Teck Coal Limited
Water Quality Management
P.O. Box 1777
421 Pine Avenue
Sparwood, B.C. Canada V0B 2G0

+1 250 425 8086 Tel
www.teck.com

Technical Report Overview

Report: 2021 Coal Mountain Mine Local Aquatic Effects Monitoring Program (LAEMP) Report

Overview: This report presents the 2021 results of the local aquatic effects monitoring program developed for Teck's Coal Mountain Operations. The report presents data and evaluates the magnitude and spatial extent of influence of mine operations on water quality, calcite, and benthic invertebrate communities downstream of Coal Mountain Operations.

This report was prepared for Teck by Golder Associates Ltd. and Minnow Environmental Inc.

For More Information

If you have questions regarding this report, please:

- Phone toll-free to 1.855.806.6854
- Email **feedbackteckcoal@teck.com**

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

REPORT

2021 Coal Mountain Mine Local Aquatic Effects Monitoring Program (LAEMP) Report

Submitted to:

Teck Coal Limited

Sparwood, British Columbia
Attn.: Cybele Heddle

Submitted by:

Golder Associates Ltd.

2800, 700 - 2nd Street SW, Calgary, Alberta, T2P 2W2, Canada

and

Minnow Environmental Inc.

+1 403 299 5600

Reference No. 21502121-003-R-Rev0-1000

30 June 2022

Distribution List

Electronic Copy - Teck Coal Limited - Coal Mountain Operations

Electronic Copy - Golder Associates Ltd.

Electronic Copy - Minnow Environmental Inc.

Electronic Copy - Environmental Monitoring Committee

Executive Summary

A local aquatic effects monitoring program (LAEMP) was initiated for Teck Coal Limited (Teck)'s Coal Mountain Mine (CMm; currently in care and maintenance) in 2018 "to assess the magnitude and extent of influence from CMm on water quality, calcite, and benthic invertebrate communities downstream of CMm, and to assess what factors are contributing to the observed effects" (per 25 August 2018 and 4 April 2019 amendments to Permit 107517). Sediment and benthic invertebrate tissue are also monitored under the CMm LAEMP to support the interpretation of the effects to benthic invertebrate community. Sampling began at the CMm study sites in September 2018 and was repeated in September 2019, 2020, and 2021.

There are two study questions considered for the CMm LAEMP.

Study Question 1

Study Question 1. What are the magnitude and spatial extent of influence from CMm on water quality, calcite, sediment quality, and benthic invertebrate communities in Michel Creek downstream of CMm, how are these conditions changing over time, and are the conditions expected?

The highest concentrations of mine-influenced water quality constituents (i.e., total dissolved solids, sulphate, nitrate, nickel, and selenium) were observed at the station closest to CMm on Corbin Creek, followed by the first station downstream of CMm on Michel Creek (0.94 km downstream). A declining gradient of concentrations further downstream was observed for most mine-influenced water quality constituents; for nickel in particular, concentrations returned to concentrations similar to the reference areas by the station downstream of the Andy Good Creek confluence. A decrease since 2018 (i.e., when sampling for the CMm LAEMP began) in concentrations of sulphate, nitrate, and nickel was observed in Michel Creek. This was expected based on the modelled data derived by SRK, which modelled the data based on changes in mine water management with the transition to Care and Maintenance.

Calcite index scores in 2021 in Corbin Creek were higher than observed in Michel Creek. The calcite index scores remained consistently low in Michel Creek in 2021 compared to previous years and were within the regional normal range.

Sediment selenium and PAH concentrations were above the lower British Columbia working sediment quality guidelines (BC WSQG) at both mine-influenced and reference stations but were higher at mine-influenced stations in the CMm area. Most sediment metal concentrations (except for arsenic, iron, and selenium, which did not show a clear spatial pattern) declined in a downstream gradient from the Corbin Creek confluence in Michel Creek and reached similar concentrations to reference stations by 13.84 km downstream.

Benthic invertebrate community (BIC) richness and abundance were similar among mine-influenced and reference stations and were within or above the site-specific and/or regional normal ranges in Michel Creek in 2021. The proportion of Ephemeroptera, Plecoptera, Trichoptera taxa (% EPT) and proportion of Ephemeroptera taxa (% E) were lower at the station closest to the Corbin Creek confluence on Michel Creek compared to the downstream and reference stations and below the regional and site-specific normal ranges in 2021. All other stations on Michel Creek had % EPT and % E values within the normal ranges. There was no significant decrease in BIC endpoint values in 2021 compared to previous years (i.e., 2012 to 2020) at mine-influenced stations. Ephemeroptera dominated the communities at mine-influenced stations in Michel Creek and at the reference stations, except at the station closest to the Corbin Creek confluence, where Diptera dominated. The patterns in BIC endpoints indicate that the mine-related influence on EPT taxa is localized to the area near the Corbin Creek confluence, immediately downstream of CMm. The BIC endpoints were all within normal ranges downstream of the Andy Good confluence, which is 5.27 km downstream of the Corbin Creek confluence.

Benthic invertebrate tissue selenium concentrations were within the regional normal range at reference and mine-influenced stations in 2021 and were less than the lowest level 1 benchmark and lower than expected based on water quality data from stations on Michel Creek. Westslope Cutthroat Trout muscle selenium concentration collected as part of the regional aquatic effects monitoring program (RAEMP) were less than the site-specific benchmark (i.e., 15.5 mg/kg dw) in 2021 and have been similar over time in the upper Michel Creek area. Based on results from the RAEMP and LAEMP, selenium concentrations are not expected to negatively impact the benthic invertebrate or fish communities in Michel Creek.

Overall, in Michel Creek, water quality is improving, as expected based on the SRK modelled data. Calcite Index scores are within the regional normal range. Sediment quality data declined in a downstream gradient from the Corbin Creek confluence in Michel Creek reaching similar concentrations to reference stations by 13.84 km downstream. Benthic invertebrate community endpoints and benthic invertebrate tissue selenium concentrations were all within or above the regional and/or site-specific normal ranges in 2021, except for %EPT and %E, which were below at the station closest to the Corbin Creek confluence, indicating the effects on the BIC are localized to the area around CMm.

Study Question 2

Study Question 2. How do spatial and temporal patterns in the benthic invertebrate communities correspond to water quality, calcite, sediment quality, and other potential stressors, and what does this tell us about what factors are causing observed effects?

Habitat variables (i.e., substrate composition, dissolved oxygen, stream velocity) were similar between reference and mine-influenced stations in 2021, and were unlikely to have caused the differences observed in BIC endpoints (i.e., % EPT and % E) noted in study question 1 at the stations downstream of CMm in Michel Creek. It is also unlikely that calcite presence and concretion in Michel Creek was a factor in the lower % EPT and % E taxa at the station closest to the Corbin Creek confluence, because calcite index values were low and within the reference normal range in Michel Creek between 2012 and 2021. Calcite presence may have been a factor in effects observed in BIC endpoints in Corbin Creek because the presence of calcite in Corbin Creek may reduce habitat availability for benthic invertebrates.

Spatial and temporal patterns in BIC endpoints corresponded more closely with mine-influenced water quality than with sediment quality or calcite, supporting the interpretation that observed patterns in BIC are linked to water quality. Spatial comparisons indicated correlations of % EPT and % E with aqueous concentrations of nickel across stations. The only water quality constituent with concentrations in Michel Creek above invertebrate screening values was nickel. Concentrations were above the level 3 invertebrate screening value of 22 µg/L in Corbin Creek and above the level 1 invertebrate screening value of 5.3 µg/L at the first station downstream of CMm on Michel Creek.

Early studies in the area suggested that nickel is likely responsible for the BIC changes. The findings of the 2019, 2020, and 2021 CMm LAEMP and the Chronic Toxicity Testing Program support findings that nickel is likely responsible for the BIC changes. Results of the 2019 to 2021 CMm LAEMPs, as well as additional sampling as part of the ongoing Nickel Benchmark Study, suggest that BIC effects from nickel in Michel Creek are localized near CMm on Michel Creek, downstream of the Corck Creek confluence and do not extend farther on

Michel Creek than 5.27 km downstream. Chronic toxicity testing results also indicate no adverse effects on fish, which is supported by results of the RAEMP, the Fish Community Survey, and the Fisheries Habitat Assessment Procedure carried out in Corbin Creek.

Conclusions

Spatial and temporal patterns in BIC endpoints downstream of CMm corresponded more closely with mine-influenced water quality than with habitat, sediment quality, or calcite, suggesting that observed patterns in BIC are attributable to water quality. Nickel has been implicated as the likely cause of the observed effects in BIC. This interpretation is supported by the results of the Chronic Toxicity Testing Program. However, these effects appear to be localized and no effects were observed downstream of the Andy Good confluence in 2021.

There are no recommended changes to the field sampling program for the CMm LAEMP 2022 study design; however, an updated study design is being submitted with minor updates to the data analysis approach.

Table of Contents

TABLES

FIGURES

APPENDICES

Abbreviations and Units of Measure

Abbreviation	Definition
%	percent
<	less than
>	greater than
µS/cm	microsiemens per centimetre
cm	centimetre
°C	degree Celsius
g	gram
L/s	litres per second
m	metre
m/s	metres per second
min	minute
mg/L	milligrams per litre
mg-N/L	milligrams nitrogen per litre
mg/kg dw	milligram per kilogram dry weight
µg/kg dw	microgram per kilogram dry weight
µg/L	micrograms per litre
ADIT	Aquatic Data Integration Tool
AEMP	Aquatic Effects Monitoring Program
ALS	ALS Environmental
AMP	Water Quality Adaptive Management Plan for Teck Coal in the Elk Valley
ANOVA	Analysis of Variance
BC	British Columbia
BIC	Benthic Invertebrate Community
BIT	Benthic Invertebrate Tissue Chemistry
CABIN	Canadian Aquatic Biomonitoring Network
CCME	Canadian Council of Ministers of the Environment
C&M	Care and Maintenance
CMm	Coal Mountain mine
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRM	Certified Reference Material
DELT	Deformities, Erosion, Lesions, and Tumors
DQO	Data Quality Objective
E	Ephemeroptera
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EFN	Environmental Flow Needs
EMC	Elk Valley Environmental Monitoring Committee
ENV	British Columbia Ministry of Environment and Climate Change Strategy
EPT	Ephemeroptera, Plecoptera, and Trichoptera
EVO	Elkview Operations

Abbreviation	Definition
EVWQP	Elk Valley Water Quality Plan
FRO	Fording River Operations
GHO	Greenhills Operations
Golder	Golder Associates Ltd.
GPS	Global Positioning System
IFN	Instream Flow Study
K	Condition Factor
LA-ICPMS	Laser Ablation with Inductively Coupled Plasma Mass Spectrometry
LAEMP	Local Aquatic Effects Monitoring Program
LCO	Line Creek Operations
MDS	Multidimensional Scaling
PAH	Polycyclic Aromatic Hydrocarbon
QA	Quality Assurance
QC	Quality Control
RAEMP	Regional Aquatic Effects Monitoring program
SARA	Species at Risk Act
SD	Standard Deviation
SPO	Site Performance Objective
SRK	SRK Consulting Inc.
TDS	Total Dissolved Solids
Teck	Teck Coal Limited
TN	Total Nitrogen
TP	Total Phosphorus
Trich	TrichAnalytics Inc.
TOC	Total Organic Carbon
UTM	Universal Transverse Mercator
WSQG	Working Sediment Quality Guidelines
WQG	Water Quality Guideline
YOY	Young-of-the-Year

1.0 INTRODUCTION

Golder Associates Ltd. (WSP Golder) is pleased to provide Teck Coal Limited (Teck) with the following report on the 2021 local aquatic effects monitoring program (LAEMP) for Teck's Coal Mountain mine (CMm, formerly Coal Mountain Operations [CMO]) in the Elk Valley. This study represents the third year of monitoring under the approved study design (Golder 2019a, 2020a, 2021a) to satisfy requirements under Permit 107517.

1.1 Background

Teck maintains and operates five steelmaking coal mines in the Elk River watershed: Fording River Operation (FRO), Greenhills Operation (GHO), Line Creek Operation (LCO), Elkview Operation (EVO), and CMm (Figure 1.1-1). Discharges from the mines are authorized by the British Columbia Ministry of Environment and Climate Change Strategy (ENV) through Permit 107517, issued under the provisions of the *Environmental Management Act*.

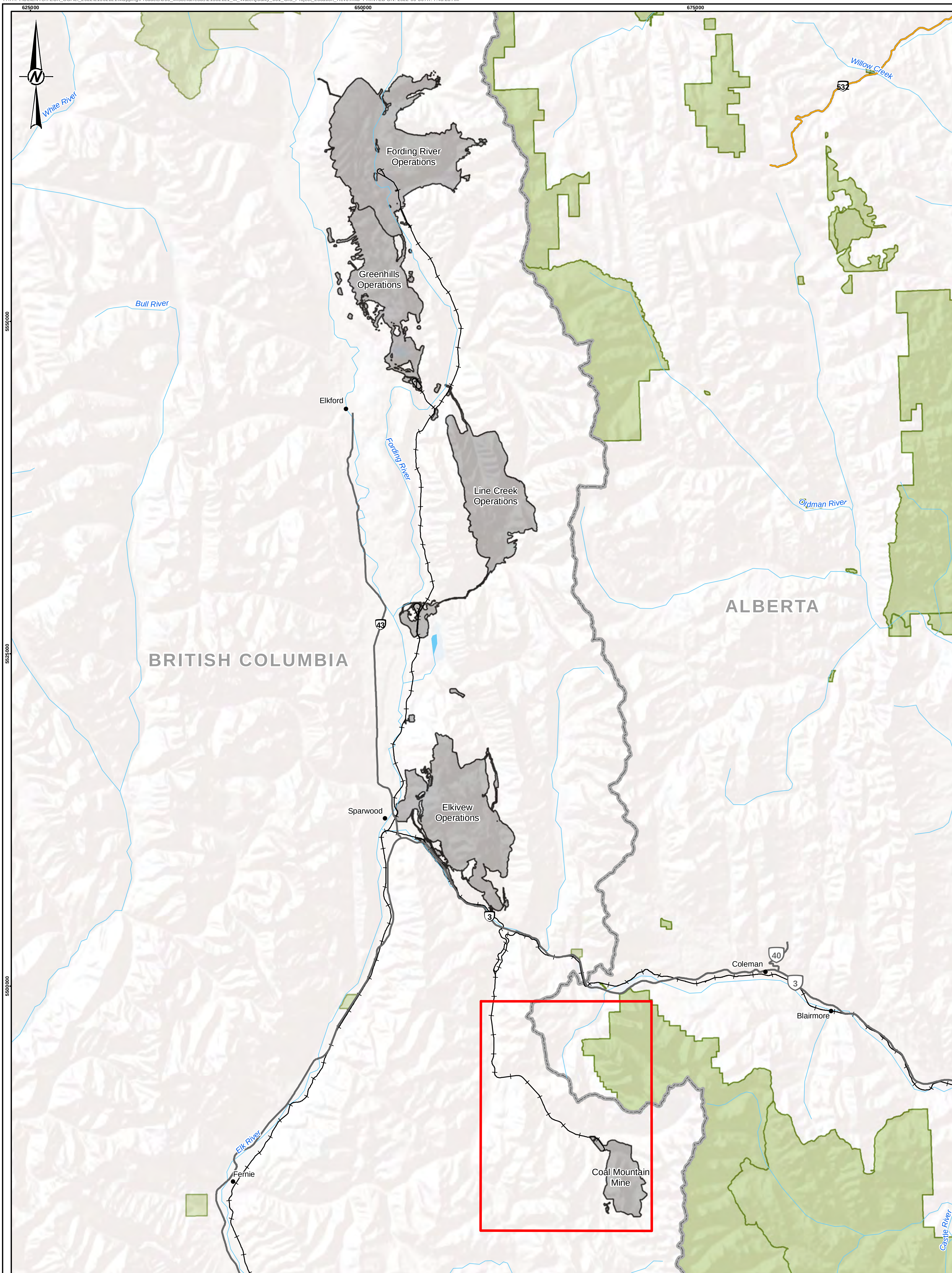
Permit 107517 requires that Teck evaluate potential effects on aquatic life associated with the mines in the Elk River watershed via a regional aquatic effects monitoring program (RAEMP). The RAEMP (Minnow 2015, 2018a,b, 2020a,b) and its predecessor programs (Minnow et al. 2007, 2011, 2012, Minnow 2014) provide comprehensive routine annual monitoring and assessment every three years of potential mine-related effects on the aquatic environment downstream from Teck's coal mines in the Elk Valley.

In addition to regional monitoring, Teck conducts LAEMPs to address local-scale uncertainties associated with potential mine-related aquatic effects. The study questions addressed by the LAEMPs are unique to each program and distinct from those of the RAEMP. The ultimate objective of all LAEMPs is to reduce uncertainty and thereby support effective environmental management decisions. Investigations undertaken in the LAEMPs can also inform refinement of the RAEMP, for example by developing refined interpretive tools or identifying locations of interest for ongoing inclusion in RAEMP monitoring. As the LAEMP's study questions are answered and uncertainty is reduced, the intent is that the scope of the LAEMP will be progressively reduced. All LAEMPs are intended to eventually be discontinued.

The CMm LAEMP was initiated by Teck in response to findings from the RAEMP between 2015 and 2017 (Minnow 2018 a,b), the routine Chronic Toxicity Testing Program (Golder 2018a), and an aquatic health assessment conducted to support planning for care and maintenance at CMm (Golder 2017). Specifically, the results of RAEMP monitoring between 2015 and 2017 indicated alteration of the benthic invertebrate community (BIC) in Corbin Creek and in Michel Creek immediately downstream of Corbin Creek relative to stations upstream in Michel Creek, local reference areas, and the regional normal range. Concurrently, the Chronic Toxicity Testing Program reported effects to the invertebrate test species *Hyalella azteca* and *Ceriodaphnia dubia* exposed to water collected from the compliance monitoring point in Michel Creek downstream of Corbin Creek. Follow-up testing attributed the observed chronic toxicity test responses to nickel (Nautilus Environmental 2018) and an evaluation of published toxicity data for nickel supported the interpretation that nickel could be the cause of observed changes to the BIC (Golder 2017).

The objective of the CMm LAEMP was specified in amendments to Permit 107517 that were issued by ENV on 25 August 2018 and 4 April 2019. Specifically, the CMm LAEMP was required to "assess the magnitude and extent of influence from CMm on water quality, calcite, and benthic invertebrate communities downstream of CMm, and to assess what factors are contributing to the observed effects". The 2019 CMm LAEMP study design (Golder 2019a) was developed to address this permit requirement. Sampling began in September 2018 under a preliminary study design. Finalization of the study design was completed in 2019, with updates in 2020 and 2021 (Golder 2020a; 2021a). Sampling was conducted under the approved study design in September 2019, 2020, and 2021.

PATH: I:\CLIENTS\TECK_COAL_2022\21502121\Mapping\Products\006_Miscellaneous\21502121_M_WaterQuality_001_GIS_Project_Location_Rev0.mxd PRINTED ON: 2022-06-30 AT: 7:43:28 AM



LEGEND

- CITY / TOWN / COMMUNITY
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- RAILROAD
- WATERCOURSE
- BRITISH COLUMBIA-ALBERTA BOUNDARY
- COAL MINING OPERATION
- PARK / PROTECTED AREA
- PROJECT LOCATION
- WATERBODY

0 5 10

1:275,000 KILOMETRES

REFERENCE(S)

BASE DATA OBTAINED FROM TECK COAL LIMITED AND FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 PROJECTION: UTM ZONE 11

CLIENT
TECK COAL LIMITED

PROJECT
COAL MOUNTAIN MINE (CMM) LOCAL AQUATIC EFFECTS MONITORING PROGRAM (LAEMP)

TITLE
CMM LAEMP PROJECT LOCATION

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2022-06-30
DESIGNED	KH
PREPARED	DR
REVIEWED	KH
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
21502121	M_WQ_001	0	1.1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

1.2 Study Questions and Scope

The CMm LAEMP study questions were developed in consultation with the Elk Valley Environmental Monitoring Committee (EMC) to meet the objectives specified in the 25 August 2018 and 4 April 2019 amendments to Permit 107517. The study questions define the scope of the CMm LAEMP by explicitly defining the intended use of the data. The CMm LAEMP study questions are:

1) *What are the magnitude and spatial extent of influence from CMm on water quality, calcite, sediment quality, and benthic invertebrate communities in Michel Creek downstream of CMm, how are these conditions changing over time, and are the conditions expected?*

2) *How do spatial and temporal patterns in the benthic invertebrate communities correspond to water quality, calcite, sediment quality, and other potential stressors, and what does this tell us about what factors are causing observed effects?*

The study questions are intended to address uncertainties and information gaps identified by the EMC and the CMm care and maintenance aquatic health assessment (Golder 2017). The study questions address the nature, extent, and cause(s) of observed effects on biota in Michel Creek and are intended to inform decisions regarding water quality management at CMm.

In addition to addressing the study questions, this report integrates information from other relevant monitoring studies in the Michel Creek watershed to help characterize and understand potential effects of activities at CMm on fish and aquatic-dependent wildlife.

1.3 Linkages to Adaptive Management

As discussed in Section 1.1, the CMm LAEMP was initiated in response to findings of the RAEMP and other investigations that indicated unexpected biological conditions in Michel Creek. The decision to initiate a LAEMP was made under the response framework of the Water Quality Adaptive Management Plan for Teck Coal in the Elk Valley (hereafter, 'AMP' [Teck 2018a]). The AMP provides detailed information on the adaptive management framework, a series of Management Questions and associated Key Uncertainties, the response framework, continuous improvement procedures, linkages between the AMP and other Elk Valley Water Quality Plan (EVWQP) programs, and AMP reporting. The AMP was developed by Teck to support implementation of the EVWQP to achieve water quality and calcite targets, to protect human health and the environment (and where necessary, restore it), and to facilitate continual improvement of water quality management in the Elk Valley.

In addition to addressing the CMm LAEMP study questions on an annual basis, monitoring data from the CMm LAEMP will contribute to the full monitoring dataset assessed every three years within the RAEMP. Combined data from the RAEMP and the LAEMPs inform the AMP to address the following two questions:

1) *AMP Management Question #2: Will aquatic ecosystem health be protected by meeting the long-term site performance objectives?*

2) *AMP Management Question #5: Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?*

Draft biological triggers were developed in the 2018 AMP (Teck 2018a) and finalized in 2021 (Teck 2021a) under Management Question 5. Assessment of the biological triggers is provided in Appendix A; in brief, biological triggers were developed for three measurement endpoints:

1) percent Ephemeroptera, Plecoptera, and Trichoptera (% EPT)

2) benthic invertebrate tissue selenium (BIT Se)

3) Westslope Cutthroat Trout muscle tissue selenium (WCT Se)

The third trigger does not apply directly to the CMm LAEMP, because fish tissue selenium is not included in the CMm LAEMP, but is considered as supporting information (Sections 2.8, 4.0 and 6.0).

The method of assessment for the biological triggers reflects refinements made in consultation with the EMC since the draft triggers were developed in the 2018 AMP (Teck 2018a) and finalized in 2021. The 2021 CMm LAEMP represents the second time that biological triggers will be evaluated and reported for CMm. Through future iterative biological trigger evaluations, the process and/or biological triggers may adjust over time.

Following the adaptive management framework, data collected as part of the CMm LAEMP will also be used to inform:

1) understanding of conditions in Michel Creek

2) interpretation of information collected under routine chronic toxicity testing and other programs

3) decisions on environmental management at CMm

4) potential adjustments to the 2022 CMm LAEMP study design

1.4 Site Activities and Water Management at CMm

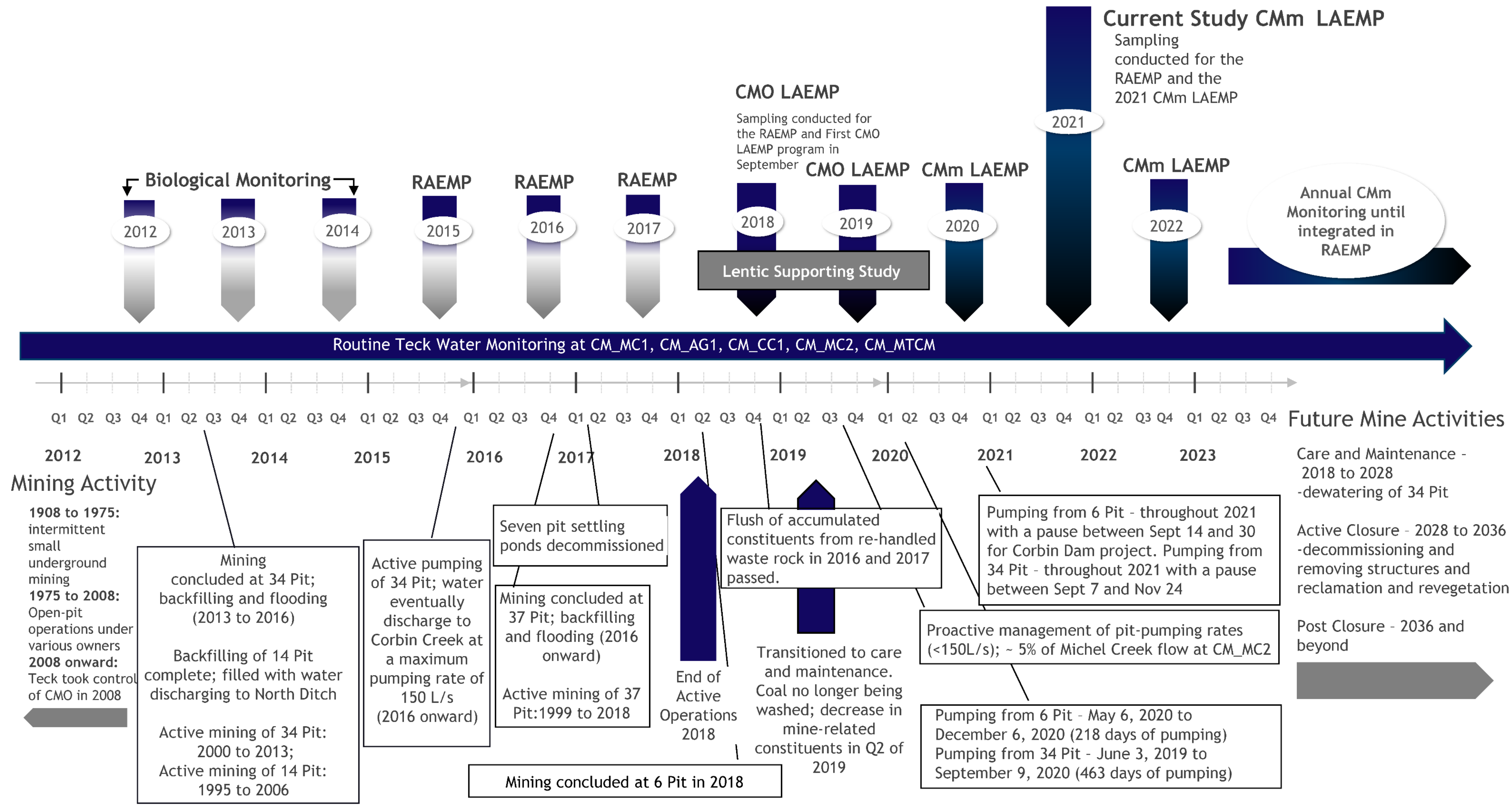
During operations at CMm, the mine consisted of four pits: 6 Pit, 14 Pit, 34 Pit, and 37 Pit, with mining of 14 Pit ceasing in 2006, 34 Pit in 2013, and 37 Pit and 6 Pit in 2018 (Figure 1.4-1; Teck 2017). Coal Mountain concluded active mining and processing operations on 30 April 2019 and made the transition into care and maintenance (C&M) on 1 May 2019. Since ceasing operations and moving into care and maintenance the mine has been working on dewatering of the pits (see Appendix B for details). Current pit dewatering practices direct water to backfilled and dormant pits or to established and permitted mining contact water collection systems, which eventually discharge to Corbin Creek.

Between 2016 and 2018, concentrations of several constituents (see Appendix B for details) were identified as increasing in water discharged from Corbin Dam at monitoring station CM_CCPD (or CM_CCOFF[1]) and at the Main Interceptor Sedimentation Ponds (CM_SPD; Teck 2019). These constituents were associated with the flush of blasting residues and with metal leaching. Between 2018 and 2019, a decrease in some of these constituents was measured at CM_CCPD and at CM_SPD, resulting in an improvement to water quality downstream of CMm in Corbin Creek and Michel Creek (Teck 2019). The decrease was in part attributed to completion of the flush of accumulated constituents that resulted from the re-handled of waste rock in 2016 and 2017.

---

[1] CM_CCOFF is the alternate sampling location for CM_CCPD because CM_CCPD is no longer safe to access. Teck is in the process of amending the monitoring location to CM_CCOFF.

Figure 1.4-1: Timeline of Mining, Water Management, and Monitoring in the CMm Area



An increase in sulphate concentrations was observed between 2019 and 2020. This trend appears to have stabilized in 2021. There were no exceedances of compliance limits (based on monthly averages) at CMm's compliance point, CM_MC2 in 2021 (Teck 2021a).

Consistent with the Chronic Toxicity Testing Program (Golder 2021b), nickel has been identified as a causal factor for adverse responses at CMm. The main loading sources of nickel are from 34 Pit and the Corbin Creek Rock Drain. Proactive water management and pit-pumping of 34 Pit in recent years has resulted in an improvement in water quality and nickel concentrations downstream of CMm since 2017.

In addition to the influence of past and current activities at CMm on Michel Creek, there are other anthropogenic influences that cannot clearly be accounted for, including logging. These potential influences have been taken into consideration when interpreting the 2021 CMm LAEMP data; however, they are believed to represent minor uncertainties in the interpretation of CMm results. Despite these uncertainties, results to date suggest that the greatest influence on water quality in Michel Creek has been mining activities.

1.5 Conceptual Site Model

A conceptual site model for the CMm LAEMP is shown in Figure 1.5-1 which provides an illustrative depiction of the relationships between activities at CMm and the ways in which those activities might alter the environment and affect biological receptors. The conceptual model illustrates potential stressors, pathways, and receptors for potential effects of CMm on water quality and aquatic biota in Michel Creek. Figure 1.4-1 also summarizes existing and planned monitoring under the CMm LAEMP and the RAEMP to evaluate potential effects to aquatic biota.

The CMm LAEMP evaluates pathways related to the study questions by monitoring the following:

1) **Supporting Environmental Variables:** to provide information on water quality, calcite, sediment quality, and physical habitat characteristics to aid in interpretation of biological data.

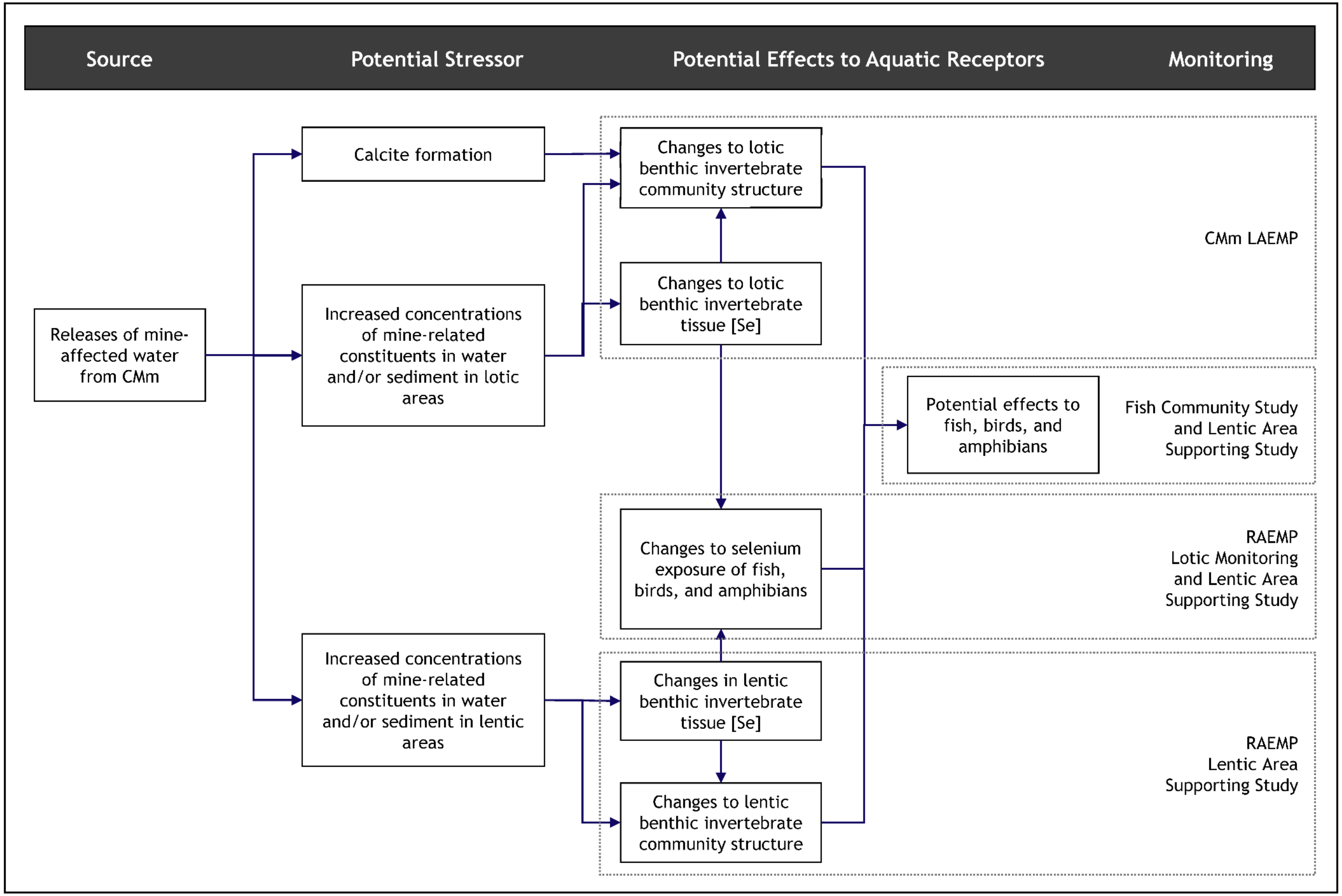
2) **Benthic Invertebrate Community (BIC):** to characterize potential effects of CMm on the BIC resulting from changes in water and sediment quality or other mine-related stressors.

3) **Benthic Invertebrate Tissue Chemistry (BIT):** to provide a measure of selenium exposure to aquatic biota over time, relative to historical conditions, relative to reference areas, and relative to benchmarks for potential effects.

Although the conceptual model depicted in Figure 1.5-1 includes pathways for exposure of benthic invertebrates to both water and sediment, the interpretation of data for the CMm LAEMP focuses on the aqueous exposure pathway. Work completed under the RAEMP (Minnow 2020a) and the lotic sediment toxicity program has highlighted uncertainty around the relevance of lotic sediment quality to the BIC. Importantly, BIC samples are collected from riffle habitats that are highly erosional and contain very little to no surficial fines. The dominant taxa in these areas (EPT) tend to be associated with the hard gravel and cobble substrates that predominate in erosional areas. Depositional areas are small and uncommon on Michel Creek, and sediment samples for sediment quality analysis, although collected within the same general reaches as the BIC samples, are located in low-energy areas along the margins of the creek, in back eddies, or in small side channels that do not represent the habitat where the BIC were collected. Thus, there is no significant operable pathway for exposure of the sampled BIC to the measured sediment quality.

The conceptual model depicted in Figure 1.5-1 includes a pathway for potential effects of tissue selenium on the BIC because selenium is widely understood to be a bioaccumulative substance and the most reliable basis for evaluating potential effects is via bioaccumulated concentrations.

Figure 1.5-1: Conceptual Site Model for the CMm LAEMP



Note: CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program; RAEMP = regional aquatic effects monitoring program; [Se] = selenium concentration

2.0 METHODS

Biological monitoring areas included in the CMm LAEMP and corresponding water quality monitoring stations are listed in Table 2.1-1 and shown on Figure 2.1-1. Integrated monitoring locations for other programs (e.g., RAEMP stations, lentic supporting study stations) in and around the CMm area are shown on Figure 2.1-2. Monitoring areas were selected to delineate the spatial extent of observed effects to physical and biological conditions and to provide a basis for evaluating potential future changes, including those related to water quality mitigation. Areas monitored in previous years were retained to provide temporal consistency. Stations were added on Michel Creek downstream of Andy Good Creek (MIDAG) and upstream of Leach Creek (MIULE) to help delineate how far downstream from Corbin Creek effects are observed. Reference locations on Andy Good Creek (AGCK) and Leach Creek (LE1) were included, in addition to MI25 on Michel Creek upstream of mine operations, to characterize local reference conditions.

Components monitored under the CMm LAEMP in 2021 were:

1) water quality
2) calcite index
3) sediment quality
4) BIC
5) BIT selenium

These components, along with the supporting physical habitat variables, were used to answer the two CMm LAEMP study questions (Section 1.2). The spatial distribution of the stations along Michel Creek supported the determination of spatial extent of downstream influence from CMm on the monitoring components (Study Question #1). Reference stations enabled the characterization of local reference conditions and the magnitude of mine-related changes to monitoring components (Study Question #1). Historical data from the RAEMP and previous studies within the CMm area were used to assess how conditions have changed over time (Study Question #1). The CMm water and load balance report (SRK 2016) and updates (SRK 2019 and SRK 2022) were used to assess whether water quality conditions were expected (Study Question #1). The aquatic health assessment (Golder 2017) was used to assess if the effects to the BIC were expected based on the water quality conditions.

In 2020, samples were collected from supplemental stations CM_CM2, MIDAG-S1, and MIDAG-S2 between MIDCO and MIDAG (Golder 2020a) to improve characterization and delineation of nickel concentrations and BIC effects in Michel Creek as part of the ongoing Nickel Benchmark Study. Sampling was conducted in coordination with the CMm LAEMP field program for efficiency, but sampling at these stations was not intended to be a permanent change to the CMm LAEMP and sampling at the supplemental stations did not occur in 2021.

Supporting environmental information (i.e., water quality, calcite, sediment quality, and physical habitat characteristics) gathered for Study Question #1 was considered alongside the BIC data to answer how spatial and temporal patterns correspond to the BIC data and to suggest which factors may be causing observed effects in the BIC (Study Question #2).

Sampling was conducted by Minnow Environmental Inc. (Minnow) in September 2021 following the 2019 CMm LAEMP Study Design (Golder 2019a), with minor updates in 2020 (Golder 2020a). Sample collection, laboratory analysis, and data analysis methods for each component are consistent with methods developed for the RAEMP (Minnow 2018b, 2020b) and are presented in Sections 2.1 to 2.6. To be consistent with previous monitoring and RAEMP methods, the BIC sampling was conducted in September.

Table 2.1-1: Monitoring Locations and Replication of Sampling Components for the 2021 CMm LAEMP

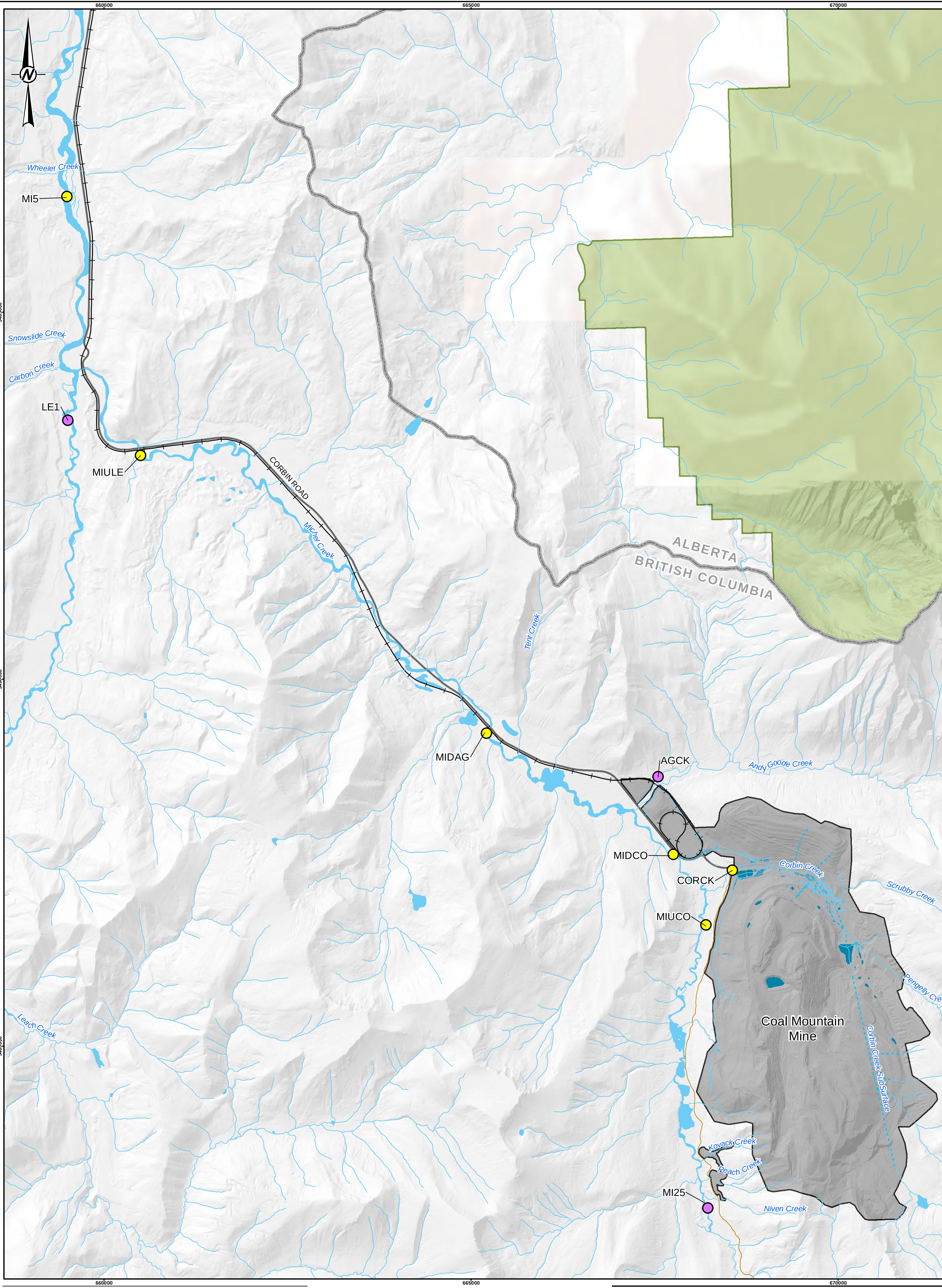
Watercourse	Biological Monitoring Areas	Teck Water Monitoring Code[(a)]	Location Description	Distance Downstream of Corbin Creek Confluence (km)	UTM Coordinates		Replication of Sampling Components				
										Benthic Invertebrate	
					Easting	Northing	Water Chemistry	Calcite Index	Sediment Chemistry	Community	Tissue Chemistry
Michel Creek	RG_MI25	CM_MC1	reference location, u/s of CMm	-6.3	668226	5482795	1	3	3	3	3
Andy Good Creek	RG_AGCK	CM_AG1	reference location, outside of CMm influence	-	667551	5488669	1	3	0	3	3
Leach Creek	RG_LE1	-	reference location, u/s of Michel Creek confluence	-	659512	5493527	1	3	3	3	3
Michel Creek	RG_MIUCO	-	u/s of Corbin Creek confluence	-0.82	668203	5486653	1	3	3	3	3
Corbin Creek	RG_CORCK	CM_CC1	Corbin Creek u/s of Michel Creek confluence	-	668563	5487395	1	3	5	3	3
Michel Creek	RG_MIDCO	-	d/s of Corbin Creek confluence	+0.94	667757	5487611	1	5	5	5	5
Michel Creek	RG_MIDAG	-	d/s of Corbin Creek and Andy Good Creek confluences	+5.27	665212	5489264	1	3	1	3	3
Michel Creek	RG_MIULE	-	d/s of Corbin Creek and Andy Good Creek confluences but u/s of Leach Creek confluence	+13.84	660503	5493048	1	3	5	3	3
Michel Creek	RG_MI5	-	d/s of Leach Creek confluence	+18.25	659497	5496573	1	3	5	3	3

Note: RG designation, which refers to monitoring locations in the Elk Valley is used in table but dropped from figures and text in the remainder of the document for ease of presentation.

a) Teck Water Monitoring stations that are in the proximity of the biological monitoring areas are listed; UTM coordinates represent coordinates for the biological monitoring areas not the water monitoring stations.

- = not applicable; u/s = upstream; d/s = downstream; CMm = Coal Mountain Mine.

PATH: I:\CLIENTS\TECK_COAL_2022\21502121\Mapping\Products\006_Miscellaneous\21502121_M_WaterQuality_002_GIS_MonitoringLocs_CMM_LAEMP_Rev0.mxd PRINTED ON: 2022-06-30 AT: 7:45:05 AM



LEGEND

- MINE-EXPOSED STATION
- REFERENCE STATION
- RAILWAY
- ROAD - PAVED
- SURFACE FLOW WATERCOURSE
- SUBSURFACE FLOW WATERCOURSE
- BRITISH COLUMBIA-ALBERTA BOUNDARY
- CMM C-84 PERMIT BOUNDARY
- PARK / PROTECTED AREA
- WASTE WATER/SEDIMENT POND
- WATERBODY

0 1 2

1:50,000 KILOMETRES

REFERENCE(S)

BASE DATA OBTAINED TECK COAL LIMITED AND FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 PROJECTION: UTM ZONE 11

CLIENT
TECK COAL LIMITED

PROJECT
COAL MOUNTAIN MINE LOCAL AQUATIC EFFECTS MONITORING PROGRAM

TITLE
MONITORING LOCATIONS FOR THE COAL MOUNTAIN MINE LOCAL AQUATIC EFFECTS MONITORING PROGRAM

CONSULTANT

WSP GOLDER

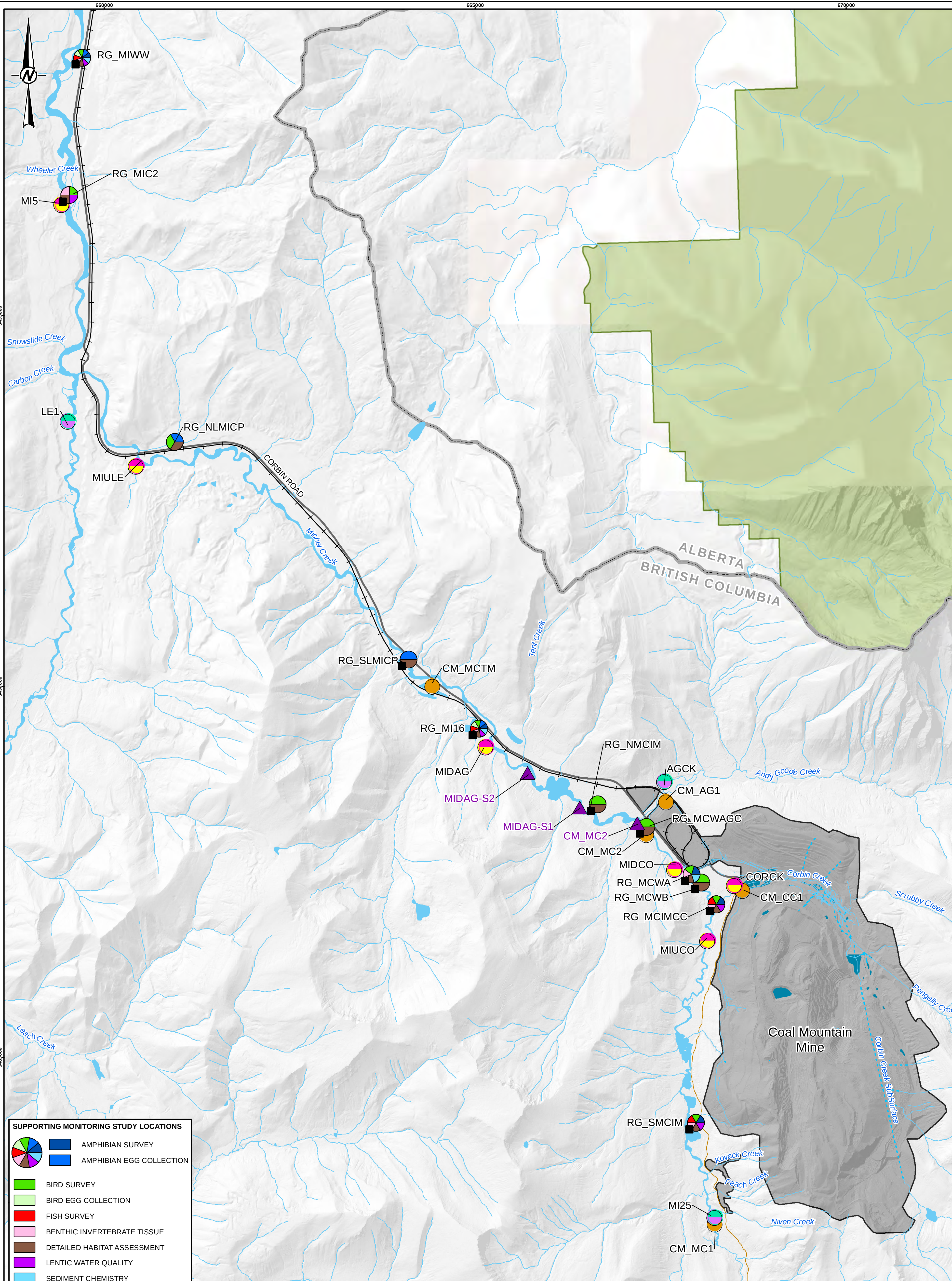
YYYY-MM-DD	2022-06-30
DESIGNED	KH
PREPARED	DR
REVIEWED	KH
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
21502121	M_WQ_002	0	2.1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

PATH: I:\CLIENTS\TECK_COAL_2022\21502121\Mapping\Products\006_Miscellaneous\21502121_M_WaterQuality_003_GIS_IntegratedMonLocs_SamplingPrograms_nearCMM_Rev0.mxd PRINTED ON: 2022-06-30 AT: 7:42:49 AM



660000 665000 670000

LEGEND

- LENTIC SAMPLING STATION
- 2020 NICKEL BENCHMARKS STUDY STATION
- WATER QUALITY STATION

CMM LAEMP STATIONS

- MINE-EXPOSED
- REFERENCE

RAEMP

- MINE-EXPOSED
- REFERENCE

- RAILWAY
- ROAD - PAVED
- ROAD - UNPAVED
- SURFACE FLOW WATERCOURSE
- SUBSURFACE FLOW WATERCOURSE
- BRITISH COLUMBIA-ALBERTA BOUNDARY
- CMM C-84 PERMIT BOUNDARY
- PARK / PROTECTED AREA
- WASTE WATER/SEDIMENT POND
- WATERBODY

0 1 2
1:50,000 KILOMETRES

REFERENCE(S)
BASE DATA OBTAINED TECK COAL LIMITED AND FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 PROJECTION: UTM ZONE 11

CLIENT
TECK COAL LIMITED

PROJECT
COAL MOUNTAIN MINE LOCAL AQUATIC EFFECTS MONITORING PROGRAM

TITLE
INTEGRATED MONITORING LOCATIONS FOR SAMPLING PROGRAMS NEAR THE COAL MOUNTAIN MINE

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-06-30
DESIGNED	KH
PREPARED	DR
REVIEWED	KH
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
21502121	M_WQ_003	0	2.1-2

25mm
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

2.1 Water Quality

Water quality is routinely monitored by Teck at stations within the CMm LAEMP as required by Permit 107517 to support management decisions (Table 2.1-1; Figure 2.1-1). Data are reported annually in the Permit 107517 Annual Water Quality Monitoring Report (Teck 2019, 2020, 2021b) and incorporated into the annual CMm LAEMP where appropriate. Water quality samples are also collected in lentic areas as part of the RAEMP and at benthic invertebrate sampling stations to support the biological data as part of the CMm LAEMP. Detailed methods for sampling and laboratory analysis of water quality samples collected to support the biological data are described in Section 3.0 of the RAEMP (Minnow 2020b) and are provided in brief below.

2.1.1 Sample Collection

In 2021, water quality samples were collected from mine-influenced and reference areas during biological monitoring, following the 2019 CMm LAEMP study design (Golder 2019a, 2020a, 2021a). One sample was collected from each area in September 2021. However, a shipping error resulted in the loss of the sample collected from MI5 (Appendix C and Appendix D), resulting in a lack of water quality data for MI5 in 2021.

Following RAEMP methods, water samples were collected far enough upstream or downstream of tributaries or discharges to avoid areas of incomplete lateral or vertical mixing and upstream from bridges or other structures to avoid potential associated contamination.

Temperature, pH, dissolved oxygen (DO), and specific conductivity were measured at each sampling area using a calibrated water quality meter. Water chemistry samples were collected by wading into a mid-channel area, moving from downstream to upstream, to avoid disturbing the substrate. Clean sample bottles provided by the laboratory were filled to minimize the amount of air in the container, consistent with the *British Columbia Field Sampling Manual* (BC MOE 2013). Water samples for analysis of dissolved organic carbon and dissolved metals were field filtered with a 0.45 µm membrane and preserved according to laboratory specifications. Samples were kept cool until being shipped to a qualified laboratory for analysis.

2.1.2 Laboratory Analysis

Samples were shipped to ALS Environmental (ALS; Calgary, Alberta) for analysis of the analytes listed in Permit 107517. Analytical methods were consistent with the *British Columbia Environmental Laboratory Manual* (BC MOE 2020).

2.1.3 Data Analysis

Water quality data collected in 2021 were screened against the BC water quality guidelines (WQGs) for the protection of freshwater aquatic life (BC MOE 2021a, 2021b). In the absence of BC WQGs, guidelines were adopted from Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CCME 1999), Environment and Climate Change Canada (ECCC) Predicted No-effect Concentrations (PNECs; ECCC 2018), or ECCC draft Federal Environmental Quality Guidelines (FEQGs; ECCC 2017). Water quality at all stations was screened against EVWQP benchmarks for selenium, nitrate, sulphate, and cadmium. Nickel was screened against the interim invertebrate screening values. Where guidelines or benchmarks were not available, or concentrations were higher than an available guideline or benchmark, screening values previously derived for the Elk Valley were considered and adopted, where applicable. Table 2.2-1 provides the EVWQP benchmarks and screening values included in the CMm LAEMP water quality screening, with supporting rationale provided in Appendix E.

Table 2.2-1: Elk Valley Benchmarks and Screening Values

Receptor and Constituent	Unit	Benchmark or Screening Value[a]		
		Level 1	Level 2	Level 3
Invertebrates				
Sulphate	mg/L	625	729	1,315
Bromide	mg/L	2.2	-	-
Fluoride	mg/L	1.9	-	-
Nitrate[b]	mg-N/L	$=10^{(1.0003x(Log(hardness))-b)}$		
		b = 1.82	-	-
Total Phosphorous[c]	mg-P/L	0.030	-	-
Dissolved Cadmium	µg/L	$=10^{(0.83*Log(hardness)-b)}$		
		b = 2.53	-	-
Total Nickel	µg/L	5.3	15	22
Total Selenium	µg/L	104	-	-
Total Dissolved Solids	mg/L	1,000	1,750	-
Fish				
Sulphate	mg/L	499	674	1,173
Bromide	mg/L	7.8	-	-
Fluoride	mg/L	1.9	-	-
Nitrate	mg-N/L	$=10^{(1.0003x(Log(hardness))-b)}$		
		b = 1.35	-	-
Total Phosphorous[c]	mg-P/L	0.030	-	-
Dissolved Cadmium	µg/L	$=10^{(0.83*Log(hardness)-b)}$		
		b = 2.02	-	-
Total Nickel	µg/L	$10^{(log(b)- 0.763\times(log(103)-log(hardness)) - 0.073x(Log(0.5)-Log(DOC))+0.242x(7.4-pH))}$		
		b = 88	-	-
Total Selenium	µg/L	19	-	-
Total Dissolved Solids	mg/L	1,000	2,000	-
Amphibians				
Sulphate	mg/L	481	822	1,545
Nitrate	mg-N/L	$=10^{(1.0003)x(Log(hardness))-b}$		
		b = 1.04	-	-
Dissolved Cadmium	µg/L	$=10^{(0.83xLog(hardness)-b)}$		
		b = -0.914	-	-
Juvenile Birds				
Total Selenium	µg/L	203	-	-
Bird Reproduction				
Total Selenium	µg/L	394	-	-

a) Values for sulphate, nitrate, cadmium and selenium are EVWQP benchmarks and values for nickel are interim screening values. All other constituents are screening values previously derived for the Elk Valley. Rationale for each benchmark and screening value is provided in Appendix E.

b) Nitrate screening values are for Elk River.

c) EVWQP benchmarks and screening values are effect based with the exception of phosphorus, rationale provided in Appendix E.

"-" = not derived; exp = exponent. EVWQP = Elk Valley Water Quality Plan.

Water quality data collected under Permit 107517 from 2018 to 2021, data collected from 2012 to 2021 for the RAEMP and its predecessor programs (Minnow et al. 2007, 2011, 2012, Minnow 2014, 2015, 2018a, 2020b), and samples collected from the Nickel Benchmark Study stations (CM_MC2, MIDAG-S1, and MIDAG-S2) in 2020 were plotted for comparison between reference and mine-influenced sites and to visualize spatial patterns. Additional water quality data collected by Teck during monthly or weekly routine monitoring at water quality monitoring locations CM_CC1, CM_CM1 and CM_MC2 were plotted for visual assessment of temporal trends and comparison to the 2013 to 2021 SRK modelled data (SRK 2022). Data from the closest monitoring stations CM_CC1, CM_MC1, and the compliance station CM_MC2 were used to represent potential temporal trends at the LAEMP stations CORCK, MI25, and MIDCO, respectively. These SRK modelled data were used to determine if the water quality conditions in 2021 were expected.

2.2 Calcite Index

Methods for monitoring calcite are described in Section 5.0 of the RAEMP (Minnow 2020b) and summarized in brief below. Methods for characterizing calcite are consistent with those used to monitor calcite as part of the regional calcite monitoring program (Lotic and Teck 2016; 2021a,b), but data for the CMm LAEMP are collected at a localized scale in riffle habitat only, relevant to the biological sampling area.

2.2.1 Sample Collection

Calcite was measured at areas where benthic invertebrate samples were collected in 2021. The calcite index was developed to provide a quantitative method of measuring and tracking calcite levels in a stream. The calcite index is determined by examining 100 pebbles at a site. For each of the 100 pebbles sampled the calcite index is a combined total of the calcite concretion score and the calcite presence score. The degree of concretion was assessed by determining if the pebble could be removed with negligible resistance (not concreted; score = 0), noticeable resistance but removable (partially concreted; score = 1), or immovable (fully concreted; score = 2). Three measurements of calcite were collected from each mine-influenced and reference area, except at MIDCO where five measurements were collected.

Calcite was measured in association with BIC sampling; calcite monitoring under the RAEMP and LAEMPs is conducted in riffle habitats within approximately 10 m of where each invertebrate community replicate sample is collected, whereas the regional calcite monitoring program involves calcite measurements in 100 m long reaches that includes multiple habitat units.

Calcite presence collection has historically been assessed in a binary collection; as presence (score = 1) or absence (score = 0) of calcite for each of the 100 pebbles; an adapted method of assessing calcite presence was trialed by Teck in 2020 and 2021, which is referred to as CP prime (CPˈ; Lotic and Teck 2021a,b). Under CP’, the surficial coverage of each pebble is assessed in 10% increments (e.g., a rock with 50% surficial coverage of calcite on all surfaces would get a presence score of 0.5). The calcite index scores using both methods was included in 2021 and are presented in Section 3.2 and in Appendix F.

2.2.2 Data Analysis

Calcite data were considered for spatial trends using both methods for calculating calcite index by comparing the reference and mine-influenced areas. Data collected as part of the original calcite index method were plotted relative to previous results and the reference area normal range (i.e., 0 to 1) defined in the RAEMP (Minnow 2020b).

2.3 Sediment Quality

Methods for sampling and laboratory analysis of sediment samples are described in Section 4.0 of the RAEMP (Minnow 2020b) and are summarized in brief below.

2.3.1 Sample Collection

In 2021, sediment samples were collected from mine-influenced and reference areas where BIC samples were collected. Five samples were collected at CORCK, MIDCO, MIULE and MI5, and three samples were collected from MIULE and reference areas MI25 and LEI. Sediment samples could not be collected from reference area AGCK because of a lack of sediment at the station and a single sediment sample was collected at MIDAG in 2021[2].

Sediment samples were collected using a spoon to gather deposits of sand and/or fines amongst the cobbles. When no such deposits were found, but there was evidence of fine deposits on rock surfaces, then the sediments were gently brushed off the rocks into sample containers. Supporting information (Section 2.4) was also recorded. Sediment samples were stored in a cooler with ice or ice packs and then transferred to a refrigerator at the end of the day.

2.3.2 Laboratory Analysis

Sediment samples were shipped to ALS for analysis of moisture content, particle size, pH, total organic carbon (TOC), and metals (<2 mm fractions). The laboratory homogenized each sediment sample before analysis according to standard laboratory protocols. Analysis methods were consistent with the *British Columbia Environmental Laboratory Manual* (BC MOE 2016).

2.3.3 Data Analysis

Sediment quality data were compared to BC working sediment quality guidelines (WSQG) for the protection of freshwater aquatic life (BC MOE 2017), reference area concentrations, and sediment quality previously observed in the same areas. In addition, sediment quality data were plotted for visual examination of spatial and temporal variability. Data from 2018 to 2021 were plotted for all constituents for which a BC WSQG was available and visually assessed for temporal changes.

2.4 Physical Habitat Characteristics

Physical habitat characteristics can influence aquatic biota (Rosenberg and Resh 1992); therefore, supporting data were collected concurrent to the sediment and benthic invertebrate sampling programs to describe the sampling areas. The characteristics documented included physical water characteristics (i.e., water depth, temperature, velocity, pH, DO, and specific conductivity), substrate composition, colour, texture, and presence of aquatic vegetation and TOC content.

[2] Three sediment samples were planned at MIDAG, but only one sample was collected in 2021.

2.5 Benthic Invertebrate Community

Potential mine-related effects on BIC were evaluated by comparing BIC endpoints at mine-influenced stations to reference stations and to the regional normal ranges. Methods for sampling and laboratory analysis of BIC samples are described in Section 7.0 of the RAEMP (Minnow 2020b) and are summarized in brief below.

2.5.1 Sample Collection

Three BIC samples were collected from each mine-influenced and reference area except for MIDCO, where five samples were collected. Each sample was collected from a separate riffle at each stream area or from 50 m apart if the sampling area was one long riffle. Supporting habitat information was collected concurrent with benthic sampling, including calcite presence and substrate concretion scores (Section 2.2) and stream habitat characteristics (Section 2.4).

Collection methods were consistent with the *CABIN Field Manual: Wadeable Streams* (ECCC 2012). A 400-µm mesh kick net was used to collect a time-integrated sample. The reach sampled was traversed from bank to bank in an upstream direction for a collection time of three minutes. The kick net was held downstream of the sampler while the substrate in the top 5 to 10 cm was disturbed and rocks were overturned to dislodge invertebrates clinging to interstitial spaces and allow them to drift into the kick net. The collected material was transferred to labelled containers and preserved with 10% phosphate-buffered formalin.

2.5.2 Laboratory Analysis

BIC samples were sent to Cordillera Consulting, Summerland, BC for sorting and taxonomic identification. Organisms were identified to the lowest practical level of taxonomy (typically genus or species) using up-to-date taxonomic keys. Analysis methods were consistent with the *CABIN Laboratory Methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples* (ECCC 2014). Sorting efficiency and sub-sampling accuracy and precision were quantified using methods specified by Environment Canada (ECCC 2014).

2.5.3 Data Analysis

The BIC endpoints that were evaluated at mine-influenced and reference stations were consistent with those used in the RAEMP, and include: abundance (i.e., the number of organisms per 3 min kick); richness; Ephemeroptera-Plecoptera-Trichoptera (EPT) abundance and proportion (% EPT); and Ephemeroptera abundance and proportion (% E).

EPT taxa are particularly sensitive to poor water quality conditions in rivers and streams (Rosenberg and Resh 1993) and active anthropogenic activities near rivers can affect the abundance and diversity of EPT (Dudgeon 1984). Often the presence of EPT taxa in a river or stream indicates that it is within the tolerance limit for a number of environmental factors (e.g., water temperature, DO, nutrients, toxic chemicals and metals (Dudgeon 1984). Ephemeroptera (mayflies) are also good bioindicators of freshwater quality because they are only able to survive in rivers or streams that have good water quality (Chapman 1996). Therefore, EPT taxa and Ephemeroptera taxa were used as biological indicators in determining water quality in Michel Creek.

BIC endpoints were plotted for visual examination of spatial and temporal variability. Mine-influenced stations were compared to reference stations, the regional and site-specific normal ranges (Section 2.5.3.1), and to historical data presented in the RAEMP and it's predecessor programs between 2012 to 2017 (Minnow et al. 2007, 2011, 2012, Minnow 2014, 2015, 2018a, 2020b). Statistical analyses were also conducted on the BIC endpoints to compare mine-influenced stations to reference stations and to delineate spatial extent of effects (Section 2.5.3.2.1). Temporal changes were also evaluated, comparing 2021 data to previous years data to evaluate how BIC endpoints have changed over time (Section 2.5.3.2.2).

The relationship of % EPT and % E with aqueous nickel concentrations was examined to further evaluate potential cause(s) of lower proportions of % EPT and % E. Nickel was chosen for follow-up comparisons because of results from early chronic toxicity testing that implicated nickel as the likely cause of BIC changes (Golder 2017). In addition, the relationships between % EPT, % E and, percent fines, sand, gravel, cobble, and boulder, which were used as a habitat indicators, was examined to see if habitat differences could be related to spatial differences in % EPT and % E downstream of CMm. As discussed in Section 1.5, there is no operable pathway for effects of sediment chemistry on EPT in the sampled erosional habitats of Michel Creek and it is not assessed further herein.

2.5.3.1 Regional and Site-Specific Normal Ranges

The BIC data collected as part of the CMm LAEMP were compared to the regional and site-specific normal ranges for each community endpoint. Regional normal ranges were developed for the RAEMP using pooled reference area data from 2012 to 2019 (Table 2.5-1; Minnow 2020a). Prediction intervals were calculated as 95th percentiles, and the upper and lower prediction intervals from each replicate sample were used, when applicable. Site-specific normal ranges, which are calculated annually and specific to that year's data, were calculated using linear mixed-effects models to relate benthic invertebrate community endpoints, where applicable, the yearly average lower and upper bounds were used to define the site-specific normal range as described in Appendix J of the RAEMP (Minnow 2020a).

Table 2.5-1: Benthic Invertebrate Community Regional Normal Ranges

Variable	Unit	Regional Normal Range	
		Lower Limit	Upper Limit
Benthic invertebrate taxonomic richness (lowest practical level)	no. of taxa per sample	25	48
Benthic invertebrate abundance	no. of organisms per sample (per 3 min kick)	1,812	26,922
Percent Ephemeroptera, Plecoptera, Trichoptera	%	50	98
Ephemeroptera, Plecoptera, Trichoptera abundance	no. of organisms per sample (per 3 min kick)	909	26,270
Percent Ephemeroptera	%	21	82
Ephemeroptera Abundance	no. of organisms per sample (per 3 min kick)	387	21,949

Source: 2017 to 2019 RAEMP (Minnow 2020a).

2.5.3.2 Univariate Statistical Analysis

Statistical analyses of BIC endpoints followed a similar approach to that described in the RAEMP (Minnow 20120b), with the exception that planned linear orthogonal contrasts were used to assess differences among stations and years in place of Tukey's Honestly Significant Difference test. Statistical analyses were conducted in R version 4.0.2 (R Core Team 2022).

2.5.3.2.1 Spatial Evaluation

Spatial differences in BIC endpoints were evaluated among stations using an analysis of variance (ANOVA), with planned linear orthogonal contrasts to test whether effects exhibited linear spatial gradients; *P*-values ≤ 0.05 were considered significant.

For each endpoint, an overall ANOVA model was fit to the 2021 data as:

$$Y = Station + \epsilon \qquad \text{Equation 2.5-1}$$

where: *Y* = response variable; *Station* = a fixed factor for area; and Є = the error term.

Differences in BIC endpoints were then evaluated among stations using planned linear orthogonal contrasts per Hoke et al. (1990). Each mine-influenced station was compared to stations downstream and to the reference stations. For example, planned contrasts for MIDCO compared MIDCO to stations downstream and to the reference stations, but excluded MIUCO and CORCK from the comparisons because they are located upstream (Table 2.5-2). The best transformation for each endpoint (i.e., untransformed or ln[x+1]) was chosen as the transformation for which a Shapiro-Wilk's test on the residuals gave the highest *P*-value. Contrasts were considered significant after applying the Dunn-Ŝidák correction for six planned comparisons, at *P*<0.009. With these comparisons, significant differences for a variable for all or most comparisons, with consistent negative magnitude of differences would be consistent with a potential adverse effect originating at the upstream end of the study reach and extending throughout the entire reach; significant contrasts for upstream stations, which are no longer significant in downstream contrasts would be indicative of effects upstream, followed by recovery with distance downstream.

The magnitude of the difference was calculated for each planned linear orthogonal contrast as the number of standard deviations (SD) from the contrast mean using the following equation:

$$Magnitude\ (SD) = (Station\ Mean - Contrast\ Mean) / Contrast\ SD \qquad \text{Equation 2.5-2}$$

where: SD = standard deviation; Contrast Mean = mean of the downstream and reference stations included in the contrast; Contrast SD = standard deviation of the downstream and reference stations included in the contrast.

The ecological significance of a statistical difference was assessed by determining if, for a particular endpoint, a station was within a magnitude of difference of 2 SD from downstream and reference stations (i.e., the contrast). This approach defines ecological significance in terms of the natural range of variability observed in the downstream and reference communities. If a statistical difference is observed between a station and its contrast, but is within a magnitude of difference of 2 SDs, the statistical significance is not considered biologically meaningful or ecologically significant.

Table 2.5-2: Spatial Planned Linear Orthogonal Contrasts for Benthic Invertebrate Community Endpoints

Station	EXP/REF	MIUCO	CORCK	MIDCO	MIDAG	MIULE	MI5
MIUCO	EXP	8	0	0	0	0	0
CORCK	EXP	-1	7	0	0	0	0
MIDCO	EXP	-1	-1	6	0	0	0
MIDAG	EXP	-1	-1	-1	5	0	0
MIULE	EXP	-1	-1	-1	-1	4	0
MI5	EXP	-1	-1	-1	-1	-1	3
AGCK	REF	-1	-1	-1	-1	-1	-1
MI25	REF	-1	-1	-1	-1	-1	-1
LE1	REF	-1	-1	-1	-1	-1	-1

EXP = mine-influenced stations; REF = reference station.

2.5.3.2.2 Temporal Evaluation

Temporal changes in BIC endpoints were evaluated for data collected between 2012 and 2021. For each station, BIC endpoints were compared among years using ANOVA with planned linear orthogonal contrasts to test whether effects exhibited linear gradients over time; *P*-values ≤ 0.05 were considered significant.

For each endpoint, an overall ANOVA model was fit to the data as:

$$Y = Year + \epsilon \qquad \text{Equation 2.5-3}$$

where: *Y* = response variable; *Year* = a fixed factor for year; and ϵ = the error term.

Differences in BIC endpoints were evaluated among years for each station using planned linear orthogonal contrasts per Hoke et al. (1990). To evaluate the presence of a gradient response over time, BIC endpoints for each of the stations were compared to previous years. For example, planned contrasts compared 2021 to 2012 to 2020, but did not compare 2021 data to itself (Table 2.5-3). The best transformation for each endpoint (i.e., untransformed or ln[x+1]) was chosen as the transformation for which a Shapiro-Wilk's test on the residuals gave the highest *P*-value. The magnitude of the difference was calculated for each planned linear orthogonal contrast as the number of SD from the contrast mean following Equation 2.5-2, except Station Mean was replaced by the Year Mean in the equation.

Contrasts were considered significant after applying the Dunn-Ŝidák correction for three to eight planned comparisons, at *P*<0.017 to *P*<0.006. With these comparisons, significant differences for a variable for all or most comparisons, with consistent negative magnitude of differences would be consistent with a potential adverse effect persisting throughout most of the sampling period; significant contrasts for later years, which are no longer significant in recent year contrasts would be indicative of effects in the past, followed by recovery since then.

The ecological significance of a statistical difference was assessed by determining if, for a particular endpoint, a year was within a magnitude of difference of 2 SD from previous years (i.e., the contrast). This approach defines ecological significance in terms of the natural range of variability observed in each year. If a statistical significance is observed between a year and its contrast, but is within a magnitude of difference of 2 SDs, the statistical significance is not considered biologically meaningful or ecologically significant because the results for that endpoint are still within the typical range of variability.

Table 2.5-3: Temporal Planned Linear Orthogonal Contrasts for Benthic Invertebrate Community Endpoint

Year	2021	2020	2019	2018	2017	2016	2015	2014	2013
2021	9	0	0	0	0	0	0	0	0
2020	-1	8	0	0	0	0	0	0	0
2019	-1	-1	7	0	0	0	0	0	0
2018	-1	-1	-1	6	0	0	0	0	0
2017	-1	-1	-1	-1	5	0	0	0	0
2016	-1	-1	-1	-1	-1	4	0	0	0
2015	-1	-1	-1	-1	-1	-1	3	0	0
2014	-1	-1	-1	-1	-1	-1	-1	2	0
2013	-1	-1	-1	-1	-1	-1	-1	-1	1
2012	-1	-1	-1	-1	-1	-1	-1	-1	-1

2.6 Benthic Invertebrate Tissue

Methods for sampling and laboratory analysis of BIT are described in Section 7.3 of the RAEMP (Minnow 2020b) and summarized in brief below.

2.6.1 Sample Collection

Benthic invertebrate tissue samples were collected as taxonomic composites from mine-influenced and reference areas where benthic invertebrate community samples were collected. Five samples were collected from MIDCO, while three samples were collected from all other areas.

Benthic invertebrate tissue samples were collected using a kick net as described for BIC samples (Section 2.5). Representative taxa were combined, and invertebrates were picked free of debris in the field until at least 2 grams of wet tissue was obtained. Benthic invertebrate tissue samples were kept cool until shipment to the analytical laboratory.

2.6.2 Laboratory Analysis

Samples were shipped to TrichAnalytics Inc. (Trich), Saanichton, BC for analysis of metals by laser ablation with inductively coupled plasma mass spectrometry (LA-ICP-MS). Trich is accredited by the Canadian Association for Laboratory Accreditation for metals analysis in biological samples. Results were reported on a dry weight (dw) basis along with moisture content.

2.6.3 Data Analysis

Benthic invertebrate selenium concentrations were compared to available EVWQP benchmarks (Teck 2014) and BC tissue guidelines (BC MOE 2021a). Benthic invertebrate selenium concentrations were plotted relative to previous results and to the reference area normal range defined in the RAEMP (Minnow 2018b) to evaluate spatial and temporal variability.

The relationship between BIT chromium (an indicator of particulate entrainment in BIT samples) and BIT selenium was visually evaluated to consider whether BIT selenium results were affected by confounding material in low volume samples, following discussions at the 7 June 2022 EMC meeting.

2.7 Quality Assurance and Quality Control

Quality assurance (QA) and quality control (QC) methods were consistent with methods developed for the RAEMP (Minnow 2020b, Section 10.0). Because CMm LAEMP data were collected by Minnow as part of data collection for the RAEMP, QA/QC procedures and samples for the RAEMP relate to the CMm LAEMP as well. Detailed QA/QC procedures and results are presented in the RAEMP on a three-year cycle (i.e., 2022). A summary of the QA/QC results relevant to the 2021 CMm LAEMP are provided in Appendix C and analytical reports are provided in Appendix D. Review of the QA/QC results for 2021 indicated that the data quality objectives were met, and that the data are appropriate for the purposes of this assessment (Appendix C).

2.8 Related Aquatic Programs

Teck conducts additional programs to monitor, evaluate, and/or manage the aquatic effects of mining operations within the CMm area. The results of studies of fish and aquatic-dependent wildlife in the Michel Creek watershed are summarized herein to contribute to the data evaluation and interpretation (Section 4.0). The relevant studies incorporated into the CMm LAEMP interpretation are:

1) RAEMP – regional lotic aquatic effects monitoring results. Finalized results and interpretation for the second comprehensive RAEMP cycle (2017 to 2019; Minnow 2020a) and results of the 2021 Westslope Cutthroat Trout muscle selenium concentations (Minnow in prep.) were available for incorporation into the 2021 CMm LAEMP and were used to evaluate selenium exposure and potential effects to fish. Water quality results associated with the 2015 to 2021 cycles of the RAEMP were incorporated into Section 3.1.

2) Chronic Toxicity Testing Program – the program reviews data quality to confirm that results meet acceptability criteria, standardizes the data to help discern toxicological responses, and compares responses in tests to that in reference waters not influenced by mining. Results from the 2021 Chronic Toxicity Testing Program (Golder 2021b) were available for incorporation into the 2021 CMm LAEMP and were used to evaluate nickel toxicity in BIC.

3) Lentic Area Supporting Study – regional lentic aquatic effects results. This study occurred in 2018 and 2019 to support the RAEMP and provided information regarding use of lentic areas by fish and aquatic-dependent wildlife and evaluated amphibian use, amphibian egg tissue chemistry, bird use, bird egg tissue chemistry, fish use, fish abundance, fish tissue chemistry, benthic invertebrate tissue chemistry, habitat features, water quality, and sediment chemistry. Several lentic areas along Michel Creek and in reference areas were included in the Lentic Area Supporting Study. Lentic sampling was incorporated into the RAEMP as part of the 2021 to 2023 RAEMP study design (Minnow 2020b). Applicable results of the 2018 and 2019 Lentic Area Supporting Study were incorporated into the 2021 CMm LAEMP.

4) Nickel Benchmark Study – supplemental sampling between MIDCO and MIDAG was added to improve characterization of nickel concentrations and BIC effects in Michel Creek immediately downstream of CMm. The objective of the study was to describe field-based responses to nickel exposure to test how well these responses align with laboratory-based toxicity data used to derive benchmarks. The Nickel Benchmark Study is still in progress, finalized results and interpretation will be available for incorporation into the 2022 CMm LAEMP.

The CMm LAEMP integrates information from these and other relevant studies (e.g,. Nutrient Study, Environmental Flow Needs [EFN] Study) to better characterize and understand potential effects of CMm on fish and aquatic-dependent wildlife in the Michel Creek watershed. Summaries of relevant results from these reports are provided in Section 4.0, while methods are presented within the specific monitoring reports.

3.0 RESULTS

3.1 Water Quality

Water quality screening and spatial and temporal trends (including comparisons to projections [SRK 2022]) are summarized in Sections 3.1.1 to 3.1.3. Supplementary plots and tabulated data are provided in Appendix E and Appendix G.

3.1.1 Data Screening

Water quality data that were collected concurrently with biological monitoring in September 2021 were screened against BC WQGs, Permit 107517 Compliance Limits and Site Performance Objectives (SPOs), EVWQP benchmarks, interim screening values, and Elk Valley screening values. The screening data are provided in Appendix E, Table E-1. Constituents with concentrations greater than one or more of these values are summarized in Table 3.1-1 and described in brief below:

- Total nickel concentrations were above the level 3 invertebrate interim screening value (22 µg/L) at CORCK. At MIDCO, the first station in Michel Creek downstream of the Corbin Creek confluence, total nickel concentrations were above the level 1 invertebrate interim screening value (5.3 µg/L). Stations downstream of MIDCO were below the interim screening values. The potential impact of these concentrations on the benthic invertebrate community is discussed further in Section 3.5.

- Sulphate, nitrate, and total selenium were below the Permit 107517 Compliance Limits and dissolved cadmium was below the Permit 107517 SPO at the biological station immediately upstream from CMm compliance point (MIDCO).

- Sulphate concentrations were above the level 2 fish, level 1 invertebrate, and level 1 amphibian benchmarks and the BC WQGs at CORCK. Sulphate was below BC WQGs and EVWQP benchmarks derived for Elk Valley at all Michel Creek stations, and therefore are not expected to negatively impact the benthic invertebrate community.

- At CORCK only, TDS was above the level 1 invertebrate and fish benchmarks and nitrate was above the long-term chronic BC WQGs. Nitrate and TDS concentrations were below applicable guidelines and benchmarks values in Michel Creek; therefore, these constituents are not expected to negatively impact the benthic invertebrate community in Michel Creek.

- Total selenium concentrations were above the long-term chronic BC WQGs, but below EVWQP benchmarks at CORCK. Total selenium concentrations were also below EVWWP benchmarks at stations in Michel Creek; therefore, negative impacts to the benthic invertebrate community as a result of selenium exposure are not expected.

- Fluoride was above the interim CCME WQG (0.12 mg/L) at CORCK and all stations downstream of CORCK on Michel Creek; however, at all stations in the CMm LAEMP study area, fluoride was below the chronic effects benchmark of 1.9 mg/L that was derived by MacPherson et al. (2014) to be conservatively protective of aquatic life. Therefore, it is unlikely that fluoride represents a source of mine-influence that may negatively impact benthic invertebrate communities.

Table 3.1-1: Summary of Water Quality Screening Exceedances at Stations Downstream of CMm, September 2021

Constituent	BC Long-term Chronic Water Quality Guideline(a)	Elk Valley Water Quality Plan Benchmarks and Screening Values(b)						Concentration				
		Invertebrates			Fish		Amphibians	AGCK	CORCK	MIDCO	MIDAG	MIULE
		Level 1	Level 2	Level 3	Level 1	Level 2	Level 1					
Total Dissolved Solids (mg/L)	-	1,000	-	-	1,000	-	-	-	1,320	-	-	-
Fluoride (mg/L)	0.12d	-	-	-	-	-	-	**0.30**	**0.15**	**0.13**	**0.20**	**0.18**
Sulphate (mg/L)	309 to 429(c,d)	625	729	-	499	674	481	-	**689**	-	-	-
Nitrate (mg-N/L)	3	-	-	-	-	-	-	-	**4.7**	-	-	-
Total Nickel (µg/L)	95 to 150(c)	5.3	15	22	-	-	-	-	38	14	-	-
Total Selenium (µg/L)	2	-	-	-	-	-	-	-	**19**	**7.9**	**4.0**	**3.4**

Notes: Stations are ordered from upstream to downstream. This table summarizes constituents and stations that have concentrations greater than a guideline, screening value, or benchmark. Appendix E presents the remaining constituents, stations, guidelines, screening values, and benchmarks, including the selenium benchmarks that are not presented here because concentrations were not exceeded in 2021.

a) Data were screened against BC Working and Approved Water Quality Guidelines (BC MOE 2021a, 2021b).

b) Values for sulphate, nitrate, and selenium are benchmarks (Teck 2014), values for nickel are interim screening values and values for remaining constituents are screening values.

c) Guideline is hardness dependent.

d) For some samples, water hardness was greater than 250 mg/L. No BC MOE water quality guideline was established for sulphate at hardness greater than 250 mg/L; however, the observed data were screened against the guideline for very hard water (i.e., 429 mg/L) for comparative purposes.

Bolded values exceed the BC Long-term WQG (BC MOE 2021a, 2021b).

Shaded values exceed an EVWQP benchmark or interim screening value.

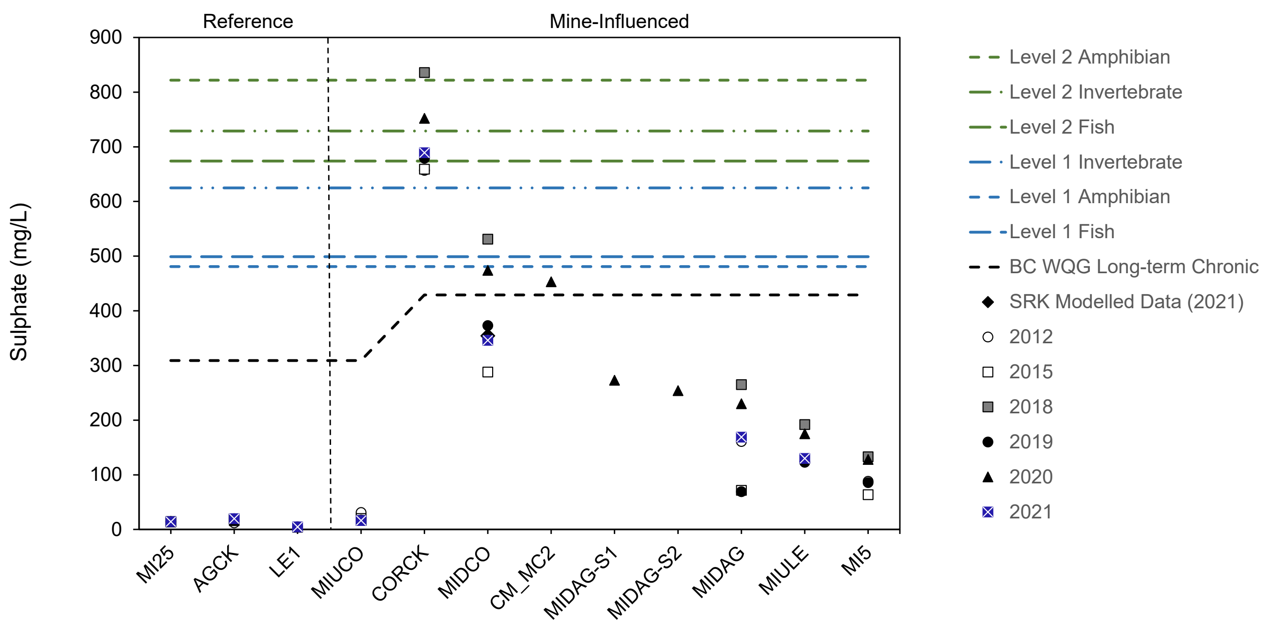
“-“ = no data available or EVWQP benchmark was not exceeded; mg-N/L = milligrams nitrogen per litre.

3.1.2 Spatial Trends

Water quality data collected concurrently with the biological monitoring in September 2012, 2015, 2018, 2019, 2020, and 2021, and data from the Nickel Benchmark Study stations (i.e., CM_MC2, MIDAG-S1, MIDAG-S2) collected in 2020, were plotted to visually assess spatial patterns. Constituents identified in the data screening (Section 3.1.1) are presented in Figures 3.1-1 to 3.1-5, while plots for all other monitored constituents are provided in Appendix G.

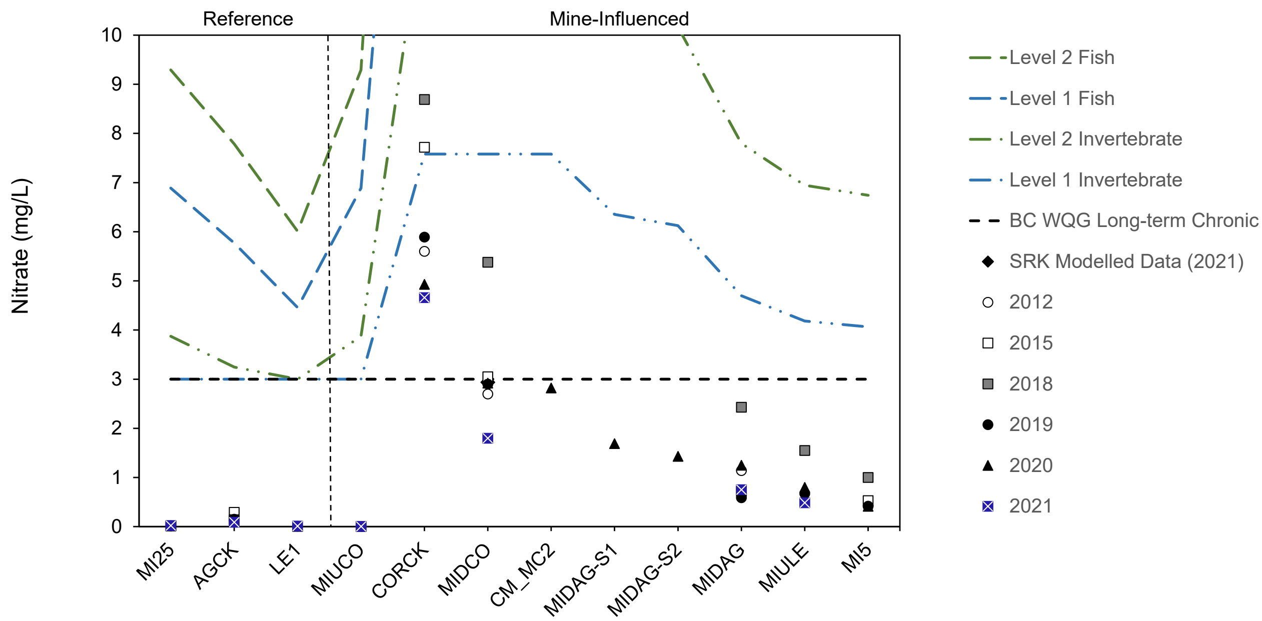
The predominant spatial pattern for mine-influenced constituents had the highest concentrations being observed at CORCK, with a gradient of declining concentrations downstream of CMm in Michel Creek (Figures 3.1-1 to 3.1-5). Concentrations at MIUCO were similar to those observed at the reference stations MI25, AGCK, and LE1. Comparable spatial patterns were observed for other metals (i.e., antimony, boron, cadmium, cobalt, lithium, manganese, molybdenum, strontium, and uranium), major ions (i.e., calcium, potassium, sodium, and magnesium), and related constituents (i.e., TDS, specific conductivity, hardness, alkalinity; Appendix G).

Figure 3.1-1: Spatial and Temporal Variation in Sulphate Concentrations Collected in the CMm LAEMP Study Area, September 2012 to 2021



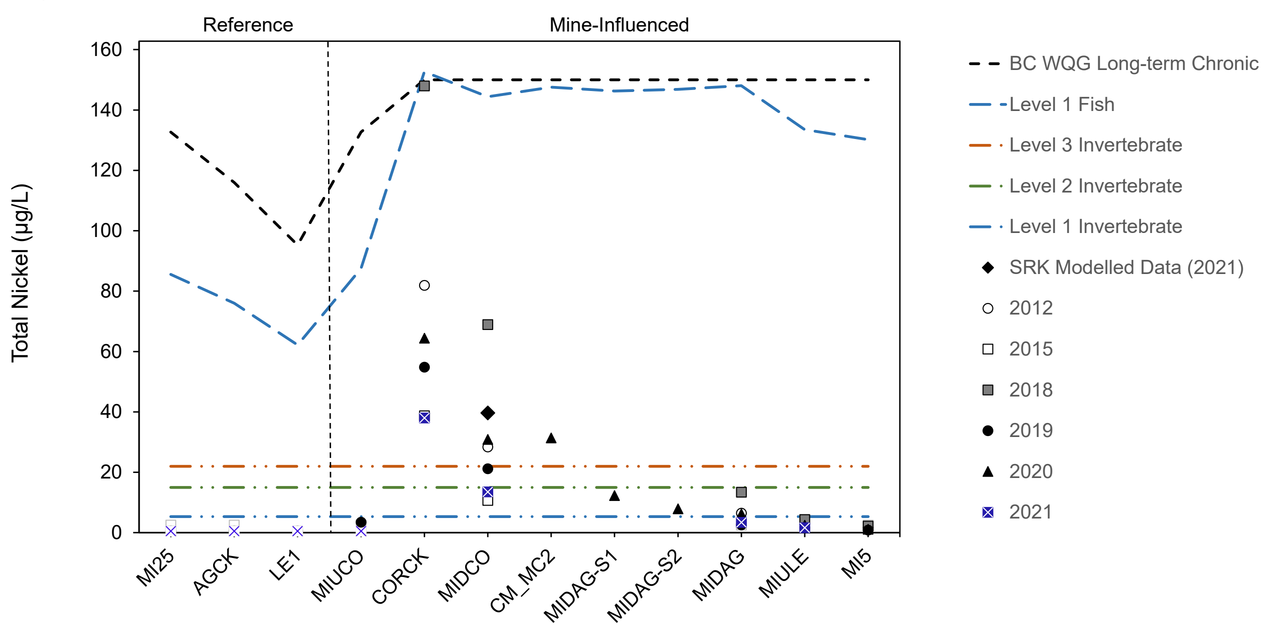
Notes: The sulphate WQG guideline is hardness-dependent and calculated based on hardness observed in 2021.
CMm = Coal Mountain Mine; mg/L = milligrams per litre; WQG = water quality guideline.

Figure 3.1-2: Spatial and Temporal Variation in Nitrate Concentrations Collected in the CMm LAEMP Study Area, September 2012 to 2021



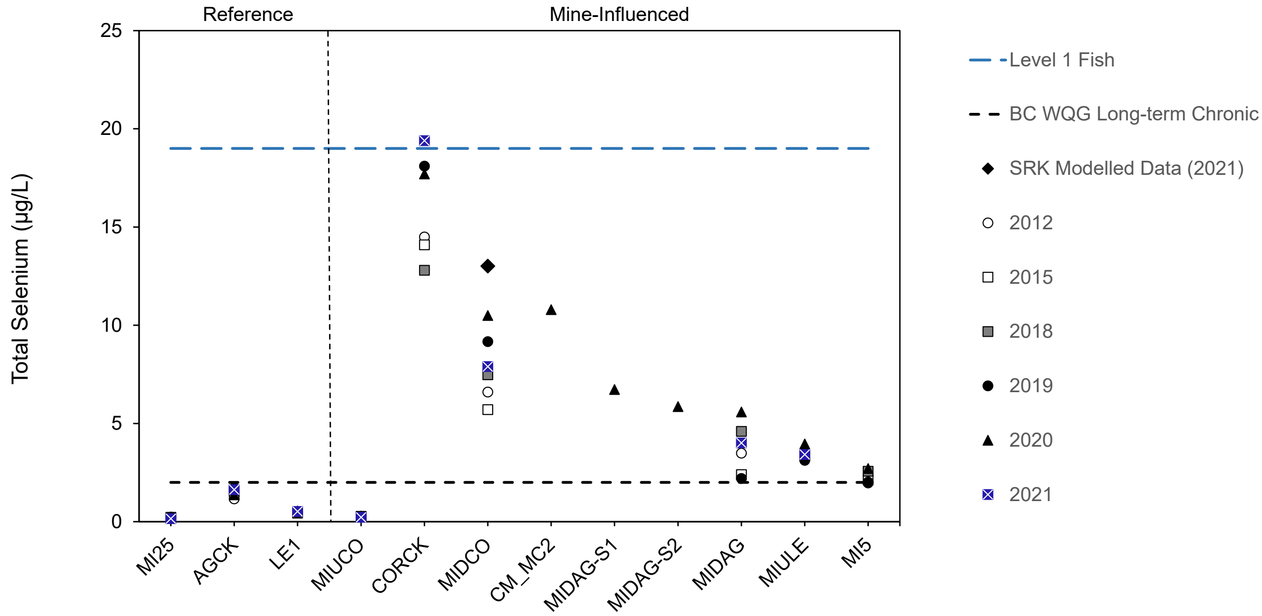
Notes: The nitrate benchmarks are hardness-dependent and calculated based on hardness observed in 2021.
CMm = Coal Mountain Mine; mg/L = milligrams per litre; WQG = water quality guideline.

Figure 3.1-3: Spatial and Temporal Variation in Total Nickel Concentrations Collected in the CMm LAEMP Study Area, September 2012 to 2021



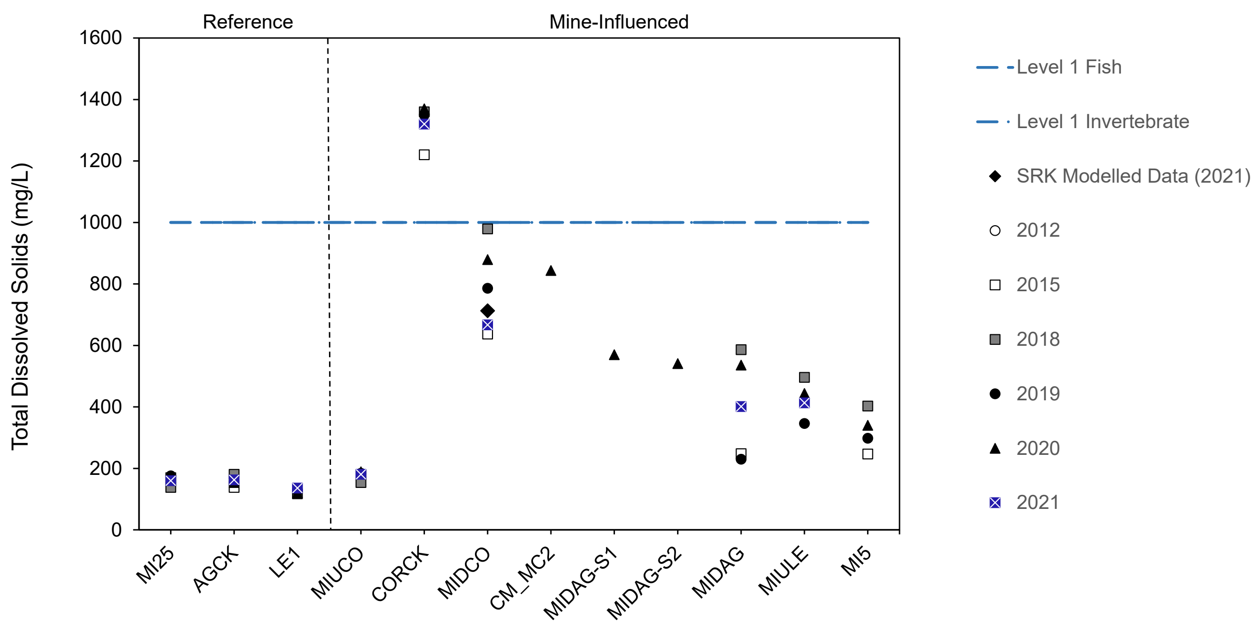
Notes: The nickel WQG is hardness-dependent and calculated based on 2021 hardness.
CMm= Coal Mountain Mine; µg/L = micrograms per litre; WQG = water quality guideline.

Figure 3.1-4: Spatial and Temporal Variation in Total Selenium Concentrations Collected in the CMm LAEMP Study Area, September 2012 to 2021



Notes: CMm = Coal Mountain Mine; µg/L = micrograms per litre; WQG = water quality guideline.

Figure 3.1-5: Spatial and Temporal Variation in Total Dissolved Solids Concentrations Collected in the CMm LAEMP Study Area, September 2012 to 2021



Notes: CMm = Coal Mountain Mine; mg/L = milligrams per litre; WQG = water quality guideline.

3.1.3 Comparison to Projections and Temporal Trends

Available water quality data from Teck surface water monitoring stations from 2012 through 2021 were plotted for CM_MC1, CM_MC2 (compliance point), and CM_CC1 and visually assessed for temporal trends. These monitoring stations are located nearest to the LAEMP stations MI25, MIDCO, and CORCK, respectively. Constituents identified in the data screening (Section 3.1.1) or constituents that were greater in 2021 compared to previous years are presented in Figures 3.1-6 to 3.1-11. Plots for all other monitored constituents are provided in Appendix G.

A common trend was observed across several constituents in Michel Creek downstream of CORCK, in which concentrations increased between 2012 and 2018, and then decreased or remained consistent through 2019 to 2021. Sulphate and TDS peaked in 2018 with concentrations appearing relatively consistent through to 2021. Nitrate exhibited a consistent decrease between 2018 and 2021. Nickel decreased in 2019, and then increased in 2020 to remain consistent in 2021 with concentrations observed in 2016 and 2017. Dissolved sodium also decreased in 2019, but increased in 2020 to levels greater than those observed in 2018. This was followed by a decrease in sodium in 2021 (Figure 3.1-11). The dissolved sodium peak in 2020 was likely a result of the re-initiation of pumping water from 6 Pit (which is high in sodium) in 2020 (Section 1.4). Total selenium increased from 2012 to 2021. Key trends in the temporal comparison of these constituents relative to projected concentrations (SRK 2022) are:

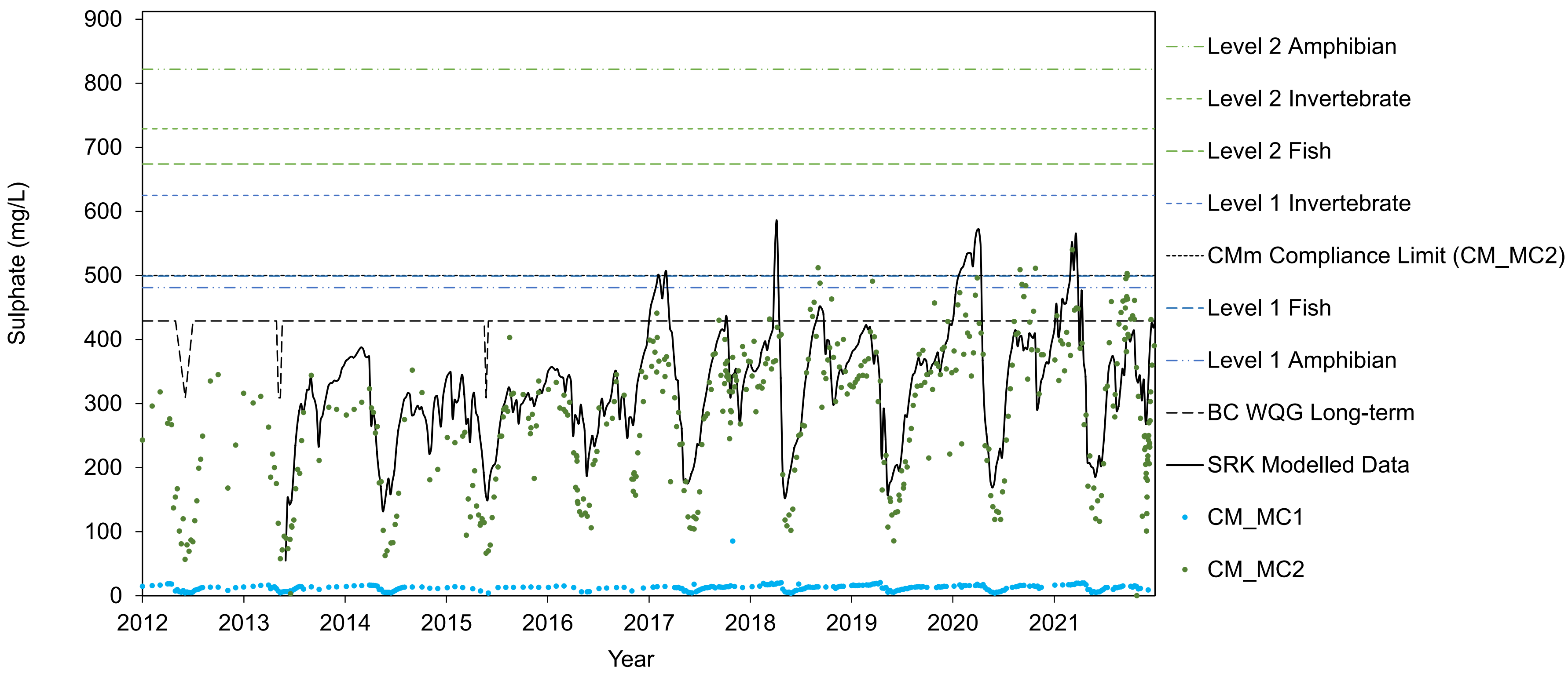
- Concentrations of sulphate, nitrate, and nickel (Figures 3.1-6 to 3.1-8) were as expected and were either lower than or similar to modelled data, with occasional excursions beyond the modelled data for sulphate in some years:
  - In 2021, sulphate was periodically greater than the modelled data (2018 to 2021). Concentrations of sulphate (Figure 3.1-6) were greater than the level 1 fish benchmarks and the Permit 107517 Compliance Limit for CM_MC2 on two occurrences in 2018, two occurrences in 2020 and two occurrences in 2021. Concentrations of sulphate were frequently greater than the lowest level 1 benchmarks (fish and amphibians) at CM_CC1 between 2012 and 2022, and were frequently greater than the level 2 invertebrate and fish benchmarks between 2016 and 2021.
  - In 2021, nitrate was less than the modelled data in all samples. Concentrations of nitrate were intermittently (i.e., <20% samples per year) above the Permit 107517 Compliance Limit for CM_MC2 in 2016, 2017, and 2018 but were below the limit in 2019 through 2021 (Figure 3.1-7). Nitrate concentrations were more frequently above than below the BC WQG (long-term) at CM_MC2 between 2016 and 2018, with intermittent occurrences above the BC WQG in 2019, 2020, and 2021. CM_CC1 was frequently (i.e., >20% of samples per year) above the BC WQG between 2012 and 2021.
  - In 2021, total nickel was lower than projected based on the modelled data for dissolved nickel in all samples. Concentrations of nickel were consistently above the level 1 invertebrate screening value at CM_MC2 between 2012 and 2021, with frequent occurrences above the level 2 and level 3 invertebrate screening values between 2016 and 2021 (Figure 3.1-8). Concentrations were consistently above the level 3 invertebrate screening value at CM_CC1 with a few exceptions between 2012 and 2016, and one exception in 2021 that exceeded the level 2 screening value. There was one non-detect in 2021.

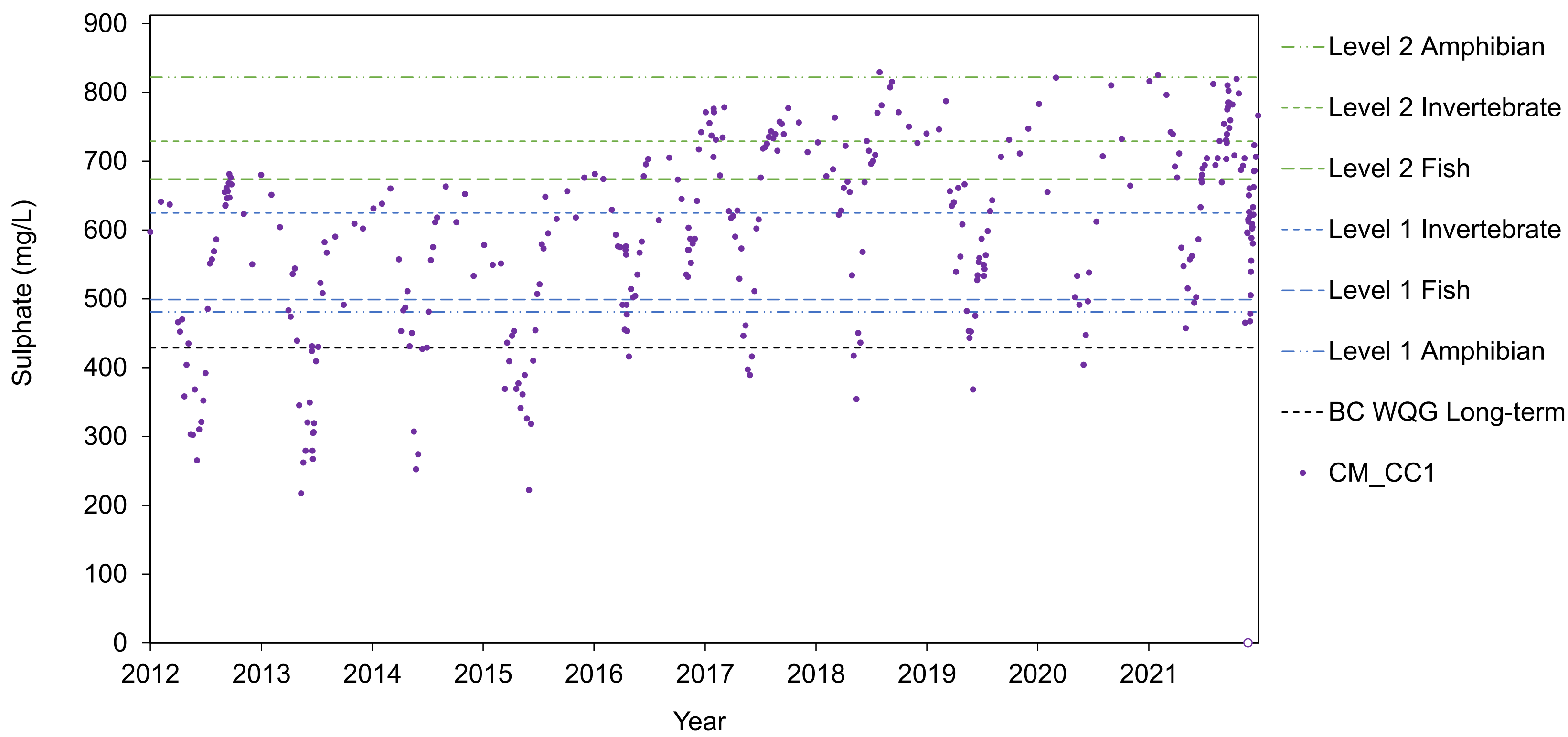
- Concentrations of total selenium (Figure 3.1-9) were as expected based on the modelled data and were either lower than or similar to the modelled data for dissolved selenium for all years. Concentrations of selenium were below the EVWQP benchmarks at CM_MC2, but there were occurrences between 2012 and 2021 when concentrations were greater than the level 1 fish benchmark at CM_CC1.
- TDS increased between 2012 and 2018 and remained consistent through to 2021 at CM_MC2 and CM_CC1 (Figure 3.1-10). Concentrations were below EVWQP benchmarks at CM_MC2 with one exception in 2017. The majority (i.e., >80% of samples per year) of TDS measurements at CM_CC1 between 2016 and 2021 were above the level 1 invertebrate screening value.
- Concentrations of sodium were slightly above the modelled data periodically between 2013 and 2019 (Figure 3.1-11), while between 2020 and 2021, the majority of the measurements were greater than the modelled data. No BC WQG or screening value currently exists for sodium; but literature and reference toxicant tests performed by Golder (2018b) indicate that chronic toxicity would occur at much higher concentrations (e.g., 1,200 mg/L; Golder 2020a). Given that concentrations of sodium were below 100 mg/L at CM_MC2 and CM_CC1, effects on the receiving environment are not expected to occur at observed sodium concentrations.

Temporal trends and comparisons to projections for all other constituents are provided in Appendix G. Key trends for other constituents are:

- Similar trends were observed for total antimony, total cobalt, and nitrite as described previously for nickel, where concentrations in 2020 and 2021 were similar to those observed in 2018 and 2019. Total boron increased in 2020 and 2021, returning to 2018 concentrations (Appendix G) which remained below relevant guidelines. Concentrations of total molybdenum, total manganese, and total uranium increased in either 2017 or 2018, followed by a consistent decrease to 2021. The remaining constituents appeared consistent across years or were at concentrations below detection.
- Constituents intermittently above modelled data were total aluminum, total cadmium, total chromium, total copper, dissolved calcium, dissolved magnesium, hardness, and alkalinity (Appendix G).
- Constituents with the majority of samples above modelled data for the dissolved fraction include total barium and total uranium (Appendix G). Concentrations of barium and uranium were below long-term chronic BC WQGs in 2021.

Figure 3.1-6: Total Sulphate Concentrations at CM_MC2 and CM_MC1 (top panel) and CM_CC1 (bottom panel), 2012 to 2021



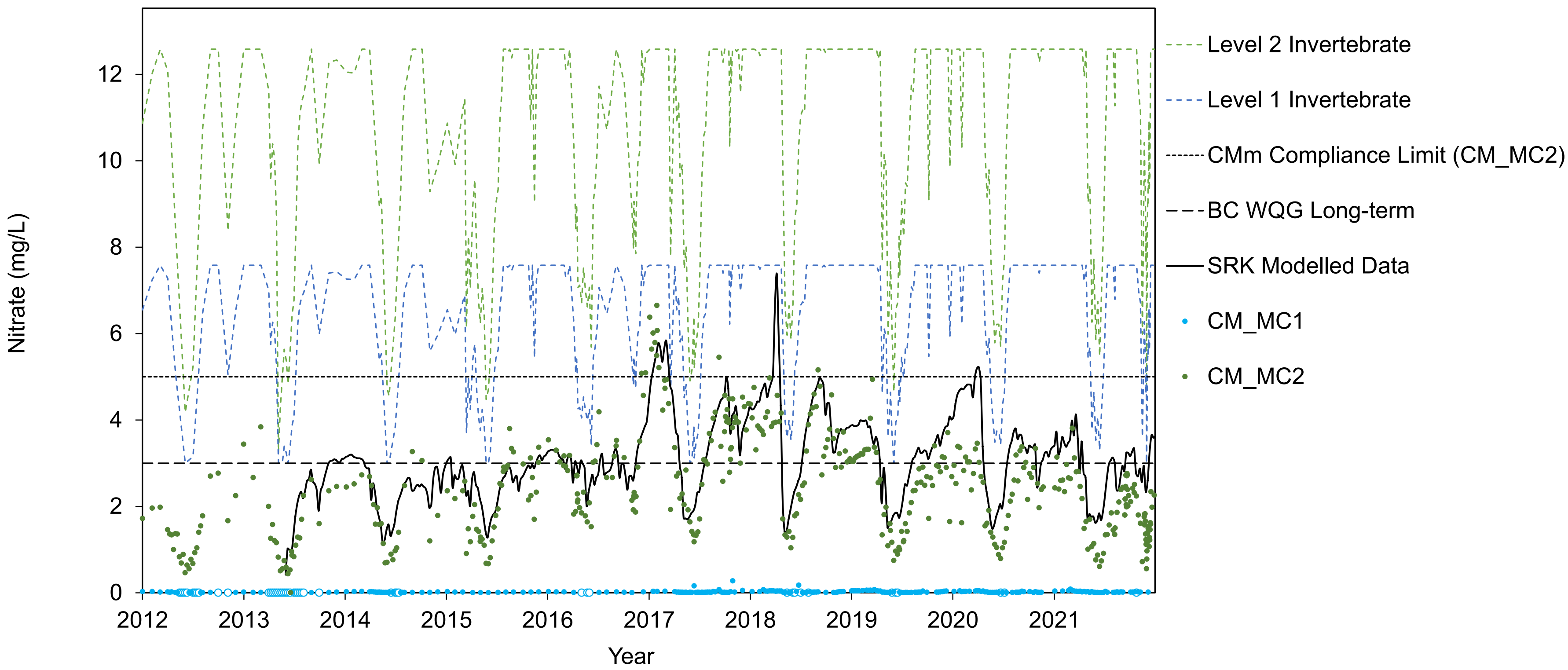


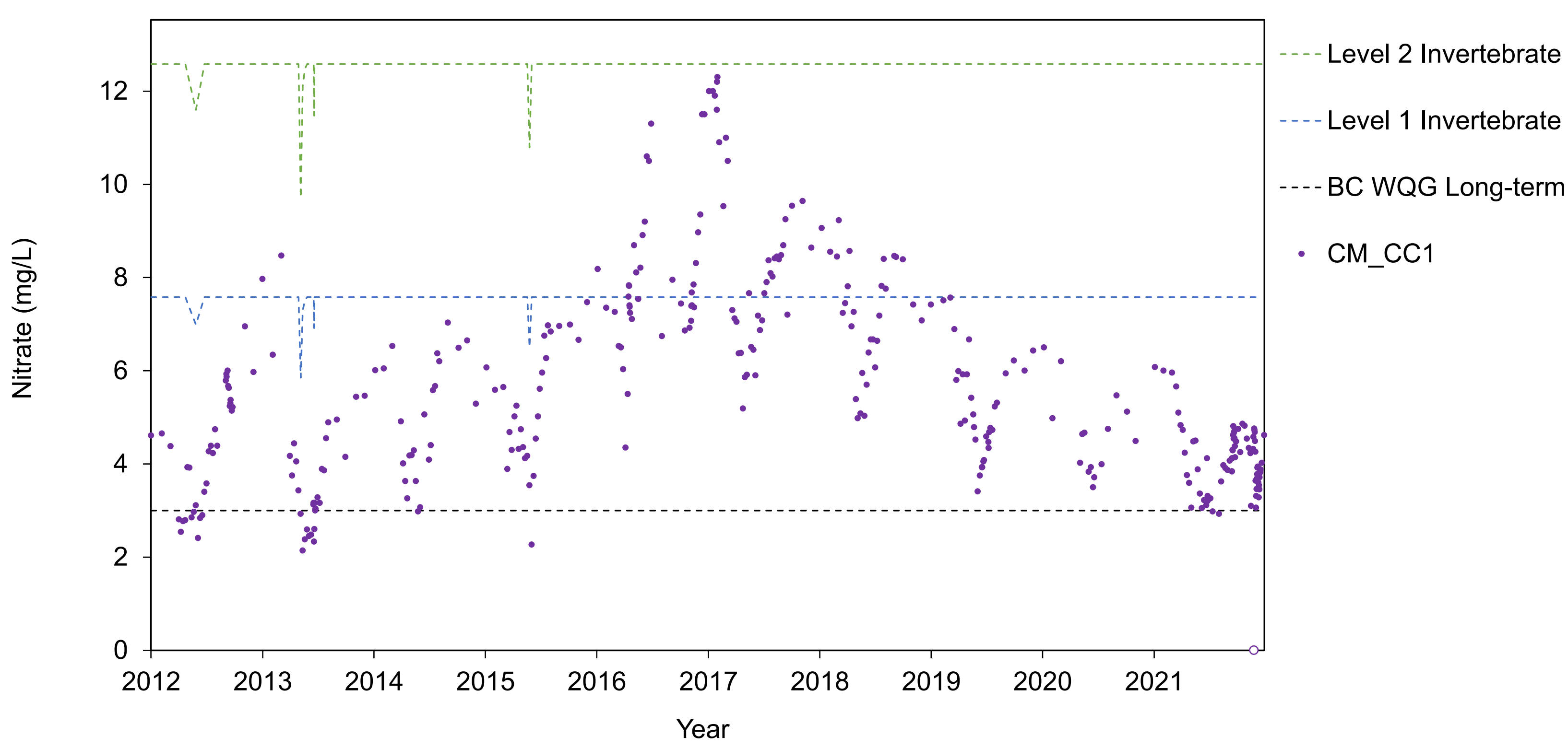
Notes: EVWQP screening values; level 3 invertebrate (1,315 mg/L), level 3 fish (1,173 mg/L), and level 3 amphibian (1,545 mg/L) not shown. Measured concentrations for CM_MC1, CM_MC2 and CM_CC1 are shown as blue, green, and purple circles and SRK modelled data are represented by the solid black line in the upper panel.

The end of active operations occurred in 2018. Near the end of 2018, a flush of accumulated constituents was observed in Corbin Creek and Michel Creek water as a result of re-handled waste rock that occurred in 2016 and 2017. In 2019, coal was no longer being washed. Active dewatering of 34 Pit was initiated in 2019; dewatering of 6 Pit did not commence until 2020. Pit pumping from 34 Pit occurred between 3 June 2019 and 9 September 2020 (463 days of pit pumping) and throughout 2021, with a pause for the Corbin Dam Dewatering Project between 7 September 2021 and 4 November 2021 (334 days of pit pumping). Pit pumping from 6 Pit occurred between 6 May 2020 and 6 December 2020 (218 days of pit pumping) and throughout 2021, with a pause for the Corbin Dam Dewatering Project between 14 September 2021 and 30 September 2021 (348 days of pit pumping).

BC WQG = British Columbia water quality guideline; mg/L = milligrams per litre.

Figure 3.1-7: Total Nitrate Concentrations at CM_MC2 and CM_MC1 (top panel) and CM_CC1 (bottom panel), 2012 to 2021



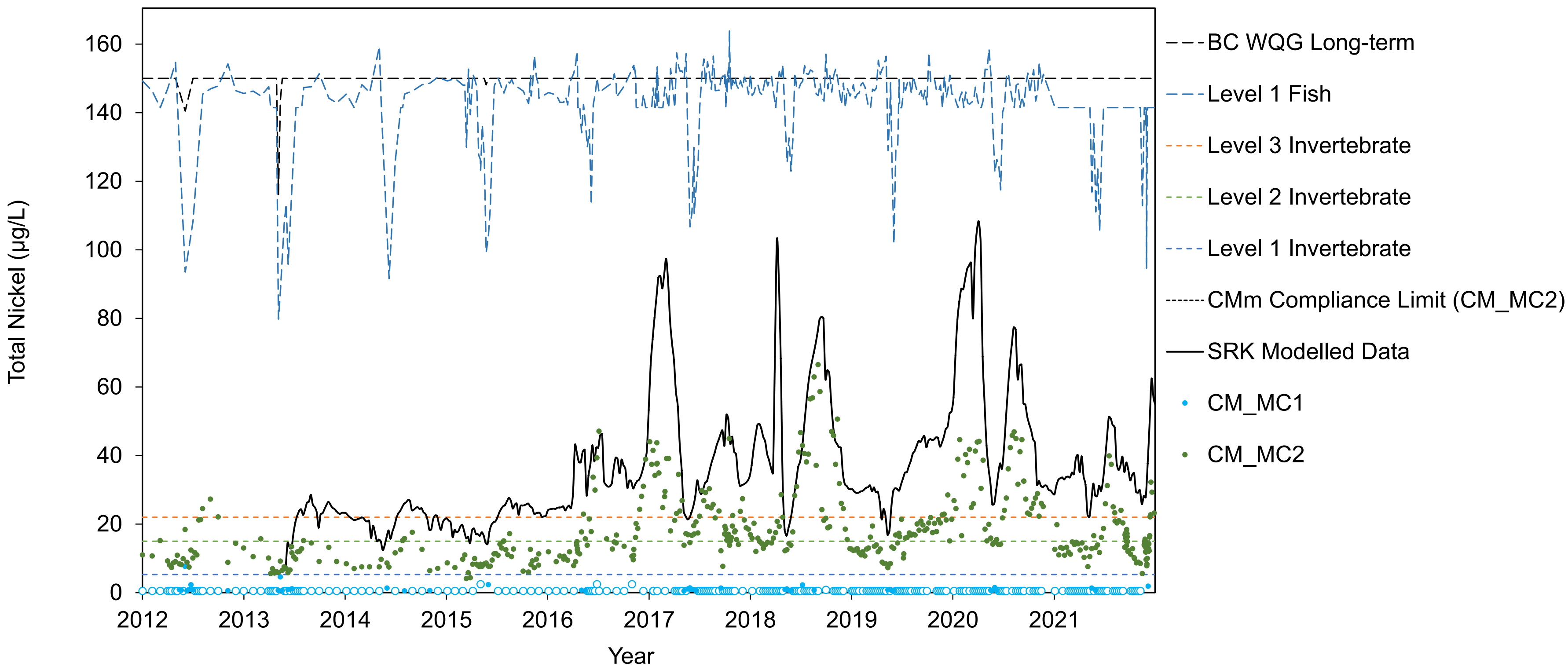


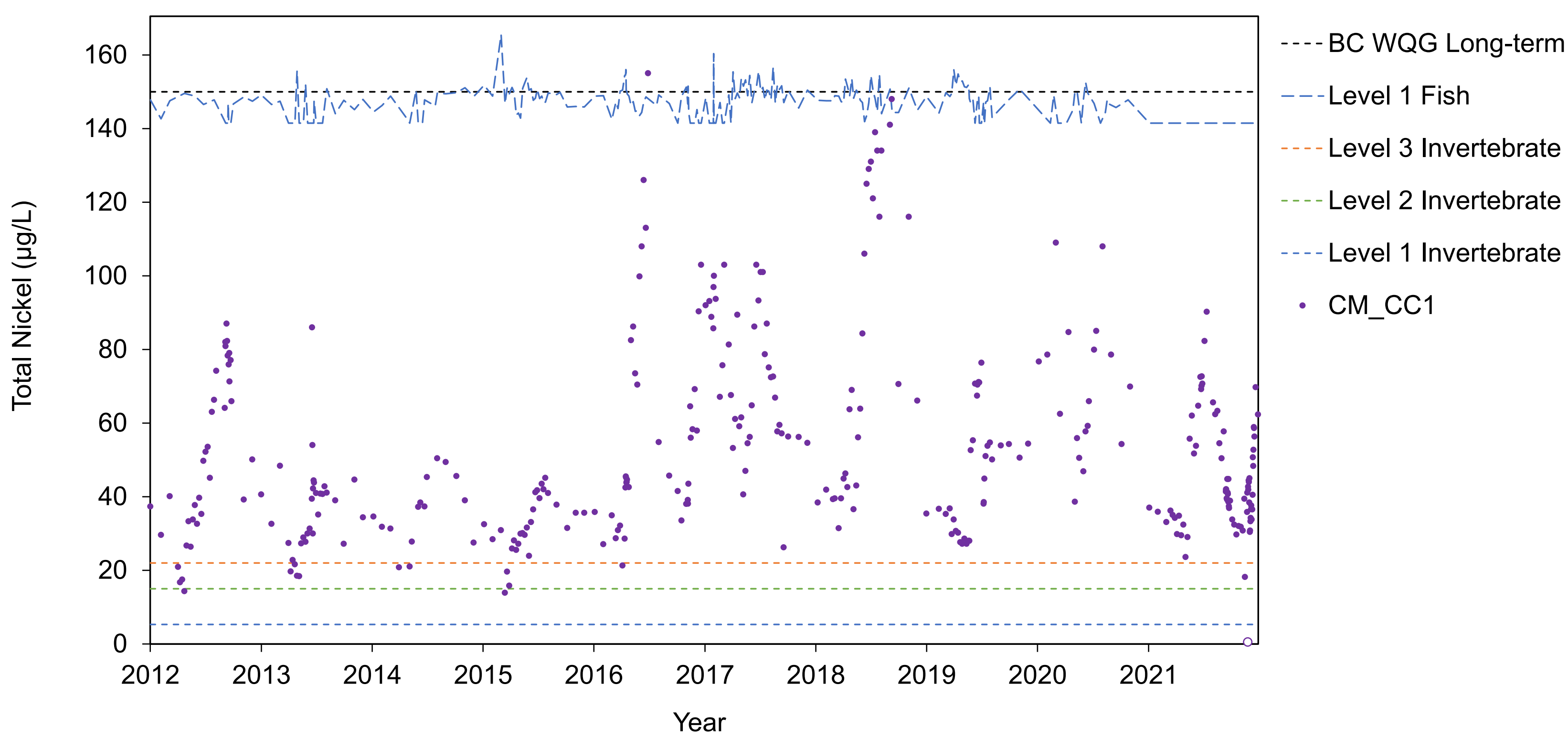
Notes: EVWQP screening values; level 3 invertebrate (12 to 52 mg/L), level 1 fish (5.0 to 22 mg/L), and level 1 amphibian (10 to 46 mg/L) not shown. Measured concentrations for CM_MC1, CM_MC2 and CM_CC1 are shown as blue, green, and purple circles and SRK modelled data are represented by the solid black line in the upper panel. Open symbols indicate non-detects.

The end of active operations occurred in 2018. Near the end of 2018, a flush of accumulated constituents was observed in Corbin Creek and Michel Creek water as a result of re-handled waste rock that occurred in 2016 and 2017. In 2019, coal was no longer being washed. Active dewatering of 34 Pit was initiated in 2019; dewatering of 6 Pit did not commence until 2020. Pit pumping from 34 Pit occurred between 3 June 2019 and 9 September 2020 (463 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 7 September 2021 and 4 November 2021 (334 days of pit pumping). Pit pumping from 6 Pit occurred between 6 May 2020 and 6 December 2020 (218 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 14 September 2021 and 30 September 2021 (348 days of pit pumping).

BC WQG = British Columbia water quality guideline; mg/L = milligrams per litre.

Figure 3.1-8: Total Nickel Concentrations at CM_MC2 and CM_MC1 (top panel) and CM_CC1 (bottom panel), 2012 to 2021



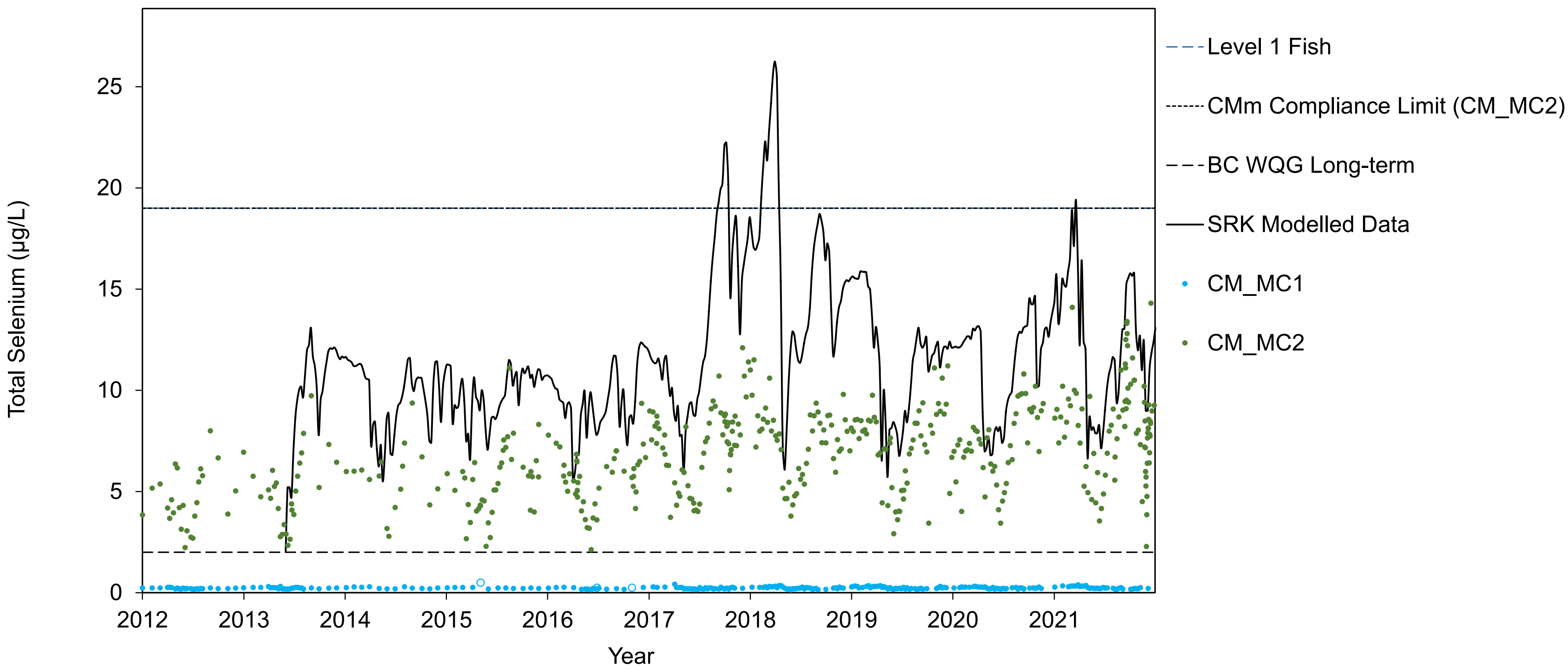


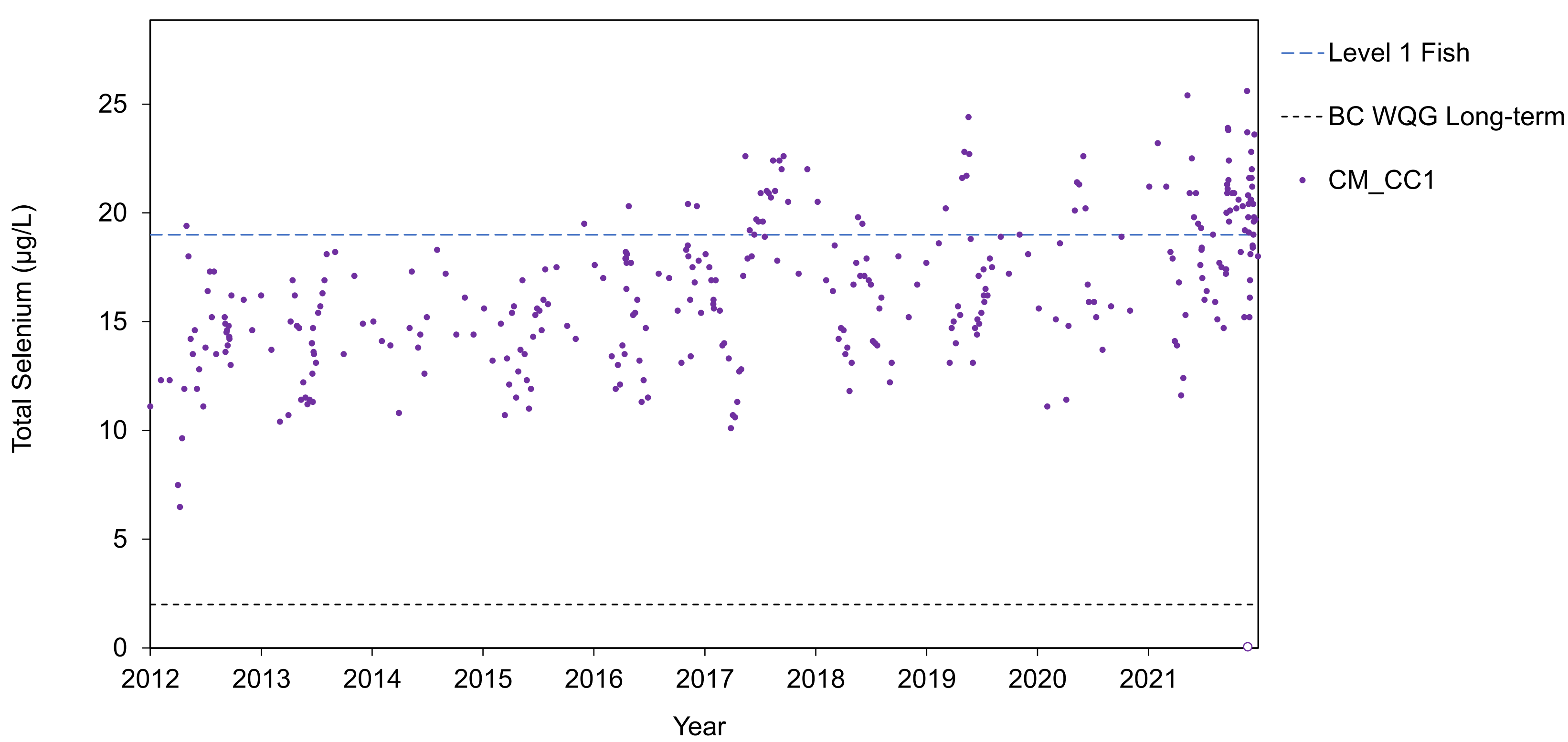
Notes: SRK modelled projections for dissolved nickel (SRK 2022). These projections were included for comparisons to total nickel. EVWQP screening values; level 2 fish (114 to 255 µg/L) not shown. Measured concentrations for CM_MC1, CM_MC2 and CM_CC1 are shown as blue, green, and purple circles and SRK modelled data are represented by the solid black line in the upper panel. Open symbols indicate non-detects.

The end of active operations occurred in 2018. Near the end of 2018, a flush of accumulated constituents was observed in Corbin Creek and Michel Creek water as a result of re-handled waste rock that occurred in 2016 and 2017. In 2019, coal was no longer being washed. Active dewatering of 34 Pit was initiated in 2019; dewatering of 6 Pit did not commence until 2020. Pit pumping from 34 Pit occurred between 3 June 2019 and 9 September 2020 (463 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 7 September 2021 and 4 November 2021 (334 days of pit pumping). Pit pumping from 6 Pit occurred between 6 May 2020 and 6 December 2020 (218 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 14 September 2021 and 30 September 2021 (348 days of pit pumping).

BC WQG = British Columbia water quality guideline; µg/L = micrograms per litre.

Figure 3.1-9: Total Selenium Concentrations at CM_MC2 and CM_MC1 (top panel) and CM_CC1 (bottom panel), 2012 to 2021





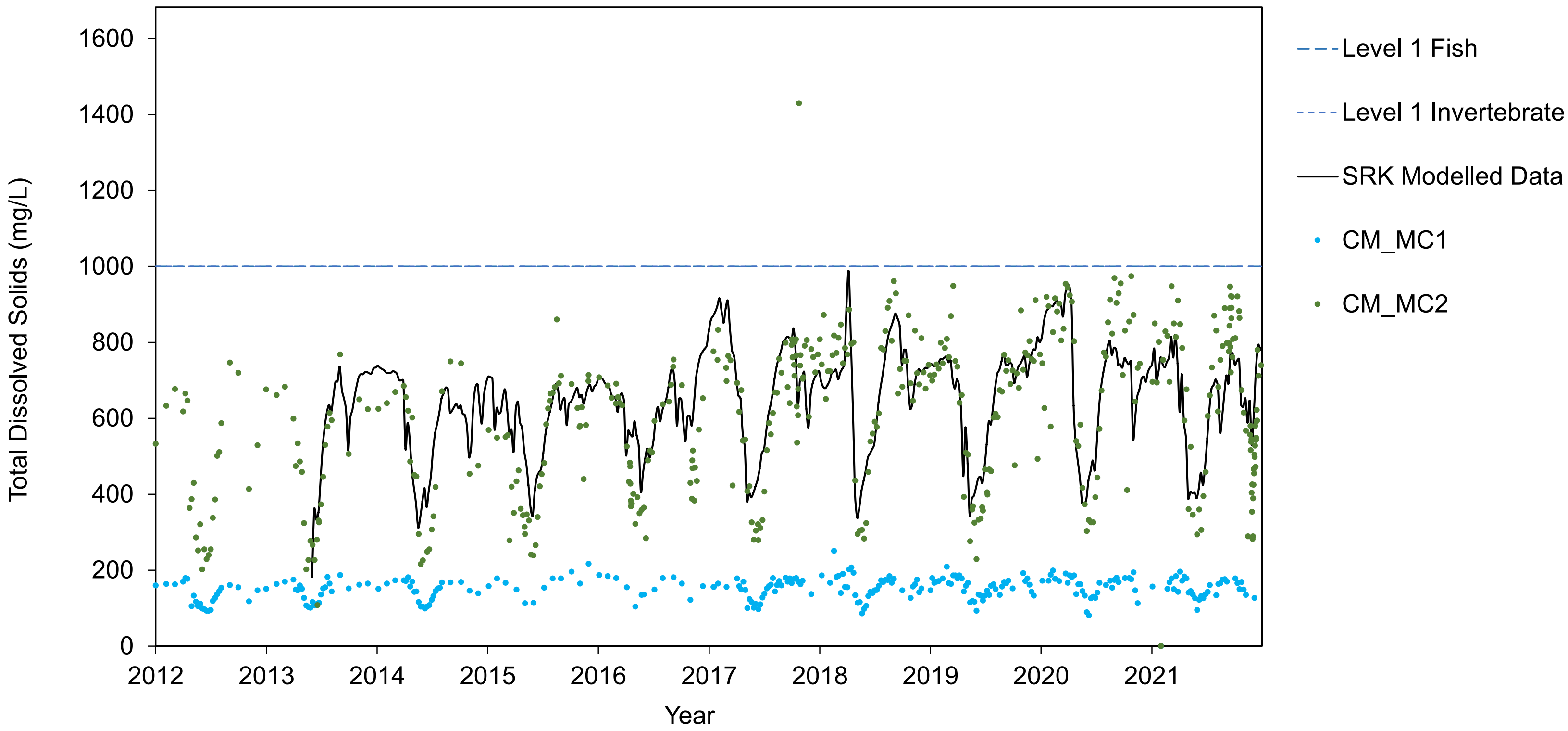
Notes: SRK modelled projections for dissolved selenium (SRK 2022). These projections were included for comparisons to total selenium. Measured concentrations for CM_MC1, CM_MC2 and CM_CC1 are shown as blue, green, and purple circles and SRK modelled data are represented by the solid black line in the upper panel.

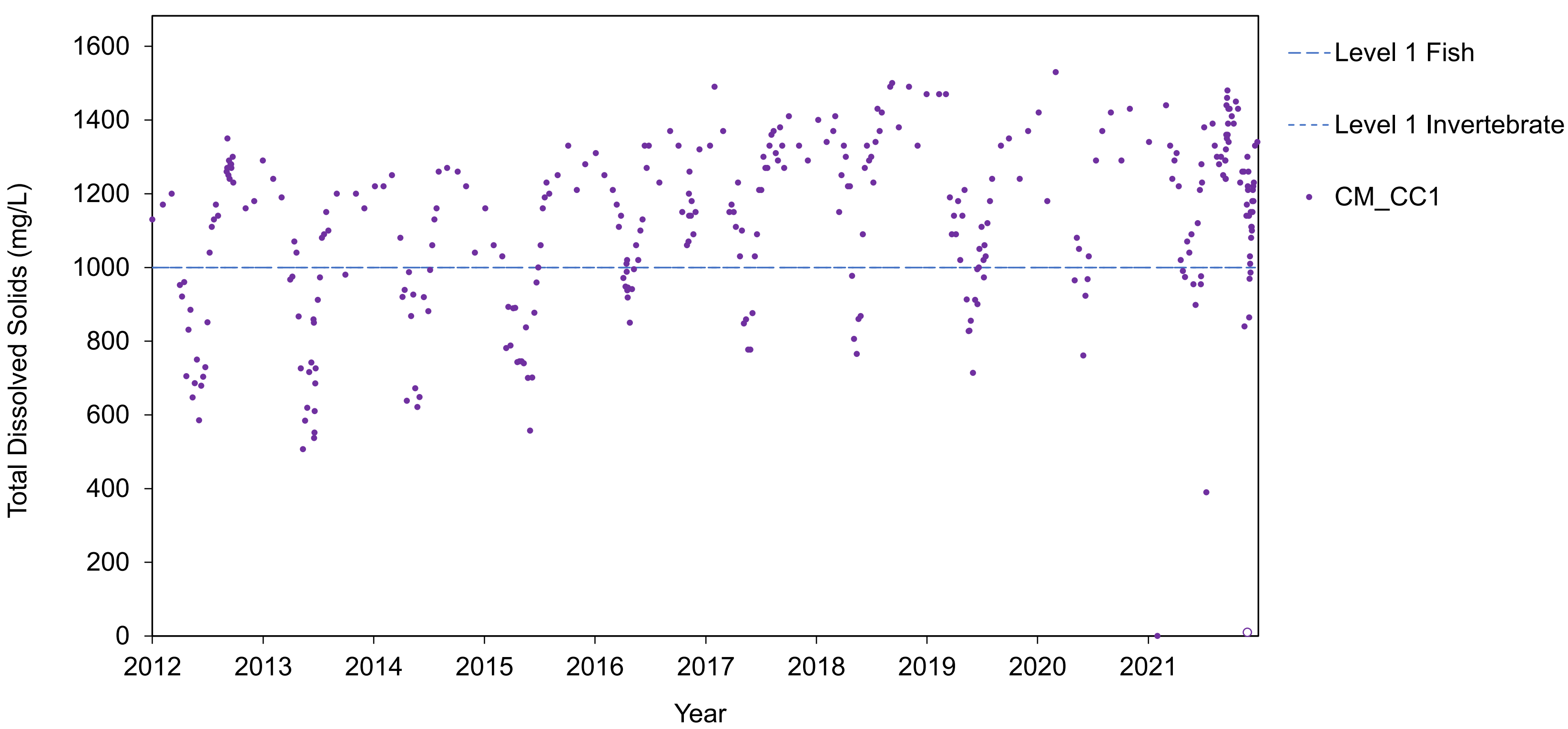
EVWQP screening values; level 1 invertebrate (104 µg/L), level 2 fish (74 µg/L), level 1 adult bird (203 µg/L), and level 1 juvenile bird (394 µg/L) not shown.

The end of active operations occurred in 2018. Near the end of 2018, a flush of accumulated constituents was observed in Corbin Creek and Michel Creek water as a result of re-handled waste rock that occurred in 2016 and 2017. In 2019, coal was no longer being washed. Active dewatering of 34 Pit was initiated in 2019; dewatering of 6 Pit did not commence until 2020. Pit pumping from 34 Pit occurred between 3 June 2019 and 9 September 2020 (463 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 7 September 2021 and 4 November 2021 (334 days of pit pumping). Pit pumping from 6 Pit occurred between 6 May 2020 and 6 December 2020 (218 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 14 September 2021 and 30 September 2021 (348 days of pit pumping).

BC WQG = British Columbia water quality guideline; µg/L = micrograms per litre.

Figure 3.1-10: Total Dissolved Solids Concentrations at CM_MC2 and CM_MC1 (top panel) and CM_CC1 (bottom panel), 2012 to 2021



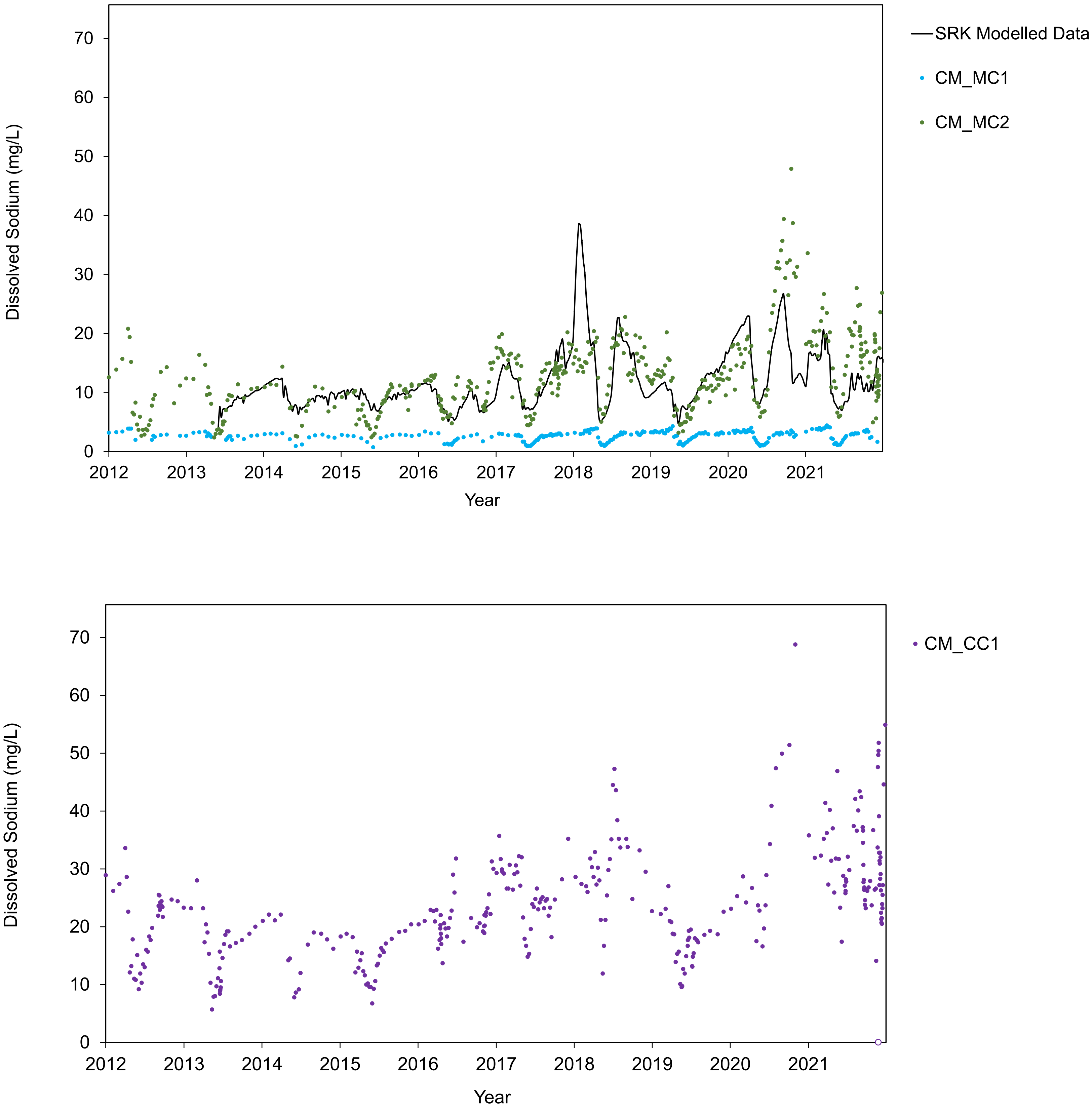


Notes: EVWQP screening values; level 2 invertebrate (1,750 mg/L), level 2 fish (2,000 mg/L) not shown. Measured concentrations for CM_MC1, CM_MC2 and CM_CC1 are shown as blue, green, and purple circles and SRK modelled data are represented by the solid black line in the upper panel.

The end of active operations occurred in 2018. Near the end of 2018, a flush of accumulated constituents was observed in Corbin Creek and Michel Creek water as a result of re-handled waste rock that occurred in 2016 and 2017. In 2019, coal was no longer being washed. Active dewatering of 34 Pit was initiated in 2019; dewatering of 6 Pit did not commence until 2020. Pit pumping from 34 Pit occurred between 3 June 2019 and 9 September 2020 (463 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 7 September 2021 and 4 November 2021 (334 days of pit pumping). Pit pumping from 6 Pit occurred between 6 May 2020 and 6 December 2020 (218 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 14 September 2021 and 30 September 2021 (348 days of pit pumping).

mg/L = milligrams per litre.

Figure 3.1-11: Dissolved Sodium Concentrations at CM_MC2 and CM_MC1 (top panel) and CM_CC1 (bottom panel), 2012 to 2021



Notes: Measured concentrations for CM_MC1, CM_MC2 and CM_CC1 are shown as blue, green, and purple circles and SRK modelled data are represented by the solid black line in the upper panel.

The end of active operations occurred in 2018. Near the end of 2018, a flush of accumulated constituents was observed in Corbin Creek and Michel Creek water as a result of re-handled waste rock that occurred in 2016 and 2017. In 2019, coal was no longer being washed. Active dewatering of 34 Pit was initiated in 2019; dewatering of 6 Pit did not commence until 2020. Pit pumping from 34 Pit occurred between 3 June 2019 and 9 September 2020 (463 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 7 September 2021 and 4 November 2021 (334 days of pit pumping). Pit pumping from 6 Pit occurred between 6 May 2020 and 6 December 2020 (218 days of pit pumping) and throughout 2021 with a pause for the Corbin Dam Dewatering Project between 14 September 2021 and 30 September 2021 (348 days of pit pumping).

mg/L = milligrams per litre.

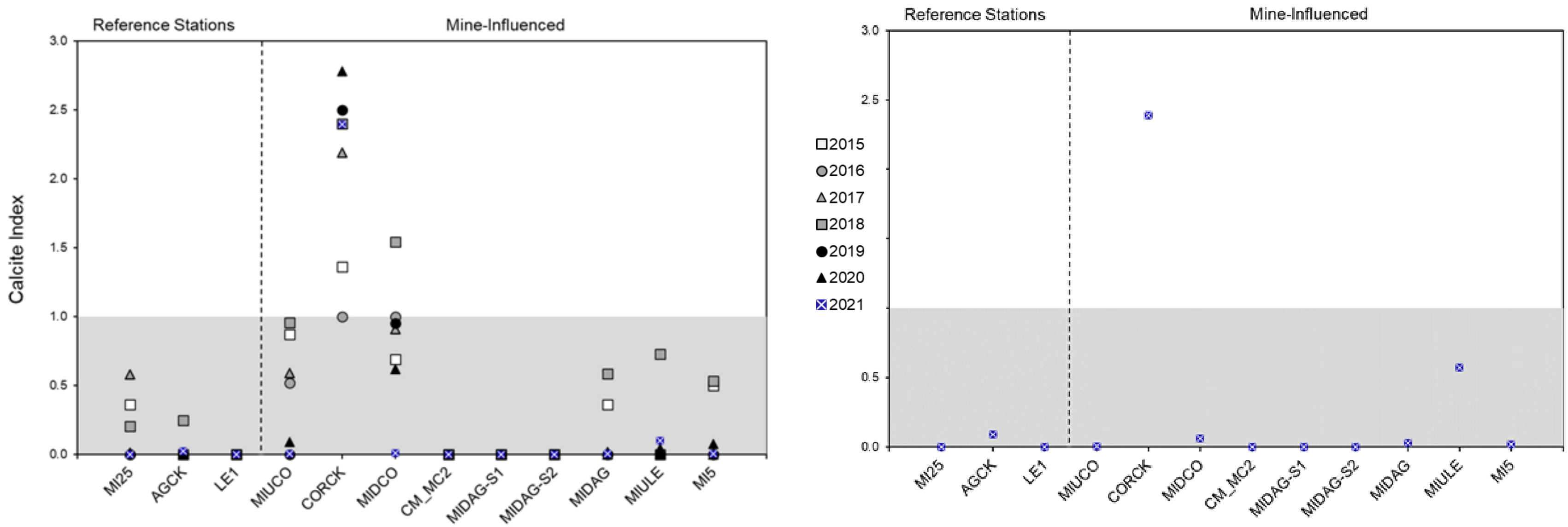
3.2 Calcite Index

Teck initiated a regional calcite monitoring program in 2013 to document calcite conditions in tributary and mainstem areas of the Elk River watershed (Robinson and Atherton 2016). In 2021, the regional calcite program sampled 174 reaches and 346 sites. Of these, 29 reaches in 21 mine-influenced streams had concretion scores above the 2024 Site Performance Objective of 0.5 (Robinson et al. 2021). Within the CMm area, CORB1 and CORB2 on Corbin Creek had concretion scores above 0.5. These calcite results are not co-located with biological monitoring under the RAEMP or LAEMPs and are not specific to the habitats sampled under those programs. Therefore, the calcite monitoring program results cannot be directly related to biological conditions to evaluate potential effects of calcite on biota. Rather, the regional calcite monitoring program focuses on evaluating broad stream reaches, integrating across habitat types to provide a regional overview of calcite conditions.

To evaluate potential effects of calcite on biota, site-specific calcite monitoring is also conducted as part of the RAEMP and other biological monitoring programs, including the CMm LAEMP. Because this monitoring is targeted to the riffle habitats that are sampled for biota, results of this monitoring are not directly comparable to the regional program. Where the two programs give different results in the same watercourse, the calcite measurements taken under the biological monitoring programs are considered to be more directly relevant to potential effects of calcite on the BIC.

Calcite measurements taken for the CMm LAEMP in 2021 were within the reference normal range of 0 to 1 at reference stations and in Michel Creek (Figure 3.2-1; Appendix F), using both the historical calcite presence binary method and trial calcite presence proportional (CP') method (Section 2.2). Calcite index values above the reference normal range were observed at CORCK in all years except 2016. In Michel Creek, the calcite index value was above the reference normal range only at MIDCO in 2018. Calcite index values at MIDCO have been near the upper end of the reference normal range since 2016, but in 2021 the calcite index value at MIDCO was less than 0.1 (Appendix F). Calcite index values in Corbin creek (CORCK) have been higher relative to stations in Michel Creek. Calcite index values increased between 2016 and 2020, with a decrease between 2020 and 2021; the highest values were observed in 2020 in Corbin Creek.

Figure 3.2-1: Spatial Variation in Calcite Index using the Historic Method (left panel) and (b) the Trial CPI Method (right panel), in the CMm LAEMP Study Area



Notes: Grey shading represents the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data from the RAEMP (Minnow 2018b).

3.3 Sediment Quality

Sediment quality data screening and spatial trends in sediment quality data are summarized in Sections 3.3.1 and 3.3.2. Tabulated data and supplementary plots are provided in Appendix G and Appendix H.

3.3.1 Data Screening

Sediment quality results were screened against the BC WSQG for the protection of aquatic life (BC MOE 2021a,b) and are provided in Appendix H. A summary of metal and polycyclic aromatic hydrocarbon (PAH) constituents with concentrations greater than BC WSQGs is provided in Tables 3.3-1 and 3.3-2. Plots showing spatial trends of metal constituents with concentrations higher than BC WSQGs are provided in Figure 3.3-1 and plots for the remaining constituents are provided in Appendix G. Substrate composition, sediment texture, grain size and sediment TOC content are provided in Section 3.4.

3.3.2 Spatial Trends

Metal concentrations[3] above lower BC WSQGs were observed at both reference and mine-influenced stations in 2021 (Table 3.3-1; Figure 3.3-1). Metals above the lower BC WSQGs at mine-influenced stations were arsenic, cadmium, iron, manganese, nickel, selenium, and zinc; with the exceptions of selenium, these metals were also above BC WSQGs at one or more reference stations. Metal concentrations that were above the upper BC WSQGs were cadmium, manganese, nickel and zinc at CORCK and MIUCO, and nickel concentrations at MIDCO and MIDAG in Michel Creek downstream of CORCK. Key spatial patterns in sediment quality results for metals in 2021 were:

- Concentrations of 15 constituents in sediment were lower at CORCK relative to Michel Creek, including aluminum, arsenic, beryllium, boron, chromium, copper, iron, lead, lithium, molybdenum, phosphorous, potassium, thallium, titanium, and vanadium.
- Concentrations of 10 sediment constituents were highest at CORCK and declined in a downstream gradient in Michel Creek, including cadmium, calcium, cobalt, manganese, nickel, sodium, strontium, sulfur, uranium, and zinc.
- Concentrations of three sediment constituents were highest at the two most downstream stations in Michel Creek (MIULE and MI5): antimony, barium, and titanium.
- Downstream of MIDCO, metal concentrations were similar to or lower than concentrations at reference stations, with the exceptions of calcium, cobalt, nickel, selenium, sodium, sulfur, strontium, and tin, which had higher concentrations at one or more downstream stations compared to the reference stations.
- At MIUCO (which is upstream of the Corbin Creek confluence in Michel Creek) and at CORCK, cadmium, manganese, nickel and zinc concentrations were higher than at mine-influenced stations further downstream on Michel Creek, and were above the upper BC WSQG (Table 3.3-1).
- Concentrations of selenium were above the lower BC WSQG at CORCK and other Michel Creek stations, except MIUCO and MI5 (Figure 3.31). No spatial pattern in selenium was evident, and the highest concentrations were observed at CORCK, MIDAG, and MIULE. Replicates at these stations with relatively high selenium also had relatively high sulfur concentrations compared to other replicates within the same

[3] Metal concentrations used in data screening are the maximum of the replicate samples at each mine-influenced and reference station.

station, with the exception of one sample at MIDCO. This pattern may indicate that selenium was present in those samples in a sulfide containing mineral (Alexander et al. 2015).

- Concentrations of nickel (Figure 3.3-1) were above the lower BC WSQG at all stations and above the upper BC WSQG at MUICO, CORCK, MIDCO, and MIDAG. Nickel was observed to be highest at CORCK and declined in a downstream gradient.
- Concentrations of calcium, cobalt, sodium, sulfur, strontium, and tin were below the BC WSQGs at all stations. Calcium, cobalt, sodium, sulfur, and strontium concentrations were all highest at CORCK and declined in a downstream gradient. No spatial patterns were apparent for tin.

Polycyclic aromatic hydrocarbon concentrations were above the lower BC WSQGs at both reference and mine-influenced stations in 2021 (Table 3.3-2; Appendix G), whereas PAH concentrations above the upper BC WSQG occurred at CORCK and at stations downstream of CORCK on Michel Creek. Concentrations of PAHs were consistently highest at CORCK and declined in a downstream gradient in Michel Creek. These compounds are slow to degrade and tend to accumulate in habitats where they are found in association with fine sediments, and high TOC and detritus content (Newman and Unger 2003). However, substrate composition at reference and mine-influenced stations was mostly composed of cobble and gravel (>50%) or boulders, and TOC content, in small depositional areas near the erosional BIC habitat, was <10% (Section 3.4). Considering these habitat parameters, the PAH accumulation pattern observed does not align with the habitat variables in the study area. Additional studies on PAH accumulation are being completed outside the scope of the CMm LAEMP which will be considered in future reports for interpretation of the PAH results.

3.3.3 Temporal Trends

An increase in concentrations were observed for cadmium, selenium, and zinc at CORCK from 2018 to 2019 followed by a decrease in 2020 and a further decrease in 2021, while concentrations of cobalt, nickel and strontium remained similar between 2021 and 2020 (Figure 3.3-1; Appendix G). In contrast, a decrease between 2018 and 2019 was observed at MIDCO for cobalt, nickel, selenium, strontium, and uranium this was followed by an increase in 2020, with similar concentrations observed in 2021compared to 2020. A similar pattern was not observed in water chemistry, indicating that this observation may reflect spatial variability in sediment quality within each station. With the exception of selenium (which increased between 2019 and 2020 followed by a decrease in 2021), concentrations of metals at stations downstream in Michel Creek were generally similar or lower in 2020 and 2021 compared to 2019.

Table 3.3-1: Summary of Sediment Quality Screening Exceedances for Metals at CMm, September 2021

Constituent	BC Lower WSQG (mg/kg dw)	BC Upper WSQG (mg/kg dw)	Maximum Concentration (mg/kg dw)[(a)]							
			Reference Stations		Mine-influenced Stations					
			MI25	LEI	MIUCO	CORCK	MIDCO	MIDAG	MIULE	MI5
Arsenic	5.9	17	**12.3**	**6.56**	**7.43**	-	**7.66**	**7.83**	**9.15**	**7.53**
Cadmium	0.6	3.5	**1.47**	**2.12**	**5.11**	**9.26**	**1.44**	**1.44**	**1.26**	**1.23**
Iron	21,200	43,766	**25,500**	-	**22,000**	-	-	-	-	-
Manganese	460	1,100	**541**	-	**1,730**	**2,720**	**1,040**	**493**	-	-
Nickel	16	75	**33.3**	**27.6**	**171**	**304**	**125**	**80**	**46.3**	**29.3**
Selenium	1.9	-	-	-	-	**3.19**	**2.76**	**2.18**	**3.07**	-
Zinc	123	315	**152**	-	**438**	**782**	**146**	**157**	-	-

Note: Stations are ordered upstream to downstream.

a) Concentrations shown are the maximum of the replicate samples at each mine-influenced and reference station.

Bolded values exceed the lower BC WSQG for the protection of aquatic life (BC MOE 2021a,b).

Shaded values exceed the upper BC WSQG for the protection of aquatic life (BC MOE 2021a,b).

"-" = no data available or values below detection limit; mg/kg dw = milligram per kilogram dry weight; WSQG = working sediment quality guideline; CMm = Coal Mountain Mine.

Table 3.3-2: Summary of Sediment Quality Screening Exceedances for Polycyclic Aromatic Hydrocarbons at CMm, September 2021

Constituent	BC Lower WSQG (mg/kg dw)	BC Upper WSQG (mg/kg dw)	Maximum Concentration (mg/kg dw)[(a)]							
			Reference Stations		Mine-influenced Stations					
			MI25	LEI	MIUCO	CORCK	MIDCO	MIDAG	MIULE	MI5
Acenaphthene	0.0067	0.089	-	-	-	**0.13**	-	-	-	-
Acenaphthylene	0.0059	0.13	-	-	-	**0.018**	-	-	-	-
Benz(a)anthracene	0.032	0.39	-	-	-	**0.16**	**0.12**	-	-	-
Benzo(a)pyrene	0.032	0.78	-	-	-	**0.12**	-	-	-	-
Benzo(g,h,i)perylene	0.17	3.2	-	-	-	**0.29**	-	-	-	-
Chrysene	0.057	0.86	-	**0.06**	**0.075**	**0.74**	**0.12**	-	-	-
Dibenz(a,h)anthracene	0.0062	0.14	-		**0.0069**	**0.0066**	-	-	-	-
Fluorene	0.021	0.14	-	-	-	**0.41**	**0.068**	-	-	-
2-Methylnaphthalene	0.020	0.2	-	**0.14**	**0.15**	**4.2**	**0.83**	**0.28**	**0.33**	**0.09**
Naphthalene	0.035	0.39	-	**0.071**	**0.098**	**1.35**	**0.31**	**0.19**	**0.16**	**0.042**
Phenanthrene	0.042	0.52	**0.067**	**0.21**	**0.18**	**2.13**	**0.54**	**0.34**	**0.32**	**0.12**
Pyrene	0.053	0.88	-	-	-	**0.26**	-	-	-	-
LMW PAH[(b)]	0.10	-	**0.44**	**0.66**	**0.71**	**11**	**2.4**	**1.8**	**1.2**	**0.42**
HMW PAH[(c)]	1.00	-	-	-	-	**3.48**	-	**2.3**	**1.3**	-
Total PAH	4.0	35	-	-	-	**14.69**	-	**4.2**	-	-

Note: Stations are ordered upstream to downstream.

a) Concentrations shown are the maximum of the replicate samples at each mine-influenced and reference station.

b) Low molecular weight PAHs are comprised of acenaphthene, acenaphthylene, acridine, anthracene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, and quinoline.

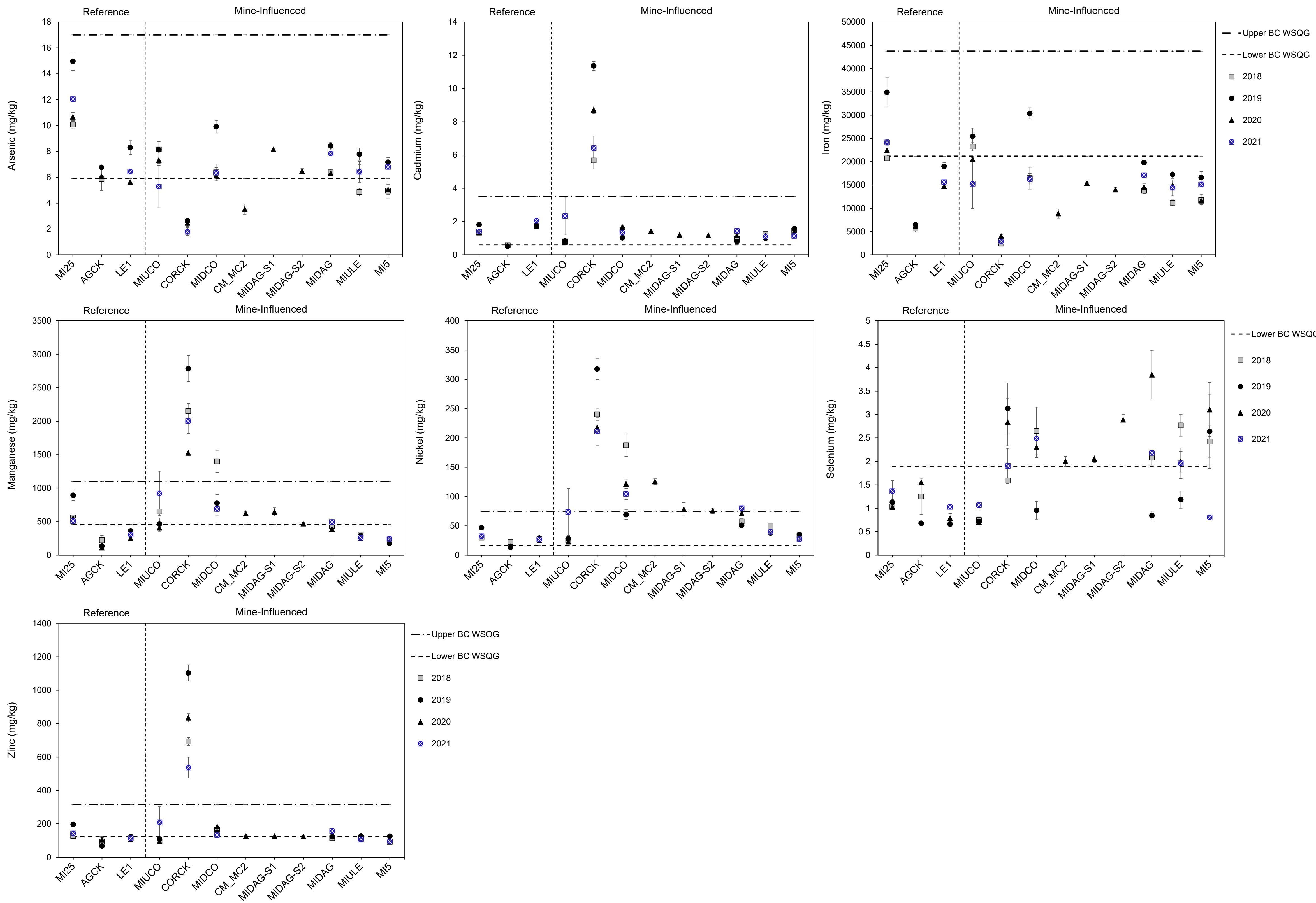
c) High molecular weight PAHs are comprised of benz(a)anthracene, benzo(a)pyrene, benzo(b&j)fluoranthene, benzo(b+j+k)fluoranthene, benzo(e)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, perylene, and pyrene.

Bolded values exceed the lower BC WSQG for the protection of aquatic life (BC MOE 2021a,b).

Shaded values exceed the upper BC WSQG for the protection of aquatic life (BC MOE 2021a,b).

"-" = values below WSQG or detection limit; mg/kg dw = milligram per kilogram dry weight; LMW = low molecule weight; PAH = polycyclic aromatic hydrocarbon; BC = British Columbia; WSQG = working sediment quality guidelines; CMm = Coal Mountain Mine.

Figure 3.3-1: Spatial Variation in Sediment Metal Concentrations in the CMm LAEMP Study Area, September 2018 to 2021



Notes: WSQG = working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine.

3.4 Physical Habitat Characteristics

Variation in physical habitat characteristics such as water depth, velocity, sediment particle size, and TOC can influence BIC structure in streams (Rosenberg and Resh 1992). Water depth ranged between 0.08 m and 0.25 m among sampling stations in 2021, and stream velocity ranged from 0.27 to 0.49 m/s (Table 3.4-1).

Field water quality measurements taken at the benthic invertebrate sampling stations in Michel Creek in 2021 indicated that pH was neutral to slightly basic (i.e., 7.4 to 8.8), the water was well oxygenated (i.e., 8.6 to 13.3 mg/L of DO), and these constituents were similar among stations (Table 3.4-1). Specific conductivity was lower at the reference stations and at MIUCO upstream of CMm (i.e., 190 to 347 µS/cm), and was higher at CORCK and MIDCO (i.e., 1,141 to 2,103 µS/cm). Water temperature was relatively similar among stations and ranged from 7.4 °C to 10.9 °C.

Based on visual examination of the area, substrate composition at both reference and mine-influenced stations was mostly composed of cobble and gravel (>50%), with the exception of MIUCO, which was mostly composed of boulder (Table 3.4-1; Figure 3.4-1; Appendix I). Sediment texture, based on the sediment samples collected near BIC stations not within the erosional habitat where BIC was collected, was sandy, silty loam, and particle size generally consisted of sand/silt, with low proportions of gravel and clay (Table 3.4-1; Figure 3.4-1; Appendix I). Sediment TOC content was similar among stations and was generally below 7% between 2018 and 2021, with the exception of AGCK (2018 and 2020), CORCK (2019 and 2020), MIDAG-S1 (2020), and MIDAG-S2 (2020), which had higher sediment TOC content, ranging from 7.1% to 9.5%.

Overall, physical habitat characteristics were similar between reference and mine-influenced stations and there was similar substrate composition and sediment particle size distribution between stations (Table 3.4-1; Figure 3.4-1; Appendix I).

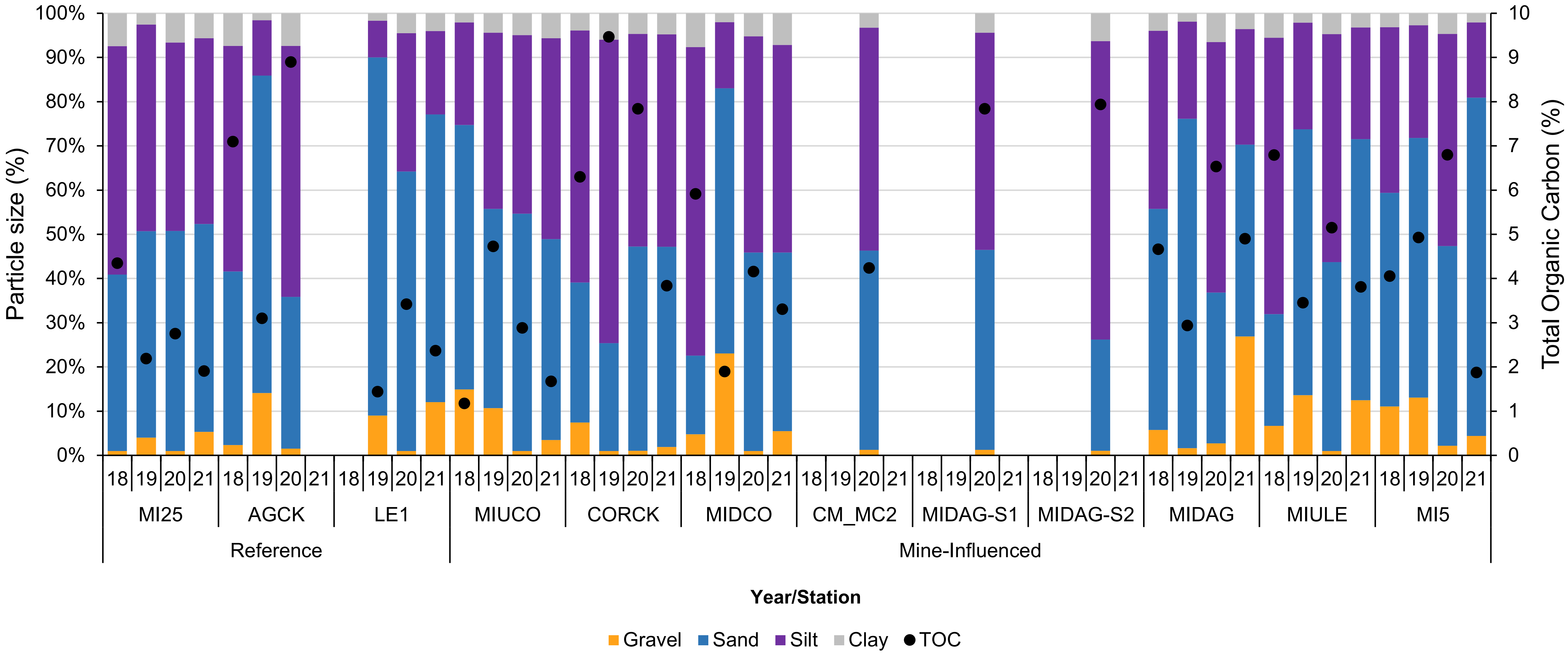
Table 3.4-1: Habitat Characteristics at Benthic Invertebrate Sampling Stations in the CMm LAEMP Study Area, September 2021

Parameter	Units	Reference Stations			Mine-Influenced Stations					
		MI25	AGCK	LEI	MIUCO	CORCK	MIDCO	MIDAG	MIULE	MI5
Physical Parameters										
Sample water depth	m	0.08	0.17	0.15	0.12	0.13	0.14	0.25	0.23	0.17
Velocity	m/s	0.28	0.32	0.32	0.30	0.27	0.41	0.34	0.43	0.49
Water temperature	°C	7.9	7.4	9.0	8.9	9.4	10.9	9.1	10.1	7.9
Dissolved oxygen	mg/L	13.3	11.3	10.3	8.6	10.1	8.5	9.4	9.8	11.4
Specific conductivity	µS/cm	288	290	190	347	2,103	1,141	704	581	672
pH	-	8.3	8.8	8.2	8.4	7.6	8.3	7.8	8.6	7.4
Organic Carbon										
Total organic carbon	%	1.9	-	2.4	1.7	3.8	3.3	4.9	3.8	1.9
Sediment Particle Size										
Clay (<0.004 mm)	%	6	-	4	6	5	7	4	3	2
Silt (0.004 to 0.06 mm)	%	42	-	19	46	48	47	26	25	17
Fine sand (0.06 to 0.25 mm)	%	37	-	44	20	40	21	16	38	67
Coarse sand (0.25 to 2.0 mm)	%	11	-	21	25	6	20	27	20	9
Gravel (>2.0 mm)	%	5	-	12	5	3	7	27	13	4
Substrate Composition										
Bedrock	%	0	0	0	0	0	5	0	0	0
Boulder	%	5	5	5	80	0	5	10	5	5
Cobble	%	85	85	85	10	5[(a)]	75	40	85	85
Gravel	%	5	5	5	0	0	5	40	5	5
Sand	%	5	5	5	5	0	5	5	5	5
Finer	%	5	0	0	5	0	5	5	0	0

a) Site was 95% calcite.

µS/cm = microsiemens per centimetre; - = no data.

Figure 3.4-1: Mean Particle Size and Total Organic Carbon in Sediment in the CMm LAEMP Study Area, September 2018 to 2021



CMm = Coal Mountain Mine.

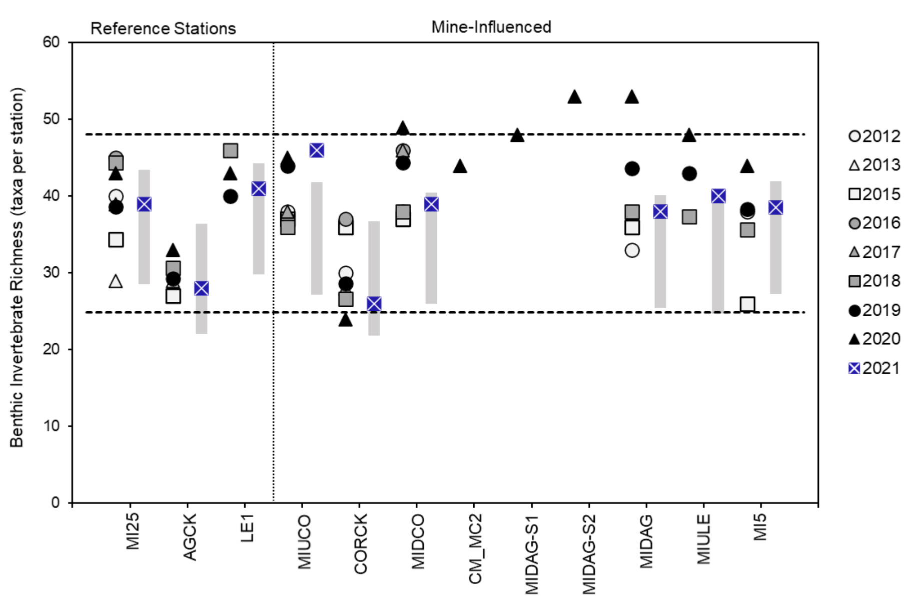
3.5 Benthic Invertebrate Community

3.5.1 Richness and Abundance

Benthic invertebrate richness was similar among stations between 2012 and 2021 but was greater in 2020 compared to other years. With one exception (i.e., MI25), there were no significant differences in richness in 2021 relative to previous years or throughout the monitoring period. At MI25, there was a significant decrease in richness from 2012 to 2013, where richness decreased from 40 to 29 taxa per station, respectively (Appendix J, Table J-5). Richness was within or above the site-specific and regional normal ranges at mine-influenced stations and reference stations in 2021 (Figure 3.5-1; Appendix J). Richness at CORCK was significantly lower than downstream stations (i.e., MIDCO to MI5; Appendix J, Table J-4), and the magnitude of difference was -2.1 SD based on the contrast mean (Section 2.5.3).

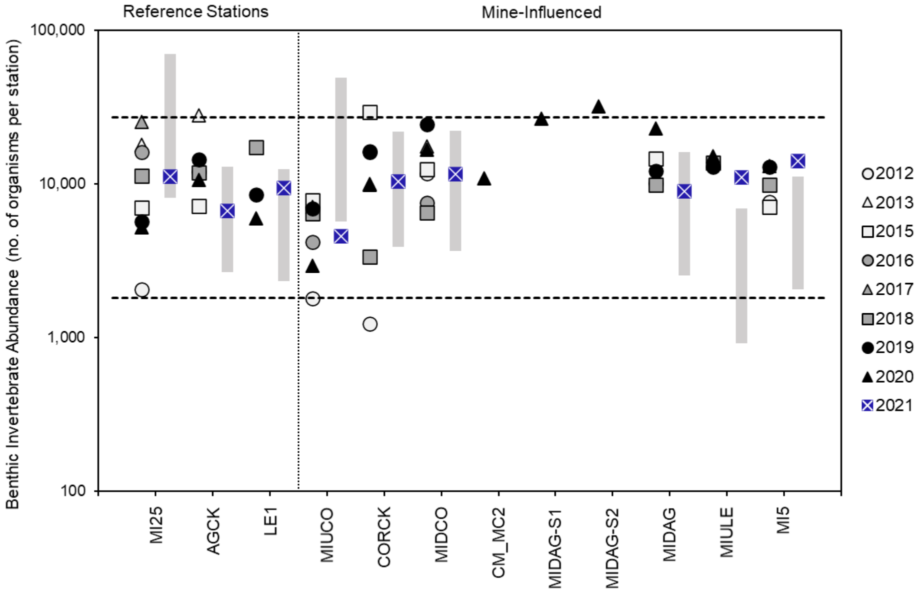
Benthic invertebrate abundance was similar among years between 2012 and 2021 (Figure 3.5-2), and there were no significant differences at mine-influenced stations in 2021 compared to previous years (i.e., 2012 to 2020), but abundance decreased at the reference station, AGCK, in 2021 compared to previous years. The magnitude of difference for AGCK abundance in 2021 was less than 2 SD, indicating that although statistically significant, the difference was likely not biologically meaningful (Appendix J, Table J-5). Abundance of benthic invertebrates was within or above the upper bound of the site-specific and regional normal ranges at all stations except MIUCO in 2021, and MIUCO was below the lower bound of the site-specific normal range (Figure 3.5-2). Spatially, invertebrate abundance was significantly lower at MIUCO compared to downstream and reference stations, with a magnitude of difference of -2.2 SD (Appendix J, Table J-4). Abundance at MIUCO has been historically lower compared to other stations in Michel Creek and is likely the result of differences in habitat rather than mine-influence because this station is located upstream of the influence from CMm (i.e., Corbin Creek).

Figure 3.5-1: Benthic Invertebrate Taxonomic Richness in the CMm LAEMP Study Area, September 2012 to 2021



Notes: Grey shading represents the 2021 site-specific normal ranges for comparisons to 2021 results only; data from 2012 to 2021 compared to each year's site-specific normal range are presented in Appendix J. The dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020a).

Figure 3.5-2: Benthic Invertebrate Abundance in the CMm LAEMP Study Area, September 2012 to 2021



Notes: Grey shading represents the 2021 site-specific normal ranges for comparisons to 2021 results only; data from 2012 to 2021 compared to each year's site-specific normal range are presented in Appendix J. The dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020a).

3.5.2 Community Composition

The BIC at the reference stations was dominated by Ephemeroptera in 2021, with minor differences in the proportion of the other major groups (Figure 3.5-3). Ephemeroptera also dominated the community at most mine-influenced stations in Michel Creek (i.e., MIUCO, MIDAG, MIULE, and MI5) between 2012 and 2021, with the exception of MI5, which was co-dominated by Ephemeroptera and Trichoptera in 2015 and 2019 (Figure 3.5-4). The BIC in Corbin Creek (i.e., CORCK) and in Michel Creek closest to CMm (i.e., MIDCO) were dominated by Diptera, with higher proportions of Chironomidae compared to reference stations and stations in Michel Creek farther downstream from CMm. Higher proportions of Oligochaeta were observed at CORCK from 2016 to 2021 compared to other stations. The relative proportion of major taxonomic groups at each exposure station has generally remained similar from 2012 to 2021, with greater variability among stations than years (Figure 3.5-4).

Acari (i.e., ticks and mites) have also been considered in the CMm LAEMP following review of the 2019 report and interest by the EMC (Golder 2020a). In 2021, Acari comprised less than 1% to 3% of the community at the exposure stations and up to 1% at reference stations. There were no clear spatial patterns in the proportion of the community belonging to Acari downstream of CMm.

Figure 3.5-3: Benthic Invertebrate Community Composition at Reference Stations in the CMm LAEMP Study Area, September 2012 to 2021

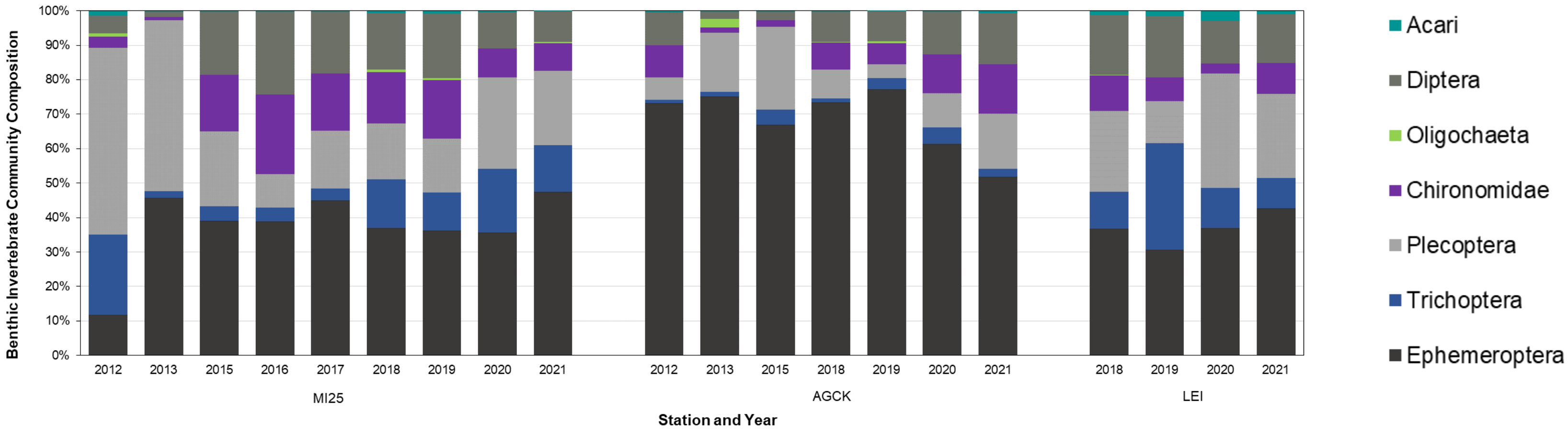
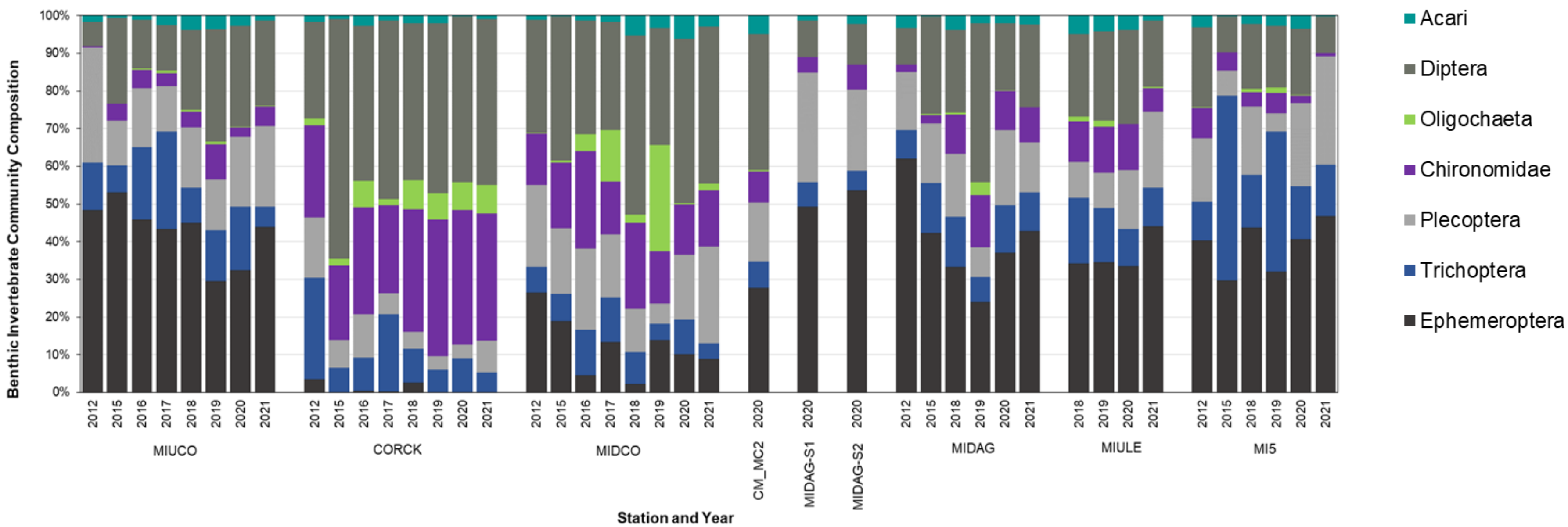


Figure 3.5-4: Benthic Invertebrate Community Composition at Mine-influenced Stations in the CMm LAEMP Study Area, September 2012 to 2021

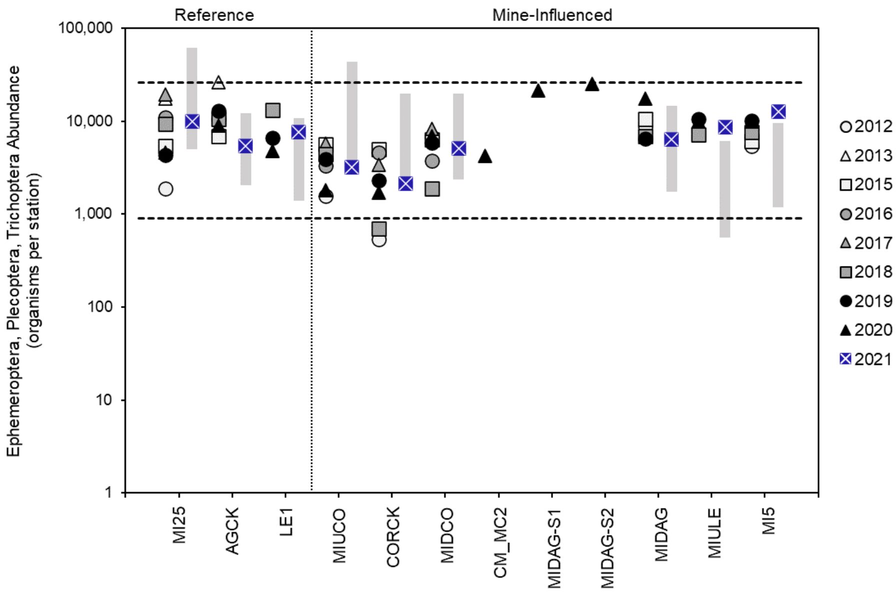


3.5.3 Ephemeroptera, Plecoptera, Trichoptera Abundance

Key spatial and temporal patterns in the abundance and proportion of EPT taxa (i.e., % EPT) were:

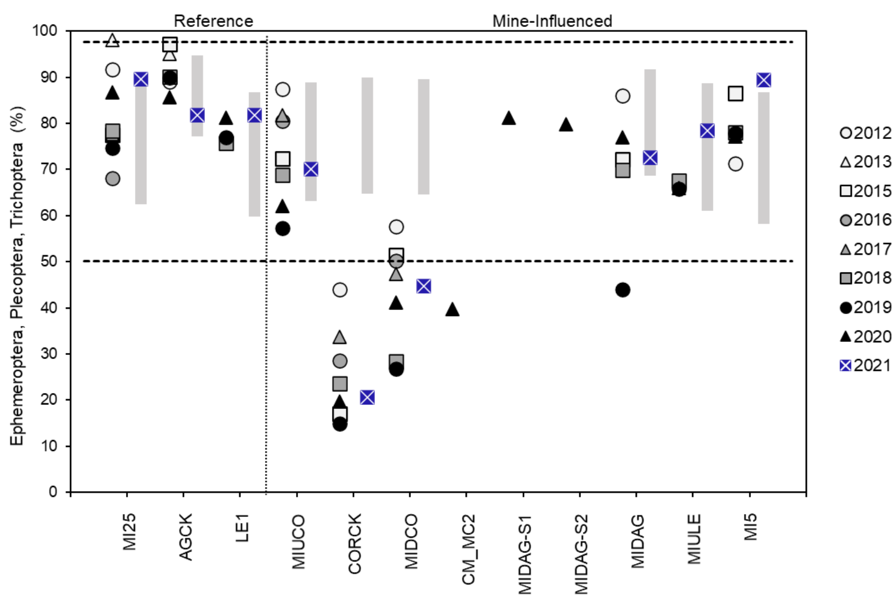
- EPT abundance was generally within or above the site specific and regional normal ranges at reference and mine influenced stations in Michel Creek between 2012 and 2021, except at MIUCO and CORCK where it was below the site-specific normal range in 2021 (Figure 3.5-5). At CORCK, EPT abundance was also below the lower boundary of the regional normal range in 2012 and 2018, and was significantly lower than the mean of the reference stations by a magnitude of difference greater than 2 SDs (Appendix J, Table J-4).
- EPT abundance at various reference stations was significantly lower in 2013, 2015, 2020, and 2021 compared to prior years (magnitude of difference up to -2.2 SD; Appendix J, Table J-5), indicating changes throughout the monitoring period unrelated to the Mine.
- EPT abundance at exposure stations did not differ in 2019, 2020, and 2021 compared to prior years.
- At reference stations and at mine-influenced stations, % EPT was within the site specific and regional normal ranges, except at CORCK and MIDCO in 2021 (Figure 3.5 6; Appendix J). Throughout the timeseries, % EPT was below the regional normal range at CORCK (2012 to 2021), MIDCO (2017 to 2021), CM_MC2 (2020) and MIDAG (2019).
- At CORCK, MIDCO, and MIDAG, % EPT was significantly lower in 2021 compared to downstream and reference stations, with magnitudes of difference of 2 SD or greater (Appendix J, Table J-4).
- In 2021, % EPT at stations downstream of CORCK in Michel Creek did not significantly differ from previous years, except for an increase at MIULE (Appendix J, Table J-5). In other years, % EPT was significantly lower at MIUCO in 2018, 2019, and 2020 and at MIDCO in 2018 and 2019 compared to previous years, and at MIDAG in 2019 compared to 2012 to 2018. The magnitudes of differences among years ranged from -0.7 to -5.8 SD. At reference station AGCK in 2021, % EPT was significantly lower compared to previous years (2012 to 2020), but the magnitude of difference was within 2 SD, indicating this difference was not biologically meaningful (Section 2.5.3).

Figure 3.5-5: Ephemeroptera, Plecoptera, Trichoptera Abundance in the CMm LAEMP Study Area, September 2012 to 2021



Notes: Grey shading represents the 2021 site-specific normal ranges for comparisons to 2021 results only; data from 2012 to 2021 compared to each year's site-specific normal range are presented in Appendix J. The dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020a).

Figure 3.5-6: Ephemeroptera, Plecoptera, Trichoptera Proportion in the CMm LAEMP Study Area, September 2012 to 2021



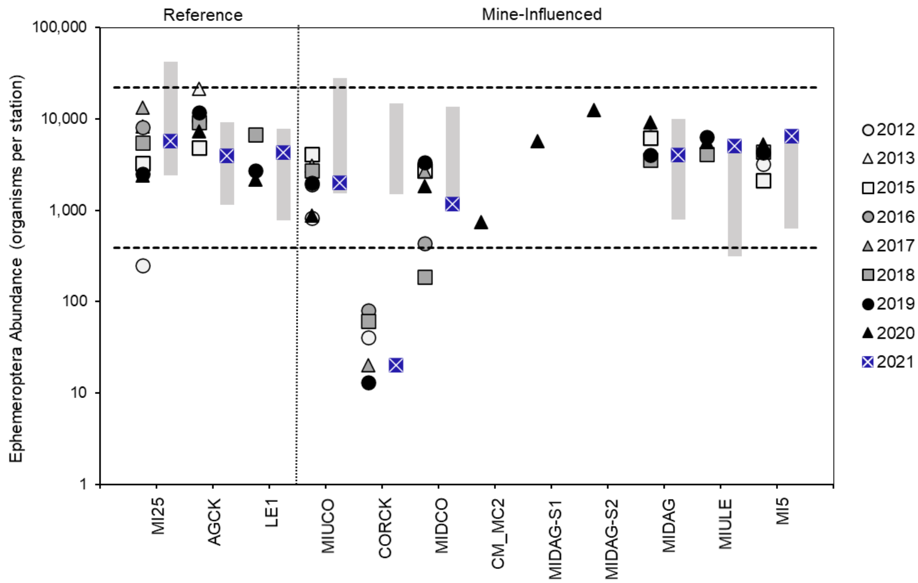
Notes: Grey shading represents the 2021 site-specific normal ranges for comparisons to 2021 results only; data from 2012 to 2021 compared to each year's site-specific normal range are presented in Appendix J. The dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020a).

Ephemeroptera Abundance

Key spatial and temporal patterns in the abundance and proportion of Ephemeroptera taxa (i.e.,%E) were:

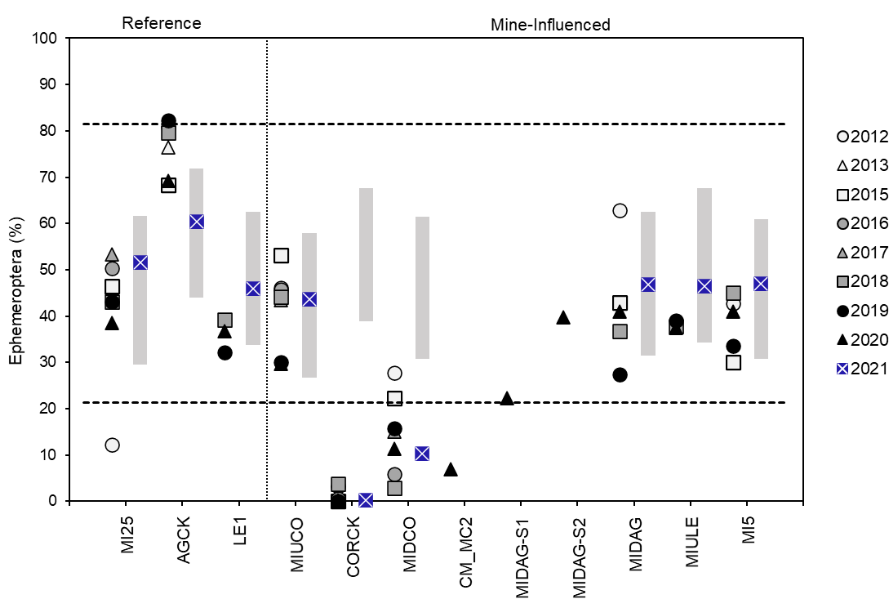
- At mine-influenced stations closest to CMm (i.e., CORCK and MIDCO), Ephemeroptera abundance was significantly lower in 2021 compared to downstream and reference stations, with magnitudes of difference of -1.8 and -2.0 SD, respectively (Appendix J, Table J-4).
- Ephemeroptera abundance was within or above the site-specific and regional normal ranges at reference and mine-influenced stations between 2012 to 2021, except for samples collected at CORCK (2012 to 2021), MIDCO (2016 and 2018), and MI25 (2012), which were below the regional normal range (Figure 3.5-7).
- Ephemeroptera abundance was significantly lower at AGCK in 2021 compared to previous years (2012 to 2020), although magnitudes of difference were less than 2 SD (Appendix J, Table J-5), indicating this difference was likely not biologically meaningful (Section 2.5.3).
- Ephemeroptera abundance at MIDCO was not significantly different from previous years (i.e., 2012 to 2020) in 2021 but was significantly lower in 2016 and 2018, compared to previous years with magnitudes of differences greater than 2 SD (Appendix J, Table J-5).
- With the exception of samples collected at CORCK and MIDCO, % E was within the site-specific and regional normal ranges in 2021 at reference and mine-influenced stations. Throughout the timeseries, % E was below the regional normal range at CORCK (2012 to 2021), MIDCO (2013 to 2021), CM_MC2 (2020), MIDAG (2019), and MI25 (2012) (Figure 3.5-8).
- In 2021, % E was significantly lower at mine-influenced stations closest to CMm (i.e., CORCK and MIDCO) compared to downstream and reference stations, with magnitudes of difference of -2.4 and -7.4 SD, respectively (Appendix J, Table J-4).
- At mine-influenced stations in 2021, % E did not differ significantly from previous years (2012 to 2020) (Appendix J, Table J-5); % E at the reference station AGCK was lower in 2021 than in prior years, indicating that this change was unrelated to the Mine. The magnitude of effect for % E at AGCK was -2.1 SD.
- Percent E was significantly lower at: MIUCO in 2019 and 2020 compared to previous years (2012 to 2018), at MIDCO in 2016 and 2018 compared to previous years, and at MIDAG in 2019 compared to 2012 to 2018, with magnitudes of difference between -1.3 and -5.5 SD.

Figure 3.5-7: Ephemeroptera Abundance in the CMm LAEMP Study Area, September 2012 to 2021



Notes: Grey shading represents the 2021 site-specific normal ranges for comparisons to 2021 results only; data from 2012 to 2021 compared to each year's site-specific normal range are presented in Appendix J. The dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020a). No Ephemeroptera were collected at CORCK in 2015 and 2020; therefore, these years are not shown on the plot for these locations.

Figure 3.5-8: Ephemeroptera Proportion in the CMm LAEMP Study Area, September 2012 to 2021



Notes: Grey shading represents the 2021 site-specific normal ranges for comparisons to 2021 results only; data from 2012 to 2021 compared to each year's site-specific normal range are presented in Appendix J. The dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020a).

3.5.4 Benthic Invertebrate Community Summary

The abundance, richness, and overall community composition of benthic invertebrates in Michel Creek were similar at most mine-influenced stations and reference stations in 2021, and followed similar spatial patterns among years, with the exception of MIDCO on Michel Creek and CORCK on Corbin Creek. All community variables analyzed were significantly lower at CORCK compared to downstream and reference stations with magnitudes of difference above 2 SD for four out of six of the endpoints assessed. Richness and abundance were generally within or above the site-specific and regional normal ranges between 2012 and 2021. Ephemeroptera dominated the community at reference and most mine-influenced stations, with the exceptions of CORCK and MIDCO, where Diptera dominated.

Despite total abundance being similar among stations downstream of Corbin Creek (i.e., not statistically different or if statistically different, within a magnitude of difference less than 2 SD), EPT abundance, % EPT, E abundance and % E differed among stations and years. Specifically, the following differences were identified in endpoints at CORCK and at stations downstream of the Corbin Creek confluence in Michel Creek:

- Abundance of EPT was below the regional normal range at CORCK in 2012 and 2018, and was slightly below the site-specific normal range in 2021.
- Ephemeroptera abundance was below the regional and/or site-specific normal ranges at CORCK in all years, and at MIDCO in 2018, with no Ephemeroptera identified at CORCK in 2015 and 2020.
- Percent EPT was below the regional and/or site-specific normal ranges at CORCK (in all years), MIDCO (2017 and 2021), MIDAG (2019) and CM_MC2 (2020).
- Percent E was below the regional and/or site-specific normal ranges at CORCK (in all years), MIDCO (2017 and 2021), CM_MC2 (2020), and MI25 (2012).

These patterns indicate that the mine-related influence on some EPT taxa is localized to the area near the Corbin Creek confluence, immediately downstream of CMm (i.e., CORCK to MIDCO), with BIC endpoints generally within normal ranges by MIDAG (i.e., 5.27 km downstream of CORCK).

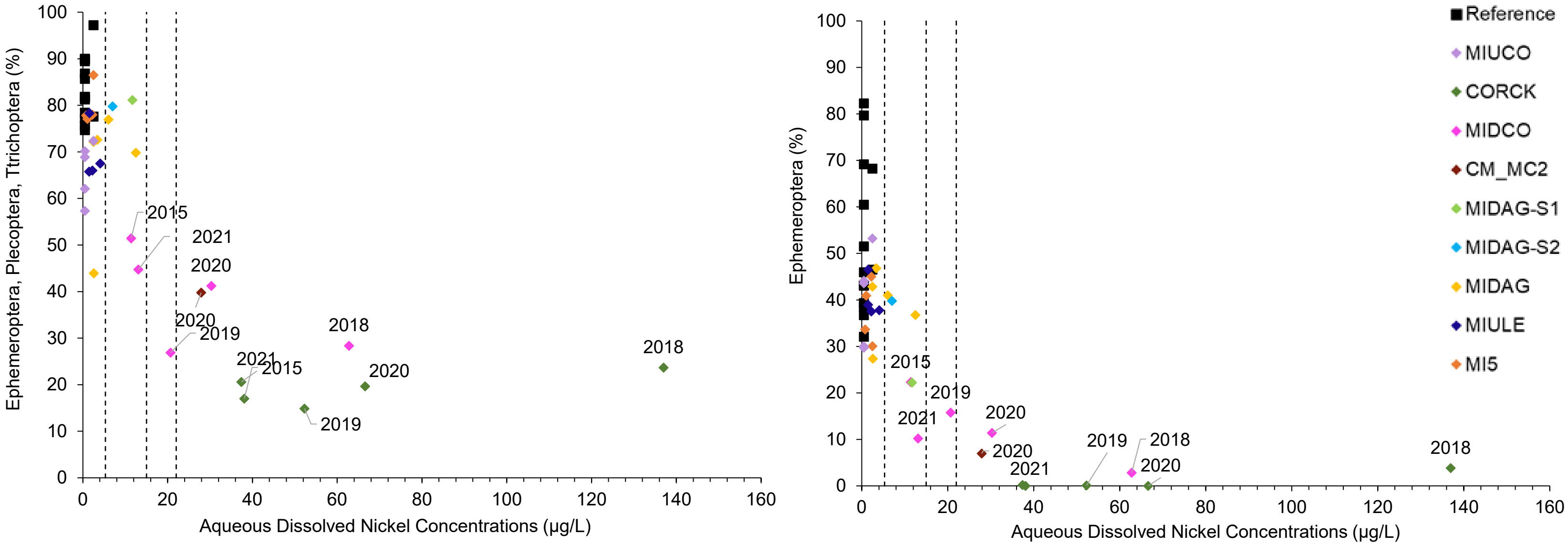
3.5.5 Benthic Invertebrate Community Relationships to Habitat Variables and Aqueous Nickel

The relationships between percent fines, sand, gravel, cobble, and boulder and % EPT and % E indicate that it is unlikely, based on visual evaluation, that differences in habitat characteristics caused the differences observed in BIC downstream of CMm in Michel Creek (Appendix G). Habitat variables were similar between reference and mine-influenced stations and there were similar substrate compositions and sediment particle sizes among stations. It is unlikely that calcite presence and concretion in Michel Creek was a factor in the lower % EPT and% E, because calcite index values were low between 2012 and 2021 and within the reference normal range in Michel Creek. Calcite is, however, a likely contributor to lower % EPT and % E in Corbin Creek (calcite index >1).

An inverse relationship was observed between % EPT and % E and aqueous nickel concentrations, based on the 2012 to 2021 data (Figure 3.5-9). While other constituents also showed an inverse correlation with % EPT and % E (including aqueous cobalt, sulphate, nitrate, nitrite, major ions [e.g., calcium], manganese, molybdenum, strontium, and uranium), nickel is believed to be the primary contributor to the spatial patterns observed in % EPT and % E in the CMm area. This conclusion is based on a visual evaluation of the spatial patterns in the BIC, and is supported by the results of the Chronic Toxicity Testing Program (Golder 2017, 2019b, 2020c, 2021b, 2022).

Nickel concentrations also exceeded the level 1 invertebrate screening value at MIDCO (2015 and 2021), MIDAG-S1 (2020), MIDAG-S2 (2020), and MIDAG (2018 and 2020), the level 2 invertebrate screening value at MIDCO (2019), and the level 3 invertebrate screening value at CORCK (2018 to 2021), MIDCO (2018 and 2020), and CM_MC2 (2020).

Figure 3.5-9: Proportion of Ephemeroptera, Plecoptera, and Trichoptera versus Aqueous Nickel Concentrations (left panel) and Proportion of Ephemeroptera versus Nickel Concentrations (right panel) in the CMm LAEMP Study Area, September 2012 to 2021



Note: Values below detection limit were substituted with the detection limit. Total nickel invertebrate screening values (level 1, level 2, and level 3) are represented by dashed vertical lines, with the leftmost line representing level 1 and the rightmost line representing level 3.

CMm = Coal Mountain Mine.

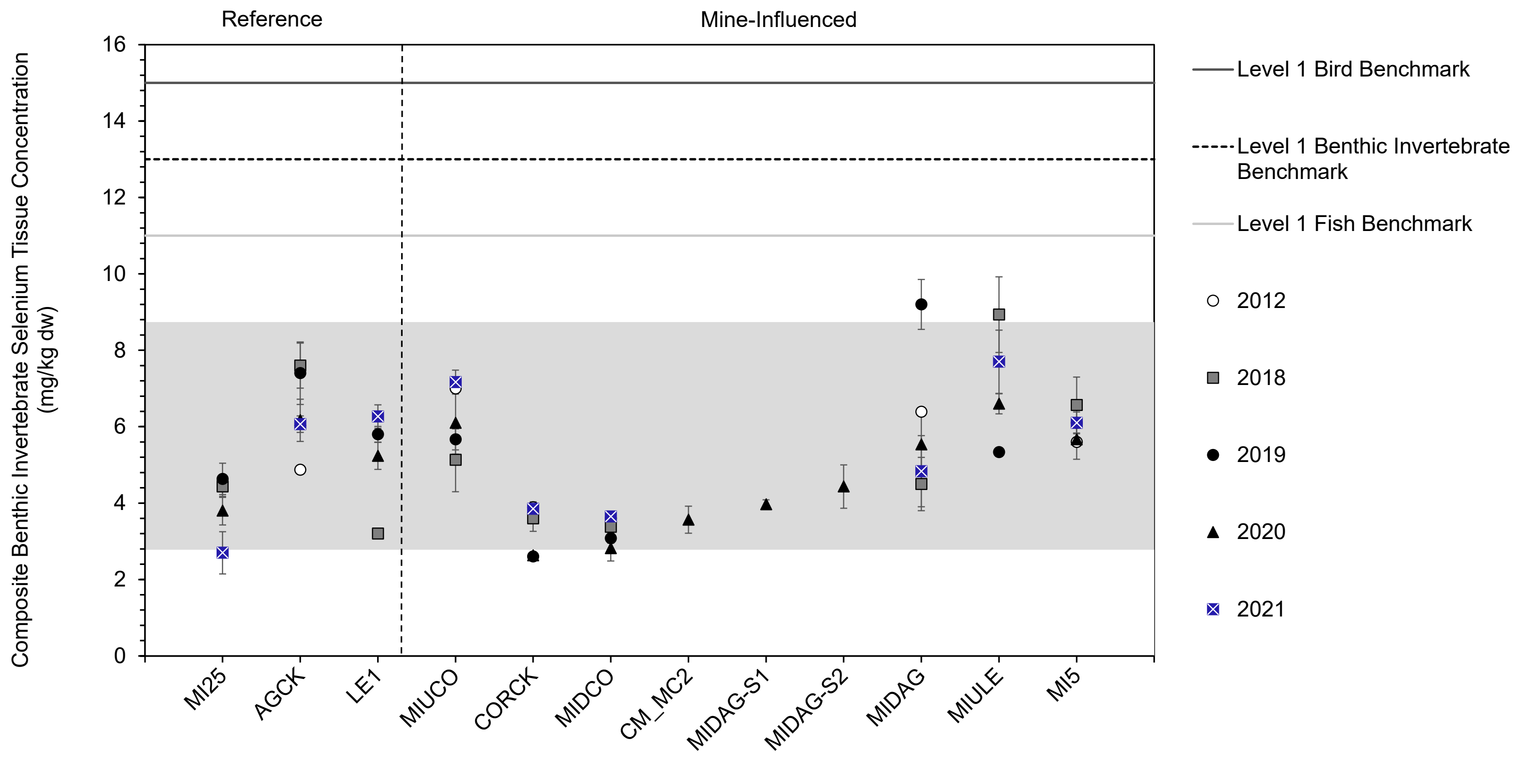
3.6 Benthic Invertebrate Tissue Chemistry

Benthic invertebrate tissue selenium concentrations were plotted relative to historical data and to the reference normal range (Golder 2019a) to help interpret results of water quality and BIC monitoring. The BIT selenium concentrations provide a direct indication of the bioaccumulative potential of aqueous selenium and a direct, tissue-based measure of exposure to evaluate potential effects of selenium to other biota (i.e., fish). Results for other constituents in BIT are provided in Appendix J.

Between 2012 and 2021, Benthic invertebrate selenium concentrations were within or below the regional normal range at reference and mine-influenced stations, with the exception of MIULE in 2018 and MIDAG in 2019, which were above the regional normal range (Figure 3.6-1). In all sampling areas, in all years, BIT selenium concentrations were less than the lowest level 1 benchmark (Figure 3.6-1). Although most BIT selenium concentrations at mine-influenced stations were within the normal range (with the noted exceptions), a spatial gradient was observed, particularly in 2020 where monitoring stations CM_MC2, MIDAG-S1, and MIDAG-S2 were reported. The lowest BIT selenium concentrations were observed at CORCK and MIDCO, with an increase in BIT selenium concentrations observed with increasing distance downstream in Michel Creek until MIULE, and a subsequent decrease at M15.

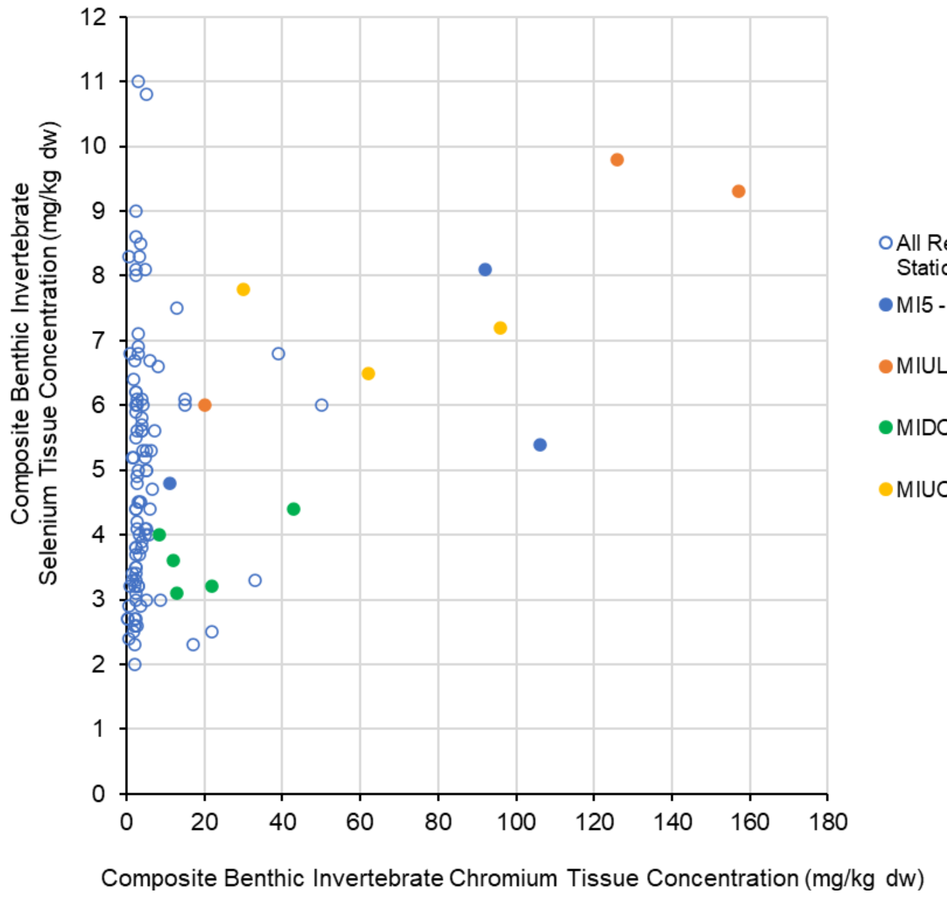
Following the EMC meeting on 7 June 2022, and associated discussions related to low volume samples and the possibility of particulate entrainment influencing the reliability of the BIT chemistry results, the relationship between BIT chromium and BIT selenium was considered further as a possible indicator of particulate entrainment in low volume samples. A strong relationship between the BIT chromium and BIT selenium concentrations was observed in low volume samples in 2021 (Figure 3.6-2), which may indicate particulate entrainment in these BIT samples. The correlation between BIT chromium and BIT selenium suggests that the 2021 chemistry results for low volume samples may have been biased high by non-biological material in the samples (i.e., particulates retained in the sample after rinsing and processing). Consideration will be given towards avoiding such circumstances in the future, to the extent possible; however, it may also be appropriate to interpret replicates with evidence of particulate entrainment (i.e., a feeling of grit during sample preparation) and chromium concentrations greater than 40 to 50 ppm with caution.

Figure 3.6-1: Composite Benthic Invertebrate Tissue Selenium Concentrations from the CMm LAEMP Study Area, 2012 to 2021



Notes: Grey shading represents the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2019 reference area data from the RAEMP (Minnow 2020a).
CMm = Coal Mountain Mine; mg/kg dw = milligrams per kilogram dry weight.

Figure 3.6-2: Benthic Invertebrate Tissue Selenium Concentrations relative to Benthic Invertebrate Tissue Chromium Concentrations, CMm LAEMP 2021



CMm = Coal Mountain Mine; mg/kg dw = milligrams per kilogram dry weight.

4.0 RELATED AQUATIC PROGRAMS

The following summary of related aquatic programs in the Michel Creek watershed provides linkages across studies and supplements the CMm LAEMP results while providing content relevant to answering the study questions outlined in Section 1.2.

4.1 Regional Aquatic Effects Monitoring Program

Teck's RAEMP provides spatially comprehensive monitoring and assessment of potential mine-related effects on the aquatic environment downstream from Teck's coal mines in the Elk Valley. The RAEMP reporting encompasses monitoring data for the six management units associated with Teck's five coal mines (Minnow 2018b). Management Unit 4 applies to the CMm area and the EVO areas.

The objective of the RAEMP is to monitor, assess, and interpret indicators of aquatic ecosystem condition related to mine operations, and to inform adaptive management relative to expectations established in approved plans for mine development and in Permit 107517 (Minnow 2020b). Another objective of the RAEMP is to determine if conditions in the aquatic environment are consistent with expectations outlined in Environmental Assessments (EAs) supporting approved mine development applications.

The 2017 to 2019 RAEMP represents the second comprehensive RAEMP cycle (Minnow 2020a) and follows the 2015 to 2018 and the 2018 to 2020 RAEMP Study Designs (Minnow 2018a,b). The first comprehensive RAEMP presented results from 2015 and 2016 (Minnow 2018b). Previously, an Aquatic Effects Monitoring Program (AEMP; Minnow 2014) was conducted in 2012, and selenium monitoring programs were conducted in 2006 (Minnow et al. 2007) and 2009 (Minnow et al. 2011).

The RAEMP data evaluation incorporates data from all lines of evidence applicable to each assessment endpoint. The data are interpreted relative to the RAEMP study questions, and in support of the AMP (Section 1.3). An Aquatic Data Integration Tool (ADIT) was developed to integrate applicable lines of evidence and help Teck use their monitoring data to inform environmental management decisions (Table 4.1-1; Golder 2020c), and the ADIT is updated annually.

A summary of the RAEMP results applicable to CMm are presented in Section 4.1.1. In addition, Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi)* selenium tissue concentrations are discussed in Section 4.1.2 and the Chronic Toxicity Testing Program results are summarized in Section 4.1.3.

Table 4.1-1: Interpretation of Aquatic Data Integration Tool (ADIT) Scores

ADIT Score	Indication of Change	Indication of Potential Effect
0	No apparent change; well within normal range.	No effect; less than lowest benchmark.
1	Possible change, still consistent with reference; within normal range but near edge.	Possible low-level effect on chronic, sublethal endpoint for most sensitive species. Not expected to be measurable or ecologically meaningful.
2	Probable change, possibly different from reference. Sometimes outside the normal range or often near the edge, in the direction of adverse effects.	Probable effect, potentially measurable and ecologically meaningful. Potential for changes to populations of sensitive species.
3	Likely change, likely different from reference. Often or always outside the normal range in the direction of adverse effects.	Likely effect. Expected to be measurable and ecologically meaningful. Potential for changes to benthic invertebrate communities and fish populations.

Source: Golder 2020b.

4.1.1 Results Applicable to CMm

Key results from the RAEMP applicable to CMm are:

- The summer seven-day flow was flagged as being lower than the level 3 screening value in Michel Creek (Golder 2020b), but annual seven-day flows and annual peak flows were within the expected range (ADIT score of zero). The calcite index was high (1.0 or greater) at CORCK but had not changed since the previous RAEMP cycle.
- Benthic invertebrate tissue selenium concentrations were below the level 1 benchmark for effects to benthic invertebrates (ADIT score of zero) in most areas near CMm and temporal increases since the base year and the previous cycle were not observed (Minnow 2020a).
- Westslope Cutthroat Trout muscle selenium concentrations were below respective benchmarks for effects near CMm based on data collected in 2015, 2018 (Minnow 2020a), and 2021 (Minnow in prep). No significant temporal changes were observed in muscle selenium concentrations (Section 4.1.2).
- The greatest effects to the BIC (i.e., ADIT scores of two and three) were observed in the tributaries with the highest aqueous concentrations of mine-related constituents (e.g., CORCK). Specifically, low % EPT,% E, and Ephemeroptera abundance were observed at CORCK. Lower % EPT and % E than normal ranges were also observed at MIDCO, located downstream of Corbin Creek, and to a lesser extend at MIDAG, downstream of Andy Good Creek.
- Lower than expected BIT selenium was observed based on water quality data at CORCK and stations on Michel Creek. However, greater than expected effects to one or more BIC endpoints were observed at CORCK and MIDCO, were attributed to water quality. The majority of observed effects were represented by lower than expected % EPT and% E, but lower EPT and/or Ephemeroptera abundances were also observed at CORCK.

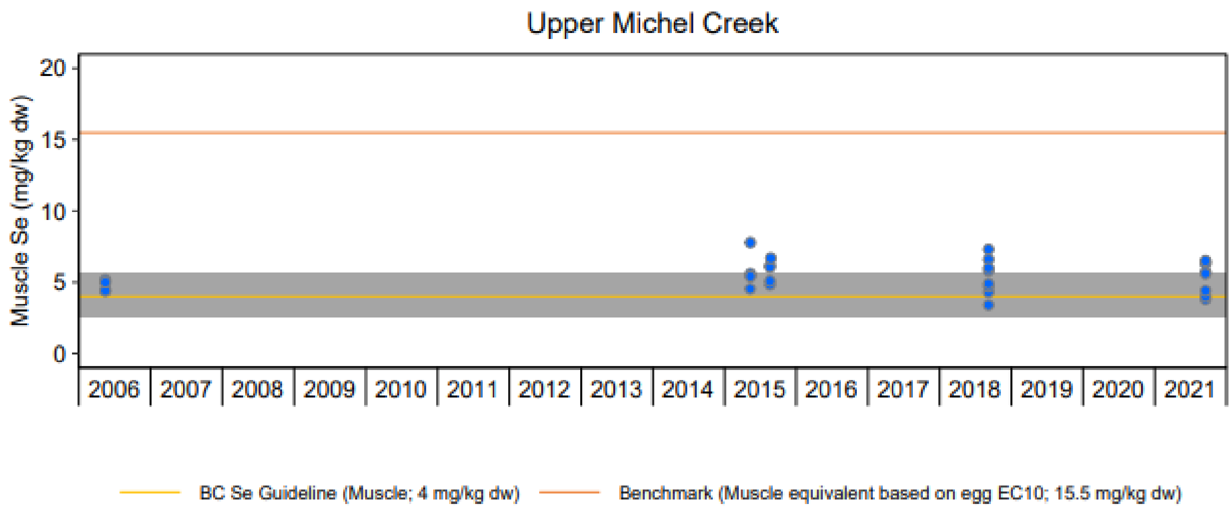
The RAEMP also evaluates the overall condition of the MU currently and/or in the future. A spatial roll-up was completed in the ADIT to summarize the proportion of the watershed associated with each score for each endpoint (Golder 2020b; Minnow 2020a). On average, an ADIT score of 1 was observed for 2.7% of the assessed habitat area, an ADIT score of 2 was observed for 7.0%, and an ADIT score of 3 was observed for 1.4%. The measurement endpoints exhibiting the greatest effect (i.e., ADIT score of 3) were aqueous nickel concentrations, flow (summer seven-day flow), and BIC metrics (i.e., % EPT and% E). An ADIT score of 0, indicating no effects and no apparent change in condition from the normal reference ranges or benchmarks, was observed for 89% of the assessed habitat area in the lotic portion of the watershed evaluated.

4.1.2 Westslope Cutthroat Trout Tissue Selenium Concentrations

Westslope Cutthroat Trout muscle samples were collected using non-lethal methods under the RAEMP at MIDCO in 2018 and 2021 to evaluate tissue selenium concentrations and compare them to the relative normal ranges, EVWQP benchmarks, and predictions (Minnow 2020a). In 2018, four out of the eight samples collected were at or above the upper limit of the normal range and all samples were less than the site-specific benchmark of 15.5 mg/kg dw (Nautilus Environmental and Interior Reforestation 2011; Figure 4.1-1). In 2021, five out of the eight samples collected were at or above the upper limit of the normal range and all samples were less than the site-specific benchmark of 15.5 mg/kg dw. Westslope Cutthroat Trout muscle selenium concentrations have been similar over time in the upper Michel Creek area near CMm with no significant differences detected among years (Minnow 2020a).

Non-lethal opportunistic fish tissue sampling was also carried out in 2019 in Corbin Creek at CM_CC1 (CORCK) and CM_CC2 (upstream of CORCK; Table 4.1-3). Two Westslope Cutthroat Trout were captured and muscle plug samples were collected, during the September EFN electrofishing survey by Ecofish. Tissue selenium concentrations were 4.2 mg/kg dw in both samples, which were below the lowest level 1 benchmark for fish (i.e., 11 mg/kg dw).

Figure 4.1-1: Westslope Cutthroat Trout Muscle Selenium Concentrations in Upper Michel Creek, 2006 to 2021



Source: 2020 to 2022 RAEMP report (Minnow in prep).

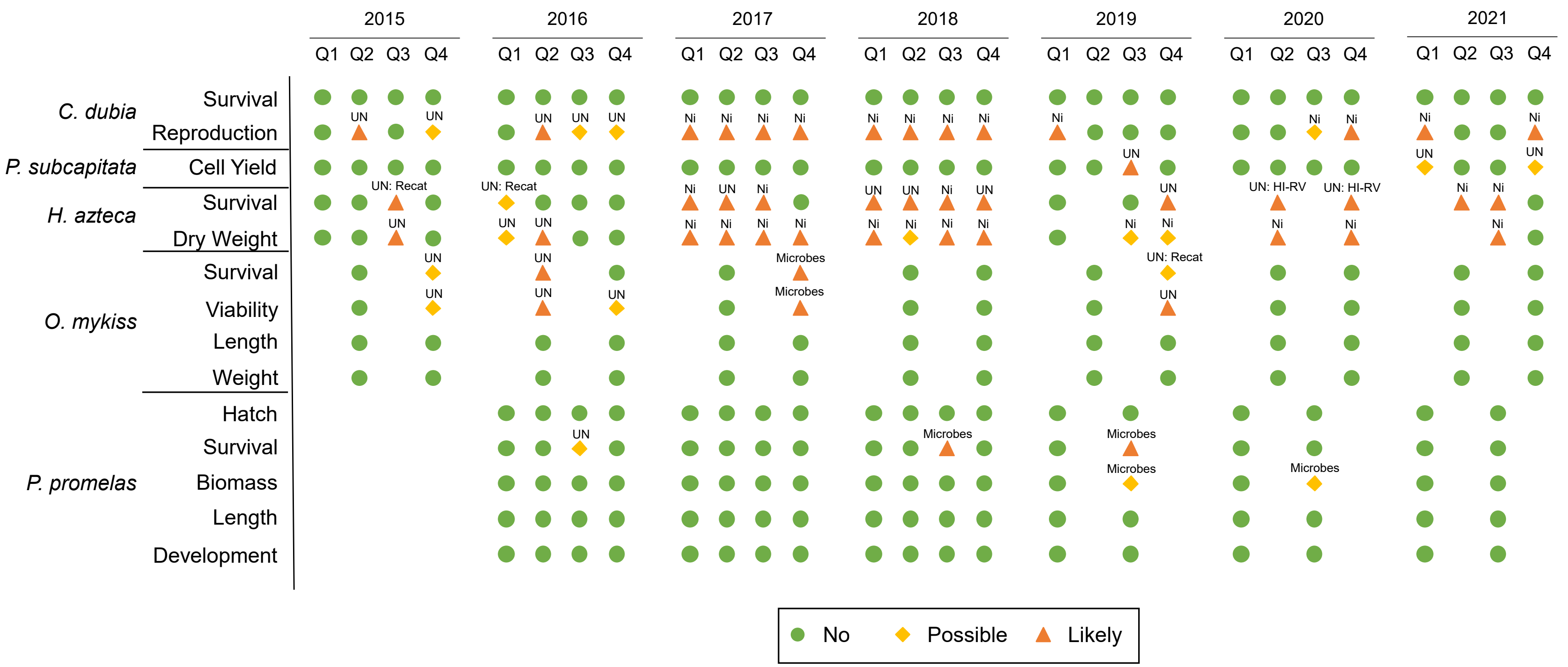
Notes: Gray shading represents the reference area normal range defined as the 2.5th and 97.5th percentiles of the distribution of reference area data (pooled 1996 to 2019 data) reported in the RAEMP. Fish collected from lotic areas only.

4.1.3 Chronic Toxicity Testing Program

The Chronic Toxicity Testing Program supports AMP Management Questions #2 and #5 (Section 1.3). The program reviews data quality to confirm that results meet acceptability criteria, standardizes the data to help discern toxicological responses from other sources of variability in data. The program also interprets chronic toxicity test results by comparing site water to reference water and evaluates correspondence between water chemistry and toxicological responses. It considers the size of response in each test and how that compares to responses in tests of reference waters (not influenced by mining) to categorize each result as a “no”, “possible”, or “likely” adverse response, and evaluates the correspondence between test responses and indicators of mine-related water quality. This evaluation includes statistical assessment of patterns and specialized laboratory tests (called “toxicity identification evaluations”) designed to identify causes of toxicity.

Chronic toxicity tests performed included quarterly toxicity testing using the water flea (*Ceriodaphnia dubia*) and an alga (*Pseudokirchneriella subcapitata*), and semi-annual toxicity testing with an amphipod (*Hyallela azteca*), early-life stage Rainbow Trout (*Oncorhynchus mykiss*) and early-life stage Fathead Minnow (*Pimephales promelas*). Tests were conducted using reference and mine-influenced water that was collected from two stations on Michel Creek near CMm between 2015 and 2021: one station was located 1.80 km downstream of CMm (CM_MC2), and the second station was located 5.27 km downstream (MIDAG), which was originally sampled at CM_MC3 (2018). Test results for CM_MC2 from 2015 to 2021 are summarized in Figure 4.1-2. Test results for CM_MC3 (2018) and MIDAG (2019 to 2021) are summarized in Figure 4.1-3. Chronic toxicity results for CM_MC2 have shown consistent patterns of response over time for *C. dubia* reproduction and *H. azteca* survival and dry weight, and likely adverse responses were observed for *C. dubia* and *H. azteca* in 2021 (for *C. dubia* in Q1 and Q4, and *H. azteca* in Q2 and Q3). These two crustacean species are known to be sensitive to dissolved nickel exposure, and multiple lines of evidence have implicated nickel as contributing to adverse responses at this sampling location. For other test species, CM_MC2 has shown few adverse responses, with no apparent consistent pattern of responses over time and no clear evidence of causal factors. Between 2019 and 2021, the only results categorized as adverse response were *H. azteca* results and they were categorized as having high uncertainty (Golder 2022). No adverse responses were observed at MIDAG in 2021. Temporal improvement in crustacean responses which were observed at CM_MC2 since 2018 were also observed at MIDAG. Overall, the toxicity test results indicate that the potential nickel response may be localized, and the spatial extent of effects do not extend downstream of MIDAG (i.e., 5.27 km downstream).

Figure 4.1-2: Summary of Test Results by Category at CM_MC2, 2015 to 2021



Source: 2021 Regional Chronic Toxicity Report (Golder 2022).

Note: Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. HI-RV = high inter-replicate variability; Ni = nickel; UN = unknown: no water quality constituent was identified; Recat = category was previously assigned as “no adverse response.” Toxicity Identification Evaluations were conducted to support the causation assessment for *C. dubia* tests in 2017 (Q3 and Q4), 2018 (Q1 to Q4), 2019 (Q1 to Q4), 2020 (Q1 to Q4), and 2021 (Q1 to Q4); and. *H. azteca* tests in 2018 (Q1 to Q4), 2019 (Q1, Q3, and Q4), 2020 (Q2 and Q4), and 2021 (Q2 and Q4).

Figure 4.1-3: Summary of Test Results by Category at CM_MC3 and RG_MIDAG, 2018 to 2021.

Source: 2021 Regional Chronic Toxicity Report (Golder 2022).

Note: 2018 test results are for CM_MC3. In 2019, CM_MC3 was replaced by RG_MIDAG because of inconsistent sampling conditions at CM_MC3 in the winter. The station was replaced by RG_MIDAG because it is the closest station downstream of CM_MC3 (2 km downstream). Possible and likely symbols are annotated with constituent(s) identified as potentially contributing to observed response. HI-RV = high inter-replicate variability; Ni = nickel; UN = unknown: no water quality constituent was identified.

4.2 Lentic Area Supporting Study

Only a small proportion of aquatic habitat in the Elk River watershed is classified as lentic (Minnow 2018b). In the Michel Creek watershed, lentic areas are located in off-channel wetlands, beaver ponds or impoundments, swamps and marshes along Michel Creek (Figure 2.1-1).

The Lentic Area Supporting Study was conducted in 2018 and 2019. Preliminary surveys occurred in 2018 and additional surveys were conducted in 2019 to support the RAEMP. The Lentic Area Supporting Study provided information regarding the use of lentic areas by fish and aquatic-dependent wildlife and evaluated potential effects from mine-related constituents. Several lentic areas along Michel Creek (Table 4.2-1; Figure 2.1-1) and in reference areas, classified under the MU4 management unit in the RAEMP, were included in the Lentic Area Supporting Study. These areas were classified according to use (low, moderate or high, based on historical observations of habitat use and data gathered in 2018 and 2019) and exposure risk (Minnow 2020a). The lentic areas sampled near CMm were either classified as moderate or high use but were assigned a low exposure risk classification based on water and sediment chemistry and/or tissue selenium concentrations, except the southern portion of Michel Creek pond (RG_SLMICP), which was assigned a high exposure risk classification based on water chemistry and benthic invertebrate tissue selenium (Table 4.2-1). These results indicate that the lentic areas near CMm are highly used by fish and aquatic-dependent wildlife, but their exposure risk to mine-related effects is low with the exception of RG_SLMICP (Minnow 2020a; Appendix K).

The Lentic Area Supporting Study evaluated amphibian use and amphibian egg tissue chemistry, bird use and bird egg tissue chemistry, fish use, fish abundance, and fish tissue chemistry, benthic invertebrate tissue chemistry, habitat features, water quality, and sediment chemistry. Components evaluated in the Lentic Area Supporting Study and the years these evaluations were conducted are listed in Table 4.2-2.

Table 4.2-1: Lentic Sampling Areas near CMm

Lentic Area ID	Area Description	UTM Coordinates (NAD83, Zone 11U)		Classifications Based on Overall Ratings	
		Easting	Northing	Use Classification	Exposure Risk Classification[(a)]
RG_SMCIM	Southern Michel Creek impoundment	667979	5484119	High	Low
RG_MCIMCC	Michel Creek impoundment at Corbin Creek	668254	5487064	High	Low
RG_MCWB	Michel Creek Wetlands	668051	5487358	Moderate	Not Assigned
RG_MCWA	Michel Creek Beaver Pond	667917	5487467	High	Low
RG_MCWAGC	Michel Creek Wetland at Andy Good Creek	667308	5488107	Moderate	Sediment-based risk only
RG_NMCIM	Northern Michel Creek Impoundment	666651	5488412	Moderate	Not Assigned
RG_MI16	Michel Creek/Corbin Road Wetland	665055	5489432	High	Low
RG_SLMICP	Southern Lower Michel Creek Pond	664106	5490363	Moderate	High
RG_MIC2	Michel Creek Oxbow #2	659533	5496626	High	Low
RG_MIWW	Lower Michel Wetland d/s Wheeler Creek	659707	5498474	High	Low

Source: 2017 to 2019 RAEMP (Minnow 2020a; Appendix K).

Note: The Lentic Area Supporting Study report was submitted as part of the 2017 to 2019 RAEMP (Minnow 2020a). Overall use and exposure risk classifications were carried out in the 2017 to 2019 RAEMP.

a) Exposure risk ratings and classifications were not assigned to lentic areas where chemistry sampling (i.e., water, sediment, or tissue) was not completed.

CMm = Coal Mountain Mine.

Table 4.2-2: Lentic Sampling Components near CMm, 2018 and 2019

Lentic Area ID	Amphibian Survey (a)				Amphibian Egg Collections			Bird Surveys(b)	Bird Egg Collections(c)	Fish Survey	Fish Meristics(d)	Fish Tissue	Benthic Invertebrate Composite Tissue
	Egg Survey	Tadpole/ Larvae Survey	Adult Survey 1	Adult Survey 2	Columbia Spotted Frog	Western Toad	Long-toed Salamander						
RG_SMCIM	2018, 2019	2018, 2019	2018, 2019	2019	2019	2019	-	2018, 2019	-	2018	-	-	2018, 2019
RG_MCIMCC	2018, 2019	2018, 2019	2018, 2019	2019	-	2019	-	2018, 2019	-	2018	2019	2019(e)	2019
RG_MCWB	-	-	-	-	-	-	-	2018, 2019	-	-	-	-	-
RG_MCWA	2018, 2019	2018, 2019	2018, 2019	2019	-	-	-	2018, 2019	-	-	-	-	2019
RG_MCWAGC	-	-	-	-	-	-		2018, 2019	-	-	-	-	-
RG_NMCIM	-	-	-	-	-	-	-	2018, 2019	-	-	-	-	-
RG_MI16	2018, 2019	2018, 2019	2018, 2019	2019	2018	-	-	2018, 2019	2019	2018	-	-	2018, 2019
RG_SLMICP	-	-	-	-	-	-	2018	-	-	-	-	-	2018
RG_NLMICP	-	-	-	-	-	2018	-	2018	-	-	-	-	-
RG_MIC2	-	-	-	-	-	-	-	2018, 2019	-	-	2019	-	2019
RG_MIWW	2018, 2019	2018, 2019	2018, 2019	2019	2018	-	-	2018, 2019	2019	2018	2019	2019(f)	2018, 2019

Source: 2017 to 2019 RAEMP (Minnow 2020a; Appendix K).

a) Amphibian occurrence and distribution surveys were completed by VAST Resource Solutions.

b) Surveys focused on aquatic and aquatic-dependent bird species.

c) Red-winged blackbird and spotted sandpiper.

d) Targeted eight female longnose sucker for tissue in May 2019 and 100 young-of-year and 100 non young-of-year for non-lethal measurements in September 2019.

e) Muscle and aging structures.

f) Muscle, ovary, and aging structures.

g) Three samples were collected per lentic area per sampling event, concurrent with fish surveys in 2019 and amphibian egg, bird egg, or fish tissue chemistry sampling in 2018 and 2019.

CMm = Coal Mountain Mine.

4.2.1 Lentic Area Supporting Study Results Summary

Lentic sampling is now completed under the RAEMP. These results (i.e., 2022 lentic data) will be considered in the 2021 CMm LAEMP report, as well as reported fully in the 2020 t0 2022 RAEMP report. Available data from previous years is summarized herein.

Water Quality

Two of the mine-influenced lentic areas immediately downstream of CMm and within 500 m of mine-related infrastructure were considered heavily influenced based on specific conductivity measurements: Michel Creek impoundment at Corbin Creek (RG_MCIMCC; mean = 1,322 µS/cm; n = 29), and Michel Creek Beaver Pond (RG_MCWA; mean = 1,369 µS/cm; n = 13). With the exception of DO, selenium, nitrate and sulphate, water quality constituent concentrations were below BC WQG, applicable EVWQP Level 1 benchmarks, or relevant screening values (Minnow 2020a). Most lentic areas had at least one DO measurement less than the 8 mg/L BC WQG for fish life stages other than buried embryos/alevin. Concentrations less than the 5 mg/L instantaneous minimum guideline were also common. Aqueous total selenium concentrations in samples from RG_MCIMCC were elevated relative to the BC WQG and nitrate and sulphate were measured at elevated concentrations relative to the most conservative Level 1 benchmarks at RG_MCIMCC.

Sediment Quality

Sediment quality was variable in lentic areas near CMm. Concentrations of cadmium, nickel, selenium, fluorene, 2-methylnaphthalene, and phenanthrene in sediment samples were frequently greater than the lower BC WSQG, alert concentration for selenium, and/or the upper boundary of the reference area normal range (Minnow 2020a). Mean selenium concentrations in sediment samples collected from the Michel Creek/Corbin Road Wetland (RG_MI16) between 2015 and 2019 and the Lower Michel Wetland downstream of Wheeler Creek (RG_MIWW) in 2018 and 2019 were consistently and significantly higher than concentrations in the base year (2013). At RG_MI16, concentrations of most metals and PAHs included in the temporal analyses were lower in 2015, 2018, and 2019, relative to 2013. Concentrations of some PAHs were also lower in RG_MIWW in 2018 and 2019 compared to 2013.

Amphibians

Amphibian detections recorded in 2018 and 2019 indicated that Columbia spotted frog (*Heleioporus albopunctatus*), western toad (*Anaxyrus boreas*) and long-toed salamander (*Ambystoma macrodactylum*) use lentic habitats near CMm to fulfill one or more life cycle functions (Minnow 2020a). Egg and larval life stages of Columbia spotted frog, western toad, and long-toed salamander were detected at RG_MCIMCC (western toad eggs and larvae) and RG_MCWA (western toad eggs and larvae and long-toed salamander larvae).
The distributions of metamorph/sub-adult/adult life stages of Columbia spotted frog and western toad were generally similar to those of egg and larval life stages. Long-toed salamander metamorphs/sub-adults/adults were detected at RG_MCIMCC and RG_MCWA.

Amphibian eggs collected from lentic habitat in the CMm area in 2018 and 2019 had selenium concentrations that were within the reference area normal range (9.61 µg/g dw; Minnow 2020a). None of the amphibian eggs collected in 2018 or 2019 had selenium concentrations exceeding the preliminary Level 1 benchmark of 45 µg/g dw (Massé et al. 2015) and were within model predictions.

Aquatic and Aquatic-dependent Birds

Aquatic and aquatic-dependent birds were observed using lentic habitats in the CMm area in 2018 and 2019. The most commonly encountered species were the red-winged blackbird (*Agelaius phoeniceus*), tree swallow (*Tachycineta bicolor*), and common yellowthroat (*Geothlypis trichas*; Minnow 2020a). Species diversity was highest at mine-exposed area RG_MI16, which is a large impoundment with abundant grassy, shrubby, and woody vegetation. Michel Creek Wetlands (RG_MCWB), RG_MI16, and RG_MIWW were confirmed as nesting and chick-rearing habitats for a variety of aquatic and aquatic-dependent bird species in 2018 and 2019. Few changes in bird species presence/absence and relative abundance over time (i.e., since 2012; Minnow 2014) were identified for lentic areas around CMm. Selenium concentrations in bird eggs were generally elevated relative to the reference area normal range and guidelines, but were less than the Level 1 benchmark and were within model predictions.

Fish

A total of 5 fish species were observed in lentic habitats near CMm in 2018 and/or 2019: Brook Trout (*Salvelinus fontinalis*), Longnose Dace (*Rhinichthys cataractae*), Longnose Sucker (Catostomus Catostomus), Mountain Whitefish (*Prosopium williamsoni*), and Westslope Cutthroat Trout (*Oncorhynchus clarkia lewisi*; Minnow 2018a). Of these, Westslope Cutthroat Trout is the only species with a special conservation status in the Kootenay Region of B, it is blue-listed provincially (Pearson and Healey 2012), listed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and as Special Concern under the Species at Risk Act (SARA; COSEWIC 2016; Government of Canada 2018). Westslope Cutthroat Trout were only captured at RG_MIC2.

Juvenile (including young-of-the-year [YOY]) longnose sucker were captured from RG_MIWW, indicating this area is used for rearing and juvenile foraging. Juvenile salmonids were also incidentally observed using RG_MI16 and RG_MIWW. Some differences in endpoints were observed related to survival, recruitment, body size, and energy storage for YOY and non-YOY longnose sucker captured in lentic areas in the CMm area. In May 2019, larger adult longnose suckers were more abundant in the catches from mine-influenced lentic areas in the CMm area, relative to the reference areas, except at RG_MCIMCC. Overall, YOY longnose suckers from mine-influenced areas around the CMm (except RG_MIWW) were in significantly better condition than fish from reference areas. Few statistically significant and biologically meaningful differences in length, weight, or condition were identified for non-YOY fish captured in September 2019, relative to reference.

Selenium concentrations in muscle and ovaries/eggs from female longnose sucker captured in lentic areas near CMm were consistently greater than the tissue-specific reference area normal ranges (i.e., 6.03 µg/g dw and 5.70 µg/g dw, respectively). Selenium concentrations in muscle from all areas and in ovaries/eggs from RG_MIWW were also consistently greater than the applicable BC MOE (2019a,b) guidelines. Mean selenium concentrations in longnose sucker ovaries/eggs were within the range of model uncertainty for stations in the CMm area. No statistically significant temporal changes in selenium concentrations were observed in longnose sucker ovaries.

Benthic Invertebrates

Except for RG_SLMICP, BIT selenium concentrations were within the range of model uncertainty for the lentic areas near CMm, where mean concentrations were higher than expected based on the model results. Mean BIT selenium from lentic areas near CMm were often greater than the BC MOE (2019a) guideline of 4 µg/g dw. Mean BIT selenium samples collected from mine-exposed areas (RG_MI16 and RG_MIWW) also exceeded the level 1 benchmark for dietary effects to juvenile fish (Golder 2014).

4.3 Nutrient Study

A Nutrient Study was conducted to support the 2017 to 2019 RAEMP (Minnow 2020a). It was intended to fulfill ENV's condition that Teck should undertake "additional studies to address nutrient loading in the Fording and Elk Rivers from mine-related sources." The Nutrient Study aimed to identify the aqueous nutrient most likely to be limiting biological productivity, and estimate the trophic (productivity) classification, at each monitoring station in the Elk River, Fording River, Michel Creek, and associated tributaries, based on water samples collected between 2013 and 2019.

Stations near CMm were classified as ultra-oligotrophic and phosphorus-limited with high total nitrogen (TN) concentrations and high TN to total phosphorus (TP) ratios (Minnow 2020a). Concentrations of TN at CM_CC1 (CORCK) and CM_MC2 have increased significantly relative to 2013 (Minnow 2020a), but appear to have peaked between 2016 and 2017. At CORCK, TP concentrations have decreased resulting in a significant increase in TN:TP ratios.

4.4 Nickel Benchmark Study

The nickel benchmark is currently being prepared by Teck. It is anticipated finalized results and interpretation will be available for incorporation into the 2022 CMm LAEMP.

4.5 Environmental Flow Needs Study

Teck retained Ecofish Research Ltd. (Ecofish) to develop and evaluate alternative EFN thresholds for Corbin Creek. To support this work, Ecofish completed three background studies between 2019 and 2020: a Fish Community Survey (Regehr et al. 2020a), a Fisheries Habitat Assessment Procedure (Regehr et al. 2020b), and an Instream Flow Study (IFN; Healey and Hatfield 2020).

Existing information on fish species documented in Corbin Creek and surrounding area was reviewed. Fish species documented in Corbin Creek were Brook Trout[4], Mountain Whitefish, and Westslope Cutthroat Trout (BC MOE 2019a). Downstream in Michel Creek, Bull Trout[5], Mountain Whitefish, Westslope Cutthroat Trout and Longnose Sucker (Golder 2015, BC MOE 2019b) were documented. Westslope Cutthroat Trout was the most common species observed in these two streams (Golder 2015, BC MOE 2019b). Tributaries such as Corbin Creek provide spawning, juvenile rearing, and high flow velocity refuge habitats that are limited in the frequently confined mainstem of Michel Creek (Golder 2015).

During the fish community survey, electrofishing captures were mostly Westslope Cutthroat Trout (81%, 96%, and 91% of captures for open-site electrofishing, closed-site electrofishing, and minnow trapping, respectively), although a few longnose sucker and Brook Trout were also captured (Regehr et al. 2020a). Analysis of density and biomass by age class, as determined from closed-site electrofishing results, indicated that fry (0+ years), parr (1+ years), parr (2+ years), and sub-adult (3+ years) age classes were present in Corbin Creek; adults ($\geq$4+ years) were not captured. Mountain Whitefish, which were previously documented in Corbin Creek (BC MOE 2019b), were not detected during the Fish Community Survey.

Fry, parr, and sub-adult age classes of Westslope Cutthroat Trout were captured in Corbin Creek; no adult fish were captured (Regehr et al. 2020a). Three redds were identified in June and July 2020 downstream of the Mine.

---

4 Brook Trout is an introduced species, native to eastern North America.

5 Numerous FIDQ records note the presence of Dolly Varden in Michel Creek; however, based on known provincial Dolly Varden distribution, Golder (2015) assumed that these records referred to incorrectly identified Bull Trout.

The presence of fry during the growing season sampling program indicated that spawning had occurred in the vicinity of Corbin Creek despite spawners not being observed in 2020. Spawners and redds were not observed in Corbin Creek during spawning surveys in 2019.

Westslope Cutthroat Trout were present in Corbin Creek during the winter and accounted for 95% of the fish observed during the overwintering assessment (Regehr et al. 2020a). A comparison of numbers of fish observed and habitat characteristics by sub-site (defined as a section of stream that had similar habitat characteristics within an overwintering site) suggested that sub-sites with cover tended to have higher numbers of fish, and that fish presence was associated with the presence of cover (Regehr et al. 2020b).

Physical habitat parameters (i.e., wetted area, water depth, and water velocity) were identified as potentially limiting for fish, as well as water temperature (Regehr et al. 2020a,b). Because calcite concretion has been observed in Corbin Creek, overwintering cover in the substrate may be limiting; habitats with other cover sources (i.e., small woody debris, deep pool, undercut banks, overhanging vegetation, and organics) were identified as important for overwintering. Based on water temperature data, the growing season for Westslope Cutthroat Trout in Corbin Creek is estimated as April 16 to October 15 (Regehr et al. 2020a).

The IFN study (Healey and Hatfield 2020) provided an evaluation of prospective minimum flow thresholds for Corbin Creek, considering the quantity of water available for Teck Coal and the habitat available for fish. The proposed minimum flow thresholds were designed as the maximum instream flow rates that will provide 0.001 m^3/s for water use by Teck Coal.

5.0 ADAPTIVE MANAGEMENT

All replicates at CORCK and MIDCO had % EPT results that resulted in a biological trigger event (Appendix A). These findings are consistent with results of sampling and evaluation in previous years that prompted management action under the AMP response framework. Teck first investigated localized effects on % EPT at CMm in 2017 as part of the Integrated Water Management Plan for Closure for CMO (Golder 2017). Analyses presented in Golder (2017) attributed the localized effects at least in large part to nickel, although effects in Corbin Creek are interpreted to also reflect calcite conditions there. Since 2017, Teck has conducted a series of laboratory and field investigations to better understand nickel toxicity and effects to% EPT, with the objective of deriving benchmarks to guide assessment and management of nickel in the Elk Valley. Teck continues to evaluate nickel treatment options as benchmarks are developed. These activities are reported annually in AMP reporting.

None of the BIT replicates in 2021 had selenium concentrations above the biological trigger thresholds or above the level 1 benchmarks for juvenile fish. These findings do not indicate a need to track BIT Se under the AMP framework.

6.0 STUDY QUESTIONS

An integrated evaluation of CMm LAEMP data is presented below to address each study question (Sections 6.1 and 6.2), and a tabular summary is presented in Section 6.3.

6.1 Study Question 1

What are the magnitude and spatial extent of influence from CMm on water quality, calcite, sediment quality, and benthic invertebrate communities in Michel Creek downstream of CMm, how are these conditions changing over time, and are the conditions expected?

The highest concentrations of mine-influenced water quality constituents were observed at the CORCK station in Corbin Creek, followed by MIDCO, the first station downstream of CMm on Michel Creek (0.94 km downstream of CORCK), with a declining gradient of concentrations further downstream. This was expected as Corbin Creek receives discharges of mine-influenced water before entering Michel Creek. Concentrations of most water quality constituents were similar between the reference stations and MIUCO, which is 0.82 km upstream of CORCK and 1.76 km upstream of MIDCO. Downstream of CMm, concentrations of nickel returned to near concentrations observed at MIUCO by MIDAG, which is 5.27 km downstream. Spatially, concentrations of sulphate, selenium, and nitrate remained elevated, compared to reference, at MIULE (the furthest station downstream of CMm measured in 2021); however, only selenium was above a BC WQG at MIULE.

Concentrations of sulphate, nitrate, and nickel were lower in 2021 compared to previous years in Michel Creek. Concentrations of selenium were similar to or slightly above concentrations observed in 2018. The decrease from previous years in mine-related constituents downstream of CMm in Michel Creek was expected based on modelled data derived by SRK (2022), which projected a decrease between 2017 and 2019 based on changes in mine water management with the transition to Care and Maintenance. Overall, concentrations of sulphate and nitrate were either lower than or similar to the SRK modelled data (with some exceptions for sulphate) in 2021. Concentrations of total selenium and nickel were either lower than or similar to projections for dissolved selenium and nickel for all years.

Calcite presence was high in Corbin Creek (calcite index >1) but generally low in Michel Creek (calcite index <1) in 2021. Calcite index values were not high enough for calcite to be an influencing factor in benthic invertebrate effects in Michel Creek (Minnow 2018b); however, calcite may have been a factor in Corbin Creek. Calcite index values remained within the reference normal range in Michel Creek in 2021.

Consistent with the 2017 to 2019 RAEMP results, sediment selenium and PAH concentrations were above the lower British Columbia working sediment quality guidelines (BC WSQG) at both mine-influenced and reference stations but were higher at mine-influenced stations in the CMm area. Cadmium, manganese, nickel, selenium, and zinc concentrations were above the BC WSQGs, and were higher at CORCK and MIUCO compared to downstream and reference stations. Arsenic and iron were also above BC WSQGs, but were higher at MIUCO and lower at CORCK compared to downstream and reference stations. Most sediment metal concentrations (except for arsenic, iron, and selenium) declined in a downstream gradient from MIDCO in Michel Creek and reached similar concentrations to reference stations by MIDAG (5.27 km downstream) or MIULE (13.84 km downstream). Arsenic, iron, and selenium did not show a clear spatial pattern.

Benthic invertebrate community richness and abundance were similar among mine-influenced and reference stations and were within or above the site-specific and/or regional normal ranges in Michel Creek in 2021. There was no significant decrease in benthic invertebrate endpoint values in 2021 compared to previous years (i.e., 2012 to 2020) at mine-influenced stations. Ephemeroptera dominated the communities at mine-influenced stations in Michel Creek and at the reference stations, except at MIDCO and CORCK, where Diptera dominated.

Significant changes to BIC were identified at CORCK in 2021 compared to reference stations and stations on Michel Creek; these changes took the form of reduced taxonomic richness, EPT abundance, abundance of E taxa, % EPT, and% E. There were also differences in community composition (i.e., Diptera dominance) at CORCK compared to reference stations and stations on Michel Creek. Richness in Corbin Creek was within regional and site-specific normal ranges in 2021. Abundance of EPT and % EPT were within the site-specific normal ranges, and while this reduction in EPT endpoints may be related to habitat parameters (i.e., substrate composition) at CORCK, a similar reduction in the abundance of E taxa and % E were greater than expected based solely on habitat variables. The magnitude of difference in abundance of E taxa was less than 2 standard deviations, which suggests the difference may not be biologically meaningful.

In Michel Creek, richness, abundance, and EPT and E abundance were within the regional normal ranges at all stations in 2021, and within or above the site-specific normal ranges at all stations, except for abundance and EPT abundance at MIUCO, which as below. The benthic invertebrate community in Michel Creek was dominated by Ephemeroptera, except at MIDCO, where it was dominated by Diptera. The % EPT and % E were also lower at MIDCO in 2021 compared to downstream and reference stations and below the regional and site-specific normal ranges, while % EPT and % E were within the normal ranges at all other stations.

These patterns indicate that the mine-related influence on some EPT taxa is localized to the area near the Corbin Creek confluence, immediately downstream of CMm (i.e., CORCK and MIDCO), with community endpoints within normal ranges by MIDAG (i.e., 5.27 km downstream of CORCK).

Consistent with the 2017 to 2019 RAEMP results (Minnow 2020a), BIT selenium concentrations were within the regional normal range at reference and mine-influenced stations in 2021 and were less than the lowest level 1 benchmark and lower than expected based on water quality data at CORCK and at stations on Michel Creek. Westslope Cutthroat Trout muscle selenium concentrations were less than the site-specific benchmark of 15.5 mg/kg dw in 2021 and have been similar over time in the upper Michel Creek area near CMm with no significant differences detected among years (Minnow 2020a). Mean BIT selenium from lentic areas near CMm were often greater than the BC MOE (2019a) guideline and exceeded the level 1 benchmark for dietary effects to juvenile fish (Golder 2014). However, the 2018 and 2019 Lentic Supporting Study results did indicate that lentic areas near CMm, were highly used by fish and aquatic-dependent wildlife and that their exposure risk to mine-related selenium effects was low, with the exception of RG_SLMICP (Minnow 2020a; Appendix K). Overall based on the RAEMP and LAEMP results, selenium concentrations are not expected to negatively impact the benthic invertebrate or fish communities in Michel Creek.

Nutrient concentrations are similar among stations in Michel Creek and at CORCK, and were classified as ultra-oligotrophic, i.e., having low phosphorus concentrations; however, it is unlikely that nutrient concentrations are responsible for the low % EPT or % E at CORCK or MIDCO. Golder (2017) suggested that nickel is likely responsible for the BIC changes. The findings of the 2019, 2020, and 2021 CMm LAEMP and the Chronic Toxicity Testing Program (Golder 2017, 2019b, 2020b, 2021b, 2022) support the interpretation in Golder (2017) that nickel is likely responsible for the BIC changes. Results of the 2019 to 2021 CMm LAEMPs, as well as additional sampling as part of the ongoing Nickel Benchmark Study, suggest that BIC effects from nickel in Michel Creek are localized near CORCK and do not extend farther on Michel Creek than MIDCO. Chronic toxicity testing results also indicate no adverse effects on fish, which is supported by RAEMP results (Minnow 2020a) and results of the Fish Community Survey (Regehr et al. 2020a), and Fisheries Habitat Assessment Procedure (Regehr et al. 2020b) carried out in Corbin Creek.

6.2 Study Question 2

How do spatial and temporal patterns in the benthic invertebrate communities correspond to water quality, calcite, sediment quality, and other potential stressors, and what does this tell us about what factors are causing observed effects?

Habitat variables were similar between reference and mine-influenced stations and it was concluded that differences in habitat are unlikely to have caused the differences observed in % EPT and % E at the stations downstream of CMm in Michel Creek. It is also unlikely that calcite presence and concretion in Michel Creek was a factor in the lower proportions of EPT and Ephemeroptera taxa at MIDCO, because calcite index values were low between 2012 and 2021 and within the reference normal range in Michel Creek. However, calcite presence may have been a factor at CORCK.

Spatial comparisons indicated correlations of % EPT and % E with aqueous concentrations of nickel. There were intercorrelations of nickel with other potential stressors (e.g., cobalt, selenium) and intercorrelations between aqueous concentrations, sediment concentrations, and tissue concentrations in benthic invertebrates. However, the only water quality constituent with concentrations in Michel Creek above invertebrate screening values was nickel. Concentrations were above the level 3 invertebrate screening value of 22 µg/L at CORCK and above the level 1 invertebrate screening value of 5.3 µg/L in Michel Creek downstream of CMm at MIDCO.

Spatial and temporal patterns in BIC endpoints corresponded more closely with mine-influenced water quality than with sediment quality or calcite, supporting the interpretation that observed patterns in BIC are linked to water quality. Spatial and temporal patterns in constituent concentrations greater than WQGs, benchmarks, or screening values support previous assessments completed through the Chronic Toxicity Testing Program (Golder 2017, 2019b, 2020b, 2021b, 2022) which have implicated nickel as the likely cause of observed effects in BIC. Increased understanding of the nickel benchmarks and effects thresholds for the BIC will improve understanding and inform relationships between water quality and BIC endpoints.

6.3 Summary

The objective of the CMm LAEMP is to assess the magnitude and extent of influence from CMm on water quality, calcite, sediment quality, and benthic invertebrate communities downstream of CMm, and to assess what factors are contributing to the observed effects. This objective is effectively met through the study design, the results of which are presented herein for 2021 and summarized in Table 6.3-1.

Table 6.3-1: Summary of 2021 CMm LAEMP Results

Study Questions	Water Quality[(a)]	Calcite[(b)]	Sediment Quality[(c)]	BIC	BIT Se
Study Question 1: What are the magnitude and spatial extent of influence from CMm in 2021?	Aqueous Ni >level 1 interim screening value at MIDCO (0.94 km ds) and below the level 1 screening value by MIDAG (5.27 km ds). No other constituents >benchmarks or screening values.	Within the reference normal range (0 to 1) at all stations in Michel Creek.	Ni >upper BC WSQG at MIUCO, upstream of CORCK (-0.82 km us) and at MIDCO (0.94 km ds) and MIDAG (5.27 km ds) Cd, Mn, Ni, Zn >upper BC WSQG at MIUCO, upstream of CORCK (-0.82 km us) 2-Methylnaphthalene >upper BC WSQG from MIDCO (0.94 km ds) to MIULE (13.84 km ds) Phenanthrene >upper BC WSQG at MIDCO (0.94 km ds)	% EPT and % E were below habitat-adjusted normal range and significantly lower than downstream and reference stations at MIDCO (0.94 km ds), with magnitudes of difference of -5.4 and -7.4 SD, respectively.	BIT Se within normal range and lower than level 1 benchmark at all stations.
Study Question 1: Are the conditions changing over time?	Aqueous Ni has decreased since 2018.	Calcite index was lower in 2021 compared to previous years.	No clear temporal trend	% EPT and % E are variable across years at MIDCO, which appears to relate to variation in aqueous Ni. There was no significant decrease in benthic invertebrate endpoints in 2021 compared to prior years at Mine-influenced stations.	No
Study Question 1: Are the 2021 results expected based on projections, historical conditions, or habitat conditions?	Aqueous Ni consistent with SRK projections and previous RAEMP and LAEMP results.	Consistent with previous RAEMP and LAEMP results.	Consistent with previous RAEMP and LAEMP results.	% EPT and % E are consistent with expected effects of aqueous Ni evident in monitoring since 2015.	BIT Se spatial patterns are consistent with aqueous Se spatial patterns and historical conditions.
Study Question 2: Are spatial and temporal patterns in exposure variables correlated with BIC?	Yes, for Ni.	Not in Michel Creek.	Yes, because sediment quality is correlated with water quality[(d)].	n/a	No
Study Question 2: What factors may be causing effects?	Water quality, calcite, and sediment quality in Michel Creek immediately downstream of CMm are related to historical mining and pit pumping.			Aqueous Ni is the most likely cause of observed BIC effects.	BIT Se reflects low aqueous Se at CMm.

a) Only constituents with exceedances of a benchmark or screening value shown; BC WQG exceedances not shown when below the EVWQP benchmarks derived for the Elk Valley because they are not expected to negatively impact the benthic invertebrate community (Section 3.1).

b) Calcite data collected during the RAEMP/CMm LAEMP does not apply to the Regional Calcite Monitoring Program data.

c) Only constituents exceeding the upper BC WSQG shown; those constituents below the lower BC WSQG not shown.

d) BIC collected in erosional habitat, not depositional habitat; therefore, unlikely pathway for mine-effects.

BIC = benthic invertebrate community; BIT = benthic invertebrate tissue; CMm = Coal Mountain Mine; Ni = nickel; Cd = cadmium; Mn = manganese; Zn = zinc; ds = downstream; BC WSQG = British Columbia Working Sediment Quality Guideline; % EPT = percent Ephemeroptera, Plecoptera, Trichoptera; % E = percent Ephemeroptera; SS NR = site-specific normal range; RNR = regional normal range; SD = standard deviation; Se = selenium; Co = cobalt; n/a = not applicable; >= greater than; <= less than; μg/L = micrograms per litre; mg/kg = milligrams per kilogram; dw = dry weight; km = kilometers.

7.0 RECOMMENDATIONS

The current study design is effective at collecting sufficient data to address the study questions; therefore, there are no recommended changes to data collection for the CMm LAEMP 2022 study design. However, an updated CMm LAEMP 2022 study design is being submitted with minor updates to the data analysis approach.

The CMm LAEMP will continue to assess relevant site-specific issues, as required, until sufficient data have been collected, concerns no longer exist, or monitoring can be incorporated into the RAEMP. The next CMm LAEMP field program is planned for September 2022.

8.0 CLOSURE

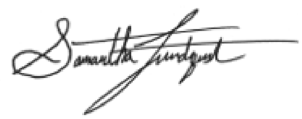
The reader is referred to the Study Limitations, which follows the text and forms an integral part of this report.

We trust the above meets your present requirements. If you have any questions or comments, please contact the undersigned.

Signature Page

Golder Associates Ltd.

Jennifer Arens, Ph.D.
Experienced, Aquatic Biologist



Samantha Lundquist, B.Sc., BIT
Environmental Scientist

Kelly Hille, MSc, RPBio
Lead Aquatic Scientist

Rainie Sharpe, MSc, PhD, PBiol, RPBio
Senior Environmental Scientist

JA/KM/SL/KH/RS/hp

https://golderassociates.sharepoint.com/sites/155697/project files/6 deliverables/3.0 issued/21502121-003-r-rev0-1000 cmm laemp report/21502121-003-r-rev0-1000 cmm laemp report 30jun_22.docx

REFERENCES

Alexander J. 2015. Chapter 52: Selenium. Handbook on the Toxicology of Metals 4th Ed. Nordberg, Nordberg, and Fowler. Academic Pres, San Diego, CA. p. 1175-1208.

British Columbia Ministry of Environment (BC MOE). 2013. British Columbia Field Sampling Manual for continuous monitoring plus the collection of air, air-emission, water, wastewater, soil, sediment, and biological samples. Water, Air and Climate Change Branch, Ministry of Environment. 2013 Edition.

BC MOE. 2016. British Columbia Environmental Laboratory Manual. Prepared and published by: Environmental monitoring, reporting and economics knowledge manage branch Ministry of Environment Province of British Columbia. February 2016.

BC MOE. 2017. BC working sediment quality guidelines (WSQG) for the protection of freshwater aquatic life. Environmental Protection and Sustainability Branch, Ministry of Environment.

BC MOE. 2019a. Fish Inventories Data Queries - Corbin Creek. Available online at: http://a100.gov.bc.ca/pub/fidq/infoSingleWaterbody.do. Accessed on December 11, 2019.

BC MOE. 2019b. Fish Inventories Data Queries - Michel Creek. Available online at: http://a100.gov.bc.ca/pub/fidq/infoSingleWaterbody.do. Accessed on December 11, 2019.

BC MOE. 2020. British Columbia Environmental Laboratory Manual. Knowledge Management Branch, Ministry of Environment. 2020 Edition.

BC MOE. 2021a. British Columbia Approved Water Quality Guidelines: aquatic life, wildlife and agriculture. Environmental Protection and Sustainability Branch, Ministry of Environment. February 2021.

BC MOE. 2021b. British Columbia Working Water Quality Guidelines: drinking water sources. Environmental Protection and Sustainability Branch, Ministry of Environment. February 2021.

British Columbia Ministry of Environment (BC MOE). 2016. British Columbia Environmental Laboratory Manual. Prepared and published by: Environmental monitoring, reporting and economics knowledge manage branch Ministry of Environment Province of British Columbia. February 2016.

CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines, including updates to 2016. Winnipeg, MB. Available online at: http://st-ts.ccme.ca/.

Chapman D. 1996. Water quality assessments. A guide to the use of biota, sediments and water in environmental monitoring, 2nd Ed. Chapman and Hall, New York, NY.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2016. COSEWIC assessment and status report on the Westslope Cutthroat Trout *Oncorhynchus clarkii lewisi*, Saskatchewan-Nelson River populations and Pacific populations, in Canada. Ottawa, ON.

Dudgeon D. 1984. Longitudinal and temporal changes in functional organization of the macroinvertebrate communities in the Tsuen River, Hong Kong. Hydrobiologia 111: 207–317.

ECCC (Environment and Climate Change Canada). 2012. Canadian Aquatic Biomonitoring Network (CABIN) field manual: wadeable streams. April 2012.

ECCC. 2014. Canadian Aquatic Biomonitoring Network (CABIN) laboratory methods: processing, taxonomy, and quality control of benthic macroinvertebrate samples. May 2014.

ECCC. 2017. Federal Environmental Quality Guidelines (FEQG) Summary Table. Version 1.0 (January 2021). Accessed 19 May 2021: https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/federal-environmental-quality-guidelines-summary-table.html

ECCC. 2018. Science Approach Document: Ecological Risk Classification of Inorganic Substances. May 2018. Accessed 19 May 2021: https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/science-approach-ecological-risk-classification-inorganic-substances.html

Golder (Golder Associates Ltd.). 2014 Benchmark Derivation Report for Selenium. Annex E of the Elk Valley Water Quality Plan. Prepared for Teck Coal Limited. July.

Golder. 2015. Coal Mountain Phase 2 Project. Annex I: Fish and Fish Habitat Baseline Report. Consultant's report prepared for Teck Coal Limited by Golder Associates (Golder), October 2015.

Golder. 2017. Aquatic health assessment – Coal Mountain Operations. Prepared for Teck Coal Limited. December 2017.

Golder. 2018a. 2017 Chronic toxicity program Elk Valley testing to satisfy Permit requirements – interpretive report. Prepared for Teck Coal Limited. April 2018 (updated July 2018).

Golder. 2018b. Proposed site-specific total dissolved solids limit for the Eagle Mine Humboldt tailings disposal facility water treatment plant effluent. Dated 10 July 2017. Reference No. 1792415-001-TM-RevB-2000.

Golder. 2019a. Coal Mountain Operations local aquatic effects monitoring program – 2019 study design. Prepared for Teck Coal Limited. February 2019.

Golder. 2019b. Annual Interpretive Report—2018 Chronic Toxicity Testing Program. Elk Valley Testing to Satisfy Permit Requirements. Submitted to Cait Good, Teck Coal Limited. April 2019.

Golder. 2020a. Coal Mountain Operations local aquatic effects monitoring program – 2020 study design. Prepared for Teck Coal Limited. June 2020.

Golder. 2020b. Annual Interpretive Report—2019 Chronic Toxicity Testing Program. Elk Valley Testing to Satisfy Permit Requirements. Submitted to Cait Good, Teck Coal Limited. April 2020.

Golder. 2020c. User's Manual-Aquatic Data Integration Tool (ADIT) for the Elk Valley. Draft submitted to Mariah Arnold, Teck Coal Limited. 17 January 2020.

Golder. 2021a. 2020 Coal Mountain Mine Local Aquatic Effects Monitoring Program (LAEMP) Report. Submitted to Cait Good, Teck Coal Limited. June 2021.

Golder. 2021b. Annual Interpretive Report—2020 Chronic Toxicity Testing Program. Elk Valley Testing to Satisfy Permit Requirements. Submitted to Cait Good, Teck Coal Limited. April 2021.

Golder. 2022. 2021 Chronic Toxicity Testing Program. Elk Valley Testing to Satisfy Permit Requirements. Submitted to Teck Coal Limited. April 2022.

Government of Canada. 2018. Species at Risk Public Registry: A to Z species index [online]. Available from http://www.registrelep-sararegistry.gc.ca/sar/index/default_e.cfm [accessed May 2020].

Healey K, Hatfield T. 2020. Corbin Creek Environmental Flow Needs - Evaluation of Minimum Flow Thresholds Assessment Consultant's report prepared by Ecofish Research Ltd. for Teck Coal Limited. November 30, 2020

Hoke RA, Giesy JP, Adams JR. 1990. Use of linear orthogonal contrasts in analysis of environmental data. Environmental Toxicology and Chemistry, 9: 815-819.

Lotic and Teck (Lotic Environmental Ltd. and Teck Coal Limited). 2016. Teck Coal Ltd – 2016 to 2018 Calcite monitoring program. Submitted to the British Columbia Ministry of Environment and Climate Change Strategy, May 2016.

Lotic and Teck. 2021a. Teck Coal Ltd. – Calcite monitoring program. Submitted to the British Columbia Ministry of Environment and Climate Change Strategy, May 2021.

Lotic and Teck. 2021b. Teck Coal Ltd. – Regional Calcite Monitoring Plan – Field Manual. May 2021.

MacPherson CA, Lee DHY, Chapman PM. 2014. Development of a Fluoride Chronic Effects Benchmark for Aquatic Life in Freshwater. Environ Toxicol Chem. 33: 2621-2627.

Massé AJ, Muscatello JR, Janz DM. 2015. Dose-dependent early life stage toxicities in *Xenopus laevis* exposed in ovo to selenium. Environmental Science and Technology, 49(22): 13658-13666.

Minnow (Minnow Environmental Inc.). 2014. 2012 Aquatic monitoring program report. Prepared for Teck Coal Ltd., Sparwood, BC. Project #2456.

Minnow. 2015. Design for the Regional Aquatic Effects Monitoring Program (RAEMP), Elk River watershed. Prepared for Teck Coal Limited, Sparwood, B.C. March 2015. Project #2529

Minnow. 2018a. Elk River watershed Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2015 to 2016. Prepared for Teck Coal Limited. January 2018.

Minnow. 2018b. Study design for the Regional Aquatic Effects Monitoring Program (RAEMP), 2018 to 2020. Prepared for Teck Coal Limited and Environmental Monitoring Committee. March 2018.

Minnow. 2020a. Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2017 to 2019. Prepared for Teck Coal Limited. November 2020.

Minnow. 2020b. Study design for the Regional Aquatic Effects Monitoring Program (RAEMP), 2021 to 2023. Prepared for Teck Coal Limited and Environmental Monitoring Committee. March 2020.

Minnow. In preparation. Elk River watershed Regional Aquatic Effects Monitoring Program (RAEMP) Report, 2020 to 2022. Prepared for Teck Coal Limited.

Minnow Environmental Inc., Interior Reforestation Co. Ltd., and Paine Ledge and Associates. 2007. Selenium in the Elk River Watershed, BC. (2006). Prepared for Elk Valley Selenium Task Force. December. Project #2160.

Minnow Environmental Inc., Interior Reforestation Co. Ltd., and Paine Ledge and Associates. 2011. Selenium monitoring in the Elk River Watershed, BC. (2009). Prepared for Teck Coal Limited. February. Project #2275.

Minnow Environmental Inc. and Paine, Ledge and Associates (PLA). 2012. Surface Water Quality Evaluation for Teck's Coal Mining Operations in the Elk River Valley, BC. Prepared for Teck Coal Limited. August. Project #2386.

Nautilus Environmental and Interior Reforestation 2011. Elk River Fish Distribution and Longnose Dace Tissue Assessment. Final report.

Nautilus Environmental. 2018. Toxicity identification evaluation for CM_MC2. Final Report. Submitted to Teck Coal Limited. September 2018.

Newman MC, Unger MA. 2003. Fundamentals of Ecotoxicology, 2nd Ed. CRC Press LLC, Boca Raton, FL.

Pearson M, Healey MC. 2012. Species at risk and local government: a primer for BC. Stewardship Centre of British Columbia, Courtenay, BC.

R Core Team. 2022. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL: https://www.R-project.org/.

Regehr H, Chambers K, Swain N, Jensma T, Tamminga A, Faulkner S. 2020a. Corbin Creek EFN Fish Community Report. Consultant's report prepared for Teck Coal Limited by Ecofish Research Ltd.

Regehr H, Chambers K, Faulkner S. 2020b. Corbin Creek EFN Fish Habitat Assessment Procedure. Draft V1. Consultant's report prepared for Teck Coal Limited by Ecofish Research Ltd, May 1, 2020.

Robinson M, Atherton K. 2016. Teck Coal Limited 2016 to 2018 calcite monitoring program. Prepared by Lotic Environmental Ltd. and Teck Coal Limited.

Robinson M, Gordon S, Otto M. 2022. Teck Coal Ltd. 2021 Calcite Monitoring Program Annual Report. Prepared for Teck Coal Ltd. by Lotic Environmental Ltd.

Rosenberg DM, Resh VH. 1992. Freshwater biomonitoring and benthic macroinvertebrates. Chapman and Hall, New York, NY.

SRK (SRK Consulting Inc). 2016. Coal Mountain Operations 2016 water and load balance revision. Prepared for Teck Coal Ltd. Project No. 1CT017.125. December 2016.

SRK 2019. Coal Mountain Operations water and load balance model 2019 comprehensive update. Report prepared by SRK Consulting for Teck Coal Limited – Coal Mountain Operations. March 2019.

SRK 2022. Coal Mountain Mine water and load balance model 2022 comprehensive update. Report prepared by SRK Consulting for Teck Coal Limited – Coal Mountain Mine. March 2022.

Teck (Teck Coal Limited). 2014. Elk Valley water quality plan. July 2014.

Teck. 2017. Coal Mountain Operations care and maintenance integrated water management plan. December 2017.

Teck. 2018a. Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley. December 2018.

Teck. 2018b. Coal Mountain Operations Corbin Creek water licence amendment EFN Workplan. Submitted to Ministry of Forest, Lands, Natural Resource Operations, and Rural Development. August 2018.

Teck. 2019. Permit 107517 annual water quality monitoring report. Teck Coal Limited. 31 March 2019.

Teck. 2020. Permit 107517 annual water quality monitoring report. Teck Coal Limited. 31 March 2020.

Teck 2021a. AMP Teck (Teck Coal Limited). 2018. Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley. December 21, 2018.

Teck. 2021b. Permit 107517 annual water quality monitoring report. Teck Coal Limited. 31 March 2021.

STUDY LIMITATIONS

Golder Associates Ltd. (WSP Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by WSP Golder for the sole benefit of Teck Coal Limited. All third parties relying on this document do so at their own risk.

This document represents WSP Golder's professional judgement based on the knowledge and information available at the time of completion. The factual data, interpretations, suggestions, recommendations and opinions expressed pertain to the specific project, site conditions, design objective, development and purpose described to WSP Golder by Teck Coal Limited, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

Teck Coal Limited may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. WSP Golder is not responsible for any unauthorized use or modification of this document. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

APPENDIX A

Adaptive Management Plan – Biotriggers

Table of Contents

A ADAPTIVE MANAGEMENT – BIOLOGICAL TRIGGERS

A1 INTRODUCTION

A1.1 Background

Biological triggers for management action have been developed as part of Teck's Adaptive Management Plan (AMP; Teck 2018). Triggers are intended as a simple way to provide warning of potential unexpected monitoring results that may require management action. Additionally, information provided from the analysis of biological triggers may lead to the opening of a response framework under the AMP, which would be reported within the annual AMP report.

Draft biological triggers for Management Question 5 were developed in the 2018 AMP (Teck 2018) for three measurement endpoints:

- Percent EPT (% EPT; Ephemeroptera, Plecoptera, and Trichoptera) – based on travelling kick samples (CABIN protocol), generally three replicates per location per sampling event
- Benthic invertebrate tissue selenium (BIT Se) – generally several replicates collected per location per sampling event, where each replicate is a composite sample of invertebrates
- Westslope Cutthroat Trout muscle tissue selenium (WCT Se) – generally eight replicates collected per location per sampling event, where each replicate corresponds to a sample from a single fish

These three endpoints are evaluated (where data are available) in detailed spatial and/or temporal analyses in Local Aquatic Effects Monitoring Program (LAEMP) reports and the Regional Aquatic Effects Monitoring Program (RAEMP) report and, therefore, there is some degree of redundancy in evaluating the same data using biological triggers. Notably, data collected under the RAEMP are incorporated into the aquatic data integration tool (ADIT), where they are integrated to characterize the state of the aquatic environment for the whole of the study area (i.e., all management units). Biological trigger analyses are not identical to the evaluations in the LAEMP, RAEMP, and ADIT, and are intended to be complementary to these other analyses. The methods applied for biological trigger analyses reflect refinements made in consultation with the EMC since the draft triggers were developed in the 2018 AMP (Teck 2018) and finalized in 2021 (Teck 2021). Through future iterative evaluations, the process and/or biological triggers may be adjusted over time.

A2 METHODS

A2.1 Overview

Biological trigger analyses for the 2021 CMm LAEMP included two of the three measurement endpoints (i.e., % EPT and BIT Se) because fish tissue sampling is not conducted as part of the CMm LAEMP. Expected conditions for these endpoints were developed using projected water quality (rather than measured water quality) so that the triggers would detect biological results that were unexpected, regardless of whether those results relate to unexpected water quality or unexpected relationships between water quality and biological endpoints.

Therefore, biological triggers were applied at locations where water quality projections were available[1]. Specifically, one mine-influenced station on Michel Creek (MIDCO) and one on Corbin Creek (CORCK; CM_CC1) were evaluated for biological triggers within the CMm LAEMP.

A2.2 Percent EPT

Data for percent EPT were compared to:

- **Normal range:** the lower limit of habitat-adjusted normal range (2.5th percentile).
- **Expectations:** the % EPT corresponding to the predicted ADIT score. Predicted ADIT scores correspond to modelled potential effects on benthic invertebrate community (BIC) endpoints, based on relationships between concentrations of nitrate, sulphate, and nickel[2] and sensitive toxicity test endpoints that are interpreted to be predictive of potential effects on BIC endpoints. A predicted ADIT score of 3 corresponds to >50% potential effects on the sensitive toxicity test endpoint, 2 corresponds to 20 to 50% potential effects, 1 corresponds to 10 to 20% potential effects, and 0 corresponds to potential effect levels of 10% or less.

Predicted ADIT scores were compared to measured ADIT scores, which are calculated in the ADIT as follows (Golder 2020):

- an ADIT score of 0 corresponds to measured % EPT ≥ the 10th percentile of the habitat-adjusted normal range
- an ADIT score of 1 corresponds to measured % EPT between the 10th percentile and the 2.5th percentile of the habitat-adjusted normal range
- an ADIT score of 2 corresponds to measured % EPT between the 2.5th percentile and half of the 2.5th percentile of the habitat-adjusted normal range
- an ADIT score of 3 corresponds to measured % EPT ≤ half of the 2.5th percentile and ≥ 0

Individual replicate habitat-adjusted normal ranges were used at each location for establishing the % EPT percentiles associated with each ADIT score.

In summary, this component of the biological trigger for % EPT asks whether the measured ADIT score, calculated based on measured % EPT relative to normal ranges, is greater than the ADIT score that was predicted based on water quality projections.

Benthic invertebrate community data for % EPT collected in September for the 2021 CMm LAEMP were included in the biological trigger analysis.

---

1 Biological triggers have not been developed for lentic areas because the complex and site-specific hydrology of lentic areas precludes the development of useful water quality projections, and because the highly variable and site-specific habitat of lentic areas precludes the development of useful normal ranges for benthic invertebrate community metrics that would be appropriate for all lentic areas.

2 Projections were based on the highest maximum monthly mean across all flow scenarios (i.e., low, average, high). Selenium was not included because selenium effects on BIC endpoints are not expected under the range of conditions evaluated herein.

A2.3 Benthic Invertebrate Tissue Selenium

Data for BIT Se were compared to:

- **Normal range:** The upper limit of regional normal range (97.5th percentile).
- **Expectations:** The upper limit of the 95% prediction interval based on the water to BIT bioaccumulation model. The model was originally developed in the EVWQP (Golder 2014) and was updated (Golder 2020). The updated best fit relationship is $log_{10}[Se]_{inv} = 0.720 + 0.071 \times log_{10}[Se]_{aq}$. Prediction intervals were calculated based on the *t*-distribution with *n*=2 degrees of freedom. Prediction intervals were estimated for BIT Se for individual replicates, taking into account that the data points for the original model were based on geometric means rather than individual replicates (Azimuth 2021, in preparation).

Benthic invertebrate tissue selenium data collected during the September 2021 CMm LAEMP sampling program was included in the biological trigger analysis and compared to the normal range information based on samples collected in September between 1996 and 2020.

Although effects benchmarks are not part of the trigger, they are relevant for interpreting potential significance and responses. Consequently, the level 1, 2 and 3 benchmarks (11, 18 and 26 mg/kg selenium, respectively) for the most sensitive receptor (i.e., juvenile fish growth via dietary exposure) are included in plots.

A3 RESULTS

A3.1 Percent EPT

Percent EPT for each mine-influenced replicate was assessed against its respective biological trigger criteria (Table A-1 and Figure A-1). All replicates at CORCK and MIDCO had % EPT values lower than the 2.5th percentile of the habitat-adjusted normal range (i.e., indicating a change from the reference normal range) and measured ADIT scores greater than the predicted ADIT score based on projected water quality (i.e., indicating a greater than expected change from the reference normal range), resulting in biological triggers at each station.

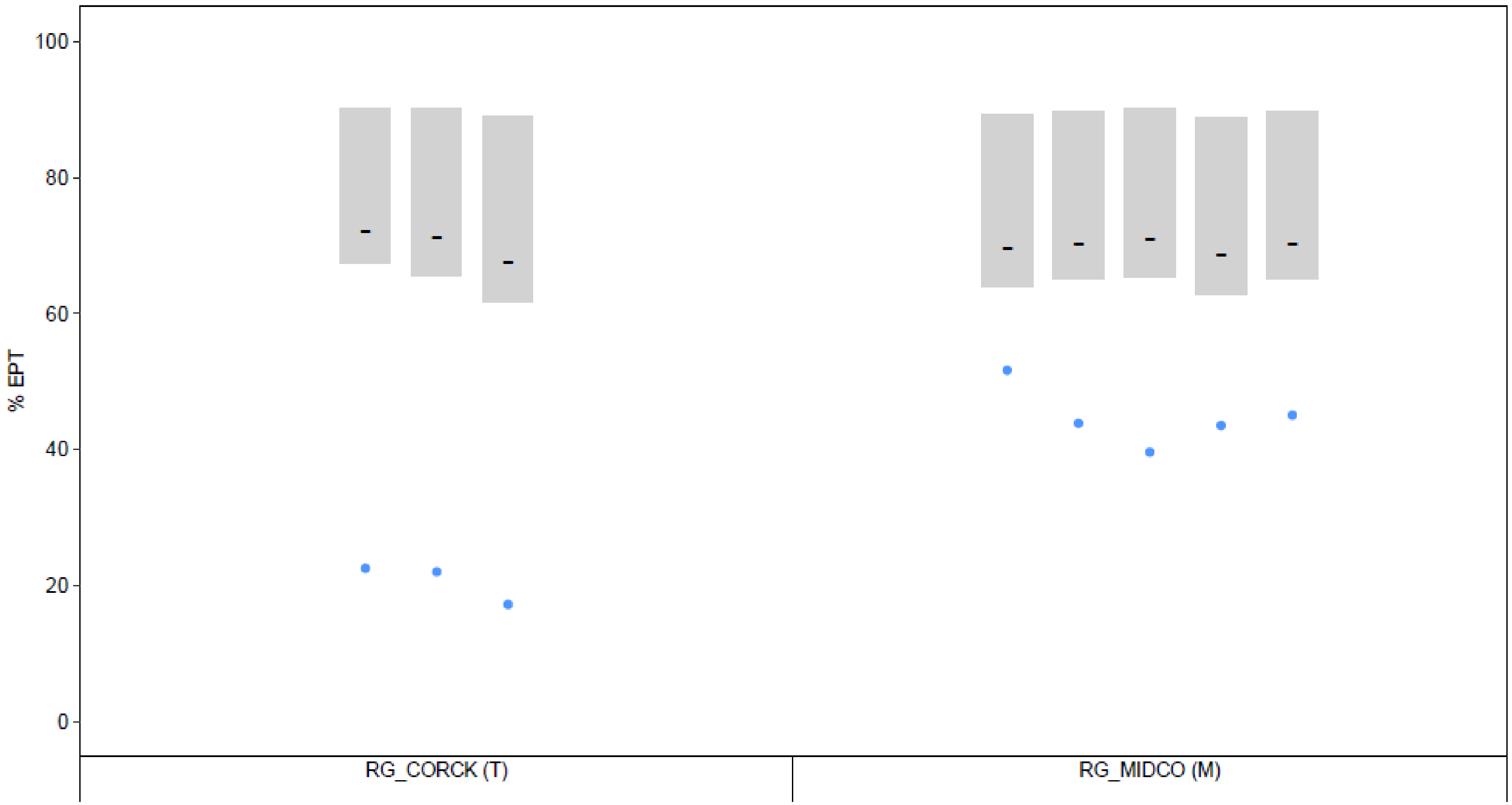
Table A-1: Biological Trigger Analysis for Percent Ephemeroptera, Plecoptera, and Trichoptera (EPT) at CMm LAEMP Sampling Stations, 2021

Watercourse		Station	Type	Replicate	Date	Measured % EPT	Measured ADIT Score	Predicted ADIT Score	2.5th Percentile of the Habitat Adjusted Normal Range	Biological Trigger Event?
Mine Influenced Stations	Corbin Creek	CORCK	T	1	14-Sep-2021	22.5	3 (32.5)	0 (72.8)	68.0	Yes
		CORCK	T	2	14-Sep-2021	22.0	3 (31.4)	0 (71.1)	65.5	Yes
		CORCK	T	3	14-Sep-2021	17.2	3 (29.3)	0 (68.1)	62.0	Yes
	Michel Creek	MIDCO	M	1	12-Sep-2021	51.7	2 (61.9)	0 (70.4)	64.6	Yes
		MIDCO	M	2	12-Sep-2021	43.9	2 (61.9)	0 (71.2)	65.6	Yes
		MIDCO	M	3	12-Sep-2021	39.6	2 (62.5)	0 (71.6)	66.2	Yes
		MIDCO	M	4	12-Sep-2021	43.5	2 (59.9)	0 (69.5)	63.3	Yes
		MIDCO	M	5	12-Sep-2021	45.1	2 (62.4)	0 (71.3)	65.6	Yes

Note: The % EPT percentile value associated with each ADIT score are presented in parentheses.

M = mainstem; T = tributary; ADIT = Aquatic Data Integration Tool.

Figure A-1: Percent Ephemeroptera, Plecoptera, and Trichoptera Compared to Predicted Values at CMm LAEMP Sampling Stations, 2021



Note: Black bars indicate the lower limit of the predicted ADIT score for the location. Blue dots represent values exceeding the trigger (below 2.5th percentile of the normal range and below the lower limit of the predicted ADIT score). Grey shading represents the habitat-adjusted site-specific normal range for each replicate. The water quality projection for RG_CM_MC2 was used for biological trigger calculations for RG_MIDCO.

M = mainstem; T = tributary; ADIT = Aquatic Data Integration Tool.

A3.2 Benthic Invertebrate Tissue Selenium

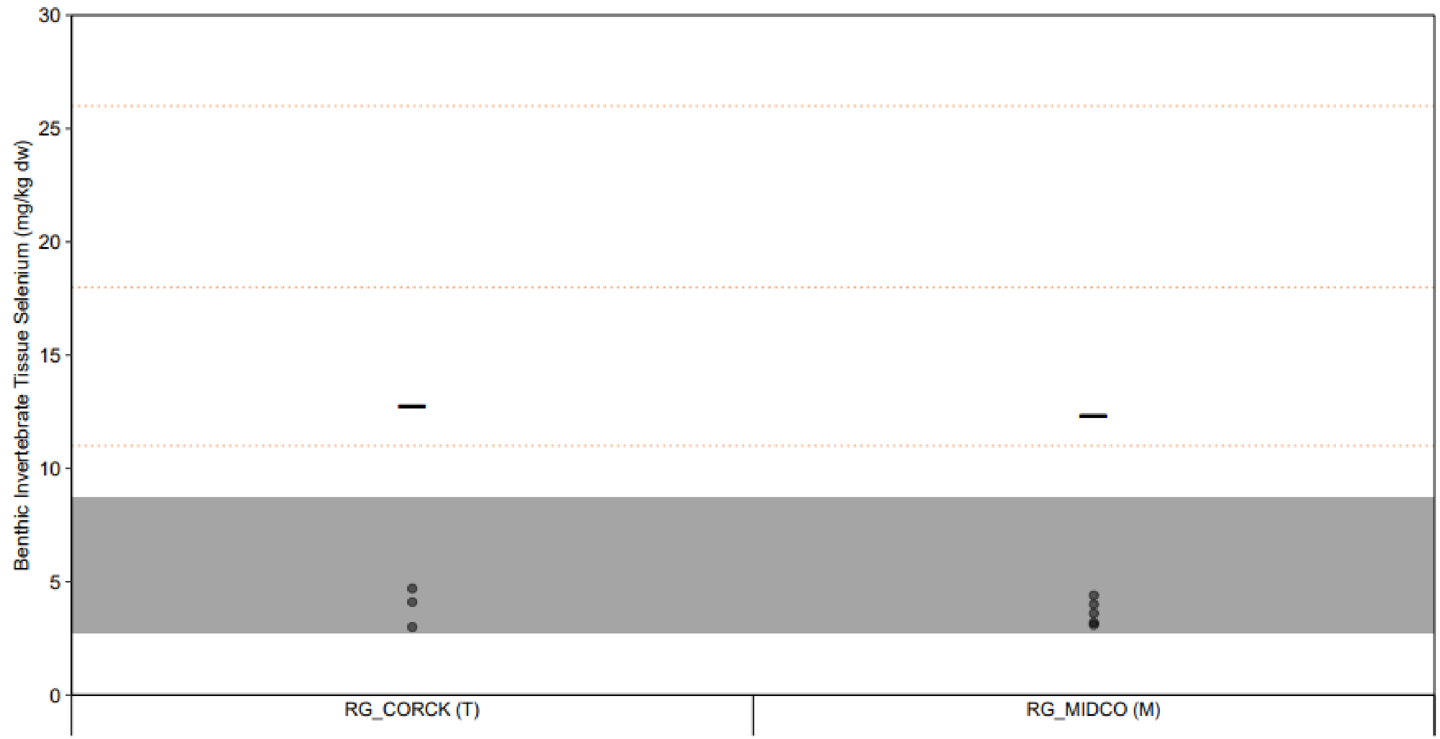
Concentrations of BIT Se for each mine-influenced replicate were assessed against their respective biological trigger criteria (Table A-2 and Figure A-2). None of the replicates in 2021 had concentrations of BIT Se above the biological trigger threshold (i.e., higher than both the upper 95% prediction limit based on predicted water quality, and the upper 97.5th percentile normal range), or above the level 1 benchmarks for juvenile fish (i.e., 11 mg/kg dw); resulting in no biological trigger for BIT Se.

Table A-2: Biological Trigger Analysis for Selenium Concentrations in Benthic Invertebrate Tissue at CMm LAEMP Sampling Stations, 2021

Watercourse		Station	Watercourse Type	Replicate	Date	Predicted Aqueous Selenium Concentration (µg/L)	Benthic Invertebrate Tissue Selenium Concentration (mg/kg dw)			Biological Trigger Event?
							Reported Concentration	Upper 95% Prediction Limit	97.5th Percentile of Normal Range	
Mine Influenced Stations	Corbin Creek	CORCK	T	1	14-Sep-2021	13.8	4.1	12.7	8.7	No
		CORCK	T	2	14-Sep-2021	13.8	3.0	12.7	8.7	No
		CORCK	T	3	14-Sep-2021	13.8	4.7	12.7	8.7	No
	Michel Creek	MIDCO	M	1	12-Sep-2021	8.3	4.4	12.3	8.7	No
		MIDCO	M	2	12-Sep-2021	8.3	3.1	12.3	8.7	No
		MIDCO	M	3	12-Sep-2021	8.3	4.0	12.3	8.7	No
		MIDCO	M	4	12-Sep-2021	8.3	3.6	12.3	8.7	No
		MIDCO	M	5	12-Sep-2021	8.3	3.2	12.3	8.7	No

M = mainstem; T = tributary; mg/kg = milligram per kilogram; mg/L = milligrams per litre; dw = dry weight.

Figure A-2: Selenium Concentrations in Benthic Invertebrate Composite Taxa Samples – Compared to Predicted Values at CMm LAEMP Sampling Stations, 2021



Note: Black bars indicate the upper 95th prediction interval of the bioaccumulation model. Dotted lines indicate level 1, 2, 3 benchmarks for juvenile fish (11, 18, and 26 mg/kg, respectively). Grey shading represents the reference area normal range defined as the 2.5th and 97.5th percentiles of the distribution of the reference area data (pooled 1996 to 2019 data) reported in the RAEMP. The water quality projection for CM_MC2 was used for biological trigger calculation at MIDCO.

M = mainstem; T = tributary; mg/kg = milligrams per kilograms; dw = dry weight; RAEMP = regional aquatic effects monitoring plan.

A4 SUMMARY

All replicates at CORCK and MIDCO had % EPT values that resulted in a biological trigger event. These findings are consistent with results of sampling and evaluation in previous years, including in the 2020 CMm LAEMP, that prompted management action under the AMP response framework. Teck first investigated localized effects on % EPT at CMm in 2017 as part of the Integrated Water Management Plan for Closure for CMO (Golder 2017). Analyses presented in Golder (2017) attributed the localized effects at least in large part to nickel, although effects in Corbin Creek are interpreted to also reflect calcite conditions there. Since 2017, Teck has conducted a series of laboratory and field investigations to better understand nickel toxicity and effects to % EPT, with the objective of deriving benchmarks to guide assessment and management of nickel in the Elk Valley. Teck also initiated the CMm LAEMP (of which this assessment of biological triggers is a part) and initiated ongoing evaluations of nickel treatment options. These activities are reported annually in AMP reporting.

None of the replicates in 2021 had concentrations of BIT Se above the biological trigger threshold or above the level 1 benchmarks for juvenile fish, similar to 2020 results. These findings do not indicate a need to track BIT Se under the AMP framework.

REFERENCES

Golder (Golder Associates Ltd.) 2014. Benchmark Derivation Report for Selenium. Annex E of the Elk Valley Water Quality Plan. Prepared for Teck Coal Limited. July.

Golder. 2017. Aquatic health assessment – Coal Mountain Operations. Prepared for Teck Coal Limited. December 2017.

Golder. 2020. Updates to the lotic and lentic statistical bioaccumulation models for selenium in the Elk Valley. Technical memorandum to Teck Coal Limited, 27 November 2020.

Teck (Teck Coal Limited). 2018. Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley. December 2018.

Teck. 2021. Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley. December 2021.

APPENDIX B

Site Conditions and Water Management

Table of Contents

B SITE ACTIVITIES AND WATER MANAGEMENT

Mining activity at Coal Mountain began around 1908 with small underground mines and has continued intermittently for over a century. Open pit operations began in 1975 and mining progressed under various owners until Teck took ownership of CMm in 2008 (Teck 2017a). Coal Mountain ceased active mining and processing operations on 30 April 2019 and made the transition into a care and maintenance (C&M) phase on 1 May 2019 (Figure B-1). Reclamation efforts will increase through C&M and will be guided by the plans outlined in Coal Mountain's 2017 Closure Plan (Teck 2017b). Following C&M, closure (2028 to 2036) and post closure (2036 and beyond) activities will be carried out at CMm, which will include decommissioning of infrastructure, remediation, and revegetation, as appropriate.

During operations between 2008 and 2019, CMm consisted of four pits: 6 Pit, 14 Pit, 34 Pit, and 37 Pit (Teck 2017a). Mining concluded in 14 Pit in 2006, 34 Pit in 2013, and in 37 Pit and 6 Pit in 2018. Backfilling has occurred since the pits closed; 14 Pit, 34 Pit, and 37 Pit have been fully (14 Pit) and partially (34 Pit and 37 Pit) backfilled with waste rock and refuse. Water storage capacity of the pits have been maximized and pit pumping is required for geotechnical safety. Current pit dewatering practices at CMm direct water to established and permitted mining contact water collection systems, which eventually discharge to Corbin Creek.

The surface water management system at CMm is designed to capture all mine contact surface water. The water management system includes:

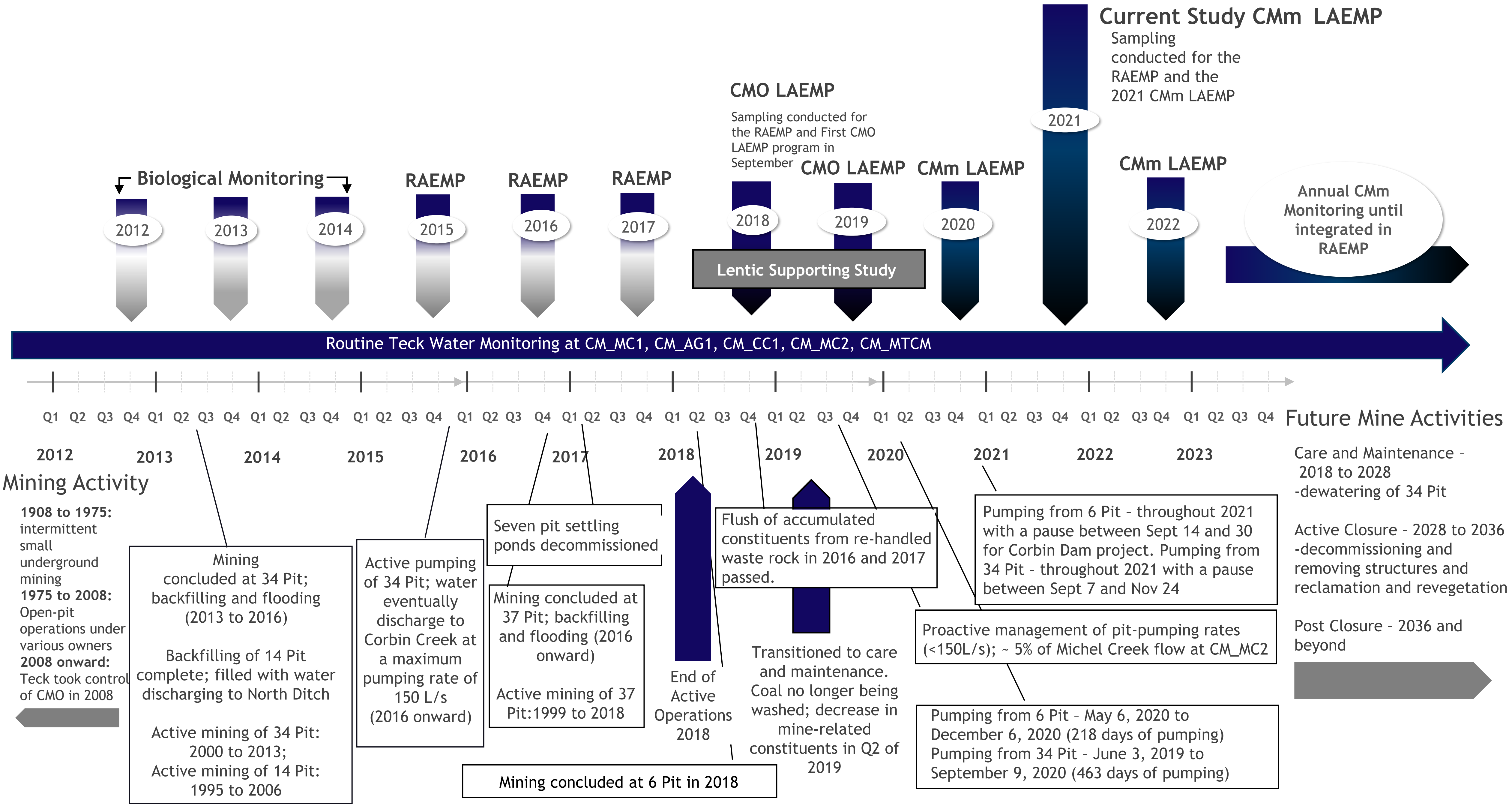
1) a three-pond system for settling out total suspended solids (Corbin Creek Dam and the west and east Main Interceptor Sedimentation Ponds)
2) clean water diversions to move clean water around mine disturbed areas
3) North and West Ditches to convey contact water to the ponds
4) rock drains utilized in creeks where there is spoiling of waste rock
5) infiltration sumps used to collect additional runoff from other structures

Runoff from the local waste rock spoils, pit wall runoff, groundwater inflow and direct precipitation is received by 6 Pit. Outflows include evaporation and pumping. Teck's preferred water management strategy is to maintain 6 Pit empty of water, if safe to do so. Teck intends to pump continuously to maintain water levels at or below the recommended target maximum volume; however, during some periods, such as during extremely low flows, pumping may pause temporarily. Though some periods of intermittent pumping may occur, pumping rates are planned to match rates of inflow into 6 Pit. Water is pumped from 6 Pit to the Corbin Creek rock drain and then flows to the Corbin Pond, Corbin Creek, and eventually Michel Creek. Water quality in 6 Pit has historically had higher concentrations of sodium and chloride than are observed in other water on site (SRK 2022).

Excess water from 37 Pit and runoff from local waste rock spoils, pit wall runoff, runoff from waste rock backfill within 34 Pit, groundwater inflow, and direct precipitation are received by 34 Pit. Outflows from 34 Pit include evaporation and active pumping to maintain the water level below the passive decant level. Water from 34 Pit is pumped to a sump downstream of the 14 Pit horizontal drain discharge, eventually flowing to the North Ditch and reporting to Michel Creek. The volume of water that is dewatered annually is equal to the total inflows to the pit, because the pit water elevation is already near it's maximum elevation. Pumping of 34 Pit occurs at a rate synchronized to seasonal flow in Michel Creek at monitoring location CM_MC2, targeting a pump rate of 5% of projected flow in Michel Creek at CM_MC2 up to the current maximum pumping infrastructure capacity (150 L/s) to maintain target pit water levels for geotechnical stability.

Pit dewatering occurred in 2019, 2020 and continued into 2021. In 2019, pumping rates from 34 Pit were below maximum authorized rates (i.e., 150 L/s) and no pumping from 6 Pit occurred; 6 Pit filled in naturally but did not decant. In 2020 and 2021, active dewatering of 34 Pit and 6 Pit occurred at rates below the maximum authorized rates. Pumping from 6 Pit began in May 2020 when 6 Pit reached its storage capacity and continued into 2021. It was paused for a short period from 14 September to 30 September 2021 to support the Corbin Dam Dewatering Project associated with the Corbin Dam Spillway Upgrade Project. Pumping from 34 Pit began in June 2019 and continued until fall 2020. Pumping resumed in May 2021 and continued throughout 2021, with a short pause during the Corbin Dam Dewatering project, between September and November 2021.

The main source of nickel to Michel Creek originates from 34 Pit and the Corbin Creek Rock Drain. Proactive water management and pit-pumping of 34 Pit in recent years has resulted in an improvement in water quality and nickel concentrations downstream of CMm since 2017 (Teck 2019). However, even under a no pumping scenario, Teck is projected to exceed the interim screening values for nickel. Pumping of 34 Pit is required to mitigate the geotechnical risk associated with water reporting to the west spoils passively. The pumping plan has been optimized to manage constituent loads to Corbin Creek and the competing need to manage geotechnical risk. The current proactive pit pumping management at CMm that has occurred since 2019 has given Teck the ability to actively manage the release of mining-related constituents to Corbin Creek and manage geotechnical risk. CMm is working towards re-sloping of the west spoils to support passive discharge over active pumping in the future.


Current Study CMm LAEMP
Sampling conducted for the RAEMP and the 2021 CMm LAEMP
2021
CMO LAEMP
Sampling conducted for the RAEMP and First CMO LAEMP program in September
CMO LAEMP
CMm LAEMP
CMm LAEMP
Biological Monitoring
RAEMP
RAEMP
RAEMP
2012
2013
2014
2015
2016
2017
2018
2019
2020
2022
Annual CMm Monitoring until integrated in RAEMP
Lentic Supporting Study
Routine Teck Water Monitoring at CM_MC1, CM_AG1, CM_CC1, CM_MC2, CM_MTCM
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Future Mine Activities
Care and Maintenance - 2018 to 2028 -dewatering of 34 Pit
Active Closure - 2028 to 2036 -decommissioning and removing structures and reclamation and revegetation
Post Closure - 2036 and beyond
Mining Activity
1908 to 1975: intermittent small underground mining
1975 to 2008: Open-pit operations under various owners
2008 onward: Teck took control of CMO in 2008
Mining concluded at 34 Pit; backfilling and flooding (2013 to 2016)
Backfilling of 14 Pit complete; filled with water discharging to North Ditch
Active mining of 34 Pit: 2000 to 2013;
Active mining of 14 Pit: 1995 to 2006
Active pumping of 34 Pit; water eventually discharge to Corbin Creek at a maximum pumping rate of 150 L/s (2016 onward)
Seven pit settling ponds decommissioned
Mining concluded at 37 Pit; backfilling and flooding (2016 onward)
Active mining of 37 Pit:1999 to 2018
End of Active Operations 2018
Mining concluded at 6 Pit in 2018
Flush of accumulated constituents from re-handled waste rock in 2016 and 2017 passed.
Transitioned to care and maintenance. Coal no longer being washed; decrease in mine-related constituents in Q2 of 2019
Pumping from 6 Pit - throughout 2021 with a pause between Sept 14 and 30 for Corbin Dam project. Pumping from 34 Pit - throughout 2021 with a pause between Sept 7 and Nov 24
Proactive management of pit-pumping rates (<150L/s); ~ 5% of Michel Creek flow at CM_MC2
Pumping from 6 Pit - May 6, 2020 to December 6, 2020 (218 days of pumping)
Pumping from 34 Pit - June 3, 2019 to September 9, 2020 (463 days of pumping)

Water quality is monitored at CMm as required under Permits 4750 and 107517. The permits require water quality be maintained to meet permit limits, and the water must not cause greater than 50% mortality in 96-hour Rainbow Trout (*Oncorhynchus mykiss*) single concentration toxicity tests (EPS 1/RM/13 2nd edition, December 2000) or greater than 50% mortality in 48-hour *Daphnia magna* single concentration toxicity tests (EPS 1/RM/14 2nd edition, December 2000).

Between 2016 and 2018, concentrations of several constituents were identified as increasing in water discharged from Corbin Dam at monitoring station CM_CCPD (or CM_CCOFF[1]) and at the Main Interceptor Sedimentation Ponds (CM_SPD; Teck 2019). The constituents were associated with the flush of blasting residues (i.e., nitrate, ammonia and nitrite) and with metal leaching (i.e., sulphate, boron, calcium, cobalt, lithium, magnesium, manganese, molybdenum, nickel, potassium, selenium, sodium, and hardness). The onset of pumping from 6 pit and 34 pit also started in 2016 because water started accumulating in these pits as they got deeper and narrower.

Between 2018 and 2019, a decrease in mining related constituents (i.e., nitrate, cobalt, sulphate, and total dissolved solids) was measured at CM_CCPD and at CM_SPD, resulting in an improvement to water quality downstream of CMm in Corbin Creek and Michel Creek (Teck 2019). The decrease was in part attributed to completion of the flush of accumulated constituents resulting from rehandled waste rock in 2016 and 2017. It was suspected that rehandling of waste rock disturbed constituents that had accumulated in the rock and caused a flush of constituents downstream of CMm when the waste rock was being disturbed. In addition, coal was no longer being washed as CMm transitioned to C&M in May 2019; therefore, plant washdown discharge to the North Ditch or Main Interceptor Sedimentation Ponds had ceased.

Between 2018 and 2020, there were no permit exceedances of compliance limits at CMm's compliance point, CM_MC2. The source discharge analysis for order constituents revealed a long-term increasing trend for sulphate in Corbin Creek (CM_CC1), but concentrations of most constituents were lower in 2020 compared to in 2019 and 2018 at CM_MC2 (Teck 2020).

Recent trends of increasing sulphate concentrations in 2019 and 2020 appear to have stabilized, with 2021 concentrations similar to, or lower than, recent years. Sulphate concentrations were elevated in 6 Pit (500 to 600 mg/L) and 34 Pit (regularly exceeding 1,000 mg/L) in 2021, and occasionally exceeded the permit limit of 500 mg/L at CM_MC2; however, the permit limit is based on the monthly average, which was not exceeded. The Corbin Creek Rock Drain (CCRD) is the main source of sulphate loading at CMm, which may partly be attributable to upstream East Spoils re-sloping works, as part of ongoing reclamation activities (Teck 2022a). There were no exceedances of compliance limits at CMm's compliance point, CM_MC2 in 2021 (Teck 2021; 2022a).

Examination of trends at upstream discharge locations in 2021 revealed significant increasing trends in: cobalt, sulphate, and total dissolved solids at CM_CCPD; sulphate, total dissolved solids, and cobalt (to a lesser extent) at CM_SPD; and a marginally significant trend in total dissolved solids at CM_PC2 (Teck 2021). As a result, early warning trigger criteria were met for sulphate, cobalt, and total dissolved solids in 2021.

---

[1] CM_CCOFF is the alternate sampling location for CM_CCPD because CM_CCPD is no longer safe to access. Teck is in the process of amending the monitoring location to CM_CCOFF.

Consistent with the Chronic Toxicity Testing Program and AMP response framework, Teck has taken steps to manage the release of mining-related constituents to Michel Creek. Teck updated the Coal Mountain Operations Water and Load Balance Model (Teck 2022b) and conducted a detailed evaluation of data from 2016 to 2018 to optimize the pumping plans for 34 Pit and 6 Pit. The thresholds set out in these optimized plans were designed to help Teck meet permit limits at CM_MC2 and meet the aquatic effects benchmarks in Michel and Corbin creeks. Proactive pit pumping management since 2019 has had an overall positive effect on Teck's ability to manage the release of mining-related constituents to Corbin Creek.

In addition to the influence of past and current activities at CMm on Michel Creek, there are other anthropogenic influences such as logging and other industry in the watershed that may also impact water quality in Michel Creek. However, these influences are considered minor contributors and the greatest influence on water quality in Michel Creek has been mining activities.

REFERENCES

SRK 2022. Coal Mountain Mine water and load balance model 2022 comprehensive update. Report prepared by SRK Consulting for Teck Coal Limited – Coal Mountain Mine. March 2022

Teck (Teck Coal Limited). 2017a. Coal Mountain Operations care and maintenance integrated water management plan. December 2017.

Teck. 2017b. Coal Mountain Operations Closure Plan. December 2017.

Teck. 2019. Permit 107517 annual water quality monitoring report. Teck Coal Limited. 31 March 2019.

Teck. 2020. Permit 107517 annual water quality monitoring report. Teck Coal Limited. 31 March 2020.

Teck. 2021. Permit 107517 annual water quality monitoring report. Teck Coal Limited. 31 March 2021.

Teck. 2022a. Permit 107517 annual water quality monitoring report. Teck Coal Limited. 31 March 2022.

Teck 2022b. Coal Mountain WLBM_1CT017.356_Rev11

APPENDIX C

Quality Assurance and Quality Control

Table of Contents

C QUALITY ASSURANCE AND QUALITY CONTROL

C1 Quality Assurance

Quality assurance practices were implemented to assure the quality and integrity of the data produced by both the CMm LAEMP and the RAEMP (Minnow 2020). Detailed quality assurance procedures are presented in the RAEMP study design (Minnow 2020). Study personnel were appropriately educated, trained, and experienced for their respective technical responsibilities, whether in the field, laboratory, or office. To minimize errors and to maintain comparability of data over time, standard operating procedures (SOPs) were developed and followed for sample collection methods, calibration, and maintenance of field instruments, and proper sample handling and laboratory sample submission procedures. The routine procedures followed are presented in detail in each SOP (Minnow 2020).

C2 Quality Control

Quality control samples were collected for the water quality, sediment quality and tissue chemistry components of the CMm LAEMP. Quality control procedures and results are discussed for each component in Sections C2.1 to C2.4. The data quality objectives for the water quality, sediment quality, and tissue chemistry data are presented in Table C-1.

C2.1 Water Quality

Laboratory Reporting Limits

The analytical reports from ALS Environmental (ALS) (Appendix D) were examined to provide an inventory of analytes for which the sample results were less than the laboratory reporting limit (LRL). The LRLs for water quality analytes were assessed relative to working (BC MOE 2021a) and approved (BC MOE 2021b) British Columbia Water Quality Guidelines (BC WQG) for the protection of freshwater aquatic life, Elk Valley Water Quality Plan (EVWQP) Level 1 Benchmarks for water quality (Teck 2014), and relevant site-specific benchmarks.

Constituents with reported concentrations consistently less than the LRL in two or more samples in 2021 were: acidity, carbonate, total suspended solids, total kjeldahl nitrogen, nitrite, dissolved orthophosphate, total phosphorus, total and dissolved antimony, boron, cobalt, and nickel, total iron, total mercury, total thallium, dissolved aluminum, and dissolved zinc (Appendix D). In 2021, hydroxide, bromide, total and dissolved beryllium, bismuth, copper, lead, silver, tin, titanium, and vanadium, dissolved iron, and total zinc were also consistently below the LRL, with the exception of one total zinc sample. Turbidity, total and dissolved cadmium, total manganese, dissolved chromium and dissolved manganese concentrations were detectable in all but one sample in 2021. The LRLs achieved for water samples were lower than the BC WQG and the lowest level 1 EVWQP benchmark for all analytes. In summary, the achieved LRLs were appropriate for this study.

Table C-1: Data Quality Objectives for the Water Quality, Sediment Quality and Tissue Chemistry Components of the CMm LAEMP, 2021

Quality Control Measure	Sample Type	Component		
		Water Quality	Sediment Quality	Tissue Chemistry
		ALS	ALS	Trich
Analytical laboratory LRLs	Comparison of actual LRL to target LRL.	LRL for each parameter should be at least as low as the applicable guidelines, benchmarks, and screening values.	LRL for each parameter should be at least as low as the applicable guidelines and benchmarks.	
Blank analysis	Field or laboratory blanks.	Concentrations measured in blank samples should be <LRL.	-	-
Laboratory precision	Laboratory duplicates.	RPDs ≤ 20%, when at least one result is greater than five times the LRL.		RPDs ≤ 40% for all elements except Ca and Sr for which the DQO is RPD ≤ 60%, when at least one result is greater than five times the LRL.
Accuracy	Recovery of Laboratory Control Samples.	The result should lie within ± 1 of the LOR for the target concentration.		-
	Recovery of Method Blank.	Concentrations measured in method blank samples should be <LOR.		-
	Recovery Matrix Spike.	Calculated recovery results of matrix spikes should lie within accuracy DQO percentages for the given sample.		-
	Recovery of certified reference material.	Calculated recovery results of CRMs should lie within accuracy DQO specified limits for the given test.		DQO of 60 to 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba; 90 to 110% of the certified values for Se, and 70 to 130% of the certified values for all other elements including Ni.

ALS = ALS Laboratories; Trich = TrichAnalytics Inc.; LRL = laboratory reporting limit; <= less than; LOR = limit of reporting; ≤ = less than or equal to; DQO = data quality objective; CRM = certified reference materials; Ca = calcium; Sr = strontium; B = boron; Ti = titanium; Ag = silver; Sn = tin; Sb = antimony; Ba = barium; Se = selenium; Ni = nickel.

Laboratory and Field Blanks

A total of 79 laboratory method blank samples were analyzed by ALS (see Appendix D for applicable laboratory reports). Of the reported method blank results, no analyte concentrations were greater than the LRL.

One trip blank and one field blank sample were used to assess field sampling contamination (Appendix D). The same data quality objectives (DQOs) that were used for the laboratory assessment were used for the trip, and field blanks (Table C-1).

All results in the trip blank sample were below the LRL. For the field blank, three analytes were greater than the LRL in one sample:

- dissolved barium
- dissolved copper
- dissolved sodium

Of the reported concentrations that were detected, none of the analytes in the field blanks had concentrations greater than five-times the LRL. Detectable concentrations in the blank samples were not reported for selenium, sulphate, or cadmium, which have long-term water quality targets as part of the EVWQP (Teck 2014). Overall, these results are expected to have a negligible impact on data quality for this study.

Data Precision

A total of 72 laboratory duplicate samples were used to evaluate analytical precision in 2021 (Appendix D). For all paired samples, comparisons were within the DQO set by the analytical laboratory (Table C-1). The laboratory analytical precision was considered excellent.

One field duplicate sample was collected at MI25 to assess field sampling precision. Field precision and reproducibility were considered good for all parameters, where the RPDs between the concentration in the parent and duplicate samples were below 20%. Overall, the field sampling precision was considered acceptable for the purposes of this study.

Table C-2: Field Duplicate Water Quality Results, CMm LAEMP, 2021

Location		MDL	Reference Station			
Watercourse			Michel Creek			
Station			MI25			
Date			13-Sep-21			
Sample ID			RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_RIVER_WS_2021-09-13_NP	Mean	RPD (%)
Parameter	Unit					
Conventional Parameters						
pH	-	0.1	8.37	8.38	8.38	0
Conductivity	μS/cm	2	288	285	286.5	1
Acidity (as CaCO3)	mg/L	2	<2.0	<2.0	2	NA
Alkalinity, bicarbonate (as CaCO3)	mg/L	1	143	137	140	4
Alkalinity, bicarbonate (as HCO3)	mg/L	1	174	167	170.5	4
Alkalinity, carbonate (as CO3)	mg/L	1	5.4	6.1	5.75	12
Alkalinity, carbonate (as CaCO3)	mg/L	1	9.0	10.2	9.6	13
Alkalinity, hydroxide (as CaCO3)	mg/L	1	<1.0	<1.0	1	NA
Alkalinity, hydroxide (as OH)	mg/L	1	<1.0	<1.0	1	NA
Total Alkalinity (as CaCO3)	mg/L	1	152	147	149.5	3
Dissolved hardness (as CaCO3)	mg/L	0.5	154	148	151	4
Total dissolved solids	mg/L	10	160	172	166	7
Total suspended solids	mg/L	1	<1.0	<1.0	1	NA
Turbidity	NTU	0.1	0.19	0.15	0.17	NA
Dissolved organic carbon	mg/L	0.5	1.06	0.94	1	NA
Total organic carbon	mg/L	0.5	0.99	1.07	1.03	NA
Major Ions						
Bromide	mg/L	0.05	<0.050	<0.050	0.05	NA
Chloride	mg/L	0.1	0.46	0.44	0.45	NA
Fluoride	mg/L	0.02	0.075	0.073	0.074	NA
Sulfate (as SO4)	mg/L	0.3	14.4	14.4	14.4	0
Anion sum	meq/L	0.1	3.36	3.25	3.305	3
Cation sum	meq/L	0.1	3.22	3.12	3.17	3
Ion balance (cation-anion difference)	%	0.01	2.13	2.04	2.085	4
Ion balance (cations/anions ratio)	%	0.01	95.8	96.0	95.9	0
Oxidation-reduction potential	mV	0.1	440	441	440.5	0
Nutrients						
Nitrate	mg-N/L	0.005	0.0214	0.0147	0.01805	NA
Nitrite	mg-N/L	0.001	<0.0010	0.0015	0.00125	NA
Total ammonia	mg-N/L	0.005	0.0161	0.0057	0.0109	NA
Total Kjeldahl Nitrogen	mg-N/L	0.05	0.072	<0.050	0.061	NA
Orthophosphate	mg-P/L	0.001	0.0035	0.0011	0.0023	NA
Total phosphorus	mg-P/L	0.002	0.0064	0.0063	0.00635	NA

Table C-2: Field Duplicate Water Quality Results, CMm LAEMP, 2021

Location		MDL	Reference Station			
Watercourse			Michel Creek			
Station			MI25			
Date			13-Sep-21			
Sample ID			RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_RIVER_WS_2021-09-13_NP	Mean	RPD (%)
Parameter	Unit					
Total Metas						
Aluminum	mg/L	0.003	0.0132	0.0090	0.01	NA
Antimony	mg/L	0.0001	<0.00010	<0.00010	0.0001	NA
Arsenic	mg/L	0.0001	0.00021	0.00019	0.0002	NA
Barium	mg/L	0.0001	0.0514	0.0512	0.05	0
Beryllium	µg/L	0.02	<0.020	<0.020	0.02	NA
Bismuth	mg/L	0.00005	<0.000050	<0.000050	0.00005	NA
Boron	mg/L	0.01	0.017	0.020	0.019	NA
Cadmium	µg/L	0.005	0.0132	0.0114	0.012	NA
Calcium	mg/L	0.05	39.4	45.9	42.7	15
Chromium	mg/L	0.0001	0.00020	0.00016	0.00018	NA
Cobalt	µg/L	0.1	<0.10	<0.10	0.1	NA
Copper	mg/L	0.0005	<0.00050	<0.00050	0.0005	NA
Iron	mg/L	0.01	0.013	<0.010	0.012	NA
Lead	mg/L	0.00005	<0.000050	<0.000050	0.00005	NA
Lithium	mg/L	0.001	0.0046	0.0056	0.005	NA
Magnesium	mg/L	0.005	10.7	11.0	10.9	3
Manganese	mg/L	0.0001	0.00081	0.00038	0.00060	NA
Mercury	µg/L	0.0005	0.00055	0.00051	0.00053	NA
Molybdenum	mg/L	0.00005	0.000923	0.000940	0.00093	2
Nickel	mg/L	0.0005	<0.00050	<0.00050	0.0005	NA
Potassium	mg/L	0.05	0.542	0.485	0.514	11
Selenium	µg/L	0.05	0.154	0.218	0.186	NA
Silicon	mg/L	0.1	2.28	2.24	2.26	2
Silver	mg/L	0.00001	<0.000010	<0.000010	0.000010	NA
Sodium	mg/L	0.05	3.04	3.15	3.10	4
Strontium	mg/L	0.0002	0.148	0.163	0.156	10
Sulfur	mg/L	0.5	4.58	4.42	4.50	4
Thallium	mg/L	0.00001	<0.000010	<0.000010	0.00001	NA
Tin	mg/L	0.0001	<0.00010	<0.00010	0.0001	NA
Titanium	mg/L	0.0003	<0.00030	<0.00030	0.0003	NA
Uranium	mg/L	0.00001	0.000248	0.000247	0.000248	0
Vanadium	mg/L	0.0005	<0.00050	<0.00050	0.0005	NA
Zinc	mg/L	0.003	<0.0030	<0.0030	0.003	NA

Table C-2: Field Duplicate Water Quality Results, CMm LAEMP, 2021

Location		MDL	Reference Station			
Watercourse			Michel Creek			
Station			MI25			
Date			13-Sep-21			
Sample ID			RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_RIVER_WS_2021-09-13_NP	Mean	RPD (%)
Parameter	Unit					
Dissolved Metals						
Aluminum	mg/L	0.001	0.0016	0.0014	0.0015	NA
Antimony	mg/L	0.0001	<0.00010	<0.00010	0.0001	NA
Arsenic	mg/L	0.0001	0.00019	0.00018	0.000185	NA
Barium	mg/L	0.0001	0.0504	0.0519	0.05115	3
Beryllium	µg/L	0.02	<0.020	<0.020	0.02	NA
Bismuth	mg/L	0.00005	<0.000050	<0.000050	0.00005	NA
Boron	mg/L	0.01	0.017	0.017	0.017	NA
Cadmium	µg/L	0.005	0.0092	0.0101	0.00965	NA
Calcium	mg/L	0.05	44.0	42.2	43.1	4
Chromium	mg/L	0.0001	0.00014	0.00016	0.00015	NA
Cobalt	µg/L	0.1	<0.10	<0.10	0.1	NA
Copper	mg/L	0.0002	<0.00020	<0.00020	0.0002	NA
Iron	mg/L	0.01	<0.010	<0.010	0.01	NA
Lead	mg/L	0.00005	<0.000050	<0.000050	0.00005	NA
Lithium	mg/L	0.001	0.0056	0.0053	0.00545	6
Magnesium	mg/L	0.005	10.6	10.4	10.5	2
Manganese	mg/L	0.0001	0.00015	0.00017	0.00016	NA
Mercury	mg/L	0.000005	<0.0000050	<0.0000050	0.000005	NA
Molybdenum	mg/L	0.00005	0.000864	0.000870	0.000867	1
Nickel	mg/L	0.0005	<0.00050	<0.00050	0.0005	NA
Potassium	mg/L	0.05	0.511	0.531	0.521	4
Selenium	µg/L	0.05	0.202	0.174	0.188	NA
Silicon	mg/L	0.05	2.34	2.27	2.305	3
Silver	mg/L	0.00001	<0.000010	<0.000010	0.00001	NA
Sodium	mg/L	0.05	3.11	3.25	3.18	4
Strontium	mg/L	0.0002	0.145	0.149	0.147	3
Sulfur	mg/L	0.5	4.74	4.70	4.72	1
Thallium	mg/L	0.00001	<0.000010	<0.000010	0.00001	NA
Tin	mg/L	0.0001	<0.00010	<0.00010	0.0001	NA
Titanium	mg/L	0.0003	<0.00030	<0.00030	0.0003	NA
Uranium	mg/L	0.00001	0.000219	0.000232	0.000226	6
Vanadium	mg/L	0.0005	<0.00050	<0.00050	0.0005	NA
Zinc	mg/L	0.001	<0.0010	<0.0010	0.001	NA

- = no guideline or no data; µS/cm = microsiemens per centimetre; µg/L = micrograms per litre; $CaCO_3$ = calcium carbonate; CO3 = carbonate; HCO3 = bicarbonate; OH = hydroxide; meq/L = milliequivalents per litre; mg/L = milligrams per litre; mV = millivolts; NTU = Nephelometric Turbidity Units; < = less than; NA = not applicable; MDL = method detection limit; RPD = relative percent difference; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Data Quality Statement

Water chemistry data collected for the CMm LAEMP in 2021 were of acceptable quality as characterized by good detectability, concentrations below LRLs in all laboratory blank samples, good laboratory precision and accuracy, and good field sampling precision. Therefore, the associated data are considered acceptable for this study.

C2.2 Sediment Quality

Laboratory Reporting Limits

The analytical reports from ALS for sediment samples collected in 2021 were examined to provide an inventory of analytes for which sample results were less than the LRL (Appendix D). The LRLs for these analytes were assessed relative to existing British Columbia Working Sediment Quality Guidelines (BC WSQG; BC MOE 2021a) and the alert concentration for selenium (BC MOE 2021a).

Eight of the 35 metals and all of the polycyclic aromatic hydrocarbons (PAHs) measured in sediment samples from 2021 had at least one reported value below the LRL. Tungsten, zirconium, anthracene, benzo(k)fluoranthene, and quinoline were consistently less than the LRL in 2021 (i.e., no detectable concentrations). Additionally, tin and perylene were generally less than the LRL in 2021 (i.e., concentrations less than the LRL in 90% or more of the samples). All samples had detectable concentrations of selenium and nickel in 2021.

The LRLs for metal concentrations measured in sediment samples from 2021 were consistently less than applicable BC WSQG and the alert concentration for selenium. The LRLs for acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, naphthalene, and pyrene exceeded the lower BC WSQG for one or more samples collected in 2021 (BC MOE 2021a). The LRLs for these analytes were below the BC WSQG in more than 50% of the samples. None of the analytes had LRLs greater than the upper BC WSQG in 2021 (BC MOE 2021a). Overall, the LRLs for most analytes were considered appropriate for this study.

Laboratory Blanks

A total of 12 laboratory method blank samples were analyzed by ALS (Appendix D). All reported method blank results were within the laboratory DQO (Table C-1). Thus, the method blank results for this study indicated no inadvertent contamination of sediment samples within the laboratory during analysis.

Data Precision

A total of 12 laboratory duplicate samples were used to evaluate laboratory precision (Appendix D). The RPDs between all laboratory duplicate measurements were within the laboratory DQO (Table C-1), indicating that laboratory analytical precision was excellent.

One field duplicate sample was collected at MI25 to assess the precision of field sampling (Table C-3). The sample was collected as a split sample (i.e., a larger sample was homogenized and split into two duplicate sub-samples). RPDs for concentrations of analytes were ≤ 30%, except for potassium and titanium, where the RPDs were 50% and 41% respectively. Of the paired comparisons, 6 out of 35 metals and 2 out of 31 PAHs had an RPD greater than 20%, representing 12% of the overall dataset. Overall, field precision and reproducibility were considered good in sediment samples because some variability is expected, based on the heterogeneous nature of sediments.

Table C-3: Field Duplicate Sediment Quality Results, CMm LAEMP, 2021

Location		MDL	Reference Station			
Watercourse			Michel Creek			
Station			MI25			
Date			15-Sep-21			
Sample ID			RG_MI25_SE-1_2021-09-15_1200	RG_RIVER_SE-1_2021-09-15_1200	Mean	RPD (%)
Parameter	Unit					
Moisture	%	0.25	38.0	43.2	40.6	13
pH (1:2 soil:water)	pH	0.10	8.13	8.13	8.1	0
% Gravel (>2mm)	%	1.0	4.0	9.9	7.0	NA
% Sand (2.00mm - 1.00mm)	%	1.0	5.1	6.9	6.0	30
% Sand (1.00mm - 0.50mm)	%	1.0	5.8	3.0	4.4	NA
% Sand (0.50mm - 0.25mm)	%	1.0	11.7	3.9	7.8	NA
% Sand (0.25mm - 0.125mm)	%	1.0	17.6	7.8	12.7	**77**
% Sand (0.125mm - 0.063mm)	%	1.0	12.9	10.7	11.8	19
% Silt (0.063mm - 0.0312mm)	%	1.0	15.9	24.9	20.4	44
% Silt (0.0312mm - 0.004mm)	%	1.0	20.6	27.2	23.9	28
% Clay (<4um)	%	1.0	6.4	5.6	6.0	13
Texture	-	-	Sandy loam	Silt loam	-	-
Total Organic Carbon	%	0.050	2.12	1.94	2.0	9
Metals						
Aluminum (Al)	mg/kg	50	12700	16700	14700.0	27
Antimony (Sb)	mg/kg	0.10	0.64	0.60	0.6	6
Arsenic (As)	mg/kg	0.10	12.0	11.8	11.9	2
Barium (Ba)	mg/kg	0.50	151	159	155.0	5
Beryllium (Be)	mg/kg	0.10	0.83	1.04	0.9	22
Bismuth (Bi)	mg/kg	0.20	0.22	0.22	0.2	NA
Boron (B)	mg/kg	5.0	8.6	15.5	12.1	NA
Cadmium (Cd)	mg/kg	0.020	1.31	1.43	1.4	9
Calcium (Ca)	mg/kg	50	15000	14500	14750.0	3
Chromium (Cr)	mg/kg	0.50	17.7	23.1	20.4	26
Cobalt (Co)	mg/kg	0.10	8.65	8.78	8.7	1
Copper (Cu)	mg/kg	0.50	26.7	27.8	27.3	4
Iron (Fe)	mg/kg	50	23800	25000	24400.0	5
Lead (Pb)	mg/kg	0.50	16.7	16.3	16.5	2
Lithium (Li)	mg/kg	2.0	21.7	23.5	22.6	8
Magnesium (Mg)	mg/kg	20	6530	6640	6585.0	2
Manganese (Mn)	mg/kg	1.0	476	479	477.5	1
Mercury (Hg)	mg/kg	0.0050	0.0270	0.0289	0.0	7
Molybdenum (Mo)	mg/kg	0.10	5.74	5.36	5.6	7
Nickel (Ni)	mg/kg	0.50	31.3	31.8	31.6	2
Phosphorus (P)	mg/kg	50	1500	1580	1540.0	5
Potassium (K)	mg/kg	100	2270	3800	3035.0	**50**
Selenium (Se)	mg/kg	0.20	0.94	0.97	1.0	NA
Silver (Ag)	mg/kg	0.10	0.13	0.14	0.1	NA
Sodium (Na)	mg/kg	50	86	104	95.0	NA
Strontium (Sr)	mg/kg	0.50	46.2	42.8	44.5	8
Sulfur (S)	mg/kg	1000	<1000	<1000	1000.0	NA
Thallium (Tl)	mg/kg	0.050	0.645	0.719	0.7	11
Tin (Sn)	mg/kg	2.0	<2.0	<2.0	2.0	NA
Titanium (Ti)	mg/kg	1.0	9.9	15.0	12.5	41
Tungsten (W)	mg/kg	0.50	<0.50	<0.50	0.5	NA
Uranium (U)	mg/kg	0.050	0.860	0.905	0.9	5
Vanadium (V)	mg/kg	0.20	32.0	41.4	36.7	26
Zinc (Zn)	mg/kg	2.0	134	142	138.0	6
Zirconium (Zr)	mg/kg	1.0	<1.0	<1.0	1.0	NA
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	mg/kg	0.0050	<0.0050	<0.0050	0.005	NA
Acenaphthylene	mg/kg	0.0050	<0.0050	<0.0050	0.005	NA
Acridine	mg/kg	0.010	<0.010	<0.010	0.010	NA
Anthracene	mg/kg	0.0040	<0.0040	<0.0040	0.004	NA
Benz(a)anthracene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Benzo(a)pyrene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Benzo(b&j)fluoranthene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Benzo(b+j+k)fluoranthene	mg/kg	0.015	<0.015	<0.015	0.015	NA
Benzo(e)pyrene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Benzo(g,h,i)perylene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Benzo(k)fluoranthene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Chrysene	mg/kg	0.010	<0.010	0.016	0.013	NA
Dibenz(a,h)anthracene	mg/kg	0.0050	<0.0050	<0.0050	0.005	NA
Fluoranthene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Fluorene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Indeno(1,2,3-c,d)pyrene	mg/kg	0.010	<0.010	<0.010	0.010	NA
1-Methylnaphthalene	mg/kg	0.020	<0.050	<0.050	0.050	NA
2-Methylnaphthalene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Naphthalene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Perylene	mg/kg	0.010	<0.010	<0.010	0.010	NA

Table C-3: Field Duplicate Sediment Quality Results, CMm LAEMP, 2021

Location		MDL	Reference Station			
Watercourse			Michel Creek			
Station			MI25			
Date			15-Sep-21			
Sample ID			RG_MI25_SE-1_2021-09-15_1200	RG_RIVER_SE-1_2021-09-15_1200	Mean	RPD (%)
Parameter	Unit					
Phenanthrene	mg/kg	0.010	<0.020	0.012	0.016	NA
Pyrene	mg/kg	0.010	<0.010	<0.010	0.010	NA
Quinoline	mg/kg	0.020	<0.050	<0.050	0.050	NA
d10-Acenaphthene	%	-	78.6	64.6	71.6	20
d12-Chrysene	%	-	97	74.2	85.6	27
d8-Naphthalene	%	-	79.6	75.3	77.5	6
d10-Phenanthrene	%	-	90.5	72.3	81.4	22
IACR:Coarse	-	0.050	<0.050	<0.050	0.050	NA
IACR:Fine	-	0.050	<0.050	<0.050	0.050	NA
B(a)P Total Potency Equivalent	mg/kg	0.020	<0.020	<0.020	0.020	NA
IACR (CCME)	-	0.15	<0.15	<0.15	0.150	NA

Notes: grey cells represent values with RPDs greater than 20%. Grey cells with bolded values represent values with RPDs greater than 50%.

- = no guideline or no data; % = percent; mg/kg = milligrams per kilograms; dw = dry weight; <= less than; >= greater than; mm = millimetres; µm = micrometers; MDL = method detection limit; RPD = relative percent difference; NA = not applicable; CCME = Canadian Council of the Ministers of Environment; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Data Quality Statement

Sediment chemistry data collected for the CMm LAEMP in 2021 were of acceptable quality as characterized by good detectability, no analyte concentrations in method blanks, good laboratory precision and accuracy, and good field sampling precision. Overall, the associated data were considered acceptable for this study.

C2.3 Benthic Invertebrate Tissue

Laboratory Reporting Limits

The analytical reports (Appendix D) were examined to provide an inventory of analytes for which the sample results were less than the LRL. Arsenic and mercury had tissue concentrations below the LRL in 9 to 13% of the samples, respectively. Selenium concentrations were greater than the LRL in benthic invertebrate tissue (BIT) chemistry samples for all samples and selenium LRLs were above the BC MOE (2021b) interim selenium guideline for BIT of 4 µg/g dw. Therefore, the achieved LRLs were considered appropriate for the study.

Data Precision

Laboratory precision was evaluated based on duplicate analysis of three BIT samples (Appendix D). The laboratory DQO (Table C-1) was met for all parameters. Furthermore, the RPD of four samples using certified values met the laboratory DQO for all analytes. Laboratory precision and reproducibility were considered acceptable for the study.

Data Accuracy

Data accuracy was evaluated based on results within the analytical reports from TrichAnalytics Inc. (Trich) associated with certified values; the DQO for all analytes in the four samples was met. The accuracy achieved by the laboratory in this study was considered acceptable.

Data Quality Statement

Benthic invertebrate tissue data collected for the CMm LAEMP in 2021 were of acceptable quality as characterized by good detectability, appropriate LRLs, and good laboratory precision and accuracy. Therefore, the associated data were considered acceptable for this study.

C2.4 Benthic Invertebrate Community

The benthic invertebrate community (BIC) quality control reports are provided in Appendix D. Organism sorting efficiency was compared to the laboratory's DQO (≥ 90%). The average recovery was 99.7% with the lowest percent recovery for any given sample equal to 99%. Therefore, organism sorting efficiency was considered excellent.

With the exception of replicate 1 at MI5, all BIC samples collected in 2021 were subject to subsampling; the percentage of material sorted in each sample ranged from 5% to 10% of the total sample material. Both the precision and accuracy of the sub-samples randomly chosen for subsample error assessment met the DQO (≤ 20%; Appendix D). Thus, the precision and accuracy for sub-sampling of the benthic invertebrate community samples was appropriate.

Replicate 1 at MI5 had unusually low benthic invertebrate abundance (i.e., 31 organisms). Upon further investigation it was discovered that the sample had been inadequately preserved; data from this sample were excluded from analyses.

The laboratory performed an internal audit of taxonomic identification for roughly 10% of all samples. The analysts reported a total identification error rate (TIR) of 0.00% for all three QC samples; a percent difference in enumeration of 0.00 to 0.26%; percent taxonomic disagreement of 0.92 to 3.22%, and a Bray Curtis Dissimilarity Index (a measure of the differences in identifications between different analysts) of 0.008 to 0.030 (Appendix D). The laboratory DQO was based on TIR per Canadian Aquatic Biomonitoring Network (CABIN) laboratory methods (i.e., <5% TIR; Environment Canada 2014). Since TIR was zero for all but one sample in 2021, the taxonomic accuracy of the analysis was considered excellent.

Data Quality Statement

Benthic community data collected in 2021 were of acceptable quality as characterized by good sorting efficiency, subsampling precision and accuracy, and excellent taxonomic identification accuracy. Therefore, the associated data could be used with a high level of confidence in the derivation of conclusions, with the exception of replicate 1 of MI5, which was excluded due to preservation issues.

References

British Columbia Ministry of Environment (BC MOE). 2021a. British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture. Environmental Protection and Sustainability Branch, Ministry of Environment.

BC MOE. 2021b. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture – Summary Report. Environmental Protection and Sustainability Branch, Ministry of Environment.

Environment Canada. 2014. Canadian Aquatic Biomonitoring Network (CABIN) laboratory methods: processing, taxonomy, and quality control of benthic macroinvertebrate samples. May 2014.

Minnow (Minnow Environmental Inc.). 2020. Study design for the Regional Aquatic Effects Monitoring Program (RAEMP), 2021 to 2023. Prepared for Teck Coal Limited and Environmental Monitoring Committee. December 2020.

Teck (Teck Resources Limited). 2014. Elk Valley Water Quality Plan. Submitted to BC Ministry of Environment on 22 July 2014.

APPENDIX D

Laboratory Reports

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104076**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: RR#1 HIGHWAY #3 SPARWOOD BC Canada V1C 4C3	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 14-Sep-2021 10:30
PO	: VPO00750546	Date Analysis Commenced	: 15-Sep-2021
C-O-C number	: September CMO LAEMP 2021	Issue Date	: 30-Sep-2021 12:56
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Maria Tuguinay	Lab Assistant	Inorganics, Calgary, Alberta
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*
HTA	*Analytical holding time was exceeded.*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	----	----
				Client sampling date / time	11-Sep-2021 14:00	11-Sep-2021 09:00	12-Sep-2021 10:30	----	----
					CG2104076-001	CG2104076-002	CG2104076-003	--------	--------
					Result	Result	Result	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	<2.0	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	121	173	151	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	4.6	7.2	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	121	177	158	----	----
conductivity	----	E100	2.0	µS/cm	258	620	305	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	129	310	154	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	520	476	468	----	----
pH	----	E108	0.10	pH units	8.28	8.31	8.36	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	163	401	181	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	<1.0	<1.0	<1.0	----	----
turbidity	----	E121	0.10	NTU	<0.10 HTA	0.36 HTA	0.42 HTA	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	148	211	184	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	2.8	4.3	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	<1.0	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0054	0.0053	0.0054	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	<0.050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.23	1.17	0.30	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.302	0.204	0.077	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	0.102	<0.050	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0905 HTA	0.753 HTA	0.0054 HTA	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010 HTA	0.0011 HTA	<0.0010 HTA	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010 HTA	<0.0010 HTA	0.0016 HTA	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	0.0028	0.0034	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	19.9	169	16.4	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.34	1.30	1.44	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.12	1.47	1.27	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	----	----
				Client sampling date / time	11-Sep-2021 14:00	11-Sep-2021 09:00	12-Sep-2021 10:30	----	----
					CG2104076-001	CG2104076-002	CG2104076-003	--------	--------
					Result	Result	Result	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	2.86	7.15	3.51	----	----
cation sum	----	EC101	0.10	meq/L	2.60	6.66	3.21	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	90.9	93.1	91.4	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	4.76	3.55	4.46	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0119	0.0069	0.0128	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	0.00013	<0.00010	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00051	0.00028	0.00015	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0188	0.0662	0.0741	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L	<0.020	<0.020	<0.020	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
boron, total	7440-42-8	E420	0.010	mg/L	<0.010	0.024	0.012	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0118	0.0154	<0.0050	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	41.5	78.7	44.6	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00030	0.00019	0.00023	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	<0.10	<0.10	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0.015	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0019	0.0121	0.0044	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	8.01	28.1	12.4	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	<0.00010	0.00203	0.00194	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	<0.00050	<0.00050	<0.00050	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000824	0.000861	0.000782	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	0.00340	<0.00050	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	0.231	0.992	0.462	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	1.63	4.01	0.224	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	1.36	1.68	2.12	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	0.490	9.27	2.63	----	----

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	----	----
				Client sampling date / time	11-Sep-2021 14:00	11-Sep-2021 09:00	12-Sep-2021 10:30	----	----
					CG2104076-001	CG2104076-002	CG2104076-003	--------	--------
					Result	Result	Result	----	----
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.137	0.291	0.150	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	6.81	55.6	5.36	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	0.000051	0.000018	<0.000010	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00060 DLM	<0.00030	<0.00030	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000728	0.00156	0.000278	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	<0.0030	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0024	<0.0010	0.0012	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	0.00011	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00047	0.00024	0.00012	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0180	0.0657	0.0727	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	<0.020	<0.020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	0.022	0.011	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0088	0.0163	<0.0050	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	38.3	76.0	41.4	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00025	0.00018	0.00018	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	<0.10	<0.10	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0014	0.0111	0.0038	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	8.06	29.3	12.3	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	0.00164	0.00135	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000695	0.000802	0.000706	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	0.00339	<0.00050	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.205	1.00	0.448	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	----	----
				Client sampling date / time	11-Sep-2021 14:00	11-Sep-2021 09:00	12-Sep-2021 10:30	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2104076-001**	**CG2104076-002**	**CG2104076-003**	--------	--------
					Result	Result	Result	----	----
Dissolved Metals									
selenium, dissolved	7782-49-2	E421	0.050	µg/L	1.84	3.96	0.245	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.28	1.62	2.12	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	0.486	9.94	2.72	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.128	0.287	0.142	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	6.36	54.2	5.44	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000050	0.000019	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000676	0.00148	0.000247	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0262 DTC	0.0011	<0.0010	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2104076**	Page	: 1 of 17
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: RR#1 HIGHWAY #3 SPARWOOD BC Canada V1C 4C3	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 14-Sep-2021 10:30
PO	: VPO00750546	Issue Date	: 30-Sep-2021 12:56
C-O-C number	: September CMO LAEMP 2021		
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E298	12-Sep-2021	24-Sep-2021	----	----		24-Sep-2021	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E298	11-Sep-2021	24-Sep-2021	----	----		24-Sep-2021	28 days	13 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E298	11-Sep-2021	24-Sep-2021	----	----		24-Sep-2021	28 days	13 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E235.Br-L	12-Sep-2021	----	----	----		15-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E235.Br-L	11-Sep-2021	----	----	----		15-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E235.Br-L	11-Sep-2021	----	----	----		15-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E235.Cl-L	12-Sep-2021	----	----	----		15-Sep-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E235.Cl-L	11-Sep-2021	----	----	----		15-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E235.Cl-L	11-Sep-2021	----	----	----		15-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E378-U	12-Sep-2021	----	----	----		15-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E378-U	11-Sep-2021	----	----	----		15-Sep-2021	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E378-U	11-Sep-2021	----	----	----		15-Sep-2021	3 days	4 days	× EHTL
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E235.F	12-Sep-2021	----	----	----		15-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E235.F	11-Sep-2021	----	----	----		15-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E235.F	11-Sep-2021	----	----	----		15-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E235.NO3-L	12-Sep-2021	----	----	----		15-Sep-2021	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E235.NO3-L	11-Sep-2021	----	----	----		15-Sep-2021	3 days	4 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E235.NO3-L	11-Sep-2021	----	----	----		15-Sep-2021	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E235.NO2-L	12-Sep-2021	----	----	----		15-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E235.NO2-L	11-Sep-2021	----	----	----		15-Sep-2021	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E235.NO2-L	11-Sep-2021	----	----	----		15-Sep-2021	3 days	4 days	× EHTL
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E235.SO4	12-Sep-2021	----	----	----		15-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E235.SO4	11-Sep-2021	----	----	----		15-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E235.SO4	11-Sep-2021	----	----	----		15-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E318	11-Sep-2021	20-Sep-2021	----	----		21-Sep-2021	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E318	11-Sep-2021	20-Sep-2021	----	----		21-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E318	12-Sep-2021	20-Sep-2021	----	----		21-Sep-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E372-U	12-Sep-2021	17-Sep-2021	----	----		17-Sep-2021	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E372-U	11-Sep-2021	17-Sep-2021	----	----		17-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E372-U	11-Sep-2021	17-Sep-2021	----	----		17-Sep-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E421.Cr-L	12-Sep-2021	20-Sep-2021	----	----		20-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E421.Cr-L	11-Sep-2021	20-Sep-2021	----	----		20-Sep-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E421.Cr-L	11-Sep-2021	20-Sep-2021	----	----		20-Sep-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E509	11-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E509	11-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E509	12-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E421	12-Sep-2021	20-Sep-2021	----	----		20-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E421	11-Sep-2021	20-Sep-2021	----	----		20-Sep-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E421	11-Sep-2021	20-Sep-2021	----	----		20-Sep-2021	180 days	9 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E358-L	12-Sep-2021	21-Sep-2021	----	----		24-Sep-2021	28 days	12 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E358-L	11-Sep-2021	21-Sep-2021	----	----		24-Sep-2021	28 days	13 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E358-L	11-Sep-2021	21-Sep-2021	----	----		24-Sep-2021	28 days	13 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E355-L	12-Sep-2021	21-Sep-2021	----	----		24-Sep-2021	28 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E355-L	11-Sep-2021	21-Sep-2021	----	----		24-Sep-2021	28 days	13 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E355-L	11-Sep-2021	21-Sep-2021	----	----		24-Sep-2021	28 days	13 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E283	11-Sep-2021	----	----	----		21-Sep-2021	14 days	10 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E283	11-Sep-2021	----	----	----		21-Sep-2021	14 days	10 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E283	12-Sep-2021	----	----	----		21-Sep-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E290	12-Sep-2021	----	----	----		22-Sep-2021	14 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E290	11-Sep-2021	----	----	----		22-Sep-2021	14 days	11 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E290	11-Sep-2021	----	----	----		22-Sep-2021	14 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E100	12-Sep-2021	----	----	----		22-Sep-2021	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Physical Tests : Conductivity in Water										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E100	11-Sep-2021	----	----	----		22-Sep-2021	28 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E100	11-Sep-2021	----	----	----		22-Sep-2021	28 days	11 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E125	12-Sep-2021	----	----	----		21-Sep-2021	0.34 hrs	221 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E125	11-Sep-2021	----	----	----		21-Sep-2021	0.34 hrs	242 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E125	11-Sep-2021	----	----	----		21-Sep-2021	0.34 hrs	247 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E108	12-Sep-2021	----	----	----		22-Sep-2021	0.25 hrs	241 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E108	11-Sep-2021	----	----	----		22-Sep-2021	0.25 hrs	261 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E108	11-Sep-2021	----	----	----		22-Sep-2021	0.25 hrs	266 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E162	12-Sep-2021	----	----	----		17-Sep-2021	7 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TDS by Gravimetry										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E162	11-Sep-2021	----	----	----		17-Sep-2021	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E162	11-Sep-2021	----	----	----		17-Sep-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E160-L	12-Sep-2021	----	----	----		16-Sep-2021	7 days	4 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E160-L	11-Sep-2021	----	----	----		16-Sep-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E160-L	11-Sep-2021	----	----	----		16-Sep-2021	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E121	12-Sep-2021	----	----	----		15-Sep-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E121	11-Sep-2021	----	----	----		15-Sep-2021	3 days	4 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E121	11-Sep-2021	----	----	----		15-Sep-2021	3 days	4 days	× EHTL
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E420.Cr-L	12-Sep-2021	----	----	----		18-Sep-2021	180 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E420.Cr-L	11-Sep-2021	----	----	----		18-Sep-2021	180 days	7 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E420.Cr-L	11-Sep-2021	----	----	----		18-Sep-2021	180 days	7 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E508-L	11-Sep-2021	----	----	----		21-Sep-2021	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E508-L	11-Sep-2021	----	----	----		21-Sep-2021	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E508-L	12-Sep-2021	----	----	----		21-Sep-2021	28 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	E420	12-Sep-2021	----	----	----		18-Sep-2021	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	E420	11-Sep-2021	----	----	----		18-Sep-2021	180 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	E420	11-Sep-2021	----	----	----		18-Sep-2021	180 days	7 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	298053	2	33	6.0	5.0	✓
Alkalinity Species by Titration	E290	299359	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	301690	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	292676	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	292677	1	20	5.0	5.0	✓
Conductivity in Water	E100	299361	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	297293	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	297698	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	297294	2	20	10.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	298734	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	292598	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	292674	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	292678	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	292679	1	20	5.0	5.0	✓
ORP by Electrode	E125	297941	1	15	6.6	5.0	✓
pH by Meter	E108	299360	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	292675	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	294151	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295736	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	296970	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	298052	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295735	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	298741	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	293779	1	18	5.5	5.0	✓
Turbidity by Nephelometry	E121	292635	1	10	10.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	298053	2	33	6.0	5.0	✓
Alkalinity Species by Titration	E290	299359	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	301690	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	292676	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	292677	1	20	5.0	5.0	✓
Conductivity in Water	E100	299361	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	297293	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	297698	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	297294	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	298734	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	292598	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	292674	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	292678	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	292679	1	20	5.0	5.0	✓
ORP by Electrode	E125	297941	1	15	6.6	5.0	✓
pH by Meter	E108	299360	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	292675	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	294151	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295736	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	296970	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	298052	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295735	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	298741	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	293779	1	18	5.5	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	292790	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	292635	1	10	10.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	298053	2	33	6.0	5.0	✓
Alkalinity Species by Titration	E290	299359	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	301690	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	292676	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	292677	1	20	5.0	5.0	✓
Conductivity in Water	E100	299361	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	297293	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	297698	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	297294	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	298734	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	292598	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	292674	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	292678	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	292679	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	292675	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	294151	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295736	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	296970	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	298052	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295735	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	298741	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	293779	1	18	5.5	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	292790	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	292635	1	10	10.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	301690	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	292676	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	292677	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	297293	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	297698	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	297294	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	298734	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	292598	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	292674	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	292678	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	292679	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	292675	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295736	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	296970	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	298052	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295735	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	298741	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	293779	1	18	5.5	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by “mod”).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **CG2104076**		
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: RR#1 HIGHWAY #3 SPARWOOD BC Canada V1C 4C3	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 14-Sep-2021 10:30
PO	: VPO00750546	Date Analysis Commenced	: 15-Sep-2021
C-O-C number	: September CMO LAEMP 2021	Issue Date	: 30-Sep-2021 12:56
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Maria Tuguinay	Lab Assistant	Inorganics, Calgary, Alberta
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

= Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 292635)											
CG2104076-001	RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	turbidity	----	E121	0.10	NTU	<0.10	<0.10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 294151)											
CG2104062-008	Anonymous	solids, total dissolved [TDS]	----	E162	10	mg/L	<10	<10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 297941)											
CG2104065-002	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	451	442	1.88%	15%	----
Physical Tests (QC Lot: 298053)											
CG2104062-001	Anonymous	acidity (as CaCO3)	----	E283	10.0	mg/L	18.1	16.0	2.1	Diff <2x LOR	----
Physical Tests (QC Lot: 298054)											
CG2104076-003	RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 299359)											
CG2104069-018	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	223	237	5.83%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	10.4	8.6	1.8	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	234	245	4.84%	20%	----
Physical Tests (QC Lot: 299360)											
CG2104069-018	Anonymous	pH	----	E108	0.10	pH units	8.38	8.37	0.119%	4%	----
Physical Tests (QC Lot: 299361)											
CG2104069-018	Anonymous	conductivity	----	E100	1.0	µS/cm	2640	2600	1.53%	10%	----
Anions and Nutrients (QC Lot: 292598)											
CG2104065-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 292674)											
CG2104067-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.173	0.170	0.004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 292675)											
CG2104067-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	335	335	0.0609%	20%	----
Anions and Nutrients (QC Lot: 292676)											
CG2104067-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 292677)											
CG2104067-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	1.63	1.60	1.75%	20%	----
Anions and Nutrients (QC Lot: 292678)											
CG2104067-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	20.9	20.9	0.198%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Anions and Nutrients (QC Lot: 292679)											
CG2104067-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0092	0.0104	0.0012	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 293779)											
CG2104076-001	RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296970)											
CG2104048-009	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.292	0.270	0.022	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 301690)											
CG2104066-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0096	0.0097	0.0001	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 298734)											
CG2104064-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.45	1.72	0.27	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 298741)											
CG2104062-002	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.74	0.80	0.06	Diff <2x LOR	----
Total Metals (QC Lot: 295735)											
CG2104062-001	Anonymous	aluminum, total	7429-90-5	E420	0.0060	mg/L	0.0114	0.0114	0.00002	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00020	mg/L	0.00148	0.00148	0.00001	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00020	mg/L	0.0152	0.0148	2.34%	20%	----
		beryllium, total	7440-41-7	E420	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.020	mg/L	0.107	0.108	0.0006	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0100	mg/L	1.68 µg/L	0.00164	2.31%	20%	----
		calcium, total	7440-70-2	E420	0.100	mg/L	510	515	0.936%	20%	----
		cobalt, total	7440-48-4	E420	0.20	mg/L	30.9 µg/L	0.0303	1.80%	20%	----
		copper, total	7440-50-8	E420	0.00100	mg/L	<0.00100	0.00101	0.00001	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.020	mg/L	0.115	0.134	0.018	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000100	mg/L	0.000111	0.000107	0.000004	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0020	mg/L	0.738	0.720	2.45%	20%	----
		magnesium, total	7439-95-4	E420	0.0100	mg/L	217	214	1.23%	20%	----
		manganese, total	7439-96-5	E420	0.00020	mg/L	0.726	0.719	1.02%	20%	----
		molybdenum, total	7439-98-7	E420	0.000100	mg/L	0.00250	0.00251	0.428%	20%	----
		nickel, total	7440-02-0	E420	0.00100	mg/L	0.228	0.226	0.477%	20%	----
		potassium, total	7440-09-7	E420	0.100	mg/L	8.39	8.43	0.511%	20%	----
		selenium, total	7782-49-2	E420	0.100	mg/L	4.36 µg/L	0.00448	2.58%	20%	----
		silicon, total	7440-21-3	E420	0.20	mg/L	3.01	2.98	0.956%	20%	----
		silver, total	7440-22-4	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.100	mg/L	14.6	14.5	0.723%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 295735) - continued											
CG2104062-001	Anonymous	strontium, total	7440-24-6	E420	0.00040	mg/L	0.420	0.414	1.44%	20%	----
		sulfur, total	7704-34-9	E420	1.00	mg/L	424	427	0.600%	20%	----
		thallium, total	7440-28-0	E420	0.000020	mg/L	0.000161	0.000150	0.000011	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.0392	0.0377	3.94%	20%	----
		vanadium, total	7440-62-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0060	mg/L	0.109	0.107	1.37%	20%	----
Total Metals (QC Lot: 295736)											
CG2104062-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00020	mg/L	0.00039	0.00031	0.00008	Diff <2x LOR	----
Total Metals (QC Lot: 298052)											
CG2104048-008	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 297293)											
CG2104064-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 297294)											
CG2104064-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
CG2104064-001	Anonymous	antimony, dissolved	7440-36-0	E421	0.00020	mg/L	0.00205	0.00211	3.18%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.0166	0.0169	1.53%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.020	mg/L	0.096	0.097	0.001	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0100	mg/L	2.69 µg/L	0.00273	1.47%	20%	----
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	580	598	3.06%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.20	mg/L	83.8 µg/L	0.0838	0.0551%	20%	----
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.020	mg/L	0.216	0.213	1.21%	20%	----
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.868	0.884	1.88%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	273	271	0.672%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.710	0.705	0.742%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.00425	0.00425	0.0486%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.432	0.432	0.225%	20%	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	16.8	16.5	1.91%	20%	----
		selenium, dissolved	7782-49-2	E421	0.100	mg/L	92.3 µg/L	0.0899	2.63%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Dissolved Metals (QC Lot: 297294) - continued											
CG2104064-001	Anonymous	silicon, dissolved	7440-21-3	E421	0.100	mg/L	2.86	2.77	3.19%	20%	----
		silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.100	mg/L	16.7	16.7	0.151%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	1.02	1.05	2.90%	20%	----
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	445	430	3.51%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	0.000377	0.000372	1.23%	20%	----
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.0378	0.0378	0.0967%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	0.182	0.178	1.88%	20%	----
Dissolved Metals (QC Lot: 297698)											
CG2104076-001	RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 292635)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 292790)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 294151)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 298053)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 298054)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 299359)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 299361)						
conductivity	----	E100	1	µS/cm	<1.0	----
Anions and Nutrients (QCLot: 292598)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 292674)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 292675)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 292676)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 292677)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 292678)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 292679)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 293779)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 296970)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 296970) - continued						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 301690)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 298734)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 298741)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 295735)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 295735) - continued						
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 295736)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 298052)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 297293)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 297294)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 297294) - continued						
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 297698)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 292635)									
turbidity	----	E121	0.1	NTU	200 NTU	99.4	85.0	115	----
Physical Tests (QCLot: 292790)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	100	85.0	115	----
Physical Tests (QCLot: 294151)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	100	85.0	115	----
Physical Tests (QCLot: 297941)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	100	95.4	104	----
Physical Tests (QCLot: 298053)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	111	85.0	115	----
Physical Tests (QCLot: 298054)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	106	85.0	115	----
Physical Tests (QCLot: 299359)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	101	85.0	115	----
Physical Tests (QCLot: 299360)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 299361)									
conductivity	----	E100	1	μS/cm	146.9 μS/cm	99.3	90.0	110	----
Anions and Nutrients (QCLot: 292598)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	97.3	80.0	120	----
Anions and Nutrients (QCLot: 292674)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 292675)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 292676)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	99.2	85.0	115	----
Anions and Nutrients (QCLot: 292677)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 292678)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 292679)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 293779)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 293779) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	97.6	80.0	120	----
Anions and Nutrients (QCLot: 296970)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	94.7	75.0	125	----
Anions and Nutrients (QCLot: 301690)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	101	85.0	115	----
Organic / Inorganic Carbon (QCLot: 298734)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	99.6	80.0	120	----
Organic / Inorganic Carbon (QCLot: 298741)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	105	80.0	120	----
Total Metals (QCLot: 295735)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	104	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	110	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.6	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	95.5	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	99.4	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	100	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.1	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	99.9	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.8	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	97.2	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	99.5	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	112	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	99.4	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	100	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	105	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	107	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	98.6	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 295735) - continued									
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	101	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	103	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	103	80.0	120	----
Total Metals (QCLot: 295736)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Total Metals (QCLot: 298052)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	94.4	80.0	120	----
Dissolved Metals (QCLot: 297293)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	97.5	80.0	120	----
Dissolved Metals (QCLot: 297294)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	100	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	99.4	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.4	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	100	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	91.3	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	94.8	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	94.5	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.9	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	95.6	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	95.6	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	100	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	92.6	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.2	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	97.8	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	100	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	95.3	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	98.8	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.9	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	91.9	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	105	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Dissolved Metals (QCLot: 297294) - continued									
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	104	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	94.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	93.4	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	98.3	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.3	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	95.6	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	94.9	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 292598)										
CG2104065-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0573 mg/L	0.05 mg/L	115	70.0	130	----
Anions and Nutrients (QCLot: 292674)										
CG2104067-002	Anonymous	fluoride	16984-48-8	E235.F	0.902 mg/L	1 mg/L	90.2	75.0	125	----
Anions and Nutrients (QCLot: 292675)										
CG2104067-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 292676)										
CG2104067-002	Anonymous	bromide	24959-67-9	E235.Br-L	0.470 mg/L	0.5 mg/L	93.9	75.0	125	----
Anions and Nutrients (QCLot: 292677)										
CG2104067-002	Anonymous	chloride	16887-00-6	E235.Cl-L	108 mg/L	100 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 292678)										
CG2104067-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	2.5 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 292679)										
CG2104067-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.541 mg/L	0.5 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 293779)										
CG2104076-002	RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	phosphorus, total	7723-14-0	E372-U	0.0535 mg/L	0.0676 mg/L	79.1	70.0	130	----
Anions and Nutrients (QCLot: 296970)										
CG2104048-011	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.51 mg/L	2.5 mg/L	100	70.0	130	----
Anions and Nutrients (QCLot: 301690)										
CG2104067-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0988 mg/L	0.1 mg/L	98.8	75.0	125	----
Organic / Inorganic Carbon (QCLot: 298734)										
CG2104064-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	24.8 mg/L	23.9 mg/L	104	70.0	130	----
Organic / Inorganic Carbon (QCLot: 298741)										
CG2104062-002	Anonymous	carbon, total organic [TOC]	----	E355-L	22.3 mg/L	23.9 mg/L	93.3	70.0	130	----
Total Metals (QCLot: 295735)										
CG2104062-002	Anonymous	aluminum, total	7429-90-5	E420	0.384 mg/L	0.4 mg/L	95.9	70.0	130	----
		antimony, total	7440-36-0	E420	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*Concentration*	*Target*	*MS*	*Low*	*High*	*Qualifier*
Total Metals (QCLot: 295735) - continued										
CG2104062-002	Anonymous	barium, total	7440-39-3	E420	0.0375 mg/L	0.04 mg/L	93.7	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0756 mg/L	0.08 mg/L	94.6	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0179 mg/L	0.02 mg/L	89.6	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00746 mg/L	0.008 mg/L	93.2	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		copper, total	7440-50-8	E420	0.0349 mg/L	0.04 mg/L	87.3	70.0	130	----
		iron, total	7439-89-6	E420	3.70 mg/L	4 mg/L	92.6	70.0	130	----
		lead, total	7439-92-1	E420	0.0357 mg/L	0.04 mg/L	89.2	70.0	130	----
		lithium, total	7439-93-2	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0420 mg/L	0.04 mg/L	105	70.0	130	----
		nickel, total	7440-02-0	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E420	0.0833 mg/L	0.08 mg/L	104	70.0	130	----
		silicon, total	7440-21-3	E420	18.8 mg/L	20 mg/L	94.0	70.0	130	----
		silver, total	7440-22-4	E420	0.00771 mg/L	0.008 mg/L	96.4	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00725 mg/L	0.008 mg/L	90.6	70.0	130	----
		tin, total	7440-31-5	E420	0.0397 mg/L	0.04 mg/L	99.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0789 mg/L	0.08 mg/L	98.6	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.199 mg/L	0.2 mg/L	99.7	70.0	130	----
		zinc, total	7440-66-6	E420	0.710 mg/L	0.8 mg/L	88.8	70.0	130	----
Total Metals (QCLot: 295736)										
CG2104062-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0781 mg/L	0.08 mg/L	97.6	70.0	130	----
Total Metals (QCLot: 298052)										
CG2104048-009	Anonymous	mercury, total	7439-97-6	E508-L	4.29 ng/L	5 ng/L	85.8	70.0	130	----
Dissolved Metals (QCLot: 297293)										
CG2104067-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	----
Dissolved Metals (QCLot: 297294)										

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 297294) - continued										
CG2104067-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.198 mg/L	0.2 mg/L	99.1	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0197 mg/L	0.02 mg/L	98.6	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00882 mg/L	0.01 mg/L	88.2	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.097 mg/L	0.1 mg/L	96.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00381 mg/L	0.004 mg/L	95.3	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0182 mg/L	0.02 mg/L	91.2	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0180 mg/L	0.02 mg/L	90.3	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.84 mg/L	2 mg/L	91.8	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0190 mg/L	0.02 mg/L	95.2	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0890 mg/L	0.1 mg/L	89.0	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0193 mg/L	0.02 mg/L	96.3	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0354 mg/L	0.04 mg/L	88.6	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.91 mg/L	4 mg/L	97.7	70.0	130	----
		selenium, dissolved	7782-49-2	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.06 mg/L	10 mg/L	90.6	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00365 mg/L	0.004 mg/L	91.3	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00371 mg/L	0.004 mg/L	92.7	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00385 mg/L	0.004 mg/L	96.2	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0995 mg/L	0.1 mg/L	99.5	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.372 mg/L	0.4 mg/L	93.1	70.0	130	----
Dissolved Metals (QCLot: 297698)										
CG2104076-002	RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	mercury, dissolved	7439-97-6	E509	0.0000938 mg/L	0.0001 mg/L	93.8	70.0	130	----

Teck

Page 1 of 1

COC ID: September CMO LAEMP 2021 | TURNAROUND TIME:

PROJECT/CLIENT INFO

Facility Name / Job#	REP
Project Manager	Cybele Heddle
Email	[illegible]
Address	421 Pine Avenue
City	
Province	BC
Postal Code	
Country	Canada
Phone Number	

LABORATORY

Lab Name	ALS Calgary
Lab Contact	Lyudmyla Shvets
Email	lyudmyla.shvets@alsglobal.com
Address	2559 29 Street NE
City	Calgary
Province	AB
Postal Code	T1Y 7B5
Country	Canada
Phone Number	1 403 407 1794

Excel | PDF | EDD

Environmental Division
Calgary
Work Order Reference
CG2104076

Telephone : + 1 403 407 1800

ANALYSIS REQUESTED

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	TECKCOAL-ROUTINE-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-T-U-CVAF-VA	HG-D-CVAF-VA	TECKCOAL-MET-T-VA	TECKCOAL-MET-D-VA
								N	F	N	N	F	N	F
									H2SO4	H2SO4		HCL	HNO3	HNO3
RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	RG_AGCK	WS	No	9/11/2021	1400	G	7	X	X	X	X	X	X	X
RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	RG_MIDAG	WS	No	9/11/2021	900	G	7	X	X	X	X	X	X	X
RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	RG_MIUCO	WS	No	9/12/2021	1030	G	7	X	X	X	X	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
ALS PO 750546	Jennifer Ings/Minnow	################		9/14 1030

NE OF BOTTLES RETURNED/DESCRIPTION

Regular (default)	x	Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge		Sampler's Signature		Date/Time	September 13, 2021
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

9

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104113**	Page	: 1 of 8
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 15-Sep-2021 08:50
PO	: VPO00750546	Date Analysis Commenced	: 16-Sep-2021
C-O-C number	: September CMO LAEMP 2021	Issue Date	: 30-Sep-2021 13:05
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Millicent Brentnall	Laboratory Analyst	Metals, Calgary, Alberta
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shirley Li		Metals, Calgary, Alberta
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Sample Comments

Sample	*Client Id*	*Comment*
CG2104113-004	RG_FBLANK_WS_2021-09-13_NP	Did not receive dissolved Metals, Hg, nutrients for RG_TRIP

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
HTD	*Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	RG_RIVER_WS_2021-09-13_NP	RG_FBLANK_WS_2021-09-13_NP	RG_TRIP_WS_2021-09-13_NP
Client sampling date / time					13-Sep-2021 13:00	13-Sep-2021 09:00	13-Sep-2021 13:00	13-Sep-2021 11:30	13-Sep-2021 12:30
					CG2104113-001	**CG2104113-002**	**CG2104113-003**	**CG2104113-004**	**CG2104113-005**
					Result	Result	Result	Result	Result
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	2.0
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	143	222	137	<1.0	<1.0
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	9.0	15.0	10.2	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	152	236	147	<1.0	<1.0
conductivity	----	E100	2.0	µS/cm	288	967	285	<2.0	<2.0
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	154	516	148	<0.50	<0.50
oxidation-reduction potential [ORP]	----	E125	0.10	mV	440	473	441	440	446
pH	----	E108	0.10	pH units	8.37	8.39	8.38	5.32	5.08
solids, total dissolved [TDS]	----	E162	10	mg/L	160	667	172	<10	<10
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	<1.0	1.6	<1.0	<1.0	<1.0
turbidity	----	E121	0.10	NTU	0.19	0.35	0.15	<0.10	<0.10
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	174	270	167	<1.0	<1.0
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	5.4	9.0	6.1	<1.0	<1.0
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0161	0.0179	0.0057	<0.0050	<0.0050
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.250 DLDS	<0.050	<0.050	<0.050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.46	2.08	0.44	<0.10	<0.10
fluoride	16984-48-8	E235.F	0.020	mg/L	0.075	0.129	0.073	<0.020	<0.020
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.072	0.341	<0.050	<0.050	<0.050
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0214 HTD	1.80 HTD	0.0147 HTD	<0.0050 HTD	<0.0050 HTD
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010 HTD	0.0066 HTD	0.0015 HTD	<0.0010 HTD	<0.0010 HTD
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0035	<0.0010	0.0011	<0.0010	<0.0010
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0064	0.0053	0.0063	<0.0020	<0.0020
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	14.4	346	14.4	<0.30	<0.30
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.06	0.66	0.94	<0.50	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.99	0.84	1.07	<0.50	<0.50

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

				Client sample ID	RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	RG_RIVER_WS_2021-09-13_NP	RG_FBLANK_WS_2021-09-13_NP	RG_TRIP_WS_2021-09-13_NP
				Client sampling date / time	13-Sep-2021 13:00	13-Sep-2021 09:00	13-Sep-2021 13:00	13-Sep-2021 11:30	13-Sep-2021 12:30
Analyte	CAS Number	Method	LOR	Unit	CG2104113-001	CG2104113-002	CG2104113-003	CG2104113-004	CG2104113-005
					Result	Result	Result	Result	Result
Ion Balance									
anion sum	----	EC101	0.10	meq/L	3.36	12.1	3.25	<0.10	<0.10
cation sum	----	EC101	0.10	meq/L	3.22	11.2	3.12	<0.10	<0.10
ion balance (cations/anions ratio)	----	EC101	0.010	%	95.8	92.6	96.0	100	100
ion balance (cation-anion difference)	----	EC101	0.010	%	2.13	3.86	2.04	<0.010	<0.010
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0132	0.0198	0.0090	<0.0030	<0.0030
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	0.00020	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00021	0.00017	0.00019	<0.00010	<0.00010
barium, total	7440-39-3	E420	0.00010	mg/L	0.0514	0.0686	0.0512	<0.00010	<0.00010
beryllium, total	7440-41-7	E420	0.020	µg/L	<0.020	<0.020	<0.020	<0.020	<0.020
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L	0.017	0.057	0.020	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0132	0.0187	0.0114	<0.0050	<0.0050
calcium, total	7440-70-2	E420	0.050	mg/L	39.4	131	45.9	<0.050	<0.050
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00020	0.00014	0.00016	<0.00010	<0.00010
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	0.43	<0.10	<0.10	<0.10
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L	0.013	0.033	<0.010	<0.010	<0.010
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0046	0.0257	0.0056	<0.0010	<0.0010
magnesium, total	7439-95-4	E420	0.0050	mg/L	10.7	54.3	11.0	<0.0050	<0.0050
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00081	0.00480	0.00038	<0.00010	<0.00010
mercury, total	7439-97-6	E508-L	0.00050	µg/L	0.00055	0.00056	0.00051	<0.00050	<0.00050
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000923	0.00100	0.000940	<0.000050	<0.000050
nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	0.0135	<0.00050	<0.00050	<0.00050
potassium, total	7440-09-7	E420	0.050	mg/L	0.542	1.81	0.485	<0.050	<0.050
selenium, total	7782-49-2	E420	0.050	µg/L	0.154	7.90	0.218	<0.050	<0.050
silicon, total	7440-21-3	E420	0.10	mg/L	2.28	2.11	2.24	<0.10	<0.10
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	17341-25-2	E420	0.050	mg/L	3.04	19.1	3.15	<0.050	<0.050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	RG_RIVER_WS_2021-09-13_NP	RG_FBLANK_WS_2021-09-13_NP	RG_TRIP_WS_2021-09-13_NP
				Client sampling date / time	13-Sep-2021 13:00	13-Sep-2021 09:00	13-Sep-2021 13:00	13-Sep-2021 11:30	13-Sep-2021 12:30
					CG2104113-001	CG2104113-002	CG2104113-003	CG2104113-004	CG2104113-005
					Result	Result	Result	Result	Result
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.148	0.507	0.163	<0.00020	<0.00020
sulfur, total	7704-34-9	E420	0.50	mg/L	4.58	118	4.42	<0.50	<0.50
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	0.000018	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000248	0.00286	0.000247	<0.000010	<0.000010
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0016	<0.0010	0.0014	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	0.00019	<0.00010	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00019	0.00017	0.00018	<0.00010	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0504	0.0739	0.0519	0.00018 RRV	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	<0.020	<0.020	<0.020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	0.017	0.052	0.017	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0092	0.0155	0.0101	<0.0050	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	44.0	123	42.2	<0.050	<0.050
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00014	0.00011	0.00016	<0.00010	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	0.24	<0.10	<0.10	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	0.00056 RRV	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0056	0.0264	0.0053	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	10.6	50.6	10.4	<0.0050	<0.0050
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00015	0.00194	0.00017	<0.00010	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000864	0.000922	0.000870	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	0.0131	<0.00050	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.511	1.87	0.531	<0.050	<0.050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	RG_RIVER_WS_2021-09-13_NP	RG_FBLANK_WS_2021-09-13_NP	RG_TRIP_WS_2021-09-13_NP
				Client sampling date / time	13-Sep-2021 13:00	13-Sep-2021 09:00	13-Sep-2021 13:00	13-Sep-2021 11:30	13-Sep-2021 12:30
					CG2104113-001	CG2104113-002	CG2104113-003	CG2104113-004	CG2104113-005
					Result	Result	Result	Result	Result
Dissolved Metals									
selenium, dissolved	7782-49-2	E421	0.050	µg/L	0.202	7.41	0.174	<0.050	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.34	2.08	2.27	<0.050	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	3.11	19.4	3.25	0.094 RRV	<0.050
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.145	0.451	0.149	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	4.74	112	4.70	<0.50	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	0.000015	<0.000010	<0.000010	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000219	0.00268	0.000232	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	0.0012	<0.0010	<0.0010	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Laboratory

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2104113**	Page	: 1 of 23
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 15-Sep-2021 08:50
PO	: VPO00750546	Issue Date	: 30-Sep-2021 13:06
C-O-C number	: September CMO LAEMP 2021		
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_FBLANK_WS_2021-09-13_NP	E298	13-Sep-2021	27-Sep-2021	----	----		27-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E298	13-Sep-2021	27-Sep-2021	----	----		27-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E298	13-Sep-2021	27-Sep-2021	----	----		27-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_RIVER_WS_2021-09-13_NP	E298	13-Sep-2021	27-Sep-2021	----	----		27-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_TRIP_WS_2021-09-13_NP	E298	13-Sep-2021	27-Sep-2021	----	----		27-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_2021-09-13_NP	E235.Br-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E235.Br-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E235.Br-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_RIVER_WS_2021-09-13_NP	E235.Br-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_TRIP_WS_2021-09-13_NP	E235.Br-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_2021-09-13_NP	E235.Cl-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E235.Cl-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E235.Cl-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_RIVER_WS_2021-09-13_NP	E235.Cl-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_TRIP_WS_2021-09-13_NP	E235.Cl-L	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_FBLANK_WS_2021-09-13_NP	E378-U	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E378-U	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E378-U	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_RIVER_WS_2021-09-13_NP	E378-U	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_TRIP_WS_2021-09-13_NP	E378-U	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_FBLANK_WS_2021-09-13_NP	E235.F	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E235.F	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E235.F	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_RIVER_WS_2021-09-13_NP	E235.F	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_TRIP_WS_2021-09-13_NP	E235.F	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓

Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_2021-09-13_NP	E235.NO3-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E235.NO3-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E235.NO3-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_RIVER_WS_2021-09-13_NP	E235.NO3-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_TRIP_WS_2021-09-13_NP	E235.NO3-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_2021-09-13_NP	E235.NO2-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E235.NO2-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E235.NO2-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_RIVER_WS_2021-09-13_NP	E235.NO2-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	✖ EHT

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_TRIP_WS_2021-09-13_NP	E235.NO2-L	13-Sep-2021	----	----	----		19-Sep-2021	3 days	6 days	× EHT
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_FBLANK_WS_2021-09-13_NP	E235.SO4	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E235.SO4	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E235.SO4	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_RIVER_WS_2021-09-13_NP	E235.SO4	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_TRIP_WS_2021-09-13_NP	E235.SO4	13-Sep-2021	----	----	----		19-Sep-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_FBLANK_WS_2021-09-13_NP	E318	13-Sep-2021	21-Sep-2021	----	----		23-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E318	13-Sep-2021	21-Sep-2021	----	----		23-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E318	13-Sep-2021	21-Sep-2021	----	----		23-Sep-2021	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_RIVER_WS_2021-09-13_NP	E318	13-Sep-2021	21-Sep-2021	----	----		23-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_TRIP_WS_2021-09-13_NP	E318	13-Sep-2021	21-Sep-2021	----	----		23-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_FBLANK_WS_2021-09-13_NP	E372-U	13-Sep-2021	17-Sep-2021	----	----		17-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E372-U	13-Sep-2021	17-Sep-2021	----	----		17-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E372-U	13-Sep-2021	17-Sep-2021	----	----		17-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_RIVER_WS_2021-09-13_NP	E372-U	13-Sep-2021	17-Sep-2021	----	----		17-Sep-2021	28 days	4 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_TRIP_WS_2021-09-13_NP	E372-U	13-Sep-2021	17-Sep-2021	----	----		17-Sep-2021	28 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_FBLANK_WS_2021-09-13_NP	E421.Cr-L	13-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E421.Cr-L	13-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	180 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E421.Cr-L	13-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_RIVER_WS_2021-09-13_NP	E421.Cr-L	13-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_FBLANK_WS_2021-09-13_NP	E509	13-Sep-2021	22-Sep-2021	----	----		22-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E509	13-Sep-2021	22-Sep-2021	----	----		22-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E509	13-Sep-2021	22-Sep-2021	----	----		22-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_RIVER_WS_2021-09-13_NP	E509	13-Sep-2021	22-Sep-2021	----	----		22-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_TRIP_WS_2021-09-13_NP	E421	13-Sep-2021	24-Sep-2021	----	----		24-Sep-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_FBLANK_WS_2021-09-13_NP	E421	13-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E421	13-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	180 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E421	13-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_RIVER_WS_2021-09-13_NP	E421	13-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	180 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_FBLANK_WS_2021-09-13_NP	E358-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E358-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E358-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_RIVER_WS_2021-09-13_NP	E358-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_FBLANK_WS_2021-09-13_NP	E355-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E355-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E355-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_RIVER_WS_2021-09-13_NP	E355-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_TRIP_WS_2021-09-13_NP	E355-L	13-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	11 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_FBLANK_WS_2021-09-13_NP	E283	13-Sep-2021	----	----	----		22-Sep-2021	14 days	9 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E283	13-Sep-2021	----	----	----		22-Sep-2021	14 days	9 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E283	13-Sep-2021	----	----	----		22-Sep-2021	14 days	9 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_RIVER_WS_2021-09-13_NP	E283	13-Sep-2021	----	----	----		22-Sep-2021	14 days	9 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_TRIP_WS_2021-09-13_NP	E283	13-Sep-2021	----	----	----		22-Sep-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_FBLANK_WS_2021-09-13_NP	E290	13-Sep-2021	----	----	----		25-Sep-2021	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E290	13-Sep-2021	----	----	----		25-Sep-2021	14 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E290	13-Sep-2021	----	----	----		25-Sep-2021	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_RIVER_WS_2021-09-13_NP	E290	13-Sep-2021	----	----	----		25-Sep-2021	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_TRIP_WS_2021-09-13_NP	E290	13-Sep-2021	----	----	----		25-Sep-2021	14 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_FBLANK_WS_2021-09-13_NP	E100	13-Sep-2021	----	----	----		25-Sep-2021	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E100	13-Sep-2021	----	----	----		25-Sep-2021	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E100	13-Sep-2021	----	----	----		25-Sep-2021	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_RIVER_WS_2021-09-13_NP	E100	13-Sep-2021	----	----	----		25-Sep-2021	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_TRIP_WS_2021-09-13_NP	E100	13-Sep-2021	----	----	----		25-Sep-2021	28 days	12 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E125	13-Sep-2021	----	----	----		24-Sep-2021	0.34 hrs	264 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Physical Tests : ORP by Electrode										
HDPE RG_RIVER_WS_2021-09-13_NP	E125	13-Sep-2021	----	----	----		24-Sep-2021	0.34 hrs	264 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_TRIP_WS_2021-09-13_NP	E125	13-Sep-2021	----	----	----		24-Sep-2021	0.34 hrs	265 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_FBLANK_WS_2021-09-13_NP	E125	13-Sep-2021	----	----	----		24-Sep-2021	0.34 hrs	266 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E125	13-Sep-2021	----	----	----		24-Sep-2021	0.34 hrs	268 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E108	13-Sep-2021	----	----	----		25-Sep-2021	0.25 hrs	290 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_RIVER_WS_2021-09-13_NP	E108	13-Sep-2021	----	----	----		25-Sep-2021	0.25 hrs	290 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_TRIP_WS_2021-09-13_NP	E108	13-Sep-2021	----	----	----		25-Sep-2021	0.25 hrs	290 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_FBLANK_WS_2021-09-13_NP	E108	13-Sep-2021	----	----	----		25-Sep-2021	0.25 hrs	291 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E108	13-Sep-2021	----	----	----		25-Sep-2021	0.25 hrs	294 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE RG_FBLANK_WS_2021-09-13_NP	E162	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E162	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E162	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_RIVER_WS_2021-09-13_NP	E162	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_TRIP_WS_2021-09-13_NP	E162	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_FBLANK_WS_2021-09-13_NP	E160-L	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E160-L	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E160-L	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_RIVER_WS_2021-09-13_NP	E160-L	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE										
RG_TRIP_WS_2021-09-13_NP	E160-L	13-Sep-2021	----	----	----		20-Sep-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_FBLANK_WS_2021-09-13_NP	E121	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E121	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E121	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_RIVER_WS_2021-09-13_NP	E121	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_TRIP_WS_2021-09-13_NP	E121	13-Sep-2021	----	----	----		16-Sep-2021	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E420.Cr-L	13-Sep-2021	----	----	----		18-Sep-2021	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
RG_FBLANK_WS_2021-09-13_NP	E420.Cr-L	13-Sep-2021	----	----	----		21-Sep-2021	180 days	8 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E420.Cr-L	13-Sep-2021	----	----	----		21-Sep-2021	180 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_RIVER_WS_2021-09-13_NP	E420.Cr-L	13-Sep-2021	----	----	----		21-Sep-2021	180 days	8 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_TRIP_WS_2021-09-13_NP	E420.Cr-L	13-Sep-2021	----	----	----		21-Sep-2021	180 days	8 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_FBLANK_WS_2021-09-13_NP	E508-L	13-Sep-2021	----	----	----		22-Sep-2021	28 days	9 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E508-L	13-Sep-2021	----	----	----		22-Sep-2021	28 days	9 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E508-L	13-Sep-2021	----	----	----		22-Sep-2021	28 days	9 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_RIVER_WS_2021-09-13_NP	E508-L	13-Sep-2021	----	----	----		22-Sep-2021	28 days	9 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_TRIP_WS_2021-09-13_NP	E508-L	13-Sep-2021	----	----	----		22-Sep-2021	28 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	E420	13-Sep-2021	----	----	----		18-Sep-2021	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_FBLANK_WS_2021-09-13_NP	E420	13-Sep-2021	----	----	----		21-Sep-2021	180 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	E420	13-Sep-2021	----	----	----		21-Sep-2021	180 days	8 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_RIVER_WS_2021-09-13_NP	E420	13-Sep-2021	----	----	----		21-Sep-2021	180 days	8 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_TRIP_WS_2021-09-13_NP	E420	13-Sep-2021	----	----	----		21-Sep-2021	180 days	8 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	299286	1	5	20.0	5.0	✓
Alkalinity Species by Titration	E290	302838	2	24	8.3	5.0	✓
Ammonia by Fluorescence	E298	304100	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	293813	1	18	5.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	293814	1	18	5.5	5.0	✓
Conductivity in Water	E100	302840	2	24	8.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	298315	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	298918	2	40	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	298316	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	299651	1	9	11.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	293964	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	293811	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	293815	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	293816	1	18	5.5	5.0	✓
ORP by Electrode	E125	299553	1	14	7.1	5.0	✓
pH by Meter	E108	302839	2	24	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	293812	1	18	5.5	5.0	✓
TDS by Gravimetry	E162	296875	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295737	2	38	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	298289	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	299637	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295738	2	38	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	299659	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	293784	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	293633	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	299286	1	5	20.0	5.0	✓
Alkalinity Species by Titration	E290	302838	2	24	8.3	5.0	✓
Ammonia by Fluorescence	E298	304100	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	293813	1	18	5.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	293814	1	18	5.5	5.0	✓
Conductivity in Water	E100	302840	2	24	8.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	298315	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	298918	2	40	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	298316	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	299651	1	9	11.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	293964	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	293811	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	293815	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	293816	1	18	5.5	5.0	✓
ORP by Electrode	E125	299553	1	14	7.1	5.0	✓
pH by Meter	E108	302839	2	24	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	293812	1	18	5.5	5.0	✓
TDS by Gravimetry	E162	296875	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295737	2	38	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	298289	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	299637	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295738	2	38	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	299659	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	293784	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	296870	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	293633	1	20	5.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	299286	1	5	20.0	5.0	✓
Alkalinity Species by Titration	E290	302838	2	24	8.3	5.0	✓
Ammonia by Fluorescence	E298	304100	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	293813	1	18	5.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	293814	1	18	5.5	5.0	✓
Conductivity in Water	E100	302840	2	24	8.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	298315	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	298918	2	40	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	298316	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	299651	1	9	11.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	293964	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	293811	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	293815	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	293816	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	293812	1	18	5.5	5.0	✓
TDS by Gravimetry	E162	296875	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295737	2	38	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	298289	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	299637	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295738	2	38	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	299659	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	293784	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	296870	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	293633	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	304100	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	293813	1	18	5.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	293814	1	18	5.5	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	298315	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	298918	2	40	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	298316	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	299651	1	9	11.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	293964	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	293811	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	293815	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	293816	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	293812	1	18	5.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295737	2	38	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	298289	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	299637	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295738	2	38	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	299659	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	293784	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by “mod”).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	*Method / Lab*	*Matrix*	*Method Reference*	*Method Descriptions*
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Calgary - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	*Method / Lab*	*Matrix*	*Method Reference*	*Method Descriptions*
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
	Vancouver - Environmental			

QUALITY CONTROL REPORT

Work Order	:**CG2104113**	Page	: 1 of 26
Client	:Teck Coal Limited	Laboratory	:Calgary - Environmental
Contact	:Cybele Heddle	Account Manager	:Lyudmyla Shvets
Address	:421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	:2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	:----	Telephone	:+1 403 407 1800
Project	:REGIONAL EFFECTS PROGRAM	Date Samples Received	:15-Sep-2021 08:50
PO	:VPO00750546	Date Analysis Commenced	:16-Sep-2021
C-O-C number	:September CMO LAEMP 2021	Issue Date	:30-Sep-2021 13:05
Sampler	:Jennifer Ings		
Site	:----		
Quote number	:Teck Coal Master Quote		
No. of samples received	:5		
No. of samples analysed	:5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Millicent Brentnall	Laboratory Analyst	Metals, Calgary, Alberta
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shirley Li		Metals, Calgary, Alberta

Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Physical Tests (QC Lot: 293633)											
CG2104105-001	Anonymous	turbidity	----	E121	0.10	NTU	1.04	0.99	0.05	Diff <2x LOR	----
Physical Tests (QC Lot: 296875)											
CG2104111-004	Anonymous	solids, total dissolved [TDS]	----	E162	10	mg/L	<10	<10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 299286)											
CG2104113-001	RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 299553)											
CG2104111-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	461	458	0.544%	15%	----
Physical Tests (QC Lot: 302838)											
CG2104109-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	680	656	3.67%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	680	656	3.67%	20%	----
Physical Tests (QC Lot: 302839)											
CG2104109-001	Anonymous	pH	----	E108	0.10	pH units	8.01	8.02	0.125%	4%	----
Physical Tests (QC Lot: 302840)											
CG2104109-001	Anonymous	conductivity	----	E100	1.0	µS/cm	6580	6590	0.152%	10%	----
Physical Tests (QC Lot: 302841)											
CG2104113-004	RG_FBLANK_WS_2021-09-13_NP	conductivity	----	E100	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 302842)											
CG2104113-004	RG_FBLANK_WS_2021-09-13_NP	pH	----	E108	0.10	pH units	5.32	5.20	2.28%	4%	----
Physical Tests (QC Lot: 302843)											
CG2104113-004	RG_FBLANK_WS_2021-09-13_NP	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	1.1	0.1	Diff <2x LOR	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	1.1	0.1	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 293784)											
CG2104104-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0576	0.0545	5.51%	20%	----
Anions and Nutrients (QC Lot: 293811)											
CG2104110-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.221	0.218	0.003	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Anions and Nutrients (QC Lot: 293812)											
CG2104110-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	376	373	0.636%	20%	----
Anions and Nutrients (QC Lot: 293813)											
CG2104110-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 293814)											
CG2104110-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	1.87	1.82	0.05	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 293815)											
CG2104110-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	15.4	15.3	0.398%	20%	----
Anions and Nutrients (QC Lot: 293816)											
CG2104110-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	0.0311	0.0304	0.0007	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 293964)											
CG2104110-004	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 298289)											
CG2104108-003	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 304100)											
CG2104111-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0228	0.0253	0.0025	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 299651)											
CG2104113-001	RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.06	1.07	0.004	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 299659)											
CG2104108-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.60	0.58	0.02	Diff <2x LOR	----
Total Metals (QC Lot: 295737)											
CG2104064-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Total Metals (QC Lot: 295738)											
CG2104064-001	Anonymous	aluminum, total	7429-90-5	E420	0.0060	mg/L	<0.0060	<0.0060	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00020	mg/L	0.00208	0.00212	1.81%	20%	----
		arsenic, total	7440-38-2	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00020	mg/L	0.0169	0.0176	4.09%	20%	----
		beryllium, total	7440-41-7	E420	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.020	mg/L	0.102	0.104	0.002	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0100	mg/L	2.77 µg/L	0.00288	3.69%	20%	----
		calcium, total	7440-70-2	E420	0.100	mg/L	589	606	2.89%	20%	----
		cobalt, total	7440-48-4	E420	0.20	mg/L	88.4 µg/L	0.0889	0.519%	20%	----
		copper, total	7440-50-8	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.020	mg/L	0.221	0.226	2.14%	20%	----
		lead, total	7439-92-1	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 295738) - continued											
CG2104064-001	Anonymous	lithium, total	7439-93-2	E420	0.0020	mg/L	0.941	0.933	0.806%	20%	----
		magnesium, total	7439-95-4	E420	0.0100	mg/L	263	267	1.41%	20%	----
		manganese, total	7439-96-5	E420	0.00020	mg/L	0.719	0.735	2.15%	20%	----
		molybdenum, total	7439-98-7	E420	0.000100	mg/L	0.00425	0.00442	3.73%	20%	----
		nickel, total	7440-02-0	E420	0.00100	mg/L	0.456	0.466	2.26%	20%	----
		potassium, total	7440-09-7	E420	0.100	mg/L	17.4	17.0	2.03%	20%	----
		selenium, total	7782-49-2	E420	0.100	mg/L	89.1 µg/L	0.0908	1.93%	20%	----
		silicon, total	7440-21-3	E420	0.20	mg/L	2.84	2.93	3.30%	20%	----
		silver, total	7440-22-4	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.100	mg/L	16.3	16.4	0.592%	20%	----
		strontium, total	7440-24-6	E420	0.00040	mg/L	1.03	1.04	0.806%	20%	----
		sulfur, total	7704-34-9	E420	1.00	mg/L	409	420	2.82%	20%	----
		thallium, total	7440-28-0	E420	0.000020	mg/L	0.000372	0.000371	0.188%	20%	----
		tin, total	7440-31-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.0411	0.0430	4.46%	20%	----
		vanadium, total	7440-62-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0060	mg/L	0.185	0.189	2.08%	20%	----
Total Metals (QC Lot: 295747)											
CG2104087-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00018	<0.00010	0.00008	Diff <2x LOR	----
Total Metals (QC Lot: 295748)											
CG2104087-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0035	0.0034	0.0001	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00028	0.00028	0.000007	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00021	0.00018	0.00002	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0540	0.0538	0.401%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.013	0.012	0.0004	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0509 µg/L	0.0000618	19.3%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	196	197	0.516%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00070	0.00070	0.000006	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0221	0.0207	6.74%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 295748) - continued											
CG2104087-001	Anonymous	magnesium, total	7439-95-4	E420	0.0050	mg/L	146	147	1.14%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00054	0.00059	0.00005	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00123	0.00122	0.370%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00138	0.00142	0.00003	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	2.58	2.63	1.72%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	147 µg/L	0.146	0.998%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.31	2.29	0.728%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	3.60	3.62	0.420%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.191	0.186	2.59%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	249	248	0.250%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000012	0.000011	0.0000003	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00813	0.00801	1.51%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 299637)											
CG2104111-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 298315)											
CG2104087-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00013	0.00015	0.00002	Diff <2x LOR	----
Dissolved Metals (QC Lot: 298316)											
CG2104087-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0011	0.0011	0.00001	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00026	0.00026	0.000007	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00020	0.00019	0.000006	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0563	0.0567	0.739%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.011	0.010	0.0005	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.0583 µg/L	0.0000598	2.47%	20%	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	175	172	1.48%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00086	0.00087	0.000008	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000052	<0.000050	0.000002	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Dissolved Metals (QC Lot: 298316) - continued											
CG2104087-001	Anonymous	lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0195	0.0187	4.06%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	136	133	2.20%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00051	0.00048	0.00003	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00128	0.00129	0.223%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00147	0.00144	0.00002	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.62	2.69	2.43%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	137 µg/L	0.135	1.58%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.21	2.17	1.84%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	3.64	3.60	0.935%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.189	0.188	0.634%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	234	232	0.864%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00770	0.00766	0.487%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0021	0.0020	0.0001	Diff <2x LOR	----
Dissolved Metals (QC Lot: 298918)											
CG2104099-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 298919)											
CG2104113-004	RG_FBLANK_WS_2021-09-13_NP	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 301402)											
CG2104109-004	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00050	mg/L	0.00174	0.00171	0.00003	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00050	mg/L	0.00116	0.00115	0.00001	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00050	mg/L	0.0183	0.0184	0.431%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000250	mg/L	<0.000250	<0.000250	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.050	mg/L	0.125	0.133	0.007	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000250	mg/L	0.0000324	0.0000393	0.0000070	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.250	mg/L	106	111	4.62%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00050	mg/L	0.00113	0.00115	0.00002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00100	mg/L	0.00128	0.00132	0.00004	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Dissolved Metals (QC Lot: 301402) - continued											
CG2104109-004	Anonymous	lead, dissolved	7439-92-1	E421	0.000250	mg/L	<0.000250	<0.000250	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0050	mg/L	0.0791	0.0821	3.66%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0250	mg/L	38.7	39.2	1.17%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00050	mg/L	0.278	0.278	0.109%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000250	mg/L	0.0125	0.0127	1.89%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00250	mg/L	0.00480	0.00482	0.00002	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.250	mg/L	7.16	7.36	2.83%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000250	mg/L	0.00104	0.00123	0.000190	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.250	mg/L	2.40	2.52	0.117	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.250	mg/L	638	650	1.93%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00100	mg/L	1.98	2.01	1.35%	20%	----
		sulfur, dissolved	7704-34-9	E421	2.50	mg/L	484	512	5.65%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000050	mg/L	0.000128	0.000122	0.000006	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00150	mg/L	<0.00150	<0.00150	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000050	mg/L	0.00902	0.00932	3.27%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00250	mg/L	<0.00250	<0.00250	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 293633)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 296870)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 296875)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 299286)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 302838)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 302840)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 302841)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 302843)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 293784)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 293811)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 293812)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 293813)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 293814)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 293815)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 293816)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 293964)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 298289)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 304100)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 299651)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 299659)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 295737)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 295738)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 295738) - continued						
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 295747)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 295748)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 295748) - continued						
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 299637)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 298315)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 298316)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 298316) - continued						
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 298918)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 298919)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 301402)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 301402) - continued						
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 293633)									
turbidity	----	E121	0.1	NTU	200 NTU	98.8	85.0	115	----
Physical Tests (QCLot: 296870)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	95.8	85.0	115	----
Physical Tests (QCLot: 296875)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	94.2	85.0	115	----
Physical Tests (QCLot: 299286)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	103	85.0	115	----
Physical Tests (QCLot: 299553)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	100	95.4	104	----
Physical Tests (QCLot: 302838)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	105	85.0	115	----
Physical Tests (QCLot: 302839)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 302840)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.0	90.0	110	----
Physical Tests (QCLot: 302841)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.2	90.0	110	----
Physical Tests (QCLot: 302842)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 302843)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	108	85.0	115	----
Anions and Nutrients (QCLot: 293784)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	94.0	80.0	120	----
Anions and Nutrients (QCLot: 293811)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	108	90.0	110	----
Anions and Nutrients (QCLot: 293812)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 293813)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	109	85.0	115	----
Anions and Nutrients (QCLot: 293814)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 293815)									

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Anions and Nutrients (QCLot: 293815) - continued									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 293816)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 293964)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	103	80.0	120	----
Anions and Nutrients (QCLot: 298289)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 304100)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	102	85.0	115	----
Organic / Inorganic Carbon (QCLot: 299651)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	98.0	80.0	120	----
Organic / Inorganic Carbon (QCLot: 299659)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	93.7	80.0	120	----
Total Metals (QCLot: 295737)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	99.4	80.0	120	----
Total Metals (QCLot: 295738)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	99.4	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	100	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	99.7	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	99.4	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	100	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	95.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	96.1	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.1	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	91.4	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.0	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	97.7	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	97.0	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	99.9	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	99.0	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	98.8	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	104	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	High	Qualifier
Total Metals (QCLot: 295738) - continued									
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	92.9	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	98.8	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	95.8	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	96.6	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	93.5	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	102	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	97.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	105	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	107	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	101	80.0	120	----
Total Metals (QCLot: 295747)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	99.0	80.0	120	----
Total Metals (QCLot: 295748)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	106	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	99.5	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	98.9	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	102	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	103	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	100	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	107	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	99.1	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.4	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	100	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	104	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	103	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	96.9	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	97.6	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.4	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	98.2	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	107	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 295748) - continued									
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	100	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	104	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	106	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	99.4	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	96.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	99.8	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	99.5	80.0	120	----
Total Metals (QCLot: 299637)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	92.2	80.0	120	----
Dissolved Metals (QCLot: 298315)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.3	80.0	120	----
Dissolved Metals (QCLot: 298316)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	97.3	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	98.4	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	102	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.2	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.9	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.1	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	98.4	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	103	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	88.1	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	97.2	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.8	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	98.7	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	99.7	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	98.8	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 298316) - continued									
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	98.7	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	80.3	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.6	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	95.0	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	100.0	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	99.4	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	101	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Dissolved Metals (QCLot: 301402)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	117	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	116	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	118	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	116	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	116	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	105	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	113	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	114	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	116	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	110	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	116	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	118	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	110	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	113	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	105	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	114	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	112	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	109	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	110	60.0	140	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	106	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	114	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	119	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	112	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Dissolved Metals (QCLot: 301402) - continued									
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	116	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	118	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	114	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	120	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	116	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 293784)										
CG2104105-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0598 mg/L	0.0676 mg/L	88.5	70.0	130	----
Anions and Nutrients (QCLot: 293811)										
CG2104113-005	RG_TRIP_WS_2021-09-13_NP	fluoride	16984-48-8	E235.F	1.04 mg/L	1 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 293812)										
CG2104113-005	RG_TRIP_WS_2021-09-13_NP	sulfate (as SO4)	14808-79-8	E235.SO4	113 mg/L	100 mg/L	113	75.0	125	----
Anions and Nutrients (QCLot: 293813)										
CG2104113-005	RG_TRIP_WS_2021-09-13_NP	bromide	24959-67-9	E235.Br-L	0.534 mg/L	0.5 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 293814)										
CG2104113-005	RG_TRIP_WS_2021-09-13_NP	chloride	16887-00-6	E235.Cl-L	102 mg/L	100 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 293815)										
CG2104113-005	RG_TRIP_WS_2021-09-13_NP	nitrate (as N)	14797-55-8	E235.NO3-L	2.56 mg/L	2.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 293816)										
CG2104113-005	RG_TRIP_WS_2021-09-13_NP	nitrite (as N)	14797-65-0	E235.NO2-L	0.510 mg/L	0.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 293964)										
CG2104111-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0567 mg/L	0.05 mg/L	113	70.0	130	----
Anions and Nutrients (QCLot: 298289)										
CG2104110-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.83 mg/L	2.5 mg/L	113	70.0	130	----
Anions and Nutrients (QCLot: 304100)										
CG2104111-003	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0938 mg/L	0.1 mg/L	93.8	75.0	125	----
Organic / Inorganic Carbon (QCLot: 299651)										
CG2104113-001	RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	carbon, dissolved organic [DOC]	----	E358-L	23.5 mg/L	23.9 mg/L	98.4	70.0	130	----
Organic / Inorganic Carbon (QCLot: 299659)										
CG2104108-001	Anonymous	carbon, total organic [TOC]	----	E355-L	24.7 mg/L	23.9 mg/L	103	70.0	130	----
Total Metals (QCLot: 295737)										
CG2104077-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0376 mg/L	0.04 mg/L	94.1	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 295738)										
CG2104077-001	Anonymous	aluminum, total	7429-90-5	E420	0.189 mg/L	0.2 mg/L	94.3	70.0	130	----
		antimony, total	7440-36-0	E420	0.0194 mg/L	0.02 mg/L	97.0	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0198 mg/L	0.02 mg/L	98.8	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0382 mg/L	0.04 mg/L	95.4	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00946 mg/L	0.01 mg/L	94.6	70.0	130	----
		boron, total	7440-42-8	E420	0.095 mg/L	0.1 mg/L	95.4	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00386 mg/L	0.004 mg/L	96.5	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0189 mg/L	0.02 mg/L	94.7	70.0	130	----
		copper, total	7440-50-8	E420	0.0185 mg/L	0.02 mg/L	92.3	70.0	130	----
		iron, total	7439-89-6	E420	1.78 mg/L	2 mg/L	88.8	70.0	130	----
		lead, total	7439-92-1	E420	0.0187 mg/L	0.02 mg/L	93.5	70.0	130	----
		lithium, total	7439-93-2	E420	0.1000 mg/L	0.1 mg/L	100.0	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0195 mg/L	0.02 mg/L	97.4	70.0	130	----
		nickel, total	7440-02-0	E420	0.0376 mg/L	0.04 mg/L	94.0	70.0	130	----
		potassium, total	7440-09-7	E420	3.92 mg/L	4 mg/L	98.1	70.0	130	----
		selenium, total	7782-49-2	E420	0.0374 mg/L	0.04 mg/L	93.6	70.0	130	----
		silicon, total	7440-21-3	E420	8.62 mg/L	10 mg/L	86.2	70.0	130	----
		silver, total	7440-22-4	E420	0.00376 mg/L	0.004 mg/L	94.0	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00381 mg/L	0.004 mg/L	95.3	70.0	130	----
		tin, total	7440-31-5	E420	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		titanium, total	7440-32-6	E420	0.0402 mg/L	0.04 mg/L	101	70.0	130	----
		uranium, total	7440-61-1	E420	0.00431 mg/L	0.004 mg/L	108	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0997 mg/L	0.1 mg/L	99.7	70.0	130	----
		zinc, total	7440-66-6	E420	0.395 mg/L	0.4 mg/L	98.7	70.0	130	----
Total Metals (QCLot: 295747)										
CG2104087-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0368 mg/L	0.04 mg/L	92.0	70.0	130	----
Total Metals (QCLot: 295748)										
CG2104087-002	Anonymous	aluminum, total	7429-90-5	E420	0.159 mg/L	0.2 mg/L	79.7	70.0	130	----
		antimony, total	7440-36-0	E420	0.0206 mg/L	0.02 mg/L	103	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 295748) - continued										
CG2104087-002	Anonymous	arsenic, total	7440-38-2	E420	0.0190 mg/L	0.02 mg/L	95.2	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0387 mg/L	0.04 mg/L	96.7	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00946 mg/L	0.01 mg/L	94.6	70.0	130	----
		boron, total	7440-42-8	E420	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00371 mg/L	0.004 mg/L	92.8	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0174 mg/L	0.02 mg/L	87.2	70.0	130	----
		copper, total	7440-50-8	E420	0.0173 mg/L	0.02 mg/L	86.6	70.0	130	----
		iron, total	7439-89-6	E420	1.86 mg/L	2 mg/L	92.8	70.0	130	----
		lead, total	7439-92-1	E420	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		lithium, total	7439-93-2	E420	0.0968 mg/L	0.1 mg/L	96.8	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0180 mg/L	0.02 mg/L	90.0	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		nickel, total	7440-02-0	E420	0.0347 mg/L	0.04 mg/L	86.8	70.0	130	----
		potassium, total	7440-09-7	E420	3.46 mg/L	4 mg/L	86.6	70.0	130	----
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, total	7440-21-3	E420	9.18 mg/L	10 mg/L	91.8	70.0	130	----
		silver, total	7440-22-4	E420	0.00391 mg/L	0.004 mg/L	97.7	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00370 mg/L	0.004 mg/L	92.5	70.0	130	----
		tin, total	7440-31-5	E420	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		titanium, total	7440-32-6	E420	0.0367 mg/L	0.04 mg/L	91.8	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0946 mg/L	0.1 mg/L	94.6	70.0	130	----
		zinc, total	7440-66-6	E420	0.357 mg/L	0.4 mg/L	89.3	70.0	130	----
Total Metals (QCLot: 299637)										
CG2104111-002	Anonymous	mercury, total	7439-97-6	E508-L	4.87 ng/L	5 ng/L	97.5	70.0	130	----
Dissolved Metals (QCLot: 298315)										
CG2104087-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0391 mg/L	0.04 mg/L	97.8	70.0	130	----
Dissolved Metals (QCLot: 298316)										
CG2104087-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.203 mg/L	0.2 mg/L	102	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 298316) - continued										
CG2104087-002	Anonymous	arsenic, dissolved	7440-38-2	E421	0.0221 mg/L	0.02 mg/L	110	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0369 mg/L	0.04 mg/L	92.2	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00906 mg/L	0.01 mg/L	90.6	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.096 mg/L	0.1 mg/L	95.9	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00372 mg/L	0.004 mg/L	93.1	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0183 mg/L	0.02 mg/L	91.7	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.86 mg/L	2 mg/L	92.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0954 mg/L	0.1 mg/L	95.4	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0365 mg/L	0.04 mg/L	91.3	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.58 mg/L	4 mg/L	89.5	70.0	130	----
		selenium, dissolved	7782-49-2	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.40 mg/L	10 mg/L	84.0	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00376 mg/L	0.004 mg/L	94.1	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00387 mg/L	0.004 mg/L	96.8	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0195 mg/L	0.02 mg/L	97.7	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0393 mg/L	0.04 mg/L	98.3	70.0	130	----
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.358 mg/L	0.4 mg/L	89.6	70.0	130	----
Dissolved Metals (QCLot: 298918)										
CG2104099-006	Anonymous	mercury, dissolved	7439-97-6	E509	0.000103 mg/L	0.0001 mg/L	103	70.0	130	----
Dissolved Metals (QCLot: 298919)										
CG2104206-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000998 mg/L	0.0001 mg/L	99.8	70.0	130	----
Dissolved Metals (QCLot: 301402)										
CG2104109-005	Anonymous	aluminum, dissolved	7429-90-5	E421	1.94 mg/L	2 mg/L	96.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.203 mg/L	0.2 mg/L	102	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 301402) - continued										
CG2104109-005	Anonymous	arsenic, dissolved	7440-38-2	E421	0.194 mg/L	0.2 mg/L	97.2	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.196 mg/L	0.2 mg/L	98.1	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.374 mg/L	0.4 mg/L	93.4	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0926 mg/L	0.1 mg/L	92.6	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.891 mg/L	1 mg/L	89.1	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.0380 mg/L	0.04 mg/L	94.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.192 mg/L	0.2 mg/L	96.1	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.186 mg/L	0.2 mg/L	93.1	70.0	130	----
		iron, dissolved	7439-89-6	E421	18.6 mg/L	20 mg/L	93.0	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.193 mg/L	0.2 mg/L	96.5	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.947 mg/L	1 mg/L	94.7	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.2 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.201 mg/L	0.2 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.374 mg/L	0.4 mg/L	93.4	70.0	130	----
		potassium, dissolved	7440-09-7	E421	37.5 mg/L	40 mg/L	93.8	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.361 mg/L	0.4 mg/L	90.3	70.0	130	----
		silicon, dissolved	7440-21-3	E421	96.0 mg/L	100 mg/L	96.0	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.0400 mg/L	0.04 mg/L	99.9	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	200 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0382 mg/L	0.04 mg/L	95.6	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.199 mg/L	0.2 mg/L	99.3	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.394 mg/L	0.4 mg/L	98.5	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.0392 mg/L	0.04 mg/L	97.9	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.989 mg/L	1 mg/L	98.9	70.0	130	----
		zinc, dissolved	7440-66-6	E421	3.52 mg/L	4 mg/L	87.9	70.0	130	----

Page 1 of 1

Teck

COC ID:	September CMO LAEMP 2021	TURNAROUND TIME:	

PROJECT/CLIENT INFO

Facility Name / Job#	REP
Project Manager	Cybele Heddle
Email	[illegible]
Address	421 Pine Avenue
City	Sparwood — Province: BC
Postal Code	V0B 2G0 — Country: Canada
Phone Number	250-425-8202

LABORATORY

Lab Name	ALS Calgary
Lab Contact	Lyudmyla Shvets
Email	lyudmyla.shvets@alsglobal.com
Address	2559 29 Street NE
City	Calgary — Province: AB
Postal Code	T1Y 7B5 — Country: Canada
Phone Number	1 403 407 1794

	Excel	PDF	EDD

SAMPLE DETAILS / **ANALYSIS REQUESTED**

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	TECKCOAL-ROUTINE-VA (N)	ALS_Package-DOC (F, H2SO4)	ALS_Package-TKN/TOC (N, H2SO4)	HG-T-U-CVAF-VA (N)	HG-D-CVAF-VA (F, HCL)	TECKCOAL-MET-T-VA (N, HNO3)	TECKCOAL-MET-D-VA (F, HNO3)
RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_MI25	WS	No	9/13/2021	1300	G	7	X	X	X	X	X	X	X
RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	RG_MIDCO	WS	No	9/13/2021	900	G	7	X	X	X	X	X	X	X
RG_RIVER_WS_2021-09-13_NP	RG_RIVER	WS	No	9/13/2021	1300	G	7	X	X	X	X	X	X	X
RG_FBLANK_WS_2021-09-13_NP	RG_FBLANK	WS	No	9/13/2021	1130	G	7	X	X	X	X	X	X	X
RG_TRIP_WS_2021-09-13_NP	RG_TRIP	WS	No	9/13/2021	1230	G	7	X	X	X	X	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

ALS PO 750546

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
Jennifer Ings/Minnow	################	DK	9/15 0850

NB OF BOTTLES RETURNED/DESCRIPTION

Regular (default)	x
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Sampler's Signature	Jennifer Ings	Date/Time	September 14, 2021

6°

Environmental Division
Calgary
Work Order Reference
CG2104113

Telephone : +1 403 407 1800

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104150**	Page	: 1 of 7
Amendment	: **2**		
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 16-Sep-2021 10:30
PO	: VPO00750546	Date Analysis Commenced	: 17-Sep-2021
C-O-C number	: September CMO LAEMP 2021	Issue Date	: 07-Oct-2021 10:53
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
μg/L	micrograms per litre
μS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Sample Comments

Sample	*Client Id*	*Comment*
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	Sample 1: Water sample for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	----	----	----
				Client sampling date / time	14-Sep-2021 14:30	14-Sep-2021 11:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	CG2104150-001	CG2104150-002	--------	--------	--------
					Result	Result	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	2.2	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	166	99.3	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	13.4	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	180	99.3	----	----	----
conductivity	----	E100	2.0	µS/cm	562	194	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	276	99.6	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	449	466	----	----	----
pH	----	E108	0.10	pH units	8.45	8.28	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	413	136	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	3.1	<1.0	----	----	----
turbidity	----	E121	0.10	NTU	0.40	0.21	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	203	121	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	8.0	<1.0	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0355	0.0190	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	1.21	0.19	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.180	0.061	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	0.058	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.486	0.0110	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	0.0013	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	0.0097	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0038	0.0082	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	130	4.66	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.06	1.28	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.11	1.34	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	----	----	----
				Client sampling date / time	14-Sep-2021 14:30	14-Sep-2021 11:00	----	----	----
					CG2104150-001	CG2104150-002	--------	--------	--------
					Result	Result	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	6.38	2.09	----	----	----
cation sum	----	EC101	0.10	meq/L	5.89	2.04	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	92.3	97.6	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	3.99	1.21	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0360	0.0066	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00012	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00025	0.00022	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0985	0.139	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L	<0.020	<0.020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.020	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0313	0.0322	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	79.0	27.4	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00020	0.00011	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	0.18	<0.10	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.042	<0.010	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0106	0.0017	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	27.5	8.91	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00341	0.00084	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	<0.00050	0.00069	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000816	0.000670	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00162	<0.00050	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	0.940	0.550	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	3.42	0.525	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	2.13	2.09	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	8.68	0.828	----	----	----

Analytical Results

Sub-Matrix: Water

(Matrix: Water)

				Client sample ID	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	----	----	----
				Client sampling date / time	14-Sep-2021 14:30	14-Sep-2021 11:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	CG2104150-001	CG2104150-002	--------	--------	--------
					Result	Result	----	----	----
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.253	0.0663	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	49.8	2.03	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00060 DLM	<0.00030	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00126	0.000195	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0016	0.0016	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00020	0.00016	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.106	0.133	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	<0.020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	0.019	<0.010	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0199	0.0253	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	70.8	26.5	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00014	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	<0.10	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0100	0.0016	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	24.2	8.11	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00074	0.00038	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000814	0.000621	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00154	<0.00050	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.915	0.524	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	----	----	----
				Client sampling date / time	14-Sep-2021 14:30	14-Sep-2021 11:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	CG2104150-001	CG2104150-002	--------	--------	--------
					Result	Result	----	----	----
Dissolved Metals									
selenium, dissolved	7782-49-2	E421	0.050	µg/L	3.35	0.514	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.12	2.04	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	7.85	0.749	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.246	0.0632	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	47.9	1.44	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000011	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00120	0.000189	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0017	<0.0010	----	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2104150**	Page	: 1 of 15
Amendment	: **2**		
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 16-Sep-2021 10:30
PO	: VPO00750546	Issue Date	: 07-Oct-2021 10:53
C-O-C number	: September CMO LAEMP 2021		
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E298	14-Sep-2021	28-Sep-2021	----	----		28-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E298	14-Sep-2021	28-Sep-2021	----	----		28-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E235.Br-L	14-Sep-2021	----	----	----		17-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E235.Br-L	14-Sep-2021	----	----	----		17-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E235.Cl-L	14-Sep-2021	----	----	----		17-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E235.Cl-L	14-Sep-2021	----	----	----		17-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E378-U	14-Sep-2021	----	----	----		17-Sep-2021	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E378-U	14-Sep-2021	----	----	----		17-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E235.F	14-Sep-2021	----	----	----		17-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E235.F	14-Sep-2021	----	----	----		17-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E235.NO3-L	14-Sep-2021	----	----	----		17-Sep-2021	3 days	3 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E235.NO3-L	14-Sep-2021	----	----	----		17-Sep-2021	3 days	3 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E235.NO2-L	14-Sep-2021	----	----	----		17-Sep-2021	3 days	3 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E235.NO2-L	14-Sep-2021	----	----	----		17-Sep-2021	3 days	3 days	× EHT
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E235.SO4	14-Sep-2021	----	----	----		17-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E235.SO4	14-Sep-2021	----	----	----		17-Sep-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E318	14-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E318	14-Sep-2021	22-Sep-2021	----	----		24-Sep-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E372-U	14-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E372-U	14-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E421.Cr-L	14-Sep-2021	23-Sep-2021	----	----		24-Sep-2021	180 days	10 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E421.Cr-L	14-Sep-2021	23-Sep-2021	----	----		24-Sep-2021	180 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E509	14-Sep-2021	23-Sep-2021	----	----		23-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E509	14-Sep-2021	23-Sep-2021	----	----		23-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E421	14-Sep-2021	23-Sep-2021	----	----		24-Sep-2021	180 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E421	14-Sep-2021	23-Sep-2021	----	----		24-Sep-2021	180 days	10 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E358-L	14-Sep-2021	27-Sep-2021	----	----		28-Sep-2021	28 days	14 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E358-L	14-Sep-2021	27-Sep-2021	----	----		28-Sep-2021	28 days	14 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E355-L	14-Sep-2021	27-Sep-2021	----	----		28-Sep-2021	28 days	14 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E355-L	14-Sep-2021	27-Sep-2021	----	----		28-Sep-2021	28 days	14 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E283	14-Sep-2021	----	----	----		26-Sep-2021	14 days	12 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E283	14-Sep-2021	----	----	----		26-Sep-2021	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E290	14-Sep-2021	----	----	----		26-Sep-2021	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E290	14-Sep-2021	----	----	----		26-Sep-2021	14 days	12 days	✓

Matrix: **Water**

Evaluation: ✘ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E100	14-Sep-2021	----	----	----		26-Sep-2021	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E100	14-Sep-2021	----	----	----		26-Sep-2021	28 days	12 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E125	14-Sep-2021	----	----	----		24-Sep-2021	0.34 hrs	244 hrs	✘ EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E125	14-Sep-2021	----	----	----		24-Sep-2021	0.34 hrs	247 hrs	✘ EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E108	14-Sep-2021	----	----	----		26-Sep-2021	0.25 hrs	286 hrs	✘ EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E108	14-Sep-2021	----	----	----		26-Sep-2021	0.25 hrs	289 hrs	✘ EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E162	14-Sep-2021	----	----	----		21-Sep-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E162	14-Sep-2021	----	----	----		21-Sep-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E160-L	14-Sep-2021	----	----	----		21-Sep-2021	7 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E160-L	14-Sep-2021	----	----	----		21-Sep-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E121	14-Sep-2021	----	----	----		17-Sep-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E121	14-Sep-2021	----	----	----		17-Sep-2021	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E420.Cr-L	14-Sep-2021	----	----	----		23-Sep-2021	180 days	9 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E420.Cr-L	14-Sep-2021	----	----	----		23-Sep-2021	180 days	9 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E508-L	14-Sep-2021	----	----	----		23-Sep-2021	28 days	9 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E508-L	14-Sep-2021	----	----	----		23-Sep-2021	28 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	E420	14-Sep-2021	----	----	----		23-Sep-2021	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	E420	14-Sep-2021	----	----	----		23-Sep-2021	180 days	9 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	303171	2	33	6.0	5.0	✓
Alkalinity Species by Titration	E290	303166	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	304917	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	295584	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	295585	1	14	7.1	5.0	✓
Conductivity in Water	E100	303164	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	299727	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	300042	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	299726	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	303783	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	295121	1	9	11.1	5.0	✓
Fluoride in Water by IC	E235.F	295582	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	295586	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	295587	1	14	7.1	5.0	✓
ORP by Electrode	E125	300486	1	17	5.8	5.0	✓
pH by Meter	E108	303165	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	295583	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	297777	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	299621	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	299771	1	6	16.6	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	300456	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	299620	2	20	10.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	303784	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	296033	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	295090	1	19	5.2	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	303171	2	33	6.0	5.0	✓
Alkalinity Species by Titration	E290	303166	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	304917	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	295584	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	295585	1	14	7.1	5.0	✓
Conductivity in Water	E100	303164	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	299727	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	300042	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	299726	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	303783	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	295121	1	9	11.1	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	295582	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	295586	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	295587	1	14	7.1	5.0	✓
ORP by Electrode	E125	300486	1	17	5.8	5.0	✓
pH by Meter	E108	303165	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	295583	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	297777	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	299621	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	299771	1	6	16.6	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	300456	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	299620	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	303784	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	296033	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	297310	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	295090	1	19	5.2	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	303171	2	33	6.0	5.0	✓
Alkalinity Species by Titration	E290	303166	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	304917	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	295584	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	295585	1	14	7.1	5.0	✓
Conductivity in Water	E100	303164	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	299727	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	300042	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	299726	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	303783	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	295121	1	9	11.1	5.0	✓
Fluoride in Water by IC	E235.F	295582	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	295586	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	295587	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	295583	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	297777	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	299621	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	299771	1	6	16.6	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	300456	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	299620	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	303784	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	296033	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	297310	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	295090	1	19	5.2	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	304917	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	295584	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	295585	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	299727	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	300042	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	299726	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	303783	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	295121	1	9	11.1	5.0	✓
Fluoride in Water by IC	E235.F	295582	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	295586	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	295587	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	295583	1	14	7.1	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	299621	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	299771	1	6	16.6	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	300456	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	299620	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	303784	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	296033	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by “mod”).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	*Method / Lab*	*Matrix*	*Method Reference*	*Method Descriptions*
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as $CaCO_3$), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	*Method / Lab*	*Matrix*	*Method Reference*	*Method Descriptions*
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO_3.

Preparation Methods	*Method / Lab*	*Matrix*	*Method Reference*	*Method Descriptions*
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **CG2104150**		
Amendment	: **2**		
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 16-Sep-2021 10:30
PO	: VPO00750546	Date Analysis Commenced	: 17-Sep-2021
C-O-C number	: September CMO LAEMP 2021	Issue Date	: 07-Oct-2021 10:53
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
\# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 295090)											
CG2104099-010	Anonymous	turbidity	----	E121	0.10	NTU	0.48	0.45	0.02	Diff <2x LOR	----
Physical Tests (QC Lot: 297777)											
CG2104099-011	Anonymous	solids, total dissolved [TDS]	----	E162	40	mg/L	2670	2710	1.26%	20%	----
Physical Tests (QC Lot: 300486)											
CG2104148-006	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	446	455	2.15%	15%	----
Physical Tests (QC Lot: 303164)											
CG2104146-004	Anonymous	conductivity	----	E100	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 303165)											
CG2104146-004	Anonymous	pH	----	E108	0.10	pH units	5.31	5.36	0.937%	4%	----
Physical Tests (QC Lot: 303166)											
CG2104146-004	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 303171)											
CG2104135-003	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 303172)											
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	acidity (as CaCO3)	----	E283	2.0	mg/L	2.2	<2.0	0.2	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 295121)											
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 295582)											
CG2104148-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.201	0.197	0.004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 295583)											
CG2104148-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	18.6	18.4	0.884%	20%	----
Anions and Nutrients (QC Lot: 295584)											
CG2104148-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 295585)											
CG2104148-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.46	0.43	0.03	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 295586)											
CG2104148-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0260	0.0257	0.0003	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Anions and Nutrients (QC Lot: 295587)											
CG2104148-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0014	0.0012	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296033)											
CG2104146-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 299771)											
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 304917)											
CG2104146-005	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0292	0.0299	0.0007	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 303783)											
CG2104149-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.99	0.90	0.09	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 303784)											
CG2104149-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.88	0.81	0.07	Diff <2x LOR	----
Total Metals (QC Lot: 299620)											
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0360	0.0299	18.5%	20%	----
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	antimony, total	7440-36-0	E420	0.00010	mg/L	0.00012	0.00012	0.000001	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00025	0.00025	0.000001	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0985	0.102	3.52%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.020	0.021	0.001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0313 µg/L	0.0000259	0.0000054	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	79.0	84.2	6.35%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	0.18 µg/L	0.00017	0.00001	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.042	0.032	0.010	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0106	0.0108	2.14%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	27.5	27.7	0.686%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00341	0.00351	2.94%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000816	0.000819	0.392%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00162	0.00170	0.00007	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.940	0.988	4.90%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	3.42 µg/L	0.00354	3.26%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.13	2.18	2.28%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 299620) - continued											
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	sodium, total	17341-25-2	E420	0.050	mg/L	8.68	8.98	3.42%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.253	0.268	5.74%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	49.8	52.1	4.60%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000010	<0.000010	0.00000009	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00126	0.00125	0.986%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 299621)											
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00020	0.00016	0.00004	Diff <2x LOR	----
Total Metals (QC Lot: 300456)											
CG2104149-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 299726)											
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0016	<0.0010	0.0006	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00010	0.00010	0.0000002	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00020	0.00020	0.000007	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.106	0.101	4.27%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.019	0.020	0.0006	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.0199 µg/L	0.0000192	0.0000008	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	70.8	72.8	2.75%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0100	0.0101	0.854%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	24.2	24.8	2.44%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00074	0.00078	0.00003	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000814	0.000808	0.610%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00154	0.00152	0.00003	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.915	0.920	0.517%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	3.35 µg/L	0.00340	1.29%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Dissolved Metals (QC Lot: 299726) - continued											
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.12	2.11	0.400%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	7.85	7.86	0.201%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.246	0.246	0.148%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	47.9	48.8	1.92%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000011	0.000011	0.0000006	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00120	0.00123	2.14%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0017	0.0014	0.0003	Diff <2x LOR	----
Dissolved Metals (QC Lot: 299727)											
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00014	0.00013	0.00001	Diff <2x LOR	----
Dissolved Metals (QC Lot: 300042)											
CG2104148-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 295090)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 297310)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 297777)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 303164)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 303166)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 303171)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 303172)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Anions and Nutrients (QCLot: 295121)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 295582)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 295583)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 295584)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 295585)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 295586)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 295587)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 296033)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 299771)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 299771) - continued						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 304917)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 303783)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 303784)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 299620)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 299620) - continued						
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 299621)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 300456)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 299726)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 299726) - continued						
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 299727)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 300042)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 295090)									
turbidity	----	E121	0.1	NTU	200 NTU	97.8	85.0	115	----
Physical Tests (QCLot: 297310)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	93.3	85.0	115	----
Physical Tests (QCLot: 297777)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	96.2	85.0	115	----
Physical Tests (QCLot: 300486)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	100	95.4	104	----
Physical Tests (QCLot: 303164)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 303165)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 303166)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	101	85.0	115	----
Physical Tests (QCLot: 303171)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	103	85.0	115	----
Physical Tests (QCLot: 303172)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	105	85.0	115	----
Anions and Nutrients (QCLot: 295121)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	99.8	80.0	120	----
Anions and Nutrients (QCLot: 295582)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	110	90.0	110	----
Anions and Nutrients (QCLot: 295583)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	107	90.0	110	----
Anions and Nutrients (QCLot: 295584)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	108	85.0	115	----
Anions and Nutrients (QCLot: 295585)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	107	90.0	110	----
Anions and Nutrients (QCLot: 295586)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	107	90.0	110	----
Anions and Nutrients (QCLot: 295587)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 296033)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 296033) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	90.5	80.0	120	----
Anions and Nutrients (QCLot: 299771)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 304917)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	91.2	85.0	115	----
Organic / Inorganic Carbon (QCLot: 303783)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	94.4	80.0	120	----
Organic / Inorganic Carbon (QCLot: 303784)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	102	80.0	120	----
Total Metals (QCLot: 299620)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	99.2	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	106	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	96.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	98.7	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	103	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	97.9	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	97.8	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	107	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	108	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	99.9	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	107	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	96.5	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	107	80.0	120	----

Sub-Matrix: **Water**

Laboratory Control Sample (LCS) Report

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 299620) - continued									
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	99.4	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	99.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	106	80.0	120	----
Total Metals (QCLot: 299621)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
Total Metals (QCLot: 300456)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	99.4	80.0	120	----
Dissolved Metals (QCLot: 299726)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	100	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	99.4	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.1	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	105	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	93.7	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.9	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.8	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.1	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	104	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	94.5	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.9	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	98.7	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.3	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.5	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	97.3	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	98.7	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	90.5	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 299726) - continued									
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	103	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	95.3	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	103	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	97.3	80.0	120	----
Dissolved Metals (QCLot: 299727)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.2	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	94.0	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 295121)										
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0570 mg/L	0.05 mg/L	114	70.0	130	----
Anions and Nutrients (QCLot: 295582)										
CG2104148-002	Anonymous	fluoride	16984-48-8	E235.F	1.15 mg/L	1 mg/L	115	75.0	125	----
Anions and Nutrients (QCLot: 295583)										
CG2104148-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	106 mg/L	100 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 295584)										
CG2104148-002	Anonymous	bromide	24959-67-9	E235.Br-L	0.495 mg/L	0.5 mg/L	99.1	75.0	125	----
Anions and Nutrients (QCLot: 295585)										
CG2104148-002	Anonymous	chloride	16887-00-6	E235.Cl-L	105 mg/L	100 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 295586)										
CG2104148-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.64 mg/L	2.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 295587)										
CG2104148-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.515 mg/L	0.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 296033)										
CG2104146-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0646 mg/L	0.0676 mg/L	95.6	70.0	130	----
Anions and Nutrients (QCLot: 299771)										
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	Kjeldahl nitrogen, total [TKN]	----	E318	2.67 mg/L	2.5 mg/L	107	70.0	130	----
Anions and Nutrients (QCLot: 304917)										
CG2104148-005	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0992 mg/L	0.1 mg/L	99.2	75.0	125	----
Organic / Inorganic Carbon (QCLot: 303783)										
CG2104149-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	23.9 mg/L	23.9 mg/L	100	70.0	130	----
Organic / Inorganic Carbon (QCLot: 303784)										
CG2104149-001	Anonymous	carbon, total organic [TOC]	----	E355-L	24.9 mg/L	23.9 mg/L	104	70.0	130	----
Total Metals (QCLot: 299620)										
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	aluminum, total	7429-90-5	E420	0.197 mg/L	0.2 mg/L	98.4	70.0	130	----
		antimony, total	7440-36-0	E420	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report: Spike Concentration	Spike Target	Recovery (%) MS	Recovery Limits (%) Low	High	Qualifier
Total Metals (QCLot: 299620) - continued										
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0413 mg/L	0.04 mg/L	103	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0104 mg/L	0.01 mg/L	104	70.0	130	----
		boron, total	7440-42-8	E420	0.094 mg/L	0.1 mg/L	94.1	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00409 mg/L	0.004 mg/L	102	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		copper, total	7440-50-8	E420	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		iron, total	7439-89-6	E420	2.06 mg/L	2 mg/L	103	70.0	130	----
		lead, total	7439-92-1	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		lithium, total	7439-93-2	E420	0.107 mg/L	0.1 mg/L	107	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E420	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		potassium, total	7440-09-7	E420	4.22 mg/L	4 mg/L	105	70.0	130	----
		selenium, total	7782-49-2	E420	0.0431 mg/L	0.04 mg/L	108	70.0	130	----
		silicon, total	7440-21-3	E420	9.32 mg/L	10 mg/L	93.2	70.0	130	----
		silver, total	7440-22-4	E420	0.00404 mg/L	0.004 mg/L	101	70.0	130	----
		sodium, total	17341-25-2	E420	2.00 mg/L	2 mg/L	99.9	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	21.0 mg/L	20 mg/L	105	70.0	130	----
		thallium, total	7440-28-0	E420	0.00407 mg/L	0.004 mg/L	102	70.0	130	----
		tin, total	7440-31-5	E420	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		titanium, total	7440-32-6	E420	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		uranium, total	7440-61-1	E420	0.00423 mg/L	0.004 mg/L	106	70.0	130	----
		vanadium, total	7440-62-2	E420	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, total	7440-66-6	E420	0.420 mg/L	0.4 mg/L	105	70.0	130	----
Total Metals (QCLot: 299621)										
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	chromium, total	7440-47-3	E420.Cr-L	0.0416 mg/L	0.04 mg/L	104	70.0	130	----
Total Metals (QCLot: 300456)										
CG2104150-001	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	mercury, total	7439-97-6	E508-L	4.50 ng/L	5 ng/L	89.9	70.0	130	----
Dissolved Metals (QCLot: 299726)										
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	aluminum, dissolved	7429-90-5	E421	0.204 mg/L	0.2 mg/L	102	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0203 mg/L	0.02 mg/L	101	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 299726) - continued										
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	arsenic, dissolved	7440-38-2	E421	0.0199 mg/L	0.02 mg/L	99.4	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0390 mg/L	0.04 mg/L	97.6	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00953 mg/L	0.01 mg/L	95.3	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.096 mg/L	0.1 mg/L	95.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0201 mg/L	0.02 mg/L	101	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.02 mg/L	2 mg/L	101	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0949 mg/L	0.1 mg/L	94.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0196 mg/L	0.02 mg/L	98.3	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0393 mg/L	0.04 mg/L	98.4	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.95 mg/L	4 mg/L	98.7	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0440 mg/L	0.04 mg/L	110	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.95 mg/L	10 mg/L	99.5	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00394 mg/L	0.004 mg/L	98.4	70.0	130	----
		sodium, dissolved	17341-25-2	E421	2.15 mg/L	2 mg/L	107	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.0 mg/L	20 mg/L	105	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00396 mg/L	0.004 mg/L	99.1	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0207 mg/L	0.02 mg/L	104	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00403 mg/L	0.004 mg/L	101	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.407 mg/L	0.4 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 299727)										
CG2104150-002	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	chromium, dissolved	7440-47-3	E421.Cr-L	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
Dissolved Metals (QCLot: 300042)										
CG2104148-003	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000930 mg/L	0.0001 mg/L	93.0	70.0	130	----

Teck

COC ID:	September CMO LAEMP 2021	TURNAROUND TIME:	

PROJECT/CLIENT INFO

Facility Name / Job#	REP
Project Manager	Cybele Heddle
Email	[illegible]
Address	421 Pine Avenue
City	Sparwood
Province	BC
Postal Code	V0B 2G0
Country	Canada
Phone Number	250-425-8202

LABORATORY

Lab Name	ALS Calgary
Lab Contact	Lyudmyla Shvets
Email	lyudmyla.shvets@alsglobal.com
Address	2559 29 Street NE
City	Calgary
Province	AB
Postal Code	T1Y 7B5
Country	Canada
Phone Number	1 403 407 1794

	Excel	PDF	EDD

SAMPLE DETAILS / **ANALYSIS REQUESTED**

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	TECKCOAL-ROUTINE-VA (N)	ALS_Package-DOC (F, H2SO4)	ALS_Package-TKN/TOC (N, H2SO4)	HG-T-U-CVAF-VA (N)	HG-D-CVAF-VA (F, HCl)	TECKCOAL-MET-T-VA (N, HNO3)	TECKCOAL-MET-D-VA (F, HNO3)
RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP	RG_MIULE	WS	No	9/14/2021	1430	G	7	X	X	X	X	X	X	X
RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	RG_LE1	WS	No	9/14/2021	1100	G	7	X	X	X	X	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

ALS PO 750546

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
Jennifer Ings/Minnow	################		9/16 1030

NB OF BOTTLES RETURNED/DESCRIPTION

Regular (default) x
Priority (2-3 business days) - 50% surcharge
Emergency (1 Business Day) - 100% surcharge
For Emergency <1 Day, ASAP or Weekend - Contact ALS

Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Sampler's Signature		Date/Time	September 15, 2021

8

Environmental Division
Calgary
Work Order Reference
CG2104150

Telephone : +1 403 407 1800

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104263**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 21-Sep-2021 08:50
PO	: VPO00750546	Date Analysis Commenced	: 22-Sep-2021
C-O-C number	: September CMO LAEMP 2021	Issue Date	: 09-Oct-2021 17:04
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Maria Tuguinay	Lab Assistant	Inorganics, Calgary, Alberta
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Oscar Ruiz	Lab Assistant	Inorganics, Calgary, Alberta
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
HTD	*Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

					Client sample ID	RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	----	----	----	----
					Client sampling date / time	15-Sep-2021 11:00	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit		CG2104263-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		5.1 HTD	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		282	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		282	----	----	----	----
conductivity	----	E100	2.0	µS/cm		1610	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		899	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		457	----	----	----	----
pH	----	E108	0.10	pH units		8.27	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		1320	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		2.5	----	----	----	----
turbidity	----	E121	0.10	NTU		0.27	----	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L		344	----	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L		<1.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0508	----	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.250 DLDS	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.20	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.154	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.382 TKNI	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		4.66	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0222	----	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		<0.0010	----	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		<0.0020	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		689	----	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		1.42	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	----	----	----	----
				Client sampling date / time	15-Sep-2021 11:00	----	----	----	----
					CG2104263-001	--------	--------	--------	--------
					Result	----	----	----	----
Organic / Inorganic Carbon									
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.37	----	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	20.4	----	----	----	----
cation sum	----	EC101	0.10	meq/L	19.5	----	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	95.6	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	2.26	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0060	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00034	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00021	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0411	----	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L	<0.020	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.094	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0600	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	201	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00010	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	1.24	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.011	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0445	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	113	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00789	----	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	0.00178	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00112	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.0380	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	3.38	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	19.4	----	----	----	----

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	----	----	----	----
Client sampling date / time					15-Sep-2021 11:00	----	----	----	----
					CG2104263-001	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
silicon, total	7440-21-3	E420	0.10	mg/L	2.20	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	38.2	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.848	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	267	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	0.000042	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00590	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0057	----	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0035	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00035	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00020	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0408	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	0.086	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0556	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	192	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00010	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	1.08	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0428	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	102	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00609	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	----	----	----	----
				Client sampling date / time	15-Sep-2021 11:00	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	CG2104263-001	--------	--------	--------	--------
					Result	----	----	----	----
Dissolved Metals									
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00110	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.0374	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	3.30	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L	18.4	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.89	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	33.6	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.863	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	232	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000041	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00610	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0045	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-	Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2104263**	Page	: 1 of 12
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 21-Sep-2021 08:50
PO	: VPO00750546	Issue Date	: 09-Oct-2021 17:05
C-O-C number	: September CMO LAEMP 2021		
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: ✘ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E298	15-Sep-2021	29-Sep-2021	----	----		29-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E235.Br-L	15-Sep-2021	----	----	----		22-Sep-2021	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E235.Cl-L	15-Sep-2021	----	----	----		22-Sep-2021	28 days	7 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E378-U	15-Sep-2021	----	----	----		22-Sep-2021	3 days	7 days	✘ EHTR
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E235.F	15-Sep-2021	----	----	----		22-Sep-2021	28 days	7 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E235.NO3-L	15-Sep-2021	----	----	----		22-Sep-2021	3 days	7 days	✘ EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E235.NO2-L	15-Sep-2021	----	----	----		22-Sep-2021	3 days	7 days	✘ EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E235.SO4	15-Sep-2021	----	----	----		22-Sep-2021	28 days	7 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E318	15-Sep-2021	27-Sep-2021	----	----		28-Sep-2021	28 days	13 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E372-U	15-Sep-2021	24-Sep-2021	----	----		24-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E421.Cr-L	15-Sep-2021	26-Sep-2021	----	----		27-Sep-2021	180 days	12 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E509	15-Sep-2021	28-Sep-2021	----	----		28-Sep-2021	28 days	13 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E421	15-Sep-2021	26-Sep-2021	----	----		27-Sep-2021	180 days	12 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E358-L	15-Sep-2021	29-Sep-2021	----	----		01-Oct-2021	28 days	16 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E355-L	15-Sep-2021	29-Sep-2021	----	----		01-Oct-2021	28 days	16 days	✓
Physical Tests : Acidity by Titration										
HDPE										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E283	15-Sep-2021	----	----	----		30-Sep-2021	14 days	15 days	× EHT

Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Alkalinity Species by Titration										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E290	15-Sep-2021	----	----	----		29-Sep-2021	14 days	14 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E100	15-Sep-2021	----	----	----		29-Sep-2021	28 days	14 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E125	15-Sep-2021	----	----	----		28-Sep-2021	0.34 hrs	314 hrs	✖ EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E108	15-Sep-2021	----	----	----		29-Sep-2021	0.25 hrs	335 hrs	✖ EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E162	15-Sep-2021	----	----	----		23-Sep-2021	7 days	8 days	✖ EHT
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E160-L	15-Sep-2021	----	----	----		23-Sep-2021	7 days	8 days	✖ EHT
Physical Tests : Turbidity by Nephelometry										
HDPE RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E121	15-Sep-2021	----	----	----		22-Sep-2021	3 days	7 days	✖ EHTR
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E420.Cr-L	15-Sep-2021	----	----	----		25-Sep-2021	180 days	10 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E508-L	15-Sep-2021	----	----	----		27-Sep-2021	28 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	E420	15-Sep-2021	----	----	----		25-Sep-2021	180 days	10 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: ✗ = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	306984	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	305852	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	306154	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	298996	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	298997	1	14	7.1	5.0	✓
Conductivity in Water	E100	305854	0	16	0.0	5.0	✗
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	303255	1	12	8.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	304269	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	303254	1	16	6.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	306496	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	299350	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	298994	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	298998	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	298999	1	14	7.1	5.0	✓
ORP by Electrode	E125	304906	1	20	5.0	5.0	✓
pH by Meter	E108	305853	0	17	0.0	5.0	✗
Sulfate in Water by IC	E235.SO4	298995	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	300155	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	302335	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	303732	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	303842	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	302334	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	306501	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	300193	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	299002	1	9	11.1	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	306984	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	305852	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	306154	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	298996	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	298997	1	14	7.1	5.0	✓
Conductivity in Water	E100	305854	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	303255	1	12	8.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	304269	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	303254	1	16	6.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	306496	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	299350	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	298994	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	298998	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	298999	1	14	7.1	5.0	✓
ORP by Electrode	E125	304906	1	20	5.0	5.0	✓
pH by Meter	E108	305853	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	298995	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	300155	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	302335	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	303732	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	303842	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	302334	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	306501	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	300193	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	300148	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	299002	1	9	11.1	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	306984	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	305852	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	306154	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	298996	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	298997	1	14	7.1	5.0	✓
Conductivity in Water	E100	305854	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	303255	1	12	8.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	304269	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	303254	1	16	6.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	306496	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	299350	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	298994	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	298998	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	298999	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	298995	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	300155	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	302335	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	303732	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	303842	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	302334	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	306501	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	300193	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	300148	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	299002	1	9	11.1	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	306154	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	298996	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	298997	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	303255	1	12	8.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	304269	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	303254	1	16	6.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	306496	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	299350	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	298994	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	298998	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	298999	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	298995	1	14	7.1	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	302335	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	303732	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	303842	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	302334	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	306501	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	300193	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2104263**	Page	: 1 of 18
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 21-Sep-2021 08:50
PO	: VPO00750546	Date Analysis Commenced	: 22-Sep-2021
C-O-C number	: September CMO LAEMP 2021	Issue Date	: 09-Oct-2021 17:04
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Maria Tuguinay	Lab Assistant	Inorganics, Calgary, Alberta
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Oscar Ruiz	Lab Assistant	Inorganics, Calgary, Alberta
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 299002)											
CG2104217-001	Anonymous	turbidity	----	E121	0.10	NTU	2.67	2.88	7.57%	15%	----
Physical Tests (QC Lot: 300155)											
CG2104243-006	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	1530	1510	1.68%	20%	----
Physical Tests (QC Lot: 304906)											
CG2104260-010	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	536	537	0.261%	15%	----
Physical Tests (QC Lot: 305852)											
CG2104255-004	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	549	545	0.694%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	549	545	0.694%	20%	----
Physical Tests (QC Lot: 306984)											
CG2104260-002	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	14.8	14.4	0.4	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 298994)											
CG2104258-001	Anonymous	fluoride	16984-48-8	E235.F	0.400	mg/L	<0.400	0.311	0.089	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 298995)											
CG2104258-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	6.00	mg/L	1300	1240	4.28%	20%	----
Anions and Nutrients (QC Lot: 298996)											
CG2104258-001	Anonymous	bromide	24959-67-9	E235.Br-L	1.00	mg/L	<1.00	<0.500	0.500	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 298997)											
CG2104258-001	Anonymous	chloride	16887-00-6	E235.Cl-L	2.00	mg/L	5.35	6.61	1.27	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 298998)											
CG2104258-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.100	mg/L	305	287	5.85%	20%	----
Anions and Nutrients (QC Lot: 298999)											
CG2104258-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0200	mg/L	<0.0200	0.0110	0.0090	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 299350)											
CG2104260-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 300193)											
CG2104255-008	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 303732)											
CG2104240-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	0.135	0.085	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 306154)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 306154) - continued											
CG2104241-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.210	0.201	4.13%	20%	----
Organic / Inorganic Carbon (QC Lot: 306496)											
CG2104255-007	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.94	0.86	0.08	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 306501)											
CG2104255-006	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.85	0.64	0.21	Diff <2x LOR	----
Total Metals (QC Lot: 302334)											
CG2104263-001	RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0060	0.0033	0.0028	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00034	0.00035	0.00001	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00021	0.00019	0.00001	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0411	0.0425	3.52%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.094	0.094	0.0003	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0600 µg/L	0.0000657	9.12%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	201	199	0.869%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	1.24 µg/L	0.00124	0.227%	20%	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.011	0.011	0.00006	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0445	0.0446	0.0310%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	113	114	0.402%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00789	0.00781	1.08%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00112	0.00115	2.90%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.0380	0.0381	0.255%	20%	----
		potassium, total	7440-09-7	E420	0.050	mg/L	3.38	3.36	0.598%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	19.4 µg/L	0.0191	1.84%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.20	2.24	1.78%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	38.2	37.1	2.82%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.848	0.876	3.24%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	267	270	1.34%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000042	0.000040	0.000002	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00590	0.00591	0.173%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 302334) - continued											
CG2104263-001	RG_CORCK_WS_LAEMP _CMO_2021-09-15_NP	vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0057	0.0056	0.0001	Diff <2x LOR	----
Total Metals (QC Lot: 302335)											
CG2104263-001	RG_CORCK_WS_LAEMP _CMO_2021-09-15_NP	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00010	0.00010	0.000001	Diff <2x LOR	----
Total Metals (QC Lot: 303842)											
CG2104261-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 303254)											
CG2104254-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0019	0.0013	0.0006	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00014	0.00014	0.000008	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0738	0.0767	3.90%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.014	0.014	0.0002	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.0739 µg/L	0.0000795	7.35%	20%	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	77.8	77.1	0.827%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	0.17 µg/L	0.00016	0.000006	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00110	0.00113	0.00003	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000068	0.000068	0.0000003	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0061	0.0061	0.00001	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	26.3	27.1	3.01%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0421	0.0428	1.83%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00450	0.00458	1.77%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00099	0.00096	0.00002	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.15	1.17	1.80%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	3.70 µg/L	0.00390	5.24%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.11	4.14	0.742%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	3.30	3.29	0.189%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.245	0.244	0.257%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	18.7	19.0	1.52%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000055	0.000056	0.0000009	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 303254) - continued											
CG2104254-001	Anonymous	titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00271	0.00275	1.21%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0093	0.0095	0.0002	Diff <2x LOR	----
Dissolved Metals (QC Lot: 303255)											
CG2104254-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 304269)											
CG2104251-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	0.0000062	0.0000056	0.0000006	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 299002)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 300148)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 300155)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 305852)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 305854)						
conductivity	----	E100	1	µS/cm	1.0	----
Physical Tests (QCLot: 306984)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Anions and Nutrients (QCLot: 298994)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 298995)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 298996)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 298997)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 298998)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 298999)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 299350)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 300193)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 303732)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 306154)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 306154) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 306496)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 306501)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 302334)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 302334) - continued						
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 302335)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 303842)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 303254)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 303254) - continued						
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 303255)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 304269)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 299002)									
turbidity	----	E121	0.1	NTU	200 NTU	98.8	85.0	115	----
Physical Tests (QCLot: 300148)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	93.8	85.0	115	----
Physical Tests (QCLot: 300155)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	100	85.0	115	----
Physical Tests (QCLot: 304906)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	101	95.4	104	----
Physical Tests (QCLot: 305852)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.5	85.0	115	----
Physical Tests (QCLot: 305853)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 305854)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	102	90.0	110	----
Physical Tests (QCLot: 306984)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	103	85.0	115	----
Anions and Nutrients (QCLot: 298994)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 298995)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.7	90.0	110	----
Anions and Nutrients (QCLot: 298996)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 298997)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 298998)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 298999)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 299350)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	98.3	80.0	120	----
Anions and Nutrients (QCLot: 300193)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	86.8	80.0	120	----
Anions and Nutrients (QCLot: 303732)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 303732) - continued									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 306154)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	104	85.0	115	----
Organic / Inorganic Carbon (QCLot: 306496)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	104	80.0	120	----
Organic / Inorganic Carbon (QCLot: 306501)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	109	80.0	120	----
Total Metals (QCLot: 302334)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	112	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	113	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	107	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	113	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	107	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	107	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	106	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	103	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	106	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	107	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	109	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	109	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	107	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	113	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	105	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	112	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	109	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	107	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	98.5	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	105	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 302334) - continued									
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	103	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	105	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	109	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	111	80.0	120	----
Total Metals (QCLot: 302335)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
Total Metals (QCLot: 303842)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	107	80.0	120	----
Dissolved Metals (QCLot: 303254)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	106	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	110	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	96.2	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	109	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	95.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.2	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	106	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	108	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.4	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	103	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	109	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	106	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	106	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	96.8	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	111	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Dissolved Metals (QCLot: 303254) - continued									
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	105	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	107	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	107	80.0	120	----
Dissolved Metals (QCLot: 303255)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	97.9	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 298994)										
CG2104260-010	Anonymous	fluoride	16984-48-8	E235.F	1.12 mg/L	1 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 298995)										
CG2104260-010	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	106 mg/L	100 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 298996)										
CG2104260-010	Anonymous	bromide	24959-67-9	E235.Br-L	0.541 mg/L	0.5 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 298997)										
CG2104260-010	Anonymous	chloride	16887-00-6	E235.Cl-L	109 mg/L	100 mg/L	109	75.0	125	----
Anions and Nutrients (QCLot: 298998)										
CG2104260-010	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.49 mg/L	2.5 mg/L	99.6	75.0	125	----
Anions and Nutrients (QCLot: 298999)										
CG2104260-010	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.569 mg/L	0.5 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 299350)										
CG2104260-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0572 mg/L	0.05 mg/L	114	70.0	130	----
Anions and Nutrients (QCLot: 300193)										
CG2104257-001	Anonymous	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.0676 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 303732)										
CG2104240-009	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.76 mg/L	2.5 mg/L	110	70.0	130	----
Anions and Nutrients (QCLot: 306154)										
CG2104241-013	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.101 mg/L	0.1 mg/L	101	75.0	125	----
Organic / Inorganic Carbon (QCLot: 306496)										
CG2104255-007	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	22.9 mg/L	23.9 mg/L	96.0	70.0	130	----
Organic / Inorganic Carbon (QCLot: 306501)										
CG2104255-006	Anonymous	carbon, total organic [TOC]	----	E355-L	23.0 mg/L	23.9 mg/L	96.1	70.0	130	----
Total Metals (QCLot: 302334)										
CG2104299-001	Anonymous	aluminum, total	7429-90-5	E420	0.199 mg/L	0.2 mg/L	99.5	70.0	130	----
		antimony, total	7440-36-0	E420	0.0200 mg/L	0.02 mg/L	99.9	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

Matrix Spike (MS) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Spike Concentration	Spike Target	Recovery (%) MS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 302334) - continued										
CG2104299-001	Anonymous	beryllium, total	7440-41-7	E420	0.0380 mg/L	0.04 mg/L	94.9	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00898 mg/L	0.01 mg/L	89.8	70.0	130	----
		boron, total	7440-42-8	E420	0.100 mg/L	0.1 mg/L	99.5	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00380 mg/L	0.004 mg/L	94.9	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0184 mg/L	0.02 mg/L	92.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0176 mg/L	0.02 mg/L	88.0	70.0	130	----
		iron, total	7439-89-6	E420	1.90 mg/L	2 mg/L	95.0	70.0	130	----
		lead, total	7439-92-1	E420	0.0179 mg/L	0.02 mg/L	89.3	70.0	130	----
		lithium, total	7439-93-2	E420	0.0940 mg/L	0.1 mg/L	94.0	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0205 mg/L	0.02 mg/L	103	70.0	130	----
		nickel, total	7440-02-0	E420	0.0359 mg/L	0.04 mg/L	89.8	70.0	130	----
		potassium, total	7440-09-7	E420	3.96 mg/L	4 mg/L	99.1	70.0	130	----
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, total	7440-21-3	E420	9.28 mg/L	10 mg/L	92.8	70.0	130	----
		silver, total	7440-22-4	E420	0.00380 mg/L	0.004 mg/L	94.9	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00352 mg/L	0.004 mg/L	87.9	70.0	130	----
		tin, total	7440-31-5	E420	0.0200 mg/L	0.02 mg/L	100.0	70.0	130	----
		titanium, total	7440-32-6	E420	0.0384 mg/L	0.04 mg/L	96.1	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, total	7440-66-6	E420	0.366 mg/L	0.4 mg/L	91.4	70.0	130	----
Total Metals (QCLot: 302335)										
CG2104299-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0390 mg/L	0.04 mg/L	97.6	70.0	130	----
Total Metals (QCLot: 303842)										
CG2104261-002	Anonymous	mercury, total	7439-97-6	E508-L	4.43 ng/L	5 ng/L	88.7	70.0	130	----
Dissolved Metals (QCLot: 303254)										
CG2104254-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.192 mg/L	0.2 mg/L	96.1	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
					Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 303254) - continued										
CG2104254-002	Anonymous	beryllium, dissolved	7440-41-7	E421	0.0369 mg/L	0.04 mg/L	92.2	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00905 mg/L	0.01 mg/L	90.5	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.095 mg/L	0.1 mg/L	95.3	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00398 mg/L	0.004 mg/L	99.5	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0190 mg/L	0.02 mg/L	94.8	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0181 mg/L	0.02 mg/L	90.4	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.90 mg/L	2 mg/L	94.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0945 mg/L	0.1 mg/L	94.5	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0205 mg/L	0.02 mg/L	103	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0366 mg/L	0.04 mg/L	91.4	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.85 mg/L	4 mg/L	96.2	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0424 mg/L	0.04 mg/L	106	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.71 mg/L	10 mg/L	87.1	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00400 mg/L	0.004 mg/L	100	70.0	130	----
		sodium, dissolved	17341-25-2	E421	1.94 mg/L	2 mg/L	96.8	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00385 mg/L	0.004 mg/L	96.2	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0384 mg/L	0.04 mg/L	96.1	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00394 mg/L	0.004 mg/L	98.5	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0973 mg/L	0.1 mg/L	97.3	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.369 mg/L	0.4 mg/L	92.3	70.0	130	----
Dissolved Metals (QCLot: 303255)										
CG2104254-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0390 mg/L	0.04 mg/L	97.5	70.0	130	----
Dissolved Metals (QCLot: 304269)										
CG2104251-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000997 mg/L	0.0001 mg/L	99.7	70.0	130	----

Teck

COC ID:	September CMO LAEMP 2021	TURNAROUND TIME:	

PROJECT/CLIENT INFO

Facility Name / Job#	REP
Project Manager	Cybele Heddle
Email	[illegible]
Address	421 Pine Avenue
City	Sparwood
Province	BC
Postal Code	V0B 2G0
Country	Canada
Phone Number	250-425-8202

LABORATORY

Lab Name	ALS Calgary
Lab Contact	Lyudmyla Shvets
Email	lyudmyla.shvets@alsglobal.com
Address	2559 29 Street NE
City	Calgary
Province	AB
Postal Code	T1Y 7B5
Country	Canada
Phone Number	1 403 407 1794

Report recipients	Excel	PDF	EDD
[illegible]	x	x	x
teckcoal@equisonline.com			x
[illegible]	x	x	x
[illegible]	x	x	x
[illegible]	x	x	

SAMPLE DETAILS / **ANALYSIS REQUESTED**

Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	TECKCOAL-ROUTINE-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-T-U-CVAF-VA	HG-D-CVAF-VA	TECKCOAL-MET-T-VA	TECKCOAL-MET-D-VA
Filtered								N	F	N	N	F	N	F
Preservative									H2SO4	H2SO4		HCL	HNO3	HNO3
RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	RG_CORCK	WS	No	9/15/2021	1100	G	7	X	X	X	X	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

ALS PO 750546
Sample was missed in earlier shipment, so now exceeds hold time for at least nitrate. I'm sending anyway in case some parameters can be measured (not sure of the other hold times).

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
Jennifer Ings/Minnow	################	DK	9/21 0850

NB OF BOTTLES RETURNED/DESCRIPTION

Regular (default)	x
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Sampler's Signature	Jennifer Ings	Date/Time	September 20, 2021

Environmental Division
Calgary
Work Order Reference
CG2104263

Telephone : +1 403 407 1800

29

[redacted]

Teck Coal Ltd.
ATTN: Cybele Heddle
421 Pine Avenue
Sparwood BC V0B 2G0

Date Received: 21-SEP-21
Report Date: 11-OCT-21 18:41 (MT)
Version: FINAL

Client Phone: 250-425-8202

Certificate of Analysis

Lab Work Order #: L2644315
Project P.O. #: VPO00750546
Job Reference: REGIONAL EFFECTS PROGRAM
C of C Numbers: September CMO LAEMP
Legal Site Desc:

[redacted]

Lyudmyla Shvets, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2644315-1 SE 16-SEP-21 10:45 RG_MI5_SE-1_2021-09-16_1045	L2644315-2 SE 16-SEP-21 09:20 RG_MI5_SE-2_2021-09-16_0920	L2644315-3 SE 16-SEP-21 09:20 RG_M15_SE-3_2021-09-16_0920	L2644315-4 SE 14-SEP-21 11:00 RG_LE1_SE-1_2021-09-14_1100	L2644315-5 SE 14-SEP-21 10:00 RG_LE1_SE-2_2021-09-14_1000
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	36.1	44.9	52.5	45.0	52.4
	pH (1:2 soil:water) (pH)	8.26	8.40	7.99	7.80	7.74
Particle Size	% Gravel (>2mm) (%)	9.4	2.4	5.8	3.3	5.2
	% Sand (2.00mm - 1.00mm) (%)	11.4	<1.0	1.6	1.6	5.5
	% Sand (1.00mm - 0.50mm) (%)	17.4	2.1	3.7	15.2	19.3
	% Sand (0.50mm - 0.25mm) (%)	27.7	20.4	17.1	26.5	32.4
	% Sand (0.25mm - 0.125mm) (%)	15.5	37.4	29.8	16.1	14.1
	% Sand (0.125mm - 0.063mm) (%)	6.5	18.6	19.6	10.4	6.3
	% Silt (0.063mm - 0.0312mm) (%)	5.0	9.3	10.4	10.2	5.2
	% Silt (0.0312mm - 0.004mm) (%)	5.5	6.9	9.1	12.5	7.7
	% Clay (<4um) (%)	1.6	1.9	2.9	4.2	4.2
	Texture	Sand	Loamy sand	Loamy sand	Loamy sand	Loamy sand
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.47	1.37	1.74	2.70	1.82
Metals	Aluminum (Al) (mg/kg)	6000	6670	7690	10000	8330
	Antimony (Sb) (mg/kg)	1.04	1.05	0.99	1.26	1.34
	Arsenic (As) (mg/kg)	7.53	6.83	6.31	6.53	6.56
	Barium (Ba) (mg/kg)	172	208	204	326	300
	Beryllium (Be) (mg/kg)	0.54	0.59	0.62	0.75	0.62
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	1.23	1.08	1.22	2.12	2.04
	Calcium (Ca) (mg/kg)	27400	21800	25900	6230	5690
	Chromium (Cr) (mg/kg)	11.2	12.3	13.9	18.1	15.8
	Cobalt (Co) (mg/kg)	7.37	6.58	7.15	6.66	6.43
	Copper (Cu) (mg/kg)	13.3	12.3	12.7	17.3	16.5
	Iron (Fe) (mg/kg)	16600	15400	14500	16000	16000
	Lead (Pb) (mg/kg)	8.34	8.21	8.15	9.83	9.43
	Lithium (Li) (mg/kg)	7.7	8.3	9.0	10.9	9.7
	Magnesium (Mg) (mg/kg)	4180	4440	4500	2450	2230
	Manganese (Mn) (mg/kg)	308	236	202	322	296
	Mercury (Hg) (mg/kg)	0.0404	0.0418	0.0474	0.0674	0.0580
	Molybdenum (Mo) (mg/kg)	1.63	1.44	1.36	1.77	1.55
	Nickel (Ni) (mg/kg)	29.3	26.7	27.1	27.6	26.3
	Phosphorus (P) (mg/kg)	1200	1270	1100	1450	1330
	Potassium (K) (mg/kg)	1100	1220	1480	1850	1450
	Selenium (Se) (mg/kg)	0.83	0.73	0.89	0.93	1.03
	Silver (Ag) (mg/kg)	0.14	0.15	0.16	0.24	0.28

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-6	L2644315-7	L2644315-8	L2644315-9	L2644315-10
	Description	SE	SE	SE	SE	SE
	Sampled Date	14-SEP-21	14-SEP-21	14-SEP-21	14-SEP-21	15-SEP-21
	Sampled Time	09:20	14:30	13:45	12:50	13:30
	Client ID	RG_LE1_SE-3_2021-09-14_0920	RG_MIULE_SE-1_2021-09-14_1430	RG_MIULE_SE-2_2021-09-14_1345	RG_MIULE_SE-3_2021-09-14_1345	RG_MIULE_SE-4_2021-09-14_1250
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	60.9	33.2	76.4	61.5	94.8
	pH (1:2 soil:water) (pH)	7.23	8.15	7.54	7.76	7.26
Particle Size	% Gravel (>2mm) (%)	27.7	10.3	6.7	1.3	13.5
	% Sand (2.00mm - 1.00mm) (%)	12.2	8.8	1.9	<1.0	17.7
	% Sand (1.00mm - 0.50mm) (%)	8.4	18.6	4.0	4.0	23.1
	% Sand (0.50mm - 0.25mm) (%)	7.4	20.3	12.9	17.3	12.8
	% Sand (0.25mm - 0.125mm) (%)	10.1	16.6	17.2	19.5	7.3
	% Sand (0.125mm - 0.063mm) (%)	9.7	7.7	11.9	14.6	4.6
	% Silt (0.063mm - 0.0312mm) (%)	9.2	6.6	19.2	18.1	8.1
	% Silt (0.0312mm - 0.004mm) (%)	11.8	8.0	22.0	20.5	10.4
	% Clay (<4um) (%)	3.6	3.0	4.3	4.1	2.4
	Texture	Sandy loam	Loamy sand	Sandy loam	Sandy loam	Loamy sand
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.59	2.67	7.05	3.94	2.68
Metals	Aluminum (Al) (mg/kg)	9570	9090	5730	6710	4210
	Antimony (Sb) (mg/kg)	1.21	0.80	0.31	0.41	0.31
	Arsenic (As) (mg/kg)	6.20	9.15	4.98	5.79	4.31
	Barium (Ba) (mg/kg)	348	143	162	153	165
	Beryllium (Be) (mg/kg)	0.72	0.82	0.47	0.55	0.39
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	<5.0	8.9	7.4	7.5	7.4
	Cadmium (Cd) (mg/kg)	2.02	1.06	1.14	1.06	1.26
	Calcium (Ca) (mg/kg)	6090	37200	79900	61900	99100
	Chromium (Cr) (mg/kg)	17.7	14.6	9.13	10.2	7.12
	Cobalt (Co) (mg/kg)	6.10	10.0	14.7	13.7	15.4
	Copper (Cu) (mg/kg)	16.8	15.2	11.8	12.4	10.4
	Iron (Fe) (mg/kg)	14800	19700	11900	13800	9110
	Lead (Pb) (mg/kg)	9.08	9.76	7.54	8.15	6.14
	Lithium (Li) (mg/kg)	10.6	11.7	8.7	9.6	6.3
	Magnesium (Mg) (mg/kg)	2450	5930	6650	6870	5680
	Manganese (Mn) (mg/kg)	297	316	224	188	273
	Mercury (Hg) (mg/kg)	0.0519	0.0241	0.0256	0.0262	0.0285
	Molybdenum (Mo) (mg/kg)	1.43	2.47	1.03	1.20	0.96
	Nickel (Ni) (mg/kg)	26.0	31.5	44.1	40.2	46.3
	Phosphorus (P) (mg/kg)	1200	1270	978	1090	1000
	Potassium (K) (mg/kg)	1720	2200	1280	1430	930
	Selenium (Se) (mg/kg)	1.13	1.29	2.45	1.85	3.07
	Silver (Ag) (mg/kg)	0.31	0.15	0.12	0.12	0.11

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2644315-11	L2644315-12	L2644315-13	L2644315-14	L2644315-15
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	13:30	13:30	13:30	13:30	13:30
	Client ID	RG_MIULE_SE-5_2021-09-14_1250	RG_MIDCO_SE-1_2021-09-15_1330	RG_MIDCO_SE-2_2021-09-15_1330	RG_MIDCO_SE-3_2021-09-15_1330	RG_MIDCO_SE-4_2021-09-15_1330
SOIL						
Physical Tests	Moisture (%)	38.2	82.4	83.2	58.7	57.8
	pH (1:2 soil:water) (pH)	7.98	8.02	7.97	8.27	8.24
Particle Size	% Gravel (>2mm) (%)	30.7	6.7	1.8	<1.0	1.1
	% Sand (2.00mm - 1.00mm) (%)	9.7	24.3	4.0	<1.0	5.1
	% Sand (1.00mm - 0.50mm) (%)	14.2	19.6	5.6	3.2	13.2
	% Sand (0.50mm - 0.25mm) (%)	14.2	6.5	4.8	2.6	6.2
	% Sand (0.25mm - 0.125mm) (%)	9.8	3.7	4.6	4.9	5.0
	% Sand (0.125mm - 0.063mm) (%)	5.7	4.7	6.6	14.8	12.4
	% Silt (0.063mm - 0.0312mm) (%)	5.8	9.2	26.0	28.4	20.6
	% Silt (0.0312mm - 0.004mm) (%)	7.9	18.7	38.2	37.4	29.1
	% Clay (<4um) (%)	2.1	6.7	8.4	7.8	7.3
	Texture	Loamy sand	Sandy loam	Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.71	2.39	5.30	3.19	2.79
Metals	Aluminum (Al) (mg/kg)	6780	6770	8180	13000	13500
	Antimony (Sb) (mg/kg)	0.72	0.29	0.26	0.40	0.39
	Arsenic (As) (mg/kg)	7.86	5.45	5.49	7.66	7.08
	Barium (Ba) (mg/kg)	147	135	152	127	134
	Beryllium (Be) (mg/kg)	0.68	0.49	0.59	0.82	0.77
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	6.4	7.0	10.4	13.4	14.9
	Cadmium (Cd) (mg/kg)	0.933	1.25	1.29	1.42	1.44
	Calcium (Ca) (mg/kg)	50500	84900	106000	36400	37400
	Chromium (Cr) (mg/kg)	11.4	9.35	11.2	17.2	18.2
	Cobalt (Co) (mg/kg)	10.8	83.0	74.6	31.9	33.2
	Copper (Cu) (mg/kg)	13.1	14.0	14.9	17.9	18.0
	Iron (Fe) (mg/kg)	17500	13900	13000	19400	19600
	Lead (Pb) (mg/kg)	8.32	8.84	8.15	11.0	11.2
	Lithium (Li) (mg/kg)	9.7	11.4	11.5	19.3	20.0
	Magnesium (Mg) (mg/kg)	5580	6050	6930	7260	7280
	Manganese (Mn) (mg/kg)	298	1040	703	467	484
	Mercury (Hg) (mg/kg)	0.0391	0.0249	0.0224	0.0235	0.0254
	Molybdenum (Mo) (mg/kg)	1.74	1.38	1.26	2.17	2.04
	Nickel (Ni) (mg/kg)	35.9	125	120	76.7	78.4
	Phosphorus (P) (mg/kg)	1220	1010	1170	1310	1330
	Potassium (K) (mg/kg)	1440	1450	1940	3030	3230
	Selenium (Se) (mg/kg)	1.13	1.81	2.68	2.61	2.76
	Silver (Ag) (mg/kg)	0.11	<0.10	<0.10	0.11	0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2644315-16	L2644315-17	L2644315-18	L2644315-19	L2644315-20
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	13:30	15:00	15:00	12:00	12:00
	Client ID	RG_MIDCO_SE-5_2021-09-15_1330	RG_MI5_SE-4_2021-09-15_1500	RG_MI5_SE-5_2021-09-15_1500	RG_MI25_SE-1_2021-09-15_1200	RG_MI25_SE-2_2021-09-15_1200
SOIL						
Physical Tests	Moisture (%)	89.2	37.2	50.2	38.0	48.2
	pH (1:2 soil:water) (pH)	7.93	8.34	8.29	8.13	8.15
Particle Size	% Gravel (>2mm) (%)	17.0	1.5	2.9	4.0	5.7
	% Sand (2.00mm - 1.00mm) (%)	8.0	1.1	1.1	5.1	7.5
	% Sand (1.00mm - 0.50mm) (%)	14.6	3.3	3.9	5.8	9.9
	% Sand (0.50mm - 0.25mm) (%)	13.1	17.7	19.0	11.7	14.4
	% Sand (0.25mm - 0.125mm) (%)	7.6	35.2	34.6	17.6	13.8
	% Sand (0.125mm - 0.063mm) (%)	6.1	19.0	18.0	12.9	10.8
	% Silt (0.063mm - 0.0312mm) (%)	10.2	10.8	10.1	15.9	14.2
	% Silt (0.0312mm - 0.004mm) (%)	17.5	9.4	8.7	20.6	18.3
	% Clay (<4um) (%)	5.8	2.1	1.8	6.4	5.4
	Texture	Sandy loam	Loamy sand	Loamy sand	Sandy loam	Sandy loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.87	2.13	1.66	2.12	1.64
Metals	Aluminum (Al) (mg/kg)	10300	7210	6620	12700	15600
	Antimony (Sb) (mg/kg)	0.33	1.00	1.02	0.64	0.66
	Arsenic (As) (mg/kg)	6.03	6.81	6.52	12.0	12.3
	Barium (Ba) (mg/kg)	153	209	214	151	165
	Beryllium (Be) (mg/kg)	0.67	0.56	0.54	0.83	1.00
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	0.22	0.24
	Boron (B) (mg/kg)	13.3	<5.0	<5.0	8.6	13.0
	Cadmium (Cd) (mg/kg)	1.27	1.11	1.07	1.31	1.45
	Calcium (Ca) (mg/kg)	82000	21400	22500	15000	14700
	Chromium (Cr) (mg/kg)	13.8	12.9	12.4	17.7	21.6
	Cobalt (Co) (mg/kg)	72.8	6.63	6.37	8.65	8.92
	Copper (Cu) (mg/kg)	15.6	12.1	11.6	26.7	29.8
	Iron (Fe) (mg/kg)	15300	14900	14100	23800	25500
	Lead (Pb) (mg/kg)	9.32	8.23	7.97	16.7	18.6
	Lithium (Li) (mg/kg)	14.9	8.4	8.3	21.7	23.6
	Magnesium (Mg) (mg/kg)	6730	4550	4590	6530	6390
	Manganese (Mn) (mg/kg)	762	235	223	476	541
	Mercury (Hg) (mg/kg)	0.0299	0.0241	0.0366	0.0270	0.0260
	Molybdenum (Mo) (mg/kg)	1.59	1.51	1.49	5.74	5.94
	Nickel (Ni) (mg/kg)	123	27.4	26.7	31.3	33.3
	Phosphorus (P) (mg/kg)	1030	1230	1270	1500	1450
	Potassium (K) (mg/kg)	2580	1440	1290	2270	3380
	Selenium (Se) (mg/kg)	2.56	0.76	0.82	0.94	1.90
	Silver (Ag) (mg/kg)	0.10	0.15	0.14	0.13	0.14

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-21	L2644315-22	L2644315-23	L2644315-24	L2644315-25
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	12:00	12:00	12:30	12:30	12:30
	Client ID	RG_MI25_SE-3_2021-09-15_1200	RG_RIVER_SE_1_2021-09-15_1200	RG_MIDAG_SE_1_2021-09-15_1400	RG_MIUCO_SE_1_2021-09-15_1230	RG_MIUCO_SE_2_2021-09-15_1230
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	90.3	43.2	97.5	88.3	85.7
	pH (1:2 soil:water) (pH)	7.64	8.13	8.04	7.70	7.94
Particle Size	% Gravel (>2mm) (%)	6.2	9.9	26.9 PSAL	5.6	<1.0
	% Sand (2.00mm - 1.00mm) (%)	1.4	6.9	12.1 PSAL	13.9	8.8
	% Sand (1.00mm - 0.50mm) (%)	1.8	3.0	15.0 PSAL	22.1	11.2
	% Sand (0.50mm - 0.25mm) (%)	6.2	3.9	8.5 PSAL	9.1	7.2
	% Sand (0.25mm - 0.125mm) (%)	13.4	7.8	3.0 PSAL	3.7	4.1
	% Sand (0.125mm - 0.063mm) (%)	8.8	10.7	4.7 PSAL	5.6	10.1
	% Silt (0.063mm - 0.0312mm) (%)	27.9	24.9	11.3 PSAL	17.3	21.2
	% Silt (0.0312mm - 0.004mm) (%)	29.0	27.2	14.8 PSAL	19.3	29.9
	% Clay (<4um) (%)	5.2	5.6	3.6 PSAL	3.5	7.2
	Texture	Silt loam	Silt loam	Sandy loam	Sandy loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	1.96	1.94	4.9	1.10	1.96
Metals	Aluminum (Al) (mg/kg)	14500	16700	10400	15000	14100
	Antimony (Sb) (mg/kg)	0.67	0.60	0.41	0.40	0.38
	Arsenic (As) (mg/kg)	11.8	11.8	7.83	7.43	7.13
	Barium (Ba) (mg/kg)	171	159	166	185	264
	Beryllium (Be) (mg/kg)	0.91	1.04	0.76	0.96	0.95
	Bismuth (Bi) (mg/kg)	0.22	0.22	<0.20	0.21	0.20
	Boron (B) (mg/kg)	11.2	15.5	10.5	15.0	14.2
	Cadmium (Cd) (mg/kg)	1.47	1.43	1.44	0.999	0.887
	Calcium (Ca) (mg/kg)	15200	14500	59700	19700	19200
	Chromium (Cr) (mg/kg)	20.7	23.1	15.5	19.9	18.7
	Cobalt (Co) (mg/kg)	8.79	8.78	29.5	9.31	8.63
	Copper (Cu) (mg/kg)	28.4	27.8	16.2	21.1	19.5
	Iron (Fe) (mg/kg)	23100	25000	17100	21600	22000
	Lead (Pb) (mg/kg)	21.1	16.3	9.34	12.9	12.3
	Lithium (Li) (mg/kg)	22.5	23.5	13.9	21.6	22.4
	Magnesium (Mg) (mg/kg)	5910	6640	9360	6310	6550
	Manganese (Mn) (mg/kg)	512	479	493	585	447
	Mercury (Hg) (mg/kg)	0.0335	0.0289	0.0395	0.0259	0.0219
	Molybdenum (Mo) (mg/kg)	5.28	5.36	1.37	2.22	2.07
	Nickel (Ni) (mg/kg)	32.1	31.8	80.0	25.9	24.0
	Phosphorus (P) (mg/kg)	1460	1580	1190	1450	1340
	Potassium (K) (mg/kg)	3030	3800	2390	3570	3180
	Selenium (Se) (mg/kg)	1.24	0.97	2.18	1.13	0.86
	Silver (Ag) (mg/kg)	0.16	0.14	0.15	0.13	0.11

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-26	L2644315-27	L2644315-28	L2644315-29	L2644315-30
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	08:30	08:30	08:30	09:45	09:45
	Client ID	RG_MIUCO_SE_3_2021-09-15_1230	RG_CORCK_SE_1_2021_09_15_0830	RG_CORCK_SE_2_2021_09_15_0830	RG_CORCK_SE_3_2021_09_15_0945	RG_CORCK_SE_4_2021_09_15_0945
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	68.1	84.6	62.1	69.2	59.3
	pH (1:2 soil:water) (pH)	8.07	8.03	8.28	8.09	8.04
Particle Size	% Gravel (>2mm) (%)	3.9	4.1	<1.0	<1.0	<1.0
	% Sand (2.00mm - 1.00mm) (%)	10.9	1.9	1.7	2.0	3.0
	% Sand (1.00mm - 0.50mm) (%)	9.8	1.9	2.6	2.6	3.7
	% Sand (0.50mm - 0.25mm) (%)	5.4	2.3	7.1	6.0	7.7
	% Sand (0.25mm - 0.125mm) (%)	5.3	9.5	20.9	17.5	17.7
	% Sand (0.125mm - 0.063mm) (%)	9.4	15.8	22.6	19.7	19.1
	% Silt (0.063mm - 0.0312mm) (%)	20.7	25.9	20.8	21.9	20.8
	% Silt (0.0312mm - 0.004mm) (%)	28.2	33.0	20.9	25.4	23.1
	% Clay (<4um) (%)	6.3	5.6	3.4	4.4	4.7
	Texture	Silt loam	Silt loam	Sandy loam	Sandy loam	Sandy loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	1.97	4.0	3.4	3.2	4.4
Metals	Aluminum (Al) (mg/kg)	670	867	823	953	2600
	Antimony (Sb) (mg/kg)	0.15	0.14	0.14	0.15	0.31
	Arsenic (As) (mg/kg)	1.27	1.06	1.31	1.38	3.07
	Barium (Ba) (mg/kg)	124	103	123	121	214
	Beryllium (Be) (mg/kg)	0.21	0.19	0.19	0.23	0.44
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	5.4	5.5	<5.0	5.2	7.9
	Cadmium (Cd) (mg/kg)	5.11	4.41	6.10	5.42	9.26
	Calcium (Ca) (mg/kg)	235000	194000	240000	226000	338000
	Chromium (Cr) (mg/kg)	1.17	1.34	1.27	1.57	3.79
	Cobalt (Co) (mg/kg)	170	145	232	203	370
	Copper (Cu) (mg/kg)	3.89	3.19	3.99	4.13	7.73
	Iron (Fe) (mg/kg)	2210	1870	1860	2310	4730
	Lead (Pb) (mg/kg)	1.54	1.24	1.10	1.44	2.60
	Lithium (Li) (mg/kg)	<2.0	<2.0	2.1	2.1	3.7
	Magnesium (Mg) (mg/kg)	4830	4200	5140	4720	6870
	Manganese (Mn) (mg/kg)	1730	1510	1880	1800	2720
	Mercury (Hg) (mg/kg)	0.0124	0.0089	0.0110	0.0145	0.0250
	Molybdenum (Mo) (mg/kg)	0.23	0.24	0.24	0.26	0.78
	Nickel (Ni) (mg/kg)	171	147	189	180	304
	Phosphorus (P) (mg/kg)	184	130	136	153	283
	Potassium (K) (mg/kg)	220	260	240	270	680
	Selenium (Se) (mg/kg)	1.21	1.25	1.04	1.43	3.19
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-31				
	Description	SE				
	Sampled Date	15-SEP-21				
	Sampled Time	11:00				
	Client ID	RG_CORCK_SE_5_2021_09-15_1100				
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	92.9				
	pH (1:2 soil:water) (pH)	7.80				
Particle Size	% Gravel (>2mm) (%)	2.5				
	% Sand (2.00mm - 1.00mm) (%)	4.6				
	% Sand (1.00mm - 0.50mm) (%)	4.1				
	% Sand (0.50mm - 0.25mm) (%)	5.4				
	% Sand (0.25mm - 0.125mm) (%)	11.7				
	% Sand (0.125mm - 0.063mm) (%)	16.3				
	% Silt (0.063mm - 0.0312mm) (%)	21.4				
	% Silt (0.0312mm - 0.004mm) (%)	28.2				
	% Clay (<4um) (%)	5.9				
	Texture	Silt loam				
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.2				
Metals	Aluminum (Al) (mg/kg)	1390				
	Antimony (Sb) (mg/kg)	0.25				
	Arsenic (As) (mg/kg)	2.09				
	Barium (Ba) (mg/kg)	178				
	Beryllium (Be) (mg/kg)	0.33				
	Bismuth (Bi) (mg/kg)	<0.20				
	Boron (B) (mg/kg)	8.0				
	Cadmium (Cd) (mg/kg)	6.89				
	Calcium (Ca) (mg/kg)	290000				
	Chromium (Cr) (mg/kg)	2.28				
	Cobalt (Co) (mg/kg)	223				
	Copper (Cu) (mg/kg)	5.92				
	Iron (Fe) (mg/kg)	3570				
	Lead (Pb) (mg/kg)	2.26				
	Lithium (Li) (mg/kg)	2.8				
	Magnesium (Mg) (mg/kg)	6310				
	Manganese (Mn) (mg/kg)	2090				
	Mercury (Hg) (mg/kg)	0.0251				
	Molybdenum (Mo) (mg/kg)	0.37				
	Nickel (Ni) (mg/kg)	235				
	Phosphorus (P) (mg/kg)	308				
	Potassium (K) (mg/kg)	410				
	Selenium (Se) (mg/kg)	2.60				
	Silver (Ag) (mg/kg)	<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-1	L2644315-2	L2644315-3	L2644315-4	L2644315-5
	Description	SE	SE	SE	SE	SE
	Sampled Date	16-SEP-21	16-SEP-21	16-SEP-21	14-SEP-21	14-SEP-21
	Sampled Time	10:45	09:20	09:20	11:00	10:00
	Client ID	RG_MI5_SE-1_2021-09-16_1045	RG_MI5_SE-2_2021-09-16_0920	RG_M15_SE-3_2021-09-16_0920	RG_LE1_SE-1_2021-09-14_1100	RG_LE1_SE-2_2021-09-14_1000
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (mg/kg)	62	68	74	<50	<50
	Strontium (Sr) (mg/kg)	57.5	52.9	67.8	44.1	40.5
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.238	0.222	0.238	0.247	0.220
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	19.8	26.2	31.8	32.8	28.4
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	0.927	0.915	0.951	1.62	1.31
	Vanadium (V) (mg/kg)	36.3	37.6	39.8	57.2	49.3
	Zinc (Zn) (mg/kg)	97.5	89.7	95.9	114	114
	Zirconium (Zr) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.0050	<0.0050	0.0052	0.0050	<0.0050
	Acenaphthylene (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Acridine (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (mg/kg)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Benz(a)anthracene (mg/kg)	<0.010	<0.010	0.011	0.012	0.020
	Benzo(a)pyrene (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b&j)fluoranthene (mg/kg)	0.013	0.018	0.018	0.015	0.020
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.015	0.018	0.018	<0.015	0.020
	Benzo(e)pyrene (mg/kg)	0.018	0.023	0.022	0.019	0.024
	Benzo(g,h,i)perylene (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (mg/kg)	0.036	0.043	0.041	0.025	0.060
	Dibenz(a,h)anthracene (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (mg/kg)	<0.020 DLCI	<0.020 DLCI	<0.020 DLCI	<0.010	<0.030 DLCI
	Fluorene (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (mg/kg)	0.070	0.058	0.080	0.060	0.147
	2-Methylnaphthalene (mg/kg)	0.086	0.070	0.090	0.052	0.143
	Naphthalene (mg/kg)	0.039	0.030	0.042	0.023	0.071
	Perylene (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Phenanthrene (mg/kg)	0.110	0.102	0.123	0.117	0.211
	Pyrene (mg/kg)	<0.020 DLCI	<0.020 DLCI	<0.030 DLCI	<0.020 DLCI	<0.030 DLCI
	Quinoline (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: d10-Acenaphthene (%)	82.6	82.3	77.6	81.0	75.9
	Surrogate: d12-Chrysene (%)	96.3	97.6	94.2	97.3	91.5

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2644315-6	L2644315-7	L2644315-8	L2644315-9	L2644315-10
	Description	SE	SE	SE	SE	SE
	Sampled Date	14-SEP-21	14-SEP-21	14-SEP-21	14-SEP-21	15-SEP-21
	Sampled Time	09:20	14:30	13:45	12:50	13:30
	Client ID	RG_LE1_SE-3_2021-09-14_0920	RG_MIULE_SE-1_2021-09-14_1430	RG_MIULE_SE-2_2021-09-14_1345	RG_MIULE_SE-3_2021-09-14_1345	RG_MIULE_SE-4_2021-09-14_1250
SOIL						
Metals	Sodium (Na) (mg/kg)	51	84	137	106	161
	Strontium (Sr) (mg/kg)	41.7	76.1	109	88.4	130
	Sulfur (S) (mg/kg)	<1000	<1000	2200	1800	2000
	Thallium (Tl) (mg/kg)	0.232	0.352	0.295	0.317	0.248
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	37.4	15.7	13.9	14.6	10.2
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.26	0.835	0.862	0.819	0.747
	Vanadium (V) (mg/kg)	52.5	33.8	17.5	20.9	13.7
	Zinc (Zn) (mg/kg)	110	108	105	109	102
	Zirconium (Zr) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.0050	<0.0050	<0.020 DLCI	<0.010 DLCI	<0.050 DLHM
	Acenaphthylene (mg/kg)	<0.0050	<0.0050	<0.010 DLHM	<0.0050	<0.050 DLHM
	Acridine (mg/kg)	<0.010	<0.010	<0.030 DLCI	<0.010	<0.10 DLHM
	Anthracene (mg/kg)	0.0040	<0.0040	<0.0080 DLHM	<0.0040	<0.040 DLHM
	Benz(a)anthracene (mg/kg)	0.016	<0.010	0.021 DLHM	0.015	<0.10 DLHM
	Benzo(a)pyrene (mg/kg)	<0.010	<0.010	<0.020 DLHM	<0.010	<0.10 DLHM
	Benzo(b&j)fluoranthene (mg/kg)	0.022	0.012	0.044 DLHM	0.034	<0.10 DLHM
	Benzo(b+j+k)fluoranthene (mg/kg)	0.022	<0.015	0.044	0.034	<0.14
	Benzo(e)pyrene (mg/kg)	0.020	0.014	0.055 DLHM	0.039	<0.10 DLHM
	Benzo(g,h,i)perylene (mg/kg)	<0.010	<0.010	<0.020 DLHM	0.012	<0.10 DLHM
	Benzo(k)fluoranthene (mg/kg)	<0.010	<0.010	<0.020 DLHM	<0.010	<0.10 DLHM
	Chrysene (mg/kg)	0.029	0.010	0.054 DLHM	0.024	<0.10 DLHM
	Dibenz(a,h)anthracene (mg/kg)	<0.0050	<0.0050	<0.010 DLHM	<0.0050	<0.050 DLHM
	Fluoranthene (mg/kg)	0.014	<0.010	0.043 DLHM	0.029	<0.10 DLHM
	Fluorene (mg/kg)	<0.010	<0.010	<0.020 DLHM	0.021	<0.10 DLHM
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.010	<0.010	<0.020 DLHM	<0.010	<0.10 DLHM
	1-Methylnaphthalene (mg/kg)	0.078	<0.050	0.231 DLHM	0.146	0.15 DLHM
	2-Methylnaphthalene (mg/kg)	0.083	0.044	0.330 DLHM	0.222	0.24 DLHM
	Naphthalene (mg/kg)	0.040	0.020	0.158 DLHM	0.104	<0.10 DLHM
	Perylene (mg/kg)	<0.010	<0.010	<0.020 DLHM	<0.010	<0.10 DLHM
	Phenanthrene (mg/kg)	0.145	0.052	0.318 DLHM	0.217	0.27 DLHM
	Pyrene (mg/kg)	<0.030 DLCI	<0.010	0.048 DLHM	0.031	<0.10 DLHM
	Quinoline (mg/kg)	<0.050	<0.050	<0.020 DLHM	<0.050	<0.10 DLHM
	Surrogate: d10-Acenaphthene (%)	74.7	76.7	90.7	91.9	74.5
	Surrogate: d12-Chrysene (%)	91.5	93.1	108.8	109.5	96.3

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-11	L2644315-12	L2644315-13	L2644315-14	L2644315-15
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	13:30	13:30	13:30	13:30	13:30
	Client ID	RG_MIULE_SE-5_2021-09-14_1250	RG_MIDCO_SE-1_2021-09-15_1330	RG_MIDCO_SE-2_2021-09-15_1330	RG_MIDCO_SE-3_2021-09-15_1330	RG_MIDCO_SE-4_2021-09-15_1330
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (mg/kg)	89	208	230	137	146
	Strontium (Sr) (mg/kg)	81.5	130	148	74.0	76.5
	Sulfur (S) (mg/kg)	<1000	2200	2600	1400	1400
	Thallium (Tl) (mg/kg)	0.340	0.263	0.261	0.387	0.399
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	14.2	6.1	17.4	14.9	15.6
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	0.786	0.801	0.864	0.777	0.765
	Vanadium (V) (mg/kg)	27.2	15.5	18.5	28.0	28.7
	Zinc (Zn) (mg/kg)	110	120	120	146	146
	Zirconium (Zr) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.0050	<0.025 DLCI	<0.035 DLCI	<0.010 DLCI	<0.015 DLCI
	Acenaphthylene (mg/kg)	<0.0050	<0.013 DLHM	<0.013 DLHM	<0.0050	<0.0050
	Acridine (mg/kg)	<0.010	<0.040 DLCI	<0.050 DLCI	<0.020 DLCI	0.015
	Anthracene (mg/kg)	<0.0040	<0.010 DLHM	<0.010 DLHM	<0.0040	<0.0040
	Benz(a)anthracene (mg/kg)	<0.010	0.033 DLHM	0.034 DLHM	0.011	0.014
	Benzo(a)pyrene (mg/kg)	<0.010	<0.025 DLHM	<0.025 DLHM	<0.010	<0.010
	Benzo(b&j)fluoranthene (mg/kg)	0.013	0.099 DLHM	0.106 DLHM	0.039	0.040
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.015	0.099	0.106	0.039	0.040
	Benzo(e)pyrene (mg/kg)	0.016	0.110 DLHM	0.111 DLHM	0.048	0.050
	Benzo(g,h,i)perylene (mg/kg)	<0.010	0.038 DLHM	0.048 DLHM	0.016	0.019
	Benzo(k)fluoranthene (mg/kg)	<0.010	<0.025 DLHM	<0.025 DLHM	<0.010	<0.010
	Chrysene (mg/kg)	<0.010	0.115 DLHM	0.088 DLHM	0.038	0.060
	Dibenz(a,h)anthracene (mg/kg)	<0.0050	<0.013 DLHM	<0.013 DLHM	<0.0050	<0.0050
	Fluoranthene (mg/kg)	0.010	<0.030 DLCI	0.033 DLHM	<0.020 DLCI	0.013
	Fluorene (mg/kg)	<0.010	0.055 DLHM	0.050 DLHM	0.025	0.027
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.010	<0.025 DLHM	<0.025 DLHM	<0.010	<0.010
	1-Methylnaphthalene (mg/kg)	0.052	0.402 DLHM	0.482 DLHM	0.155	0.176
	2-Methylnaphthalene (mg/kg)	0.072	0.611 DLHM	0.752 DLHM	0.241	0.272
	Naphthalene (mg/kg)	0.032	0.228 DLHM	0.288 DLHM	0.093	0.102
	Perylene (mg/kg)	<0.010	<0.025 DLHM	<0.025 DLHM	0.020	0.020
	Phenanthrene (mg/kg)	0.071	0.403 DLHM	0.479 DLHM	0.177	0.185
	Pyrene (mg/kg)	0.011	0.044 DLHM	<0.060 DLCI	<0.030 DLCI	0.025
	Quinoline (mg/kg)	<0.050	<0.025 DLHM	<0.025 DLHM	<0.050	<0.050
	Surrogate: d10-Acenaphthene (%)	75.0	72.0	72.1	78.8	86.8
	Surrogate: d12-Chrysene (%)	89.4	88.9	87.9	96.7	105.1

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-16	L2644315-17	L2644315-18	L2644315-19	L2644315-20
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	13:30	15:00	15:00	12:00	12:00
	Client ID	RG_MIDCO_SE-5_2021-09-15_1330	RG_MI5_SE-4_2021-09-15_1500	RG_MI5_SE-5_2021-09-15_1500	RG_MI25_SE-1_2021-09-15_1200	RG_MI25_SE-2_2021-09-15_1200
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (mg/kg)	214	67	63	86	98
	Strontium (Sr) (mg/kg)	127	55.2	56.7	46.2	43.6
	Sulfur (S) (mg/kg)	2600	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.354	0.246	0.239	0.645	0.747
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	10.3	23.8	24.7	9.9	14.2
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	0.843	0.950	0.915	0.860	0.878
	Vanadium (V) (mg/kg)	22.9	37.4	34.9	32.0	38.8
	Zinc (Zn) (mg/kg)	127	96.0	90.8	134	152
	Zirconium (Zr) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	DLCI <0.030	<0.0050	<0.0050	<0.0050	<0.0050
	Acenaphthylene (mg/kg)	DLHM <0.020	<0.0050	<0.0050	<0.0050	<0.0050
	Acridine (mg/kg)	DLHM <0.040	<0.010	<0.010	<0.010	<0.010
	Anthracene (mg/kg)	DLHM <0.016	<0.0040	<0.0040	<0.0040	<0.0040
	Benz(a)anthracene (mg/kg)	DLHM 0.123	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (mg/kg)	DLHM <0.040	<0.010	<0.010	<0.010	<0.010
	Benzo(b&j)fluoranthene (mg/kg)	DLHM 0.110	0.016	0.018	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (mg/kg)	0.110	0.016	0.018	<0.015	<0.015
	Benzo(e)pyrene (mg/kg)	DLHM 0.152	0.020	0.021	<0.010	0.011
	Benzo(g,h,i)perylene (mg/kg)	DLHM 0.056	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (mg/kg)	DLHM <0.040	<0.010	<0.010	<0.010	<0.010
	Chrysene (mg/kg)	DLHM 0.095	0.023	0.038	<0.010	0.017
	Dibenz(a,h)anthracene (mg/kg)	DLHM <0.020	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (mg/kg)	DLCI <0.040	DLCI <0.020	0.014	<0.010	<0.010
	Fluorene (mg/kg)	DLHM 0.068	<0.010	0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)	DLHM <0.040	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (mg/kg)	DLHM 0.533	0.064	0.075	<0.050	<0.050
	2-Methylnaphthalene (mg/kg)	DLHM 0.827	0.075	0.090	<0.010	<0.010
	Naphthalene (mg/kg)	DLHM 0.310	0.034	0.038	<0.010	<0.010
	Perylene (mg/kg)	DLHM <0.040	<0.010	<0.010	<0.010	<0.010
	Phenanthrene (mg/kg)	DLHM 0.538	0.106	0.114	DLCI <0.020	0.017
	Pyrene (mg/kg)	DLCI <0.070	DLCI <0.020	DLCI <0.020	<0.010	<0.010
	Quinoline (mg/kg)	DLHM <0.040	<0.050	<0.050	<0.050	<0.050
	Surrogate: d10-Acenaphthene (%)	85.0	84.9	75.7	78.6	75.9
	Surrogate: d12-Chrysene (%)	105.7	102.4	90.8	97.0	92.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-21	L2644315-22	L2644315-23	L2644315-24	L2644315-25
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	12:00	12:00	12:30	12:30	12:30
	Client ID	RG_MI25_SE-3_2021-09-15_1200	RG_RIVER_SE_1_2021-09-15_1200	RG_MIDAG_SE_1_2021-09-15_1400	RG_MIUCO_SE_1_2021-09-15_1230	RG_MIUCO_SE_2_2021-09-15_1230
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (mg/kg)	92	104	151	111	127
	Strontium (Sr) (mg/kg)	46.7	42.8	102	49.1	53.3
	Sulfur (S) (mg/kg)	<1000	<1000	1900	1000	1000
	Thallium (Tl) (mg/kg)	0.715	0.719	0.609	0.438	0.374
	Tin (Sn) (mg/kg)	<2.0	<2.0	2.1	<2.0	<2.0
	Titanium (Ti) (mg/kg)	8.7	15.0	12.2	11.4	14.7
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	0.914	0.905	0.763	0.682	0.549
	Vanadium (V) (mg/kg)	36.6	41.4	25.6	31.8	29.7
	Zinc (Zn) (mg/kg)	141	142	157	95.2	94.7
	Zirconium (Zr) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	DLHM <0.050	<0.0050	DLHM <0.090	DLHM <0.020	DLHM <0.020
	Acenaphthylene (mg/kg)	DLHM <0.025	<0.0050	DLHM <0.090	DLHM <0.020	DLHM <0.020
	Acridine (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Anthracene (mg/kg)	DLHM <0.020	<0.0040	DLHM <0.072	DLHM <0.016	DLHM <0.016
	Benz(a)anthracene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Benzo(a)pyrene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Benzo(b&j)fluoranthene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Benzo(b+j+k)fluoranthene (mg/kg)	DLHM <0.075	<0.015	DLHM <0.27	DLHM <0.060	DLHM <0.060
	Benzo(e)pyrene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM 0.048	DLHM <0.040
	Benzo(g,h,i)perylene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Benzo(k)fluoranthene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Chrysene (mg/kg)	DLHM <0.050	0.016	DLHM <0.18	DLHM 0.075	DLHM <0.040
	Dibenz(a,h)anthracene (mg/kg)	DLHM <0.025	<0.0050	DLHM <0.090	DLHM <0.020	DLHM <0.020
	Fluoranthene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Fluorene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Indeno(1,2,3-c,d)pyrene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	1-Methylnaphthalene (mg/kg)	DLHM 0.025	<0.050	DLHM 0.21	DLHM 0.110	DLHM <0.040
	2-Methylnaphthalene (mg/kg)	DLHM <0.050	<0.010	DLHM 0.28	DLHM 0.147	DLHM 0.041
	Naphthalene (mg/kg)	DLHM <0.050	<0.010	DLHM 0.19	DLHM 0.098	DLHM <0.040
	Perylene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Phenanthrene (mg/kg)	DLHM 0.067	0.012	DLHM 0.34	DLHM 0.182	DLHM 0.071
	Pyrene (mg/kg)	DLHM <0.050	<0.010	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Quinoline (mg/kg)	DLHM <0.050	<0.050	DLHM <0.18	DLHM <0.040	DLHM <0.040
	Surrogate: d10-Acenaphthene (%)	67.0	64.6	63.9	74.7	70.8
	Surrogate: d12-Chrysene (%)	80.1	74.2	72.1	79.4	73.3

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-26	L2644315-27	L2644315-28	L2644315-29	L2644315-30
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	08:30	08:30	08:30	09:45	09:45
	Client ID	RG_MIUCO_SE_3 _2021-09-15_1230	RG_CORCK_SE_1 _2021_09-15_0830	RG_CORCK_SE_2 _2021_09-15_0830	RG_CORCK_SE_3 _2021_09-15_0945	RG_CORCK_SE_4 _2021_09-15_0945
Grouping	**Analyte**					
SOIL						
Metals	Sodium (Na) (mg/kg)	285	246	270	268	419
	Strontium (Sr) (mg/kg)	316	269	299	305	431
	Sulfur (S) (mg/kg)	4000	3300	3500	3800	5100
	Thallium (Tl) (mg/kg)	0.091	0.084	0.173	0.159	0.413
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	1.9	3.1	3.6	4.0	8.3
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.46	1.27	1.46	1.52	2.13
	Vanadium (V) (mg/kg)	2.43	2.89	2.94	3.17	8.26
	Zinc (Zn) (mg/kg)	438	377	486	458	782
	Zirconium (Zr) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	0.0055	0.082 DLHM	0.0271	0.0352	0.0481
	Acenaphthylene (mg/kg)	<0.0050	0.018 DLHM	<0.0050	0.0088	0.0091
	Acridine (mg/kg)	<0.010	0.139 DLHM	0.049	0.076	0.091
	Anthracene (mg/kg)	<0.0040	<0.012 DLHM	<0.0040	<0.0040	<0.0040
	Benz(a)anthracene (mg/kg)	0.011	0.095 DLHM	0.035	0.049	0.063
	Benzo(a)pyrene (mg/kg)	<0.010	0.077 DLHM	0.030	0.041	0.048
	Benzo(b&j)fluoranthene (mg/kg)	0.032	0.272 DLHM	0.103	0.143	0.174
	Benzo(b+j+k)fluoranthene (mg/kg)	0.032	0.272 DLHM	0.103	0.143	0.174
	Benzo(e)pyrene (mg/kg)	0.033	0.341 DLHM	0.134	0.182	0.219
	Benzo(g,h,i)perylene (mg/kg)	<0.010	0.173 DLHM	0.067	0.094	0.110
	Benzo(k)fluoranthene (mg/kg)	<0.010	<0.030 DLHM	<0.010	<0.010	<0.010
	Chrysene (mg/kg)	0.060	0.450 DLHM	0.172	0.231	0.276
	Dibenz(a,h)anthracene (mg/kg)	0.0069	0.043 DLHM	0.0147	0.0273	0.0236
	Fluoranthene (mg/kg)	0.016	0.101 DLHM	0.032	0.040	0.046
	Fluorene (mg/kg)	0.013	0.239 DLHM	0.090	0.128	0.143
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.010	0.031 DLHM	0.012	0.012	0.022
	1-Methylnaphthalene (mg/kg)	0.054	1.52 DLHM	0.619	0.819	0.943
	2-Methylnaphthalene (mg/kg)	0.079	2.57 DLHM	1.04	1.37	1.58
	Naphthalene (mg/kg)	0.060	0.841 DLHM	0.355	0.438	0.518
	Perylene (mg/kg)	0.024	<0.030 DLHM	<0.010	<0.010	<0.010
	Phenanthrene (mg/kg)	0.112	1.32 DLHM	0.491	0.677	0.777
	Pyrene (mg/kg)	0.019	0.144 DLHM	0.054	0.072	0.085
	Quinoline (mg/kg)	<0.050	<0.030 DLHM	<0.050	<0.050	<0.050
	Surrogate: d10-Acenaphthene (%)	70.0	80.5	79.9	84.7	82.9
	Surrogate: d12-Chrysene (%)	78.1	74.1	77.2	97.2	93.9

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-31
	Description	SE
	Sampled Date	15-SEP-21
	Sampled Time	11:00
	Client ID	RG_CORCK_SE_5 _2021_09-15_1100
Grouping	**Analyte**	
SOIL		
Metals	Sodium (Na) (mg/kg)	418
	Strontium (Sr) (mg/kg)	398
	Sulfur (S) (mg/kg)	5900
	Thallium (Tl) (mg/kg)	0.148
	Tin (Sn) (mg/kg)	<2.0
	Titanium (Ti) (mg/kg)	5.4
	Tungsten (W) (mg/kg)	<0.50
	Uranium (U) (mg/kg)	1.90
	Vanadium (V) (mg/kg)	4.78
	Zinc (Zn) (mg/kg)	582
	Zirconium (Zr) (mg/kg)	<1.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	DLHM 0.129
	Acenaphthylene (mg/kg)	DLHM <0.035
	Acridine (mg/kg)	DLHM 0.250
	Anthracene (mg/kg)	DLHM <0.028
	Benz(a)anthracene (mg/kg)	DLHM 0.164
	Benzo(a)pyrene (mg/kg)	DLHM 0.120
	Benzo(b&j)fluoranthene (mg/kg)	DLHM 0.482
	Benzo(b+j+k)fluoranthene (mg/kg)	DLHM 0.48
	Benzo(e)pyrene (mg/kg)	DLHM 0.590
	Benzo(g,h,i)perylene (mg/kg)	DLHM 0.294
	Benzo(k)fluoranthene (mg/kg)	DLHM <0.070
	Chrysene (mg/kg)	DLHM 0.744
	Dibenz(a,h)anthracene (mg/kg)	DLHM 0.066
	Fluoranthene (mg/kg)	DLHM <0.070
	Fluorene (mg/kg)	DLHM 0.411
	Indeno(1,2,3-c,d)pyrene (mg/kg)	DLHM <0.070
	1-Methylnaphthalene (mg/kg)	DLHM 2.61
	2-Methylnaphthalene (mg/kg)	DLHM 4.20
	Naphthalene (mg/kg)	DLHM 1.35
	Perylene (mg/kg)	DLHM <0.070
	Phenanthrene (mg/kg)	DLHM 2.13
	Pyrene (mg/kg)	DLHM 0.261
	Quinoline (mg/kg)	DLHM <0.070
	Surrogate: d10-Acenaphthene (%)	83.8
	Surrogate: d12-Chrysene (%)	96.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-1	L2644315-2	L2644315-3	L2644315-4	L2644315-5
	Description	SE	SE	SE	SE	SE
	Sampled Date	16-SEP-21	16-SEP-21	16-SEP-21	14-SEP-21	14-SEP-21
	Sampled Time	10:45	09:20	09:20	11:00	10:00
	Client ID	RG_MI5_SE-1_2021-09-16_1045	RG_MI5_SE-2_2021-09-16_0920	RG_M15_SE-3_2021-09-16_0920	RG_LE1_SE-1_2021-09-14_1100	RG_LE1_SE-2_2021-09-14_1000
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: d8-Naphthalene (%)	82.9	82.9	78.1	81.8	78.9
	Surrogate: d10-Phenanthrene (%)	91.4	93.9	92.1	93.8	88.5
	IACR:Coarse	<0.050	<0.050	<0.050	<0.050	<0.050
	IACR:Fine	<0.050	<0.050	<0.050	<0.050	<0.050
	B(a)P Total Potency Equivalent (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	IACR (CCME)	0.17	0.20	0.22	0.20	0.27

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-6	L2644315-7	L2644315-8	L2644315-9	L2644315-10
	Description	SE	SE	SE	SE	SE
	Sampled Date	14-SEP-21	14-SEP-21	14-SEP-21	14-SEP-21	15-SEP-21
	Sampled Time	09:20	14:30	13:45	12:50	13:30
	Client ID	RG_LE1_SE-3_2021-09-14_0920	RG_MIULE_SE-1_2021-09-14_1430	RG_MIULE_SE-2_2021-09-14_1345	RG_MIULE_SE-3_2021-09-14_1345	RG_MIULE_SE-4_2021-09-14_1250
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: d8-Naphthalene (%)	77.9	77.4	93.3	94.7	75.3
	Surrogate: d10-Phenanthrene (%)	87.6	88.4	104.6	104.2	90.4
	IACR:Coarse	<0.050	<0.050	<0.050	<0.050	0.062
	IACR:Fine	<0.050	<0.050	<0.050	<0.050	<0.12
	B(a)P Total Potency Equivalent (mg/kg)	<0.020	<0.020	0.024	<0.020	<0.096
	IACR (CCME)	0.26	0.15	0.48	0.33	<1.1

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-11	L2644315-12	L2644315-13	L2644315-14	L2644315-15
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	13:30	13:30	13:30	13:30	13:30
	Client ID	RG_MIULE_SE-5_2021-09-14_1250	RG_MIDCO_SE-1_2021-09-15_1330	RG_MIDCO_SE-2_2021-09-15_1330	RG_MIDCO_SE-3_2021-09-15_1330	RG_MIDCO_SE-4_2021-09-15_1330
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: d8-Naphthalene (%)	78.6	73.9	73.7	79.6	88.2
	Surrogate: d10-Phenanthrene (%)	85.2	86.1	81.4	90.6	98.6
	IACR:Coarse	<0.050	<0.050	<0.050	<0.050	<0.050
	IACR:Fine	<0.050	0.064	0.066	<0.050	<0.050
	B(a)P Total Potency Equivalent (mg/kg)	<0.020	0.036	0.037	<0.020	<0.020
	IACR (CCME)	0.15	0.92	0.96	0.36	0.38

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-16	L2644315-17	L2644315-18	L2644315-19	L2644315-20
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	13:30	15:00	15:00	12:00	12:00
	Client ID	RG_MIDCO_SE-5_2021-09-15_1330	RG_MI5_SE-4_2021-09-15_1500	RG_MI5_SE-5_2021-09-15_1500	RG_MI25_SE-1_2021-09-15_1200	RG_MI25_SE-2_2021-09-15_1200
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: d8-Naphthalene (%)	86.1	83.9	76.6	79.6	76.3
	Surrogate: d10-Phenanthrene (%)	99.8	96.0	85.3	90.5	88.4
	IACR:Coarse	0.050	<0.050	<0.050	<0.050	<0.050
	IACR:Fine	0.096	<0.050	<0.050	<0.050	<0.050
	B(a)P Total Potency Equivalent (mg/kg)	0.059	<0.020	<0.020	<0.020	<0.020
	IACR (CCME)	1.35	0.19	0.20	<0.15	<0.15

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L2644315-21	L2644315-22	L2644315-23	L2644315-24	L2644315-25
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	12:00	12:00	12:30	12:30	12:30
	Client ID	RG_MI25_SE-3_2021-09-15_1200	RG_RIVER_SE_1_2021-09-15_1200	RG_MIDAG_SE_1_2021-09-15_1400	RG_MIUCO_SE_1_2021-09-15_1230	RG_MIUCO_SE_2_2021-09-15_1230
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: d8-Naphthalene (%)	74.6	75.3	72.0	70.7	73.3
	Surrogate: d10-Phenanthrene (%)	78.3	72.3	71.1	77.9	72.2
	IACR:Coarse	<0.050	<0.050	0.11	<0.050	<0.050
	IACR:Fine	0.059	<0.050	0.21	<0.050	<0.050
	B(a)P Total Potency Equivalent (mg/kg)	<0.048	<0.020	<0.17	0.039	<0.038
	IACR (CCME)	<0.54	<0.15	<1.9	0.45	<0.43

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-26	L2644315-27	L2644315-28	L2644315-29	L2644315-30
	Description	SE	SE	SE	SE	SE
	Sampled Date	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21	15-SEP-21
	Sampled Time	08:30	08:30	08:30	09:45	09:45
	Client ID	RG_MIUCO_SE_3_2021-09-15_1230	RG_CORCK_SE_1_2021_09-15_0830	RG_CORCK_SE_2_2021_09-15_0830	RG_CORCK_SE_3_2021_09-15_0945	RG_CORCK_SE_4_2021_09-15_0945
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: d8-Naphthalene (%)	77.9	72.0	75.8	88.6	84.0
	Surrogate: d10-Phenanthrene (%)	76.4	72.7	72.5	91.2	88.4
	IACR:Coarse	<0.050	0.085	<0.050	<0.050	<0.050
	IACR:Fine	<0.050	0.163	0.060	0.082	0.096
	B(a)P Total Potency Equivalent (mg/kg)	<0.020	0.167	0.063	0.093	0.102
	IACR (CCME)	0.34	2.73	1.02	1.43	1.70

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2644315-31				
	Description	SE				
	Sampled Date	15-SEP-21				
	Sampled Time	11:00				
	Client ID	RG_CORCK_SE_5_2021_09-15_1100				
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	Surrogate: d8-Naphthalene (%)	86.5				
	Surrogate: d10-Phenanthrene (%)	92.9				
	IACR:Coarse	0.153				
	IACR:Fine	0.295				
	B(a)P Total Potency Equivalent (mg/kg)	0.268				
	IACR (CCME)	4.75				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2644315-26	Soil	Note: Watery Sample	
L2644315-28	Soil	Note: Watery Sample	
L2644315-29	Soil	Note: Watery Sample	
L2644315-30	Soil	Note: Watery Sample	

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Dibenz(a,h)anthracene	DUP-H	L2644315-21, -22, -23, -24, -25, -26, -27, -28, -29, -30, -31
Duplicate	Pyrene	DUP-H,J	L2644315-21, -22, -23, -24, -25, -26, -27, -28, -29, -30, -31

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLHM	Detection Limit Adjusted: Sample has High Moisture Content
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
DUP-H,J	Duplicate results outside ALS DQO, due to sample heterogeneity. Duplicate results and limits are expressed in terms of absolute difference.
PSAL	Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.

C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

HG-200.2-CVAA-CL	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
MET-200.2-CCMS-CL	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

MOISTURE-CL	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)

This analysis is carried out gravimetrically by drying the sample at 105 C

PAH-TMB-H/A-MS-CL	Soil	PAH Tumbler Extraction (Hexane/Acetone)	EPA 3570/8270-GC/MS

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3545 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-1:2-CL	Soil	pH in soil (1:2 Soil:Water Extraction)	CSSS Ch. 16

Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.

PSA-PIPET-DETAIL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1

Reference Information

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

September CMO LAEMP

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

[redacted]

Quality Control Report

Client: Teck Coal Ltd.
421 Pine Avenue
Sparwood BC V0B 2G0

Contact: Cybele Heddle

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TIC-PCT-SK	**Soil**							
Batch R5612136								
WG3630724-4 IRM		**08-109_SOIL**						
Inorganic Carbon			94.1		%		80-120	06-OCT-21
WG3630724-2 LCS		**0.5**						
Inorganic Carbon			94.5		%		90-110	06-OCT-21
WG3630724-3 MB								
Inorganic Carbon			<0.050		%		0.05	06-OCT-21
Batch R5612137								
WG3630726-1 DUP		**L2644315-19**						
Inorganic Carbon		0.525	0.527		%	0.4	20	06-OCT-21
WG3630726-4 IRM		**08-109_SOIL**						
Inorganic Carbon			96.3		%		80-120	06-OCT-21
WG3630726-2 LCS		**0.5**						
Inorganic Carbon			93.7		%		90-110	06-OCT-21
WG3630726-3 MB								
Inorganic Carbon			<0.050		%		0.05	06-OCT-21
C-TOT-LECO-SK	**Soil**							
Batch R5610916								
WG3628023-1 DUP		**L2644315-30**						
Total Carbon by Combustion		13.9	13.7		%	1.7	20	04-OCT-21
WG3628023-2 IRM		**08-109_SOIL**						
Total Carbon by Combustion			106.7		%		80-120	04-OCT-21
WG3628023-4 LCS		**SULFADIAZINE**						
Total Carbon by Combustion			103.7		%		90-110	04-OCT-21
WG3628023-3 MB								
Total Carbon by Combustion			<0.05		%		0.05	04-OCT-21
Batch R5614460								
WG3628018-1 DUP		**L2644315-10**						
Total Carbon by Combustion		4.45	4.77		%	7.1	20	05-OCT-21
WG3628018-2 IRM		**08-109_SOIL**						
Total Carbon by Combustion			100.1		%		80-120	05-OCT-21
WG3628018-4 LCS		**SULFADIAZINE**						
Total Carbon by Combustion			101.5		%		90-110	05-OCT-21
WG3628018-3 MB								
Total Carbon by Combustion			<0.05		%		0.05	05-OCT-21
HG-200.2-CVAA-CL	**Soil**							

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAA-CL	**Soil**							
Batch R5611541								
WG3632545-14 CRM		**TILL-2**						
Mercury (Hg)			121.1		%		70-130	06-OCT-21
WG3632545-19 CRM		**TILL-2**						
Mercury (Hg)			116.6		%		70-130	06-OCT-21
WG3632545-4 CRM		**TILL-2**						
Mercury (Hg)			110.1		%		70-130	06-OCT-21
WG3632545-9 CRM		**TILL-2**						
Mercury (Hg)			112.6		%		70-130	06-OCT-21
WG3632545-10 DUP		**L2644315-5**						
Mercury (Hg)		0.0580	0.0587		mg/kg	1.2	40	06-OCT-21
WG3632545-15 DUP		**L2644315-26**						
Mercury (Hg)		0.0124	0.0131		mg/kg	6.0	40	06-OCT-21
WG3632545-12 LCS								
Mercury (Hg)			103.0		%		80-120	06-OCT-21
WG3632545-17 LCS								
Mercury (Hg)			109.0		%		80-120	06-OCT-21
WG3632545-2 LCS								
Mercury (Hg)			101.0		%		80-120	06-OCT-21
WG3632545-7 LCS								
Mercury (Hg)			101.0		%		80-120	06-OCT-21
WG3632545-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	06-OCT-21
WG3632545-11 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	06-OCT-21
WG3632545-16 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	06-OCT-21
WG3632545-6 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	06-OCT-21
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-14 CRM		**TILL-2**						
Aluminum (Al)			92.3		%		70-130	07-OCT-21
Antimony (Sb)			105.0		%		70-130	07-OCT-21
Arsenic (As)			101.9		%		70-130	07-OCT-21
Barium (Ba)			98.6		%		70-130	07-OCT-21
Beryllium (Be)			94.9		%		70-130	07-OCT-21
Bismuth (Bi)			103.4		%		70-130	07-OCT-21
Cadmium (Cd)			112.7		%		70-130	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-14 CRM		**TILL-2**						
Calcium (Ca)			93.4		%		70-130	07-OCT-21
Chromium (Cr)			100.6		%		70-130	07-OCT-21
Cobalt (Co)			105.3		%		70-130	07-OCT-21
Copper (Cu)			96.3		%		70-130	07-OCT-21
Iron (Fe)			99.7		%		70-130	07-OCT-21
Lead (Pb)			99.1		%		70-130	07-OCT-21
Lithium (Li)			97.4		%		70-130	07-OCT-21
Magnesium (Mg)			95.1		%		70-130	07-OCT-21
Manganese (Mn)			92.2		%		70-130	07-OCT-21
Molybdenum (Mo)			95.3		%		70-130	07-OCT-21
Nickel (Ni)			105.1		%		70-130	07-OCT-21
Phosphorus (P)			98.0		%		70-130	07-OCT-21
Potassium (K)			96.3		%		70-130	07-OCT-21
Selenium (Se)			0.37		mg/kg		0.15-0.55	07-OCT-21
Silver (Ag)			0.27		mg/kg		0.16-0.36	07-OCT-21
Sodium (Na)			96.8		%		70-130	07-OCT-21
Strontium (Sr)			102.7		%		70-130	07-OCT-21
Thallium (Tl)			102.7		%		70-130	07-OCT-21
Tin (Sn)			2.2		mg/kg		0.2-4.2	07-OCT-21
Titanium (Ti)			82.2		%		70-130	07-OCT-21
Tungsten (W)			1.13		mg/kg		1-2	07-OCT-21
Uranium (U)			102.0		%		70-130	07-OCT-21
Vanadium (V)			97.7		%		70-130	07-OCT-21
Zinc (Zn)			107.7		%		70-130	07-OCT-21
Zirconium (Zr)			112.7		%		70-130	07-OCT-21
WG3632545-19 CRM		**TILL-2**						
Aluminum (Al)			96.5		%		70-130	07-OCT-21
Antimony (Sb)			100.2		%		70-130	07-OCT-21
Arsenic (As)			105.5		%		70-130	07-OCT-21
Barium (Ba)			96.4		%		70-130	07-OCT-21
Beryllium (Be)			97.9		%		70-130	07-OCT-21
Bismuth (Bi)			90.6		%		70-130	07-OCT-21
Cadmium (Cd)			99.5		%		70-130	07-OCT-21
Calcium (Ca)			107.7		%		70-130	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-19 CRM		**TILL-2**						
Chromium (Cr)			100.8		%		70-130	07-OCT-21
Cobalt (Co)			101.5		%		70-130	07-OCT-21
Copper (Cu)			101.0		%		70-130	07-OCT-21
Iron (Fe)			99.3		%		70-130	07-OCT-21
Lead (Pb)			93.0		%		70-130	07-OCT-21
Lithium (Li)			96.8		%		70-130	07-OCT-21
Magnesium (Mg)			97.3		%		70-130	07-OCT-21
Manganese (Mn)			95.3		%		70-130	07-OCT-21
Molybdenum (Mo)			99.2		%		70-130	07-OCT-21
Nickel (Ni)			98.4		%		70-130	07-OCT-21
Phosphorus (P)			103.3		%		70-130	07-OCT-21
Potassium (K)			98.2		%		70-130	07-OCT-21
Selenium (Se)			0.33		mg/kg		0.15-0.55	07-OCT-21
Silver (Ag)			0.26		mg/kg		0.16-0.36	07-OCT-21
Sodium (Na)			91.4		%		70-130	07-OCT-21
Strontium (Sr)			93.9		%		70-130	07-OCT-21
Thallium (Tl)			94.2		%		70-130	07-OCT-21
Tin (Sn)			2.3		mg/kg		0.2-4.2	07-OCT-21
Titanium (Ti)			102.9		%		70-130	07-OCT-21
Tungsten (W)			1.15		mg/kg		1-2	07-OCT-21
Uranium (U)			92.5		%		70-130	07-OCT-21
Vanadium (V)			101.1		%		70-130	07-OCT-21
Zinc (Zn)			96.6		%		70-130	07-OCT-21
Zirconium (Zr)			104.6		%		70-130	07-OCT-21
WG3632545-4 CRM		**TILL-2**						
Aluminum (Al)			97.7		%		70-130	06-OCT-21
Antimony (Sb)			102.1		%		70-130	06-OCT-21
Arsenic (As)			104.6		%		70-130	06-OCT-21
Barium (Ba)			113.8		%		70-130	06-OCT-21
Beryllium (Be)			90.9		%		70-130	06-OCT-21
Bismuth (Bi)			95.2		%		70-130	06-OCT-21
Cadmium (Cd)			105.2		%		70-130	06-OCT-21
Calcium (Ca)			99.4		%		70-130	06-OCT-21
Chromium (Cr)			100.6		%		70-130	06-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-4 CRM		**TILL-2**						
Cobalt (Co)			104.0		%		70-130	06-OCT-21
Copper (Cu)			102.4		%		70-130	06-OCT-21
Iron (Fe)			100.7		%		70-130	06-OCT-21
Lead (Pb)			101.4		%		70-130	06-OCT-21
Lithium (Li)			100.4		%		70-130	06-OCT-21
Magnesium (Mg)			103.0		%		70-130	06-OCT-21
Manganese (Mn)			106.1		%		70-130	06-OCT-21
Molybdenum (Mo)			92.8		%		70-130	06-OCT-21
Nickel (Ni)			102.4		%		70-130	06-OCT-21
Phosphorus (P)			97.3		%		70-130	06-OCT-21
Potassium (K)			93.3		%		70-130	06-OCT-21
Selenium (Se)			0.41		mg/kg		0.15-0.55	06-OCT-21
Silver (Ag)			0.25		mg/kg		0.16-0.36	06-OCT-21
Sodium (Na)			90.9		%		70-130	06-OCT-21
Strontium (Sr)			99.8		%		70-130	06-OCT-21
Thallium (Tl)			109.0		%		70-130	06-OCT-21
Tin (Sn)			2.2		mg/kg		0.2-4.2	06-OCT-21
Titanium (Ti)			92.8		%		70-130	06-OCT-21
Tungsten (W)			1.47		mg/kg		1-2	06-OCT-21
Uranium (U)			93.0		%		70-130	06-OCT-21
Vanadium (V)			101.3		%		70-130	06-OCT-21
Zinc (Zn)			95.2		%		70-130	06-OCT-21
Zirconium (Zr)			91.6		%		70-130	06-OCT-21
WG3632545-9 CRM		**TILL-2**						
Aluminum (Al)			95.3		%		70-130	07-OCT-21
Antimony (Sb)			112.6		%		70-130	07-OCT-21
Arsenic (As)			111.0		%		70-130	07-OCT-21
Barium (Ba)			101.9		%		70-130	07-OCT-21
Beryllium (Be)			105.4		%		70-130	07-OCT-21
Bismuth (Bi)			114.0		%		70-130	07-OCT-21
Cadmium (Cd)			104.3		%		70-130	07-OCT-21
Calcium (Ca)			104.1		%		70-130	07-OCT-21
Chromium (Cr)			109.8		%		70-130	07-OCT-21
Cobalt (Co)			107.1		%		70-130	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-9 CRM		**TILL-2**						
Copper (Cu)			102.5		%		70-130	07-OCT-21
Iron (Fe)			107.0		%		70-130	07-OCT-21
Lead (Pb)			108.0		%		70-130	07-OCT-21
Lithium (Li)			108.5		%		70-130	07-OCT-21
Magnesium (Mg)			97.5		%		70-130	07-OCT-21
Manganese (Mn)			97.7		%		70-130	07-OCT-21
Molybdenum (Mo)			110.1		%		70-130	07-OCT-21
Nickel (Ni)			109.3		%		70-130	07-OCT-21
Phosphorus (P)			108.7		%		70-130	07-OCT-21
Potassium (K)			98.4		%		70-130	07-OCT-21
Selenium (Se)			0.37		mg/kg		0.15-0.55	07-OCT-21
Silver (Ag)			0.30		mg/kg		0.16-0.36	07-OCT-21
Sodium (Na)			95.9		%		70-130	07-OCT-21
Strontium (Sr)			103.0		%		70-130	07-OCT-21
Thallium (Tl)			110.8		%		70-130	07-OCT-21
Tin (Sn)			2.4		mg/kg		0.2-4.2	07-OCT-21
Titanium (Ti)			101.0		%		70-130	07-OCT-21
Tungsten (W)			1.61		mg/kg		1-2	07-OCT-21
Uranium (U)			112.6		%		70-130	07-OCT-21
Vanadium (V)			103.5		%		70-130	07-OCT-21
Zinc (Zn)			111.2		%		70-130	07-OCT-21
Zirconium (Zr)			105.4		%		70-130	07-OCT-21
WG3632545-10 DUP		**L2644315-5**						
Aluminum (Al)		8330	7810		mg/kg	6.5	40	07-OCT-21
Antimony (Sb)		1.34	1.32		mg/kg	1.3	30	07-OCT-21
Arsenic (As)		6.56	6.77		mg/kg	3.1	30	07-OCT-21
Barium (Ba)		300	313		mg/kg	4.3	40	07-OCT-21
Beryllium (Be)		0.62	0.63		mg/kg	2.6	30	07-OCT-21
Bismuth (Bi)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	07-OCT-21
Boron (B)		<5.0	<5.0	RPD-NA	mg/kg	N/A	30	07-OCT-21
Cadmium (Cd)		2.04	2.14		mg/kg	4.8	30	07-OCT-21
Calcium (Ca)		5690	5880		mg/kg	3.2	30	07-OCT-21
Chromium (Cr)		15.8	15.2		mg/kg	3.8	30	07-OCT-21
Cobalt (Co)		6.43	6.57		mg/kg	2.1	30	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-10 DUP		**L2644315-5**						
Copper (Cu)		16.5	17.1		mg/kg	3.7	30	07-OCT-21
Iron (Fe)		16000	15600		mg/kg	2.3	30	07-OCT-21
Lead (Pb)		9.43	9.50		mg/kg	0.8	40	07-OCT-21
Lithium (Li)		9.7	9.4		mg/kg	2.6	30	07-OCT-21
Magnesium (Mg)		2230	2230		mg/kg	0.3	30	07-OCT-21
Manganese (Mn)		296	311		mg/kg	5.3	30	07-OCT-21
Molybdenum (Mo)		1.55	1.63		mg/kg	4.8	40	07-OCT-21
Nickel (Ni)		26.3	27.0		mg/kg	2.5	30	07-OCT-21
Phosphorus (P)		1330	1240		mg/kg	7.5	30	07-OCT-21
Potassium (K)		1450	1210		mg/kg	18	40	07-OCT-21
Selenium (Se)		1.03	1.02		mg/kg	1.0	30	07-OCT-21
Silver (Ag)		0.28	0.27		mg/kg	2.7	40	07-OCT-21
Sodium (Na)		<50	<50	RPD-NA	mg/kg	N/A	40	07-OCT-21
Strontium (Sr)		40.5	41.6		mg/kg	2.7	40	07-OCT-21
Sulfur (S)		<1000	<1000	RPD-NA	mg/kg	N/A	30	07-OCT-21
Thallium (Tl)		0.220	0.217		mg/kg	1.2	30	07-OCT-21
Tin (Sn)		<2.0	<2.0	RPD-NA	mg/kg	N/A	40	07-OCT-21
Titanium (Ti)		28.4	26.0		mg/kg	9.1	40	07-OCT-21
Tungsten (W)		<0.50	<0.50	RPD-NA	mg/kg	N/A	30	07-OCT-21
Uranium (U)		1.31	1.29		mg/kg	1.2	30	07-OCT-21
Vanadium (V)		49.3	47.6		mg/kg	3.4	30	07-OCT-21
Zinc (Zn)		114	110		mg/kg	2.9	30	07-OCT-21
Zirconium (Zr)		<1.0	<1.0	RPD-NA	mg/kg	N/A	30	07-OCT-21
WG3632545-15 DUP		**L2644315-26**						
Aluminum (Al)		670	733		mg/kg	9.0	40	08-OCT-21
Antimony (Sb)		0.15	0.16		mg/kg	4.2	30	08-OCT-21
Arsenic (As)		1.27	1.22		mg/kg	3.9	30	08-OCT-21
Barium (Ba)		124	113		mg/kg	9.6	40	08-OCT-21
Beryllium (Be)		0.21	0.20		mg/kg	5.3	30	08-OCT-21
Bismuth (Bi)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	08-OCT-21
Boron (B)		5.4	5.5		mg/kg	2.5	30	08-OCT-21
Cadmium (Cd)		5.11	4.48		mg/kg	13	30	08-OCT-21
Calcium (Ca)		235000	207000		mg/kg	12	30	08-OCT-21
Chromium (Cr)		1.17	1.22		mg/kg	3.9	30	08-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-15 DUP		**L2644315-26**						
Cobalt (Co)		170	156		mg/kg	8.3	30	08-OCT-21
Copper (Cu)		3.89	3.64		mg/kg	6.6	30	08-OCT-21
Iron (Fe)		2210	2130		mg/kg	3.5	30	08-OCT-21
Lead (Pb)		1.54	1.44		mg/kg	6.8	40	08-OCT-21
Lithium (Li)		<2.0	<2.0	RPD-NA	mg/kg	N/A	30	08-OCT-21
Magnesium (Mg)		4830	4440		mg/kg	8.4	30	08-OCT-21
Manganese (Mn)		1730	1570		mg/kg	9.8	30	08-OCT-21
Molybdenum (Mo)		0.23	0.24		mg/kg	1.3	40	08-OCT-21
Nickel (Ni)		171	154		mg/kg	10	30	08-OCT-21
Phosphorus (P)		184	179		mg/kg	2.5	30	08-OCT-21
Potassium (K)		220	230		mg/kg	5.9	40	08-OCT-21
Selenium (Se)		1.21	1.35		mg/kg	10	30	08-OCT-21
Silver (Ag)		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	08-OCT-21
Sodium (Na)		285	262		mg/kg	8.3	40	08-OCT-21
Strontium (Sr)		316	287		mg/kg	9.6	40	08-OCT-21
Sulfur (S)		4000	3700		mg/kg	9.0	30	08-OCT-21
Thallium (Tl)		0.091	0.096		mg/kg	5.7	30	08-OCT-21
Tin (Sn)		<2.0	<2.0	RPD-NA	mg/kg	N/A	40	08-OCT-21
Titanium (Ti)		1.9	3.7	J	mg/kg	1.8	2	08-OCT-21
Tungsten (W)		<0.50	<0.50	RPD-NA	mg/kg	N/A	30	08-OCT-21
Uranium (U)		1.46	1.38		mg/kg	5.7	30	08-OCT-21
Vanadium (V)		2.43	2.57		mg/kg	5.5	30	08-OCT-21
Zinc (Zn)		438	396		mg/kg	10	30	08-OCT-21
Zirconium (Zr)		<1.0	<1.0	RPD-NA	mg/kg	N/A	30	08-OCT-21
WG3632545-12 LCS								
Aluminum (Al)			100.5		%		80-120	07-OCT-21
Antimony (Sb)			104.6		%		80-120	07-OCT-21
Arsenic (As)			100.7		%		80-120	07-OCT-21
Barium (Ba)			101.6		%		80-120	07-OCT-21
Beryllium (Be)			100.3		%		80-120	07-OCT-21
Bismuth (Bi)			94.6		%		80-120	07-OCT-21
Boron (B)			92.1		%		80-120	07-OCT-21
Cadmium (Cd)			99.7		%		80-120	07-OCT-21
Calcium (Ca)			96.8		%		80-120	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-12 LCS								
Chromium (Cr)			102.6		%		80-120	07-OCT-21
Cobalt (Co)			99.3		%		80-120	07-OCT-21
Copper (Cu)			95.0		%		80-120	07-OCT-21
Iron (Fe)			107.6		%		80-120	07-OCT-21
Lead (Pb)			95.9		%		80-120	07-OCT-21
Lithium (Li)			101.3		%		80-120	07-OCT-21
Magnesium (Mg)			97.8		%		80-120	07-OCT-21
Manganese (Mn)			100.6		%		80-120	07-OCT-21
Molybdenum (Mo)			99.5		%		80-120	07-OCT-21
Nickel (Ni)			99.8		%		80-120	07-OCT-21
Phosphorus (P)			108.4		%		80-120	07-OCT-21
Potassium (K)			100.3		%		80-120	07-OCT-21
Selenium (Se)			103.2		%		80-120	07-OCT-21
Silver (Ag)			105.3		%		80-120	07-OCT-21
Sodium (Na)			100.1		%		80-120	07-OCT-21
Strontium (Sr)			96.8		%		80-120	07-OCT-21
Sulfur (S)			96.5		%		80-120	07-OCT-21
Thallium (Tl)			96.4		%		80-120	07-OCT-21
Tin (Sn)			99.3		%		80-120	07-OCT-21
Titanium (Ti)			92.1		%		80-120	07-OCT-21
Tungsten (W)			101.5		%		80-120	07-OCT-21
Uranium (U)			103.9		%		80-120	07-OCT-21
Vanadium (V)			101.8		%		80-120	07-OCT-21
Zinc (Zn)			102.3		%		80-120	07-OCT-21
Zirconium (Zr)			103.9		%		80-120	07-OCT-21
WG3632545-17 LCS								
Aluminum (Al)			99.7		%		80-120	07-OCT-21
Antimony (Sb)			106.3		%		80-120	07-OCT-21
Arsenic (As)			100.7		%		80-120	07-OCT-21
Barium (Ba)			100.2		%		80-120	07-OCT-21
Beryllium (Be)			98.3		%		80-120	07-OCT-21
Bismuth (Bi)			99.3		%		80-120	07-OCT-21
Boron (B)			90.2		%		80-120	07-OCT-21
Cadmium (Cd)			100.4		%		80-120	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-17 LCS								
Calcium (Ca)			97.2		%		80-120	07-OCT-21
Chromium (Cr)			99.4		%		80-120	07-OCT-21
Cobalt (Co)			100.0		%		80-120	07-OCT-21
Copper (Cu)			99.4		%		80-120	07-OCT-21
Iron (Fe)			104.3		%		80-120	07-OCT-21
Lead (Pb)			99.8		%		80-120	07-OCT-21
Lithium (Li)			95.5		%		80-120	07-OCT-21
Magnesium (Mg)			99.5		%		80-120	07-OCT-21
Manganese (Mn)			99.2		%		80-120	07-OCT-21
Molybdenum (Mo)			101.9		%		80-120	07-OCT-21
Nickel (Ni)			95.5		%		80-120	07-OCT-21
Phosphorus (P)			108.0		%		80-120	07-OCT-21
Potassium (K)			97.9		%		80-120	07-OCT-21
Selenium (Se)			100.0		%		80-120	07-OCT-21
Silver (Ag)			95.4		%		80-120	07-OCT-21
Sodium (Na)			95.3		%		80-120	07-OCT-21
Strontium (Sr)			92.8		%		80-120	07-OCT-21
Sulfur (S)			105.7		%		80-120	07-OCT-21
Thallium (Tl)			98.4		%		80-120	07-OCT-21
Tin (Sn)			101.0		%		80-120	07-OCT-21
Titanium (Ti)			104.5		%		80-120	07-OCT-21
Tungsten (W)			95.3		%		80-120	07-OCT-21
Uranium (U)			95.4		%		80-120	07-OCT-21
Vanadium (V)			101.0		%		80-120	07-OCT-21
Zinc (Zn)			96.8		%		80-120	07-OCT-21
Zirconium (Zr)			98.8		%		80-120	07-OCT-21
WG3632545-2 LCS								
Aluminum (Al)			105.8		%		80-120	06-OCT-21
Antimony (Sb)			102.3		%		80-120	06-OCT-21
Arsenic (As)			106.0		%		80-120	06-OCT-21
Barium (Ba)			109.6		%		80-120	06-OCT-21
Beryllium (Be)			99.6		%		80-120	06-OCT-21
Bismuth (Bi)			100.5		%		80-120	06-OCT-21
Boron (B)			101.1		%		80-120	06-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-2 LCS								
Cadmium (Cd)			102.1		%		80-120	06-OCT-21
Calcium (Ca)			104.9		%		80-120	06-OCT-21
Chromium (Cr)			104.2		%		80-120	06-OCT-21
Cobalt (Co)			104.4		%		80-120	06-OCT-21
Copper (Cu)			101.1		%		80-120	06-OCT-21
Iron (Fe)			109.1		%		80-120	06-OCT-21
Lead (Pb)			102.1		%		80-120	06-OCT-21
Lithium (Li)			107.0		%		80-120	06-OCT-21
Magnesium (Mg)			106.3		%		80-120	06-OCT-21
Manganese (Mn)			106.8		%		80-120	06-OCT-21
Molybdenum (Mo)			100.2		%		80-120	06-OCT-21
Nickel (Ni)			104.8		%		80-120	06-OCT-21
Phosphorus (P)			107.4		%		80-120	06-OCT-21
Potassium (K)			104.5		%		80-120	06-OCT-21
Selenium (Se)			109.3		%		80-120	06-OCT-21
Silver (Ag)			100.2		%		80-120	06-OCT-21
Sodium (Na)			105.3		%		80-120	06-OCT-21
Strontium (Sr)			105.0		%		80-120	06-OCT-21
Sulfur (S)			116.8		%		80-120	06-OCT-21
Thallium (Tl)			100.2		%		80-120	06-OCT-21
Tin (Sn)			102.3		%		80-120	06-OCT-21
Titanium (Ti)			101.1		%		80-120	06-OCT-21
Tungsten (W)			104.2		%		80-120	06-OCT-21
Uranium (U)			94.9		%		80-120	06-OCT-21
Vanadium (V)			106.8		%		80-120	06-OCT-21
Zinc (Zn)			96.1		%		80-120	06-OCT-21
Zirconium (Zr)			96.3		%		80-120	06-OCT-21
WG3632545-7 LCS								
Aluminum (Al)			105.9		%		80-120	07-OCT-21
Antimony (Sb)			117.3		%		80-120	07-OCT-21
Arsenic (As)			107.1		%		80-120	07-OCT-21
Barium (Ba)			105.8		%		80-120	07-OCT-21
Beryllium (Be)			111.1		%		80-120	07-OCT-21
Bismuth (Bi)			106.6		%		80-120	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-7 LCS								
Boron (B)			104.5		%		80-120	07-OCT-21
Cadmium (Cd)			105.1		%		80-120	07-OCT-21
Calcium (Ca)			107.3		%		80-120	07-OCT-21
Chromium (Cr)			110.2		%		80-120	07-OCT-21
Cobalt (Co)			107.0		%		80-120	07-OCT-21
Copper (Cu)			100.4		%		80-120	07-OCT-21
Iron (Fe)			117.2		%		80-120	07-OCT-21
Lead (Pb)			106.2		%		80-120	07-OCT-21
Lithium (Li)			113.3		%		80-120	07-OCT-21
Magnesium (Mg)			99.6		%		80-120	07-OCT-21
Manganese (Mn)			107.2		%		80-120	07-OCT-21
Molybdenum (Mo)			115.5		%		80-120	07-OCT-21
Nickel (Ni)			107.5		%		80-120	07-OCT-21
Phosphorus (P)			113.5		%		80-120	07-OCT-21
Potassium (K)			106.7		%		80-120	07-OCT-21
Selenium (Se)			110.5		%		80-120	07-OCT-21
Silver (Ag)			118.7		%		80-120	07-OCT-21
Sodium (Na)			103.0		%		80-120	07-OCT-21
Strontium (Sr)			109.8		%		80-120	07-OCT-21
Sulfur (S)			94.3		%		80-120	07-OCT-21
Thallium (Tl)			106.9		%		80-120	07-OCT-21
Tin (Sn)			110.3		%		80-120	07-OCT-21
Titanium (Ti)			102.2		%		80-120	07-OCT-21
Tungsten (W)			113.2		%		80-120	07-OCT-21
Uranium (U)			116.0		%		80-120	07-OCT-21
Vanadium (V)			107.3		%		80-120	07-OCT-21
Zinc (Zn)			108.3		%		80-120	07-OCT-21
Zirconium (Zr)			114.3		%		80-120	07-OCT-21
WG3632545-1 MB								
Aluminum (Al)			<50		mg/kg		50	06-OCT-21
Antimony (Sb)			<0.10		mg/kg		0.1	06-OCT-21
Arsenic (As)			<0.10		mg/kg		0.1	06-OCT-21
Barium (Ba)			<0.50		mg/kg		0.5	06-OCT-21
Beryllium (Be)			<0.10		mg/kg		0.1	06-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-1 MB								
Bismuth (Bi)			<0.20		mg/kg		0.2	06-OCT-21
Boron (B)			<5.0		mg/kg		5	06-OCT-21
Cadmium (Cd)			<0.020		mg/kg		0.02	06-OCT-21
Calcium (Ca)			<50		mg/kg		50	06-OCT-21
Chromium (Cr)			<0.50		mg/kg		0.5	06-OCT-21
Cobalt (Co)			<0.10		mg/kg		0.1	06-OCT-21
Copper (Cu)			<0.50		mg/kg		0.5	06-OCT-21
Iron (Fe)			<50		mg/kg		50	06-OCT-21
Lead (Pb)			<0.50		mg/kg		0.5	06-OCT-21
Lithium (Li)			<2.0		mg/kg		2	06-OCT-21
Magnesium (Mg)			<20		mg/kg		20	06-OCT-21
Manganese (Mn)			<1.0		mg/kg		1	06-OCT-21
Molybdenum (Mo)			<0.10		mg/kg		0.1	06-OCT-21
Nickel (Ni)			<0.50		mg/kg		0.5	06-OCT-21
Phosphorus (P)			<50		mg/kg		50	06-OCT-21
Potassium (K)			<100		mg/kg		100	06-OCT-21
Selenium (Se)			<0.20		mg/kg		0.2	06-OCT-21
Silver (Ag)			<0.10		mg/kg		0.1	06-OCT-21
Sodium (Na)			<50		mg/kg		50	06-OCT-21
Strontium (Sr)			<0.50		mg/kg		0.5	06-OCT-21
Sulfur (S)			<1000		mg/kg		1000	06-OCT-21
Thallium (Tl)			<0.050		mg/kg		0.05	06-OCT-21
Tin (Sn)			<2.0		mg/kg		2	06-OCT-21
Titanium (Ti)			<1.0		mg/kg		1	06-OCT-21
Tungsten (W)			<0.50		mg/kg		0.5	06-OCT-21
Uranium (U)			<0.050		mg/kg		0.05	06-OCT-21
Vanadium (V)			<0.20		mg/kg		0.2	06-OCT-21
Zinc (Zn)			<2.0		mg/kg		2	06-OCT-21
Zirconium (Zr)			<1.0		mg/kg		1	06-OCT-21
WG3632545-11 MB								
Aluminum (Al)			<50		mg/kg		50	07-OCT-21
Antimony (Sb)			<0.10		mg/kg		0.1	07-OCT-21
Arsenic (As)			<0.10		mg/kg		0.1	07-OCT-21
Barium (Ba)			<0.50		mg/kg		0.5	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-11 MB								
Beryllium (Be)			<0.10		mg/kg		0.1	07-OCT-21
Bismuth (Bi)			<0.20		mg/kg		0.2	07-OCT-21
Boron (B)			<5.0		mg/kg		5	07-OCT-21
Cadmium (Cd)			<0.020		mg/kg		0.02	07-OCT-21
Calcium (Ca)			<50		mg/kg		50	07-OCT-21
Chromium (Cr)			<0.50		mg/kg		0.5	07-OCT-21
Cobalt (Co)			<0.10		mg/kg		0.1	07-OCT-21
Copper (Cu)			<0.50		mg/kg		0.5	07-OCT-21
Iron (Fe)			<50		mg/kg		50	07-OCT-21
Lead (Pb)			<0.50		mg/kg		0.5	07-OCT-21
Lithium (Li)			<2.0		mg/kg		2	07-OCT-21
Magnesium (Mg)			<20		mg/kg		20	07-OCT-21
Manganese (Mn)			<1.0		mg/kg		1	07-OCT-21
Molybdenum (Mo)			<0.10		mg/kg		0.1	07-OCT-21
Nickel (Ni)			<0.50		mg/kg		0.5	07-OCT-21
Phosphorus (P)			<50		mg/kg		50	07-OCT-21
Potassium (K)			<100		mg/kg		100	07-OCT-21
Selenium (Se)			<0.20		mg/kg		0.2	07-OCT-21
Silver (Ag)			<0.10		mg/kg		0.1	07-OCT-21
Sodium (Na)			<50		mg/kg		50	07-OCT-21
Strontium (Sr)			<0.50		mg/kg		0.5	07-OCT-21
Sulfur (S)			<1000		mg/kg		1000	07-OCT-21
Thallium (Tl)			<0.050		mg/kg		0.05	07-OCT-21
Tin (Sn)			<2.0		mg/kg		2	07-OCT-21
Titanium (Ti)			<1.0		mg/kg		1	07-OCT-21
Tungsten (W)			<0.50		mg/kg		0.5	07-OCT-21
Uranium (U)			<0.050		mg/kg		0.05	07-OCT-21
Vanadium (V)			<0.20		mg/kg		0.2	07-OCT-21
Zinc (Zn)			<2.0		mg/kg		2	07-OCT-21
Zirconium (Zr)			<1.0		mg/kg		1	07-OCT-21
WG3632545-16 MB								
Aluminum (Al)			<50		mg/kg		50	07-OCT-21
Antimony (Sb)			<0.10		mg/kg		0.1	07-OCT-21
Arsenic (As)			<0.10		mg/kg		0.1	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-16 MB								
Barium (Ba)			<0.50		mg/kg		0.5	07-OCT-21
Beryllium (Be)			<0.10		mg/kg		0.1	07-OCT-21
Bismuth (Bi)			<0.20		mg/kg		0.2	07-OCT-21
Boron (B)			<5.0		mg/kg		5	07-OCT-21
Cadmium (Cd)			<0.020		mg/kg		0.02	07-OCT-21
Calcium (Ca)			<50		mg/kg		50	07-OCT-21
Chromium (Cr)			<0.50		mg/kg		0.5	07-OCT-21
Cobalt (Co)			<0.10		mg/kg		0.1	07-OCT-21
Copper (Cu)			<0.50		mg/kg		0.5	07-OCT-21
Iron (Fe)			<50		mg/kg		50	07-OCT-21
Lead (Pb)			<0.50		mg/kg		0.5	07-OCT-21
Lithium (Li)			<2.0		mg/kg		2	07-OCT-21
Magnesium (Mg)			<20		mg/kg		20	07-OCT-21
Manganese (Mn)			<1.0		mg/kg		1	07-OCT-21
Molybdenum (Mo)			<0.10		mg/kg		0.1	07-OCT-21
Nickel (Ni)			<0.50		mg/kg		0.5	07-OCT-21
Phosphorus (P)			<50		mg/kg		50	07-OCT-21
Potassium (K)			<100		mg/kg		100	07-OCT-21
Selenium (Se)			<0.20		mg/kg		0.2	07-OCT-21
Silver (Ag)			<0.10		mg/kg		0.1	07-OCT-21
Sodium (Na)			<50		mg/kg		50	07-OCT-21
Strontium (Sr)			<0.50		mg/kg		0.5	07-OCT-21
Sulfur (S)			<1000		mg/kg		1000	07-OCT-21
Thallium (Tl)			<0.050		mg/kg		0.05	07-OCT-21
Tin (Sn)			<2.0		mg/kg		2	07-OCT-21
Titanium (Ti)			<1.0		mg/kg		1	07-OCT-21
Tungsten (W)			<0.50		mg/kg		0.5	07-OCT-21
Uranium (U)			<0.050		mg/kg		0.05	07-OCT-21
Vanadium (V)			<0.20		mg/kg		0.2	07-OCT-21
Zinc (Zn)			<2.0		mg/kg		2	07-OCT-21
Zirconium (Zr)			<1.0		mg/kg		1	07-OCT-21
WG3632545-6 MB								
Aluminum (Al)			<50		mg/kg		50	07-OCT-21
Antimony (Sb)			<0.10		mg/kg		0.1	07-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R5612016								
WG3632545-6 MB								
Arsenic (As)			<0.10		mg/kg		0.1	07-OCT-21
Barium (Ba)			<0.50		mg/kg		0.5	07-OCT-21
Beryllium (Be)			<0.10		mg/kg		0.1	07-OCT-21
Bismuth (Bi)			<0.20		mg/kg		0.2	07-OCT-21
Boron (B)			<5.0		mg/kg		5	07-OCT-21
Cadmium (Cd)			<0.020		mg/kg		0.02	07-OCT-21
Calcium (Ca)			<50		mg/kg		50	07-OCT-21
Chromium (Cr)			<0.50		mg/kg		0.5	07-OCT-21
Cobalt (Co)			<0.10		mg/kg		0.1	07-OCT-21
Copper (Cu)			<0.50		mg/kg		0.5	07-OCT-21
Iron (Fe)			<50		mg/kg		50	07-OCT-21
Lead (Pb)			<0.50		mg/kg		0.5	07-OCT-21
Lithium (Li)			<2.0		mg/kg		2	07-OCT-21
Magnesium (Mg)			<20		mg/kg		20	07-OCT-21
Manganese (Mn)			<1.0		mg/kg		1	07-OCT-21
Molybdenum (Mo)			<0.10		mg/kg		0.1	07-OCT-21
Nickel (Ni)			<0.50		mg/kg		0.5	07-OCT-21
Phosphorus (P)			<50		mg/kg		50	07-OCT-21
Potassium (K)			<100		mg/kg		100	07-OCT-21
Selenium (Se)			<0.20		mg/kg		0.2	07-OCT-21
Silver (Ag)			<0.10		mg/kg		0.1	07-OCT-21
Sodium (Na)			<50		mg/kg		50	07-OCT-21
Strontium (Sr)			<0.50		mg/kg		0.5	07-OCT-21
Sulfur (S)			<1000		mg/kg		1000	07-OCT-21
Thallium (Tl)			<0.050		mg/kg		0.05	07-OCT-21
Tin (Sn)			<2.0		mg/kg		2	07-OCT-21
Titanium (Ti)			<1.0		mg/kg		1	07-OCT-21
Tungsten (W)			<0.50		mg/kg		0.5	07-OCT-21
Uranium (U)			<0.050		mg/kg		0.05	07-OCT-21
Vanadium (V)			<0.20		mg/kg		0.2	07-OCT-21
Zinc (Zn)			<2.0		mg/kg		2	07-OCT-21
Zirconium (Zr)			<1.0		mg/kg		1	07-OCT-21
MOISTURE-CL	**Soil**							

[redacted]

Quality Control Report

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-CL		**Soil**							
Batch	**R5604085**								
WG3626752-3	**DUP**		**L2644315-1**						
Moisture			36.1	35.7		%	1.3	20	28-SEP-21
WG3626752-2	**LCS**								
Moisture				94.6		%		90-110	28-SEP-21
WG3626752-1	**MB**								
Moisture				<0.25		%		0.25	28-SEP-21
Batch	**R5604160**								
WG3626758-3	**DUP**		**L2644315-21**						
Moisture			90.3	95.0		%	5.1	20	29-SEP-21
WG3626758-2	**LCS**								
Moisture				95.0		%		90-110	29-SEP-21
WG3626758-1	**MB**								
Moisture				<0.25		%		0.25	29-SEP-21
PAH-TMB-H/A-MS-CL		**Soil**							
Batch	**R5606098**								
WG3629474-12	**DUP**		**L2644315-21**						
Acenaphthene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Acenaphthylene			<0.025	<0.025	RPD-NA	mg/kg	N/A	50	01-OCT-21
Anthracene			<0.020	<0.020	RPD-NA	mg/kg	N/A	50	01-OCT-21
Acridine			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Benz(a)anthracene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Benzo(a)pyrene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Benzo(b&j)fluoranthene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Benzo(e)pyrene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Benzo(g,h,i)perylene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Benzo(k)fluoranthene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Chrysene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Dibenz(a,h)anthracene			<0.025	<0.025	RPD-NA	mg/kg	N/A	50	01-OCT-21
Fluoranthene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Fluorene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Indeno(1,2,3-c,d)pyrene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
2-Methylnaphthalene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Naphthalene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Perylene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Phenanthrene			0.067	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
Pyrene			<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-12 DUP		**L2644315-21**						
1-Methylnaphthalene		0.025	<0.025	RPD-NA	mg/kg	N/A	50	01-OCT-21
Quinoline		<0.050	<0.050	RPD-NA	mg/kg	N/A	50	01-OCT-21
WG3629474-10 IRM		**ALS PAH RM2**						
Acenaphthene			89.7		%		60-130	01-OCT-21
Acenaphthylene			98.2		%		60-130	01-OCT-21
Anthracene			101.9		%		60-130	01-OCT-21
Acridine			88.5		%		60-130	01-OCT-21
Benz(a)anthracene			92.7		%		60-130	01-OCT-21
Benzo(a)pyrene			85.1		%		60-130	01-OCT-21
Benzo(b&j)fluoranthene			85.0		%		60-130	01-OCT-21
Benzo(e)pyrene			94.7		%		60-130	01-OCT-21
Benzo(g,h,i)perylene			89.0		%		60-130	01-OCT-21
Benzo(k)fluoranthene			73.9		%		60-130	01-OCT-21
Chrysene			91.0		%		60-130	01-OCT-21
Dibenz(a,h)anthracene			88.3		%		60-130	01-OCT-21
Fluoranthene			86.8		%		60-130	01-OCT-21
Fluorene			91.2		%		60-130	01-OCT-21
Indeno(1,2,3-c,d)pyrene			112.3		%		60-130	01-OCT-21
2-Methylnaphthalene			84.1		%		60-130	01-OCT-21
Naphthalene			78.9		%		50-130	01-OCT-21
Perylene			90.4		%		60-130	01-OCT-21
Phenanthrene			88.5		%		60-130	01-OCT-21
Pyrene			88.8		%		60-130	01-OCT-21
1-Methylnaphthalene			85.4		%		60-130	01-OCT-21
WG3629474-14 IRM		**ALS PAH RM2**						
Acenaphthene			76.8		%		60-130	01-OCT-21
Acenaphthylene			83.8		%		60-130	01-OCT-21
Anthracene			90.7		%		60-130	01-OCT-21
Acridine			86.7		%		60-130	01-OCT-21
Benz(a)anthracene			80.8		%		60-130	01-OCT-21
Benzo(a)pyrene			79.2		%		60-130	01-OCT-21
Benzo(b&j)fluoranthene			74.7		%		60-130	01-OCT-21
Benzo(e)pyrene			80.6		%		60-130	01-OCT-21
Benzo(g,h,i)perylene			75.2		%		60-130	01-OCT-21
Benzo(k)fluoranthene			64.2		%		60-130	01-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-14 IRM		**ALS PAH RM2**						
Chrysene			78.5		%		60-130	01-OCT-21
Dibenz(a,h)anthracene			70.1		%		60-130	01-OCT-21
Fluoranthene			74.6		%		60-130	01-OCT-21
Fluorene			78.3		%		60-130	01-OCT-21
Indeno(1,2,3-c,d)pyrene			93.0		%		60-130	01-OCT-21
2-Methylnaphthalene			75.9		%		60-130	01-OCT-21
Naphthalene			68.9		%		50-130	01-OCT-21
Perylene			83.6		%		60-130	01-OCT-21
Phenanthrene			77.6		%		60-130	01-OCT-21
Pyrene			77.3		%		60-130	01-OCT-21
1-Methylnaphthalene			72.8		%		60-130	01-OCT-21
WG3629474-18 IRM		**ALS PAH RM2**						
Acenaphthene			101.0		%		60-130	02-OCT-21
Acenaphthylene			99.6		%		60-130	02-OCT-21
Anthracene			112.9		%		60-130	02-OCT-21
Acridine			99.7		%		60-130	02-OCT-21
Benz(a)anthracene			98.0		%		60-130	02-OCT-21
Benzo(a)pyrene			85.8		%		60-130	02-OCT-21
Benzo(b&j)fluoranthene			91.2		%		60-130	02-OCT-21
Benzo(e)pyrene			98.3		%		60-130	02-OCT-21
Benzo(g,h,i)perylene			96.4		%		60-130	02-OCT-21
Benzo(k)fluoranthene			76.5		%		60-130	02-OCT-21
Chrysene			95.1		%		60-130	02-OCT-21
Dibenz(a,h)anthracene			87.7		%		60-130	02-OCT-21
Fluoranthene			92.1		%		60-130	02-OCT-21
Fluorene			101.0		%		60-130	02-OCT-21
Indeno(1,2,3-c,d)pyrene			105.8		%		60-130	02-OCT-21
2-Methylnaphthalene			95.8		%		60-130	02-OCT-21
Naphthalene			89.5		%		50-130	02-OCT-21
Perylene			91.8		%		60-130	02-OCT-21
Phenanthrene			97.6		%		60-130	02-OCT-21
Pyrene			94.9		%		60-130	02-OCT-21
1-Methylnaphthalene			93.4		%		60-130	02-OCT-21
WG3629474-3 IRM		**ALS PAH RM2**						
Acenaphthene			77.6		%		60-130	30-SEP-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-3 IRM		**ALS PAH RM2**						
Acenaphthylene			86.8		%		60-130	30-SEP-21
Anthracene			92.5		%		60-130	30-SEP-21
Acridine			91.4		%		60-130	30-SEP-21
Benz(a)anthracene			86.0		%		60-130	30-SEP-21
Benzo(a)pyrene			82.8		%		60-130	30-SEP-21
Benzo(b&j)fluoranthene			82.9		%		60-130	30-SEP-21
Benzo(e)pyrene			87.5		%		60-130	30-SEP-21
Benzo(g,h,i)perylene			77.9		%		60-130	30-SEP-21
Benzo(k)fluoranthene			63.5		%		60-130	30-SEP-21
Chrysene			84.1		%		60-130	30-SEP-21
Dibenz(a,h)anthracene			76.5		%		60-130	30-SEP-21
Fluoranthene			77.8		%		60-130	30-SEP-21
Fluorene			81.0		%		60-130	30-SEP-21
Indeno(1,2,3-c,d)pyrene			116.5		%		60-130	30-SEP-21
2-Methylnaphthalene			79.0		%		60-130	30-SEP-21
Naphthalene			76.2		%		50-130	30-SEP-21
Perylene			85.9		%		60-130	30-SEP-21
Phenanthrene			80.9		%		60-130	30-SEP-21
Pyrene			80.3		%		60-130	30-SEP-21
1-Methylnaphthalene			77.4		%		60-130	30-SEP-21
WG3629474-6 IRM		**ALS PAH RM2**						
Acenaphthene			88.0		%		60-130	01-OCT-21
Acenaphthylene			89.4		%		60-130	01-OCT-21
Anthracene			98.4		%		60-130	01-OCT-21
Acridine			80.9		%		60-130	01-OCT-21
Benz(a)anthracene			86.4		%		60-130	01-OCT-21
Benzo(a)pyrene			80.4		%		60-130	01-OCT-21
Benzo(b&j)fluoranthene			78.9		%		60-130	01-OCT-21
Benzo(e)pyrene			84.8		%		60-130	01-OCT-21
Benzo(g,h,i)perylene			78.5		%		60-130	01-OCT-21
Benzo(k)fluoranthene			68.1		%		60-130	01-OCT-21
Chrysene			85.6		%		60-130	01-OCT-21
Dibenz(a,h)anthracene			75.4		%		60-130	01-OCT-21
Fluoranthene			81.8		%		60-130	01-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-6 IRM		**ALS PAH RM2**						
Fluorene			90.2		%		60-130	01-OCT-21
Indeno(1,2,3-c,d)pyrene			110.5		%		60-130	01-OCT-21
2-Methylnaphthalene			81.7		%		60-130	01-OCT-21
Naphthalene			75.2		%		50-130	01-OCT-21
Perylene			68.0		%		60-130	01-OCT-21
Phenanthrene			85.5		%		60-130	01-OCT-21
Pyrene			84.4		%		60-130	01-OCT-21
1-Methylnaphthalene			81.5		%		60-130	01-OCT-21
WG3629474-13 LCS								
Acenaphthene			88.2		%		60-130	01-OCT-21
Acenaphthylene			86.5		%		60-130	01-OCT-21
Anthracene			92.3		%		60-130	01-OCT-21
Acridine			89.4		%		60-130	01-OCT-21
Benz(a)anthracene			91.8		%		60-130	01-OCT-21
Benzo(a)pyrene			84.1		%		60-130	01-OCT-21
Benzo(b&j)fluoranthene			85.9		%		60-130	01-OCT-21
Benzo(e)pyrene			90.2		%		60-130	01-OCT-21
Benzo(g,h,i)perylene			85.5		%		60-130	01-OCT-21
Benzo(k)fluoranthene			86.8		%		60-130	01-OCT-21
Chrysene			87.6		%		60-130	01-OCT-21
Dibenz(a,h)anthracene			81.2		%		60-130	01-OCT-21
Fluoranthene			86.1		%		60-130	01-OCT-21
Fluorene			91.0		%		60-130	01-OCT-21
Indeno(1,2,3-c,d)pyrene			81.5		%		60-130	01-OCT-21
2-Methylnaphthalene			91.3		%		60-130	01-OCT-21
Naphthalene			90.1		%		50-130	01-OCT-21
Perylene			83.9		%		60-130	01-OCT-21
Phenanthrene			93.3		%		60-130	01-OCT-21
Pyrene			88.3		%		60-130	01-OCT-21
1-Methylnaphthalene			90.1		%		60-130	01-OCT-21
Quinoline			82.6		%		60-130	01-OCT-21
WG3629474-17 LCS								
Acenaphthene			102.3		%		60-130	02-OCT-21
Acenaphthylene			98.2		%		60-130	02-OCT-21
Anthracene			102.3		%		60-130	02-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-17 LCS								
Acridine			96.5		%		60-130	02-OCT-21
Benz(a)anthracene			101.9		%		60-130	02-OCT-21
Benzo(a)pyrene			90.0		%		60-130	02-OCT-21
Benzo(b&j)fluoranthene			96.3		%		60-130	02-OCT-21
Benzo(e)pyrene			99.9		%		60-130	02-OCT-21
Benzo(g,h,i)perylene			100.5		%		60-130	02-OCT-21
Benzo(k)fluoranthene			91.4		%		60-130	02-OCT-21
Chrysene			99.0		%		60-130	02-OCT-21
Dibenz(a,h)anthracene			91.3		%		60-130	02-OCT-21
Fluoranthene			100.6		%		60-130	02-OCT-21
Fluorene			100.3		%		60-130	02-OCT-21
Indeno(1,2,3-c,d)pyrene			82.0		%		60-130	02-OCT-21
2-Methylnaphthalene			101.4		%		60-130	02-OCT-21
Naphthalene			100.7		%		50-130	02-OCT-21
Perylene			92.7		%		60-130	02-OCT-21
Phenanthrene			103.0		%		60-130	02-OCT-21
Pyrene			101.9		%		60-130	02-OCT-21
1-Methylnaphthalene			100.7		%		60-130	02-OCT-21
Quinoline			91.8		%		60-130	02-OCT-21
COMMENTS: Watery Sample								
WG3629474-2 LCS								
Acenaphthene			106.1		%		60-130	30-SEP-21
Acenaphthylene			102.8		%		60-130	30-SEP-21
Anthracene			109.4		%		60-130	30-SEP-21
Acridine			101.3		%		60-130	30-SEP-21
Benz(a)anthracene			113.1		%		60-130	30-SEP-21
Benzo(a)pyrene			105.6		%		60-130	30-SEP-21
Benzo(b&j)fluoranthene			107.8		%		60-130	30-SEP-21
Benzo(e)pyrene			111.7		%		60-130	30-SEP-21
Benzo(g,h,i)perylene			104.6		%		60-130	30-SEP-21
Benzo(k)fluoranthene			106.2		%		60-130	30-SEP-21
Chrysene			106.4		%		60-130	30-SEP-21
Dibenz(a,h)anthracene			99.9		%		60-130	30-SEP-21
Fluoranthene			104.3		%		60-130	30-SEP-21
Fluorene			105.2		%		60-130	30-SEP-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-2 LCS								
Indeno(1,2,3-c,d)pyrene			105.8		%		60-130	30-SEP-21
2-Methylnaphthalene			106.2		%		60-130	30-SEP-21
Naphthalene			104.1		%		50-130	30-SEP-21
Perylene			103.6		%		60-130	30-SEP-21
Phenanthrene			109.9		%		60-130	30-SEP-21
Pyrene			107.9		%		60-130	30-SEP-21
1-Methylnaphthalene			104.3		%		60-130	30-SEP-21
Quinoline			97.2		%		60-130	30-SEP-21
WG3629474-5 LCS								
Acenaphthene			90.4		%		60-130	01-OCT-21
Acenaphthylene			86.8		%		60-130	01-OCT-21
Anthracene			91.2		%		60-130	01-OCT-21
Acridine			88.0		%		60-130	01-OCT-21
Benz(a)anthracene			92.4		%		60-130	01-OCT-21
Benzo(a)pyrene			86.5		%		60-130	01-OCT-21
Benzo(b&j)fluoranthene			87.4		%		60-130	01-OCT-21
Benzo(e)pyrene			92.7		%		60-130	01-OCT-21
Benzo(g,h,i)perylene			86.3		%		60-130	01-OCT-21
Benzo(k)fluoranthene			87.5		%		60-130	01-OCT-21
Chrysene			90.4		%		60-130	01-OCT-21
Dibenz(a,h)anthracene			81.5		%		60-130	01-OCT-21
Fluoranthene			88.9		%		60-130	01-OCT-21
Fluorene			89.6		%		60-130	01-OCT-21
Indeno(1,2,3-c,d)pyrene			91.1		%		60-130	01-OCT-21
2-Methylnaphthalene			89.1		%		60-130	01-OCT-21
Naphthalene			90.1		%		50-130	01-OCT-21
Perylene			85.8		%		60-130	01-OCT-21
Phenanthrene			91.9		%		60-130	01-OCT-21
Pyrene			89.6		%		60-130	01-OCT-21
1-Methylnaphthalene			87.4		%		60-130	01-OCT-21
Quinoline			79.0		%		60-130	01-OCT-21
WG3629474-9 LCS								
Acenaphthene			102.9		%		60-130	01-OCT-21
Acenaphthylene			99.8		%		60-130	01-OCT-21
Anthracene			106.0		%		60-130	01-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-9 LCS								
Acridine			99.6		%		60-130	01-OCT-21
Benz(a)anthracene			101.2		%		60-130	01-OCT-21
Benzo(a)pyrene			94.2		%		60-130	01-OCT-21
Benzo(b&j)fluoranthene			95.9		%		60-130	01-OCT-21
Benzo(e)pyrene			101.4		%		60-130	01-OCT-21
Benzo(g,h,i)perylene			100.0		%		60-130	01-OCT-21
Benzo(k)fluoranthene			99.6		%		60-130	01-OCT-21
Chrysene			102.0		%		60-130	01-OCT-21
Dibenz(a,h)anthracene			88.8		%		60-130	01-OCT-21
Fluoranthene			101.9		%		60-130	01-OCT-21
Fluorene			104.5		%		60-130	01-OCT-21
Indeno(1,2,3-c,d)pyrene			104.6		%		60-130	01-OCT-21
2-Methylnaphthalene			103.4		%		60-130	01-OCT-21
Naphthalene			101.8		%		50-130	01-OCT-21
Perylene			93.7		%		60-130	01-OCT-21
Phenanthrene			107.6		%		60-130	01-OCT-21
Pyrene			103.0		%		60-130	01-OCT-21
1-Methylnaphthalene			99.0		%		60-130	01-OCT-21
Quinoline			91.2		%		60-130	01-OCT-21
WG3629474-1 MB								
Acenaphthene			<0.0050		mg/kg		0.005	30-SEP-21
Acenaphthylene			<0.0050		mg/kg		0.005	30-SEP-21
Anthracene			<0.0040		mg/kg		0.004	30-SEP-21
Acridine			<0.010		mg/kg		0.01	30-SEP-21
Benz(a)anthracene			<0.010		mg/kg		0.01	30-SEP-21
Benzo(a)pyrene			<0.010		mg/kg		0.01	30-SEP-21
Benzo(b&j)fluoranthene			<0.010		mg/kg		0.01	30-SEP-21
Benzo(e)pyrene			<0.010		mg/kg		0.01	30-SEP-21
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	30-SEP-21
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	30-SEP-21
Chrysene			<0.010		mg/kg		0.01	30-SEP-21
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	30-SEP-21
Fluoranthene			<0.010		mg/kg		0.01	30-SEP-21
Fluorene			<0.010		mg/kg		0.01	30-SEP-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-1 MB								
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	30-SEP-21
2-Methylnaphthalene			<0.010		mg/kg		0.01	30-SEP-21
Naphthalene			<0.010		mg/kg		0.01	30-SEP-21
Perylene			<0.010		mg/kg		0.01	30-SEP-21
Phenanthrene			<0.010		mg/kg		0.01	30-SEP-21
Pyrene			<0.010		mg/kg		0.01	30-SEP-21
1-Methylnaphthalene			<0.050		mg/kg		0.05	30-SEP-21
Quinoline			<0.050		mg/kg		0.05	30-SEP-21
Surrogate: d8-Naphthalene			80.6		%		50-130	30-SEP-21
Surrogate: d10-Acenaphthene			80.3		%		60-130	30-SEP-21
Surrogate: d10-Phenanthrene			87.6		%		60-130	30-SEP-21
Surrogate: d12-Chrysene			88.5		%		60-130	30-SEP-21
WG3629474-11 MB								
Acenaphthene			<0.0050		mg/kg		0.005	01-OCT-21
Acenaphthylene			<0.0050		mg/kg		0.005	01-OCT-21
Anthracene			<0.0040		mg/kg		0.004	01-OCT-21
Acridine			<0.010		mg/kg		0.01	01-OCT-21
Benz(a)anthracene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(a)pyrene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(b&j)fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(e)pyrene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Chrysene			<0.010		mg/kg		0.01	01-OCT-21
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	01-OCT-21
Fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Fluorene			<0.010		mg/kg		0.01	01-OCT-21
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	01-OCT-21
2-Methylnaphthalene			<0.010		mg/kg		0.01	01-OCT-21
Naphthalene			<0.010		mg/kg		0.01	01-OCT-21
Perylene			<0.010		mg/kg		0.01	01-OCT-21
Phenanthrene			<0.010		mg/kg		0.01	01-OCT-21
Pyrene			<0.010		mg/kg		0.01	01-OCT-21
1-Methylnaphthalene			<0.050		mg/kg		0.05	01-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-11 MB								
Quinoline			<0.050		mg/kg		0.05	01-OCT-21
Surrogate: d8-Naphthalene			76.4		%		50-130	01-OCT-21
Surrogate: d10-Acenaphthene			78.0		%		60-130	01-OCT-21
Surrogate: d10-Phenanthrene			83.7		%		60-130	01-OCT-21
Surrogate: d12-Chrysene			82.1		%		60-130	01-OCT-21
WG3629474-15 MB								
Acenaphthene			<0.0050		mg/kg		0.005	01-OCT-21
Acenaphthylene			<0.0050		mg/kg		0.005	01-OCT-21
Anthracene			<0.0040		mg/kg		0.004	01-OCT-21
Acridine			<0.010		mg/kg		0.01	01-OCT-21
Benz(a)anthracene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(a)pyrene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(b&j)fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(e)pyrene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Chrysene			<0.010		mg/kg		0.01	01-OCT-21
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	01-OCT-21
Fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Fluorene			<0.010		mg/kg		0.01	01-OCT-21
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	01-OCT-21
2-Methylnaphthalene			<0.010		mg/kg		0.01	01-OCT-21
Naphthalene			<0.010		mg/kg		0.01	01-OCT-21
Perylene			<0.010		mg/kg		0.01	01-OCT-21
Phenanthrene			<0.010		mg/kg		0.01	01-OCT-21
Pyrene			<0.010		mg/kg		0.01	01-OCT-21
1-Methylnaphthalene			<0.050		mg/kg		0.05	01-OCT-21
Quinoline			<0.050		mg/kg		0.05	01-OCT-21
Surrogate: d8-Naphthalene			81.0		%		50-130	01-OCT-21
Surrogate: d10-Acenaphthene			84.4		%		60-130	01-OCT-21
Surrogate: d10-Phenanthrene			93.3		%		60-130	01-OCT-21
Surrogate: d12-Chrysene			96.2		%		60-130	01-OCT-21
WG3629474-7 MB								
Acenaphthene			<0.0050		mg/kg		0.005	01-OCT-21
Acenaphthylene			<0.0050		mg/kg		0.005	01-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5606098								
WG3629474-7 MB								
Anthracene			<0.0040		mg/kg		0.004	01-OCT-21
Acridine			<0.010		mg/kg		0.01	01-OCT-21
Benz(a)anthracene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(a)pyrene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(b&j)fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(e)pyrene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	01-OCT-21
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Chrysene			<0.010		mg/kg		0.01	01-OCT-21
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	01-OCT-21
Fluoranthene			<0.010		mg/kg		0.01	01-OCT-21
Fluorene			<0.010		mg/kg		0.01	01-OCT-21
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	01-OCT-21
2-Methylnaphthalene			<0.010		mg/kg		0.01	01-OCT-21
Naphthalene			<0.010		mg/kg		0.01	01-OCT-21
Perylene			<0.010		mg/kg		0.01	01-OCT-21
Phenanthrene			<0.010		mg/kg		0.01	01-OCT-21
Pyrene			<0.010		mg/kg		0.01	01-OCT-21
1-Methylnaphthalene			<0.050		mg/kg		0.05	01-OCT-21
Quinoline			<0.050		mg/kg		0.05	01-OCT-21
Surrogate: d8-Naphthalene			76.0		%		50-130	01-OCT-21
Surrogate: d10-Acenaphthene			82.9		%		60-130	01-OCT-21
Surrogate: d10-Phenanthrene			93.2		%		60-130	01-OCT-21
Surrogate: d12-Chrysene			96.2		%		60-130	01-OCT-21
Batch R5610657								
WG3632375-5 DUP		**L2644315-1**						
Acenaphthene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-OCT-21
Acenaphthylene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-OCT-21
Anthracene		<0.0040	<0.0040	RPD-NA	mg/kg	N/A	50	06-OCT-21
Acridine		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-OCT-21
Benz(a)anthracene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-OCT-21
Benzo(a)pyrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-OCT-21
Benzo(b&j)fluoranthene		0.013	0.017		mg/kg	23	50	06-OCT-21
Benzo(e)pyrene		0.018	0.018		mg/kg	2.8	50	06-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5610657								
WG3632375-5 DUP		**L2644315-1**						
Benzo(g,h,i)perylene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-OCT-21
Benzo(k)fluoranthene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-OCT-21
Chrysene		0.036	0.029		mg/kg	23	50	06-OCT-21
Dibenz(a,h)anthracene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-OCT-21
Fluoranthene		<0.020	<0.020	RPD-NA	mg/kg	N/A	50	06-OCT-21
Fluorene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-OCT-21
Indeno(1,2,3-c,d)pyrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-OCT-21
2-Methylnaphthalene		0.086	0.067		mg/kg	25	50	06-OCT-21
Naphthalene		0.039	0.031		mg/kg	24	50	06-OCT-21
Perylene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-OCT-21
Phenanthrene		0.110	0.106		mg/kg	4.0	50	06-OCT-21
Pyrene		<0.020	<0.020	RPD-NA	mg/kg	N/A	50	06-OCT-21
1-Methylnaphthalene		0.070	0.058		mg/kg	18	50	06-OCT-21
Quinoline		<0.050	<0.050	RPD-NA	mg/kg	N/A	50	06-OCT-21
WG3632375-3 IRM		**ALS PAH RM2**						
Acenaphthene			87.0		%		60-130	05-OCT-21
Acenaphthylene			89.9		%		60-130	05-OCT-21
Anthracene			95.4		%		60-130	05-OCT-21
Acridine			88.5		%		60-130	05-OCT-21
Benz(a)anthracene			83.5		%		60-130	05-OCT-21
Benzo(a)pyrene			79.2		%		60-130	05-OCT-21
Benzo(b&j)fluoranthene			78.5		%		60-130	05-OCT-21
Benzo(e)pyrene			85.0		%		60-130	05-OCT-21
Benzo(g,h,i)perylene			77.3		%		60-130	05-OCT-21
Benzo(k)fluoranthene			65.5		%		60-130	05-OCT-21
Chrysene			84.6		%		60-130	05-OCT-21
Dibenz(a,h)anthracene			82.2		%		60-130	05-OCT-21
Fluoranthene			83.6		%		60-130	05-OCT-21
Fluorene			86.8		%		60-130	05-OCT-21
Indeno(1,2,3-c,d)pyrene			106.6		%		60-130	05-OCT-21
2-Methylnaphthalene			86.9		%		60-130	05-OCT-21
Naphthalene			85.8		%		50-130	05-OCT-21
Perylene			81.4		%		60-130	05-OCT-21
Phenanthrene			86.1		%		60-130	05-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5610657								
WG3632375-3 IRM		**ALS PAH RM2**						
Pyrene			86.8		%		60-130	05-OCT-21
1-Methylnaphthalene			86.1		%		60-130	05-OCT-21
WG3632375-9 IRM		**ALS PAH RM2**						
Acenaphthene			90.5		%		60-130	06-OCT-21
Acenaphthylene			99.0		%		60-130	06-OCT-21
Anthracene			102.1		%		60-130	06-OCT-21
Acridine			91.3		%		60-130	06-OCT-21
Benz(a)anthracene			87.5		%		60-130	06-OCT-21
Benzo(a)pyrene			83.7		%		60-130	06-OCT-21
Benzo(b&j)fluoranthene			82.8		%		60-130	06-OCT-21
Benzo(e)pyrene			88.5		%		60-130	06-OCT-21
Benzo(g,h,i)perylene			78.7		%		60-130	06-OCT-21
Benzo(k)fluoranthene			72.1		%		60-130	06-OCT-21
Chrysene			87.1		%		60-130	06-OCT-21
Dibenz(a,h)anthracene			83.7		%		60-130	06-OCT-21
Fluoranthene			83.3		%		60-130	06-OCT-21
Fluorene			90.4		%		60-130	06-OCT-21
Indeno(1,2,3-c,d)pyrene			111.0		%		60-130	06-OCT-21
2-Methylnaphthalene			89.7		%		60-130	06-OCT-21
Naphthalene			91.5		%		50-130	06-OCT-21
Perylene			86.8		%		60-130	06-OCT-21
Phenanthrene			86.5		%		60-130	06-OCT-21
Pyrene			86.1		%		60-130	06-OCT-21
1-Methylnaphthalene			88.9		%		60-130	06-OCT-21
WG3632375-4 LCS								
Acenaphthene			94.1		%		60-130	05-OCT-21
Acenaphthylene			91.8		%		60-130	05-OCT-21
Anthracene			97.1		%		60-130	05-OCT-21
Acridine			90.8		%		60-130	05-OCT-21
Benz(a)anthracene			99.1		%		60-130	05-OCT-21
Benzo(a)pyrene			94.0		%		60-130	05-OCT-21
Benzo(b&j)fluoranthene			96.3		%		60-130	05-OCT-21
Benzo(e)pyrene			99.0		%		60-130	05-OCT-21
Benzo(g,h,i)perylene			91.1		%		60-130	05-OCT-21
Benzo(k)fluoranthene			91.8		%		60-130	05-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5610657								
WG3632375-4 LCS								
Chrysene			94.8		%		60-130	05-OCT-21
Dibenz(a,h)anthracene			87.0		%		60-130	05-OCT-21
Fluoranthene			96.7		%		60-130	05-OCT-21
Fluorene			93.7		%		60-130	05-OCT-21
Indeno(1,2,3-c,d)pyrene			102.6		%		60-130	05-OCT-21
2-Methylnaphthalene			100.3		%		60-130	05-OCT-21
Naphthalene			95.7		%		50-130	05-OCT-21
Perylene			91.6		%		60-130	05-OCT-21
Phenanthrene			98.4		%		60-130	05-OCT-21
Pyrene			96.5		%		60-130	05-OCT-21
1-Methylnaphthalene			97.1		%		60-130	05-OCT-21
Quinoline			92.0		%		60-130	05-OCT-21
WG3632375-8 LCS								
Acenaphthene			98.2		%		60-130	06-OCT-21
Acenaphthylene			97.6		%		60-130	06-OCT-21
Anthracene			103.3		%		60-130	06-OCT-21
Acridine			94.9		%		60-130	06-OCT-21
Benz(a)anthracene			105.2		%		60-130	06-OCT-21
Benzo(a)pyrene			100.6		%		60-130	06-OCT-21
Benzo(b&j)fluoranthene			102.1		%		60-130	06-OCT-21
Benzo(e)pyrene			105.3		%		60-130	06-OCT-21
Benzo(g,h,i)perylene			96.3		%		60-130	06-OCT-21
Benzo(k)fluoranthene			98.6		%		60-130	06-OCT-21
Chrysene			99.1		%		60-130	06-OCT-21
Dibenz(a,h)anthracene			92.7		%		60-130	06-OCT-21
Fluoranthene			99.6		%		60-130	06-OCT-21
Fluorene			99.2		%		60-130	06-OCT-21
Indeno(1,2,3-c,d)pyrene			107.0		%		60-130	06-OCT-21
2-Methylnaphthalene			103.1		%		60-130	06-OCT-21
Naphthalene			102.7		%		50-130	06-OCT-21
Perylene			98.5		%		60-130	06-OCT-21
Phenanthrene			102.0		%		60-130	06-OCT-21
Pyrene			100.9		%		60-130	06-OCT-21
1-Methylnaphthalene			103.0		%		60-130	06-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5610657								
WG3632375-8 LCS								
Quinoline			99.2		%		60-130	06-OCT-21
WG3632375-1 MB								
Acenaphthene			<0.0050		mg/kg		0.005	05-OCT-21
Acenaphthylene			<0.0050		mg/kg		0.005	05-OCT-21
Anthracene			<0.0040		mg/kg		0.004	05-OCT-21
Acridine			<0.010		mg/kg		0.01	05-OCT-21
Benz(a)anthracene			<0.010		mg/kg		0.01	05-OCT-21
Benzo(a)pyrene			<0.010		mg/kg		0.01	05-OCT-21
Benzo(b&j)fluoranthene			<0.010		mg/kg		0.01	05-OCT-21
Benzo(e)pyrene			<0.010		mg/kg		0.01	05-OCT-21
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	05-OCT-21
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	05-OCT-21
Chrysene			<0.010		mg/kg		0.01	05-OCT-21
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	05-OCT-21
Fluoranthene			<0.010		mg/kg		0.01	05-OCT-21
Fluorene			<0.010		mg/kg		0.01	05-OCT-21
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	05-OCT-21
2-Methylnaphthalene			<0.010		mg/kg		0.01	05-OCT-21
Naphthalene			<0.010		mg/kg		0.01	05-OCT-21
Perylene			<0.010		mg/kg		0.01	05-OCT-21
Phenanthrene			<0.010		mg/kg		0.01	05-OCT-21
Pyrene			<0.010		mg/kg		0.01	05-OCT-21
1-Methylnaphthalene			<0.050		mg/kg		0.05	05-OCT-21
Quinoline			<0.050		mg/kg		0.05	05-OCT-21
Surrogate: d8-Naphthalene			73.5		%		50-130	05-OCT-21
Surrogate: d10-Acenaphthene			71.5		%		60-130	05-OCT-21
Surrogate: d10-Phenanthrene			80.9		%		60-130	05-OCT-21
Surrogate: d12-Chrysene			87.4		%		60-130	05-OCT-21
WG3632375-6 MB								
Acenaphthene			<0.0050		mg/kg		0.005	06-OCT-21
Acenaphthylene			<0.0050		mg/kg		0.005	06-OCT-21
Anthracene			<0.0040		mg/kg		0.004	06-OCT-21
Acridine			<0.010		mg/kg		0.01	06-OCT-21
Benz(a)anthracene			<0.010		mg/kg		0.01	06-OCT-21
Benzo(a)pyrene			<0.010		mg/kg		0.01	06-OCT-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-CL	**Soil**							
Batch R5610657								
WG3632375-6 MB								
Benzo(b&j)fluoranthene			<0.010		mg/kg		0.01	06-OCT-21
Benzo(e)pyrene			<0.010		mg/kg		0.01	06-OCT-21
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	06-OCT-21
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	06-OCT-21
Chrysene			<0.010		mg/kg		0.01	06-OCT-21
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	06-OCT-21
Fluoranthene			<0.010		mg/kg		0.01	06-OCT-21
Fluorene			<0.010		mg/kg		0.01	06-OCT-21
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	06-OCT-21
2-Methylnaphthalene			<0.010		mg/kg		0.01	06-OCT-21
Naphthalene			<0.010		mg/kg		0.01	06-OCT-21
Perylene			<0.010		mg/kg		0.01	06-OCT-21
Phenanthrene			<0.010		mg/kg		0.01	06-OCT-21
Pyrene			<0.010		mg/kg		0.01	06-OCT-21
1-Methylnaphthalene			<0.050		mg/kg		0.05	06-OCT-21
Quinoline			<0.050		mg/kg		0.05	06-OCT-21
Surrogate: d8-Naphthalene			67.7		%		50-130	06-OCT-21
Surrogate: d10-Acenaphthene			65.6		%		60-130	06-OCT-21
Surrogate: d10-Phenanthrene			72.7		%		60-130	06-OCT-21
Surrogate: d12-Chrysene			76.3		%		60-130	06-OCT-21
PH-1:2-CL	**Soil**							
Batch R5613931								
WG3633633-9 DUP		**L2644315-30**						
pH (1:2 soil:water)		8.04	8.08	J	pH	0.04	0.2	07-OCT-21
WG3633633-2 IRM		**SAL-STD11**						
pH (1:2 soil:water)			8.02		pH		7.7-8.3	07-OCT-21
WG3633633-5 IRM		**SAL-STD11**						
pH (1:2 soil:water)			7.99		pH		7.7-8.3	07-OCT-21
WG3633633-8 IRM		**SAL-STD11**						
pH (1:2 soil:water)			8.07		pH		7.7-8.3	07-OCT-21
WG3633633-1 LCS								
pH (1:2 soil:water)			7.02		pH		6.8-7.2	07-OCT-21
WG3633633-4 LCS								
pH (1:2 soil:water)			7.01		pH		6.8-7.2	07-OCT-21
WG3633633-7 LCS								

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-1:2-CL	**Soil**							
Batch R5613931								
WG3633633-7 LCS								
pH (1:2 soil:water)			7.04		pH		6.8-7.2	07-OCT-21
PSA-PIPET-DETAIL-SK	**Soil**							
Batch R5611996								
WG3628439-1 DUP		**L2644315-8**						
% Gravel (>2mm)		6.7	6.7		%	0.0	25	06-OCT-21
% Sand (2.00mm - 1.00mm)		1.9	1.6	J	%	0.3	5	06-OCT-21
% Sand (1.00mm - 0.50mm)		4.0	3.7	J	%	0.3	5	06-OCT-21
% Sand (0.50mm - 0.25mm)		12.9	12.8	J	%	0.1	5	06-OCT-21
% Sand (0.25mm - 0.125mm)		17.2	17.8	J	%	0.6	5	06-OCT-21
% Sand (0.125mm - 0.063mm)		11.9	12.5	J	%	0.6	5	06-OCT-21
% Silt (0.063mm - 0.0312mm)		19.2	19.2	J	%	0.0	5	06-OCT-21
% Silt (0.0312mm - 0.004mm)		22.0	21.6	J	%	0.4	5	06-OCT-21
% Clay (<4um)		4.3	4.2	J	%	0.1	5	06-OCT-21
WG3628439-2 IRM		**2020-PSA_SOIL**						
% Sand (2.00mm - 1.00mm)			2.2		%		0-7.2	06-OCT-21
% Sand (1.00mm - 0.50mm)			3.6		%		0-8.7	06-OCT-21
% Sand (0.50mm - 0.25mm)			8.8		%		4-14	06-OCT-21
% Sand (0.25mm - 0.125mm)			16.6		%		11.7-21.7	06-OCT-21
% Sand (0.125mm - 0.063mm)			13.9		%		8.4-18.4	06-OCT-21
% Silt (0.063mm - 0.0312mm)			12.7		%		8.5-18.5	06-OCT-21
% Silt (0.0312mm - 0.004mm)			21.0		%		15.1-25.1	06-OCT-21
% Clay (<4um)			21.3		%		16.5-26.5	06-OCT-21
Batch R5611999								
WG3628441-1 DUP		**L2644315-25**						
% Gravel (>2mm)		<1.0	<1.0	RPD-NA	%	N/A	25	06-OCT-21
% Sand (2.00mm - 1.00mm)		8.8	9.0	J	%	0.2	5	06-OCT-21
% Sand (1.00mm - 0.50mm)		11.2	11.4	J	%	0.2	5	06-OCT-21
% Sand (0.50mm - 0.25mm)		7.2	6.3	J	%	0.9	5	06-OCT-21
% Sand (0.25mm - 0.125mm)		4.1	5.0	J	%	0.9	5	06-OCT-21
% Sand (0.125mm - 0.063mm)		10.1	9.2	J	%	0.9	5	06-OCT-21
% Silt (0.063mm - 0.0312mm)		21.2	21.7	J	%	0.4	5	06-OCT-21
% Silt (0.0312mm - 0.004mm)		29.9	30.1	J	%	0.2	5	06-OCT-21
% Clay (<4um)		7.2	7.1	J	%	0.2	5	06-OCT-21
WG3628441-2 IRM		**2020-PSA_SOIL**						

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PSA-PIPET-DETAIL-SK	**Soil**							
Batch R5611999								
WG3628441-2 IRM		**2020-PSA_SOIL**						
% Sand (2.00mm - 1.00mm)			2.9		%		0-7.2	06-OCT-21
% Sand (1.00mm - 0.50mm)			3.3		%		0-8.7	06-OCT-21
% Sand (0.50mm - 0.25mm)			8.5		%		4-14	06-OCT-21
% Sand (0.25mm - 0.125mm)			16.9		%		11.7-21.7	06-OCT-21
% Sand (0.125mm - 0.063mm)			13.6		%		8.4-18.4	06-OCT-21
% Silt (0.063mm - 0.0312mm)			12.6		%		8.5-18.5	06-OCT-21
% Silt (0.0312mm - 0.004mm)			20.8		%		15.1-25.1	06-OCT-21
% Clay (<4um)			21.4		%		16.5-26.5	06-OCT-21

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Teck

COC ID: **September CMO LAEMP 2021**

TURNAROUND TIME:

PROJECT/CLIENT INFO			
Facility Name / Job#	REP		
Project Manager	Cybele Heddle		
Email	cybele.heddle@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	250-425-8202		

LABORATORY			
Lab Name	ALS Calgary		
Lab Contact	Lyudmyla Shvets		
Email	lyudmyla.shvets@alsglobal.com		
Address	2559 29 Street NE		
City	Calgary	Province	AB
Postal Code	T1Y 7B5	Country	Canada
Phone Number	1 403 407 1794		

	Excel	PDF	EDD
cybele.heddle@teck.com	x	x	x
teckcoal@equisonline.com			x
[illegible]	x	x	x
[illegible]	x	x	x
[illegible]	x	x	x

L2644315-COFC

SAMPLE DETAILS / ANALYSIS REQUESTED (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

	Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	C-TOC-SK	MET-CCME+FULL-CL	MOISTURE-CL - % Moisture	PSA-PIPET-DETAIL-SK Particle Size	PAH-TMB-D/A-MS-CL-PAHs
FILTERED									N	N	N	N	N
PRESERVED									NONE	NONE	NONE	NONE	NONE
1	RG_MI5_SE-1_2021-09-16_1045	RG_MI5	SE	No	9/16/2021	1045	G	2	X	X	X	X	X
2	RG_MI5_SE-2_2021-09-16_0920	RG_MI5	SE	No	9/16/2021	920	G	2	X	X	X	X	X
3	RG_MI5_SE-3_2021-09-16_0920	RG_MI5	SE	No	9/16/2021	920	G	2	X	X	X	X	X
4	RG_LE1_SE-1_2021-09-14_1100	RG_LE1	SE	No	9/14/2021	1100	G	2	X	X	X	X	X
5	RG_LE1_SE-2_2021-09-14_1000	RG_LE1	SE	No	9/14/2021	1000	G	2	X	X	X	X	X
6	RG_LE1_SE-3_2021-09-14_0920	RG_LE1	SE	No	9/14/2021	920	G	2	X	X	X	X	X
7	RG_MIULE_SE-1_2021-09-14_1430	RG_MIULE	SE	No	9/14/2021	1430	G	2	X	X	X	X	X
8	RG_MIULE_SE-2_2021-09-14_1345	RG_MIULE	SE	No	9/14/2021	1345	G	2	X	X	X	X	X
9	RG_MIULE_SE-3_2021-09-14_1345	RG_MIULE	SE	No	9/14/2021	1345	G	2	X	X	X	X	X
10	RG_MIULE_SE-4_2021-09-14_1250	RG_MIULE	SE	No	9/14/2021	1250	G	2	X	X	X	X	X
11	RG_MIULE_SE-5_2021-09-14_1250	RG_MIULE	SE	No	9/14/2021	1250	G	2	X	X	X	X	X
12	RG_MIDCO_SE-1_2021-09-15_1330	RG_MIDCO	SE	No	9/15/2021	1330	G	2	X	X	X	X	X
13	RG_MIDCO_SE-2_2021-09-15_1330	RG_MIDCO	SE	No	9/15/2021	1330	G	2	X	X	X	X	X
14	RG_MIDCO_SE-3_2021-09-15_1330	RG_MIDCO	SE	No	9/15/2021	1330	G	2	X	X	X	X	X
15	RG_MIDCO_SE-4_2021-09-15_1330	RG_MIDCO	SE	No	9/15/2021	1330	G	2	X	X	X	X	X
16	RG_MIDCO_SE-5_2021-09-15_1330	RG_MIDCO	SE	No	9/15/2021	1330	G	2	X	X	X	X	X
17	RG_MI5_SE-4_2021-09-15_1500	RG_MI5	SE	No	9/15/2021	1500	G	2	X	X	X	X	X
18	RG_MI5_SE-5_2021-09-15_1500	RG_MI5	SE	No	9/15/2021	1500	G	2	X	X	X	X	X
19	RG_MI25_SE-1_2021-09-15_1200	RG_MI25	SE	No	9/15/2021	1200	G	2	X	X	X	X	X
20	RG_MI25_SE-2_2021-09-15_1200	RG_MI25	SE	No	9/15/2021	1200	G	2	X	X	X	X	X
21	RG_MI25_SE-3_2021-09-15_1200	RG_MI25	SE	No	9/15/2021	1200	G	2	X	X	X	X	X
22	RG_RIVER_SE_1_2021-09-15_1200	RG_RIVER	SE	No	9/15/2021	1200	G	2	X	X	X	X	X
23	RG_MIDAG_SE_1_2021-09-15_1400	RG_MIDAG	SE	No	9/15/2021	1400	G	2	X	X	X	X	X
24	RG_MIUCO_SE_1_2021-09-15_1230	RG_MIUCO	SE	No	9/15/2021	1230	G	2	X	X	X	X	X
25	RG_MIUCO_SE_2_2021-09-15_1230	RG_MIUCO	SE	No	9/15/2021	1230	G	2	X	X	X	X	X
26	RG_MIUCO_SE_3_2021-09-15_1230	RG_MIUCO	SE	No	9/15/2021	1230	G	2	X	X	X	X	X
27	RG_CORCK_SE_1_2021_09-15_0830	RG_CORCK	SE	No	9/15/2021	830	G	2	X	X	X	X	X
28	RG_CORCK_SE_2_2021_09-15_0830	RG_CORCK	SE	No	9/15/2021	830	G	2	X	X	X	X	X
29	RG_CORCK_SE_3_2021_09-15_0945	RG_CORCK	SE	No	9/15/2021	945	G	2	X	X	X	X	X
30	RG_CORCK_SE_4_2021_09-15_0945	RG_CORCK	SE	No	9/15/2021	945	G	2	X	X	X	X	X
31	RG_CORCK_SE_5_2021_09-15_1100	RG_CORCK	SE	No	9/15/2021	1100	G	2	X	X	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
ALS PO 750546	Jennifer Ings/Minnow	################	[illegible]	9/28 [illegible]

NB OF BOTTLES RETURNED/DESCRIPTION

Methods and QC Report 2022

Project ID: CMO LAEMP (21-22)

Client: Minnow Environmental

Prepared by:
Cordillera Consulting Inc.
Summerland, BC

Unit 1, 13216 Henry Ave B1202
Summerland, BC, V0H 1Z0
www.cordilleraconsulting.ca

P: 250.494.7553
F: 250.494.7562

Table of Contents

Sample Reception

On September 29, 2021, Cordillera Consulting received 29 benthic samples from Minnow Environmental. When samples arrived to Cordillera Consulting, exterior packaging was initially inspected for damage or wet spots that would have indicated damage to the interior containers.

Samples were logged into a proprietary software database (INSTAR1) where the clients assigned sample name was recorded along with a Cordillera Consulting (CC) number for cross-reference. Each sample was checked to ensure that all sites and replicates recorded on field sheets or packing lists were delivered intact and with adequate preservative. Any missing, mislabelled or extra samples were reported to the client immediately to confirm the total numbers and correct names on the sample jars. The client representative was notified of the arrival of the shipment and provided a sample inventory once intake was completed.
See table below for sample inventory:

Table 1: Summary of sample information including Cordillera Consulting (CC) number

Sample	CC#	Date	Size	# of Jars
RG_MIUCO_BIC-1_2021-09-12	CC221379	9/12/2021	400µM	1
RG_MIUCO_BIC-2_2021-09-12	CC221380	9/12/2021	400µM	1
RG_MIUCO_BIC-3_2021-09-12	CC221381	9/12/2021	400µM	1
RG_MIDCO_BIC-1_2021-09-12	CC221382	9/12/2021	400µM	1
RG_MIDCO_BIC-2_2021-09-12	CC221383	9/12/2021	400µM	1
RG_MIDCO_BIC-3_2021-09-12	CC221384	9/12/2021	400µM	1
RG_MIDCO_BIC-4_2021-09-12	CC221385	9/12/2021	400µM	1
RG_MIDCO_BIC-5_2021-09-12	CC221386	9/12/2021	400µM	1
RG_LE1_BIC-1_2021-09-14	CC221387	9/14/2021	400µM	1
RG_LE1_BIC-2_2021-09-14	CC221388	9/14/2021	400µM	1
RG_LE1_BIC-3_2021-09-14	CC221389	9/14/2021	400µM	1
RG_AGCK_BIC-1_2021-09-11	CC221390	9/11/2021	400µM	1
RG_AGCK_BIC-2_2021-09-11	CC221391	9/11/2021	400µM	1
RG_AGCK_BIC-3_2021-09-11	CC221392	9/11/2021	400µM	1
RG_MIDAG_BIC-1_2021-09-11	CC221393	9/11/2021	400µM	1
RG_MIDAG_BIC-2_2021-09-11	CC221394	9/11/2021	400µM	1
RG_MIDAG_BIC-3_2021-09-11	CC221395	9/11/2021	400µM	1
RG_MI5_BIC-1_2021-09-15	CC221396	9/15/2021	400µM	1
RG_CORCK_BIC-1_2021-09-15	CC221397	9/15/2021	400µM	2
RG_CORCK_BIC-2_2021-09-15	CC221398	9/15/2021	400µM	4
RG_CORCK_BIC-3_2021-09-15	CC221399	9/15/2021	400µM	2
RG_MIULE_BIC-1_2021-09-14	CC221400	9/14/2021	400µM	1
RG_MIULE_BIC-2_2021-09-14	CC221401	9/14/2021	400µM	1
RG_MIULE_BIC-3_2021-09-14	CC221402	9/14/2021	400µM	1
RG_MI25_BIC-1_2021-09-13	CC221403	9/13/2021	400µM	1
RG_MI25_BIC-2_2021-09-13	CC221404	9/13/2021	400µM	1

RG_MI25_BIC-3_2021-09-13	CC221405	9/13/2021	400µM	1
RG_M15_BIC-2_2021-09-16	CC221406	9/16/2021	400µM	2
RG_M15_BIC-3_2021-09-16	CC221407	9/16/2021	400µM	2

Sample Sorting

- Using a gridded Petri dish, fine forceps and a low power stereo-microscope (Olympus, Nikon, Leica) the sorting technicians removed the invertebrates and sorted them into family/orders.
- The sorting technician kept a running tally of total numbers excluding organisms from Porifera, Nemata, Platyhelminthes, Ostracoda, Copepoda, Cladocera and terrestrial drop-ins such as aphids. These organisms were marked for their presence (given a value of 1) only and left in the sample. They were not included towards the 300-organism subsample count.
- Where specimens are broken or damaged, only heads were counted.
- Subsampling was conducted with the use of a Marchant Box.
- When using the Marchant box, cells were extracted at the same time in the order indicated by a random number table. If the 300th organism was found part way into sorting a cell then the balance of that cell was sorted. If the organism count had not reached 300 by the 50th cell then the entire sample was sorted.
- The total number of cells sorted and the number of organisms removed were recorded manually on a bench sheet and then recorded into INSTAR1
- Organisms were stored in vials containing 80% ethanol and an interior label indicating the site names, date of sampling, site code numbers and portion subsampled. This information was also recorded on the laboratory bench sheet and on INSTAR1.
- The sorted portion of the debris was preserved and labeled separately from the unsorted portion and was tested for sorting efficiency (Sorting Quality Control – Sorting Efficiency). The unsorted portion was also labeled and preserved in separate jars.

Percent sub-sampled and total countable invertebrates pulled from the samples were summarized in the table below.

Table 2: Percent sub-sample and invertebrate count for each sample

Sample	**Date**	**CC#**	**400 micron fraction**	
			% Sampled	**# Invertebrates**
RG_MIUCO_BIC-1_2021-09-12	12-Sep-21	CC221379	10%	513
RG_MIUCO_BIC-2_2021-09-12	12-Sep-21	CC221380	8%	325
RG_MIUCO_BIC-3_2021-09-12	12-Sep-21	CC221381	10%	453
RG_MIDCO_BIC-1_2021-09-12	12-Sep-21	CC221382	5%	476
RG_MIDCO_BIC-2_2021-09-12	12-Sep-21	CC221383	5%	620

RG_MIDCO_BIC-3_2021-09-12	12-Sep-21	CC221384	5%	621
RG_MIDCO_BIC-4_2021-09-12	12-Sep-21	CC221385	5%	565
RG_MIDCO_BIC-5_2021-09-12	12-Sep-21	CC221386	5%	588
RG_LE1_BIC-1_2021-09-14	14-Sep-21	CC221387	5%	376
RG_LE1_BIC-2_2021-09-14	14-Sep-21	CC221388	5%	426
RG_LE1_BIC-3_2021-09-14	14-Sep-21	CC221389	5%	604
RG_AGCK_BIC-1_2021-09-11	11-Sep-21	CC221390	5%	418
RG_AGCK_BIC-2_2021-09-11	11-Sep-21	CC221391	6%	351
RG_AGCK_BIC-3_2021-09-11	11-Sep-21	CC221392	7%	396
RG_MIDAG_BIC-1_2021-09-11	11-Sep-21	CC221393	5%	597
RG_MIDAG_BIC-2_2021-09-11	11-Sep-21	CC221394	5%	540
RG_MIDAG_BIC-3_2021-09-11	11-Sep-21	CC221395	10%	394
RG_MI5_BIC-1_2021-09-15	15-Sep-21	CC221396	100%	31
RG_CORCK_BIC-1_2021-09-15	15-Sep-21	CC221397	5%	444
RG_CORCK_BIC-2_2021-09-15	15-Sep-21	CC221398	5%	654
RG_CORCK_BIC-3_2021-09-15	15-Sep-21	CC221399	5%	453
RG_MIULE_BIC-1_2021-09-14	14-Sep-21	CC221400	5%	612
RG_MIULE_BIC-2_2021-09-14	14-Sep-21	CC221401	5%	529
RG_MIULE_BIC-3_2021-09-14	14-Sep-21	CC221402	5%	506
RG_MI25_BIC-1_2021-09-13	13-Sep-21	CC221403	5%	631
RG_MI25_BIC-2_2021-09-13	13-Sep-21	CC221404	5%	659
RG_MI25_BIC-3_2021-09-13	13-Sep-21	CC221405	5%	371
RG_M15_BIC-2_2021-09-16	16-Sep-21	CC221406	5%	1081
RG_M15_BIC-3_2021-09-16	16-Sep-21	CC221407	5%	332

Sorting Quality Control - Sorting Efficiency

As a part of Cordillera’s laboratory policy, all projects undergo sorting efficiency checks.

- As sorting progresses, 10% of samples were randomly chosen by senior members of the sorting team for resorting.
- All sorters working on a project had at least 1 sample resorted by another sorter.
- An efficiency of 90 % was expected (95% for CABIN samples).
- If 90/95% efficiency was not met, samples from that sorter were resorted.
- To calculated sorting efficiency the following formula was used:

$$\frac{\#OrganismsMissed}{TotalOrganismsFound} * 100 = \%OM$$

Table 3 Summary of sorting efficiency

		Total from Sample	Percent Efficiency
Site - QC, Sample - QC 1, CC# - CC221384, Percent sampled = 5%, Sieve size = 400			
No Invertebrates Found	0		
Total:	**0**	**621**	**100%**
Site - QC, Sample - QC 2, CC# - CC221386, Percent sampled = 5%, Sieve size = 400			
Oligochaeta	4		
Chironomidae	1		
Plecoptera	1		
Total:	**6**	**588**	**99%**
Site - QC, Sample - QC 3, CC# - CC221404, Percent sampled = 5%, Sieve size = 400			
Plecoptera	1		
Ephemerellidae	1		
Total:	**2**	**659**	**100%**

Sorting Quality Control - Sub-Sampling QC

Certain Provincial and Mining projects require additional sorting checks in the form of sub-sampling QC, (Environmental Effects Monitoring (EEM) protocol). This ensured that any fraction of the total sample that was examined was actually an accurate representation of the number of total organisms. Organisms from the additional sub-samples were not identified; rather total organism count only was compared.

Sub-Sampling efficiency was measured on 10% of the number of sub-sampled samples in the project. Ex. In a project where 50 of 100 total samples were processed through subsampling using a Marchant box, then 10% of 50; or 5 samples were used for sub sampling efficiency.

Sub-Sampling efficiency was performed by fractioning the entire sample into sub-sample percentages. On each sub-sampled portion, a total organism count was recorded and compared to the rest of the sub-samples. In order to pass, all fractions were required to be within 20% of total organism count.

Example: If 300 organisms are found in 10% of the sample, the sorter will continue to sample in 10% fractions until the entire sample is separated. They will then count the total number of organisms in each of the 10 fractions of 10% and compare the organism count.

When divergence is >20% the sorting manager examines for the source of the problem and takes steps to correct it. With the Marchant box, the problem typically rested with how the box is flipped back to the upright position. For this reason, subsampling was performed by experienced employees only. Another common source of error would be the type of debris in the sample. Samples with algae or heavy with periphyton have a higher incident of failure due to clumping than clear samples.

Table 4 Summary of Sub Sample efficiency

Station ID		Organisms in Subsample																				Sorter		Actual Total	Precision		Accuracy	
CC#	Sample Name	1	2	3	4	5	6	7	8	9	10											By	Time		Percent Range		Min	Max
221381	RG_MIUCO_BIC-3	448	449	434	416	454																CM	220	2201	0.22	8.37	1.41	5.50
221402	RG_MIULE_BIC-3	497	452	412	505	472																CM	240	2338	1.58	18.42	0.94	11.89
221395	RG_MIDAG_BIC-3	389	431	405	409	403	367	369	382	364	388											CM	450	3907	0.26	15.55	0.44	10.31

Taxonomic Effort

The next procedure was the identification to genus-species level where possible of all the organisms in the sample.

- Identifications were made at the genus/species level for all insect organisms found including Chironomidae (Based on CABIN protocol).
- Non-insect organisms (except those not included in CABIN count) were identified to genus/species where possible and to a minimum of family level with intact and mature specimens.
- The Standard Taxonomic Effort lists compiled by the CABIN manual[1], SAFIT[2] , and PNAMP[3] were used as a guide line for what level of identification to achieve where the condition and maturity of the organism enabled.
- Organisms from the same families/order were kept in separate vials with 80% ethanol and an interior label of printed laser paper.
- Chironomidae was identified to genus/species level where possible and was aided by slide mounts. CMC-10 was used to clear and mount the slide.
- Oligochaetes was identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slide.
- Other Annelida (leeches, polychaetes) were identified to the family/genus/species level with undamaged, mature specimens.
- Mollusca was identified to family and genus/species where possible
- Decapoda, Amphipoda and Isopoda were identified at family/genus/species level where possible.
- Bryozoans and Nemata remained at the phylum level
- Hydrachnidae and Cnidaria were identified at the family/genus level where possible.
- When requested, reference collections were made containing at least one individual from each taxa listed. Organisms represented will have been identified to the lowest practical level.
- Reference collection specimens were stored in 55 mm glass vials with screw-cap lids with polyseal inserts (museum quality). They were labeled with taxa name, site code, date identified and taxonomist name. The same information was applied to labels on the slide mounts.

Taxonomists

The taxonomists for this project were certified by the Society of Freshwater Science (SFS) Taxonomic Certification Program at level 2 which is the required certification for CABIN projects:

Scott Finlayson: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae (East/West); Group 4 Oligochaeta

Adam Bliss: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae
Rita Avery: Group 1 General Arthropods (East/West); Group 2 EPT (East/West)

Taxonomic QC

Taxonomic QC was performed in house by someone other than the original taxonomist.

- Quality control protocol involved complete, blind re-identification and re-enumeration of at least 10% of samples by a second SFS-certified taxonomist.
- Samples for taxonomic quality control were randomly selected and quality control procedures were conducted as the project progresses through the laboratories.

- The second (QC) taxonomist will calculate and record four types of errors:
    1. Misidentification error
    2. Enumeration error
    3. Questionable taxonomic resolution error
    4. Insufficient taxonomic resolution error

The QC coordinator then calculates the following estimates of taxonomic precision.

1. The percent total identification error rate is calculated as:

$$\frac{Sum\ of\ incorrect\ identifications}{total\ organisms\ counted\ in\ audit} * (100)$$

The average total identification error rate of audited samples did not exceed 5%. All samples that exceed a 5% error rate were re-evaluated to determine whether repeated errors or patterns in error contributed.

2. The percent difference in enumeration (PDE) to quantify the consistency of specimen counts.

$$PDE = \frac{|n_1 - n_2|}{n_1 + n_2} x100$$

3. The percent taxonomic disagreement (PTD) to quantify the shared precision between two sets of identifications.

$$PTD = \left(1 - \left[\frac{a}{N}\right]\right) x100$$

4. Bray Curtis dissimilarity Index to quantify the differences in identifications.

$$BC_{ij} = 1 - \frac{2C_{ij}}{S_j + S_i}$$

Error Summary

All samples report errors within the acceptable limits for CABIN Laboratory methods (less than 5% error).

Table 5 Summary of taxonomic error following QC

Site	Taxa Identified	% Error	PDE	PTD	Bray - Curtis Dissimilarity index
Site - 2021, Sample - RG_MIUCO_BIC-2_2021-09-12, CC# - CC221380, Percent sampled = 8%, Sieve size = 400	325	0.00	0	0.92307692	0.00923077
Site - 2021, Sample - RG_LE1_BIC-1_2021-09-14, CC# - CC221387, Percent sampled = 5%, Sieve size = 400	378	0.00	0.26525199	1.05820106	0.00795756
Site - 2021, Sample - RG_MI5_BIC-1_2021-09-15, CC# - CC221396, Percent sampled = 100%, Sieve size = 400	31	0.00	0	3.22580645	0.03225806

There will always be disagreements between taxonomists regarding the degree of taxonomic resolution in immature specimens and when laboratories make use of different keys for certain groups (Mollusks is an especially disputed group). It is always possible that some taxa found by the original taxonomist were overlooked in QC.

All of the Taxonomic QC samples that were observed passed testing according to the CABIN misidentification protocols. See the tables below for results from taxonomic QC audit.

Error Rationale

Site - 2021, Sample - RG_MIUCO_BIC-2_2021-09-12, CC# - CC221380, Percent sampled = 8%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Ameletus	1	1						
Baetidae	30	31	No			X		
Baetis	9	8	No			X		

Baetis rhodani group	37	37						
Brachycentrus	2	2						
Chironomidae	2	2						
Chironominae	1	2	No			X		
Chloroperlidae	2	2						
Cinygmula	17	17						
Cricotopus (Nostococladius)	5	5						
Doroneuria	1	1						
Drunella coloradensis	4	4						
Drunella doddsii	8	8						
Drunella grandis group	1	1						
Elmidae	5	4	No			X		
Epeorus	1	1						
Ephemerellidae	20	20						
Eukiefferiella	2	2						
Glossosomatidae	1	1						
Heptageniidae	11	11						
Heterlimnius	5	5						
Heterlimnius	15	15						
Hydrobaenus	1	1						
Hydropsychidae	1	1						
Kogotus	4	4						
Leptophlebiidae	2	2						
Leuctridae	1	1						
Mallochohelea	2	2						
Orthocladius complex	5	5						
Pagastia	1	1						
Parapsyche	1	1						
Pericoma/Telmatoscopus	61	61						
Pseudodiamesa	1	1						
Rhithrogena	6	6						
Rhyacophila	2	3	No			X		
Rhyacophila atrata complex	3	2	No			X		
Rhyacophila betteni group	2	2						
Rhyacophila narvae	2	2						
Sperchon	5	5						
Sweltsa	4	4						
Taeniopterygidae	21	21						
Thienemannimyia group	1	1						
Zapada	11	11						
Zapada cinctipes	7	7						
Zapada oregonensis group	1	1						

Total:	**325**	**325**						
					0	**6**	**0**	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				
Site - 2021, Sample - RG_LE1_BIC-1_2021-09-14, CC# - CC221387, Percent sampled = 5%, Sieve size = 400	**Laboratory Count**	**QC Audit Count**	**Agreement**	**Misidentification**	**Questionable Taxonomic Resolution**	**Enumeration**	**Insufficient Taxonomic Resolution**	**Comments**
Antocha	1	1						
Apatania	1	1						
Baetidae	49	48	No			X		
Baetis	1	2	No			X		
Baetis bicaudatus	1	1						
Baetis rhodani group	33	33						
Bezzia/ Palpomyia	2	2						
Brachycentrus	3	3						
Capniidae	2	2						
Caudatella	1	1						
Chironomidae	2	2						
Cinygmula	43	44	No			X		
Cricotopus (Nostococladius)	4	4						
Drunella doddsii	12	12						
Epeorus	1	1						
Ephemerellidae	15	15						
Eukiefferiella	4	4						
Glossosoma	25	24	No			X		
Glossosomatidae	5	6	No			X		
Heptageniidae	11	11						
Heterlimnius	2	2						
Heterlimnius	8	8						
Hexatoma	1	1						
Hydropsyche	2	2						
Kogotus	7	7						
Mallochohelea	2	2						
Oligophlebodes	4	4						
Orthocladius complex	2	2						
Parapsyche	2	2						
Pericoma/Telmatoscopus	13	13						
Perlidae	1	1						

Protzia	1	1						
Rhithrogena	11	11						
Rhyacophila	3	3						
Rhyacophila brunnea/vemna group	1	1						
Roederiodes	2	2						
Simulium	2	2						
Sweltsa	6	6						
Taeniopterygidae	36	37	No			X		
Thienemannimyia group	2	2						
Tvetenia	2	2						
Zapada	10	10						
Zapada cinctipes	38	38						
Zapada columbiana	2	2						
Total:	**376**	**378**						
					0	**6**	**0**	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				
Site - 2021, Sample - RG_MI5_BIC-1_2021-09-15, CC# - CC221396, Percent sampled = 100%, Sieve size = 400	**Laboratory Count**	**QC Audit Count**	**Agreement**	**Misidentification**	**Questionable Taxonomic Resolution**	**Enumeration**	**Insufficient Taxonomic Resolution**	**Comments**
Baetis rhodani group	3	3						
Chironomidae	1	1						
Drunella doddsii	1	1						
Elmidae	1	1						
Ephemerellidae	2	2						
Lebertia	2	2						
Protzia	2	2						
Rhyacophila	4	3	No			X		
Rhyacophila betteni group	1	2	No			X		
Simuliidae	1	1						
Sperchon	3	3						
Sweltsa	1	1						
Taeniopterygidae	4	4						
Testudacarus	3	3						
Torrenticola	1	1						
Zapada cinctipes	1	1						

Total:	**31**	**31**						
					0	**2**	**0**	
% Total Misidentification Rate =	misidentifications	x100 =	0.00	**Pass**				
	total number							

References

[1] McDermott, H., Paull, T., Strachan, S. (May 2014). Laboratory Methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples, Environment Canada. ISBN: 978-1-100-25417-3

[2] Southwest Association of Freshwater Invertebrate Taxonomists. (2015). www.safit.org

[3] Pacific Northwest Aquatic Monitoring Partnership (Accessed 2015). www.pnamp.org

Taxonomic Keys

Below is a reference list of taxonomic keys utilized by taxonomists at Cordillera Consulting. Cordillera taxonomists routinely seek out new literature to ensure the most accurate identification keys are being utilized. This is not reflective of the exhaustive list of resources that we use for identification. A more complete list of taxonomic resources can be found at Southwest Association of Freshwater Invertebrate Taxonomists. (2015).
http://www.safit.org/Docs/SAFIT_Taxonomic_Literature_Database_1_March_2011.enl

Brook, Arthur R. and Leonard A. Kelton. 1967. Aquatic and semiaquatic Heteroptera of Alberta, Saskatchewan and Manitoba (Hemiptera) Memoirs of the Entomological Society of Canada. No. 51.

Brown HP & White DS (1978) Notes on Seperation and Identification of North
American Riffle Beetles (Coleoptera: Dryopidea: Elmidae).Entomological News 89 (1&2): 1-13

Clifford, Hugh F. 1991. Aquatic Invertebrates of Alberta. University of Alberta Press Edmonton, Alberta.

Epler, John. 2001 The Larval Chironomids of North and South Carolina. http://home.earthlink.net/~johnepler/

Epler, John. Identification Manual for the Water Beetles of Florida. http://home.earthlink.net/~johnepler/

Epler, John. Identification Manual for the Aquatic and Semi-aquatic Heteroptera of Florida.
http://home.earthlink.net/~johnepler/

Trond Andersen, Peter S. Cranston & John H. Epler (Eds) (2013) Chironomidae of the Holarctic Region: Keys and DIagnoses. Part 1. Larvae. *Insect Systematics and Evolution Supplements* 66: 1-571.

Jacobus, Luke and Pat Randolph. 2005. Northwest Ephemeroptera Nymphs. Manual from Northwest Biological Assessment Working Group. Moscow Idaho 2005. Not Published.

Jacobus LM, McCafferty WP (2004) Revisionary Contributions to the Genus Drunella (Ephemeroptera : Ephemerellidae). Journal of the New York Entomological Society 112: 127-147

Jacobus LM, McCafferty WP (2003) Revisionary Contributions to North American Ephemerella and Serratella (Ephemeroptera : Ephemerellidae). Journal of the New York Entomological Society 111 (4): 174-193.

Kathman,R.D., R.O. Brinkhurst. 1999. Guide to the Freshwater Oligochaetes of North America. Aquatic Resources Center, College Grove, Tennessee.

Larson, D.J., Y. Alarie, R.E. Roughly.2005. Predaceous Diving Beetles (Coleoptera: Dytiscidae) of the Neararctic Region. NRC-CNRC Research Press. Ottawa.

Merritt, R.W., K.W. Cummins, M. B. Berg. (eds.). 2007. An introduction to the aquatic insects of North America, 4th. Kendall/Hunt, Dubuque, IA

Morihara DK, McCafferty WP (1979) The Baetis Larvae of North American (Ephemeroptera: Baetidae). Transactions of the American Entomological Society 105: 139-221.

Needham, James, M. May, M. Westfall Jr. 2000. Dragonflies of North America. Scientific Publishers. Gainsville FL.

Prescott David, R.C.and Medea M. Curteanu.2004. Survey of Aquatic Gastropods of Alberta. Species at Risk Report No. 104. ISSN: 1496-7146 (Online Edition)

Needham, K. 1996. An Identification Guide to the Nymphal Mayflies of British Columbia. Publication #046 Resource Inventory Committee, Government of British Columbia.

Oliver, Donald R. and Mary E. Roussel. 1983. The Insects and Arachnids of Canada Part 11. The Genera of larval midges of Canada. Biosystematics Research Institute. Ottawa, Ontario. Research Branch, Agriculture Canada. Publication 1746.

Proctor, H. The 'Top 18' Water Mite Families in Alberta. Zoology 351. University of Alberta, Edmonton, Alberta.

Rogers, D.C. and M. Hill, 2008. Key to the Freshwater Malacostraca (Crustacea) of the mid-Atlantic Region. EPA-230-R-08-017. US Environmental Protection Agency, Office of Environmental Information, Washington, DC.

Stewart, Kenneth W. and Bill Stark. 2002. The Nymphs of North American Stonefly Genera (Plecoptera). The Caddis Press. Columbus Ohio.

Stewart, Kenneth W. and Mark W. Oswood. 2006 The Stoneflies (Plecoptera) of Alaska and Western Canada. The Caddis Press.

Stonedahl, Gary and John D. Lattin. 1986. The Corixidae of Oregon and Washington (Hemiptera: Heteroptera). Technical Bulletin 150. Oregon State University, Corvalis Oregon.

Thorpe, J. H. and A. P. Covich [Eds.] 1991. Ecology and classification of North American freshwater invertebrates. Academic Press, San Diego.

Tinerella, Paul P. and Ralph W. Gunderson.2005. The Waterboatmen (Insecta: Heteroptera: Corixidae) of Minisota. Publication No.23 Dept. Of Entomology, North Dakota State University, Fargo, North Dakota, USA.

Weiderholm, Torgny (Ed.) 1983. The larvae of Chironomidae (Diptera) of the Holartic region. Entomologica Scaninavica. Supplement No. 19.

Westfall, Minter J. Jr. and May, Michael L. 1996. Damselflies of North America. Scientific Publishers, Gainesville, FL.

Wiggins, Glenn B. 1998. Larvae of the North American Caddisfly Genera (Tricoptera) 2nd ed. University of Toronto Press. Toronto Ontario.

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client: Alex McClymont
MSc Aquatic Ecology
Minnow Environmental
Phone: (780) 293-6750
Email: alex.mcclymont@minnow.ca

Date Received:	28 Sep 2021
	01 Oct 2021
Date of Analysis:	20 Oct 2021
Final Report Date:	22 Oct 2021
Project No.:	2021-262
Method No.:	MET-002.05

Client Project: CMO LAEMP (21-22) (PO 748530)

Analytical Request: Composite-Taxa Benthic Invertebrate Tissue (total metals and moisture) - 29 samples.
See chain of custody form provided for sample identification numbers.

Notes:
Analytical results are expressed in parts per million (ppm) dry weight (equivalent to mg/kg).
Samples quantified using DORM-4, NIST-1566b, and NIST-2976 certified reference standards.
Aluminum concentrations above 1,000 ppm are outside linear range of the calibration curve.
RPD values calculated according to the British Columbia Environmental Laboratory Manual (2020) criteria.
Client specific DQO for Selenium accuracy is 90-110% of the certified value; result achieved 104% (ranging from 98-109%).

This report provides the analytical results only for tissue samples noted above as received from the Client.

Reviewed and Approved by Jennie Christensen, PhD, RPBio

22 Oct 2021
Date

TrichAnalytics Inc.
207-1753 Sean Heights
Saanichton, BC V8M 0B3
www.trichanalytics.com

CALA Testing Accreditation No. A4196

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_MIUCO_INV-1_2021-09-12	RG_MIUCO_INV-2_2021-09-12	RG_MIUCO_INV-3_2021-09-12	RG_MIDCO_INV-1_2021-09-12	RG_MIDCO_INV-2_2021-09-12
		Lab ID	650	651	652	653	654
		Wet Weight (g)	0.0625	0.0942	0.1458	0.2885	0.1774
		Dry Weight (g)	0.0219	0.0165	0.0280	0.0696	0.0368
		Moisture (%)	65.0	82.5	80.8	75.9	79.3
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.660	2.8	3.4	3.7	0.563
11B	0.097	0.323	2.9	13	16	18	2.1
23Na	0.950	3.2	3,775	16,101	3,904	4,571	10,211
24Mg	0.021	0.070	1,766	2,820	2,742	2,658	1,898
27Al	0.043	0.143	2,167	9,513	11,166	11,586	1,448
31P	33	110	13,258	17,124	13,174	11,413	11,142
39K	5.4	18	14,278	20,961	14,635	16,236	12,279
44Ca	23	77	2,306	4,360	6,510	17,887	2,994
49Ti	0.238	0.793	144	867	925	1,082	110
51V	0.053	0.177	2.6	12	13	14	1.5
52Cr	0.663	2.2	30	96	62	43	13
55Mn	0.010	0.033	129	256	376	247	80
57Fe	1.8	6.0	1,618	4,522	4,717	3,637	713
59Co	0.008	0.027	2.0	6.9	6.0	58	72
60Ni	0.037	0.123	47	176	99	110	34
63Cu	0.016	0.053	20	29	21	21	15
66Zn	0.430	1.4	115	180	125	161	162
75As	0.441	1.5	1.6	1.9	2.3	2.0	0.545
77Se	0.253	0.843	7.8	7.2	6.5	4.4	3.1
88Sr	0.001	0.003	6.7	14	19	52	9.6
95Mo	0.001	0.003	1.4	1.6	1.1	0.566	0.519
107Ag	0.001	0.003	0.074	0.163	0.086	0.155	0.086
111Cd	0.054	0.180	3.1	3.9	2.6	0.898	1.0
118Sn	0.023	0.077	0.934	2.8	1.4	0.826	0.921
121Sb	0.005	0.017	0.041	0.106	0.158	0.191	0.028
137Ba	0.001	0.003	87	147	187	147	25
202Hg	0.025	0.083	0.053	0.069	0.069	0.046	0.038
205Tl	0.001	0.003	0.070	0.206	0.244	0.293	0.107
208Pb	0.001	0.003	0.552	1.8	2.0	2.2	0.302
238U	0.001	0.003	0.062	0.228	0.309	0.407	0.055

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_MIDCO_INV-3_2021-09-12	RG_MIDCO_INV-4_2021-09-12	RG_MIULE_INV-1_2021-09-14	RG_MIULE_INV-2_2021-09-14	RG_MIULE_INV-3_2021-09-14
		Lab ID	655	656	657	658	659
		Wet Weight (g)	0.3597	0.1703	0.0936	0.1567	0.2783
		Dry Weight (g)	0.0971	0.0364	0.0246	0.0384	0.0452
		Moisture (%)	73.0	78.6	73.7	75.5	83.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.676	0.703	1.1	2.2	0.651
11B	0.097	0.323	2.8	3.2	5.4	6.1	1.7
23Na	0.950	3.2	3,760	4,272	3,099	3,520	13,407
24Mg	0.021	0.070	1,477	1,414	2,258	1,540	1,445
27Al	0.043	0.143	1,537	1,568	3,567	4,977	905
31P	33	110	10,011	10,925	11,449	9,880	12,695
39K	5.4	18	10,931	12,455	11,638	9,908	12,663
44Ca	23	77	3,301	3,732	9,129	9,810	2,977
49Ti	0.238	0.793	95	128	248	633	71
51V	0.053	0.177	2.1	2.2	8.0	6.7	1.7
52Cr	0.663	2.2	8.3	12	157	126	20
55Mn	0.010	0.033	138	97	97	82	40
57Fe	1.8	6.0	655	725	3,738	3,269	683
59Co	0.008	0.027	25	24	15	20	6.1
60Ni	0.037	0.123	27	52	250	219	37
63Cu	0.016	0.053	14	13	17	20	15
66Zn	0.430	1.4	176	118	199	269	205
75As	0.441	1.5	0.633	0.570	1.1	1.4	0.585
77Se	0.253	0.843	4.0	3.6	9.3	9.8	6.0
88Sr	0.001	0.003	10	11	30	21	7.0
95Mo	0.001	0.003	0.307	0.307	0.589	1.8	0.307
107Ag	0.001	0.003	0.046	0.092	0.097	0.092	0.168
111Cd	0.054	0.180	0.359	1.1	1.7	3.1	1.8
118Sn	0.023	0.077	0.175	0.644	0.778	1.6	0.508
121Sb	0.005	0.017	0.042	0.039	0.072	0.123	0.030
137Ba	0.001	0.003	35	41	107	107	29
202Hg	0.025	0.083	0.053	0.053	0.053	0.053	0.090
205Tl	0.001	0.003	0.099	0.100	0.181	0.186	0.097
208Pb	0.001	0.003	0.490	0.426	0.748	0.924	0.266
238U	0.001	0.003	0.100	0.114	0.189	0.172	0.066

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LE1_INV-1_2021-09-14	RG_LE1_INV-2_2021-09-14	RG_LE1_INV-3_2021-09-14	RG_CORCK_INV-1_2021-09-14	RG_CORCK_INV-2_2021-09-14
		Lab ID	660	661	662	663	664
		Wet Weight (g)	0.0850	0.0605	0.1322	0.3060	0.0899
		Dry Weight (g)	0.0155	0.0172	0.0222	0.0981	0.0275
		Moisture (%)	81.8	71.6	83.2	67.9	69.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.512	0.442	1.2	0.724	0.265
11B	0.097	0.323	3.1	1.6	15	1.5	1.2
23Na	0.950	3.2	5,549	3,115	3,545	3,619	2,318
24Mg	0.021	0.070	1,838	1,667	1,820	1,297	1,272
27Al	0.043	0.143	1,097	1,100	3,055	411	116
31P	33	110	14,101	12,296	12,615	9,718	7,296
39K	5.4	18	15,285	11,843	13,218	9,911	6,267
44Ca	23	77	2,797	1,724	4,714	13,410	3,761
49Ti	0.238	0.793	61	56	212	31	9.4
51V	0.053	0.177	2.3	2.4	6.7	0.613	0.253
52Cr	0.663	2.2	39	15	50	5.1	8.7
55Mn	0.010	0.033	63	66	94	160	66
57Fe	1.8	6.0	982	573	1,728	325	228
59Co	0.008	0.027	1.6	1.7	3.2	25	13
60Ni	0.037	0.123	66	22	76	30	25
63Cu	0.016	0.053	29	20	24	13	12
66Zn	0.430	1.4	258	238	240	160	131
75As	0.441	1.5	0.919	0.864	1.1	<0.441	<0.441
77Se	0.253	0.843	6.8	6.0	6.0	4.1	3.0
88Sr	0.001	0.003	5.8	4.2	10	22	13
95Mo	0.001	0.003	0.885	0.737	0.725	0.270	0.221
107Ag	0.001	0.003	0.406	0.224	0.399	0.035	0.035
111Cd	0.054	0.180	8.7	7.3	6.3	0.439	0.176
118Sn	0.023	0.077	1.3	0.960	1.1	0.127	0.120
121Sb	0.005	0.017	0.083	0.073	0.132	0.054	0.033
137Ba	0.001	0.003	124	270	367	25	6.6
202Hg	0.025	0.083	0.114	0.106	0.082	<0.025	<0.025
205Tl	0.001	0.003	0.037	0.039	0.057	0.032	0.017
208Pb	0.001	0.003	0.256	0.232	0.674	0.114	0.040
238U	0.001	0.003	0.072	0.066	0.166	0.162	0.033

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_CORCK_INV-3_2021-09-14	RG_MI5_INV-3_2021-09-16	RG_AGCK_INV-1_2021-09-11	RG_AGCK_INV-2_2021-09-11	RG_AGCK_INV-3_2021-09-11
		Lab ID	665	666	667	668	669
		Wet Weight (g)	0.1625	0.1888	0.3775	0.0611	0.1402
		Dry Weight (g)	0.0453	0.0530	0.0826	0.0134	0.0293
		Moisture (%)	72.1	71.9	78.1	78.1	79.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.267	1.3	0.371	0.199	0.286
11B	0.097	0.323	1.1	4.2	1.2	0.440	0.592
23Na	0.950	3.2	4,482	2,901	4,584	3,699	4,577
24Mg	0.021	0.070	1,734	1,401	1,697	1,386	2,122
27Al	0.043	0.143	188	3,430	607	146	318
31P	33	110	10,856	11,501	14,925	12,740	14,152
39K	5.4	18	10,277	11,195	14,434	11,848	12,235
44Ca	23	77	5,424	2,977	2,868	2,429	2,851
49Ti	0.238	0.793	13	298	40	7.3	18
51V	0.053	0.177	0.433	9.6	1.0	0.372	0.637
52Cr	0.663	2.2	6.7	106	7.5	13	9.7
55Mn	0.010	0.033	52	96	23	17	12
57Fe	1.8	6.0	297	2,576	410	322	460
59Co	0.008	0.027	8.7	5.6	0.623	0.307	0.585
60Ni	0.037	0.123	17	169	17	22	19
63Cu	0.016	0.053	13	17	11	10	9.9
66Zn	0.430	1.4	143	198	295	193	165
75As	0.441	1.5	<0.441	1.1	2.5	1.4	1.8
77Se	0.253	0.843	4.7	5.4	5.6	5.2	7.4
88Sr	0.001	0.003	20	11	6.2	6.2	4.4
95Mo	0.001	0.003	0.369	0.516	0.425	0.450	0.375
107Ag	0.001	0.003	0.084	0.137	0.091	0.056	0.056
111Cd	0.054	0.180	0.483	0.878	1.3	0.772	0.741
118Sn	0.023	0.077	0.675	0.460	0.843	1.7	0.601
121Sb	0.005	0.017	0.036	0.194	0.048	0.027	0.034
137Ba	0.001	0.003	12	130	36	8.5	6.1
202Hg	0.025	0.083	0.041	0.078	0.095	0.052	0.034
205Tl	0.001	0.003	0.027	0.087	0.666	0.348	0.918
208Pb	0.001	0.003	0.074	0.694	0.195	0.073	0.103
238U	0.001	0.003	0.063	0.175	0.068	0.035	0.041

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited
Tissue Analysis Results

Parameter	DL (ppm)	LOQ (ppm)	RG_MIDAG_INV-1_2021-09-11	RG_MIDAG_INV-2_2021-09-11	RG_MIDAG_INV-3_2021-09-11	RG_MI25_INV-1_2021-09-13	RG_MI25_INV-2_2021-09-13
		Lab ID	670	671	672	673	674
		Wet Weight (g)	0.4136	0.2945	0.2900	0.3550	0.2114
		Dry Weight (g)	0.1089	0.0514	0.0574	0.0853	0.0302
		Moisture (%)	73.7	82.5	80.2	76.0	85.7
			(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.646	0.666	0.450	1.4	0.921
11B	0.097	0.323	2.7	2.2	2.6	5.9	5.6
23Na	0.950	3.2	3,087	7,834	7,559	4,265	3,099
24Mg	0.021	0.070	1,189	1,544	2,117	1,714	1,324
27Al	0.043	0.143	1,761	1,241	1,155	2,570	1,834
31P	33	110	11,255	12,067	13,357	11,608	8,758
39K	5.4	18	9,833	12,038	12,009	13,111	9,513
44Ca	23	77	2,499	6,141	4,488	2,061	3,208
49Ti	0.238	0.793	129	87	81	321	136
51V	0.053	0.177	2.2	1.6	1.5	4.6	3.1
52Cr	0.663	2.2	15	13	13	33	22
55Mn	0.010	0.033	106	46	60	59	57
57Fe	1.8	6.0	947	646	713	1,663	1,428
59Co	0.008	0.027	18	7.0	36	2.4	1.8
60Ni	0.037	0.123	50	30	32	56	41
63Cu	0.016	0.053	11	18	15	29	11
66Zn	0.430	1.4	161	180	281	193	111
75As	0.441	1.5	1.3	0.613	1.0	1.4	1.6
77Se	0.253	0.843	6.1	2.5	5.9	3.3	2.5
88Sr	0.001	0.003	7.4	16	10	7.3	9.4
95Mo	0.001	0.003	0.550	0.225	0.525	0.550	0.525
107Ag	0.001	0.003	0.070	0.168	0.140	0.119	0.035
111Cd	0.054	0.180	0.818	0.741	2.4	2.0	1.5
118Sn	0.023	0.077	0.437	0.579	0.592	0.494	0.556
121Sb	0.005	0.017	0.069	0.050	0.047	0.091	0.113
137Ba	0.001	0.003	42	37	28	75	65
202Hg	0.025	0.083	0.060	0.052	0.069	0.082	0.060
205Tl	0.001	0.003	0.158	0.147	0.223	0.111	0.105
208Pb	0.001	0.003	0.492	0.336	0.303	0.813	0.792
238U	0.001	0.003	0.094	0.101	0.068	0.117	0.168

Notes:
ppm = parts per million
DL = detection limit
LOQ = limit of quantitation
< = less than detection limit
g = grams
% = percent

Teck Coal Limited
Tissue Analysis Results

		Client ID	RG_MI25_INV-3_2021-09-13	RG_MIDCO_INV-5_2021-09-12	RG_MI5_INV-1_2021-09-16	RG_MI5_INV-2_2021-09-16
		Lab ID	675	676	677	678
		Wet Weight (g)	0.2793	0.1210	0.3508	0.5446
		Dry Weight (g)	0.0561	0.0279	0.0564	0.0973
		Moisture (%)	79.9	76.9	83.9	82.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.975	0.798	0.395	2.5
11B	0.097	0.323	4.7	3.3	1.5	7.2
23Na	0.950	3.2	4,781	1,730	8,645	3,993
24Mg	0.021	0.070	1,293	1,112	1,332	1,906
27Al	0.043	0.143	1,911	2,109	737	7,279
31P	33	110	11,741	6,628	10,726	11,245
39K	5.4	18	13,476	6,622	11,774	13,573
44Ca	23	77	2,163	3,106	2,212	4,034
49Ti	0.238	0.793	141	144	36	601
51V	0.053	0.177	2.4	2.5	1.3	16
52Cr	0.663	2.2	17	22	11	92
55Mn	0.010	0.033	57	81	50	109
57Fe	1.8	6.0	942	1,066	489	4,468
59Co	0.008	0.027	1.2	22	2.3	7.7
60Ni	0.037	0.123	26	44	22	151
63Cu	0.016	0.053	20	12	12	19
66Zn	0.430	1.4	170	124	160	208
75As	0.441	1.5	1.5	0.851	0.482	1.5
77Se	0.253	0.843	2.3	3.2	4.8	8.1
88Sr	0.001	0.003	6.1	13	6.4	17
95Mo	0.001	0.003	0.363	0.459	0.266	0.653
107Ag	0.001	0.003	0.101	0.050	0.108	0.166
111Cd	0.054	0.180	1.3	0.520	2.3	3.2
118Sn	0.023	0.077	0.379	0.365	0.732	0.961
121Sb	0.005	0.017	0.095	0.074	0.047	0.253
137Ba	0.001	0.003	143	40	50	221
202Hg	0.025	0.083	0.090	0.045	0.063	0.081
205Tl	0.001	0.003	0.086	0.073	0.080	0.203
208Pb	0.001	0.003	0.612	0.431	0.194	1.4
238U	0.001	0.003	0.093	0.092	0.059	0.288

Notes:
ppm = parts per million
DL = detection limit
LOQ = limit of quantitation
< = less than detection limit
g = grams
% = percent

Tissue QA/QC Relative Percent Difference Results

Client ID		RG_MIDCO_INV-3_2021-09-12			RG_MIULE_INV-3_2021-09-14			RG_CORCK_INV-1_2021-09-14		
Lab ID		655			659			663		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.009	0.676	0.671	0.7	0.651	0.599	8.3	0.724	0.558	26
11B	0.097	2.8	3.3	16	1.7	1.8	5.7	1.5	1.5	0.0
23Na	0.950	3,760	2,814	29	13,407	13,374	0.2	3,619	2,819	25
24Mg	0.021	1,477	1,635	10	1,445	1,500	3.7	1,297	1,225	5.7
27Al	0.043	1,537	1,504	2.2	905	856	5.6	411	410	0.2
31P	33	10,011	8,146	21	12,695	12,766	0.6	9,718	7,623	24
39K	5.4	10,931	9,092	18	12,663	12,526	1.1	9,911	7,758	24
44Ca	23	3,301	2,649	22	2,977	2,854	4.2	13,410	10,252	27
49Ti	0.238	95	139	38	71	62	14	31	29	6.7
51V	0.053	2.1	1.9	10	1.7	1.6	6.1	0.613	0.552	11
52Cr	0.663	8.3	5.6	-	20	17	16	5.1	5.1	-
55Mn	0.010	138	109	24	40	37	7.8	160	177	10
57Fe	1.8	655	599	8.9	683	613	11	325	313	3.8
59Co	0.008	25	25	0.0	6.1	6.2	1.6	25	22	13
60Ni	0.037	27	27	0.0	37	31	18	30	27	11
63Cu	0.016	14	11	24	15	16	6.5	13	10	26
66Zn	0.430	176	125	34	205	217	5.7	160	124	25
75As	0.441	0.633	0.608	-	0.585	0.571	-	<0.441	<0.441	-
77Se	0.253	4.0	3.6	11	6.0	5.7	5.1	4.1	3.6	13
88Sr	0.001	10	8.6	15	7.0	6.7	4.4	22	19	15
95Mo	0.001	0.307	0.259	17	0.307	0.356	15	0.270	0.246	9.3
107Ag	0.001	0.046	0.034	30	0.168	0.151	11	0.035	0.035	0.0
111Cd	0.054	0.359	0.387	-	1.8	1.7	5.7	0.439	0.307	-
118Sn	0.023	0.175	0.306	-	0.508	0.487	4.2	0.127	0.108	-
121Sb	0.005	0.042	0.047	-	0.030	0.038	-	0.054	0.045	-
137Ba	0.001	35	26	30	29	28	3.5	25	22	13
202Hg	0.025	0.053	<0.025	-	0.090	0.074	-	<0.025	0.033	-
205Tl	0.001	0.099	0.093	6.3	0.097	0.098	1.0	0.032	0.026	21
208Pb	0.001	0.490	0.473	3.5	0.266	0.252	5.4	0.114	0.118	3.4
238U	0.001	0.100	0.087	14	0.066	0.066	0.0	0.162	0.133	20

Notes:

ppm = parts per million
RPD = relative percent difference
DL = detection limit
< = less than detection limit
% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%
Minimum DQOs apply to individual samples at concentrations above 10x DL

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

Sample Group ID			01			02		
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.009	1.21	1.3	104	4.7	1.3	108	3.9
11B	0.097	4.5	5.4	119	4.8	5.1	112	2.9
23Na	0.950	14,000	15,662	112	4.6	15,189	108	1.9
24Mg	0.021	910	950	104	5.0	1,025	113	1.4
27Al	0.043	197.2	221	112	3.2	201	102	6.1
31P	33	8,000	8,384	105	5.4	8,780	110	3.0
39K	5.4	15,500	16,394	106	6.7	16,550	107	4.8
44Ca	23	2,360	2,488	105	3.7	2,595	110	2.7
49Ti	0.238	12.24	14	115	9.9	14	115	6.6
51V	0.053	1.57	1.9	119	5.2	1.5	98	7.4
52Cr	0.663	1.87	2.1	114	3.5	2.1	110	5.0
55Mn	0.010	3.17	3.5	109	6.7	3.7	118	4.6
57Fe	1.8	343	374	109	5.6	391	114	3.2
59Co	0.008	0.25	0.295	118	4.7	0.278	111	3.2
60Ni	0.037	1.34	1.5	116	4.5	1.6	120	9.4
63Cu	0.016	15.7	18	116	5.7	18	116	2.6
66Zn	0.430	51.6	57	110	3.2	58	113	2.7
75As	0.441	6.87	7.3	107	4.2	7.5	109	2.8
77Se	0.253	3.45	3.8	109	3.5	3.7	107	6.4
88Sr	0.001	10.1	11	107	4.9	11	112	3.2
95Mo	0.001	0.29	0.330	114	5.1	0.302	104	9.8
107Ag	0.001	0.0252	0.028	111	15	0.031	122	12
111Cd	0.054	0.299	0.317	106	13	0.348	116	7.1
118Sn	0.023	0.061	0.071	116	19	0.065	107	19
121Sb	0.005	0.011	0.015	139	13	0.013	121	8.7
137Ba	0.001	8.6	9.6	111	3.4	9.5	111	2.7
202Hg	0.025	0.412	0.409	99	7.5	0.442	107	7.1
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.438	108	3.1	0.406	100	9.1
238U	0.001	0.05	0.054	108	7.9	0.049	99	11

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

		Sample Group ID	03			04		
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.009	1.21	1.2	100	1.3	1.2	101	4.6
11B	0.097	4.5	4.7	105	3.8	4.5	99	1.6
23Na	0.950	14,000	13,430	96	4.2	14,600	104	4.1
24Mg	0.021	910	916	101	3.8	913	100	2.6
27Al	0.043	197.2	192	97	6.2	184	93	3.1
31P	33	8,000	7,836	98	1.6	8,199	102	3.2
39K	5.4	15,500	15,472	100	5.1	16,844	109	3.0
44Ca	23	2,360	2,343	99	4.1	2,413	102	2.2
49Ti	0.238	12.24	12	100	9.7	12	97	7.0
51V	0.053	1.57	1.5	98	7.7	1.6	104	14
52Cr	0.663	1.87	1.9	100	3.3	1.9	103	2.9
55Mn	0.010	3.17	3.1	97	2.1	3.2	100	3.1
57Fe	1.8	343	347	101	2.1	357	104	4.1
59Co	0.008	0.25	0.253	101	5.7	0.257	103	2.8
60Ni	0.037	1.34	1.3	99	4.9	1.4	102	2.5
63Cu	0.016	15.7	16	100	1.6	16	104	6.9
66Zn	0.430	51.6	51	98	1.9	55	106	2.4
75As	0.441	6.87	6.6	97	5.0	7.1	104	3.3
77Se	0.253	3.45	3.4	98	6.3	3.5	102	4.2
88Sr	0.001	10.1	9.9	98	1.7	10	104	4.7
95Mo	0.001	0.29	0.295	102	7.1	0.280	97	4.7
107Ag	0.001	0.0252	0.025	100	15	0.026	103	15
111Cd	0.054	0.299	0.306	102	10	0.328	110	6.5
118Sn	0.023	0.061	0.058	95	11	0.065	106	16
121Sb	0.005	0.011	0.014	127	17	0.011	99	16
137Ba	0.001	8.6	9.0	105	2.9	8.6	100	1.8
202Hg	0.025	0.412	0.434	105	11	0.434	105	5.3
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.410	102	12	0.414	102	6.3
238U	0.001	0.05	0.053	106	11	0.048	95	9.0

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	RG_MIUCO_INV-1_2021-09-12	650	20 Oct 2021
	RG_MIUCO_INV-2_2021-09-12	651	
	RG_MIUCO_INV-3_2021-09-12	652	
	RG_MIDCO_INV-1_2021-09-12	653	
	RG_MIDCO_INV-2_2021-09-12	654	
	RG_MIDCO_INV-3_2021-09-12	655	
	RG_MIDCO_INV-4_2021-09-12	656	
	RG_MIULE_INV-1_2021-09-14	657	
	RG_MIULE_INV-2_2021-09-14	658	
02	RG_MIULE_INV-3_2021-09-14	659	20 Oct 2021
	RG_LE1_INV-1_2021-09-14	660	
	RG_LE1_INV-2_2021-09-14	661	
	RG_LE1_INV-3_2021-09-14	662	
	RG_CORCK_INV-1_2021-09-14	663	
	RG_CORCK_INV-2_2021-09-14	664	
	RG_CORCK_INV-3_2021-09-14	665	
	RG_MI5_INV-3_2021-09-16	666	
03	RG_AGCK_INV-1_2021-09-11	667	20 Oct 2021
	RG_AGCK_INV-2_2021-09-11	668	
	RG_AGCK_INV-3_2021-09-11	669	
	RG_MIDAG_INV-1_2021-09-11	670	
	RG_MIDAG_INV-2_2021-09-11	671	
	RG_MIDAG_INV-3_2021-09-11	672	
	RG_MI25_INV-1_2021-09-13	673	
	RG_MI25_INV-2_2021-09-13	674	
04	RG_MI25_INV-3_2021-09-13	675	20 Oct 2021
	RG_MIDCO_INV-5_2021-09-12	676	
	RG_MI5_INV-1_2021-09-16	677	
	RG_MI5_INV-2_2021-09-16	678	

TrichAnalytics Inc. 207-1753 Sean Heights, Saanichton, BC, V8M 0B3 Ph: (250) 532-1084	Chain of Custody (COC) for LA-ICP-MS Analysis
Invoicing	Reporting (if different from Invoicing)

Project Number: CMO LAEMP (21-22) (PO 748530)

Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental
Contact Name:	Cybele Heddle	Contact Name:	Alex McClymont
Address:	421 Pine Avenue	Address:	Unit A, 101 Centennial Square
City, Province:	Sparwood, BC	City, Province:	Sparwood, BC
Postal Code:	V0B 2G0	Postal Code:	V0B 2G0
Phone:	250-910-8755	Phone:	(780)-293 - 6750
Email:	cybele.heddle@teck.com	Email:	alex.mcclymont@minnow.ca

Sample Analysis Requested

TRICH ID		Sample Identification:	Sample Type: Species	Sample type
650	1	RG_MIUCO_INV-1_2021-09-12 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
651	2	RG_MIUCO_INV-2_2021-09-12 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
652	3	RG_MIUCO_INV-3_2021-09-12 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
653	4	RG_MIDCO_INV-1_2021-09-12 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
654	5	RG_MIDCO_INV-2_2021-09-12 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
655	6	RG_MIDCO_INV-3_2021-09-12 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
656	7	RG_MIDCO_INV-4_2021-09-12 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
657	8	RG_MIULE_INV-1_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
658	9	RG_MIULE_INV-2_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
659	10	RG_MIULE_INV-3_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
660	11	RG_LE1_INV-1_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
661	12	RG_LE1_INV-2_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
662	13	RG_LE1_INV-3_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
663	14	RG_CORCK_INV-1_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
664	15	RG_CORCK_INV-2_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
665	16	RG_CORCK_INV-3_2021-09-14 ✓	Composite	Composite-taxa benthic invertebrate tissue samples
666	17	RG_MI5_INV-3_2021-09-16 ✓ **	Composite	Composite-taxa benthic invertebrate tissue samples
667	18	RG_AGCK_INV-1_2021-09-11 * ✓	Composite	Composite-taxa benthic invertebrate tissue samples
668	19	RG_AGCK_INV-2_2021-09-11 * ✓	Composite	Composite-taxa benthic invertebrate tissue samples
669	20	RG_AGCK_INV-3_2021-09-11 * ✓	Composite	Composite-taxa benthic invertebrate tissue samples

Sample(s) Released By:	Sample(s) Received By: [signature]
Signature:	Signature: Jennie Christensen
Date Sent:	Date Received: 01 Oct 2021 (lab) aw 05oct2021
Sample(s) Returned to Client By:	Shipping Conditions: frozen
	Shipping Container: cooler.
Signature:	Date Sent:

aw 05oct2021 * samples missing → samples located in another project bag (now in correct project) aw 05oct2021

** Two samples w/ same label, both w/ labeling discrepency from COC

aw ~oct2021 ↳ use sample recieved w/ first batch (w/ side label date 2021-09-16) as per client request

TrichAnalytics Inc. 207-1753 Sean Heights, Saanichton, BC, V8M 0B3 Ph: (250) 532-1084		Chain of Custody (COC) for LA-ICP-MS Analysis	
Invoicing		Reporting (if different from Invoicing)	
Project Number: CMO LAEMP (21-22) (PO 748530)			
Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental
Contact Name:	Cybele Heddle	Contact Name:	Alex McClymont
Address:	421 Pine Avenue	Address:	Unit A, 101 Centennial Square
City, Province:	Sparwood, BC	City, Province:	Sparwood, BC
Postal Code:	V0B 2G0	Postal Code:	V0B 2G0
Phone:	250-910-8755	Phone:	(780) 293 - 6750
Email:	cybele.heddle@teck.com	Email:	alex.mcclymont@minnow.ca

Sample Analysis Requested

	Sample Identification:	Sample Type: Species	Sample type
670	21 RG_MIDAG_INV-1_2021-09-11 *	Composite	Composite-taxa benthic invertebrate tissue samples
671	22 RG_MIDAG_INV-2_2021-09-11 *	Composite	Composite-taxa benthic invertebrate tissue samples
672	23 RG_MIDAG_INV-3_2021-09-11 *	Composite	Composite-taxa benthic invertebrate tissue samples
673	24 RG_MI25_INV-1_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
674	25 RG_MI25_INV-2_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
675	26 RG_MI25_INV-3_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
676	27 RG_MIDCO_INV-5_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
677	28 RG_MI5_INV-1_2021-09-16 *	Composite	Composite-taxa benthic invertebrate tissue samples
678	29 RG_MI5_INV-2_2021-09-16 *	Composite	Composite-taxa benthic invertebrate tissue samples
	30	Composite	Composite-taxa benthic invertebrate tissue samples
	31	Composite	Composite-taxa benthic invertebrate tissue samples
	32	Composite	Composite-taxa benthic invertebrate tissue samples
	33	Composite	Composite-taxa benthic invertebrate tissue samples
	34	Composite	Composite-taxa benthic invertebrate tissue samples
	35	Composite	Composite-taxa benthic invertebrate tissue samples
	36	Composite	Composite-taxa benthic invertebrate tissue samples
	37	Composite	Composite-taxa benthic invertebrate tissue samples
	38	Composite	Composite-taxa benthic invertebrate tissue samples
	39	Composite	Composite-taxa benthic invertebrate tissue samples
	40	Composite	Composite-taxa benthic invertebrate tissue samples

Sample(s) Released By:	Sample(s) Received By: Alex Wade
Signature:	Signature:
Date Sent:	Date Received: (Lab) ~~Oct~~ 28 Sep 2021 (Proj # 2021-262) aw 05 Oct 2021 aw Saitoori
Sample(s) Returned to Client By:	Shipping Conditions:
	Shipping Container:
Signature:	Date Sent:

aw 05 Oct 2021 * samples missing → samples located in another project bag (now in correct location)

COM-011.01

APPENDIX E

Water Quality Screening Data

Table E-1: Water Quality Data Screening, CMm LAEMP, 2021

Location	Unit	BC Water Quality Guidelines for the Protection of Aquatic Life		Elk Valley Water Quality Plan Benchmarks and Screening Values											Reference Sites							
Watercourse															Michel Creek	Andy Goode Creek	Leech Creek	Michel Creek	Corbin Creek	Michel Creek	Michel Creek	Michel Creek
Station															MI25	AGCK	LE1	MIUCO	CORCK	MIDCO	MIDAG	MIULE
Sample ID		Long-term Chronic	Short-term Acute	Invertebrates Level 1	Invertebrates Level 2	Invertebrates Level 3	Fish Level 1	Fish Level 2	Fish Level 3	Amphibians Level 1	Amphibians Level 2	Amphibians Level 3	Adult Birds Level 1	Juvenile Birds Level 1	RG_MI25_WS_LAEMP_CMO_2021-09-13_NP	RG_AGCK_WS_LAEMP_CMO_2021-09-11_NP	RG_LE1_WS_LAEMP_CMO_2021-09-14_NP	RG_MIUCO_WS_LAEMP_CMO_2021-09-12_NP	RG_CORCK_WS_LAEMP_CMO_2021-09-15_NP	RG_MIDCO_WS_LAEMP_CMO_2021-09-13_NP	RG_MIDAG_WS_LAEMP_CMO_2021-09-11_NP	RG_MIULE_WS_LAEMP_CMO_2021-09-14_NP
Date															09-13-2021	09-11-2021	09-14-2021	09-12-2021	09-15-2021	09-13-2021	09-11-2021	09-14-2021
Conventional Parameters																						
pH	-	6.5 - 9.0	6.5 - 9.0	-	-	-	-	-	-	-	-	-	-	-	8.4	8.3	8.3	8.4	8.3	8.4	8.3	8.5
Hardness, as $CaCO_3$	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	154	129	100	154	899	516	310	276
Total alkalinity, as $CaCO_3$	mg/L	20[a]	-	-	-	-	-	-	-	-	-	-	-	-	152	121	99	158	282	236	177	180
Total dissolved solids	mg/L	-	-	1,000	1,750	-	1,000	2,000	-	-	-	-	-	-	160	163	136	181	**1,320**[I1, F1]	667	401	413
Total suspended solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	2.5	1.6	<1.0	3.1
Total organic carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.99	1.1	1.3	1.3	1.4	0.84	1.5	1.1
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	1.3	1.3	1.4	1.4	0.66	1.3	1.1
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	<0.1	0.2	0.4	0.3	0.4	0.4	0.4
Total acidity	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<2.0	<2.0	2.2	<2.0	5.1	<2.0	<2.0	<2.0
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	288	258	194	305	1,610	967	620	562
Bicarbonate (as HCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	174	148	121	184	344	270	211	203
Carbonate (as CO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	5.4	<1.0	<1.0	4.3	<1.0	9.0	2.8	8.0
Hydroxide (as OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Oxidation-reduction potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	440	520	466	468	457	473	476	449
Major Ions																						
Bicarbonate, as $CaCO_3$	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	143	121	99	151	282	222	173	166
Bromide	mg/L	-	-	2.2	-	-	7.8	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.25	<0.25	<0.05	<0.05
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	44	38	27	41	192	123	76	71
Carbonate, as $CaCO_3$	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0	<1.0	<1.0	7.2	<1.0	15	4.6	13
Chloride	mg/L	150	600	-	-	-	-	-	-	-	-	-	-	-	0.46	0.23	0.19	0.30	2.2	2.1	1.2	1.2
Fluoride	mg/L	0.12[b]	1.3 - 2.2[c]	1.9	-	-	1.9	-	-	-	-	-	-	-	0.075	**0.300**[Mn]	0.061	0.077	**0.150**[Mn]	**0.130**[Mn]	**0.200**[Mn]	**0.180**[Mn]
Hydroxide, as $CaCO_3$	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	11	8.1	8.1	12	102	51	29	24
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.511	0.205	0.524	0.448	3.3	1.9	1.0	0.915
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1	0.486	0.749	2.7	34	19	9.9	7.9
Sulphate	mg/L	309 - 429[c, d]	-	625	729	1,315	499	674	1,173	481	822	1,545	-	-	14	20	4.7	16	**689**[Mn, I1, F1, F2, A1]	346	169	130
Anion sum	meq/L	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	2.9	2.1	3.5	20	12	7.2	6.4
Cation sum	meq/L	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	2.6	2.0	3.2	20	11	6.7	5.9
Nutrients																						
Nitrate	mg-N/L	3.0	33	3.0 - 15[c,k,l]	-	-	4.5 - 22[c,k,l]	-	-	9.1 - 46[c,k,l]	-	-	-	-	0.0214	0.0905	0.0110	0.0054	**4.7**[Mn]	1.8	0.7530	0.4860
Nitrite	mg-N/L	0.020 - 0.040[e]	0.060 - 0.120[e]	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	0.001	<0.001	0.022	0.007	0.001	<0.001
Total ammonia	mg-N/L	2.1	14	-	-	-	-	-	-	-	-	-	-	-	0.0161	0.0054	0.0190	0.0054	0.0508	0.0179	0.0053	0.0355
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	<0.05	0.06	<0.05	0.38	0.34	0.10	<0.05
Total phosphorus	mg-P/L	-	-	0.030	-	-	0.030	-	-	-	-	-	-	-	0.006	<0.002	0.008	0.003	<0.002	0.005	0.003	0.004
Dissolved orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.004	<0.001	0.010	0.002	<0.001	<0.001	<0.001	<0.001
Total Metals																						
Aluminum	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	13	12	6.6	13	6.0	20	6.9	36
Antimony	µg/L	9.0	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.3	0.2	0.1	0.1
Arsenic	µg/L	5.0	5.0	-	-	-	-	-	-	-	-	-	-	-	0.21	0.51	0.22	0.15	0.21	0.17	0.28	0.25
Barium	µg/L	1,000	-	-	-	-	-	-	-	-	-	-	-	-	51	19	139	74	41	69	66	99
Beryllium	µg/L	0.13	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bismuth	µg/L	0.5[g]	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	1,200	29,000	-	-	-	-	-	-	-	-	-	-	-	17	<10	<10	12	94	57	24	20
Cadmium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.013	0.012	0.032	<0.005	0.060	0.019	0.015	0.031
Calcium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	39,400	41,500	27,400	44,600	201,000	131,000	78,700	79,000
Chromium	µg/L	1.0[h]	-	-	-	-	-	-	-	-	-	-	-	-	0.20	0.30	0.11	0.23	0.10	0.14	0.19	0.20
Cobalt	µg/L	4.0	110	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	1.2	0.4	<0.1	0.2
Copper	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	µg/L	1,348[f]	1,000	-	-	-	-	-	-	-	-	-	-	-	13	<10	<10	15	11	33	<10	42
Lead	µg/L	6.5 - 20[c]	81 - 417[c]	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	121.6[g]	-	-	-	-	-	-	-	-	-	-	-	-	4.6	1.9	1.7	4.4	45	26	12	11
Magnesium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	10,700	8,010	8,910	12,400	113,000	54,300	28,100	27,500
Manganese	µg/L	1,043 - 2,585[c]	1,638 - 3,394[c]	-	-	-	-	-	-	-	-	-	-	-	0.8	<0.1	0.8	1.9	7.9	4.8	2.0	3.4
Mercury	µg/L	0.0100	-	-	-	-	-	-	-	-	-	-	-	-	0.0006	<0.0005	0.0007	<0.0005	0.0018	0.0006	<0.0005	<0.0005
Molybdenum	µg/L	1,000	2,000	-	-	-	-	-	-	-	-	-	-	-	0.923	0.824	0.670	0.782	1.1	1.0	0.861	0.816
Nickel	µg/L	95 - 150[c]	-	5.3	15	22	63 - 153[c,f]	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	**38**[I1, I2, I3]	**14**[I1]	3.4	1.6
Potassium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	542	231	550	462	3,380	1,810	992	940
Selenium	µg/L	2.0	-	104	-	-	19	-	-	-	-	-	394	203	0.154	1.6	0.525	0.224	**19**[Mn]	**7.9**[Mn]	**4.0**[Mn]	**3.4**[Mn]
Silicon	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	2,280	1,360	2,090	2,120	2,200	2,110	1,680	2,130
Silver	µg/L	0.05 - 1.5[c]	0.10 - 3.0[c]	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	3,040	490	828	2,630	38,200	19,100	9,270	8,680
Strontium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	148	137	66	150	848	507	291	253
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	4,580	6,810	2,030	5,360	267,000	118,000	55,600	49,800
Thallium	µg/L	0.80	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	0.05	<0.01	<0.01	0.04	0.02	0.02	0.01
Tin	µg/L	300[g]	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	850[g]	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	<0.6	<0.3	<0.3	<0.3	<0.3	<0.3	<0.6
Uranium	µg/L	8.5	33	-	-	-	-	-	-	-	-	-	-	-	0.248	0.728	0.195	0.278	5.9	2.9	1.6	1.3
Vanadium	µg/L	120[i]	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	15 - 188	40 - 341	-	-	-	-	-	-	-	-	-	-	-	<3.0	<3.0	<3.0	<3.0	5.7	<3.0	<3.0	<3.0
Dissolved Metals																						
Aluminum	µg/L	50[f]	100[f]	-	-	-	-	-	-	-	-	-	-	-	1.6	2.4	1.6	1.2	3.5	<1.0	<1.0	1.6
Antimony	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.4	0.2	0.1	0.1
Arsenic	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.19	0.47	0.16	0.12	0.20	0.17	0.24	0.20
Barium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	50	18	133	73	41	74	66	106
Beryllium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bismuth	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	17	<10	<10	11	86	52	22	19
Cadmium	µg/L	0.211 - 0.457[c]	0.586 - 2.8[c]	0.134 - 0.322[c]	-	-	0.435 - 1.0[c]	-	-	374 - 894[c]	-	-	-	-	0.009	0.009	0.025	<0.005	0.056	0.016	0.016	0.020
Chromium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.3	<0.1	0.2	0.1	0.1	0.2	0.1
Cobalt	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	1.1	0.2	<0.1	<0.1
Copper	µg/L	0.7 - 1.3[j]	3.8 - 7.8[j]	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Iron	µg/L	-	350	-	-	-	-	-	-	-	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10
Lead	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6	1.4	1.6	3.8	43	26	11	10
Manganese	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	<0.1	0.4	1.4	6.1	1.9	1.6	0.7
Mercury	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.864	0.695	0.621	0.706	1.1	0.922	0.802	0.814
Nickel	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	37	13	3.4	1.5
Selenium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.202	1.8	0.514	0.245	18	7.4	4.0	3.4
Silicon	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	2,340	1,280	2,040	2,120	1,890	2,080	1,620	2,120
Silver	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	µg/L	2500[i]	-	-	-	-	-	-	-	-	-	-	-	-	145	128	63	142	863	451	287	246
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	4,740	6,360	1,440	5,440	232,000	112,000	54,200	47,900
Thallium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	0.05	<0.01	<0.01	0.04	0.02	0.02	0.01
Tin	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Uranium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.219	0.676	0.189	0.247	6.1	2.7	1.5	1.2
Vanadium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	26	<1.0	<1.0	4.5	1.2	1.1	1.7

Note: Data were screened against BC Working and Approved WQGs (BC ENV 2019a, 2021) where available, compliance limits and site performance objectives, and EVWQP benchmarks and screening values. In the absence of BC WQGs, guidelines were adopted from CCME Canadian Environmental Quality Guidelines (CCME 1999), Environment and Climate Change Canada (ECCC) Predicted No Effect Concentration (PNECs; ECCC 2018), or ECCC draft Federal Environmental Quality Guidline (FEQG; ECCC 2017). There were no data available to screen for station MI5 in 2021 (Appendix B).

(a) = guideline is a minimum value, unless the background concentration or value is lower

(b) = guideline is adopted from Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CCME, 1999)

(c) = guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (100 to 899 mg/L). The guideline is calculated based on the individual hardness value for each sample

(d) = for some samples, water hardness was greater than 250 mg/L. At this hardness, no BC ENV water quality guideline has been established for sulphate; however, the observed data were screened against the guideline for very hard water (i.e., 429 mg/L) for comparative purposes

(e) = guideline is chloride dependent. The guideline range shown is based on the chloride concentration range observed in the dataset (0.19 to 2.2 mg/L). The guideline is calculated based on the individual chloride concentration in each sample

(f) = guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (8.3 to 8.5). The guideline is calculated based on the individual pH for each sample

(g) = guideline is adopted from Environment and Climate Change Canada's (ECCC) PNEC (ECCC 2018)

(h) = guideline is for chromium VI

(i) = guideline is adopted from Environment and Climate Change Canada's (ECCC) FEQG (ECCC 2017)

(j) = dissolved copper guideline was calculated using the Biotic Ligand Model (BC ENV 2019b) and humic acid was assumed to be 10%

(k) = Elk Valley Water Quality Plan (EVWQP) hardness dependent benchmarks and screening values applicable within a range of hardness values, above or below which the minimum or maximum of the range is used. Nitrate benchmarks are from 67 to 500 mg/L CaCO3 with a minimum benchmark value of 3 mg/L N

(l) = EVWQP nitrate benchmark was derived specific to Elk River conditions

Value[Mn] = concentration exceeds the long-term chronic BC Water Quality Guideline

Value[I1] = concentration exceeds the invertebrate level 1 EVWQP benchmark or screening value

Value[I2] = concentration exceeds the invertebrate level 2 EVWQP benchmark or screening value

Value[I3] = concentration exceeds the invertebrate level 3 EVWQP benchmark or screening value

Value[F1] = concentration exceeds the fish level 1 EVWQP benchmark or screening value

Value[F2] = concentration exceeds the fish level 2 EVWQP benchmark or screening value

Value[A1] = concentration exceeds the EVWQP amphibian level 1 benchmark or screening value

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

- = no guideline or no data; °C = degrees Celsius; µs/cm = microsiemens per centimetre; µg/L = micrograms per litre; BC WQGs = British Columbia water quality guidelines; $CaCO_3$ = calcium carbonate; mg/L = milligrams per litre; mV = millivolts; NTU = Nephelometric Turbidity Units; PNEC = Predicted No-effect Concentration; FEQG = Federal Environmental Quality Guideline.

Table E-2: Chronic Benchmarks for the Elk Valley Water Quality Plan Constituents

Receptor and Parameter	Unit	Benchmark or Screening Value[b]			Rationale
		Level 1	Level 2	Level 3	
Invertebrates					
Sulphate	mg/L	625	729	1,315	Level 1 benchmark is associated with 10% effect size, reflecting the geometric mean of two independent three-brood reproduction studies of *Ceriodaphnia dubia* (Annex F of the EVWQP, Teck 2014).
Nitrate[a]	mg/L	$=10^{(1.0003*(Log(hardness))-b)}$			Nitrate benchmarks were derived from 8-day reproductive effects in *C. dubia* in Fording River water (Annex F of the EVWQP, Teck 2014), corresponding to 10% effect for level 1.
		b = 1.82	-	-	
Dissolved Cadmium	µg/L	$=(10^{(0.83*Log(hardness)-b)}$			The level 1 benchmark represents chronic, sublethal toxicity data for the most sensitive organism reviewed for the EVWQP: the geometric mean of 7-day reproduction EC_{10} and 21-day reproduction EC_{16} for *Daphnia magna*.
		b = 2.53	-	-	
Total Selenium	µg/L	104	-	-	The upper confidence limit of the invertebrate bioaccumulation model reaches the level 1 tissue benchmark for invertebrate reproduction at an aqueous concentration of 104 µg/L (a LOEC for mayfly reproduction).
Fish					
Sulphate	mg/L	499	674	1,173	Sulphate benchmarks were derived in the EVWQP (Teck 2014). Benchmarks reflect the geometric mean of two independent rainbow trout 21- to 28-day embryo-alevin development (percent swim-up) studies (Annex F of Teck 2014).
Nitrate	mg/L	$=10^{(1.0003*(Log(hardness))-b)}$			Nitrate benchmarks were derived in the EVWQP (Teck 2014) as hardness-dependent values expressed as an equation. Benchmarks were derived from the concentration causing a 10% effect (EC_{10}) (level 1), causing a 20% effect (EC_{20}) and causing a 50% effect (EC_{50}) (level 2) for 39-day embryo-alevin development (percent swim-up) effects to rainbow trout in Fording River water (Annex F of Teck 2014).
		b = 1.35	-	-	
Dissolved Cadmium	µg/L	$=10^{(0.83*Log(hardness)-b)}$			Cadmium benchmarks were derived in the EVWQP (Teck 2014) as hardness-dependent values expressed as an equation. The level 1 benchmark was derived using the lowest effect concentration for fish reported in Annex G of the Elk Valley Water Quality Plan (EVWQP; Teck 2014), which was a lowest observed effect concentration (LOEC) for Rainbow Trout (*Oncorhynchus mykiss*) growth from a 62-day test with early life stages (embryo-alevin-fry).
		b = 2.02	-	-	
Total Selenium	µg/L	19	-	-	Selenium reproduction benchmarks were derived in the EVWQP (Teck 2014) from an integrated assessment of reproductive effects on populations of sensitive fish species. The adopted benchmarks were those derived to be protective of reproductive effects on Westslope Cutthroat Trout (WCT; *Oncorhynchus clarkii lewisi*). As detailed in the EVWQP (Teck 2014), WCT benchmarks are reproductive EC_{10} (level 1), EC_{20} (level 2), and EC_{50} (level 3) values from a site-specific and species-specific dose-response relationship for WCT (i.e., percent survival at swim-up). In egg tissue, the benchmark concentrations are 25 mg/kg dw (level 1), 27 mg/kg dw (level 2), and 33 mg/kg dw (level 3). These tissue-based effects concentrations were then translated into associated aqueous concentrations by applying a site-specific bioaccumulation model.
Amphibians					
Sulphate	mg/L	481	822	1,545	Benchmarks reflect the average of two inhibitory concentration estimates for 21-day survival and growth of Pacific tree frogs (*Pseudacris regilla*) derived from scientific literature (Annex F of the EVWQP, Teck 2014). The lowest level 1 benchmark for sulphate in the EVWQP was 481 mg/L, based on a potential 10% effect on growth of larval amphibians. A slightly lower value of 429 mg/L (equal to the BC WQG for high hardness waters) was adopted as a basis for setting a long-term water quality target for sulphate in the EVWQP and was applied as the lowest level 1 benchmark for amphibians.
Nitrate	µg/L	$=10^{(1.0003)(Log\ (hardness))-b}$			The level 1 benchmark was derived from 52-day growth studies in Northern leopard frogs (*Rana pipiens*).
		b = 1.04	-	-	
Dissolved Cadmium	µg/L	$=10^{(0.83*Log(hardness)-b)}$			The level 1 screening value was derived using the lowest effect concentration for amphibians reported in Annex G of the EVWQP (Teck 2014), which was a 24-day growth LOEC for Northwestern salamander (*Ambystoma gracile*).
		b = -0.914	-	-	
Juvenile Birds					
Total Selenium	µg/L	203	-	-	The upper confidence limit of the invertebrate bioaccumulation model reaches a level 1 dietary benchmark for juvenile bird growth (an EC10 for growth of juvenile mallard, *Anas platyrhynchos*) at 203 µg/L. Waterbirds may, therefore, be affected at an aqueous concentration of 203 µg/L (Annex E of the EVWQP, Teck 2014).
Bird Reproduction					
Total Selenium	µg/L	394	-	-	The level 1 benchmark for reproductive effects on sensitive bird species is 394 µg/L (Annex E of the EVWQP, Teck 2014).

a) Nitrate screening values are for Elk River.

"-" = not derived; µg/L = micrograms per litre; mg/L = milligrams per litre; EC_{10} = concentration causing a 10% effect; EC_{20} = concentration causing a 20% effect; EC_{50} = concentration causing a 50% effect; EVWQP = Elk Valley water quality plan; LOEC = lowest observed effect concentration.

Table E3: Chronic Screening Values for Constituents Not Included in the Elk Valley Water Quality Plan

Receptor and Parameter	Unit	Benchmark or Screening Value[(a)]			Rationale
		Level 1	Level 2	Level 3	
Invertebrates					
Bromide	mg/L	2.2	-	-	Flury and Papritz (1993) summarized chronic toxicity data for 10 invertebrate species. The lowest effect concentration was selected as the level 1 screening value for invertebrates: a 16-day length NOEC of 2.2 mg/L for *D. magna*. The next higher effect concentration for invertebrates was selected as the level 2 screening value: a 40-day reproduction NOEC of 7.8 mg/L for *L. stagnalis*. The next higher effect concentration for invertebrates was selected as the level 3 screening value: a 4-day LC50 of >67 mg/L for three invertebrate species (*Dugesia tigrine, Heliosoma trivolvis, and Lumbriculus variegatus*). Because the level 1 and level 2 screening values are based on NOEC values for invertebrates and the level 3 screening value is based on the maximum concentration tested without causing a 50% effect, there is elevated uncertainty and potentially conservatism in the interpretation of potential effects.
Fluoride	mg/L	1.9	-	-	MacPherson et al. (2014) compiled chronic toxicity data for 16 species (5 fish, 7 invertebrates, and 4 aquatic plants), fit a species sensitivity distribution (SSD), and derived a chronic effects benchmark of 1.94 mg/L. The chronic effects benchmark was adopted as the level 1 screening value for invertebrates and fish.
Total Nickel	µg/L	5.3	15	22	Screening values were calculated as percentiles of the European Union (EU; 2008) SSD, rather than individual toxicity values, to increase the amount of toxicity information considered and to evaluate potential effects at the level of both individual species and the broader invertebrate community. The level 1 screening value is the 5th percentile of the SSD, representing a concentration that could result in chronic, sublethal effects to the most sensitive invertebrate species. The level 2 screening value is approximately the 15th percentile of the SSD, which is slightly higher than the third lowest toxicity value (NOEC for *Ceriodaphnia quadrangula*) and approximately equal to the fourth lowest toxicity value (NOEC for *Peracantha truncata*). Because the level 2 and level 3 screening values are based on NOEC values for invertebrates, there is elevated uncertainty and potentially conservatism in the interpretation of potential effects.
Total Phosphorous	mg-P/L	0.030	-	-	A study of the relationship between nutrients and productivity in Elk Valley waters was recently conducted by Minnow (2020). Analyses of site-specific data and information in the scientific literature indicated that most of the streams in the Elk Valley are phosphorus-limited and also suggest that nutrient-related effects on productivity may not be distinguishable from the effects of other environmental factors (e.g., flow cycles, light) until concentrations of total phosphorus are greater than 0.03 mg/L and/or concentrations of orthophosphate are greater than 0.006 mg/L (Minnow 2020). These values were adopted as the level 1 screening value.
Total Dissolved Solids	mg/L	1,000	1,750	3,000	Golder and Nautilus (2013) reported a *C. dubia* reproduction IC_{20} at approximately 1,000 mg/L TDS. Reliable IC_{10} values could not be calculated for this dataset, so Golder and Nautilus (2013) recommended use of IC_{20}. Chapman et al. (2000) reported a 10-day LOEC of 1,750 mg/L for survival of *C. tentans* exposed to synthetic TDS mixtures composed mainly of calcium sulphate, although Hynes (1990) reported no effects on the benthic invertebrate community of a lake receiving treated uranium mill effluent where TDS levels increased from 76 to 2,700 mg/L. The Chapman et al. (2000) LOEC of 1,750 mg/L was selected as a level 2 screening value for TDS. Hammer et al. (1975) reported that freshwater species start to disappear when TDS levels exceed 3,000 mg/L. This concentration was selected as the level 3 screening value for all aquatic species.
Fish					
Bromide	mg/L	7.8	-	-	Flury and Papritz (1993) compiled chronic toxicity data for bromide. Chronic toxicity data was available for 13 aquatic species (five species of fish, seven invertebrate species, and one amphibian species). The lowest effect concentration for fish was selected as the level 1 screening value: a 124-day reproduction NOEC of 7.8 mg/L for the guppy *Poecilia reticulata*. Rainbow trout were similarly sensitive with a 90-day growth NOEC of 8 mg/L. Because the level 1 screening value is based on NOEC values, there is elevated uncertainty and potentially conservatism in the interpretation of potential effects.
Fluoride	mg/L	1.9	-	-	MacPherson et al. (2014) compiled chronic toxicity data for 16 species (5 fish, 7 invertebrates, and 4 aquatic plants), fit a species sensitivity distribution (SSD), and derived a chronic effects benchmark of 1.94 mg/L. The chronic effects benchmark was adopted as the level 1 screening value for invertebrates and fish.
Total Nickel	µg/L	$10^{(\log(b) - 0.763\times(\log(103)-\log(hardness)) - 0.073\times(\log(0.5)-\log(DOC))+0.242\times(7.4-pH))}$			Nickel toxicity data summarized by the EU (2008) indicate that fish are less sensitive than invertebrates, with effects concentrations more than an order of magnitude higher than those calculated for sensitive invertebrate species. EU (2008) identified median hatching time for Zebrafish as the lowest reliable effect concentration for fish. Fathead Minnow survival was a similarly sensitive endpoint, with EU (2008) reporting normalized effect concentrations for Fathead Minnow survival being 8% higher than those reported for Zebrafish. The Zebrafish study did not measure aqueous nickel concentrations, mortality was high in the control treatment, and there is greater uncertainty in the relevance of the test endpoint (hatch time). In comparison, the Fathead Minnow study reported measured aqueous nickel concentrations, control mortality was low, and the survival endpoint was considered relevant. For these reasons, the Fathead Minnow data were relied upon to develop screening values for fish using the following approach. Fathead Minnow survival data for day 32 (the longest test duration in study) and water chemistry were compiled from the EU website[1]; nickel concentrations were log-transformed prior to analyses. A logistic concentration-response curve was fit using US EPA toxicity relationship analysis program (TRAP) (version 1.3) to estimate the following effects concentrations (± 95% confidence limits): LC_{10} = 88 µg/L (43–177), LC_{20} = 134 µg/L (80–225), and LC_{50} = 278 µg/L (210–367). Slopes for hardness, DOC, and pH from the MLR were used to describe how the concentration-response curve for Fathead Minnow survival would be adjusted as a function of these variables by converting the LC50 value from the test water chemistry to a target hardness, DOC, and pH. The resulting hardness-, DOC-, and pH-dependent curve for Fathead Minnow survival was used to estimate response sizes for sensitive fish species. Screening values for fish corresponding to 10% (Level 1), 20% (Level 2), and 50% (Level 3) effects can be estimated with this equation based on site-specific hardness, DOC, and pH (e.g., Elk Valley conditions). This equation applies for hardness of 80 to 320 mg/L as $CaCO_3$, DOC of 1 to 5 mg/L, and pH of 7.0 to 8.1.
		b = 88	-	-	
Total Phosphorous	mg-P/L	0.030	-	-	A study of the relationship between nutrients and productivity in Elk Valley waters was recently conducted by Minnow (2020). Analyses of site-specific data and information in the scientific literature indicated that most of the streams in the Elk Valley are phosphorus-limited and also suggest that nutrient-related effects on productivity may not be distinguishable from the effects of other environmental factors (e.g., flow cycles, light) until concentrations of total phosphorus are greater than 0.03 mg/L and/or concentrations of orthophosphate are greater than 0.006 mg/L (Minnow 2020). These values were adopted as the level 1 screening value.

1 https://echa.europa.eu/registration-dossier/-/registered-dossier/15544/6/2/3/?documentUUID=6f17e5cd-3390-4c00-bff8-1ff25f66b019. EU (2008) reported the following test conditions: hardness = 103 mg/L as $CaCO_3$, DOC of 0 mg/L, and pH = 7.4. For the purpose of the analysis, DOC was set equal to 0.5 mg/L which is the method detection limit in most commercial laboratories.

Table E3: Chronic Screening Values for Constituents Not Included in the Elk Valley Water Quality Plan

Receptor and Parameter	Unit	Benchmark or Screening Value[(a)]			Rationale
		Level 1	Level 2	Level 3	
Total Dissolved Solids	mg/L	1,000	2,000	3,000	Golder and Nautilus (2013) evaluated sulphate toxicity to Rainbow Trout in Fording River waters. The program was designed to assess how the toxicity of sulphate may change in very hard waters and whether the overall ionic content of the water may induce a toxic effect. Therefore, Golder and Nautilus (2013) tested two TDS mixtures to assess how overall ionic content and the associated ionic mixture could affect sulphate toxicity: 1) Fording River water, which is representative of most locations, and 2) Fording River water supplemented with alkalinity (which results in higher bicarbonate) to be representative of conditions in a subset of tributaries, including Kilmarnock Creek. Total alkalinity was ~184 mg/L in the first mixture (average across all treatments) and ~218 mg/L in the second mixture (average across all treatments). Sulphate was introduced into all of the test solutions as calcium sulphate and magnesium sulphate in a calcium-to-magnesium ratio that is comparable to that observed in the Fording River. Therefore, TDS effect concentrations from this study are site-specific and representative of the ionic composition in the upper Fording River watershed. Golder and Nautilus (2013) reported that survival and normal swim-up was the most sensitive endpoint in Rainbow Trout embryos, yielding an EC_{20} for TDS of approximately 1,000 mg/L. Reliable IC_{10} values could not be calculated for this dataset, so Golder and Nautilus (2013) recommended use of IC_{20}. Kimmel and Argent (2009) suggest a range of 2,000 to 3,000 mg/L TDS as a threshold for changes to fish communities in streams receiving coal mine discharge. The lower end of this range was selected as the level 2 screening value for fish. Hammer et al. (1975) reported that freshwater species start to disappear when TDS levels exceed 3,000 mg/L. This concentration was selected as the level 3 screening value for all life stages.

µg/L = micrograms per litre; mg/L = milligrams per litre; BLM = biotic ligand model; $CaCO_3$ = calcium carbonate; DOC = dissolved organic carbon; EC_{20} = concentration causing a 20% effect; EC_{50} = concentration causing a 50% effect; EU = European Union; IC_{10} = concentration causing 10% inhibition; IC_{20} = concentration causing 20% inhibition; LC_{10} = concentration causing 10% lethality; LC_{20}= concentration causing 10% lethality; LC_{50} = concentration causing 50% lethality; LOEC = lowest observed effect concentration; MLR = Multiple Linear Regression; NOEC = no observed effect concentration; SSD = species sensitivity distribution; TDS = total dissolved solids; TRAP = Toxicity Relationship Analysis Program.

REFERENCES

Chapman PM, Bailey H, Canaria E. 2000. Toxicity of total dissolved solids associated with two mine effluents to chironomid larvae and early life stages of rainbow trout. Environmental Toxicology and Chemistry 19:210–214.

De Schamphelaere K, Van Laer L, Deleebeeck N, Muyssen B, Degryse F, Smolders E, Janssen C. 2006. Nickel speciation and ecotoxicity in European natural surface waters: development, refinement and validation of bioavailability models. Gent, Belgium: Ghent University. Laboratory of Environmental Toxicology and Chemistry.

European Union (EU). 2008. European Union Risk Assessment Report – Nickel. May 2008. [updated 30 May 2018, accessed January 2019]. Available at: https://echa.europa.eu/documents/10162/cefda8bc-2952-4c11-885f-342aacf769b3

Environment Canada. 2017. Federal Environmental Quality Guidelines – Cobalt. May 2017. Available at: http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=92F47C5D-1.

Flury M, Paptriz A.1993. Bromide in the Natural Environment: Occurrence and Toxicity. Journal of Environmental Quality 22(4): 747-758.

Golder and Nautilus (Nautilus Environmental). 2013. Elk Valley mixture toxicity study, Phase I Report. Submitted to Teck Coal Limited July 2013.

Hammer UT, Haynes RC, Heseltin JM, Swanson S. 1975. The saline lakes of Saskatchewan. Proceedings of the International Association of Theoretical and Applied Limnology 18:589-598.

Hynes TP. 1990. The impacts of the Cluff Lake Uranium Mine and mill effluent on the aquatic environment of northern Saskatchewan. M.Sc. Thesis. University of Saskatchewan, Department of Biology, Saskatoon, Saskatchewan.

Kimmel WG, Argent DG. 2009. Stream fish community responses to a gradient of specific conductance. Water, Air, and Soil Pollution 206: 49-56.

MacPherson CA, Lee DHY, Chapman PM. 2014. Development of a Fluoride Chronic Effects Benchmark for Aquatic Life in Freshwater. Environ Toxicol Chem. 33: 2621-7.

Minnow. 2020. Evaluation of Nutrient Concentrations in the Elk River Watershed. Prepared for Teck Coal Limited. November 2020.

Teck (Teck Coal Limited). 2014. Elk Valley water quality plan. Submitted to the British Columbia Ministry of Environment, July 22, 2014. Approved on November 18, 2014. Sparwood, BC. 290 pp.

APPENDIX F

Calcite Data

Table F-1: Calcite Data at CMm LAEMP Sampling Stations, 2015 to 2021

Station		Location (UTMs)[a]		Replicates	Calcite Index							
		Easting	Northing		2015	2016	2017	2018	2019	2020	2021[b]	
											Old Method	New Method
Reference	RG_MI25	668184	5482818	1	0.360	0.000	0.580	0.350	0.000	0.020	0.000	0.000
				2	0.360	-	-	0.240	0.000	0.000	0.000	0.000
				3	0.360	-	-	0.020	0.000	0.020	0.000	0.000
	RG_AGCK	667557	5488648	1	0.000	-	-	0.310	0.000	0.000	0.070	0.022
				2	-	-	-	0.210	0.000	0.000	0.080	0.014
				3	-	-	-	0.220	0.000	0.000	0.120	0.035
	RG_LE1	659635	5494108	1	-	-	-	0.000	0.000	0.000	0.000	0.000
				2	-	-	-	-	0.000	0.000	0.000	0.000
				3	-	-	-	-	0.000	0.000	0.000	0.000
Mine-influenced	RG_MIUCO	668135	5486767	1	0.870	0.520	0.590	1.410	0.000	0.040	0.000	0.000
				2	-	-	-	0.720	0.000	0.100	0.000	0.000
				3	-	-	-	0.740	0.000	0.130	0.003	0.010
	RG_CORCK	668539	5487366	1	1.360	1.000	2.190	2.740	2.300	2.770	1.920	2.023
				2	-	-	-	1.980	2.300	2.700	2.660	2.444
				3	-	-	-	2.480	2.900	2.880	2.760	2.635
	RG_MIDCO	667616	5487621	1	0.690	1.000	0.910	1.630	0.900	0.610	0.080	0.015
				2	-	-	-	1.780	0.990	0.550	0.100	0.015
				3	-	-	-	1.470	0.970	0.500	0.080	0.012
				4	-	-	-	1.530	0.980	0.620	0.000	0.000
				5	-	-	-	1.300	0.930	0.820	0.060	0.010
	RG_CM_MC2[c]	667249	5488144	1	-	-	-	-	-	0.640	-	-
				2	-	-	-	-	-	0.700	-	-
				3	-	-	-	-	-	0.800	-	-
	SS_MIDAG-S1[c]	666290	5488507	1	-	-	-	-	-	0.190	-	-
				2	-	-	-	-	-	0.040	-	-
				3	-	-	-	-	-	0.060	-	-
	SS_MIDAG-S2[c]	665770	5488854	1	-	-	-	-	-	0.010	-	-
				2	-	-	-	-	-	0.020	-	-
				3	-	-	-	-	-	0.070	-	-
	RG_MIDAG	665220	5489324	1	0.360	-	-	0.660	0.000	0.030	0.070	0.015
				2	-	-	-	0.550	0.000	0.010	0.000	0.000
				3	-	-	-	0.550	0.000	0.010	0.010	0.001
	RG_MIULE	660503	5493048	1	-	-	-	1.020	0.000	0.020	0.500	0.078
				2	-	-	-	0.560	0.000	0.040	0.626	0.107
				3	-	-	-	0.600	0.000	0.070	0.586	0.111
	RG_MI5	659496	5496774	1	0.500	-	-	0.420	0.000	0.030	0.030	0.005
				2	-	-	-	0.370	0.000	0.110	0.030	0.003
				3	-	-	-	0.800	0.000	0.090	0.000	0.000

a) UTM coordinates provided are from the 2021 sampling program, except for the three stations CM-MC2, MIDAG-S1, and MIDAG-S2, which were only sampled in 2020 as part of the Nickel Benchmark Study.
b) The Calclite Index calculation method changed in 2021 to a proportional assessment of calcite presence. All previous years were calculated using a binary presence/absence methodology. The 2021 results are presented using both methods.
c) Supplemental stations for the Nickel Benchmark Study in 2020.
- = data not available or data not recorded; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

APPENDIX G

Supplemental Figures

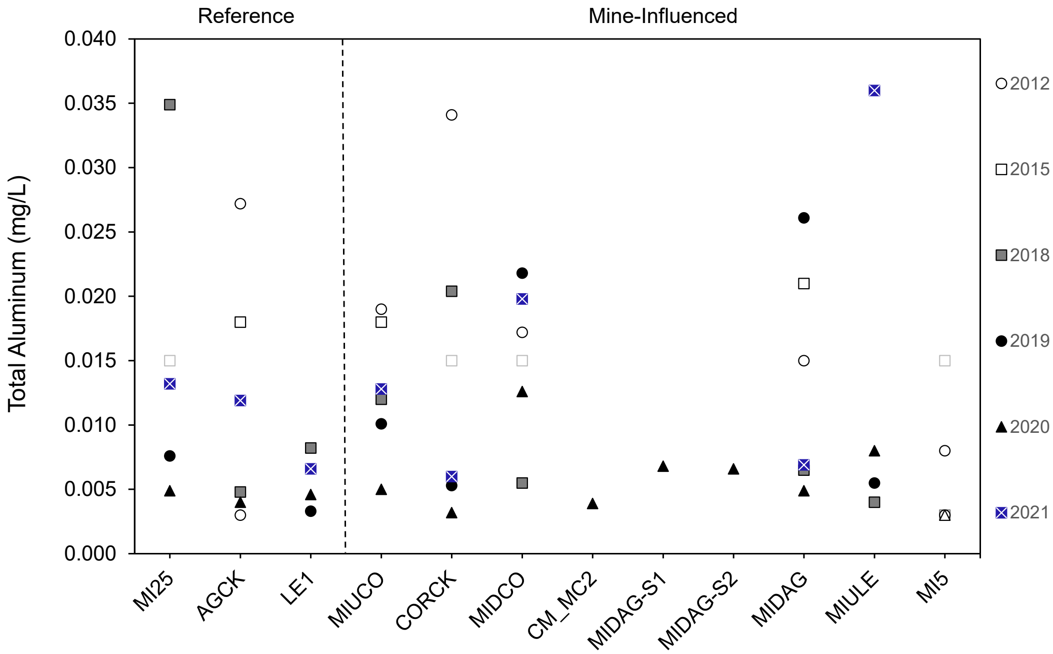
Table of Contents

G SUPPLEMENTARY FIGURES

G1 WATER QUALITY

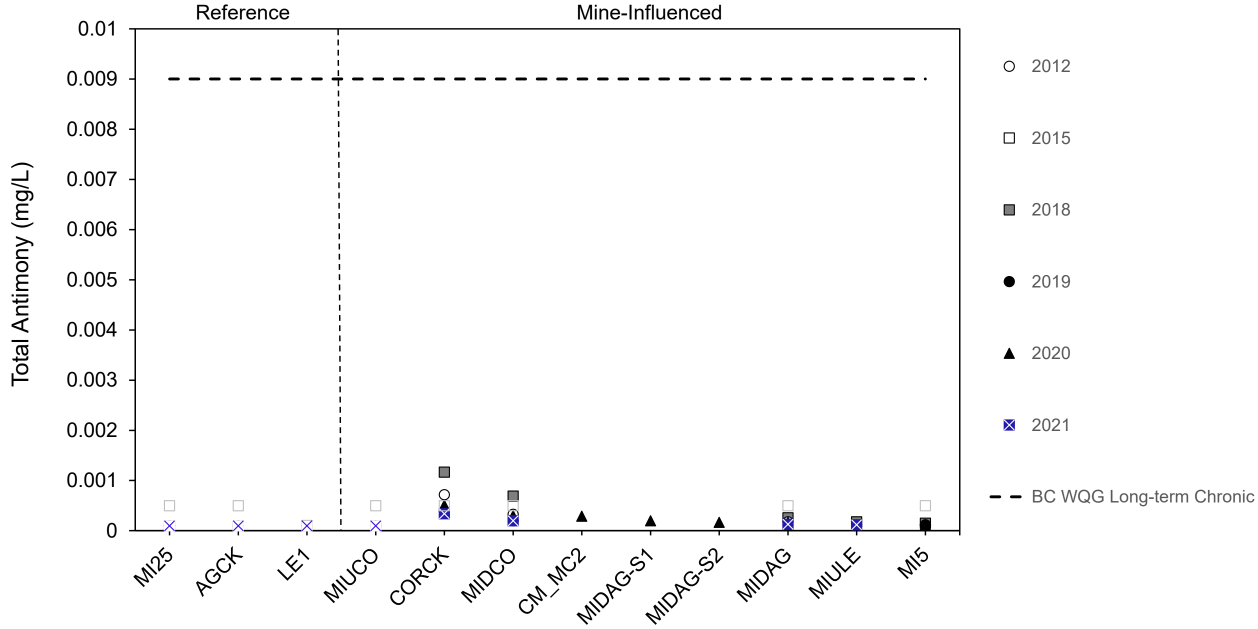
G1.1 Spatial Trends

Figure G1.1-1: Spatial Variation in Aqueous Aluminum Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



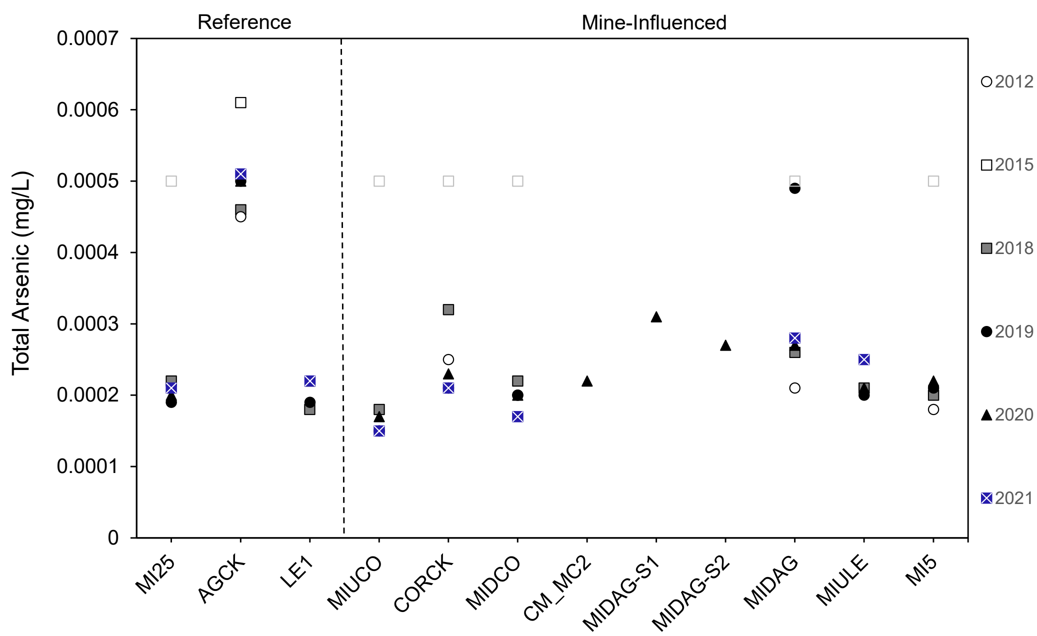
Note: Open symbols represent non-detects.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-2: Spatial Variation in Aqueous Antimony Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



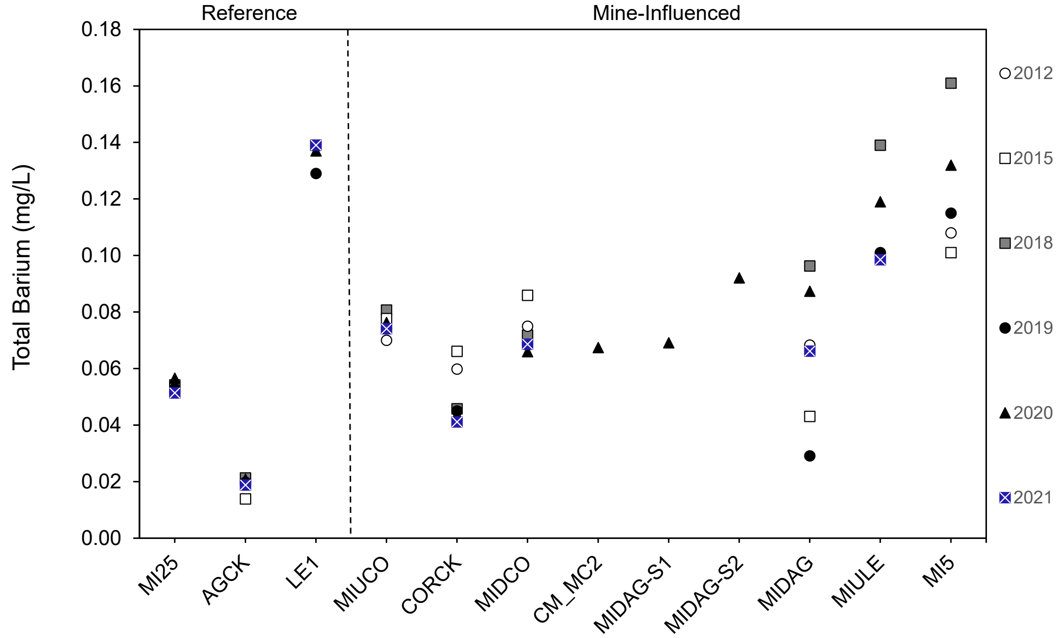
Note: Open symbols represent non-detects.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure F1.1-3: Spatial Variation in Aqueous Arsenic Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



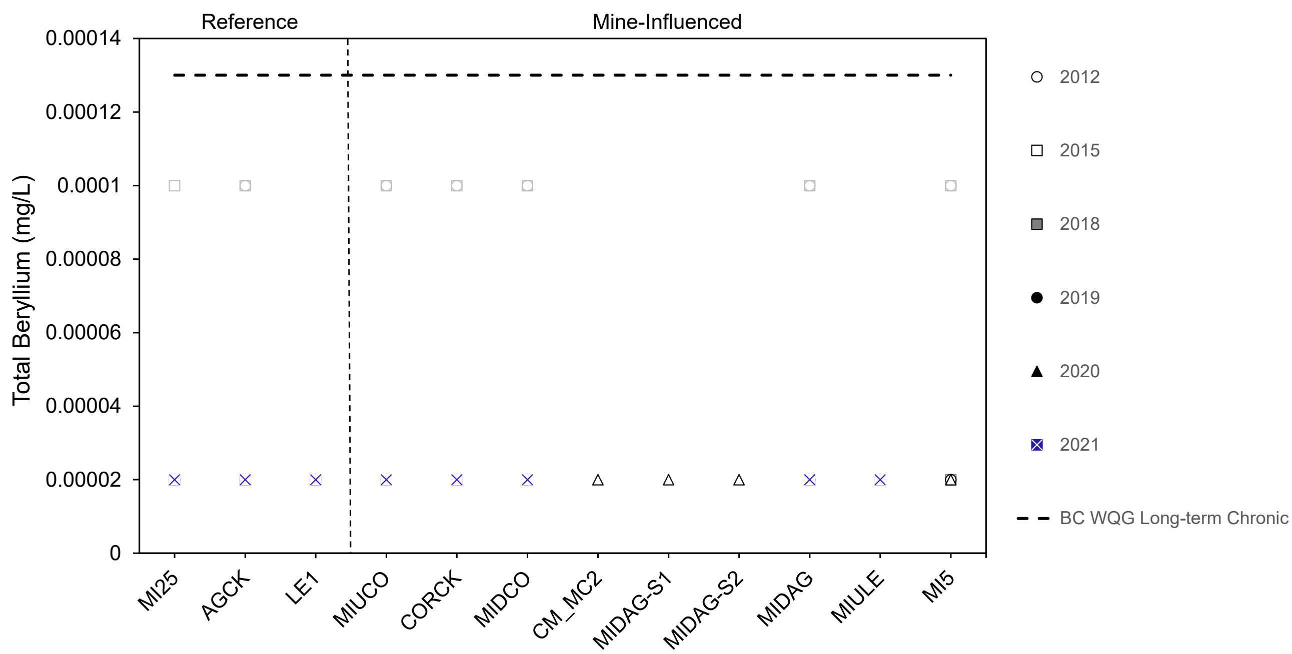
Note: Open symbols represent non-detects. Short-term BC WQG not shown (0.5 mg/L).
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-4: Spatial Variation in Aqueous Barium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



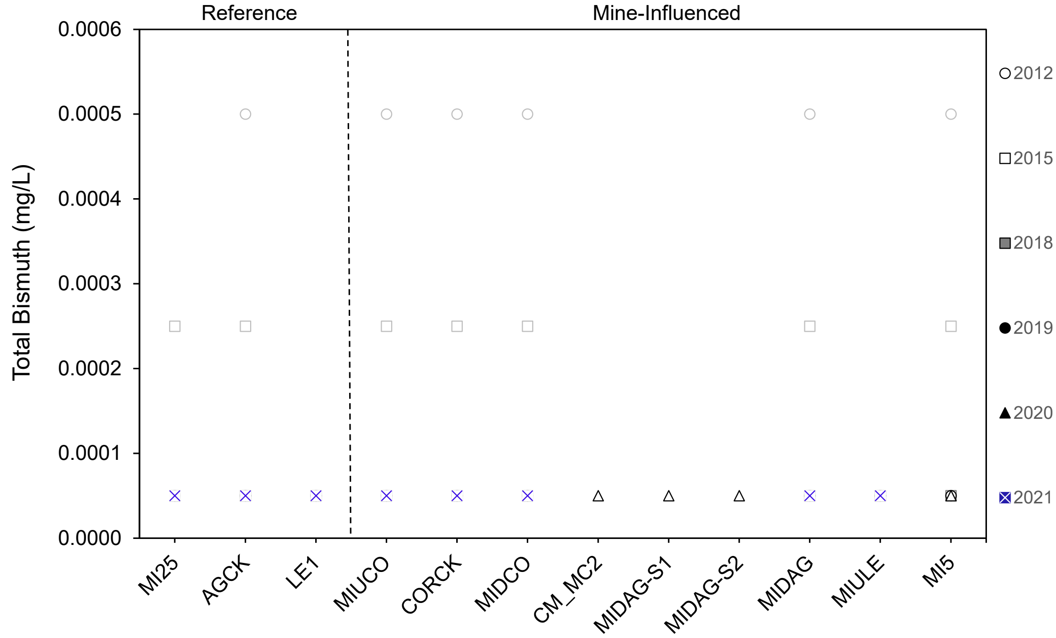
Note: Long-term BC WQG (1.0 mg/L) not shown.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-5: Spatial Variation in Aqueous Beryllium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



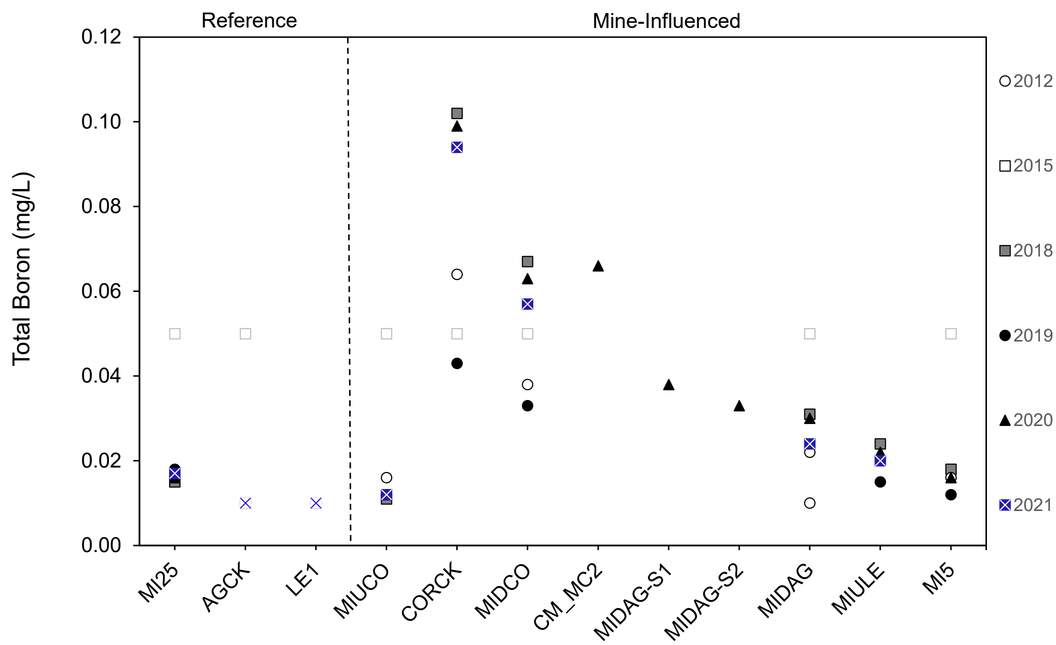
Note: Open symbols represent non-detects.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-6: Spatial Variation in Aqueous Bismuth Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



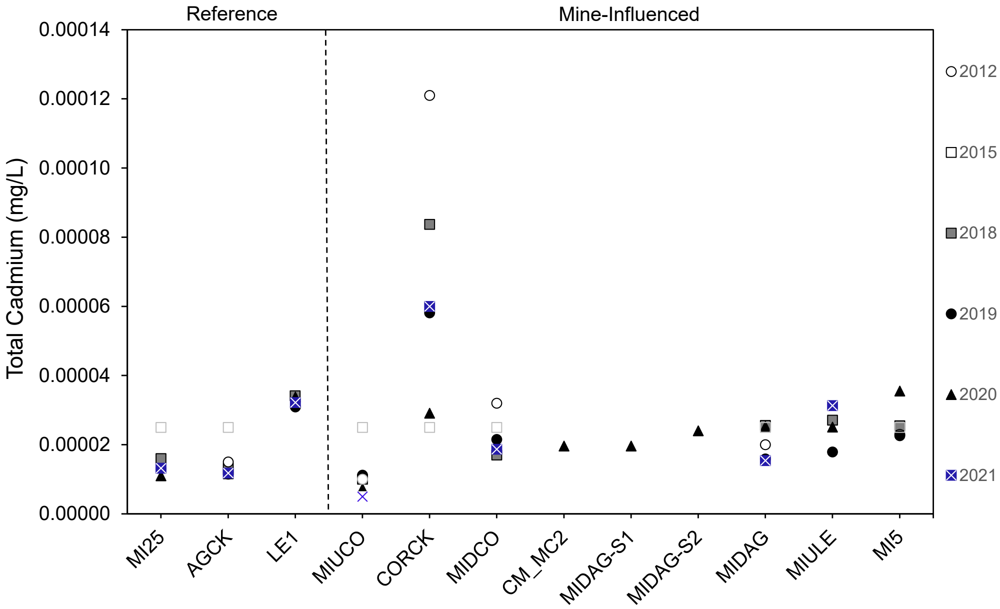
Note: Open symbols represent non-detects.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-7: Spatial Variation in Aqueous Boron Concentrations in Samples Collected from the CMm LAEMP, 2012 to 20201



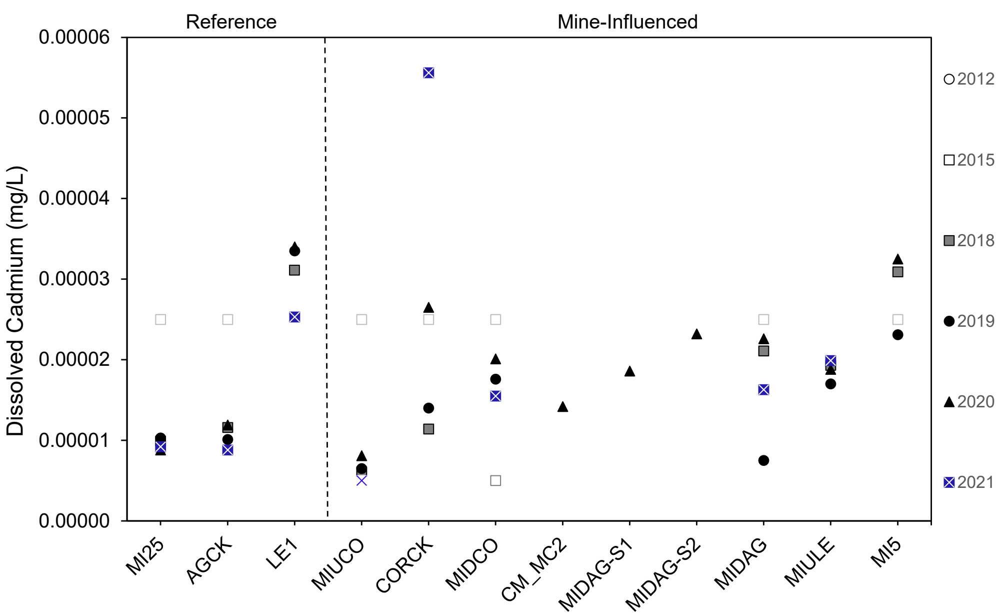
Note: Open symbols represent non-detects. Long-term BC WQG not shown (1.2 mg/L).
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-8: Spatial Variation in Aqueous Cadmium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Open symbols represent non-detects. Permit 107517 Site Performance Objective (CM_MC2) not shown (0.00015 to 0.0009 mg/L). mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

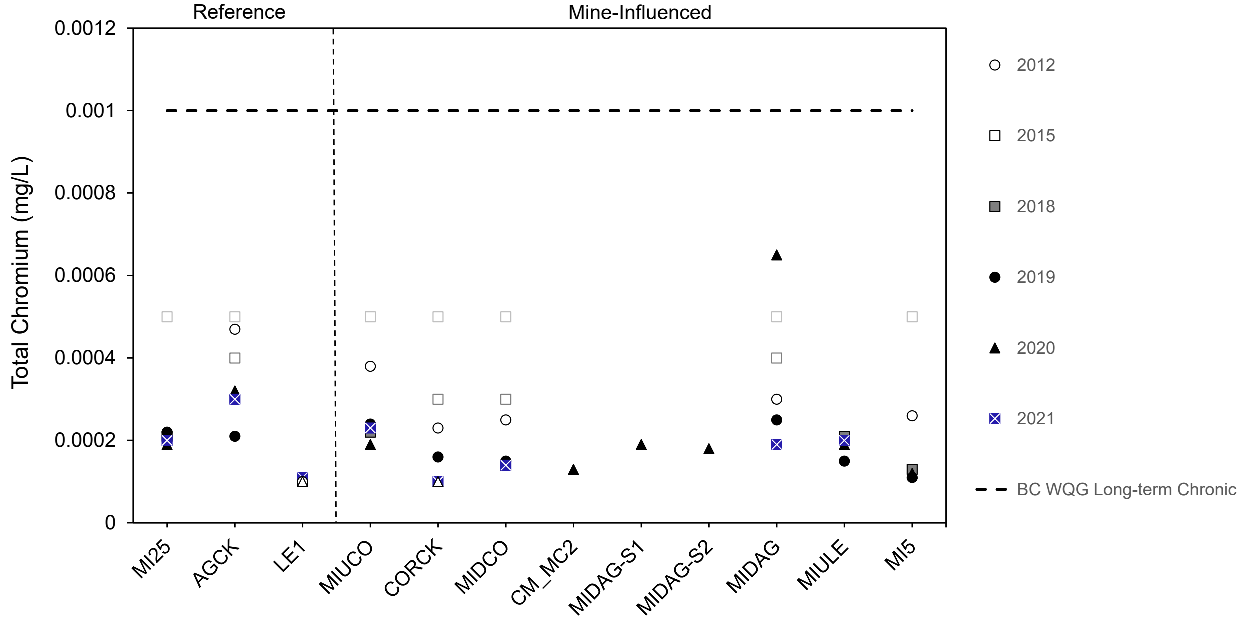
Figure G1.1-9: Spatial Variation in Aqueous Dissolved Cadmium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note:
Dissolved cadmium is presented because it is an order constituent (i.e., there is a benchmark for dissolved cadmium unlike other dissolved metals). Open symbols represent non-detects. Guidelines not shown: long-term BC WQG (0.00023 to 0.00046 mg/L); short-term BC WQG (0.00066 to 0.00028 mg/L); EVWQP level 1 invertebrate benchmark (0.00015 to 0.00032 mg/L); EVWQP level 1 fish benchmark (0.00048 to 0.00010 mg/L); and, EVWQP level 1 amphibian benchmark (0.41 to 89 mg/L).

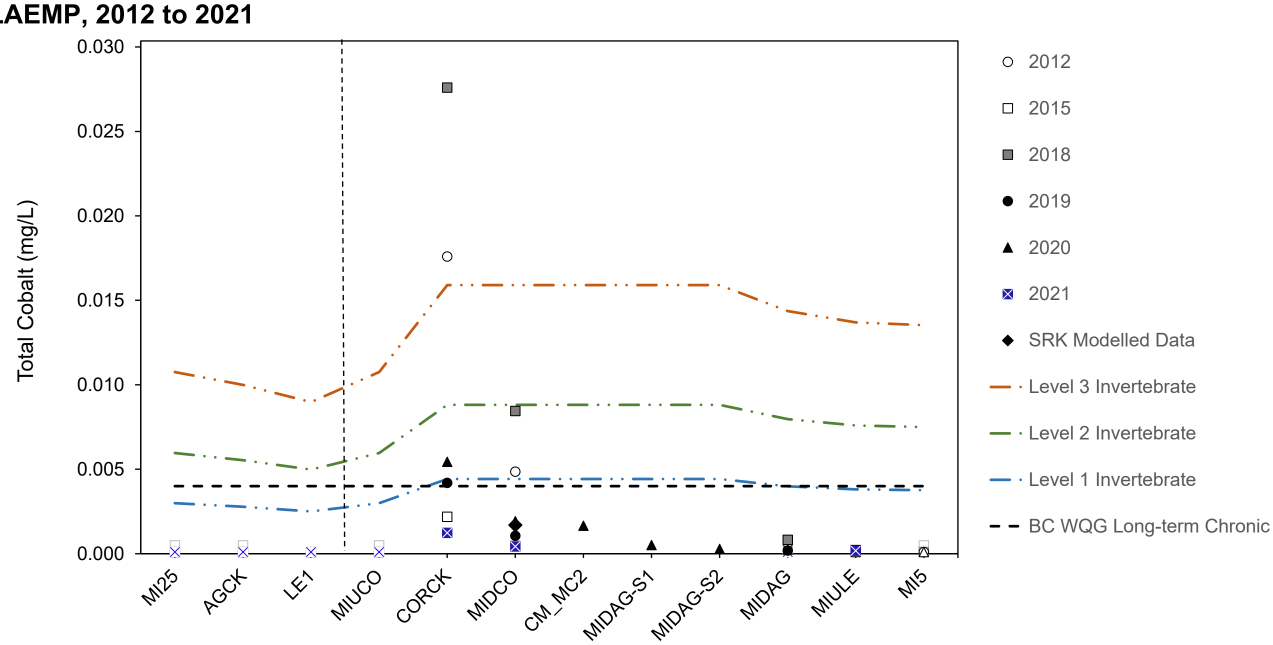
EVWQP = Elk Valley water quality plan; mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-10: Spatial Variation in Aqueous Chromium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



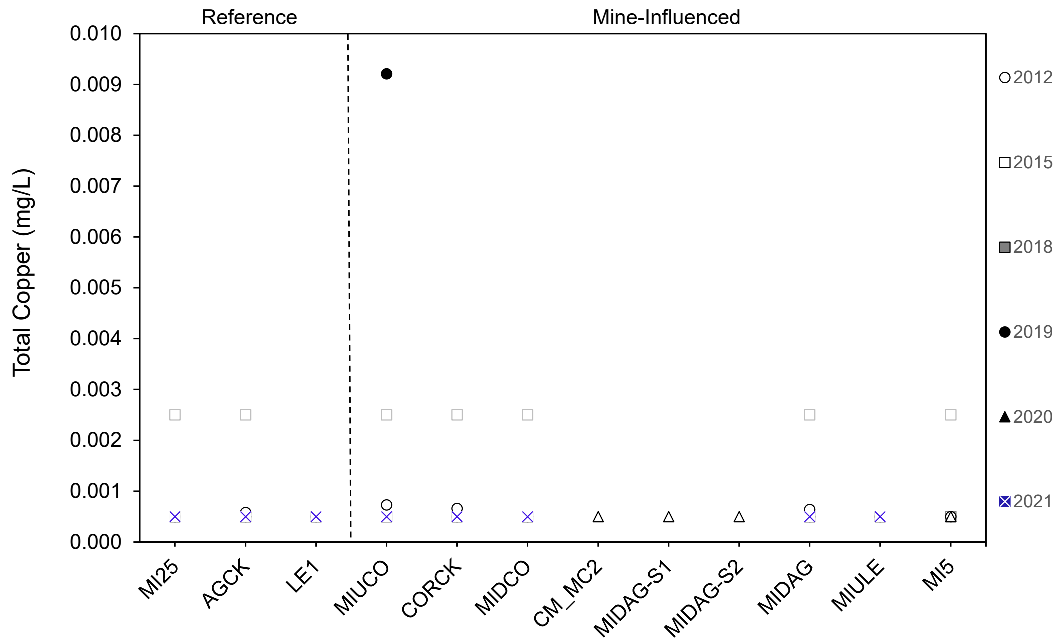
Note: Open symbols represent non-detects.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; EVWQP = Elk Valley Water Quality Plan; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-11: Spatial Variation in Aqueous Cobalt Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



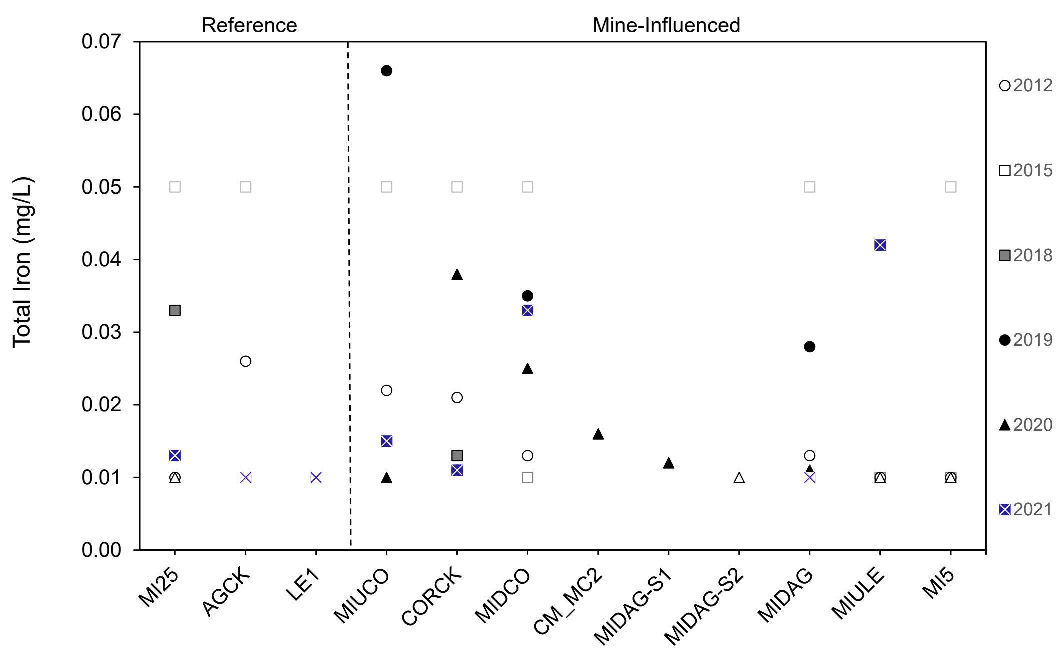
Notes: Open symbols represent non-detects. BC WQG short-term (0.11 mg/L) not shown due to scale. Level 1, 2, and 3 screening values are hardness-dependent and calculated based on hardness observed in 2021. The SRK modelled data point is for 2021 (SRK 2022).
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-12: Spatial Variation in Aqueous Copper Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



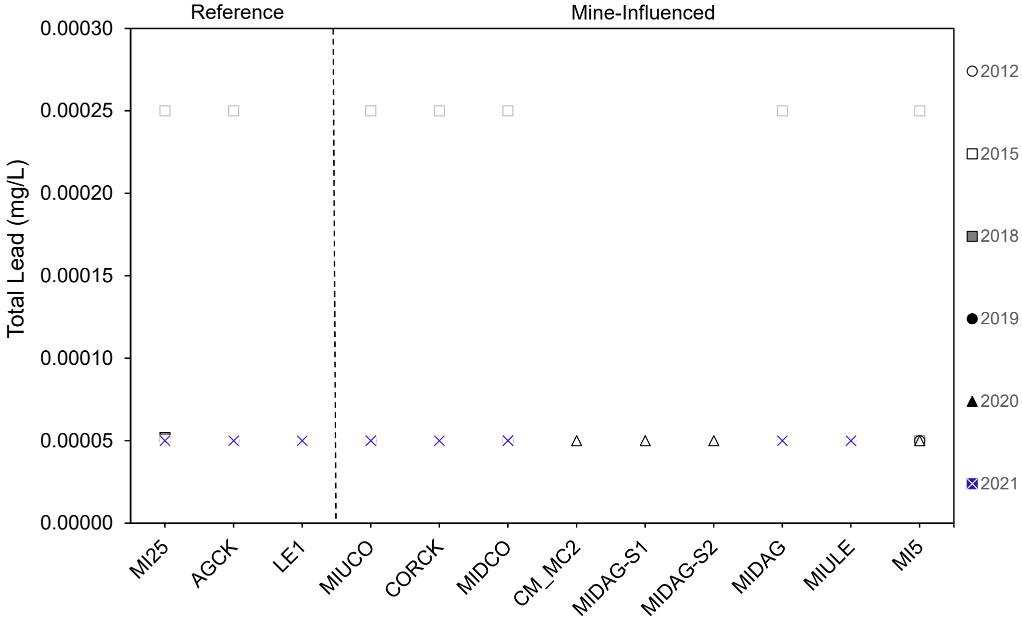
Note: Open symbols represent non-detects.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-13: Spatial Variation in Aqueous Iron Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



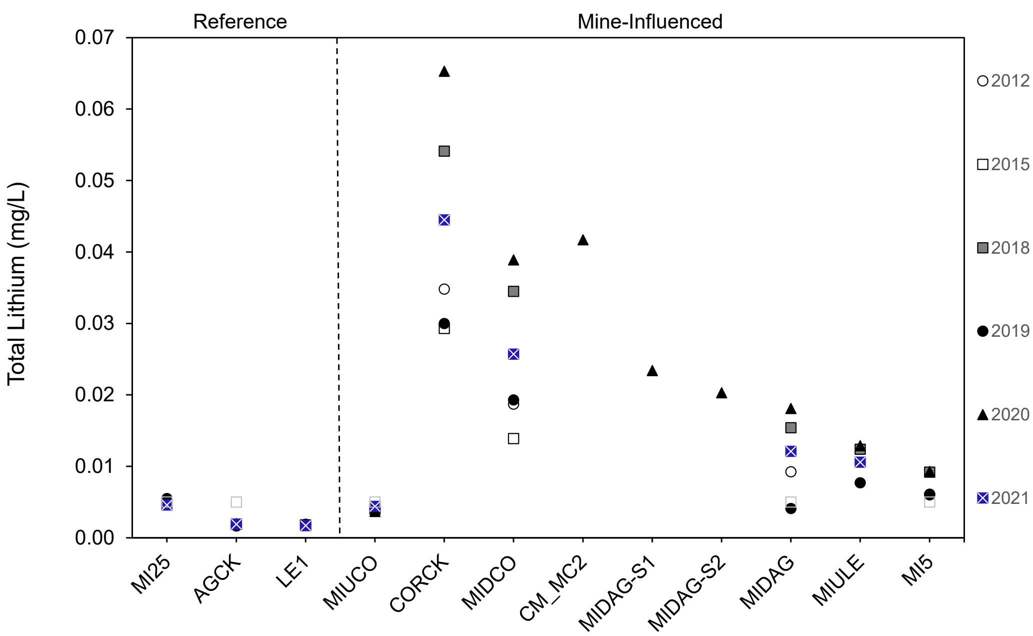
Note: Open symbols represent non-detects. Short-term BC WQG not shown (1.0 mg/L).
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-14: Spatial Variation in Aqueous Lead Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



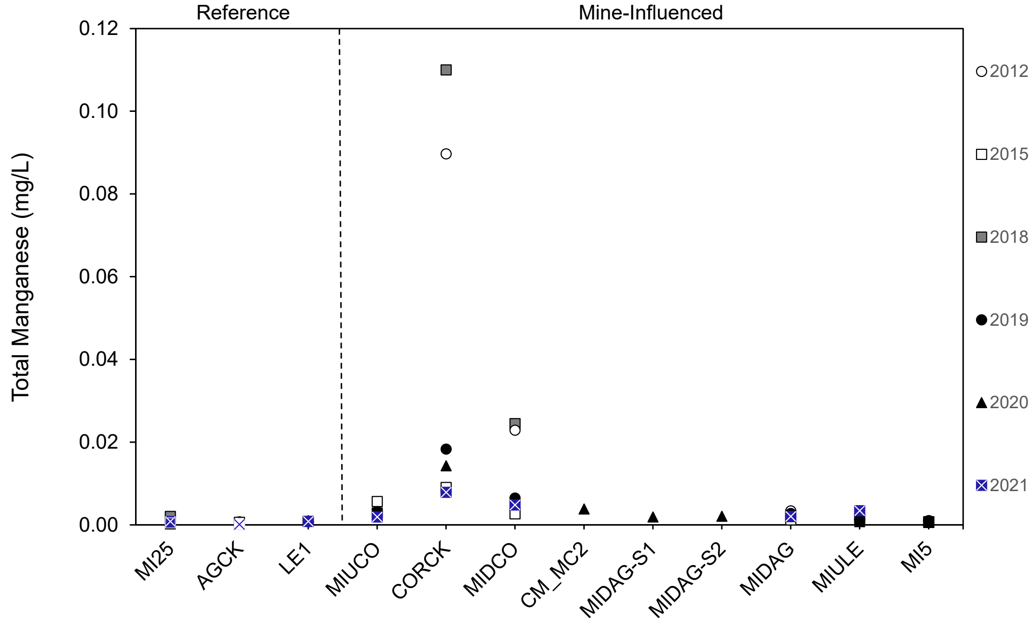
Note: Open symbols represent non-detects. Long-term BC WQG (hardness dependent; 0.007 to 0.020 mg/L) and the short-term BC WQG (0.094 to 0.420 mg/L) not shown.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-15: Spatial Variation in Aqueous Lithium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



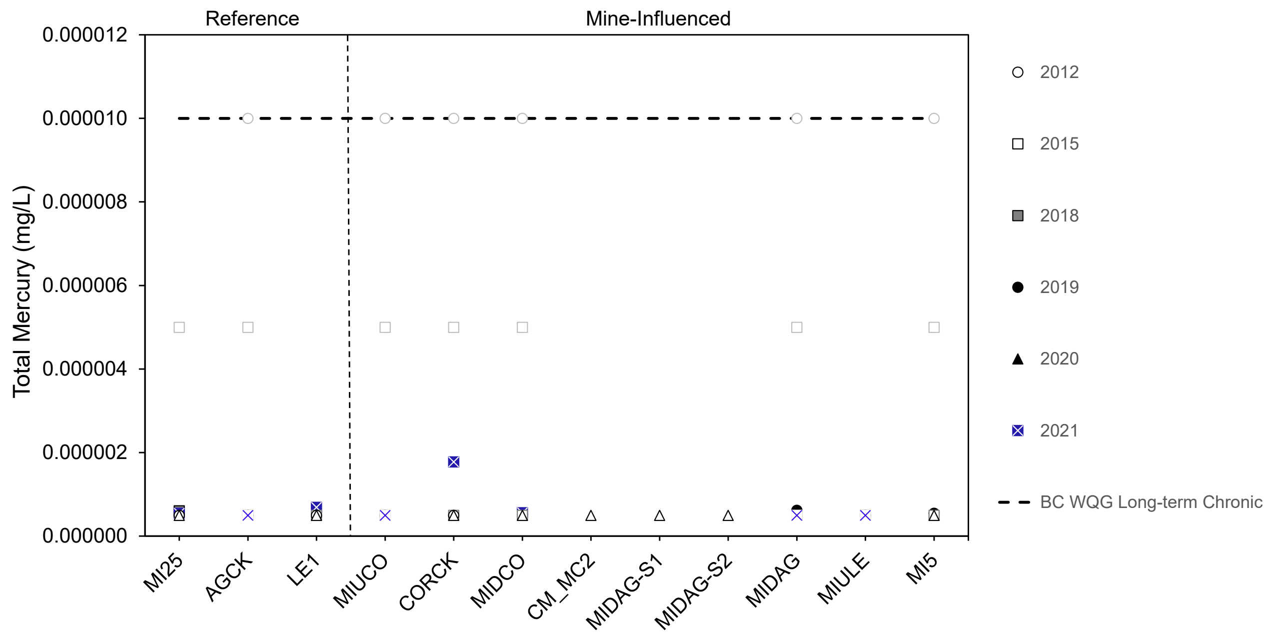
Note: Open symbols represent non-detects. Environment and Climate Change Canada predicted no effect concentration (0.12 mg/L) not shown.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-16: Spatial Variation in Aqueous Manganese Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



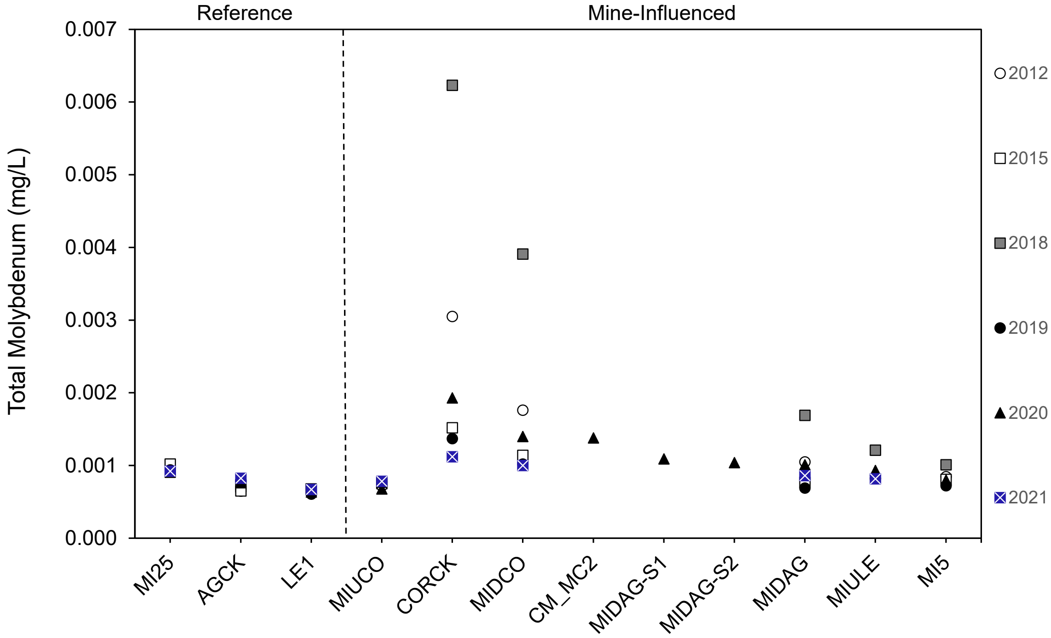
Note: Open symbols represent non-detects. Long-term BC WQG (hardness dependent; 1.1 to 4.9 mg/L) and short-term BC WQG (1.8 to 11 mg/L) not shown.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-17: Spatial Variation in Aqueous Mercury Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



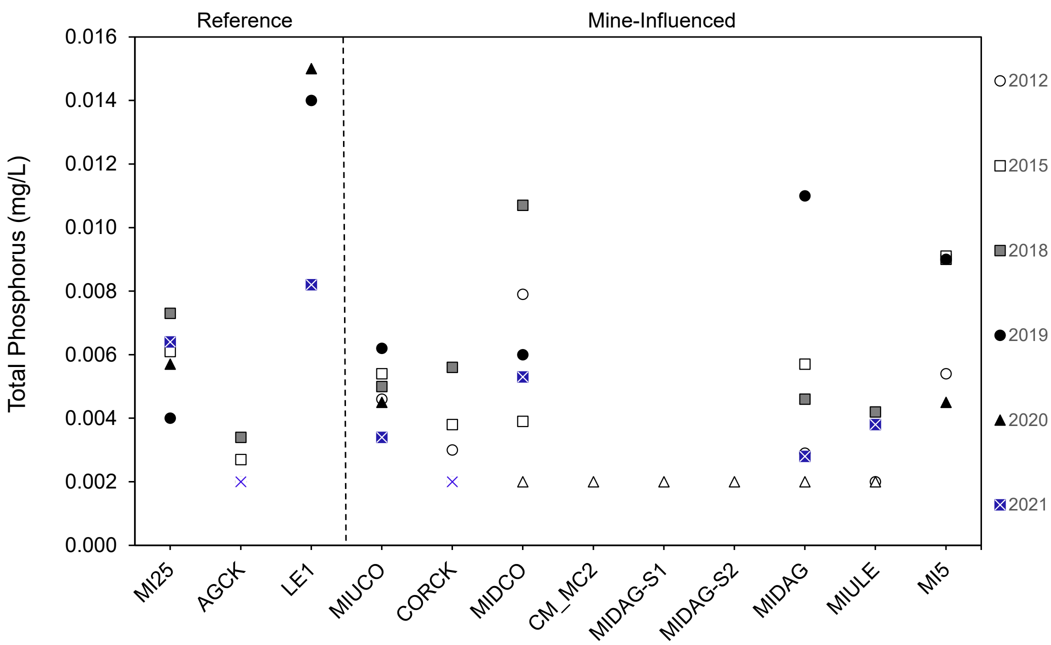
Note: Open symbols represent non-detects.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-18: Spatial Variation in Aqueous Molybdenum Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



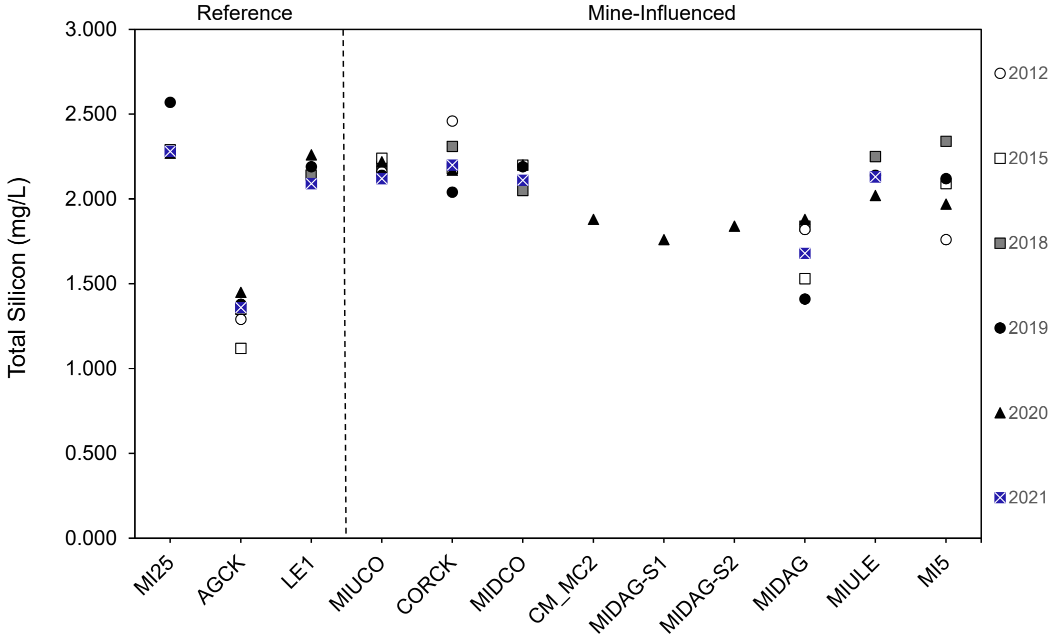
Notes: Open symbols represent non-detects. BC long-term WQG (1.0 mg/L) and BC short-term WQG (2.0 mg/L) not shown.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-19: Spatial Variation in Aqueous Phosphorus Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



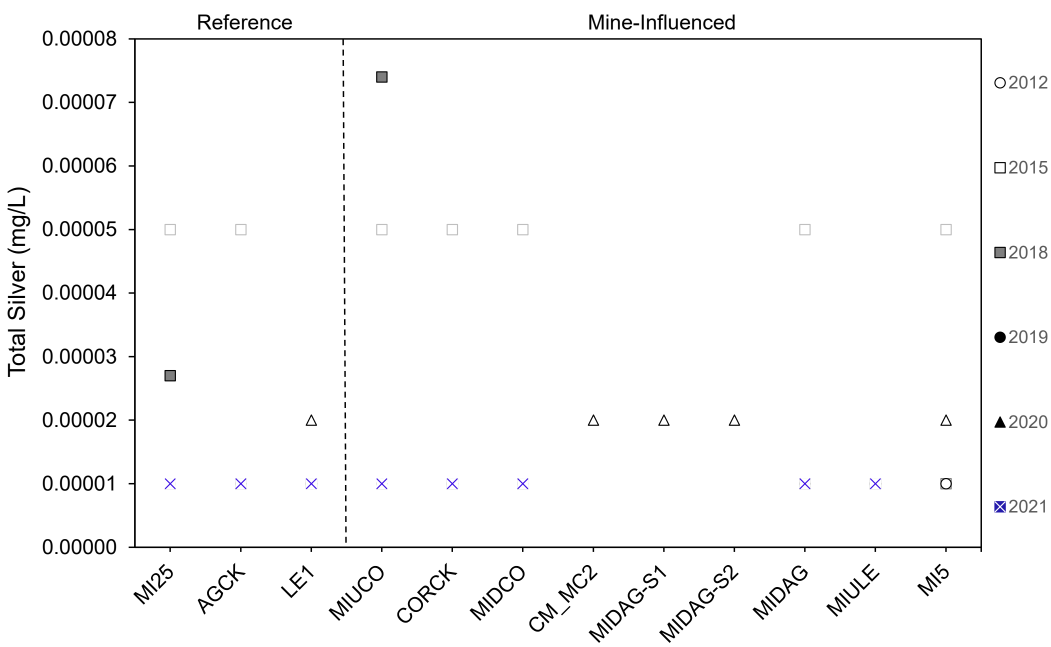
Note: Open symbols represent non-detects.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-20: Spatial Variation in Aqueous Silicon Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



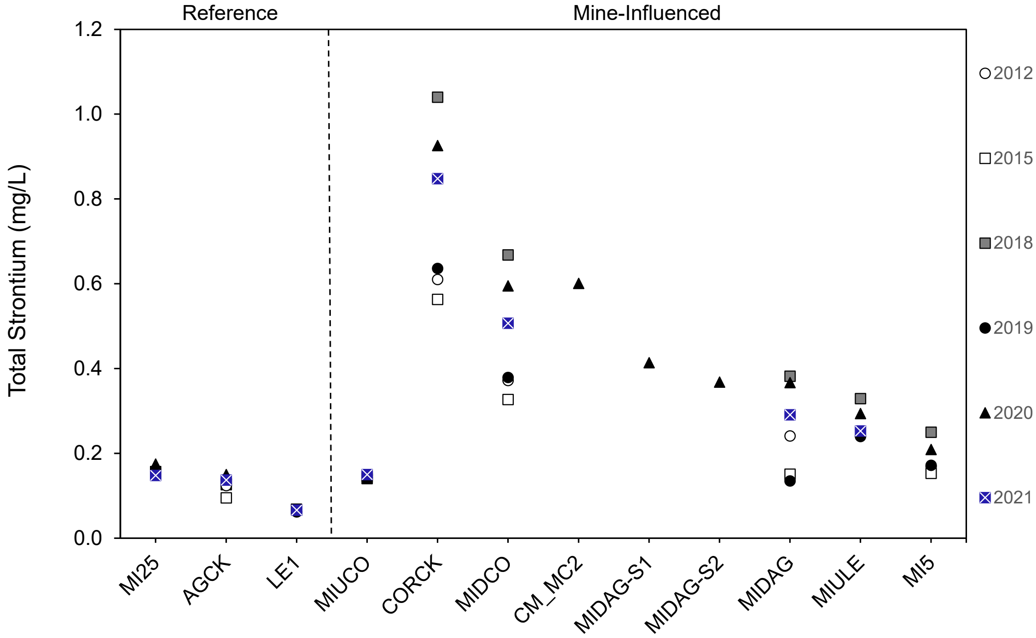
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-21: Spatial Variation in Aqueous Silver Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



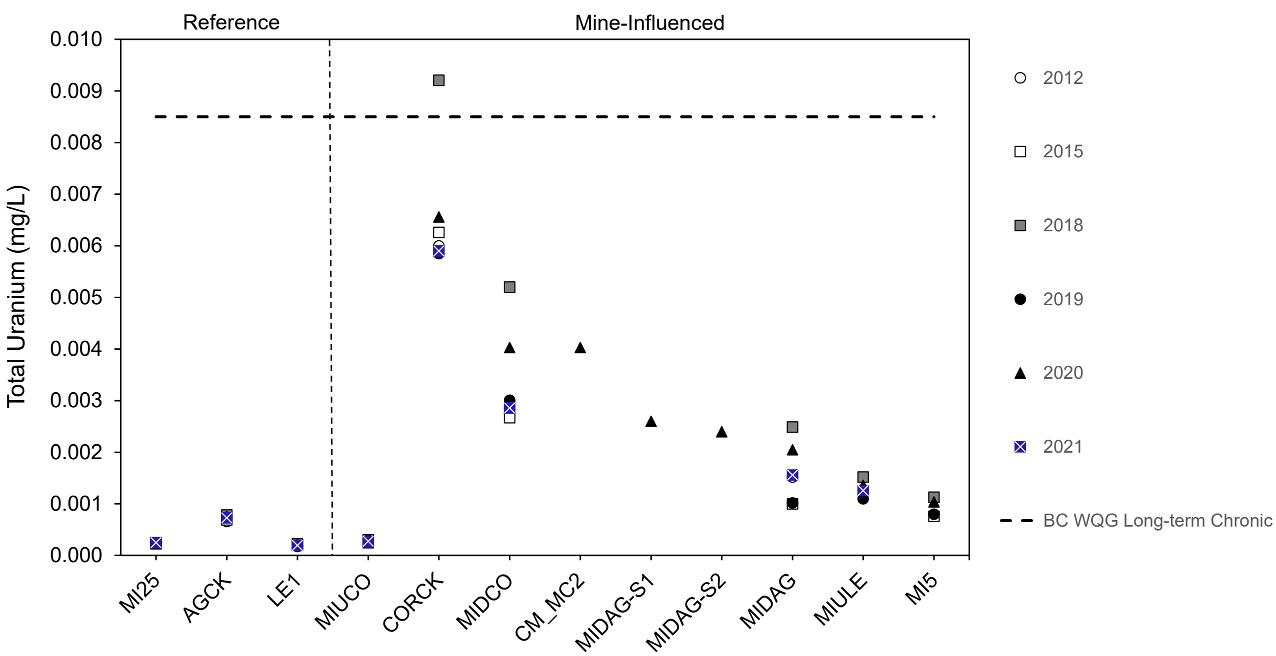
Note: Open symbols represent non-detects. Long-term BC WQG (0.0015 mg/L) and short-term BC WQG (0.003 mg/L) not shown.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-22: Spatial Variation in Aqueous Strontium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



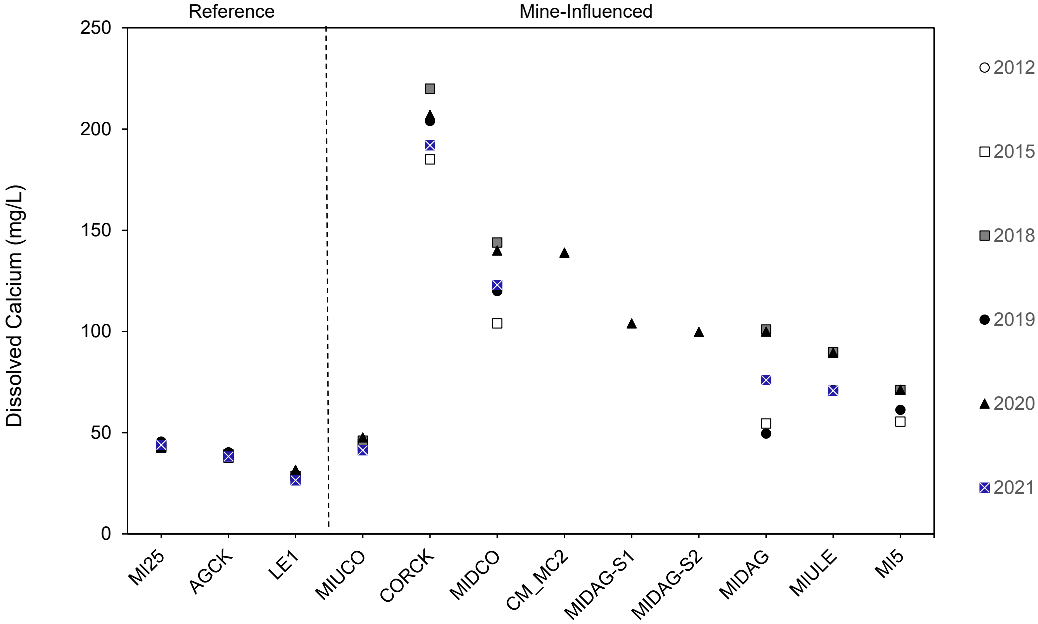
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-23: Spatial Variation in Aqueous Uranium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2020



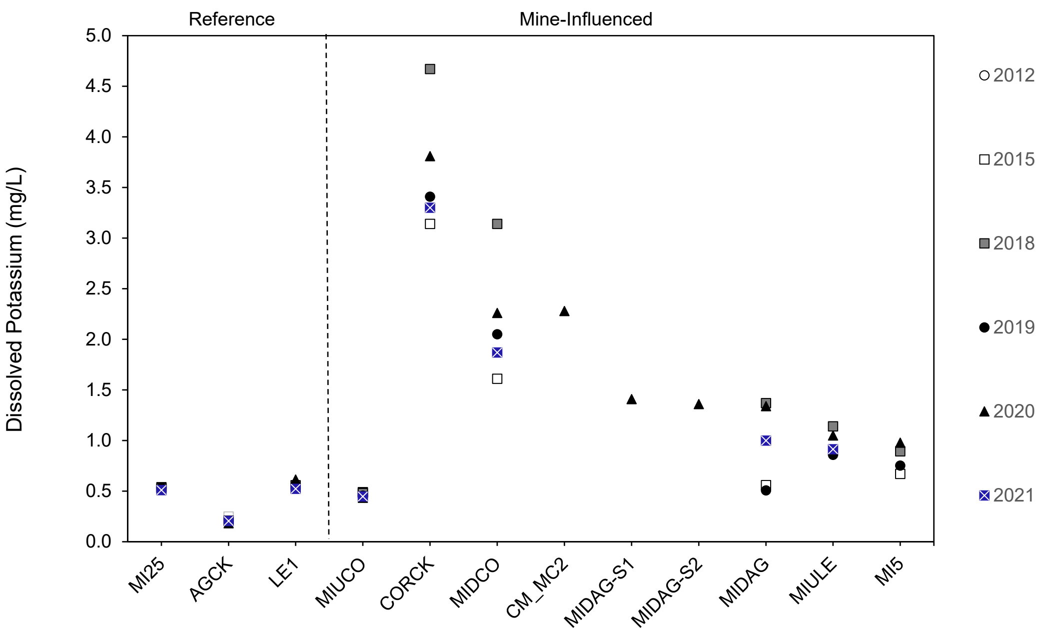
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-24: Spatial Variation in Aqueous Calcium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



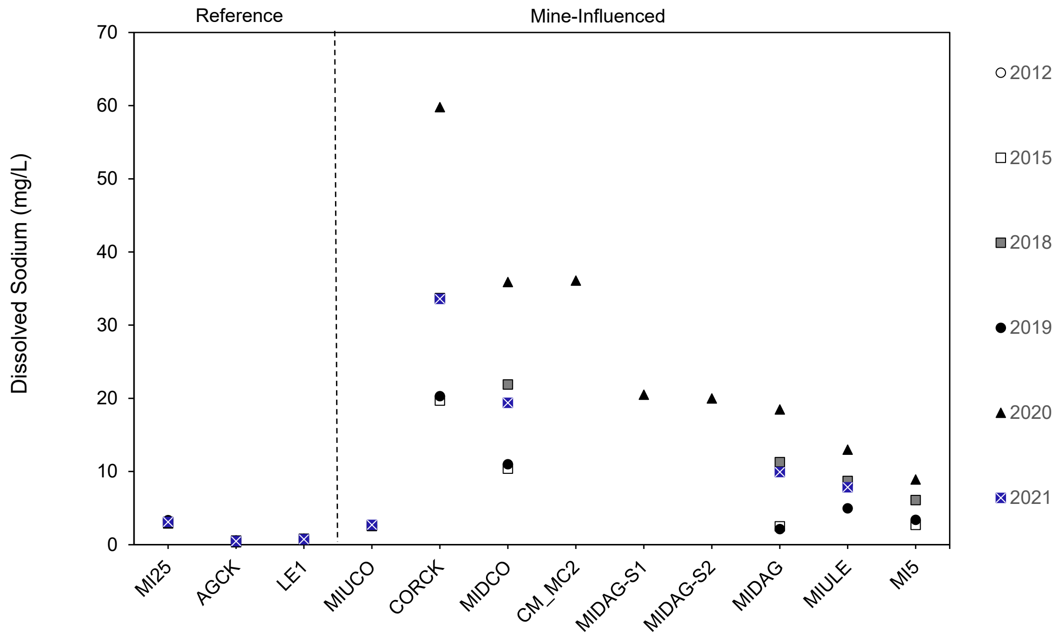
Note: Dissolved calcium is presented because it is an order constituent (i.e., there is a benchmark for dissolved calcium unlike for other dissolved metals).
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-25: Spatial Variation in Aqueous Potassium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



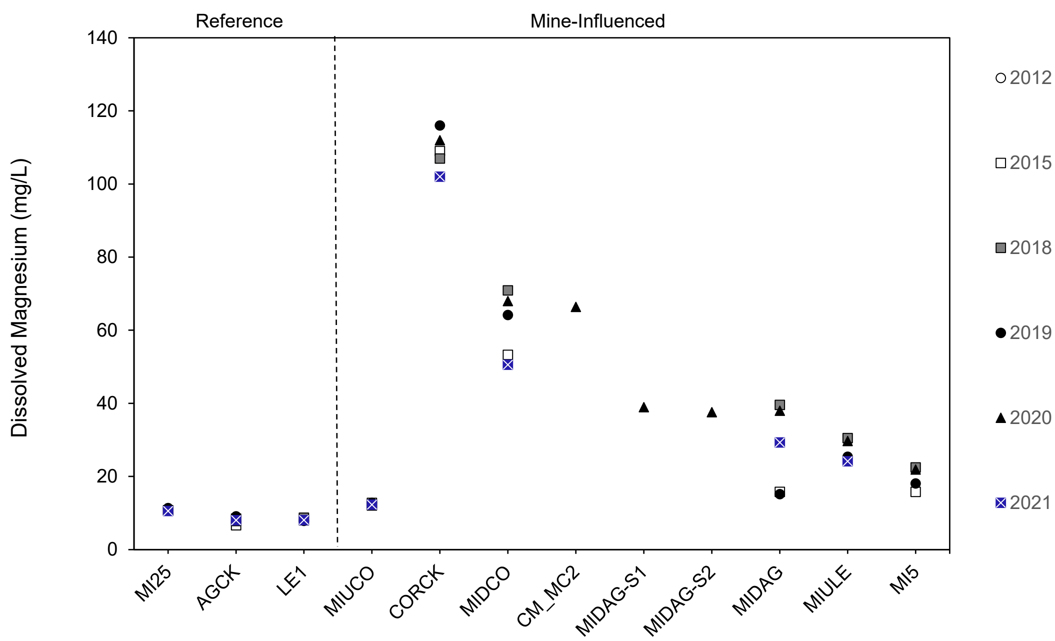
Note: Dissolved potassium is shown here because it is an order constituent (i.e., there is a benchmark for dissolved potassium unlike for other dissolved metals). Open symbols represent non-detects.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-25: Spatial Variation in Aqueous Sodium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



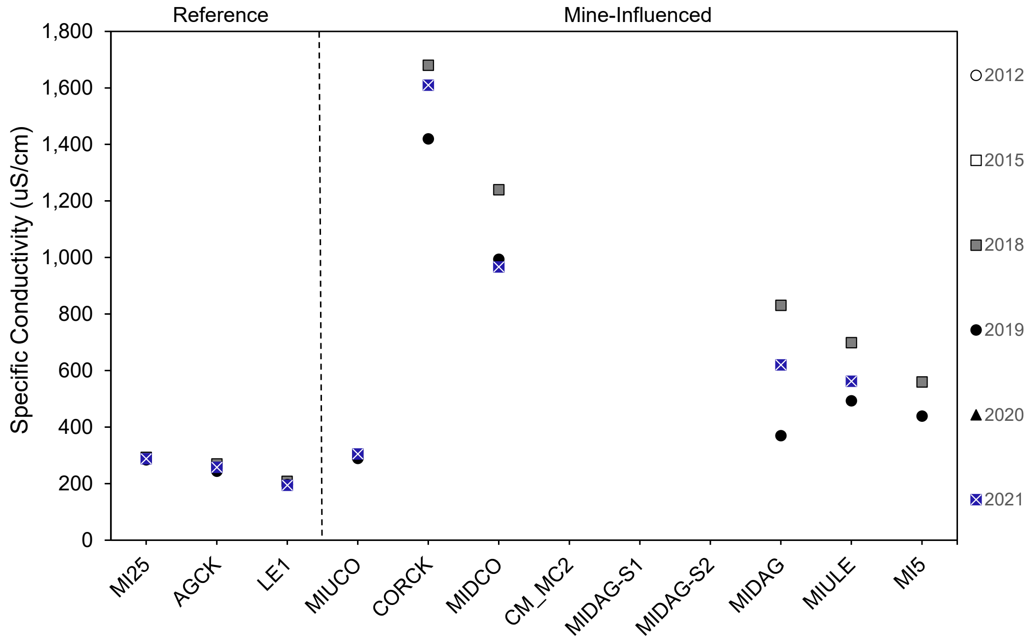
Note: Dissolved sodium is shown here because it is an order constituent (i.e., there is a benchmark for dissolved sodium unlike for other dissolved metals).
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-26: Spatial Variation in Aqueous Magnesium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



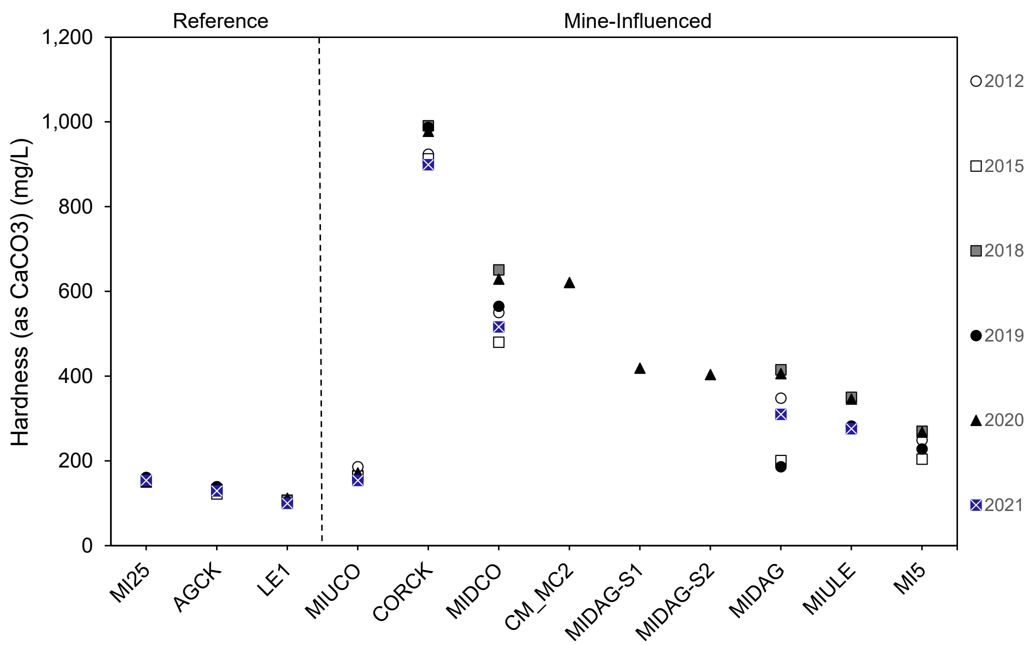
Note: Dissolved magnesium is shown here because it is an order constituent (i.e., there is a benchmark for dissolved magnesium unlike for other dissolved metals).
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-27: Spatial Variation in Specific Conductivity in Samples Collected from the CMm LAEMP, 2012 to 2021



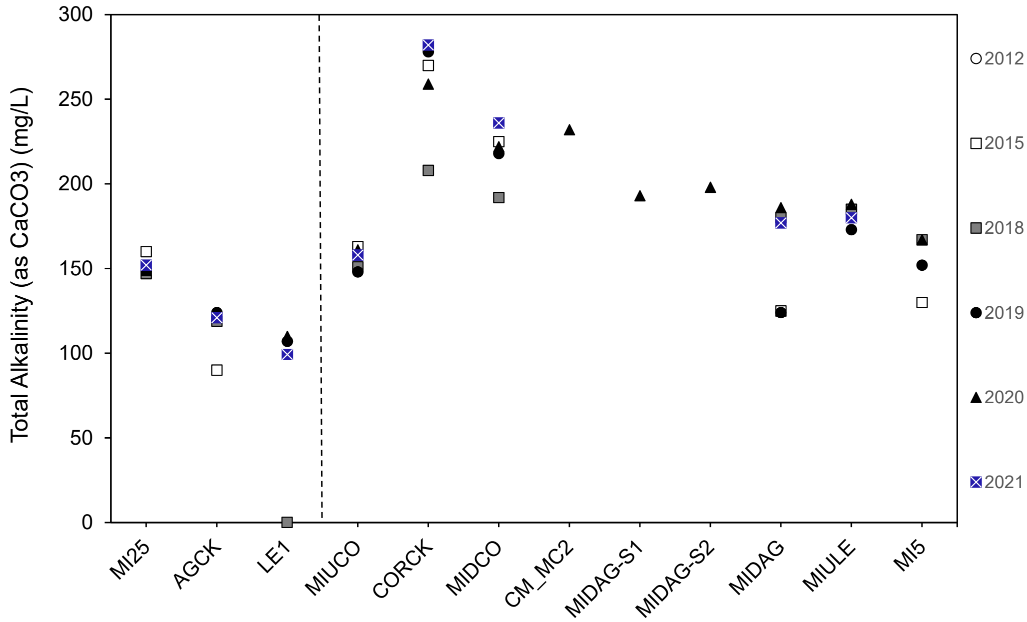
µs/cm = microSiemens per centimeter; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-28: Spatial Variation in Hardness in samples collected from the CMm LAEMP, 2012 to 2021



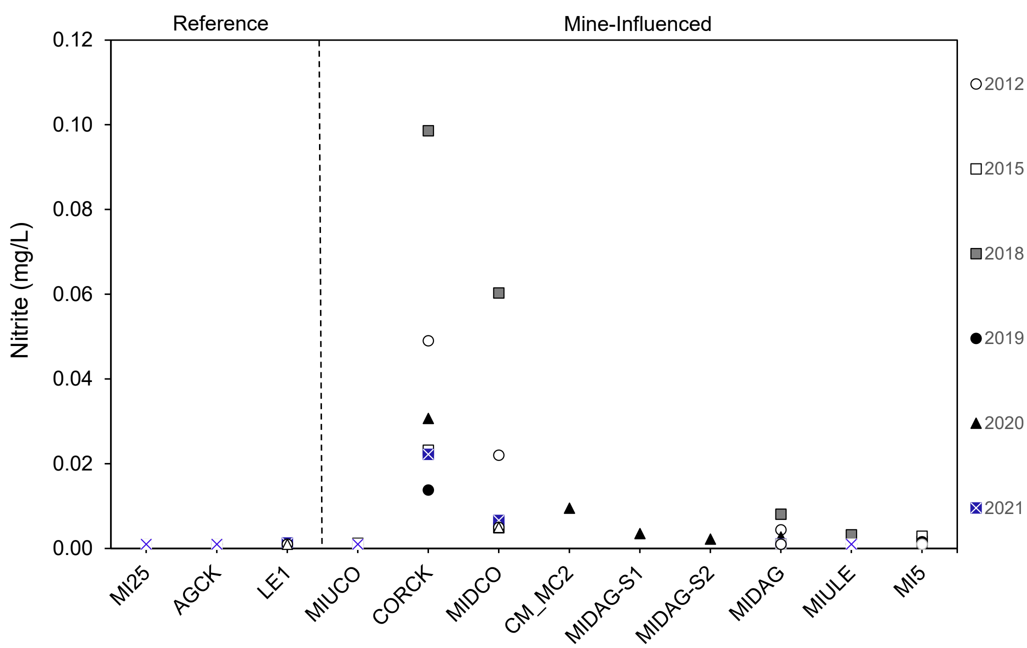
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.1-29: Spatial Variation in Alkalinity in Samples Collected from the CMm LAEMP, 2012 to 2021



mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

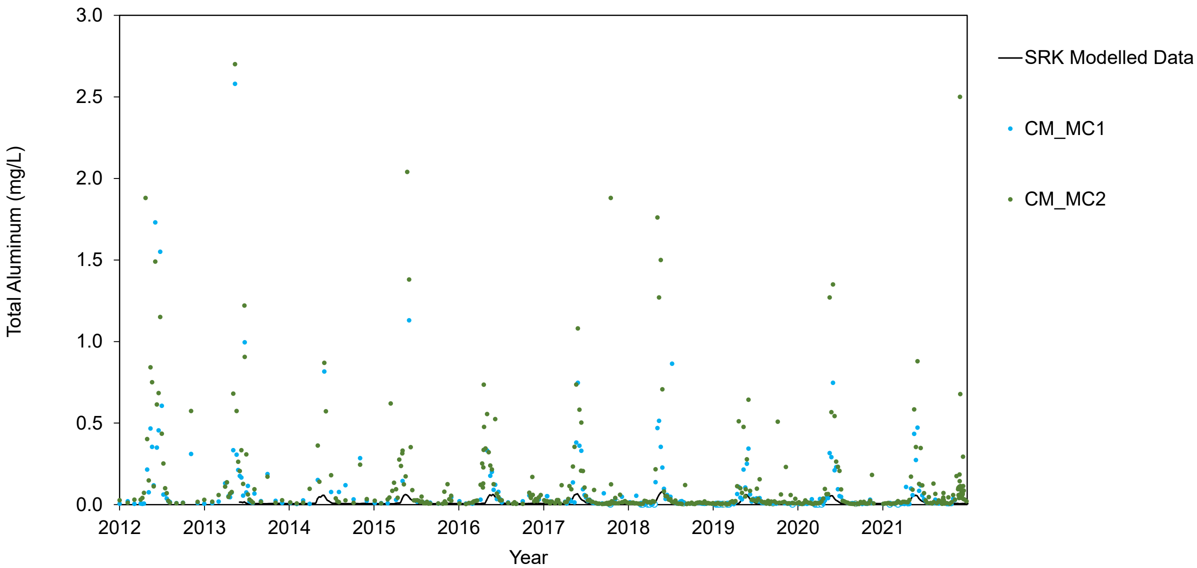
Figure G1.1-30: Spatial Variation in Nitrite in Samples Collected from the CMm LAEMP, 2012 to 2021

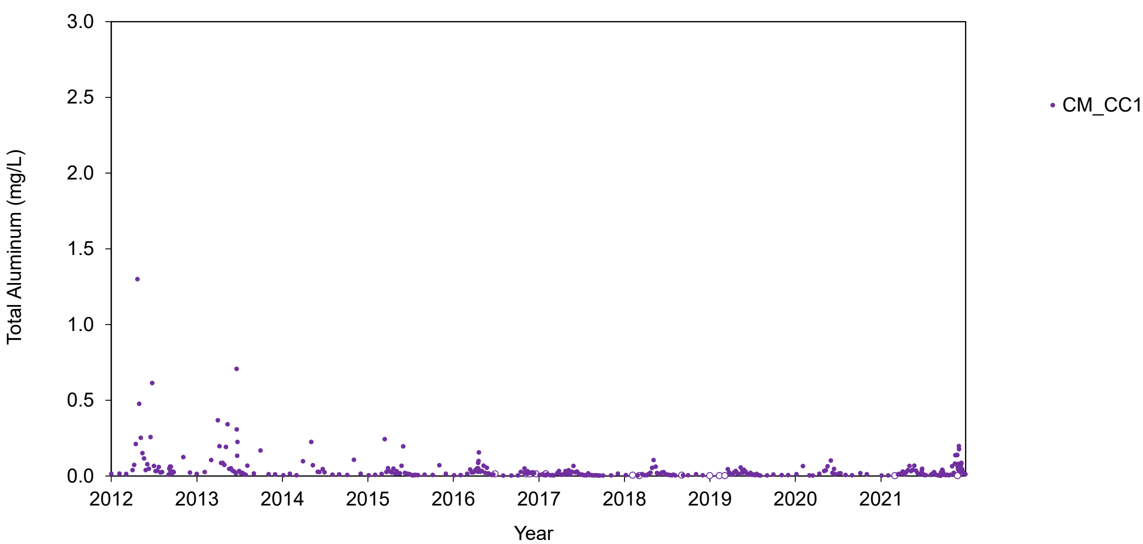


Note: Open symbols represent non-detects. Long-term BC WQG (0.02 mg/L) and short-term BC WQG (0.06 mg/L) not shown.
mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

G1.2 Temporal Trends

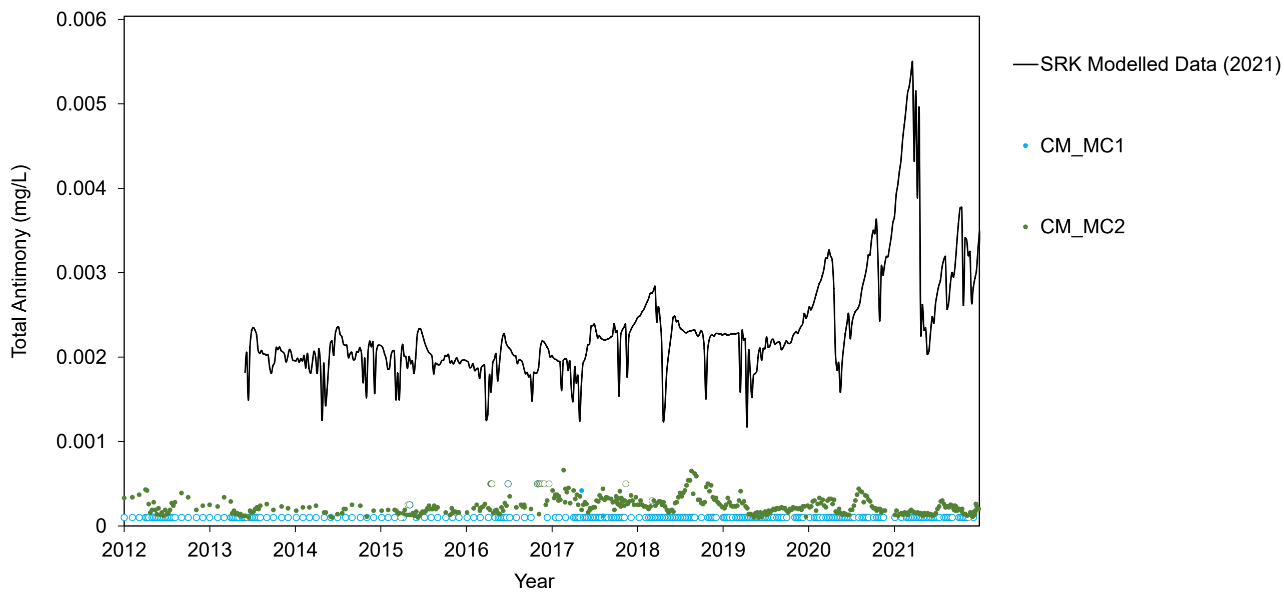
Figure G1.2-1: Temporal Variation in Aqueous Aluminum Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

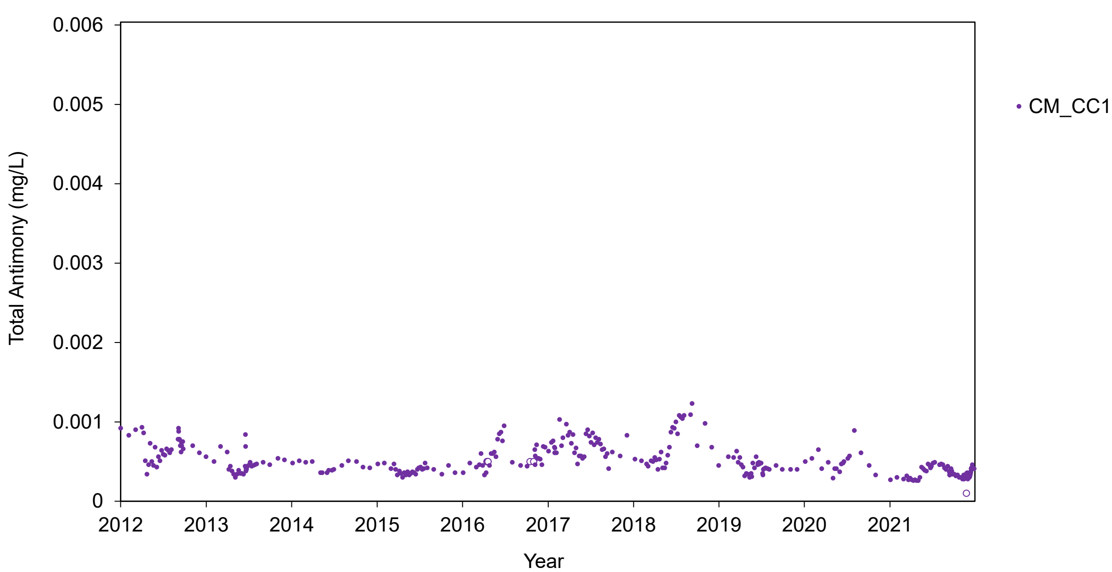




Note: Open symbols represent non-detects. SRK modelled projections for dissolved aluminum are included for comparison (SRK 2022). Two points not shown in the bottom panel (6.3 and 15.2 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-2: Temporal Variation in Aqueous Antimony Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

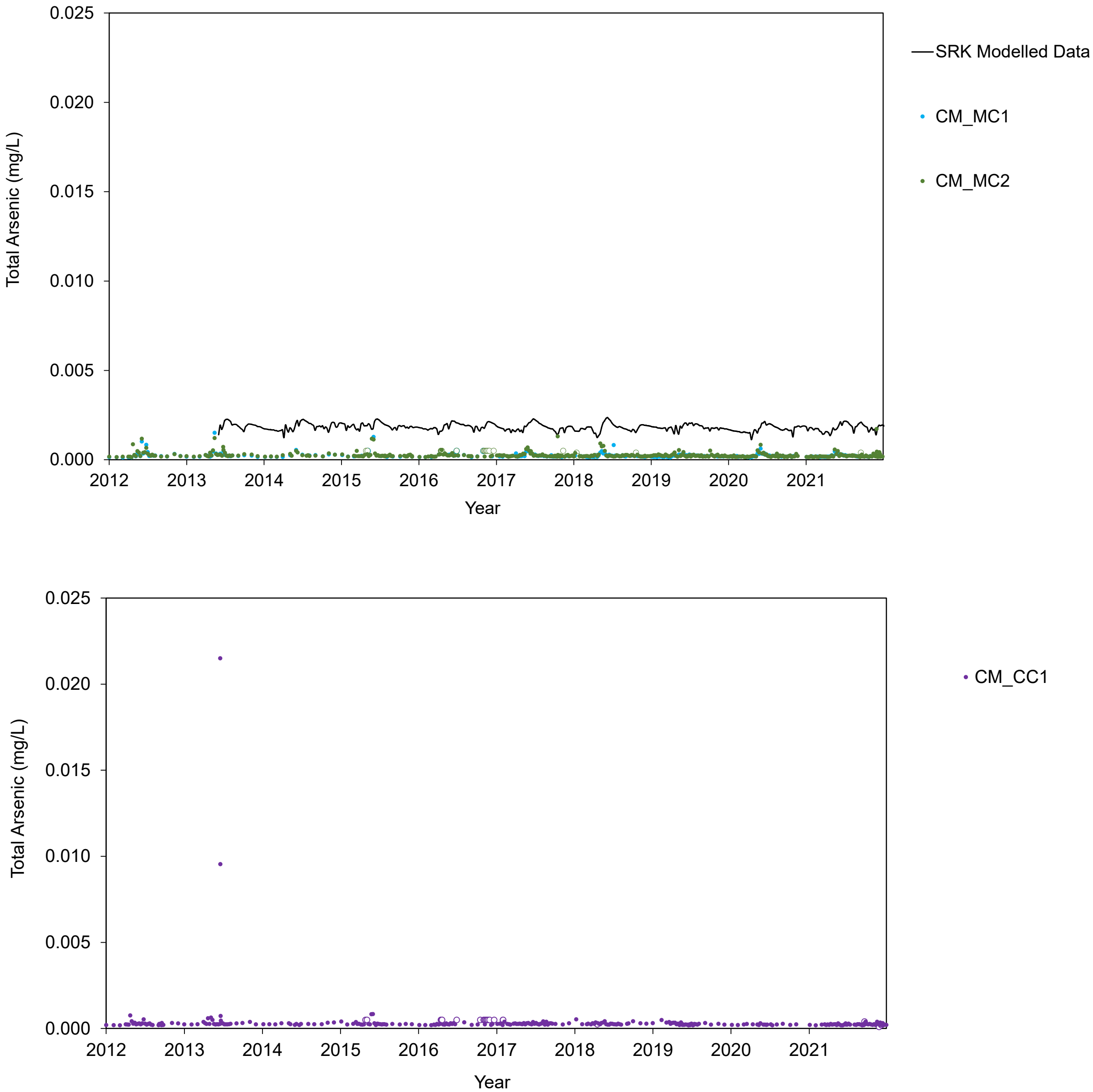




Note: Open symbols represent non-detects. Long-term BC WQG not shown (0.009 mg/L).

mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

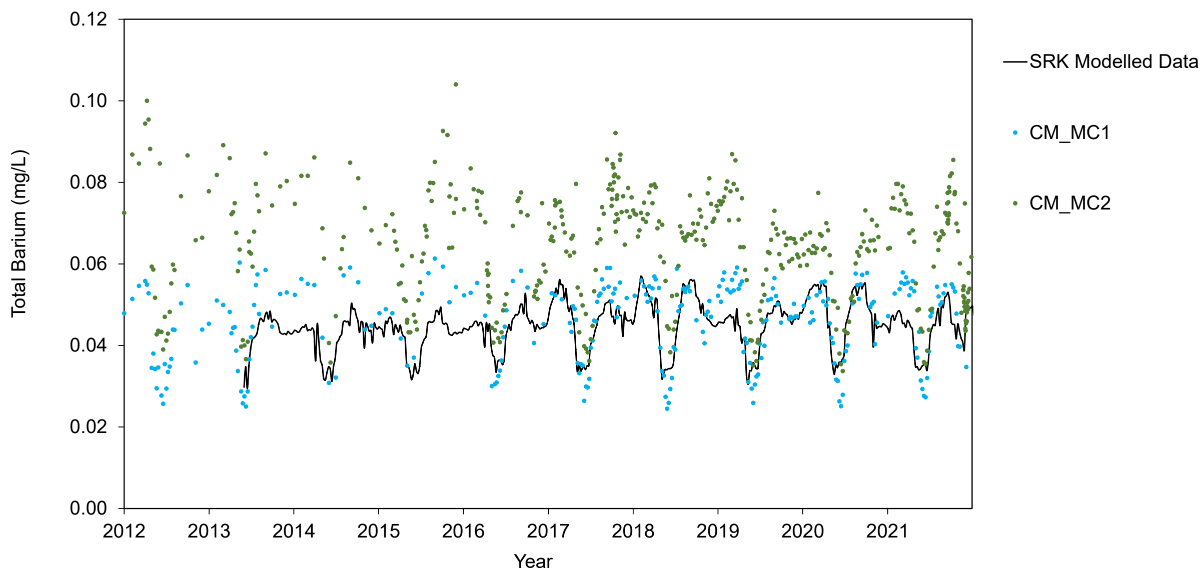
Figure G1.2-3: Temporal Variation in Aqueous Arsenic Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

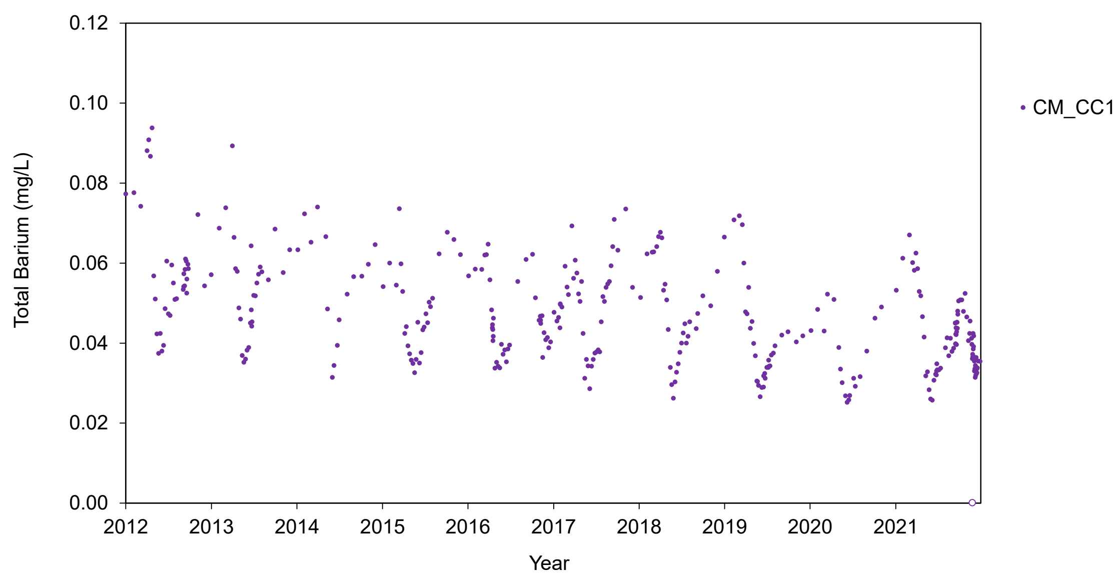


Note: Open symbols represent non-detects. SRK modelled projections for dissolved arsenic are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

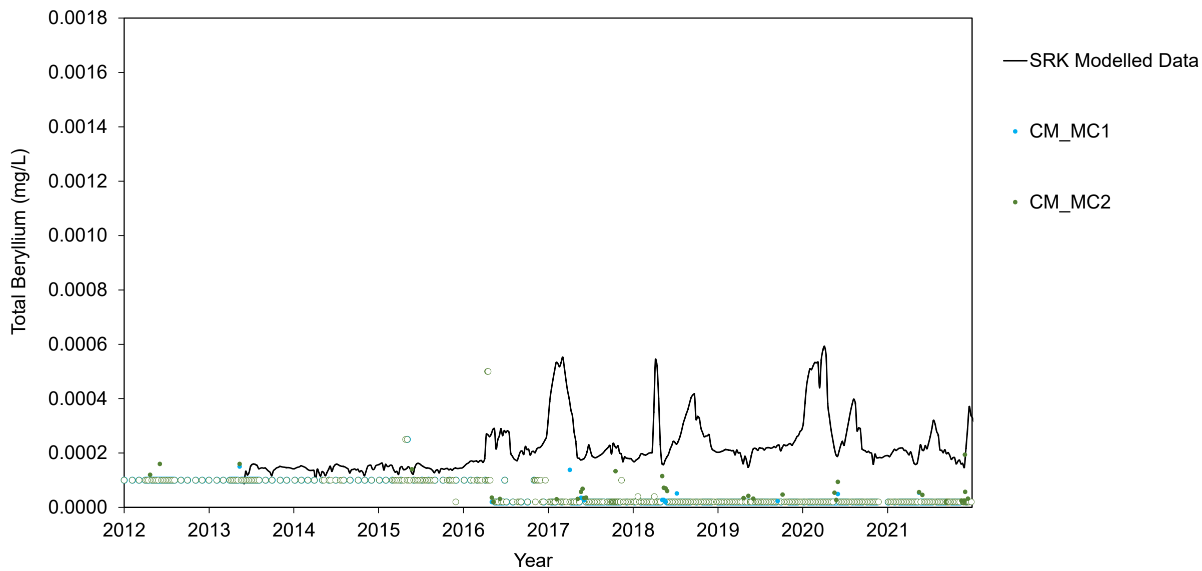
Figure G1.2-4: Temporal Variation in Aqueous Barium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

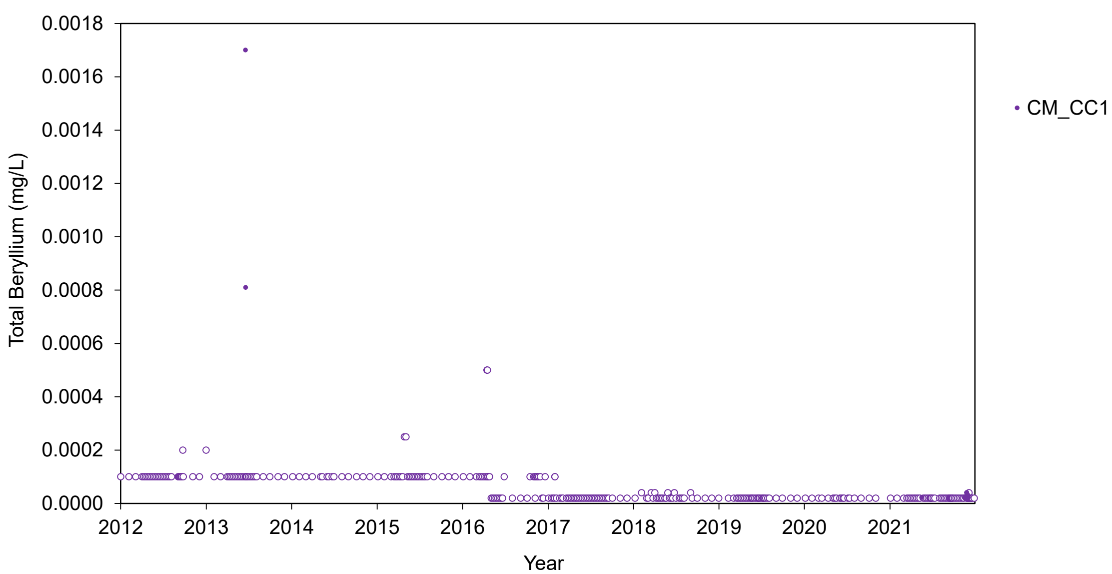




Note: Open symbols represent non-detects. SRK modelled projections for dissolved barium are included for comparison (SRK 2022).
Two points not shown in the bottom panel (0.52 and 1.57 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-5: Temporal Variation in Aqueous Beryllium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



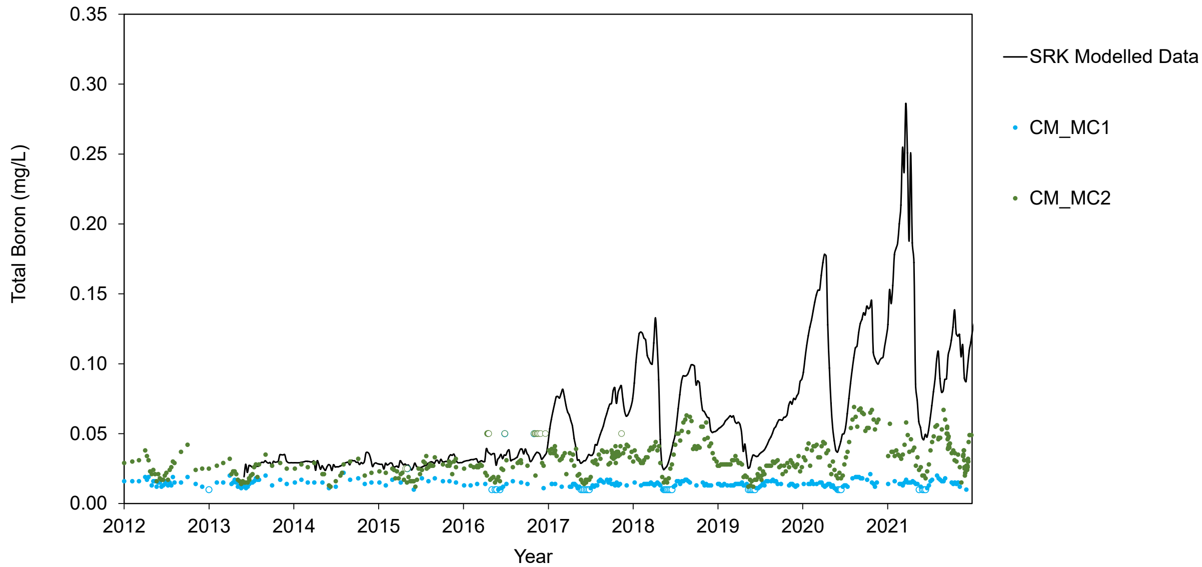


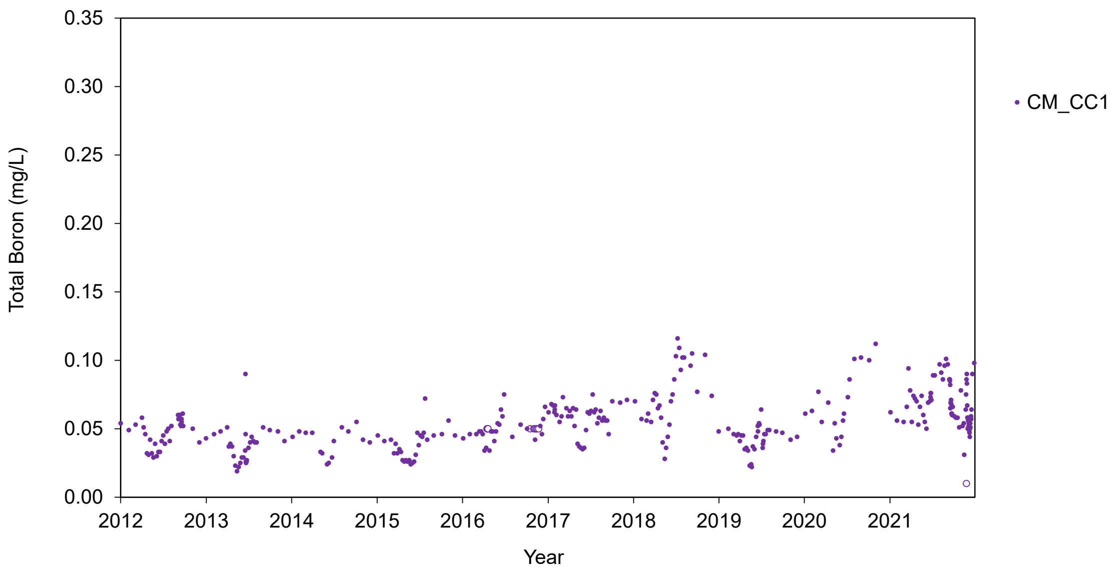
Note: Open symbols represent non-detects. SRK modelled projections for dissolved beryllium are included for comparison (SRK 2022).

One point not shown in the bottom panel (0.0017 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-6: Temporal Variation in Aqueous Boron Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

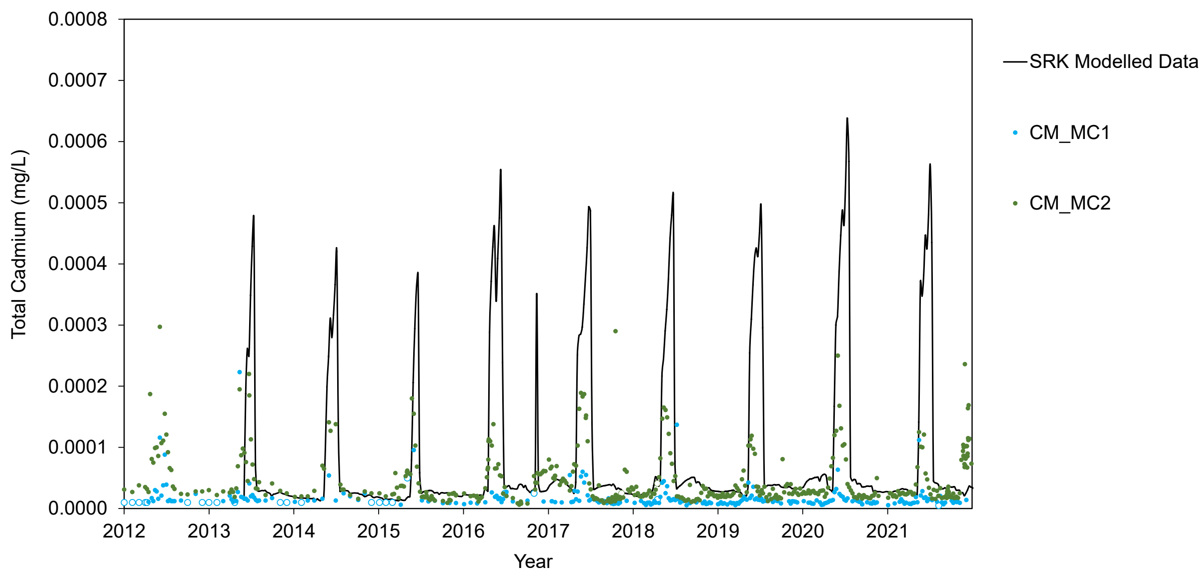


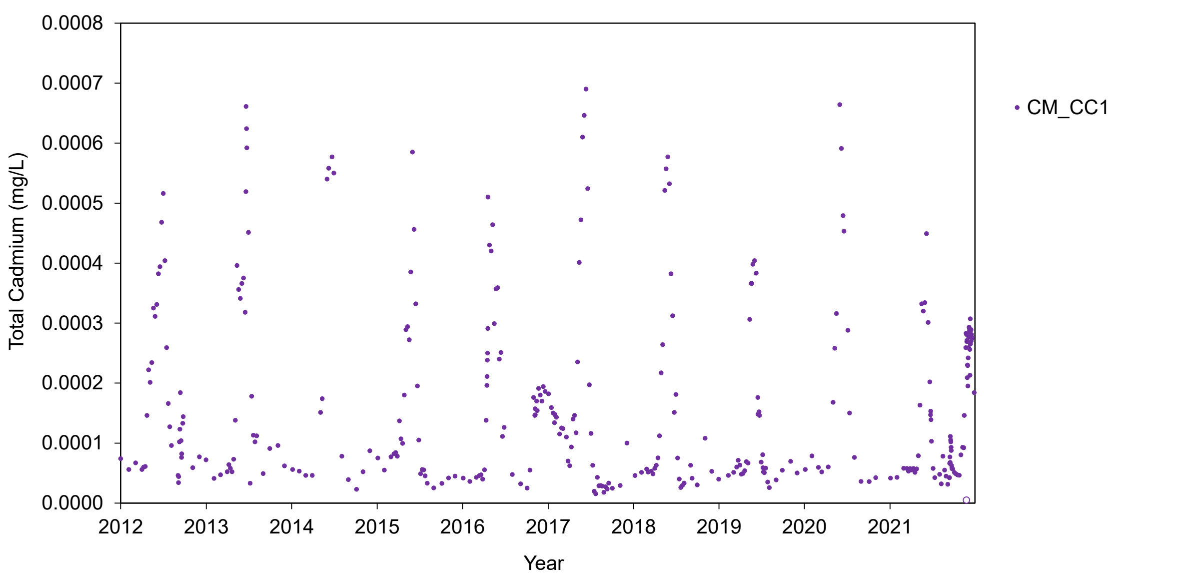


Note: Open symbols represent non-detects. SRK modelled projections for dissolved boron are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

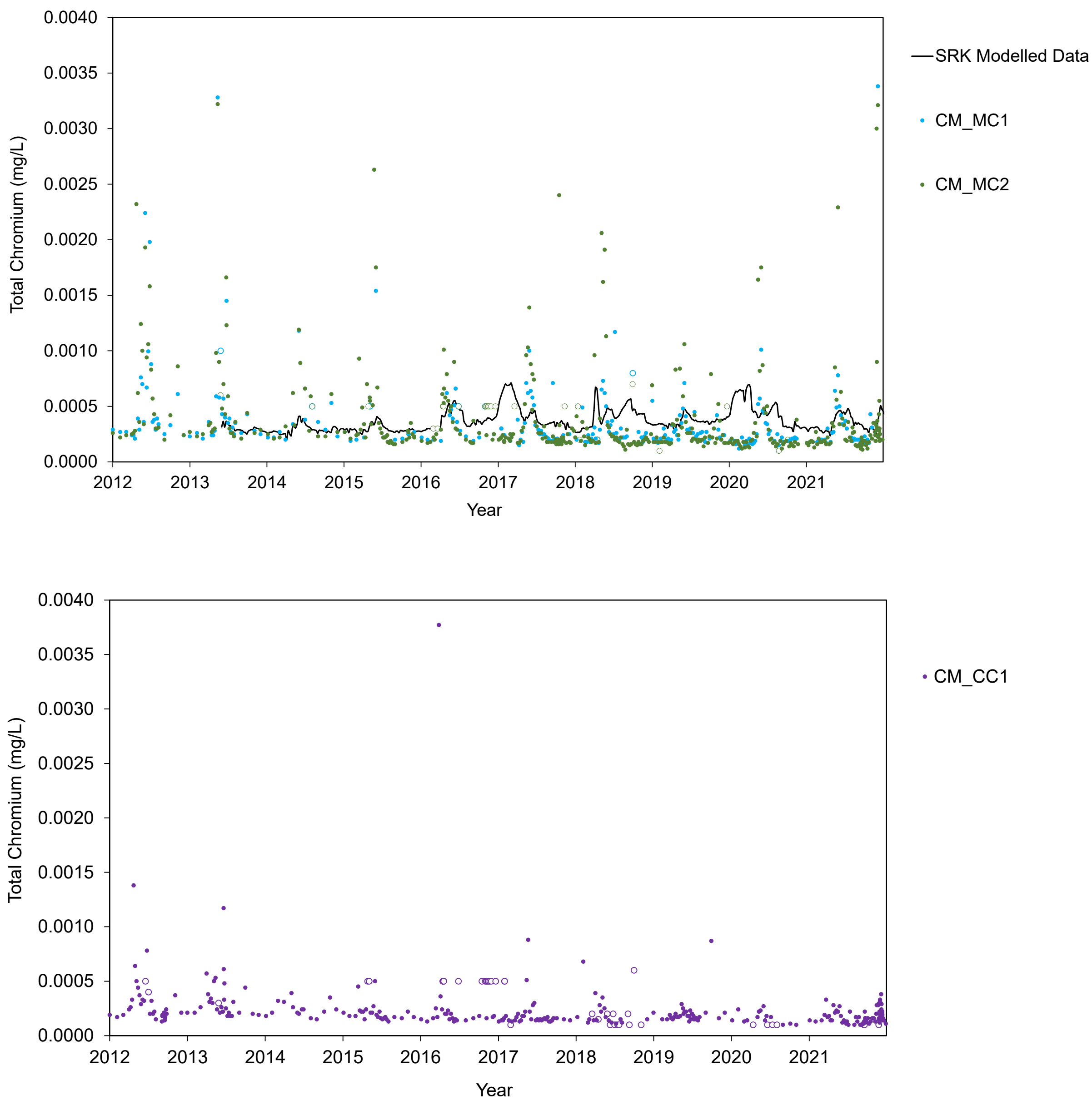
Figure G1.2-7: Temporal Variation in Aqueous Cadmium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021





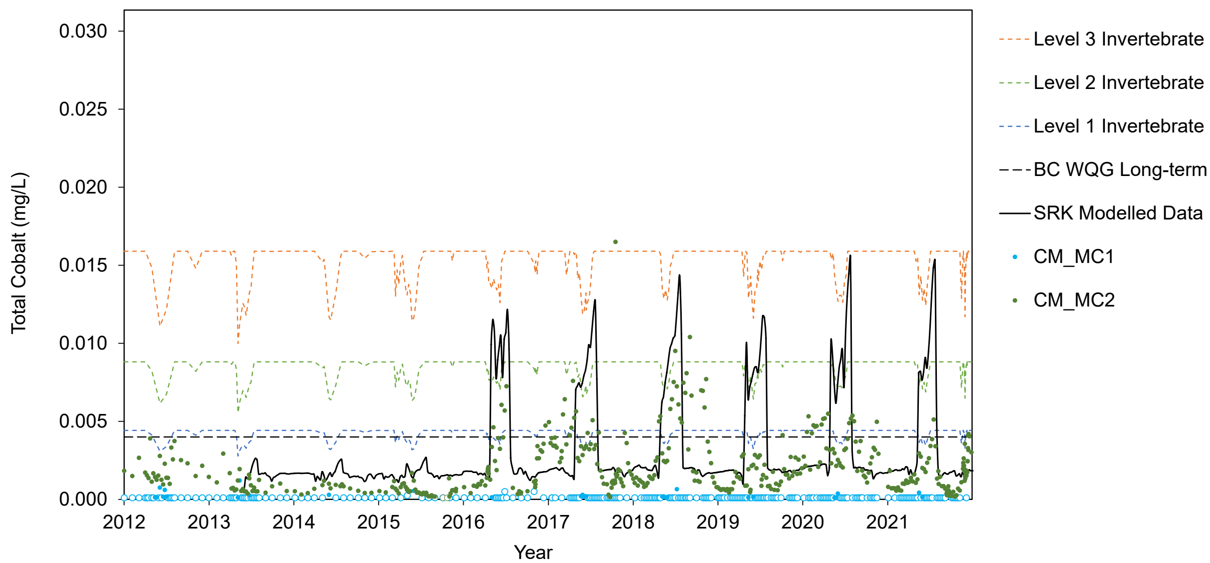
Note: Open symbols represent non-detects. SRK modelled projections for dissolved cadmium are included for comparison (SRK 2022). Two points not shown in the bottom panel (0.00169 and 0.00219 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

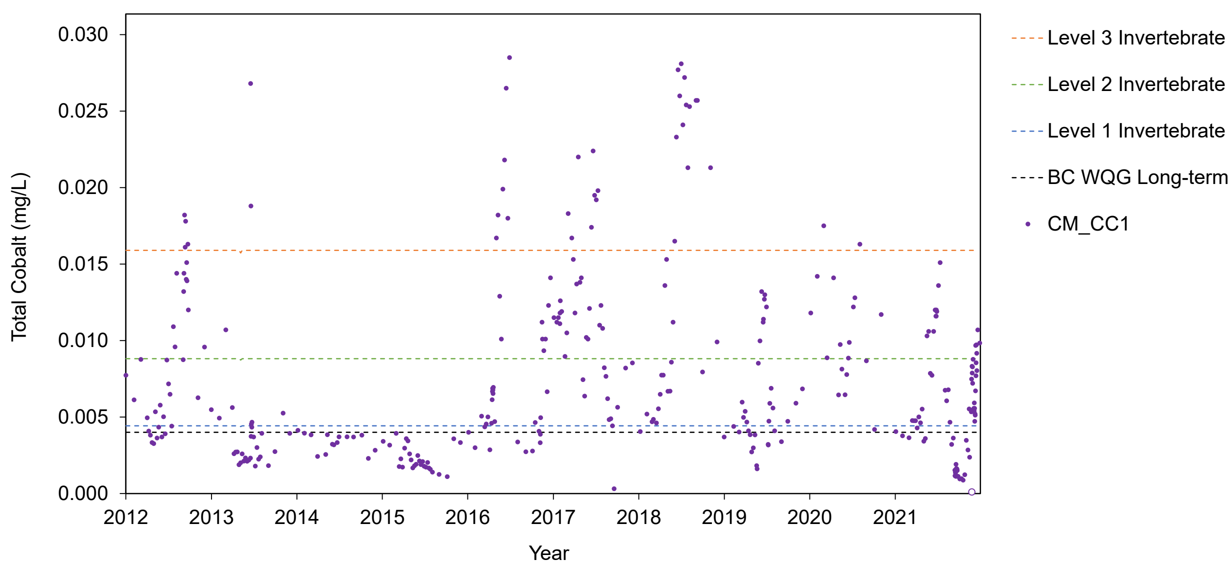
Figure G1.2-8: Temporal Variation in Aqueous Chromium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Open symbols represent non-detects. SRK modelled projections for dissolved chromium are included for comparison (SRK 2022).
Two points not shown in the bottom panel (0.0108 and 0.0251 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-9: Temporal Variation in Aqueous Cobalt Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

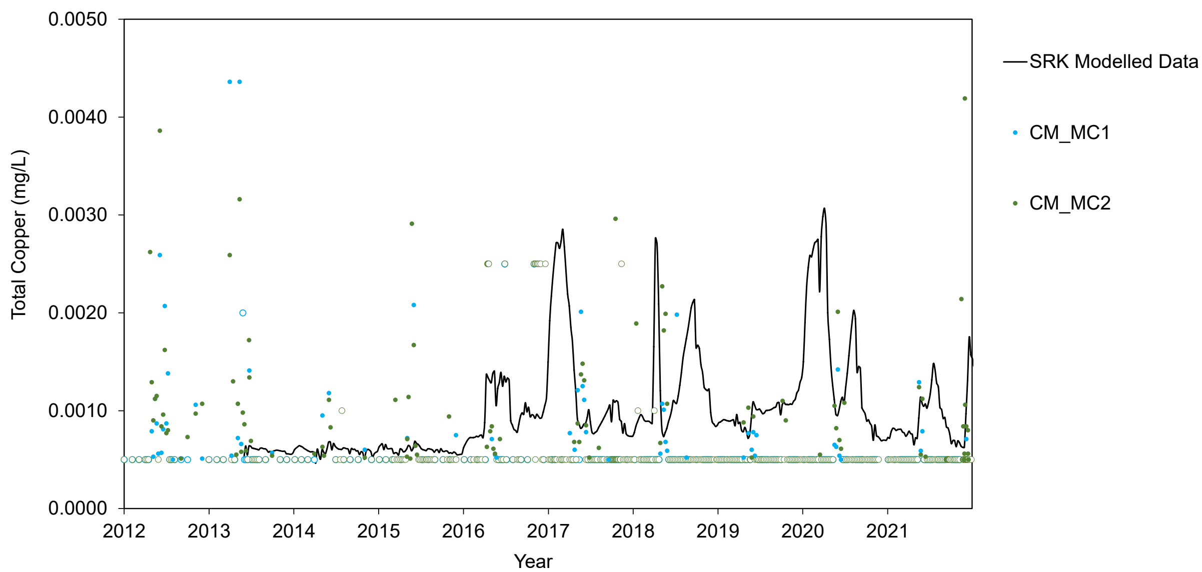


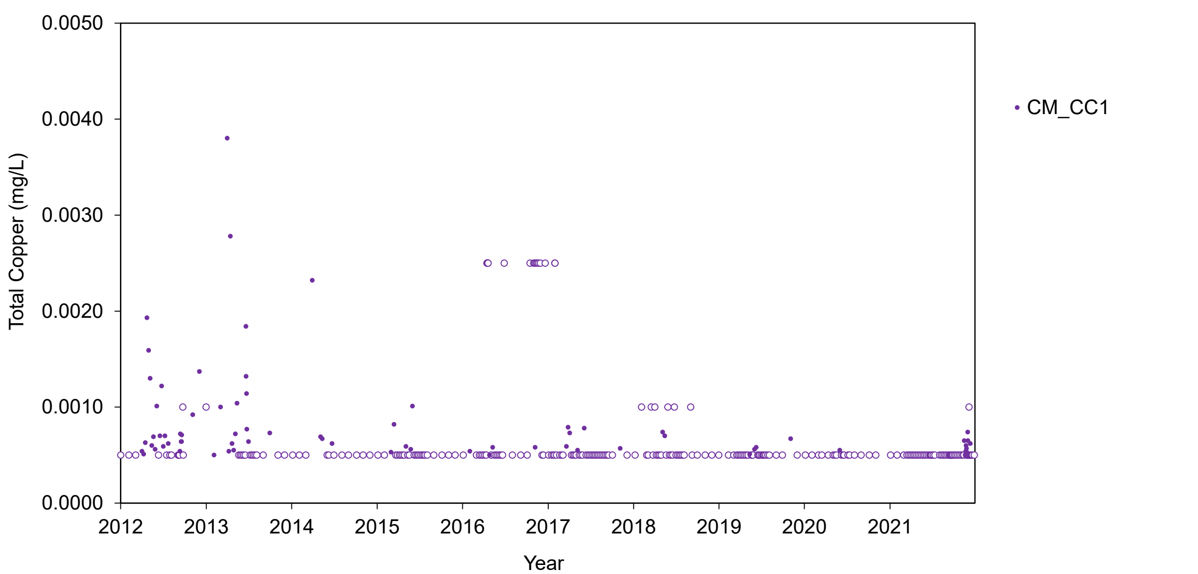


Notes: Open symbols indicate non-detects. SRK modelled projections for dissolved cobalt (SRK 2022). These projections were included for comparisons to total cobalt. Elk Valley screening value level 1 fish (0.36 to 0.60 mg/L) not shown. SRK modelled data are represented by the solid black line in the upper panel.

BC WQG = British Columbia water quality guideline; SV = screening value; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-10: Temporal Variation in Aqueous Copper Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

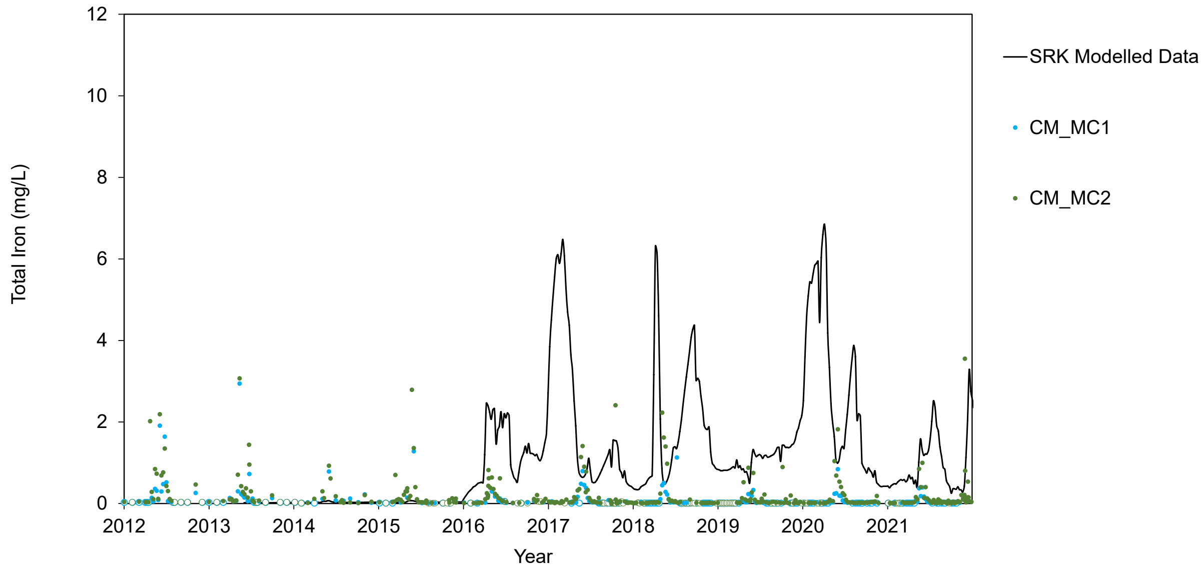


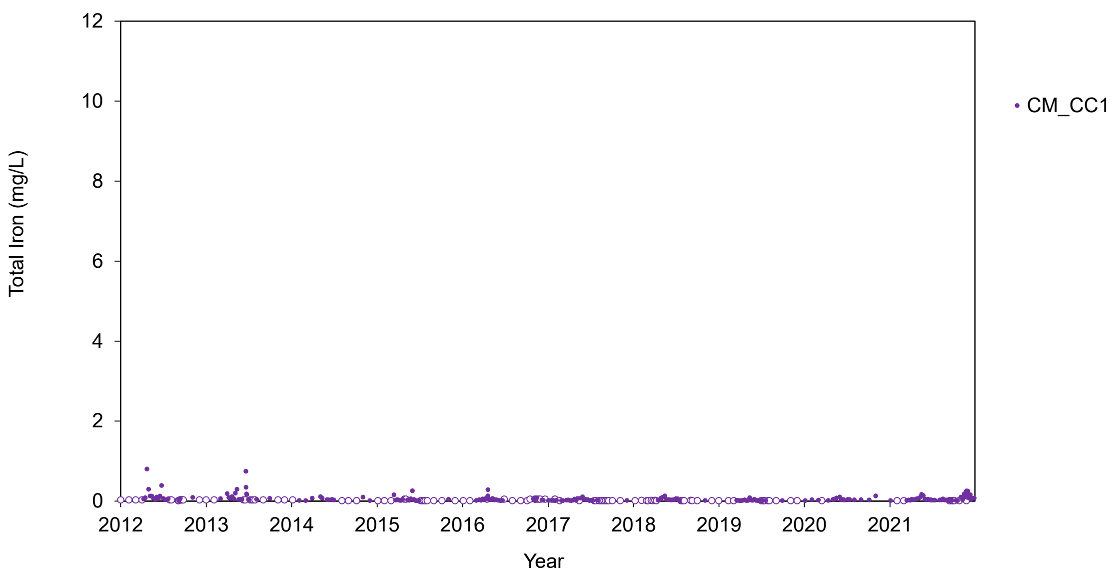


Note: Open symbols represent non-detects. SRK modelled projections for dissolved copper are included for comparison (SRK 2022).
Two points not shown in the bottom panel (0.0255 and 0.0593 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

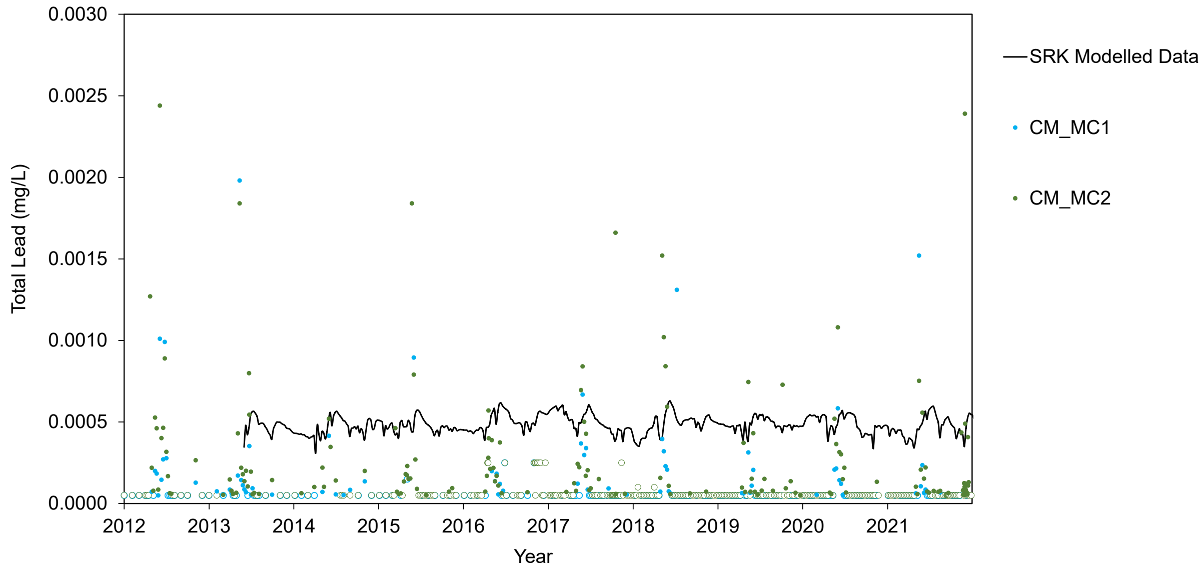
Figure G1.2-11: Temporal Variation in Aqueous Iron Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

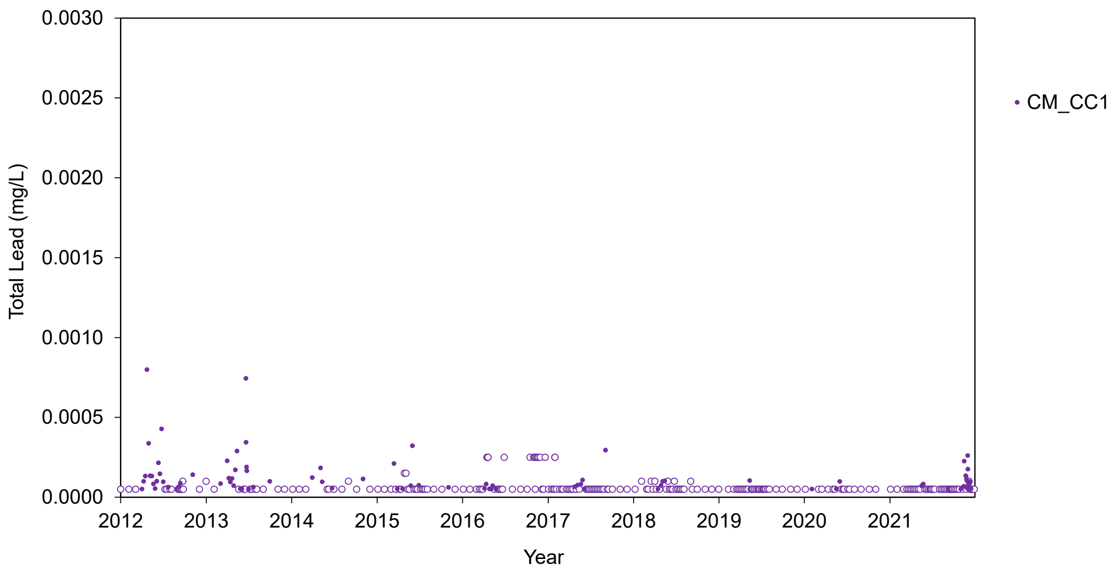




Note: Open symbols represent non-detects. SRK modelled projections for dissolved iron are included for comparison (SRK 2022).
Two points not shown in the bottom panel (12.4 and 25 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

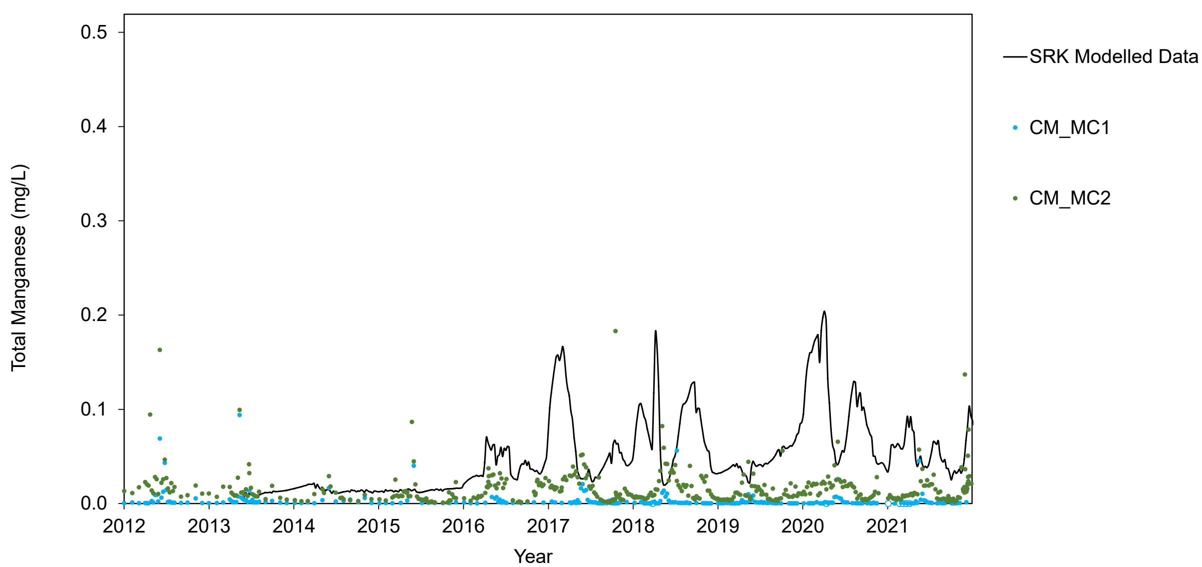
Figure G1.2-12: Temporal Variation in Aqueous Lead Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

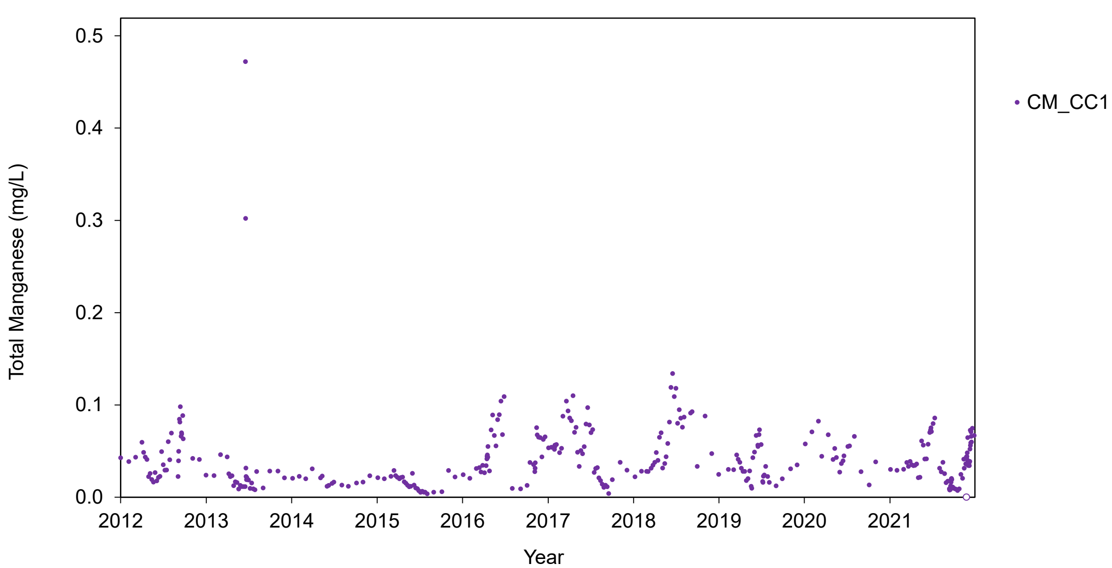




Note: Open symbols represent non-detects. SRK modelled projections for dissolved lead are included for comparison (SRK 2022).
Two points not shown in the bottom panel (0.0132 and 0.0284 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-13: Temporal Variation in Aqueous Manganese Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

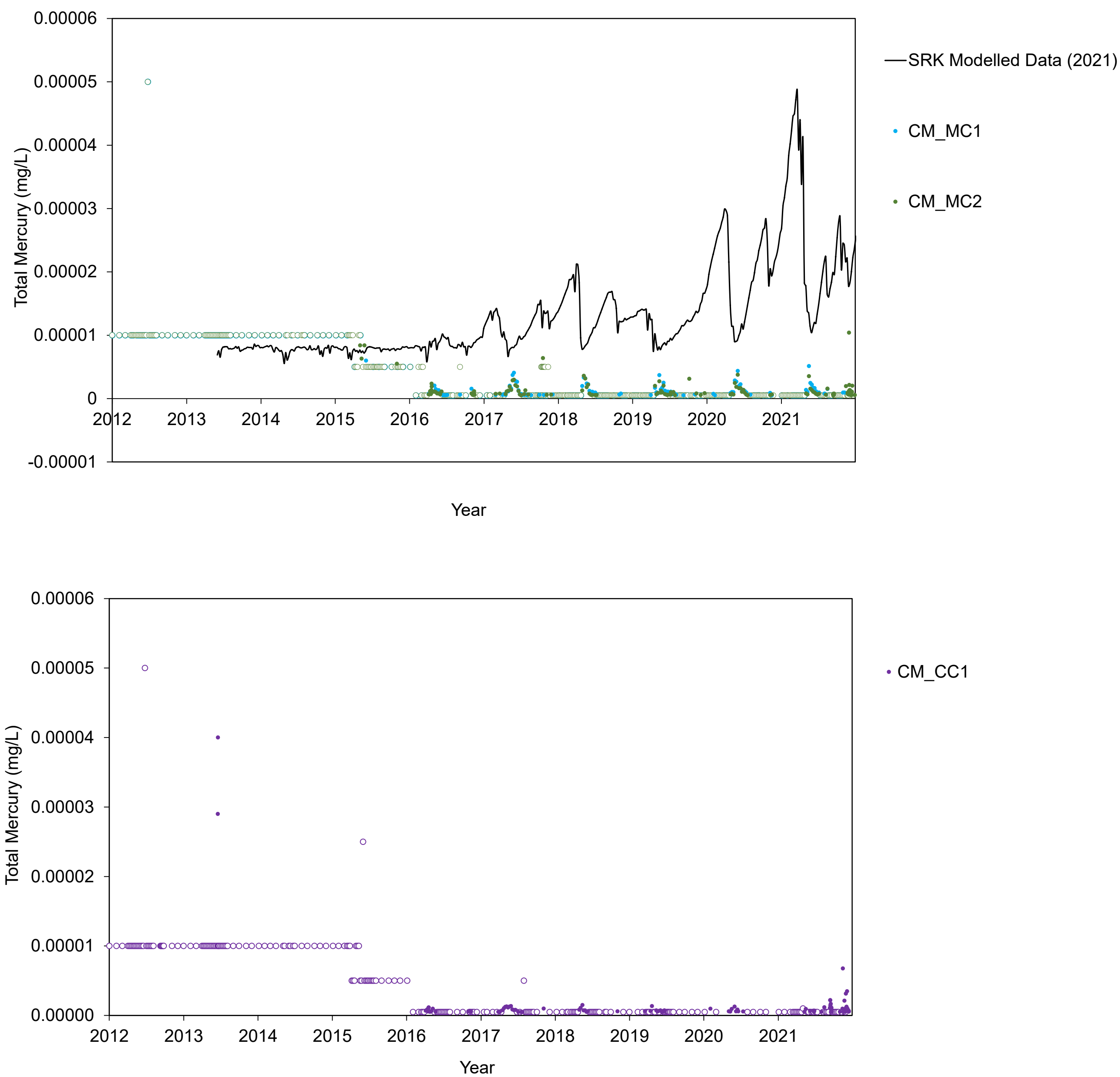




Note: Open symbols represent non-detects. SRK modelled projections for dissolved manganese are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

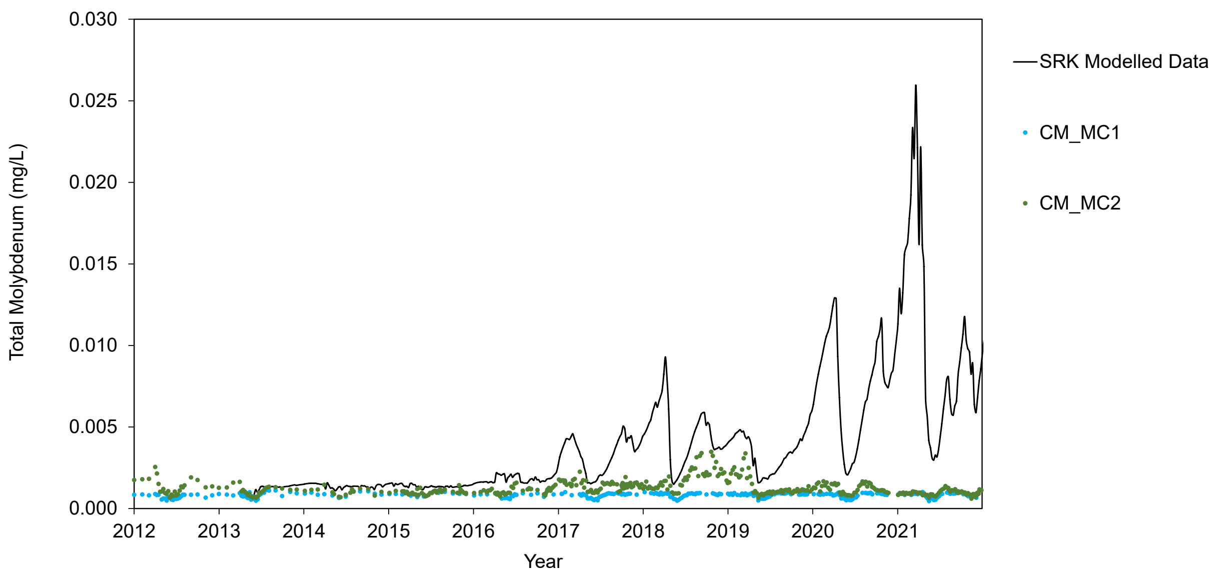
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

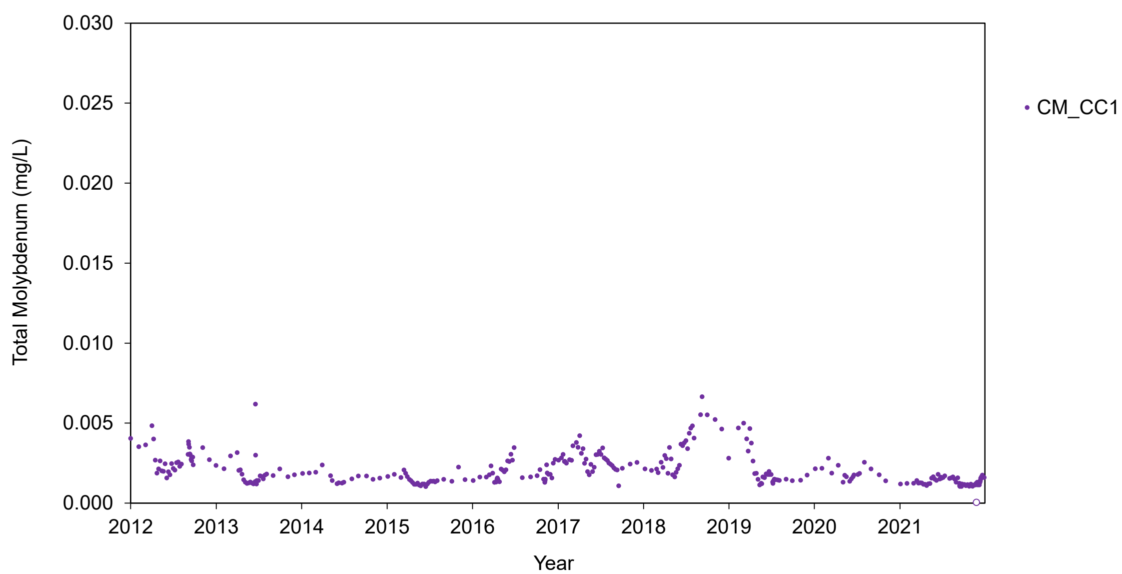
Figure G1.2-14: Temporal Variation in Aqueous Mercury Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Open symbols represent non-detects.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

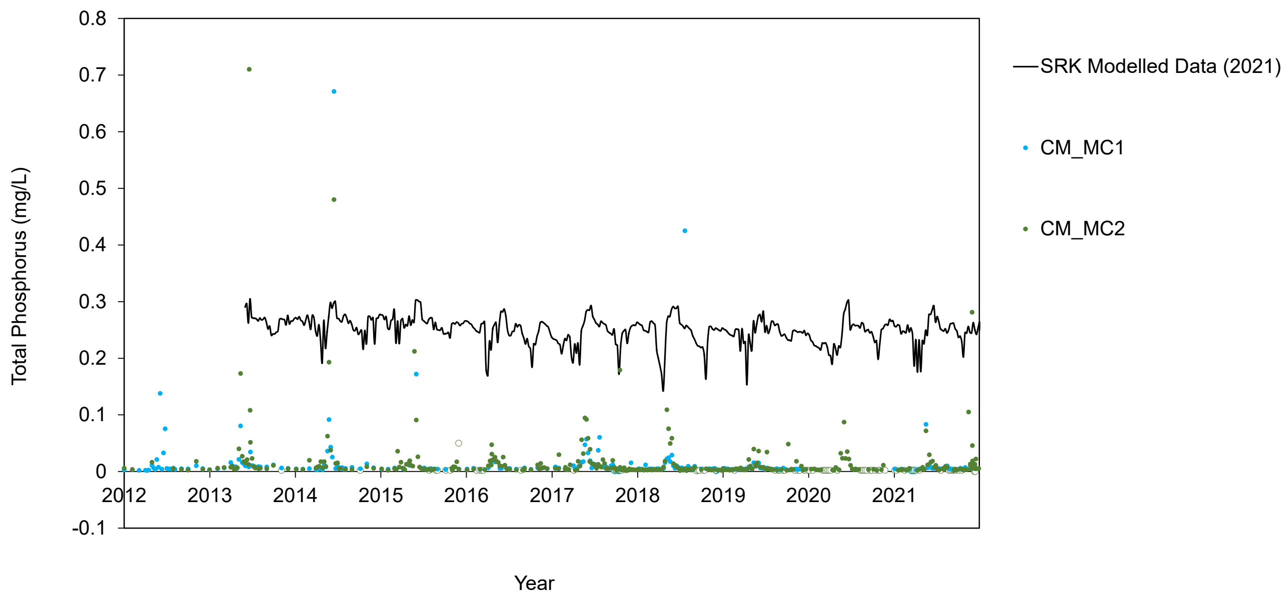
Figure G1.2-15: Temporal Variation in Aqueous Molybdenum Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

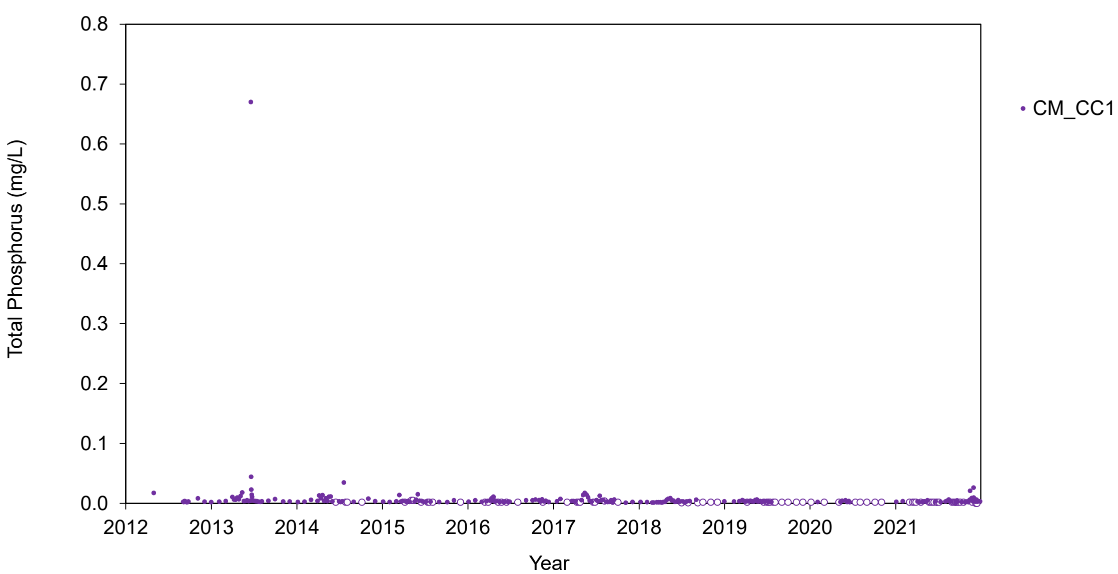




Note: Open symbols represent non-detects. SRK modelled projections for dissolved molybdenum are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

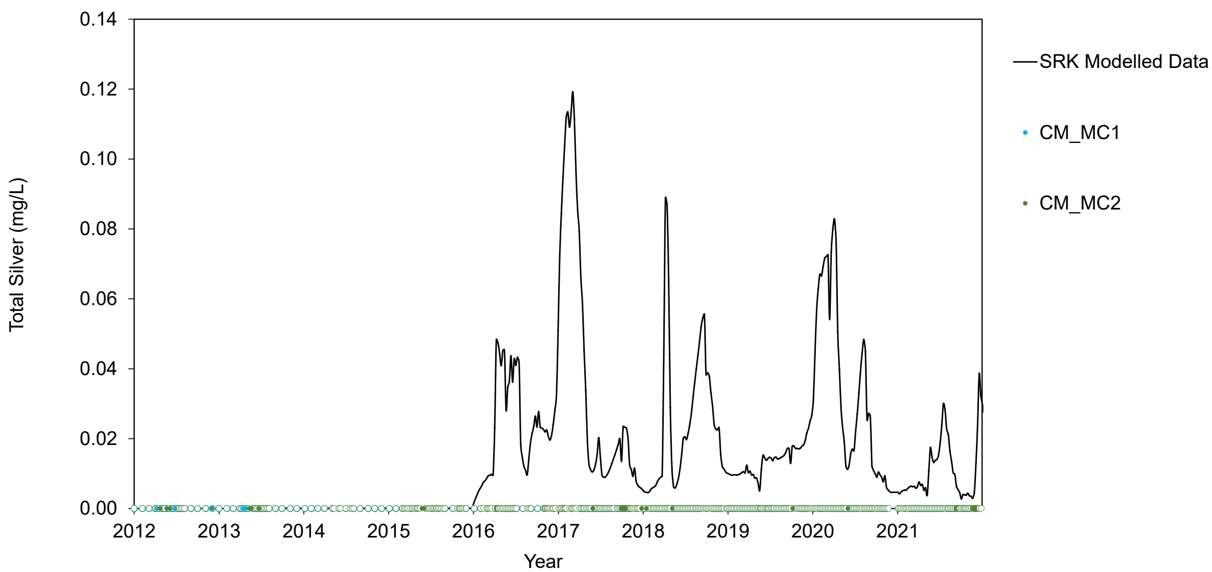
Figure G1.2-16: Temporal Variation in Aqueous Phosphorus Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

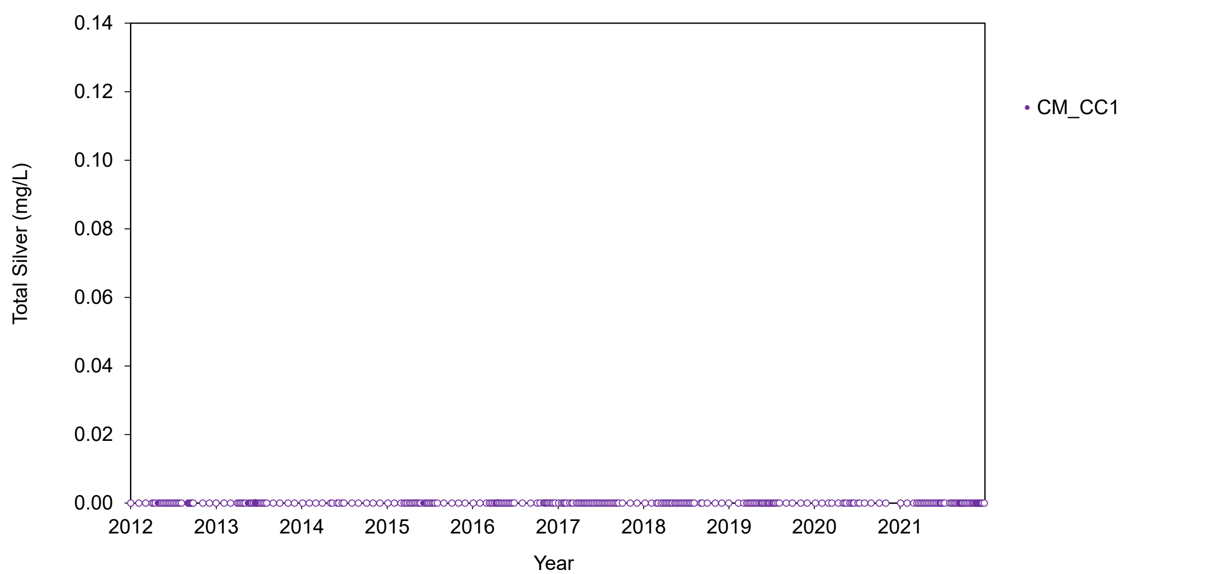




Note: Open symbols represent non-detects. One point not shown in the bottom panel (1.52 mg/L in June 2013).
mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-17: Temporal Variation in Aqueous Silver Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

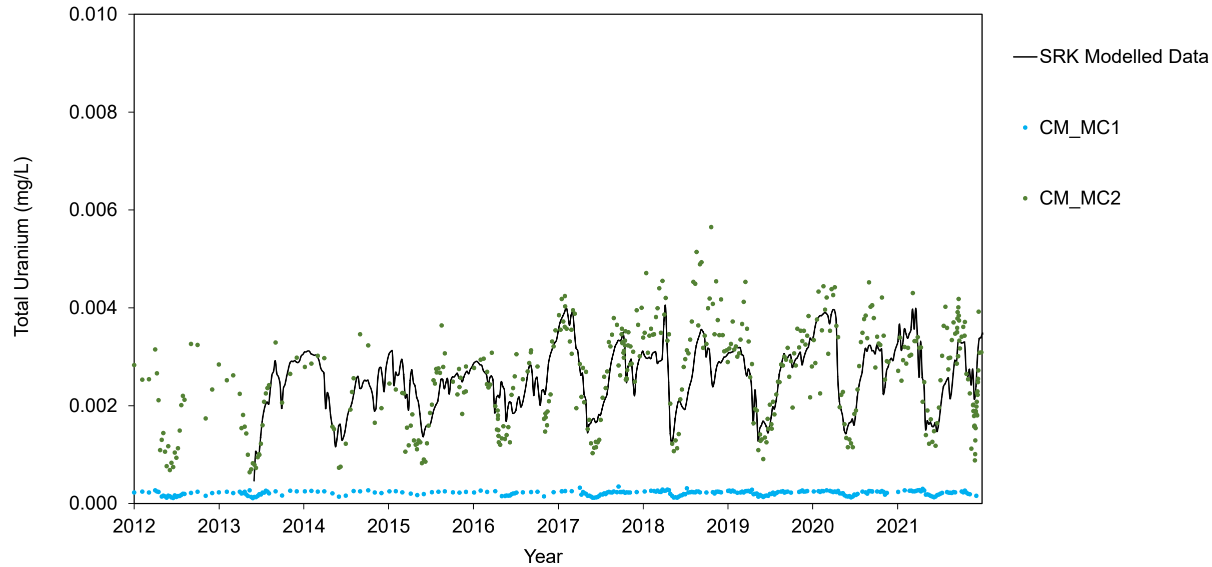


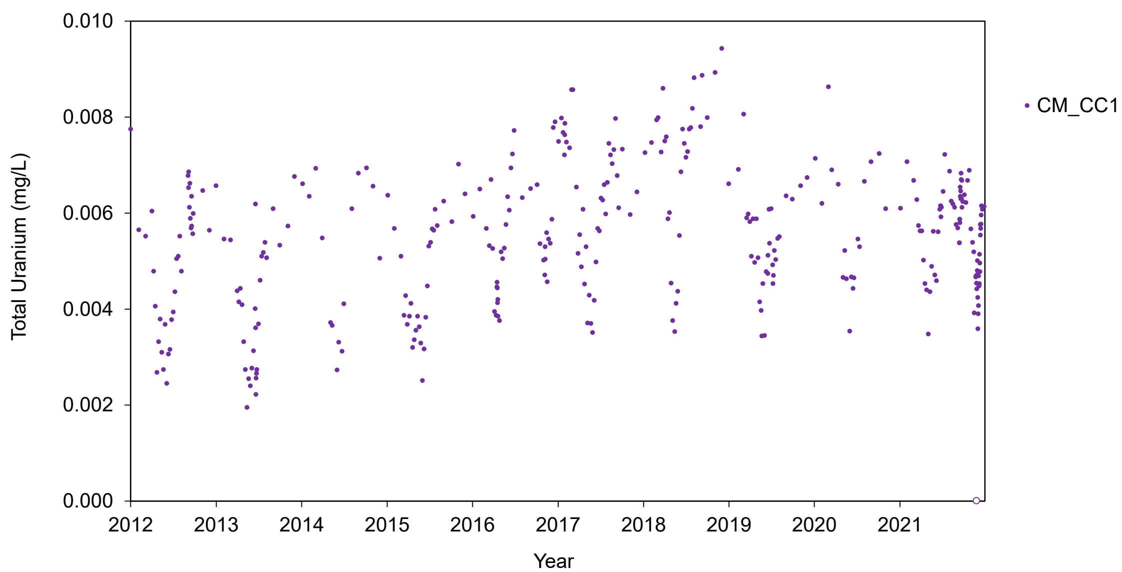


Note: Open symbols represent non-detects. SRK modelled projections for dissolved silver are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-18: Temporal Variation in Aqueous Uranium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

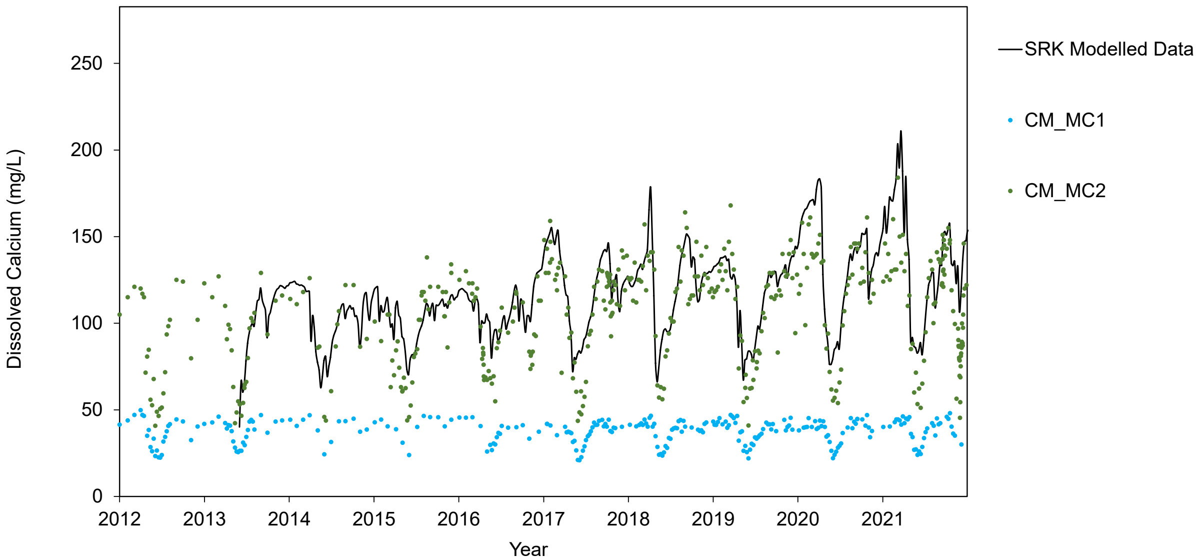


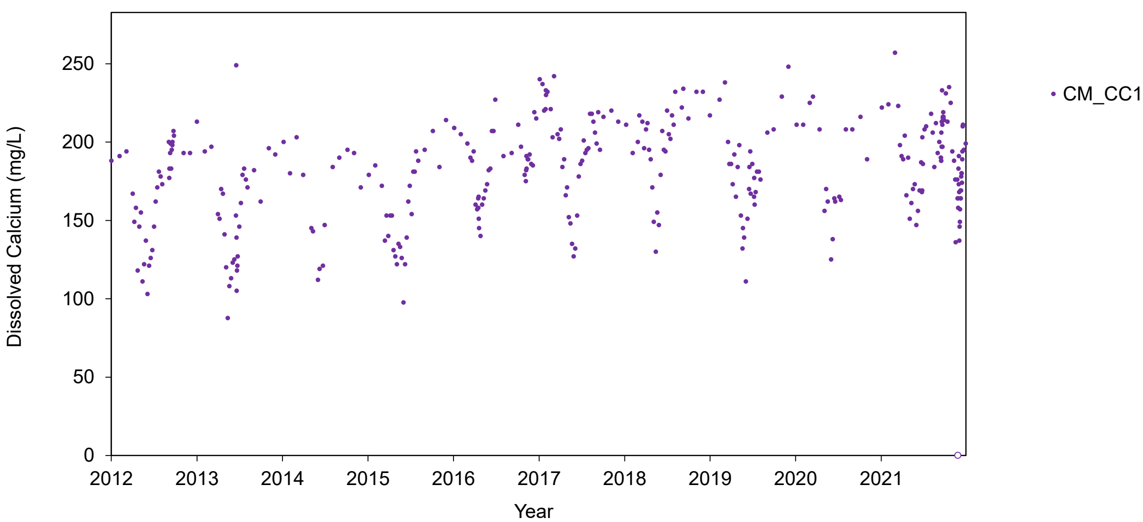


Note: Open symbols represent non-detects. SRK modelled projections for dissolved uranium are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-19: Temporal Variation in Aqueous Calcium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

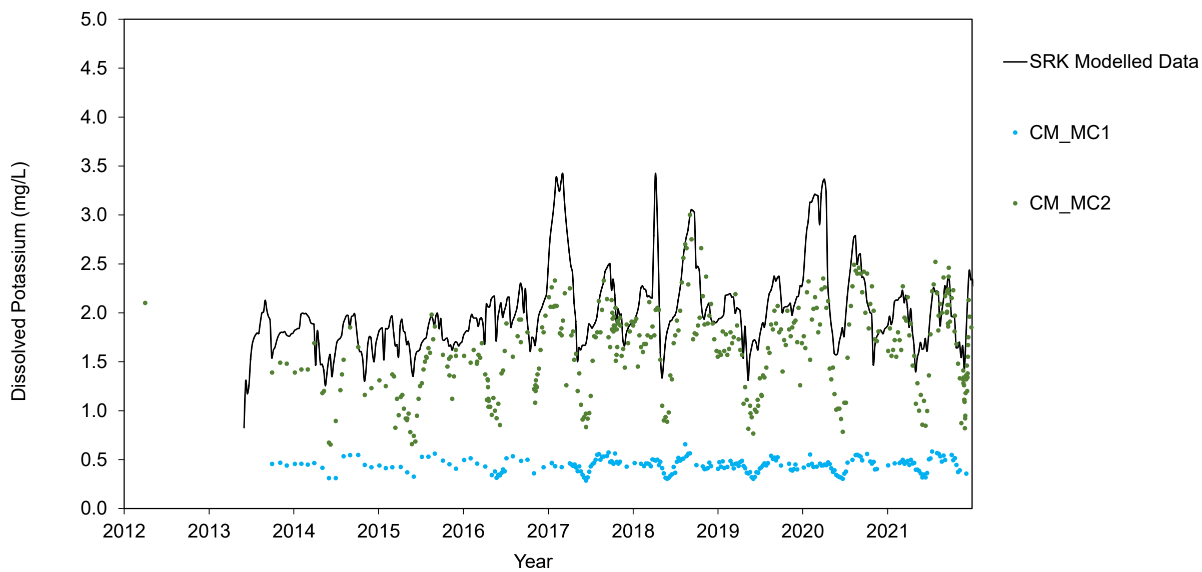


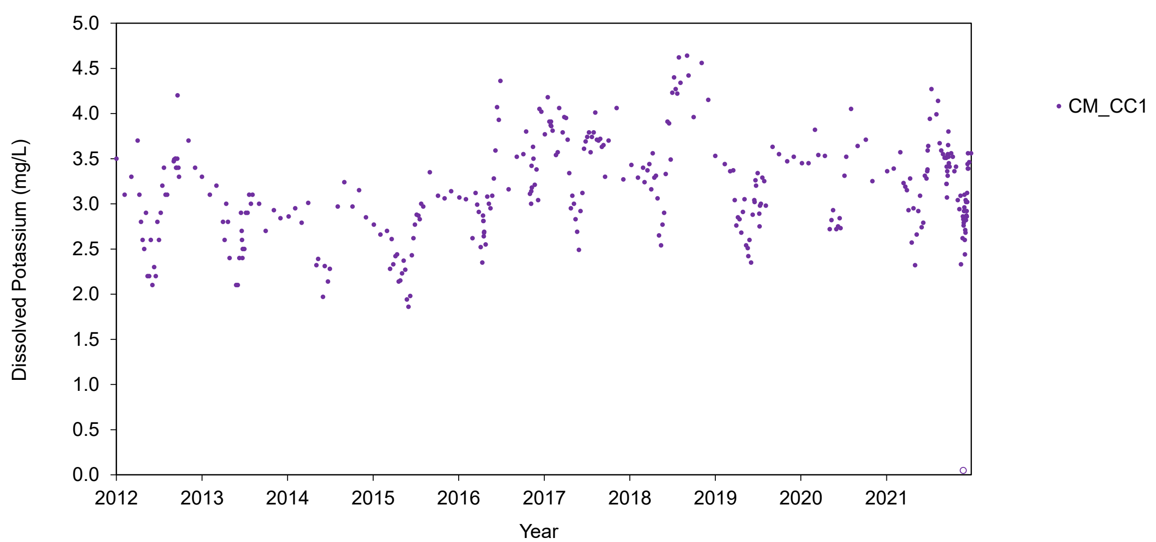


Note: Open symbols represent non-detects. SRK modelled projections for dissolved calcium are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-20: Temporal Variation in Aqueous Potassium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

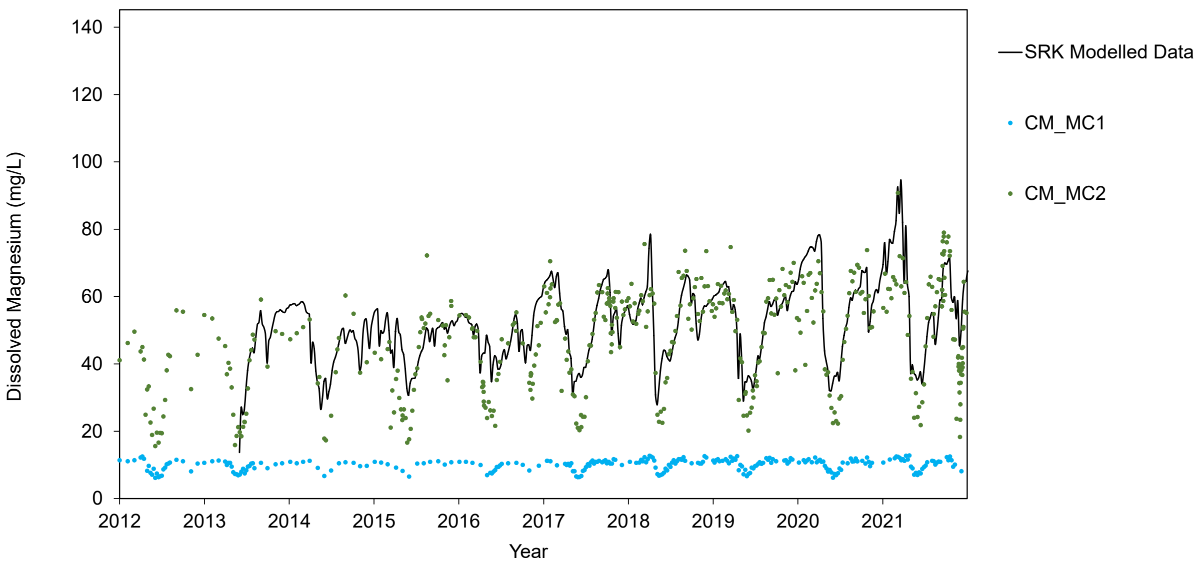


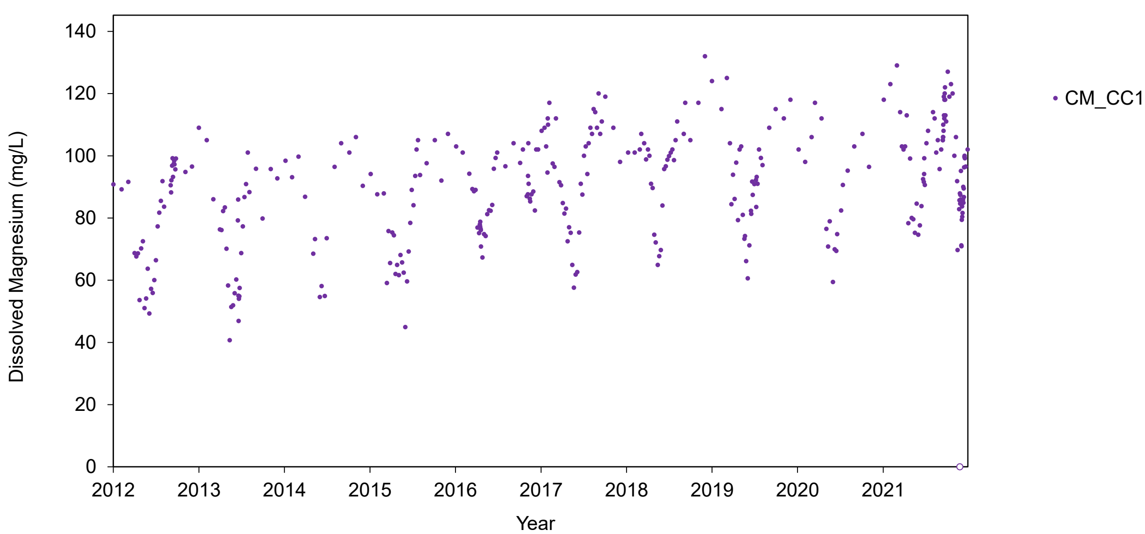


Note: Open symbols represent non-detects. SRK modelled projections for dissolved potassium are included for comparison (SRK 2022). Two points not shown in the bottom panel (5.7 and 8.1 mg/L in June 2013). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-21: Temporal Variation in Aqueous Magnesium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

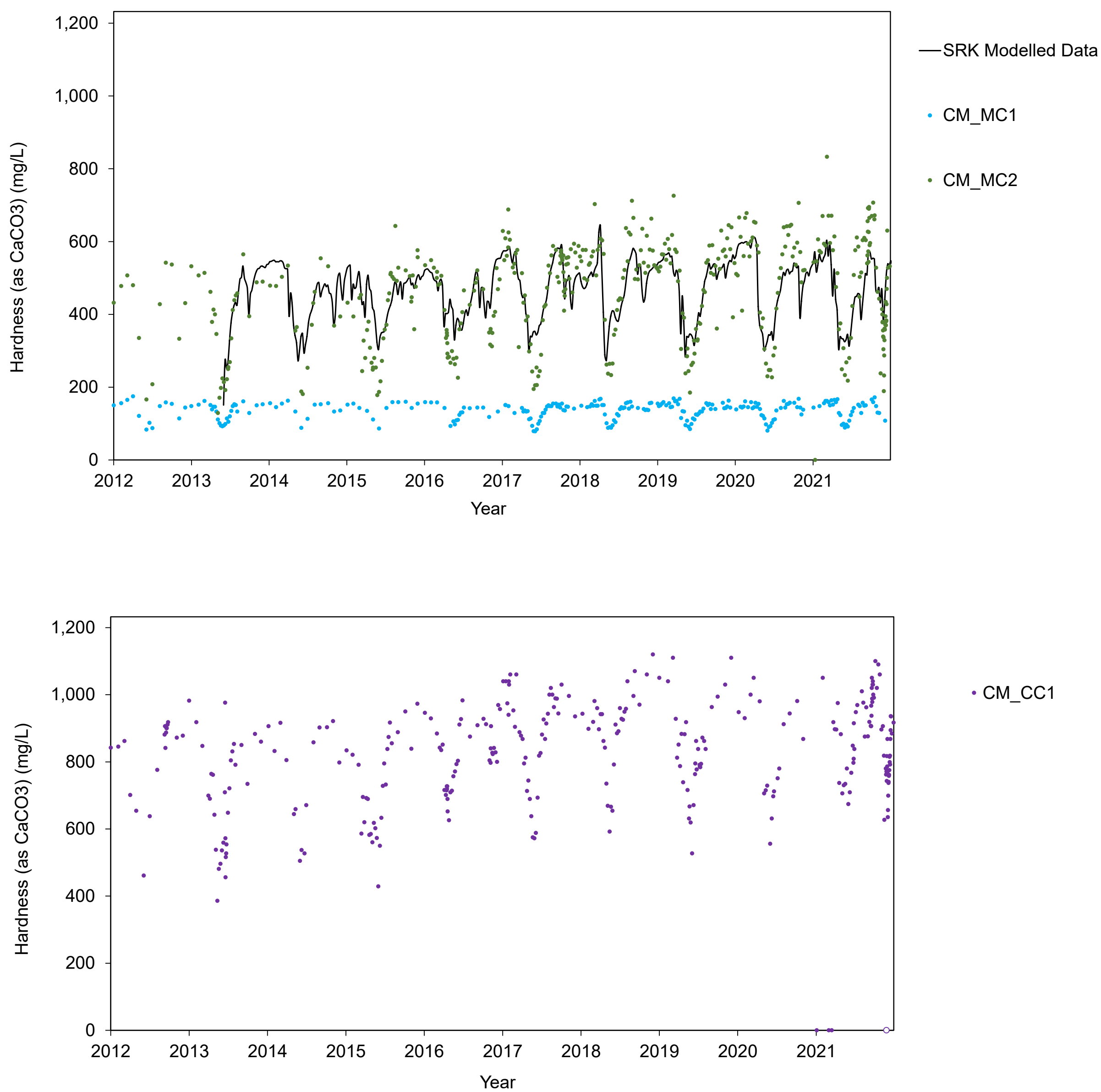




Note: Open symbols represent non-detects. SRK modelled projections for dissolved magnesium are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

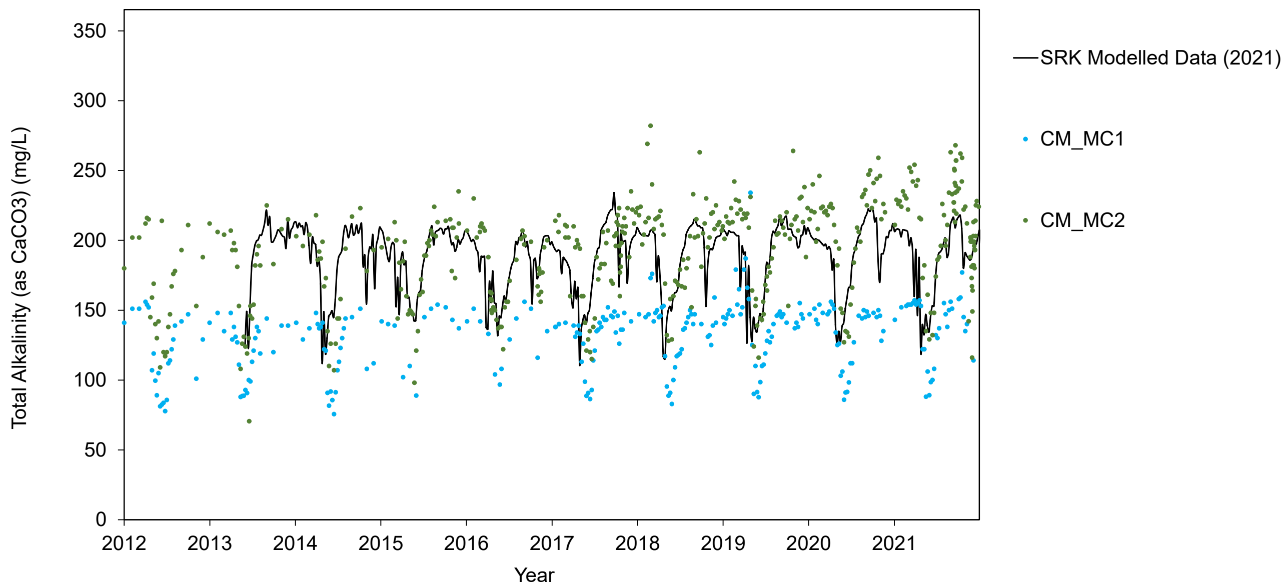
Figure G1.2-22: Temporal Variation in Hardness in Samples Collected from the CMm LAEMP, 2012 to 2021

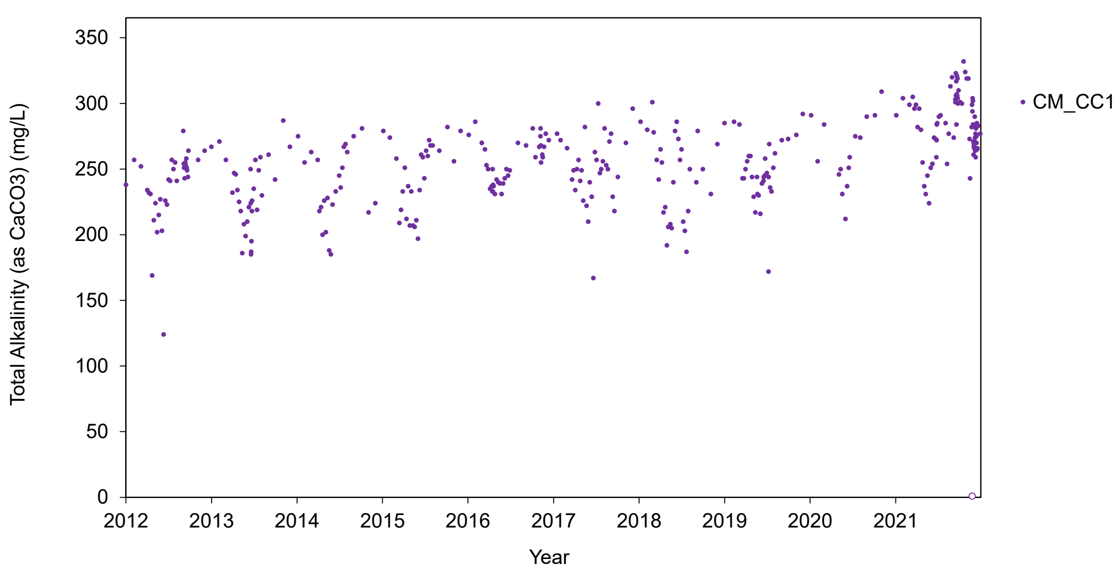


Note: Open symbols represent non-detects. SRK modelled projections for hardness are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-23: Temporal Variation in Alkalinity in Samples Collected from the CMm LAEMP, 2012 to 2021

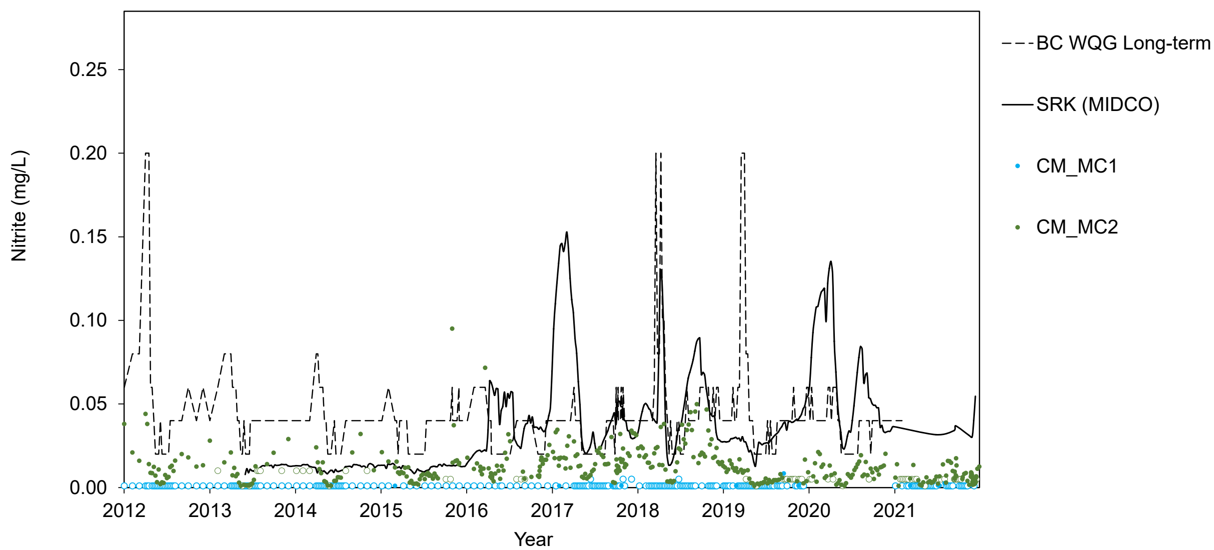


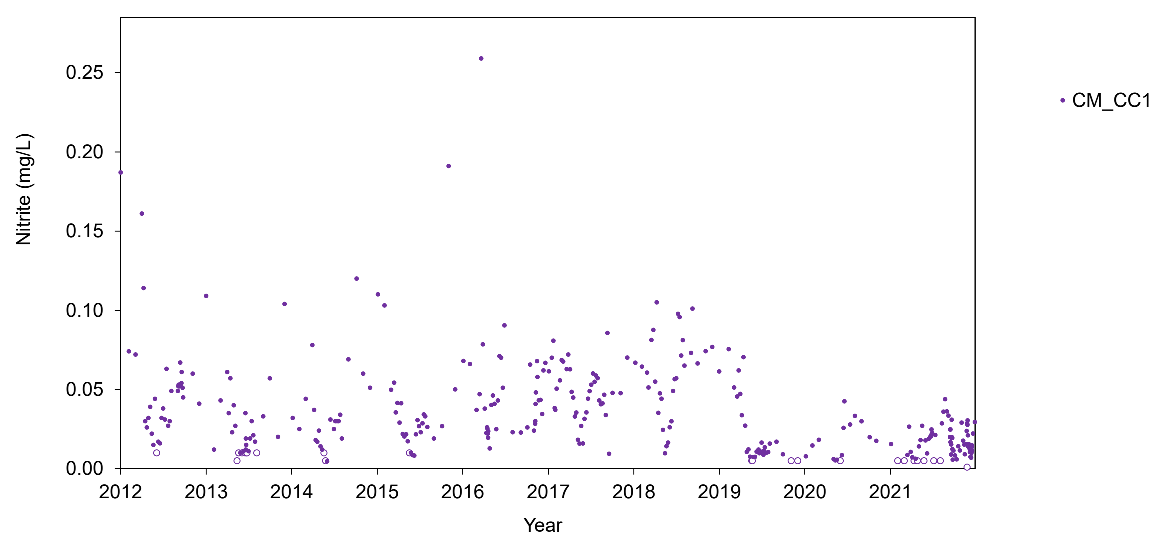


Note: Open symbols represent non-detects. SRK modelled projections for total alkalinity are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line.

mg/L = milligrams per litre; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G1.2-24: Temporal Variation in Nitrite in Samples Collected from the CMm LAEMP, 2012 to 2021



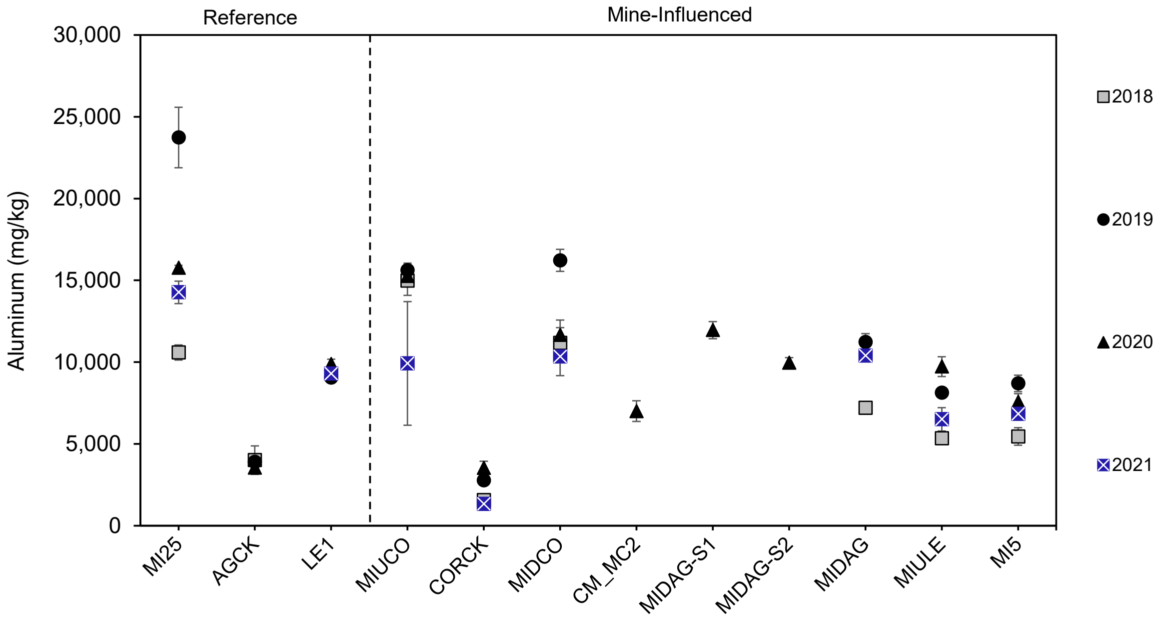


Note: Open symbols represent non-detects. SRK modelled projections for nitrite are included for comparison (SRK 2022). SRK modelled data are represented by the solid black line in the upper panel.

mg/L = milligrams per litre; BC WQG = British Columbia water quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

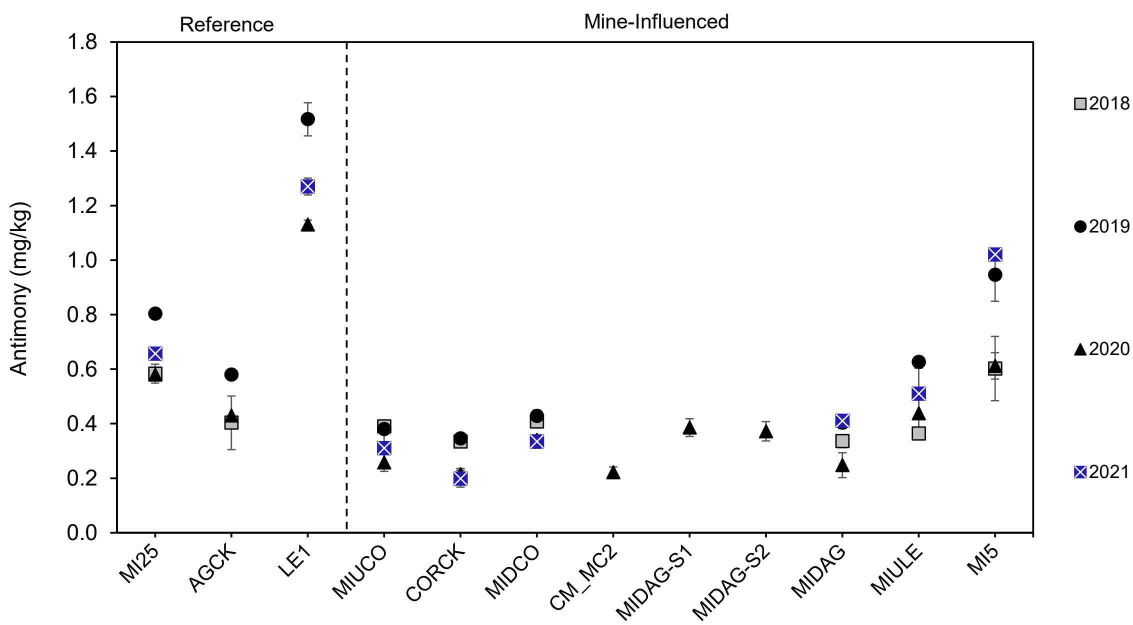
G2 SEDIMENT QUALITY

Figure G2.1-1: Spatial Variation in Sediment Aluminum Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



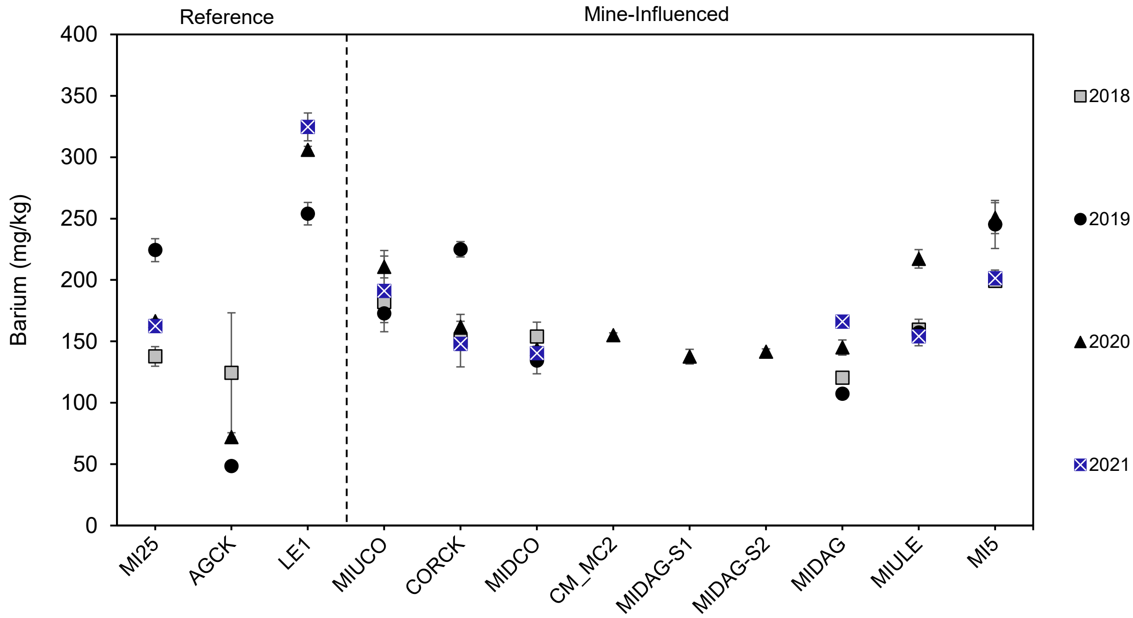
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-2: Spatial Variation in Sediment Antimony Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



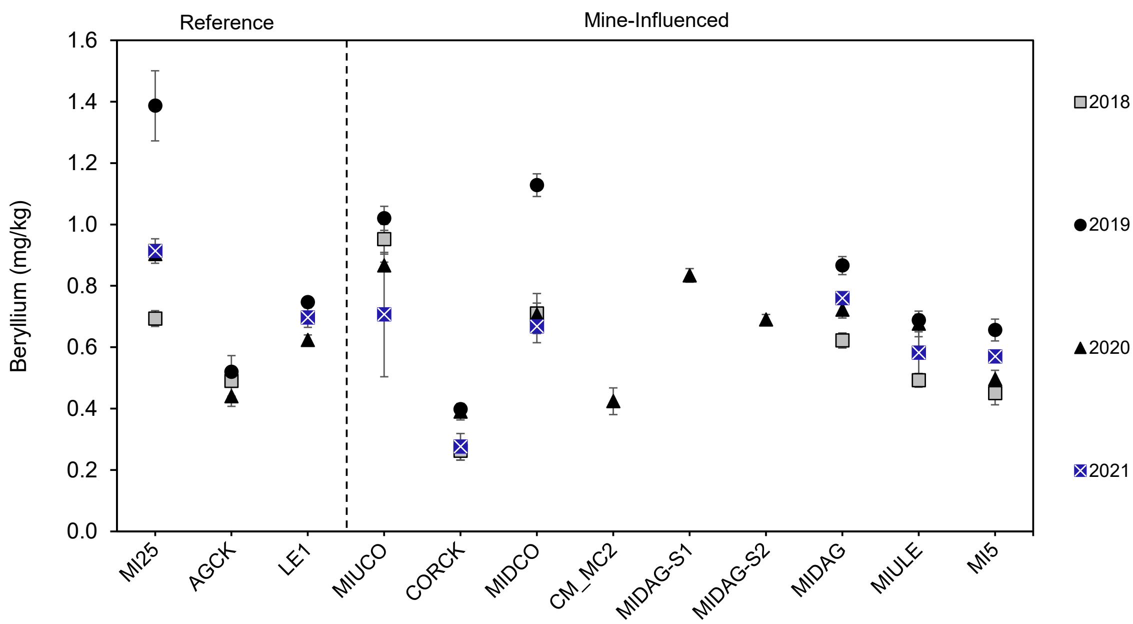
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-3: Spatial Variation in Sediment Barium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



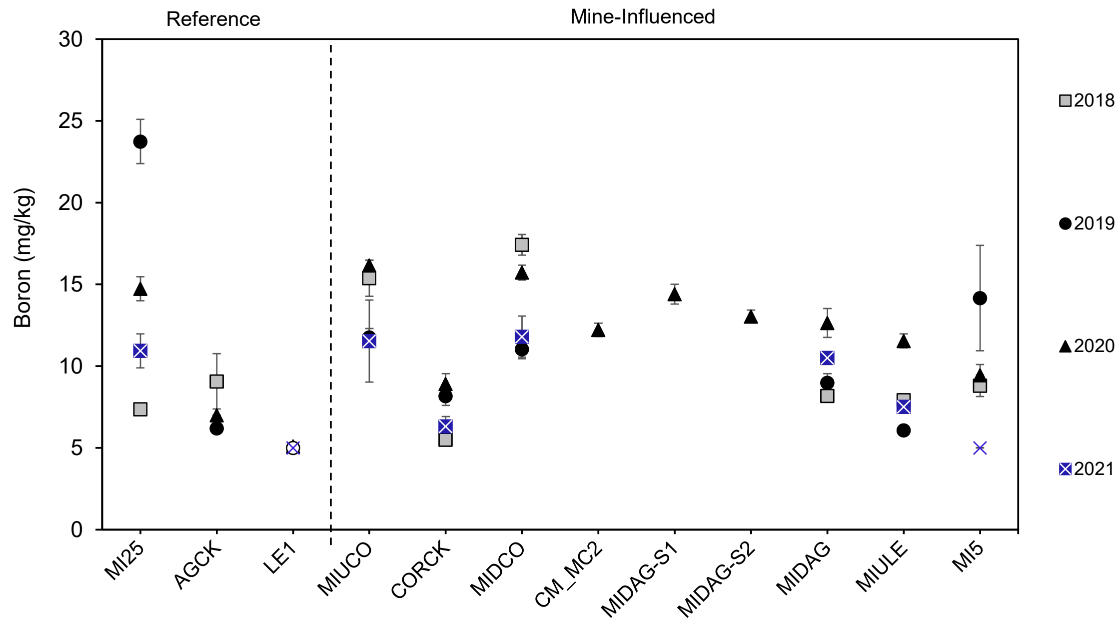
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-4: Spatial Variation in Sediment Beryllium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



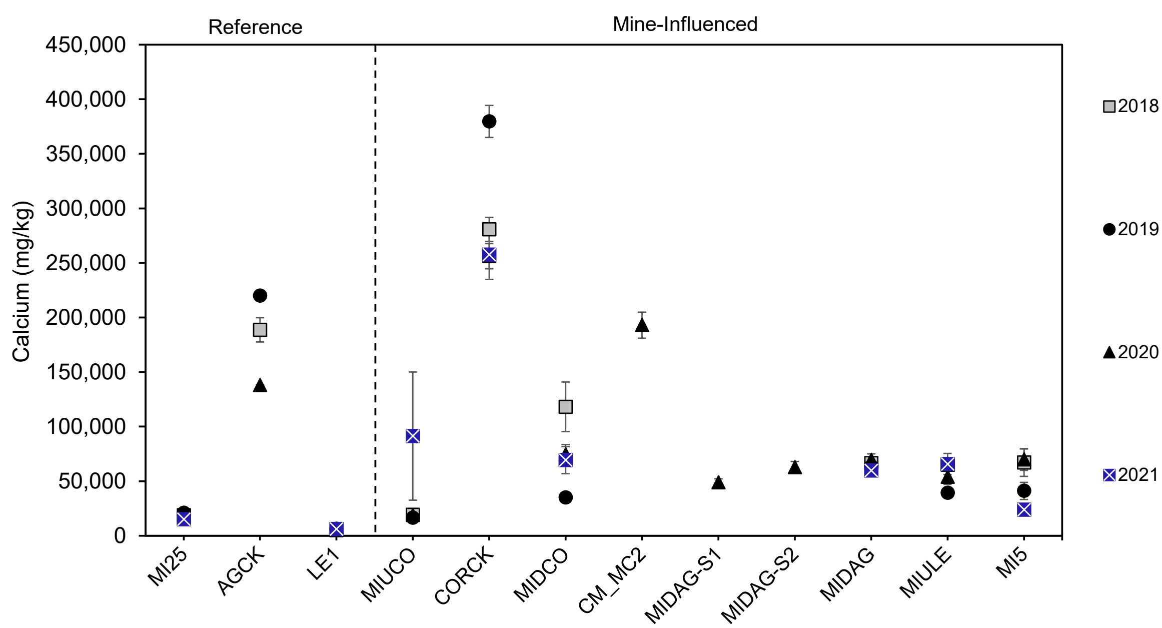
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-5: Spatial Variation in Sediment Boron Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



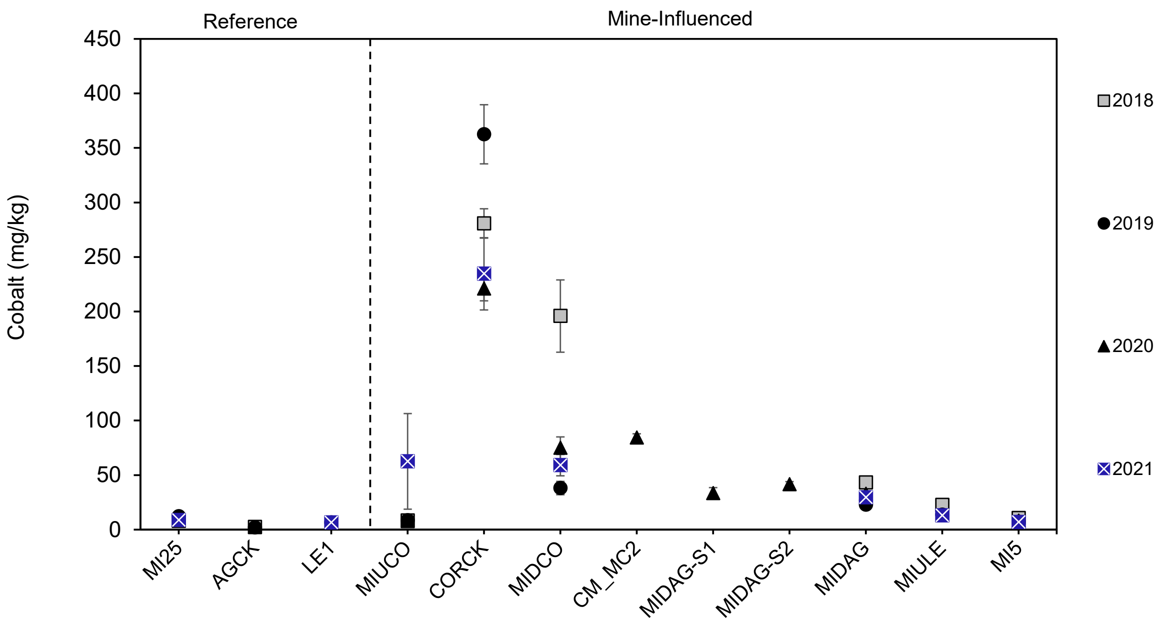
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-6: Spatial Variation in Sediment Calcium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



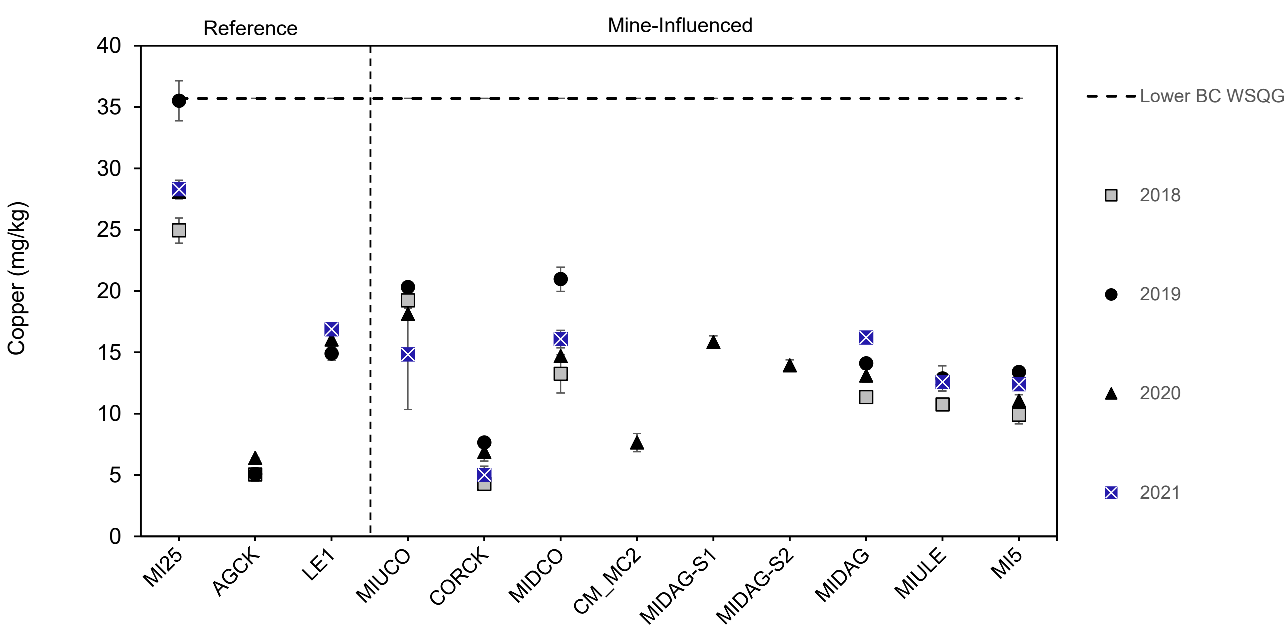
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-7: Spatial Variation in Sediment Cobalt Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



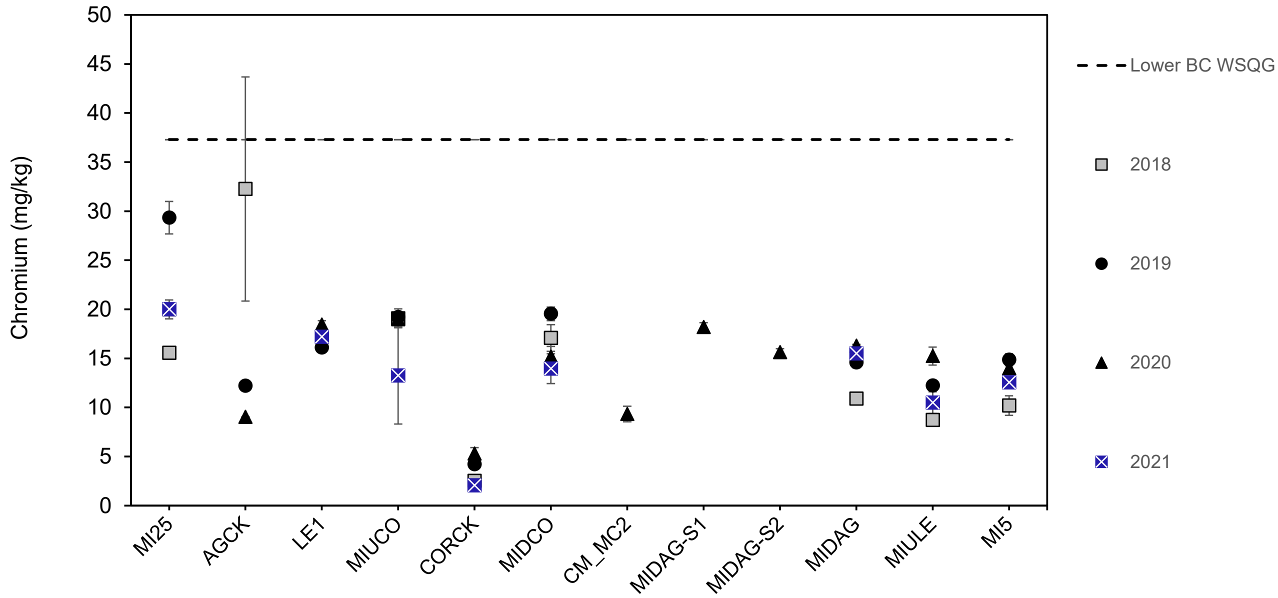
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-8: Spatial Variation in Sediment Copper Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Upper BC WSQG (197 mg/kg) not shown.
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

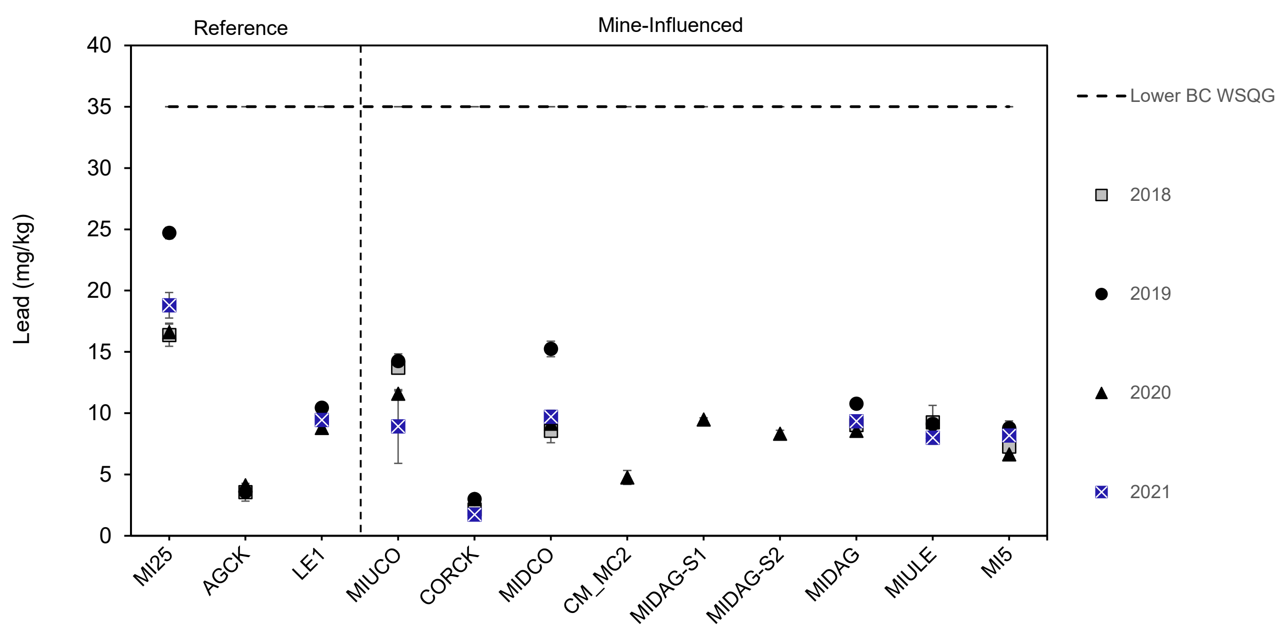
Figure G2.1-9: Spatial Variation in Sediment Chromium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Upper BC WSQG (90 mg/kg) not shown.

mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

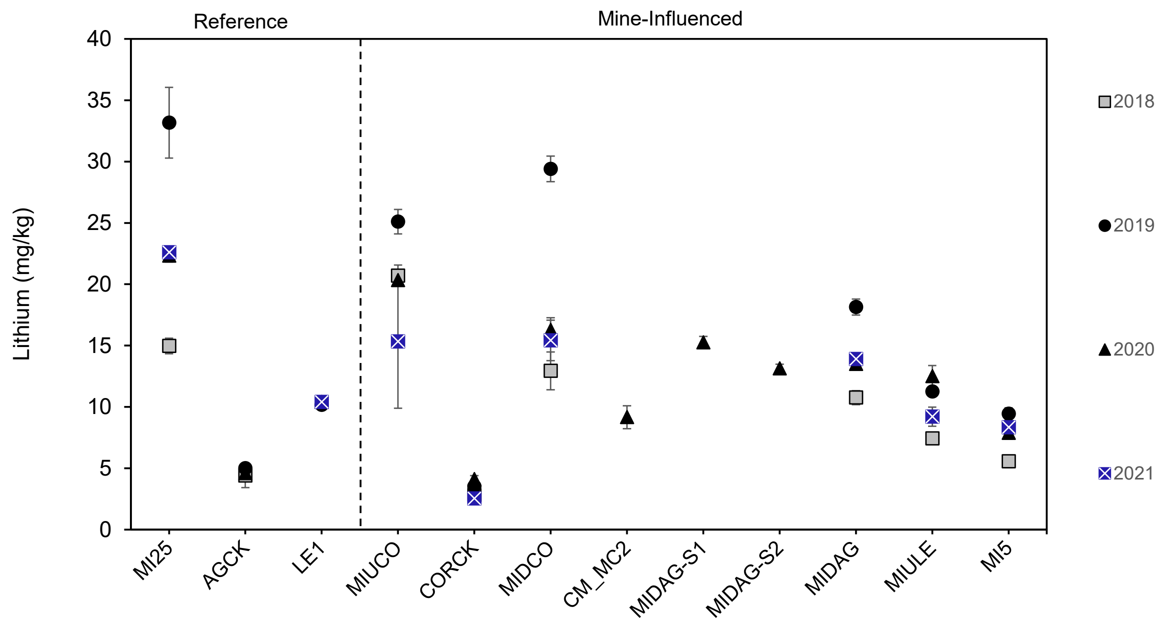
Figure G2.1-10: Spatial Variation in Sediment Lead Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Upper BC WSQG (91.3 mg/kg) not shown.

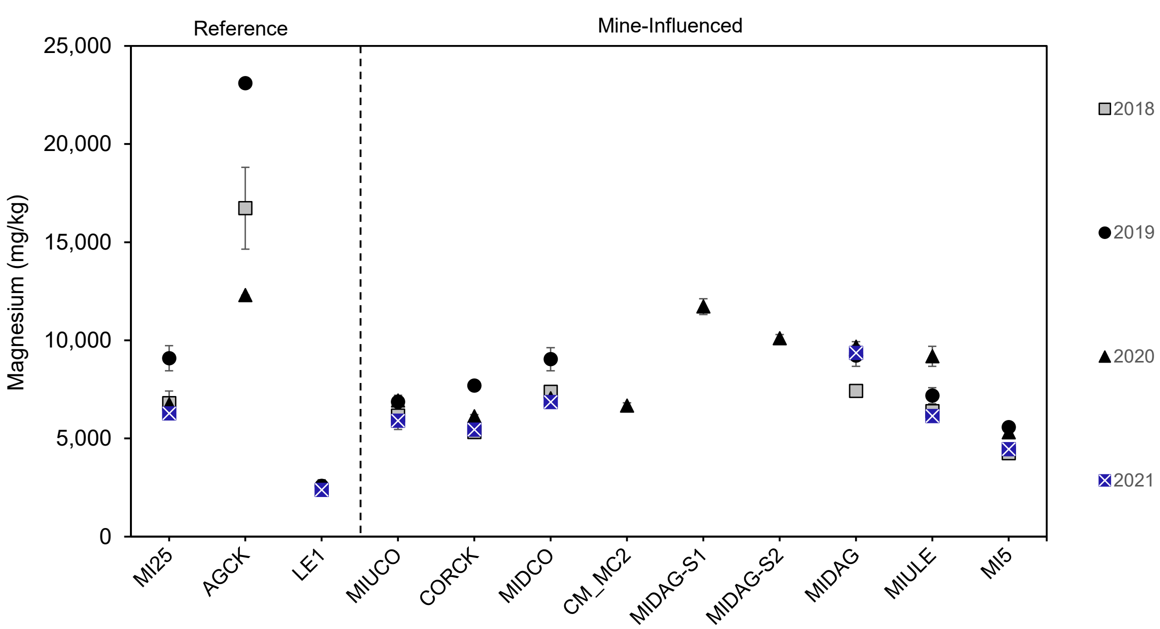
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-11: Spatial Variation in Sediment Lithium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



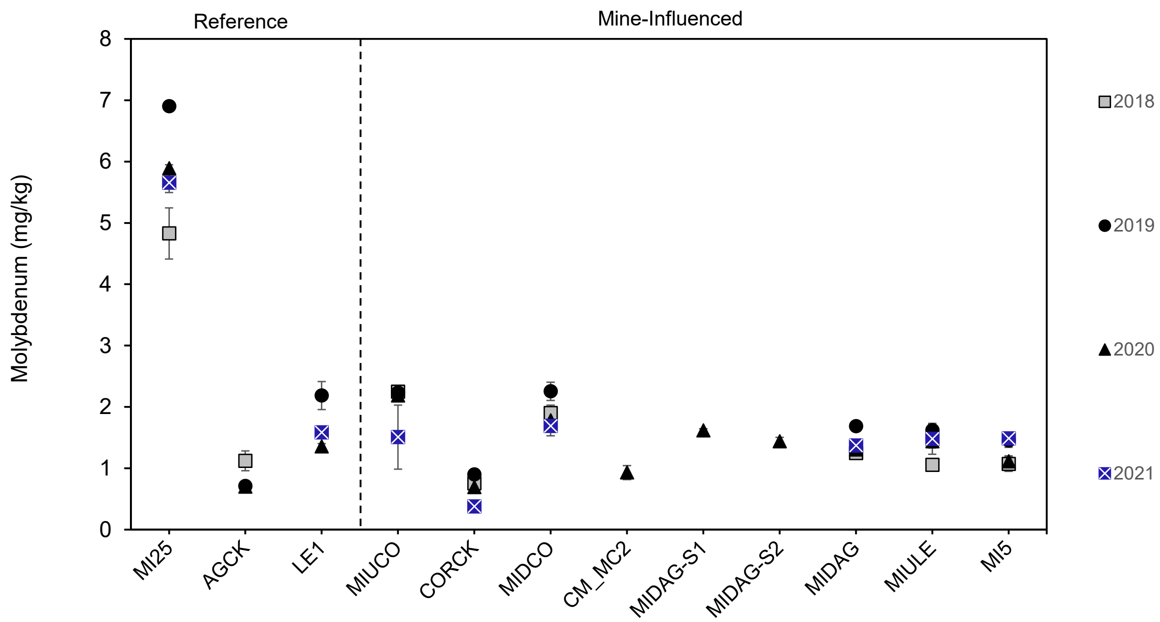
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-12: Spatial Variation in Sediment Magnesium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



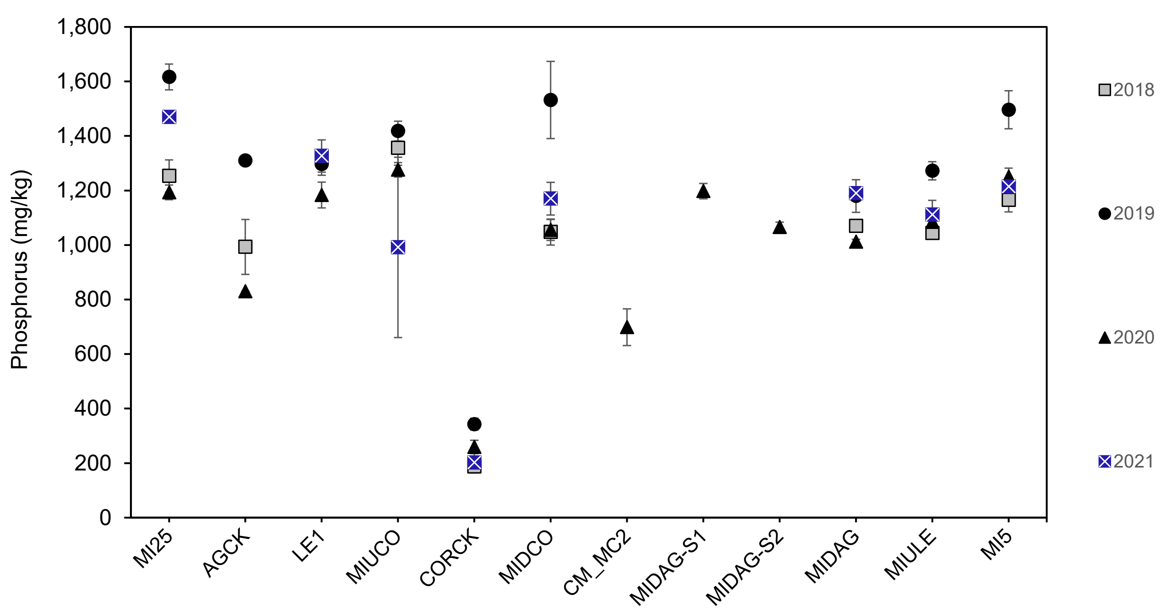
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-13: Spatial Variation in Sediment Molybdenum Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



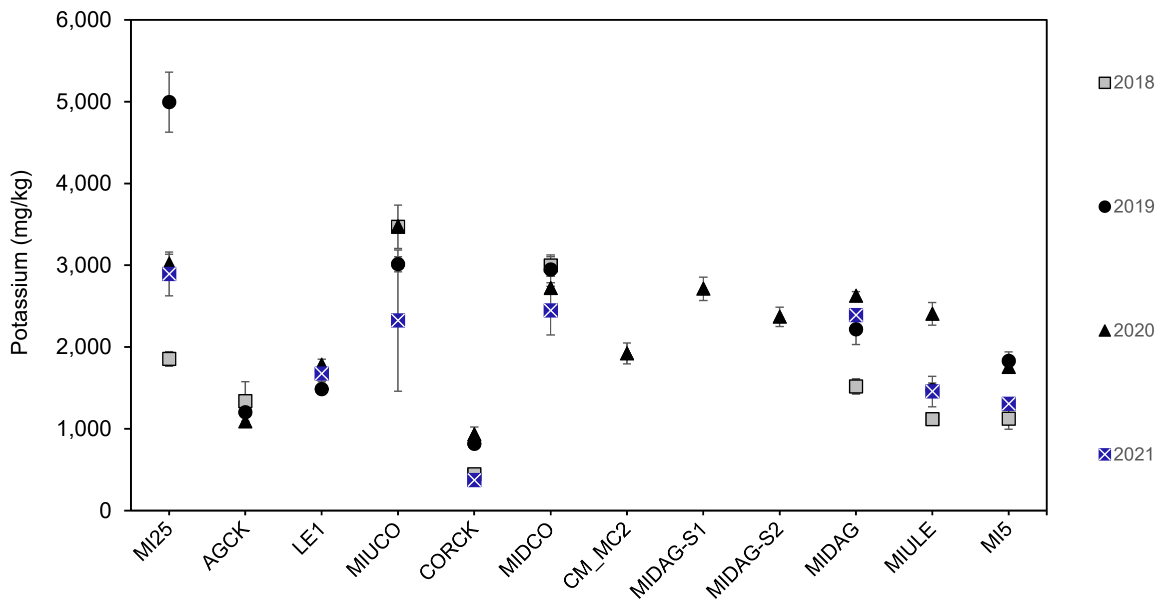
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-14: Spatial Variation in Sediment Phosphorus Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



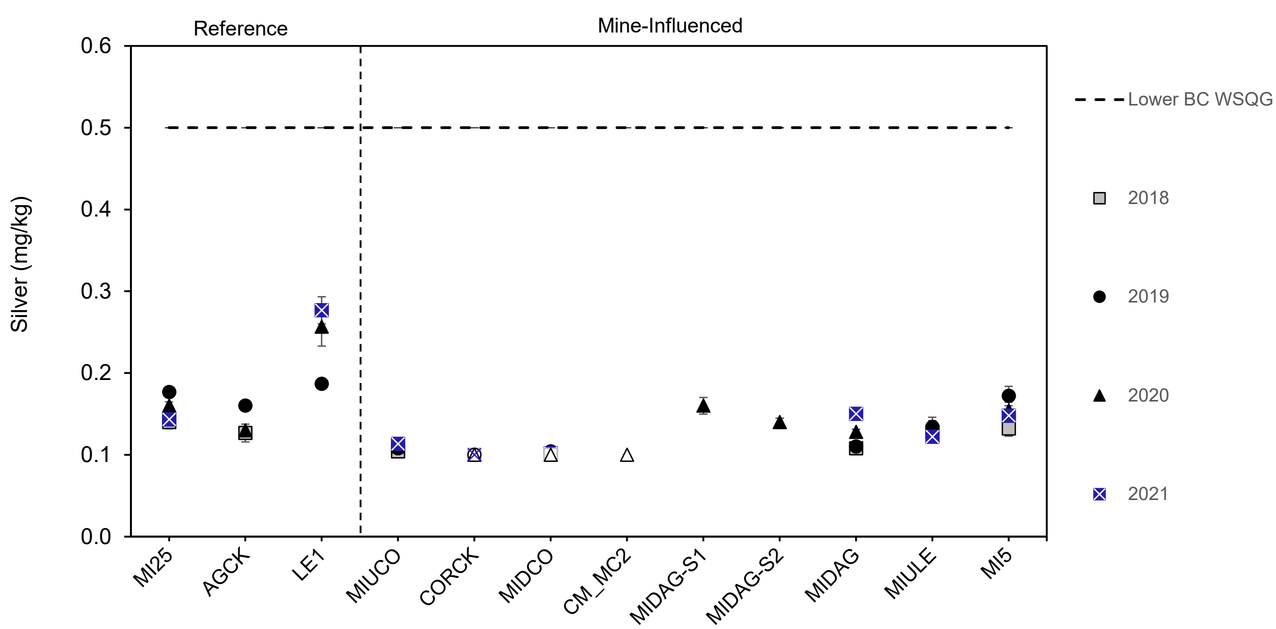
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-15: Spatial Variation in Sediment Potassium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

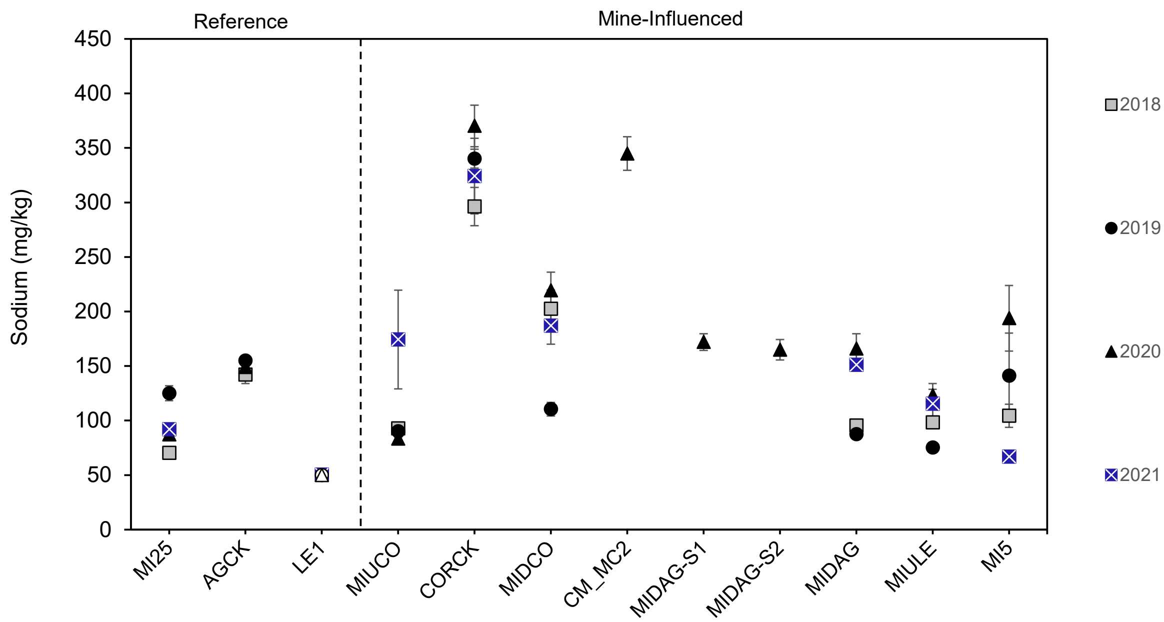
Figure G2.1-16: Spatial Variation in Sediment Silver Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Open symbols represent non-detects. No upper BC WSQG for freshwater aquatic life.

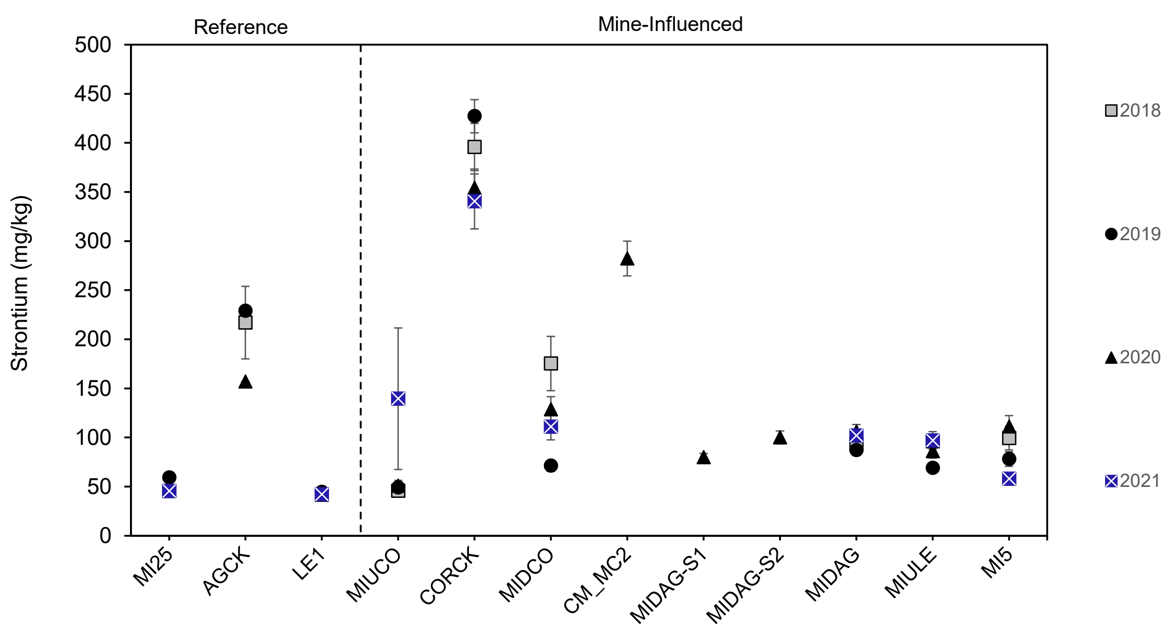
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-17: Spatial Variation in Sediment Sodium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



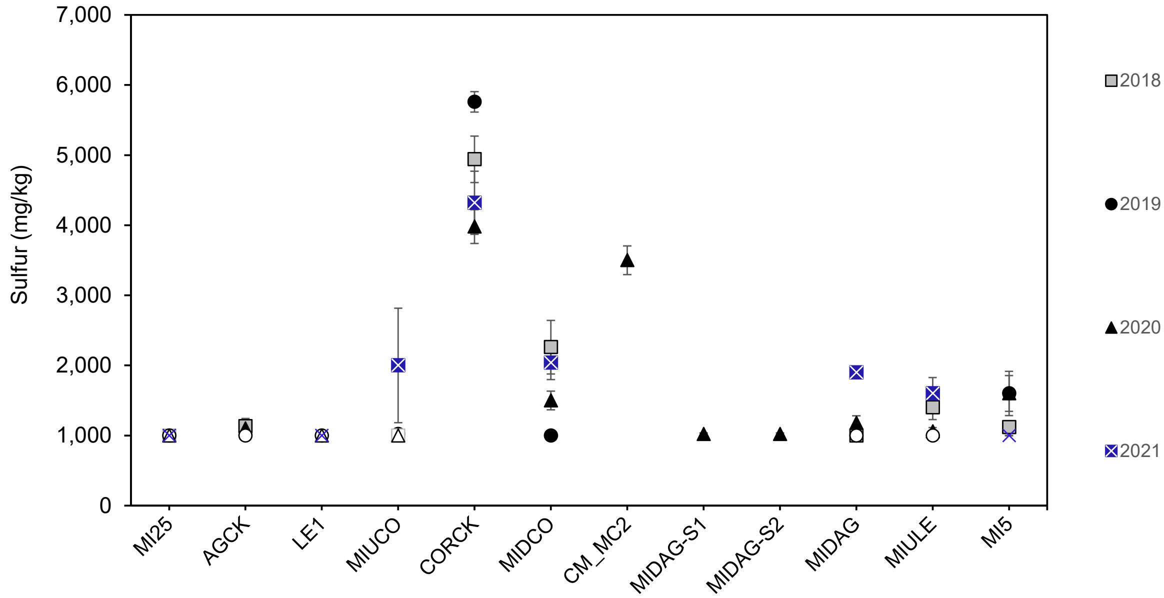
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-18: Spatial Variation in Sediment Strontium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



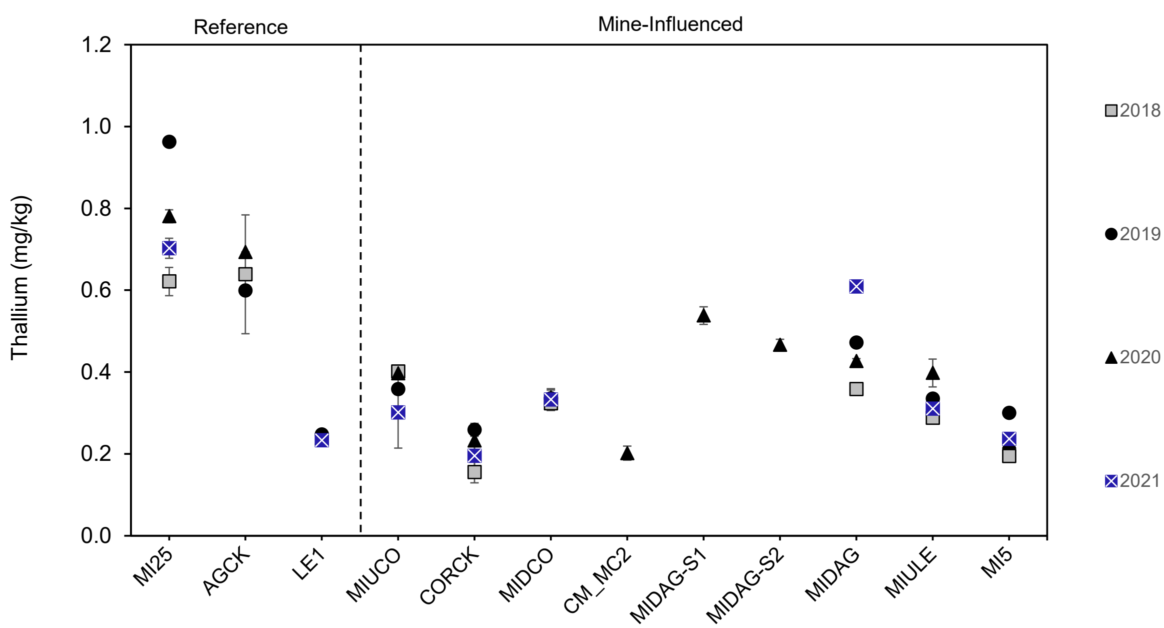
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-19: Spatial Variation in Sediment Sulfur Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



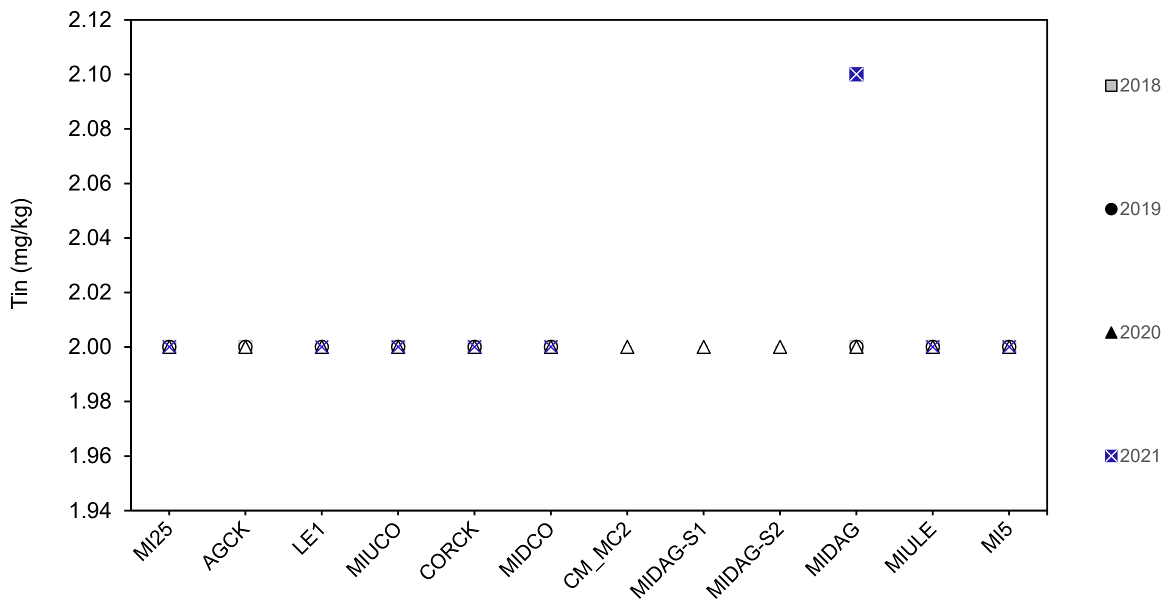
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-20: Spatial Variation in Sediment Thallium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



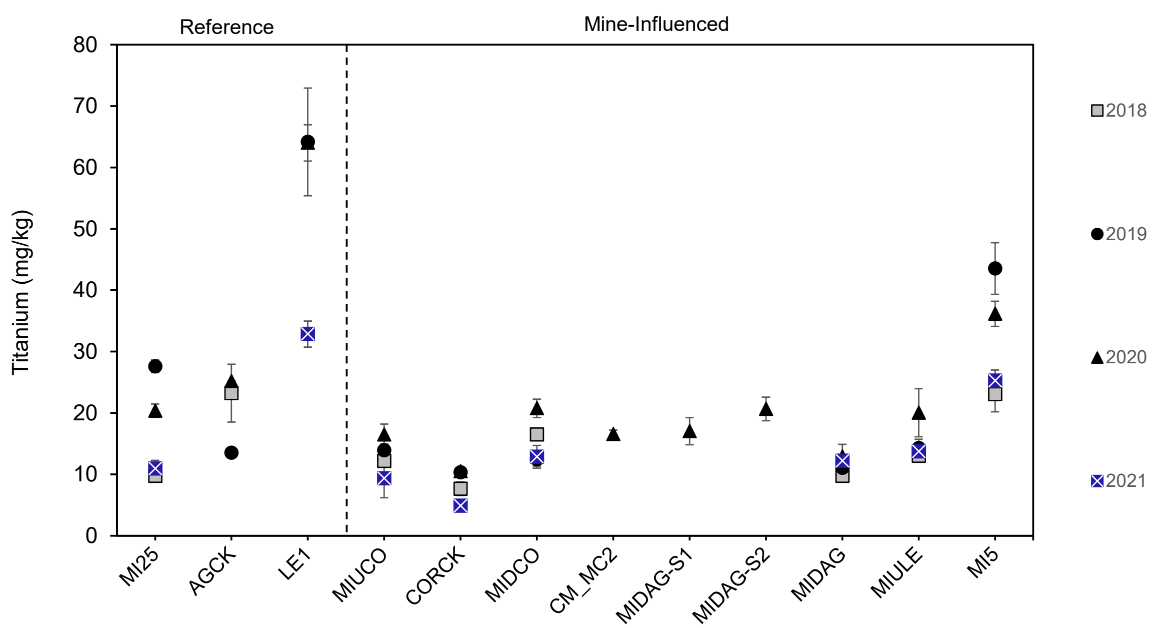
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-21: Spatial Variation in Sediment Tin Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



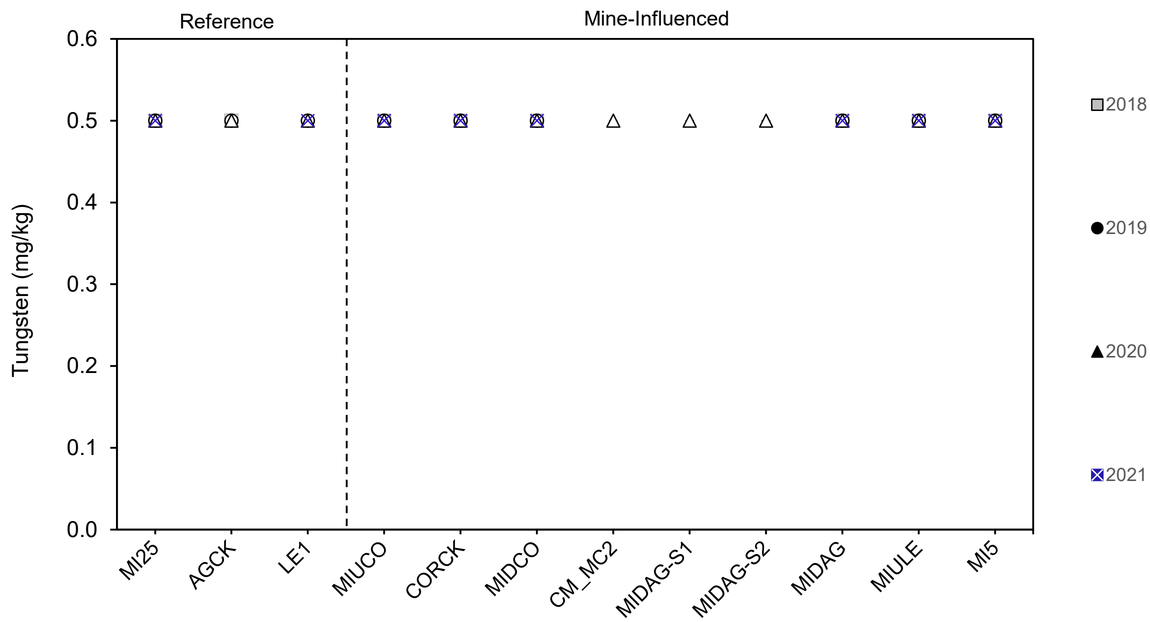
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-22: Spatial Variation in Sediment Titanium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



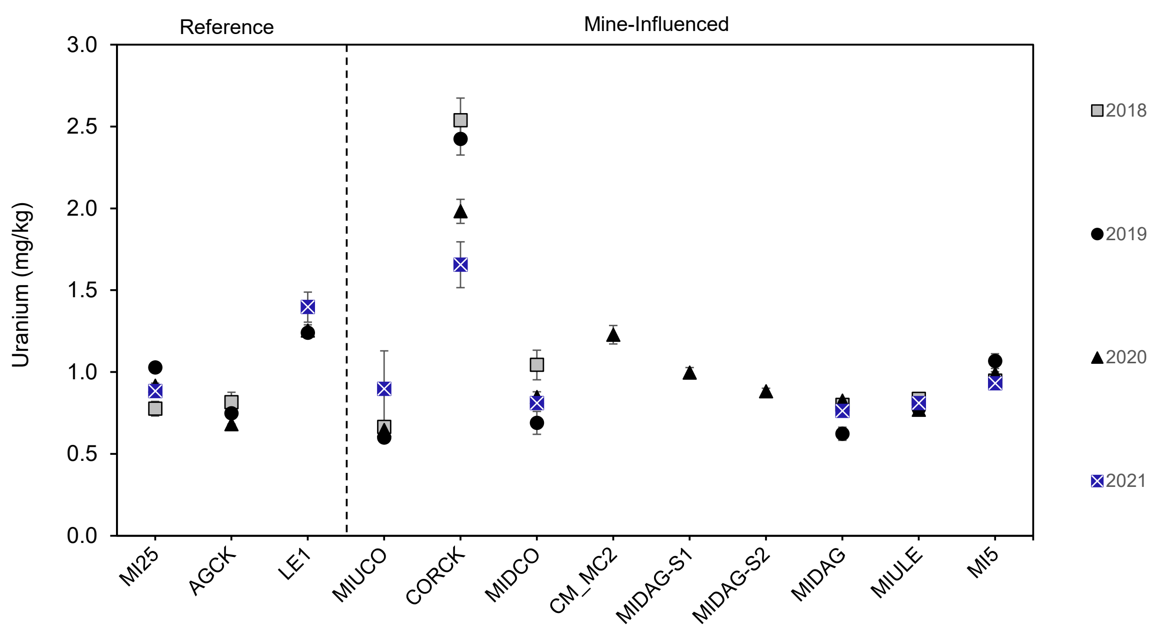
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-23: Spatial Variation in Sediment Tungsten Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



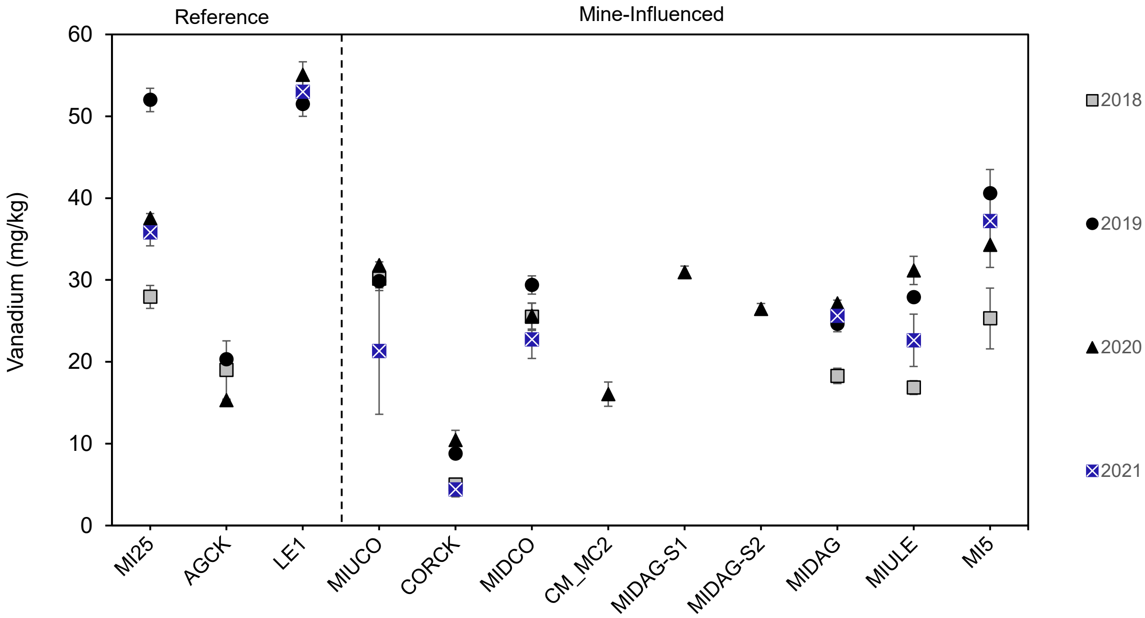
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-24: Spatial Variation in Sediment Uranium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



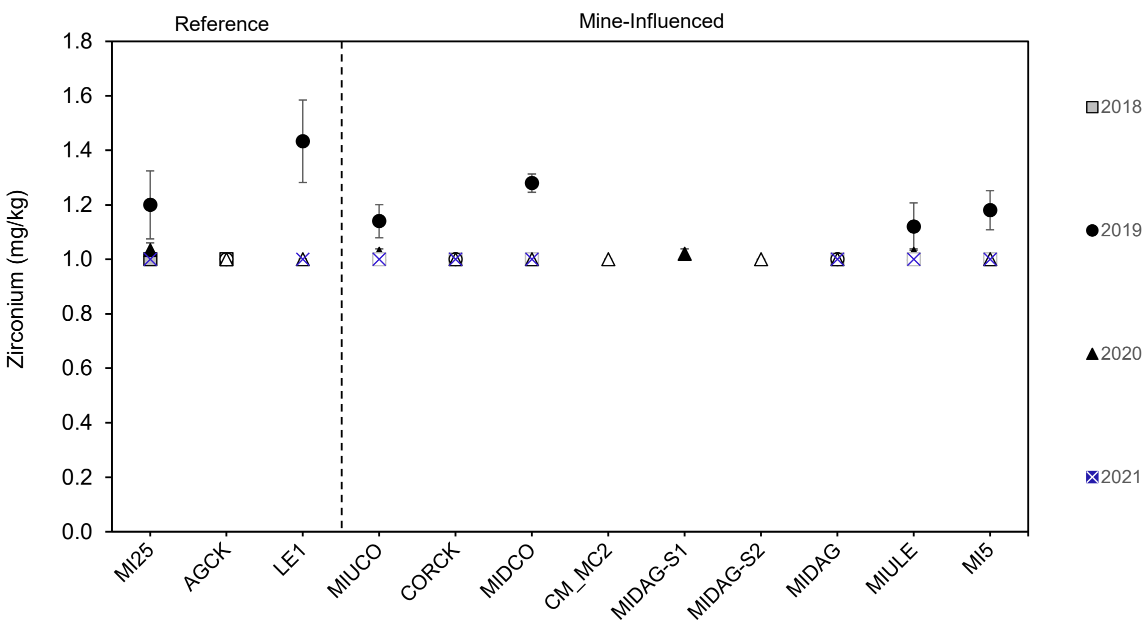
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-25: Spatial Variation in Sediment Vanadium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



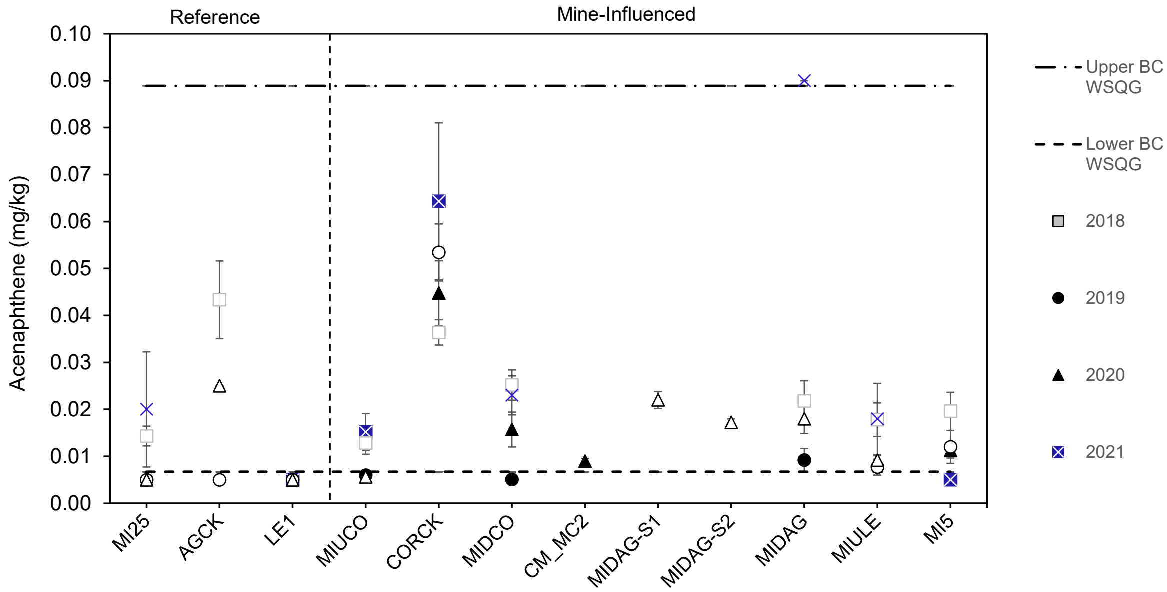
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-26: Spatial Variation in Sediment Zirconium Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

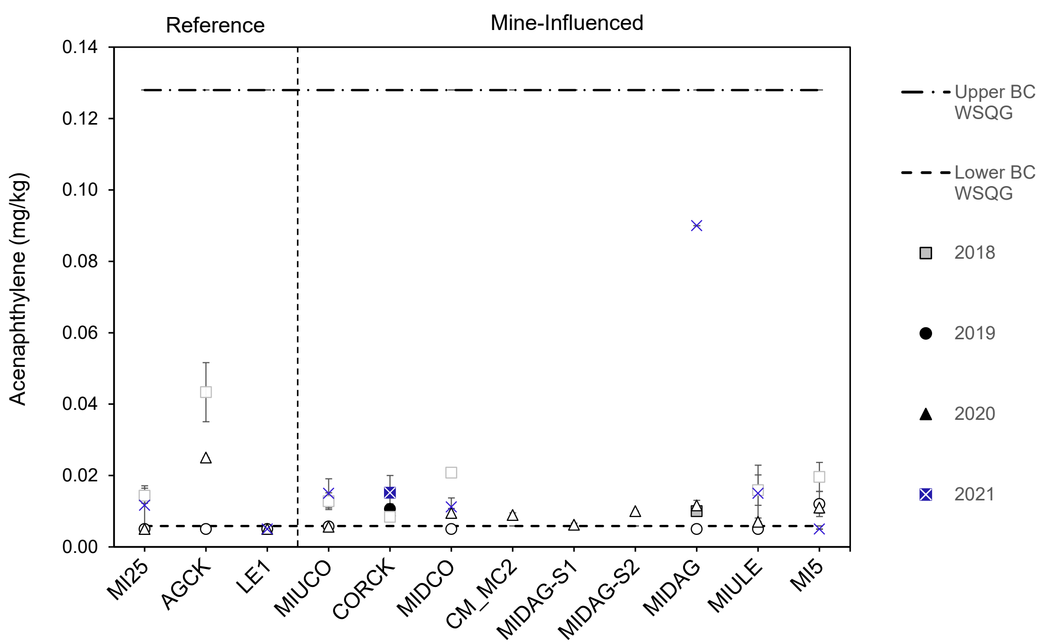
Figure G2.1-27: Spatial Variation in Sediment Acenaphthene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Open symbols represent non-detects.

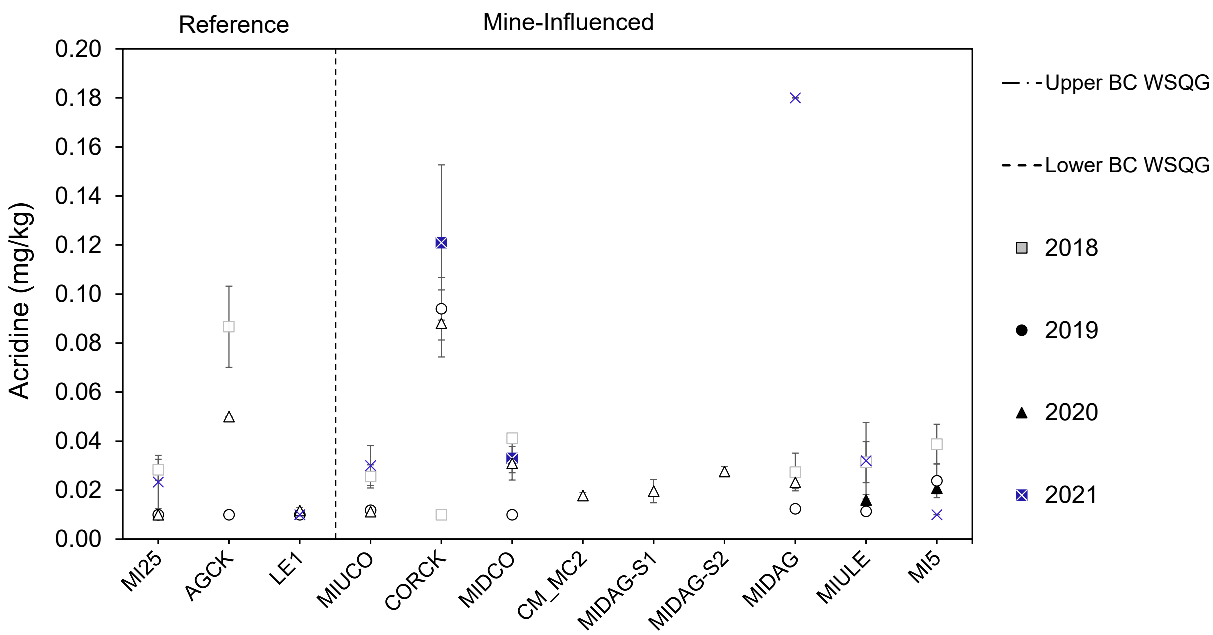
BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-28: Spatial Variation in Sediment Acenaphthylene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



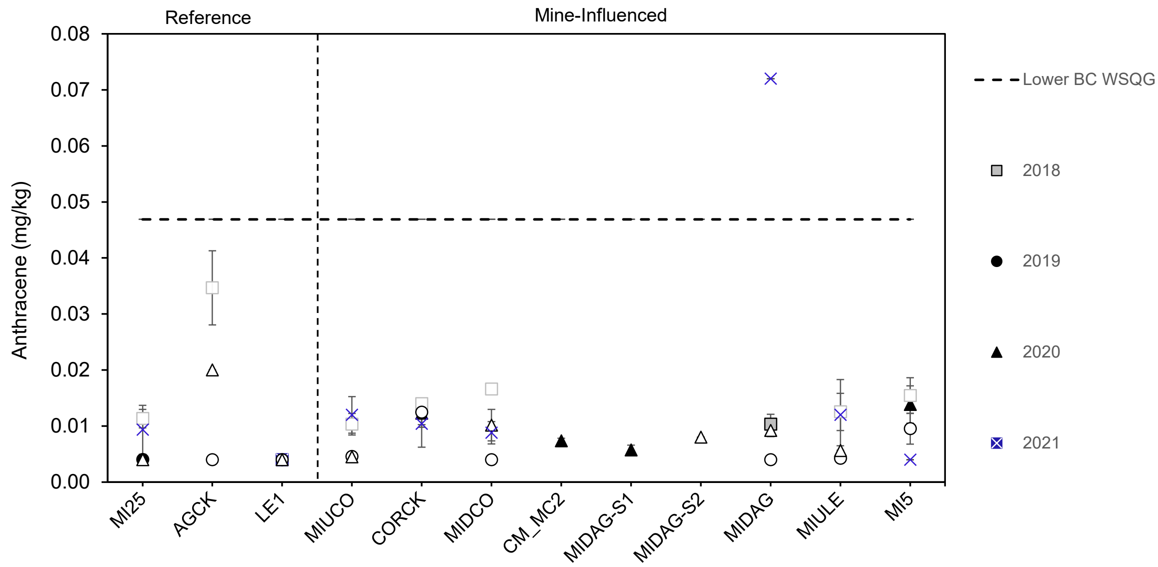
Notes: Open symbols represent non-detects.
WSQG = working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-29: Spatial Variation in Sediment Acridine Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



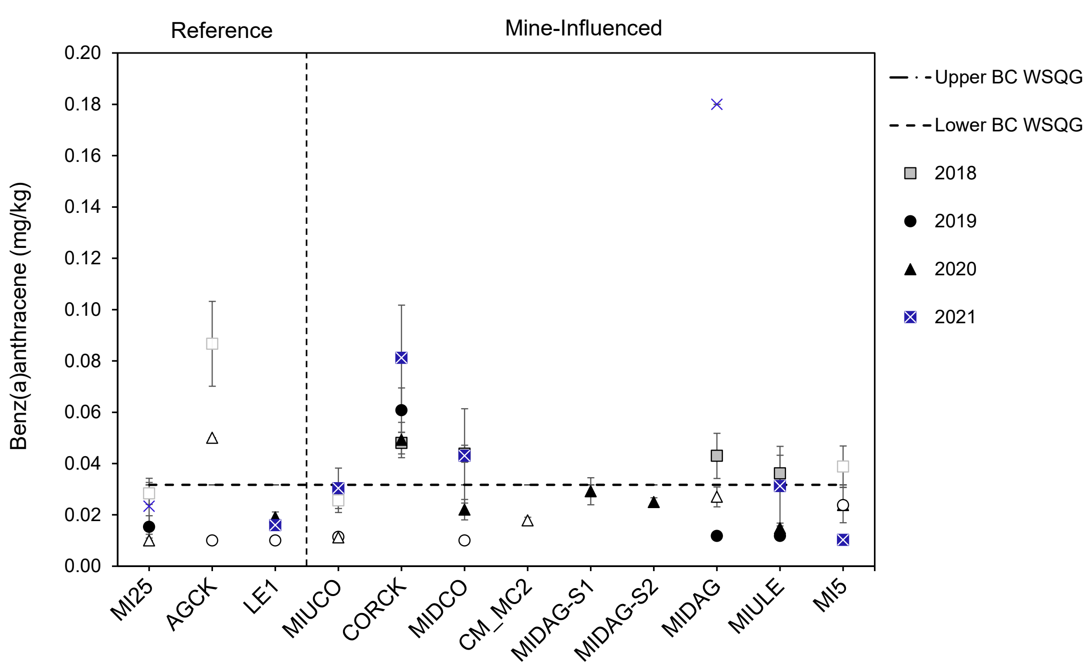
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-30: Spatial Variation in Sediment Anthracene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



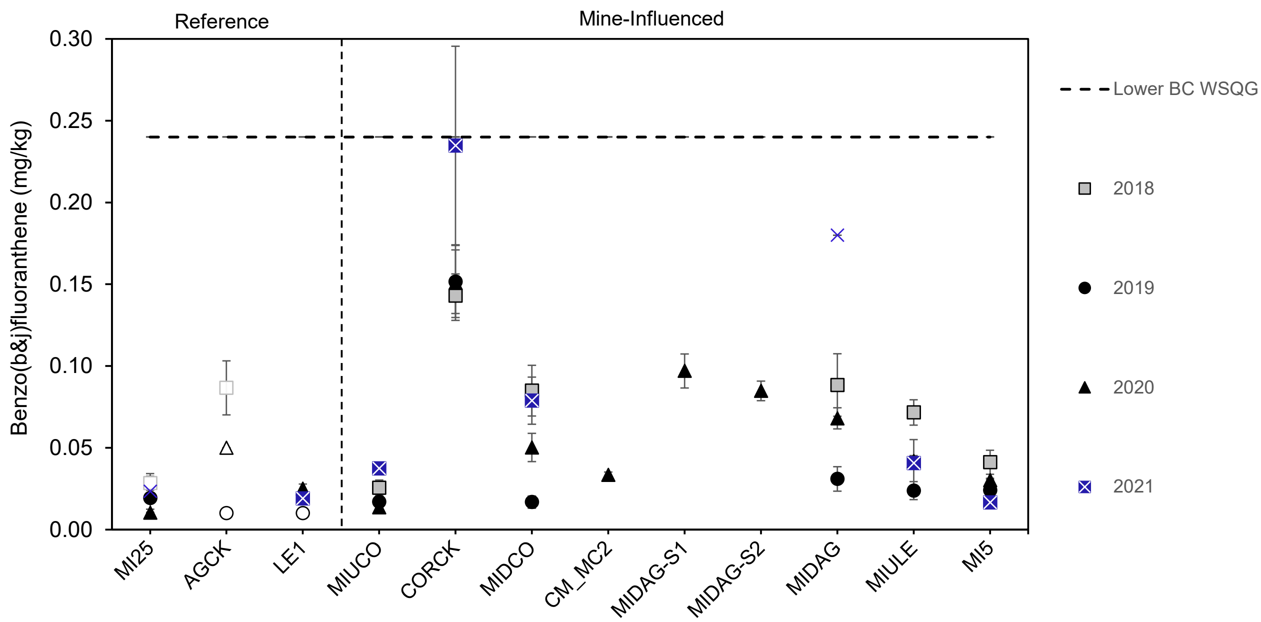
Note: Open symbols represent non-detects. Upper BC WSQG (0.245 mg/kg) not shown.
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-31: Spatial Variation in Sediment Benzo(a)anthracene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



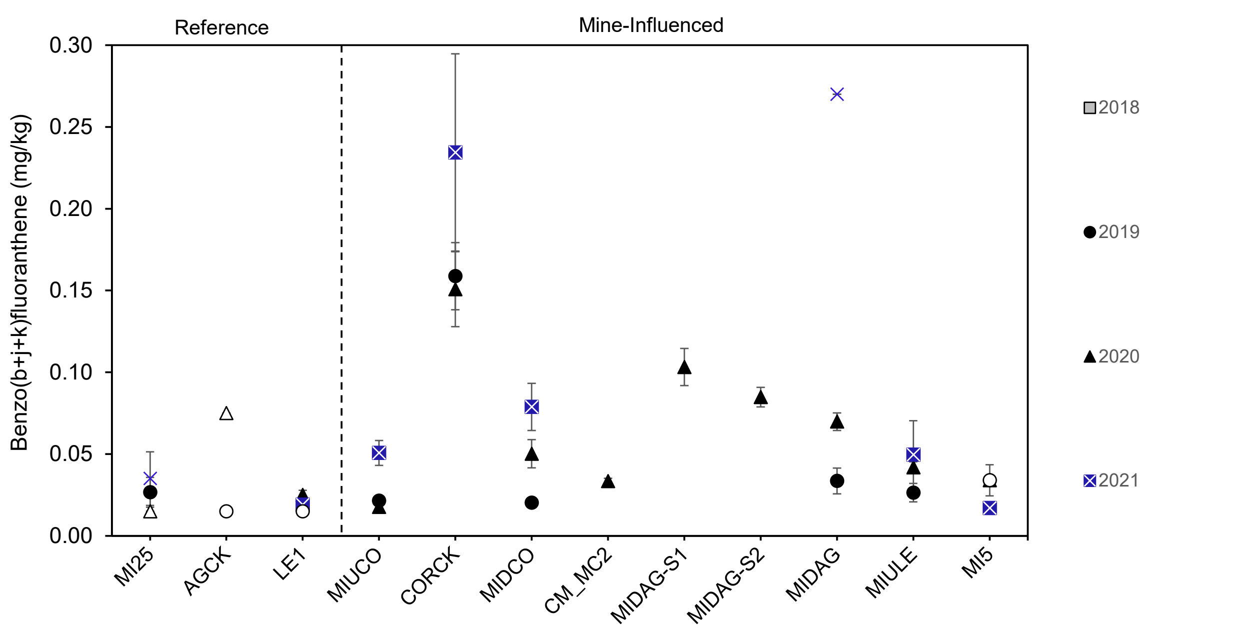
Notes: Upper BC WSQG not shown for benz(a)anthracene (0.39 mg/kg) and benzo(a)pyrene (0.78 mg/kg).
WSQG = working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-32: Spatial Variation in Sediment Benzo(b,j)fluoranthene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



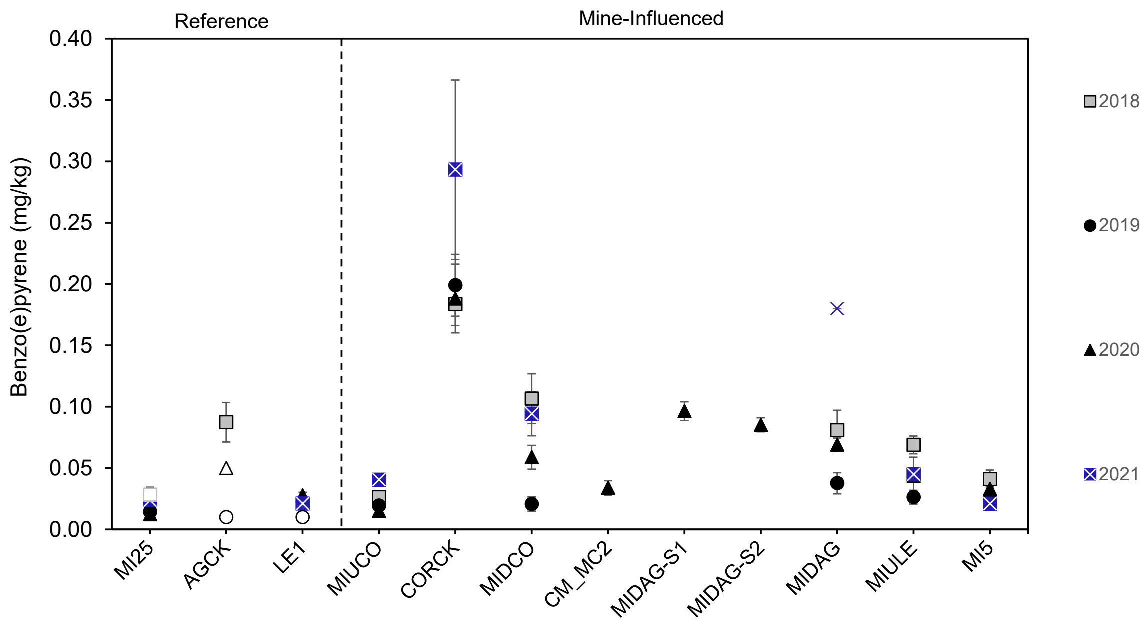
Note: Open symbols represent non-detects. Upper BC WSQG (13 mg/kg) not shown.
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-33: Spatial Variation in Sediment Benzo(b,j,k)fluoranthene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



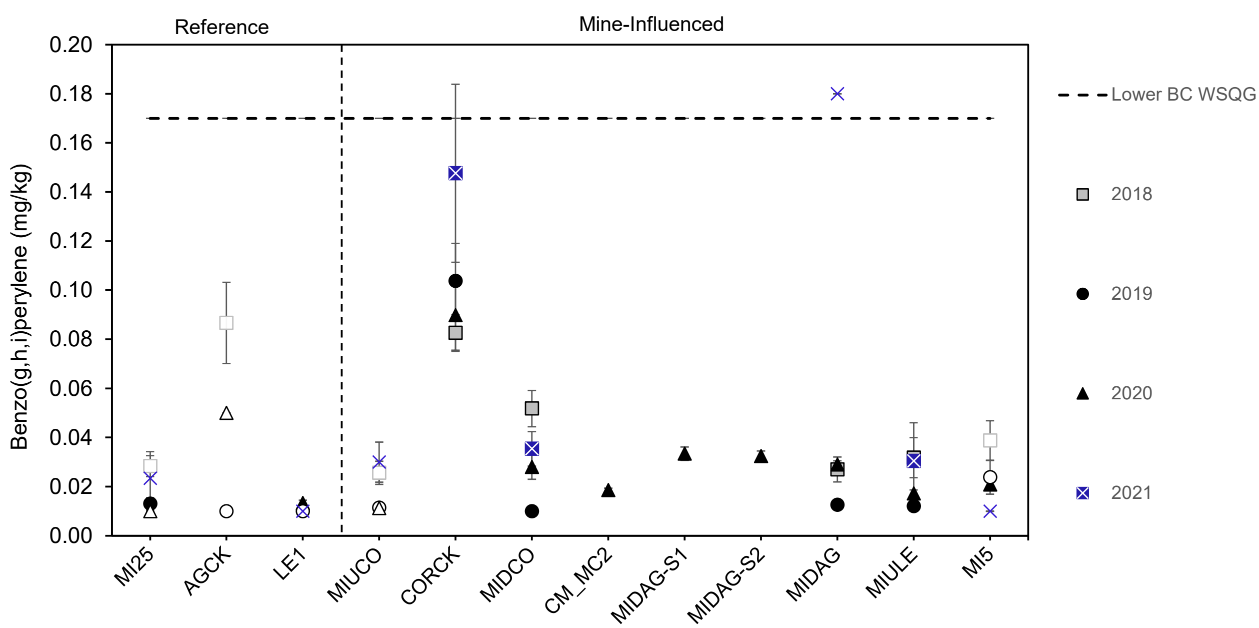
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-34: Spatial Variation in Sediment Benzo(e)pyrene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



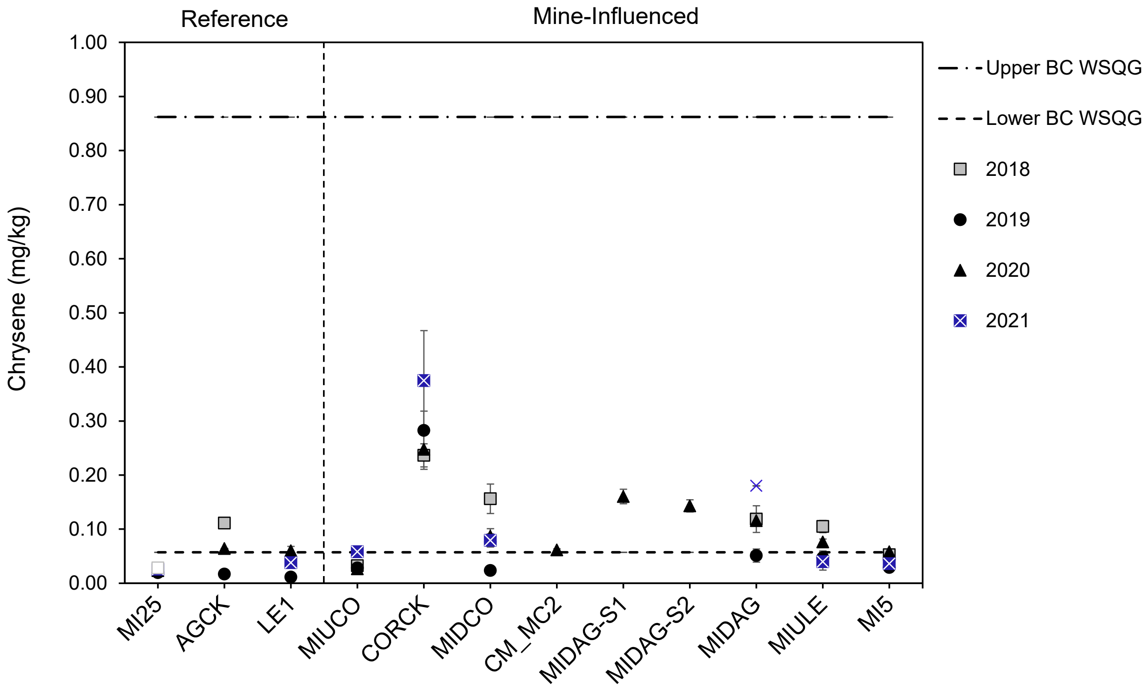
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-35: Spatial Variation in Sediment Benzo(g,h,i)perylene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



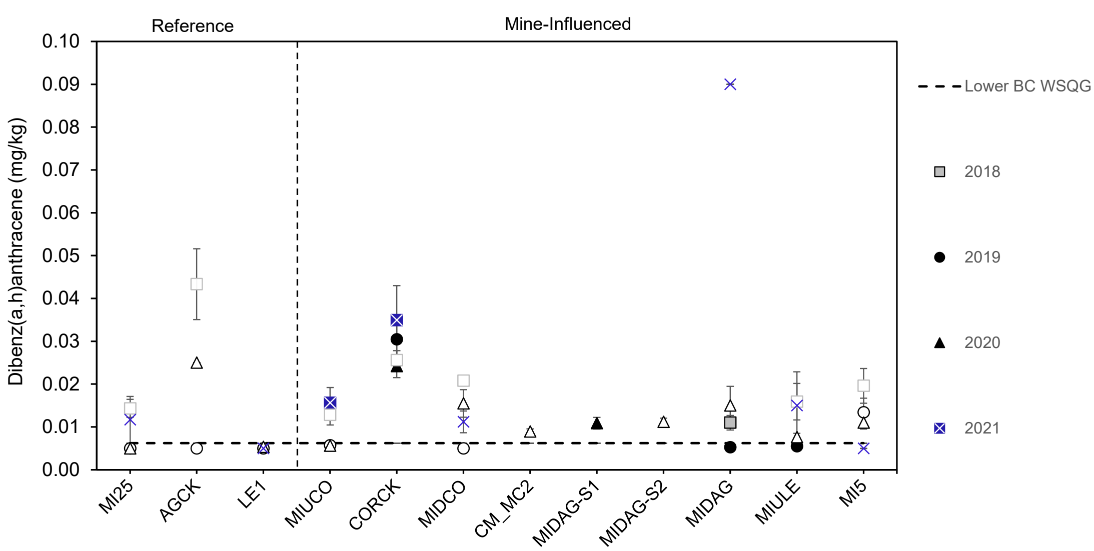
Note: Open symbols represent non-detects. Upper BC WSQG (0.32 mg/kg) not shown.
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-36: Spatial Variation in Sediment Chrysene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



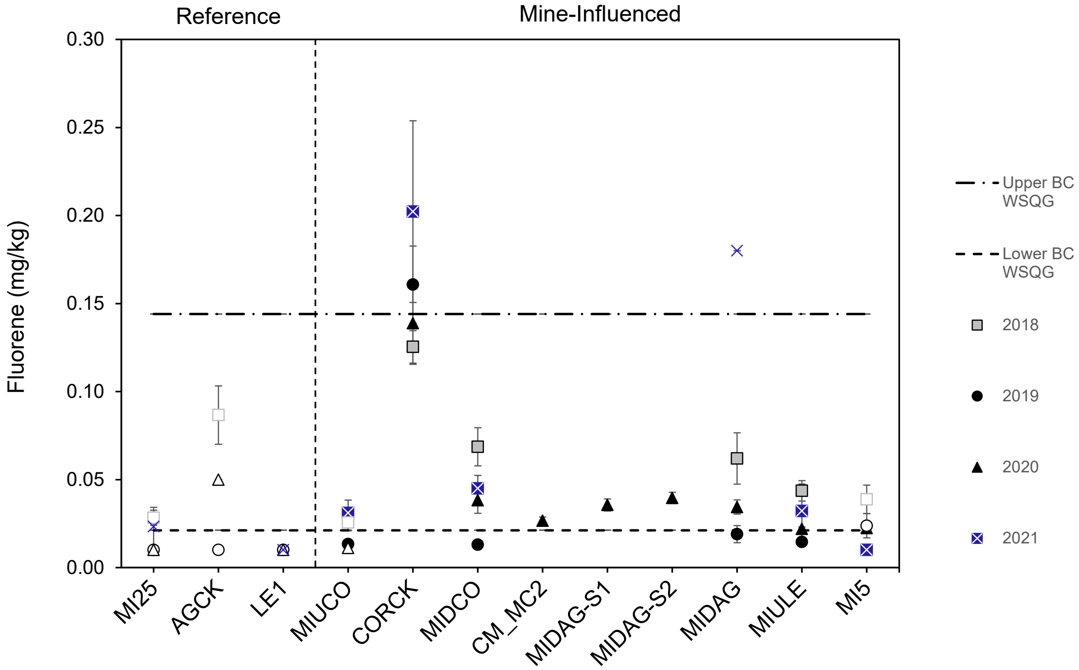
BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-37: Spatial Variation in Sediment Dibenzo(a,h)anthracene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



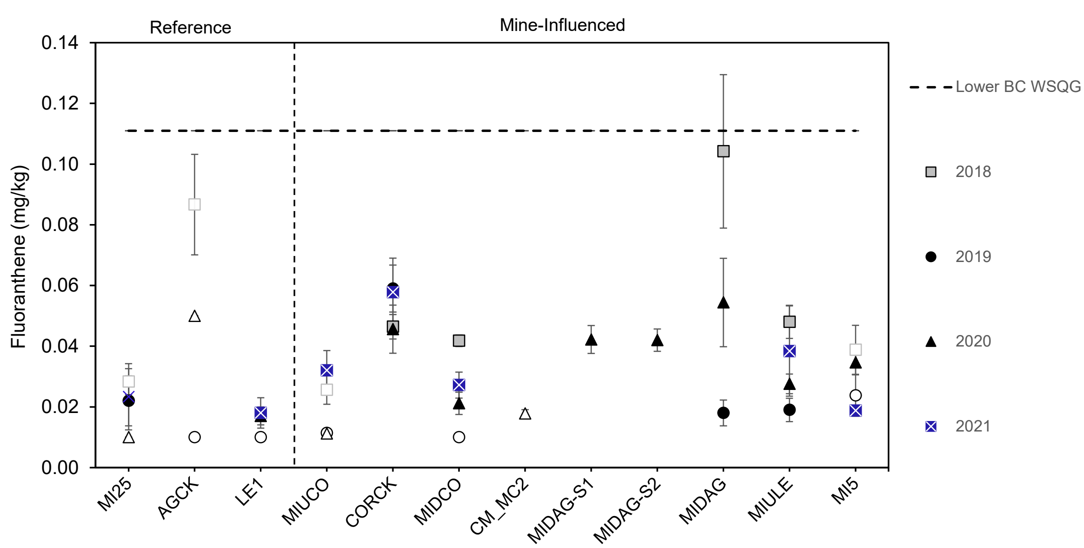
Note: Open symbols represent non-detects. Upper BC WSQG (0.135mg/kg) not shown.
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-38: Spatial Variation in Sediment Fluorene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



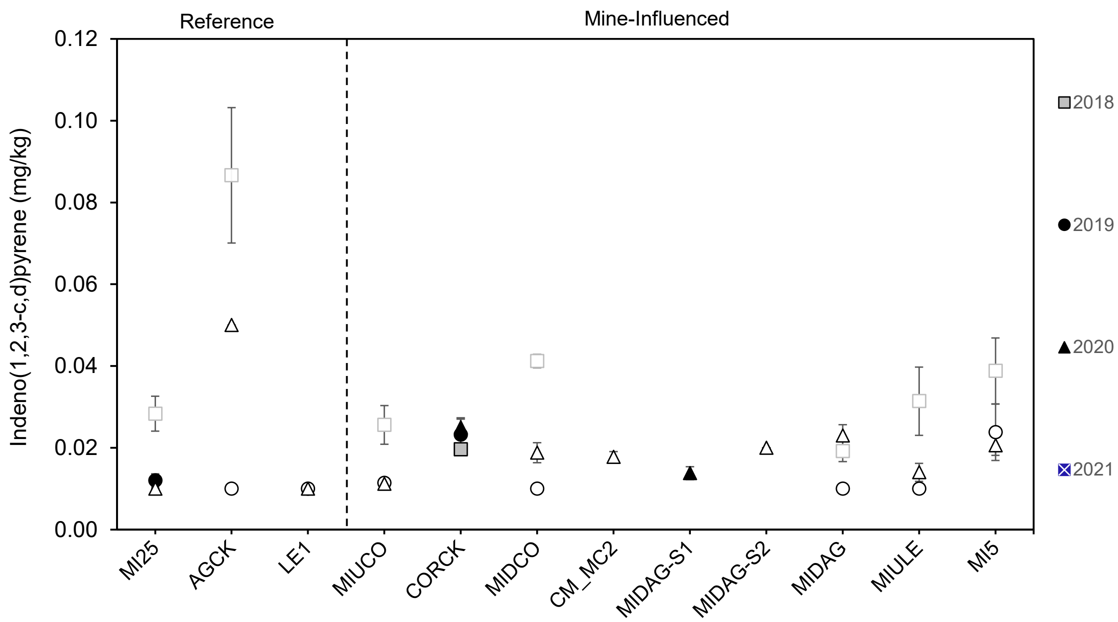
Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-39: Spatial Variation in Sediment Fluoranthene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



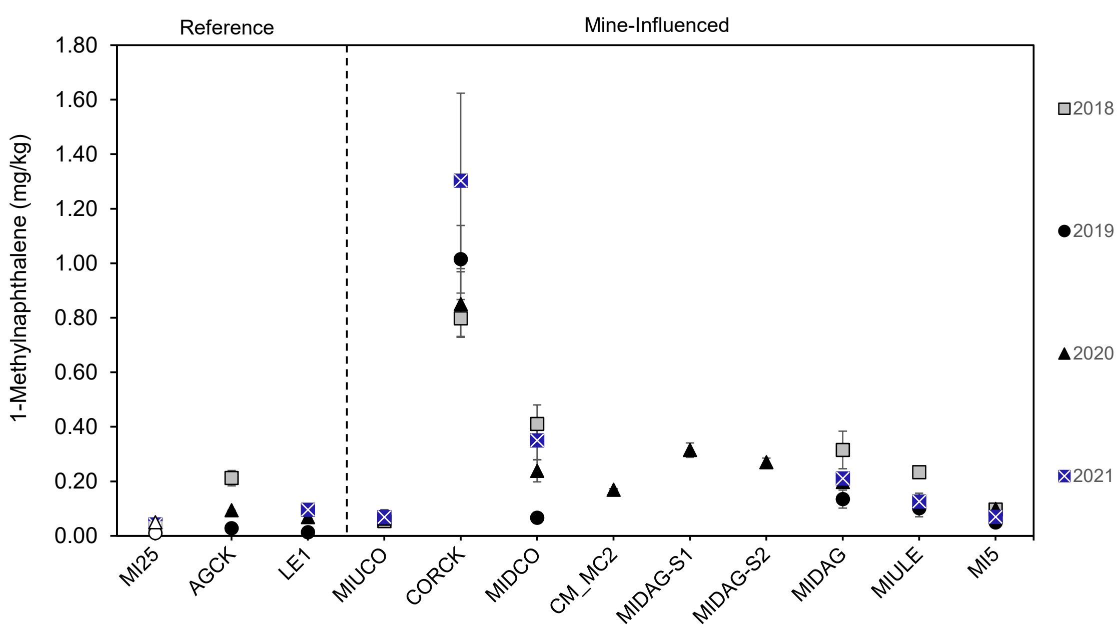
Note: Open symbols represent non-detects. Upper BC WSQG (2.355 mg/L) not shown.
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-40: Spatial Variation in Sediment Ideno(1,2,3-c,d)pyrene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



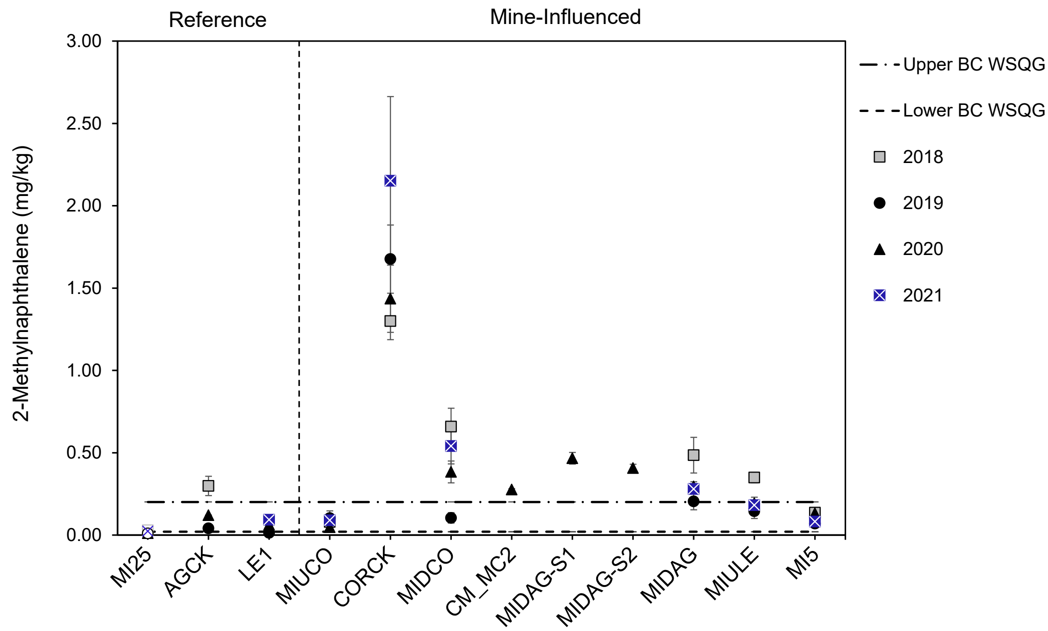
Note: Open symbols represent non-detects. Lower BC WSQG (0.2 mg/kg) and Upper BC WSQG (3.2 mg/kg) not shown.
mg/kg = milligrams per kilogram; BC WSQG = British Columbia working sediment quality guideline; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-41: Spatial Variation in Sediment 1-Methtylnaphthalene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Open symbols represent non-detects.
mg/kg = milligrams per kilogram; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

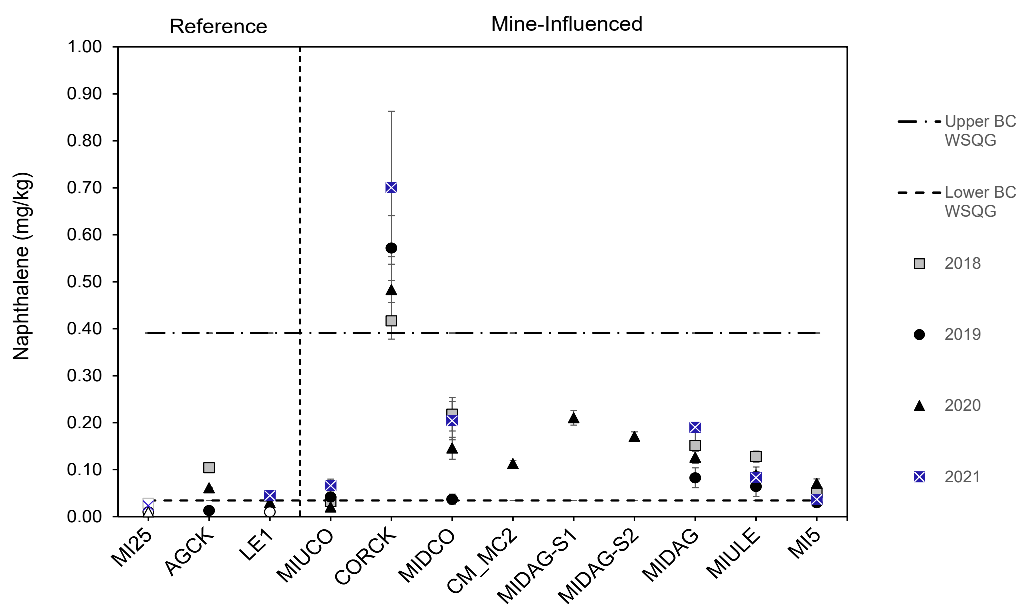
Figure G2.1-42: Spatial Variation in Sediment 2-Methtylnaphthalene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Notes: Open symbols represent non-detects.

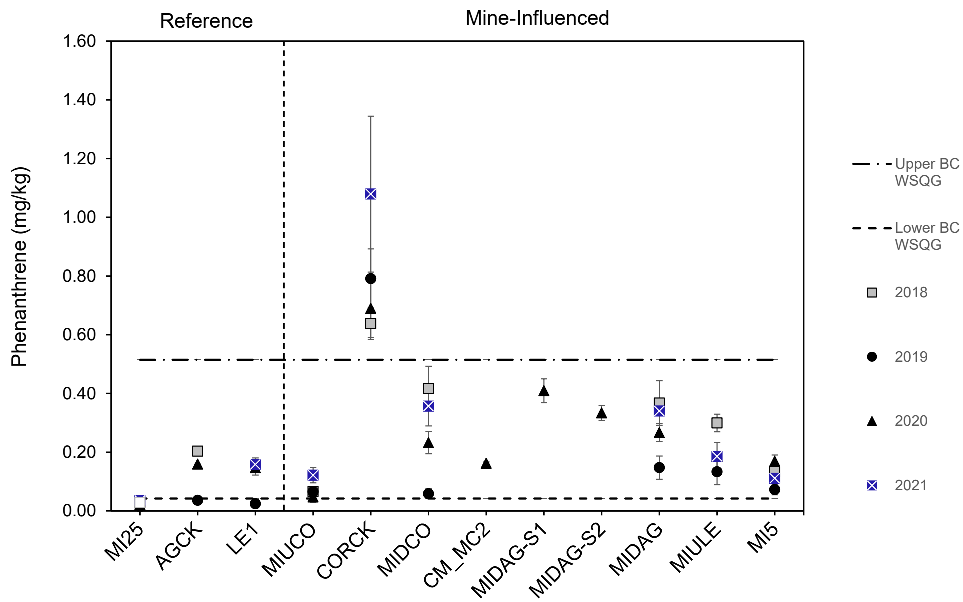
BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-43: Spatial Variation in Sediment Naphthalene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Notes: Open symbols represent non-detects.
BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

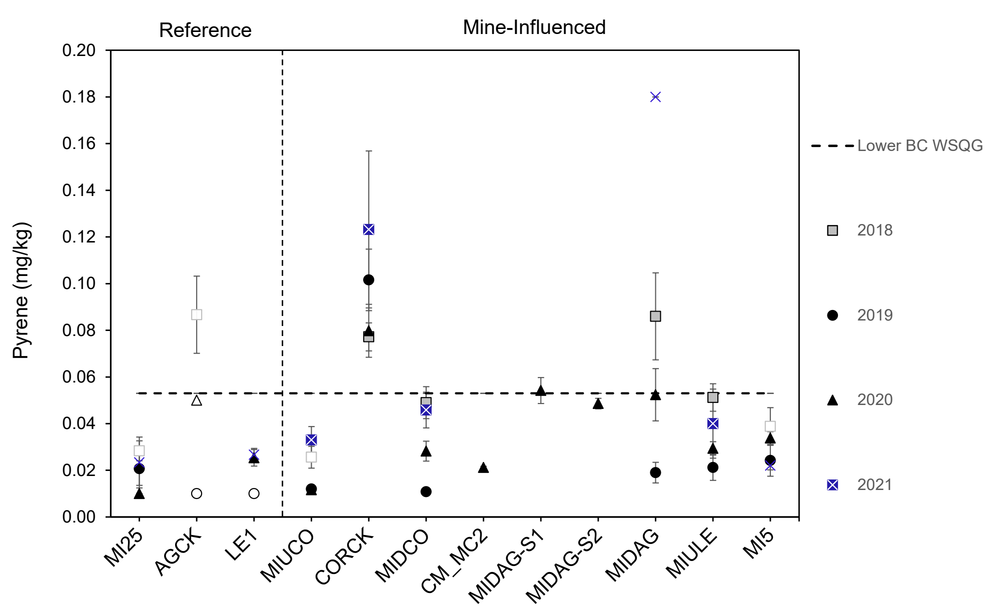
Figure G2.1-44: Spatial Variation in Sediment Phenanthrene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Notes: Open symbols represent non-detects.

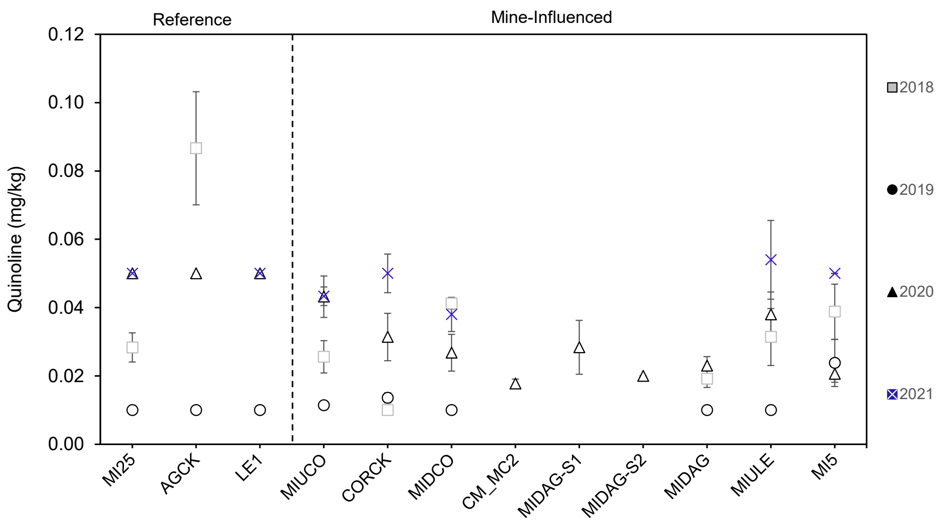
WSQG = working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-45: Spatial Variation in Sediment Pyrene Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Notes: Open symbols represent non-detects. Upper BC WSQG not shown for pyrene (0.88 mg/kg).
BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

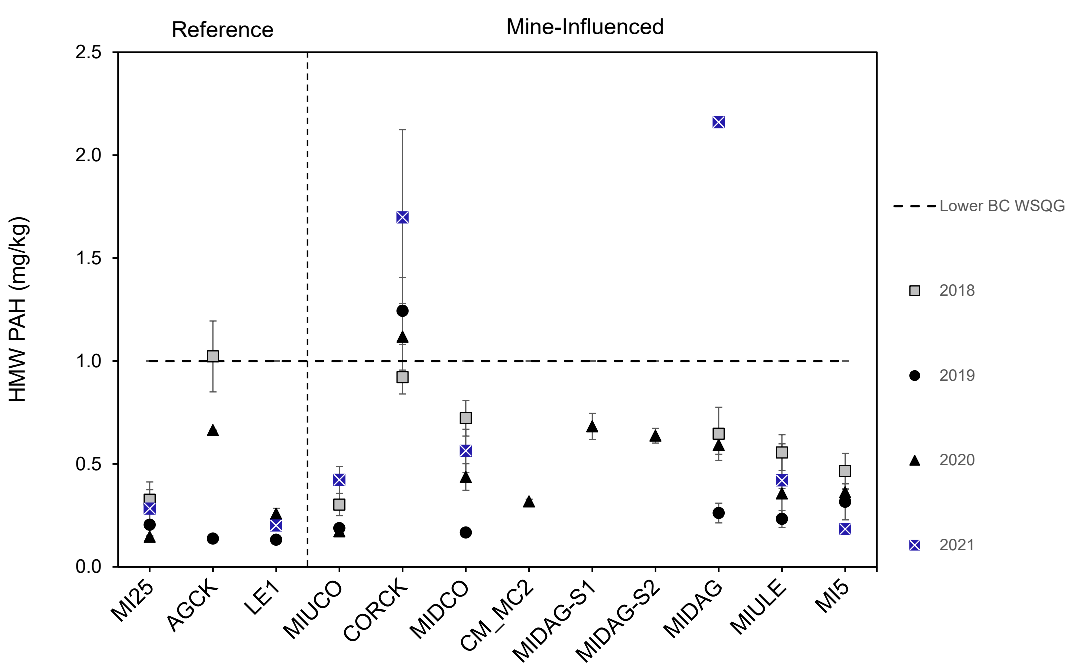
Figure G2.1-46: Spatial Variation in Sediment Quinoline Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Notes: Open symbols represent non-detects.

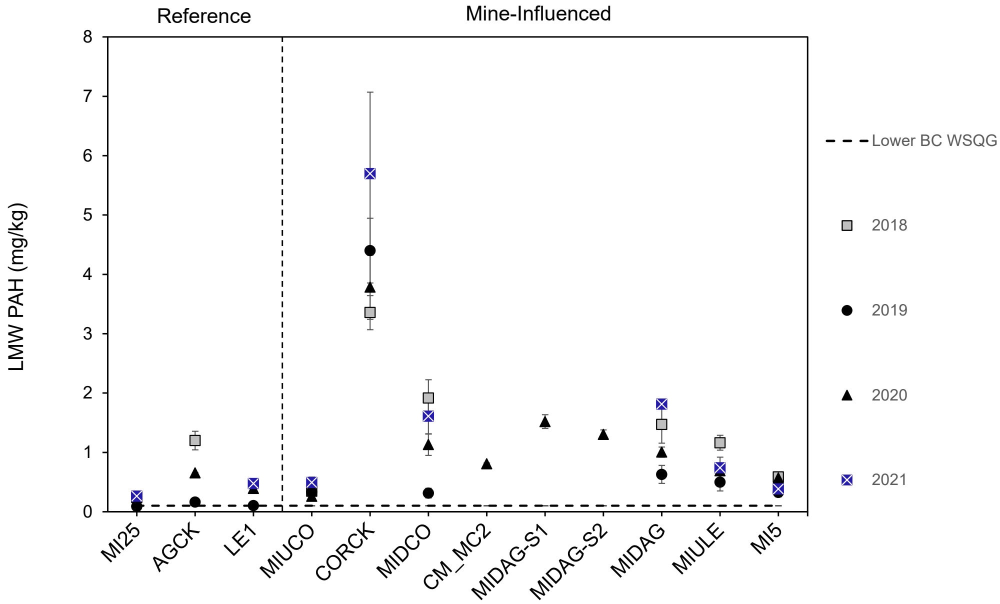
BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-48: Spatial Variation in Sediment Quinoline Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Notes: No upper BC WSQG for freshwater aquatic life.
HMW = high molecular weight; BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

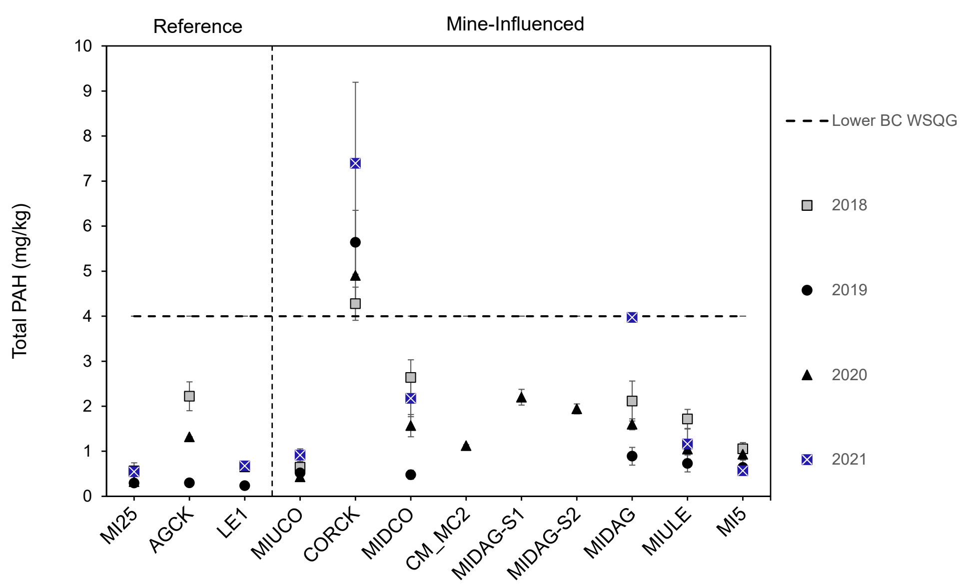
Figure G2.1-49: Spatial Variation in Sediment Quinoline Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021



Notes: No upper BC WSQG for freshwater aquatic life.

LMW = low molecular weight; BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G2.1-50: Spatial Variation in Sediment Quinoline Concentrations in Samples Collected from the CMm LAEMP, 2012 to 2021

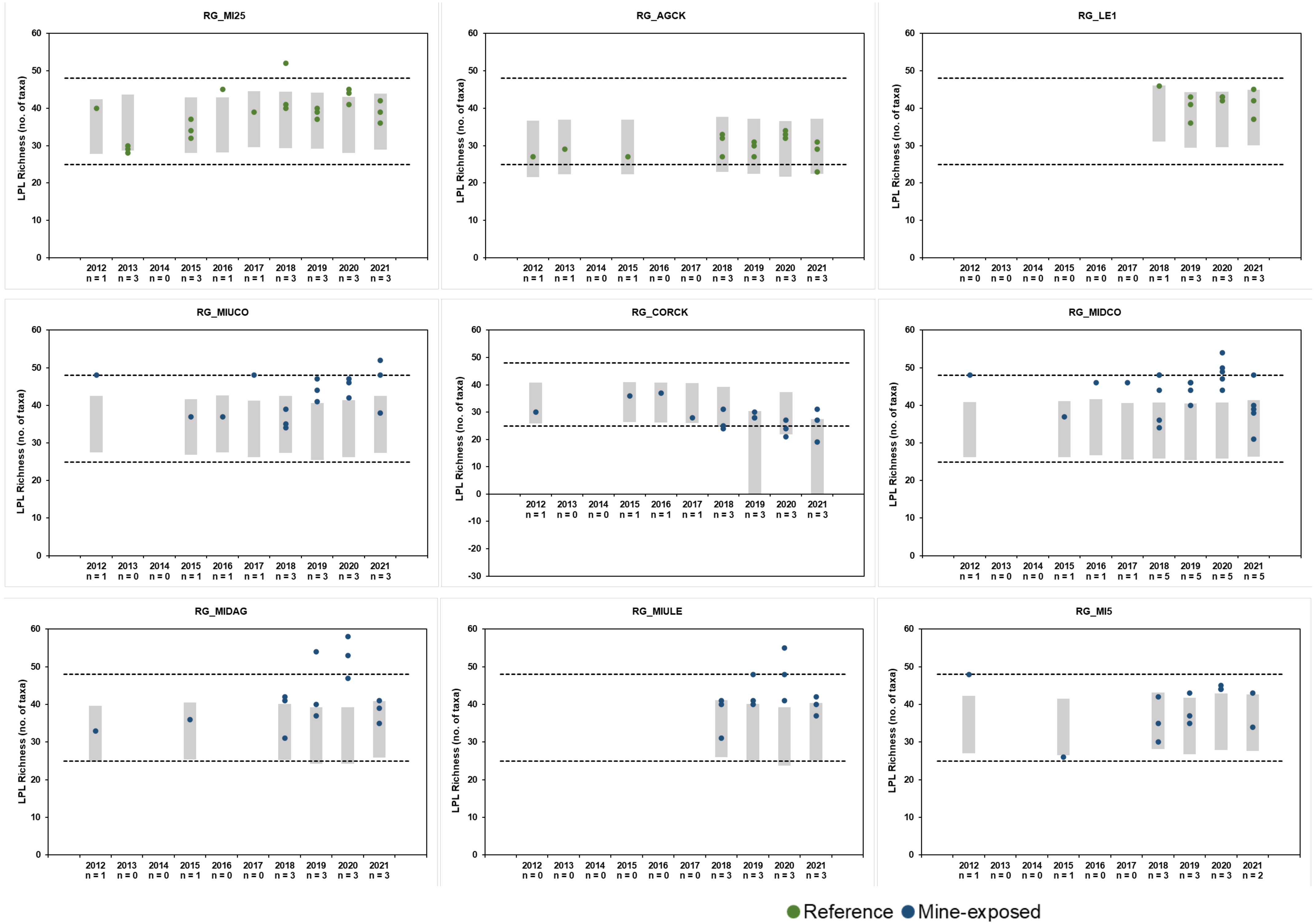


Notes: Upper BC WSQG not shown for total PAH (35 mg/kg).

BC WSQG = British Columbia working sediment quality guideline; mg/kg = milligrams per kilogram dry weight; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

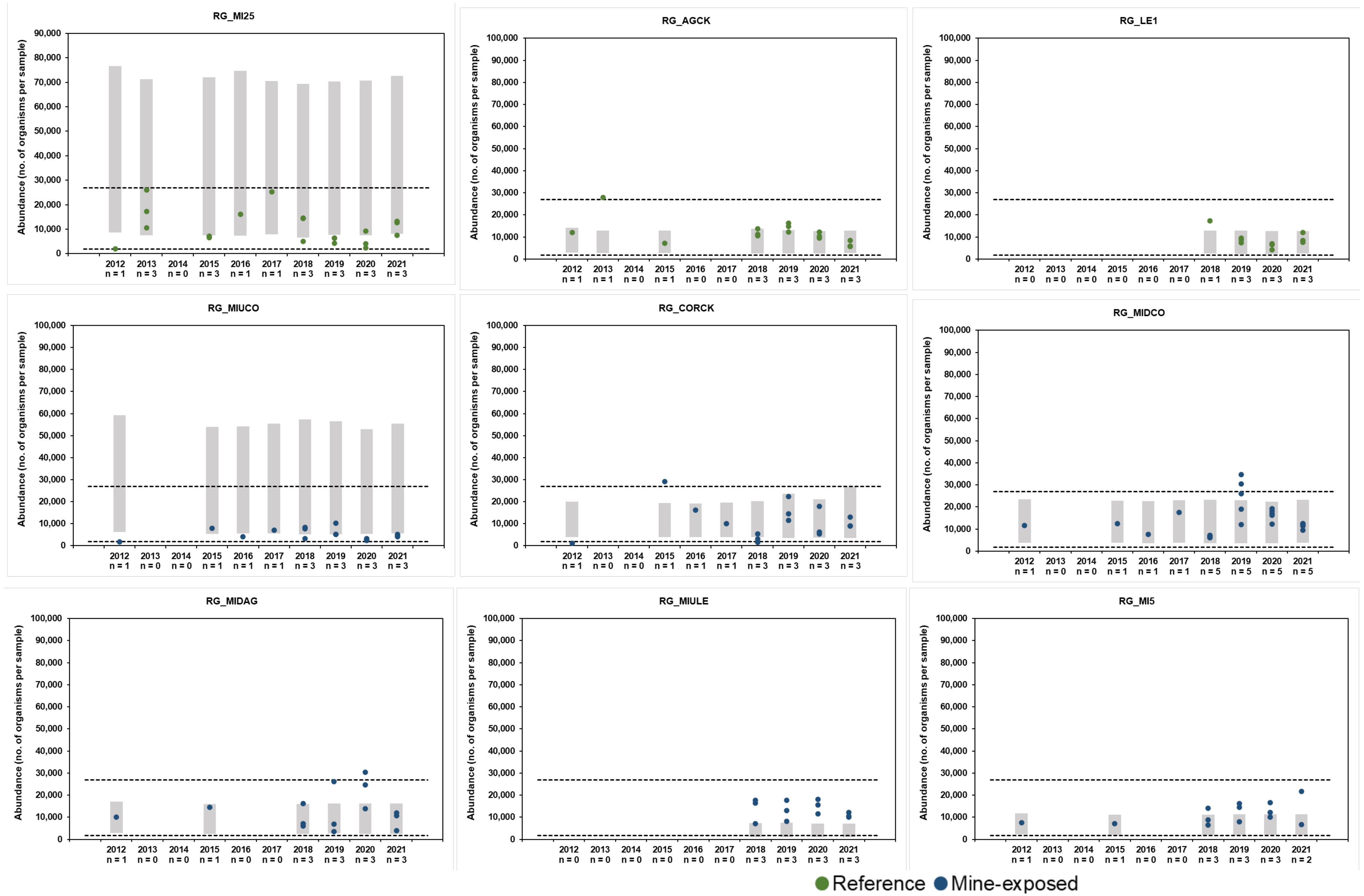
G3 BENTHIC INVERTEBRATE COMMUNITY

Figure G3.1-1: Benthic Invertebrate Taxonomic Richness (Lowest Possible Level) in Samples Collected from the CMm LAEMP, 2012 to 2021



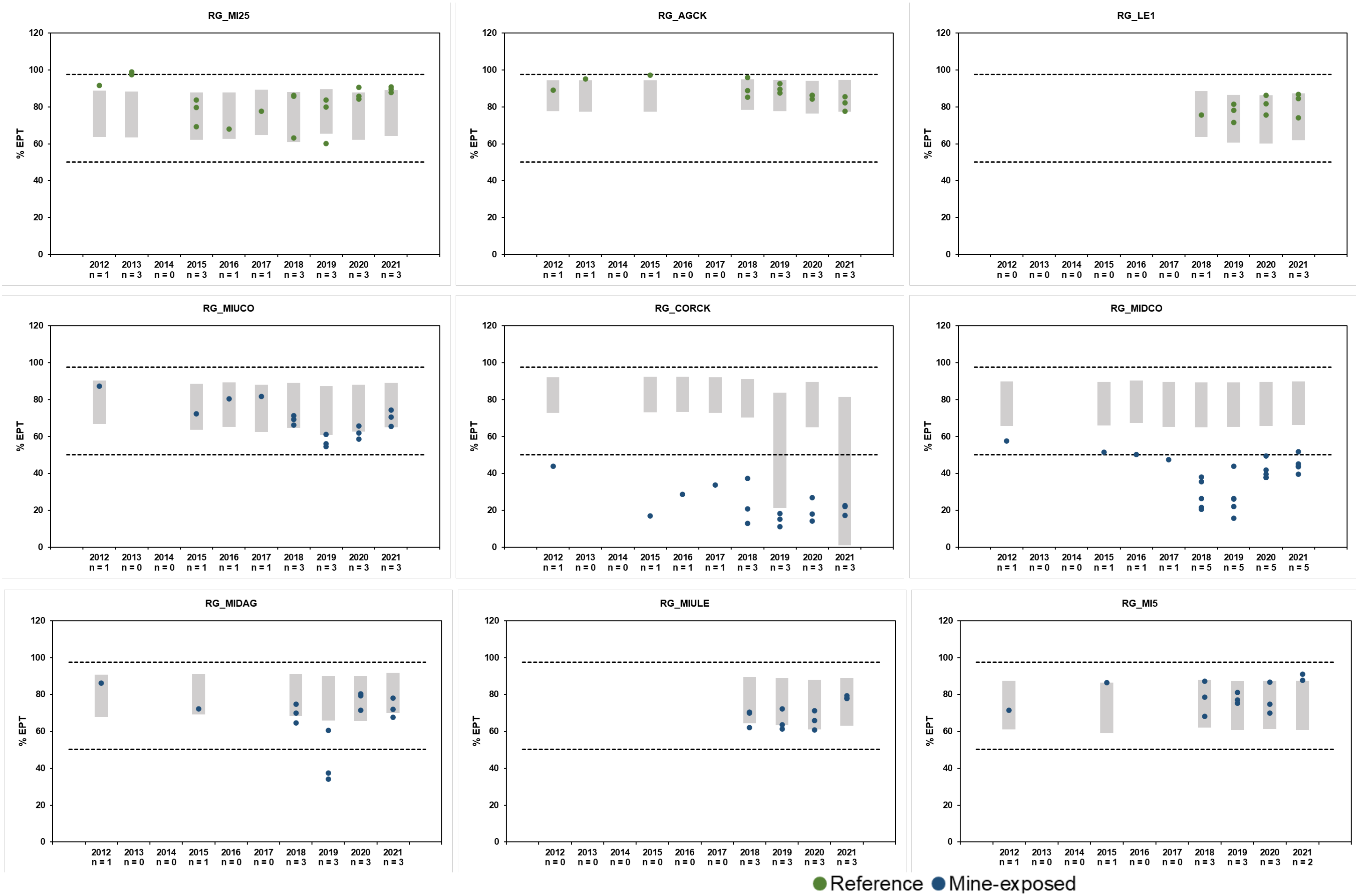
Note: Grey shading represents the site-specific normal ranges and the dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020).
LPL = lowest possible level (i.e., species or genus); n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-2: Benthic Invertebrate Abundance in Samples Collected from the CMm LAEMP, 2012 to 2021



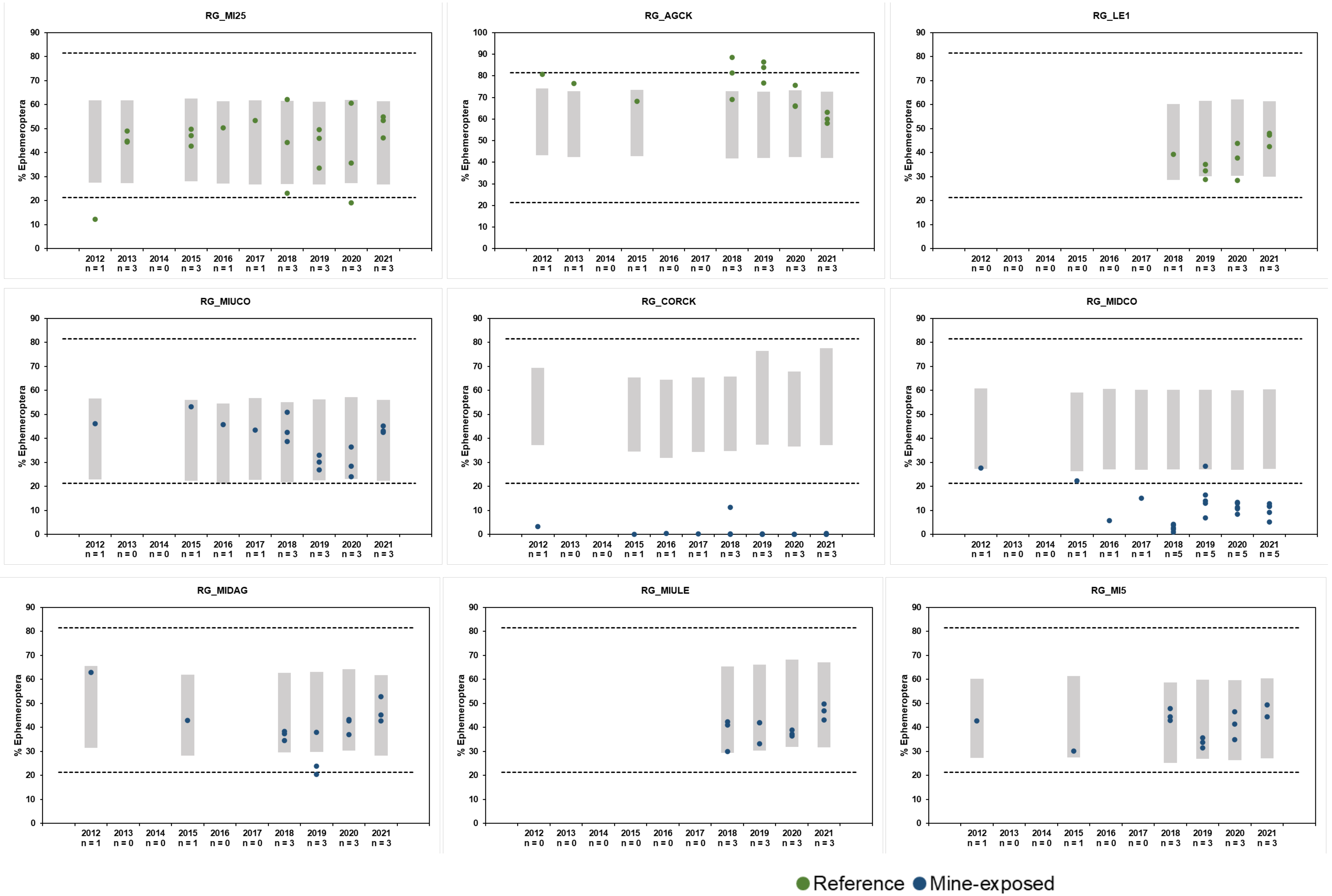
Note: Grey shading represents the site-specific normal ranges and the dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020).
n = sample size; no. = number; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-3: Percent Ephemeroptera, Plecoptera, Trichoptera in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Grey shading represents the site-specific normal ranges and the dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020).
% = percent; EPT = Ephemeroptera, Plecoptera, Trichoptera; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

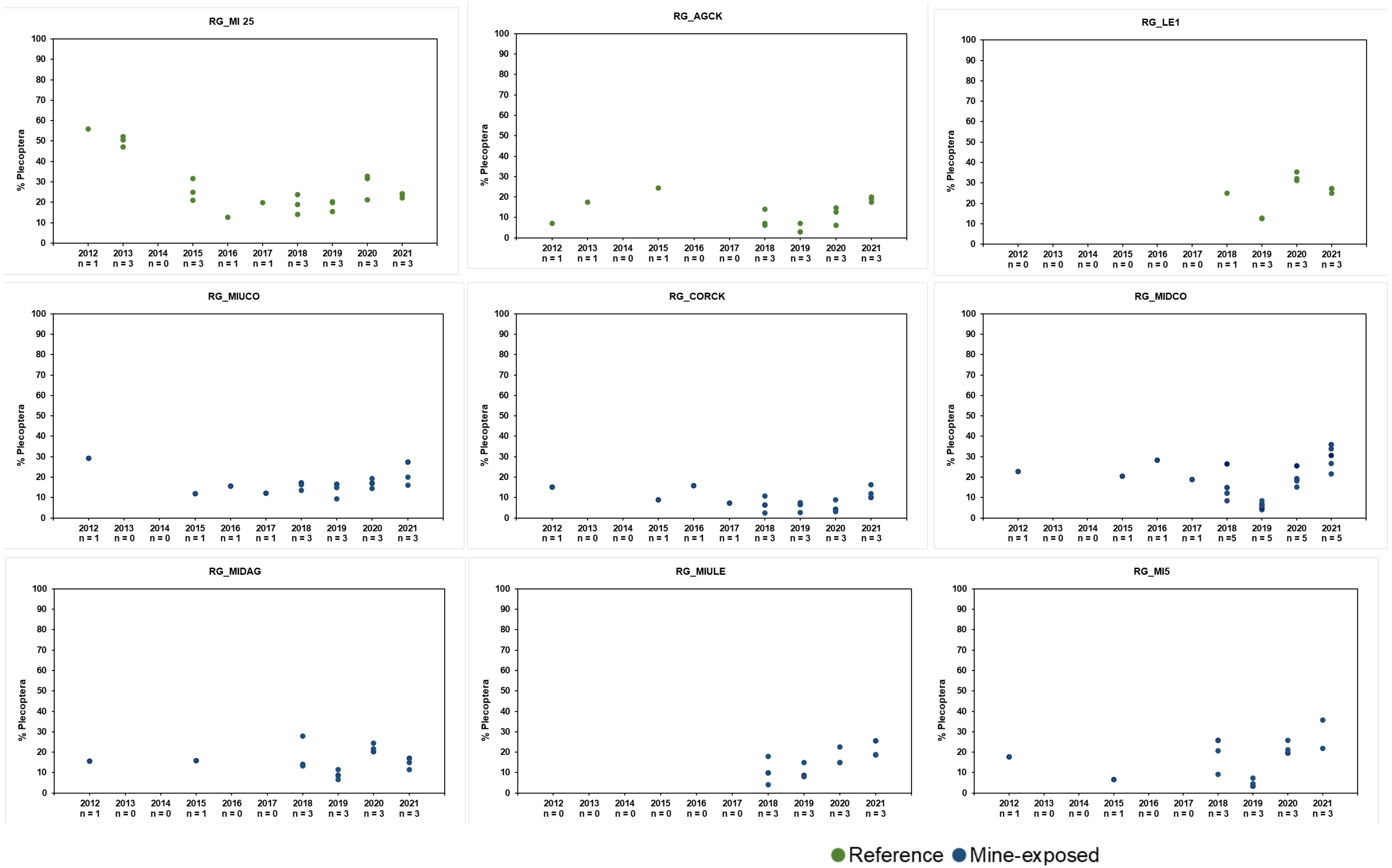
Figure G3.1-4: Percent Ephemeroptera in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Grey shading represents the site-specific normal ranges and the dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020).

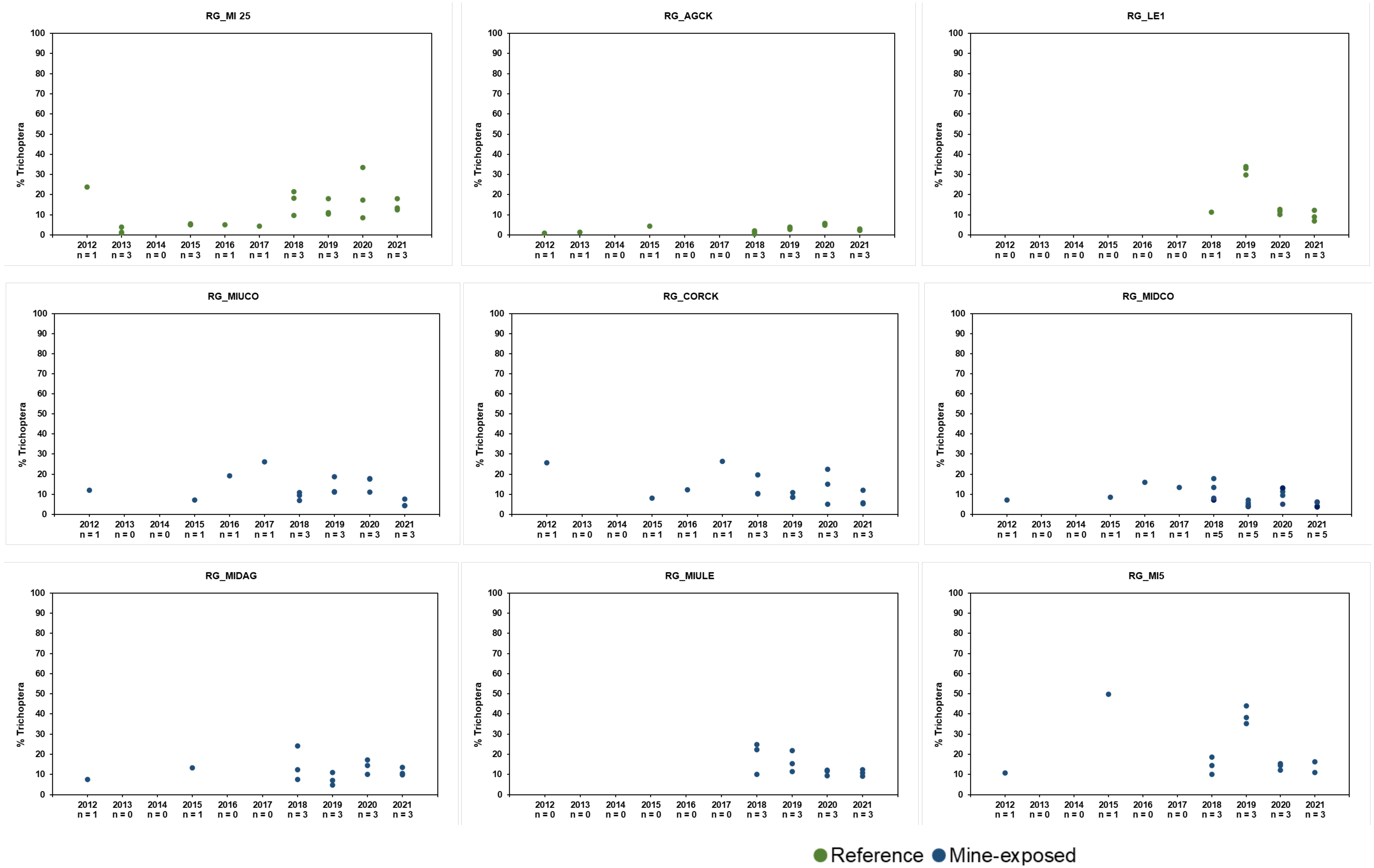
% = percent; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-5: Percent Plecoptera in Samples Collected from the CMm LAEMP, 2012 to 2021



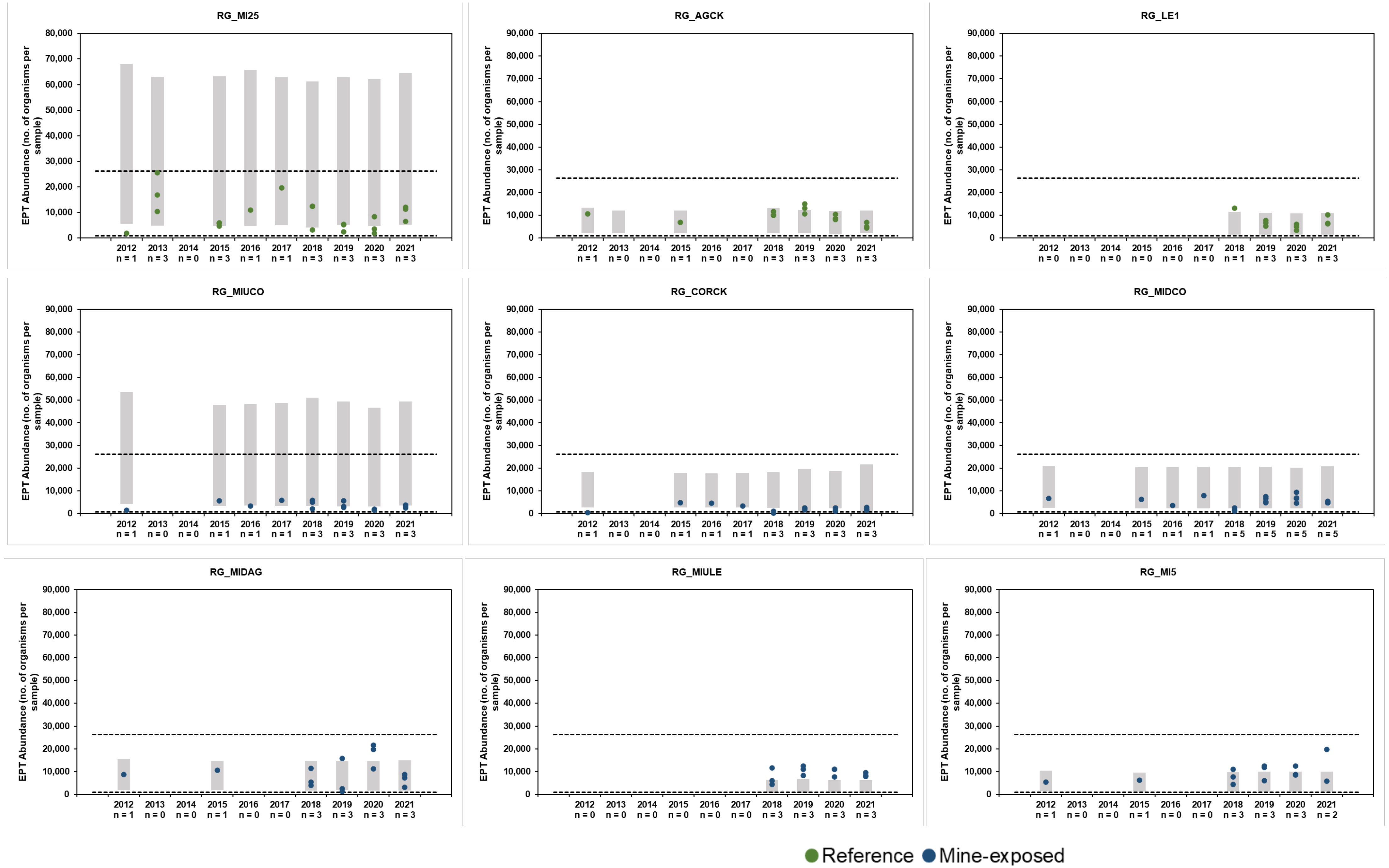
% = percent; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-6: Percent Trichoptera in Samples Collected from the CMm LAEMP, 2012 to 2021



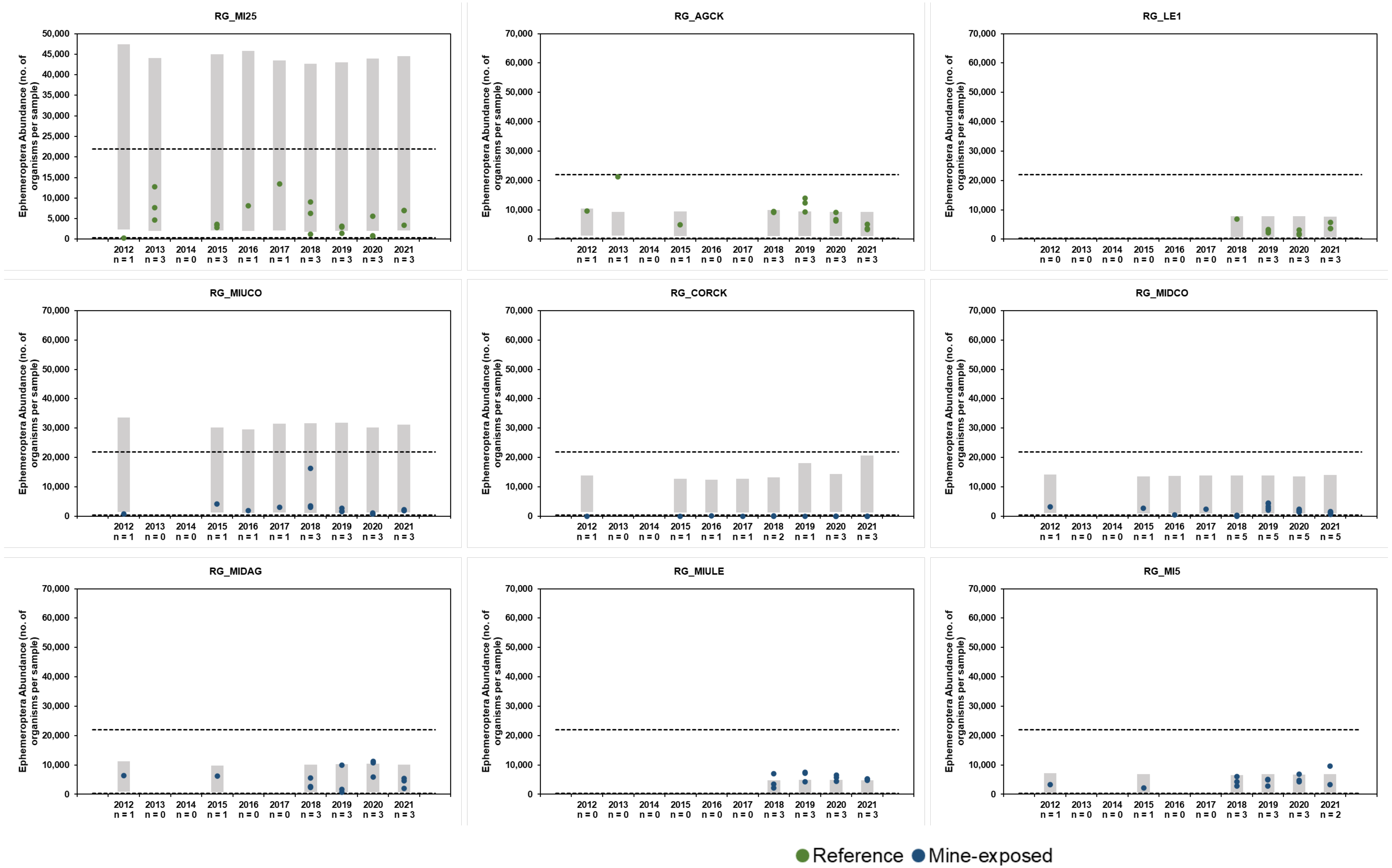
% = percent; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-7: Ephemeroptera, Plecoptera, Trichoptera Abundance in Samples Collected from the CMm LAEMP, 2012 to 2020



Note: Grey shading represents the site-specific normal ranges and the dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020).
EPT = Ephemeroptera, Plecoptera, Trichoptera; No. = number; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

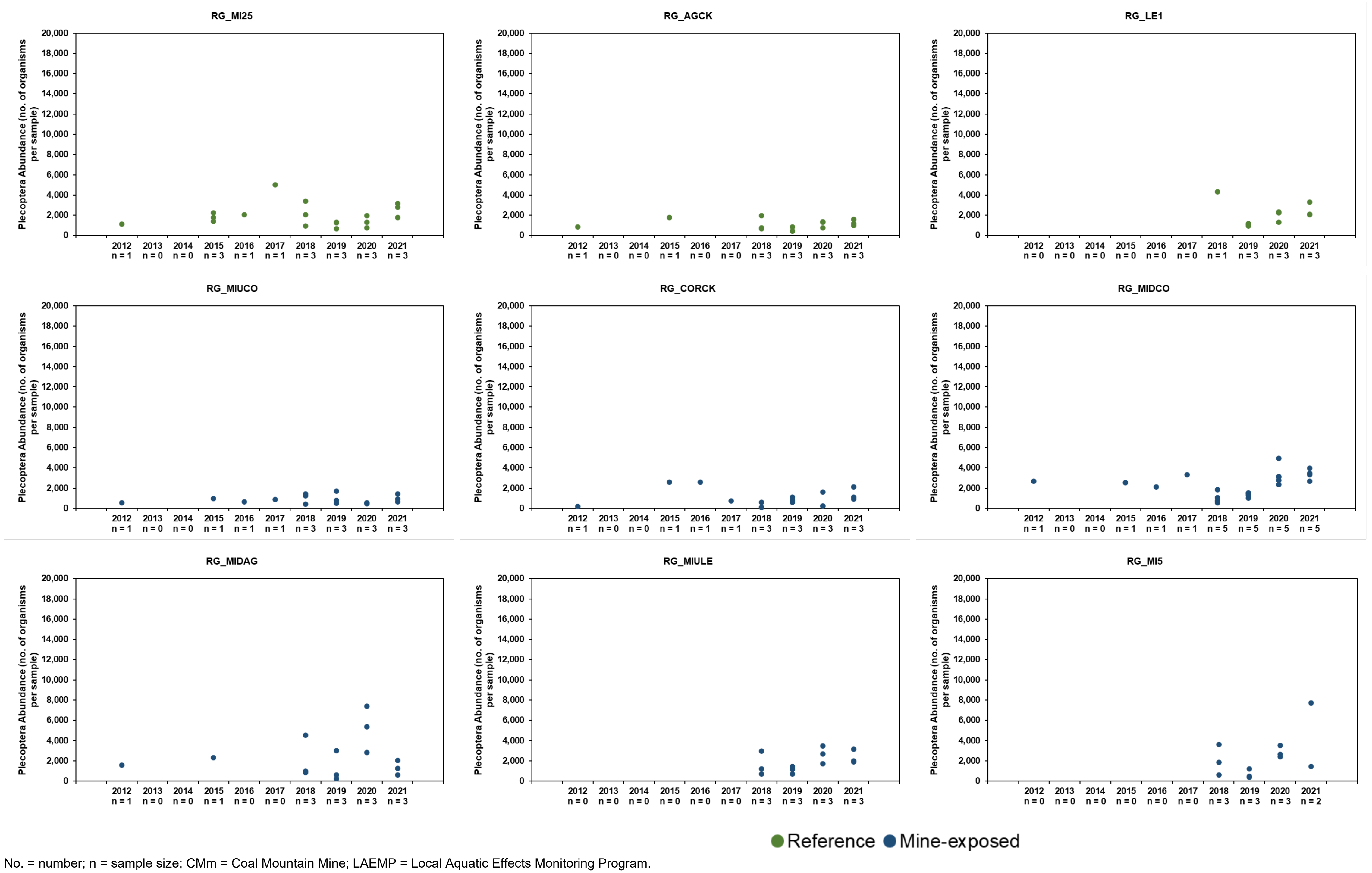
Figure G3.1-8: Ephemeroptera Abundance in Samples Collected from the CMm LAEMP, 2012 to 2021



Note: Grey shading represents the site-specific normal ranges and the dotted line represents the regional normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data from the RAEMP (Minnow 2020).

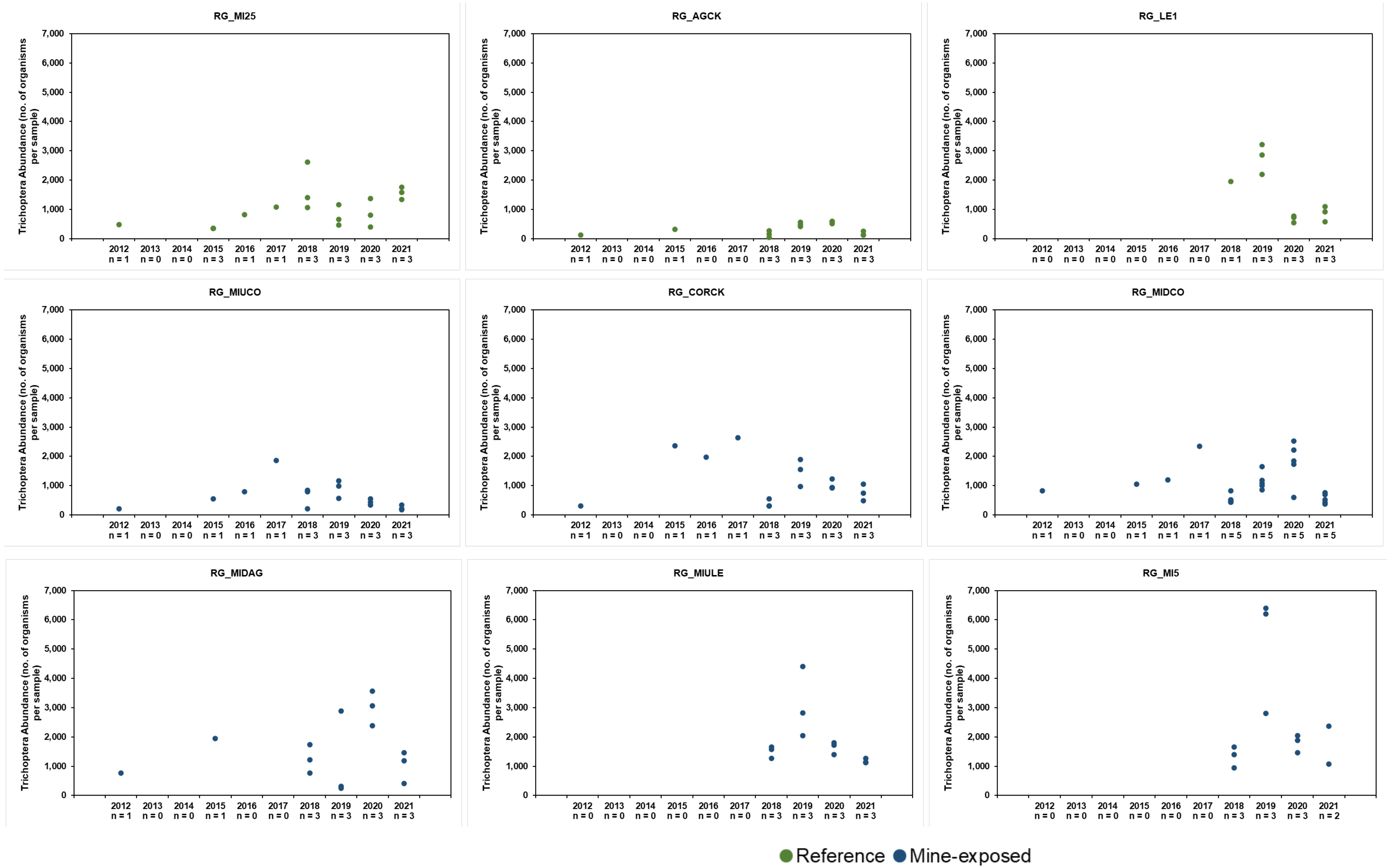
No. = number; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-9: Plecoptera Abundance in Samples Collected from the CMm LAEMP, 2012 to 2021



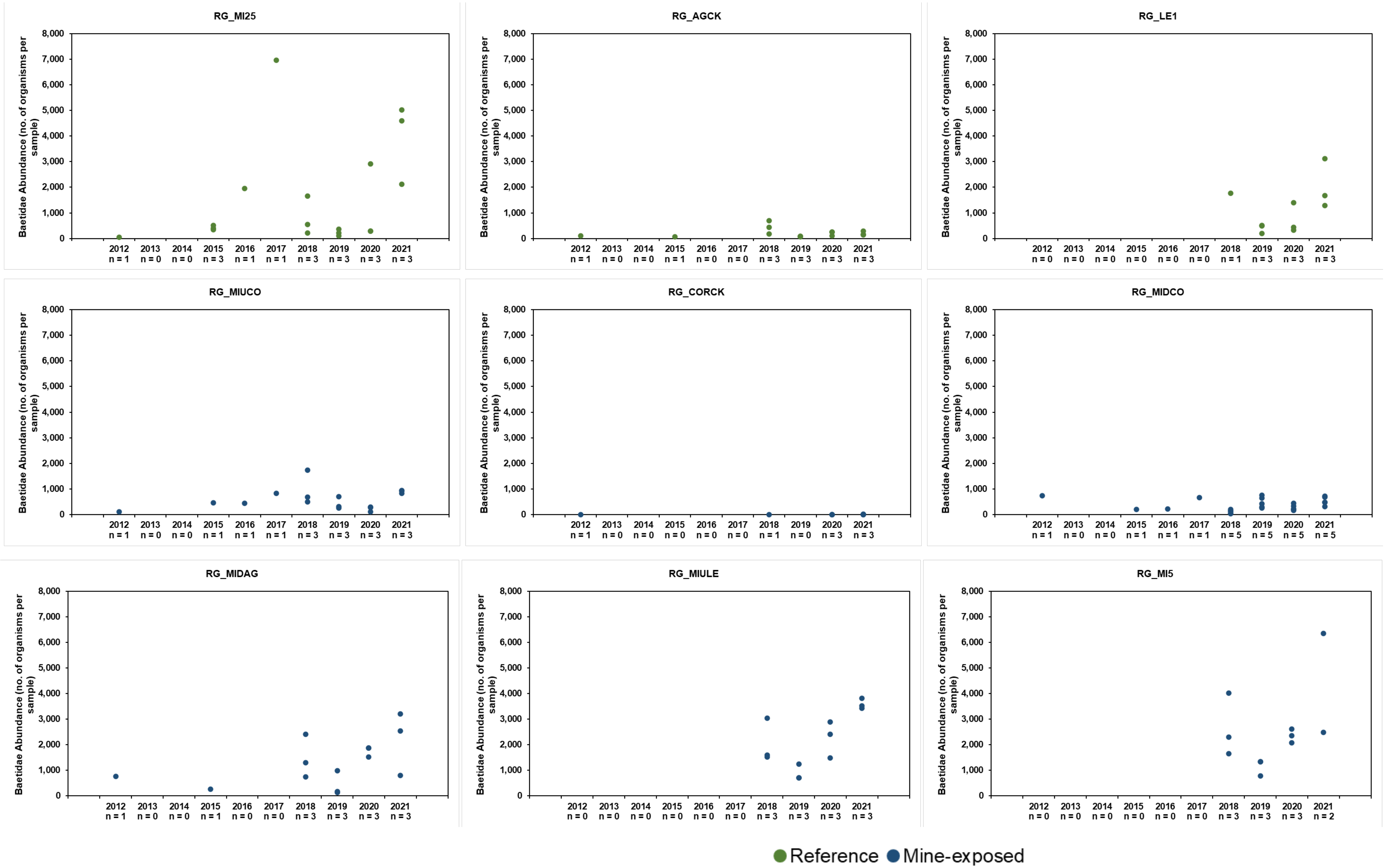
No. = number; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-10: Trichoptera Abundance in Samples Collected from the CMm LAEMP, 2012 to 2021



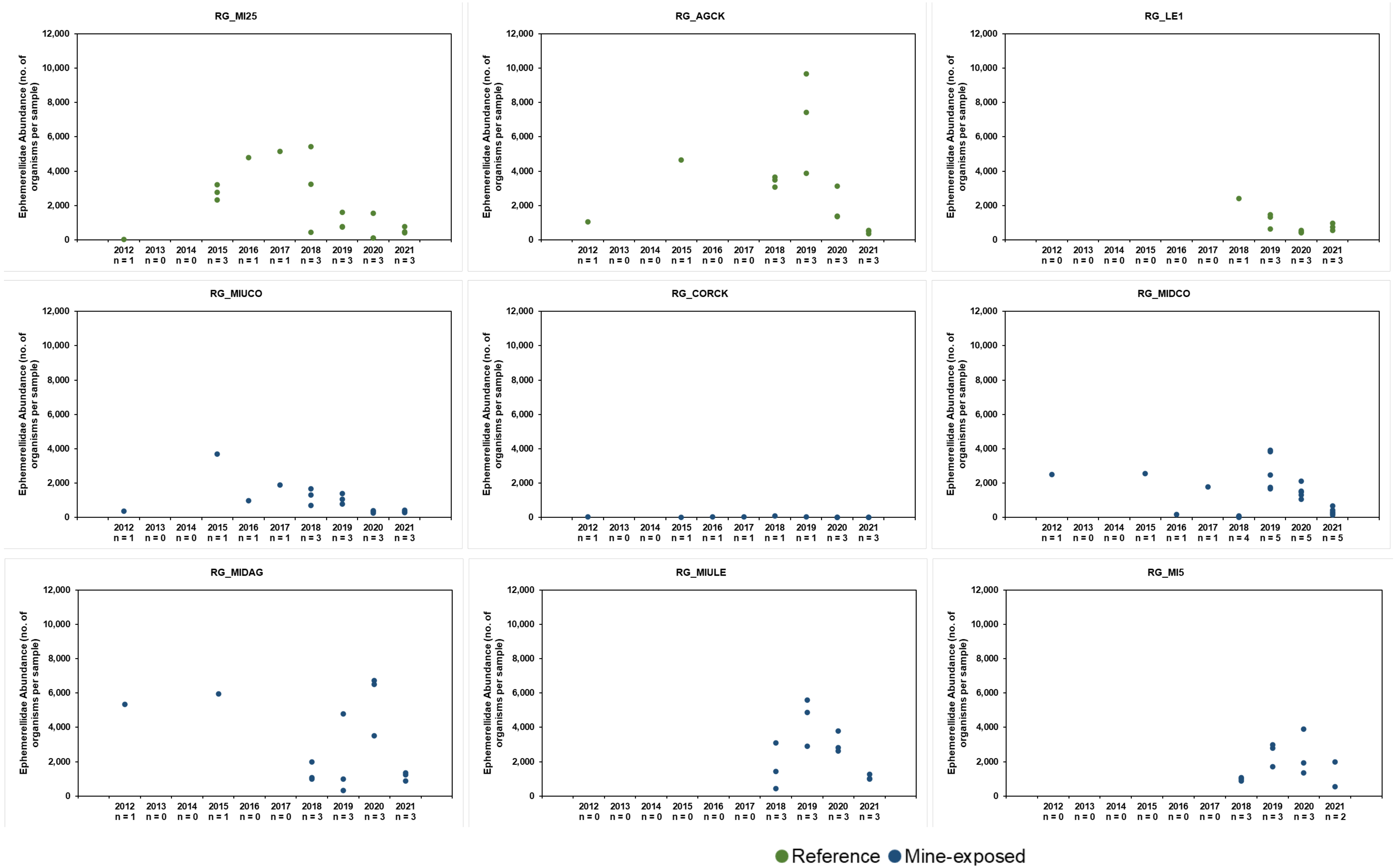
No. = number; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-11: Baetidae Abundance in Samples Collected from the CMm LAEMP, 2012 to 2021



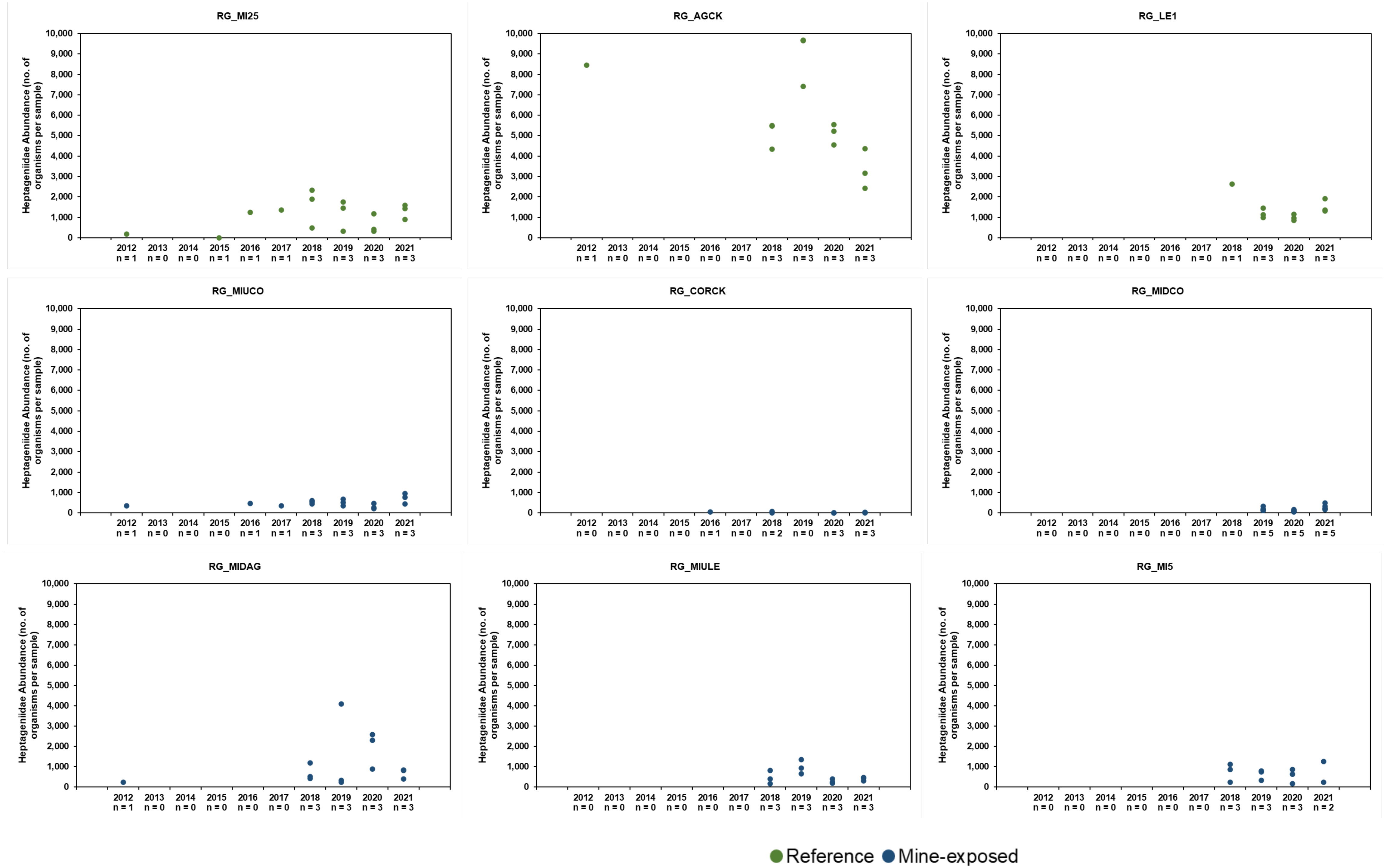
No. = number; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.1-12: Ephemerillidae Abundance in Samples Collected from the CMm LAEMP, 2012 to 2021



No. = number; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

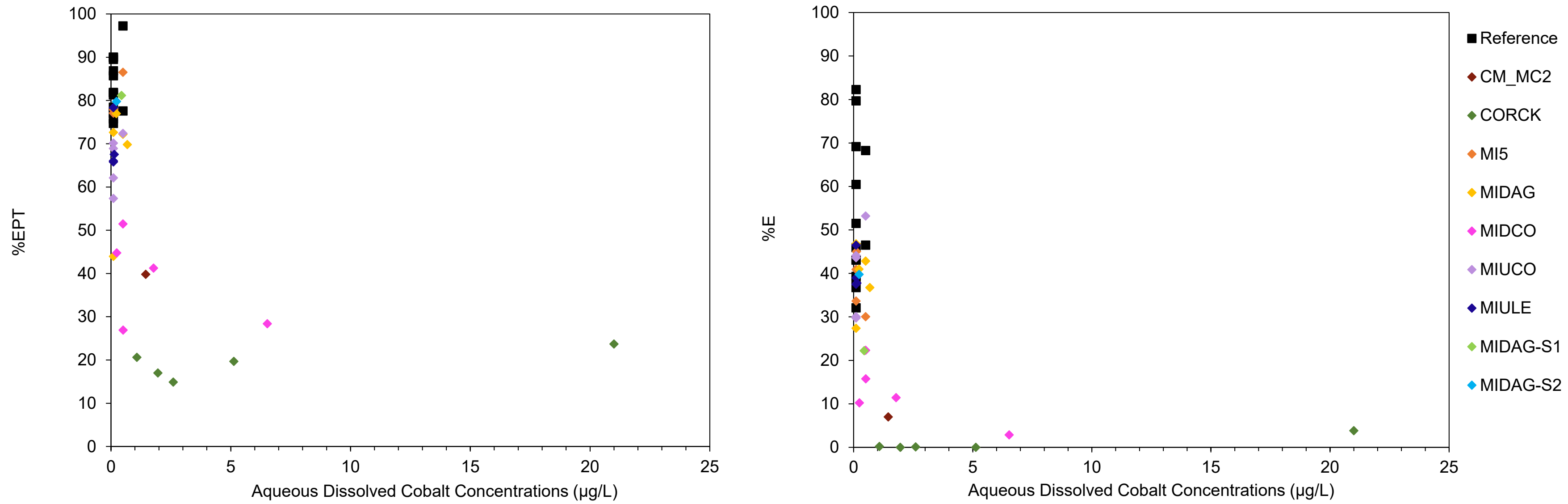
Figure G3.1-13: Heptageniidae Abundance in Samples Collected from the CMm LAEMP, 2012 to 2021



No. = number; n = sample size; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

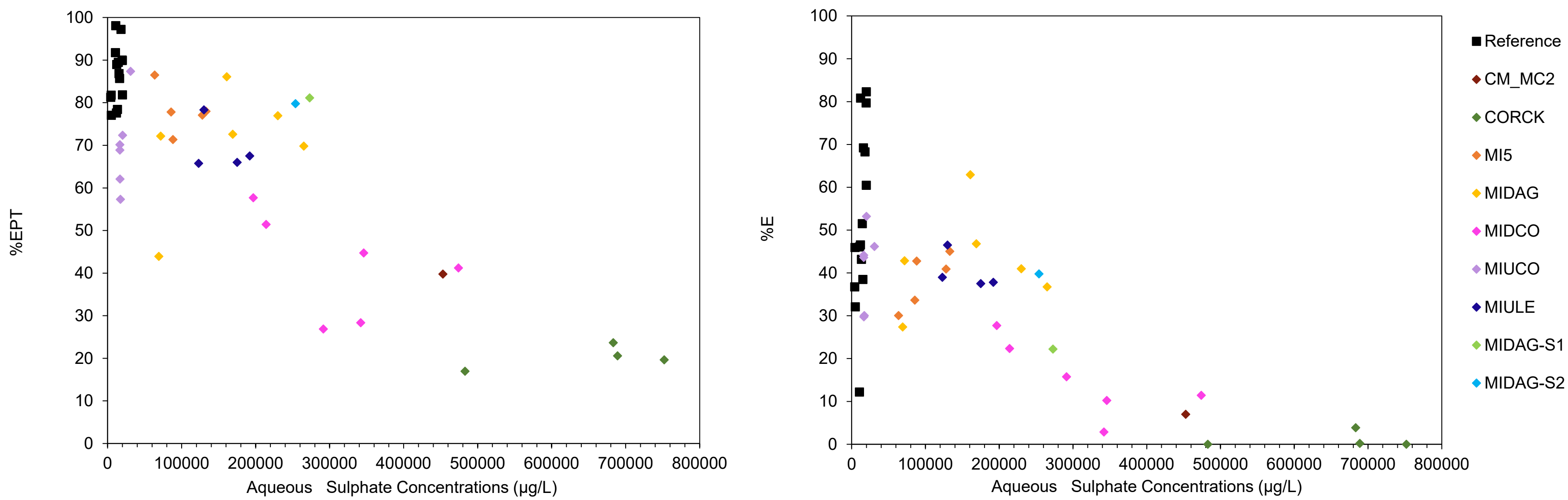
G3.1 Correlations of Benthic Invertebrate Community Endpoints with Water Quality

Figure G3.2-1: Proportion of Ephemeroptera, Plecoptera, and Trichoptera versus Aqueous Cobalt (left panel) and Proportion of Ephemeroptera versus Aqueous Cobalt (right panel) Concentrations from the CMm LAEMP Study Area, 2012 to 2021.



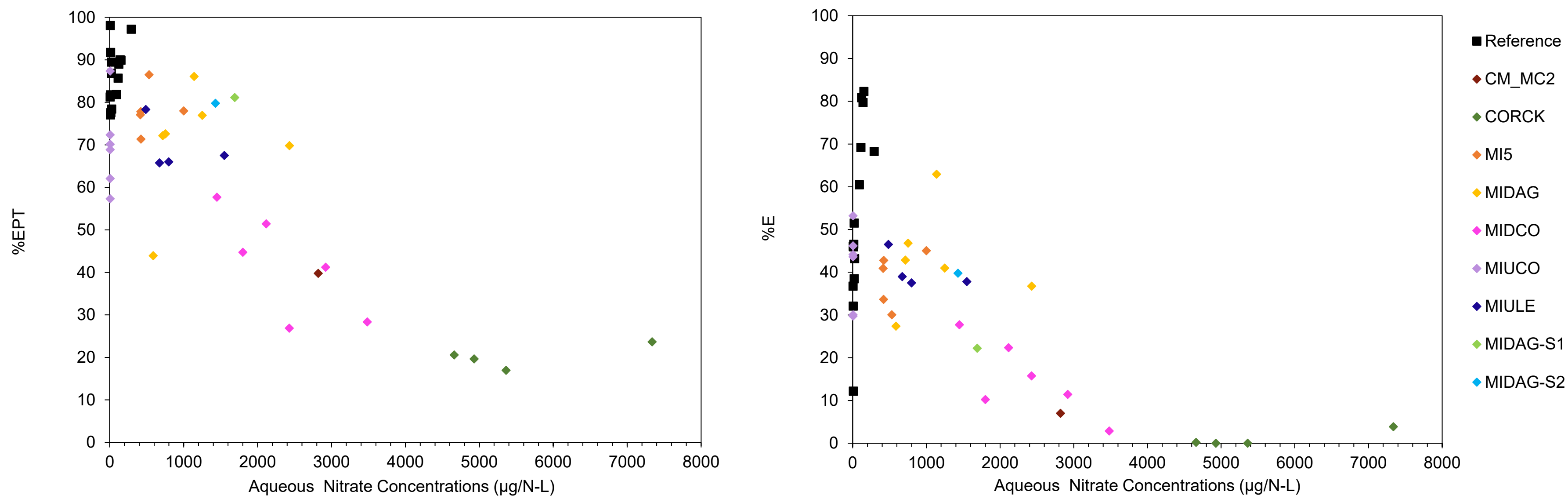
% = percent; µg/L= micrograms per litre; EPT = Ephemeroptera, Plecopteran, and Trichopteran; E = Ephemeroptera; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.2-2: Proportion of Ephemeroptera, Plecoptera, and Trichoptera versus Aqueous Sulphate (left panel) and Proportion of Ephemeroptera versus Aqueous Sulphate (right panel) Concentrations from the CMm LAEMP Study Area, 2012 to 2021.



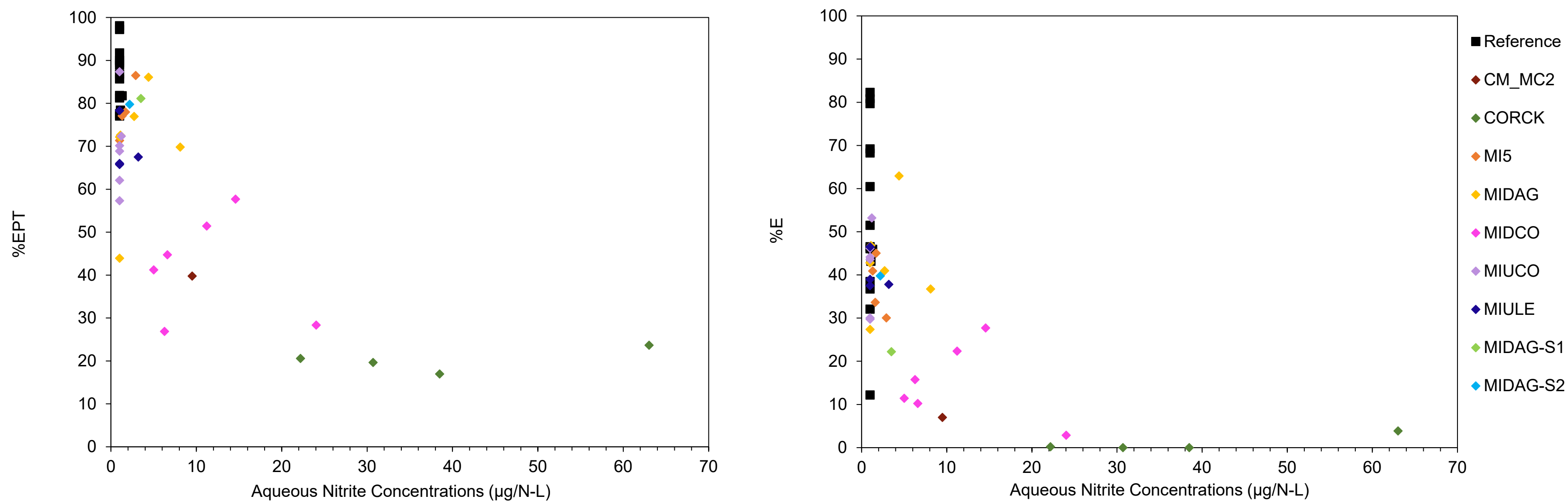
% = percent; µg/L= micrograms per litre; EPT = Ephemeroptera, Plecopteran, and Trichopteran; E = Ephemeroptera; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.2-3: Proportion of Ephemeroptera, Plecoptera, and Trichoptera versus Aqueous Nitrate (left panel) and Proportion of Ephemeroptera versus Aqueous Nitrate (right panel) Concentrations from the CMm LAEMP Study Area, 2012 to 2021.



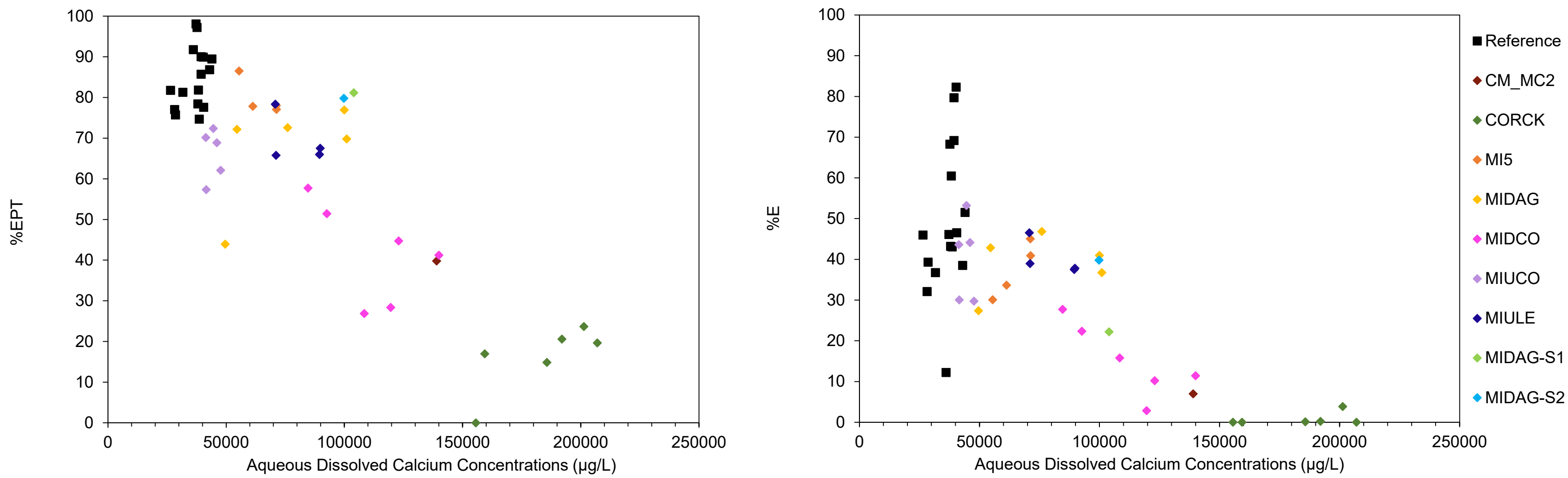
% = percent; µg/L= micrograms per litre; EPT = Ephemeroptera, Plecopteran, and Trichopteran; E = Ephemeroptera; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.2-4: Proportion of Ephemeroptera, Plecoptera, and Trichoptera versus Aqueous Nitrite (left panel) and Proportion of Ephemeroptera versus Aqueous Nitrite (right panel) Concentrations from the CMm LAEMP Study Area, 2012 to 2021.



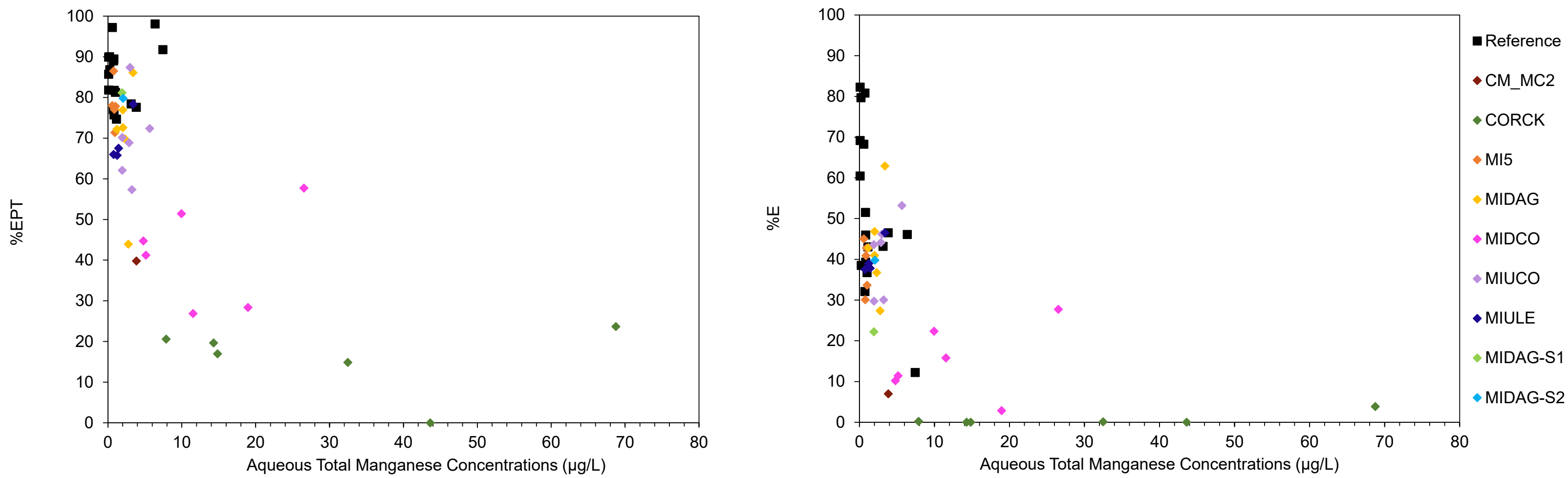
% = percent; µg/L= micrograms per litre; EPT = Ephemeroptera, Plecopteran, and Trichopteran; E = Ephemeroptera; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.2-5: Proportion of Ephemeroptera, Plecoptera, and Trichoptera versus Aqueous Calcium (left panel) and Proportion of Ephemeroptera versus Aqueous Calcium (right panel) Concentrations from the CMm LAEMP Study Area, 2012 to 2021.



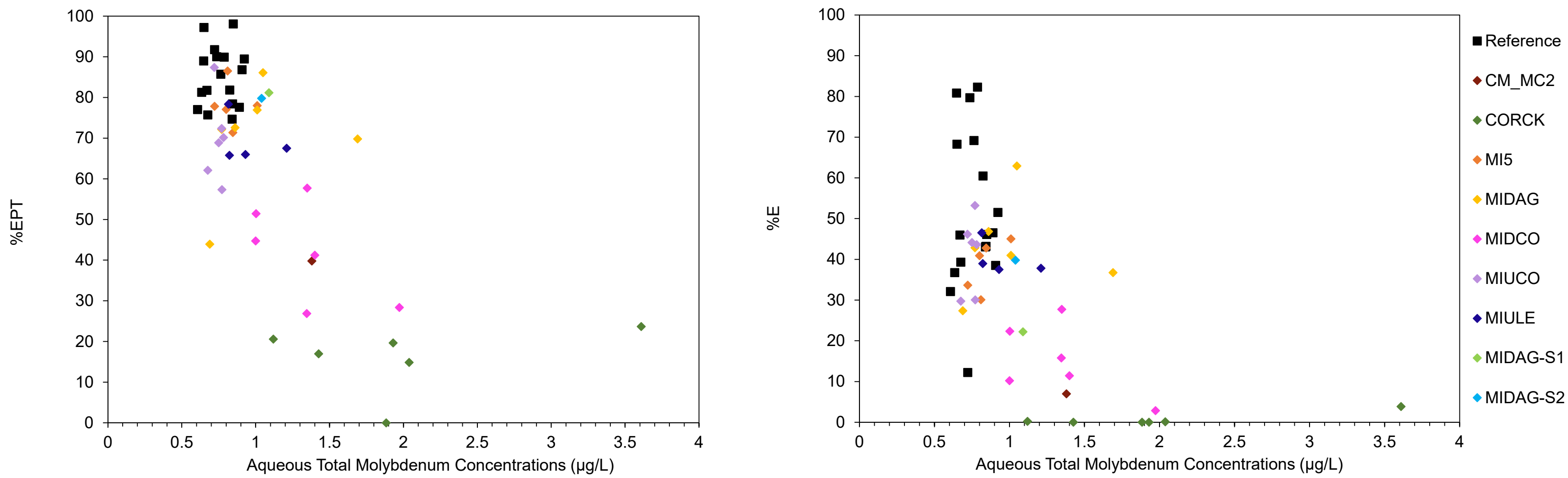
% = percent; µg/L= micrograms per litre; EPT = Ephemeroptera, Plecopteran, and Trichopteran; E = Ephemeroptera; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G3.2-6: Proportion of Ephemeroptera, Plecoptera, and Trichoptera versus Aqueous Total Manganese (left panel) and Proportion of Ephemeroptera versus Aqueous Total Manganese (right panel) Concentrations from the CMm LAEMP Study Area, 2012 to 2021.



% = percent; µg/L= micrograms per litre; EPT = Ephemeroptera, Plecopteran, and Trichopteran; E = Ephemeroptera; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

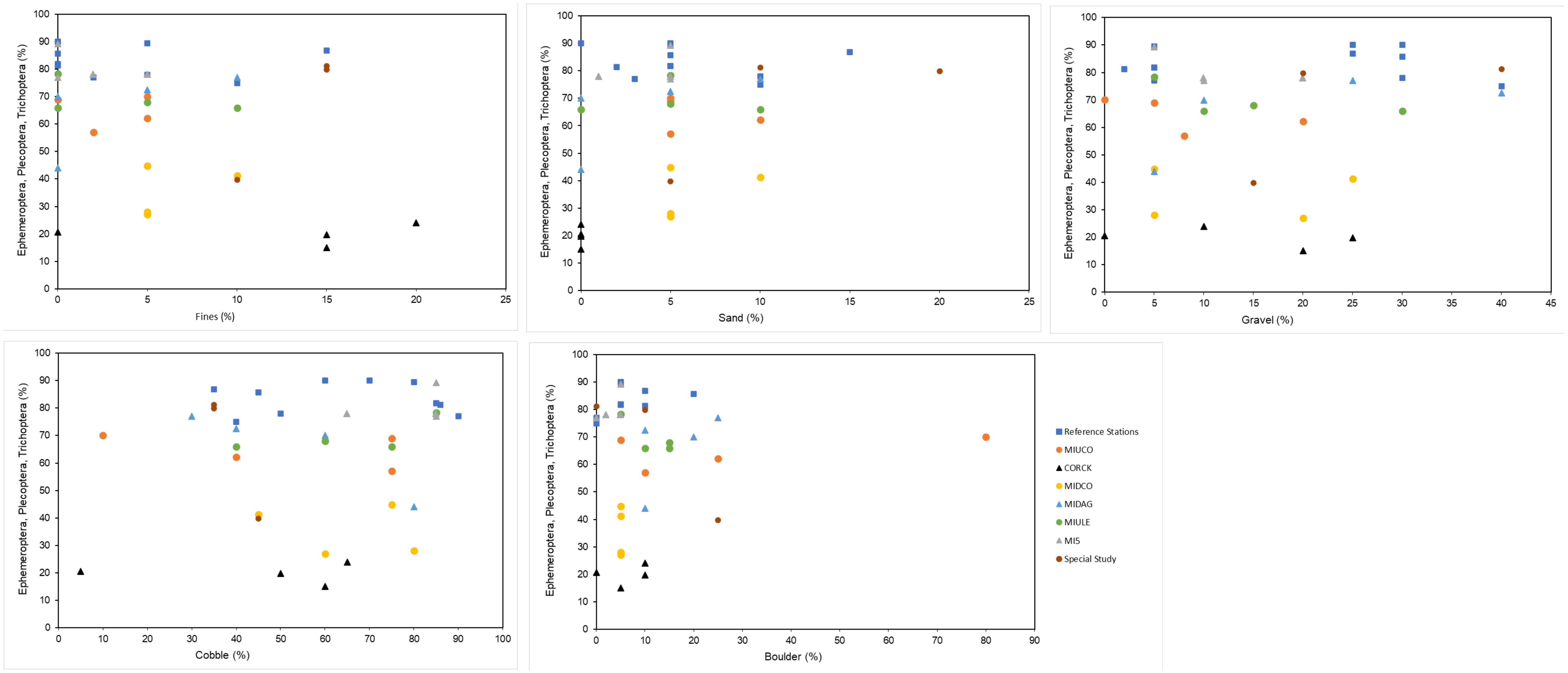
Figure G3.2-7: Proportion of Ephemeroptera, Plecoptera, and Trichoptera versus Aqueous Total Molybdenum (left panel) and Proportion of Ephemeroptera versus Aqueous Total Molybdenum (right panel) Concentrations from the CMm LAEMP Study Area, 2012 to 2021.



% = percent; µg/L= micrograms per litre; EPT = Ephemeroptera, Plecopteran, and Trichopteran; E = Ephemeroptera; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

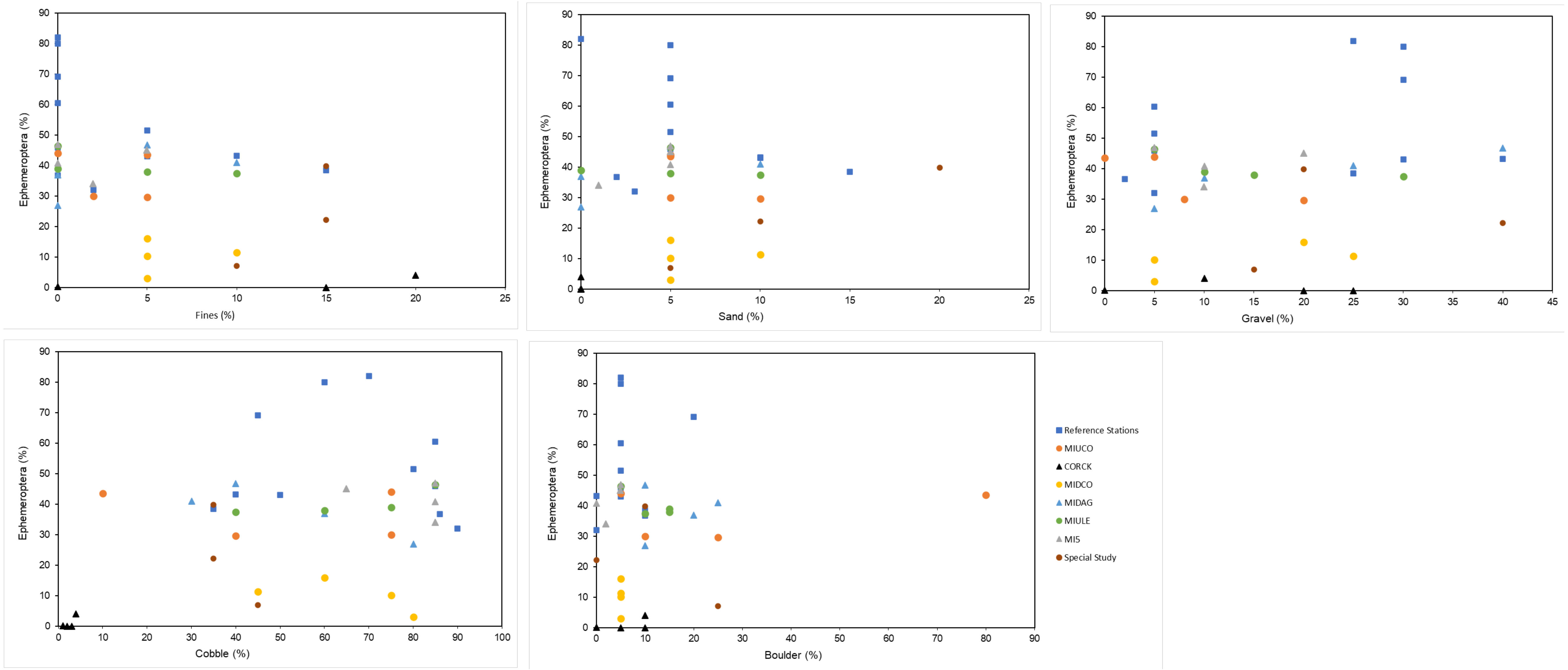
G4 HABITAT COMPARISON

Figure G4.1-1: Proportion of Ephemeroptera, Plecoptera, and Trichoptera Compared to Substrate Composition in the CMm LAEMP Study Area, 2018 and 2021



% = percent; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

Figure G4.1-2: Proportion of Ephemeroptera Compared to Substrate Composition in the CMm LAEMP Study Area, 2018 and 2021



% = percent; CMm = Coal Mountain Mine; LAEMP = Local Aquatic Effects Monitoring Program.

APPENDIX H

Sediment Quality Screening Data

Table H-1: Sediment Quality Data Screening, 2021

Location		BC Working Sediment Quality Guidelines for the Protection of Aquatic Life		Reference Sites						Mine-Influenced Sites		
Watercourse				Michel Creek			Leach Creek			Michel Creek		
Station				MI25			LE1			MIUCO		
Sample ID				RG_MI25_SE-1_2021-09-15_1200	RG_MI25_SE-2_2021-09-15_1200	RG_MI25_SE-3_2021-09-15_1200	RG_LE1_SE-1_2021-09-14_1100	RG_LE1_SE-2_2021-09-14_1000	RG_LE1_SE-3_2021-09-14_0920	RG_MIUCO_SE-1_2021-09-15_1230	RG_MIUCO_SE-2_2021-09-15_1230	RG_MIUCO_SE-3_2021-09-15_1230
Replicate		Lower WSQG (mg/kg dw)	Upper WSQG (mg/kg dw)	1	2	3	1	2	3	1	2	3
Date				15-Sep-21	15-Sep-21	15-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21
Parameter	**Unit**											
Physical Tests												
Moisture Content	%	-	-	38	48	90	45	52	61	88	86	68
pH (1:2 soil to water)	pH	-	-	8.1	8.2	7.6	7.8	7.7	7.2	7.7	7.9	8.1
Texture	-	-	-	Sandy loam	Sandy loam	Silt loam	Loamy sand	Loamy sand	Sandy loam	Sandy loam	Silt loam	Silt loam
Particle Size Distribution												
% Gravel (>2mm)	%	-	-	4.0	5.7	6.2	3.3	5.2	28	5.6	<1.0	3.9
% Sand (2.00mm to 1.00mm)	%	-	-	5.1	7.5	1.4	1.6	5.5	12	14	8.8	11
% Sand (1.00mm to 0.50mm)	%	-	-	5.8	9.9	1.8	15	19	8.4	22	11	9.8
% Sand (0.50mm to 0.25mm)	%	-	-	12	14	6.2	27	32	7.4	9.1	7.2	5.4
% Sand (0.25mm to 0.125mm)	%	-	-	18	14	13	16	14	10	3.7	4.1	5.3
% Sand (0.125mm to 0.063mm)	%	-	-	13	11	8.8	10	6.3	9.7	5.6	10	9.4
% Silt (0.063mm to 0.0312mm)	%	-	-	16	14	28	10	5.2	9.2	17	21	21
% Silt (0.0312mm to 0.004mm)	%	-	-	21	18	29	13	7.7	12	19	30	28
% Clay (<4µm)	%	-	-	6.4	5.4	5.2	4.2	4.2	3.6	3.5	7.2	6.3
Organic Carbon												
Total Organic Carbon	%	-	-	2.1	1.6	2.0	2.7	1.8	2.6	1.1	2.0	2.0
Total Metals												
Aluminum	mg/kg	-	-	12700	15600	14500	10000	8330	9570	15000	14100	670
Antimony	mg/kg	-	-	0.64	0.66	0.67	1.3	1.3	1.2	0.4	0.38	0.15
Arsenic	mg/kg	5.9	17	**12**	**12**	**12**	**6.5**	**6.6**	**6.2**	**7.4**	**7.1**	1.3
Barium	mg/kg	-	-	151	165	171	326	300	348	185	264	124
Beryllium	mg/kg	-	-	0.83	1.0	0.91	0.75	0.62	0.72	0.96	0.95	0.21
Bismuth	mg/kg	-	-	0.22	0.24	0.22	<0.20	<0.20	<0.20	0.21	0.2	<0.20
Boron	mg/kg	-	-	8.6	13	11	<5.0	<5.0	<5.0	15	14	5.4
Cadmium	mg/kg	0.6	3.5	**1.31**	**1.45**	**1.47**	**2.1**	**2.0**	**2.0**	**1.0**	**0.89**	**5.1**
Calcium	mg/kg	-	-	15000	14700	15200	6230	5690	6090	19700	19200	235000
Chromium	mg/kg	37	90	18	22	21	18	16	18	20	19	1.2
Cobalt	mg/kg	-	-	8.7	8.9	8.8	6.7	6.4	6.1	9.3	8.6	170
Copper	mg/kg	36	197	27	30	28	17	17	17	21	20	3.9
Iron	mg/kg	21200	43766	**23800**	**25500**	**23100**	16000	16000	14800	**21600**	**22000**	2210
Lead	mg/kg	35	91	17	19	21	9.8	9.4	9.1	13	12	1.5
Lithium	mg/kg	-	-	22	24	23	11	9.7	11	22	22	<2.0
Magnesium	mg/kg	-	-	6530	6390	5910	2450	2230	2450	6310	6550	4830
Manganese	mg/kg	460	1100	**476**	**541**	**512**	322	296	297	**585**	447	**1730**
Mercury	mg/kg	0.17	0.49	0.027	0.026	0.034	0.067	0.058	0.052	0.026	0.022	0.012
Molybdenum	mg/kg	-	-	5.7	5.9	5.3	1.8	1.6	1.4	2.2	2.1	0.23
Nickel	mg/kg	16	75	**31**	**33.3**	**32**	**28**	**26**	**26**	**26**	**24**	**171**
Phosphorus	mg/kg	-	-	1500	1450	1460	1450	1330	1200	1450	1340	184
Potassium	mg/kg	-	-	2270	3380	3030	1850	1450	1720	3570	3180	220
Selenium	mg/kg	1.9	-	0.94	1.9	1.2	0.93	1.0	1.1	1.1	0.86	1.2
Silver	mg/kg	0.5	-	0.13	0.14	0.16	0.24	0.28	0.31	0.13	0.11	<0.10
Sodium	mg/kg	-	-	86	98	92	<50	<50	51	111	127	285
Strontium	mg/kg	-	-	46	44	47	44	41	42	49	53	316
Sulfur	mg/kg	-	-	<1000	<1000	<1000	<1000	<1000	<1000	1000	1000	4000
Thallium	mg/kg	-	-	0.65	0.75	0.72	0.25	0.22	0.23	0.44	0.37	0.091
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg	-	-	9.9	14	8.7	33	28	37	11	15	1.9
Tungsten	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	mg/kg	-	-	0.86	0.88	0.91	1.6	1.3	1.3	0.68	0.55	1.5
Vanadium	mg/kg	-	-	32	39	37	57	49	53	32	30	2.4
Zinc	mg/kg	123	315	**134**	**152**	**141**	114	114	110	95	95	**438**
Zirconium	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table H-1: Sediment Quality Data Screening, 2021

Location		BC Working Sediment Quality Guidelines for the Protection of Aquatic Life		Reference Sites						Mine-Influenced Sites		
Watercourse				Michel Creek			Leach Creek			Michel Creek		
Station				MI25			LE1			MIUCO		
Sample ID				RG_MI25_SE-1_2021-09-15_1200	RG_MI25_SE-2_2021-09-15_1200	RG_MI25_SE-3_2021-09-15_1200	RG_LE1_SE-1_2021-09-14_1100	RG_LE1_SE-2_2021-09-14_1000	RG_LE1_SE-3_2021-09-14_0920	RG_MIUCO_SE-1_2021-09-15_1230	RG_MIUCO_SE-2_2021-09-15_1230	RG_MIUCO_SE-3_2021-09-15_1230
Replicate		Lower WSQG	Upper WSQG	1	2	3	1	2	3	1	2	3
Date		(mg/kg dw)	(mg/kg dw)	15-Sep-21	15-Sep-21	15-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21
Parameter	**Unit**											
Polycyclic Aromatic Hydrocarbons (PAHs)												
Acenaphthene	mg/kg	0.0067	0.089	<0.0050	<0.0050	**<0.050**(DL>Mn)	0.005	<0.0050	<0.0050	**<0.020**	**<0.020**	0.0055
Acenaphthylene	mg/kg	0.0059	0.13	<0.0050	<0.0050	**<0.025**(DL>Mn)	<0.0050	<0.0050	<0.0050	**<0.020**	**<0.020**	<0.0050
Acridine	mg/kg	-	-	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.040	<0.040	<0.010
Anthracene	mg/kg	0.047	0.25	<0.0040	<0.0040	<0.020	<0.0040	<0.0040	0.004	<0.016	<0.016	<0.0040
Benz(a)anthracene	mg/kg	0.032	0.39	<0.010	<0.010	**<0.050**(DL>Mn)	0.012	0.02	0.016	**<0.040**(DL>Mn)	**<0.040**(DL>Mn)	0.011
Benzo(a)pyrene	mg/kg	0.032	0.78	<0.010	<0.010	**<0.050**(DL>Mn)	<0.010	<0.010	<0.010	**<0.040**(DL>Mn)	**<0.040**(DL>Mn)	<0.010
Benzo(b&j)fluoranthene	mg/kg	-	-	<0.010	<0.010	<0.050	0.015	0.02	0.022	<0.040	<0.040	0.032
Benzo(b+j+k)fluoranthene	mg/kg	-	-	<0.015	<0.015	<0.075	<0.015	0.02	0.022	<0.060	<0.060	0.032
Benzo(e)pyrene	mg/kg	-	-	<0.010	0.011	<0.050	0.019	0.024	0.02	0.048	<0.040	0.033
Benzo(g,h,i)perylene	mg/kg	0.17	3.2	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.040	<0.040	<0.010
Benzo(k)fluoranthene	mg/kg	0.24	13.40	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.040	<0.040	<0.010
Chrysene	mg/kg	0.057	0.86	<0.010	0.017	<0.050	0.025	**0.06**	0.029	**0.075**	<0.040	**0.06**
Dibenz(a,h)anthracene	mg/kg	0.0062	0.14	<0.0050	<0.0050	**<0.025**(DL>Mn)	<0.0050	<0.0050	<0.0050	**<0.020**(DL>Mn)	**<0.020**(DL>Mn)	**0.0069**
Fluoranthene	mg/kg	0.11	2.4	<0.010	<0.010	<0.050	<0.010	<0.030	0.014	<0.040	<0.040	0.016
Fluorene	mg/kg	0.021	0.14	<0.010	<0.010	**<0.050**(DL>Mn)	<0.010	<0.010	<0.010	**<0.040**(DL>Mn)	**<0.040**(DL>Mn)	0.013
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.040	<0.040	<0.010
1-Methylnaphthalene	mg/kg	-	-	<0.050	<0.050	0.025	0.06	0.15	0.078	0.11	<0.040	0.054
2-Methylnaphthalene	mg/kg	0.02	0.2	<0.010	<0.010	**<0.050**(DL>Mn)	**0.052**	**0.14**	**0.083**	**0.15**	**0.041**	**0.079**
Naphthalene	mg/kg	0.035	0.39	<0.010	<0.010	**<0.050**(DL>Mn)	0.023	**0.071**	**0.04**	**0.098**	**<0.040**(DL>Mn)	**0.06**
Perylene	mg/kg	-	-	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.040	<0.040	0.024
Phenanthrene	mg/kg	0.042	0.52	<0.020	0.017	**0.067**	**0.12**	**0.21**	**0.15**	**0.18**	**0.071**	**0.11**
Pyrene	mg/kg	0.053	0.88	<0.010	<0.010	<0.050	<0.020	<0.030	<0.030	<0.040	<0.040	0.019
Quinoline	mg/kg	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.040	<0.040	<0.050
B(a)P Total Potency Equivalent	mg/kg	-	-	<0.020	<0.020	<0.048	<0.020	<0.020	<0.020	0.039	<0.038	<0.020
LMW PAH[(a)]	mg/kg	0.10	-	**0.17**	**0.17**	**0.44**	**0.34**	**0.66**	**0.43**	**0.71**	**0.37**	**0.39**
HMW PAH[(b)]	mg/kg	1.00	-	0.13	0.14	0.65	0.17	0.26	0.21	0.56	0.52	0.27
Total PAH[(c)]	mg/kg	4.00	35.00	0.3	0.31	1.1	0.51	0.92	0.64	1.3	0.89	0.67
IACR: Coarse	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
IACR: Fine	-	-	-	<0.050	<0.050	0.059	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
IACR (CCME)	-	-	-	<0.15	<0.15	<0.54	0.2	0.27	0.26	0.45	<0.43	0.34

Note: Data were screened against BC working sediment quality guidelines (WSQGs) for the protection of Aquatic Life (BC ENV 2021) where available.

(a) = Low molecular weight PAHs are comprised of acenaphthene, acenaphthylene, acridine, anthracene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, and quinoline.

(b) = High molecular weight PAHs are comprised of benz(a)anthracene, benzo(a)pyrene, benzo(b&j)fluoranthene, benzo(b+j+k)fluoranthene, benzo(e)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, perylene, and pyrene.

(c) = Sum of all compounds analyzed in the chemical class, values below the method detection limit were assigned a value of the detection limit.

Value = concentration exceeds the BC Lower Sediment Water Quality Guideline.

<u>Value</u> = concentration exceeds the BC Upper Sediment Water Quality Guideline.

CCME = Canadian Council of the Ministers of the Environment; LMW = low molecular weight; HMW = high molecular weight; WSQG = working sediment quality guidelines.

- = no guideline or no data; % = percent; mg/kg = milligrams per kilograms; dw = dry weight; < = less than; > = greater than; mm = millimetres

Table H-1: Sediment Quality Data Screening, 2021

Location		BC Working Sediment Quality Guidelines for the Protection of Aquatic Life		Mine-Influenced Sites									
Watercourse				Corbin Creek					Michel Creek				
Station				CORCK					MIDCO				
Sample ID				RG_CORCK_SE-1_2021_09-15_0830	RG_CORCK_SE-2_2021_09-15_0830	RG_CORCK_SE-3_2021_09-15_0945	RG_CORCK_SE-4_2021_09-15_0945	RG_CORCK_SE-5_2021_09-15_1100	RG_MIDCO_SE-1_2021-09-15_1330	RG_MIDCO_SE-2_2021-09-15_1330	RG_MIDCO_SE-3_2021-09-15_1330	RG_MIDCO_SE-4_2021-09-15_1330	RG_MIDCO_SE-5_2021-09-15_1330
Replicate		Lower WSQG (mg/kg dw)	Upper WSQG (mg/kg dw)	1	2	3	4	5	1	2	3	4	5
Date				15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21
Parameter	**Unit**												
Physical Tests													
Moisture Content	%	-	-	85	62	69	59	93	82	83	59	58	89
pH (1:2 soil to water)	pH	-	-	8.0	8.3	8.1	8.0	7.8	8.0	8.0	8.3	8.2	7.9
Texture	-	-	-	Silt loam	Sandy loam	Sandy loam	Sandy loam	Silt loam	Sandy loam	Silt loam	Silt loam	Silt loam	Sandy loam
Particle Size Distribution													
% Gravel (>2mm)	%	-	-	4.1	<1.0	<1.0	<1.0	2.5	6.7	1.8	<1.0	1.1	17
% Sand (2.00mm to 1.00mm)	%	-	-	1.9	1.7	2.0	3.0	4.6	24	4.0	<1.0	5.1	8.0
% Sand (1.00mm to 0.50mm)	%	-	-	1.9	2.6	2.6	3.7	4.1	20	5.6	3.2	13	15
% Sand (0.50mm to 0.25mm)	%	-	-	2.3	7.1	6.0	7.7	5.4	6.5	4.8	2.6	6.2	13
% Sand (0.25mm to 0.125mm)	%	-	-	9.5	21	18	18	12	3.7	4.6	4.9	5.0	7.6
% Sand (0.125mm to 0.063mm)	%	-	-	16	23	20	19	16	4.7	6.6	15	12	6.1
% Silt (0.063mm to 0.0312mm)	%	-	-	26	21	22	21	21	9.2	26	28	21	10
% Silt (0.0312mm to 0.004mm)	%	-	-	33	21	25	23	28	19	38	37	29	18
% Clay (<4µm)	%	-	-	5.6	3.4	4.4	4.7	5.9	6.7	8.4	7.8	7.3	5.8
Organic Carbon													
Total Organic Carbon	%	-	-	4.0	3.4	3.2	4.4	4.2	2.4	5.3	3.2	2.8	2.9
Total Metals													
Aluminum	mg/kg	-	-	867	823	953	2600	1390	6770	8180	13000	13500	10300
Antimony	mg/kg	-	-	0.14	0.14	0.15	0.31	0.25	0.29	0.26	0.4	0.39	0.33
Arsenic	mg/kg	5.9	17	1.1	1.3	1.4	3.1	2.1	5.5	5.5	**7.7**	**7.1**	**6.0**
Barium	mg/kg	-	-	103	123	121	214	178	135	152	127	134	153
Beryllium	mg/kg	-	-	0.19	0.19	0.23	0.44	0.33	0.49	0.59	0.82	0.77	0.67
Bismuth	mg/kg	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron	mg/kg	-	-	5.5	<5.0	5.2	7.9	8.0	7.0	10	13	15	13
Cadmium	mg/kg	0.6	3.5	**4.4**	**6.1**	**5.4**	**9.3**	**6.9**	**1.3**	**1.3**	**1.4**	**1.4**	**1.3**
Calcium	mg/kg	-	-	194000	240000	226000	338000	290000	84900	106000	36400	37400	82000
Chromium	mg/kg	37	90	1.3	1.3	1.6	3.8	2.3	9.4	11	17	18	14
Cobalt	mg/kg	-	-	145	232	203	370	223	83	75	32	33	73
Copper	mg/kg	36	197	3.2	4.0	4.1	7.7	5.9	14	15	18	18	16
Iron	mg/kg	21200	43766	1870	1860	2310	4730	3570	13900	13000	19400	19600	15300
Lead	mg/kg	35	91	1.2	1.1	1.4	2.6	2.3	8.8	8.2	11	11	9.3
Lithium	mg/kg	-	-	<2.0	2.1	2.1	3.7	2.8	11	12	19	20	15
Magnesium	mg/kg	-	-	4200	5140	4720	6870	6310	6050	6930	7260	7280	6730
Manganese	mg/kg	460	1100	**1510**	**1880**	**1800**	**2720**	**2090**	**1040**	**703**	**467**	**484**	**762**
Mercury	mg/kg	0.17	0.49	0.0089	0.011	0.015	0.025	0.025	0.025	0.022	0.024	0.025	0.03
Molybdenum	mg/kg	-	-	0.24	0.24	0.26	0.78	0.37	1.4	1.3	2.2	2.0	1.6
Nickel	mg/kg	16	75	**147**	**189**	**180**	**304**	**235**	**125**	**120**	**77**	**78**	**123**
Phosphorus	mg/kg	-	-	130	136	153	283	308	1010	1170	1310	1330	1030
Potassium	mg/kg	-	-	260	240	270	680	410	1450	1940	3030	3230	2580
Selenium	mg/kg	1.9	-	1.3	1.0	1.4	**3.2**	**2.6**	1.8	**2.7**	**2.6**	**2.8**	**2.6**
Silver	mg/kg	0.5	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	0.1	0.1
Sodium	mg/kg	-	-	246	270	268	419	418	208	230	137	146	214
Strontium	mg/kg	-	-	269	299	305	431	398	130	148	74	77	127
Sulfur	mg/kg	-	-	3300	3500	3800	5100	5900	2200	2600	1400	1400	2600
Thallium	mg/kg	-	-	0.084	0.17	0.16	0.41	0.15	0.26	0.26	0.39	0.4	0.35
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg	-	-	3.1	3.6	4.0	8.3	5.4	6.1	17	15	16	10
Tungsten	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	mg/kg	-	-	1.3	1.5	1.5	2.1	1.9	0.8	0.86	0.78	0.77	0.84
Vanadium	mg/kg	-	-	2.9	2.9	3.2	8.3	4.8	16	19	28	29	23
Zinc	mg/kg	123	315	**377**	**486**	**458**	**782**	**582**	120	120	**146**	**146**	**127**
Zirconium	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table H-1: Sediment Quality Data Screening, 2021

Location		BC Working Sediment Quality Guidelines for the Protection of Aquatic Life		Mine-Influenced Sites									
Watercourse				Corbin Creek					Michel Creek				
Station				CORCK					MIDCO				
Sample ID				RG_CORCK_SE-1_2021_09-15_0830	RG_CORCK_SE-2_2021_09-15_0830	RG_CORCK_SE-3_2021_09-15_0945	RG_CORCK_SE-4_2021_09-15_0945	RG_CORCK_SE-5_2021_09-15_1100	RG_MIDCO_SE-1_2021-09-15_1330	RG_MIDCO_SE-2_2021-09-15_1330	RG_MIDCO_SE-3_2021-09-15_1330	RG_MIDCO_SE-4_2021-09-15_1330	RG_MIDCO_SE-5_2021-09-15_1330
Replicate		Lower WSQG	Upper WSQG	1	2	3	4	5	1	2	3	4	5
Date		(mg/kg dw)	(mg/kg dw)	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21
Parameter	Unit												
Polycyclic Aromatic Hydrocarbons (PAHs)													
Acenaphthene	mg/kg	0.0067	0.089	**0.082**	**0.027**	**0.035**	**0.048**	**0.13**	**<0.025(DL>Mn)**	**<0.035(DL>Mn)**	**<0.010(DL>Mn)**	**<0.015(DL>Mn)**	**<0.030(DL>Mn)**
Acenaphthylene	mg/kg	0.0059	0.13	**0.018**	<0.0050	**0.0088**	**0.0091**	**<0.035(DL>Mn)**	**<0.013(DL>Mn)**	**<0.013(DL>Mn)**	<0.0050	<0.0050	**<0.020(DL>Mn)**
Acridine	mg/kg	-	-	0.14	0.049	0.076	0.091	0.25	<0.040	<0.050	<0.020	0.015	<0.040
Anthracene	mg/kg	0.047	0.25	<0.012	<0.0040	<0.0040	<0.0040	<0.028	<0.010	<0.010	<0.0040	<0.0040	<0.016
Benz(a)anthracene	mg/kg	0.032	0.39	**0.095**	**0.035**	**0.049**	**0.063**	**0.16**	**0.033**	**0.034**	0.011	0.014	**0.12**
Benzo(a)pyrene	mg/kg	0.032	0.78	**0.077**	0.03	**0.041**	**0.048**	**0.12**	<0.025	<0.025	<0.010	<0.010	**<0.040(DL>Mn)**
Benzo(b&j)fluoranthene	mg/kg	-	-	0.27	0.1	0.14	0.17	0.48	0.099	0.11	0.039	0.04	0.11
Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.27	0.1	0.14	0.17	0.48	0.099	0.11	0.039	0.04	0.11
Benzo(e)pyrene	mg/kg	-	-	0.34	0.13	0.18	0.22	0.59	0.11	0.11	0.048	0.05	0.15
Benzo(g,h,i)perylene	mg/kg	0.17	3.2	**0.17**	0.067	0.094	0.11	**0.29**	0.038	0.048	0.016	0.019	0.056
Benzo(k)fluoranthene	mg/kg	0.24	13.40	<0.030	<0.010	<0.010	<0.010	<0.070	<0.025	<0.025	<0.010	<0.010	<0.040
Chrysene	mg/kg	0.057	0.86	**0.45**	**0.17**	**0.23**	**0.28**	**0.74**	**0.12**	**0.088**	0.038	**0.06**	**0.095**
Dibenz(a,h)anthracene	mg/kg	0.0062	0.14	**0.043**	**0.015**	**0.027**	**0.024**	**0.066**	<0.013	<0.013	<0.0050	<0.0050	**<0.020(DL>Mn)**
Fluoranthene	mg/kg	0.11	2.4	0.1	0.032	0.04	0.046	<0.070	<0.030	0.033	<0.020	0.013	<0.040
Fluorene	mg/kg	0.021	0.14	**0.24**	**0.09**	**0.13**	**0.14**	**0.41**	**0.055**	**0.05**	**0.025**	**0.027**	**0.068**
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	0.031	0.012	0.012	0.022	<0.070	<0.025	<0.025	<0.010	<0.010	<0.040
1-Methylnaphthalene	mg/kg	-	-	1.5	0.62	0.82	0.94	2.6	0.4	0.48	0.16	0.18	0.53
2-Methylnaphthalene	mg/kg	0.02	0.2	**2.6**	**1.0**	**1.4**	**1.6**	**4.2**	**0.61**	**0.75**	**0.24**	**0.27**	**0.83**
Naphthalene	mg/kg	0.035	0.39	**0.84**	**0.36**	**0.44**	**0.52**	**1.4**	**0.23**	**0.29**	**0.093**	**0.1**	**0.31**
Perylene	mg/kg	-	-	<0.030	<0.010	<0.010	<0.010	<0.070	<0.025	<0.025	0.02	0.02	<0.040
Phenanthrene	mg/kg	0.042	0.52	**1.3**	**0.49**	**0.68**	**0.78**	**2.1**	**0.4**	**0.48**	**0.18**	**0.19**	**0.54**
Pyrene	mg/kg	0.053	0.88	**0.14**	**0.054**	**0.072**	**0.085**	**0.26**	0.044	<0.060	<0.030	0.025	**<0.070(DL>Mn)**
Quinoline	mg/kg	-	-	<0.030	<0.050	<0.050	<0.050	<0.070	<0.025	<0.025	<0.050	<0.050	<0.040
B(a)P Total Potency Equivalent	mg/kg	-	-	0.17	0.063	0.093	0.1	0.27	0.036	0.037	<0.020	<0.020	0.059
LMW PAH[(a)]	mg/kg	0.10	-	**6.8**	**2.7**	**3.6**	**4.2**	**11**	**1.8**	**2.2**	**0.78**	**0.85**	**2.4**
HMW PAH[(b)]	mg/kg	1.00	-	**2.1**	0.78	**1.1**	**1.3**	**3.5**	0.68	0.7	0.3	0.32	0.94
Total PAH[(c)]	mg/kg	4.00	35.00	**8.8**	3.5	**4.7**	**5.4**	**15**	2.5	2.9	1.1	1.2	3.4
IACR: Coarse	-	-	-	0.085	<0.050	<0.050	<0.050	0.15	<0.050	<0.050	<0.050	<0.050	0.05
IACR: Fine	-	-	-	0.16	0.06	0.082	0.096	0.3	0.064	0.066	<0.050	<0.050	0.096
IACR (CCME)	-	-	-	2.7	1.0	1.4	1.7	4.8	0.92	0.96	0.36	0.38	1.4

Note: Data were screened against BC working sediment quality guidelines (WSQGs) for the protection of Aquatic Life (BC ENV 2021) where available.
(a) = Low molecular weight PAHs are comprised of acenaphthene, acenaphthylene, acridine, anthracene, fluorene, 1-methylnapht ene, 2-methylnaphthalene, naphthalene, phenanthrene, and quinoline.
(b) = High molecular weight PAHs are comprised of benz(a)anthracene, benzo(a)pyrene, benzo(b&j)fluoranthene, benzo(b+j+k)flu nthene, benzo(e)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, perylene, and pyrene.
(c) = Sum of all compounds analyzed in the chemical class, values below the method detection limit were assigned a value of detection limit.
Value = concentration exceeds the BC Lower Sediment Water Quality Guideline.
Value (underlined, shaded) = concentration exceeds the BC Upper Sediment Water Quality Guideline.
CCME = Canadian Council of the Ministers of the Environment; LMW = low molecular weight; HMW = high molecular weight; WSQG = working sediment quality guidelines.
- = no guideline or no data; % = percent; mg/kg = milligrams per kilograms; dw = dry weight; < = less than; > = greater than; mm = millimetres

Table H-1: Sediment Quality Data Screening, 2021

Location		BC Working Sediment Quality Guidelines for the Protection of Aquatic Life		Mine-Influenced Sites										
Watercourse				Michel Creek	Michel Creek					Michel Creek				
Station				MIDAG	MUILE					MI5				
Sample ID				RG_MIDAG_SE-1_2021-09-15_1400	RG_MIULE_SE-1_2021-09-14_1430	RG_MIULE_SE-2_2021-09-14_1345	RG_MIULE_SE-3_2021-09-14_1345	RG_MIULE_SE-4_2021-09-14_1250	RG_MIULE_SE-5_2021-09-14_1250	RG_MI5_SE-1_2021-09-16_1045	RG_MI5_SE-2_2021-09-16_0920	RG_MI5_SE-3_2021-09-16_0920	RG_MI5_SE-4_2021-09-15_1500	RG_MI5_SE-5_2021-09-15_1500
Replicate		Lower WSQG (mg/kg dw)	Upper WSQG (mg/kg dw)	1	1	2	3	4	5	1	2	3	4	5
Date				15-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21	15-Sep-21	15-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	15-Sep-21	15-Sep-21
Parameter	**Unit**													
Physical Tests														
Moisture Content	%	-	-	98	33	76	62	95	38	36	45	53	37	50
pH (1:2 soil to water)	pH	-	-	8.0	8.2	7.5	7.8	7.3	8.0	8.3	8.4	8.0	8.3	8.3
Texture	-	-	-	Sandy loam	Loamy sand	Sandy loam	Sandy loam	Loamy sand	Loamy sand	Sand	Loamy sand	Loamy sand	Loamy sand	Loamy sand
Particle Size Distribution														
% Gravel (>2mm)	%	-	-	27	10	6.7	1.3	14	31	9.4	2.4	5.8	1.5	2.9
% Sand (2.00mm to 1.00mm)	%	-	-	12	8.8	1.9	<1.0	18	9.7	11	<1.0	1.6	1.1	1.1
% Sand (1.00mm to 0.50mm)	%	-	-	15	19	4.0	4.0	23	14	17	2.1	3.7	3.3	3.9
% Sand (0.50mm to 0.25mm)	%	-	-	8.5	20	13	17	13	14	28	20	17	18	19
% Sand (0.25mm to 0.125mm)	%	-	-	3.0	17	17	20	7.3	9.8	16	37	30	35	35
% Sand (0.125mm to 0.063mm)	%	-	-	4.7	7.7	12	15	4.6	5.7	6.5	19	20	19	18
% Silt (0.063mm to 0.0312mm)	%	-	-	11	6.6	19	18	8.1	5.8	5.0	9.3	10	11	10
% Silt (0.0312mm to 0.004mm)	%	-	-	15	8.0	22	21	10	7.9	5.5	6.9	9.1	9.4	8.7
% Clay (<4µm)	%	-	-	3.6	3.0	4.3	4.1	2.4	2.1	1.6	1.9	2.9	2.1	1.8
Organic Carbon														
Total Organic Carbon	%	-	-	4.9	2.7	7.1	3.9	2.7	2.7	2.5	1.4	1.7	2.1	1.7
Total Metals														
Aluminum	mg/kg	-	-	10400	9090	5730	6710	4210	6780	6000	6670	7690	7210	6620
Antimony	mg/kg	-	-	0.41	0.8	0.31	0.41	0.31	0.72	1.0	1.1	0.99	1.0	1.0
Arsenic	mg/kg	5.9	17	**7.8**	**9.2**	5.0	5.8	4.3	**7.9**	**7.5**	**6.8**	**6.3**	**6.8**	**6.5**
Barium	mg/kg	-	-	166	143	162	153	165	147	172	208	204	209	214
Beryllium	mg/kg	-	-	0.76	0.82	0.47	0.55	0.39	0.68	0.54	0.59	0.62	0.56	0.54
Bismuth	mg/kg	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron	mg/kg	-	-	11	8.9	7.4	7.5	7.4	6.4	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium	mg/kg	0.6	3.5	**1.4**	**1.1**	**1.1**	**1.1**	**1.3**	**0.9**	**1.2**	**1.1**	**1.2**	**1.1**	**1.1**
Calcium	mg/kg	-	-	59700	37200	79900	61900	99100	50500	27400	21800	25900	21400	22500
Chromium	mg/kg	37	90	16	15	9.1	10	7.1	11	11	12	14	13	12
Cobalt	mg/kg	-	-	30	10	15	14	15	11	7.4	6.6	7.2	6.6	6.4
Copper	mg/kg	36	197	16	15	12	12	10	13	13	12	13	12	12
Iron	mg/kg	21200	43766	17100	19700	11900	13800	9110	17500	16600	15400	14500	14900	14100
Lead	mg/kg	35	91	9.3	9.8	7.5	8.2	6.1	8.3	8.3	8.2	8.2	8.2	8.0
Lithium	mg/kg	-	-	14	12	8.7	9.6	6.3	9.7	7.7	8.3	9.0	8.4	8.3
Magnesium	mg/kg	-	-	9360	5930	6650	6870	5680	5580	4180	4440	4500	4550	4590
Manganese	mg/kg	460	1100	**493**	316	224	188	273	298	308	236	202	235	223
Mercury	mg/kg	0.17	0.49	0.04	0.024	0.026	0.026	0.029	0.039	0.04	0.042	0.047	0.024	0.037
Molybdenum	mg/kg	-	-	1.4	2.5	1.0	1.2	0.96	1.7	1.6	1.4	1.4	1.5	1.5
Nickel	mg/kg	16	75	**80**	**32**	**44**	**40**	**46**	**36**	**29**	**27**	**27**	**27**	**27**
Phosphorus	mg/kg	-	-	1190	1270	978	1090	1000	1220	1200	1270	1100	1230	1270
Potassium	mg/kg	-	-	2390	2200	1280	1430	930	1440	1100	1220	1480	1440	1290
Selenium	mg/kg	1.9	-	**2.2**	1.3	**2.5**	1.9	**3.1**	1.1	0.83	0.73	0.89	0.76	0.82
Silver	mg/kg	0.5	-	0.15	0.15	0.12	0.12	0.11	0.11	0.14	0.15	0.16	0.15	0.14
Sodium	mg/kg	-	-	151	84	137	106	161	89	62	68	74	67	63
Strontium	mg/kg	-	-	102	76	109	88	130	82	58	53	68	55	57
Sulfur	mg/kg	-	-	1900	<1000	2200	1800	2000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium	mg/kg	-	-	0.61	0.35	0.3	0.32	0.25	0.34	0.24	0.22	0.24	0.25	0.24
Tin	mg/kg	-	-	2.1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg	-	-	12	16	14	15	10	14	20	26	32	24	25
Tungsten	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	mg/kg	-	-	0.76	0.84	0.86	0.82	0.75	0.79	0.93	0.92	0.95	0.95	0.92
Vanadium	mg/kg	-	-	26	34	18	21	14	27	36	38	40	37	35
Zinc	mg/kg	123	315	**157**	108	105	109	102	110	98	90	96	96	91
Zirconium	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table H-1: Sediment Quality Data Screening, 2021

Location		BC Working Sediment Quality Guidelines for the Protection of Aquatic Life		Mine-Influenced Sites										
Watercourse				Michel Creek	Michel Creek					Michel Creek				
Station				MIDAG	MUILE					MI5				
Sample ID				RG_MIDAG_SE-1_2021-09-15_1400	RG_MIULE_SE-1_2021-09-14_1430	RG_MIULE_SE-2_2021-09-14_1345	RG_MIULE_SE-3_2021-09-14_1345	RG_MIULE_SE-4_2021-09-14_1250	RG_MIULE_SE-5_2021-09-14_1250	RG_MI5_SE-1_2021-09-16_1045	RG_MI5_SE-2_2021-09-16_0920	RG_MI5_SE-3_2021-09-16_0920	RG_MI5_SE-4_2021-09-15_1500	RG_MI5_SE-5_2021-09-15_1500
Replicate		Lower WSQG (mg/kg dw)	Upper WSQG (mg/kg dw)	1	1	2	3	4	5	1	2	3	4	5
Date				15-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21	15-Sep-21	15-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	15-Sep-21	15-Sep-21
Parameter	Unit													
Polycyclic Aromatic Hydrocarbons (PAHs)														
Acenaphthene	mg/kg	0.0067	0.089	**<0.090**[(DL>Mn,Mx)]	<0.0050	**<0.020**[(DL>Mn)]	**<0.010**[(DL>Mn)]	**<0.050**[(DL>Mn)]	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	<0.0050
Acenaphthylene	mg/kg	0.0059	0.13	**<0.090**[(DL>Mn)]	<0.0050	**<0.010**[(DL>Mn)]	<0.0050	**<0.050**[(DL>Mn)]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acridine	mg/kg	-	-	<0.18	<0.010	<0.030	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene	mg/kg	0.047	0.25	**<0.072**[(DL>Mn)]	<0.0040	<0.0080	<0.0040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Benz(a)anthracene	mg/kg	0.032	0.39	**<0.18**[(DL>Mn)]	<0.010	0.021	0.015	**<0.10**[(DL>Mn)]	<0.010	<0.010	<0.010	0.011	<0.010	<0.010
Benzo(a)pyrene	mg/kg	0.032	0.78	**<0.18**[(DL>Mn)]	<0.010	<0.020	<0.010	**<0.10**[(DL>Mn)]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b&j)fluoranthene	mg/kg	-	-	<0.18	0.012	0.044	0.034	<0.10	0.013	0.013	0.018	0.018	0.016	0.018
Benzo(b+j+k)fluoranthene	mg/kg	-	-	<0.27	<0.015	0.044	0.034	<0.14	<0.015	<0.015	0.018	0.018	0.016	0.018
Benzo(e)pyrene	mg/kg	-	-	<0.18	0.014	0.055	0.039	<0.10	0.016	0.018	0.023	0.022	0.02	0.021
Benzo(g,h,i)perylene	mg/kg	0.17	3.2	**<0.18**[(DL>Mn)]	<0.010	<0.020	0.012	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(k)fluoranthene	mg/kg	0.24	13.40	<0.18	<0.010	<0.020	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg	0.057	0.86	**<0.18**[(DL>Mn)]	0.01	0.054	0.024	**<0.10**[(DL>Mn)]	<0.010	0.036	0.043	0.041	0.023	0.038
Dibenz(a,h)anthracene	mg/kg	0.0062	0.14	**<0.090**[(DL>Mn)]	<0.0050	**<0.010**[(DL>Mn)]	<0.0050	**<0.050**[(DL>Mn)]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene	mg/kg	0.11	2.4	**<0.18**[(DL>Mn)]	<0.010	0.043	0.029	<0.10	0.01	<0.020	<0.020	<0.020	<0.020	0.014
Fluorene	mg/kg	0.021	0.14	**<0.18**[(DL>Mn)]	<0.010	<0.020	0.021	**<0.10**[(DL>Mn)]	<0.010	<0.010	<0.010	<0.010	<0.010	0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.18	<0.010	<0.020	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1-Methylnaphthalene	mg/kg	-	-	0.21	<0.050	0.23	0.15	0.15	0.052	0.07	0.058	0.08	0.064	0.075
2-Methylnaphthalene	mg/kg	0.02	0.2	**0.28**	**0.044**	**0.33**	**0.22**	**0.24**	**0.072**	**0.086**	**0.07**	**0.09**	**0.075**	**0.09**
Naphthalene	mg/kg	0.035	0.39	**0.19**	0.02	**0.16**	**0.1**	**<0.10**[(DL>Mn)]	0.032	**0.039**	0.03	**0.042**	0.034	**0.038**
Perylene	mg/kg	-	-	<0.18	<0.010	<0.020	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phenanthrene	mg/kg	0.042	0.52	**0.34**	**0.052**	**0.32**	**0.22**	**0.27**	**0.071**	**0.11**	**0.1**	**0.12**	**0.11**	**0.11**
Pyrene	mg/kg	0.053	0.88	**<0.18**[(DL>Mn)]	<0.010	0.048	0.031	**<0.10**[(DL>Mn)]	0.011	<0.020	<0.020	<0.030	<0.020	<0.020
Quinoline	mg/kg	-	-	<0.18	<0.050	<0.020	<0.050	<0.10	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
B(a)P Total Potency Equivalent	mg/kg	-	-	<0.17	<0.020	0.024	<0.020	<0.096	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
LMW PAH[(a)]	mg/kg	0.10	-	**1.8**	**0.25**	**1.1**	**0.79**	**1.2**	**0.31**	**0.39**	**0.34**	**0.42**	**0.36**	**0.4**
HMW PAH[(b)]	mg/kg	1.00	-	**2.3**	0.14	0.42	0.26	**1.3**	0.14	0.19	0.21	0.22	0.18	0.19
Total PAH[(c)]	mg/kg	4.00	35.00	**4.2**	0.39	1.6	1.1	1.5	0.45	0.58	0.55	0.63	0.54	0.6
IACR: Coarse	-	-	-	0.11	<0.050	<0.050	<0.050	75.8	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
IACR: Fine	-	-	-	0.21	<0.050	<0.050	<0.050	97.5	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
IACR (CCME)	-	-	-	<1.9	0.15	0.48	0.33	151.0	0.15	0.17	0.2	0.22	0.19	0.2

Note: Data were screened against BC working sediment quality guidelines (WSQGs) for the protection of Aquatic Life (BC ENV 2021) where available.

(a) = Low molecular weight PAHs are comprised of acenaphthene, acenaphthylene, acridine, anthracene, fluorene, 1-methylnapht ene, 2-methylnaphthalene, naphthalene, phenanthrene, and quinoline.

(b) = High molecular weight PAHs are comprised of benz(a)anthracene, benzo(a)pyrene, benzo(b&j)fluoranthene, benzo(b+j+k)flu nthene, benzo(e)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, perylene, and pyrene.

(c) = Sum of all compounds analyzed in the chemical class, values below the method detection limit were assigned a value of detection limit.

Value = concentration exceeds the BC Lower Sediment Water Quality Guideline.

<u>Value</u> = concentration exceeds the BC Upper Sediment Water Quality Guideline.

CCME = Canadian Council of the Ministers of the Environment; LMW = low molecular weight; HMW = high molecular weight; WSQG = working sediment quality guidelines.

- = no guideline or no data; % = percent; mg/kg = milligrams per kilograms; dw = dry weight; < = less than; > = greater than; mm = millimetres

APPENDIX I

Field and Habitat Data

Table I-1: Supporting Habitat Data at CMm LAEMP Sampling Stations, 2021

Station ID		Reference			Mine-influenced					
		MI25	AGCK	LE1	MIUCO	CORCK	MIDCO	MIDAG	MIULE	MI5
Watercourse		Michel Creek	Andy Good Creek	Leach Creek	Michel Creek	Corbin Creek	Michel Creek			
Date Sampled		13-Sep-21	11-Sep-21	14-Sep-21	12-Sep-21	15-Sep-21	12-Sep-21	11-Sep-21	14-Sep-21	15-Sep-21
Zone 11 UTMs - Easting		668184	667557	659635	668135	668539	667616	665220	660503	659496
Zone 11 UTMs - Northing		5482818	5488648	5494108	5486767	5487366	5487621	5489324	5493048	5496774
Habitat Characteristics										
Surrounding Land Use and Area Description		Forest	Forest	Forest	Mining, logging, and forest	Mining, logging, and forest	Mining, logging, and forest	Mining, logging, and forest	Mining, logging, and forest	Mining and forest
Anthropogenic Influences		-	-	-	-	CMm	CMm upstream	CMm upstream	CMm upstream	CMm upstream
Length of Reach Assessed (m)		50	100	100	100	50	100	100	100	100
Substrate	% Bedrock	0	0	0	0	0	5	0	0	0
	% Boulder	5	5	5	80	0	5	10	5	5
	% Cobble	80	85	85	10	5[(a)]	75	40	85	85
	% Gravel	5	5	5	0	0	5	40	5	5
	% Sand	5	5	5	5	0	5	5	5	5
	% Finer	5	0	0	5	0	5	5	0	0
Bank Stability		moderate	stable, no erosion	stable, no erosion	moderate	stable, no erosion	stable, no erosion	moderate	unstable, substantial erosion	moderate
Water Colour & Clarity		brown/clear	colourless/clear	colourless/clear	brown/clear	colourless/clear	brown/clear	colourless/clear	colourless/clear	colourless/clear
Channel Measurements										
Bankfull Width (m)		6	11	10	9	5	9	10	15	22
Wetted Width (m)		5	9	8	7	5	8	8	14	20
Bankfull-Wetted Depth (cm)		15	20	40	20	10	30	30	20	90

Note: Stations are ordered upstream to downstream.

a) Site was 95% calcite

"-" = data not available or data not recorded; % = percent; cm = centimetre; m = metre; u/s = upstream; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Table I-2: Kick and Sweep Net Data for Samples Collected at CMm LAEMP Stations, 2021

Field Parameters	Reference			Mine-Influenced					
	RG_MI25	RG_AGCK	RG_LE1	RG_MIUCO	RG_CORCK	RG_MIDCO	RG_MIDAG	RG_MIULE	RG_MI5
Easting	668185	667566	659583	668232	668527	667754	665271	660541	659530
Northing	5482814	5488693	5494063	5486600	5487371	5487585	5489373	5493015	5496485
Date	13-Sep-21	11-Sep-21	14-Sep-21	12-Sep-21	15-Sep-21	12-Sep-21	11-Sep-21	14-Sep-21	16-Sep-21
Samplers' Initials	AMc	RH	RH	AMc	AMc	RH	RH	AMc	AMc
Number of Jars	1	1	1	1	2	1	1	1	1
Total Kick Distance (m)	20	22	20	12	18	24	14	14	15
Full Transect (Yes / No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Number of Transects	1.5	3.0	2.0	3.0	4.0	3.0	2.0	0.8	1.0
Easting	668187	667546	659602	668227	668485	667740	665267	660525	659493
Northing	5482834	5488640	5494117	5486628	5487357	5487632	5489386	5493017	5496565
Date	13-Sep-21	11-Sep-21	14-Sep-21	12-Sep-21	15-Sep-21	12-Sep-21	11-Sep-21	14-Sep-21	16-Sep-21
Samplers' Initials	RH	RH	AMc	RH	RH	AMc	RH	RH	PSc
Number of Jars	1	1	1	1	4	1	1	1	1
Total Kick Distance (m)	22	20	20	10	22	25	14	20	22
Full Transect (Yes / No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Number of Transects	4.0	4.0	2.0	2.0	4.0	3.0	1.5	0.8	2.0
Easting	668173	667532	659633	668209	668478	667713	665265	660489	659504
Northing	5482859	5488604	5494111	5486645	5487339	5487624	5489439	5493082	5496614
Date	13-Sep-21	11-Sep-21	14-Sep-21	12-Sep-21	15-Sep-21	12-Sep-21	11-Sep-21	14-Sep-21	15-Sep-21
Samplers' Initials	AMc	RH	RH	AMc	AMc	RH	RH	AMc	RH
Number of Jars	1	1	1	1	2	1	1	1	1
Total Kick Distance (m)	20	24	30	15	24	25	20	20	20
Full Transect (Yes / No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Transects	4.0	3.0	4.0	3.0	4.0	3.0	2.0	2.0	2.0
Easting	-	-	-	-	-	667690	-	-	-
Northing	-	-	-	-	-	5487630	-	-	-
Date	-	-	-	-	-	12-Sep-21	-	-	-
Samplers' Initials	-	-	-	-	-	AMc	-	-	-
Number of Jars	-	-	-	-	-	1	-	-	-
Total Kick Distance (m)	-	-	-	-	-	15	-	-	-
Full Transect (Yes / No)	-	-	-	-	-	Yes	-	-	-
Number of Transects	-	-	-	-	-	2.0	-	-	-
Easting	-	-	-	-	-	667675	-	-	-
Northing	-	-	-	-	-	5487637	-	-	-
Date	-	-	-	-	-	12-Sep-21	-	-	-
Samplers' Initials	-	-	-	-	-	RH	-	-	-
Number of Jars	-	-	-	-	-	1	-	-	-
Total Kick Distance (m)	-	-	-	-	-	12	-	-	-
Full Transect (Yes / No)	-	-	-	-	-	Yes	-	-	-
Number of Transects	-	-	-	-	-	2.0	-	-	-

"-" = data not available or data not recorded; m = metre; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Table I-3: Channel Measurements of Sampling Stations at CMm LAEMP, 2021

Station Type	Replicate		Location (UTMs)[a] Easting	Location (UTMs)[a] Northing	A	B	C	D	E	Mean
Reference Stations	MI25		668184	5482818						
	1	Depth (cm)			11.50	3.00	7.50	8.00	10.50	8.10
		Velocity (m/s)			0.82	0.15	0.09	0.16	0.13	0.27
	2	Depth (cm)			7.00	11.50	10.00	4.00	4.50	7.40
		Velocity (m/s)			0.29	0.31	0.41	0.44	0.22	0.34
	3	Depth (cm)			8.50	10.00	7.50	10.00	5.00	8.20
		Velocity (m/s)			0.22	0.17	0.22	0.45	0.15	0.24
	AGCK		667557	5488648						
	1	Depth (cm)			5.50	19.50	13.00	15.00	22.50	15.10
		Velocity (m/s)			0.25	0.12	0.28	0.70	0.49	0.37
	2	Depth (cm)			14.00	31.00	16.50	9.00	10.00	16.10
		Velocity (m/s)			0.32	0.24	0.24	0.34	0.54	0.34
	3	Depth (cm)			5.50	23.00	28.50	21.00	20.00	19.60
		Velocity (m/s)			0.32	0.20	0.43	0.11	0.22	0.26
	LE1		659635	5494108						
	1	Depth (cm)			15.00	12.00	15.00	10.50	26.50	15.80
		Velocity (m/s)			0.17	0.12	0.40	0.57	0.35	0.32
	2	Depth (cm)			13.00	9.50	18.00	9.50	15.50	13.10
		Velocity (m/s)			0.11	0.48	0.38	0.18	0.25	0.28
	3	Depth (cm)			14.50	23.00	16.50	17.00	15.00	17.20
		Velocity (m/s)			0.38	0.34	0.25	0.33	0.48	0.35
Mine-influenced Stations	MIUCO		668135	5486767						
	1	Depth (cm)			11.50	10.00	12.00	13.50	12.50	11.90
		Velocity (m/s)			0.28	0.49	0.44	0.36	0.24	0.36
	2	Depth (cm)			8.00	13.00	9.50	10.00	9.50	10.00
		Velocity (m/s)			0.16	0.31	0.22	0.56	0.10	0.27
	3	Depth (cm)			10.50	13.50	17.50	17.00	13.00	14.30
		Velocity (m/s)			0.33	0.30	0.28	0.14	0.25	0.26
	CORCK		668539	5487366						
	1	Depth (cm)			7.00	5.50	13.00	19.50	10.50	11.10
		Velocity (m/s)			0.11	0.28	0.38	0.64	0.25	0.33
	2	Depth (cm)			19.50	17.00	8.00	15.00	11.00	14.10
		Velocity (m/s)			0.13	0.21	0.21	0.21	0.27	0.21
	3	Depth (cm)			24.00	20.00	13.00	7.50	7.00	14.30
		Velocity (m/s)			0.37	0.14	0.23	0.33	0.24	0.26
	MIDCO		667616	5487621						
	1	Depth (cm)			9.00	28.50	8.50	10.00	8.00	12.80
		Velocity (m/s)			0.52	0.25	0.29	0.49	0.46	0.40
	2	Depth (cm)			8.00	7.50	20.00	16.50	15.50	13.50
		Velocity (m/s)			0.24	0.52	0.22	0.51	0.41	0.38
	3	Depth (cm)			13.50	17.50	18.00	26.00	19.50	18.90
		Velocity (m/s)			0.13	0.26	0.31	0.41	0.78	0.38
	4	Depth (cm)			12.00	13.50	9.00	17.00	8.00	11.90
		Velocity (m/s)			0.28	0.39	0.86	0.23	0.47	0.44
	5	Depth (cm)			10.50	9.00	13.50	13.00	12.50	11.70
		Velocity (m/s)			0.81	0.20	0.31	0.58	0.24	0.43
	MIDAG		665220	5489324						
	1	Depth (cm)			9.50	27.00	28.00	24.00	33.50	24.40
		Velocity (m/s)			0.56	0.11	0.66	0.34	0.40	0.41
	2	Depth (cm)			16.50	26.00	17.00	37.00	37.50	26.80
		Velocity (m/s)			0.22	0.26	0.81	0.25	0.15	0.34
	3	Depth (cm)			12.00	29.50	33.00	15.00	22.00	22.30
		Velocity (m/s)			0.29	0.15	0.36	0.28	0.26	0.27
	MIULE		660503	5493048						
	1	Depth (cm)			28.00	34.00	22.50	15.00	7.00	21.30
		Velocity (m/s)			0.16	0.29	0.60	0.37	0.24	0.33
	2	Depth (cm)			13.00	28.00	22.00	25.00	18.00	21.20
		Velocity (m/s)			0.34	0.70	0.80	0.51	0.83	0.64
	3	Depth (cm)			14.00	27.00	40.50	28.00	20.00	25.90
		Velocity (m/s)			0.18	0.39	0.39	0.43	0.20	0.31
	MI5		659496	5496774						
	1	Depth (cm)			16.00	19.00	15.00	15.00	29.00	18.80
		Velocity (m/s)			0.28	0.80	0.49	0.70	0.99	0.65
	2	Depth (cm)			5.50	13.50	12.00	12.00	28.00	14.20
		Velocity (m/s)			0.41	0.20	0.69	0.27	0.10	0.34
	3	Depth (cm)			16.00	31.00	22.00	13.00	9.50	18.30
		Velocity (m/s)			0.35	0.55	0.88	0.46	0.22	0.49

Notes: Stations are ordered upstream to downstream. Velocity measurements were taken at five randomly chosen locations throughout the kick sample area. Velocity was measured at the bottom of the water column.

a) UTM coordinates provided are from the 2021 sampling program, except for the three stations CM-MC2, MIDAG-S1, and MIDAG-S2.

"-" = data not available or data not recorded; % = percent; cm = centimetre; m/s = metres per second; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

APPENDIX J

Benthic Invertebrate Community Data

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MIUCO_BIC-1_2021-09-12**		**RG_MIUCO_BIC-2_2021-09-12**		**RG_MIUCO_BIC-3_2021-09-12**		**RG_MIDCO_BIC-1_2021-09-12**		**RG_MIDCO_BIC-2_2021-09-12**	
Sample Collection Date:				**12-Sep-21**		**12-Sep-21**		**12-Sep-21**		**12-Sep-21**		**12-Sep-21**	
Chain of Custody Identification Number:				**CC221379**		**CC221380**		**CC221381**		**CC221382**		**CC221383**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**10**		**8**		**10**		**5**		**5**	
Phylum (sub-phylum)	**Order/Class**	**Family (sub-family/tribe)**	**Genus/Species**										
Arthropoda	Collembola	-	-	0	-	0	-	0	-	0	-	0	-
		Hypogastruridae	-	0	-	0	-	0	-	0	-	0	-
Arthropoda (Hexapoda)	Ephermeroptera	Ameletidae	*Ameletus* sp.	1	-	1	-	0	-	0	-	0	-
		Baetidae	-	38	ND	30	ND	36	ND	7	ND	6	ND
			Acentrella sp.	1	-	0	-	0	-	0	-	0	-
			Baetis sp.	7	ND	9	-	4	ND	5	-	1	-
			Baetis fuscatus group	1	-	0	-	0	-	0	-	0	-
			Baetis rhodani group	44	-	37	-	42	-	24	-	27	-
			Baetis bicaudatus	1	-	0	-	1	-	0	-	0	-
		Ephemerellidae	-	11	-	20	-	22	ND	7	-	17	-
			Caudatella sp.	2	-	0	-	1	-	0	-	0	-
			Drunella sp.	0	-	0	-	0	-	0	-	0	-
			Drunella grandis group	1	-	1	-	0	-	0	-	0	-
			Drunella coloradensis	1	-	4	-	0	-	0	-	0	-
			Drunella doddsii	11	-	8	-	9	-	4	-	4	-
			Drunella spinifera	1	-	0	-	0	-	0	-	0	-
			Ephemerella sp.	0	-	0	-	1	-	0	-	0	-
			Ephemerella tibialis	0	-	0	-	0	-	0	-	0	-
		Heptageniidae	-	16	-	11	-	13	-	0	-	0	-
			Cinygmula sp.	43	-	17	-	48	-	8	-	17	-
			Epeorus sp.	4	-	1	-	1	-	1	-	0	-
			Rhithrogena sp.	33	-	6	-	15	-	0	-	8	-
		Leptophlebiidae	-	1	-	2	-	2	-	0	-	0	-
			Neoleptophlebia sp.	1	-	0	-	0	-	0	-	0	-
	Plecoptera	-	-	0	-	0	-	0	-	0	-	0	-
		Capniidae	-	2	-	0	-	2	-	2	-	5	-
		Chloroperlidae	-	1	-	2	-	0	-	0	-	0	-
			Haploperla sp.	0	-	0	-	0	-	0	-	0	-
			Plumiperla sp.	0	-	0	-	0	-	0	-	0	-
			Sweltsa sp.	0	-	4	-	2	-	0	-	1	-
		Leuctridae	-	2	-	1	-	0	-	0	-	6	-
			Paraleuctra sp.	1	-	0	-	2	-	0	-	0	-
		Nemouridae	-	1	ND	0	-	1	ND	2	-	2	ND
			Malenka sp.	0	-	0	-	0	-	0	-	0	-
			Visoka cataractae	0	-	0	-	0	-	0	-	0	-
			Zapada sp.	32	ND	11	-	24	ND	38	ND	26	ND
			Zapada oregonensis group	9	-	1	-	2	-	5	-	3	-
			Zapada cinctipes	41	-	7	-	26	-	104	-	92	-
			Zapada columbiana	3	-	0	-	3	-	3	-	4	-
		Peltoperlidae	*Yoraperla* sp.	0	-	0	-	0	-	0	-	0	-
		Perlidae	-	2	ND	0	-	1	ND	0	-	0	-
			Doroneuria sp.	1	-	1	-	1	-	0	-	1	-
		Perlodidae	-	1	-	0	-	0	-	1	-	0	-
			Kogotus sp.	13	-	4	-	6	-	12	-	10	-
			Megarcys sp.	1	-	0	-	2	-	0	-	1	-
			Skwala sp.	2	-	0	-	0	-	0	-	0	-
		Taeniopterygidae	-	29	-	21	-	19	-	4	-	15	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MIUCO_BIC-1_2021-09-12**		**RG_MIUCO_BIC-2_2021-09-12**		**RG_MIUCO_BIC-3_2021-09-12**		**RG_MIDCO_BIC-1_2021-09-12**		**RG_MIDCO_BIC-2_2021-09-12**	
Sample Collection Date:				**12-Sep-21**		**12-Sep-21**		**12-Sep-21**		**12-Sep-21**		**12-Sep-21**	
Chain of Custody Identification Number:				**CC221379**		**CC221380**		**CC221381**		**CC221382**		**CC221383**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**10**		**8**		**10**		**5**		**5**	
Arthropoda (Hexapoda)	Trichoptera	-	-	0	-	0	-	0	-	1	ND	0	-
		Apataniidae	*Apatania* sp.	0	-	0	-	1	-	3	-	5	-
		Brachycentridae	-	0	-	0	-	0	-	0	-	0	-
			Brachycentrus sp.	0	-	2	-	4	-	0	-	1	-
			Micrasema sp.	0	-	0	-	0	-	1	-	0	-
		Glossosomatidae	-	0	-	1	-	0	-	0	-	0	-
			Glossosoma sp.	0	-	0	-	1	-	2	-	4	-
		Hydropsychidae	-	0	-	1	-	0	-	0	-	0	-
			Arctopsyche sp.	0	-	0	-	0	-	0	-	0	-
			Hydropsyche sp.	0	-	0	-	0	-	0	-	0	-
			Parapsyche sp.	1	ND	1	-	3	ND	3	-	1	-
			Parapsyche elsis	1	-	0	-	1	-	0	-	0	-
		Hydroptilidae	-	0	-	0	-	0	-	0	-	0	-
			Hydroptila sp.	0	-	0	-	0	-	0	-	0	-
			Metrichia sp.	0	-	0	-	0	-	0	-	0	-
		Limnephilidae	-	0	-	0	-	0	-	0	-	0	-
		Rhyacophilidae	*Rhyacophila* sp.	4	-	2	-	15	-	5	-	6	-
			Rhyacophila betteni group	2	-	2	-	3	-	0	-	0	-
			Rhyacophila brunnea/vemna sp. group	6	-	0	-	1	-	2	-	4	-
			Rhyacophila hyalinata group	0	-	0	-	0	-	0	-	0	-
			Rhyacophila vofixa group	4	-	0	-	2	-	0	-	0	-
			Rhyacophila atrata complex	2	-	3	-	2	-	1	-	1	-
			Rhyacophila narvae	2	-	2	-	1	-	0	-	1	-
		-	-	0	-	0	-	0	-	0	-	0	
		Thremmatidae	*Oligophlebodes* sp.	0	-	0	-	0	-	1	-	3	
	Coleoptera	Elmidae	-	0	-	5	ND	0	-	0	-	1	ND
			Heterlimnius sp.	35	-	20	-	13	-	3	-	14	-
		Staphylinidae	-	0	-	0	-	0	-	0	-	0	-
	Diptera	Ceratopogonidae	*Bezzia* sp./ *Palpomyia* sp.	0	-	0	-	0	-	0	-	0	-
			Mallochohelea sp.	1	-	2	-	3	-	2	-	4	-
		Chironomidae (Chironominae/Chironomini)	-	3	ND	3	ND	5	ND	5	ND	18	ND
			Polypedilum sp.	0	-	0	-	0	-	0	-	0	-
			Stictochironomus sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Chironominae/Tanytarsini)	-	1	-	0	-	0	-	1	-	1	-
			Constempellina sp.	0	-	0	-	0	-	0	-	0	-
			Micropsectra sp.	0	-	0	-	0	-	1	-	1	-
			Stempellinella sp.	0	-	0	-	0	-	0	-	0	-
			Tanytarsus sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Diamesinae/Diamesini)	*Diamesa* sp.	0	-	0	-	1	-	0	-	0	-
			Pagastia sp.	3	-	1	-	4	-	2	-	1	-
			Pseudodiamesa sp.	0	-	1	-	1	-	0	-	0	-
		Chironomidae (Orthocladiinae)	-	0	-	0	-	0	-	0	-	0	-
			Brillia sp.	0	-	0	-	0	-	0	-	0	-
			Cricotopus sp. (*Nostococladius* sp.)	7	-	5	-	3	-	0	-	0	-
			Eukiefferiella sp.	1	-	2	-	3	-	11	-	4	-
			Hydrobaenus sp.	0	-	1	-	0	-	0	-	0	-
			Orthocladius sp. complex	2	-	5	-	7	-	46	-	36	-
			Orthocladius lignicola	0	-	0	-	0	-	0	-	0	-
			Parametriocnemus sp.	0	-	0	-	0	-	0	-	0	-
			Parorthocladius sp.	0	-	0	-	0	-	0	-	0	-
			Rheocricotopus sp.	0	-	0	-	0	-	0	-	0	-
			Thienemanniella sp.	0	-	0	-	0	-	0	-	1	-
			Tvetenia sp.	0	-	0	-	1	-	1	-	5	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MIUCO_BIC-1_2021-09-12**		**RG_MIUCO_BIC-2_2021-09-12**		**RG_MIUCO_BIC-3_2021-09-12**		**RG_MIDCO_BIC-1_2021-09-12**		**RG_MIDCO_BIC-2_2021-09-12**	
Sample Collection Date:				**12-Sep-21**		**12-Sep-21**		**12-Sep-21**		**12-Sep-21**		**12-Sep-21**	
Chain of Custody Identification Number:				**CC221379**		**CC221380**		**CC221381**		**CC221382**		**CC221383**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**10**		**8**		**10**		**5**		**5**	
Arthropoda (Hexapoda)	Diptera	Chironomidae (Tanypodinae/Pentaneurini)	*Thienemannimyia* sp. group	2	-	1	-	2	-	6	-	11	-
		Empididae	-	0	-	0	-	1	-	0	-	0	-
			Chelifera sp./ *Metachela* sp.	0	-	0	-	1	-	0	-	0	-
			Clinocera sp.	0	-	0	-	0	-	0	-	0	-
			Neoplasta sp.	1	-	0	-	0	-	0	-	0	-
			Roederiodes sp.	0	-	0	-	0	-	0	-	0	-
			Trichoclinocera sp.	0	-	0	-	0	-	0	-	0	-
			Wiedemannia sp.	0	-	0	-	0	-	0	-	0	-
		Limoniidae	*Eloeophila* sp.	0	-	0	-	0	-	0	-	0	-
		Pelecorhynchidae	*Glutops* sp.	0	-	0	-	0	-	0	-	0	-
		Psychodidae	*Pericoma* sp./ *Telmatoscopus* sp.	60	-	61	-	80	-	130	-	222	-
		Simuliidae	-	0	-	0	-	0	-	0	-	0	-
			Simulium sp.	3	-	0	-	2	-	1	-	0	-
		Stratiomyidae	-	0	-	0	-	0	-	0	-	0	-
		Tipulidae	-	0	-	0	-	0	-	0	-	0	-
			Antocha sp.	0	-	0	-	1	-	0	-	1	-
			Dicranota sp.	1	-	0	-	1	-	0	-	1	-
			Hexatoma sp.	1	-	0	-	0	-	0	-	1	-
			Tipula sp.	0	-	0	-	0	-	0	-	0	-
Arthropoda (Chelicerata)	Trombidiformes	Aturidae	*Aturus* sp.	0	-	0	-	0	-	0	-	0	-
		Hydryphantidae	*Protzia* sp.	0	-	0	-	0	-	0	-	0	-
		Hygrobatidae	*Atractides* sp.	0	-	0	-	0	-	0	-	0	-
			Hygrobates sp.	2	-	0	-	0	-	0	-	0	-
		Lebertiidae	*Lebertia* sp.	2	-	0	-	1	-	14	-	11	-
		Sperchontidae	*Sperchon* sp.	4	-	5	-	3	-	7	-	4	-
		Torrenticolidae	*Testudacarus* sp.	0	-	0	-	0	-	0	-	0	-
			Torrenticola sp.	0	-	0	-	0	-	0	-	0	-
	Oribatida		-	0	-	0	-	0	-	0	-	0	-
Annelida (Clitelata)	Lumbriculida	Lumbriculidae	-	0	-	0	-	0	-	0	-	0	-
			Rhynchelmis sp.	0	-	0	-	0	-	0	-	0	-
	Tubificida	Enchytraeidae	-	0	-	0	-	0	-	0	-	0	-
			Enchytraeus sp.	0	-	0	-	0	-	0	-	0	-
		Naididae	-	0	-	0	-	0	-	0	-	0	-
			Chaetogaster sp.	0	-	0	-	0	-	0	-	0	-
			Nais sp.	0	-	0	-	0	-	0	-	11	-
			Pristina sp.	3	-	0	-	0	-	0	-	0	-
		Naididae (Subfamily: Tubificinae without hair chaetae)		0	-	0	-	0	-	0	-	0	-
Arthropoda (Crustacea)	Class: Ostracoda	-	-	1	-	0	-	1	-	1	-	0	-
	Class: Copepoda	-	-	0	-	0	-	0	-	0	-	0	-
Nemata	-	-	-	1	-	0	-	1	-	0	-	0	-
Platyhelminthes	Class: Turbellaria	-	-	0	-	0	-	0	-	0	-	1	-
Total Benthic Invertebrate Abundance:				**513**	-	**325**	-	**453**	-	**476**	-	**620**	-

Note: Grey cells represent taxa that were present in the samples but were not included in the calculations because they are non-benthic taxa. The ND designation represents a non-distinct taxa.
-"= no data; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.
Samples collected by Minnow Environmental (BC) and submitted to Cordillera Consulting Inc. for taxonomic identification and enumeration. Taxonomist contact information: Scott Finlayson; scottfinlayson@cordilleraconsulting.ca; +1-250-494-7553.

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				RG_MIDCO_BIC-3_2021-09-12		RG_MIDCO_BIC-4_2021-09-12		RG_MIDCO_BIC-5_2021-09-12		RG_LE1_BIC-1_2021-09-14		RG_LE1_BIC-2_2021-09-14	
Sample Collection Date:				12-Sep-21		12-Sep-21		12-Sep-21		14-Sep-21		14-Sep-21	
Chain of Custody Identification Number:				CC221384		CC221385		CC221386		CC221387		CC221388	
Sieve Size:				400		400		400		400		400	
Subsample proportion:				5		5		5		5		5	
Phylum (sub-phylum)	Order/Class	Family (sub-family/tribe)	Genus/Species										
Arthropoda	Collembola	-	-	1	-	0	-	0	-	0	-	0	-
		Hypogastruridae	-	0	-	0	-	0	-	0	-	0	-
Arthropoda (Hexapoda)	Ephermeroptera	Ameletidae	*Ameletus* sp.	0	-	0	-	0	-	0	-	1	-
		Baetidae	-	2	ND	8	ND	3	-	49	ND	42	ND
			Acentrella sp.	0	-	0	-	0	-	0	-	0	-
			Baetis sp.	0	-	1	-	0	-	1	ND	1	-
			Baetis fuscatus group	0	-	0	-	0	-	0	-	0	-
			Baetis rhodani group	22	-	15	-	13	-	33	-	21	-
			Baetis bicaudatus	0	-	0	-	0	-	1	-	0	-
		Ephemerellidae	-	25	ND	10	-	3	-	15	-	37	ND
			Caudatella sp.	0	-	0	-	0	-	1	-	0	-
			Drunella sp.	0	-	0	-	0	-	0	-	0	-
			Drunella grandis group	1	-	0	-	0	-	0	-	0	-
			Drunella coloradensis	0	-	0	-	0	-	0	-	0	-
			Drunella doddsii	6	-	6	-	4	-	12	-	7	-
			Drunella spinifera	0	-	0	-	0	-	0	-	0	-
			Ephemerella sp.	2	-	0	-	0	-	0	-	4	-
			Ephemerella tibialis	0	-	0	-	0	-	0	-	0	-
		Heptageniidae	-	1	-	6	-	4	-	11	-	24	-
			Cinygmula sp.	9	-	4	-	4	-	43	-	41	-
			Epeorus sp.	0	-	0	-	0	-	1	-	0	-
			Rhithrogena sp.	6	-	2	-	0	-	11	-	3	-
		Leptophlebiidae	-	0	-	0	-	0	-	0	-	0	-
			Neoleptophlebia sp.	0	-	0	-	0	-	0	-	0	-
	Plecoptera	-	-	0	-	0	-	0	-	0	-	3	ND
		Capniidae	-	4	-	3	-	0	-	2	-	1	-
		Chloroperlidae	-	0	-	0	-	0	-	0	-	3	-
			Haploperla sp.	0	-	0	-	0	-	0	-	0	-
			Plumiperla sp.	0	-	0	-	0	-	0	-	0	-
			Sweltsa sp.	1	-	1	-	0	-	6	-	3	-
		Leuctridae	-	0	-	0	-	1	-	0	-	2	-
			Paraleuctra sp.	0	-	0	-	0	-	0	-	0	-
		Nemouridae	-	1	-	0	-	6	-	0	-	1	ND
			Malenka sp.	0	-	0	-	0	-	0	-	0	-
			Visoka cataractae	0	-	0	-	0	-	0	-	0	-
			Zapada sp.	32	ND	52	ND	40	ND	10	-	14	-
			Zapada oregonensis group	6	-	8	-	3	-	0	-	5	-
			Zapada cinctipes	69	-	88	-	144	-	38	-	38	-
			Zapada columbiana	5	-	4	-	2	-	2	-	0	-
		Peltoperlidae	*Yoraperla* sp.	0	-	0	-	0	-	0	-	0	-
		Perlidae	-	1	ND	1	-	0	-	1	-	0	-
			Doroneuria sp.	4	-	2	-	0	-	0	-	2	-
		Perlodidae	-	0	-	0	-	0	-	0	-	0	-
			Kogotus sp.	5	-	7	-	1	-	7	-	9	-
			Megarcys sp.	0	-	0	-	0	-	0	-	3	-
			Skwala sp.	0	-	0	-	0	-	0	-	0	-
		Taeniopterygidae	-	6	-	7	-	2	-	36	-	22	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MIDCO_BIC-3_2021-09-12**		**RG_MIDCO_BIC-4_2021-09-12**		**RG_MIDCO_BIC-5_2021-09-12**		**RG_LE1_BIC-1_2021-09-14**		**RG_LE1_BIC-2_2021-09-14**	
Sample Collection Date:				**12-Sep-21**		**12-Sep-21**		**12-Sep-21**		**14-Sep-21**		**14-Sep-21**	
Chain of Custody Identification Number:				**CC221384**		**CC221385**		**CC221386**		**CC221387**		**CC221388**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**5**		**5**		**5**		**5**	
Arthropoda (Hexapoda)	Trichoptera	-	-	2	ND	0	-	0	-	0	-	0	-
		Apataniidae	*Apatania* sp.	14	-	0	-	1	-	1	-	1	-
		Brachycentridae	-	0	-	0	-	0	-	0	-	0	-
			Brachycentrus sp.	0	-	1	-	1	-	3	-	1	-
			Micrasema sp.	2	-	0	-	4	-	0	-	1	-
		Glossosomatidae	-	0	-	0	-	0	-	5	ND	0	-
			Glossosoma sp.	2	-	1	-	1	-	25	-	8	-
		Hydropsychidae	-	0	-	0	-	0	-	0	-	1	-
			Arctopsyche sp.	0	-	0	-	0	-	0	-	0	-
			Hydropsyche sp.	0	-	0	-	0	-	2	-	0	-
			Parapsyche sp.	1	ND	3	ND	6	-	2	-	0	-
			Parapsyche elsis	1	-	4	-	0	-	0	-	0	-
		Hydroptilidae	-	1	-	0	-	1	-	0	-	0	-
			Hydroptila sp.	0	-	0	-	0	-	0	-	0	-
			Metrichia sp.	1	-	0	-	0	-	0	-	0	-
		Limnephilidae	-	0	-	0	-	0	-	0	-	0	-
		Rhyacophilidae	*Rhyacophila* sp.	3	-	5	-	12	-	3	-	11	-
			Rhyacophila betteni group	1	-	1	-	1	-	0	-	0	-
			Rhyacophila brunnea/vemna sp. group	6	-	1	-	5	-	1	-	5	-
			Rhyacophila hyalinata group	0	-	2	-	0	-	0	-	0	-
			Rhyacophila vofixa group	2	-	0	-	1	-	0	-	0	-
			Rhyacophila atrata complex	0	-	0	-	0	-	0	-	0	-
			Rhyacophila narvae	0	-	0	-	0	-	0	-	1	-
		-	-	0	-	0	-	0	-	0	-	0	-
		Thremmatidae	*Oligophlebodes* sp.	2	-	3	-	2	-	4	-	0	-
	Coleoptera	Elmidae	-	4	ND	1	ND	0	-	0	-	1	ND
			Heterlimnius sp.	15	-	10	-	0	-	10	-	4	-
		Staphylinidae	-	0	-	0	-	0	-	0	-	0	-
	Diptera	Ceratopogonidae	*Bezzia* sp./ *Palpomyia* sp.	0	-	0	-	0	-	2	-	0	-
			Mallochohelea sp.	2	-	3	-	2	-	2	-	6	-
		Chironomidae (Chironominae/Chironomini)	-	23	ND	14	ND	18	ND	2	ND	6	ND
			Polypedilum sp.	0	-	0	-	0	-	0	-	1	-
			Stictochironomus sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Chironominae/Tanytarsini)	-	1	ND	0	-	0	-	0	-	2	-
			Constempellina sp.	0	-	0	-	0	-	0	-	2	-
			Micropsectra sp.	4	-	2	-	4	-	0	-	0	-
			Stempellinella sp.	0	-	0	-	0	-	0	-	0	-
			Tanytarsus sp.	1	-	0	-	0	-	0	-	0	-
		Chironomidae (Diamesinae/Diamesini)	*Diamesa* sp.	0	-	0	-	0	-	0	-	0	-
			Pagastia sp.	4	-	4	-	3	-	0	-	1	-
			Pseudodiamesa sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Orthocladiinae)	-	1	-	0	-	1	-	0	-	0	-
			Brillia sp.	0	-	0	-	0	-	0	-	0	-
			Cricotopus sp. (*Nostococladius* sp.)	0	-	0	-	0	-	4	-	18	-
			Eukiefferiella sp.	5	-	10	-	29	-	4	-	16	-
			Hydrobaenus sp.	0	-	0	-	1	-	0	-	0	-
			Orthocladius sp. complex	73	-	49	-	62	-	2	-	10	-
			Orthocladius lignicola	0	-	0	-	0	-	0	-	0	-
			Parametriocnemus sp.	0	-	0	-	0	-	0	-	0	-
			Parorthocladius sp.	0	-	0	-	0	-	0	-	0	-
			Rheocricotopus sp.	0	-	0	-	0	-	0	-	0	-
			Thienemanniella sp.	0	-	0	-	0	-	0	-	0	-
			Tvetenia sp.	1	-	2	-	11	-	2	-	1	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MIDCO_BIC-3_2021-09-12**		**RG_MIDCO_BIC-4_2021-09-12**		**RG_MIDCO_BIC-5_2021-09-12**		**RG_LE1_BIC-1_2021-09-14**		**RG_LE1_BIC-2_2021-09-14**	
Sample Collection Date:				**12-Sep-21**		**12-Sep-21**		**12-Sep-21**		**14-Sep-21**		**14-Sep-21**	
Chain of Custody Identification Number:				**CC221384**		**CC221385**		**CC221386**		**CC221387**		**CC221388**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**5**		**5**		**5**		**5**	
Arthropoda (Hexapoda)	Diptera	Chironomidae (Tanypodinae/Pentaneurini)	*Thienemannimyia* sp. group	8	-	8	-	9	-	2	-	2	-
		Empididae	-	0	-	0	-	0	-	0	-	0	-
			Chelifera sp./ *Metachela* sp.	0	-	0	-	0	-	0	-	0	-
			Clinocera sp.	0	-	0	-	0	-	0	-	0	-
			Neoplasta sp.	0	-	0	-	0	-	0	-	0	-
			Roederiodes sp.	0	-	0	-	0	-	2	-	6	-
			Trichoclinocera sp.	0	-	0	-	0	-	0	-	0	-
			Wiedemannia sp.	0	-	0	-	0	-	0	-	0	-
		Limoniidae	*Eloeophila* sp.	0	-	0	-	0	-	0	-	0	-
		Pelecorhynchidae	*Glutops* sp.	0	-	0	-	0	-	0	-	0	-
		Psychodidae	*Pericoma* sp./ *Telmatoscopus* sp.	189	-	175	-	142	-	13	-	22	-
		Simuliidae	-	0	-	0	-	0	-	0	-	0	-
			Simulium sp.	1	-	1	-	1	-	2	-	0	-
		Stratiomyidae	-	0	-	0	-	0	-	0	-	0	-
		Tipulidae	-	0	-	0	-	0	-	0	-	0	-
			Antocha sp.	3	-	3	-	2	-	1	-	2	-
			Dicranota sp.	1	-	1	-	0	-	0	-	0	-
			Hexatoma sp.	1	-	0	-	0	-	1	-	0	-
			Tipula sp.	1	-	0	-	0	-	0	-	0	-
Arthropoda (Chelicerata)	Trombidiformes	Aturidae	*Aturus* sp.	0	-	1	-	0	-	0	-	0	-
		Hydryphantidae	*Protzia* sp.	0	-	0	-	0	-	1	-	1	-
		Hygrobatidae	*Atractides* sp.	0	-	0	-	0	-	0	-	0	-
			Hygrobates sp.	0	-	0	-	0	-	0	-	0	-
		Lebertiidae	*Lebertia* sp.	11	-	12	-	7	-	0	-	3	-
		Sperchontidae	*Sperchon* sp.	7	-	10	-	12	-	0	-	5	-
		Torrenticolidae	*Testudacarus* sp.	1	-	0	-	1	-	0	-	1	-
			Torrenticola sp.	0	-	0	-	0	-	0	-	0	-
	Oribatida		-	0	-	0	-	0	-	0	-	0	-
Annelida (Clitelata)	Lumbriculida	Lumbriculidae	-	0	-	0	-	0	-	0	-	0	-
			Rhynchelmis sp.	0	-	0	-	0	-	0	-	0	-
	Tubificida	Enchytraeidae	-	0	-	0	-	0	-	0	-	0	-
			Enchytraeus sp.	0	-	0	-	1	-	0	-	0	-
		Naididae	-	0	-	0	-	1	ND	0	-	0	-
			Chaetogaster sp.	1	-	0	-	0	-	0	-	0	-
			Nais sp.	16	-	13	-	16	-	0	-	0	-
			Pristina sp.	0	-	0	-	0	-	0	-	0	-
		Naididae (Subfamily: Tubificinae without hair chaetae)		0	-	0	-	0	-	0	-	0	-
Arthropoda (Crustacea)	Class: Ostracoda	-	-	1	-	0	-	1	-	0	-	0	-
	Class: Copepoda	-	-	0	-	0	-	0	-	0	-	0	-
Nemata	-	-	-	1	-	0	-	1	-	0	-	1	-
Platyhelminthes	Class: Turbellaria	-	-	1	-	1	-	1	-	1	-	1	-
Total Benthic Invertebrate Abundance:				**621**	-	**565**	-	**588**	-	**376**	-	**426**	-

Note: Grey cells represent taxa that were present in the samples but were not included in the calculations because they are non-benthic taxa. The ND designation represents a non-distinct taxa.
-"= no data; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.
Samples collected by Minnow Environmental (BC) and submitted to Cordillera Consulting Inc. for taxonomic identification and enumeration. Taxonomist contact information: Scott Finlayson; scottfinlayson@cordilleraconsulting.ca; +1-250-494-7553.

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				RG_LE1_BIC-3_2021-09-14		RG_AGCK_BIC-1_2021-09-11		RG_AGCK_BIC-2_2021-09-11		RG_AGCK_BIC-3_2021-09-11		RG_MIDAG_BIC-1_2021-09-11	
Sample Collection Date:				14-Sep-21		11-Sep-21		11-Sep-21		11-Sep-21		11-Sep-21	
Chain of Custody Identification Number:				CC221389		CC221390		CC221391		CC221392		CC221393	
Sieve Size:				400		400		400		400		400	
Subsample proportion:				5		5		6		7		5	
Phylum (sub-phylum)	**Order/Class**	**Family (sub-family/tribe)**	**Genus/Species**										
Arthropoda	Collembola	-	-	0	-	0	-	0	-	0	-	0	-
		Hypogastruridae	-	0	-	0	-	0	-	1	-	0	-
Arthropoda (Hexapoda)	Ephermeroptera	Ameletidae	*Ameletus* sp.	0	-	0	-	3	-	2	-	0	-
		Baetidae	-	106	ND	0	-	0	-	1	ND	34	ND
			Acentrella sp.	0	-	0	-	0	-	0	-	0	-
			Baetis sp.	1	ND	0	-	0	-	1	ND	9	ND
			Baetis fuscatus group	0	-	0	-	0	-	0	-	0	-
			Baetis rhodani group	49	-	8	-	8	-	18	-	117	-
			Baetis bicaudatus	0	-	0	-	0	-	0	-	0	-
		Ephemerellidae	-	18	-	24	-	19	-	33	-	58	-
			Caudatella sp.	4	-	0	-	0	-	0	-	0	-
			Drunella sp.	0	-	0	-	0	-	0	-	0	-
			Drunella grandis group	0	-	0	-	0	-	0	-	0	-
			Drunella coloradensis	0	-	1	-	1	-	1	-	1	-
			Drunella doddsii	11	-	0	-	1	-	4	-	8	-
			Drunella spinifera	0	-	0	-	0	-	0	-	0	-
			Ephemerella sp.	4	-	0	-	0	-	0	-	0	-
			Ephemerella tibialis	0	-	0	-	0	-	0	-	0	-
		Heptageniidae	-	14	-	42	-	33	-	48	-	8	-
			Cinygmula sp.	77	-	146	-	122	-	88	-	22	-
			Epeorus sp.	1	-	17	-	20	-	23	-	2	-
			Rhithrogena sp.	4	-	13	-	15	-	11	-	10	-
		Leptophlebiidae	-	1	-	0	-	0	-	0	-	0	-
			Neoleptophlebia sp.	0	-	0	-	0	-	0	-	0	-
	Plecoptera	-	-	0	-	0	-	0	-	0	-	1	ND
		Capniidae	-	2	-	0	-	0	-	0	-	0	-
		Chloroperlidae	-	0	-	0	-	0	-	0	-	1	-
			Haploperla sp.	0	-	0	-	0	-	0	-	0	-
			Plumiperla sp.	0	-	3	-	2	-	0	-	0	-
			Sweltsa sp.	1	-	4	-	0	-	2	-	1	-
		Leuctridae	-	1	-	0	-	0	-	0	-	1	-
			Paraleuctra sp.	0	-	0	-	0	-	0	-	0	-
		Nemouridae	-	1	ND	0	-	0	-	0	-	3	ND
			Malenka sp.	0	-	0	-	0	-	0	-	0	-
			Visoka cataractae	0	-	1	-	0	-	0	-	0	-
			Zapada sp.	28	ND	7	ND	0	-	3	-	27	ND
			Zapada oregonensis group	3	-	12	-	6	-	5	-	6	-
			Zapada cinctipes	52	-	1	-	1	-	0	-	15	-
			Zapada columbiana	4	-	5	-	5	-	1	-	5	-
		Peltoperlidae	*Yoraperla* sp.	0	-	0	-	0	-	0	-	0	-
		Perlidae	-	0	-	0	-	0	-	0	-	2	ND
			Doroneuria sp.	1	-	0	-	0	-	0	-	3	-
		Perlodidae	-	0	-	0	-	0	-	0	-	0	-
			Kogotus sp.	5	-	1	-	0	-	0	-	5	-
			Megarcys sp.	0	-	5	-	4	-	3	-	4	-
			Skwala sp.	0	-	0	-	0	-	0	-	0	-
		Taeniopterygidae	-	67	-	41	-	52	-	55	-	28	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				RG_LE1_BIC-3_2021-09-14		RG_AGCK_BIC-1_2021-09-11		RG_AGCK_BIC-2_2021-09-11		RG_AGCK_BIC-3_2021-09-11		RG_MIDAG_BIC-1_2021-09-11	
Sample Collection Date:				14-Sep-21		11-Sep-21		11-Sep-21		11-Sep-21		11-Sep-21	
Chain of Custody Identification Number:				CC221389		CC221390		CC221391		CC221392		CC221393	
Sieve Size:				400		400		400		400		400	
Subsample proportion:				5		5		6		7		5	
Arthropoda (Hexapoda)	Trichoptera	-	-	0	-	4	-	6	-	2	-	2	-
		Apataniidae	*Apatania* sp.	2	-	0	-	0	-	1	-	8	-
		Brachycentridae	-	0	-	0	-	0	-	0	-	0	-
			Brachycentrus sp.	6	-	0	-	0	-	0	-	0	-
			Micrasema sp.	2	-	0	-	0	-	0	-	0	-
		Glossosomatidae	-	0	-	0	-	0	-	0	-	1	ND
			Glossosoma sp.	7	-	0	-	0	-	1	-	13	-
		Hydropsychidae	-	1	-	4	-	1	-	3	-	2	-
			Arctopsyche sp.	0	-	0	-	0	-	0	-	0	-
			Hydropsyche sp.	0	-	0	-	0	-	0	-	0	-
			Parapsyche sp.	0	-	0	-	0	-	0	-	2	-
			Parapsyche elsis	0	-	3	-	0	-	1	-	0	-
		Hydroptilidae	-	0	-	0	-	0	-	0	-	0	-
			Hydroptila sp.	0	-	0	-	0	-	0	-	0	-
			Metrichia sp.	0	-	0	-	0	-	0	-	0	-
		Limnephilidae	-	0	-	0	-	0	-	0	-	0	-
		Rhyacophilidae	*Rhyacophila* sp.	32	-	0	-	0	-	0	-	1	-
			Rhyacophila betteni group	0	-	1	-	0	-	0	-	1	-
			Rhyacophila brunnea/vemna sp. group	1	-	1	-	0	-	1	-	0	-
			Rhyacophila hyalinata group	0	-	0	-	0	-	0	-	0	-
			Rhyacophila vofixa group	0	-	0	-	0	-	0	-	1	-
			Rhyacophila atrata complex	0	-	0	-	0	-	0	-	2	-
			Rhyacophila narvae	0	-	0	-	0	-	0	-	0	-
		-	-	0	-	0	-	0	-	0	-	0	-
		Thremmatidae	*Oligophlebodes* sp.	4	-	0	-	1	-	0	-	26	-
	Coleoptera	Elmidae	-	1	-	0	-	0	-	0	-	0	-
			Heterlimnius sp.	9	-	0	-	0	-	0	-	6	-
		Staphylinidae	-	0	-	0	-	0	-	0	-	0	-
	Diptera	Ceratopogonidae	*Bezzia* sp./ *Palpomyia* sp.	1	-	0	-	0	-	0	-	0	-
			Mallochohelea sp.	0	-	1	-	0	-	0	-	0	-
		Chironomidae (Chironominae/Chironomini)	-	7	ND	8	ND	7	ND	15	ND	5	ND
			Polypedilum sp.	1	-	0	-	0	-	0	-	1	-
			Stictochironomus sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Chironominae/Tanytarsini)	-	0	-	0	-	0	-	0	-	0	-
			Constempellina sp.	0	-	0	-	0	-	0	-	0	-
			Micropsectra sp.	0	-	0	-	0	-	0	-	0	-
			Stempellinella sp.	0	-	1	-	0	-	0	-	0	-
			Tanytarsus sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Diamesinae/Diamesini)	*Diamesa* sp.	0	-	11	-	9	-	18	-	1	-
			Pagastia sp.	0	-	3	-	0	-	2	-	2	-
			Pseudodiamesa sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Orthocladiinae)	-	1	ND	0	-	0	-	0	-	1	-
			Brillia sp.	0	-	0	-	0	-	0	-	0	-
			Cricotopus sp. (*Nostococladius* sp.)	8	-	0	-	0	-	0	-	0	-
			Eukiefferiella sp.	18	-	7	-	5	-	5	-	21	-
			Hydrobaenus sp.	0	-	0	-	0	-	0	-	0	-
			Orthocladius sp. complex	12	-	31	-	24	-	37	-	53	-
			Orthocladius lignicola	0	-	0	-	0	-	0	-	0	-
			Parametriocnemus sp.	0	-	0	-	0	-	0	-	0	-
			Parorthocladius sp.	0	-	0	-	0	-	0	-	0	-
			Rheocricotopus sp.	1	-	4	-	3	-	3	-	0	-
			Thienemanniella sp.	2	-	0	-	0	-	0	-	0	-
			Tvetenia sp.	12	-	1	-	0	-	1	-	2	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				RG_LE1_BIC-3_2021-09-14		RG_AGCK_BIC-1_2021-09-11		RG_AGCK_BIC-2_2021-09-11		RG_AGCK_BIC-3_2021-09-11		RG_MIDAG_BIC-1_2021-09-11	
Sample Collection Date:				14-Sep-21		11-Sep-21		11-Sep-21		11-Sep-21		11-Sep-21	
Chain of Custody Identification Number:				CC221389		CC221390		CC221391		CC221392		CC221393	
Sieve Size:				400		400		400		400		400	
Subsample proportion:				5		5		6		7		5	
Arthropoda (Hexapoda)	Diptera	Chironomidae (Tanypodinae/Pentaneurini)	*Thienemannimyia* sp. group	1	-	0	-	0	-	0	-	0	-
		Empididae	-	0	-	0	-	0	-	0	-	0	-
			Chelifera sp./ *Metachela* sp.	0	-	0	-	0	-	0	-	0	-
			Clinocera sp.	0	-	0	-	0	-	0	-	0	-
			Neoplasta sp.	0	-	0	-	0	-	0	-	0	-
			Roederiodes sp.	0	-	0	-	0	-	0	-	0	-
			Trichoclinocera sp.	0	-	1	-	0	-	0	-	0	-
			Wiedemannia sp.	0	-	0	-	0	-	0	-	0	-
		Limoniidae	*Eloeophila* sp.	0	-	0	-	0	-	0	-	0	-
		Pelecorhynchidae	*Glutops* sp.	0	-	0	-	0	-	0	-	0	-
		Psychodidae	*Pericoma* sp./ *Telmatoscopus* sp.	6	-	5	-	0	-	1	-	63	-
		Simuliidae	-	0	-	0	-	0	-	0	-	0	-
			Simulium sp.	6	-	1	-	0	-	0	-	3	-
		Stratiomyidae	-	0	-	0	-	0	-	0	-	0	-
		Tipulidae	-	0	-	0	-	0	-	0	-	0	-
			Antocha sp.	1	-	0	-	0	-	0	-	0	-
			Dicranota sp.	1	-	0	-	0	-	0	-	0	-
			Hexatoma sp.	0	-	0	-	0	-	0	-	0	-
			Tipula sp.	0	-	0	-	0	-	0	-	0	-
Arthropoda (Chelicerata)	Trombidiformes	Aturidae	*Aturus* sp.	0	-	0	-	0	-	0	-	0	-
		Hydryphantidae	*Protzia* sp.	1	-	0	-	0	-	0	-	0	-
		Hygrobatidae	*Atractides* sp.	0	-	0	-	0	-	0	-	0	-
			Hygrobates sp.	0	-	0	-	0	-	0	-	0	-
		Lebertiidae	*Lebertia* sp.	2	-	0	-	1	-	2	-	7	-
		Sperchontidae	*Sperchon* sp.	1	-	0	-	2	-	3	-	1	-
		Torrenticolidae	*Testudacarus* sp.	2	-	0	-	0	-	0	-	0	-
			Torrenticola sp.	0	-	0	-	0	-	0	-	0	-
	Oribatida		-	0	-	0	-	0	-	0	-	0	-
Annelida (Clitelata)	Lumbriculida	Lumbriculidae	-	0	-	0	-	0	-	0	-	0	-
			Rhynchelmis sp.	0	-	0	-	0	-	0	-	0	-
	Tubificida	Enchytraeidae	-	0	-	0	-	0	-	0	-	0	-
			Enchytraeus sp.	0	-	0	-	0	-	0	-	1	-
		Naididae	-	0	-	0	-	0	-	0	-	0	-
			Chaetogaster sp.	0	-	0	-	0	-	0	-	0	-
			Nais sp.	0	-	0	-	0	-	0	-	0	-
			Pristina sp.	0	-	0	-	0	-	0	-	0	-
		Naididae (Subfamily: Tubificinae without hair chaetae)		0	-	0	-	0	-	0	-	0	-
Arthropoda (Crustacea)	Class: Ostracoda	-	-	0	-	0	-	0	-	0	-	1	-
	Class: Copepoda	-	-	0	-	0	-	0	-	0	-	0	-
Nemata	-	-	-	0	-	0	-	0	-	0	-	1	-
Platyhelminthes	Class: Turbellaria	-	-	0	-	1	-	1	-	0	-	1	-
Total Benthic Invertebrate Abundance:				**604**	-	**418**	-	**351**	-	**396**	-	**597**	-

Note: Grey cells represent taxa that were present in the samples but were not included in the calculations because they are non-benthic taxa. The ND designation represents a non-distinct taxa.
-"= no data; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.
Samples collected by Minnow Environmental (BC) and submitted to Cordillera Consulting Inc. for taxonomic identification and enumeration. Taxonomist contact information: Scott Finlayson; scottfinlayson@cordilleraconsulting.ca; +1-250-494-7553.

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				RG_MIDAG_BIC-2_2021-09-11		RG_MIDAG_BIC-3_2021-09-11		RG_MI5_BIC-1_2021-09-15		RG_CORCK_BIC-1_2021-09-15		RG_CORCK_BIC-2_2021-09-15	
Sample Collection Date:				11-Sep-21		11-Sep-21		15-Sep-21		15-Sep-21		15-Sep-21	
Chain of Custody Identification Number:				CC221394		CC221395		CC221396		CC221397		CC221398	
Sieve Size:				400		400		400		400		400	
Subsample proportion:				5		10		100		5		5	
Phylum (sub-phylum)	**Order/Class**	**Family (sub-family/tribe)**	**Genus/Species**										
Arthropoda	Collembola	-	-	0	-	0	-	0	-	0	-	0	-
		Hypogastruridae	-	0	-	0	-	0	-	0	-	0	-
Arthropoda (Hexapoda)	Ephermeroptera	Ameletidae	*Ameletus* sp.	0	-	0	-	0	-	0	-	0	-
		Baetidae	-	16	ND	15	ND	0	-	0	-	0	-
			Acentrella sp.	0	-	0	-	0	-	0	-	0	-
			Baetis sp.	3	ND	4	ND	0	-	0	-	0	-
			Baetis fuscatus group	1	-	0	-	0	-	0	-	0	-
			Baetis rhodani group	106	-	60	-	3	-	1	-	0	-
			Baetis bicaudatus	1	-	2	-	0	-	0	-	0	-
		Ephemerellidae	-	51	ND	73	ND	2	-	0	-	0	-
			Caudatella sp.	0	-	1	-	0	-	0	-	0	-
			Drunella sp.	0	-	0	-	0	-	0	-	0	-
			Drunella grandis group	0	-	0	-	0	-	0	-	0	-
			Drunella coloradensis	0	-	0	-	0	-	0	-	0	-
			Drunella doddsii	9	-	12	-	1	-	0	-	0	-
			Drunella spinifera	0	-	0	-	0	-	0	-	0	-
			Ephemerella sp.	2	-	1	-	0	-	0	-	0	-
			Ephemerella tibialis	0	-	0	-	0	-	0	-	0	-
		Heptageniidae	-	6	-	2	-	0	-	1	-	1	-
			Cinygmula sp.	23	-	33	-	0	-	0	-	0	-
			Epeorus sp.	2	-	1	-	0	-	0	-	0	-
			Rhithrogena sp.	10	-	4	-	0	-	0	-	0	-
		Leptophlebiidae	-	0	-	0	-	0	-	0	-	0	-
			Neoleptophlebia sp.	0	-	0	-	0	-	0	-	0	-
	Plecoptera	-	-	0	-	0	-	0	-	0	-	0	-
		Capniidae	-	1	-	3	-	0	-	1	-	1	-
		Chloroperlidae	-	0	-	1	-	0	-	0	-	1	-
			Haploperla sp.	0	-	1	-	0	-	0	-	0	-
			Plumiperla sp.	0	-	0	-	0	-	0	-	0	-
			Sweltsa sp.	2	-	0	-	1	-	0	-	0	-
		Leuctridae	-	3	-	3	-	0	-	0	-	0	-
			Paraleuctra sp.	0	-	0	-	0	-	0	-	0	-
		Nemouridae	-	1	ND	0	-	0	-	3	ND	2	ND
			Malenka sp.	0	-	0	-	0	-	5	-	4	-
			Visoka cataractae	0	-	0	-	0	-	0	-	0	-
			Zapada sp.	14	-	13	-	0	-	1	-	3	-
			Zapada oregonensis group	3	-	0	-	0	-	0	-	0	-
			Zapada cinctipes	5	-	9	-	1	-	35	-	86	-
			Zapada columbiana	0	-	0	-	0	-	0	-	0	-
		Peltoperlidae	*Yoraperla* sp.	0	-	0	-	0	-	0	-	0	-
		Perlidae	-	2	-	3	ND	0	-	0	-	0	-
			Doroneuria sp.	0	-	1	-	0	-	0	-	0	-
		Perlodidae	-	1	ND	0	-	0	-	0	-	0	-
			Kogotus sp.	2	-	2	-	0	-	0	-	4	-
			Megarcys sp.	0	-	1	-	0	-	0	-	0	-
			Skwala sp.	1	-	0	-	0	-	0	-	0	-
		Taeniopterygidae	-	27	-	22	-	4	-	0	-	5	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MIDAG_BIC-2_2021-09-11**		**RG_MIDAG_BIC-3_2021-09-11**		**RG_MI5_BIC-1_2021-09-15**		**RG_CORCK_BIC-1_2021-09-15**		**RG_CORCK_BIC-2_2021-09-15**	
Sample Collection Date:				**11-Sep-21**		**11-Sep-21**		**15-Sep-21**		**15-Sep-21**		**15-Sep-21**	
Chain of Custody Identification Number:				**CC221394**		**CC221395**		**CC221396**		**CC221397**		**CC221398**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**10**		**100**		**5**		**5**	
Arthropoda (Hexapoda)	Trichoptera	-	-	1	ND	1	ND	0	-	2	-	1	-
		Apataniidae	*Apatania* sp.	10	-	4	-	0	-	0	-	0	-
		Brachycentridae	-	0	-	0	-	0	-	2	ND	1	ND
			Brachycentrus sp.	0	-	0	-	0	-	1	-	0	-
			Micrasema sp.	0	-	0	-	0	-	8	-	13	-
		Glossosomatidae	-	2	ND	0	-	0	-	0	-	0	-
			Glossosoma sp.	18	-	7	-	0	-	0	-	0	-
		Hydropsychidae	-	1	-	0	-	0	-	0	-	0	-
			Arctopsyche sp.	0	-	0	-	0	-	0	-	0	-
			Hydropsyche sp.	0	-	0	-	0	-	1	-	0	-
			Parapsyche sp.	2	-	1	-	0	-	0	-	0	-
			Parapsyche elsis	0	-	0	-	0	-	0	-	0	-
		Hydroptilidae	-	0	-	0	-	0	-	2	ND	0	-
			Hydroptila sp.	0	-	0	-	0	-	29	-	12	-
			Metrichia sp.	0	-	0	-	0	-	0	-	0	-
		Limnephilidae	-	0	-	0	-	0	-	2	-	1	-
		Rhyacophilidae	*Rhyacophila* sp.	5	-	2	-	4	-	6	-	4	-
			Rhyacophila betteni group	0	-	0	-	1	-	0	-	0	-
			Rhyacophila brunnea/vemna sp. group	3	-	0	-	0	-	0	-	5	-
			Rhyacophila hyalinata group	1	-	0	-	0	-	0	-	0	-
			Rhyacophila vofixa group	0	-	0	-	0	-	0	-	0	-
			Rhyacophila atrata complex	2	-	2	-	0	-	0	-	0	-
			Rhyacophila narvae	0	-	0	-	0	-	0	-	0	-
		-	-	0	-	0		0	-	0	-	0	-
		Thremmatidae	*Oligophlebodes* sp.	28	-	24		0	-	0	-	0	-
	Coleoptera	Elmidae	-	0	-	1	ND	1	-	0	-	0	-
			Heterlimnius sp.	3	-	3	-	0	-	2	-	2	-
		Staphylinidae	-	0	-	0	-	0	-	1	-	0	-
	Diptera	Ceratopogonidae	*Bezzia* sp./ *Palpomyia* sp.	0	-	0	-	0	-	0	-	0	-
			Mallochohelea sp.	1	-	0	-	0	-	0	-	0	-
		Chironomidae (Chironominae/Chironomini)	-	4	ND	2	ND	1	-	28	ND	25	ND
			Polypedilum sp.	0	-	0	-	0	-	0	-	0	-
			Stictochironomus sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Chironominae/Tanytarsini)	-	0	-	0	-	0	-	1	ND	0	-
			Constempellina sp.	0	-	0	-	0	-	0	-	0	-
			Micropsectra sp.	0	-	0	-	0	-	49	-	42	-
			Stempellinella sp.	0	-	0	-	0	-	0	-	0	-
			Tanytarsus sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Diamesinae/Diamesini)	*Diamesa* sp.	1	-	1	-	0	-	0	-	0	-
			Pagastia sp.	1	-	0	-	0	-	79	-	113	-
			Pseudodiamesa sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Orthocladiinae)	-	0	-	0	-	0	-	0	-	0	-
			Brillia sp.	0	-	0	-	0	-	0	-	0	-
			Cricotopus sp. (*Nostococladius* sp.)	0	-	0	-	0	-	0	-	0	-
			Eukiefferiella sp.	13	-	2	-	0	-	14	-	26	-
			Hydrobaenus sp.	0	-	0	-	0	-	0	-	0	-
			Orthocladius sp. complex	48	-	6	-	0	-	57	-	90	-
			Orthocladius lignicola	0	-	0	-	0	-	0	-	0	-
			Parametriocnemus sp.	0	-	0	-	0	-	0	-	0	-
			Parorthocladius sp.	0	-	0	-	0	-	0	-	0	-
			Rheocricotopus sp.	0	-	0	-	0	-	0	-	0	-
			Thienemanniella sp.	0	-	0	-	0	-	0	-	0	-
			Tvetenia sp.	1	-	1	-	0	-	2	-	0	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MIDAG_BIC-2_2021-09-11**		**RG_MIDAG_BIC-3_2021-09-11**		**RG_MI5_BIC-1_2021-09-15**		**RG_CORCK_BIC-1_2021-09-15**		**RG_CORCK_BIC-2_2021-09-15**	
Sample Collection Date:				**11-Sep-21**		**11-Sep-21**		**15-Sep-21**		**15-Sep-21**		**15-Sep-21**	
Chain of Custody Identification Number:				**CC221394**		**CC221395**		**CC221396**		**CC221397**		**CC221398**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**10**		**100**		**5**		**5**	
Arthropoda (Hexapoda)	Diptera	Chironomidae (Tanypodinae/Pentaneurini)	*Thienemannimyia* sp. group	1	-	1	-	0	-	6	-	1	-
		Empididae	-	0	-	0	-	0	-	0	-	0	-
			Chelifera sp./ *Metachela* sp.	0	-	1	-	0	-	0	-	0	-
			Clinocera sp.	0	-	0	-	0	-	0	-	1	-
			Neoplasta sp.	0	-	0	-	0	-	2	-	5	-
			Roederiodes sp.	0	-	0	-	0	-	0	-	0	-
			Trichoclinocera sp.	1	-	0	-	0	-	0	-	1	-
			Wiedemannia sp.	0	-	0	-	0	-	0	-	0	-
		Limoniidae	*Eloeophila* sp.	0	-	0	-	0	-	0	-	1	-
		Pelecorhynchidae	*Glutops* sp.	0	-	0	-	0	-	6	-	1	-
		Psychodidae	*Pericoma* sp./ *Telmatoscopus* sp.	77	-	56	-	0	-	74	-	83	-
		Simuliidae	-	0	-	0	-	1	-	1	-	0	-
			Simulium sp.	2	-	0	-	0	-	2	-	4	-
		Stratiomyidae	-	0	-	0	-	0	-	0	-	1	-
		Tipulidae	-	0	-	0	-	0	-	1	ND	0	-
			Antocha sp.	0	-	0	-	0	-	1	-	3	-
			Dicranota sp.	1	-	2	-	0	-	0	-	0	-
			Hexatoma sp.	0	-	0	-	0	-	0	-	0	-
			Tipula sp.	0	-	0	-	0	-	0	-	0	-
Arthropoda (Chelicerata)	Trombidiformes	Aturidae	*Aturus* sp.	0	-	0	-	0	-	5	-	4	-
		Hydryphantidae	*Protzia* sp.	0	-	0	-	2	-	0	-	0	-
		Hygrobatidae	*Atractides* sp.	0	-	0	-	0	-	0	-	0	-
			Hygrobates sp.	0	-	0	-	0	-	0	-	0	-
		Lebertiidae	*Lebertia* sp.	13	-	5	-	2	-	4	-	4	-
		Sperchontidae	*Sperchon* sp.	8	-	5	-	3	-	0	-	2	-
		Torrenticolidae	*Testudacarus* sp.	0	-	0	-	3	-	0	-	0	-
			Torrenticola sp.	0	-	0	-	1	-	0	-	0	-
	Oribatida		-	0	-	0	-	0	-	0	-	0	-
Annelida (Clitelata)	Lumbriculida	Lumbriculidae	-	0	-	0	-	0	-	0	-	0	-
			Rhynchelmis sp.	0	-	0	-	0	-	0	-	0	-
	Tubificida	Enchytraeidae	-	0	-	0	-	0	-	1	ND	11	ND
			Enchytraeus sp.	0	-	0	-	0	-	8	-	90	-
		Naididae	-	0	-	0	-	0	-	0	-	0	-
			Chaetogaster sp.	0	-	0	-	0	-	0	-	0	-
			Nais sp.	0	-	0	-	0	-	0	-	0	-
			Pristina sp.	0	-	0	-	0	-	0	-	0	-
		Naididae (Subfamily: Tubificinae without hair chaetae)		0	-	0	-	0	-	0	-	0	-
Arthropoda (Crustacea)	Class: Ostracoda	-	-	1	-	0	-	1	-	1	-	1	-
	Class: Copepoda	-	-	0	-	0	-	0	-	1	-	0	-
Nemata	-	-	-	0	-	1	-	0	-	0	-	1	-
Platyhelminthes	Class: Turbellaria	-	-	1	-	1	-	1	-	1	-	1	-
Total Benthic Invertebrate Abundance:				**540**	-	**394**	-	**31**	-	**444**	-	**654**	-

Note: Grey cells represent taxa that were present in the samples but were not included in the calculations because they are non-benthic taxa. The ND designation represents a
-"= no data; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.
Samples collected by Minnow Environmental (BC) and submitted to Cordillera Consulting Inc. for taxonomic identification and enumeration. Taxonomist contact information: Sc

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				RG_CORCK_BIC-3_2021-09-15		RG_MIULE_BIC-1_2021-09-14		RG_MIULE_BIC-2_2021-09-14		RG_MIULE_BIC-3_2021-09-14		RG_MI25_BIC-1_2021-09-13	
Sample Collection Date:				15-Sep-21		14-Sep-21		14-Sep-21		14-Sep-21		13-Sep-21	
Chain of Custody Identification Number:				CC221399		CC221400		CC221401		CC221402		CC221403	
Sieve Size:				400		400		400		400		400	
Subsample proportion:				5		5		5		5		5	
Phylum (sub-phylum)	**Order/Class**	**Family (sub-family/tribe)**	**Genus/Species**										
Arthropoda	Collembola	-	-	0	-	0	-	0	-	0	-	0	-
		Hypogastruridae	-	0	-	0	-	0	-	0	-	0	-
Arthropoda (Hexapoda)	Ephermeroptera	Ameletidae	*Ameletus* sp.	0	-	0	-	0	-	0	-	2	-
		Baetidae	-	0	-	90	ND	52	ND	41	ND	250	-
			Acentrella sp.	0	-	0	-	0	-	0	-	0	-
			Baetis sp.	0	-	2	ND	14	ND	5	-	0	-
			Baetis fuscatus group	0	-	0	-	0	-	0	-	0	-
			Baetis rhodani group	0	-	82	-	124	-	125	-	1	-
			Baetis bicaudatus	0	-	2	-	1	-	0	-	0	-
		Ephemerellidae	-	0	-	35	ND	24	ND	18	ND	18	ND
			Caudatella sp.	0	-	1	-	3	-	2	-	0	-
			Drunella sp.	0	-	1	ND	0	-	0	-	0	-
			Drunella grandis group	0	-	1	-	0	-	1	-	0	-
			Drunella coloradensis	0	-	0	-	0	-	0	-	0	-
			Drunella doddsii	0	-	21	-	21	-	21	-	2	-
			Drunella spinifera	0	-	0	-	0	-	0	-	0	-
			Ephemerella sp.	0	-	4	-	2	-	8	-	3	-
			Ephemerella tibialis	0	-	0	-	0	-	1	-	0	-
		Heptageniidae	-	0	-	4	-	6	-	2	-	4	-
			Cinygmula sp.	0	-	11	-	7	-	7	-	66	-
			Epeorus sp.	0	-	0	-	0	-	0	-	1	-
			Rhithrogena sp.	0	-	9	-	9	-	6	-	0	-
		Leptophlebiidae	-	0	-	0	-	0	-	0	-	0	-
			Neoleptophlebia sp.	0	-	0	-	0	-	0	-	0	-
	Plecoptera	-	-	0	-	0	-	0	-	0	-	0	-
		Capniidae	-	0	-	1	-	0	-	1	-	0	-
		Chloroperlidae	-	0	-	1	-	2	-	0	-	1	ND
			Haploperla sp.	0	-	0	-	0	-	2	-	0	-
			Plumiperla sp.	0	-	0	-	0	-	0	-	0	-
			Sweltsa sp.	0	-	1	-	0	-	0	-	13	-
		Leuctridae	-	0	-	4	-	2	-	3	-	0	-
			Paraleuctra sp.	0	-	0	-	0	-	0	-	4	-
		Nemouridae	-	2	ND	1	ND	1	ND	1	ND	0	-
			Malenka sp.	2	-	0	-	0	-	0	-	0	-
			Visoka cataractae	0	-	0	-	0	-	0	-	4	-
			Zapada sp.	2	-	34	ND	28	-	11	ND	38	-
			Zapada oregonensis group	0	-	1	-	1	-	1	-	12	-
			Zapada cinctipes	45	-	57	-	30	-	34	-	0	-
			Zapada columbiana	0	-	2	-	0	-	1	-	7	-
		Peltoperlidae	*Yoraperla* sp.	0	-	0	-	0	-	0	-	0	-
		Perlidae	-	0	-	1	-	0	-	2	-	2	-
			Doroneuria sp.	0	-	0	-	2	-	0	-	0	-
		Perlodidae	-	0	-	0	-	0	-	0	-	3	-
			Kogotus sp.	3	-	0	-	2	-	5	-	1	-
			Megarcys sp.	0	-	0	-	0	-	0	-	1	-
			Skwala sp.	0	-	0	-	0	-	0	-	0	-
		Taeniopterygidae	-	0	-	54	-	31	-	34	-	54	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_CORCK_BIC-3_2021-09-15**		**RG_MIULE_BIC-1_2021-09-14**		**RG_MIULE_BIC-2_2021-09-14**		**RG_MIULE_BIC-3_2021-09-14**		**RG_MI25_BIC-1_2021-09-13**	
Sample Collection Date:				**15-Sep-21**		**14-Sep-21**		**14-Sep-21**		**14-Sep-21**		**13-Sep-21**	
Chain of Custody Identification Number:				**CC221399**		**CC221400**		**CC221401**		**CC221402**		**CC221403**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**5**		**5**		**5**		**5**	
Arthropoda (Hexapoda)	Trichoptera	-	-	0	-	0	-	0	-	0	-	1	-
		Apataniidae	*Apatania* sp.	0	-	3	-	2	-	5	-	0	-
		Brachycentridae	-	0	-	0	-	0	-	0	-	0	-
			Brachycentrus sp.	0	-	0	-	0	-	0	-	0	-
			Micrasema sp.	3	-	0	-	3	-	0	-	0	-
		Glossosomatidae	-	0	-	0	-	0	-	1	ND	0	-
			Glossosoma sp.	0	-	5	-	3	-	8	-	0	-
		Hydropsychidae	-	0	-	0	-	0	-	0	-	3	ND
			Arctopsyche sp.	0	-	0	-	0	-	0	-	0	-
			Hydropsyche sp.	0	-	0	-	0	-	0	-	0	-
			Parapsyche sp.	0	-	1	-	0	-	1	-	5	-
			Parapsyche elsis	0	-	0	-	1	-	0	-	0	-
		Hydroptilidae	-	0	-	1	-	0	-	0	-	0	-
			Hydroptila sp.	14	-	0	-	0	-	0	-	0	-
			Metrichia sp.	0	-	0	-	0	-	0	-	0	-
		Limnephilidae	-	0	-	0	-	0	-	0	-	0	-
		Rhyacophilidae	*Rhyacophila* sp.	2	-	37	-	39	-	34	-	32	-
			Rhyacophila betteni group	0	-	0	-	0	-	0	-	2	-
			Rhyacophila brunnea/vemna sp. group	5	-	7	-	4	-	5	-	3	-
			Rhyacophila hyalinata group	0	-	0	-	0	-	0	-	2	-
			Rhyacophila vofixa group	0	-	0	-	0	-	0	-	1	-
			Rhyacophila atrata complex	0	-	1	-	0	-	1	-	2	-
			Rhyacophila narvae	0	-	0	-	0	-	1	-	28	-
		-	-	0	-	0	-	0	-	0	-	0	-
		Thremmatidae	*Oligophlebodes* sp.	0	-	1	-	5	-	7	-	0	-
	Coleoptera	Elmidae	-	0	-	0	-	0	-	0	-	0	-
			Heterlimnius sp.	0	-	5	-	5	-	11	-	4	-
		Staphylinidae	-	0	-	0	-	0	-	0	-	0	-
	Diptera	Ceratopogonidae	*Bezzia* sp./ *Palpomyia* sp.	0	-	0	-	0	-	0	-	0	-
			Mallochohelea sp.	0	-	1	-	0	-	0	-	1	-
		Chironomidae (Chironominae/Chironomini)	-	28	ND	5	ND	10	ND	12	ND	2	ND
			Polypedilum sp.	0	-	0	-	0	-	0	-	0	-
			Stictochironomus sp.	0	-	1	-	0	-	0	-	0	-
		Chironomidae (Chironominae/Tanytarsini)	-	0	-	0	-	0	-	0	-	0	-
			Constempellina sp.	0	-	0	-	0	-	0	-	0	-
			Micropsectra sp.	9	-	2	-	0	-	1	-	1	-
			Stempellinella sp.	0	-	0	-	0	-	0	-	0	-
			Tanytarsus sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Diamesinae/Diamesini)	*Diamesa* sp.	0	-	0	-	1	-	0	-	0	-
			Pagastia sp.	97	-	1	-	1	-	1	-	7	-
			Pseudodiamesa sp.	0	-	0	-	0	-	0	-	0	-
		Chironomidae (Orthocladiinae)	-	0	-	0	-	0	-	0	-	0	-
			Brillia sp.	0	-	0	-	0	-	0	-	4	-
			Cricotopus sp. (*Nostococladius* sp.)	0	-	0	-	0	-	0	-	23	-
			Eukiefferiella sp.	36	-	9	-	14	-	11	-	3	-
			Hydrobaenus sp.	0	-	1	-	0	-	0	-	0	-
			Orthocladius sp. complex	76	-	13	-	11	-	4	-	7	-
			Orthocladius lignicola	0	-	0	-	0	-	0	-	1	-
			Parametriocnemus sp.	0	-	0	-	0	-	0	-	0	-
			Parorthocladius sp.	0	-	0	-	0	-	0	-	1	-
			Rheocricotopus sp.	0	-	0	-	0	-	0	-	0	-
			Thienemanniella sp.	0	-	0	-	0	-	0	-	0	-
			Tvetenia sp.	1	-	3	-	1	-	1	-	0	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_CORCK_BIC-3_2021-09-15**		**RG_MIULE_BIC-1_2021-09-14**		**RG_MIULE_BIC-2_2021-09-14**		**RG_MIULE_BIC-3_2021-09-14**		**RG_MI25_BIC-1_2021-09-13**	
Sample Collection Date:				**15-Sep-21**		**14-Sep-21**		**14-Sep-21**		**14-Sep-21**		**13-Sep-21**	
Chain of Custody Identification Number:				**CC221399**		**CC221400**		**CC221401**		**CC221402**		**CC221403**	
Sieve Size:				**400**		**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**5**		**5**		**5**		**5**	
Arthropoda (Hexapoda)	Diptera	Chironomidae (Tanypodinae/Pentaneurini)	*Thienemannimyia* sp. group	0	-	5	-	1	-	1	-	0	-
		Empididae	-	0	-	0	-	0	-	0	-	0	-
			Chelifera sp./ *Metachela* sp.	0	-	0	-	1	-	0	-	1	-
			Clinocera sp.	0	-	0	-	0	-	0	-	0	-
			Neoplasta sp.	1	-	0	-	0	-	0	-	1	-
			Roederiodes sp.	0	-	2	-	0	-	0	-	0	-
			Trichoclinocera sp.	1	-	0	-	0	-	0	-	0	-
			Wiedemannia sp.	0	-	0	-	1	-	0	-	0	-
		Limoniidae	*Eloeophila* sp.	0	-	0	-	0	-	0	-	0	-
		Pelecorhynchidae	*Glutops* sp.	0	-	0	-	0	-	0	-	0	-
		Psychodidae	*Pericoma* sp./ *Telmatoscopus* sp.	41	-	59	-	45	-	52	-	5	-
		Simuliidae	-	0	-	7	-	3	-	0	-	0	-
			Simulium sp.	8	-	7	-	7	-	9	-	0	-
		Stratiomyidae	-	0	-	0	-	0	-	0	-	0	-
		Tipulidae	-	0	-	0	-	1	-	0	-	0	-
			Antocha sp.	0	-	0	-	1	-	0	-	0	-
			Dicranota sp.	0	-	2	-	0	-	0	-	1	-
			Hexatoma sp.	0	-	0	-	1	-	0	-	0	-
			Tipula sp.	0	-	0	-	0	-	0	-	0	-
Arthropoda (Chelicerata)	Trombidiformes	Aturidae	*Aturus* sp.	3	-	0	-	0	-	0	-	0	-
		Hydryphantidae	*Protzia* sp.	0	-	0	-	0	-	0	-	0	-
		Hygrobatidae	*Atractides* sp.	0	-	0	-	0	-	0	-	1	-
			Hygrobates sp.	0	-	0	-	0	-	0	-	0	-
		Lebertiidae	*Lebertia* sp.	1	-	6	-	3	-	5	-	0	-
		Sperchontidae	*Sperchon* sp.	0	-	1	-	3	-	1	-	0	-
		Torrenticolidae	*Testudacarus* sp.	0	-	0	-	0	-	0	-	0	-
			Torrenticola sp.	0	-	0	-	0	-	1	-	0	-
	Oribatida		-	0	-	0	-	0	-	1	-	0	-
Annelida (Clitelata)	Lumbriculida	Lumbriculidae	-	0	-	0	-	0	-	0	-	0	-
			Rhynchelmis sp.	0	-	0	-	0	-	0	-	0	-
	Tubificida	Enchytraeidae	-	8	ND	0	-	0	-	0	-	0	-
			Enchytraeus sp.	65	-	0	-	0	-	0	-	0	-
		Naididae	-	0	-	0	-	0	-	0	-	0	-
			Chaetogaster sp.	0	-	0	-	0	-	0	-	0	-
			Nais sp.	0	-	6	-	0	-	0	-	0	-
			Pristina sp.	0	-	0	-	0	-	0	-	0	-
		Naididae (Subfamily: Tubificinae without hair chaetae)		0	-	0	-	0	-	0	-	2	-
Arthropoda (Crustacea)	Class: Ostracoda	-	-	1	-	1	-	0	-	1	-	1	-
	Class: Copepoda	-	-	0	-	0	-	0	-	0	-	0	-
Nemata	-	-	-	0	-	1	-	0	-	1	-	1	-
Platyhelminthes	Class: Turbellaria	-	-	1	-	1	-	1	-	0	-	1	-
Total Benthic Invertebrate Abundance:				**453**	-	**612**	-	**529**	-	**506**	-	**631**	-

Note: Grey cells represent taxa that were present in the samples but were not included in the calculations because they are non-benthic taxa. The ND designation represents a
-"= no data; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.
Samples collected by Minnow Environmental (BC) and submitted to Cordillera Consulting Inc. for taxonomic identification and enumeration. Taxonomist contact information: Sc

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MI25_BIC-2_2021-09-13**		**RG_MI25_BIC-3_2021-09-13**		**RG_M15_BIC-2_2021-09-16**		**RG_M15_BIC-3_2021-09-16**	
Sample Collection Date:				**13-Sep-21**		**13-Sep-21**		**16-Sep-21**		**16-Sep-21**	
Chain of Custody Identification Number:				**CC221404**		**CC221405**		**CC221406**		**CC221407**	
Sieve Size:				**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**5**		**5**		**5**	
Phylum (sub-phylum)	**Order/Class**	**Family (sub-family/tribe)**	**Genus/Species**								
Arthropoda	Collembola	-	-	1	-	0	-	0	-	0	-
		Hypogastruridae	-	0	-	0	-	0	-	0	-
Arthropoda (Hexapoda)	Ephermeroptera	Ameletidae	*Ameletus* sp.	4	-	0	-	0	-	0	-
		Baetidae	-	227	-	105	-	193	ND	51	ND
			Acentrella sp.	0	-	0	-	0	-	0	-
			Baetis sp.	1	ND	1	-	7	-	5	-
			Baetis fuscatus group	0	-	0	-	0	-	0	-
			Baetis rhodani group	2	-	0	-	117	-	67	-
			Baetis bicaudatus	0	-	0	-	0	-	1	-
		Ephemerellidae	-	35	ND	19	-	54	ND	13	ND
			Caudatella sp.	0	-	0	-	0	-	0	-
			Drunella sp.	0	-	0	-	0	-	0	-
			Drunella grandis group	0	-	0	-	1	-	2	-
			Drunella coloradensis	0	-	0	-	0	-	0	-
			Drunella doddsii	1	-	0	-	38	-	12	-
			Drunella spinifera	0	-	0	-	0	-	0	-
			Ephemerella sp.	3	-	1	-	7	-	1	-
			Ephemerella tibialis	0	-	0	-	0	-	0	-
		Heptageniidae	-	4	-	4	-	4	-	1	-
			Cinygmula sp.	60	-	41	-	38	-	6	-
			Epeorus sp.	7	-	0	-	2	-	2	-
			Rhithrogena sp.	8	-	0	-	19	-	3	-
		Leptophlebiidae	-	0	-	0	-	0	-	0	-
			Neoleptophlebia sp.	0	-	0	-	0	-	0	-
	Plecoptera	-	-	0	-	0	-	0	-	0	-
		Capniidae	-	3	-	0	-	5	-	0	-
		Chloroperlidae	-	2	-	0	-	7	-	0	-
			Haploperla sp.	0	-	0	-	2	-	0	-
			Plumiperla sp.	0	-	0	-	0	-	0	-
			Sweltsa sp.	8	-	4	-	4	-	1	-
		Leuctridae	-	0	-	1	-	0	-	1	-
			Paraleuctra sp.	0	-	0	-	0	-	1	-
		Nemouridae	-	0	-	1	ND	1	ND	0	-
			Malenka sp.	0	-	0	-	0	-	0	-
			Visoka cataractae	2	-	1	-	0	-	0	-
			Zapada sp.	33	-	29	ND	38	ND	4	ND
			Zapada oregonensis group	22	-	10	-	11	-	2	-
			Zapada cinctipes	0	-	3	-	206	-	36	-
			Zapada columbiana	17	-	5	-	5	-	1	-
		Peltoperlidae	*Yoraperla* sp.	1	-	1	-	0	-	0	-
		Perlidae	-	7	-	1	ND	1	ND	0	-
			Doroneuria sp.	0	-	1	-	6	-	3	-
		Perlodidae	-	0	-	0	-	0	-	0	-
			Kogotus sp.	4	-	2	-	2	-	1	-
			Megarcys sp.	4	-	8	-	2	-	0	-
			Skwala sp.	0	-	0	-	0	-	0	-
		Taeniopterygidae	-	56	-	21	-	96	-	23	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MI25_BIC-2_2021-09-13**		**RG_MI25_BIC-3_2021-09-13**		**RG_M15_BIC-2_2021-09-16**		**RG_M15_BIC-3_2021-09-16**	
Sample Collection Date:				**13-Sep-21**		**13-Sep-21**		**16-Sep-21**		**16-Sep-21**	
Chain of Custody Identification Number:				**CC221404**		**CC221405**		**CC221406**		**CC221407**	
Sieve Size:				**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**5**		**5**		**5**	
Arthropoda (Hexapoda)	Trichoptera	-	-	2	-	0	-	0	-	0	-
		Apataniidae	*Apatania* sp.	0	-	0	-	6	-	6	-
		Brachycentridae	-	0	-	0	-	0	-	0	-
			Brachycentrus sp.	0	-	1	-	7	-	0	-
			Micrasema sp.	0	-	0	-	1	-	0	-
		Glossosomatidae	-	0	-	0	-	3	ND	5	ND
			Glossosoma sp.	0	-	0	-	63	-	18	-
		Hydropsychidae	-	3	ND	4	ND	0	-	0	-
			Arctopsyche sp.	0	-	0	-	9	-	6	-
			Hydropsyche sp.	0	-	0	-	0	-	0	-
			Parapsyche sp.	5	-	8	ND	0	-	0	-
			Parapsyche elsis	0	-	4	-	0	-	0	-
		Hydroptilidae	-	0	-	0	-	0	-	0	-
			Hydroptila sp.	0	-	0	-	0	-	0	-
			Metrichia sp.	0	-	0	-	0	-	0	-
		Limnephilidae	-	0	-	0	-	0	-	0	-
		Rhyacophilidae	*Rhyacophila* sp.	53	-	33	-	22	-	6	-
			Rhyacophila betteni group	1	-	4	-	0	-	0	-
			Rhyacophila brunnea/vemna sp. group	1	-	2	-	5	-	9	-
			Rhyacophila hyalinata group	0	-	3	-	0	-	0	-
			Rhyacophila vofixa group	1	-	3	-	0	-	0	-
			Rhyacophila atrata complex	2	-	0	-	0	-	0	-
			Rhyacophila narvae	20	-	5	-	0	-	1	-
		-	-	0	-	0	-	0	-	0	-
		Thremmatidae	*Oligophlebodes* sp.	0	-	0	-	2	-	3	-
	Coleoptera	Elmidae	-	0	-	0	-	0	-	0	-
			Heterlimnius sp.	2	-	0	-	14	-	1	-
		Staphylinidae	-	0	-	0	-	0	-	0	-
	Diptera	Ceratopogonidae	*Bezzia* sp./ *Palpomyia* sp.	0	-	0	-	1	-	0	-
			Mallochohelea sp.	0	-	0	-	1	-	0	-
		Chironomidae (Chironominae/Chironomini)	-	1	ND	4	ND	4	ND	0	-
			Polypedilum sp.	0	-	0	-	0	-	0	-
			Stictochironomus sp.	0	-	0	-	0	-	0	-
		Chironomidae (Chironominae/Tanytarsini)	-	0	-	0	-	0	-	0	-
			Constempellina sp.	0	-	0	-	0	-	0	-
			Micropsectra sp.	2	-	0	-	1	-	0	-
			Stempellinella sp.	0	-	0	-	0	-	0	-
			Tanytarsus sp.	0	-	0	-	0	-	0	-
		Chironomidae (Diamesinae/Diamesini)	*Diamesa* sp.	0	-	0	-	0	-	0	-
			Pagastia sp.	2	-	4	-	1	-	0	-
			Pseudodiamesa sp.	0	-	0	-	0	-	0	-
		Chironomidae (Orthocladiinae)	-	0	-	0	-	0	-	0	-
			Brillia sp.	2	-	1	-	0	-	0	-
			Cricotopus sp. (*Nostococladius* sp.)	35	-	19	-	0	-	0	-
			Eukiefferiella sp.	0	-	3	-	0	-	0	-
			Hydrobaenus sp.	0	-	0	-	0	-	0	-
			Orthocladius sp. complex	8	-	7	-	1	-	1	-
			Orthocladius lignicola	0	-	0	-	0	-	0	-
			Parametriocnemus sp.	0	-	1	-	0	-	0	-
			Parorthocladius sp.	2	-	0	-	0	-	0	-
			Rheocricotopus sp.	0	-	0	-	0	-	0	-
			Thienemanniella sp.	0	-	0	-	0	-	0	-
			Tvetenia sp.	0	-	0	-	4	-	0	-

Table J-1: Raw Benthic Invertebrate Community Abundance Data at CMm LAEMP Sampling Stations, 2021

Sample name:				**RG_MI25_BIC-2_2021-09-13**		**RG_MI25_BIC-3_2021-09-13**		**RG_M15_BIC-2_2021-09-16**		**RG_M15_BIC-3_2021-09-16**	
Sample Collection Date:				**13-Sep-21**		**13-Sep-21**		**16-Sep-21**		**16-Sep-21**	
Chain of Custody Identification Number:				**CC221404**		**CC221405**		**CC221406**		**CC221407**	
Sieve Size:				**400**		**400**		**400**		**400**	
Subsample proportion:				**5**		**5**		**5**		**5**	
Arthropoda (Hexapoda)	Diptera	Chironomidae (Tanypodinae/Pentaneurini)	*Thienemannimyia* sp. group	0	-	0	-	3	-	1	-
		Empididae	-	0	-	0	-	0	-	0	-
			Chelifera sp./ *Metachela* sp.	1	-	0	-	0	-	0	-
			Clinocera sp.	0	-	0	-	0	-	0	-
			Neoplasta sp.	0	-	0	-	0	-	0	-
			Roederiodes sp.	0	-	0	-	1	-	2	-
			Trichoclinocera sp.	0	-	0	-	0	-	0	-
			Wiedemannia sp.	0	-	0	-	0	-	0	-
		Limoniidae	*Eloeophila* sp.	0	-	0	-	0	-	0	-
		Pelecorhynchidae	*Glutops* sp.	0	-	0	-	0	-	0	-
		Psychodidae	*Pericoma* sp./ *Telmatoscopus* sp.	1	-	3	-	30	-	16	-
		Simuliidae	-	0	-	0	-	4	-	3	-
			Simulium sp.	0	-	0	-	24	-	13	-
		Stratiomyidae	-	0	-	0	-	0	-	0	-
		Tipulidae	-	0	-	0	-	0	-	0	-
			Antocha sp.	0	-	0	-	0	-	0	-
			Dicranota sp.	0	-	0	-	2	-	1	-
			Hexatoma sp.	0	-	0	-	4	-	2	-
			Tipula sp.	1	-	0	-	0	-	0	-
Arthropoda (Chelicerata)	Trombidiformes	Aturidae	*Aturus* sp.	0	-	0	-	0	-	0	-
		Hydryphantidae	*Protzia* sp.	0	-	0	-	0	-	0	-
		Hygrobatidae	*Atractides* sp.	0	-	0	-	0	-	0	-
			Hygrobates sp.	0	-	0	-	0	-	0	-
		Lebertiidae	*Lebertia* sp.	0	-	0	-	1	-	0	-
		Sperchontidae	*Sperchon* sp.	2	-	0	-	1	-	1	-
		Torrenticolidae	*Testudacarus* sp.	0	-	0	-	0	-	0	-
			Torrenticola sp.	0	-	0	-	0	-	0	-
	Oribatida		-	0	-	0	-	0	-	0	-
Annelida (Clitelata)	Lumbriculida	Lumbriculidae	-	0	-	1	ND	0	-	0	-
			Rhynchelmis sp.	0	-	1	-	0	-	0	-
	Tubificida	Enchytraeidae	-	0	-	0	-	0	-	0	-
			Enchytraeus sp.	0	-	0	-	0	-	0	-
		Naididae	-	0	-	0	-	0	-	0	-
			Chaetogaster sp.	0	-	0	-	0	-	0	-
			Nais sp.	0	-	0	-	0	-	0	-
			Pristina sp.	0	-	0	-	0	-	0	-
		Naididae (Subfamily: Tubificinae without hair chaetae)		0	-	1	-	0	-	0	-
Arthropoda (Crustacea)	Class: Ostracoda	-	-	1	-	0	-	0	-	0	-
	Class: Copepoda	-	-	0	-	0	-	0	-	0	-
Nemata	-	-	-	0	-	0	-	0	-	1	-
Platyhelminthes	Class: Turbellaria	-	-	1	-	1	-	1	-	1	-
Total Benthic Invertebrate Abundance:				**659**	-	**371**	-	**1081**	-	**332**	-

Note: Grey cells represent taxa that were present in the samples but were not included in the calculations because they are non-benthic taxa. The ND designation represents a
-"= no data; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.
Samples collected by Minnow Environmental (BC) and submitted to Cordillera Consulting Inc. for taxonomic identification and enumeration. Taxonomist contact information: Sc

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	Richness (# of taxa)	Abundance (# of individuals)	Percent Dominance (%)	Simpson's Diversity	Shannon's Diversity	Simpson's Dominance	Simpson's Eveness
			Easting	Northing										
Michel Creek	MI25	Reference Sites	668186	5482838	2012	1	RG_MI25_BIC-1_2012-09-15	40	2050	17.5	0.9	3.0	1.1	0.3
Michel Creek	MI25	Reference Sites	668186	5482838	2013	1	RG_MI25_BIC-1_2013-09-15	28	26100	43.4	0.7	1.6	1.5	0.1
Michel Creek	MI25	Reference Sites	668186	5482838	2015	1	RG_MI25_BIC-1_2015-09-10	37	7140	16.5	0.9	2.7	1.1	0.3
Michel Creek	MI25	Reference Sites	668186	5482838	2016	1	RG_MI25_BIC-1_2016-09-13	45	16160	29.2	0.9	2.6	1.2	0.2
Michel Creek	MI25	Reference Sites	668186	5482838	2017	1	RG_MI25_BIC-1_2017-09-14	39	25200	27.3	0.9	2.4	1.2	0.2
Michel Creek	MI25	Reference Sites	668184	5482818	2018	1	RG_MI25_BIC-1_2018-09-10	41	14560	35.7	0.8	2.4	1.2	0.1
Michel Creek	MI25	Reference Sites	668186	5482838	2019	1	RG_MI25_BIC-1_2019-09-04	37	6420	24.0	0.9	2.5	1.2	0.2
Michel Creek	MI25	Reference Sites	668183	5482819	2020	1	RG_MI25_BIC-1_2020-09-11	41	9300	18.8	0.9	2.8	1.1	0.2
Michel Creek	MI25	Reference Sites	668185	5482814	2021	1	RG_MI25_BIC-1_2021-09-13	42	12620	0.4	0.8	2.4	1.2	0.1
Michel Creek	MI25	Reference Sites	668186	5482838	2013	2	RG_MI25_BIC-2_2013-09-15	30	10500	35.3	0.8	2.0	1.3	0.2
Michel Creek	MI25	Reference Sites	668186	5482838	2015	2	RG_MI25_BIC-2_2015-09-10	32	7200	24.7	0.9	2.6	1.1	0.3
Michel Creek	MI25	Reference Sites	668184	5482818	2018	2	RG_MI25_BIC-2_2018-09-10	40	5014	18.2	0.9	3.0	1.1	0.3
Michel Creek	MI25	Reference Sites	668186	5482838	2019	2	RG_MI25_BIC-2_2019-09-04	39	4200	23.2	0.9	2.8	1.1	0.2
Michel Creek	MI25	Reference Sites	668183	5482819	2020	2	RG_MI25_BIC-2_2020-09-11	45	4113	12.6	0.9	3.2	1.1	0.4
Michel Creek	MI25	Reference Sites	668187	5482834	2021	2	RG_MI25_BIC-2_2021-09-13	39	13180	0.3	0.8	2.5	1.2	0.2
Michel Creek	MI25	Reference Sites	668186	5482838	2013	3	RG_MI25_BIC-3_2013-09-15	29	17300	46.9	0.7	1.7	1.4	0.1
Michel Creek	MI25	Reference Sites	668186	5482838	2015	3	RG_MI25_BIC-3_2015-09-10	34	6640	19.9	0.9	2.7	1.1	0.3
Michel Creek	MI25	Reference Sites	668184	5482818	2018	3	RG_MI25_BIC-3_2018-09-10	52	14340	21.3	0.9	3.0	1.1	0.2
Michel Creek	MI25	Reference Sites	668186	5482838	2019	3	RG_MI25_BIC-3_2019-09-04	40	6440	25.8	0.9	2.8	1.1	0.2
Michel Creek	MI25	Reference Sites	668183	5482819	2020	3	RG_MI25_BIC-3_2020-09-11	44	2285	13.6	0.9	3.1	1.1	0.3
Michel Creek	MI25	Reference Sites	668173	5482859	2021	3	RG_MI25_BIC-3_2021-09-13	36	7420	0.3	0.9	2.7	1.1	0.2
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2012	1	AGCK_BIC-1_2012-09-16	27	11980	66.4	0.5	1.5	1.8	0.1
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2013	1	AGCK_BIC-1_2013-09-15	29	27840	65.4	0.5	1.4	1.8	0.1
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2015	1	AGCK_BIC-1_2015-09-12	27	7180	59.6	0.6	1.5	1.7	0.1
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	1	AGCK_BIC-1_2018-09-08	27	10500	50.9	0.7	1.6	1.5	0.1
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	1	AGCK_BIC-1_2019-09-06	27	16280	57.1	0.6	1.5	1.6	0.1
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	1	AGCK_BIC-1_2020-09-10	33	9400	35.5	0.8	2.5	1.2	0.2
Andy Good Creek	AGCK	Reference Sites	667566	5488693	2021	1	RG_AGCK_BIC-1_2021-09-11	31	8360	0.3	0.8	2.4	1.2	0.2
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	2	AGCK_BIC-2_2018-09-08	33	11200	37.3	0.8	2.0	1.3	0.1
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	2	AGCK_BIC-2_2019-09-06	30	14760	62.2	0.6	1.5	1.7	0.1
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	2	AGCK_BIC-2_2020-09-10	32	12180	39.9	0.8	2.1	1.3	0.1
Andy Good Creek	AGCK	Reference Sites	667546	5488640	2021	2	RG_AGCK_BIC-2_2021-09-11	23	5850	0.3	0.8	2.3	1.2	0.3
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	3	AGCK_BIC-3_2018-09-08	32	13760	37.5	0.8	2.1	1.3	0.1
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	3	AGCK_BIC-3_2019-09-06	31	12220	57.3	0.6	1.8	1.6	0.1
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	3	AGCK_BIC-3_2020-09-10	34	10240	43.4	0.8	2.2	1.3	0.1
Andy Good Creek	AGCK	Reference Sites	667532	5488604	2021	3	RG_AGCK_BIC-3_2021-09-11	29	5657	0.2	0.9	2.5	1.1	0.3
Leach Creek	LE1	Reference Sites	659635	5494108	2018	1	LE1_BIC-1_2018-09-13	46	17300	14.0	0.9	3.1	1.1	0.3
Leach Creek	LE1	Reference Sites	659632	5494112	2019	1	LE1_BIC-1_2019-09-05	41	7360	19.0	0.9	2.9	1.1	0.3
Leach Creek	LE1	Reference Sites	659635	5494114	2020	1	LE1_BIC-1_2020-09-17	43	7020	14.2	0.9	3.1	1.1	0.3
Leach Creek	LE1	Reference Sites	659583	5494063	2021	1	RG_LE1_BIC-1_2021-09-14	37	7520	0.2	0.9	2.7	1.1	0.3
Leach Creek	LE1	Reference Sites	659632	5494112	2019	2	LE1_BIC-2_2019-09-05	36	9480	29.1	0.9	2.6	1.2	0.2
Leach Creek	LE1	Reference Sites	659635	5494114	2020	2	LE1_BIC-2_2020-09-17	42	4230	13.7	0.9	3.1	1.1	0.4
Leach Creek	LE1	Reference Sites	659602	5494117	2021	2	RG_LE1_BIC-2_2021-09-14	42	8520	0.2	0.9	3.0	1.1	0.3
Leach Creek	LE1	Reference Sites	659632	5494112	2019	3	LE1_BIC-3_2019-09-05	43	8640	26.6	0.9	2.6	1.1	0.2
Leach Creek	LE1	Reference Sites	659635	5494114	2020	3	LE1_BIC-3_2020-09-17	43	6600	13.0	0.9	3.1	1.1	0.4
Leach Creek	LE1	Reference Sites	659633	5494111	2021	3	RG_LE1_BIC-3_2021-09-14	45	12080	0.3	0.9	2.7	1.1	0.2
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2012	1	RG_MIUCO_BIC-1_2012-09-15	38	1806	19.1	0.9	2.9	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2015	1	RG_MIUCO_BIC-1_2015-09-10	37	7820	24.0	0.9	2.6	1.1	0.2
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2016	1	RG_MIUCO_BIC-1_2016-09-13	37	4175	20.1	0.9	2.9	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2017	1	RG_MIUCO_BIC-1_2017-09-14	38	7120	20.5	0.9	2.8	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	1	RG_MIUCO_BIC-1_2018-09-10	39	8400	13.1	0.9	3.0	1.1	0.4
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	1	RG_MIUCO_BIC-1_2019-09-09	47	10280	20.9	0.9	3.2	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	1	RG_MIUCO_BIC-1_2020-09-12	46	3190	23.8	0.9	3.0	1.1	0.2
Michel Creek	MIUCO	Exposure Sites	668232	5486600	2021	1	RG_MIUCO_BIC-1_2021-09-12	52	5130	0.2	0.9	3.0	1.1	0.2
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	2	RG_MIUCO_BIC-2_2018-09-10	34	3200	20.6	0.9	2.8	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	2	RG_MIUCO_BIC-2_2019-09-09	41	5229	18.0	0.9	2.9	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	2	RG_MIUCO_BIC-2_2020-09-12	47	3136	21.2	0.9	3.1	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668227	5486628	2021	2	RG_MIUCO_BIC-2_2021-09-12	38	4063	0.2	0.9	2.7	1.1	0.2
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	3	RG_MIUCO_BIC-3_2018-09-10	35	7680	18.0	0.9	2.8	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	3	RG_MIUCO_BIC-3_2019-09-09	44	5200	16.5	0.9	3.0	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	3	RG_MIUCO_BIC-3_2020-09-12	42	2508	16.0	0.9	3.1	1.1	0.3
Michel Creek	MIUCO	Exposure Sites	668209	5486645	2021	3	RG_MIUCO_BIC-3_2021-09-12	48	4530	0.2	0.9	2.9	1.1	0.2
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2012	1	RG_CORCK_BIC-1_2012-09-15	30	1230	28.3	0.9	2.5	1.2	0.2
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2015	1	RG_CORCK_BIC-1_2015-09-11	36	29180	53.1	0.7	1.9	1.4	0.1
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2016	1	RG_CORCK_BIC-1_2016-09-13	37	16180	12.7	0.9	2.7	1.1	0.3
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2017	1	RG_CORCK_BIC-1_2017-09-14	28	10000	26.6	0.8	2.3	1.2	0.2
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	1	RG_CORCK_BIC-1_2018-09-08	31	1560	19.1	0.9	2.7	1.1	0.3
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	1	RG_CORCK_BIC-1_2019-09-07	30	11580	23.2	0.9	2.4	1.1	0.3
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	1	RG_CORCK_BIC-1_2020-09-12	24	5463	25.7	0.9	2.4	1.2	0.3
Corbin Creek	CORCK	Exposure Sites	668527	5487371	2021	1	RG_CORCK_BIC-1_2021-09-14	27	8880	0.2	0.9	2.4	1.1	0.3
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	2	RG_CORCK_BIC-2_2018-09-08	25	3073	23.3	0.9	2.4	1.2	0.3
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	2	RG_CORCK_BIC-2_2019-09-07	28	22360	17.6	0.9	2.5	1.1	0.3

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	Richness (# of taxa)	Abundance (# of individuals)	Percent Dominance (%)	Simpson's Diversity	Shannon's Diversity	Simpson's Dominance	Simpson's Eveness
			Easting	Northing										
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	2	RG_CORCK_BIC-2_2020-09-12	21	6300	35.1	0.8	2.2	1.2	0.3
Corbin Creek	CORCK	Exposure Sites	668485	5487357	2021	2	RG_CORCK_BIC-2_2021-09-14	31	13080	0.2	0.9	2.4	1.1	0.3
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	3	RG_CORCK_BIC-3_2018-09-08	24	5433	20.2	0.9	2.5	1.1	0.4
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	3	RG_CORCK_BIC-3_2019-09-07	28	14500	18.6	0.9	2.5	1.1	0.3
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	3	RG_CORCK_BIC-3_2020-09-12	27	17960	24.8	0.9	2.4	1.2	0.3
Corbin Creek	CORCK	Exposure Sites	668478	5487339	2021	3	RG_CORCK_BIC-3_2021-09-14	19	9060	0.2	0.8	2.1	1.2	0.4
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2012	1	RG_MIDCO_BIC-1_2012-09-15	38	11667	15.7	0.9	2.8	1.1	0.3
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2015	1	RG_MIDCO_BIC-1_2015-09-11	37	12360	22.8	0.9	2.7	1.1	0.3
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2016	1	RG_MIDCO_BIC-1_2016-09-13	46	7500	19.7	0.9	3.2	1.1	0.3
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2017	1	RG_MIDCO_BIC-1_2017-09-14	46	17580	15.5	0.9	3.0	1.1	0.3
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	1	RG_MIDCO_BIC-1_2018-09-09	44	7100	23.7	0.9	2.8	1.1	0.2
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	1	RG_MIDCO_BIC-1_2019-09-09	46	18980	29.7	0.9	2.7	1.1	0.2
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	1	RG_MIDCO_BIC-1_2020-09-13	47	16280	29.2	0.9	2.8	1.1	0.2
Michel Creek	MIDCO	Exposure Sites	667754	5487585	2021	1	RG_MIDCO_BIC-1_2021-09-13	31	9520	0.3	0.8	2.2	1.2	0.2
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	2	RG_MIDCO_BIC-2_2018-09-09	34	6050	22.0	0.9	2.7	1.1	0.3
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	2	RG_MIDCO_BIC-2_2019-09-09	46	34580	49.0	0.7	2.1	1.4	0.1
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	2	RG_MIDCO_BIC-2_2020-09-13	49	18200	33.4	0.9	2.6	1.2	0.1
Michel Creek	MIDCO	Exposure Sites	667740	5487632	2021	2	RG_MIDCO_BIC-2_2021-09-12	40	12400	0.4	0.8	2.4	1.2	0.1
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	3	RG_MIDCO_BIC-3_2018-09-09	36	6140	25.7	0.9	2.7	1.1	0.2
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	3	RG_MIDCO_BIC-3_2019-09-09	40	12040	20.8	0.9	2.7	1.1	0.2
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	3	RG_MIDCO_BIC-3_2020-09-13	50	17140	33.3	0.9	2.7	1.2	0.1
Michel Creek	MIDCO	Exposure Sites	667713	5487624	2021	3	RG_MIDCO_BIC-3_2021-09-12	48	12420	0.3	0.9	2.6	1.2	0.1
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	4	RG_MIDCO_BIC-4_2018-09-09	38	7000	24.1	0.9	2.7	1.1	0.2
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	4	RG_MIDCO_BIC-4_2019-09-09	46	30340	46.9	0.7	2.1	1.3	0.1
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	4	RG_MIDCO_BIC-4_2020-09-13	54	19280	26.1	0.9	2.9	1.1	0.2
Michel Creek	MIDCO	Exposure Sites	667690	5487630	2021	4	RG_MIDCO_BIC-4_2021-09-12	39	11300	0.3	0.8	2.4	1.2	0.2
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	5	RG_MIDCO_BIC-5_2018-09-09	38	6350	47.0	0.8	2.3	1.3	0.1
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	5	RG_MIDCO_BIC-5_2019-09-09	44	25920	34.0	0.8	2.3	1.2	0.1
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	5	RG_MIDCO_BIC-5_2020-09-13	44	12180	38.1	0.8	2.5	1.2	0.1
Michel Creek	MIDCO	Exposure Sites	667675	5487637	2021	5	RG_MIDCO_BIC-5_2021-09-12	38	11760	0.3	0.8	2.3	1.2	0.1
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	1	RG_MIDAG-S1_BIC-1_2020-09-18	49	29200	27.2	0.9	2.9	1.1	0.2
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	2	RG_MIDAG-S1_BIC-2_2020-09-18	50	28800	45.4	0.8	2.4	1.3	0.1
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	3	RG_MIDAG-S1_BIC-3_2020-09-18	46	21320	14.1	0.9	3.0	1.1	0.3
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	1	RG_MIDAG-S2_BIC-1_2020-09-17	59	37060	25.4	0.9	2.8	1.1	0.2
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	2	RG_MIDAG-S2_BIC-2_2020-09-17	49	24240	26.6	0.9	2.7	1.1	0.2
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	3	RG_MIDAG-S2_BIC-3_2020-09-17	52	33920	24.2	0.9	2.8	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2012	1	RG_MIDAG_BIC-1_2012-09-16	33	10067	23.5	0.9	2.6	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2015	1	RG_MIDAG_BIC-1_2015-09-12	36	14520	23.0	0.9	2.4	1.2	0.2
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	1	RG_MIDAG_BIC-1_2018-09-08	42	6160	16.6	0.9	3.0	1.1	0.3
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	1	RG_MIDAG_BIC-1_2019-09-10	40	6860	25.9	0.9	2.7	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	1	RG_MIDAG_BIC-1_2020-09-15	47	13860	22.7	0.9	3.0	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665271	5489373	2021	1	RG_MIDAG_BIC-1_2021-09-11	39	11940	0.3	0.9	2.7	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	2	RG_MIDAG_BIC-2_2018-09-08	41	16220	12.1	0.9	3.0	1.1	0.4
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	2	RG_MIDAG_BIC-2_2019-09-10	54	26120	18.9	0.9	2.8	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	2	RG_MIDAG_BIC-2_2020-09-15	53	30340	20.6	0.9	2.9	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665267	5489386	2021	2	RG_MIDAG_BIC-2_2021-09-11	41	10800	0.2	0.9	2.8	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	3	RG_MIDAG_BIC-3_2018-09-08	31	7220	14.2	0.9	2.9	1.1	0.4
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	3	RG_MIDAG_BIC-3_2019-09-10	37	3489	46.1	0.8	2.3	1.3	0.1
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	3	RG_MIDAG_BIC-3_2020-09-15	58	24760	22.1	0.9	3.0	1.1	0.2
Michel Creek	MIDAG	Exposure Sites	665265	5489439	2021	3	RG_MIDAG_BIC-3_2021-09-11	35	3940	0.2	0.9	2.6	1.1	0.2
Michel Creek	MIULE	Exposure Sites	660503	5493048	2018	1	RG_MIULE_BIC-1_2018-09-11	31	7080	19.0	0.9	2.8	1.1	0.4
Michel Creek	MIULE	Exposure Sites	660502	5493059	2019	1	RG_MIULE_BIC-1_2019-09-06	41	12940	19.8	0.9	3.0	1.1	0.3
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	1	RG_MIULE_BIC-1_2020-09-16	55	18180	15.5	0.9	3.0	1.1	0.2
Michel Creek	MIULE	Exposure Sites	660541	5493015	2021	1	RG_MIULE_BIC-1_2021-09-14	42	12240	0.3	0.9	2.6	1.2	0.2
Michel Creek	MIULE	Exposure Sites	660503	5493048	2018	2	RG_MIULE_BIC-2_2018-09-11	41	16420	16.7	0.9	2.9	1.1	0.3
Michel Creek	MIULE	Exposure Sites	660502	5493059	2019	2	RG_MIULE_BIC-2_2019-09-06	48	17800	23.3	0.9	2.8	1.1	0.2
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	2	RG_MIULE_BIC-2_2020-09-16	48	15480	15.4	0.9	3.0	1.1	0.3
Michel Creek	MIULE	Exposure Sites	660525	5493017	2021	2	RG_MIULE_BIC-2_2021-09-14	37	10580	0.4	0.8	2.5	1.2	0.2
Michel Creek	MIULE	Exposure Sites	660502	5493059	2018	3	RG_MIULE_BIC-3_2019-09-06	40	17740	27.2	0.9	2.6	1.1	0.2
Michel Creek	MIULE	Exposure Sites	660503	5493048	2019	3	RG_MIULE_BIC-3_2018-09-11	40	8160	15.9	0.9	2.9	1.1	0.3
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	3	RG_MIULE_BIC-3_2020-09-16	41	11520	18.6	0.9	2.7	1.1	0.2
Michel Creek	MIULE	Exposure Sites	660489	5493082	2021	3	RG_MIULE_BIC-3_2021-09-14	40	10120	0.3	0.9	2.6	1.2	0.2
Michel Creek	MI5	Exposure Sites	659387	5496818	2012	1	RG_MI5_BIC-1_2012-09-16	38	7600	10.9	0.9	3.1	1.1	0.4
Michel Creek	MI5	Exposure Sites	659387	5496818	2015	1	RG_MI5_BIC-1_2015-09-13	26	7120	37.3	0.8	2.2	1.2	0.2
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	1	RG_MI5_BIC-1_2018-09-11	42	14040	20.2	0.9	2.8	1.1	0.3
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	1	RG_MI5_BIC-1_2019-09-05	37	14560	30.9	0.8	2.3	1.2	0.2
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	1	RG_MI5_BIC-1_2020-09-17	44	12260	19.4	0.9	2.9	1.1	0.2
Michel Creek	MI5	Exposure Sites	659530	5496485	2021	1	RG_MI5_BIC-1_2021-09-16[b]	-	-	-	-	-	-	-
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	2	RG_MI5_BIC-2_2018-09-11	35	6480	15.7	0.9	2.8	1.1	0.3
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	2	RG_MI5_BIC-2_2019-09-05	43	16220	24.4	0.9	2.7	1.1	0.2
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	2	RG_MI5_BIC-2_2020-09-17	44	16720	16.5	0.9	2.9	1.1	0.3
Michel Creek	MI5	Exposure Sites	659493	5496565	2021	2	RG_MI5_BIC-2_2021-09-16	43	21620	0.3	0.8	2.4	1.2	0.1

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	Richness (# of taxa)	Abundance (# of individuals)	Percent Dominance (%)	Simpson's Diversity	Shannon's Diversity	Simpson's Dominance	Simpson's Eveness
			Easting	Northing										
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	3	RG_MI5_BIC-3_2018-09-11	30	8880	20.1	0.9	2.7	1.1	0.4
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	3	RG_MI5_BIC-3_2019-09-05	35	7960	24.4	0.9	2.5	1.1	0.2
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	3	RG_MI5_BIC-3_2020-09-17	45	10140	24.2	0.9	2.8	1.1	0.2
Michel Creek	MI5	Exposure Sites	659504	5496614	2021	3	RG_MI5_BIC-3_2021-09-16	34	6640	0.4	0.8	2.4	1.2	0.2
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	1	CM_MC2_BIC-1_2020-09-19	46	13100	37.7	0.8	2.6	1.2	0.1
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	2	CM_MC2_BIC-2_2020-09-19	45	11060	18.0	0.9	2.9	1.1	0.3
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	3	CM_MC2_BIC-3_2020-09-19	40	8380	27.9	0.9	2.7	1.1	0.2

a) UTM coordinates for 2012 to 2019 data available from the RAEMP; 2020 and 2021 UTMs included here for reference.

b) The MI5, replicate 1 sample was inadequately preserved and data were excluded.

"-" = data not available; % = percent; EPT = ephemeroptera, plecoptera, trichoptera; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	EPT Richness (# of taxa)	Percent EPT (%)	Ephemeroptera Richness (# of taxa)	Percent Ephemeroptera (%)	Trichoptera Richness (# of taxa)	Percent Trichoptera (%)	Plecoptera Richness (# of taxa)	Percent Plecoptera (%)	Chironomidae Richness (# of taxa)
			Easting	Northing												
Michel Creek	MI25	Reference Sites	668186	5482838	2012	1	RG_MI25_BIC-1_2012-09-15	29	91.8	9	12.2	7	23.8	13	55.8	3
Michel Creek	MI25	Reference Sites	668186	5482838	2013	1	RG_MI25_BIC-1_2013-09-15	20	97.6	7	49.0	5	1.5	8	47.2	2
Michel Creek	MI25	Reference Sites	668186	5482838	2015	1	RG_MI25_BIC-1_2015-09-10	23	83.8	8	47.1	6	5.0	9	31.7	10
Michel Creek	MI25	Reference Sites	668186	5482838	2016	1	RG_MI25_BIC-1_2016-09-13	26	68.1	7	50.4	9	5.1	10	12.6	13
Michel Creek	MI25	Reference Sites	668186	5482838	2017	1	RG_MI25_BIC-1_2017-09-14	22	77.6	7	53.4	7	4.3	8	19.9	9
Michel Creek	MI25	Reference Sites	668184	5482818	2018	1	RG_MI25_BIC-1_2018-09-10	23	85.9	7	62.2	7	9.6	9	14.0	9
Michel Creek	MI25	Reference Sites	668186	5482838	2019	1	RG_MI25_BIC-1_2019-09-04	27	80.1	8	49.5	8	10.3	11	20.2	8
Michel Creek	MI25	Reference Sites	668183	5482819	2020	1	RG_MI25_BIC-1_2020-09-11	28	90.5	8	60.6	9	8.6	11	21.3	8
Michel Creek	MI25	Reference Sites	668185	5482814	2021	1	RG_MI25_BIC-1_2021-09-13	26	0.9	8	0.5	9	0.1	9	0.2	8
Michel Creek	MI25	Reference Sites	668186	5482838	2013	2	RG_MI25_BIC-2_2013-09-15	25	99.0	8	44.8	9	3.8	8	50.5	2
Michel Creek	MI25	Reference Sites	668186	5482838	2015	2	RG_MI25_BIC-2_2015-09-10	19	79.7	8	49.7	4	5.0	7	25.0	7
Michel Creek	MI25	Reference Sites	668184	5482818	2018	2	RG_MI25_BIC-2_2018-09-10	22	63.2	7	23.1	7	21.4	8	18.8	10
Michel Creek	MI25	Reference Sites	668186	5482838	2019	2	RG_MI25_BIC-2_2019-09-04	20	60.1	7	33.6	4	11.0	9	15.5	10
Michel Creek	MI25	Reference Sites	668183	5482819	2020	2	RG_MI25_BIC-2_2020-09-11	32	84.2	11	19.1	9	33.4	12	31.6	6
Michel Creek	MI25	Reference Sites	668187	5482834	2021	2	RG_MI25_BIC-2_2021-09-13	27	0.9	9	0.5	8	0.1	10	0.2	6
Michel Creek	MI25	Reference Sites	668186	5482838	2013	3	RG_MI25_BIC-3_2013-09-15	20	97.6	8	44.5	4	0.9	8	52.1	5
Michel Creek	MI25	Reference Sites	668186	5482838	2015	3	RG_MI25_BIC-3_2015-09-10	23	69.3	8	42.8	7	5.4	8	21.1	9
Michel Creek	MI25	Reference Sites	668184	5482818	2018	3	RG_MI25_BIC-3_2018-09-10	28	86.2	10	44.2	7	18.3	11	23.7	13
Michel Creek	MI25	Reference Sites	668186	5482838	2019	3	RG_MI25_BIC-3_2019-09-04	23	83.9	8	46.0	6	18.0	9	19.9	10
Michel Creek	MI25	Reference Sites	668183	5482819	2020	3	RG_MI25_BIC-3_2020-09-11	28	85.8	9	35.7	8	17.3	11	32.8	7
Michel Creek	MI25	Reference Sites	668173	5482859	2021	3	RG_MI25_BIC-3_2021-09-13	26	0.9	5	0.5	9	0.2	12	0.2	6
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2012	1	AGCK_BIC-1_2012-09-16	18	89.0	8	80.8	3	1.0	7	7.2	5
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2013	1	AGCK_BIC-1_2013-09-15	24	95.1	9	76.4	6	1.3	9	17.4	1
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2015	1	AGCK_BIC-1_2015-09-12	20	97.2	9	68.2	4	4.5	7	24.5	5
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	1	AGCK_BIC-1_2018-09-08	18	96.0	10	88.6	2	0.4	6	7.0	6
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	1	AGCK_BIC-1_2019-09-06	15	92.6	9	86.4	2	3.4	4	2.8	8
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	1	AGCK_BIC-1_2020-09-10	24	86.4	9	66.2	4	5.5	11	14.7	5
Andy Good Creek	AGCK	Reference Sites	667566	5488693	2021	1	RG_AGCK_BIC-1_2021-09-11	20	0.8	7	0.6	4	0.0	9	0.2	7
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	2	AGCK_BIC-2_2018-09-08	17	88.9	9	81.4	2	1.4	6	6.1	12
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	2	AGCK_BIC-2_2019-09-06	16	89.6	9	83.9	2	2.8	5	2.8	7
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	2	AGCK_BIC-2_2020-09-10	22	86.4	9	75.5	5	4.8	8	6.1	8
Andy Good Creek	AGCK	Reference Sites	667546	5488640	2021	2	RG_AGCK_BIC-2_2021-09-11	17	0.9	9	0.6	2	0.0	6	0.2	4
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	3	AGCK_BIC-3_2018-09-08	20	85.2	9	69.0	3	2.0	8	14.1	7
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	3	AGCK_BIC-3_2019-09-06	20	87.6	10	76.6	3	3.9	7	7.0	5
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	3	AGCK_BIC-3_2020-09-10	27	84.4	7	65.8	9	5.9	11	12.7	5
Andy Good Creek	AGCK	Reference Sites	667532	5488604	2021	3	RG_AGCK_BIC-3_2021-09-11	19	0.8	9	0.6	5	0.0	5	0.2	6
Leach Creek	LE1	Reference Sites	659635	5494108	2018	1	LE1_BIC-1_2018-09-13	25	75.7	7	39.3	7	11.3	11	25.1	10
Leach Creek	LE1	Reference Sites	659632	5494112	2019	1	LE1_BIC-1_2019-09-05	23	71.5	5	28.8	10	29.9	8	12.8	5
Leach Creek	LE1	Reference Sites	659635	5494114	2020	1	LE1_BIC-1_2020-09-17	29	86.3	9	43.9	11	10.3	9	32.2	7
Leach Creek	LE1	Reference Sites	659583	5494063	2021	1	RG_LE1_BIC-1_2021-09-14	23	0.9	8	0.5	8	0.1	7	0.3	5
Leach Creek	LE1	Reference Sites	659632	5494112	2019	2	LE1_BIC-2_2019-09-05	22	81.4	7	35.0	6	34.0	9	12.4	6
Leach Creek	LE1	Reference Sites	659635	5494114	2020	2	LE1_BIC-2_2020-09-17	27	81.8	9	37.8	9	12.8	9	31.2	4
Leach Creek	LE1	Reference Sites	659602	5494117	2021	2	RG_LE1_BIC-2_2021-09-14	25	0.7	8	0.4	8	0.1	9	0.2	8
Leach Creek	LE1	Reference Sites	659632	5494112	2019	3	LE1_BIC-3_2019-09-05	26	78.2	8	32.4	7	33.1	11	12.7	9
Leach Creek	LE1	Reference Sites	659635	5494114	2020	3	LE1_BIC-3_2020-09-17	34	75.8	9	28.5	11	11.8	14	35.5	2
Leach Creek	LE1	Reference Sites	659633	5494111	2021	3	RG_LE1_BIC-3_2021-09-14	27	0.8	10	0.5	8	0.1	9	0.3	8
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2012	1	RG_MIUCO_BIC-1_2012-09-15	29	87.4	8	46.2	10	12.0	11	29.2	1
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2015	1	RG_MIUCO_BIC-1_2015-09-10	23	72.4	9	53.2	8	7.2	6	12.0	8
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2016	1	RG_MIUCO_BIC-1_2016-09-13	25	80.5	9	45.8	8	19.2	8	15.6	3
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2017	1	RG_MIUCO_BIC-1_2017-09-14	26	81.7	7	43.5	9	26.1	10	12.1	4
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	1	RG_MIUCO_BIC-1_2018-09-10	27	69.3	8	42.6	10	9.5	9	17.1	4
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	1	RG_MIUCO_BIC-1_2019-09-09	32	54.7	9	26.8	11	11.3	12	16.5	6
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	1	RG_MIUCO_BIC-1_2020-09-12	31	58.6	10	24.1	8	17.6	13	16.9	4
Michel Creek	MIUCO	Exposure Sites	668232	5486600	2021	1	RG_MIUCO_BIC-1_2021-09-12	35	0.7	15	0.4	7	0.0	13	0.3	6
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	2	RG_MIUCO_BIC-2_2018-09-10	22	71.3	8	50.9	6	6.9	8	13.4	4
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	2	RG_MIUCO_BIC-2_2019-09-09	27	61.2	9	33.1	9	18.9	9	9.3	5
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	2	RG_MIUCO_BIC-2_2020-09-12	33	62.0	10	36.5	9	11.0	14	14.5	3
Michel Creek	MIUCO	Exposure Sites	668227	5486628	2021	2	RG_MIUCO_BIC-2_2021-09-12	26	0.7	11	0.5	8	0.0	7	0.2	8
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	3	RG_MIUCO_BIC-3_2018-09-10	23	66.1	9	38.8	7	10.9	7	16.4	3
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	3	RG_MIUCO_BIC-3_2019-09-09	26	56.2	11	30.2	6	11.0	9	15.0	8
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	3	RG_MIUCO_BIC-3_2020-09-12	30	65.6	11	28.5	8	17.8	11	19.3	3
Michel Creek	MIUCO	Exposure Sites	668209	5486645	2021	3	RG_MIUCO_BIC-3_2021-09-12	31	0.7	10	0.4	10	0.1	11	0.2	8
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2012	1	RG_CORCK_BIC-1_2012-09-15	18	44.0	4	3.3	8	25.6	6	15.1	5
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2015	1	RG_CORCK_BIC-1_2015-09-11	13	17.0	0	0.0	5	8.1	8	8.9	10
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2016	1	RG_CORCK_BIC-1_2016-09-13	12	28.6	3	0.5	4	12.2	5	15.8	10
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2017	1	RG_CORCK_BIC-1_2017-09-14	8	33.8	1	0.2	5	26.4	2	7.2	9
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	1	RG_CORCK_BIC-1_2018-09-08	13	37.2	4	11.2	4	19.6	5	6.4	5
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	1	RG_CORCK_BIC-1_2019-09-07	11	15.2	1	0.2	6	8.5	4	6.6	6
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	1	RG_CORCK_BIC-1_2020-09-12	10	26.8	0	0.0	6	22.4	4	4.3	5
Corbin Creek	CORCK	Exposure Sites	668527	5487371	2021	1	RG_CORCK_BIC-1_2021-09-14	11	0.2	2	0.0	6	0.1	3	0.1	6
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	2	RG_CORCK_BIC-2_2018-09-08	7	13.0	1	0.3	5	10.4	1	2.4	7
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	2	RG_CORCK_BIC-2_2019-09-07	8	11.1	0	0.0	5	8.5	3	2.6	7

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	EPT Richness (# of taxa)	Percent EPT (%)	Ephemeroptera Richness (# of taxa)	Percent Ephemeroptera (%)	Trichoptera Richness (# of taxa)	Percent Trichoptera (%)	Plecoptera Richness (# of taxa)	Percent Plecoptera (%)	Chironomidae Richness (# of taxa)
			Easting	Northing												
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	2	RG_CORCK_BIC-2_2020-09-12	8	18.1	0	0.0	6	14.9	2	3.2	4
Corbin Creek	CORCK	Exposure Sites	668485	5487357	2021	2	RG_CORCK_BIC-2_2021-09-14	12	0.2	1	0.0	5	0.1	6	0.2	5
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	3	RG_CORCK_BIC-3_2018-09-08	9	20.9	0	0.0	5	10.1	4	10.7	4
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	3	RG_CORCK_BIC-3_2019-09-07	10	18.3	1	0.1	6	10.8	3	7.4	5
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	3	RG_CORCK_BIC-3_2020-09-12	9	14.1	0	0.0	5	5.1	4	9.0	5
Corbin Creek	CORCK	Exposure Sites	668478	5487339	2021	3	RG_CORCK_BIC-3_2021-09-14	7	0.2	0	0.0	4	0.1	3	0.1	5
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2012	1	RG_MIDCO_BIC-1_2012-09-15	25	57.7	6	27.7	6	7.1	13	22.9	3
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2015	1	RG_MIDCO_BIC-1_2015-09-11	22	51.5	7	22.3	7	8.6	8	20.6	7
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2016	1	RG_MIDCO_BIC-1_2016-09-13	26	50.1	6	5.9	9	16.0	11	28.3	7
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2017	1	RG_MIDCO_BIC-1_2017-09-14	28	47.3	6	15.1	10	13.3	12	18.9	7
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	1	RG_MIDCO_BIC-1_2018-09-09	21	35.5	5	2.8	6	17.7	10	14.9	8
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	1	RG_MIDCO_BIC-1_2019-09-09	22	26.4	5	13.9	9	5.7	8	6.8	9
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	1	RG_MIDCO_BIC-1_2020-09-13	27	41.8	7	11.3	10	11.3	10	19.2	8
Michel Creek	MIDCO	Exposure Sites	667754	5487585	2021	1	RG_MIDCO_BIC-1_2021-09-13	19	0.5	5	0.1	8	0.0	6	0.4	6
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	2	RG_MIDCO_BIC-2_2018-09-09	19	21.5	4	2.2	8	7.2	7	12.1	6
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	2	RG_MIDCO_BIC-2_2019-09-09	23	22.0	6	13.1	7	4.8	10	4.1	8
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	2	RG_MIDCO_BIC-2_2020-09-13	28	37.7	7	13.0	11	9.6	10	15.2	8
Michel Creek	MIDCO	Exposure Sites	667740	5487632	2021	2	RG_MIDCO_BIC-2_2021-09-12	24	0.4	5	0.1	9	0.0	10	0.3	7
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	3	RG_MIDCO_BIC-3_2018-09-09	17	26.4	2	1.0	7	13.4	8	12.1	8
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	3	RG_MIDCO_BIC-3_2019-09-09	21	44.0	7	28.4	7	7.1	7	8.5	8
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	3	RG_MIDCO_BIC-3_2020-09-13	31	39.6	8	8.5	13	13.0	10	18.1	6
Michel Creek	MIDCO	Exposure Sites	667713	5487624	2021	3	RG_MIDCO_BIC-3_2021-09-12	27	0.4	8	0.1	10	0.1	9	0.2	7
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	4	RG_MIDCO_BIC-4_2018-09-09	24	38.0	6	4.3	9	7.1	9	26.6	6
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	4	RG_MIDCO_BIC-4_2019-09-09	27	15.8	6	6.9	12	3.9	9	4.9	9
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	4	RG_MIDCO_BIC-4_2020-09-13	35	49.4	8	10.8	14	13.1	13	25.5	8
Michel Creek	MIDCO	Exposure Sites	667690	5487630	2021	4	RG_MIDCO_BIC-4_2021-09-12	23	0.4	6	0.1	8	0.0	9	0.3	6
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	5	RG_MIDCO_BIC-5_2018-09-09	20	20.5	6	3.9	7	8.1	7	8.4	8
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	5	RG_MIDCO_BIC-5_2019-09-09	25	26.2	7	16.5	8	3.9	10	5.9	9
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	5	RG_MIDCO_BIC-5_2020-09-13	26	37.8	5	13.5	10	4.9	11	19.4	6
Michel Creek	MIDCO	Exposure Sites	667675	5487637	2021	5	RG_MIDCO_BIC-5_2021-09-12	22	0.5	5	0.1	11	0.1	6	0.3	7
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	1	RG_MIDAG-S1_BIC-1_2020-09-18	32	79.5	7	18.0	12	11.6	13	49.9	7
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	2	RG_MIDAG-S1_BIC-2_2020-09-18	34	92.0	9	19.4	13	9.5	12	63.1	7
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	3	RG_MIDAG-S1_BIC-3_2020-09-18	31	72.0	9	29.2	10	11.6	12	31.1	6
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	1	RG_MIDAG-S2_BIC-1_2020-09-17	37	80.7	10	37.1	13	9.3	14	34.3	8
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	2	RG_MIDAG-S2_BIC-2_2020-09-17	34	81.1	12	41.9	10	7.2	12	32.0	7
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	3	RG_MIDAG-S2_BIC-3_2020-09-17	36	77.5	12	40.3	12	7.0	12	30.2	7
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2012	1	RG_MIDAG_BIC-1_2012-09-16	23	86.1	8	62.9	8	7.6	7	15.6	4
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2015	1	RG_MIDAG_BIC-1_2015-09-12	21	72.2	10	42.8	5	13.4	6	16.0	7
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	1	RG_MIDAG_BIC-1_2018-09-08	23	64.6	9	38.3	4	12.3	10	14.0	9
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	1	RG_MIDAG_BIC-1_2019-09-10	19	37.3	7	23.9	4	4.7	8	8.7	9
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	1	RG_MIDAG_BIC-1_2020-09-15	31	80.2	10	42.7	10	17.2	11	20.3	6
Michel Creek	MIDAG	Exposure Sites	665271	5489373	2021	1	RG_MIDAG_BIC-1_2021-09-11	27	0.7	8	0.5	9	0.1	10	0.2	6
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	2	RG_MIDAG_BIC-2_2018-09-08	27	70.0	8	34.5	7	7.5	12	28.0	6
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	2	RG_MIDAG_BIC-2_2019-09-10	31	60.4	10	37.8	11	11.0	10	11.6	12
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	2	RG_MIDAG_BIC-2_2020-09-15	35	71.4	12	37.0	10	10.1	13	24.3	8
Michel Creek	MIDAG	Exposure Sites	665267	5489386	2021	2	RG_MIDAG_BIC-2_2021-09-11	27	0.7	9	0.4	9	0.1	9	0.1	6
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	3	RG_MIDAG_BIC-3_2018-09-08	19	74.8	6	37.4	5	24.1	8	13.3	5
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	3	RG_MIDAG_BIC-3_2019-09-10	16	34.1	7	20.4	4	7.0	5	6.7	9
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	3	RG_MIDAG_BIC-3_2020-09-15	37	79.2	11	43.2	12	14.4	14	21.6	8
Michel Creek	MIDAG	Exposure Sites	665265	5489439	2021	3	RG_MIDAG_BIC-3_2021-09-11	24	0.8	9	0.5	6	0.1	9	0.1	5
Michel Creek	MIULE	Exposure Sites	660503	5493048	2018	1	RG_MIULE_BIC-1_2018-09-11	17	62.1	6	29.9	4	22.3	7	9.9	6
Michel Creek	MIULE	Exposure Sites	660502	5493059	2019	1	RG_MIULE_BIC-1_2019-09-06	25	63.7	7	33.1	9	21.8	9	8.8	7
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	1	RG_MIULE_BIC-1_2020-09-16	32	60.7	11	36.4	9	9.5	12	14.9	9
Michel Creek	MIULE	Exposure Sites	660541	5493015	2021	1	RG_MIULE_BIC-1_2021-09-14	25	0.8	9	0.4	8	0.1	8	0.3	8
Michel Creek	MIULE	Exposure Sites	660503	5493048	2018	2	RG_MIULE_BIC-2_2018-09-11	24	70.5	8	42.4	6	10.1	10	18.0	7
Michel Creek	MIULE	Exposure Sites	660502	5493059	2019	2	RG_MIULE_BIC-2_2019-09-06	26	61.3	9	41.9	8	11.5	9	8.0	10
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	2	RG_MIULE_BIC-2_2020-09-16	32	71.3	12	37.2	10	11.6	10	22.5	4
Michel Creek	MIULE	Exposure Sites	660525	5493017	2021	2	RG_MIULE_BIC-2_2021-09-14	22	0.8	8	0.5	7	0.1	7	0.2	6
Michel Creek	MIULE	Exposure Sites	660502	5493059	2018	3	RG_MIULE_BIC-3_2019-09-06	21	69.9	8	41.0	6	24.8	7	4.1	8
Michel Creek	MIULE	Exposure Sites	660503	5493048	2019	3	RG_MIULE_BIC-3_2018-09-11	23	72.3	7	41.9	7	15.4	9	15.0	6
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	3	RG_MIULE_BIC-3_2020-09-16	25	66.0	10	38.9	8	12.2	7	14.9	5
Michel Creek	MIULE	Exposure Sites	660489	5493082	2021	3	RG_MIULE_BIC-3_2021-09-14	27	0.8	10	0.5	8	0.1	9	0.2	6
Michel Creek	MI5	Exposure Sites	659387	5496818	2012	1	RG_MI5_BIC-1_2012-09-16	26	71.4	10	42.8	6	10.9	10	17.8	3
Michel Creek	MI5	Exposure Sites	659387	5496818	2015	1	RG_MI5_BIC-1_2015-09-13	18	86.5	8	30.1	3	49.7	7	6.7	3
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	1	RG_MI5_BIC-1_2018-09-11	28	78.6	8	42.9	9	10.0	11	25.8	5
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	1	RG_MI5_BIC-1_2019-09-05	19	81.0	6	33.8	7	44.0	6	3.3	9
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	1	RG_MI5_BIC-1_2020-09-17	27	69.8	10	34.9	9	15.3	8	19.6	7
Michel Creek	MI5	Exposure Sites	659530	5496485	2021	1	RG_MI5_BIC-1_2021-09-16[b]	-	-	-	-	-	-	-	-	-
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	2	RG_MI5_BIC-2_2018-09-11	20	68.2	6	44.4	4	14.5	10	9.3	6
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	2	RG_MI5_BIC-2_2019-09-05	23	77.1	8	31.4	8	38.2	7	7.4	8
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	2	RG_MI5_BIC-2_2020-09-17	29	74.6	9	41.3	11	12.2	9	21.2	3
Michel Creek	MI5	Exposure Sites	659493	5496565	2021	2	RG_MI5_BIC-2_2021-09-16	28	0.9	9	0.4	8	0.1	11	0.4	5

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	EPT Richness (# of taxa)	Percent EPT (%)	Ephemeroptera Richness (# of taxa)	Percent Ephemeroptera (%)	Trichoptera Richness (# of taxa)	Percent Trichoptera (%)	Plecoptera Richness (# of taxa)	Percent Plecoptera (%)	Chironomidae Richness (# of taxa)
			Easting	Northing												
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	3	RG_MI5_BIC-3_2018-09-11	20	87.2	9	47.7	5	18.7	6	20.7	2
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	3	RG_MI5_BIC-3_2019-09-05	18	75.4	7	35.7	7	35.2	4	4.5	7
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	3	RG_MI5_BIC-3_2020-09-17	31	86.8	10	46.5	10	14.4	11	25.8	3
Michel Creek	MI5	Exposure Sites	659504	5496614	2021	3	RG_MI5_BIC-3_2021-09-16	25	0.9	9	0.5	7	0.2	9	0.2	2
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	1	CM_MC2_BIC-1_2020-09-19	26	34.2	5	7.9	11	7.8	10	18.5	5
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	2	CM_MC2_BIC-2_2020-09-19	28	47.0	5	4.9	12	12.7	11	29.5	6
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	3	CM_MC2_BIC-3_2020-09-19	24	38.2	4	8.1	12	9.8	8	20.3	5

a) UTM coordinates for 2012 to 2019 data available from the RAEMP; 2020 and 2021 UTMs included here for reference.

b) The MI5, replicate 1 sample was inadequately preserved and data were excluded.

"-" = data not available; % = percent; EPT = ephemeroptera, plecoptera, trichoptera; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	Percent Chironomidae (%)	Percent Oligochaeta (%)	Diptera Richness (# of taxa)	Percent Diptera (%)	Percent Acari (%)	Percent Mollusca (%)	Percent Bivalvia (%)
			Easting	Northing										
Michel Creek	MI25	Reference Sites	668186	5482838	2012	1	RG_MI25_BIC-1_2012-09-15	3.4	1	6	5	2	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2013	1	RG_MI25_BIC-1_2013-09-15	1.3	0	6	2	0	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2015	1	RG_MI25_BIC-1_2015-09-10	14.3	0	13	16	1	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2016	1	RG_MI25_BIC-1_2016-09-13	30.0	0	16	31	0	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2017	1	RG_MI25_BIC-1_2017-09-14	19.8	0	13	21	0	0	0
Michel Creek	MI25	Reference Sites	668184	5482818	2018	1	RG_MI25_BIC-1_2018-09-10	12.5	0	14	13	1	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2019	1	RG_MI25_BIC-1_2019-09-04	18.7	1	8	19	0	0	0
Michel Creek	MI25	Reference Sites	668183	5482819	2020	1	RG_MI25_BIC-1_2020-09-11	7.3	0	9	8	1	0	0
Michel Creek	MI25	Reference Sites	668185	5482814	2021	1	RG_MI25_BIC-1_2021-09-13	0.1	0	13	0	0	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2013	2	RG_MI25_BIC-2_2013-09-15	0.4	0	3	1	0	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2015	2	RG_MI25_BIC-2_2015-09-10	17.5	0	11	19	0	0	0
Michel Creek	MI25	Reference Sites	668184	5482818	2018	2	RG_MI25_BIC-2_2018-09-10	30.2	2	13	33	1	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2019	2	RG_MI25_BIC-2_2019-09-04	30.4	0	15	34	3	0	0
Michel Creek	MI25	Reference Sites	668183	5482819	2020	2	RG_MI25_BIC-2_2020-09-11	10.9	0	10	13	0	0	0
Michel Creek	MI25	Reference Sites	668187	5482834	2021	2	RG_MI25_BIC-2_2021-09-13	0.1	0	9	0	0	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2013	3	RG_MI25_BIC-3_2013-09-15	1.3	0	6	2	0	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2015	3	RG_MI25_BIC-3_2015-09-10	27.1	0	11	31	0	0	0
Michel Creek	MI25	Reference Sites	668184	5482818	2018	3	RG_MI25_BIC-3_2018-09-10	9.2	1	18	11	1	0	0
Michel Creek	MI25	Reference Sites	668186	5482838	2019	3	RG_MI25_BIC-3_2019-09-04	11.8	1	14	14	0	0	0
Michel Creek	MI25	Reference Sites	668183	5482819	2020	3	RG_MI25_BIC-3_2020-09-11	9.4	0	13	12	0	0	0
Michel Creek	MI25	Reference Sites	668173	5482859	2021	3	RG_MI25_BIC-3_2021-09-13	0.1	0	7	0	0	0	0
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2012	1	AGCK_BIC-1_2012-09-16	10.4	0	6	11	1	0	0
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2013	1	AGCK_BIC-1_2013-09-15	1.7	3	2	2	0	0	0
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2015	1	AGCK_BIC-1_2015-09-12	1.9	0	6	3	0	0	0
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	1	AGCK_BIC-1_2018-09-08	3.0	0	8	4	0	0	0
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	1	AGCK_BIC-1_2019-09-06	4.7	0	10	7	0	0	0
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	1	AGCK_BIC-1_2020-09-10	11.5	0	7	13	1	0	0
Andy Good Creek	AGCK	Reference Sites	667566	5488693	2021	1	RG_AGCK_BIC-1_2021-09-11	0.2	0	11	0	0	0	0
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	2	AGCK_BIC-2_2018-09-08	9.1	0	14	11	0	0	0
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	2	AGCK_BIC-2_2019-09-06	8.3	1	11	10	0	0	0
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	2	AGCK_BIC-2_2020-09-10	11.3	0	9	13	0	0	0
Andy Good Creek	AGCK	Reference Sites	667546	5488640	2021	2	RG_AGCK_BIC-2_2021-09-11	0.1	0	4	0	0	0	0
Andy Good Creek	AGCK	Reference Sites	667557	5488648	2018	3	AGCK_BIC-3_2018-09-08	13.5	0	10	14	0	0	0
Andy Good Creek	AGCK	Reference Sites	667555	5488644	2019	3	AGCK_BIC-3_2019-09-06	6.5	1	8	11	0	0	0
Andy Good Creek	AGCK	Reference Sites	667556	5488649	2020	3	AGCK_BIC-3_2020-09-10	14.8	0	7	16	0	0	0
Andy Good Creek	AGCK	Reference Sites	667532	5488604	2021	3	RG_AGCK_BIC-3_2021-09-11	0.2	0	7	0	0	0	0
Leach Creek	LE1	Reference Sites	659635	5494108	2018	1	LE1_BIC-1_2018-09-13	11.0	0	16	19	1	0	0
Leach Creek	LE1	Reference Sites	659632	5494112	2019	1	LE1_BIC-1_2019-09-05	6.0	0	10	21	3	0	0
Leach Creek	LE1	Reference Sites	659635	5494114	2020	1	LE1_BIC-1_2020-09-17	3.1	0	11	9	3	0	0
Leach Creek	LE1	Reference Sites	659583	5494063	2021	1	RG_LE1_BIC-1_2021-09-14	0.0	0	12	0	0	0	0
Leach Creek	LE1	Reference Sites	659632	5494112	2019	2	LE1_BIC-2_2019-09-05	7.8	0	10	16	1	0	0
Leach Creek	LE1	Reference Sites	659635	5494114	2020	2	LE1_BIC-2_2020-09-17	3.8	0	10	12	3	0	0
Leach Creek	LE1	Reference Sites	659602	5494117	2021	2	RG_LE1_BIC-2_2021-09-14	0.1	0	12	0	0	0	0
Leach Creek	LE1	Reference Sites	659632	5494112	2019	3	LE1_BIC-3_2019-09-05	7.6	0	12	19	1	0	0
Leach Creek	LE1	Reference Sites	659635	5494114	2020	3	LE1_BIC-3_2020-09-17	1.5	0	5	15	3	0	0
Leach Creek	LE1	Reference Sites	659633	5494111	2021	3	RG_LE1_BIC-3_2021-09-14	0.1	0	13	0	0	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2012	1	RG_MIUCO_BIC-1_2012-09-15	0.3	0	5	6	2	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2015	1	RG_MIUCO_BIC-1_2015-09-10	4.3	0	12	23	1	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2016	1	RG_MIUCO_BIC-1_2016-09-13	4.8	0	7	13	1	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2017	1	RG_MIUCO_BIC-1_2017-09-14	3.4	1	7	12	3	0	0
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	1	RG_MIUCO_BIC-1_2018-09-10	4.3	0	9	21	5	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	1	RG_MIUCO_BIC-1_2019-09-09	12.1	1	10	37	3	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	1	RG_MIUCO_BIC-1_2020-09-12	2.5	0	10	29	3	0	0
Michel Creek	MIUCO	Exposure Sites	668232	5486600	2021	1	RG_MIUCO_BIC-1_2021-09-12	0.0	0	12	0	0	0	0
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	2	RG_MIUCO_BIC-2_2018-09-10	5.9	1	8	19	2	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	2	RG_MIUCO_BIC-2_2019-09-09	9.1	1	10	27	2	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	2	RG_MIUCO_BIC-2_2020-09-12	2.9	1	9	26	2	0	0
Michel Creek	MIUCO	Exposure Sites	668227	5486628	2021	2	RG_MIUCO_BIC-2_2021-09-12	0.1	0	10	0	0	0	0
Michel Creek	MIUCO	Exposure Sites	668135	5486767	2018	3	RG_MIUCO_BIC-3_2018-09-10	2.1	1	7	23	4	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486767	2019	3	RG_MIUCO_BIC-3_2019-09-09	7.3	0	13	27	6	0	0
Michel Creek	MIUCO	Exposure Sites	668134	5486768	2020	3	RG_MIUCO_BIC-3_2020-09-12	1.5	0	7	19	3	0	0
Michel Creek	MIUCO	Exposure Sites	668209	5486645	2021	3	RG_MIUCO_BIC-3_2021-09-12	0.1	0	14	0	0	0	0
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2012	1	RG_CORCK_BIC-1_2012-09-15	23.2	2	8	24	2	0	0
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2015	1	RG_CORCK_BIC-1_2015-09-11	24.5	2	16	78	1	0	0
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2016	1	RG_CORCK_BIC-1_2016-09-13	39.3	10	16	57	4	0	0
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2017	1	RG_CORCK_BIC-1_2017-09-14	30.0	2	15	61	2	0	0
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	1	RG_CORCK_BIC-1_2018-09-08	37.8	9	12	49	4	0	0
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	1	RG_CORCK_BIC-1_2019-09-07	58.9	6	13	76	2	0	0
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	1	RG_CORCK_BIC-1_2020-09-12	46.7	14	11	58	0	0	0
Corbin Creek	CORCK	Exposure Sites	668527	5487371	2021	1	RG_CORCK_BIC-1_2021-09-14	0.5	0	11	1	0	0	0
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	2	RG_CORCK_BIC-2_2018-09-08	62.4	10	13	75	1	0	0
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	2	RG_CORCK_BIC-2_2019-09-07	57.2	15	13	69	4	0	0

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	Percent Chironomidae (%)	Percent Oligochaeta (%)	Diptera Richness (# of taxa)	Percent Diptera (%)	Percent Acari (%)	Percent Mollusca (%)	Percent Bivalvia (%)
			Easting	Northing										
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	2	RG_CORCK_BIC-2_2020-09-12	65.1	5	12	77	0	0	0
Corbin Creek	CORCK	Exposure Sites	668485	5487357	2021	2	RG_CORCK_BIC-2_2021-09-14	0.5	0	14	1	0	0	0
Corbin Creek	CORCK	Exposure Sites	668539	5487366	2018	3	RG_CORCK_BIC-3_2018-09-08	43.9	15	10	61	3	0	0
Corbin Creek	CORCK	Exposure Sites	668556	5487388	2019	3	RG_CORCK_BIC-3_2019-09-07	54.8	11	12	67	4	0	0
Corbin Creek	CORCK	Exposure Sites	668476	5487347	2020	3	RG_CORCK_BIC-3_2020-09-12	54.6	15	13	70	1	0	0
Corbin Creek	CORCK	Exposure Sites	668478	5487339	2021	3	RG_CORCK_BIC-3_2021-09-14	0.5	0	9	1	0	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2012	1	RG_MIDCO_BIC-1_2012-09-15	14.3	0	6	31	1	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2015	1	RG_MIDCO_BIC-1_2015-09-11	20.6	0	12	45	0	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2016	1	RG_MIDCO_BIC-1_2016-09-13	33.9	6	13	40	2	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2017	1	RG_MIDCO_BIC-1_2017-09-14	15.7	15	13	32	2	0	0
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	1	RG_MIDCO_BIC-1_2018-09-09	24.2	3	15	54	6	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	1	RG_MIDCO_BIC-1_2019-09-09	21.0	11	17	54	7	0	0
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	1	RG_MIDCO_BIC-1_2020-09-13	16.0	1	14	46	9	0	0
Michel Creek	MIDCO	Exposure Sites	667754	5487585	2021	1	RG_MIDCO_BIC-1_2021-09-13	0.2	0	9	0	0	0	0
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	2	RG_MIDCO_BIC-2_2018-09-09	37.7	5	11	64	9	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	2	RG_MIDCO_BIC-2_2019-09-09	13.0	49	16	24	4	0	0
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	2	RG_MIDCO_BIC-2_2020-09-13	14.1	1	15	49	10	0	0
Michel Creek	MIDCO	Exposure Sites	667740	5487632	2021	2	RG_MIDCO_BIC-2_2021-09-12	0.1	0	12	0	0	0	0
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	3	RG_MIDCO_BIC-3_2018-09-09	36.2	1	12	64	7	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	3	RG_MIDCO_BIC-3_2019-09-09	11.5	21	14	28	4	0	0
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	3	RG_MIDCO_BIC-3_2020-09-13	19.1	0	11	54	4	0	0
Michel Creek	MIDCO	Exposure Sites	667713	5487624	2021	3	RG_MIDCO_BIC-3_2021-09-12	0.2	0	14	1	0	0	0
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	4	RG_MIDCO_BIC-4_2018-09-09	28.1	2	10	56	4	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	4	RG_MIDCO_BIC-4_2019-09-09	18.9	47	14	35	2	0	0
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	4	RG_MIDCO_BIC-4_2020-09-13	14.8	0	14	44	4	0	0
Michel Creek	MIDCO	Exposure Sites	667690	5487630	2021	4	RG_MIDCO_BIC-4_2021-09-12	0.2	0	11	0	0	0	0
Michel Creek	MIDCO	Exposure Sites	667616	5487621	2018	5	RG_MIDCO_BIC-5_2018-09-09	18.6	4	11	67	7	0	0
Michel Creek	MIDCO	Exposure Sites	667711	5487625	2019	5	RG_MIDCO_BIC-5_2019-09-09	14.7	34	14	37	2	0	0
Michel Creek	MIDCO	Exposure Sites	667646	5487701	2020	5	RG_MIDCO_BIC-5_2020-09-13	10.8	0	14	52	8	0	0
Michel Creek	MIDCO	Exposure Sites	667675	5487637	2021	5	RG_MIDCO_BIC-5_2021-09-12	0.2	0	11	0	0	0	0
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	1	RG_MIDAG-S1_BIC-1_2020-09-18	8.6	0	12	17	3	0	0
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	2	RG_MIDAG-S1_BIC-2_2020-09-18	1.0	0	13	7	1	0	0
Michel Creek	MIDAG-S1	Exposure Sites	666290	5488507	2020	3	RG_MIDAG-S1_BIC-3_2020-09-18	10.2	0	11	25	3	0	0
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	1	RG_MIDAG-S2_BIC-1_2020-09-17	8.8	0	14	15	3	0	0
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	2	RG_MIDAG-S2_BIC-2_2020-09-17	10.5	0	11	15	3	0	0
Michel Creek	MIDAG-S2	Exposure Sites	665770	5488854	2020	3	RG_MIDAG-S2_BIC-3_2020-09-17	10.6	0	13	19	3	0	0
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2012	1	RG_MIDAG_BIC-1_2012-09-16	2.0	0	6	10	3	0	0
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2015	1	RG_MIDAG_BIC-1_2015-09-12	2.2	0	11	26	0	0	0
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	1	RG_MIDAG_BIC-1_2018-09-08	8.1	2	14	25	7	0	0
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	1	RG_MIDAG_BIC-1_2019-09-10	24.8	5	14	53	3	0	0
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	1	RG_MIDAG_BIC-1_2020-09-15	8.4	0	11	15	3	0	0
Michel Creek	MIDAG	Exposure Sites	665271	5489373	2021	1	RG_MIDAG_BIC-1_2021-09-11	0.1	0	8	0	0	0	0
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	2	RG_MIDAG_BIC-2_2018-09-08	11.8	0	10	27	1	0	0
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	2	RG_MIDAG_BIC-2_2019-09-10	13.5	3	17	34	2	0	0
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	2	RG_MIDAG_BIC-2_2020-09-15	15.1	0	13	26	2	0	0
Michel Creek	MIDAG	Exposure Sites	665267	5489386	2021	2	RG_MIDAG_BIC-2_2021-09-11	0.1	0	11	0	0	0	0
Michel Creek	MIDAG	Exposure Sites	665220	5489324	2018	3	RG_MIDAG_BIC-3_2018-09-08	14.4	0	9	20	4	0	0
Michel Creek	MIDAG	Exposure Sites	665258	5489417	2019	3	RG_MIDAG_BIC-3_2019-09-10	9.3	4	15	58	2	0	0
Michel Creek	MIDAG	Exposure Sites	665240	5489482	2020	3	RG_MIDAG_BIC-3_2020-09-15	11.3	0	14	18	2	0	0
Michel Creek	MIDAG	Exposure Sites	665265	5489439	2021	3	RG_MIDAG_BIC-3_2021-09-11	0.0	0	8	0	0	0	0
Michel Creek	MIULE	Exposure Sites	660503	5493048	2018	1	RG_MIULE_BIC-1_2018-09-11	15.5	1	9	28	8	0	0
Michel Creek	MIULE	Exposure Sites	660502	5493059	2019	1	RG_MIULE_BIC-1_2019-09-06	18.4	1	10	29	6	0	0
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	1	RG_MIULE_BIC-1_2020-09-16	16.2	0	19	31	6	0	0
Michel Creek	MIULE	Exposure Sites	660541	5493015	2021	1	RG_MIULE_BIC-1_2021-09-14	0.1	0	13	0	0	0	0
Michel Creek	MIULE	Exposure Sites	660503	5493048	2018	2	RG_MIULE_BIC-2_2018-09-11	9.4	1	13	22	5	0	0
Michel Creek	MIULE	Exposure Sites	660502	5493059	2019	2	RG_MIULE_BIC-2_2019-09-06	15.2	3	15	30	4	0	0
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	2	RG_MIULE_BIC-2_2020-09-16	14.7	0	10	23	3	0	0
Michel Creek	MIULE	Exposure Sites	660525	5493017	2021	2	RG_MIULE_BIC-2_2021-09-14	0.1	0	12	0	0	0	0
Michel Creek	MIULE	Exposure Sites	660502	5493059	2018	3	RG_MIULE_BIC-3_2019-09-06	10.6	3	14	22	3	0	0
Michel Creek	MIULE	Exposure Sites	660503	5493048	2019	3	RG_MIULE_BIC-3_2018-09-11	7.8	2	12	21	4	0	0
Michel Creek	MIULE	Exposure Sites	660502	5493049	2020	3	RG_MIULE_BIC-3_2020-09-16	9.9	0	10	29	4	0	0
Michel Creek	MIULE	Exposure Sites	660489	5493082	2021	3	RG_MIULE_BIC-3_2021-09-14	0.1	0	8	0	0	0	0
Michel Creek	MI5	Exposure Sites	659387	5496818	2012	1	RG_MI5_BIC-1_2012-09-16	8.6	0	8	22	3	0	0
Michel Creek	MI5	Exposure Sites	659387	5496818	2015	1	RG_MI5_BIC-1_2015-09-13	5.1	0	6	10	0	0	0
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	1	RG_MI5_BIC-1_2018-09-11	4.1	0	11	20	1	0	0
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	1	RG_MI5_BIC-1_2019-09-05	5.5	1	12	15	2	0	0
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	1	RG_MI5_BIC-1_2020-09-17	3.4	0	11	24	5	0	0
Michel Creek	MI5	Exposure Sites	659530	5496485	2021	1	RG_MI5_BIC-1_2021-09-16[b]	-	-	-	-	-	-	-
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	2	RG_MI5_BIC-2_2018-09-11	4.9	2	10	25	3	0	0
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	2	RG_MI5_BIC-2_2019-09-05	6.5	2	12	17	3	0	0
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	2	RG_MI5_BIC-2_2020-09-17	1.4	0	9	21	3	0	0
Michel Creek	MI5	Exposure Sites	659493	5496565	2021	2	RG_MI5_BIC-2_2021-09-16	0.0	0	12	0	0	0	0

Table J-2: Benthic Invertebrate Community Data at CMm LAEMP Sampling Stations, 2012 to 2021

Watercourse	Station	Reference or Mine-influenced	Location (UTMs)[a]		Year	Replicate	Sample	Percent Chironomidae (%)	Percent Oligochaeta (%)	Diptera Richness (# of taxa)	Percent Diptera (%)	Percent Acari (%)	Percent Mollusca (%)	Percent Bivalvia (%)
			Easting	Northing										
Michel Creek	MI5	Exposure Sites	659496	5496774	2018	3	RG_MI5_BIC-3_2018-09-11	2.7	0	6	9	2	0	0
Michel Creek	MI5	Exposure Sites	659387	5496818	2019	3	RG_MI5_BIC-3_2019-09-05	5.0	1	11	20	3	0	0
Michel Creek	MI5	Exposure Sites	659501	5496620	2020	3	RG_MI5_BIC-3_2020-09-17	1.2	0	9	8	2	0	0
Michel Creek	MI5	Exposure Sites	659504	5496614	2021	3	RG_MI5_BIC-3_2021-09-16	0.0	0	7	0	0	0	0
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	1	CM_MC2_BIC-1_2020-09-19	12.4	1	12	57	7	0	0
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	2	CM_MC2_BIC-2_2020-09-19	13.1	0	12	47	5	0	0
Michel Creek	CM MC2	Exposure Sites	667249	5488144	2020	3	CM_MC2_BIC-3_2020-09-19	10.3	0	11	52	9	0	0

a) UTM coordinates for 2012 to 2019 data available from the RAEMP; 2020 and 2021 UTMs included here for reference.

b) The MI5, replicate 1 sample was inadequately preserved and data were excluded.

"-" = data not available; % = percent; EPT = ephemeroptera, plecoptera, trichoptera; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Richness	RG_MI25	2012	1	Reference	27	42
Richness	RG_MI25	2013	1	Reference	28	43
Richness	RG_MI25	2013	2	Reference	28	43
Richness	RG_MI25	2013	3	Reference	28	43
Richness	RG_MI25	2015	1	Reference	28	42
Richness	RG_MI25	2015	2	Reference	28	42
Richness	RG_MI25	2015	3	Reference	28	42
Richness	RG_MI25	2016	1	Reference	28	42
Richness	RG_MI25	2017	1	Reference	29	44
Richness	RG_MI25	2018	1	Reference	29	44
Richness	RG_MI25	2018	2	Reference	29	44
Richness	RG_MI25	2018	3	Reference	29	43
Richness	RG_MI25	2019	1	Reference	29	44
Richness	RG_MI25	2019	2	Reference	29	44
Richness	RG_MI25	2019	3	Reference	28	43
Richness	RG_MI25	2020	1	Reference	28	43
Richness	RG_MI25	2020	2	Reference	27	42
Richness	RG_MI25	2020	3	Reference	28	42
Richness	RG_MI25	2021	1	Reference	29	44
Richness	RG_MI25	2021	2	Reference	29	44
Richness	RG_MI25	2021	3	Reference	28	43
Richness	RG_AGCK	2012	1	Reference	21	36
Richness	RG_AGCK	2013	1	Reference	22	36
Richness	RG_AGCK	2015	1	Reference	22	36
Richness	RG_AGCK	2018	1	Reference	22	37
Richness	RG_AGCK	2018	2	Reference	22	36
Richness	RG_AGCK	2018	3	Reference	23	37
Richness	RG_AGCK	2019	1	Reference	22	36
Richness	RG_AGCK	2019	2	Reference	21	35
Richness	RG_AGCK	2019	3	Reference	22	37
Richness	RG_AGCK	2020	1	Reference	20	34
Richness	RG_AGCK	2020	2	Reference	23	37
Richness	RG_AGCK	2020	3	Reference	21	36
Richness	RG_AGCK	2021	1	Reference	21	35
Richness	RG_AGCK	2021	2	Reference	23	37
Richness	RG_AGCK	2021	3	Reference	23	37
Richness	RG_LE1	2018	1	Reference	31	45
Richness	RG_LE1	2019	1	Reference	30	45
Richness	RG_LE1	2019	2	Reference	29	43
Richness	RG_LE1	2019	3	Reference	29	43
Richness	RG_LE1	2020	1	Reference	29	43
Richness	RG_LE1	2020	2	Reference	29	44
Richness	RG_LE1	2020	3	Reference	30	44
Richness	RG_LE1	2021	1	Reference	30	45
Richness	RG_LE1	2021	2	Reference	29	44
Richness	RG_LE1	2021	3	Reference	30	44
Richness	RG_MIUCO	2012	1	Mine-Influenced	27	42
Richness	RG_MIUCO	2015	1	Mine-Influenced	26	41
Richness	RG_MIUCO	2016	1	Mine-Influenced	27	42
Richness	RG_MIUCO	2017	1	Mine-Influenced	26	41
Richness	RG_MIUCO	2018	1	Mine-Influenced	27	41
Richness	RG_MIUCO	2018	2	Mine-Influenced	27	42
Richness	RG_MIUCO	2018	3	Mine-Influenced	27	42
Richness	RG_MIUCO	2019	1	Mine-Influenced	25	40
Richness	RG_MIUCO	2019	2	Mine-Influenced	25	40
Richness	RG_MIUCO	2019	3	Mine-Influenced	25	40
Richness	RG_MIUCO	2020	1	Mine-Influenced	26	41
Richness	RG_MIUCO	2020	2	Mine-Influenced	27	41
Richness	RG_MIUCO	2020	3	Mine-Influenced	25	40
Richness	RG_MIUCO	2021	1	Mine-Influenced	27	42
Richness	RG_MIUCO	2021	2	Mine-Influenced	27	42
Richness	RG_MIUCO	2021	3	Mine-Influenced	27	42
Richness	RG_CORCK	2012	1	Mine-Influenced	26	40
Richness	RG_CORCK	2015	1	Mine-Influenced	26	40
Richness	RG_CORCK	2016	1	Mine-Influenced	26	40
Richness	RG_CORCK	2017	1	Mine-Influenced	25	40
Richness	RG_CORCK	2018	1	Mine-Influenced	23	38
Richness	RG_CORCK	2018	2	Mine-Influenced	25	39
Richness	RG_CORCK	2018	3	Mine-Influenced	25	39
Richness	RG_CORCK	2019	1	Mine-Influenced	25	40
Richness	RG_CORCK	2019	2	Mine-Influenced	24	39
Richness	RG_CORCK	2019	3	Mine-Influenced	24	38
Richness	RG_CORCK	2020	1	Mine-Influenced	21	36
Richness	RG_CORCK	2020	2	Mine-Influenced	23	37
Richness	RG_CORCK	2020	3	Mine-Influenced	21	36
Richness	RG_CORCK	2021	1	Mine-Influenced	23	38
Richness	RG_CORCK	2021	2	Mine-Influenced	22	37
Richness	RG_CORCK	2021	3	Mine-Influenced	20	36
Richness	RG_MIDCO	2012	1	Mine-Influenced	26	40
Richness	RG_MIDCO	2015	1	Mine-Influenced	26	40

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Richness	RG_MIDCO	2016	1	Mine-Influenced	26	41
Richness	RG_MIDCO	2017	1	Mine-Influenced	25	40
Richness	RG_MIDCO	2018	1	Mine-Influenced	26	40
Richness	RG_MIDCO	2018	2	Mine-Influenced	25	40
Richness	RG_MIDCO	2018	3	Mine-Influenced	23	38
Richness	RG_MIDCO	2018	4	Mine-Influenced	25	40
Richness	RG_MIDCO	2018	5	Mine-Influenced	27	41
Richness	RG_MIDCO	2019	1	Mine-Influenced	26	41
Richness	RG_MIDCO	2019	2	Mine-Influenced	24	39
Richness	RG_MIDCO	2019	3	Mine-Influenced	25	39
Richness	RG_MIDCO	2019	4	Mine-Influenced	24	39
Richness	RG_MIDCO	2019	5	Mine-Influenced	26	40
Richness	RG_MIDCO	2020	1	Mine-Influenced	26	41
Richness	RG_MIDCO	2020	2	Mine-Influenced	26	40
Richness	RG_MIDCO	2020	3	Mine-Influenced	25	39
Richness	RG_MIDCO	2020	4	Mine-Influenced	25	40
Richness	RG_MIDCO	2020	5	Mine-Influenced	26	40
Richness	RG_MIDCO	2021	1	Mine-Influenced	26	40
Richness	RG_MIDCO	2021	2	Mine-Influenced	26	41
Richness	RG_MIDCO	2021	3	Mine-Influenced	26	41
Richness	RG_MIDCO	2021	4	Mine-Influenced	25	40
Richness	RG_MIDCO	2021	5	Mine-Influenced	26	41
Richness	RG_MIDAG-S1	2020	1	Mine-Influenced	25	40
Richness	RG_MIDAG-S1	2020	2	Mine-Influenced	26	41
Richness	RG_MIDAG-S1	2020	3	Mine-Influenced	26	41
Richness	RG_MIDAG-S2	2020	1	Mine-Influenced	25	40
Richness	RG_MIDAG-S2	2020	2	Mine-Influenced	25	40
Richness	RG_MIDAG-S2	2020	3	Mine-Influenced	25	40
Richness	RG_MIDAG	2012	1	Mine-Influenced	24	39
Richness	RG_MIDAG	2015	1	Mine-Influenced	25	40
Richness	RG_MIDAG	2018	1	Mine-Influenced	25	39
Richness	RG_MIDAG	2018	2	Mine-Influenced	25	40
Richness	RG_MIDAG	2018	3	Mine-Influenced	25	39
Richness	RG_MIDAG	2019	1	Mine-Influenced	23	38
Richness	RG_MIDAG	2019	2	Mine-Influenced	24	39
Richness	RG_MIDAG	2019	3	Mine-Influenced	24	39
Richness	RG_MIDAG	2020	1	Mine-Influenced	23	37
Richness	RG_MIDAG	2020	2	Mine-Influenced	25	40
Richness	RG_MIDAG	2020	3	Mine-Influenced	24	39
Richness	RG_MIDAG	2021	1	Mine-Influenced	26	40
Richness	RG_MIDAG	2021	2	Mine-Influenced	25	40
Richness	RG_MIDAG	2021	3	Mine-Influenced	26	40
Richness	RG_MIULE	2018	1	Mine-Influenced	25	40
Richness	RG_MIULE	2018	2	Mine-Influenced	26	41
Richness	RG_MIULE	2018	3	Mine-Influenced	26	40
Richness	RG_MIULE	2019	1	Mine-Influenced	24	39
Richness	RG_MIULE	2019	2	Mine-Influenced	25	40
Richness	RG_MIULE	2019	3	Mine-Influenced	25	40
Richness	RG_MIULE	2020	1	Mine-Influenced	23	38
Richness	RG_MIULE	2020	2	Mine-Influenced	23	38
Richness	RG_MIULE	2020	3	Mine-Influenced	25	39
Richness	RG_MIULE	2021	1	Mine-Influenced	24	39
Richness	RG_MIULE	2021	2	Mine-Influenced	25	40
Richness	RG_MIULE	2021	3	Mine-Influenced	25	40
Richness	RG_MI5	2012	1	Mine-Influenced	27	41
Richness	RG_MI5	2015	1	Mine-Influenced	26	41
Richness	RG_MI5	2018	1	Mine-Influenced	28	43
Richness	RG_MI5	2018	2	Mine-Influenced	28	43
Richness	RG_MI5	2018	3	Mine-Influenced	27	42
Richness	RG_MI5	2019	1	Mine-Influenced	26	41
Richness	RG_MI5	2019	2	Mine-Influenced	27	42
Richness	RG_MI5	2019	3	Mine-Influenced	26	41
Richness	RG_MI5	2020	1	Mine-Influenced	28	42
Richness	RG_MI5	2020	2	Mine-Influenced	28	42
Richness	RG_MI5	2020	3	Mine-Influenced	27	41
Richness	RG_MI5	2021	1	Mine-Influenced	27	42
Richness	RG_MI5	2021	2	Mine-Influenced	28	43
Richness	RG_MI5	2021	3	Mine-Influenced	27	41
Richness	CM_MC2	2020	1	Mine-Influenced	-	-
Richness	CM_MC2	2020	2	Mine-Influenced	-	-
Richness	CM_MC2	2020	3	Mine-Influenced	-	-
Abundance	RG_MI25	2012	1	Reference	9097	76622
Abundance	RG_MI25	2013	1	Reference	7708	66021
Abundance	RG_MI25	2013	2	Reference	7711	66867
Abundance	RG_MI25	2013	3	Reference	7571	67486
Abundance	RG_MI25	2015	1	Reference	7651	68006
Abundance	RG_MI25	2015	2	Reference	7782	70288
Abundance	RG_MI25	2015	3	Reference	7633	68223
Abundance	RG_MI25	2016	1	Reference	7497	71250
Abundance	RG_MI25	2017	1	Reference	7909	67064

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Abundance	RG_MI25	2018	1	Reference	7186	67084
Abundance	RG_MI25	2018	2	Reference	4404	67837
Abundance	RG_MI25	2018	3	Reference	7468	67088
Abundance	RG_MI25	2019	1	Reference	8530	72689
Abundance	RG_MI25	2019	2	Reference	7657	66578
Abundance	RG_MI25	2019	3	Reference	7313	65698
Abundance	RG_MI25	2020	1	Reference	7863	68311
Abundance	RG_MI25	2020	2	Reference	7215	67094
Abundance	RG_MI25	2020	3	Reference	7784	68304
Abundance	RG_MI25	2021	1	Reference	8141	69044
Abundance	RG_MI25	2021	2	Reference	7802	68334
Abundance	RG_MI25	2021	3	Reference	8295	71286
Abundance	RG_AGCK	2012	1	Reference	2874	14742
Abundance	RG_AGCK	2013	1	Reference	2597	12901
Abundance	RG_AGCK	2015	1	Reference	2608	13096
Abundance	RG_AGCK	2018	1	Reference	2609	14003
Abundance	RG_AGCK	2018	2	Reference	2594	13523
Abundance	RG_AGCK	2018	3	Reference	2536	13355
Abundance	RG_AGCK	2019	1	Reference	2704	13570
Abundance	RG_AGCK	2019	2	Reference	2556	12684
Abundance	RG_AGCK	2019	3	Reference	2626	13368
Abundance	RG_AGCK	2020	1	Reference	2371	12090
Abundance	RG_AGCK	2020	2	Reference	2656	13108
Abundance	RG_AGCK	2020	3	Reference	2541	12958
Abundance	RG_AGCK	2021	1	Reference	2699	13081
Abundance	RG_AGCK	2021	2	Reference	2619	13037
Abundance	RG_AGCK	2021	3	Reference	2612	12706
Abundance	RG_LE1	2018	1	Reference	2323	12419
Abundance	RG_LE1	2019	1	Reference	2283	12736
Abundance	RG_LE1	2019	2	Reference	2254	12446
Abundance	RG_LE1	2019	3	Reference	2249	12490
Abundance	RG_LE1	2020	1	Reference	2165	12633
Abundance	RG_LE1	2020	2	Reference	2335	12740
Abundance	RG_LE1	2020	3	Reference	2299	12105
Abundance	RG_LE1	2021	1	Reference	2328	12165
Abundance	RG_LE1	2021	2	Reference	2363	12947
Abundance	RG_LE1	2021	3	Reference	2283	12112
Abundance	RG_MIUCO	2012	1	Mine-Influenced	6475	55023
Abundance	RG_MIUCO	2015	1	Mine-Influenced	5565	48320
Abundance	RG_MIUCO	2016	1	Mine-Influenced	5568	48108
Abundance	RG_MIUCO	2017	1	Mine-Influenced	5671	48761
Abundance	RG_MIUCO	2018	1	Mine-Influenced	5122	49162
Abundance	RG_MIUCO	2018	2	Mine-Influenced	5412	50690
Abundance	RG_MIUCO	2018	3	Mine-Influenced	5278	51456
Abundance	RG_MIUCO	2019	1	Mine-Influenced	5369	51744
Abundance	RG_MIUCO	2019	2	Mine-Influenced	5203	50614
Abundance	RG_MIUCO	2019	3	Mine-Influenced	5237	48231
Abundance	RG_MIUCO	2020	1	Mine-Influenced	4981	46544
Abundance	RG_MIUCO	2020	2	Mine-Influenced	5595	50202
Abundance	RG_MIUCO	2020	3	Mine-Influenced	5244	47470
Abundance	RG_MIUCO	2021	1	Mine-Influenced	5588	48067
Abundance	RG_MIUCO	2021	2	Mine-Influenced	5936	49862
Abundance	RG_MIUCO	2021	3	Mine-Influenced	5582	49219
Abundance	RG_CORCK	2012	1	Mine-Influenced	3933	19694
Abundance	RG_CORCK	2015	1	Mine-Influenced	3685	18706
Abundance	RG_CORCK	2016	1	Mine-Influenced	3874	18830
Abundance	RG_CORCK	2017	1	Mine-Influenced	3813	18843
Abundance	RG_CORCK	2018	1	Mine-Influenced	3771	20202
Abundance	RG_CORCK	2018	2	Mine-Influenced	3773	18623
Abundance	RG_CORCK	2018	3	Mine-Influenced	3647	19812
Abundance	RG_CORCK	2019	1	Mine-Influenced	3650	18703
Abundance	RG_CORCK	2019	2	Mine-Influenced	3904	20143
Abundance	RG_CORCK	2019	3	Mine-Influenced	3475	18911
Abundance	RG_CORCK	2020	1	Mine-Influenced	3863	19346
Abundance	RG_CORCK	2020	2	Mine-Influenced	3811	19205
Abundance	RG_CORCK	2020	3	Mine-Influenced	3683	22768
Abundance	RG_CORCK	2021	1	Mine-Influenced	4017	20470
Abundance	RG_CORCK	2021	2	Mine-Influenced	3806	23122
Abundance	RG_CORCK	2021	3	Mine-Influenced	3809	22164
Abundance	RG_MIDCO	2012	1	Mine-Influenced	3808	22178
Abundance	RG_MIDCO	2015	1	Mine-Influenced	3588	22001
Abundance	RG_MIDCO	2016	1	Mine-Influenced	3657	21788
Abundance	RG_MIDCO	2017	1	Mine-Influenced	3684	21346
Abundance	RG_MIDCO	2018	1	Mine-Influenced	3398	21066
Abundance	RG_MIDCO	2018	2	Mine-Influenced	3638	21601
Abundance	RG_MIDCO	2018	3	Mine-Influenced	3623	22641
Abundance	RG_MIDCO	2018	4	Mine-Influenced	3753	22852
Abundance	RG_MIDCO	2018	5	Mine-Influenced	3663	22144
Abundance	RG_MIDCO	2019	1	Mine-Influenced	3547	21249
Abundance	RG_MIDCO	2019	2	Mine-Influenced	3665	21730

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Abundance	RG_MIDCO	2019	3	Mine-Influenced	3808	21718
Abundance	RG_MIDCO	2019	4	Mine-Influenced	3795	22725
Abundance	RG_MIDCO	2019	5	Mine-Influenced	3751	21475
Abundance	RG_MIDCO	2020	1	Mine-Influenced	3332	20869
Abundance	RG_MIDCO	2020	2	Mine-Influenced	3461	21788
Abundance	RG_MIDCO	2020	3	Mine-Influenced	3271	20937
Abundance	RG_MIDCO	2020	4	Mine-Influenced	3645	22032
Abundance	RG_MIDCO	2020	5	Mine-Influenced	3465	20992
Abundance	RG_MIDCO	2021	1	Mine-Influenced	3766	22096
Abundance	RG_MIDCO	2021	2	Mine-Influenced	3717	22158
Abundance	RG_MIDCO	2021	3	Mine-Influenced	3419	21125
Abundance	RG_MIDCO	2021	4	Mine-Influenced	3666	22744
Abundance	RG_MIDCO	2021	5	Mine-Influenced	3739	22385
Abundance	RG_MIDAG-S1	2020	1	Mine-Influenced	841	8107
Abundance	RG_MIDAG-S1	2020	2	Mine-Influenced	856	8394
Abundance	RG_MIDAG-S1	2020	3	Mine-Influenced	783	7874
Abundance	RG_MIDAG-S2	2020	1	Mine-Influenced	627	8025
Abundance	RG_MIDAG-S2	2020	2	Mine-Influenced	649	7875
Abundance	RG_MIDAG-S2	2020	3	Mine-Influenced	679	8606
Abundance	RG_MIDAG	2012	1	Mine-Influenced	2897	17251
Abundance	RG_MIDAG	2015	1	Mine-Influenced	2621	16048
Abundance	RG_MIDAG	2018	1	Mine-Influenced	2584	16771
Abundance	RG_MIDAG	2018	2	Mine-Influenced	2461	15289
Abundance	RG_MIDAG	2018	3	Mine-Influenced	2477	15485
Abundance	RG_MIDAG	2019	1	Mine-Influenced	2643	16357
Abundance	RG_MIDAG	2019	2	Mine-Influenced	2536	16500
Abundance	RG_MIDAG	2019	3	Mine-Influenced	2774	17144
Abundance	RG_MIDAG	2020	1	Mine-Influenced	2158	15224
Abundance	RG_MIDAG	2020	2	Mine-Influenced	2691	16549
Abundance	RG_MIDAG	2020	3	Mine-Influenced	2564	16240
Abundance	RG_MIDAG	2021	1	Mine-Influenced	2453	15731
Abundance	RG_MIDAG	2021	2	Mine-Influenced	2456	15827
Abundance	RG_MIDAG	2021	3	Mine-Influenced	2672	16670
Abundance	RG_MIULE	2018	1	Mine-Influenced	852	6904
Abundance	RG_MIULE	2018	2	Mine-Influenced	910	7229
Abundance	RG_MIULE	2018	3	Mine-Influenced	869	7004
Abundance	RG_MIULE	2019	1	Mine-Influenced	879	7315
Abundance	RG_MIULE	2019	2	Mine-Influenced	892	7125
Abundance	RG_MIULE	2019	3	Mine-Influenced	952	7869
Abundance	RG_MIULE	2020	1	Mine-Influenced	914	6896
Abundance	RG_MIULE	2020	2	Mine-Influenced	892	6725
Abundance	RG_MIULE	2020	3	Mine-Influenced	912	7144
Abundance	RG_MIULE	2021	1	Mine-Influenced	981	7102
Abundance	RG_MIULE	2021	2	Mine-Influenced	875	6724
Abundance	RG_MIULE	2021	3	Mine-Influenced	889	6841
Abundance	RG_MI5	2012	1	Mine-Influenced	2216	11745
Abundance	RG_MI5	2015	1	Mine-Influenced	2044	11124
Abundance	RG_MI5	2018	1	Mine-Influenced	1885	10826
Abundance	RG_MI5	2018	2	Mine-Influenced	2008	11006
Abundance	RG_MI5	2018	3	Mine-Influenced	2146	11003
Abundance	RG_MI5	2019	1	Mine-Influenced	1939	10688
Abundance	RG_MI5	2019	2	Mine-Influenced	2294	12092
Abundance	RG_MI5	2019	3	Mine-Influenced	2076	11138
Abundance	RG_MI5	2020	1	Mine-Influenced	1848	10623
Abundance	RG_MI5	2020	2	Mine-Influenced	2174	11876
Abundance	RG_MI5	2020	3	Mine-Influenced	1840	10819
Abundance	RG_MI5	2021	1	Mine-Influenced	2249	11926
Abundance	RG_MI5	2021	2	Mine-Influenced	1995	10720
Abundance	RG_MI5	2021	3	Mine-Influenced	1903	10627
Abundance	CM_MC2	2020	1	Mine-Influenced	-	-
Abundance	CM_MC2	2020	2	Mine-Influenced	-	-
Abundance	CM_MC2	2020	3	Mine-Influenced	-	-
EPT Abundance	RG_MI25	2012	1	Reference	5675	68144
EPT Abundance	RG_MI25	2013	1	Reference	4726	58053
EPT Abundance	RG_MI25	2013	2	Reference	4722	58907
EPT Abundance	RG_MI25	2013	3	Reference	4664	59553
EPT Abundance	RG_MI25	2015	1	Reference	4595	59452
EPT Abundance	RG_MI25	2015	2	Reference	4671	61539
EPT Abundance	RG_MI25	2015	3	Reference	4608	59591
EPT Abundance	RG_MI25	2016	1	Reference	4538	62214
EPT Abundance	RG_MI25	2017	1	Reference	4969	59796
EPT Abundance	RG_MI25	2018	1	Reference	4507	59677
EPT Abundance	RG_MI25	2018	2	Reference	2169	58471
EPT Abundance	RG_MI25	2018	3	Reference	4556	59161
EPT Abundance	RG_MI25	2019	1	Reference	5589	65831
EPT Abundance	RG_MI25	2019	2	Reference	4920	59491
EPT Abundance	RG_MI25	2019	3	Reference	4553	58184
EPT Abundance	RG_MI25	2020	1	Reference	4844	60154
EPT Abundance	RG_MI25	2020	2	Reference	4138	57804
EPT Abundance	RG_MI25	2020	3	Reference	4811	60099

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
EPT Abundance	RG_MI25	2021	1	Reference	5138	61527
EPT Abundance	RG_MI25	2021	2	Reference	4893	60539
EPT Abundance	RG_MI25	2021	3	Reference	5123	62746
EPT Abundance	RG_AGCK	2012	1	Reference	2216	14013
EPT Abundance	RG_AGCK	2013	1	Reference	2008	12215
EPT Abundance	RG_AGCK	2015	1	Reference	2015	12409
EPT Abundance	RG_AGCK	2018	1	Reference	2033	13288
EPT Abundance	RG_AGCK	2018	2	Reference	2028	12859
EPT Abundance	RG_AGCK	2018	3	Reference	1991	12697
EPT Abundance	RG_AGCK	2019	1	Reference	2111	12906
EPT Abundance	RG_AGCK	2019	2	Reference	1941	11973
EPT Abundance	RG_AGCK	2019	3	Reference	2047	12690
EPT Abundance	RG_AGCK	2020	1	Reference	1737	11323
EPT Abundance	RG_AGCK	2020	2	Reference	2078	12452
EPT Abundance	RG_AGCK	2020	3	Reference	1926	12203
EPT Abundance	RG_AGCK	2021	1	Reference	2016	12252
EPT Abundance	RG_AGCK	2021	2	Reference	2052	12370
EPT Abundance	RG_AGCK	2021	3	Reference	2050	12112
EPT Abundance	RG_LE1	2018	1	Reference	1432	10913
EPT Abundance	RG_LE1	2019	1	Reference	1381	11095
EPT Abundance	RG_LE1	2019	2	Reference	1292	10581
EPT Abundance	RG_LE1	2019	3	Reference	1301	10676
EPT Abundance	RG_LE1	2020	1	Reference	1174	10617
EPT Abundance	RG_LE1	2020	2	Reference	1380	10989
EPT Abundance	RG_LE1	2020	3	Reference	1369	10460
EPT Abundance	RG_LE1	2021	1	Reference	1422	10634
EPT Abundance	RG_LE1	2021	2	Reference	1394	11172
EPT Abundance	RG_LE1	2021	3	Reference	1356	10465
EPT Abundance	RG_MIUCO	2012	1	Mine-Influenced	4257	49715
EPT Abundance	RG_MIUCO	2015	1	Mine-Influenced	3447	42679
EPT Abundance	RG_MIUCO	2016	1	Mine-Influenced	3535	42785
EPT Abundance	RG_MIUCO	2017	1	Mine-Influenced	3424	42701
EPT Abundance	RG_MIUCO	2018	1	Mine-Influenced	3125	43331
EPT Abundance	RG_MIUCO	2018	2	Mine-Influenced	3466	45237
EPT Abundance	RG_MIUCO	2018	3	Mine-Influenced	3291	45804
EPT Abundance	RG_MIUCO	2019	1	Mine-Influenced	3188	44984
EPT Abundance	RG_MIUCO	2019	2	Mine-Influenced	3023	43886
EPT Abundance	RG_MIUCO	2019	3	Mine-Influenced	3085	41780
EPT Abundance	RG_MIUCO	2020	1	Mine-Influenced	2952	40588
EPT Abundance	RG_MIUCO	2020	2	Mine-Influenced	3523	44618
EPT Abundance	RG_MIUCO	2020	3	Mine-Influenced	3146	41449
EPT Abundance	RG_MIUCO	2021	1	Mine-Influenced	3453	42431
EPT Abundance	RG_MIUCO	2021	2	Mine-Influenced	3812	44679
EPT Abundance	RG_MIUCO	2021	3	Mine-Influenced	3543	43702
EPT Abundance	RG_CORCK	2012	1	Mine-Influenced	2836	18149
EPT Abundance	RG_CORCK	2015	1	Mine-Influenced	2672	17301
EPT Abundance	RG_CORCK	2016	1	Mine-Influenced	2794	17390
EPT Abundance	RG_CORCK	2017	1	Mine-Influenced	2737	17388
EPT Abundance	RG_CORCK	2018	1	Mine-Influenced	2553	18298
EPT Abundance	RG_CORCK	2018	2	Mine-Influenced	2635	17019
EPT Abundance	RG_CORCK	2018	3	Mine-Influenced	2532	18068
EPT Abundance	RG_CORCK	2019	1	Mine-Influenced	2590	17185
EPT Abundance	RG_CORCK	2019	2	Mine-Influenced	2725	18385
EPT Abundance	RG_CORCK	2019	3	Mine-Influenced	2303	17014
EPT Abundance	RG_CORCK	2020	1	Mine-Influenced	2392	17234
EPT Abundance	RG_CORCK	2020	2	Mine-Influenced	2519	17294
EPT Abundance	RG_CORCK	2020	3	Mine-Influenced	2259	20218
EPT Abundance	RG_CORCK	2021	1	Mine-Influenced	2703	18479
EPT Abundance	RG_CORCK	2021	2	Mine-Influenced	2492	20870
EPT Abundance	RG_CORCK	2021	3	Mine-Influenced	2351	19753
EPT Abundance	RG_MIDCO	2012	1	Mine-Influenced	2449	19814
EPT Abundance	RG_MIDCO	2015	1	Mine-Influenced	2315	19666
EPT Abundance	RG_MIDCO	2016	1	Mine-Influenced	2406	19660
EPT Abundance	RG_MIDCO	2017	1	Mine-Influenced	2333	19023
EPT Abundance	RG_MIDCO	2018	1	Mine-Influenced	2169	18833
EPT Abundance	RG_MIDCO	2018	2	Mine-Influenced	2298	19197
EPT Abundance	RG_MIDCO	2018	3	Mine-Influenced	2112	19721
EPT Abundance	RG_MIDCO	2018	4	Mine-Influenced	2408	20485
EPT Abundance	RG_MIDCO	2018	5	Mine-Influenced	2444	20104
EPT Abundance	RG_MIDCO	2019	1	Mine-Influenced	2336	19129
EPT Abundance	RG_MIDCO	2019	2	Mine-Influenced	2249	19185
EPT Abundance	RG_MIDCO	2019	3	Mine-Influenced	2374	19293
EPT Abundance	RG_MIDCO	2019	4	Mine-Influenced	2373	20177
EPT Abundance	RG_MIDCO	2019	5	Mine-Influenced	2427	19341
EPT Abundance	RG_MIDCO	2020	1	Mine-Influenced	2182	18795
EPT Abundance	RG_MIDCO	2020	2	Mine-Influenced	2274	19651
EPT Abundance	RG_MIDCO	2020	3	Mine-Influenced	2008	18492
EPT Abundance	RG_MIDCO	2020	4	Mine-Influenced	2286	19505
EPT Abundance	RG_MIDCO	2020	5	Mine-Influenced	2225	18728
EPT Abundance	RG_MIDCO	2021	1	Mine-Influenced	2405	19747

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
EPT Abundance	RG_MIDCO	2021	2	Mine-Influenced	2419	19882
EPT Abundance	RG_MIDCO	2021	3	Mine-Influenced	2236	19029
EPT Abundance	RG_MIDCO	2021	4	Mine-Influenced	2304	20195
EPT Abundance	RG_MIDCO	2021	5	Mine-Influenced	2439	20102
EPT Abundance	RG_MIDAG-S1	2020	1	Mine-Influenced	539	7365
EPT Abundance	RG_MIDAG-S1	2020	2	Mine-Influenced	560	7672
EPT Abundance	RG_MIDAG-S1	2020	3	Mine-Influenced	516	7204
EPT Abundance	RG_MIDAG-S2	2020	1	Mine-Influenced	415	7328
EPT Abundance	RG_MIDAG-S2	2020	2	Mine-Influenced	431	7179
EPT Abundance	RG_MIDAG-S2	2020	3	Mine-Influenced	459	7906
EPT Abundance	RG_MIDAG	2012	1	Mine-Influenced	1938	15657
EPT Abundance	RG_MIDAG	2015	1	Mine-Influenced	1748	14598
EPT Abundance	RG_MIDAG	2018	1	Mine-Influenced	1771	15370
EPT Abundance	RG_MIDAG	2018	2	Mine-Influenced	1599	13820
EPT Abundance	RG_MIDAG	2018	3	Mine-Influenced	1651	14047
EPT Abundance	RG_MIDAG	2019	1	Mine-Influenced	1654	14589
EPT Abundance	RG_MIDAG	2019	2	Mine-Influenced	1587	14777
EPT Abundance	RG_MIDAG	2019	3	Mine-Influenced	1841	15509
EPT Abundance	RG_MIDAG	2020	1	Mine-Influenced	1311	13493
EPT Abundance	RG_MIDAG	2020	2	Mine-Influenced	1755	14973
EPT Abundance	RG_MIDAG	2020	3	Mine-Influenced	1645	14585
EPT Abundance	RG_MIDAG	2021	1	Mine-Influenced	1668	14357
EPT Abundance	RG_MIDAG	2021	2	Mine-Influenced	1670	14467
EPT Abundance	RG_MIDAG	2021	3	Mine-Influenced	1863	15370
EPT Abundance	RG_MIULE	2018	1	Mine-Influenced	509	6091
EPT Abundance	RG_MIULE	2018	2	Mine-Influenced	574	6491
EPT Abundance	RG_MIULE	2018	3	Mine-Influenced	550	6271
EPT Abundance	RG_MIULE	2019	1	Mine-Influenced	520	6417
EPT Abundance	RG_MIULE	2019	2	Mine-Influenced	551	6344
EPT Abundance	RG_MIULE	2019	3	Mine-Influenced	594	7053
EPT Abundance	RG_MIULE	2020	1	Mine-Influenced	531	6035
EPT Abundance	RG_MIULE	2020	2	Mine-Influenced	490	5820
EPT Abundance	RG_MIULE	2020	3	Mine-Influenced	570	6361
EPT Abundance	RG_MIULE	2021	1	Mine-Influenced	604	6290
EPT Abundance	RG_MIULE	2021	2	Mine-Influenced	511	5916
EPT Abundance	RG_MIULE	2021	3	Mine-Influenced	563	6125
EPT Abundance	RG_MI5	2012	1	Mine-Influenced	1313	10193
EPT Abundance	RG_MI5	2015	1	Mine-Influenced	1152	9541
EPT Abundance	RG_MI5	2018	1	Mine-Influenced	1120	9460
EPT Abundance	RG_MI5	2018	2	Mine-Influenced	1224	9665
EPT Abundance	RG_MI5	2018	3	Mine-Influenced	1260	9514
EPT Abundance	RG_MI5	2019	1	Mine-Influenced	1124	9198
EPT Abundance	RG_MI5	2019	2	Mine-Influenced	1416	10690
EPT Abundance	RG_MI5	2019	3	Mine-Influenced	1172	9571
EPT Abundance	RG_MI5	2020	1	Mine-Influenced	1089	9253
EPT Abundance	RG_MI5	2020	2	Mine-Influenced	1322	10428
EPT Abundance	RG_MI5	2020	3	Mine-Influenced	1052	9320
EPT Abundance	RG_MI5	2021	1	Mine-Influenced	1335	10394
EPT Abundance	RG_MI5	2021	2	Mine-Influenced	1199	9371
EPT Abundance	RG_MI5	2021	3	Mine-Influenced	1049	9095
EPT Abundance	CM_MC2	2020	1	Mine-Influenced	-	-
EPT Abundance	CM_MC2	2020	2	Mine-Influenced	-	-
EPT Abundance	CM_MC2	2020	3	Mine-Influenced	-	-
Percent EPT	RG_MI25	2012	1	Reference	62	89
Percent EPT	RG_MI25	2013	1	Reference	61	88
Percent EPT	RG_MI25	2013	2	Reference	61	88
Percent EPT	RG_MI25	2013	3	Reference	62	88
Percent EPT	RG_MI25	2015	1	Reference	60	87
Percent EPT	RG_MI25	2015	2	Reference	60	88
Percent EPT	RG_MI25	2015	3	Reference	60	87
Percent EPT	RG_MI25	2016	1	Reference	61	87
Percent EPT	RG_MI25	2017	1	Reference	63	89
Percent EPT	RG_MI25	2018	1	Reference	63	89
Percent EPT	RG_MI25	2018	2	Reference	49	86
Percent EPT	RG_MI25	2018	3	Reference	61	88
Percent EPT	RG_MI25	2019	1	Reference	66	91
Percent EPT	RG_MI25	2019	2	Reference	64	89
Percent EPT	RG_MI25	2019	3	Reference	62	89
Percent EPT	RG_MI25	2020	1	Reference	62	88
Percent EPT	RG_MI25	2020	2	Reference	57	86
Percent EPT	RG_MI25	2020	3	Reference	62	88
Percent EPT	RG_MI25	2021	1	Reference	63	89
Percent EPT	RG_MI25	2021	2	Reference	63	89
Percent EPT	RG_MI25	2021	3	Reference	62	88
Percent EPT	RG_AGCK	2012	1	Reference	77	95
Percent EPT	RG_AGCK	2013	1	Reference	77	95
Percent EPT	RG_AGCK	2015	1	Reference	77	95
Percent EPT	RG_AGCK	2018	1	Reference	78	95
Percent EPT	RG_AGCK	2018	2	Reference	78	95
Percent EPT	RG_AGCK	2018	3	Reference	79	95

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Percent EPT	RG_AGCK	2019	1	Reference	78	95
Percent EPT	RG_AGCK	2019	2	Reference	76	94
Percent EPT	RG_AGCK	2019	3	Reference	78	95
Percent EPT	RG_AGCK	2020	1	Reference	73	94
Percent EPT	RG_AGCK	2020	2	Reference	78	95
Percent EPT	RG_AGCK	2020	3	Reference	76	94
Percent EPT	RG_AGCK	2021	1	Reference	75	94
Percent EPT	RG_AGCK	2021	2	Reference	78	95
Percent EPT	RG_AGCK	2021	3	Reference	78	95
Percent EPT	RG_LE1	2018	1	Reference	62	88
Percent EPT	RG_LE1	2019	1	Reference	60	87
Percent EPT	RG_LE1	2019	2	Reference	57	85
Percent EPT	RG_LE1	2019	3	Reference	58	85
Percent EPT	RG_LE1	2020	1	Reference	54	84
Percent EPT	RG_LE1	2020	2	Reference	59	86
Percent EPT	RG_LE1	2020	3	Reference	60	86
Percent EPT	RG_LE1	2021	1	Reference	61	87
Percent EPT	RG_LE1	2021	2	Reference	59	86
Percent EPT	RG_LE1	2021	3	Reference	59	86
Percent EPT	RG_MIUCO	2012	1	Mine-Influenced	66	90
Percent EPT	RG_MIUCO	2015	1	Mine-Influenced	62	88
Percent EPT	RG_MIUCO	2016	1	Mine-Influenced	63	89
Percent EPT	RG_MIUCO	2017	1	Mine-Influenced	60	88
Percent EPT	RG_MIUCO	2018	1	Mine-Influenced	61	88
Percent EPT	RG_MIUCO	2018	2	Mine-Influenced	64	89
Percent EPT	RG_MIUCO	2018	3	Mine-Influenced	62	89
Percent EPT	RG_MIUCO	2019	1	Mine-Influenced	59	87
Percent EPT	RG_MIUCO	2019	2	Mine-Influenced	58	87
Percent EPT	RG_MIUCO	2019	3	Mine-Influenced	59	87
Percent EPT	RG_MIUCO	2020	1	Mine-Influenced	59	87
Percent EPT	RG_MIUCO	2020	2	Mine-Influenced	63	89
Percent EPT	RG_MIUCO	2020	3	Mine-Influenced	60	87
Percent EPT	RG_MIUCO	2021	1	Mine-Influenced	62	88
Percent EPT	RG_MIUCO	2021	2	Mine-Influenced	64	90
Percent EPT	RG_MIUCO	2021	3	Mine-Influenced	63	89
Percent EPT	RG_CORCK	2012	1	Mine-Influenced	72	92
Percent EPT	RG_CORCK	2015	1	Mine-Influenced	73	92
Percent EPT	RG_CORCK	2016	1	Mine-Influenced	72	92
Percent EPT	RG_CORCK	2017	1	Mine-Influenced	72	92
Percent EPT	RG_CORCK	2018	1	Mine-Influenced	68	91
Percent EPT	RG_CORCK	2018	2	Mine-Influenced	70	91
Percent EPT	RG_CORCK	2018	3	Mine-Influenced	69	91
Percent EPT	RG_CORCK	2019	1	Mine-Influenced	71	92
Percent EPT	RG_CORCK	2019	2	Mine-Influenced	70	91
Percent EPT	RG_CORCK	2019	3	Mine-Influenced	66	90
Percent EPT	RG_CORCK	2020	1	Mine-Influenced	62	89
Percent EPT	RG_CORCK	2020	2	Mine-Influenced	66	90
Percent EPT	RG_CORCK	2020	3	Mine-Influenced	61	89
Percent EPT	RG_CORCK	2021	1	Mine-Influenced	67	90
Percent EPT	RG_CORCK	2021	2	Mine-Influenced	65	90
Percent EPT	RG_CORCK	2021	3	Mine-Influenced	62	89
Percent EPT	RG_MIDCO	2012	1	Mine-Influenced	64	89
Percent EPT	RG_MIDCO	2015	1	Mine-Influenced	65	89
Percent EPT	RG_MIDCO	2016	1	Mine-Influenced	66	90
Percent EPT	RG_MIDCO	2017	1	Mine-Influenced	63	89
Percent EPT	RG_MIDCO	2018	1	Mine-Influenced	64	89
Percent EPT	RG_MIDCO	2018	2	Mine-Influenced	63	89
Percent EPT	RG_MIDCO	2018	3	Mine-Influenced	58	87
Percent EPT	RG_MIDCO	2018	4	Mine-Influenced	64	90
Percent EPT	RG_MIDCO	2018	5	Mine-Influenced	67	91
Percent EPT	RG_MIDCO	2019	1	Mine-Influenced	66	90
Percent EPT	RG_MIDCO	2019	2	Mine-Influenced	61	88
Percent EPT	RG_MIDCO	2019	3	Mine-Influenced	62	89
Percent EPT	RG_MIDCO	2019	4	Mine-Influenced	63	89
Percent EPT	RG_MIDCO	2019	5	Mine-Influenced	65	90
Percent EPT	RG_MIDCO	2020	1	Mine-Influenced	65	90
Percent EPT	RG_MIDCO	2020	2	Mine-Influenced	66	90
Percent EPT	RG_MIDCO	2020	3	Mine-Influenced	61	88
Percent EPT	RG_MIDCO	2020	4	Mine-Influenced	63	89
Percent EPT	RG_MIDCO	2020	5	Mine-Influenced	64	89
Percent EPT	RG_MIDCO	2021	1	Mine-Influenced	64	89
Percent EPT	RG_MIDCO	2021	2	Mine-Influenced	65	90
Percent EPT	RG_MIDCO	2021	3	Mine-Influenced	65	90
Percent EPT	RG_MIDCO	2021	4	Mine-Influenced	63	89
Percent EPT	RG_MIDCO	2021	5	Mine-Influenced	65	90
Percent EPT	RG_MIDAG-S1	2020	1	Mine-Influenced	64	91
Percent EPT	RG_MIDAG-S1	2020	2	Mine-Influenced	65	91
Percent EPT	RG_MIDAG-S1	2020	3	Mine-Influenced	66	91
Percent EPT	RG_MIDAG-S2	2020	1	Mine-Influenced	66	91
Percent EPT	RG_MIDAG-S2	2020	2	Mine-Influenced	66	91

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Percent EPT	RG_MIDAG-S2	2020	3	Mine-Influenced	68	92
Percent EPT	RG_MIDAG	2012	1	Mine-Influenced	67	91
Percent EPT	RG_MIDAG	2015	1	Mine-Influenced	67	91
Percent EPT	RG_MIDAG	2018	1	Mine-Influenced	69	92
Percent EPT	RG_MIDAG	2018	2	Mine-Influenced	65	90
Percent EPT	RG_MIDAG	2018	3	Mine-Influenced	67	91
Percent EPT	RG_MIDAG	2019	1	Mine-Influenced	63	89
Percent EPT	RG_MIDAG	2019	2	Mine-Influenced	63	90
Percent EPT	RG_MIDAG	2019	3	Mine-Influenced	66	90
Percent EPT	RG_MIDAG	2020	1	Mine-Influenced	61	89
Percent EPT	RG_MIDAG	2020	2	Mine-Influenced	65	90
Percent EPT	RG_MIDAG	2020	3	Mine-Influenced	64	90
Percent EPT	RG_MIDAG	2021	1	Mine-Influenced	68	91
Percent EPT	RG_MIDAG	2021	2	Mine-Influenced	68	91
Percent EPT	RG_MIDAG	2021	3	Mine-Influenced	70	92
Percent EPT	RG_MIULE	2018	1	Mine-Influenced	60	88
Percent EPT	RG_MIULE	2018	2	Mine-Influenced	63	90
Percent EPT	RG_MIULE	2018	3	Mine-Influenced	63	90
Percent EPT	RG_MIULE	2019	1	Mine-Influenced	59	88
Percent EPT	RG_MIULE	2019	2	Mine-Influenced	62	89
Percent EPT	RG_MIULE	2019	3	Mine-Influenced	62	90
Percent EPT	RG_MIULE	2020	1	Mine-Influenced	58	88
Percent EPT	RG_MIULE	2020	2	Mine-Influenced	55	87
Percent EPT	RG_MIULE	2020	3	Mine-Influenced	63	89
Percent EPT	RG_MIULE	2021	1	Mine-Influenced	62	89
Percent EPT	RG_MIULE	2021	2	Mine-Influenced	58	88
Percent EPT	RG_MIULE	2021	3	Mine-Influenced	63	90
Percent EPT	RG_MI5	2012	1	Mine-Influenced	59	87
Percent EPT	RG_MI5	2015	1	Mine-Influenced	56	86
Percent EPT	RG_MI5	2018	1	Mine-Influenced	59	87
Percent EPT	RG_MI5	2018	2	Mine-Influenced	61	88
Percent EPT	RG_MI5	2018	3	Mine-Influenced	59	86
Percent EPT	RG_MI5	2019	1	Mine-Influenced	58	86
Percent EPT	RG_MI5	2019	2	Mine-Influenced	62	88
Percent EPT	RG_MI5	2019	3	Mine-Influenced	56	86
Percent EPT	RG_MI5	2020	1	Mine-Influenced	59	87
Percent EPT	RG_MI5	2020	2	Mine-Influenced	61	88
Percent EPT	RG_MI5	2020	3	Mine-Influenced	57	86
Percent EPT	RG_MI5	2021	1	Mine-Influenced	59	87
Percent EPT	RG_MI5	2021	2	Mine-Influenced	60	87
Percent EPT	RG_MI5	2021	3	Mine-Influenced	55	86
Percent EPT	CM_MC2	2020	1	Mine-Influenced	-	-
Percent EPT	CM_MC2	2020	2	Mine-Influenced	-	-
Percent EPT	CM_MC2	2020	3	Mine-Influenced	-	-
Ephemeroptera Abundance	RG_MI25	2012	1	Reference	2744	47600
Ephemeroptera Abundance	RG_MI25	2013	1	Reference	2341	41128
Ephemeroptera Abundance	RG_MI25	2013	2	Reference	2311	41193
Ephemeroptera Abundance	RG_MI25	2013	3	Reference	2284	42046
Ephemeroptera Abundance	RG_MI25	2015	1	Reference	2368	42780
Ephemeroptera Abundance	RG_MI25	2015	2	Reference	2425	44542
Ephemeroptera Abundance	RG_MI25	2015	3	Reference	2369	42879
Ephemeroptera Abundance	RG_MI25	2016	1	Reference	2213	43942
Ephemeroptera Abundance	RG_MI25	2017	1	Reference	2367	41446
Ephemeroptera Abundance	RG_MI25	2018	1	Reference	2206	41749
Ephemeroptera Abundance	RG_MI25	2018	2	Reference	1317	42004
Ephemeroptera Abundance	RG_MI25	2018	3	Reference	2186	41103
Ephemeroptera Abundance	RG_MI25	2019	1	Reference	2522	44792
Ephemeroptera Abundance	RG_MI25	2019	2	Reference	2213	40953
Ephemeroptera Abundance	RG_MI25	2019	3	Reference	2213	40940
Ephemeroptera Abundance	RG_MI25	2020	1	Reference	2337	42090
Ephemeroptera Abundance	RG_MI25	2020	2	Reference	2217	42249
Ephemeroptera Abundance	RG_MI25	2020	3	Reference	2365	42501
Ephemeroptera Abundance	RG_MI25	2021	1	Reference	2369	42337
Ephemeroptera Abundance	RG_MI25	2021	2	Reference	2298	42072
Ephemeroptera Abundance	RG_MI25	2021	3	Reference	2509	44164
Ephemeroptera Abundance	RG_AGCK	2012	1	Reference	1292	10804
Ephemeroptera Abundance	RG_AGCK	2013	1	Reference	1144	9286
Ephemeroptera Abundance	RG_AGCK	2015	1	Reference	1159	9540
Ephemeroptera Abundance	RG_AGCK	2018	1	Reference	1157	10193
Ephemeroptera Abundance	RG_AGCK	2018	2	Reference	1140	9735
Ephemeroptera Abundance	RG_AGCK	2018	3	Reference	1094	9564
Ephemeroptera Abundance	RG_AGCK	2019	1	Reference	1201	9846
Ephemeroptera Abundance	RG_AGCK	2019	2	Reference	1124	9136
Ephemeroptera Abundance	RG_AGCK	2019	3	Reference	1138	9564
Ephemeroptera Abundance	RG_AGCK	2020	1	Reference	1059	8811
Ephemeroptera Abundance	RG_AGCK	2020	2	Reference	1161	9453
Ephemeroptera Abundance	RG_AGCK	2020	3	Reference	1131	9379
Ephemeroptera Abundance	RG_AGCK	2021	1	Reference	1200	9491
Ephemeroptera Abundance	RG_AGCK	2021	2	Reference	1149	9350
Ephemeroptera Abundance	RG_AGCK	2021	3	Reference	1134	9061

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Ephemeroptera Abundance	RG_LE1	2018	1	Reference	765	7629
Ephemeroptera Abundance	RG_LE1	2019	1	Reference	756	7814
Ephemeroptera Abundance	RG_LE1	2019	2	Reference	786	7884
Ephemeroptera Abundance	RG_LE1	2019	3	Reference	754	7769
Ephemeroptera Abundance	RG_LE1	2020	1	Reference	757	8004
Ephemeroptera Abundance	RG_LE1	2020	2	Reference	787	7941
Ephemeroptera Abundance	RG_LE1	2020	3	Reference	800	7718
Ephemeroptera Abundance	RG_LE1	2021	1	Reference	764	7486
Ephemeroptera Abundance	RG_LE1	2021	2	Reference	815	8178
Ephemeroptera Abundance	RG_LE1	2021	3	Reference	774	7594
Ephemeroptera Abundance	RG_MIUCO	2012	1	Mine-Influenced	1751	31962
Ephemeroptera Abundance	RG_MIUCO	2015	1	Mine-Influenced	1482	27815
Ephemeroptera Abundance	RG_MIUCO	2016	1	Mine-Influenced	1417	27153
Ephemeroptera Abundance	RG_MIUCO	2017	1	Mine-Influenced	1544	28573
Ephemeroptera Abundance	RG_MIUCO	2018	1	Mine-Influenced	1330	27955
Ephemeroptera Abundance	RG_MIUCO	2018	2	Mine-Influenced	1393	28492
Ephemeroptera Abundance	RG_MIUCO	2018	3	Mine-Influenced	1363	29356
Ephemeroptera Abundance	RG_MIUCO	2019	1	Mine-Influenced	1408	29498
Ephemeroptera Abundance	RG_MIUCO	2019	2	Mine-Influenced	1392	29274
Ephemeroptera Abundance	RG_MIUCO	2019	3	Mine-Influenced	1422	28183
Ephemeroptera Abundance	RG_MIUCO	2020	1	Mine-Influenced	1356	27085
Ephemeroptera Abundance	RG_MIUCO	2020	2	Mine-Influenced	1561	29764
Ephemeroptera Abundance	RG_MIUCO	2020	3	Mine-Influenced	1432	27826
Ephemeroptera Abundance	RG_MIUCO	2021	1	Mine-Influenced	1468	27663
Ephemeroptera Abundance	RG_MIUCO	2021	2	Mine-Influenced	1577	28793
Ephemeroptera Abundance	RG_MIUCO	2021	3	Mine-Influenced	1510	28677
Ephemeroptera Abundance	RG_CORCK	2012	1	Mine-Influenced	1514	13216
Ephemeroptera Abundance	RG_CORCK	2015	1	Mine-Influenced	1378	12291
Ephemeroptera Abundance	RG_CORCK	2016	1	Mine-Influenced	1350	12194
Ephemeroptera Abundance	RG_CORCK	2017	1	Mine-Influenced	1402	12382
Ephemeroptera Abundance	RG_CORCK	2018	1	Mine-Influenced	1416	13393
Ephemeroptera Abundance	RG_CORCK	2018	2	Mine-Influenced	1410	12226
Ephemeroptera Abundance	RG_CORCK	2018	3	Mine-Influenced	1343	12968
Ephemeroptera Abundance	RG_CORCK	2019	1	Mine-Influenced	1386	12412
Ephemeroptera Abundance	RG_CORCK	2019	2	Mine-Influenced	1457	13262
Ephemeroptera Abundance	RG_CORCK	2019	3	Mine-Influenced	1299	12394
Ephemeroptera Abundance	RG_CORCK	2020	1	Mine-Influenced	1514	13215
Ephemeroptera Abundance	RG_CORCK	2020	2	Mine-Influenced	1477	12931
Ephemeroptera Abundance	RG_CORCK	2020	3	Mine-Influenced	1440	15507
Ephemeroptera Abundance	RG_CORCK	2021	1	Mine-Influenced	1559	13788
Ephemeroptera Abundance	RG_CORCK	2021	2	Mine-Influenced	1476	15613
Ephemeroptera Abundance	RG_CORCK	2021	3	Mine-Influenced	1495	15054
Ephemeroptera Abundance	RG_MIDCO	2012	1	Mine-Influenced	1198	13702
Ephemeroptera Abundance	RG_MIDCO	2015	1	Mine-Influenced	1078	13305
Ephemeroptera Abundance	RG_MIDCO	2016	1	Mine-Influenced	1125	13349
Ephemeroptera Abundance	RG_MIDCO	2017	1	Mine-Influenced	1129	13066
Ephemeroptera Abundance	RG_MIDCO	2018	1	Mine-Influenced	1022	12722
Ephemeroptera Abundance	RG_MIDCO	2018	2	Mine-Influenced	1118	13197
Ephemeroptera Abundance	RG_MIDCO	2018	3	Mine-Influenced	1118	13993
Ephemeroptera Abundance	RG_MIDCO	2018	4	Mine-Influenced	1158	13992
Ephemeroptera Abundance	RG_MIDCO	2018	5	Mine-Influenced	1117	13418
Ephemeroptera Abundance	RG_MIDCO	2019	1	Mine-Influenced	1078	12976
Ephemeroptera Abundance	RG_MIDCO	2019	2	Mine-Influenced	1130	13213
Ephemeroptera Abundance	RG_MIDCO	2019	3	Mine-Influenced	1164	13242
Ephemeroptera Abundance	RG_MIDCO	2019	4	Mine-Influenced	1156	13875
Ephemeroptera Abundance	RG_MIDCO	2019	5	Mine-Influenced	1155	13123
Ephemeroptera Abundance	RG_MIDCO	2020	1	Mine-Influenced	1033	12797
Ephemeroptera Abundance	RG_MIDCO	2020	2	Mine-Influenced	1048	13078
Ephemeroptera Abundance	RG_MIDCO	2020	3	Mine-Influenced	1007	12845
Ephemeroptera Abundance	RG_MIDCO	2020	4	Mine-Influenced	1112	13405
Ephemeroptera Abundance	RG_MIDCO	2020	5	Mine-Influenced	1064	12914
Ephemeroptera Abundance	RG_MIDCO	2021	1	Mine-Influenced	1147	13488
Ephemeroptera Abundance	RG_MIDCO	2021	2	Mine-Influenced	1125	13504
Ephemeroptera Abundance	RG_MIDCO	2021	3	Mine-Influenced	1031	12742
Ephemeroptera Abundance	RG_MIDCO	2021	4	Mine-Influenced	1169	14518
Ephemeroptera Abundance	RG_MIDCO	2021	5	Mine-Influenced	1148	13623
Ephemeroptera Abundance	RG_MIDAG-S1	2020	1	Mine-Influenced	263	5308
Ephemeroptera Abundance	RG_MIDAG-S1	2020	2	Mine-Influenced	266	5449
Ephemeroptera Abundance	RG_MIDAG-S1	2020	3	Mine-Influenced	249	5154
Ephemeroptera Abundance	RG_MIDAG-S2	2020	1	Mine-Influenced	203	5242
Ephemeroptera Abundance	RG_MIDAG-S2	2020	2	Mine-Influenced	213	5226
Ephemeroptera Abundance	RG_MIDAG-S2	2020	3	Mine-Influenced	225	5711
Ephemeroptera Abundance	RG_MIDAG	2012	1	Mine-Influenced	991	11318
Ephemeroptera Abundance	RG_MIDAG	2015	1	Mine-Influenced	831	10036
Ephemeroptera Abundance	RG_MIDAG	2018	1	Mine-Influenced	865	10840
Ephemeroptera Abundance	RG_MIDAG	2018	2	Mine-Influenced	763	9564
Ephemeroptera Abundance	RG_MIDAG	2018	3	Mine-Influenced	810	9882
Ephemeroptera Abundance	RG_MIDAG	2019	1	Mine-Influenced	884	10536
Ephemeroptera Abundance	RG_MIDAG	2019	2	Mine-Influenced	852	10533
Ephemeroptera Abundance	RG_MIDAG	2019	3	Mine-Influenced	878	10743

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Ephemeroptera Abundance	RG_MIDAG	2020	1	Mine-Influenced	753	10119
Ephemeroptera Abundance	RG_MIDAG	2020	2	Mine-Influenced	862	10353
Ephemeroptera Abundance	RG_MIDAG	2020	3	Mine-Influenced	874	10525
Ephemeroptera Abundance	RG_MIDAG	2021	1	Mine-Influenced	767	9763
Ephemeroptera Abundance	RG_MIDAG	2021	2	Mine-Influenced	765	9864
Ephemeroptera Abundance	RG_MIDAG	2021	3	Mine-Influenced	853	10497
Ephemeroptera Abundance	RG_MIULE	2018	1	Mine-Influenced	284	4570
Ephemeroptera Abundance	RG_MIULE	2018	2	Mine-Influenced	284	4653
Ephemeroptera Abundance	RG_MIULE	2018	3	Mine-Influenced	284	4625
Ephemeroptera Abundance	RG_MIULE	2019	1	Mine-Influenced	297	4870
Ephemeroptera Abundance	RG_MIULE	2019	2	Mine-Influenced	297	4712
Ephemeroptera Abundance	RG_MIULE	2019	3	Mine-Influenced	316	5226
Ephemeroptera Abundance	RG_MIULE	2020	1	Mine-Influenced	317	4707
Ephemeroptera Abundance	RG_MIULE	2020	2	Mine-Influenced	312	4641
Ephemeroptera Abundance	RG_MIULE	2020	3	Mine-Influenced	315	4847
Ephemeroptera Abundance	RG_MIULE	2021	1	Mine-Influenced	335	4791
Ephemeroptera Abundance	RG_MIULE	2021	2	Mine-Influenced	302	4578
Ephemeroptera Abundance	RG_MIULE	2021	3	Mine-Influenced	306	4610
Ephemeroptera Abundance	RG_MI5	2012	1	Mine-Influenced	675	7213
Ephemeroptera Abundance	RG_MI5	2015	1	Mine-Influenced	644	6925
Ephemeroptera Abundance	RG_MI5	2018	1	Mine-Influenced	503	6391
Ephemeroptera Abundance	RG_MI5	2018	2	Mine-Influenced	558	6536
Ephemeroptera Abundance	RG_MI5	2018	3	Mine-Influenced	648	6731
Ephemeroptera Abundance	RG_MI5	2019	1	Mine-Influenced	583	6502
Ephemeroptera Abundance	RG_MI5	2019	2	Mine-Influenced	687	7298
Ephemeroptera Abundance	RG_MI5	2019	3	Mine-Influenced	648	6889
Ephemeroptera Abundance	RG_MI5	2020	1	Mine-Influenced	524	6340
Ephemeroptera Abundance	RG_MI5	2020	2	Mine-Influenced	643	7171
Ephemeroptera Abundance	RG_MI5	2020	3	Mine-Influenced	581	6731
Ephemeroptera Abundance	RG_MI5	2021	1	Mine-Influenced	689	7283
Ephemeroptera Abundance	RG_MI5	2021	2	Mine-Influenced	599	6411
Ephemeroptera Abundance	RG_MI5	2021	3	Mine-Influenced	598	6589
Ephemeroptera Abundance	CM_MC2	2020	1	Mine-Influenced		
Ephemeroptera Abundance	CM_MC2	2020	2	Mine-Influenced		
Ephemeroptera Abundance	CM_MC2	2020	3	Mine-Influenced		
Percent Ephemeroptera	RG_MI25	2012	1	Reference	30	62
Percent Ephemeroptera	RG_MI25	2013	1	Reference	30	62
Percent Ephemeroptera	RG_MI25	2013	2	Reference	30	62
Percent Ephemeroptera	RG_MI25	2013	3	Reference	30	62
Percent Ephemeroptera	RG_MI25	2015	1	Reference	31	63
Percent Ephemeroptera	RG_MI25	2015	2	Reference	31	63
Percent Ephemeroptera	RG_MI25	2015	3	Reference	31	63
Percent Ephemeroptera	RG_MI25	2016	1	Reference	30	62
Percent Ephemeroptera	RG_MI25	2017	1	Reference	30	62
Percent Ephemeroptera	RG_MI25	2018	1	Reference	31	62
Percent Ephemeroptera	RG_MI25	2018	2	Reference	30	62
Percent Ephemeroptera	RG_MI25	2018	3	Reference	29	61
Percent Ephemeroptera	RG_MI25	2019	1	Reference	30	62
Percent Ephemeroptera	RG_MI25	2019	2	Reference	29	62
Percent Ephemeroptera	RG_MI25	2019	3	Reference	30	62
Percent Ephemeroptera	RG_MI25	2020	1	Reference	30	62
Percent Ephemeroptera	RG_MI25	2020	2	Reference	31	63
Percent Ephemeroptera	RG_MI25	2020	3	Reference	30	62
Percent Ephemeroptera	RG_MI25	2021	1	Reference	29	61
Percent Ephemeroptera	RG_MI25	2021	2	Reference	29	62
Percent Ephemeroptera	RG_MI25	2021	3	Reference	30	62
Percent Ephemeroptera	RG_AGCK	2012	1	Reference	45	73
Percent Ephemeroptera	RG_AGCK	2013	1	Reference	44	72
Percent Ephemeroptera	RG_AGCK	2015	1	Reference	44	73
Percent Ephemeroptera	RG_AGCK	2018	1	Reference	44	73
Percent Ephemeroptera	RG_AGCK	2018	2	Reference	44	72
Percent Ephemeroptera	RG_AGCK	2018	3	Reference	43	72
Percent Ephemeroptera	RG_AGCK	2019	1	Reference	44	73
Percent Ephemeroptera	RG_AGCK	2019	2	Reference	44	72
Percent Ephemeroptera	RG_AGCK	2019	3	Reference	43	72
Percent Ephemeroptera	RG_AGCK	2020	1	Reference	45	73
Percent Ephemeroptera	RG_AGCK	2020	2	Reference	44	72
Percent Ephemeroptera	RG_AGCK	2020	3	Reference	45	72
Percent Ephemeroptera	RG_AGCK	2021	1	Reference	44	73
Percent Ephemeroptera	RG_AGCK	2021	2	Reference	44	72
Percent Ephemeroptera	RG_AGCK	2021	3	Reference	43	71
Percent Ephemeroptera	RG_LE1	2018	1	Reference	33	61
Percent Ephemeroptera	RG_LE1	2019	1	Reference	33	61
Percent Ephemeroptera	RG_LE1	2019	2	Reference	35	63
Percent Ephemeroptera	RG_LE1	2019	3	Reference	34	62
Percent Ephemeroptera	RG_LE1	2020	1	Reference	35	63
Percent Ephemeroptera	RG_LE1	2020	2	Reference	34	62
Percent Ephemeroptera	RG_LE1	2020	3	Reference	35	64
Percent Ephemeroptera	RG_LE1	2021	1	Reference	33	62
Percent Ephemeroptera	RG_LE1	2021	2	Reference	34	63

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Percent Ephemeroptera	RG_LE1	2021	3	Reference	34	63
Percent Ephemeroptera	RG_MIUCO	2012	1	Mine-Influenced	27	58
Percent Ephemeroptera	RG_MIUCO	2015	1	Mine-Influenced	27	58
Percent Ephemeroptera	RG_MIUCO	2016	1	Mine-Influenced	25	56
Percent Ephemeroptera	RG_MIUCO	2017	1	Mine-Influenced	27	59
Percent Ephemeroptera	RG_MIUCO	2018	1	Mine-Influenced	26	57
Percent Ephemeroptera	RG_MIUCO	2018	2	Mine-Influenced	26	56
Percent Ephemeroptera	RG_MIUCO	2018	3	Mine-Influenced	26	57
Percent Ephemeroptera	RG_MIUCO	2019	1	Mine-Influenced	26	57
Percent Ephemeroptera	RG_MIUCO	2019	2	Mine-Influenced	27	58
Percent Ephemeroptera	RG_MIUCO	2019	3	Mine-Influenced	27	58
Percent Ephemeroptera	RG_MIUCO	2020	1	Mine-Influenced	27	58
Percent Ephemeroptera	RG_MIUCO	2020	2	Mine-Influenced	28	59
Percent Ephemeroptera	RG_MIUCO	2020	3	Mine-Influenced	27	59
Percent Ephemeroptera	RG_MIUCO	2021	1	Mine-Influenced	26	58
Percent Ephemeroptera	RG_MIUCO	2021	2	Mine-Influenced	27	58
Percent Ephemeroptera	RG_MIUCO	2021	3	Mine-Influenced	27	58
Percent Ephemeroptera	RG_CORCK	2012	1	Mine-Influenced	38	67
Percent Ephemeroptera	RG_CORCK	2015	1	Mine-Influenced	37	66
Percent Ephemeroptera	RG_CORCK	2016	1	Mine-Influenced	35	65
Percent Ephemeroptera	RG_CORCK	2017	1	Mine-Influenced	37	66
Percent Ephemeroptera	RG_CORCK	2018	1	Mine-Influenced	38	66
Percent Ephemeroptera	RG_CORCK	2018	2	Mine-Influenced	37	66
Percent Ephemeroptera	RG_CORCK	2018	3	Mine-Influenced	37	65
Percent Ephemeroptera	RG_CORCK	2019	1	Mine-Influenced	38	66
Percent Ephemeroptera	RG_CORCK	2019	2	Mine-Influenced	37	66
Percent Ephemeroptera	RG_CORCK	2019	3	Mine-Influenced	37	66
Percent Ephemeroptera	RG_CORCK	2020	1	Mine-Influenced	39	68
Percent Ephemeroptera	RG_CORCK	2020	2	Mine-Influenced	39	67
Percent Ephemeroptera	RG_CORCK	2020	3	Mine-Influenced	39	68
Percent Ephemeroptera	RG_CORCK	2021	1	Mine-Influenced	39	67
Percent Ephemeroptera	RG_CORCK	2021	2	Mine-Influenced	39	68
Percent Ephemeroptera	RG_CORCK	2021	3	Mine-Influenced	39	68
Percent Ephemeroptera	RG_MIDCO	2012	1	Mine-Influenced	31	62
Percent Ephemeroptera	RG_MIDCO	2015	1	Mine-Influenced	30	60
Percent Ephemeroptera	RG_MIDCO	2016	1	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2017	1	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2018	1	Mine-Influenced	30	60
Percent Ephemeroptera	RG_MIDCO	2018	2	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2018	3	Mine-Influenced	31	62
Percent Ephemeroptera	RG_MIDCO	2018	4	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2018	5	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MIDCO	2019	1	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MIDCO	2019	2	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2019	3	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2019	4	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MIDCO	2019	5	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2020	1	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2020	2	Mine-Influenced	30	60
Percent Ephemeroptera	RG_MIDCO	2020	3	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDCO	2020	4	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MIDCO	2020	5	Mine-Influenced	31	62
Percent Ephemeroptera	RG_MIDCO	2021	1	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MIDCO	2021	2	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MIDCO	2021	3	Mine-Influenced	30	60
Percent Ephemeroptera	RG_MIDCO	2021	4	Mine-Influenced	32	64
Percent Ephemeroptera	RG_MIDCO	2021	5	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MIDAG-S1	2020	1	Mine-Influenced	31	65
Percent Ephemeroptera	RG_MIDAG-S1	2020	2	Mine-Influenced	31	65
Percent Ephemeroptera	RG_MIDAG-S1	2020	3	Mine-Influenced	32	65
Percent Ephemeroptera	RG_MIDAG-S2	2020	1	Mine-Influenced	32	65
Percent Ephemeroptera	RG_MIDAG-S2	2020	2	Mine-Influenced	33	66
Percent Ephemeroptera	RG_MIDAG-S2	2020	3	Mine-Influenced	33	66
Percent Ephemeroptera	RG_MIDAG	2012	1	Mine-Influenced	34	66
Percent Ephemeroptera	RG_MIDAG	2015	1	Mine-Influenced	32	63
Percent Ephemeroptera	RG_MIDAG	2018	1	Mine-Influenced	33	65
Percent Ephemeroptera	RG_MIDAG	2018	2	Mine-Influenced	31	63
Percent Ephemeroptera	RG_MIDAG	2018	3	Mine-Influenced	33	64
Percent Ephemeroptera	RG_MIDAG	2019	1	Mine-Influenced	33	64
Percent Ephemeroptera	RG_MIDAG	2019	2	Mine-Influenced	34	64
Percent Ephemeroptera	RG_MIDAG	2019	3	Mine-Influenced	32	63
Percent Ephemeroptera	RG_MIDAG	2020	1	Mine-Influenced	35	66
Percent Ephemeroptera	RG_MIDAG	2020	2	Mine-Influenced	32	63
Percent Ephemeroptera	RG_MIDAG	2020	3	Mine-Influenced	34	65
Percent Ephemeroptera	RG_MIDAG	2021	1	Mine-Influenced	31	62
Percent Ephemeroptera	RG_MIDAG	2021	2	Mine-Influenced	31	62
Percent Ephemeroptera	RG_MIDAG	2021	3	Mine-Influenced	32	63
Percent Ephemeroptera	RG_MIULE	2018	1	Mine-Influenced	33	66
Percent Ephemeroptera	RG_MIULE	2018	2	Mine-Influenced	31	64
Percent Ephemeroptera	RG_MIULE	2018	3	Mine-Influenced	33	66

Table J-3: Site Specific Normal Ranges at CMm LAEMP Sampling Stations, 2012 to 2021

Variable	Station	Year	Replicate	Status	Lower Bound	Upper Bound
Percent Ephemeroptera	RG_MIULE	2019	1	Mine-Influenced	34	67
Percent Ephemeroptera	RG_MIULE	2019	2	Mine-Influenced	33	66
Percent Ephemeroptera	RG_MIULE	2019	3	Mine-Influenced	33	66
Percent Ephemeroptera	RG_MIULE	2020	1	Mine-Influenced	35	68
Percent Ephemeroptera	RG_MIULE	2020	2	Mine-Influenced	35	69
Percent Ephemeroptera	RG_MIULE	2020	3	Mine-Influenced	34	68
Percent Ephemeroptera	RG_MIULE	2021	1	Mine-Influenced	34	67
Percent Ephemeroptera	RG_MIULE	2021	2	Mine-Influenced	34	68
Percent Ephemeroptera	RG_MIULE	2021	3	Mine-Influenced	34	67
Percent Ephemeroptera	RG_MI5	2012	1	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MI5	2015	1	Mine-Influenced	31	62
Percent Ephemeroptera	RG_MI5	2018	1	Mine-Influenced	27	59
Percent Ephemeroptera	RG_MI5	2018	2	Mine-Influenced	28	59
Percent Ephemeroptera	RG_MI5	2018	3	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MI5	2019	1	Mine-Influenced	30	61
Percent Ephemeroptera	RG_MI5	2019	2	Mine-Influenced	30	60
Percent Ephemeroptera	RG_MI5	2019	3	Mine-Influenced	31	62
Percent Ephemeroptera	RG_MI5	2020	1	Mine-Influenced	28	60
Percent Ephemeroptera	RG_MI5	2020	2	Mine-Influenced	30	60
Percent Ephemeroptera	RG_MI5	2020	3	Mine-Influenced	32	62
Percent Ephemeroptera	RG_MI5	2021	1	Mine-Influenced	31	61
Percent Ephemeroptera	RG_MI5	2021	2	Mine-Influenced	30	60
Percent Ephemeroptera	RG_MI5	2021	3	Mine-Influenced	31	62
Percent Ephemeroptera	CM_MC2	2020	1	Mine-Influenced	-	-
Percent Ephemeroptera	CM_MC2	2020	2	Mine-Influenced	-	-
Percent Ephemeroptera	CM_MC2	2020	3	Mine-Influenced	-	-

Note: The average of the replicates was used as the site-specific normal range.

EPT = Ephemeroptera, Plecoptera, Trichoptera; '-"= no data; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Table J-4: Spatial Analysis of Benthic Invertebrate Community Variables at CMm LAEMP Sampling Stations, 2021

Variable	Year	Transformation	Overall ANOVA	Mine-Influenced Station Compared to Downstream Stations					
			p-value	MIUCO[(a)]	CORCK	MIDCO	MIDAG	MIULE	MI5
Benthic invertebrate taxonomic richness (taxa per 3 min kick)	2021	none	**0.002**	**0.005 (1.4)**	**0.001 (-2.1)**	0.496 (0.3)	0.736 (0.2)	0.367 (0.5)	0.533 (0.4)
Benthic invertebrate abundance (organisms per 3 min kick)	2021	ln(X+1)	**0.030**	**0.001 (-2.2)**	0.790 (0.1)	0.249 (0.5)	0.374 (-0.5)	0.478 (0.4)	0.217 (1.0)
Ephemeroptera, Plecoptera, Trichoptera abundance (organisms per 3 min kick)	2021	ln(X+1)	**<0.001**	**0.004 (-1.1)**	**<0.001 (-2.9)**	0.026 (-0.9)	0.127 (-0.8)	0.755 (0.2)	0.153 (1.1)
Percent Ephemeroptera, Plecoptera, Trichoptera (%)	2021	none	**<0.001**	0.904 (0.1)	**<0.001 (-3.1)**	**<0.001 (-5.4)**	**<0.001 (-2.0)**	0.014 (-1.3)	0.137 (0.9)
Emphemeroptera abundance (organisms per 3 min kick)	2021	none	**<0.001**	0.050 (-0.6)	**<0.001 (-1.8)**	**<0.001 (-2.0)**	0.246 (-0.6)	0.954 (0.0)	0.144 (1.1)
Percent Ephemeroptera (%)	2021	ln(X+1)	**<0.001**	**0.005 (0.4)**	**<0.001 (-2.4)**	**<0.001 (-7.4)**	0.154 (-0.6)	0.065 (-0.7)	0.061 (-0.8)

Notes: A posteriori comparisons following significant overall tests were considered significant at P-value<0.009 after Dunn-Ŝidák correction. The direction and magnitude of difference (expressed as standard deviation) is provided in backets. Magnitude of difference was calculated as [(average at station)-(average of downstream and reference stations)]/standard deviation of downstream and reference stations.

a) MIUCO is located in Michel Creek upstream of the Corbin Creek confluence.

Grey cells represent magnitude of differences greater than two standard deviations below the mean.

% = percent; min = minute; ANOVA = analysis of variance; Ln = natural logarithm; < = less than; p = probability; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

Table J-5: Temporal Analysis of Benthic Invertebrate Community Variables at CMm LAEMP Sampling Stations, 2012 to 2021

Benthic Invertebrate Community Endpoint	Area	Station	Transformation	Overall ANOVA (*p*-value)	Year Compared to Combined Previous Years									
					Dunn-Sidak corrected level of significance[(a)]	2021 VS 2012-2020	2020 VS 2012-2019	2019 VS 2012-2018	2018 VS 2012-2017	2017 VS 2012-2016	2016 VS 2012-2015	2015 VS 2012-2014	2014 VS 2012-2013	2013 VS 2012
Benthic Invertebrate Richness (taxa per 3 min kick)	Reference Stations	MI25	ln(X+1)	**0.001**	0.006	0.955 (0.1)	0.031 (0.9)	0.805 (0.3)	0.008 (1.5)	0.468 (0.8)	0.007 (2.5)	0.926 (0.5)	n/a	**0.004 (n/a)**
		AGCK	none	0.363	0.009	0.409 (-0.9)	0.058 (1.6)	0.676 (0.1)	n/a	n/a	0.237 (2.6)	0.783 (-0.7)	n/a	0.636 (n/a)
		LE1	none	0.447	0.017	0.518 (-0.2)	0.901 (0.3)	0.150 (n/a)	n/a	n/a	n/a	n/a	n/a	n/a
	Mine-Influenced Stations	MIUCO	ln(X+1)	0.139	0.007	0.049 (1.2)	0.045 (1.5)	0.047 (3.6)	0.595 (-2.8)	0.882 (1.2)	0.916 (-0.7)	0.856 (n/a)	n/a	n/a
		CORCK	none	0.172	0.007	0.130 (-0.6)	0.030 (-1.4)	0.336 (-0.3)	0.078 (-1.4)	0.201 (-1.7)	0.431 (0.9)	0.313 (n/a)	n/a	n/a
		MIDCO	none	**0.016**	0.007	0.157 (-0.8)	0.008 (1.7)	0.203 (1.1)	0.204 (-0.8)	0.262 (1.1)	0.119 (12)	0.869 (n/a)	n/a	n/a
		MIDAG	ln(X+1)	0.102	0.010	0.678 (-0.5)	0.011 (1.8)	0.125 (1.3)	0.528 (1.4)	n/a	n/a	0.687 (n/a)	n/a	n/a
		MIULE	none	0.138	0.017	0.388 (-0.5)	0.062 (1.4)	0.212 (1.0)	n/a	n/a	n/a	n/a	n/a	n/a
		MI5	ln(X+1)	0.093	0.010	0.529 (0.1)	0.019 (1.4)	0.148 (0.7)	0.338 (0.4)	n/a	n/a	0.068 (n/a)	n/a	n/a
Benthic Invertebrate Abundance (organisms per 3 min kick)	Reference Stations	MI25	ln(X+1)	**0.012**	0.006	0.415 (0.4)	0.030 (-1)	0.079 (-0.8)	0.952 (0.0)	0.036 (1.3)	0.078 (0.8)	0.647 (-0.3)	n/a	**0.002 (n/a)**
		AGCK	ln(X+1)	**0.001**	0.009	**<0.001 (-1.9)**	0.080 (-0.6)	0.424 (0.3)	n/a	n/a	0.353 (-0.2)	**0.002 (-1.6)**	n/a	**0.006 (n/a)**
		LE1	ln(X+1)	**0.028**	0.017	0.856 (0.3)	**0.007 (-1.5)**	0.033 (n/a)	n/a	n/a	n/a	n/a	n/a	n/a
	Mine-Influenced Stations	MIUCO	ln(X+1)	0.070	0.007	0.923 (-0.1)	0.049 (-1.2)	0.233 (0.4)	0.338 (0.4)	0.165 (0.8)	0.808 (0.1)	0.016 (n/a)	n/a	n/a
		CORCK	ln(X+1)	**0.011**	0.007	0.503 (0.3)	0.864 (0.1)	0.054 (0.9)	0.021 (-0.8)	0.759 (0.1)	0.138 (0.4)	**0.002 (n/a)**	n/a	n/a
		MIDCO	ln(X+1)	**<0.001**	0.007	0.516 (-0.2)	0.030 (0.5)	**<0.001 (2.6)**	**0.002 (-1.7)**	0.069 (2)	0.127 (-11.5)	0.866 (n/a)	n/a	n/a
		MIDAG	ln(X+1)	0.519	0.010	0.404 (-0.6)	0.157 (1.3)	0.651 (-0.4)	0.644 (-1.2)	n/a	n/a	0.714 (n/a)	n/a	n/a
		MIULE	none	0.691	0.017	0.320 (-0.7)	0.579 (0.4)	0.824 (-0.1)	n/a	n/a	n/a	n/a	n/a	n/a
		MI5	none	0.780	0.010	0.373 (0.8)	0.366 (0.7)	0.290 (1.3)	0.635 (7.2)	n/a	n/a	0.951 (n/a)	n/a	n/a
Ephemeroptera, Plecoptera, Trichoptera Abundance (organisms per 3 min kick)	Reference Stations	MI25	ln(X+1)	**0.027**	0.006	0.324 (0.5)	0.084 (-0.8)	0.079 (-0.9)	0.928 (-0.1)	0.080 (1.1)	0.253 (0.4)	0.946 (-0.5)	n/a	**0.004 (n/a)**
		AGCK	ln(X+1)	**0.001**	0.009	**<0.001 (-2.2)**	0.032 (-0.8)	0.584 (0.3)	n/a	n/a	0.239 (-0.3)	**0.002 (-1.4)**	n/a	**0.005 (n/a)**
		LE1	ln(X+1)	0.056	0.017	0.936 (0.4)	**0.017 (-1.3)**	0.053 (n/a)	n/a	n/a	n/a	n/a	n/a	n/a
	Mine-Influenced Stations	MIUCO	ln(X+1)	0.061	0.007	0.814 (0.0)	0.012 (-1.6)	0.977 (0.0)	0.662 (0.2)	0.133 (1.0)	0.774 (0.1)	0.024 (n/a)	n/a	n/a
		CORCK	ln(X+1)	**0.007**	0.007	0.771 (0.3)	0.458 (0.0)	0.577 (0.4)	**0.002 (-1.3)**	0.418 (0.3)	0.059 (0.7)	**0.004 (n/a)**	n/a	n/a
		MIDCO	ln(X+1)	**<0.001**	0.007	0.957 (0.2)	0.034 (0.8)	0.186 (0.9)	**<0.001 (-3.6)**	0.146 (1.3)	0.079 (-13.7)	0.869 (n/a)	n/a	n/a
		MIDAG	none	0.220	0.010	0.347 (-0.6)	0.043 (2)	0.619 (-0.5)	0.609 (-2.1)	n/a	n/a	0.821 (n/a)	n/a	n/a
		MIULE	none	0.889	0.017	0.738 (-0.2)	0.626 (0.3)	0.636 (-0.3)	n/a	n/a	n/a	n/a	n/a	n/a
		MI5	none	0.741	0.010	0.227 (1.4)	0.459 (0.6)	0.343 (1.2)	0.663 (3.7)	n/a	n/a	0.915 (n/a)	n/a	n/a
Percent Ephemeroptera, Plecoptera, Trichoptera (%)	Reference Stations	MI25	none	0.050	0.006	0.160 (0.6)	0.287 (0.4)	0.211 (-0.7)	0.476 (-0.5)	0.494 (-0.7)	0.036 (-1.8)	0.024 (-5.9)	n/a	0.518 (n/a)
		AGCK	none	**0.048**	0.009	**0.005 (-1.8)**	0.032 (-1.3)	0.308 (-0.4)	n/a	n/a	0.244 (-0.9)	0.280 (1.2)	n/a	0.268 (n/a)
		LE1	none	0.648	0.017	0.398 (0.6)	0.335 (1.1)	0.848 (n/a)	n/a	n/a	n/a	n/a	n/a	n/a
	Mine-Influenced Stations	MIUCO	none	**0.001**	0.007	0.270 (0.2)	**0.001 (-0.7)**	**<0.001 (-2.3)**	**0.003 (-1.9)**	0.698 (0.2)	0.883 (0.1)	0.017 (n/a)	n/a	n/a
		CORCK	ln(X+1)	0.152	0.007	0.336 (-0.2)	0.199 (-0.4)	0.025 (-1.2)	0.248 (-0.7)	0.638 (0.3)	0.899 (-0.1)	0.039 (n/a)	n/a	n/a
		MIDCO	ln(X+1)	**0.003**	0.007	0.664 (0.7)	0.680 (0.5)	**<0.001 (-0.9)**	**<0.001 (-5.8)**	0.561 (-1.5)	0.676 (-1.0)	0.614 (n/a)	n/a	n/a
		MIDAG	none	**0.009**	0.010	0.634 (0.4)	0.171 (0.8)	**0.001 (-3.7)**	0.260 (-0.9)	n/a	n/a	0.276 (n/a)	n/a	n/a
		MIULE	none	**0.028**	0.017	**0.005 (2.6)**	0.847 (-0.1)	0.653 (-0.4)	n/a	n/a	n/a	n/a	n/a	n/a
		MI5	ln(X+1)	0.361	0.010	0.092 (1.6)	0.794 (-0.2)	0.908 (0)	0.887 (-0.1)	n/a	n/a	0.178 (n/a)	n/a	n/a
Ephemeroptera Abundance (organisms per 3 min kick)	Reference Stations	MI25	ln(X+1)	**0.025**	0.006	0.252 (0.5)	0.102 (-0.9)	0.357 (-0.5)	0.857 (0.0)	0.060 (1.1)	0.083 (0.7)	0.176 (0.0)	n/a	**0.001 (n/a)**
		AGCK	none	**<0.001**	0.009	**<0.001 (-1.4)**	**0.005 (-0.8)**	0.578 (0.2)	n/a	n/a	0.063 (-0.3)	**<0.001 (-1.3)**	n/a	**0.001 (n/a)**
		LE1	ln(X+1)	**0.034**	0.017	0.325 (0.9)	0.022 (-1.0)	0.031 (n/a)	n/a	n/a	n/a	n/a	n/a	n/a
	Mine-Influenced Stations	MIUCO	ln(X+1)	**0.009**	0.007	0.826 (0.2)	**0.001 (-1.9)**	0.563 (-0.3)	0.399 (0.3)	0.171 (0.6)	0.942 (0.0)	**0.004 (n/a)**	n/a	n/a
		CORCK	ln(X+1)	0.437	0.007	0.993 (0.2)	0.072 (-1.3)	0.608 (-0.3)	0.838 (-0.2)	0.879 (0.1)	0.297 (1)	0.192 (n/a)	n/a	n/a
		MIDCO	ln(X+1)	**<0.001**	0.007	0.326 (0.0)	0.183 (0.4)	**0.001 (1.3)**	**<0.001 (-2.5)**	0.290 (0.5)	**0.002 (-17.1)**	0.790 (n/a)	n/a	n/a
		MIDAG	ln(X+1)	0.417	0.010	0.632 (-0.2)	0.199 (1.1)	0.214 (-1.3)	0.389 (-50.5)	n/a	n/a	0.987 (n/a)	n/a	n/a
		MIULE	none	0.977	0.017	0.823 (-0.2)	0.790 (0.2)	0.801 (-0.1)	n/a	n/a	n/a	n/a	n/a	n/a
		MI5	none	0.627	0.010	0.171 (1.5)	0.276 (1.0)	0.551 (0.4)	0.417 (2.1)	n/a	n/a	0.724 (n/a)	n/a	n/a

Table J-5: Temporal Analysis of Benthic Invertebrate Community Variables at CMm LAEMP Sampling Stations, 2012 to 2021

Benthic Invertebrate Community Endpoint	Area	Station	Transformation	Overall ANOVA (*p*-value)	Year Compared to Combined Previous Years									
					Dunn-Sidak corrected level of significance[(a)]	2021 VS 2012-2020	2020 VS 2012-2019	2019 VS 2012-2018	2018 VS 2012-2017	2017 VS 2012-2016	2016 VS 2012-2015	2015 VS 2012-2014	2014 VS 2012-2013	2013 VS 2012
Percent Ephemeroptera (%)	Reference Stations	MI25	none	0.395	0.006	0.239 (0.7)	0.662 (-0.4)	0.898 (0.0)	0.869 (0.0)	0.299 (0.9)	0.277 (0.7)	0.113 (0.5)	n/a	0.036 (n/a)
		AGCK	ln(X+1)	**0.030**	0.009	**0.005 (-2.1)**	0.092 (-1.4)	0.237 (0.6)	n/a	n/a	0.421 (0.7)	0.212 (-3.5)	n/a	0.643 (n/a)
		LE1	none	0.077	0.017	0.036 (1.9)	0.813 (0.6)	0.268 (n/a)	n/a	n/a	n/a	n/a	n/a	n/a
	Mine-Influenced Stations	MIUCO	ln(X+1)	**0.011**	0.007	0.546 (0.6)	**0.002 (-1.3)**	**0.001 (-3.4)**	0.445 (-0.8)	0.435 (-1.2)	0.559 (-0.8)	0.366 (n/a)	n/a	n/a
		CORCK	ln(X+1)	0.778	0.007	0.665 (-0.3)	0.551 (-0.5)	0.530 (-0.5)	0.285 (1.7)	0.772 (-0.6)	0.767 (-0.5)	0.469 (n/a)	n/a	n/a
		MIDCO	ln(X+1)	**0.001**	0.007	0.107 (-0.2)	0.209 (0.0)	0.665 (0.7)	**<0.001 (-1.6)**	0.549 (-0.3)	**0.003 (-5.5)**	0.434 (n/a)	n/a	n/a
		MIDAG	none	**0.007**	0.010	0.259 (0.8)	0.719 (0.3)	**0.002 (-1.4)**	0.014 (-1.1)	n/a	n/a	0.037 (n/a)	n/a	n/a
		MIULE	ln(X+1)	0.143	0.017	0.029 (1.9)	0.816 (-0.1)	0.755 (0.2)	n/a	n/a	n/a	n/a	n/a	n/a
		MI5	none	**0.023**	0.010	0.026 (1.2)	0.297 (0.3)	0.096 (-1.2)	0.043 (1.0)	n/a	n/a	0.051 (n/a)	n/a	n/a

Notes: **Bold** values indicate *P*-values representing statistically significant differences. Overall comparisons were considered significant at P<0.05. The direction and magnitude of difference (expressed as standard deviation) is provided in backets. Magnitude of difference was calculated as [(average at year)-(average of all previous years]/standard deviation of all previous years.

a) A posteriori comparisons following significant overall tests were considered significant at varying levels of significance after Dunn- Šidák correction.

Grey cells represent magnitude of differences greater than two standard deviations below the mean.

n/a = not applicable; ANOVA = analysis of variance; Ln = natural logarithm; < = less than; p = probability; CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program.

APPENDIX K

Benthic Invertebrate Tissue Data

Table K-1: Benthic Invertebrate Tissue Chemistry at CMm LAEMP Sampling Stations, 2021

Location		BC Invertebrate Tissue Guidelines for the Protection of Aquatic Life	EVWQP Invertebrate Benchmarks		Reference Sites											
Watercourse					Michel Creek				Andy Goode Creek				Leach Creek			
Station					MI25				AGCK				LE1			
Replicate					1	2	3	CV%	1	2	3	CV%	1	2	3	CV%
Date			Level 1	Level 2	09/13/2021	09/13/2021	09/13/2021		09/11/2021	09/11/2021	09/11/2021		09/14/2021	09/14/2021	09/14/2021	
Parameter	Unit															
Wet Weight	g	-	-	-	0.355	0.2114	0.2793	25	0.3775	0.0611	0.1402	85	0.085	0.0605	0.1322	39
Dry Weight	g	-	-	-	0.0853	0.0302	0.0561	48	0.0826	0.0134	0.0293	87	0.0155	0.0172	0.0222	19
Moisture	%	-	-	-	76	85.7	79.9	6	78.1	78.1	79.1	1	81.8	71.6	83.2	8
Aluminum	ppm	-	-	-	2570	1834	1911	19	607	146	318	65	1097	1100	3055	65
Antimony	ppm	-	-	-	0.091	0.113	0.095	12	0.048	0.027	0.034	29	0.083	0.073	0.132	33
Arsenic	ppm	-	-	-	1.4	1.6	1.5	7	2.5	1.4	1.8	29	0.919	0.864	1.1	13
Barium	ppm	-	-	-	75	65	143	45	36	8.5	6.1	98	124	270	367	48
Boron	ppm	-	-	-	5.9	5.6	4.7	12	1.2	0.44	0.592	54	3.1	1.6	15	112
Cadmium	ppm	-	-	-	2	1.5	1.3	23	1.3	0.772	0.741	34	8.7	7.3	6.3	16
Calcium	ppm	-	-	-	2061	3208	2163	26	2868	2429	2851	9	2797	1724	4714	49
Chromium	ppm	-	-	-	33	22	17	34	7.5	13	9.7	27	39	15	50	52
Cobalt	ppm	-	-	-	2.4	1.8	1.2	33	0.623	0.307	0.585	34	1.6	1.7	3.2	41
Copper	ppm	-	-	-	29	11	20	45	11	10	9.9	6	29	20	24	19
Iron	ppm	-	-	-	1663	1428	942	27	410	322	460	18	982	573	1728	54
Lead	ppm	-	-	-	0.813	0.792	0.612	15	0.195	0.073	0.103	51	0.256	0.232	0.674	64
Lithium	ppm	-	-	-	1.4	0.921	0.975	24	0.371	0.199	0.286	30	0.512	0.442	1.2	58
Magnesium	ppm	-	-	-	1714	1324	1293	16	1697	1386	2122	21	1838	1667	1820	5
Manganese	ppm	-	-	-	59	57	57	2	23	17	12	32	63	66	94	23
Mercury	ppm	-	-	-	0.082	0.06	0.09	20	0.095	0.052	0.034	52	0.114	0.106	0.082	17
Molybdenum	ppm	-	-	-	0.55	0.525	0.363	21	0.425	0.45	0.375	9	0.885	0.737	0.725	11
Nickel	ppm	-	-	-	56	41	26	37	17	22	19	13	66	22	76	53
Phosphorus	ppm	-	-	-	11608	8758	11741	16	14925	12740	14152	8	14101	12296	12615	7
Potassium	ppm	-	-	-	13111	9513	13476	18	14434	11848	12235	11	15285	11843	13218	13
Selenium	ppm	4	13	20	3.3	2.5	2.3	20	5.6	5.2	7.4	19	6.8	6	6	7
Silver	ppm	-	-	-	0.119	0.035	0.101	52	0.091	0.056	0.056	30	0.406	0.224	0.399	30
Sodium	ppm	-	-	-	4265	3099	4781	21	4584	3699	4577	12	5549	3115	3545	32
Strontium	ppm	-	-	-	7.3	9.4	6.1	22	6.2	6.2	4.4	19	5.8	4.2	10	45
Thallium	ppm	-	-	-	0.111	0.105	0.086	13	0.666	0.348	0.918	44	0.037	0.039	0.057	25
Tin	ppm	-	-	-	0.494	0.556	0.379	19	0.843	1.7	0.601	55	1.3	0.96	1.1	15
Titanium	ppm	-	-	-	321	136	141	53	40	7.3	18	77	61	56	212	81
Uranium	ppm	-	-	-	0.117	0.168	0.093	30	0.068	0.035	0.041	37	0.072	0.066	0.166	55
Vanadium	ppm	-	-	-	4.6	3.1	2.4	33	1	0.372	0.637	47	2.3	2.4	6.7	66
Zinc	ppm	-	-	-	193	111	170	27	295	193	165	31	258	238	240	4

Note: Data were screened against the approved invertebrate tissue guideline for the protection of aquatic life (BC ENV 2019a) and EVWQP benchmarks for selenium. Invertebrate tissue guidelines and benchmarks were not available for additional parameters.

Grey cells represent concentrations that exceed the British Columbia invertebrate tissue guideline.

CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program; BC ENV = BC Ministry of Environment and Climate Change Strategy; CV = coefficient of variance; EVWQP = Elk Valley Water Quality Plan.

'- = no guideline or data; < = below method detection limit; % = percent; g = grams; mg/kg dw = milligrams per kilogram dry weight; ppm = parts per million: %CV = percent coefficient of variation.

Table K-1: Benthic Invertebrate Tissue Chemistry at CMm LAEMP Sampling Stations, 2021

Location		BC Invertebrate Tissue Guidelines for the Protection of Aquatic Life	EVWQP Invertebrate Benchmarks		Mine-Influenced Sites							
Watercourse					Michel Creek				Corbin Creek			
Station					MIUCO				CORCK			
Replicate					1	2	3	CV%	1	2	3	CV%
Date			Level 1	Level 2	09/12/2021	09/12/2021	09/12/2021		09/14/2021	09/14/2021	09/14/2021	
Parameter	Unit											
Wet Weight	g	-	-	-	0.0625	0.0942	0.1458	42	0.306	0.0899	0.1625	59
Dry Weight	g	-	-	-	0.0219	0.0165	0.028	26	0.0981	0.0275	0.0453	64
Moisture	%	-	-	-	65	82.5	80.8	13	67.9	69.4	72.1	3
Aluminum	ppm	-	-	-	2167	9513	11166	63	411	116	188	65
Antimony	ppm	-	-	-	0.041	0.106	0.158	58	0.054	0.033	0.036	28
Arsenic	ppm	-	-	-	1.6	1.9	2.3	18	<0.441	<0.441	<0.441	0
Barium	ppm	-	-	-	87	147	187	36	25	6.6	12	65
Boron	ppm	-	-	-	2.9	13	16	65	1.5	1.2	1.1	16
Cadmium	ppm	-	-	-	3.1	3.9	2.6	20	0.439	0.176	0.483	45
Calcium	ppm	-	-	-	2306	4360	6510	48	13410	3761	5424	68
Chromium	ppm	-	-	-	30	96	62	53	5.1	8.7	6.7	26
Cobalt	ppm	-	-	-	2	6.9	6	53	25	13	8.7	54
Copper	ppm	-	-	-	20	29	21	21	13	12	13	5
Iron	ppm	-	-	-	1618	4522	4717	48	325	228	297	18
Lead	ppm	-	-	-	0.552	1.8	2	54	0.114	0.04	0.074	49
Lithium	ppm	-	-	-	0.66	2.8	3.4	63	0.724	0.265	0.267	63
Magnesium	ppm	-	-	-	1766	2820	2742	24	1297	1272	1734	18
Manganese	ppm	-	-	-	129	256	376	49	160	66	52	63
Mercury	ppm	-	-	-	0.053	0.069	0.069	15	<0.025	<0.025	0.041	30
Molybdenum	ppm	-	-	-	1.4	1.6	1.1	18	0.27	0.221	0.369	26
Nickel	ppm	-	-	-	47	176	99	60	30	25	17	27
Phosphorus	ppm	-	-	-	13258	17124	13174	16	9718	7296	10856	20
Potassium	ppm	-	-	-	14278	20961	14635	23	9911	6267	10277	25
Selenium	ppm	4	13	20	7.8	7.2	6.5	9	4.1	3	4.7	22
Silver	ppm	-	-	-	0.074	0.163	0.086	45	0.035	0.035	0.084	55
Sodium	ppm	-	-	-	3775	16101	3904	89	3619	2318	4482	31
Strontium	ppm	-	-	-	6.7	14	19	47	22	13	20	26
Thallium	ppm	-	-	-	0.07	0.206	0.244	53	0.032	0.017	0.027	30
Tin	ppm	-	-	-	0.934	2.8	1.4	57	0.127	0.12	0.675	104
Titanium	ppm	-	-	-	144	867	925	67	31	9.4	13	65
Uranium	ppm	-	-	-	0.062	0.228	0.309	63	0.162	0.033	0.063	78
Vanadium	ppm	-	-	-	2.6	12	13	62	0.613	0.253	0.433	42
Zinc	ppm	-	-	-	115	180	125	25	160	131	143	10

Note: Data were screened against the approved invertebrate tissue guideline for the protection of aquatic life (BC ENV 2019a) and EVWQP benchmarks for selenium. Invertebrate tissue guidelines and benchmarks were not available for additional parameters.
Grey cells represent concentrations that exceed the British Columbia invertebrate tissue guideline.

CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program; BC ENV = BC Ministry of Environment and Climate Change Strategy; CV = coefficient of variance; EVWQP = Elk Valley Water Quality Plan.

'- = no guideline or data; < = below method detection limit; % = percent; g = grams; mg/kg dw = milligrams per kilogram dry weight; ppm = parts per million: %CV = percent coefficient of variation.

Table K-1: Benthic Invertebrate Tissue Chemistry at CMm LAEMP Sampling Stations, 2021

Location		BC Invertebrate Tissue Guidelines for the Protection of Aquatic Life	EVWQP Invertebrate Benchmarks		Mine-Influenced Sites									
Watercourse					Michel Creek						Michel Creek			
Station					MIDCO						MIDAG			
Replicate					1	2	3	4	5	CV%	1	2	3	CV%
Date			Level 1	Level 2	09/12/2021	09/12/2021	09/12/2021	09/12/2021	09/12/2021		09/11/2021	09/11/2021	09/11/2021	
Parameter	**Unit**													
Wet Weight	g	-	-	-	0.2885	0.1774	0.3597	0.1703	0.121	58	0.4136	0.2945	0.29	21
Dry Weight	g	-	-	-	0.0696	0.0368	0.0971	0.0364	0.0279	70	0.1089	0.0514	0.0574	44
Moisture	%	-	-	-	75.9	79.3	73	78.6	76.9	4	73.7	82.5	80.2	6
Aluminum	ppm	-	-	-	11586	1448	1537	1568	2109	19	1761	1241	1155	24
Antimony	ppm	-	-	-	0.191	0.028	0.042	0.039	0.074	38	0.069	0.05	0.047	22
Arsenic	ppm	-	-	-	2	0.545	0.633	0.57	0.851	22	1.3	0.613	1	35
Barium	ppm	-	-	-	147	25	35	41	40	8	42	37	28	20
Boron	ppm	-	-	-	18	2.1	2.8	3.2	3.3	9	2.7	2.2	2.6	11
Cadmium	ppm	-	-	-	0.898	1	0.359	1.1	0.52	59	0.818	0.741	2.4	71
Calcium	ppm	-	-	-	17887	2994	3301	3732	3106	9	2499	6141	4488	42
Chromium	ppm	-	-	-	43	13	8.3	12	22	50	15	13	13	8
Cobalt	ppm	-	-	-	58	72	25	24	22	6	18	7	36	72
Copper	ppm	-	-	-	21	15	14	13	12	8	11	18	15	24
Iron	ppm	-	-	-	3637	713	655	725	1066	27	947	646	713	21
Lead	ppm	-	-	-	2.2	0.302	0.49	0.426	0.431	8	0.492	0.336	0.303	27
Lithium	ppm	-	-	-	3.7	0.563	0.676	0.703	0.798	9	0.646	0.666	0.45	20
Magnesium	ppm	-	-	-	2658	1898	1477	1414	1112	15	1189	1544	2117	29
Manganese	ppm	-	-	-	247	80	138	97	81	28	106	46	60	44
Mercury	ppm	-	-	-	0.046	0.038	0.053	0.053	0.045	9	0.06	0.052	0.069	14
Molybdenum	ppm	-	-	-	0.566	0.519	0.307	0.307	0.459	25	0.55	0.225	0.525	42
Nickel	ppm	-	-	-	110	34	27	52	44	31	50	30	32	30
Phosphorus	ppm	-	-	-	11413	11142	10011	10925	6628	25	11255	12067	13357	9
Potassium	ppm	-	-	-	16236	12279	10931	12455	6622	30	9833	12038	12009	11
Selenium	ppm	4	13	20	4.4	3.1	4	3.6	3.2	11	6.1	2.5	5.9	42
Silver	ppm	-	-	-	0.155	0.086	0.046	0.092	0.05	41	0.07	0.168	0.14	40
Sodium	ppm	-	-	-	4571	10211	3760	4272	1730	41	3087	7834	7559	43
Strontium	ppm	-	-	-	52	9.6	10	11	13	13	7.4	16	10	40
Thallium	ppm	-	-	-	0.293	0.107	0.099	0.1	0.073	17	0.158	0.147	0.223	23
Tin	ppm	-	-	-	0.826	0.921	0.175	0.644	0.365	60	0.437	0.579	0.592	16
Titanium	ppm	-	-	-	1082	110	95	128	144	20	129	87	81	26
Uranium	ppm	-	-	-	0.407	0.055	0.1	0.114	0.092	11	0.094	0.101	0.068	20
Vanadium	ppm	-	-	-	14	1.5	2.1	2.2	2.5	9	2.2	1.6	1.5	21
Zinc	ppm	-	-	-	161	162	176	118	124	23	161	180	281	31

Note: Data were screened against the approved invertebrate tissue guideline for the protection of aquatic life (BC ENV 2019a) and EVWQP benchmarks for selenium. Invertebrate tissue guidelines and benchmarks were not available for additional parameters.

Grey cells represent concentrations that exceed the British Columbia invertebrate tissue guideline.

CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program; BC ENV = BC Ministry of Environment and Climate Change Strategy; CV = coefficient of variance; EVWQP = Elk Valley Water Quality Plan.

'- = no guideline or data; < = below method detection limit; % = percent; g = grams; mg/kg dw = milligrams per kilogram dry weight; ppm = parts per million: %CV = percent coefficient of variation.

Table K-1: Benthic Invertebrate Tissue Chemistry at CMm LAEMP Sampling Stations, 2021

Location		BC Invertebrate Tissue Guidelines for the Protection of Aquatic Life	EVWQP Invertebrate Benchmarks		Mine-Influenced Sites							
Watercourse					Michel Creek				Michel Creek			
Station					MIULE				MI5			
Replicate					1	2	3	CV%	1	2	3	CV%
Date			Level 1	Level 2	09/14/2021	09/14/2021	09/14/2021		09/16/2021	09/16/2021	09/16/2021	
Parameter	Unit											
Wet Weight	g	-	-	-	0.0936	0.1567	0.2783	53	0.3508	0.5446	0.1888	49
Dry Weight	g	-	-	-	0.0246	0.0384	0.0452	29	0.0564	0.0973	0.053	36
Moisture	%	-	-	-	73.7	75.5	83.8	7	83.9	82.1	71.9	8
Aluminum	ppm	-	-	-	3567	4977	905	66	737	7279	3430	86
Antimony	ppm	-	-	-	0.072	0.123	0.03	62	0.047	0.253	0.194	64
Arsenic	ppm	-	-	-	1.1	1.4	0.585	40	0.482	1.5	1.1	50
Barium	ppm	-	-	-	107	107	29	56	50	221	130	64
Boron	ppm	-	-	-	5.4	6.1	1.7	54	1.5	7.2	4.2	66
Cadmium	ppm	-	-	-	1.7	3.1	1.8	36	2.3	3.2	0.878	55
Calcium	ppm	-	-	-	9129	9810	2977	52	2212	4034	2977	30
Chromium	ppm	-	-	-	157	126	20	71	11	92	106	74
Cobalt	ppm	-	-	-	15	20	6.1	51	2.3	7.7	5.6	52
Copper	ppm	-	-	-	17	20	15	15	12	19	17	23
Iron	ppm	-	-	-	3738	3269	683	64	489	4468	2576	79
Lead	ppm	-	-	-	0.748	0.924	0.266	53	0.194	1.4	0.694	79
Lithium	ppm	-	-	-	1.1	2.2	0.651	61	0.395	2.5	1.3	76
Magnesium	ppm	-	-	-	2258	1540	1445	25	1332	1906	1401	20
Manganese	ppm	-	-	-	97	82	40	40	50	109	96	36
Mercury	ppm	-	-	-	0.053	0.053	0.09	33	0.063	0.081	0.078	13
Molybdenum	ppm	-	-	-	0.589	1.8	0.307	88	0.266	0.653	0.516	41
Nickel	ppm	-	-	-	250	219	37	68	22	151	169	70
Phosphorus	ppm	-	-	-	11449	9880	12695	12	10726	11245	11501	4
Potassium	ppm	-	-	-	11638	9908	12663	12	11774	13573	11195	10
Selenium	ppm	4	13	20	9.3	9.8	6	25	4.8	8.1	5.4	29
Silver	ppm	-	-	-	0.097	0.092	0.168	36	0.108	0.166	0.137	21
Sodium	ppm	-	-	-	3099	3520	13407	87	8645	3993	2901	59
Strontium	ppm	-	-	-	30	21	7	60	6.4	17	11	46
Thallium	ppm	-	-	-	0.181	0.186	0.097	32	0.08	0.203	0.087	56
Tin	ppm	-	-	-	0.778	1.6	0.508	59	0.732	0.961	0.46	35
Titanium	ppm	-	-	-	248	633	71	91	36	601	298	91
Uranium	ppm	-	-	-	0.189	0.172	0.066	47	0.059	0.288	0.175	66
Vanadium	ppm	-	-	-	8	6.7	1.7	61	1.3	16	9.6	82
Zinc	ppm	-	-	-	199	269	205	17	160	208	198	13

Note: Data were screened against the approved invertebrate tissue guideline for the protection of aquatic life (BC ENV 2019a) and EVWQP benchmarks for selenium. Invertebrate tissue guidelines and benchmarks were not available for additional parameters.
Grey cells represent concentrations that exceed the British Columbia invertebrate tissue guideline.

CMm = Coal Mountain Mine; LAEMP = local aquatic effects monitoring program; BC ENV = BC Ministry of Environment and Climate Change Strategy; CV = coefficient of variance; EVWQP = Elk Valley Water Quality Plan.

'- = no guideline or data; < = below method detection limit; % = percent; g = grams; mg/kg dw = milligrams per kilogram dry weight; ppm = parts per million: %CV = percent coefficient of variation.

wsp GOLDER

golder.com