting	Total Caught	8	0	0	152	0	2	105	242	4	62	0	3	34	**612**	
		CPUE[a]	0.16	0	0	2.9	0	0.040	2.0	4.7	0.080	1.2	0	0.060	0.66	**12**	
	Hoop Netting	Total Caught	0	0	0	43	1	0	2	1	0	0	0	0	37	**84**	
		CPUE[a]	0	0	0	5.5	0.13	0	0.26	0.13	0	0	0	0	4.8	**11**	

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for a fishing method in a study area (i.e., number of fish per angler per 24 hour period, number of fish per gill or hoop net per 24 hour period).

Table F.44: Summary of Fish Catches at the Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, August 2016

Study Area	Fishing Method	Summary Statistic	Fish Species					Total by Fishing Method	Total No. Species (all methods)
			Kokanee	Largescale Sucker	Mountain Whitefish	Northern Pikeminnow	Yellow Perch		
Sand Creek	Gill Netting	Total Caught	4	58	5	10	3	**80**	**5**
		CPUE[a]	0.12	1.8	0.16	0.31	0.093	**2.5**	
Elk River	Gill Netting	Total Caught	10	25	11	10	0	**56**	**4**
		CPUE[a]	0.73	1.9	0.81	0.73	0	**4.2**	
Gold Creek	Gill Netting	Total Caught	0	48	0	11	0	**59**	**2**
		CPUE[a]	0	3.2	0	0.72	0	**3.9**	

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for a fishing method in a study area (i.e., number of fish per angler per 24 hour period, number of fish per hoop net per 24 hour period).

Table F.45: Summary of Externally and Internally Observed Fish Abnormalities at Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, 2014

Fish Species	Study Area	External			Internal				Total Proportion of Fish with Abnormalities
		Sample Size	Damage to Fins, Eye, Operculum, or Scales	Cysts	Sample Size	Excessive Internal Connective Tissue	Parasites	Irregular Size or Discolouration of Liver or Gonads	
Peamouth Chub (April)	Sand Creek	36	0%	0%	36	0%	19%	2.8%	22%
	Elk River	33	3.0%	0%	33	0%	9.1%	3.0%	15%
	Gold Creek	34	0%	0%	34	0%	35%	0%	35%
All Other Fish Species (February, April, August)	Sand Creek[a]	127	0.79%	0%	50	0%	0%	6.0%	6.8%
	Elk River[b]	105	0%	0%	46	0%	0%	0%	0%
	Gold Creek	102	0%	0%	38	0%	2.6%	0%	2.6%

[a] Includes fish caught from the Oestreich Road sampling location in Koocanusa reservoir, February 2014.

[b] Includes fish caught from the Englishmen Creek sampling location in Koocanusa reservoir, February 2014.

Table F.46: Summary of Externally and Internally Observed Fish Abnormalities at Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, 2015

Fish Species	Study Area	External			Internal				Total Proportion of Fish with Abnormalities
		Sample Size	Damage to Fins, Eye, Operculum, or Scales	Cysts	Sample Size	Excessive Internal Connective Tissue	Parasites[a]	Irregular Size or Discolouration of Liver or Gonads	
Largescale Sucker (April)	Sand Creek	7	14%	0%	7	0%	0%	0%	14%
	Elk River	19	0%	0%	17	0%	0%	0%	0%
	Gold Creek	18	0%	0%	16	0%	0%	0%	0%
Northern Pikeminnow (April)	Sand Creek	41	0%	0%	41	0%	0%	0%	0%
	Elk River	41	2.4%	0%	41	0%	0%	0%	2.4%
	Gold Creek	41	0%	0%	41	0%	2.4%	0%	2.4%
Peamouth Chub (April)	Sand Creek	50	2.0%	0%	50	2.0%	10%	0%	14%
	Elk River	55	1.8%	1.8%	54	0%	1.9%	0%	5.5%
	Gold Creek	57	0%	0%	57	0%	5.3%	0%	5.3%
Redside Shiner (April)	Sand Creek	9	0%	0%	8	0%	11%	0%	11%
	Elk River	16	0%	0%	13	0%	46%	0%	46%
	Gold Creek	10	0%	0%	6	0%	83%	0%	83%
Yellow Perch (April)	Sand Creek	27	0%	0%	26	0%	0.038%	0%	0.038%
	Elk River	38	0%	0%	33	0%	3.0%	0%	3.0%
	Gold Creek	36	0%	0%	35	0%	2.9%	0%	2.9%
All Other Fish Species (February, April, August)	Sand Creek	17	0%	0%	9	0%	0%	0%	0%
	Elk River	15	6.7%	0%	10	0%	0%	0%	6.7%
	Gold Creek	3	0%	0%	1	0%	0%	0%	0%

[a] Parasites found were almost exclusively tapeworms; however, parasitic flukes (*Clinostomum marginatum*) were observed on northern pikeminnow at Gold Creek.

Table F.47: Summary of Externally and Internally Observed Fish Abnormalities at Sand Creek, Elk River, and Gold Creek Study Areas in Koocanusa Reservoir, 2016

Fish Species	Study Area	External			Internal				Total Proportion of Fish with Abnormalities
		Sample Size	Damage to Fins, Eye, Operculum, or Scales	Cysts	Sample Size	Excessive Internal Connective Tissue	Parasites[a]	Irregular Size or Discolouration of Liver or Gonads	
Largescale Sucker (April)	Sand Creek	42	7.1%	0%	32	0%	6.3%	0%	13%
	Elk River	37	0%	0%	33	0%	0%	0%	0%
	Gold Creek	35	0%	0%	31	0%	19%	0%	19%
Northern Pikeminnow (April)	Sand Creek	42	2.4%	0%	39	0%	7.7%	0%	10%
	Elk River	43	0%	0%	41	0%	2.4%	0%	2.4%
	Gold Creek	33	0%	0%	32	0%	3.1%	0%	3.1%
Peamouth Chub (April)	Sand Creek	50	0%	0%	50	0%	38%	0%	38%
	Elk River	56	0%	1.8%	53	0%	23%	0%	24%
	Gold Creek	68	0%	0%	66	0%	23%	0%	23%
Redside Shiner (April)	Sand Creek	43	0%	0%	43	0%	30%	0%	30%
	Elk River	42	4.8%	0%	42	0%	38%	0%	43%
	Gold Creek	44	0%	0%	43	0%	37%	0%	37%
Yellow Perch (April)	Sand Creek	34	0%	0%	34	0%	2.9%	0%	2.9%
	Elk River	35	0%	0%	35	0%	20%	0%	20%
	Gold Creek	42	0%	0%	42	0%	7.1%	0%	7.1%
All Other Fish Species[a] (April, August)	Sand Creek	27	0%	0%	3	0%	0%	0%	0%
	Elk River	30	0%	0%	5	0%	0%	0%	0%
	Gold Creek	10	0%	10%	8	0%	0%	0%	10%

[a] Parasites found were exclusively tapeworms; almost all tapeworms were found in body cavity except one found within the operculum of a largescale sucker in Gold Creek.

APPENDIX G
TISSUE CHEMISTRY DATA

Table G.1: Metal Concentrations in Zooplankton (August) and Benthic Invertebrates (April and August) in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Tissue Type	Sample Dry Weight (g)	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw	Ga µg/g dw
2014	T2-2 ZOOT-14	Zooplankton	0.18	99.6	0.0525	1,300	3.36	2.5	36.4	0.0514	0.0156	18,600	1.14	0.62	2.43	0.143	9.19	1,010	0.392
	T2-3 ZOOT-14	Zooplankton	0.16	99.7	0.038	981	3.1	2.08	33.3	0.043	0.0139	18,000	0.966	0.437	1.73	0.12	8.57	737	0.29
	T2-4 ZOOT-14	Zooplankton	0.17	99.7	0.0365	989	3.07	1.94	32.5	0.048	0.0106	18,400	1.02	0.449	1.4	0.127	8.31	696	0.278
	T2-5 ZOOT-14	Zooplankton	0.19	99.6	0.0374	1,040	3.43	1.86	31.2	0.0546	0.00996	17,400	0.971	0.473	1.28	0.13	7.26	680	0.294
	T2-6 ZOOT-14	Zooplankton	0.29	99.4	0.0387	1,250	3.6	1.65	29.9	0.053	0.0127	17,100	1.025	0.566	1.54	0.15	7.08	812	0.382
	T4-2 ZOOT-14	Zooplankton	0.20	99.6	0.0335	1,150	3.34	1.82	34.3	0.0563	0.0122	19,100	0.926	0.598	1.62	0.125	7.62	835	0.333
	T4-3 ZOOT-14	Zooplankton	0.11	99.8	0.0768	982	3.2	2.68	41.6	0.0517	0.0243	23,600	1.1	0.496	1.58	0.111	8.87	746	0.298
	T4-4 ZOOT-14	Zooplankton	0.14	99.7	0.0432	1,050	3.34	2.6	41.3	0.0466	0.0211	24,400	1.02	0.539	1.63	0.12	6.92	805	0.301
	T4-5 ZOOT-14	Zooplankton	0.10	99.8	0.049	1,070	3.23	2.78	39.5	0.0475	0.0336	22,600	1.05	0.521	1.88	0.118	8.3	731	0.309
	T4-6 ZOOT-153-14	Zooplankton	0.11	99.8	0.069	1,160	3.09	3.04	48.1	0.046	0.0152	23,500	1.67	0.464	1.46	0.131	19.1	708	0.338
	T4-6 ZOOT-60-14	Zooplankton	0.052	99.9	0.0715	5,110	3.6	6.7	85.3	0.187	0.0628	27,600	1.46	1.33	6.57	0.492	14.9	3,090	1.59
	T2-B-APR-14	Benthos	0.12	78.3	0.124	10,500	5.43	8.91	131	0.372	0.132	44,200	2.49	5.34	13.6	1.51	42.3	11,200	3.51
	T4-B-APR-14	Benthos	0.17	79.8	0.0983	6,130	5.5	7.25	103	0.288	0.0964	20,500	2.72	3.67	8.42	0.916	22.9	8,500	2.11
	T2-B-AUG-14	Benthos	0.039	95.9	0.0786	8,210	7.02	6	97.4	0.258	0.131	36,900	0.751	4.98	9.78	0.912	17.8	9,290	3.08
	T4-B-AUG-14	Benthos	0.017	95.8	0.224	4,870	4.61	6.7	316	0.223	0.0566	14,600	2.51	4.01	5.72	0.507	20.8	3,460	1.66
2015	TN-01-ZOOT-15	Zooplankton	0.034	99.9	0.0385	477	3.78	8.4	61.8	<0.024	0.0242	45,300	0.773	0.359	2.31	0.0726	8.1	456	0.165
	TN-02-ZOOT-15	Zooplankton	0.037	99.9	0.0313	645	3.86	8.2	67.6	0.027	0.0317	54,800	0.717	0.391	1.54	0.0895	8.82	543	0.213
	TN-03-ZOOT-15	Zooplankton	0.041	99.9	0.0438	431	3.84	4.5	48.1	<0.024	0.0132	37,900	0.814	0.354	1.13	0.076	7.66	459	0.135
	TN-04-ZOOT-15	Zooplankton	0.014	100.0	0.065	1,290	10.1	37	292	<0.20	0.035	221,000	1.72	0.893	2.88	0.177	17.3	1,350	0.495
	TN-05-ZOOT-15	Zooplankton	0.035	99.9	0.0264	229	3.59	2.9	35.5	<0.022	0.0113	27,100	0.702	0.246	1.97	0.0507	7.42	232	0.0739
	T4-01-ZOOT-15	Zooplankton	0.030	99.9	0.0487	344	3.51	9.9	70.9	<0.027	0.009	48,600	0.777	0.283	1.1	0.0483	6.63	255	0.105
	T4-02-ZOOT-15	Zooplankton	0.023	99.9	0.068	584	7.35	15	133	<0.11	0.0196	90,900	1.96	0.603	2.29	0.0927	17.2	538	0.221
	T4-03-ZOOT-15	Zooplankton	0.013	100.0	0.0199	700	2.54	12.4	116	<0.076	0.0142	86,300	0.464	0.353	1.15	0.104	6.61	1,390	0.274
	T4-04-ZOOT-15	Zooplankton	0.013	100.0	0.0157	206	2.3	14.7	105	<0.075	0.0065	75,900	0.595	0.214	0.553	0.0301	5.06	206	0.082
	T4-05-ZOOT-15	Zooplankton	0.018	100.0	0.0221	235	2.8	8.2	90.9	<0.046	0.008	65,100	0.507	0.221	1.14	0.033	6.26	234	0.088
	T2-B-APR-15	Benthos	0.052	86.9	0.121	11,400	3.4	10.7	98.6	0.344	0.109	37,000	3.42	3.64	12.8	1.28	31	9,590	3.69
	T4-B-APR-15	Benthos	0.046	87.4	0.103	6,730	2.92	7	96.3	0.194	0.0629	23,300	3.4	2.36	7.49	0.726	21.2	5,050	2.13
	TN-B-AUG-15	Benthos	0.083	65.1	0.104	6,360	7.87	3.48	88.2	0.27	0.147	248,000	0.339	3.91	8.35	0.857	15.8	9,750	2.42
	T4-B-AUG-15	Benthos	0.032	76.8	0.207	7,960	5.12	12.8	417	0.292	0.0794	27,500	2.28	5.61	8.71	0.83	19.6	6,150	2.55
2016	TN-01-ZooT-Aug-16	Zooplankton	0.081	99.8	0.0314	770	2.82	3.43	60.3	0.0276	0.0175	48,500	0.841	0.418	1.27	0.109	7.02	629	0.261
	TN-02-ZooT-Aug-16	Zooplankton	0.078	99.8	0.0303	483	3.17	3.63	52.1	0.013	0.0112	46,700	0.85	0.37	0.755	0.0924	6.61	427	0.166
	TN-03-ZooT-Aug-16	Zooplankton	0.061	99.9	0.0274	617	2.64	3.69	72.7	0.026	0.012	61,000	0.753	0.391	1	0.0897	6.08	587	0.206
	TN-04-ZooT-Aug-16	Zooplankton	0.076	99.8	0.0264	584	2.8	3.74	63.7	<0.0092	0.00858	54,200	0.765	0.35	0.86	0.0887	6.04	456	0.198
	TN-05-ZooT-Aug-16	Zooplankton	0.077	99.8	0.0216	511	2.12	3.54	52.6	0.0268	0.0102	45,600	0.606	0.281	0.893	0.0769	4.74	419	0.175
	T4-02-ZooT-Aug-16	Zooplankton	0.072	99.8	0.0422	1,850	3.21	4.6	78.9	0.042	0.0458	40,000	0.937	1.03	4.18	0.192	10.5	2,000	0.703
	T4-03-ZooT-Aug-16	Zooplankton	0.060	99.9	0.0263	996	1.71	3.8	41.3	0.0366	0.022	25,500	0.611	0.42	1.58	0.108	6.45	775	0.348
	T4-04-ZooT-Aug-16	Zooplankton	0.050	99.9	0.0348	1,460	2.81	6.48	70.2	0.043	0.0321	44,900	0.878	0.612	2.43	0.167	8.6	1,110	0.521
	T4-05-ZooT-Aug-16	Zooplankton	0.044	99.9	0.0374	1,520	2.87	7.49	75.5	0.061	0.0413	47,600	0.918	0.686	2.72	0.171	9.72	1,270	0.532
	T4-06-ZooT-Aug-16	Zooplankton	0.087	99.8	0.0281	679	2.4	3.34	50	0.0278	0.00803	40,100	0.966	0.356	1.52	0.0912	5.85	567	0.233
	TN-BIT-Aug-16	Benthos	0.04	92.5	0.0598	9,120	8.26	7.18	101	0.287	0.138	46,200	0.599	4.67	11.9	1.14	15.6	12,200	3.52
	T4-BIT-Aug-16	Benthos	0.029	78.4	0.191	4,770	7.76	7.43	200	0.192	0.0682	112,000	2.71	2.59	6.21	0.588	23.2	6,070	1.76
	TN-BIT-1-Apr-16	Benthos	0.31	65.0	0.0346	2,690	2.84	7.64	27.8	0.038	0.0692	10,700	1.71	0.944	3.01	0.259	24.7	3,280	0.999
	T4-BIT-1-Apr-16	Benthos	0.20	78.0	0.167	11,500	3.24	12	125	0.377	0.125	41,800	5.36	3.35	14	1.41	37.2	8,890	4.33

Table G.1: Metal Concentrations in Zooplankton (August) and Benthic Invertebrates (April and August) in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Tissue Type	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw
2014	T2-2 ZOOT-14	Zooplankton	0.0311	6,860	1.57	3,040	64.3	0.382	2,970	1.91	9,410	5.18	9.43	0.00179	0.0327	2.32	0.56	60.9	0.258
	T2-3 ZOOT-14	Zooplankton	0.0304	5,790	1.25	2,990	48	0.34	2,630	1.54	10,100	1.79	9.42	0.00111	0.0147	2.33	0.372	63.7	0.183
	T2-4 ZOOT-14	Zooplankton	0.0322	7,500	1.23	3,170	48	0.348	3,230	1.4	10,700	1.25	11.2	0.0013	0.0127	2.59	0.272	65.2	0.179
	T2-5 ZOOT-14	Zooplankton	0.0323	7,880	1.27	3,030	49.9	0.355	3,420	1.41	9,700	1.04	11.6	0.00137	0.0183	2.61	0.15	61.4	0.181
	T2-6 ZOOT-14	Zooplankton	0.0321	7,530	1.34	2,720	58.4	0.307	3,030	1.61	9,610	1.11	12.2	0.000982	0.0135	2.64	0.147	56.0	0.229
	T4-2 ZOOT-14	Zooplankton	0.0312	7,200	1.38	3,020	67.6	0.393	3,050	1.57	9,400	1.59	8.64	0.00254	0.0164	2.48	0.143	60.4	0.223
	T4-3 ZOOT-14	Zooplankton	0.0326	6,140	1.51	3,970	50.6	0.451	3,190	2.06	10,100	265	8.41	0.00199	0.0805	2.56	0.31	74.9	0.196
	T4-4 ZOOT-14	Zooplankton	0.0299	6,830	1.56	4,020	53.7	0.436	3,570	1.82	9,290	774	9.13	0.0028	0.0496	2.62	0.266	80.5	0.196
	T4-5 ZOOT-14	Zooplankton	0.029	6,880	1.6	4,570	51.5	0.487	3,710	2.02	9,330	635	9.45	0.00282	0.061	2.77	0.225	74.7	0.187
	T4-6 ZOOT-153-14	Zooplankton	0.0557	6,080	1.37	5,070	60.1	0.594	2,470	1.5	14,100	15	9.24	0.00284	0.0844	2.84	0.741	77.7	0.193
	T4-6 ZOOT-60-14	Zooplankton	0.0326	3,750	4.92	6,480	110	0.688	1,440	4.28	8,060	129	10.9	0.0018	0.105	2.84	0.86	95.3	0.947
	T2-B-APR-14	Benthos	0.0778	6,380	13.7	8,070	289	0.836	3,250	12	4,930	8.95	17.9	0.00105	0.0153	4.69	0.231	99.7	3.43
	T4-B-APR-14	Benthos	0.0614	6,220	7.24	4,330	170	0.797	3,520	9.36	5,510	7.38	12.2	0.0015	0.0365	6.18	0.205	47.5	1.92
	T2-B-AUG-14	Benthos	0.065	6,850	10.9	8,100	181	0.583	4,080	8.52	7,090	9.06	14.2	0.00079	0.0179	4.19	0.161	90.8	2.89
	T4-B-AUG-14	Benthos	<0.047	9,320	4.63	3,630	120	0.555	4,990	4.5	10,800	4.43	11	0.0018	0.045	7.5	0.134	36.3	0.93
2015	TN-01-ZOOT-15	Zooplankton	0.0429	5,770	1.95	9,160	27.7	0.822	4,750	1.59	11,100	4.26	7.5	0.00309	0.107	5.58	3.1	147	0.105
	TN-02-ZOOT-15	Zooplankton	0.0419	6,970	2.76	11,800	33.2	0.962	6,000	1.62	10,600	1.47	8.68	0.00381	0.0707	5.89	1.04	174	0.134
	TN-03-ZOOT-15	Zooplankton	0.0358	7,740	1.64	7,160	29.8	0.657	5,340	1.41	11,000	1.96	9.81	0.00205	0.0518	6.37	0.502	109	0.107
	TN-04-ZOOT-15	Zooplankton	0.067	17,900	11.9	57,900	75.6	4.5	21,500	4.46	22,800	4.14	22.6	0.0173	0.278	14.6	2.68	797	0.376
	TN-05-ZOOT-15	Zooplankton	0.0337	7,490	1.33	6,000	18.9	0.556	5,100	0.883	10,400	0.699	9.49	0.00207	0.0498	6.16	0.269	89	0.0498
	T4-01-ZOOT-15	Zooplankton	0.0303	7,510	2.73	13,000	20.3	1.11	6,220	1.34	9,640	1.21	9.59	0.00396	0.0789	5.3	0.447	173	0.0553
	T4-02-ZOOT-15	Zooplankton	0.062	16,500	5.11	23,900	43.7	2.12	12,800	2.68	20,800	1.84	20.1	0.0085	0.14	13.2	0.606	319	0.134
	T4-03-ZOOT-15	Zooplankton	0.035	4,410	4.12	18,000	24.4	1.34	5,960	2	6,450	2.13	5.21	0.0058	0.118	4.9	0.494	284	0.229
	T4-04-ZOOT-15	Zooplankton	0.028	4,820	3.98	20,600	17.1	1.59	6,670	1.14	5,900	0.672	5.76	0.006	0.098	4.6	0.266	271	0.0435
	T4-05-ZOOT-15	Zooplankton	0.026	5,470	3.72	17,600	19.2	1.31	6,450	1.14	7,150	0.844	5.92	0.00752	0.092	4.32	0.393	226	0.0447
	T2-B-APR-15	Benthos	0.0705	6,760	12	7,860	255	0.499	2,530	8.53	5,260	8.01	20.8	0.00049	0.0183	5.85	0.24	88.9	2.99
	T4-B-APR-15	Benthos	0.0604	8,050	6.09	4,650	136	0.533	4,270	4.64	7,830	3.48	12.6	0.00097	0.0223	5.29	0.192	48.7	1.42
	TN-B-AUG-15	Benthos	0.0455	1,490	10.7	7,490	216	0.32	275	8.9	380	36.1	8.07	0.00035	0.0172	1.98	0.122	423	3.44
	T4-B-AUG-15	Benthos	0.0902	7,450	6.58	4,710	199	0.603	2,810	7.91	7,330	5.24	15.5	0.00234	0.0534	6.96	0.208	65.7	1.54
2016	TN-01-ZooT-Aug-16	Zooplankton	0.0441	6,360	1.51	5,560	41.2	0.556	4,680	1.44	12,300	1.54	8.1	0.00157	0.108	3.13	1.03	150	0.202
	TN-02-ZooT-Aug-16	Zooplankton	0.049	7,840	1.31	6,130	34.3	0.608	6,170	1.16	12,800	0.537	9.63	0.00178	0.0363	3.59	0.633	147	0.111
	TN-03-ZooT-Aug-16	Zooplankton	0.0462	5,630	1.53	6,610	41.6	0.597	4,780	1.24	13,900	0.908	6.84	0.00168	0.037	2.65	0.575	191	0.145
	TN-04-ZooT-Aug-16	Zooplankton	0.0471	6,030	1.46	5,970	34.9	0.571	4,940	1.21	13,000	0.587	7.61	0.0015	0.0317	2.89	0.236	170	0.126
	TN-05-ZooT-Aug-16	Zooplankton	0.0351	4,100	1.08	4,430	29.8	0.421	3,180	0.888	10,400	0.562	5.35	0.00101	0.0247	2.15	0.254	140	0.113
	T4-02-ZooT-Aug-16	Zooplankton	0.0405	6,350	2.6	5,990	77	0.719	3,420	2.72	10,800	15.9	9.28	0.00239	0.187	3.65	1.03	113	1.56
	T4-03-ZooT-Aug-16	Zooplankton	0.0271	3,190	1.24	3,030	35	0.302	1,610	1.23	8,080	2.61	5.01	0.00108	0.196	2.41	1.55	72.8	0.287
	T4-04-ZooT-Aug-16	Zooplankton	0.0461	6,890	2.65	7,830	49.1	0.714	4,310	1.9	10,100	1.74	9.66	0.00324	0.199	3.67	1.78	142	0.385
	T4-05-ZooT-Aug-16	Zooplankton	0.0425	6,140	2.47	8,090	51.6	0.749	3,880	2.38	10,500	2.44	8.97	0.00311	0.381	3.33	1.48	155	0.608
	T4-06-ZooT-Aug-16	Zooplankton	0.0369	7,360	1.59	5,310	32	0.493	4,140	1.31	12,100	1.16	9.51	0.00226	0.0331	3.21	0.23	123	0.167
	TN-BIT-Aug-16	Benthos	0.0788	7,080	13	10,100	262	0.561	5,740	9.42	6,430	8.69	16.7	0.00032	0.0146	5.48	0.218	115	3.6
	T4-BIT-Aug-16	Benthos	0.0847	5,420	5	3,840	129	0.449	3,170	5	6,000	3.77	10.6	0.00121	0.0219	6.03	0.107	127	1.35
	TN-BIT-1-Apr-16	Benthos	0.0566	8,800	2.66	3,330	60.4	0.45	5,820	2.17	10,300	2.66	10	<0.00046	0.0292	7.8	0.065	27.2	0.741
	T4-BIT-1-Apr-16	Benthos	0.088	8,010	10.8	8,430	264	0.614	3,570	8.79	5,510	6.98	23.1	0.00092	0.028	9.71	0.292	86.2	3.23

Table G.1: Metal Concentrations in Zooplankton (August) and Benthic Invertebrates (April and August) in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Tissue Type	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	T2-2 ZOOT-14	Zooplankton	18.3	0.0535	0.279	1.54	0.582	80.2	2.11
	T2-3 ZOOT-14	Zooplankton	12.2	0.0557	0.259	1.06	0.41	69.4	1.5
	T2-4 ZOOT-14	Zooplankton	11.6	0.0592	0.245	1.08	0.39	67.8	1.32
	T2-5 ZOOT-14	Zooplankton	11.5	0.064	0.21	1.11	0.374	59.9	1.21
	T2-6 ZOOT-14	Zooplankton	11.7	0.0746	0.174	1.37	0.462	65.2	1.38
	T4-2 ZOOT-14	Zooplankton	12.5	0.0477	0.206	1.26	0.476	59	1.51
	T4-3 ZOOT-14	Zooplankton	11.9	0.0512	0.314	1.22	0.44	76.8	1.45
	T4-4 ZOOT-14	Zooplankton	11.9	0.0574	0.296	1.28	0.473	89.8	1.36
	T4-5 ZOOT-14	Zooplankton	12.6	0.0518	0.324	1.29	0.441	81.2	1.6
	T4-6 ZOOT-153-14	Zooplankton	14.7	0.0653	0.398	1.31	0.463	107	4.32
	T4-6 ZOOT-60-14	Zooplankton	59.8	0.141	0.589	5.77	1.93	178	7.81
	T2-B-APR-14	Benthos	61.4	0.276	0.667	18.9	5.38	92.1	5.93
	T4-B-APR-14	Benthos	43.7	0.215	0.482	13.8	4.62	77.3	5.46
	T2-B-AUG-14	Benthos	94.9	0.134	0.529	10.6	4.34	97.1	4.72
	T4-B-AUG-14	Benthos	55.9	0.256	0.252	8.12	2.09	168	2.41
2015	TN-01-ZOOT-15	Zooplankton	8.92	0.0407	0.697	0.856	0.219	76.7	0.985
	TN-02-ZOOT-15	Zooplankton	11.7	0.042	0.803	1.08	0.262	68.9	1.64
	TN-03-ZOOT-15	Zooplankton	7.34	0.0394	0.484	0.807	0.217	81.9	0.764
	TN-04-ZOOT-15	Zooplankton	38.8	0.128	3.65	2.72	0.606	163	3.24
	TN-05-ZOOT-15	Zooplankton	5.14	0.0405	0.381	0.398	0.109	71.9	0.32
	T4-01-ZOOT-15	Zooplankton	13	0.0375	0.887	0.69	0.115	64.8	4.01
	T4-02-ZOOT-15	Zooplankton	18.5	0.0828	1.79	1.26	0.223	164	10.3
	T4-03-ZOOT-15	Zooplankton	11.9	0.0311	1.35	1.2	0.501	49.4	1.02
	T4-04-ZOOT-15	Zooplankton	5.02	0.0264	1.44	0.629	0.112	44.5	0.58
	T4-05-ZOOT-15	Zooplankton	8.25	0.0305	1.21	0.617	0.105	45.5	0.532
	T2-B-APR-15	Benthos	95.7	0.195	0.434	15.9	4.48	137	4.72
	T4-B-APR-15	Benthos	57.8	0.143	0.227	10.3	2.54	115	2.65
	TN-B-AUG-15	Benthos	91.9	0.0956	1.48	8.74	5.65	38.4	5.69
	T4-B-AUG-15	Benthos	68.7	0.255	0.416	13.5	3.3	138	3.91
2016	TN-01-ZooT-Aug-16	Zooplankton	12	0.0578	0.514	1.16	0.342	82.8	0.991
	TN-02-ZooT-Aug-16	Zooplankton	6.91	0.0598	0.418	0.763	0.2	73.8	0.483
	TN-03-ZooT-Aug-16	Zooplankton	8.03	0.0557	0.584	0.946	0.263	77.3	1.05
	TN-04-ZooT-Aug-16	Zooplankton	9.91	0.0584	0.464	0.838	0.226	89.6	1.85
	TN-05-ZooT-Aug-16	Zooplankton	7.86	0.0438	0.379	0.761	0.198	76.9	0.531
	T4-02-ZooT-Aug-16	Zooplankton	32.9	0.0589	3.01	3.3	1.78	124	1.95
	T4-03-ZooT-Aug-16	Zooplankton	18.1	0.0325	0.493	1.49	0.477	80.1	1.08
	T4-04-ZooT-Aug-16	Zooplankton	26.7	0.0516	0.829	2.14	0.65	102	1.46
	T4-05-ZooT-Aug-16	Zooplankton	29.4	0.0464	1.25	2.41	0.815	108	1.72
	T4-06-ZooT-Aug-16	Zooplankton	10.5	0.0647	0.398	0.961	0.304	76.1	0.716
	TN-BIT-Aug-16	Benthos	94.8	0.107	0.475	11.8	4.29	82.4	4.68
	T4-BIT-Aug-16	Benthos	50.3	0.158	0.219	8.61	2.13	103	2.42
	TN-BIT-1-Apr-16	Benthos	38.2	0.0528	0.155	3.27	1.27	128	1.19
	T4-BIT-1-Apr-16	Benthos	93.8	0.275	0.515	19.1	4.95	101	5.32

Table G.2: Metal Concentrations (µg/g Dry Weight) in Bull Trout Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2014	OR-BT-01M-Feb-14	Oestreich Road	Muscle Plug	78	<0.00078	4.93	0.220	<0.11	0.306	<0.0048	0.00274	994	0.0025	0.0184	0.376	0.262	0.82	16.5
	SC-BT-01M-Aug-14	Sand Creek	Muscle Plug	58	<0.0099	8.2	0.102	<1.3	0.199	<0.029	0.00872	288	<0.0060	0.0276	0.393	0.103	1.08	17.5
	ER-BT-01M-Aug-14	Elk River	Muscle	80	<0.00073	2.95	0.128	<0.11	0.0968	<0.0036	0.000527	526	0.0089	0.0237	0.0923	0.0176	1.14	12.4
2015	SC-BT-01-Feb-15	Sand Creek	Muscle	73	<0.00089	45.1	0.26	<0.33	1.19	<0.018	0.0017	442	0.015	0.039	1.400	0.057	1.22	49.4
	SC-BT-01-Apr-15	Sand Creek	Muscle	67	<0.0013	111.0	0.24	0.95	1.47	<0.026	0.0013	2,050	0.007	0.044	0.521	0.086	0.94	68.3
	ER-BT-02-Apr-15	Elk River	Muscle	76	<0.0022	15.3	0.06	<0.81	0.87	<0.043	0.0022	3,250	0.013	0.120	1.720	0.078	1.72	33.3
	GC-BT-01-Apr-15	Gold Creek	Muscle	76	<0.0017	5.2	0.14	<0.63	0.15	<0.034	0.0008	490	0.006	0.025	0.147	0.061	1.23	20.6
2016	SC-BT-01-Apr-16	Sand Creek	Muscle Plug	72	<0.0039	146	0.139	0.87	1.9	<0.014	0.00202	1,710	0.0848	0.0783	5.62	0.0733	2.09	194
	SC-BT-02-Apr-16	Sand Creek	Muscle Plug	72	0.0063	207	0.143	0.58	2.16	<0.017	0.0067	1,440	0.0301	0.164	1.77	0.146	2.11	259
	SC-BT-03-Apr-16	Sand Creek	Muscle Plug	69	<0.0025	18.7	0.091	<0.21	0.637	<0.0087	0.00091	2,170	0.0144	0.0185	0.205	0.141	1.36	26.2
	SC-BT-04-Apr-16	Sand Creek	Muscle Plug	75	<0.0027	11	0.019	<0.24	0.188	<0.0096	0.00167	431	0.0075	0.0159	0.236	0.108	0.798	19.3
	SC-BT-05-Apr-16	Sand Creek	Muscle Plug	69	<0.0025	44.6	0.043	<0.22	0.429	<0.0088	0.00143	356	0.01	0.0178	0.179	0.136	1.12	33.2
	SC-BT-06-Apr-16	Sand Creek	Muscle Plug	68	<0.0029	14.6	0.109	<0.25	0.304	<0.01	0.00079	1,400	0.0056	0.0193	0.498	0.0736	0.872	36.7
	SC-BT-07-Apr-16	Sand Creek	Muscle Plug	73	<0.0027	4.35	0.072	<0.23	0.0787	<0.0095	0.0006	316	<0.0042	0.0124	0.258	0.0989	0.873	11.6
	SC-BT-08-Apr-16	Sand Creek	Muscle Plug	76	<0.0029	28.8	0.175	<0.25	0.214	<0.01	0.00106	1,100	<0.0045	0.0203	0.193	0.0776	0.867	15.6
	SC-BT-09-Apr-16	Sand Creek	Muscle Plug	77	<0.0018	35	0.565	<0.16	0.391	<0.0063	0.00077	1,320	<0.0028	0.0294	1.03	0.0904	0.803	44.5
	SC-BT-10-Apr-16	Sand Creek	Muscle Plug	76	<0.0026	20.2	0.294	0.23	0.261	<0.0093	0.00127	883	0.0095	0.0215	0.383	0.1	0.984	24.4
	ER-BT-04 M-Apr-16	Elk River	Muscle	74	0.00048	2.88	0.0992	0.1005	0.04955	0.00515	0.00043	297	0.00235	0.009335	0.06255	0.113	1.125	13.8
	ER-BT-06 M-Apr-16	Elk River	Muscle	73	<0.00047	1.04	0.0975	0.111	0.0204	<0.0051	0.000362	196	<0.0023	0.0132	0.0484	0.138	1.15	10.6
	ER-BT-10 M-Apr-16	Elk River	Muscle	71	<0.0005	4.56	0.164	0.161	0.0585	<0.0054	0.000416	351	<0.0024	0.00867	0.0578	0.123	0.952	11.1
	ER-BT-06 O-Apr-16	Elk River	Ovary	68	0.0173	1.64	0.129	0.165	0.227	<0.0031	0.000131	1,650	<0.0023	0.287	0.0867	0.0625	18.2	149
	ER-BT-01-Apr-16	Elk River	Muscle Plug	77	<0.0012	7.67	0.024	<0.24	0.251	<0.0077	0.00188	1,250	<0.004	0.0192	0.473	0.102	1.2	14.3
	ER-BT-02-Apr-16	Elk River	Muscle Plug	78	<0.0012	4.25	0.073	<0.22	0.465	<0.0071	0.0018	3,320	<0.0037	0.0243	0.552	0.0539	0.935	15.3
	ER-BT-03-Apr-16	Elk River	Muscle Plug	76	<0.0014	1.16	<0.02	<0.27	0.137	<0.0088	0.00269	1,230	<0.0045	0.0139	0.143	0.0762	1.05	9.02
	ER-BT-05-Apr-16	Elk River	Muscle Plug	68	<0.0025	6.38	0.153	<0.47	0.0922	<0.015	<0.00041	228	<0.0078	0.0125	0.78	0.0867	0.853	15.3
	ER-BT-07-Apr-16	Elk River	Muscle Plug	64	<0.0024	9.42	0.256	<0.46	0.133	<0.015	0.00054	237	<0.0078	0.0109	0.222	0.0776	0.808	12.8
	ER-BT-08-Apr-16	Elk River	Muscle Plug	78	<0.002	9.55	0.051	<0.38	0.186	<0.012	0.00271	838	<0.0064	0.0374	0.33	0.0953	1.53	16.7
	ER-BT-09-Apr-16	Elk River	Muscle Plug	72	<0.001	22.7	0.178	<0.19	0.386	<0.0064	0.00045	1,000	<0.0033	0.022	0.463	0.101	0.897	26.1
	ER-BT-11-Apr-16	Elk River	Muscle Plug	77	<0.004	56.9	<0.056	<0.76	1.63	<0.025	0.0019	427	<0.013	0.0315	0.273	0.126	1.18	77.6
	ER-BT-12-Apr-16	Elk River	Muscle Plug	64	<0.0012	7.47	0.13	<0.23	2.16	<0.0074	<0.0002	3,920	<0.0038	0.0164	0.253	0.0823	0.576	11.5
	GC-BT-02 M-Apr-16	Gold Creek	Muscle	77	0.000415	1.73	0.0361	0.1	0.0268	0.0026	0.001865	403	0.0013	0.01085	0.0718	0.116	0.947	9.065
	GC-BT-03 M-Apr-16	Gold Creek	Muscle	79	<0.00039	5.44	0.0723	<0.095	0.0839	<0.0025	0.00043	390	0.0021	0.0182	0.0788	0.0322	0.892	17.1
	GC-BT-04 M-Apr-16	Gold Creek	Muscle	77	0.001795	1.47	0.03555	0.1325	0.0712	0.0025	0.00595	1,044	0.0012	0.01715	0.0814	0.0818	1.055	9.765
	GC-BT-05 M-Apr-16	Gold Creek	Muscle	78	<0.00042	1.57	0.0213	0.21	0.0678	<0.0027	0.00267	1,040	<0.0013	0.0182	0.0681	0.0858	1.31	12.9
	GC-BT-06 M-Apr-16	Gold Creek	Muscle	79	<0.00039	1.11	0.0155	0.106	0.028	<0.0025	0.00112	514	<0.0012	0.0211	0.0631	0.0957	0.895	11.6
	GC-BT-07 M-Apr-16	Gold Creek	Muscle	64	<0.00041	1.58	0.33	0.18	0.025	<0.0026	0.00016	264	<0.0013	0.00724	0.088	0.0699	1	9.92
	GC-BT-07 O-Apr-16	Gold Creek	Ovary	71	0.0144	0.41	0.224	<0.1	0.176	<0.0026	<0.00013	1,620	<0.0013	0.235	0.0825	0.0623	16	177
	GC-BT-01-Apr-16	Gold Creek	Muscle Plug	76	0.0026	72.2	0.117	<0.23	0.937	<0.0072	0.00242	390	0.0141	0.0411	0.24	0.128	1.78	86.5

Table G.2: Metal Concentrations (µg/g Dry Weight) in Bull Trout Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw
2014	OR-BT-01M-Feb-14	Oestreich Road	Muscle Plug	0.0107	0.778	16,700	<0.012	1,000	0.715	0.014	3,540	0.119	10,000	0.0294	25	0.00044	0.00294	2.61
	SC-BT-01M-Aug-14	Sand Creek	Muscle Plug	<0.022	0.402	20,100	<0.093	1,400	0.6	0.0191	932	0.247	11,900	0.0625	16.8	<0.0019	<0.0066	1.91
	ER-BT-01M-Aug-14	Elk River	Muscle	0.00968	0.0964	23,700	0.0572	1,370	0.638	0.0060	1,240	0.0531	11,700	0.0371	9.2	<0.00010	0.00134	2.62
2015	SC-BT-01-Feb-15	Sand Creek	Muscle	0.0209	0.500	20,100	0.047	1,230	1.41	0.0163	1,090	0.638	11,700	0.171	13.3	<0.00063	0.0166	1.92
	SC-BT-01-Apr-15	Sand Creek	Muscle	0.0459	0.339	10,700	0.099	953	3.00	0.0221	1,690	0.441	7,890	0.169	13.6	<0.00092	0.0078	1.51
	ER-BT-02-Apr-15	Elk River	Muscle	0.0141	0.340	16,100	<0.036	1,200	1.27	0.0402	2,550	0.911	11,500	0.191	17.5	<0.0015	0.0155	3.30
	GC-BT-01-Apr-15	Gold Creek	Muscle	0.0068	0.703	19,900	<0.028	1,260	0.60	0.0123	1,150	0.198	11,300	0.038	18.2	<0.0012	0.0033	1.54
2016	SC-BT-01-Apr-16	Sand Creek	Muscle Plug	0.057	0.134	19,500	0.119	1,400	3.51	0.0647	867	0.828	11,600	0.631	16.4	0.00027	0.0202	1.89
	SC-BT-02-Apr-16	Sand Creek	Muscle Plug	0.082	0.546	17,700	0.237	1,380	6.21	0.023	1,040	0.513	10,000	1.55	22.2	<0.00032	0.0361	1.3
	SC-BT-03-Apr-16	Sand Creek	Muscle Plug	0.0098	1.02	12,800	<0.025	896	0.943	0.0092	1,040	0.124	8,950	0.225	15.5	<0.00017	0.0071	1.48
	SC-BT-04-Apr-16	Sand Creek	Muscle Plug	<0.008	0.472	19,300	<0.027	1,240	0.825	0.009	805	0.0362	10,800	0.0673	22.7	<0.00018	0.0067	2.35
	SC-BT-05-Apr-16	Sand Creek	Muscle Plug	0.0156	0.601	18,100	0.036	1,160	0.676	0.0078	605	0.107	10,800	0.0758	23.2	<0.00017	0.0112	1.97
	SC-BT-06-Apr-16	Sand Creek	Muscle Plug	<0.0084	0.537	11,900	<0.029	946	0.676	0.0064	1,960	0.0692	7,970	0.0495	15.8	<0.00019	<0.0023	1.54
	SC-BT-07-Apr-16	Sand Creek	Muscle Plug	<0.0079	0.506	19,200	<0.027	1,220	0.412	0.0078	1,290	0.0199	10,700	0.0149	21.1	<0.00018	<0.0022	1.63
	SC-BT-08-Apr-16	Sand Creek	Muscle Plug	0.0126	0.514	17,000	<0.029	1,160	0.588	0.0072	1,470	0.0333	10,000	0.0271	16.4	<0.0002	<0.0023	1.26
	SC-BT-09-Apr-16	Sand Creek	Muscle Plug	0.0208	0.208	20,300	0.022	1,320	1.53	0.0069	1,020	0.0707	11,400	0.0886	17.4	<0.00012	0.0022	1.66
	SC-BT-10-Apr-16	Sand Creek	Muscle Plug	0.0127	0.44	19,500	<0.027	1,250	0.795	0.0106	1,460	0.0553	11,300	0.317	20.8	<0.00018	0.0028	2.45
	ER-BT-04 M-Apr-16	Elk River	Muscle	0.0052	1.015	17,300	0.004	1,007	0.3785	0.00285	886	0.02465	9,910	0.01625	21.95	0.0001155	0.00165	2.18
	ER-BT-06 M-Apr-16	Elk River	Muscle	0.0031	0.506	18,400	<0.0034	1,090	0.201	<0.0028	608	0.017	10,600	0.00391	24	0.000223	<0.0011	2.36
	ER-BT-10 M-Apr-16	Elk River	Muscle	0.0042	0.546	15,400	0.0084	958	0.469	<0.003	690	0.0106	8,900	0.00435	21.1	0.000523	<0.0011	2.17
	ER-BT-06 O-Apr-16	Elk River	Ovary	0.0056	0.0659	6,450	0.0087	1,350	1.93	0.024	4,000	0.0142	9,600	0.00473	10.2	0.00161	<0.00097	7.17
	ER-BT-01-Apr-16	Elk River	Muscle Plug	0.008	0.334	18,500	0.013	1,210	0.609	0.055	725	0.502	11,100	0.0645	21.5	<0.000088	0.0111	2.83
	ER-BT-02-Apr-16	Elk River	Muscle Plug	0.0083	0.279	17,700	0.02	1,210	0.98	0.0136	1,330	0.416	12,000	0.165	18	0.000182	0.0019	2.77
	ER-BT-03-Apr-16	Elk River	Muscle Plug	0.0051	0.634	17,400	<0.014	1,150	0.432	0.0081	1,140	0.094	10,400	0.00858	17.8	<0.0001	<0.0017	2.92
	ER-BT-05-Apr-16	Elk River	Muscle Plug	<0.0056	0.426	12,000	<0.025	869	0.197	<0.012	822	0.085	7,150	0.0597	16.6	0.00026	0.0049	1.68
	ER-BT-07-Apr-16	Elk River	Muscle Plug	0.0063	0.413	9,450	<0.024	753	0.312	<0.012	1,460	0.079	5,930	0.009	12.8	<0.00017	<0.0029	1.49
	ER-BT-08-Apr-16	Elk River	Muscle Plug	0.007	0.301	16,600	0.037	1,070	0.5	<0.01	3,060	0.101	9,740	0.0343	19.5	0.00017	<0.0023	2.8
	ER-BT-09-Apr-16	Elk River	Muscle Plug	0.0128	0.514	13,200	0.029	940	0.811	0.0095	1,100	0.235	8,370	0.0294	18.7	0.000428	0.0046	1.78
	ER-BT-11-Apr-16	Elk River	Muscle Plug	0.021	1.61	13,200	0.079	1,020	1.31	<0.02	1,840	0.168	8,140	0.133	14	<0.00028	0.0063	2.7
	ER-BT-12-Apr-16	Elk River	Muscle Plug	0.0068	0.428	7,990	0.027	594	0.427	0.0082	1,950	0.129	7,380	0.0129	11.4	0.000606	<0.0014	1.55
	GC-BT-02 M-Apr-16	Gold Creek	Muscle	0.00754	0.6755	20,550	0.00335	1,230	0.444	0.00635	784	0.01365	10,500	0.00215	25.6	0.0000585	0.000985	2.26
	GC-BT-03 M-Apr-16	Gold Creek	Muscle	0.0093	0.413	25,700	0.0084	1,450	0.616	0.0078	1,030	0.0146	12,700	0.0204	12.2	0.000097	0.00104	2.55
	GC-BT-04 M-Apr-16	Gold Creek	Muscle	0.011095	0.542	22,450	0.00615	1,340	0.4615	0.0069	911	0.0337	11,950	0.01025	23.95	0.0000775	0.000715	2.72
	GC-BT-05 M-Apr-16	Gold Creek	Muscle	0.00673	0.447	22,400	<0.0036	1,350	0.455	0.0081	991	0.0117	12,000	0.00345	21.8	0.000128	<0.00039	4.26
	GC-BT-06 M-Apr-16	Gold Creek	Muscle	0.00645	0.295	24,500	0.0045	1,380	0.663	0.0069	918	0.0187	12,300	0.00122	24.1	0.000087	<0.00036	2.4
	GC-BT-07 M-Apr-16	Gold Creek	Muscle	0.00381	0.34	11,200	<0.0032	713	0.192	0.0033	664	0.0078	6,340	0.00158	15.3	0.00039	<0.00038	1.26
	GC-BT-07 O-Apr-16	Gold Creek	Ovary	0.0041	0.0759	6,950	0.0089	1,190	1.59	0.0229	4,180	0.0138	8,480	0.00168	12.4	0.00247	0.00063	7.55
	GC-BT-01-Apr-16	Gold Creek	Muscle Plug	0.0299	1.96	12,500	0.054	903	1.76	0.0128	2,260	0.193	8,220	0.419	12.5	<0.00027	0.0094	2.06

Table G.2: Metal Concentrations (µg/g Dry Weight) in Bull Trout Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	OR-BT-01M-Feb-14	Oestreich Road	Muscle Plug	0.00438	1.22	0.000800	0.570	0.0167	0.00051	0.0354	0.00208	28.6	0.00419
	SC-BT-01M-Aug-14	Sand Creek	Muscle Plug	0.0128	0.154	0.00096	0.233	0.0409	<0.0016	0.0148	0.0023	16.1	0.0184
	ER-BT-01M-Aug-14	Elk River	Muscle	0.00650	0.196	0.000526	0.166	0.0657	0.00053	0.00672	0.00187	22.9	0.0100
2015	SC-BT-01-Feb-15	Sand Creek	Muscle	0.0300	1.040	0.00870	0.904	0.0329	0.0018	0.0811	0.018	17.4	0.038
	SC-BT-01-Apr-15	Sand Creek	Muscle	0.0300	1.910	0.01980	2.170	0.0555	0.0044	0.1700	0.033	13.9	0.066
	ER-BT-02-Apr-15	Elk River	Muscle	0.0353	2.240	0.00520	0.276	0.0437	0.0018	0.0376	0.011	35.0	0.014
	GC-BT-01-Apr-15	Gold Creek	Muscle	0.0119	0.229	0.00270	0.336	0.0316	0.0006	0.0126	0.003	27.7	0.014
2016	SC-BT-01-Apr-16	Sand Creek	Muscle Plug	0.0926	1.68	0.0217	3.46	0.048	0.0093	0.471	0.0434	31.2	0.105
	SC-BT-02-Apr-16	Sand Creek	Muscle Plug	0.115	2.79	0.0493	4.73	0.0385	0.0102	0.408	0.11	18.3	0.126
	SC-BT-03-Apr-16	Sand Creek	Muscle Plug	0.0706	1.64	0.00528	0.689	0.0281	0.00206	0.0348	0.00684	15.2	0.0275
	SC-BT-04-Apr-16	Sand Creek	Muscle Plug	0.0254	0.196	0.0014	0.219	0.0498	<0.00081	0.0329	0.00474	16.3	0.0163
	SC-BT-05-Apr-16	Sand Creek	Muscle Plug	0.0146	0.243	0.00643	0.487	0.0423	0.00093	0.0692	0.0103	16.9	0.0252
	SC-BT-06-Apr-16	Sand Creek	Muscle Plug	0.0089	0.955	0.00395	0.224	0.0278	0.00095	0.021	0.00625	14.1	0.0377
	SC-BT-07-Apr-16	Sand Creek	Muscle Plug	0.0052	0.114	0.00051	0.132	0.0353	<0.0008	0.0062	0.00085	12.6	0.0128
	SC-BT-08-Apr-16	Sand Creek	Muscle Plug	0.0046	0.67	0.00212	0.238	0.0271	<0.00086	0.0157	0.0037	14.9	0.0163
	SC-BT-09-Apr-16	Sand Creek	Muscle Plug	0.0084	2.82	0.0112	0.662	0.0323	0.00157	0.0693	0.0244	14.4	0.0195
	SC-BT-10-Apr-16	Sand Creek	Muscle Plug	0.0212	0.533	0.00358	0.286	0.038	0.00087	0.0277	0.00612	16.3	0.0155
	ER-BT-04 M-Apr-16	Elk River	Muscle	0.00491	0.0834	0.000674	0.137	0.02905	0.000304	0.008725	0.00134	12.25	0.008855
	ER-BT-06 M-Apr-16	Elk River	Muscle	<0.00099	0.0572	0.00017	0.0815	0.0801	<0.00006	0.00303	0.00039	12.1	0.00597
	ER-BT-10 M-Apr-16	Elk River	Muscle	0.0106	0.0941	0.000804	0.133	0.0683	0.00019	0.0088	0.00195	11.4	0.00563
	ER-BT-06 O-Apr-16	Elk River	Ovary	<0.0012	1.77	0.00043	0.108	0.0933	0.000348	0.00813	0.00241	180	0.00344
	ER-BT-01-Apr-16	Elk River	Muscle Plug	0.0154	0.783	0.00067	0.257	0.0499	<0.001	0.0111	0.00202	14.5	0.0224
	ER-BT-02-Apr-16	Elk River	Muscle Plug	0.008	2.13	0.00058	0.194	0.0392	<0.00092	0.011	0.00173	60.6	0.0144
	ER-BT-03-Apr-16	Elk River	Muscle Plug	<0.0034	0.759	<0.00026	0.108	0.0329	<0.0011	0.0032	<0.00066	14.9	0.0096
	ER-BT-05-Apr-16	Elk River	Muscle Plug	<0.0059	0.0886	0.00082	0.47	0.0506	<0.002	0.0127	0.0028	19.6	0.0307
	ER-BT-07-Apr-16	Elk River	Muscle Plug	<0.0059	0.114	0.00153	0.18	0.0476	<0.002	0.0194	0.0028	19.7	0.0247
	ER-BT-08-Apr-16	Elk River	Muscle Plug	<0.0048	0.542	0.00133	0.271	0.0488	<0.0016	0.0198	0.00259	19.8	0.0397
	ER-BT-09-Apr-16	Elk River	Muscle Plug	0.0033	0.747	0.00505	0.298	0.0628	0.00102	0.0491	0.00964	12.2	0.025
	ER-BT-11-Apr-16	Elk River	Muscle Plug	<0.0096	0.467	0.016	1.21	0.021	<0.0032	0.0891	0.0167	15.8	0.0362
	ER-BT-12-Apr-16	Elk River	Muscle Plug	<0.0029	2.52	0.00109	0.261	0.0476	0.00203	0.024	0.0032	144	0.0184
	GC-BT-02 M-Apr-16	Gold Creek	Muscle	0.0009	0.07095	0.000197	0.182	0.0329	0.000076	0.00606	0.00066	13	0.00461
	GC-BT-03 M-Apr-16	Gold Creek	Muscle	0.00144	0.157	0.000999	0.198	0.0168	0.000311	0.0116	0.00229	14.4	0.00665
	GC-BT-04 M-Apr-16	Gold Creek	Muscle	0.001465	0.4415	0.000219	0.1165	0.0337	0.000217	0.002875	0.00065	14.6	0.0147
	GC-BT-05 M-Apr-16	Gold Creek	Muscle	<0.00077	0.523	0.000212	0.0869	0.0514	0.000126	0.00267	0.00041	14.5	0.00269
	GC-BT-06 M-Apr-16	Gold Creek	Muscle	0.00083	0.102	0.000114	0.133	0.0447	0.000094	0.00373	0.00071	14.9	0.00458
	GC-BT-07 M-Apr-16	Gold Creek	Muscle	<0.00076	0.077	0.000212	0.081	0.0394	0.000127	0.00244	0.00039	14.3	0.00267
	GC-BT-07 O-Apr-16	Gold Creek	Ovary	0.00082	1.27	0.000133	0.053	0.0973	0.00028	0.00554	0.0023	147	0.00304
	GC-BT-01-Apr-16	Gold Creek	Muscle Plug	0.027	0.538	0.0154	1.72	0.0286	0.00294	0.116	0.0251	21.3	0.194

Table G.3: Metal Concentrations (µg/g Dry Weight) in Burbot Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Total Dry Mass (g)	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw
2014	SC-BB-01M-Feb-14	Sand Creek	Muscle Plug	0.0067	73	<0.0022	13.4	0.132	<0.31	3.77	<0.014
	SC-BB-02M-Feb-14	Sand Creek	Muscle Plug	0.0066	69	<0.0023	3.47	0.175	<0.32	0.162	<0.015
	SC-BB-03M-Feb-14	Sand Creek	Muscle Plug	0.0089	80	<0.0018	18.8	0.121	<0.24	0.551	<0.011
	SC-BB-04M-Feb-14	Sand Creek	Muscle Plug	0.0059	76	<0.0026	39.7	0.218	<0.36	1.68	<0.016
	SC-BB-05M-Feb-14	Sand Creek	Muscle Plug	0.0135	81	0.0014	22.7	0.165	0.21	0.722	<0.0075
	SC-BB-06M-Feb-14	Sand Creek	Muscle	3.0993	79	<0.00038	1.01	0.181	<0.052	0.0363	<0.0024
	SC-BB-06G-Feb-14	Sand Creek	Ovary	4.0732	79	0.00057	0.907	0.530	<0.053	0.0554	<0.0025
	OR-BB-01M-Feb-14	Oestreich Road	Muscle Plug	0.0153	78	<0.0010	7.18	0.161	0.23	0.417	<0.0062
	SC-BB-01M-Apr-14	Sand Creek	Muscle Plug	0.0024	77	<0.0078	284	0.157	<1.1	2.44	<0.048
	SC-BB-02M-Apr-14	Sand Creek	Muscle Plug	0.0136	77	<0.0011	70.1	0.274	<0.15	0.821	<0.0071
	SC-BB-03M-Apr-14	Sand Creek	Muscle Plug	0.0054	63	0.0153	578	0.29	<0.41	5.77	<0.019
	ER-BB-01M-Apr-14	Elk River	Muscle Plug	0.0044	50	<0.0035	114	0.11	<0.47	1.22	<0.022
	ER-BB-02M-Apr-14	Elk River	Muscle Plug	0.0070	74	0.0102	1330	0.532	1.68	13.7	0.045
	SC-BB-01M-Aug-14	Sand Creek	Muscle Plug	0.00357	74	<0.0092	67.9	0.354	<1.2	3.02	<0.027
2015	SC-BB-01-Apr-15	Sand Creek	Muscle Plug	0.0070	77	<0.0015	19.2	0.14	<0.54	0.27	<0.029
	SC-BB-02-Apr-15	Sand Creek	Muscle Plug	0.0088	71	<0.0012	45.2	0.10	<0.44	1.99	<0.023
	SC-BB-03-Apr-15	Sand Creek	Muscle Plug	0.0031	71	<0.0034	14.1	0.24	<1.3	0.37	<0.067
	SC-BB-04-Apr-15	Sand Creek	Muscle Plug	0.0098	75	0.254	16.0	0.17	<0.40	0.23	<0.022
	ER-BB-01-Feb-15	Elk River	Muscle Plug	0.0079	74	<0.0012	57.2	0.17	<0.45	1.64	<0.024
	ER-BB-02-Apr-15	Elk River	Muscle Plug	0.0029	82	<0.0036	25.5	0.15	<1.3	1.22	<0.072
	GC-BB-01-Apr-15	Gold Creek	Muscle Plug	0.0052	80	<0.0020	15.9	0.23	<0.73	0.35	<0.039
	GC-BB-01-Mar-15	Gold Creek	Muscle Plug	1.9928	75	0.0020	2.3	0.24	<0.0965	0.06	<0.0052
2016	ER-BB-01-Apr-16	Elk River	Muscle Plug	0.00511	80	<0.003	51.6	0.177	<0.56	0.576	<0.018
	ER-BB-02-Apr-16	Elk River	Muscle Plug	0.00647	77	<0.0043	41.4	0.15	<0.47	0.652	<0.016
	ER-BB-03-Apr-16	Elk River	Muscle Plug	0.00282	77	<0.0097	32.3	0.194	<1	0.366	<0.036
	ER-BB-04-Apr-16	Elk River	Muscle Plug	0.00184	81	<0.016	5.26	<0.1	<1.7	0.201	<0.058
	ER-BB-05-Apr-16	Elk River	Muscle Plug	0.00449	78	<0.0059	9.19	0.558	<0.64	0.23	<0.022
	ER-BB-06-Apr-16	Elk River	Muscle Plug	0.01115	79	<0.0026	26.8	0.203	<0.28	1.31	<0.0094
	ER-BB-07-Apr-16	Elk River	Muscle Plug	0.00541	79	<0.0053	9.26	0.17	<0.57	0.158	<0.02
	ER-BB-08-Apr-16	Elk River	Muscle Plug	0.00737	78	<0.0038	17.1	0.146	<0.42	1.09	<0.014
	ER-BB-09-Apr-16	Elk River	Muscle Plug	0.0053	81	<0.005	17	0.169	<0.54	1.45	<0.018
	ER-BB-10-Apr-16	Elk River	Muscle Plug	0.00467	81	<0.0063	16.6	0.17	<0.68	0.399	<0.023
	SC-BB-01-Apr-16	Sand Creek	Muscle Plug	0.00332	79	<0.0069	95.6	0.19	<0.6	2.23	<0.024
	SC-BB-02-Apr-16	Sand Creek	Muscle Plug	0.00675	78	<0.0036	27.5	0.44	<0.31	0.314	<0.013
	SC-BB-03-Apr-16	Sand Creek	Muscle Plug	0.00362	80	<0.0064	409	0.226	<0.55	3.7	<0.022
	SC-BB-04-Apr-16	Sand Creek	Muscle Plug	0.00594	80	<0.0041	820	0.542	0.54	7.92	0.019
	SC-BB-05-Apr-16	Sand Creek	Muscle Plug	0.00867	81	<0.0029	142	0.235	<0.25	1.33	<0.01
	SC-BB-06-Apr-16	Sand Creek	Muscle Plug	0.0124	77	<0.0021	53.4	0.256	<0.18	3.38	<0.0074
	SC-BB-07-Apr-16	Sand Creek	Muscle Plug	0.00483	78	<0.0048	31.2	0.552	<0.42	0.394	<0.017
	SC-BB-08-Apr-16	Sand Creek	Muscle Plug	0.00903	80	<0.0027	15.9	0.363	<0.23	0.14	<0.0094
	SC-BB-09-Apr-16	Sand Creek	Muscle Plug	0.01019	79	<0.0023	27.6	0.257	<0.2	0.266	0.0133
	SC-BB-10-Apr-16	Sand Creek	Muscle Plug	0.00891	77	<0.0024	7.31	0.195	<0.3	0.173	<0.0092

Table G.3: Metal Concentrations (µg/g Dry Weight) in Burbot Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw
2014	SC-BB-01M-Feb-14	Sand Creek	Muscle Plug	0.0024	730	0.0107	0.0306	1.85	0.118	0.822
	SC-BB-02M-Feb-14	Sand Creek	Muscle Plug	0.00264	735	<0.0058	0.121	1.49	0.157	1.66
	SC-BB-03M-Feb-14	Sand Creek	Muscle Plug	0.00187	1,350	<0.0044	0.0361	0.468	0.122	1.32
	SC-BB-04M-Feb-14	Sand Creek	Muscle Plug	0.00162	3,160	0.0124	0.0466	0.325	0.0842	3.03
	SC-BB-05M-Feb-14	Sand Creek	Muscle Plug	0.00296	1,350	0.006	0.041	0.976	0.15	1.32
	SC-BB-06M-Feb-14	Sand Creek	Muscle	0.0028	637	<0.0010	0.00866	0.076	0.379	0.787
	SC-BB-06G-Feb-14	Sand Creek	Ovary	0.00561	384	0.00472	0.129	0.0808	0.187	2.38
	OR-BB-01M-Feb-14	Oestreich Road	Muscle Plug	0.00202	793	<0.0025	0.0261	0.5	0.12	1.01
	SC-BB-01M-Apr-14	Sand Creek	Muscle Plug	0.00428	2,790	<0.019	0.119	0.926	0.276	3.21
	SC-BB-02M-Apr-14	Sand Creek	Muscle Plug	0.0022	896	0.003	0.0374	0.191	0.191	1.68
	SC-BB-03M-Apr-14	Sand Creek	Muscle Plug	0.00802	4,490	<0.0074	0.182	1.47	0.356	1.39
	ER-BB-01M-Apr-14	Elk River	Muscle Plug	0.00172	1,470	<0.0086	0.0507	0.297	0.109	0.847
	ER-BB-02M-Apr-14	Elk River	Muscle Plug	0.0127	5,060	0.0531	0.368	2.61	0.3	2.03
	SC-BB-01M-Aug-14	Sand Creek	Muscle Plug	0.00478	875	0.0146	0.039	0.437	0.0701	2.18
2015	SC-BB-01-Apr-15	Sand Creek	Muscle Plug	0.0022	464	<0.005	0.026	1.720	0.111	1.17
	SC-BB-02-Apr-15	Sand Creek	Muscle Plug	0.0030	2,000	0.117	0.036	2.460	0.151	1.85
	SC-BB-03-Apr-15	Sand Creek	Muscle Plug	<0.0012	842	<0.012	0.027	1.280	0.189	1.31
	SC-BB-04-Apr-15	Sand Creek	Muscle Plug	0.0025	361	0.004	0.061	2.010	0.132	1.71
	ER-BB-01-Feb-15	Elk River	Muscle Plug	0.0044	1,750	0.005	0.044	1.360	0.189	1.56
	ER-BB-02-Apr-15	Elk River	Muscle Plug	0.0013	1,980	<0.012	0.038	1.670	0.062	1.31
	GC-BB-01-Apr-15	Gold Creek	Muscle Plug	0.0029	484	0.015	0.033	1.030	0.090	1.32
	GC-BB-01-Mar-15	Gold Creek	Muscle Plug	0.0009	272	0.002	0.013	0.064	0.145	1.70
2016	ER-BB-01-Apr-16	Elk River	Muscle Plug	0.00207	678	<0.0095	0.0295	0.177	0.104	0.74
	ER-BB-02-Apr-16	Elk River	Muscle Plug	0.00264	805	<0.012	0.0456	3.91	0.11	1.31
	ER-BB-03-Apr-16	Elk River	Muscle Plug	0.00148	597	<0.027	0.0384	0.254	0.0788	1.31
	ER-BB-04-Apr-16	Elk River	Muscle Plug	0.00196	482	<0.043	0.0234	0.266	0.0936	1.7
	ER-BB-05-Apr-16	Elk River	Muscle Plug	0.002	514	<0.016	0.0224	0.289	0.0843	0.773
	ER-BB-06-Apr-16	Elk River	Muscle Plug	0.00282	2,080	<0.007	0.028	0.152	0.0715	1.25
	ER-BB-07-Apr-16	Elk River	Muscle Plug	0.00173	610	<0.015	0.0183	0.26	0.14	1
	ER-BB-08-Apr-16	Elk River	Muscle Plug	0.00228	1,940	<0.011	0.0405	1.24	0.0833	1.37
	ER-BB-09-Apr-16	Elk River	Muscle Plug	0.00079	1,990	<0.014	0.0374	0.092	0.0609	0.94
	ER-BB-10-Apr-16	Elk River	Muscle Plug	0.00092	977	<0.017	0.0423	0.987	0.0494	1.83
	SC-BB-01-Apr-16	Sand Creek	Muscle Plug	0.0138	690	0.027	0.059	3.04	0.185	1.95
	SC-BB-02-Apr-16	Sand Creek	Muscle Plug	0.00274	652	<0.0055	0.0222	0.376	0.114	0.769
	SC-BB-03-Apr-16	Sand Creek	Muscle Plug	0.00369	1,940	0.0334	0.141	3.19	0.184	1.32
	SC-BB-04-Apr-16	Sand Creek	Muscle Plug	0.00713	3,670	0.0113	0.269	1.05	0.209	1.47
	SC-BB-05-Apr-16	Sand Creek	Muscle Plug	0.00236	952	<0.0045	0.0524	1.28	0.2	1.08
	SC-BB-06-Apr-16	Sand Creek	Muscle Plug	0.00194	641	0.0248	0.028	0.323	0.167	0.993
	SC-BB-07-Apr-16	Sand Creek	Muscle Plug	0.002	783	0.0147	0.0206	0.233	0.108	1.66
	SC-BB-08-Apr-16	Sand Creek	Muscle Plug	0.00161	499	<0.0042	0.0178	0.076	0.15	0.857
	SC-BB-09-Apr-16	Sand Creek	Muscle Plug	0.00173	580	<0.0036	0.0174	0.23	0.156	0.94
	SC-BB-10-Apr-16	Sand Creek	Muscle Plug	0.00187	690	<0.0034	0.0266	1.12	0.161	0.816

Table G.3: Metal Concentrations (µg/g Dry Weight) in Burbot Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dw	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw
2014	SC-BB-01M-Feb-14	Sand Creek	Muscle Plug	35.1	0.014	0.405	16,900	<0.034	1,110	1.58
	SC-BB-02M-Feb-14	Sand Creek	Muscle Plug	23.8	0.0094	1.02	15,700	<0.035	979	1.47
	SC-BB-03M-Feb-14	Sand Creek	Muscle Plug	24.9	0.0166	0.539	15,600	<0.026	1,060	1.58
	SC-BB-04M-Feb-14	Sand Creek	Muscle Plug	48.3	0.0218	0.462	11,600	0.043	902	2.4
	SC-BB-05M-Feb-14	Sand Creek	Muscle Plug	30.5	0.0216	0.443	16,900	0.025	1,070	1.8
	SC-BB-06M-Feb-14	Sand Creek	Muscle	7.23	0.00976	1.11	19,200	<0.0058	1,150	0.915
	SC-BB-06G-Feb-14	Sand Creek	Ovary	57.4	0.0153	0.340	17,450	<0.0058	792	1.55
	OR-BB-01M-Feb-14	Oestreich Road	Muscle Plug	12.2	0.0113	0.467	16,300	<0.015	962	0.946
	SC-BB-01M-Apr-14	Sand Creek	Muscle Plug	288	0.124	1.26	17,900	0.34	1,960	4.68
	SC-BB-02M-Apr-14	Sand Creek	Muscle Plug	76.7	0.0345	0.958	16,700	0.053	1,100	2.06
	SC-BB-03M-Apr-14	Sand Creek	Muscle Plug	462	0.284	0.459	18,600	0.448	1,760	9.97
	ER-BB-01M-Apr-14	Elk River	Muscle Plug	90	0.0515	0.231	16,400	0.098	1,140	2.78
	ER-BB-02M-Apr-14	Elk River	Muscle Plug	1060	0.479	1.40	14,900	0.989	1,920	35.7
	SC-BB-01M-Aug-14	Sand Creek	Muscle Plug	69.8	0.02	0.143	12,800	<0.087	1,220	2.21
2015	SC-BB-01-Apr-15	Sand Creek	Muscle Plug	27.9	0.0124	0.647	13,900	<0.024	972	0.98
	SC-BB-02-Apr-15	Sand Creek	Muscle Plug	58.5	0.0229	1.330	11,500	0.066	987	2.38
	SC-BB-03-Apr-15	Sand Creek	Muscle Plug	19.7	<0.0074	0.566	16,700	<0.056	1,120	1.11
	SC-BB-04-Apr-15	Sand Creek	Muscle Plug	26.0	0.0112	0.675	14,000	<0.018	962	1.13
	ER-BB-01-Feb-15	Elk River	Muscle Plug	66.9	0.0251	0.477	15,200	0.069	1,060	2.57
	ER-BB-02-Apr-15	Elk River	Muscle Plug	27.4	0.0121	0.252	13,300	<0.060	1,100	2.44
	GC-BB-01-Apr-15	Gold Creek	Muscle Plug	42.3	0.0124	0.387	18,600	<0.033	1,270	1.22
	GC-BB-01-Mar-15	Gold Creek	Muscle Plug	16.1	0.0055	0.589	15,150	<0.0043	966	0.42
2016	ER-BB-01-Apr-16	Elk River	Muscle Plug	40.5	0.0194	0.223	17,000	0.059	1,230	1.62
	ER-BB-02-Apr-16	Elk River	Muscle Plug	71.1	0.0224	0.257	17,200	0.043	1,250	1.91
	ER-BB-03-Apr-16	Elk River	Muscle Plug	31.1	0.013	0.296	15,900	0.047	1,140	1.3
	ER-BB-04-Apr-16	Elk River	Muscle Plug	11.2	<0.014	0.459	13,100	<0.074	1,150	1.03
	ER-BB-05-Apr-16	Elk River	Muscle Plug	11.4	0.0068	0.442	16,100	<0.028	1,200	0.917
	ER-BB-06-Apr-16	Elk River	Muscle Plug	33.7	0.0172	0.144	13,600	0.022	1,040	2.25
	ER-BB-07-Apr-16	Elk River	Muscle Plug	14.9	0.01	0.247	17,400	<0.025	1,260	1.35
	ER-BB-08-Apr-16	Elk River	Muscle Plug	29.4	0.0098	0.351	13,900	0.022	990	1.97
	ER-BB-09-Apr-16	Elk River	Muscle Plug	19	0.009	0.147	13,600	0.027	1,110	2.2
	ER-BB-10-Apr-16	Elk River	Muscle Plug	30.8	0.0065	0.267	12,500	<0.03	1,070	1.64
	SC-BB-01-Apr-16	Sand Creek	Muscle Plug	123	0.043	0.532	17,200	0.091	1,250	4.07
	SC-BB-02-Apr-16	Sand Creek	Muscle Plug	27.6	0.013	0.263	15,800	<0.036	1,230	1.29
	SC-BB-03-Apr-16	Sand Creek	Muscle Plug	357	0.163	0.327	14,900	0.449	1,430	6.88
	SC-BB-04-Apr-16	Sand Creek	Muscle Plug	668	0.35	0.285	13,900	0.856	1,740	13.2
	SC-BB-05-Apr-16	Sand Creek	Muscle Plug	121	0.0519	0.359	16,700	0.144	1,240	2.77
	SC-BB-06-Apr-16	Sand Creek	Muscle Plug	89	0.0221	0.276	16,300	0.035	1,200	1.64
	SC-BB-07-Apr-16	Sand Creek	Muscle Plug	30.3	<0.014	0.336	15,200	<0.049	1,080	1.02
	SC-BB-08-Apr-16	Sand Creek	Muscle Plug	19.8	0.0098	0.265	17,400	<0.027	1,200	0.932
	SC-BB-09-Apr-16	Sand Creek	Muscle Plug	25.1	0.0157	0.328	17,500	<0.024	1,280	0.929
	SC-BB-10-Apr-16	Sand Creek	Muscle Plug	18.4	0.006	0.257	16,000	<0.02	1,180	0.94

Table G.3: Metal Concentrations (µg/g Dry Weight) in Burbot Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw
2014	SC-BB-01M-Feb-14	Sand Creek	Muscle Plug	0.0262	2,200	2.18	8,700	0.373	23	<0.00033
	SC-BB-02M-Feb-14	Sand Creek	Muscle Plug	0.0278	3,690	0.783	8,930	0.0487	24.2	0.00173
	SC-BB-03M-Feb-14	Sand Creek	Muscle Plug	0.028	4,850	0.296	9,420	0.0985	21.3	0.00185
	SC-BB-04M-Feb-14	Sand Creek	Muscle Plug	0.0353	5,980	0.271	9,640	0.212	13.7	0.0073
	SC-BB-05M-Feb-14	Sand Creek	Muscle Plug	0.0345	4,830	0.521	9,950	0.204	23	0.00264
	SC-BB-06M-Feb-14	Sand Creek	Muscle	0.00554	1,850	0.0124	9,230	0.0128	31.6	<0.000056
	SC-BB-06G-Feb-14	Sand Creek	Ovary	0.122	6,670	0.0309	15,600	0.0140	28.3	0.000420
	OR-BB-01M-Feb-14	Oestreich Road	Muscle Plug	0.0231	3,650	0.27	9,240	0.0153	21.6	0.00127
	SC-BB-01M-Apr-14	Sand Creek	Muscle Plug	0.023	6,130	1.39	10,100	0.73	27.5	<0.0011
	SC-BB-02M-Apr-14	Sand Creek	Muscle Plug	0.0075	3,600	0.424	9,860	0.0756	24.2	0.00107
	SC-BB-03M-Apr-14	Sand Creek	Muscle Plug	0.0965	3,460	3.38	11,100	0.604	30	<0.00044
	ER-BB-01M-Apr-14	Elk River	Muscle Plug	0.0096	4,960	0.182	9,470	0.0661	22.1	0.00157
	ER-BB-02M-Apr-14	Elk River	Muscle Plug	0.0838	4,650	1.48	7,920	0.644	16.9	0.00412
	SC-BB-01M-Aug-14	Sand Creek	Muscle Plug	0.0207	1,510	0.385	7,200	0.329	10.1	<0.0018
2015	SC-BB-01-Apr-15	Sand Creek	Muscle Plug	0.0299	2,730	0.831	8,360	0.185	18.3	<0.0010
	SC-BB-02-Apr-15	Sand Creek	Muscle Plug	0.0402	1,320	1.870	8,520	0.109	19.1	<0.00083
	SC-BB-03-Apr-15	Sand Creek	Muscle Plug	0.0266	2,310	0.797	10,100	0.057	28.4	<0.0024
	SC-BB-04-Apr-15	Sand Creek	Muscle Plug	0.0432	1,800	0.981	8,620	0.050	22.9	<0.00077
	ER-BB-01-Feb-15	Elk River	Muscle Plug	0.0280	4,310	0.688	9,630	0.186	28.9	<0.00086
	ER-BB-02-Apr-15	Elk River	Muscle Plug	0.0583	3,190	0.680	8,860	0.049	14.2	<0.0026
	GC-BB-01-Apr-15	Gold Creek	Muscle Plug	0.0301	1,920	0.355	10,800	0.128	22.6	<0.0014
	GC-BB-01-Mar-15	Gold Creek	Muscle Plug	0.0051	1,625	0.054	8,410	0.189	18.3	<0.000185
2016	ER-BB-01-Apr-16	Elk River	Muscle Plug	<0.015	1,780	0.126	9,640	0.0603	21.9	<0.00021
	ER-BB-02-Apr-16	Elk River	Muscle Plug	0.0202	2,540	0.333	10,200	0.16	21.8	<0.00026
	ER-BB-03-Apr-16	Elk River	Muscle Plug	<0.017	3,100	0.196	9,250	0.108	17.7	<0.00057
	ER-BB-04-Apr-16	Elk River	Muscle Plug	<0.027	2,850	0.381	8,640	0.048	17.1	<0.00093
	ER-BB-05-Apr-16	Elk River	Muscle Plug	0.014	2,800	0.055	9,870	0.0266	20.3	<0.00035
	ER-BB-06-Apr-16	Elk River	Muscle Plug	0.0226	3,520	0.291	9,840	0.059	18.2	0.00071
	ER-BB-07-Apr-16	Elk River	Muscle Plug	0.0117	3,100	0.141	10,200	0.0138	26.7	0.00146
	ER-BB-08-Apr-16	Elk River	Muscle Plug	0.0362	3,070	0.61	9,670	0.0376	18.3	0.00028
	ER-BB-09-Apr-16	Elk River	Muscle Plug	0.0269	3,520	0.096	9,230	0.0517	17.2	0.00131
	ER-BB-10-Apr-16	Elk River	Muscle Plug	0.018	4,880	0.198	8,210	0.0784	13.9	0.00117
	SC-BB-01-Apr-16	Sand Creek	Muscle Plug	0.031	2,590	0.312	9,480	0.683	25.5	<0.00047
	SC-BB-02-Apr-16	Sand Creek	Muscle Plug	<0.0072	1,990	0.134	8,660	0.0671	19.4	0.00044
	SC-BB-03-Apr-16	Sand Creek	Muscle Plug	0.02	4,000	0.465	8,500	0.486	21.8	<0.00043
	SC-BB-04-Apr-16	Sand Creek	Muscle Plug	0.0319	1,470	0.849	8,140	0.782	22.4	<0.00028
	SC-BB-05-Apr-16	Sand Creek	Muscle Plug	0.0208	2,280	0.266	9,540	0.15	29.8	<0.00019
	SC-BB-06-Apr-16	Sand Creek	Muscle Plug	0.0475	1,410	0.0917	9,780	0.111	25.6	<0.00014
	SC-BB-07-Apr-16	Sand Creek	Muscle Plug	0.0177	3,340	0.083	8,840	0.0821	18.2	0.00075
	SC-BB-08-Apr-16	Sand Creek	Muscle Plug	0.0108	2,310	0.0383	10,000	0.0146	23.4	<0.00018
	SC-BB-09-Apr-16	Sand Creek	Muscle Plug	0.0093	1,710	0.0476	10,400	0.0577	29	<0.00016
	SC-BB-10-Apr-16	Sand Creek	Muscle Plug	0.011	2,190	0.195	9,220	0.164	26.1	<0.00034

Table G.3: Metal Concentrations (µg/g Dry Weight) in Burbot Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sb µg/g dw	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw
2014	SC-BB-01M-Feb-14	Sand Creek	Muscle Plug	0.0135	3.19	0.108	1.1	0.00124	0.894	0.00952
	SC-BB-02M-Feb-14	Sand Creek	Muscle Plug	0.0035	2.56	0.0255	0.7	0.00036	0.163	0.0106
	SC-BB-03M-Feb-14	Sand Creek	Muscle Plug	0.0102	2.84	0.0404	1.62	0.00377	0.486	0.0136
	SC-BB-04M-Feb-14	Sand Creek	Muscle Plug	0.0147	2.87	0.111	4.72	0.00702	1.01	0.0191
	SC-BB-05M-Feb-14	Sand Creek	Muscle Plug	0.0124	2.88	0.0975	1.94	0.00594	0.523	0.0102
	SC-BB-06M-Feb-14	Sand Creek	Muscle	0.00683	2.42	0.00337	0.487	0.00017	0.108	0.0145
	SC-BB-06G-Feb-14	Sand Creek	Ovary	0.00467	4.33	0.00637	0.584	0.000179	0.115	0.0525
	OR-BB-01M-Feb-14	Oestreich Road	Muscle Plug	0.00204	3.34	0.00501	0.947	0.00093	0.245	0.012
	SC-BB-01M-Apr-14	Sand Creek	Muscle Plug	0.023	3.49	0.0797	2.45	0.0952	4.49	0.0106
	SC-BB-02M-Apr-14	Sand Creek	Muscle Plug	0.00629	2.95	0.0188	1.21	0.0137	1.32	0.0177
	SC-BB-03M-Apr-14	Sand Creek	Muscle Plug	0.0156	1.95	0.191	7.53	0.193	8.43	0.0196
	ER-BB-01M-Apr-14	Elk River	Muscle Plug	0.0042	3.6	0.0081	2.02	0.0143	1.8	0.018
	ER-BB-02M-Apr-14	Elk River	Muscle Plug	0.0306	3.05	0.0471	7.45	0.241	13.4	0.0359
	SC-BB-01M-Aug-14	Sand Creek	Muscle Plug	0.0175	1.63	0.0472	1.47	0.0113	1.68	0.0163
2015	SC-BB-01-Apr-15	Sand Creek	Muscle Plug	0.0077	2.92	0.0392	0.532	0.00580	0.565	0.0104
	SC-BB-02-Apr-15	Sand Creek	Muscle Plug	0.0056	2.58	0.0215	3.370	0.00650	0.950	0.0096
	SC-BB-03-Apr-15	Sand Creek	Muscle Plug	0.0059	2.90	0.0085	1.070	<0.0054	0.240	0.0212
	SC-BB-04-Apr-15	Sand Creek	Muscle Plug	0.0046	3.41	0.0117	0.403	0.00190	0.365	0.0143
	ER-BB-01-Feb-15	Elk River	Muscle Plug	0.0104	1.87	0.0431	2.770	0.01210	2.650	0.0173
	ER-BB-02-Apr-15	Elk River	Muscle Plug	0.0042	5.30	0.0112	2.880	<0.0058	0.936	0.0224
	GC-BB-01-Apr-15	Gold Creek	Muscle Plug	0.0094	3.08	0.0377	0.345	0.00330	0.740	0.0267
	GC-BB-01-Mar-15	Gold Creek	Muscle Plug	0.0057	2.93	0.0025	0.229	0.00045	0.129	0.0225
2016	ER-BB-01-Apr-16	Elk River	Muscle Plug	0.0035	1.82	0.0088	0.628	0.00758	1.03	0.0201
	ER-BB-02-Apr-16	Elk River	Muscle Plug	0.095	3.08	0.0142	0.958	0.00812	1.02	0.0219
	ER-BB-03-Apr-16	Elk River	Muscle Plug	<0.011	4.3	0.016	0.486	0.0078	0.9	0.0256
	ER-BB-04-Apr-16	Elk River	Muscle Plug	<0.018	<2.9	<0.023	0.53	<0.0017	0.3	0.0188
	ER-BB-05-Apr-16	Elk River	Muscle Plug	<0.0068	2.3	<0.0087	0.304	0.00097	0.5	0.0118
	ER-BB-06-Apr-16	Elk River	Muscle Plug	<0.0029	4.09	0.0053	3.24	0.00685	0.652	0.0187
	ER-BB-07-Apr-16	Elk River	Muscle Plug	<0.0061	2.96	<0.0078	0.371	0.00086	0.281	0.023
	ER-BB-08-Apr-16	Elk River	Muscle Plug	<0.0044	3.54	<0.0057	2.77	0.00289	0.356	0.0167
	ER-BB-09-Apr-16	Elk River	Muscle Plug	<0.0057	3.98	<0.0073	2.87	0.00362	0.348	0.0165
	ER-BB-10-Apr-16	Elk River	Muscle Plug	0.0362	4.6	0.432	1.2	0.00554	0.561	0.0184
	SC-BB-01-Apr-16	Sand Creek	Muscle Plug	0.0282	3.4	0.0606	1.03	0.0141	3.15	0.0143
	SC-BB-02-Apr-16	Sand Creek	Muscle Plug	0.0033	6.27	0.0107	0.485	0.00595	0.42	0.0212
	SC-BB-03-Apr-16	Sand Creek	Muscle Plug	0.0119	1.63	0.0512	3.99	0.101	9.65	0.0268
	SC-BB-04-Apr-16	Sand Creek	Muscle Plug	0.013	2.39	0.038	8.25	0.27	16.4	0.0268
	SC-BB-05-Apr-16	Sand Creek	Muscle Plug	0.004	2.26	0.0134	1.29	0.0413	2.57	0.0139
	SC-BB-06-Apr-16	Sand Creek	Muscle Plug	0.0078	1.8	0.0343	1.81	0.0068	0.687	0.0196
	SC-BB-07-Apr-16	Sand Creek	Muscle Plug	0.0098	4.06	0.0343	0.764	0.00515	0.578	0.0214
	SC-BB-08-Apr-16	Sand Creek	Muscle Plug	<0.0022	1.39	0.0039	0.329	0.00153	0.203	0.0201
	SC-BB-09-Apr-16	Sand Creek	Muscle Plug	<0.0019	1.98	0.0035	0.354	0.00305	0.399	0.0212
	SC-BB-10-Apr-16	Sand Creek	Muscle Plug	0.0047	2.21	0.307	0.668	0.00247	0.35	0.0201

Table G.3: Metal Concentrations (µg/g Dry Weight) in Burbot Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	SC-BB-01M-Feb-14	Sand Creek	Muscle Plug	<0.00064	0.0356	0.00394	14.8	0.0312
	SC-BB-02M-Feb-14	Sand Creek	Muscle Plug	<0.00067	0.0197	0.00132	33	0.0082
	SC-BB-03M-Feb-14	Sand Creek	Muscle Plug	0.0008	0.0335	0.00566	30.1	0.0167
	SC-BB-04M-Feb-14	Sand Creek	Muscle Plug	0.00212	0.0555	0.0138	65.8	0.0334
	SC-BB-05M-Feb-14	Sand Creek	Muscle Plug	0.00279	0.0387	0.00963	28.2	0.0234
	SC-BB-06M-Feb-14	Sand Creek	Muscle	0.0002	0.00282	0.00133	15.3	0.00502
	SC-BB-06G-Feb-14	Sand Creek	Ovary	0.00056	0.0147	0.00125	141	0.0152
	OR-BB-01M-Feb-14	Oestreich Road	Muscle Plug	0.00032	0.0171	0.00214	24.6	0.0089
	SC-BB-01M-Apr-14	Sand Creek	Muscle Plug	0.0088	0.266	0.0911	28.2	0.178
	SC-BB-02M-Apr-14	Sand Creek	Muscle Plug	0.00228	0.0935	0.0203	29.9	0.0502
	SC-BB-03M-Apr-14	Sand Creek	Muscle Plug	0.0197	0.641	0.234	27.1	0.281
	ER-BB-01M-Apr-14	Elk River	Muscle Plug	0.003	0.18	0.0308	21	0.0667
	ER-BB-02M-Apr-14	Elk River	Muscle Plug	0.0574	3.32	0.674	28.5	0.717
	SC-BB-01M-Aug-14	Sand Creek	Muscle Plug	0.0043	0.162	0.0281	39.8	0.0897
2015	SC-BB-01-Apr-15	Sand Creek	Muscle Plug	0.0016	0.0351	0.010	24.7	0.027
	SC-BB-02-Apr-15	Sand Creek	Muscle Plug	0.0028	0.0844	0.017	38.5	0.034
	SC-BB-03-Apr-15	Sand Creek	Muscle Plug	0.0010	0.0276	0.008	25.2	0.018
	SC-BB-04-Apr-15	Sand Creek	Muscle Plug	0.0010	0.0309	0.005	24.6	0.084
	ER-BB-01-Feb-15	Elk River	Muscle Plug	0.0030	0.1190	0.019	32.0	0.061
	ER-BB-02-Apr-15	Elk River	Muscle Plug	0.0024	0.0451	0.006	33.2	0.031
	GC-BB-01-Apr-15	Gold Creek	Muscle Plug	0.0016	0.0306	0.004	33.5	0.033
	GC-BB-01-Mar-15	Gold Creek	Muscle Plug	0.0001	0.0040	0.001	24.1	0.011
2016	ER-BB-01-Apr-16	Elk River	Muscle Plug	<0.0024	0.0986	0.0202	17.2	0.0332
	ER-BB-02-Apr-16	Elk River	Muscle Plug	0.0153	0.153	0.0121	38	0.0442
	ER-BB-03-Apr-16	Elk River	Muscle Plug	0.00164	0.0661	0.0137	29.3	0.0382
	ER-BB-04-Apr-16	Elk River	Muscle Plug	0.00086	0.0124	0.004	31.8	0.0356
	ER-BB-05-Apr-16	Elk River	Muscle Plug	0.00098	0.0171	0.00221	24.7	0.0199
	ER-BB-06-Apr-16	Elk River	Muscle Plug	0.00274	0.0598	0.0129	34.1	0.0271
	ER-BB-07-Apr-16	Elk River	Muscle Plug	0.00056	0.0246	0.00184	20	0.0852
	ER-BB-08-Apr-16	Elk River	Muscle Plug	0.00127	0.0423	0.00786	36.5	0.0227
	ER-BB-09-Apr-16	Elk River	Muscle Plug	0.00171	0.0341	0.00896	28	0.0283
	ER-BB-10-Apr-16	Elk River	Muscle Plug	0.0102	0.0421	0.00742	45.5	0.0314
	SC-BB-01-Apr-16	Sand Creek	Muscle Plug	0.0068	0.249	0.0386	27.6	0.104
	SC-BB-02-Apr-16	Sand Creek	Muscle Plug	0.0014	0.0393	0.0102	16.3	0.023
	SC-BB-03-Apr-16	Sand Creek	Muscle Plug	0.0138	0.576	0.155	21.1	0.167
	SC-BB-04-Apr-16	Sand Creek	Muscle Plug	0.0403	1.03	0.381	25.2	0.353
	SC-BB-05-Apr-16	Sand Creek	Muscle Plug	0.00481	0.182	0.0589	23.3	0.088
	SC-BB-06-Apr-16	Sand Creek	Muscle Plug	0.00169	0.0657	0.0101	19.4	0.0364
	SC-BB-07-Apr-16	Sand Creek	Muscle Plug	0.0015	0.0455	0.0084	35.8	0.029
	SC-BB-08-Apr-16	Sand Creek	Muscle Plug	<0.0008	0.012	0.00302	20.8	0.0154
	SC-BB-09-Apr-16	Sand Creek	Muscle Plug	0.00085	0.0426	0.00491	16.7	0.0201
	SC-BB-10-Apr-16	Sand Creek	Muscle Plug	0.00318	0.0227	0.00459	18.3	0.0566

Table G.4: Metal Concentrations (µg/g Dry Weight) in Kokanee Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	SC-KO-01M-Aug-14	Sand Creek	Muscle	1.48	0.0796	0.43	0.00696	0.912	0.0436	0.00206	0.0841	0.0124	21.1	0.0461
	SC-KO-10M-Aug-14	Sand Creek	Muscle	1.85	0.07960	0.43	<0.006960	0.9120	0.0436	0.00206	0.08410	<0.01240	21.1	0.0461
	SC-KO-11M-Aug-14	Sand Creek	Muscle	1.72	0.00106	0.386	0.000135	0.0882	0.0526	<0.00023	0.00252	<0.00026	26.7	0.0137
	SC-KO-12M-Aug-14	Sand Creek	Muscle	1.69	0.00129	0.66	0.000121	0.097	0.0564	<0.00022	0.00273	<0.00026	13.2	0.0037
	SC-KO-13M-Aug-14	Sand Creek	Muscle	1.99	0.00163	0.76	0.00162	0.193	0.0559	0.00056	0.0139	0.00303	16.5	0.00689
	SC-KO-14M-Aug-14	Sand Creek	Muscle	2.00	<0.015	0.30	0.00115	0.47	0.0416	<0.0024	0.0196	<0.0020	22.9	1.75
	SC-KO-15M-Aug-14	Sand Creek	Muscle	1.73	0.0227	0.401	0.0035	0.851	0.0419	<0.0016	0.0285	0.0076	21.5	0.235
	SC-KO-16M-Aug-14	Sand Creek	Muscle	2.9	0.063	1.07	0.0436	1.61	0.0572	0.0243	0.134	0.134	25.8	0.394
	SC-KO-17M-Aug-14	Sand Creek	Muscle	1.92	0.00833	0.113	0.000364	0.146	0.0482	0.00042	0.0056	0.00079	16.4	0.0125
	SC-KO-18M-Aug-14	Sand Creek	Muscle	1.89	0.00722	0.346	0.000468	0.165	0.0642	0.00024	0.00702	0.00129	19	0.0449
	SC-KO-19M-Aug-14	Sand Creek	Muscle	1.66	0.00355	0.305	0.00329	0.108	0.0488	0.00078	0.00695	0.00396	16	0.00406
	SC-KO-02M-Aug-14	Sand Creek	Muscle	1.82	0.0552	1.39	0.00745	1.36	0.0494	0.00272	0.0902	0.0144	27	0.0552
	SC-KO-20M-Aug-14	Sand Creek	Muscle	1.93	0.029375	0.848	0.00537	0.734	0.0491	<0.00175	0.048575	0.00918	21.5	0.02963
	SC-KO-21M-Aug-14	Sand Creek	Muscle	2.02	0.00183	0.178	0.000108	0.485	0.0549	<0.00020	0.0024	<0.00023	17.8	0.0372
	SC-KO-22M-Aug-14	Sand Creek	Muscle	1.75	0.00382	0.41	0.000148	0.133	0.0476	<0.00022	0.00421	0.00037	15.8	0.00552
	SC-KO-23M-Aug-14	Sand Creek	Muscle	2.2	0.00099	0.273	0.000088	0.0879	0.049	<0.00022	0.00224	<0.00025	15.7	0.00148
	SC-KO-24M-Aug-14	Sand Creek	Muscle	2.04	0.00201	0.489	0.000173	0.136	0.0432	0.00029	0.00283	0.00098	15.3	0.00572
	SC-KO-25M-Aug-14	Sand Creek	Muscle	1.98	0.00189	0.571	0.000146	0.129	0.0541	0.0004	0.00428	0.00058	15.1	0.00526
	SC-KO-03M-Aug-14	Sand Creek	Muscle	1.25	0.0174	0.459	0.0046	0.245	0.037	<0.0013	0.0174	0.0064	24.5	0.0668
	SC-KO-04M-Aug-14	Sand Creek	Muscle	1.84	0.028	0.338	0.00154	1.01	0.048	<0.0016	0.0489	0.004	23.1	0.0296
	SC-KO-05M-Aug-14	Sand Creek	Muscle	2.72	0.032	0.371	0.0033	1.41	0.0469	<0.0020	0.0557	0.0068	20	0.0241
	SC-KO-06M-Aug-14	Sand Creek	Muscle	1.89	0.00312	2.51	0.000115	0.159	0.043	0.00033	0.0141	<0.00026	25.2	0.0374
	SC-KO-07M-Aug-14	Sand Creek	Muscle	1.94	0.00251	0.215	0.000409	0.138	0.0468	<0.00021	0.00537	0.00084	25	0.0193
	SC-KO-08M-Aug-14	Sand Creek	Muscle	1.83	0.00151	0.361	<0.000076	0.0879	0.0714	<0.00021	0.00207	<0.00025	16.6	0.00437
	SC-KO-09M-Aug-14	Sand Creek	Muscle	1.74	0.00221	0.39	0.000643	0.137	0.0488	0.00031	0.00687	0.00126	42.6	0.00657
	SC-KO-11G-Aug-14	Sand Creek	Ovary	5.33	0.00108	2.18	0.000122	0.0471	0.0173	0.00026	0.0043	0.00056	72.7	0.00118
	SC-KO-12G-Aug-14	Sand Creek	Ovary	4.65	<0.00081	1.68	<0.000057	0.0571	0.0209	0.00042	0.0055	0.00082	105	0.00092
	SC-KO-13G-Aug-14	Sand Creek	Ovary	3.59	<0.00084	1.85	0.000068	0.0713	0.00687	0.00036	0.00591	0.00052	88.1	0.00096
	SC-KO-19G-Aug-14	Sand Creek	Ovary	3.12	<0.00083	1.76	0.000084	0.0651	0.00334	0.00028	0.0107	0.00049	66.9	0.00244
	SC-KO-21G-Aug-14	Sand Creek	Ovary	4.23	0.0027	1.91	0.000193	0.0852	0.00778	0.00084	0.00809	0.00162	66.1	0.002
	SC-KO-24G-Aug-14	Sand Creek	Ovary	3.87	<0.00086	2.02	<0.000061	0.0679	0.00379	0.00038	0.00409	0.00040	87.8	0.00119
	SC-KO-25G-Aug-14	Sand Creek	Ovary	4.24	<0.00083	1.68	0.000085	0.063	0.00522	0.00049	0.00526	0.00054	96.8	0.0008
	SC-KO-07G-Aug-14	Sand Creek	Ovary	4.93	0.00100	1.58	0.0001197	0.0760	0.00866	0.00033	0.00624	0.00080	89.7	0.00159
	SC-KO-08G-Aug-14	Sand Creek	Ovary	4.07	<0.00084	1.64	0.000093	0.055	0.00844	0.00018	0.00463	0.00076	89.1	0.00217
	ER-KO-01M-Aug-14	Elk River	Muscle	1.75	0.00222	0.325	0.000177	0.134	0.0628	<0.00011	0.00297	0.00054	15.3	0.00369
	ER-KO-10M-Aug-14	Elk River	Muscle	1.4	0.038	2.19	0.0168	1.22	0.0455	0.0035	0.117	0.0287	26.3	0.0661
	ER-KO-11M-Aug-14	Elk River	Muscle	2.01	0.00112	1.42	0.000073	0.0906	0.0573	0.00014	0.00331	<0.00017	14.7	0.00865
	ER-KO-12M-Aug-14	Elk River	Muscle	1.41	0.00143	0.17	0.000201	0.0905	0.051	0.00014	0.00274	0.00034	35	0.00915
	ER-KO-13M-Aug-14	Elk River	Muscle	1.69	0.0012	0.356	0.000174	0.136	0.0472	<0.00011	0.00421	0.00059	26.9	0.00497
	ER-KO-14M-Aug-14	Elk River	Muscle	1.98	0.00149	0.276	0.000206	0.101	0.0466	0.00013	0.00283	0.00046	14.7	0.00375
	ER-KO-15M-Aug-14	Elk River	Muscle	1.9	0.00194	1.08	0.000157	0.116	0.0593	0.00025	0.00486	0.00062	21.3	0.00428
	ER-KO-16M-Aug-14	Elk River	Muscle	2.08	0.00187	0.61	0.000139	0.1	0.0602	0.00012	0.00462	0.00036	14	0.00768
	ER-KO-17M-Aug-14	Elk River	Muscle	1.64	0.00061	0.595	0.000059	0.0824	0.0583	<0.00011	0.00201	0.00021	15.8	0.00132
	ER-KO-02M-Aug-14	Elk River	Muscle	1.76	0.0046	0.232	0.00041	0.14	0.0568	0.00022	0.00592	0.00094	22.4	0.00582
	ER-KO-03M-Aug-14	Elk River	Muscle	2.03	0.0105	0.939	0.000587	0.191	0.0443	0.00077	0.00744	0.00115	18.6	0.011
	ER-KO-04M-Aug-14	Elk River	Muscle	1.89	0.00328	1.58	0.000129	0.127	0.062	0.00037	0.00419	0.00072	20.8	0.00553
	ER-KO-05M-Aug-14	Elk River	Muscle	2.05	0.00363	0.326	0.000431	0.103	0.0578	0.000152	0.00469	0.00073	18.4	0.0572
	ER-KO-06M-Aug-14	Elk River	Muscle	2.4	0.039	0.595	0.0088	1.45	0.0505	<0.0029	0.116	0.0157	23	0.126
	ER-KO-07M-Aug-14	Elk River	Muscle	2.3	0.052	0.971	0.0197	1.31	0.0472	0.0033	0.117	0.0356	27.4	0.0734
	ER-KO-08M-Aug-14	Elk River	Muscle	1.87	0.0134	1.45	0.0168	4.08	0.0497	0.00405	0.154	0.0417	19.9	0.118
	ER-KO-09M-Aug-14	Elk River	Muscle	2.41	0.0245	4.69	0.0117	0.922	0.0622	0.0047	0.0959	0.0287	26.7	0.0819
	ER-KO-01G-Aug-14	Elk River	Ovary	3.74	0.00112	1.33	0.000138	0.0728	0.0248	0.00022	0.00576	0.00086	90.2	0.00199
	ER-KO-11G-Aug-14	Elk River	Ovary	3.57	0.00097	1.53	<0.000061	0.067	0.00453	0.00032	0.00482	0.00044	69.1	0.00139
	ER-KO-12G-Aug-14	Elk River	Ovary	3.44	<0.00083	1.67	<0.000059	0.056	0.0161	0.00029	0.0034	0.00049	98.5	0.0008
	ER-KO-15G-Aug-14	Elk River	Ovary	3.13	<0.00086	1.61	<0.000061	0.0733	0.0134	0.00032	0.00484	0.00066	76.7	0.00083
	ER-KO-16G-Aug-14	Elk River	Ovary	4.3	0.00104	1.44	0.000062	0.0652	0.0124	0.00025	0.00453	0.00056	82.9	0.00072
	ER-KO-04G-Aug-14	Elk River	Ovary	3.46	0.00098	1.44	0.000131	0.0676	0.00363	0.00052	0.00337	0.00051	82.7	0.00493
	ER-KO-05G-Aug-14	Elk River	Ovary	4.37	0.0017	1.42	0.000153	0.0631	0.0167	0.00029	0.00508	0.0009	95.5	0.00077
	GC-KO-01M-Aug-14	Gold Creek	Muscle	1.86	0.00089	0.652	<0.000065	0.088	0.0596	<0.00077	0.00184	<0.00019	16.8	0.00300
	GC-KO-02M-Aug-14	Gold Creek	Muscle	1.26	0.00269	0.434	0.000162	0.115	0.0656	<0.00082	0.00332	0.00058	15.7	0.00509
	GC-KO-03M-Aug-14	Gold Creek	Muscle	1.12	0.00229	0.202	0.000716	0.127	0.0601	<0.00080	0.00411	0.00126	25.2	0.104
	GC-KO-04M-Aug-14	Gold Creek	Muscle	1.52	0.00209	0.65	0.000073	0.098	0.0644	<0.00086	0.00326	0.00034	16.2	0.0268
	GC-KO-05M-Aug-14	Gold Creek	Muscle	1.05	0.00176	0.268	<0.000066	0.076	0.072	<0.00078	0.00188	0.00028	18.4	0.0139
	GC-KO-06M-Aug-14	Gold Creek	Muscle	1.65	0.00448	0.274	0.000956	0.182	0.0735	<0.00083	0.00755	0.00177	23.4	0.0319
2015	SC-KO-01-Aug-15	Sand Creek	Muscle	1.49	0.00274	0.508	0.000397	0.163	0.0492	0.000670	0.00808	0.000920	27.2	0.0216
	SC-KO-02-Aug-15	Sand Creek	Muscle	1.78	0.00197	1.27	0.000109	0.0872	0.0492	0.000889	0.00610	0.000605	25.5	0.00603
	SC-KO-03-Aug-15	Sand Creek	Muscle	2.48	0.00137	0.32	<0.000079	0.0875	0.0668	0.000187	0.00307	0.000210	28.3	0.00570
	SC-KO-04-Aug-15	Sand Creek	Muscle	1.88	0.00240	1.54	0.000306	0.116	0.0529	0.000512	0.00426	0.000360	22.0	0.00750
	SC-KO-05-Aug-15	Sand Creek	Muscle	1.72	0.00220	1.26	0.000993	0.115	0.0507	0.000339	0.00784	0.00323	30.6	0.0116
	SC-KO-06-Aug-15	Sand Creek	Muscle	1.54	0.00188	4.51	0.000505	0.105	0.0534	0.000693	0.00852	0.000430	37.8	0.00852
	SC-KO-07-Aug-15	Sand Creek	Muscle	1.83	0.00143	0.671	0.000404	0.104	0.0654	0.000366	0.00361	0.000610	31.3	0.00530
	SC-KO-08-Aug-15	Sand Creek	Muscle	1.80	0.00201	0.594	0.000191	0.0797	0.0629	0.000153	0.00413	0.000350	21.0	0.00809
	SC-KO-09-Aug-15	Sand Creek	Muscle	1.53	0.00756	0.592	0.000465	0.204	0.0540	0.000501	0.0103	0.00123	25.3	0.00798
	ER-KO-01-Aug-15	Elk River	Muscle	1.93	0.00225	0.587	<0.000089	0.0847	0.0482	0.000120	0.00261	0.000190	21.8	0.0174
	ER-KO-02-Aug-15	Elk River	Muscle	1.91	0.00174	0.672	0.000576	0.0834	0.0462	0.000196	0.00472	0.000860	50.8	0.00721
	ER-KO-03-Aug-15	Elk River	Muscle	1.71	0.00208	0.553	0.000116	0.0784	0.0438	0.0000950	0.00283	0.000270	23.2	0.00953
	ER-KO-04-Aug-15	Elk River	Muscle	1.96	0.000840	0.531	0.000201	0.0941	0.0508	0.000136	0.00458	0.000600	20.1	0.00614
	ER-KO-05-Aug-15	Elk River	Muscle	1.82	0.00130	0.499	0.000951	0.0782	0.0354	0.000118	0.00319	0.000720	18.1	0.00590
	ER-KO-06-Aug-15	Elk River	Muscle	1.93	0.00111	0.569	0.000531	0.0968	0.0492	0.000105	0.00368	0.000580	31.0	0.00598
	ER-KO-07-Aug-15	Elk River	Muscle	1.58	0.00158	0.645	0.000442	0.0795	0.0529	0.000165	0.00380	0.000440	31.2	0.00602
	ER-KO-08-Aug-15	Elk River	Muscle	1.49	0.00119	0.608	0.000245	0.0745	0.0567	0.000274	0.00498	0.000940	40.3	0.0481
	ER-KO-09-Aug-15	Elk River	Muscle	1.51	0.00112	1.09	0.000244	0.0734	0.0451	0.000237	0.00344	0.000570	17.7	0.00606
	ER-KO-10-Aug-15	Elk River	Muscle	1.77	0.00159	0.391	0.000509	0.0746	0.0605	0.000140	0.00476	0.000610	42.5	0.0104
2016	ER-KO-01 M-Apr-16	Elk River	Muscle	1.69	0.00176	0.213	0.000461	0.12	0.089	0.000218	0.00786	0.00151	19.7	0.00573
	ER-KO-02 M-Apr-16	Elk River	Muscle	1.62	<0.001	0.594	0.00041	0.102	0.102	0.000147	0.00628	0.00146	23.4	0.00533
	ER-KO-03 M-Apr-16	Elk River	Muscle	2.15	0.0016	0.445	0.000466	0.121	0.0883	0.000321	0.00915	0.00172	34.1	0.0094
	ER-KO-04 M-Apr-16	Elk River	Muscle	1.78	<0.00096	0.448	0.000223	0.0758	0.104	0.000123	0.00367	0.00048	18.2	0.00374
	SC-KO-01-Aug-16	Sand Creek	Muscle	2.18	0.0124	0.692	0.00108	0.476	0.0392	0.00117	0.023	0.00363	20.3	0.0232
	SC-KO-02-Aug-16	Sand Creek	Muscle	2.08	0.00258	0.193	0.00013	0.134	0.0387	0.000317	0.00336	<0.00035	15.6	0.00443
	SC-KO-03-Aug-16	Sand Creek	Muscle	1.91	0.00609	1.05	0.00046	0.17	0.0324	0.000424	0.00784	0.00083	15.8	0.00631
	SC-KO-04-Aug-16	Sand Creek	Muscle	2.28	0.00195	0.239	0.00029	0.128	0.0354	0.000129	0.00328	0.00045	14.4	0.0056
	ER-KO-01-Aug-16	Elk River	Muscle	2.19	0.00077	3.24	0.00015	0.076	0.0432	0.000614	0.00644	<0.00035	23.1	0.00259
	ER-KO-02-Aug-16	Elk River	Muscle	1.99	0.00107	0.228	0.00016	0.106	0.0374	0.000115	0.00312	<0.00037	47.2	0.0025
	ER-KO-03-Aug-16	Elk River	Muscle	2.38	0.00213	0.187	0.000258	0.157	0.0433	0.000371	0.00448	0.00058	16.6	0.0105
	ER-KO-04-Aug-16	Elk River	Muscle	2.08	0.00161	0.492	0.000233	0.145	0.0502	0.00049	0.00673	0.00072	18	0.007
	ER-KO-05-Aug-16	Elk River	Muscle	2.09	0.00151	0.342	0.000147	0.117	0.0622	0.000197	0.00446	0.00033	15.5	0.0093
	ER-KO-06-Aug-16	Elk River	Muscle	2.17	0.00095	1.46	<0.000059	0.085	0.0604	0.000306	0.00601	0.00057	18	0.0284
	ER-KO-07-Aug-16	Elk River	Muscle	2.02	0.00128	0.733	0.000436	0.167	0.0558	0.000236	0.00676	0.00197	16.8	0.0135
	ER-KO-08-Aug-16	Elk River	Muscle	2.17	0.00799	0.747	0.00111	0.106	0.0529	0.00034	0.00884	0.00112	17.2	0.0104
	ER-KO-09-Aug-16	Elk River	Muscle	2.25	0.00147	0.433	0.000158	0.122	0.0502	0.000225	0.00493	0.0005	17.6	0.0108
	ER-KO-10-Aug-16	Elk River	Muscle	2.32	0.00126	1.5	0.000101	0.109	0.0433	0.00021	0.00492	0.00054	18.5	0.0068

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw
2014	SC-LSS-01M-APR-14	Sand Creek	Muscle Plug	79.25	0.0319	1.94	0.118	<0.86	0.671	<0.019	0.00683	1,110	<0.0068	0.015	0.696	0.0482	4.48
	SC-LSS-02M-APR-14	Sand Creek	Muscle Plug	74.24	0.0163	27.8	0.189	<0.41	0.485	<0.0092	0.00216	671	<0.0033	0.0266	0.516	0.134	0.747
	SC-LSS-03M-APR-14	Sand Creek	Muscle Plug	79.58	<0.0013	7.26	0.093	<0.33	0.255	<0.0073	0.0116	550	<0.0026	0.0148	0.415	0.0641	0.629
	SC-LSS-04M-APR-14	Sand Creek	Muscle Plug	82.70	<0.0025	38	0.137	<0.61	4.1	<0.013	0.00289	10,700	0.0328	0.073	0.272	0.101	0.961
	SC-LSS-07M-APR-14	Sand Creek	Muscle Plug	78.61	<0.0017	18.3	0.207	<0.40	0.325	<0.0089	0.00462	478	0.0042	0.0367	0.384	0.201	0.761
	SC-LSS-08M-APR-14	Sand Creek	Muscle Plug	81.29	<0.0021	50.1	0.234	<0.51	0.744	<0.011	0.0323	812	0.0066	0.0445	0.57	0.0831	0.988
	SC-LSS-09M-APR-14	Sand Creek	Muscle Plug	81.08	<0.0022	5.49	0.185	<0.55	0.526	<0.012	0.0239	519	0.0045	0.0266	0.481	0.0942	0.698
	SC-LSS-10M-APR-14	Sand Creek	Muscle Plug	81.89	<0.0014	24.3	0.105	<0.34	0.531	<0.0076	0.0100	400	0.007	0.0431	0.434	0.0582	0.966
	SC-LSS-11M-APR-14	Sand Creek	Muscle Plug	81.55	<0.0018	16.9	0.188	<0.44	0.752	<0.0097	0.0100	379	0.0073	0.0356	0.237	0.277	0.895
	SC-LSS-12M-APR-14	Sand Creek	Muscle Plug	75.99	<0.0018	10	0.268	<0.43	0.367	<0.0096	0.00449	538	0.0036	0.0245	0.156	0.132	0.91
	SC-LSS-01M-AUG-14	Sand Creek	Muscle Plug	77.98	<0.0048	59.1	0.13	<0.65	6.13	<0.014	0.0107	622	0.0114	0.0423	3.14	0.102	1.29
	SC-LSS-02M-AUG-14	Sand Creek	Muscle Plug	78.37	<0.0051	19.9	0.07	<0.68	2.84	<0.015	0.00816	5,880	0.0115	0.0368	0.351	0.118	0.998
	SC-LSS-03M-AUG-14	Sand Creek	Muscle Plug	80.61	<0.011	16.1	0.06	<1.4	0.449	<0.032	0.00369	742	<0.0066	0.0281	0.179	0.121	0.895
	SC-LSS-04M-AUG-14	Sand Creek	Muscle Plug	76.20	<0.0079	64.6	0.132	<1.1	3.22	<0.023	0.0216	602	0.0109	0.036	0.62	0.0729	1.87
	ER-LSS-08M-APR-14	Elk River	Muscle Plug	78.46	<0.0017	7.55	0.121	<0.42	3.78	<0.0094	0.00727	9,630	<0.0033	0.0378	1.28	0.0346	1.38
	ER-LSS-09M-APR-14	Elk River	Muscle Plug	79.22	<0.0017	5.19	0.147	<0.41	1.15	<0.0091	0.00358	1,520	0.004	0.0365	0.651	0.0644	0.871
	ER-LSS-10M-APR-14	Elk River	Muscle Plug	79.87	<0.0015	353	0.278	<0.37	2.66	0.0161	0.00725	5,520	0.0165	0.133	0.813	0.0656	1.25
	ER-LSS-11M-APR-14	Elk River	Muscle Plug	81.25	<0.0025	210	0.293	<0.60	2.69	<0.013	0.0116	2,360	0.0196	0.0923	0.665	0.0654	1.39
	ER-LSS-12M-APR-14	Elk River	Muscle Plug	81.06	<0.0017	38.5	0.050	<0.41	0.54	<0.0092	0.0125	766	0.006	0.0327	0.185	0.0638	1.01
	ER-LSS-13M-APR-14	Elk River	Muscle Plug	76.00	<0.0020	6.26	0.126	<0.49	2.28	<0.011	0.00655	5,960	0.0042	0.023	0.19	0.0489	0.958
	ER-LSS-14M-APR-14	Elk River	Muscle Plug	80.77	<0.0028	124	0.156	<0.69	3.86	<0.015	0.00618	9,970	0.0063	0.0586	0.47	0.0828	1.04
	ER-LSS-15M-APR-14	Elk River	Muscle Plug	78.49	<0.0018	108	0.155	<0.43	3.26	<0.0095	0.0101	7,360	0.0037	0.0762	1.79	0.0677	1.03
	ER-LSS-16M-APR-14	Elk River	Muscle Plug	77.52	<0.0015	25.2	0.144	<0.36	2.02	<0.0080	0.011	3,930	<0.0029	0.0307	0.315	0.0423	0.966
	ER-LSS-17M-APR-14	Elk River	Muscle Plug	79.92	<0.0013	19.8	0.104	<0.33	1.74	<0.0073	0.00519	5,700	0.0031	0.0401	0.184	0.102	0.935
	ER-LSS-01M-AUG-14	Elk River	Muscle Plug	75.34	<0.0034	53.8	0.108	<0.45	1.23	<0.010	0.00548	490	0.024	0.266	1.39	0.0512	1.52
	ER-LSS-02M-AUG-14	Elk River	Muscle Plug	76.73	<0.0068	36.9	0.084	<0.91	3.55	<0.020	0.0102	7,980	0.0171	0.0443	0.744	0.0586	0.975
	ER-LSS-03M-AUG-14	Elk River	Muscle Plug	77.42	<0.0088	11.8	0.11	<1.2	0.331	<0.026	0.00772	472	0.0073	0.0226	0.23	0.0611	0.831
	ER-LSS-04M-AUG-14	Elk River	Muscle Plug	80.63	<0.0093	14.3	0.068	<1.2	0.762	<0.028	0.00698	815	0.0114	0.0396	0.309	0.079	0.715
	ER-LSS-05M-AUG-14	Elk River	Muscle Plug	80.91	<0.0041	8.55	0.132	<0.55	0.361	<0.012	0.00655	599	0.0085	0.0231	0.216	0.0782	1.08
	ER-LSS-06M-AUG-14	Elk River	Muscle Plug	70.38	<0.0078	6.17	0.105	<1.0	0.61	<0.023	0.00331	385	0.0459	0.0456	0.123	0.0917	1.66
	ER-LSS-07M-AUG-14	Elk River	Muscle Plug	76.33	<0.0075	5.96	0.061	<1.0	0.247	<0.022	0.00339	416	0.0189	0.0246	0.279	0.0663	0.805
	ER-LSS-08M-AUG-14	Elk River	Muscle Plug	78.57	<0.0069	87.7	0.119	<0.92	9.33	<0.020	0.00455	26,100	0.0266	0.0554	0.583	0.082	1.04
	ER-LSS-09M-AUG-14	Elk River	Muscle Plug	75.03	<0.0058	5.25	0.06	<0.78	0.237	<0.017	0.00922	412	0.01	0.0258	0.177	0.0548	0.979
	ER-LSS-10M-AUG-14	Elk River	Muscle Plug	81.01	<0.0048	14.6	0.124	<0.64	0.862	<0.014	0.00542	403	0.0157	0.0349	1.04	0.0597	1.3
	GC-LSS-01M-APR-14	Gold Creek	Muscle Plug	80.19	0.0082	8.36	0.0768	<0.25	0.607	<0.0056	0.014	1,020	0.003	0.0668	1.00	0.0349	0.782
	GC-LSS-02M-APR-14	Gold Creek	Muscle Plug	79.79	<0.0036	29.7	0.108	<0.49	2.36	<0.011	0.0186	4,370	0.0108	0.107	0.749	0.125	0.899
	GC-LSS-03M-APR-14	Gold Creek	Muscle Plug	79.17	<0.0011	44.2	0.186	<0.28	1.97	<0.0061	0.00319	627	0.0026	0.169	0.457	0.053	2.62
	GC-LSS-01M-AUG-14	Gold Creek	Muscle Plug	74.83	<0.0088	33.3	0.075	<1.2	1.68	<0.026	0.0172	517	0.0107	0.0431	1.08	0.0283	1.19
	GC-LSS-02M-AUG-14	Gold Creek	Muscle Plug	78.83	<0.0071	4.29	0.072	<0.95	0.425	<0.021	0.0428	377	0.0068	0.0283	1.43	0.0433	0.759
	GC-LSS-03M-AUG-14	Gold Creek	Muscle Plug	80.23	<0.0038	16	0.06	<0.51	0.815	<0.011	0.0163	388	0.01	0.0268	0.272	0.064	1.04
	GC-LSS-04M-AUG-14	Gold Creek	Muscle Plug	74.12	<0.0081	43.9	0.115	<1.1	4.47	<0.024	0.00705	659	0.0727	0.0689	0.53	0.0629	1.57
	GC-LSS-05M-AUG-14	Gold Creek	Muscle Plug	79.32	<0.0049	5.03	0.077	<0.65	0.774	<0.014	0.0113	409	<0.0030	0.0186	0.198	0.0281	0.925

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw
2014	GC-LSS-06M-AUG-14	Gold Creek	Muscle Plug	75.98	<0.0074	15.8	0.098	<0.99	0.758	<0.022	0.01	426	0.0049	0.0254	0.243	0.0489	0.689
	GC-LSS-07M-AUG-14	Gold Creek	Muscle Plug	74.95	<0.0054	4.41	0.077	<0.73	0.289	<0.016	0.00199	387	<0.0033	0.0206	0.115	0.0445	0.924
	GC-LSS-08M-AUG-14	Gold Creek	Muscle Plug	78.61	<0.012	6.68	<0.061	<1.6	1.36	<0.035	0.0129	470	<0.0073	0.0348	0.391	0.0435	1.02
	GC-LSS-09M-AUG-14	Gold Creek	Muscle Plug	79.76	<0.0037	5.51	0.061	<0.50	0.278	<0.011	0.0159	435	0.0051	0.0187	0.123	0.0616	0.684
	GC-LSS-10M-AUG-14	Gold Creek	Muscle Plug	80.54	<0.0048	3.95	0.123	<0.65	2.23	<0.014	0.00262	5,820	0.0044	0.0207	0.145	0.0479	0.815
2015	SC-CSU-02-APR-15	Sand Creek	Muscle	81.50	<0.00046	11.90	0.0920	<0.073	1.254	<0.0023	0.00926	3,128	0.0048	0.01970	0.1340	0.0548	0.750
	SC-CSU-03-APR-15	Sand Creek	Muscle	81.11	0.00095	44.80	0.2650	0.130	1.350	<0.0025	0.01520	2,840	0.0063	0.04040	0.1140	0.1770	1.230
	SC-CSU-04-APR-15	Sand Creek	Muscle	85.33	0.00196	5.37	0.1710	0.137	1.490	<0.0025	0.00517	396	0.0276	0.10600	0.0844	0.1600	3.500
	SC-CSU-05-APR-15	Sand Creek	Muscle	80.76	0.00046	2.04	0.2720	<0.071	1.050	<0.0022	0.00186	3,750	0.0035	0.04030	0.0620	0.1800	1.440
	SC-CSU-06-APR-15	Sand Creek	Muscle	83.47	0.00120	18.40	0.2620	<0.079	1.900	<0.0025	0.02580	4,630	0.0137	0.04740	0.0811	0.1330	1.260
	SC-CSU-07-APR-15	Sand Creek	Muscle	81.19	0.00079	6.50	0.2120	<0.072	0.437	<0.0023	0.01110	1,100	0.0066	0.05950	0.0664	0.1530	2.430
	SC-CSU-05-APR-15	Sand Creek	Ovary	44.23	0.02697	7.98	0.2160	0.123	0.615	0.0023	0.00051	960	0.0103	0.18867	0.0687	0.0244	5.650
	ER-CSU-01-APR-15	Elk River	Muscle	78.22	0.00488	597.00	0.2700	0.914	7.780	0.0155	0.00877	3,690	0.0300	0.16000	0.8220	0.1050	1.720
	ER-CSU-02-APR-15	Elk River	Muscle	81.38	0.00088	1.93	0.1135	0.137	1.335	<0.0024	0.00248	3,720	0.0038	0.03415	0.0517	0.1145	1.090
	ER-CSU-04-APR-15	Elk River	Muscle	84.38	0.00221	82.50	0.1370	0.300	3.760	0.0051	0.00343	7,140	0.0332	0.07990	0.1870	0.1110	2.560
	ER-CSU-05-APR-15	Elk River	Muscle	79.73	0.00081	8.76	0.1310	0.140	1.350	<0.0026	0.00308	2,010	0.0056	0.03930	0.0727	0.0451	2.080
	ER-CSU-08-APR-15	Elk River	Muscle	82.02	0.00081	16.00	0.0569	0.120	1.960	<0.0027	0.00710	4,420	0.0081	0.04290	0.0932	0.0508	1.250
	ER-CSU-09-APR-15	Elk River	Muscle	80.30	0.00059	2.68	0.0985	<0.13	3.610	<0.00245	0.00402	7,845	0.0040	0.01895	0.0583	0.0813	0.721
	ER-CSU-10-APR-15	Elk River	Muscle	79.81	0.00077	20.80	0.1290	<0.13	2.490	<0.0024	0.00308	3,790	0.0061	0.03200	0.0913	0.0517	1.450
	ER-CSU-11-APR-15	Elk River	Muscle	81.58	0.00127	21.00	0.1440	0.123	1.920	<0.0023	0.00409	3,570	0.0068	0.05300	0.0816	0.0673	1.710
	ER-CSU-12-APR-15	Elk River	Muscle	79.77	0.00057	6.28	0.1180	0.105	1.570	<0.0024	0.01650	3,240	0.0186	0.02590	0.0751	0.0641	0.878
	ER-CSU-17-APR-15	Elk River	Muscle	81.57	0.00050	5.88	0.0387	<0.11	1.430	<0.00265	0.00949	3,845	0.0073	0.03455	0.0606	0.0550	1.145
	GC-CSU-02-APR-15	Gold Creek	Muscle	79.92	0.00207	22.30	0.1480	<0.10	0.974	<0.0026	0.00679	1,820	0.0054	0.02580	0.0818	0.1350	0.942
	GC-CSU-08-APR-15	Gold Creek	Muscle	81.86	0.00166	0.68	0.0354	<0.10	3.190	<0.0025	0.02220	6,040	0.0029	0.01560	0.0679	0.0381	0.635
	GC-CSU-09-APR-15	Gold Creek	Muscle	85.76	0.00287	5.00	0.0772	<0.11	0.620	<0.0027	0.00653	417	0.0487	0.08450	0.0695	0.0811	3.090
	GC-CSU-10-APR-15	Gold Creek	Muscle	82.16	0.00229	2.30	0.0840	0.105	1.385	<0.00255	0.00469	2,335	0.0059	0.02650	0.0659	0.0266	1.200
	GC-CSU-11-APR-15	Gold Creek	Muscle	80.51	0.00138	2.69	0.0915	0.094	2.110	<0.0023	0.00937	4,810	0.0037	0.01750	0.0563	0.0350	0.735
	GC-CSU-13-APR-15	Gold Creek	Muscle	80.81	0.00140	0.65	0.1270	<0.098	4.290	<0.0024	0.00530	7,730	0.0026	0.01930	0.0564	0.0468	0.831
	GC-CSU-14-APR-15	Gold Creek	Muscle	81.38	0.00078	0.63	0.0563	0.110	1.310	<0.0023	0.00322	4,440	0.0046	0.02390	0.0534	0.0560	0.687
	GC-CSU-15-APR-15	Gold Creek	Muscle	82.01	0.00127	25.50	0.0949	0.110	11.200	<0.0026	0.00647	22,100	0.0100	0.11300	0.0763	0.0489	1.610
	GC-CSU-17-APR-15	Gold Creek	Muscle	83.26	0.00093	0.66	0.0484	<0.10	3.600	<0.0026	0.01970	7,150	0.0058	0.03410	0.0480	0.0844	1.210
	GC-CSU-18-APR-15	Gold Creek	Muscle	81.88	0.00090	8.54	0.0815	<0.10	2.130	<0.0026	0.00478	5,410	0.0124	0.03130	0.0668	0.0590	1.320
	GC-CSU-10-APR-15	Gold Creek	Ovary	23.70	0.0205	8.07	0.0625	0.13	0.551	<0.0027	0.00130	1,490	0.0327	0.177	0.0620	0.00712	8.79
2016	SC-CSU-08 M-Apr-16	Sand Creek	Muscle	79.76	<0.00065	3.81	0.0943	<0.14	0.616	<0.0025	0.0113	1,820	<0.0013	0.0131	0.0906	0.0943	0.696
	SC-CSU-36 M-Apr-16	Sand Creek	Muscle	80.83	0.000815	2.2	0.07925	0.155	0.16	0.00275	0.005645	454	0.0058	0.02475	0.0577	0.06565	1.115
	SC-CSU-08 O -Apr-16	Sand Creek	Ovary	67.10	0.03265	1.22	0.07935	0.265	0.375	0.0026	0.00259	619	0.0111	0.105	0.0622	0.0114	4.875
	SC-CSU-36 O-Apr-16	Sand Creek	Ovary	75.11	0.0711	6.18	0.083	0.32	0.368	<0.0026	0.00171	1,170	0.0324	0.151	0.0737	0.0165	12.2
	ER-CSU-03 M-Apr-16	Elk River	Muscle	78.41	0.00231	3.74	0.175	0.218	0.221	<0.0026	0.0106	395	0.0027	0.0309	0.0708	0.043	1.55
	ER-CSU-04 M-Apr-16	Elk River	Muscle	80.57	0.00068	3.795	0.1375	0.184	1.43	0.00235	0.00325	3,405	0.00225	0.0152	0.05925	0.0594	0.8405
	ER-CSU-34 M-Apr-16	Elk River	Muscle	80.48	0.0022	5.34	0.225	0.088	0.6825	0.0026	0.00722	1,505	0.0087	0.0401	0.07175	0.05525	1.495
	ER-CSU-45 M-Apr-16	Elk River	Muscle	80.22	<0.00073	1.02	0.119	<0.063	0.518	<0.0026	0.00389	1,540	0.0178	0.0191	0.0585	0.129	0.792
	ER-CSU-03 O -Apr-16	Elk River	Ovary	67.14	0.0845	2.705	0.1265	0.315	0.821	0.0033	0.002755	620	0.0105	0.213	0.0686	0.00669	5.335

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw
2016	ER-CSU-04 O-Apr-16	Elk River	Ovary	63.44	0.029	0.63	0.146	0.165	0.5305	0.0025	0.000443	459	0.0049	0.0657	0.06935	0.007815	3.425
	ER-CSU-34 O-Apr-16	Elk River	Ovary	71.69	0.124	22.1	0.221	<0.18	0.931	<0.0027	0.00399	1,060	0.0504	0.278	0.0875	0.0135	8.43
	ER-CSU-45 O-Apr-16	Elk River	Ovary	72.40	0.0479	11.2	0.127	0.26	0.6	<0.0026	0.00119	1,210	0.109	0.133	0.0759	0.0276	7.66
	GC-CSU-04 M-Apr-16	Gold Creek	Muscle	77.78	0.000625	8.275	0.0938	0.17	0.3475	0.00235	0.001375	1,235	0.00147	0.02365	0.06125	0.236	0.9525
	GC-CSU-05 M-Apr-16	Gold Creek	Muscle	81.09	<0.0006	1.67	0.107	0.191	1.94	<0.0023	0.0358	4,780	0.00197	0.0211	0.0706	0.0441	0.851
	GC-CSU-09 M-Apr-16	Gold Creek	Muscle	78.36	0.00064	1.495	0.1415	0.0865	0.8	0.0024	0.00244	2,195	0.001375	0.03545	0.061	0.273	0.963
	GC-CSU-26 M-Apr-16	Gold Creek	Muscle	79.84	<0.00067	2.35	0.121	0.424	1.47	<0.0025	0.00207	4,910	0.00192	0.0182	0.0591	0.515	0.859
	GC-CSU-27 M-Apr-16	Gold Creek	Muscle	79.56	<0.00058	6.14	0.0636	0.114	1.15	<0.0022	0.00303	3,120	0.00237	0.0165	0.101	0.209	0.854
	GC-CSU-31 M-Apr-16	Gold Creek	Muscle	80.00	<0.00067	1.76	0.0718	1.24	1.06	<0.0025	0.0236	3,160	0.00162	0.0176	0.0928	0.0501	1.15
	GC-CSU-34 M-Apr-16	Gold Creek	Muscle	78.74	<0.00063	2.56	0.0948	0.084	0.169	<0.0024	0.00163	845	0.00241	0.025	0.0605	0.217	0.819
	GC-CSU-37 M-Apr-16	Gold Creek	Muscle	79.23	<0.00067	4.78	0.161	0.193	5.16	<0.0025	0.00327	9,570	0.00257	0.0296	0.0677	0.0859	0.813
	GC-CSU-43 M-Apr-16	Gold Creek	Muscle	78.97	<0.00068	1.63	0.243	0.138	0.468	<0.0026	0.00078	2,030	0.0016	0.0327	0.0734	0.437	1.94
	GC-CSU-04 O-Apr-16	Gold Creek	Ovary	62.74	0.02075	2.05	0.10265	0.2205	0.358	0.00475	0.000229	368	0.0021	0.103	0.0665	0.02485	3.455
	GC-CSU-05 O-Apr-16	Gold Creek	Ovary	65.06	0.0283	0.82	0.0622	0.287	0.639	<0.0045	0.00558	484	0.0058	0.114	0.063	0.00426	2.97
	GC-CSU-09 O-Apr-16	Gold Creek	Ovary	64.82	0.0204	0.533	0.149	0.274	0.589	<0.0049	0.000228	447	0.0027	0.171	0.064	0.0358	3.95
	GC-CSU-26 O-Apr-16	Gold Creek	Ovary	62.82	0.013	0.747	0.13	0.238	0.383	<0.0047	0.000152	411	0.0026	0.0864	0.069	0.0442	2.78
	GC-CSU-27 O-Apr-16	Gold Creek	Ovary	62.48	0.0105	0.484	0.0828	0.226	0.393	<0.0044	0.000203	278	<0.0011	0.0774	0.067	0.0231	3.42
	GC-CSU-31 O-Apr-16	Gold Creek	Ovary	70.23	0.02095	1.25	0.0641	0.12	0.7005	0.0035	0.005625	941	0.00365	0.127	0.0647	0.008215	3.06
	GC-CSU-34 O-Apr-16	Gold Creek	Ovary	64.00	0.0122	1.01	0.116	0.12	0.254	<0.0034	0.00021	353	0.0041	0.0905	0.0719	0.0278	4.19
	GC-CSU-37 O-Apr-16	Gold Creek	Ovary	65.92	0.035	0.397	0.138	0.25	0.698	<0.0035	0.000465	503	0.0039	0.141	0.0676	0.00939	4.78
	GC-CSU-43 O-Apr-16	Gold Creek	Ovary	64.08	0.0143	0.16	0.156	0.27	0.251	<0.0036	0.000103	433	0.0036	0.0966	0.0723	0.0595	4.01

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dw	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw
2014	SC-LSS-01M-APR-14	Sand Creek	Muscle Plug	8.53	<0.011	0.171	22,400	<0.044	1,380	1.18	0.025	1,120	0.368	10,000	0.0126	15.7	<0.0011
	SC-LSS-02M-APR-14	Sand Creek	Muscle Plug	26.8	0.0173	0.234	22,100	0.027	1,400	1.2	0.0106	1,120	0.376	11,300	0.0257	22.3	0.00106
	SC-LSS-03M-APR-14	Sand Creek	Muscle Plug	11.9	0.0081	0.226	23,100	<0.017	1,450	0.771	0.0078	873	0.249	11,900	0.0336	15.6	<0.00042
	SC-LSS-04M-APR-14	Sand Creek	Muscle Plug	59	0.0199	2.18	23,100	0.067	1,330	5.71	0.0096	3,880	0.32	17,000	0.23	15.4	<0.00078
	SC-LSS-07M-APR-14	Sand Creek	Muscle Plug	43.4	0.0089	1.58	22,200	0.026	1,270	0.816	0.0086	1,420	0.221	11,600	0.0859	19.5	<0.00052
	SC-LSS-08M-APR-14	Sand Creek	Muscle Plug	67	0.018	0.809	22,900	0.053	1,300	1.7	0.0533	1,880	0.365	11,400	0.204	13	<0.00065
	SC-LSS-09M-APR-14	Sand Creek	Muscle Plug	21.5	0.0107	1.86	22,000	<0.028	1,170	0.669	0.0046	1,920	0.112	10,800	0.128	12.4	<0.00070
	SC-LSS-10M-APR-14	Sand Creek	Muscle Plug	49.1	0.0131	3.08	24,900	0.024	1,160	1.1	0.0118	1,820	0.246	11,600	0.112	12.8	<0.00044
	SC-LSS-11M-APR-14	Sand Creek	Muscle Plug	29.9	0.0102	2.75	22,300	<0.022	1,280	0.677	0.0118	2,350	0.251	12,400	0.0729	21.9	<0.00056
	SC-LSS-12M-APR-14	Sand Creek	Muscle Plug	25.7	0.0082	0.658	24,300	<0.022	1,330	0.627	0.0063	1,110	0.08	12,600	0.0691	17.5	<0.00056
	SC-LSS-01M-AUG-14	Sand Creek	Muscle Plug	63.1	0.024	0.503	24,800	0.059	1,710	1.87	0.028	989	0.859	12,600	0.21	10.7	<0.00095
	SC-LSS-02M-AUG-14	Sand Creek	Muscle Plug	33.8	0.016	1.14	24,500	<0.048	1,650	4.8	0.0099	1,440	0.301	15,100	0.218	10.3	<0.0010
	SC-LSS-03M-AUG-14	Sand Creek	Muscle Plug	26.2	<0.023	1.23	25,600	<0.10	1,570	0.93	0.0105	2,410	0.132	12,900	0.0849	13.9	<0.0021
	SC-LSS-04M-AUG-14	Sand Creek	Muscle Plug	78.3	0.028	0.715	20,000	<0.075	1,610	1.8	0.0135	914	0.405	9,720	1.15	9.86	<0.0016
	ER-LSS-08M-APR-14	Elk River	Muscle Plug	26.3	0.010	0.406	20,100	0.03	1,350	2.82	0.0196	1,550	0.76	15,900	0.0334	5.15	<0.00054
	ER-LSS-09M-APR-14	Elk River	Muscle Plug	16.8	0.0089	0.473	24,200	<0.021	1,350	1.47	0.0156	1,630	0.421	12,900	0.0163	10.5	<0.00053
	ER-LSS-10M-APR-14	Elk River	Muscle Plug	381	0.154	0.44	22,000	0.353	1,570	11.7	0.0224	1,400	0.498	12,100	0.238	8.28	<0.00047
	ER-LSS-11M-APR-14	Elk River	Muscle Plug	167	0.122	0.766	19,500	0.203	2,140	5.69	0.0228	2,660	0.405	10,500	0.349	8.71	<0.00077
	ER-LSS-12M-APR-14	Elk River	Muscle Plug	39.5	0.0195	0.549	22,200	0.035	1,300	1.25	0.0126	1,930	0.114	12,000	0.112	12.1	<0.00053
	ER-LSS-13M-APR-14	Elk River	Muscle Plug	14	0.0084	0.448	22,400	0.037	1,420	2.86	0.0233	2,000	0.125	14,200	0.151	8.43	<0.00063
	ER-LSS-14M-APR-14	Elk River	Muscle Plug	130	0.0504	0.756	20,700	0.139	1,700	13.2	0.0257	1,670	0.333	15,100	0.124	12.8	<0.00088
	ER-LSS-15M-APR-14	Elk River	Muscle Plug	147	0.0446	0.344	21,700	0.117	1,720	7.89	0.0389	1,600	0.3	15,100	0.144	9.1	<0.00055
	ER-LSS-16M-APR-14	Elk River	Muscle Plug	28.2	0.0147	0.316	21,600	0.042	1,290	1.93	0.0341	1,620	0.152	13,300	0.0784	6.94	<0.00046
	ER-LSS-17M-APR-14	Elk River	Muscle Plug	22.2	0.0137	0.833	22,300	0.034	1,360	3.35	0.008	1,920	0.0912	14,600	0.09	14.9	<0.00042
	ER-LSS-01M-AUG-14	Elk River	Muscle Plug	102	0.0243	0.381	19,700	0.056	1,460	6.94	0.0229	2,160	2.1	10,500	0.141	6.41	<0.00067
	ER-LSS-02M-AUG-14	Elk River	Muscle Plug	44.2	0.024	0.494	25,000	0.074	1,650	5.17	0.0109	1,670	0.486	16,100	0.201	11.7	<0.0013
	ER-LSS-03M-AUG-14	Elk River	Muscle Plug	18.9	<0.019	0.538	25,700	<0.083	1,640	0.832	<0.0063	1,460	0.122	12,600	0.0553	8.8	<0.0017
	ER-LSS-04M-AUG-14	Elk River	Muscle Plug	33.6	<0.020	1.3	31,200	<0.088	1,530	1.1	0.0089	3,650	0.237	15,500	0.0617	12.9	<0.0018
	ER-LSS-05M-AUG-14	Elk River	Muscle Plug	23.9	<0.0089	0.989	24,900	<0.039	1,550	1.15	0.0186	1,600	0.112	12,600	0.0429	9.38	<0.00080
	ER-LSS-06M-AUG-14	Elk River	Muscle Plug	45.8	<0.017	1.52	25,900	<0.073	1,500	0.517	0.0099	2,350	0.104	13,200	0.0411	13.5	<0.0015
	ER-LSS-07M-AUG-14	Elk River	Muscle Plug	18.7	<0.016	1.07	27,300	<0.071	1,530	0.605	0.0111	1,910	0.141	12,900	0.0437	10.4	<0.0015
	ER-LSS-08M-AUG-14	Elk River	Muscle Plug	126	0.044	0.943	23,200	0.179	1,920	21.6	0.0365	2,410	0.363	25,200	0.696	9.13	<0.0014
	ER-LSS-09M-AUG-14	Elk River	Muscle Plug	24	<0.013	1.26	28,400	<0.055	1,680	0.426	0.0148	1,910	0.059	13,900	0.0268	8.34	<0.0012
	ER-LSS-10M-AUG-14	Elk River	Muscle Plug	31.5	0.012	1.21	27,100	<0.045	1,650	1.04	0.0323	1,430	0.57	13,200	0.0867	9.27	<0.00095
	GC-LSS-01M-APR-14	Gold Creek	Muscle Plug	22.2	0.0104	1.13	26,200	<0.018	1,450	0.895	0.0365	1,150	0.576	13,100	0.0418	12.7	<0.00037
	GC-LSS-02M-APR-14	Gold Creek	Muscle Plug	33.3	0.0173	1.31	23,800	0.035	1,420	4.52	0.0161	2,090	0.37	13,500	0.149	17.6	<0.00072
	GC-LSS-03M-APR-14	Gold Creek	Muscle Plug	100	0.0201	0.765	23,400	0.044	1,350	1.46	0.0119	1,250	0.242	11,900	0.0771	13.5	<0.00035
	GC-LSS-01M-AUG-14	Gold Creek	Muscle Plug	63.6	0.02	1.79	25,800	<0.083	1,660	2.17	0.0266	1,500	0.637	13,200	0.256	11.1	<0.0017
	GC-LSS-02M-AUG-14	Gold Creek	Muscle Plug	21.3	<0.015	0.776	25,600	<0.067	1,570	0.942	0.0323	1,380	0.803	12,600	0.0236	13.5	<0.0014
	GC-LSS-03M-AUG-14	Gold Creek	Muscle Plug	31.5	0.0118	1.18	25,500	<0.036	1,560	0.862	0.0121	1,320	0.193	13,100	0.12	12.8	<0.00075
	GC-LSS-04M-AUG-14	Gold Creek	Muscle Plug	72.1	0.026	1.77	24,100	<0.077	1,590	2.42	0.0248	1,880	0.395	12,300	0.975	11.8	<0.0016
	GC-LSS-05M-AUG-14	Gold Creek	Muscle Plug	16.2	<0.011	0.809	24,100	<0.046	1,530	0.687	0.0042	1,340	0.151	12,300	0.0243	14	<0.00096

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dw	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw
2014	GC-LSS-06M-AUG-14	Gold Creek	Muscle Plug	25.2	<0.016	0.731	23,000	<0.070	1,610	0.838	0.0084	1,430	0.084	11,700	0.103	14.1	<0.0015
	GC-LSS-07M-AUG-14	Gold Creek	Muscle Plug	14	<0.012	0.845	23,700	<0.051	1,550	0.557	0.0065	1,280	0.079	12,300	0.032	15.6	<0.0011
	GC-LSS-08M-AUG-14	Gold Creek	Muscle Plug	28.2	<0.026	1.1	29,600	<0.11	1,730	0.86	<0.0086	2,310	0.146	14,500	0.0523	16.9	<0.0023
	GC-LSS-09M-AUG-14	Gold Creek	Muscle Plug	13.8	0.0082	0.915	26,000	<0.035	1,510	0.618	0.01	1,300	0.074	12,800	0.0273	11.2	<0.00073
	GC-LSS-10M-AUG-14	Gold Creek	Muscle Plug	16	0.011	0.281	22,800	<0.046	1,660	5.5	0.0062	1,570	0.103	14,700	0.0776	13.8	<0.00095
2015	SC-CSU-02-APR-15	Sand Creek	Muscle	14.9	0.00960	0.598	24,400	0.0405	1,585	3.059	0.0081	1,435	0.0885	13,750	0.05245	12.5	<0.000027
	SC-CSU-03-APR-15	Sand Creek	Muscle	46.8	0.02150	1.150	24,200	0.0409	1,360	2.680	0.0102	1,500	0.0597	12,500	0.08140	14.4	<0.000028
	SC-CSU-04-APR-15	Sand Creek	Muscle	76.3	0.00773	1.340	22,400	0.0125	1,110	1.270	0.0246	5,460	0.0719	12,000	0.05370	14.6	<0.000029
	SC-CSU-05-APR-15	Sand Creek	Muscle	16.2	0.00745	0.749	22,800	0.0072	1,280	2.590	0.0100	1,360	0.0246	12,300	0.02970	17.7	<0.000026
	SC-CSU-06-APR-15	Sand Creek	Muscle	33.1	0.01470	1.750	26,000	0.0259	1,350	4.330	0.0119	2,550	0.0465	13,700	0.11300	15.5	<0.000029
	SC-CSU-07-APR-15	Sand Creek	Muscle	36.3	0.00801	1.040	21,700	0.0082	1,130	1.270	0.0151	1,350	0.0237	10,600	0.01660	16.3	<0.000026
	SC-CSU-05-APR-15	Sand Creek	Ovary	79.1	0.01038	0.019	8,157	0.0066	831	23.600	0.1410	1,810	0.0414	10,633	0.01271	8.0	2.827E-05
	ER-CSU-01-APR-15	Elk River	Muscle	377.0	0.19600	0.583	19,900	0.4150	1,500	12.300	0.0379	1,160	0.5020	10,100	0.24800	9.2	0.000056
	ER-CSU-02-APR-15	Elk River	Muscle	14.9	0.00682	0.662	23,750	0.0212	1,230	2.425	0.0094	1,355	0.0343	12,200	0.02790	17.2	<0.000030
	ER-CSU-04-APR-15	Elk River	Muscle	93.2	0.03550	1.630	21,500	0.1180	1,100	3.560	0.0275	4,080	0.1810	13,400	0.13400	14.7	<0.000030
	ER-CSU-05-APR-15	Elk River	Muscle	34.4	0.00814	0.432	20,900	0.0215	1,060	1.690	0.0145	1,170	0.0568	10,800	0.01860	6.5	<0.000033
	ER-CSU-08-APR-15	Elk River	Muscle	31.9	0.01130	1.170	21,500	0.0258	1,060	3.140	0.0124	1,770	0.0658	11,200	0.03840	6.8	<0.000034
	ER-CSU-09-APR-15	Elk River	Muscle	10.2	0.00970	0.815	22,750	0.0203	1,280	5.445	0.0111	1,080	0.0570	14,250	0.06635	11.2	<0.0000038
	ER-CSU-10-APR-15	Elk River	Muscle	32.1	0.01370	0.321	20,500	0.0256	1,140	3.320	0.0175	1,280	0.0710	11,700	0.03430	12.1	<0.0000037
	ER-CSU-11-APR-15	Elk River	Muscle	34.2	0.01220	0.534	21,900	0.0311	1,130	2.840	0.0129	1,350	0.0669	11,700	0.02870	9.7	<0.000029
	ER-CSU-12-APR-15	Elk River	Muscle	15.3	0.00830	1.020	22,600	0.0138	1,200	2.230	0.0068	1,030	0.0410	11,600	0.04130	8.7	<0.000030
	ER-CSU-17-APR-15	Elk River	Muscle	25.0	0.00901	1.285	23,950	0.0280	1,200	2.735	0.0100	1,540	0.0476	12,400	0.04485	8.0	<0.000033
	GC-CSU-02-APR-15	Gold Creek	Muscle	34.1	0.01330	0.806	24,000	0.0223	1,350	1.760	0.0081	1,280	0.0334	11,600	0.01930	22.9	<0.000032
	GC-CSU-08-APR-15	Gold Creek	Muscle	11.3	0.00733	2.680	25,100	0.0106	1,240	4.320	0.0068	1,630	0.0196	14,500	0.09870	12.0	<0.000032
	GC-CSU-09-APR-15	Gold Creek	Muscle	103.0	0.00780	1.370	23,300	0.0147	1,010	0.815	0.0207	5,360	0.0353	12,200	0.09940	15.5	<0.000034
	GC-CSU-10-APR-15	Gold Creek	Muscle	16.3	0.00690	3.055	25,600	0.0126	1,210	1.845	0.0108	1,610	0.0417	12,800	0.02440	12.3	<0.000033
	GC-CSU-11-APR-15	Gold Creek	Muscle	14.0	0.00693	1.430	23,500	0.0066	1,270	3.910	0.0072	1,100	0.0223	13,000	0.05390	9.6	<0.000029
	GC-CSU-13-APR-15	Gold Creek	Muscle	10.9	0.00715	2.710	25,100	0.0114	1,280	6.590	0.0076	1,170	0.0230	15,200	0.08600	12.0	<0.000031
	GC-CSU-14-APR-15	Gold Creek	Muscle	8.6	0.00763	0.563	24,900	0.0108	1,280	3.330	0.0081	1,130	0.0331	13,100	0.02330	8.0	<0.000029
	GC-CSU-15-APR-15	Gold Creek	Muscle	50.7	0.02170	1.970	21,200	0.0660	1,390	12.200	0.0121	2,450	0.0878	22,000	0.32400	14.3	0.000033
	GC-CSU-17-APR-15	Gold Creek	Muscle	22.3	0.00818	2.270	26,700	0.0093	1,230	5.490	0.0098	1,740	0.0278	15,600	0.04390	17.5	<0.000032
	GC-CSU-18-APR-15	Gold Creek	Muscle	21.2	0.01110	0.837	24,700	0.0156	1,230	3.880	0.0106	1,240	0.0289	14,100	0.04450	14.3	<0.000033
	GC-CSU-10-APR-15	Gold Creek	Ovary	88.7	0.00965	0.228	11,900	0.0153	1,360	23.6	0.229	3,590	0.0393	9,850	0.0118	7.28	<0.000038
2016	SC-CSU-08 M-Apr-16	Sand Creek	Muscle	13.8	0.00803	0.881	23,800	<0.0064	1,420	1.35	0.0046	1,250	0.0356	11,700	0.0298	14.7	<0.0000038
	SC-CSU-36 M-Apr-16	Sand Creek	Muscle	17.9	0.007435	1.105	23,750	0.0071	1,225	0.496	0.00325	1,420	0.0183	10,850	0.006445	9.03	5.25E-06
	SC-CSU-08 O -Apr-16	Sand Creek	Ovary	53.3	0.00802	0.02065	7,395	0.00705	831	26.05	0.08735	1,810	0.0288	10,850	0.008475	5.535	0.000087
	SC-CSU-36 O-Apr-16	Sand Creek	Ovary	109	0.00929	0.0305	10,400	0.0121	1,160	15.3	0.106	3,320	0.102	10,500	0.0231	5.13	<0.000087
	ER-CSU-03 M-Apr-16	Elk River	Muscle	22.2	0.0063	0.671	20,600	0.0113	1,210	0.541	0.0046	1,060	0.0434	10,400	0.00762	5.97	<0.00005
	ER-CSU-04 M-Apr-16	Elk River	Muscle	11.65	0.00765	0.3855	23,900	0.0146	1,300	2.48	0.00345	994	0.02	12,500	0.01835	12.4	0.000046
	ER-CSU-34 M-Apr-16	Elk River	Muscle	38.15	0.01015	0.7895	22,150	0.01025	1,130	1.002	0.00525	1,220	0.03655	11,250	0.0129	9.025	0.0000495
	ER-CSU-45 M-Apr-16	Elk River	Muscle	11	0.0085	1.91	23,600	0.0079	1,280	0.98	0.0025	1,240	0.0247	11,400	0.012	20.6	<0.000049
	ER-CSU-03 O -Apr-16	Elk River	Ovary	90.35	0.0073	0.0123	6,940	0.015	776	17.65	0.107	1,960	0.117	9,855	0.00929	2.44	0.00011

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dw	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw
2016	ER-CSU-04 O-Apr-16	Elk River	Ovary	34.55	0.006445	0.00579	6,245	0.011	677	15.7	0.0772	1,475	0.0389	10,450	0.00418	3.82	0.000083
	ER-CSU-34 O-Apr-16	Elk River	Ovary	151	0.0142	0.0248	8,550	0.0468	1,060	15.9	0.156	2,380	0.143	9,630	0.0126	3.79	<0.00009
	ER-CSU-45 O-Apr-16	Elk River	Ovary	85.3	0.00974	0.0671	8,740	0.0217	1,050	6.82	0.204	2,960	0.0718	9,000	0.0153	8.95	<0.000089
	GC-CSU-04 M-Apr-16	Gold Creek	Muscle	14.25	0.009255	0.3615	21,600	0.008	1,405	1.485	0.00346	1,070	0.02405	11,300	0.012075	16.2	0.0000875
	GC-CSU-05 M-Apr-16	Gold Creek	Muscle	14.5	0.00814	2.22	23,800	0.0076	1,410	2.27	0.00164	1,100	0.029	13,200	0.0319	10.3	<0.000084
	GC-CSU-09 M-Apr-16	Gold Creek	Muscle	9.285	0.00614	0.533	20,300	0.00575	1,305	2.86	0.00477	1,135	0.02615	11,150	0.023555	16.75	0.00009
	GC-CSU-26 M-Apr-16	Gold Creek	Muscle	11.5	0.00821	0.368	21,800	0.006	1,410	5.19	0.00516	1,020	0.0201	13,000	0.0281	23.7	<0.000094
	GC-CSU-27 M-Apr-16	Gold Creek	Muscle	13	0.0094	0.398	22,200	0.0106	1,430	2.78	0.00605	1,080	0.0287	12,000	0.0393	12.4	<0.000081
	GC-CSU-31 M-Apr-16	Gold Creek	Muscle	16	0.00693	0.946	23,200	0.0074	1,360	2.41	0.00468	897	0.0231	12,300	0.02	13	<0.000094
	GC-CSU-34 M-Apr-16	Gold Creek	Muscle	10.4	0.00646	0.769	21,800	<0.0051	1,350	1.1	0.00385	1,140	0.0146	11,200	0.0153	14.5	<0.000088
	GC-CSU-37 M-Apr-16	Gold Creek	Muscle	10.8	0.0103	0.627	22,200	0.0189	1,370	10.3	0.00287	1,100	0.0442	14,900	0.121	16.7	<0.000094
	GC-CSU-43 M-Apr-16	Gold Creek	Muscle	13	0.00592	0.435	20,000	<0.0056	1,300	2.22	0.00452	1,200	0.0226	11,500	0.034	16.5	<0.000095
	GC-CSU-04 O-Apr-16	Gold Creek	Ovary	28.35	0.00847	0.0081	6,690	0.00645	529	19.6	0.05785	1,355	0.03165	11,050	0.00571	5.34	0.000102
	GC-CSU-05 O-Apr-16	Gold Creek	Ovary	60.7	0.00616	0.0582	6,580	<0.0061	761	19.8	0.0738	1,440	0.0214	10,400	0.00333	3.26	<0.000096
	GC-CSU-09 O-Apr-16	Gold Creek	Ovary	31.8	0.00621	0.0097	6,910	<0.0066	709	16.2	0.084	1,650	0.0423	11,000	0.00668	6.22	<0.0001
	GC-CSU-26 O-Apr-16	Gold Creek	Ovary	23.1	0.00711	0.0067	6,070	<0.0063	503	19.7	0.0551	1,260	0.022	10,700	0.00257	7.27	<0.000099
	GC-CSU-27 O-Apr-16	Gold Creek	Ovary	25.4	0.00635	0.009	6,760	<0.0059	642	6.47	0.052	1,400	0.0145	11,000	0.00338	4.09	<0.000092
	GC-CSU-31 O-Apr-16	Gold Creek	Ovary	56.35	0.0073	0.02875	7,720	0.012	1,020	40.4	0.174	1,930	0.04015	9,875	0.00569	5.045	0.00012
	GC-CSU-34 O-Apr-16	Gold Creek	Ovary	30.9	0.00569	0.014	6,620	<0.012	629	13.4	0.0526	1,420	0.0232	11,400	0.00526	4.77	<0.00012
	GC-CSU-37 O-Apr-16	Gold Creek	Ovary	43.1	0.00612	0.0114	6,800	<0.012	693	28.8	0.092	1,720	0.0604	10,300	0.00483	5.54	<0.00012
	GC-CSU-43 O-Apr-16	Gold Creek	Ovary	31	0.0061	0.00997	6,790	<0.012	618	16	0.0663	1,350	0.0172	11,100	0.00278	6.25	<0.00012

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sb µg/g dw	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	SC-LSS-01M-APR-14	Sand Creek	Muscle Plug	0.0042	2.84	0.0184	0.846	0.00107	0.15	0.0287	<0.0063	0.0084	<0.0015	22.5	0.0279
	SC-LSS-02M-APR-14	Sand Creek	Muscle Plug	0.0024	1.65	0.0119	0.41	0.0084	0.438	0.0352	<0.0030	0.0417	0.00723	27.9	0.0304
	SC-LSS-03M-APR-14	Sand Creek	Muscle Plug	0.0023	2.21	0.0082	0.183	0.00156	0.241	0.0584	<0.0024	0.0117	0.0023	28.3	0.0285
	SC-LSS-04M-APR-14	Sand Creek	Muscle Plug	0.0041	2.43	0.135	8.73	0.00838	1.55	0.0151	0.0068	0.0792	0.0186	56.4	0.0567
	SC-LSS-07M-APR-14	Sand Creek	Muscle Plug	0.0188	1.35	0.0182	0.297	0.00377	0.414	0.0209	<0.0029	0.0261	0.00542	46.2	0.0168
	SC-LSS-08M-APR-14	Sand Creek	Muscle Plug	0.0498	2.8	0.0225	0.79	0.0161	0.961	0.00624	<0.0037	0.0753	0.0249	63.2	0.0797
	SC-LSS-09M-APR-14	Sand Creek	Muscle Plug	0.0062	1.91	0.014	0.296	0.00163	0.198	0.00568	<0.0040	0.013	0.0036	57.2	0.0446
	SC-LSS-10M-APR-14	Sand Creek	Muscle Plug	0.0177	2.88	0.0119	0.218	0.00484	0.49	0.0125	<0.0025	0.0295	0.0104	63.3	0.0261
	SC-LSS-11M-APR-14	Sand Creek	Muscle Plug	0.0087	1.24	0.0127	0.245	0.00271	0.35	0.00739	<0.0032	0.0197	0.00463	116	0.0259
	SC-LSS-12M-APR-14	Sand Creek	Muscle Plug	0.0034	3.1	0.0131	0.337	0.00228	0.34	0.0272	<0.0032	0.0149	0.00321	72	0.0183
	SC-LSS-01M-AUG-14	Sand Creek	Muscle Plug	0.0098	1.17	0.0175	1.39	0.0164	7.91	0.00432	0.00328	0.111	0.045	36.8	0.62
	SC-LSS-02M-AUG-14	Sand Creek	Muscle Plug	0.007	1.64	0.0453	5.27	0.00496	0.762	0.0126	0.00346	0.0403	0.0183	42.9	0.0637
	SC-LSS-03M-AUG-14	Sand Creek	Muscle Plug	<0.0072	1.1	0.011	0.498	0.00453	0.47	0.0044	<0.0017	0.0232	0.0034	24.5	0.0218
	SC-LSS-04M-AUG-14	Sand Creek	Muscle Plug	0.0181	3.12	0.124	0.784	0.00878	2.44	0.00562	0.0088	0.126	0.0261	39.1	0.0735
	ER-LSS-08M-APR-14	Elk River	Muscle Plug	0.0038	5.51	0.0114	8.22	0.00102	0.255	0.00831	<0.0031	0.0348	0.00348	33.3	0.0108
	ER-LSS-09M-APR-14	Elk River	Muscle Plug	<0.0020	3.65	0.009	1.37	0.00074	0.19	0.0242	<0.0030	0.0169	0.00295	40.3	0.0097
	ER-LSS-10M-APR-14	Elk River	Muscle Plug	0.0076	9.85	0.0202	5.78	0.0921	6.92	0.0284	0.0131	0.82	0.191	38.7	0.146
	ER-LSS-11M-APR-14	Elk River	Muscle Plug	0.0115	3.96	0.0359	1.47	0.146	4.4	0.0182	0.0211	0.392	0.109	49.6	0.137
	ER-LSS-12M-APR-14	Elk River	Muscle Plug	0.0047	4.02	0.0134	0.943	0.00682	1.14	0.00716	<0.0030	0.0477	0.014	33.2	0.0701
	ER-LSS-13M-APR-14	Elk River	Muscle Plug	0.0029	6.13	0.0148	5.57	0.00139	0.29	0.0204	<0.0036	0.0173	0.00319	27.7	0.0199
	ER-LSS-14M-APR-14	Elk River	Muscle Plug	0.0038	4.47	0.0177	9.83	0.0447	1.49	0.0319	0.009	0.166	0.101	93.3	0.077
	ER-LSS-15M-APR-14	Elk River	Muscle Plug	0.0041	4.87	0.0133	6.57	0.022	5.18	0.0353	0.0059	0.244	0.0479	67.6	0.0589
	ER-LSS-16M-APR-14	Elk River	Muscle Plug	0.002	4.16	0.0102	3.35	0.0019	0.584	0.00691	<0.0026	0.0342	0.00374	22.8	0.0197
	ER-LSS-17M-APR-14	Elk River	Muscle Plug	0.0055	2.14	0.01	5.05	0.00418	0.436	0.0202	0.0036	0.031	0.00636	31.8	0.0163
	ER-LSS-01M-AUG-14	Elk River	Muscle Plug	0.0067	4.99	0.0178	0.386	0.00756	3.23	0.0216	0.00376	0.133	0.0715	72.4	0.0627
	ER-LSS-02M-AUG-14	Elk River	Muscle Plug	0.0093	6.73	0.0223	6.87	0.00675	1.28	0.00748	0.0044	0.0768	0.0192	39.7	0.0555
	ER-LSS-03M-AUG-14	Elk River	Muscle Plug	0.0269	9.86	0.0116	0.294	0.00077	0.387	0.00832	<0.0014	0.0247	0.0027	36.3	0.0202
	ER-LSS-04M-AUG-14	Elk River	Muscle Plug	0.011	5.1	<0.0092	0.704	0.00322	0.472	0.00893	<0.0015	0.0239	0.0048	95.1	0.0179
	ER-LSS-05M-AUG-14	Elk River	Muscle Plug	0.0062	9.39	0.0109	0.482	0.00458	0.31	0.00692	0.00219	0.017	0.00964	34.3	0.0189
	ER-LSS-06M-AUG-14	Elk River	Muscle Plug	0.017	2.25	0.0199	0.262	0.00164	0.187	0.0169	<0.0012	0.0143	0.0024	33.8	0.0141
	ER-LSS-07M-AUG-14	Elk River	Muscle Plug	<0.0050	4.59	0.0145	0.242	0.0016	0.233	0.00817	<0.0012	0.0164	0.00409	30.8	0.0206
	ER-LSS-08M-AUG-14	Elk River	Muscle Plug	0.0235	6.29	0.0416	23.4	0.0223	1.93	0.0117	0.0145	0.204	0.0361	51.8	0.106
	ER-LSS-09M-AUG-14	Elk River	Muscle Plug	0.0081	9.27	<0.0057	0.189	0.00066	0.211	0.00782	<0.00094	0.0089	0.00121	34.5	0.011
	ER-LSS-10M-AUG-14	Elk River	Muscle Plug	0.0055	9.03	0.0117	0.272	0.00394	0.492	0.0147	0.00106	0.0434	0.0078	30.5	0.0295
	GC-LSS-01M-APR-14	Gold Creek	Muscle Plug	0.0037	2.62	0.0069	0.607	0.00193	0.282	0.0113	0.00084	0.0212	0.00384	25	0.0106
	GC-LSS-02M-APR-14	Gold Creek	Muscle Plug	0.0061	1.85	0.0119	3.42	0.00632	0.564	0.00499	0.00269	0.0514	0.00994	22.3	0.0249
	GC-LSS-03M-APR-14	Gold Creek	Muscle Plug	0.0044	2.83	0.0087	0.786	0.0281	0.742	0.0289	0.0064	0.0716	0.0263	23.4	0.0717
	GC-LSS-01M-AUG-14	Gold Creek	Muscle Plug	0.0126	3.13	0.0304	0.408	0.00744	1.13	0.0034	0.0026	0.0869	0.0156	48.6	0.122
	GC-LSS-02M-AUG-14	Gold Creek	Muscle Plug	<0.0047	3.79	0.0137	0.144	0.00131	0.237	0.00349	<0.0011	0.0185	0.00276	36.1	0.0244
	GC-LSS-03M-AUG-14	Gold Creek	Muscle Plug	0.0068	6.12	0.011	0.222	0.00218	1.69	0.00367	0.0012	0.0306	0.00707	43.1	0.0918
	GC-LSS-04M-AUG-14	Gold Creek	Muscle Plug	0.0161	2.53	0.0746	1.5	0.00791	1.51	0.00432	0.0047	0.0859	0.0234	78.9	0.0828
	GC-LSS-05M-AUG-14	Gold Creek	Muscle Plug	<0.0033	4.04	0.0163	0.203	0.00058	0.2	0.0035	<0.00078	0.0114	0.00081	51.9	0.0139

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sb µg/g dw	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	GC-LSS-06M-AUG-14	Gold Creek	Muscle Plug	<0.0050	3.58	0.0163	0.25	0.00174	0.483	0.00307	<0.0012	0.0309	0.0072	45.5	0.0393
	GC-LSS-07M-AUG-14	Gold Creek	Muscle Plug	0.0039	2.43	0.0104	0.175	0.00087	0.17	0.00481	<0.00087	0.0085	0.00184	30.4	0.0117
	GC-LSS-08M-AUG-14	Gold Creek	Muscle Plug	0.0094	4.95	0.017	0.377	0.0023	0.25	0.0041	<0.0019	0.0153	0.0024	118	0.103
	GC-LSS-09M-AUG-14	Gold Creek	Muscle Plug	0.0038	3.63	0.0075	0.179	0.00079	0.233	0.00879	<0.00059	0.012	0.00188	25.7	0.021
	GC-LSS-10M-AUG-14	Gold Creek	Muscle Plug	0.004	3.73	0.0089	5.17	0.00057	0.176	0.0128	0.00106	0.0112	0.00158	36.4	0.0134
2015	SC-CSU-02-APR-15	Sand Creek	Muscle	0.0039	3.68	0.00820	2.67	0.00068	0.2045	0.0108	0.00083	0.01160	0.00158	31.1	0.0172
	SC-CSU-03-APR-15	Sand Creek	Muscle	0.0037	1.79	0.00716	2.81	0.01030	0.8280	0.0155	0.00232	0.06400	0.01440	23.4	0.0849
	SC-CSU-04-APR-15	Sand Creek	Muscle	0.0068	1.60	0.00784	0.29	0.00133	0.2040	0.0331	0.00113	0.01610	0.00225	87.0	0.0291
	SC-CSU-05-APR-15	Sand Creek	Muscle	<0.0010	1.34	0.00145	3.92	0.00040	0.1010	0.0153	0.00125	0.00591	0.00074	37.2	0.0159
	SC-CSU-06-APR-15	Sand Creek	Muscle	0.0050	3.23	0.00441	4.12	0.00430	0.4250	0.0073	0.00293	0.02960	0.00703	29.0	0.0572
	SC-CSU-07-APR-15	Sand Creek	Muscle	0.0029	1.74	0.00151	0.96	0.00183	0.1840	0.0243	0.00070	0.01140	0.00261	36.8	0.0225
	SC-CSU-05-APR-15	Sand Creek	Ovary	0.0013	2.60	0.00103	0.89	0.00233	0.1567	0.0133	0.00634	0.01222	0.00927	111.0	0.0086
	ER-CSU-01-APR-15	Elk River	Muscle	0.0128	6.58	0.02460	4.21	0.12200	6.1600	0.0348	0.03040	1.44000	0.32600	29.9	0.2760
	ER-CSU-02-APR-15	Elk River	Muscle	0.0012	3.17	0.00141	3.58	0.00029	0.1290	0.0321	0.00106	0.00972	0.00117	31.0	0.0061
	ER-CSU-04-APR-15	Elk River	Muscle	0.0051	2.82	0.01090	6.92	0.01920	1.4500	0.0411	0.00605	0.22300	0.04380	95.0	0.0507
	ER-CSU-05-APR-15	Elk River	Muscle	0.0023	5.13	0.00143	1.71	0.00179	0.2830	0.0241	0.00084	0.02330	0.00395	51.0	0.0092
	ER-CSU-08-APR-15	Elk River	Muscle	0.0024	5.69	0.00129	4.12	0.00325	0.3930	0.0157	0.00206	0.05050	0.00792	35.6	0.0154
	ER-CSU-09-APR-15	Elk River	Muscle	0.0018	4.46	0.00172	7.28	0.00051	0.1125	0.0286	0.00146	0.00991	0.00204	38.9	0.0089
	ER-CSU-10-APR-15	Elk River	Muscle	0.0021	4.61	0.00220	3.92	0.00511	0.4240	0.0329	0.00224	0.05530	0.01200	38.2	0.0157
	ER-CSU-11-APR-15	Elk River	Muscle	0.0029	5.09	0.00172	3.46	0.00408	0.4570	0.0377	0.00197	0.05900	0.01130	37.4	0.0167
	ER-CSU-12-APR-15	Elk River	Muscle	0.0019	3.50	0.00060	3.09	0.00172	0.2040	0.0237	0.00072	0.01910	0.00373	36.6	0.0059
	ER-CSU-17-APR-15	Elk River	Muscle	0.0029	8.35	0.00172	3.40	0.00132	0.4640	0.0219	0.00141	0.01820	0.00398	33.3	0.0083
	GC-CSU-02-APR-15	Gold Creek	Muscle	0.0021	2.15	0.00530	1.67	0.00533	0.6620	0.0219	0.00163	0.03360	0.01540	27.6	0.0187
	GC-CSU-08-APR-15	Gold Creek	Muscle	0.0034	2.64	0.00084	4.81	0.00019	0.0820	0.0050	0.00245	0.00972	0.00175	27.2	0.0146
	GC-CSU-09-APR-15	Gold Creek	Muscle	0.0078	5.70	0.00496	0.33	0.00109	0.1690	0.0195	0.00107	0.01810	0.00331	67.8	0.0085
	GC-CSU-10-APR-15	Gold Creek	Muscle	0.0018	0.97	0.00261	1.58	0.00035	0.1305	0.0082	0.00176	0.00576	0.00121	26.3	0.0063
	GC-CSU-11-APR-15	Gold Creek	Muscle	0.0023	3.01	0.00231	3.82	0.00054	0.1200	0.0097	0.00241	0.00982	0.00194	26.9	0.0062
	GC-CSU-13-APR-15	Gold Creek	Muscle	0.0016	1.93	<0.00055	5.88	0.00016	0.0910	0.0053	0.00440	0.00492	0.00236	21.5	0.0075
	GC-CSU-14-APR-15	Gold Creek	Muscle	0.0013	4.86	<0.00051	4.20	0.00026	0.0840	0.0224	0.00107	0.00572	0.00164	22.3	0.0067
	GC-CSU-15-APR-15	Gold Creek	Muscle	0.0060	2.32	0.00151	19.60	0.00824	0.6790	0.0251	0.01110	0.04930	0.01610	44.9	0.0311
	GC-CSU-17-APR-15	Gold Creek	Muscle	0.0022	2.89	0.00099	6.44	0.00035	0.0990	0.0071	0.00220	0.00862	0.00152	31.9	0.0060
	GC-CSU-18-APR-15	Gold Creek	Muscle	0.0026	4.34	0.00197	5.01	0.00141	0.2180	0.0149	0.00210	0.01610	0.00414	41.6	0.0132
	GC-CSU-10-APR-15	Gold Creek	Ovary	0.00149	2.40	0.000690	0.378	0.00443	0.293	0.0147	0.00718	0.0170	0.0176	146	0.0112
2016	SC-CSU-08 M-Apr-16	Sand Creek	Muscle	0.00216	2.02	0.00339	1.54	0.00079	0.152	0.00357	0.00087	0.00841	0.00114	21.7	0.00504
	SC-CSU-36 M-Apr-16	Sand Creek	Muscle	0.00128	5.165	0.00086	0.1215	0.000695	0.1185	0.009715	0.00027	0.00435	0.00096	26.1	0.00426
	SC-CSU-08 O -Apr-16	Sand Creek	Ovary	0.002605	2.64	0.00088	0.3655	0.0006525	0.08065	0.003205	0.00735	0.006795	0.008265	97.3	0.00794
	SC-CSU-36 O-Apr-16	Sand Creek	Ovary	0.00211	5.21	0.00447	0.414	0.00214	0.16	0.015	1.02	0.015	0.0144	158	0.00945
	ER-CSU-03 M-Apr-16	Elk River	Muscle	0.00243	6.64	0.00138	0.151	0.000776	0.172	0.00909	0.00025	0.00893	0.0016	21	0.006
	ER-CSU-04 M-Apr-16	Elk River	Muscle	0.001575	4.055	0.000825	3.07	0.0005615	0.1625	0.01475	0.000805	0.0109	0.00162	24.5	0.0056
	ER-CSU-34 M-Apr-16	Elk River	Muscle	0.003105	6.415	0.00107	1.2345	0.001655	0.236	0.02335	0.000885	0.0275	0.00287	25.35	0.00805
	ER-CSU-45 M-Apr-16	Elk River	Muscle	0.00092	2.25	<0.00088	1.24	0.000757	0.09	0.0224	0.00055	0.00537	0.00062	21.7	0.036
	ER-CSU-03 O -Apr-16	Elk River	Ovary	0.003035	9.07	0.001815	0.3465	0.000618	0.111	0.00803	0.00227	0.010465	0.010035	114.95	0.007455

Table G.5: Metal Concentrations (µg/g Dry Weight) in Largescale Sucker Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sb µg/g dw	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2016	ER-CSU-04 O-Apr-16	Elk River	Ovary	0.00097	3.845	0.000615	0.275	0.000254	0.0687	0.009855	0.00094	0.00453	0.0026	72.65	0.00229
	ER-CSU-34 O-Apr-16	Elk River	Ovary	0.0046	6.9	0.00158	0.505	0.00576	0.28	0.0247	0.00999	0.052	0.0374	128	0.0215
	ER-CSU-45 O-Apr-16	Elk River	Ovary	0.0022	3.24	0.00171	0.524	0.004	0.301	0.0217	0.00855	0.0434	0.0351	128	0.0184
	GC-CSU-04 M-Apr-16	Gold Creek	Muscle	0.0008	0.72	0.001495	0.9845	0.001665	0.247	0.006425	0.0007	0.010155	0.00397	18.2	0.02595
	GC-CSU-05 M-Apr-16	Gold Creek	Muscle	0.00246	3.77	0.00087	3.95	0.00025	0.123	0.00145	0.00109	0.00666	0.00125	19.8	0.0108
	GC-CSU-09 M-Apr-16	Gold Creek	Muscle	0.00081	0.82	0.0012	2.03	0.00031	0.1295	0.00756	0.001055	0.00328	0.0013	16.3	0.00544
	GC-CSU-26 M-Apr-16	Gold Creek	Muscle	0.00115	1.45	<0.00088	5.04	0.00045	0.119	0.0122	0.00144	0.00565	0.0011	20.7	0.0109
	GC-CSU-27 M-Apr-16	Gold Creek	Muscle	0.00113	1.5	0.00202	2.83	0.00113	0.16	0.00629	0.00193	0.0105	0.00207	22.1	0.0255
	GC-CSU-31 M-Apr-16	Gold Creek	Muscle	0.00133	4.21	0.0012	2.71	0.00036	0.133	0.00732	0.00076	0.00651	0.0011	16.3	0.00723
	GC-CSU-34 M-Apr-16	Gold Creek	Muscle	0.00118	1.05	<0.00083	0.522	0.0006	0.151	0.00979	0.00043	0.0045	0.00092	18.7	0.00534
	GC-CSU-37 M-Apr-16	Gold Creek	Muscle	0.00112	3.29	0.00133	9.53	0.00154	0.166	0.0241	0.00406	0.0143	0.00243	22.1	0.0118
	GC-CSU-43 M-Apr-16	Gold Creek	Muscle	0.00064	0.71	0.00155	1.79	0.00029	0.102	0.0113	0.00092	0.00351	0.00067	23.3	0.00706
	GC-CSU-04 O-Apr-16	Gold Creek	Ovary	0.000545	0.9615	0.00065	0.2995	0.000517	0.13575	0.00368	0.00157	0.00602	0.00237	83.35	0.005695
	GC-CSU-05 O-Apr-16	Gold Creek	Ovary	0.00274	6.54	<0.00042	0.268	0.000472	0.0669	0.00153	0.00155	0.00505	0.0111	86.9	0.0037
	GC-CSU-09 O-Apr-16	Gold Creek	Ovary	0.00173	1.45	0.00051	0.344	0.000282	0.0621	0.00519	0.00215	0.00349	0.00202	88.3	0.00372
	GC-CSU-26 O-Apr-16	Gold Creek	Ovary	0.00118	1.13	<0.00044	0.312	0.000245	0.0654	0.00759	0.00148	0.00244	0.00076	75	0.00185
	GC-CSU-27 O-Apr-16	Gold Creek	Ovary	0.00118	1.21	<0.00041	0.213	0.000235	0.0554	0.00518	0.00175	0.00259	0.00096	81.1	0.00366
	GC-CSU-31 O-Apr-16	Gold Creek	Ovary	0.001985	5.845	0.000675	0.442	0.0005095	0.0895	0.006125	0.00174	0.006175	0.007485	145.5	0.00487
	GC-CSU-34 O-Apr-16	Gold Creek	Ovary	0.00095	1.46	<0.00062	0.233	0.000264	0.048	0.00799	0.00206	0.00482	0.00219	74.2	0.00838
	GC-CSU-37 O-Apr-16	Gold Creek	Ovary	0.00105	4.9	<0.00064	0.322	0.000286	0.064	0.0167	0.00225	0.00562	0.00377	84.9	0.00522
	GC-CSU-43 O-Apr-16	Gold Creek	Ovary	0.00092	1.16	<0.00065	0.318	0.000106	0.053	0.00497	0.00138	0.00307	0.0012	76.9	0.00346

Table G.6: Metal Concentrations (µg/g Dry Weight) in Mountain Whitefish Tissues Collected in Koocanusa Reservoir, April 2015 and 2016 and August 2016

Year	Sample ID	Area	Tissue Type	Total wet mass	Total dry mass	Dry matter	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs
				g	g	%	%	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt
2015	GC-MW-01-Apr-15	Gold Creek	Muscle	3.79187	0.8841	0.23	77	<0.00030	1.9	0.17	<0.11	0.15	<0.0060	0.0019	769	0.003	0.040	0.070	0.017
2016	SC-MW-01 M-Apr-16	Sand Creek	Muscle	4.208	0.878	0.20865	79	<0.00052	1.93	0.254	0.134	0.0574	<0.0056	0.00156	598	0.0062	0.0256	0.0503	0.0932
	GC-MW-01-Apr-16	Gold Creek	Muscle plug	0.0359	0.0052	0.144847	86	0.0054	55	0.159	0.79	1.54	<0.0065	0.0689	519	0.0399	0.0837	0.367	0.122
	GC-MW-02 M-Apr-16	Gold Creek	Muscle	5.92572	1.35917	0.229368	77	<0.00042	7.32	0.243	0.1	0.212	<0.0026	0.0021	1,190	0.002	0.0241	0.104	0.0372
	ER-MW-01-Aug-16	Elk River	Muscle	0.03347	0.00894	0.267105	73	<0.0011	17.3	0.113	<0.39	1.04	<0.0098	0.00026	361	0.0072	0.17	3.42	0.0271
	ER-MW-02-Aug-16	Elk River	Muscle	0.06418	0.01537	0.239483	76	0.00068	11.7	0.0476	<0.23	0.744	<0.0057	0.000785	366	<0.0031	0.141	3.46	0.0213
	ER-MW-03A-Aug-16 avg	Elk River	Muscle	0.10241	0.02699	0.263548	73	<0.000625	1.53	0.106	<0.235	0.1373	<0.0058	0.0002975	237.5	0.0035	0.0497	2.59	0.0421
	ER-MW-04-Aug-16	Elk River	Muscle	0.05299	0.01444	0.272504	73	<0.00065	3.14	0.0845	<0.24	0.0417	<0.0060	0.00014	292	<0.0032	0.0622	10.9	0.0634
	ER-MW-05-Aug-16	Elk River	Muscle	0.04461	0.01187	0.266084	73	<0.00076	3.61	0.0464	<0.28	0.188	<0.0070	0.00054	323	0.0043	0.0717	2.46	0.0206
	ER-MW-06-Aug-16	Elk River	Muscle	0.07757	0.01859	0.239655	76	<0.00051	11.6	0.183	0.28	1.25	<0.0047	0.000423	375	0.0055	0.0925	2.93	0.038
	ER-MW-07-Aug-16	Elk River	Muscle	0.0507	0.01394	0.274951	73	<0.00066	3.14	0.232	<0.25	0.106	<0.0061	0.00036	313	<0.0033	0.0406	0.357	0.067
	ER-MW-08-Aug-16	Elk River	Muscle	0.08222	0.01977	0.240452	76	0.00068	24.5	0.135	<0.21	0.282	<0.0052	0.000489	413	<0.0028	0.0635	1.74	0.028
	ER-MW-09-Aug-16	Elk River	Muscle	0.05775	0.01412	0.244502	76	<0.00066	26.8	0.128	0.27	0.35	<0.0061	0.00052	408	0.0045	0.0791	0.583	0.0356
	ER-MW-10-Aug-16	Elk River	Muscle	0.06388	0.01704	0.26675	73	<0.00056	24.9	0.293	<0.21	0.312	<0.0052	0.000457	407	<0.0028	0.048	0.352	0.0375
	SC-MW-01-Aug-16	Sand Creek	Muscle plug	0.04367	0.01044	0.239066	76	0.0063	4.42	0.04	<0.34	0.126	<0.0083	0.0002	372	<0.0045	0.0843	2.77	0.0201
	SC-MW-02-Aug-16 avg	Sand Creek	Muscle plug	0.13864	0.03451	0.248918	75	0.000575	2.22	0.223	0.21	0.0692	0.0053	0.0002665	358	0.0132	0.03765	1.5	0.04475
	SC-MW-03-Aug-16	Sand Creek	Muscle plug	0.06573	0.01502	0.228511	77	<0.00064	5.1	0.0698	0.61	0.11	<0.0059	0.0004	357	0.0273	0.0984	9.6	0.0259
	SC-MW-04-Aug-16	Sand Creek	Muscle plug	0.0509	0.01261	0.247741	75	0.00081	31.8	0.134	<0.27	0.431	<0.0068	0.00071	449	<0.0037	0.0714	1.66	0.0432
	SC-MW-05-Aug-16	Sand Creek	Muscle plug	0.05096	0.01246	0.244505	76	<0.00083	63.9	0.0565	<0.31	0.756	<0.0077	0.00116	568	0.0057	0.0795	0.923	0.0389

Table G.6: Metal Concentrations (µg/g Dry Weight) in Mountain Whitefish Tissues Collected in Koocanusa Reservoir, April 2015 and 2016 and August 2016

Year	Sample ID	Area	Tissue Type	Cu µg/g dry wt	Fe µg/g dry wt	Ga µg/g dry wt	Hg µg/g dry wt	K µg/g dry wt	Li µg/g dry wt	Mg µg/g dry wt	Mn µg/g dry wt	Mo µg/g dry wt	Na µg/g dry wt	Ni µg/g dry wt	P µg/g dry wt	Pb µg/g dry wt
2015	GC-MW-01-Apr-15	Gold Creek	Muscle	1.40	13.4	0.0081	0.310	20,300	<0.0050	1,380	0.88	0.0035	835	0.014	10,900	0.009
2016	SC-MW-01 M-Apr-16	Sand Creek	Muscle	1.03	14.8	0.0039	0.376	24,900	0.0297	1,480	0.707	<0.0031	1,080	0.0274	13,200	0.00819
	GC-MW-01-Apr-16	Gold Creek	Muscle plug	1.86	61.1	0.022	0.301	14,400	0.095	1,080	1.65	0.0373	1,290	0.516	8,640	1.82
	GC-MW-02 M-Apr-16	Gold Creek	Muscle	0.653	13.3	0.00936	0.148	22,600	0.0354	1,470	0.764	0.0062	758	0.024	11,700	0.00889
	ER-MW-01-Aug-16	Elk River	Muscle	1.41	75.7	0.0136	0.0711	17,400	0.129	1380	3.56	0.0348	900	0.844	10,900	0.053
	ER-MW-02-Aug-16	Elk River	Muscle	1.53	73.9	0.0124	0.0791	17,400	0.169	1400	3.07	0.0238	942	0.411	11,200	0.0611
	ER-MW-03A-Aug-16 avg	Elk River	Muscle	0.9445	41.1	0.00555	0.06955	14,600	0.2135	1145	0.5	0.01465	950	0.1955	9,505	0.021495
	ER-MW-04-Aug-16	Elk River	Muscle	1.49	86.3	0.0087	0.0876	17,200	0.092	1330	0.792	0.0501	948	0.77	11,500	0.0119
	ER-MW-05-Aug-16	Elk River	Muscle	1.3	44	0.0057	0.2	17,200	0.111	1320	0.967	0.0225	1040	0.823	11,100	0.0185
	ER-MW-06-Aug-16	Elk River	Muscle	1.74	122	0.0129	0.0604	18,400	0.0844	1400	2.54	0.0269	1020	0.355	11,700	0.135
	ER-MW-07-Aug-16	Elk River	Muscle	1.92	27.9	0.0081	0.0585	15,100	0.044	1100	1.02	0.0116	739	0.165	9,540	0.021
	ER-MW-08-Aug-16	Elk River	Muscle	4.09	54.1	0.0138	0.0943	16,100	0.094	1230	1.35	0.0345	960	0.868	10,800	0.0409
	ER-MW-09-Aug-16	Elk River	Muscle	1.61	45.9	0.0137	0.154	16,400	0.334	1330	1.5	0.0166	900	0.228	10,700	0.0579
	ER-MW-10-Aug-16	Elk River	Muscle	1.28	31	0.0121	0.122	16,300	0.083	1270	1.16	0.0115	1030	0.142	10,500	0.0419
	SC-MW-01-Aug-16	Sand Creek	Muscle plug	1.4	33.6	0.0072	0.086	15,300	0.242	1240	0.846	0.0446	973	1.25	10,200	0.0229
	SC-MW-02-Aug-16 avg	Sand Creek	Muscle plug	1.895	25.6	0.0048	0.1095	18,000	0.0854	1350	0.67	0.01755	1125	0.494	11,750	0.02015
	SC-MW-03-Aug-16	Sand Creek	Muscle plug	2.28	95.6	0.0076	0.0815	17,800	0.1	1330	1.22	0.0454	1260	0.586	11,500	0.0356
	SC-MW-04-Aug-16	Sand Creek	Muscle plug	1.79	46.8	0.0155	0.0851	18,900	0.086	1430	1.39	0.0338	1130	0.667	11,400	0.161
	SC-MW-05-Aug-16	Sand Creek	Muscle plug	2.1	87.5	0.027	0.091	17,200	0.146	1300	2.45	0.0229	1350	0.369	10,200	0.0879

Table G.6: Metal Concentrations (µg/g Dry Weight) in Mountain Whitefish Tissues Collected in Koocanusa Reservoir, April 2015 and 2016 and August 2016

Year	Sample ID	Area	Tissue Type	Rb	Re	Sb	Se	Sn	Sr	Th	Ti	Tl	U	V	Y	Zn	Zr
				µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt
2015	GC-MW-01-Apr-15	Gold Creek	Muscle	10.1	<0.00021	0.0010	3.76	0.0009	0.299	0.01340	0.094	0.0356	0.0003	0.0046	0.001	14.5	0.169
2016	SC-MW-01 M-Apr-16	Sand Creek	Muscle	13.9	0.000122	0.0014	3.88	0.0015	0.186	0.000523	0.163	0.0256	0.000274	0.00622	0.00084	41.0	0.00524
	GC-MW-01-Apr-16	Gold Creek	Muscle plug	13.5	0.00036	0.144	2.71	0.0696	0.651	0.0109	2.39	0.0321	0.00478	0.0911	0.0233	112.0	1.58
	GC-MW-02 M-Apr-16	Gold Creek	Muscle	9.7	0.000093	0.00067	4.3	0.00083	0.651	0.00203	0.253	0.0133	0.000837	0.0173	0.00531	14.1	0.00716
	ER-MW-01-Aug-16	Elk River	Muscle	7.25	<0.00018	<0.0030	4.56	0.0137	0.0808	0.02	0.237	0.0561	0.684	0.028	0.127	18.2	0.0321
	ER-MW-02-Aug-16	Elk River	Muscle	4.22	<0.00011	0.0026	7.71	0.0115	0.0995	0.00989	0.506	0.0336	0.133	0.115	0.0264	29.8	0.016
	ER-MW-03A-Aug-16 avg	Elk River	Muscle	8.06	<0.000108	<0.00175	4.605	0.006675	0.07155	0.001015	0.2085	0.133	0.01239	0.02915	0.00099	19.25	0.01145
	ER-MW-04-Aug-16	Elk River	Muscle	9.88	0.00015	0.0036	4.16	0.015	0.0367	0.00043	0.122	0.169	0.00956	0.0565	0.00231	22.2	0.011
	ER-MW-05-Aug-16	Elk River	Muscle	3.13	<0.00013	0.0035	7.33	0.0118	0.0959	0.00134	0.159	0.0363	0.0225	0.0232	0.00525	23.3	0.0163
	ER-MW-06-Aug-16	Elk River	Muscle	8.16	0.000108	0.0024	4.96	0.0103	0.104	0.0195	0.534	0.0417	0.338	0.0393	0.0748	28	0.0262
	ER-MW-07-Aug-16	Elk River	Muscle	10.3	<0.00011	0.002	5.2	0.0102	0.106	0.00127	0.296	0.155	0.0178	0.00925	0.00395	39.4	0.013
	ER-MW-08-Aug-16	Elk River	Muscle	5.09	0.000117	0.0028	5.49	0.0091	0.221	0.00792	1.45	0.0398	0.00414	0.0597	0.0153	26.4	0.0299
	ER-MW-09-Aug-16	Elk River	Muscle	5.38	<0.00011	0.0033	5.24	0.0071	0.3	0.00469	1.02	0.0314	0.00931	0.042	0.0133	22.6	0.0288
	ER-MW-10-Aug-16	Elk River	Muscle	8.85	<0.000095	0.0023	3.77	0.00626	0.2	0.00407	0.741	0.0313	0.00339	0.0345	0.0165	28.4	0.0277
	SC-MW-01-Aug-16	Sand Creek	Muscle plug	3.26	<0.00015	0.0043	7.08	0.0099	0.272	0.00078	0.164	0.0401	0.00161	0.019	0.00113	24.2	0.0102
	SC-MW-02-Aug-16 avg	Sand Creek	Muscle plug	10.6	0.000143	0.0019	3.605	0.01237	0.06625	0.001035	0.146	0.03745	0.003345	0.0131	0.00122	18.6	0.00134
	SC-MW-03-Aug-16	Sand Creek	Muscle plug	7.03	<0.00011	0.0042	6.43	0.0405	0.177	0.00096	0.417	0.0621	0.00566	0.0653	0.00275	15.9	0.0127
	SC-MW-04-Aug-16	Sand Creek	Muscle plug	9.21	0.00015	0.0053	4.57	0.0144	0.234	0.0056	0.692	0.0453	0.00576	0.0488	0.0126	21.9	0.0334
	SC-MW-05-Aug-16	Sand Creek	Muscle plug	7.46	0.00015	0.0061	6.12	0.0107	0.495	0.0154	1.98	0.0545	0.00669	0.112	0.0249	20.6	0.0623

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2014	EC-PM-01M-Feb-14	Englishman Creek	Muscle	78	<0.00097	7.51	0.0169	<0.17	0.335	<0.0027	0.00243	546	0.0034	0.0071	0.122	0.109	0.798	13
	EC-PM-01G-Feb-14	Englishman Creek	Ovary	77	0.00266	14.1	0.23	<0.081	0.608	<0.0040	0.00078	532	0.0125	0.053	0.187	0.0715	2.87	111
	SC-PM-05M-Feb-14	Sand Creek	Muscle	79	<0.00096	2.76	0.0138	<0.17	0.289	<0.0027	0.00261	1,290	0.0018	0.0047	0.0802	0.177	0.653	10
	SC-PM-10M-Feb-14	Sand Creek	Muscle	77	<0.00094	1.97	0.0338	<0.17	0.132	<0.0026	0.00107	552	0.00214	0.0037	0.0788	0.170	1.016	9.15
	SC-PM-01M-Apr-14	Sand Creek	Muscle	78	<0.00079	6.61	0.0193	<0.084	0.526	<0.0023	0.00177	2,405	0.00111	0.00707	0.0758	0.173	0.656	16.5
	SC-PM-02M-Apr-14	Sand Creek	Muscle	77	<0.00080	16.9	0.024	<0.085	0.49	<0.0023	0.00315	686	0.00161	0.00865	0.0874	0.115	0.822	31.5
	SC-PM-03M-Apr-14	Sand Creek	Muscle	79	<0.00081	12.7	0.0147	<0.086	0.26	<0.0024	0.00229	566	0.00151	0.00889	0.107	0.106	0.936	17
	SC-PM-04M-Apr-14	Sand Creek	Muscle	77	<0.00079	11.8	0.0219	<0.084	0.714	<0.0023	0.00151	1,650	0.00259	0.00838	0.0859	0.174	0.65	15
	SC-PM-05M-Apr-14	Sand Creek	Muscle	81	<0.00080	12.9	0.0124	<0.085	0.458	<0.0024	0.00115	1,040	0.00103	0.00776	0.0736	0.243	0.656	19.4
	SC-PM-06M-Apr-14	Sand Creek	Muscle	77	<0.00078	7.96	0.0241	<0.083	0.278	<0.0023	0.00106	565	0.0022	0.0071	0.298	0.127	0.823	15.6
	SC-PM-07M-Apr-14	Sand Creek	Muscle	77	<0.00073	26	0.021	<0.078	0.474	<0.0022	0.00355	1,370	0.00178	0.0115	0.0954	0.136	0.654	39.1
	SC-PM-08M-Apr-14	Sand Creek	Muscle	78	<0.00084	4.6	0.0182	<0.090	0.458	<0.0025	0.00147	1,340	<0.00069	0.00587	0.103	0.158	0.68	11.4
	SC-PM-09M-Apr-14	Sand Creek	Muscle	76	<0.00081	17.9	0.032	<0.086	0.28	<0.0024	0.00133	656	0.00163	0.00841	0.0877	0.108	0.775	20
	SC-PM-10M-Apr-14	Sand Creek	Muscle	78	<0.00077	4.1	0.0212	<0.082	0.302	<0.0023	0.00192	642	0.00107	0.00538	0.072	0.124	0.613	10.3
	SC-PM-01M-Aug-14	Sand Creek	Muscle	79	<0.00078	2.76	0.0219	<0.12	0.465	<0.0039	0.00182	1,520	0.00830	0.0065	0.109	0.131	0.662	11.3
	SC-PM-02M-Aug-14	Sand Creek	Muscle	78	<0.00078	11.6	0.0384	<0.12	0.688	<0.0039	0.00204	682	0.0121	0.0113	0.129	0.104	1.39	32.4
	SC-PM-03M-Aug-14	Sand Creek	Muscle	78	<0.00074	11.6	0.0246	0.13	0.383	<0.0037	0.00221	1,060	0.00423	0.0094	0.118	0.106	0.665	19.9
	SC-PM-04M-Aug-14	Sand Creek	Muscle	79	<0.00079	1.16	0.0157	<0.12	0.618	<0.0039	0.0018	2,730	0.00159	0.0051	0.0808	0.0888	0.766	9.08
	SC-PM-05M-Aug-14	Sand Creek	Muscle	78	<0.00079	6.74	0.0448	<0.12	0.162	<0.0039	0.00245	556	0.00274	0.0077	0.0905	0.0691	0.742	13.4
	SC-PM-06M-Aug-14	Sand Creek	Muscle	79	<0.00080	2.86	0.0225	<0.12	0.582	<0.0039	0.00176	2,120	0.00203	0.0068	0.234	0.0885	0.630	11.4
	SC-PM-07M-Aug-14	Sand Creek	Muscle	79	<0.00073	4.56	0.024	<0.11	0.318	<0.0036	0.00209	763	0.00225	0.00514	0.0942	0.0921	0.74	16.1
	SC-PM-08M-Aug-14	Sand Creek	Muscle	79	<0.00078	10.1	0.0212	<0.12	0.933	<0.0039	0.00296	1,720	0.00304	0.009	0.106	0.136	1.11	16
	SC-PM-09M-Aug-14	Sand Creek	Muscle	79	<0.00077	1.56	0.0084	<0.12	0.245	<0.0038	0.00273	519	0.00177	0.0041	0.0656	0.079	0.682	9.54
	SC-PM-10M-Aug-14	Sand Creek	Muscle	79	<0.00083	13.6	0.102	<0.13	0.714	<0.0041	0.00162	666	0.00631	0.0144	0.129	0.0855	1.88	32.6
	SC-PM-05G-Feb-14	Sand Creek	Ovary	76	0.00326	64.6	0.143	<0.076	0.815	<0.0037	0.00159	1,620	0.0094	0.0581	0.147	0.142	2.9	173
	SC-PM-10G-Feb-14	Sand Creek	Ovary	73	0.00476	2.23	0.104	<0.077	0.0599	<0.0037	0.00025	1,173	0.00267	0.0467	0.0786	0.109	2.85	109
	SC-PM-01G-Apr-14	Sand Creek	Ovary	76	0.00276	16.8	0.0638	<0.079	0.216	<0.0038	0.00056	1,170	0.006	0.0434	0.0875	0.121	2.76	211
	SC-PM-10G-Apr-14	Sand Creek	Ovary	81	0.00352	15.6	0.101	<0.080	0.744	<0.0039	0.00063	880	0.0262	0.0597	0.09	0.146	4.4	318
	ER-PM-06M-Feb-14	Elk River	Muscle	77	<0.00097	4.55	0.0295	<0.17	0.532	<0.0027	0.00216	1,020	0.0053	0.0071	0.12	0.0705	1	11.7
	ER-PM-09M-Feb-14	Elk River	Muscle	80	<0.00096	5.73	0.0526	<0.17	0.255	<0.0026	0.00213	477	0.0038	0.0066	0.0909	0.114	0.864	11.4
	ER-PM-12M-Feb-14	Elk River	Muscle	78	<0.00098	1.83	0.0198	<0.18	1.16	<0.0027	0.00366	2,970	0.0017	0.0091	0.0713	0.0481	0.913	11
	ER-PM-01M-Apr-14	Elk River	Muscle	80	<0.00090	23	0.0156	0.28	0.758	<0.0025	0.002	1,700	0.00272	0.0097	0.125	0.0664	0.769	29.5
	ER-PM-02M-Apr-14	Elk River	Muscle	78	<0.00099	3	0.0158	2.96	0.995	<0.0027	0.00189	3,290	0.0023	0.0052	0.0689	0.0451	0.688	9
	ER-PM-03M-Apr-14	Elk River	Muscle	78	<0.00096	12.1	0.021	<0.17	0.34	<0.0027	0.00145	550	0.0022	0.0086	0.091	0.0948	0.779	19.4
	ER-PM-04M-Apr-14	Elk River	Muscle	77	<0.00086	37.5	0.0324	0.19	0.942	<0.0024	0.00154	1,160	0.00605	0.018	0.135	0.0487	1.17	48.8
	ER-PM-05M-Apr-14	Elk River	Muscle	78	<0.0010	9.26	0.0213	<0.18	0.922	<0.0028	0.00113	2,630	0.0034	0.0084	0.0878	0.0447	0.776	14.1
	ER-PM-06M-Apr-14	Elk River	Muscle	78	<0.00092	7.02	0.0205	<0.16	0.219	<0.0025	0.000907	615	0.00419	0.00893	0.0894	0.184	0.883	17.2
	ER-PM-07M-Apr-14	Elk River	Muscle	79	<0.00096	6.31	0.0228	<0.17	0.968	<0.0027	0.00198	3,235	0.0024	0.0073	0.0771	0.0836	0.628	16.8
	ER-PM-08M-Apr-14	Elk River	Muscle	76	<0.00098	15.6	0.0185	<0.17	0.385	<0.0027	0.00197	600	0.0025	0.0125	0.105	0.0926	0.924	23.9
	ER-PM-09M-Apr-14	Elk River	Muscle	80	<0.00095	33.6	0.0274	<0.17	1.05	<0.0026	0.00151	2,140	0.0036	0.0132	0.123	0.0784	1.15	41.6
	ER-PM-10M-Apr-14	Elk River	Muscle	78	<0.00096	13.7	0.0171	<0.17	0.425	<0.0027	0.00135	1,110	0.0016	0.0079	0.0887	0.0917	0.773	20.3
	ER-PM-11M-Apr-14	Elk River	Muscle	77	<0.00091	8.89	0.0151	<0.16	0.246	<0.0025	0.00237	540	0.00155	0.00634	0.102	0.11	0.654	15.8
	ER-PM-12M-Apr-14	Elk River	Muscle	80	<0.00095	10.1	0.0164	<0.17	0.474	<0.0026	0.000633	599	0.0022	0.0074	0.0794	0.0553	0.685	18
	ER-PM-13M-Apr-14	Elk River	Muscle	78	<0.00096	11	0.0152	<0.17	0.569	<0.0026	0.00088	1,430	0.0022	0.0065	0.0798	0.0674	0.763	18.6
	ER-PM-14M-Apr-14	Elk River	Muscle	77	<0.00097	16.8	0.0175	<0.17	0.345	<0.0027	0.00159	549	0.0029	0.0081	0.0963	0.0631	0.696	24.5
	ER-PM-01M-Aug-14	Elk River	Muscle	79	<0.00083	1.18	0.02	<0.088	0.818	<0.0024	0.000869	2,890	0.00427	0.00413	0.0687	0.0559	0.55	8.45
	ER-PM-02M-Aug-14	Elk River	Muscle	79	<0.00080	2.72	0.0191	<0.085	0.464	<0.0024	0.000793	1,200	0.00386	0.00496	0.0846	0.0575	0.928	11.4

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2014	ER-PM-03M-Aug-14	Elk River	Muscle	78	<0.00080	1.36	0.0194	<0.086	0.63	<0.0024	0.000756	2,090	0.00327	0.00607	0.0693	0.0548	0.653	7.48
	ER-PM-04M-Aug-14	Elk River	Muscle	79	<0.00080	4.99	0.0247	<0.086	0.341	<0.0024	0.0014	1,390	0.00182	0.00509	0.0829	0.102	0.72	12.6
	ER-PM-05M-Aug-14	Elk River	Muscle	79	<0.00082	1.64	0.0136	<0.087	0.557	<0.0024	0.00464	1,430	0.00634	0.00576	0.0696	0.0494	0.742	10.8
	ER-PM-06M-Aug-14	Elk River	Muscle	78	<0.00078	1.99	0.0230	<0.083	0.202	<0.0024	0.00189	501	0.00333	0.00488	0.0775	0.163	0.670	7.03
	ER-PM-07M-Aug-14	Elk River	Muscle	78	0.00128	1.86	0.0218	<0.087	1.57	<0.0024	0.00213	4,440	0.00477	0.00815	0.0575	0.0665	0.713	8.3
	ER-PM-08M-Aug-14	Elk River	Muscle	78	0.00088	1.93	0.0304	<0.085	0.293	<0.0023	0.00408	873	0.00296	0.00425	0.0653	0.0761	0.725	8.58
	ER-PM-09M-Aug-14	Elk River	Muscle	78	<0.00074	0.731	0.0117	<0.079	0.755	<0.0022	0.00231	2,880	0.0026	0.00454	0.0612	0.103	0.591	7.5
	ER-PM-10M-Aug-14	Elk River	Muscle	79	<0.00084	1.19	0.0096	<0.090	0.245	<0.0025	0.00277	651	0.00192	0.00629	0.0801	0.0544	0.629	8.83
	ER-PM-06G-Feb-14	Elk River	Ovary	75	0.00366	5.04	0.0539	<0.077	0.537	<0.0037	0.00047	2,115	0.0120	0.0533	0.0849	0.0469	2.36	129
	ER-PM-09G-Feb-14	Elk River	Ovary	83	0.00201	12.7	0.189	0.081	0.83	<0.0039	0.00112	802	0.0175	0.048	0.128	0.108	3.14	150
	ER-PM-12G-Feb-14	Elk River	Ovary	79	0.00698	1.63	0.094	<0.079	0.497	<0.0039	0.00265	1,500	0.0755	0.0585	0.0931	0.0403	4.14	147
	ER-PM-07G-Apr-14	Elk River	Ovary	73	0.00439	44.7	0.0712	0.17	0.673	<0.0038	0.00051	1,330	0.0118	0.0529	0.147	0.0559	2.71	138
	ER-PM-11G-Apr-14	Elk River	Ovary	71	0.00433	12.1	0.101	<0.079	0.256	<0.0038	0.00037	1,190	0.0121	0.035	0.121	0.0712	2.23	90.3
	ER-PM-14G-Apr-14	Elk River	Ovary	77	0.00415	12.6	0.0188	<0.078	0.375	<0.0038	0.00029	2,670	0.0164	0.0545	0.111	0.0605	3.53	185
	GC-PM-23M-Feb-14	Gold Creek	Muscle	79	<0.00096	2.2	0.054	<0.17	0.232	<0.0026	0.00208	577	0.0015	0.0054	0.078	0.0624	0.866	8.44
	GC-PM-28M-Feb-14	Gold Creek	Muscle	78	<0.00096	7.16	0.0134	<0.17	0.541	<0.0027	0.00336	573	0.0035	0.0064	0.0971	0.0676	0.699	12.2
	GC-PM-29M-Feb-14	Gold Creek	Muscle	78	<0.00087	1.2	0.0189	<0.16	0.307	<0.0024	0.00289	1,290	<0.00093	0.00308	0.0692	0.0852	0.739	5.53
	GC-PM-31M-Feb-14	Gold Creek	Muscle	79	<0.00091	2.29	0.0181	<0.16	0.966	<0.0025	0.00224	4,420	0.00186	0.00542	0.0707	0.0961	0.725	10.8
	GC-PM-01M-Apr-14	Gold Creek	Muscle	78	<0.00097	6.18	0.0252	<0.17	0.919	<0.0027	0.00146	2,090	0.003	0.0085	0.0614	0.049	0.732	14.3
	GC-PM-02M-Apr-14	Gold Creek	Muscle	78	<0.00098	14.6	0.0256	<0.18	0.664	<0.0027	0.00236	653	0.0016	0.0094	0.0789	0.0664	0.666	19.5
	GC-PM-03M-Apr-14	Gold Creek	Muscle	78	<0.00097	2.64	0.0118	0.31	1.1	<0.0027	0.00308	3,740	<0.0010	0.0063	0.0648	0.0481	0.699	7.85
	GC-PM-04M-Apr-14	Gold Creek	Muscle	79	<0.00096	11.5	0.0417	0.38	0.434	<0.0027	0.00121	534	0.0012	0.00825	0.0780	0.140	0.974	20.4
	GC-PM-05M-Apr-14	Gold Creek	Muscle	78	<0.00098	4.02	0.0182	<0.17	1.52	<0.0027	0.00135	4,840	0.0037	0.0088	0.0732	0.0573	0.623	11.2
	GC-PM-06M-Apr-14	Gold Creek	Muscle	79	<0.00084	6.19	0.0138	0.36	0.48	<0.0023	0.0049	570	0.0016	0.00884	0.171	0.0537	0.781	16.1
	GC-PM-07M-Apr-14	Gold Creek	Muscle	79	<0.00097	3.32	0.03315	<0.17	0.4155	<0.0027	0.001007	539	0.00165	0.00705	0.07395	0.09445	0.815	18.35
	GC-PM-08M-Apr-14	Gold Creek	Muscle	76	<0.00096	41.4	0.0317	<0.17	0.643	<0.0026	0.00304	772	0.0026	0.0163	0.134	0.09	0.891	43.4
	GC-PM-09M-Apr-14	Gold Creek	Muscle	78	<0.00080	7.99	0.0206	<0.14	1.75	<0.0022	0.00262	5,550	0.00175	0.0073	0.0781	0.0537	0.727	17.1
	GC-PM-10M-Apr-14	Gold Creek	Muscle	79	<0.0010	3.21	0.0136	<0.18	0.311	<0.0028	0.00437	520	<0.0011	0.0057	0.073	0.0669	0.619	13.3
	GC-PM-11M-Apr-14	Gold Creek	Muscle	79	<0.00097	27.8	0.0389	<0.17	0.45	<0.0027	0.00138	988	0.0019	0.0128	0.112	0.0673	0.633	31.5
	GC-PM-12M-Apr-14	Gold Creek	Muscle	79	<0.00098	4.66	0.0134	<0.17	0.376	<0.0027	0.000679	546	0.0017	0.0052	0.0825	0.0604	0.705	20.6
	GC-PM-13M-Apr-14	Gold Creek	Muscle	78	<0.00096	4.46	0.0173	<0.17	0.398	<0.0027	0.00286	859	0.0016	0.0071	0.087	0.0564	0.727	12.5
	GC-PM-01M-Aug-14	Gold Creek	Muscle	78	<0.00073	4.07	0.0138	<0.078	0.377	<0.0030	0.00233	817	0.00165	0.00506	0.0749	0.056	0.637	11.7
	GC-PM-02M-Aug-14	Gold Creek	Muscle	81	<0.00070	12.1	0.0308	<0.075	1.34	<0.0029	0.00238	3,870	0.00907	0.00834	0.103	0.0549	0.742	15.3
	GC-PM-03M-Aug-14	Gold Creek	Muscle	78	<0.00072	5.23	0.0377	<0.077	0.798	<0.0030	0.00249	1,485	0.0113	0.0067	0.0909	0.0731	0.898	11.0
	GC-PM-04M-Aug-14	Gold Creek	Muscle	77	<0.00071	3.02	0.0112	<0.075	0.41	<0.0029	0.00284	523	0.0071	0.00513	0.508	0.0479	0.805	11.3
	GC-PM-05M-Aug-14	Gold Creek	Muscle	78	<0.00068	4.55	0.0141	<0.073	0.254	<0.0029	0.00156	836	0.00684	0.00599	0.0941	0.151	0.914	11.7
	GC-PM-06M-Aug-14	Gold Creek	Muscle	78	<0.00069	3.67	0.0243	<0.074	0.379	<0.0029	0.000932	664	0.00235	0.0052	0.0899	0.117	0.971	11.4
	GC-PM-07M-Aug-14	Gold Creek	Muscle	78	<0.00075	1.34	0.0186	<0.080	0.528	<0.0031	0.00224	1,110	0.00322	0.00477	0.0675	0.106	0.865	8.39
	GC-PM-08M-Aug-14	Gold Creek	Muscle	78	<0.00068	2.27	0.0204	<0.073	0.33	<0.0028	0.00256	1,200	0.00343	0.0036	0.075	0.0391	0.701	7.62
	GC-PM-09M-Aug-14	Gold Creek	Muscle	79	<0.00076	4.13	0.0207	<0.12	0.48	<0.0037	0.00369	617	0.00199	0.005	0.092	0.0964	1.06	16.1
	GC-PM-10M-Aug-14	Gold Creek	Muscle	77	<0.00073	0.993	0.0263	<0.11	0.416	<0.0036	0.00617	603	0.00188	0.00531	0.0721	0.0903	0.803	7.92
	GC-PM-23G-Feb-14	Gold Creek	Ovary	70	0.00199	7.97	0.154	<0.078	0.334	<0.0038	0.00061	856	0.0092	0.0309	0.101	0.0376	1.93	87.5
	GC-PM-28G-Feb-14	Gold Creek	Ovary	83	0.00365	13.7	0.12	<0.077	3.64	<0.0037	0.00119	455	0.0089	0.0557	0.106	0.0724	4.68	134
	GC-PM-29G-Feb-14	Gold Creek	Ovary	74	0.00158	8.99	0.292	<0.079	0.244	<0.0039	0.00065	483	0.0076	0.0337	0.107	0.0448	2.52	90.2
	GC-PM-31G-Feb-14	Gold Creek	Ovary	78	0.0152	4.8	0.117	<0.080	0.462	<0.0039	0.00246	1,190	0.0957	0.0613	0.116	0.0707	9.28	193
	GC-PM-10G-Apr-14	Gold Creek	Ovary	71	0.00419	16.8	0.0712	<0.080	0.439	<0.0039	0.00067	1,020	0.0044	0.0517	0.137	0.0368	2.51	132

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2015	SC-NSC-13-Apr-15	Sand Creek	Muscle	79	<0.00051	0.959	0.0085	<0.083	0.271	<0.0027	0.00289	2,600	<0.0016	0.00438	0.0529	0.1600	0.700	8.4
	SC-NSC-23-Apr-15	Sand Creek	Muscle	78	<0.00047	0.401	0.0503	<0.076	0.294	<0.0024	0.00226	1,500	<0.0014	0.00335	0.0534	0.1140	0.660	6.2
	SC-NSC-28-Apr-15	Sand Creek	Muscle	78	<0.00045	0.470	0.0181	<0.072	0.328	<0.0023	0.00065	1,550	<0.0014	0.00348	0.0572	0.3290	0.688	6.5
	SC-NSC-33-Apr-15	Sand Creek	Muscle	79	<0.00047	1.030	0.0256	<0.077	0.177	<0.0024	0.00137	506	<0.0014	0.00385	0.0752	0.1170	0.946	12.0
	SC-NSC-36-Apr-15	Sand Creek	Muscle	78	<0.00041	1.070	0.0119	0.091	0.492	<0.0021	0.00118	2,120	0.0015	0.00330	0.1340	0.1500	0.675	7.1
	SC-NSC-37-Apr-15	Sand Creek	Muscle	79	<0.00048	0.562	0.0656	0.441	0.397	<0.0024	0.00140	527	0.0016	0.00886	0.0763	0.1380	1.550	17.0
	SC-NSC-39-Apr-15	Sand Creek	Muscle	79	<0.00047	0.800	0.0153	0.081	0.357	<0.0024	0.00109	1,460	<0.0014	0.00317	0.0602	0.1500	0.674	6.4
	SC-NSC-44-Apr-15	Sand Creek	Muscle	78	<0.00047	3.230	0.0317	<0.076	1.030	<0.0024	0.00139	3,940	0.0019	0.00786	0.0679	0.1810	1.320	17.7
	SC-NSC-46-Apr-15	Sand Creek	Muscle	80	<0.00048	2.900	0.0106	<0.078	0.209	<0.0025	0.00263	764	0.0054	0.00605	0.0638	0.1515	0.866	10.6
	SC-NSC-47-Apr-15	Sand Creek	Muscle	79	<0.00048	0.349	0.0197	<0.077	1.250	<0.0024	0.00215	3,350	0.0046	0.00482	0.0593	0.1210	0.675	10.2
	SC-NSC-01-Aug-15	Sand Creek	Muscle	77	0.00115	3.23	0.103	<0.24	1.75	<0.0026	0.00143	311	0.00630	0.0204	0.158	0.0880	3.81	54.2
	SC-NSC-02-Aug-15	Sand Creek	Muscle	78	<0.00025	1.22	0.0150	<0.24	0.851	<0.0026	0.000689	1,740	0.00510	0.00460	0.0659	0.0756	0.763	10.5
	SC-NSC-03-Aug-15	Sand Creek	Muscle	78	0.000310	1.60	0.0560	<0.23	0.551	<0.0025	0.00137	807	0.00260	0.00512	0.0935	0.0473	0.844	9.78
	SC-NSC-04-Aug-15	Sand Creek	Muscle	79	0.000260	1.46	0.0860	<0.24	0.803	<0.0026	0.00138	784	0.00370	0.00762	0.0772	0.0969	1.01	16.4
	SC-NSC-05-Aug-15	Sand Creek	Muscle	80	0.000420	1.59	0.0362	<0.21	0.789	<0.0023	0.00204	1,020	0.00440	0.00679	0.0639	0.108	0.671	14.6
	SC-NSC-06-Aug-15	Sand Creek	Muscle	79	0.000405	1.33	0.0350	<0.24	0.767	<0.0026	0.00105	581	0.00290	0.00619	0.0722	0.147	0.994	17.4
	SC-NSC-07-Aug-15	Sand Creek	Muscle	78	<0.00025	2.70	0.0130	<0.25	0.308	<0.0027	0.00204	671	0.00400	0.00533	0.0904	0.105	0.612	52.8
	SC-NSC-08-Aug-15	Sand Creek	Muscle	79	0.000390	2.78	0.0330	<0.25	0.284	<0.0027	0.00222	910	0.00420	0.00472	0.0747	0.118	0.748	13.9
	SC-NSC-09-Aug-15	Sand Creek	Muscle	79	0.000300	1.44	0.0300	<0.24	0.971	<0.0026	0.00142	587	<0.0023	0.00680	0.0713	0.0877	1.07	14.5
	SC-NSC-10-Aug-15	Sand Creek	Muscle	78	0.000510	4.74	0.0860	<0.23	0.426	<0.0025	0.00158	1,150	0.00510	0.00556	0.140	0.112	0.785	18.6
	SC-NSC-11-Aug-15	Sand Creek	Muscle	78	0.000320	1.10	0.0401	<0.21	0.149	<0.0023	0.000799	681	0.00200	0.00336	0.0693	0.520	0.771	25.1
	SC-NSC-13-Apr-15	Sand Creek	Ovary	69	0.00448	1.14	0.202	<0.14	0.104	<0.0025	0.000610	992	0.00430	0.0269	0.0901	0.0872	2.10	68.6
	SC-NSC-33-Apr-15	Sand Creek	Ovary	75	0.00296	1.19	0.0971	<0.14	0.111	<0.0025	0.000430	921	0.00440	0.0388	0.0816	0.0795	2.97	96.3
	SC-NSC-36-Apr-15	Sand Creek	Ovary	64	0.00128	6.03	0.425	0.22	0.393	<0.0025	0.00208	435	0.00610	0.0229	0.0873	0.0603	1.71	90.2
	SC-NSC-37-Apr-15	Sand Creek	Ovary	74	0.00323	1.16	0.148	0.30	0.255	<0.0025	0.000490	1,140	0.00730	0.0402	0.0680	0.101	2.64	107
	SC-NSC-39-Apr-15	Sand Creek	Ovary	72	0.00353	1.17	0.169	<0.14	0.0637	<0.0026	0.000290	913	0.0119	0.0423	0.0840	0.0914	2.06	81.8
	SC-NSC-44-Apr-15	Sand Creek	Ovary	73	0.00337	3.30	0.124	<0.12	0.132	<0.0023	0.00107	1,180	0.0155	0.0391	0.102	0.115	2.79	197
	SC-NSC-46-Apr-15	Sand Creek	Ovary	76	0.00660	2.03	0.0332	<0.14	0.0963	<0.0026	0.000825	1,345	0.00885	0.0413	0.0638	0.0835	2.48	102
	SC-NSC-47-Apr-15	Sand Creek	Ovary	72	0.00353	5.01	0.0902	<0.14	0.201	<0.0026	0.000430	666	0.0246	0.0427	0.0911	0.0833	2.88	127
	ER-NSC-06-Apr-15	Elk River	Muscle	80	0.00077	7.040	0.0153	<0.14	0.975	<0.0026	0.00362	3,500	0.0032	0.00770	0.0737	0.1040	0.728	17.2
	ER-NSC-08-Apr-15	Elk River	Muscle	79	<0.00039	1.600	0.0326	<0.15	0.371	<0.0027	0.00160	617	0.0019	0.00486	0.0588	0.0875	0.757	9.5
	ER-NSC-13-Apr-15	Elk River	Muscle	79	<0.00035	0.829	0.0405	<0.13	0.548	<0.00245	0.00208	2,760	<0.00165	0.00239	0.0540	0.0958	0.536	6.7
	ER-NSC-14-Apr-15	Elk River	Muscle	80	<0.00038	2.620	0.0324	0.160	0.350	<0.0026	0.00138	1,400	0.0027	0.00524	0.0530	0.1440	0.703	13.5
	ER-NSC-17-Apr-15	Elk River	Muscle	80	<0.00037	4.950	0.0630	<0.14	0.400	<0.0026	0.00164	1,200	0.0028	0.00540	0.0662	0.0936	0.631	13.5
	ER-NSC-19-Apr-15	Elk River	Muscle	80	0.00114	2.070	0.0366	<0.14	0.386	<0.0026	0.00145	906	0.0028	0.00511	0.0636	0.1070	0.629	8.0
	ER-NSC-25-Apr-15	Elk River	Muscle	80	<0.00036	0.700	0.0128	<0.14	0.197	<0.0025	0.00227	974	0.0021	0.00466	0.0607	0.1060	0.643	8.7
	ER-NSC-29-Apr-15	Elk River	Muscle	80	<0.00039	0.453	0.0239	<0.15	0.295	<0.0027	0.00176	1,040	0.0026	0.00383	0.0605	0.0702	0.558	9.5
	ER-NSC-43-Apr-15	Elk River	Muscle	79	<0.00037	3.690	0.0362	<0.14	0.818	<0.0026	0.00184	588	0.0112	0.00799	0.0672	0.0650	1.170	16.6
	ER-NSC-01-Aug-15	Elk River	Muscle	79	0.000510	2.86	0.0187	0.20	0.374	<0.0023	0.00210	1,380	0.00760	0.00583	0.0911	0.123	0.707	13.5
	ER-NSC-02-Aug-15	Elk River	Muscle	78	<0.00044	1.20	0.0923	0.18	0.509	<0.0022	0.00125	467	0.00280	0.00873	0.0866	0.298	1.99	25.7
	ER-NSC-03-Aug-15	Elk River	Muscle	80	0.00173	29.9	0.0301	0.29	0.862	<0.0025	0.00283	1,191	0.0168	0.0112	0.0913	0.141	1.32	33.8
	ER-NSC-04-Aug-15	Elk River	Muscle	79	<0.00022	0.937	0.0344	<0.22	0.925	<0.0024	0.00156	2,000	0.00290	0.00502	0.0569	0.131	0.799	11.7
	ER-NSC-05-Aug-15	Elk River	Muscle	80	0.000370	1.95	0.176	<0.24	0.346	<0.0026	0.000669	874	0.00430	0.00467	0.0663	0.105	1.24	14.2
	ER-NSC-06-Aug-15	Elk River	Muscle	78	<0.00025	0.786	0.0200	<0.24	0.859	<0.0027	0.000754	4,120	0.00340	0.00474	0.0609	0.0598	0.819	9.14
	ER-NSC-07-Aug-15	Elk River	Muscle	80	<0.00022	0.869	0.319	<0.22	0.630	<0.0024	0.00102	1,470	0.00600	0.00404	0.0630	0.0926	0.719	12.1
	ER-NSC-08-Aug-15	Elk River	Muscle	79	0.000310	2.45	0.714	<0.24	1.55	<0.0027	0.00119	1,890	0.00920	0.00791	0.0689	0.0929	0.996	18.2
	ER-NSC-09-Aug-15	Elk River	Muscle	80	0.000280	1.14	0.137	0.40	1.52	<0.0025	0.00125	1,190	0.00980	0.0117	0.0739	0.0505	1.81	25.7
	ER-NSC-10-Aug-15	Elk River	Muscle	81	<0.00025	2.39	0.0740	<0.25	1.77	<0.0027	0.000955	749	0.00760	0.00988	0.0819	0.107	1.43	24.0
	ER-NSC-05-Apr-15	Elk River	Ovary	46	0.00233	3.72	0.436	0.13	0.126	<0.0021	0.000190	145	0.00400	0.0145	0.116	0.0330	0.929	37.0
	ER-NSC-13-Apr-15	Elk River	Ovary	73	0.00935	5.00	0.102	0.15	0.199	<0.0024	0.000440	994	0.00520	0.0234	0.0835	0.0693	2.34	97.1

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2015	ER-NSC-25-Apr-15	Elk River	Ovary	77	0.00395	3.01	0.0490	<0.12	0.276	<0.0023	0.000620	1,330	0.0183	0.0589	0.0666	0.0737	3.62	98.8
	ER-NSC-43-Apr-15	Elk River	Ovary	76	0.00572	6.91	0.0852	0.15	0.565	<0.0023	0.000870	963	0.0449	0.0511	0.0873	0.0535	3.20	123
	GC-NSC-02-Apr-15	Gold Creek	Muscle	79	<0.00046	5.275	0.0164	0.081	0.580	<0.0024	0.00187	2,185	<0.0014	0.00558	0.1002	0.0685	0.588	9.7
	GC-NSC-04-Apr-15	Gold Creek	Muscle	78	<0.00044	0.665	0.0222	0.122	0.776	<0.0023	0.00164	2,340	0.0019	0.00440	0.0565	0.0616	0.703	10.1
	GC-NSC-10-Apr-15	Gold Creek	Muscle	81	0.00051	0.586	0.0137	<0.077	0.638	<0.0024	0.00217	1,580	0.0028	0.00507	0.0560	0.0607	0.605	8.7
	GC-NSC-13-Apr-15	Gold Creek	Muscle	78	<0.00042	1.200	0.0421	<0.068	1.760	<0.0022	0.00143	602	0.0040	0.01360	0.0577	0.0384	1.820	24.7
	GC-NSC-20-Apr-15	Gold Creek	Muscle	80	0.00432	0.277	0.0256	<0.10	0.770	<0.0025	0.00143	2,100	0.0027	0.00866	0.0474	0.0888	1.340	17.2
	GC-NSC-31-Apr-15	Gold Creek	Muscle	79	0.00373	0.312	0.0307	<0.11	0.597	<0.0027	0.00229	1,750	0.0014	0.00383	0.0475	0.0764	0.617	7.6
	GC-NSC-33-Apr-15	Gold Creek	Muscle	79	0.00266	0.757	0.0121	<0.10	0.086	<0.0026	0.00282	560	<0.0011	0.00358	0.0538	0.0924	0.638	6.2
	GC-NSC-34-Apr-15	Gold Creek	Muscle	79	0.00235	1.270	0.0693	<0.096	0.334	<0.0024	0.00092	587	0.0014	0.00490	0.0573	0.0840	0.939	11.9
	GC-NSC-37-Apr-15	Gold Creek	Muscle	79	0.00174	0.533	0.0223	<0.11	0.474	<0.0026	0.00208	1,580	0.0019	0.00351	0.0559	0.0623	0.584	6.4
	GC-NSC-49-Apr-15	Gold Creek	Muscle	75	0.00110	1.100	0.0860	<0.096	0.171	<0.0024	0.00053	566	<0.0011	0.00434	0.0681	0.1100	1.350	11.8
	GC-NSC-01-Aug-15	Gold Creek	Muscle	82	<0.00024	0.588	0.0130	<0.24	0.960	<0.0026	0.00325	818	<0.0022	0.00392	0.0652	0.0691	0.653	11.1
	GC-NSC-02-Aug-15	Gold Creek	Muscle	79	<0.00023	0.552	0.0273	<0.22	0.304	<0.0024	0.00455	535	0.00220	0.00580	0.0595	0.0802	0.863	16.5
	GC-NSC-03-Aug-15	Gold Creek	Muscle	80	0.000270	1.06	0.0850	<0.24	0.847	<0.0026	0.00274	1,020	0.00440	0.00955	0.0613	0.0772	1.12	17.2
	GC-NSC-04-Aug-15	Gold Creek	Muscle	80	0.000270	2.51	0.0460	<0.24	1.58	<0.0026	0.00137	2,370	0.00430	0.00576	0.0585	0.0663	0.803	16.2
	GC-NSC-05-Aug-15	Gold Creek	Muscle	80	<0.00025	3.91	0.100	<0.25	3.31	<0.0027	0.00187	2,840	0.00550	0.0155	0.0769	0.0348	0.950	21.4
	GC-NSC-06-Aug-15	Gold Creek	Muscle	79	<0.00025	1.30	0.0510	<0.24	0.946	<0.0026	0.00144	3,360	<0.0023	0.00421	0.0599	0.0933	0.541	11.4
	GC-NSC-07-Aug-15	Gold Creek	Muscle	79	<0.00023	1.60	0.0365	<0.23	0.845	<0.0025	0.00164	1,400	<0.0022	0.00699	0.0647	0.0384	1.24	14.8
	GC-NSC-08-Aug-15	Gold Creek	Muscle	80	<0.00022	0.621	0.0361	<0.22	1.07	<0.0024	0.00149	1,910	0.00240	0.00851	0.0608	0.0680	0.842	12.6
	GC-NSC-09-Aug-15	Gold Creek	Muscle	79	<0.00024	3.55	0.127	<0.24	1.02	<0.0026	0.00146	1,350	0.00480	0.00795	0.0734	0.0482	0.901	16.6
	GC-NSC-10-Aug-15	Gold Creek	Muscle	79	<0.00024	1.51	0.0150	<0.24	0.326	<0.0026	0.00422	591	<0.0022	0.00638	0.0657	0.0891	0.919	14.7
	GC-NSC-13-Apr-15	Gold Creek	Ovary	74	0.00278	2.32	0.0527	<0.11	0.766	<0.0025	0.000510	1,420	0.0131	0.0522	0.0700	0.0301	2.85	101
	GC-NSC-31-Apr-15	Gold Creek	Ovary	66	0.00118	3.31	0.333	0.11	0.669	<0.0024	0.000330	692	0.00500	0.0276	0.0966	0.0430	1.83	77.7
	GC-NSC-33-Apr-15	Gold Creek	Ovary	67	0.00121	10.9	0.340	0.17	0.489	<0.0025	0.000800	403	0.00780	0.0362	0.117	0.0468	2.09	82.6
	GC-NSC-34-Apr-15	Gold Creek	Ovary	70	0.000870	8.85	0.268	0.25	1.05	<0.0025	0.000960	228	0.0197	0.0226	0.102	0.0524	1.96	98.8
	GC-NSC-49-Apr-15	Gold Creek	Ovary	72	0.00321	1.52	0.0908	<0.12	0.0603	<0.0026	0.000165	1,150	0.00210	0.0412	0.0680	0.0728	3.00	92.6
2016	SC-NSC-03 O-Apr-16	Sand Creek	Ovary	71	0.00369	0.886	0.214	0.21	0.0514	<0.0025	0.000219	910	0.0045	0.0401	0.0941	0.082	2.77	118
	SC-NSC-09 O-Apr-16	Sand Creek	Ovary	68	0.004675	6.27	0.1445	0.1125	0.2305	0.0035	0.000479	862	0.02265	0.03505	0.10055	0.06925	2.315	208.5
	SC-NSC-21 O-Apr-16	Sand Creek	Ovary	60	0.00202	3.63	0.194	0.111	0.0842	<0.0035	0.000988	490	0.003	0.0269	0.109	0.0519	2.27	59.1
	SC-NSC-25 O-Apr-16	Sand Creek	Ovary	68	0.0019	1.33	0.0681	0.277	0.0905	<0.0035	0.000269	657	0.0015	0.0403	0.125	0.155	3	101
	SC-NSC-29 O-Apr-16	Sand Creek	Ovary	66	0.00377	11.6	0.257	0.321	0.241	<0.0035	0.000683	642	0.0099	0.0491	0.103	0.073	2.62	83.7
	SC-NSC-32 O-Apr-16	Sand Creek	Ovary	72	0.00574	0.926	0.0787	0.106	0.0674	<0.0033	0.000132	911	0.0016	0.0405	0.0712	0.0837	2.86	105
	SC-NSC-33 O-Apr-16	Sand Creek	Ovary	69	0.00539	1.07	0.0558	<0.083	0.0707	<0.0033	0.000102	564	0.0021	0.0296	0.0687	0.0866	3.61	73.7
	SC-NSC-34 O-Apr-16	Sand Creek	Ovary	72	0.00258	9.51	0.15	0.107	0.0896	<0.0035	0.000283	1,470	0.002	0.0508	0.0776	0.0896	2.77	113
	SC-NSC-35 O-Apr-16	Sand Creek	Ovary	73	0.00507	3.89	0.0906	0.103	0.0671	<0.0035	0.000158	1,120	0.0021	0.0494	0.0676	0.0971	3.1	120
	SC-NSC-36 O-Apr-16	Sand Creek	Ovary	67	0.00251	7.52	0.252	0.093	0.143	<0.0032	0.000463	780	0.002	0.0327	0.111	0.0693	2.09	80.6
	SC-NSC-03 M-Apr-16	Sand Creek	Muscle	78	<0.0007	0.956	0.0145	0.17	0.0864	<0.0027	0.00109	532	<0.0014	0.00316	0.0789	0.149	0.675	7.2
	SC-NSC-09 M-Apr-16	Sand Creek	Muscle	79	<0.00069	0.676	0.0318	<0.15	1.2	<0.0027	0.00205	3,620	<0.0014	0.0049	0.0615	0.131	0.899	12.6
	SC-NSC-21 M-Apr-16	Sand Creek	Muscle	78	<0.00071	0.376	0.0234	0.21	0.209	<0.0027	0.00179	1,120	<0.0014	0.00432	0.059	0.149	0.766	6.98
	SC-NSC-25 M-Apr-16	Sand Creek	Muscle	79	0.000655	0.2	0.0164	0.195	0.3095	0.00255	0.00121	1,860	0.00135	0.00603	0.05665	0.3985	1.135	15.2
	SC-NSC-29 M-Apr-16	Sand Creek	Muscle	79	<0.00072	0.624	0.0149	0.34	0.291	<0.0028	0.00131	2,110	<0.0015	0.00543	0.0675	0.187	0.871	8.4
	SC-NSC-32 M-Apr-16	Sand Creek	Muscle	78	<0.00071	1.03	0.0291	0.24	0.109	<0.0028	0.000546	611	<0.0014	0.00218	0.068	0.15	0.57	6.44
	SC-NSC-33 M-Apr-16	Sand Creek	Muscle	78	<0.00063	7.23	0.064	0.42	0.0823	<0.0024	0.000753	466	<0.0013	0.00589	0.0687	0.189	0.645	11.4
	SC-NSC-34 M-Apr-16	Sand Creek	Muscle	78	0.000715	6.84	0.0359	0.155	0.2105	0.0028	0.0009035	1,485	0.0014	0.003385	0.08835	0.17	0.734	9.12
	SC-NSC-35 M-Apr-16	Sand Creek	Muscle	79	<0.00072	2.66	0.022	<0.16	0.0867	<0.0028	0.000596	662	<0.0014	0.00308	0.0651	0.167	0.603	7.43
	SC-NSC-36 M-Apr-16	Sand Creek	Muscle	78	<0.00062	2.11	0.0226	<0.14	0.95	<0.0024	0.000642	6,090	<0.0012	0.00348	0.0672	0.155	0.664	9.25

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Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2016	ER-NSC-09 M-Apr-16	Elk River	Muscle	72	<0.00071	3.77	0.258	0.205	0.322	<0.0025	0.000861	304	0.0012	0.0072	0.0832	0.0919	1.25	14.8
	ER-NSC-15 M-Apr-16	Elk River	Muscle	75	<0.00074	1.62	0.112	0.29	0.0723	<0.0026	0.00043	559	<0.0011	0.0029	0.0709	0.131	0.745	9.4
	ER-NSC-16 M-Apr-16	Elk River	Muscle	79	<0.00074	2.81	0.0478	0.114	0.143	<0.0026	0.000365	524	<0.0012	0.0027	0.0761	0.128	0.788	9.32
	ER-NSC-17 M-Apr-16	Elk River	Muscle	79	<0.00074	0.742	0.0216	<0.064	0.328	<0.0026	0.000427	1,420	0.0014	0.0029	0.0666	0.158	0.721	7.12
	ER-NSC-19 M-Apr-16	Elk River	Muscle	79	<0.00071	0.601	0.0197	<0.062	0.791	<0.0025	0.000875	3,870	<0.0011	0.0039	0.065	0.133	0.605	5.82
	ER-NSC-21 M-Apr-16	Elk River	Muscle	78	<0.00074	6.43	0.0172	0.08	0.823	<0.0026	0.000961	1,420	0.002	0.0047	0.0965	0.0648	0.729	9.94
	ER-NSC-27 M-Apr-16	Elk River	Muscle	72	<0.0007	0.694	0.15	0.075	0.126	<0.0025	0.000519	312	0.0011	0.0051	0.0719	0.153	1.23	11.4
	ER-NSC-28 M-Apr-16	Elk River	Muscle	75	0.00074	0.75	0.06815	0.2225	0.3065	0.00265	0.000418	1,560	0.00125	0.00305	0.0822	0.1385	0.744	6.395
	ER-NSC-29 M-Apr-16	Elk River	Muscle	78	<0.00073	1.07	0.0584	0.283	0.0608	<0.0026	0.00134	494	<0.0011	0.0039	0.115	0.17	0.675	9.14
	ER-NSC-38 M-Apr-16	Elk River	Muscle	74	<0.00068	0.478	0.323	0.097	0.0982	<0.0024	0.000214	182	0.0012	0.0094	0.0874	0.0741	2.58	30.1
	ER-NSC-09 O-Apr-16	Elk River	Ovary	75	0.00813	5.92	0.0831	0.35	0.0913	<0.0026	0.00034	1,110	0.005	0.0437	0.0801	0.0816	2.87	108
	ER-NSC-15 O-Apr-16	Elk River	Ovary	70	0.00705	0.755	0.0682	<0.16	0.168	<0.0025	<0.000095	758	0.0023	0.033	0.064	0.0658	3.36	57.8
	ER-NSC-16 O-Apr-16	Elk River	Ovary	75	0.00334	1.61	0.0796	<0.17	0.0506	<0.0026	<0.000097	1,290	0.0027	0.0484	0.0626	0.0796	2.96	130
	ER-NSC-17 O-Apr-16	Elk River	Ovary	76	0.00652	1.37	0.0696	<0.15	0.0537	<0.0023	0.000172	1,250	0.0087	0.0395	0.0775	0.115	3.42	173
	ER-NSC-19 O-Apr-16	Elk River	Ovary	66	0.00501	4.3	0.336	<0.15	0.202	<0.0023	0.000421	928	0.0123	0.0289	0.175	0.0566	1.83	103
	ER-NSC-21 O-Apr-16	Elk River	Ovary	68	0.00782	4.91	0.0735	<0.16	0.382	<0.0025	0.000354	822	0.0064	0.0293	0.081	0.0297	2.01	83.5
	ER-NSC-27 O -Apr-16	Elk River	Ovary	70	0.003345	1.3	0.1775	0.245	0.10165	0.0024	0.0004685	1,205	0.0044	0.03295	0.0685	0.0985	2.53	98.5
	ER-NSC-28 O-Apr-16	Elk River	Ovary	66	0.00536	1.47	0.0734	0.33	0.11	<0.0023	<0.000087	584	0.0019	0.0269	0.0635	0.0543	3.39	59.5
	ER-NSC-29 O-Apr-16	Elk River	Ovary	67	0.00537	0.43	0.0492	<0.17	0.0521	<0.0025	<0.000096	651	<0.0016	0.0287	0.0647	0.0747	2.67	61.3
	ER-NSC-38 O-Apr-16	Elk River	Ovary	73	0.00486	1.21	0.0962	0.29	0.0732	<0.0026	0.000274	1,050	0.0081	0.0534	0.0605	0.0778	3.18	102
	GC-NSC-01 M-Apr-16	Gold Creek	Muscle	79	0.000335	1.4	0.0229	0.085	1.289	0.00475	0.00152	3,626	0.00115	0.00566	0.066	0.08425	0.822	10.75
	GC-NSC-05 M-Apr-16	Gold Creek	Muscle	78	<0.00035	1.66	0.0322	0.125	0.125	<0.005	0.00219	455	<0.0012	0.00335	0.133	0.137	0.831	12.9
	GC-NSC-06 M-Apr-16	Gold Creek	Muscle	79	<0.00034	1.01	0.0275	0.25	0.104	<0.0049	0.0012	545	<0.0012	0.00414	0.063	0.115	0.895	10
	GC-NSC-08 M-Apr-16	Gold Creek	Muscle	76	<0.00034	2.54	0.0648	0.118	0.3	<0.0048	0.00143	1,700	<0.0012	0.00532	0.071	0.128	0.776	12.9
	GC-NSC-12 M-Apr-16	Gold Creek	Muscle	77	<0.00034	0.818	0.0931	0.08	0.441	<0.0048	0.000996	940	<0.0012	0.00651	0.067	0.0821	1.41	15.7
	GC-NSC-13 M-Apr-16	Gold Creek	Muscle	78	<0.00034	0.293	0.0704	0.091	1.26	<0.0048	0.000475	8,520	<0.0012	0.00315	0.064	0.12	0.563	4.59
	GC-NSC-14 M-Apr-16	Gold Creek	Muscle	79	<0.00035	2.01	0.0198	0.125	0.526	<0.005	0.00455	2,080	0.0026	0.00567	0.064	0.102	0.995	14.6
	GC-NSC-16 M-Apr-16	Gold Creek	Muscle	79	<0.00035	0.453	0.0729	0.267	0.419	<0.0049	0.000446	1,950	<0.0012	0.00522	0.062	0.135	1.03	11.4
	GC-NSC-17 M-Apr-16	Gold Creek	Muscle	81	<0.00035	1.44	0.0281	0.071	0.204	<0.005	0.00216	892	<0.0012	0.00479	0.274	0.0881	0.622	10.5
	GC-NSC-24 M-Apr-16	Gold Creek	Muscle	76	<0.00033	0.867	0.084	0.087	0.21	<0.0046	0.000648	1,350	<0.0011	0.0078	3.34	0.0984	0.755	26.5
	GC-NSC-26 M -Apr-16	Gold Creek	Muscle	75	0.000325	0.72	0.05675	0.219	0.127	0.0046	0.0008115	511	0.00115	0.00369	0.062	0.1195	0.7985	7.93
	GC-NSC-01 O-Apr-16	Gold Creek	Ovary	74	0.00304	11.3	0.091	0.13	0.187	<0.0035	0.00106	1,030	0.0058	0.046	0.0881	0.0485	2.68	128
	GC-NSC-05 O-Apr-16	Gold Creek	Ovary	71	0.00566	1	0.0476	<0.12	0.0949	<0.0035	0.00033	722	0.0032	0.0356	0.067	0.0542	3.42	78.8
	GC-NSC-06 O-Apr-16	Gold Creek	Ovary	75	0.00329	2.36	0.134	<0.12	0.0532	<0.0035	0.000623	1,110	0.0026	0.0416	0.0716	0.0679	2.58	108
	GC-NSC-08 O-Apr-16	Gold Creek	Ovary	72	0.00576	1.52	0.0401	<0.11	0.0732	<0.0032	0.00043	978	<0.0013	0.0465	0.0728	0.0663	3.4	98.6
	GC-NSC-12 O-Apr-16	Gold Creek	Ovary	69	0.00566	2.97	0.107	0.11	0.108	<0.0032	0.000155	788	0.0027	0.0428	0.0746	0.0472	3.21	81.9
	GC-NSC-13 O -Apr-16	Gold Creek	Ovary	67	0.0063	3.46	0.07715	0.24	0.117	0.0034	0.000139	494	0.0015	0.0261	0.0675	0.047	3.21	80.85
	GC-NSC-14 O-Apr-16	Gold Creek	Ovary	74	0.00767	6.36	0.0687	0.34	0.151	<0.0035	0.000953	1,380	0.0094	0.052	0.0718	0.0599	2.52	127
	GC-NSC-16 O-Apr-16	Gold Creek	Ovary	65	0.00225	2.55	0.399	0.25	0.102	<0.0036	0.000203	476	0.0086	0.0328	0.0908	0.0593	2.45	82.5
	GC-NSC-17 O-Apr-16	Gold Creek	Ovary	77	0.00424	6.79	0.0837	0.18	0.275	<0.0035	0.00087	888	0.0055	0.0394	0.156	0.0558	2.7	160
	GC-NSC-24 O-Apr-16	Gold Creek	Ovary	63	0.00414	0.602	0.127	0.22	0.302	<0.0036	<0.000075	486	<0.0014	0.0282	0.0815	0.0369	3.37	60.5
	GC-NSC-26 O-Apr-16	Gold Creek	Ovary	68	0.0083	0.576	0.037	<0.12	0.102	<0.0035	0.000148	571	<0.0014	0.0319	0.0646	0.052	3.33	67

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2016	SC-NSC-01A avg	Sand Creek	Muscle	80	0.000525	0.885	0.02845	0.0865	1.06	0.00255	0.002255	2,160	0.00215	0.009605	0.0769	0.173	1.165	20.15
	SC-NSC-02A	Sand Creek	Muscle	79	0.00105	1.27	0.0718	0.229	0.968	<0.0027	0.00086	2210	0.0014	0.00474	0.0588	0.17	0.881	16.5
	SC-NSC-03A	Sand Creek	Muscle	77	0.00066	1.16	0.381	0.277	0.203	<0.0024	0.00072	762	0.0018	0.00732	0.0691	0.272	1.91	21.8
	SC-NSC-04A	Sand Creek	Muscle	78	0.00032	0.426	0.0249	0.08	0.428	<0.0025	0.00226	2030	<0.0011	0.00325	0.0595	0.345	0.698	8.3
	SC-NSC-05A	Sand Creek	Muscle	77	0.00054	1.38	0.135	<0.063	0.542	<0.0026	0.00114	388	0.0028	0.0129	0.0886	0.104	2.85	30.4
	SC-NSC-06A	Sand Creek	Muscle	80	0.00042	2.52	0.0538	<0.062	0.556	<0.0025	0.00118	761	0.002	0.008	0.07	0.0973	1.05	15.5
	SC-NSC-07A	Sand Creek	Muscle	78	<0.00029	1.69	0.0195	0.111	0.14	<0.0026	0.00068	583	<0.0011	0.00365	0.0624	0.174	0.809	7.89
	SC-NSC-08A	Sand Creek	Muscle	81	0.00083	2.57	0.0703	<0.064	0.174	<0.0026	0.00093	383	0.0022	0.00712	0.0742	0.121	1.31	15.3
	SC-NSC-09A	Sand Creek	Muscle	78	<0.00029	1.77	0.0294	0.105	0.359	<0.0026	0.00124	1410	<0.0011	0.00425	0.0608	0.177	0.692	16.8
	SC-NSC-10A	Sand Creek	Muscle	77	0.00038	2.94	0.0649	0.147	0.813	<0.0025	0.00139	2160	0.0021	0.00685	0.0744	0.139	1.12	23
	GC-NSC-01A avg	Gold Creek	Muscle	78	0.00183	2.88	0.05595	0.2565	0.5065	0.00255	0.003615	1,181	0.00455	0.007705	0.146	0.07865	1.03	18.35
	GC-NSC-02A	Gold Creek	Muscle	78	0.00032	0.42	0.0999	0.152	0.417	<0.0027	0.0004	1540	<0.0012	0.00304	0.0613	0.105	0.655	6.05
	GC-NSC-03A	Gold Creek	Muscle	78	<0.00028	0.537	0.0858	0.168	0.572	<0.0025	0.00123	547	0.0027	0.00982	0.0666	0.336	2.12	23.3
	GC-NSC-04A	Gold Creek	Muscle	78	<0.00029	0.818	0.0791	0.182	0.675	<0.0026	0.00351	2310	0.0013	0.0034	0.059	0.0923	0.674	7.56
	GC-NSC-05A	Gold Creek	Muscle	79	<0.00030	0.595	0.181	<0.065	0.93	<0.0027	0.00329	2820	0.0013	0.00417	0.0611	0.0775	0.6	12.6
	GC-NSC-06A	Gold Creek	Muscle	77	<0.00026	0.577	0.204	0.292	0.707	<0.0024	0.0013	447	0.0011	0.00663	0.0671	0.0764	1.5	18.7
	GC-NSC-07A	Gold Creek	Muscle	80	<0.00029	0.958	0.045	0.089	0.342	<0.0026	0.00397	1420	<0.0012	0.0046	0.057	0.0769	0.83	9.14
	GC-NSC-08A	Gold Creek	Muscle	79	<0.00030	0.858	0.0391	0.071	0.484	<0.0027	0.00314	1160	<0.0012	0.00387	0.0579	0.0727	0.742	9.61
	GC-NSC-09A	Gold Creek	Muscle	80	<0.00029	0.902	0.175	<0.065	0.666	<0.0027	0.00293	2230	<0.0012	0.00417	0.0638	0.093	0.634	7.9
	GC-NSC-10A	Gold Creek	Muscle	78	<0.00028	0.682	0.454	0.11	2.17	<0.0026	0.00253	3230	0.0018	0.00895	0.0631	0.0537	1.37	22.9
	ER-NSC-01A avg	Elk River	Muscle	73	0.000385	2.88	0.2635	0.0965	0.138	0.0026	0.000505	299	0.0013	0.007	0.0849	0.105	1.355	16.5
	ER-NSC-02A avg	Elk River	Muscle	72	0.00028	2.88	0.3395	0.13	0.1605	0.0026	0.0006055	496	0.0014	0.005935	0.0739	0.106	1.094	11.3
	ER-NSC-03A	Elk River	Muscle	76	0.00039	1.21	0.277	0.134	0.29	<0.0026	0.00052	328	0.0031	0.00994	0.0743	0.122	2.11	25.5
	ER-NSC-04A avg	Elk River	Muscle	75	0.00028	2.88	0.118	0.2305	0.184	0.0026	0.00048	655	0.00185	0.004685	0.07205	0.129	0.975	12.5
	ER-NSC-05A	Elk River	Muscle	80	0.00043	0.896	0.0337	0.185	1.59	<0.0026	0.00122	1560	0.0031	0.00903	0.067	0.0649	1.31	14.7
	ER-NSC-06A	Elk River	Muscle	79	0.0003	1.54	0.0318	0.32	0.669	<0.0025	0.00181	1450	0.0035	0.00601	0.0613	0.0763	1.08	12.3
	ER-NSC-07A	Elk River	Muscle	79	<0.00029	1.82	0.0503	0.472	1.43	<0.0026	0.00071	4000	0.0032	0.00754	0.083	0.0406	0.807	18.6
	ER-NSC-08A	Elk River	Muscle	69	<0.00028	4.12	0.302	0.217	0.172	<0.0026	0.00041	659	<0.0011	0.00557	0.0848	0.103	0.953	15.7
	ER-NSC-09A	Elk River	Muscle	71	<0.00026	0.994	0.217	0.242	0.15	<0.0023	0.00046	257	0.001	0.00754	0.0725	0.108	1.49	12.8
	ER-NSC-10A	Elk River	Muscle	77	<0.00028	2.81	0.124	0.204	0.487	<0.0026	0.00077	2360	0.0012	0.00518	0.0761	0.167	0.996	15.8

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw
2014	EC-PM-01M-Feb-14	Englishman Creek	Muscle	0.0085	1.05	18,900	0.015	1,210	0.622	0.00329	1,000	0.0566	8,620	0.0495	19.3	<0.00012	0.00597	2.65
	EC-PM-01G-Feb-14	Englishman Creek	Ovary	0.0139	0.059	13,800	0.0259	746	1.54	0.0727	2,670	0.146	11,400	0.0879	14.7	<0.000079	0.00531	22
	SC-PM-05M-Feb-14	Sand Creek	Muscle	0.0072	1.37	20,600	<0.010	1,280	0.632	0.0017	1,040	0.0201	9,800	0.0133	25.7	<0.00011	0.00062	1.59
	SC-PM-10M-Feb-14	Sand Creek	Muscle	0.0077	1.41	19,700	<0.0099	1,225	0.273	0.00195	870	0.0321	9,560	0.0264	24.9	<0.00011	0.00470	1.20
	SC-PM-01M-Apr-14	Sand Creek	Muscle	0.00923	1.30	19,600	0.0115	1,275	0.828	0.00384	995	0.0571	10,060	0.0186	18.0	<0.000048	0.00137	2.94
	SC-PM-02M-Apr-14	Sand Creek	Muscle	0.0115	1.29	19,400	0.0181	1,210	0.873	0.00323	898	0.0509	9,020	0.0395	19.6	<0.000048	0.00135	2.44
	SC-PM-03M-Apr-14	Sand Creek	Muscle	0.0103	1.27	20,900	0.0164	1,220	0.798	0.00254	962	0.0642	8,950	0.0216	18	<0.000049	0.00072	1.7
	SC-PM-04M-Apr-14	Sand Creek	Muscle	0.00907	1.50	19,200	0.0106	1,280	0.897	0.00284	670	0.101	9,700	0.0207	21.9	<0.000048	0.00141	1.76
	SC-PM-05M-Apr-14	Sand Creek	Muscle	0.0103	2.48	21,550	0.0141	1,220	0.720	0.00297	1,085	0.0324	10,025	0.0115	21.8	<0.000049	0.00062	1.47
	SC-PM-06M-Apr-14	Sand Creek	Muscle	0.00989	1.22	19,700	0.0083	1,220	0.603	0.00265	765	0.0263	9,050	0.0112	19.6	<0.000048	<0.00048	1.39
	SC-PM-07M-Apr-14	Sand Creek	Muscle	0.0137	1.83	18,400	0.0269	1,240	1.04	0.00329	854	0.0458	8,900	0.0294	20.5	<0.000045	0.00102	2.09
	SC-PM-08M-Apr-14	Sand Creek	Muscle	0.00595	0.996	20,000	0.0076	1,270	0.639	0.00183	801	0.0419	9,880	0.00758	24.2	<0.000051	<0.00052	1.55
	SC-PM-09M-Apr-14	Sand Creek	Muscle	0.0109	0.618	18,900	0.0175	1,300	0.766	0.00196	825	0.0981	8,730	0.0224	16.9	<0.000049	0.00066	1.65
	SC-PM-10M-Apr-14	Sand Creek	Muscle	0.00628	1.30	19,900	0.0058	1,230	0.546	0.00168	695	0.0178	9,030	0.0074	18.9	<0.000047	0.00073	1.63
	SC-PM-01M-Aug-14	Sand Creek	Muscle	0.00926	1.19	20,550	0.0118	1,305	0.781	0.0039	1,300	0.0601	10,130	0.0285	20.9	<0.00011	0.00236	1.73
	SC-PM-02M-Aug-14	Sand Creek	Muscle	0.0109	0.625	20,300	0.0138	1,330	1.06	0.0101	1,450	0.0664	9,850	0.116	13.5	<0.00011	0.00354	2.75
	SC-PM-03M-Aug-14	Sand Creek	Muscle	0.0115	0.754	20,900	0.0136	1,370	1.08	0.0057	1,660	0.148	9,820	0.136	18.1	<0.00010	0.00322	2
	SC-PM-04M-Aug-14	Sand Creek	Muscle	0.00903	0.909	20,700	0.008	1,350	1.29	0.0029	1,310	0.0235	11,000	0.0102	15.8	<0.00011	0.00053	2.78
	SC-PM-05M-Aug-14	Sand Creek	Muscle	0.0101	0.929	20,600	0.0118	1,410	0.725	0.0062	1,520	0.0479	9,980	0.0532	14.6	<0.00011	0.00225	1.84
	SC-PM-06M-Aug-14	Sand Creek	Muscle	0.00989	0.463	21,050	0.0091	1,430	1.19	0.0058	1,325	0.0413	10,750	0.0208	16.7	<0.00011	0.00085	2.47
	SC-PM-07M-Aug-14	Sand Creek	Muscle	0.00877	1.21	20,600	0.0107	1,330	0.68	0.0035	1,960	0.0978	9,950	0.0859	15.7	<0.00010	0.00189	2.78
	SC-PM-08M-Aug-14	Sand Creek	Muscle	0.0106	1.34	19,900	0.014	1,360	0.968	0.005	1,840	0.0809	10,400	0.0915	21.6	<0.00011	0.0034	1.6
	SC-PM-09M-Aug-14	Sand Creek	Muscle	0.00883	1.31	20,100	0.0073	1,300	0.509	0.0028	1,760	0.0131	9,520	0.00733	16.4	<0.00011	0.0007	1.53
	SC-PM-10M-Aug-14	Sand Creek	Muscle	0.00988	0.615	17,900	0.0226	1,130	0.925	0.0061	2,020	0.119	8,930	0.176	16.5	<0.00012	0.00367	1.83
	SC-PM-05G-Feb-14	Sand Creek	Ovary	0.0351	0.0544	13,500	0.0344	852	2.84	0.115	1,690	0.0714	11,700	0.0573	19.6	<0.000074	0.00162	13.7
	SC-PM-10G-Feb-14	Sand Creek	Ovary	0.00856	0.0623	10,867	<0.0070	847	1.54	0.117	1,917	0.0251	8,870	0.0120	16.7	<0.000075	0.00287	3.79
	SC-PM-01G-Apr-14	Sand Creek	Ovary	0.0151	0.0426	14,700	0.0152	947	2.5	0.0434	2,390	0.135	10,700	0.0208	15.8	<0.000076	0.0009	30.7
	SC-PM-10G-Apr-14	Sand Creek	Ovary	0.0193	0.105	24,300	0.0142	1,130	1.55	0.0759	2,060	0.0305	18,400	0.0151	25.6	<0.000077	0.00152	17
	ER-PM-06M-Feb-14	Elk River	Muscle	0.0081	0.812	20,300	<0.010	1,210	0.473	0.00696	1,010	0.0728	9,740	0.109	11.7	<0.00012	0.00501	4.98
	ER-PM-09M-Feb-14	Elk River	Muscle	0.008	1.09	18,700	<0.010	1,210	0.586	0.00273	1,120	0.158	8,410	0.0991	16.9	<0.00011	0.00677	1.64
	ER-PM-12M-Feb-14	Elk River	Muscle	0.0071	1.24	17,700	0.015	1,160	0.922	0.00272	2,600	0.0233	9,990	0.009	17	<0.00012	0.00037	2.37
	ER-PM-01M-Apr-14	Elk River	Muscle	0.0139	0.963	20,500	0.0292	1,290	1.07	0.00267	891	0.0588	10,500	0.0238	14.5	<0.00011	0.00341	5.46
	ER-PM-02M-Apr-14	Elk River	Muscle	0.0083	0.756	20,000	0.017	1,310	1.42	0.0021	864	0.0231	10,900	0.00535	12.6	<0.00012	0.00222	5.84
	ER-PM-03M-Apr-14	Elk River	Muscle	0.0097	1.63	19,200	0.017	1,110	0.769	0.0023	999	0.0255	9,200	0.0077	17.3	<0.00012	0.00261	2.84
	ER-PM-04M-Apr-14	Elk River	Muscle	0.0179	0.542	18,200	0.0494	1,200	1.36	0.00452	1,180	0.0641	9,150	0.0331	11.4	<0.00010	0.0037	5.92
	ER-PM-05M-Apr-14	Elk River	Muscle	0.01	0.574	20,000	0.016	1,280	1.08	0.00202	954	0.0355	10,500	0.0103	13	<0.00012	0.00281	5.8
	ER-PM-06M-Apr-14	Elk River	Muscle	0.0082	0.611	20,100	0.012	1,220	0.567	0.0029	1,080	0.0313	9,750	0.0064	14.2	<0.00011	0.00221	5.97
	ER-PM-07M-Apr-14	Elk River	Muscle	0.0132	1.09	20,400	0.021	1,210	1.091	0.00211	958	0.0362	10,950	0.00785	15.8	<0.00012	0.00265	4.60
	ER-PM-08M-Apr-14	Elk River	Muscle	0.0121	1.89	18,900	0.017	1,220	0.796	0.00248	950	0.0401	9,230	0.0126	17.1	<0.00012	0.00329	3.13
	ER-PM-09M-Apr-14	Elk River	Muscle	0.0164	1.82	17,700	0.04	1,210	1.41	0.00458	952	0.0662	9,460	0.0348	10.3	<0.00011	0.00274	5.44
	ER-PM-10M-Apr-14	Elk River	Muscle	0.0097	1.36	19,200	0.015	1,180	0.725	0.00278	991	0.0474	9,750	0.0124	11.7	<0.00011	0.00099	5.49
	ER-PM-11M-Apr-14	Elk River	Muscle	0.008	1.03	18,700	0.0116	1,150	0.547	0.00312	851	0.0462	8,910	0.00748	21.1	<0.00011	0.00103	2.53
	ER-PM-12M-Apr-14	Elk River	Muscle	0.009	1.68	20,800	0.016	1,210	0.682	0.00216	1,220	0.0449	10,100	0.0096	7.74	<0.00011	0.00073	7.08
	ER-PM-13M-Apr-14	Elk River	Muscle	0.0094	1.07	19,500	0.017	1,230	0.926	0.00171	947	0.0264	10,000	0.00783	10.3	<0.00011	0.00092	6.47
	ER-PM-14M-Apr-14	Elk River	Muscle	0.0097	0.736	18,800	0.02	1,190	0.693	0.00207	797	0.0251	8,680	0.00859	14	<0.00012	0.0008	6.17
	ER-PM-01M-Aug-14	Elk River	Muscle	0.00643	0.589	22,400	0.0157	1,480	1.24	0.0024	1,150	0.0245	11,600	0.0134	12.9	<0.000050	0.00094	3.02
	ER-PM-02M-Aug-14	Elk River	Muscle	0.00860	0.651	21,550	0.0149	1,460	0.712	0.00227	1,640	0.0423	10,850	0.0242	10.6	<0.000049	0.00093	7.42

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw
2014	ER-PM-03M-Aug-14	Elk River	Muscle	0.00653	0.615	21,800	0.0131	1,490	1.16	0.00348	1,560	0.0276	11,300	0.0233	12.8	<0.000049	0.00098	3.26
	ER-PM-04M-Aug-14	Elk River	Muscle	0.00595	0.759	20,400	0.0225	1,390	0.782	0.00388	1,720	0.0507	9,980	0.0301	22.9	<0.000049	0.00152	2.98
	ER-PM-05M-Aug-14	Elk River	Muscle	0.00667	0.827	20,600	0.0149	1,360	0.847	0.00307	1,350	0.0498	10,200	0.0594	12.3	<0.000050	0.00311	5.02
	ER-PM-06M-Aug-14	Elk River	Muscle	0.00908	4.26	22,600	0.0168	1,255	0.292	0.00234	1,215	0.0262	10,810	0.0218	18.1	<0.000047	0.00184	2.62
	ER-PM-07M-Aug-14	Elk River	Muscle	0.008	0.943	20,800	0.0193	1,440	1.47	0.0039	1,540	0.0384	12,000	0.0133	14.7	<0.000049	0.00068	7.12
	ER-PM-08M-Aug-14	Elk River	Muscle	0.00699	1.11	21,000	0.0138	1,390	0.519	0.00198	1,140	0.0268	10,300	0.0296	12.7	<0.000048	0.00053	5.81
	ER-PM-09M-Aug-14	Elk River	Muscle	0.00681	1.29	20,600	0.0129	1,360	0.994	0.0021	1,460	0.0233	11,200	0.00908	17.7	<0.000045	0.00083	4.95
	ER-PM-10M-Aug-14	Elk River	Muscle	0.00629	1.23	20,500	0.0121	1,340	0.555	0.00386	1,570	0.0214	9,700	0.00743	13.3	<0.000051	0.00067	4.98
	ER-PM-06G-Feb-14	Elk River	Ovary	0.0106	0.0355	12,800	0.0143	885	4.05	0.150	2,455	0.0481	10,950	0.0684	8.48	<0.000074	0.00232	40.1
	ER-PM-09G-Feb-14	Elk River	Ovary	0.0177	0.0551	18,800	0.0202	949	1.51	0.068	3,320	0.096	15,900	0.062	17.8	<0.000077	0.00678	25.7
	ER-PM-12G-Feb-14	Elk River	Ovary	0.00948	0.161	15,900	0.0106	1,080	2.65	0.141	3,880	0.0268	10,800	0.013	15.3	<0.000077	0.00089	3.29
	ER-PM-07G-Apr-14	Elk River	Ovary	0.0242	0.0411	13,200	0.0458	950	3.84	0.132	2,170	0.07	10,800	0.0269	10.8	<0.000077	0.0023	21.9
	ER-PM-11G-Apr-14	Elk River	Ovary	0.0129	0.0307	12,700	0.0157	752	1.51	0.111	1,390	0.0316	10,200	0.00908	15.3	<0.000077	0.00108	8.62
	ER-PM-14G-Apr-14	Elk River	Ovary	0.0154	0.0328	17,800	0.0164	1,070	3.89	0.177	1,480	0.0422	13,800	0.00874	15	<0.000076	0.00065	40.1
	GC-PM-23M-Feb-14	Gold Creek	Muscle	0.0053	1.47	18,700	<0.010	1,100	0.416	0.00219	908	0.0417	8,570	0.0333	21	<0.00011	0.00298	2.81
	GC-PM-28M-Feb-14	Gold Creek	Muscle	0.0085	1.29	19,600	<0.010	1,190	0.709	0.00399	1,140	0.0334	8,830	0.0578	19.7	<0.00012	0.00408	2.19
	GC-PM-29M-Feb-14	Gold Creek	Muscle	0.0061	1.27	19,900	<0.0095	1,240	0.578	0.00162	659	0.0237	9,440	0.0117	22.3	<0.00010	0.00201	2.45
	GC-PM-31M-Feb-14	Gold Creek	Muscle	0.0083	0.824	20,400	0.0209	1,200	1.38	0.00287	2,020	0.028	11,900	0.0083	24.5	<0.00011	0.0008	2.4
	GC-PM-01M-Apr-14	Gold Creek	Muscle	0.008	0.714	20,500	<0.011	1,280	1.35	0.00225	990	0.0268	9,820	0.00867	13.6	<0.00012	0.00053	2.2
	GC-PM-02M-Apr-14	Gold Creek	Muscle	0.0104	0.556	20,100	0.012	1,240	0.842	0.0013	909	0.0358	9,560	0.201	18.3	<0.00012	0.00866	2.32
	GC-PM-03M-Apr-14	Gold Creek	Muscle	0.008	0.631	21,400	<0.010	1,360	1.67	<0.00071	828	0.0227	11,800	0.00639	19.2	<0.00012	0.00055	2.04
	GC-PM-04M-Apr-14	Gold Creek	Muscle	0.0118	2.82	19,850	<0.012	1,170	0.544	0.00294	1,145	0.0303	9,865	0.0180	22.4	<0.00012	0.00202	1.76
	GC-PM-05M-Apr-14	Gold Creek	Muscle	0.0085	0.702	20,100	<0.011	1,330	2.1	0.0104	988	0.0527	11,800	0.0128	14.5	<0.00012	0.00086	2.92
	GC-PM-06M-Apr-14	Gold Creek	Muscle	0.0089	2.43	20,500	<0.0091	1,240	0.774	0.00179	962	0.0162	9,780	0.00698	12.9	<0.00010	0.00041	2.55
	GC-PM-07M-Apr-14	Gold Creek	Muscle	0.0076	3.59	20,250	<0.010	1,175	0.510	0.00126	1,100	0.0303	9,180	0.0116	20.2	<0.00012	0.00064	1.28
	GC-PM-08M-Apr-14	Gold Creek	Muscle	0.0189	1.25	17,400	0.04	1,190	1.17	0.00311	918	0.0593	8,630	0.03	19.6	<0.00011	0.00247	2.37
	GC-PM-09M-Apr-14	Gold Creek	Muscle	0.0113	0.966	21,100	0.0145	1,370	2.17	0.00283	971	0.0394	12,300	0.0109	20.3	<0.000096	0.00056	2.11
	GC-PM-10M-Apr-14	Gold Creek	Muscle	0.0072	2.21	21,300	<0.011	1,190	0.498	0.00219	1,060	0.0262	9,860	0.00484	18.7	<0.00012	0.00042	2.27
	GC-PM-11M-Apr-14	Gold Creek	Muscle	0.0169	0.66	19,800	0.03	1,300	1.27	0.00257	1,390	0.0487	9,060	0.0161	14.1	<0.00012	0.00104	1.72
	GC-PM-12M-Apr-14	Gold Creek	Muscle	0.0085	2.43	20,200	<0.011	1,200	0.531	0.00304	1,140	0.0267	9,270	0.00527	12	<0.00012	<0.00031	5.77
	GC-PM-13M-Apr-14	Gold Creek	Muscle	0.0082	0.704	21,000	<0.010	1,310	0.75	0.00143	1,000	0.0256	9,650	0.00597	16.8	<0.00011	<0.00030	2.66
	GC-PM-01M-Aug-14	Gold Creek	Muscle	0.00826	0.732	21,300	0.0104	1,340	0.807	0.00495	1,450	0.0307	10,600	0.0437	18.6	<0.00027	0.00118	2.07
	GC-PM-02M-Aug-14	Gold Creek	Muscle	0.0107	0.686	18,800	0.0288	1,340	1.56	0.00759	1,640	0.0829	11,300	0.052	17	<0.00026	0.00289	1.96
	GC-PM-03M-Aug-14	Gold Creek	Muscle	0.00776	0.790	20,550	0.0137	1,340	1.05	0.00433	1,495	0.201	10,650	0.286	18.4	<0.00027	0.0140	2.39
	GC-PM-04M-Aug-14	Gold Creek	Muscle	0.00737	1.62	21,000	0.0079	1,340	0.641	0.00516	1,270	0.0398	10,400	0.0336	13.4	<0.00026	0.00104	2.21
	GC-PM-05M-Aug-14	Gold Creek	Muscle	0.00836	0.723	20,700	0.0088	1,400	0.652	0.00518	1,180	0.23	10,600	0.298	19.6	<0.00025	0.014	2.48
	GC-PM-06M-Aug-14	Gold Creek	Muscle	0.0072	0.871	20,200	0.0149	1,300	0.54	0.00444	1,690	0.132	10,200	0.0504	22.1	<0.00026	0.00128	1.76
	GC-PM-07M-Aug-14	Gold Creek	Muscle	0.00759	1.29	21,300	0.0105	1,360	0.675	0.00258	1,180	0.0373	10,500	0.0435	23.2	<0.00028	0.00331	2.11
	GC-PM-08M-Aug-14	Gold Creek	Muscle	0.00746	0.871	21,300	0.0135	1,370	0.689	0.00489	1,260	0.0619	10,800	0.13	12.9	<0.00025	0.00572	1.68
	GC-PM-09M-Aug-14	Gold Creek	Muscle	0.00942	1.53	20,900	0.0108	1,340	0.675	0.0037	2,010	0.0755	9,710	0.0554	21.5	<0.00011	0.00173	2.18
	GC-PM-10M-Aug-14	Gold Creek	Muscle	0.00831	2.60	20,100	0.0053	1,310	0.554	0.0026	1,270	0.0122	9,720	0.0131	21.4	<0.00010	0.00072	2.37
	GC-PM-23G-Feb-14	Gold Creek	Ovary	0.0107	0.0366	10,700	<0.0071	585	1.15	0.0838	1,100	0.0436	8,930	0.0295	13.6	<0.000076	0.00288	7.62
	GC-PM-28G-Feb-14	Gold Creek	Ovary	0.0199	0.09	22,000	0.0149	1,080	2.11	0.0934	4,310	0.117	18,100	0.056	23.2	<0.000075	0.00896	15.4
	GC-PM-29G-Feb-14	Gold Creek	Ovary	0.0109	0.0522	11,200	0.0082	595	1.09	0.0581	2,270	0.0338	9,830	0.0335	12.7	<0.000077	0.00201	10.3
	GC-PM-31G-Feb-14	Gold Creek	Ovary	0.0136	0.0974	16,800	0.0224	1,230	1.94	0.102	2,970	0.0426	14,100	0.0319	20	<0.000078	0.00089	4.05
	GC-PM-10G-Apr-14	Gold Creek	Ovary	0.0146	0.095	12,900	0.0124	805	2.01	0.0991	1,340	0.0382	10,700	0.0131	12.1	<0.000078	0.0007	5

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw
2015	SC-NSC-13-Apr-15	Sand Creek	Muscle	0.00534	1.180	20,800	0.0195	1,225	0.870	0.0059	850	0.0330	10,250	0.00648	23.0	<0.000030	0.0018	1.51
	SC-NSC-23-Apr-15	Sand Creek	Muscle	0.00548	0.994	20,700	<0.0067	1,300	0.917	0.0034	774	0.0101	9,720	0.00299	21.0	<0.000028	0.0019	2.56
	SC-NSC-28-Apr-15	Sand Creek	Muscle	0.00545	0.882	19,900	<0.0064	1,170	0.713	0.0045	849	0.0141	9,450	0.00284	33.1	<0.000026	0.0015	1.46
	SC-NSC-33-Apr-15	Sand Creek	Muscle	0.00471	0.803	20,500	<0.0068	1,190	0.435	0.0054	1,020	0.0138	9,090	0.00434	18.2	<0.000028	<0.0011	1.39
	SC-NSC-36-Apr-15	Sand Creek	Muscle	0.00513	0.892	20,300	<0.0059	1,220	0.708	0.0056	861	0.0197	10,100	0.07080	25.5	<0.000024	<0.00097	1.86
	SC-NSC-37-Apr-15	Sand Creek	Muscle	0.00492	0.853	20,100	<0.0069	1,140	0.451	0.0066	1,420	0.0101	9,140	0.00664	22.3	<0.000028	<0.0011	1.69
	SC-NSC-39-Apr-15	Sand Creek	Muscle	0.00554	0.949	21,200	<0.0067	1,240	0.551	0.0060	895	0.0086	9,930	0.00542	23.9	<0.000028	0.0012	1.98
	SC-NSC-44-Apr-15	Sand Creek	Muscle	0.00719	1.190	20,200	0.0070	1,250	1.030	0.0079	1,010	0.0205	11,100	0.01770	24.7	<0.000028	0.0013	2.37
	SC-NSC-46-Apr-15	Sand Creek	Muscle	0.00639	2.010	21,750	<0.0069	1,195	0.543	0.0056	978	0.0119	9,625	0.02235	27.9	<0.000029	<0.0012	1.69
	SC-NSC-47-Apr-15	Sand Creek	Muscle	0.00553	1.020	22,100	0.0072	1,270	1.110	0.0038	857	0.0130	10,900	0.00758	21.8	<0.000028	<0.0011	2.43
	SC-NSC-01-Aug-15	Sand Creek	Muscle	0.00591	0.946	15,700	0.0124	854	0.679	0.0148	1,550	0.0370	8,610	0.0350	11.9	<0.0000031	0.00261	1.97
	SC-NSC-02-Aug-15	Sand Creek	Muscle	0.00625	1.94	20,800	0.00820	1,280	1.06	0.00790	1,280	0.0274	10,700	0.0159	12.8	<0.0000031	0.00130	4.16
	SC-NSC-03-Aug-15	Sand Creek	Muscle	0.00617	0.593	21,300	0.0121	1,350	0.672	0.00790	1,630	0.0297	10,400	0.0150	13.0	<0.0000030	0.00153	3.19
	SC-NSC-04-Aug-15	Sand Creek	Muscle	0.00539	0.902	21,900	0.0102	1,320	0.852	0.00880	1,530	0.0219	10,600	0.0101	15.5	<0.0000031	0.000750	2.37
	SC-NSC-05-Aug-15	Sand Creek	Muscle	0.00591	1.21	22,300	0.00800	1,340	0.748	0.00900	1,910	0.0202	11,000	0.00698	17.3	<0.0000027	0.000570	2.58
	SC-NSC-06-Aug-15	Sand Creek	Muscle	0.00922	1.35	21,500	0.00695	1,215	0.512	0.00785	1,355	0.0278	10,500	0.0293	20.4	<0.0000031	0.00154	2.69
	SC-NSC-07-Aug-15	Sand Creek	Muscle	0.00649	0.848	20,600	0.00690	1,330	0.616	0.00890	1,270	0.0285	9,790	0.0140	18.8	<0.0000031	0.00120	3.07
	SC-NSC-08-Aug-15	Sand Creek	Muscle	0.00687	0.938	21,800	0.0117	1,300	0.759	0.0108	1,490	0.0395	10,300	0.0205	17.4	<0.0000032	0.00255	2.86
	SC-NSC-09-Aug-15	Sand Creek	Muscle	0.00550	0.976	21,100	0.00940	1,290	0.722	0.0134	1,410	0.0370	10,300	0.0199	17.4	<0.0000031	0.000990	2.38
	SC-NSC-10-Aug-15	Sand Creek	Muscle	0.00728	0.986	21,200	0.0110	1,250	0.777	0.00840	1,450	0.0218	10,400	0.0154	20.5	0.00000600	0.00137	2.48
	SC-NSC-11-Aug-15	Sand Creek	Muscle	0.00462	0.874	21,000	0.00355	1,315	0.432	0.0108	966	0.0274	10,750	0.00642	35.5	<0.0000027	0.000730	1.36
	SC-NSC-13-Apr-15	Sand Creek	Ovary	0.00620	0.0477	9,760	0.00530	644	1.38	0.106	1,490	0.0341	7,990	0.00812	14.6	<0.0000039	0.0148	6.15
	SC-NSC-33-Apr-15	Sand Creek	Ovary	0.00660	0.0398	14,600	0.00530	856	2.25	0.104	1,590	0.0121	10,900	0.00545	16.3	<0.0000039	<0.0011	11.4
	SC-NSC-36-Apr-15	Sand Creek	Ovary	0.00590	0.0238	8,280	0.00620	458	0.552	0.0504	995	0.0210	7,040	0.325	13.2	<0.0000039	0.00310	4.80
	SC-NSC-37-Apr-15	Sand Creek	Ovary	0.00790	0.0489	15,000	0.00620	894	1.79	0.133	2,210	0.0167	11,300	0.0125	21.0	<0.0000038	<0.0011	7.21
	SC-NSC-39-Apr-15	Sand Creek	Ovary	0.00740	0.0352	14,200	<0.0052	736	1.27	0.103	1,350	0.0224	10,800	0.00768	20.6	<0.0000040	0.00360	11.6
	SC-NSC-44-Apr-15	Sand Creek	Ovary	0.00777	0.0655	12,900	0.00770	878	1.91	0.131	2,080	0.0252	9,770	0.0195	21.8	<0.0000035	0.00180	15.1
	SC-NSC-46-Apr-15	Sand Creek	Ovary	0.00630	0.122	13,300	0.00615	979	5.45	0.150	2,090	0.0151	9,700	0.0262	22.9	<0.0000040	<0.0011	5.82
	SC-NSC-47-Apr-15	Sand Creek	Ovary	0.00780	0.0360	14,200	0.00990	780	1.43	0.110	1,590	0.0309	11,500	0.0446	18.2	<0.0000040	0.00290	18.3
	ER-NSC-06-Apr-15	Elk River	Muscle	0.00760	1.210	21,500	0.0094	1,170	1.170	0.0124	1,140	0.0368	10,900	0.03590	23.7	<0.0000041	0.0032	2.75
	ER-NSC-08-Apr-15	Elk River	Muscle	0.00610	0.817	21,200	0.0057	1,180	0.501	0.0093	980	0.0226	9,500	0.01020	22.6	<0.0000042	0.0022	2.18
	ER-NSC-13-Apr-15	Elk River	Muscle	0.00647	0.940	20,600	0.0078	1,155	0.849	0.0058	735	0.0133	10,275	0.01195	19.7	0.00002075	0.0013	5.95
	ER-NSC-14-Apr-15	Elk River	Muscle	0.00630	1.200	20,700	0.0066	1,170	0.549	0.0052	1,130	0.0133	9,910	0.00920	24.0	<0.0000041	0.0032	1.85
	ER-NSC-17-Apr-15	Elk River	Muscle	0.00690	0.877	22,600	<0.0054	1,220	0.861	0.0099	899	0.0146	10,100	0.02320	21.9	0.0000061	<0.0012	2.23
	ER-NSC-19-Apr-15	Elk River	Muscle	0.00790	0.913	21,100	0.0071	1,190	0.628	0.0087	655	0.0136	9,610	0.10200	22.1	0.0000198	<0.0012	7.3
	ER-NSC-25-Apr-15	Elk River	Muscle	0.00574	1.320	22,500	0.0069	1,200	0.476	0.0096	913	0.0102	10,000	0.00660	22.5	<0.0000039	<0.0011	3.14
	ER-NSC-29-Apr-15	Elk River	Muscle	0.00570	0.713	21,200	0.0091	1,120	0.654	0.0111	725	0.0091	9,450	0.00946	15.6	<0.0000042	<0.0012	5.92
	ER-NSC-43-Apr-15	Elk River	Muscle	0.00620	0.807	20,300	<0.0053	1,110	0.655	0.0104	1,040	0.0178	9,160	0.03180	16.7	<0.0000040	<0.0012	4.13
	ER-NSC-01-Aug-15	Elk River	Muscle	0.00746	0.675	21,500	0.00710	1,290	0.846	0.00649	1,150	0.0213	10,600	0.0179	22.5	<0.000036	0.00200	2.72
	ER-NSC-02-Aug-15	Elk River	Muscle	0.00410	0.638	17,500	0.00900	1,010	0.536	0.0109	1,340	0.0240	8,970	0.00648	17.7	<0.000033	0.000820	4.75
	ER-NSC-03-Aug-15	Elk River	Muscle	0.0147	1.43	22,650	0.0267	1,380	1.26	0.0194	1,340	0.0445	10,450	0.0575	24.9	0.0000104	0.00107	2.64
	ER-NSC-04-Aug-15	Elk River	Muscle	0.00628	1.17	21,500	0.00670	1,390	0.943	0.0109	1,270	0.0230	11,300	0.00810	21.4	0.00000480	0.000770	2.32
	ER-NSC-05-Aug-15	Elk River	Muscle	0.00552	0.600	22,700	0.00860	1,390	0.667	0.0156	1,370	0.0408	10,900	0.0336	21.7	<0.0000030	0.00109	2.14
	ER-NSC-06-Aug-15	Elk River	Muscle	0.00617	0.556	21,600	0.0109	1,440	1.30	0.0136	1,060	0.0276	12,200	0.00623	11.9	<0.0000031	0.000850	7.92
	ER-NSC-07-Aug-15	Elk River	Muscle	0.00671	0.814	22,600	0.00880	1,340	1.05	0.0160	1,360	0.0160	11,300	0.00654	19.7	0.00000420	0.00115	2.94
	ER-NSC-08-Aug-15	Elk River	Muscle	0.00664	1.07	21,400	0.0164	1,380	1.06	0.0196	1,590	0.0291	11,400	0.0138	16.9	0.00000400	0.000870	2.71
	ER-NSC-09-Aug-15	Elk River	Muscle	0.00556	0.597	21,600	0.00770	1,210	0.744	0.0197	1,840	0.0720	11,300	0.00794	13.6	0.00000340	0.000940	2.93
	ER-NSC-10-Aug-15	Elk River	Muscle	0.00642	0.903	21,200	0.00900	1,230	0.757	0.0155	1,500	0.0358	10,700	0.0291	20.2	<0.0000032	0.00202	1.96
	ER-NSC-05-Apr-15	Elk River	Ovary	0.00309	0.0129	4,940	0.00460	252	0.319	0.0244	664	0.0151	4,470	0.292	7.65	<0.000031	0.00127	3.97
	ER-NSC-13-Apr-15	Elk River	Ovary	0.00630	0.0326	11,500	0.0139	850	2.02	0.132	1,640	0.0204	9,730	0.144	13.4	<0.000036	0.000910	11.8

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw
2015	ER-NSC-25-Apr-15	Elk River	Ovary	0.00671	0.0534	14,400	0.0135	891	3.77	0.169	2,120	0.0248	11,500	0.0120	18.3	<0.000034	0.00195	9.19
	ER-NSC-43-Apr-15	Elk River	Ovary	0.00848	0.0389	14,900	0.0170	817	2.84	0.121	1,920	0.0369	11,100	0.120	16.1	<0.000035	0.00127	12.9
	GC-NSC-02-Apr-15	Gold Creek	Muscle	0.00716	0.680	20,500	0.0091	1,215	0.893	0.0067	912	0.0349	9,405	0.00936	20.6	<0.000027	<0.0011	2.01
	GC-NSC-04-Apr-15	Gold Creek	Muscle	0.00491	0.903	19,700	<0.0064	1,180	1.090	0.0062	920	0.0107	9,440	0.00434	17.3	<0.000026	<0.0011	2.66
	GC-NSC-10-Apr-15	Gold Creek	Muscle	0.00648	0.878	20,800	<0.0068	1,180	1.010	0.0050	1,390	0.0135	9,120	0.03800	19.9	<0.000028	<0.0011	2.14
	GC-NSC-13-Apr-15	Gold Creek	Muscle	0.00507	1.210	17,900	<0.0061	1,050	0.792	0.0081	1,240	0.0094	8,640	0.00666	13.0	<0.000025	0.0010	1.94
	GC-NSC-20-Apr-15	Gold Creek	Muscle	0.00441	0.651	19,200	0.0073	1,110	0.696	0.0050	1,270	0.0200	10,300	0.00208	20.5	<0.000032	0.0010	1.94
	GC-NSC-31-Apr-15	Gold Creek	Muscle	0.00614	1.550	19,600	<0.0067	1,180	0.589	0.0046	948	0.0231	10,100	0.00148	17.4	<0.000034	<0.00037	1.96
	GC-NSC-33-Apr-15	Gold Creek	Muscle	0.00427	1.250	20,300	<0.0066	1,170	0.379	0.0046	825	0.0067	9,550	0.00749	23.5	<0.000033	0.0009	2.26
	GC-NSC-34-Apr-15	Gold Creek	Muscle	0.00457	0.941	19,300	<0.0061	1,170	0.456	0.0044	1,010	0.0097	9,670	0.00772	19.0	0.000035	0.0011	1.55
	GC-NSC-37-Apr-15	Gold Creek	Muscle	0.00512	0.957	19,400	<0.0067	1,270	0.771	0.0042	774	0.0082	10,100	0.00597	18.0	<0.000033	0.0010	2.05
	GC-NSC-49-Apr-15	Gold Creek	Muscle	0.00481	0.855	16,850	<0.0061	1,065	0.263	0.0051	828	0.0060	9,005	0.01755	19.2	<0.000030	0.0011	1.31
	GC-NSC-01-Aug-15	Gold Creek	Muscle	0.00520	1.12	22,900	0.00630	1,280	0.580	0.0120	1,420	0.00930	10,800	0.00361	19.2	<0.0000030	0.000940	2.39
	GC-NSC-02-Aug-15	Gold Creek	Muscle	0.00937	1.72	21,800	0.00495	1,270	0.563	0.0105	1,190	0.00900	10,400	0.00344	24.4	0.0000165	0.00104	2.26
	GC-NSC-03-Aug-15	Gold Creek	Muscle	0.00618	0.801	22,500	0.00690	1,240	0.824	0.0152	1,370	0.00890	10,700	0.0163	19.1	<0.0000031	0.00141	2.45
	GC-NSC-04-Aug-15	Gold Creek	Muscle	0.00794	0.796	21,200	0.00810	1,250	1.29	0.00890	1,540	0.0104	10,400	0.00649	16.9	<0.0000030	0.00106	3.93
	GC-NSC-05-Aug-15	Gold Creek	Muscle	0.00711	0.546	22,000	0.0279	1,330	1.61	0.0168	1,640	0.0304	11,500	0.00919	11.3	<0.0000032	0.00127	2.57
	GC-NSC-06-Aug-15	Gold Creek	Muscle	0.00684	0.676	22,500	0.00760	1,420	1.13	0.0146	1,190	0.0136	12,100	0.00692	20.4	<0.0000031	0.000880	2.26
	GC-NSC-07-Aug-15	Gold Creek	Muscle	0.00680	0.390	21,200	0.00920	1,320	0.844	0.0198	1,510	0.0112	10,800	0.00930	12.2	0.0000161	0.00108	1.77
	GC-NSC-08-Aug-15	Gold Creek	Muscle	0.00615	0.767	21,000	0.00830	1,270	0.945	0.0155	1,630	0.00850	11,100	0.00574	18.0	<0.0000028	0.000630	2.39
	GC-NSC-09-Aug-15	Gold Creek	Muscle	0.00736	0.479	21,800	0.00790	1,320	1.14	0.0163	1,180	0.0138	10,600	0.00595	16.8	<0.0000031	0.00102	2.52
	GC-NSC-10-Aug-15	Gold Creek	Muscle	0.00640	1.14	21,500	0.00610	1,180	0.565	0.0148	1,250	0.0113	10,000	0.00386	22.2	<0.0000031	0.00112	2.69
	GC-NSC-13-Apr-15	Gold Creek	Ovary	0.00726	0.0713	14,400	0.00640	978	9.93	0.128	2,070	0.0197	11,100	0.0167	13.2	<0.000036	0.000670	5.17
	GC-NSC-31-Apr-15	Gold Creek	Ovary	0.00543	0.0498	11,000	0.00480	570	0.769	0.0406	1,360	0.0175	10,500	0.0164	11.6	<0.000034	0.00121	13.8
	GC-NSC-33-Apr-15	Gold Creek	Ovary	0.00767	0.0302	11,500	0.0103	571	0.782	0.0361	1,480	0.0224	10,400	0.118	14.7	<0.000035	0.000690	7.93
	GC-NSC-34-Apr-15	Gold Creek	Ovary	0.0110	0.0391	13,500	0.0106	650	0.755	0.0287	1,520	0.505	11,800	0.0499	14.4	<0.000036	0.00123	7.60
	GC-NSC-49-Apr-15	Gold Creek	Ovary	0.00500	0.0611	11,400	0.00680	864	0.892	0.129	1,795	0.00865	9,105	0.0108	16.6	<0.000038	0.000660	3.53
2016	SC-NSC-03 O-Apr-16	Sand Creek	Ovary	0.00556	0.0413	10,100	<0.0068	873	1.88	0.105	1,960	0.0167	9,190	0.00453	15.9	<0.000084	0.00108	7.83
	SC-NSC-09 O-Apr-16	Sand Creek	Ovary	0.0085	0.0572	9,845	0.0122	668	2.45	0.1025	1,325	0.0236	8,775	0.007505	13.15	0.00017	0.00098	17.6
	SC-NSC-21 O-Apr-16	Sand Creek	Ovary	0.0047	0.0358	7,840	0.0061	499	0.861	0.0806	1,030	0.0206	6,830	0.00801	11.3	<0.00017	0.0009	12.2
	SC-NSC-25 O-Apr-16	Sand Creek	Ovary	0.006	0.0286	8,590	<0.0037	753	3.09	0.0931	1,650	0.0142	9,140	0.00282	12.8	<0.00017	0.00077	17
	SC-NSC-29 O-Apr-16	Sand Creek	Ovary	0.0067	0.0365	7,430	0.0136	703	3.32	0.0835	1,650	0.0443	6,550	0.0268	12.1	<0.00017	0.00101	4.6
	SC-NSC-32 O-Apr-16	Sand Creek	Ovary	0.005	0.0456	10,300	0.0066	944	1.29	0.122	2,030	0.0099	10,000	0.00536	19.8	<0.00016	0.00116	4.1
	SC-NSC-33 O-Apr-16	Sand Creek	Ovary	0.0064	0.133	8,960	<0.0035	671	0.766	0.0869	1,950	0.0054	10,700	0.00301	15.6	<0.00016	0.00104	5.39
	SC-NSC-34 O-Apr-16	Sand Creek	Ovary	0.0129	0.105	9,820	0.0131	987	4.2	0.127	2,080	0.018	8,760	0.0131	16.7	<0.00017	0.00092	7.03
	SC-NSC-35 O-Apr-16	Sand Creek	Ovary	0.0058	0.0573	10,400	0.0108	952	1.97	0.13	2,330	0.0119	9,430	0.00404	20.8	<0.00017	<0.00064	5.03
	SC-NSC-36 O-Apr-16	Sand Creek	Ovary	0.0055	0.0397	7,600	0.0144	694	1.57	0.0965	1,630	0.0176	6,590	0.017	13.6	<0.00016	0.00091	3.2
	SC-NSC-03 M-Apr-16	Sand Creek	Muscle	0.00523	0.999	18,500	<0.0069	1,220	0.348	0.0022	938	0.0253	9,120	0.00197	22.9	<0.0000041	<0.00055	1.26
	SC-NSC-09 M-Apr-16	Sand Creek	Muscle	0.00693	1.24	20,200	<0.0068	1,330	1.18	0.0021	1,040	0.0119	11,600	0.00461	20.2	<0.0000041	<0.00055	2.01
	SC-NSC-21 M-Apr-16	Sand Creek	Muscle	0.00555	0.929	20,500	<0.007	1,340	0.52	0.0025	922	0.0104	10,200	0.00147	23.8	<0.0000042	<0.00056	1.94
	SC-NSC-25 M-Apr-16	Sand Creek	Muscle	0.00701	0.703	20,250	0.0065	1,320	0.814	0.0027	1,280	0.01033	10,950	0.00197	22.1	0.0000255	0.00052	2.565
	SC-NSC-29 M-Apr-16	Sand Creek	Muscle	0.00698	1.03	21,300	<0.0072	1,300	0.585	0.0027	1,070	0.015	10,900	0.00404	25	0.0000116	0.00084	1.52
	SC-NSC-32 M-Apr-16	Sand Creek	Muscle	0.00554	1.17	19,400	<0.0071	1,240	0.184	0.0026	824	0.0067	9,480	0.00398	26.1	0.0000115	0.00087	1.4
	SC-NSC-33 M-Apr-16	Sand Creek	Muscle	0.0177	2.86	18,200	0.0062	1,120	0.316	0.0018	997	0.0127	8,950	0.00571	23.3	0.0000073	0.00112	1.27
	SC-NSC-34 M-Apr-16	Sand Creek	Muscle	0.007255	1.215	20,200	0.0077	1,225	0.3275	0.00145	917	0.0123	10,105	0.005405	24.8	0.0000085	0.00086	1.345
	SC-NSC-35 M-Apr-16	Sand Creek	Muscle	0.00555	1.12	20,700	<0.0071	1,350	0.261	0.0015	815	0.0095	10,100	0.0034	27.9	0.0000155	0.00133	1.39
	SC-NSC-36 M-Apr-16	Sand Creek	Muscle	0.00712	1.13	18,500	0.012	1,330	1.02	0.0019	882	0.0188	12,200	0.00827	25.1	<0.0000037	0.00121	1.39

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw
2016	ER-NSC-09 M-Apr-16	Elk River	Muscle	0.0047	1.36	11,600	0.0085	694	0.28	0.0029	944	0.0151	6,320	0.0159	14.7	<0.000048	<0.00057	1.18
	ER-NSC-15 M-Apr-16	Elk River	Muscle	0.0048	1.99	15,200	<0.0075	1,040	0.158	0.0022	1,090	0.0118	8,350	0.00196	19.7	<0.00005	<0.0006	1.52
	ER-NSC-16 M-Apr-16	Elk River	Muscle	0.0065	1.17	18,500	<0.0075	1,130	0.192	0.0017	912	0.0535	8,940	0.00668	24.8	<0.00005	<0.0006	1.6
	ER-NSC-17 M-Apr-16	Elk River	Muscle	0.0062	1.08	19,000	<0.0075	1,220	0.435	<0.0015	792	0.0172	9,470	0.00202	27.5	<0.00005	<0.00059	2.04
	ER-NSC-19 M-Apr-16	Elk River	Muscle	0.0047	1.05	21,000	0.0086	1,310	0.919	<0.0014	888	0.0194	11,300	0.0128	23.1	<0.000048	0.00086	1.7
	ER-NSC-21 M-Apr-16	Elk River	Muscle	0.0066	1.86	19,300	0.0119	1,200	0.726	0.002	857	0.0273	9,470	0.0142	15.1	<0.00005	0.00115	2.88
	ER-NSC-27 M-Apr-16	Elk River	Muscle	0.0035	0.757	13,100	<0.007	909	0.187	0.0022	752	0.0096	7,750	0.0106	21.1	<0.000047	<0.00056	1.28
	ER-NSC-28 M-Apr-16	Elk River	Muscle	0.0045	1.635	15,800	0.0075	1,110	0.294	0.0018	847	0.02495	9,050	0.00287	19.5	0.00005	0.0006	1.665
	ER-NSC-29 M-Apr-16	Elk River	Muscle	0.0041	2.63	18,100	<0.0074	1,120	0.185	0.0018	881	0.0126	8,850	0.00328	23.5	<0.00005	<0.00059	1.63
	ER-NSC-38 M-Apr-16	Elk River	Muscle	0.0025	0.501	9,630	<0.0069	579	0.234	0.0035	660	0.0054	5,810	0.00675	12.3	<0.000046	<0.00055	1.45
	ER-NSC-09 O-Apr-16	Elk River	Ovary	0.00853	0.148	11,600	0.0181	929	1.39	0.141	2,640	0.0212	9,450	0.0187	18.6	<0.000088	0.00083	3.1
	ER-NSC-15 O-Apr-16	Elk River	Ovary	0.00669	0.108	9,350	<0.0068	819	1.28	0.0911	1,930	0.0066	10,400	0.00192	14.5	<0.000084	0.00037	3.01
	ER-NSC-16 O-Apr-16	Elk River	Ovary	0.00624	0.0711	12,000	<0.007	981	1.38	0.141	2,330	0.0146	10,300	0.00313	19.2	<0.000086	<0.00037	8.24
	ER-NSC-17 O-Apr-16	Elk River	Ovary	0.00675	0.0503	14,000	0.0141	1,060	1.8	0.141	2,230	0.0247	11,100	0.00443	24.4	<0.000077	<0.00034	6.24
	ER-NSC-19 O-Apr-16	Elk River	Ovary	0.00587	0.0292	9,130	0.0095	626	1.37	0.081	1,550	0.0222	7,650	0.0427	14.2	<0.000077	0.00143	6.95
	ER-NSC-21 O-Apr-16	Elk River	Ovary	0.00673	0.0756	8,410	0.011	785	3.41	0.0992	1,900	0.0276	8,630	0.0251	8.91	<0.000084	0.00132	10.9
	ER-NSC-27 O -Apr-16	Elk River	Ovary	0.00512	0.0387	10,085	0.0066	823	1.44	0.113	1,955	0.0158	8,345	0.02835	18.75	0.0000815	0.00103	7.615
	ER-NSC-28 O-Apr-16	Elk River	Ovary	0.00538	0.0812	8,110	0.0084	666	0.674	0.0806	1,490	0.0084	10,100	0.003	11.7	<0.000078	0.00053	5.54
	ER-NSC-29 O-Apr-16	Elk River	Ovary	0.00573	0.114	8,650	<0.0069	731	0.993	0.0887	1,700	0.0232	10,100	0.00161	14.4	<0.000086	0.00043	3.59
	ER-NSC-38 O-Apr-16	Elk River	Ovary	0.00604	0.0427	11,400	0.0149	967	1.15	0.138	2,320	0.0136	9,550	0.0178	17.9	<0.000088	0.00074	9.86
	GC-NSC-01 M-Apr-16	Gold Creek	Muscle	0.00634	1.245	18,800	0.00755	1,205	0.9415	0.001825	917	0.02125	11,175	0.006115	23.95	0.000099	0.000665	1.565
	GC-NSC-05 M-Apr-16	Gold Creek	Muscle	0.00531	3.9	18,100	<0.0067	1,160	0.279	0.00164	1,010	0.0177	9,290	0.00346	21.7	<0.00011	0.00091	1.6
	GC-NSC-06 M-Apr-16	Gold Creek	Muscle	0.00603	2.43	18,900	<0.0066	1,170	0.276	0.00313	1,130	0.0169	9,590	0.00274	25.7	<0.0001	0.00067	1.7
	GC-NSC-08 M-Apr-16	Gold Creek	Muscle	0.00589	1.17	17,100	0.0075	1,180	0.46	0.00181	1,040	0.0085	9,530	0.0042	25.1	<0.0001	0.00147	2.16
	GC-NSC-12 M-Apr-16	Gold Creek	Muscle	0.00433	1.29	15,600	<0.0066	1,050	0.367	0.00282	959	0.0115	9,010	0.0019	23.6	<0.0001	0.00124	1.32
	GC-NSC-13 M-Apr-16	Gold Creek	Muscle	0.0069	2.04	16,800	0.0121	1,220	0.78	0.00191	816	0.0214	12,800	0.00683	20.2	<0.0001	0.00079	1.6
	GC-NSC-14 M-Apr-16	Gold Creek	Muscle	0.00548	1.27	19,200	0.0075	1,270	0.685	0.00276	1,210	0.0118	10,600	0.00684	27.4	<0.00011	0.00058	1.99
	GC-NSC-16 M-Apr-16	Gold Creek	Muscle	0.00442	0.976	18,900	<0.0066	1,100	0.405	0.00201	1,210	0.0166	10,300	0.00224	27	<0.0001	0.00059	1.62
	GC-NSC-17 M-Apr-16	Gold Creek	Muscle	0.00529	1.08	19,300	<0.0067	1,180	0.628	0.00269	935	0.0242	9,400	0.0075	23.6	<0.0001	0.00167	2.06
	GC-NSC-24 M-Apr-16	Gold Creek	Muscle	0.00576	1.5	16,800	<0.0063	1,120	0.37	0.158	876	0.0561	9,590	0.00166	21.6	<0.000097	0.00093	1.43
	GC-NSC-26 M -Apr-16	Gold Creek	Muscle	0.005345	1.55	15,850	0.0062	1,135	0.1945	0.001605	796	0.0084	8,795	0.001575	22.05	0.0000965	0.001395	1.52
	GC-NSC-01 O-Apr-16	Gold Creek	Ovary	0.00776	0.0628	11,700	<0.012	776	2.2	0.111	2,020	0.177	10,000	0.0329	19.1	<0.00012	0.00231	12.9
	GC-NSC-05 O-Apr-16	Gold Creek	Ovary	0.00551	0.228	9,210	<0.012	745	0.979	0.0899	2,440	0.0132	10,200	0.00494	13.8	<0.00012	0.00048	4.06
	GC-NSC-06 O-Apr-16	Gold Creek	Ovary	0.00428	0.109	10,700	<0.012	871	1.17	0.114	1,970	0.0229	9,530	0.00663	18.8	<0.00012	0.00086	6.2
	GC-NSC-08 O-Apr-16	Gold Creek	Ovary	0.00744	0.059	10,300	<0.011	1,030	4.16	0.113	2,110	0.0095	9,670	0.00355	19.9	<0.00011	0.00061	5.33
	GC-NSC-12 O-Apr-16	Gold Creek	Ovary	0.00454	0.0688	8,750	<0.011	904	1.25	0.11	1,890	0.0094	8,650	0.0054	16.8	<0.00011	0.00086	3.89
	GC-NSC-13 O -Apr-16	Gold Creek	Ovary	0.005365	0.06885	7,655	0.012	608	0.6395	0.0683	1,645	0.01235	10,300	0.006265	12	0.000115	0.00076	3.715
	GC-NSC-14 O-Apr-16	Gold Creek	Ovary	0.00683	0.0658	11,600	0.014	1,010	4.39	0.148	2,460	0.0329	9,240	0.0157	22.5	<0.00012	0.002	8.91
	GC-NSC-16 O-Apr-16	Gold Creek	Ovary	0.00403	0.0268	9,270	<0.012	513	0.685	0.0446	1,330	0.0227	8,020	0.00848	15.7	<0.00012	0.00056	4.3
	GC-NSC-17 O-Apr-16	Gold Creek	Ovary	0.00759	0.0623	13,000	<0.012	832	2.64	0.101	1,760	0.0501	11,900	0.0218	20.2	<0.00012	0.00166	8.96
	GC-NSC-24 O-Apr-16	Gold Creek	Ovary	0.00431	0.0606	7,040	<0.012	677	0.897	0.0779	1,570	0.0056	8,620	0.00163	11.6	<0.00012	<0.00045	3.81
	GC-NSC-26 O-Apr-16	Gold Creek	Ovary	0.00489	0.0755	8,360	<0.012	698	0.608	0.0727	1,690	0.0084	10,600	0.00117	14.6	<0.00012	0.00046	3.76

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw
2016	SC-NSC-01A avg	Sand Creek	Muscle	0.0066	1.23	18,250	0.013	1,270	0.848	0.0048	1,290	0.035	10,215	0.038	25.85	0.000046	0.0022	1.81
	SC-NSC-02A	Sand Creek	Muscle	0.0059	1.3	19100	0.011	1280	0.481	0.003	1810	0.0197	10800	0.0089	22.9	<0.000048	0.0006	1.71
	SC-NSC-03A	Sand Creek	Muscle	0.0046	0.681	15400	<0.0078	1050	0.484	0.0045	1160	0.0131	8830	0.0082	23.3	<0.000044	0.00077	1.68
	SC-NSC-04A	Sand Creek	Muscle	0.0055	0.93	19100	0.009	1330	0.682	0.004	1120	0.0142	10800	0.0069	28.5	<0.000045	0.00144	1.8
	SC-NSC-05A	Sand Creek	Muscle	0.004	0.816	13800	<0.0083	906	0.388	0.0068	1290	0.0161	7900	0.0111	14.7	<0.000046	0.00087	1.92
	SC-NSC-06A	Sand Creek	Muscle	0.0047	0.827	17700	0.0084	1260	0.572	0.0055	1490	0.019	9410	0.0131	17.7	<0.000046	0.00076	2.31
	SC-NSC-07A	Sand Creek	Muscle	0.0056	1.46	19200	<0.0084	1250	0.248	0.0019	1030	0.0274	9870	0.00927	24.4	<0.000047	0.00098	1.81
	SC-NSC-08A	Sand Creek	Muscle	0.0065	1.12	17700	0.0104	1170	0.405	0.0048	1520	0.0246	9590	0.00746	19.2	<0.000047	0.00085	2.35
	SC-NSC-09A	Sand Creek	Muscle	0.0045	1.29	18900	<0.0084	1210	0.438	0.0033	1280	0.0177	10300	0.00963	24.5	<0.000047	0.00089	1.77
	SC-NSC-10A	Sand Creek	Muscle	0.0049	0.833	17100	0.0148	1160	0.68	0.0045	1620	0.0225	9800	0.01	21.6	<0.000045	<0.00045	1.95
	GC-NSC-01A avg	Gold Creek	Muscle	0.00925	1.225	19,150	0.0211	1,230	0.6295	0.0051	1,285	0.0589	10,200	0.1333	23.1	0.000046	0.00525	2.305
	GC-NSC-02A	Gold Creek	Muscle	0.0047	1.55	18300	<0.0086	1260	0.486	0.0015	1170	0.0111	10100	0.00326	24	<0.000048	<0.00047	1.23
	GC-NSC-03A	Gold Creek	Muscle	0.004	0.714	17500	<0.0081	1110	0.451	0.0053	1200	0.0131	9410	0.00235	21.2	<0.000045	0.00068	2.27
	GC-NSC-04A	Gold Creek	Muscle	0.005	1.65	21000	0.0095	1340	0.845	0.0013	1230	0.0161	11500	0.00521	29.5	<0.000047	0.00086	1.84
	GC-NSC-05A	Gold Creek	Muscle	0.004	1.51	22200	0.0099	1400	1.36	0.0018	1450	0.021	11200	0.00385	22	<0.000048	0.00061	2.6
	GC-NSC-06A	Gold Creek	Muscle	0.0043	1.02	15600	0.0085	959	0.315	0.0045	1230	0.016	8150	0.00199	20.6	<0.000043	0.00068	1.71
	GC-NSC-07A	Gold Creek	Muscle	0.0052	1.47	19100	0.0099	1260	0.519	0.0025	1150	0.0112	10500	0.00368	24.8	<0.000047	0.00064	2.75
	GC-NSC-08A	Gold Creek	Muscle	0.0054	1.83	19800	<0.0086	1290	0.672	0.0019	1230	0.0161	10400	0.00422	18.3	<0.000048	0.00057	2.2
	GC-NSC-09A	Gold Creek	Muscle	0.0057	1.71	20000	0.0102	1280	0.619	0.003	1640	0.0171	10400	0.00452	25.3	<0.000048	0.0011	2.22
	GC-NSC-10A	Gold Creek	Muscle	0.0048	1.86	19600	0.0097	1240	1.28	0.0041	1180	0.0215	11200	0.00512	17.2	<0.000046	0.0006	2.05
	ER-NSC-01A avg	Elk River	Muscle	0.0035	1.515	12,350	0.0084	733	0.176	0.00315	764	0.015	6,885	0.0175	16.05	0.0000465	0.001025	1.19
	ER-NSC-02A avg	Elk River	Muscle	0.00355	1.91	13,350	0.00705	880	0.181	0.002075	927	0.00855	7,535	0.0125	16.2	0.000048	0.000785	1.25
	ER-NSC-03A	Elk River	Muscle	0.004	2.05	13200	0.0106	741	0.276	0.0066	1110	0.0109	7050	0.0119	16.3	<0.000046	0.00077	1.61
	ER-NSC-04A avg	Elk River	Muscle	0.0038	1.415	16,700	0.01035	1,024	0.174	0.0022	1,140	0.0193	9,160	0.009125	20.8	0.000046	0.00127	1.6
	ER-NSC-05A	Elk River	Muscle	0.0056	2.2	17600	0.0261	1120	0.844	0.0037	1220	0.0291	10000	0.0103	13.6	<0.000047	0.00093	3.71
	ER-NSC-06A	Elk River	Muscle	0.0055	1.4	17900	0.0219	1210	0.638	0.004	1440	0.0191	10000	0.0111	17.2	<0.000044	0.00077	5.39
	ER-NSC-07A	Elk River	Muscle	0.0064	0.574	18600	0.0278	1330	1.55	0.0053	1460	0.0268	11500	0.0149	10.9	<0.000047	0.00086	4.85
	ER-NSC-08A	Elk River	Muscle	0.0049	1.67	13900	0.0097	851	0.239	0.0045	923	0.0156	7500	0.0186	18.2	<0.000046	0.00066	1.49
	ER-NSC-09A	Elk River	Muscle	0.0033	1.96	12200	0.0087	792	0.159	0.0023	929	0.0169	7360	0.00517	15.2	<0.000042	0.00078	1.83
	ER-NSC-10A	Elk River	Muscle	0.0052	1.72	16100	0.0169	1050	0.246	0.0022	1040	0.0247	9410	0.0196	21.9	<0.000046	0.00169	1.67

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	EC-PM-01M-Feb-14	Englishman Creek	Muscle	0.0189	0.215	0.00186	0.38	0.0118	0.00044	0.0165	0.00317	22.4	0.0097
	EC-PM-01G-Feb-14	Englishman Creek	Ovary	0.0426	0.298	0.00251	0.421	0.0333	0.0009	0.0333	0.00435	263	0.0161
	SC-PM-05M-Feb-14	Sand Creek	Muscle	0.00512	0.859	0.000346	0.176	0.0162	<0.00033	0.00646	0.00073	20.1	0.00397
	SC-PM-10M-Feb-14	Sand Creek	Muscle	0.00974	0.313	0.000283	0.175	0.00949	<0.00032	0.00452	0.00076	16.3	0.00849
	SC-PM-01M-Apr-14	Sand Creek	Muscle	0.00894	1.89	0.00178	0.231	0.0100	0.00088	0.0136	0.00241	22.8	0.00875
	SC-PM-02M-Apr-14	Sand Creek	Muscle	0.0146	0.475	0.00405	0.416	0.016	0.00095	0.0216	0.013	26.5	0.0309
	SC-PM-03M-Apr-14	Sand Creek	Muscle	0.0039	0.22	0.00323	0.254	0.00801	0.00074	0.0191	0.00395	18.8	0.0214
	SC-PM-04M-Apr-14	Sand Creek	Muscle	0.0061	1.21	0.00243	0.452	0.0154	0.00096	0.0184	0.00338	26.7	0.00805
	SC-PM-05M-Apr-14	Sand Creek	Muscle	0.00370	0.725	0.00228	0.311	0.00952	0.00066	0.0185	0.00432	18.1	0.00748
	SC-PM-06M-Apr-14	Sand Creek	Muscle	0.00328	0.231	0.00367	0.222	0.00998	0.00029	0.0132	0.00306	19.7	0.0151
	SC-PM-07M-Apr-14	Sand Creek	Muscle	0.00465	0.941	0.0062	0.512	0.0132	0.00128	0.0364	0.00894	20.6	0.0114
	SC-PM-08M-Apr-14	Sand Creek	Muscle	0.00343	0.849	0.000863	0.193	0.0272	0.00037	0.00803	0.00141	19.5	0.00315
	SC-PM-09M-Apr-14	Sand Creek	Muscle	0.00807	0.36	0.00431	0.375	0.0156	0.00086	0.0246	0.00708	30.1	0.0298
	SC-PM-10M-Apr-14	Sand Creek	Muscle	0.00141	0.249	0.000859	0.177	0.0282	0.00035	0.0133	0.00157	22	0.00532
	SC-PM-01M-Aug-14	Sand Creek	Muscle	0.0182	0.951	0.000690	0.234	0.00506	0.00050	0.00973	0.00148	20.5	0.0178
	SC-PM-02M-Aug-14	Sand Creek	Muscle	0.0266	0.378	0.00266	0.542	0.00713	0.00161	0.0267	0.00517	31.5	0.0212
	SC-PM-03M-Aug-14	Sand Creek	Muscle	0.0249	0.609	0.00182	0.48	0.00313	0.00254	0.026	0.0044	27.9	0.0237
	SC-PM-04M-Aug-14	Sand Creek	Muscle	0.00576	2.05	0.000248	0.122	0.00591	0.00172	0.00741	0.00062	24.4	0.0318
	SC-PM-05M-Aug-14	Sand Creek	Muscle	0.018	0.169	0.00134	0.435	0.00189	0.001	0.0177	0.00295	25.2	0.0103
	SC-PM-06M-Aug-14	Sand Creek	Muscle	0.00988	1.58	0.0006225	0.183	0.00698	0.00038	0.0102	0.00127	30.3	0.00423
	SC-PM-07M-Aug-14	Sand Creek	Muscle	0.00708	0.338	0.000675	0.262	0.00382	0.00041	0.00953	0.00166	25.8	0.0073
	SC-PM-08M-Aug-14	Sand Creek	Muscle	0.0114	1.59	0.00188	0.431	0.00374	0.00091	0.0192	0.00454	23.7	0.012
	SC-PM-09M-Aug-14	Sand Creek	Muscle	0.00292	0.148	0.000261	0.144	0.00235	<0.00022	0.00577	0.00054	16.5	0.00347
	SC-PM-10M-Aug-14	Sand Creek	Muscle	0.0318	0.444	0.00213	0.454	0.00705	0.00074	0.0246	0.00445	59.7	0.0208
	SC-PM-05G-Feb-14	Sand Creek	Ovary	0.0118	0.935	0.0144	2.43	0.0458	0.00454	0.12	0.0176	235	0.0186
	SC-PM-10G-Feb-14	Sand Creek	Ovary	0.00711	0.327	0.000532	0.125	0.0216	0.00046	0.0212	0.00229	142	0.00271
	SC-PM-01G-Apr-14	Sand Creek	Ovary	0.0179	0.434	0.00387	0.299	0.0225	0.00256	0.0529	0.0148	183	0.0256
	SC-PM-10G-Apr-14	Sand Creek	Ovary	0.00401	0.561	0.00453	0.336	0.0886	0.00424	0.0761	0.0148	457	0.022
	ER-PM-06M-Feb-14	Elk River	Muscle	0.0463	0.77	0.000871	0.283	0.0121	0.00047	0.0127	0.00265	24.5	0.0139
	ER-PM-09M-Feb-14	Elk River	Muscle	0.0158	0.206	0.000998	0.252	0.00851	0.00043	0.00987	0.00194	18.9	0.0162
	ER-PM-12M-Feb-14	Elk River	Muscle	0.0037	2.36	0.000375	0.162	0.0115	0.00082	0.0192	0.00076	34.7	0.00569
	ER-PM-01M-Apr-14	Elk River	Muscle	0.0127	1.24	0.00532	0.391	0.0156	0.00100	0.0308	0.00691	28.4	0.0159
	ER-PM-02M-Apr-14	Elk River	Muscle	0.00202	2.66	0.000498	0.167	0.0137	0.00095	0.0122	0.0011	21.2	0.00497
	ER-PM-03M-Apr-14	Elk River	Muscle	0.00272	0.302	0.00224	0.32	0.00624	0.00069	0.0329	0.00607	18.3	0.0143
	ER-PM-04M-Apr-14	Elk River	Muscle	0.0074	0.836	0.00745	0.61	0.0181	0.00203	0.0957	0.0165	33.2	0.0655
	ER-PM-05M-Apr-14	Elk River	Muscle	0.00413	2.04	0.00184	0.246	0.0117	0.00091	0.0206	0.00389	27.6	0.00785
	ER-PM-06M-Apr-14	Elk River	Muscle	0.00295	0.348	0.00152	0.221	0.0113	0.00049	0.0166	0.00378	15.8	0.0151
	ER-PM-07M-Apr-14	Elk River	Muscle	0.00148	2.31	0.00175	0.291	0.0133	0.00078	0.0258	0.00245	20.9	0.00793
	ER-PM-08M-Apr-14	Elk River	Muscle	0.00662	0.3	0.00312	0.313	0.00896	0.00075	0.0379	0.00522	16.8	0.0143
	ER-PM-09M-Apr-14	Elk River	Muscle	0.00716	1.54	0.00627	0.57	0.00954	0.00185	0.0612	0.0132	19.9	0.0307
	ER-PM-10M-Apr-14	Elk River	Muscle	0.00371	0.727	0.00352	0.338	0.012	0.00098	0.0256	0.00581	20.8	0.0106
	ER-PM-11M-Apr-14	Elk River	Muscle	0.00304	0.242	0.00212	0.242	0.0184	0.00042	0.0176	0.00339	17.7	0.00823
	ER-PM-12M-Apr-14	Elk River	Muscle	0.0045	0.331	0.00229	0.283	0.00774	0.00054	0.0221	0.00411	19.4	0.0152
	ER-PM-13M-Apr-14	Elk River	Muscle	0.00176	1.01	0.00212	0.302	0.0093	0.00091	0.0247	0.00422	26	0.00856
	ER-PM-14M-Apr-14	Elk River	Muscle	0.00208	0.204	0.00352	0.483	0.0209	0.00077	0.0357	0.00601	24.3	0.0118
	ER-PM-01M-Aug-14	Elk River	Muscle	0.00155	2.12	0.000131	0.235	0.0125	0.00039	0.00562	<0.00018	30.3	0.00615
	ER-PM-02M-Aug-14	Elk River	Muscle	0.00408	0.643	0.0007605	0.161	0.0109	0.00019	0.00638	0.00142	24.4	0.00812

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	ER-PM-03M-Aug-14	Elk River	Muscle	0.00145	1.5	0.000194	0.152	0.00592	0.00031	0.00572	0.00051	29.2	0.00253
	ER-PM-04M-Aug-14	Elk River	Muscle	0.00648	0.735	0.000808	0.284	0.00703	0.00033	0.0102	0.00195	24.7	0.00639
	ER-PM-05M-Aug-14	Elk River	Muscle	0.00596	0.883	0.000242	0.148	0.00717	0.00045	0.0085	0.00067	22.4	0.00314
	ER-PM-06M-Aug-14	Elk River	Muscle	0.00458	0.149	0.000447	0.189	0.00517	0.00027	0.00943	0.00058	16.0	0.00787
	ER-PM-07M-Aug-14	Elk River	Muscle	0.00371	3.38	0.000135	0.152	0.00529	0.00152	0.0105	0.00195	25.9	0.00645
	ER-PM-08M-Aug-14	Elk River	Muscle	0.0115	0.429	0.000249	0.171	0.00899	0.00038	0.00537	0.00066	19.9	0.00891
	ER-PM-09M-Aug-14	Elk River	Muscle	0.00202	1.98	0.000104	0.104	0.00502	0.00069	0.0048	0.00029	20.2	0.00397
	ER-PM-10M-Aug-14	Elk River	Muscle	0.00288	0.184	0.00101	0.122	0.00265	0.0002	0.00631	0.00035	19.9	0.0046
	ER-PM-06G-Feb-14	Elk River	Ovary	0.00973	0.874	0.00133	0.258	0.0259	0.00165	0.0348	0.00604	187	0.00734
	ER-PM-09G-Feb-14	Elk River	Ovary	0.0279	0.62	0.00243	0.371	0.0337	0.001	0.0309	0.00415	412	0.0167
	ER-PM-12G-Feb-14	Elk River	Ovary	0.00217	1.15	0.000624	0.13	0.0136	0.00187	0.0649	0.00456	130	0.168
	ER-PM-07G-Apr-14	Elk River	Ovary	0.00746	0.609	0.00942	0.787	0.0402	0.00264	0.113	0.0213	199	0.0299
	ER-PM-11G-Apr-14	Elk River	Ovary	0.00243	0.424	0.00242	0.28	0.0342	0.0008	0.0328	0.00504	193	0.0131
	ER-PM-14G-Apr-14	Elk River	Ovary	0.00328	1.29	0.00254	0.273	0.0592	0.00081	0.0449	0.00756	256	0.00875
	GC-PM-23M-Feb-14	Gold Creek	Muscle	0.00878	0.215	0.000418	0.154	0.00754	<0.00032	0.00608	0.00124	17.7	0.00467
	GC-PM-28M-Feb-14	Gold Creek	Muscle	0.00924	0.241	0.00129	0.362	0.00717	0.00042	0.0168	0.00274	21.6	0.0103
	GC-PM-29M-Feb-14	Gold Creek	Muscle	0.00352	0.709	0.000255	0.14	0.0147	<0.00030	0.00528	0.00048	18.2	0.0179
	GC-PM-31M-Feb-14	Gold Creek	Muscle	0.00315	3.65	0.000363	0.136	0.00979	0.00117	0.0147	0.00083	25	0.00355
	GC-PM-01M-Apr-14	Gold Creek	Muscle	0.00479	1.38	0.00118	0.403	0.00967	0.00068	0.0115	0.00261	27.3	0.0114
	GC-PM-02M-Apr-14	Gold Creek	Muscle	0.00497	0.354	0.00258	0.583	0.00558	0.00037	0.0204	0.00506	35.2	0.00927
	GC-PM-03M-Apr-14	Gold Creek	Muscle	0.00183	2.65	0.000454	0.175	0.00802	0.00091	0.00646	0.00128	24.4	0.00281
	GC-PM-04M-Apr-14	Gold Creek	Muscle	0.00325	0.261	0.00340	0.468	0.00798	0.00051	0.0237	0.00397	23.3	0.00857
	GC-PM-05M-Apr-14	Gold Creek	Muscle	0.0039	3.82	0.00073	0.181	0.00824	0.00093	0.0116	0.00175	26.4	0.00477
	GC-PM-06M-Apr-14	Gold Creek	Muscle	0.0045	0.202	0.00128	0.216	0.00376	<0.00028	0.0148	0.00228	20.9	0.0804
	GC-PM-07M-Apr-14	Gold Creek	Muscle	0.00242	0.196	0.0008175	0.215	0.0102	<0.00033	0.0110	0.00116	17.0	0.00499
	GC-PM-08M-Apr-14	Gold Creek	Muscle	0.00636	0.547	0.0105	0.758	0.0159	0.00151	0.0694	0.0145	20.4	0.0554
	GC-PM-09M-Apr-14	Gold Creek	Muscle	0.00169	4.01	0.00207	0.244	0.00858	0.00269	0.024	0.00569	23.1	0.0169
	GC-PM-10M-Apr-14	Gold Creek	Muscle	0.00168	0.199	0.00131	0.168	0.00418	<0.00034	0.00763	0.00197	24.1	0.00827
	GC-PM-11M-Apr-14	Gold Creek	Muscle	0.00436	0.682	0.00795	0.572	0.00637	0.00223	0.0467	0.0136	31.2	0.0216
	GC-PM-12M-Apr-14	Gold Creek	Muscle	0.00183	0.229	0.000852	0.181	0.0117	<0.00033	0.00988	0.00174	18.5	0.0122
	GC-PM-13M-Apr-14	Gold Creek	Muscle	0.00541	0.442	0.0009	0.182	0.0107	0.00044	0.00969	0.00235	24.6	0.00722
	GC-PM-01M-Aug-14	Gold Creek	Muscle	0.00849	0.353	0.000793	0.208	0.00263	<0.00041	0.0089	0.00157	21.6	0.0146
	GC-PM-02M-Aug-14	Gold Creek	Muscle	0.0196	2.95	0.0021	0.468	0.00474	0.00134	0.0248	0.00859	40.7	0.0357
	GC-PM-03M-Aug-14	Gold Creek	Muscle	0.0209	0.923	0.0006435	0.257	0.00481	0.00054	0.0115	0.00187	22.9	0.0132
	GC-PM-04M-Aug-14	Gold Creek	Muscle	0.0116	0.167	0.000727	0.186	0.00234	<0.00040	0.00922	0.00095	18.6	0.0105
	GC-PM-05M-Aug-14	Gold Creek	Muscle	0.011	0.515	0.000704	0.248	0.00308	<0.00038	0.0102	0.00179	24.3	0.0109
	GC-PM-06M-Aug-14	Gold Creek	Muscle	0.0156	0.255	0.000467	0.193	0.00605	<0.00039	0.00882	0.0013	26.1	0.00835
	GC-PM-07M-Aug-14	Gold Creek	Muscle	0.00238	0.595	0.0001	0.145	0.0037	<0.00042	0.00434	0.00045	18.8	0.00301
	GC-PM-08M-Aug-14	Gold Creek	Muscle	0.00448	0.629	0.000248	0.144	0.00184	<0.00038	0.00558	0.00078	20.4	0.00572
	GC-PM-09M-Aug-14	Gold Creek	Muscle	0.00804	0.198	0.000887	0.185	0.00391	0.00035	0.0103	0.0022	19.5	0.0105
	GC-PM-10M-Aug-14	Gold Creek	Muscle	0.00172	0.256	0.000105	0.127	0.00284	<0.00021	0.00372	0.00029	20.3	0.00405
	GC-PM-23G-Feb-14	Gold Creek	Ovary	0.00982	0.246	0.00103	0.384	0.0187	0.00042	0.0285	0.0026	194	0.0109
	GC-PM-28G-Feb-14	Gold Creek	Ovary	0.034	0.275	0.00261	0.557	0.0301	0.00095	0.0463	0.0068	502	0.022
	GC-PM-29G-Feb-14	Gold Creek	Ovary	0.0064	0.186	0.00123	0.306	0.0268	0.00033	0.0255	0.00312	237	0.0111
	GC-PM-31G-Feb-14	Gold Creek	Ovary	0.00556	0.78	0.000854	0.229	0.0147	0.00086	0.0429	0.00209	306	0.00461
	GC-PM-10G-Apr-14	Gold Creek	Ovary	0.00947	0.279	0.00322	0.368	0.0104	0.00081	0.0561	0.00713	205	0.00962

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2015	SC-NSC-13-Apr-15	Sand Creek	Muscle	0.00141	1.67	<0.00042	0.1076	0.0162	0.00041	0.00335	0.00031	19.3	0.0249
	SC-NSC-23-Apr-15	Sand Creek	Muscle	0.00151	0.96	0.00044	0.0988	0.0129	0.00023	0.00194	<0.00020	19.7	0.0475
	SC-NSC-28-Apr-15	Sand Creek	Muscle	0.00073	1.19	<0.00037	0.0838	0.0110	0.00040	0.00163	0.00024	23.2	0.0136
	SC-NSC-33-Apr-15	Sand Creek	Muscle	0.00102	0.16	<0.00039	0.0932	0.0111	<0.00022	0.00274	<0.00020	33.8	0.0184
	SC-NSC-36-Apr-15	Sand Creek	Muscle	0.00132	1.69	<0.00034	0.1070	0.0195	0.00036	0.00520	0.00047	20.7	0.0104
	SC-NSC-37-Apr-15	Sand Creek	Muscle	0.00082	0.19	<0.00039	0.0829	0.0186	<0.00022	0.00341	0.00033	52.6	0.0120
	SC-NSC-39-Apr-15	Sand Creek	Muscle	0.00098	1.04	<0.00039	0.0824	0.0148	0.00031	0.00314	0.00033	18.5	0.0066
	SC-NSC-44-Apr-15	Sand Creek	Muscle	0.00140	3.37	0.00043	0.1030	0.0153	0.00094	0.00855	0.00088	25.7	0.0069
	SC-NSC-46-Apr-15	Sand Creek	Muscle	0.00099	0.40	0.00062	0.1445	0.0058	0.00030	0.00750	0.00116	17.4	0.0075
	SC-NSC-47-Apr-15	Sand Creek	Muscle	<0.00069	2.58	<0.00039	0.0961	0.0153	0.00087	0.00596	<0.00020	17.6	0.2270
	SC-NSC-01-Aug-15	Sand Creek	Muscle	0.0461	0.155	0.000618	0.181	0.00559	0.000369	0.0128	0.00130	56.7	0.0287
	SC-NSC-02-Aug-15	Sand Creek	Muscle	0.0206	1.17	0.000121	0.0970	0.00364	0.000411	0.00534	0.000530	24.6	0.0170
	SC-NSC-03-Aug-15	Sand Creek	Muscle	0.0332	0.391	0.000211	0.146	0.00182	0.000110	0.00580	0.000570	48.7	0.0647
	SC-NSC-04-Aug-15	Sand Creek	Muscle	0.0224	0.325	0.000174	0.105	0.00340	0.000249	0.00509	0.000480	38.0	0.0368
	SC-NSC-05-Aug-15	Sand Creek	Muscle	0.0101	0.554	0.000398	0.111	0.00758	0.000242	0.00475	0.000470	35.3	0.0164
	SC-NSC-06-Aug-15	Sand Creek	Muscle	0.0197	0.136	0.000494	0.124	0.00695	0.0000955	0.00535	0.000600	33.1	0.0146
	SC-NSC-07-Aug-15	Sand Creek	Muscle	0.0172	0.186	0.000627	0.273	0.00683	0.000321	0.0863	0.00125	23.6	0.0414
	SC-NSC-08-Aug-15	Sand Creek	Muscle	0.0377	0.432	0.000650	0.178	0.00433	0.000333	0.00678	0.00113	25.5	0.0275
	SC-NSC-09-Aug-15	Sand Creek	Muscle	0.0304	0.169	0.000569	0.140	0.00532	0.000217	0.00584	0.00146	36.4	0.0222
	SC-NSC-10-Aug-15	Sand Creek	Muscle	0.0155	0.712	0.00117	0.179	0.00458	0.000461	0.00943	0.00161	24.1	0.0155
	SC-NSC-11-Aug-15	Sand Creek	Muscle	0.00182	0.314	0.000475	0.118	0.00711	0.000362	0.00340	0.000460	19.5	0.0104
	SC-NSC-13-Apr-15	Sand Creek	Ovary	0.00190	0.351	0.000424	0.0710	0.0222	0.000394	0.0157	0.000930	150	0.00568
	SC-NSC-33-Apr-15	Sand Creek	Ovary	<0.0011	0.264	0.000272	0.0762	0.0247	0.000184	0.0107	0.000680	235	0.00585
	SC-NSC-36-Apr-15	Sand Creek	Ovary	0.00290	0.167	0.00114	0.142	0.0305	0.00110	0.0163	0.00459	189	0.0110
	SC-NSC-37-Apr-15	Sand Creek	Ovary	0.00110	0.350	0.000333	0.0813	0.0391	0.000436	0.0193	0.00140	214	0.00656
	SC-NSC-39-Apr-15	Sand Creek	Ovary	<0.0012	0.281	0.000195	0.0763	0.0443	0.000439	0.0197	0.000810	224	0.0667
	SC-NSC-44-Apr-15	Sand Creek	Ovary	0.00180	0.326	0.00174	0.115	0.0289	0.00652	0.0671	0.0125	175	0.0287
	SC-NSC-46-Apr-15	Sand Creek	Ovary	0.00150	0.357	0.0004905	0.113	0.0119	0.000627	0.0362	0.00275	155	0.00695
	SC-NSC-47-Apr-15	Sand Creek	Ovary	0.00200	0.216	0.000912	0.140	0.0418	0.00110	0.0510	0.00498	271	0.0205
	ER-NSC-06-Apr-15	Elk River	Muscle	0.00630	2.77	0.00147	0.2360	0.0112	0.00113	0.01630	0.00287	22.8	0.0091
	ER-NSC-08-Apr-15	Elk River	Muscle	0.00350	0.18	0.00033	0.1200	0.0106	0.00022	0.00361	0.00081	31.2	0.0043
	ER-NSC-13-Apr-15	Elk River	Muscle	0.00115	1.76	0.000123	0.0756	0.0142	0.00038	0.00737	0.00037	18.0	0.0037
	ER-NSC-14-Apr-15	Elk River	Muscle	0.00260	0.88	0.000465	0.1420	0.0096	0.00039	0.00715	0.00101	35.9	0.0505
	ER-NSC-17-Apr-15	Elk River	Muscle	0.00150	0.68	0.000998	0.1510	0.0093	0.00030	0.00909	0.00120	25.9	0.0306
	ER-NSC-19-Apr-15	Elk River	Muscle	0.00200	0.40	0.00049	0.1180	0.0122	0.00025	0.00542	0.00081	24.6	0.0240
	ER-NSC-25-Apr-15	Elk River	Muscle	<0.0011	0.44	0.000122	0.0909	0.0083	0.00014	0.00286	0.00022	20.3	0.0119
	ER-NSC-29-Apr-15	Elk River	Muscle	<0.0012	0.59	<0.000086	0.0890	0.0166	0.00013	0.00281	0.00028	20.9	0.0073
	ER-NSC-43-Apr-15	Elk River	Muscle	0.00160	0.20	0.000763	0.1420	0.0289	0.00024	0.01330	0.00253	25.1	0.0106
	ER-NSC-01-Aug-15	Elk River	Muscle	0.00720	0.842	0.000540	0.206	0.00713	0.000490	0.0108	0.000810	27.5	0.0126
	ER-NSC-02-Aug-15	Elk River	Muscle	0.00236	0.201	0.000229	0.0940	0.00811	<0.00030	0.00435	0.000370	52.6	0.00730
	ER-NSC-03-Aug-15	Elk River	Muscle	0.00374	0.842	0.00464	0.428	0.0100	0.00276	0.0473	0.0187	37.7	0.0271
	ER-NSC-04-Aug-15	Elk River	Muscle	0.00277	1.36	<0.000084	0.105	0.00673	0.000445	0.00494	0.000490	27.9	0.0132
	ER-NSC-05-Aug-15	Elk River	Muscle	0.00303	0.375	0.000351	0.146	0.00452	0.000299	0.00477	0.00102	27.8	0.0159
	ER-NSC-06-Aug-15	Elk River	Muscle	0.00142	2.89	<0.000094	0.105	0.0102	0.000504	0.00649	0.000480	33.7	0.00750
	ER-NSC-07-Aug-15	Elk River	Muscle	0.00173	0.912	0.000127	0.0941	0.00845	0.000297	0.00591	0.000370	33.3	0.00655
	ER-NSC-08-Aug-15	Elk River	Muscle	0.00190	1.46	0.000184	0.153	0.00630	0.000628	0.00971	0.000760	37.4	0.00789
	ER-NSC-09-Aug-15	Elk River	Muscle	0.00200	0.759	0.000119	0.103	0.00724	0.000197	0.00662	0.000360	74.2	0.00621
	ER-NSC-10-Aug-15	Elk River	Muscle	0.00472	0.497	0.000391	0.154	0.00645	0.000332	0.0105	0.00116	54.1	0.0220
	ER-NSC-05-Apr-15	Elk River	Ovary	0.00488	0.0854	0.000714	0.0830	0.0126	<0.00028	0.0102	0.00129	111	0.00680
	ER-NSC-13-Apr-15	Elk River	Ovary	0.00250	0.239	0.000806	0.142	0.0310	0.000440	0.0378	0.00219	160	0.00610

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2015	ER-NSC-25-Apr-15	Elk River	Ovary	0.00182	0.355	0.000535	0.119	0.0273	0.000690	0.0364	0.00196	198	0.00480
	ER-NSC-43-Apr-15	Elk River	Ovary	0.00297	0.301	0.00203	0.192	0.0787	0.00131	0.0824	0.00562	216	0.0184
	GC-NSC-02-Apr-15	Gold Creek	Muscle	0.00126	1.47	0.00077	0.1565	0.0082	0.00039	0.00955	0.00076	23.2	0.0144
	GC-NSC-04-Apr-15	Gold Creek	Muscle	0.00070	1.79	<0.00037	0.0997	0.0097	0.00040	0.00456	<0.00019	23.9	0.0059
	GC-NSC-10-Apr-15	Gold Creek	Muscle	0.00190	1.06	<0.00039	0.1030	0.0085	0.00041	0.00586	0.00027	33.1	0.0113
	GC-NSC-13-Apr-15	Gold Creek	Muscle	0.00093	0.32	<0.00035	0.1400	0.0058	0.00023	0.00879	0.00044	49.5	0.0116
	GC-NSC-20-Apr-15	Gold Creek	Muscle	0.00061	1.48	<0.000044	0.0790	0.0126	0.00020	0.00277	<0.00020	38.7	0.0070
	GC-NSC-31-Apr-15	Gold Creek	Muscle	<0.00060	1.02	<0.000046	0.0790	0.0202	0.00025	0.00310	<0.00021	21.5	0.0040
	GC-NSC-33-Apr-15	Gold Creek	Muscle	<0.00058	0.14	0.000056	0.0850	0.0081	<0.00016	0.00207	<0.00020	17.3	0.0037
	GC-NSC-34-Apr-15	Gold Creek	Muscle	0.00122	0.22	0.000282	0.1060	0.0121	<0.00015	0.00307	0.00047	26.9	0.0263
	GC-NSC-37-Apr-15	Gold Creek	Muscle	<0.00059	0.97	0.000061	0.0940	0.0146	0.00020	0.00263	0.00033	28.5	0.0043
	GC-NSC-49-Apr-15	Gold Creek	Muscle	0.00075	0.27	0.000459	0.1050	0.0254	<0.00015	0.00485	0.00066	19.1	0.0056
	GC-NSC-01-Aug-15	Gold Creek	Muscle	0.00454	0.349	<0.000091	0.0900	0.00566	0.000178	0.00330	0.000270	37.8	0.0240
	GC-NSC-02-Aug-15	Gold Creek	Muscle	0.00258	0.211	0.000579	0.102	0.00391	0.000373	0.0152	0.000220	30.2	0.00647
	GC-NSC-03-Aug-15	Gold Creek	Muscle	0.00779	0.492	0.000211	0.117	0.00437	0.000198	0.00640	0.000350	55.5	0.00609
	GC-NSC-04-Aug-15	Gold Creek	Muscle	0.00584	1.72	<0.000091	0.138	0.00335	0.000471	0.0114	0.000570	43.4	0.0416
	GC-NSC-05-Aug-15	Gold Creek	Muscle	0.00326	3.07	0.000707	0.184	0.00350	0.000745	0.0112	0.00177	38.4	0.0604
	GC-NSC-06-Aug-15	Gold Creek	Muscle	0.00159	2.29	<0.000093	0.0988	0.00176	0.000404	0.00580	0.000970	23.8	0.0577
	GC-NSC-07-Aug-15	Gold Creek	Muscle	0.00238	0.845	<0.000088	0.100	0.00367	0.000255	0.00537	0.000470	46.2	0.0211
	GC-NSC-08-Aug-15	Gold Creek	Muscle	0.00144	1.27	0.0000880	0.0981	0.00403	0.000286	0.00549	0.000270	49.7	0.0127
	GC-NSC-09-Aug-15	Gold Creek	Muscle	0.00155	0.814	0.000932	0.153	0.00328	0.000629	0.00723	0.00256	73.5	0.0291
	GC-NSC-10-Aug-15	Gold Creek	Muscle	0.000670	0.174	0.000271	0.111	0.00324	0.000137	0.00365	0.000730	39.0	0.0126
	GC-NSC-13-Apr-15	Gold Creek	Ovary	0.00404	0.337	0.000758	0.128	0.0104	0.00097	0.0688	0.00273	196	0.00682
	GC-NSC-31-Apr-15	Gold Creek	Ovary	0.00397	0.444	0.000708	0.0943	0.0374	0.000429	0.0118	0.00177	272	0.00676
	GC-NSC-33-Apr-15	Gold Creek	Ovary	0.00273	0.379	0.00315	0.193	0.0253	0.000713	0.0225	0.00611	276	0.0108
	GC-NSC-34-Apr-15	Gold Creek	Ovary	0.00358	0.178	0.00215	0.245	0.0241	0.000588	0.0174	0.00392	340	0.0137
	GC-NSC-49-Apr-15	Gold Creek	Ovary	<0.00063	0.301	0.000299	0.0866	0.0557	0.000257	0.0180	0.00223	134	0.00436
2016	SC-NSC-03 O-Apr-16	Sand Creek	Ovary	0.00159	0.295	0.000231	0.0662	0.0257	0.00042	0.0122	0.00206	146	0.00227
	SC-NSC-09 O-Apr-16	Sand Creek	Ovary	0.001645	0.2875	0.001635	0.157	0.0219	0.004205	0.06225	0.009435	177.5	0.008555
	SC-NSC-21 O-Apr-16	Sand Creek	Ovary	0.00163	0.169	0.00108	0.067	0.0197	0.00033	0.0135	0.00189	128	0.0119
	SC-NSC-25 O-Apr-16	Sand Creek	Ovary	0.00062	0.408	0.000566	0.058	0.0106	0.00619	0.0102	0.00281	137	0.00501
	SC-NSC-29 O-Apr-16	Sand Creek	Ovary	0.00441	0.266	0.00217	0.196	0.0202	0.00086	0.0246	0.00608	116	0.0222
	SC-NSC-32 O-Apr-16	Sand Creek	Ovary	0.0009	0.325	0.000141	0.079	0.0154	0.00092	0.0162	0.00208	141	0.00687
	SC-NSC-33 O-Apr-16	Sand Creek	Ovary	0.00073	0.248	0.000327	0.061	0.00904	0.00166	0.0381	0.00218	158	0.00446
	SC-NSC-34 O-Apr-16	Sand Creek	Ovary	0.00215	0.597	0.0067	0.223	0.0199	0.00139	0.0342	0.0219	139	0.0392
	SC-NSC-35 O-Apr-16	Sand Creek	Ovary	<0.00059	0.332	0.000645	0.109	0.018	0.00042	0.0208	0.00151	126	0.0144
	SC-NSC-36 O-Apr-16	Sand Creek	Ovary	0.00199	0.342	0.00225	0.161	0.0195	0.00053	0.0253	0.00477	95.1	0.0201
	SC-NSC-03 M-Apr-16	Sand Creek	Muscle	0.00096	0.133	0.00016	0.1	0.0136	<0.00019	0.0038	0.00031	16.5	0.00526
	SC-NSC-09 M-Apr-16	Sand Creek	Muscle	<0.00065	2.77	<0.00013	0.106	0.0131	0.00114	0.00789	0.0005	22.3	0.00206
	SC-NSC-21 M-Apr-16	Sand Creek	Muscle	<0.00066	0.692	0.00013	0.115	0.0138	0.00023	0.00219	0.00029	17.5	0.00319
	SC-NSC-25 M-Apr-16	Sand Creek	Muscle	0.00061	1.56	0.00012	0.0775	0.01014	0.00069	0.002285	<0.00012	16.55	0.00264
	SC-NSC-29 M-Apr-16	Sand Creek	Muscle	0.00098	1.5	<0.00013	0.089	0.0185	0.00021	0.00333	0.00022	14.2	0.00508
	SC-NSC-32 M-Apr-16	Sand Creek	Muscle	<0.00067	0.245	0.0006	0.142	0.0114	0.0002	0.00246	0.00052	15.8	0.00635
	SC-NSC-33 M-Apr-16	Sand Creek	Muscle	0.00117	0.23	0.0244	0.191	0.00784	0.00039	0.0106	0.00334	13.8	0.0514
	SC-NSC-34 M-Apr-16	Sand Creek	Muscle	0.00074	1.083	0.001085	0.136	0.01001	0.00037	0.006845	0.00164	13.7	0.00902
	SC-NSC-35 M-Apr-16	Sand Creek	Muscle	0.00091	0.231	0.00061	0.141	0.013	<0.0002	0.00481	0.00091	14.1	0.0198
	SC-NSC-36 M-Apr-16	Sand Creek	Muscle	<0.00058	5.12	0.00037	0.109	0.0212	0.00114	0.011	0.00097	19.8	0.0108

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Year	Sample ID	Area	Tissue Type	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2016	ER-NSC-09 M-Apr-16	Elk River	Muscle	0.0738	0.192	0.00139	0.135	0.00928	0.00028	0.0105	0.0019	19.9	0.021
	ER-NSC-15 M-Apr-16	Elk River	Muscle	<0.0009	0.302	0.000551	0.096	0.00766	<0.00022	0.00344	0.00048	13.6	0.0065
	ER-NSC-16 M-Apr-16	Elk River	Muscle	0.00201	0.225	0.00216	0.157	0.00956	<0.00022	0.00692	0.00111	16.4	0.0101
	ER-NSC-17 M-Apr-16	Elk River	Muscle	<0.00089	0.91	0.000133	0.085	0.0225	<0.00022	0.00471	0.00039	19.3	0.0057
	ER-NSC-19 M-Apr-16	Elk River	Muscle	0.00148	2.95	0.000258	0.088	0.0159	0.00072	0.00687	0.0004	18.9	0.0029
	ER-NSC-21 M-Apr-16	Elk River	Muscle	0.0023	0.976	0.000916	0.213	0.0128	0.00071	0.0212	0.00269	17.2	0.01
	ER-NSC-27 M-Apr-16	Elk River	Muscle	0.00237	0.137	0.000074	0.083	0.0178	<0.00021	0.00236	0.00027	12.4	0.0061
	ER-NSC-28 M-Apr-16	Elk River	Muscle	0.000895	1.1975	0.000229	0.108	0.00764	0.000305	0.00399	0.000365	13.4	0.0035
	ER-NSC-29 M-Apr-16	Elk River	Muscle	0.00111	0.189	0.000162	0.077	0.0108	<0.00022	0.00447	0.00037	15.2	0.0035
	ER-NSC-38 M-Apr-16	Elk River	Muscle	0.00106	0.101	<0.000068	0.062	0.017	<0.0002	0.00293	0.00023	15.8	0.0038
	ER-NSC-09 O-Apr-16	Elk River	Ovary	0.00457	0.335	0.000897	0.154	0.0171	0.00164	0.068	0.00401	147	0.00837
	ER-NSC-15 O-Apr-16	Elk River	Ovary	<0.00062	0.259	0.000277	0.0646	0.0114	0.00147	0.0345	0.00165	142	0.00378
	ER-NSC-16 O-Apr-16	Elk River	Ovary	0.00082	0.333	0.000313	0.106	0.023	0.00033	0.0229	0.00216	162	0.00427
	ER-NSC-17 O-Apr-16	Elk River	Ovary	0.00137	0.307	0.000319	0.0822	0.0516	0.00121	0.0304	0.00307	191	0.00288
	ER-NSC-19 O-Apr-16	Elk River	Ovary	0.00634	0.426	0.00104	0.0886	0.0223	0.0011	0.0372	0.00295	144	0.00822
	ER-NSC-21 O-Apr-16	Elk River	Ovary	0.00406	0.316	0.000832	0.15	0.012	0.00155	0.0941	0.00314	120	0.00694
	ER-NSC-27 O -Apr-16	Elk River	Ovary	0.00129	0.5495	0.000283	0.0875	0.02165	0.000555	0.0158	0.001715	126.5	0.01125
	ER-NSC-28 O-Apr-16	Elk River	Ovary	0.00074	0.255	0.000267	0.0737	0.00778	0.00097	0.022	0.00137	134	0.002
	ER-NSC-29 O-Apr-16	Elk River	Ovary	<0.00063	0.222	0.000112	0.057	0.0129	0.00104	0.0292	0.00103	151	0.00184
	ER-NSC-38 O-Apr-16	Elk River	Ovary	0.00091	0.346	0.000184	0.0809	0.0271	0.00049	0.0191	0.00153	132	0.00451
	GC-NSC-01 M-Apr-16	Gold Creek	Muscle	0.00091	2.422	0.0001285	0.09805	0.0117	0.00098	0.006865	0.00044	19.45	0.00406
	GC-NSC-05 M-Apr-16	Gold Creek	Muscle	0.00146	0.164	0.000332	0.122	0.00784	<0.00063	0.00391	0.00051	15.6	0.0106
	GC-NSC-06 M-Apr-16	Gold Creek	Muscle	0.00173	0.24	0.000078	0.0766	0.00516	<0.00061	0.00381	0.00019	14.4	0.006
	GC-NSC-08 M-Apr-16	Gold Creek	Muscle	0.0008	1.14	0.000607	0.134	0.00635	<0.00061	0.0076	0.00287	14.4	0.00609
	GC-NSC-12 M-Apr-16	Gold Creek	Muscle	0.00075	0.604	0.000131	0.0624	0.0146	<0.00061	0.00701	0.00052	20.8	0.00415
	GC-NSC-13 M-Apr-16	Gold Creek	Muscle	0.00078	6.46	<0.000062	0.0639	0.0117	0.00148	0.0184	0.00026	22	0.00621
	GC-NSC-14 M-Apr-16	Gold Creek	Muscle	0.002	1.4	0.000314	0.122	0.0172	<0.00063	0.00681	0.00092	17.6	0.00544
	GC-NSC-16 M-Apr-16	Gold Creek	Muscle	0.00099	1.36	<0.000064	0.0763	0.0119	<0.00062	0.00276	<0.00019	16.1	0.00221
	GC-NSC-17 M-Apr-16	Gold Creek	Muscle	0.00126	0.395	0.000257	0.088	0.00776	<0.00063	0.00527	0.00039	16.3	0.0142
	GC-NSC-24 M-Apr-16	Gold Creek	Muscle	0.00224	0.871	0.000125	0.106	0.00943	<0.00058	0.0385	0.00024	13.9	0.00258
	GC-NSC-26 M -Apr-16	Gold Creek	Muscle	0.000705	0.2555	0.000707	0.0943	0.0151	0.000575	0.002875	0.0004	14.5	0.007855
	GC-NSC-01 O-Apr-16	Gold Creek	Ovary	0.0045	0.347	0.00158	0.216	0.0197	0.00067	0.0332	0.00519	189	0.0136
	GC-NSC-05 O-Apr-16	Gold Creek	Ovary	0.00114	0.227	0.000175	0.078	0.00945	0.00172	0.0505	0.00127	130	0.0145
	GC-NSC-06 O-Apr-16	Gold Creek	Ovary	0.00193	0.28	0.000432	0.128	0.013	<0.00035	0.0401	0.00119	169	0.00713
	GC-NSC-08 O-Apr-16	Gold Creek	Ovary	0.00069	0.264	0.00351	0.122	0.0108	0.00054	0.0372	0.00235	122	0.00416
	GC-NSC-12 O-Apr-16	Gold Creek	Ovary	0.00099	0.253	0.000559	0.096	0.021	0.00066	0.0396	0.00219	120	0.0045
	GC-NSC-13 O -Apr-16	Gold Creek	Ovary	0.001355	0.2185	0.0005395	0.0885	0.007745	0.002585	0.04795	0.002295	155	0.005475
	GC-NSC-14 O-Apr-16	Gold Creek	Ovary	0.00588	0.36	0.0048	0.202	0.0275	0.00163	0.0279	0.0053	130	0.0108
	GC-NSC-16 O-Apr-16	Gold Creek	Ovary	0.00333	0.271	0.000756	0.065	0.0197	0.00037	0.0137	0.00162	194	0.00489
	GC-NSC-17 O-Apr-16	Gold Creek	Ovary	0.00431	0.249	0.00178	0.234	0.0241	0.00084	0.0667	0.00473	273	0.0642
	GC-NSC-24 O-Apr-16	Gold Creek	Ovary	<0.00065	0.179	0.000146	0.054	0.00911	0.00039	0.0135	0.00119	111	0.00237
	GC-NSC-26 O-Apr-16	Gold Creek	Ovary	<0.00063	0.205	0.000301	0.063	0.0164	0.00082	0.0202	0.00088	166	0.00236

Table G.7: Metal Concentrations (µg/g Dry Weight) in Northern Pikeminnow Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2016	SC-NSC-01A avg	Sand Creek	Muscle	0.0072	1.67	0.00077	0.35	0.0052	0.0011	0.019	0.00042	28.85	0.027
	SC-NSC-02A	Sand Creek	Muscle	0.0023	1.72	0.00023	0.121	0.00587	0.000435	0.0063	0.00051	24.5	0.0108
	SC-NSC-03A	Sand Creek	Muscle	0.0019	0.472	0.00014	0.104	0.00777	0.000291	0.00492	0.0005	21.3	0.0106
	SC-NSC-04A	Sand Creek	Muscle	0.00077	1.52	<0.00011	0.091	0.00412	0.00054	0.00275	<0.00036	16.9	0.00483
	SC-NSC-05A	Sand Creek	Muscle	0.0018	0.276	0.00043	0.106	0.00796	0.000387	0.00701	0.00042	34.4	0.0128
	SC-NSC-06A	Sand Creek	Muscle	0.0027	0.495	0.00028	0.181	0.00557	0.000432	0.00781	0.00124	27.1	0.0122
	SC-NSC-07A	Sand Creek	Muscle	0.0013	0.252	0.00023	0.126	0.00818	0.000284	0.00443	0.00058	17.6	0.0229
	SC-NSC-08A	Sand Creek	Muscle	0.0021	0.204	0.00049	0.142	0.00722	0.000518	0.00637	0.00132	19.4	0.0104
	SC-NSC-09A	Sand Creek	Muscle	0.0029	1.16	0.00031	0.15	0.00741	0.000518	0.0054	0.00066	16.9	0.00572
	SC-NSC-10A	Sand Creek	Muscle	0.011	1.71	0.00048	0.183	0.00396	0.000617	0.00799	0.00089	26.3	0.00963
	GC-NSC-01A avg	Gold Creek	Muscle	0.022	0.8415	0.004915	0.496	0.003015	0.002075	0.0199	0.00134	25.7	0.0476
	GC-NSC-02A	Gold Creek	Muscle	0.00086	1.05	0.00016	0.091	0.00314	0.000407	0.00392	<0.00038	16.3	0.00249
	GC-NSC-03A	Gold Creek	Muscle	0.00105	0.315	<0.00011	0.072	0.00606	0.000169	0.00395	<0.00036	26.7	0.00232
	GC-NSC-04A	Gold Creek	Muscle	0.00091	1.54	0.00013	0.094	0.00353	0.000548	0.00511	<0.00037	18.9	0.00271
	GC-NSC-05A	Gold Creek	Muscle	0.00099	1.91	<0.00012	0.1	0.00295	0.000572	0.00459	<0.00038	21.8	0.00276
	GC-NSC-06A	Gold Creek	Muscle	0.00078	0.216	<0.00011	0.083	0.00353	0.000109	0.00244	<0.00034	23.6	0.00225
	GC-NSC-07A	Gold Creek	Muscle	0.00092	0.858	0.00041	0.119	0.00302	0.00024	0.00388	0.00078	21.6	0.0271
	GC-NSC-08A	Gold Creek	Muscle	0.00086	0.583	0.0002	0.098	0.00229	0.000297	0.0047	<0.00038	22.3	0.0132
	GC-NSC-09A	Gold Creek	Muscle	0.00133	1.34	0.00014	0.125	0.00228	0.000443	0.0055	<0.00038	20.6	0.00894
	GC-NSC-10A	Gold Creek	Muscle	0.00114	2.2	<0.00012	0.13	0.00476	0.000727	0.00713	0.00071	32	0.00815
	ER-NSC-01A avg	Elk River	Muscle	0.00239	0.1675	0.000415	0.1	0.01001	0.000359	0.004495	0.00134	14.1	0.007455
	ER-NSC-02A avg	Elk River	Muscle	0.001585	0.285	0.000151	0.0845	0.00694	0.000198	0.005055	0.00134	14.35	0.00995
	ER-NSC-03A	Elk River	Muscle	0.00163	0.177	0.00019	0.118	0.00594	0.000336	0.00774	0.0005	20.3	0.00687
	ER-NSC-04A avg	Elk River	Muscle	0.001355	0.443	0.000165	0.12	0.00914	0.0002285	0.00581	0.00134	15.5	0.00457
	ER-NSC-05A	Elk River	Muscle	0.00302	1.07	0.00018	0.088	0.00322	0.00069	0.0134	<0.00037	25.5	0.00555
	ER-NSC-06A	Elk River	Muscle	0.0032	0.969	0.00023	0.184	0.00515	0.000523	0.00736	0.0006	27.7	0.00442
	ER-NSC-07A	Elk River	Muscle	0.00331	3.14	0.00036	0.226	0.00305	0.00143	0.0204	0.00127	30.2	0.00654
	ER-NSC-08A	Elk River	Muscle	0.00398	0.381	0.00056	0.19	0.00599	0.000388	0.00776	0.00121	15.2	0.01
	ER-NSC-09A	Elk River	Muscle	0.00183	0.106	0.00054	0.107	0.00808	0.000187	0.00478	0.00042	13.9	0.00415
	ER-NSC-10A	Elk River	Muscle	0.00302	1.79	0.00056	0.166	0.00839	0.000789	0.00801	0.00108	18.1	0.00901

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2014	SC-PC-02M-Apr-14	Sand Creek	Muscle	79.2	<0.00065	16.3	0.13	0.128	1.84	<0.0026	0.00698	4,540	0.0068	0.0167	0.159	0.0611	0.803	22.1
	SC-PC-03M-Apr-14	Sand Creek	Muscle	79.1	<0.00062	15.3	0.195	0.061	2.11	<0.0025	0.0133	3,900	0.0036	0.0173	0.0939	0.0714	0.829	25.6
	SC-PC-04M-Apr-14	Sand Creek	Muscle	79.1	<0.00051	25.4	0.174	0.117	1.47	<0.0025	0.00771	3,290	0.00329	0.0161	0.118	0.0863	0.576	23.6
	SC-PC-06M-Apr-14	Sand Creek	Muscle	80.7	<0.00067	24.9	0.142	0.141	2.82	<0.0027	0.0244	4,720	0.0037	0.0218	0.124	0.0557	0.987	32.5
	SC-PC-07M-Apr-14	Sand Creek	Muscle	77.2	<0.00068	58.5	0.107	0.217	1.73	<0.0027	0.00273	1,560	0.0047	0.0318	0.213	0.0649	1.73	62.2
	SC-PC-10M-Apr-14	Sand Creek	Muscle	78.1	<0.00067	11.8	0.0514	0.127	1.48	<0.0027	0.00173	3,420	0.0028	0.0122	0.0834	0.046	1.06	19.2
	SC-PC-11M-Apr-14	Sand Creek	Muscle	79.5	<0.00067	17.7	0.0801	0.073	1.23	<0.0026	0.00229	4,250	0.0021	0.0145	0.0902	0.0565	0.57	26
	SC-PC-12M-Apr-14	Sand Creek	Muscle	79.0	<0.00063	10.5	0.0973	0.058	2.16	<0.0025	0.00846	6,080	0.0055	0.012	0.111	0.115	0.596	15.4
	SC-PC-14M-Apr-14	Sand Creek	Muscle	78.7	<0.00067	47.7	0.154	0.256	1.35	<0.0027	0.0145	2,820	0.0061	0.0357	0.248	0.055	1.02	49.8
	SC-PC-15M-Apr-14	Sand Creek	Muscle	78.4	<0.00070	15.8	0.136	0.09	1.62	<0.0028	0.018	3,850	0.0027	0.0142	0.151	0.0484	0.542	15.8
	SC-PC-01M-Aug-14	Sand Creek	Muscle	80.1	<0.00082	6.88	0.118	<0.13	2.15	<0.0041	0.00306	5,260	0.0111	0.0113	0.111	0.103	0.748	15.7
	SC-PC-02M-Aug-14	Sand Creek	Muscle	79.5	<0.00075	3.07	0.0505	<0.11	1.45	<0.0037	0.0105	3,890	0.00444	0.0101	0.101	0.0567	0.533	12.4
	SC-PC-02G-Apr	Sand Creek	Ovary	66.5	0.0141	36.8	0.139	<0.12	1.58	<0.0026	0.00203	434	0.0259	0.0841	0.12	0.0198	3.66	79
	SC-PC-02G-Apr	Sand Creek	Ovary	66.5	0.014	87.4	0.197	<0.13	2.3	<0.0027	0.00277	688	0.0254	0.116	0.228	0.0257	3.7	160
	SC-PC-02G-Apr-14	Sand Creek	Ovary	66.5	0.0141	62.1	0.168	<0.13	1.94	<0.0027	0.00240	561	0.0257	0.100	0.174	0.0228	3.68	120
	SC-PC-03G-Apr-14	Sand Creek	Ovary	65.6	0.0118	148	0.235	0.14	3.08	0.0035	0.00367	715	0.0186	0.118	0.237	0.0342	3.76	232
	SC-PC-04G-Apr-14	Sand Creek	Ovary	67.1	0.0125	12.7	0.116	<0.12	1.74	<0.0026	0.000619	415	0.0152	0.0845	0.136	0.0297	4.58	73.6
	SC-PC-06G-Apr-14	Sand Creek	Ovary	70.8	0.00818	112	0.209	0.14	3.05	0.0053	0.00701	783	0.0141	0.118	0.206	0.0293	2.26	158
	SC-PC-07G-Apr-14	Sand Creek	Ovary	79.5	0.0163	21	0.0901	<0.15	0.612	<0.0032	0.000698	724	0.0166	0.0784	0.139	0.0641	5.15	91.1
	SC-PC-10G-Apr-14	Sand Creek	Ovary	69.7	0.0138	2.24	0.0688	<0.12	0.57	<0.0026	0.000498	460	0.0109	0.0719	0.0778	0.0209	4.36	85.9
	SC-PC-11G-Apr-14	Sand Creek	Ovary	67.8	0.0083	21.3	0.177	<0.12	1.73	<0.0027	0.000652	564	0.0109	0.0613	0.122	0.0224	3.16	106
	SC-PC-12G-Apr-14	Sand Creek	Ovary	68.6	0.0162	4.81	0.153	<0.13	2.57	<0.0027	0.00149	425	0.0182	0.0802	0.0854	0.031	4.17	111
	SC-PC-14G-Apr-14	Sand Creek	Ovary	69.2	0.0121	54.7	0.156	<0.12	1.68	<0.0026	0.00334	675	0.0087	0.136	0.161	0.0226	2.93	128
	SC-PC-15G-Apr-14	Sand Creek	Ovary	65.3	0.018	19.5	0.134	<0.12	1.14	<0.0027	0.00367	349	0.0066	0.0887	0.103	0.0163	3.46	75
	SC-PC-01WB-Apr-14	Sand Creek	Whole Body	75.0	<0.00490	33.9	0.214	0.26	10.6	<0.0026	0.00201	53,550	0.0960	0.148	0.102	0.0615	2.31	71.1
	SC-PC-05WB-Apr-14	Sand Creek	Whole Body	77.1	<0.00210	59.6	0.286	0.24	6.1	<0.0025	0.00365	25,100	0.0739	0.0902	0.172	0.0794	2.02	91.7
	SC-PC-08WB-Apr-14	Sand Creek	Whole Body	76.1	<0.00379	459	0.232	0.31	11.2	<0.0143	0.00547	29,300	0.0908	0.194	0.526	0.0858	2.26	317
	SC-PC-13WB-Apr-14	Sand Creek	Whole Body	78.4	<0.00146	26	0.2	0.25	9.8	<0.0026	0.0032	52,000	0.0686	0.0671	0.1	0.0484	1.66	63
	SC-PC-16WB-Apr-14	Sand Creek	Whole Body	78.3	<0.00320	466	0.285	0.36	17.1	<0.0107	0.00636	68,500	0.077	0.25	0.518	0.0794	2.01	296
	ER-PC-01M-Apr-14	Elk River	Muscle	81.0	<0.00068	56.3	0.0958	0.15	1.96	0.0037	0.00629	4,860	0.0068	0.026	0.165	0.0335	0.71	61.7
	ER-PC-02M-Apr-14	Elk River	Muscle	79.7	<0.00075	104	0.117	0.195	3.21	<0.0030	0.00372	2,780	0.0209	0.0353	0.217	0.025	0.845	86.4
	ER-PC-04M-Apr-14	Elk River	Muscle	78.9	<0.00062	11.1	0.139	0.077	1.44	<0.0025	0.00756	4,490	0.0048	0.0673	0.106	0.121	0.746	39.7
	ER-PC-05M-Apr-14	Elk River	Muscle	79.4	<0.00072	38.2	0.0971	0.169	1.36	<0.0028	0.00448	3,940	0.0096	0.0197	0.127	0.0405	0.646	35.3
	ER-PC-06M-Apr-14	Elk River	Muscle	78.7	<0.00066	39.4	0.197	0.169	1.71	<0.0026	0.00409	1,450	0.0416	0.0318	0.193	0.0682	1.21	53
	ER-PC-07M-Apr-14	Elk River	Muscle	79.4	<0.00070	8.38	0.136	0.06	1.42	<0.0028	0.00136	5,430	0.0114	0.0121	0.101	0.056	0.712	16.6
	ER-PC-08M-Apr-14	Elk River	Muscle	79.4	<0.00064	9.9	0.0688	0.164	2.17	<0.0026	0.00782	4,060	0.0049	0.00932	0.0874	0.0751	0.594	12.5
	ER-PC-09M-Apr-14	Elk River	Muscle	79.3	<0.00078	18.3	0.142	0.131	0.943	<0.0031	0.00588	2,110	0.0074	0.015	0.158	0.0998	0.779	26.7
	ER-PC-10M-Apr-14	Elk River	Muscle	79.1	<0.00061	24.6	0.125	0.092	0.783	<0.0024	0.00648	720	0.0253	0.017	0.129	0.0541	1.01	41.9
	ER-PC-11M-Apr-14	Elk River	Muscle	79.7	<0.00062	6.24	0.131	0.116	2.62	<0.0024	0.00649	7,400	0.0076	0.0146	0.0868	0.06	0.531	13.7
	ER-PC-01M-Aug-14	Elk River	Muscle	80.6	<0.00080	4.33	0.142	<0.086	1.99	<0.0024	0.00755	1,130	0.0159	0.0173	0.0935	0.036	1.68	35
	ER-PC-02M-Aug-14	Elk River	Muscle	79.7	<0.00080	1.81	0.122	<0.085	1.72	<0.0024	0.00692	4,590	0.00684	0.00706	0.0715	0.0287	0.548	9.43
	ER-PC-03M-Aug-14	Elk River	Muscle	80.5	<0.00080	5.8	0.107	<0.085	1.58	<0.0024	0.00442	2,160	0.0107	0.00897	0.0759	0.0348	0.709	17.9

Table G.8: **Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016**

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2014	ER-PC-04M-Aug-14	Elk River	Muscle	79.9	<0.00079	2.9	0.177	<0.084	1.04	<0.0023	0.00534	986	0.0166	0.0128	0.0777	0.0531	0.968	19.5
	ER-PC-01G-Apr-14	Elk River	Ovary	69.4	0.0181	70.4	0.173	<0.11	1.99	<0.0024	0.00186	846	0.0251	0.0924	0.171	0.0154	3.12	149
	ER-PC-02G-Apr-14	Elk River	Ovary	68.3	0.0173	22.7	0.186	<0.12	4.94	<0.0027	0.00108	614	0.0576	0.0742	0.0999	0.00659	3.73	101
	ER-PC-04G-Apr-14	Elk River	Ovary	64.2	0.0139	10.7	0.269	<0.11	1.85	<0.0024	0.00105	345	0.0107	0.0592	0.0979	0.0305	3.57	68.9
	ER-PC-05G-Apr-14	Elk River	Ovary	65.5	0.0114	43.5	0.201	<0.12	1.42	<0.0025	0.00121	453	0.0242	0.0625	0.133	0.013	3.06	101
	ER-PC-06G-Apr-14	Elk River	Ovary	65.8	0.0144	7.22	0.195	<0.12	0.56	<0.0025	0.000453	366	0.0255	0.0599	0.0904	0.0219	3.91	65.5
	ER-PC-07G-Apr-14	Elk River	Ovary	67.5	0.0133	37.7	0.419	<0.12	2.58	<0.0026	0.000906	521	0.0717	0.0948	0.158	0.0173	3.86	166
	ER-PC-08G-Apr-14	Elk River	Ovary	66.4	0.00919	13.2	0.129	<0.12	1.95	<0.0026	0.00142	367	0.0216	0.0629	0.0996	0.0229	3.54	66.4
	ER-PC-09G-Apr-14	Elk River	Ovary	68.6	0.0133	7.49	0.163	<0.12	1.49	<0.0025	0.000983	482	0.0133	0.0577	0.0669	0.0369	4	72.2
	ER-PC-10G-Apr-14	Elk River	Ovary	68.4	0.00954	3.97	0.0586	<0.13	0.567	<0.0027	0.00139	486	0.0206	0.0463	0.0784	0.0172	3.49	110
	ER-PC-11G-Apr-14	Elk River	Ovary	67.9	0.0142	29	0.152	<0.12	1.45	<0.0025	0.00156	481	0.0324	0.0894	0.132	0.0198	4.04	118
	ER-PC-03WB-Apr-14	Elk River	Whole Body	77.0	<0.00715	308	0.359	0.77	20.3	<0.0126	0.00639	60,800	0.185	0.22	0.55	0.111	2.26	313
	ER-PC-15WB-Apr-14	Elk River	Whole Body	77.1	<0.00556	90.9	0.273	0.24	7.12	<0.0031	0.00413	31,300	0.124	0.0841	0.252	0.0532	2.46	104
	ER-PC-23WB-Apr-14	Elk River	Whole Body	77.7	<0.00285	20.6	0.118	0.235	11.9	<0.0024	0.00626	60,650	0.0999	0.0785	0.102	0.0418	1.78	74.4
	ER-PC-24WB-Apr-14	Elk River	Whole Body	75.5	<0.01490	713	0.458	1.49	14	<0.0284	0.00679	32,900	0.173	0.371	1.13	0.128	3.28	570
	ER-PC-26WB-Apr-14	Elk River	Whole Body	76.5	<0.00592	20.8	0.0941	0.22	13.8	<0.0022	0.000865	95,700	0.0755	0.0701	0.081	0.0237	1.66	47.7
	GC-PC-01M-Apr-14	Gold Creek	Muscle	78.5	<0.00063	10.3	0.0889	0.083	0.638	<0.0025	0.00222	1,310	0.0053	0.0113	0.186	0.0402	0.656	18.3
	GC-PC-02M-Apr-14	Gold Creek	Muscle	78.4	<0.00069	2.33	0.0562	0.073	1.02	<0.0027	0.00257	3,450	0.0023	0.00852	0.0898	0.0706	0.569	6.9
	GC-PC-05M-Apr-14	Gold Creek	Muscle	78.3	<0.00057	16.3	0.221	0.146	0.99	<0.0023	0.0077	874	0.0063	0.0169	0.0985	0.0527	0.829	18.6
	GC-PC-06M-Apr-14	Gold Creek	Muscle	80.5	<0.00064	14.7	0.0783	0.104	1.12	<0.0025	0.00622	2,740	0.009	0.0174	0.301	0.0222	0.846	23.9
	GC-PC-07M-Apr-14	Gold Creek	Muscle	78.7	<0.00062	6.51	0.0564	0.098	1.12	<0.0025	0.00118	4,310	0.0039	0.00992	0.0848	0.0409	0.49	9.73
	GC-PC-11M-Apr-14	Gold Creek	Muscle	78.6	<0.00064	6.76	0.12	0.407	0.62	<0.0025	0.00186	1,470	0.006	0.00874	0.087	0.092	0.702	12.6
	GC-PC-13M-Apr-14	Gold Creek	Muscle	79.1	<0.00061	3.9	0.118	0.073	1.22	<0.0024	0.00303	4,240	0.0083	0.0133	0.0648	0.0576	0.652	10.3
	GC-PC-15M-Apr-14	Gold Creek	Muscle	79.1	<0.00063	7.47	0.0709	0.231	1.6	<0.0025	0.00419	2,730	0.006	0.0124	0.235	0.0302	0.625	13.7
	GC-PC-18M-Apr-14	Gold Creek	Muscle	79.5	<0.00061	12	0.0622	0.078	1.63	<0.0024	0.00392	3,590	0.0022	0.00816	0.078	0.0336	0.573	17.2
	GC-PC-19M-Apr-14	Gold Creek	Muscle	80.5	<0.00062	22.3	0.0878	0.143	1.61	<0.0025	0.00384	1,260	0.0037	0.0139	0.12	0.0898	0.713	20.9
	GC-PC-01M-Aug-14	Gold Creek	Muscle	83.3	<0.00049	11.5	0.0821	<0.12	1.32	<0.0026	0.00266	3,050	0.00505	0.0093	0.101	0.0577	0.759	15.2
	GC-PC-01G-Apr-14	Gold Creek	Ovary	78.7	0.014	4.93	0.115	<0.12	2	<0.0027	0.000908	804	0.0478	0.0822	0.274	0.0251	4.87	128
	GC-PC-02G-Apr-14	Gold Creek	Ovary	66.6	0.0172	10.4	0.144	<0.13	1.02	<0.0027	0.000642	342	0.0128	0.0859	0.0884	0.0221	4.15	59.6
	GC-PC-05G-Apr-14	Gold Creek	Ovary	62.8	0.0178	1.22	0.28	<0.12	1.02	<0.0027	0.00152	268	0.0134	0.0782	0.0999	0.0149	3.4	95.8
	GC-PC-06G-Apr-14	Gold Creek	Ovary	72.8	0.0135	4.05	0.0437	<0.12	0.535	<0.0027	0.00144	652	0.0327	0.0777	0.0752	0.00888	4.2	134
	GC-PC-07G-Apr-14	Gold Creek	Ovary	77.7	0.0128	25.6	0.263	<0.12	3.46	<0.0026	0.000753	823	0.0311	0.13	0.105	0.0301	5.17	120
	GC-PC-11G-Apr-14	Gold Creek	Ovary	62.1	0.00953	6.27	0.341	0.18	1.78	<0.0027	0.000611	313	0.0191	0.0536	0.12	0.0254	3.24	56.7
	GC-PC-13G-Apr-14	Gold Creek	Ovary	62.6	0.0126	3.4	0.227	<0.12	0.729	<0.0025	0.000551	297	0.0147	0.0614	0.0871	0.0113	3	48.9
	GC-PC-15G-Apr-14	Gold Creek	Ovary	72.7	0.0134	2.31	0.141	<0.14	1.28	<0.0027	0.00147	691	0.0247	0.122	0.0865	0.0104	3.54	107
	GC-PC-18G-Apr-14	Gold Creek	Ovary	74.7	0.0102	20.3	0.109	<0.12	3.37	<0.0027	0.00172	767	0.0232	0.0897	0.11	0.0183	3.74	121
	GC-PC-19G-Apr-14	Gold Creek	Ovary	67.0	0.0155	4.79	0.231	<0.11	1.08	<0.0025	0.000704	298	0.0064	0.0476	0.0687	0.0257	3.13	65.2
	GC-PC-04WB-Apr-14	Gold Creek	Whole Body	74.5	<0.00556	27	0.295	0.24	7.05	<0.0024	0.00302	34,300	0.0702	0.117	0.106	0.0643	2.19	61.5
	GC-PC-08WB-Apr-14	Gold Creek	Whole Body	73.5	<0.00163	34.8	0.266	0.23	7.35	<0.0023	0.00118	32,800	0.122	0.114	0.121	0.0397	1.81	75.4
	GC-PC-12WB-Apr-14	Gold Creek	Whole Body	73.9	<0.00300	23.7	0.26	0.24	5.37	<0.0024	0.00218	27,700	0.0778	0.11	0.11	0.0571	1.97	63.4
	GC-PC-14WB-Apr-14	Gold Creek	Whole Body	75.5	<0.00324	30.1	0.243	0.25	10.5	<0.0025	0.00374	38,600	0.161	0.154	0.0972	0.0314	2.41	71.2
	GC-PC-16WB-Apr-14	Gold Creek	Whole Body	74.2	<0.00568	16.8	0.209	0.24	7.10	<0.0025	0.00180	37,800	0.0900	0.112	0.0986	0.0202	2.00	47.2

Table G.8: **Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016**

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
	SC-PCC-01-Apr-15	Sand Creek	Muscle	79.8	<0.00049	3.500	0.1320	0.106	2.030	<0.0025	0.00632	2,530	0.0031	0.01620	0.0716	0.0511	1.470	18.6
	SC-PCC-02-Apr-15	Sand Creek	Muscle	79.0	<0.00049	0.532	0.0808	<0.079	1.550	<0.0025	0.00209	3,910	0.0038	0.00856	0.0666	0.0528	0.804	11.0
	SC-PCC-04-Apr-15	Sand Creek	Muscle	80.4	<0.00047	3.920	0.1660	0.098	3.080	<0.0024	0.00497	806	0.0130	0.02260	0.0679	0.0878	1.700	35.0
	SC-PCC-05-Apr-15	Sand Creek	Muscle	79.2	<0.000475	2.250	0.1610	0.141	1.870	<0.00245	0.00499	3,325	0.0045	0.02105	0.0637	0.0686	1.220	17.9
	SC-PCC-06-Apr-15	Sand Creek	Muscle	80.4	<0.00046	1.110	0.2120	<0.075	2.140	<0.0024	0.00444	3,630	0.0113	0.01530	0.0638	0.0900	1.370	25.7
	SC-PCC-08-Apr-15	Sand Creek	Muscle	78.9	<0.00047	1.440	0.1280	0.155	1.550	<0.0024	0.01070	961	0.0112	0.02040	0.0647	0.0467	1.930	29.9
	SC-PCC-10-Apr-15	Sand Creek	Muscle	78.8	<0.00047	3.770	0.2240	0.150	1.700	<0.0024	0.00347	3,070	0.0064	0.01170	0.0663	0.0899	0.843	11.3
	SC-PCC-13-Apr-15	Sand Creek	Muscle	78.4	<0.00045	1.450	0.2120	0.466	1.270	<0.0023	0.00285	3,910	0.0028	0.00851	0.0570	0.0692	0.654	7.4
	SC-PCC-14-Apr-15	Sand Creek	Muscle	79.7	<0.00049	3.130	0.1390	0.593	5.400	<0.0025	0.01720	6,750	0.0033	0.01650	0.0597	0.0353	0.585	10.9
	SC-PCC-15-Apr-15	Sand Creek	Muscle	78.2	<0.00048	4.550	0.1550	0.459	0.866	<0.0025	0.00731	1,020	0.0063	0.01140	0.0695	0.0637	0.955	13.8
	SC-PCC-01-Apr-15	Sand Creek	Ovary	64.0	0.0178	21.1	0.136	<0.14	2.72	<0.0025	0.00122	338	0.00670	0.0742	0.0809	0.0159	3.55	53.4
	SC-PCC-02-Apr-15	Sand Creek	Ovary	77.0	0.0150	1.04	0.251	<0.14	2.64	<0.0026	0.000790	740	0.0224	0.0657	0.0669	0.0224	3.76	128
	SC-PCC-04-Apr-15	Sand Creek	Ovary	76.1	0.0126	2.22	0.144	<0.14	2.95	<0.0026	0.00167	841	0.0316	0.0819	0.0696	0.0460	3.30	131
	SC-PCC-05-Apr-15	Sand Creek	Ovary	65.7	0.0182	6.80	0.127	<0.14	1.45	<0.0025	0.000925	303	0.0112	0.0928	0.0656	0.0174	3.44	58.2
	SC-PCC-06-Apr-15	Sand Creek	Ovary	70.9	0.0275	2.82	0.225	<0.14	1.97	<0.0026	0.00122	547	0.0482	0.0722	0.0728	0.0338	4.24	105
	SC-PCC-08-Apr-15	Sand Creek	Ovary	67.1	0.0155	2.91	0.103	<0.12	1.52	<0.0026	0.00207	409	0.0190	0.0687	0.0924	0.0161	3.19	82.7
	SC-PCC-10-Apr-15	Sand Creek	Ovary	69.4	0.0235	3.60	0.162	0.23	2.15	<0.0026	0.000980	490	0.0521	0.0796	0.0683	0.0318	4.53	84.9
	SC-PCC-13-Apr-15	Sand Creek	Ovary	67.4	0.0167	3.92	0.179	0.39	2.66	<0.0025	0.00129	493	0.0124	0.0629	0.0628	0.0232	3.81	62.4
	SC-PCC-14-Apr-15	Sand Creek	Ovary	69.5	0.0235	11.8	0.0937	0.20	1.20	<0.0025	0.00345	523	0.0210	0.110	0.0737	0.0106	3.53	132
	SC-PCC-15-Apr-15	Sand Creek	Ovary	69.8	0.0103	3.36	0.0853	0.34	1.97	<0.0025	0.00123	551	0.0239	0.0604	0.0785	0.0211	3.98	85.3
	SC-PCC-03-Apr-15	Sand Creek	Whole Body	75.3	0.00151	29.1	0.206	<0.23	8.5	<0.0025	0.00256	27,800	0.0854	0.0565	0.0946	0.083	1.82	67.7
2015	SC-PCC-07-Apr-15	Sand Creek	Whole Body	76.6	0.00364	48.2	0.276	0.32	8.79	<0.0025	0.00345	31,300	0.123	0.115	0.126	0.0743	1.88	88.7
	SC-PCC-09-Apr-15	Sand Creek	Whole Body	76.2	0.00314	9.13	0.191	0.67	7.15	<0.0026	0.0028	33,400	0.0935	0.0651	0.116	0.044	1.71	48.3
	SC-PCC-11-Apr-15	Sand Creek	Whole Body	74.9	0.00314	233	0.276	0.47	11.3	0.0062	0.00266	35,300	0.0799	0.101	0.307	0.0614	1.84	176
	SC-PCC-12-Apr-15	Sand Creek	Whole Body	77.6	0.00222	191	0.15	0.94	14.4	0.00455	0.00385	52,550	0.179	0.135	0.322	0.0454	1.65	172
	ER-PCC-01-Apr-15	Elk River	Muscle	77.2	0.00147	10.800	0.1760	<0.11	1.940	<0.0027	0.00996	3,740	0.0113	0.03180	0.0776	0.0285	1.630	26.2
	ER-PCC-02-Apr-15	Elk River	Muscle	79.5	0.00071	3.190	0.1080	<0.10	2.660	<0.0025	0.01150	4,170	0.0082	0.02200	0.1010	0.0357	1.290	31.1
	ER-PCC-04-Apr-15	Elk River	Muscle	79.7	0.00040	3.380	0.1360	<0.11	1.410	<0.0026	0.00613	2,740	0.0037	0.01250	0.0561	0.0639	0.696	13.7
	ER-PCC-05-Apr-15	Elk River	Muscle	79.2	0.00202	18.900	0.1310	<0.10	3.040	<0.0025	0.01150	4,680	0.0137	0.03150	0.0934	0.0317	1.280	35.3
	ER-PCC-06-Apr-15	Elk River	Muscle	79.4	0.00073	4.930	0.1880	0.101	1.920	<0.0024	0.01540	3,930	0.0030	0.01740	0.0641	0.0691	0.753	17.3
	ER-PCC-07-Apr-15	Elk River	Muscle	78.7	0.00115	10.100	0.0635	0.120	1.050	<0.0027	0.00138	8,900	0.0071	0.01730	0.0689	0.0921	0.806	16.7
	ER-PCC-08-Apr-15	Elk River	Muscle	78.7	0.00036	5.110	0.1900	<0.10	2.260	<0.0026	0.01100	5,810	0.0053	0.01230	0.2020	0.0672	0.651	10.7
	ER-PCC-10-Apr-15	Elk River	Muscle	81.1	0.00087	4.675	0.1465	0.130	2.360	<0.0026	0.00731	4,775	0.0080	0.01785	0.0631	0.0323	0.895	17.7
	ER-PCC-11-Apr-15	Elk River	Muscle	80.9	0.00119	5.280	0.1050	0.370	3.040	<0.0024	0.00932	5,700	0.0126	0.03310	0.0606	0.0292	0.772	23.0
	ER-PCC-12-Apr-15	Elk River	Muscle	79.9	0.00042	1.950	0.0437	0.360	5.520	<0.0027	0.00334	7,460	0.0083	0.01330	0.0573	0.0316	0.720	13.7
	ER-PCC-01-Apr-15	Elk River	Ovary	66.3	0.0297	16.0	0.124	0.19	0.952	<0.0025	0.00209	407	0.0182	0.0914	0.106	0.00953	3.53	81.4
	ER-PCC-02-Apr-15	Elk River	Ovary	74.4	0.00877	4.79	0.0659	0.23	1.78	<0.0024	0.00388	668	0.0393	0.0861	0.0829	0.0174	2.41	229
	ER-PCC-04-Apr-15	Elk River	Ovary	67.7	0.0174	3.58	0.130	0.18	1.61	<0.0023	0.00117	389	0.0110	0.0610	0.0726	0.0202	3.39	96.1
	ER-PCC-05-Apr-15	Elk River	Ovary	65.8	0.0243	46.4	0.0834	0.21	1.39	<0.0023	0.00233	448	0.0179	0.111	0.118	0.0128	3.12	106
	ER-PCC-06-Apr-15	Elk River	Ovary	66.7	0.0165	261	0.186	0.48	4.54	0.0065	0.00393	1,010	0.0189	0.123	0.414	0.0519	3.39	253
	ER-PCC-07-Apr-15	Elk River	Ovary	65.4	0.0194	30.9	0.233	<0.12	1.68	<0.0023	0.000540	365	0.0215	0.0836	0.124	0.0360	3.55	69.7
	ER-PCC-08-Apr-15	Elk River	Ovary	70.7	0.0171	54.9	0.230	0.14	4.18	<0.0023	0.00266	636	0.0296	0.127	0.137	0.0283	3.99	107
	ER-PCC-10-Apr-15	Elk River	Ovary	75.5	0.0222	22.8	0.183	0.22	4.32	<0.0021	0.00309	850	0.0672	0.112	0.119	0.0184	4.92	169

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2015	ER-PCC-11-Apr-15	Elk River	Ovary	71.6	0.0240	7.85	0.106	0.20	1.91	<0.0024	0.00315	451	0.0518	0.139	0.0910	0.0115	4.02	195
	ER-PCC-12-Apr-15	Elk River	Ovary	67.6	0.0106	3.83	0.0717	0.17	4.55	<0.0021	0.000720	410	0.0201	0.0500	0.0724	0.0102	1.48	98.1
	ER-PCC-24-Apr-15	Elk River	Whole Body	72.9	0.00608	141	0.212	<0.18	12.2	<0.0029	0.00318	39,100	0.115	0.107	0.22	0.0351	2.15	122
	ER-PCC-25-Apr-15	Elk River	Whole Body	76.0	0.00564	4.24	0.299	<0.15	16.7	<0.0025	0.00731	41,400	0.167	0.135	0.144	0.0181	2.21	66.3
	ER-PCC-26-Apr-15	Elk River	Whole Body	75.2	0.00241	10.3	0.169	<0.16	11.9	<0.0027	0.00566	51,600	0.106	0.133	0.195	0.0284	1.71	72.3
	ER-PCC-27-Apr-15	Elk River	Whole Body	78.1	0.00234	5.62	0.331	0.17	7.77	<0.0027	0.00141	27,650	0.161	0.0649	0.184	0.0509	2.04	73.5
	ER-PCC-28-Apr-15	Elk River	Whole Body	75.2	0.00391	200	0.248	0.5	13.5	0.0064	0.00447	51,500	0.135	0.188	0.317	0.0446	1.83	177
	GC-PCC-01-Apr-15	Gold Creek	Muscle	78.9	0.00081	3.430	0.1540	<0.10	2.510	<0.0026	0.01770	3,600	0.0073	0.02860	0.0560	0.0337	1.290	20.7
	GC-PCC-02-Apr-15	Gold Creek	Muscle	79.9	0.00167	13.300	0.1750	<0.11	2.330	<0.0026	0.00673	3,940	0.0143	0.02150	0.0754	0.0477	1.440	36.4
	GC-PCC-03-Apr-15	Gold Creek	Muscle	79.7	0.00098	2.160	0.1260	<0.10	3.020	<0.0025	0.00584	8,810	0.0124	0.01320	0.0614	0.0410	0.767	15.0
	GC-PCC-04-Apr-15	Gold Creek	Muscle	80.2	0.00171	36.200	0.1350	0.160	2.730	<0.0027	0.01010	3,880	0.0102	0.03470	0.0915	0.0321	1.020	41.6
	GC-PCC-05-Apr-15	Gold Creek	Muscle	78.6	0.00048	3.130	0.0810	<0.0965	1.630	<0.00245	0.00363	3,385	0.0042	0.01155	0.0595	0.0683	0.963	16.0
	GC-PCC-06-Apr-15	Gold Creek	Muscle	79.7	0.00057	0.628	0.0592	1.220	2.070	<0.0027	0.00399	6,250	0.0058	0.00971	0.0531	0.0490	0.633	9.7
	GC-PCC-07-Apr-15	Gold Creek	Muscle	78.3	0.00119	1.080	0.1720	<0.10	1.830	<0.0026	0.00788	2,110	0.0095	0.02500	0.0626	0.0438	2.060	23.0
	GC-PCC-08-Apr-15	Gold Creek	Muscle	78.1	0.00127	0.800	0.0555	<0.099	1.290	<0.0025	0.00029	3,600	0.0028	0.00661	0.0599	0.0439	0.843	6.6
	GC-PCC-09-Apr-15	Gold Creek	Muscle	79.5	0.00067	2.880	0.1470	<0.11	1.920	<0.0026	0.00318	7,660	0.0091	0.01450	0.0606	0.0938	1.010	19.1
	GC-PCC-10-Apr-15	Gold Creek	Muscle	79.4	0.00129	4.180	0.1450	<0.11	2.270	<0.0027	0.01290	4,500	0.0057	0.01320	0.0697	0.0274	0.698	17.8
	GC-PCC-01-Apr-15	Gold Creek	Ovary	68.1	0.0220	11.5	0.115	0.14	1.76	<0.0026	0.00349	458	0.0178	0.107	0.0747	0.0128	3.66	107
	GC-PCC-02-Apr-15	Gold Creek	Ovary	71.0	0.0165	12.3	0.183	<0.12	1.86	<0.0027	0.00215	672	0.0410	0.0991	0.0971	0.0182	4.08	116
	GC-PCC-03-Apr-15	Gold Creek	Ovary	73.5	0.0229	19.7	0.298	<0.11	4.54	<0.0025	0.00316	840	0.0757	0.105	0.0814	0.0202	3.59	162
	GC-PCC-04-Apr-15	Gold Creek	Ovary	72.3	0.0272	906	0.618	0.44	18.4	0.0206	0.0130	2,230	0.0597	0.446	0.918	0.106	4.29	895
	GC-PCC-05-Apr-15	Gold Creek	Ovary	62.7	0.0139	3.35	0.0553	<0.11	1.26	<0.0024	0.000690	221	0.00730	0.0400	0.0785	0.0160	4.71	49.4
	GC-PCC-06-Apr-15	Gold Creek	Ovary	69.8	0.0192	3.45	0.0831	0.53	1.47	<0.0024	0.00115	388	0.0228	0.0593	0.0840	0.0151	3.87	92.2
	GC-PCC-07-Apr-15	Gold Creek	Ovary	65.6	0.0207	2.20	0.226	<0.12	3.81	<0.0027	0.00149	332	0.0171	0.0778	0.0794	0.0125	3.21	53.0
	GC-PCC-08-Apr-15	Gold Creek	Ovary	66.5	0.0246	0.900	0.272	0.13	1.59	<0.0027	<0.00016	404	0.00915	0.0649	0.0727	0.0156	4.56	50.8
	GC-PCC-09-Apr-15	Gold Creek	Ovary	66.7	0.0203	3.35	0.275	<0.12	3.40	<0.0027	0.00182	372	0.0265	0.0767	0.0768	0.0274	3.99	66.6
	GC-PCC-10-Apr-15	Gold Creek	Ovary	71.7	0.0156	72.0	0.142	<0.12	2.88	<0.0026	0.00341	726	0.0306	0.131	0.139	0.0186	3.61	165
	GC-PCC-12-Apr-15	Gold Creek	Whole Body	76.1	0.00237	7.1	0.217	<0.18	5.32	<0.0029	0.00077	23,300	0.0559	0.0654	0.194	0.0364	2.46	58.3
	GC-PCC-16-Apr-15	Gold Creek	Whole Body	75.1	0.0301	16.5	0.224	<0.17	10.7	<0.0028	0.00318	39,800	0.221	0.101	0.0837	0.0539	2.36	67.4
	GC-PCC-17-Apr-15	Gold Creek	Whole Body	73.4	0.00597	54.8	0.202	0.27	8.33	0.0037	0.00461	31,400	0.0823	0.157	0.154	0.0257	2.47	123
	GC-PCC-18-Apr-15	Gold Creek	Whole Body	76.8	0.00284	12.1	0.188	<0.16	13.6	<0.0026	0.00407	45,200	0.162	0.0996	0.0907	0.0322	1.94	66.7
	GC-PCC-21-Apr-15	Gold Creek	Whole Body	73.9	0.00181	13.9	0.227	<0.16	8.4	<0.0027	0.00157	36,100	0.102	0.0753	0.0921	0.047	2.36	68
2016	SC-PCC-06 M-Apr-16	Sand Creek	Muscle	78.5	0.000505	2.65	0.186	0.1075	1.1525	0.00545	0.01075	2,420	0.00385	0.02125	0.5375	0.07245	1.555	26.25
	SC-PCC-11 M-Apr-16	Sand Creek	Muscle	78.2	<0.00047	4.74	0.116	0.099	1.48	<0.0051	0.00414	2,500	0.0083	0.019	0.0593	0.0667	2	25.9
	SC-PCC-12 M-Apr-16	Sand Creek	Muscle	80.7	<0.00046	1.27	0.184	0.158	1.42	<0.0049	0.00775	2,180	0.0031	0.0152	0.0526	0.0522	1.46	20.7
	SC-PCC-16 M-Apr-16	Sand Creek	Muscle	79.6	<0.00051	2.12	0.133	0.159	1.83	<0.0055	0.0144	2,300	0.0085	0.021	0.0549	0.0529	1.97	33.6
	SC-PCC-17 M-Apr-16	Sand Creek	Muscle	79.7	<0.00049	2.88	0.0878	<0.083	1.86	<0.0052	0.00916	4,450	0.0026	0.0113	0.0547	0.065	0.761	13.7
	SC-PCC-18 M-Apr-16	Sand Creek	Muscle	81.2	<0.0005	0.522	0.16	<0.085	2.14	<0.0054	0.017	4,380	0.011	0.0205	0.0465	0.0647	1.78	25
	SC-PCC-19 M-Apr-16	Sand Creek	Muscle	80.7	<0.00049	1.68	0.236	<0.083	3.38	<0.0053	0.0137	6,940	0.0052	0.0162	0.0434	0.0826	0.673	14.1
	SC-PCC-20 M-Apr-16	Sand Creek	Muscle	80.7	<0.00049	0.534	0.202	<0.083	2.29	<0.0053	0.0102	8,830	0.0042	0.0147	0.0512	0.0611	0.92	16
	SC-PCC-21 M-Apr-16	Sand Creek	Muscle	78.9	<0.0005	3.83	0.18	<0.084	1.06	<0.0053	0.00364	1,700	0.0071	0.0151	0.0617	0.0721	1.29	18.3
	SC-PCC-22 M-Apr-16	Sand Creek	Muscle	79.9	<0.00051	1.77	0.167	0.105	2.09	<0.0055	0.0104	2,500	0.0067	0.0241	0.0505	0.0379	2.11	31.9

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2016	SC-PCC-06 O-Apr-16	Sand Creek	Ovary	62.7	0.00888	6.16	0.117	<0.087	0.719	<0.003	0.00321	243	0.0047	0.049	0.102	0.0167	2.55	58.9
	SC-PCC-11 O-Apr-16	Sand Creek	Ovary	70.6	0.0178	4.5	0.103	<0.091	1.06	<0.0031	0.00192	564	0.0432	0.0862	0.086	0.0303	4.82	142
	SC-PCC-12 O-Apr-16	Sand Creek	Ovary	66.2	0.0169	3.21	0.1275	0.1505	1.64	0.003	0.00188	393	0.01045	0.0691	0.0768	0.0151	3.75	72.9
	SC-PCC-16 O-Apr-16	Sand Creek	Ovary	65.6	0.0145	1.52	0.0961	0.231	1.14	<0.0028	0.00259	341	0.0107	0.0498	0.0805	0.0173	2.4	45.3
	SC-PCC-17 O-Apr-16	Sand Creek	Ovary	64.5	0.0102	3.42	0.107	0.105	0.694	<0.0027	0.00194	231	0.013	0.0672	0.0902	0.0155	2.16	70.8
	SC-PCC-18 O-Apr-16	Sand Creek	Ovary	64.4	0.0215	1.33	0.12	0.151	0.891	<0.0032	0.00287	315	0.0119	0.0708	0.0766	0.0178	4.32	66.2
	SC-PCC-19 O-Apr-16	Sand Creek	Ovary	66.6	0.0322	4.07	0.16	0.135	1.45	<0.0031	0.00321	311	0.0327	0.0915	0.0812	0.0237	5.04	53.4
	SC-PCC-20 O-Apr-16	Sand Creek	Ovary	62.9	0.0199	0.904	0.0963	0.112	1.02	<0.003	0.00138	242	0.0062	0.0469	0.0774	0.0136	2.07	64.8
	SC-PCC-21 O-Apr-16	Sand Creek	Ovary	65.4	0.0297	1.81	0.115	0.149	1.05	<0.003	0.000465	282	0.0102	0.0458	0.0749	0.0201	4.24	52.3
	SC-PCC-22 O-Apr-16	Sand Creek	Ovary	64.6	0.0351	1.5	0.143	0.207	1.95	<0.0032	0.00231	277	0.0137	0.0755	0.0882	0.0101	3.03	70.6
	SC-PCC-07 WB-Apr-16	Sand Creek	Whole Body	77.9	0.00254	8.42	0.215	<0.092	16.1	<0.0031	0.00105	32,300	0.0828	0.0682	0.0792	0.0726	1.77	62
	SC-PCC-09 WB-Apr-16	Sand Creek	Whole Body	76.8	0.00349	19.9	0.15	<0.079	8.51	<0.0027	0.00568	28,100	0.146	0.105	0.0937	0.0293	2.04	66.8
	SC-PCC-14 WB-Apr-16	Sand Creek	Whole Body	75.2	0.00297	9.42	0.192	0.085	6.09	<0.0027	0.0015	30,600	0.047	0.0639	0.102	0.0672	1.89	60.7
	SC-PCC-23 WB-Apr-16	Sand Creek	Whole Body	76.9	0.00426	27.5	0.246	<0.089	7.87	<0.003	0.00595	31,500	0.0699	0.155	0.12	0.0416	2.12	81.6
	SC-PCC-24 WB-Apr-16	Sand Creek	Whole Body	75.0	0.00187	43.2	0.164	0.132	23.7	<0.0032	0.00219	103,000	0.0305	0.0678	0.102	0.0303	1.29	63.3
	GC-PCC-13 WB-Apr-16	Gold Creek	Whole Body	75.2	0.00343	11.1	0.191	0.295	14.2	<0.0029	0.00146	39,400	0.108	0.0881	0.113	0.0339	1.9	53.1
	GC-PCC-16 WB-Apr-16	Gold Creek	Whole Body	77.5	0.00345	10.3	0.232	0.136	10.6	<0.0027	0.00395	38,600	0.0919	0.0819	0.0939	0.048	2.08	57.6
	GC-PCC-27 WB-Apr-16	Gold Creek	Whole Body	73.9	0.004905	14.05	0.3435	0.2305	8.465	0.00285	0.002555	31,800	0.0733	0.0923	0.142	0.03655	1.94	57.95
	GC-PCC-31 WB-Apr-16	Gold Creek	Whole Body	76.6	0.00436	15.2	0.335	0.231	7.08	<0.0031	0.0027	31,800	0.0491	0.0737	0.0976	0.0366	1.88	47.8
	GC-PCC-36 WB-Apr-16	Gold Creek	Whole Body	73.4	0.00339	4.84	0.336	0.432	9.01	<0.0031	0.00116	41,000	0.049	0.0536	0.0668	0.0285	1.77	38.7
	ER-PCC-01 M-Apr-16	Elk River	Muscle	79.1	0.000495	0.885	0.1325	0.085	1.96	0.00535	0.005675	2,885	0.00515	0.01755	0.0593	0.02915	1.705	26.7
	ER-PCC-02 M-Apr-16	Elk River	Muscle	78.0	<0.00051	8.64	0.0595	0.208	1.47	<0.0055	0.00408	3,270	0.0045	0.00941	0.0651	0.0549	0.758	15.2
	ER-PCC-03 M-Apr-16	Elk River	Muscle	78.7	0.0009	30.7	0.132	0.368	1.49	<0.0052	0.00777	2,130	0.0062	0.0259	0.124	0.0353	1.7	28.1
	ER-PCC-05 M-Apr-16	Elk River	Muscle	77.6	0.00167	11.9	0.128	0.16	2.29	<0.0054	0.00204	4,070	0.0047	0.0177	0.129	0.089	1.8	21.4
	ER-PCC-06 M-Apr-16	Elk River	Muscle	77.2	<0.00049	5.49	0.0414	0.098	1.4	<0.0053	0.00166	4,280	0.0026	0.00786	0.0564	0.0722	0.729	9.85
	ER-PCC-07 M-Apr-16	Elk River	Muscle	78.3	0.00051	6.23	0.0894	0.099	2.76	<0.0052	0.006	4,550	0.0045	0.0227	0.0622	0.0508	1.69	22.1
	ER-PCC-08 M-Apr-16	Elk River	Muscle	78.7	<0.00048	2.27	0.084	0.082	1.74	<0.0051	0.00838	4,730	0.0039	0.0122	0.0599	0.0393	0.68	7.32
	ER-PCC-10 M-Apr-16	Elk River	Muscle	79.3	<0.00051	3.07	0.191	0.104	3.3	<0.0055	0.0052	6,170	0.003	0.0151	0.0842	0.0229	0.698	12.7
	ER-PCC-14 M-Apr-16	Elk River	Muscle	77.9	<0.00047	1.07	0.0752	0.095	1.53	<0.0051	0.00244	3,790	<0.0023	0.0102	0.0501	0.0763	1.36	9.43
	ER-PCC-15 M-Apr-16	Elk River	Muscle	78.6	<0.00051	11.1	0.239	0.263	1.2	<0.0055	0.00497	3,280	0.005	0.0166	0.075	0.0693	2.89	16.5
	ER-PCC-01 O-Apr-16	Elk River	Ovary	63.9	0.0297	0.72	0.0789	0.181	1.35	<0.0024	0.00071	222	0.0066	0.0517	0.0741	0.00672	1.93	46.5
	ER-PCC-02 O-Apr-16	Elk River	Ovary	62.5	0.0209	3.91	0.0669	0.138	0.907	<0.0026	0.0009	213	0.0047	0.0493	0.0775	0.0123	2.93	35.4
	ER-PCC-03 O-Apr-16	Elk River	Ovary	71.7	0.0365	403	0.222	0.86	6.63	0.0077	0.00482	1,630	0.0299	0.19	0.587	0.0583	2.8	362
	ER-PCC-05 O-Apr-16	Elk River	Ovary	61.6	0.032	19.2	0.188	0.203	1.55	<0.0026	0.00054	195	0.0047	0.0682	0.101	0.0203	4.32	51.4
	ER-PCC-06 O -Apr-16	Elk River	Ovary	62.5	0.03035	4.45	0.193	0.141	0.834	0.00315	0.0004285	180	0.00675	0.0497	0.08915	0.01745	3.68	41.85
	ER-PCC-07 O-Apr-16	Elk River	Ovary	64.3	0.0297	26.3	0.0825	0.187	2.19	<0.0031	0.00133	326	0.0103	0.0718	0.122	0.0136	4.1	83.8
	ER-PCC-08 O-Apr-16	Elk River	Ovary	64.2	0.0426	7.66	0.123	0.305	1.65	<0.0031	0.00153	287	0.0158	0.0896	0.0957	0.0101	3.78	58.3
	ER-PCC-10 O-Apr-16	Elk River	Ovary	70.1	0.0344	20.9	0.169	0.238	2.25	<0.0031	0.00141	502	0.0139	0.132	0.112	0.00993	3.07	146
	ER-PCC-14 O-Apr-16	Elk River	Ovary	61.4	0.0286	1.51	0.268	0.12	1.03	<0.0031	0.000471	195	0.0063	0.0511	0.0915	0.0183	3.51	39.7
	ER-PCC-15 O-Apr-16	Elk River	Ovary	62.0	0.0292	38.8	0.182	0.156	1.28	<0.0031	0.00136	294	0.007	0.0887	0.139	0.0204	4.47	73.6
	ER-PCC-12 WB-Apr-16	Elk River	Whole Body	73.7	0.00633	20.2	0.205	0.462	10	<0.0028	0.00147	39,100	0.0659	0.0558	0.11	0.0268	2.2	43.6
	ER-PCC-13 WB-Apr-16	Elk River	Whole Body	76.4	0.005565	22.65	0.174	0.4205	11.55	0.00315	0.00131	57,750	0.04675	0.0636	0.2185	0.0639	2.215	58.3
	ER-PCC-21 WB-Apr-16	Elk River	Whole Body	74.7	0.00895	370	0.456	0.632	13.8	0.0174	0.0144	21,900	0.12	0.295	0.629	0.086	2.64	344

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2016	ER-PCC-26 WB-Apr-16	Elk River	Whole Body	74.8	0.00253	6.18	0.244	0.162	4.22	<0.003	0.00147	20,000	0.0788	0.096	0.164	0.0674	1.92	57.2
	ER-PCC-27 WB-Apr-16	Elk River	Whole Body	75.8	0.00573	16.5	0.293	0.215	9	<0.0029	0.00242	23,600	0.273	0.138	0.119	0.0422	2.27	105
	GC-PCC-25 M-Apr-16	Gold Creek	Muscle	81.9	<0.0005	4.86	0.0488	<0.086	0.909	<0.0054	0.000641	3,050	0.0068	0.00792	0.0603	0.0868	0.943	13.3
	GC-PCC-26 M-Apr-16	Gold Creek	Muscle	79.0	<0.00051	1.7	0.143	0.128	2	<0.0055	0.0086	4,100	0.0028	0.0128	0.0918	0.0331	0.83	9.91
	GC-PCC-34 M-Apr-16	Gold Creek	Muscle	80.4	<0.00049	2.65	0.0663	0.123	2.19	<0.0053	0.0084	4,280	0.0052	0.0118	0.172	0.0365	1.09	13.4
	GC-PCC-44 M-Apr-16	Gold Creek	Muscle	78.6	<0.00042	4.96	0.101	<0.1	3.48	<0.0027	0.0131	4,130	0.0076	0.0291	0.0796	0.0192	1.95	34.2
	GC-PCC-45 M-Apr-16	Gold Creek	Muscle	78.6	<0.0004	10.7	0.172	0.18	2.73	<0.0025	0.00819	5,600	0.0062	0.0135	0.0878	0.0455	0.624	19
	GC-PCC-81 M-Apr-16	Gold Creek	Muscle	80.0	<0.00041	2.71	0.151	<0.1	0.895	<0.0026	0.0106	1,400	0.0051	0.0301	0.113	0.0329	0.998	17.7
	GC-PCC-82 M-Apr-16	Gold Creek	Muscle	79.6	<0.0004	2.82	0.177	<0.098	1.61	<0.0026	0.00675	3,270	0.0047	0.0114	0.112	0.0325	0.726	16
	GC-PCC-86 M-Apr-16	Gold Creek	Muscle	79.7	<0.0004	5.58	0.122	<0.097	1.72	<0.0025	0.0123	5,380	0.005	0.0152	0.0801	0.0918	0.908	16.5
	GC-PCC-90 M-Apr-16	Gold Creek	Muscle	79.4	<0.00039	4.39	0.174	<0.096	1.9	<0.0025	0.0153	3,840	0.0068	0.0193	0.0756	0.031	1.14	19.4
	GC-PCC-92 M-Apr-16	Gold Creek	Muscle	78.2	<0.00042	5.78	0.156	<0.1	1.82	<0.0027	0.00698	2,000	0.0089	0.0264	0.0906	0.0353	1.7	27.3
	GC-PCC-25 O-Apr-16	Gold Creek	Ovary	60.9	0.0335	8.64	0.19	<0.095	0.997	<0.0025	0.0002	173	0.0101	0.0409	0.0804	0.0203	3.64	43.8
	GC-PCC-26 O-Apr-16	Gold Creek	Ovary	64.5	0.0218	1.08	0.0829	0.196	1.48	<0.0024	0.00174	293	0.0053	0.076	0.0664	0.00886	2.83	50.4
	GC-PCC-34 O-Apr-16	Gold Creek	Ovary	64.8	0.0167	3.57	0.161	0.21	1.27	<0.0027	0.00115	265	0.0053	0.0641	0.0696	0.0112	4.77	51.6
	GC-PCC-44 O-Apr-16	Gold Creek	Ovary	66.6	0.0287	6.87	0.0999	<0.098	1.91	<0.0026	0.00201	372	0.0119	0.0993	0.0718	0.00714	2.94	62.1
	GC-PCC-45 O-Apr-16	Gold Creek	Ovary	64.7	0.0452	9.1	0.169	0.16	2.93	<0.0026	0.00272	323	0.045	0.107	0.0932	0.0108	3.98	79
	GC-PCC-81 O-Apr-16	Gold Creek	Ovary	62.0	0.0418	6	0.0935	<0.099	1.54	<0.0026	0.00153	237	0.0092	0.0914	0.0811	0.00801	3.55	56.9
	GC-PCC-82 O-Apr-16	Gold Creek	Ovary	62.6	0.0213	0.907	0.115	<0.099	1.36	<0.0026	0.00101	190	0.0065	0.0517	0.0881	0.0062	2.64	65.5
	GC-PCC-86 O-Apr-16	Gold Creek	Ovary	63.2	0.0194	7.58	0.0965	0.11	1.01	<0.0026	0.00264	236	0.0109	0.0663	0.0787	0.0184	3.15	74.9
	GC-PCC-90 O-Apr-16	Gold Creek	Ovary	63.4	0.03575	8.745	0.1065	0.15	1.2	0.00265	0.00179	258	0.0117	0.07385	0.07745	0.00839	3.225	77.1
	GC-PCC-92 O-Apr-16	Gold Creek	Ovary	67.6	0.0376	6.03	0.146	0.2	1.79	<0.0027	0.00156	383	0.0163	0.102	0.0866	0.0108	3.59	77.4

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw	Sn µg/g dw
2014	SC-PC-02M-Apr-14	Sand Creek	Muscle	0.015	0.799	20,500	0.0237	1,370	1.47	0.00714	1,160	0.0978	11,400	0.124	11.3	<0.000054	0.00211	1.5	0.0342
	SC-PC-03M-Apr-14	Sand Creek	Muscle	0.0138	0.919	20,700	0.0204	1,250	1.28	0.0049	1,120	0.0619	11,000	0.0548	10.1	<0.000051	0.00161	1.62	0.0104
	SC-PC-04M-Apr-14	Sand Creek	Muscle	0.0186	0.813	20,550	0.0211	1,300	1.44	0.00456	1,034	0.0616	10,650	0.0389	17.2	<0.000054	0.00188	1.23	0.0196
	SC-PC-06M-Apr-14	Sand Creek	Muscle	0.0192	0.601	22,500	0.027	1,310	1.37	0.00606	1,130	2.21	12,100	0.0712	9.48	<0.000055	0.0022	2.58	0.0152
	SC-PC-07M-Apr-14	Sand Creek	Muscle	0.0276	0.376	18,200	0.0574	1,220	1.58	0.00944	1,180	0.128	9,270	0.174	16.4	<0.000056	0.00283	1.77	0.0614
	SC-PC-10M-Apr-14	Sand Creek	Muscle	0.0125	0.29	19,400	0.0124	1,180	1.42	0.00459	941	0.0474	10,500	0.048	15.4	<0.000055	0.00096	1.31	0.0148
	SC-PC-11M-Apr-14	Sand Creek	Muscle	0.0203	0.356	20,400	0.0539	1,340	1.73	0.004	885	0.286	11,200	0.0329	17	<0.000055	0.00144	1.59	0.0143
	SC-PC-12M-Apr-14	Sand Creek	Muscle	0.0136	0.946	22,500	0.0148	1,360	1.69	0.00291	981	0.0498	12,900	0.0313	14.3	<0.000051	0.00136	1.97	0.00649
	SC-PC-14M-Apr-14	Sand Creek	Muscle	0.023	0.62	21,500	0.0456	1,280	1.52	0.00709	1,370	0.238	10,500	0.205	8.57	<0.000055	0.00696	2.07	0.0509
	SC-PC-15M-Apr-14	Sand Creek	Muscle	0.0145	0.542	21,700	0.0142	1,350	1.26	0.0031	895	0.0544	11,400	0.0509	8.39	<0.000058	0.00171	1.78	0.0079
	SC-PC-01M-Aug-14	Sand Creek	Muscle	0.0123	1.41	22,400	0.0241	1,410	1.74	0.0065	1,490	0.0678	12,600	0.257	14.1	<0.00012	0.0115	1.96	0.0135
	SC-PC-02M-Aug-14	Sand Creek	Muscle	0.00992	1.01	21,300	0.0135	1,360	1.14	0.0039	1,400	0.0684	11,500	0.174	9.01	<0.00011	0.00195	1.86	0.00361
	SC-PC-02G-Apr	Sand Creek	Ovary	0.0236	0.0218	7,860	0.0304	820	9.69	0.109	1,640	0.0943	11,400	0.0447	5.87	0.000074	0.00218	4.49	0.0229
	SC-PC-02G-Apr	Sand Creek	Ovary	0.0453	0.024	7,810	0.101	881	11.0	0.114	1,540	0.165	11,300	0.0871	5.81	0.000114	0.00296	4.56	0.0224
	SC-PC-02G-Apr-14	Sand Creek	Ovary	0.0345	0.0229	7,835	0.066	851	10.3	0.112	1,590	0.130	11,350	0.0659	5.84	0.000094	0.00257	4.53	0.0227
	SC-PC-03G-Apr-14	Sand Creek	Ovary	0.0643	0.0379	7,940	0.119	1,060	9.82	0.156	1,640	0.349	11,300	0.114	5.53	<0.000038	0.00334	4.65	0.0249
	SC-PC-04G-Apr-14	Sand Creek	Ovary	0.0152	0.0294	8,750	0.0096	880	8.73	0.13	1,560	1.17	11,400	0.0212	8.89	0.000106	0.00101	4.8	0.0133
	SC-PC-06G-Apr-14	Sand Creek	Ovary	0.0494	0.0289	9,790	0.090	1,170	5.41	0.182	2,100	1.1	11,500	0.0879	5.59	0.000049	0.00422	10.6	0.0409
	SC-PC-07G-Apr-14	Sand Creek	Ovary	0.02	0.0236	19,700	0.0177	1,450	22.3	0.227	2,570	5.86	15,500	0.0294	23.3	0.000078	0.00128	12.8	0.0153
	SC-PC-10G-Apr-14	Sand Creek	Ovary	0.0118	0.0148	9,600	<0.0050	1,110	13.1	0.168	1,990	0.03	10,700	0.00669	10.3	<0.000039	0.00032	4.96	0.00275
	SC-PC-11G-Apr-14	Sand Creek	Ovary	0.0139	0.0175	9,330	0.0207	1,040	12.3	0.173	1,940	0.874	7,760	0.0204	10.1	<0.000040	0.00129	4.09	0.0156
	SC-PC-12G-Apr-14	Sand Creek	Ovary	0.012	0.0326	8,990	0.0053	1,000	10.8	0.109	1,980	0.122	11,300	0.0104	7.74	<0.000041	0.00167	6.39	0.0108
	SC-PC-14G-Apr-14	Sand Creek	Ovary	0.0284	0.0289	8,640	0.0486	1,110	9.66	0.177	2,020	0.0905	10,800	0.0554	4.68	<0.000039	0.00239	6.15	0.0105
	SC-PC-15G-Apr-14	Sand Creek	Ovary	0.0164	0.0140	7,340	0.016	867	5.99	0.11	1,370	0.07	11,300	0.027	4.05	<0.000040	0.00173	5.34	0.00548
	SC-PC-01WB-Apr-14	Sand Creek	Whole Body	0.0409	0.469	12,100	0.0835	2,165	8.52	0.0381	3,480	0.271	35,300	0.143	9.96	<0.000057	0.00429	1.44	0.051
	SC-PC-05WB-Apr-14	Sand Creek	Whole Body	0.0371	0.454	13,800	0.092	1,320	4.43	0.0411	2,380	0.233	21,700	0.104	11.1	<0.000053	0.00343	2.12	0.0361
	SC-PC-08WB-Apr-14	Sand Creek	Whole Body	0.165	0.233	13,100	0.415	1,420	11.2	0.0408	2,590	0.376	22,500	0.26	11.8	<0.000053	0.0057	1.55	0.0255
	SC-PC-13WB-Apr-14	Sand Creek	Whole Body	0.0388	0.294	13,700	0.083	1,560	8.13	0.0346	3,240	0.242	35,100	0.122	11.7	<0.000055	0.00201	1.35	0.011
	SC-PC-16WB-Apr-14	Sand Creek	Whole Body	0.176	0.266	12,200	0.524	1,820	13	0.052	2,960	0.532	42,500	0.27	9.62	<0.000060	0.00595	1.53	0.0203
	ER-PC-01M-Apr-14	Elk River	Muscle	0.0278	0.669	20,200	0.0678	1,330	2.15	0.00568	859	0.119	11,100	0.066	6.82	<0.000056	0.00216	3.3	0.0211
	ER-PC-02M-Apr-14	Elk River	Muscle	0.0422	0.786	18,600	0.107	1,190	2.4	0.00729	1,600	0.122	9,500	0.0698	5.59	0.000062	0.00302	3.61	0.0155
	ER-PC-04M-Apr-14	Elk River	Muscle	0.014	1.24	21,900	0.02	1,360	1.39	0.00392	1,110	0.0838	12,000	0.0394	14.2	<0.000051	0.0022	1.74	0.0102
	ER-PC-05M-Apr-14	Elk River	Muscle	0.0184	0.724	19,300	0.0384	1,270	1.88	0.00616	723	0.0663	10,100	0.037	12	<0.000059	0.00158	3.19	0.00918
	ER-PC-06M-Apr-14	Elk River	Muscle	0.0208	1.17	18,800	0.0441	1,160	1.23	0.00887	943	0.103	9,000	0.0617	10.8	<0.000054	0.00367	2.89	0.0221
	ER-PC-07M-Apr-14	Elk River	Muscle	0.0135	1.23	22,000	0.0266	1,340	1.23	0.00337	1,020	0.105	12,300	0.0197	12	<0.000058	0.00113	2.58	0.0132
	ER-PC-08M-Apr-14	Elk River	Muscle	0.0130	1.52	22,700	0.0194	1,295	1.64	0.00357	1,004	0.0405	11,700	0.0393	13.4	<0.000053	0.00138	2.55	0.00531
	ER-PC-09M-Apr-14	Elk River	Muscle	0.0131	1.07	18,400	0.0236	1,100	1.15	0.0043	802	0.075	8,890	0.0604	13.2	<0.000064	0.00265	1.37	0.00909
	ER-PC-10M-Apr-14	Elk River	Muscle	0.0145	0.999	20,600	0.0319	1,160	0.897	0.00931	1,370	0.0595	9,200	0.0327	11.6	<0.000050	0.0021	2.63	0.00802
	ER-PC-11M-Apr-14	Elk River	Muscle	0.0133	1.19	21,400	0.0204	1,290	1.79	0.00402	998	0.0479	12,900	0.052	10.7	<0.000051	0.00088	1.59	0.00131
	ER-PC-01M-Aug-14	Elk River	Muscle	0.00809	1.07	21,600	0.0756	1,320	0.603	0.0105	1,900	0.0552	10,600	0.0441	8.27	<0.000049	0.00203	5.09	0.00984
	ER-PC-02M-Aug-14	Elk River	Muscle	0.00887	0.580	24,700	0.0414	1,590	1.57	0.00407	1,430	0.0431	13,800	0.0224	8.34	<0.000049	0.0018	5.13	0.00743
	ER-PC-03M-Aug-14	Elk River	Muscle	0.0103	1.39	24,200	0.0353	1,400	0.903	0.00385	1,650	0.119	12,000	0.138	7.75	<0.000048	0.00395	4.78	0.0209

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw	Sn µg/g dw
2014	ER-PC-04M-Aug-14	Elk River	Muscle	0.00643	1.00	22,000	0.027	1,380	0.623	0.00494	1,990	0.0447	10,800	0.0406	13.2	<0.000048	0.00187	3.08	0.00457
	ER-PC-01G-Apr-14	Elk River	Ovary	0.0363	0.0256	8,810	0.0679	1,020	11.8	0.15	1,240	0.138	10,800	0.0564	3.64	0.000057	0.00376	7.87	0.00649
	ER-PC-02G-Apr-14	Elk River	Ovary	0.0181	0.0296	7,980	0.0275	999	15	0.14	1,620	0.0727	10,300	0.0293	3.18	<0.000040	0.00288	9.37	0.00576
	ER-PC-04G-Apr-14	Elk River	Ovary	0.0129	0.038	7,990	0.0176	720	6.34	0.0976	1,240	0.0458	11,300	0.015	6.21	<0.000036	0.00062	5.14	0.00374
	ER-PC-05G-Apr-14	Elk River	Ovary	0.024	0.0177	6,420	0.0378	752	8.47	0.109	960	0.1	9,670	0.033	5.35	0.000057	0.00173	5.62	0.00657
	ER-PC-06G-Apr-14	Elk River	Ovary	0.0124	0.03	7,710	0.0104	826	8.32	0.104	1,150	0.0253	11,100	0.00932	5.46	<0.000038	0.00085	6.57	0.00275
	ER-PC-07G-Apr-14	Elk River	Ovary	0.0232	0.057	8,420	0.037	898	9.6	0.152	1,510	0.115	10,700	0.0365	6.09	<0.000039	0.00239	10.8	0.0142
	ER-PC-08G-Apr-14	Elk River	Ovary	0.0151	0.0481	8,120	0.0199	871	9.13	0.125	1,610	0.0492	11,200	0.0202	6.23	0.000047	0.00184	10.3	0.00602
	ER-PC-09G-Apr-14	Elk River	Ovary	0.012	0.0449	8,460	0.0116	924	8.9	0.122	1,630	0.0314	10,600	0.008	8.32	0.000046	0.00077	4.98	0.00244
	ER-PC-10G-Apr-14	Elk River	Ovary	0.0121	0.0368	9,260	0.0142	998	7.62	0.134	1,870	0.0346	11,700	0.0155	6.15	<0.000040	0.0011	6.92	0.00235
	ER-PC-11G-Apr-14	Elk River	Ovary	0.0204	0.0433	8,630	0.0323	949	9.96	0.125	1,580	0.0697	11,300	0.024	5.32	0.000046	0.00191	5.05	0.00364
	ER-PC-03WB-Apr-14	Elk River	Whole Body	0.127	0.48	14,400	0.406	1,850	18.1	0.0812	3,760	0.597	38,700	0.476	8.39	<0.000093	0.00965	2.51	0.0178
	ER-PC-15WB-Apr-14	Elk River	Whole Body	0.0513	0.334	13,600	0.161	1,360	5.83	0.0409	2,600	0.299	24,900	0.0956	9.97	<0.000063	0.00467	1.9	0.0112
	ER-PC-23WB-Apr-14	Elk River	Whole Body	0.0433	0.341	14,450	0.112	1,655	9.79	0.0429	4,095	0.323	39,900	0.104	11.0	<0.000113	0.00346	1.47	0.00696
	ER-PC-24WB-Apr-14	Elk River	Whole Body	0.245	0.226	12,500	0.726	2,440	20.1	0.0879	2,900	0.841	23,800	0.358	10.5	<0.000208	0.0142	2.12	0.025
	ER-PC-26WB-Apr-14	Elk River	Whole Body	0.0538	0.141	11,000	0.203	2,040	10	0.0385	3,520	0.397	55,000	0.047	10.5	<0.000047	0.00299	1.17	0.00573
	GC-PC-01M-Apr-14	Gold Creek	Muscle	0.0118	0.567	20,400	0.0107	1,200	0.717	0.00385	968	0.0716	9,280	0.0186	15.8	<0.000052	0.00089	1.87	0.00673
	GC-PC-02M-Apr-14	Gold Creek	Muscle	0.00803	0.405	21,200	<0.0061	1,350	1.48	0.00234	727	0.0356	10,900	0.0183	15.5	<0.000056	0.00189	1.77	0.00277
	GC-PC-05M-Apr-14	Gold Creek	Muscle	0.012	0.604	19,400	0.0131	1,210	0.716	0.00544	752	0.0711	9,290	0.0304	12.3	0.000049	0.00174	1.69	0.00855
	GC-PC-06M-Apr-14	Gold Creek	Muscle	0.0153	0.877	22,600	0.0208	1,220	1.35	0.0142	1,240	0.0565	10,900	0.0172	10.1	<0.000053	0.00087	7.02	0.00514
	GC-PC-07M-Apr-14	Gold Creek	Muscle	0.0111	0.322	20,600	0.0129	1,270	1.17	0.00389	754	0.0365	11,000	0.013	15.1	<0.000051	0.00093	1.46	0.00315
	GC-PC-11M-Apr-14	Gold Creek	Muscle	0.0103	0.839	20,300	0.0096	1,220	0.687	0.00292	1,010	0.0319	9,710	0.0389	13.2	<0.000052	0.00202	4.51	0.00297
	GC-PC-13M-Apr-14	Gold Creek	Muscle	0.0111	0.465	21,400	0.0089	1,280	1.11	0.00326	815	0.0363	11,900	0.00765	13.2	<0.000051	<0.00053	1.7	0.00393
	GC-PC-15M-Apr-14	Gold Creek	Muscle	0.0102	0.705	20,400	0.0105	1,230	1.18	0.00278	1,040	0.0502	10,500	0.0264	13.2	<0.000052	0.00123	2.31	0.005
	GC-PC-18M-Apr-14	Gold Creek	Muscle	0.0135	0.377	20,800	0.0153	1,290	1.43	0.00248	820	0.0358	11,000	0.0223	12.7	<0.000050	0.00156	3.69	0.00553
	GC-PC-19M-Apr-14	Gold Creek	Muscle	0.0143	0.468	18,500	0.0234	1,280	0.97	0.00467	789	0.0773	9,060	0.0405	12.2	<0.000051	0.00226	1.93	0.00777
	GC-PC-01M-Aug-14	Gold Creek	Muscle	0.0114	0.566	21,300	0.0529	1,500	1.06	0.00491	837	0.0667	11,500	0.0364	14.9	<0.00015	0.00143	2.24	0.00869
	GC-PC-01G-Apr-14	Gold Creek	Ovary	0.0152	0.0502	16,100	0.0103	1,320	27.6	0.259	2,650	0.0412	13,900	0.0127	15.1	0.000048	0.00089	10.7	0.00409
	GC-PC-02G-Apr-14	Gold Creek	Ovary	0.0125	0.0108	7,910	0.0092	938	6.84	0.146	1,430	0.0426	11,500	0.0139	7.76	<0.000040	0.0009	8.75	0.00297
	GC-PC-05G-Apr-14	Gold Creek	Ovary	0.0101	0.0152	7,640	<0.0051	854	7.67	0.107	1,170	0.0155	12,700	0.00994	6.77	<0.000040	0.00065	3.99	0.00253
	GC-PC-06G-Apr-14	Gold Creek	Ovary	0.0121	0.0336	11,100	0.0102	1,300	14.5	0.179	2,240	0.0434	11,200	0.0068	6.25	0.00007	0.00059	12.8	0.00201
	GC-PC-07G-Apr-14	Gold Creek	Ovary	0.0216	0.0294	15,700	0.0274	1,140	18.7	0.239	2,600	0.0734	13,300	0.0203	14.1	<0.000039	0.00178	4.79	0.00925
	GC-PC-11G-Apr-14	Gold Creek	Ovary	0.0106	0.0237	6,920	0.0075	697	4.82	0.0894	1,070	0.0182	11,000	0.00922	5.72	<0.000041	0.00071	4.99	0.00361
	GC-PC-13G-Apr-14	Gold Creek	Ovary	0.012	0.0165	6,640	0.0059	745	6.79	0.0946	1,090	0.0153	10,800	0.00341	5.77	<0.000038	0.00035	4.24	0.00121
	GC-PC-15G-Apr-14	Gold Creek	Ovary	0.0116	0.0505	10,450	0.0058	1,215	27.5	0.195	2,635	0.0372	10,350	0.0126	8.90	<0.000040	0.00082	15.8	0.00286
	GC-PC-18G-Apr-14	Gold Creek	Ovary	0.0191	0.0299	11,200	0.018	1,360	20.1	0.274	2,460	0.0812	11,400	0.0277	8.88	<0.000040	0.00271	12	0.0201
	GC-PC-19G-Apr-14	Gold Creek	Ovary	0.0106	0.0135	6,670	0.007	753	7.16	0.108	1,020	0.0154	9,950	0.00678	6.26	<0.000037	0.00053	4.96	0.00807
	GC-PC-04WB-Apr-14	Gold Creek	Whole Body	0.0326	0.354	12,700	0.0776	2,090	5.73	0.0353	3,240	0.167	26,200	0.0415	10.9	<0.000052	0.00204	2.27	0.00568
	GC-PC-08WB-Apr-14	Gold Creek	Whole Body	0.0335	0.404	12,200	0.11	1,220	5.3	0.0356	2,920	0.171	25,200	0.0442	8.07	<0.000050	0.00152	3.09	0.00438
	GC-PC-12WB-Apr-14	Gold Creek	Whole Body	0.0288	0.352	13,100	0.0743	1,210	4.73	0.0322	2,970	0.138	22,800	0.033	13.2	<0.000052	0.00141	1.78	0.00562
	GC-PC-14WB-Apr-14	Gold Creek	Whole Body	0.0367	0.355	13,500	0.103	1,400	6.71	0.0416	3,250	0.22	28,800	0.0487	9.83	<0.000054	0.00161	2.52	0.00543
	GC-PC-16WB-Apr-14	Gold Creek	Whole Body	0.0303	0.179	12,950	0.0651	1,835	6.65	0.0302	2,895	0.194	28,000	0.0295	11.2	<0.000053	0.00196	1.81	0.00399

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw	Sn µg/g dw
	SC-PCC-01-Apr-15	Sand Creek	Muscle	0.00782	0.412	21,900	<0.0070	1,300	1.060	0.0085	758	0.0275	10,600	0.01850	13.0	<0.000029	<0.0012	3.32	0.00151
	SC-PCC-02-Apr-15	Sand Creek	Muscle	0.00643	0.435	21,900	0.0071	1,440	1.150	0.0087	1,150	0.0214	11,400	0.00908	17.4	<0.000029	<0.0012	2.43	<0.00071
	SC-PCC-04-Apr-15	Sand Creek	Muscle	0.00647	1.270	20,600	0.0088	1,160	0.722	0.0113	1,880	0.0233	9,610	0.01110	13.2	<0.000028	0.0019	1.89	0.00165
	SC-PCC-05-Apr-15	Sand Creek	Muscle	0.00682	0.840	22,100	0.0074	1,345	1.290	0.0062	918	0.0234	11,150	0.02265	12.7	<0.000028	0.0013	2.545	0.00081
	SC-PCC-06-Apr-15	Sand Creek	Muscle	0.00647	1.470	22,100	0.0100	1,290	1.100	0.0107	1,560	0.0234	11,500	0.01990	16.2	<0.000027	0.0033	1.76	<0.00067
	SC-PCC-08-Apr-15	Sand Creek	Muscle	0.00653	0.855	21,100	<0.0068	1,170	0.597	0.0113	1,170	0.0209	10,200	0.00793	9.3	<0.000028	0.0017	3.63	0.00073
	SC-PCC-10-Apr-15	Sand Creek	Muscle	0.00814	1.460	22,700	0.0068	1,300	1.210	0.0068	1,110	0.0218	10,900	0.09650	12.6	<0.000028	<0.0011	1.89	0.00137
	SC-PCC-13-Apr-15	Sand Creek	Muscle	0.00632	0.789	22,400	0.0074	1,340	1.280	0.0068	897	0.0184	11,300	0.03240	16.0	<0.000027	<0.0011	2.31	0.00068
	SC-PCC-14-Apr-15	Sand Creek	Muscle	0.00786	0.886	20,400	0.0138	1,200	1.740	0.0068	1,140	0.0372	11,700	0.09070	6.8	<0.000029	0.0050	3.68	0.00235
	SC-PCC-15-Apr-15	Sand Creek	Muscle	0.00638	0.950	22,000	<0.0069	1,360	0.583	0.0076	1,150	0.0291	10,200	0.02690	9.1	<0.000028	0.0013	2.23	0.00211
	SC-PCC-01-Apr-15	Sand Creek	Ovary	0.0111	0.0139	6,630	0.0141	776	7.15	0.111	1,010	0.0338	10,100	0.0173	5.85	<0.0000039	0.00140	11.9	<0.0011
	SC-PCC-02-Apr-15	Sand Creek	Ovary	0.00560	0.0410	8,890	0.0100	1,340	9.92	0.224	5,380	0.0389	9,050	0.00972	9.79	0.0000176	0.00180	12.2	0.00150
	SC-PCC-04-Apr-15	Sand Creek	Ovary	0.00730	0.146	14,000	0.00680	1,310	10.6	0.280	2,610	0.0375	10,600	0.0110	11.5	<0.0000040	<0.0012	10.1	<0.0012
	SC-PCC-05-Apr-15	Sand Creek	Ovary	0.00881	0.0363	7,385	0.00730	832	9.64	0.108	1,315	0.0355	10,350	0.0124	6.02	<0.0000039	0.00140	17.1	<0.0012
	SC-PCC-06-Apr-15	Sand Creek	Ovary	0.00780	0.112	9,380	0.00550	972	7.73	0.182	2,050	0.0367	10,600	0.0178	9.58	<0.0000040	0.00160	10.7	<0.0012
	SC-PCC-08-Apr-15	Sand Creek	Ovary	0.0103	0.0500	8,785	0.00510	956	6.98	0.131	1,505	0.0450	11,550	0.0142	5.06	<0.000037	0.00184	22.6	<0.00062
	SC-PCC-10-Apr-15	Sand Creek	Ovary	0.00834	0.0704	8,760	0.00620	978	10.7	0.123	2,230	0.0278	10,400	0.0591	6.20	0.000067	0.00121	6.21	0.000650
	SC-PCC-13-Apr-15	Sand Creek	Ovary	0.00668	0.0309	7,870	0.00510	874	8.27	0.125	1,980	0.0258	10,700	0.0332	7.56	<0.000035	0.00143	13.3	0.000640
	SC-PCC-14-Apr-15	Sand Creek	Ovary	0.00750	0.0593	8,370	0.0114	968	6.39	0.151	2,280	0.0890	10,800	0.0879	3.61	<0.000036	0.00310	16.0	0.00102
	SC-PCC-15-Apr-15	Sand Creek	Ovary	0.00650	0.0629	8,780	0.00610	997	12.5	0.156	2,250	0.0347	10,700	0.0207	5.10	<0.000035	0.00191	9.18	0.00192
	SC-PCC-03-Apr-15	Sand Creek	Whole Body	0.0198	0.72	15,100	0.0482	1,290	3.71	0.0342	2,840	0.109	22,300	0.0526	10.7	<0.0000030	0.00231	2.75	0.00194
2015	SC-PCC-07-Apr-15	Sand Creek	Whole Body	0.0264	0.69	15,500	0.0677	1,390	5.92	0.0441	3,440	0.139	23,900	0.0857	13.6	0.0000818	0.00274	2.48	0.00324
	SC-PCC-09-Apr-15	Sand Creek	Whole Body	0.0152	0.483	15,700	0.0489	1,360	4.43	0.0394	2,860	0.159	25,200	0.0634	12.9	0.000012	0.00236	3.42	0.00557
	SC-PCC-11-Apr-15	Sand Creek	Whole Body	0.0825	0.292	13,800	0.209	1,400	9.12	0.0451	3,000	0.225	25,100	0.193	20.9	<0.0000027	0.00706	2.66	0.00977
	SC-PCC-12-Apr-15	Sand Creek	Whole Body	0.0698	0.691	13,500	0.290	1,645	9.26	0.0432	4,335	0.290	34,700	0.242	11.8	0.000053	0.00420	3.20	0.00882
	ER-PCC-01-Apr-15	Elk River	Muscle	0.01090	0.502	19,500	0.0179	1,280	1.280	0.0081	1,020	0.0692	11,000	0.09430	6.2	<0.000034	0.0032	4.49	0.00868
	ER-PCC-02-Apr-15	Elk River	Muscle	0.00621	1.210	20,900	0.0127	1,230	1.440	0.0103	1,470	0.0480	11,300	0.08350	6.5	<0.000032	0.0042	4.12	0.00587
	ER-PCC-04-Apr-15	Elk River	Muscle	0.00597	0.762	20,300	0.0093	1,200	0.908	0.0064	1,060	0.0433	10,300	0.03670	9.4	<0.000033	0.0018	1.8	0.00285
	ER-PCC-05-Apr-15	Elk River	Muscle	0.01230	0.431	21,600	0.0209	1,320	1.990	0.0124	1,150	0.0937	12,200	0.06570	6.3	<0.000032	0.0082	4.29	0.00331
	ER-PCC-06-Apr-15	Elk River	Muscle	0.00720	0.858	21,000	0.0132	1,260	1.120	0.0079	1,340	0.0540	11,500	0.06540	8.3	<0.000030	0.0031	2.08	0.00386
	ER-PCC-07-Apr-15	Elk River	Muscle	0.00941	0.393	20,800	0.0142	1,410	1.010	0.0086	1,180	0.0723	11,000	0.01740	14.3	<0.000034	0.0010	2.21	0.00282
	ER-PCC-08-Apr-15	Elk River	Muscle	0.00732	0.674	22,000	0.0161	1,410	1.790	0.0065	966	0.0353	12,700	0.03670	8.8	<0.000033	0.0014	2.22	0.00139
	ER-PCC-10-Apr-15	Elk River	Muscle	0.00717	0.835	24,250	0.0167	1,255	1.235	0.0097	1,380	0.0486	12,800	0.02470	9.1	<0.0000325	0.0028	9.23	0.00291
	ER-PCC-11-Apr-15	Elk River	Muscle	0.00737	0.882	22,700	0.0180	1,320	1.680	0.0082	1,570	0.0663	12,600	0.05700	6.2	<0.000030	0.0020	4.54	0.00176
	ER-PCC-12-Apr-15	Elk River	Muscle	0.00768	2.690	20,800	0.0227	1,250	2.220	0.0068	1,210	0.0368	13,200	0.05600	7.0	<0.000034	0.0014	5.93	0.00265
	ER-PCC-01-Apr-15	Elk River	Ovary	0.0115	0.0192	7,570	0.0178	1,020	7.04	0.136	1,450	0.0947	11,200	0.0841	3.04	0.000050	0.00281	10.9	0.00663
	ER-PCC-02-Apr-15	Elk River	Ovary	0.00962	0.140	10,950	0.0127	1,240	9.29	0.227	2,515	0.128	11,350	0.0965	4.36	<0.000036	0.00594	13.4	0.00802
	ER-PCC-04-Apr-15	Elk River	Ovary	0.00796	0.0363	7,760	0.0115	937	8.79	0.134	1,640	0.0485	11,000	0.0348	4.42	<0.000035	0.00173	10.1	0.00316
	ER-PCC-05-Apr-15	Elk River	Ovary	0.0227	0.0152	7,590	0.0328	934	6.25	0.129	1,420	0.0954	11,500	0.0366	2.89	0.000085	0.00190	12.1	0.00280
	ER-PCC-06-Apr-15	Elk River	Ovary	0.0997	0.0344	7,490	0.208	1,100	9.43	0.143	1,380	0.209	11,400	0.156	4.07	0.000137	0.00829	14.2	0.0102
	ER-PCC-07-Apr-15	Elk River	Ovary	0.0161	0.0197	7,820	0.0303	842	7.68	0.143	1,230	0.109	11,300	0.0251	6.88	<0.000035	0.00112	13.6	0.00216
	ER-PCC-08-Apr-15	Elk River	Ovary	0.0244	0.0365	9,620	0.0472	1,140	5.81	0.196	1,790	0.109	11,000	0.0609	4.91	<0.000035	0.00414	17.3	0.00445
	ER-PCC-10-Apr-15	Elk River	Ovary	0.0145	0.105	11,900	0.0262	1,320	14.9	0.224	2,570	0.122	10,400	0.103	5.47	0.000045	0.00345	18.9	0.00695

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw	Sn µg/g dw
2015	ER-PCC-11-Apr-15	Elk River	Ovary	0.00920	0.0523	9,100	0.0137	1,130	4.76	0.192	1,930	0.101	10,500	0.0357	3.24	0.000048	0.00283	14.6	0.00181
	ER-PCC-12-Apr-15	Elk River	Ovary	0.00764	0.289	7,940	0.00890	949	17.3	0.127	1,470	0.0426	10,900	0.0220	3.53	<0.000031	0.00151	7.21	0.00166
	ER-PCC-24-Apr-15	Elk River	Whole Body	0.0542	0.173	13,200	0.201	1,520	8.69	0.0328	3,440	0.192	29,000	0.108	10.5	<0.000053	0.00424	3.08	0.00584
	ER-PCC-25-Apr-15	Elk River	Whole Body	0.0134	0.425	13,500	0.0673	1,470	9.47	0.0408	3,990	0.209	30,300	0.092	7.08	<0.000045	0.0034	3.74	0.00166
	ER-PCC-26-Apr-15	Elk River	Whole Body	0.017	0.489	14,000	0.127	1,640	6.57	0.0329	3,890	0.315	35,400	0.114	4.98	<0.000048	0.00398	4.02	0.00278
	ER-PCC-27-Apr-15	Elk River	Whole Body	0.0121	0.793	16,250	0.0961	1,340	6.37	0.0549	4,040	0.142	23,850	0.187	11.5	<0.000049	0.00268	2.81	0.00419
	ER-PCC-28-Apr-15	Elk River	Whole Body	0.0715	0.276	13,500	0.27	1,750	8.83	0.0396	3,730	0.367	34,400	0.197	5.24	<0.000051	0.00689	3.12	0.00881
	GC-PCC-01-Apr-15	Gold Creek	Muscle	0.00800	0.598	20,900	0.0104	1,250	1.220	0.0072	1,160	0.0283	11,600	0.02970	8.2	<0.000033	0.0022	2.75	0.01420
	GC-PCC-02-Apr-15	Gold Creek	Muscle	0.01020	1.340	22,100	0.0148	1,250	1.330	0.0129	1,520	0.0346	12,000	0.02160	12.7	<0.000033	0.0014	2.19	0.00294
	GC-PCC-03-Apr-15	Gold Creek	Muscle	0.00818	0.959	22,900	0.0168	1,340	1.390	0.0087	1,080	0.0398	14,600	0.01940	8.3	<0.000032	0.0011	2.84	0.00178
	GC-PCC-04-Apr-15	Gold Creek	Muscle	0.01760	0.609	22,300	0.0375	1,340	1.850	0.0117	1,780	0.0611	11,900	0.03480	9.4	0.000035	0.0025	3.71	0.00237
	GC-PCC-05-Apr-15	Gold Creek	Muscle	0.00784	0.758	21,700	0.0074	1,360	1.620	0.0077	1,005	0.0215	11,500	0.01990	19.1	<0.0000305	0.0014	1.84	0.00410
	GC-PCC-06-Apr-15	Gold Creek	Muscle	0.00725	1.800	23,100	0.0102	1,260	2.070	0.0082	1,450	0.0279	13,500	0.06190	10.3	<0.000034	0.0024	1.75	<0.00060
	GC-PCC-07-Apr-15	Gold Creek	Muscle	0.00596	0.686	20,600	<0.0065	1,270	0.762	0.0108	1,030	0.0294	11,100	0.00839	10.1	<0.000032	0.0017	2.6	0.00077
	GC-PCC-08-Apr-15	Gold Creek	Muscle	0.00674	0.251	21,100	0.0069	1,440	1.200	0.0076	786	0.0163	11,800	0.01150	20.1	<0.000031	0.0022	1.88	0.00102
	GC-PCC-09-Apr-15	Gold Creek	Muscle	0.00626	1.430	22,400	0.0129	1,340	1.330	0.0100	1,120	0.0323	12,600	0.01110	14.9	<0.000033	0.0009	2.21	0.00101
	GC-PCC-10-Apr-15	Gold Creek	Muscle	0.00769	1.490	22,200	0.0112	1,310	1.270	0.0079	1,050	0.0315	12,000	0.02880	10.1	<0.000034	0.0017	3.11	0.00128
	GC-PCC-01-Apr-15	Gold Creek	Ovary	0.0111	0.0310	9,300	0.00880	970	8.61	0.135	1,440	0.0436	11,500	0.0252	4.93	<0.000037	0.00198	13.0	0.00381
	GC-PCC-02-Apr-15	Gold Creek	Ovary	0.00935	0.135	9,870	0.00950	1,160	15.5	0.163	1,500	0.0527	10,400	0.0182	7.10	<0.000038	0.00177	6.01	0.00301
	GC-PCC-03-Apr-15	Gold Creek	Ovary	0.0131	0.0910	11,700	0.0162	1,240	8.16	0.224	1,980	0.0892	11,300	0.0245	5.37	0.000038	0.00210	19.4	0.00463
	GC-PCC-04-Apr-15	Gold Creek	Ovary	0.343	0.0477	10,300	0.689	1,700	26.6	0.220	2,020	0.679	9,940	0.442	6.89	0.000049	0.0115	14.6	0.0293
	GC-PCC-05-Apr-15	Gold Creek	Ovary	0.00789	0.0179	7,630	0.00480	745	7.57	0.0880	992	0.0157	12,000	0.00679	8.55	<0.000034	0.00102	6.33	0.00141
	GC-PCC-06-Apr-15	Gold Creek	Ovary	0.00743	0.137	9,170	0.00570	933	4.98	0.148	2,160	0.0413	11,100	0.0221	5.50	0.000038	0.00212	9.67	0.000840
	GC-PCC-07-Apr-15	Gold Creek	Ovary	0.00571	0.0265	7,890	<0.0042	872	4.21	0.117	1,440	0.0416	11,200	0.0110	5.12	0.000057	0.00122	8.84	<0.00064
	GC-PCC-08-Apr-15	Gold Creek	Ovary	0.00586	0.0114	8,145	0.00560	899	9.75	0.134	1,650	0.0173	9,595	0.00531	10.6	<0.000038	0.00106	8.48	0.000910
	GC-PCC-09-Apr-15	Gold Creek	Ovary	0.00674	0.0625	8,510	0.00580	958	3.31	0.134	1,470	0.0277	11,200	0.00774	6.96	<0.000038	0.00169	9.37	<0.00064
	GC-PCC-10-Apr-15	Gold Creek	Ovary	0.0374	0.0873	10,600	0.0509	1,150	9.36	0.171	1,880	0.106	11,100	0.0577	6.76	<0.000037	0.00359	10.9	0.00389
	GC-PCC-12-Apr-15	Gold Creek	Whole Body	0.0105	0.33	14,400	0.0533	1,220	4	0.039	2,790	0.135	20,400	0.0213	13.7	<0.000053	0.00158	2.28	0.00163
	GC-PCC-16-Apr-15	Gold Creek	Whole Body	0.0173	0.506	13,400	0.0963	1,490	5.9	0.0425	3,690	0.136	29,300	0.0694	10.6	<0.000051	0.00213	3.64	0.00168
	GC-PCC-17-Apr-15	Gold Creek	Whole Body	0.0301	0.249	12,500	0.102	1,300	6.62	0.0514	3,400	0.193	24,700	0.112	8.29	<0.000053	0.00553	2.92	0.00284
	GC-PCC-18-Apr-15	Gold Creek	Whole Body	0.0158	0.486	13,500	0.101	1,540	8.44	0.0436	4,390	0.148	31,900	0.0956	10.3	<0.000046	0.0017	2.31	0.00267
	GC-PCC-21-Apr-15	Gold Creek	Whole Body	0.0155	0.734	12,400	0.0534	1,340	5.22	0.0388	4,140	0.125	26,600	0.0505	8.97	<0.000048	0.00159	1.87	0.0015
2016	SC-PCC-06 M-Apr-16	Sand Creek	Muscle	0.00425	1.003	20,200	0.00785	1,310	1.14	0.0065	819	0.03615	11,300	0.02215	8.325	0.0000425	0.00145	3.07	0.0043
	SC-PCC-11 M-Apr-16	Sand Creek	Muscle	0.0054	0.662	20,000	0.0083	1,280	1.08	0.0043	859	0.029	11,500	0.0166	16.4	<0.00004	<0.0011	3.37	<0.00099
	SC-PCC-12 M-Apr-16	Sand Creek	Muscle	0.0032	0.597	20,800	0.0109	1,300	1.02	0.0034	748	0.0249	11,600	0.021	8.65	<0.000039	0.0013	2.86	<0.00096
	SC-PCC-16 M-Apr-16	Sand Creek	Muscle	0.0041	0.783	20,500	0.0096	1,220	0.976	0.0278	1,470	0.0263	11,700	0.0147	8.98	0.000121	0.002	2.33	0.0027
	SC-PCC-17 M-Apr-16	Sand Creek	Muscle	0.0062	0.811	23,000	0.0096	1,420	1.55	0.0031	873	0.0307	13,600	0.0425	10.1	<0.000041	0.0011	2.18	<0.001
	SC-PCC-18 M-Apr-16	Sand Creek	Muscle	0.0041	0.754	22,200	0.0059	1,290	1.59	0.0042	1,380	0.0343	13,500	0.0343	12.1	<0.000042	<0.0011	2.44	<0.0011
	SC-PCC-19 M-Apr-16	Sand Creek	Muscle	0.0055	0.843	22,200	0.0098	1,380	2.58	0.003	1,170	0.0328	14,300	0.557	12.1	<0.000042	0.002	2.6	0.0075
	SC-PCC-20 M-Apr-16	Sand Creek	Muscle	0.0058	0.817	22,200	0.0077	1,360	1.59	<0.0029	1,150	0.0323	15,500	0.0431	6.75	<0.000042	0.0019	1.83	<0.001
	SC-PCC-21 M-Apr-16	Sand Creek	Muscle	0.0048	1.44	19,500	0.0092	1,360	0.978	0.0043	1,370	0.0359	11,000	0.0133	12.4	<0.000042	0.0014	1.7	0.0014
	SC-PCC-22 M-Apr-16	Sand Creek	Muscle	0.0036	0.49	20,800	0.007	1,260	1.16	0.0054	1,150	0.0443	11,900	0.0188	6.48	<0.000043	0.0023	4.89	0.0013

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw	Sn µg/g dw
	SC-PCC-06 O-Apr-16	Sand Creek	Ovary	0.00855	0.0439	6,840	0.0093	769	4.12	0.0857	1,190	0.0336	11,600	0.0132	3.78	<0.000048	<0.00093	17.9	<0.0012
	SC-PCC-11 O-Apr-16	Sand Creek	Ovary	0.00923	0.0564	9,170	0.0073	1,160	9.7	0.176	1,650	0.0446	11,400	0.0169	9.91	<0.00005	0.00118	30.1	<0.0012
	SC-PCC-12 O-Apr-16	Sand Creek	Ovary	0.007795	0.02685	7,260	0.0103	889	11.7	0.1225	1,290	0.0347	11,000	0.01185	3.895	0.000048	0.00177	14.15	0.0012
	SC-PCC-16 O-Apr-16	Sand Creek	Ovary	0.00793	0.036	7,700	0.0049	891	7.21	0.125	1,420	0.0286	11,600	0.011	4.78	<0.000046	0.00099	9.5	<0.0011
	SC-PCC-17 O-Apr-16	Sand Creek	Ovary	0.00898	0.0369	6,730	0.0105	772	6.19	0.0961	1,300	0.0412	11,600	0.0112	3.9	<0.000044	<0.00085	13.5	<0.0011
	SC-PCC-18 O-Apr-16	Sand Creek	Ovary	0.00646	0.0323	6,940	0.0042	825	8.64	0.104	1,440	0.0416	11,500	0.0139	5.27	<0.000051	0.00147	12.7	<0.0013
	SC-PCC-19 O-Apr-16	Sand Creek	Ovary	0.00989	0.0452	7,390	0.0048	931	9.95	0.126	1,620	0.0456	11,700	0.0176	5.47	<0.00005	0.00185	15.3	<0.0012
	SC-PCC-20 O-Apr-16	Sand Creek	Ovary	0.00591	0.0241	5,930	<0.0039	649	3.99	0.0781	1,230	0.0204	10,100	0.0103	2.47	<0.000049	0.00104	7.32	0.0064
	SC-PCC-21 O-Apr-16	Sand Creek	Ovary	0.00741	0.0503	6,720	0.007	907	6.53	0.115	1,420	0.0187	11,400	0.00904	5.92	<0.000048	0.00133	6.9	<0.0012
	SC-PCC-22 O-Apr-16	Sand Creek	Ovary	0.00861	0.0205	7,550	0.0042	872	5.7	0.102	1,560	0.06	12,400	0.0166	3.17	<0.000051	0.00353	18.1	<0.0013
	SC-PCC-07 WB-Apr-16	Sand Creek	Whole Body	0.0169	0.52	12,700	0.0527	1,490	4.97	0.0275	2,600	0.13	26,100	0.0742	10.3	<0.000051	0.00125	1.8	0.0056
	SC-PCC-09 WB-Apr-16	Sand Creek	Whole Body	0.0196	0.338	12,400	0.0709	1,370	4.91	0.0354	2,940	0.186	23,800	0.0985	4.96	<0.000043	0.00275	3.82	0.0024
	SC-PCC-14 WB-Apr-16	Sand Creek	Whole Body	0.0145	0.398	12,600	0.0468	1,330	4.95	0.0388	2,850	0.121	23,800	0.0475	14.4	<0.000044	0.00098	2.16	0.0048
	SC-PCC-23 WB-Apr-16	Sand Creek	Whole Body	0.0218	0.306	12,800	0.0674	1,440	6.07	0.0336	3,520	0.194	25,800	0.106	7.82	<0.000049	0.00266	3.43	0.0028
	SC-PCC-24 WB-Apr-16	Sand Creek	Whole Body	0.0443	0.114	9,020	0.119	2,040	17.2	0.0323	2,980	0.352	59,700	0.184	6.88	<0.000051	0.00201	1.33	0.0024
	GC-PCC-13 WB-Apr-16	Gold Creek	Whole Body	0.0202	0.201	12,100	0.0611	1,550	9.79	0.0326	3,420	0.182	29,900	0.103	8.5	<0.000047	0.00213	4.35	0.003
	GC-PCC-16 WB-Apr-16	Gold Creek	Whole Body	0.0205	0.477	14,600	0.0589	1,550	5.82	0.0335	3,760	0.149	29,700	0.0539	10.9	<0.000043	0.00215	2.4	0.0033
	GC-PCC-27 WB-Apr-16	Gold Creek	Whole Body	0.0171	0.1745	11,350	0.0644	1,340	4.21	0.0321	2,625	0.214	24,850	0.0547	8.145	0.0000465	0.00176	3.69	0.00245
	GC-PCC-31 WB-Apr-16	Gold Creek	Whole Body	0.0163	0.249	11,900	0.0484	1,390	5.02	0.0363	2,620	0.161	25,500	0.0614	9.61	<0.00005	0.00174	2.83	0.0029
	GC-PCC-36 WB-Apr-16	Gold Creek	Whole Body	0.0179	0.13	10,800	0.0476	1,330	5.39	0.0317	2,630	0.15	29,600	0.0251	9.9	<0.00005	<0.00096	2.41	0.0014
	ER-PCC-01 M-Apr-16	Elk River	Muscle	0.0044	0.4575	21,950	0.00935	1,345	0.9095	0.003	993	0.04765	13,000	0.01505	4.995	0.0000425	0.00235	5.025	0.00105
2016	ER-PCC-02 M-Apr-16	Elk River	Muscle	0.0075	0.261	19,100	0.018	1,530	1.43	<0.003	1,010	0.0499	12,000	0.0212	10	<0.000043	<0.0011	3.75	0.0032
	ER-PCC-03 M-Apr-16	Elk River	Muscle	0.0111	0.335	20,200	0.0226	1,320	1.05	0.0057	1,150	0.0741	12,000	0.0328	6.1	0.000043	0.0022	5.36	0.0045
	ER-PCC-05 M-Apr-16	Elk River	Muscle	0.009	0.281	19,900	0.0191	1,410	1.77	0.005	1,070	0.0647	13,200	0.0318	22.4	<0.000042	0.0022	2.31	0.0032
	ER-PCC-06 M-Apr-16	Elk River	Muscle	0.0058	0.333	20,000	0.0111	1,520	1.58	<0.0029	902	0.0387	13,000	0.019	16.3	<0.000041	<0.0011	2.32	0.0039
	ER-PCC-07 M-Apr-16	Elk River	Muscle	0.0066	0.318	20,400	0.0226	1,350	1.81	0.0043	1,110	0.0492	13,300	0.0298	10.1	<0.000041	0.0014	3.59	0.0015
	ER-PCC-08 M-Apr-16	Elk River	Muscle	0.0044	0.609	21,100	0.0137	1,440	1.44	<0.0028	838	0.0394	13,100	0.0307	6.55	<0.00004	0.0017	5.06	<0.001
	ER-PCC-10 M-Apr-16	Elk River	Muscle	0.0076	0.368	21,100	0.0207	1,390	1.64	0.0033	1,120	0.0682	13,900	0.0382	5.67	<0.000043	0.0028	6.85	0.0027
	ER-PCC-14 M-Apr-16	Elk River	Muscle	0.004	0.279	20,700	0.0121	1,400	1.03	<0.0028	864	0.0348	13,100	0.00464	16.2	<0.00004	<0.0011	2.8	<0.00099
	ER-PCC-15 M-Apr-16	Elk River	Muscle	0.009	0.34	21,500	0.0144	1,550	1.38	<0.003	963	0.0731	12,800	0.0293	9.12	<0.000043	0.0017	3.23	0.0022
	ER-PCC-01 O-Apr-16	Elk River	Ovary	0.00793	0.0165	7,340	0.0056	739	4.23	0.0942	1,190	0.0628	10,500	0.00774	2.18	0.000039	0.00171	16.3	0.00098
	ER-PCC-02 O-Apr-16	Elk River	Ovary	0.00764	0.00724	6,810	0.0085	612	6.62	0.08	1,010	0.0412	10,500	0.00824	4.37	<0.00003	0.00149	12.6	0.00178
	ER-PCC-03 O-Apr-16	Elk River	Ovary	0.137	0.0199	9,110	0.335	1,410	19.9	0.222	2,420	0.369	9,240	0.199	3.91	0.000047	0.00684	18.9	0.017
	ER-PCC-05 O-Apr-16	Elk River	Ovary	0.0117	0.00674	6,530	0.0206	668	4.73	0.0777	1,050	0.0593	10,100	0.0328	9.49	<0.00003	0.0015	8.9	0.00225
	ER-PCC-06 O -Apr-16	Elk River	Ovary	0.008355	0.01029	6,415	0.0066	726	6.795	0.09105	1,150	0.02375	10,850	0.00886	7.075	0.000051	0.000985	8.15	0.0027
	ER-PCC-07 O-Apr-16	Elk River	Ovary	0.0154	0.0112	6,630	0.0286	778	5.51	0.0886	1,360	0.369	11,000	0.0334	4.31	<0.00005	0.00181	11	0.0031
	ER-PCC-08 O-Apr-16	Elk River	Ovary	0.00911	0.0269	7,480	0.0165	846	7.46	0.0893	1,490	0.155	11,900	0.0164	3	<0.000049	0.00115	25.4	0.0017
	ER-PCC-10 O-Apr-16	Elk River	Ovary	0.0103	0.0165	7,730	0.0306	862	5.38	0.141	2,440	0.168	10,600	0.0266	2.9	<0.00005	0.0021	18.4	0.0029
	ER-PCC-14 O-Apr-16	Elk River	Ovary	0.00602	0.0106	6,380	0.0079	703	7.68	0.0915	1,150	0.026	10,600	0.00348	6.71	<0.00005	<0.00097	7.25	<0.0012
	ER-PCC-15 O-Apr-16	Elk River	Ovary	0.0224	0.0102	6,970	0.035	725	6.52	0.0854	1,260	0.0876	11,800	0.0288	3.72	0.000068	0.00151	10.3	0.0021
	ER-PCC-12 WB-Apr-16	Elk River	Whole Body	0.0241	0.153	11,800	0.0803	1,470	8.49	0.0273	2,790	0.21	29,200	0.842	8.96	<0.000045	0.00546	3.54	0.0042
	ER-PCC-13 WB-Apr-16	Elk River	Whole Body	0.02805	0.1935	12,900	0.0869	1,775	7.51	0.0377	3,685	0.3695	39,600	0.10215	12	0.000048	0.0021	3.08	0.00345
	ER-PCC-21 WB-Apr-16	Elk River	Whole Body	0.142	0.342	12,800	0.335	1,580	12.6	0.058	3,280	0.46	19,700	0.346	7.32	0.000117	0.00916	4	0.0141

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw	Sn µg/g dw
2016	ER-PCC-26 WB-Apr-16	Elk River	Whole Body	0.0129	0.291	12,400	0.0321	1,280	2.85	0.028	2,580	0.0862	18,800	0.0382	11.9	<0.000048	0.00133	2.42	0.0024
	ER-PCC-27 WB-Apr-16	Elk River	Whole Body	0.018	0.57	13,300	0.0731	1,370	3.59	0.041	3,290	0.16	22,400	0.0604	10.3	<0.000047	0.00131	3.02	0.0027
	GC-PCC-25 M-Apr-16	Gold Creek	Muscle	0.0051	0.277	21,300	0.0098	1,510	1.06	<0.003	960	0.0462	12,300	0.00802	18	<0.000043	<0.0011	2.65	0.0014
	GC-PCC-26 M-Apr-16	Gold Creek	Muscle	0.0052	0.692	21,800	0.0087	1,420	1.26	<0.0031	916	0.0337	12,800	0.0222	7.81	<0.000044	0.0019	4.64	<0.0011
	GC-PCC-34 M-Apr-16	Gold Creek	Muscle	0.0056	0.415	21,200	0.0109	1,400	1.73	<0.0029	1,040	0.0609	13,100	0.0135	14.3	<0.000041	<0.0011	4.64	0.0018
	GC-PCC-44 M-Apr-16	Gold Creek	Muscle	0.00846	0.964	20,500	0.0109	1,390	1.49	0.0073	1,170	0.0389	12,500	0.0214	6.16	<0.000031	0.00136	3.97	0.00204
	GC-PCC-45 M-Apr-16	Gold Creek	Muscle	0.0106	0.972	19,400	0.0244	1,380	1.58	0.0056	1,080	0.0563	12,000	0.0229	10.4	0.000042	0.00213	2.6	0.00215
	GC-PCC-81 M-Apr-16	Gold Creek	Muscle	0.00765	0.371	21,700	0.0049	1,520	0.695	0.0046	965	0.0444	11,300	0.00814	7.75	0.000038	0.00392	5.29	<0.00076
	GC-PCC-82 M-Apr-16	Gold Creek	Muscle	0.00812	0.461	20,800	0.0113	1,420	1.06	0.0064	896	0.0311	11,500	0.0151	6.46	<0.00003	0.00085	4.61	<0.00074
	GC-PCC-86 M-Apr-16	Gold Creek	Muscle	0.00998	1.05	23,600	0.0097	1,510	1.64	0.0071	1,040	0.0375	13,800	0.0251	9.7	<0.00003	0.00115	1.74	0.00223
	GC-PCC-90 M-Apr-16	Gold Creek	Muscle	0.00862	0.864	21,500	0.0083	1,440	1.23	0.0047	962	0.0386	12,300	0.0209	6.57	<0.000029	0.00128	4.67	<0.00072
	GC-PCC-92 M-Apr-16	Gold Creek	Muscle	0.00792	0.511	19,200	0.0096	1,340	1.05	0.0077	1,050	0.0412	10,700	0.0151	5.84	<0.000031	0.00135	4.12	0.00105
	GC-PCC-25 O-Apr-16	Gold Creek	Ovary	0.00883	0.00917	6,630	0.0093	594	3.35	0.0737	968	0.0239	10,200	0.00545	6.94	<0.000029	0.00246	6.27	<0.00072
	GC-PCC-26 O-Apr-16	Gold Creek	Ovary	0.00743	0.0244	7,520	<0.0032	689	8.17	0.0971	1,240	0.0433	10,600	0.00922	3.34	<0.000028	0.00218	11.4	<0.00069
	GC-PCC-34 O-Apr-16	Gold Creek	Ovary	0.00785	0.0141	8,070	0.004	832	12.5	0.11	1,120	0.0262	10,500	0.0192	6.88	<0.000031	0.00184	12.1	<0.00077
	GC-PCC-44 O-Apr-16	Gold Creek	Ovary	0.00854	0.049	8,680	0.0079	872	10.4	0.111	1,560	0.0404	10,700	0.00811	3.26	0.000037	0.0024	14	<0.00074
	GC-PCC-45 O-Apr-16	Gold Creek	Ovary	0.00881	0.0285	7,030	0.0071	729	6.88	0.0985	1,410	0.0604	10,500	0.0159	4.96	0.000053	0.00311	8.29	0.00212
	GC-PCC-81 O-Apr-16	Gold Creek	Ovary	0.00802	0.0109	6,610	0.0058	665	6.58	0.0822	1,120	0.06	10,400	0.0105	2.88	<0.00003	0.00374	13.7	<0.00074
	GC-PCC-82 O-Apr-16	Gold Creek	Ovary	0.00708	0.0161	7,080	0.004	669	5.51	0.0706	1,190	0.0316	10,600	0.00781	2.58	<0.00003	0.00219	14	<0.00075
	GC-PCC-86 O-Apr-16	Gold Creek	Ovary	0.0131	0.0331	6,890	0.0089	747	5.8	0.0949	1,210	0.037	10,600	0.0161	3.93	0.00007	0.00312	6.65	<0.00075
	GC-PCC-90 O-Apr-16	Gold Creek	Ovary	0.009665	0.025	6,670	0.00705	741	4.76	0.1025	1,200	0.0488	10,200	0.01375	2.915	0.0000315	0.001215	15.05	0.000775
	GC-PCC-92 O-Apr-16	Gold Creek	Ovary	0.00836	0.0224	8,080	0.0062	892	7.05	0.141	1,690	0.0458	10,300	0.0148	3.11	<0.000031	0.00094	14.4	<0.00077

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	SC-PC-02M-Apr-14	Sand Creek	Muscle	5.62	0.0047	0.377	0.00968	0.003	0.0327	0.00625	30.4	0.0235
	SC-PC-03M-Apr-14	Sand Creek	Muscle	5.09	0.00329	0.347	0.00738	0.00329	0.0332	0.00492	40.5	0.0205
	SC-PC-04M-Apr-14	Sand Creek	Muscle	4.56	0.00409	0.453	0.0101	0.00206	0.0353	0.00804	19.3	0.0192
	SC-PC-06M-Apr-14	Sand Creek	Muscle	5.74	0.00473	0.481	0.00387	0.00489	0.0418	0.00652	24.1	0.0247
	SC-PC-07M-Apr-14	Sand Creek	Muscle	1.96	0.0127	0.983	0.016	0.00252	0.0817	0.0177	37.8	0.205
	SC-PC-10M-Apr-14	Sand Creek	Muscle	4.54	0.00225	0.227	0.00561	0.00143	0.0213	0.00306	26.8	0.0279
	SC-PC-11M-Apr-14	Sand Creek	Muscle	4.93	0.00261	1.13	0.00504	0.00162	0.0404	0.00396	16	0.0142
	SC-PC-12M-Apr-14	Sand Creek	Muscle	7.72	0.00223	0.268	0.0124	0.00266	0.0227	0.00342	19.5	0.0172
	SC-PC-14M-Apr-14	Sand Creek	Muscle	3.05	0.0095	1.2	0.0045	0.00424	0.0757	0.0143	25.7	0.0586
	SC-PC-15M-Apr-14	Sand Creek	Muscle	5.1	0.00307	0.429	0.00391	0.00247	0.0288	0.00551	15	0.0168
	SC-PC-01M-Aug-14	Sand Creek	Muscle	7.01	0.00164	0.294	0.00339	0.00259	0.0181	0.00266	28.5	0.0145
	SC-PC-02M-Aug-14	Sand Creek	Muscle	4.85	0.000492	0.168	0.00301	0.00152	0.0119	0.00168	20.3	0.00795
	SC-PC-02G-Apr	Sand Creek	Ovary	0.529	0.00626	0.654	0.0095	0.00476	0.0622	0.0119	126	0.0669
	SC-PC-02G-Apr	Sand Creek	Ovary	1.04	0.0308	1.32	0.0108	0.00955	0.136	0.0357	135	0.11
	SC-PC-02G-Apr-14	Sand Creek	Ovary	0.785	0.0185	0.987	0.0102	0.00716	0.0991	0.0238	131	0.0885
	SC-PC-03G-Apr-14	Sand Creek	Ovary	1.06	0.0302	1.93	0.01	0.0103	0.247	0.0472	117	0.143
	SC-PC-04G-Apr-14	Sand Creek	Ovary	0.456	0.00243	0.301	0.00808	0.00377	0.0366	0.00704	124	0.022
	SC-PC-06G-Apr-14	Sand Creek	Ovary	0.972	0.0231	1.55	0.00697	0.0137	0.174	0.0368	141	0.123
	SC-PC-07G-Apr-14	Sand Creek	Ovary	0.486	0.00418	0.52	0.0322	0.00095	0.0358	0.00532	289	0.0293
	SC-PC-10G-Apr-14	Sand Creek	Ovary	0.348	0.000831	0.109	0.00491	0.00424	0.0169	0.00698	128	0.00871
	SC-PC-11G-Apr-14	Sand Creek	Ovary	0.438	0.00397	0.395	0.00609	0.0056	0.0349	0.0107	127	0.0171
	SC-PC-12G-Apr-14	Sand Creek	Ovary	0.406	0.000965	0.169	0.0125	0.00356	0.0284	0.00318	126	0.0115
	SC-PC-14G-Apr-14	Sand Creek	Ovary	0.708	0.0128	0.764	0.00562	0.0075	0.105	0.0178	117	0.0602
	SC-PC-15G-Apr-14	Sand Creek	Ovary	0.39	0.00393	0.357	0.0054	0.00449	0.0465	0.00644	98	0.0266
	SC-PC-01WB-Apr-14	Sand Creek	Whole Body	74.4	0.00663	0.618	0.0201	0.0133	0.0791	0.0128	100	0.0817
	SC-PC-05WB-Apr-14	Sand Creek	Whole Body	32.4	0.0135	1.1	0.0212	0.00939	0.0915	0.0196	99.2	0.108
	SC-PC-08WB-Apr-14	Sand Creek	Whole Body	38	0.102	5.97	0.0177	0.0222	0.574	0.116	78.7	0.2
	SC-PC-13WB-Apr-14	Sand Creek	Whole Body	71.9	0.00542	0.513	0.0106	0.0138	0.0651	0.0126	95	0.112
	SC-PC-16WB-Apr-14	Sand Creek	Whole Body	89.1	0.0975	4.99	0.0212	0.0271	0.595	0.119	84.5	0.359
	ER-PC-01M-Apr-14	Elk River	Muscle	5.46	0.0212	1.14	0.0143	0.00419	0.104	0.0251	21.3	0.0619
	ER-PC-02M-Apr-14	Elk River	Muscle	3.17	0.0229	1.74	0.00679	0.00497	0.16	0.0414	30.9	0.132
	ER-PC-04M-Apr-14	Elk River	Muscle	5.41	0.00256	0.348	0.0131	0.0024	0.0238	0.00584	18	0.0161
	ER-PC-05M-Apr-14	Elk River	Muscle	4.65	0.0068	0.906	0.00758	0.00312	0.0916	0.0153	17.9	0.0407
	ER-PC-06M-Apr-14	Elk River	Muscle	1.59	0.0082	0.926	0.0132	0.00198	0.074	0.016	31.9	0.0796
	ER-PC-07M-Apr-14	Elk River	Muscle	6.38	0.00195	0.275	0.00847	0.00147	0.0212	0.00496	23.3	0.0134
	ER-PC-08M-Apr-14	Elk River	Muscle	4.99	0.00161	0.250	0.00737	0.00399	0.0177	0.00311	17.8	0.0152
	ER-PC-09M-Apr-14	Elk River	Muscle	2.66	0.00384	0.421	0.00795	0.00232	0.0356	0.00729	23.7	0.0267
	ER-PC-10M-Apr-14	Elk River	Muscle	0.716	0.00641	0.42	0.0124	0.00157	0.0438	0.00805	31	0.0571
	ER-PC-11M-Apr-14	Elk River	Muscle	9.37	0.00101	0.219	0.00746	0.00461	0.0169	0.00206	20.5	0.0125
	ER-PC-01M-Aug-14	Elk River	Muscle	0.953	0.000839	0.257	0.0112	0.0005	0.0107	0.00163	69.6	0.0129
	ER-PC-02M-Aug-14	Elk River	Muscle	5.21	0.000344	0.14	0.00915	0.00154	0.00851	0.0007	19.6	0.00651
	ER-PC-03M-Aug-14	Elk River	Muscle	2.2	0.00122	0.228	0.00539	0.00106	0.0147	0.00221	22.7	0.00769

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	ER-PC-04M-Aug-14	Elk River	Muscle	0.89	0.000482	0.159	0.0104	0.00048	0.00724	0.00109	40.7	0.00702
	ER-PC-01G-Apr-14	Elk River	Ovary	0.809	0.0167	1.27	0.0174	0.00676	0.187	0.0444	105	0.0992
	ER-PC-02G-Apr-14	Elk River	Ovary	0.569	0.00518	0.638	0.00642	0.00453	0.0783	0.0127	142	0.0463
	ER-PC-04G-Apr-14	Elk River	Ovary	0.314	0.00165	0.283	0.0126	0.00281	0.0324	0.00453	114	0.0166
	ER-PC-05G-Apr-14	Elk River	Ovary	0.483	0.00803	0.811	0.00695	0.00445	0.11	0.0178	109	0.0434
	ER-PC-06G-Apr-14	Elk River	Ovary	0.351	0.000951	0.279	0.00932	0.00185	0.0255	0.00402	93.7	0.00713
	ER-PC-07G-Apr-14	Elk River	Ovary	0.489	0.0105	0.772	0.0126	0.0113	0.0971	0.0221	164	0.0402
	ER-PC-08G-Apr-14	Elk River	Ovary	0.365	0.00275	0.311	0.00681	0.00639	0.0594	0.0078	93.9	0.0389
	ER-PC-09G-Apr-14	Elk River	Ovary	0.446	0.000502	0.119	0.011	0.0028	0.0204	0.00376	142	0.0153
	ER-PC-10G-Apr-14	Elk River	Ovary	0.413	0.00134	0.151	0.00936	0.013	0.0542	0.00864	117	0.0366
	ER-PC-11G-Apr-14	Elk River	Ovary	0.427	0.00521	0.627	0.00818	0.00583	0.107	0.01	111	0.0441
	ER-PC-03WB-Apr-14	Elk River	Whole Body	87.9	0.0588	3.32	0.0161	0.063	0.891	0.157	107	0.197
	ER-PC-15WB-Apr-14	Elk River	Whole Body	39.6	0.0166	1.25	0.019	0.0082	0.247	0.049	98	0.148
	ER-PC-23WB-Apr-14	Elk River	Whole Body	85.2	0.00386	0.46	0.00846	0.0175	0.0795	0.0149	111	0.0627
	ER-PC-24WB-Apr-14	Elk River	Whole Body	38.3	0.129	5.99	0.0351	0.0364	2.08	0.379	84.7	0.358
	ER-PC-26WB-Apr-14	Elk River	Whole Body	114	0.00407	0.463	0.0147	0.0075	0.108	0.0122	62	0.0331
	GC-PC-01M-Apr-14	Gold Creek	Muscle	1.3	0.00207	0.339	0.00432	0.00064	0.0211	0.00402	17	0.025
	GC-PC-02M-Apr-14	Gold Creek	Muscle	4.35	0.000447	0.14	0.0115	0.00101	0.0078	0.00108	18	0.0062
	GC-PC-05M-Apr-14	Gold Creek	Muscle	0.94	0.00423	0.386	0.0152	0.00081	0.0227	0.00562	40.6	0.0216
	GC-PC-06M-Apr-14	Gold Creek	Muscle	3.06	0.00952	0.363	0.00343	0.00284	0.0305	0.00878	22	0.0283
	GC-PC-07M-Apr-14	Gold Creek	Muscle	5.12	0.00126	0.266	0.00835	0.00082	0.0321	0.00218	15.9	0.0113
	GC-PC-11M-Apr-14	Gold Creek	Muscle	1.56	0.00156	0.271	0.0103	0.00064	0.0103	0.00192	20.5	0.0112
	GC-PC-13M-Apr-14	Gold Creek	Muscle	5.29	0.000686	0.205	0.00964	0.00089	0.0116	0.00168	14	0.00857
	GC-PC-15M-Apr-14	Gold Creek	Muscle	3.05	0.00126	0.312	0.00795	0.00142	0.0176	0.00251	18.5	0.0138
	GC-PC-18M-Apr-14	Gold Creek	Muscle	4.33	0.00177	0.482	0.00837	0.00214	0.0234	0.00437	15.7	0.013
	GC-PC-19M-Apr-14	Gold Creek	Muscle	1.49	0.00418	0.823	0.0169	0.00133	0.0347	0.00695	22.7	0.0264
	GC-PC-01M-Aug-14	Gold Creek	Muscle	3.45	0.00181	0.403	0.00865	0.00107	0.0252	0.00414	30.6	0.0293
	GC-PC-01G-Apr-14	Gold Creek	Ovary	0.53	0.000989	0.2	0.0156	0.0008	0.0451	0.00238	227	0.0136
	GC-PC-02G-Apr-14	Gold Creek	Ovary	0.294	0.00288	0.316	0.0114	0.00293	0.0217	0.00621	112	0.0163
	GC-PC-05G-Apr-14	Gold Creek	Ovary	0.286	0.000183	0.106	0.012	0.00164	0.0109	0.00135	97.1	0.00284
	GC-PC-06G-Apr-14	Gold Creek	Ovary	0.506	0.00118	0.162	0.00511	0.0037	0.0393	0.00536	120	0.0193
	GC-PC-07G-Apr-14	Gold Creek	Ovary	0.619	0.0314	0.675	0.0246	0.00186	0.046	0.0111	237	0.0568
	GC-PC-11G-Apr-14	Gold Creek	Ovary	0.363	0.00127	0.157	0.014	0.00177	0.0178	0.00246	120	0.00977
	GC-PC-13G-Apr-14	Gold Creek	Ovary	0.296	0.000713	0.122	0.00741	0.00168	0.0208	0.00331	82.3	0.00701
	GC-PC-15G-Apr-14	Gold Creek	Ovary	0.451	0.0006655	0.128	0.0129	0.00404	0.0261	0.00720	115	0.0167
	GC-PC-18G-Apr-14	Gold Creek	Ovary	0.569	0.00491	0.456	0.0135	0.011	0.0713	0.0196	176	0.0441
	GC-PC-19G-Apr-14	Gold Creek	Ovary	0.274	0.000634	0.252	0.0146	0.00147	0.0149	0.00306	96.6	0.00742
	GC-PC-04WB-Apr-14	Gold Creek	Whole Body	40.1	0.00679	0.822	0.0285	0.00497	0.0615	0.0143	80.7	0.0448
	GC-PC-08WB-Apr-14	Gold Creek	Whole Body	38.7	0.00887	0.884	0.0101	0.00654	0.0705	0.0206	82.7	0.0652
	GC-PC-12WB-Apr-14	Gold Creek	Whole Body	33.4	0	0.603	0.0197	0.00415	0.0508	0.0151	79.4	0.0466
	GC-PC-14WB-Apr-14	Gold Creek	Whole Body	48.7	0.00706	0.806	0.0117	0.00853	0.0894	0.0177	86.5	0.0565
	GC-PC-16WB-Apr-14	Gold Creek	Whole Body	46.9	0.00544	0.472	0.0175	0.00487	0.0597	0.0186	64.4	0.105

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2015	SC-PCC-01-Apr-15	Sand Creek	Muscle	2.94	0.00073	0.1310	0.0136	0.00115	0.00888	0.00122	54.7	0.0127
	SC-PCC-02-Apr-15	Sand Creek	Muscle	4.89	<0.00040	0.1010	0.0133	0.00069	0.00404	<0.00021	36.8	0.0076
	SC-PCC-04-Apr-15	Sand Creek	Muscle	1.05	0.00073	0.1270	0.0128	0.00107	0.01120	0.00154	92.1	0.0193
	SC-PCC-05-Apr-15	Sand Creek	Muscle	4.74	0.00053	0.1155	0.0099	0.00226	0.00832	0.00084	42.5	0.0160
	SC-PCC-06-Apr-15	Sand Creek	Muscle	4.74	0.00079	0.1040	0.0098	0.00130	0.00770	0.00071	66.3	0.0094
	SC-PCC-08-Apr-15	Sand Creek	Muscle	0.87	0.00049	0.1040	0.0069	0.00064	0.00636	0.00064	29.5	0.0152
	SC-PCC-10-Apr-15	Sand Creek	Muscle	4.65	0.00094	0.1870	0.0170	0.00197	0.01300	0.00148	37.4	0.0288
	SC-PCC-13-Apr-15	Sand Creek	Muscle	5.86	0.00055	0.1060	0.0075	0.00243	0.00943	0.00109	25.1	0.0090
	SC-PCC-14-Apr-15	Sand Creek	Muscle	7.23	0.00069	0.1330	0.0036	0.00552	0.01710	0.00106	25.6	0.0336
	SC-PCC-15-Apr-15	Sand Creek	Muscle	1.10	0.00094	0.1450	0.0058	0.00071	0.01000	0.00158	35.8	0.0202
	SC-PCC-01-Apr-15	Sand Creek	Ovary	0.416	0.00484	0.326	0.00659	0.00470	0.0343	0.00901	105	0.0194
	SC-PCC-02-Apr-15	Sand Creek	Ovary	0.803	0.000299	0.118	0.0198	0.00196	0.0165	0.00333	170	0.00765
	SC-PCC-04-Apr-15	Sand Creek	Ovary	0.846	0.00113	0.111	0.0148	0.00494	0.0527	0.00496	176	0.0108
	SC-PCC-05-Apr-15	Sand Creek	Ovary	0.364	0.00365	0.140	0.00647	0.00582	0.0191	0.00348	90.8	0.00968
	SC-PCC-06-Apr-15	Sand Creek	Ovary	0.457	0.00147	0.0921	0.0126	0.00765	0.0348	0.00758	149	0.0132
	SC-PCC-08-Apr-15	Sand Creek	Ovary	0.271	0.00106	0.133	0.00457	0.0121	0.0286	0.00472	107	0.0180
	SC-PCC-10-Apr-15	Sand Creek	Ovary	0.561	0.000828	0.193	0.0190	0.00400	0.0356	0.00340	122	0.0177
	SC-PCC-13-Apr-15	Sand Creek	Ovary	0.645	0.000858	0.126	0.00739	0.00367	0.0298	0.00208	116	0.0118
	SC-PCC-14-Apr-15	Sand Creek	Ovary	0.424	0.00219	0.207	0.00470	0.00786	0.0656	0.00660	92.0	0.0236
	SC-PCC-15-Apr-15	Sand Creek	Ovary	0.397	0.00105	0.105	0.00593	0.00682	0.0297	0.00458	128	0.0146
	SC-PCC-03-Apr-15	Sand Creek	Whole Body	35.7	0.00763	0.56	0.0127	0.00669	0.0538	0.0292	104	0.244
	SC-PCC-07-Apr-15	Sand Creek	Whole Body	39.7	0.00986	0.847	0.0143	0.00846	0.0914	0.0379	137	0.321
	SC-PCC-09-Apr-15	Sand Creek	Whole Body	37.2	0.00238	0.314	0.011	0.00564	0.0462	0.0198	87.9	0.207
	SC-PCC-11-Apr-15	Sand Creek	Whole Body	42.2	0.052	2.97	0.0156	0.0134	0.295	0.0932	86.7	0.411
	SC-PCC-12-Apr-15	Sand Creek	Whole Body	66.4	0.0358	3.14	0.0142	0.0188	0.282	0.0706	115	0.266
	ER-PCC-01-Apr-15	Elk River	Muscle	4.25	0.00207	0.3570	0.0240	0.00266	0.03050	0.00467	21.2	0.0815
	ER-PCC-02-Apr-15	Elk River	Muscle	4.99	0.00052	0.1790	0.0043	0.00326	0.01830	0.00145	26.0	0.0299
	ER-PCC-04-Apr-15	Elk River	Muscle	3.97	0.000698	0.1500	0.0062	0.00154	0.01110	0.00137	26.4	0.0097
	ER-PCC-05-Apr-15	Elk River	Muscle	5.38	0.00546	0.3320	0.0116	0.00586	0.06300	0.01000	18.8	0.0705
	ER-PCC-06-Apr-15	Elk River	Muscle	4.78	0.000995	0.1870	0.0063	0.00346	0.01850	0.00249	22.2	0.0094
	ER-PCC-07-Apr-15	Elk River	Muscle	3.35	0.00224	0.2650	0.0145	0.00098	0.02660	0.00435	21.7	0.0105
	ER-PCC-08-Apr-15	Elk River	Muscle	7.43	0.000776	0.1940	0.0037	0.00310	0.01940	0.00296	18.2	0.0116
	ER-PCC-10-Apr-15	Elk River	Muscle	5.94	0.0011465	0.1895	0.0082	0.00194	0.01800	0.00208	23.4	0.0070
	ER-PCC-11-Apr-15	Elk River	Muscle	6.99	0.000941	0.2110	0.0047	0.00470	0.02700	0.00241	21.1	0.0088
	ER-PCC-12-Apr-15	Elk River	Muscle	9.85	0.000426	0.1280	0.0051	0.01030	0.03250	0.00100	22.3	0.0116
	ER-PCC-01-Apr-15	Elk River	Ovary	0.306	0.00340	0.326	0.0165	0.00461	0.0536	0.00813	105	0.0139
	ER-PCC-02-Apr-15	Elk River	Ovary	0.394	0.00183	0.185	0.00538	0.00888	0.0958	0.00952	153	0.0352
	ER-PCC-04-Apr-15	Elk River	Ovary	0.396	0.000817	0.110	0.00782	0.00738	0.0517	0.00412	111	0.0219
	ER-PCC-05-Apr-15	Elk River	Ovary	0.395	0.00944	0.797	0.0111	0.00595	0.118	0.0227	93.5	0.0307
	ER-PCC-06-Apr-15	Elk River	Ovary	1.20	0.0661	2.93	0.0105	0.0231	0.662	0.132	94.5	0.124
	ER-PCC-07-Apr-15	Elk River	Ovary	0.351	0.00615	0.475	0.0160	0.00316	0.0719	0.0158	125	0.0212
	ER-PCC-08-Apr-15	Elk River	Ovary	0.513	0.0123	0.776	0.00728	0.00621	0.137	0.0301	147	0.0344
	ER-PCC-10-Apr-15	Elk River	Ovary	0.545	0.00597	0.429	0.0193	0.00371	0.106	0.0135	153	0.103

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2015	ER-PCC-11-Apr-15	Elk River	Ovary	0.297	0.00260	0.163	0.00569	0.00954	0.125	0.0104	121	0.0312
	ER-PCC-12-Apr-15	Elk River	Ovary	0.305	0.000830	0.155	0.00649	0.0139	0.128	0.00379	97.0	0.0255
	ER-PCC-24-Apr-15	Elk River	Whole Body	48.3	0.0264	1.95	0.033	0.0101	0.287	0.0538	66.4	0.131
	ER-PCC-25-Apr-15	Elk River	Whole Body	51.2	0.00152	0.184	0.0111	0.0136	0.105	0.011	98.9	0.169
	ER-PCC-26-Apr-15	Elk River	Whole Body	68.2	0.0021	0.308	0.0103	0.0101	0.0774	0.0236	99.6	0.204
	ER-PCC-27-Apr-15	Elk River	Whole Body	34.8	0.0008545	0.190	0.0117	0.00533	0.0410	0.0276	116	0.304
	ER-PCC-28-Apr-15	Elk River	Whole Body	63.3	0.0394	3.24	0.0154	0.0143	0.488	0.0993	95.1	0.2
	GC-PCC-01-Apr-15	Gold Creek	Muscle	4.05	0.000654	0.1660	0.0084	0.00197	0.01230	0.00203	27.9	0.0047
	GC-PCC-02-Apr-15	Gold Creek	Muscle	4.39	0.00356	0.3800	0.0093	0.00150	0.02440	0.00562	33.8	0.0108
	GC-PCC-03-Apr-15	Gold Creek	Muscle	11.40	0.00065	0.1090	0.0126	0.00218	0.01250	0.00184	31.7	0.0050
	GC-PCC-04-Apr-15	Gold Creek	Muscle	4.55	0.00944	0.7850	0.0047	0.00430	0.05700	0.01940	28.5	0.0873
	GC-PCC-05-Apr-15	Gold Creek	Muscle	4.60	0.0004815	0.1810	0.0053	0.00203	0.00910	0.00160	30.4	0.0078
	GC-PCC-06-Apr-15	Gold Creek	Muscle	7.56	0.000144	0.0980	0.0056	0.00747	0.01410	0.00072	20.2	0.0295
	GC-PCC-07-Apr-15	Gold Creek	Muscle	2.39	0.000342	0.0910	0.0271	0.00083	0.00695	0.00060	34.9	0.0225
	GC-PCC-08-Apr-15	Gold Creek	Muscle	4.11	0.000125	0.1050	0.0240	0.00040	0.00605	0.00056	24.1	0.0137
	GC-PCC-09-Apr-15	Gold Creek	Muscle	6.83	0.000454	0.1340	0.0098	0.00159	0.01120	0.00132	38.6	0.0110
	GC-PCC-10-Apr-15	Gold Creek	Muscle	5.12	0.00116	0.1550	0.0050	0.00289	0.01320	0.00177	32.8	0.0278
	GC-PCC-01-Apr-15	Gold Creek	Ovary	0.292	0.00276	0.267	0.00920	0.00331	0.0387	0.00686	108	0.0133
	GC-PCC-02-Apr-15	Gold Creek	Ovary	0.421	0.00315	0.274	0.0103	0.00275	0.0430	0.00862	139	0.0551
	GC-PCC-03-Apr-15	Gold Creek	Ovary	0.496	0.00485	0.533	0.0250	0.00332	0.0641	0.0119	198	0.0407
	GC-PCC-04-Apr-15	Gold Creek	Ovary	3.37	0.318	15.3	0.0168	0.0391	1.19	0.475	162	0.598
	GC-PCC-05-Apr-15	Gold Creek	Ovary	0.216	0.00140	0.108	0.00373	0.00426	0.0170	0.00229	84.0	0.00580
	GC-PCC-06-Apr-15	Gold Creek	Ovary	0.362	0.00187	0.117	0.00779	0.00960	0.0732	0.00520	106	0.0404
	GC-PCC-07-Apr-15	Gold Creek	Ovary	0.240	0.000539	0.110	0.0145	0.00428	0.0189	0.00293	129	0.00945
	GC-PCC-08-Apr-15	Gold Creek	Ovary	0.402	0.0002025	0.0547	0.0217	0.000849	0.0166	0.00182	116	0.00739
	GC-PCC-09-Apr-15	Gold Creek	Ovary	0.333	0.000880	0.105	0.00899	0.00291	0.0305	0.00417	144	0.0127
	GC-PCC-10-Apr-15	Gold Creek	Ovary	0.473	0.0214	1.68	0.00737	0.00727	0.131	0.0478	137	0.0694
	GC-PCC-12-Apr-15	Gold Creek	Whole Body	25.3	0.00181	0.224	0.00806	0.00285	0.0459	0.0136	94.1	0.146
	GC-PCC-16-Apr-15	Gold Creek	Whole Body	52.5	0.00369	0.42	0.018	0.00987	0.0517	0.0195	106	0.162
	GC-PCC-17-Apr-15	Gold Creek	Whole Body	38.6	0.0141	1.46	0.0132	0.0122	0.122	0.0693	87.7	0.243
	GC-PCC-18-Apr-15	Gold Creek	Whole Body	54.2	0.00269	0.515	0.0189	0.0109	0.0909	0.0414	94.8	0.392
	GC-PCC-21-Apr-15	Gold Creek	Whole Body	43.8	0.00332	0.414	0.00751	0.00948	0.0627	0.0158	101	0.111
2016	SC-PCC-06 M-Apr-16	Sand Creek	Muscle	2.48	0.0006715	0.1339	0.00719	0.002915	0.0128	0.00065	38.55	0.00828
	SC-PCC-11 M-Apr-16	Sand Creek	Muscle	3.15	0.00206	0.189	0.017	0.00158	0.00948	0.0015	66	0.00703
	SC-PCC-12 M-Apr-16	Sand Creek	Muscle	2.58	0.000252	0.0961	0.00735	0.00164	0.00535	0.00051	31.8	0.0058
	SC-PCC-16 M-Apr-16	Sand Creek	Muscle	2.59	0.000323	0.177	0.0108	0.0017	0.012	0.0009	51.4	0.0112
	SC-PCC-17 M-Apr-16	Sand Creek	Muscle	5.93	0.00064	0.114	0.00713	0.00382	0.0106	0.00133	22.1	0.009
	SC-PCC-18 M-Apr-16	Sand Creek	Muscle	5.71	0.000133	0.0647	0.0106	0.00265	0.0118	0.00025	27.9	0.00668
	SC-PCC-19 M-Apr-16	Sand Creek	Muscle	8.96	0.000598	0.0918	0.00577	0.00643	0.0124	0.00108	30.7	0.0167
	SC-PCC-20 M-Apr-16	Sand Creek	Muscle	11.5	0.000101	0.0739	0.00336	0.00579	0.0101	0.00059	29.5	0.00848
	SC-PCC-21 M-Apr-16	Sand Creek	Muscle	1.97	0.000778	0.166	0.00457	0.00176	0.0134	0.00185	30.9	0.0149
	SC-PCC-22 M-Apr-16	Sand Creek	Muscle	2.82	0.000323	0.125	0.0117	0.00142	0.00838	0.00071	34.3	0.00537

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
	SC-PCC-06 O-Apr-16	Sand Creek	Ovary	0.252	0.0015	0.131	0.00461	0.00647	0.0231	0.00395	80.7	0.0117
	SC-PCC-11 O-Apr-16	Sand Creek	Ovary	0.445	0.00199	0.165	0.0196	0.00721	0.0367	0.00811	171	0.0109
	SC-PCC-12 O-Apr-16	Sand Creek	Ovary	0.3105	0.001032	0.122	0.006495	0.026285	0.0208	0.003	106	0.00796
	SC-PCC-16 O-Apr-16	Sand Creek	Ovary	0.278	0.00151	0.092	0.00614	0.00801	0.0263	0.0023	99.1	0.0122
	SC-PCC-17 O-Apr-16	Sand Creek	Ovary	0.222	0.00145	0.124	0.00587	0.00846	0.0204	0.00421	87.9	0.0411
	SC-PCC-18 O-Apr-16	Sand Creek	Ovary	0.294	0.00056	0.0835	0.00602	0.00463	0.0287	0.00244	88.2	0.0168
	SC-PCC-19 O-Apr-16	Sand Creek	Ovary	0.34	0.00128	0.107	0.0048	0.00654	0.0444	0.00396	100	0.0208
	SC-PCC-20 O-Apr-16	Sand Creek	Ovary	0.205	0.000677	0.0647	0.00142	0.00591	0.0132	0.00157	81.8	0.0098
	SC-PCC-21 O-Apr-16	Sand Creek	Ovary	0.314	0.000618	0.0908	0.00313	0.00518	0.0367	0.00193	95.3	0.0124
	SC-PCC-22 O-Apr-16	Sand Creek	Ovary	0.283	0.000591	0.108	0.00642	0.00734	0.0205	0.00411	100	0.011
	SC-PCC-07 WB-Apr-16	Sand Creek	Whole Body	46.2	0.00306	0.386	0.0121	0.00688	0.0348	0.0258	101	0.326
	SC-PCC-09 WB-Apr-16	Sand Creek	Whole Body	33.4	0.00577	0.398	0.0267	0.00942	0.0614	0.0129	75	0.0683
	SC-PCC-14 WB-Apr-16	Sand Creek	Whole Body	35.6	0.00388	0.282	0.011	0.00477	0.0366	0.0291	81.8	0.33
	SC-PCC-23 WB-Apr-16	Sand Creek	Whole Body	39.2	0.00794	0.502	0.0144	0.0111	0.0602	0.0165	83.3	0.0835
	SC-PCC-24 WB-Apr-16	Sand Creek	Whole Body	128	0.00882	0.813	0.0155	0.0186	0.131	0.0193	80.1	0.112
	GC-PCC-13 WB-Apr-16	Gold Creek	Whole Body	49.5	0.00214	0.397	0.0265	0.0122	0.0906	0.0433	83	0.365
	GC-PCC-16 WB-Apr-16	Gold Creek	Whole Body	44.2	0.00265	0.344	0.0183	0.00572	0.0375	0.0258	103	0.275
	GC-PCC-27 WB-Apr-16	Gold Creek	Whole Body	38.45	0.00292	0.3375	0.0275	0.00554	0.0517	0.01135	76.7	0.0996
	GC-PCC-31 WB-Apr-16	Gold Creek	Whole Body	36.1	0.00296	0.356	0.0259	0.00618	0.0462	0.0104	74.1	0.121
	GC-PCC-36 WB-Apr-16	Gold Creek	Whole Body	48.1	0.000991	0.195	0.0328	0.0065	0.0314	0.00758	98.7	0.0922
	ER-PCC-01 M-Apr-16	Elk River	Muscle	3.59	0.0001285	0.1115	0.03315	0.00145	0.010575	0.00042	34.9	0.00657
2016	ER-PCC-02 M-Apr-16	Elk River	Muscle	3.89	0.00154	0.264	0.0194	0.0013	0.0262	0.00397	20.8	0.015
	ER-PCC-03 M-Apr-16	Elk River	Muscle	2.45	0.00215	0.45	0.018	0.00115	0.0444	0.00604	39.1	0.0164
	ER-PCC-05 M-Apr-16	Elk River	Muscle	4.84	0.00185	0.326	0.0435	0.00188	0.0302	0.00487	33.5	0.0191
	ER-PCC-06 M-Apr-16	Elk River	Muscle	5.34	0.000891	0.177	0.021	0.000971	0.017	0.00203	18.8	0.0126
	ER-PCC-07 M-Apr-16	Elk River	Muscle	5.36	0.00106	0.191	0.0125	0.00215	0.0232	0.00402	27.5	0.0112
	ER-PCC-08 M-Apr-16	Elk River	Muscle	5.74	0.000381	0.125	0.0171	0.00203	0.0113	0.00119	18.8	0.00783
	ER-PCC-10 M-Apr-16	Elk River	Muscle	7.59	0.00202	0.16	0.00816	0.00296	0.0176	0.00254	32.9	0.0206
	ER-PCC-14 M-Apr-16	Elk River	Muscle	4.6	0.000088	0.0783	0.0279	0.000562	0.00613	0.00029	26.9	0.16
	ER-PCC-15 M-Apr-16	Elk River	Muscle	3.56	0.0027	0.286	0.00966	0.00156	0.0325	0.00583	40.9	0.012
	ER-PCC-01 O-Apr-16	Elk River	Ovary	0.205	0.000478	0.0817	0.0073	0.00512	0.021	0.0022	93.8	0.00593
	ER-PCC-02 O-Apr-16	Elk River	Ovary	0.221	0.000711	0.151	0.0147	0.0027	0.0153	0.00269	72.4	0.00537
	ER-PCC-03 O-Apr-16	Elk River	Ovary	2.25	0.0777	4.94	0.021	0.0201	0.943	0.189	110	0.185
	ER-PCC-05 O-Apr-16	Elk River	Ovary	0.247	0.00365	0.439	0.0197	0.00355	0.0473	0.0105	83.9	0.0126
	ER-PCC-06 O -Apr-16	Elk River	Ovary	0.228	0.000914	0.159	0.0207	0.00225	0.0192	0.00261	90.85	0.00631
	ER-PCC-07 O-Apr-16	Elk River	Ovary	0.384	0.00488	0.513	0.00778	0.00516	0.0852	0.0142	83.8	0.0194
	ER-PCC-08 O-Apr-16	Elk River	Ovary	0.228	0.00143	0.244	0.014	0.00396	0.0288	0.00531	107	0.00865
	ER-PCC-10 O-Apr-16	Elk River	Ovary	0.477	0.00398	0.419	0.0107	0.00522	0.0762	0.0133	115	0.018
	ER-PCC-14 O-Apr-16	Elk River	Ovary	0.241	0.000259	0.088	0.0154	0.0016	0.0103	0.00114	87.9	0.00455
	ER-PCC-15 O-Apr-16	Elk River	Ovary	0.431	0.00779	0.664	0.00772	0.0041	0.0785	0.0162	88.7	0.0184
	ER-PCC-12 WB-Apr-16	Elk River	Whole Body	49.9	0.00466	0.671	0.0275	0.00971	0.109	0.0141	65.8	0.0822
	ER-PCC-13 WB-Apr-16	Elk River	Whole Body	72.35	0.004135	0.608	0.03195	0.007015	0.08305	0.0221	123	0.117
	ER-PCC-21 WB-Apr-16	Elk River	Whole Body	26.6	0.0845	4.26	0.0369	0.0272	1	0.191	89.3	0.25

Table G.8: Metal Concentrations (µg/g Dry Weight) in Peamouth Chub Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2016	ER-PCC-26 WB-Apr-16	Elk River	Whole Body	23.3	0.00165	0.23	0.0216	0.00242	0.0274	0.00661	87.3	0.0585
	ER-PCC-27 WB-Apr-16	Elk River	Whole Body	30.9	0.00327	0.431	0.023	0.0068	0.0684	0.0161	129	0.0861
	GC-PCC-25 M-Apr-16	Gold Creek	Muscle	3.52	0.00113	0.209	0.0166	0.000673	0.0114	0.002	24.8	0.00753
	GC-PCC-26 M-Apr-16	Gold Creek	Muscle	4.53	0.000229	0.105	0.00989	0.00246	0.01	0.00095	23.6	0.0292
	GC-PCC-34 M-Apr-16	Gold Creek	Muscle	5.24	0.000401	0.103	0.0184	0.00113	0.0131	0.00132	26.6	0.00598
	GC-PCC-44 M-Apr-16	Gold Creek	Muscle	4.41	0.00131	0.16	0.0244	0.00217	0.015	0.00442	31.9	0.0149
	GC-PCC-45 M-Apr-16	Gold Creek	Muscle	6.93	0.00109	0.291	0.0149	0.00268	0.0223	0.00349	40.8	0.0112
	GC-PCC-81 M-Apr-16	Gold Creek	Muscle	1.29	0.00323	0.114	0.0216	0.00094	0.00984	0.00924	19.1	0.00675
	GC-PCC-82 M-Apr-16	Gold Creek	Muscle	3.91	0.000532	0.187	0.0112	0.00204	0.0163	0.00174	17.6	0.00867
	GC-PCC-86 M-Apr-16	Gold Creek	Muscle	6.73	0.00113	0.205	0.00893	0.00274	0.0115	0.00286	21.7	0.00934
	GC-PCC-90 M-Apr-16	Gold Creek	Muscle	4.02	0.00101	0.166	0.0096	0.00199	0.0121	0.00231	19.2	0.00791
	GC-PCC-92 M-Apr-16	Gold Creek	Muscle	2.01	0.00101	0.179	0.0226	0.000799	0.0133	0.00253	48.9	0.0117
	GC-PCC-25 O-Apr-16	Gold Creek	Ovary	0.224	0.0016	0.19	0.0103	0.00121	0.0149	0.00361	79.6	0.0055
	GC-PCC-26 O-Apr-16	Gold Creek	Ovary	0.221	0.000257	0.0807	0.00619	0.00352	0.0232	0.00263	87.4	0.00645
	GC-PCC-34 O-Apr-16	Gold Creek	Ovary	0.209	0.00129	0.143	0.018	0.00209	0.0154	0.00444	107	0.0322
	GC-PCC-44 O-Apr-16	Gold Creek	Ovary	0.263	0.00161	0.228	0.0125	0.00371	0.0204	0.0059	96.5	0.0198
	GC-PCC-45 O-Apr-16	Gold Creek	Ovary	0.326	0.0018	0.23	0.0118	0.00623	0.0407	0.00711	88	0.0233
	GC-PCC-81 O-Apr-16	Gold Creek	Ovary	0.209	0.00165	0.174	0.0172	0.00329	0.0274	0.00665	75.9	0.0133
	GC-PCC-82 O-Apr-16	Gold Creek	Ovary	0.158	0.000164	0.0757	0.00691	0.00411	0.022	0.00134	71.1	0.0149
	GC-PCC-86 O-Apr-16	Gold Creek	Ovary	0.254	0.0123	0.234	0.00565	0.00549	0.0225	0.0081	77.5	0.012
	GC-PCC-90 O-Apr-16	Gold Creek	Ovary	0.1995	0.002385	0.203	0.00479	0.003015	0.024	0.00685	71.85	0.01009
	GC-PCC-92 O-Apr-16	Gold Creek	Ovary	0.254	0.00112	0.155	0.0164	0.00222	0.0272	0.004	114	0.00962

Table G.9: Metal Concentrations (µg/g Dry Weight) in Rainbow Trout Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw	Fe µg/g dw
2014	SC-RT-01M-FEB-14	Sand Creek	Muscle	76	<0.00041	2.27	0.0628	<0.056	0.0226	<0.0026	0.00158	457	<0.0010	0.0166	0.0790	0.211	1.09	9.93
	SC-RT-01M-APR-14	Sand Creek	Muscle	77	<0.00068	5.85	0.0901	<0.055	0.0642	<0.0027	0.000184	217	0.0019	0.0113	0.078	0.127	1.79	31
	SC-RT-02M-APR-14	Sand Creek	Muscle	78	<0.00065	7.87	0.0247	0.099	0.152	<0.0026	0.000445	1,050	0.0013	0.0148	0.0744	0.16	1.38	25.4
	SC-RT-03M-APR-14	Sand Creek	Muscle	76	<0.00063	5.84	0.109	<0.051	0.0705	<0.0025	0.000132	237	<0.0012	0.0126	0.087	0.265	1.82	23
	SC-RT-01G-FEB-14	Sand Creek	Ovary	82	0.0369	2.49	0.101	<0.052	0.154	<0.0025	0.000554	4,880	0.008	0.437	0.0741	0.206	23.7	220
	SC-RT-01G-APR-14	Sand Creek	Ovary	59	0.0611	2.54	0.083	<0.093	0.244	<0.0027	0.00097	1,350	<0.0011	0.0788	0.0801	0.0281	11.6	62.3
	SC-RT-02G-APR-14	Sand Creek	Ovary	59	0.0314	0.89	0.0348	<0.13	0.257	<0.0028	0.000083	1,250	<0.0012	0.109	0.0755	0.0272	12.7	71.3
	SC-RT-03G-APR-14	Sand Creek	Ovary	59	0.0117	4.01	0.0777	<0.13	0.376	<0.0028	0.00011	1,250	<0.0012	0.0633	0.0902	0.053	12	51.9
	ER-RT-01M-FEB-14	Elk River	Muscle	77	<0.00044	3.13	0.0615	<0.061	0.108	<0.0028	0.00307	559	0.0026	0.0145	0.0917	0.157	1.19	10.5
	GC-RT-01M-FEB-14	Gold Creek	Muscle	77	<0.00043	1.88	0.0642	0.071	0.0585	<0.0027	0.00091	569	0.0025	0.00934	0.0709	0.122	0.959	9.34
	GC-RT-02M-FEB-14	Gold Creek	Muscle	77	<0.00042	0.907	0.0146	<0.057	0.282	<0.0026	0.000312	3,860	0.0014	0.0114	0.0776	0.0397	0.946	9.68
	GC-RT-01M-AUG-14	Gold Creek	Muscle	69	<0.0089	38.2	0.09	<1.2	2.74	<0.026	0.00076	336	0.0117	0.0398	0.372	0.128	2.35	82.9
	GC-RT-01G-FEB-14	Gold Creek	Ovary	78	0.0228	1.74	0.131	<0.052	0.267	<0.0025	0.000818	5,990	0.0085	0.461	0.0846	0.121	17.1	433
	GC-RT-02G-FEB-14	Gold Creek	Ovary	85	0.0214	2.27	0.0643	<0.14	0.129	<0.0070	0.00024	417	0.02	0.416	0.088	0.0493	15.5	355
2015	GC-RB-01-APR-15	Gold Creek	Muscle	77	0.00042	12.6	0.18	<0.11	1.12	<0.0056	0.0011	8,660	0.008	0.026	0.082	0.024	1.13	26.2
2016	SC-RT-01 M-Apr-16	Sand Creek	Muscle	79	0.00051	0.72	0.08475	0.125	0.19015	0.0055	0.000303	2,604	0.00245	0.01215	0.0463	0.03605	1.06	13.95
	SC-RT-02 M-Apr-16	Sand Creek	Muscle	78	<0.00045	1.36	0.037	0.154	0.164	<0.0048	0.000606	1,770	<0.0022	0.0134	0.0455	0.0248	0.911	11.5
	SC-RT-04 M-Apr-16	Sand Creek	Muscle	77	<0.00049	5.31	0.385	0.097	0.0939	<0.0053	0.0002	438	<0.0024	0.0148	0.0645	0.185	2.63	24.4
	GC-RT-01 M-Apr-16	Gold Creek	Muscle	78	<0.00042	7.16	0.0597	<0.1	0.225	<0.0026	0.00041	689	0.004	0.0166	0.0765	0.0522	0.991	21.9
	GC-RT-02 M-Apr-16	Gold Creek	Muscle	79	<0.00037	1.31	0.0407	0.142	0.0626	<0.0024	0.00064	752	0.0023	0.0153	0.375	0.0349	1.02	12
	GC-RT-03 M-Apr-16	Gold Creek	Muscle	78	<0.0004	1.06	0.0511	<0.098	0.204	<0.0026	0.00033	2,350	<0.0012	0.0278	0.0641	0.0426	1.53	19.7
	SC-RT-04 O-Apr-16	Sand Creek	Ovary	60	0.0556	0.661	0.205	0.099	0.2555	0.00265	0.000125	1,215	0.00175	0.0807	0.0797	0.0415	17.15	60.8
	GC-RT-01 O-Apr-16	Gold Creek	Ovary	83	0.0184	6.06	0.163	0.753	0.186	<0.0023	<0.00011	628	0.0119	0.287	0.0767	0.0524	10.8	378
	GC-RT-03 O-Apr-16	Gold Creek	Ovary	74	0.0651	4.19	0.148	0.18	0.0881	<0.0026	0.00049	711	0.0097	0.875	0.0708	0.0428	27.5	423

Table G.9: Metal Concentrations (µg/g Dry Weight) in Rainbow Trout Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw	Se µg/g dw
2014	SC-RT-01M-FEB-14	Sand Creek	Muscle	0.0119	0.716	19,450	<0.0062	1,125	0.554	0.00504	951	0.0151	9,800	0.0282	22.5	0.000204	0.00190	1.32
	SC-RT-01M-APR-14	Sand Creek	Muscle	0.0105	0.557	21,500	<0.0060	1,070	0.289	0.00667	960	0.0147	11,100	0.0044	27.8	0.000402	0.00076	1.7
	SC-RT-02M-APR-14	Sand Creek	Muscle	0.0114	0.596	21,300	0.0079	1,140	0.47	0.00617	1,070	0.025	11,300	0.0691	28.1	0.000359	<0.00056	1.97
	SC-RT-03M-APR-14	Sand Creek	Muscle	0.0108	0.918	19,900	0.0063	1,050	0.325	0.0066	952	0.044	10,100	0.0109	36.7	0.000368	0.00103	1.96
	SC-RT-01G-FEB-14	Sand Creek	Ovary	0.0107	0.112	13,900	0.0189	541	6.37	0.0549	9,180	0.0429	10,900	0.093	19	0.00188	0.00612	8.45
	SC-RT-01G-APR-14	Sand Creek	Ovary	0.0101	0.0215	5,030	0.0059	1,445	3.04	0.0145	1,660	0.0107	10,550	0.00176	8.60	0.00739	0.00042	5.65
	SC-RT-02G-APR-14	Sand Creek	Ovary	0.0107	0.0246	4,750	<0.0053	1,430	2.26	0.0128	1,340	0.0133	10,700	0.00903	8.9	0.00562	0.00026	6.38
	SC-RT-03G-APR-14	Sand Creek	Ovary	0.0114	0.0423	5,300	0.0068	1,630	0.922	0.0106	1,520	0.0164	11,100	0.00642	12.3	0.00639	0.00034	7.06
	ER-RT-01M-FEB-14	Elk River	Muscle	0.0127	0.577	21,000	<0.0067	1,280	0.616	0.00646	1,020	0.0204	10,900	0.0431	28.7	0.000272	0.00216	2.44
	GC-RT-01M-FEB-14	Gold Creek	Muscle	0.0105	0.648	18,900	<0.0065	1,180	0.667	0.00542	957	0.0206	9,440	0.0187	23.2	0.000419	0.00185	1.64
	GC-RT-02M-FEB-14	Gold Creek	Muscle	0.0145	0.29	22,400	0.0077	1,320	0.893	0.00762	995	0.0309	13,300	0.0251	11.7	0.000199	0.00138	1.47
	GC-RT-01M-AUG-14	Gold Creek	Muscle	<0.019	0.544	17,600	<0.084	1,260	0.81	0.0113	1,290	0.28	10,700	0.264	21.2	<0.0018	0.0089	2.31
	GC-RT-01G-FEB-14	Gold Creek	Ovary	0.01	0.12	12,300	0.0172	559	6.31	0.0465	8,530	0.0366	11,000	0.0285	18.4	0.00256	0.00377	7.39
	GC-RT-02G-FEB-14	Gold Creek	Ovary	0.0149	0.113	27,100	<0.016	1,030	8.46	0.0562	4,700	0.0587	17,400	0.241	19.4	0.00223	0.0217	6.37
2015	GC-RB-01-APR-15	Gold Creek	Muscle	0.0129	0.309	18,700	<0.0047	1,250	2.37	0.0105	1,660	0.050	14,700	0.073	8.5	<0.00020	0.0018	1.40
2016	SC-RT-01 M-Apr-16	Sand Creek	Muscle	0.005	0.163	24,150	0.0118	1,340	0.6695	0.00305	1,265	0.01905	14,350	0.00357	9.965	0.0000555	0.00115	1.525
	SC-RT-02 M-Apr-16	Sand Creek	Muscle	0.0052	0.146	23,600	0.0073	1,290	0.472	0.0046	1,060	0.0223	13,900	0.00284	9.82	0.000094	<0.001	1.16
	SC-RT-04 M-Apr-16	Sand Creek	Muscle	0.0059	0.416	20,100	0.0066	1,100	0.338	0.0038	838	0.0188	11,800	0.0137	37.1	0.000299	<0.0011	2.58
	GC-RT-01 M-Apr-16	Gold Creek	Muscle	0.0082	0.261	22,900	0.0138	1,320	0.488	0.0071	1,240	0.0165	11,800	0.00861	13.9	0.000153	0.001	1.29
	GC-RT-02 M-Apr-16	Gold Creek	Muscle	0.0092	0.203	24,200	0.0034	1,330	0.387	0.0211	885	0.0203	12,500	0.00534	14.6	0.000092	0.00095	2.18
	GC-RT-03 M-Apr-16	Gold Creek	Muscle	0.00736	0.305	20,000	0.0067	1,200	0.66	0.0093	759	0.02	11,900	0.00569	10.8	0.000191	0.00053	1.68
	SC-RT-04 O-Apr-16	Sand Creek	Ovary	0.00591	0.02395	5,240	0.0034	1,470	1.575	0.0191	1,700	0.0093	10,200	0.00227	11.35	0.00545	0.00127	10.7
	GC-RT-01 O-Apr-16	Gold Creek	Ovary	0.00935	0.0635	22,300	0.0481	767	13.7	0.106	5,250	0.0995	13,300	0.0111	18.1	0.00123	0.00083	8.23
	GC-RT-03 O-Apr-16	Gold Creek	Ovary	0.0082	0.0775	16,900	0.044	721	19.3	0.0511	5,540	0.0854	10,300	0.0129	12	0.00109	0.00311	19.8

Table G.9: Metal Concentrations (µg/g Dry Weight) in Rainbow Trout Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	SC-RT-01M-FEB-14	Sand Creek	Muscle	0.00195	0.119	0.0001955	0.120	0.0318	<0.00012	0.00312	0.00061	11.5	0.00279
	SC-RT-01M-APR-14	Sand Creek	Muscle	0.00155	0.105	0.00269	0.211	0.118	<0.00038	0.00983	0.00224	14.4	0.00566
	SC-RT-02M-APR-14	Sand Creek	Muscle	0.00232	0.521	0.00200	0.21	0.093	0.00042	0.0108	0.00378	11.7	0.0408
	SC-RT-03M-APR-14	Sand Creek	Muscle	0.0032	0.1	0.000885	0.193	0.152	<0.00035	0.00827	0.00212	10.7	0.0793
	SC-RT-01G-FEB-14	Sand Creek	Ovary	0.00535	2.84	0.000674	0.126	0.0799	0.00052	0.0129	0.00199	382	0.00968
	SC-RT-01G-APR-14	Sand Creek	Ovary	0.0015	1.07	0.000318	0.104	0.00497	0.00027	0.00657	0.00159	75.5	0.00210
	SC-RT-02G-APR-14	Sand Creek	Ovary	<0.00098	1.12	0.000216	0.098	0.02	0.00032	0.00481	0.00089	63.1	0.00284
	SC-RT-03G-APR-14	Sand Creek	Ovary	0.0012	1.16	0.00103	0.168	0.0115	0.00041	0.00871	0.00165	52.0	0.00768
	ER-RT-01M-FEB-14	Elk River	Muscle	0.00863	0.271	0.000489	0.193	0.0584	0.00014	0.00601	0.00101	14.3	0.00654
	GC-RT-01M-FEB-14	Gold Creek	Muscle	0.00592	0.162	0.000201	0.156	0.0538	0.00016	0.00404	0.00091	11.4	0.00855
	GC-RT-02M-FEB-14	Gold Creek	Muscle	0.00354	2.11	0.000075	0.126	0.0298	0.00024	0.0044	0.0004	16.6	0.00254
	GC-RT-01M-AUG-14	Gold Creek	Muscle	0.0149	0.473	0.00376	0.916	0.0937	<0.0014	0.0507	0.0101	21.9	0.0829
	GC-RT-01G-FEB-14	Gold Creek	Ovary	0.00374	2.95	0.000522	0.124	0.115	<0.00035	0.0135	0.00593	272	0.00721
	GC-RT-02G-FEB-14	Gold Creek	Ovary	0.0149	0.418	0.00036	0.205	0.0319	0.00118	0.018	0.00093	262	0.110
2015	GC-RB-01-APR-15	Gold Creek	Muscle	0.0025	5.020	0.00356	0.269	0.0162	0.0010	0.0286	0.005	25.2	0.014
2016	SC-RT-01 M-Apr-16	Sand Creek	Muscle	0.0013	1.8095	0.000065	0.0722	0.0111	0.0002465	0.00255	<0.00023	19.3	0.0053
	SC-RT-02 M-Apr-16	Sand Creek	Muscle	<0.00094	1.33	0.00022	0.103	0.0201	0.000143	0.00472	0.00043	16	0.00417
	SC-RT-04 M-Apr-16	Sand Creek	Muscle	0.0017	0.184	0.00099	0.141	0.136	0.000299	0.00964	0.00222	15.5	0.0049
	GC-RT-01 M-Apr-16	Gold Creek	Muscle	0.00194	0.397	0.00144	0.228	0.0287	0.00051	0.0109	0.00296	15.1	0.00849
	GC-RT-02 M-Apr-16	Gold Creek	Muscle	<0.00068	0.388	0.000341	0.13	0.0253	0.000149	0.00617	0.00063	13.7	0.0068
	GC-RT-03 M-Apr-16	Gold Creek	Muscle	<0.00074	1.56	0.000248	0.111	0.0286	0.000287	0.00317	0.00038	17.2	0.00877
	SC-RT-04 O-Apr-16	Sand Creek	Ovary	0.000765	1.005	0.000093	0.06805	0.01645	0.0003115	0.003965	0.000705	87.2	0.00595
	GC-RT-01 O-Apr-16	Gold Creek	Ovary	0.00166	0.506	0.00118	0.208	0.0321	0.000815	0.0206	0.00246	157	0.0107
	GC-RT-03 O-Apr-16	Gold Creek	Ovary	0.0024	0.488	0.00079	0.17	0.0418	0.00127	0.0205	0.00375	141	0.0114

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu
				%	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt
2015	SC-RSC-03-Apr-15	Sand Creek	Muscle	78	<0.00055	1.160	0.0601	<0.089	1.330	<0.0028	0.00092	1,650	0.0021	0.01000	0.0630	0.0973	2.450
	SC-RSC-04-Apr-15	Sand Creek	Muscle	78	<0.00047	2.680	0.0837	0.092	1.700	<0.0024	0.00068	2,050	0.0033	0.01260	0.0720	0.0665	2.360
	SC-RSC-06-Apr-15	Sand Creek	Muscle	78	<0.0011	2.370	0.0282	<0.18	0.820	<0.0058	0.00082	2,270	0.0211	0.00693	0.0924	0.1580	1.440
	SC-RSC-07-Apr-15	Sand Creek	Muscle	79	<0.00059	8.460	0.0562	0.190	1.370	<0.0030	0.00120	2,000	0.0062	0.01100	0.0833	0.0729	1.900
	SC-RSC-08-Apr-15	Sand Creek	Muscle	80	<0.0025	19.200	0.1220	0.570	2.380	<0.013	0.00156	1,030	0.0146	0.02700	0.1060	0.0410	2.590
	SC-RSC-09-Apr-15	Sand Creek	Muscle	16	<0.00047	5.260	0.0645	0.183	1.170	<0.0024	0.00102	4,030	0.0067	0.01180	0.1650	0.0687	1.810
	SC-RSC-03-Apr-15	Sand Creek	Ovary	77	0.0204	2.29	0.142	<0.35	1.61	<0.0064	0.000310	1,690	0.0138	0.0651	0.0854	0.0696	6.13
	SC-RSC-04-Apr-15	Sand Creek	Ovary	75	0.0252	3.56	0.276	<0.22	1.29	<0.0041	0.000780	1,560	0.0088	0.0779	0.0841	0.0412	5.72
	SC-RSC-06-Apr-15	Sand Creek	Ovary	74	0.0161	1.57	0.0603	0.34	0.761	<0.0045	0.000370	3,090	0.0116	0.0611	0.0712	0.0967	5.15
	SC-RSC-07-Apr-15	Sand Creek	Ovary	75	0.0196	3.66	0.104	<0.20	1.39	<0.0037	0.000370	1,130	0.0250	0.0852	0.0637	0.0465	4.77
	SC-RSC-08-Apr-15	Sand Creek	Ovary	78	0.0369	39.7	0.151	2.5	2.37	<0.022	<0.00096	1,400	0.0700	0.0706	0.122	0.0271	7.83
	SC-RSC-09-Apr-15	Sand Creek	Ovary	73	0.0207	2.92	0.122	0.26	0.767	<0.0028	0.000380	965	0.0103	0.0607	0.0662	0.0353	4.66
	SC-RSC-01-Apr-15	Sand Creek	Whole Body	74	0.0036	107	0.288	0.32	8.19	<0.0027	0.00883	40,100	0.065	0.0951	0.355	0.0716	2.16
	SC-RSC-05-Apr-15	Sand Creek	Whole Body	72	0.00146	3.31	0.213	<0.24	6.84	<0.0026	0.00068	44,900	0.0396	0.0336	0.106	0.0647	1.63
	ER-RSC-02-Apr-15	Elk River	Muscle	80	0.00103	10.500	0.0512	0.330	1.370	<0.0035	0.00092	1,740	0.0280	0.01950	0.0755	0.0579	2.090
	ER-RSC-04-Apr-15	Elk River	Muscle	77	0.00058	7.750	0.0734	0.190	1.370	<0.0027	0.00296	2,610	0.0073	0.01190	0.0783	0.0444	2.210
	ER-RSC-07-Apr-15	Elk River	Muscle	80	0.00090	21.600	0.0808	0.180	2.360	<0.0027	0.00135	3,100	0.0071	0.01550	0.2900	0.0722	2.100
	ER-RSC-08-Apr-15	Elk River	Muscle	80	0.00061	11.400	0.0734	0.108	3.860	<0.0024	0.00084	3,240	0.0043	0.01270	0.0669	0.0449	2.660
	ER-RSC-09-Apr-15	Elk River	Muscle	79	0.00083	18.600	0.0411	<0.15	1.450	<0.0027	0.00095	4,660	0.0038	0.01070	0.0846	0.1460	1.120
	ER-RSC-10-Apr-15	Elk River	Muscle	80	0.00058	7.320	0.0218	<0.15	1.250	<0.0027	0.00275	4,580	0.0037	0.00918	0.0673	0.0534	1.630
	ER-RSC-11-Apr-15	Elk River	Muscle	78	<0.0020	6.960	0.0330	0.780	1.460	<0.014	0.00110	1,930	0.0118	0.00920	0.0740	0.0279	1.540
	ER-RSC-13-Apr-15	Elk River	Muscle	80	0.00055	3.390	0.0464	<0.14	1.190	<0.0027	0.00045	2,310	0.0071	0.00768	0.0674	0.1290	1.430
	ER-RSC-15-Apr-15	Elk River	Muscle	78	0.00083	6.960	0.0521	<0.16	0.651	<0.0030	0.00124	2,040	0.0264	0.00800	0.3100	0.0547	1.260
	ER-RSC-16-Apr-15	Elk River	Muscle	80	0.00089	2.870	0.0807	<0.19	1.680	<0.0035	0.00097	2,640	0.0093	0.00866	0.1000	0.0886	1.880
	ER-RSC-02-Apr-15	Elk River	Ovary	75	0.0256	21.4	0.108	0.27	1.90	<0.0039	0.000820	2,040	0.0828	0.0869	0.0960	0.0395	6.82
	ER-RSC-04-Apr-15	Elk River	Ovary	74	0.0204	15.3	0.172	0.43	1.62	<0.0053	0.00157	1,630	0.0881	0.0772	0.0767	0.0319	4.89
	ER-RSC-07-Apr-15	Elk River	Ovary	79	0.0268	11.0	0.252	0.40	2.42	<0.0034	0.000700	1,490	0.0510	0.0742	0.0856	0.0586	5.97
	ER-RSC-08-Apr-15	Elk River	Ovary	79	0.0254	50.9	0.118	0.32	4.37	<0.0043	0.00165	1,310	0.0606	0.0743	0.134	0.0345	5.74
	ER-RSC-09-Apr-15	Elk River	Ovary	77	0.0106	72.0	0.244	0.72	5.09	<0.0060	0.00152	2,150	0.175	0.0716	0.169	0.103	5.12
	ER-RSC-10-Apr-15	Elk River	Ovary	75	0.0203	6.45	0.0438	<0.12	1.21	<0.0024	0.00272	1,570	0.0498	0.0717	0.0613	0.0334	6.70
	ER-RSC-11-Apr-15	Elk River	Ovary	80	0.0192	5.83	0.108	0.39	2.92	<0.0053	0.00120	1,730	0.120	0.0827	0.0944	0.0287	5.33
	ER-RSC-13-Apr-15	Elk River	Ovary	75	0.0190	3.23	0.111	<0.12	1.57	<0.0024	0.000190	1,660	0.0663	0.0672	0.0525	0.0906	6.73
	ER-RSC-15-Apr-15	Elk River	Ovary	75	0.0313	49.9	0.158	0.27	1.50	<0.0039	0.000670	1,490	0.0297	0.0886	0.136	0.0450	6.50
	ER-RSC-16-Apr-15	Elk River	Ovary	85	0.0426	5.49	0.111	0.67	0.627	<0.0061	0.000480	1,520	0.0572	0.0579	0.0848	0.0621	7.55
	ER-RSC-05-Apr-15	Elk River	Whole Body	74	0.00235	7.82	0.0884	4.17	9.58	<0.0029	0.00101	63,400	0.0698	0.0381	0.0647	0.0653	1.69
	ER-RSC-12-Apr-15	Elk River	Whole Body	77	0.00307	15.4	0.126	0.26	6.74	<0.0029	0.0009	44,300	0.138	0.0454	0.0878	0.0585	1.92
	ER-RSC-14-Apr-15	Elk River	Whole Body	75	0.00248	6.63	0.235	0.29	11.8	<0.0026	0.00059	73,400	0.107	0.0469	0.0556	0.0498	1.83
	GC-RSC-01-Apr-15	Gold Creek	Muscle	80	0.00047	10.800	0.0836	<0.12	1.380	<0.0029	0.00074	1,340	0.0054	0.01630	0.0720	0.0760	1.950
	GC-RSC-05-Apr-15	Gold Creek	Muscle	84	0.00115	9.150	0.1740	0.420	2.180	<0.0060	0.00165	3,040	0.0116	0.01820	0.1470	0.1160	2.340
	GC-RSC-07-Apr-15	Gold Creek	Muscle	78	0.00072	1.280	0.0348	<0.13	0.714	<0.0031	0.00114	4,250	0.0018	0.00401	0.0729	0.1250	0.967
	GC-RSC-08-Apr-15	Gold Creek	Muscle	80	<0.00035	2.360	0.0386	0.130	0.753	<0.0027	0.00103	2,760	0.0037	0.07450	0.0614	0.0815	1.060
	GC-RSC-10-Apr-15	Gold Creek	Muscle	80	0.00066	4.500	0.0830	<0.11	2.170	<0.0027	0.00110	3,390	0.0038	0.01890	0.0682	0.0960	2.800
	GC-RSC-01-Apr-15	Gold Creek	Ovary	74	0.0289	17.4	0.171	0.33	1.84	<0.0039	0.000750	1,600	0.0402	0.0807	0.0706	0.0554	6.74

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu
				%	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt
2015	GC-RSC-05-Apr-15	Gold Creek	Ovary	79	0.0245	16.6	0.145	0.31	0.574	<0.0068	0.00115	1,560	0.0373	0.0734	0.0954	0.0732	5.98
	GC-RSC-07-Apr-15	Gold Creek	Ovary	78	0.0143	6.66	0.0900	1.03	0.371	<0.011	0.00114	1,100	0.0390	0.0856	0.0770	0.0722	5.71
	GC-RSC-08-Apr-15	Gold Creek	Ovary	77	0.0184	3.72	0.0914	<0.12	1.20	<0.0027	0.000500	1,450	0.0126	0.0430	0.0635	0.0507	6.34
	GC-RSC-10-Apr-15	Gold Creek	Ovary	77	0.0330	33.1	0.666	0.43	1.91	<0.0049	0.00210	1,410	0.600	0.156	0.122	0.0600	9.30
2016	SC-RSC-07 M-Apr-16	Sand Creek	Muscle	79	<0.0012	5.71	0.0903	<0.15	1.99	<0.0045	0.00085	13,200	0.0263	0.021	0.0875	0.0902	1.11
	SC-RSC-22 M-Apr-16	Sand Creek	Muscle	80	<0.0012	7.35	0.0508	<0.15	0.631	<0.0046	0.00089	2,510	0.01	0.0164	0.0563	0.105	1.16
	SC-RSC-01 M-Apr-16	Sand Creek	Muscle	81	0.00079	10.2	0.0566	<0.16	0.914	<0.0028	0.000849	3,910	0.0031	0.0114	0.601	0.146	1.03
	SC-RSC-06 M-Apr-16	Sand Creek	Muscle	79	<0.0014	7.67	0.0218	<0.31	0.716	<0.0055	0.00064	2,430	0.0066	0.0128	0.161	0.0479	1
	SC-RSC-09 M-Apr-16	Sand Creek	Muscle	79	<0.0017	5.18	0.0285	<0.36	0.293	<0.0065	0.00093	1,580	0.0048	0.0115	0.127	0.0471	0.826
	SC-RSC-10 M-Apr-16	Sand Creek	Muscle	78	<0.0012	8.54	0.0646	<0.27	2.26	<0.0047	0.00141	12,300	0.0185	0.0327	0.109	0.0609	1.13
	SC-RSC-12 M-Apr-16	Sand Creek	Muscle	78	0.00094	3.71	0.0826	0.42	0.507	<0.0032	0.00113	1,210	0.0091	0.0126	0.0791	0.101	1.39
	SC-RSC-15 M-Apr-16	Sand Creek	Muscle	79	0.00089	7.59	0.0573	<0.18	1.68	<0.0032	0.000808	5,970	0.009	0.0233	0.118	0.0841	2.31
	SC-RSC-24 M-Apr-16	Sand Creek	Muscle	79	<0.00061	2.28	0.054	0.2	1.35	<0.0024	0.00125	8,340	0.0054	0.0131	0.0636	0.0795	1.22
	SC-RSC-25 M-Apr-16	Sand Creek	Muscle	80	<0.0012	4.55	0.0715	0.75	1.08	<0.0047	0.00188	1,490	0.0031	0.0186	0.0682	0.104	1.94
	SC-RSC-01 O-Apr-16	Sand Creek	Ovary	77	0.0139	6.25	0.167	<0.23	1.87	<0.0035	0.00113	1,160	0.0184	0.1	0.0749	0.0912	4.73
	SC-RSC-06 O-Apr-16	Sand Creek	Ovary	75	0.0257	2.34	0.0676	<0.25	1.33	<0.0038	0.00044	1,120	0.0118	0.0593	0.0787	0.0339	6.95
	SC-RSC-07 O-Apr-16	Sand Creek	Ovary	75	0.0186	4.81	0.129	0.3	1.2	<0.0042	0.00073	1,250	0.0146	0.116	0.0929	0.0853	4.29
	SC-RSC-09 O-Apr-16	Sand Creek	Ovary	75	0.0268	4.97	0.172	<0.27	0.442	<0.004	0.00107	983	0.0733	0.136	0.0886	0.0332	7.36
	SC-RSC-10 O-Apr-16	Sand Creek	Ovary	73	0.0339	239	0.33	2.09	3.32	<0.0072	0.00273	2,030	0.0866	0.269	0.369	0.0657	7.25
	SC-RSC-12 O-Apr-16	Sand Creek	Ovary	72	0.0387	3.08	0.203	0.19	0.616	<0.0026	0.000461	1,070	0.0715	0.0932	0.0701	0.0538	5.38
	SC-RSC-15 O-Apr-16	Sand Creek	Ovary	75	0.0317	15.1	0.161	0.97	0.99	<0.004	0.00087	1,550	0.031	0.178	0.101	0.0644	7.22
	SC-RSC-22 O-Apr-16	Sand Creek	Ovary	77	0.0195	35.5	0.106	4.73	0.859	<0.012	0.0016	1,470	0.0354	0.114	0.143	0.08	7.83
	SC-RSC-24 O-Apr-16	Sand Creek	Ovary	75	0.0201	7.99	0.257	1.46	1.74	<0.007	0.0015	1,190	0.0583	0.167	0.0817	0.0575	5
	SC-RSC-25 O-Apr-16	Sand Creek	Ovary	74	0.0244	37.7	0.179	0.96	2.28	<0.0048	0.00148	1,330	0.0226	0.159	0.432	0.0738	6.04
	SC-RSC-04 WB-Apr-16	Sand Creek	Whole Body	30	0.00639	64.8	0.325	0.29	6.37	<0.0035	0.00177	40,100	0.0797	0.249	0.154	0.0502	3.17
	SC-RSC-05 WB-Apr-16	Sand Creek	Whole Body	28	0.00327	53.6	0.192	0.274	6.59	<0.0034	0.00302	38,400	0.0849	0.152	0.139	0.0591	2.52
	SC-RSC-14 WB-Apr-16	Sand Creek	Whole Body	30	0.00331	46.3	0.257	0.247	4.96	<0.0035	0.00383	31,200	0.0659	0.152	0.165	0.038	2.77
	SC-RSC-17 WB-Apr-16	Sand Creek	Whole Body	37	0.00303	19.8	0.575	0.303	5.22	<0.0035	0.002	34,700	0.117	0.0897	0.0968	0.0615	2.35
	SC-RSC-18 WB-Apr-16	Sand Creek	Whole Body	32	0.00353	69.3	0.422	0.1935	6.91	0.0034	0.00246	50,350	0.09875	0.2065	0.154	0.06435	2.565
	ER-RSC-04 M-Apr-16	Elk River	Muscle	79	<0.0012	6.88	0.148	0.54	1.42	<0.0047	0.00085	1,280	0.0094	0.0109	0.0586	0.044	2.45
	ER-RSC-05 M-Apr-16	Elk River	Muscle	78	0.0014	6.36	0.0515	0.25	1	<0.0046	0.00156	1,680	0.0062	0.0108	0.36	0.0573	1.33
	ER-RSC-06 M-Apr-16	Elk River	Muscle	79	0.00113	9.32	0.062	0.336	0.645	<0.0034	0.000726	1,490	0.0124	0.0119	0.181	0.0306	1.42
	ER-RSC-07 M-Apr-16	Elk River	Muscle	80	<0.0013	3.09	0.0595	0.68	0.453	<0.0046	0.00131	1,450	0.0039	0.01	0.0813	0.107	0.946
	ER-RSC-09 M-Apr-16	Elk River	Muscle	79	<0.0012	2.34	0.0542	0.87	1.38	<0.0042	0.000802	1,830	0.0078	0.0104	0.296	0.065	1.47
	ER-RSC-11 M-Apr-16	Elk River	Muscle	80	<0.0012	3.89	0.0567	1.28	0.504	<0.0046	0.00132	1,600	0.0055	0.0097	0.0698	0.0853	1.02
	ER-RSC-13 M-Apr-16	Elk River	Muscle	82	0.00125	1.725	0.04405	0.34	1.0735	0.00475	0.00079	2,935	0.0134	0.01145	0.06525	0.04445	1.315
	ER-RSC-14 M-Apr-16	Elk River	Muscle	80	<0.0011	4.27	0.0473	0.38	0.709	<0.0038	0.000858	3,490	0.0023	0.0083	0.0866	0.0907	1.22
	ER-RSC-15 M-Apr-16	Elk River	Muscle	79	<0.0014	8.14	0.0327	0.55	0.515	<0.0048	0.00086	1,670	0.0179	0.0146	0.0905	0.063	0.941
	ER-RSC-16 M-Apr-16	Elk River	Muscle	78	<0.0012	4.41	0.0455	0.56	0.573	<0.0042	0.00152	1,820	0.0138	0.0114	0.127	0.103	1.02
	ER-RSC-04 O-Apr-16	Elk River	Ovary	75	0.0158	6.72	0.157	<0.3	0.82	<0.0087	0.00067	1,120	0.0374	0.0608	0.085	0.0388	6.28
	ER-RSC-05 O-Apr-16	Elk River	Ovary	69	0.0249	6.75	0.216	0.24	1.46	<0.0033	0.000665	876	0.0214	0.0492	0.117	0.0294	4.24
	ER-RSC-06 O-Apr-16	Elk River	Ovary	74	0.0228	5.39	0.152	0.5	0.568	<0.0035	0.000354	1,910	0.0172	0.0792	0.298	0.0208	4.36

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu
				%	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt
2016	ER-RSC-07 O-Apr-16	Elk River	Ovary	76	0.0359	5.63	0.097	0.81	0.803	<0.0066	0.00073	1,710	0.0306	0.0777	0.119	0.0742	7.81
	ER-RSC-09 O-Apr-16	Elk River	Ovary	71	0.0204	2.46	0.124	0.39	0.847	<0.0033	0.000275	876	0.0292	0.069	0.0791	0.0274	4.54
	ER-RSC-11 O-Apr-16	Elk River	Ovary	74	0.038	9.39	0.129	1.29	0.855	<0.0043	0.000828	1,260	0.0213	0.0559	0.094	0.0568	6.11
	ER-RSC-13 O-Apr-16	Elk River	Ovary	74	0.036	1.63	0.0949	0.64	1.11	<0.0048	0.00033	1,080	0.0477	0.0977	0.0663	0.0279	6.31
	ER-RSC-14 O-Apr-16	Elk River	Ovary	76	0.0265	5.39	0.0861	1.27	0.741	<0.0068	0.00055	1,280	0.0086	0.0796	0.0857	0.0629	6.24
	ER-RSC-15 O-Apr-16	Elk River	Ovary	75	0.0468	7.2	0.124	0.75	0.973	<0.005	0.00031	1,550	0.0341	0.0907	0.0845	0.0432	7.74
	ER-RSC-16 O-Apr-16	Elk River	Ovary	72	0.0253	5.18	0.221	0.55	1.03	<0.0044	0.000436	1,100	0.0669	0.0813	0.091	0.0577	4.58
	ER-RSC-01 WB-Apr-16	Elk River	Whole Body	34	0.002085	63.35	0.223	0.7985	5.545	0.00335	0.000997	36,100	0.0551	0.0735	0.1685	0.07385	1.655
	ER-RSC-02 WB-Apr-16	Elk River	Whole Body	24	0.0129	146	0.269	1.88	9.58	0.0076	0.00194	33,300	0.346	0.226	0.275	0.0429	3.26
	ER-RSC-08 WB-Apr-16	Elk River	Whole Body	31	0.00666	27.3	0.268	2.41	5.31	<0.0032	0.00109	35,400	0.167	0.0933	0.12	0.0528	2.38
	ER-RSC-10 WB-Apr-16	Elk River	Whole Body	30	0.00918	96.5	0.201	1.89	10.1	0.0068	0.00139	38,300	0.312	0.156	0.21	0.0325	2.74
	ER-RSC-12 WB-Apr-16	Elk River	Whole Body	32	0.0071	34.6	0.56	2.06	6.08	<0.0032	0.00105	34,900	0.115	0.111	0.121	0.0691	2.66
	GC-RSC-08 M-Apr-16	Gold Creek	Muscle	77	0.0016	10	0.0701	0.8	1.05	<0.0052	0.0009	1,400	0.0026	0.0138	0.08	0.0371	2.29
	GC-RSC-09 M-Apr-16	Gold Creek	Muscle	79	<0.0017	17	0.0728	0.28	2.33	<0.0065	0.00278	2,320	0.0049	0.0159	0.13	0.0303	2.15
	GC-RSC-10 M-Apr-16	Gold Creek	Muscle	81	<0.0012	8.67	0.0686	0.26	0.826	<0.0045	0.00139	1,590	0.002	0.0147	0.0961	0.0806	1.5
	GC-RSC-11 M-Apr-16	Gold Creek	Muscle	80	<0.001	3.66	0.0533	0.2	2.14	<0.0039	0.00309	8,230	0.0241	0.0336	0.064	0.0821	1.29
	GC-RSC-12 M-Apr-16	Gold Creek	Muscle	80	<0.0012	12.7	0.0553	<0.15	0.625	<0.0046	0.00159	1,690	0.0058	0.0126	0.0609	0.065	1
	GC-RSC-13 M-Apr-16	Gold Creek	Muscle	83	0.0018	21	0.0593	0.44	1.88	<0.006	0.00184	1,320	0.0084	0.0222	0.233	0.0366	2.35
	GC-RSC-14 M-Apr-16	Gold Creek	Muscle	78	<0.0013	11	0.096	<0.16	2.69	<0.0048	0.00218	13,400	0.0098	0.0193	0.109	0.0306	1.9
	GC-RSC-16 M-Apr-16	Gold Creek	Muscle	78	0.00123	6.05	0.0977	0.265	2.47	<0.0023	0.000956	11,700	0.0258	0.0351	0.0732	0.0439	1.9
	GC-RSC-03 M-Apr-16	Gold Creek	Muscle	80	<0.0015	6.69	0.0362	0.42	0.586	<0.0058	0.00223	2,490	0.0037	0.0104	0.0864	0.0915	1.08
	GC-RSC-07 M-Apr-16	Gold Creek	Muscle	81	<0.00083	6.2	0.0405	0.27	1.61	<0.0032	0.00692	3,390	0.0033	0.0136	0.0826	0.0616	1.49
	GC-RSC-03 O-Apr-16	Gold Creek	Ovary	77	0.0263	6.9	0.0724	1.31	1.26	<0.015	0.00157	1,260	0.0441	0.0653	0.073	0.0611	6.29
	GC-RSC-07 O-Apr-16	Gold Creek	Ovary	77	0.0135	11.5	0.114	0.186	2.38	<0.0086	0.00328	1,490	0.0161	0.0704	0.082	0.0457	5.49
	GC-RSC-08 O-Apr-16	Gold Creek	Ovary	73	0.0324	684	3.57	1.26	8.72	<0.027	0.00932	3,390	2.02	0.264	0.69	0.0903	16.2
	GC-RSC-09 O-Apr-16	Gold Creek	Ovary	78	0.0096	16.1	0.095	0.72	2.11	<0.023	0.00091	1,420	0.0215	0.0973	0.084	0.0288	4.59
	GC-RSC-10 O-Apr-16	Gold Creek	Ovary	75	0.0197	9.82	0.201	0.166	0.559	<0.012	0.00067	1,400	0.0266	0.0891	0.122	0.0703	5.51
	GC-RSC-11 O-Apr-16	Gold Creek	Ovary	77	0.0166	5.52	0.16	0.41	1.25	<0.013	0.00096	1,330	0.0278	0.0955	0.088	0.0567	4.93
	GC-RSC-12 O-Apr-16	Gold Creek	Ovary	75	0.0287	35.2	0.208	0.594	1.65	<0.0061	0.000931	1,800	0.338	0.132	0.151	0.0475	7.79
	GC-RSC-13 O-Apr-16	Gold Creek	Ovary	70	0.0161	1.08	0.0944	0.154	0.407	<0.0048	0.000302	630	0.0041	0.0505	0.074	0.0162	3.64
	GC-RSC-14 O-Apr-16	Gold Creek	Ovary	71	0.026	6.58	0.253	0.602	0.515	<0.0048	0.00128	851	0.0596	0.0674	0.066	0.0194	5.03
	GC-RSC-16 O-Apr-16	Gold Creek	Ovary	75	0.0223	8.68	0.115	0.706	1.13	<0.0089	0.00058	1,390	0.0179	0.088	0.067	0.0338	5.31
	GC-RSC-01 WB-Apr-16	Gold Creek	Whole Body	33	0.00369	17.8	0.248	0.154	4.93	<0.0033	0.00101	35,900	0.146	0.049	0.105	0.0469	1.87
	GC-RSC-02 WB-Apr-16	Gold Creek	Whole Body	31	0.00274	42.2	0.438	0.363	6.29	<0.0034	0.000997	34,500	0.0793	0.0752	0.149	0.0372	2.11
	GC-RSC-04 WB-Apr-16	Gold Creek	Whole Body	37	0.00407	33	0.203	0.472	5.73	<0.0035	0.00175	36,500	0.152	0.109	0.116	0.0361	2.39
	GC-RSC-05 WB-Apr-16	Gold Creek	Whole Body	25	0.00271	30.5	0.395	0.224	5.44	<0.0034	0.00102	43,900	0.0426	0.11	0.134	0.0728	2.31
	GC-RSC-15 WB-Apr-16	Gold Creek	Whole Body	33	0.00309	29	0.533	0.139	6.14	<0.0035	0.0009	39,100	0.135	0.153	0.112	0.0614	2.23

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dry wt	Ga µg/g dry wt	Hg µg/g dry wt	K µg/g dry wt	Li µg/g dry wt	Mg µg/g dry wt	Mn µg/g dry wt	Mo µg/g dry wt	Na µg/g dry wt	Ni µg/g dry wt	P µg/g dry wt	Pb µg/g dry wt
2015	SC-RSC-03-Apr-15	Sand Creek	Muscle	20.9	0.00540	0.349	20,200	<0.0078	1,310	1.11	0.01	719	0.0138	10,200	0.00442
	SC-RSC-04-Apr-15	Sand Creek	Muscle	24.5	0.00683	0.376	19,100	<0.0068	1,280	1.46	0.01	987	0.0194	9,740	0.13200
	SC-RSC-06-Apr-15	Sand Creek	Muscle	16.7	0.00590	0.379	18,800	<0.016	1,360	1.60	0.01	1,020	0.0214	9,710	0.04330
	SC-RSC-07-Apr-15	Sand Creek	Muscle	27.3	0.00818	0.334	20,000	0.0129	1,410	1.57	0.01	1,080	0.0314	10,200	0.06830
	SC-RSC-08-Apr-15	Sand Creek	Muscle	45.2	0.01190	0.622	17,700	<0.035	1,170	1.69	0.01	1,730	0.0419	8,240	0.12500
	SC-RSC-09-Apr-15	Sand Creek	Muscle	23.2	0.00833	0.341	20,600	0.0075	1,420	1.62	0.01	984	0.0453	11,500	0.06420
	SC-RSC-03-Apr-15	Sand Creek	Ovary	149	0.00910	0.0499	13,700	<0.013	1,200	11.10	0.22	1,830	0.357	11,300	0.00667
	SC-RSC-04-Apr-15	Sand Creek	Ovary	110	0.00600	0.0272	11,700	<0.0083	1,100	4.24	0.19	2,000	0.0176	9,200	0.0460
	SC-RSC-06-Apr-15	Sand Creek	Ovary	96.8	0.00630	0.0289	11,000	<0.0093	1,200	6.21	0.17	2,000	0.0225	9,770	0.0159
	SC-RSC-07-Apr-15	Sand Creek	Ovary	112	0.00680	0.0326	12,400	<0.0076	1,140	11.70	0.18	1,790	0.0196	9,850	0.0147
	SC-RSC-08-Apr-15	Sand Creek	Ovary	136	0.0165	0.0653	14,100	<0.045	1,400	11.60	0.20	1,980	0.0530	12,000	0.0913
	SC-RSC-09-Apr-15	Sand Creek	Ovary	91.2	0.00770	0.0289	10,700	<0.0058	1,060	8.74	0.12	1,830	0.0225	9,520	0.0119
	SC-RSC-01-Apr-15	Sand Creek	Whole Body	115	0.0478	0.198	13,500	0.111	1,520	9.16	0.04	2,370	0.286	28,000	0.228
	SC-RSC-05-Apr-15	Sand Creek	Whole Body	36.5	0.0172	0.198	12,600	0.0404	1,400	7.35	0.03	2,330	0.138	30,100	0.0341
	ER-RSC-02-Apr-15	Elk River	Muscle	34.6	0.00930	0.577	20,700	0.0291	1,280	1.26	0.02	1,430	0.0324	9,930	0.01420
	ER-RSC-04-Apr-15	Elk River	Muscle	26.2	0.00727	0.253	17,900	0.0188	1,230	1.61	0.01	962	0.0291	9,850	0.01590
	ER-RSC-07-Apr-15	Elk River	Muscle	32.7	0.01090	0.419	17,100	0.0339	1,240	1.61	0.02	1,020	0.1540	9,560	0.12600
	ER-RSC-08-Apr-15	Elk River	Muscle	32.2	0.00873	0.518	20,200	0.0276	1,240	1.750	0.0140	1,330	0.0202	11,200	0.02110
	ER-RSC-09-Apr-15	Elk River	Muscle	24.8	0.01270	0.615	20,700	0.0202	1,310	2.130	0.0117	1,400	0.0288	11,900	0.02560
	ER-RSC-10-Apr-15	Elk River	Muscle	30.1	0.00930	0.840	20,600	0.0165	1,320	1.480	0.0136	1,220	0.0238	11,600	0.02560
	ER-RSC-11-Apr-15	Elk River	Muscle	19.5	0.00780	0.477	16,900	<0.028	1,240	1.090	0.0208	1,360	0.0220	8,930	0.04880
	ER-RSC-13-Apr-15	Elk River	Muscle	19.4	0.00720	0.693	21,400	0.0141	1,270	1.050	0.0126	1,030	0.0321	10,900	0.01100
	ER-RSC-15-Apr-15	Elk River	Muscle	17.1	0.00940	0.453	19,300	0.0117	1,320	1.560	0.0136	901	0.0621	10,300	0.07780
	ER-RSC-16-Apr-15	Elk River	Muscle	18.8	0.00740	0.343	20,800	0.0109	1,280	1.240	0.0176	1,190	0.0193	10,900	0.04700
	ER-RSC-02-Apr-15	Elk River	Ovary	166	0.0117	0.0453	12,500	0.0352	1,210	9.71	0.160	1,770	0.0386	11,400	0.0289
	ER-RSC-04-Apr-15	Elk River	Ovary	115	0.00930	0.0187	11,400	0.0235	1,290	16.8	0.158	1,720	0.0285	10,500	0.0914
	ER-RSC-07-Apr-15	Elk River	Ovary	144	0.00720	0.0378	12,300	0.0208	1,100	4.63	0.188	1,300	0.0356	11,200	0.0360
	ER-RSC-08-Apr-15	Elk River	Ovary	261	0.0212	0.0392	14,300	0.0599	1,240	7.60	0.188	2,900	0.0732	12,300	0.117
	ER-RSC-09-Apr-15	Elk River	Ovary	190	0.0328	0.0701	13,500	0.0578	954	4.07	0.127	3,270	0.0710	13,500	0.0729
	ER-RSC-10-Apr-15	Elk River	Ovary	106	0.00740	0.0564	11,900	0.0210	1,130	3.77	0.197	1,690	0.0236	10,400	0.0140
	ER-RSC-11-Apr-15	Elk River	Ovary	233	0.00770	0.0355	13,900	0.0266	962	2.66	0.113	2,050	0.0432	12,600	0.0723
	ER-RSC-13-Apr-15	Elk River	Ovary	122	0.00480	0.0510	12,700	0.0198	1,080	5.91	0.198	1,600	0.0348	11,100	0.0116
	ER-RSC-15-Apr-15	Elk River	Ovary	166	0.0218	0.0362	12,900	0.0415	1,300	7.80	0.195	1,880	0.0635	10,500	0.0339
	ER-RSC-16-Apr-15	Elk River	Ovary	140	0.00500	0.0325	12,200	0.0145	1,200	8.70	0.168	1,790	0.0204	9,900	0.0263
	ER-RSC-05-Apr-15	Elk River	Whole Body	57.7	0.0217	0.387	12,900	0.0816	1,710	13	0.0295	3,680	0.151	41,300	0.0734
	ER-RSC-12-Apr-15	Elk River	Whole Body	68.4	0.0183	0.338	14,100	0.118	1,460	6.96	0.0377	3,080	0.13	31,300	0.0555
	ER-RSC-14-Apr-15	Elk River	Whole Body	54.7	0.022	0.292	11,800	0.127	1,680	14.9	0.0459	3,240	0.167	45,300	0.0365
	GC-RSC-01-Apr-15	Gold Creek	Muscle	30.6	0.00771	0.451	18,800	0.0136	1,270	1.280	0.0076	1,580	0.0165	9,220	0.00933
	GC-RSC-05-Apr-15	Gold Creek	Muscle	38.1	0.00880	0.604	17,600	0.0260	1,210	1.560	0.0148	1,140	0.0294	9,890	0.02530
	GC-RSC-07-Apr-15	Gold Creek	Muscle	9.1	0.00600	0.416	21,300	0.0101	1,380	1.420	0.0054	1,140	0.0216	11,700	0.00637
	GC-RSC-08-Apr-15	Gold Creek	Muscle	14.3	0.00648	0.558	20,600	0.0081	1,290	1.320	0.0043	1,220	0.0162	10,500	0.00714
	GC-RSC-10-Apr-15	Gold Creek	Muscle	31.8	0.00702	0.535	21,600	0.0107	1,220	1.300	0.0105	1,560	0.0190	11,600	0.00735
	GC-RSC-01-Apr-15	Gold Creek	Ovary	148	0.0107	0.0355	13,200	0.0167	1,330	8.84	0.203	1,480	0.0387	11,100	0.0153

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dry wt	Ga µg/g dry wt	Hg µg/g dry wt	K µg/g dry wt	Li µg/g dry wt	Mg µg/g dry wt	Mn µg/g dry wt	Mo µg/g dry wt	Na µg/g dry wt	Ni µg/g dry wt	P µg/g dry wt	Pb µg/g dry wt
2015	GC-RSC-05-Apr-15	Gold Creek	Ovary	211	0.0144	0.0562	12,100	0.0250	1,260	8.14	0.148	1,670	0.0360	10,900	0.0225
	GC-RSC-07-Apr-15	Gold Creek	Ovary	199	0.0130	0.0373	12,800	<0.017	1,030	5.46	0.114	4,690	0.0265	12,100	0.0166
	GC-RSC-08-Apr-15	Gold Creek	Ovary	124	0.00832	0.0501	13,800	0.0113	1,250	5.92	0.212	2,850	0.0159	10,500	0.00466
	GC-RSC-10-Apr-15	Gold Creek	Ovary	289	0.0201	0.0832	12,700	0.0273	1,160	6.09	0.188	3,240	0.0740	11,500	0.0762
2016	SC-RSC-07 M-Apr-16	Sand Creek	Muscle	20.8	0.008	0.311	15,300	0.0188	1,320	5.02	0.00709	1,670	0.079	16,100	0.0166
	SC-RSC-22 M-Apr-16	Sand Creek	Muscle	20.5	0.0092	0.237	17,200	0.013	1,390	1.85	0.0104	1,620	0.0313	11,000	0.0127
	SC-RSC-01 M-Apr-16	Sand Creek	Muscle	29.4	0.0101	0.533	20,100	0.0181	1,380	1.8	0.0073	1,190	0.0684	11,200	0.0259
	SC-RSC-06 M-Apr-16	Sand Creek	Muscle	17.5	0.0109	0.235	19,700	<0.014	1,520	1.79	0.0028	1,230	0.0451	10,600	0.0146
	SC-RSC-09 M-Apr-16	Sand Creek	Muscle	14.3	0.0071	0.287	17,900	<0.016	1,520	1.62	<0.0031	1,280	0.0409	9,310	0.00858
	SC-RSC-10 M-Apr-16	Sand Creek	Muscle	25.8	0.0114	0.296	16,400	0.025	1,480	3.96	0.0087	1,440	0.0471	14,400	0.014
	SC-RSC-12 M-Apr-16	Sand Creek	Muscle	21.8	0.00824	0.331	18,900	<0.0082	1,350	1.06	0.0056	1,370	0.0143	9,680	0.00496
	SC-RSC-15 M-Apr-16	Sand Creek	Muscle	30.7	0.00791	0.276	17,700	0.0172	1,350	2.59	0.0085	1,310	0.0306	11,800	0.00942
	SC-RSC-24 M-Apr-16	Sand Creek	Muscle	14	0.00855	0.273	19,800	0.0146	1,430	2.29	0.0054	1,310	0.0317	13,500	0.0119
	SC-RSC-25 M-Apr-16	Sand Creek	Muscle	23.8	0.0067	0.304	18,100	<0.012	1,360	1.53	0.0065	1,430	0.0244	9,720	0.0122
	SC-RSC-01 O-Apr-16	Sand Creek	Ovary	142	0.008	0.0464	12,600	<0.0095	1,210	6.58	0.128	1,950	0.0659	10,800	0.0206
	SC-RSC-06 O-Apr-16	Sand Creek	Ovary	120	0.0072	0.0283	12,600	<0.01	1,330	10.2	0.228	2,160	0.0496	10,200	0.00342
	SC-RSC-07 O-Apr-16	Sand Creek	Ovary	148	0.006	0.0344	12,700	<0.011	1,250	8.98	0.146	2,440	0.0463	10,200	0.0148
	SC-RSC-09 O-Apr-16	Sand Creek	Ovary	130	0.0078	0.0331	13,000	<0.011	1,400	11.3	0.236	2,020	0.0405	11,000	0.00902
	SC-RSC-10 O-Apr-16	Sand Creek	Ovary	286	0.0984	0.0391	12,200	0.197	1,320	16.3	0.214	1,990	0.174	10,400	0.116
	SC-RSC-12 O-Apr-16	Sand Creek	Ovary	101	0.00606	0.0198	11,000	<0.007	980	10.3	0.153	1,750	0.0236	9,780	0.0172
	SC-RSC-15 O-Apr-16	Sand Creek	Ovary	125	0.0112	0.0272	12,300	0.018	1,300	17.3	0.186	2,050	0.0507	10,200	0.0176
	SC-RSC-22 O-Apr-16	Sand Creek	Ovary	141	0.0174	0.0267	14,600	<0.033	1,390	9.41	0.277	2,090	0.061	11,100	0.0414
	SC-RSC-24 O-Apr-16	Sand Creek	Ovary	145	0.0089	0.0261	13,400	<0.019	1,130	10.8	0.117	1,750	0.056	10,600	0.0258
	SC-RSC-25 O-Apr-16	Sand Creek	Ovary	149	0.0188	0.0305	11,800	0.042	1,430	14	0.238	1,900	0.0724	9,510	0.0338
	SC-RSC-04 WB-Apr-16	Sand Creek	Whole Body	111	0.0341	0.162	12,400	0.102	1,440	14.1	0.0513	2,930	0.183	27,800	0.0616
	SC-RSC-05 WB-Apr-16	Sand Creek	Whole Body	81.2	0.0304	0.15	12,300	0.101	1,400	10.4	0.0407	2,940	0.161	26,500	0.069
	SC-RSC-14 WB-Apr-16	Sand Creek	Whole Body	85.8	0.0269	0.199	12,300	0.0688	1,350	9.7	0.0371	2,760	0.128	23,600	0.0532
	SC-RSC-17 WB-Apr-16	Sand Creek	Whole Body	79.6	0.0188	0.233	13,000	0.0605	1,390	9.39	0.0507	3,160	0.108	25,600	0.0299
	SC-RSC-18 WB-Apr-16	Sand Creek	Whole Body	93.8	0.0371	0.2025	11,550	0.1295	1,460	11.85	0.05155	2,885	0.192	32,300	0.0549
	ER-RSC-04 M-Apr-16	Elk River	Muscle	27.8	0.0066	0.218	14,300	0.01	1,080	1.24	0.00805	1,050	0.0469	9,090	0.00894
	ER-RSC-05 M-Apr-16	Elk River	Muscle	19.2	0.0087	0.361	17,600	0.0153	1,400	1.79	0.00621	977	0.058	10,600	0.0282
	ER-RSC-06 M-Apr-16	Elk River	Muscle	22.5	0.0069	0.224	17,000	0.0136	1,330	1.49	0.0065	917	0.0444	9,400	0.0489
	ER-RSC-07 M-Apr-16	Elk River	Muscle	18	0.0052	0.385	18,800	<0.013	1,390	1.46	0.0051	1,060	0.052	9,660	0.0134
	ER-RSC-09 M-Apr-16	Elk River	Muscle	20.3	0.0068	0.275	18,900	<0.012	1,360	1.32	0.007	1,120	0.0473	10,400	0.00758
	ER-RSC-11 M-Apr-16	Elk River	Muscle	17.6	0.0055	0.322	16,200	0.011	1,360	1.76	0.00415	1,320	0.0653	10,000	0.0262
	ER-RSC-13 M-Apr-16	Elk River	Muscle	17.6	0.00685	0.309	17,850	0.014	1,365	2.285	0.006785	1,075	0.0484	11,700	0.009045
	ER-RSC-14 M-Apr-16	Elk River	Muscle	23.8	0.0058	0.374	17,200	0.017	1,370	1.85	0.0033	1,210	0.0472	10,600	0.0112
	ER-RSC-15 M-Apr-16	Elk River	Muscle	16	0.0093	0.327	18,100	0.023	1,370	1.59	0.0039	1,100	0.0464	9,700	0.0171
	ER-RSC-16 M-Apr-16	Elk River	Muscle	16.7	0.0065	0.307	18,000	0.017	1,390	1.37	0.0072	994	0.0519	9,680	0.0219
	ER-RSC-04 O-Apr-16	Elk River	Ovary	102	0.0042	0.0273	12,000	<0.03	1,270	13.2	0.226	1,940	0.0483	9,580	0.0129
	ER-RSC-05 O-Apr-16	Elk River	Ovary	84.8	0.00809	0.0267	8,990	0.015	798	10.3	0.0972	1,560	0.0307	10,700	0.0172
	ER-RSC-06 O-Apr-16	Elk River	Ovary	103	0.0062	0.0207	11,300	0.02	912	8.5	0.159	2,280	0.0468	9,860	0.0133

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dry wt	Ga µg/g dry wt	Hg µg/g dry wt	K µg/g dry wt	Li µg/g dry wt	Mg µg/g dry wt	Mn µg/g dry wt	Mo µg/g dry wt	Na µg/g dry wt	Ni µg/g dry wt	P µg/g dry wt	Pb µg/g dry wt
2016	ER-RSC-07 O-Apr-16	Elk River	Ovary	164	0.0089	0.035	13,100	<0.023	1,100	7.03	0.138	2,820	0.133	10,900	0.0153
	ER-RSC-09 O-Apr-16	Elk River	Ovary	89	0.00514	0.0232	9,260	0.013	978	8.3	0.139	1,730	0.0365	10,100	0.00687
	ER-RSC-11 O-Apr-16	Elk River	Ovary	99.3	0.00952	0.0304	10,900	0.017	1,040	10	0.197	2,230	0.0542	9,530	0.0319
	ER-RSC-13 O-Apr-16	Elk River	Ovary	110	0.00491	0.0251	10,900	<0.016	1,110	7.52	0.133	2,040	0.0359	9,890	0.00516
	ER-RSC-14 O-Apr-16	Elk River	Ovary	114	0.007	0.0283	13,600	<0.023	1,320	6.36	0.202	2,350	0.0371	10,500	0.0204
	ER-RSC-15 O-Apr-16	Elk River	Ovary	113	0.0086	0.0253	11,700	0.032	1,130	12.6	0.165	2,240	0.046	9,620	0.00717
	ER-RSC-16 O-Apr-16	Elk River	Ovary	120	0.00657	0.0216	10,100	0.017	948	8.29	0.152	1,740	0.045	8,220	0.00717
	ER-RSC-01 WB-Apr-16	Elk River	Whole Body	83.85	0.03195	0.196	12,600	0.1135	1,405	9.425	0.04465	3,055	0.15	25,350	0.09445
	ER-RSC-02 WB-Apr-16	Elk River	Whole Body	144	0.0577	0.177	11,700	0.183	1,360	13.7	0.0713	2,900	0.284	23,900	0.272
	ER-RSC-08 WB-Apr-16	Elk River	Whole Body	64	0.0203	0.179	10,500	0.0961	1,250	8.38	0.0434	2,840	0.153	24,900	0.0412
	ER-RSC-10 WB-Apr-16	Elk River	Whole Body	123	0.0472	0.159	13,000	0.187	1,450	12.2	0.0838	3,570	0.23	27,300	0.0913
	ER-RSC-12 WB-Apr-16	Elk River	Whole Body	70.2	0.0218	0.197	11,500	0.0942	1,350	7.64	0.0475	3,170	0.14	25,600	0.0801
	GC-RSC-08 M-Apr-16	Gold Creek	Muscle	34.5	0.0091	0.278	16,200	0.012	1,300	1.65	0.0055	868	0.0251	9,160	0.0134
	GC-RSC-09 M-Apr-16	Gold Creek	Muscle	32.4	0.0109	0.288	18,200	0.023	1,430	1.93	0.0075	928	0.037	10,200	0.0251
	GC-RSC-10 M-Apr-16	Gold Creek	Muscle	20	0.0071	0.411	15,700	0.0136	1,350	1.36	0.00438	1,080	0.0289	8,840	0.0212
	GC-RSC-11 M-Apr-16	Gold Creek	Muscle	20.2	0.01	0.565	18,700	0.0137	1,420	2.21	0.00708	1,310	0.0343	13,300	0.00635
	GC-RSC-12 M-Apr-16	Gold Creek	Muscle	19.1	0.0109	0.357	16,700	0.014	1,190	1.61	0.00759	875	0.035	9,760	0.0989
	GC-RSC-13 M-Apr-16	Gold Creek	Muscle	45.5	0.0125	0.364	16,700	0.02	1,260	1.85	0.0113	1,300	0.0693	10,200	0.0553
	GC-RSC-14 M-Apr-16	Gold Creek	Muscle	36.1	0.0109	0.354	15,900	0.032	1,410	4.21	0.0072	1,240	0.0712	15,200	0.0193
	GC-RSC-16 M-Apr-16	Gold Creek	Muscle	23.9	0.0119	0.341	16,400	0.019	1,320	3.48	0.00931	1,180	0.051	14,300	0.0102
	GC-RSC-03 M-Apr-16	Gold Creek	Muscle	18	0.0138	0.37	19,100	<0.015	1,450	1.55	<0.0028	1,560	0.0314	9,900	0.0172
	GC-RSC-07 M-Apr-16	Gold Creek	Muscle	41	0.00791	0.694	20,400	0.0137	1,400	1.46	0.0059	1,260	0.0304	11,200	0.011
	GC-RSC-03 O-Apr-16	Gold Creek	Ovary	121	0.009	0.0311	12,800	<0.02	1,390	8.79	0.132	1,800	0.0347	10,200	0.0415
	GC-RSC-07 O-Apr-16	Gold Creek	Ovary	132	0.01	0.0557	13,200	0.018	1,100	4.93	0.159	2,140	0.0308	10,100	0.0135
	GC-RSC-08 O-Apr-16	Gold Creek	Ovary	676	0.26	0.0945	7,140	0.547	1,220	20.4	0.351	5,270	0.398	8,220	0.234
	GC-RSC-09 O-Apr-16	Gold Creek	Ovary	134	0.013	0.0272	17,100	<0.031	1,190	9.68	0.148	2,620	0.0343	11,900	0.0146
	GC-RSC-10 O-Apr-16	Gold Creek	Ovary	148	0.0097	0.0539	13,600	0.019	1,220	8.66	0.189	2,420	0.0275	11,000	0.0139
	GC-RSC-11 O-Apr-16	Gold Creek	Ovary	180	0.0094	0.0442	13,900	<0.018	1,210	5.64	0.149	2,280	0.0227	10,800	0.0092
	GC-RSC-12 O-Apr-16	Gold Creek	Ovary	156	0.0154	0.0296	11,700	0.032	1,310	12.3	0.196	2,840	0.0534	9,640	0.0226
	GC-RSC-13 O-Apr-16	Gold Creek	Ovary	77.1	0.00619	0.0229	9,450	<0.0065	883	5.97	0.107	1,690	0.0138	10,200	0.00357
	GC-RSC-14 O-Apr-16	Gold Creek	Ovary	85.3	0.00751	0.0321	9,210	0.0093	855	6.12	0.107	1,570	0.0239	9,270	0.00914
	GC-RSC-16 O-Apr-16	Gold Creek	Ovary	126	0.0081	0.0338	13,000	0.013	1,210	10.7	0.14	2,170	0.0264	9,830	0.0082
	GC-RSC-01 WB-Apr-16	Gold Creek	Whole Body	64.3	0.0191	0.145	12,200	0.0649	1,290	13.6	0.0406	2,670	0.119	25,200	0.0579
	GC-RSC-02 WB-Apr-16	Gold Creek	Whole Body	77.3	0.0244	0.199	11,400	0.102	1,300	7.53	0.0435	2,320	0.12	24,600	0.059
	GC-RSC-04 WB-Apr-16	Gold Creek	Whole Body	71.3	0.0234	0.232	12,300	0.116	1,510	6.31	0.0496	3,060	0.114	26,200	0.0401
	GC-RSC-05 WB-Apr-16	Gold Creek	Whole Body	81.4	0.0247	0.186	12,700	0.0876	1,490	8.91	0.0495	3,080	0.143	29,500	0.134
	GC-RSC-15 WB-Apr-16	Gold Creek	Whole Body	77.1	0.022	0.176	11,000	0.079	1,340	8.39	0.046	2,500	0.114	26,900	0.0423

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Rb µg/g dry wt	Re µg/g dry wt	Sb µg/g dry wt	Se µg/g dry wt	Sn µg/g dry wt	Sr µg/g dry wt	Th µg/g dry wt	Ti µg/g dry wt	Tl µg/g dry wt	U µg/g dry wt	V µg/g dry wt	Y µg/g dry wt	Zn µg/g dry wt	Zr µg/g dry wt
2015	SC-RSC-03-Apr-15	Sand Creek	Muscle	14.6	<0.000032	<0.0013	1.81	<0.00079	1.74	<0.00045	0.1270	0.0260	<0.00025	0.00354	0.00055	54.3	0.0646
	SC-RSC-04-Apr-15	Sand Creek	Muscle	15.0	<0.000028	<0.0011	1.96	0.00153	2.23	0.0005	0.1650	0.0276	0.00058	0.00719	0.00154	81.1	0.0593
	SC-RSC-06-Apr-15	Sand Creek	Muscle	16.4	<0.000067	<0.0027	1.26	<0.0016	2.35	<0.00093	0.1610	0.0204	<0.00053	0.00603	0.00073	35.8	0.0662
	SC-RSC-07-Apr-15	Sand Creek	Muscle	14.8	<0.000035	<0.0014	2.24	0.00251	2.03	0.00196	0.2730	0.0175	0.00071	0.01220	0.00305	54.7	0.0355
	SC-RSC-08-Apr-15	Sand Creek	Muscle	8.1	<0.00015	<0.0058	2.53	<0.0036	1.15	0.0032	0.4390	0.0220	0.00190	0.03560	0.00670	177.0	0.1220
	SC-RSC-09-Apr-15	Sand Creek	Muscle	13.1	0.00003	<0.0011	1.49	0.00590	4.33	0.00116	0.2300	0.0155	0.00079	0.01150	0.00209	46.6	0.0199
	SC-RSC-03-Apr-15	Sand Creek	Ovary	13.3	<0.0000099	<0.0028	27.9	<0.0029	1.16	0.000700	0.133	0.0298	<0.00021	0.00810	0.000920	223	0.0239
	SC-RSC-04-Apr-15	Sand Creek	Ovary	12.6	<0.0000063	<0.0018	15.5	<0.0018	0.777	0.000700	0.145	0.0247	0.000680	0.0119	0.00223	200	0.0279
	SC-RSC-06-Apr-15	Sand Creek	Ovary	12.8	<0.0000070	<0.0020	10.7	<0.0020	2.66	0.000580	0.135	0.0273	0.000180	0.00687	0.00129	158	0.00750
	SC-RSC-07-Apr-15	Sand Creek	Ovary	12.5	<0.0000057	0.00200	29.5	<0.0017	0.526	0.000690	0.149	0.0277	0.000490	0.0112	0.00266	165	0.0116
	SC-RSC-08-Apr-15	Sand Creek	Ovary	8.28	<0.0000340	<0.0096	26.7	<0.0098	0.968	0.00550	0.457	0.0374	0.00509	0.0460	0.00860	342	0.0617
	SC-RSC-09-Apr-15	Sand Creek	Ovary	9.44	<0.0000044	0.00470	15.1	0.00240	0.465	0.000560	0.167	0.0252	0.000326	0.00737	0.00171	156	0.00614
	SC-RSC-01-Apr-15	Sand Creek	Whole Body	11.4	0.0000286	0.00777	2.95	0.0156	45.5	0.026	1.88	0.0147	0.00784	0.159	0.036	139	0.0666
	SC-RSC-05-Apr-15	Sand Creek	Whole Body	10.2	<0.0000031	0.00234	2.81	0.00287	47.9	0.000992	0.139	0.02	0.00267	0.0128	0.00287	132	0.0243
	ER-RSC-02-Apr-15	Elk River	Muscle	14.5	<0.000045	0.0024	1.99	0.00305	1.53	0.00501	0.2980	0.0244	0.00084	0.02660	0.00672	81.1	0.0106
	ER-RSC-04-Apr-15	Elk River	Muscle	12.5	<0.000034	0.0018	2.92	0.00264	2.74	0.00169	0.2450	0.0220	0.00097	0.01800	0.00378	58.5	0.0085
	ER-RSC-07-Apr-15	Elk River	Muscle	12.5	<0.000035	0.0063	2.34	0.00797	3.64	0.00444	0.5220	0.0291	0.00164	0.04300	0.00744	42.1	0.0255
	ER-RSC-08-Apr-15	Elk River	Muscle	7.1	<0.000031	0.0011	6.23	0.00137	3.76	0.00242	0.3230	0.0151	0.00088	0.02050	0.00389	68.5	0.0074
	ER-RSC-09-Apr-15	Elk River	Muscle	16.0	0.0000537	0.0023	1.56	<0.0012	5.30	0.0037	0.4050	0.0177	0.00159	0.04940	0.00975	40.4	0.0282
	ER-RSC-10-Apr-15	Elk River	Muscle	10.3	0.0000222	0.0018	2.07	<0.0012	5.25	0.00146	0.3210	0.0080	0.00106	0.01930	0.00297	47.9	0.0125
	ER-RSC-11-Apr-15	Elk River	Muscle	6.4	0.000315	<0.0061	4.04	<0.0062	1.86	0.00096	0.3060	0.0138	0.00066	0.01530	0.00440	55.2	0.0217
	ER-RSC-13-Apr-15	Elk River	Muscle	19.4	0.0000288	0.0015	1.6	0.00130	2.22	0.000777	0.1590	0.0176	0.00035	0.00908	0.00185	40.3	0.0142
	ER-RSC-15-Apr-15	Elk River	Muscle	15.2	0.0000052	0.0018	2.08	0.01570	1.78	0.00143	0.1810	0.0219	0.00068	0.01620	0.00253	42.1	0.0200
	ER-RSC-16-Apr-15	Elk River	Muscle	16.0	0.0000251	0.0017	2.11	0.00230	2.62	0.00068	0.1080	0.0331	0.00048	0.00937	0.00128	43.6	0.0269
	ER-RSC-02-Apr-15	Elk River	Ovary	10.5	<0.000060	0.00151	9.78	0.00290	0.999	0.00375	0.548	0.0504	0.00171	0.0479	0.00972	224	0.0156
	ER-RSC-04-Apr-15	Elk River	Ovary	10.3	<0.000080	0.00610	15.2	0.00340	0.734	0.00239	0.385	0.0404	0.000860	0.0323	0.00718	202	0.0236
	ER-RSC-07-Apr-15	Elk River	Ovary	11.0	<0.000051	0.00169	17.7	0.00419	0.675	0.00194	0.338	0.0435	0.00174	0.0264	0.00499	227	0.0139
	ER-RSC-08-Apr-15	Elk River	Ovary	6.27	<0.000065	0.00271	77.9	0.00650	0.905	0.0102	1.21	0.0265	0.00473	0.111	0.0235	221	0.0353
	ER-RSC-09-Apr-15	Elk River	Ovary	13.4	<0.000090	0.00210	8.96	0.00680	2.24	0.0151	1.60	0.0350	0.00760	0.179	0.0386	278	0.0399
	ER-RSC-10-Apr-15	Elk River	Ovary	7.90	<0.000036	0.000870	15.1	0.00120	0.638	0.00120	0.187	0.0154	0.00123	0.0155	0.00361	210	0.00560
	ER-RSC-11-Apr-15	Elk River	Ovary	6.66	<0.000081	0.00260	34.2	<0.0014	1.19	0.00145	0.202	0.0461	0.00396	0.0196	0.00874	264	0.0100
	ER-RSC-13-Apr-15	Elk River	Ovary	14.9	<0.000036	0.000730	7.95	0.000850	0.665	0.000616	0.131	0.0391	0.000450	0.0141	0.00136	231	0.00660
	ER-RSC-15-Apr-15	Elk River	Ovary	12.6	<0.000059	0.00251	13.7	0.00420	0.661	0.0118	1.18	0.0492	0.00289	0.122	0.0260	170	0.0274
	ER-RSC-16-Apr-15	Elk River	Ovary	13.1	<0.000092	<0.0012	16.6	0.00240	0.737	0.00135	0.236	0.0520	<0.00083	0.0150	0.00270	156	0.00600
	ER-RSC-05-Apr-15	Elk River	Whole Body	9.96	<0.000052	0.00284	3.85	0.00295	73.2	0.00183	0.288	0.0161	0.00505	0.0269	0.00706	177	0.023
	ER-RSC-12-Apr-15	Elk River	Whole Body	10.1	<0.000053	0.00253	4.28	0.00223	49.3	0.00231	0.463	0.0107	0.0046	0.0428	0.00792	146	0.0357
	ER-RSC-14-Apr-15	Elk River	Whole Body	8.93	<0.000047	0.00159	4.05	0.00168	79.6	0.00105	0.293	0.0207	0.00446	0.0408	0.00464	148	0.0204
	GC-RSC-01-Apr-15	Gold Creek	Muscle	17.0	<0.000037	0.0007	1.82	0.00365	1.10	0.00238	0.4530	0.0390	0.00047	0.01630	0.00535	70.1	0.0128
	GC-RSC-05-Apr-15	Gold Creek	Muscle	21.1	<0.000076	0.0032	1.92	0.00390	3.55	0.00164	0.3420	0.0266	0.00133	0.01310	0.00360	82.5	0.0143
	GC-RSC-07-Apr-15	Gold Creek	Muscle	17.0	<0.000039	0.0016	2.07	0.00127	4.39	0.000141	0.1500	0.0162	0.00037	0.00341	0.00076	24.4	0.0852
	GC-RSC-08-Apr-15	Gold Creek	Muscle	11.8	<0.000033	0.0018	1.41	0.00365	2.88	0.00105	0.1370	0.0092	0.00030	0.00485	0.00111	29.8	0.0076
	GC-RSC-10-Apr-15	Gold Creek	Muscle	19.2	<0.000033	0.0014	1.8	0.00155	3.56	0.00107	0.2280	0.0322	0.00040	0.00966	0.00169	59.9	0.0110
	GC-RSC-01-Apr-15	Gold Creek	Ovary	15.8	<0.000055	0.00178	8.42	0.00327	0.604	0.00419	0.569	0.0840	0.00127	0.0256	0.00951	219	0.0151

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Rb µg/g dry wt	Re µg/g dry wt	Sb µg/g dry wt	Se µg/g dry wt	Sn µg/g dry wt	Sr µg/g dry wt	Th µg/g dry wt	Ti µg/g dry wt	Tl µg/g dry wt	U µg/g dry wt	V µg/g dry wt	Y µg/g dry wt	Zn µg/g dry wt	Zr µg/g dry wt
2015	GC-RSC-05-Apr-15	Gold Creek	Ovary	16.1	<0.000096	0.00180	7.52	0.00300	0.629	0.00445	0.462	0.0414	0.00128	0.0266	0.0108	171	0.0194
	GC-RSC-07-Apr-15	Gold Creek	Ovary	13.9	<0.00015	<0.0025	11.6	0.00380	0.871	0.00457	0.395	0.0329	0.00121	0.0224	0.00575	208	0.0175
	GC-RSC-08-Apr-15	Gold Creek	Ovary	10.1	<0.000038	0.000840	12.5	0.000810	0.586	0.000839	0.149	0.0249	0.000832	0.00914	0.00304	185	0.00472
	GC-RSC-10-Apr-15	Gold Creek	Ovary	13.9	<0.000070	0.00340	8.54	0.00350	0.866	0.00892	0.918	0.0570	0.00486	0.0535	0.0181	162	0.0373
2016	SC-RSC-07 M-Apr-16	Sand Creek	Muscle	12.7	<0.00017	<0.00097	1.72	0.0039	16.7	0.00107	0.189	0.0149	0.0013	0.0102	0.00237	61.5	0.0112
	SC-RSC-22 M-Apr-16	Sand Creek	Muscle	12.1	<0.00017	0.0036	1.61	0.003	2.86	0.00167	0.24	0.00799	0.00092	0.0106	0.00455	49.8	0.0113
	SC-RSC-01 M-Apr-16	Sand Creek	Muscle	13.8	0.0000121	0.00067	1.08	0.0044	3.79	0.00186	0.274	0.015	0.00214	0.0188	0.00344	44.0	0.0142
	SC-RSC-06 M-Apr-16	Sand Creek	Muscle	11.8	0.0000084	<0.0011	1.37	0.0402	2.62	0.00163	0.312	0.00721	0.00065	0.0105	0.00247	22.7	0.0097
	SC-RSC-09 M-Apr-16	Sand Creek	Muscle	9.7	0.0000287	<0.0013	1.18	<0.0016	1.53	0.00072	0.19	0.00949	0.0006	0.00927	0.0023	30.2	0.0078
	SC-RSC-10 M-Apr-16	Sand Creek	Muscle	11.6	0.0000342	<0.00096	2.51	0.0019	13.8	0.00198	0.3	0.0135	0.00109	0.014	0.0034	47.9	0.299
	SC-RSC-12 M-Apr-16	Sand Creek	Muscle	11.7	<0.0000049	0.00197	2.47	0.00121	1.05	0.00158	0.286	0.0218	0.00024	0.00478	0.00111	46.2	0.00575
	SC-RSC-15 M-Apr-16	Sand Creek	Muscle	18.2	<0.0000049	<0.00066	1.59	0.00101	6.87	0.00098	0.254	0.0125	0.00067	0.0114	0.00317	62.2	0.0172
	SC-RSC-24 M-Apr-16	Sand Creek	Muscle	13.3	<0.0000036	<0.00049	2.06	0.00155	8.62	0.00055	0.124	0.0156	0.00061	0.00469	0.00083	36.1	0.00365
	SC-RSC-25 M-Apr-16	Sand Creek	Muscle	13.9	<0.0000071	<0.00095	1.45	0.0017	1.48	0.0013	0.248	0.0282	0.00048	0.00809	0.00201	71.1	0.0069
	SC-RSC-01 O-Apr-16	Sand Creek	Ovary	11.3	<0.00012	0.00146	25.5	0.00215	0.739	0.00183	0.225	0.0217	0.00239	0.0169	0.00339	255.0	0.0178
	SC-RSC-06 O-Apr-16	Sand Creek	Ovary	10.0	<0.00013	0.00091	46	0.00161	0.476	0.000455	0.131	0.0119	<0.00033	0.00664	0.00199	196.0	0.0067
	SC-RSC-07 O-Apr-16	Sand Creek	Ovary	13.5	<0.00014	0.0017	22.2	0.0027	0.63	0.00131	0.157	0.035	0.00039	0.0109	0.00189	199.0	0.0194
	SC-RSC-09 O-Apr-16	Sand Creek	Ovary	8.4	<0.00014	0.0019	29.9	0.0024	0.475	0.00166	0.145	0.0161	0.00061	0.00796	0.00287	171.0	0.0071
	SC-RSC-10 O-Apr-16	Sand Creek	Ovary	11.1	<0.00024	0.0032	13.6	0.0099	2.62	0.0606	3.33	0.03	0.0125	0.288	0.11	185.0	0.105
	SC-RSC-12 O-Apr-16	Sand Creek	Ovary	8.9	<0.000087	0.00249	22	0.00091	0.443	0.0009	0.133	0.0238	0.00043	0.00548	0.00236	165.0	0.00815
	SC-RSC-15 O-Apr-16	Sand Creek	Ovary	17.0	<0.00013	0.00188	19.5	0.00226	0.855	0.00458	0.29	0.0172	0.00134	0.0229	0.00941	190.0	0.0209
	SC-RSC-22 O-Apr-16	Sand Creek	Ovary	12.3	<0.00041	0.0018	17.4	0.0054	1.06	0.00842	0.583	0.0152	0.0109	0.0832	0.0183	174.0	0.0256
	SC-RSC-24 O-Apr-16	Sand Creek	Ovary	12.1	<0.00023	0.0038	15.1	0.0032	0.562	0.00281	0.22	0.0298	0.00071	0.0142	0.0084	251.0	0.0106
	SC-RSC-25 O-Apr-16	Sand Creek	Ovary	11.4	<0.00016	0.00206	17.2	0.0046	1.03	0.00799	0.503	0.0313	0.00216	0.0518	0.0185	191.0	0.0227
	SC-RSC-04 WB-Apr-16	Sand Creek	Whole Body	9.7	<0.00017	0.00298	2.71	0.00389	48.2	0.0159	1.07	0.0133	0.00738	0.0862	0.0473	121.0	0.166
	SC-RSC-05 WB-Apr-16	Sand Creek	Whole Body	9.8	<0.00016	0.00244	4.33	0.00554	49.8	0.0124	0.845	0.00938	0.00505	0.0743	0.0329	137.0	0.109
	SC-RSC-14 WB-Apr-16	Sand Creek	Whole Body	8.8	<0.00017	0.00297	2.6	0.00362	36	0.0113	0.688	0.00855	0.00474	0.0619	0.0243	125.0	0.0465
	SC-RSC-17 WB-Apr-16	Sand Creek	Whole Body	9.1	<0.00017	0.00154	2.44	0.00276	42.5	0.00418	0.365	0.00945	0.00337	0.0318	0.022	107.0	0.149
	SC-RSC-18 WB-Apr-16	Sand Creek	Whole Body	8.7	0.00016	0.00292	3.43	0.004825	59.95	0.01505	1.12	0.01765	0.006135	0.093	0.03855	125.5	0.1365
	ER-RSC-04 M-Apr-16	Elk River	Muscle	8.0	<0.00017	0.007	1.68	0.0025	1.45	0.00097	0.236	0.00767	0.0004	0.0142	0.00275	120.0	0.0137
	ER-RSC-05 M-Apr-16	Elk River	Muscle	12.5	<0.00017	0.00123	2.56	0.0103	1.63	0.00082	0.243	0.0227	0.00062	0.0116	0.0021	51.8	0.0365
	ER-RSC-06 M-Apr-16	Elk River	Muscle	10.3	<0.000066	0.00474	2.45	0.0092	1.32	0.00172	0.304	0.0171	0.00072	0.0153	0.00366	33.9	0.0298
	ER-RSC-07 M-Apr-16	Elk River	Muscle	15.6	<0.000088	0.0073	3.23	0.0042	1.44	0.00046	0.198	0.0166	<0.00038	0.0066	0.00072	36.2	0.0153
	ER-RSC-09 M-Apr-16	Elk River	Muscle	15.9	<0.000081	<0.00097	2.43	0.0018	1.82	0.00076	0.176	0.0152	<0.00036	0.00725	0.00148	58.5	0.0071
	ER-RSC-11 M-Apr-16	Elk River	Muscle	12.5	<0.00017	0.0021	2.08	0.0072	1.59	0.00059	0.206	0.0181	0.00071	0.00963	0.00148	54.3	0.0101
	ER-RSC-13 M-Apr-16	Elk River	Muscle	9.7	0.000175	0.001035	6.175	0.0025	3.25	0.00032	0.1245	0.0185	0.000505	0.005225	0.00058	49.2	0.0124
	ER-RSC-14 M-Apr-16	Elk River	Muscle	15.4	<0.000073	0.00099	1.75	0.0021	3.64	0.00177	0.223	0.0195	0.00044	0.0229	0.00507	37.2	0.0114
	ER-RSC-15 M-Apr-16	Elk River	Muscle	13.1	<0.000092	0.0012	4.18	0.0031	1.54	0.00154	0.526	0.0174	0.00052	0.0188	0.00532	35.1	0.0142
	ER-RSC-16 M-Apr-16	Elk River	Muscle	14.4	<0.000081	<0.00096	3	0.0026	1.68	0.00065	0.251	0.0217	0.00038	0.0104	0.00225	30.8	0.0108
	ER-RSC-04 O-Apr-16	Elk River	Ovary	8.7	<0.0003	0.006	17.6	<0.0016	0.552	0.00114	0.209	0.0108	<0.00087	0.0164	0.00388	179.0	0.0148
	ER-RSC-05 O-Apr-16	Elk River	Ovary	8.2	<0.00011	0.00417	18.5	0.00409	0.622	0.00116	0.223	0.0235	0.00077	0.0135	0.00271	168.0	0.0121
	ER-RSC-06 O-Apr-16	Elk River	Ovary	8.7	<0.00012	<0.00044	30.2	0.00367	0.931	0.000992	0.223	0.0259	<0.00035	0.0131	0.00205	147.0	0.0107

Table G.10: Metal Concentrations (µg/g Dry Weight) in Redside Shiner Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Rb µg/g dry wt	Re µg/g dry wt	Sb µg/g dry wt	Se µg/g dry wt	Sn µg/g dry wt	Sr µg/g dry wt	Th µg/g dry wt	Ti µg/g dry wt	Tl µg/g dry wt	U µg/g dry wt	V µg/g dry wt	Y µg/g dry wt	Zn µg/g dry wt	Zr µg/g dry wt
2016	ER-RSC-07 O-Apr-16	Elk River	Ovary	14.1	<0.00023	0.00176	21.7	0.0108	0.981	0.000976	0.222	0.0314	<0.00066	0.013	0.00201	178.0	0.0138
	ER-RSC-09 O-Apr-16	Elk River	Ovary	9.5	<0.00011	0.00074	18.6	0.00108	0.525	0.000626	0.106	0.0207	0.00061	0.00655	0.00272	148.0	0.0433
	ER-RSC-11 O-Apr-16	Elk River	Ovary	10.6	<0.00015	0.0018	18.2	0.00262	0.617	0.00213	0.24	0.032	0.0006	0.0211	0.00387	161.0	0.0582
	ER-RSC-13 O-Apr-16	Elk River	Ovary	7.8	<0.00016	0.00062	25.3	0.00101	0.465	0.000491	0.093	0.0324	<0.00047	0.00646	0.00124	169.0	0.00405
	ER-RSC-14 O-Apr-16	Elk River	Ovary	14.7	<0.00023	0.00286	11.8	0.0035	0.5	0.00103	0.259	0.0379	<0.00067	0.0123	0.00234	213.0	0.0078
	ER-RSC-15 O-Apr-16	Elk River	Ovary	10.9	<0.00017	0.00172	18.8	0.0021	0.552	0.00231	0.284	0.0317	0.00061	0.0193	0.00479	175.0	0.0109
	ER-RSC-16 O-Apr-16	Elk River	Ovary	10.0	<0.00015	0.00078	25.2	0.00115	0.533	0.000915	0.2	0.0349	0.00123	0.0131	0.00254	161.0	0.00613
	ER-RSC-01 WB-Apr-16	Elk River	Whole Body	11.2	0.000165	0.002895	2.11	0.00531	45.35	0.01145	1.105	0.0141	0.00481	0.128	0.0286	109.0	0.0813
	ER-RSC-02 WB-Apr-16	Elk River	Whole Body	7.2	<0.00017	0.00684	5.62	0.0102	39	0.0284	2.48	0.0255	0.00916	0.364	0.0741	137.0	0.106
	ER-RSC-08 WB-Apr-16	Elk River	Whole Body	7.2	<0.00016	0.00237	4.56	0.00412	45.6	0.00557	0.601	0.0173	0.00363	0.0674	0.0231	106.0	0.0672
	ER-RSC-10 WB-Apr-16	Elk River	Whole Body	6.0	<0.00017	0.0043	5.85	0.00697	47.6	0.0172	1.98	0.0182	0.00831	0.229	0.0463	140.0	0.132
	ER-RSC-12 WB-Apr-16	Elk River	Whole Body	10.3	<0.00016	0.00205	2.33	0.00313	45.3	0.0066	0.811	0.0247	0.00382	0.077	0.0154	114.0	0.0449
	GC-RSC-08 M-Apr-16	Gold Creek	Muscle	7.2	<0.00019	<0.0011	2.15	0.0031	1.32	0.00204	0.318	0.0139	0.00051	0.0142	0.00377	56.6	0.0111
	GC-RSC-09 M-Apr-16	Gold Creek	Muscle	11.8	<0.00024	<0.0014	2.85	0.0053	2.65	0.0029	0.429	0.0201	0.00104	0.0238	0.00926	49.9	0.032
	GC-RSC-10 M-Apr-16	Gold Creek	Muscle	11.8	<0.00017	0.00178	2	0.0047	1.61	0.00162	0.315	0.0248	0.00116	0.0124	0.00364	37.5	0.0504
	GC-RSC-11 M-Apr-16	Gold Creek	Muscle	16.3	<0.00015	0.00121	2.07	0.002	8.3	0.00078	0.153	0.0289	0.00063	0.00688	0.00167	40.5	0.0059
	GC-RSC-12 M-Apr-16	Gold Creek	Muscle	11.5	<0.00017	0.00593	1.96	0.0103	1.61	0.00232	0.31	0.0184	0.0008	0.0206	0.00451	41.1	0.0233
	GC-RSC-13 M-Apr-16	Gold Creek	Muscle	11.7	<0.00022	0.0032	2.45	0.01	1.36	0.00337	0.504	0.0156	0.00139	0.0269	0.00655	101.0	0.153
	GC-RSC-14 M-Apr-16	Gold Creek	Muscle	9.6	<0.00018	0.0029	2.65	0.0035	13.9	0.00192	0.35	0.0244	0.00102	0.0168	0.00399	68.0	0.0227
	GC-RSC-16 M-Apr-16	Gold Creek	Muscle	11.5	<0.000085	0.00098	2.18	0.00229	12.7	0.00152	0.291	0.0244	0.001	0.0126	0.00327	60.0	0.0155
	GC-RSC-03 M-Apr-16	Gold Creek	Muscle	17.5	0.0000138	0.0023	1.88	0.0027	2.68	0.00561	0.342	0.0301	0.00067	0.0124	0.00479	32.4	0.0146
	GC-RSC-07 M-Apr-16	Gold Creek	Muscle	13.5	<0.0000049	0.0007	2.12	0.00422	3.11	0.00165	0.212	0.0242	0.00067	0.0168	0.00384	35.0	0.0101
	GC-RSC-03 O-Apr-16	Gold Creek	Ovary	14.4	<0.00031	0.004	12.3	0.0034	0.563	0.00107	0.357	0.0462	<0.0018	0.0168	0.00365	211.0	0.0587
	GC-RSC-07 O-Apr-16	Gold Creek	Ovary	12.3	<0.00018	0.00239	22.4	0.00143	0.613	0.00222	0.22	0.0535	<0.0011	0.0173	0.00472	212.0	0.0369
	GC-RSC-08 O-Apr-16	Gold Creek	Ovary	6.2	<0.00056	0.0106	5.93	0.0243	3.99	0.161	13.6	0.0301	0.0282	0.816	0.332	86.3	0.468
	GC-RSC-09 O-Apr-16	Gold Creek	Ovary	14.4	<0.00048	0.0046	34.9	0.005	0.802	0.00224	0.349	0.0287	<0.0029	0.0257	0.00491	243.0	0.0276
	GC-RSC-10 O-Apr-16	Gold Creek	Ovary	12.6	<0.00024	0.0027	14.4	0.0031	0.597	0.00214	0.303	0.0573	<0.0015	0.016	0.00624	185.0	0.0459
	GC-RSC-11 O-Apr-16	Gold Creek	Ovary	16.0	<0.00027	0.0053	23.3	<0.0012	0.587	0.00069	0.223	0.0454	<0.0016	0.0129	0.0031	200.0	0.0141
	GC-RSC-12 O-Apr-16	Gold Creek	Ovary	10.7	<0.00013	0.00171	11.4	0.00409	1.18	0.0065	0.739	0.0386	0.00254	0.0504	0.0135	175.0	0.0322
	GC-RSC-13 O-Apr-16	Gold Creek	Ovary	8.0	<0.0001	0.00072	8.38	<0.00045	0.365	0.000211	0.0768	0.0149	<0.0006	0.00328	0.00127	117.0	0.00879
	GC-RSC-14 O-Apr-16	Gold Creek	Ovary	7.0	<0.0001	0.00099	19.6	0.00107	0.439	0.000999	0.202	0.0263	0.00063	0.00982	0.00282	135.0	0.0121
	GC-RSC-16 O-Apr-16	Gold Creek	Ovary	11.0	<0.00019	0.00141	13.1	0.00215	0.543	0.00252	0.304	0.034	<0.0011	0.0146	0.00486	181.0	0.0162
	GC-RSC-01 WB-Apr-16	Gold Creek	Whole Body	9.5	<0.00016	0.00265	3.05	0.00589	40.7	0.00325	0.439	0.0201	0.00248	0.0308	0.00796	115.0	0.0253
	GC-RSC-02 WB-Apr-16	Gold Creek	Whole Body	7.1	<0.00017	0.00182	2.8	0.00521	39.5	0.00808	0.645	0.0321	0.0027	0.056	0.0156	114.0	0.0541
	GC-RSC-04 WB-Apr-16	Gold Creek	Whole Body	9.1	<0.00017	0.00182	7.16	0.00649	38.6	0.00751	0.745	0.0181	0.004	0.0506	0.0255	125.0	0.131
	GC-RSC-05 WB-Apr-16	Gold Creek	Whole Body	11.5	<0.00016	0.00299	2.66	0.00764	49.1	0.0436	0.721	0.0387	0.00363	0.0476	0.0223	121.0	0.135
	GC-RSC-15 WB-Apr-16	Gold Creek	Whole Body	9.9	<0.00017	0.00195	2.85	0.00394	46.1	0.0074	0.664	0.0348	0.00429	0.0442	0.0209	122.0	0.0929

Table G.11: Metal Concentrations (µg/g Dry Weight) in Yellow Perch Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw
2014	SC-YP-1-Aug-14	Sand Creek	Muscle	78	<0.00079	2.08	0.0339	<0.12	0.165	<0.0039	0.0134	365	0.00409	0.0217	0.0841	0.203	0.486
	SC-YP-2-Aug-14	Sand Creek	Muscle	78	<0.00073	4.12	0.0441	<0.11	0.199	<0.0036	0.00425	1,840	0.00346	0.0557	0.102	0.0433	0.949
	SC-YP-3-Aug-14	Sand Creek	Muscle	78	<0.00095	2.82	0.0379	<0.15	0.160	<0.0047	0.00332	1,400	0.0023	0.0487	0.0795	0.0442	0.800
	SC-YP-4-Aug-14	Sand Creek	Muscle	77	<0.00076	3.76	0.0269	<0.12	1.49	<0.0038	0.00740	8,270	0.0037	0.0176	0.077	0.131	0.529
	GC-YP-1-Aug-14	Gold Creek	Muscle	77	<0.00091	19.5	0.0403	0.144	0.740	<0.0038	0.00558	4,910	0.00531	0.0188	0.237	0.0319	0.524
	GC-YP-2-Aug-14	Gold Creek	Muscle	77	<0.00160	2.26	0.0920	<0.17	0.0604	<0.0067	0.00280	381	0.0021	0.0085	0.0869	0.0396	0.680
	GC-YP-3-Aug-14	Gold Creek	Muscle	78	<0.00071	2.14	0.0206	<0.076	0.0594	<0.0030	0.00496	463	0.00496	0.00846	0.0807	0.0765	0.638
	GC-YP-4-Aug-14	Gold Creek	Muscle	80	<0.00069	8.33	0.0201	<0.074	0.273	<0.0029	0.00677	1,450	0.00577	0.00975	0.0893	0.0726	0.433
	GC-YP-5-Aug-14	Gold Creek	Muscle	78	<0.00068	0.952	0.0188	<0.073	0.116	<0.0028	0.00505	1,366	0.00086	0.00566	0.0660	0.0808	0.409
	GC-YP-6-Aug-14	Gold Creek	Muscle	77	<0.00072	2.18	0.0218	<0.077	0.0513	<0.0030	0.00240	346	0.00183	0.00801	0.0854	0.0468	0.672
	GC-YP-7-Aug-14	Gold Creek	Muscle	78	<0.00069	1.16	0.0196	<0.074	0.106	<0.0029	0.00442	1,190	0.00145	0.00475	0.068	0.0818	0.343
	GC-YP-8-Aug-14	Gold Creek	Muscle	78	<0.00070	1.40	0.0227	<0.075	0.157	<0.0029	0.00424	1,880	0.00111	0.0137	0.113	0.0529	0.619
	GC-YP-9-Aug-14	Gold Creek	Muscle	78	<0.00071	0.992	0.0208	<0.076	0.0444	<0.0030	0.00341	556	0.0009	0.00766	0.0687	0.0646	0.528
	GC-YP-10-Aug-14	Gold Creek	Muscle	78	<0.00070	0.756	0.0211	<0.075	0.0578	<0.0029	0.00493	604	0.00112	0.00964	0.0675	0.0258	0.492
2015	SC-YP-01-Apr-15	Sand Creek	Muscle	77	<0.00059	3.430	0.0332	<0.096	0.209	<0.0030	0.00294	1,950	0.0025	0.02550	0.0639	0.1090	0.903
	SC-YP-10-Apr-15	Sand Creek	Muscle	82	<0.00047	1.270	0.0271	<0.076	0.211	<0.0024	0.00464	3,470	0.0144	0.00927	0.0840	0.1070	0.592
	SC-YP-15-Apr-15	Sand Creek	Muscle	77	<0.00060	32.400	0.0352	0.168	0.715	<0.0031	0.00669	3,090	0.0034	0.04540	0.1120	0.0433	1.650
	SC-YP-17-Apr-15	Sand Creek	Muscle	80	<0.00047	2.620	0.0231	<0.076	0.072	<0.0024	0.00401	887	0.0014	0.01060	0.0641	0.1580	0.647
	SC-YP-19-Apr-15	Sand Creek	Muscle	81	<0.00050	0.944	0.0149	<0.080	0.061	<0.0025	0.00541	826	0.0015	0.01000	0.0723	0.1230	0.641
	SC-YP-25-Apr-15	Sand Creek	Muscle	80	<0.00048	13.400	0.0392	0.091	0.276	<0.0025	0.00653	1,650	0.0046	0.02240	0.0772	0.0376	1.110
	SC-YP-01-Apr-15	Sand Creek	Ovary	82	0.00259	1.36	0.0588	<0.14	0.227	<0.0026	0.000690	777	0.00480	0.134	0.0718	0.0389	2.34
	SC-YP-10-Apr-15	Sand Creek	Ovary	83	0.00208	5.30	0.0453	<0.14	0.353	<0.0026	0.000760	1,520	0.00580	0.0477	0.0712	0.0305	2.17
	SC-YP-17-Apr-15	Sand Creek	Ovary	69	0.00169	0.796	0.0760	<0.14	0.158	<0.0026	0.000930	1,010	0.00190	0.0443	0.0619	0.0434	2.10
	SC-YP-19-Apr-15	Sand Creek	Ovary	67	0.00178	0.710	0.0378	<0.14	0.224	<0.0024	0.000620	1,120	0.00225	0.0425	0.0599	0.0307	1.96
	ER-YP-01-Apr-15	Elk River	Muscle	81	<0.00038	9.560	0.0504	<0.14	0.482	<0.0026	0.00432	2,790	0.0039	0.01500	0.0675	0.0739	1.020
	ER-YP-02-Apr-15	Elk River	Muscle	83	<0.00039	2.710	0.0290	<0.15	0.201	<0.0027	0.00652	1,760	0.0031	0.01700	0.0607	0.0887	0.852
	ER-YP-04-Apr-15	Elk River	Muscle	82	<0.00038	3.630	0.0282	<0.14	0.203	<0.0026	0.00409	2,880	0.0040	0.01150	0.0745	0.2000	0.870
	ER-YP-05-Apr-15	Elk River	Muscle	82	<0.00046	11.900	0.0250	0.510	0.470	<0.0032	0.00403	4,040	0.0051	0.01840	1.0300	0.1500	0.993
	ER-YP-07-Apr-15	Elk River	Muscle	83	<0.00037	2.180	0.0091	<0.14	0.102	<0.0026	0.00483	1,390	0.0050	0.00657	0.0256	0.0755	0.351
	ER-YP-08-Apr-15	Elk River	Muscle	82	0.00079	1.450	0.0210	<0.14	0.076	<0.0025	0.00898	963	0.0050	0.01480	0.0879	0.3015	0.451
	ER-YP-09-Apr-15	Elk River	Muscle	81	<0.00038	2.100	0.0271	<0.14	0.293	<0.0026	0.00351	2,970	0.0045	0.01970	0.0616	0.0978	0.798
	ER-YP-10-Apr-15	Elk River	Muscle	81	<0.00037	1.480	0.0198	<0.14	0.180	<0.0026	0.00591	1,870	0.0045	0.03110	0.0575	0.0658	1.250
	ER-YP-11-Apr-15	Elk River	Muscle	80	<0.00037	0.539	0.0167	<0.14	0.150	<0.0026	0.00494	2,240	0.0026	0.01240	0.0599	0.1050	0.545
	ER-YP-12-Apr-15	Elk River	Muscle	83	<0.00037	1.380	0.0315	<0.14	0.442	<0.0026	0.01340	4,600	0.0054	0.02100	0.0998	0.2130	1.220
	ER-YP-01-Apr-15	Elk River	Ovary	83	0.00321	30.750	0.0892	0.140	0.807	<0.0023	0.00091	1,525	0.0206	0.06145	0.1760	0.0242	2.080
	ER-YP-02-Apr-15	Elk River	Ovary	83	0.00407	3.20	0.0381	<0.12	0.315	<0.0024	0.00114	1,025	0.00330	0.0499	0.0684	0.0190	2.28
	ER-YP-04-Apr-15	Elk River	Ovary	70	0.00254	0.317	0.0412	<0.12	0.248	<0.0024	0.000390	1,150	<0.0018	0.0341	0.0548	0.0453	2.08
	ER-YP-05-Apr-15	Elk River	Ovary	70	0.00234	0.611	0.0358	0.36	0.274	<0.0024	0.000540	962	<0.0018	0.0490	0.0636	0.0316	1.90
	ER-YP-07-Apr-15	Elk River	Ovary	67	0.00235	0.534	0.0304	<0.11	0.271	<0.0022	0.00104	1,020	<0.0017	0.0371	0.0617	0.0465	1.96
	ER-YP-08-Apr-15	Elk River	Ovary	85	0.00095	1.28	0.0325	<0.12	0.0515	<0.0024	0.0112	490	0.0406	0.0900	0.0614	0.205	2.45
	ER-YP-09-Apr-15	Elk River	Ovary	83	0.00401	0.463	0.0509	<0.12	0.258	<0.0023	0.000550	1,040	0.00520	0.0805	0.0774	0.0270	2.09
	ER-YP-10-Apr-15	Elk River	Ovary	61	0.00223	0.684	0.0260	<0.11	0.317	<0.0022	0.000700	937	0.00430	0.116	0.0593	0.0185	1.86

Table G.11: Metal Concentrations (µg/g Dry Weight) in Yellow Perch Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw
2015	ER-YP-11-Apr-15	Elk River	Ovary	82	0.00370	0.698	0.0383	<0.12	0.669	<0.0024	0.000840	842	0.00375	0.0721	0.0639	0.0237	2.17
	ER-YP-12-Apr-15	Elk River	Ovary	76	0.00229	8.68	0.0436	<0.11	0.331	<0.0021	0.00225	1,070	0.00610	0.0402	0.0728	0.0504	2.23
	GC-YP-01-Apr-15	Gold Creek	Muscle	81	0.00180	10.100	0.0299	0.106	0.519	<0.0024	0.00481	6,190	0.0058	0.01530	0.1620	0.1340	0.589
	GC-YP-02-Apr-15	Gold Creek	Muscle	79	<0.00045	11.400	0.0274	<0.074	0.456	<0.0023	0.00319	4,830	0.0046	0.01750	0.0807	0.0826	0.822
	GC-YP-03-Apr-15	Gold Creek	Muscle	82	<0.00049	2.670	0.0178	<0.080	0.247	<0.0025	0.00418	1,700	0.0054	0.01580	0.0824	0.0893	0.742
	GC-YP-04-Apr-15	Gold Creek	Muscle	81	0.00112	0.662	0.0149	<0.079	0.079	<0.0025	0.00575	1,550	0.0026	0.00618	0.1150	0.1730	0.527
	GC-YP-05-Apr-15	Gold Creek	Muscle	81	<0.00047	1.500	0.0202	<0.076	0.094	<0.0024	0.00361	882	0.0035	0.00879	0.0650	0.1130	0.865
	GC-YP-06-Apr-15	Gold Creek	Muscle	82	<0.000485	1.535	0.0187	<0.0795	0.160	<0.0025	0.00581	1,960	0.0049	0.02100	0.0991	0.1330	0.721
	GC-YP-07-Apr-15	Gold Creek	Muscle	80	<0.00049	0.484	0.0134	<0.079	0.524	<0.0025	0.00551	9,290	0.0019	0.01060	0.0708	0.1600	0.761
	GC-YP-08-Apr-15	Gold Creek	Muscle	81	<0.00048	0.599	0.0110	0.080	0.098	<0.0025	0.00826	1,720	<0.0015	0.00846	0.0588	0.1690	0.698
	GC-YP-09-Apr-15	Gold Creek	Muscle	80	<0.00047	0.412	0.0095	0.113	0.025	<0.0024	0.00918	471	<0.0014	0.01110	0.0569	0.1740	0.788
	GC-YP-10-Apr-15	Gold Creek	Muscle	79	0.00073	0.580	0.0233	<0.080	0.282	<0.0025	0.00571	4,520	0.0016	0.01180	0.0764	0.1140	0.645
	GC-YP-01-Apr-15	Gold Creek	Ovary	72	0.00314	4.17	0.0419	<0.12	0.329	<0.0024	0.000690	909	0.00240	0.0520	0.0612	0.0347	1.96
	GC-YP-02-Apr-15	Gold Creek	Ovary	81	0.00217	5.16	0.0421	<0.11	0.287	<0.0026	0.000790	1,040	0.00360	0.0685	0.0742	0.0235	1.97
	GC-YP-03-Apr-15	Gold Creek	Ovary	82	0.00230	0.221	0.0463	<0.11	0.216	<0.0024	0.000430	1,070	<0.0015	0.0656	0.0719	0.0223	1.70
	GC-YP-04-Apr-15	Gold Creek	Ovary	65	0.00253	0.982	0.0401	<0.12	0.244	<0.0026	0.00107	1,010	0.00260	0.0258	0.0643	0.0417	1.75
	GC-YP-05-Apr-15	Gold Creek	Ovary	83	0.00258	0.394	0.0658	<0.11	0.223	<0.0024	0.000760	1,100	<0.0016	0.0382	0.0873	0.0274	1.69
	GC-YP-06-Apr-15	Gold Creek	Ovary	73	0.00228	0.346	0.0377	0.13	0.435	<0.0025	0.000690	1,185	0.00410	0.0898	0.0534	0.0300	1.97
	GC-YP-07-Apr-15	Gold Creek	Ovary	65	0.00347	0.196	0.0364	<0.12	0.216	<0.0026	0.000850	1,100	0.00230	0.0440	0.0722	0.0402	2.29
	GC-YP-08-Apr-15	Gold Creek	Ovary	70	0.00190	0.138	0.0398	<0.10	0.291	<0.0022	0.000710	913	<0.0015	0.0430	0.0644	0.0364	1.97
	GC-YP-09-Apr-15	Gold Creek	Ovary	67	0.00113	0.341	0.0286	0.12	0.341	<0.0027	0.00136	1,170	0.00200	0.0377	0.0575	0.0380	1.71
	GC-YP-10-Apr-15	Gold Creek	Ovary	67	0.00209	0.179	0.0635	0.16	0.288	<0.0026	0.000730	1,070	<0.0017	0.0619	0.0550	0.0311	2.05
2016	SC-YP-01 M-Apr-16	Sand Creek	Muscle	83	<0.00075	16.6	0.0215	0.249	0.233	<0.0026	0.00669	2,340	0.0025	0.0135	0.622	0.144	0.605
	SC-YP-03 M-Apr-16	Sand Creek	Muscle	82	<0.00073	12.9	0.0185	0.471	0.4	<0.0026	0.00307	3,670	0.002	0.0164	0.103	0.205	0.532
	SC-YP-05 M-Apr-16	Sand Creek	Muscle	82	<0.00069	2.01	0.0336	0.159	0.623	<0.0024	0.00411	6,780	0.0038	0.0176	0.0773	0.151	0.741
	SC-YP-06 M-Apr-16	Sand Creek	Muscle	82	<0.00072	3.6	0.0136	0.24	0.341	<0.0026	0.00707	6,700	0.0018	0.0081	0.161	0.218	0.599
	SC-YP-09 M-Apr-16	Sand Creek	Muscle	81	<0.00074	7.03	0.0237	0.234	0.238	<0.0026	0.00451	3,000	0.0026	0.0135	0.0569	0.172	0.679
	SC-YP-10 M-Apr-16	Sand Creek	Muscle	82	<0.00073	3.58	0.0351	0.25	0.979	<0.0026	0.00337	17,600	0.0033	0.0251	0.0586	0.185	0.636
	SC-YP-14 M-Apr-16	Sand Creek	Muscle	81	<0.00069	11.2	0.014	<0.15	0.184	<0.0027	0.00601	1,600	<0.0014	0.0104	0.161	0.179	0.665
	SC-YP-17 M-Apr-16	Sand Creek	Muscle	81	<0.0007	3.87	0.0162	0.21	0.0497	<0.0027	0.00591	427	<0.0014	0.0116	0.427	0.172	0.615
	SC-YP-18 M-Apr-16	Sand Creek	Muscle	81	<0.0007	11.3	0.0178	0.28	0.16	<0.0027	0.00621	1,650	<0.0014	0.00914	0.113	0.155	0.485
	SC-YP-19 M-Apr-16	Sand Creek	Muscle	80	<0.00073	3.1	0.0155	<0.16	0.102	<0.0028	0.00345	1,580	<0.0015	0.00959	0.101	0.212	0.567
	SC-YP-01 O-Apr-16	Sand Creek	Ovary	84	0.00319	0.553	0.0346	0.37	0.184	<0.0026	0.000977	1,050	<0.0016	0.0332	0.0624	0.0327	2.02
	SC-YP-03 O-Apr-16	Sand Creek	Ovary	84	0.00404	1.95	0.0371	0.22	0.219	<0.0026	0.000465	995	0.002	0.073	0.0597	0.0453	2.38
	SC-YP-05 O-Apr-16	Sand Creek	Ovary	84	0.00234	8.82	0.0659	0.28	0.362	<0.0026	0.00102	1,210	0.0039	0.0789	0.0689	0.0403	2.21
	SC-YP-06 O-Apr-16	Sand Creek	Ovary	83	0.00212	1.07	0.0468	0.3	0.229	<0.0025	0.000961	950	<0.0015	0.0265	0.0567	0.0549	1.98
	SC-YP-09 O-Apr-16	Sand Creek	Ovary	84	0.00231	1.26	0.0672	0.32	0.19	<0.0026	0.000704	835	<0.0016	0.046	0.0597	0.0444	2.15
	SC-YP-10 O-Apr-16	Sand Creek	Ovary	84	0.002965	1.3	0.05935	0.17	0.1935	0.00255	0.000599	1,377	0.00185	0.09925	0.0616	0.0465	2.67
	SC-YP-14 O-Apr-16	Sand Creek	Ovary	83	0.00241	4.48	0.0452	<0.17	0.206	<0.0026	0.00126	1,010	0.0027	0.0424	0.137	0.0442	2.13
	SC-YP-17 O-Apr-16	Sand Creek	Ovary	84	0.00256	0.36	0.0526	0.25	0.147	<0.0026	0.000802	1,020	0.0018	0.0575	0.0632	0.0447	2.18
	SC-YP-18 O-Apr-16	Sand Creek	Ovary	86	0.00197	2.07	0.0434	0.3	0.185	<0.0026	0.00113	1,130	<0.0016	0.041	0.0745	0.0381	1.92
	SC-YP-19 O-Apr-16	Sand Creek	Ovary	83	0.00118	0.959	0.0591	<0.16	0.149	<0.0025	0.000824	924	0.0018	0.0485	0.0785	0.0568	2.05
	ER-YP-01 M-Apr-16	Elk River	Muscle	81	<0.00066	5.84	0.0285	0.257	0.067	<0.0023	0.00369	468	0.0025	0.0125	0.108	0.171	0.629
	ER-YP-02 M-Apr-16	Elk River	Muscle	82	0.00075	3.65	0.01055	0.1405	0.262	0.00265	0.004845	2,765	0.00475	0.0109	0.1145	0.2015	0.7135
	ER-YP-03 M-Apr-16	Elk River	Muscle	79	<0.00075	5.99	0.0357	0.513	1.64	<0.0026	0.00204	21,200	0.009	0.0225	0.0772	0.0565	1.02

Table G.11: Metal Concentrations (µg/g Dry Weight) in Yellow Perch Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Moisture (%)	Ag µg/g dw	Al µg/g dw	As µg/g dw	B µg/g dw	Ba µg/g dw	Be µg/g dw	Bi µg/g dw	Ca µg/g dw	Cd µg/g dw	Co µg/g dw	Cr µg/g dw	Cs µg/g dw	Cu µg/g dw
2016	ER-YP-05 M-Apr-16	Elk River	Muscle	84	<0.00076	5.36	0.0339	0.714	0.0948	<0.0027	0.00227	407	0.0055	0.0254	0.0742	0.112	1.83
	ER-YP-06 M-Apr-16	Elk River	Muscle	80	<0.00072	11.4	0.0426	1.27	3.45	<0.0025	0.00312	43,000	0.0088	0.0336	0.126	0.0551	1.05
	ER-YP-07 M-Apr-16	Elk River	Muscle	81	<0.00069	11.5	0.0308	0.434	0.147	<0.0024	0.00355	466	0.0034	0.0171	0.101	0.139	0.974
	ER-YP-09 M-Apr-16	Elk River	Muscle	81	<0.00074	6.61	0.0273	0.47	0.235	<0.0026	0.00357	1,340	0.0019	0.0159	0.0645	0.116	0.929
	ER-YP-10 M-Apr-16	Elk River	Muscle	82	<0.00074	2.94	0.0304	0.305	0.351	<0.0026	0.00622	3,620	0.0035	0.0149	0.123	0.0818	0.729
	ER-YP-11 M-Apr-16	Elk River	Muscle	82	<0.00072	2.33	0.0435	0.166	0.765	<0.0026	0.00364	10,400	0.0054	0.0284	0.323	0.118	0.75
	ER-YP-16 M-Apr-16	Elk River	Muscle	82	<0.00074	4.15	0.0152	0.263	0.29	<0.0026	0.00543	4,440	0.0022	0.0096	0.0624	0.229	0.511
	ER-YP-01 O-Apr-16	Elk River	Ovary	84	0.00275	1.62	0.0766	0.2	0.214	<0.0035	0.0011	1,000	0.0023	0.0767	0.0676	0.047	1.95
	ER-YP-02 O-Apr-16	Elk River	Ovary	83	0.00259	1.22	0.0275	0.24	0.274	<0.0036	0.000467	905	0.0278	0.0347	0.0658	0.04	2.37
	ER-YP-03 O-Apr-16	Elk River	Ovary	82	0.00366	5.56	0.0652	0.31	0.375	<0.0035	0.000507	1,140	0.003	0.0685	0.0736	0.0173	1.89
	ER-YP-05 O-Apr-16	Elk River	Ovary	84	0.00373	1.43	0.06165	0.165	0.3625	0.00345	0.000319	1,001	0.0042	0.07125	0.0638	0.0269	2.055
	ER-YP-06 O-Apr-16	Elk River	Ovary	82	0.00339	2.07	0.0526	0.22	0.38	<0.0033	0.000732	963	0.0035	0.0959	0.0723	0.018	2.37
	ER-YP-07 O-Apr-16	Elk River	Ovary	82	0.00333	5.04	0.0577	0.47	0.245	<0.0035	0.000559	1,050	0.0031	0.0617	0.079	0.0326	1.85
	ER-YP-09 O-Apr-16	Elk River	Ovary	82	0.00228	2.83	0.0581	0.54	0.443	<0.0035	0.000382	3,080	0.0052	0.0613	0.0699	0.0266	1.84
	ER-YP-10 O-Apr-16	Elk River	Ovary	84	0.00281	0.979	0.0807	0.28	0.402	<0.0034	0.000651	919	0.0041	0.0734	0.07	0.0171	2.08
	ER-YP-11 O-Apr-16	Elk River	Ovary	83	0.00301	19.3	0.0915	0.13	0.426	<0.0035	0.00159	964	0.0047	0.093	0.153	0.0277	2.12
	ER-YP-16 O-Apr-16	Elk River	Ovary	83	0.00235	1.42	0.0394	0.16	0.241	<0.0032	0.00115	964	0.0025	0.0498	0.062	0.0489	2.15
	GC-YP-06 M-Apr-16	Gold Creek	Muscle	82	<0.00068	8.41	0.0193	<0.15	0.211	<0.0027	0.0182	1,610	0.0017	0.0206	0.0838	0.14	2.05
	GC-YP-09 M-Apr-16	Gold Creek	Muscle	81	<0.0008	9.08	0.0604	<0.17	0.225	<0.0031	0.00509	1,060	0.0032	0.0133	0.108	0.0729	0.676
	GC-YP-21 M-Apr-16	Gold Creek	Muscle	81	<0.00069	6.19	0.0225	<0.15	0.0896	<0.0027	0.0102	611	0.004	0.0133	0.0823	0.0589	0.592
	GC-YP-23 M-Apr-16	Gold Creek	Muscle	81	<0.0007	2.56	0.0112	0.25	0.0947	<0.0027	0.00416	1,100	0.0021	0.00622	0.0852	0.198	0.511
	GC-YP-24 M-Apr-16	Gold Creek	Muscle	81	<0.00071	4.13	0.0264	<0.15	0.289	<0.0028	0.00389	3,390	<0.0014	0.0142	0.112	0.101	0.938
	GC-YP-31 M -Apr-16	Gold Creek	Muscle	81	0.000715	1.39	0.0089	0.215	0.0642	0.00275	0.00852	405	0.00145	0.0077	0.07065	0.201	0.8465
	GC-YP-32 M-Apr-16	Gold Creek	Muscle	81	<0.00078	5.14	0.0234	0.29	0.449	<0.003	0.00339	3,340	0.0042	0.116	4.68	0.0941	1.1
	GC-YP-33 M-Apr-16	Gold Creek	Muscle	81	<0.00067	2.29	0.0362	0.34	0.61	<0.0026	0.00562	7,610	0.0056	0.016	0.104	0.08	0.737
	GC-YP-35 M-Apr-16	Gold Creek	Muscle	82	<0.00072	6.74	0.0245	0.21	0.528	<0.0028	0.00373	7,060	0.0039	0.0226	0.0724	0.112	0.745
	GC-YP-37 M-Apr-16	Gold Creek	Muscle	80	<0.00071	3.76	0.0126	0.26	0.0801	<0.0028	0.018	935	<0.0014	0.00795	0.0827	0.123	0.545
	GC-YP-06 O-Apr-16	Gold Creek	Ovary	83	0.00281	1.7	0.0354	0.275	0.23	<0.0049	0.00232	927	0.0018	0.0339	0.067	0.0307	1.97
	GC-YP-09 O-Apr-16	Gold Creek	Ovary	83	0.00662	2.69	0.158	0.44	0.486	<0.0049	0.000498	950	0.0045	0.0481	0.069	0.0219	1.89
	GC-YP-21 O-Apr-16	Gold Creek	Ovary	83	0.0022	8.82	0.0709	0.242	0.568	<0.0049	0.00186	1,120	0.003	0.0678	0.072	0.015	1.81
	GC-YP-23 O-Apr-16	Gold Creek	Ovary	83	0.00136	6	0.0512	0.216	0.31	<0.0048	0.000908	928	0.0023	0.0333	0.068	0.0453	1.92
	GC-YP-24 O-Apr-16	Gold Creek	Ovary	83	0.00224	2.09	0.074	0.176	0.305	<0.0045	0.000705	964	0.0014	0.0505	0.062	0.0231	1.99
	GC-YP-31 O-Apr-16	Gold Creek	Ovary	83	0.00162	0.63	0.0273	0.173	0.192	<0.0044	0.00184	927	<0.0011	0.0228	0.066	0.0472	1.64
	GC-YP-32 O-Apr-16	Gold Creek	Ovary	83	0.00273	0.664	0.0475	0.268	0.304	<0.0047	0.000485	1,160	0.0029	0.0895	0.065	0.0234	1.76
	GC-YP-33 O-Apr-16	Gold Creek	Ovary	83	0.002185	0.548	0.0722	0.1195	0.319	0.0048	0.000794	1,080	0.0026	0.0777	0.062	0.01885	1.895
	GC-YP-35 O-Apr-16	Gold Creek	Ovary	84	0.0033	1.38	0.0566	0.14	0.285	<0.0049	0.0006	1,090	0.0025	0.0837	0.07	0.0254	1.93
	GC-YP-37 O-Apr-16	Gold Creek	Ovary	82	0.00225	0.753	0.0362	0.298	0.231	<0.005	0.00347	889	0.0015	0.0466	0.063	0.0258	2.09

Table G.11: Metal Concentrations (µg/g Dry Weight) in Yellow Perch Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dw	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw
2014	SC-YP-1-Aug-14	Sand Creek	Muscle	5.96	0.00875	0.316	22,200	0.0132	1,200	0.841	0.0033	1,200	0.0162	10,300	0.0122	29.1	<0.00011	0.00071
	SC-YP-2-Aug-14	Sand Creek	Muscle	10.9	0.0103	0.173	20,200	0.0366	1,390	2.70	0.014	1,970	0.112	10,600	0.143	20.3	<0.00010	0.00331
	SC-YP-3-Aug-14	Sand Creek	Muscle	9.14	0.00973	0.538	20,800	0.0157	1,400	2.03	0.0122	1,480	0.033	10,200	0.0337	21.1	<0.00013	0.00155
	SC-YP-4-Aug-14	Sand Creek	Muscle	6.85	0.0117	0.770	21,100	0.0430	1,270	1.74	0.0027	1,130	0.0531	14,000	0.134	18.5	<0.00011	0.00058
	GC-YP-1-Aug-14	Gold Creek	Muscle	23.7	0.0162	0.316	19,300	0.0383	1,400	1.51	0.00858	1,820	0.102	11,700	0.166	15.1	<0.00034	0.00311
	GC-YP-2-Aug-14	Gold Creek	Muscle	7.15	0.0076	0.173	20,200	<0.016	1,480	0.99	0.0083	1,020	0.0134	9,540	0.0057	20.7	<0.00060	<0.00098
	GC-YP-3-Aug-14	Gold Creek	Muscle	5.90	0.0078	0.538	22,400	0.0118	1,320	0.872	0.00486	998	0.0355	10,300	0.0386	27.5	<0.00026	0.00134
	GC-YP-4-Aug-14	Gold Creek	Muscle	10.1	0.0112	0.770	23,100	0.0232	1,400	0.886	0.00368	689	0.0415	11,600	0.0305	23.9	<0.00026	0.00113
	GC-YP-5-Aug-14	Gold Creek	Muscle	5.35	0.0106	0.657	23,050	0.0213	1,280	0.547	0.00371	961	0.0224	11,400	0.00357	25.4	<0.00025	<0.00041
	GC-YP-6-Aug-14	Gold Creek	Muscle	7.28	0.00744	0.400	21,300	0.0203	1,340	0.853	0.00642	798	0.048	10,400	0.0209	18.8	<0.00027	0.00072
	GC-YP-7-Aug-14	Gold Creek	Muscle	5.79	0.00819	0.674	22,200	0.0208	1,240	0.666	0.00349	818	0.0165	10,800	0.00543	25.6	<0.00026	0.00057
	GC-YP-8-Aug-14	Gold Creek	Muscle	7.23	0.00866	0.303	20,400	0.0194	1,370	0.935	0.00735	1,550	0.049	10,800	0.0149	20.9	<0.00026	0.00723
	GC-YP-9-Aug-14	Gold Creek	Muscle	4.93	0.00678	0.399	22,200	0.0111	1,390	0.64	0.00629	961	0.0168	10,900	0.00526	25.8	<0.00027	<0.00043
	GC-YP-10-Aug-14	Gold Creek	Muscle	4.37	0.00738	0.442	22,400	0.0252	1,350	0.981	0.0039	823	0.017	10,800	0.00478	15.1	<0.00026	0.00077
2015	SC-YP-01-Apr-15	Sand Creek	Muscle	11.0	0.00644	0.216	18,600	<0.0085	1,260	1.020	0.0080	877	0.0185	9,740	0.01160	23.7	<0.000035	<0.0014
	SC-YP-10-Apr-15	Sand Creek	Muscle	9.5	0.00646	0.417	24,100	0.0199	1,390	1.170	0.0059	1,800	0.0202	12,000	0.02500	32.4	<0.000028	<0.0011
	SC-YP-15-Apr-15	Sand Creek	Muscle	36.8	0.01600	0.330	18,100	0.0389	1,290	7.280	0.0116	1,110	0.0518	10,400	0.15500	18.4	<0.000035	0.0022
	SC-YP-17-Apr-15	Sand Creek	Muscle	10.6	0.00644	0.404	20,900	0.0291	1,190	0.968	0.0069	1,390	0.0202	9,650	0.02090	34.7	0.000047	<0.0011
	SC-YP-19-Apr-15	Sand Creek	Muscle	6.3	0.00650	0.331	24,400	0.0135	1,300	0.940	0.0069	1,420	0.0353	10,800	0.00704	32.4	<0.000029	<0.0012
	SC-YP-25-Apr-15	Sand Creek	Muscle	17.9	0.01010	0.191	22,000	0.0249	1,300	1.210	0.0085	753	0.0269	10,700	0.01330	19.1	<0.000029	0.0017
	SC-YP-01-Apr-15	Sand Creek	Ovary	28.2	0.00560	0.0205	7,920	0.0309	1,120	3.40	0.0474	10,400	0.0249	8,710	0.00900	12.3	0.0000254	0.00170
	SC-YP-10-Apr-15	Sand Creek	Ovary	31.1	0.00790	0.0238	8,750	0.0592	1,180	2.71	0.0396	12,600	0.0143	9,260	0.00679	14.9	0.0000173	0.00130
	SC-YP-17-Apr-15	Sand Creek	Ovary	33.4	0.00515	0.0155	7,445	0.120	1,085	2.14	0.0398	12,300	0.0107	7,985	0.00346	16.5	0.00000620	0.00125
	SC-YP-19-Apr-15	Sand Creek	Ovary	34.3	0.00609	0.0142	9,155	0.0875	1,115	2.28	0.0441	13,650	0.0111	9,035	0.00523	15.7	0.0000158	<0.0011
	ER-YP-01-Apr-15	Elk River	Muscle	19.1	0.01160	0.379	22,800	0.0503	1,230	1.450	0.0167	1,380	0.0263	12,000	0.01250	26.8	<0.0000041	0.0019
	ER-YP-02-Apr-15	Elk River	Muscle	9.8	0.00890	0.354	25,400	0.0396	1,200	0.904	0.0133	1,490	0.0108	12,400	0.02140	32.9	<0.0000042	0.0014
	ER-YP-04-Apr-15	Elk River	Muscle	14.8	0.00880	0.987	24,100	0.0530	1,250	1.120	0.0117	1,960	0.0203	12,400	0.01700	32.3	0.0000154	0.0018
	ER-YP-05-Apr-15	Elk River	Muscle	21.4	0.01140	0.789	21,200	0.1130	1,190	1.540	0.0620	2,920	0.0723	12,000	0.06880	29.1	<0.0000049	0.0035
	ER-YP-07-Apr-15	Elk River	Muscle	7.6	0.00460	0.874	9,940	0.0194	502	0.416	0.0028	1,300	0.0076	6,210	0.01290	14.0	<0.0000040	<0.0012
	ER-YP-08-Apr-15	Elk River	Muscle	7.4	0.00716	1.670	24,550	0.0239	1,180	0.634	0.0117	2,380	0.0191	12,400	0.01840	38.1	0.0000071	<0.0011
	ER-YP-09-Apr-15	Elk River	Muscle	9.2	0.00900	0.322	23,900	0.0342	1,190	1.010	0.0077	1,110	0.0211	12,400	0.04270	30.5	<0.0000041	0.0014
	ER-YP-10-Apr-15	Elk River	Muscle	15.5	0.00620	0.505	21,500	0.0734	1,130	1.060	0.0126	2,070	0.0169	11,500	0.02660	16.9	<0.0000040	<0.0011
	ER-YP-11-Apr-15	Elk River	Muscle	7.7	0.00810	0.295	23,200	0.0396	1,310	1.120	0.0134	825	0.0116	11,900	0.00354	29.1	<0.0000040	<0.0011
	ER-YP-12-Apr-15	Elk River	Muscle	19.2	0.00890	1.340	23,400	0.0439	1,150	0.855	0.0131	3,040	0.0196	13,600	0.02650	40.1	<0.0000040	0.0016
	ER-YP-01-Apr-15	Elk River	Ovary	54.1	0.01545	0.018	7,825	0.2485	1,190	4.795	0.0388	11,150	0.0551	9,645	0.02030	11.9	0.00005	0.0013
	ER-YP-02-Apr-15	Elk River	Ovary	34.0	0.00521	0.0175	7,200	0.229	1,285	3.14	0.0367	11,400	0.0159	8,820	0.0111	12.0	<0.000035	0.00101
	ER-YP-04-Apr-15	Elk River	Ovary	30.5	0.00498	0.0454	7,860	0.222	1,230	2.57	0.0337	12,300	0.00970	9,290	0.00243	12.6	0.0000820	0.000510
	ER-YP-05-Apr-15	Elk River	Ovary	26.7	0.00401	0.0250	7,220	0.366	1,160	1.97	0.0352	11,200	0.0140	8,930	0.00678	12.0	0.000109	<0.00047
	ER-YP-07-Apr-15	Elk River	Ovary	31.9	0.00450	0.137	8,510	0.145	1,330	2.19	0.0314	11,700	0.00820	9,240	0.00340	14.8	<0.000033	<0.00045
	ER-YP-08-Apr-15	Elk River	Ovary	129	0.00580	0.267	16,800	0.0669	749	1.77	0.0557	7,860	0.0122	11,000	0.00760	35.2	<0.000037	0.00104
	ER-YP-09-Apr-15	Elk River	Ovary	38.2	0.00316	0.0118	8,090	0.209	1,030	3.03	0.0467	11,500	0.0129	8,780	0.00637	13.1	<0.000035	<0.00046
	ER-YP-10-Apr-15	Elk River	Ovary	41.1	0.00475	0.0236	8,170	0.310	1,090	2.39	0.0384	12,800	0.0201	9,040	0.00962	8.14	0.0000530	0.000900

Table G.11: Metal Concentrations (µg/g Dry Weight) in Yellow Perch Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dw	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw
2015	ER-YP-11-Apr-15	Elk River	Ovary	34.8	0.00464	0.0128	7,670	0.292	1,170	3.17	0.0475	9,450	0.0215	9,040	0.00365	12.0	0.0000465	0.000665
	ER-YP-12-Apr-15	Elk River	Ovary	47.9	0.00611	0.0999	8,460	0.139	1,230	2.60	0.0341	12,700	0.0144	9,290	0.00664	17.2	0.0000350	0.000610
	GC-YP-01-Apr-15	Gold Creek	Muscle	19.2	0.01210	1.020	23,700	0.0506	1,310	1.550	0.0096	2,120	0.1170	13,000	0.02300	30.4	<0.000028	0.0088
	GC-YP-02-Apr-15	Gold Creek	Muscle	18.9	0.01100	0.592	20,700	0.0463	1,250	1.760	0.0068	1,860	0.0307	11,600	0.01160	24.3	<0.000027	<0.0011
	GC-YP-03-Apr-15	Gold Creek	Muscle	12.4	0.00636	0.496	23,100	0.0182	1,290	1.210	0.0078	1,650	0.0238	10,500	0.02000	27.7	<0.000029	0.0018
	GC-YP-04-Apr-15	Gold Creek	Muscle	9.4	0.00744	0.834	23,600	0.0274	1,280	0.685	0.0066	1,410	0.0675	10,900	0.01160	32.6	<0.000029	0.0107
	GC-YP-05-Apr-15	Gold Creek	Muscle	11.4	0.00583	0.554	23,500	0.0181	1,240	0.930	0.0066	1,110	0.0211	10,400	0.01540	31.4	<0.000028	0.0030
	GC-YP-06-Apr-15	Gold Creek	Muscle	15.1	0.00661	1.205	24,650	0.0225	1,235	0.865	0.0079	1,735	0.0134	11,350	0.00600	30.1	<0.000029	<0.001115
	GC-YP-07-Apr-15	Gold Creek	Muscle	9.1	0.00723	0.794	21,100	0.0950	1,270	1.260	0.0058	2,200	0.0283	14,300	0.00717	32.4	<0.000029	<0.0012
	GC-YP-08-Apr-15	Gold Creek	Muscle	12.1	0.00657	1.130	24,600	0.0235	1,210	0.617	0.0076	1,520	0.0163	11,200	0.00340	35.0	<0.000029	<0.0011
	GC-YP-09-Apr-15	Gold Creek	Muscle	5.9	0.00643	2.040	21,800	0.0305	1,100	0.474	0.0055	2,450	0.0081	10,400	0.00295	30.8	<0.000028	<0.0011
	GC-YP-10-Apr-15	Gold Creek	Muscle	7.3	0.00716	0.728	21,700	0.0340	1,210	1.260	0.0049	1,340	0.0418	11,500	0.01000	29.7	<0.000029	0.0059
	GC-YP-01-Apr-15	Gold Creek	Ovary	35.6	0.00538	0.0378	7,850	0.110	1,170	3.16	0.0294	11,800	0.0169	9,080	0.00401	12.7	<0.000036	0.000550
	GC-YP-02-Apr-15	Gold Creek	Ovary	32.8	0.00572	0.0255	8,250	0.103	1,160	2.61	0.0336	11,300	0.0101	9,230	0.00445	11.8	<0.000037	0.000650
	GC-YP-03-Apr-15	Gold Creek	Ovary	22.7	0.00505	0.0227	7,860	0.0756	1,330	2.30	0.0325	12,600	0.0105	9,300	0.00177	11.6	<0.000034	0.00134
	GC-YP-04-Apr-15	Gold Creek	Ovary	29.9	0.00540	0.0292	9,550	0.0966	1,210	2.13	0.0365	13,700	0.0145	9,890	0.00989	16.7	<0.000037	0.00108
	GC-YP-05-Apr-15	Gold Creek	Ovary	23.1	0.00474	0.0242	8,170	0.104	1,170	2.83	0.0374	12,700	0.0103	8,820	0.00355	13.2	<0.000035	0.000850
	GC-YP-06-Apr-15	Gold Creek	Ovary	33.6	0.00447	0.0654	9,005	0.112	1,270	2.93	0.0383	14,850	0.00825	10,100	0.00179	13.4	0.0000505	<0.00058
	GC-YP-07-Apr-15	Gold Creek	Ovary	27.6	0.00476	0.0334	9,250	0.181	1,220	2.49	0.0302	12,900	0.00800	9,970	0.00302	17.1	<0.000037	0.000850
	GC-YP-08-Apr-15	Gold Creek	Ovary	30.2	0.00467	0.0381	7,850	0.101	1,350	2.04	0.0373	13,500	0.00620	10,000	0.00116	14.0	<0.000032	<0.00052
	GC-YP-09-Apr-15	Gold Creek	Ovary	61.9	0.00428	0.0676	8,870	0.153	1,200	2.36	0.0323	14,300	0.0110	10,200	0.00290	15.0	<0.000038	0.000730
	GC-YP-10-Apr-15	Gold Creek	Ovary	29.1	0.00584	0.0291	8,810	0.102	1,250	2.63	0.0337	13,300	0.00790	9,810	0.00700	15.1	<0.000037	0.00179
2016	SC-YP-01 M-Apr-16	Sand Creek	Muscle	25.5	0.0127	0.501	24,800	0.0315	1,420	1.51	0.0045	1,330	0.0499	11,700	0.0169	33.9	<0.000051	0.00078
	SC-YP-03 M-Apr-16	Sand Creek	Muscle	20	0.0103	0.506	24,000	0.0283	1,350	1.45	0.0029	1,340	0.0402	12,700	0.0116	38.2	<0.000049	0.00105
	SC-YP-05 M-Apr-16	Sand Creek	Muscle	11.6	0.0088	0.301	23,000	0.0271	1,360	1.63	0.0054	1,760	0.0223	14,000	0.00687	30.6	<0.000047	<0.00056
	SC-YP-06 M-Apr-16	Sand Creek	Muscle	12.7	0.0078	0.57	21,500	0.0562	1,190	1.13	0.0057	2,110	0.0425	13,400	0.00874	35.9	<0.000049	<0.00058
	SC-YP-09 M-Apr-16	Sand Creek	Muscle	13.1	0.0085	0.344	21,200	0.0418	1,210	1.32	0.0043	1,660	0.0264	11,400	0.0129	33.2	<0.00005	0.00072
	SC-YP-10 M-Apr-16	Sand Creek	Muscle	11	0.0114	0.337	22,300	0.0761	1,440	2.47	0.0071	2,040	0.0454	19,200	0.0135	40.3	<0.000049	<0.00058
	SC-YP-14 M-Apr-16	Sand Creek	Muscle	16.1	0.00949	0.551	23,000	0.0287	1,370	0.892	0.004	1,730	0.0264	11,700	0.0181	34.7	0.0000173	0.00067
	SC-YP-17 M-Apr-16	Sand Creek	Muscle	11.9	0.00645	0.531	22,600	0.0264	1,290	0.762	0.0083	1,430	0.045	10,700	0.00479	32.3	0.0000177	<0.00055
	SC-YP-18 M-Apr-16	Sand Creek	Muscle	14.2	0.0114	0.447	22,200	0.0475	1,410	1.34	0.0031	1,550	0.0428	11,400	0.0104	32.6	0.000019	0.00064
	SC-YP-19 M-Apr-16	Sand Creek	Muscle	8.6	0.00723	0.416	19,600	0.0231	1,310	1.1	0.0041	1,410	0.0831	10,100	0.0293	35.4	0.0000115	<0.00058
	SC-YP-01 O-Apr-16	Sand Creek	Ovary	31.7	0.00691	0.024	7,460	0.0654	1,190	2.77	0.0392	14,100	0.0158	8,190	0.0149	13.2	<0.000086	0.00346
	SC-YP-03 O-Apr-16	Sand Creek	Ovary	38.1	0.00624	0.0225	7,520	0.113	1,150	2.36	0.0413	14,600	0.0216	8,190	0.00238	15.4	<0.000088	0.00048
	SC-YP-05 O-Apr-16	Sand Creek	Ovary	35.4	0.0081	0.0135	8,440	0.0843	1,180	2.45	0.045	14,000	0.0341	9,010	0.00578	13.5	<0.000087	<0.00038
	SC-YP-06 O-Apr-16	Sand Creek	Ovary	29.6	0.00567	0.0191	8,540	0.169	1,270	1.91	0.0337	14,500	0.0112	9,440	0.00174	18.5	<0.000084	<0.00037
	SC-YP-09 O-Apr-16	Sand Creek	Ovary	29.7	0.00568	0.012	8,060	0.221	1,090	1.79	0.0388	16,100	0.013	8,350	0.00354	15.7	<0.000087	0.00063
	SC-YP-10 O-Apr-16	Sand Creek	Ovary	32.95	0.005145	0.0152	7,685	0.203	1,170	3.24	0.04245	15,500	0.01805	8,825	0.006605	17.7	0.0000855	0.00083
	SC-YP-14 O-Apr-16	Sand Creek	Ovary	38.9	0.00631	0.0236	7,630	0.127	1,180	2.43	0.0388	15,300	0.0156	8,650	0.00652	14.1	<0.000088	0.00086
	SC-YP-17 O-Apr-16	Sand Creek	Ovary	34.4	0.00535	0.0194	7,920	0.221	1,150	2.42	0.0403	16,000	0.026	8,390	0.00204	14.4	<0.000087	0.00057
	SC-YP-18 O-Apr-16	Sand Creek	Ovary	38.6	0.00516	0.0195	8,130	0.291	1,120	2.25	0.0423	17,900	0.0143	8,330	0.00278	15.1	<0.000088	0.00086
	SC-YP-19 O-Apr-16	Sand Creek	Ovary	37.6	0.00471	0.0156	7,510	0.138	1,130	2.08	0.0355	14,300	0.0168	8,220	0.00285	16.7	<0.000083	0.00104
	ER-YP-01 M-Apr-16	Elk River	Muscle	13.2	0.0074	0.534	21,900	0.0349	1,320	1.08	0.0027	1,560	0.0567	10,200	0.0211	33.2	<0.000045	0.00163
	ER-YP-02 M-Apr-16	Elk River	Muscle	11.65	0.0079	1.07	24,850	0.0959	1,290	0.9345	0.00415	2,090	0.0292	12,750	0.03945	35.35	0.0000505	0.00064
	ER-YP-03 M-Apr-16	Elk River	Muscle	12.8	0.0117	0.198	16,600	0.127	1,360	2.21	0.0087	1,300	0.0682	19,700	0.0278	20.1	<0.00005	0.001

Table G.11: Metal Concentrations (µg/g Dry Weight) in Yellow Perch Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Fe µg/g dw	Ga µg/g dw	Hg µg/g dw	K µg/g dw	Li µg/g dw	Mg µg/g dw	Mn µg/g dw	Mo µg/g dw	Na µg/g dw	Ni µg/g dw	P µg/g dw	Pb µg/g dw	Rb µg/g dw	Re µg/g dw	Sb µg/g dw
2016	ER-YP-05 M-Apr-16	Elk River	Muscle	23.5	0.0065	0.324	22,900	0.0406	1,240	0.838	0.0057	1,510	0.0259	11,500	0.0189	35.7	<0.000052	0.00064
	ER-YP-06 M-Apr-16	Elk River	Muscle	19.8	0.0198	0.154	14,800	0.217	1,510	4.16	0.0093	2,060	0.124	29,700	0.0671	15.7	<0.000049	0.00104
	ER-YP-07 M-Apr-16	Elk River	Muscle	20.1	0.0096	0.416	23,000	0.0403	1,320	0.845	0.004	1,570	0.0263	11,200	0.0487	34.9	<0.000047	0.00088
	ER-YP-09 M-Apr-16	Elk River	Muscle	12.2	0.0081	0.504	22,300	0.0698	1,260	0.982	0.0035	1,780	0.0293	11,700	0.0269	28.5	<0.00005	0.00063
	ER-YP-10 M-Apr-16	Elk River	Muscle	11.3	0.0082	0.505	23,600	0.0748	1,320	1.23	0.006	1,470	0.0356	12,900	0.0531	24.7	<0.00005	0.00082
	ER-YP-11 M-Apr-16	Elk River	Muscle	12.4	0.0098	0.397	23,400	0.129	1,410	1.62	0.0071	1,690	0.0435	16,500	0.0118	36.2	0.000049	0.00092
	ER-YP-16 M-Apr-16	Elk River	Muscle	9.03	0.009	1.31	23,300	0.0439	1,340	1.02	0.0033	1,830	0.0253	13,100	0.0145	36.4	<0.00005	0.00065
	ER-YP-01 O-Apr-16	Elk River	Ovary	35.3	0.00604	0.018	8,230	0.206	1,150	3.12	0.0351	14,300	0.0243	9,500	0.00929	16.3	<0.00012	<0.00044
	ER-YP-02 O-Apr-16	Elk River	Ovary	33.4	0.00442	0.0471	8,060	0.532	1,210	2.53	0.0351	13,100	0.0129	9,030	0.0196	14.3	<0.00012	0.0008
	ER-YP-03 O-Apr-16	Elk River	Ovary	37.6	0.00708	0.0141	7,190	0.267	1,320	3.58	0.0447	11,000	0.0401	9,290	0.00954	10.4	<0.00012	0.00361
	ER-YP-05 O-Apr-16	Elk River	Ovary	41.6	0.004835	0.01865	8,010	0.1995	1,115	2.33	0.03585	12,750	0.0254	9,045	0.00643	15.7	0.00012	0.00239
	ER-YP-06 O-Apr-16	Elk River	Ovary	38.5	0.00557	0.0103	7,490	0.251	1,290	3.18	0.0373	11,500	0.0377	9,420	0.00604	9.65	<0.00011	0.00282
	ER-YP-07 O-Apr-16	Elk River	Ovary	39.8	0.00622	0.0188	7,800	0.253	1,190	2.67	0.0316	12,200	0.0262	9,150	0.0138	15.4	<0.00012	0.00211
	ER-YP-09 O-Apr-16	Elk River	Ovary	36.4	0.00578	0.0253	7,710	0.347	1,160	2.24	0.0371	12,000	0.0282	9,960	0.0092	13.4	<0.00012	0.00177
	ER-YP-10 O-Apr-16	Elk River	Ovary	37.3	0.00504	0.0215	7,650	0.426	1,230	3.05	0.0447	13,300	0.0353	9,170	0.00693	10.6	<0.00012	0.00254
	ER-YP-11 O-Apr-16	Elk River	Ovary	41.8	0.01	0.0164	7,280	0.559	1,110	2.14	0.0376	12,600	0.0494	8,400	0.00928	14.6	<0.00012	0.00274
	ER-YP-16 O-Apr-16	Elk River	Ovary	35.3	0.00437	0.0647	8,420	0.164	1,170	1.81	0.032	13,400	0.0219	8,770	0.0045	17	<0.00011	0.00363
	GC-YP-06 M-Apr-16	Gold Creek	Muscle	25.3	0.0103	1.65	23,000	0.0377	1,180	0.89	0.0076	2,450	0.0201	11,600	0.0107	33.3	<0.000004	0.001
	GC-YP-09 M-Apr-16	Gold Creek	Muscle	18.4	0.00973	0.279	21,100	0.0266	1,320	1.42	0.0044	2,030	0.0479	10,100	0.0181	23.7	<0.0000047	0.0016
	GC-YP-21 M-Apr-16	Gold Creek	Muscle	15.2	0.0075	0.671	22,900	0.0159	1,370	1.24	0.0045	1,570	0.0414	10,500	0.0228	26.6	<0.000004	0.0013
	GC-YP-23 M-Apr-16	Gold Creek	Muscle	7.01	0.00685	1.07	23,700	0.0414	1,210	0.649	0.003	1,620	0.0248	11,100	0.00517	36.5	<0.0000041	0.00313
	GC-YP-24 M-Apr-16	Gold Creek	Muscle	12.9	0.00887	0.399	22,400	0.0564	1,290	1.46	0.0048	2,090	0.0338	12,200	0.0232	33.7	0.0000112	0.00108
	GC-YP-31 M -Apr-16	Gold Creek	Muscle	10.405	0.007265	1.21	23,150	0.05095	1,190	0.4085	0.0026	1,645	0.01385	10,700	0.00621	35.4	0.0000127	0.00064
	GC-YP-32 M-Apr-16	Gold Creek	Muscle	45.9	0.00787	0.454	21,900	0.0255	1,260	1.54	0.0103	1,410	0.112	11,500	0.0287	28	<0.0000046	0.00273
	GC-YP-33 M-Apr-16	Gold Creek	Muscle	11.1	0.00975	0.444	23,000	0.0287	1,370	1.78	0.0044	1,400	0.0299	14,000	0.0143	28.8	<0.0000039	<0.00053
	GC-YP-35 M-Apr-16	Gold Creek	Muscle	12.3	0.0102	0.488	25,300	0.0348	1,440	1.61	0.0041	1,520	0.133	14,700	0.0291	33.6	0.000009	0.00381
	GC-YP-37 M-Apr-16	Gold Creek	Muscle	10.1	0.00675	1.12	23,400	0.0259	1,240	1.09	0.0027	1,570	0.0222	10,600	0.0127	33.5	<0.0000042	0.00118
	GC-YP-06 O-Apr-16	Gold Creek	Ovary	29.4	0.00631	0.07	8,040	0.116	1,320	1.96	0.03	13,500	0.0172	9,320	0.00342	15.3	<0.0001	0.0005
	GC-YP-09 O-Apr-16	Gold Creek	Ovary	30.3	0.00652	0.0139	8,040	0.111	1,140	4.48	0.039	12,500	0.0204	8,520	0.00384	13	<0.0001	0.00054
	GC-YP-21 O-Apr-16	Gold Creek	Ovary	41.4	0.00729	0.0378	7,680	0.0731	1,270	5.39	0.0383	12,200	0.0286	8,760	0.0153	11	<0.0001	0.00084
	GC-YP-23 O-Apr-16	Gold Creek	Ovary	36.3	0.00798	0.0338	7,900	0.317	1,320	2.98	0.0348	13,200	0.0157	9,080	0.00807	17.3	<0.0001	0.0005
	GC-YP-24 O-Apr-16	Gold Creek	Ovary	32.2	0.00563	0.0145	8,150	0.202	1,270	1.82	0.0329	12,800	0.0176	8,720	0.00454	16.6	<0.000096	0.0009
	GC-YP-31 O-Apr-16	Gold Creek	Ovary	25.4	0.00515	0.0428	7,940	0.289	1,180	2.24	0.0224	12,500	0.018	8,950	0.00195	17.1	<0.000092	0.00166
	GC-YP-32 O-Apr-16	Gold Creek	Ovary	27.2	0.0044	0.0246	8,600	0.0818	1,220	1.72	0.0306	13,000	0.0249	8,740	0.00311	14.6	<0.000099	0.00228
	GC-YP-33 O-Apr-16	Gold Creek	Ovary	29.05	0.004675	0.0228	8,310	0.09215	1,140	1.95	0.03395	12,400	0.0296	8,615	0.00351	13.4	0.000098	0.002885
	GC-YP-35 O-Apr-16	Gold Creek	Ovary	33.2	0.0058	0.0276	8,250	0.0894	1,210	2.38	0.038	14,300	0.0305	8,830	0.00492	14.2	<0.0001	0.00148
	GC-YP-37 O-Apr-16	Gold Creek	Ovary	29.3	0.00508	0.0492	7,980	0.159	1,110	2.03	0.0309	12,700	0.0133	8,880	0.0027	15.1	<0.00011	0.00119

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Year	Sample ID	Area	Tissue Type	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2014	SC-YP-1-Aug-14	Sand Creek	Muscle	1.56	0.00451	0.155	0.000332	0.169	0.0500	<0.00023	0.00711	0.00074	22.2	0.0225
	SC-YP-2-Aug-14	Sand Creek	Muscle	1.84	0.00682	1.05	0.000764	0.201	0.0219	0.00038	0.0104	0.00163	21.0	0.0179
	SC-YP-3-Aug-14	Sand Creek	Muscle	1.74	0.00882	0.799	0.000551	0.210	0.0263	<0.00027	0.00747	0.00101	20.6	0.00968
	SC-YP-4-Aug-14	Sand Creek	Muscle	1.97	0.00265	3.75	0.000594	0.219	0.0279	0.00064	0.0132	0.00123	20.2	0.00524
	GC-YP-1-Aug-14	Gold Creek	Muscle	2.17	0.0216	2.46	0.00476	0.721	0.0216	0.00161	0.0339	0.00916	17.7	0.0461
	GC-YP-2-Aug-14	Gold Creek	Muscle	1.81	0.0038	0.0956	0.00062	0.154	0.0325	<0.00091	0.00287	0.00077	18.0	0.0136
	GC-YP-3-Aug-14	Gold Creek	Muscle	2.60	0.00335	0.110	0.000298	0.175	0.0336	<0.00040	0.00449	0.00099	23.0	0.0096
	GC-YP-4-Aug-14	Gold Creek	Muscle	2.66	0.00763	0.576	0.00160	0.311	0.0237	0.00055	0.0140	0.00449	20.5	0.0140
	GC-YP-5-Aug-14	Gold Creek	Muscle	2.59	0.00147	0.538	0.0001035	0.130	0.0387	<0.00038	0.00261	0.00092	20.1	0.00466
	GC-YP-6-Aug-14	Gold Creek	Muscle	2.27	0.00459	0.0672	0.000277	0.153	0.0230	<0.00040	0.00418	0.00067	21.5	0.00736
	GC-YP-7-Aug-14	Gold Creek	Muscle	2.71	0.00227	0.525	0.000164	0.113	0.0332	<0.00039	0.00324	0.00048	19.7	0.00369
	GC-YP-8-Aug-14	Gold Creek	Muscle	3.01	0.00248	0.817	0.00013	0.124	0.0261	<0.00039	0.00673	0.00049	20.3	0.0102
	GC-YP-9-Aug-14	Gold Creek	Muscle	3.06	0.00205	0.152	0.000056	0.107	0.0238	<0.00040	0.00305	0.00033	21.0	0.00279
	GC-YP-10-Aug-14	Gold Creek	Muscle	3.02	0.0031	0.152	0.000072	0.125	0.0202	<0.00040	0.00303	0.00043	17.6	0.0180
2015	SC-YP-01-Apr-15	Sand Creek	Muscle	1.25	0.00202	1.33	0.00089	0.1850	0.0408	0.00054	0.01040	0.00171	21.7	0.0250
	SC-YP-10-Apr-15	Sand Creek	Muscle	3.49	0.00116	1.88	0.00041	0.1230	0.0336	0.00026	0.00743	0.00062	23.3	0.0143
	SC-YP-15-Apr-15	Sand Creek	Muscle	1.93	0.00424	2.10	0.0047	0.5500	0.0262	0.00111	0.04960	0.00797	23.9	0.0354
	SC-YP-17-Apr-15	Sand Creek	Muscle	2.2	0.00203	0.37	0.00157	0.1450	0.0498	0.00022	0.00572	0.00120	25.0	0.0185
	SC-YP-19-Apr-15	Sand Creek	Muscle	3.16	0.00130	0.35	<0.00041	0.1390	0.0404	<0.00023	0.00415	0.00031	25.9	0.0106
	SC-YP-25-Apr-15	Sand Creek	Muscle	4.03	0.00250	0.87	0.00297	0.3070	0.0634	0.00052	0.01900	0.00399	20.6	0.0237
	SC-YP-01-Apr-15	Sand Creek	Ovary	2.05	<0.0012	1.73	0.000613	0.0862	0.0310	0.000784	0.0348	0.00308	69.0	0.00666
	SC-YP-10-Apr-15	Sand Creek	Ovary	4.33	<0.0012	1.99	0.00181	0.139	0.0158	0.000637	0.0272	0.00334	77.1	0.00753
	SC-YP-17-Apr-15	Sand Creek	Ovary	2.36	<0.0012	1.48	0.000662	0.0898	0.0197	0.000186	0.0164	0.00103	67.5	0.00588
	SC-YP-19-Apr-15	Sand Creek	Ovary	3.35	0.00120	1.67	0.000289	0.0831	0.0118	0.000312	0.0167	0.000905	69.2	0.00690
	ER-YP-01-Apr-15	Elk River	Muscle	3.01	0.00260	1.51	0.00192	0.2880	0.0466	0.00089	0.02620	0.00417	34.4	0.0073
	ER-YP-02-Apr-15	Elk River	Muscle	3.99	<0.0012	0.91	0.000402	0.1720	0.0348	0.00032	0.01190	0.00200	30.8	0.0117
	ER-YP-04-Apr-15	Elk River	Muscle	3.67	0.00190	1.30	0.000787	0.1650	0.0293	0.00044	0.00994	0.00141	36.0	0.0079
	ER-YP-05-Apr-15	Elk River	Muscle	3.91	0.00610	2.11	0.00198	0.3190	0.0287	0.00104	0.03120	0.00359	27.3	0.0142
	ER-YP-07-Apr-15	Elk River	Muscle	1.52	<0.0012	0.60	0.000564	0.1030	0.0138	0.00018	0.00688	0.00107	19.9	0.0027
	ER-YP-08-Apr-15	Elk River	Muscle	3.41	0.00230	0.39	0.0002595	0.1150	0.0385	0.00024	0.00629	0.00081	27.9	0.0044
	ER-YP-09-Apr-15	Elk River	Muscle	3.32	0.00230	1.57	0.000927	0.1300	0.0292	0.00027	0.00589	0.00108	24.9	0.0081
	ER-YP-10-Apr-15	Elk River	Muscle	15	0.00300	0.80	0.000463	0.1240	0.0510	0.00012	0.00638	0.00069	32.3	0.0047
	ER-YP-11-Apr-15	Elk River	Muscle	4.45	<0.0012	0.93	0.000222	0.1020	0.0541	0.00025	0.00307	0.00033	17.5	0.0021
	ER-YP-12-Apr-15	Elk River	Muscle	3.91	0.00180	2.41	0.000484	0.1100	0.0412	0.00051	0.00811	0.00077	44.4	0.0054
	ER-YP-01-Apr-15	Elk River	Ovary	3.75	0.00223	1.96	0.00723	0.5895	0.0460	0.00256	0.08200	0.01625	73.7	0.0179
	ER-YP-02-Apr-15	Elk River	Ovary	4.36	0.000850	1.39	0.000534	0.142	0.0298	0.000505	0.0326	0.00258	75.1	0.0046
	ER-YP-04-Apr-15	Elk River	Ovary	3.56	<0.00064	1.46	0.000100	0.0880	0.0176	0.000490	0.0176	0.00101	78.7	0.0510
	ER-YP-05-Apr-15	Elk River	Ovary	4.11	<0.00064	1.43	0.000148	0.0890	0.0181	0.000510	0.0166	0.000980	68.0	0.0252
	ER-YP-07-Apr-15	Elk River	Ovary	3.34	<0.00060	1.40	0.000129	0.0810	0.00918	0.000610	0.0170	0.000930	71.2	0.0146
	ER-YP-08-Apr-15	Elk River	Ovary	4.80	0.00161	0.32	0.000371	0.115	0.0465	0.00119	0.0269	0.00190	139	0.0114
	ER-YP-09-Apr-15	Elk River	Ovary	3.57	<0.00062	1.51	0.000102	0.0810	0.0255	0.000410	0.0210	0.000980	72.1	0.0160
	ER-YP-10-Apr-15	Elk River	Ovary	10.3	0.000650	1.37	0.000184	0.114	0.0229	0.000440	0.0216	0.000680	69.0	0.00480

Table G.11: Metal Concentrations (µg/g Dry Weight) in Yellow Perch Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2015	ER-YP-11-Apr-15	Elk River	Ovary	4.38	<0.00063	1.37	0.000178	0.0730	0.0368	0.000795	0.0258	0.00173	71.4	0.00385
	ER-YP-12-Apr-15	Elk River	Ovary	3.84	0.000780	1.51	0.00240	0.177	0.0352	0.00109	0.0338	0.00432	82.2	0.00890
	GC-YP-01-Apr-15	Gold Creek	Muscle	2.51	0.00466	3.08	0.0034	0.3530	0.0263	0.00076	0.02010	0.00530	24.6	0.0392
	GC-YP-02-Apr-15	Gold Creek	Muscle	2.69	0.00206	2.35	0.00301	0.3850	0.0206	0.00080	0.01910	0.00606	28.5	0.0613
	GC-YP-03-Apr-15	Gold Creek	Muscle	2.77	0.00459	0.82	0.00061	0.1620	0.0301	0.00103	0.00645	0.00136	22.5	0.0312
	GC-YP-04-Apr-15	Gold Creek	Muscle	2.55	0.00194	0.67	<0.00040	0.1240	0.0335	<0.00023	0.00661	0.00037	21.6	0.0394
	GC-YP-05-Apr-15	Gold Creek	Muscle	2.76	0.00275	0.34	0.00048	0.1320	0.0315	0.00030	0.00450	0.00080	24.3	0.0251
	GC-YP-06-Apr-15	Gold Creek	Muscle	2.345	0.00154	0.86	<0.00040	0.1380	0.0236	0.00052	0.00538	0.00130	25.6	0.0203
	GC-YP-07-Apr-15	Gold Creek	Muscle	2.73	<0.00071	4.82	<0.00040	0.1120	0.0344	0.00048	0.00472	0.00032	28.2	0.0157
	GC-YP-08-Apr-15	Gold Creek	Muscle	2.61	<0.00070	0.75	<0.00040	0.1010	0.0288	<0.00022	0.00273	0.00025	24.2	0.0106
	GC-YP-09-Apr-15	Gold Creek	Muscle	3.16	0.00136	0.15	<0.00039	0.0957	0.0274	<0.00022	0.00259	0.00022	21.0	0.0151
	GC-YP-10-Apr-15	Gold Creek	Muscle	2.49	0.00129	2.41	<0.00041	0.1250	0.0319	0.00032	0.00673	0.00069	22.8	0.0119
	GC-YP-01-Apr-15	Gold Creek	Ovary	2.66	0.000690	1.27	0.00107	0.166	0.0208	0.000660	0.0389	0.00286	80.0	0.00810
	GC-YP-02-Apr-15	Gold Creek	Ovary	3.31	0.000680	1.37	0.00145	0.160	0.0166	0.00108	0.0154	0.0153	72.9	0.00950
	GC-YP-03-Apr-15	Gold Creek	Ovary	3.49	0.000780	1.49	<0.000048	0.0728	0.0216	0.000421	0.0107	0.000940	73.5	0.00640
	GC-YP-04-Apr-15	Gold Creek	Ovary	2.73	0.00179	1.38	0.000194	0.0823	0.0124	0.000381	0.0108	0.000980	71.1	0.00515
	GC-YP-05-Apr-15	Gold Creek	Ovary	3.71	0.000870	1.40	0.000169	0.0867	0.0238	0.000512	0.0200	0.00119	72.6	0.00810
	GC-YP-06-Apr-15	Gold Creek	Ovary	3.09	0.00064	1.40	0.000108	0.0849	0.0192	0.000935	0.0203	0.00204	80.0	0.00318
	GC-YP-07-Apr-15	Gold Creek	Ovary	3.68	<0.00063	1.40	<0.000053	0.0620	0.0292	0.000434	0.0108	0.000340	70.0	0.00351
	GC-YP-08-Apr-15	Gold Creek	Ovary	3.12	0.000920	1.26	0.0000820	0.0561	0.0244	0.000391	0.0136	0.000780	76.8	0.00562
	GC-YP-09-Apr-15	Gold Creek	Ovary	3.64	0.00104	1.59	0.000140	0.0713	0.0215	0.000565	0.0132	0.00117	78.3	0.00282
	GC-YP-10-Apr-15	Gold Creek	Ovary	3.35	<0.00062	1.66	0.000450	0.0652	0.0232	0.000509	0.0265	0.000870	81.6	0.00241
2016	SC-YP-01 M-Apr-16	Sand Creek	Muscle	2	0.00177	1.19	0.00531	0.294	0.0419	0.00055	0.021	0.00383	24.9	0.0098
	SC-YP-03 M-Apr-16	Sand Creek	Muscle	1.85	0.002	2.08	0.00244	0.463	0.0515	0.00092	0.0238	0.00437	22.8	0.011
	SC-YP-05 M-Apr-16	Sand Creek	Muscle	2.44	<0.00084	4.06	0.000357	0.115	0.0708	0.00063	0.0147	0.00085	26.7	0.0037
	SC-YP-06 M-Apr-16	Sand Creek	Muscle	2.54	0.0012	3.92	0.00101	0.176	0.0628	0.00038	0.00779	0.0012	26.8	0.0057
	SC-YP-09 M-Apr-16	Sand Creek	Muscle	1.32	0.00124	1.49	0.00152	0.227	0.0843	0.00083	0.0105	0.00207	23	0.0074
	SC-YP-10 M-Apr-16	Sand Creek	Muscle	1.79	0.00118	10.3	0.000916	0.155	0.0547	0.00146	0.019	0.00154	39.7	0.0077
	SC-YP-14 M-Apr-16	Sand Creek	Muscle	1.73	0.00276	0.783	0.00175	0.296	0.0482	0.00049	0.0174	0.00365	20.9	0.0163
	SC-YP-17 M-Apr-16	Sand Creek	Muscle	1.64	0.0011	0.108	0.00064	0.146	0.0426	<0.00019	0.00765	0.0011	25.3	0.0115
	SC-YP-18 M-Apr-16	Sand Creek	Muscle	1.62	0.00202	0.794	0.00215	0.249	0.0423	0.00052	0.0157	0.00385	19.6	0.0116
	SC-YP-19 M-Apr-16	Sand Creek	Muscle	1.34	0.00141	0.804	0.00082	0.135	0.0509	0.00025	0.00609	0.002	17.2	0.0253
	SC-YP-01 O-Apr-16	Sand Creek	Ovary	2.72	0.00153	1.41	0.00202	0.0844	0.0223	0.00065	0.0282	0.00165	63.8	0.00231
	SC-YP-03 O-Apr-16	Sand Creek	Ovary	2.05	<0.00065	1.74	0.000456	0.105	0.0332	0.00058	0.0284	0.00175	66.3	0.00463
	SC-YP-05 O-Apr-16	Sand Creek	Ovary	2.62	0.00105	2.2	0.00189	0.22	0.0376	0.0008	0.0494	0.00439	70.9	0.00743
	SC-YP-06 O-Apr-16	Sand Creek	Ovary	3.04	<0.00062	1.66	0.000223	0.0991	0.0177	0.00028	0.00818	0.00075	78.9	0.00377
	SC-YP-09 O-Apr-16	Sand Creek	Ovary	1.91	0.00073	1.3	0.000304	0.0828	0.0246	0.00029	0.0114	0.00118	58.5	0.0025
	SC-YP-10 O-Apr-16	Sand Creek	Ovary	2.095	0.00063	1.76	0.0005385	0.10845	0.04365	0.000505	0.01755	0.0021	72.75	0.004685
	SC-YP-14 O-Apr-16	Sand Creek	Ovary	2.14	0.00097	1.53	0.000742	0.173	0.0333	0.00047	0.0175	0.00224	73.4	0.00571
	SC-YP-17 O-Apr-16	Sand Creek	Ovary	2.07	<0.00064	1.52	0.000094	0.0825	0.025	0.00023	0.0116	0.0007	67	0.00308
	SC-YP-18 O-Apr-16	Sand Creek	Ovary	2.38	0.00076	1.51	0.000535	0.109	0.0177	0.00038	0.0141	0.0014	61	0.0322
	SC-YP-19 O-Apr-16	Sand Creek	Ovary	1.74	<0.00061	1.45	0.000678	0.197	0.0246	0.00056	0.0101	0.00454	67.9	0.0129
	ER-YP-01 M-Apr-16	Elk River	Muscle	3.7	0.00596	0.143	0.000811	0.238	0.122	0.00024	0.0146	0.00279	20.9	0.0128
	ER-YP-02 M-Apr-16	Elk River	Muscle	3.785	0.00202	1.552	0.0007435	0.1885	0.02935	0.00074	0.01061	0.001505	31.2	0.0081
	ER-YP-03 M-Apr-16	Elk River	Muscle	4.83	0.00252	12.1	0.00103	0.231	0.0505	0.0017	0.0363	0.00241	43.1	0.0339

Table G.11: Metal Concentrations (µg/g Dry Weight) in Yellow Perch Tissues Collected in Koocanusa Reservoir, 2014 to 2016

Year	Sample ID	Area	Tissue Type	Se µg/g dw	Sn µg/g dw	Sr µg/g dw	Th µg/g dw	Ti µg/g dw	Tl µg/g dw	U µg/g dw	V µg/g dw	Y µg/g dw	Zn µg/g dw	Zr µg/g dw
2016	ER-YP-05 M-Apr-16	Elk River	Muscle	4.14	0.00192	0.163	0.0013	0.215	0.0759	0.00074	0.0171	0.00334	32.7	0.0174
	ER-YP-06 M-Apr-16	Elk River	Muscle	4.54	0.00336	23.4	0.00227	0.366	0.0626	0.00337	0.0623	0.00572	43.7	0.0252
	ER-YP-07 M-Apr-16	Elk River	Muscle	2.89	0.00308	0.172	0.0025	0.35	0.0534	0.00067	0.027	0.00564	25	0.0156
	ER-YP-09 M-Apr-16	Elk River	Muscle	3.64	0.00245	0.659	0.0015	0.216	0.0602	0.00046	0.0173	0.00298	22.2	0.0116
	ER-YP-10 M-Apr-16	Elk River	Muscle	4.56	0.00362	1.84	0.000524	0.17	0.0814	0.00053	0.0129	0.00149	24	0.0166
	ER-YP-11 M-Apr-16	Elk River	Muscle	3.43	0.00165	5.96	0.000253	0.158	0.0527	0.00089	0.0201	0.00099	28.5	0.0043
	ER-YP-16 M-Apr-16	Elk River	Muscle	3.99	0.0014	2.44	0.000667	0.282	0.0419	0.00048	0.0116	0.00243	21	0.005
	ER-YP-01 O-Apr-16	Elk River	Ovary	3.66	0.0013	1.69	0.00114	0.098	0.0802	0.00042	0.0204	0.00128	78.3	0.00332
	ER-YP-02 O-Apr-16	Elk River	Ovary	4.3	0.00122	1.62	0.000506	0.093	0.0195	0.00062	0.0201	0.00134	83.4	0.00705
	ER-YP-03 O-Apr-16	Elk River	Ovary	5.45	0.00142	1.63	0.0044	0.177	0.037	0.00096	0.0646	0.0036	77	0.00719
	ER-YP-05 O-Apr-16	Elk River	Ovary	4.715	0.000745	1.785	0.0002725	0.0905	0.01815	0.00081	0.05955	0.00179	76.7	0.0032
	ER-YP-06 O-Apr-16	Elk River	Ovary	5.55	0.00103	1.71	0.000386	0.108	0.0462	0.00105	0.0622	0.00263	73.6	0.00451
	ER-YP-07 O-Apr-16	Elk River	Ovary	3.66	0.001	1.46	0.00143	0.161	0.0151	0.0006	0.0316	0.0027	68	0.00543
	ER-YP-09 O-Apr-16	Elk River	Ovary	4.93	0.00091	2.61	0.000665	0.134	0.0199	0.00077	0.0267	0.00388	77.7	0.0284
	ER-YP-10 O-Apr-16	Elk River	Ovary	4.52	0.00065	1.62	0.000177	0.096	0.0327	0.00097	0.042	0.0019	76.9	0.0138
	ER-YP-11 O-Apr-16	Elk River	Ovary	3.63	0.00192	1.45	0.00345	0.409	0.0199	0.00122	0.0669	0.0065	67.3	0.0203
	ER-YP-16 O-Apr-16	Elk River	Ovary	3.9	0.00198	1.53	0.000367	0.11	0.012	0.00044	0.0173	0.0016	66.5	0.00576
	GC-YP-06 M-Apr-16	Gold Creek	Muscle	2.97	0.00313	0.829	0.00328	0.246	0.0298	0.00054	0.016	0.00575	30.2	0.0176
	GC-YP-09 M-Apr-16	Gold Creek	Muscle	3.26	0.00352	0.544	0.00167	0.347	0.0465	0.00055	0.0208	0.00428	22.5	0.0493
	GC-YP-21 M-Apr-16	Gold Creek	Muscle	3.12	0.00142	0.197	0.00139	0.187	0.0425	0.00042	0.0121	0.00367	19.8	0.0205
	GC-YP-23 M-Apr-16	Gold Creek	Muscle	2.68	0.00153	0.515	0.00055	0.131	0.043	<0.00019	0.00577	0.00127	20.7	0.00554
	GC-YP-24 M-Apr-16	Gold Creek	Muscle	2.74	0.00516	1.7	0.0008	0.171	0.0323	0.00042	0.0115	0.00183	25.7	0.00914
	GC-YP-31 M -Apr-16	Gold Creek	Muscle	2.665	0.00235	0.13	0.000335	0.1235	0.0259	0.000235	0.003335	0.00058	26.15	0.00618
	GC-YP-32 M-Apr-16	Gold Creek	Muscle	2.84	0.00553	1.99	0.00087	0.223	0.0373	0.0007	0.027	0.00208	27.1	0.0646
	GC-YP-33 M-Apr-16	Gold Creek	Muscle	3.57	0.00293	4.14	0.00046	0.151	0.0585	0.00068	0.0129	0.00084	27.2	0.00598
	GC-YP-35 M-Apr-16	Gold Creek	Muscle	3.29	0.0202	3.85	0.00187	0.321	0.0527	0.00084	0.0187	0.00279	26.9	0.0404
	GC-YP-37 M-Apr-16	Gold Creek	Muscle	3.06	0.00242	0.361	0.00069	0.181	0.0267	<0.00019	0.00523	0.00154	19.6	0.0071
	GC-YP-06 O-Apr-16	Gold Creek	Ovary	4.01	0.00175	1.33	0.00035	0.115	0.00946	<0.00062	0.0111	0.00158	73.2	0.00588
	GC-YP-09 O-Apr-16	Gold Creek	Ovary	3.55	0.0012	1.63	0.000455	0.149	0.0209	0.00072	0.033	0.00243	70.1	0.00948
	GC-YP-21 O-Apr-16	Gold Creek	Ovary	4.36	0.00211	1.56	0.00222	0.235	0.0233	0.00203	0.0447	0.00749	73.5	0.0151
	GC-YP-23 O-Apr-16	Gold Creek	Ovary	3.43	0.00172	1.44	0.00256	0.153	0.0293	<0.0006	0.0266	0.00243	77.8	0.00602
	GC-YP-24 O-Apr-16	Gold Creek	Ovary	3.37	0.0013	1.47	0.00137	0.132	0.0102	<0.00057	0.0269	0.00117	67.2	0.00584
	GC-YP-31 O-Apr-16	Gold Creek	Ovary	3.71	0.00089	1.36	0.00017	0.0922	0.0144	<0.00055	0.0087	0.00066	76.2	0.0035
	GC-YP-32 O-Apr-16	Gold Creek	Ovary	4.37	0.00151	1.76	0.000155	0.103	0.0106	0.00069	0.0213	0.00142	77.2	0.00824
	GC-YP-33 O-Apr-16	Gold Creek	Ovary	4.39	0.001155	1.745	0.000129	0.0777	0.0178	0.0006	0.02115	0.001555	74.4	0.00439
	GC-YP-35 O-Apr-16	Gold Creek	Ovary	4.07	0.00168	1.64	0.000311	0.112	0.0179	0.00071	0.044	0.0019	70.5	0.00385
	GC-YP-37 O-Apr-16	Gold Creek	Ovary	4.03	0.00108	1.41	0.000128	0.091	0.0121	<0.00063	0.0187	0.00129	75.5	0.00361

Table G.12: Metal Concentrations (µg/g Dry Weight) in Westslope Cutthroat Trout Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Total wet mass	Total dry mass	Dry matter	Moisture	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs
				g	g	%	%	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt	µg/g dry wt
2015	SC-WCT-01-Apr-15	Sand Creek	Muscle	0.04699	0.0111	0.24	76	<0.00091	3.9	0.11	<0.34	0.55	<0.018	0.0003	4,750	0.003	0.026	0.567	0.030
2016	SC-WCT-01 M-Apr-16	Sand Creek	Muscle	5.85517	1.27697	0.218093	78	<0.0005	4.16	0.0419	0.122	0.306	<0.0054	0.000661	2,160	<0.0024	0.0175	0.0684	0.0157
	SC-WCT-02-Apr-16	Sand Creek	Muscle	0.0373	0.00941	0.252279	75	<0.0023	303	0.206	0.47	5.54	0.0116	0.00211	1,060	0.0094	0.143	0.757	0.0436
	SC-WCT-03-Apr-16	Sand Creek	Muscle plug	0.02012	0.00559	0.277833	72	<0.0039	130	0.055	<0.47	1.84	<0.015	0.00118	6,450	0.0199	0.0561	1.4	0.0323
	ER-WCT-01 M-Apr-16	Elk River	Muscle	4.45329	0.95363	0.214141	79	<0.0005	2.22	0.0513	0.222	0.239	<0.0054	0.000523	2,200	<0.0024	0.0262	0.0509	0.016
	GC-WCT-01-Apr-16	Gold Creek	Muscle plug	0.03372	0.00803	0.238138	76	<0.0026	3.88	0.145	<0.32	1.5	<0.0098	0.00041	4,810	0.0053	0.0442	0.097	0.0275
	GC-WCT-02-Apr-16	Gold Creek	Muscle plug	0.02227	0.00499	0.224068	78	<0.0043	0.716	0.064	<0.53	0.122	<0.016	0.00059	1,180	<0.006	0.0411	0.347	0.025
	GC-WCT-03-Apr-16	Gold Creek	Muscle plug	0.0386	0.00882	0.228497	77	<0.0024	2.1	0.054	<0.3	0.0965	<0.0092	0.00047	484	<0.0034	0.0208	0.141	0.0269

Table G.12: Metal Concentrations (µg/g Dry Weight) in Westslope Cutthroat Trout Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Cu µg/g dry wt	Fe µg/g dry wt	Ga µg/g dry wt	Hg µg/g dry wt	K µg/g dry wt	Li µg/g dry wt	Mg µg/g dry wt	Mn µg/g dry wt	Mo µg/g dry wt	Na µg/g dry wt	Ni µg/g dry wt	P µg/g dry wt	Pb µg/g dry wt
2015	SC-WCT-01-Apr-15	Sand Creek	Muscle	0.98	14.2	0.0105	0.082	19,200	<0.015	1,330	0.89	0.0137	1,620	0.320	14,200	0.054
2016	SC-WCT-01 M-Apr-16	Sand Creek	Muscle	1	27.1	0.0069	0.223	23,900	0.011	1,400	1.01	<0.003	976	0.0488	13,700	0.00676
	SC-WCT-02-Apr-16	Sand Creek	Muscle	1.27	226	0.121	0.139	18,100	0.205	1,480	4.72	0.0118	1,010	0.298	10,600	0.645
	SC-WCT-03-Apr-16	Sand Creek	Muscle plug	1.32	117	0.044	0.147	16,600	0.121	1,390	2.97	0.0128	2,230	0.198	13,000	0.173
	ER-WCT-01 M-Apr-16	Elk River	Muscle	1.59	17.5	0.0045	0.134	23,000	0.0297	1,350	0.857	<0.003	1,080	0.0277	14,000	0.00834
	GC-WCT-01-Apr-16	Gold Creek	Muscle plug	0.977	20.8	0.0073	0.154	17,300	<0.021	1,230	1.05	0.0046	1,330	0.163	12,600	0.0409
	GC-WCT-02-Apr-16	Gold Creek	Muscle plug	1.55	18.6	0.007	0.249	18,500	<0.035	1,160	0.366	0.007	1,550	0.107	10,700	0.0059
	GC-WCT-03-Apr-16	Gold Creek	Muscle plug	1.47	17.4	0.0053	0.19	18,700	<0.02	1,210	0.298	0.0043	824	0.0468	10,900	0.00565

Table G.12: Metal Concentrations (µg/g Dry Weight) in Westslope Cutthroat Trout Muscle Collected in Koocanusa Reservoir, April 2015 and 2016

Year	Sample ID	Area	Tissue Type	Rb µg/g dry wt	Re µg/g dry wt	Sb µg/g dry wt	Se µg/g dry wt	Sn µg/g dry wt	Sr µg/g dry wt	Th µg/g dry wt	Ti µg/g dry wt	Tl µg/g dry wt	U µg/g dry wt	V µg/g dry wt	Y µg/g dry wt	Zn µg/g dry wt	Zr µg/g dry wt
2015	SC-WCT-01-Apr-15	Sand Creek	Muscle	8.8	<0.00064	0.0031	3.59	0.0079	3.440	0.00150	0.138	0.0349	0.0008	0.0095	0.001	24.1	0.009
2016	SC-WCT-01 M-Apr-16	Sand Creek	Muscle	11.6	<0.000043	<0.0011	1.8	0.0017	1.23	0.000834	0.153	0.0089	0.000444	0.0464	0.00226	15.9	0.00602
	SC-WCT-02-Apr-16	Sand Creek	Muscle	10.3	<0.00033	0.0089	5.01	0.0335	1.65	0.231	7.17	0.0161	0.0238	0.363	0.145	18.6	0.169
	SC-WCT-03-Apr-16	Sand Creek	Muscle plug	7.9	<0.00054	0.0325	2.1	0.0272	5.11	0.024	2.04	0.0163	0.00745	0.152	0.0797	26.6	0.072
	ER-WCT-01 M-Apr-16	Elk River	Muscle	10.9	0.000127	0.0015	4.92	0.0013	0.873	0.00052	0.117	0.025	0.000423	0.0053	0.00111	18.8	0.00656
	GC-WCT-01-Apr-16	Gold Creek	Muscle plug	7.6	<0.00037	<0.0021	4.39	0.0079	3.28	0.00056	0.177	0.0172	0.00153	0.0099	0.00194	21.9	0.111
	GC-WCT-02-Apr-16	Gold Creek	Muscle plug	8.6	<0.00061	<0.0035	3.17	<0.0057	0.656	<0.0008	0.108	0.0185	<0.00075	0.0062	<0.0014	16.6	0.0236
	GC-WCT-03-Apr-16	Gold Creek	Muscle plug	8.4	<0.00034	<0.002	2.13	0.004	0.209	<0.00045	0.129	0.0131	<0.00043	0.0049	<0.0008	24.5	0.0167

APPENDIX H
LABORATORY AGING DATA

2014

2015

2016

2014

1.0

Peamouth Chub. – Project 2509. Koocanusa.

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
1	SC	April 11	PC	01		236	M	Oto.	8	++	(7)	9°	Poss. 10°	
2	SC	"	PC	02		276	F	Oto.	10	++	(6-7)	11°	Poss. 12° Tough Jaw	
3	SC	"	PC	03		309	F	Oto.	13	++	(6)	14°	Poss ±1 or 2	
4	"	April 11	PC	04		266	F	Oto.	11	++	(6-7)	12°	1 oto. Poss. ±1.	
5	"	"	PC	05		215	M	Sc	3	++	(6)	4°	Wrong otoliths collected.	
6	SC	"	PC	06		272	F	Oto.	16	++	(7)	17°	17° Poss 16°	
7	SC	"	PC	07		232	F	Sc	4	++	(6)	5°	No otoliths. 1st?	
8	SC	April 11	PC	08		224	M	Oto.	4	++	(7)	5°	1 oto.	**
9	SC	"	PC	09		24	IF	Oto.	7	++	(7)	8°		**
10	"	"	PC	10		234	F	Oto.	6	++	(7)	7°		x
11	"	"	PC	11		24	F	Oto.	5	++	(7)	6°		
12	"	April 12	PC	12		286	F	Oto.	9	++	(6-7)	10°	Poss. 11° Tough Jaw	
13	SC	"	PC	13		233	M	Oto.	7	++	(7)	8°		x
14	"	"	PC	14		265	F	Oto.	13	++	(6-7)	14°	14° Poss 13°	
15	"	"	PC	15		267	F	Oto.	10	++	"	11°	Poss ±1	
16	"	April 12	PC	16		236	F	Oto.	5	++	(7)	6°		x
17	"	"	PC	17		234	F	Oto.	6	++	(7)	7°		
18	SC	"	PC	18		241	F	Oto.	10	++	(6-7)	11°	Poss. ±1.	
19	SC	"	PC	19		20	I	Oto.	2	++	"	3°	FCS. Scales = 3°	2++(6) FCS-E Use 3°.
20	"	April 12	PC	20		292	F	Oto.	16	++	(6)	17°	Poss. overaging by lab.	
21	"	April 13	PC	21		282	F	Oto.	16	++	(7)	17°	17°	x
22	"	" "	PC	22		215	M	Oto.	5	++	(6-7)	6°	1 otolith. 1st?	
23	"	" 14	PC	23		227	F	Oto.	11	++	(7)	12°		x
24	"	"	PC	24		246	F	Oto.	5	++	(6-7)	6°	Poss 5° Tough Jaw.	
25	SC	"	PC	25		247	IF	Oto.	5	++	(7)	6°	2nd?	
26	"	April 14	PC	26		228	M	Oto.	5	++	(6)	6°	2 oto. 1st? almost gone? Sc.	=6°5+ (6)
27	"	"	PC	27		245	F	Oto.	6	++	(6-7)	7°	2nd? poss. F.C.	
28	SC	"	PC	28		20	IM	Oto.	4	++	(7)	5°		x**
29	"	"	PC	29		24	F	Oto.	4	++	(7)	5°	1 oto. FCS. Sc = 5° 4++(6)	
30	"	"	"	30		212	M	Oto.	3	++	(7)	4°		x
31	SC	April 14	PC	31		233	F	Oto.	4	++	(7)	5°		x**
32	"	"	PC	32		304	F	Oto.	18	++	(6-7)	19°	19° Poss ±1 or 2	
33	"	"	PC	33		201	M	Oto.	4	++	(7)	5°		

Note: Some very tough aging especially on older fish. Edges are often difficult because of the shape & surface structure of the otoliths. It is essential to prep both otoliths as often only 1 or 2 halves are assessable.

Sc = 05
Oto = 31.

2.0

Peamouth/Chub - Project 2509. Koocanusa

FISH AGING TALLY FORM

SAM	EFF	DATE (2014)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
34	SC	April 14	PC	34		214	M	Oto.	3	++	(7)	4°	
35	SC	"	PC	35		213	M	Oto.	4	++	(6-7)	5°	weaker Jan.
36	"	"	PC	36		262	F	Oto.	7	++	(7)	8°	2nd?
37	"	April 14	PC	37		17.9	M	Oto.	4	++	(7)	5°	
38	"	April 15	PC	38		30.1	F	Oto.	14	++	(6-7)	15°	16°, 15° Poss 16°
39	SC	April 17	PC	39		24	M	Oto.	10	++	(7)	11°	
40	SC	" 18	PC	40		251	M	Oto.	7	++	(7)	8°	
41	GC	April 11	PC	01		264	F	Oto.	6	++	(7)	7°	
42	GC	"	PC	02		242	F	Oto.	6	++	(6-7)	7°	Poor Jan.
43	"	"	PC	03		250	F	Oto.	6	++	(7)	7°	
44	"	April 12	PC	04		245	M	Oto.	5	++	(7)	6°	FCa
45	GC	"	PC	05		245	F	Oto.	7	++	(7)	8°	FCa.
46	GC	"	PC	06		290	F	Oto.	15	++	(7)	16°	Poss ±1.
47	"	April 12	PC	07		235	F	Oto.	4	++	(7)	5°	Otolith Weak Jan Sa = 4*3+(6) Use 5°
48	"	"	PC	08		278	M	Oto.	8	++	(7)	9°	FCa.
49	"	"	PC	09		283	F	Oto.	14	++	(5-6)	15°	15° Tough Jan.
50	GC	"	PC	10		277	F	Oto.	13	++	(6-7)	14°	Otolith. Tough edge Yr. 9-10.
51	"	April 12	PC	11		282	F	Oto.	10	++	"	11°	11°; Poss 12° @ edge
52	"	"	PC	12		231	M	Oto.	5	++	(7)	6°	
53	"	"	PC	13		265	F	Oto.	7	++	(7)	8°	
54	"	"	PC	14		231	M	Oto.	7	++	(7)	8°	FCa
55	GC	"	PC	15		262	F	Oto.	7	++	(7)	8°	
56	"	April 12	PC	16		231	M	Oto.	4	++	(7)	5°	2nd Oto. P.C.
57	"	"	PC	17		215	M	Oto.	3	++	(7)	4°	Sa = 4*(6)
58	"	April 13	PC	18		267	F	Oto.	7	++	(7)	8°	
59	GC	"	PC	19		251	F	Oto.	3	++	(6)	4°	Poss 5th @ edge - Poor Jan.
60	GC	"	PC	20		231	M	Oto.	7	++	(7)	8°	Otolith
60	GC	"	PC	21		270	F	Oto.	11	++	(6-7)	12°	Tough Jan.
61	"	"	PC	22		227	F	Oto.	3	++	"	4°	Use 4° FCa.
62	"	April 14	PC	23		268	F	Oto.	7	++	(7)	8°	
63	"	"	PC	24		258	M	Oto.	4	++	(7)	5°	
64	"	"	PC	25		248	M	Oto.	4	++	(6)	5°	Tough Jan. Sa: 6*5+(6) Use 5°

2 # 60.

3.0

Peamouth Chub. - Project 2509. Kootenusa

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
65	GC	April 14	PC	26		226	F	Oto.	4	++	(7)	5°		x
66	GC	"	PC	27		188	IM	Oto.	2	++	(7)	3°	Sc = 4°31 (6) Poss: 3*	→ Use 3° JJ
67	"	"	PC	28		245	M	Oto.	7	++	(7)	8°		x
68	GC	"	PC	29		242	M	Oto.	4	++	(7)	5°		
69	"	April 14	PC	30		298	F	Oto.	16	++	(6-7)	17°	17°. 1st ? Poss ±1	x
70	"	"	PC	31		204	IM	Oto.	3	++	(7)	4°		
71	GC	"	PC	32		256	M	Oto	7	++	(6)	8°	Poss 9° Resorp	
72	GC	"	PC	33		277	F	Oto.	7	++	(6)	8°	Poss 7° Read ?	
73	"	April 14	PC	34		251	M	Oto.	4	++	(6-7)	5°	Poss 6°	
74	GC	"	PC	35		247	F	Oto.	7	++	(7)	8°	1oto. Excellent	xx
75	"	"	PC	36		285	F	Oto.	15	++	(6-7)	16°	1otolith 16°;	
76		April 15	PC	37		247	M	Oto.	6	++	(7)	7°		x
77	ER	April 11	P.C.	01		259	F	Oto.	10	+	(6)	11°	Poss ±1 Poor Jon.	
78	ER	"	PC	02		277	F	Oto.	16	++	(6-7)	17°	17°; Poss ±1 Tough Jon.	
79	ER	April 11	PC	03		236	M	Oto.	14	++	(7)	15°	1otolith 15°	
80	ER	"	PC	04		269	F	Oto.	9	++	(6)	10°	1otolith Poss ±1	
81	ER	"	PC	05		287	F	Oto.	10	++	(6)	11°	1otolith " "	
82	ER	April 11	PC	06		273	F	Oto.	10	++	(6-7)	11°	Poss. 10°	
83	ER	"	PC	07		285	F	Oto.	10	++	(5-6)	11°	Tough Jon. Poss. ±1	
84	ER	April 12	PC	08		293	F	Oto.	23	++	(6-7)	24°	24° Poss ±1 or 2	
85	ER	"	PC	09		271	F	Oto.	11	++	(7)	12°	12° FCS	
86	ER	"	PC	10		29	F	Oto.	18	++	(6)	19°	20°; 19° Poss ±1 or 2	
87	ER	"	PC	11		303	F	Oto.	14	++	(4-5)	15°	Very tough Jonation. True annuli ??	
88	ER	"	PC	12		287	F	Oto.	16	++	(6-7)	17°	" " " Poss 16-17.	
89	ER	April 12	PC	13		23	F	Oto.	7	++	(7)	8°		
90	ER	"	PC	14		315	F	Oto.	20	++	(6)	21°	22°, 21° Poss ±1 or 2 Tough Jon.	
91	ER	April 13	PC	15		228	M	Oto.	5	++	(7)	6°		
92	ER	April 14	PC	16		257	F	Oto.	7	++	(6-7)	8°	Poss. 9°	
93	ER	"	PC	17		263	F	Oto.	9	++	(6-7)	10°	Poss. 11°	
94	ER	April 15	PC	18		288	F	Oto.	20	++	"	21°	21° Tough Jon.	
95	ER	April 15	PC	19		281	F	Oto.	14	++	(6)	15°	15° Poss ±1 or 2.	
96	ER	"	PC	20		257	F	Oto.	10	++	(5-6)	11°	True annuli ??	

Note: GC fish pretty good. Jonation is fair to good often on 1 of the 2 otoliths. Good to have both to prep.

Note: ER fish. Some tougher aging in this group. Jonation is tougher to follow than previous areas possibly because these are possibly more older fish.

4.0

Peamouth Chub - / Rainbow Trout - Kootenay #2509.

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
97	ER	April 15	PC	21		301	F	0 to	15	++	(5-6)	16°	16° Poor Tag. Poss ± 1 to 3	
98	ER	"	PC	22		258	F	0 to	19	++	(6-7)	20°	20°/19° Poss. ± 1	
99	ER	"	PC	23		219	M	0 to	7	++	(7)	8°		xx
100	ER	April 15	PC	24		238	M	0 to	4	++	(7)	5°		
101	ER	April 18	PC	25		292	F	0 to	Unable to Age ? 15Yrs.				Good to 10-11. Poor edge growth	
102	ER	" 19	PC	26		243	M	0 to	4	++	(7)	5°		
103	ER	"	PC	27		256	M	0 to	7	++	(6-7)	8°	Poss. 9°	
104	ER	"	PC	28		255	M	0 to	9	++	(7)	10°		
105	ER	"	PC	29		268	M	0 to	11	++	(6)	12°	1st? Poss ± 1 eccentric	
106	ER	April 19	PC	30		265	M	0 to	11	++	(6-7)	12°	Poss. 11°	
107	ER	"	PC	31		245	M	0 to	7	++	(7)	8°		xx
108	ER	"	PC	32		233	M	0 to	8	++	(7)	9°		
109	ER	"	PC	33		228	M	0 to	11	++	(6-7)	12°	Poss ± 1.	
110	KOSC		BB	6		626	F	0 to	6	++	(6-7)	7°	FCO-1; Tough Tag.	
111	KOSC-1	Feb 14	R.T.	1		535	F	0 to	5	++	(6)	6°	Both PC. Poss 5°.	Use 6°
"	"	"	"	"		"	"	Sc	5	++	(6)	6°	Poss 8°.	
112	KOER 3	Feb 15	R.T.	1		46	M	0 to	4	++	(6-7)	5°	Both PC	Use 5°
"	"	"	"	"		"	"	Sc	5	+	(6)	6°		
113	KOGC-1	Feb 16	R.T.	2		314	F	0 to	3	+	(6)	4°	Poss. 3° 3rd.?	4°
"	"	"	"	"		"	"	Sc	3	++	(7)	4°		
114	KOGC-2	Feb 14	R.T.	1		57	F	Sc	5	++	(7)	6°	No OTOLITHS.	
115	SC	April 14	R.T.	01		398	F	0 to	3	++	(6)	4°	Poss. 5° FCC 1st.?	5° (Poss. 4°)
"	"	"	"	"		"	"	Sc	4	++	(6)	5°	Stress 3-4.	
116	SC	April 16	R.T.	02		345	F	0 to	4	++	(6-7)	5°	1st? Poss. 4°.	5°
"	"	"	"	"		"	"	Sc	4	++	(7)	5°		
117	SC	"	R.T.	03		515	F	0 to	5	++	(7)	6°	Use 6°	6° x
"	"	"	"	"		"	"	Sc	4	++	(6)	5°		

1.0

Koocanusa - Project 2509.

↓ Best Age

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
1	SC	Aug 19	PM	01				Oto.	12	+	(7)	12+	
2	Sc	"	PM	02				Oto.	8	+	(6-7)	8+	8th near edge Post 7++
3	Sc	"	PM	03				Oto.	7	+	"	7+	7th C edge. Post 6++
4	Sc	Aug 19	PM	04				Oto.	9	++	(6-7)	9++	Post 10th C edge.
5	Sc.	"	PM	05				Oto.	9	+	(7)	9+	FC 1-2
6	Sc	"	PM	06				Oto.	4	+	(7)	4+	
7	Sc	Aug 21	PM	07				Oto.	11	++	(7)	11++	Post 12* C edge.
8	Sc	"	PM	08				Oto.	11	+	(6-7)	11+	
9	Sc	"	PM	09				Oto.	12	+	(7)	12+	12th C edge - 2nd Oto PC.
10	Sc	"	PM	10				Oto.	6	+	(6)	6+	Post. 5th ist? Poor break
11	Sc.	Aug 21	LSS	01				Sc.	8	++	(6-7)	8++	
12	Sc	" 23	LSS	2				Sc	9	++	(6)	9++	Post. 10 C edge
13	Sc.	"	LSS	3				Sc	12	++	(6)	12++	edge ?? Prob. older
14	Sc	"	LSS	4				Sc	8	++	(5)	8++	Poor Zon.
15	Sc	Aug 21	YP	1				Oto.	11	+	(7)	11+	
16	Sc.	"	YP	2				Oto	1	++	(7)	1++	1 oto.
17	Sc	"	YP	3				Oto	2	++	(6)	2++	1 oto; Post-2 ist? Post 1++
18	Sc.	Aug 23	YP	4				Oto.	11	+	(7)	11+	
19	Sc	Aug 23	PC	1				Oto.	11	+	(6-7)	11+	11th.? Post 10++
20	Sc.	"	PC	2				Oto.	11	+	(7)	11+	
* 21	Sc.		BT	01				Sc	4	++	(6)	4++	Poor Scales
"	"		"	"				ER	8	++	(6)	8++	True annuli ?? — 8++ (poss. ±1)
22	Sc	Aug 23	KO	1				Sc	No	Sample			Unable to prepare
23	"	"	KO	2				Sc		"			"
24	"	"	KO	3				Sc		"			"
25	"	"	KO	4				Sc		"			"
26	"	"	KO	5				Sc.		"			"
27	Sc	Aug 23	KO	6				Sc.	2	+	(6)	2+	" Probable.
28	"	"	KO	7				Oto.	2	+	(6)	2+	Poor Zon. — 2+
"	"	"	"	"				Sc	2	+	(7)	2+	

Note: PM otoliths - Tough breaks - Difficult to prep. Pretty good zonation but tough edges. Some could go ±1 either way.
LSS - scales - Probably not overly reliable. Strongly suggest taking pectoral fin rays.

2.0

Koocanusa - Project 2509.

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
29	Sc	Aug 23	KO	8				Oto.	2	+	(6-7)	2+	1 oto. Fco-1. Sc = 2+ (6)
30	Sc	"	KO	9				Oto.	2	+	(6)	2+	1 oto. Fp-2
31	Sc	"	KO	10				Oto.	2	+	(7)	2+	] 2+
"	"	"	"	"				Sc	2	+	(7)	2+	
32	Sc	"	KO	11				Oto.	2	++	(6-7)	2++	
33	Sc	Aug 23	KO	12				Oto.	2	+	"	2+	1 oto. weaker Jon.] 2+
"	"	"	"	"				Sc	2	+	(7)	2+	
34	"	"	KO	13				Oto.	2	++	(6)	2++	1st? Poss. 1++] 2+
"	"	"	"	"				Sc	2	+	(7)	2+	
35	Sc	Aug 25	KO	14				Sc	Unable to Prep.				
36	"	"	KO	15				Sc	"	"	"		
37	Sc	"	KO	16				Sc	"	"	"		
38	"	"	KO	17				Oto.	2	++	(6-7)	2++	
39	"	Aug 25	KO	18				Oto.	2	+	"	2+	Poss 1++
40	Sc	"	KO	19				Oto	2	+	"	2+	1 oto. 1st?] 2+
"	"	"	"	"				Sc	2	+	(7)	2+	
41	Sc	"	KO	20				Oto.	2	+	(6)	2+	Fco-1. Poss 3+] 2+
"	"	"	"	"				Sc	2	+	(7)	2+	
42	Sc	"	KO	21				Oto.	2	+	(6-7)	2+	x
43	"	"	KO	22				Oto.	2	++	"	2++	
44	"	Aug 25	KO	23				Oto.	2	+	(7)	2+	x
45	"	"	KO	24				Oto.	2	++	(6-7)	2++	2nd? Poss-1++] 2+
"	"	"	"	"				Sc	2	+	(7)	2+	
46	Sc	"	KO	25				Oto.	3	++	(5-6)	3++	Weak Jon. Slow 2-3?] 2+
"	"	"	"	"				Sc	2	+	(7)	2+	
47	Sc	Aug 25	BU	01					Unable to Prep.				
48	GC	Aug 19	PM	1				Oto.	8	+	(6-7)	8+	8th near edge? Poss 7++
49	GC	"	PM	2				Oto.	6	+	(7)	6+	
50	"	Aug. 20	PM	3				Oto.	8	+	(6-7)	8+	8th near edge
51	"	"	PM	4				Oto.	8	++	(6)	8++	Poor edge Poss ±1
52	GC	"	PM	5				Oto.	7	+	(6-7)	7+	edge.?

Note: KO - otoliths - Not great zonation on most of these fish. Annular deposition is often weak. Most look like 2+ or 2++ but some could be 1++ fish.

3.0

Koocanusa - Project 2509.

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
53	GC	Aug 20	PM	6				Oto.	10	+	(5-6)	10+	Poor breaks; Poor Jon. Poss ±1.	
54	"	"	PM	7				Oto.	9	+	(7)	9+		x
55	GC	"	PM	8				Oto.	7	+	(7)	7+	Slower 0-1.	
56	"	"	PM	9				Oto.	10	+	(7)	10+	FC 1-2	x
57	"	"	PM	10				Oto.	12	+	(6-7)	12+	Poss ±1 @ the edge	
58	GC	Aug 19	YP	1				Oto.	2	++	(7)	2++		
59	"	"	YP	2				Oto.	1	++	(7)	1++		
60a	GC	Aug 20	YP	3				Oto.	3	++	(7)	3++		x
60B	GC	"	YP	4				Oto.	3	+	(6-7)	3+	1 oto.	
61	GC	" 22	YP	5				Oto.	3	+	(7)	3+	1 oto.	
62	"	"	YP	6				Sp.	2	++	(7)	2++		
63	"	"	YP	7				Oto.	3	++	(7)	3++		x
64	"	"	YP	8				Oto.	2	++	(7)	2++		
65	"	Aug 22	YP	9				Oto.	2	++	(7)	2++		x
66	GC	"	YP	10				Oto.	2	++	(7)	2++		x
67	GC.	Aug 22	LSS	1				Sc.	8	++	(6)	8++	Edge? Slow 7-8-Edge	
68	GC	"	LSS	2				Sc.	9	++	(6)	9++	" 1st??	
69	"	"	LSS	3				Sc.	8	++	(5-6)	8++	edge area eroded. Mostly Regen.	
70	"	"	LSS	4				Sc.	8	*	(6)	8*	Edge? FC 7th.	
71	GC.	"	LSS	5				Sc	8	++	(6-7)	8++		x
72	"	"	LSS	6				Sc	5	++	(6)	5++	FC 3-4; edge?	
73	"	Aug 22	LSS	7				Sc	8	++	(6)	8++		
74	"	"	LSS	8				Sc	8	++	(6-7)	8++		
75	"	"	LSS	9				Sc	9	++	"	9++		
76	GC	"	LSS	10				Sc.	5	+	(6)	5+	Mostly Regen 1st?	
77	GC.	Aug 22	PC	1				Oto.	5	+	(7)	6+		x
78	GC	Aug 25	WCT	1				Sc	2	++	(7)	2++		
79	"	" 26	WCT	2				Sc	3	++	(6)	3++	Poss 4* @ edge; 2 stream, 2 lake	
80	"	"	WCT	3				Sc	2	++	(5-6)	2++	mostly Regen scales	

Note & LSS. scales O.K. but not a lot of faith in scale ages. Strongly suggest pectoral Fin rays be taken as a primary structure.

4.0

Koocanusa - Project #2509.

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
81	GC	Aug 25	KO	1				Oto.	2	++	(6-7)	2++	weak Zon.	2+
"	"	"	"	"				Sc	2	+	(7)	2+	2nd ann. w/ on edge	
82	GC	"	KO	2				Oto.	1	++	(6)	1++	FC 0-1; 1-Edge Poss 2++ Vis=2+	1++
"	"	"	"	"				Sc	1	++	(7)	1++	inside: FC 0-1.	
83	GC	Aug 25	KO	3				Oto.	2	+	(6)	2+	Otoliths AC. - 2nd? Vis=2+	2+
"	"	"	"	4				Sc	1	++	(7)	1++	FC 1-Edge; edge?	
84	"	"	KO	4				Oto.	1	++	(6)	1++	FC 0-1? Poss 2++	1++
"	"	"	"	"				Sc	1	++	(7)	1++		
85	GC	"	KO	5				Oto.	1	++	(6-7)	1++		x
86	"	" 26	KO	6				Oto.	1	++	(7)	1++		x
87	GC	Aug 26	RT	01				Sc	5	+	(6)	5+	1stream; 5lake edge? Poss 4++.	
	ELK RIVER													
88	ER	Aug 20	LSS	1				Sc	8	++	(6)	8++	edge?	
89	ER	" 22	LSS	2				Sc	9	++	(6-7)	9++	1st ann. close	
90	ER	Aug 22	LSS	3				Sc	9	++	(6)	9++	mostly Regen. edge?	
91	"	"	LSS	4				Sc	12	*	(5-6)	12*	slow stacking edge?	
92	"	"	LSS	5				Sc	12	*	"	12*	" "	
93	"	"	LSS	6				Sc	8	++	(5)	8++	eroded edge: stacking??	
94	ER	Aug 22	LSS	7				Sc	8	++	(6-7)	8++	edge?	
95	"	"	LSS	8				Sc	7	+	(5)	7+	Poor Zon. - 2nd? edge?	
96	"	"	LSS	9				Sc	8	++	(6)	8++	mostly Regen Poss 9+	
97		Aug 24	LSS	10				Sc	10	+	(6)	10+	edge: poss. 11th c 10+.	
98	ER	Aug 20	PM	1				Oto.	5	++	(6-7)	5++	Poss. 6th c edge	
99	ER	"	PM	2				Oto.	9	+	"	9+	9th c edge	
100	"	"	PM	3				Oto.	5	++	(6-7)	5++	edge?	
101	"	"	PM	4				Oto.	7	++	(7)	7++		xx
102	ER	Aug 20	PM	5				Oto.	10	++	(7)	10++	Poss 9++ edge?	
103	"	Aug 22	PM	6				Oto.	25	+	(6)	25+	Poss 1 to 3. Last plane of grp	
104	"	" 4	PM	7				Oto.	9	++	(7)	9++	Poss 10th c edge	

Note: KO otoliths in G.C. not great. Generally weak zonation. True annuli tough to sort out.
LSS - scales for LSS in ER tough to age. Many with mostly regenerated scales. Strongly suggest taking fin rays as primary structure for any sucker species

5.0

Koocanusa - Project #2509.

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
105.	ER	Aug 22	PM	8				Oto.	12	+	(6-7)	12+	12th edge; poss. 11++	
106	"	"	PM	9				Oto.	12	++	(7)	12+	Poss. 13 th edge	x
107	"	"	PM	10				Oto.	11	+	(7)	11+		x
108	ER	Aug 21	KO	1				Oto.	3	++	(6-7)	3++	weaker Jm. FCO-1. 3++ ✓	3++
"	"	"	"	"				Sc	2	+	(7)	2+	2nd annulus near edge ??	
109	ER	"	KO	2				Oto.	4	+	(7)	4+	weaker annular def'n	
110	"	Aug 22	KO	3				Oto.	3	+	(6)	3+	1 oto. 2nd.? slower 2-3	3++ (Poss 4++)
"	"	"	"	"				Sc	2	+	(7)	2+		
111	"	"	KO	4				Oto.	2	++	(6)	2++	2nd.? weaker.	2+
"	"	"	"	"				Sc	2	+	(7)	2+		
112	ER	Aug 24	KO	5				Oto.	3	++	(6-7)	3++	slower 2-3. 2nd oto. PC.	3++ (Poss 4++)
"	"	"	"	"				Sc	2	+	(7)	2+	Sc = 2+ (7)	
113	"	Aug 25	KO	6				Sc	—	Unable to Prepp. —				
114	"	"	KO	7				Sc	"		"	"		
115	"	"	KO	8				Sc	"		"	"		
116	"	"	KO	9				Sc	"		"	"		
117	"	"	KO	10				Sc	"		"	"		
118.	ER	"	KO	11				Oto.	2	+	(7)	2+	1 oto. FCO-1.	x
119	ER	Aug 25	KO	12				Oto.	2	++	(6-7)	2++	FCC 2nd	x
120	"	"	KO	13				Oto.	3	++	"	3++	1 oto.	x
121	ER	Aug 26	KO	14				Oto.	3	+	(6)	3+	1 oto. weak Jm. Poss 2+	2+
"	"	"	"	"				Sc	2	+	(7)	2+		
122	ER	"	KO	15				Oto.	3	+	(6-7)	3+	slower 1-2.	
123	"	"	KO	16				Oto.	2	++	(6)	2++	very weak Jm. Poss 3++	2+
"	"	"	"	"				Sc	2	+	(7)	2+		
124	"	Aug 26	KO	17				Oto.	2	++	(7)	2++		x
125	ER	Aug 22	PC	1				Oto.	10	++	(6-7)	10+	FCO. Tough Jm.	
126	ER	"	PC	2				Oto.	9	+	(7)	9+		x
127	"	Aug 24	PC	3				Oto.	17	++	(6-7)	17++	Poss 3+.	
128	"	" 26	PC	4				Oto.	9	+	(7)	9+		x
129.	ER	Aug 22	BT.	01				Oto	3	+	(6)	3+	weaker Jm.	
130	ER	" 25	WCT	1				Sc	2	++	(6-7)	2++	FCC eff - Poss. 2 Stream; 1 Lake.	

Note: PM oto's. in zone ER pretty good zonation. Edge call tough on some fish. Good annular defn. Better breaks. Not as much shattering during prep. 8 KO from ER zone. Annular defn often weak. Tough to sort out true annuli.

2015

1.0

Sand Creek 2015. Project # 2564.

FISH AGING TALLY FORM

	SAM	EFF	2015 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
01	1	Sc	April 22	CSU	01				ER	12	H	(6)	13°	1st? edge? Takegaut?
02	2	"	"	"	02				ER	11	H	(6-7)	12°	" FC 11-12
03	3	Sc	"	"	03				ER	9	H	"	10°	1st? edge? Poss 11°
04	4	Sc	April 24	CSU	04				ER	14	H	(6-7)	15°	" " Poss 1/ Countless
05	5	"	" 27	CSU	05				ER	10	+	"	11°	" " Poss. 10°
06	6	"	May 01	CSU	06				ER	15	H	(7)	16°	" " edge? 15°, 14°, 14° Poss 15°
07	7	"	/ "	CSU	07				ER	14	+	(6-7)	15°	" " " ?
095	8	Sc.	April 23	YP	01				Sp.	2	*	(6-7)	2*	FC 2.
096	9	"	" 27	YP	03				Sp.	2	*	"	2*	FC 0-1.
097	10	"	"	YP	04				Sp.	1	H	(7)	2°	
098	11	Sc	"	YP	05				Sp	1	H	(7)	2°	
079	12	"	Apr. 28	YP	06				Sp.	3	*	(7)	3*	xx
080	13	"	"	YP	07				Sp.	1	H	(6-7)	2°	FC 1-1 Edge?
* 081	-	Sc	"	YP	08				Sp.	3	*	(7)	3*	x
082	14	"	"	YP	09				Sp.	3	H	(7)	4°	
083	15	"	"	YP	10				Sp.	2	H	(6-7)	3°	
084	16	"	"	YP	11				Sp	2	*	(7)	2*	
085	17	"	"	YP.	12				Sp.	2	*	(7)	2*	
086	18	"	April 29	YP	13				Sp.	2	*	(7)	2*	xx
087	19	Sc.	"	YP	14				Sp.	2	*	(6-7)	2*	FC 2 0-1. 1-1 Edge
088	20	"	April 30	YP.	15				Sp.	2	*	(6)	2*	FC @ 1st?
089	21	"	"	YP	16				Sp.	1	H	(7)	2°	Poss 2* on edge
090	22	"	"	YP.	17				Sp.	3	*	(7)	3*	x
091	23	"	May 01	YP	18				Sp.	3	*	(7)	3*	
092	24	"	/ "	YP	19				Sp.	3	*	(7)	3*	xx Edge? Poss 3°
093	25	"	"	YP	20				Sp.	3	+	(7)	4°	
094	26	"	"	YP	21				Sp.	3	*	(7)	3*	
095	27	Sc.	"	YP.	22				Sp.	1	H	(6-7)	2°	FC 2.
096	28	"	"	YP.	23				Sp.	3	*	"	3*	1st is weaked?
097	29	"	May 01	YP	24				Sp.	2	*	"	2*	Lots of growth 0-1.
098	31	"	/ "	YP	25				Sp.	2	*	"	2*	FC 0-1.

Note: SC-CSU-fin rays - some very tricky centres and edges. Most taken a little for ovet. First annulus often gone. Tough edge call on some due to possible slower growth @ edge in last season.?

SC-YP - Need scales as a back-up!

2.0

Sand Creek (Sc) Project #2564

FISH AGING TALLY FORM

	SAM	EFF	2015 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
099	32	Sc	May 01	YP	26				Sp	2	*	(6)	2*	Poor Eng. FC e 1st	
0100	33	"	"	"	27				Sp.	2	*	(6)	2*	FCA-Edge ; Poss 3°.	
	34	Sc.	April 22	NSC	01				0to.	6	++	(7)	7°	FCe edge	
	35	Sc	" 23	NSC	03				0to.	10	++	(7)	11°	Poss 12° edge	
	36	"	"	NSC	04				0to.	10	++	(6)	11°	1oto. Wrong oto. Poss ± 1.	
	37	Sc.	April 24	NSC	06				0to.	9	++	(6-7)	10°	1st? Poss 9°	
	38	"	"	NSC	07				0to.	7	++	(7)	8°		x
	39	"	" 25	NSC	09				0to.	12	+	(7)	13°		x
	40	"	"	NSC	10				0to.	13	++	(6-7)	14°	Poss ± 1.	
**	90	Sc	"	NSC	11				0to.	12	+	"	13°	" "	
**	92	Sc.	"	NSC	12				0to.	10	++	(6)	11°	1oto. 1st? Poss ± 1	
	41	Sc.	April 25	NSC	13				0to.	13	+	(6-7)	14°	edge?	
	42	Sc	"	NSC	15				0to.	12	+	(6)	13°	1oto. Tough after 8-10.	
	43	"	"	NSC	16				0to.	9	++	(5-6)	10°	Poor Zoth.	
	44	"	"	NSC	17				0to.	9	++	(7)	10°		xx
	45	"	"	NSC	18				0to.	8	++	(7)	9°		
	46	Sc	April 25	NSC.	19				0to.	10	+	(6-7)	11°	Edge? Poss 10°	
	47	"	"	NSC	21				0to.	9	++	"	10°	"	
	48	"	"	NSC	22				0to.	8	++	"	9°	"	
	49	"	"	"	23				0to.	8	++	(6-7)	9°	1st? Poss 8°	
	50	"	"	"	25				0to.	9	++	(6)	10°	Poss 11° edge?	
	51	Sc	April 25	NSC	26				0to.	9	++	(6-7)	10°		
	52	"	"	"	27				0to.	11	++	"	12°	1oto. Poss ± 1	
	53	"	"	"	28				0to.	11	++	"	12°	"	
	54	"	"	"	29				0to.	8	++	(7)	9°		xx
	55	"	"	"	30				0to.	8	++	(6-7)	9°		
	56	Sc	April 25	NSC	31				0to.	8	++	(6)	9°	FCA	
	57	"	"	"	32				0to.	9	++	(7)	10°	1oto.	
	58	"	"	"	33				0to.	7	++	(6)	8°	1oto. Poss ± 1.	
	59	"	"	"	34				0to.	5	++	(7)	6°	1oto.	
	60	"	" 26	NSC	35				0to.	8	++	(7)	9°	Slower 5-6	xx

Note: Secondary otoliths pretty good on some fish for these NSC samples.

& Edge area a tough call on some fish. Last annulus near edge often tough to sort out.

3.0

Sand Creek — Project #2564

FISH AGING TALLY FORM

SAM	EFF	DATE (2015)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
61	Sc	April 26	NSC	36				Otо.	9	tt	(7)	10°	
62	"	April 27	"	37				Otо.	8	tt	(6-7)	9°	Post 10°
63	"	"	"	38				Otо.	6	tt	(7)	7°	
64	"	"	"	39				Otо.	11	tt	(6-7)	12°	Post ±1
65	Sc	"	NSC	40				Otо.	7	tt	(7)	8°	
66	"	April 27	"	41				Otо.	8	tt	(7)	9°	
67	"	"	"	42				Otо.	7	tt	(7)	8°	
68	"	"	"	43				Otо.	8	tt	(7)	9°	1 oto.
69	"	"	"	44				Otо.	12	tt	(7)	13°	1 oto.
70	Sc	April 27	NSC	45				Otо.	8	tt	(7)	9°	
71	"	April 28	NSC	46				Otо.	12	tt	(6-7)	13°	1 oto.
72	"	"	NSC	47				Otо.	12	tt	(7)	13°	1 oto.
73	Sc.	April 22	RSC	01				Sc.	1	tt	(6-7)	2°	
74	"	" 25	RSC	03				Otо.	2	tt	(7)	3°	
75	"	" 26	RSC	04				Otо.	3	tt	(6-7)	4°	1st ? maybe a FC Post 3°
76	Sc	April 28	RSC	06				Otо.	2	tt	(7)	3°	
77	"	April 30	RSC	07				Otо.	2	tt	(6-7)	3°	
78	"	"	RSC	08				Otо.	2	t	(7)	3°	
79	Sc.	May 01	RSC	09				Otо.	2	tt	(7)	3°	
80	Sc	April 24	PCC	01				Otо.	6	t	(6-7)	7°	
81	"	April 25	PCC	02				Otо.	5	tt	(6)	6°	1 oto. Tough Seq.
82	"	"	PCC	03				Otо.	7	t	(6-7)	8°	Tilt? Post 7°. Edge: ??
83	"	"	PCC	04				Otо.	7	H	"	8°	
84	Sc	"	PCC	05				Otо.	10	tt	(7)	11°	1 oto.
85	"	"	PCC	06				Otо.	11	tt	(6-7)	12°	Tough age
86	"	April 25	PCC	07				Otо.	8	tt	(7)	9°	
87	"	"	PCC	08				Otо.	13	tt	(7)	14°	Post ±1
88	Sc	April 26	PCC	09				Otо.	8	tt	(7)	9°	
89	"	"	PCC	10				Otо.	12	tt	(7)	13°	

4.0

Sand Creek / Gold Creek Project 2564

FISH AGING TALLY FORM

SAM	EFF	2015 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
91	Sc	April 26	PCC	11				Oto.	5	++	(6-7)	6°	Poor Zon.
93	Sc	"	PCC	12				Oto.	11	++	"	12°	1st?
94	"	"	PCC	13				Oto.	11	++	"	12°	
95	"	"	PCC	14				Oto.	20	++	(7)	21°	21° Poss. 26°
96	"	"	PCC	15				Oto.	10	++	(6-7)	11°	Poss. 12°
97	Sc	April 27	PCC	14				Oto.	16	++	(7)	17°	17°
98	"	"	PCC	17				Oto.	12	++	(7)	13°	Poss. 14°
99	"	"	PCC	18				Oto.	26	++	(6)	27°	27° Poss 1 to 3. Tough Zon.
100	"	"	PCC	19				Oto.	10	++	(6-7)	11°	1st?
101	"	"	PCC	20				Oto.	8	++	(7)	9°	
102	Sc	April 27	PCC	21				Oto.	9	+	(7)	10°	
103	"	"	PCC	22				Oto.	9	++	(7)	10°	tough zone
104	"	"	PCC	23				Oto.	12	++	(6-7)	13°	edge?
105	"	"	PCC	24				Oto.	9	++	(5)	10°	Very poor Zonation - deformed?
106	Sc	"	PCC	25				Oto.	Unable to Age				" " " p.c.
107	"	"	PCC	26				Oto.	12	+	(7?)	13°	
108	"	"	PCC	27				Oto.	14	++	(7)	15°	15°
109	"	April 28	PCC	28				Oto.	3	++	(7)	4°	Milky Zon.
110	"	"	PCC	29				Oto.	11	++	(7)	12°	O.J.
111	Sc.	April 30	PCC	30				Oto.	3	++	(7)	4°	
112	"	"	PCC	31				Oto.	4	++	(6)	5°	Tough Zon.
113	"	"	PCC	32				Oto.	5	++	(7)	6°	
114	"	"	PCC	33				Oto.	7	++	(6-7)	8°	Poss. 7° 2nd?
	Gold Creek.												
115	GC	April 27	RSC	01				Oto.	2	++	(7)	3°	
116	GC	"	RSC	05				Oto.	2	++	(7)	3°	
117	GC	"	RSC	07				Oto.	3	++	(6-7)	4°	1st? Poss. 3°
118	GC	"	RSC	08				Oto.	3	++	(7)	4°	
119	GC	April 27	RSC	09				Oto.	2	++	(7)	3°	
120	"	"	RSC	10				Oto.	3	++	(7)	4°	
121	GC	April 23	MW	01				FR	3	+	(4)	4°	No Scales ??

Box 1 / Box 2

Note: Sc - PCC - Otolith zonation tough to sort out on some of these fish. More difficult to get an even break than say the NSC or RSC. A few deformed otoliths as well.

5.0

Gold Creek — Project 2564

FISH AGING TALLY FORM

2015

SAM	EFF	DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
122	GC	April 22	PCC	01				0 to.	9	##	(6)	10°	Poss ±1
123	"	"	PCC	02				0 to.	10	##	(6-7)	11°	Poss 12° @ edge
124	"	"	PCC	03				0 to.	9	##	(5-6)	10°	Poor Contrast 10° Three annuli?
125	"	"	PCC	04				0 to.	12	##	(6)	13°	" " 13° Poss ±1
126	GC	April 22	PCC	05				0 to.	12	##	(6-7)	13°	Poss 12°
127	"	April 23	PCC	06				0 to.	24	##	(7)	25°	25°; 24° Poss ±1 or 2
128	"	"	PCC	07				0 to.	8	##	(7)	9°	
129	"	"	PCC	08				0 to.	3	##	(7)	4°	FC2: weak 3rd
130	"	"	PCC	09				0 to.	13	##	(7)	14°	
131	GC	April 23	PCC	10				0 to.	12	##	(7)	13°	edge Poss ±1
132	"	"	"	11				0 to.	11	##	(6-7)	12°	
133	"	"	"	12				0 to.	4	##	(7)	5°	
134	"	"	"	13				0 to.	23	##	(6-7)	24°	24°; 24° Poss ±1 or 2
135		"	"	14				0 to.	Unable to see				very poor zonation
136	GC	April 24	PCC	15				0 to.	16	##	(6-7)	17°	17° Poss ±1 or 2
137	"	"	"	16				0 to.	9	##	"	10°	
138	"	"	"	17				0 to.	4	##	"	5°	Poss 6° @ edge
139	"	"	"	18				0 to.	8	##	(7)	9°	FC2-3
140	"	"	"	19				0 to.	12	##	(7)	13°	1 to. Tricky edge
141	GC	April 24	PCC	20				0 to.	5	##	(7)	6°	
142	"	"	"	21				0 to.	9	##	(6-7)	10°	Poss 9°
143	"	"	"	22				0 to.	9	##	(5-6)	10°	Tough 2nd. Poss ±1.
144	"	"	"	23				0 to.	13	##	(7)	14°	Poss 13°
145	"	"	"	24				0 to.	13	##	(7)	14°	
146	GC	April 24	PCC	25				0 to.	15	##	(5-6)	16°	Tough. 17°. Poss ±1 or 2
147	"	"	"	26				0 to.	10	##	"	11°	1 to. Tough 2nd.
148	"	"	"	27				0 to.	10	##	(5)	11°	Poss ±1
149	GC	April 24	"	28				0 to.	11	##	(6-7)	12°	
150	"	" 25	"	29				0 to.	4	##	"	5°	
151	"	April 26	PCC	30				0 to.	4	##	(7)	5°	1 to.
152	"	"	"	31				0 to.	11	##	(7)	12°	1 to. Poss 13°
153	"	"	PCC	32				0 to.	8	##	(7)	9°	
154	Sc?	"	"	33				0 to.	5	##	(7)	6°	

?

Note: GC - PCC - Some very tough & tricky zonation. Many of these fish could vary by ±1 or 2 years. Tough to sort out true annuli and ages are very tough.

6.0

Gold Creek — Project # 2564.

FISH AGING TALLY FORM

SAM	EFF	DATE (2015)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
155	GC	April 27	PCC	34				Ofo.	6	##	(7)	7°		xx
156	"	"	"	35				Ofo.	4	##	(7)	5°		x
157	"	"	"	36				Ofo.	4	##	(6)	5°	Poor Zonation	
158	GC	April 29	PCC	37				Ofo.	6	##	(7)	7°		
159	"	May 01	"	38				Ofo.	5	##	(7)	6°		xx
160	"	"	PCC	39				Ofo.	3	##	(6)	4°	Edge? Poss. 5°	
161	GC	April 22	NSC	01				0 fo.	Unable	to Age	7.2	0.4 Rs.	Good to 19-20. Probable 24-26.	
162	"	"	NSC	02				Ofo.	6	##	(6-7)	7°	1 ofo. Poss 6°	
163	"	"	"	03				Ofo.	9	##	(7)	10°	1 ofo.	x
164	"	"	"	04				Ofo.	7	##	(6-7)	8°		
165	GC	"	NSC	05				Ofo.	8	#	(7)	9°	1 ofo.	x
166	"	"	NSC	06				Ofo.	7	##	(7)	8°		xx
167	"	April 23	"	10				Ofo.	8	##	(7)	9°		x
168	"	" 24	"	13				Ofo.	8	##	(6-7)	9°	Poss 10°	
169	"	"	"	14				Ofo.	10	##	(7)	11°	1 ofo.	
170	GC	"	NSC	15				Ofo.	8	#	(6)	9°	1 ofo. edge?	
171	"	"	"	16				Ofo.	9	##	(7)	10°		xx
172	"	"	"	17				Ofo.	9	#	(6-7)	10°	9Rs? Poss 9°	
173	"	"	"	18				Ofo.	9	##	(7)	10°		x
174	"	"	"	19				Ofo.	8	##	(7)	9°		
175	GC	April 24	NSC	20				Ofo.	7	##	(7)	8°		xx
176	"	"	"	21				Ofo.	5	##	(6-7)	6°	Poss 7°	
177	"	"	"	22				Ofo.	8	##	(5)	9°	Poor Zonation	
178	GC	"	NSC	23				Ofo.	8	##	(6)	9°	1 ofo. "	
179	"	April 25	NSC	24				Ofo.	10	#	(6)	11°	poor edge	
180	"	"	"	27				Ofo.	8	##	(7)	9°		
181	"	"	"	28				Ofo.	7	##	(6-7)	8°	1 ofo edge? Poss 7°.	
182	"	"	NSC	30				Ofo.	8	##	(7)	9°		
183	"	"	"	31				Ofo.	11	##	(7)	12°		
184	"	"	"	32				Ofo.	11	#	(6-7)	12°	1 ofo.	
185	"	April 26	"	33				Ofo.	9	##	(7)	10°		xx

Note: GC-PCC - Very tough aging. GC-NSC - Much better Zonation than PCC. Also more younger fish. Zonation much more reliable on NSC otoliths from Gold Creek when compared to PCC samples.

7.0

Gold Creek / Elk River Project 2564.

FISH AGING TALLY FORM

1 Box 2 / Box 3.

SAM	EFF	2015 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
186	GC	April 26	NSC	34				Oto.	8	##	(7)	9°	1 oto.
187	GC	"	NSC	35				Oto.	7	##	(7)	8°	
188	"	"	NSC	36				Oto.	7	##	(7)	8°	1 oto.
189	"	"	"	37				Oto.	7	##	(7)	8°	
190	"	April 27	"	38				Oto.	7	##	(7)	8°	
191	"	"	"	39				Oto.	8	##	(7)	9°	
192	GC	"	NSC	40				Oto.	7	##	(7)	8°	
193	"	"	"	41				Oto.	8	##	(7)	9°	
194	"	"	"	42				Oto.	8	##	(7)	9°	1 oto.
195	"	"	"	43		No Oto.		Sc	4	##	(5)	5°	bit? refr.? "Winded not use"
196	"	April 29	"	44				Oto.	8	##	(7)	9°	
197	GC.	April 29	NSC	45				Oto.	7	##	(7)	8°	2nd otolith R.C.
198	"	"	"	46				Oto.	8	##	(7)	9°	
199	"	"	"	47				Oto.	6	##	(7)	7°	
200	"	"	"	48				Oto.	7	##	(7)	8°	
201	GC	April 30	NSC	49.				Oto.	11	##	(7)	12°	
236.	GC	April 30	RB.	01				Oto	3	##	(6-7)	4°	EC 2-3.
"	"	"	"	"				Sc	3	##	(6)	4°	Tough Zon. EC 1-2. Lots of annuli 1-2.] 4
		ELK RIVER											
253	ER	April 23.	RSC	02				Oto.	3	##	(7)	4°	
254	ER	"	RSC	04				Oto.	2	##	(7)	3°	
255	ER.	"	RSC	05				Oto.	2	##	(6)	3°	1 oto. wrong oto.
256	"	" 24	RSC	07				Oto.	3	##	(7)	4°	
257	"	" 26	RSC	08				Oto.	3	##	(7)	4°	
258	"	"	RSC	09				Oto.	3	##	(7)	4°	
259	"	"	RSC	10				Oto.	4	##	(6-7)	5°	
260	ER	April 28	RSC	11				Oto.	3	##	(7)	4°	
261	"	" 29	RSC	13				Oto.	3	##	(7)	4°	
262	"	" 30	RSC.	15				Oto.	2	##	(7)	3°	
263	"	"	RSC	16				Oto	2	##	(6-7)	3°.	

Note: RSC - otoliths - Zonation is good to excellent. Fairly straight forward. to age.

Elk River — Project # 2564

FISH AGING TALLY FORM

SAM	EFF	2015 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
314	ER	April 22	NSC	01	No	0to.		Sc		Unable to age.			
315	ER	"	NSC	02				0to.	12	+	(7)	13°	
316	"	"	NSC	03				0to.	9	+	(7)	10°	
317	"	April 23	NSC	04				0to.	13	++	(6-7)	14°	Post 1.
318	"	"	"	05				0to.	9	++	(7)	10°	
319	ER	"	"	06				0to.	10	++	(7)	11°	Slow 0-1.
320	"	"	NSC	07				0to.	9	++	(7)	10°	
321	"	"	"	08				0to.	7	++	(6-7)	8°	
322	"	"	"	09				0to.	10	++	(7)	11°	
323	ER	April 23	NSC	10				0to.	7	++	(6-7)	8°	Poss 9° ctr.
324	"	"	"	11				0to.	8	+	"	9°	8th? Post 8.
325	"	"	"	12				0to.	14	++	"	15°	15° edge stacking slow Post 12.
326	"	"	"	13				0to.	12	++	(7)	13°	
327	"	"	"	14				0to.	12	++	(6-7)	13°	Poss 12.
328	ER	April 23	NSC	15				0to.	7	++	(7)	8°	
329	"	"	"	16				0to.	10	++	(7)	11°	
330	"	"	"	17				0to.	8	++	(7)	9°	
331	"	"	NSC	19				0to.	10	+	(7)	11°	
332	"	"	"	21				0to.	8	+	(7)	9°	1 to.
333	"	"	"	23				0to.	12	++	(7)	13°	1 to.
334	ER	April 24	NSC	24				0to.	8	++	(7)	9°	
335	"	"	"	25				0to.	12	++	(7)	13°	1 to.
336	ER	April 26	"	27				0to.	12	++	(7)	13°	
337	"	"	"	28				0to.	8	+	(6-7)	9°	8th?
338	"	"	"	29				0to.	8	++	(7)	9°	Tough Gm.
339	"	"	NSC	30				0to.	9	++	(7)	10°	
340	"	"	"	31				0to.	9	+	(6-7)	10°	
341	"	"	"	32				0to.	8	++	"	9°	
342	"	"	"	33	*			0to.	11	+	(7)	12°	1 to.
343	ER	April 27	NSC	35				0to.	8	++	(7)	9°	
344	"	"	"	36				0to.	5	++	(6)	6°	1st? Poss 5.
345	"	"	"	37				0to	7	++	(7)	8°	1 to.
346	"	"	"	38				0to.	8	++	(6)	9°	Post 1.
-	ER	April 26	NSC	34.				0to	8	++	(7)	9°	1 to.

TC

Elk River Project #2564.

FISH AGING TALLY FORM

SAM	EFF	DATE 2015.	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
347	ER	April 27	NSC	39				Oto.	8	++	(7)	9°		*
348	"	"	"	40				Oto.	12	++	(7)	13°		
349	"	April 28	"	41				Oto.	Unable to age - Poor Zon. 7 15.4 yr. Prob 15 to 20.					
350	ER	"	NSC	42				Oto.	13	++	(7)	14°	Poss. 15° Cent.	
351	"	"	"	43				Oto.	12	++	(7)	13°		*
352	"	April 29	"	44				Oto.	9	++	(6-7)	10°		
353	"	"	NSC	45				Oto.	6	++	"	7°	Poss 8° Cent.	
354	ER	April 22	PCC	01	No	Otoliths.		Sc.	4	+	(5)	5°	edge ?? - Would not let go on scale age.	
355	ER	"	PCC	02				Oto.	21	++	(6)	22°	Wrong oto's. 17°, 21°	
356	ER	"	PCC	03				Oto.	20	++	(7)	21°	" " " 21°	
357	"	"	PCC	04				Oto.	10	++	(6)	11°	Poss ±1 1 of each oto.	
358	"	"	PCC	05				Oto.	14	++	(6-7)	15°	10 to. 14°	
359	ER	"	PCC	06				Oto.	14	++	(7)	15°	15° Both oto. = 15°	**
360	"	April 22	PCC	07				Oto.	4	++	(7)	5°		
361	"	"	PCC	08				Oto.	8	++	(7)	9°		
362	"	"	PCC	09				Oto.	16	++	(7)	17°	17° - 17°. Poss 18° Cent.	*
363	"	"	PCC	10				Oto.	12	++	(6-7)	13°	13°. Poss ±1.	
364	"	"	PCC	11				Oto.	19	++	(5)	20°	20°. Poss ±1 to 3. Tough Zon.	
365	ER	"	PCC	12				Oto.	18	++	(6)	19°	19° Poss ±1 or 2 10 to	
366	"	"	"	13				Oto.	12	++	(7)	13°	edge ?	
367	"	April 23	"	14				Oto.	19	++	(5-6)	20°	15+? 21°. Poss. ±1 to 3. Tough Zon.	
368	"	"	"	15				Oto.	20	++	(6-7)	21°	15+? 21°. Poss ±1 or 2.	
369	ER	"	PCC	16				Oto.	8	++	(6)	9°	Tough Zon	
370	"	"	PCC	18				Oto.	14	++	(7)	15°	14°. 15°. 15°	**
371	"	"	"	20				Oto.	14	++	(5)	15°	16°. 15°. Poss ±1 or 2. Tough Zon	
372	"	"	"	21				Oto.	8	+	(6-9)	9°	edge ?? Poss 8°.	
373	"	"	"	22				Oto.	16	++	(5)	17°	17°. 17°. Very Tough Zon. Poss ±1 to 3	
374	"	April 23	PCC	23				Oto.	12	++	(7)	13°	13°	*
375	"	April 26	PCC	24				Oto.	3	++	(7)	4°	F Ca).	
376	"	"	"	25				Oto.	8	++	(7)	9°		**
377	ER	April 27	PCC	26				Oto.	8	++	(6-7)	9°	10 to. Slow 7-8-9.	

Note: ER-NSC otoliths pretty good. Good zonation on most fish. Some very old fish very tough to assess.
ER-PCC otoliths. Some tough aging. Difficult zonation on many.
Samples ER-PCC-02 and ER-PCC-03 both aged by scales as well. Both aged as 7 or 8 yr (5). Scales underaging at these 12-13 years.!

10.0

Elk River

Project #2564

FISH AGING TALLY FORM

SAM	EFF	2015 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
378	ER	April 27	PCC	27				Oto.	11	++	(7)	12°	
379	"	April 28	"	28				Oto.	5	++	(7)	6°	
380	"	"	"	29				Oto.	Unable to Age			-	Probable 10-13. Poor Prep.
381	"	"	"	30				Oto.	5	++	(7)	6°	
382	"	"	PCC	31				Oto.	8	++	(7)	9°	
383	"	"	"	32				Oto.	5	+	(6-7)	6°	Poss 5° 5th?
384	ER	April 28	PCC	33				Oto.	11	++	(6)	12°	Poss ±1
385	"	"	"	35				Oto.	8	++	(7)	9°	
386	"	"	"	36				Oto.	12	++	(6-7)	13°	1st?
387	"	April 29	PCC	37				Oto.	5	++	(7)	6°	
388	"	"	"	38				Oto.	8	++	(7)	9°	
389	"	"	"	39				Oto.	5	++	(7)	6°	
390	ER	April 29	PCC	40				Oto.	8	++	(7)	9°	
391	"	"	"	41				Oto.	3	++	(7)	4°	1 oto.
392	"	"	"	42				Oto.	8	++	(6-7)	9°	
393	"	"	"	43				Oto.	3	++	(7)	4°	

Note: ER-PCC-otoliths - Some are very good for zonation. Others show very tough zonation to follow.
Older fish generally tougher to assess.
Edge condition is a tough call on some fish of A few could be older by a year.

1.0

Gold Creek (GC) Project #2524

FISH AGING TALLY FORM

	SAM	EFF	DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
0101	202	GC.	April 22	YP.	01				Sp.	3	H	(7)	4°	FCo-1
0102	203	"	"	YP	02				Sp.	2	H	(6-7)	3°	FC @ 2nd?
" 103	204	"	April 23	YP	03				Sp.	2	H	(7)	3°	
" 104	205	GC.	"	YP	04				Sp.	4	*	(7)	4*	Annulus on edge probable 3* on cut
" 105	206	"	"	YP	05				Sp.	2	H	(7)	3°	
0106	207	"	"	YP.	06				Sp.	5	H	(7)	6°	
" 107	208	"	-24	YP	07				Sp.	3	H	(7)	4°	
" 108	209	GC	April 25	YP.	08				Sp.	3	H	(7)	4°	
" 109	210	"	"	YP	09				Sp.	5	1	(7)	6°	
" 110	211	"	"	YP	10				Sp.	3	H	(7)	4°	
0 111	212	"	"	YP.	11				Sp.	8	*	(7)	8*	
0 112	213	"	"	YP.	12				Sp.	3	1	(6)	4°	Edge? Poss 3*
" 113	214	"	April 26	YP	14				Sp.	2	*	(7)	2*	FCo.
" 114	215	GC.	"	YP.	15				Sp.	1	H	(6-7)	2°	FCo.
" 115	216	"	"	YP.	16				Sp.	2	*	(7)	2*	
0 116	217	"	"	YP	17				Sp.	2	*	(6-7)	2*	FCo.
" 117	218	"	"	YP	18				Sp.	2	H	(7)	3°	
" 118	219	"	April 27	YP	19				Sp.	2	*	(6-7)	2*	FCo-1.
" 119	220	"	"	YP	20				Sp.	2	*	(6)	2*	FCo. 1st cut?
0 120	221	GC	"	YP	21				Sp.	2	*	(6-7)	2*	
" 121	222	"	April 29	YP	22				Sp.	2	*	"	2*	Poor Sp. FCo.
" 122	223	"	"	"	23				Sp.	2	*	"	2*	
" 123	224	"	"	"	24				Sp.	2	*	"	2*	FCo.
" 124	225	"	"	"	25.				Sp.	2	*	(6-7)	2*	FCo-1.
0 125	226	"	"	YP	26				Sp.	1	H	(7)	2°	
" 126	227	"	"	"	27				Sp.	2	*	(6-7)	2*	FC 0-1.
" 127	228	"	April 30	"	28				Sp.	2	*	(7)	2*	Poss 2°.
" 128	229	GC.	"	"	29				Sp.	2	*	(7)	2*	
" 129	230	"	May 01	YP	30				Sp.	3	*	(6-7)	3*	FCo-1. Poss 4*
" 130	231	"	"	"	31				Sp.	7	1	"	8°	Poss 7+
" 131	232	"	"	"	32				Sp.	1	H	(7)	2°	Poss 2* Cut
" 132	233	"	"	YP	33				Sp.	3	*	(7)	3*	
" 133	234	"	"	"	34				Sp.	1	H	(6)	2°	FCo 0-1; 1-2.

2.0

Gold Creek (GC) Project #2564

FISH AGING TALLY FORM

	SAM	EFF	DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
0134	235	GC	May 01	YP	35				Sp.	1	##	(6)	2°	Poss 2*
* 0135	—	"	"	YP	36				Sp.	1	#	(7)	2°	" "
08	237	GC	April 22	CSU	01				FR	11	##	(6-7)	12°	Poss ±1 @ edge
09	238	"	"	CSU	02				FR	11	##	(7)	12°	FCa.
010	239	"	"	CSU	03				FR	9	##	(5)	10°	Poor Zon. True annuli ?? Poss ±1.
011	240	GC.	April 23	CSU	04				FR	9	##	(6-7)	10°	1st? Poor Zon. ?? Poss ±1. ±1 to 12
012	241	"	"	CSU	05				FR	11	#	(7)	12°	1st? edge x
013	242	"	April 24	"	07				FR	9	##	(6-7)	10°	1st? Poss 11-12
014	243	"	" 25	"	08				FR	10	##	"	11°	1st? Poss ±1.
015	244	GC.	"	"	09				FR	15	##	(7)	16°	16° xx
016	245	"	"	CSU	10				FR	14	##	(6)	15°	1st? 15° Poor Zon. 16 Poss ±1 to 12.
017	246	"	"	"	11				FR	12	#	(6-7)	13°	edge? Poss 12°
018	247	"	April 27	CSU	13				FR	11	##	(7)	12°	FCa.
019	248	"	" 29	"	14				FR	11	##	(7)	12°	Poss 11-12. x
020	249	"	"	"	16				FR	13	##	(6)	14°	FCa. Tough Zon.
021	250	"	"	"	16				FR	10	#	(6-7)	11°	Poss. 10+ @ edge
022	251	GC	April 30	"	17				FR	11	*	(7)	11*	FCa edge?
023	252	"	May 01	CSU	18				FR	8	*	(6-7)	8*	FCa edge?
—	236	GC	April 30	RB	01				Oto.	3	##	(6-7)	4°	FC-2-3.
	"	"	"	"	"				Sc	3	##	(6)	4°	Tough Zon. FC1-2 lots of growth-2 ?
041	121	GC.	April 23	MW	01				FR.	3	#	(4)	4°	Terrible cap-only 1 temp fair. No Scales.
	—	GC	April 26	BT	01				Sc	3	##	(6)	4°	Few good scales. Dirty. FC1-2.

Note: YP-spines from Gold Creek. Pretty good zonation. Looks like fairly rapid growth. Would like to see scales as a back up. Prefer otoliths if fish culled!
CSU-fin rays-Gold Creek. Some very tough zonation on fin rays. Lots of apparent false checking (FCa). 1st annulus and edge often a tough call.

1.0

Elk River — Project 2564

FISH AGING TALLY FORM

	SAM	EFF	2015 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
024	264	ER.	April 22	CSU	01				ER	12	+	(7)	13°	1st?
025	265	ER.	"	CSU	02				ER	10	##	(7)	11°	FCI-2.
026	266	"	"	"	04				ER	16	+	(6-7)	17°	1st? edge? Poss ± edge
027	267	"	"	"	05				ER	10	+	(6-7)	11°	center?
028	268	"	April 23	CSU	06				ER	8	*	(7)	8*	
029	269	ER	" 26	"	08				ER	12	+	(6-7)	13°	Poss. older. FCI.
030	270	"	"	"	09				ER	12	+	"	13°	1st? edge? Poss ±1.
031	271	"	"	CSU	10				ER	10	*	(7)	10*	
032	272	"	"	"	11				ER	10	##	(7)	11°	edge?
033	273	ER.	April 28	"	12				ER	12	#	(7)	13°	1st?
034	274	"	"	"	13				ER	12	+	(6)(7)	13°	" Poss. 1st?
035	275	"	"	CSU	14				ER	8	*	(7)	8*	
036	276	"	"	"	15				ER	8	##	(6-7)	9°	
037	277	"	April 29	"	16				ER	8	+	(6-7)	9°	Tough edge? 1st?
038	278	ER.	April 30	CSU	17				ER	12	##	(6)	13°	Tough 1st. poss ±1 or 2
039	279	"	"	"	18				ER	13	##	(6)	14°	" " " "
040	280	"	"	CSU	19				ER	9	#	(6)	10°	1st? " " True annuli ??
042	281	ER	April 23	YP	01				Sp.	3	*	(7)	3*	Poss. 3° edge?
" 43	282	"	"	YP	02				Sp.	3	*	(7)	3*	
044	283	"	"	YP	03				Sp.	1	##	(7)	2°	
045	284	"	April 26	"	04				Sp.	4	*	(7)	4*	FCI.
046	285	ER	" 27	YP	05				Sp.	3	*	(6)	3*	edge? FCI.
047	286	"	"	"	06				Sp.	2	##	(7)	3°	Poss. 3* edge
048	287	"	" 28	"	07				Sp.	5	##	(7)	6°	
049	288	"	April 29	"	08				Sp.	8	*	(7)	8*	
050	289	"	"	"	09				Sp.	2	##	(7)	3°	edge? Poss 3*
051	290	ER	"	YP	10				Sp.	3	##	(6-7)	4°	edge?
052	291	"	"	YP	11				Sp.	1	##	(7)	2°	Lots of growth 0-1-2
053	292	"	"	"	12				Sp.	5	*	(7)	5*	1st? FCI edge?
054	293	ER.	"	YP	13				Sp.	2	*	(6)	2*	FCI.
055	294	"	"	YP	14				Sp.	2	##	(7)	3°	

Note: Elk River - CSU - fin rays. Again, tough formation on many of these fish. True annuli often tough to sort out from false checking. First annulus and edge often a tough call.

2.0

Elk River Project 2564

FISH AGING TALLY FORM

2015.

	SAM	EFF	DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
056	295	ER	April 29	YP	15				Sp.	2	++	(7)	3°		x
057	296	"	"	YP.	16				Sp.	2	*	(6)	2*	FCO-1. ? Pos-3°	
058	297	"	"	YP	17				Sp.	1	++	(7)	2°	FCO.	
059	298	ER	April 30	YP.	19				Sp.	1	++	(6-7)	2°	FCO.	
060	299	"	"	YP	20				Sp.	1	++	(7)	2°	Poss. 2* Cenfo	
061	300	"	"	"	21				Sp.	2	*	(6-7)	2*	FCO.	
062	301	"	"	"	22				Sp.	2	*	(7)	2*	FCO-1.	
063	302	ER	"	YP.	23.				Sp.	2	*	(7)	2*	FCO.	
064	303	"	"	"	24				Sp.	1	++	(7)	2°	FCO-1.	
065	304	"	April 30	YP.	25				Sp.	4	*	(7)	4*	FCO 3rd	
066	305	"	"	"	26				Sp.	2	*	(7)	2*		xx
067	306	"	"	"	27				Sp.	3	*	(7)	3*		
068	307	"	"	"	28				Sp.	3	*	(6)	3*	FCO. Cst & 2nd.	
069	308	ER	"	YP	29				Sp.	2	*	(7)	2*	FCO-1	x
070	309	"	"	"	30				Sp.	2	*	(6)	2*	FCO 1st.	
071	310	"	April 30	"	31				Sp.	1	++	(6)	2°	FCO.	
072	311	ER	May 01	YP	34				Sp.	2	*	(7)	2*		x
073	312	"	"	"	35				Sp.	1	++	(4)	2°	Poor sections - Spines fall out ?	
074	313	"	"	"	36				Sp.	1	++	(7)	2°		

Pg 1.0

Lake Koocanusa - Project # 2564.

x or xx - potential QAQC samples.

FISH AGING TALLY FORM

SAM	EFF	DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
	Sand Creek 2015													
1	SC	Aug 24	KO	1			M	Sc.	2	++	(6)	2++	Poss. 3+ @ edge	
2	"	"	KO	2			M	Oto.	2	+	(6-7)	2+		
3	"	"	KO	3			M	Oto	2	++	"	2++	FC@	
4	SC	"	KO	4			M	Oto.	2	+	(6)	2+	FC 1-2. Poss. 3++	
5	SC	"	KO	5			"	Oto.	2	+	(7)	2+		xx
6	SC	Aug 24	KO	6			"	Oto.	2	+	(7)	2+		
7	SC	"	KO	7			M	Oto	2	+	(7)	2+	1 oto.	
8	"	"	KO	8			"	Oto.	2	++	(7)	2++	Vis = 2+	
9	"	"	KO	9			M	Oto.	2	++	(6-7)	2++	" " P.C. FC 0-1.	
	ELK RIVER													
10	ER	Aug 25	KO	01			M	Oto.	2	+	(6-7)	2+	2nd? Vis = 2+	
11	ER	"	KO	02			M	Oto.	2	+	"	2+	Poss 1++	
12	"	"	KO	03			M	Oto.	2	+	(7)	2+	Vis = 2+	
13	"	"	KO	04			M	Oto.	2	+	(7)	2+	" " 2++	
14	"	"	KO	05			F	Oto.	2	+	(7)	2+	" "	xx
15	ER	Aug-25	KO	06			F	Oto.	2	++	(6-7)	2++	" " FC 2-@ edge	
16	"	"	KO	07			M	Oto.	2	++	(7)	2++	" "	xx
17	"	"	KO	08			M	Oto.	2	+	(7)	2+	" "	
18	"	"	KO	10			F	Oto.	2	++	(6-7)	2++	FC 2-Edge Poss. 3+	
	SAND CREEK													
19	SC	Aug 22	NSC	01				Oto.	14	+	(7)	14+	Poss. 13++	
20	SC	"	NSC	02				Oto.	13	+	(6)	13+	Poss ± 1 @ edge	
21	"	"	NSC	03				Oto.	6	++	(7)	6++		x xx
22	"	"	NSC	04				Oto.	11	+	(7)	11+		
23	SC	"	NSC	05				Oto.	9	++	(6)	9++	1 oto. Good to 7-8. edge ?	Poss 10+ @ edge
24	SC	Aug 22	NSC	06				Oto.	13	+	(6-7)	13+	edge ?	
25	"	"	NSC	07				Oto.	8	++	"	8++	" "	
26	"	"	NSC	08				Oto.	9	+	(7)	9+		
27	SC	"	NSC	09				Oto.	8	++	(7)	8++	1 oto.	
28	"	"	NSC	10				Oto.	10	++	(7)	10++	edge ?	

Note: Most otoliths require considerable scraping to remove tissue.

Note: Edge is a tough call on some of the SC-NSC fish. Many look 1+ but may be 1 year older on the edge

Lake Koocanusa - Project #2564.

FISH AGING TALLY FORM

SAM	EFF	DATE (2015)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
31	SC	Aug 24	NSC	11				0+0.	13	++	(5-6)	13++	1 0+0. 13++ Poor Bred c. Poss 3/or 2
	Elk River												
32	ER	Aug 23	NSC	01				0+0.	6	++	(6-7)	6++	
33	ER	"	NSC	02				0+0.	8	++	(6)	8++	8++ Poss ± 1 Cedge
34	"		NSC	03				0+0.	13	++	(6-7)	13++	13++ Tough 2003.
35	"	"	NSC	04				0+0.	12	++	(6-7)	12++	Poss 13++ C edge.
36	ER	"	NSC	05				0+0.	8	+	(6)	8+	1 0+0. edge?
37	ER	"	NSC	06				0+0.	6	++	(7)	6++	1 0+0. 2nd wrong 0+0. edge?
38	"	"	NSC	07				0+0.	8	++	(6-7)	8++	Poss 9+ C edge
39	"	Aug 23.	NSC	08				0+0.	9	+	(6-7)	9+	edge ?? Poss ± 1 C edge
40	"	"	NSC	09				0+0.	6	+	(7)	6+	Poss 5++
41	"	"	NSC	10				0+0.	9	++	(6-7)	9++	edge ?
	Gold Creek												
43.	GC	Aug 24	NSC	01				0+0.	7	++	(6-7)	7++	Poss. 8+ C edge
44	GC	"	NSC	02				0+0.	12	+	(7)	12+	12+ edge? x
45	"	"	NSC	03				0+0.	6	+	(6)	6+	
46	"	"	NSC	04				0+0.	6	+	(7)	6+	x
47	GC	" 25	NSC	05				0+0.	6	++	(6-7)	6++	6++ edge? Tough 2003.
48	"	Aug 25	NSC	06				0+0.	6	++	"	6++	"
49	"	"	NSC	07				0+0.	6	++	(7)	6++	xx
50	"	"	"	08				0+0.	6	+	(6-7)	6+	Poss. 5++ edge?
51	GC	"	NSC	09				0+0.	4	++	(7)	4++	x
52	GC	Aug 26	NSC	10				0+0.	9	+	(6-7)	9+.	9++

Notes: In all NSC samples, the edge is often a difficult call. Some ++ fish may be 1 year older. Edges are often corroded off or obliterated by a dark surface layer that makes edge assessment difficult especially if growth is not substantial.

Difficult call on edges.

2016

1.0

Sport Fish (Large): Project # 16-49-2016

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
11	ELKR	April 19	BT	01				Sc	3	++	(6-7)	4°	3rd weaker
12	"	"	BT	02				Sc	3	++	(6)	4°	1st? Poss 3°
13	ELKR	"	BT	03				Sc	3	++	(6-7)	4°	
14	"	"	BT	05				- No scales -					
15	"	April 21	BT	06				Oto	3	++	(6-7)	4°	No Scales
16		" 24	BT	09				Sc	5	*	"	5*	Poss 6° edge
17		April 24	BT	10				Sc	5	+	"	6°	
652	ELKR	April 21	WCT	01				Oto	3	++	(6-7)	4°	] 4°
"	"	"	"	"				Sc	2	++	(6-7)	3°	FCC edge]
648	ELKR	April 22	KO	01				Oto	2	++	(5-6)	3°	True annuli?? FCO-1
649	"	"	KO	02				Oto	3	++	(6)	4°	weak Jun
650	"	"	KO	03				Oto	4	++	(5)	5°	poss 1 weak Jug. Ulu = 6°
651	"	"	KO	04					4	++	(4)	5°	weak Jun
			Note KO otoliths poor to age. Weak zonation. True annuli is tough to sort out.										
			BT scales OK. but not great to age. Would suggest otoliths										
			are not available.										
01	Sand Crk	April 19	BT	01	232			Sc	NO Scales				
02	"	"	BT	02	427			Sc	3	+	(6)	4°	3rd?
03	Sand Crk	April 20	BT	03	755			Sc	NO Scales				- just slimes
04	"	"	BT	04	341			Sc	3	++	(6)	4°	Shrw 1-2
05	"	"	BT	05	432			Sc	3	++	(7)	4°	
06	"	April 21	BT	06	-			Sc	3	++	(6)	4°	
07	"	"	BT	07	-			Sc	3	++	(6-7)	4°	
08	"	"	BT	08	-			Sc	2	++	(5-6)	3°	Few dirty Scales
09	"	"	BT	09	-			Sc	1	++	(5)	2°	Poss 3° Few Scales
10	"	"	BT	10	-			Sc	2	++	(5)	3°	All Rough Dirty
641	Sand Crk	April 20	MW	01	-			Oto	8	++	(6)	9°	Poss 10] 9°
"	"	"	"	"	"			Sc	8	++	(6)	9°	poss 1. 1st? Shrw 5-6]

1.0

Project 16-49. (C.S.U.) 2016

FISH AGING TALLY FORM

NSES #	SAM	EFF	DATE (2016)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
C1	26	Sand Crk	April 19	CSU.	02				FR	9	++	(6-7)	10°	12° 10° 10° 1st? FG?	
	27	"	"	"	03				FR	10	+	"	11°	Poss. 12° @ 10th.	
	28	"	"	"	04				FR	12	+	"	13°	1st? Poss ±1.	
	29	Sand Crk	April 20	CSU.	05				FR	12	+	(6-7)	13°	Poss. 14-15	
C5	30	"	"	"	08				FR	11	++	"	12°	Poss ±1	
	31	"	"	"	10				FR	11	++	"	12°	Poss. 13° @ edge	
	32	"	"	"	12				FR	15	++	"	16°	Poss ±1.	
	33	"	"	"	13				FR	12	+	(6)	13°	fine annuli ??	
	34	Sand Crk	April 20	CSU.	14				FR	12	++	(7)	13°	1st?	
C10	35	"	"	"	15				FR	12	+	(5-6)	13°	1st? edge.? Poss ±1 or 2	
	36	"	"	"	16				FR	10	+	(7)	11°	1st almost gone	X
	37	"	"	"	17				FR	10	+	(7)	11°	1st?	X
	38	"	"	"	18				FR	13	+	(5-6)	14°	16° ±1 or 2 1st? edge.?	
	39	"	"	"	19				FR	12	+	(6)	13°	1st? edge?	
C15	40	Sand Crk	April 20	CSU	20				FR	11	+	(6-7)	12°	1st? Poss. 11°	
	41	"	"	"	21				FR	10	++	"	11°	12° 11° 11°	
	42	"	"	"	22				FR	11	+	(5)	12°	poss overlapping - Pos. 8-9.	
	43	"	"	"	23				FR	13	+	(6-7)	14°	14° 1st?	*
	44	"	"	"	24				FR	11	++	"	12°	Poss 13-14 fine annuli ?	
C20	45	"	"	"	25				FR	12	+	(6)	13°	Poss ±1 or 2	
	46	Sand Crk	April 20	CSU	27				FR	14	+	(6-7)	15°	14° 15° 1st? Poss ±1.	
	47	"	"	"	28				FR	13	+	(7)	14°	14° Poss ±1 @ anther	
	48	"	"	"	31				FR	13	+	(6)	14°	15° 14° Poss ±1 or 2	
	49	"	"	"	32				FR	12	+	(6-7)	13°	" "	
C25	50	"	"	"	33				FR	12	+	(6)	13°	13° " "	
	51	"	"	"	34				FR	11	+	(6-7)	12°	12° Poss ±1	
	52	"	April 20	CSU	35				FR	10	+	"	11°	11°	
	53	"	"	"	36				FR	10	+	(7)	11°	1st?	X
	54	"	"	"	37				FR	14	+	(6-7)	15°	Poss ±1	
C30	55	"	"	"	38				FR	11	+	(7)	12°		
	56	"	"	"	39				FR	9	+	(6-7)	10°	1st? edge.?	
	57	"	"	"	40				FR	11	+	(7)	12°	Poss ±1	*
	58	"	"	"	41				FR	13	+	(6-7)	14°	14° Poss ±1.	

Note: Many envelopes labelled August ?? Assuming all are April.

2.0

Project 16-49 (C.S.U.) 2016.

FISH AGING TALLY FORM

	SAM	EFF	DATE (2016.)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
C34	59	Sand Crk	April 20	CSU	42				FR	10	H	(6)	11°	Poor edge after 7-8.
C35	60	"	April 21	"	43				FR	13	H	(6)	14°	
	61	"	"	"	46				FR	11	H	(7)	12°	1st?
	62	"	"	"	47				FR	12	H	(6-7)	13°	1st?
	63	"	"	"	48				FR	9	H	"	10°	1st? Poss ±1
	64	Sand Crk	April 22	CSU	49				FR	12	H	"	13°	Poss ±1
C40	65	"	"	"	50				FR	9	H	(7)	10°	1st? maybe gone
	66	"	"	"	51				FR	12	H	(7)	13°	1st? Poss 11-12
	67	"	"	"	52				FR	11	H	(6-7)	12°	12° 1st? Poss 13-14
			Note: Sand Creek CSU- fin rays are difficult to assess. Tough call often on 1st annulus and edge: Mid-zone tion well defined. Stand pretty good overall. Ages may vary by 1 or 2 years on some fish. Tough aging.											
C43	68	ElkR	April 19	CSU	02				FR	13	H	(6-7)	14°	Poss ±1.
	69	"	"	"	03				FR	13	H	"	14°	13°, 14° Poss ±1.
C45	70	"	"	"	04				FR	11	+	(7)	12°	
	71	ElkR.	Aug 20	CSU	05				FR	12	+	(7)	13°	5 ann. 9-10.
	72	"	"	"	06				FR	8	H	(7)	9°	
	73	"	April 21	CSU	07				FR	Unable to age.				>10 YRS.
	74	"	"	"	08				FR	10	H	(6-7)	11°	
C50	75	"	"	"	09				FR	9	H	(7)	10°	
	76	ElkR	"	"	10				FR	8	H	(6-7)	9°	
	77	"	"	"	11				FR	12	H	(7)	13°	
	78	"	"	CSU	13				FR	9	H	(7)	10°	1st? 10°
	79	"	April 21	CSU	15				FR	7	H	(7)	8°	FC 2-3.
C55	80	"	April 22	"	16				FR	14	H	(6)	15°	Poss ±1 or 2
	81	"	"	"	17				FR	10	+	(7)	11°	1st almost gone
	82	"	"	"	19				FR	14	H	(6)	15°	Good to 10 YR.
	83	"	"	"	20				FR	13	H	"	14°	Poss ±1.

3.0

Project 16-49. (CSU.) 2016. Teck Koocanusa.

FISH AGING TALLY FORM

	SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
	84	ELK R	April 22	CSU.	21				FR	12	++	(6-7)	13°	Poss 14-15
C60	85	"	"	"	22				FR	9	++	(7)	10°	1st?
	86	"	"	"	23				FR	12	++	(7)	13°	
	87	ELK R	April 22	CSU.	24				FR	8	++	(6)	9°	FC2.
	88	"	"	"	25				FR	10	++	(6-7)	11°	Poss ±1
	89	"	April 23	"	26				FR	11	++	(7)	12°	1st?
C65	90	"	"	"	27				FR	14	++	(7)	15°	1st?
	91	"	"	"	28				FR	11	++	(6-7)	12°	Poss ±1.
	92	"	"	"	29				FR	15	+	"	16°	16° Poss ±1 or 2
	93	"	"	CSU.	30				FR	10	++	(7)	11°	FC2.
	94	"	April 23	"	31				FR.	12	++	(7)	13°	
C70	95	"	"	"	32				FR.	11	++	(6-7)	12°	1st? poss 11°
	96	"	"	"	33				FR	9	++	"	10°	FC2 ??
	97	"	"	"	34				FR	10	++	"	11°	
	98	"	"	"	35				FR	8	++	"	9°	1st? Poss. 10° Centre
	99	"	"	"	36				FR	11	+	(6-7)	12°	12° 1st?
C75	100	ELK R.	April 23	CSU	37				FR	13	++	"	14°	
	101	"	"	"	38				FR	13	++	(7)	14°	12+? Poss. 13°
	102	"	"	"	39				FR.	10	++	(6-7)	11°	
	103	"	"	"	40				FR	8	++	"	9°	Slow. 5-6?
	104	"	"	"	41				FR	8	++	"	9°	Poss. 8°
C80	105	ELK R.	April 23	CSU	43				FR	16	++	(6-7)	17°	16° 18° Slow after 9th. Poss ±1.
	106	"	"	"	44				FR	8	++	(6)	9°	FC2 8-9 ?? Poss. 10-12
	107	"	"	"	45				FR	8	++	(6)	9°	" " ?? Five annuli ??
	108	"	April 25	CSU	46				FR	12	++	(6-7)	13°	13°
	109	"	"	"	47				FR	12	++	"	13°	12° 13, Poss ±1.

Note: Similar to Sand Crk. - Mid zonation is good to excellent but the 1st annulus and edge are often a tough call. Zonation is often tough after age 8 to 10. Some 9° fish could be 10-13 years older. True annuli tough to sort out.

4.0

NSES #

Project 16-49 (CS-U) 2016. Teck Kootenay

FISH AGING TALLY FORM

		2016												
SAM	EFF	DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
C85 110	Gold Crk	April 20	CS-U	02				FR	12	++	(6-7)	13°	Poss ±1	
111	"	"	"	03				FR	9	++	(6)	10°	Poss. 9°	
112	"	"	CSU	04				FR.	10	++	(6-7)	11°	13°. 11°, 11°	x
113	"	"	"	05				FR	12	+	"	13°	F-Ds?, True annuli?	
114	"	"	"	06				FR.	9	++	(7)	10°	edge? poss. 11°	
C90 115	"	"	"	07				FR	11	++	(7)	12°		
116	Gold Crk	April 20	"	08				FR.	9	++	(6-7)	10°	1st? Poss 9°.	
117	"	"	CSU.	09				FR	12	++	"	13°	13° Poss. ±1 centre.	
118	"	April 21	"	10				FR	12	++	"	13°	Poss ±1 or 2	
119	"	"	"	11				FR	12	++	"	13°	±1	
C95 120	"	"	"	12				FR	6	++	(6)	7°	Poss. 8th edge	
121	"	April 22	"	13				FR.	8	*	(7)	8*	edge?	x
122	"	"	CSU.	14				FR.	11	++	(7)	12°	1st??	x
123	"	"	"	16				FR.	12	+	(7)	13°		
124	"	"	"	17				FR	11	++	(6)	12°	1st? 12°, Poss ±1 centre	
C100 125	"	"	"	19				FR	10	++	(6)	11°	Poss ±1	
126	Gold Crk	April 23	"	20				FR	10	++	(6-7)	11°	" "	
127	"	"	CSU	21				FR	11	+	(6)	12°	Poss ±1.	
128	"	"	"	22				FR.	15	++	(7)	16°.	16°, 16° Poss ±1	
129	"	"	"	23				FR	10	++	(7)	11°	Poss. 12°	x
C105 130	"	"	"	24				FR	13	++	(6-7)	14°	1st? 15°, 14°	x
131	"	"	"	25				FR	17	++	"	18°	18°, 19°, Poss ±1 or 2	
132	"	"	"	26				FR	Unable to age			Poor 3m	17 0.4 Ra	
133	Gold Crk	April 23	CSU	27				FR.	12	++	(6-7)	13°	3m, Poss ±1.	
134	"	April 24	"	28				FR.	15	++	(6)	16°	16° Tough 3m after 11	
C110 135	"	"	"	29				FR.	10	++	(7)	11°		xx
136	"	"	"	30				FR	12	++	(6-7)	13°	1st?	x
137	"	"	"	31				FR	9	++	(7)	10°	"	x
138	"	"	"	32				FR	11	+	(6-7)	12°	Poss 10-11	
139	Gold Crk	April 25	CSU	34				FR	15	++	(6)	16°	16° 1st? Poss 17-18	
C115 140	"	"	"	35				FR	11	++	(6-7)	12°	12° Poss ±1 or 2	
141	"	"	"	36				FR	11	+	(5-6)	12°	12°, 11°, 13°, Poss ±1 or 2	
142	"	"	"	37				FR	11	++	(6-7)	12°	1st?, Poss ±1. Poss 11°	

5.0

Project 16-49 (CSU) 2016 Teck Kootenay

FISH AGING TALLY FORM

SAM	EFF	DATE (2014)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
C118 143	Gold Crk	April 25	CSU	38				FR	9	++	(6)	10°	FCS?
144	"	April 26	"	39				FR	12	++	(6-7)	13°	FCS?
C120 145	"	"	"	40				FR	10	++	(7)	11°	
146	"	"	CSU	41				FR	7	++	(7)	8°	1st?
147	"	"	"	42				FR	8	++	(7)	9°	
C123 148	Gold Crk	April 27	CSU	43				FR	16	++	(6-7)	17°	17°; 18° Bw ± 6-12

Similar to Sand Creek and E. Kk River samples. Often poor centres and edges but good mid growth. Sample ages could go two ways by 1 or 2 years. One annulus often tough to sort out.

1.0

Project #16-49 (2016) Teck Koocanusa.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
149	Sand Crk	April 19	NSC	01				0 to.	25	++	(6-7)	26°	Good to 17-18. Poss ± 1 or 2,	
150	"	"	NSC	03				0 to.	13	++	(7)	14°	14°	
151	"	April 20	NSC	04				"	14	++	(7)	15°		x
152	"	"	"	05				"	9	++	(7)	10°		
153	Sand Crk	April 21	"	06				"	12	++	(7)	13°	Poss. 14°	
154	"	"	"	07	NO OTOLITHS			SC	6	++	(6)	7°		
155	"	"	NSC	08				0 to.	12	++	(7)	13°		xx
156	"	"	"	09				"	12	++	(6-7)	13°	Poss ± 1.	
157	"	"	"	10				"	10	++	(7)	11°		x
158	"	"	"	11				0 to.	13	++	(6-7)	14°	Poss. 13°	
159	Sand Crk	April 22	NSC	13				"	7	++	(7)	8°	1 o to. Tough read.	
160	"	"	"	15				"	15	++	(7)	16°		
161	"	"	"	16				"	10	++	(7)	11°		
162	"	"	"	17				0 to.	9	++	(7)	10°		
163	"	"	NSC	18				"	9	++	(6)	10°	1 o to. 1st?	
164	"	April 23	NSC	19				"	10	++	(7)	11°		
165	"	"	"	20				"	13	+	(7)	14°	Poss. 13°	
166	Sand Crk	"	"	21				0 to.	12	++	(7)	13°		
167	"	"	"	22	NO OTOLITHS			SC	5	++	(5-6)	6°	poor, dirty scales Poss. 7°	
168	"	April 23	NSC	23				0 to.	8	++	(7)	9°		
169	"	"	"	24				0 to.	9	++	(7)	10°	Poss ± 1.	
170	"	"	"	25				"	11	++	(7)	12°		
171	"	"	"	26				"	8	++	(7)	9°		x
172	"	"	"	27				"	10	++	(7)	11°		
173	"	"	NSC	28				0 to.	8	++	(7)	9°		x
174	Sand Crk	April 24	NSC	29				"	9	++	(7)	10°		x
175	"	April 25	"	30				"	9	++	(6-7)	10°	FC 1-2	
176	"	"	"	31				0 to.	13	++	(7)	14°		x
177	"	"	"	33				0 to.	20	++	(6)	21°	20-22° Poor ring, Good to. Poss ± 1 or 2.	
—	"	"	NSC	32				0 to.	14	+	(6-7)	15°	Poss ± 1	
178	"	"	NSC	34				0 to.	14	++	"	15°	Poss 14°.	
179	"	"	"	35				"	13	++	(6)	14°	Poss ± 1.	
180	"	"	"	36				"	13	++	(7)	14°		x

Note: Otoliths tough to prep.

2.0

Project 16-49 (2016): Teck Koocanusa.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
181	Sand Crk	April 25	NSC	37				Oto.	10	++	(7)	11°		
182	"	"	"	38				Oto.	12	++	(7)	13°	Poss. 12°	x
183	"	"	"	39				Oto.	14	++	(7)	15°		x
184	"	"	NSC	40				Oto.	9	++	(6-7)	10°		
185	Sand Crk	April 25	NSC.	41				Oto.	12	++	(7)	13°		
186	"	"	"	42				Oto.	13	++	(7)	14°	Poss. 13°	
			Note: Sand Creek NSC. - Pretty good zonation on many fish. Edges tricky on some.											
187	Elk R	April 19	NSC	01	wrong oto's			Oto.	14	++	(6)	15°	1 oto. 15° Poss. ± 1 or 2	
188	Elk R	"	NSC	02				Oto.	8	++	(7)	9°	1 oto	
189	"	"	"	03				Oto.	8	++	(7)	9°	1 oto.	xx
190	"	"	"	04				Oto.	7	++	(7)	8°	1 oto.	
191	"	"	"	05.				Oto.	11	++	(6-7)	12°	1 oto. edge ?	
192	"	"	"	06				Oto.	9	++	"	10°	1 oto.	
193	Elk R	April 19	NSC	07	wrong oto.			Oto.	12	++	(5-6)	13°	1 oto. 13° 14° Poss ± 1 or 2	
194	"	"	"	08				Oto.	8	++	(6)	9°	1 oto. 1st ? Poss. 8°	
195	"	"	"	09				Oto.	Unable to age ?			15 yrs	1 oto. ? 15 yrs. Poor edge.	
196	"	"	"	10.				Oto.	14	++	(6)	15°	1 oto. poss 13-14	
197	"	"	"	11				Oto.	9	++	(7)	10°		
198	Elk R.	April 19	NSC	12				Oto.	9	++	(7)	10°		xx
199	"	"	"	13.				Oto.	9	++	(6-7)	10°	1 oto.	
200	"	"	"	14				Oto	9	++	(7)	10°	1 oto.	
201	"	April 20	NSC	15				Oto.	19	++	(6)	20°	20° Poss. older. Tough. Outside growth.	
202	"	"	"	16				Oto.	13	+	(6-7)	14°	1 oto. 14° 14° Poss ± 1.	
203	"	"	"	17				Oto.	13	++	(5)	14°	1 oto. poor 2m.	
204	"	"	"	18				Oto.	13	++	(6-7)	14°	14° Poss 13°.	
205	Elk R	April 21	NSC	19				Oto.	13	++	"	14°	Poss ± 1.	
206	"	"	"	20				Oto.	10	++	(7)	11°		x
207	"	"	"	21				Oto.	15	++	(7)	16°.	16° Poss ± 1	
208	"	"	"	22				Oto.	10	++	(6-7)	11°	1 oto.	
209	"	"	"	23				Oto.	10	+	(7)	11°		x
210	"	"	"	25				Oto.	10	++	(6-7)	11°		

3.0

Project 16-49 (2016) - Teck Koocanusa.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
211	ElkR	April 21	NSC	26				Otg.	8	tt	(6)	9°	Tough Jaw.	
212	"	April 22	NSC	27				Oto.	14	tt	(6-7)	15°	15°; Poss 14°	
213	"	"	"	28				Oto.	21	tt	(7)	22°	22°, 22°	x
214	"	"	"	29				Otg.	20	tt	(5-6)	21°	21°; Poss 1 or 2	
215	"	"	"	30				Otg.	9	tt	(7)	10°		x
216	"	"	"	31				Oto.	14	tt	(7)	15°	15; 14° Poss ± 1 age.	
217	"	"	NSC	32				NO SAMPLE.						
218	ElkR.	April 22	NSC	33				Oto.	8	tt	(7)	9°	1 oto.	
219	"	"	"	34				"	9	tt	(6-7)	10°	1 oto. age?	
220	"	"	"	35				"	10	tt	(7)	11°		x
221	"	"	"	36				Oto.	9	t	(7)	10°		x
222	"	"	"	37				Oto.	10	tt	(7)	11°	Poss ±1	
223	"	"	"	38				Otg.	14	tt	(7)	15°	15°;	
224	ElkR	April 22	NSC	39				Oto.	9	tt	(7)	10°		x
225	"	"	"	40				Oto.	10	tt	(7)	11°		x
226	"	"	"	41				Oto.	10	tt	(5)	11°	1 oto. Tough Jaw	
227	"	April 23	NSC	42				Oto.	9	tt	(7)	10°	1 oto.	
228	"	"	"	43				Oto.	8	tt	(7)	9°		x
			Note: NSC otoliths for Elk River fish sampled are quite good. Tough to prepare but pretty good zonation once prepped. Edge tricky to assess.											
229	Gold Crk	April 19	NSC	01				Oto.	12	tt	(7)	13°	1 oto.	x
230	"	"	"	02				Oto.	13	tt	(6-7)	14°	1 oto. Poss. 13°	
231	"	"	"	03				Oto.	12	tt	(7)	13°		x
232	Gold Crk	April 20	NSC	05				Otg	unable to age	7	15YRs		1 oto. 7 15YRs. OK to 13+....	
233	"	"	"	06				Otg.	14	tt	(5-6)	15°	1 oto; 15°	
234	"	"	"	07				Oto.	10	tt	(6)	11°	1st.	
235	"	April 21	NSC	08				Oto.	16	tt	(6-7)	17°	1 oto. 17° Poss ± 1.	
236	"	"	"	09				Oto.	13	tt	(7)	14°	Poss 13°	
237	"	"	"	10				Otg.	8	tt	(7)	9°		
238	"	"	"	11				Oto.	9	tt	(6-7)	10°	Tough Jaw.	
239	"	April 22	NSC	12				Oto.	13	tt	(6)	14°	Poss. ± 1	

Box 2 / Box 3

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Project # 16-49 (2016) Teck Kootenay.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
240	Gold Crk	April 22	NSC	13				Oto.	16	++	(5-6)	17°	17°; Tough Dog.
241	"	"	"	14				Oto.	12	++	(7)	13°	1 oto. Pos 14°
242	Gold Crk	April 23	NSC	15				Oto.	10	++	(6)	11°	Pos ± 1. Tough Dog.
243	"	"	"	16				Oto.	11	++	(6)	12°	12° "
244	"	"	"	17				Oto.	11	++	(6-7)	12°	Pos ± 1
245	"	April 24	NSC	18				Oto	9	++	(7)	10°	1 oto.
246	"	"	"	19				Oto.	10	++	(6)	11°	pos ± 1
247	"	"	"	20				Oto.	7	++	(7)	8°	1 oto.
248	"	"	"	21				Oto.	9	++	(7)	10°	
249	"	"	"	22				Oto.	8	++	(6-7)	9°	Poss. 10th C ring
250	Gold Crk.	April 24	NSC	23				Oto.	13	++	"	14°	Poss 1 C ring. Good to 12.
251	"	April 25	"	24				Oto.	13	++	(7)	14°	
252	"	"	"	25				Oto.	10	++	(6)	11°	1 oto. 1st ? poss 12°
253	"	"	"	26				Oto.	14	++	(5)	15°	Tough Dog after 10th.
254	"	"	"	27				Oto.	13	++	(7)	14°	1 oto. Poss 1 C ring
255	"	"	"	28				Oto.	9	++	(7)	10°	
256	"	"	"	29				Oto.	10	++	(7)	11°	
257	Gold Crk	April 25	NSC	30				Oto.	15	++	(6-7)	16°	13, 15° Tough outside No.
258	"	"	"	31				Oto.	11	++	(7)	12°	
259	"	"	"	32				Oto.	9	++	(7)	10°	
260	"	"	"	33				Oto.	12	++	(7)	13°	1 oto.

Note: NSC fish otoliths from Gold Creek pretty good overall. Some tough outside zonation on particularly older fish. Some greater than 12 to 13 years.

1.0

Project #16-49 (2014) Teck Koocanusa P.C.C.

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
261	Sand Crk	April 19	PCC	01				Otg.	9	++	(6-7)	10°	11°, 10° Poss. 11°	
262	"	" 20	PCC	06				Otg.	12	++	(7)	13°		x
263	"	"	"	07				Otg.	6	++	(6-7)	7°		
264	"	"	"	08				Otg.	4	++	"	5°	FC2	
265	Sand Crk	April 21	PCC	09				Otg.	8	++	(7)	9°		xx
266	"	"	"	10				Otg.	6	++	(7)	7°		
267	"	"	"	11				Otg.	12	++	(7)	13°	13° FC1.	
268	"	"	"	12				Otg.	12	++	(7)	13°	13° FC1-2.	xx
269	Sand Crk	April 21	PCC	14				Otg.	6	++	(7)	7°	1 otg.	
270	"	"	"	16				Otg.	10	+	(6-7)	11°	Poss. 10°	
271	"	"	"	17				Otg.	9	++	(7)	10°		
272	"	April 23	PCC	18				Otg.	11	++	(6)	12°	Rest 1 Tough edge.	
273	"	"	"	19				Otg.	15	++	(7)	16°	1 otg. Poss. 17 edge	
274	"	"	"	20				Otg.	13	++	(6)	14°	Poss 1.	
275	"	"	"	21				Otg.	13	++	(7)	14°		x
276	"	"	"	22				Otg.	10	++	(7)	11°		xx
277	"	"	PCC	23				Otg.	6	++	(6)	7°	Poor edge	
278	Sand Crk	April 23	PCC	24				Otg.	5	++	(7)	6°		
279	"	"	"	25				Otg.	6	++	(7)	7°		xx
280	"	"	"	26				Otg.	8	++	(5-6)	9°	Tough 7m.; Poor break.	
281	"	"	"	27				Otg.	7	++	(4)	8°	1 otg. 8°; Poor.	
282	"	"	"	28				Otg.	4	++	(6-7)	5°		
283	"	"	PCC	29				Otg.	9	++	(7)	10°	1 otg.	
284	"	"	"	30				Otg.	6	++	(7)	7°	1 otg. Weaker 7m.	
285	"	"	"	31				Otg.	12	++	(6-7)	13°	12°, 13°	
286	Sand Crk	April 23	PCC	32				Otg.	8	++	(7)	9°		x
287	"	"	"	33				Otg.	11	++	(5-6)	12°	Poss 1 or 2	
288	"	"	"	34				Otg.	7	+	(6-7)	8°		
289	"	"	"	35				Otg.	9	++	(7)	10°		
290	"	"	"	36				Otg.	17	++	(6)	18°	18°, 18° Poss 1 or 2	
291	"	"	"	37				Otg.	7	++	(6-7)	8°	1 otg.	
292	"	"	PCC	38				Otg.	9	++	(7)	10°		
293	"	"	"	39				Otg.	9	++	(7)	10°		

2.0

Project #16-49 (2016). Teck Koocanusa.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
294	Sand Crk	April 23	P.C.C.	40				Oto.	4	++	(7)	5°		
295	"	"	"	41				Oto.	9	++	(6-7)	10°		
296	"	"	"	42				Oto	4	++	(6)	5°	1 oto. Weak Zone.	
297	Sand Crk	April 23	P.C.C.	43				Oto.	6	++	(7)	7°	FC's	x
298	"	"	"	44				Oto.	8	+	(6-7)	9°	age.? Poss. 8°	
299	"	"	"	45				Oto.	4	++	(7)	5°	1 oto.	
300	"	"	"	46				Oto.	4	++	(7)	5°		
301	"	"	"	47				Oto.	4	++	(7)	5°		x
302	Sand Crk	April 23	PCC	48				Oto.	9	++	(7)	10°		x
303	"	"	"	49				Oto.	7	++	(7)	8°	1 oto.	
304	"	April 24	"	50				Oto.	5	++	(7)	6°		
305	"	"	"	51				Oto.	3	++	(6-7)	4°	Tricky Zone.	
306	"	"	"	52				Oto.	4	++	"	5°		
307	"	"	"	53				Oto.	3	++	(6)	4°	1 oto. Poor Zone.	
308	"	"	"	54				Oto.	3	++	(6-7)	4°	" "	
309	Sand Crk	"	PCC	55				Oto.	3	++	(7)	4°		
310	"	"	"	56				Oto.	4	++	(6)	5°		
		Note: PCC otoliths generally O.K. Tough to prep. Edge is often a tough call. May be												
		undereging by 1 year on some fish. Lots @ only 1 otolith making assessment more difficult.												
		Young fish ie 4-5 often difficult formation of otoliths very subtle when small.												
311	Elk R.	April 19	PCC	01		No otoliths.		Sc	3	+	(6)	4°		
312	Elk R.	"	PCC	02				Oto.	4	++	(7)	5°		x
313	"	"	"	03				Oto.	6	++	(6)	7°	Tough Zone.	
314	"	"	"	05				Oto.	4	++	(7)	5°		x
315	"	"	"	06				Oto.	4	++	(6-7)	5°		
316	"	"	"	07				Oto.	7	++	(7)	8°		
317	Elk R.	April 19	PCC	08				Oto.	8	+	(6-7)	9°	age.?	
318	"	"	"	09				Oto.	3	++	"	4°		

3.0

Project 16-49 (2016) Teck Koocanusa.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
319	ELKR	April 19	PCC	10				Oto.	8	++	(4-5)	9°	edge ? Poss. 10-11.
320	"	"	"	11				Oto.	6	++	(6-7)	7°	Tough Jaw.
321	"	"	"	12				Oto.	3	++	"	4°	
322	ELKR	"	PCC	13				Oto.	3	++	(7)	4°	FC @ 1st.
323	"	"	"	14				Oto.	4	++	(7)	5°	
324	"	April 20	PCC	15				Oto.	6	++	(7)	7°	
325	"	April 22	"	16				Oto.	Unable to Age		7/13-14		O.K. to 10-11. Poor outside
326	"	"	"	17				Oto.	17	++	(5-6)	18°	18° 18° Poss ± 1 to 3.
327	"	"	"	18				Oto.	9	++	(7)	10°	FC
328	"	"	"	19				Oto.	9	++	(7)	10°	
329	ELKR	"	PCC	20				Oto.	9	++	(7)	10°	
330	"	"	"	21				Oto.	7	++	(7)	8°	
331	"	"	"	22				Oto.	9	++	(6-7)	10°	Poss. 11 edge
332	"	"	"	23				Oto.	6	++	(7)	7°	FC's
333	"	April 22	PCC	25				Oto.	4	++	(6)	5°	weak Jaw.
334	"	"	"	26				Oto.	4	++	(6)	5°	" Jaw
335	"	"	"	27				Oto.	8	++	(6)	9°	
336	"	"	"	28				Oto.	4	++	(7)	5°	
337	"	"	"	29				Oto.	Unable to Age				1 oto. Poss. 9 to 11.
338	ELKR	April 22	PCC	30				Oto.	8	++	(5-6)	9°	Tough Jaw.
339	"	"	"	31				Oto.	12	++	"	13°	13° 12° Poss 1 or 2
340	"	"	"	32				Oto.	10	++	(7)	11°	FC's
341	"	"	"	33				Oto.	4	+	(6-7)	5°	Tough Jaw.
342	"	"	"	34				Oto.	12	++	(7)	13°	FC's.
343	"	"	"	36				Oto.	4	++	(7)	5°	
344	ELKR	April 22	PCC	38				Oto.	6	+	(5-6)	7°	1 oto. Poor.
345	"	"	"	39				Oto.	10	++	"	11°	Both P.C. Mounted.
346	"	"	"	40				Oto.	12	++	(6)	13°	1 oto. Soft Jaw. 13 • Post 1.
347	"	"	"	41				Oto.	9	+	(7)	10°	
348	"	"	"	42				Oto.	4	++	(7)	5°	FC's.
349	ELKR	April 22	PCC	43				Oto.	4	++	(7)	5°	"
350	"	"	"	44				Oto.	9	++	(6-7)	10°	
351	"	"	"	45				Oto.	5	++	(7)	6°	FC's.

4.0

Project 16-49 (2016) Teck Koocanusa

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
352	ELKR	April 22	PCC	46				Oto.	9	++	(6-7)	10°	FCs.
353	"	"	PCC	48				Oto.	4	++	(7)	5°	
354	"	"	"	49				Oto.	12	++	(7)	13°	
355	"	"	"	50				Oto.	4	++	(6-7)	5°	1 oto.
356	"	"	PCC	51				Oto.	6	++	(6)	7°	1 oto.? Poss. 6°
357	"	"	"	52				Oto.	4	++	(6-7)	5°	
358	"	"	"	53				Oto	5	++	"	6°	1 oto. FCs
359	ELKR	April 22	PCC	54				Oto.	4	++	(7)	5°	
360	"	April 25	PCC	55				Oto.	4	++	(6)	5°	1 oto. 1st?
361	"	"	"	56				Oto.	4	++	(7)	5°	
362	"	"	"	57				Oto.	4	++	(6-7)	5°	1 oto. FCs
		Notes: ELK River PCC otoliths are very tough to assess. Very difficult to keep clear of shattering (more so than previous sites.). Zone 7 is often difficult to follow with more false checking and erratic zonation than my previous sites. Tough Aging.											
363	Gold Crk	April 19	PCC	01				Oto.	4	++	(7)	5°	
364	"	"	PCC	05				Oto.	4	++	(7)	5°	
365	"	"	PCC	13				Oto.	4	++	(7)	5°	
366	Gold Crk	"	"	16				Oto.	5	++	(7)	6°	FCs
367	"	"	"	18				Oto.	3	++	(6)	4°	
368	"	"	"	21				Oto.	4	++	(7)	5°	
369	"	"	"	22				Oto.	4	++	(7)	5°	
370	Gold Crk	April 20	PCC	25				Oto.	4	++	(5)	5°	Poss. 4° - Reabsorbed.
371	"	"	"	26				Oto.	13	++	(6-7)	14°	1.5°; 14°; 13° Poss ±1.
—	"	"	"	27				Oto.	4	++	(7)	5°	
372	"	"	"	30				Oto.	4	++	(7)	5°	
373	"	"	"	31				Oto.	4	++	(7)	5°	
374	"	"	"	33				Oto.	4	++	(7)	5°	
375	Gold Crk	April 20	PCC	34				Oto.	4	++	(5-6)	5°	Poor Zon.
376	"	"	"	36				Oto.	3	++	(7)	4°	
377	"	"	"	37				Oto.	3	++	(6-7)	4°	FCs.

5.0

Project 16-49 (2016.) Teck Koocanusa.

Box 4 ↑

Box 5 ↓

FISH AGING TALLY FORM

SAM	EFF	DATE (2016)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
378	Gold Crk	April 20	P.C.C.	38				Otg.	3	++	(6-7)	4°		
379	"	" 21	"	39				Oto.	3	++	(5-6)	4°	poor formation.	
380	Gold Crk	April 21	PCC	40				Otg.	4	++	(7)	5°	FCC 1st.	×
381	"	"	"	41				Otg.	4	++	(6-7)	5°	FC2	
382	"	"	"	42				Oto.	3	++	(7)	4°	1 otg.	×
383	"	"	"	44				Oto.	10	++	(7)	11°	1 oto.	
384	"	April 21	PCC	45				Oto.	12	+	(6-7)	13°	1 oto. Poss ± cmpx	
385	"	"	"	46				Oto.	6	++	"	7°		
386	"	"	"	47				Oto.	3	++	(7)	4°		×
387	"	"	"	48				Otg.	4	++	(7)	5°		
388	"	"	"	50				Otg.	3	++	(7)	4°	1 oto.	
389	"	"	"	51				Oto.	7	++	(7)	8°		
390	Gold Crk	April 22	PCC	52				Oto	4	++	(6-7)	5°	1 oto. FC1-2.	
391	"	"	"	53				Otg.	4	++	(7)	5°	FCC 1st.	×
392	"	"	"	54				Oto.	4	++	(5-6)	5°	poor formation	
393	"	"	"	55				Oto.	4	++	(7)	5°	FCC.	
394	"	"	"	56.				Oto.	5	++	(7)	6°	FC2	
395	"	"	PCC	58.				Oto.	4	++	(7)	5°		××
396	"	"	"	59				Oto.	4	++	(7)	5°		
397	"	"	"	61				Oto.	5	++	(6-7)	6°		
398	"	"	"	63				Oto.	4	++	(6)	5°		
399	Gold Crk	April 22	PCC.	64				Otg.	3	++	(6-7)	4°	FC2.	
400	"	"	"	65				Oto.	2	++	"	3°	1 oto FCC 1st.	
401	"	"	"	66				Oto.	4	++	(7)	5°		
402	"	"	"	67				Otg.	3	++	(7)	4°		×
403	"	"	"	68				Otg.	3	++	(7)	4°	FCC 1st.	
404	"	"	"	69				Otg.	4	++	(7)	5°		
405	Gold Crk	April 22	PCC	70				Otg.	4	++	(6)	5°	Tough jaw.	
406	"	"	"	73				Oto.	3	++	(7)	4°	1 otg.	
407	"	"	"	74				Otg.	4	++	(6-7)	5°		
408	"	April 23	"	75				Otg.	5	++	"	6°		
409	"	"	"	76				Otg.	4	++	"	5°	FC2 Poss. 6°	
410	"	"	"	77				Oto.	4	++	"	5°	age-?	

6.0

Project 16-49 (2016) Teck Koocanusa.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
411	Gold Crk	April 23	PCC	78				Otg.	3	++	(6)	4°	FCa.
412	"	"	"	79				Otg.	3	++	(6-7)	4°	FC 3-Edge
413	"	"	"	80				Otg.	4	++	(7)	5°	
414	Gold Crk.	April 25	PCC	81				Otg.	11	+	(7)	12°	x
415	"	"	"	82				Otg.	10	++	(7)	11°	
416	"	"	"	83				Otg.	6	++	(6)	7°	Tough Zone
417	"	"	"	84				Otg.	11	++	(6)	12°	Tough Edge open.
418	"	"	"	86				Otg.	12	++	(6-7)	13°	13° Poss ±1
419	"	"	"	87				Otg.	Unable to Age			7 1/2	Rs
420	Gold Crk	April 25	PCC	88				Otg.	4	++	(7)	5°	
421	"	"	"	89				Otg.	8	++	(7)	9°	10 Otg.
422	"	"	"	90				Otg.	12	++	(7)	13°	13°
423	"	"	"	91				Otg	9	++	(6-7)	10°	Edge ?
424	"	"	"	92				Otg.	1	++	(6)	8°	poor edge.
425	"	"	"	93				Otg.	4	++	(6-7)	5°	
426	"	"	"	94				Otg.	4	++	"	5°	Poss. 6° edge
427	Gold Crk	April 25	PCC	95				Otg	5	++	(7)	6°	xx
		Notes &	PCC	a lot of the	from	Gold	Creek	O.K.	Some	tough	zonation.	A lot of	
		younger	fish in	this	group.	Edge	a	tough	call	on	some.		

1.0

Project #16-49 (2016) RSC.

xxIxx - possible QAQC samples

FISH AGING TALLY FORM

SAM	EFF	2016. DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
428	SandCrk.	April 20	RSC	01				0 to.	4	++	(7)	5°		x
429.	"	" 22	RSC	03				0 to.	2	++	(7)	3°		x
430	"	"	RSC.	04				0 to.	2	++	(7)	3°		
431	SandCrk	"	"	07				0 to.	2	++	(7)	3°		x
432	"	"	"	08				"	2	++	(7)	3°		
433	"	"	"	09.				"	2	++	(7)	3°		
434	"	April 22	RSC	10				"	2	++	(7)	3°		
435	"	"	"	11				0 to.	2	++	(7)	3°		
436	"	"	"	12				"	2	++	(7)	3°		
437	"	"	"	15.				"	2	++	(7)	3°	FC2.	
438	"	"	"	14.				0 to	2	++	(7)	3°	1 0 to.	
439	"	"	RSC	19				"	2	++	(7)	3°		
440	SandCrk	April 22	"	20				"	2	++	(7)	3°		
441	"	"	"	21				"	2	++	(7)	3°		
442	"	"	"	22.				0 to.	2	++	(7)	3°		
443	"	April 23	RSC	23				0 to.	2	++	(7)	3°		
444	"	"	"	24				"	2	++	(6-7)	3°	FC2.	
445	"	"	"	25				"	2	++	(7)	3°		x
446	"	"	"	27				"	2	++	(7)	3°		
447	"	"	"	28				"	2	+	(7)	3°		
448	"	"	"	29				0 to.	1	++	(7)	2°		
449	SandCrk.	April 23	RSC	30				"	2	++	(6-7)	3°	slower 0-1.	
450	"	"	"	31				"	2	++	(7)	3°		x
451	"	April 24	RSC	32				0 to.	2	++	(7)	3°		
452	"	"	"	33				"	2	++	(7)	3°		
453	"	"	"	34				"	2	++	(7)	3°		
454	"	"	"	35				"	2	++	(7)	3°		
455	"	"	"	36				"	2	++	(7)	3°		x
456	"	"	RSC	37				0 to.	1	++	(7)	2°		x
457	"	"	"	38				"	2	++	(7)	3°		x
458	"	"	"	39				"	2	++	(7)	3°		
459	"	"	"	40				"	2	++	(7)	3°		
460	"	"	RSC	41				"	1	++	(7)	2°		x

2.0

Project #16-49 (2016) RSC.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
461	Sand Crk	April 24	RSC	42				0 to.	2	++	(7)	3°		X
462	"	"	RSC	43				0 to.	3	++	(6)	4°	Poss. 3° 1st wraker ??	
463	Elk R	April 21	RSC	05				0 to.	2	++	(7)	3°		
464	Elk R	"	RSC	06				"	2	++	(7)	3°		X
465	"	"	"	07				"	2	++	(7)	3°		
466	"	"	"	09				"	2	++	(7)	3°		XX
467	"	"	"	11				0 to.	2	++	(7)	3°		
468	Elk R	April 21	RSC.	13				"	2	++	(7)	3°		
469	"	"	"	14				"	2	++	(7)	3°		X
470	"	"	"	15				"	2	++	(7)	3°		
471	"	"	"	16				"	2	++	(7)	3°		
472	"	"	"	17				"	1	++	(7)	2°		
473	"	April 21	RSC	18				0 to.	3	+	(6)	4°	3rd annuli ??	
474	"	"	"	19				"	2	++	(6-7)	3°	FC2.	
475	"	"	"	21				"	2	++	(7)	3°		
476	"	"	"	22				"	3	++	(7)	4°		
477	"	"	"	23				"	2	++	(6-7)	3°	FC2-3.	
478	"	"	"	24				0 to.	2	++	"	3°	" "	
479	Elk R.	April 21	RSC	26				"	2	++	(7)	3°		
480	"	"	"	27				"	2	++	(7)	3°		
481	"	"	"	28				"	2	++	(7)	3°		
482	"	"	"	29				0 to.	2	++	(6-7)	3°	FC0-1.	
483	"	"	"	30				"	2	++	(7)	3°		
484	"	"	"	31				"	2	++	(7)	3°		X
485	Elk R	April 21	RSC	32				0 to.	2	++	(6-7)	3°	FC0-1.	
486	"	"	"	33				"	2	++	"	3°		
487	"	"	"	34				"	3	+	"	4°		
488	"	"	"	35				"	2	++	(7)	3°		
489	"	"	"	36				"	2	++	(7)	3°		X
490	"	"	RSC	37				0 to.	1	++	(7)	2°		
491	"	"	"	38				"	2	++	(7)	3°		

3.0

Project 16-49 (2016) RSC.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
492	ELKR	April 21	RSC	39				0 to.	1	++	(7)	2°	
493	"	"	"	40				"	3	++	(6-7)	4°	3rd ? weaker; poss. FC.
494	"	" 25.	"	41				"	2	++	(7)	3°	
495	"	April 25	RSC	42				"	2	++	(7)	3°	
496	ELKR	"	"	43				0 to.	2	++	(7)	3°	
497	GoldCrk	April 21	RSC	03				0 to.	2	++	(7)	3°	
498	"	April 23	"	07				0 to.	2	++	(7)	3°	FC 2.
499	"	"	"	08				"	2	++	(7)	3°	FC 2-3.
500	"	"	"	09.				"	2	++	(7)	3°	
501	"	"	"	10.				0 to.	2	++	(7)	3°	
502	"	"	RSC	11				"	2	++	(7)	3°	
503	"	"	"	12				"	2	++	(7)	3°	
504	GoldCrk	April 23	RSC	13				"	2	++	(7)	3°	
30	"	"	"	14				0 to.	2	++	(7)	3°	
506	"	"	"	16				"	2	++	(7)	3°	
507	"	"	"	17				"	1	++	(7)	2°	
508	"	"	"	18				"	2	++	(7)	3°	
509	"	"	"	19				"	1	++	(7)	2°	FC 2.
510	GoldCrk	April 23	RSC	20				0 to.	2	++	(7)	3°	
511	"	"	"	21				"	2	++	(7)	3°	
512	"	April 24	RSC	22				0 to.	2	++	(7)	3°	
513	"	"	"	23				"	4	++	(7)	5°	
514	"	"	"	24				"	2	++	(7)	3°	
515	"	"	"	25				"	2	++	(7)	3°	
516	"	"	"	26				0 to.	2	++	(7)	3°	
517	GoldCrk	April 24	RSC	27				"	1	++	(7)	2°	
518	"	"	"	28				"	3	++	(7)	4°	
519	"		"	29				"	2	++	(7)	3°	
520	"	"	"	30				"	2	++	(7)	3°	
521	"	"	"	31				"	2	++	(7)	3°	
522	"	April 24	RSC	32				0 to.	2	++	(7)	3°	
523	"	"	"	33				"	2	++	(7)	3°	

↑ Box 1

Box 2 ↓

4.0

Project 16-49 (2016) R.S.C.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
524	Gold Crk	April 24	RSC	34				0 to.	2	++	(7)	3°	
525	"	"	"	35				0 to.	2	++	(6-7)	3°	FC's
526	"	"	"	36				"	2	++	(7)	3°	
527	"	"	"	37				"	2	++	(7)	3°	FC's
528	Gold Crk	April 24	RSC	38				0 to.	3	++	(7)	4°	
529	"	"	"	39				"	1	++	(7)	2°	
530	"	"	"	40				"	2	++	(7)	3°	
531	"	"	"	41				"	1	++	(7)	2°	
532	"	"	RSC	42				"	1	++	(7)	2°	
533	"	"	"	43				0 to	1	++	(7)	2°	
534	"	"	"	44				"	2	++	(7)	3°	

1.0

Project 16-49. Yellow Perch (2016).

FISH AGING TALLY FORM

NSES #	SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
C124	535	Sand Crk	April 20	YP	01				Sp.	2	H	(7)	3°		x
	536	"	"	"	02				Sp.	2	H	(7)	3°		
C126	537	Sand Crk	April 21	YP	03				Sp.	2	H	(7)	3°		
	538	"	"	"	04				Sp.	2	H	(7)	3°		
	539	"	April 22	YP	05				Sp.	2	H	(6-7)	3°		
	540	"	April 23	"	06				Sp.	3	H	(7)	4°		
C130	541	"	"	"	07				Sp.	2	H	(7)	3°		
	542	"	"	"	08				Sp.	2	H	(7)	3°		
	543	"	"	YP	09				Sp.	2	H	(7)	3°		
	544	Sand Crk	"	"	10				Sp.	3	*	(7)	3*	annulus forming on edge	
	545	"	"	"	11				Sp.	2	H	(7)	3°	FCC 2nd	
C135	546	"	April 24	YP	12				Sp.	2	H	(7)	3°	FC1-2.	
	547	"	"	"	13				Sp.	2	H	(7)	3°		
	548	"	April 25	"	14				Sp.	2	H	(7)	3°		
	549	"	" 26	YP	15				Sp.	2	H	(6)	3°	FCC 2nd	
	550	"	" 27	"	16				Sp.	2	H	(7)	3°		x
C140	551	"	"	YP	17				Sp.	2	H	(7)	3°		x
	552	"	"	"	18				Sp.	2	H	(7)	3°		
	553	Sand Crk	"	"	19				Sp.	2	H	(7)	3°	FC5.	
	554	"	"	"	20				Sp.	2	H	(7)	3°		
	555	"	"	"	21				Sp.	3	H	(7)	4°	Poss. 4* edge	x*
C145	556	"	"	YP	22				Sp.	2	H	(7)	3°		
	557	"	"	"	23				Sp.	2	H	(7)	3°		
	558	"	April 27	YP	24				Sp.	2	H	(6-7)	3°	FC 0-1.	
	559	"	"	"	25				Sp.	2	H	"	3°	FC2	
	560	"	"	"	26				Sp.	3	H	(7)	4°		x
C150	561	"	"	"	27				Sp.	3	H	(7)	4°		
	562	"	"	YP	28				Sp.	2	H	(7)	3°		
	563	"	"	YP	29				Sp.	2	H	(7)	3°		
	564	"	"	"	30				Sp.	2	H	(7)	3°		
	565	"	"	"	31				Sp.	2	H	(7)	3°		
C155	566	Sand Crk	April 27	"	32				Sp.	2	H	(7)	3°		
	567	"	"	"	33				Sp.	2	H	(7)	3°		
C157	568	"	"	"	34				Sp.	2	H	(7)	3°	FC1-2.	

2.0

NSES# Project 16-49. Yellow Perch 2016. (Teck Kootanuum)

FISH AGING TALLY FORM

	SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
D1	569	ELKR	April 19	YP	01				Sp.	2	++	(7)	3°	Lots of growth 0-1.	
	570	"	" 21	YP	02				Sp	4	+	(7)	5°		
	571	"	"	YP	03				Sp.	2	++	(7)	3°		
	572	"	"	"	04				Sp.	2	++	(7)	3°		
D5	573	"	"	"	05				Sp.	2	++	(7)	3°		
D6	574	ELKR	April 21	YP	06				Sp.	2	++	(7)	3°		
	575	"	"	"	07				Sp.	3	*	(7)	3*	FC @ 2nd.	
	576	"	"	"	08				Sp.	1	++	(7)	2°		
	577	"	"	YP	09				Sp.	2	++	(6)	3°	FC 0-1.	
D10	578	"	"	"	10				Sp.	3	++	(7)	4°		xx
	579	"	April 22	YP	11				Sp.	2	++	(7)	3°		
	580	"	"	"	12				Sp.	2	++	(6-7)	3°	FC @ 2nd.	
	581	"	"	"	13				Sp.	2	*	(7)	2*	annulus on edge	
	582	"	"	"	14				Sp.	1	++	(7)	2°		xx
D15	583	ELKR	"	YP	15				Sp.	2	++	(7)	3°		xxx
	584	"	April 23	"	16				Sp.	4	++	(7)	5°		xx
	585	"	"	"	17				Sp	2	++	(7)	3°		
	586	"	"	"	18				Sp.	2	++	(6)	3°	poor sections.	
	587	"	April 24	YP	19				Sp.	2	++	(7)	3°		
D20	588	"	"	"	20				Sp.	2	++	(7)	3°		xx
	589	"	"	"	21				Sp.	2	++	(7)	3°		
	590	"	"	"	22				Sp.	2	++	(7)	3°		x
	591	ELKR	"	"	23				Sp.	4	+	(7)	5°	Poss 4+	
	592	"	"	"	24				Sp.	6	*	(7)	6*	Poss 7° @ edge	x
D25	593	"	April 25	YP	25				Sp.	2	++	(7)	3°		
	594	"	"	"	26				Sp.	2	++	(7)	3°		
	595	"	"	"	27				Sp.	2	++	(7)	3°		xx
	596	"	April 26	YP	28				Sp	3	++	(7)	4°		xx
	597	"	"	"	29				Sp.	2	++	(7)	3°		
D30	598	"	"	"	30				Sp	2	++	(7)	3°	FC 1-2.	
	599	"	"	"	33				Sp.	2	++	(7)	3°		
	600	"	"	"	34				Sp.	2	++	(6-7)	3°		
D33	601	"	April 27	YP	35				Sp	1	++	(7)	2°		

Note: Spines - formation pretty good on most.

3.0

NSES. # ↓ Project 16-49. Yellow Perch 2016. (Teck/Koocanusa).

FISH AGING TALLY FORM

	SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
C158	602	Gold Crk	April 20	YP	01				Sp.	2	H	(7)	3°		
	603	"	"	YP	02				Sp.	2	H	(7)	3°		
C160	604	"	"	"	03				Sp.	2	H	(7)	3°	FC2	
	605	"	"	"	04				Sp.	2	H	(6-7)	3°		
	606	"	"	YP	05				Sp.	2	H	"	3°		
	607	"	April 21	"	06				Sp	3	H	(7)	4°		X
	608	"	"	"	07				Sp.	2	H	(7)	3°		
C165	609	Gold Crk	"	YP	09				Sp.	2	H	(6-7)	3°		
	610	"	"	"	10				Sp.	2	H	(7)	3°		
	611	"	"	"	11				Sp.	2	H	(7)	3°		X
	612	"	"	"	12				Sp.	2	H	(7)	3°		
	613	"	"	YP	13				Sp.	2	H	(6-7)	3°		
C170	614	Gold Crk	April 21	"	14				Sp.	2	H	(7)	3°	FC2.	
	615	"	"	"	15				Sp.	1	H	(7)	2°	" "	
	616	"	"	"	16				Sp.	2	H	(7)	3°		
	617	"	"	"	18				Sp.	2	H	(6-7)	3°	FC1-2	
	618	"	"	"	19				Sp.	2	H	(7)	3°		X
C175	619	"	"	YP	20				Sp.	2	H	(7)	3°		
	620	"	"	"	21				Sp.	2	H	(7)	3°		X
	621	Gold Crk	April 21	"	22				Sp.	2	H	(7)	3°		
	622	"	April 22	"	23				Sp.	4	H	(7)	5°		X
	623	"	"	"	24				Sp.	2	H	(7)	3°		
C180	624	"	"	"	25				Sp.	2	H	(7)	3°		
	625	"	"	YP	26				Sp.	2	H	(6-7)	3°	1st? FC2.	
	626	"	"	"	27				Sp.	2	H	(6)	3°		
	627	"	"	"	28				Sp.	2	H	(7)	3°		
	628	"	"	"	29				Sp.	2	H	(7)	3°		X
C185	629	Gold Crk.	April 22	YP	30				Sp.	2	H	(7)	3°		
	630	"	April 23	YP	31				Sp.	5	*	(7)	5*	annulus/annulus; edge?	X
	631	"	"	"	32				Sp	2	H	(7)	3°		
	632	"	"	"	33				Sp.	2	H	(7)	3°	FC2.	
	633	"	"	"	35				Sp.	2	H	(6-7)	3°	FC2.	
C190	634	"	"	"	36				Sp	3	H	"	4°		

4.0

Project 16-49 Yellow Perch 2016. (Teck Koocanusa).

NSES #1

FISH AGING TALLY FORM

SAM	EFF	DATE (2016)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
C191 635	Gold Crk.	April 24	YP	37				Sp.	3	##	(7)	4°	
636	"	"	"	38				Sp.	2	##	(7)	3°	x
637	"	April 25	YP	39				Sp.	2	##	(7)	3°	
638	"	"	"	40				Sp	2	##	(7)	3°	x
C195 639	"	"	"	41				Sp.	2	##	(6)	3°	poor zonation
640	"	April 27	YP	42				Sp.	2	##	(6-7)	3°	

Note 8 of Perch otoliths from Gold Creek samples considerably more difficult to assess than previous groups. More false checking and zonation is less clear than previous samples. Annuli is not as well defined etc..

2.0

Sport Fish (Large) Project #16-49.(2016.)

FISH AGING TALLY FORM

SAM	EFF	DATE (2016)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
642	Sand Crk	April 19	R.T.	01				Oto.	2	++	(6)	3°	Vis = 3° 2nd FC 1-2 Poss 4°	3°
6 "	"	"	"	"				Sc	1	++	(6)	2°	FC 0-1 ??	
643	Sand Crk	"	R.T.	02				Oto	3	++	(6)	4°	Vis = 3° 2nd	4° Poss 3°
"	"	"	"	"				Sc.	2	++	(6-7)	3°	FC @ 2nd.	
644	Sand Crk	April 25	RT	04				Oto	3	++	(6-7)	4°	FC 0-1 ; Poss 5°	4°
9	"	"	"	"				Sc	2	++	(6)	3°	FC 1-2 ??	
		Note: Both tissues difficult to assess and not much correlation between two.												
645.	Sand Crk	April 19	WCT	01				Oto	5	++	(6-7)	6°	3rd ? Poss 5°	
"	"	"	"	"				Sc	4	*	(6)	4*	Poss 5° @ edge	
646	"	April 21	WCT	02				Sc	3	*	(6)	3*	1st weak ; FC 2- Edge ?	
647	"	"	"	03				Sc	3	+	(6-7)	4°		
		Note: Few scales - some O.C.												
18	Gold Crk	April 20	BT	01				No Scales						
19	"	"	BT	02				Oto	4	++	(6-7)	5°	FC 0-1. x	5° x
"	"	"	"	"				Sc	3	++	(6)	4°		
20	Gold Crk	"	BT.	03				Oto.	3	+	(6)	4°	True annuli ?	4°
"	"	"	"	"				Sc	3	+	(6-7)	4°		
21	"	April 24	B.T.	04				Oto	4	+	(6)	5°	True annuli	5°
"	"	"	"	"				Sc	2	++	(5)	3°	All Regia 1st ?	
22	"	"	BT	05				Oto.	4	++	(6-7)	5°	1st ? Poss 4° x	5° x
"	"	"	"	"				Sc	3	++	(6)	4°	1st ? Poss 5°.	
23	Gold Crk	April 24	BT.	06				Oto.	4	+	(6)	5°	slow 2-3 ?	5°
"	"	"	"	"				Sc	3	+	(6)	4°	poss 3° 3rd ?	
24	"	April 27	BT	07				Oto.	4	++	(5-6)	5°	2nd Cyst.	5°
"	"	"	"	"				Sc	3	++	(6)	4°		
		Note: B.T. - Both tissues very tough to age. True annuli tough to sort out of otoliths. Scales not great either.												
* 25	B.S.	Jan 24	BB.	01				Oto.	5	++	(6-7)	6°		
653	Gold Crk	April 25	MW	02				Oto.	3	++	(5-6)	4°		5°
"	"	"	"	"				Sc	4	++	(6)	5°		

* Area B.S. - BB.

3.0

Sport Fish (Large) Project #16-49. (2016.)

FISH AGING TALLY FORM

SAM	EFF	DATE (2016.)	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
654	GoldCrk	April 23	R.T.	01				Oto.	2	++	(6)	3°	Vis = 4° 3++ FCO-1
"	"	"	"	"				Sc	4	++	(6-7)	5°	
655	GoldCrk	April 24	R.T.	02				Oto	2	++	(7)	3°	Vis = 3° 2++
"	"	"	"	"				Sc	2	++	(7)	3°	
656	"	"	RT	03				Oto.	2	++	(6-7)	3°	Vis = 3° 2++
"	"	"	"	"				Sc	3	++	(6)	4°	FCI-2?
				Otoliths OK. - Scales tough to assess. Fine annuli ??									
657	GoldCrk	April 20	WCT	01				Sc	3	*	(6)	3*	2 Scales.
658	"	" 24	WCT	02				Sc	2	++	(6)	3°	2 Scales FCI-2
659	"	"	WCT	03				Sc	2	++	(5-6)	3°	1 Scale
				NO Scales taken - only for 2 to work with?									
		General:		Scales generally not well collected for any of the sports species. With many samples very few, if any scales and often very dirty.									
				Otoliths generally tough to age of Brook Trout & Rainbow trout from these sampling sites. Mountain Whitefish also tough. May want to test to collect fin rays as well as otoliths and scales in future collections from these sites.									

3.0

3.0

3.0

1.0

Project # 16-49.

FISH AGING TALLY FORM

SAM	EFF	2016 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS	
11	ER	Aug 28	KO	01A				0 to.	3	++	(7)	3++		x
12	ER	"	KO	02A				0 to.	3	++	(6-7)	3++	FC 2	
13	"	"	KO	03A				0 to.	3	++	(7)	3++	1st weaker	
14	"	"	KO	04A				0 to.	3	++	(7)	3++		xx
15	"	"	KO	05A				0 to.	3	++	(7)	3++	FC 2	
16	ER	Aug 28	KO	06A				0 to.	3	++	(6)	3++	2nd is weaker.	
17	"	"	KO	07A				0 to.	3	++	(7)	3++	FC 2	
18	"	"	KO	08A				0 to.	3	++	(6-7)	3++	FC 2	
19	"	"	KO	09A				0 to.	3	++	(7)	3++		xx
20	ER	"	KO	10A				0 to.	3	++	(7)	3++	FC 2	
41	SC	Aug 24	KO	01A				0 to.	3	++	(6)	3++	FC 2-3. Poss 4++	
42	SC	"	KO	02A				0 to.	2	++	(6-7)	2++	True annuli ?? FC 2	
43	SC	"	KO	03A				0 to.	2	++	"	2++	FC 0-1.	
44	SC	"	KO	04A				0 to.	2	++	"	2++	FC 2	
01	ER	Aug 23	NSC	01A				0 to.	18	++	(6-7)	18++	17++ 19++ Poss ± 1 edge	
02	"	"	NSC	02A				0 to.	15	+	(6)	15+	14+ 15+ Poor edge. Poss 16-17.	
03	"	"	NSC	03A				0 to.	17	++	(5-6)	17++	1 to. Poss ± 1 or 2 Edge Good to 15th.	
04	ER	"	NSC	04A				0 to.	18	+	(7)	18+	16++ 18+ 18++	
05	"	"	NSC	05A				0 to.	14	+	(6-7)	14+	14+, 15+) edge ? Poss ± 1 edge	xx
06	"	"	NSC	06A				0 to.	10	++	(7)	10++		
07	ER.	Aug 23	NSC	07A				0 to.	8	++	(7)	8++		
08	"	"	NSC	08A				0 to.	17	++	(7)	17++	1 to. 17++ 17++ Poss 18 + edge	
09	"	"	NSC	09A				0 to.	20	+	(6-7)	20+	OK to 15-16. 20+ 20+ Poss 18 19.	
10	ER	"	NSC	10A				0 to.	14	+	(7)	14+	14+ edge ?	
				Note: Zonation O.K. but tough to get good breaks.				tough edges on many of these samples. Poss ± 1 or 2 on some fish.						
21	GC	Aug 23	NSC	07A				0 to.	10	++	(7)	10++		x
22	GC	" 28	NSC	02A				0 to.	14	+	(7)	14+	14+ 14+	x
23	"	" "	NSC	03A				0 to.	13	+	(7)	13+	13+) 13+	xxx

2.0

Project 16-49.

FISH AGING TALLY FORM

SAM	EFF	2014 DATE	SPC	FISH	FLEN	TLEN	SEX	AGEMT	NCA	EDGE	CONF	AGEA	COMMENTS
24	GC	Aug 28	NSC	04A				Oto.	13	+	(6)	13+	13+; Poss ±1;
25	GC	"	NSC	05A				Oto.	10	++	(7)	10++	2nd Oto pc.
26	"	"	NSC	06A				Oto.	9	++	(7)	9++	9+, 9++
27	"	"	NSC	07A				Oto.	12	++	(7)	12++	
28	GC	"	NSC	08A				Oto.	12	+	(7)	12+	
29	"	"	NSC	09A				Oto.	11	++	(7)	11++	
30	GC	Aug. 28	NSC	10A				Oto.	14	++	(6-7)	14++	14++; Poss ±1 & 2 cdp
			Note: Overall, much better breaks & zonation than Elk Creek samples.										
31	SC	Aug 24	NSC	01A				Oto.	12	++	(7)	12++	12++
32	SC	"	NSC	02A				Oto.	11	++	(7)	11++	
33	"	"	NSC	03A				Oto.	9	++	(7)	9++	edge?
34	"	"	NSC	04A				Oto.	11	++	(7)	11++	
35	SC	"	NSC	05A				Oto.	13	++	(7)	13++	13++; Poss 14+ cdp
36	"	"	NSC	06A				Oto.	9	++	(6-7)	9++	Poss 10+ cdp
37	"	"	NSC	07A				Oto.	14	++	(7)	14++	14+, 14++ ? Poss ± 1 cdp.
38	"	Aug 28	NSC	08A				Oto.	10	++	(7)	10++	10++;
39	SC	"	NSC	09A				Oto.	15	+	(6-7)	15+	15+1; Poss ±1.
40	"	"	NSC	10A				Oto.	12	+	(7)	12+	
			Note: Sand Creek. Otoliths in this batch again show pretty good zonation. Some tricky edges but again, better than Elk Creek.										