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Technical Report Overview

Report: Fording River Operations Local Aquatic Effects Monitoring Program (LAEMP) 2019 Report

Overview: This report presents the 2019 results of the local aquatic effects monitoring program (LAEMP) developed for Teck's Fording River Operations (FRO). The report presents data and evaluation of current conditions and collects baseline data to support future evaluation of changes related to commissioning of an active water treatment facility that will be treating water from Cataract, Swift, and Kilmarnock creeks.

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

For More Information

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

Fording River Operations
Local Aquatic Effects Monitoring Program (LAEMP) 2019 Report

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May 2020

Fording River Operation Local Aquatic Effects Monitoring Program 2019 Report

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EXECUTIVE SUMMARY

Discharges from Teck's coal mines to the Elk River watershed are authorized by the British Columbia Ministry of Environment and Climate Change Strategy (ENV) through permits that are issued under provisions of the *Environmental Management Act*. Permit 107517 specifies the terms and conditions associated with those discharges. Permit 107517 also requires that Teck develop a local aquatic effects monitoring program (LAEMP) related to continued development of Fording River Operation (FRO) and the future commissioning of the Fording River Operations Active Water Treatment Facility - South (FRO AWTF-S) that will be treating waters from Cataract, Swift and Kilmarnock creeks at FRO.

The first FRO LAEMP study design for 2016 to 2018 was submitted in accordance with the Permit requirement on June 1, 2016 (Minnow 2016) and subsequently approved by ENV on October 24, 2016. With the delay in construction and operation of the FRO AWTF-S, the second FRO LAEMP study design for 2019 and 2020 was submitted on May 31, 2019 (Minnow and Lotic 2019a). In consideration of potential existing and future mine-related influences at FRO, the following study questions were developed in consultation with the Environmental Monitoring Committee (EMC) during study design development (Minnow 2016, Minnow and Lotic 2019a) and in response to data evaluation in the first three years of the FRO LAEMP cycle (Minnow 2017a, Minnow and Lotic 2018, Minnow and Lotic 2019b):

1. Are nitrate concentrations increasing, and if so, are they adversely affecting biota?
2. Is active water treatment affecting biological productivity downstream in the Fording River?
3. Are tissue selenium concentrations reduced downstream from the AWTF?
4. Is AWTF operation affecting aquatic biota through thermal effects or concentrations of treatment-related constituents other than nutrients or selenium?
5. Is re-direction of water potentially affecting biota in the Fording River?
6. What are the factors contributing to the variations in percent Ephemeroptera?
7. What is the benthic invertebrate community structure in the reach of the Fording River that goes dry, and can changes be correlated with flow conditions?

Annual LAEMP reports have been submitted on May 31st each year since 2017. Benthic invertebrate community abundance and richness were within the normal range throughout the study area each year; however, a spatial decrease (i.e., in an upstream to downstream direction) in the relative abundance of mayflies (% Ephemeroptera) was identified in the upper Fording River in the area downstream of Kilmarnock Creek to upstream of Ewin Creek in September in each year since the first report (Minnow 2017a, Minnow and Lotic 2018, Minnow and Lotic 2019). Percent Ephemeroptera at monitoring areas downstream of the Compliance Point has remained below the normal range since 2015, with the lowest values recorded in 2017 at most areas. Each annual report has expanded on the understanding of potential cause(s) of the observed changes in the benthic invertebrate community, and after each LAEMP report was submitted, sampling designs were updated to reflect new learnings and knowledge gaps within the upper Fording River study area through study design amendments (Minnow 2017b, Minnow 2018a) and the 2019 to 2020 FRO LAEMP study design (Minnow and Lotic 2019a). The second annual report (Minnow and Lotic 2018) did not identify a single, direct cause of the decrease in % Ephemeroptera in the upper Fording River but analysis suggested that a combination of both mine-related and natural factors (e.g., water quality, calcite, substrate size, flow) were contributing to the observed decrease. The third annual report (Minnow and Lotic 2019) found that reduced % Ephemeroptera often corresponded with increases in % Plecoptera, leading to a % Ephemeroptera-Plecoptera-Trichoptera (EPT) that remained within the normal range. That report identified strong negative correlations between % Ephemeroptera and the aqueous concentrations of nitrate and selenium concentrations, but a strong positive correlation between % Ephemeroptera and pebble size (i.e., D84) and a significant but weaker correlation with temperature. In addition, the largest changes in BIC were observed downstream of the section of the Fording River that experiences seasonal drying. This is also an area with substantial groundwater recharge.

The 2019 FRO LAEMP further provided baseline monitoring data for pre-commissioning of FRO AWTF-S, as well as insights into physical, chemical, and biological conditions that occur in the upper Fording River. The evaluation of data (2012 to 2019) related to study question 1 did not identify increasing trends in nitrate concentrations in mine-exposed areas. Nitrate concentrations have not been changing concurrently with the observed decrease in % Ephemeroptera, however, nitrate concentrations were consistently higher than benchmarks in areas monitored in the FRO LAEMP where changes in BIC are observed, particularly in the lower study area (i.e., area downstream of Cataract Creek). Nitrate statistically correlated (negatively) with key BIC endpoints, suggesting that nitrate is a contributing factor; however, there was significant covariation between other water quality constituents (selenium, sulphate, nitrate, etc.) and habitat variables (mean depth, pebble size, stream density, etc.) that also may be affecting BIC endpoints.

Baseline data to address study questions 2 to 5 were collected during the 2019 FRO LAEMP sampling programs. To date, benthic invertebrate biomass, nutrient (phosphorus) concentrations, selenium tissue concentrations, and water temperature and discharge flows have been consistent across the baseline study period. The analysis of these data will be discussed with the EMC prior to reporting in 2021.

The results of the 2019 FRO LAEMP to support study question 6 identified a spatial decrease in % Ephemeroptera from upstream to downstream, between downstream of Cataract Creek and upstream of Ewin Creek, consistent with previous LAEMP reports (Minnow 2017a, Minnow and Lotic 2018, Minnow and Lotic 2019b). Contrary to previous years, low % EPT, % Ephemeroptera, and % Plecoptera were identified in the upper study area from downstream of the Multiplate culvert to downstream of the North Tailings Pond. Further evaluation of the BIC determined that the changes were related to a substantial shift in the community structure, rather than simply the loss of taxa. This shift in community structure was observed in the lower study area as well as the upper study area, albeit BIC structure differed between the two broad areas.

Detailed analyses into the effects of stressors on BIC determined that individual BIC endpoints (% Ephemeroptera, % Plecoptera, Ephemeroptera Abundance, etc.) correlated strongly and negatively with one or more key water quality constituents (nitrate, nitrite, total selenium, total nickel, sulphate, total dissolved solids, PC1 and PC2), except for % Plecoptera, which correlated positively with nitrate, total selenium, sulphate and total dissolved solids. Habitat variables as well as calcite measures did not correlate as strongly as water quality with individual BIC endpoints, however, many correlations were significant (Calcite Index, Calcite Presence, embeddedness, and D84). Redundancy analysis demonstrated strong co-variation between habitat and stressor variables. After accounting for the shared variation between stressors and habitat, the remaining variation in stressors could not explain BIC differences among monitoring areas. This does not indicate that stressors are not important variables, only that removing the component of the variation shared by both stressors and habitat also removed the explanatory power of those variables. Both water quality stressors and habitat variables appear to affect the BIC; however, their individual contributions are difficult to differentiate due to covariation. Areas (i.e., between the South Tailings Pond and Porter Creek) with the highest benthic invertebrate tissue selenium concentrations were the same as areas with the highest selenite concentrations (i.e., reduced form of selenium); however, most of these areas did not have % Ephemeroptera below normal range. Future LAEMP reports will continue to explore the complex interactions between water quality, habitat, and BIC.

Drying surveys in the FRO LAEMP to support study question 7 identified both spatial variability in instream drying conditions, but also temporal variability in drying as demonstrated when contrasting low flow periods of 2018 and 2019. While general spatial patterns and hydrological timing of drying (i.e., occurring at the same point in the hydrograph; baseflow) in the upper Fording River are annually similar, monitoring has shown that drying can vary by up to four months between years in the same section. Areas that have shown seasonal drying have not demonstrated BIC metrics consistently below normal ranges in September or obvious differences in seasonal patterns compared to areas in close proximity that remain wetted. The 2020 recolonization study will help to elucidate how BIC recolonizes dry areas once rewetted, and those results will be reported in the 2020 FRO LAEMP report.

Both habitat and mine-related stressors (i.e., water quality and calcite) are important factors influencing the BIC in the FRO LAEMP study area, and that not one explanation can be fit to all areas. Future FRO LAEMP reports will continue to work toward separating the variability in BIC due to habitat from the variability due to stressors.

The results from the 2019 FRO LAEMP report provide supporting information to help answer Management Question 5 and to support Management Question 2 from Teck's Adaptive Management Plan (Teck 2018).

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ACRONYMS AND ABBREVIATIONS

ALS – ALS Environmental

AMP – Adaptive Management Plan

ANOVA – Analysis of Variance

AWTF – Active Water Treatment Facility

BACI – Before-After Control-Impact

BCWQG – British Columbia Water Quality Guidelines

BIC – Benthic Invertebrate Community

CA – Correspondence Analysis

CABIN – Canadian Aquatic Biomonitoring Network

CI – Calcite Index

CMO – Coal Mountain Operation

CRC ICP-MS – Coupled Plasma-Mass Spectrometry

CSM – Conceptual Site Model

CVAFS – Cold Vapour Atomic Fluorescence Spectroscopy

DO – Dissolved Oxygen

DQR – Data Quality Review

dw - dry weight

EMC – Environmental Monitoring Committee

EMPR – Ministry of Energy, Mines and Petroleum Resources

ENV – Environment and Climate Change Strategy

EPT – Ephemeroptera-Plecoptera-Trichoptera

EVO – Elkview Operation

EVWQP – Elk Valley Water Quality Plan

EWT – Early Warning Triggers

FRO – Fording River Operation

FRO AWTF-S – Fording River Operation Active Water Treatment Facility - South

GC/MS – Gas Chromatography with Mass Spectrometric Detection

GHO – Greenhills Operation

GIS – Geographic Information System

GPS – Global Positioning System

HSD – Honestly Significant Difference

ICP-MS – Inductively Coupled Plasma-Mass Spectrophotometry

K-M – Kaplan-Meier

KNC – Ktunaxa Nation Council

LAEMP – Local Aquatic Effects Monitoring Program

LCO – Line Creek Operation

LPL – Lowest Practical Level

LRL – Laboratory Reporting Limit

MOE – Ministry of the Environment

NAD – North American Datum

OEMP – Operational Environmental Monitoring Program

PAH – Polycyclic Aromatic Hydrocarbons

PCA – Principal Component Analysis

PC – Principal Components

QA/QC – Quality Assurance / Quality Control

RAEMP – Regional Aquatic Effects Monitoring Program

RDA – Redundancy Analysis

RISC – Resources Information Standards Committee

SRC – Saskatchewan Research Council

STP – South Tailings Pond

TDS – Total Dissolved Solids

Teck – Teck Coal Limited

TOC – Total Organic Carbon

UTM – Universal Transverse Mercator system

VIF – Variance Inflation Factor

WSQG – Working Sediment Quality Guidelines

1 INTRODUCTION

1.1 Background

Teck Coal Limited (Teck) operates five steelmaking coal mines in the Elk River watershed, which are the Fording River Operation (FRO), Greenhills Operation (GHO), Line Creek Operation (LCO), Elkview Operation (EVO), and Coal Mountain Operation (CMO; Figure 1.1). Discharges from the mines to the Elk River watershed are authorized by the British Columbia Ministry of Environment and Climate Change Strategy (ENV) through permits that are issued under provisions of the *Environmental Management Act*. Permit 107517 specifies the terms and conditions associated with discharges from Teck's five Elk Valley mine operations.

Permit 107517 required that Teck develop a local aquatic effects monitoring program (LAEMP) related to ongoing mining at FRO and the future commissioning of the Fording River Operation Active Water Treatment Facility - South (FRO AWTF-S) that will treat waters from Cataract, Swift, and Kilmarnock Creeks (Figure 1.2). Section 9.3.2 of Permit 107517 outlines the LAEMP requirements as follows:

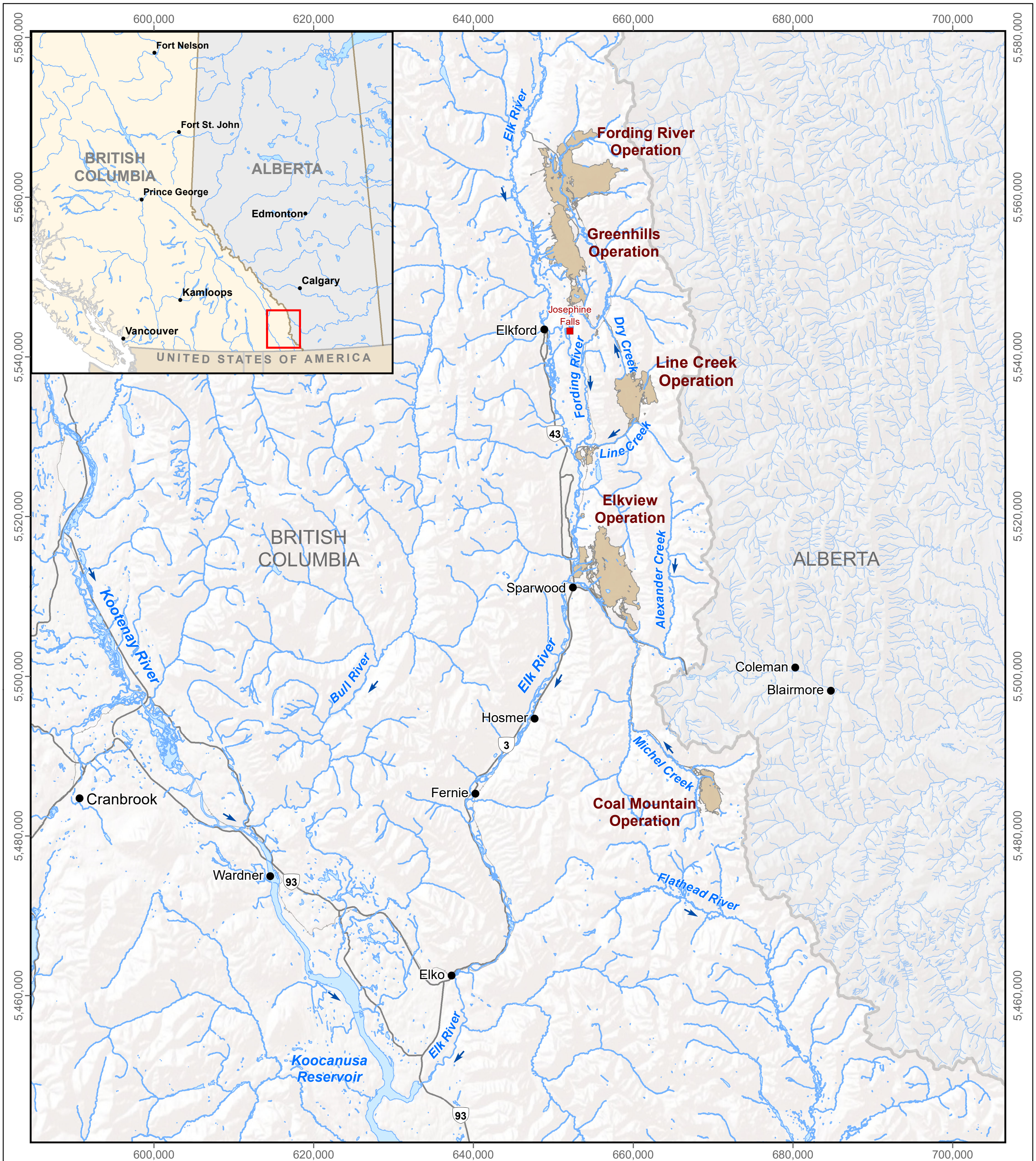
> "*The Permittee must complete to the satisfaction of MOE a study design for a LAEMP which will focus on the upper Fording River for 2016-2018 by June 1, 2016. The study design must be reviewed by the EMC*[1] *and be designed to an appropriate temporal scale to capture short term, local effects to the immediate receiving environment."*

Also, Section 10.5 of Permit 107517 states:

> *"The LAEMP Annual Reports must be reported on in accordance with generally accepted standards of good scientific practice in a written report and submitted to the Director by May 31 of each year following the data collection calendar year."*

In addition to monitoring under the LAEMP, Teck's regional aquatic effects monitoring program (RAEMP) is a requirement under Permit 107517, and provides comprehensive routine monitoring and assessment of potential mine-related effects on the aquatic environment downstream from Teck's mines in the Elk Valley (i.e., annual sampling and more comprehensive monitoring every three years, with the next cycle of sampling to be completed in September 2020). Teck conducts

[1] EMC refers to the Environmental Monitoring Committee, which Teck was required to form under Permit 107517. The EMC consists of representatives from Teck, ENV, the Ministry of Energy, Mines and Petroleum Resources (EMPR), Environment Canada, the Ktunaxa Nation Council (KNC), Interior Health Authority, and an independent scientist. Environment Canada has agreed to provide input on a case-by-case basis when requested by the other members of the EMC, but has not yet been called upon to participate. The EMC reviews submissions and provides technical advice to Teck and the ENV Director regarding monitoring programs



LEGEND

Teck Coal Mine Operation

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

0 10 20 40 km

N W E S

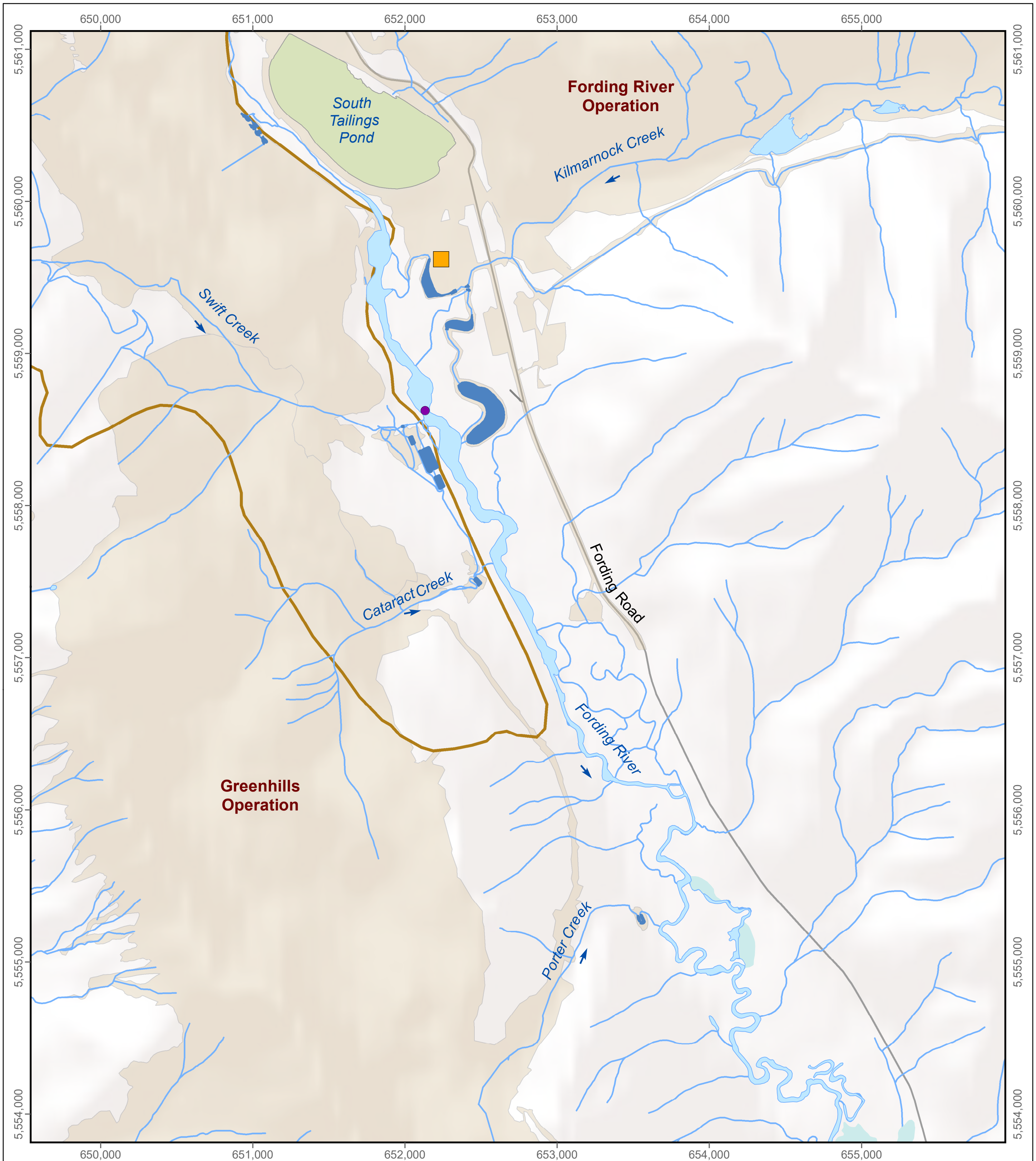
Projection: North American Datum 1983 UTM Zone 11 U

Date: May 2020
Project 197202.0004

minnow environmental inc.

Figure 1.1

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 1.1 Teck Coal Limited Operation.mxd



LEGEND

- FRO AWTF-S Outfall
- FRO AWTF-S
- Settling Pond
- Tailings Pond
- Fording Swift Project Footprint
- Teck Coal Mine Operation

Fording River Operations South AWTF

0 0.5 1 2 km

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Figure 1.2

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 1.2 Fording River Operations South AWTF.mxd a variety of additional programs to monitor, evaluate, and/or manage the aquatic effects of mining operations within the Elk Valley at local and regional scales:

- Water quality monitoring
- Calcite monitoring
- Chronic Toxicity Testing Program
- Fish and fish habitat management
- Regional Aquatic Effects Monitoring Program
- Tributary Management Plan
- Adaptive Management Plan

The first FRO LAEMP study design was submitted in accordance with the Permit requirement on June 1, 2016 (Minnow 2016) and subsequently approved by ENV on October 24, 2016. This first cycle (i.e., 2016 to 2018 sampling years) represented a period of baseline monitoring with respect to the future FRO AWTF-S. In addition to the need for baseline monitoring data prior to active water treatment, there were also concerns related to potential increases in aqueous nitrate concentrations in the Fording River prior to initiation of water treatment, as projected in the Elk Valley Water Quality Plan (EVWQP; Teck 2014). Changes in biota related to increased or decreased flows in portions of the Fording River as a result of re-direction of water (i.e., re-direction of flows from Cataract, Swift, and Kilmarnock creeks for treatment or water management purposes) were also considered in the LAEMP study design. A study design for the second FRO LAEMP cycle was submitted on May 31, 2019 (Minnow 2019). This second study design (Minnow 2019) was developed to cover the remaining baseline time period (2019 to 2020) prior to the commissioning of the FRO AWTF-S. Additional monitoring locations were added to the FRO LAEMP in 2019 to evaluate current conditions up and downstream of the proposed Fording North Treatment Plan, and downstream of the FRO AWTF-S outfall location. These additions to the study design were reviewed with the Environmental Monitoring Committee (EMC) at the June 2019 meeting and an amendment to the current study design will be submitted on June 1, 2020.

The goal of the FRO LAEMP is to assess site-specific conditions (e.g., potential aquatic effects in the Fording River in advance of or after implementation of active water treatment) on a more frequent and localized basis than the RAEMP as required until sufficient data have been collected to address the study questions, concerns no longer exist, or relevant monitoring can be incorporated into the RAEMP. With this goal in mind, the FRO LAEMP was designed to address the study questions described in Section 1.3.

The first annual LAEMP report was submitted on May 31, 2017 (Minnow 2017a). Based on discussions with the EMC in 2017 regarding a temporal and spatial decrease in the relative abundance of mayflies (% Ephemeroptera) in the upper Fording River in the area downstream of Kilmarnock Creek to between Chauncey Creek and Ewin Creek (Minnow 2017a), an updated sampling plan was submitted in September, 2017 (Minnow 2017b). Additional benthic invertebrate community (BIC) and biomass sampling, along with the installation of data loggers (temperature and level) and an evaluation of seasonal drying associated with the winter low flow period, were also added to satisfy both the FRO LAEMP and the FRO water licensing Operational Environmental Monitoring Program (OEMP).

Following completion of sampling in 2017, the second annual report was submitted on May 31, 2018 (Minnow and Lotic 2018). A single, direct cause of the decrease in % Ephemeroptera in the upper Fording River was not identified. Rather, analysis suggested that a combination of both mine-related and natural factors (e.g., water quality, calcite, substrate size, flow) were contributing to the observed decrease. Based on discussion with the EMC, additional changes to the monitoring design were submitted to ENV on May 31, 2018 (Minnow 2018a). These changes included the addition of replicate kick and sweep samples (BIC and tissue) at each of the LAEMP areas in September to increase statistical power, and the addition of BIC monitoring in June and August to assess seasonal differences to further evaluate observed changes in community structure. In November 2018, Fording River flows consisted predominantly of Cataract Creek water at the FRO Compliance Point (FR_FRCP1) due to seasonal drying immediately upstream of the Cataract Creek confluence (Teck 2020). The flow coming primarily from Cataract Creek resulted in elevated concentrations of water quality constituents at FR_FRCP1 during the winter months; therefore, additional BIC and benthic invertebrate tissue sampling events were completed in December 2018 and February 2019, following Teck's adaptive management response framework. Seasonal drying sections continue to influence water quality at FR_FRCP1 during low flow conditions and Teck has requested an amendment to relocate the FRO compliance point to an area more representative of water quality in the Fording River (Teck 2020).

The 2018 FRO LAEMP report identified a similar spatial pattern in % Ephemeroptera from upstream to downstream. Further investigation into the composition of benthic invertebrate taxa identified a high abundance of Plecoptera in the areas experiencing low % Ephemeroptera. Percent Ephemeroptera was correlated with physical factors (e.g., D84) and water chemistry constituents (e.g., nitrate and selenium concentrations). In 2019, BIC sampling was conducted in June, September, and December in accordance with the 2019 to 2020 study design (Minnow and Lotic 2019a). Drying surveys were expanded to include reaches in northern section of the upper Fording River to support baseline monitoring for the FRO north treatment plans.

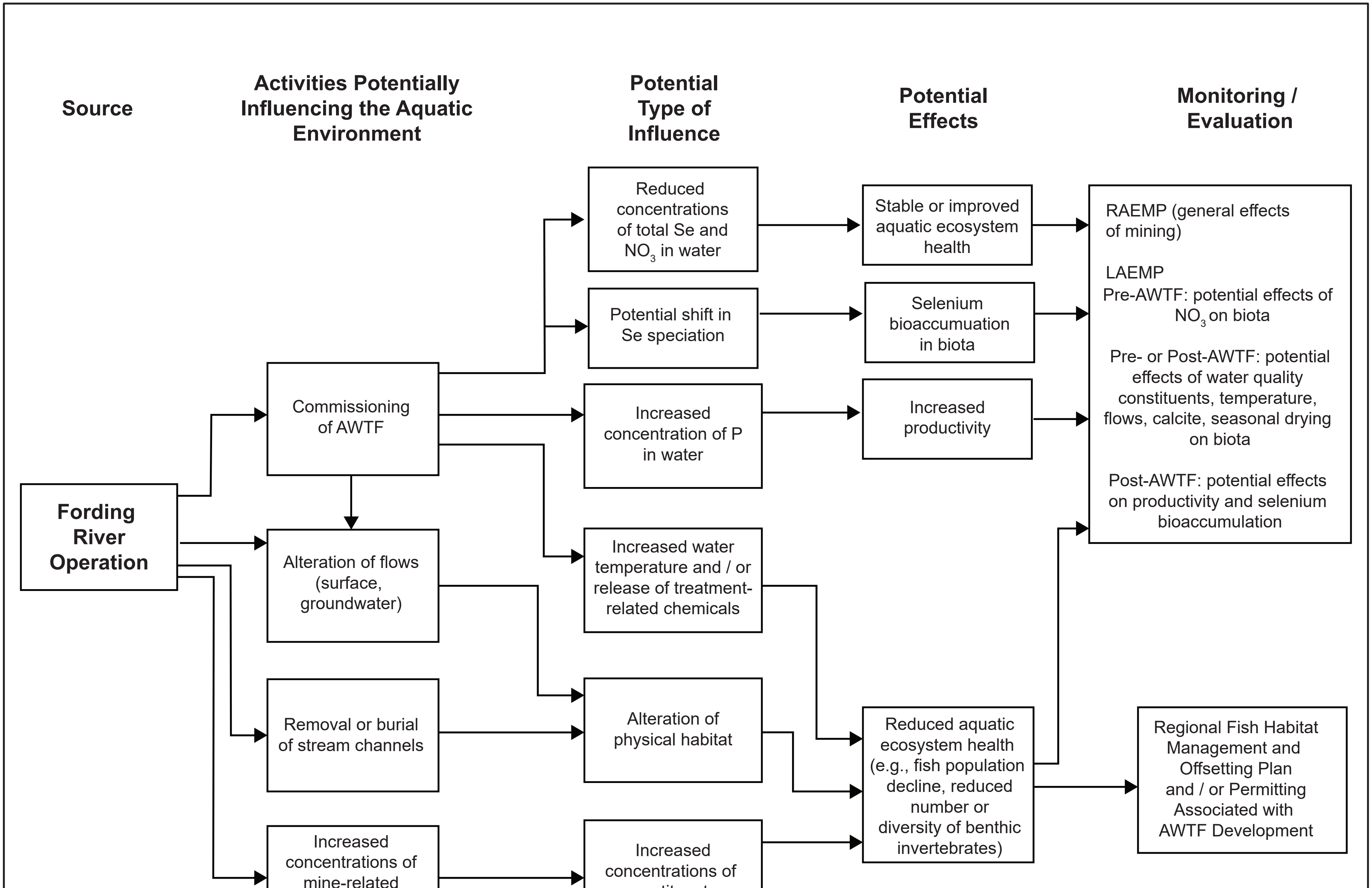
Longer survey periods (i.e., January until connection, and August to December) were also added in 2019 to fully capture drying periods.

As part of a separate Teck monitoring program focused on Westslope Cutthroat Trout (WCT), the 2019 results of fish counts were 74% lower for juveniles and 93% lower for adults than the 2017 counts in the Fording River upstream of Josephine Falls. Teck has gathered subject matter experts to evaluate causal factors that may have contributed to the decline in the WCT population. The 2019 FRO LAEMP data will be used to inform the evaluation of cause. Teck continues to work collaboratively with the Ktunaxa Nation Council, government regulators, the Environmental Monitoring Committee, the Elk Valley Fish and Fish Habitat Committee, and independent experts to gather more data and address ongoing protection of fish.

1.2 Conceptual Site Model

A conceptual site model (CSM) is a written and/or illustrative depiction of relationships between human activities that disturb the environment and the ways such disturbances can alter the ecosystem and affect biological receptors. Figure 1.3 presents a CSM for potential effects on aquatic receptors in the upper Fording River both prior to and after the commissioning of the future FRO AWTF-S in Q1 2021. Assessment endpoints are the valued attributes of an ecosystem upon which management actions focus (USEPA 1998, 2003). Assessment endpoints considered in the FRO LAEMP are described in Table 2.1 of Section 2.1. Assessment endpoints are evaluated using measurement endpoints. Typically, multiple measurement endpoints are used to support evaluation and interpretation of each assessment endpoint to conclude if the assessment endpoints/receptors are being protected.

As illustrated by the CSM, assessment and measurement endpoints may be affected through physical and/or chemical processes related to mining and operation of the AWTF. Biological measurements relating directly to population or community characteristics are referred to as direct indicators. Mine-related stressors (such as tissue selenium concentrations) will also be monitored as part of the FRO LAEMP and are referred to as indirect indicators. Laboratory chronic toxicity data (semi-direct indicators) are incorporated into the FRO LAEMP, as appropriate. Measurement of indirect and semi-direct indicators contribute to understanding if observed effects on individual receptors are mine-related. Effects may act singly or in combination to influence aquatic populations and/or communities by changing the abundance or resilience of aquatic receptors (Figure 1.3) and are evaluated by monitoring benthic invertebrates as biological receptors within the FRO LAEMP. The study questions (Section 1.3) were developed in consideration of the potential effects identified in Figure 1.3.



Fording LAEMP Conceptual Site Model

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Figure 1.3

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\December Sampling\19-04 Figure 1.3

1.3 Study Questions

Study questions were developed in consultation with the EMC during study design development (Minnow 2016, Minnow and Lotic 2019a) and in response to data evaluation in the first FRO LAEMP cycle (Minnow 2017a, Minnow and Lotic 2018, Minnow and Lotic 2019b):

1. Are nitrate concentrations increasing, and if so, are they adversely affecting biota?
2. Is active water treatment affecting biological productivity downstream in the Fording River?
3. Are tissue selenium concentrations reduced downstream from the AWTF?
4. Is AWTF operation affecting aquatic biota through thermal effects or concentrations of treatment-related constituents other than nutrients or selenium?
5. Is re-direction of water potentially affecting biota in the Fording River?
6. What are the factors contributing to the variations in percent Ephemeroptera?
7. What is the benthic invertebrate community structure in the reach of the Fording River that goes dry, and can changes be correlated with flow conditions?

Study question 1 and related investigations are being addressed through monitoring of BIC structure as part of annual sampling in the FRO LAEMP and Teck's routine water quality monitoring for stations along the upper Fording River and its tributaries. Additional information related to habitat (e.g., seasonal drying reaches, flow, substrate type, calcite, temperature) and biological requirements for benthic invertebrate taxa are being used to support findings and discussion.

Study questions 2 to 5 relate specifically to active water treatment at Fording River South (FRO AWTF-S), which is not currently operating and is scheduled to be commissioned in Q1 2021. Therefore, these initial years of the LAEMP include collection of baseline information to aid in the interpretation of potential changes in aquatic conditions after water treatment commences. Effects related to changes in physical habitat, including changes in flows (i.e., study question 5), will be addressed through Teck's routine monitoring of flows at three stations in the upper Fording River (FR_FRNTP [continuous], FR_FRCP1 [Permit requirement for monthly monitoring, and weekly from March 15th to July 15th], and FR_FRABCHf[2] [established to support proposed compliance point]), as well as through the evaluation of hydrology and seasonal drying.

[2] FR_FRABCHf was installed upstream from FR_FRABCH where the flow is more established and representative of the area. The FR_FRABCHf station measured water temperature and flow, while FR_FRABCH was used for seasonal drying surveys and water quality sampling.

Study question 6 was added to the FRO LAEMP to help direct analysis, interpretation, and discussion related to the observed decrease in % Ephemeroptera. This question is being addressed through a detailed evaluation of the BIC in the upper Fording River, and through an interpretation of the results compared to regional normal ranges, local reference areas, and chemical and physical stressors.

Study question 7 was added to the FRO LAEMP to increase understanding of seasonal drying in the upper Fording River, and how this drying relates to community structure and recolonization. It is being addressed through monthly monitoring of surface flow conditions (August to April) in the Fording River from the south tailings pond (FR_FR2) downstream to Chauncey Creek, as well as year-round continuous monitoring of water level and temperature at ten locations within this area. Biological data being collected to support study question 6 are being incorporated into the evaluation of study question 7, as appropriate.

Relevant information obtained under other programs, such as the regional calcite and chronic toxicity monitoring programs are also summarized in the LAEMP. The results of the fourth year (2019 calendar year – January to December) of monitoring for the FRO LAEMP are the subject of this report, which includes comparison to previous years of data.

1.4 Linkages to the Adaptive Management Plan for Teck Coal in the Elk Valley

As required in Permit 107517 Section 11, Teck has developed an Adaptive Management Plan (AMP) to support implementation of the EVWQP to achieve water quality and calcite targets, protect human health, groundwater, and aquatic ecosystem health (Teck 2018). Following an adaptive management framework, the AMP identifies six Management Questions that will be re-evaluated at regular intervals as part of AMP updates throughout EVWQP implementation. The AMP also identifies key uncertainties that need to be reduced to fill gaps in current understanding and support achievement of the EVWQP objectives.

The FRO LAEMP was designed to monitor conditions in the upper Fording River in advance of FRO AWTF-S operation and answer specific questions on an annual basis (Section 1.3). During or at the conclusion of each annual LAEMP cycle (results are reported on May 31st of each year for the preceding calendar year),the adaptive management response framework may be triggered based on the findings of the LAEMP. For example, the 2016 FRO LAEMP report identified a temporal and spatial decrease in the relative abundance of % Ephemeroptera in the upper Fording River in the area downstream of Kilmarnock Creek to between Chauncey Creek and Ewin Creek (Minnow 2017a). In response, additional monitoring areas were added to the LAEMP to increase spatial coverage. Also, the 2017 FRO LAEMP report identified a potential data gap surrounding the understanding of seasonal variability in BIC structure, thus, additional sampling was added to the LAEMP in June and August of 2018 (Minnow and Lotic 2018). Lastly, due to seasonal drying between Swift and Cataract Creeks in late 2018, flows in the Fording River at the FRO Compliance Point consisted of predominantly water from Cataract Creek. To evaluate the potential effects on biota in the area downstream of Cataract Creek, two additional biological sampling events were included in December 2018 and February 2019.

In addition to addressing questions specific to the FRO LAEMP on an annual basis, monitoring data from the LAEMP will contribute to the broader data set assessed every three years within the RAEMP. The RAEMP is designed to evaluate AMP Management Question #5 (i.e., "Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?"). During the development of the AMP, a number of uncertainties related to Management Question #5 were identified that were summed up as Key Uncertainty 5.1 (i.e., "How will monitoring data be used to identify potentially important mine-related effects on the aquatic ecosystem?"). Teck is working with its consultants and the EMC to develop the methodology that will address Key Uncertainty 5.1 and its underlying uncertainties prior to the next RAEMP report in 2020.

Data from the LAEMP and RAEMP will also contribute to answering AMP Management Question #2 (i.e., "Will aquatic ecosystem health be protected by meeting the long-term site performance objectives?). A Key Uncertainty associated with Management Question #2 is "How will the science-based benchmarks be validated and updated?" with underlying uncertainty about how aquatic monitoring data will be used to validate and update the benchmarks. Progress on reducing these uncertainties, and associated learnings, will be described in Annual AMP Reports.

The first annual AMP report was submitted in July 2019 and included data from 2018 (Teck 2019b). This report identified a trigger of the AMP response framework for surpassing limits for daily maximums of selenium and monthly averages of selenium, nitrate, and sulphate at the Fording River compliance point (FR_FRCP1) in 2018. Early Warning Triggers (EWTs) were reached at FR_FRCP1 for total dissolved solids (TDS) and uranium. Actions associated with the AMP response to elevated selenium, nitrate, and sulphate concentrations are outlined in detail in the 2018 Annual AMP report (Teck 2019b). The investigation of cause identified upstream drying and subsurface flow in the winter months as a major source of elevated levels of key constituents. Several adjustments have been completed, or are being completed, as part of the AMP response framework, including diversion of Cataract Creek to Swift Creek to prepare for collection and treatment at the FRO AWTF-S, commissioning of the FRO AWTF-S in Q1 of 2021, and planning/commissioning of FRO north treatment (both north and south treatment plans are designed to remove aqueous selenium and nitrate). A clean water diversion is advancing for a portion of Kilmarnock Creek. Additionally, Teck has requested relocation of the compliance point to a more representative location (i.e., mixed waters accessible year round). The implementation of these adaptive management actions is not constrained to the AMP or LAEMP annual reporting cycles but may be (and have been) triggered at any time during the monitoring and reporting cycle.

Please refer to the AMP (Teck 2018) for more information on the adaptive management framework, the Management Questions, the key uncertainties, the response framework, continuous improvement, linkages between the AMP and other EVWQP programs, and AMP reporting.

2 METHODS

2.1 Overview

The general approach for the FRO LAEMP is summarized in Table 2.1, which identifies the data that were collected and evaluated in relation to each of the study questions. Monitoring locations listed in Table 2.1 are shown in Figure 2.1.

Biological samples were collected in December 2018[3], and February, June, September and December 2019, from locations along the Fording River extending from the headwaters of the Fording River and Henretta Creek (upstream of FRO) through FRO to upstream of Ewin Creek (Figure 2.1; Table 2.2). Triplicate samples were collected at a subset of areas around the Compliance Point (FR_FRCP1; Table 2.2) in December 2018 and February 2019 to evaluate the influence of elevated water quality constituent concentrations on biota from predominantly Cataract Creek flow in this section of the upper Fording River. No sampling occurred at RG_FRCP1SW in December 2018 and 2019, and February 2019 due to this section of the river being dry (i.e., subsurface). Similarly, reduced or no sampling occurred at RG_FOBKS, RG_FOBSC, and RG_FOBCP in December 2018 and 2019, and February 2019 due to drying and ice conditions (Table 2.2). Winter conditions prevented access to RG_FO26 and RG_HENUP in December 2018 and 2019, and February 2019, so RG_UFR1 was included as a reference area for these sampling programs. Two mine-exposed biological monitoring locations (RG_FOUCL and RG_SCOUTDS) were added to the FRO LAEMP in September 2019 to provide additional spatial coverage around future water treatment. RG_FOUCL is in the Fording River upstream of the inputs from Clode Creek and in the vicinity of the proposed north water treatment plans while RG_SCOUTDS is immediately downstream of the outfall for the FRO-AWTF-S. A summary of sample area descriptions, samples taken, and of Teck water quality monitoring stations associated with the FRO LAEMP are outlined below (Table 2.2 and 2.3). Water level and temperature were monitored continuously at established gauges between the South Tailings Pond (STP) and Chauncey Creek (Table 2.4; Figure 2.2). Drying surveys were conducted monthly between January and June (see Minnow and Lotic 2018) and August through December (Table 2.4; Figure 2.2). In late October 2019, the monthly drying surveys were expanded to include the northern section of the study area as to document the extent and timing of a short drying section downstream of the Turnbull Bridge that was first identified in 2011 (McPherson and Robinson 2011). In addition to the southern survey, crews walked and documented any disconnection in flow or isolated pools for a 6.1 kilometer (km) section of the Fording from the

[3] December 2018 BIC samples were included in this report because they were not included in last year's report, on account of the laboratory processing delays.

Table 2.1: Summary of the 2019 FRO LAEMP

Study Questions	Context	Assessment Endpoints	Measurement Endpoints[ab]				How Data Will be Evaluated to Address Study Question
			Water	Water Sampling Stations	Biological	Biological Sampling Areas	
1. Are nitrate concentrations increasing and, if so, are they adversely affecting aquatic biota?	Nitrate concentrations are predicted (in the EVWQP) to increase prior to commissioning of the AWTF.	Benthic invertebrate community relative to nitrate concentrations in the upper Fording River.	Nitrate concentrations in water, surface water chronic toxicity tests (quarterly and semi-annually)	FR_UFR1, FR_HC3, FR_FR1, FR_FRABEC1, FR_MULTIPLATE, FR_FRNTP, FR_FR2, GH_FR3, FR_SCOUTDS, FR_FR4, FR_FRCP1, FR_FRCP1SW, FR_FRRD, FR_FRABCH, GH_PC2, FR_FR5; Chronic toxicity tests at FR_UFR1, FR_FRCP1 and FR_FRABCH only	Benthic invertebrate community structure (September)	RG_FO26 (Ref), RG_HENUP (Ref), RG_UFR1 (Ref), RG_FODHE, RG_FOUCL, RG_FOUNGD, RG_FODNGD, RG_MP1, RG_FOUSH, RG_FOUKI, RG_FOBKS, RG_SCOUTDS, RG_FOBSC, RG_FOBCP, RG_FRCP1SW, RG_FRUPO, RG_FODPO, RG_FO22, RG_FOUEW	1. Evaluate nitrate concentrations relative to predictions in the EVWQP. 2. Determine if benthic invertebrate community endpoints are outside of regional reference condition or moving away from the reference condition in accordance with observed nitrate concentrations. 3. Determine if benthic invertebrate community results correspond with expectations based on nitrate concentrations in water relative to the site-specific benchmark for nitrate.
2. Is active water treatment affecting biological productivity downstream in the Fording River?	The AWTF is not scheduled to be commissioned until Q1 2021, so sampling in 2019 and 2020 will be collection of baseline data so that questions can be answered after the AWTF operation commences.	Biological productivity downstream from the AWTF discharge post- compared to pre-AWTF commissioning and relative to productivity observed upstream from the discharge.	Nutrient concentrations	FR_UFR1, FR_HC3, FR_FR1, FR_FRABEC1, FR_MULTIPLATE, FR_FRNTP, FR_FR2, GH_FR3, FR_SCOUTDS, FR_FR4, FR_FRCP1, FR_FRCP1SW, FR_FRRD, FR_FRABCH, GH_PC2, FR_FR5	Benthic invertebrate biomass (September), benthic invertebrate community structure (September)	Community - as above; Biomass - RG_FO26 (Ref), RG_HENUP (Ref), RG_UFR1 (Ref), RG_FOUKI, RG_FOBKS, RG_SCOUTDS, RG_FOBSC, RG_FOBCP, RG_FRUPO, RG_FO22	Pre-AWTF Commissioning - Continue to collect baseline data indicative of productivity based on benthic invertebrate samples collected upstream and downstream of the future treatment system discharge.
3. Are tissue selenium concentrations reduced downstream from the AWTF?		Tissue selenium concentrations downstream from the AWTF discharge post- compared to pre-AWTF commissioning and relative to concentrations observed upstream from the discharge.	Total and dissolved selenium concentrations, and selenium speciation	FR_UFR1, FR_HC3, FR_FR1, FR_FRABEC1, FR_MULTIPLATE, FR_FRNTP, FR_FR2, GH_FR3, FR_SCOUTDS, FR_FR4, FR_FRCP1, FR_FRCP1SW, FR_FRRD, FR_FRABCH, GH_PC2, FR_FR5	Benthic invertebrate tissue selenium (composite-taxa samples)	Invertebrate tissue -RG_FO26 (Ref), RG_HENUP (Ref), RG_UFR1 (Ref), RG_FODHE, RG_FOUCL, RG_FOUNGD, RG_FODNGD, RG_MP1, RG_FOUSH, RG_FOUKI, RG_FOBKS, RG_SCOUTDS, RG_FOBSC, RG_FOBCP, RG_FRCP1SW, RG_FRUPO, RG_FODPO, RG_FO22, RG_FOUEW	Pre-AWTF Commissioning - Continue to collect baseline tissue selenium data from benthic invertebrates sampled upstream and downstream of the future treatment system discharge.
4. Is AWTF operation affecting aquatic biota through thermal effects or concentrations of treatment-related constituents other than nutrients or selenium?		Potential thermal effects or other treatment related constituents of interest on biota downstream from the AWTF.	Chronic toxicity tests in receiving environment (quarterly); Field *in situ* water quality (in association with water chemistry sampling); Temperature data loggers (when treatment begins); Acute toxicity tests on effluent (when treatment begins)	FR_UFR1, GH_FR3, FR_SCOUTDS, FR_FR4, FR_FRCP1, FR_FRRD, FR_FRABCH, FR_FR5 Chronic toxicity tests at FR_UFR1, FR_FRCP1 and FR_FRABCH only	Benthic invertebrate community structure (September)	Community - RG_FOBKS, RG_SCOUTDS, RG_FOBSC, RG_FOBCP, RG_FRCP1SW, RG_FRUPO, RG_FODPO, RG_FO22, RG_FOUEW	Pre-AWTF Commissioning - Continue to collect baseline temperature data through routine monitoring stations upstream and downstream of the future treatment system discharge. Temperature loggers in the expected mixing zone of the future discharge will provide continuous temperature monitoring. Continue routine water quality monitoring upstream versus downstream of the future treatment system discharge. Biological data collected for other purposes (above) will also serve as baseline data for this question.

[a] Sediment samples were also collected at RG_HENUP, RG_FO26, RG_FOUKI, RG_SCOUTDS, RG_FOBKS, RG_FOBSC, RG_FOBCP, RG_FRCP1SW, RG_FRUPO, and RG_FO22 to support various LAEMP and operational requirements.

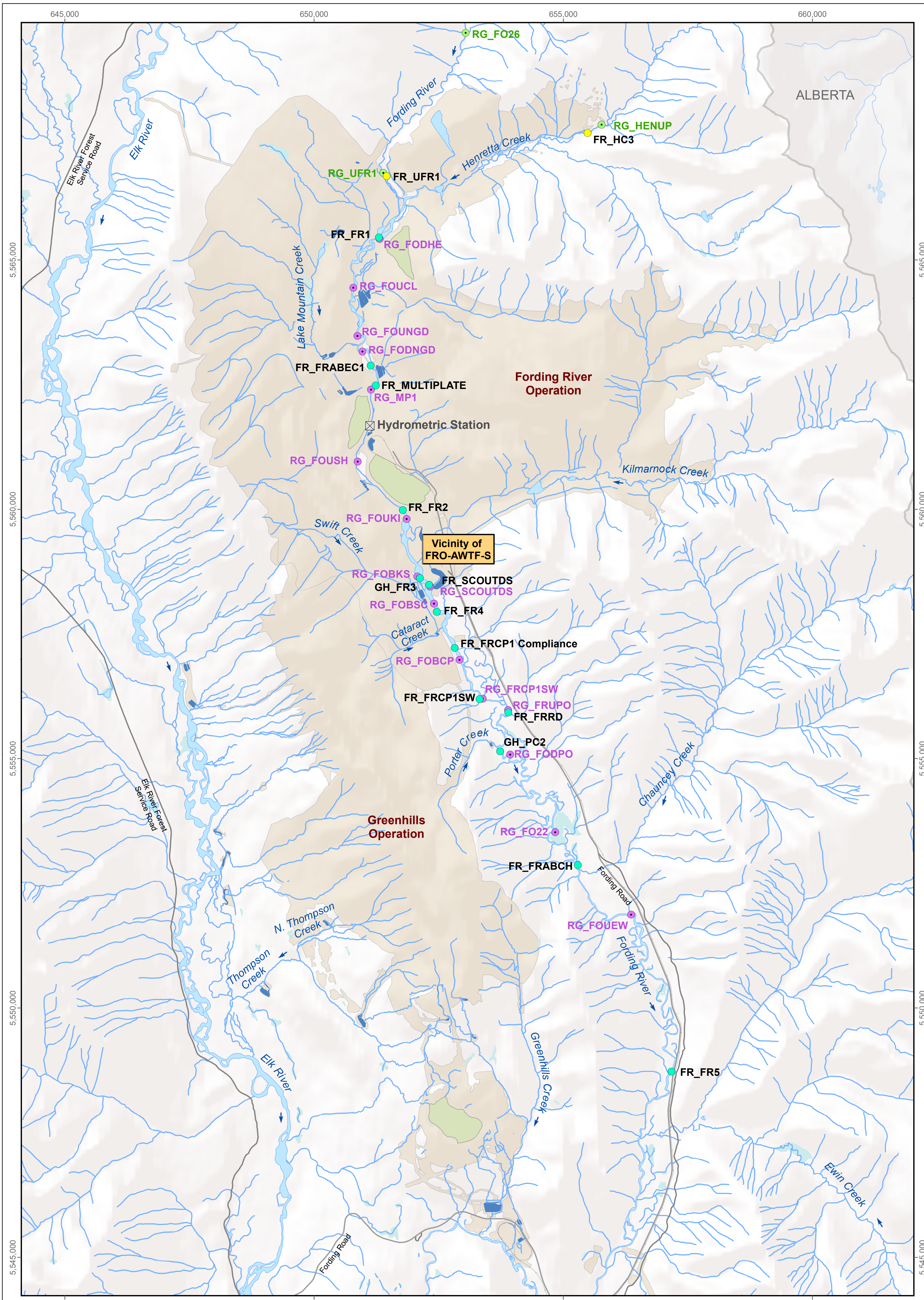
[b] RG_FOUCL was added in September to provide a biological monitoring area to support FRO north water treatment plans, and RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.

Table 2.1: Summary of the 2019 FRO LAEMP

Study Questions	Context	Assessment Endpoints	Measurement Endpoints[ab]				How Data Will be Evaluated to Address Study Question
			Water	Water Sampling Stations	Biological	Biological Sampling Areas	
5. Is re-direction of water potentially affecting biota in the Fording River?	As mining development progresses, water will be re-routed for treatment, which may alter water flows in the upper Fording River compared to current conditions.	Potential effects on biota due to changes in flow and constituent concentration	Order constituents, plus nickel and other WQ constituents with Early Warning Triggers (EWT) in surface water, chronic toxicity tests (quarterly and semi-annually)	Effluent mixing zone, FR_UFR1, GH_FR3, FR_SCOUTDS, FR_FR4, FR_FRCP1, FR_FRRD, FR_FRABCH, FR_FR5 Chronic toxicity tests at FR_UFR1, FR_FRCP1 and FR_FRABCH only	Benthic invertebrate community structure (September) and benthic invertebrate tissue selenium (composite-taxa samples)	Community - RG_FOBKS, RG_SCOUTDS, RG_FOBSC, RG_FOBCP, RG_FRCP1SW, RG_FRUPO, RG_FODPO, RG_FO22, RG_FOUEW	Evaluation of potential effects on biota in relation to changes in flows will be monitored through the LAEMP as well as further investigations completed by FRO in the development of the FRO-AWTF-S. Spatial changes in constituent concentrations may result from re-direction of water.
6. What are the factors contributing to the variations in percent Ephemeroptera?	A consistent spatial (upstream to downstream) and temporal decrease in percent Ephemeroptera has been observed in the upper Fording River. Data collected during the 2019-2020 FRO LAEMP will build on the investigation of cause initiated in the previous LAEMP cycle.	Benthic invertebrate community, tissue chemistry, water quality, sediment quality, and habitat (e.g., seasonal drying, flow, substrate type, calcite, temperature).	Order constituents, plus nickel and other WQ constituents with Early Warning Triggers (EWT) in surface water, chronic toxicity tests (quarterly and semi-annually)	FR_UFR1, FR_HC3, FR_FR1, FR_FRABEC1, FR_MULTIPLATE, FR_FRNTP, FR_FR2, GH_FR3, FR_SCOUTDS, FR_FR4, FR_FRCP1, FR_FRCP1SW, FR_FRRD, FR_FRABCH, GH_PC2, FR_FR5; Chronic toxicity tests at FR_UFR1, FR_FRCP1 and FR_FRABCH only	Benthic invertebrate community structure and composite-taxa benthic invertebrate tissue selenium (February, June, September, December)[b]	RG_FO26 (Ref), RG_HENUP (Ref), RG_UFR1 (Ref), RG_FODHE, RG_FOUCL, RG_FOUNGD, RG_FODNGD, RG_MP1, RG_FOUSH, RG_FOUKI, RG_FOBKS, RG_SCOUTDS, RG_FOBSC, RG_FOBCP, RG_FRCP1SW, RG_FRUPO, RG_FODPO, RG_FO22, RG_FOUEW	1. Determine if benthic invertebrate community endpoints are outside of regional reference condition or moving away from the reference condition in accordance with observed sulphate, selenium, nickel and/or other water quality constituent concentrations. 2. Determine if benthic invertebrate community endpoints are outside of regional reference condition or moving away from the reference condition in accordance with other potential stressors, both mine-related and/or natural. 3. Determine if mine-related and/or natural stressors correlate with % Ephemeroptera and other BIC metrics. 4. Investigate seasonal patterns in BIC.
7. What is the benthic invertebrate community structure in the reach of the Fording River that goes dry, and can changes be correlated with flow conditions?	A section of the upper Fording River has been observed to dry in the winter. The spatial and temporal extent of drying is being characterized, and the effects on benthic invertebrate communities assessed.	Monthly surveys of dry sections between August and April (annual), benthic invertebrate community.	Temperature and level data loggers (continuous). Field *in situ* water quality	FR_UFR1, FR_FR1, FR_FRUPP, FR_FRDSCC1, FR_MULTIPLATE, FR_FRNTP, FR_FR2, FR_AWTF-S, GH_FR3, FR_SCOUTDS, FR_FR4, FR_FRCP1, FR_FRCP1SW, FR_FRRD, GH_PC2, FR_FRABCH, FR_FRABCH-new	N/A	Community in dry section(s) (e.g. RG_FRCP1SW)	1. Determine the spatial and temporal extent and annual variability of seasonal dewatering in the upper Fording River. 2. Evaluate benthic invertebrate community in the dewatered section(s).

[a] Sediment samples were also collected at RG_HENUP, RG_FO26, RG_FOUKI, RG_SCOUTDS, RG_FOBKS, RG_FOBSC, RG_FOBCP, RG_FRCP1SW, RG_FRUPO, and RG_FO22 to support various LAEMP and operational requirements.

[b] RG_FOUCL was added in September to provide a biological monitoring area to support FRO north water treatment plans, and RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.



LEGEND

Water Monitoring Station

- Mine-exposed
- Reference

Biological Sampling Area

- Mine-exposed
- Reference

- Hydrometric Station
- Teck Coal Mine Operation

Monitoring Locations in Upper Fording River, FRO LAEMP, 2019

0 1 2 4
km

N W E S

Projection: North American Datum 1983 UTM Zone 11 U

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Figure 2.1

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 2.1 Monitoring Locations in Upper Fording River. 2019.mxd

Table 2.2: Summary of Annual Samples Collected for the FRO LAEMP, 2019

Biological Monitoring Area		Area Description	Biological Monitoring Area UTM Coordinates		Water Quality										Sediment Quality					Benthic Invertebrates														
					Water Chemistry					Selenium Speciation										Hess: Biomass (# of samples)					Kick and Sweep: Community (# of samples)					Kick and Sweep: Composite-taxon Selenium (# of samples)				
			Easting	Northing	2018 Dec	2019 Feb	2019 June	2019 Sept	2019 Dec	2018 Dec	2019 Feb	2019 June	2019 Sept	2019 Dec	2018 Dec	2019 Feb	2019 June	2019 Sept	2019 Dec	2018 Dec	2019 Feb	2019 June	2019 Sept	2019 Dec	2018 Dec	2019 Feb	2019 June	2019 Sept	2019 Dec	2018 Dec	2019 Feb	2019 June	2019 Sept	2019 Dec
Reference	RG_HENUP (FR_HC3)	Henretta Creek u/s all mine operations	655771	5567710	-	-	1	1	-	-	-	1	1	-	-	-	-	3	-	-	-	-	10	-	-	-	3	3	-	-	-	3	3	-
	RG_FO26 (FR_UFR1)	Fording River u/s Henretta (u/s all mines)	655965	5552879	-	-	1	1	-	-	-	1	1	-	-	-	-	3	-	-	-	-	10	-	-	-	3	3	-	-	-	3	3	-
	RG_UFR1[a] (FR_UFR1)	Fording River u/s Henretta at Teck WQ station	651376	5566758	1	1	-	-	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	3	x	-	-	3	3	3	-	-	3
Mine-exposed	RG_FODHE (FR_FR1)	Fording River d/s Henretta Creek	651320	5565422	1	1	1	1	1	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3	x	3	3	3
	RG_FOUCL[b]	Fording River u/s of Clode Creek	650787	5564445	-	-	-	1	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3	3
	RG_FOUNGD	Fording River u/s NGD	650870	5563476	1	1	1	1	1	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3	3	3	3	3
	RG_FODNGD (FR_FRABEC1)	d/s Lake Mountain Creek/ North Greenhills Diversion	650972	5563162	1	1	1	1	1	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3	3	3	3	3
	RG_MP1 (FR_MULTIPLATE)	Fording Multiplate d/s Eagle Ponds	651143	5562400	1	1	1	1	1	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3	3	3	3	3
	RG_FOUSH (FR_FRNTP)	Fording River u/s Shandley Creek	650876	5560957	1	1	1	1	1	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3	3	3	3	3
	RG_FOUKI (FR_FR2)	Fording River u/s Kilmarnock Creek	651859	5559804	1	1	1	1	1	-	1	1	1	1	-	-	-	5	-	-	-	-	10	-	3	3	3	3	3	3	3	3	3	3
	RG_FOBKS (GH_FR3)	Fording River between Kilmarnock Creek & Swift Creek	652074	5558652	1	1	1	1	1	-	1	1	1	1	-	-	-	5	-	-	-	-	10	-	-	-	3	3	-	3	1	3	3	3
	RG_SCOUTDS[b]	d/s of FRO AWTF-S outfall	652307	5558501	-	-	-	1	1	-	-	-	1	1	-	-	-	5	-	-	-	-	10	-	-	-	-	3	3	-	-	-	3	3
	RG_FOBSC[c] (FR_FR4)	Fording River d/s Swift Creek, u/s Cataract Creek	652407	5558109	1	-	1	1	1	-	-	1	1	1	-	-	-	-	-	-	-	-	10	-	3	x	3	3	x	3	x	3	3	3
	RG_FOBCP[c] (FR_FRCP1)	Fording River between Cataract & Porter Creek	652920	5556982	1	-	1	1	1	-	-	1	1	1	-	-	-	5	-	-	-	-	10	-	3	x	3	5	x	3	3	3	5	x
	RG_FRCP1SW[d] (FR_FRCP1SW)	Fording River ~1150 m d/s of Compliance Point	653387	5556201	x	-	1	1	1	-	-	1	1	1	-	-	-	-	-	-	-	-	10	-	-	-	3	3	-	-	-	3	3	x
	RG_FRUPO (FR_FRRD)	Fording River u/s of Porter Creek	653894	5555975	1	1	1	1	1	-	1	1	1	1	-	-	-	5	-	-	-	-	10	-	3	3	3	3	3	3	3	3	3	3
	RG_FODPO (GH_PC2)	Fording River d/s Porter Creek, u/s Chauncey Creek	653935	5555085	1	1	1	1	1	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	3	3	3	3	3	3	3	3	3	3
	RG_FO22 (FR_FRABCH)	u/s Chauncey Creek	654841	5553523	1	1	1	1	1	-	1	1	1	1	-	-	-	5	-	-	-	-	10	-	-	-	3	5	-	3	3	3	5	3
	RG_FOUEW (FR_FR5)	Fording River d/s Chauncey Creek, u/s Ewin Creek	656365	5551875	1	1	1	1	1	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	3	3	3	3	3	3	3	3	3	3

Notes: '-' indicates sample that was not taken because it was not a part of the sampling design; 'x' indicates sample that was not taken because of drying and/or ice conditions.
[a] RG_UFR1 was used as a reference location in December and February when there was no access to RG_FO26 or RG_HENUP.
[b] RG_FOUCL was added in September to provide a biological monitoring area to support FRO north water treatment plans, and RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.
[c] RG_FOBSC and RG_FOBCP were dry or frozen in December.
[d] RG_FRCP1SW was dry during February and December sampling periods so was not sampled.

Table 2.3: Summary of Teck Routine Water Quality Monitoring Associated with the FRO LAEMP, 2019

Location Description	Water Station ID	EMS Number	UTM (11U)		Water Quality Samples			
			Easting	Northing	Designation	Field parameters[a]	All other parameters required under mine permits[b]	Toxicity[c]
Fording River upstream of FRO	FR_UFR1	E216777	651459	5566677	Reference	W/M	W/M	Q[d]
Henretta Creek upstream of FRO	FR_HC3	E300096	655489	5567547	Reference	W/M	W/M	-
Fording River downstream of Henretta Creek	FR_FR1	0200251	651304	5565451	Exposed	W/M	W/M	-
d/s Lake Mountain Creek/ North Greenhills Diversion	FR_FRABEC1[e]	N/A	651138	5562882	Exposed	M	M	-
Multiplate Culvert on Greenhills Access Road	FR_MULTIPLATE[e]	N/A	651238	5562482	Exposed	M[e]	M[e]	-
Fording River downstream of the North Tailings Pond	FR_FRNTP[e]	N/A	651122	5561675	Exposed	M[e]	M[e]	-
Fording River upstream of the proposed AWTF discharge	FR_FR2	0200201	651781	5559984	Exposed	W/M	W/M	-
Fording River immediately upstream of the proposed AWTF discharge	GH_FR3[e]	N/A	652125	5558620	Exposed	M[e]	M[e]	-
Fording River immediately downstream of the proposed AWTF discharge	FR_SCOUTDS[e]	N/A	652307	5558501	Exposed	M[e]	M[e]	-
Fording River between Swift and Cataract	FR_FR4[e]	0200311	652464	5557943	Exposed	M	M	-
Fording River Compliance Point	FR_FRCP1	E300071	652823	5557220	Exposed	W/M	W/M	Q
Fording River ~1150 m downstream of the Compliance Point	FR_FRCP1SW[e]	N/A	653324	5556197	Exposed	M[e]	M[e]	-
Fording River upstream Porter Creek	FR_FRRD	E300097	653897	5555925	Exposed	W/M	W/M	-
Fording River downstream of Porter	GH_PC2[e]	E287431	653734	5555147	Exposed	M[e]	M[e]	-
Fording River u/s Chauncey Cr.	FR_FRABCH[e]	N/A	655293	5552865	Exposed	W/M[e]	W/M[e]	Q[f]
Fording River upstream of Ewin Creek	FR_FR5[e]	N/A	657174	5548724	Exposed	M[e]	M[e]	-

Notes: M - monthly; W/M - weekly during freshet (March 15 to July 15); Q - quarterly; N/A - Not Applicable; "-" indicates no data available.

[a] Dissolved oxygen, temperature, specific conductance, pH.

[b] Total and dissolved metals, total and dissolved organic carbon, nutrients, major ions, etc. as per Table 18 of Permit 107517.

[c] Chronic toxicity as per Permit 107517 requirements.

[d] Not required by Permit 107517, this locaiton is used as a reference location in the chronic toxicity program. Frequency may change depending on the needs of the program.

[e] Non permitted location, frequency of these sites changed in 2019.

[f] Chronic toxicity started in Q4 2018 at this location.

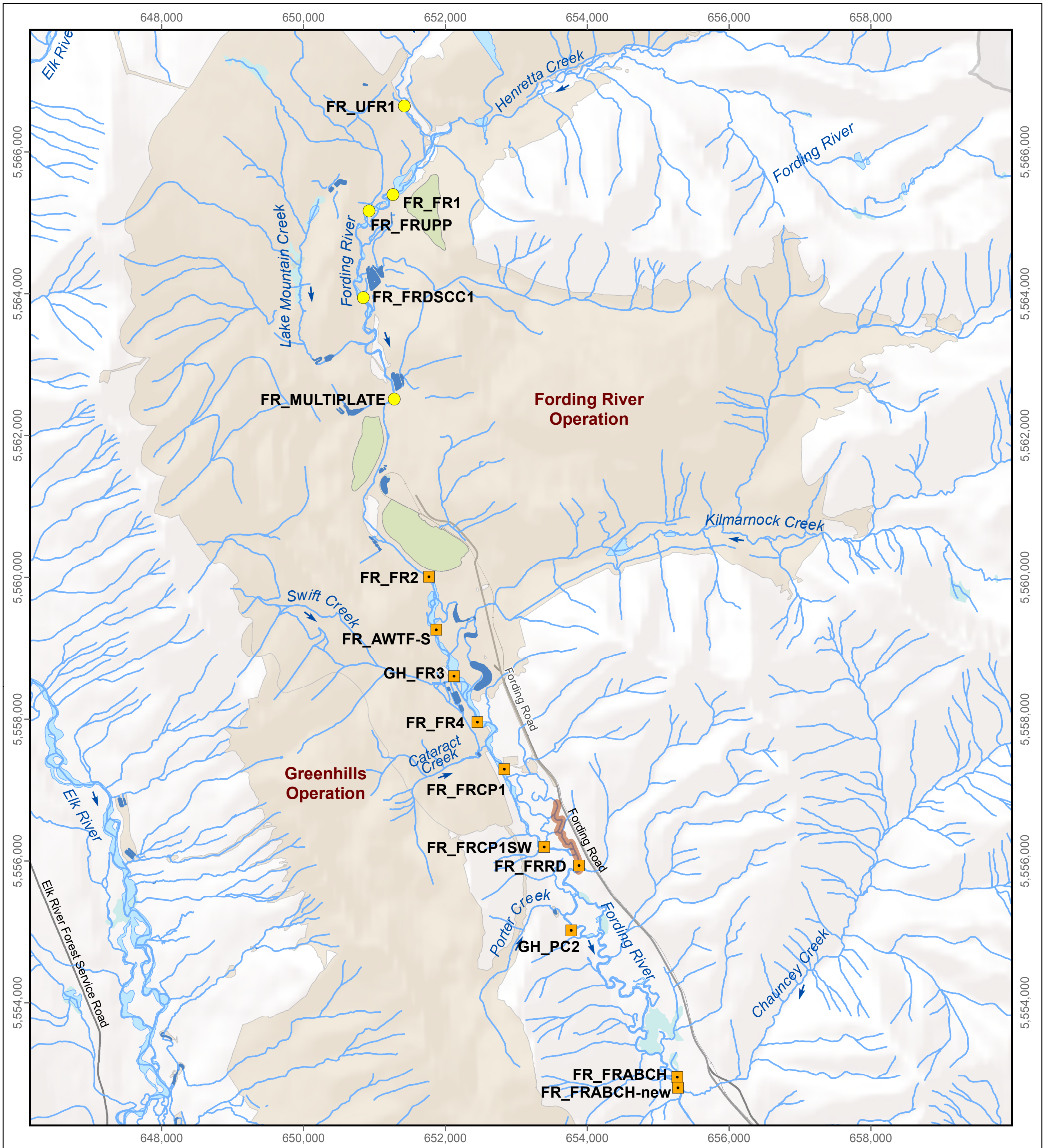
Table 2.4: Summary of Hydrometric and Water Temperature Monitoring Locations used in Drying Surveys, FRO LAEMP, 2019

Water Station ID		Location Description	UTM (11U)		Drying Survey Frequency	Data Loggers	
			Easting	Northing		Water Level (Flow)	Temperature
Reference	FR_UFR1[b]	Upper Fording river upstream of Henreta confluence	651424	5566646	M[a]	-	-
Mine-exposed	FR_FR1[b]	Fording River at the Turnbull	651263	5565397	M[a]	-	-
	FR_FRUPP[b]	Fording River upstream of Post pond	650923	5565169	M[a]	-	-
	FR_FRDSCC1[b]	Fording river downstream of clode confluence	650843	5563945	M[a]	-	-
	FR_MULTIPLATE[b]	Fording river at Multiplate	651280	5562515	M[a]	-	-
	FR_FR2	Fording River upstream of the proposed AWTF discharge	651781	5559984	M	C	C
	FR_AWTF-S	Fording River upstream of the proposed AWTF discharge	651874	5559260	M	C	C
	GH_FR3	Fording River immediately upstream of the proposed AWTF discharge	652125	5558620	M[a]	C	C
	FR_FR4	Fording River between Swift Creek reach 1 channel and Cataract Creek	652464	5557943	M[a]	C	C
	FR_FRCP1	Fording River Compliance Point	652823	5557220	M[a]	C	C
	FR_FRCP1SW	Fording River ~1150 m downstream of the Compliance Point	653324	5556197	M[a]	C	C
	FR_FRRD	Fording River upstream Porter Creek	653897	5555925	M[a]	C	C
	GH_PC2	Fording River downstream of Porter	653734	5555147	M	C	C
	FR_FRABCH	Fording River upstream of Chauncey Creek	655293	5552865	M	C	C
	FR_FRABCH-new	Fording River upstream of Chauncey Creek	655282	5552799	M	C	C

Notes: Surveys were done monthly between January to June, and August to December; M - monthly; C - Continuous.

[a] Surveys became biweekly in December.

[b] Stations were added to support northern drying section surveys, as reviewed with EMC at June 2019 meeting.



LEGEND

- Continuous Logger Station
- Water Quality Monitoring Station
- Greenhouse Groundwater Channel
- Settling Pond
- Tailings Pond
- Teck Coal Mine Operation

Hydrometric and Water Temperature Monitoring Locations in the Upper Fording River, FRO LAEMP 2019

0 1 2 4 km

Projection: North American Datum 1983 UTM Zone 11 U

N W E S

Date: May 2020
Project 197202.0004

Figure 2.2

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 2.2 FRO Dewatering.mxd

Multiplate culvert (FR_MULTIPLATE) to upstream past the confluence with Henretta Creek (FR_UFR1). Data were incorporated from other monitoring programs, as needed, to contribute to data evaluation and interpretation.

2.2 Benthic Invertebrates

2.2.1 Community Structure

2.2.1.1 Sample Collection

Benthic invertebrate community sampling followed the Canadian Aquatic Biomonitoring Network (CABIN) method, which involved 3-minute travelling kick sampling in riffle habitats into a net with a triangular aperture measuring 36 cm per side and mesh having 400 µm openings (Environment Canada 2012a). During sampling, the field technician moved across the stream channel (from bank to bank, depending on stream depth and width) in an upstream direction. With the net being held immediately downstream of the technician's feet, the detritus and invertebrates disturbed from the substrate were passively collected in the kick-net by the stream current. After three minutes of sampling time, the sampler returned to the stream bank with the sample. The kick-net was rinsed with water to move debris and invertebrates into the collection cup at the bottom of the net. The collection cup was then removed and the contents poured into a labelled plastic jar and preserved to a level of 10% buffered formalin in ambient water. Replicate samples were spaced either in separate riffles or a minimum of 50 m apart (when the area was a continuous riffle).

Consistent with the other sampling events, triplicate BIC samples were collected at each of the LAEMP areas in September 2019; however, to fulfill requirements under the 2018 to 2020 RAEMP study design, five replicate samples were collected at RG_FOBCP and RG_FO22 during September sampling (Minnow 2018c). Due to a laboratory analysis delay, BIC data from December were not included in the 2018 FRO LAEMP report, and as such, was incorporated into the current LAEMP report.

2.2.1.2 Laboratory Analysis

BIC samples were sent to Cordillera Consulting (lead taxonomist Scott Finlayson), in Summerland BC, for sorting and taxonomic identification. Organisms were identified to the lowest practical level (LPL) (typically genus or species). At the beginning of the sorting process, each sample was examined and evaluated for estimation of total invertebrate numbers. If the total number was estimated to be greater than 600, then the laboratory's sub-sampling protocol was followed. A minimum of 5% of each sample was sorted, in accordance with Quality Assurance/Quality Control (QA/QC) requirements of Environment Canada (2014). Sorting efficiency and sub-sampling accuracy and precision were quantified using methods specified by

Environment Canada (2012b, 2014). A full data quality review (DQR) will be included in the 2017 to 2019 RAEMP report (Minnow 2020a, in preparation). Based on the QA/QC results, the BIC data were judged to be of acceptable quality (Appendix H).

2.2.1.3 Supporting Measures

Consistent with the requirements of the CABIN sampling protocol, supporting habitat information (i.e., water velocity and depth, *in situ* water quality [temperature, dissolved oxygen (DO), conductivity, pH], canopy cover, substrate characteristics [Wolman 100-pebble count]) was collected concurrent with benthic invertebrate communities sampled in riffle habitats (Environment Canada 2012a).

2.2.1.4 Data Analysis

To address the investigation into the changes in BIC structure, endpoints of total sample abundance, richness (LPL taxonomy), percent (%) and total abundance of Chirnonomidae, Ephemeroptera-Plecoptera-Trichoptera (EPT) combined, Ephemeroptera, Plecoptera, and Trichoptera individually, and total abundance of key Ephemeroptera families (Baetidae, Heptageniidaie, Ephemerellidae) were plotted spatially and temporally. Based on advice from the EMC, Autotrophic to Heterotrophic Index, Filtering to Collector Index, Predator Index, and Benthic to Hyporheic Index (Table 2.5) were also computed for each monitoring area from CABIN kick samples and using the following equations:

$$Autotrophic\ to\ Heterotrophic\ Index = log10\left(\frac{Scrapers}{Shredders + Collector\ Gatherers + Filterers}\right)$$

$$Filtering\ Collector\ Index = \ log10\left(\frac{Filterers}{Collector\ Gatherers}\right)$$

$$Predator\ Index = log10\left(\frac{Predators}{All\ other\ Feeding\ Groups}\right)$$

$$Benthic\ to\ Hyporheic\ Index = \ log10\left(\frac{Burrowers}{Clingers + Sprawlers}\right)$$

Benthic invertebrate community data collected in September, with the exception of BIC indices, were compared to normal (reference area) ranges defined as the 2.5th and 97.5th percentiles of the distribution of reference area data (pooled 2012 and 2015 data) reported in the 2015-2016 RAEMP report (Minnow 2018b) and the 2017 FRO LAEMP report (Minnow and Lotic 2018). Endpoints from 2019 were plotted spatially and temporally (2012 to 2019) for each area where data were available. Seasonal data for 2018 and 2019 were plotted by area but were not compared to September normal range. Insufficient seasonal reference data are available to calculate normal ranges for months other than September. The relative composition of BIC was plotted spatially for each season where samples were collected between December 2018 and December 2019.

Table 2.5: Benthic Invertebrate Community Index Descriptions, FRO LAEMP, 2019

Index	Description
Autotrophic to Heterotrophic Index	Reflects the ratio of energy use by the benthic invertebrate community (BIC) as primary productivity within the stream from algae growth to heterotrophic energy sources (e.g., leaves and sticks)
Filtering Collector Index	Reflects the ratio of suspended Fine Particular Organic Matter (FPOM) to depositional FPOM used by the BIC
Predator Index	Reflects the abundance of predators
Benthic to Hyporheic Index	Reflects the ratio of habitats used by BIC, reflects sediment stability and flow permanence

Temporal changes in benthic endpoints calculated from September kick and sweep data were evaluated for 2012 to 2019. For some (but not all) years there were replicate data for a given area within a year. Thus, for each endpoint, an overall Analysis of Variance (ANOVA) with factors *Year*, *Area* and *Year* × *Area* was fit. The best transformation for each endpoint was chosen as the transformation for which a Shapiro-Wilk's test on the residuals gave the highest P-value (i.e., most normally distributed). If there was a significant *Year* term, the variability within years and areas from the full model was used to test for significant differences between all pairwise comparisons of year for each area (i.e., is the difference between year *i* and year *j* greater than would be expected given the variability within areas for all stations for which we have replicates). This assumes the variability to be consistent among areas and years but allows for comparisons between years without replicates. Significance of the pairwise comparisons was assessed with an α of 0.05 in a Tukey's Honestly Significant Difference test (HSD) which corrects for the number of comparisons.

For each year, a magnitude of difference from the base year (i.e., first year with data) was calculated as:

$$\frac{Year_i - Base\ Year}{Pooled\ SD}$$

and the significant differences between 2019 and previous years was assessed. All statistics were conducted in R (R Core Team 2019).

Benthic invertebrate community structure was also assessed using a multivariate ordination technique known as correspondence analysis (CA), which is used to create synthetic species abundance axes extracted in a sequential manner. Each score (number) on a CA axis is the sum of a weighted vector of species abundances. Species with correlated abundances vary together and have similar weights and scores on a CA axis. When depicted in two-dimensional plots, taxa that tend to co-occur plot together, while those that rarely co-occur plot farther apart. Similarly, areas sharing many taxa plot closest to one another, while those with little in common plot furthest apart. The greatest variation among either taxa or areas is explained by the first axis, with other axes accounting for progressively less variation. Therefore, this type of multivariate analysis describes not only which areas have distinct benthic communities, but also how these benthic communities differ among areas (i.e., which particular taxa differ in abundance). Prior to CA, the data were screened for rare taxa, as these can distort results. Taxa occurring at 10% or fewer of the areas, and constituting less than 1% of the total organism abundance, were removed from the analysis. After screening and data reduction, abundances were log (x+1) transformed. Scores for both taxa and areas were calculated using the vegan package (Oksanen et al. 2019) in R (R Core Team 2019) to evaluate the associations of organisms and stations.

To determine what physical and chemical characteristics may be driving trends in BIC, Spearman Rank Correlations were conducted between percent (%) and total abundance of Ephemeroptera and Plecoptera, individually, Ephemeroptera, Plecoptera, and Trichoptera (EPT) combined, and CA Axis 1 and CA Axis 2 against a variety of physical and chemical parameters (Appendix Table E.1). For water chemistry parameters, mean concentrations were calculated over the entire year to date, spring, and summer. Significant correlations were assessed at alpha = 0.05, Bonferroni corrected for 92 independent comparisons (corrected alpha = 0.05/92 = 0.00054). Water chemistry parameters were also analyzed by principle components analysis (PCA; Section 2.3.2) to combine multiple water quality variables into PC1 and PC2, and included in the correlation analysis.

A Redundancy Analysis (RDA) was performed to investigate patterns in BIC relative to habitat (Table 2.6) and stressor variables. A PCA summarized multivariate data into a smaller number of independent axes based on covariation in the original dataset and was comprised of linear combinations of the original multivariate matrix (i.e., benthic invertebrate community; Table 2.7). PCA axes one to six and Calcite Index (CI) were included as the stressor variables in the RDA. Only September family level benthic invertebrate community data was used in the RDA to control

Table 2.6: Summary of Habitat Variables Used in Redundancy Analysis of Benthic Invertebrate Community, FRO LAEMP, 2019

Variable Source	Habitat Variables
Steam Characteristics	Bankfull Width
	Mean Depth
Substrate	Substrate Size SD
	D16
	D84
GIS	Stream Density
	Watershed Area
GIS Landcover	% Watershed Forest Cover
	% Watershed Field Cover

for seasonal differences. The RDA constrained Principal Component Analysis (PCA) axes by a suite of predictor variables and constrained the PCA by applying a multiple regression to the PCA axis. This resulted in a subset of new RDA axis that were linear combinations of the predictor variables (i.e., habitat or stressor) that explained a subset of variation of the original PCA. The RDA was further conditioned such that the effects of one set of predictors was removed from the BIC data and a subsequent RDA was run on the residuals removing the effects of the first predictors (Legendre and Legendre 2012). The significance of each predictor was evaluated using a permutation-based ANOVA with 10,000 permutations, and the relative importance of individual predictors assessed using the associated pseudo F-statistic (Legendre et al. 2011). Limitations in available data (e.g., field habitat, calcite, water quality) resulted in only a subset of sites and years that had all necessary input data and could therefore be included in the RDA (Table 2.8). Nevertheless, the spatial and temporal coverage was enough to provide a general overview of the patterns exhibited by BIC.

Family level benthic invertebrate abundances were ln(X+1) transformed to reduce the effects of the most dominant taxa in order to better understand differences between sites that vary greatly in abundance. The resulting matrix was also subject to Chi-squared transformation to produce similar results to Correspondence Analysis (Legendre and Gallagher 2001). Taxa present in fewer than 5% of samples were excluded from the analysis. Water quality variables were averaged over 9 months prior to sampling to incorporate long-term patterns affecting BIC. A minimum of 4 months of data were used to calculate the average. The water quality dataset contained many highly correlated variables. Therefore, a PCA was conducted on the water quality data. A suite of habitat variables were calculated from field (e.g., width, depth, velocity, substrate parameters), and geographic information system (GIS) data (e.g., catchment area,

Table 2.7: Axis Loadings of Principal Component Analysis of Water Quality Analytes, FRO LAEMP, 2019

Analyte	PC1 (68%)	PC2 (12%)	PC3 (6.1%)	PC4 (4.9%)	PC5 (2.7%)	PC6 (1.6%)
Alkalinity	1.40	-0.640	-0.513	-0.607	0.0326	-0.967
Antimony	1.37	0.178	0.531	0.626	0.879	-0.0360
Arsenic	0.708	1.72	-1.19	0.179	0.128	0.136
Barium	1.14	-0.251	-0.385	-1.93	0.361	-0.345
Cadmium	1.48	0.336	0.275	-0.551	0.161	0.0469
Chromium	0.361	1.94	-1.17	0.184	-0.846	-0.250
Lithium	1.53	-0.340	-0.0841	-0.228	0.106	0.189
Manganese	1.24	1.05	0.202	-0.798	0.610	0.673
Molybdenum	1.37	0.487	0.594	0.742	0.923	-0.195
Nickel	1.41	0.395	0.0988	0.813	0.469	-0.500
Nitrate	1.43	-0.606	-0.162	0.0500	-0.657	0.947
Nitrite	1.42	0.281	0.721	-0.0627	-0.292	0.795
Ammonia	0.723	1.02	1.90	-0.318	-1.20	-0.723
Selenium	1.48	-0.523	-0.177	0.0982	-0.609	0.497
Sulphate	1.44	-0.726	-0.334	0.564	-0.421	-0.0629
TDS	1.45	-0.730	-0.496	0.166	-0.278	-0.409
Uranium	1.45	-0.602	-0.338	0.716	-0.268	-0.312

3 highest values on each PC axis.

3 Lowest values on each PC axis.

Table 2.8: Summary of Locations with Complete Datasets for Redundancy Analysis, FRO LAEMP, 2019

Station	2015 (replicates)	2018 (replicates)	2019 (replicates)
RG_HENUP	1	3	3
RG_FO26	1	3	3
RG_FODHE	1	3	3
RG_MP1	0	3	0
RG_FOUKI	1	3	3
RG_FOBKS	1	0	0
RG_FOBSC	1	3	0
RG_FODPO	1	3	0
RG_FO22	1	5	5
RG_FOUEW	1	3	0

% landcovers, stream density). To avoid overfitting the RDA model, a backwards variable elimination method with permutation-based ANOVA was applied to reduce the number of habitat variables. The Variance Inflation Factor (VIF) of the final habitat variables were all below 20 indicating the variable coefficients are not inflated by the presence of correlation among explanatory variables (i.e., no multicollinearity). All analyses were done in R 3.6.2 (R Core Team 2019), using the Vegan package (Oksanen et al., 2019).

2.2.2 Tissue Selenium

2.2.2.1 Sample Collection

Composite-taxa benthic invertebrate tissue samples were collected for selenium analysis using the kick sampling method described in Section 2.2.1, except that the sampling was not timed and kicking continued until sufficient sample was collected. Replicate samples were collected either in separate riffles or a minimum of 50 m apart (when the area was a continuous riffle). Three replicate samples were collected from the reference and mine-exposed areas included in the FRO LAEMP, except for RG_FOBCP and RG_FO22, where five samples were collected in September to support the RAEMP requirements (Minnow 2018c). Invertebrates were picked free of debris in the field, placed into sterile labelled cryovials and stored in a cooler with ice packs until they were transferred to a freezer later in the day. Approximately 2 g of wet tissue were collected for each sample where possible.

2.2.2.2 Laboratory Analysis

Benthic invertebrate tissue samples were kept in a freezer until they were shipped in coolers on ice to SRC Environmental Analytical Laboratories (SRC) in Saskatoon, SK. At the laboratory, samples were freeze-dried and analyzed for metals (including selenium and mercury) using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). Results were reported on a dry weight (dw) basis, along with moisture content (based on the difference between wet and freeze-dried sample weights). A full DQR will be included in the 2017 to 2019 RAEMP report (Minnow 2020a, in preparation). Based on the QA/QC results, the tissue selenium data were judged to be of acceptable quality (Appendix H).

2.2.2.3 Data Analysis

Composite-taxa benthic invertebrate tissue selenium concentrations were plotted relative to:

- the normal (reference area) range, defined as the 2.5th and 97.5th percentiles of tissue selenium concentrations measured in reference areas that have not been disturbed by mining in historical studies completed in the Elk River watershed from 1996 to 2016 (Minnow 2018b);
- data from previous sampling periods from 2012 to present, where available; and
- the Level 1 EVWQP benchmarks for effects to invertebrates (13 milligrams/kilogram [mg/kg] dry weight [dw]), dietary effects to birds (15 mg/kg dw), and dietary effects to juvenile fish (11 mg/kg dw; Golder 2014).

Additionally, tissue selenium concentrations were paired with corresponding water selenium concentrations and compared to the selenium bioaccumulation model (Golder 2018a).

2.2.3 Biomass

2.2.3.1 Sample Collection

Ten replicate stations were sampled at each of ten sampling areas (RG_FO26, RG_HENUP, RG_FOUKI, RG_SCOUTDS, RG_FOBKS, RG_FOBSC, RG_FOBCP, RG_FRCP1SW, RG_ FRUPO, and RG_FO22) in September for analysis of benthic invertebrate biomass and density (Table 2.2; Figure 2.1). Benthic invertebrates were collected using a Hess sampler with 500 µm mesh, for measurement of biomass and community endpoints relative to the area sampled. Stations were located a minimum of 5 m a part, so they were representative of the overall monitoring area. A single sample was collected at each station by carefully inserting the base of the Hess sampler into the substrate to a depth of approximately 5 to 10 cm. Gravel or cobble enclosed within the Hess sampler was carefully washed while allowing the current to carry dislodged organisms into the mesh collection net. Organisms collected into the net were rinsed into the bottom of the net, and then into a labelled wide-mouth plastic jar. Samples were preserved to a level of 10% buffered formalin in ambient water within approximately 6 hours of collection to ensure that biomass was not lost through predation or decomposition of tissues before the samples were sorted at the laboratory.

2.2.3.2 Laboratory Analysis

Benthic invertebrate biomass samples were sent to ZEAS Inc. (lead taxonomist Danuta Zaranko) in Nobleton, ON, for sorting and taxonomic identification. Preserved organisms in each sample were sorted from the sample debris into groups separated at the family-level of taxonomy for weighing. Each family group of organisms was placed onto a fine cloth to drain excess surface moisture before being weighed to the nearest 0.0001 g. Total biomass and density were reported for each sample (preserved wet weight). No QA/QC was conducted as the entire sample was sorted and processed.

2.2.3.3 Data Analysis

Laboratory data for benthic invertebrate Hess samples were converted to units of number of organisms per square metre (org/m^2) based on the known area sampled. Baseline biomass and density data from 2017, 2018 and 2019 were plotted and changes in biomass and density were quantified using an ANOVA with factors *Area* and *Year* and their interaction and appropriate transformations to meet the assumptions of the test. Model terms were interpreted using an α of 0.05. Post-hoc Tukey's Honestly Significant Difference Test was conducted (α = 0.05) to test for differences across time within areas due to the presence of significant interactions between Area and Year.

2.3 Water Quality

2.3.1 Sample Collection

Water quality assessment focused on constituents with EWTs (i.e., dissolved cadmium, nitrate, total selenium, sulphate, total antimony, total barium, total boron, dissolved cobalt, total lithium, total manganese, total molybdenum, total nickel, nitrite, total dissolved solids, total uranium, and total zinc (Teck 2018)). Total mercury was considered but further analysis was not completed due to an evaluation that concluded that the source of mercury concentrations in the Elk Valley were not affected by mining (Teck 2019a). Total phosphorus and orthophosphate were included in water quality assessment to address study question 2.

ENV's letter approving the 2016 to 2018 FRO LAEMP study design included a requirement to collect water samples concurrently with biological sampling. In addition, routine water quality monitoring data collected by Teck were downloaded from Teck's EQuIS^TM database for the monitoring stations that correspond with biological sampling areas in the LAEMP (Table 2.3 and Figure 2.2). Data included:

- nutrient concentrations (i.e., nitrate, total phosphorus, and ortho-phosphate);
- total and dissolved selenium concentrations;
- sulphate concentrations;
- other constituents with EWTs (i.e., dissolved cadmium, sulphate, total antimony, total barium, total boron, dissolved cobalt, total lithium, total manganese, total molybdenum, total nickel, nitrite, total dissolved solids, total uranium, and total zinc)
- total hardness as $CaCO_3$; and
- *in situ* water quality data (i.e., temperature, flow, pH, conductivity, and DO).

QA/QC associated with routine water sampling is described by Teck in annual water quality reports submitted under Permit 107517 (e.g., Teck 2019a). Water samples taken concurrently with biological samples will be reviewed in the DQR included in the 2017 to 2019 RAEMP report (Minnow 2020a, in preparation).

Water temperature and discharge measurements from Teck's continuous monitoring station, FR_FRNTP and FR_FRABCHf were also acquired from Teck. Measurements were recorded in 15 minute intervals and were used to evaluate changes in temperature and discharge over time in the upper Fording River.

Selenium speciation samples were collected to determine spatial and temporal patterns of selenium throughout the FRO LAEMP study area prior to FRO AWTF-S commissioning. Data included concentrations of selenate, selenite, dimethylselenoxide, methylseleninic acid, selenocyanate, selenomethionine, selenosulphate, and unknown selenium species).

All water samples were collected concurrent with biological sampling and were collected by wading into the river and filling sampling bottles from below the surface of the water. For water quality samples, preservatives were added to water samples for total and dissolved metals, total organic carbon, and dissolved mercury. For selenium speciation sampling, a preservative was added to total selenium samples, both a preservative and field filtering was applied to dissolved selenium, and field filtering and sample freezing was applied to selenium speciation samples.

2.3.2 Data Analysis

Data extracted from Teck's EQuIS database were screened for text values and converted to a common unit (e.g., all metal concentrations were converted to mg/L). Values reported as less than a poor laboratory reporting limit (LRL) were removed from the data set, unless they consisted of 80% or more of the data. Poor LRLs were defined as values reported as < LRL and the LRL exceeding the maximum observed (detected) value for that parameter.

Routine water quality monitoring results were screened against British Columbia Water Quality Guidelines (BCWQG; BCMOE 2017, 2018) as part of Teck's Annual Water Quality Monitoring Report under Permit 107517 (Teck 2019a). Water samples were also taken concurrently with biological monitoring samples and were integrated with routine water quality monitoring stations for a more complete data set. Routine water quality monitoring stations were matched with concurrent water samples according to proximity, with some exceptions (RG_FO26/FR_UFR1 and RG_FOUEW/FR_FR5) beyond out of range of a suitable match. Constituents with EWTs were compared to BCWQG and/or EVWQP benchmarks and interim screening benchmarks for nickel, as applicable, for the 2019 calendar year (Table 2.9). Plots of these constituent concentrations from 2012 to 2019 were prepared individually for each monitoring station relative to BCWQG, benchmarks and screening values (where applicable), and also as combined plots to allow for visual comparison among stations.

Potential changes in aqueous concentrations of nitrate, total sulphate, total selenium, and total nickel at individual stations over time were analyzed statistically to evaluate (1) if there was an increase or decrease since the base year of monitoring (2012 or the earliest year if monitoring was initiated post-2012), (2) whether the annual mean was within the range of historical annual means, and (3) if the current monitoring year (2019) was different from the previous monitoring year (2018). Nitrate, sulphate, and selenium were chosen because they are Order Constituents identified in the EVWQP (Teck 2014). Cadmium was excluded as concentrations were not above the Level 1 benchmark at the areas included in the FRO LAEMP. Nickel was included due to uncertainty in the current BCWQG (Teck 2017), and because it was identified as potentially contributing to chronic toxicity (Golder 2020b).

Monthly mean concentrations were estimated using the Kaplan-Meier (K-M) method. The method involves transforming the left censored (i.e., < value) data set to a right censored (i.e., > value) data set, and then using the K-M estimator (used to estimate the mean survival time in survival analysis) to estimate the mean. The calculation was conducted using the survfit() function in the survival package (Therneau 2017) in R and involves calculating the area under the K-M survival curve. The K-M method is non-parametric and can accommodate multiple LRLs. The method of estimating the mean is equivalent to using the distribution of detectable values below the LRL to represent values that are < LRL. For example, the mean of the data set {1, 2, <4, 5} is estimated as the mean of 1, 2, [½×1 + ½×2], and 5 which is 2.375. The value <4 is replaced by the distribution of values below 4 (i.e., 1 and 2 with equal weight of ½). Similarly, the

Table 2.9: British Columbia Water Quality Guidelines, Site-Specific Elk Valley Water Quality Plan (EVWQP) Benchmarks, and Interim Screening Values for Parameters Assessed in FRO LAEMP, 2019

		Variable	Units	British Columbia Water Quality Guidelines [a]				Site-Specific Benchmark [b]
				Long-term Average	Short-term Maximum	Year	Status	
Non-Metals		Total Alkalinity	mg/L	For dissolved calcium = < 4mg/L, WQG = <10 For dissolved calcium = 4 to 8 mg/L, WQG = 10 to 20 For dissolved calcuim = > 8 mg/L, WQG = > 20	-	2015	Working	-
		Unionized Ammonia [c]	mg/L	pH and Temperature dependent (tabular)	pH and Temperature dependent (tabular)	2009	Approved	-
		Chloride	mg/L	150	600	2003	Approved	-
		Fluoride	mg/L	-	For hardness ≤ 10 mg/L, WQG = 0.4 For hardness > 10 mg/L, WQG = [-51.73 + 92.57 × $\log_{10}$(hardness)]×0.01 Maximum applicable hardness = 385 mg/L	1990	Approved	-
		Nitrate-N	mg/L	3	33	2009	Approved	Level 1 EVWQP benchmark= $10^{1.0003[\log(hardness)]-1.52}$ Maximum applicable hardness = 500 mg/L Level 2 EVWQP benchmark= $10^{1.0003[\log(hardness)]-1.38}$ Maximum applicable hardness = 500 mg/L
		Nitrite-N [d]	mg/L	0.02 to 0.20	0.06 to 0.60	2009	Approved	-
		Dissolved oxygen [e]	mg/L	For buried embryo/alevin life stages, WQG (water column) = 11 WQG (interstitial) = 8 For other life stages, WQG (water column) = 8	For buried embryo/alevin life stages, WQG (water column) = 9 WQG (interstitial) = 6 For other life stages, WQG (water column) = 5	1997	Approved	-
		pH [f]	pH units	6.5 - 9.0		1991	Approved	-
		Sulphate [g]	mg/L	128 to 429 Maximum applicable hardness = 250 mg/L	-	2013	Approved	Level 1 EVWQP Benchmark = BCWQG = 429
		Total Dissolved Solids	mg/L	-	-	-	-	Level 1 Screening Value = 1000
Metals and Metalloids	Total	Antimony (III)	mg/L	0.009	-	2015	Working	-
		Arsenic	mg/L	-	0.005	2002	Approved	-
		Barium	mg/L	1	-	2015	Working	-
		Beryllium	mg/L	0.00013	-	2015	Working	-
		Boron	mg/L	1.2	-	2003	Approved	-
		Chromium [h]	mg/L	For Cr(VI), WQG = 0.001 For Cr(III), WQG = 0.0089	-	2015	Working	-
		Cobalt	mg/L	0.004	0.11	2004	Approved	-
		Iron	mg/L	-	1	2008	Approved	-
		Lead [g]	mg/L	For hardness ≤ 8 mg/L, none proposed For hardness 8 to 360 mg/L, WQG = 0.001×{3.31+ exp[1.273 × ln(hardness) - 4.704]} No more than 20% of samples in a 30-d period should be >1.5X the guideline. Maximum applicable hardness = 360 mg/L	For hardness ≤ 8 mg/L, WQG ≤ 0.003 For hardness 8 to 360 mg/L, WQG = 0.001×{exp[1.273 × ln(hardness) - 1.460]} Maximum applicable hardness = 360 mg/L	1987	Approved	-
		Manganese [g]	mg/L	For hardness 37 to 450 mg/L, WQG ≤ 0.004 × hardness + 0.605 Maximum applicable hardness = 450 mg/L	For hardness 25 to 259 mg/L, WQG ≤ 0.01102 × hardness + 0.54 Maximum applicable hardness = 259 mg/L	2001	Approved	-
		Mercury [i]	mg/L	MeHg ≤ 0.5% of THg, WQG = 0.00002 Else, WQG = [0.0001/(MeHg/THg)] OR When MeHg = 0.5% of THg, WQG= 0.00002 When MeHg = 1.0% of THg, WQG = 0.00001 When MeHg = 8.0% of THg, WQG= 0.00000125	-	2001	Approved	-
		Molybdenum	mg/L	1	2	1986	Approved	-
		Nickel [g]	mg/L	-	-	-	-	Level 1 Interim Screening Value = 0.0053 Level 2 Interim Screening Value = 0.015
		Selenium	μg/L	2	-	2014	Approved	Level 1 EVWQP Benchmark = 19 Level 2 EVWQP Benchmark = 74
		Silver [g]	mg/L	For hardness ≤ 100 mg/L, WQG = 0.00005 For hardness > 100 mg/L, WQG = 0.0015	For hardness ≤ 100 mg/L, WQG = 0.0001 For hardness > 100 mg/L, WQG = 0.003	1996	Approved	-
		Thallium	mg/L	0.0008	-	1997	Working	-
		Uranium	mg/L	0.0085	-	2011	Working	-
		Zinc [g]	mg/L	For hardness ≤ 90 mg/L, WQG = 0.0075 For hardness 90 to 330 mg/L, WQG = [7.5 + 0.75 (hardness - 90)]×0.001; Maximum applicable hardness = 330 mg/L	For hardness ≤ 90 mg/L, WQG = 0.033 For hardness 90 to 500 mg/L, WQG = [33 + 0.75 (hardness - 90)]×0.001; Maximum applicable hardness = 500 mg/L	1999	Approved	-
	Dissolved	Aluminum	mg/L	When pH ≥ 6.5, WQG = 0.05 When pH < 6.5, WQG = exp[1.6 - 3.327(median pH)+ 0.402(median pH)^2]	When pH ≥ 6.5, WQG = 0.1 When pH < 6.5, WQG = exp[1.209 - 2.426(pH)+ 0.286 (pH)^2]	2001	Approved	-
		Cadmium [g]	μg/L	For hardness = 3.4 to 285 mg/L, WQG = {exp[0.736×ln(hardness) - 4.943]} Maximum applicable hardness = 285 mg/L	For hardness = 7 to 455 mg/L, WQG = {exp[1.03×ln(hardness)-5.274]} Maximum applicable hardness = 455 mg/L	2015	Approved	Level 1 EVWQP Benchmark = $10^{0.83(\log(hardness))-2.53}$ Maximum applicable hardness = 285 mg/L
		Copper	mg/L	Biotic Ligand Model	Biotic Ligand Model	2019	Approved	-
		Iron	mg/L	-	WQG = 0.35 mg/L	2008	Approved	-

[a] British Columbia Working (BCMOE 2017) or Accepted (BCMOE 2019) Water Quality Guidelines for the Protection of Aquatic Life. For guidelines dependent on other analytes (e.g., hardness), guidelines were screened using concurrent values.

[b] When appropriate, site-specific Elk Valley Water Quality Plan Benchmarks (EVWQP; Teck 2014) or interim screening values were applied in addition to or instead of BC water quality guidelines. Interim screening

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

[d] Dependent on concurrent chloride, range of values reported (BCMOE 2019).

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

[f] Unrestricted change permitted within this pH range.

[g] For hardness-based guidelines, concurrent hardness values were used for calculating guidelines. If hardness values exceeding the maximum applicable hardness, then guidelines were determined using the maximum applicable hardness. If hardness values is lower than the minimum hardness, then guidelines were determined using the minimum hardness.

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

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

mean of the data set {1, 1.6, 2, 2.1, <4, 5} is estimated as the mean of 1, 1.6, 2, 2.1, [¼×1 + ¼×1.6 + ¼×2 + ¼×2.1], and 5 which is 2.229. Again, the value <4 is replaced by the distribution of values below 4 (i.e., 1, 1.6, 2, and 2.1 with equal weight of ¼). If there is only one LRL and no detected values below the LRL, then the K-M estimate of the mean is equivalent to replacing the value below the LRL with the LRL (i.e., the best estimate for the values < LRL is the LRL).

Temporal changes in monthly mean concentrations for water quality parameters were evaluated for each station (reference and mine-exposed) from 2012 to 2019. Only years with at least six months and only stations with at least three years of data were included in the analysis. Because of the presence of LRLs for most parameters, a censored regression ANOVA model with factors *Year* and *Month* and assuming a log-normal distribution of the response variable was fit with maximum likelihood estimation for each station. The significance of each term in the model was assessed using likelihood-ratio tests to determine if there is a significant change in log-likelihood with the addition of the term in the model. This tested for an overall difference among years (including the *Month* term in the model controlled for seasonal effects within a year). If the *Year* term was significant ($\alpha = 0.05$) then post-hoc contrasts were conducted to test for pairwise differences among years with an $\alpha = 0.05$ in a Tukey's HSD test which corrects for the number of comparisons.

For each year, a percent magnitude of difference from the base year (i.e., first year with minimum number of months) was calculated as:

$$\frac{Year_i - Base\ Year}{Base\ Year} \times 100\ \%$$

and the significant difference between 2019 and previous years was assessed.

Temperature and discharge data were also acquired from Teck's continuous monitoring stations, FR_FRNTP and FR_FRABCHf, located in the upper Fording River. Data were collected every 15 minutes, and monthly means were calculated and plotted between 2010 and 2019 for FR_FRNTP, and between 2017 and 2019 for FR_FRABCHf temperature but only 2019 for discharge. A gap exists from June 2013 to early 2014 as the monitoring station was damaged in the 2013 flood. Potential temporal trends in discharge and temperature at FR_FRNTP were assessed using the method described above for water constituents.

A PCA is a multivariate approach which transforms a group of 'n' variables into a smaller new set of uncorrelated variables (the principal components; PCs). The principal components are defined to be linear combinations of the original 'n' variables. A PCA was conducted using Kaplan-Meier mean water chemistry parameters calculated over the entire year to date (January to August), spring (May and June), and summer (July and August). Because a PCA cannot incorporate LRL values, any parameters with >25% of the mean values below the LRL were excluded from the

PCA and Kaplan-Meier mean values at the LRL were replaced with the LRL (Farnham et al. 2002). When there was more than one LRL for a given parameter, or detected values were below the highest LRL, these values were replaced with the highest LRL. The contribution of individual parameters to the first two principal components were quantified by calculating their correlation using a Pearson's correlation coefficient. The PCA and correlation analysis were conducted in R (R Core Team 2019).

2.4 Substrate Quality

2.4.1 Sediment

2.4.1.1 Sample Collection

Sediment quality samples were collected concurrently with benthic invertebrate samples at eight areas, RG_HENUP, RG_FO26, RG_FOUKI, RG_SCOUTDS, RG_FOBKS, RG_FOBCP, RG_FRUPO, and RG_FO22 (Table 2.2). Five replicates were collected at mine-exposed areas, and three replicates were collected at reference areas, consistent with methods outlined in the 2018 to 2020 RAEMP study design (Minnow 2018c). Sediment samples were collected using a stainless-steel spoon and were transferred into glass jars for analysis of polycyclic aromatic hydrocarbons (PAHs), and into polyethylene bags for all other analyses (i.e., metals, moisture content, total organic carbon, and particle size distribution). Samplers took care to remove only the top 1 to 2 cm of sediment and continued to collect sediment until sufficient sample volume was retrieved. Due to shear stress and deposition characteristics, sediment was collected in low flow areas along the riverbank, often behind habitat structures that reduced flow. These areas were generally found within 10 to 100 meters of biological monitoring stations.

For QA/QC purposes, duplicate (split) samples were collected at a frequency of approximately 10% of the total number of samples (based on samples collected for the overall 2018 RAEMP sampling; Minnow 2018c) to permit assessment of field precision (i.e., two sets of field duplicate samples). Following collection, samples were placed in a refrigerator at approximately 4°C until submission to the analytical laboratory.

2.4.1.2 Laboratory Analysis

Samples for chemical analysis were sent to ALS Environmental (ALS; Calgary, AB). The laboratory was instructed to thoroughly homogenize each sediment sample (according to standard laboratory protocols), to confirm the aliquots taken for analysis were representative and comparable.

Sediment samples were analyzed using the following methods: metals by Collision Reaction Cell Inductively Coupled Plasma-Mass Spectrometry (CRC ICP-MS; EPA 200.2/6020A), mercury by

Cold Vapour Atomic Fluorescence Spectroscopy (CVAFS; EPA 200.2/245.7), total organic carbon (TOC) by combustion method (Bartels and Sparks 2009), and PAHs by rotary extraction using hexane/acetone (EPA 3570/8270) followed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Particle size distribution was determined by dry sieving (coarse particles), wet sieving (sand), and the pipette sedimentation method (fine particles). Moisture content was determined gravimetrically by drying the sample at 105°C. QA/QC for sediment samples included the collection of two field duplicate samples at RG_FRUPO and RG_HENUP, and three duplicate samples at RG_FO22, with subsequent assessment of laboratory duplicates, spike recoveries, and certified reference materials (data will be reviewed in detail in the DQR included in the 2017 to 2019 RAEMP report [Minnow 2020a, in preparation]). Based on the results provided for QC samples, the sediment data collected for the FRO LAEMP were determined to be of acceptable quality.

2.4.1.3 Data Analysis

Sediment quality data were tabulated, summarized and compared to BC Working Sediment Quality Guidelines (WSQGs), where available. Data from 2017, 2018 and 2019 were plotted for all parameters for which a WSQG was available and visually assessed for temporal changes.

2.4.2 Calcite

Calcite measurements were collected concurrently with BIC sampling in September 2019. For each of the rocks measured during the 100-pebble count (see Section 2.2.1.3), calcite presence (score = 1) or absence (score = 0) was recorded and the degree of concretion was assessed by determining if the rock was removed with negligible resistance (not concreted; score = 0), noticeable resistance (partially concreted; score = 1), or was immovable (fully concreted; score = 2). If distinct particles were not visible due to heavy calcification, values of 1 (for presence) and 2 (for concretion) were recorded. Similarly, if fines were encountered and calcite presence could not be visually confirmed, values of 0 (for presence) and 0 (for concretion) were recorded. If rocks were visible under fine material, the rock was selected for calcite characterization.

2.4.2.1 Data Analysis

A calcite index (CI) was calculated as follows (Teck 2016):

$CI = CI_p + CI_c$

Where:

$$CI = Calcite\ Index$$

$$CI_p = Calcite\ Presence\ Score = \frac{Number\ of\ particles\ with\ calcite}{Number\ of\ particles\ counted}$$

$$CI_c = Calcite\ Concretion\ Score = \frac{Sum\ of\ particle\ concretion\ scores}{Number\ of\ particles\ counted}$$

Calcite data collected as part of the Regional Calcite Monitoring Program (Lotic 2020) were reported but were not used in analyses as the calcite measurements taken concurrently with biological sampling were deemed more appropriate because they are specific to the areas sampled for benthic invertebrates.

Calcite measurements made among 40 reference areas sampled in 2015 were used to characterize the normal range as part of the previous RAEMP report (Minnow 2018b), and the upper limit (97.5th percentile) was defined as CI = 1.0.

Pebble size metrics (D16 and D84) were calculated as the 16th and 84th percentiles of 100 pebbles collected from the 100-pebble count and used as an indicator of particle size in correlation analyses (Appendix Table F.62).

2.5 Hydrology

2.5.1 Seasonal Drying

2.5.1.1 Field Methods

Monthly surveys (January to June, and August to December 2019) were completed to evaluate the surface flow conditions along the Fording River. The survey covered a 12.8 kilometer (km) long section of the Fording River from Chauncey Creek (FR_FRABCH) upstream to the South Tailings Pond (FR_FR2). This section, referred to as the southern survey section, was selected as it has known sections that dry in the fall and remain dry until spring snowmelt (McPherson and Robinson 2011). An additional section of the Fording River, the northern survey section, was added to the survey in October 2019 and included a 6.1 kilometer (km) section of the Fording River from the Multiplate culvert (FR_MUTLIPLATE) upstream past the confluence with Henretta Creek (FR_UFR1). A second monthly survey was added in December 2019 with plans to continue throughout 2020 during the low flow period to closely monitor changing drying conditions on the Fording River at a biweekly frequency (i.e. twice per month). The second monthly survey focused on the sections prone to drying; the Fording River upstream of Porter Creek (FR_FRRD) to upstream of the proposed AWTF-S discharge (GH_FR3) in the south and from the Multiplate culvert (FR_MULTIPLATE) upstream past the confluence with Henretta Creek (FR_UFR1) in the north. Field crews walked the sections during each survey and delineated extent of any wet/dry areas by marking them with a handheld Global Positioning System (GPS) unit (in Universal Transverse Mercator [UTM] coordinates, using North American Datum [NAD] 83) to facilitate mapping. An iPad with a geo-referenced map was used to record tracks and to facilitate estimates of the length of the dry section. Isolated pools and wildlife observations were also marked. Additional water quality collection and field parameters were added to the Fording River drying surveys in December 2019. Field Crews collected water quality at eight stations in the southern survey section (FR_FRABCH, GH_PC2, FR_FRRD, FR_FRCP1SW, FR_FRCP1, FR_FR4, GH_FR3, and FR_FR2) and six stations in the northern survey section (FR_MULTIPLATE, FR_FRDSCC1, FR_FOUCL, FR_FRUPP, FR_FR1, and FR_UFR1). If an isolated pool was found, water quality and field parameters were collected.

2.5.1.2 Data analysis

The GPS locations and tracks collected in the field were mapped to display the dry sub-sections of the upper Fording River. Results of monthly surveys were used to identify when an area had become dry between visits. These observations where then corroborated by using water temperature and level logger records to estimate the exact dates when sections of the Fording went dry (see Section 2.5.2).

2.5.2 Water Level and Temperature

2.5.2.1 Data Collection

Water level (i.e., stream stage) and temperature were continuously monitored using Onset Hobo U-20 level-loggers at ten hydrometric stations along the Fording River in 2019 (Figure 2.2; Table 2.4). Water level and water temperature measurements were recorded at 15-minute intervals. Data were downloaded routinely from the loggers to avoid data loss. During the winter, the loggers were winterized to prevent freezing and damage.

Malfunction of the remote field shuttle used to download Hobo loggers occurred and data in that period of record (October 2018 – April 2019) was not unusable for four loggers (GH_PC2, FR_FR4, FR_FR4 (barometric logger), FR_FRCP1SW). Field crews noted the erroneous data immediately and as such, were able to trouble shoot the problem and limit the amount of data corrupted. A limited amount of data was able to be used from other Teck programs in the area to extend records somewhat further into the fall, however, winter conditions also limited those records. A different style of logger was installed at each of the flow monitoring stations to address the issue encountered with the shuttle style of download.[4] The Solinst 3250 LevelVent Dataloggers were installed at eight locations in November 2019 to provide a self-venting option as well as to increase accuracy in measurements. This logger is not dependant on one barometric

[4] The Hobo U-20 has been operated successfully in the Elk Valley for more than 10 years without this occurrence and is therefore considered to be very rare.

logger for level correction (should that record be lost) and provides a direct cable download system to immediately view data as it's downloaded. One of the sites located upstream of Chauncey Creek (FR_FRABCH) site will not be continued in 2020 and therefore a new logger was not installed there. The stilling well at GH_FR3 was damaged to the extent that a new logger could not be installed. This station will be re-established in spring 2020 with a Solinst logger.

2.5.2.2 Data Analysis

Water level data were corrected for barometric pressure using Onset Hoboware Pro (version 3.7.16) and a reference water stage relative to the staff gauge. Correcting the data for atmospheric pressure created a continuous record of water stage in meters. Stage, however, is only a locally referenced point relative to the staff gauge at a given site and cannot be used to compare water quantity between sites. Water levels and water temperatures were plotted from October 2017 to November 2019 for each site, with the exception FR_AWTF-S and FR_FRABCH, which were plotted from October 2018 to November 2019. The results were cross-referenced with observations made during monthly surveys. When a site was observed to have become dry between two surveys, the logger record was used to refine the date when the site dried or rewetted.

2.5.3 Flow

2.5.3.1 Data Collection

Each station was visited monthly and discharge measurements were completed where surface water existed and conditions permitted (i.e., wadable, excessive snow and ice cover did not interfere; Figure 2.2). Flow measurements were made consistent with those reported by Minnow and Lotic (2018; 2019b), which followed standards provided in the Manual of British Columbia Hydrometric Standards (RISC 2009). During ice covered visits, a transect was either cleared of snow and ice, or three to five holes were drilled through the ice to get an estimate for discharge. Flow measurements collected through ice or affected by ice build-up on the stream margins, are unlikely to serve as reliable data points to create a stage-discharge relationship. As such, they are collected for informative purposes and not used in stage-discharge development. Flow measurements were not possible where sites were dry or when conditions were unsafe to access the stream cross-section. Two high flow measurements (May and June) were made using a Sontek M9 ADP unit to enable flows collected without wading and to assist in developing the upper end of each rating curve. Benchmark surveys (i.e., surveys to established markers in the field) were also completed to comply with Resources Information Standards Committee (RISC) standards (RISC 2009).

2.5.3.2 Data Analysis

Paired measurements of water stage and stream discharge were used to develop the station-specific stage-discharge relationships required to convert continuous water level records (i.e. stage) to discharge. A power function stage-discharge curve was generated using manual stage and discharge measurements for each site. Stage (m) and discharge (m^3/s) values were manually verified and qualitatively determined outliers (relative to the existing relationship) or measurements with high uncertainty (e.g., flows conducted under ice conditions) were removed from further analyses. All stage measurements below 0.001 m were treated as 'dry' and were excluded. A discharge time series (i.e., hydrograph) was plotted for each site and qualitatively assessed. Lotic retained MacDonald Hydrology Consultants senior review and quality grading of the hydrological data. Grades were assigned following British Columbia Ministry of Environment Hydrological RISC Standards (RISC 2009).

3 STUDY QUESTION 1

3.1 Overview

To address study question 1 (Are nitrate concentrations increasing, and if so, are they adversely affecting biota?), aqueous nitrate concentrations and biological data were collected in the upper Fording River. An evaluation of biological data collected for the FRO LAEMP is summarized in Section 5 to support study question 6, but results are referenced in Section 3.2 (below) as they relate to study question 1.

3.2 Nitrate Concentrations in the Upper Fording River

Monitoring data collected at the FRO Compliance Point (FR_FRCP1) during winter low flow periods (i.e., November 2018 to March 2019) indicated that surface water flow at this location was predominantly discharge water from Cataract Creek (Golder 2018b, Golder 2019a). Therefore, the location was not representative of the combined and mixed contributions of FRO discharges under all conditions during this period. In August 2019, Cataract Creek flow was re-directed through Swift Ponds to Swift Creek in advance of water treatment, which facilitated better mixing upstream of FR_FRCP1. Aqueous nitrate concentrations in quarter four of 2019 were not elevated to the levels observed in the previous year prior to Cataract Creek re-direction (Appendix Figure C.10).

Nitrate concentrations were modelled in the EVWQP for the GHO Fording River Compliance Point, which is also the Fording River Order Station (GH_FR1). This station is located downstream from additional tributaries to the Fording River including two reference tributaries, Chauncey Creek and Ewin Creek, and mine-exposed tributaries, Greenhills Creek and LCO Dry Creek. Monitored concentrations at GH_FR1 have been consistently lower than model projections under average flows (Golder 2017, Golder 2018b, Golder 2020a), and updated projections for 2017 onward at this location do not suggest a continued increase in nitrate concentrations (Figure 3.1; Golder 2020a).

Nitrate concentrations in 2019 were elevated above the EVWQP Level 1 and 2 benchmarks in one or more samples at most monitoring stations in the Fording River downstream from mining activities. All mine exposed areas, with the exception of FR_FR1, FR_FRABEC1 and FR_FR5, had at least 5% of samples higher than the Level 2 benchmark, and all areas except FR_FR1 had at least 5% of samples higher than the Level 1 benchmark (Appendix Figure C.10; Appendix Table C.1). The highest mean nitrate concentrations were observed at FR_FRRD, but were above Level 2 benchmarks over a greater temporal period at FR_FRCP1 in the first quarter of 2019. As described above (Sections 1.1 and 2.1), the high nitrate concentrations at FR_FRCP1 corresponded with seasonal drying in the Fording River between Swift and Cataract Creeks,

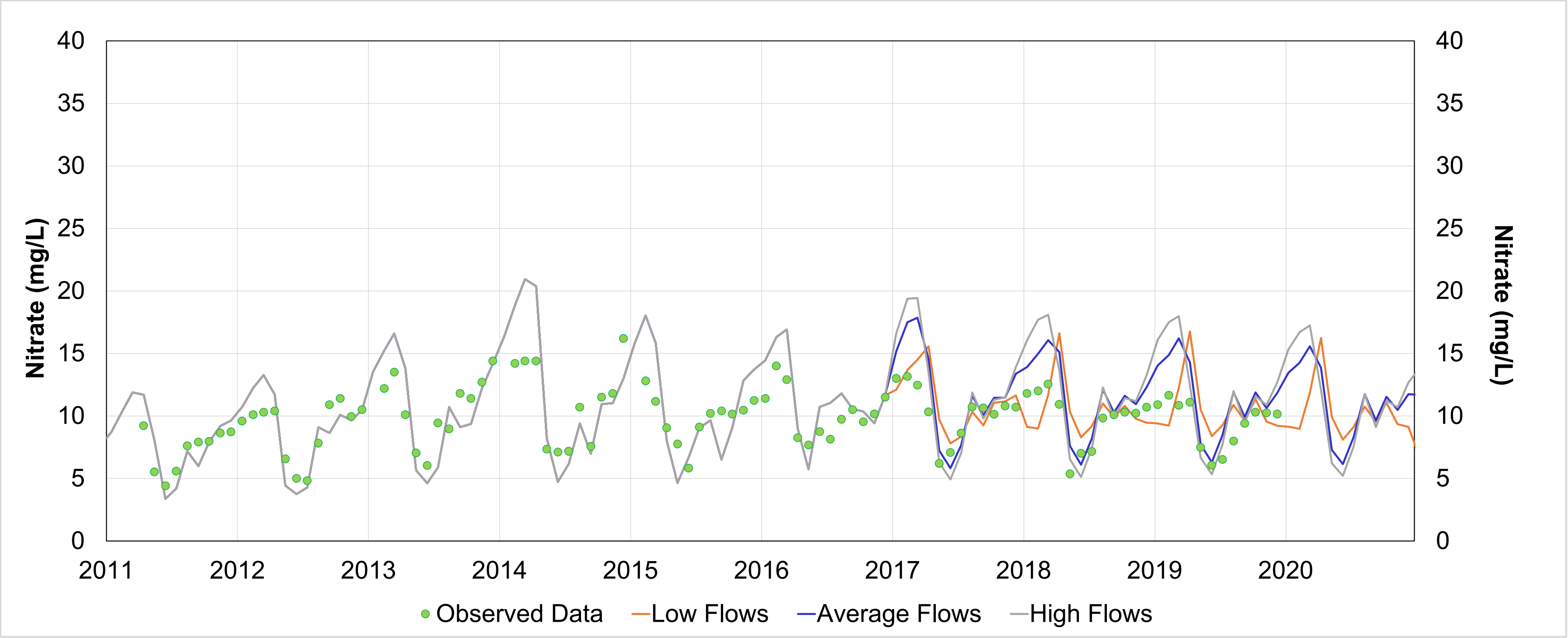


Figure 3.1: **Modelled Nitrate Concentrations at GH_FR1 Generated Using a Range of Historical Monthly Flow Statistics, FRO LAEMP, 2019**

resulting in the majority of flow at the Compliance Point consisting of water from Cataract Creek (Teck 2019a).

To evaluate changes over time, nitrate concentrations from 2012 to 2019 were statistically analyzed for temporal trends (Appendix Table C.2). For some stations (i.e., FR_FRCP1, FR_FRCP1SW, FR_FRRD, and FR_FRABCH), water quality monitoring only occurred over the most recent four to five years (Appendix Figure C.10). Of the mine- exposed areas examined, only FR_FR2 (RG_FOUKI, located upstream of Kilmarnock Creek) had nitrate concentrations that were higher in 2019 compared to the base year of 2012 (Appendix Table C.2), while FR_FR1 (RG_FODHE) had concentrations that were lower. Contrary to projections, no consistent linear increase in nitrate concentrations was observed at the mine-exposed stations. Nitrate concentrations have increased compared to the base year in both reference areas (FR_UFR1 and FR_HC3), but have not statistically changed since 2014 and 2015, respectively, (Appendix Table C.2) and are well below the Level 1 benchmark (Appendix Table C.1). It has been hypothesized that changes in flow following the 2013 flood may have contributed to the elevated nitrate concentrations; however, this has not yet been confirmed. To further understand the water chemistry at FR_UFR1 and FR_HC3, a comparison of paired water samples (seven in total) between the routine water quality stations and the at the associated biological monitoring areas (RG_FO26 and RG_HENUP), located further upstream in both cases, was conducted and discussed with the EMC in November, 2019. Overall, concentrations of key constituents, including nitrate, were similar between the routine monitoring stations and the associated biological monitoring areas. Only total barium was significantly higher at FR_UFR1 compared to RG_FO26, and no constituents were higher at FR_HC3 compared to RG_HENUP. Concentrations of nitrate and other mine-related constituents in the reference areas FR_UFR1 and FR_HC3 will continue to be monitored in future studies.

Spatial and temporal patterns in nitrate concentrations cannot be solely attributed to the observed changes in BIC at mine-exposed areas; however, nitrate may be a contributing factor as concentrations are consistently higher than benchmarks in all areas where effects are observed (Section 5). Nitrate concentrations have not been increasing temporally concurrent with the observed decrease in % Ephemeroptera (Appendix Figure B.6; Appendix Table B.2 and C.2); however, with the exception of RG_FRCP1SW, all areas (RG_MP1, RG_FRUPO, RG_FODPO, and RG_FO22) with % Ephemeroptera below the normal range had the highest mean nitrate concentrations in 2019 (Appendix Table C.1; Section 5.2.1). Correlation analysis demonstrated that nitrate concentrations were negatively correlated with % Ephemeroptera (Section 5.6.2), however, nitrate is highly correlated with other mine-related constituents, thus observed effects on BIC cannot be clearly attributed to any one constituent (Section 5.4.1). Chronic toxicity testing demonstrated a correlation between nitrate concentrations and *C. dubia* reproduction at

FR_FRCP1, and *C. dubia* and *H.azteca* at FR_FRABCH, but the extrapolation from laboratory results to BIC in the upper Fording River (e.g., Ephemeroptera) is challenging. Effects of other variables (e.g., habitat and water quality) on BIC are further discussed in Section 5.6 in relation to study question 6.

4 STUDY QUESTIONS 2 TO 5

4.1 Overview

To address study questions 2 through 5 (Section 1.2), baseline data are being collected prior to the commissioning of the FRO AWTF-S. The study questions will be addressed in detail after the FRO AWTF-S is commissioned in Q1 2021.

4.2 Study Question 2

Study question 2 is: "Is active water treatment affecting biological productivity downstream in the Fording River?"

Concentrations of total phosphorus and ortho-phosphate are routinely monitored at stations along the Fording River as part of Teck's requirements under Permit 107517 (Appendix Figures C.12 and C.13). Data currently being collected represent baseline conditions prior to FRO- S AWTF operation. Results showed consistent total phosphorus and ortho-phosphate concentrations across all years and all mine-exposed sampling areas included in the FRO LAEMP. Benthic invertebrate biomass and density samples were also collected as part of the LAEMP in 2017, 2018, and 2019 to provide the first of three years of pre-operational baseline biological productivity data (Figure 4.1; Table 4.1 and 4.2). There were few consistent, significant changes in benthic invertebrate density and biomass among years. Density values were not significantly different among study years at RG_FOUKI, RG_FOBSC, and FOBCP, while biomass values were not significantly different among years at RG_FOUKI, RG_FOBSC, and RG_FO22. At RG_FOBKS, biomass was lower in 2019 compared to 2017 and 2018, and density was lower in 2019 compared to 2018. Biomass was also lower at RG_FRUPO in both 2018 and 2019 compared to 2017, and density was reduced at both RG_FRUPO and RG_FO22 in 2019 compared to 2017. Only density at the reference areas was significantly lower in 2018 compared to 2017. It is currently anticipated that an approach similar to that being used in the Line Creek LAEMP (e.g., Minnow 2020b) will be used in the FRO LAEMP to evaluate potential changes in productivity over time [e.g., before-after control-impact (BACI)]. The 2019 CABIN scores for periphyton indicated that at both reference areas the rocks were not slippery or had any obvious colour. Rocks at RG_FOUNGD were noticeably slippery and had thick patches of green and brown algae. All other locations in the study area had slightly slippery rocks and a yellow-brown to light green colour (Appendix Figure F.47).

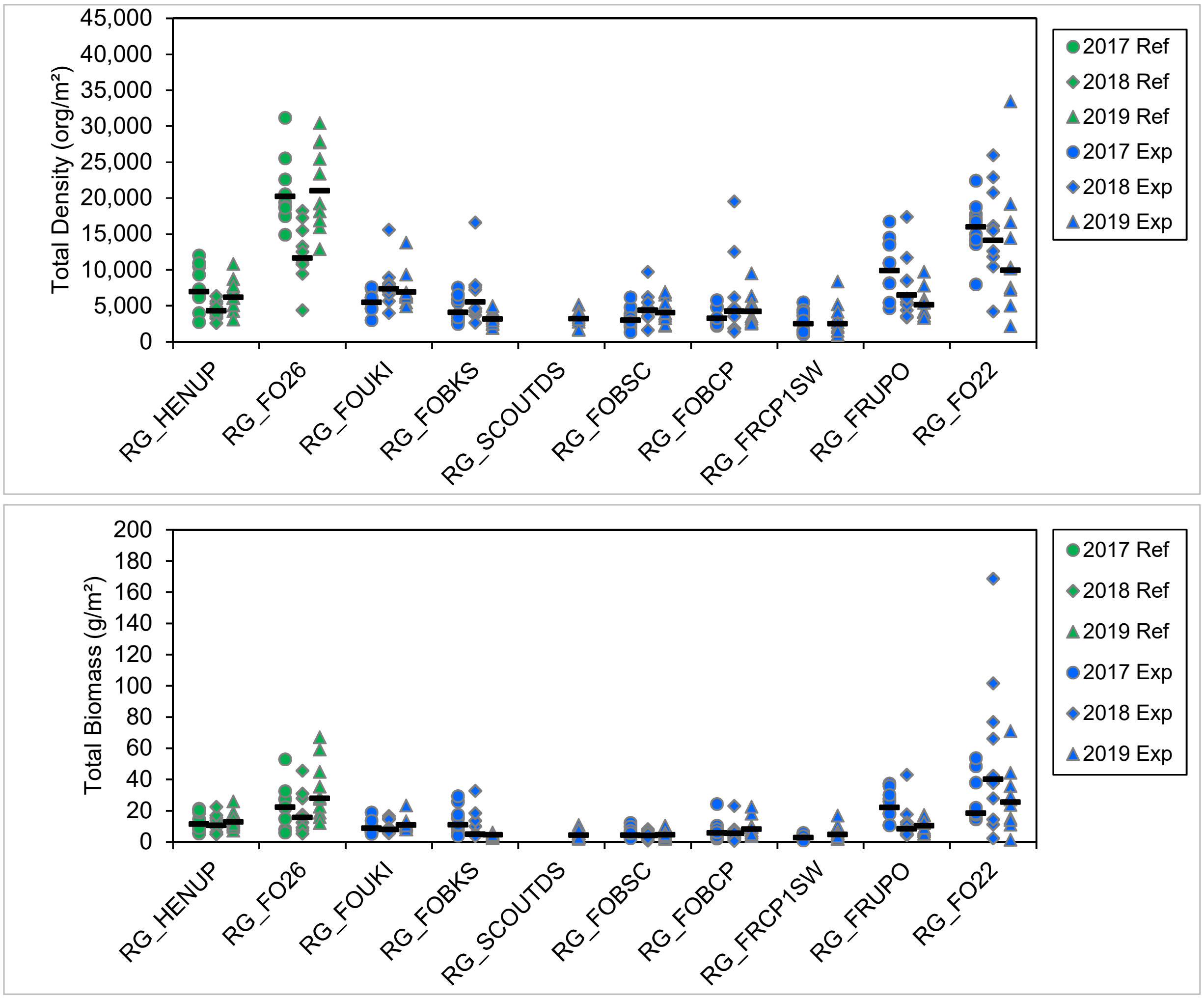


Figure 4.1: Total Benthic Invertebrate Density and Biomass (Hess Sampling) by Area, FRO LAEMP, 2017 to 2019

Note: Black lines denote the measure of central tendancy calculated in the statistical model.

Table 4.1: Temporal Changes in Benthic Invertebrate Density (Hess Sampling) by Area, FRO LAEMP, September 2017 to 2019

Endpoint	ANOVA Model			
	Transformation	Area	Year	Area × Year
Density (org/m^2)	Log10	<0.001	0.542	<0.001
	Post-hoc Contrasts and Magnitude of Difference (MOD [a])			
	Area	2018 vs 2017	2019 vs 2017	2019 vs 2018
	RG_HENUP	-38	-11	43
	RG_FO26	-42	3.8	81
	RG_FOUKI	34	26	-5.8
	RG_FOBKS	35	-23	-43
	RG_SCOUTDS[b]	-	-	-
	RG_FOBSC	46	34	-8.2
	RG_FOBCP	32	30	-1.8
	RG_FRCP1SW	-	0.57	-
	RG_FRUPO	-34	-48	-21
	RG_FO22	-12	-38	-30

(grey) Relevant P-value < 0.05.
(blue) Significant and Negative MOD (temporal drop in density).
(green) Significant and Positive MOD (temporal increase in density).

Note: "-" indicates insufficient data for analysis.

[a] MOD calculated as the geometric mean of the later year minus the geometric mean of the earlier year divided by the geometric mean of the earlier year and mutliplied by 100.

[b] RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.

Table 4.2: Temporal Changes in Benthic Invertebrate Biomass (Hess Sampling) by Area, FRO LAEMP, September 2017 to 2019

Endpoint	ANOVA Model			
	Transformation	Area	Year	Area × Year
Biomass (g/m²)	Rank	<0.001	0.061	0.001
	Post-hoc Contrasts and Magnitude of Difference (MOD [a])			
	Area	2018 vs 2017	2019 vs 2017	2019 vs 2018
	RG_HENUP	-8.0	11	21
	RG_FO26	-30	25	78
	RG_FOUKI	-8.6	23	35.0
	RG_FOBKS	-56	-59	-6.9
	RG_SCOUTDS[b]	-	-	-
	RG_FOBSC	-6.0	1.6	8.1
	RG_FOBCP	-3.7	43	48
	RG_FRCP1SW	-	75	-
	RG_FRUPO	-63	-53	26
	RG_FO22	118	38	-37

Grey: Relevant P-value < 0.1.
Blue: Significant and Negative MOD (temporal drop in biomass).
Green: Significant and Positive MOD (temporal increase in biomass).

Note: "-" indicates insufficient data for analysis.

[a] MOD caclulated as the median of the the later year minus the median of the earlier year divided by the median of the earlier year and mutliplied by 100.

[b] RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.

4.3 Study Question 3

Study question 3 is: "Are tissue selenium concentrations reduced downstream from the AWTF?"

Selenium concentrations in composite-taxa benthic invertebrate samples are being monitored in the FRO LAEMP to support study question 6 (See Section 5.3). Throughout the study period, benthic invertebrate tissue selenium concentrations have remained below the level 1 benchmarks for invertebrates, fish, and birds, and fall within prediction limits based on aqueous selenium concentrations using the selenium bioaccumulation model, for the following stations: RG_HENUP, RG_FO26, RG_UFR1, RG_FOUCL, RG_FOUNGD, RG_FODNGD, RG_MP1, RG_FOUSH, RG_FOUKI, RG_FRUPO, RG_FODPO, and RG_FO22 (Appendix Figure B.45). Results from RG_FODHE in September 2018, RG_FOBKS in February 2019, RG_SCOUTDS in September 2019, RG_FOBSC in September 2019, RG_FOBCP in December 2018, and RG_FRCP1SW in June 2019 were above the level 1, 2, or 3 benchmark. Only an anomalous single replicate at RG_FRCP1SW was outside the prediction limits of the selenium bioaccumulation model (more in Section 5.3). Visual inspection of the tissue selenium concentrations across the study period showed no clear patterns of increase or decrease at any of the study areas. The historical and 2020 data will be used to characterize conditions prior to AWTF operation, and will be used to compare to conditions after the AWTF is operational (i.e., using a BACI approach similar to that being used in the Line Creek LAEMP; Minnow 2020b).

4.4 Study Question 4

Study question 4 is: "Is AWTF operation affecting aquatic biota through thermal effects or concentrations of treatment-related constituents other than nutrients or selenium?"

Water temperature is recorded during routine monitoring at Teck water stations and concurrently with biological monitoring (see Appendix F). Water temperature trends from Teck's continuous monitoring stations, FR_FRNTP and FR_FRABCHf, are discussed in Section 5.4.3 to support study question 6. Temperature and level loggers are currently installed throughout the extent of the Fording River LAEMP study area, including upstream and downstream of the proposed AWTF discharge location to support monitoring of seasonal drying for study question 7 (see Sections 2.5 and Section 6). Water temperature will continue to be monitored as part of the FRO LAEMP to characterize conditions prior to AWTF operation.

4.5 Study Question 5

Study question 5 is: "Is re-direction of water potentially affecting biota in the Fording River?"

Water flow is recorded during routine monitoring at Teck water stations. Water discharge trends from Teck's continuous monitoring stations, FR_FRNTP and FR_FRABCHf, are discussed in

Section 5.4.3 to support study question 6. As described in Section 4.4, temperature and level loggers are currently installed upstream and downstream of FRO-S outfall location and further downstream to support monitoring of seasonal drying as part of study question 7 (See Section 2.5 and Section 6). Water level data will be used to calculate discharge, and can be used to compare water flow conditions before and after AWTF operation.

4.6 Summary

Pre-commissioning baseline data to date have shown no consistent spatial or temporal patterns related to study question 2 or 3. Few changes in benthic invertebrate density and biomass (increase or decrease) were observed over time at the monitoring areas. Benthic invertebrate tissue selenium concentrations remained consistent over time and below the EVWQP Level 1 benchmarks in most samples. In 2019, only seven samples were above the EVWQP benchmarks, the majority of which were downstream of Swift Creek in September (RG_SCOUTDS and RG_FOBSC). Results suggest that the delay in mitigation has not resulted in temporal changes in the baseline condition for tissue selenium and benthic invertebrate biomass and density downstream of future treatment.

Baseline data collection to address study questions 2 to 5 will continue in 2020 prior to active water treatment coming online in Q1 2021. An amendment to the study design will be prepared for June 1st, 2020, that will outline the approach for data collection and analysis for the post-AWTF commissioning timeframe.

5 STUDY QUESTION 6

5.1 Overview

To address study question 6 (What are the factors contributing to the variations in percent Ephemeroptera?), biological, chemical, and physical data were collected in the upper Fording River in February, June, September and December 2019. Benthic invertebrate community data from December 2018 was also considered in this report, since it was not available for incorporation into the 2018 FRO LAEMP report. Previous FRO LAEMP reports identified BIC abundance and richness within the normal range throughout the study area each year, however, a consistent spatial decrease (i.e., in an upstream to downstream direction) in % Ephemeroptera was identified in the upper Fording River in the area downstream of Kilmarnock Creek to upstream of Ewin Creek in September in each year since the first report (Minnow 2017a, Minnow and Lotic 2018, Minnow and Lotic 2019). Percent Ephemeroptera at monitoring areas downstream of RG_FOBCP has remained below the normal range since 2015, with the lowest values recorded in 2017 at most areas. Closer examination of the abundance of Ephemeroptera taxa in 2017 and 2018 identified two Ephemeroptera families as being the primary source of the observed decrease: Heptageniidae and Ephemerellidae. The abundance of a third family present in appreciable numbers, Baetidae, did not appear to change temporally or vary spatially in 2017 and 2018. In addition to % Ephemeroptera, several areas also exhibited a decrease in % EPT below the normal range in 2017 and 2018, which appeared to be directly related to the decrease in % Ephemeroptera, as % Plecoptera and % Trichoptera were highest in the areas where % Ephemeroptera was lowest (Minnow and Lotic 2018, Minnow and Lotic 2019b). Correlation analyses conducted in the 2018 FRO LAEMP report found that % Ephemeroptera and CA1 correlated negatively with nitrate, and total and dissolved selenium, but correlated positively with D84 pebble size. In contrast to decreasing trends observed in BIC metrics, the 2018 FRO LAEMP report demonstrated that water chemistry, including nitrate concentrations, remained consistent over time, except for FR_FR2 where concentrations were higher than the base year for the past several years. The following sections describe the results and interpretation as they relate to study question 6.

5.2 Benthic Invertebrate Community Structure

5.2.1 Spatial Variation in September 2019

Benthic invertebrate community metrics calculated based on September 2019 data were plotted spatially and compared to regional normal ranges (Figures 5.1 to 5.7). Total benthic invertebrate abundance was within or above the normal range at all FRO LAEMP areas in 2019, including areas with low % Ephemeroptera (i.e., RG_MP1, and RG_FRCP1SW downstream to

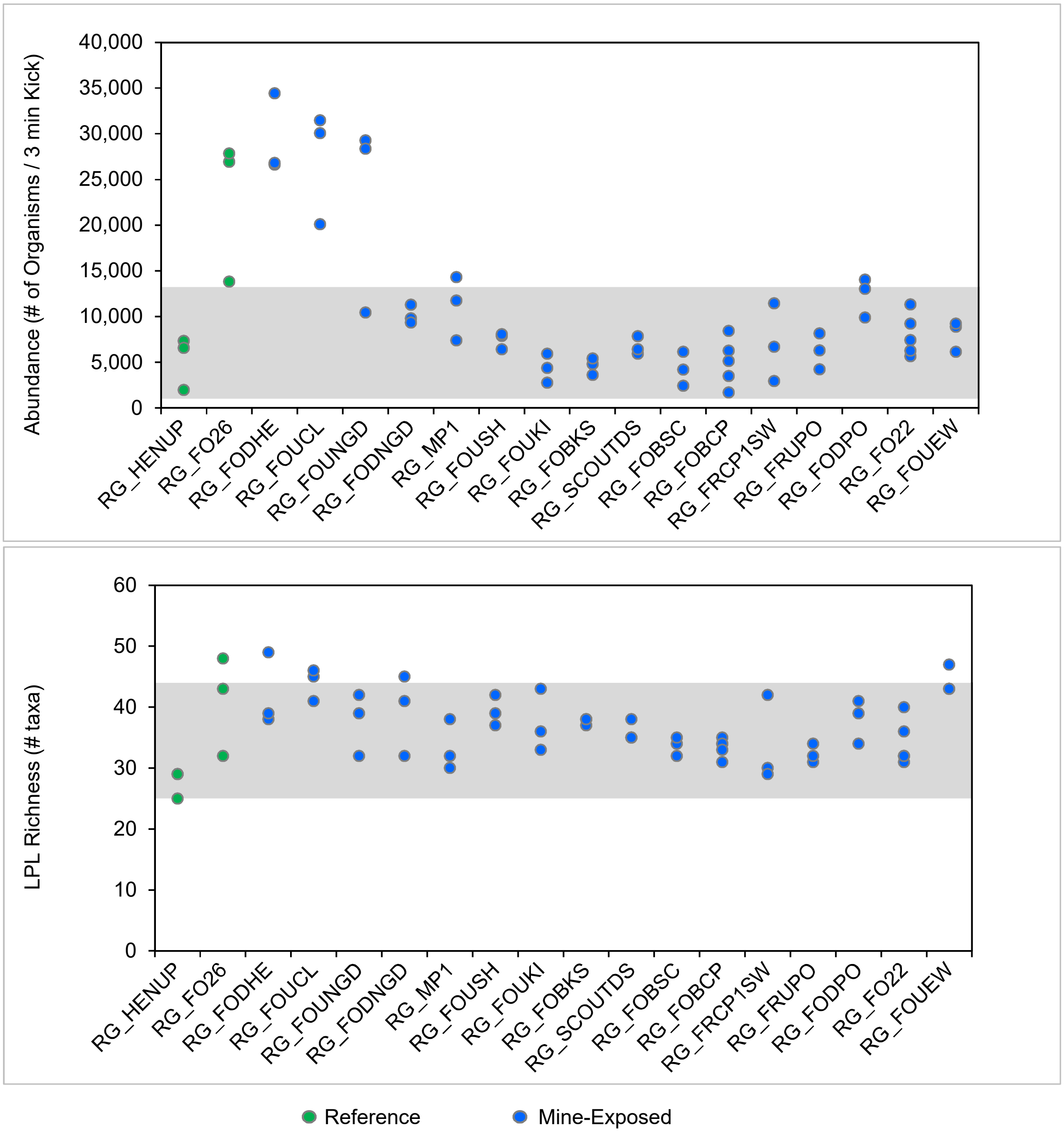


Figure 5.1: Benthic Invertebrate Community Abundance and LPL Richness, FRO LAEMP, September 2019

Note: Grey shading represent the upper and lower limits of the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

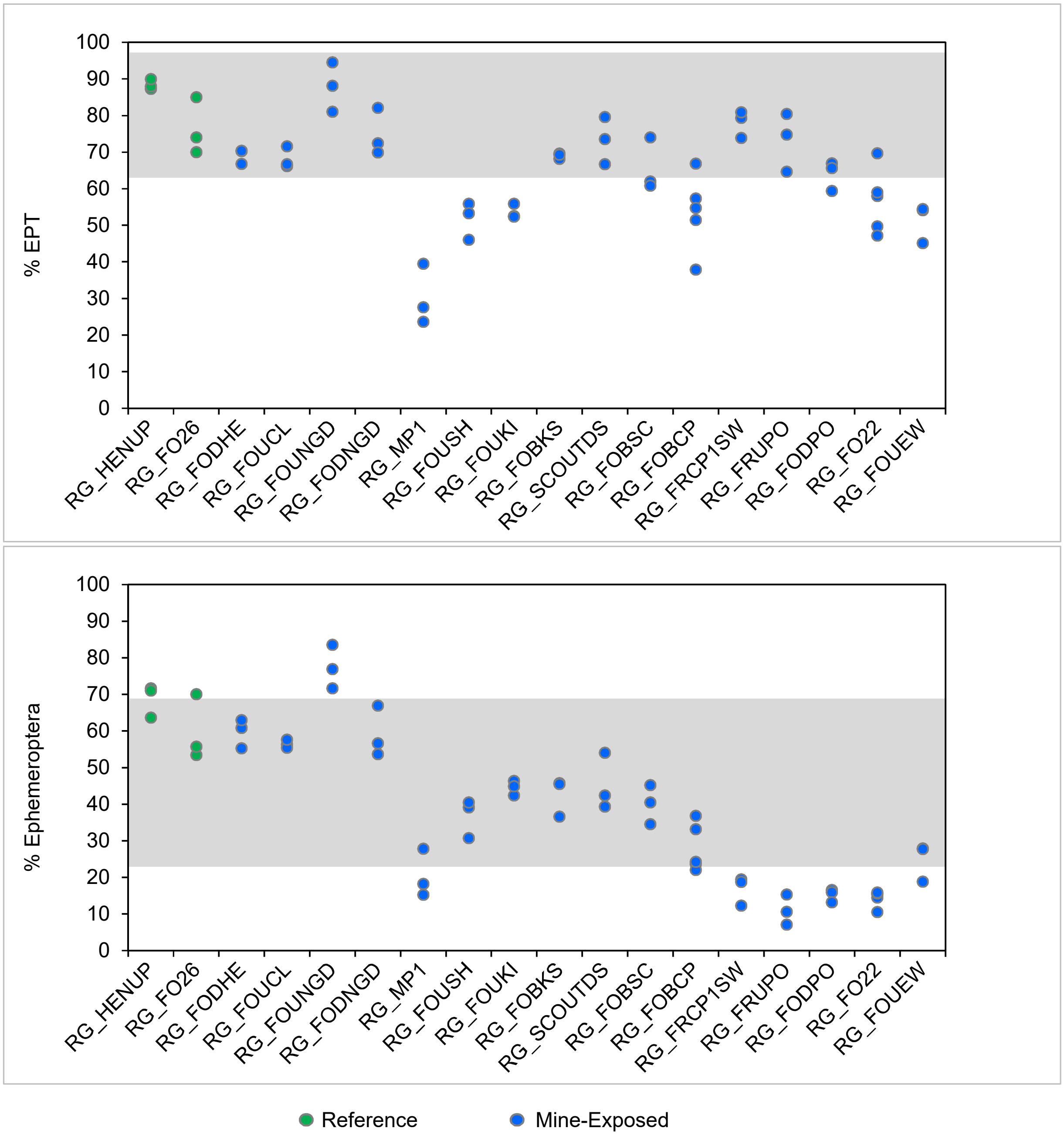


Figure 5.2: Benthic Invertebrate Community % EPT and % Ephemeroptera, FRO LAEMP, September 2019

Note: Grey shading represent the upper and lower limits of the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

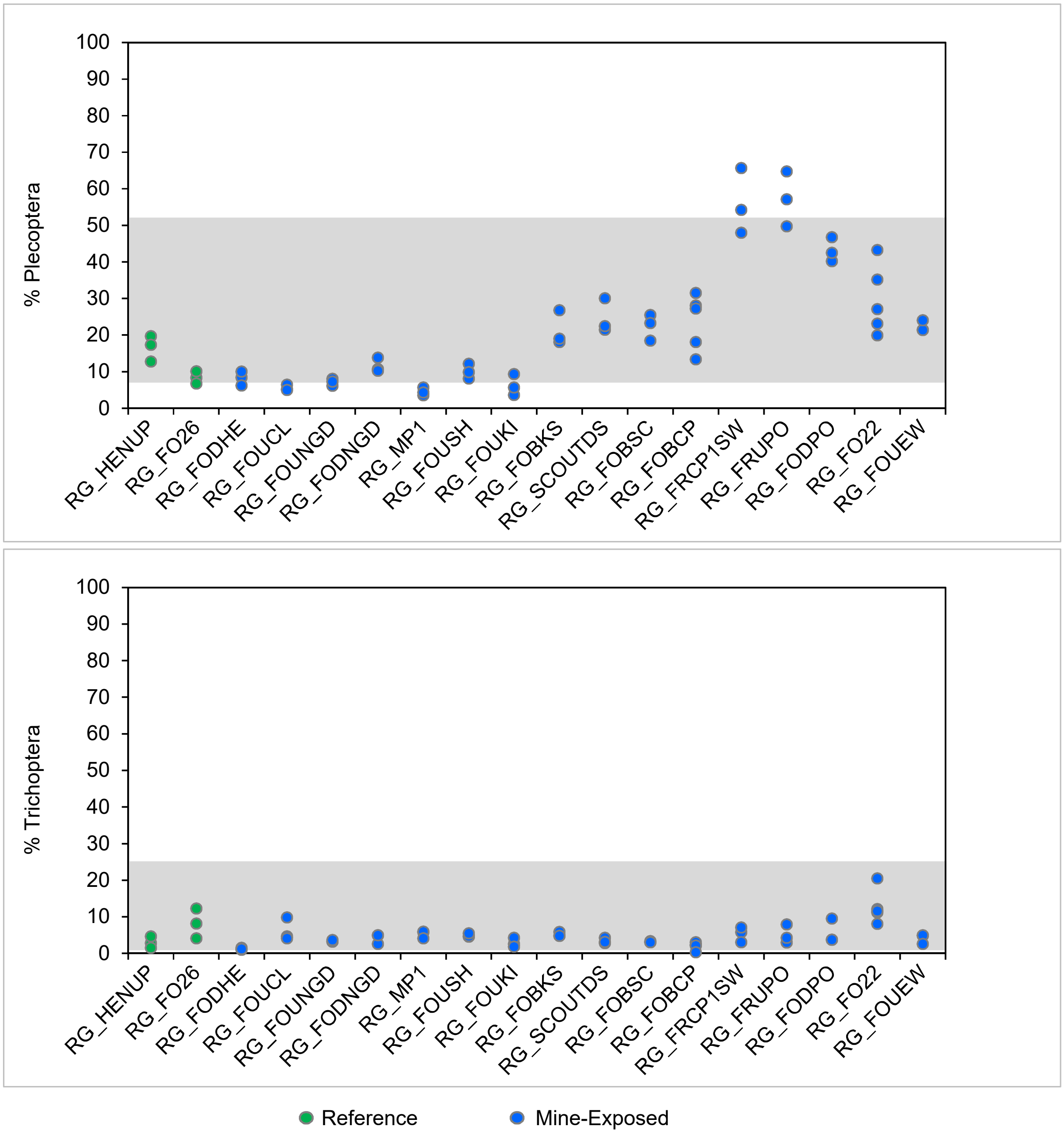


Figure 5.3: Benthic Invertebrate Community % Plecoptera and % Trichoptera, FRO LAEMP, September 2019

Note: Grey shading represent the upper and lower limits of the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

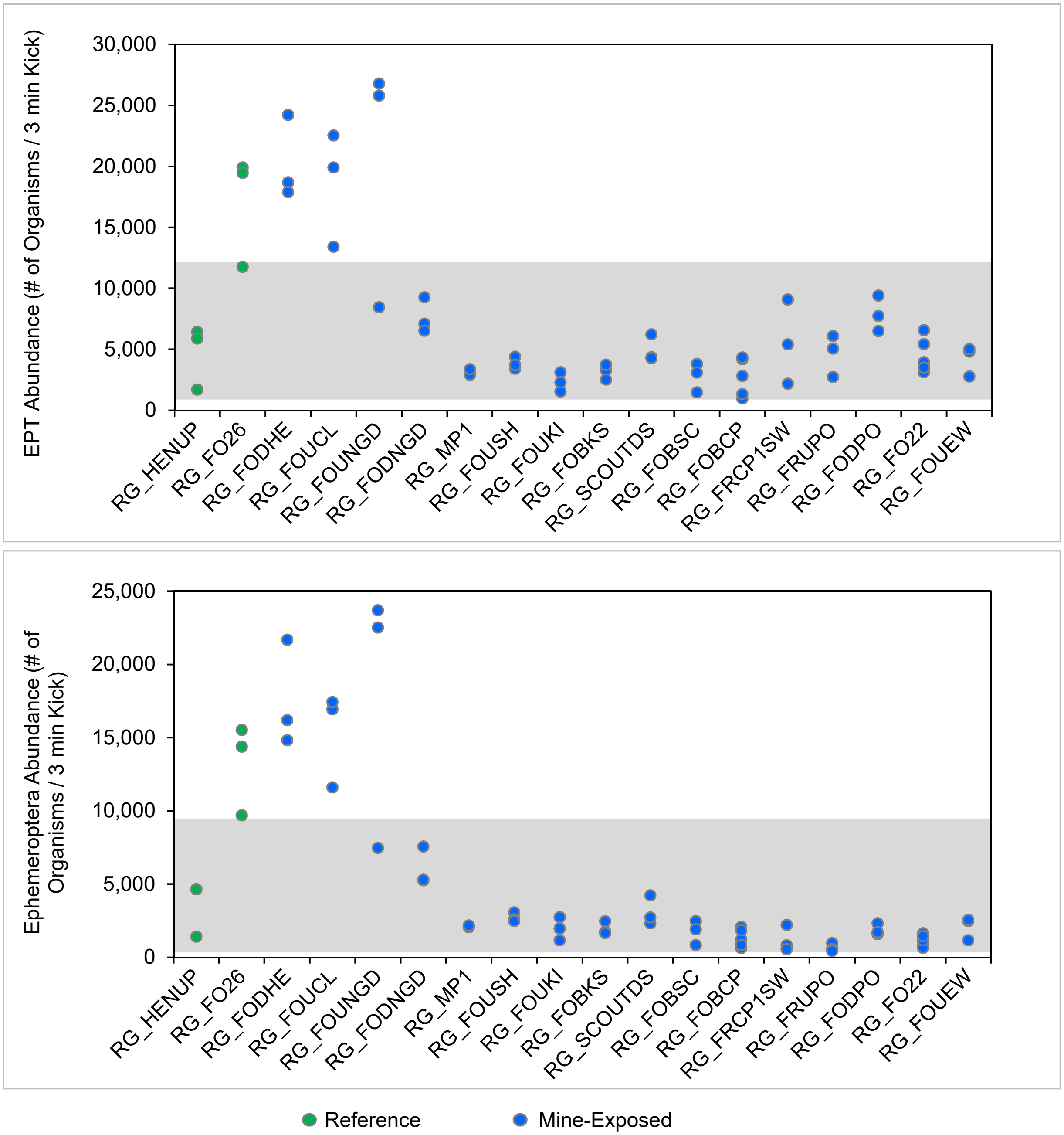


Figure 5.4: Benthic Invertebrate Community EPT Abundance and Ephemeroptera Abundance, FRO LAEMP, September 2019

Note: Grey shading represent the upper and lower limits of the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

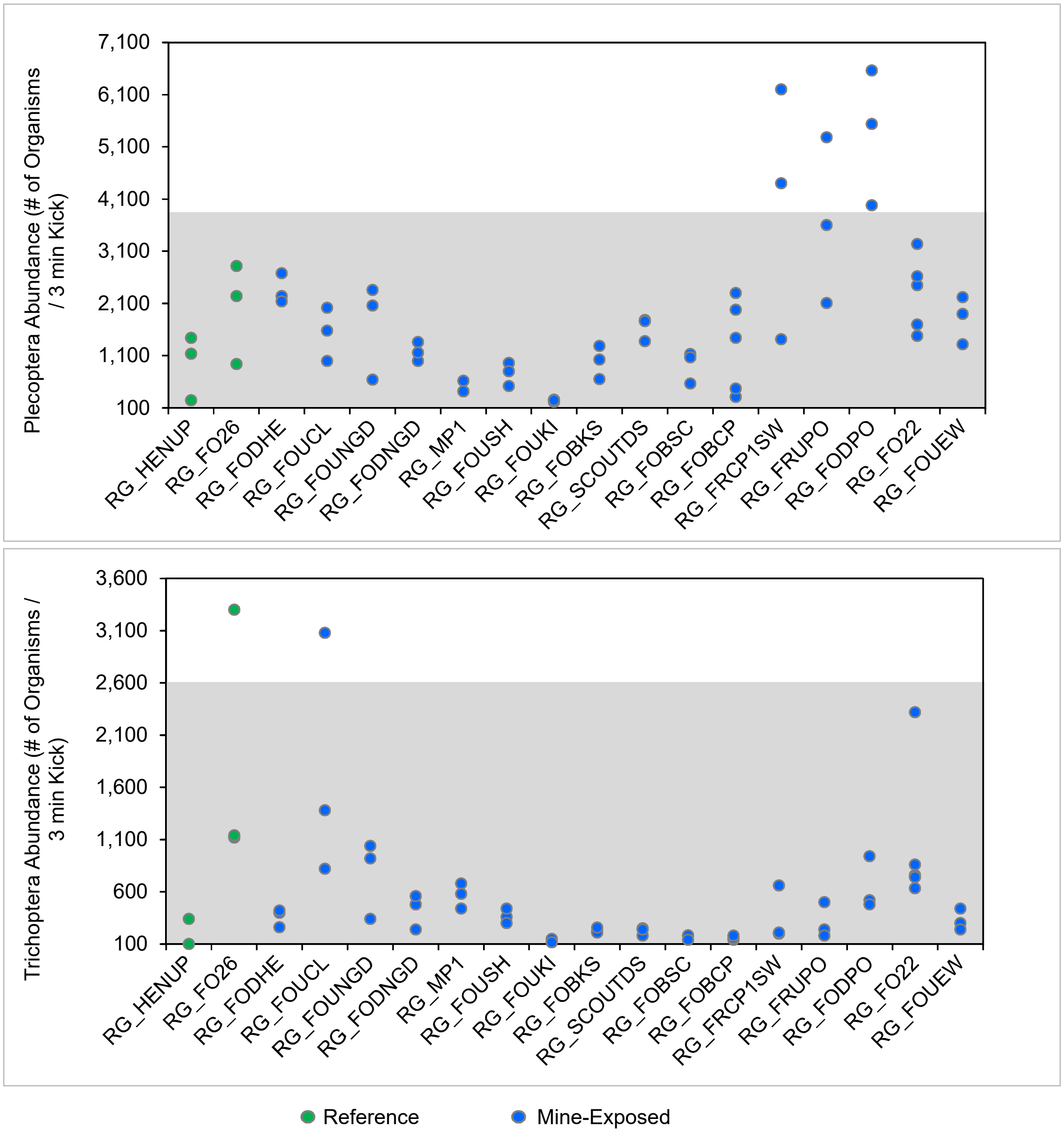


Figure 5.5: Benthic Invertebrate Plecoptera Abundance and Trichoptera Abundance, FRO LAEMP, September 2019

Note: Grey shading represent the upper and lower limits of the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

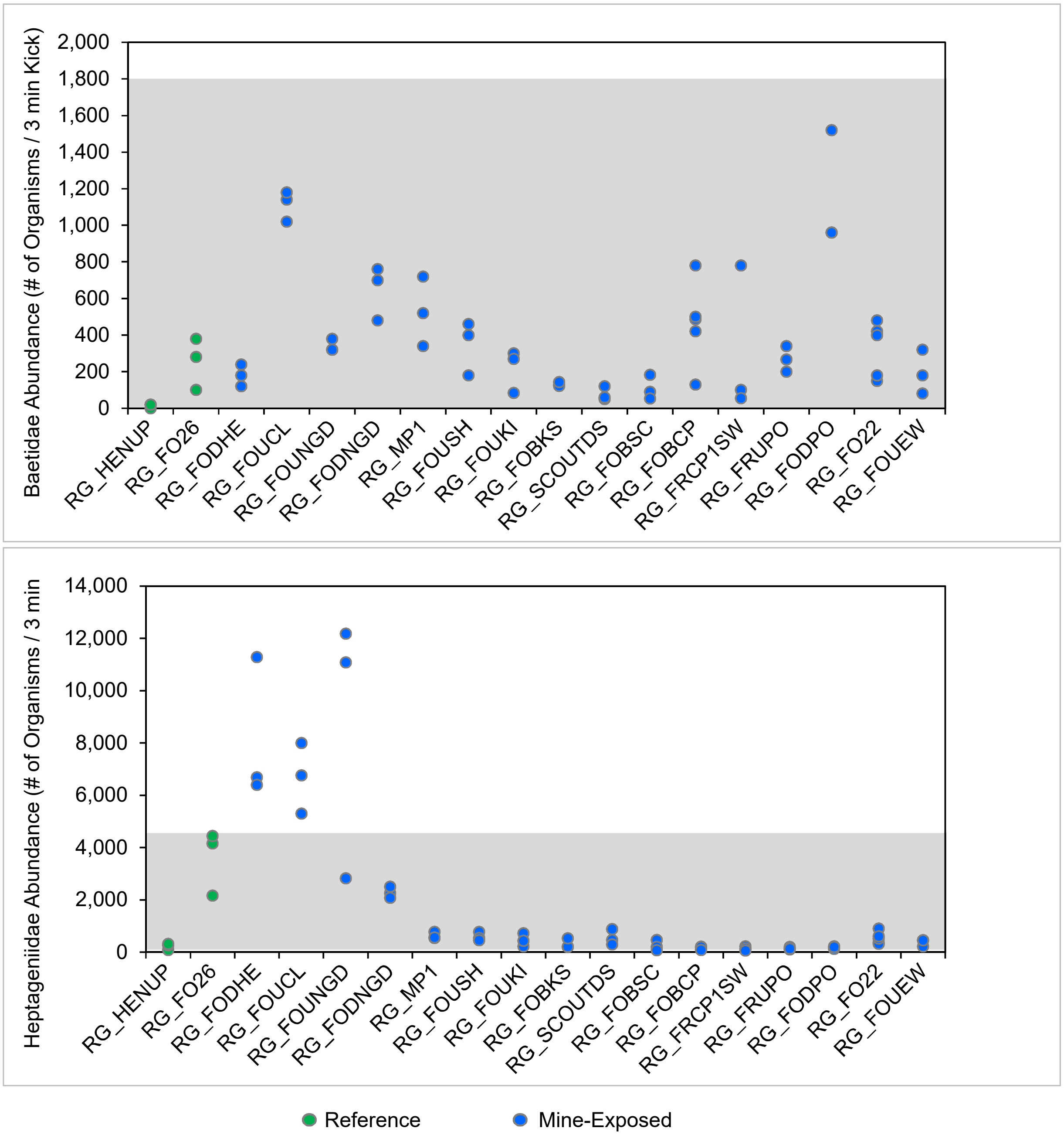


Figure 5.6: Benthic Invertebrate Baetidae Abundance and Heptegeniidae Abundance, FRO LAEMP, September 2019

Note: Grey shading represent the upper and lower limits of the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

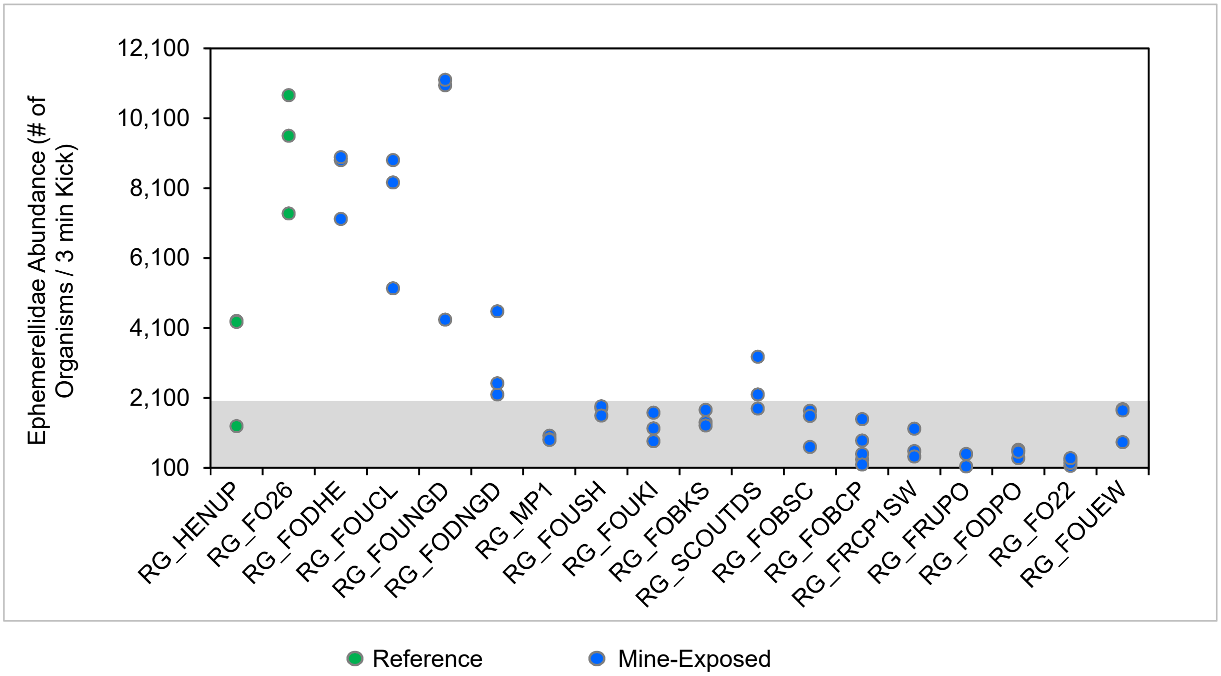


Figure 5.7: Benthic Invertebrate Ephemerellidae Abundance, FRO LAEMP, September 2019

Note: Grey shading represent the upper and lower limits of the normal range defined as the 2.5th and 97.5th percentiles of the 2012 and 2015 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

RG_FOUEW; Figures 5.1 and 5.2). Total abundance above normal range was observed at RG_FO26 (reference area), and the three most upstream mine-exposed areas (RG_FODHE, RG_FOUCL and RG_FOUNGD). LPL richness was within the normal range at all FRO LAEMP areas in 2019 (Figure 5.1).

Consistent with the previous FRO LAEMP reports (Minnow 2017a, Minnow and Lotic 2018, Minnow and Lotic 2019b), BIC data collected in September 2019 exhibited a distinct decreasing spatial pattern from upstream to downstream in both % Ephemeroptera and total Ephemeroptera abundance (Figures 5.2 and 5.4); however, in contrast to previous years, in 2019 a notable decrease in % Ephemeroptera to below the normal range was observed at RG_MP1, and to a lesser extent RG_FOUSH (Figure 5.2). In addition to RG_MP1, % Ephemeroptera was below the normal range at the five of the most downstream areas in the study area (i.e., RG_FRCP1SW, RG_FRUPO, RG_FODPO, RG_FO22, and to a lesser extent, RG_FOUEW [one of three replicate samples below the normal range; Appendix Table B.24]), although Ephemeroptera abundance remained within the regional normal range.

Both % Plecoptera and total Plecoptera abundance were high at the areas where % Ephemeroptera was low (Figures 5.2, 5.3 and 5.5), with the exception of RG_MP1, where % Plecoptera was also below the normal range (Plecoptera abundance was within the normal range). At two locations, RG_FRCP1SW and RG_FRUPO, % Plecoptera was above the upper limit of the normal range, comprising approximately 60% of the organisms in all replicates (Figures 5.3). Although in previous years the presence of high Plecoptera abundance in areas with low % Ephemeroptera meant that % EPT remained within the normal range in most cases, % EPT was below the normal range in a number of areas (i.e., RG_MP1, RG_FOUSH, RG_FOUKI, RG_FOBCP, RG_FO22 and RG_FOUEW; Figure 5.2) in 2019. EPT abundance was, however, within the normal range at all FRO LAEMP areas (Figure 5.4).

When the total abundance of Ephemeroptera families was examined in 2019, the two families identified as contributing to lower % Ephemeroptera in 2017 and 2018 (i.e., Heptageniidae and Ephemerellidae), followed similar decreasing spatial pattern from upstream to downstream as % Ephemeroptera and Ephemeroptera abundance (Figures 5.6 and 5.7). Baetidae, on the other hand, did not exhibit any obvious spatial pattern (Figure 5.6). Abundances were within their respective normal ranges for each family of Ephemeroptera; however, Heptageniidae was near the lower limit of the normal range from RG_MP1 downstream to RG_FOUEW. It should be noted that normal ranges for Ephemeroptera families are very broad, extending close to zero in all cases (Figures 5.5 and 5.6).

The Autotrophic to Heterotrophic Index was lowest at RG_MP1 and from RG_FOBCP to RG_FODPO (Figure 5.8), suggesting these areas may have more heterotrophic energy food

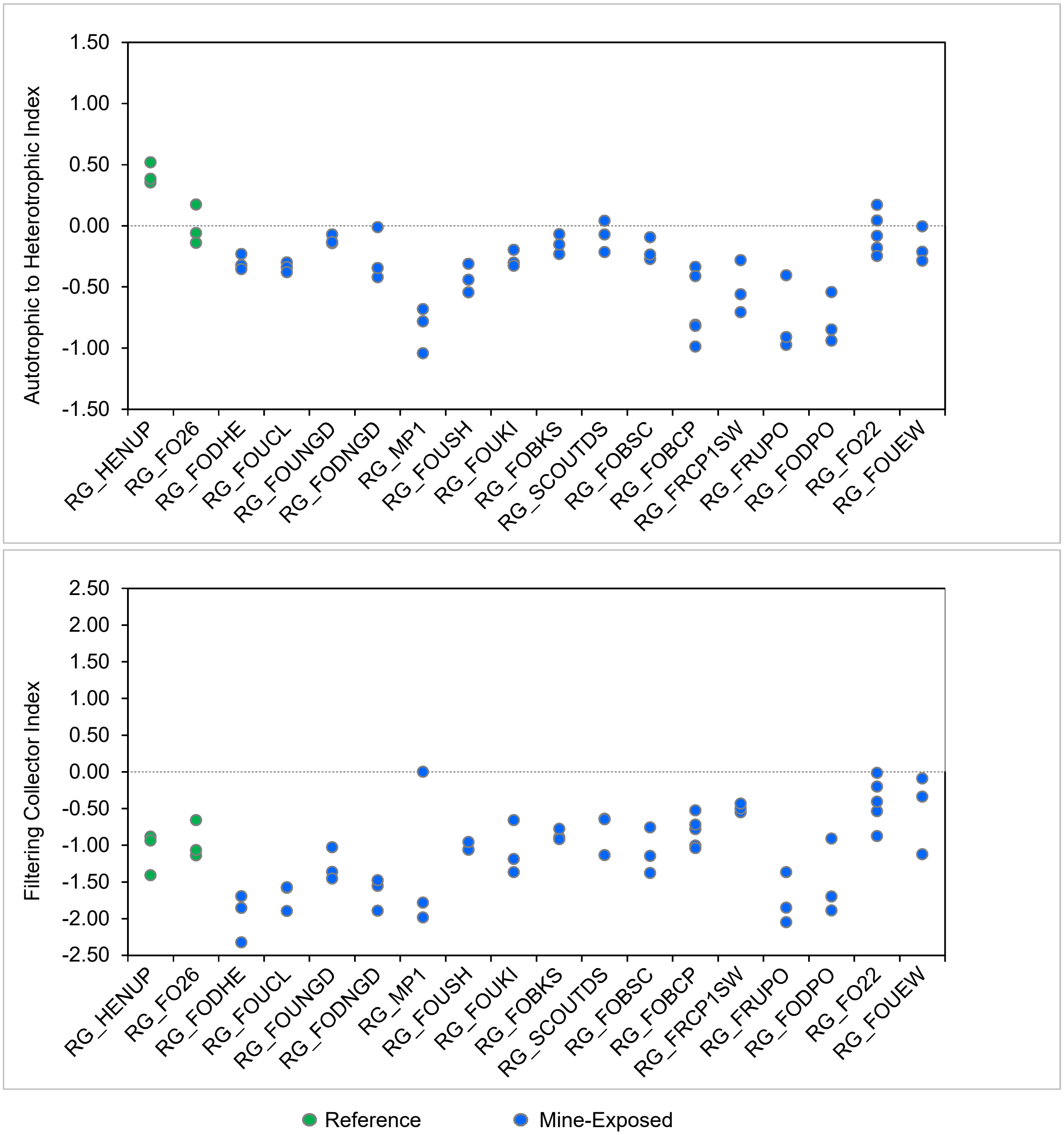


Figure 5.8: Benthic Invertebrate Autotrophic to Heterotrophic Index and Filtering Collector Index, FRO LAEMP, September 2019

Notes: Autotrophic to Heterotrophic Index = log10(scrapers/(shredders+collector-gatherers+filterers)). Filtering Collector Index = log10(filterers/collector-gatherers).

sources compared to those from primary productivity. The Filtering Collector Index was generally lowest in the most upstream mine-exposed areas (RG_FODHE downstream to RG_MP1), and downstream at RG_FRUPO and RG_FODPO (Figure 5.8), suggesting favorable conditions for the collector-gatherer functional group. The highest proportions of predators were observed in the upstream areas (RG_FODHE to RG_FODNGD) as well as at RG_FRCP1SW and RG_FRUPO (Figure 5.9). The Hyporheic to Benthic Index was generally highest between RG_FOUKI and RG_FRCP1SW (Figure 5.9). None of the BIC index endpoints demonstrated patterns that were consistent with patterns of high and low % Ephemeroptera.

To provide additional information on the benthic invertebrate communities in the FRO LAEMP study area, correspondence analysis (CA) was conducted on September family-level relative abundance data for all study years (2012-2019; Table 5.1; Figure 5.10), with CA axis 1 (CA1) and CA axis 2 (CA2) accounting for 27.6% and 12.8% of the variability in the community, respectively. The five most downstream areas (RG_FRCP1SW, RG_FRUPO, RG_FODPO, RG_FO22, and RG_FOUEW) were separated from the rest of the areas along CA1, with RG_FO22 being the most divergent area (Figure 5.11), similar to 2018 results (Minnow and Lotic 2019b). The taxon driving the separation in the negative direction on CA1 was the riffle beetle (Family Elmidae; Order Coleoptera), with significant influences from Glossosomatidae (Trichoptera), Capniidae (Plecoptera), and Tipulidae (Diptera; Tables 5.1; Figure 5.10). Taxa driving CA1 in the positive direction were largely families of Ephemeroptera, such as Ameletidae, Ephemerellidae and Heptageniidae, with significant influences from Hydropsychidae (Trichoptera), Psychodidae (Diptera), and Ceratopogonidae (Diptera). Reference and mine-exposed areas were separated along CA2, which was strongly driven by Diptera families in the negative direction (mine-exposed areas), and Chloroperlidae (Plecoptera) and Ephemeroptera taxa in the positive direction (reference areas; Table 5.2; Figure 5.11). A CA was also conducted using LPL relative abundance data and yielded similar results although the monitoring areas appear in a reversed order on CA1 (Appendix Tables B.1 and B.2; Appendix Figures B.1 and B.2).

5.2.2 Temporal Variation based on September Data

Benthic invertebrate community metrics were plotted relative to previous years and to the regional normal range, by area (Appendix Figures B.3 to B.15). Temporal trends in BIC metrics were also examined statistically to determine whether a change has occurred since the previous year, and/or compared to the historical data set (Appendix Tables B.3 to B.15).

In 2019, all monitoring areas had total benthic invertebrate abundance that was unchanged compared to previous years except for RG_FRUPO, which experienced a significant reduction in 2019 compared to the base year (2017), and RG_FODPO, which was lower in 2019 compared to 2018 (Appendix Figure B.3; Appendix Table B.3). LPL richness increased compared to the base

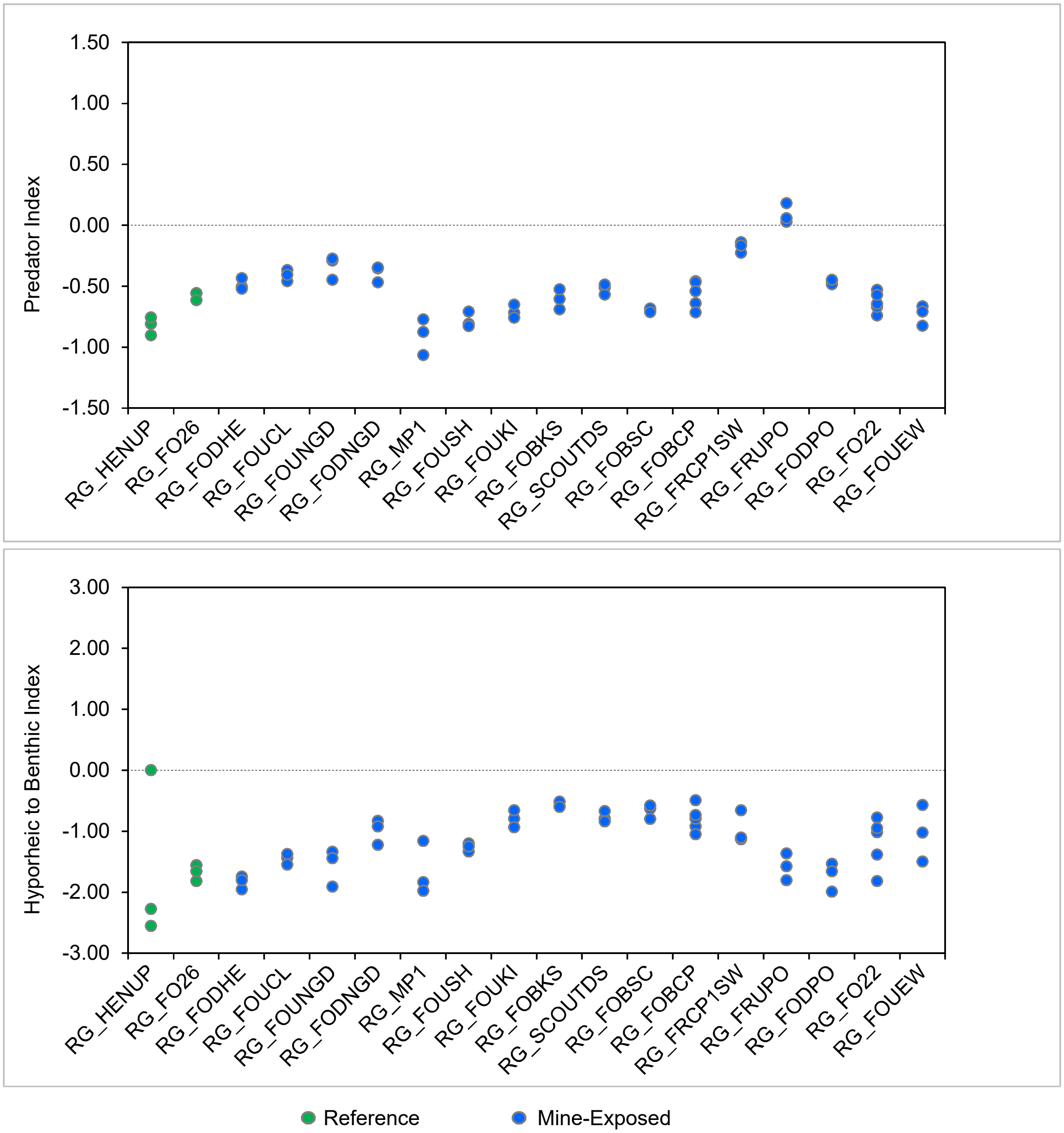


Figure 5.9: Benthic Invertebrate Predator Index and Hyporheic to Benthic Index, FRO LAEMP, September 2019

Notes: Predator Index = log10(predators/(shredders+filterers+collector-gatherers+scraper-grazers)). Hyporheic to Benthic Index = log10(burrowers/(clingers+sprawlers)).

Table 5.1: Taxa Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities, FRO LAEMP, September 2012 to September 2019

Order	Family	CA1 (27.6%)	CA2 (12.8%)
Coleoptera	Elmidae	-3.1	0.22
Diptera	Ceratopogonidae	0.62	-0.78
	Chironomidae	0.055	0.14
	Empididae	-0.46	0.11
	Psychodidae	0.62	-0.66
	Simuliidae	0.27	-1.8
	Tipulidae	-0.70	-0.084
Ephemeroptera	Ameletidae	0.76	0.50
	Baetidae	0.12	-0.37
	Ephemerellidae	0.32	0.44
	Heptageniidae	0.36	0.29
Plecoptera	Capniidae	-0.80	-1.0
	Chloroperlidae	0.19	1.7
	Nemouridae	-0.37	-0.060
	Perlodidae	-0.31	-0.30
	Taeniopterygidae	0.0080	0.35
Trichoptera	Glossosomatidae	-1.1	0.83
	Hydropsychidae	0.65	0.42
	Rhyacophilidae	-0.0000090	-0.11
Trombidiformes	Lebertiidae	-0.33	-0.52
	Sperchontidae	0.48	0.41

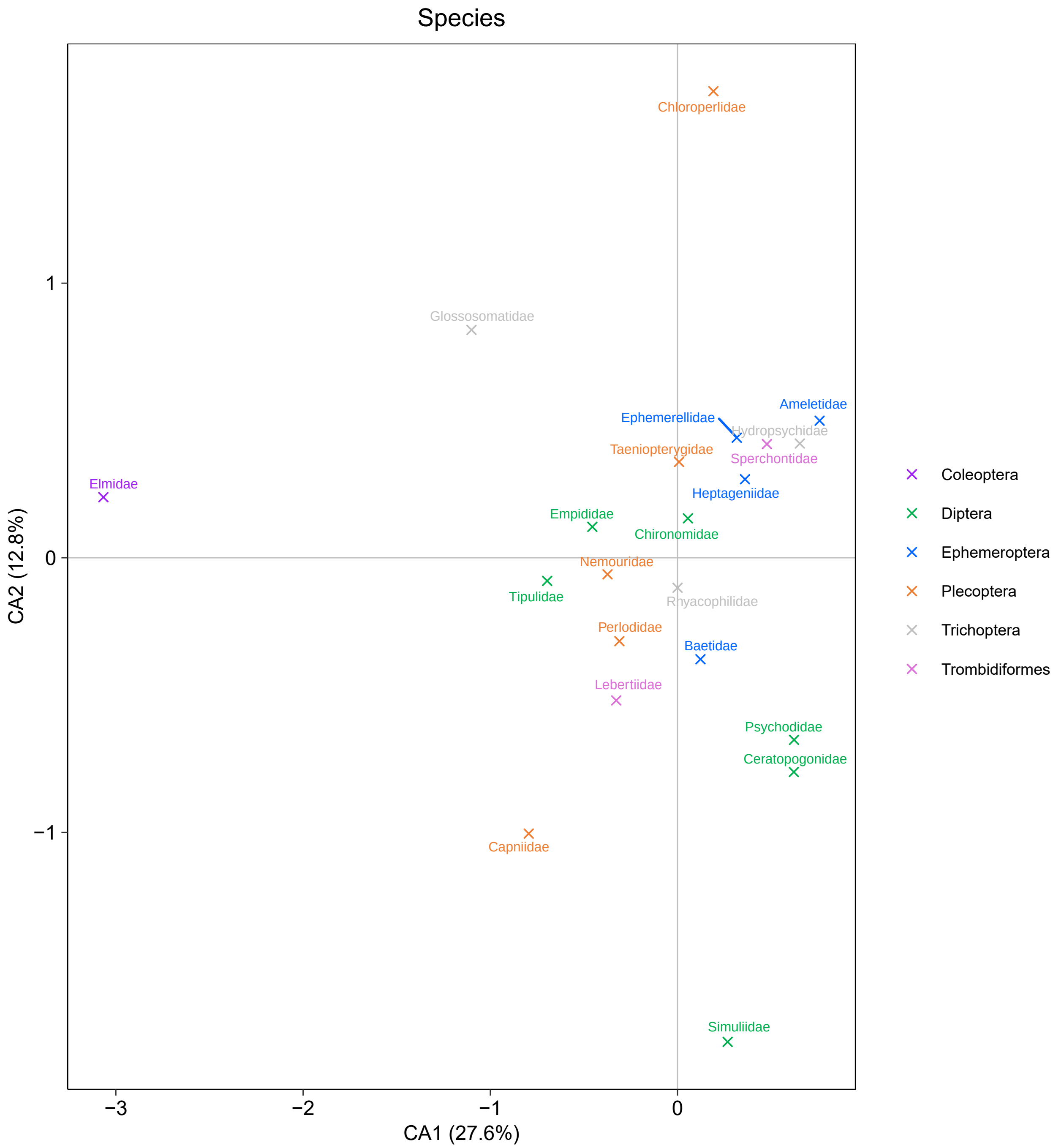


Figure 5.10: Benthic Invertebrate Community Family Correspondence Analysis Results Grouped by Taxa, FRO LAEMP, September 2012 to 2019

Note: Includes BIC data from September 2012 to September 2019.

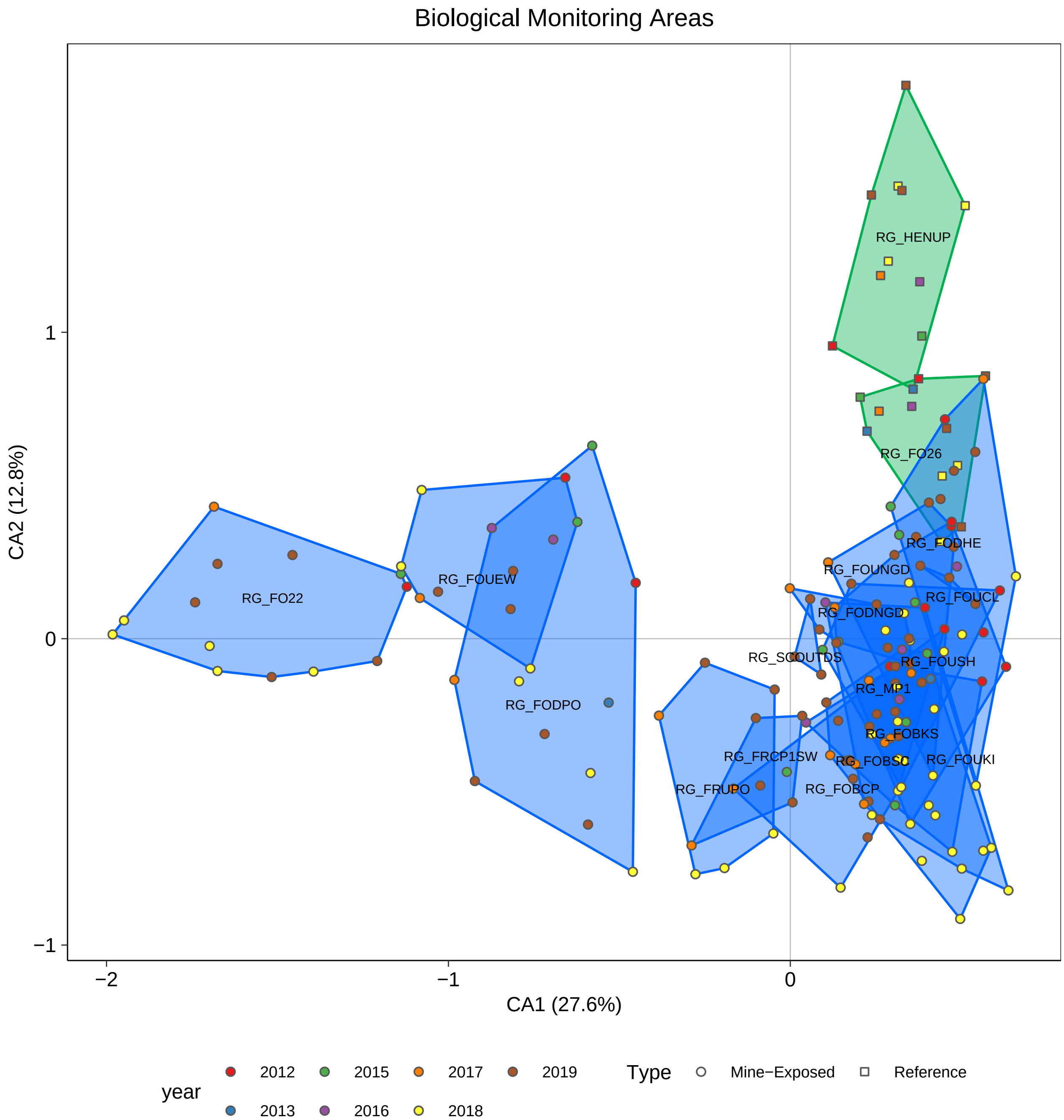


Figure 5.11: Benthic Invertebrate Community Family Correspondence Analysis Results Grouped by Areas, FRO LAEMP, September 2012 to 2019

Note: Blue groups denote mine-exposed areas and green groups denote reference areas.

Table 5.2: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities, FRO LAEMP, September 2012 to September 2019

Year	Status	Area	CA1 (27.6%)	CA2 (12.8%)
2012	Reference	RG_HENUP	0.12	0.96
		RG_FO26	0.38	0.85
	Mine-Exposed	RG_FODHE	0.45	0.72
		RG_FOUNGD	0.47	0.37
		RG_MP1	0.61	0.16
		RG_FOUSH	0.47	0.38
			0.63	-0.092
			0.56	0.020
		RG_FOUKI	0.39	0.10
		RG_FOBKS	0.29	-0.090
		RG_FOBSC	0.56	-0.14
		RG_FOBCP	0.45	0.032
		RG_FODPO	-0.45	0.18
		RG_FO22	-1.1	0.17
		RG_FOUEW	-0.66	0.53
2013	Reference	RG_HENUP	0.36	0.81
		RG_FO26	0.22	0.68
	Mine-Exposed	RG_MP1	0.41	-0.13
		RG_FODPO	-0.53	-0.21
2015	Reference	RG_HENUP	0.38	0.99
		RG_FO26	0.20	0.79
	Mine-Exposed	RG_FODHE	0.29	0.43
		RG_FOUNGD	0.32	0.34
		RG_FODNGD	0.14	-0.011
		RG_MP1	0.095	-0.036
		RG_FOUSH	0.36	0.12
		RG_FOUKI	0.34	-0.27
		RG_FOBKS	0.40	-0.048
		RG_FOBSC	0.31	-0.54
		RG_FOBCP	-0.010	-0.43
		RG_FODPO	-0.58	0.63
		RG_FO22	-1.1	0.21
		RG_FOUEW	-0.62	0.38
2016	Reference	RG_HENUP	0.38	1.2
		RG_FO26	0.36	0.76
	Mine-Exposed	RG_FODHE	0.49	0.24
		RG_FOUKI	0.10	0.12
		RG_FOBKS	0.33	-0.035
		RG_FOBSC	0.046	-0.27
		RG_FOBCP	0.32	-0.20
		RG_FODPO	-0.87	0.36
		RG_FOUEW	-0.69	0.32

Table 5.2: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities, FRO LAEMP, September 2012 to September 2019

Year	Status	Area	CA1 (27.6%)	CA2 (12.8%)
2017	Reference	RG_HENUP	0.26	1.2
		RG_FO26	0.26	0.74
	Mine-Exposed	RG_FODHE	0.56	0.85
		RG_FOUNGD	0.11	0.25
		RG_FODNGD	-0.0016	0.16
		RG_MP1	0.23	-0.14
		RG_FOUSH	0.13	0.10
		RG_FOUKI	0.22	-0.54
			0.35	-0.11
		RG_FOBKS	0.29	-0.32
			0.12	-0.38
			0.28	-0.34
		RG_FOBSC	0.19	-0.41
		RG_FOBCP	-0.17	-0.49
		RG_FRCP1SW	-0.29	-0.68
		RG_FODPO	-0.98	-0.13
		RG_FO22	-1.7	0.43
		RG_FOUEW	-1.1	0.13
		RG_FRUPO	-0.38	-0.25
2018	Reference	RG_HENUP	0.29	1.2
			0.32	1.5
			0.51	1.4
		RG_FO26	0.44	0.32
			0.49	0.57
			0.44	0.53
	Mine-Exposed	RG_FODHE	0.50	0.013
			0.54	-0.48
			0.66	0.20
		RG_FOUNGD	0.42	-0.45
			0.45	-0.042
			0.35	0.18
		RG_FODNGD	0.35	-0.0068
			0.28	0.027
			0.33	0.083
		RG_MP1	0.31	-0.16
			0.32	-0.39
			0.32	-0.48
		RG_FOUSH	0.42	-0.23
			0.31	-0.27
			0.35	-0.60
		RG_FOUKI	0.56	-0.69
			0.64	-0.82
			0.50	-0.75

Table 5.2: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities, FRO LAEMP, September 2012 to September 2019

Year	Status	Area	CA1 (27.6%)	CA2 (12.8%)
2018	Mine-Exposed	RG_FOBKS	0.50	-0.91
			0.59	-0.68
			0.38	-0.73
		RG_FOBSC	0.47	-0.70
			0.40	-0.54
			0.42	-0.58
		RG_FOBCP	0.33	-0.40
			0.24	-0.58
			0.24	-0.31
			0.31	-0.50
			0.15	-0.81
		RG_FRUPO	-0.050	-0.64
			-0.28	-0.77
			-0.19	-0.75
		RG_FODPO	-0.79	-0.14
			-0.58	-0.44
			-0.46	-0.76
		RG_FO22	-1.4	-0.11
			-1.7	-0.11
			-1.7	-0.024
			-1.9	0.060
			-2.0	0.014
		RG_FOUEW	-1.1	0.24
			-1.1	0.49
			-0.76	-0.097
2019[a]	Reference	RG_HENUP	0.34	1.8
			0.24	1.4
			0.33	1.5
		RG_FO26	0.50	0.37
			0.57	0.86
			0.46	0.69
	Mine-Exposed	RG_FODHE	0.48	0.55
			0.44	0.46
			0.54	0.61
		RG_FOUCL	0.46	0.20
			0.38	0.24
			0.54	0.11
		RG_FOUNGD	0.48	0.30
			0.37	0.33
			0.41	0.44

[a] RG_FOUCL was added in September to provide a biological monitoring area to support FRO north water treatment plans, and RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.

Table 5.2: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities, FRO LAEMP, September 2012 to September 2019

Year	Status	Area	CA1 (27.6%)	CA2 (12.8%)
2019[a]	Mine-Exposed	RG_FODNGD	0.25	0.11
			0.085	0.030
			0.35	-0.081
		RG_MP1	0.18	0.18
			0.38	-0.14
			0.28	-0.030
		RG_FOUSH	0.13	-0.014
			0.30	0.27
			0.35	0.00095
		RG_FOUKI	0.31	-0.24
			0.26	-0.59
			0.32	-0.32
		RG_FOBKS	0.23	-0.29
			0.11	-0.21
			0.14	-0.27
		RG_SCOUTDS	0.091	-0.12
			0.012	-0.059
			0.058	0.13
		RG_FOBSC	0.31	-0.091
			0.31	-0.15
			0.25	-0.25
		RG_FOBCP	0.23	-0.53
			0.23	-0.65
			0.16	-0.40
			0.17	-0.40
			0.18	-0.46
		RG_FRCP1SW	0.0065	-0.53
			-0.10	-0.26
			0.035	-0.25
		RG_FRUPO	-0.088	-0.48
			-0.25	-0.079
			-0.046	-0.17
		RG_FODPO	-0.72	-0.31
			-0.92	-0.46
			-0.59	-0.61
		RG_FO22	-1.5	0.27
			-1.5	-0.13
			-1.7	0.24
			-1.7	0.12
			-1.2	-0.073
		RG_FOUEW	-0.82	0.096
			-1.0	0.15
			-0.81	0.22

[a] RG_FOUCL was added in September to provide a biological monitoring area to support FRO north water treatment plans, and RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.

year only at RG_FODHE and RG_FOBKS, and no areas were significantly different in 2019 compared to 2018 (Appendix Figure B.4; Appendix Table B.4). In 2019, % EPT was significantly lower than base year at RG_FODHE, RG_MP1, RG_FOUSH, RG_FOUKI, RG_FOBCP, and RG_FOUEW (Appendix Table B.5), while RG_MP1, RG_FOUSH, RG_FOBCP and RG_FODPO were significantly lower in 2019 compared to 2018 (Appendix Table B.5). Percent Ephemeroptera was significantly lower than the base year at the majority of mine-exposed areas (exceptions were RG_FODHE, RG_FOUNGD, RG_FODNGD, RG_FOBSC, RG_FRCP1SW, and RG_FRUPO), and was lower at RG_MP1 and RG_FOBCP when comparing 2019 to 2018 (Appendix Table B.6). No significant decreases in % Plecoptera and % Trichoptera were observed in any mine-exposed areas compared to the base year (Appendix Tables B.7 and B.8); however, % Plecoptera decreased at RG_MP1, RG_FOUSH, and RG_FODPO in 2019 compared to 2018 (Appendix Table B.7), which was consistent with decreases in % EPT observed at all three areas. While EPT abundance was below base year at only one area (RG_FRUPO; Appendix Table B.9), total Ephemeroptera abundance was significantly lower than the base year at RG_MP1, RG_FOUSH, RG_FOUKI, and RG_FOBCP (Appendix Table B.10). Total Plecoptera and Trichoptera abundance was unchanged over time except for a decrease in Plecoptera abundance at RG_FODPO in 2019 compared to 2018 and an increase in Trichoptera abundance at RG_FO22 in 2019 compared to base year (Appendix Table B.11 and B.12). Of the Ephemeroptera families, only Ephemerellidae and Heptageniidae decreased significantly in abundance compared to base year (Appendix Tables B.13 to B.15). Specifically, Ephemerellidae was significantly lower at RG_FOBCP and RG_FODPO, while Heptageniidae was significantly lower at RG_MP1, RG_FOUSH, RG_FOUKI, RG_FOBCP and RG_FRUPO.

Benthic invertebrate community index endpoints were plotted temporally to determine if changes in BIC represented a shift in the functional communities rather than just the taxa. The Autotrophic to Heterotrophic Index was lower at RG_MP1 in 2019 compared to 2018, lower at RG_FOBSC in 2016 compared to other study years, and generally lower at RG_FODPO for the past three years; however, all other areas did not vary substantially across all years (Appendix Figure B.16), indicating consistent ratios of energy use by benthic invertebrates across the study period at most areas. The Filtering Collector Index was consistent across all study years at all areas in the FRO LAEMP except RG_FRUPO, where it was lower in 2019 compared to 2018 (Appendix Figure B.17). The Predator Index was consistent across the study years at most areas, except for at RG_MP1 where the index was lower in 2018 and 2019 compared to other years, RG_FODPO where the index was lower in 2018 compared to other study years, and RG_FO22 where the index was low in the previous three years compared to historical values (Appendix Figure B.18). The Hyporheic Benthic Index was consistent across all study years and areas, except for RG_MP1 which was lower in 2019 compared to 2018, and RG_FODPO which was higher in 2018 and 2019 compared to the preceding three years (Appendix Figure B.19).

5.2.3 Seasonal Variation

Seasonal changes in BIC were visualized using data collected in June, August, September and December 2018, and February, June, September and December 2019. Only a subset of monitoring areas were sampled in the winter programs due to study design considerations and ice conditions (Minnow 2019). The key BIC metrics described in Section 5.2.1 were plotted over the eight sampling periods (Appendix Figures B.20 to B.36). Total abundance was generally the lowest in June and increasing through September, December and February (Appendix Figure B.20). No consistent seasonal pattern in LPL richness was observed among the sampling areas (Appendix Figure B.21). Percent Ephemeroptera was generally lowest in the winter months when % Plecoptera was highest (Appendix Figures B.23 and B.24), while % EPT had no consistent seasonal pattern across monitoring areas (Appendix Figure B.22). Percent Ephemeroptera and % EPT appeared lower at RG_MP1, RG_FOUSH, and RG_FOUKI in September 2019 compared to June 2019 and September 2018. The Autotrophic to Heterotrophic Index was higher in the spring and summer months compared to winter (Appendix Figure B.33), which is consistent with lower productivity in the winter. The Filtering Collector Index did not show clear and consistent seasonal patterns (Appendix Figure B.34). The Predator Index was lower in winter months compared to summer, with the exception of RG_FOBSC in 2018 and RG_FOUEW in 2019, where the index was similar between winter and summer months (Appendix Figure B.35). The Benthic to Hyporheic Index increased from June to September and remained relatively high through the winter months, with the exception of RG_FRUPO and RG_FODPO, where index values were lower in the winter months (Appendix Figure B.36).

Relative BIC composition was visually compared among the sampling periods, and across areas, to identify seasonal patterns (Figure 5.12). Downstream areas (i.e., FR_FRUPO to RG_FOUEW), with % Ephemeroptera identified as being below the normal range in September, were dominated by Nemouridae in the winter months, but also had a high proportion of Perlodidae compared to upstream areas (Figure 5.12). In June and September, the most downstream areas had high proportions of Perlodidae and low proportions of Ephemeroptera (Baetidae, Heptageniidae, and Ephemerellidae). In all seasons, areas located the furthest upstream (i.e., RG_FODHE to RG_FOBCP, and reference areas) were dominated by Heptageniidae, Ephemerellidae, and Chironomidae. The proportion of Chironomidae at RG_MP1 was similar to other areas in the FRO LAEMP in June; however, the proportion of Chironomidae at RG_MP1 was much higher than all other areas in September. Chironomidae proportions were also higher at RG_FOUSH,

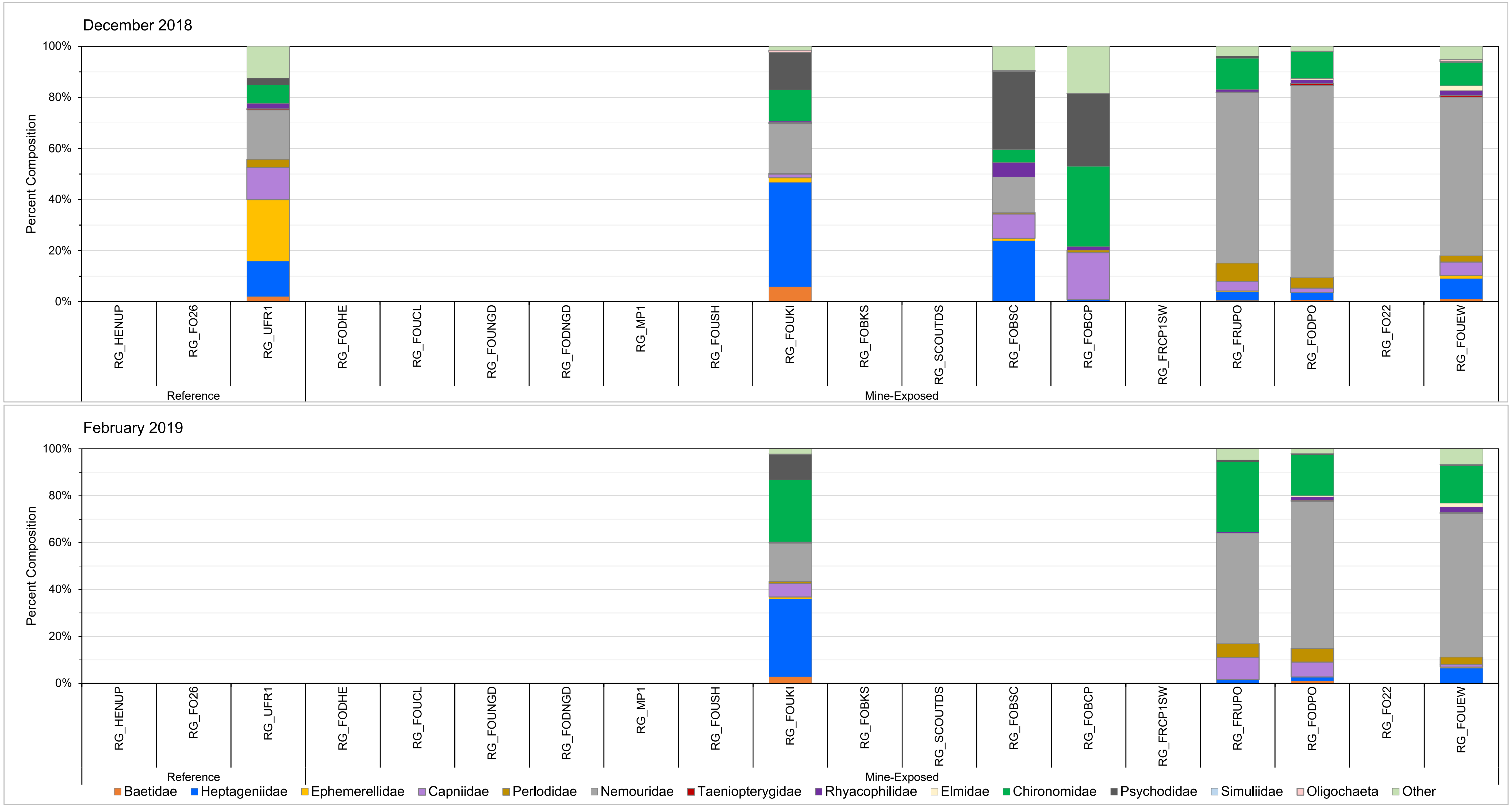


Figure 5.12: Benthic Invertebrate Community Percent Composition, FRO LAEMP, December 2018 to December 2019

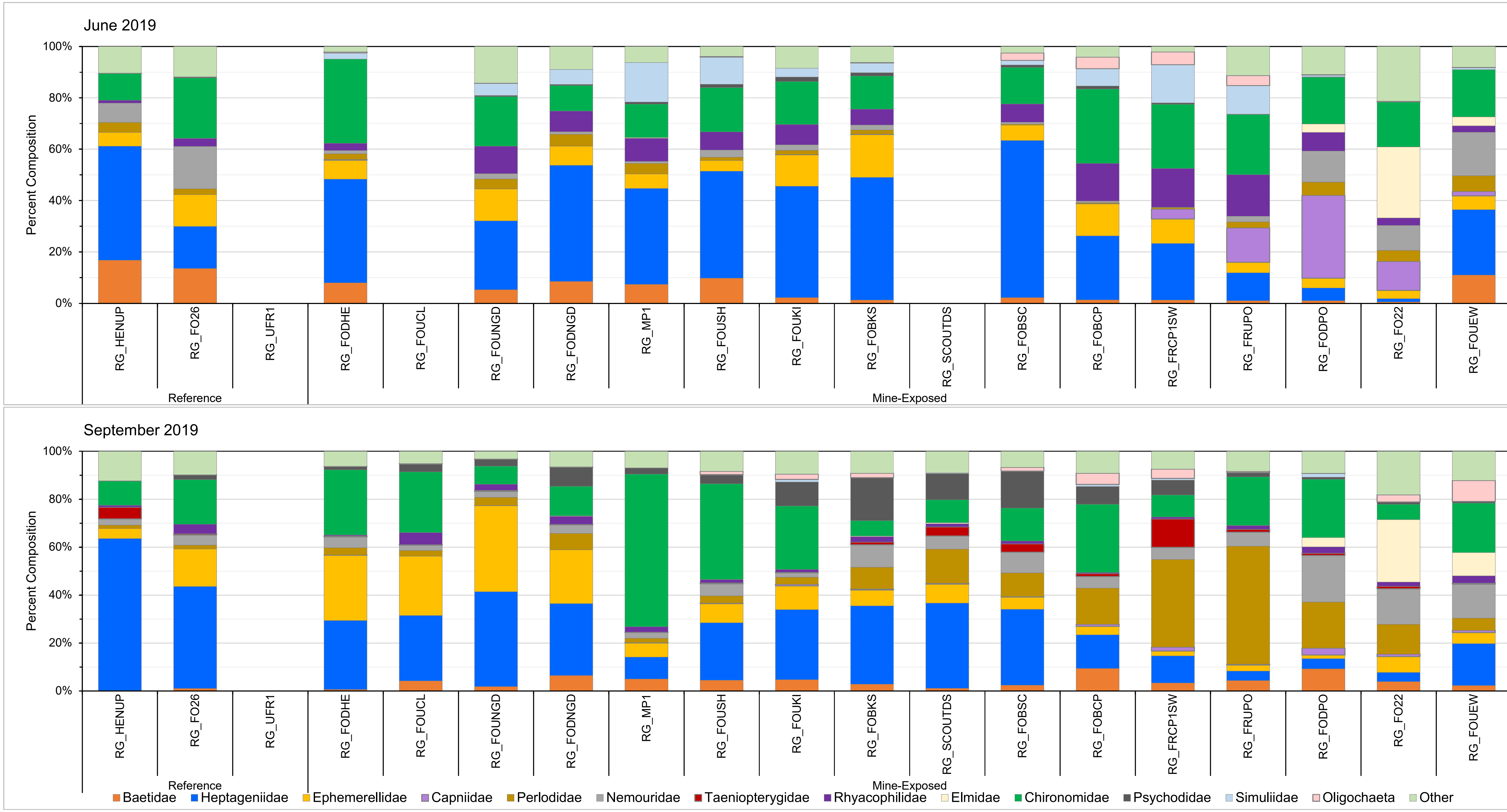


Figure 5.12: Benthic Invertebrate Community Percent Composition, FRO LAEMP, December 2018 to December 2019

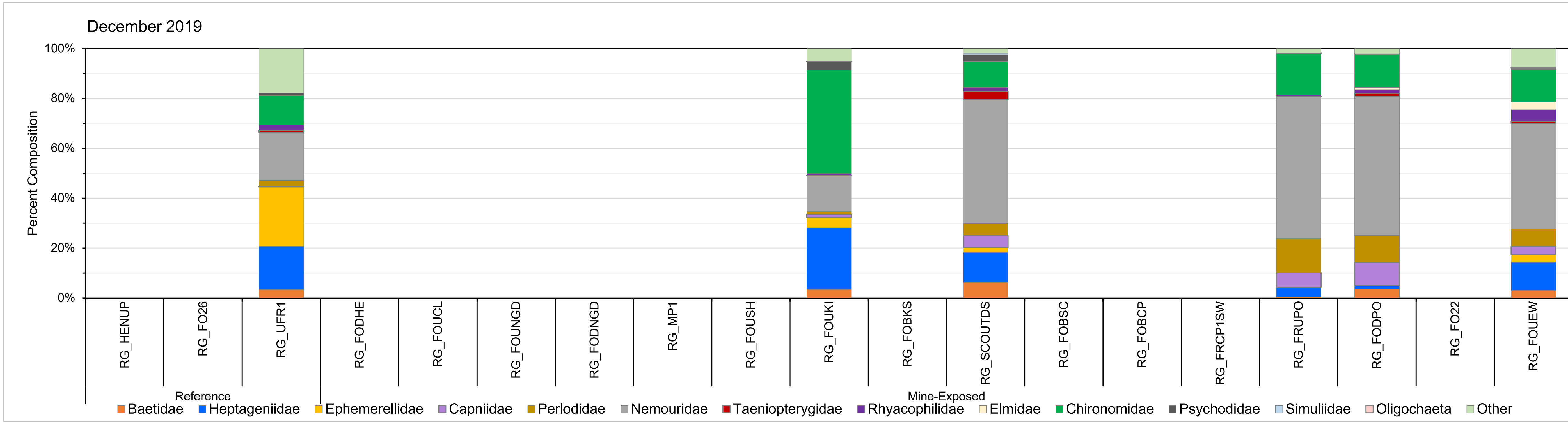


Figure 5.12: Benthic Invertebrate Community Percent Composition, FRO LAEMP, December 2018 to December 2019

and to some extent RG_FOUKI, when compared to other FRO LAEMP areas in 2019. In June and September the riffle beetle, Elmidae, made up a large proportion of the community at RG_FO22 and RG_FOUEW, was present at low proportions at RG_FODPO, and was not present in other upstream areas.

The Autotrophic to Heterotrophic Index, Filtering Collector Index, Predator Index and Hyporheic to Benthic Index were also visually compared to identify seasonal patterns across areas. In winter, the downstream areas had very large proportions of shredders, which was mostly driven by Nemouridae abundance in those months, however, that pattern did not exist in the summer months (Appendix Figure B.37). Compared to all other areas, a high proportion of sprawlers was observed at RG_MP1 in September and at RG_FOUKI in December 2019 (Appendix Figure B.38).

To provide additional information on seasonal patterns of benthic invertebrate communities in the upper Fording River, correspondence analysis (CA) was conducted on seasonal family-level relative abundance data from 2018 and 2019 (Appendix Tables B.16 and B.17; Appendix Figure B.39 to B.41), with CA axis 1 (CA1) and CA axis 2 (CA2) accounting for 26.3% and 15.0% of the variability in the community, respectively. The seasonal CA data demonstrated a clear distinction between the downstream and upstream areas along CA1 (Appendix Figure B.40) and seasons along CA2 (spring and summer in the negative direction, fall and winter in the positive direction; Appendix Figure B.41); however, CA2 did not differentiate clearly between reference and mine-exposed areas (Appendix Figure B.40). Ephemeroptera families strongly influenced CA1 in the positive direction, and Elmidae and Capniidae had strong influences in the negative direction. These results were largely driven by the differences in the most downstream areas (RG_FRUPO, RG_FODPO, RG_FO22, and RG_FOUEW) compared to upstream. A CA was also conducted using LPL relative abundance data and yielded similar results in terms of clear upstream and downstream area separation, but a lack of clear separation between reference and mine-exposed areas (Appendix Tables B.18 and B.19; Appendix Figure B.42 to B.44).

5.3 Tissue Selenium

Benthic invertebrate tissue samples were collected in February, June, September, and December 2019. Selenium concentrations in composite-taxa benthic invertebrate tissue samples were generally below the EVWQP Level 1 benchmarks for fish, benthic invertebrates, and birds, with some exceptions (Table 5.3; Appendix Figure B.45). Specifically, samples above the Level 1 Benchmark for fish included a single sample in February at RG_FOBKS, two samples in September at RG_SCOUTDS, three samples in September at RG_FOBSC, and one anomalously high replicate in June at RG_FRCP1SW. Upon follow-up with the laboratory, the reason for the

Table 5.3: Selenium Concentration in Composite-taxa Benthic Invertebrate Tissue, FRO LAEMP, 2019

Biological Monitoring Area		Composite-taxa Tissue Selenium (µg/g dw)													
		February			June			September					December		
		1	2	3	1	2	3	1	2	3	4	5	1	2	3
Reference	RG_HENUP	-	-	-	4.9	7.3	6.2	5.2	4.6	3.9	-	-	-	-	-
	RG_FO26	-	-	-	3.6	3.4	3.4	3.2	3.1	2.8	-	-	-	-	-
	RG_UFR1[a]	4.9	3.8	5.2	-	-	-	-	-	-	-	-	4.2	4.6	4.6
Mine-exposed	RG_FODHE	x	x	x	6.8	6	3.9	5.1	5.2	7	-	-	4.4	5.2	5.2
	RG_FOUCL[b]	-	-	-	-	-	-	7.2	5.5	5.8	-	-	4.5	4.6	3.4
	RG_FOUNGD	5.6	5.5	5.7	5.1	4.5	5.1	7.5	6.4	6.1	-	-	5.1	4.3	4.4
	RG_FODNGD	7.2	5	8.1	4.1	5.6	4.4	8	4.5	7	-	-	4.9	5.9	5.6
	RG_MP1	5	4.7	8.4	5.2	6	6.1	5.6	7	7.3	-	-	5.1	6.4	5.8
	RG_FOUSH	9.6	6.9	6.6	5.9	6.1	4.7	5.6	5.9	6	-	-	5.8	7.1	5.3
	RG_FOUKI	4.5	4.8	4.7	4.7	4.7	5	6.2	8.8	9.2	-	-	4.1	4.4	4.4
	RG_FOBKS	13	x	x	5	3.8	4	7.5	7.9	9.5	-	-	8.2	7.5	6.2
	RG_SCOUTDS[b]	-	-	-	-	-	-	13.7	13.7	10.2	-	-	6.7	6.8	7.5
	RG_FOBSC[c]	x	x	x	5.3	5.1	5.7	12.5	11.9	12.6	-	-	9.3	5.9	5.6
	RG_FOBCP[c]	9.4	10	8.6	2.8	5.3	4.4	9.1	8.4	6.3	7.6	7.3	x	x	x
	RG_FRCP1SW[d]	x	x	x	48	5.7	6.5	7.7	7.7	7.7	-	-	x	x	x
	RG_FRUPO	5.1	8	6.2	8.1	7.6	5	6.1	8.1	6.8	-	-	4.6	3.9	4.5
	RG_FODPO	3.6	5	8.4	4.7	5	5.7	5.4	7.3	5.6	-	-	4	4	3.7
	RG_FO22	4.9	5.8	5.4	7.5	6.8	10	7.1	7.8	7.3	6.7	6.6	4.4	5.4	4.9
	RG_FOUEW	4.4	6	4.4	5.6	6.4	6.6	7.3	6.9	6	-	-	4.8	4.4	5.5

(blue) Value > EVWQP Level 1 benchmark of 11 mg/kg dw for dietary effects to fish (Teck 2014).

(grey) Value > upper limit of normal range of (7.79 mg/kg dw; Minnow 2018).

Notes: '-' indicates sample that was not taken because it was not a part of the sampling design; 'x' indicates sample that was not taken because of drying and/or ice conditions.

[a] RG_UFR1 was used as a reference location in December and February when there was no access to RG_FO26 or RG_HENUP.

[b] RG_FOUCL was added in September to provide a biological monitoring area to support FRO north water treatment plans, and RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.

[c] RG_FOBSC and RG_FOBCP were dry or frozen in February.

[d] RG_FRCP1SW was dry during February and December sampling periods.

anomaly was not determined as all QA/QC was appropriate, including sample size. Moreover, selenium concentrations, including the reduced forms of selenium, were similar at RG_FRCP1SW compared to other monitoring areas and sampling periods (Section 5.4.2).

Selenium concentrations were within the reference normal range in 134 of 163 samples collected from mine-exposed areas in 2019. The majority of samples above the reference normal range occurred in February and September (Table 5.3; Appendix Figure B.45). Visual inspection of data from 2012 to 2019 indicated no consistent increases in selenium tissue concentrations at any of the sample areas (Appendix Figure B.45). The majority of samples that were greater than the upper limit of the reference normal range were located between RG_FOUKI and RG_FOBCP, while no reference area samples exceeded normal ranges or the EVWQP Level 1 benchmark.

Paired water and composite-taxa tissue selenium concentrations (Appendix Table B.20) were plotted against the selenium bioaccumulation model (Golder 2018a). All values except one anomalously high replicate from RG_FRCP1SW in June 2019 fell within the prediction limits, and generally values fell below the model line (Figure 5.13), suggesting that tissue concentrations were expected based on the selenium concentrations in the water.

5.4 Water Quality

5.4.1 Routine Water Quality

Parameters with EWTs under the Adaptive Management Plan (AMP) were plotted from 2012 to 2019 (Appendix Figures C.1 to C.36). All 2019 water chemistry data were screened to determine if they were above benchmarks/guidelines (Appendix Table C.1). Dissolved cadmium concentrations were below the EVWQP Level 1 benchmark at all stations in 2019 (Appendix Table C.1; Appendix Figure C.4). Sulphate concentrations were above the EVWQP Level 1 benchmark at FR_FR4, FR_FRCP1 and FR_FRCP1SW (Appendix Table C.1; Appendix Figure C.15). Nitrate concentrations (discussed in Section 3) were above the EVWQP Level 1 benchmark at all stations except FR_FR1, and above the EVWQP Level 2 benchmark at all stations downstream of FR_FRABEC1, except FR_FRCP1SW and FR_FR5 (Appendix Table C.1; Appendix Figure C.10). Total selenium was above the EVWQP Level 1 benchmark at all seven stations downstream of GH_FR3 and above the EVWQP Level 2 benchmark only at FR_FRCP1 (Appendix Table C.1; Appendix Figure C.14). Total nickel concentrations were higher than the Level 1 interim screening value at FR_FRABEC1, FR_FR2, FR_FR4, FR_FRCP1, FR_FRCP1SW, and GH_PC2, and above the Level 2 and Level 3 interim screening values at FR_FRCP1 (Appendix Table C.1; Appendix Figure C.9). Total dissolved solids were also above the Level 1 screening value (Teck 2018) from FR_FR4 to FR_FRCP1SW (Appendix Table C.1; Appendix Figure C.16). Total uranium was above the long-term BCWQG

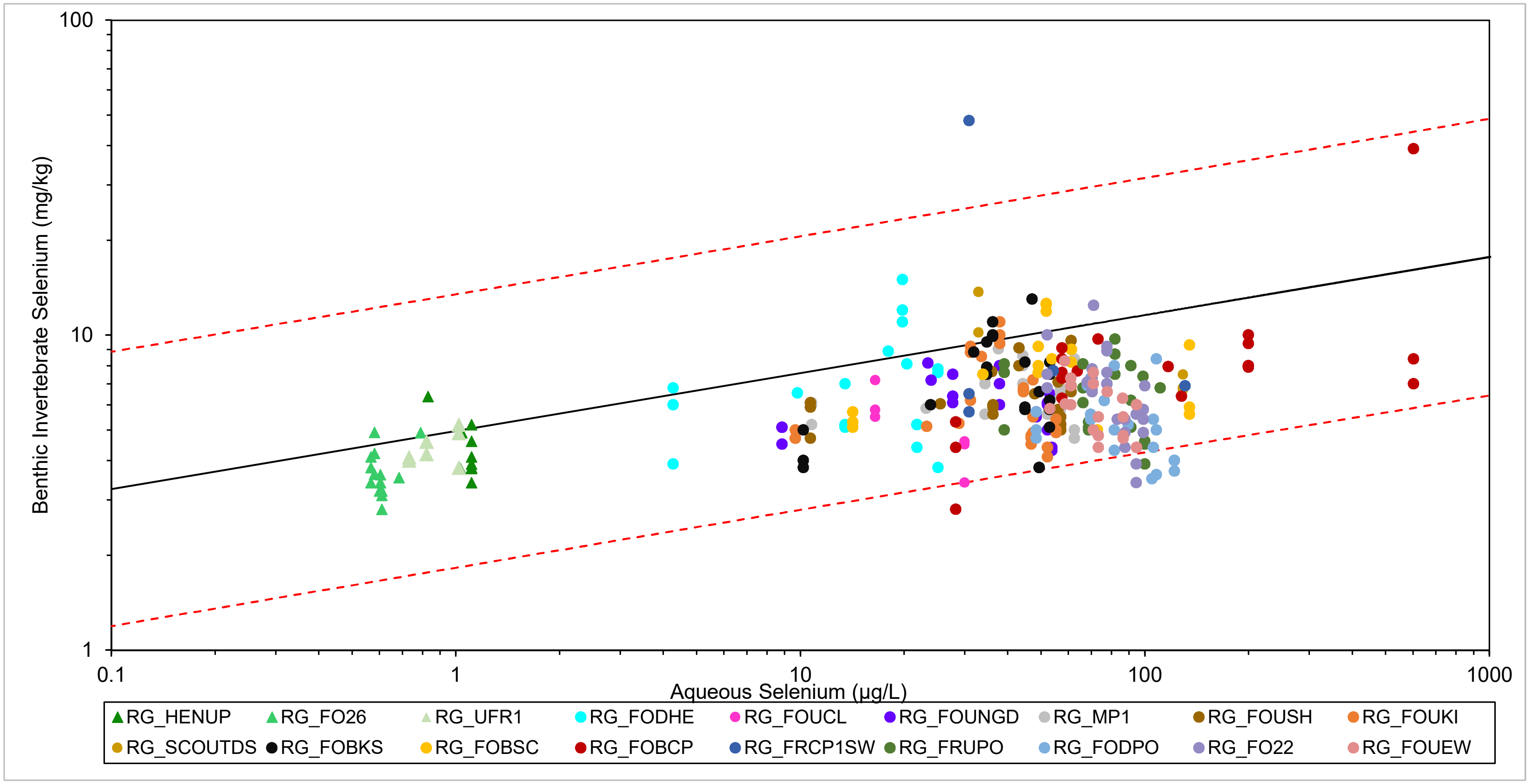


Figure 5.13: Observed and Modelled[a] Selenium Concentrations in Benthic Invertebrate Composite Samples Relative to Aqueous Selenium Concentrations at Stations Upstream and Downstream of Fording River Operations, FRO LAEMP, 2012 to 2019

[a] Mean benthic invertebrate selenium concentrations (solid black line) were estimated using a one-step water to benthic invertebrate selenium accumulation model: $\log_{10}[Se]_{benthicinvertebrate}=0.696+0.184\times\log_{10}[Se]_{aq}$ (Golder 2018a). The 95% prediction limits for a single value from the one-step water to benthic invertebrate selenium accumulation model are plotted as dashed red lines.

at FR_FRCP1 (Appendix Table C.1; Appendix Figure C.17), while dissolved copper was above the long-term BCWQG at the reference areas, at FR_MULTIPLATE, and from GH_PC2 to FR_FR5 (Appendix Table C.1). None of the other constituents with EWTs were above relevant guidelines or benchmarks.

Concentrations of water quality constituents were typically the highest in the winter months related to lower flow conditions (Appendix Figures C.1 to C.36). Constituent concentrations higher than benchmarks at FR_FRCP1 were largely a result of low flow conditions in winter and drying between Swift and Cataract creeks in the first quarter of 2019. The drying upstream of Cataract Creek disconnected the Fording River flow around FR_FRCP1 for the winter period, causing water chemistry to predominantly reflect that of Cataract Creek in the last quarter of 2018 and the first quarter of 2019. In August of 2019, however, Cataract Creek flow was re-directed through Swift Ponds to Swift Creek in advance of water treatment, which facilitated better mixing upstream of FR_FRCP1.

To evaluate changes over time, nitrate (discussed in Section 3), sulphate, total selenium, and total nickel concentrations from 2012 to 2019 were statistically analyzed for temporal trends (Appendix Table C.2). Annual mean sulphate concentrations were significantly higher at GH_PC2 in 2019 compared to the base year (Appendix Table C.2). Total selenium concentrations increased compared to the base year at both reference areas (FR_HC3 and FR_UFR1) and one mine-exposed (GH_PC2) area (Appendix Table C.2). Nickel concentrations were not significantly different from the base year in all areas. As discussed in Section 3.2, nitrate concentrations were significantly higher than the base year only at FR_FR2.

Visual evaluation of the remaining EWT constituents from 2012 to 2019 indicated no obvious increases (Appendix Figures C.1 to C.18), except for total lithium, which has had a slow linear increase in concentrations over the study period but has no guidelines or benchmarks for which to compare values. The lithium concentrations have been below the EWT screening values since 2015 at FR_FRCP1 (Teck 2020).

Principal component analysis (PCA) was conducted on water quality samples for three time periods: year to date (Table 5.4), spring (Appendix Table C.3), and summer (Appendix Table C.4) data. Year to date principal component axis 1 (PC1) and principal component axis 2 (PC2) explained 51% and 26% of the variation in water chemistry, respectively. Almost all water quality constituents on PC1 had significant and strong positive correlations, whereas fewer constituents had a significant and strong negative correlation on PC2 (Table 5.4). PC1 was influenced by almost every constituent included in the PCA, all of which are highly correlated with each other, and many of which are mine-related constituents. As a result, the explanatory power of each axis was high, but the influence of individual constituents

Table 5.4: Pearson Correlations of Year to Date Water Analytes and PCA Axis Scores, FRO LAEMP, 2012 to 2019

Variable	PCA1 (51%)		PCA2 (26%)	
	P-value	r_s	P-value	r_s
Temperature (C)	<0.001	0.427	0.098	0.195
Total Dissolved Solids (mg/L)	<0.001	0.756	<0.001	0.580
Alkalinity (mg/L as CaCO3)	<0.001	0.732	<0.001	0.516
Nitrate (mg/L)	<0.001	0.789	<0.001	0.510
Nitrite (mg/L)	<0.001	0.882	0.069	0.214
Ammonia (mg/L)	0.002	0.363	0.530	-0.075
Phosphorus (mg/L)	<0.001	0.646	<0.001	-0.654
Sulphate (mg/L)	<0.001	0.743	<0.001	0.599
Dissolved Aluminum (mg/L)	0.758	0.0366	<0.001	-0.787
Total Antimony (mg/L)	<0.001	0.834	0.522	0.076
Total Arsenic (mg/L)	<0.001	0.611	<0.001	-0.739
Total Barium (mg/L)	<0.001	0.685	0.0370	0.245
Dissolved Cadmium (mg/L)	<0.001	0.886	0.00658	0.315
Total Chromium (mg/L)	<0.001	0.511	<0.001	-0.769
Total Cobalt (mg/L)	<0.001	0.696	<0.001	-0.544
Total Copper (mg/L)	<0.001	0.556	<0.001	-0.739
Total Iron (mg/L)	<0.001	0.742	<0.001	-0.515
Total Lead (mg/L)	<0.001	0.695	<0.001	-0.671
Total Lithium (mg/L)	<0.001	0.849	<0.001	0.496
Total Manganese (mg/L)	<0.001	0.854	0.197	-0.153
Total Molybdenum (mg/L)	<0.001	0.847	0.169	0.163
Total Nickel (mg/L)	<0.001	0.880	0.392	0.102
Total Selenium (mg/L)	<0.001	0.811	<0.001	0.497
Total Thallium (mg/L)	<0.001	0.672	<0.001	-0.643
Total Uranium (mg/L)	<0.001	0.789	<0.001	0.530
Total Zinc (mg/L)	<0.001	0.640	<0.001	-0.616

[blue] $r_s \geq 0.6$ or ≤ -0.6.

[grey] significant correlation (p-value < 0.05).

Note: All water chemistry from January to August of the sampled year included.

remained low. Both PC1 and PC2 for year to date, spring and summer PCAs were used in (Spearman's) correlations tests (Section 5.6).

5.4.2 Selenium Speciation

Selenium speciation samples were collected during each sampling event in 2019 to provide a baseline understanding of speciation in the study area before the commissioning of the FRO AWTF-S (Appendix Table C.5; Appendix Figure C.37). Selenium concentrations varied according to the season, with winter months generally having higher concentrations than spring and summer for all species, and with the lowest concentrations measured in June due to the freshet. Selenate was the dominant species present in all samples, with very low concentrations of reduced species compared to the concentration of selenate at each site (Table C.5; Appendix Figure C.37). The highest concentrations of selenite, the most common selenium species other than selenate, were measured at monitoring areas between RG_MP1 and RG_FOBCP, which corresponded to areas with the highest tissue selenium concentrations (Appendix Figure C.37; Table 5.3). Other than selenite, the only other reduced selenium species above detection limits was methylseleninic acid, which was measured at RG_FOUKI and RG_FOBSC in September, and at RG_SCOUTDS and RG_FODPO in December (Appendix Figure C.37). Reference areas had low concentrations of selenate compared to mine exposed areas and had no reduced selenium.

5.4.3 Chronic Toxicity

Chronic toxicity tests were completed at FR_UFR1, FRO Compliance Point (FR_FRCP1), and at FR_FRABCH on a quarterly and semi-annual basis in 2019, and results are summarized quarterly and annually in accordance with Permit 107517. In the fourth quarter (Q4) of 2018, chronic toxicity tests were added at FR_FRABCH to inform the investigation of the Fording River Compliance Point relocation, and because it better represents mixed Fording River water quality than FR_FRCP1, where mid-winter flows from Cataract Creek have historically influenced concentrations (Golder 2020b). Results are reported in Table 5.5 and Appendix C.6 and summarized from the 2019 Chronic Toxicity Report (Golder 2020b) below using the effects ratings of no adverse response, possible adverse response, and likely adverse response.

At FR_FRCP1, adverse test responses were most common in winter (Q1) compared to other parts of the year, which was likely a result of increased flow from Cataract Creek resulting in higher concentrations of mine-related constituents. Specifically, in Q1, survival of *Ceriodaphnia dubia* was 0%, and reproduction and brood counts were zero, resulting in significantly lower values relative to all reference areas leading to a classification of likely adverse responses (Table 5.5; Appendix Table C.6). *C. dubia* reproduction and brood counts were also

Table 5.5: Results of Quarterly and Semi-Annual Toxicity Tests (Golder 2020b), FRO LAEMP, 2019

Taxa	FR_FRCP1				FR_FRABCH			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Ceriodaphnia dubia	L	N	P	N	L	N	N	N
Pseudokirchneriella subcapitata	L	N	L	N	N	N	L	N
Hyalella azteca	N	-	N	L	N	-	N	N
Oncorhynchus mykiss	-	N	-	N	-	L	-	N
Pimephales promelas[a]	L	-	P	-	P	-	N	-

Notes: "-" = not tested; N = no adverse response; P = possible adverse response; L = likely adverse response.

[a] Results for copper-amended samples are provided; reference site results are samples amended with 10 µg/L. Laboratory control results are provided for laboratory control + 10 µg/L copper (Cu) and laboratory control + 20 µg/L Cu.

significantly decreased compared to the Elk River reference in Q3, which resulted in possible adverse responses. Quarters two and four were not significantly different than reference areas and had no adverse response (Table 5.5; Appendix Table C.6). Cell yield for *Pseudokirchneriella subcapitata* was significantly lower relative to one or more reference areas in all quarters at FR_FRCP1, but only qualified as a likely adverse response in Q1 and Q3 and no adverse response in Q2 and Q4. Survival of *Hyalella azteca* was not affected by test water for any quarter at FR_FRCP1, but dry weight was significantly lower than the Fording River and Michel Creek reference areas in Q4, resulting in a likely adverse response in that quarter only. There were no significant effects on *Oncorhynchus mykiss* survival, viability, length, and weight for any quarter at FR_FRCP1, resulting in no adverse responses (Table 5.5; Appendix Table C.6). *Pimephales promelas* survival and biomass were significantly reduced relative to all reference areas in Q1, resulting in a likely adverse response. In Q3, only survival was low compared to results from the Fording River reference area, resulting in a possible adverse response rating. Overall, 8 of 14 endpoints had no adverse responses in all quarters at FR_FRCP1, including *H Azteca* survival, *O. mykiss* survival, viability, length, and weight, and *P. promelas* hatch, length, and development.

Correlation analysis was used to determine relationships between water quality and test responses at FR_FRCP1 (Golder 2020b). Depending on the quarter, sulphate, total dissolved solids, nickel and nitrate correlated with *C. dubia* reproduction, while only sulphate and total dissolved solids correlated with survival. Analysis for *P. subcapitata* showed no correlations with any single water quality constituent for all quarters in 2019. Nickel correlated the most strongly with *H. azteca* survival at FR_FRCP1 in Q4. There was no water quality constituent identified as contributing to reductions in *P. promelas* at FR_FRCP1.

At FR_FRABCH, *C. dubia* reproduction and broods were significantly lower than some of the reference areas (varied depending on the endpoint) in Q1 and Q4, but only Q1 resulted in a likely adverse response (Table 5.5; Appendix Table C.6). Cell yields for *P. subcapitata* were significantly lower than most reference areas (varied depending on the quarter) in Q3 and Q4 at FR_FRABCH, but only the Q3 resulted in a likely adverse response. Neither of the endpoints (% survival and dry weight) for *H. azteca* were below reference area values at FR_FRABCH, and no adverse responses were apparent in any quarter. Survival, viability and length of *O. mykiss* were significantly lower than many of the reference areas (varied depending on the endpoint) in Q2 at FR_FRABCH, resulting in a likely adverse response; however, only survival was lower than the Fording River and Elk River reference areas in Q4 and resulting in no adverse response. Only survival was lower than some of the reference areas for *P. promelas* at FR_FRABCH in both Q1 and Q3, which resulted in possible adverse response effects in Q1 but no adverse response in Q3. Overall, 9 of 14 endpoints had no adverse responses in all quarters at FR_FRABCH.

Correlation analysis suggested that a potential contributor to the observed responses for *C. dubia* and *H. azteca* at FR_FRABCH was nitrate. No water quality constituent was identified for potentially contributing to observed responses for *P. subcapitata, O. mykiss,* and *P. promelas*.

5.4.4 Water Temperature and Discharge

5.4.4.1 Water Temperature

Over the past three years, the effects of water temperature on BIC have been investigated in the FRO LAEMP study area. The 2016 FRO LAEMP report identified a statistically significant increase in temperature at several stations in the upper Fording River using data from 2012 to 2016 (Seasonal Kendall analysis; Minnow 2017b), leading to the hypothesis that temperature increases may be contributing to the decrease in % Ephemeroptera, possibly through the initiation of early emergence. In 2017, no trend was identified using continuous temperature data from FR_FRNTP, and aside from a small but statistically significant increase in temperature in the month of June at several mine-exposed areas (using temperature data collected concurrently with routine water quality monitoring), no other temperature increases were observed. Analysis using temperature data collected concurrently with routine water quality monitoring was not included in the 2018 or in the current FRO LAEMP report due to the influence of sampling time (i.e., different temperatures at different times of the day) on the measurements, as well as the small sample size per month, making interpretation difficult.

Monthly mean temperature from the continuous monitoring stations FR_FRNTP and FR_FRABCHf was calculated for 2010 to 2019, and 2017 (Q4) to 2019, respectively, and plotted (Figure 5.14 and 5.15). Seasonal-Kendall analysis (compared monthly means [seasons] to determine overall monotonic trend) detected a small but significant decrease in temperature over time at FR_FRNTP, but no decrease at FR_FRABCHf (Appendix Table C.7). Although not significantly different than base year, annual mean temperatures (controlled for months of years) at FR_FRNTP in 2018 and 2019 were significantly lower than they were in 2012 and 2013 (Table 5.6). Water temperature data at FR_FRABCHf were limited to only the past three years, and no significant differences existed in 2019 compared to base year.

5.4.4.2 Discharge

Monthly mean discharge from the continuous monitoring stations FR_FRNTP and FR_FRABCHf was calculated for 2010 to 2019, and for 2019, respectively, and plotted (Figure 5.14 and 5.15). Seasonal-Kendall analysis (compared monthly means [seasons] to determine overall monotonic trend) detected a small but significant decrease in discharge over time at FR_FRNTP (Appendix Table C.7), but insufficient data were available for trend analysis at FR_FRABCHf (Table 5.6; Appendix Table C.7). When comparing annual means (controlled for months of year),

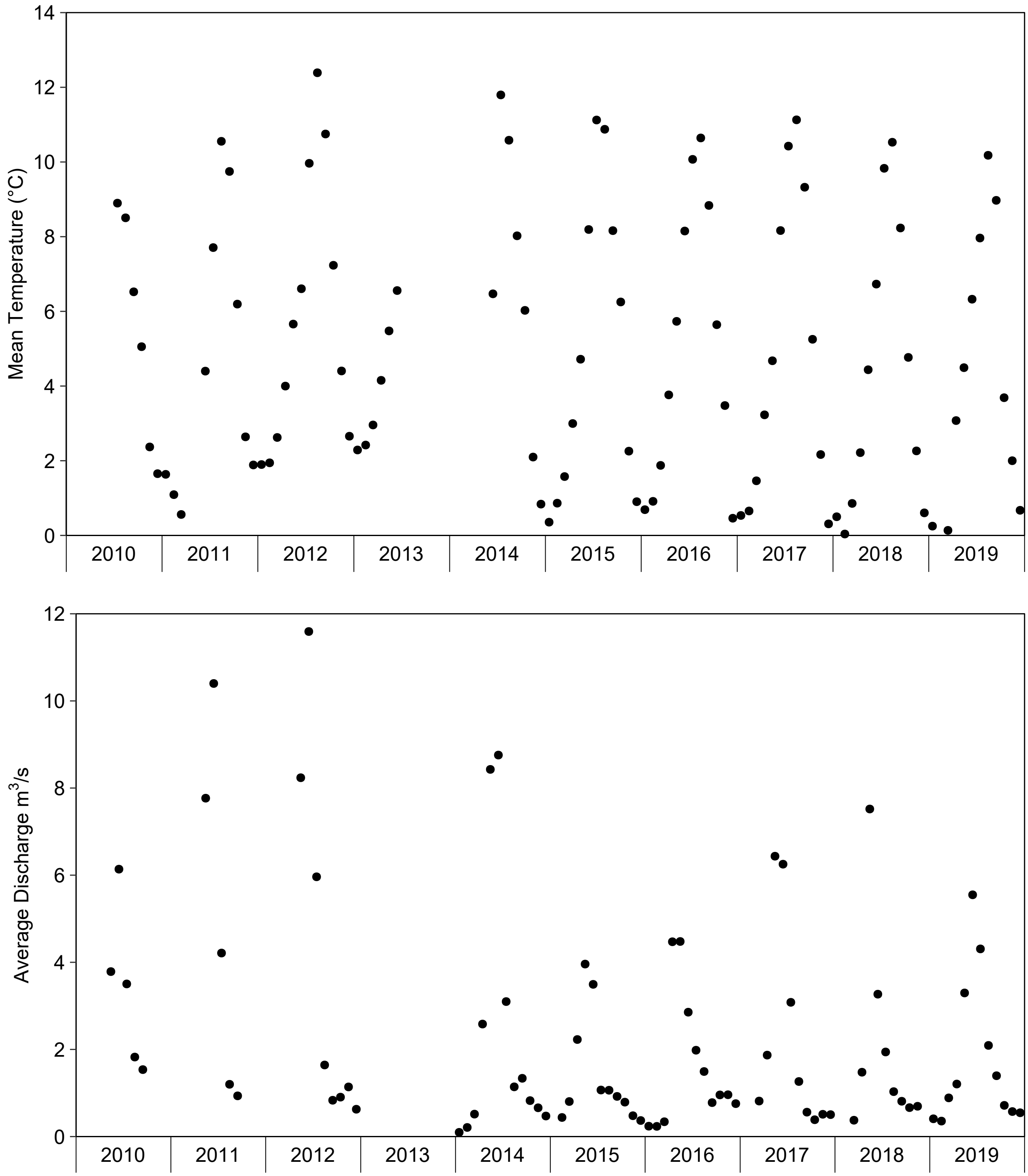


Figure 5.14: Mean Temperature and Discharge at FR_FRNTP, FRO LAEMP, 2010 to 2019

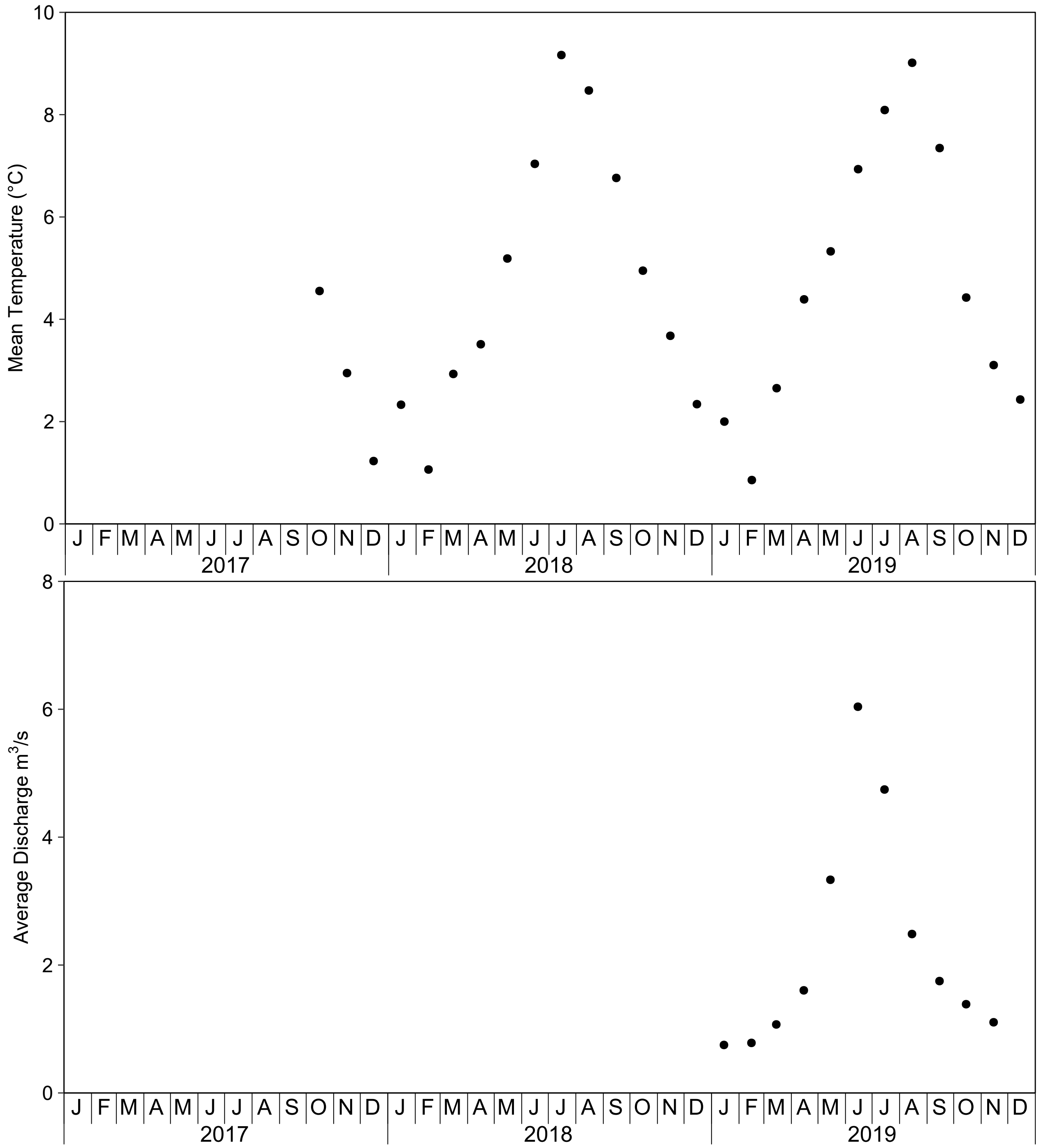


Figure 5.15: Mean Temperature and Discharge at FR_FRABCHf, FRO LAEMP, 2014 to 2019

Table 5.6. **Temporal Changes in Temperature and Discharge at Stations in the FRO LAEMP, 2010 to 2019**

Parameter	Station	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b) [c]										Q2. Is the 2019 annual mean greater or less than all annual historical means (2010 - 2018) and the previous year (2018)?[c]											
		DF	P-Value	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2019 vs. 2010-2018	2019 vs. 2018
Temperature	FR_FRNTP	9	<0.001	b	21	**57**	**55**	28	31	35	29	14	3.4	CD	BCD	A	AB	ABCD	ABCD	ABC	ABCD	CD	D	ns	ns
	FR_FRABCHf	1	0.602	-	-	-	-	-	-	-	b	ns	ns	-	-	-	-	-	-	-	ns	ns	ns	ns	ns
Discharge	FR_FRNTP	8	0.046	b	11	23	-	-13	-30	-17	-23	-31	-5.6	A	A	A	-	A	A	A	A	A	A	ns	ns
	FR_FRABCHf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

P-value < 0.05.
> 20% Decrease in concentration.
> 33% Decrease in concentration.
> 43% Decrease in concentration.
> 50% Decrease in concentration.
> 25% Increase in concentration.
> 50% Increase in concentration.
> 75% Increase in concentration.
> 100% Increase in concentration.
bold Significant increase or decrease from base year (b).
Significantly < than all historical years (or 2017).
Significantly > than all historical years (or 2017).

Note: "ns" = not significant. "-" indicates insufficient data for analysis.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[Mean_{given\ year} - Mean_{year\ b}] / Mean_{year\ b} \times 100\%$.

[c] Significance amongs year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

discharge at FR_FRNTP was not significantly different in 2019 compared to base year or compared to previous years (Table 5.6).

5.5 Substrate Quality

5.5.1 Sediment Chemistry

Sediment chemistry data were collected to support the questions related to BIC structure. Almost all samples collected from mine-exposed areas in September 2019 had concentrations of cadmium, manganese and nickel, and to a lesser extent zinc, higher than the lower working sediment quality guidelines (WSQGs; Appendix Table D.1; Appendix Figure D.1). Similarly, almost all mine-exposed area samples had selenium concentrations that were above the upper WSQG; however, selenium concentrations at RG_FOUKI were much lower in 2019 compared to 2018. Samples collected from RG_FO26 (reference) had concentrations of cadmium, manganese and nickel higher than the lower WSQG (Appendix Table D.1; Appendix Figure D.1). In general, metal concentrations were the lowest at RG_HENUP (reference), having no samples above any of the guidelines. Concentrations were comparable among years at each area (Appendix Table D.1; Appendix Figure D.1).

Concentrations of many PAHs were higher than the lower or upper WSQGs in sediment at all the sampled areas (Appendix Table D.1; Appendix Figure D.2). Each PAH exhibited the same pattern, with the highest concentrations observed in the most upstream mine-exposed area (RG_FOUKI) and concentrations decreasing with distance downstream. RG_FOUKI is downstream of the FRO South tailings pond (STP) and train loading area, which are potential sources of additional coal dust and other inputs. As with metals, PAH concentrations at RG_FO26 were higher than RG_HENUP, and were above the lower WSQGs for acenaphthene, chrysene, fluorene, naphthalene, and phenanthrene, and the upper WSQG for 2-methylnaphthalene (Appendix Table D.1; Appendix Figure D.2). PAH concentrations were similar among years in all areas where samples were collected except RG_FOUKI, where concentrations of most PAHs were lower in 2019 compared to 2018. The highest metal and PAH concentrations were not associated with areas where effects were observed on BIC in 2019.

5.5.2 Calcite

Calcite Index (CI) was measured concurrently with BIC sampling in only September in 2019 (Table 5.7). Consistent with previous years, CI values measured in the FRO LAEMP monitoring locations in September 2019 varied throughout the river but were generally lower than the previous year and below 1.0 at all areas except one replicate at RG_FOUCL, all three replicates at RG_FOUSH, and two replicates at both RG_FRUPO and RG_FOUEW (Table 5.7). Calcite indices associated with biological sampling targeted riffle habitat in the immediate

Table 5.7: **Calcite Index Values in the Fording River, FRO LAEMP, 2013 to 2019**

Biological Monitoring Area	Teck Water Station	Calcite Reach	Teck Regional Calcite Monitoring (Calcite Index)							Calcite Index at Benthic Invertebrate Monitoring Areas in Within Riffles (Calcite Index)												
			2013	2014	2015	2016	2017	2018	2019	2015	2016	2017	2018					2019[a]				
RG_FO26	FR_UFR1	FORD12	0.0	0.0	0.0	0.3	-	0.3	0.3	0.9	0.8	0.6	0.9	1.0	0.7	-	-	1.0	1.0	1.0	-	-
RG_HENUP	FR_HC3	HENR3	0.0	0.0	0.0	-	-	-		0.1	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-
RG_FODHE	FR_FR1									0.9	0.0	0.9	0.6	0.4	0.8	-	-	0.2	0.1	0.1	-	-
RG_FOUCL	-	FORD11	0.0	0.0	0.0	-	-	0.3	-	-	-	-	-	-	-	-	-	0.9	1.1	1.0	-	-
RG_FOUNGD	-									0.8	-	0.6	1.0	1.1	0.9	-	-	0.5	0.7	0.5	-	-
RG_FODNGD	FR_FRABEC1	-	-	-	-	-	-	-	-	0.8	-	1.0	0.9	0.9	1.0	-	-	0.4	0.4	0.4	-	-
RG_MP1	FR_MULTIPLATE									1.0	-	1.0	1.4	1.1	1.1	-	-	0.5	0.6	0.7	-	-
RG_FOUSH	-	FORD10	0.0	0.0	0.0	-	-	0.6	-	1.0	-	0.9	1.0	1.0	0.9	-	-	1.1	1.0	1.1	-	-
RG_FOUKI	FR_FR2									1.0	1.8	0.8	0.6	0.8	0.6	-	-	0.5	0.5	0.5	-	-
RG_SCOUTDS	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	-	-
RG_FOBKS	GH_FR3									0.9	2.0	0.5	0.8	0.5	0.7	-	-	0.8	0.9	0.9	-	-
RG_FOBSC	FR_FR4	FORD9	0.0	0.0	0.0	0.0	0.3	0.7	0.5	1.2	1.8	1.1	1.0	1.0	1.0	-	-	0.3	0.2	0.3	-	-
RG_FOBCP	FR_FRCP1									1.3	1.6	1.1	0.9	1.2	1.1	1.4	1.4	0.9	0.6	1.3	-	-
RG_FRCP1SW	FR_FRCP1SW		-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	0.4	0.1	0.7	-	-
RG_FRUPO	FR_FRRD									-	-	1.0	1.0	1.0	1.0	-	-	1.0	0.7	1.1	-	-
RG_FODPO	GH_PC2	FORD8	0.3	0.5	0.5	-	-	0.6	-	0.9	1.0	0.9	0.9	0.9	1.0	-	-	0.5	0.5	0.9	-	-
RG_FO22	FR_FRABCH									0.8	-	1.0	1.0	0.8	1.0	0.9	1.0	0.9	0.8	0.9	0.9	0.5
RG_FOUEW	FR_FR5	FORD7/6	0.6	0.7	1.0	0.6	0.7	0.8	0.9	1.0	1.0	1.0	1.1	1.0	1.0	-	-	0.6	1.0	1.1	-	-

Notes: Refer to Appendix Figure B.2 for calcite reaches. "-" indicates that no calcite monitoring was completed.

[a] RG_FOUCL was added in September to provide a biological monitoring area to support FRO north water treatment plans, and RG_SCOUTDS was added in September as the biological monitoring area for the FRO AWTF-S outfall, as reviewed with EMC at June 2019 meeting.

proximity of BIC sample collection. In contrast, the Calcite Monitoring Program assesses 100-m-long reaches which may contain a variety of habitat types (i.e., riffle, run, pool). The Regional Calcite Monitoring Program did not identify any areas with a CI greater than 1.0 in the Fording River in September 2019. Calcite Index at reference area RG_HENUP was 0.0 for all replicates but was 1.0 for all three replicates for RG_FO26, which was generally consistent with previous years.

5.6 Integrated Discussion

5.6.1 Overview

Analysis and interpretation of data collected in 2019 has furthered the understanding of the BIC in the upper Fording River at monitoring areas included in the FRO LAEMP. There remains no clear answer to study question 6 (What are the factors contributing to the variations in % Ephemeroptera), however this report provides strong evidence through integrated analyses (correlations analysis and redundancy analysis (RDA)) that changes in BIC are due to both mine-related stressors and habitat differences among monitoring areas, and that the variability attributed to each is difficult to separate (results summarized in Table 5.8). It has also become clear that the factors affecting the BIC are different depending on the location within the study area, and as such, each area is discussed separately.

5.6.2 Integrated Analyses

To integrate findings, correlations between chemical (water quality constituents, PC1 and PC2) and physical parameters (CI, pebble size [D16, D84], water velocity, water depth, temperature) and individual BIC metrics (Percent and abundance of Ephemeroptera, Plecoptera, and EPT, CA1, and CA2) using all available data (2012 to 2019) were completed (Table 5.9; Appendix Table E.1). Parameters having a strong correlation ($r_s \geq |0.6|$) and which were significantly correlated ($p<0.0005$; Bonforreni correction of 0.05/92 independent comparisons) were plotted (Appendix Figure E.1). While none of the physical parameters correlated strongly ($r_s \geq 0.6$) with the BIC metrics, some (% Ephemeroptera; Calcite Index, Calcite Presence, embeddedness, and D84) were statistically significant. Many of the key water quality constituents correlated strongly with key BIC metrics (i.e., % Ephemeroptera, % Plecoptera, Ephemeroptera Abundance, Family CA1 and CA2) in 2019, including nitrate, nitrite, total selenium, total nickel, sulphate, and total dissolved solids, PC1 and PC2 (Table 5.9). All BIC endpoints had strong negative correlations with key water quality constituents, except for % Plecoptera, which correlated positively. This was likely a result of the high Plecoptera abundance in the lower section of the study area where concentration of key constituents tended to be the highest.

Table 5.8: Summary of Results (Study Questions #1, #6, #7), FRO LAEMP, 2019

Evaluation	Assessment Endpoint	Indicator Type	Measurement Endpoint	Evaluation Criteria	Results	Conclusion
Are nitrate concentrations increasing, and if so, are they adversely affecting biota?	Benthic invertebrate abundance and assemblage	Direct	Benthic invertebrate community endpoints (See Study Question #6)	Benthic invertebrate community relative to nitrate concentrations in the upper Fording River	See Study Question #6	Nitrate concentrations are higher than benchmark(s) in most areas where changes in BIC occur, and nitrate concentrations are highly correlated with % Ephemeroptera, % Plecoptera, Ephemeroptera abundance and CA1 (See Study Question #6), however spatial and temporal patterns in nitrate concentration do not correspond exactly to observed patterns in BIC.
		Indirect	Surface water nitrate concentrations	Evaluate nitrate concentrations relative to predictions in the EVWQP, benchmarks, and past observations	Nitrate higher than benchmark(s) at most mine-exposed areas	
What are the factors contributing to the variations in percent Ephemeroptera?	Benthic invertebrate abundance and assemblage	Direct	Benthic invertebrate community endpoints (abundance, richness (LPL taxonomy), percent (%) and total abundance of Ephemeroptera-Plecoptera-Trichoptera (EPT), Ephemeroptera, Plecoptera, and Trichoptera, and total abundance of key Ephemeroptera families [Baetidae, Heptageniidaie, Ephemerellidae])	Spatial and temporal comparisons to reference areas (NR) for September, and seasonal assessments for February, June, September and December.	% Ephemeroptera was below NR at RG_MP1, and between RG_FRCP1SW and RG_FOUEW, and lower at RG_MP1 and RG_FOBCP in 2019 compared to 2018. Like 2018, Ephemeroptera abundance and abundance of Heptageniidae and Ephemerellidae followed the same spatial pattern (i.e., low in downstream areas). Plecoptera (% and abundance) was higher where Ephemeroptera was low, helping to maintain higher % EPT. Downstream areas having low % Ephemeroptera were dominated by Nemouridae in winter and Elmidae and Perlodidae in summer.	Data analysis identified a strong correlation between water quality and BIC metrics, suggesting that water quality is an important factor influencing variations in % Ephemeroptera. Contrary to last year's report, habitat variables did not strongly correlate with key BIC metrics. RDA did not further explain effects of habitat or stressor variable (i.e., water quality constituents or calcite) on BIC variability.
			Benthic invertebrate community indices	Compared spatially, temporally, and seasonally to identify if functional groups may explain differences in habitat that may affect BIC	BIC endpoint patterns were not consistent with patterns of high and low % Ephemeroptera	
			Community Composition	Correspondence analysis (CA) to assess difference in community structure among areas in 2019.	CA1 identified a clear difference in community composition in areas experiencing low % Ephemeroptera related to higher proportions of taxa other than Ephemeroptera (e.g., Elmidae, Capniidae, and Tipulidae). CA2 separated reference from mine-exposed areas.	
		Indirect	Tissue selenium concentrations	Concentrations relative to effect benchmarks and past observations	All three composite-taxa tissue selenium samples from RG_FOBSC and two of three from RG_SCOUTDS were above level 1 effects benchmarks in September; in February, one sample from RG_FOBKS was above level 1 effects benchmarks, while one sample from RG_FRCP1SW was higher in June.	
			Surface water chemistry	Concentrations of mine-related constituents relative to effect benchmarks, interim screening values, and past observations.	Water quality constituentes were highest in winter months. Nitrate was higher than EVWQP Level 1 Benchmarks at all mine exposed stations except FR_FR1; Sulphate was above Level 1 Bencharks at FR_FR4, FR_FRCP1, and FR_FRCP1SW; Nickel was above the Level 1 Interim Screening Benchmark at six sations, and above level 2 and 3 levels at FR_FRCP1; Total selenium was above Level 1 Benchmarks at all seven stations downstream of FR_FRABEC1; Total dissolved solids were above the Screening Value Level 1 benchmark from FR_FR4 to FR_FRCP1SW; Few increasing temporal trends observed in mine-exposed areas (nitrate, sulphate, selenium, nickel).	
				Principal component analysis (PCA) to assess contributions of various water quality variables to PCA1 and PCA2	The majority of variabilty in water quality explained by PC1 (51%) and PC2 (26%).	
			Temperature and Flow	Continuous Monitoring of temperature and discharge at FR_FRNTP (2010 to 2019) and FR_FRABCH (2017 to 2019) evaluated over time	Temporal analysis identified a signifiant decrease in temperature and discharge over time at FR_FRNTP. No significant differences were determined for FR_FRABCH, but there is limited data to date.	
			Sediment chemistry	Concentrations relative to BC working sediment quality guidelines (WSQGs)	Cadmium, manganese, nickel, and zinc exceeded lower WSQG at most mine-exposed areas; selenium concentrations were above the upper WSQG at almost all mine-exposed areas; with highest concentrations at typically at RG_FOBCP; Concentrations of many PAHs were higher than lower or upper WSQGs at all mine-exposed sample areas, and highest at upstream areas decreasing downstream; RG_FOUKI concentrations for most sediment parameters were lower in 2019 than in previous years.	

Note: NR = Normal Range.

Table 5.8: Summary of Results (Study Questions #1, #6, #7), FRO LAEMP, 2019

Evaluation	Assessment Endpoint	Indicator Type	Measurement Endpoint	Evaluation Criteria	Results	Conclusion
What are the factors contributing to the variations in percent Ephemeroptera?	Benthic invertebrate abundance and assemblage	Indirect	Calcite	Calcite index relative to known or suspected effect levels and past observations	Calcite indices varied throughout the river but were generally lower than the previous year and below 1.0 at almost every area.	Data analysis identified a strong correlation between water quality and BIC metrics, suggesting that water quality is an important factor influencing variations in % Ephemeroptera. Contrary to last year's report, habitat variables did not strongly correlate with key BIC metrics. RDA did not further explain effects of habitat or stressor variable (i.e., water quality constituents or calcite) on BIC variability.
			Correlations between physical and chemical factors, and BIC metrics	Physical: CI, pebble size, water velocity, temperature; Chemical: PC1, PC2, individual constituents; BIC metrics: % Ephemeroptera, %Plecoptera, % EPT, Ephemeroptera Abundance, Plecoptera Abundance, CA1, CA2	% Ephemeroptera was negatively correlated with nitrate, selenium, sulphate, total dissolved solids, PC1 and PC2 while % Plecoptera was positively correlated; Ephemeroptera abundance, and Family CA1 and CA2 were negatively correlated with most constituents included in the correlation analysis; Physical habitat variables did not correlate strongly with BIC metrics in 2019, but there some significant correlations (% Ephemeroptera; Calcite Index, Calcite Presence, embeddedness, and D84).	
			Redundancy Analysis	Habitat Variables; banfull width, mean depth, substrate size SD, D16, D84, stream density, watershed area, % watershed forest cover, % watershed field cover; Stressor Variables; PC1, PC2, PC3, PC4, PC5, PC6; PCA Variables	Habitat and stressor variables covary, sharing 24.7% of the explainable variability in BIC. After removing the variation shared by habitat and stressor variables, 8.8% of variation of BIC was explaind by stressor variables and 10.4% was explaind by habitat variables. After conditioning out the effects of habitat, and the shared variation shared between both stressors and habitat, no clear pattern differentiating sites was demonstrated. The stressor variation cannot explain the BIC differences between sites.	
To support monitoring associated with the requirements of the water license and environmental flow needs assessment, what is the benthic invertebrate community structure in the reach of the Fording River that goes dry, and can changes be correlated with flow conditions?	Assessment of dewatering in the upper Fording River	Direct	Monthly dewatering surveys, Temperature and level data loggers (continuous). Field *in situ* water quality.	Spatial and temporal extent of seasonal dewatering	Two dry sections comprising the southern drying section persisted into April 2019, after which the Fording River was reconnected with surface flow. Surface flow connectivity remained through the rest of 2019. Contrasting these results to 2018 shows the interannual variability of this system and the value of continued monitoring to better describe this occurance. Surveys added to the northern dry section documented drying near Turnbull Creek first occuring in November 2019. Whie interannually variable, the locations of the southern and northern drying sections are consistent with longterm reports dating back to 2010/11 (McPherson and Robinson 2011) and anecdotal observation by FRO staff wellprior to this.	Higher baseflow appears to have sustained surface connectivity further into the fall/winter 2019, realtive to 2017 and 2018.

Note: NR = Normal Range.

Table 5.9: Summary of Significant and Strong Correlations Between Benthic Invertebrate Community Endpoints and Water Quality Parameters Above Water Quality Guidelines and/or Benchmarks, FRO LAEMP, 2019

Mean Type	Parameter	% Ephemeroptera	% Plecoptera	Ephemeroptera Abundance	Family CA1	Family CA2
Year to Date	Nitrate (mg/L)	yes ↓	no	no	yes ↓	no
Spring	Nitrate (mg/L)	yes ↓	yes ↑	yes ↓	yes ↓	no
Summer	Nitrate (mg/L)	yes ↓	yes ↑	yes ↓	yes ↓	no
Year to Date	Nitrite (mg/L)	no	no	no	no	no
Spring	Nitrite (mg/L)	no	no	no	no	no
Summer	Nitrite (mg/L)	no	no	no	no	yes ↓
Year to Date	Total Selenium (mg/L)	yes ↓	no	yes ↓	no	yes ↓
Spring	Total Selenium (mg/L)	yes ↓	yes ↑	no	yes ↓	no
Summer	Total Selenium (mg/L)	yes ↓	yes ↑	yes ↓	yes ↓	no
Year to Date	Total Nickel (mg/L)	no	no	no	no	yes ↓
Spring	Total Nickel (mg/L)	no	no	no	no	yes ↓
Summer	Total Nickel (mg/L)	no	no	no	no	yes ↓
Year to Date	Sulphate (mg/L)	yes ↓	no	yes ↓	no	yes ↓
Spring	Sulphate (mg/L)	yes ↓	yes ↑	yes ↓	yes ↓	no
Summer	Sulphate (mg/L)	yes ↓	yes ↑	yes ↓	yes ↓	no
Year to Date	Total Dissolved Solids (mg/L)	yes ↓	no	yes ↓	no	yes ↓
Spring	Total Dissolved Solids (mg/L)	yes ↓	yes ↑	yes ↓	yes ↓	no
Summer	Total Dissolved Solids (mg/L)	yes ↓	yes ↑	yes ↓	yes ↓	no
Year to Date	PC1	no	no	no	no	yes ↓
	PC2	yes ↓	no	no	no	no
Spring	PC1	yes ↓	no	no	no	yes ↓
	PC2	no	no	no	no	no
Summer	PC1	yes ↓	no	yes ↓	no	yes ↓
	PC2	yes ↓	no	no	no	no

yes ↓ $r_s \leq -0.6$ and p-value < 0.0005. These criteria are considered strong correlations.

yes ↑ $r_s \geq 0.6$ and p-value < 0.0005. These criteria are considered strong correlations.

Notes: Year to Date = Chemistry means from January to August; Spring = Chemistry means from May and June of the sampled year included; Chemistry means from July and August of the sampled year included.

While the reason for elevated Plecoptera abundance in is not known, it is likely that some conditions in these areas may favour them over other taxa (e.g., habitat, tolerance level).

Strong correlations existed between water quality and BIC metrics, suggesting that water quality was an important factor influencing variations in % Ephemeroptera and other BIC metrics; however, the connection between water quality and habitat differences remained unclear. The importance of habitat factors on the structure of BIC in the FRO LAEMP study area is continuously being investigated as part of the LAEMP and the RAEMP.

To further elucidate the combined and separate effects of water quality and habitat on BIC, an RDA was conducted (Table 5.10; Figure 5.16). A PCA of the BIC data used in the RDA (unconstrained ordination) yielded results similar to the CA (Figures 5.10 and 5.11). The reference area RG_HENUP, was separated from the remaining downstream areas on axis 1 and 2, with higher abundances of sensitive taxa including some stonefly families (Chloroperlidae, Taeniopterygidae and Leucridae) as well as the mayfly family Ephemerellidae. These taxa are predominantly shredders that rely on heterotrophic energy sources from riparian vegetation (USGS 2016). The other reference area, RG_FO26, was more similar to some of the mine-exposed sites, especially RG_FODHE. The lower reaches of the study area (i.e.,RG_FO22, RG_FODPO, and RG_FOUEW) were separated by taxa preferring slower flows, and more depositional habitats (i.e. Bivalves [Pisidiidae], worms [Naididae]), as well as caddisflies and stoneflies that preferentially feed on periphyton and aquatic macrophytes that tend to be more abundant in slower flowing waters (Limnephilidae, Glossosmatidae and Nemouridae). The remaining sites clustered closer to the center of the ordination and were dominated by more tolerant mayflies (Baetidae), stoneflies (Perlidae), several mite families, and a variety of other taxa that utilize a variety of energy sources, but often included filterers and collector-gatherers. (Figure 5.16).

Table 5.10: Results of Variance Partitioning using Redundancy Analysis with Habitat and Stressor Predictors, FRO LAEMP, 2019

Parameters	Adjusted R^2
Total Habitat	0.352
Total Stressors	0.335
Total Habitat + Stressors	0.440
Uniquely Habitat (Stressors Removed)	0.104
Uniquely Shared between Stressors and Habitat	0.247
Uniquely Stressors (Habitat Removed)	0.0881
Unexplained Residuals	0.560

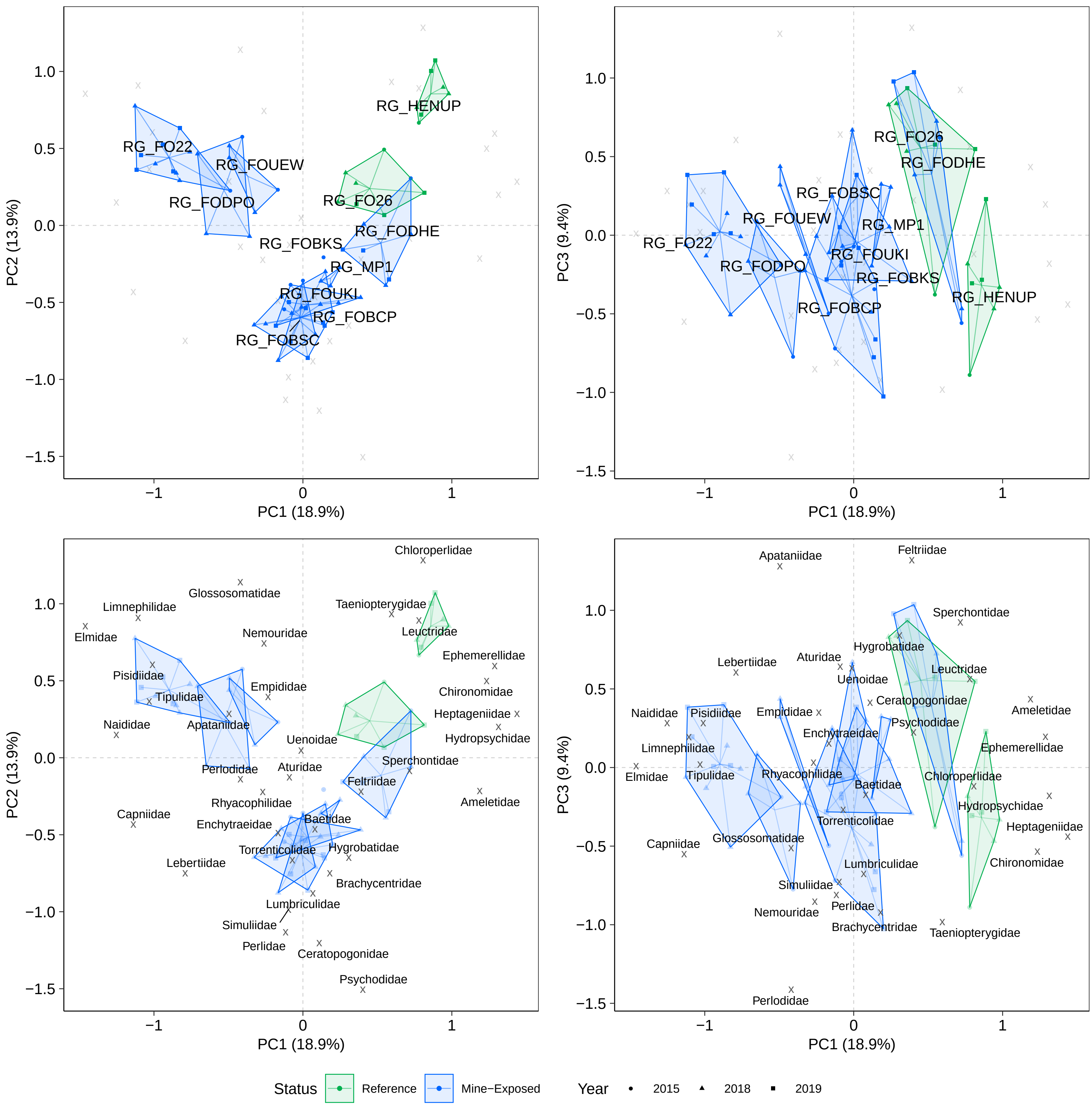


Figure 5.16: PCA Results for Benthic Invertebrate Community Data, FRO LAEMP, 2015, 2018, and 2019

Notes: Coloured lines connect samples to their centroids. Species shown as vectors pointing to the direction of increase. PCA performed on Chi−Squared and ln(x+1) transformed taxa abundances.

An RDA was conducted separately with stressors and habitat. The RDA model constraining BIC by stressor data accounted for 33.5% of the variation in the community and showed a similar pattern between sites and species as the unconstrained ordination (Table 5.10; Appendix Figure E.2). In particular, the reference areas scored low on PC1 and Calcite Index, while areas in the lower study area scored high. All constituents loaded positively on PC1, consistent with low stressor concentrations in reference areas. The RDA model constraining BIC by habitat explained 35.2% of the variation in the community and also showed a similar pattern to the unconstrained ordination, albeit with the axis flipped in direction (Appendix Figure E.3). Following the habitat vectors suggests the reference areas were differentiated by a small catchment area, narrower bank-full width, lower proportional forest cover, larger and more varied substrates, shallower depths, and lower field cover (relative to the remaining sites in the Fording). The narrow bank-full width is likely particularly important in sustaining the shredder taxa in these streams, as it suggests a narrower floodplain and more vegetation contributing organic material to the stream. The lower reaches (i.e., RG_FO22, RG_FODPO and RG_FOUEW) have smaller, and more uniformly sized substrates, indicative of lower long-term velocities at these sites, as well deeper channels with proportionally more field cover in the catchment. These deeper and slower moving sites promote a more distinct benthic community of bivalves and worms as organisms preferentially feeding on algae and aquatic macrophytes. The remaining areas have substrate sizes and depths similar to the reference areas, but larger catchment areas, wider bank-full widths, and proportionally higher forest cover, potentially fostering a more diverse benthic community.

The multivariate assessments of BIC constrained by both habitat and stressor variables resulted in very similar patterns between taxa and monitoring areas, and both were similar to the unconstrained ordination. These RDAs were used to partition the variation in the BIC explained uniquely among different groups of predictor variables (i.e., habitat and stressor); and investigate the proportion of variation in BIC that is shared between these groups (Table 5.10). This variance partitioning analysis suggests that 24.7% of the explained variation in BIC is shared between stressor and habitat predictors. This indicates a high degree of covariation between habitat and stressor predictors on the observed BIC communities. It suggests that both stressors and habitat may be the underlying drivers that are structuring BIC differences throughout the study area, and teasing apart the unique effects of either is difficult without more data (either temporally, or external to the watershed). After accounting for the shared variation, habitat and stressors explain 10.4% and 8.8% of the variation, respectively.

Examining the RDA scatterplot of stressor predictors after conditioning out the effects of habitat (and the variation shared between stressors and habitat - i.e. visualizing the 9% of unique variation not shared with habitat), results in no clear pattern differentiating sites

(Appendix Figure E.4). This suggests that after accounting for the shared variation between stressors and habitat, the remaining variation in stressors cannot explain BIC differences between sites. However, at least one site (RG_FOBCP) showed clear temporal patterns between 2018 and 2019. Together, these results highlight the complexity of disentangling habitat and stressor predictors of BIC and the need to incorporate additional data (e.g., from outside the watershed) to interpret the BIC response to mine-related stressors. Overall, RDA analysis demonstrated that both habitat and stressors significantly contribute to overall BIC variation in the FRO LAEMP study area, but due to covariation, elucidating the separate contributions of each type of predictor is difficult.

5.6.3 Lower Study Area

Benthic invertebrate community data from biological monitoring areas between Cataract Creek (RG_FOBCP) and upstream of Ewin Creek (RG_FOUEW) exhibited % Ephemeroptera, and to a lesser extent % EPT, below regional reference normal ranges in September 2019, a result that was consistent with previous years (2015 to 2018; Minnow 2017a, Minnow 2018b, Minnow and Lotic 2018, Minnow and Lotic 2019b).

In 2017 and 2018, a decrease in the total abundance of two Ephemeroptera families (Heptageniidae and Ephemerellidae) was identified as a contributing factor to the observed decrease in % Ephemeroptera (Minnow and Lotic 2018, Minnow and Lotic 2019b). To address this more closely, normal ranges were developed for total abundance metrics, including EPT and Ephemeroptera families (Heptageniidae, Ephemerellidae, and Baetidae). In both 2018 and 2019, none of the abundance metrics were below reference condition; however, normal ranges extended almost to zero in many cases. This likely reflects the greater variability in total abundance metrics compared to relative abundance metrics using a timed kick and sweep method where different samplers kick differently. Despite being within the normal range, Ephemeroptera abundance, along with Ephemerellidae and Heptageniidae abundance, decreased spatially from upstream to downstream similar to % Ephemeroptera. The spatial pattern was especially notable compared to RG_FO26, where Ephemeroptera abundance metrics were consistently higher than their respective normal ranges.

It has become clear through the evaluation of the BIC data in the FRO LAEMP study area that the areas that experience low % Ephemeroptera have a markedly different community structure than those where % Ephemeroptera is within the normal range, and this difference is apparent across seasons even in consideration of natural seasonal variability due to environmental factors (e.g., temperature, resource abundance, photoperiod, discharge; Linke et al. 1999). The reduction in % Ephemeroptera does not appear to co-occur with losses in specific genera (i.e., all genera are present in each area, albeit at lower abundances), but co-occurs with increases in abundances of other taxa which differ depending on the season. Specifically, Nemouridae, a family of Plecoptera, comprises a large proportion of the community at the downstream areas experiencing low % Ephemeroptera in the winter months (Figure 5.12). In June and September, however, these downstream areas have relatively high proportions of the Plecoptera families Capniidae and Perlodidae. The high proportion of Perlodidae in particular, a predator, may be a factor explaining low proportions of Ephemeroptera in these downstream areas, especially if the differences in physical and chemical conditions may already be favoring Plecoptera populations.

As described above, habitat in the lower study consisted of smaller, and more uniformly sized substrates, lower long-term velocities, deeper channels proportionally more field cover compared to other areas, which likely contributed to the community structure. The previous report suggested that areas with % Ephemeroptera below the normal range corresponded to areas that received significant groundwater influence (Minnow and Lotic 2019b). Areas with groundwater influence tend to be warmer in the winter and cooler in the summer, consistent with observations in the FRO LAEMP downstream of the reaches that seasonally dry and are sustained primarily by groundwater over the winter (Section 6.0; Figures 5.14 and 5.15). In addition, groundwater recharge areas starting upstream of RG_FRUPO are known to shuttle mine-exposed water from a sink near Kilmarnock Creek upstream, leading to water chemistry that may differ from immediately upstream (SNC Lavalin 2019).

Redundancy analysis suggested that the variability in BIC in the lower study area due to stressors (i.e., water quality, calcite) cannot be easily distinguished from the variability due to habitat. This is primarily due to the fact that habitat and stressors seem to vary along the same gradient. It does not suggest that water chemistry or calcite are not important predictors of BIC, but that they co-vary with habitat predictors, and that removing the component of variation that is shared between stressors and habitat means removing the explanatory power associated with those predictors.

Chronic toxicity tests were used to determine effects of water quality constituents on health, reproduction and survivability of aquatic organisms. Chronic toxicity results from water collected at FR_FRABCH, located just upstream of Chauncey Creek and downstream of RG_FO22, thus representative of monitoring areas in the lower study area have shown variable toxicity, with the majority of tests (11 of 15) indicating no adverse response (Golder 2020b) in that particular location. Correlations analysis demonstrated no water quality constituent contributing to observed responses in *P.subcapitata, O. mykiss,* and *P. promelas*; however, nitrate was identified as a potential contributor to observed responses in *C. dubia* and *H. azteca.* The results suggest that water chemistry, especially at the more mixed area FR_FRABCH, leads to fewer and lower magnitude responses in the organisms used in chronic toxicity tests; extrapolation from the laboratory to communities in the upper Fording River is challenging due to the presence of different organisms and other factors that influence benthic invertebrate communities (e.g., calcite, substrate).

5.6.4 Upper Study Area

Percent EPT, % Ephemeroptera, and % Plecoptera were below the normal range at RG_MP1 in 2019 for the first time in recent years (Appendix Figures B.5 to B.7). In addition, % EPT was below the normal range at RG_FOUSH and RG_FOUKI, the two monitoring areas downstream of RG_MP1, and was lower than previous years at RG_FOUSH (Appendix Figure B.5). Total abundance and LPL richness at these areas, however, were within the normal range in 2019 (Figure 5.1). When seasonal changes in composition were examined, the composition of the BIC at RG_MP1, RG_FOUSH, and RG_MP1 was similar to areas in close proximity (e.g., RG_FOUNGD and RG_FODNGD) in June 2019 but diverged in September 2019, predominantly at RG_MP1. Of particular note was the marked increase in the relative abundance of individuals belonging to Family Chironomidae, which is known to be tolerant of anthropogenic influences and is typically most abundant in areas with finer sediment composition (Pinder 1986). Sediment samples were not collected at RG_MP1 or RG_FOUSH in 2019, however, CABIN pebble counts did not support a shift toward smaller substrate size at those locations. Visual inspection of routine and concurrent water quality data did not identify any differences in concentrations of key mine-related constituents in 2019 compared to previous years; however, statistical analysis on temporal trends could not be completed due to an insufficient number of water quality samples at the associated water quality monitoring station. In addition, only 2018 had enough water quality data for RG_MP1 to be included in the RDA (Section 5.6.2), thus potential drivers of the change in BIC in 2019 could not be further examined using multivariate approaches. The highest benthic invertebrate tissue selenium concentrations in the FRO LAEMP study area were found between RG_FOUKI and RG_FOBCP, corresponding with the highest concentrations of reduced selenium, however, these areas were not below normal range for % Ephemeroptera.

5.6.5 Area(s) With Seasonal Drying

A detailed description of the sections of the Fording River that dry seasonally is provided in Section 6. Substantial dry sections were observed in the winter of 2018 to 2019 that extended from downstream of RG_FOUKI to upstream of RG_FRUPO starting in September 2018 and reconnecting in March 2019. This contrasted with the previous year, where only one section between downstream of RG_FOBCP and upstream of RG_FRUPO dried during December 2017 and March 2018 (Minnow and Lotic 2018).

There is still relatively little known about the effects of seasonal drying on the benthic invertebrate community, thus an additional investigation is being conducted in 2020 to more specifically address that question (i.e., the recolonization study; Minnow 2019). In September 2019, % Ephemeroptera was below the normal range at RG_FRCP1SW, the monitoring area within the most downstream dry section, and relative composition of taxa was similar to areas in close proximity, including RG_FRUPO located downstream in the section that does not dry seasonally. In general, the Hyporheic to Benthic Index was highest in the areas between RG_FOUKI and RG_FRCP1SW that either dry or freeze in the winter, suggesting more burrowers in the areas where winter ice conditions are the greatest.

Percent EPT at RG_FOBCP, located at the Compliance Point and within the drying reach, was lower in 2019 compared to previous years. In the winter of 2018 to 2019, the Fording River dried upstream and downstream of Cataract Creek, resulting in flows in the mainstem consisting of primarily Cataract Creek flows during the winter months, including at RG_FOBCP. RDA analysis identified RG_FOBCP as the only area where BIC showed a clear temporal pattern once the variation due to habitat and stressors that co-varied with habitat were removed, suggesting that water chemistry was indeed a contributing factor in the change in BIC. This was supported by the chronic toxicity results at FR_FRCP1 (co-located with RG_FOBCP), in particular in Q1 of 2019 when three out of four tests suggested likely adverse responses (Golder 2020b). Further, the benthic invertebrate selenium concentrations were above the upper limit of the normal range for all three replicates in February.

5.6.6 Summary

Both habitat variables and mine-related stressors are factors influencing the BIC in the FRO LAEMP study area, and that not one explanation can be fit to all areas. The lower section of the study area, between RG_FRUPO and RG_FOUEW upstream of Ewin Creek has seen consistently low proportions of Ephemeroptera since 2015, an effect that is likely driven by the combined influence of both water chemistry and habitat differences compared to the rest of the study area. The changes in BIC in 2019 at RG_MP1 are less clear, as habitat is similar to other areas of the watershed, and water analysis was limited due to a low sample size at that area. In contrast, benthic invertebrate community changes in 2019 at RG_FOBCP appeared to be related to water chemistry, likely a result of increases in mine-related constituents in the water in winter 2018 to 2019 due to seasonal drying (Section 6). The current report has furthered the understanding of the BIC in the FRO LAEMP study area and provided significant information to help answer study question 6.

6 STUDY QUESTION 7

6.1 Overview

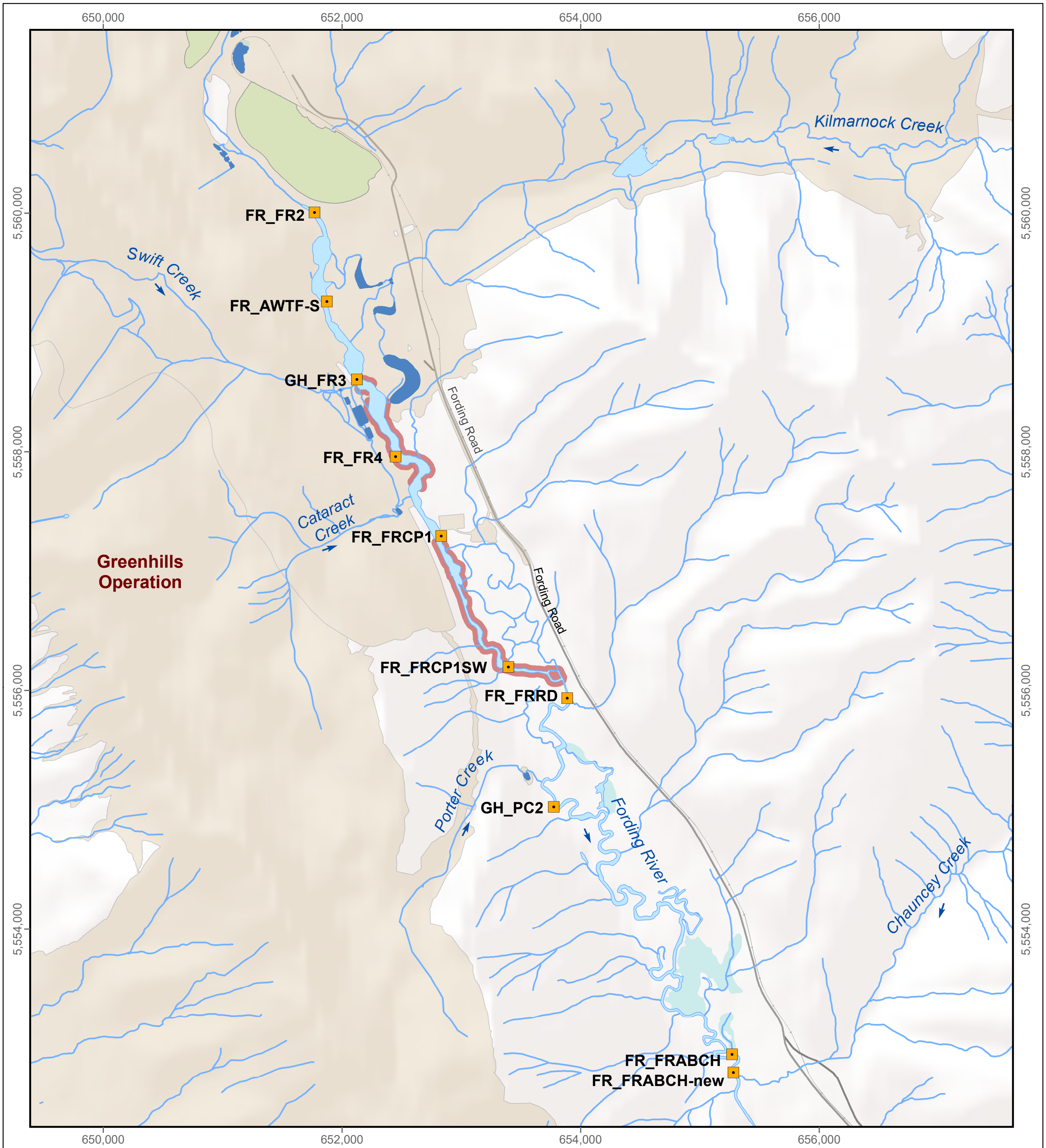
Specific reaches of the upper Fording River on FRO property are known to seasonally dry during fall/winter low flow conditions. To address study question #7 (What is the benthic invertebrate community structure in the reach of the Fording River that goes dry, and can changes be correlated with flow conditions?), Teck has been conducting baseline flow, temperature and hydrological monitoring since 2017 (Figure 2.2; Table 2.4).

The 2017 FRO LAEMP report described a 1.5 km dry section downstream of the FRO Compliance Point (FR_FRCP1) to just upstream of FR_FRRD from December 2017 to March 2018 (Minnow and Lotic 2018), encompassing one FRO LAEMP biological monitoring area (RG_FRCP1SW). In 2018, the same section was observed to dry, as well as a second section in the vicinity of FR_FRCP1. Together these form the southern drying section.

In late October 2019, a second section was added to the monthly survey in what is referred to as the northern section. The northern drying section was first identified to occur on the Fording River around Fish Pond Creek to Henretta Creek confluence, including the Turnbull Bridge area (McPherson and Robinson (2011). The limits of the northern survey section were set to include the described area and extending to, cover a 6.1 kilometer (km) section of the Fording River from the Multiplate culvert (FR_MUTLIPLATE) upstream past the confluence with Henretta Creek (FR_UFR1). The following report sections describe data collected in 2019. When possible (i.e., not frozen or dry) BIC was also assessed within the areas that dry to address the study question, as well as study question #6 (Section 5).

6.2 Seasonal Surveys of Dry Sections

Monthly surveys continued in January 2019 and were completed in each month (except July) of 2019 to provide one complete year of observations regardless of the status of dry sections, and to include May and June to capture high discharge measurements. The dry section found between FR_FRRD and FR_FRCP1SW displayed a cyclical drying/rewetting period from approximately September 8 to October 2, 2018 when it remained consistently dry into 2019. (Figure 6.1). The dry section detected between FR_FRCP1 and FR_FR4 in November 2018 was observed in January, February and March 2019, and had increased in size to approximately 2 km in length and included the level logger at FR_FR4 (Figures 6.1 and 6.2). This section was observed to be fully wetted and flowing during the site visit on April 9, 2019. The level logger installed at FR_FRCP1SW was one of the loggers that corrupted over winter 2019 and as such the date of re-watering could not be identified in a logger record. However, as the monthly LAEMP survey conducted on March 12, 2019 confirmed this section as dry, and an additional visit



Drying Surveys in South Section of Fording LAEMP, January 2019

Projection: North American Datum 1983 UTM Zone 11 U
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Date: May 2020
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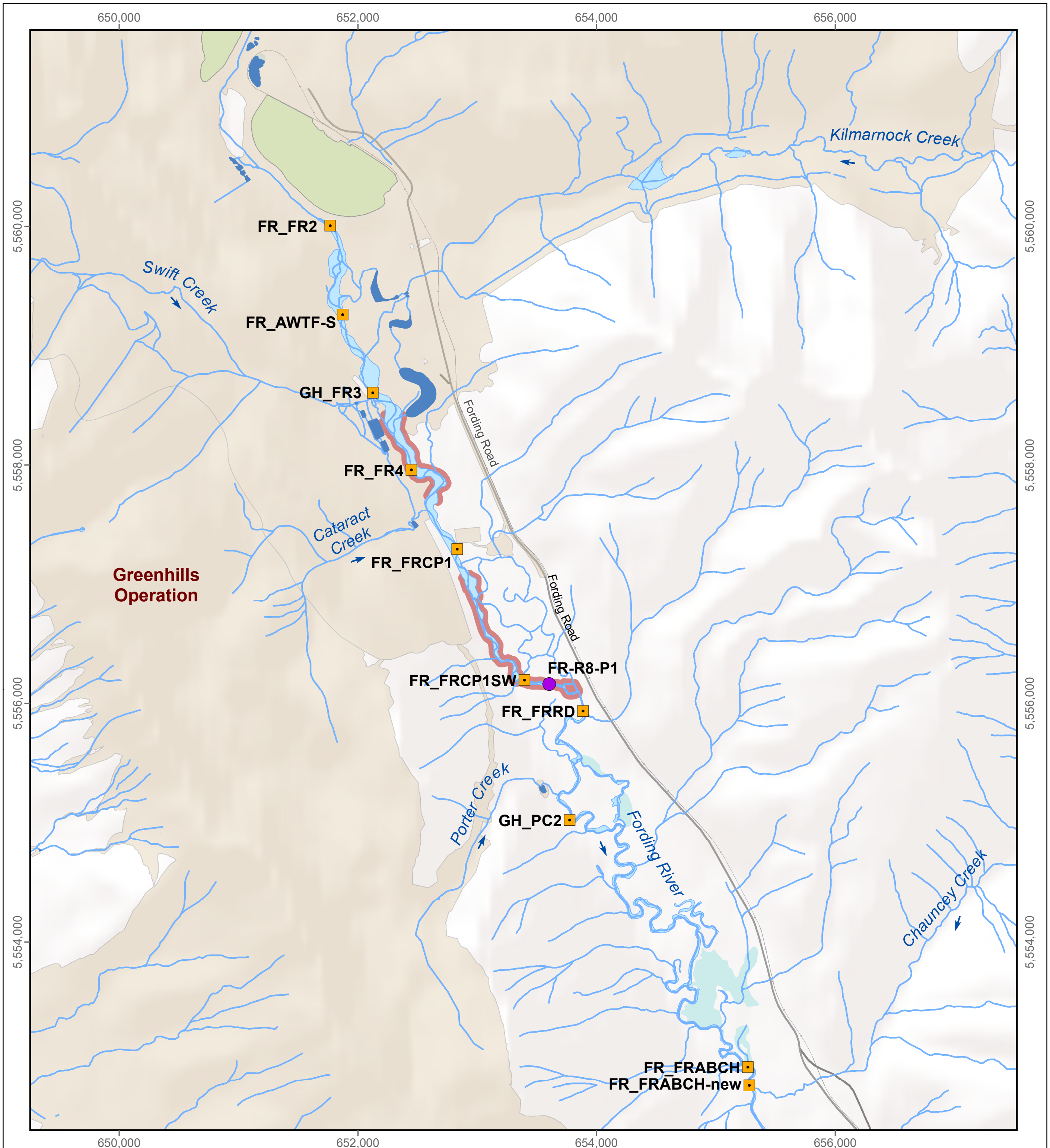
Figure 6.1

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 6.1 FRO Dewatering - Jan.mxd



LEGEND

- Pool
- Continuous Logger Station
- Settling Pond
- Tailings Pond
- Dry Section
- Teck Coal Mine Operation

Note: Pool present in February only.

Drying Surveys in South Section of Fording LAEMP, February and March, 2019

0 0.5 1 2 km

Projection: North American Datum 1983 UTM Zone 11 U
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minnow environmental inc.

Figure 6.2

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 6.2 FRO Dewatering - Feb-March.mxd conducted by FRO staff found the section rewetted on March 19, 2019, the rewetting period occurred within an eight day window.

The southern section remained wetted throughout summer and fall of 2019 (Figure 6.3), showing higher baseflow conditions than observed in 2018. The primary drying section located around FR_FRCP1SW still had flow observed during a survey on December 18 to 20, 2019, however, significant ice cover was present.

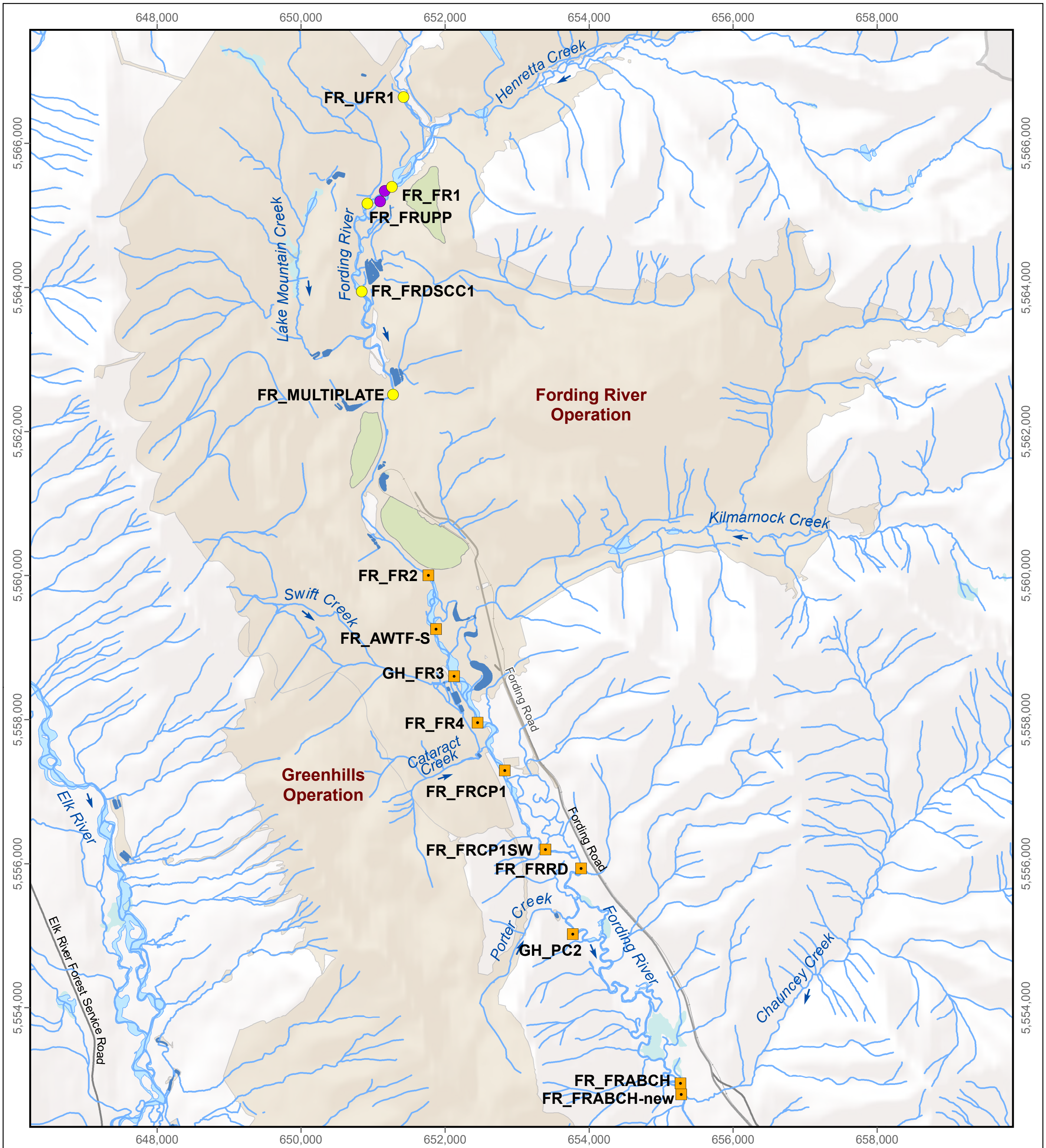
Drying surveys commenced in the northern section on October 21, 2019 and continued throughout the remainder of 2019. Two dry sections separated by a short, isolated pool were reported on November 19, 2019 (Figure 6.4). The sections were 173 m and 136 m long, with isolated pools of 25 and 50 m^2 surface area. This section expanded to connect as one section approximately 300 m long by December 10, 2019 and remained between 300-350 m in length for the remainder of the year (Figure 6.5).

6.3 Temperature

The water temperature loggers were used to plot daily low, mean, and maximum temperatures from October 2017 to October 2019 (Appendix Figures F.1 to F.15). The 2017 FRO LAEMP data (Minnow and Lotic 2018) indicated three distinct overwintering thermal regimes. These were again observed with FR_FR2, FR_FRCP1SW, and FR_FRABCH demonstrating examples of areas with lower groundwater contribution but year-round surface flows (i.e., upper study area), seasonal drying, and areas of higher groundwater contribution (i.e., lower study area), respectively. A notable observation in 2017 to 2019 temperature record was February 2019. During this month, all water level loggers were suspected to have frozen in ice, which was not observed previously and extended from FR_FRABCH upstream to FR_FRNTP. On its own, over this short period of record, it is not possible to discuss the frequency of such an occurrence or the context of how extreme this event was; however, assessment of the climatic record from the Sparwood, BC Environment Canada climate station indicated that February 2019 was an extreme atypical of the area. Data acquired from Environment and Climate Change Canada indicated that mean daily temperatures for February 2019 fell below the minimum daily temperatures for February from a 39-year record (Figure 6.6). From this, it was determined that water temperature and ice cover (i.e. thickness) during winter of 2017 to 2018 was more typical than what was observed during winter of 2018 to 2019.

6.4 Water Level and Flows

Continuous water level data were collected and corrected for barometric pressure from October 2017 to November 2019. Stage-discharge relationships were developed in this report for the first time in this project owing to a more robust set of stage-discharge data at each station.



LEGEND

- Pool
- Continuous Logger Station
- Water Quality Monitoring Station
- Settling Pond
- Tailings Pond
- Teck Coal Mine Operation

Drying Surveys in Southern and Northern Section of Fording LAEMP, August 2019 to October 2019

0 1 2 4 km

N W E S

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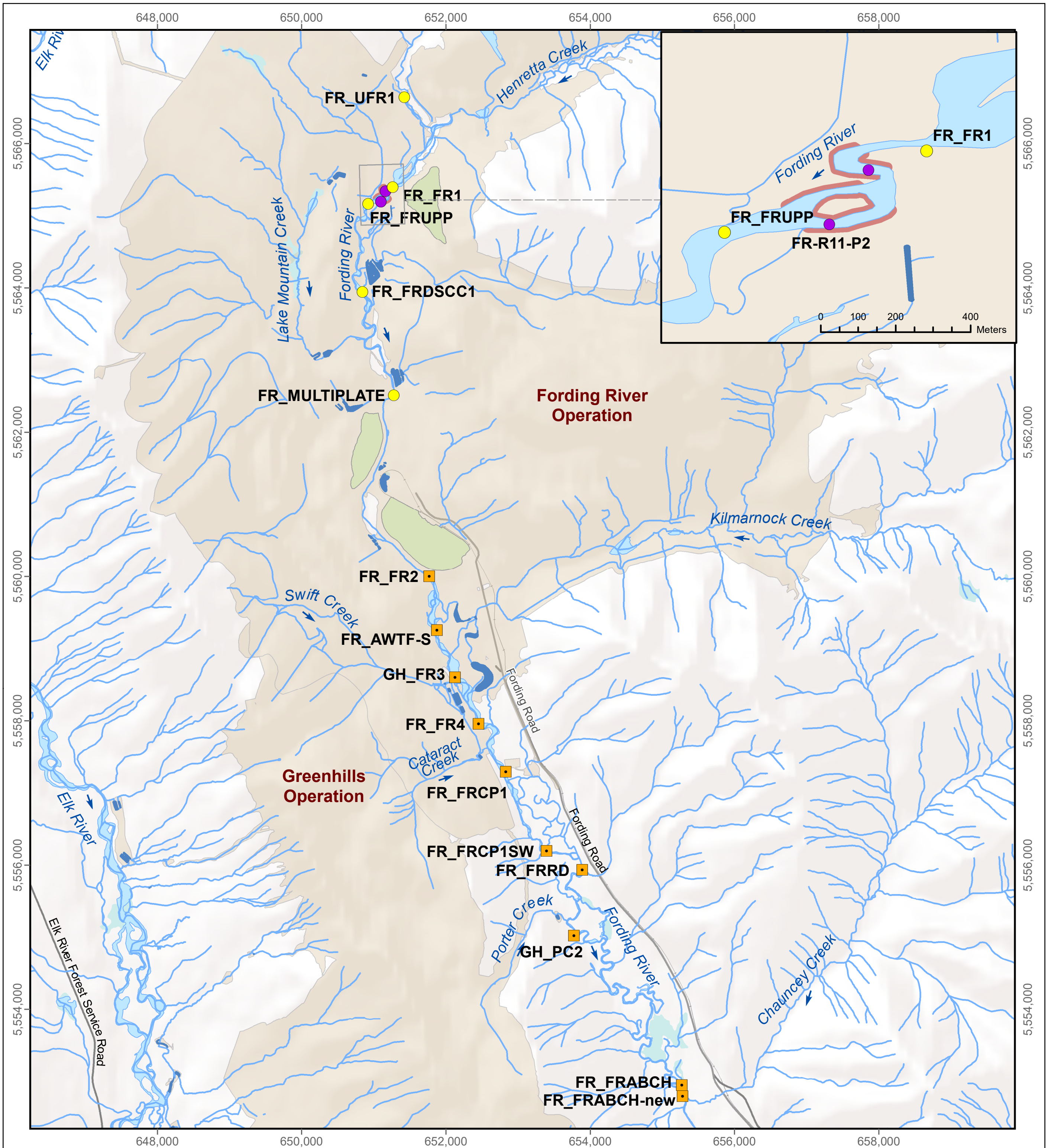
Figure 6.3

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 6.3 FRO Dewatering - AUG-OCT.mxd



LEGEND

- Pool
- Continuous Logger Station
- Water Quality Monitoring Station
- Settling Pond
- Tailings Pond
- Dry Section
- Teck Coal Mine Operation

Drying Surveys in Southern and Northern Sections of Fording LAEMP, November 2019

0 1 2 4 km

N W E S

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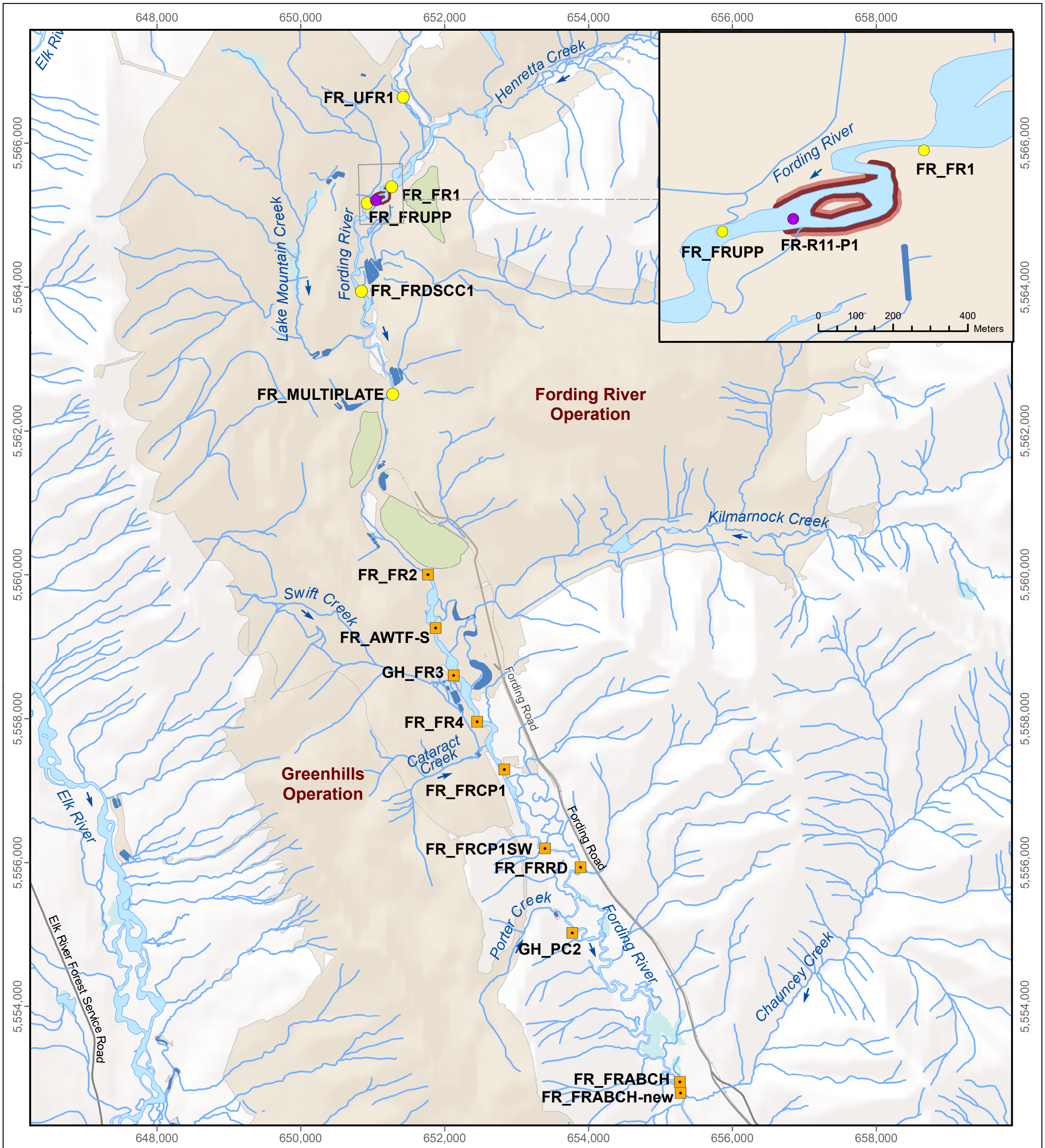
Figure 6.4

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 6.4 FRO Dewatering - Nov.mxd



LEGEND

- Pool
- Continuous Logger Station
- Water Quality Monitoring Station
- Settling Pond
- Tailings Pond
- Dry Section - December 9-12
- Dry Section - December 18-20

Drying Surveys in Southern and Northern Sections of Fording LAEMP, December 2019

0 1 2 4 km

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Figure 6.5

Document Path: S:\Projects\197202\197202.0004 - Teck FRO LAEMP 2019\4 - GIS\LAEMP Report\19-04 Figure 6.5 FRO Dewatering - Dec.mxd

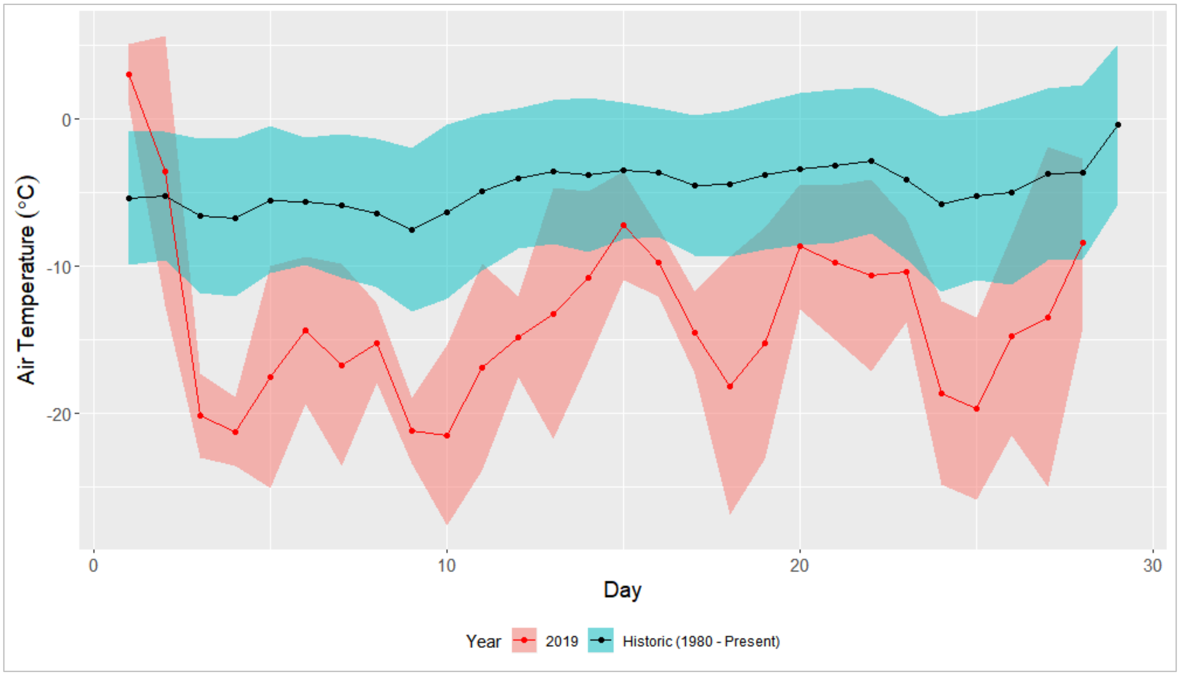

Figure 6.6: Sparwood Air Temperatures in February 2019 Compared to Historical Values, FRO LAEMP, 2019

For each hydrometric station, a log-linear stage-discharge curve was generated using manual stage and discharge measurements. Stage (m) and Discharge (m^3/s) values were initially manually verified and measurements with suspected errors or high uncertainty were removed from further analyses. All stage measurements below 0.001 m were treated as 'dry' and were excluded. Benchmarks were checked for each site, and shifts were corrected. The water level record was also verified by comparing to manual measurements and spikes and other erroneous readings were cleaned and shifts due to relocation of loggers were corrected.

Once stage-discharge curves were generated for each hydrometric station, discharge was calculated from hourly stage records. Hourly discharge and stage were compared against corresponding manual observations in order to calculate the Offset (m), Absolute Error (m^3/s), and the mean Relative Error (Absolute Error divided by Measured Flow; %). Results for each site are provided in Table 6.1.

Table 6.1: Summary Table of Error Statistics for Hydrometric Stations, FRO LAEMP, 2019

Site	Number of Measurements	Mean Measured Flow (m^3/s)	Max Measured Flow (m^3/s)	Mean Absolute Error (m^3/s)	Mean Relative Error (%)	Percent Extrapolated (%)
FR_FR2	18	1.2	5.68	0.3	22%	1%
FR_AWTF-S	14	1.75	7.24	0.52	29%	0%
FR_FR4	13	1.63	7.19	0.27	35%	4%
FR_FRCP1	16	1.14	8.38	0.5	33%	3%
FR_FRCP1SW	12	1.66	7.24	0.46	80%	5%
FR_FRRD	17	1.29	7.67	0.17	17%	5%
GH_PC2	18	1.13	4.63	0.08	15%	8%

6.5 Correlations to Regional Station

As an additional check in data quality control, all daily streamflow records were compared against the preliminary streamflow data from the Fording River at North Tailings Pond hydrometric site (FR_FRNTP; Kerr-Wood Leidal, 2019). All hydrometric sites were highly correlated with each other and with the Fording River at North Tailings Pond station; r^2 values ranged from 0.84 at FR_FRCP1SW to 0.94 at FR2 (Figure 6.7), with similar values during ice-free periods (April-October). The relationship between the hydrometric sites and FR_FRNTP appear to be non-linear. However, there is meaningful uncertainty in the stage-discharge curves for these sites, in particular at high flows, and this may affect the linearity of the curves. In addition, there appears to be a difference in relationship between calendar years at some sites (notably FR_FRRD and

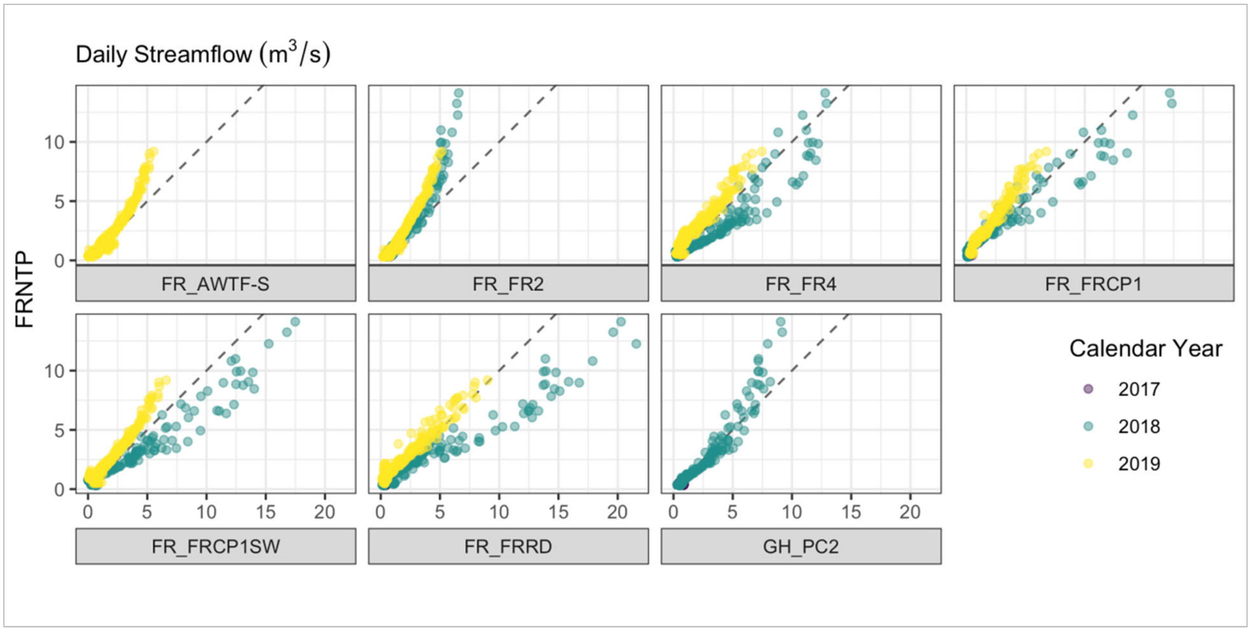

Figure 6.7: Scatter Plot for All Hydrometric Gauges Against Fording River at North Tailings Pit (FR_FRNTP) KWL Hydrometric Station, FRO LAEMP, 2019

FR_FRCP1SW), suggesting that either there was an undetected shift in the logger record or that the stage-discharge curve would benefit from additional points to refine high water level discharge estimates.

6.6 Summary

The seasonal drying surveys and associated flow and temperature monitoring provided highly valuable insight to environmental conditions in the upper Fording River. Specifically, this component of the FRO LAEMP has documented not only the spatial variability in instream conditions, but also the temporal variability as captured during the extreme cold event of February 2019 and the contrasting timing of drying demonstrated by 2018 and 2019. While general spatial extent and hydrological timing of drying (i.e., occurring at the same point in the hydrograph; baseflow) in the upper Fording River are annually similar, monitoring has shown that drying can vary by up to four months between years in the same section. Furthermore, the implications of the extreme cold event have not been assessed in terms of habitat condition and availability for biota within the upper Fording River system.

To address the biological component of study question 7, the BIC was assessed at RG_FRCP1SW, RG_FOBSC and RG_FOBCP, in June and September by comparing community metrics to normal ranges (September only) and assessing the community in the dry sections in relation to permanently wetted areas included in the FRO LAEMP as well as reference areas. Key BIC metrics (i.e., Abundance, % EPT, % Ephemeroptera) in areas that dried in early 2019 were generally within the normal range in September (Figures 5.1 and 5.2), except for % EPT at RG_FOBCP and % Ephemeroptera at RG_FRCPISW. The areas known to dry in winter show seasonal data for abundance, % EPT, and % Ephemeroptera that has similar patterns, abundances, and relative abundances to other areas that are permanently wetted (Appendix Figure B.20, B.22, and B.23; further discussion in Section 5.6.5). Drying alone in the previous winter is unlikely to impact communities in summer given the timeframe for recolonization. In areas with seasonally predictable drying, recolonization of benthic invertebrate communities tends to occur quite rapidly (e.g., <2 months; Wallace 1990), but the 2020 recolonization study outlined in the 2019 to 2020 FRO LAEMP study design will help address study question 7 more directly.

7 CONCLUSIONS AND RECOMMENDATIONS

Baseline monitoring for the pre-commissioning of the FRO AWTF-S continued in 2019. Nitrate concentrations in the upper Fording River study area were consistently below model projections during average flow conditions in 2019; however, % Ephemeroptera was below normal range at many areas experiencing the highest nitrate concentrations, and negative correlations were identified between nitrate and several individual BIC endpoints (i.e., % Ephemeroptera, Ephemeroptera abundance, Family CA1). Baseline data for study questions 2 and 3 have so far indicated no consistent temporal or spatial pattern of increased or decreased productivity or benthic invertebrate tissue selenium concentrations. Baseline data for study questions 2 to 5 will continue to be collected until FRO AWTF-S is commissioned in Q1 of 2021.

The results of the 2019 FRO LAEMP identified a spatial decrease in % Ephemeroptera from upstream to downstream, between downstream of Cataract Creek and upstream of Ewin Creek, consistent with previous LAEMP reports. Contrary to previous years, low % EPT, % Ephemeroptera, and % Plecoptera were identified in the upper watershed as well, downstream of the Multiplate culvert to downstream of the North Tailings Pond. Further evaluation of the BIC in areas with low % Ephemeroptera determined that the changes were related to a substantial shift in the community structure, rather than simply the loss of taxa. Correlation analyses into the effects of stressors on BIC determined that BIC endpoints correlated strongly and negatively with one or more key water quality constituents (nitrate, nitrite, total selenium, total nickel, sulphate, total dissolved solids, PC1 and PC2), except for % Plecoptera, which correlated positively with nitrate, total selenium, sulphate and total dissolved solids. Redundancy analysis demonstrated strong co-variation between habitat and stressor variables. After accounting for the shared variation between stressors and habitat, the remaining variation in stressors could not explain BIC differences between monitoring areas, however, this does not indicate that stressors are not important predictors, only that removing the component of the variation shared by both stressors and habitat also removed the explanatory power of those predictors. Overall, both habitat and stressors appear to be important predictors of BIC within the study area but the individual contributions are difficult to elucidate. The complex interactions between stressors and habitat will continue to be explored in future LAEMP reports.

Drying surveys in the FRO LAEMP have identified both spatial variability in instream drying conditions, but also temporal variability in drying as captured during the extreme cold event of February 2019 and the contrasting timing of drying demonstrated by 2018 and 2019. While general spatial patterns and hydrological timing of drying (i.e. occurring at the same point in the hydrograph; baseflow) in the upper Fording River are annually similar, monitoring has shown that drying can vary by up to 4-5 months between years in the same section.

It has become increasingly clear that both habitat and mine-related stressors are factors influencing the BIC in the FRO LAEMP study area, and that not one explanation can be fit to all areas. Following discussion with the EMC in March, 2020, and based on interpretation of 2019 results, the following recommendations are made to continue to support the FRO LAEMP during the 2019 to 2020 cycle:

- Explore new and/or additional ways of separating the effects of water quality from the effects of habitat on BIC (e.g., site-specific habitat adjusted normal ranges being developed for the RAEMP [Minnow 2020a, in preparation])
- Complete the investigation of BIC recolonization in the section(s) of the upper Fording River that dry to help support study question 7.
- Conduct sampling post-commissioning of FRO-AWTF-S consistent with LCO LAEMP study design (Minnow 2018d, Minnow 2019; i.e., composite tissue samples, water quality samples, including selenium speciation at 0th, 4th, 8th, 12th week from commissioning)

The 2019 to 2020 FRO LAEMP cycle includes biological sampling in June, September, and December to add to the understanding of seasonal variation and to continue to monitor changes in BIC both spatially and over a longer time period. February 2021 sampling is being added to assess post-commissioning conditions downstream of FRO AWTF-S.

The results from the 2019 FRO LAEMP report and adjustments made based on the AMP response framework are summarized in Table 7.1. The work completed under the 2019 FRO LAEMP provides supporting information to help answer Management Question 5 and to support Management Question 2 from Teck's Adaptive Management Plan (Teck 2018).

Table 7.1: Summary of Findings, Responses and Adjustments Related to the FRO LAEMP in 2019

Program Name	Study Question(s)	Data Evaluation Process	Outcome(s)	Responses & Adjustments in 2019	EMC Engagement
FRO LAEMP	Are nitrate concentrations increasing, and if so, are they adversely affecting biota?	Evaluate nitrate concentrations relative to projections in the EVWQP. Determine if benthic invertebrate community endpoints are outside of reference condition or moving away from the reference condition in accordance with observed nitrate concentrations. Determine if benthic invertebrate community results correspond with expectations based on nitrate concentrations in water relative to the site-specific benchmark for nitrate.	Nitrate concentrations at GH_FR1 have been consistently lower than model projections under normal flows and are not projected to increase. Key BIC endpoints (% Ephemeroptera, % EPT) were outside the normal range at RG_MP1, and at RG_FRCP1SW to RG_FOUEW; however, nitrate concentrations were above EVWQP Level 1 benchmarks at all stations except for FR_FR1. While % Ephemeroptera and % EPT were below normal range at more areas this year compared to last year, these changes were not concurrent with changes in nitrate concentrations.	- Study design was updated for 2019, by: a) retaining sampling periods in June and December to characterize seasonal changes in benthic community structure; and b) adding sampling in February 2019 to understand the potential effects of increased flow from Cataract Creek associated with upstream drying.	- Draft data package of 2017 results submitted to EMC Feb 15, 2018; Additional results for early 2018 presented May 3 and submitted October 23, 2018 - Report of 2017 results submitted to ENV/EMC May 31, 2018 - 2018 Study design submitted to ENV/EMC May 31, 2018 - In-person meetings on Feb 22 and May 2; and conference call on March 27, 2018 - Written input from EMC received between June 1 and July 18, 2018 - Draft data package of additional 2018 results submitted to EMC March 22, 2019 and discussed at in-person meeting March February 22, 2019 -Report of 2018 results submitted to ENV/EMC May 31, 2019 -Second FRO LAEMP study design (2019-2020) submitted May 31, 2019 -Written input from 2018 FRO LAEMP report received July 2019 -Draft data package of 2019 FRO LAEMP report data submitted March 3, 2020 -Written input from 2019 FRO LAEMP data package received March 17, 2020

Table 7.1: Summary of Findings, Responses and Adjustments Related to the FRO LAEMP in 2019

Program Name	Study Question(s)	Data Evaluation Process	Outcome(s)	Responses & Adjustments in 2019	EMC Engagement
FRO LAEMP	Is active water treatment affecting biological productivity downstream in the Fording River? Are tissue selenium concentrations reduced downstream from the AWTF? Is AWTF operation affecting aquatic biota through thermal effects or concentrations of treatment-related constituents other than nutrients or selenium? Is re-direction of water potentially affecting biota in the Fording River?	AWTF has not yet been commissioned. Data collection in 2019 continues to represent pre-AWTF conditions to provide a baseline for comparison of observations after AWTF operation begins.	Data were summarized and reported.	-RG_SCOUTDS was added in vicinity of where the FRO AWTF-S outfall is expected to be located to determine baseline conditions -RG_FOUCL was added in vicinity of where the FRO north treatment plans are expected to be located to determine baseline conditions - Selenium speciation sampling was added to determine baseline selenium species and concentrations throughout the study area	-

Table 7.1: **Summary of Findings, Responses and Adjustments Related to the FRO LAEMP in 2019**

Program Name	Study Question(s)	Data Evaluation Process	Outcome(s)	Responses & Adjustments in 2019	EMC Engagement
FRO LAEMP	What are the factors contributing to the variations in percent Ephemeroptera?	Determine if benthic invertebrate community endpoints, particularly Ephemeroptera and associated families, are outside of reference condition or moving away from the reference condition. Determine if benthic invertebrate community composition can elucidate habitat differences in FRO LAEMP study area. Investigate connection between benthic invertebrate community and water chemistry, benthic invertebrate tissue chemistry and sediment chemistry. Use habitat and water quality variables to determine their effects on benthic invertebrate community.	The most downstream study areas in the upper Fording River had % Ephemeroptera below the normal range. In 2019, those areas included RG_FRCP1SW to RG_FOUEW, but for the first time during the FRO LAEMP study period RG_MP1 was also below normal range. Areas having low % Ephemeroptera had low abundances of Ephemerellidae and Heptageniidae, and had significantly different community composition in these areas across all seasons. Specifically, they were dominated by Nemouridae in winter months, and Perlodidae and Capniidae in summer months. RG_MP1, RG_FOUSH, and RG_FOUKI, however, experienced a significant shift in September (compared to previous months and upstream locations) towards a large proportion of Chironomidae. Contrary to 2018, habitat parameters did not correlate strongly with key BIC endpoints (% Ephemeroptera, % Plecoptera, % EPT, CA1 and CA2); however, there were significant correlations (% Ephemeroptera; Calcite Index, Calcite Presence, embeddedness, and D84). Key water quality constituents (nitrate, nitrite, total selenium, total nickel, sulphate, and total dissolved solids) were strongly correlated with the key BIC endpoints, and those correlations were negative except for % Plecoptera, which was positively correlated. Redundancy analysis identified significant covariation of stressors and habitat variables (24.7%) on BIC. After removing the shared variation between stressors and habitat variables, stressor and habitat only accounted for 8.8 and 10.4% of the BIC variability, respectively. The BIC variation explained by stressors does not explain the BIC differences between sites. Areas having elevated levels of selenium tissue concentrations, sediment metals concentrations and sediment PAH concentrations were not the areas exhibiting % Ephemeroptera below the normal range.	-Included additional BIC endpoints in correlation analysis, including percent and abundance of Plecoptera and EPT, and abundance of Ephemeroptera -Redundancy analysis was added to use a multivariate approach to determine what factors (water quality or habitat) may affect BIC community the most	-

Table 7.1: Summary of Findings, Responses and Adjustments Related to the FRO LAEMP in 2019

Program Name	Study Question(s)	Data Evaluation Process	Outcome(s)	Responses & Adjustments in 2019	EMC Engagement
FRO LAEMP	What is the benthic invertebrate community structure in the reach of the Fording River that goes dry, and can changes be correlated with flow conditions?	- Determine if benthic invertebrate community endpoints are outside of reference condition or moving away from the reference condition in accordance with drying in sections of upper Fording River.	Key BIC endpoints (Abundance, % EPT, % Ephemeroptera, etc.) were generally within the normal range at areas (RG_FRCP1SW, RG_FOBSC, RG_FOBCP) that went dry in winter 2018-2019, except % Ephemeroptera at RG_FRCP1SW and % EPT at RG_FOBCP.	-drying surveys extended to northern section of upper Fording River -survey frequency increased to twice per month (began in October 2019 in northern section and December 2019 in southern section	-

ATWF = Active Water Treatment Facility; LAEMP = Local Aquatic Effects Monitoring Program; EMC = Environmental Monitoring Committee; ENV = Ministry of Environment and Climate Change Strategy; FRO = Fording River Operation

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APPENDIX A
QA/QC REPORTS

APPENDIX A DRYING SURVEY HYDROMETER QA/QC

Data were graded according to RISC standards, which is presented in Table H.1. The data are generally of modest quality. Instrumentation and field procedures were of good quality and followed recommended guidelines. Manual flow measurements had 20 panels, while the largest panel typically contained roughly 10-15% of the flow, which falls under a 'C' grade, but should be noted as still relatively reliable measurements. Discharge rating accuracy was relatively modest for many sites. This is due to two factors; a lack of high and medium flow points to construct the curve, and only measurements from one freshet period. No high-flow measurements were conducted during the 2018 freshet period and therefore only 2019 high flows were used to derive the relationship. Since the 2019 freshet was much lower than 2018, much of the upper observed points cannot be constrained and there are likely substantial under-estimates of highest water level discharge values due to the fit of the curve.

Table A.1: RISC Standards for Seven Hydrometric Stations

Station	FR_FR2	FR_AWTF-S	FR_FR4	FR_FRCP1	FR_FRCP1SW	FR_FRRD	FR_GHPC2
Instrumentation							
Meter calibration	A	A	A	A	A	A	A
Meter field verification	A	A	A	A	A	A	A
Water level gauge type	A	A	A	A	A	A	A
Water level gauge sensor accuracy	B	B	B	B	B	B	B
Field Procedures							
# Bench Marks	A	A	A	A	A	A	A
# Manual Flow Measurement Panels	C	C	C	C	C	C	C
# Manual Flow Measurements per Year	A	A	A	A	A	A	A
# Level checks per year	B	B	B	B	B	B	B
Data Calculation and Assessment							
Discharge Rating accuracy	C	C	C	C	E	B	C
Reviewed for anomalies	A	A	A	A	A	A	A
Stations/years compared as check	A	A	A	A	A	A	A

Methods and QC Report 2018

Project ID: Teck FROLAEMP Batch 4

Client: Minnow Environmental

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Sample Reception

In December, 2018, Cordillera Consulting received 21 samples from Minnow Environmental. When samples arrived at 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

Site	Sample	Site Code	CC#	Date	Size	# of Jars
Batch 4 2018	RG_FOBCP-BIC01	RG_FOBCP-BIC01	CC192963	12/3/2018	400µM	1
Batch 4 2018	RG_FOBCP-BIC02	RG_FOBCP-BIC02	CC192964	12/3/2018	400µM	1
Batch 4 2018	RG_FOBCP-BIC03	RG_FOBCP-BIC03	CC192965	12/3/2018	400µM	1

Batch 4 2018	RG_FOUK1_BIC01	RG_FOUK1_BIC01	CC192966	12/4/2018	400µM	1
Batch 4 2018	RG_FOUK1_BIC02	RG_FOUK1_BIC02	CC192967	12/4/2018	400µM	1
Batch 4 2018	RG_FOUK1_BIC03	RG_FOUK1_BIC03	CC192968	12/4/2018	400µM	1
Batch 4 2018	RG_FOBSC_BIC01	RG_FOBSC_BIC01	CC192969	12/4/2018	400µM	1
Batch 4 2018	RG_FOBSC_BIC02	RG_FOBSC_BIC02	CC192970	12/4/2018	400µM	1
Batch 4 2018	RG_FOBSC_BIC03	RG_FOBSC_BIC03	CC192971	12/4/2018	400µM	1
Batch 4 2018	RG_FODPO_BIC01	RG_FODPO_BIC01	CC192972	12/4/2018	400µM	1
Batch 4 2018	RG_FODPO_BIC02	RG_FODPO_BIC02	CC192973	12/4/2018	400µM	1
Batch 4 2018	RG_FODPO_BIC03	RG_FODPO_BIC03	CC192974	12/4/2018	400µM	1
Batch 4 2018	RG_FRUPO_BIC01	RG_FRUPO_BIC01	CC192975	12/4/2018	400µM	1
Batch 4 2018	RG_FRUPO_BIC02	RG_FRUPO_BIC02	CC192976	12/4/2018	400µM	1
Batch 4 2018	RG_FRUPO_BIC03	RG_FRUPO_BIC03	CC192977	12/4/2018	400µM	1
Batch 4 2018	RG_FOUEW_BIC01	RG_FOUEW_BIC01	CC192978	12/5/2018	400µM	1
Batch 4 2018	RG_FOUEW_BIC02	RG_FOUEW_BIC02	CC192979	12/5/2018	400µM	1
Batch 4 2018	RG_FOUEW_BIC03	RG_FOUEW_BIC03	CC192980	12/5/2018	400µM	1
Batch 4 2018	RG_UFR1_BIC01	RG_UFR1_BIC01	CC192981	12/6/2018	400µM	1
Batch 4 2018	RG_UFR1_BIC02	RG_UFR1_BIC02	CC192982	12/6/2018	400µM	1
Batch 4 2018	RG_UFR1_BIC03	RG_UFR1_BIC03	CC192983	12/6/2018	400µM	1

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

Site	Sample	Date	CC#	400 micron fraction	
				% Sampled	# Invertebrates
Batch 4 2018	RG_FOBCP-BIC01	03-Dec-18	CC192963	20%	425
Batch 4 2018	RG_FOBCP-BIC02	03-Dec-18	CC192964	14%	327
Batch 4 2018	RG_FOBCP-BIC03	03-Dec-18	CC192965	50%	311
Batch 4 2018	RG_FOUK1_BIC01	04-Dec-18	CC192966	5%	741
Batch 4 2018	RG_FOUK1_BIC02	04-Dec-18	CC192967	5%	356
Batch 4 2018	RG_FOUK1_BIC03	04-Dec-18	CC192968	5%	325
Batch 4 2018	RG_FOBSC_BIC01	04-Dec-18	CC192969	50%	394
Batch 4 2018	RG_FOBSC_BIC02	04-Dec-18	CC192970	100%	397
Batch 4 2018	RG_FOBSC_BIC03	04-Dec-18	CC192971	31%	405
Batch 4 2018	RG_FODPO_BIC01	04-Dec-18	CC192972	5%	1566
Batch 4 2018	RG_FODPO_BIC02	04-Dec-18	CC192973	5%	2353
Batch 4 2018	RG_FODPO_BIC03	04-Dec-18	CC192974	5%	2494
Batch 4 2018	RG_FRUPO_BIC01	04-Dec-18	CC192975	5%	1394
Batch 4 2018	RG_FRUPO_BIC02	04-Dec-18	CC192976	5%	2252
Batch 4 2018	RG_FRUPO_BIC03	04-Dec-18	CC192977	5%	762
Batch 4 2018	RG_FOUEW_BIC01	05-Dec-18	CC192978	5%	1021
Batch 4 2018	RG_FOUEW_BIC02	05-Dec-18	CC192979	5%	1432
Batch 4 2018	RG_FOUEW_BIC03	05-Dec-18	CC192980	5%	1513
Batch 4 2018	RG_UFR1_BIC01	06-Dec-18	CC192981	22%	338
Batch 4 2018	RG_UFR1_BIC02	06-Dec-18	CC192982	9%	337
Batch 4 2018	RG_UFR1_BIC03	06-Dec-18	CC192983	5%	532

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

CC #	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
CC192964	327	12	96%
CC192982	337	3	99%
		Average Recovery	97.5%

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 area 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 Error		Accuracy Error	
CC#	Sample Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	By	Time		Min (%)	Max (%)	Min (%)	Max (%)
183122	RG_FODNGD	336	356	348	337	348																KF	645	1725	0.00	5.62	0.87	3.19
183133	RG_FOUEW	405	417	411	413	451	390	478	385	421	407											SQ	1235	4178	0.48	19.46	0.19	14.41
190125	RG_FO22-BIC	329	318	319	336	345	340	325	331	336	338	342	353	329	311	360	324	358	313	342	310	SL	1970	6659	0.00	13.89	0.59	8.12
190129	RG_FOUSH-BIC	464	478	467	478	509	515	510	511	457	446											KF	1060	4835	0.00	13.40	1.14	7.76
191030	RG_FOBCP2_BIC	418	461	389	417	442																MH	545	2127	0.24	15.62	1.74	8.56
191006	RG_FOUEW1_BIC	320	287	302	291	325	343	356	340	345	343	332	335	293	290	308	315	338	351	307	289	MH	2191	6410	0.00	19.38	0.16	11.08
191039	RG_FOUSH3_BIC	549	510	583	587	577	565	590	579	598	605											MH	1433	5743	0.35	15.70	0.47	11.20
191035	RG_FOBSC2_BIC	543	575	541	552	543																CJ	410	2754	0.00	5.91	0.22	4.39
191013	RG_FOUK12_BIC	485	453	418	445	486	490	444	431	471	488											JD	1070	4611	0.21	14.69	1.76	9.35
192963	RG_FOBCP-BIC01	399	418	362	409	351																JH	275	1939	2.15	16.03	2.89	9.49
192969	RG_FOBSC-BIC01	397	362																			MP	60	759	8.82	8.82	4.61	4.61

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.

Taxonomic QC

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 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 4: Summary of taxonomic error following QC

Site	Taxa Identified	% Error	PDE	PTD	Bray - Curtis Dissimilarity index
Site - Batch 4 2018, Sample - RG_FOBCP-BIC01, CC# - CC192963, Percent sampled = 20%, Sieve size = 400	426	0.00	0.11750881	0.46948357	0.00352526
Site - Batch 4 2018, Sample - RG_FOUK1_BIC03, CC# - CC192968, Percent sampled = 5%, Sieve size = 400	325	0.00	0	0.61538462	0.00615385

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 - Batch 4 2018, Sample - RG_FOBCP-BIC01, CC# - CC192963, Percent sampled = 20%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Ameletus	1	1						
Apataniidae	1	1						
Aturus	2	2						
Capniidae	236	238	No			X		
Chelifera/ Metachela	1	1						
Chloroperlidae	2	2						
Cladotanytarsus	2	2						
Cultus	1	1						
Diamesa	1	1						
Dicranota	12	12						
Enchytraeus	1	1						
Epeorus	2	2						
Feltria	1	1						
Heptageniidae	1	1						
Hesperoconopa	1	1						
Hexatoma	2	2						
Hydroporinae	1	1						
Kogotus	2	2						
Lebertia	12	12						
Limnephilidae	1	1						
Mallochohelea	8	8						
Micropsectra	1	1						
Parametriocnemus	1	1						
Pericoma/Telmatoscopus	83	82	No			X		
Perlidae	1	1						
Rheocricotopus	1	1						
Rhyacophila	1	1						
Rhyacophila atrata complex	1	1						
Rhyacophila betteni group	1	1						
Skwala	1	1						
Sweltsa	1	1						
Testudacarus	1	1						

Thienemannimyia group	41	41							
Total:	**425**	**426**							
					0	**2**	**0**		
% Total Misidentification Rate =	misidentifications	x100	0.00	**Pass**					
	total number	=							
Site - Batch 4 2018, Sample - RG_FOUK1_BIC03, CC# - CC192968, Percent sampled = 5%, Sieve size = 400	**Laboratory Count**	**QC Audit Count**	**Agreement**	**Misidentification**	**Questionable Taxonomic Resolution**	**Enumeration**	**Insufficient Taxonomic Resolution**	**Comments**	
Ameletus	2	2							
Baetidae	2	2							
Baetis	2	2							
Baetis rhodani group	9	9							
Capniidae	8	8							
Cinygmula	24	23	No			X			
Dicranota	1	1							
Enchytraeus	3	3							
Epeorus	76	77	No			X			
Ephemerella	1	1							
Ephemerellidae	3	3							
Eukiefferiella	5	5							
Heptageniidae	30	31	No			X			
Lebertia	2	2							
Mallochohelea	1	1							
Micropsectra	2	2							
Nais	1	1							
Nemouridae	51	51							
Orthocladius complex	4	4							
Pagastia	15	15							
Parapsyche	2	2							
Pericoma/Telmatoscopus	62	61	No			X			
Pseudodiamesa	1	1							
Rhyacophila	2	2							
Rhyacophila brunnea/vemna group	1	1							
Taeniopterygidae	2	2							
Tvetenia	8	8							

Zapada	1	1						
Zapada cinctipes	2	2						
Zapada oregonensis group	2	2						
Total:	**325**	**325**						
					0	**4**	**0**	
% Total Misidentification Rate	misidentifications	x100	0.00	**Pass**				
=	total number	=						

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[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).
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Methods and QC Report 2019

Project ID: FROLAEMP 19-04

Client: Minnow

Prepared by:
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Sample Reception

On July 3, 2019, Cordillera Consulting received 48 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.

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RG_FOUEW_BIC-1	CC200049	6/20/2019	400µM	2
RG_FOUEW_BIC-2	CC200050	6/20/2019	400µM	1
RG_FOUEW_BIC-3	CC200051	6/20/2019	400µM	2
RG_FOUNGD_BIC-1	CC200052	6/19/2019	400µM	1
RG_FOUNGD_BIC-2	CC200053	6/19/2019	400µM	2
RG_FOUNGD_BIC-3	CC200054	6/19/2019	400µM	1
RG_FRUPO_BIC-1	CC200055	6/19/2019	400µM	2

RG_FRUPO_BIC-2	CC200056	6/19/2019	400µM	1
RG_FRUPO_BIC-3	CC200057	6/19/2019	400µM	2
RG_FRCP1SW_BIC-1	CC200058	6/19/2019	400µM	1
RG_FRCP1SW_BIC-2	CC200059	6/19/2019	400µM	1
RG_FRCP1SW_BIC-3	CC200060	6/19/2019	400µM	1
RG_FODHE_BIC-01	CC200061	6/20/2019	400µM	1
RG_FODHE_BIC-02	CC200062	6/20/2019	400µM	1
RG_FODHE_BIC-03	CC200063	6/20/2019	400µM	1
RG_FO22_BIC-1	CC200064	6/21/2019	400µM	2
RG_FO22_BIC-2	CC200065	6/21/2019	400µM	1
RG_FO22_BIC-3	CC200066	6/21/2019	400µM	2
RG_MPI_BIC-1	CC200067	6/18/2019	400µM	1
RG_MPI_BIC-2	CC200068	6/18/2019	400µM	1
RG_MPI_BIC-3	CC200069	6/18/2019	400µM	1
RG_FODNGD_BIC-1	CC200070	6/19/2019	400µM	1
RG_FODNGD_BIC-2	CC200071	6/19/2019	400µM	1
RG_FODNGD_BIC-3	CC200072	6/19/2019	400µM	1
RG_FODPO_BIC-1	CC200073	6/21/2019	400µM	2
RG_FODPO_BIC-2	CC200074	6/21/2019	400µM	1
RG_FODPO_BIC-3	CC200075	6/21/2019	400µM	1
RG_FOUK1_BIC-1	CC200076	6/18/2019	400µM	1
RG_FOUK1_BIC-2	CC200077	6/18/2019	400µM	1
RG_FOUK1_BIC-3	CC200078	6/18/2019	400µM	1
RG_FOBSC-BIC-1	CC200079	6/18/2019	400µM	1
RG_FOBSC-BIC-2	CC200080	6/18/2019	400µM	1
RG_FOBSC-BIC-3	CC200081	6/18/2019	400µM	1
RG_F026_BIC-1	CC200082	6/20/2019	400µM	1
RG_F026_BIC-2	CC200083	6/20/2019	400µM	1
RG_F026_BIC-3	CC200084	6/20/2019	400µM	2
RG_HENUP_BIC-1	CC200085	6/20/2019	400µM	1
RG_HENUP_BIC-2	CC200086	6/20/2019	400µM	1
RG_HENUP_BIC-3	CC200087	6/20/2019	400µM	1
RG_FOUSH_BIC-1	CC200088	6/17/2019	400µM	1
RG_FOUSH_BIC-2	CC200089	6/17/2019	400µM	1
RG_FOUSH_BIC-3	CC200090	6/17/2019	400µM	1
RG_FOBCP_BIC-1	CC200091	6/18/2019	400µM	1
RG_FOBCP_BIC-2	CC200092	6/18/2019	400µM	1
RG_FOBCP_BIC-3	CC200093	6/18/2019	400µM	1
RG_FOBKS_BIC-1	CC200094	6/17/2019	400µM	1
RG_FOBKS_BIC-2	CC200095	6/17/2019	400µM	1
RG_FOBKS_BIC-3	CC200096	6/17/2019	400µM	1

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_FOUEW_BIC-1	20-Jun-19	CC200049	6%	357
RG_FOUEW_BIC-2	20-Jun-19	CC200050	5%	405
RG_FOUEW_BIC-3	20-Jun-19	CC200051	5%	340
RG_FOUNGD_BIC-1	19-Jun-19	CC200052	10%	399
RG_FOUNGD_BIC-2	19-Jun-19	CC200053	14%	385
RG_FOUNGD_BIC-3	19-Jun-19	CC200054	9%	348
RG_FRUPO_BIC-1	19-Jun-19	CC200055	20%	340
RG_FRUPO_BIC-2	19-Jun-19	CC200056	25%	402
RG_FRUPO_BIC-3	19-Jun-19	CC200057	16%	331
RG_FRCP1SW_BIC-1	19-Jun-19	CC200058	16%	308
RG_FRCP1SW_BIC-2	19-Jun-19	CC200059	10%	347
RG_FRCP1SW_BIC-3	19-Jun-19	CC200060	5%	344
RG_FODHE_BIC-01	20-Jun-19	CC200061	5%	518
RG_FODHE_BIC-02	20-Jun-19	CC200062	6%	362
RG_FODHE_BIC-03	20-Jun-19	CC200063	5%	502

RG_FO22_BIC-1	21-Jun-19	CC200064	10%	305
RG_FO22_BIC-2	21-Jun-19	CC200065	6%	320
RG_FO22_BIC-3	21-Jun-19	CC200066	8%	317
RG_MPI_BIC-1	18-Jun-19	CC200067	11%	335
RG_MPI_BIC-2	18-Jun-19	CC200068	7%	317
RG_MPI_BIC-3	18-Jun-19	CC200069	9%	359
RG_FODNGD_BIC-1	19-Jun-19	CC200070	6%	327
RG_FODNGD_BIC-2	19-Jun-19	CC200071	21%	331
RG_FODNGD_BIC-3	19-Jun-19	CC200072	11%	343
RG_FODPO_BIC-1	21-Jun-19	CC200073	10%	322
RG_FODPO_BIC-2	21-Jun-19	CC200074	10%	312
RG_FODPO_BIC-3	21-Jun-19	CC200075	9%	315
RG_FOUK1_BIC-1	18-Jun-19	CC200076	13%	311
RG_FOUK1_BIC-2	18-Jun-19	CC200077	8%	344
RG_FOUK1_BIC-3	18-Jun-19	CC200078	11%	340
RG_FOBSC-BIC-1	18-Jun-19	CC200079	20%	323
RG_FOBSC-BIC-2	18-Jun-19	CC200080	30%	330
RG_FOBSC-BIC-3	18-Jun-19	CC200081	11%	329
RG_F026_BIC-1	20-Jun-19	CC200082	5%	450
RG_F026_BIC-2	20-Jun-19	CC200083	5%	585
RG_F026_BIC-3	20-Jun-19	CC200084	5%	1051
RG_HENUP_BIC-1	20-Jun-19	CC200085	12%	338
RG_HENUP_BIC-2	20-Jun-19	CC200086	11%	313
RG_HENUP_BIC-3	20-Jun-19	CC200087	8%	310
RG_FOUSH_BIC-1	17-Jun-19	CC200088	7%	335
RG_FOUSH_BIC-2	17-Jun-19	CC200089	8%	326
RG_FOUSH_BIC-3	17-Jun-19	CC200090	9%	373
RG_FOBCP_BIC-1	18-Jun-19	CC200091	7%	332
RG_FOBCP_BIC-2	18-Jun-19	CC200092	12%	318
RG_FOBCP_BIC-3	18-Jun-19	CC200093	14%	323
RG_FOBKS_BIC-1	17-Jun-19	CC200094	15%	311
RG_FOBKS_BIC-2	17-Jun-19	CC200095	7%	341
RG_FOBKS_BIC-3	17-Jun-19	CC200096	8%	336

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 - QC1, CC# - CC200054, Percent sampled = 9%, Sieve size = 400					
Diptera		2			
Chironomidae		5			
Ephemeroptera		2			
Trichoptera		1			
Trombidiformes		1			
Total:		**11**		**348**	**97%**
Site - QC, Sample - QC2, CC# - CC200063, Percent sampled = 5%, Sieve size = 400					
Trichoptera		1			
Ephemeroptera		2			
Total:		**3**		**502**	**99%**
Site - QC, Sample - QC3, CC# - CC200070, Percent sampled = 6%, Sieve size = 400					
Chironomidae		1			
Plecoptera		1			
Total:		**2**		**327**	**99%**
Site - QC, Sample - QC4, CC# - CC200081, Percent sampled = 11%, Sieve size = 400					
Chironomidae		1			
Total:		**1**		**329**	**100%**

Site - QC, Sample - QC5, CC# - CC200088, Percent sampled = 7%, Sieve size = 400					
Ephemeroptera		2			
Plecoptera		1			
Chironomidae		4			
Diptera		1			
Total:		**8**		**335**	**98%**

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 area 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 Error		Accuracy Error	
CC#	**Sample Name**	1	2	3	4	5	6	7	8	9	10											By	Time		Min (%)	Max (%)	Min (%)	Max (%)
200064	RG_F022_BIC1	307	268	285	305	305	313	316	278	299	320											CM/CJ	470	2996	0.00	16.25	0.20	10.55
200056	RG_FRUPO_BIC2	397	399	340	328																	TV	250	1464	0.50	17.79	7.10	10.38
200079	RG_FOBSC_BIC1	327	281	290	271	266																CM	255	1435	1.85	18.65	1.05	13.94
200073	RG_FODPO_BIC1	332	294	292	275	293	289	301	267	297	303											CJ	500	2943	0.34	19.58	0.10	12.81
200052	RG_FOUNGD_BIC-01	395	395	366	386	366	352	344	352	380	347											TV/CM	750	3683	0.00	12.91	0.62	7.25

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 4: Summary of taxonomic error following QC

Site	Taxa Identified	% Error	PDE	PTD	Bray - Curtis Dissimilarity index
Site - 2019, Sample - RG_FOUEW_BIC-3, CC# - CC200051, Percent sampled = 5%, Sieve size = 400	341	0.00	0.14684288	1.46627566	0.01321586
Site - 2019, Sample - RG_FOUNGD_BIC-3, CC# - CC200054, Percent sampled = 9%, Sieve size = 400	348	0.00	0	0.57471264	0.00574713
Site - 2019, Sample - RG_MPI_BIC-2, CC# - CC200068, Percent sampled = 7%, Sieve size = 400	320	0.00	0.47095761	0.9375	0.00470958
Site - 2019, Sample - RG_FOBSC-BIC-3, CC# - CC200081, Percent sampled = 11%, Sieve size = 400	324	0.00	0.76569678	1.82370821	0.01071975

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 - 2019, Sample - RG_FOUEW_BIC-3, CC# - CC200051, Percent sampled = 5%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Ameletus	1	1						
Baetidae	6	6						
Baetis	19	21	No			X		
Baetis rhodani group	29	27	No			X		
Capniidae	5	5						
Chloroperlidae	3	3						

Cinygmula	8	8						
Diamesa	2	2						
Drunella doddsii	3	3						
Elmidae	9	9						
Epeorus	12	12						
Ephemerellidae	10	10						
Eukiefferiella	3	3						
Heptageniidae	100	102	No			X		
Isoperla	1	1						
Kogotus	6	6						
Lebertia	7	7						
Limnephilidae	1	1						
Micropsectra	7	7						
Nemouridae	7	7						
Oligophlebodes	1	1						
Orthocladius complex	18	17	No			X		
Pagastia	3	3						
Pedomoecus sierra	1	1						
Perlodidae	9	9						
Prosimulium/Helodon	1	1						
Rheocricotopus	1	1						
Rhyacophila	5	5						
Rhyacophila alberta group	1	1						
Rhyacophila atrata complex	4	4						
Rhyacophila brunnea/vemna group	3	3						
Simulium	3	3						
Sweltsa	2	2						
Tipula	1	1						
Zapada	10	9	No			X		
Zapada cinctipes	10	11	No			X		
Zapada columbiana	8	8						
Zapada oregonensis group	20	20						
Total:	**340**	**341**						
					0	6	0	
% Total Misidentification Rate =	misidentifications	x100	0.00	**Pass**				
	total number	=						

Site - 2019, Sample - RG_FOUNGD_BIC-3, CC# - CC200054, Percent sampled = 9%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Ameletus	6	6						
Aturus	1	1						
Baetidae	1	1						
Baetis	12	12						
Baetis rhodani group	8	8						
Ceratopogonidae	4	4						
Chironomidae	1	1						
Chloroperlidae	18	18						
Cinygmula	11	11						
Corynoneura	4	4						
Drunella	5	5						
Drunella coloradensis	22	21	No			X		
Drunella doddsii	3	3						
Epeorus	1	1						
Ephemerellidae	15	16	No			X		
Heptageniidae	81	81						
Hexatoma	1	1						
Kogotus	4	4						
Krenosmittia	1	1						
Lebertia	4	4						
Mallochohelea	5	5						
Megarcys	1	1						
Micropsectra	6	6						
Neoplasta	1	1						
Oligophlebodes	4	4						
Oreodytes	1	1						
Orthocladius complex	16	17	No			X		
Pagastia	12	12						
Parametriocnemus	14	14						
Perlodidae	11	11						
Probezzia	5	5						
Prosimulium/Helodon	3	3						
Rheocricotopus	1	1						
Rhithrogena	2	2						
Rhyacophila	13	13						

Rhyacophila alberta group	2	2						
Rhyacophila atrata complex	6	6						
Rhyacophila betteni group	1	1						
Rhyacophila brunnea/vemna group	14	14						
Rhyacophila narvae	1	1						
Rhyacophila vofixa group	1	1						
Simuliidae	5	5						
Simulium	13	12	No			X		
Sweltsa	1	1						
Thienemannimyia group	1	1						
Tipulidae	1	1						
Tvetenia	1	1						
Zapada cinctipes	2	2						
Zapada oregonensis group	1	1						
Total:	**348**	**348**						
					0	**4**	**0**	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				

Site - 2019, Sample - RG_MPI_BIC-2, CC# - CC200068, Percent sampled = 7%, Sieve size = 400	**Laboratory Count**	**QC Audit Count**	**Agreement**	**Misidentification**	**Questionable Taxonomic Resolution**	**Enumeration**	**Insufficient Taxonomic Resolution**	**Comments**
Ameletus	4	4						
Baetis	8	8						
Ceratopogonidae	1	1						
Chironomidae	4	4						
Chloroperlidae	5	5						
Cinygmula	3	3						
Drunella	3	3						
Drunella coloradensis	5	5						
Drunella doddsii	1	1						
Epeorus	9	9						
Ephemerella excrucians complex	1	1						
Ephemerellidae	16	17	No			X		
Heptageniidae	133	135	No			X		

Hesperoperla	1	1						
Kogotus	6	6						
Lebertia	5	5						
Megarcys	1	1						
Micropsectra	11	11						
Nemouridae	4	4						
Orthocladius complex	21	21						
Parametriocnemus	11	11						
Pericoma/Telmatoscopus	5	5						
Perlodidae	8	8						
Pisidiidae	1	1						
Probezzia	6	6						
Prosimulium/Helodon	1	1						
Rhyacophila	17	17						
Rhyacophila alberta group	4	4						
Rhyacophila brunnea/vemna group	5	5						
Rhyacophila coloradensis group	1	1						
Rhyacophila vofixa group	1	1						
Simuliidae	5	5						
Simulium	1	1						
Sperchon	1	1						
Sweltsa	1	1						
Thienemannimyia group	1	1						
Tvetenia	6	6						
Total:	**317**	**320**						
					0	**2**	**0**	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				
Site - 2019, Sample - RG_FOBSC-BIC-3, CC# - CC200081, Percent sampled = 11%, Sieve size = 400	**Laboratory Count**	**QC Audit Count**	**Agreement**	**Misidentification**	**Questionable Taxonomic Resolution**	**Enumeration**	**Insufficient Taxonomic Resolution**	**Comments**
Baetis	3	4	No			X		
Baetis rhodani group	4	3	No			X		
Cinygmula	17	17						

Drunella	3	3						
Enchytraeus	8	8						
Epeorus	78	77	No			X		
Ephemerellidae	16	16						
Heptageniidae	106	102	No			X		
Lebertia	1	1						
Lepidostoma	1	1						
Micropsectra	1	1						
Nemouridae	1	1						
Orthocladius complex	3	3						
Pagastia	1	1						
Parametriocnemus	57	57						
Parapsyche	1	1						
Paratanytarsus	1	1						
Pericoma/Telmatoscopus	2	2						
Perlidae	1	1						
Rhyacophila	9	9						
Rhyacophila alberta group	1	1						
Rhyacophila atrata complex	6	6						
Simuliidae	5	5						
Simulium	1	1						
Stempellinella	1	1						
Thienemannimyia group	1	1						
Total:	**329**	**324**						
					0	**4**	**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

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Methods and QC Report 2019
Project ID: FRO LAEMP 2019 (197292.004)

Client: Minnow Environmental

Prepared by:
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Sample Reception

On February 25, 2019, Cordillera Consulting received 12 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_FODPO_BIC01	CC193173	2/14/2019	400µM	1
RG_FODPO_BIC02	CC193174	2/14/2019	400µM	1
RG_FODPO_BIC03	CC193175	2/14/2019	400µM	1
RG_FRUPO_BIC01	CC193176	2/11/2019	400µM	2
RG_FRUPO_BIC02	CC193177	2/11/2019	400µM	1
RG_FRUPO_BIC03	CC193178	2/11/2019	400µM	1
RG_FOUEW_BIC01	CC193179	2/13/2019	400µM	1

RG_FOUEW_BIC02	CC193180	2/13/2019	400µM	1
RG_FOUEW_BIC03	CC193181	2/13/2019	400µM	1
RG_FOUK1_BIC01	CC193182	2/12/2019	400µM	1
RG_FOUK1_BIC02	CC193183	2/12/2019	400µM	1
RG_FOUK1_BIC03	CC193184	2/12/2019	400µM	1

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_FODPO_BIC01	14-Feb-19	CC193173	5%	1360
RG_FODPO_BIC02	14-Feb-19	CC193174	5%	735
RG_FODPO_BIC03	14-Feb-19	CC193175	5%	2262
RG_FRUPO_BIC01	11-Feb-19	CC193176	5%	510
RG_FRUPO_BIC02	11-Feb-19	CC193177	5%	369

RG_FRUPO_BIC03	11-Feb-19	CC193178	5%	380
RG_FOUEW_BIC01	13-Feb-19	CC193179	5%	1118
RG_FOUEW_BIC02	13-Feb-19	CC193180	5%	483
RG_FOUEW_BIC03	13-Feb-19	CC193181	5%	788
RG_FOUK1_BIC01	12-Feb-19	CC193182	5%	522
RG_FOUK1_BIC02	12-Feb-19	CC193183	5%	589
RG_FOUK1_BIC03	12-Feb-19	CC193184	5%	466

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

CC #	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
CC193182	522	1	99%
		Average Recovery	99%

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 area 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 Error		Accuracy Error	
CC#	**Sample Name**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	By	Time		Min (%)	Max (%)	Min (%)	Max (%)
193177	RG_FRUPO_BIC02	358	300	351	322	299	325	300	309	316	311	314	324	290	316	331	330	300	294	291	323	JH	640	6304	0.00	18.99	0.25	13.58

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 4: Summary of taxonomic error following QC

Site	Taxa Identified	% Error	PDE	PTD	Bray - Curtis Dissimilarity index
Site - 2019, Sample - RG_FODPO_BIC01, CC# - CC193173, Percent sampled = 5%, Sieve size = 400	1378	0.00	0.65741417	1.81422351	0.01168736

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 - 2019, Sample - RG_FODPO_BIC01, CC# - CC193173, Percent sampled = 5%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Baetidae	5	5						
Baetis	10	11	No			X		
Baetis rhodani group	2	2						
Capniidae	98	96	No			X		
Dicranota	1	1						
Doddsia occidentalis	8	8						
Drunella spinifera	1	1						
Elmidae	1	1						
Empididae	2	22	No			X		
Enchytraeidae	1	1						
Epeorus	1	1						

Eukiefferiella	122	123	No			X		
Heptageniidae	19	19						
Heterlimnius	4	4						
Heterlimnius	1	1						
Hydrobaenus	3	3						
Hydropsyche	1	1						
Hydrozetidae	1	1						
Isoperla	42	44	No			X		
Kogotus	21	21						
Lebertia	3	3						
Leuctridae	1	1						
Megarcys	6	6						
Micrasema	1	1						
Nemoura	82	82						
Nemouridae	550	545	No			X		
Neoplasta	4	4						
Orthocladius complex	143	143						
Pagastia	27	27						
Pedomoecus sierra	1	1						
Pericoma/Telmatoscopus	8	8						
Perlodidae	9	9						
Plecoptera	13	13						
Rhyacophila	4	4						
Rhyacophila brunnea/vemna group	6	6						
Rhyacophila narvae	1	1						
Simuliidae	2	2						
Simulium	2	2						
Sperchon	2	2						
Taeniopterygidae	2	2						
Thienemannimyia group	1	1						
Tvetenia	33	34	No			X		
Zapada	26	26						
Zapada cinctipes	88	88						
Zapada oregonensis group	1	1						
Total:	**1360**	**1378**						
					0	**7**	**0**	
% Total Misidentification Rate =	misidentifications	x100 =	0.00	**Pass**				
	total number							

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[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

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*** Note ***

A note on the data. There are some new, exciting additions to the Cordillera data spreadsheet. You will immediately notice that we are now providing whole sample data and metrics at the Family level. You will also notice two tabs with ND. This in an important improvement to our data. This allows the metrics to be more accurately calculated. The ND or Non-Distinct is used in the lab to identify things at a higher taxonomic resolution than other things from the same Family/Order that are already counted at the Genu/Species level. This removes some duplication in the taxa richness counts. Cordillera's taxonomists use the ND when there are juvenile or damaged specimens that we can't quite ID but that we're sure are represented by existing ID's. We have been working on these changes for a while to provide better data for you, our client.

Sample Reception

On December 16, 2019, Cordillera Consulting received 18 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.
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RG_UFR1_BIC-01_2019-12-10	CC202681	12/10/2019	400µM	1
RG_UFR1_BIC-02_2019-12-10	CC202682	12/10/2019	400µM	1
RG_UFR1_BIC-03_2019-12-10	CC202683	12/10/2019	400µM	1
RG_FOUKI_BIC-01_2019-12-09	CC202684	12/9/2019	400µM	1
RG_FOUKI_BIC-02_2019-12-09	CC202685	12/9/2019	400µM	1
RG_FOUKI_BIC-03_2019-12-09	CC202686	12/9/2019	400µM	1
RG_SCOUTDS_BIC-01_2019-12-10	CC202687	12/10/2019	400µM	1
RG_SCOUTDS_BIC-02_2019-12-10	CC202688	12/10/2019	400µM	2
RG_SCOUTDS_BIC-03_2019-12-10	CC202689	12/10/2019	400µM	3
RG_FRUPO_BIC-01_2019-12-11	CC202690	12/11/2019	400µM	1
RG_FRUPO_BIC-02_2019-12-11	CC202691	12/11/2019	400µM	1
RG_FRUPO_BIC-03_2019-12-11	CC202692	12/11/2019	400µM	1
RG_FOUEW_BIC-01_2019-12-11	CC202693	12/11/2019	400µM	1
RG_FOUEW_BIC-02_2019-12-11	CC202694	12/11/2019	400µM	1
RG_FOUEW_BIC-03_2019-12-11	CC202695	12/11/2019	400µM	1
RG_FODPO_BIC-01_2019-12-12	CC202696	12/12/2019	400µM	1
RG_FODPO_BIC-02_2019-12-12	CC202697	12/12/2019	400µM	1
RG_FODPO_BIC-03_2019-12-12	CC202698	12/12/2019	400µM	1

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_UFR1_BIC-01_2019-12-10	10-Dec-19	CC202681	5%	1485
RG_UFR1_BIC-02_2019-12-10	10-Dec-19	CC202682	10%	508
RG_UFR1_BIC-03_2019-12-10	10-Dec-19	CC202683	5%	797
RG_FOUKI_BIC-01_2019-12-09	09-Dec-19	CC202684	5%	505
RG_FOUKI_BIC-02_2019-12-09	09-Dec-19	CC202685	5%	411
RG_FOUKI_BIC-03_2019-12-09	09-Dec-19	CC202686	5%	596
RG_SCOUTDS_BIC-01_2019-12-10	10-Dec-19	CC202687	5%	865
RG_SCOUTDS_BIC-02_2019-12-10	10-Dec-19	CC202688	5%	653
RG_SCOUTDS_BIC-03_2019-12-10	10-Dec-19	CC202689	5%	332
RG_FRUPO_BIC-01_2019-12-11	11-Dec-19	CC202690	5%	1598
RG_FRUPO_BIC-02_2019-12-11	11-Dec-19	CC202691	5%	1327

RG_FRUPO_BIC-03_2019-12-11	11-Dec-19	CC202692	5%	1382
RG_FOUEW_BIC-01_2019-12-11	11-Dec-19	CC202693	5%	648
RG_FOUEW_BIC-02_2019-12-11	11-Dec-19	CC202694	5%	827
RG_FOUEW_BIC-03_2019-12-11	11-Dec-19	CC202695	5%	918
RG_FODPO_BIC-01_2019-12-12	12-Dec-19	CC202696	5%	1544
RG_FODPO_BIC-02_2019-12-12	12-Dec-19	CC202697	5%	1479
RG_FODPO_BIC-03_2019-12-12	12-Dec-19	CC202698	5%	1571

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 - QC1, CC# - CC202690, Percent sampled = 5%, Sieve size = 400					
Diptera		2			
Plecoptera		1			
Total:		**3**		**1598**	**100%**
Site - QC, Sample - QC2, CC# - CC202692, Percent sampled = 5%, Sieve size = 400					
Chironomidae		3			
Plecoptera		2			
Total:		**5**		**1382**	**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

Table to come later

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 - 2019, Sample - RG_UFR1_BIC-02_2019-12-10, CC# - CC202682, Percent sampled = 10%, Sieve size = 400	508	0.00	0	0.78740157	0.00787402
Site - 2019, Sample - RG_FOUEW_BIC-01_2019-12-11, CC# - CC202693, Percent sampled = 5%, Sieve size = 400	640	0.00	0.62111801	1.85185185	0.01242236

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 - 2019, Sample - RG_UFR1_BIC-02_2019-12-10, CC# - CC202682, Percent sampled = 10%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Anagapetus	1	1						
Antocha	1	1						
Baetidae	5	5						
Baetis	1	2	No			X		
Baetis rhodani group	2	1	No			X		
Brillia	1	1						

Capniidae	3	3						
Chelifera/ Metachela	3	3						
Chloroperlidae	1	1						
Cinygmula	12	12						
Cricotopus (Nostococladius)	3	3						
Dicranota	2	2						
Drunella doddsii	6	6						
Ecclisomyia	2	2						
Ephemerellidae	115	114	No			X		
Eukiefferiella	4	4						
Feltria	3	3						
Heptageniidae	80	81	No			X		
Kogotus	12	12						
Lebertia	2	2						
Leuctridae	2	2						
Limnephilidae	2	2						
Megarcys	6	6						
Micropsectra	4	4						
Nemouridae	18	18						
Neoplasta	5	5						
Oligophlebodes	75	76	No			X		
Pagastia	8	8						
Paraleuctra	4	4						
Parapsyche	1	1						
Parapsyche elsis	2	2						
Pericoma/Telmatoscopus	8	8						
Rhyacophila	5	4	No			X		
Rhyacophila atrata complex	5	5						
Rhyacophila betteni group	3	4	No			X		
Rhyacophila brunnea/vemna group	2	2						
Rhyacophila narvae	1	1						
Simulium	1	1						
Sperchon	7	7						
Sweltsa	7	7						
Taeniopterygidae	6	6						
Tanytarsini	4	4						
Tvetenia	11	11						
Visoka cataractae	1	1						
Zapada	52	51	No			X		
Zapada cinctipes	2	2						
Zapada oregonensis group	7	7						

Total:	**508**	**508**						
					0	**8**	**0**	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				
Site - 2019, Sample - RG_FOUEW_BIC-01_2019-12-11, CC# - CC202693, Percent sampled = 5%, Sieve size = 400	**Laboratory Count**	**QC Audit Count**	**Agreement**	**Misidentification**	**Questionable Taxonomic Resolution**	**Enumeration**	**Insufficient Taxonomic Resolution**	**Comments**
Antocha	7	7						
Baetidae	4	3	No			X		
Baetis	2	3	No			X		
Baetis rhodani group	11	11						
Capniidae	34	34						
Chloroperlidae	7	7						
Cinygmula	67	66	No			X		
Drunella doddsii	2	2						
Elmidae	2	2						
Epeorus	8	8						
Ephemerellidae	24	25	No			X		
Eukiefferiella	2	2						
Glossosoma	2	2						
Haploperla	1	1						
Heptageniidae	21	22	No			X		
Hesperoperla	1	1						
Heterlimnius	30	30						
Heterlimnius	4	4						
Hydrobaenus	1	1						
Isoperla	17	17						
Kogotus	26	25	No			X		
Lebertia	18	18						
Megarcys	1	1						
Nemouridae	173	174	No			X		
Neoplasta	3	3						
Oligophlebodes	1	1						
Orthocladius complex	15	15						
Pagastia	27	20	No			X		
Parapsyche	1	1						
Pericoma/Telmatoscopus	2	2						
Perlidae	2	2						

Perlodidae	12	12						
Pisidiidae	3	3						
Rhyacophila	6	6						
Rhyacophila atrata complex	4	3	No			X		
Rhyacophila betteni group	1	1						
Rhyacophila brunnea/vemna group	4	4						
Rhyacophila narvae	1	1						
Sperchon	3	3						
Sweltsa	6	6						
Taeniopterygidae	5	4	No			X		
Tanytarsini	2	2						
Tanytarsus	1	1						
Tvetenia	4	4						
Zapada	30	30						
Zapada cinctipes	37	37						
Zapada oregonensis group	13	13						
Total:	**648**	**640**						
					0	**10**	**0**	
% Total Misidentification Rate =	misidentifications	x100 =	0.00	**Pass**				
	total number							

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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

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Mar 11, 2019

This report was generated for samples included in SRC Group # 2019-2211

Quality Control Report

Jennifer Ings
Minnow Environmental Inc.
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Reference Materials and Standards:

A reference material of known concentration is used whenever possible as either a control sample or control standard and analyzed with each batch of samples. These "QC" results are used to assess the performance of the method and must be within clearly defined limits; otherwise corrective action is required.

QC Analysis	Units	Target Value	Obtained Value
Aluminum	ug/g	1280	1440
Aluminum	ug/g	1280	1430
Arsenic	ug/g	6.87	6.87
Arsenic	ug/g	6.87	6.87
Cadmium	ug/g	0.299	0.309
Cadmium	ug/g	0.299	0.307
Chromium	ug/g	1.57	1.68
Chromium	ug/g	1.57	1.69
Copper	ug/g	14.4	14.3
Copper	ug/g	14.4	14.4
Iron	ug/g	312	298
Iron	ug/g	312	294
Lead	ug/g	0.404	0.413
Lead	ug/g	0.404	0.413
Manganese	ug/g	2.70	2.62
Manganese	ug/g	2.70	2.66
Mercury	ug/g	0.364	0.322
Mercury	ug/g	0.364	0.337
Nickel	ug/g	1.20	1.27
Nickel	ug/g	1.20	1.16
Selenium	ug/g	3.74	3.75
Selenium	ug/g	3.74	3.80
Silver	ug/g	0.0219	0.0260
Silver	ug/g	0.0219	0.0264
Zinc	ug/g	47.8	46.3
Zinc	ug/g	47.8	45.3

All quality control results were within the specified limits and considered acceptable.

Roxane Ortmann - Quality Assurance Supervisor

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Aug 14, 2019

This report was generated for samples included in SRC Group # 2019-10359

Quality Control Report

Lisa Bowron
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Georgetown, ON L7G 3M9

Reference Materials and Standards:

A reference material of known concentration is used whenever possible as either a control sample or control standard and analyzed with each batch of samples. These "QC" results are used to assess the performance of the method and must be within clearly defined limits; otherwise corrective action is required.

QC Analysis	Units	Target Value	Obtained Value
Aluminum	ug/g	1280	1200
Aluminum	ug/g	1280	1130
Arsenic	ug/g	6.87	6.92
Arsenic	ug/g	6.87	6.59
Cadmium	ug/g	0.299	0.271
Cadmium	ug/g	0.299	0.292
Chromium	ug/g	1.57	1.38
Chromium	ug/g	1.57	1.49
Copper	ug/g	13.8	12.8
Copper	ug/g	13.8	13.8
Iron	ug/g	312	269
Iron	ug/g	312	322
Lead	ug/g	0.404	0.354
Lead	ug/g	0.404	0.391
Manganese	ug/g	2.70	2.55
Manganese	ug/g	2.70	2.75
Mercury	ug/g	0.364	0.274
Mercury	ug/g	0.364	0.359
Nickel	ug/g	1.20	1.10
Nickel	ug/g	1.20	1.14
Selenium	ug/g	3.45	3.87
Selenium	ug/g	3.45	3.42
Silver	ug/g	0.0234	0.0237
Silver	ug/g	0.0234	0.0238
Zinc	ug/g	47.8	39.2
Zinc	ug/g	47.8	46.8

Please note, duplicates could not be analyzed for ICP due to insufficient sample available.

All quality control results were within the specified limits and considered acceptable.

Roxane Ortmann - Quality Assurance Supervisor

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Oct 10, 2019

This report was generated for samples included in SRC Group # 2019-13449

Quality Control Report

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Reference Materials and Standards:

A reference material of known concentration is used whenever possible as either a control sample or control standard and analyzed with each batch of samples. These "QC" results are used to assess the performance of the method and must be within clearly defined limits; otherwise corrective action is required.

QC Analysis	Units	Target Value	Obtained Value
Aluminum	ug/g	1280	1290
Aluminum	ug/g	1340	1190
Aluminum	ug/g	1340	1170
Aluminum	ug/g	1340	1270
Arsenic	ug/g	6.87	6.96
Arsenic	ug/g	6.87	5.94
Cadmium	ug/g	0.299	0.301
Cadmium	ug/g	0.299	0.278
Chromium	ug/g	1.57	1.56
Chromium	ug/g	1.57	1.45
Copper	ug/g	14.4	14.0
Copper	ug/g	14.4	12.8
Iron	ug/g	343	324
Iron	ug/g	312	306
Iron	ug/g	312	297
Iron	ug/g	312	313
Lead	ug/g	0.404	0.380
Lead	ug/g	0.404	0.365
Manganese	ug/g	2.70	2.82
Manganese	ug/g	2.70	2.74
Mercury	ug/g	0.412	0.405
Mercury	ug/g	0.364	0.315
Mercury	ug/g	0.364	0.286
Nickel	ug/g	1.20	1.19
Nickel	ug/g	1.20	1.18
Selenium	ug/g	3.74	3.59
Selenium	ug/g	3.74	3.09
Silver	ug/g	0.0219	0.0249
Silver	ug/g	0.0219	0.0220
Zinc	ug/g	51.6	48.8
Zinc	ug/g	47.8	43.2
Zinc	ug/g	47.8	41.4

SASKATCHEWAN RESEARCH COUNCIL
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E: analytical@src.sk.ca
www.src.sk.ca/analytical

Oct 10, 2019

This report was generated for samples included in SRC Group # 2019-13449

Duplicates:

Duplicates are used to assess problems with precision and help ensure that samples within a given batch were processed appropriately. The difference between duplicates must be within strict limits, otherwise corrective action is required. Please note, the duplicate(s) in this report are duplicates analyzed within a given batch of test samples and may not be from this specific group of samples.

Duplicate Analysis	**Units**	**Sample ID**	**First Result**	**Second Result**
Moisture	%	53762	84.31	81.91

Please note, duplicates could not be analyzed for ICP due to insufficient sample available.

All quality control results were within the specified limits and considered acceptable.

Roxane Ortmann - Quality Assurance Supervisor

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Jan 10, 2020

This report was generated for samples included in SRC Group # 2019-18024

Quality Control Report

Peter Schnurr
Minnow Environmental Inc.
2 Lamb Street
Georgetown, ON L7G 3M9

Reference Materials and Standards:

A reference material of known concentration is used whenever possible as either a control sample or control standard and analyzed with each batch of samples. These "QC" results are used to assess the performance of the method and must be within clearly defined limits; otherwise corrective action is required.

QC Analysis	Units	Target Value	Obtained Value
Aluminum	ug/g	1340	1180
Aluminum	ug/g	1340	1290
Arsenic	ug/g	6.87	7.06
Cadmium	ug/g	0.299	0.283
Chromium	ug/g	1.57	1.48
Copper	ug/g	14.4	12.9
Iron	ug/g	312	267
Iron	ug/g	312	321
Lead	ug/g	0.404	0.357
Manganese	ug/g	2.70	2.52
Mercury	ug/g	0.364	0.360
Nickel	ug/g	1.20	1.10
Selenium	ug/g	3.74	3.79
Silver	ug/g	0.0245	0.0246
Zinc	ug/g	47.8	45.1

Please note, duplicates could not be analyzed for ICP due to insufficient sample available.

All quality control results were within the specified limits and considered acceptable.

Roxane Ortmann - Quality Assurance Supervisor

APPENDIX B
BENTHIC INVERTEBRATES

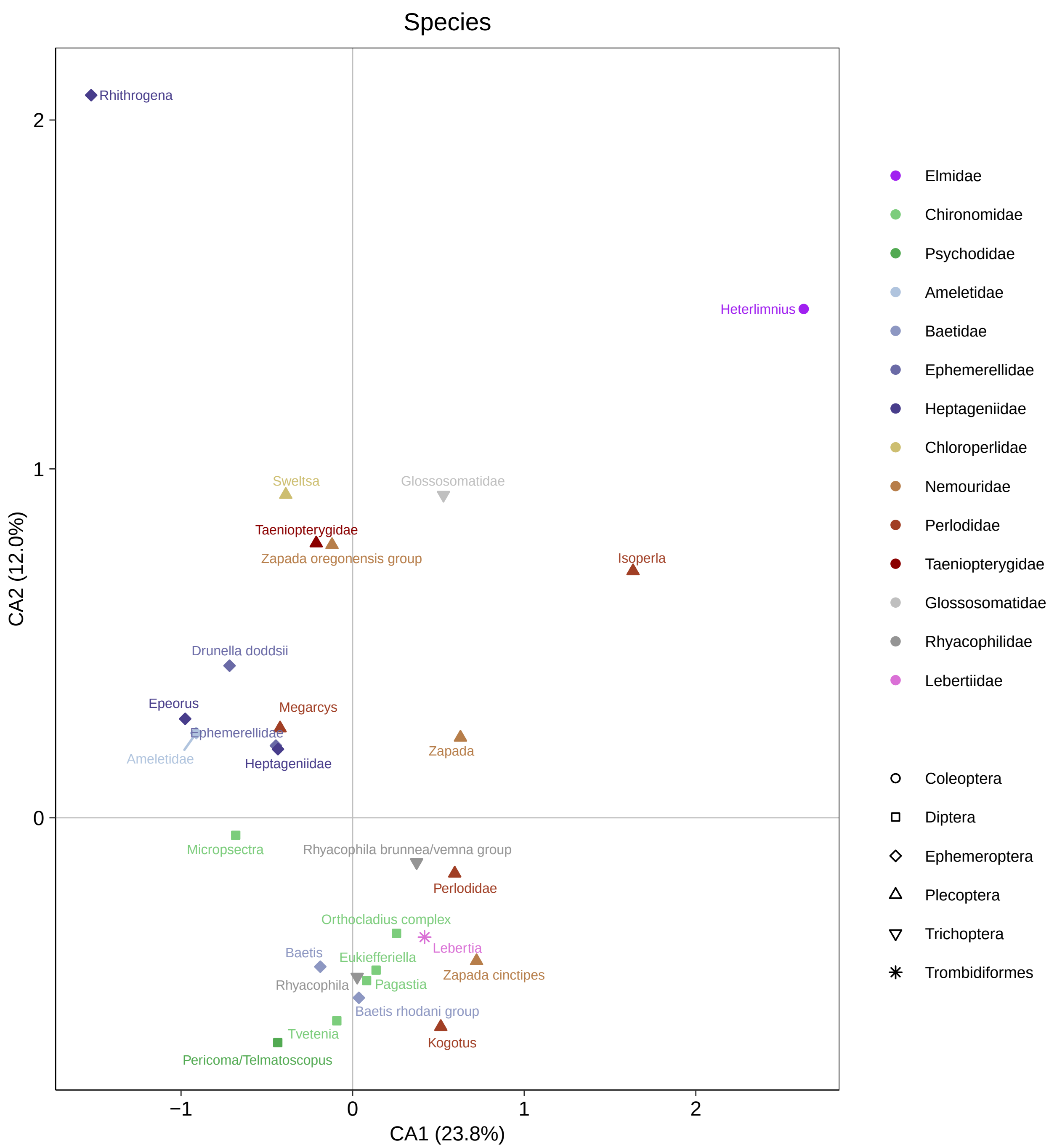

Figure B.1: Benthic Invertebrate Community Lowest Practical Level Correspondence Analysis Results Grouped by Taxa, Fording River, September 2012 to 2019

Note: Includes BIC data from September 2012 to September 2019.

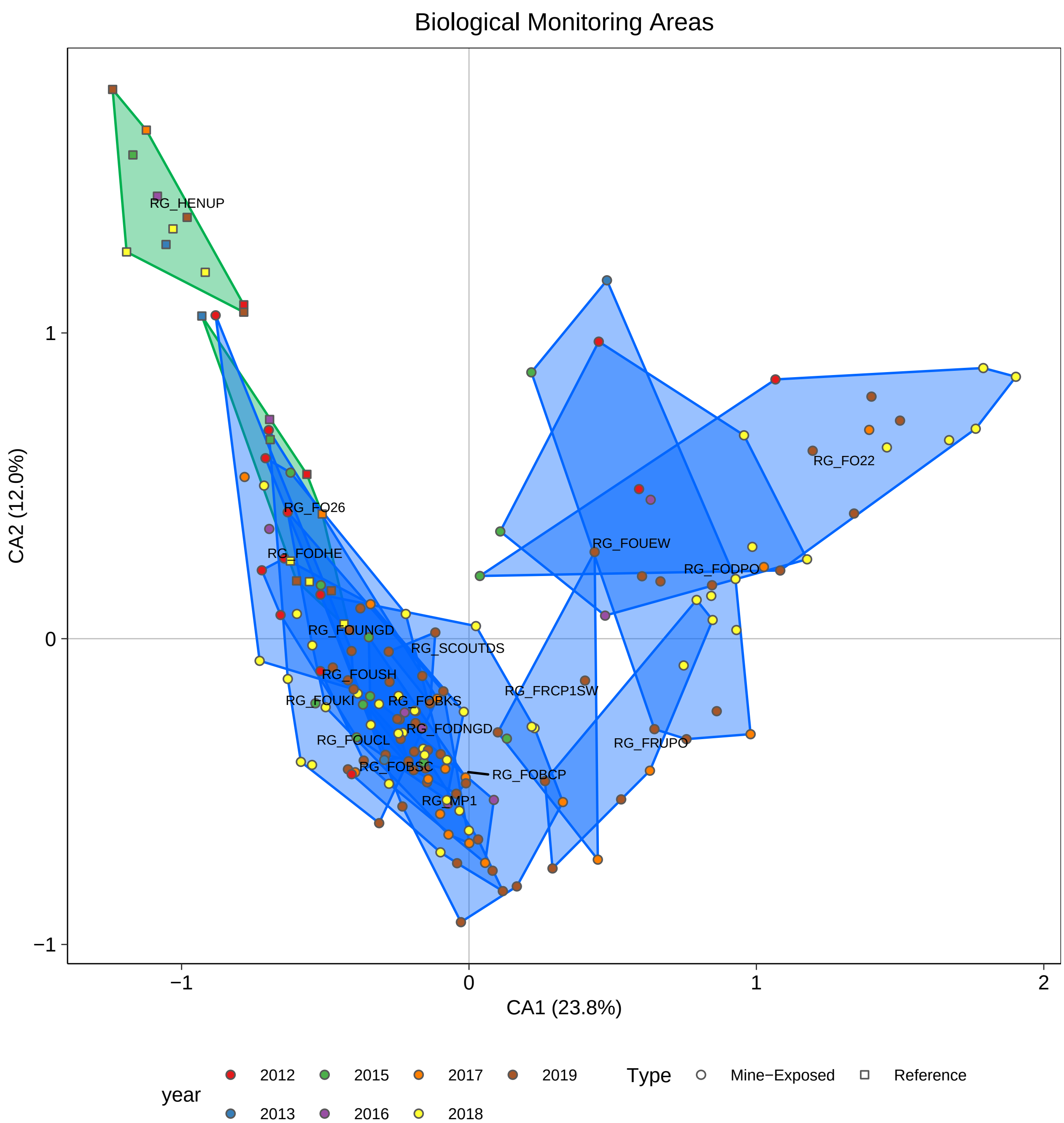

Figure B.2: Benthic Invertebrate Community Lowest Practical Level Correspondence Analysis Results Grouped by Area, Fording River, September 2012 to 2019

Note: Blue groups denote mine-exposed areas and green groups denote reference areas.

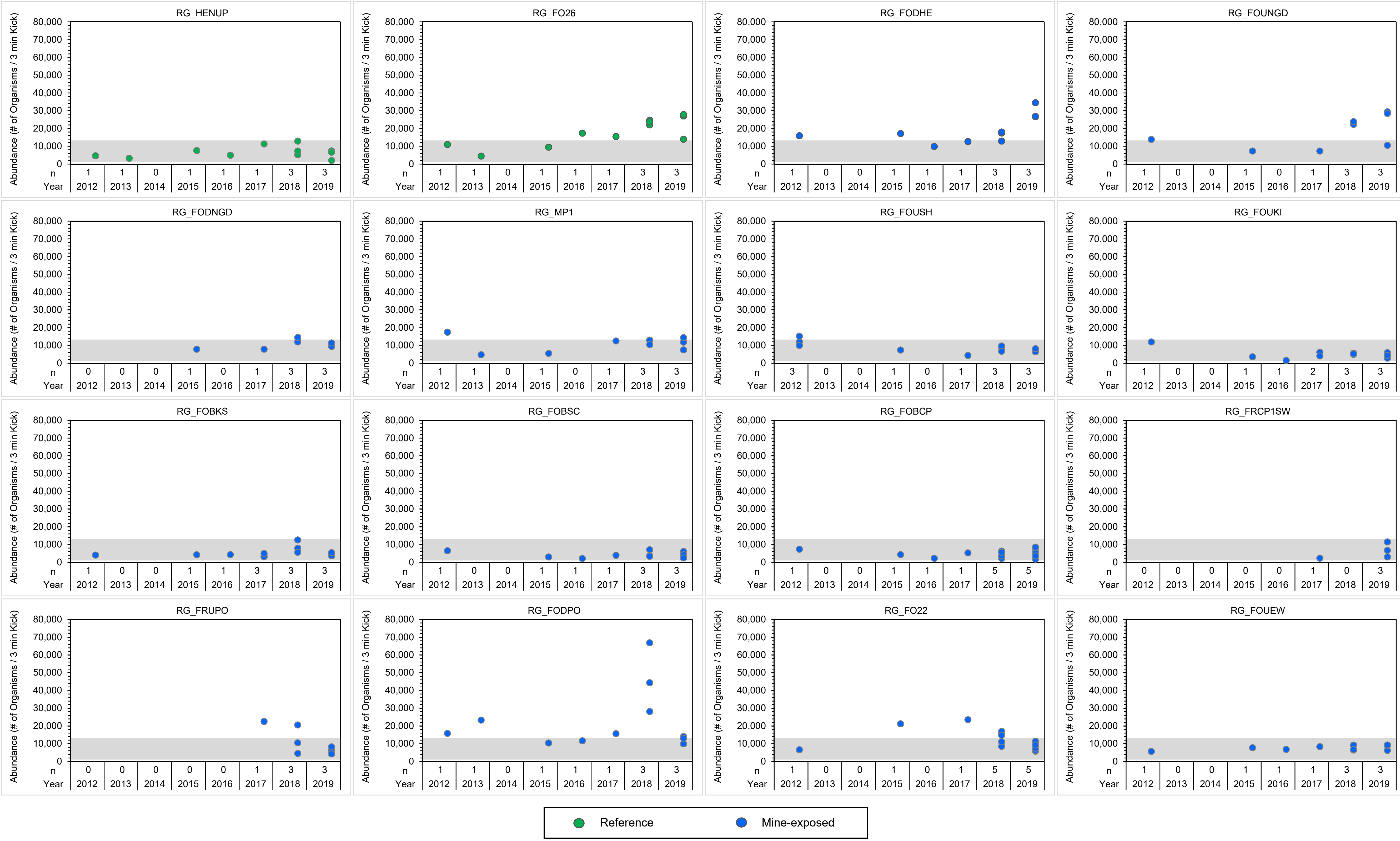

Figure B.3: Benthic Invertebrate Community Abundance in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

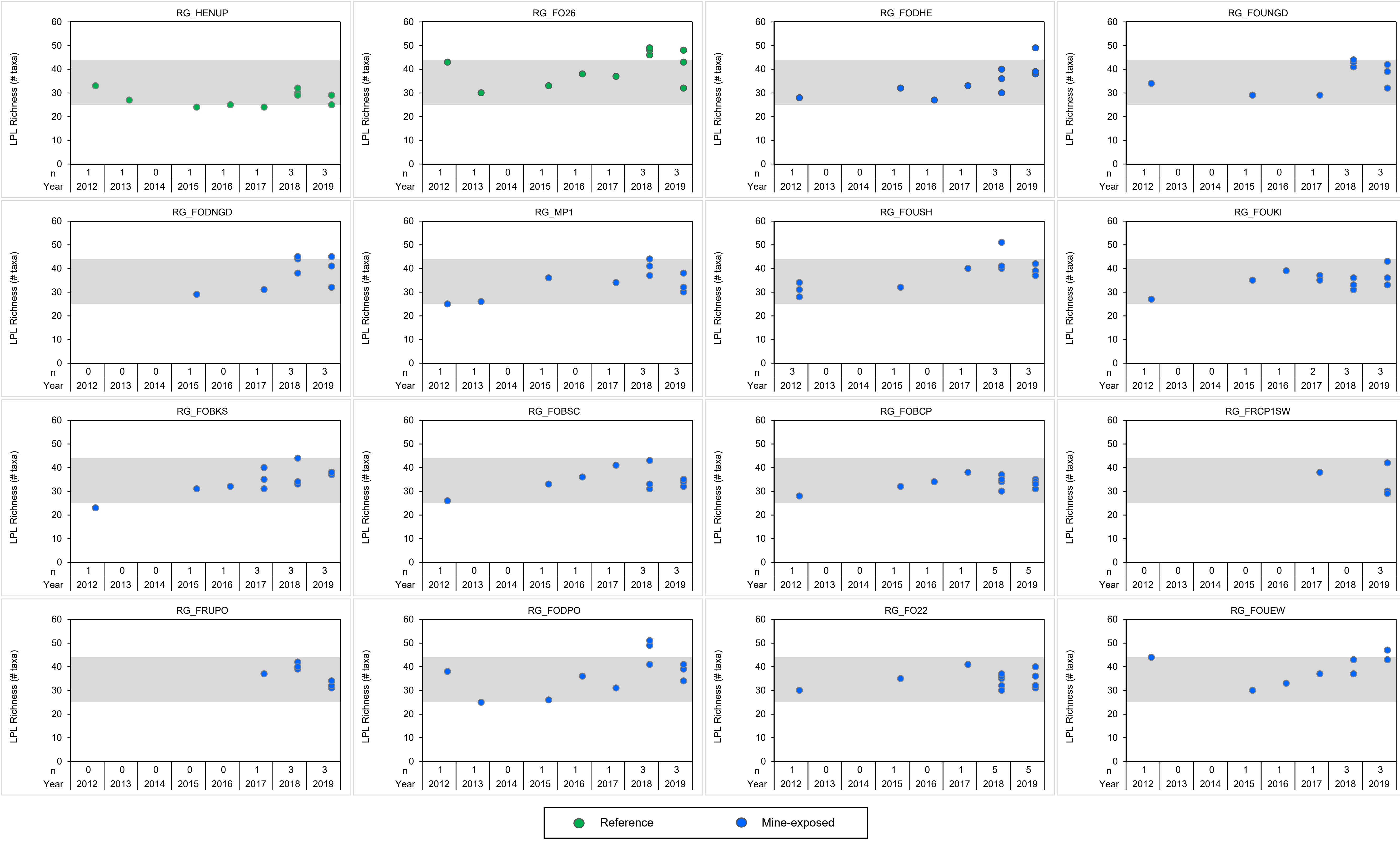

Figure B.4: Benthic Invertebrate Community LPL Richness in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year. LPL stands for lowest practical unit for taxonomy.

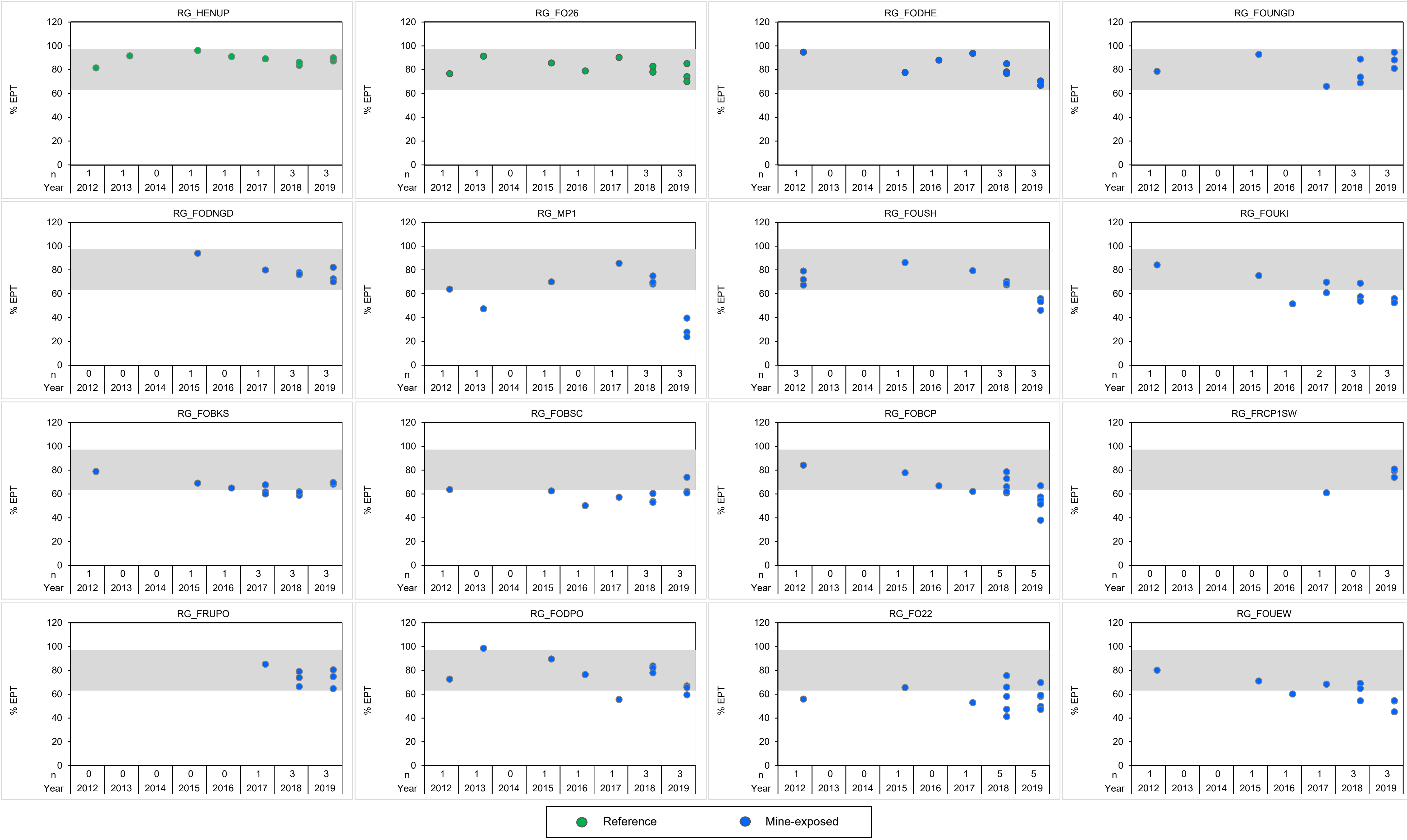

Figure B.5: Benthic Invertebrate Community %EPT in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year. EPT stands for Ephemeroptera, Plecoptera, Trichoptera.

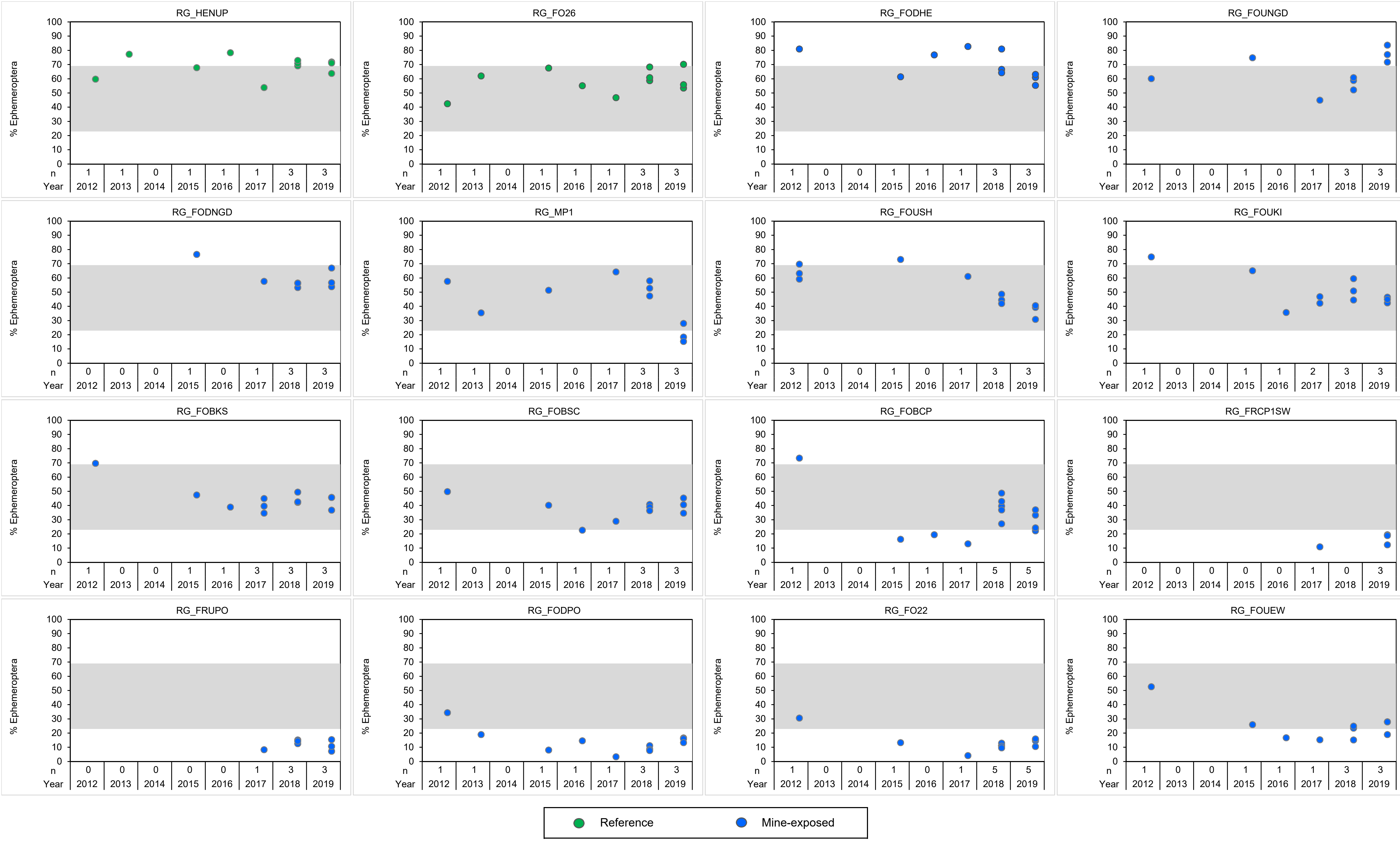

Figure B.6: Benthic Invertebrate Community % Ephemeroptera in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

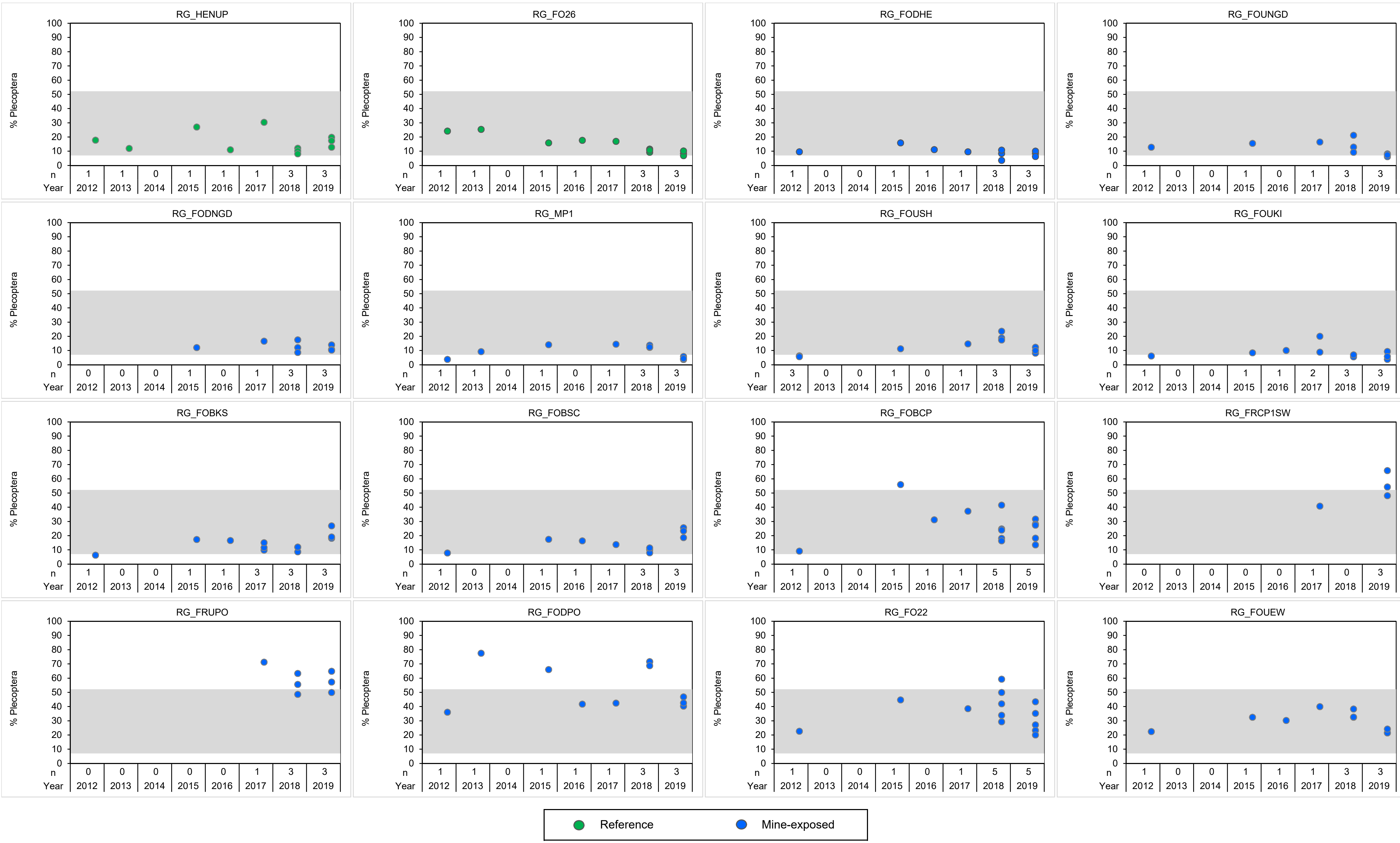

Figure B.7: Benthic Invertebrate Community % Plecoptera in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

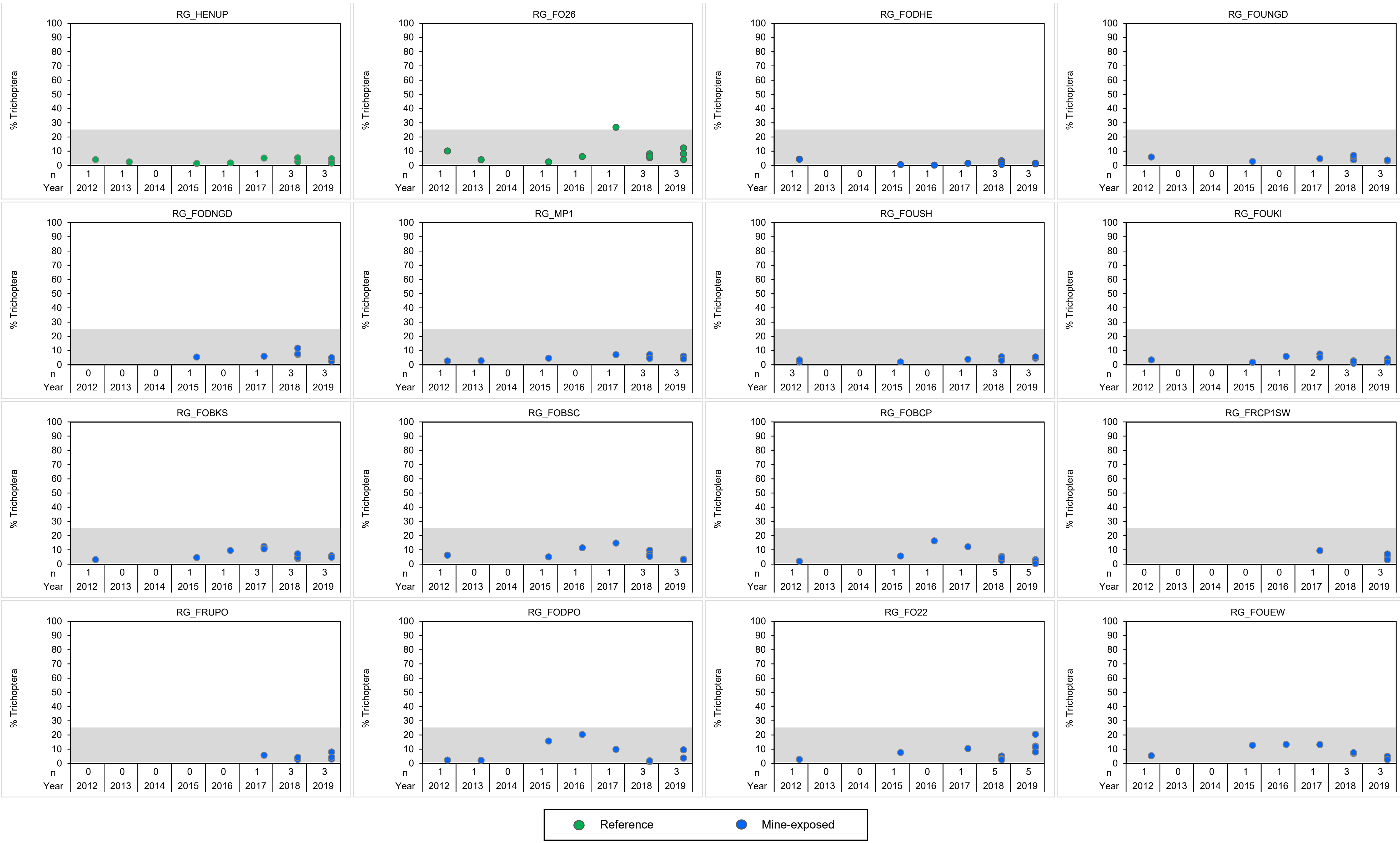

Figure B.8: Benthic Invertebrate Community % Trichoptera in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

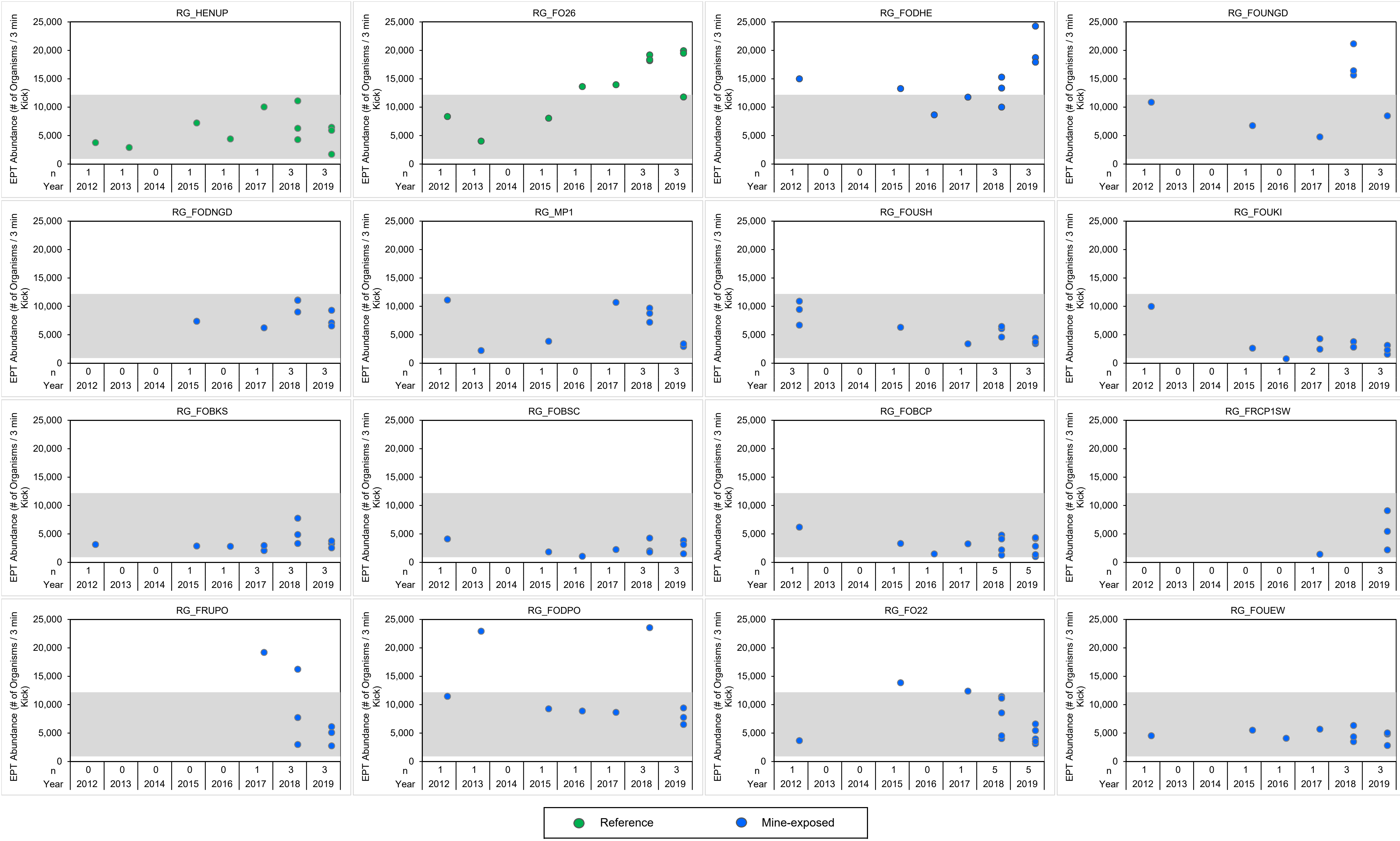

Figure B.9: Benthic Invertebrate Community EPT Abundance in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

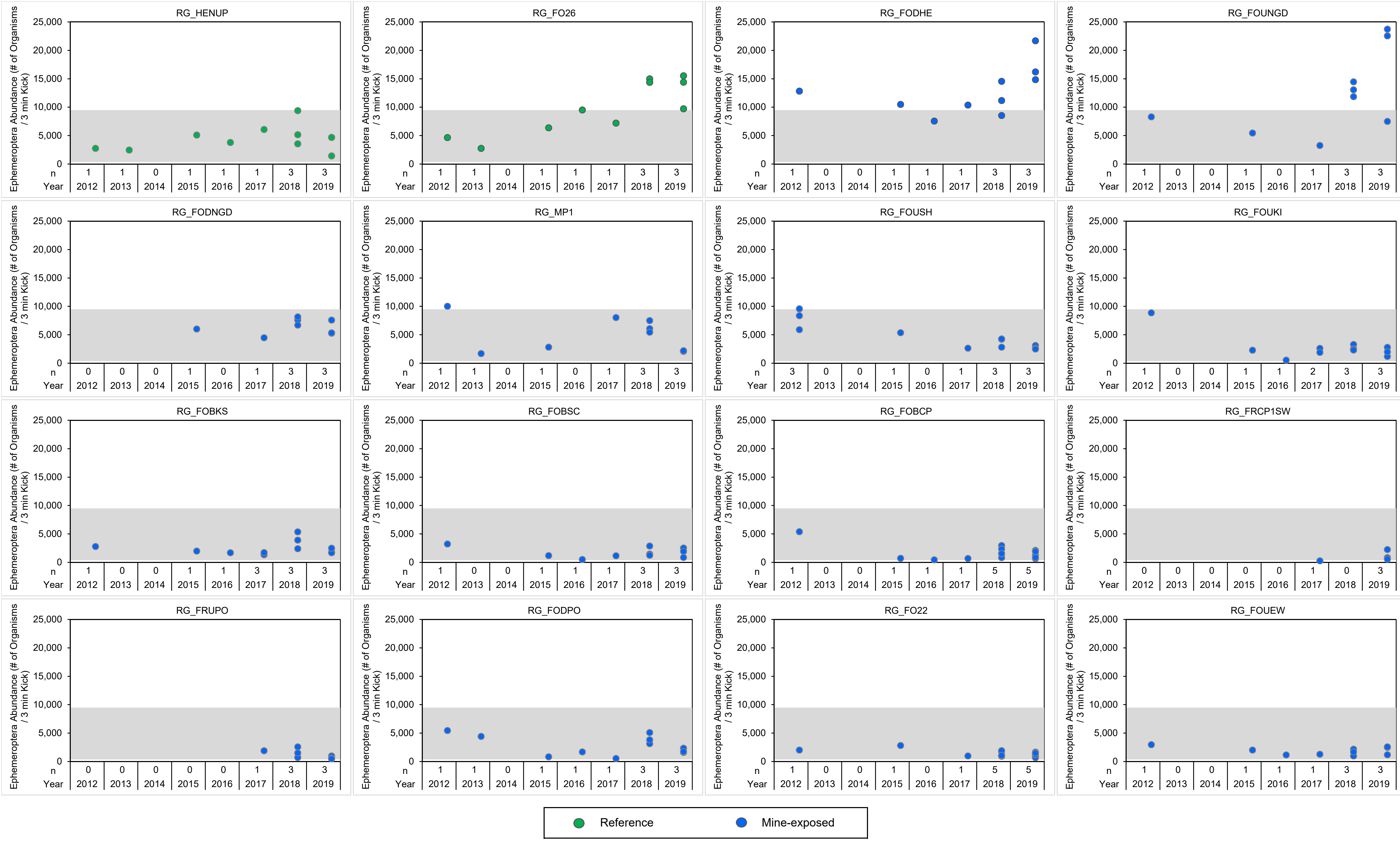

Figure B.10: Benthic Invertebrate Community Ephemeroptera Abundance in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

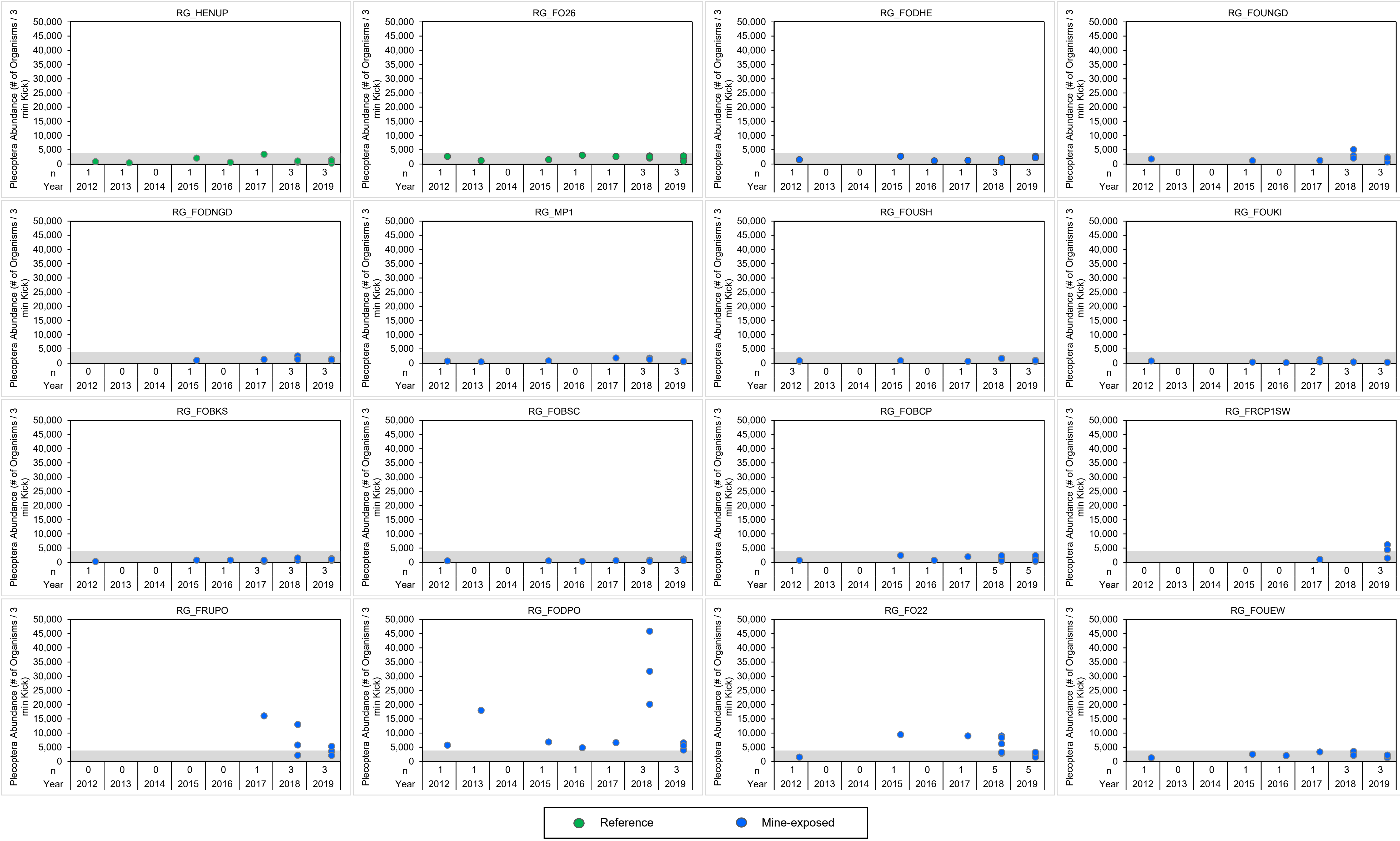

Figure B.11: Benthic Invertebrate Community Plecoptera Abundance in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

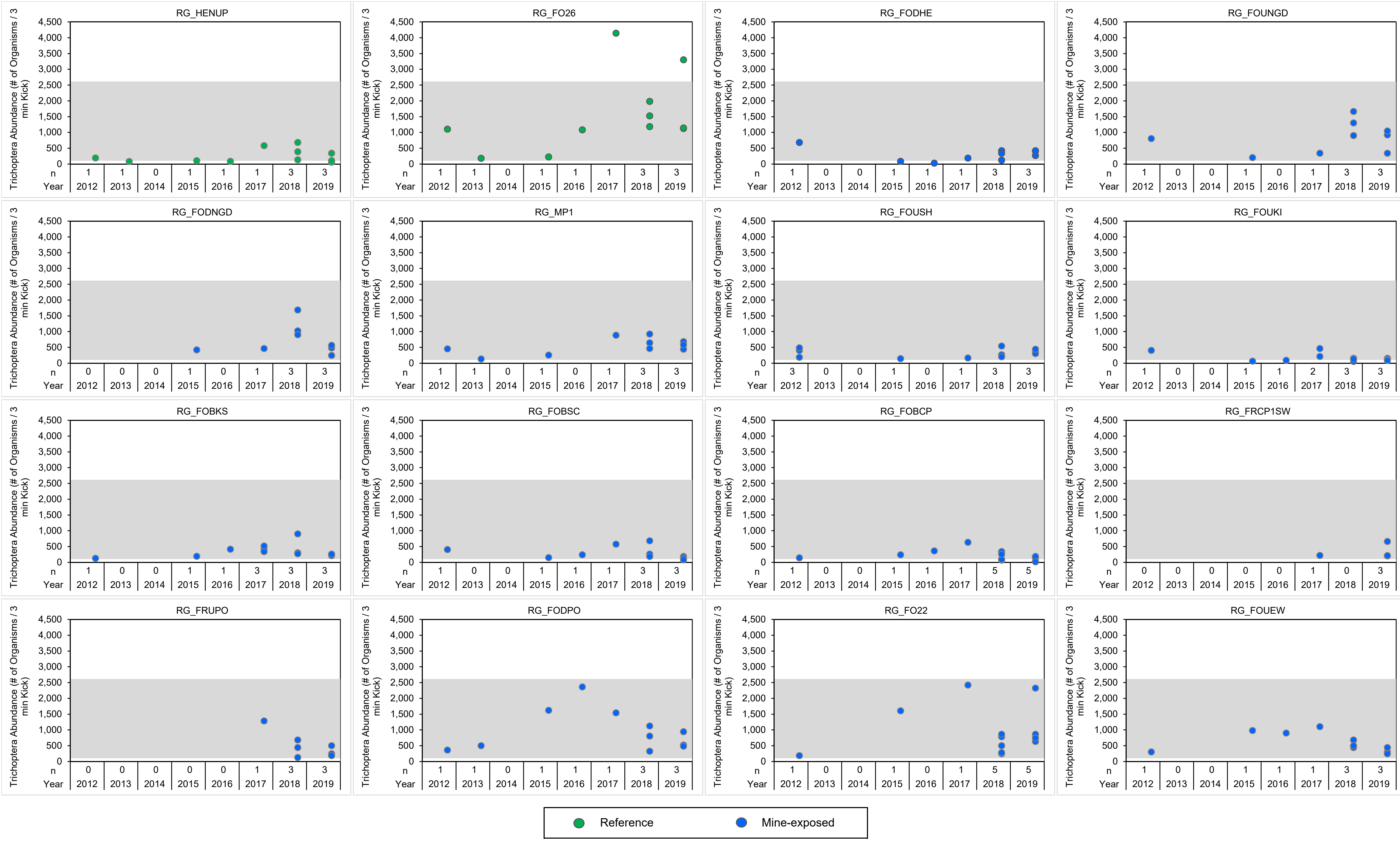

Figure B.12: Benthic Invertebrate Community Trichoptera Abundance, FRO LAEMP in September, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

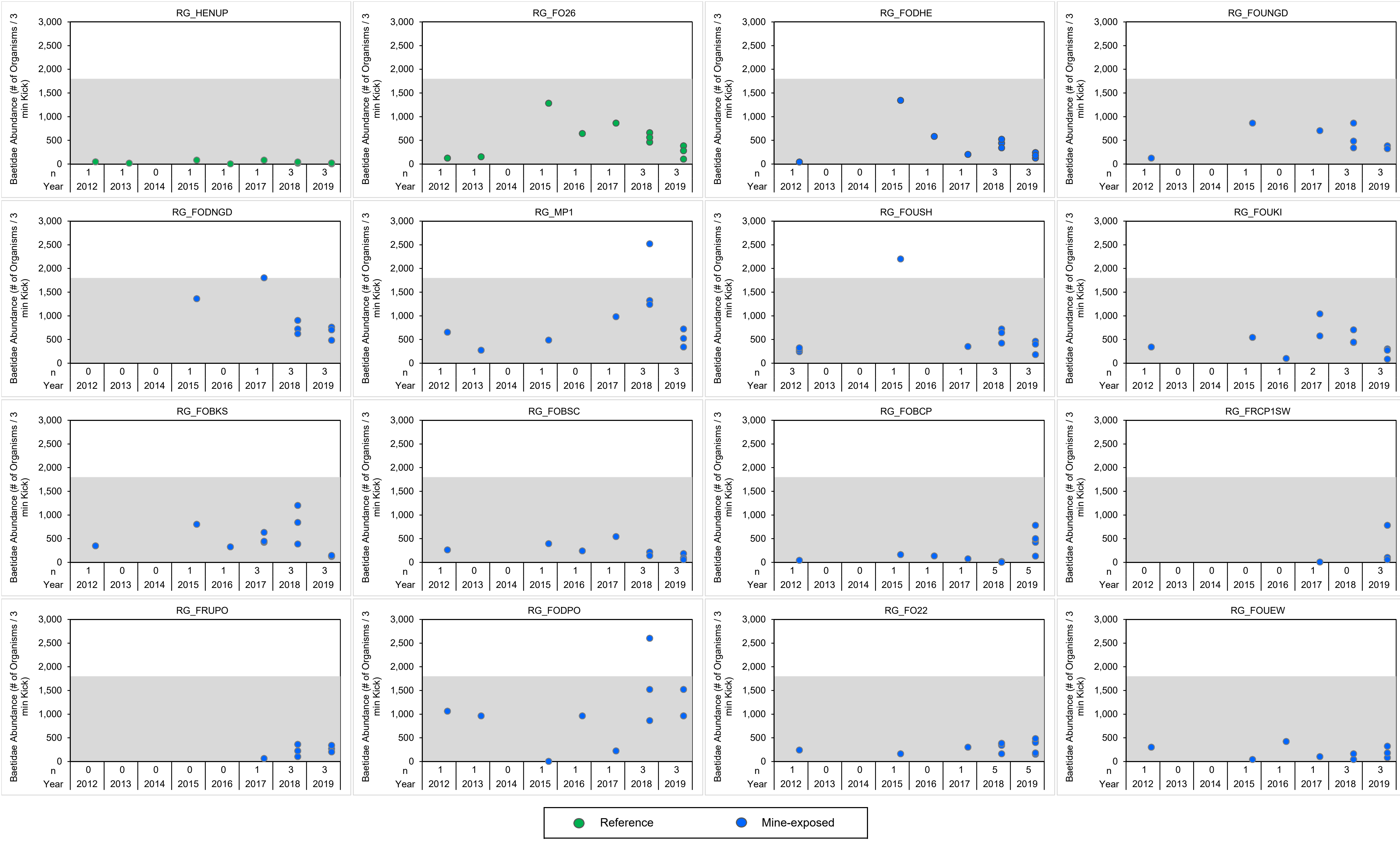

Figure B.13: Benthic Invertebrate Community Baetidae Abundance in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

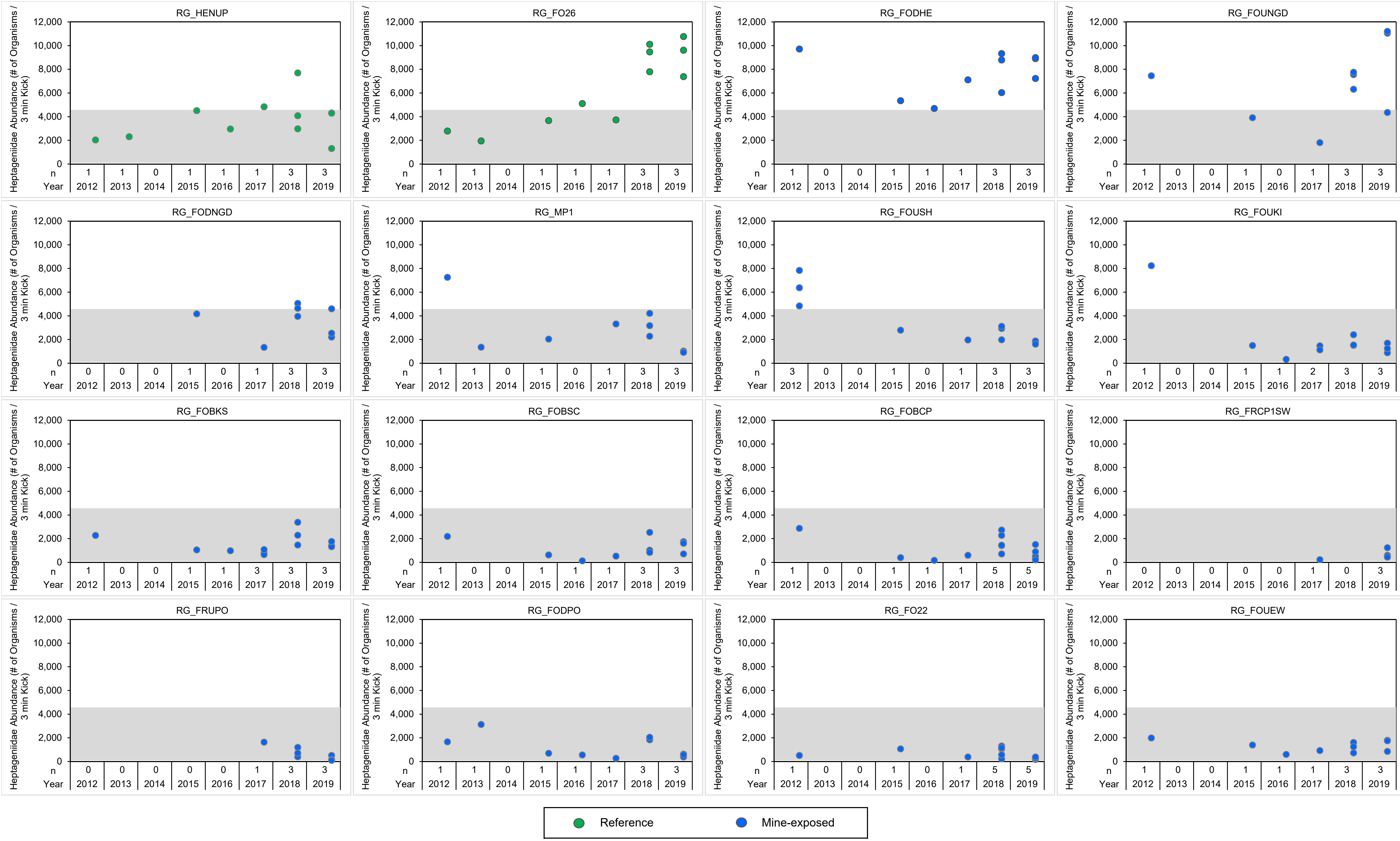

Figure B.14: Benthic Invertebrate Community Heptageneiidae Abundance in September, FRO LAEMP, 2012 to 2019

Notes: Grey shading represents the normal range defined as the 2.5[th] and 97.5[th] percentiles of the 2012 and 2015 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

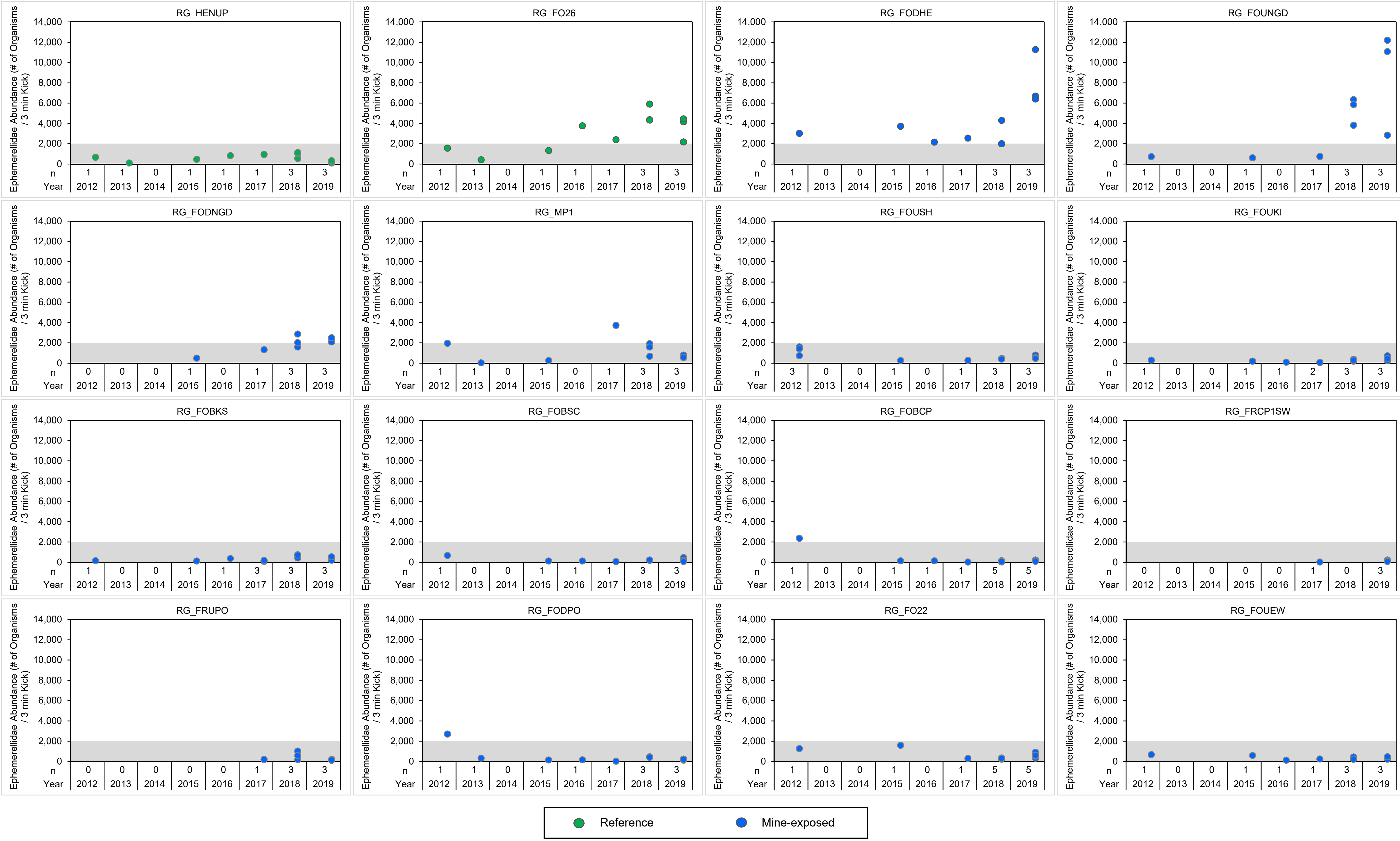

Figure B.15: Benthic Invertebrate Community Ephemerellidae Abundance in September, FRO LAEMP, 2012 to 2019

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 Regional Aquatic Environmental Monitoring Program (RAEMP). RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year.

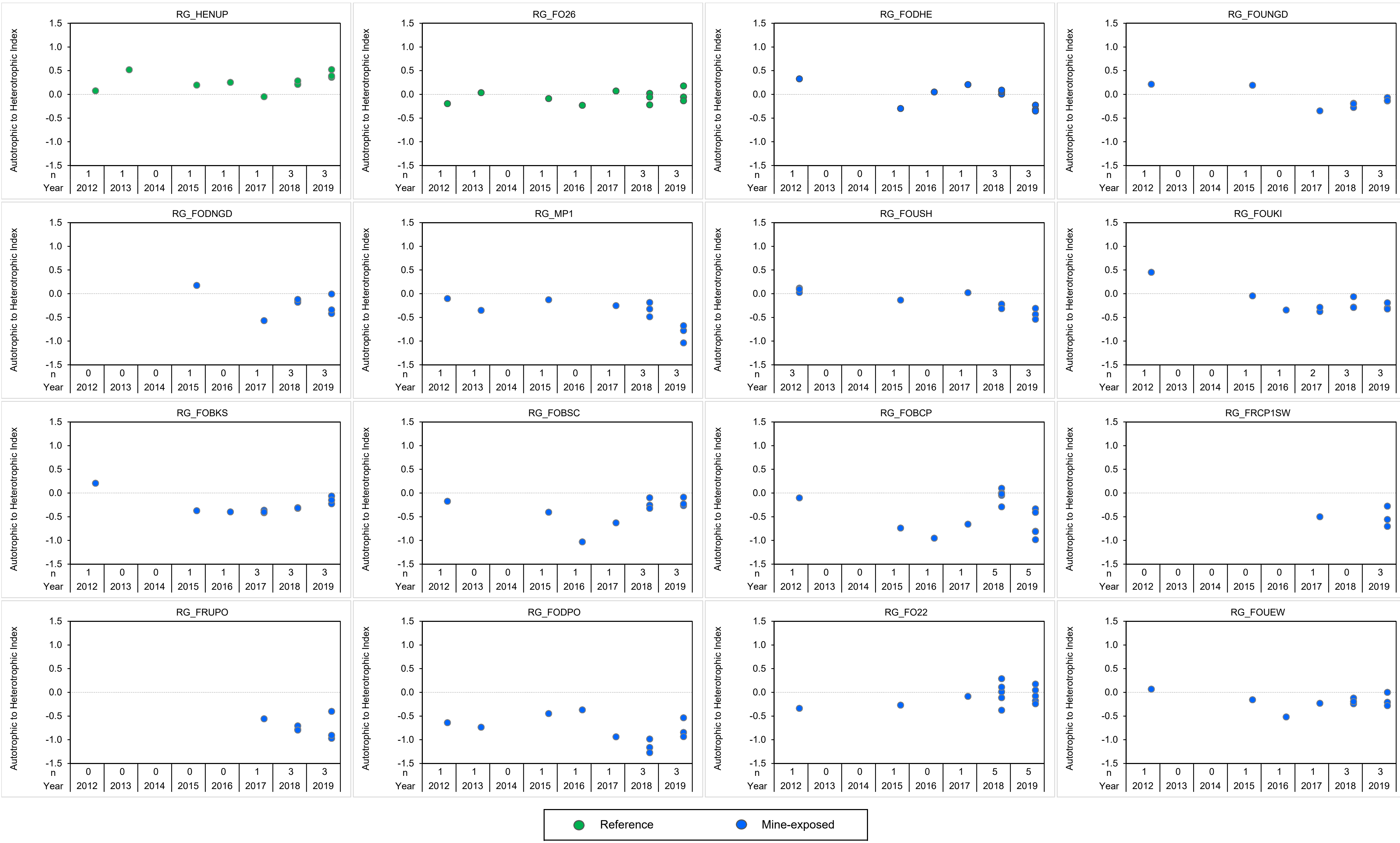

Figure B.16: Benthic Invertebrate Community Autotrophic to Heterotrophic Index in September, FRO LAEMP, 2012 to 2019

Notes: RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year. Autotrophic to Heterotrophic Index = log10(scrapers/(shredders+collector-gatherers+filterers)).

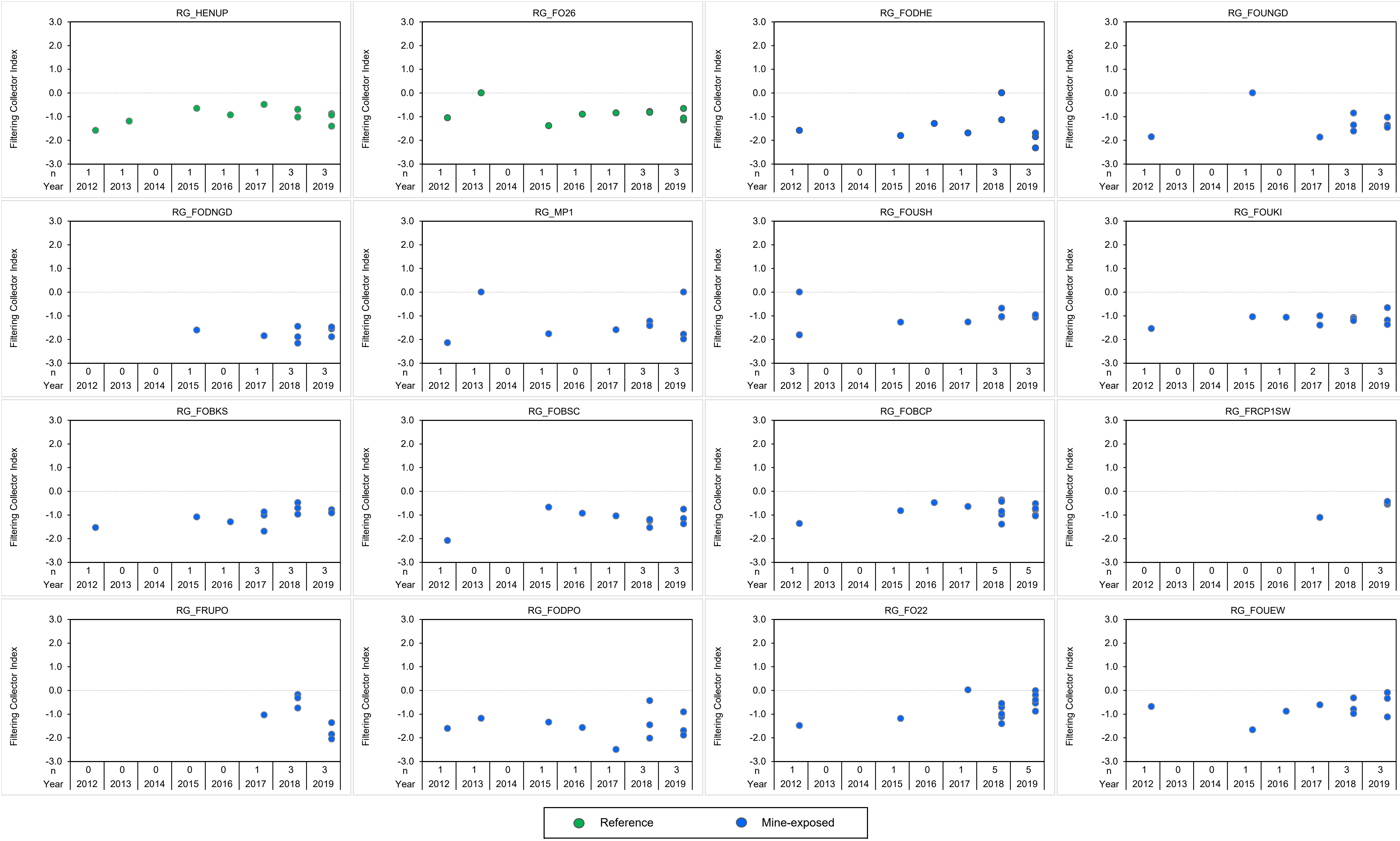

Figure B.17: **Benthic Invertebrate Community Filtering Collector Index in September, FRO LAEMP, 2012 to 2019**

Notes: RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year. Filtering Collector Index = log10(filterers/(collector-gatherers)).

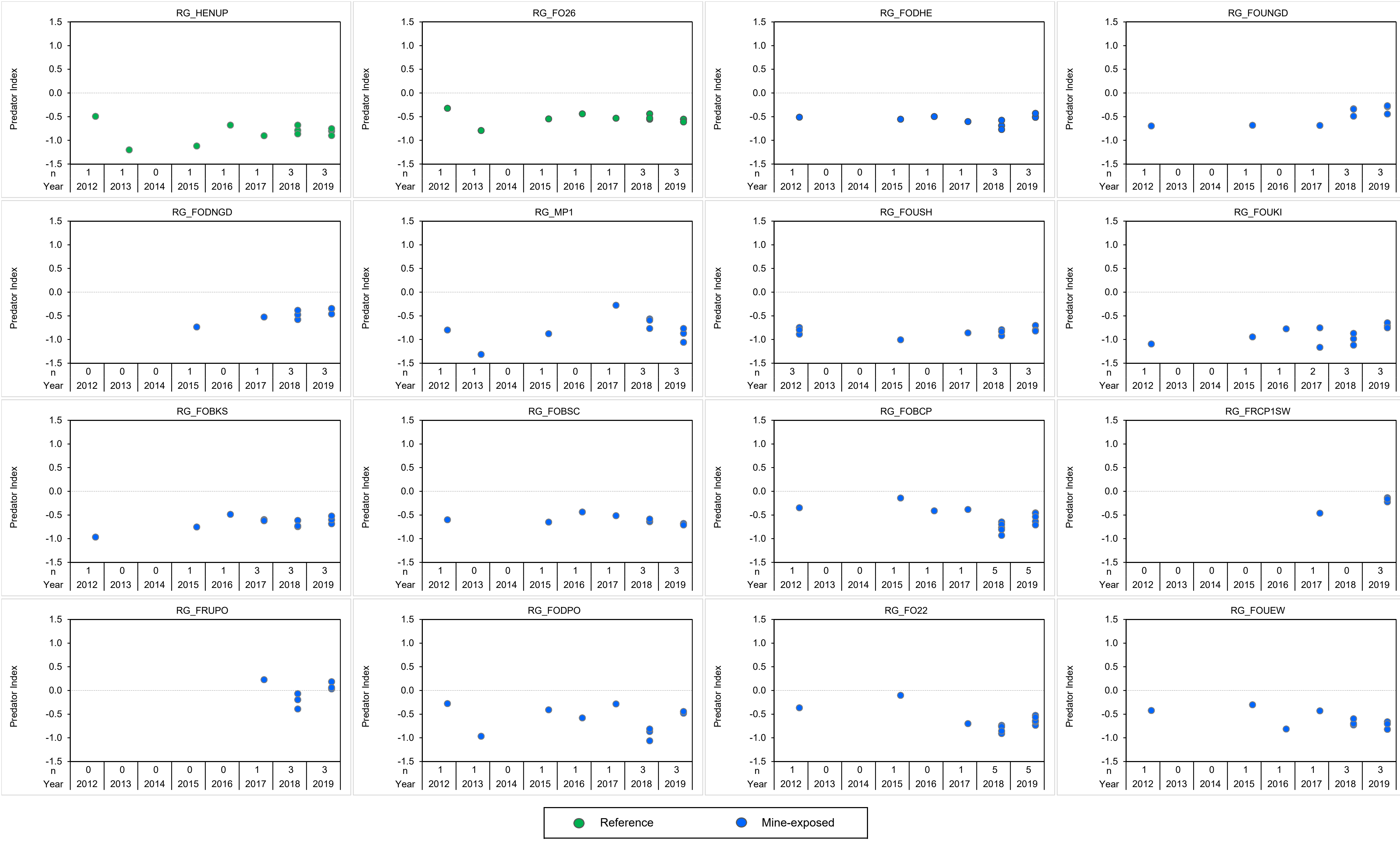

Figure B.18: Benthic Invertebrate Community Predator in September, FRO LAEMP, 2012 to 2019

Notes: RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year. Predator Index = log10(predators/(shredders+filterers+collector-gatherers+scraper-grazers)).

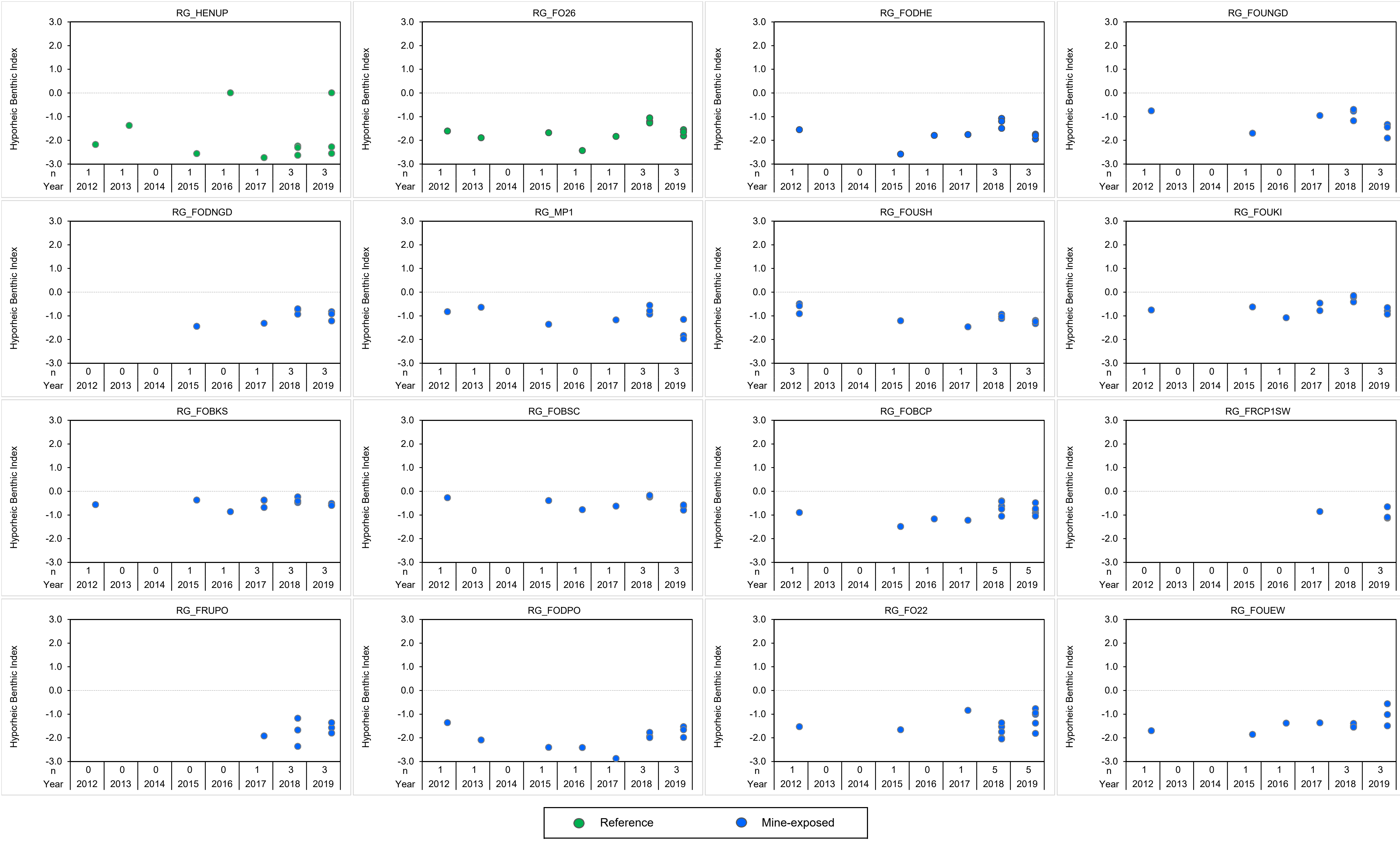

Figure B.19: Benthic Invertebrate Community Hyporheic to Benthic Index in September, FRO LAEMP, 2012 to 2019

Notes: RG_FOUCL and RG_SCOUTDS are not shown because they were only sampled in 2019. n = the sample size for a given year. Hyrorheic to Benthic Index = log10(burrowers/(clingers+sprawlers)).

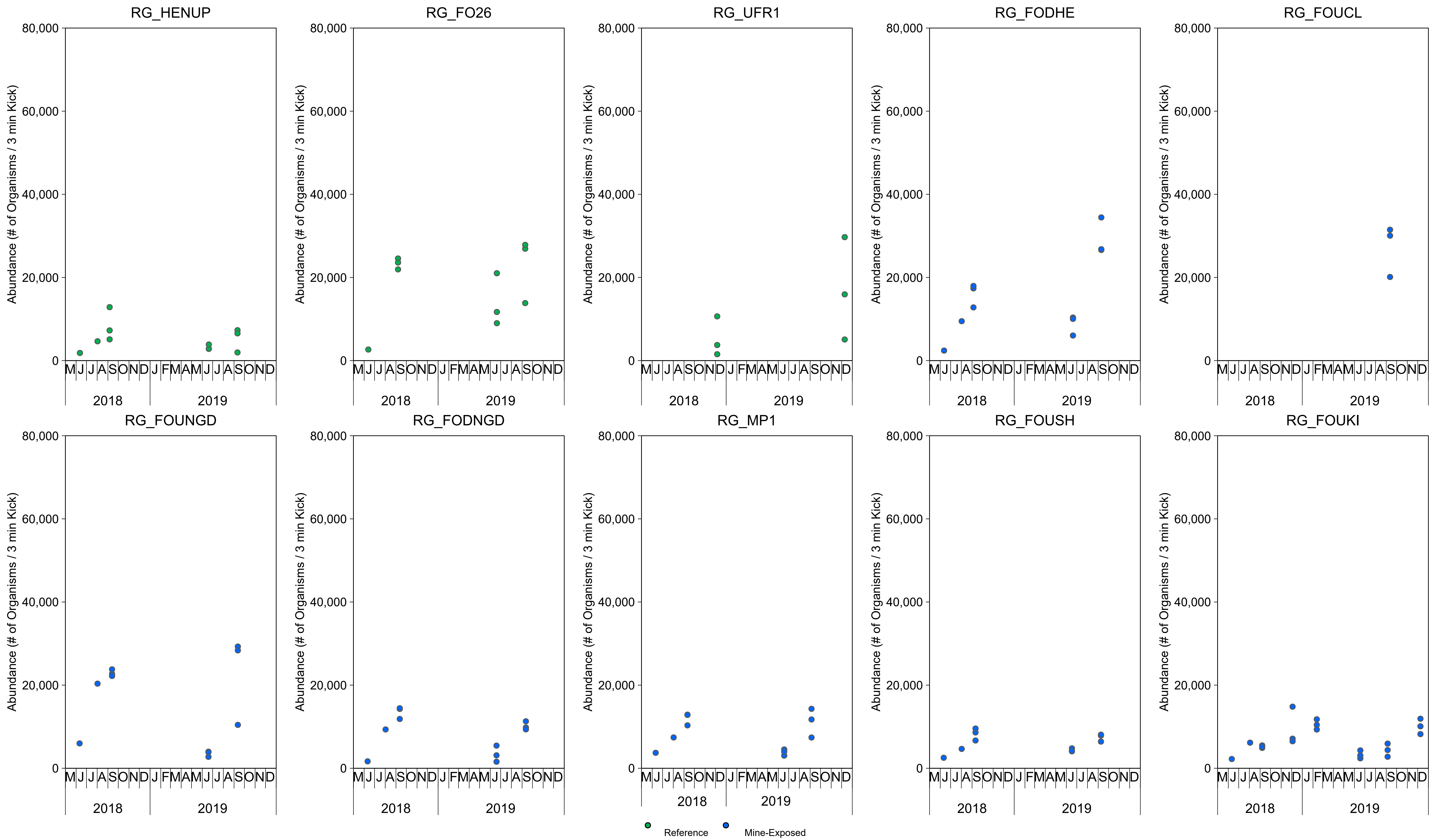

Figure B.20: **Benthic Invertebrate Abundance, FRO LAEMP, June 2018 to December 2019**

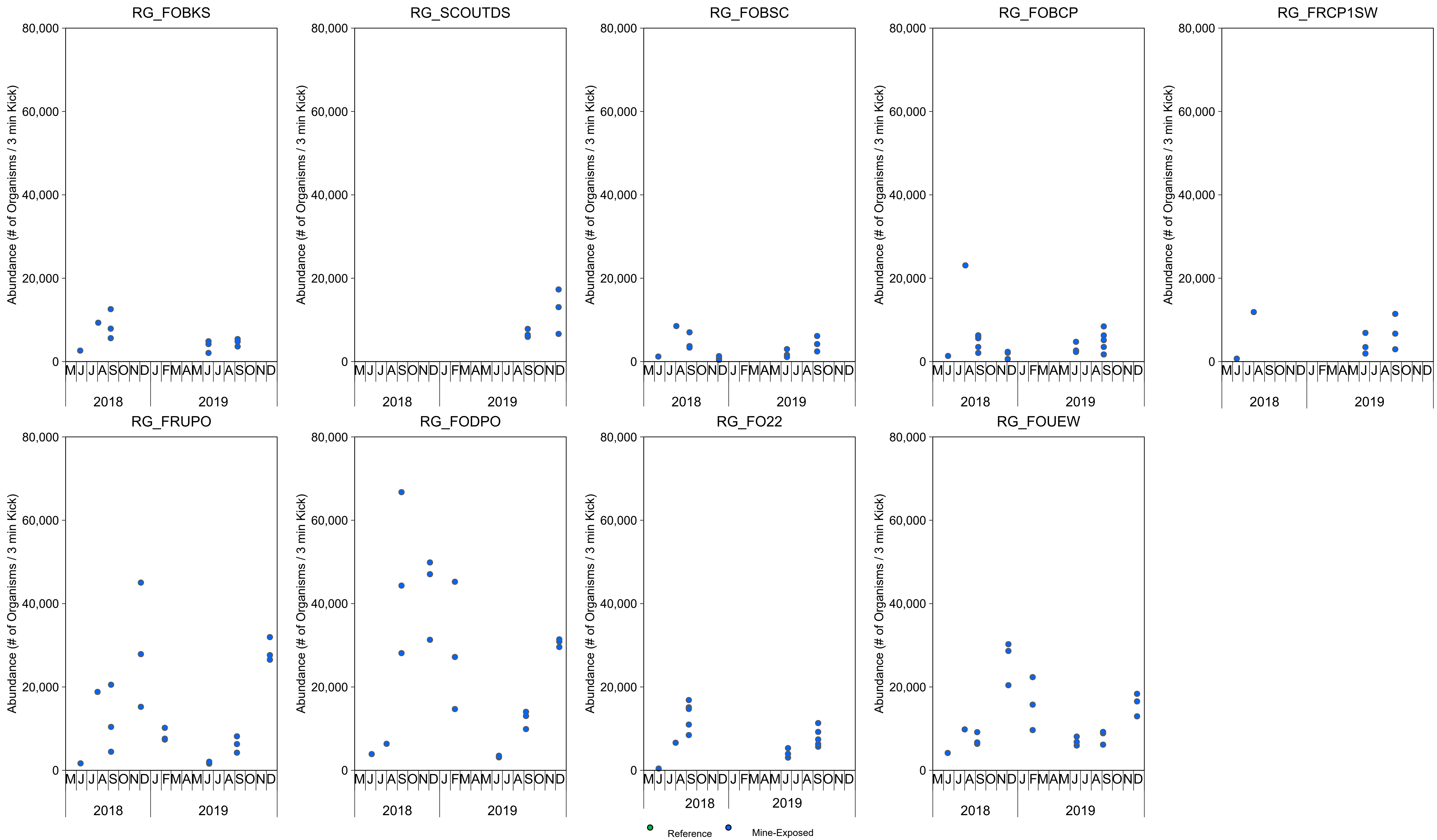

Figure B.20: Benthic Invertebrate Abundance, FRO LAEMP, June 2018 to December 2019

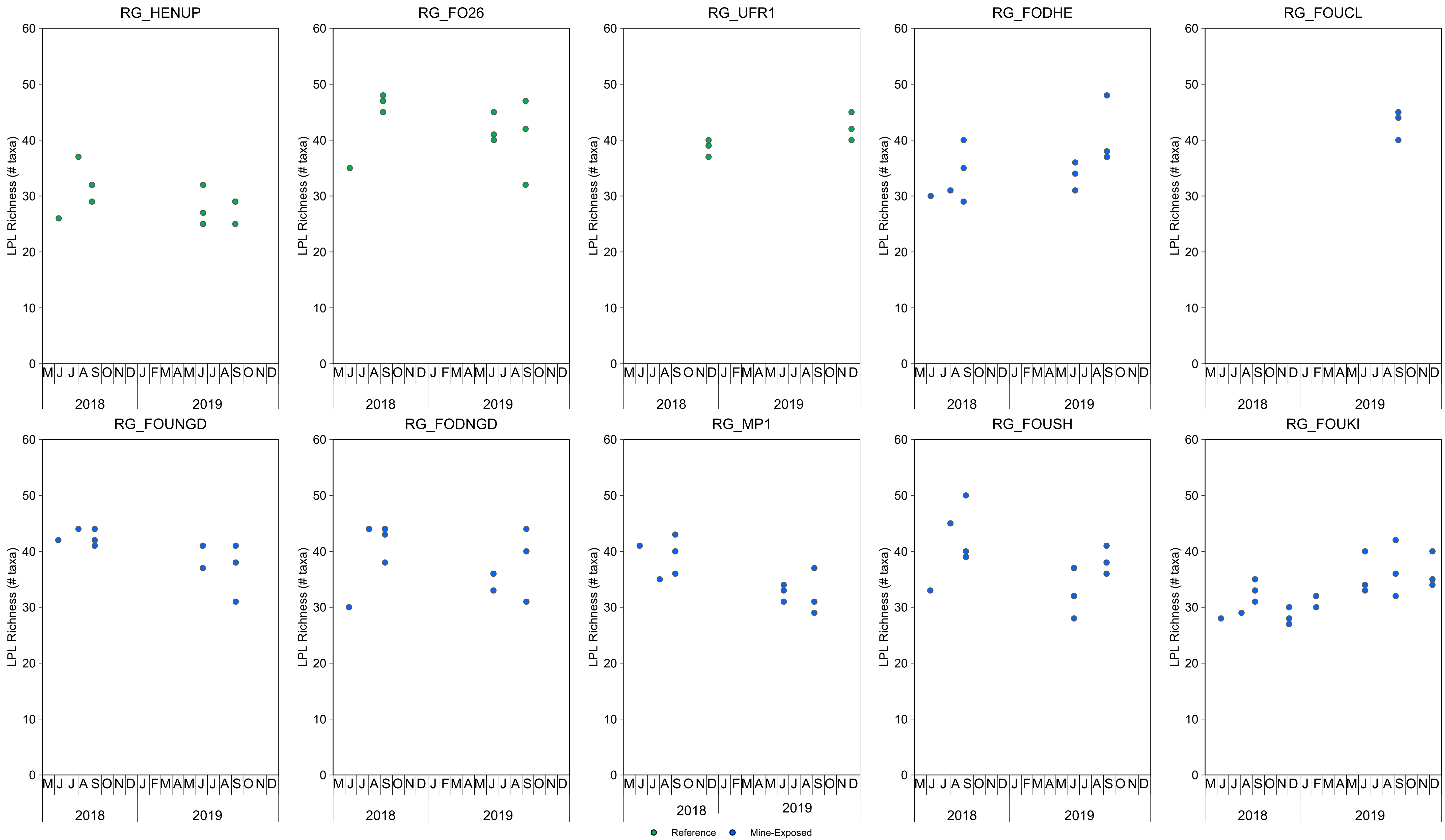

Figure B.21: Benthic Invertebrate LPL Richness, FRO LAEMP, June 2018 to December 2019

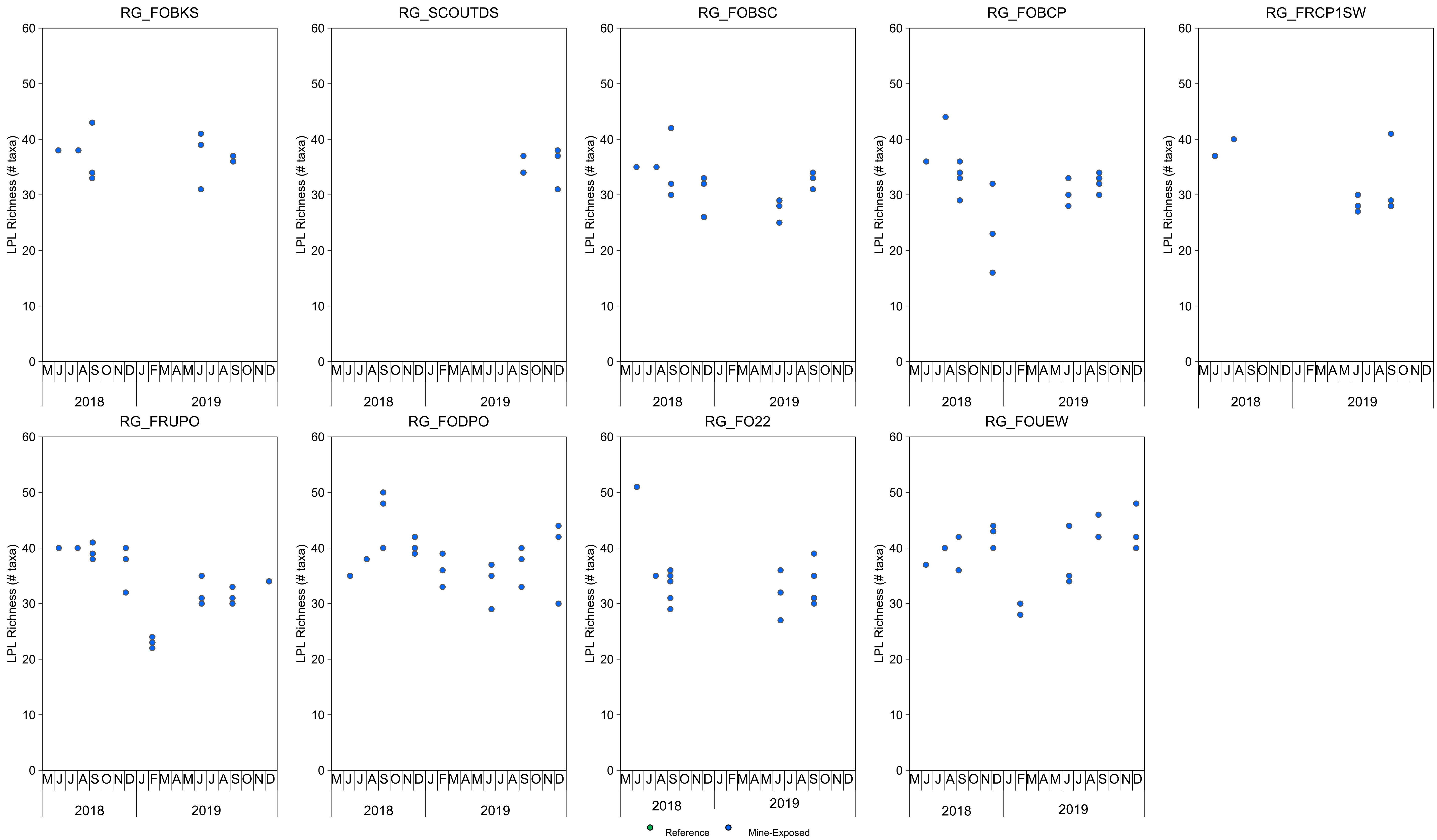

Figure B.21: **Benthic Invertebrate LPL Richness, FRO LAEMP, June 2018 to December 2019**

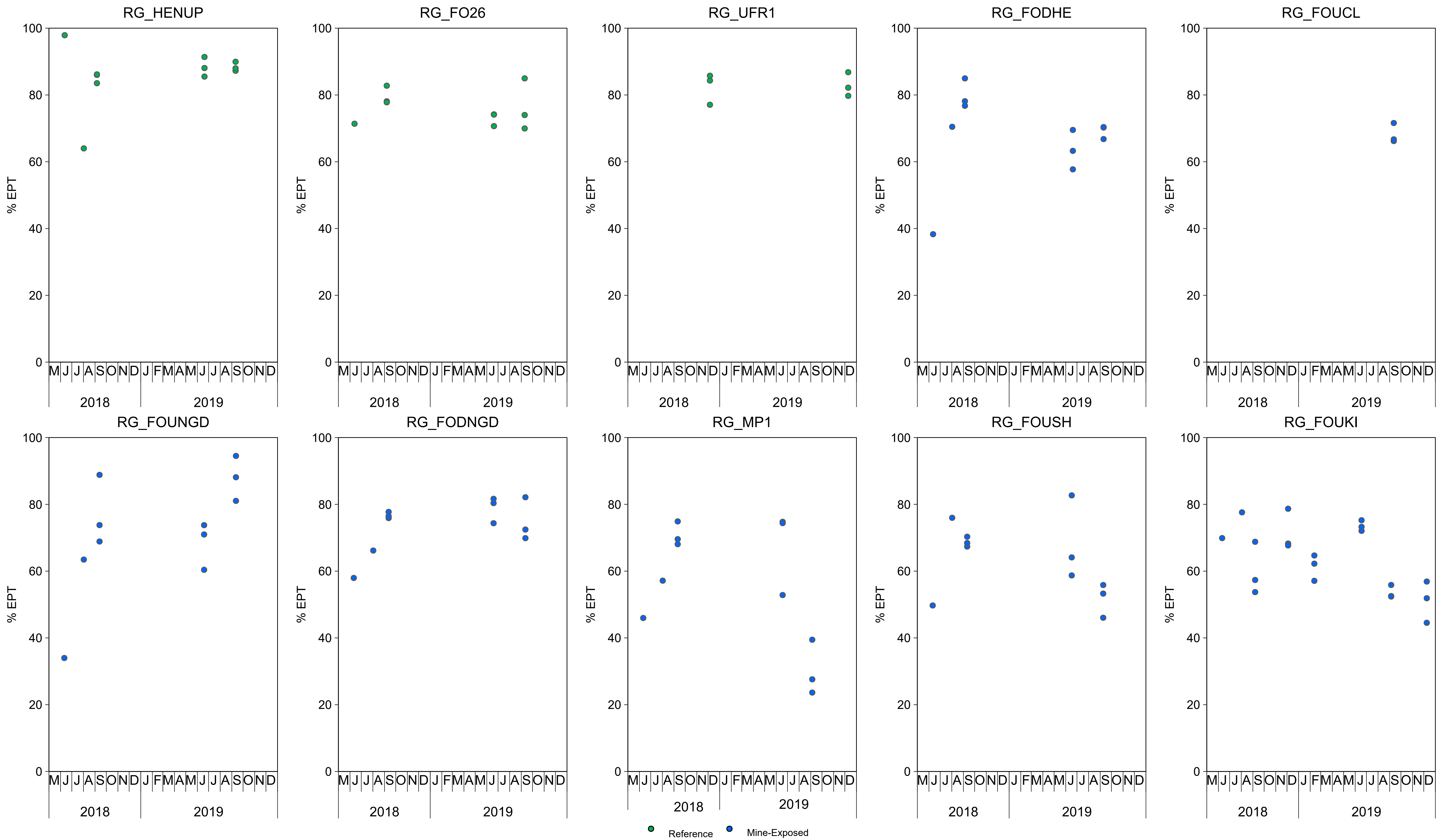

Figure B.22: Benthic Invertebrate % EPT, FRO LAEMP, June 2018 to December 2019

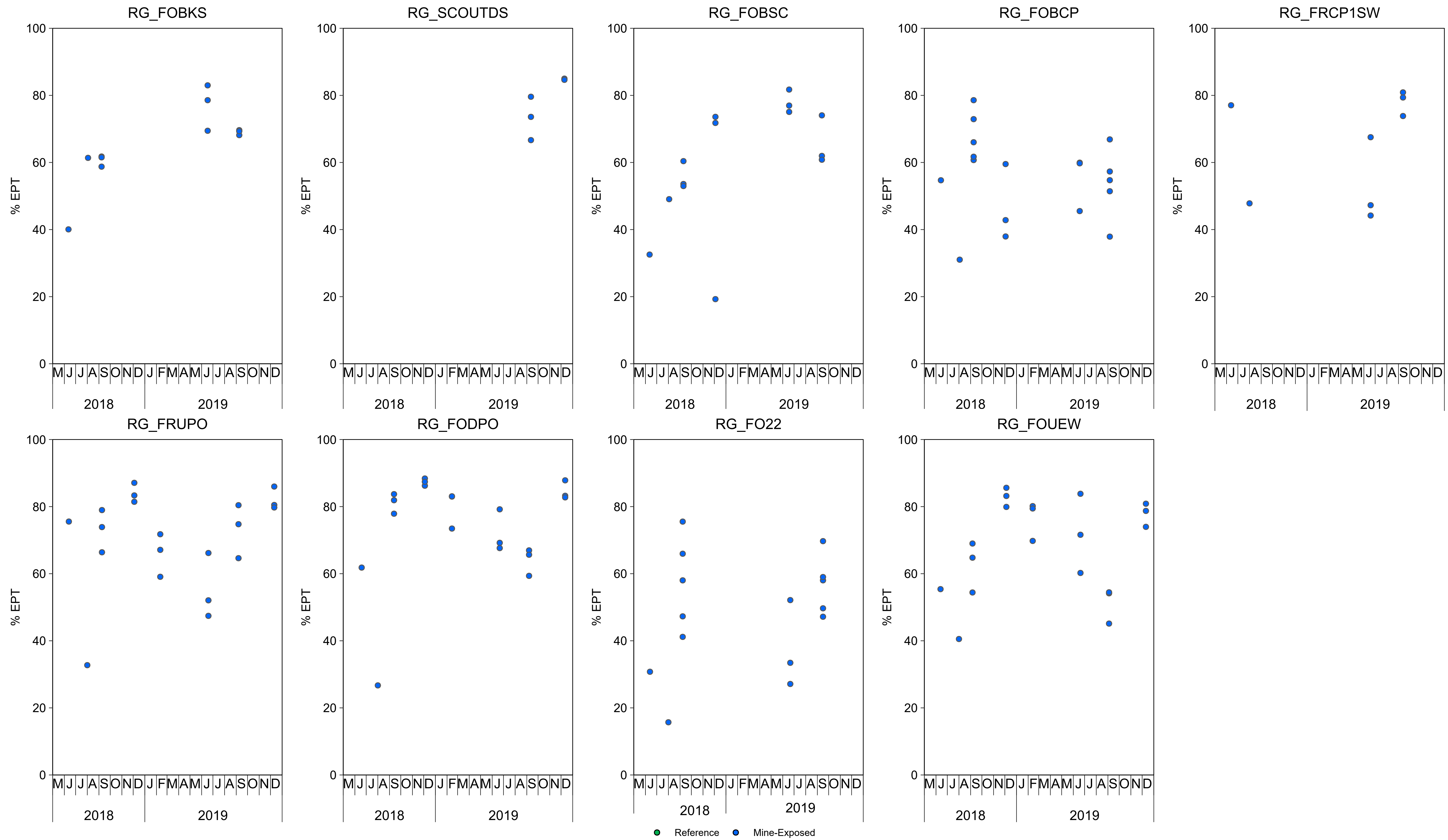

Figure B.22: Benthic Invertebrate % EPT, FRO LAEMP, June 2018 to December 2019

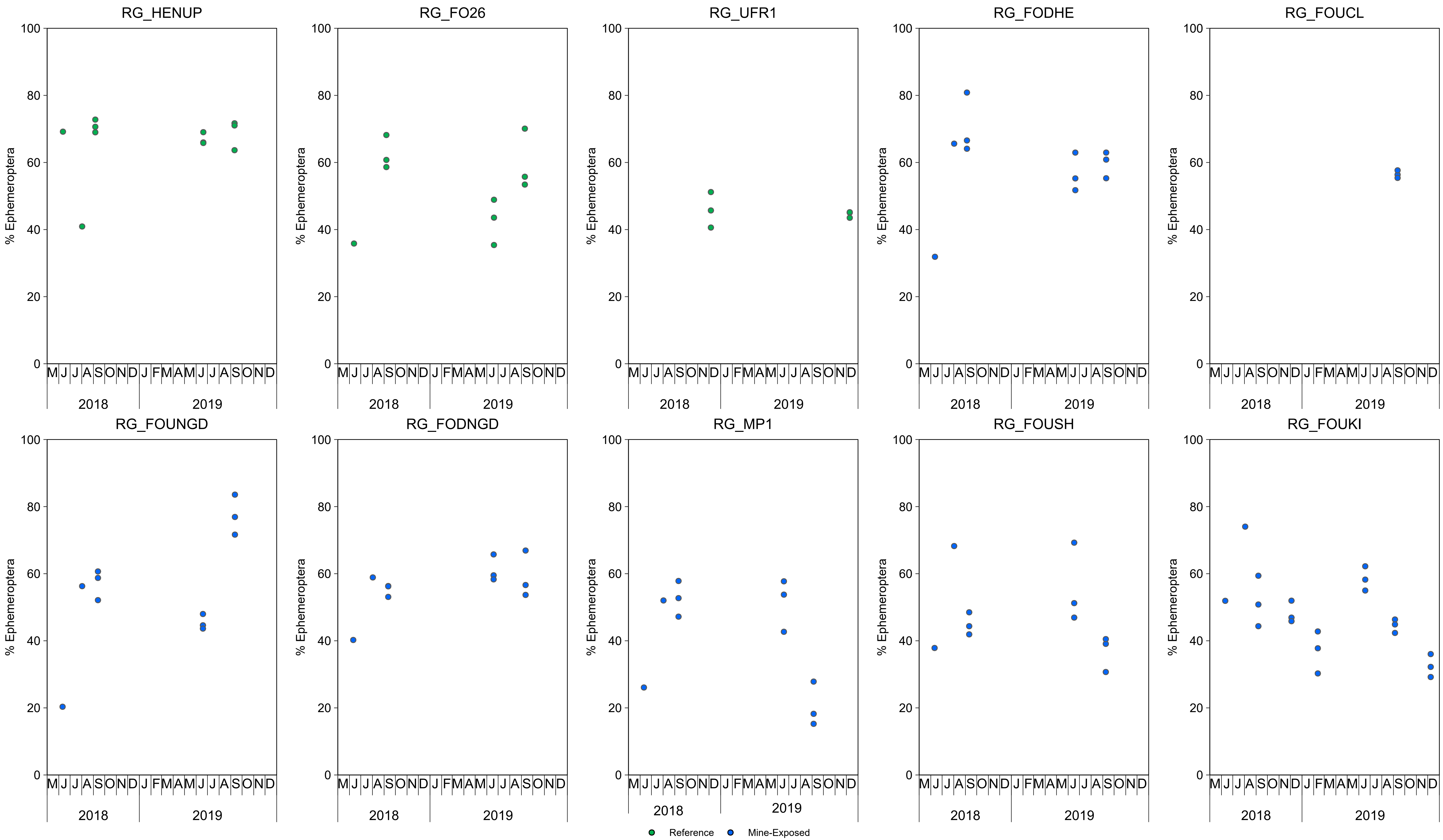

Figure B.23: Benthic Invertebrate % Ephemeroptera, FRO LAEMP, June 2018 to December 2019

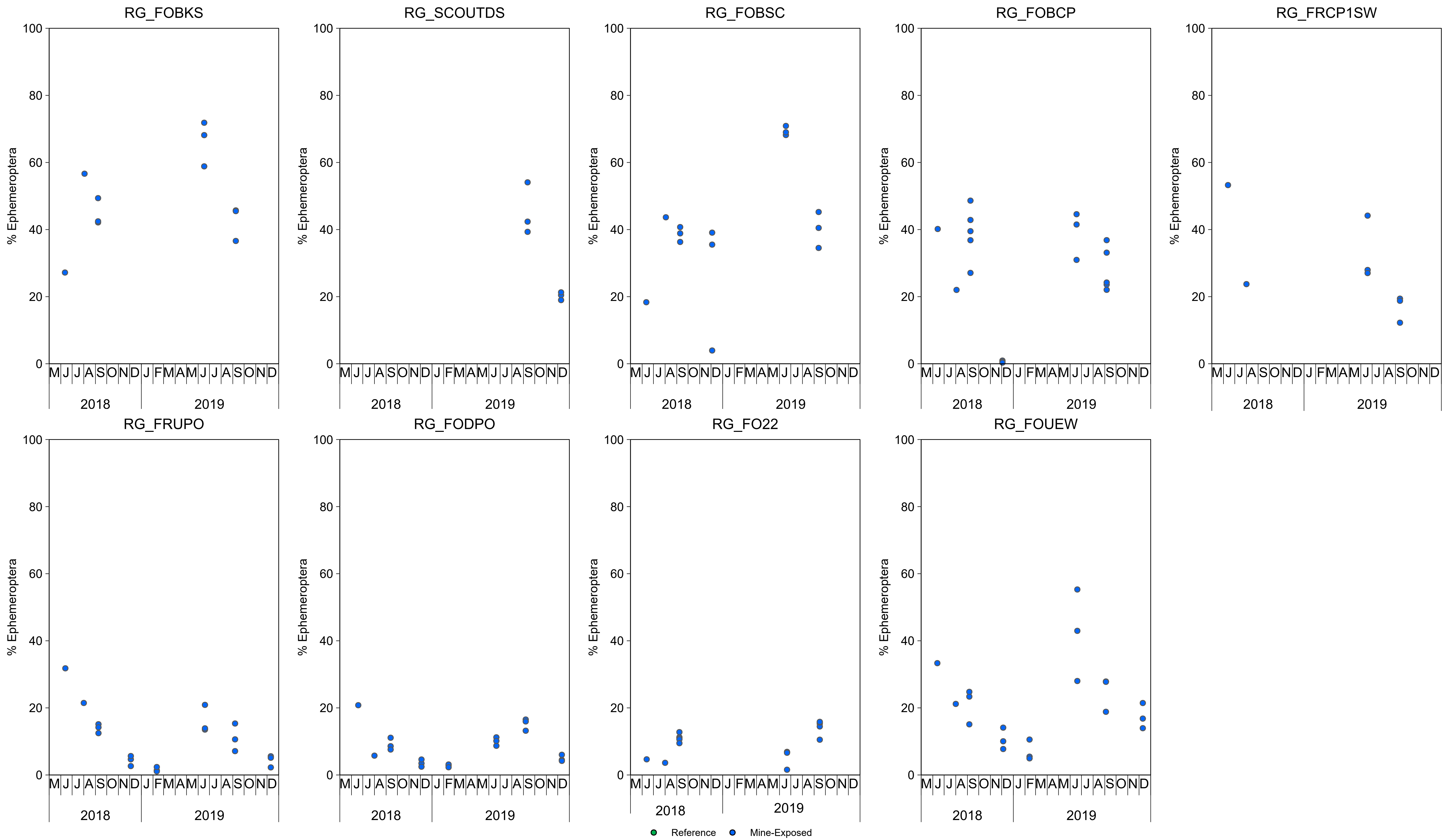

Figure B.23: Benthic Invertebrate % Ephemeroptera, FRO LAEMP, June 2018 to December 2019

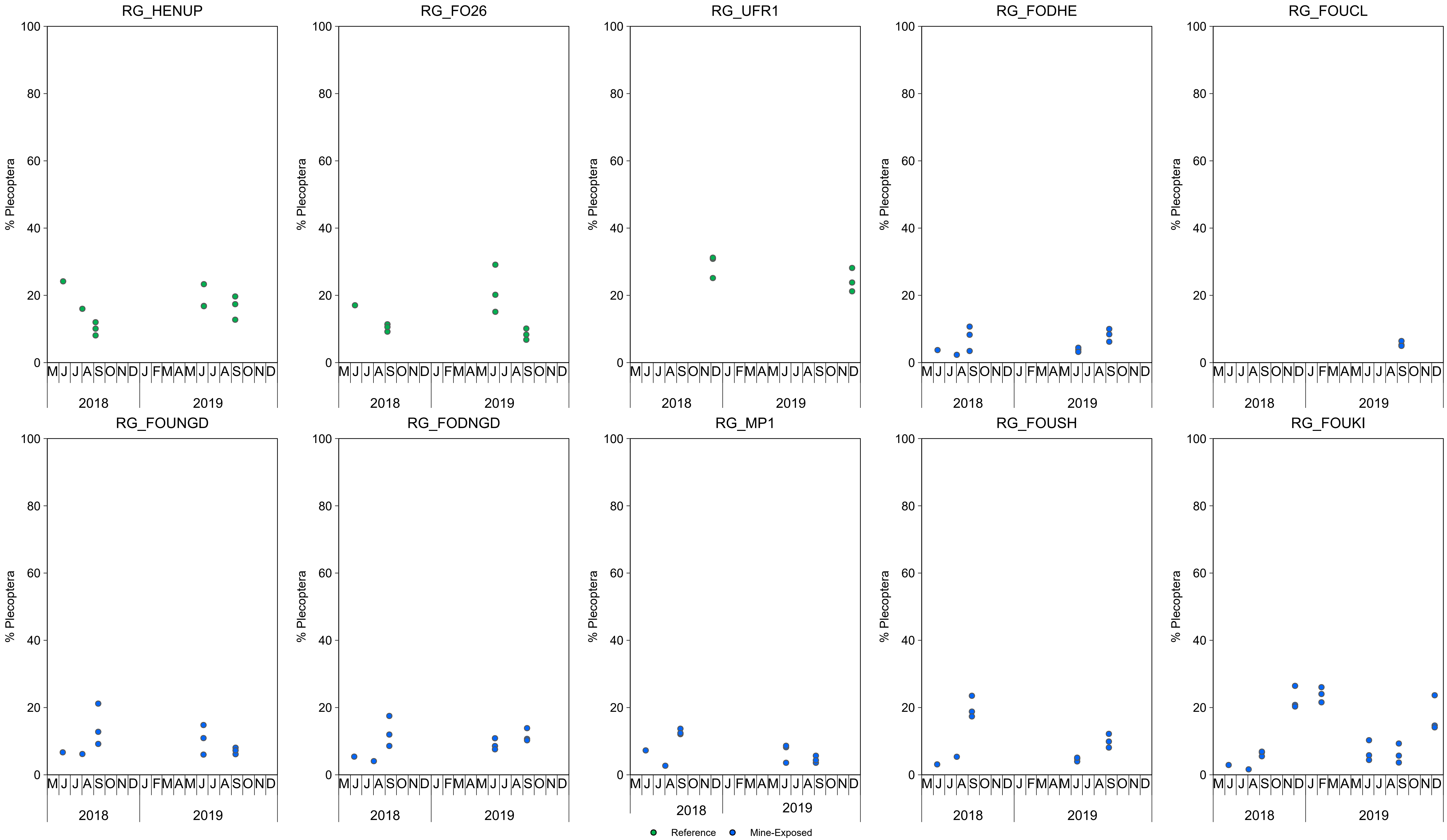

Figure B.24: Benthic Invertebrate % Plecoptera, FRO LAEMP, June 2018 to December 2019

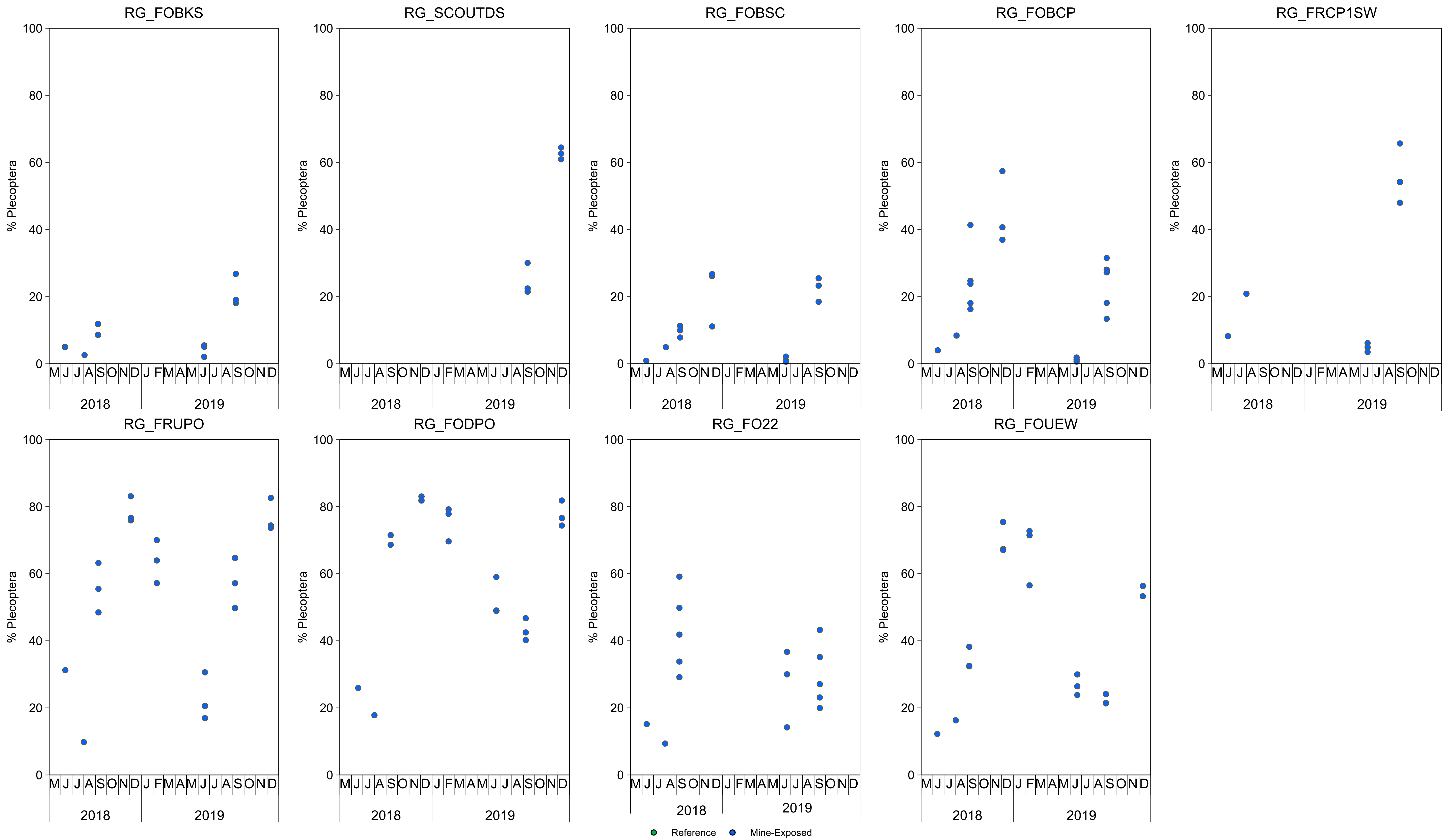

Figure B.24: Benthic Invertebrate % Plecoptera, FRO LAEMP, June 2018 to December 2019

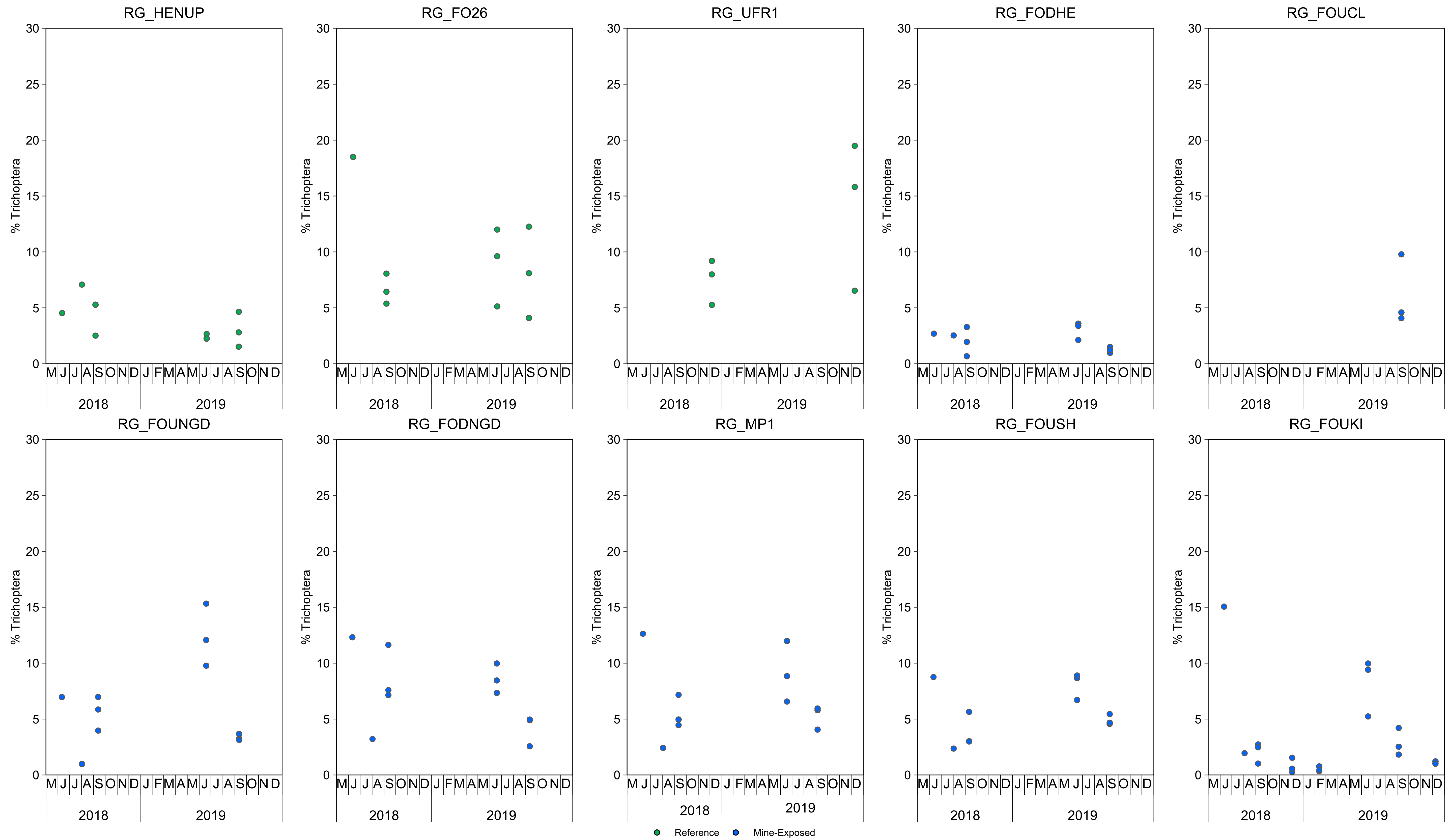

Figure B.25: Benthic Invertebrate % Trichoptera, FRO LAEMP, June 2018 to December 2019

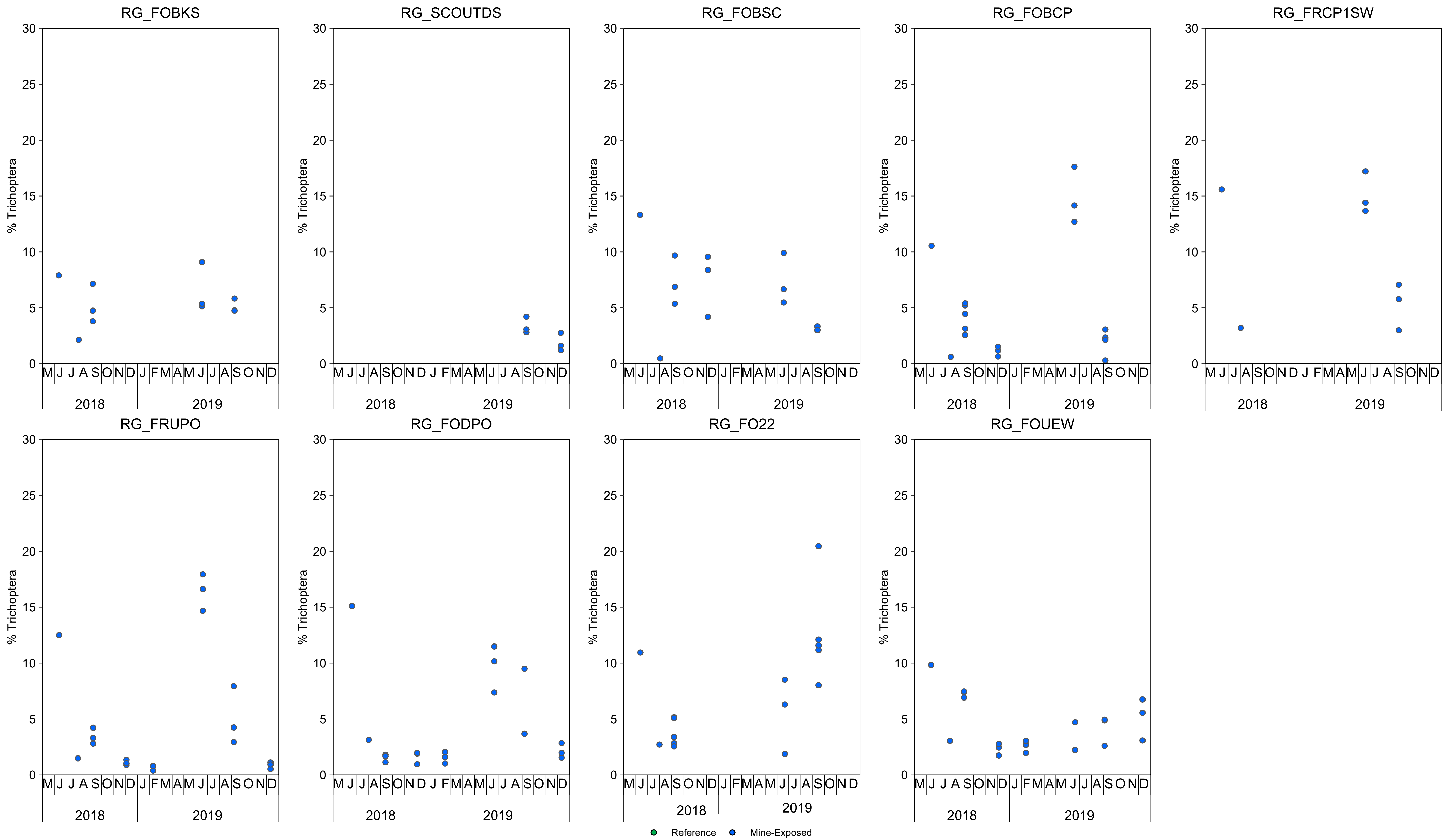

Figure B.25: Benthic Invertebrate % Trichoptera, FRO LAEMP, June 2018 to December 2019

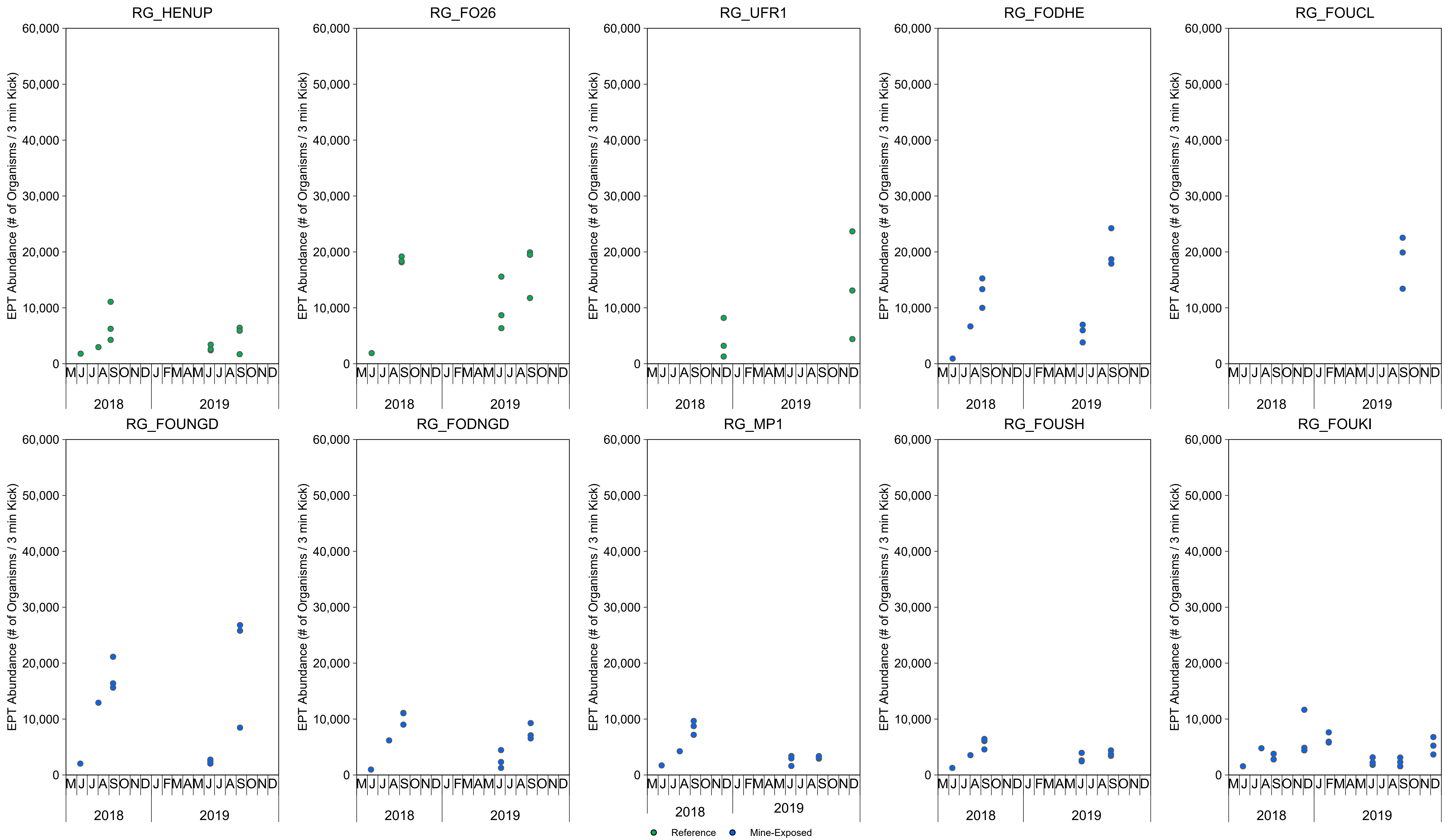

Figure B.26: **Benthic Invertebrate EPT Abundance, FRO LAEMP, June 2018 to December 2019**

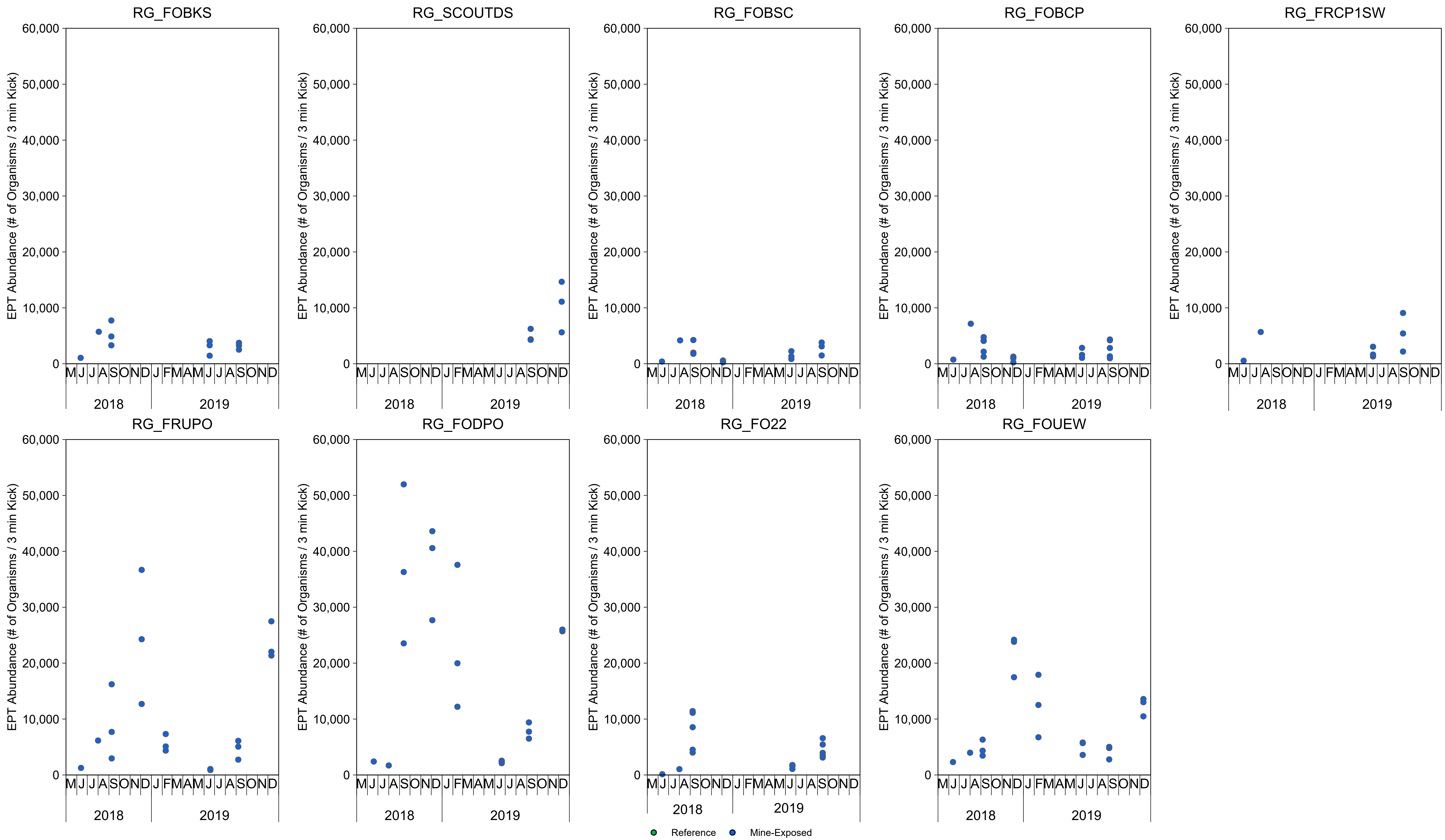

Figure B.26: **Benthic Invertebrate EPT Abundance, FRO LAEMP, June 2018 to December 2019**

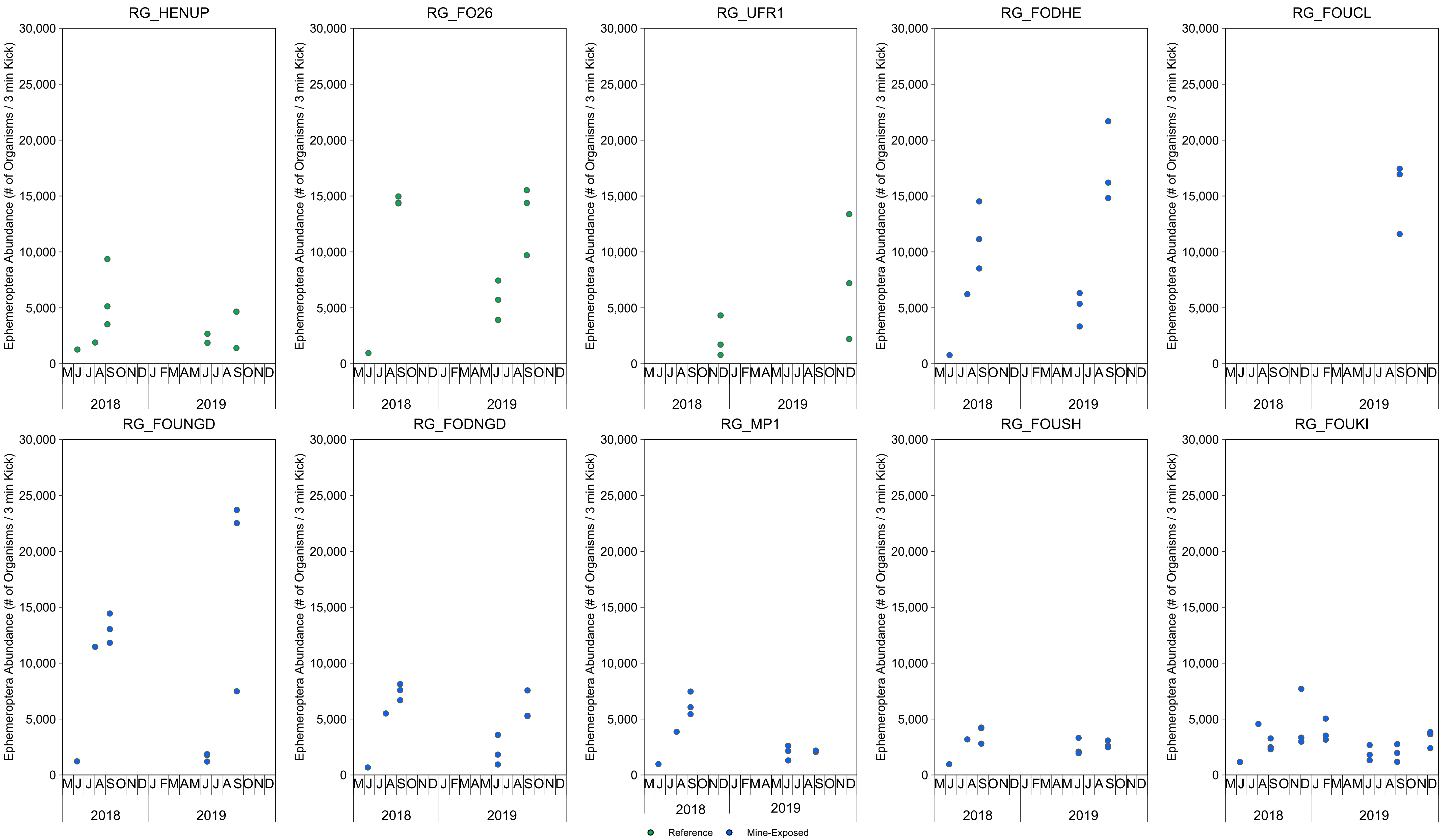

Figure B.27: Benthic Invertebrate Ephemeroptera Abundance, FRO LAEMP, June 2018 to December 2019

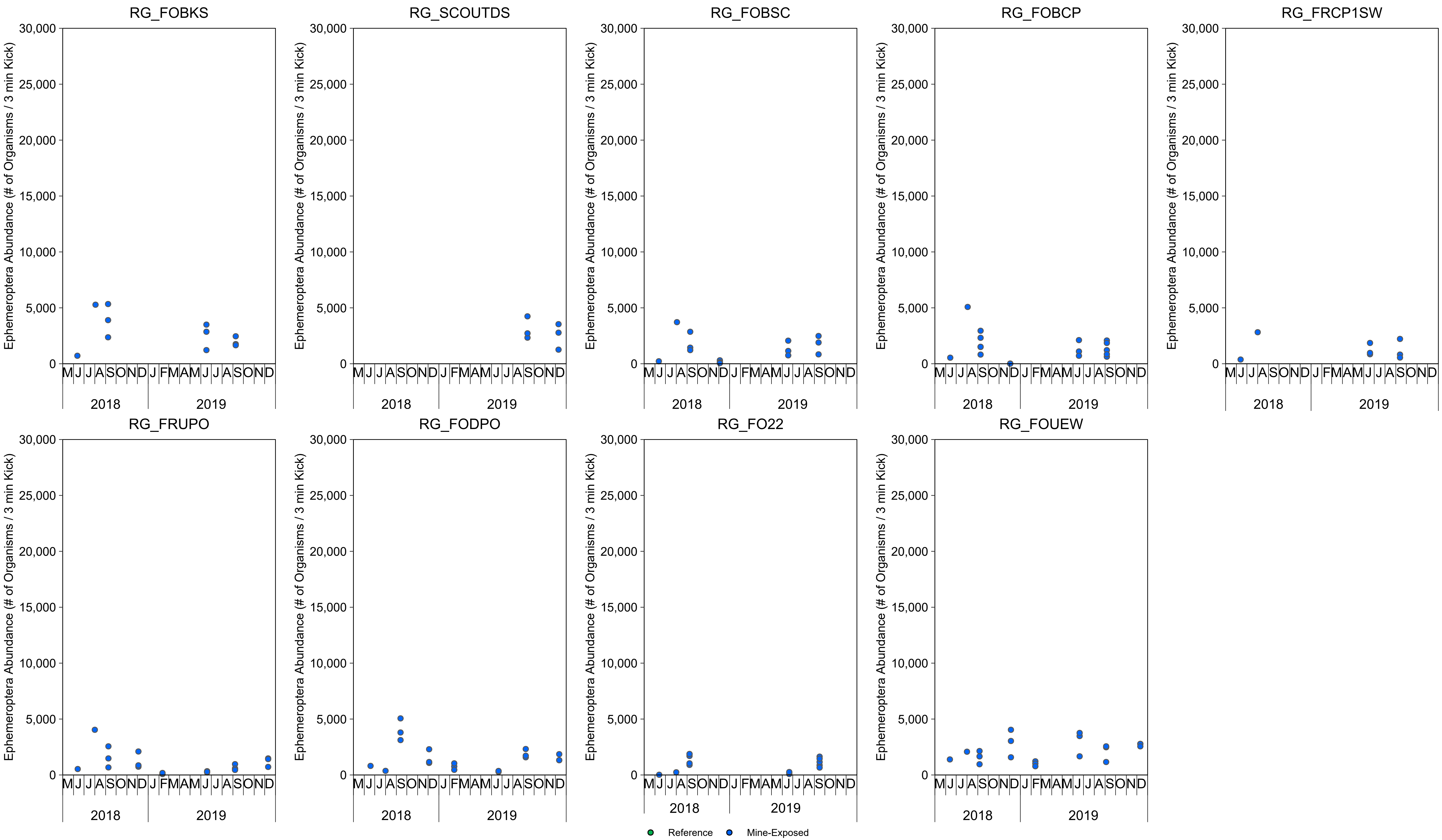

Figure B.27: **Benthic Invertebrate Ephemeroptera Abundance, FRO LAEMP, June 2018 to December 2019**

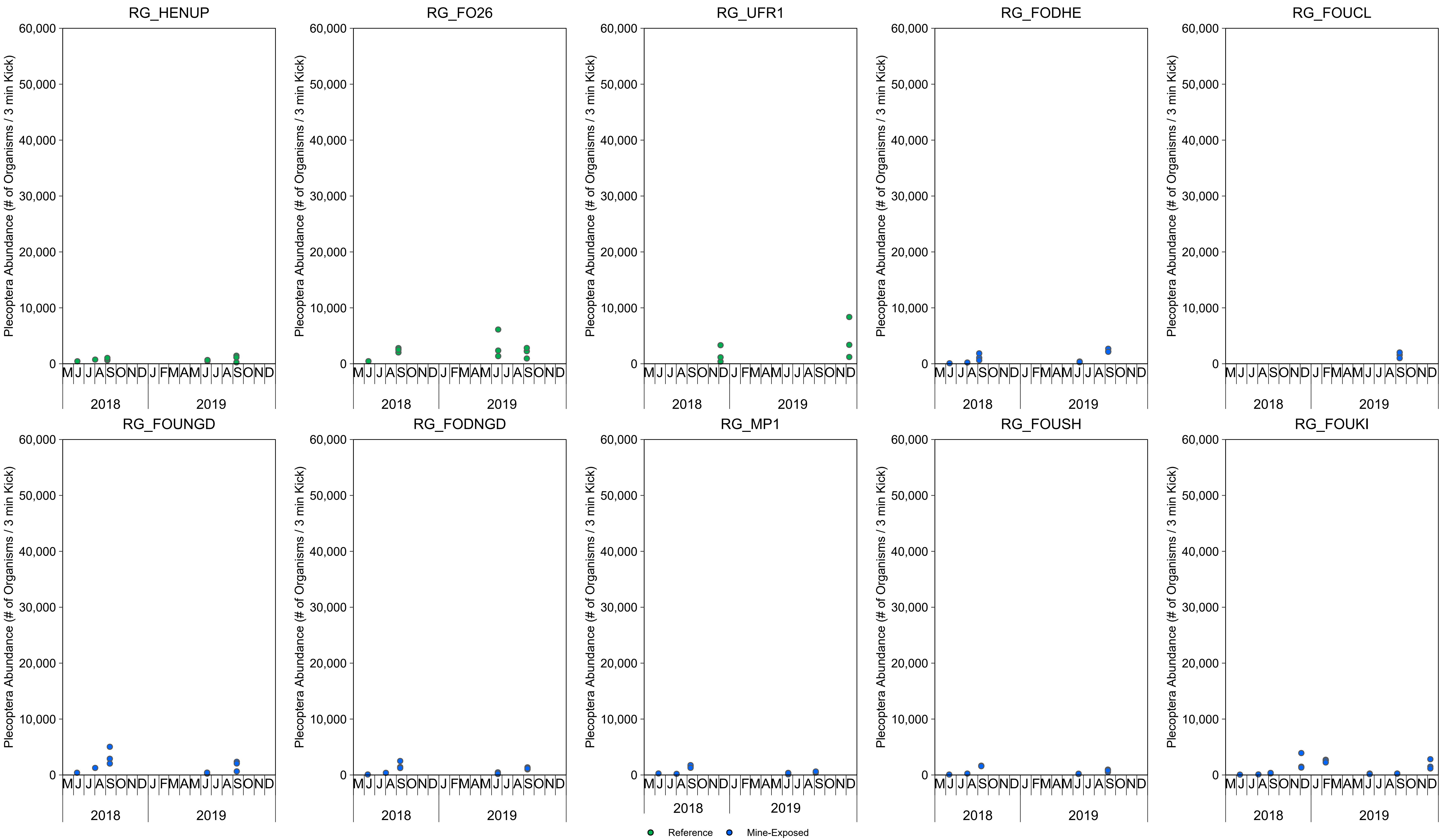

Figure B.28: **Benthic Invertebrate Plecoptera Abundance, FRO LAEMP, June 2018 to December 2019**

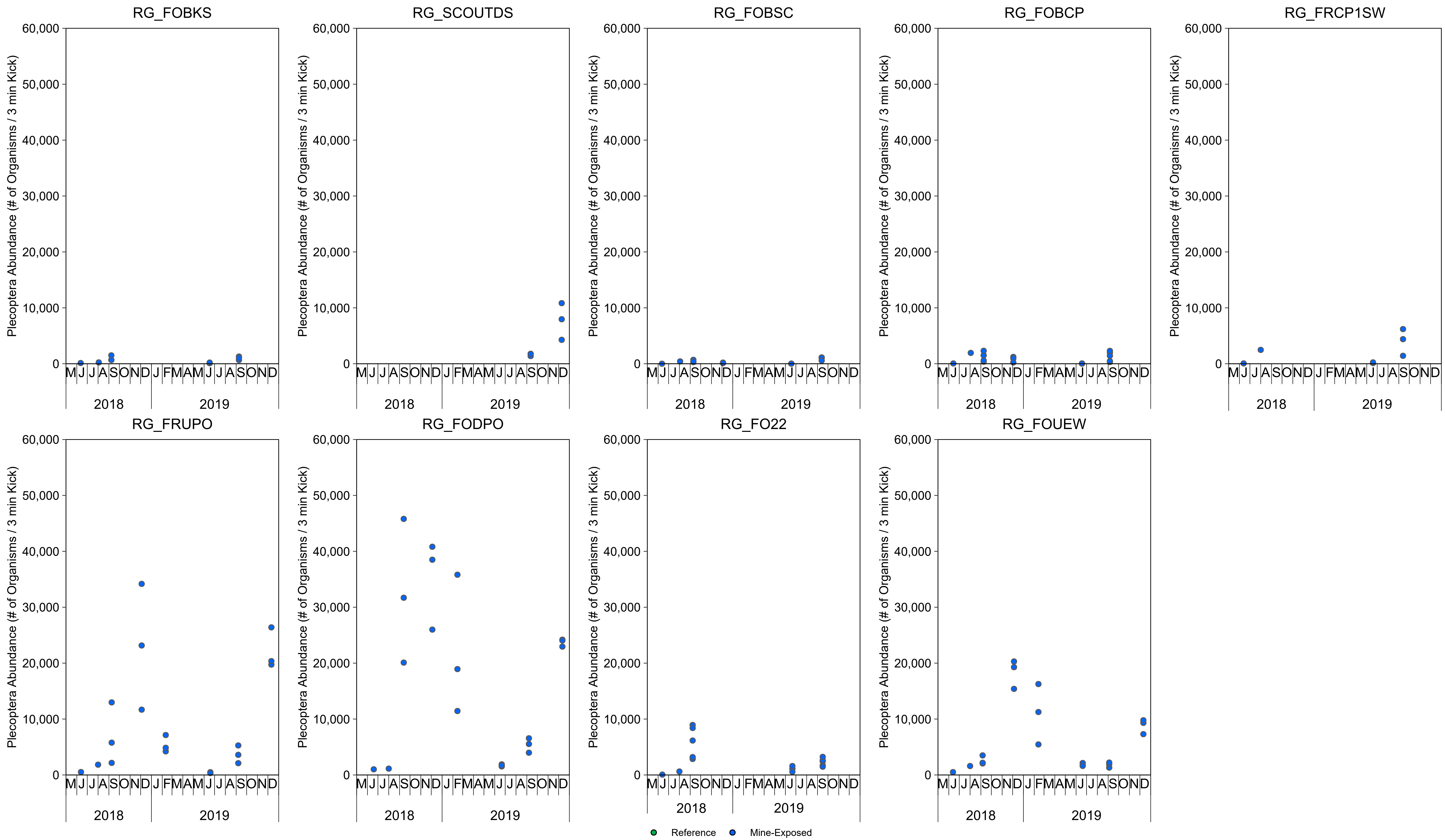

Figure B.28: Benthic Invertebrate Plecoptera Abundance, FRO LAEMP, June 2018 to December 2019

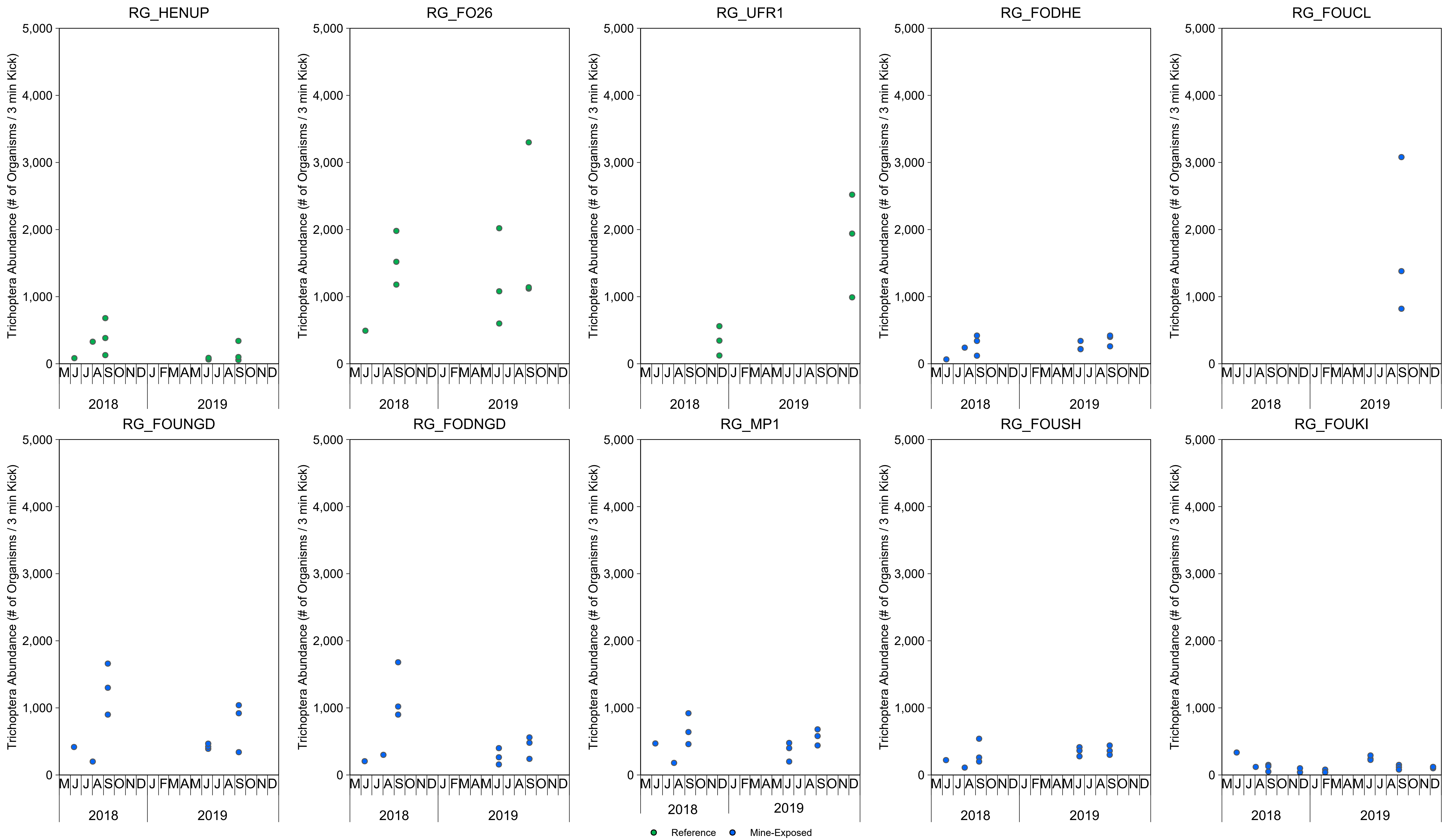

Figure B.29: **Benthic Invertebrate Trichoptera Abundance, FRO LAEMP, June 2018 to December 2019**

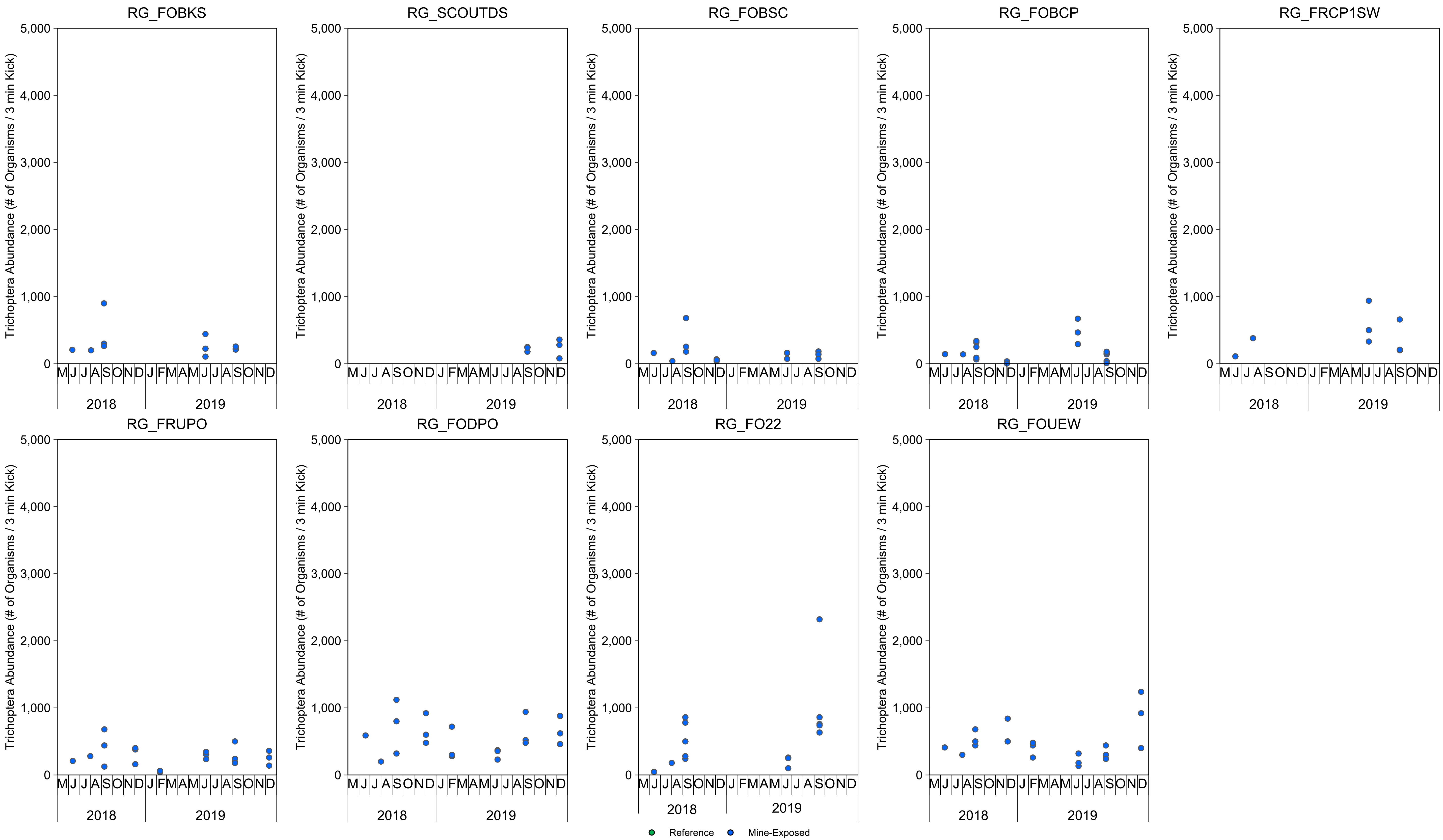

Figure B.29: Benthic Invertebrate Trichoptera Abundance, FRO LAEMP, June 2018 to December 2019

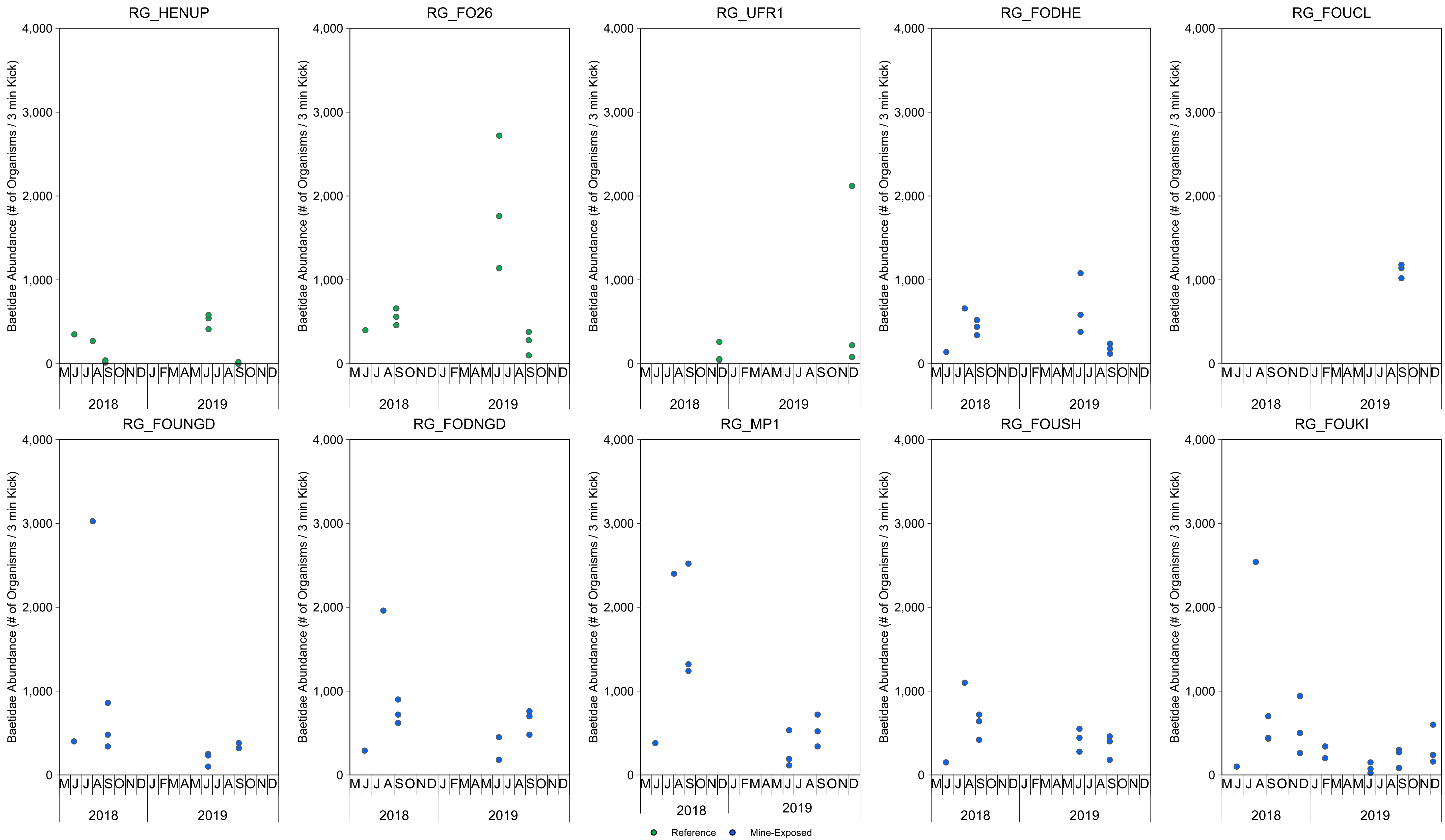

Figure B.30: **Benthic Invertebrate Baetidae Abundance, FRO LAEMP, June 2018 to December 2019**

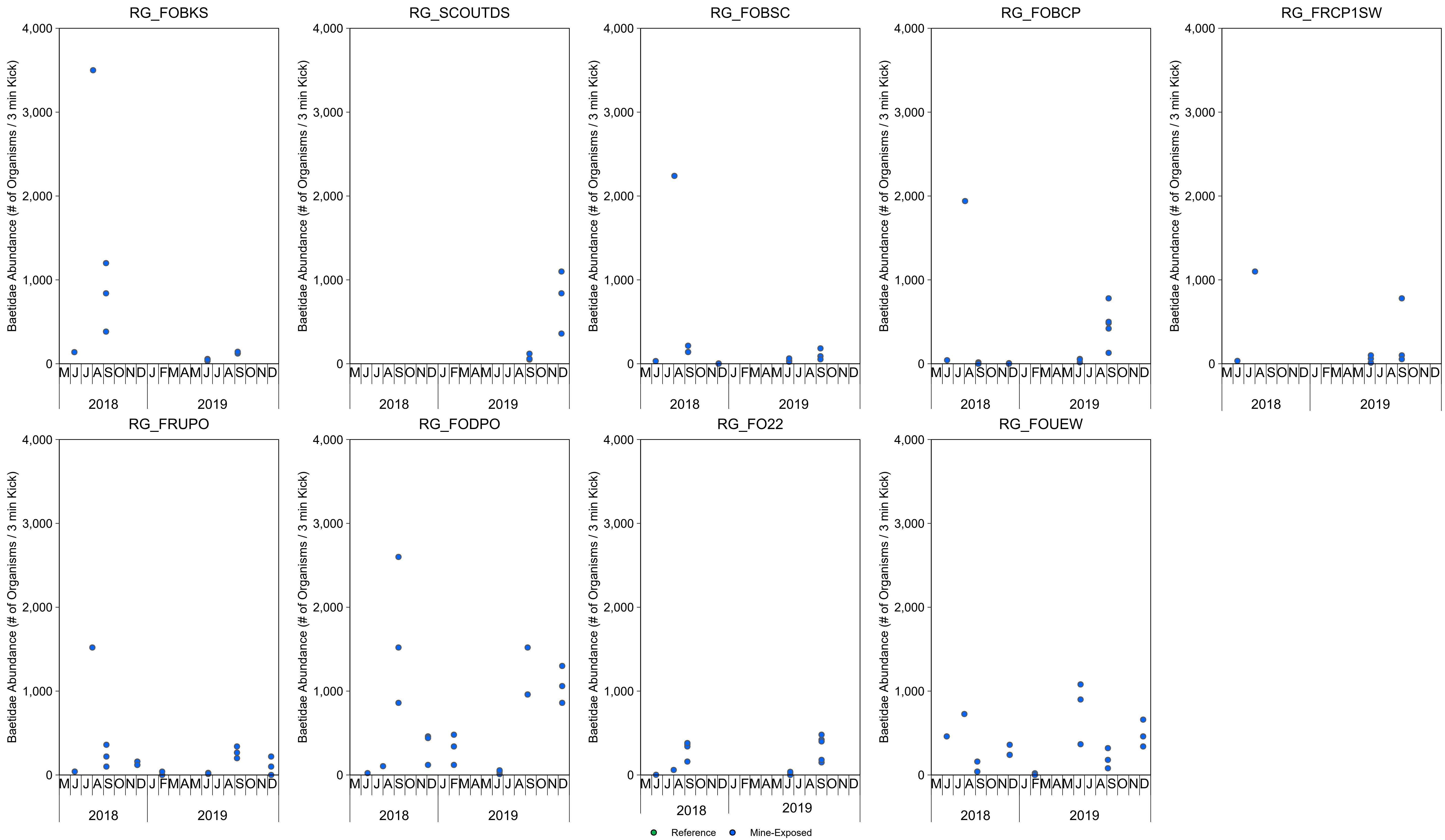

Figure B.30: **Benthic Invertebrate Baetidae Abundance, FRO LAEMP, June 2018 to December 2019**

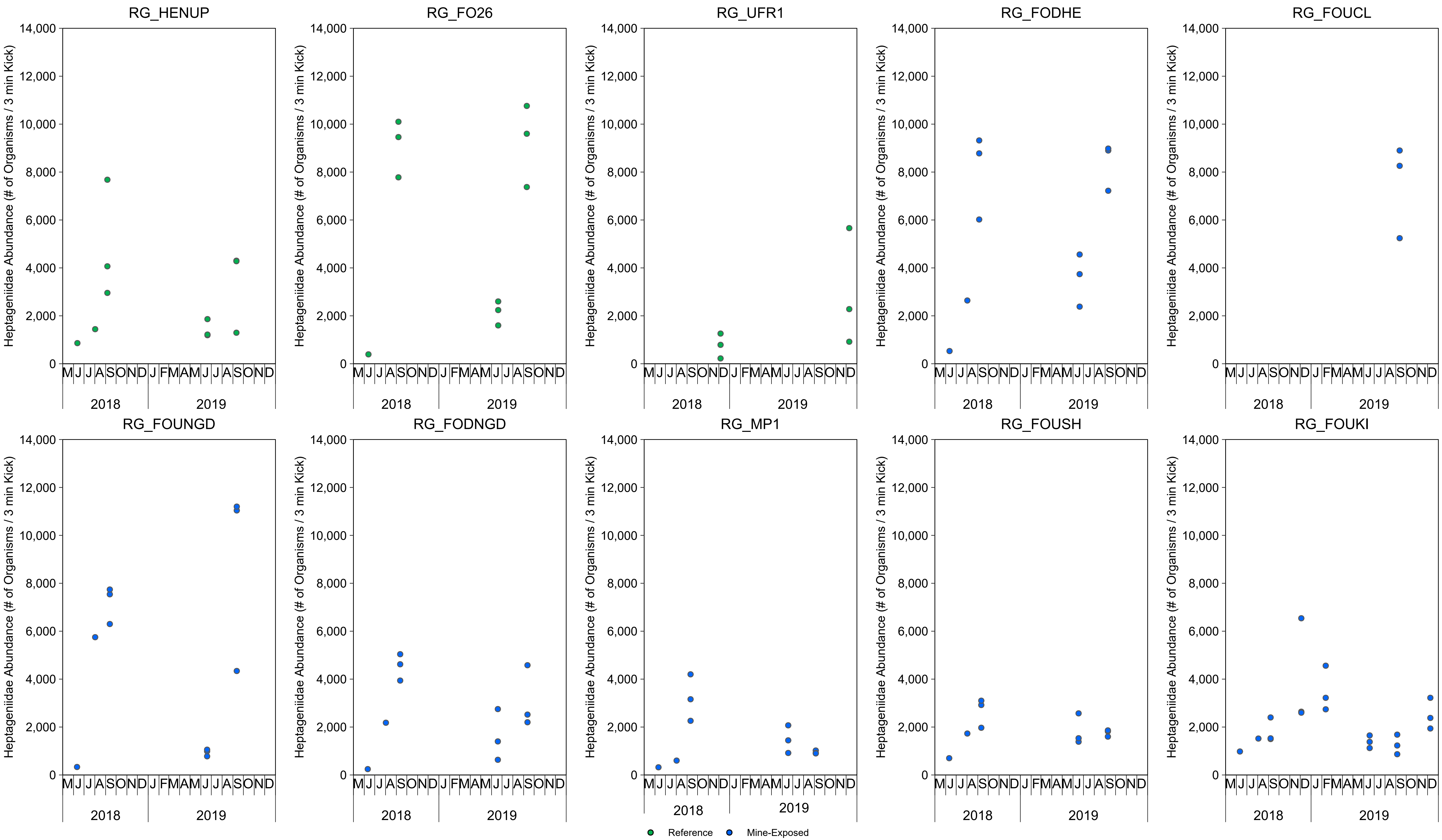

Figure B.31: **Benthic Invertebrate Heptageniidae, FRO LAEMP, June 2018 to December 2019**

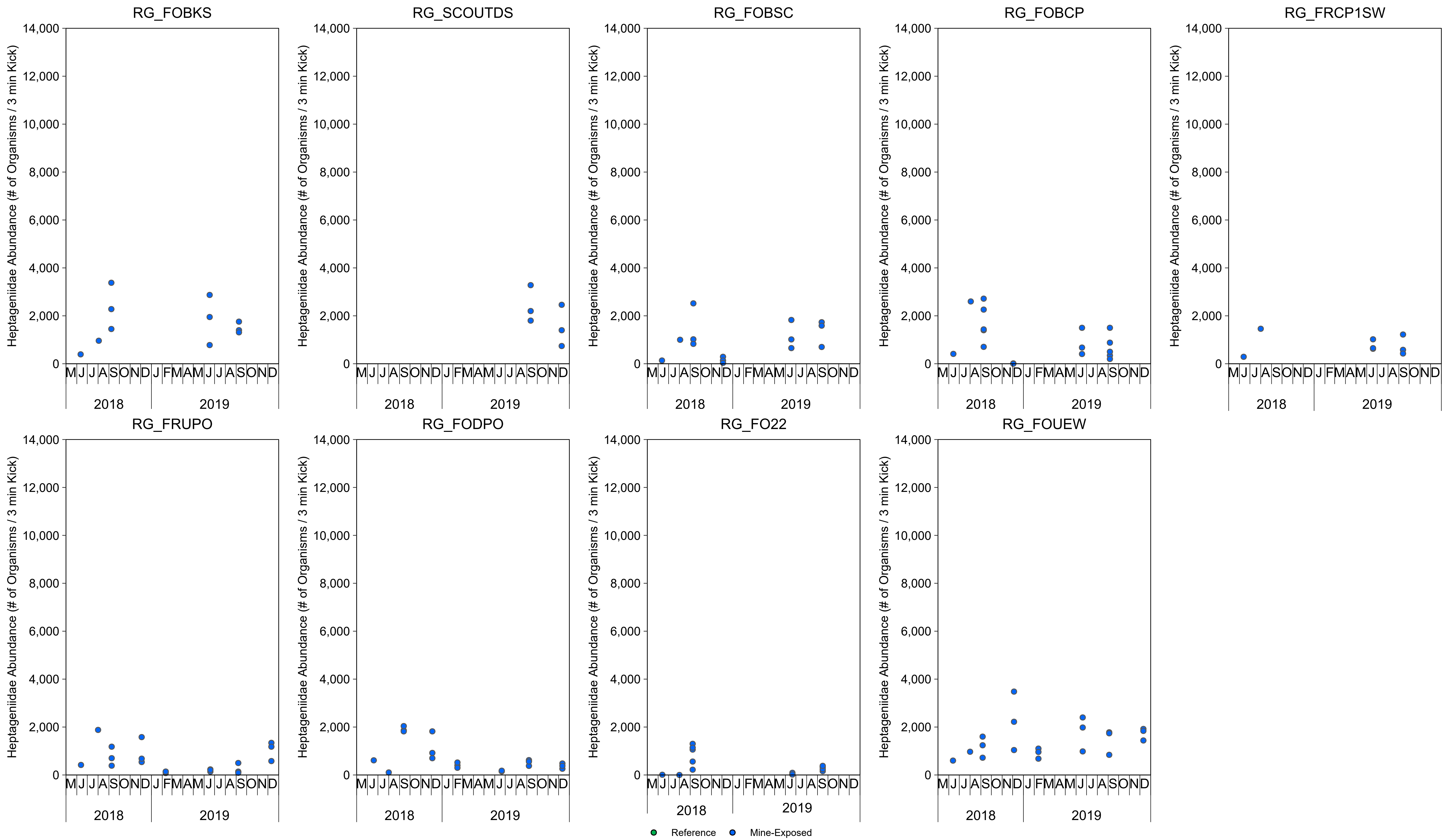

Figure B.31: **Benthic Invertebrate Heptageniidae, FRO LAEMP, June 2018 to December 2019**

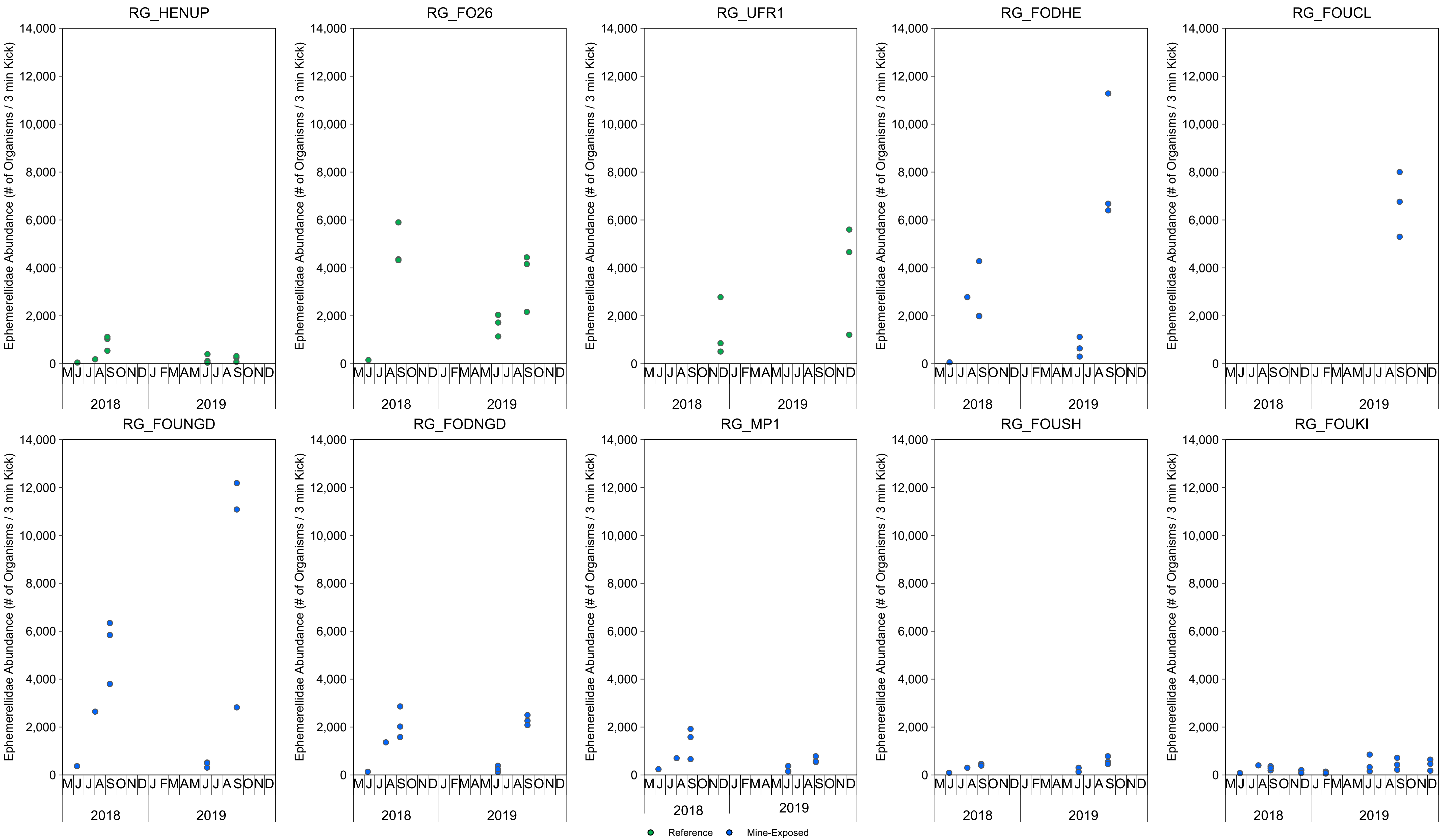

Figure B.32: **Benthic Invertebrate Ephemerellidae Abundance, FRO LAEMP, June 2018 to December 2019**

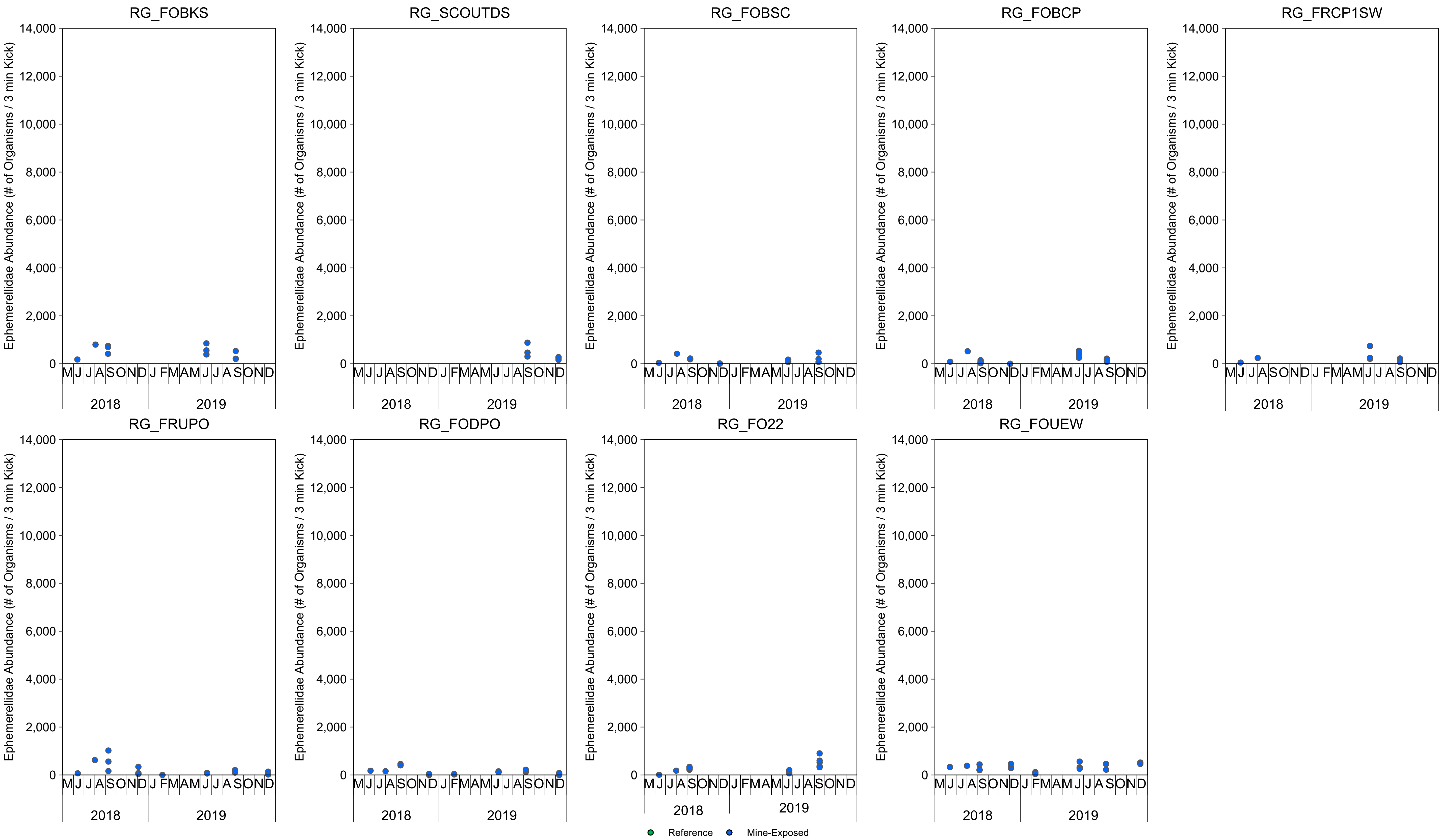

Figure B.32: **Benthic Invertebrate Ephemerellidae Abundance, FRO LAEMP, June 2018 to December 2019**

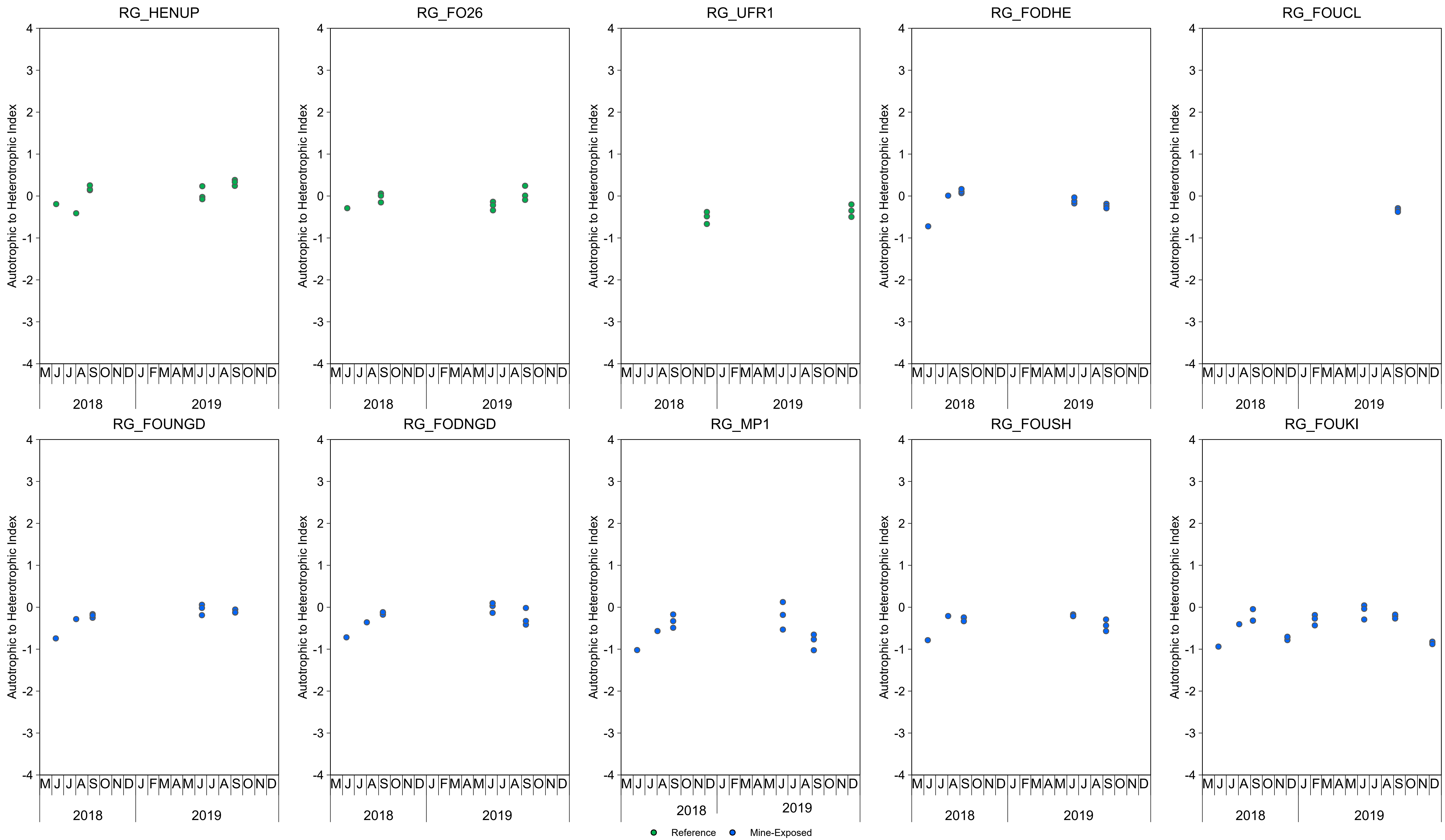

Figure B.33: **Benthic Invertebrate Autotrophic to Heterotrophic Index, FRO LAEMP, June 2018 to December 2019**

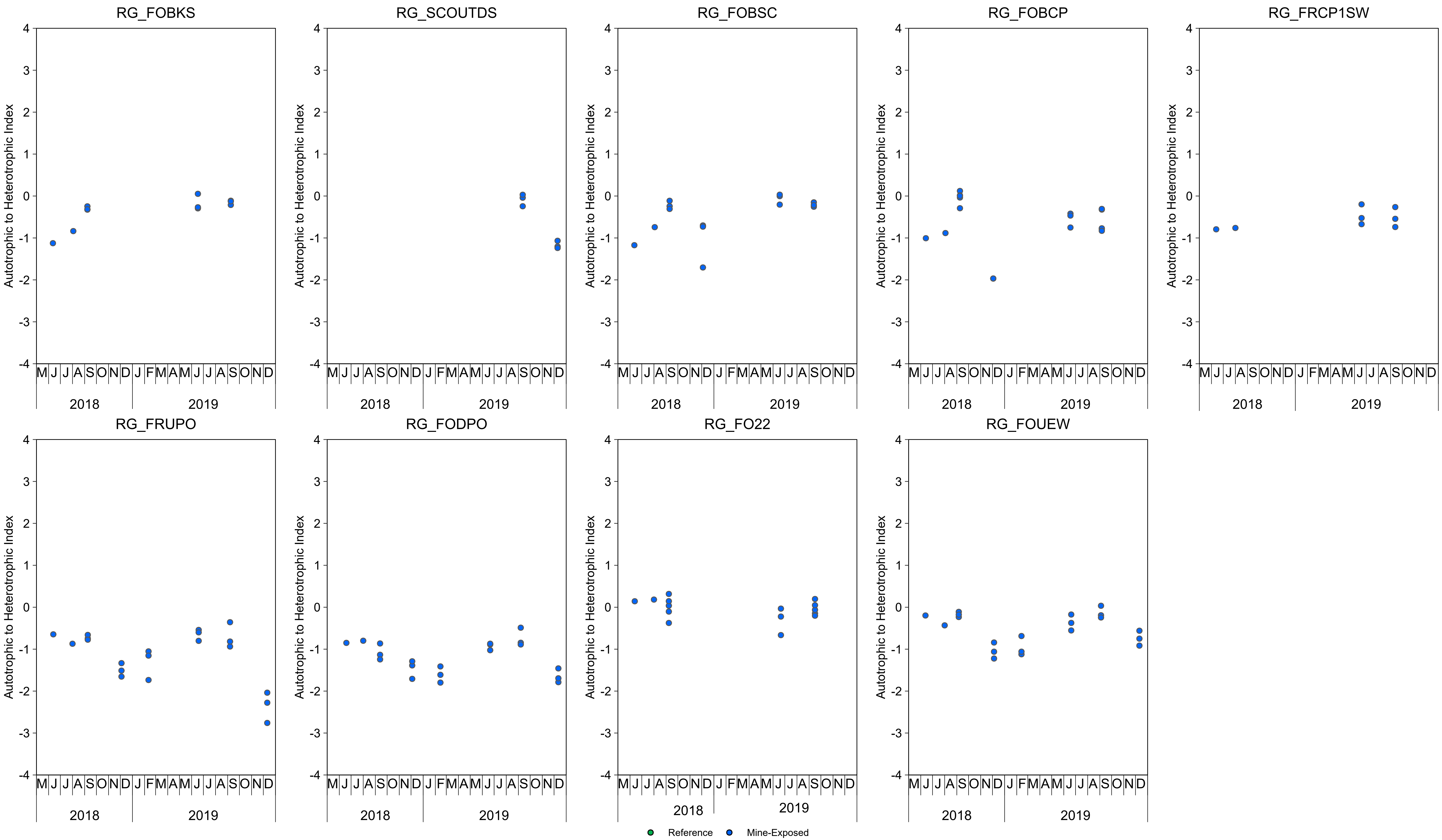

Figure B.33: Benthic Invertebrate Autotrophic to Heterotrophic Index, FRO LAEMP, June 2018 to December 2019

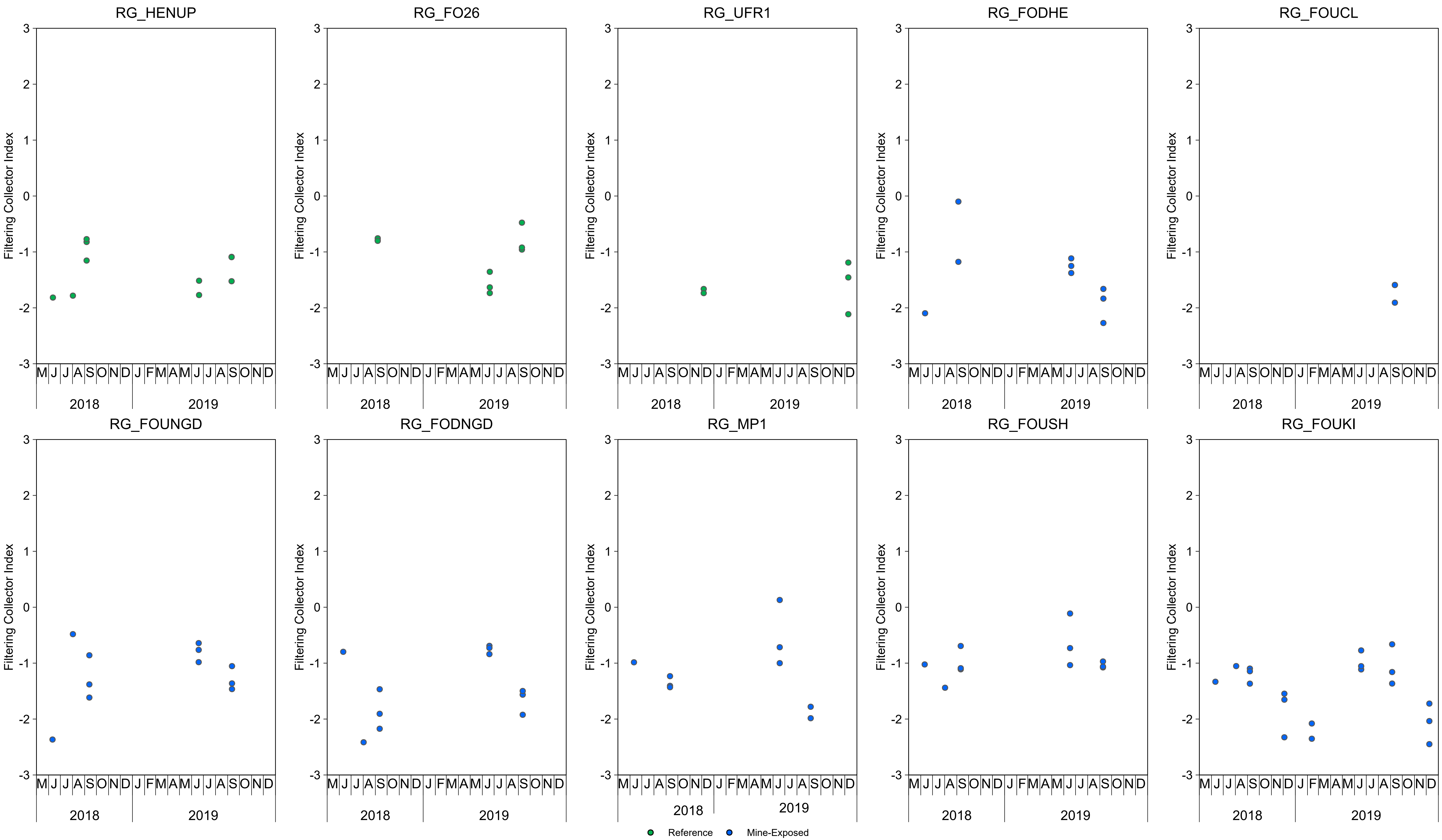

Figure B.34: **Benthic Invertebrate Filtering Collector Index, FRO LAEMP, June 2018 to December 2019**

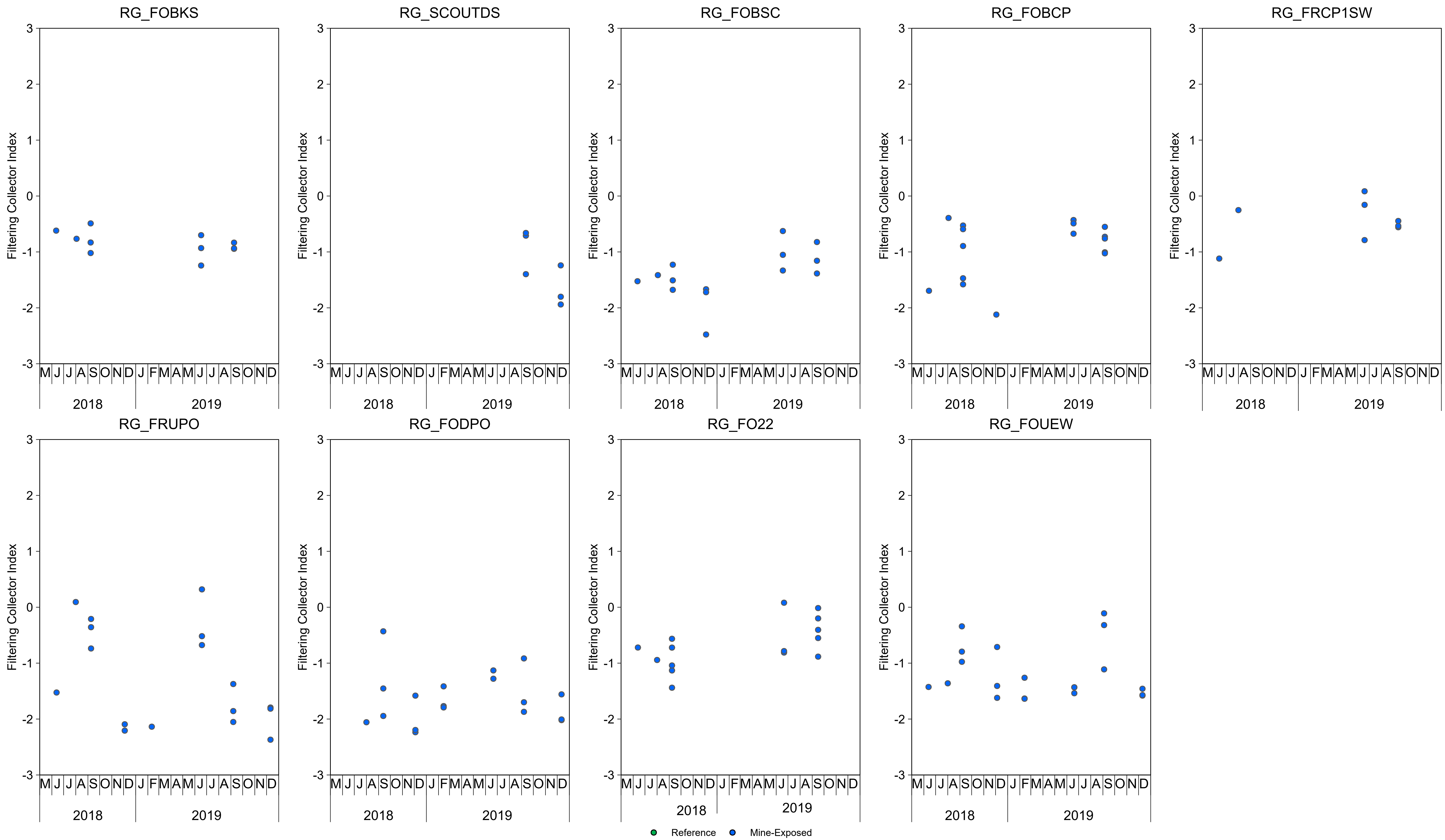

Figure B.34: Benthic Invertebrate Filtering Collector Index, FRO LAEMP, June 2018 to December 2019

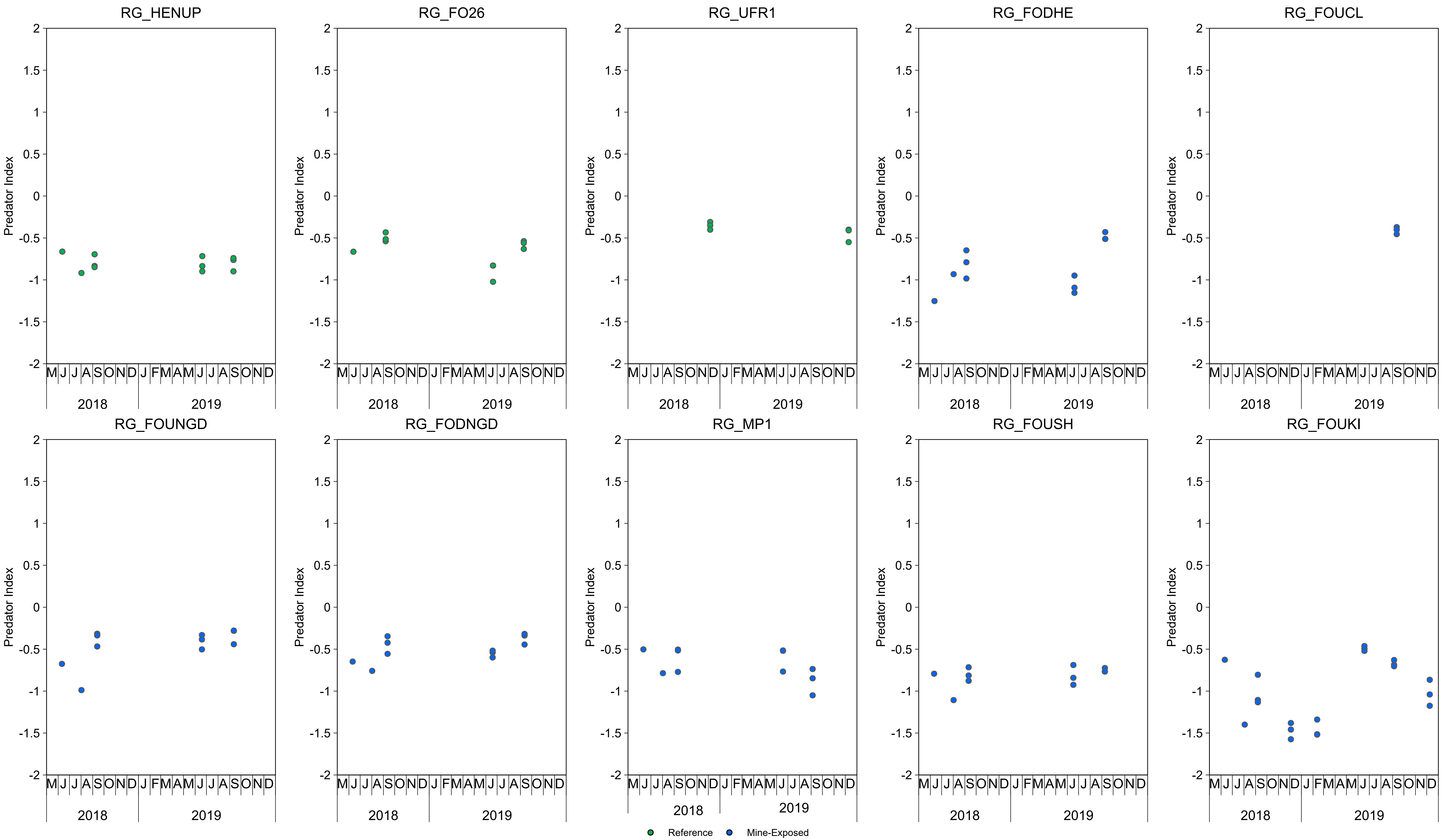

Figure B.35: Benthic Invertebrate Predator Index, FRO LAEMP, June 2018 to December 2019

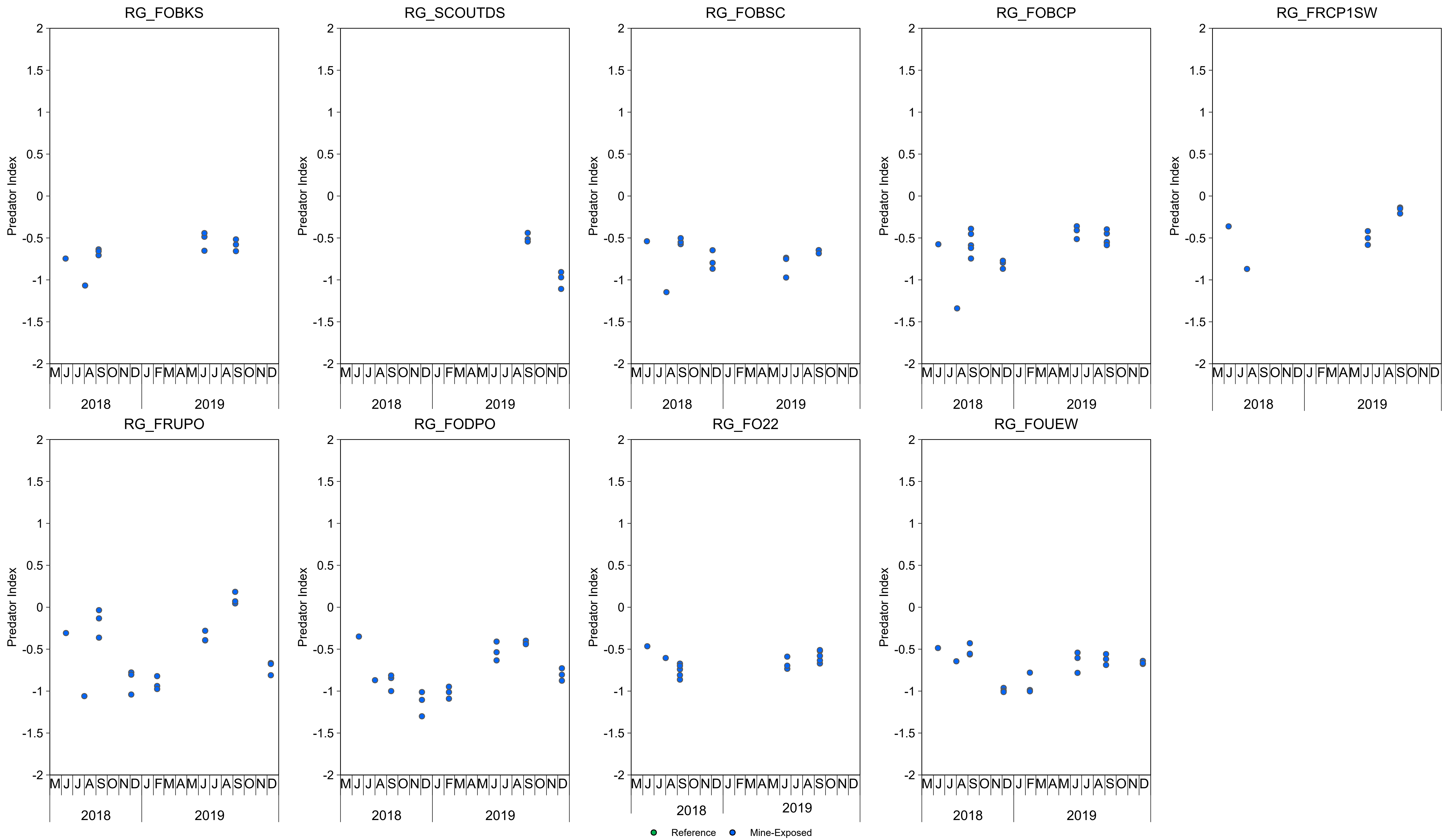

Figure B.35: Benthic Invertebrate Predator Index, FRO LAEMP, June 2018 to December 2019

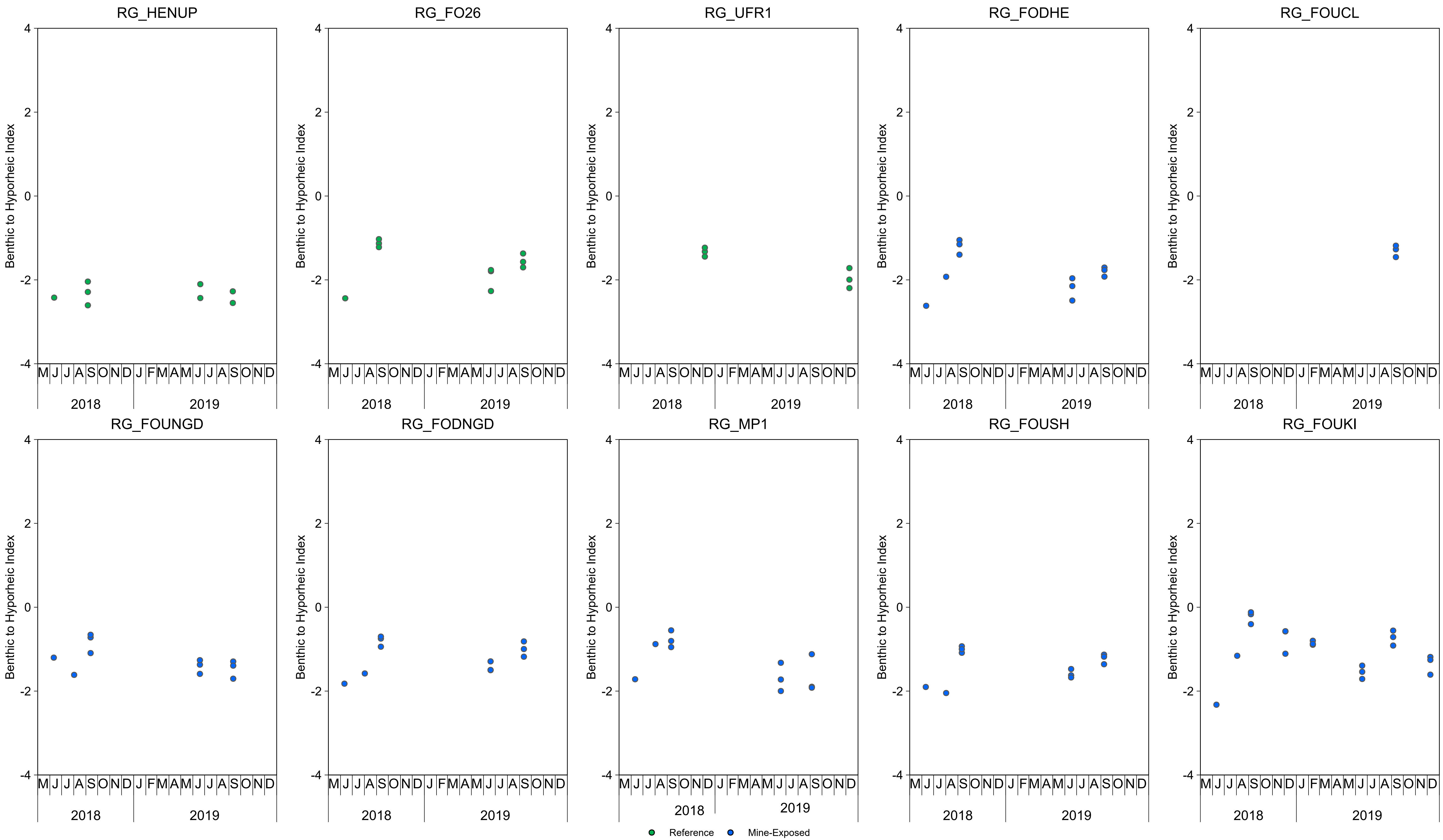

Figure B.36: Benthic Invertebrate Benthic to Hyporheic Index, FRO LAEMP, June 2018 to December 2019

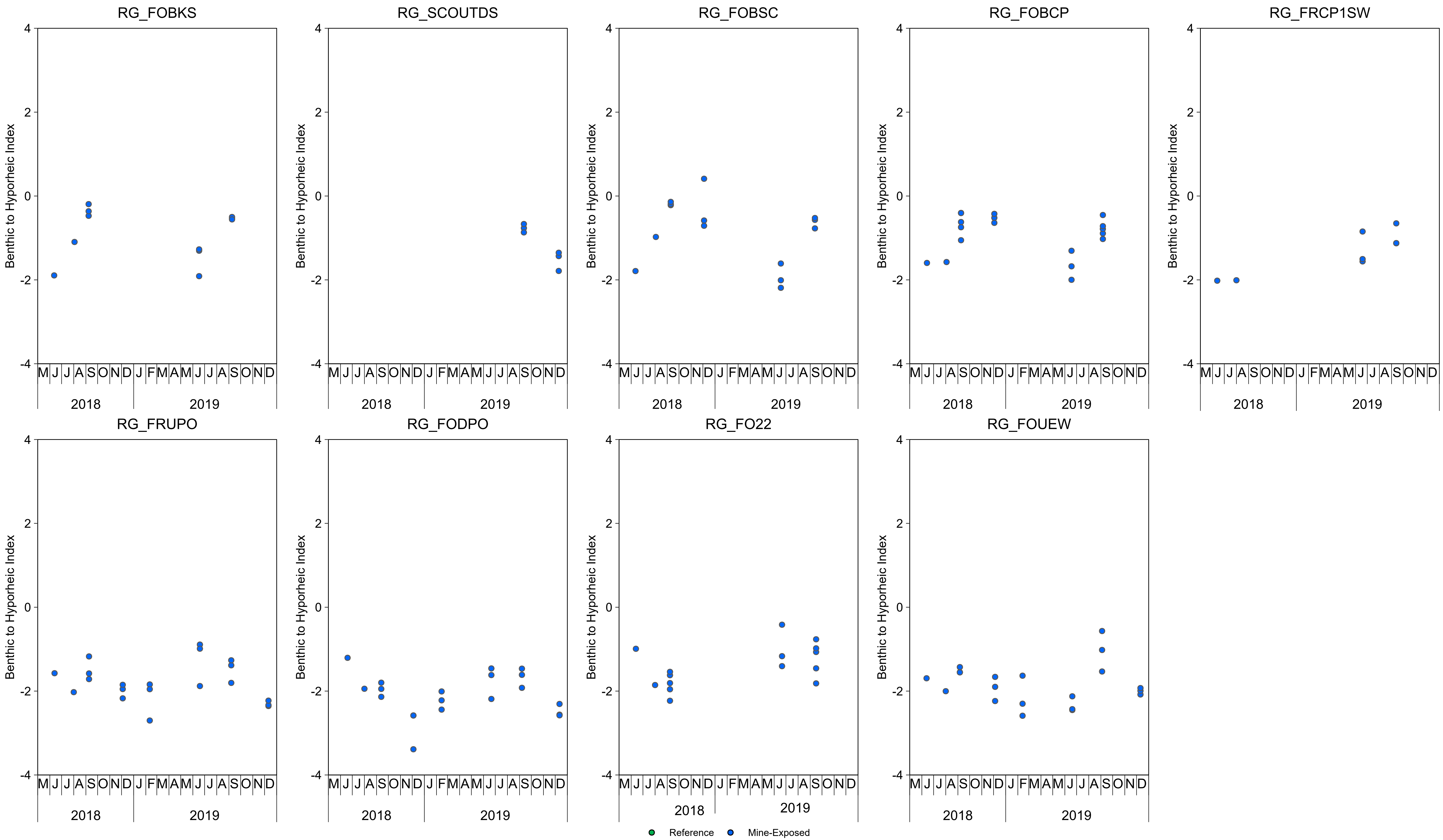

Figure B.36: **Benthic Invertebrate Benthic to Hyporheic Index, FRO LAEMP, June 2018 to December 2019**

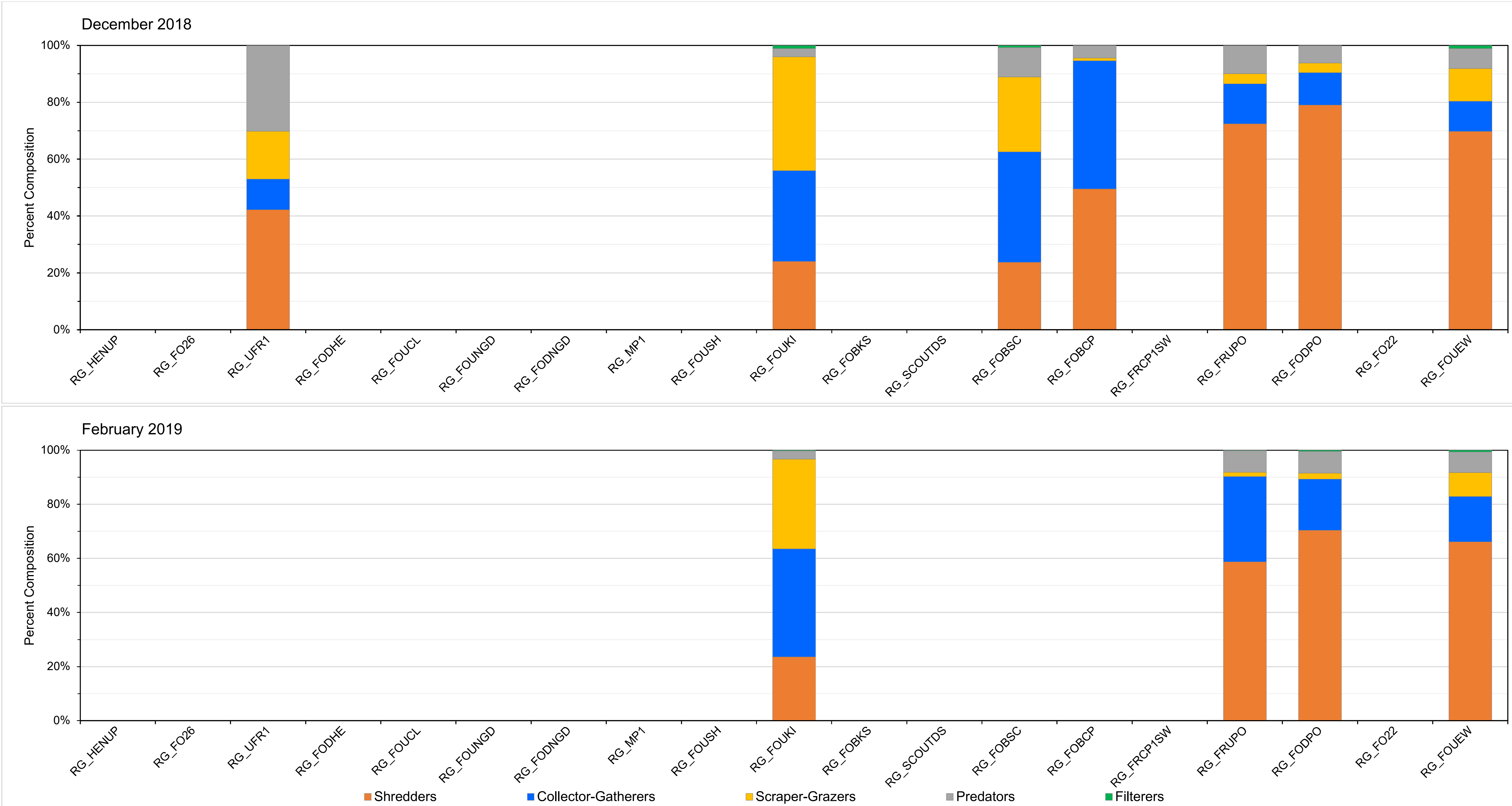

Figure B.37: Benthic Invertebrate Community Feeding Groups Percent Composition, FRO LAEMP, December 2018 to December 2019

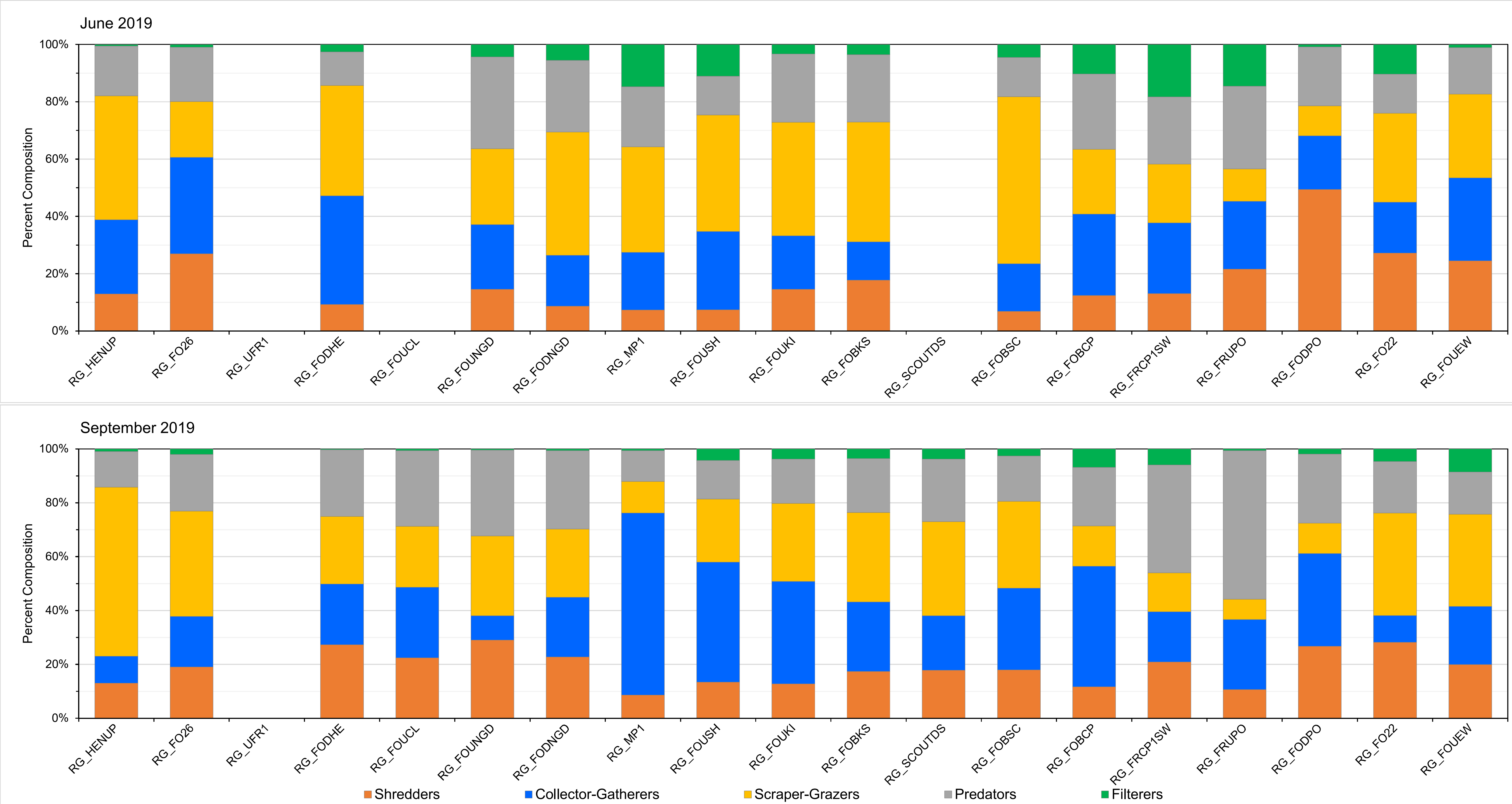

Figure B.37: Benthic Invertebrate Community Feeding Groups Percent Composition, FRO LAEMP, December 2018 to December 2019

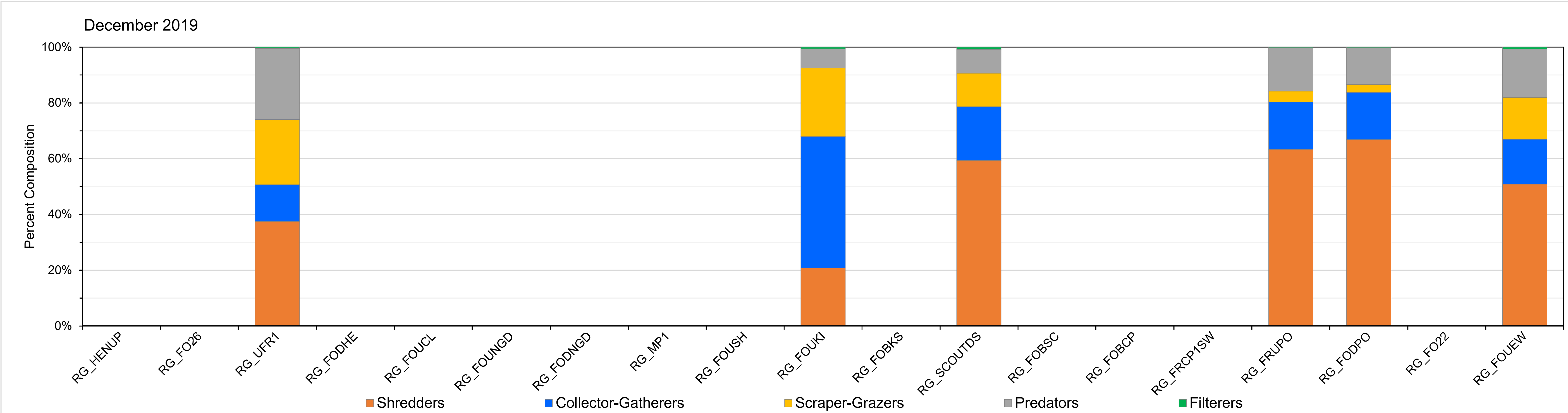

Figure B.37: Benthic Invertebrate Community Feeding Groups Percent Composition, FRO LAEMP, December 2018 to December 2019

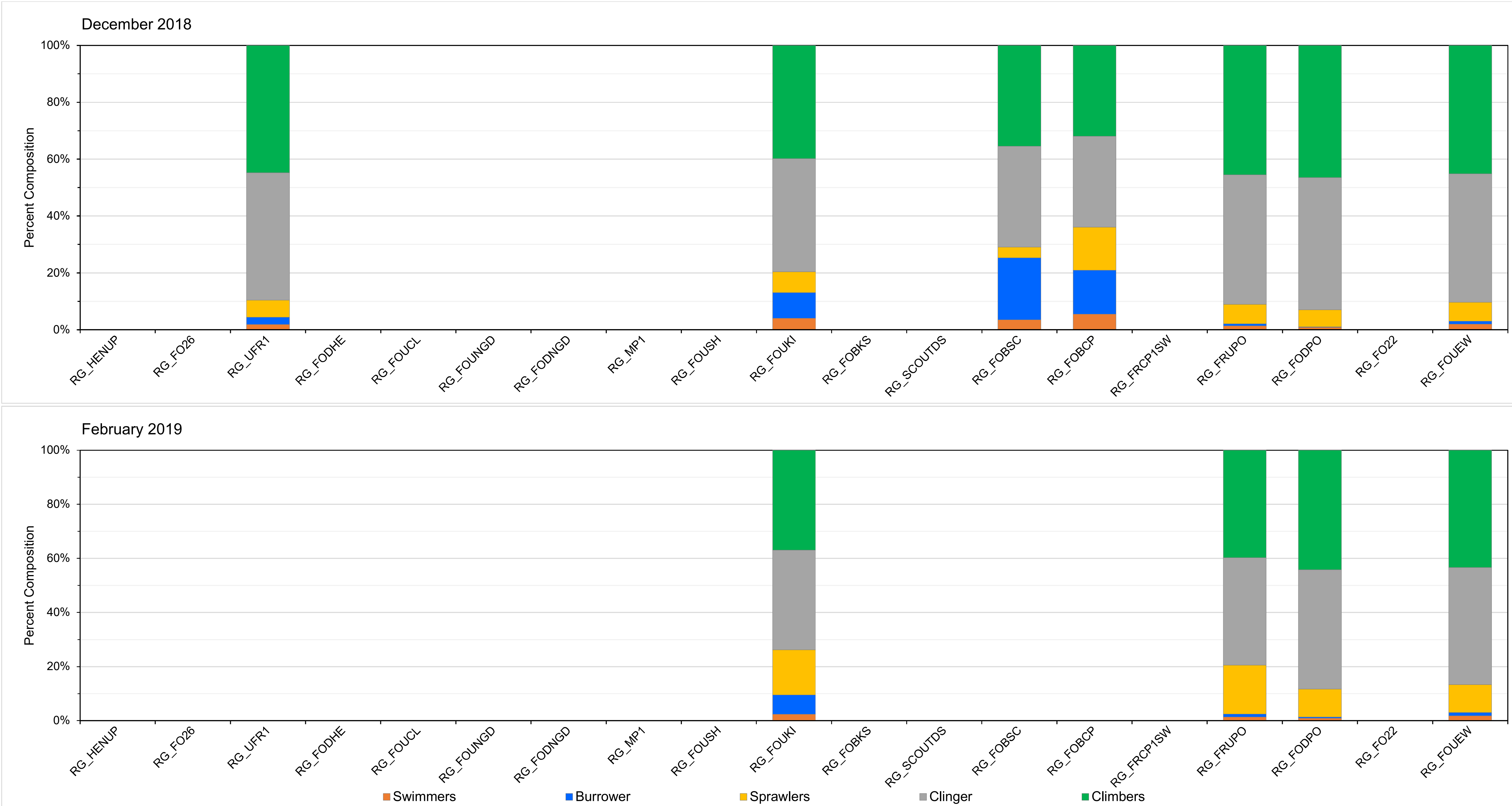

Figure B.38: **Benthic Invertebrate Community Habitat Percent Composition, FRO LAEMP, December 2018 to December 2019**

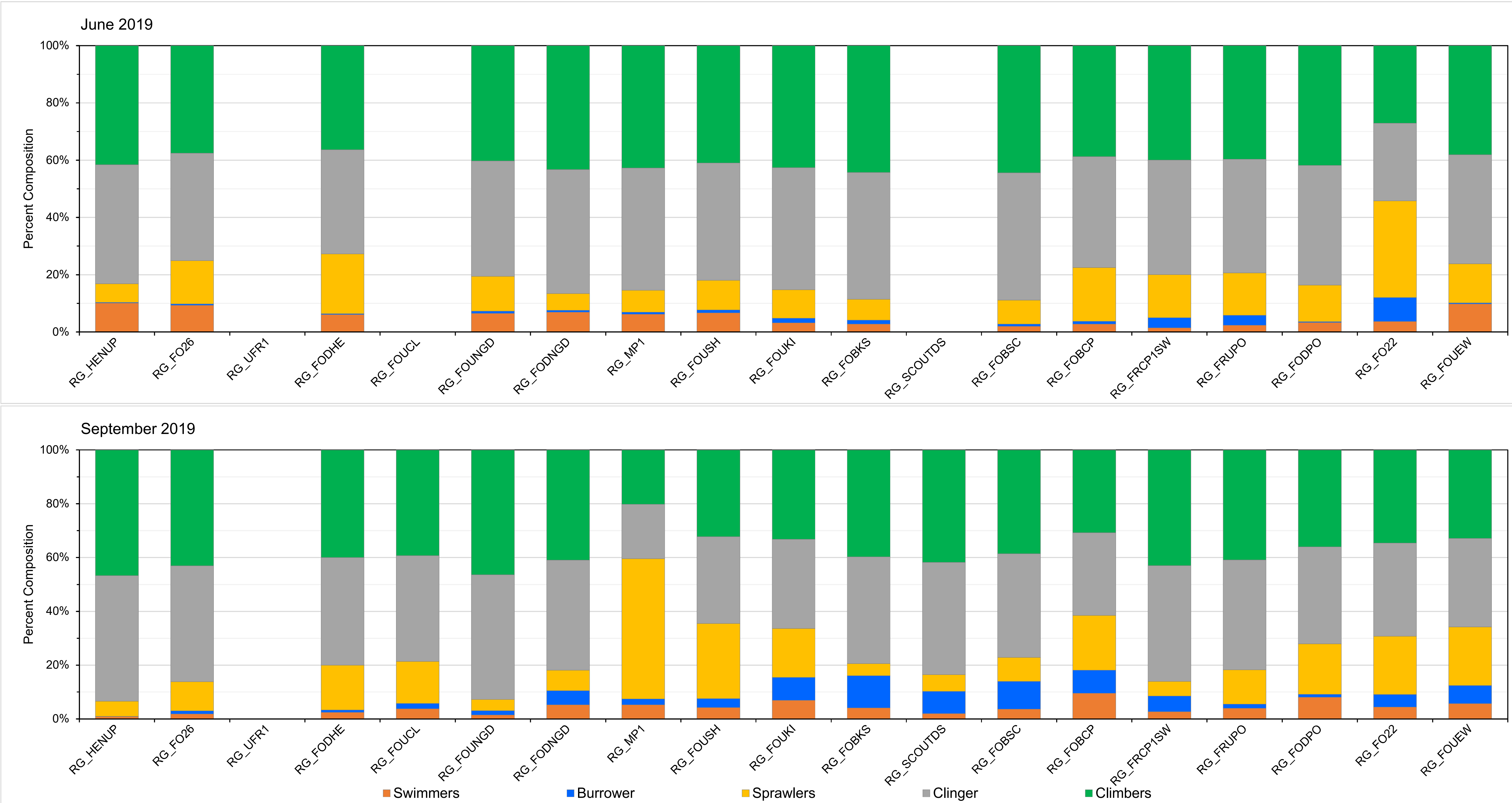

Figure B.38: **Benthic Invertebrate Community Habitat Percent Composition, FRO LAEMP, December 2018 to December 2019**

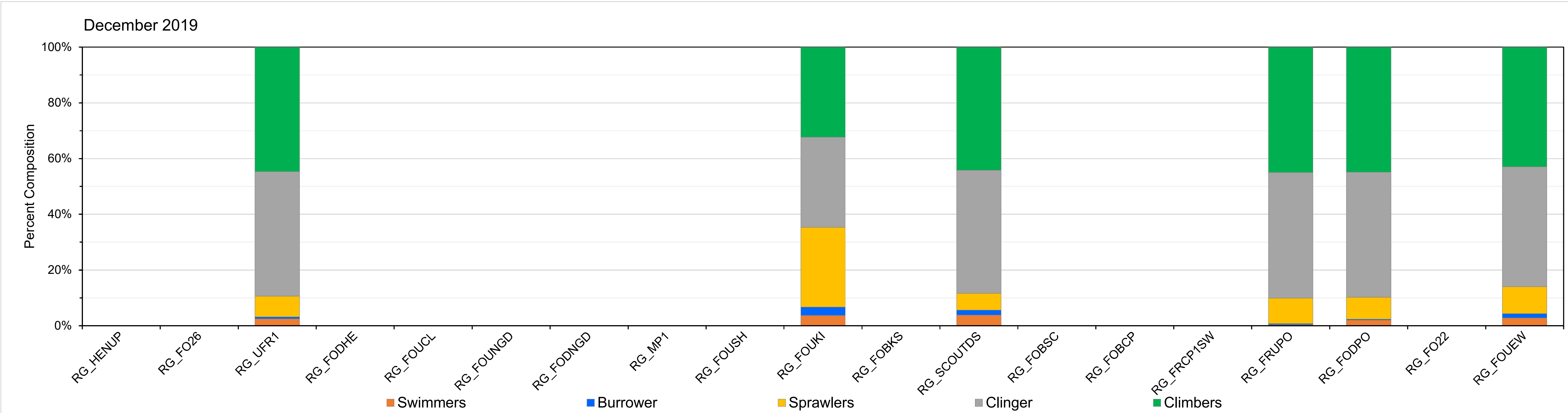

Figure B.38: Benthic Invertebrate Community Habitat Percent Composition, FRO LAEMP, December 2018 to December 2019

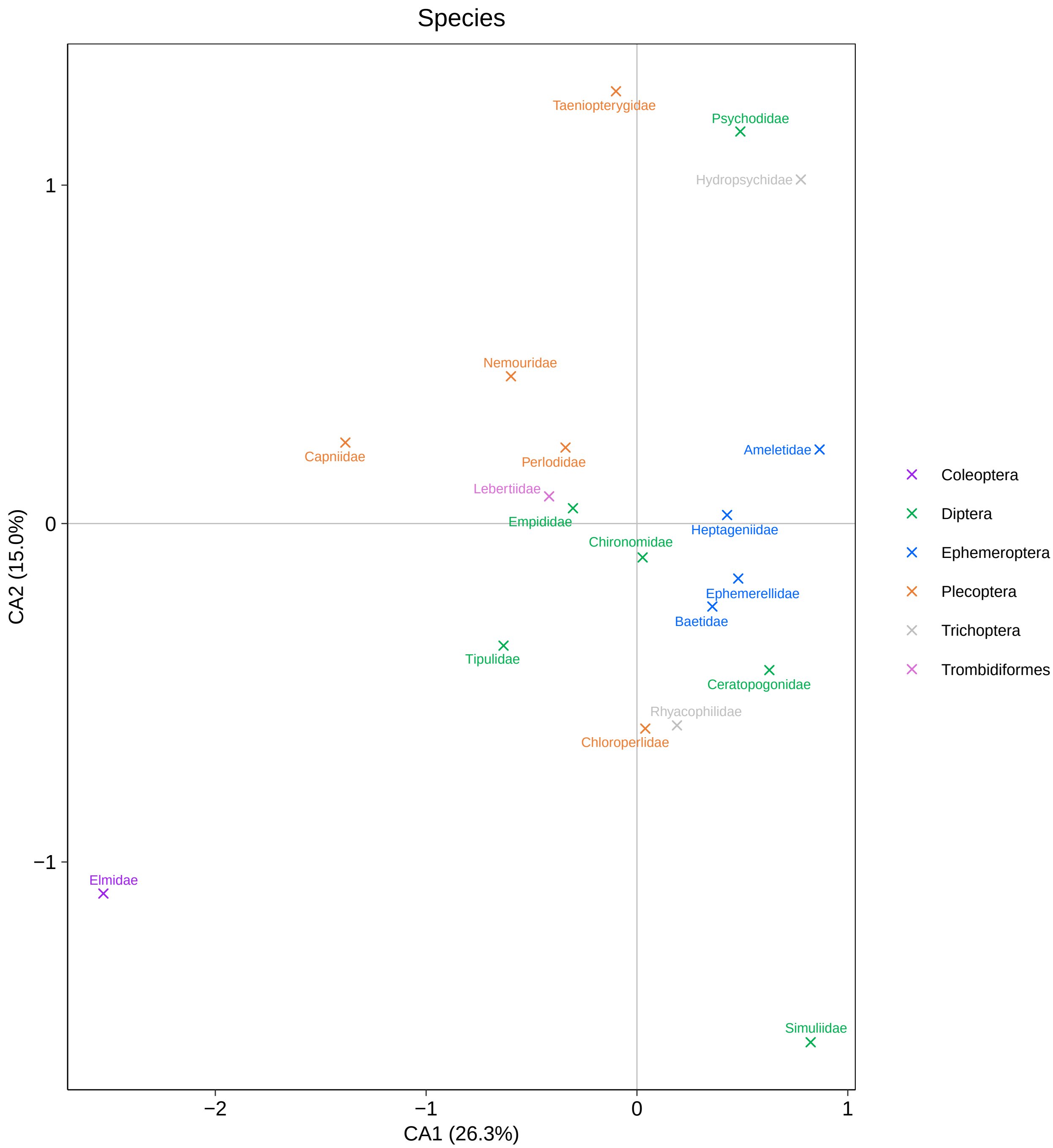

Figure B.39: Seasonal Benthic Invertebrate Community Family Correspondence Analysis Results Grouped by Taxa, Fording River, 2018 and 2019

Note: Includes BIC data from June, August, September and December 2018, and February, June, September and December 2019.

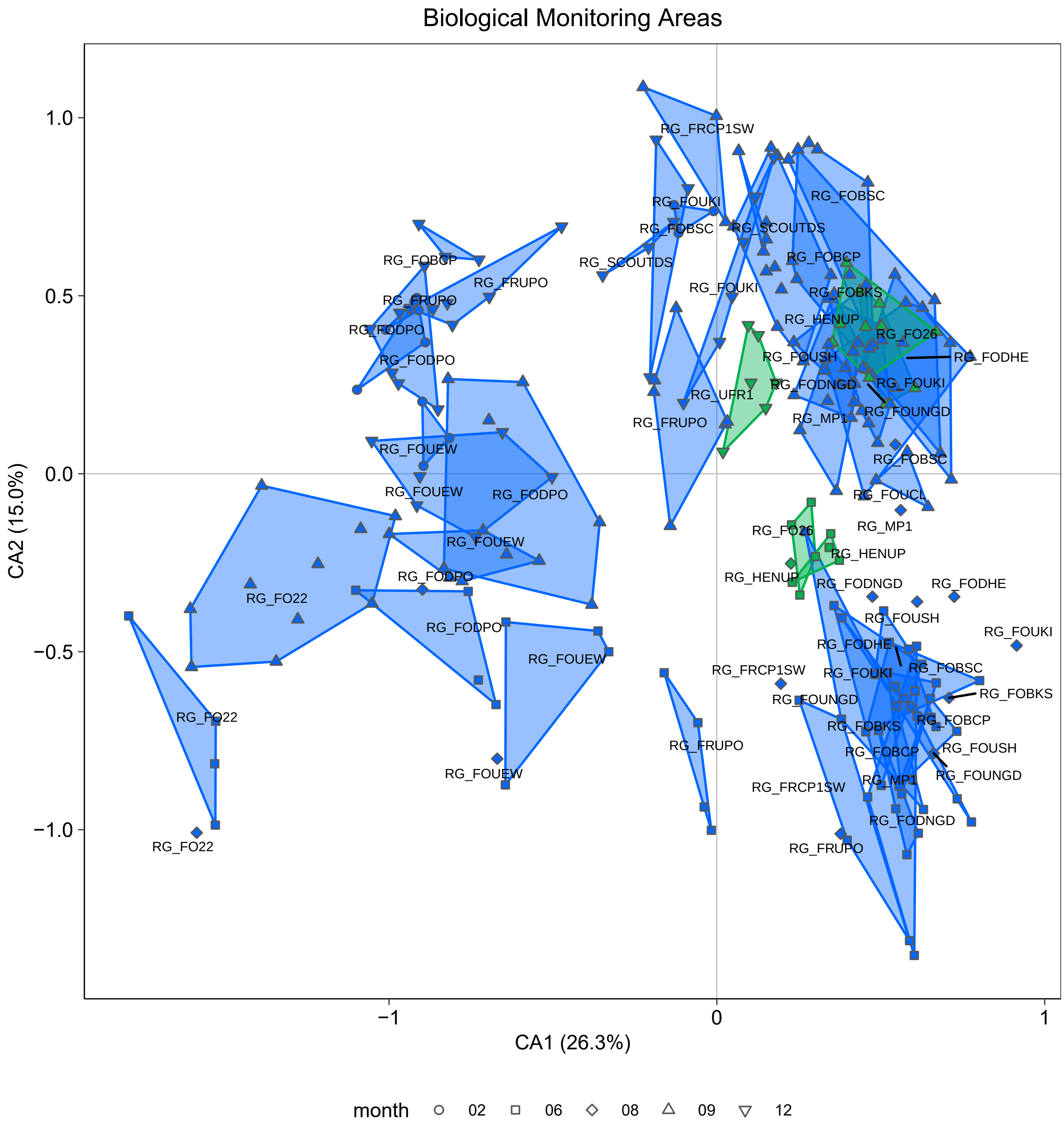

Figure B.40: **Seasonal Benthic Invertebrate Community Family Correspondence Analysis Results Grouped by Areas, Fording River, 2018 and 2019**

Notes: Blue groups denote mine-exposed areas and green groups denote reference areas. Includes BIC data from June, August, September and December 2018, and February, June, September, and December 2019.

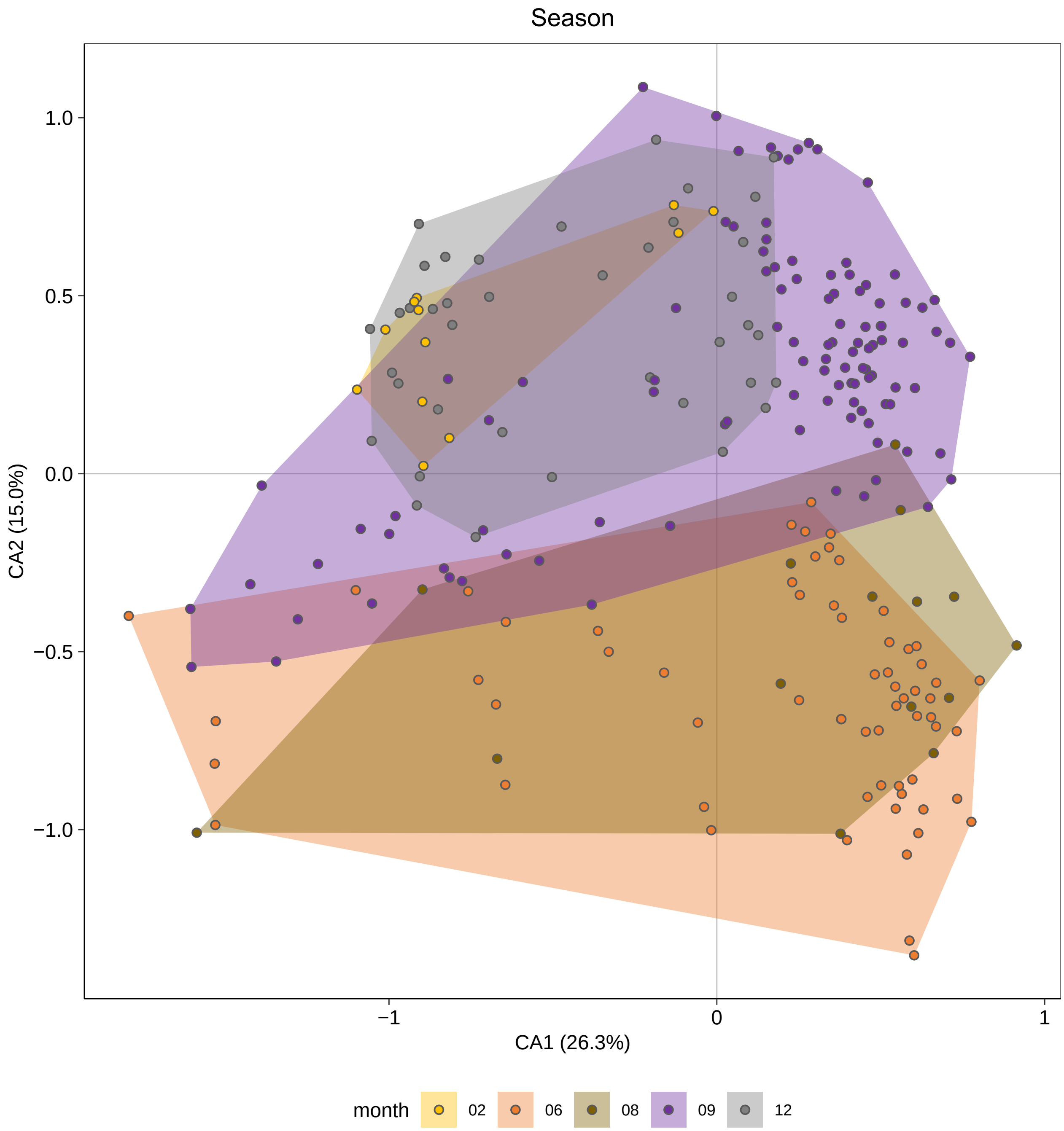

Figure B.41: Seasonal Benthic Invertebrate Community Family Correspondence Analysis Results Grouped by Month, Fording River, 2018 and 2019

Note: Includes BIC data from June, August, September and December 2018, and February, June, September and December 2019.

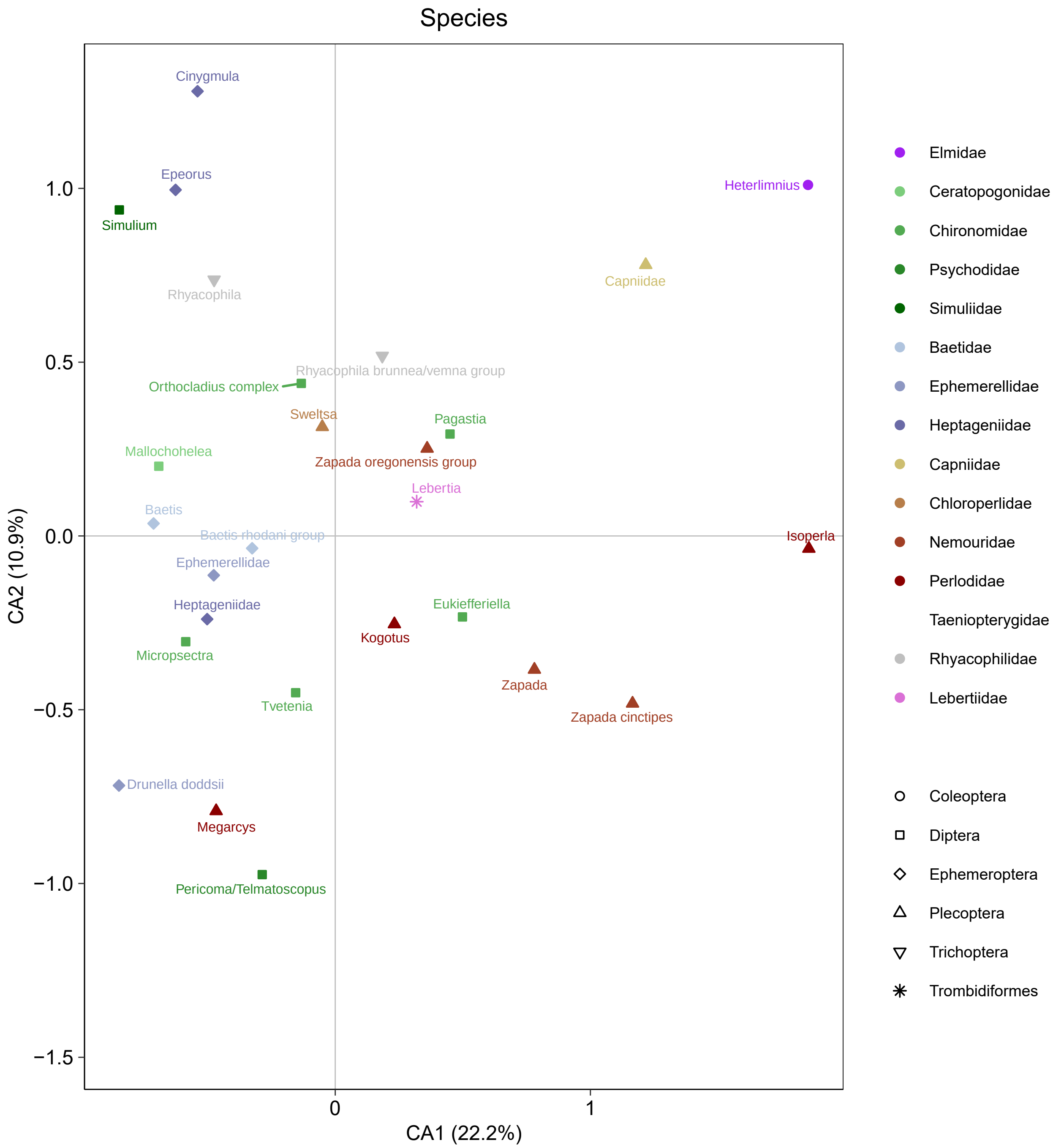

Figure B.42: Seasonal Benthic Invertebrate Community Lowest Practical Level Correspondence Analysis Results Grouped by Taxa, Fording River, 2018 and 2019

Note: Includes BIC data from June, August, September and December 2018, and February, June, September, and December 2019.

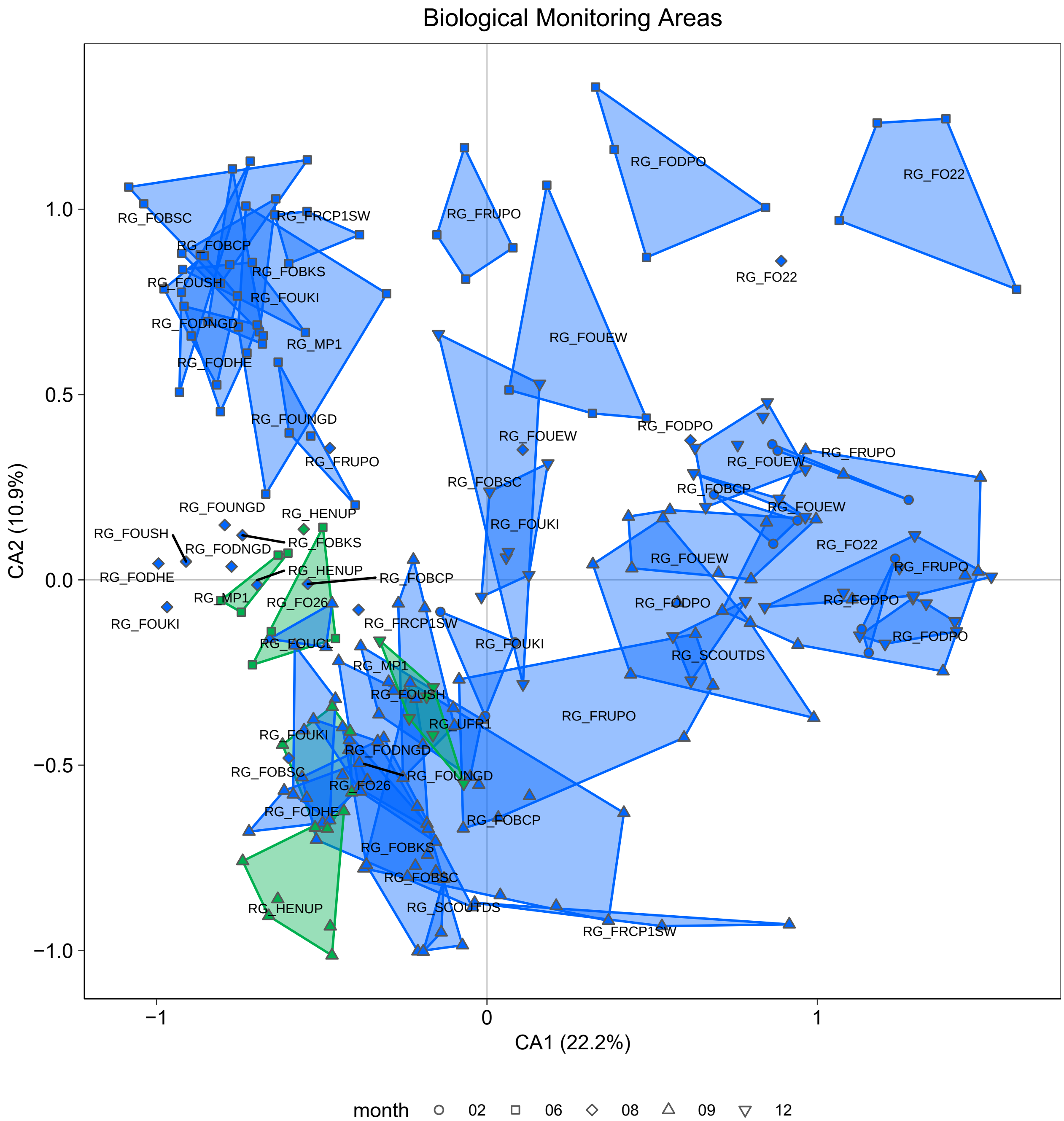

Figure B.43: Seasonal Benthic Invertebrate Community Lowest Practical Level Correspondence Analysis Results Grouped by Area, Fording River, 2018 and 2019

Notes: Blue groups denote mine-exposed areas and green groups denote reference areas. Includes BIC data from June, August, September and December 2018, and February, June, September, and December 2019.

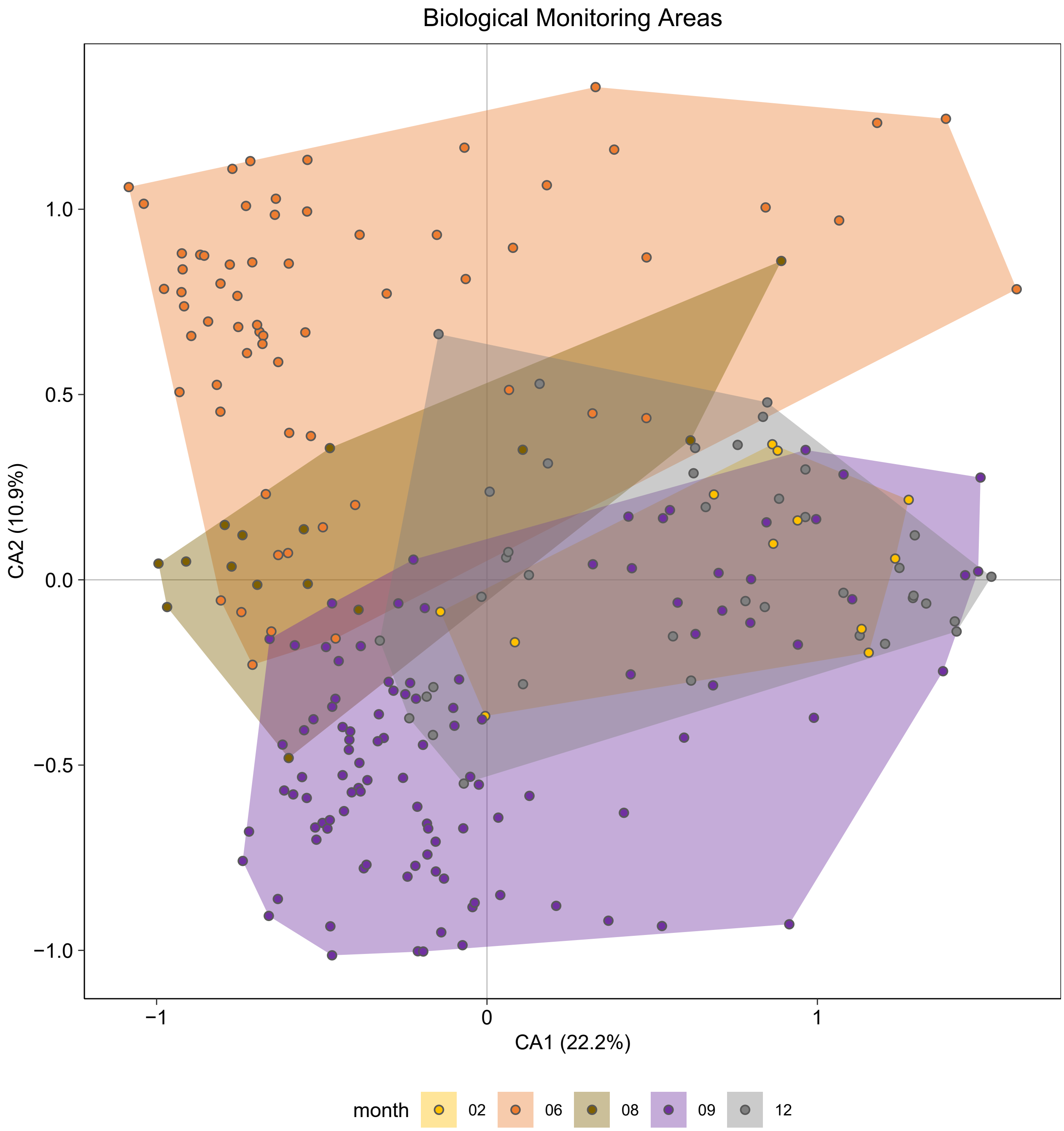

Figure B.44: Seasonal Benthic Invertebrate Community Lowest Practical Level Correspondence Analysis Results Grouped by Season, Fording River, 2018 and 2019

Note: Includes BIC data from June, August, September and December 2018, and February, June, September, and December 2019.

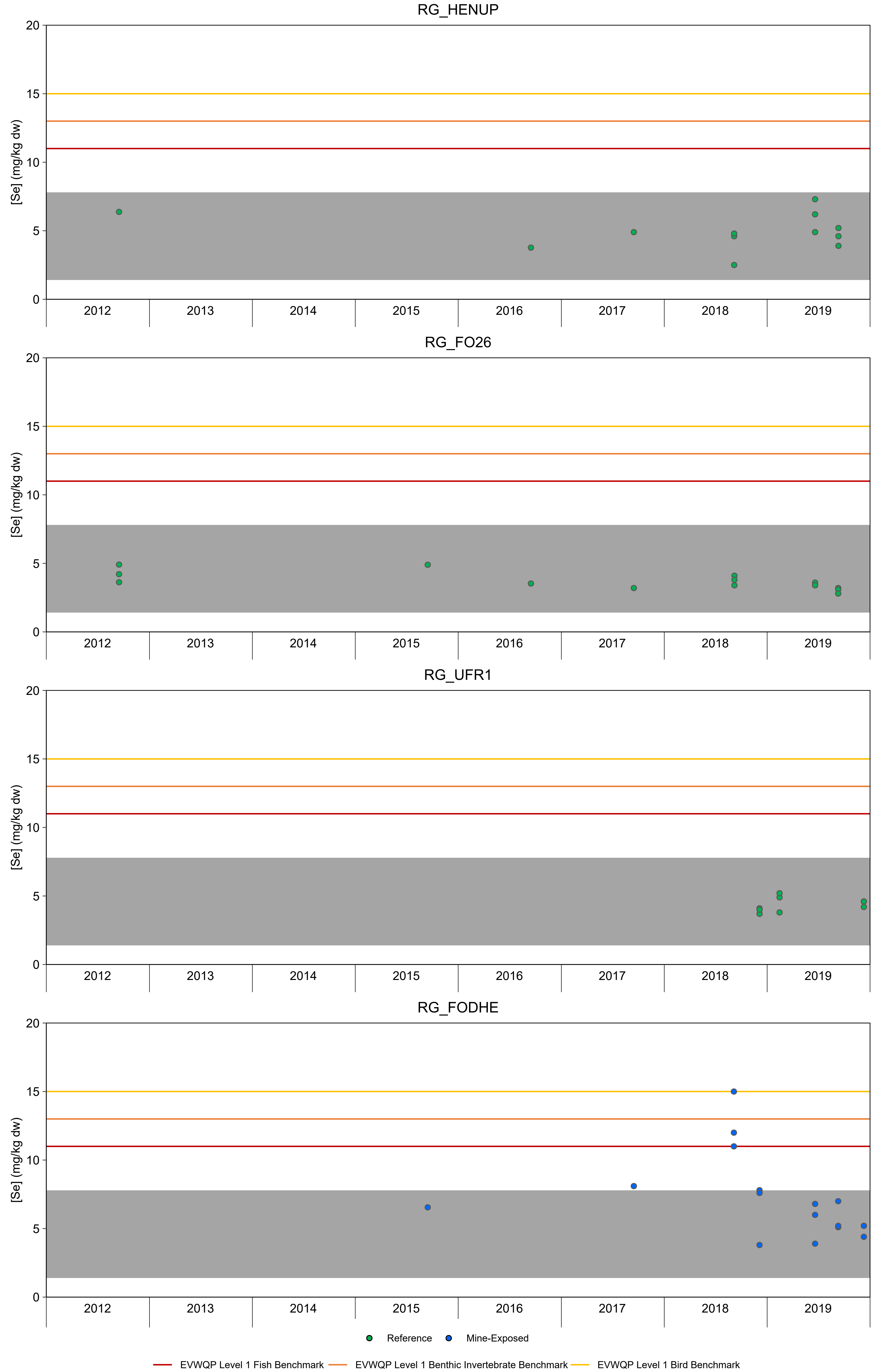

Figure B.45: Composite-taxa Benthic Invertebrate Tissue Concentrations, FRO LAEMP, 2012 to 2019

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 2016 data) reported in the RAEMP. EVWQP Level 1 Fish Benchmark = 11, EVWQP Level 1 Benthic Invertebrate Benchmark =13 andEVWQP Level 1 Bird Benchmark = 15.

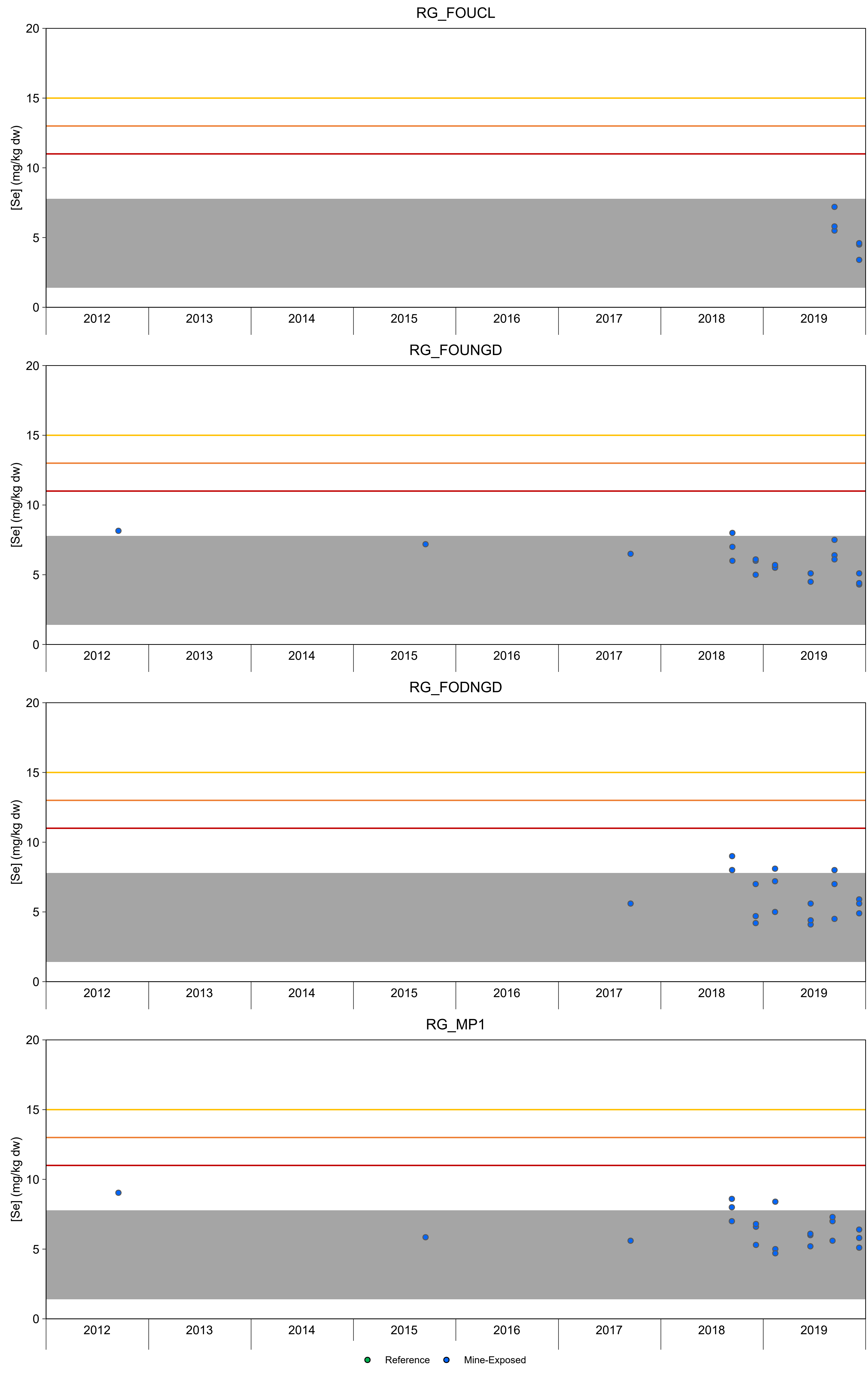

Figure B.45: Composite-taxa Benthic Invertebrate Tissue Concentrations, FRO LAEMP, 2012 to 2019

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 2016 data) reported in the RAEMP. EVWQP Level 1 Fish Benchmark = 11, EVWQP Level 1 Benthic Invertebrate Benchmark =13 andEVWQP Level 1 Bird Benchmark = 15.

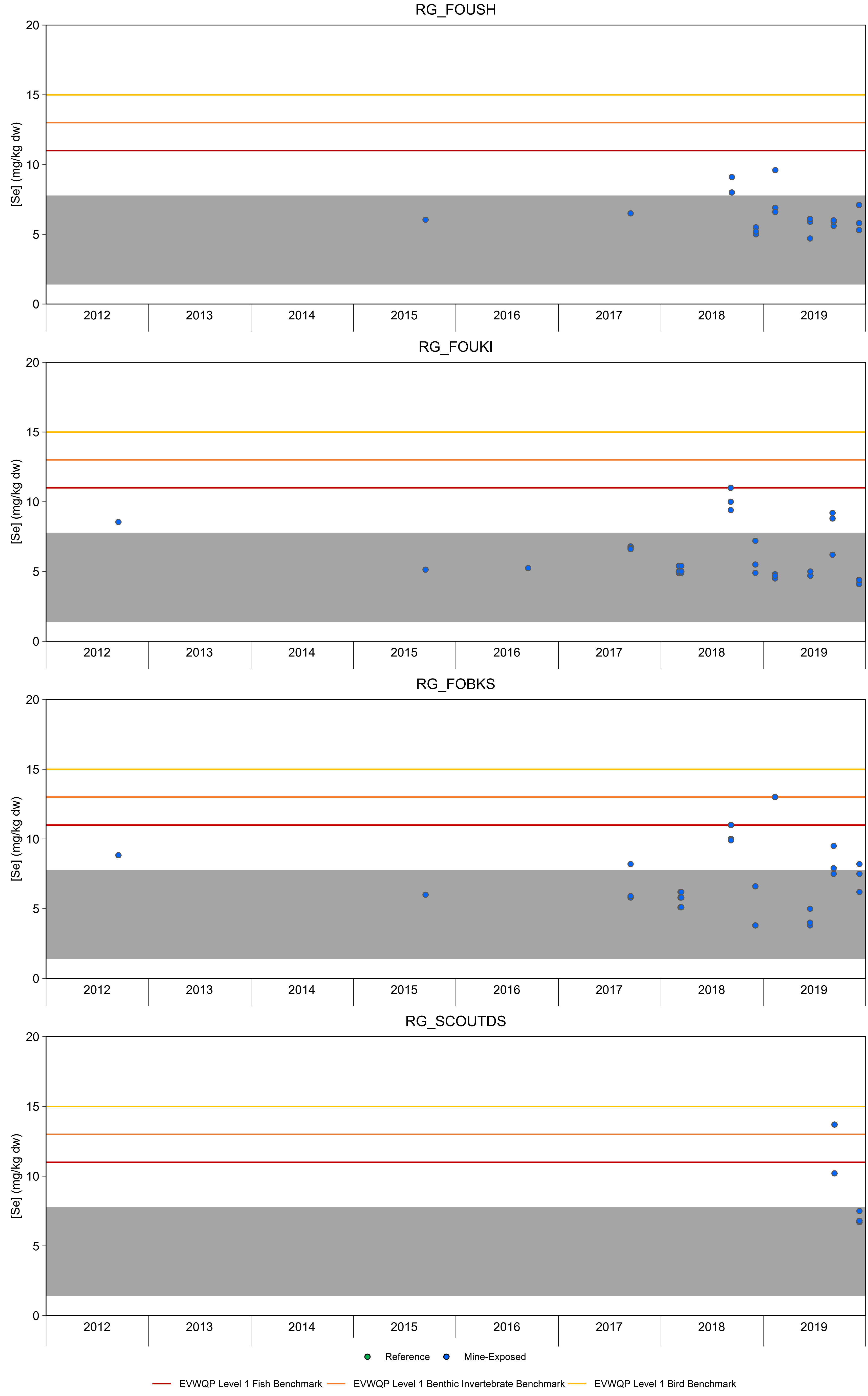

Figure B.45: Composite-taxa Benthic Invertebrate Tissue Concentrations, FRO LAEMP, 2012 to 2019

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 2016 data) reported in the RAEMP. EVWQP Level 1 Fish Benchmark = 11, EVWQP Level 1 Benthic Invertebrate Benchmark =13 andEVWQP Level 1 Bird Benchmark = 15.

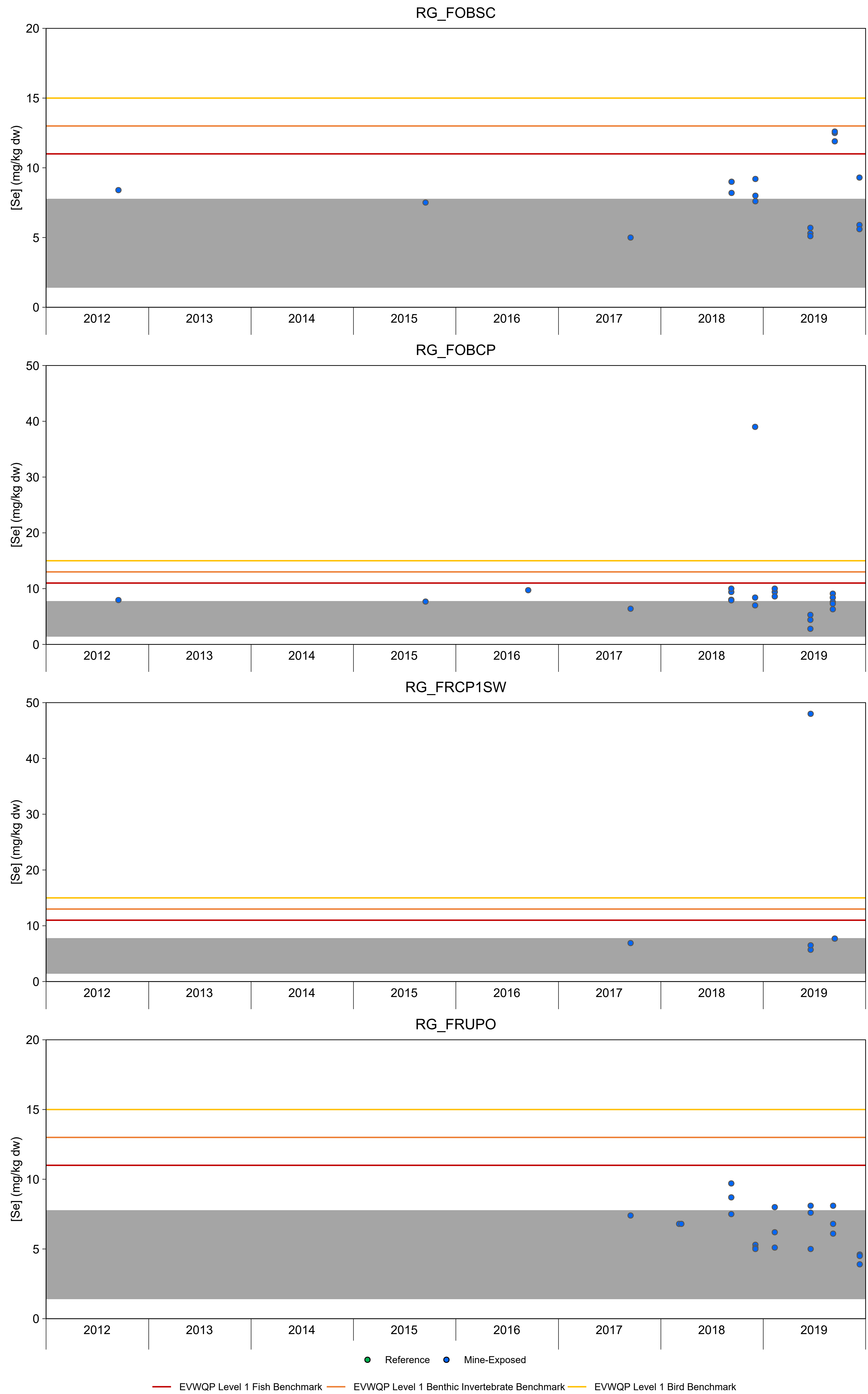

Figure B.45: Composite-taxa Benthic Invertebrate Tissue Concentrations, FRO LAEMP, 2012 to 2019

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 2016 data) reported in the RAEMP. EVWQP Level 1 Fish Benchmark = 11, EVWQP Level 1 Benthic Invertebrate Benchmark =13 andEVWQP Level 1 Bird Benchmark = 15.

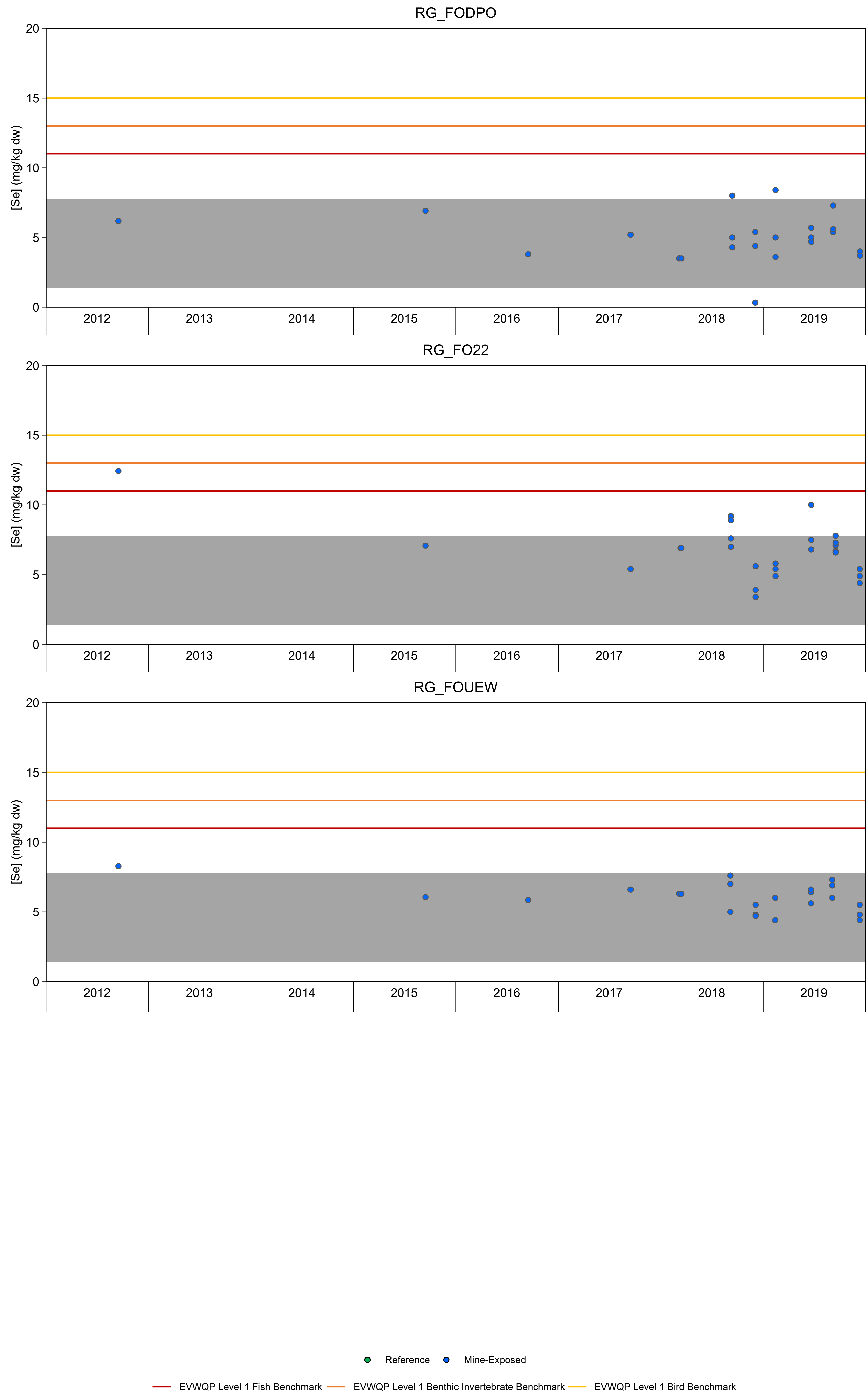

Figure B.45: Composite-taxa Benthic Invertebrate Tissue Concentrations, FRO LAEMP, 2012 to 2019

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 2016 data) reported in the RAEMP. EVWQP Level 1 Fish Benchmark = 11, EVWQP Level 1 Benthic Invertebrate Benchmark =13 andEVWQP Level 1 Bird Benchmark = 15.

Table B.1: Taxa Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, September 2012 to September 2019

Order	Family	Taxa	CA1 (18.9%)	CA2 (10.7%)
Coleoptera	Elmidae	*Heterlimnius*	-2.6	1.5
Diptera	Ceratopogonidae	*Mallochohelea*	0.35	-0.95
Diptera	Chironomidae	*Diamesa*	1.1	0.99
Diptera	Chironomidae	*Eukiefferiella*	-0.055	-0.10
Diptera	Chironomidae	*Micropsectra*	0.65	-0.082
Diptera	Chironomidae	*Orthocladius complex*	-0.18	0.028
Diptera	Chironomidae	*Pagastia*	-0.061	-0.26
Diptera	Chironomidae	*Thienemannimyia complex*	0.27	-1.3
Diptera	Chironomidae	*Tvetenia*	0.11	-0.62
Diptera	Empididae	*Neoplasta*	-0.53	-0.53
Diptera	Psychodidae	*Pericoma/Telmatoscopus*	0.40	-0.68
Diptera	Simuliidae	*Simulium*	-0.081	-1.0
Diptera	Tipulidae	*Dicranota*	-0.75	0.65
Ephemeroptera	Ameletidae	*Ameletidae*	0.84	0.19
Ephemeroptera	Baetidae	*Baetis*	0.14	-0.24
Ephemeroptera	Baetidae	*Baetis rhodani group*	-0.053	-0.45
Ephemeroptera	Ephemerellidae	*Drunella doddsii*	0.71	0.43
Ephemeroptera	Ephemerellidae	*Drunella spinifera*	-0.84	-0.60
Ephemeroptera	Ephemerellidae	*Ephemerellidae*	0.44	0.33
Ephemeroptera	Heptageniidae	*Epeorus*	0.93	0.038
Ephemeroptera	Heptageniidae	*Heptageniidae*	0.42	0.17
Ephemeroptera	Heptageniidae	*Rhithrogena*	1.4	1.6
Plecoptera	Capniidae	*Capniidae*	-0.92	-0.40
Plecoptera	Chloroperlidae	*Sweltsa*	0.40	1.1
Plecoptera	Nemouridae	*Zapada*	-0.62	0.15
Plecoptera	Nemouridae	*Zapada cinctipes*	-0.70	-0.56
Plecoptera	Nemouridae	*Zapada columbiana*	0.70	1.6
Plecoptera	Nemouridae	*Zapada oregonensis group*	0.15	0.93
Plecoptera	Perlidae	*Perlidae*	-0.020	-1.2
Plecoptera	Perlodidae	*Isoperla*	-1.6	0.037
Plecoptera	Perlodidae	*Kogotus*	-0.49	-0.57
Plecoptera	Perlodidae	*Megarcys*	0.41	0.15
Plecoptera	Perlodidae	*Perlodidae*	-0.64	-0.20
Plecoptera	Taeniopterygidae	*Taeniopterygidae*	0.14	0.36
Trichoptera	Glossosomatidae	*Glossosomatidae*	-0.56	0.80
Trichoptera	Hydropsychidae	*Hydropsychidae*	0.89	0.73
Trichoptera	Hydropsychidae	*Parapsyche*	1.0	0.37
Trichoptera	Limnephilidae	*Limnephilidae*	-1.9	1.7
Trichoptera	Rhyacophilidae	*Rhyacophila*	0.0013	-0.35
Trichoptera	Rhyacophilidae	*Rhyacophila brunnea/vemna group*	-0.35	0.0100
Trichoptera	Rhyacophilidae	*Rhyacophila hyalinata group*	0.87	-0.070
Trombidiformes	Lebertiidae	*Lebertia*	-0.41	-0.36
Trombidiformes	Sperchontidae	*Sperchon*	0.51	0.14
Enchytraeidae		*Enchytraeus*	0.14	-1.1

Table B.2: **Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, September 2012 to September 2019**

Year	Status	Area	CA1 (18.9%)	CA2 (10.7%)
2012	Reference	RG_HENUP	0.73	1.5
		RG_FO26	0.49	1.0
	Mine-Exposed	RG_FODHE	0.85	0.98
		RG_FOUNGD	0.66	0.65
		RG_MP1	0.54	0.09
		RG_FOUSH	0.61	0.50
			0.70	0.31
			0.51	0.27
		RG_FOUKI	0.68	0.57
		RG_FOBKS	0.59	0.31
		RG_FOBSC	0.45	-0.05
		RG_FOBCP	0.42	0.27
		RG_FODPO	-0.60	0.34
		RG_FO22	-1.1	0.88
		RG_FOUEW	-0.43	1
2013	Reference	RG_HENUP	1.0	1.2
		RG_FO26	0.79	0.96
	Mine-Exposed	RG_MP1	0.30	-0.04
		RG_FODPO	-0.78	0.31
2015	Reference	RG_HENUP	1.0	1.2
		RG_FO26	0.57	0.78
	Mine-Exposed	RG_FODHE	0.44	0.17
		RG_FOUNGD	0.50	0.41
		RG_FODNGD	0.16	0.00
		RG_MP1	-0.02	-0.02
		RG_FOUSH	0.25	-0.20
		RG_FOUKI	0.34	-0.11
		RG_FOBKS	0.26	-0.37
		RG_FOBSC	0.30	-0.53
		RG_FOBCP	-0.17	-0.60
		RG_FODPO	-0.37	0.60
		RG_FO22	-0.16	0.11
		RG_FOUEW	-0.12	0.35
2016	Reference	RG_HENUP	1.1	1.3
		RG_FO26	0.85	0.90
	Mine-Exposed	RG_FODHE	0.63	0.20
		RG_FOUKI	0.22	-0.09
		RG_FOBKS	0.28	-0.26
		RG_FOBSC	-0.08	-0.57
		RG_FOBCP	0.17	-0.44
		RG_FODPO	-0.65	0.32
		RG_FOUEW	-0.28	0.43

Table B.2: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, September 2012 to September 2019

Year	Status	Area	CA1 (18.9%)	CA2 (10.7%)
2017	Reference	RG_HENUP	1.1	1.6
		RG_FO26	0.60	0.82
	Mine-Exposed	RG_FODHE	0.73	0.40
		RG_FOUNGD	0.04	-0.17
		RG_FODNGD	0.01	-0.22
		RG_MP1	0.09	-0.43
		RG_FOUSH	0.25	0.04
		RG_FOUKI	0.09	-0.41
			0.32	-0.36
		RG_FOBKS	0.15	-0.44
			-0.06	-0.52
			0.05	-0.76
		RG_FOBSC	0.07	-0.64
		RG_FOBCP	-0.32	-0.70
		RG_FRCP1SW	-0.49	-0.82
		RG_FRUPO	-0.65	-0.42
		RG_FODPO	-0.96	0.16
		RG_FO22	-1.4	0.73
		RG_FOUEW	-0.92	0.18
2018	Reference	RG_HENUP	0.88	0.99
			1.1	1.2
			1.1	1.2
		RG_FO26	0.54	0.42
			0.62	0.53
			0.65	0.54
	Mine-Exposed	RG_FODHE	0.67	0.16
			0.70	0.10
			0.70	0.00
		RG_FOUNGD	0.24	-0.36
			0.35	-0.14
			0.26	0.01
		RG_FODNGD	0.25	-0.19
			0.20	-0.15
			0.32	-0.19
		RG_MP1	0.20	-0.29
			0.11	-0.43
			0.15	-0.51
		RG_FOUSH	0.20	-0.40
			0.24	-0.47
			0.14	-0.38

Table B.2: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, September 2012 to September 2019

Year	Status	Area	CA1 (18.9%)	CA2 (10.7%)
2018	Mine-Exposed	RG_FOUKI	0.53	-0.37
			0.51	-0.63
			0.48	-0.64
		RG_FOBKS	0.38	-0.64
			0.48	-0.42
			0.18	-0.56
		RG_FOBSC	0.33	-0.48
			0.24	-0.79
			0.20	-0.60
		RG_FOBCP	0.05	-0.38
			0.09	-0.57
			-0.15	-0.70
			-0.02	-0.96
			-0.28	-0.70
		RG_FRUPO	-0.74	-0.38
			-0.76	-0.35
			-0.74	-0.49
		RG_FODPO	-1.00	0.04
			-0.94	-0.13
			-0.79	-0.21
		RG_FO22	-1.5	0.50
			-1.8	0.68
			-1.8	0.62
			-1.8	0.76
			-1.9	0.73
		RG_FOUEW	-1.1	0.34
			-0.89	0.51
			-0.88	0.10
2019	Reference	RG_HENUP	1.3	1.5
			0.88	1.2
			0.93	0.97
		RG_FO26	0.55	0.61
			0.86	0.52
			0.78	0.77
	Mine-Exposed	RG_FODHE	0.53	0.23
			0.46	0.06
			0.59	0.20
		RG_FOUCL	0.37	-0.08
			0.23	0.12
			0.58	0.10
		RG_FOUNGD	0.35	-0.12
			0.28	-0.09
			0.36	0.09

Table B.2: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, September 2012 to September 2019

Year	Status	Area	CA1 (18.9%)	CA2 (10.7%)
2019	Mine-Exposed	RG_FODNGD	0.09	-0.29
			0.11	-0.08
			0.23	-0.37
		RG_MP1	0.07	-0.12
			0.12	-0.24
			0.12	-0.15
		RG_FOUSH	0.31	-0.16
			0.26	-0.51
			0.30	-0.32
		RG_FOUKI	0.38	-0.52
			0.21	-0.67
			0.30	-0.53
		RG_FOBKS	0.11	-0.61
			0.16	-0.35
			0.17	-0.39
		RG_SCOUTDS	0.20	-0.45
			0.09	-0.30
			0.06	-0.20
		RG_FOBSC	0.27	-0.65
			0.23	-0.42
			0.11	-0.64
		RG_FOBCP	0.09	-0.67
			-0.04	-0.54
			-0.20	-0.81
			-0.05	-0.70
			-0.06	-0.77
		RG_FRCP1SW	-0.11	-0.53
			-0.53	-0.19
			-0.46	-0.43
		RG_FRUPO	-0.29	-0.40
			-0.41	-0.29
			-0.22	-0.53
		RG_FODPO	-0.67	0.05
			-0.96	0.17
			-0.61	-0.16
		RG_FO22	-1.3	0.66
			-1.5	0.79
			-1.7	1.1
			-1.6	0.93
			-1.2	0.55
		RG_FOUEW	-0.55	0.55
			-0.75	0.27
			-0.62	0.21

Table B.3: Temporal Changes in Benthic Invertebrate Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.288	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	0.002	b	-2.3	-	-0.42	1.4	1.0	2.4	2.2	AB	B	-	AB	AB	AB	A	A	ns	ns
Mine-exposed	RG_FODHE	0.048	b	-	-	0.24	-1.4	-0.71	0.019	2.1	AB	-	-	AB	B	AB	AB	A	ns	ns
	RG_FOUNGD	0.052	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FODNGD	0.821	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.153	ns	ns	-	ns	-	ns	ns	ns	ns	ns	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUSH	0.229	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUKI	0.017	b	-	-	-3.1	**-4.8**	-2.3	-2.2	-2.7	A	-	-	AB	B	AB	AB	AB	ns	ns
	RG_FOBKS	0.198	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBSC	0.580	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBCP	0.479	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FRCP1SW	0.455	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.021	-	-	-	-	-	b	-2.4	**-3.9**	-	-	-	-	-	A	AB	B	ns	ns
	RG_FODPO	<0.001	b	1.3	-	-1.3	-0.94	-0.044	**3.7**	-0.79	B	AB	-	B	B	B	A	B	ns	↓
	RG_FO22	0.046	b	-	-	3.5	-	3.8	1.9	0.45	AB	-	-	AB	-	A	AB	B	ns	ns
	RG_FOUEW	0.986	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

- P-value < 0.05.
- > 2 SD Increase.
- > 3 SD Increase.
- > 4 SD Increase.
- > 5 SD Increase.
- > 2 SD Decrease.
- > 3 SD Decrease.
- > 4 SD Decrease.
- > 5 SD Decrease.
- **bold** Significant increase or decrease from base year (b).
- Significantly > than all historical years (or 2018).
- Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = [$Mean_{given\ year}$ − $Mean_{year\ b}$] /$SD_{year\ b}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.4: Temporal Changes in Benthic Invertebrate LPL Richness for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.377	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	0.007	b	-3.3	-	-2.4	-1.1	-1.4	0.95	-0.57	AB	B	-	AB	AB	AB	A	AB	ns	ns
Mine-exposed	RG_FODHE	0.014	b	-	-	1.2	-0.34	1.5	2.1	**3.7**	B	-	-	AB	B	AB	AB	A	ns	ns
	RG_FOUNGD	0.044	b	-	-	-1.5	-	-1.5	2.1	0.88	AB	-	-	B	-	B	A	AB	ns	ns
	RG_FODNGD	0.054	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.004	b	0.36	-	3.4	-	2.8	**4.5**	2.6	B	B	-	AB	-	AB	A	AB	ns	ns
	RG_FOUSH	0.004	b	-	-	0.32	-	2.4	**3.2**	2.2	B	-	-	AB	-	AB	A	AB	ns	ns
	RG_FOUKI	0.161	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBKS	0.003	b	-	-	2.8	3.0	**3.9**	**4.3**	**4.5**	B	-	-	AB	AB	A	A	A	ns	ns
	RG_FOBSC	0.058	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBCP	0.429	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FRCP1SW	0.931	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.174	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	<0.001	b	-3.9	-	-3.5	-0.50	-1.9	1.9	-0.028	ABC	C	-	BC	ABC	BC	A	AB	ns	ns
	RG_FO22	0.401	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUEW	0.040	b	-	-	-3.5	-2.7	-1.6	-1.1	0.061	AB	-	-	B	AB	AB	AB	A	ns	ns

P-value < 0.05.
> 2 SD Increase.
> 3 SD Increase.
> 4 SD Increase.
> 5 SD Increase.
> 2 SD Decrease.
> 3 SD Decrease.
> 4 SD Decrease.
> 5 SD Decrease.
bold Significant increase or decrease from base year (b).
Significantly > than all historical years (or 2018).
Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[\text{Mean}_{\text{given year}} - \text{Mean}_{\text{year b}}] / \text{SD}_{\text{year b}}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.5: **Temporal Changes in EPT Relative Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019**

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.727	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	0.485	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
Mine-exposed	RG_FODHE	0.026	b	-	-	-2.5	-0.99	-0.16	-2.2	**-3.8**	A	-	-	AB	AB	A	AB	B	ns	ns
	RG_FOUNGD	0.087	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FODNGD	0.198	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	<0.001	b	-2.4	-	0.89	-	3.2	1.0	**-5.0**	AB	BC	-	AB	-	A	AB	C	ns	↓
	RG_FOUSH	<0.001	b	-	-	2.0	-	0.98	-0.58	**-3.1**	A	-	-	A	-	A	A	B	↓	↓
	RG_FOUKI	0.004	b	-	-	-1.3	**-4.8**	-2.8	**-3.6**	**-4.5**	A	-	-	AB	B	AB	B	B	ns	ns
	RG_FOBKS	0.251	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBSC	0.437	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBCP	0.002	b	-	-	-0.96	-2.6	-3.3	-2.4	**-4.5**	A	-	-	A	AB	AB	A	B	ns	↓
	RG_FRCP1SW	0.310	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.722	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	<0.001	b	3.8	-	2.5	0.57	-2.5	1.3	-1.3	AB	A	-	A	AB	B	A	B	ns	↓
	RG_FO22	0.840	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUEW	0.007	b	-	-	-1.3	-3.0	-1.8	-2.6	**-4.3**	A	-	-	AB	AB	AB	AB	B	ns	ns

- P-value < 0.05.
- > 2 SD Increase.
- > 3 SD Increase.
- > 4 SD Increase.
- > 5 SD Increase.
- > 2 SD Decrease.
- > 3 SD Decrease.
- > 4 SD Decrease.
- > 5 SD Decrease.
- **bold** Significant increase or decrease from base year (b).
- Significantly > than all historical years (or 2018).
- Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month*.

[b] Magnitude of Difference (MOD) = $[Mean_{given\ year} - Mean_{year\ b}] / SD_{year\ b}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.6: **Temporal Changes in Ephemeroptera Relative Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019**

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.154	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	0.074	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
Mine-exposed	RG_FODHE	0.085	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOUNGD	<0.001	b	-	-	2.1	-	-2.5	-0.45	2.5	ABC	-	-	AB	-	C	BC	A	ns	↑
	RG_FODNGD	0.107	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	<0.001	b	-3.9	-	-1.0	-	1.0	-0.80	**-7.4**	AB	BC	-	AB	-	A	AB	C	ns	↓
	RG_FOUSH	<0.001	b	-	-	1.3	-	-0.44	**-3.1**	**-4.6**	A	-	-	A	-	AB	BC	C	ns	ns
	RG_FOUKI	<0.001	b	-	-	-1.4	**-6.4**	**-4.7**	**-3.5**	**-4.7**	A	-	-	AB	C	BC	BC	BC	ns	ns
	RG_FOBKS	0.001	b	-	-	-3.5	**-5.0**	**-4.9**	**-4.0**	**-4.3**	A	-	-	AB	B	B	B	B	ns	ns
	RG_FOBSC	0.004	b	-	-	-1.7	**-5.5**	-4.0	-2.0	-1.7	A	-	-	AB	B	AB	A	A	ns	ns
	RG_FOBCP	<0.001	b	-	-	**-11**	**-9.9**	**-12**	**-5.6**	**-7.9**	A	-	-	CD	CD	D	B	C	ns	↓
	RG_FRCP1SW	0.673	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.572	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	<0.001	b	-3.6	-	**-7.3**	**-4.9**	**-9.7**	**-6.8**	**-4.7**	A	AB	-	BC	B	C	BC	B	ns	ns
	RG_FO22	<0.001	b	-	-	**-4.5**	**-**	**-8.3**	**-5.3**	**-4.2**	A	-	-	BC	-	C	BC	B	ns	ns
	RG_FOUEW	<0.001	b	-	-	**-5.1**	**-7.6**	**-8.0**	**-6.4**	**-5.5**	A	-	-	B	B	B	B	B	ns	ns

(grey)	P-value < 0.05.
(lightest green)	> 2 SD Increase.
(light green)	> 3 SD Increase.
(green)	> 4 SD Increase.
(dark green)	> 5 SD Increase.
(lightest blue)	> 2 SD Decrease.
(light blue)	> 3 SD Decrease.
(blue)	> 4 SD Decrease.
(dark blue)	> 5 SD Decrease.
bold	Significant increase or decrease from base year (b).
(bright green)	Significantly > than all historical years (or 2018).
(bright blue)	Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[\text{Mean}_{\text{given year}} - \text{Mean}_{\text{year b}}] / \text{SD}_{\text{year b}}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.7: Temporal Changes in Plecoptera Relative Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.006	b	-1.5	-	1.7	-1.8	2.3	-2.1	-0.30	AB	AB	-	A	AB	A	B	AB	ns	ns
	RG_FO26	0.010	b	0.22	-	-1.7	-1.3	-1.4	-3.2	**-3.9**	A	A	-	AB	AB	AB	AB	B	ns	ns
Mine-exposed	RG_FODHE	0.187	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOUNGD	0.102	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FODNGD	0.912	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.002	b	2.7	-	4.2	-	4.3	**3.8**	0.49	BC	ABC	-	AB	-	AB	A	C	ns	↓
	RG_FOUSH	<0.001	b	-	-	2.1	-	3.0	**4.2**	1.7	B	-	-	AB	-	AB	A	B	ns	↓
	RG_FOUKI	0.051	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBKS	0.006	b	-	-	3.5	3.4	2.2	1.8	**4.3**	B	-	-	AB	AB	AB	B	A	ns	↑
	RG_FOBSC	0.004	b	-	-	2.9	2.6	1.9	0.70	**3.9**	B	-	-	AB	AB	AB	B	A	ns	↑
	RG_FOBCP	<0.001	b	-	-	**7.7**	**4.8**	**5.6**	**3.6**	**3.5**	C	-	-	A	AB	AB	B	B	ns	ns
	RG_FRCP1SW	0.819	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.905	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	0.036	b	4.0	-	3.1	0.70	0.79	3.4	0.87	AB	AB	-	AB	AB	AB	A	B	ns	↓
	RG_FO22	0.108	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUEW	0.246	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

P-value < 0.05.
> 2 SD Increase.
> 3 SD Increase.
> 4 SD Increase.
> 5 SD Increase.
> 2 SD Decrease.
> 3 SD Decrease.
> 4 SD Decrease.
> 5 SD Decrease.
bold Significant increase or decrease from base year (b).
Significantly > than all historical years (or 2018).
Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = [$Mean_{given\ year}$ – $Mean_{year\ b}$] /$SD_{year\ b}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.8: Temporal Changes in Trichoptera Relative Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.382	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	<0.001	b	-3.1	-	**-4.3**	-1.8	**5.3**	-1.6	-1.0	B	BC	-	C	BC	A	BC	BC	ns	ns
Mine-exposed	RG_FODHE	0.054	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOUNGD	0.638	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FODNGD	0.055	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.461	ns	ns	-	ns	-	ns	ns	ns	ns	ns	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUSH	0.501	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUKI	0.035	b	-	-	-1.4	1.5	1.8	-1.1	-0.46	AB	-	-	AB	AB	A	B	AB	ns	ns
	RG_FOBKS	0.008	b	-	-	0.98	3.5	**4.2**	1.3	1.3	B	-	-	AB	AB	A	B	B	ns	ns
	RG_FOBSC	<0.001	b	-	-	-0.69	2.3	3.5	0.50	-1.9	AB	-	-	AB	A	A	AB	B	ns	ns
	RG_FOBCP	<0.001	b	-	-	2.6	**7.0**	**5.5**	1.7	-0.079	C	-	-	BC	A	AB	C	C	ns	ns
	RG_FRCP1SW	0.551	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.888	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	<0.001	b	-0.11	-	**6.4**	**7.9**	4.3	-0.72	2.1	BCD	CD	-	A	A	AB	D	BC	ns	↑
	RG_FO22	<0.001	b	-	-	2.9	-	4.1	0.72	**4.9**	BC	-	-	ABC	-	AB	C	A	ns	↑
	RG_FOUEW	0.007	b	-	-	3.3	3.5	3.5	1.0	-0.78	AB	-	-	A	A	A	AB	B	ns	ns

P-value < 0.05.
> 2 SD Increase.
> 3 SD Increase.
> 4 SD Increase.
> 5 SD Increase.
> 2 SD Decrease.
> 3 SD Decrease.
> 4 SD Decrease.
> 5 SD Decrease.
bold Significant increase or decrease from base year (b).
Significantly > than all historical years (or 2018).
Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[Mean_{given\ year} - Mean_{year\ b}] / SD_{year\ b}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.9: Temporal Changes in Benthic Invertebrate EPT Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.351	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	0.010	b	-1.8	-	-0.098	1.4	1.5	2.4	2.0	AB	B	-	AB	AB	AB	A	A	ns	ns
Mine-exposed	RG_FODHE	0.303	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOUNGD	0.025	b	-	-	-1.3	-	-2.1	1.5	1.7	AB	-	-	AB	-	B	A	A	ns	ns
	RG_FODNGD	0.901	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.076	ns	ns	-	ns	-	ns	ns	ns	ns	ns	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUSH	0.168	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUKI	0.006	b	-	-	-3.2	**-5.3**	-2.7	-2.8	-3.5	A	-	-	AB	B	AB	AB	AB	ns	ns
	RG_FOBKS	0.389	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBSC	0.528	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBCP	0.357	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FRCP1SW	0.304	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.014	-	-	-	-	-	b	-2.7	**-4.0**	-	-	-	-	-	A	AB	B	ns	ns
	RG_FODPO	<0.001	b	2.2	-	-0.60	-0.72	-0.79	**3.8**	-1.1	B	AB	-	B	B	B	A	B	ns	↓
	RG_FO22	0.095	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUEW	0.994	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

(grey)	P-value < 0.05.
(light green)	> 2 SD Increase.
(green)	> 3 SD Increase.
(green)	> 4 SD Increase.
(dark green)	> 5 SD Increase.
(light blue)	> 2 SD Decrease.
(blue)	> 3 SD Decrease.
(blue)	> 4 SD Decrease.
(dark blue)	> 5 SD Decrease.
bold	Significant increase or decrease from base year (b).
(green)	Significantly > than all historical years (or 2018).
(blue)	Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[\text{Mean}_{\text{given year}} - \text{Mean}_{\text{year b}}] / \text{SD}_{\text{year b}}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.10: **Temporal Changes in Ephemeroptera Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019**

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.385	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	<0.001	b	-1.5	-	0.98	2.4	1.4	**4.0**	**3.5**	B	B	-	AB	AB	AB	A	A	ns	ns
Mine-exposed	RG_FODHE	0.107	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOUNGD	<0.001	b	-	-	-1.4	-	-2.9	1.7	2.6	ABC	-	-	BC	-	C	AB	A	ns	ns
	RG_FODNGD	0.800	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.002	b	**-5.2**	-	-3.9	-	-0.79	-1.6	**-4.6**	A	B	-	AB	-	A	A	B	ns	↓
	RG_FOUSH	0.004	b	-	-	-1.2	-	-3.3	-2.3	**-3.2**	A	-	-	AB	-	AB	AB	B	ns	ns
	RG_FOUKI	<0.001	b	-	-	-4.0	**-7.2**	**-4.1**	**-3.6**	**-4.5**	A	-	-	ABC	C	BC	B	BC	ns	ns
	RG_FOBKS	0.068	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBSC	0.064	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBCP	0.002	b	-	-	**-5.0**	**-5.8**	**-5.0**	-3.1	**-3.8**	A	-	-	B	B	B	AB	B	ns	ns
	RG_FRCP1SW	0.336	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.445	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	0.003	b	-0.63	-	**-4.7**	-3.2	**-5.6**	-0.96	-2.9	A	AB	-	BC	ABC	C	A	ABC	ns	ns
	RG_FO22	0.435	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUEW	0.668	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

P-value < 0.05.
> 2 SD Increase.
> 3 SD Increase.
> 4 SD Increase.
> 5 SD Increase.
> 2 SD Decrease.
> 3 SD Decrease.
> 4 SD Decrease.
> 5 SD Decrease.
bold Significant increase or decrease from base year (b).
Significantly > than all historical years (or 2018).
Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[Mean_{given\ year} - Mean_{year\ b}] / SD_{year\ b}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.11: Temporal Changes in Plecoptera Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.044	b	-1.5	-	1.8	-0.85	2.8	-0.094	-0.18	AB	B	-	AB	AB	A	AB	AB	ns	ns
	RG_FO26	0.797	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
Mine-exposed	RG_FODHE	0.488	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOUNGD	0.537	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FODNGD	0.963	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.089	ns	ns	-	ns	-	ns	ns	ns	ns	ns	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUSH	0.452	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUKI	0.192	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBKS	0.244	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBSC	0.575	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBCP	0.559	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FRCP1SW	0.307	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.128	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	0.001	b	2.3	-	0.36	-0.32	0.30	3.3	-0.16	AB	AB	-	AB	B	AB	A	B	ns	↓
	RG_FO22	0.101	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUEW	0.818	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

P-value < 0.05.
\> 2 SD Increase.
\> 3 SD Increase.
\> 4 SD Increase.
\> 5 SD Increase.
\> 2 SD Decrease.
\> 3 SD Decrease.
\> 4 SD Decrease.
\> 5 SD Decrease.
bold Significant increase or decrease from base year (b).
Significantly > than all historical years (or 2018).
Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[Mean_{given\ year} - Mean_{year\ b}] / SD_{year\ b}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.12: **Temporal Changes in Trichoptera Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019**

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.280	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	<0.001	b	-3.4	-	-3.1	-0.043	3.7	0.81	1.0	AB	B	-	B	AB	A	A	A	ns	ns
Mine-exposed	RG_FODHE	0.016	b	-	-	-3.4	**-4.9**	-2.3	-1.7	-1.2	A	-	-	AB	B	AB	AB	A	ns	ns
	RG_FOUNGD	0.043	b	-	-	-2.5	-	-1.7	1.0	-0.26	AB	-	-	B	-	AB	A	AB	ns	ns
	RG_FODNGD	0.117	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.219	ns	ns	-	ns	-	ns	ns	ns	ns	ns	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUSH	0.849	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUKI	0.462	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBKS	0.595	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBSC	0.329	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBCP	0.055	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FRCP1SW	0.998	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.131	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	0.054	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO22	0.005	b	-	-	**4.3**	-	**5.4**	1.7	3.1	C	-	-	AB	-	A	BC	ABC	ns	ns
	RG_FOUEW	0.333	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

P-value < 0.05.
> 2 SD Increase.
> 3 SD Increase.
> 4 SD Increase.
> 5 SD Increase.
> 2 SD Decrease.
> 3 SD Decrease.
> 4 SD Decrease.
> 5 SD Decrease.
bold Significant increase or decrease from base year (b).
Significantly > than all historical years (or 2018).
Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[\text{Mean}_{\text{given year}} - \text{Mean}_{\text{year b}}] / \text{SD}_{\text{year b}}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.13: **Temporal Changes in Baetidae Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, Septmber 2012 to 2019**

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.120	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	0.011	b	0.36	-	**5.0**	3.2	4.0	2.9	1.1	B	B	-	A	AB	AB	AB	B	ns	ns
Mine-exposed	RG_FODHE	<0.001	b	-	-	**6.7**	**4.5**	2.3	**3.8**	2.1	C	-	-	A	AB	BC	AB	BC	ns	ns
	RG_FOUNGD	0.088	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FODNGD	0.200	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	0.006	b	-1.9	-	-0.68	-	1.0	2.5	-0.56	AB	B	-	AB	-	AB	A	B	ns	↓
	RG_FOUSH	<0.001	b	-	-	**5.2**	-	0.45	1.6	0.32	B	-	-	A	-	B	B	B	ns	ns
	RG_FOUKI	0.023	b	-	-	0.99	-2.2	1.9	0.89	-1.0	AB	-	-	AB	B	A	AB	B	ns	ns
	RG_FOBKS	0.001	b	-	-	1.9	-0.12	0.75	1.7	-1.7	AB	-	-	A	AB	A	A	B	ns	↓
	RG_FOBSC	0.109	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBCP	<0.001	b	-	-	2.0	1.7	0.73	-2.2	**3.8**	BC	-	-	AB	AB	ABC	C	A	ns	↑
	RG_FRCP1SW	0.012	-	-	-	-	-	b	-	**4.1**	-	-	-	-	-	B	-	A	↑	-
	RG_FRUPO	0.405	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	ns	ns	ns	ns	ns
	RG_FODPO	<0.001	b	-0.26	-	**-8.9**	-0.26	-3.5	1.1	0.16	AB	AB	-	C	AB	B	A	A	ns	ns
	RG_FO22	0.920	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUEW	0.111	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

P-value < 0.05.
\> 2 SD Increase.
\> 3 SD Increase.
\> 4 SD Increase.
\> 5 SD Increase.
\> 2 SD Decrease.
\> 3 SD Decrease.
\> 4 SD Decrease.
\> 5 SD Decrease.
bold Significant increase or decrease from base year (b).
Significantly > than all historical years (or 2018).
Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = [$\text{Mean}_{\text{given year}}$ − $\text{Mean}_{\text{year b}}$] /$\text{SD}_{\text{year b}}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.14: Temporal Changes in Heptageniidae Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.422	ns	ns	-	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	ns	ns	ns	ns	ns
	RG_FO26	0.002	b	-0.95	-	0.78	1.8	0.83	**3.8**	**3.8**	B	B	-	AB	AB	AB	A	A	ns	ns
Mine-exposed	RG_FODHE	0.574	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOUNGD	0.003	b	-	-	-2.1	-	-4.2	-0.13	0.40	AB	-	-	AB	-	B	A	A	ns	ns
	RG_FODNGD	0.081	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	<0.001	b	**-4.8**	-	-3.8	-	-2.5	-2.6	**-5.6**	A	BC	-	ABC	-	ABC	AB	C	ns	↓
	RG_FOUSH	<0.001	b	-	-	-2.5	-	-3.4	**-2.6**	**-3.7**	A	-	-	AB	-	AB	B	B	ns	ns
	RG_FOUKI	<0.001	b	-	-	**-5.0**	**-8.0**	**-5.4**	**-4.6**	**-5.4**	A	-	-	B	B	B	B	B	ns	ns
	RG_FOBKS	0.072	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOBSC	0.005	b	-	-	-2.8	**-5.4**	-3.1	-1.2	-1.3	A	-	-	AB	B	AB	A	A	ns	ns
	RG_FOBCP	0.003	b	-	-	**-4.3**	**-5.7**	-3.6	-1.5	**-3.7**	A	-	-	BC	C	ABC	AB	C	ns	↓
	RG_FRCP1SW	0.642	-	-	-	-	-	ns	-	ns	-	-	-	-	-	ns	-	ns	ns	ns
	RG_FRUPO	0.018	-	-	-	-	-	b	-1.8	**-3.9**	-	-	-	-	-	A	AB	B	ns	ns
	RG_FODPO	0.007	b	1.6	-	-1.9	-2.4	-3.6	0.34	-2.5	AB	A	-	AB	AB	B	A	B	ns	↓
	RG_FO22	0.098	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUEW	0.495	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

P-value < 0.05.
> 2 SD Increase.
> 3 SD Increase.
> 4 SD Increase.
> 5 SD Increase.
> 2 SD Decrease.
> 3 SD Decrease.
> 4 SD Decrease.
> 5 SD Decrease.
bold Significant increase or decrease from base year (b).
Significantly > than all historical years (or 2018).
Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month*.

[b] Magnitude of Difference (MOD) = [$\text{Mean}_{\text{given year}}$ − $\text{Mean}_{\text{year b}}$] /$\text{SD}_{\text{year b}}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.15: **Temporal Changes in Ephemerellidae Abundance for Reference and Mine-exposed Areas in the FRO LAEMP, September 2012 to 2019**

Status	Area	Year P-value[a]	Q1. Is there a positive or negative change since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 September mean greater or less than the September historical means (2012 - 2018) and the previous year (2018)?[c]									
			2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2012-2018	2018
Reference	RG_HENUP	0.002	b	-4.2	-	-0.76	0.47	0.77	0.57	-2.7	ABC	C	-	ABC	AB	AB	A	BC	ns	↓
	RG_FO26	<0.001	b	-2.9	-	-0.33	1.9	0.93	2.4	1.7	AB	B	-	AB	A	AB	A	A	ns	ns
Mine-exposed	RG_FODHE	0.066	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns
	RG_FOUNGD	<0.001	b	-	-	-0.39	-	0.059	**4.2**	**4.9**	B	-	-	B	-	B	A	A	ns	ns
	RG_FODNGD	0.073	-	-	-	ns	-	ns	ns	ns	-	-	-	ns	-	ns	ns	ns	ns	ns
	RG_MP1	<0.001	b	**-9.0**	-	**-4.4**	-	1.4	-0.93	-2.5	AB	D	-	C	-	A	ABC	BC	ns	ns
	RG_FOUSH	0.086	ns	-	-	ns	-	ns	ns	ns	ns	-	-	ns	-	ns	ns	ns	ns	ns
	RG_FOUKI	0.001	b	-	-	-0.83	-2.5	-3.1	-0.070	0.79	AB	-	-	AB	AB	B	A	A	ns	ns
	RG_FOBKS	0.002	b	-	-	-0.47	1.9	-0.47	2.9	1.3	AB	-	-	AB	AB	B	A	AB	ns	ns
	RG_FOBSC	0.004	b	-	-	-3.5	-3.7	**-5.5**	-2.5	-2.7	A	-	-	AB	AB	B	AB	AB	ns	ns
	RG_FOBCP	<0.001	b	-	-	**-6.1**	**-6.1**	**-11**	**-7.9**	**-6.0**	A	-	-	B	B	C	BC	B	ns	ns
	RG_FRCP1SW	0.003	-	-	-	-	-	b	-	**4.5**	-	-	-	-	-	B	-	A	↑	-
	RG_FRUPO	0.046	-	-	-	-	-	b	2.0	-0.52	-	-	-	-	-	AB	A	B	ns	↓
	RG_FODPO	<0.001	b	**-4.6**	-	**-6.3**	**-6.0**	**-10**	**-4.0**	**-5.9**	A	B	-	BC	B	C	B	B	ns	ns
	RG_FO22	0.021	b	-	-	0.48	-	-3.2	-3.2	-2.0	AB	-	-	A	-	AB	B	AB	ns	ns
	RG_FOUEW	0.143	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	ns	ns	ns	ns	ns	ns	ns

- (grey) P-value < 0.05.
- > 2 SD Increase.
- > 3 SD Increase.
- > 4 SD Increase.
- > 5 SD Increase.
- > 2 SD Decrease.
- > 3 SD Decrease.
- > 4 SD Decrease.
- > 5 SD Decrease.
- **bold** Significant increase or decrease from base year (b).
- (green) Significantly > than all historical years (or 2018).
- (blue) Significantly < than all historical years (or 2018).

Notes: "ns" = not significant; "-" insufficient data for comparison.

[a] *Year* p-value from an ANOVA with factors *Year* and *Month.*

[b] Magnitude of Difference (MOD) = $[\text{Mean}_{\text{given year}} - \text{Mean}_{\text{year b}}] / \text{SD}_{\text{year b}}$.

[c] Significance among year determined using all pairwise comparisons using Tukey's honestly signifciant differences method. Years that share a letter are not significantly different. Letters assigned such that the mean with with highest magnitude is assigned "A".

Table B.16: Taxa Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Order	Family	CA1 (26.3%)	CA2 (15.0%)
Coleoptera	Elmidae	-2.5	-1.1
Diptera	Ceratopogonidae	0.63	-0.43
	Chironomidae	0.027	-0.10
	Empididae	-0.30	0.045
	Psychodidae	0.49	1.2
	Simuliidae	0.82	-1.5
	Tipulidae	-0.63	-0.36
Ephemeroptera	Ameletidae	0.87	0.22
	Baetidae	0.36	-0.25
	Ephemerellidae	0.48	-0.16
	Heptageniidae	0.43	0.025
Plecoptera	Capniidae	-1.4	0.24
	Chloroperlidae	0.039	-0.61
	Nemouridae	-0.60	0.44
	Perlodidae	-0.34	0.22
	Taeniopterygidae	-0.099	1.3
Trichoptera	Hydropsychidae	0.78	1.0
	Rhyacophilidae	0.19	-0.60
Trombidiformes	Lebertiidae	-0.42	0.080

Table B.17: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (26.3%)	CA2 (15.0%)
2018	June	Reference	RG_HENUP	0.37	-0.24
			RG_FO26	0.25	-0.34
		Mine-Exposed	RG_FODHE	0.51	-0.385
			RG_FOUNGD	0.27	-0.16
			RG_FODNGD	0.58	-1.07
			RG_MP1	0.46	-0.908
			RG_FOUSH	0.56	-0.877
			RG_FOUKI	0.50	-0.876
			RG_FOBKS	0.56	-0.900
			RG_FOBSC	0.45	-0.725
			RG_FOBCP	0.38	-0.405
			RG_FRCP1SW	0.38	-0.689
			RG_FRUPO	-0.058	-0.699
			RG_FODPO	-0.673	-0.648
			RG_FO22	-1.53	-0.987
			RG_FOUEW	-0.645	-0.874
	August	Reference	RG_HENUP	0.23	-0.25
		Mine-Exposed	RG_FODHE	0.72	-0.35
			RG_FOUNGD	0.66	-0.785
			RG_FODNGD	0.47	-0.35
			RG_MP1	0.56	-0.10
			RG_FOUSH	0.61	-0.36
			RG_FOUKI	0.91	-0.482
			RG_FOBKS	0.71	-0.630
			RG_FOBSC	0.54	0.082
			RG_FOBCP	0.59	-0.654
			RG_FRCP1SW	0.20	-0.590
			RG_FRUPO	0.38	-1.01
			RG_FODPO	-0.898	-0.33
			RG_FO22	-1.59	-1.01
			RG_FOUEW	-0.670	-0.801
	September	Reference	RG_HENUP	0.40	0.59
				0.50	0.42
				0.67	0.40
			RG_FO26	0.45	0.41
				0.50	0.48
				0.44	0.51
		Mine-Exposed	RG_FODHE	0.54	0.56
				0.72	-0.016
				0.71	0.37
			RG_FOUNGD	0.46	0.14
				0.50	0.42
				0.34	0.49

Table B.17: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (26.3%)	CA2 (15.0%)
2018	September	Mine-Exposed	RG_FODNGD	0.36	0.51
				0.33	0.29
				0.43	0.37
			RG_MP1	0.34	0.36
				0.39	0.30
				0.42	0.20
			RG_FOUSH	0.46	0.53
				0.37	0.25
				0.41	0.25
			RG_FOUKI	0.63	0.47
				0.77	0.33
				0.58	0.48
			RG_FOBKS	0.68	0.057
				0.66	0.49
				0.55	0.24
			RG_FOBSC	0.46	0.82
				0.48	0.36
				0.41	0.56
			RG_FOBCP	0.35	0.56
				0.15	0.71
				0.17	0.92
				0.19	0.89
				0.051	0.69
			RG_FRUPO	0.025	0.14
				-0.19	0.23
				-0.14	-0.15
			RG_FODPO	-0.820	0.27
				-0.592	0.26
				-0.36	-0.14
			RG_FO22	-1.05	-0.36
				-1.39	-0.033
				-1.42	-0.31
				-1.61	-0.380
				-1.60	-0.543
			RG_FOUEW	-0.999	-0.17
				-0.815	-0.29
				-0.542	-0.24
	December	Reference	RG_UFR1	0.019	0.062
				0.096	0.42
				0.13	0.39
		Mine-Exposed	RG_FOUKI	0.081	0.65
				0.12	0.78
				0.17	0.89

Table B.17: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (26.3%)	CA2 (15.0%)
2018	December	Mine-Exposed	RG_FOBSC	-0.20	0.27
				-0.088	0.80
				-0.19	0.94
			RG_FOBCP	-0.726	0.60
				-0.909	0.70
				-0.828	0.61
			RG_FRUPO	-0.822	0.48
				-0.694	0.50
				-0.473	0.69
			RG_FODPO	-0.967	0.45
				-0.851	0.18
				-0.892	0.58
			RG_FOUEW	-0.906	-0.0073
				-1.05	0.092
				-0.654	0.12
2019	February	Mine-Exposed	RG_FOUKI	-0.010	0.74
				-0.13	0.75
				-0.12	0.68
			RG_FRUPO	-1.01	0.40
				-0.923	0.48
				-0.910	0.46
			RG_FODPO	-0.915	0.49
				-1.10	0.24
				-0.889	0.37
			RG_FOUEW	-0.898	0.20
				-0.816	0.10
				-0.895	0.022
	June	Reference	RG_HENUP	0.34	-0.21
				0.35	-0.17
				0.23	-0.30
			RG_FO26	0.30	-0.23
				0.29	-0.080
				0.23	-0.14
		Mine-Exposed	RG_FODHE	0.58	-0.493
				0.48	-0.564
				0.67	-0.710
			RG_FOUNGD	0.55	-0.652
				0.38	-0.690
				0.63	-0.943
			RG_FODNGD	0.55	-0.941
				0.61	-1.01
				0.49	-0.721
			RG_MP1	0.60	-1.35
				0.61	-0.485
				0.60	-0.859

Table B.17: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (26.3%)	CA2 (15.0%)
2019	June	Mine-Exposed	RG_FOUSH	0.65	-0.631
				0.65	-0.684
				0.73	-0.723
			RG_FOUKI	0.36	-0.370
				0.63	-0.535
				0.54	-0.598
			RG_FOBKS	0.52	-0.558
				0.67	-0.587
				0.57	-0.631
			RG_FOBSC	0.60	-0.610
				0.53	-0.473
				0.80	-0.581
			RG_FOBCP	0.78	-0.978
				0.73	-0.913
				0.61	-0.681
			RG_FRCP1SW	0.25	-0.636
				0.40	-1.03
				0.59	-1.31
			RG_FRUPO	-0.039	-0.936
				-0.017	-1.00
				-0.16	-0.559
			RG_FODPO	-1.10	-0.33
				-0.758	-0.33
				-0.727	-0.579
			RG_FO22	-1.53	-0.695
				-1.79	-0.399
				-1.53	-0.815
			RG_FOUEW	-0.643	-0.417
				-0.36	-0.442
				-0.33	-0.500
	September	Reference	RG_HENUP	0.46	0.27
				0.35	0.37
				0.38	0.42
			RG_FO26	0.52	0.20
				0.60	0.24
				0.46	0.29
		Mine-Exposed	RG_FODHE	0.50	0.38
				0.45	0.30
				0.57	0.37
			RG_FOUCL	0.58	0.062
				0.49	-0.018
				0.64	-0.093
			RG_FOUNGD	0.53	0.19
				0.44	0.18
				0.49	0.087

Table B.17: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (26.3%)	CA2 (15.0%)
2019	September	Mine-Exposed	RG_FODNGD	0.34	0.20
				0.24	0.22
				0.41	0.16
			RG_MP1	0.25	0.12
				0.42	0.25
				0.36	-0.048
			RG_FOUSH	0.23	0.37
				0.46	0.35
				0.42	0.34
			RG_FOUKI	0.47	0.28
				0.45	-0.063
				0.33	0.32
			RG_FOBKS	0.25	0.91
				0.24	0.55
				0.23	0.60
			RG_SCOUTDS	0.067	0.91
				0.14	0.62
				0.15	0.66
			RG_FOBSC	0.28	0.93
				0.31	0.91
				0.22	0.88
			RG_FOBCP	0.26	0.32
				0.18	0.58
				0.15	0.57
				0.20	0.52
				0.18	0.41
			RG_FRCP1SW	0.027	0.71
				-0.22	1.1
				-0.0014	1
			RG_FRUPO	-0.12	0.47
				-0.19	0.26
				0.032	0.15
			RG_FODPO	-0.695	0.15
				-0.832	-0.27
				-0.382	-0.368
			RG_FO22	-1.09	-0.16
				-1.22	-0.25
				-1.28	-0.409
				-1.34	-0.528
				-0.980	-0.12
			RG_FOUEW	-0.713	-0.16
				-0.777	-0.30
				-0.641	-0.23

Table B.17: Biological Monitoring Area Scores from Correspondence Analysis on Family Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (26.3%)	CA2 (15.0%)
2019	December	Reference	RG_UFR1	0.18	0.26
				0.10	0.26
				0.15	0.18
		Mine-Exposed	RG_FOUKI	0.0087	0.37
				-0.10	0.20
				0.047	0.50
			RG_SCOUTDS	-0.13	0.71
				-0.21	0.64
				-0.35	0.56
			RG_FRUPO	-0.936	0.47
				-0.866	0.46
				-0.807	0.42
			RG_FODPO	-0.971	0.25
				-0.991	0.28
				-1.06	0.41
			RG_FOUEW	-0.915	-0.089
				-0.736	-0.18
				-0.503	-0.0094

Table B.18 Taxa Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Order	Family	Taxa	CA1 (22.2%)	CA2 (10.9%)
Coleoptera	Elmidae	*Heterlimnius*	1.9	1.0
Diptera	Ceratopogonidae	*Mallochohelea*	-0.69	0.20
	Chironomidae	*Eukiefferiella*	0.50	-0.23
		Micropsectra	-0.59	-0.30
		Orthocladius complex	-0.13	0.44
		Pagastia	0.45	0.29
		Tvetenia	-0.16	-0.45
	Psychodidae	*Pericoma/Telmatoscopus*	-0.29	-0.97
	Simuliidae	*Simulium*	-0.85	0.94
Ephemeroptera	Baetidae	*Baetis*	-0.71	0.036
		Baetis rhodani group	-0.33	-0.036
	Ephemerellidae	*Drunella doddsii*	-0.85	-0.72
		Ephemerellidae	-0.48	-0.11
	Heptageniidae	*Cinygmula*	-0.54	1.3
		Epeorus	-0.63	1.00
		Heptageniidae	-0.50	-0.24
Plecoptera	Capniidae	Capniidae	1.2	0.78
	Chloroperlidae	*Sweltsa*	-0.051	0.31
	Nemouridae	*Zapada*	0.78	-0.38
		Zapada cinctipes	1.2	-0.48
		Zapada oregonensis group	0.36	0.25
	Perlodidae	*Isoperla*	1.9	-0.036
		Kogotus	0.23	-0.25
		Megarcys	-0.47	-0.79
	Taeniopterygidae	Taeniopterygidae	0.35	-1.5
Trichoptera	Rhyacophilidae	*Rhyacophila*	-0.47	0.74
		Rhyacophila brunnea/vemna group	0.18	0.52
Trombidiformes	Lebertiidae	*Lebertia*	0.32	0.099

Table B.19: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (22.2%)	CA2 (10.9%)
2018	June	Reference	RG_HENUP	-0.632	0.0669
			RG_FO26	-0.497	0.142
		Mine-Exposed	RG_FODHE	-0.726	0.612
			RG_FOUNGD	-0.399	0.202
			RG_FODNGD	-0.755	0.766
			RG_MP1	-0.304	0.772
			RG_FOUSH	-0.716	1.13
			RG_FOUKI	-0.771	1.11
			RG_FOBKS	-0.710	0.857
			RG_FOBSC	-0.544	1.13
			RG_FOBCP	-0.639	1.03
			RG_FRCP1SW	-0.642	0.985
			RG_FRUPO	-0.0683	1.17
			RG_FODPO	0.328	1.33
			RG_FO22	1.39	1.24
			RG_FOUEW	0.181	1.06
	August	Reference	RG_HENUP	-0.555	0.137
		Mine-Exposed	RG_FODHE	-0.994	0.0439
			RG_FOUNGD	-0.794	0.148
			RG_FODNGD	-0.773	0.0358
			RG_MP1	-0.695	-0.0135
			RG_FOUSH	-0.911	0.0494
			RG_FOUKI	-0.968	-0.0734
			RG_FOBKS	-0.740	0.120
			RG_FOBSC	-0.600	-0.481
			RG_FOBCP	-0.542	-0.0110
			RG_FRCP1SW	-0.389	-0.0808
			RG_FRUPO	-0.476	0.356
			RG_FODPO	0.616	0.376
			RG_FO22	0.891	0.860
			RG_FOUEW	0.108	0.351
	September	Reference	RG_HENUP	-0.474	-0.935
				-0.633	-0.861
				-0.739	-0.759
			RG_FO26	-0.409	-0.573
				-0.520	-0.668
				-0.483	-0.671
		Mine-Exposed	RG_FODHE	-0.498	-0.656
				-0.614	-0.568
				-0.720	-0.679
			RG_FOUNGD	-0.331	-0.436
				-0.383	-0.571
				-0.156	-0.707

Table B.19: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (22.2%)	CA2 (10.9%)
2018	September	Mine-Exposed	RG_FODNGD	-0.178	-0.671
				-0.194	-0.445
				-0.389	-0.562
			RG_MP1	-0.254	-0.534
				-0.0986	-0.394
				-0.247	-0.309
			RG_FOUSH	-0.0509	-0.532
				-0.102	-0.346
				-0.0152	-0.377
			RG_FOUKI	-0.476	-0.648
				-0.546	-0.589
				-0.586	-0.579
			RG_FOBKS	-0.560	-0.532
				-0.516	-0.701
				-0.312	-0.427
			RG_FOBSC	-0.365	-0.769
				-0.437	-0.397
				-0.182	-0.658
			RG_FOBCP	0.129	-0.583
				0.0402	-0.851
				0.367	-0.920
				0.209	-0.880
				0.414	-0.629
			RG_FRUPO	0.596	-0.426
				0.684	-0.285
				0.631	-0.146
			RG_FODPO	0.989	-0.372
				0.797	-0.116
				0.577	-0.0614
			RG_FO22	1.11	-0.0524
				1.38	-0.247
				1.49	0.0226
				1.45	0.0123
				1.49	0.276
			RG_FOUEW	0.996	0.164
				0.799	0.00180
				0.701	0.0186
	December	Reference	RG_UFR1	-0.325	-0.164
				-0.183	-0.315
				-0.0704	-0.550
		Mine-Exposed	RG_FOUKI	0.0581	0.0603
				-0.0167	-0.0458
				0.00799	0.238

Table B.19: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (22.2%)	CA2 (10.9%)
2018	December	Mine-Exposed	RG_FOBSC	-0.147	0.663
				0.159	0.529
				0.109	-0.282
			RG_FOBCP	0.625	0.288
				0.963	0.169
				0.884	0.219
			RG_FRUPO	1.29	-0.0428
				1.08	-0.0351
				0.841	-0.0733
			RG_FODPO	1.29	-0.0491
				1.20	-0.173
				1.13	-0.150
			RG_FOUEW	0.964	0.298
				0.835	0.440
				0.630	0.356
2019	February		RG_FOUKI	-0.00549	-0.368
				0.0843	-0.168
				-0.141	-0.0861
			RG_FRUPO	1.28	0.216
				0.863	0.366
				0.880	0.349
			RG_FODPO	1.16	-0.197
				1.24	0.0574
				1.13	-0.132
			RG_FOUEW	0.866	0.0974
				0.687	0.230
				0.940	0.160
	June	Reference	RG_HENUP	-0.806	-0.0556
				-0.744	-0.0871
				-0.602	0.0723
			RG_FO26	-0.710	-0.229
				-0.653	-0.139
				-0.458	-0.158
		Mine-Exposed	RG_FODHE	-0.807	0.454
				-0.696	0.688
				-0.917	0.738
			RG_FOUNGD	-0.533	0.388
				-0.599	0.396
				-0.632	0.588
			RG_FODNGD	-0.856	0.875
				-0.978	0.785
				-0.818	0.526
			RG_MP1	-0.730	1.01
				-0.669	0.231
				-0.753	0.682

Table B.19: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (22.2%)	CA2 (10.9%)
2019	June	Mine-Exposed	RG_FOUSH	-0.925	0.776
				-0.931	0.507
				-0.895	0.658
			RG_FOUKI	-0.677	0.659
				-0.680	0.637
				-0.844	0.697
			RG_FOBKS	-0.550	0.668
				-0.921	0.838
				-0.778	0.851
			RG_FOBSC	-1.04	1.01
				-0.807	0.799
				-1.08	1.06
			RG_FOBCP	-0.868	0.877
				-0.924	0.881
				-0.688	0.669
			RG_FRCP1SW	-0.386	0.931
				-0.545	0.994
				-0.600	0.853
			RG_FRUPO	-0.0646	0.812
				-0.152	0.931
				0.0785	0.896
			RG_FODPO	0.843	1.00
				0.483	0.870
				0.385	1.16
			RG_FO22	1.07	0.970
				1.60	0.784
				1.18	1.23
			RG_FOUEW	0.482	0.437
				0.319	0.449
				0.0666	0.512
	September	Reference	RG_HENUP	-0.661	-0.907
				-0.433	-0.624
				-0.469	-1.01
			RG_FO26	-0.468	-0.342
				-0.619	-0.445
				-0.414	-0.409
		Mine-Exposed	RG_FODHE	-0.362	-0.541
				-0.386	-0.494
				-0.437	-0.527
			RG_FOUCL	-0.487	-0.181
				-0.469	-0.0635
				-0.658	-0.159
			RG_FOUNGD	-0.525	-0.376
				-0.417	-0.432
				-0.418	-0.459

Table B.19: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (22.2%)	CA2 (10.9%)
2019	September	Mine-Exposed	RG_FODNGD	-0.215	-0.321
				-0.283	-0.299
				-0.449	-0.219
			RG_MP1	-0.188	-0.0762
				-0.268	-0.0635
				-0.223	0.0546
			RG_FOUSH	-0.327	-0.363
				-0.298	-0.275
				-0.382	-0.179
			RG_FOUKI	-0.554	-0.406
				-0.582	-0.177
				-0.459	-0.321
			RG_FOBKS	-0.0438	-0.883
				-0.217	-0.772
				-0.241	-0.801
			RG_SCOUTDS	-0.138	-0.951
				-0.193	-1.00
				-0.130	-0.806
			RG_FOBSC	-0.209	-1.00
				-0.155	-0.787
				-0.0742	-0.986
			RG_FOBCP	-0.373	-0.778
				-0.211	-0.612
				-0.0247	-0.553
				-0.180	-0.741
				-0.233	-0.278
			RG_FRCP1SW	-0.0374	-0.871
				0.915	-0.930
				0.529	-0.934
			RG_FRUPO	-0.0719	-0.671
				0.0342	-0.642
				-0.0846	-0.269
			RG_FODPO	0.435	-0.255
				0.533	0.166
				0.320	0.0421
			RG_FO22	0.941	-0.175
				0.846	0.155
				1.08	0.284
				0.964	0.350
				0.712	-0.0830
			RG_FOUEW	0.428	0.171
				0.554	0.188
				0.438	0.0313

Table B.19: Biological Monitoring Area Scores from Correspondence Analysis on Lowest-Practical-Level Benthic Invertebrate Communities from the Fording River, 2018 to 2019

Year	Month	Status	Area	CA1 (22.2%)	CA2 (10.9%)
2019	December	Reference	RG_UFR1	-0.162	-0.289
				-0.164	-0.419
				-0.235	-0.373
		Mine-Exposed	RG_FOUKI	0.0646	0.0750
				0.184	0.314
				0.127	0.0129
			RG_SCOUTDS	0.563	-0.152
				0.618	-0.272
				0.782	-0.0573
			RG_FRUPO	1.53	0.00835
				1.29	0.120
				1.25	0.0322
			RG_FODPO	1.33	-0.0638
				1.42	-0.139
				1.42	-0.112
			RG_FOUEW	0.848	0.479
				0.759	0.364
				0.662	0.196

Table B.20: Paired Tissue and Water Selenium Concentrations for the FRO LAEMP, 2012 to 2019

Watershed	Exposure Status	Minnow Biological Monitoring Area	Associated Teck Water Monitoring Station Code	Year	Total Selenium in Water		Selenium in Tissue	
					Sample Date	µg/L	Sample Date	mg/kg dw
Fording River	Reference	RG_HENUP	FR_HC3	2012	18-Sep-12	0.83	18-Sep-12	6.4
				2015	15-Sep-15	1.03	15-Sep-15	3.8
				2016	7-Sep-16	1.11	12-Sep-16	3.8
				2017	15-Sep-17	1.04	15-Sep-17	4.9
				2018	6-Sep-18	1.11	06-Sep-18	3.4
				2018	6-Sep-18	1.11	06-Sep-18	4.1
				2018	6-Sep-18	1.11	06-Sep-18	3.8
				2019	11-Sep-19	1.11	11-Sep-19	5.2
				2019	11-Sep-19	1.11	11-Sep-19	4.6
				2019	11-Sep-19	1.11	11-Sep-19	3.9
		RG_FO26	FR_UFR1	2012	18-Sep-12	0.58	18-Sep-12	4.9
				2012	18-Sep-12	0.58	18-Sep-12	3.6
				2012	18-Sep-12	0.58	18-Sep-12	4.2
				2015	14-Sep-15	0.79	14-Sep-15	4.9
				2016	20-Sep-16	0.68	12-Sep-16	3.5
				2017	12-Sep-17	0.60	12-Sep-17	3.2
				2018	7-Sep-18	0.57	07-Sep-18	3.4
				2018	7-Sep-18	0.57	07-Sep-18	4.1
				2018	7-Sep-18	0.57	07-Sep-18	3.8
				2019	20-Jun-19	0.60	20-Jun-19	3.6
				2019	20-Jun-19	0.60	20-Jun-19	3.4
				2019	20-Jun-19	0.60	20-Jun-19	3.4
				2019	10-Sep-19	0.61	10-Sep-19	3.2
				2019	10-Sep-19	0.61	10-Sep-19	3.1
				2019	10-Sep-19	0.61	10-Sep-19	2.8
		RG_UFR1	FR_UFR1	2018	5-Dec-18	0.73	05-Dec-18	4.1
				2018	5-Dec-18	0.73	05-Dec-18	3.7
				2018	5-Dec-18	0.73	05-Dec-18	4.0
				2019	10-Dec-19	0.82	10-Dec-19	4.2
				2019	10-Dec-19	0.82	10-Dec-19	4.6
				2019	10-Dec-19	0.82	10-Dec-19	4.6
				2019	14-Feb-19	1.02	14-Feb-19	4.9
				2019	14-Feb-19	1.02	14-Feb-19	3.8
				2019	14-Feb-19	1.02	14-Feb-19	5.2
	Mine-exposed	RG_FODHE	FR_FR1	2012	19-Sep-12	18.0	19-Sep-12	8.9
				2015	14-Sep-15	9.8	14-Sep-15	6.6
				2017	15-Sep-17	20.4	15-Sep-17	8.1
				2018	5-Sep-18	19.8	05-Sep-18	11.0
				2018	5-Sep-18	19.8	05-Sep-18	12.0
				2018	5-Sep-18	19.8	05-Sep-18	15.0
				2018	5-Dec-18	25.1	05-Dec-18	7.8
				2018	5-Dec-18	25.1	05-Dec-18	7.6
				2018	5-Dec-18	25.1	05-Dec-18	3.8
				2019	12-Feb-19	23.6	12-Feb-19	-
				2019	12-Feb-19	23.6	12-Feb-19	-
				2019	12-Feb-19	23.6	12-Feb-19	-
				2019	20-Jun-19	4.3	20-Jun-19	6.8
				2019	20-Jun-19	4.3	20-Jun-19	6.0
				2019	20-Jun-19	4.3	20-Jun-19	3.9
				2019	10-Sep-19	13.5	10-Sep-19	5.1
				2019	10-Sep-19	13.5	10-Sep-19	5.2
				2019	10-Sep-19	13.5	10-Sep-19	7.0
				2019	10-Dec-19	21.8	10-Dec-19	4.4
				2019	10-Dec-19	21.8	10-Dec-19	5.2
				2019	10-Dec-19	21.8	10-Dec-19	5.2
		RG_FOUCL	RG_FOUCL	2019	12-Sep-19	16.5	12-Sep-19	7.2
				2019	12-Sep-19	16.5	12-Sep-19	5.5
				2019	12-Sep-19	16.5	12-Sep-19	5.8
				2019	9-Dec-19	30.0	09-Dec-19	4.5
				2019	9-Dec-19	30.0	09-Dec-19	4.6
				2019	9-Dec-19	30.0	09-Dec-19	3.4
		RG_FOUNGD	-	2012	12-Sep-12	23.5	12-Sep-12	8.2
				2015	15-Sep-15	24.0	15-Sep-15	7.2
				2017	16-Sep-17	53.0	16-Sep-17	6.5
				2018	13-Sep-18	37.9	13-Sep-18	6.0
				2018	13-Sep-18	37.9	13-Sep-18	7.0
				2018	13-Sep-18	37.9	13-Sep-18	8.0
				2018	5-Dec-18	52.2	05-Dec-18	6.0
				2018	5-Dec-18	52.2	05-Dec-18	6.1
				2018	5-Dec-18	52.2	05-Dec-18	5.0
				2019	12-Feb-19	48.4	12-Feb-19	5.6
				2019	12-Feb-19	48.4	12-Feb-19	5.5
				2019	12-Feb-19	48.4	12-Feb-19	5.7

Notes: No concurrent water selenium data were available for 2016 tissue samples, so concentrations from the closest sample date from each associated Teck WQ monitoring station was used. No selenium water data was available for MP1 in 2012, so the corresponding data from FR_MULTIPLATE was used for that data point only in 2012. "-" indicates stations where benthic tissue samples were not taken because of frozen conditions.

Table B.20: Paired Tissue and Water Selenium Concentrations for the FRO LAEMP, 2012 to 2019

Watershed	Exposure Status	Minnow Biological Monitoring Area	Associated Teck Water Monitoring Station Code	Year	Total Selenium in Water		Selenium in Tissue	
					Sample Date	µg/L	Sample Date	mg/kg dw
Fording River	Mine-exposed	RG_FOUNGD	-	2019	19-Jun-19	8.9	19-Jun-19	5.1
				2019	19-Jun-19	8.9	19-Jun-19	4.5
				2019	19-Jun-19	8.9	19-Jun-19	5.1
				2019	12-Sep-19	27.7	12-Sep-19	7.5
				2019	12-Sep-19	27.7	12-Sep-19	6.4
				2019	12-Sep-19	27.7	12-Sep-19	6.1
				2019	9-Dec-19	53.8	09-Dec-19	5.1
				2019	9-Dec-19	53.8	09-Dec-19	4.3
				2019	9-Dec-19	53.8	09-Dec-19	4.4
		RG_FODNGD	FR_FRABEC1	2015	14-Sep-15	23.4	14-Sep-15	6.2
				2017	16-Sep-17	54.3	16-Sep-17	5.6
				2018	12-Sep-18	42.0	12-Sep-18	9.0
				2018	12-Sep-18	42.0	12-Sep-18	8.0
				2018	12-Sep-18	42.0	12-Sep-18	8.0
				2018	5-Dec-18	51.8	05-Dec-18	4.7
				2018	5-Dec-18	51.8	05-Dec-18	4.2
				2018	5-Dec-18	51.8	05-Dec-18	7.0
				2019	12-Feb-19	54.4	12-Feb-19	7.2
				2019	12-Feb-19	54.4	12-Feb-19	5.0
				2019	12-Feb-19	54.4	12-Feb-19	8.1
				2019	19-Jun-19	8.6	19-Jun-19	4.1
				2019	19-Jun-19	8.6	19-Jun-19	5.6
				2019	19-Jun-19	8.6	19-Jun-19	4.4
				2019	12-Sep-19	30.2	12-Sep-19	8.0
				2019	12-Sep-19	30.2	12-Sep-19	4.5
				2019	12-Sep-19	30.2	12-Sep-19	7.0
				2019	9-Dec-19	55.4	09-Dec-19	4.9
				2019	9-Dec-19	55.4	09-Dec-19	5.9
				2019	9-Dec-19	55.4	09-Dec-19	5.6
		RG_MP1	FR_MULTIPLATE	2012	18-Sep-12	37.6	18-Sep-12	9.0
				2015	15-Sep-15	23.2	15-Sep-15	5.9
				2017	12-Sep-17	52.2	12-Sep-17	5.6
				2018	11-Sep-18	44.3	11-Sep-18	7.0
				2018	11-Sep-18	44.3	11-Sep-18	8.6
				2018	11-Sep-18	44.3	11-Sep-18	8.0
				2018	6-Dec-18	57.0	06-Dec-18	6.6
				2018	6-Dec-18	57.0	06-Dec-18	6.8
				2018	6-Dec-18	57.0	06-Dec-18	5.3
				2019	18-Jun-19	10.8	18-Jun-19	5.2
				2019	18-Jun-19	10.8	18-Jun-19	6.0
				2019	18-Jun-19	10.8	18-Jun-19	6.1
				2019	5-Sep-19	34.4	05-Sep-19	5.6
				2019	5-Sep-19	34.4	05-Sep-19	7.0
				2019	5-Sep-19	34.4	05-Sep-19	7.3
				2019	9-Dec-19	57.0	09-Dec-19	5.1
				2019	9-Dec-19	57.0	09-Dec-19	6.4
				2019	9-Dec-19	57.0	09-Dec-19	5.8
				2019	13-Feb-19	62.5	13-Feb-19	5.0
				2019	13-Feb-19	62.5	13-Feb-19	4.7
				2019	13-Feb-19	62.5	13-Feb-19	8.4
		RG_FOUSH	FR_FRNTP	2012	13-Sep-12	36.0	13-Sep-12	7.6
				2015	15-Sep-15	25.5	15-Sep-15	6.0
				2017	14-Sep-17	47.9	14-Sep-17	6.5
				2018	11-Sep-18	43.2	11-Sep-18	8.0
				2018	11-Sep-18	43.2	11-Sep-18	8.0
				2018	11-Sep-18	43.2	11-Sep-18	9.1
				2018	6-Dec-18	57.1	06-Dec-18	5.5
				2018	6-Dec-18	57.1	06-Dec-18	5.0
				2018	6-Dec-18	57.1	06-Dec-18	5.2
				2019	17-Jun-19	10.7	17-Jun-19	5.9
				2019	17-Jun-19	10.7	17-Jun-19	6.1
				2019	17-Jun-19	10.7	17-Jun-19	4.7
				2019	9-Sep-19	36.3	09-Sep-19	5.6
				2019	9-Sep-19	36.3	09-Sep-19	5.9
				2019	9-Sep-19	36.3	09-Sep-19	6.0
				2019	9-Dec-19	56.1	09-Dec-19	5.8
				2019	9-Dec-19	56.1	09-Dec-19	7.1
				2019	9-Dec-19	56.1	09-Dec-19	5.3
				2019	13-Feb-19	61.2	13-Feb-19	9.6
				2019	13-Feb-19	61.2	13-Feb-19	6.9
				2019	13-Feb-19	61.2	13-Feb-19	6.6
		RG_FOUKI	FR_FR2	2012	14-Sep-12	33.6	14-Sep-12	8.5

Notes: No concurrent water selenium data were available for 2016 tissue samples, so concentrations from the closest sample date from each associated Teck WQ monitoring station was used. No selenium water data was available for MP1 in 2012, so the corresponding data from FR_MULTIPLATE was used for that data point only in 2012. "-" indicates stations where benthic tissue samples were not taken because of frozen conditions.

Table B.20: Paired Tissue and Water Selenium Concentrations for the FRO LAEMP, 2012 to 2019

Watershed	Exposure Status	Minnow Biological Monitoring Area	Associated Teck Water Monitoring Station Code	Year	Total Selenium in Water		Selenium in Tissue	
					Sample Date	µg/L	Sample Date	mg/kg dw
Fording River	Mine-exposed	RG_FOUKI	FR_FR2	2015	16-Sep-15	23.3	16-Sep-15	5.1
				2016	8-Sep-16	28.9	12-Sep-16	5.2
		RG_FOUKI	FR_FR2	2017	12-Sep-17	44.5	12-Sep-17	6.7
				2017	12-Sep-17	44.5	12-Sep-17	6.6
				2017	12-Sep-17	44.5	12-Sep-17	6.8
				2018	6-Mar-18	55.3	06-Mar-18	4.9
				2018	6-Mar-18	55.3	06-Mar-18	5.4
				2018	6-Mar-18	55.3	06-Mar-18	5.0
				2018	7-Sep-18	38.0	07-Sep-18	9.4
				2018	7-Sep-18	38.0	07-Sep-18	10.0
				2018	7-Sep-18	38.0	07-Sep-18	11.0
				2018	4-Dec-18	47.4	04-Dec-18	4.9
				2018	4-Dec-18	47.4	04-Dec-18	5.5
				2018	4-Dec-18	47.4	04-Dec-18	7.2
				2019	12-Feb-19	46.8	12-Feb-19	4.5
				2019	12-Feb-19	46.8	12-Feb-19	4.8
				2019	12-Feb-19	46.8	12-Feb-19	4.7
				2019	18-Jun-19	9.7	18-Jun-19	4.7
				2019	18-Jun-19	9.7	18-Jun-19	4.7
				2019	18-Jun-19	9.7	18-Jun-19	5.0
				2019	5-Sep-19	31.2	05-Sep-19	6.2
				2019	5-Sep-19	31.2	05-Sep-19	8.8
				2019	5-Sep-19	31.2	05-Sep-19	9.2
				2019	9-Dec-19	52.2	09-Dec-19	4.1
				2019	9-Dec-19	52.2	09-Dec-19	4.4
				2019	9-Dec-19	52.2	09-Dec-19	4.4
		RG_SCOUTDS	RG_SCOUTDS	2019	12-Sep-19	32.9	12-Sep-19	13.7
				2019	12-Sep-19	32.9	12-Sep-19	13.7
				2019	12-Sep-19	32.9	12-Sep-19	10.2
				2019	10-Dec-19	129.0	10-Dec-19	6.7
				2019	10-Dec-19	129.0	10-Dec-19	6.8
				2019	10-Dec-19	129.0	10-Dec-19	7.5
		RG_FOBKS	GH_FR3	2012	14-Sep-12	31.9	14-Sep-12	8.8
				2015	16-Sep-15	23.9	16-Sep-15	6.0
				2017	13-Sep-17	44.9	13-Sep-17	5.8
				2017	13-Sep-17	44.9	13-Sep-17	8.2
				2017	13-Sep-17	44.9	13-Sep-17	5.9
				2018	12-Mar-18	52.9	12-Mar-18	5.8
				2018	12-Mar-18	52.9	12-Mar-18	5.1
				2018	12-Mar-18	52.9	12-Mar-18	6.2
				2018	8-Sep-18	36.2	8-Sep-18	11.0
				2018	8-Sep-18	36.2	8-Sep-18	10.0
				2018	8-Sep-18	36.2	8-Sep-18	9.9
				2018	4-Dec-18	49.4	4-Dec-18	3.8
				2018	4-Dec-18	49.4	4-Dec-18	3.8
				2018	4-Dec-18	49.4	4-Dec-18	6.6
		RG_FOBKS	RG_FOBKS	2019	12-Feb-19	47.1	12-Feb-19	-
				2019	12-Feb-19	47.1	12-Feb-19	-
				2019	12-Feb-19	47.1	12-Feb-19	13
				2019	17-Jun-19	10.2	17-Jun-19	5.0
				2019	17-Jun-19	10.2	17-Jun-19	3.8
				2019	17-Jun-19	10.2	17-Jun-19	4.0
				2019	9-Sep-19	34.8	9-Sep-19	7.5
				2019	9-Sep-19	34.8	9-Sep-19	7.9
				2019	9-Sep-19	34.8	9-Sep-19	9.5
				2019	10-Dec-19	53.0	10-Dec-19	8.2
				2019	10-Dec-19	53.0	10-Dec-19	7.5
				2019	10-Dec-19	53.0	10-Dec-19	6.2
		RG_FOBSC	FR_FR4	2012	15-Sep-12	53.8	15-Sep-12	8.4
				2015	17-Sep-15	33.9	17-Sep-15	7.5
				2017	15-Sep-17	72.9	15-Sep-17	5.0
				2018	10-Sep-18	61.3	10-Sep-18	9.0
				2018	10-Sep-18	61.3	10-Sep-18	9.0
				2018	10-Sep-18	61.3	10-Sep-18	8.2
				2018	4-Dec-18	49.1	04-Dec-18	8.0
				2018	4-Dec-18	49.1	04-Dec-18	9.2
				2018	4-Dec-18	49.1	04-Dec-18	7.6
				2019	18-Jun-19	14.2	18-Jun-19	5.3
				2019	18-Jun-19	14.2	18-Jun-19	5.1
				2019	18-Jun-19	14.2	18-Jun-19	5.7
				2019	13-Sep-19	51.8	13-Sep-19	12.5
				2019	13-Sep-19	51.8	13-Sep-19	11.9

Notes: No concurrent water selenium data were available for 2016 tissue samples, so concentrations from the closest sample date from each associated Teck WQ monitoring station was used. No selenium water data was available for MP1 in 2012, so the corresponding data from FR_MULTIPLATE was used for that data point only in 2012. "-" indicates stations where benthic tissue samples were not taken because of frozen conditions.

Table B.20: **Paired Tissue and Water Selenium Concentrations for the FRO LAEMP, 2012 to 2019**

Watershed	Exposure Status	Minnow Biological Monitoring Area	Associated Teck Water Monitoring Station Code	Year	Total Selenium in Water		Selenium in Tissue	
					Sample Date	µg/L	Sample Date	mg/kg dw
Fording River	Mine-exposed	RG_FOBSC	FR_FR4	2019	13-Sep-19	51.8	13-Sep-19	12.6
				2019	10-Dec-19	135.0	10-Dec-19	9.3
				2019	10-Dec-19	135.0	10-Dec-19	5.9
				2019	10-Dec-19	135.0	10-Dec-19	5.6
		RG_FOBCP	FR_FRCP1	2012	15-Sep-12	117	15-Sep-12	7.9
				2015	17-Sep-15	63.8	17-Sep-15	7.7
				2016	13-Sep-16	73.2	12-Sep-16	9.7
				2017	14-Sep-17	128	14-Sep-17	6.4
				2018	9-Sep-18	200	9-Sep-18	9.4
				2018	9-Sep-18	200	9-Sep-18	8.0
				2018	9-Sep-18	200	9-Sep-18	10.0
				2018	9-Sep-18	200	9-Sep-18	8.0
				2018	9-Sep-18	200	9-Sep-18	7.9
				2018	3-Dec-18	603	03-Dec-18	39.0
				2018	3-Dec-18	603	03-Dec-18	8.4
				2018	3-Dec-18	603	03-Dec-18	7.0
				2019	18-Jun-19	28	18-Jun-19	2.8
				2019	18-Jun-19	28	18-Jun-19	5.3
				2019	18-Jun-19	28	18-Jun-19	4.4
				2019	6-Sep-19	58	06-Sep-19	9.1
				2019	6-Sep-19	58	06-Sep-19	8.4
				2019	6-Sep-19	58	06-Sep-19	6.3
				2019	6-Sep-19	58	06-Sep-19	7.6
				2019	6-Sep-19	58	06-Sep-19	7.3
				2019	11-Dec-19	118	11-Dec-19	-
				2019	11-Dec-19	118	11-Dec-19	-
				2019	11-Dec-19	118	11-Dec-19	-
		RG_FRCP1SW	FR_FRCP1SW	2017	14-Sep-17	131	14-Sep-17	6.9
				2019	19-Jun-19	31	19-Jun-19	48
				2019	19-Jun-19	31	19-Jun-19	5.7
				2019	19-Jun-19	31	19-Jun-19	6.5
				2019	13-Sep-19	54	13-Sep-19	7.7
				2019	13-Sep-19	54	13-Sep-19	7.7
				2019	13-Sep-19	54	13-Sep-19	7.7
				2019	12-Dec-19	92	12-Dec-19	-
				2019	12-Dec-19	92	12-Dec-19	-
				2019	12-Dec-19	92	12-Dec-19	-
		RG_FRUPO	FR_FRRD	2017	15-Sep-17	98.9	15-Sep-17	7.4
				2018	7-Mar-18	111	7-Mar-18	6.8
				2018	9-Sep-18	82	9-Sep-18	7.5
				2018	9-Sep-18	82	9-Sep-18	9.7
				2018	9-Sep-18	82	9-Sep-18	8.7
				2018	4-Dec-18	69	4-Dec-18	5.3
				2018	4-Dec-18	69	4-Dec-18	5.1
				2018	4-Dec-18	69	4-Dec-18	5.0
				2019	11-Feb-19	91	11-Feb-19	5.1
				2019	11-Feb-19	91	11-Feb-19	8.0
				2019	11-Feb-19	91	11-Feb-19	6.2
				2019	19-Jun-19	39	19-Jun-19	8.1
				2019	19-Jun-19	39	19-Jun-19	7.6
				2019	19-Jun-19	39	19-Jun-19	5.0
				2019	7-Sep-19	66	7-Sep-19	6.1
				2019	7-Sep-19	66	7-Sep-19	8.1
				2019	7-Sep-19	66	7-Sep-19	6.8
				2019	11-Dec-19	100	11-Dec-19	4.6
				2019	11-Dec-19	100	11-Dec-19	3.9
				2019	11-Dec-19	100	11-Dec-19	4.5
		RG_FODPO	GH_PC2	2012	17-Sep-12	76.3	17-Sep-12	6.2
				2015	15-Sep-15	68.2	15-Sep-15	6.9
				2017	13-Sep-17	89.6	13-Sep-17	5.2
				2018	7-Mar-18	105	7-Mar-18	3.5
				2018	13-Sep-18	82	13-Sep-18	4.3
				2018	13-Sep-18	82	13-Sep-18	8.0
				2018	13-Sep-18	82	13-Sep-18	5.0
				2018	4-Dec-18	106	4-Dec-18	0.3
				2018	4-Dec-18	106	4-Dec-18	4.4
				2018	4-Dec-18	106	4-Dec-18	5.4
				2019	21-Jun-19	48	21-Jun-19	4.7
				2019	21-Jun-19	48	21-Jun-19	5.0
				2019	21-Jun-19	48	21-Jun-19	5.7
				2019	7-Sep-19	70	7-Sep-19	5.4
				2019	7-Sep-19	70	7-Sep-19	7.3

Notes: No concurrent water selenium data were available for 2016 tissue samples, so concentrations from the closest sample date from each associated Teck WQ monitoring station was used. No selenium water data was available for MP1 in 2012, so the corresponding data from FR_MULTIPLATE was used for that data point only in 2012. "-" indicates stations where benthic tissue samples were not taken because of frozen conditions.

Table B.20: Paired Tissue and Water Selenium Concentrations for the FRO LAEMP, 2012 to 2019

Watershed	Exposure Status	Minnow Biological Monitoring Area	Associated Teck Water Monitoring Station Code	Year	Total Selenium in Water		Selenium in Tissue	
					Sample Date	µg/L	Sample Date	mg/kg dw
Fording River	Mine-exposed	RG_FODPO	GH_PC2	2019	7-Sep-19	70	7-Sep-19	5.6
Fording River	Mine-exposed	RG_FODPO	GH_PC2	2019	12-Dec-19	122	12-Dec-19	4.0
Fording River	Mine-exposed	RG_FODPO	GH_PC2	2019	12-Dec-19	122	12-Dec-19	4.0
Fording River	Mine-exposed	RG_FODPO	GH_PC2	2019	12-Dec-19	122	12-Dec-19	3.7
Fording River	Mine-exposed	RG_FODPO	GH_PC2	2019	14-Feb-19	108	14-Feb-19	3.6
Fording River	Mine-exposed	RG_FODPO	GH_PC2	2019	14-Feb-19	108	14-Feb-19	5.0
Fording River	Mine-exposed	RG_FODPO	GH_PC2	2019	14-Feb-19	108	14-Feb-19	8.4
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2012	16-Sep-12	71.1	16-Sep-12	12.4
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2015	12-Sep-15	68.0	12-Sep-15	7.1
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2017	14-Sep-17	83.3	14-Sep-17	5.4
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	12-Mar-18	100	12-Mar-18	6.9
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	8-Sep-18	78	8-Sep-18	7.0
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	8-Sep-18	78	8-Sep-18	9.2
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	8-Sep-18	78	8-Sep-18	7.0
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	8-Sep-18	78	8-Sep-18	8.9
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	8-Sep-18	78	8-Sep-18	7.6
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	5-Dec-18	94	5-Dec-18	3.4
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	5-Dec-18	94	5-Dec-18	3.9
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2018	5-Dec-18	94	5-Dec-18	5.6
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	21-Jun-19	52	21-Jun-19	7.5
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	21-Jun-19	52	21-Jun-19	6.8
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	21-Jun-19	52	21-Jun-19	10
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	16-Sep-19	70	16-Sep-19	7.1
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	16-Sep-19	70	16-Sep-19	7.8
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	16-Sep-19	70	16-Sep-19	7.3
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	16-Sep-19	70	16-Sep-19	6.7
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	16-Sep-19	70	16-Sep-19	6.6
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	11-Dec-19	88	11-Dec-19	4.4
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	11-Dec-19	88	11-Dec-19	5.4
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	11-Dec-19	88	11-Dec-19	4.9
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	14-Feb-19	99	14-Feb-19	4.9
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	14-Feb-19	99	14-Feb-19	5.8
Fording River	Mine-exposed	RG_FO22	FR_FRABCH	2019	14-Feb-19	99	14-Feb-19	5.4
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2012	16-Sep-12	58.6	16-Sep-12	8.3
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2015	13-Sep-15	58.8	13-Sep-15	6.1
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2016	8-Sep-16	53.0	12-Sep-16	5.8
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2017	13-Sep-17	77.9	13-Sep-17	6.6
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2018	7-Mar-18	86.3	7-Mar-18	6.3
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2018	6-Sep-18	70.9	6-Sep-18	7.6
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2018	6-Sep-18	70.9	6-Sep-18	7.0
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2018	6-Sep-18	70.9	6-Sep-18	5.0
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2018	5-Dec-18	86.6	5-Dec-18	4.8
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2018	5-Dec-18	86.6	5-Dec-18	5.5
Fording River	Mine-exposed	RG_FOUEW	FR_FR5	2018	5-Dec-18	86.6	5-Dec-18	4.7
Fording River	Mine-exposed			2019	4-Sep-19	61.0	4-Sep-19	7.3
Fording River	Mine-exposed			2019	4-Sep-19	61.0	4-Sep-19	6.9
Fording River	Mine-exposed			2019	4-Sep-19	61.0	4-Sep-19	6.0
Fording River	Mine-exposed			2019	11-Dec-19	73.3	11-Dec-19	4.8
Fording River	Mine-exposed			2019	11-Dec-19	73.3	11-Dec-19	4.4
Fording River	Mine-exposed			2019	11-Dec-19	73.3	11-Dec-19	5.5
Fording River	Mine-exposed			2019	13-Feb-19	94.7	13-Feb-19	4.4
Fording River	Mine-exposed			2019	13-Feb-19	94.7	13-Feb-19	6.0
Fording River	Mine-exposed			2019	13-Feb-19	94.7	13-Feb-19	4.4

Notes: No concurrent water selenium data were available for 2016 tissue samples, so concentrations from the closest sample date from each associated Teck WQ monitoring station was used. No selenium water data was available for MP1 in 2012, so the corresponding data from FR_MULTIPLATE was used for that data point only in 2012. "-" indicates stations where benthic tissue samples were not taken because of frozen conditions.

Table B.21: Benthic Invertebrate Density and Biomass from Biomass from Reference and Mine-exposed Areas, FRO LAEMP, September 2019

Station	RG_FO26																				RG_FOBCP													
Replicate	1		2		3		4		5		6		7		8		9		10		1		2		3		4		5		6		7	
ROUNDWORMS																																		
P. Nemata	12	0.0008	24	0.0008	4	0.0004	4	0.0004	8	0.0004	8	0.0008	4	0.0004	24	0.0072	8	0.0008	20	0.0084	17	0.0115	11	0.0083	17	0.0109	3	0.0001	8	0.0098	21	0.0224	22	0.0192
FLATWORMS																																		
P. Platyhelminthes																																		
Cl. Turbellaria																																		
F. Planariidae	12	0.0120	8	0.0120	24	0.0984	28	0.0664	12	0.0096	16	0.0096	24	0.0892	12	0.0212	8	0.0552	20	0.0380	1	0.0002	-	-	-	-	1	0.0004	-	-	1	0.0013	-	-
ANNELIDS																																		
P. Annelida																																		
WORMS																																		
Cl. Oligochaeta																																		
F. Enchytraeidae	-	-	8	0.0024	-	-	4	0.0004	-	-	-	-	-	-	4	0.0028	-	-	-	-	6	0.0021	1	0.0002	62	0.0140	35	0.0046	83	0.0208	28	0.0097	34	0.0083
F. Lumbricidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.1137	-	-	-	-	2	0.0799	-	-	1	0.0006	1	0.0686
F. Lumbriculidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Naididae	4	0.0216	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	0.0264	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																																		
MITES																																		
Cl. Arachnida																																		
Subcl. Acari imm.	-	-	-	-	-	-	-	-	**4**	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydryphantidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	0.0008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae	24	0.0072	48	0.0192	16	0.0092	60	0.0180	20	0.0120	56	0.0512	28	0.0116	12	0.0092	48	0.0280	40	0.0176	-	-	3	0.0003	28	0.0072	31	0.0112	33	0.0076	22	0.0061	16	0.0037
F. Sperchontidae	24	0.0120	40	0.0232	16	0.0080	76	0.0272	84	0.0296	64	0.0288	48	0.0280	12	0.0064	48	0.0240	44	0.0208	1	0.0005	-	-	3	0.0011	-	-	9	0.0025	15	0.0092	-	-
SEED SHRIMPS																																		
Cl. Ostracoda	-	-	32	0.0200	16	0.0124	80	0.0192	-	-	64	0.0224	16	0.0068	4	0.0012	16	0.0048	4	0.0004	-	-	-	-	3	0.0006	-	-	-	-	1	0.0004	1	0.0005
INSECTS																																		
Cl. Insecta																																		
BEETLES																																		
O. Coleoptera																																		
F. Curculionidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0009	-	-
F. Elmidae	4	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES																																		
O. Ephemeroptera																																		
F. Ameletidae	-	-	-	-	-	-	24	0.0064	-	-	8	0.0008	-	-	-	-	-	-	-	-	1	0.0022	1	0.0004	4	0.0257	7	0.0202	1	0.0013	4	0.0497	1	0.0008
F. Baetidae	8	0.0100	16	0.0080	12	0.0364	8	0.0144	4	0.0004	24	0.0752	32	0.0852	12	0.0144	40	0.0848	16	0.0432	20	0.0520	22	0.0656	22	0.0717	4	0.0143	96	0.3080	48	0.1578	31	0.0909
F. Ephemerellidae	224	0.3488	24	0.0184	220	0.4056	100	0.0924	108	0.1724	56	0.2176	252	1.2484	236	0.1592	192	0.1528	284	0.3060	4	0.0156	13	0.0533	13	0.0234	14	0.0350	29	0.0492	25	0.0415	11	0.0365
F. Heptageniidae	104	0.0292	216	0.0632	392	0.1432	320	0.1060	340	0.2160	496	0.1176	348	0.1708	336	0.0780	672	0.4168	560	0.2728	114	0.2391	60	0.1953	107	0.1885	23	0.0205	124	0.2669	94	0.1304	81	0.1155
STONEFLIES																																		
O. Plecoptera																																		
F. Capniidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	0.0008	-	-	3	0.0012	-	-	1	0.0006	1	0.0004	2	0.0021	1	0.0001	4	0.0046
F. Chloroperlidae	8	0.0056	8	0.0088	16	0.0104	12	0.0144	32	0.0424	24	0.0952	28	0.0200	8	0.0204	56	0.1208	20	0.0356	-	-	-	-	1	0.0009	-	-	-	-	-	-	-	-
F. Leuctridae	28	0.0200	40	0.0272	64	0.0612	32	0.0128	20	0.0152	16	0.0248	4	0.0076	16	0.0148	48	0.0976	64	0.0520	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Nemouridae	32	0.1136	80	0.2344	16	0.0192	44	0.1120	56	0.1788	48	0.1976	36	0.1640	44	0.1696	120	0.4184	68	0.2380	29	0.0100	25	0.0125	39	0.0176	-	-	46	0.0143	19	0.0076	15	0.0051
F. Perlidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.0056	-	-	1	0.0020	-	-	7	0.0076	4	0.0044	1	0.0010
F. Perlodidae	20	0.0748	8	0.0040	8	0.0012	28	0.0096	4	0.0388	32	0.0136	4	0.0008	24	0.2672	16	0.1824	16	0.1612	36	0.0479	46	0.0291	62	0.0311	45	0.0311	130	0.0921	93	0.0907	57	0.0398
F. Peltoperlidae	-	-	-	-	-	-	-	-	-	-	8	0.0360	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Taeniopterygidae	4	0.0028	-	-	-	-	-	-	8	0.0036	-	-	4	0.0016	-	-	8	0.0016	4	0.0044	3	0.0007	5	0.0016	1	0.0001	1	0.0001	2	0.0009	-	-	5	0.0020
CADDISFLIES																																		
O. Trichoptera																																		
immature	**176**	0.0080	**152**	0.0064	**188**	0.0080	44	0.0008	**20**	0.0008	136	0.0064	**72**	0.0040	8	0.0004	**184**	0.0080	**44**	0.0016	-	-	-	-	-	-	-	-	**1**	0.0001	-	-	-	-
F. Apataniidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.0013	-	-	-	-	1	0.0008
F. Brachycentridae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.0002	3	0.0003	-	-	-	-	5	0.0013	-	-	1	0.0006
F. Glossosomatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0006	1	0.0001	-	-
F. Helicopsychidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae	-	-	8	0.1464	8	0.4532	-	-	12	0.8280	32	3.2800	4	0.0004	12	1.8640	40	1.8760	32	3.4480	3	0.0015	12	0.0131	2	0.0015	-	-	2	0.2081	1	0.0599	-	-
F. Hydroptilidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0002	-	-	-	-	4	0.0024	3	0.0046	1	0.0012	1	0.0009
F. Limnephilidae	-	-	8	0.0008	-	-	-	-	-	-	8	0.0016	4	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.5110	2	0.8087	-	-
F. Rhyacophilidae	44	0.3560	48	0.3344	28	0.0836	24	0.0848	16	0.4828	40	0.6064	24	0.5528	36	0.3520	24	0.0472	28	0.9852	8	0.1274	6	0.2094	24	0.5057	9	0.1698	28	0.1394	19	0.7123	19	0.4655
F. Uenoidae	8	0.0004	8	0.0008	28	0.0060	-	-	4	0.0004	-	-	8	0.0004	-	-	8	0.0008	4	0.0004	-	-	-	-	-	-	-	-	1	0.0006	-	-	1	0.0001
TRUE FLIES																																		
O. Diptera																																		
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**	0.0013	**1**	0.0020	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ceratopogonidae	16	0.0052	8	0.0080	36	0.0232	24	0.0080	40	0.0176	16	0.0048	36	0.0164	36	0.0180	8	0.0040	16	0.0108	1	0.0005	-	-	-	-	-	-	3	0.0024	2	0.0013	-	-
F. Chironomidae	524	0.8220	1752	1.3080	484	0.1884	972	0.5928	1520	0.6300	1880	1.1192	804	0.4092	816	0.5032	1160	0.9200	1444	0.9940	56	0.0320	68	0.0254	105	0.0385	43	0.0168	288	0.1071	199	0.0915	188	0.0744
F. Empididae	8	0.0044	-	-	12	0.0104	8	0.0084	16	0.0088	8	0.0072	20	0.0136	12	0.0100	16	0.0152	16	0.0172	1	0.0022	-	-	17	0.0370	14	0.0355	12	0.0324	8	0.0189	5	0.0130
F. Pelecorhyncidae	-	-	-	-	-	-	-	-	4	0.0512	-	-	8	0.0088	4	0.0084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Psychodidae	4	0.0004	8	0.0008	-	-	24	0.0040	4	0.0004	-	-	4	0.0004	8	0.0008	32	0.0136	32	0.0080	28	0.0085	16	0.0067	30	0.0129	42	0.0077	29	0.0001	22	0.0074	27	0.0085
F. Simuliidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	0.0568	26	0.1050	1	0.0025	-	-	4	0.0123	2	0.0046	11	0.0367
F. Tipulidae	-	-	-	-	-	-	4	0.0008	-	-	-	-	-	-	8	0.0020	-	-	-	-	-	-	-	-	-	-	2	0.0004	1	0.0057	-	-	-	-
CLAMS																																		
Cl. Bivalvia																																		
F. Sphaeriidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS per sample	1288		2544		1588		1920		2336		3040		1812		1684		2768		2788		353		319		543		283		949		635		534	
TOTAL NUMBER OF TAXA [a]	20		20		18		21		20		21		22		22		22		21		23		16		21		19		27		26		23	
TOTAL BIOMASS (g)		1.8552		2.2472		1.5784		1.1992		2.7396		5.9168		2.8408		3.5304		4.4744		6.6900		0.7329		0.7285		0.9935		0.4517		1.8088		2.2387		0.9970

Note: Data not normalized to area (0.1 m^2).
[a] Bold entries excluded from taxa count.

Table B.21: Benthic Invertebrate Density and Biomass from Biomass from Reference and Mine-exposed Areas, FRO LAEMP, September 2019

Station	RG_FOBCP						RG_FOBKS																				RG_FOBSC							
Replicate	8		9		10		1		2		3		4		5		6		7		8		9		10		1		2		3		4	
ROUNDWORMS																																		
P. Nemata	17	0.0189	7	0.0086	5	0.0118	3	2E-04	9	0.0067	2	0.0024	3	0.0006	1	0.0003	2	0.0002	10	0.0070	3	0.0013	3	0.003	20	0.0182	5	0.0013	9	0.0392	6	0.0082	22	0.0204
FLATWORMS																																		
P. Platyhelminthes																																		
Cl. Turbellaria																																		
F. Planariidae	-	-	-	-	1	0.0125	-	-	-	-	1	0.0012	1	0.0090	7	0.0049	1	0.0015	4	0.0105	1	0.0012	4	0.0219	2	0.0063	-	-	-	-	1	0.0001	-	-
ANNELIDS																																		
P. Annelida																																		
WORMS																																		
Cl. Oligochaeta																																		
F. Enchytraeidae	5	0.0022	37	0.0124	33	0.0102	1	0.0001	2	0.0011	1	0.0001	-	-	8	0.0022	4	0.0019	1	0.0001	3	0.0010	15	0.0023	4	0.0011	8	0.0010	7	0.0317	5	0.0011	10	0.0072
F. Lumbricidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0065	-	-	1	0.0065	5	0.0399	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Naididae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																																		
MITES																																		
Cl. Arachnida																																		
Subcl. Acari imm.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**	0.0002	**6**	0.0012	-	-	**2**	0.0011	-	-	-	-	-	-	-	-
F. Hydryphantidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae	6	0.0019	4	0.0011	7	0.0027	2	1E-04	4	0.0013	7	0.0065	1	0.0001	12	0.0039	11	0.0021	10	0.0033	42	0.0097	45	0.013	21	0.0088	2	0.0001	6	0.0008	5	0.0004	16	0.0020
F. Sperchontidae	4	0.0010	3	0.0009	-	-	-	-	-	-	-	-	-	-	2	0.0004	-	-	-	-	14	0.0048	26	0.01	3	0.0023	-	-	-	-	-	-	-	-
SEED SHRIMPS																																		
Cl. Ostracoda	-	-	1	0.0003	1	0.0003	11	0.003	13	0.0040	6	0.0018	2	0.0007	37	0.0097	21	0.0063	5	0.0015	1	0.0008	59	0.015	14	0.0032	9	0.0009	4	0.0001	6	0.0004	2	0.0002
INSECTS																																		
Cl. Insecta																																		
BEETLES																																		
O. Coleoptera																																		
F. Curculionidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Elmidae	-	-	-	-	-	-	-	-	1	0.0018	-	-	-	-	-	-	-	-	1	0.0011	1	0.0011	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES																																		
O. Ephemeroptera																																		
F. Ameletidae	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0008	10	0.0116	5	0.0031	-	-	5	0.0102	12	0.005	-	-	3	0.0001	-	-	1	0.0001	4	0.0002
F. Baetidae	23	0.0559	59	0.1336	34	0.1305	2	0.013	4	0.0116	4	0.0227	3	0.0099	8	0.0245	5	0.0108	2	0.0073	5	0.0174	3	0.013	10	0.0454	1	0.0001	-	-	1	0.0020	2	0.0034
F. Ephemerellidae	5	0.0117	3	0.0142	13	0.0238	11	0.007	9	0.0133	6	0.0147	1	0.0008	6	0.0116	8	0.0224	7	0.0116	22	0.0260	17	0.023	11	0.0285	8	0.0139	11	0.0147	3	0.0019	8	0.0004
F. Heptageniidae	22	0.1310	29	0.0397	17	0.0530	235	0.153	129	0.1605	98	0.0733	69	0.0900	107	0.1610	96	0.0648	153	0.2334	89	0.0247	102	0.042	105	0.0946	188	0.1594	140	0.1874	106	0.0652	214	0.1512
STONEFLIES																																		
O. Plecoptera																																		
F. Capniidae	-	-	-	-	1	0.0003	4	0.0066	5	0.0580	-	-	2	0.0022	2	0.0016	-	-	1	0.0006	-	-	-	-	-	-	2	0.0001	-	-	3	0.0048	6	0.0068
F. Chloroperlidae	-	-	-	-	-	-	-	-	1	0.0016	1	0.0010	-	-	-	-	1	0.0024	-	-	1	0.0007	1	0.015	-	-	-	-	1	0.0001	-	-	-	-
F. Leuctridae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Nemouridae	2	0.0008	13	0.0058	10	0.0031	5	0.007	24	0.0186	1	0.0004	13	0.0062	9	0.0059	7	0.0143	18	0.0125	5	0.0060	41	0.062	18	0.0101	20	0.0350	35	0.0252	4	0.0012	32	0.0126
F. Perlidae	1	0.0006	-	-	-	-	2	0.013	-	-	-	-	-	-	-	-	-	-	2	0.0211	1	0.1958	2	0.015	-	-	-	-	1	0.0001	-	-	-	-
F. Perlodidae	27	0.0583	69	0.0870	28	0.0187	29	0.029	16	0.0140	15	0.0189	17	0.0222	18	0.0524	5	0.0037	15	0.0691	26	0.1127	23	0.06	16	0.0101	47	0.0374	32	0.1538	6	0.0432	38	0.0214
F. Peltoperlidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Taeniopterygidae	1	0.0006	6	0.0021	2	0.0004	2	7E-04	2	0.0008	-	-	1	0.0006	-	-	-	-	1	0.0002	-	-	-	-	-	-	5	0.0001	6	0.0001	2	0.0002	12	0.0002
CADDISFLIES																																		
O. Trichoptera																																		
immature	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	1	0.0001	-	-	1	1E-04	-	-	-	-	-	-	-	-	-	-
F. Apataniidae	1	0.0008	-	-	-	-	-	-	1	0.0008	-	-	3	0.0008	5	0.0016	3	0.0005	1	0.0003	-	-	-	-	2	0.0018	4	0.0022	-	-	5	0.0028	4	0.0016
F. Brachycentridae	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	3	0.0005	-	-	-	-	-	-	5	0.0005	3	0.0001	-	-	-	-
F. Glossosomatidae	1	0.0008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.0007	-	-	-	-	1	0.0002	1	0.0001	1	0.0014	-	-	-	-
F. Helicopsychidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.0070
F. Hydropsychidae	1	0.0022	3	0.0013	-	-	2	0.003	9	0.0113	-	-	5	0.0056	1	0.1337	-	-	8	0.0066	-	-	-	-	-	-	4	0.0018	5	0.0206	-	-	-	-
F. Hydroptilidae	-	-	1	0.0014	2	0.0024	-	-	-	-	-	-	-	-	1	0.0004	-	-	1	0.0001	2	0.0016	1	0.0012	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae	-	-	-	-	-	-	1	1E-04	-	-	-	-	1	0.0002	1	0.0001	1	0.0001	1	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Rhyacophilidae	11	0.2925	16	0.3518	9	0.1902	6	0.046	7	0.1500	3	0.0129	5	0.0554	2	0.0220	10	0.1900	5	0.1000	9	0.1168	7	0.088	7	0.1527	5	0.0560	7	0.1336	2	0.0152	6	0.1360
F. Uenoidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES																																		
O. Diptera																																		
pupae	**2**	0.0060	**1**	0.0032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	4	0.0011	-	-	1	0.0005	-	-	-	-	1	0.0002	-	-	-	-	-	-	2	0.0106	-	-	-	-	-	-	-	-	-	-
F. Ceratopogonidae	-	-	-	-	-	-	1	1E-04	-	-	1	0.0012	1	0.0004	-	-	6	0.0019	1	0.0003	3	0.0018	3	0.001	6	0.0025	1	0.0001	1	0.0001	4	0.0007	2	0.0002
F. Chironomidae	108	0.0439	173	0.0657	67	0.0193	11	0.005	18	0.0093	7	0.0108	10	0.0036	12	0.0064	6	0.0018	19	0.0076	9	0.0052	13	0.005	9	0.0050	39	0.0162	43	0.0470	14	0.0038	88	0.0570
F. Empididae	2	0.0049	6	0.0122	5	0.0142	5	0.009	3	0.0044	5	0.0060	3	0.0041	10	0.0157	7	0.0078	3	0.0040	17	0.0265	6	0.013	4	0.0058	5	0.0076	5	0.0060	-	-	6	0.0122
F. Pelecorhyncidae	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0016	-	-	-	-	1	0.0106	-	-	2	0.002	-	-	-	-	-	-	-	-	-	-
F. Psychodidae	3	0.0010	6	0.0019	11	0.0028	105	0.057	110	0.0458	81	0.0553	44	0.0188	70	0.0275	56	0.0225	68	0.0271	58	0.0233	108	0.044	37	0.0226	138	0.0776	73	0.0386	46	0.0292	176	0.1134
F. Simuliidae	21	0.0723	40	0.1733	-	-	-	-	3	0.0104	1	0.0057	-	-	-	-	1	0.0027	-	-	1	0.0070	-	-	-	-	-	-	-	-	-	-	-	-
F. Tipulidae	-	-	-	-	-	-	-	-	-	-	1	0.0011	1	0.0288	1	0.0005	-	-	-	-	1	0.0005	-	-	1	0.0236	-	-	1	0.0001	-	-	2	0.0002
CLAMS																																		
Cl. Bivalvia																																		
F. Sphaeriidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS per sample	263		477		250		438		372		242		188		331		257		345		326		502		293		500		391		220		652	
TOTAL NUMBER OF TAXA [a]	19		18		18		19		22		19		22		23		21		27		25		25		19		21		20		18		20	
TOTAL BIOMASS (g)		0.7073		0.9165		0.4973		0.3517		0.5259		0.2361		0.2624		0.4981		0.3673		0.5375		0.6038		0.5056		0.4439		0.4115		0.7007		0.1805		0.5536

Note: Data not normalized to area (0.1 m^2).
[a] Bold entries excluded from taxa count.

Table B.21: Benthic Invertebrate Density and Biomass from Biomass from Reference and Mine-exposed Areas, FRO LAEMP, September 2019

Station	RG_FOBSC												RG_FOUKI																				RG_FO22	
Replicate	5		6		7		8		9		10		1		2		3		4		5		6		7		8		9		10		1	
ROUNDWORMS																																		
P. Nemata	14	0.0161	28	0.0310	4	0.0034	4	0.005	30	0.0383	3	0.0001	8	0.0096	3	0.0010	3	0.0004	18	0.0172	11	0.0058	12	0.0068	18	0.0224	17	0.0138	32	0.0220	21	0.0079	26	0.0240
FLATWORMS																																		
P. Platyhelminthes																																		
Cl. Turbellaria																																		
F. Planariidae	-	-	-	-	1	0.0042	-	-	-	-	1	0.0002	-	-	1	0.0004	11	0.0356	8	0.0098	6	0.0108	5	0.0073	18	0.0320	17	0.0359	8	0.0008	6	0.0058	24	0.0180
ANNELIDS																																		
P. Annelida																																		
WORMS																																		
Cl. Oligochaeta																																		
F. Enchytraeidae	16	0.0059	68	0.0336	37	0.0080	50	0.0152	17	0.0115	3	0.0030	6	0.0014	12	0.0014	15	0.0049	44	0.0148	63	0.0179	6	0.0027	8	0.0048	3	0.0011	120	0.0192	8	0.0035	10	0.0028
F. Lumbricidae	-	-	1	0.0884	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Naididae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.0002	3	0.0003	-	-	-	-	-	-	-	-	-	-	10	0.0014
ARTHROPODS																																		
MITES																																		
Cl. Arachnida																																		
Subcl. Acari imm.	**1**	0.0001	-	-	-	-	-	-	-	-	**1**	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydryphantidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae	1	0.0019	8	0.0118	5	0.0008	5	9E-04	8	0.0015	3	0.0001	8	0.0036	8	0.0044	17	0.0052	8	0.0052	9	0.0030	2	0.0020	34	0.0284	4	0.0016	32	0.0032	18	0.0041	6	0.0016
F. Sperchontidae	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	1	0.0004	4	0.0030	3	0.0019	-	-	12	0.0058	-	-	24	0.0028	11	0.0063	-	-
SEED SHRIMPS																																		
Cl. Ostracoda	2	0.0001	16	0.0166	5	0.0003	2	1E-04	2	0.0006	-	-	24	0.0058	40	0.0092	26	0.0062	6	0.0032	11	0.0031	5	0.0017	16	0.0114	12	0.0035	24	0.0048	17	0.0079	-	-
INSECTS																																		
Cl. Insecta																																		
BEETLES																																		
O. Coleoptera																																		
F. Curculionidae	-	-	2	0.0046	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae	-	-	2	0.0066	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Elmidae	-	-	-	-	-	-	-	-	-	-	-	-	6	0.0014	3	0.0062	1	0.0001	-	-	-	-	-	-	2	0.0002	-	-	-	-	-	-	92	0.0980
MAYFLIES																																		
O. Ephemeroptera																																		
F. Ameletidae	1	0.0001	-	-	2	0.0001	-	-	-	-	1	0.0001	-	-	2	0.0003	1	0.0003	-	-	-	-	-	-	6	0.0020	-	-	-	-	1	0.0007	-	-
F. Baetidae	2	0.0050	-	-	1	0.0007	2	0.008	4	0.0035	1	0.0031	26	0.0550	36	0.1320	22	0.0650	16	0.0460	25	0.0660	10	0.0186	16	0.0566	6	0.0227	36	0.1148	35	0.1152	36	0.2244
F. Ephemerellidae	6	0.0123	30	0.0378	6	0.0033	8	0.013	8	0.0146	6	0.0068	24	0.0322	34	0.0339	38	0.0199	22	0.0520	32	0.0418	19	0.0410	36	0.0968	22	0.0383	32	0.0824	19	0.0370	12	0.0050
F. Heptageniidae	83	0.1305	152	0.1998	94	0.0708	92	0.142	133	0.2044	94	0.1283	204	0.4014	339	0.3143	244	0.2580	220	0.3882	212	0.2947	210	0.3743	206	0.1528	327	0.3351	151	0.1964	231	0.1308	22	0.0112
STONEFLIES																																		
O. Plecoptera																																		
F. Capniidae	3	0.0015	2	0.0002	2	0.0003	2	0.0002	-	-	2	0.0063	6	0.0066	8	0.0070	2	0.0019	4	0.0058	7	0.0035	8	0.0080	2	0.0018	16	0.0201	-	-	7	0.0060	16	0.0204
F. Chloroperlidae	-	-	2	0.0078	-	-	-	-	-	-	2	0.0001	2	0.0058	5	0.0343	6	0.0300	6	0.0308	1	0.0005	3	0.0210	2	0.0056	8	0.0220	-	-	5	0.0368	14	0.0016
F. Leuctridae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.0030	1	0.0005	1	0.0014	-	-	5	0.0039	-	-	-	-	-	-
F. Nemouridae	7	0.0108	46	0.0410	19	0.0111	27	0.016	115	0.0997	48	0.0296	10	0.0040	14	0.0089	10	0.0110	14	0.0260	6	0.0116	6	0.0078	24	0.0084	9	0.0052	20	0.0548	16	0.0396	140	0.0688
F. Perlidae	-	-	-	-	-	-	1	0.009	-	-	1	0.0002	-	-	1	0.1237	-	-	-	-	-	-	-	-	-	-	1	0.0045	-	-	1	0.0092	-	-
F. Perlodidae	12	0.0114	72	0.2456	10	0.0085	26	0.042	55	0.0598	24	0.0820	10	0.0514	8	0.0067	12	0.0253	12	0.1092	11	0.0120	10	0.0752	14	0.0100	7	0.0557	33	0.1546	5	0.0025	102	0.3078
F. Peltoperlidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Taeniopterygidae	4	0.0017	14	0.0150	4	0.0011	12	0.004	10	0.0020	9	0.0047	-	-	-	-	-	-	4	0.0012	1	0.0004	-	-	-	-	4	0.0005	-	-	-	-	16	0.0046
CADDISFLIES																																		
O. Trichoptera																																		
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Apataniidae	2	0.0011	-	-	7	0.0042	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Brachycentridae	1	0.0001	4	0.0002	-	-	-	-	8	0.0008	-	-	4	0.0004	4	0.0004	-	-	2	0.0002	-	-	-	-	-	-	-	-	1	0.0002	-	-	-	-
F. Glossosomatidae	1	0.0035	-	-	-	-	-	-	-	-	-	-	-	-	3	0.0002	1	0.0001	2	0.0004	4	0.0006	2	0.0005	4	0.0004	3	0.0034	8	0.0012	-	-	44	0.0106
F. Helicopsychidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae	1	0.0038	-	-	1	0.0008	2	0.002	14	0.0356	-	-	8	0.0014	14	0.0065	9	0.0986	-	-	2	0.0012	6	0.0046	4	0.0006	6	0.0054	27	0.4357	4	0.4979	2	0.0010
F. Hydroptilidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0002	-	-	1	0.0008	2	0.0008	2	0.0006	1	0.0003	4	0.0004	3	0.0018	-	-
F. Limnephilidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0001	1	0.0001	-	-	-	-	-	-	1	0.3471	-	-	1	0.4731	-	-	28	0.0058
F. Rhyacophilidae	3	0.0306	9	0.1647	2	0.0196	2	0.029	4	0.0501	4	0.0694	2	0.0618	1	0.0020	8	0.1478	22	0.2816	16	0.1936	14	0.2992	8	0.2182	14	0.3496	28	0.4723	6	0.2565	12	0.1952
F. Uenoidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.0004
TRUE FLIES																																		
O. Diptera																																		
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ceratopogonidae	-	-	4	0.0032	1	0.0001	-	-	3	0.0012	-	-	6	0.0016	6	0.0020	9	0.0036	16	0.0114	17	0.0007	-	-	6	0.0034	2	0.0008	12	0.0004	7	0.0038	4	0.0016
F. Chironomidae	25	0.0056	56	0.0500	32	0.0126	18	0.011	27	0.0098	59	0.0268	76	0.0388	61	0.0302	86	0.0464	158	0.0722	70	0.0218	105	0.0482	426	0.1534	55	0.0164	712	0.2368	171	0.0762	108	0.0494
F. Empididae	7	0.0192	2	0.0086	5	0.0098	2	0.005	1	0.0022	10	0.0214	2	0.0040	-	-	6	0.0102	2	0.0020	7	0.0095	3	0.0047	14	0.0254	2	0.0031	24	0.0296	8	0.0240	8	0.0134
F. Pelecorhyncidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Psychodidae	42	0.0272	172	0.1054	121	0.0552	66	0.042	97	0.0576	124	0.0916	102	0.0250	44	0.0104	87	0.0262	86	0.0312	125	0.0354	38	0.0109	46	0.0150	74	0.0174	52	0.0124	65	0.0179	2	0.0008
F. Simuliidae	-	-	-	-	-	-	-	-	1	0.0020	-	-	4	0.0052	1	0.0004	-	-	-	-	1	0.0035	24	0.1311	-	-	10	0.0422	-	-	-	-	2	0.0124
F. Tipulidae	-	-	2	0.0500	2	0.0006	3	1E-04	1	0.0001	-	-	4	0.0816	5	0.0572	3	0.1677	4	0.0038	5	0.0515	2	0.0319	8	0.0014	2	0.0483	-	-	10	0.0167	18	0.0134
CLAMS																																		
Cl. Bivalvia																																		
F. Sphaeriidae	-	-	-	-	-	-	-	-	1	0.0030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS per sample	234		692		362		324		539		397		542		654		621		682		650		493		933		627		1381		675		756	
TOTAL NUMBER OF TAXA [a]	20		21		22		18		20		19		21		25		26		24		26		22		25		25		21		23		25	
TOTAL BIOMASS (g)		0.2885		1.1219		0.2156		0.3457		0.5983		0.4740		0.7980		0.7931		0.9652		1.1184		0.7924		1.0997		1.2045		1.0508		2.3179		1.3081		1.0936

Note: Data not normalized to area (0.1 m^2).
[a] Bold entries excluded from taxa count.

Table B.21: Benthic Invertebrate Density and Biomass from Biomass from Reference and Mine-exposed Areas, FRO LAEMP, September 2019

Station	RG_FO22																		RG_FRCP1SW															
Replicate	2		3		4		5		6		7		8		9		10		1		2		3		4		5		6		7		8	
ROUNDWORMS																																		
P. Nemata	32	0.0192	2	0.0036	24	0.0040	14	0.0032	16	0.0020	12	0.002	8	0.0024	12	0.0008	32	0.0056	8	0.0066	4	0.003	2	0.0008	4	0.0036	4	0.0006	15	0.0185	2	0.0024	15	0.0140
FLATWORMS																																		
P. Platyhelminthes																																		
Cl. Turbellaria																																		
F. Planariidae	56	0.0752	26	0.0296	4	0.0012	4	0.0094	2	0.0002	1	0.0003	2	0.0028	8	0.0188	-	-	1	0.0067	-	-	1	0.0003	4	0.0064	-	-	-	-	-	-	-	-
ANNELIDS																																		
P. Annelida																																		
WORMS																																		
Cl. Oligochaeta																																		
F. Enchytraeidae	8	0.0008	4	0.0012	4	0.0012	2	0.0012	2	0.0004	15	0.0020	-	-	-	-	12	0.0016	17	0.0101	-	-	1	0.0001	38	0.0069	2	0.0004	8	0.0072	-	-	19	0.0056
F. Lumbricidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0099	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0009	-	-	-	-	-	-	-	-	-	-
F. Naididae	16	0.0008	6	0.0008	-	-	-	-	-	-	13	0.0030	-	-	24	0.0020	28	0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																																		
MITES																																		
Cl. Arachnida																																		
Subcl. Acari imm.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydryphantidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae	24	0.0024	34	0.0112	16	0.0052	4	0.0008	6	0.0014	5	6E-04	6	0.0020	88	0.0292	52	0.0128	10	0.0052	1	3E-04	3	0.0013	4	0.0017	14	0.0066	6	0.0034	5	0.0019	14	0.0056
F. Sperchontidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-
SEED SHRIMPS																																		
Cl. Ostracoda	-	-	-	-	24	0.0108	-	-	-	-	6	0.001	-	-	8	0.0036	12	0.0008	3	0.0041	-	-	-	-	2	0.0002	-	-	-	-	-	-	-	-
INSECTS																																		
Cl. Insecta																																		
BEETLES																																		
O. Coleoptera																																		
F. Curculionidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0007	-	-	-	-	-	-
F. Elmidae	1112	1.2920	426	0.4554	300	0.3956	352	0.3452	314	0.2324	91	0.0858	272	0.2578	524	0.6504	804	0.8892	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES																																		
O. Ephemeroptera																																		
F. Ameletidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.0216	-	-	1	0.0175	-	-
F. Baetidae	104	0.8176	40	0.2376	32	0.1352	38	0.1602	24	0.0824	-	-	36	0.1976	24	0.1092	56	0.2676	12	0.0511	1	0.008	-	-	7	0.0373	9	0.0415	3	0.0218	4	0.0214	1	0.0016
F. Ephemerellidae	104	0.1528	26	0.0358	68	0.0232	34	0.0240	28	1.4674	5	0.003	16	0.0420	30	0.0612	44	0.0872	13	0.0483	2	0.004	-	-	7	0.0247	6	0.0228	3	0.0217	1	0.0011	6	0.0163
F. Heptageniidae	56	0.0104	42	0.0230	60	0.0284	62	0.0252	24	0.0086	-	-	6	0.0034	40	0.0160	84	0.0400	86	0.1018	16	0.01	24	0.0121	29	0.0231	103	0.0773	44	0.0238	53	0.0604	79	0.0351
STONEFLIES																																		
O. Plecoptera																																		
F. Capniidae	40	0.0752	4	0.0124	16	0.0004	4	0.0028	2	0.0012	2	0.0001	-	-	-	-	4	0.0004	7	0.0135	2	0.0014	5	0.0059	7	0.0037	1	0.0010	2	0.0029	10	0.0043	9	0.0105
F. Chloroperlidae	16	0.0320	14	0.0194	12	0.0064	10	0.0088	4	0.0076	3	6E-04	2	0.0012	4	0.0012	-	-	-	-	-	-	2	0.0016	-	-	-	-	-	-	-	-	-	-
F. Leuctridae	-	-	4	0.0064	-	-	2	0.0034	-	-	-	-	2	0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Nemouridae	360	0.2664	102	0.1020	304	0.2060	92	0.0792	36	0.0220	4	0.002	6	0.0028	272	0.1644	236	0.4692	16	0.0101	3	0.002	3	0.0030	1	0.0007	5	0.0061	9	0.0046	16	0.0064	6	0.0037
F. Perlidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Perlodidae	280	0.7144	108	0.0730	116	0.0916	178	0.1456	110	0.0774	8	0.004	28	0.0314	216	0.1752	212	0.1888	158	0.2329	28	0.051	19	0.0303	29	0.0853	90	0.0922	273	0.2974	52	0.0627	44	0.0924
F. Peltoperlidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Taeniopterygidae	24	0.0080	10	0.0034	12	0.0040	18	0.0046	12	0.0032	-	-	2	0.0008	-	-	4	0.0008	35	0.0169	10	0.005	2	0.0025	7	0.0045	17	0.0111	11	0.0059	9	0.0036	9	0.0043
CADDISFLIES																																		
O. Trichoptera																																		
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Apataniidae	48	0.0608	-	-	28	0.0520	4	0.0086	4	0.0050	1	5E-04	2	0.0020	28	0.0312	4	0.0072	2	0.0014	3	0.004	6	0.0079	2	0.0024	10	0.0106	3	0.0023	4	0.0048	3	0.0034
F. Brachycentridae	-	-	-	-	-	-	-	-	4	0.0006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.0001	1	0.0001
F. Glossosomatidae	488	0.1336	2	0.0008	12	0.0112	18	0.0044	12	0.0040	-	-	-	-	8	0.0008	8	0.0004	7	0.0084	-	-	-	-	2	0.0003	1	0.0006	1	0.0004	-	-	-	-
F. Helicopsychidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae	-	-	-	-	-	-	-	-	2	0.0018	-	-	-	-	-	-	-	-	3	0.0162	-	-	-	-	-	-	-	-	1	0.0018	1	0.2184	1	0.0017
F. Hydroptilidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae	352	0.0736	30	0.0040	164	0.0280	26	0.0038	20	0.0034	3	5E-04	14	0.0016	200	0.0368	80	0.0172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Rhyacophilidae	16	0.0008	20	0.0176	20	0.2404	20	0.1428	10	0.0390	1	0.002	6	0.0014	12	0.1308	12	0.2324	16	0.4090	3	0.061	6	0.1315	10	0.1908	11	0.1780	11	0.2511	5	0.0935	4	0.0988
F. Uenoidae	16	0.0032	4	0.0004	-	-	2	0.0004	12	0.0016	-	-	4	0.0006	32	0.0020	8	0.0008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES																																		
O. Diptera																																		
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ceratopogonidae	16	0.0048	2	0.0006	-	-	-	-	4	0.0028	-	-	4	0.0014	12	0.0064	4	0.0032	1	0.0015	1	0.001	6	0.0029	1	0.0002	1	0.0005	-	-	-	-	4	0.0019
F. Chironomidae	96	0.0544	94	0.0482	116	0.0652	114	0.0710	58	0.0218	14	0.004	42	0.0222	36	0.0144	124	0.0724	57	0.0275	2	5E-04	10	0.0033	30	0.0164	33	0.0307	15	0.0062	17	0.0089	24	0.0208
F. Empididae	-	-	6	0.0084	12	0.0124	4	0.0034	4	0.0044	1	0.002	2	0.0042	20	0.0392	24	0.0360	2	0.0054	-	-	1	0.0017	-	-	1	0.0003	-	-	-	-	1	0.0034
F. Pelecorhyncidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Psychodidae	16	0.0040	-	-	8	0.0024	8	0.0020	2	0.0002	2	3E-04	4	0.0012	20	0.0056	4	0.0004	60	0.0313	14	0.009	4	0.0033	35	0.0176	33	0.0157	11	0.0059	16	0.0062	25	0.0121
F. Simuliidae	-	-	-	-	-	-	4	0.0232	-	-	-	-	-	-	-	-	-	-	-	-	1	5E-04	-	-	-	-	1	0.0028	-	-	2	0.0059	-	-
F. Tipulidae	24	3.2408	7	0.3968	16	2.2136	2	0.3317	12	0.7252	9	0.005	26	2.3190	8	2.8936	8	0.0044	2	0.0379	1	0.014	-	-	1	0.0067	1	0.0007	-	-	1	0.0242	2	0.0191
CLAMS																																		
Cl. Bivalvia																																		
F. Sphaeriidae	40	0.0520	20	0.0240	72	0.0388	-	-	-	-	18	0.0155	10	0.0048	36	0.0224	60	0.0212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS per sample	3344		1033		1440		1016		724		214		500		1662		1916		517		92		97		220		348		416		201		267	
TOTAL NUMBER OF TAXA [a]	24		24		23		24		25		20		22		23		24		21		16		18		19		22		16		18		19	
TOTAL BIOMASS (g)		7.0952		1.5156		3.5772		1.4049		2.7160		0.1338		2.9038		4.4152		2.3608		1.0460		0.1739		0.2193		0.4325		0.5219		0.6749		0.5437		0.3504

Note: Data not normalized to area (0.1 m^2).
[a] Bold entries excluded from taxa count.

Table B.21: Benthic Invertebrate Density and Biomass from Biomass from Reference and Mine-exposed Areas, FRO LAEMP, September 2019

Station	RG_FRCP1SW				RG_FRUPO																				RG_HENUP									
Replicate	9		10		1		2		3		4		5		6		7		8		9		10		1		2		3		4		5	
ROUNDWORMS																																		
P. Nemata	8	0.0057	1	0.0001	5	0.0027	14	0.0128	7	0.0013	5	0.0009	8	7E-04	3	0.0012	7	0.004	6	0.0059	4	0.0037	4	0.0013	4	0.0033	6	0.0029	2	0.0013	-	-	1	0.0013
FLATWORMS																																		
P. Platyhelminthes																																		
Cl. Turbellaria																																		
F. Planariidae	1	0.0005	1	0.0020	2	0.0046	2	0.0001	1	0.0047	2	0.0042	-	-	1	0.0021	-	-	3	0.0060	3	0.0202	5	0.0101	2	0.0051	1	0.0008	7	0.0213	-	-	1	0.0006
ANNELIDS																																		
P. Annelida																																		
WORMS																																		
Cl. Oligochaeta																																		
F. Enchytraeidae	12	0.0046	5	0.0040	16	0.0052	23	0.0050	11	0.0019	4	0.0011	5	0.0009	-	-	6	0.0013	2	0.0016	7	0.0023	3	0.0030	-	-	-	-	-	-	-	-	-	-
F. Lumbricidae	-	-	-	-	-	-	-	-	1	0.0294	-	-	-	-	-	-	-	-	-	-	-	-	3	0.0140	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae	-	-	-	-	-	-	1	0.0159	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Naididae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																																		
MITES																																		
Cl. Arachnida																																		
Subcl. Acari imm.	**3**	0.0035	-	-	-	-	-	-	-	-	-	-	**1**	0.0001	**1**	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydryphantidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae	15	0.0063	9	0.0044	11	0.0016	11	0.0031	11	0.0022	24	0.0062	3	1E-04	10	0.0002	7	1E-04	9	0.0021	6	0.0017	8	0.0028	11	0.0041	1	0.0002	2	0.0007	-	-	-	-
F. Sperchontidae	-	-	-	-	1	0.0001	2	0.0005	2	0.0001	1	0.0001	-	-	1	0.0001	3	1E-04	2	0.0001	-	-	1	0.0001	24	0.0113	10	0.0028	3	0.0009	1	0.0013	-	-
SEED SHRIMPS																																		
Cl. Ostracoda	-	-	1	0.0001	-	-	-	-	3	0.0001	1	0.0001	2	1E-04	1	0.0001	3	7E-04	-	-	-	-	1	0.0001	2	0.0007	1	0.0004	1	0.0006	1	0.0005	-	-
INSECTS																																		
Cl. Insecta																																		
BEETLES																																		
O. Coleoptera																																		
F. Curculionidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0053	-	-	-	-	-	-	-	-	-	-
F. Elmidae	-	-	-	-	4	0.0007	6	0.0041	2	0.0001	6	0.0015	-	-	-	-	2	0.0012	3	0.0031	2	0.0011	7	0.0141	-	-	-	-	-	-	-	-	-	-
MAYFLIES																																		
O. Ephemeroptera																																		
F. Ameletidae	-	-	-	-	-	-	-	-	1	0.0209	2	0.0056	-	-	-	-	1	0.013	-	-	1	0.0183	-	-	9	0.0276	4	0.0027	13	0.0065	-	-	-	-
F. Baetidae	20	0.0825	3	0.0119	26	0.1235	33	0.1422	9	0.0581	3	0.0784	17	0.065	7	0.0474	8	0.022	24	0.1051	28	0.1261	22	0.1286	-	-	-	-	-	-	-	-	-	-
F. Ephemerellidae	12	0.0332	5	0.0112	17	0.0482	12	0.0497	5	0.0059	16	0.0536	3	0.001	5	0.0053	9	0.003	13	0.0415	8	0.0367	14	0.0884	24	0.0047	24	0.0375	26	0.0484	5	0.0394	5	0.0025
F. Heptageniidae	172	0.1353	34	0.0457	22	0.0556	25	0.0292	13	0.0120	15	0.0043	15	0.022	23	0.0091	10	0.014	41	0.0476	20	0.0561	32	0.1597	326	0.4412	308	0.3426	405	0.4449	212	0.5885	187	0.2727
STONEFLIES																																		
O. Plecoptera																																		
F. Capniidae	13	0.0137	10	0.0029	-	-	5	0.0007	3	0.0022	7	0.0029	17	0.0031	1	0.0001	3	0.0001	3	0.0061	2	0.0001	3	0.0006	-	-	1	0.0001	2	0.0009	-	-	-	-
F. Chloroperlidae	-	-	4	0.0061	-	-	6	0.0062	2	0.0001	4	0.0022	3	2E-04	1	0.0006	1	1E-04	4	0.0063	2	0.0001	6	0.0097	33	0.1521	18	0.0642	53	0.1694	72	0.2331	33	0.0700
F. Leuctridae	-	-	-	-	-	-	5	0.0014	-	-	-	-	2	0.004	-	-	-	-	3	0.0025	1	0.0021	1	0.0001	3	0.0041	1	0.0015	5	0.0047	19	0.0234	2	0.0027
F. Nemouridae	73	0.0306	2	0.0015	17	0.0109	13	0.0067	5	0.0001	16	0.0120	30	0.008	8	0.0089	9	4E-04	15	0.0176	7	0.0015	17	0.0036	10	0.0385	11	0.0560	9	0.0280	5	0.0101	3	0.0083
F. Perlidae	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	-	-	-	-	-	-
F. Perlodidae	276	0.4332	19	0.0154	262	0.3800	180	0.2709	87	0.0718	96	0.0859	343	0.532	223	0.2981	201	0.254	122	0.1811	111	0.2407	280	0.3968	7	0.2128	8	0.2435	1	0.0213	3	0.0589	3	0.1109
F. Peltoperlidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Taeniopterygidae	37	0.0141	9	0.0047	9	0.0005	1	0.0002	1	0.0001	2	0.0003	2	1E-04	-	-	10	4E-04	1	0.0004	2	0.0006	9	0.0011	6	0.0024	13	0.0055	9	0.0043	14	0.0049	5	0.0021
CADDISFLIES																																		
O. Trichoptera																																		
immature	-	-	-	-	2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	**1**	0.0001	2	0.0001	-	-	5	0.0001	**2**	0.0001	-	-	-	-	1	0.0001
F. Apataniidae	4	0.0046	7	0.0061	15	0.0072	5	0.0029	3	0.0023	48	0.0253	7	0.004	5	0.0027	1	9E-04	14	0.0073	17	0.0069	11	0.0083	-	-	-	-	-	-	-	-	-	-
F. Brachycentridae	5	0.0014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Glossosomatidae	2	0.0014	2	0.0039	37	0.0436	16	0.0915	9	0.0067	1	0.0001	3	0.008	12	0.0256	7	0.003	11	0.0158	1	0.0055	9	0.0186	22	0.0500	13	0.0447	9	0.0230	7	0.0195	12	0.0244
F. Helicopsychidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae	9	0.0181	-	-	-	-	2	0.0016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.4977	3	0.1444	4	0.4377	2	0.3399	2	0.1834
F. Hydroptilidae	-	-	-	-	-	-	1	0.0014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae	1	0.3313	-	-	-	-	2	0.2795	-	-	7	0.0010	1	2E-04	1	0.0001	1	1E-04	2	0.0001	1	0.0105	-	-	-	-	-	-	1	0.0186	-	-	-	-
F. Rhyacophilidae	21	0.4838	5	0.1091	48	0.6621	36	0.4925	25	0.3990	22	0.2799	6	0.092	6	0.0455	28	0.394	38	0.6663	45	0.6395	35	0.3227	2	0.0452	5	0.0221	3	0.0428	2	0.0034	-	-
F. Uenoidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-	1	0.0001	-	-	-	-	-	-
TRUE FLIES																																		
O. Diptera																																		
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0006
F. Ceratopogonidae	3	0.0024	-	-	10	0.0037	5	0.0029	7	0.0036	10	0.0065	8	0.005	5	0.0024	2	1E-04	6	0.0038	2	0.0001	2	0.0018	-	-	3	0.0019	1	0.0015	1	0.0012	-	-
F. Chironomidae	85	0.0315	13	0.0049	418	0.3232	335	0.1944	129	0.1169	108	0.0763	93	0.038	103	0.0617	247	0.12	58	0.0428	30	0.0190	41	0.0318	234	0.3639	171	0.2268	50	0.0414	78	0.0378	48	0.0334
F. Empididae	-	-	-	-	23	0.0436	10	0.0229	11	0.0295	12	0.0247	3	0.005	2	0.0033	18	0.026	13	0.0235	17	0.0257	7	0.0069	3	0.0105	9	0.0171	1	0.0033	5	0.0074	4	0.0088
F. Pelecorhyncidae	-	-	-	-	2	0.0008	6	0.0281	2	0.0055	-	-	-	-	-	-	1	0.003	-	-	8	0.0120	2	0.0141	-	-	-	-	-	-	-	-	-	-
F. Psychodidae	62	0.0324	18	0.0099	19	0.0054	21	0.0053	12	0.0020	9	0.0014	5	0.002	3	0.0001	4	4E-04	11	0.0037	1	0.0002	12	0.0027	-	-	1	0.0003	-	-	-	-	-	-
F. Simuliidae	1	0.0015	-	-	1	0.0014	-	-	-	-	-	-	1	8E-04	-	-	-	-	-	-	-	-	1	0.0006	-	-	-	-	-	-	-	-	-	-
F. Tipulidae	2	0.0057	4	0.1136	2	0.0049	1	0.0008	1	0.0001	3	0.0008	1	1E-04	-	-	5	0.028	1	0.0016	2	0.0007	5	0.0310	-	-	1	0.0008	-	-	-	-	-	-
CLAMS																																		
Cl. Bivalvia																																		
F. Sphaeriidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS per sample	837		152		971		779		363		426		579		422		594		408		332		542		730		616		607		427		308	
TOTAL NUMBER OF TAXA [a]	23		19		24		28		26		27		24		20		25		26		28		28		19		23		21		15		15	
TOTAL BIOMASS (g)		1.6773		0.3575		1.7299		1.6725		0.7766		0.6755		0.7917		0.5147		0.8893		1.1922		1.2317		1.2779		1.8753		1.2190		1.3215		1.3693		0.7218

Note: Data not normalized to area (0.1 m^2).
[a] Bold entries excluded from taxa count.

Table B.21: Benthic Invertebrate Density and Biomass from Biomass from Reference and Mine-exposed Areas, FRO LAEMP, September 2019

Station	RG_HENUP										RG_SCOUTDS																			
Replicate	6		7		8		9		10		1		2		3		4		5		6		7		8		9		10	
ROUNDWORMS																														
P. Nemata	-	-	3	0.0011	2	0.0007	1	0.0002	3	0.0031	3	0.003	5	0.0028	10	0.0096	32	0.023	7	0.0129	1	0.0002	18	0.0196	3	0.0023	5	0.0057	3	0.0018
FLATWORMS																														
P. Platyhelminthes																														
Cl. Turbellaria																														
F. Planariidae	2	0.0081	9	0.0145	2	0.0031	6	0.0067	13	0.0544	1	0.0001	-	-	-	-	-	-	-	-	2	0.0118	1	0.0005	-	-	-	-	1	0.0031
ANNELIDS																														
P. Annelida																														
WORMS																														
Cl. Oligochaeta																														
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-	9	0.0021	-	-	8	0.0054	7	0.0015	21	0.0062	13	0.0016	4	0.0014	4	0.0039	6	0.0024	3	0.0019
F. Lumbricidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0472	-	-	-	-
F. Lumbriculidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Naididae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																														
MITES																														
Cl. Arachnida																														
Subcl. Acari imm.	**1**	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**	0.0001	-	-	-	-	-	-	-	-	**1**	0.0001	-	-
F. Hydryphantidae	3	0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hygrobatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lebertiidae	3	0.0012	-	-	3	0.0028	-	-	7	0.0048	13	0.005	5	0.0012	5	0.0013	4	4E-04	7	0.0025	11	0.0042	10	0.0045	10	0.0038	11	0.0035	15	0.0037
F. Sperchontidae	-	-	-	-	2	0.0009	-	-	8	0.0048	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS																														
Cl. Ostracoda	6	0.0029	1	0.0002	2	0.0002	1	0.0004	5	0.0013	7	0.001	2	0.0003	4	0.0001	-	-	6	0.0018	19	0.0043	1	0.0001	3	0.0012	26	0.0064	10	0.0028
INSECTS																														
Cl. Insecta																														
BEETLES																														
O. Coleoptera																														
F. Curculionidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Elmidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES																														
O. Ephemeroptera																														
F. Ameletidae	2	0.0014	3	0.0024	2	0.0028	-	-	5	0.0031	3	8E-04	2	0.0010	1	0.0050	-	-	-	-	1	0.0006	-	-	1	0.0044	2	0.0012	1	0.0002
F. Baetidae	-	-	-	-	-	-	-	-	1	0.0009	2	0.004	1	0.0056	1	0.0014	6	0.018	1	0.0012	5	0.0133	2	0.0070	2	0.0026	3	0.0156	1	0.0042
F. Ephemerellidae	12	0.0907	10	0.0017	4	0.0380	10	0.0018	24	0.1827	7	0.012	5	0.0032	9	0.0177	5	0.006	11	0.0072	8	0.0061	13	0.0150	10	0.0058	21	0.0105	8	0.0092
F. Heptageniidae	567	0.5036	232	0.3750	483	0.3944	302	0.3672	651	0.6611	167	0.111	92	0.0746	132	0.0899	143	0.128	126	0.1329	29	0.0103	236	0.1558	222	0.1696	89	0.0631	157	0.1381
STONEFLIES																														
O. Plecoptera																														
F. Capniidae	3	0.0016	-	-	-	-	6	0.0026	4	0.0046	3	0.0117	-	-	-	-	1	0.0001	2	0.0025	-	-	1	0.0013	3	0.0025	1	0.0018	7	0.0049
F. Chloroperlidae	97	0.3120	75	0.1863	61	0.1783	118	0.2878	83	0.3167	-	-	-	-	1	0.0014	-	-	-	-	-	-	1	0.0002	-	-	-	-	3	0.0039
F. Leuctridae	11	0.0181	29	0.0343	15	0.0125	9	0.0102	18	0.0242	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Nemouridae	1	0.0020	6	0.0195	1	0.0049	12	0.0230	29	0.1116	40	0.019	11	0.0065	20	0.0079	23	0.019	8	0.0049	1	0.0006	34	0.0154	30	0.0137	8	0.0051	29	0.0157
F. Perlidae	-	-	-	-	-	-	-	-	-	-	1	0.004	1	0.0006	-	-	-	-	-	-	-	-	1	0.0007	2	0.0156	-	-	3	0.0285
F. Perlodidae	6	0.1665	3	0.1128	3	0.0930	4	0.1004	9	0.2938	24	0.052	5	0.0021	41	0.0233	44	0.059	62	0.0783	9	0.0088	42	0.0653	37	0.1774	18	0.0188	31	0.0529
F. Peltoperlidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Taeniopterygidae	4	0.0026	13	0.0060	10	0.0037	29	0.0117	22	0.0091	1	1E-04	-	-	1	0.0004	7	0.002	1	0.0007	-	-	4	0.0014	2	0.0007	5	0.0016	2	0.0007
CADDISFLIES																														
O. Trichoptera																														
immature	-	-	-	-	2	0.0001	1	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Apataniidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0002	-	-	2	0.0004	3	0.0016	2	0.0011	2	0.0006	17	0.0066	3	0.0009
F. Brachycentridae	-	-	-	-	-	-	-	-	-	-	2	1E-04	1	0.0004	3	0.0006	7	8E-04	2	0.0004	-	-	4	0.0018	1	0.0001	-	-	-	-
F. Glossosomatidae	59	0.1853	32	0.1543	21	0.0595	12	0.0406	16	0.0604	-	-	-	-	2	0.0021	2	7E-04	1	0.0004	-	-	2	0.0041	-	-	-	-	-	-
F. Helicopsychidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae	4	0.0422	3	0.0921	-	-	3	0.1932	5	0.6127	5	0.004	1	0.0017	3	0.0027	3	0.004	3	0.0048	-	-	3	0.0049	1	0.0008	1	0.0013	7	0.2929
F. Hydroptilidae	-	-	-	-	-	-	-	-	-	-	2	0.0006	-	-	-	-	-	-	-	-	1	0.0002	-	-	-	-	-	-	-	-
F. Limnephilidae	-	-	1	0.0001	2	0.0208	-	-	1	0.0897	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0002	-	-
F. Rhyacophilidae	2	0.1074	-	-	1	0.0199	1	0.0005	6	0.0136	5	0.081	7	0.1555	9	0.1376	10	0.285	12	0.1891	5	0.0849	14	0.5540	6	0.0598	4	0.0738	9	0.1470
F. Uenoidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES																														
O. Diptera																														
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ceratopogonidae	1	0.0016	2	0.0009	1	0.0010	2	0.0015	-	-	-	-	-	-	-	-	-	-	1	0.0005	-	-	-	-	-	-	-	-	-	-
F. Chironomidae	83	0.0589	74	0.0564	148	0.0865	85	0.0433	172	0.1219	34	0.015	8	0.0039	8	0.0036	15	0.009	28	0.0142	28	0.0128	39	0.0258	25	0.0113	27	0.0130	18	0.0147
F. Empididae	6	0.0147	10	0.0212	9	0.0250	7	0.0163	1	0.0047	-	-	1	0.0012	5	0.0088	-	-	11	0.0177	6	0.0105	7	0.0121	6	0.0142	11	0.0202	3	0.0047
F. Pelecorhyncidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Psychodidae	-	-	-	-	2	0.0017	-	-	-	-	65	0.026	28	0.0167	14	0.0056	33	0.015	72	0.0347	20	0.0086	72	0.0285	64	0.0309	55	0.0297	71	0.0331
F. Simuliidae	-	-	-	-	-	-	-	-	-	-	1	0.001	-	-	-	-	1	0.003	1	0.0021	-	-	-	-	-	-	-	-	-	-
F. Tipulidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.0002	-	-	1	0.0126	-	-	3	0.1475	-	-	-	-	4	0.0057
CLAMS																														
Cl. Bivalvia																														
F. Sphaeriidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS per sample	873		506		776		609		1083		395		175		279		344		386		162		514		435		312		389	
TOTAL NUMBER OF TAXA [a]	19		17		21		18		21		21		16		21		17		22		17		23		21		19		22	
TOTAL BIOMASS (g)		1.5214		1.0788		0.9498		1.1076		2.5792		0.3536		0.2773		0.3248		0.5733		0.5280		0.1804		1.0680		0.5684		0.2806		0.7706

Note: Data not normalized to area (0.1 m^2).
[a] Bold entries excluded from taxa count.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-18						
	RG_UFR11	RG_UFR12	RG_UFR13	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FOBSC1
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	11	0	0	0	0	0
| Family: Sminthuridae	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	9	11	20	20	0	40	0
| Family: Baetidae	5	33	160	140	140	40	2
Acentrella	0	0	0	0	0	0	0
Baetis	23	22	60	100	40	40	2
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	18	0	40	680	320	180	0
Baetis bicaudatus	0	0	0	0	0	0	0
Diphetor hageni	0	0	0	20	0	0	0
| Family: Ephemerellidae	464	844	2700	200	160	60	14
Caudatella	0	0	0	0	0	0	0
Drunella	0	0	0	0	0	0	0
Drunella grandis group	0	0	0	0	0	0	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	41	11	80	0	40	0	0
Drunella grandis	0	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0
Ephemerella	5	0	0	0	0	20	0
Serratella	0	0	0	0	0	0	0
| Family: Heptageniidae	173	656	1160	2020	740	600	56
Cinygmula	23	44	0	360	220	480	56
Epeorus	14	33	100	4140	1660	1520	176
Rhithrogena	14	56	0	20	20	0	2
| Order: Plecoptera	0	0	0	0	20	0	0
| Family: Capniidae	9	22	20	260	240	160	52
| Family: Chloroperlidae	0	11	0	0	0	0	4
Haploperla	0	0	0	0	0	0	0
Neaviperla	0	0	0	0	0	0	0
Paraperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	23	56	60	0	0	0	2
| Family: Leuctridae	14	33	80	0	0	0	0
Paraleuctra	0	22	0	0	0	0	0
| Family: Nemouridae	232	478	1820	3220	1000	1020	132
Malenka	0	0	0	0	0	0	0
Prostoia	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	41	133	500	100	80	20	6
Zapada oregonensis group	23	144	380	20	0	40	0
Zapada cinctipes	0	0	80	160	80	40	0
Zapada columbiana	0	0	20	20	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	0	4
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	0	11	0	0	0	0	0
Cultus	0	0	0	0	0	0	0
Diura	0	0	0	0	0	0	0
Isoperla	0	0	0	0	20	0	0
Kogotus	41	156	320	0	20	0	4
Megarcys	5	33	20	60	0	0	2
Rickera sorpta	0	0	0	0	0	0	0
Skwala	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	56	20	80	20	40	0
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Anagapetus	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0
Parapsyche	0	11	20	0	20	40	0
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
Ecclisomyia	5	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	9	11	40	0	0	40	12
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	22	20	0	0	0	0
Rhyacophila brunnea/vemna group	0	0	20	0	0	20	18
Rhyacophila hyalinata group	5	22	0	40	20	0	22
Rhyacophila vobara subgroup	0	0	0	0	0	0	0
Rhyacophila vofixa group	5	11	20	0	0	0	0
Rhyacophila alberta group	0	0	0	0	0	0	0
Rhyacophila atrata complex	18	56	40	0	0	0	12
Rhyacophila narvae	0	0	0	0	0	0	0
Rhyacophila verrula group	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	82	211	400	0	0	0	2

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-18						
	RG_UFR11	RG_UFR12	RG_UFR13	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FOBSC1
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Liodessus	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
Sanfilippodytes	0	0	0	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0
| Subfamily: Hydroporinae	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	2
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0
Mallochohelea	0	0	0	0	40	20	14
| Family: Chironomidae	0	0	0	0	0	0	0
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Paracladopelma	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	23	78	700	0	160	0	0
Cladotanytarsus	0	0	0	0	0	0	0
Micropsectra	5	0	0	200	80	40	8
Stempellina	0	0	0	0	0	0	0
Stempellinella	0	0	0	100	0	0	0
Sublettea	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	40	0	0	0
Pagastia	5	33	80	560	240	300	2
Potthastia gaedii group	0	0	0	0	0	0	0
Pseudodiamesa	5	0	0	20	0	20	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	11	40	0	0	0	0
Corynoneura	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	20	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0
Eukiefferiella	0	0	260	460	160	100	0
Heleniella	0	0	0	0	0	0	0
Hydrobaenus	9	0	0	0	20	0	0
Krenosmittia	0	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	18	78	80	400	80	80	2
Orthocladius lignicola	0	0	0	0	0	0	0
Parakiefferiella	0	0	0	0	0	0	0
Parametriocnemus	0	11	0	0	0	0	0
Paraphaenocladius	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0
Rheocricotopus	0	0	0	0	0	0	0
Rheosmittia	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0
Tvetenia	5	11	240	200	80	160	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0
| Tribe: Macropelopiini	0	0	0	0	0	0	0
Macropelopia	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	9	0	0	60	20	0	16
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0
| Family: Dolichopodidae	0	0	0	0	0	0	0
| Family: Empididae	5	0	40	0	0	0	0
Chelifera/ Metachela	9	56	140	0	0	0	0
Clinocera	0	0	20	0	0	0	0
Hemerodromia	0	0	0	0	0	0	0
Neoplasta	18	67	40	0	0	0	0
Oreogeton	0	0	0	0	0	0	0
Roederiodes	0	0	0	0	0	0	2
Trichoclinocera	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	32	111	460	980	1280	1240	106
| Family: Sciaridae	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	20	0	0	0
Helodon	0	0	0	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	0	0	20	0	0	2
Twinnia	0	0	0	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0
Nemotelus	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	0
Antocha	9	0	0	0	0	0	0
Dicranota	14	0	40	0	20	20	12
Erioptera	0	0	0	0	0	0	0
Hesperoconopa	23	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	0	0
Limnophila	9	0	0	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0
Sialis	0	0	0	0	0	0	0

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Dec-18						
	RG_UFR11	RG_UFR12	RG_UFR13	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FOBSC1
| Order: Thysanoptera	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
Albaxona	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	11	0	0	0	0	2
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	120	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Wandesia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	14	22	60	60	0	40	24
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	32	33	80	40	0	0	8
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	2
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Sphaerium	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	20	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	80	60	6
| Family: Naididae	0	0	0	0	0	0	0
Chaetogaster	0	0	0	0	0	0	0
Nais	0	0	0	0	0	20	0
Pristina	0	0	0	0	0	0	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**1545**	**3742**	**10640**	**14820**	**7120**	**6500**	**788**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-18						
	RG_FOBSC2	RG_FOBSC3	RG_FOBCP1	RG_FOBCP2	RG_FOBCP3	RG_FRUPO1	RG_FRUPO2
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	7	0	0	0
| Family: Sminthuridae	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	0	6	5	0	0	0	20
| Family: Baetidae	1	0	0	0	2	20	20
Acentrella	0	0	0	0	0	0	0
Baetis	0	0	0	7	0	40	0
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	0	0	0	0	0	60	140
Baetis bicaudatus	0	0	0	0	0	0	0
Diphetor hageni	1	0	0	0	0	0	0
| Family: Ephemerellidae	2	10	0	0	0	40	320
Caudatella	0	0	0	0	0	0	0
Drunella	0	0	0	0	0	0	0
Drunella grandis group	0	0	0	0	0	40	20
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	1	0	0	0	0	0	0
Drunella grandis	0	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0
Ephemerella	0	0	0	0	0	0	0
Serratella	0	0	0	0	0	0	0
| Family: Heptageniidae	22	3	5	0	0	120	260
Cinygmula	34	0	0	0	0	40	100
Epeorus	80	32	10	7	0	380	1220
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	17	65	1180	914	218	1180	1500
| Family: Chloroperlidae	0	0	10	0	4	40	80
Haploperla	0	0	0	7	0	60	160
Neaviperla	0	0	0	0	0	0	0
Paraperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	5	0	4	80	240
| Family: Leuctridae	0	0	0	0	0	0	0
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	73	58	0	0	0	17120	25460
Malenka	0	0	0	0	0	0	0
Prostoia	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	1	13	0	0	0	840	820
Zapada oregonensis group	2	0	0	0	0	200	940
Zapada cinctipes	7	0	0	0	0	740	940
Zapada columbiana	0	0	0	0	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	2	6	5	7	0	20	0
Hesperoperla	0	3	0	0	0	0	0
| Family: Perlodidae	0	0	0	0	4	100	400
Cultus	0	0	5	7	0	0	0
Diura	0	0	0	0	0	0	0
Isoperla	0	0	0	0	0	1940	2180
Kogotus	3	0	10	14	0	760	1260
Megarcys	1	0	0	0	0	0	80
Rickera sorpta	0	0	0	0	0	0	0
Skwala	0	0	5	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	0	80	120
| Order: Trichoptera	0	0	0	0	0	0	20
| Family: Apataniidae	0	0	5	0	0	0	0
Apatania	0	0	0	0	0	0	0
Pedomoecus sierra	1	10	0	0	0	0	20
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Anagapetus	0	0	0	0	0	0	40
Glossosoma	1	0	0	0	0	0	0
| Family: Hydropsychidae	1	0	0	0	0	0	0
Arctopsyche	0	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0
Parapsyche	3	0	0	0	0	0	0
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	3	0	7	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	1	19	0	0	0	0	20
| Family: Limnephilidae	0	0	5	0	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
Ecclisomyia	0	3	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	9	13	5	0	0	40	0
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	5	7	0	20	0
Rhyacophila brunnea/vemna group	12	3	0	0	2	220	240
Rhyacophila hyalinata group	6	3	0	0	0	0	0
Rhyacophila vobara subgroup	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila alberta group	0	0	0	0	0	0	0
Rhyacophila atrata complex	4	0	5	14	2	20	40
Rhyacophila narvae	0	0	0	0	0	80	0
Rhyacophila verrula group	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	7	0	0	20

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-18						
	RG_FOBSC2	RG_FOBSC3	RG_FOBCP1	RG_FOBCP2	RG_FOBCP3	RG_FRUPO1	RG_FRUPO2
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	2	0	0
Liodessus	1	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
Sanfilippodytes	0	0	0	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0
| Subfamily: Hydroporinae	0	0	5	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	20
Heterlimnius	0	0	0	7	0	20	20
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0
Mallochohelea	0	13	40	0	0	0	0
| Family: Chironomidae	0	0	0	0	0	0	0
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Paracladopelma	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Cladotanytarsus	0	0	10	0	0	0	0
Micropsectra	1	42	5	0	0	340	500
Stempellina	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Sublettea	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	5	0	0	0	0
Pagastia	7	26	0	21	10	1640	2860
Potthastia gaedii group	0	0	0	0	0	0	0
Pseudodiamesa	0	0	0	0	0	0	40
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0
Eukiefferiella	0	0	0	0	0	140	1180
Heleniella	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	300	1220
Krenosmittia	0	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	2	0	0	0	0	300	460
Orthocladius lignicola	0	0	0	0	0	0	0
Parakiefferiella	0	0	0	0	0	0	0
Parametriocnemus	0	0	5	0	0	0	0
Paraphaenocladius	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0
Rheocricotopus	0	0	5	0	0	0	20
Rheosmittia	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0
Tvetenia	0	0	0	0	0	100	420
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0
| Tribe: Macropelopiini	0	0	0	0	0	0	0
Macropelopia	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	6	42	205	471	198	0	0
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0
| Family: Dolichopodidae	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	0	0
Chelifera/ Metachela	0	6	5	0	0	40	0
Clinocera	1	0	0	0	0	0	0
Hemerodromia	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	0	0	20
Oreogeton	0	0	0	0	0	0	0
Roederiodes	0	0	0	0	0	20	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	78	819	415	550	102	160	440
| Family: Sciaridae	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0
Helodon	0	0	0	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	0	0	0	0	20	0
Twinnia	0	0	0	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0
Nemotelus	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	0
Antocha	0	3	0	0	0	0	0
Dicranota	1	19	60	29	12	60	160
Erioptera	0	0	0	0	0	0	0
Hesperoconopa	0	0	5	14	2	0	20
Hexatoma	0	0	10	0	0	20	20
Limnophila	0	0	0	7	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0
Sialis	0	0	0	0	0	0	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-18						
	RG_FOBSC2	RG_FOBSC3	RG_FOBCP1	RG_FOBCP2	RG_FOBCP3	RG_FRUPO1	RG_FRUPO2
| Order: Thysanoptera	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
Albaxona	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	3	10	0	4	40	20
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	2	0	5	14	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Wandesia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	9	77	60	193	50	380	820
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	4	0	0	7	2	20	120
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	5	14	4	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Sphaerium	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	3	5	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Chaetogaster	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
Pristina	0	0	0	0	0	0	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**397**	**1303**	**2125**	**2332**	**622**	**27880**	**45040**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-18						
	RG_FRUPO3	RG_FODPO1	RG_FODPO2	RG_FODPO3	RG_FOUEW1	RG_FOUEW2	RG_FOUEW3
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
| Family: Sminthuridae	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	20	0	0	0	20	0	0
| Family: Baetidae	40	0	200	40	0	40	20
Acentrella	0	0	0	0	0	0	0
Baetis	40	40	80	200	20	60	160
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	40	80	180	200	220	140	180
Baetis bicaudatus	0	0	0	0	0	0	0
Diphetor hageni	0	0	0	0	0	0	0
| Family: Ephemerellidae	40	40	0	0	240	320	460
Caudatella	0	0	0	0	0	0	0
Drunella	0	0	0	0	0	0	0
Drunella grandis group	0	0	0	40	20	0	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	0	0	0	0	20	0	0
Drunella grandis	0	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0
Ephemerella	0	0	0	0	0	0	0
Serratella	0	0	0	0	0	0	0
| Family: Heptageniidae	60	420	340	980	400	1060	400
Cinygmula	20	440	100	440	320	1140	720
Epeorus	600	60	260	400	300	1240	1100
Rhithrogena	0	0	0	0	20	40	0
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	140	1240	560	1780	500	1180	540
| Family: Chloroperlidae	0	0	20	20	20	0	20
Haploperla	0	0	40	20	20	0	20
Neaviperla	0	0	0	0	0	0	0
Paraperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	20	60	0	60	60
| Family: Leuctridae	0	0	0	0	0	0	0
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	10300	16600	26400	26440	10900	12160	14960
Malenka	0	0	0	0	0	0	0
Prostoia	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	240	1900	3480	2400	1020	1820	1000
Zapada oregonensis group	220	200	400	580	980	920	1300
Zapada cinctipes	160	4200	5700	7280	1260	1980	1760
Zapada columbiana	0	20	0	0	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	120	0	20	20	0	20	0
Hesperoperla	0	0	0	0	0	0	20
| Family: Perlodidae	0	180	180	0	20	200	60
Cultus	0	0	0	20	0	0	0
Diura	0	0	0	0	0	0	0
Isoperla	240	820	1080	900	160	260	140
Kogotus	140	620	440	480	380	480	220
Megarcys	100	60	80	40	20	0	20
Rickera sorpta	0	0	0	0	0	0	0
Skwala	0	0	0	0	0	0	0
| Family: Taeniopterygidae	20	160	80	780	120	200	180
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0
Pedomoecus sierra	20	0	40	80	0	20	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	20
| Family: Glossosomatidae	0	0	0	0	0	0	0
Anagapetus	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	40	0	0	0	0	0	0
Hydropsyche	0	0	0	0	0	0	0
Parapsyche	0	0	20	0	0	0	0
Parapsyche elsis	20	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	20	0	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
Ecclisomyia	0	40	0	80	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	0	100	100	80	40	120	360
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	20	0	0	0	20
Rhyacophila brunnea/vemna group	80	280	420	40	400	120	180
Rhyacophila hyalinata group	0	0	0	0	0	0	0
Rhyacophila vobara subgroup	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	20	0	0	0	0	0
Rhyacophila alberta group	0	0	0	0	0	0	0
Rhyacophila atrata complex	0	60	80	20	20	120	60
Rhyacophila narvae	0	100	220	180	0	0	40
Rhyacophila verrula group	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	40	120	160

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-18						
	RG_FRUPO3	RG_FODPO1	RG_FODPO2	RG_FODPO3	RG_FOUEW1	RG_FOUEW2	RG_FOUEW3
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Liodessus	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
Sanfilippodytes	0	0	0	0	0	0	0
Stictotarsus	0	0	0	0	0	0	0
| Subfamily: Hydroporinae	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	60	100	0
Heterlimnius	0	160	320	160	320	880	240
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0
Mallochohelea	0	0	0	0	0	0	0
| Family: Chironomidae	0	0	0	0	0	0	20
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Paracladopelma	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	380	720
Cladotanytarsus	0	0	0	0	0	0	0
Micropsectra	320	160	300	380	0	80	0
Stempellina	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Sublettea	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	20	0
Pagastia	720	1440	1380	1720	600	740	1480
Potthastia gaedii group	0	0	0	0	0	0	0
Pseudodiamesa	0	40	0	40	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	20	0	0	0	0	0	0
Corynoneura	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0
Eukiefferiella	180	600	1820	1020	60	60	300
Heleniella	0	0	0	0	0	0	0
Hydrobaenus	280	120	20	640	0	20	20
Krenosmittia	0	0	0	0	0	0	0
Limnophyes	0	20	0	0	0	0	0
Orthocladius complex	300	340	880	1380	360	920	1640
Orthocladius lignicola	0	0	0	0	0	0	0
Parakiefferiella	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0
Paraphaenocladius	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0
Rheocricotopus	20	0	0	0	0	0	0
Rheosmittia	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0
Tvetenia	20	80	820	380	120	100	140
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0
| Tribe: Macropelopiini	0	0	0	0	0	0	0
Macropelopia	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	20	0	0	0	0	0
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0
| Family: Dolichopodidae	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	0	0
Chelifera/ Metachela	0	20	140	60	100	60	80
Clinocera	0	0	0	0	0	0	0
Hemerodromia	0	0	0	0	0	0	0
Neoplasta	20	40	40	40	160	60	80
Oreogeton	0	0	0	0	0	0	0
Roederiodes	0	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	40	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	180	80	80	0	0	80	40
| Family: Sciaridae	0	0	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0
Helodon	0	0	0	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	20	140	20	80	40	60
Twinnia	0	0	0	0	0	0	0
| Family: Stratiomyidae	0	0	0	0	0	0	0
Nemotelus	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	40	20
Antocha	0	0	0	0	140	60	140
Dicranota	60	40	80	120	20	40	0
Erioptera	0	0	0	0	0	0	0
Hesperoconopa	0	0	20	0	80	60	20
Hexatoma	0	0	0	0	0	0	0
Limnophila	0	0	20	0	0	20	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0
Sialis	0	0	0	0	0	0	0

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Dec-18						
	RG_FRUPO3	RG_FODPO1	RG_FODPO2	RG_FODPO3	RG_FOUEW1	RG_FOUEW2	RG_FOUEW3
| Order: Thysanoptera	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	20	0	0	0	0
Albaxona	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	20	0	20	40	40
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	20	100	0	20	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Wandesia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	420	400	260	280	380	740	900
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	20	20	0	60	60	20
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	20	20	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	20	0	0	0	20	20
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	20	0	0	0
Pisidium	0	0	0	0	0	40	0
Sphaerium	0	0	0	0	0	0	20
| Class: Gastropoda	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Chaetogaster	0	0	0	0	0	0	0
Nais	0	0	0	0	340	120	80
Pristina	0	0	0	0	0	0	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**15240**	**31320**	**47060**	**49880**	**20420**	**28640**	**30260**

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Feb-19						
	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FRUPO1	RG_FRUPO2	RG_FRUPO3	RG_FODPO1
Phylum: Arthropoda	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	20	0	20	0	0	0	0
| Family: Baetidae	0	0	0	0	0	0	100
Baetis	300	260	180	0	0	40	200
Baetis rhodani group	40	80	20	0	0	0	40
| Family: Ephemerellidae	60	120	40	0	0	0	0
Drunella	0	20	0	0	0	0	0
Drunella doddsii	0	0	40	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	20
| Family: Heptageniidae	2660	4340	3020	140	80	140	380
Cinygmula	60	200	140	0	0	0	0
Epeorus	0	0	0	0	0	0	20
Rhithrogena	20	20	60	0	0	0	0
| Order: Plecoptera	60	0	0	100	20	100	260
| Family: Capniidae	340	720	740	1160	520	700	1960
| Family: Chloroperlidae	0	20	0	140	80	40	0
Sweltsa	20	0	40	0	0	0	0
| Family: Leuctridae	40	20	20	20	0	0	20
| Family: Nemouridae	380	300	280	2000	1060	1020	11000
Nemoura	1400	1020	1020	1860	2180	2580	1640
Zapada	80	300	0	700	60	60	520
Zapada oregonensis group	0	0	20	0	0	0	20
Zapada cinctipes	140	100	20	120	20	40	1760
Zapada columbiana	40	0	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	20	0
Hesperoperla	20	0	20	0	20	0	0
| Family: Perlodidae	0	20	0	80	80	100	180
Isoperla	20	20	0	880	180	200	840
Kogotus	60	0	0	60	0	0	420
Megarcys	100	0	60	20	0	0	120
| Family: Taeniopterygidae	0	0	20	0	0	0	40
Doddsia occidentalis	20	20	0	0	0	0	160
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	20
| Family: Brachycentridae	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	20
| Family: Glossosomatidae	0	20	0	0	0	0	0
Glossosoma	0	0	0	0	20	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	0	20	0	20	0	0	0
Hydropsyche	0	0	0	0	0	0	20
Parapsyche	40	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	20	0	20	0	20	20	80
Rhyacophila brunnea/vemna group	20	0	0	20	20	40	120
Rhyacophila hyalinata group	0	0	20	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	20
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	20
Heterlimnius	0	0	0	0	0	0	100
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0
Mallochohelea	0	0	20	0	0	0	0
Probezzia	80	20	40	0	0	0	0
| Family: Chironomidae	0	0	20	0	0	0	0
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	40	160	120	40	0	0	0
Micropsectra	120	40	120	40	60	100	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	40	0	0	0	0
Pagastia	300	280	260	940	260	380	540
Pseudodiamesa	0	0	20	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	700	60	0
Brillia	0	0	0	0	0	0	0
Eukiefferiella	420	480	420	300	40	100	2440
Hydrobaenus	0	40	0	20	300	300	60
Limnophyes	0	0	0	20	0	0	0
Orthocladius complex	1860	1560	1260	1280	1060	1020	2860
Rheocricotopus	0	0	20	20	40	80	0
Tvetenia	280	180	100	80	80	80	660
| Subfamily: Tanypodinae	60	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	20	80	0	20	0	20
| Family: Empididae	0	20	0	0	0	40	40
Neoplasta	0	0	0	0	0	0	80
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	1280	1220	980	20	100	80	160
| Family: Simuliidae	0	0	0	20	0	0	40
Simulium	0	0	0	0	0	0	40
| Family: Tipulidae	0	0	0	40	40	0	0
Antocha	20	0	0	0	0	0	0
Dicranota	20	20	0	20	40	80	20
Limnophila	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
| Order: Megaloptera	0	0	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0	0	0
Sialis	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	40	0	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Feb-19						
	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FRUPO1	RG_FRUPO2	RG_FRUPO3	RG_FODPO1
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	0	100	20	40	240	160	60
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	0	0	20	40
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	20
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	20
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	20	0	0	0	0	0
Totals:	**10440**	**11780**	**9320**	**10200**	**7380**	**7600**	**27200**

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Feb-19				
	RG_FODPO2	RG_FODPO3	RG_FOUEW1	RG_FOUEW2	RG_FOUEW3
Phylum: Arthropoda	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0
| Class: Insecta	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0
Ameletus	0	0	0	0	20
| Family: Baetidae	0	0	0	0	0
Baetis	100	380	0	0	0
Baetis rhodani group	20	100	0	20	0
| Family: Ephemerellidae	0	40	120	40	60
Drunella	0	0	0	0	0
Drunella doddsii	0	0	0	0	0
Drunella spinifera	40	0	0	0	20
| Family: Heptageniidae	280	440	1060	880	660
Cinygmula	0	80	40	80	20
Epeorus	0	0	0	0	0
Rhithrogena	20	0	0	0	0
| Order: Plecoptera	360	120	40	80	0
| Family: Capniidae	1120	1660	220	140	100
| Family: Chloroperlidae	0	120	20	40	220
Sweltsa	0	0	60	0	0
| Family: Leuctridae	0	20	0	0	40
| Family: Nemouridae	2020	5180	4260	2300	4220
Nemoura	4400	14900	8600	1460	3760
Zapada	1740	7240	1840	780	2100
Zapada oregonensis group	20	60	0	100	20
Zapada cinctipes	1080	3080	280	180	240
Zapada columbiana	0	0	0	0	0
| Family: Perlidae	0	60	20	0	20
Hesperoperla	0	0	0	20	0
| Family: Perlodidae	100	60	0	40	20
Isoperla	380	2200	280	120	220
Kogotus	200	820	460	200	160
Megarcys	0	80	0	0	40
| Family: Taeniopterygidae	0	0	0	0	20
Doddsia occidentalis	20	220	180	0	80
| Order: Trichoptera	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0
Micrasema	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0
Glossosoma	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0
Arctopsyche	0	0	0	0	0
Hydropsyche	0	0	0	0	0
Parapsyche	0	0	20	0	20
| Family: Hydroptilidae	0	20	0	0	0
| Family: Limnephilidae	0	0	0	0	0
Ecclisomyia	20	20	0	20	0
| Family: Rhyacophilidae	0	0	0	0	0
Rhyacophila	160	360	200	140	300
Rhyacophila brunnea/vemna group	40	280	220	80	100
Rhyacophila hyalinata group	0	0	0	0	0
Rhyacophila narvae	80	40	0	20	0
| Family: Thremmatidae	0	0	0	0	0
Oligophlebodes	0	0	0	0	60
| Order: Coleoptera	0	0	0	0	0
| Family: Elmidae	20	20	160	80	280
Heterlimnius	120	80	120	60	60
| Order: Diptera	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0
Mallochohelea	0	0	0	0	0
Probezzia	0	0	0	0	0
| Family: Chironomidae	0	0	0	0	0
| Subfamily: Chironominae	0	0	0	0	0
| Tribe: Tanytarsini	40	80	0	240	0
Micropsectra	0	0	20	20	0
| Subfamily: Diamesinae	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0
Diamesa	20	0	0	0	0
Pagastia	300	760	360	220	260
Pseudodiamesa	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	400	0	0
Brillia	20	0	0	0	0
Eukiefferiella	440	2040	100	0	220
Hydrobaenus	20	0	0	280	0
Limnophyes	0	20	0	0	0
Orthocladius complex	860	2580	2060	1040	2000
Rheocricotopus	0	0	0	0	0
Tvetenia	200	1360	60	0	20
| Subfamily: Tanypodinae	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0
| Family: Empididae	0	100	20	20	40
Neoplasta	60	80	120	20	20
| Family: Psychodidae	0	0	0	0	0
Pericoma/Telmatoscopus	60	20	20	80	0
| Family: Simuliidae	0	0	0	0	0
Simulium	20	60	0	0	0
| Family: Tipulidae	0	60	120	60	60
Antocha	0	0	260	60	20
Dicranota	120	0	0	20	0
Limnophila	0	20	20	0	0
Tipula	0	20	0	0	0
| Order: Megaloptera	0	0	0	0	0
| Family: Sialidae	0	0	0	0	0
Sialis	0	0	0	20	0
Subphylum: Chelicerata	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Feb-19				
	RG_FODPO2	RG_FODPO3	RG_FOUEW1	RG_FOUEW2	RG_FOUEW3
| Family: Lebertiidae	0	0	0	0	0
Lebertia	120	240	400	600	220
| Family: Sperchontidae	0	0	0	0	0
Sperchon	0	40	140	0	0
| Family: Torrenticolidae	0	0	0	0	0
Testudacarus	20	20	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0
| Family: Pisidiidae	40	40	0	40	0
Pisidium	20	0	0	0	0
Phylum: Annelida	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0
| Family: Enchytraeidae	0	20	0	0	0
| Family: Naididae	0	0	0	0	0
Nais	0	0	60	60	40
Totals:	**14700**	**45240**	**22360**	**9660**	**15760**

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Jun-19						
	RG_HENUP1	RG_HENUP2	RG_HENUP3	RG_FO261	RG_FO262	RG_FO263	RG_FODHE1
Phylum: Arthropoda	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	8	27	0	40	0	80	120
| Family: Baetidae	183	0	13	0	0	0	20
Acentrella	0	0	0	0	0	0	0
Baetis	342	445	325	720	1300	1980	180
Baetis rhodani group	17	136	75	420	460	740	180
Callibaetis	0	0	0	0	0	0	0
| Family: Ephemerellidae	8	9	0	0	60	20	660
Drunella	25	0	38	660	580	440	80
Drunella grandis group	0	0	0	0	0	0	0
Drunella coloradensis	50	27	338	300	720	1260	360
Drunella doddsii	33	9	25	180	360	320	20
Drunella spinifera	0	0	0	0	0	0	0
Ephemerella excrucians complex	0	0	0	0	0	0	0
| Family: Heptageniidae	1017	964	1663	1500	1840	2340	2940
Cinygmula	92	91	138	100	320	240	720
Epeorus	50	27	38	0	60	0	80
Rhithrogena	33	136	25	0	20	20	0
| Order: Plecoptera	0	0	0	20	0	0	0
| Family: Capniidae	0	0	0	0	0	0	20
| Family: Chloroperlidae	50	182	175	180	200	240	20
Haploperla	0	0	0	0	40	0	0
Neaviperla	0	0	0	0	0	0	0
Suwallia	92	109	75	20	20	80	0
Sweltsa	8	9	0	0	40	220	0
| Family: Leuctridae	0	0	13	20	0	40	0
| Family: Nemouridae	25	18	0	0	0	0	0
Malenka	0	0	0	0	0	0	0
Nemoura	0	0	0	20	0	40	40
Visoka cataractae	0	0	0	0	0	0	0
Zapada	92	164	138	140	700	1420	40
Zapada oregonensis group	8	27	113	340	480	2120	20
Zapada cinctipes	0	0	0	0	0	0	0
Zapada columbiana	50	27	63	400	540	1620	40
Zapada frigida	0	0	0	0	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	20	0
Yoraperla	0	0	0	20	0	0	0
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	133	118	75	160	120	300	100
Isoperla	0	0	0	0	0	0	0
Kogotus	0	0	0	20	0	20	80
Megarcys	17	9	0	20	220	0	40
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	60	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	20	20	0	0
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	18	0	20	20	40	0
Parapsyche elsis	17	0	0	40	140	60	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	20	0	0	0
Limnephilus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	17	27	25	100	200	220	100
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	0	0	20	0
Rhyacophila brunnea/vemna group	0	0	0	0	20	0	0
Rhyacophila hyalinata group	0	0	0	140	20	40	0
Rhyacophila vofixa group	0	0	0	20	20	40	0
Rhyacophila alberta group	17	0	13	80	40	120	100
Rhyacophila atrata complex	0	0	0	20	0	20	0
Rhyacophila coloradensis group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
Rhyacophila rotunda group	0	0	0	0	0	0	0
Rhyacophila verrula group	0	0	0	40	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	25	18	50	580	120	1400	20
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	20	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	8	0	0	40	20	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0
Ceratopogon	0	0	0	0	0	0	0
Mallochohelea	0	0	0	40	0	40	0
Probezzia	0	0	0	0	0	0	40
| Family: Chironomidae	0	0	0	0	60	80	20
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	58	55	63	1140	880	2320	0
Constempellina	0	0	0	0	0	0	20
Micropsectra	33	109	0	200	300	780	520
Paratanytarsus	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	42	18	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19						
	RG_HENUP1	RG_HENUP2	RG_HENUP3	RG_FO261	RG_FO262	RG_FO263	RG_FODHE1
Diamesa	0	0	0	80	0	20	40
Pagastia	8	0	0	0	20	20	20
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	80	0	0
Corynoneura	0	0	25	0	0	0	40
Cricotopus (Nostococladius)	0	0	0	120	120	340	0
Eukiefferiella	8	0	0	0	0	20	0
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	9	0	0	0	0	0
Krenosmittia	0	0	0	0	20	0	0
Limnophyes	0	0	0	0	0	0	0
Lopescladius	0	0	0	0	0	0	0
Orthocladius complex	67	9	25	500	420	340	1000
Parametriocnemus	83	18	50	40	40	60	1820
Rheocricotopus	25	0	13	20	20	100	360
Thienemanniella	0	0	38	0	0	0	0
Tvetenia	50	27	163	180	580	860	180
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	40
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	20	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	20	80	0
Oreogeton	0	0	63	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	0	0	20	40	40	0
| Family: Simuliidae	0	0	0	0	20	0	80
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	20	20
Simulium	0	0	0	0	0	20	60
Twinnia	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	0
Antocha	0	0	0	0	0	0	0
Dicranota	8	0	13	60	60	60	0
Erioptera	0	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	0	0
Limnophila	0	0	13	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	20	60	60	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	0	0	0	20	100	100	40
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	140	160	60	20
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	8	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	60
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	8	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**2815**	**2842**	**3884**	**9000**	**11700**	**21020**	**10360**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19						
	RG_FODHE2	RG_FODHE3	RG_FOUNGD1	RG_FOUNGD2	RG_FOUNGD3	RG_FODNGD1	RG_FODNGD2
Phylum: Arthropoda	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	67	40	20	14	67	0	0
| Family: Baetidae	0	0	40	14	11	17	0
Acentrella	0	0	0	0	0	0	0
Baetis	267	700	70	43	133	217	81
Baetis rhodani group	317	380	140	43	89	217	100
Callibaetis	0	0	0	0	0	0	0
| Family: Ephemerellidae	83	120	270	79	167	167	48
Drunella	83	60	60	21	56	117	33
Drunella grandis group	0	0	0	0	0	0	0
Drunella coloradensis	117	460	150	150	244	100	29
Drunella doddsii	17	0	40	57	33	0	14
Drunella spinifera	0	0	0	0	0	0	0
Ephemerella excrucians complex	0	0	0	0	0	0	0
| Family: Heptageniidae	1983	3560	890	679	900	1900	352
Cinygmula	300	800	60	100	122	350	143
Epeorus	100	200	40	0	11	500	138
Rhithrogena	0	0	0	0	22	0	0
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	33	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	20	186	200	150	67
Haploperla	0	0	0	7	0	0	10
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	7	0	0	5
Sweltsa	0	0	10	7	11	0	0
| Family: Leuctridae	0	0	0	0	0	0	0
| Family: Nemouridae	33	0	0	7	0	17	0
Malenka	0	0	0	0	0	0	0
Nemoura	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	33	40	30	14	0	0	0
Zapada oregonensis group	17	20	50	57	11	33	5
Zapada cinctipes	0	0	0	0	22	0	0
Zapada columbiana	0	60	10	0	0	17	5
Zapada frigida	0	0	0	7	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	83	80	110	86	122	183	57
Isoperla	0	0	0	0	0	0	0
Kogotus	67	100	10	21	44	33	10
Megarcys	0	20	0	7	11	33	14
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	17	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	0	0	10	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Ecclisomyia	17	0	0	0	0	0	0
Limnephilus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	83	200	60	164	144	150	81
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	7	11	17	0
Rhyacophila brunnea/vemna group	17	0	180	79	156	100	19
Rhyacophila hyalinata group	0	20	0	0	0	17	5
Rhyacophila vofixa group	17	0	10	0	11	0	0
Rhyacophila alberta group	83	80	40	71	22	33	5
Rhyacophila atrata complex	0	20	10	43	67	67	38
Rhyacophila coloradensis group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	7	11	0	0
Rhyacophila rotunda group	0	0	0	0	0	0	0
Rhyacophila verrula group	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	20	80	50	44	0	10
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	11	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	20	0	44	17	24
Bezzia/ Palpomyia	0	0	0	0	0	0	0
Ceratopogon	0	0	0	0	0	0	0
Mallochohelea	0	0	90	43	56	100	5
Probezzia	0	20	0	0	56	0	0
| Family: Chironomidae	33	40	30	36	11	17	0
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Constempellina	0	0	0	0	0	0	0
Micropsectra	133	360	100	36	67	33	5
Paratanytarsus	0	0	0	0	0	0	5
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Jun-19						
	RG_FODHE2	RG_FODHE3	RG_FOUNGD1	RG_FOUNGD2	RG_FOUNGD3	RG_FODNGD1	RG_FODNGD2
Diamesa	50	20	0	0	0	0	5
Pagastia	17	0	120	29	133	17	10
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	17	0	0	0	44	33	0
Cricotopus (Nostococladius)	17	0	0	0	0	0	0
Eukiefferiella	0	0	0	7	0	0	5
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	0	0
Krenosmittia	33	20	0	0	11	0	5
Limnophyes	0	0	0	0	0	0	0
Lopescladius	0	0	0	0	0	0	0
Orthocladius complex	917	1280	690	229	178	133	24
Parametriocnemus	667	740	20	100	156	83	76
Rheocricotopus	33	40	0	14	11	67	0
Thienemanniella	33	0	10	0	0	0	0
Tvetenia	33	120	20	14	11	33	5
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	11	0	5
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	7	0	33	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	0	0	10	50	11	0	5
Oreogeton	0	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	17	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	0	30	14	0	0	5
| Family: Simuliidae	67	40	50	21	56	50	10
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	20	140	29	33	0	0
Simulium	83	260	30	21	144	283	105
Twinnia	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	11	0	5
Antocha	0	0	20	7	0	0	0
Dicranota	17	0	0	21	0	0	0
Erioptera	0	0	0	0	0	0	0
Hexatoma	0	0	0	0	11	17	0
Limnophila	0	0	0	7	0	17	0
Rhabdomastix	0	0	0	0	0	0	5
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	11	0	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	10	7	0	17	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	33	20	130	21	44	50	5
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	40	50	7	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	17	40	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	10	0	0	0	0
Enchytraeus	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**6034**	**10040**	**3990**	**2747**	**3863**	**5452**	**1583**

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Jun-19						
	RG_FODNGD3	RG_MP11	RG_MP12	RG_MP13	RG_FOUSH1	RG_FOUSH2	RG_FOUSH3
Phylum: Arthropoda	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	0	36	57	22	0	13	11
| Family: Baetidae	0	0	0	100	0	50	22
Acentrella	0	0	0	0	0	0	0
Baetis	118	91	114	267	229	425	211
Baetis rhodani group	64	100	0	167	214	75	44
Callibaetis	0	0	0	0	0	0	0
| Family: Ephemerellidae	136	118	229	78	243	88	67
Drunella	9	0	43	22	14	38	22
Drunella grandis group	0	0	0	0	0	0	0
Drunella coloradensis	73	9	71	33	29	0	22
Drunella doddsii	9	27	14	11	14	13	11
Drunella spinifera	9	0	0	0	0	0	0
Ephemerella excrucians complex	0	0	14	0	0	0	0
| Family: Heptageniidae	1155	482	1900	1122	1557	1263	1356
Cinygmula	200	36	43	44	86	25	56
Epeorus	45	400	129	278	929	100	122
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	25	11
| Family: Capniidae	0	0	0	0	0	0	0
| Family: Chloroperlidae	55	18	71	89	0	25	11
Haploperla	18	0	0	11	0	0	0
Neaviperla	0	0	0	0	14	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	9	14	11	0	0	0
| Family: Leuctridae	0	0	0	0	0	0	0
| Family: Nemouridae	0	9	57	0	43	13	44
Malenka	0	0	0	0	0	0	0
Nemoura	0	0	0	0	0	0	11
Visoka cataractae	0	0	0	0	0	0	0
Zapada	0	0	0	0	0	0	0
Zapada oregonensis group	18	9	0	22	29	0	22
Zapada cinctipes	0	0	0	0	0	0	0
Zapada columbiana	18	0	0	0	29	88	56
Zapada frigida	0	0	0	0	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	0	11
Hesperoperla	0	0	14	0	0	0	0
| Family: Perlodidae	100	55	114	144	71	13	11
Isoperla	0	0	0	0	0	0	0
Kogotus	18	9	86	22	14	0	0
Megarcys	9	0	14	44	29	0	33
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	0	13	11
Parapsyche elsis	0	0	0	0	14	13	33
| Family: Hydroptilidae	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	0
Limnephilus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	118	109	243	222	257	213	156
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	0	0	13	0
Rhyacophila brunnea/vemna group	64	73	71	111	0	0	0
Rhyacophila hyalinata group	0	9	0	11	0	0	11
Rhyacophila vofixa group	0	0	14	0	0	0	11
Rhyacophila alberta group	18	0	57	56	57	63	33
Rhyacophila atrata complex	45	0	0	67	71	0	11
Rhyacophila coloradensis group	0	0	14	11	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
Rhyacophila rotunda group	0	0	0	0	0	0	0
Rhyacophila verrula group	0	0	0	0	0	13	11
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	18	9	0	0	14	38	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	27	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	9	14	0	0	0	0
Bezzia/ Palpomyia	0	9	0	0	0	0	0
Ceratopogon	0	0	0	0	0	0	0
Mallochohelea	91	0	0	11	71	38	11
Probezzia	0	18	86	0	0	0	0
| Family: Chironomidae	36	9	57	56	57	100	78
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	9	0	0	14	0	0
Constempellina	0	0	0	0	0	0	0
Micropsectra	109	0	157	0	0	25	33
Paratanytarsus	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19						
	RG_FODNGD3	RG_MP11	RG_MP12	RG_MP13	RG_FOUSH1	RG_FOUSH2	RG_FOUSH3
Diamesa	9	0	0	0	0	0	0
Pagastia	9	9	0	78	43	13	67
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	9	18	0	11	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	0	27	0	0	14	50	22
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	13	0
Krenosmittia	0	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0	0
Lopescladius	0	0	0	0	0	0	0
Orthocladius complex	164	55	300	411	386	675	400
Parametriocnemus	18	9	157	33	14	38	33
Rheocricotopus	9	0	0	11	0	0	11
Thienemanniella	0	9	0	0	0	0	0
Tvetenia	45	36	86	22	0	50	44
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	9	14	0	0	25	0
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	11	0	0	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	9	0	0	0	14	0	0
Oreogeton	0	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	27	9	71	22	29	63	67
| Family: Simuliidae	9	73	71	122	43	63	244
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	145	14	0	0	0	22
Simulium	118	909	14	156	129	238	600
Twinnia	0	0	0	0	0	0	0
| Family: Tipulidae	9	0	0	0	0	0	0
Antocha	9	9	0	0	0	38	11
Dicranota	0	0	0	0	0	0	0
Erioptera	0	0	0	0	0	0	0
Hexatoma	9	0	0	0	0	0	0
Limnophila	0	18	0	0	0	13	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	11	0	0	0
Feltria	9	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	91	18	71	56	14	13	22
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	9	0	14	0	0	13	11
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	14	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	0	11	0	0	33
| Family: Naididae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**3115**	**3042**	**4523**	**3987**	**4785**	**4088**	**4140**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19						
	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FOBKS1	RG_FOBKS2	RG_FOBKS3	RG_FOBSC1
Phylum: Arthropoda	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	15	25	18	20	14	13	0
| Family: Baetidae	0	13	18	0	0	0	0
Acentrella	0	0	0	0	0	0	0
Baetis	23	100	18	20	43	38	20
Baetis rhodani group	0	38	27	13	14	13	20
Callibaetis	0	0	9	0	0	0	0
| Family: Ephemerellidae	138	800	309	360	486	788	80
Drunella	8	38	9	0	29	0	10
Drunella grandis group	0	0	0	0	0	13	0
Drunella coloradensis	8	0	9	13	14	50	0
Drunella doddsii	0	0	0	13	29	0	0
Drunella spinifera	0	13	0	0	0	0	0
Ephemerella excrucians complex	0	0	0	0	0	0	0
| Family: Heptageniidae	915	1200	1118	493	2114	1063	635
Cinygmula	115	75	82	93	229	200	110
Epeorus	92	375	182	187	529	688	270
Rhithrogena	0	0	0	7	0	0	0
| Order: Plecoptera	8	13	0	0	14	13	0
| Family: Capniidae	8	0	0	7	0	0	0
| Family: Chloroperlidae	85	13	27	0	0	25	0
Haploperla	38	0	27	0	0	0	0
Neaviperla	8	13	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	0	13	0	0	0
| Family: Leuctridae	0	0	0	0	0	0	0
| Family: Nemouridae	8	50	9	7	14	38	5
Malenka	0	0	0	0	0	0	0
Nemoura	0	13	0	0	29	0	5
Visoka cataractae	8	0	0	0	0	0	0
Zapada	0	25	0	0	0	25	0
Zapada oregonensis group	8	50	9	13	14	50	0
Zapada cinctipes	0	0	0	0	0	0	0
Zapada columbiana	23	13	9	7	0	13	0
Zapada frigida	0	0	0	0	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	0	13	0	0	0	13	0
Hesperoperla	0	13	9	0	0	0	0
| Family: Perlodidae	31	0	36	27	0	13	5
Isoperla	0	13	0	20	0	0	0
Kogotus	23	13	9	13	29	25	0
Megarcys	0	13	0	7	0	0	0
| Order: Trichoptera	0	13	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	7	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	0	25	0	0	0	0	0
Parapsyche	8	0	0	0	0	0	0
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	7	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	0
Limnephilus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	154	100	182	40	286	75	95
Rhyacophila angelita group	0	0	0	7	0	0	0
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	8	0	0	7	43	75	0
Rhyacophila hyalinata group	8	13	0	13	86	13	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila alberta group	8	13	18	7	14	13	5
Rhyacophila atrata complex	54	38	91	13	14	50	60
Rhyacophila coloradensis group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
Rhyacophila rotunda group	0	13	0	0	0	0	0
Rhyacophila verrula group	0	13	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	7	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	8	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0
| Order: Diptera	0	13	0	7	0	0	0
| Family: Ceratopogonidae	0	13	9	0	0	25	5
Bezzia/ Palpomyia	0	0	0	0	0	0	0
Ceratopogon	0	0	0	0	0	0	0
Mallochohelea	0	13	55	40	29	88	0
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	15	25	36	13	0	13	5
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Constempellina	0	0	0	0	0	0	0
Micropsectra	92	100	100	53	71	88	15
Paratanytarsus	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19						
	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FOBKS1	RG_FOBKS2	RG_FOBKS3	RG_FOBSC1
Diamesa	0	0	0	0	0	0	5
Pagastia	23	113	36	113	57	25	5
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	0	0	0	7	0	25	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	8	38	0	7	14	0	5
Heterotrissocladius	0	0	9	0	0	0	0
Hydrobaenus	0	0	0	0	0	0	5
Krenosmittia	0	0	0	0	0	0	0
Limnophyes	0	0	0	7	0	0	0
Lopescladius	0	0	0	0	14	0	0
Orthocladius complex	208	388	145	73	57	100	20
Parametriocnemus	8	25	164	47	400	100	155
Rheocricotopus	0	0	18	0	14	25	0
Thienemanniella	0	0	9	0	0	0	0
Tvetenia	0	13	0	0	14	13	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	31	25	9	0	14	0	5
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	13	0
| Family: Empididae	0	0	18	0	0	0	5
Clinocera	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	0	0	5
Oreogeton	0	0	0	0	0	0	0
Trichoclinocera	8	13	9	0	0	0	5
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	62	50	45	40	29	50	10
| Family: Simuliidae	31	25	36	27	86	50	5
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	8	0	0	7	0	0	0
Simulium	8	213	45	87	0	113	20
Twinnia	0	0	0	0	0	0	0
| Family: Tipulidae	8	0	0	7	0	0	0
Antocha	15	38	18	20	0	13	0
Dicranota	8	0	9	0	14	25	5
Erioptera	0	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	13	0
Limnophila	0	0	0	0	0	25	0
Rhabdomastix	0	0	0	7	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	7	0	13	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	18	0	0	25	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	13	0	0	0	13	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	54	25	73	53	14	38	10
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	13	0	0	0	13	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	0	13	0	0	5
| Family: Naididae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**2397**	**4316**	**3086**	**2076**	**4871**	**4213**	**1615**

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Jun-19						
	RG_FOBSC2	RG_FOBSC3	RG_FOBCP1	RG_FOBCP2	RG_FOBCP3	RG_FRCP1SW1	RG_FRCP1SW2
Phylum: Arthropoda	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	0	0	14	0	7	6	10
| Family: Baetidae	0	0	0	0	0	0	10
Acentrella	0	0	0	0	0	0	40
Baetis	13	27	43	8	36	13	0
Baetis rhodani group	10	36	14	8	14	0	10
Callibaetis	0	0	0	0	0	0	0
| Family: Ephemerellidae	67	145	543	400	243	206	250
Drunella	0	27	0	0	0	0	0
Drunella grandis group	0	0	0	0	7	0	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	7	0	0	8	0	0	0
Drunella spinifera	0	0	0	0	0	0	0
Ephemerella excrucians complex	0	0	0	0	0	0	0
| Family: Heptageniidae	430	964	1057	500	250	581	600
Cinygmula	137	155	57	42	14	6	0
Epeorus	87	709	386	133	143	38	50
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	19	40
| Family: Capniidae	0	0	14	0	0	88	120
| Family: Chloroperlidae	0	0	14	0	7	0	0
Haploperla	0	0	0	0	0	0	0
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	0	0	0	0	0
| Family: Leuctridae	0	0	0	0	0	0	0
| Family: Nemouridae	13	9	29	0	14	0	0
Malenka	0	0	0	0	0	0	0
Nemoura	0	0	0	17	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	0	0	0	0	0	0	0
Zapada oregonensis group	0	0	0	0	0	0	0
Zapada cinctipes	0	0	0	0	0	0	0
Zapada columbiana	0	0	0	0	0	0	0
Zapada frigida	0	0	0	0	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	0	9	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	0	0	0	0	21	13	10
Isoperla	0	0	0	0	0	0	0
Kogotus	10	0	0	0	0	0	0
Megarcys	0	0	0	0	0	0	0
| Order: Trichoptera	0	0	0	0	0	0	10
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	8	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	9	0	0	0	0	0
Parapsyche elsis	0	0	0	8	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	9	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	0
Limnephilus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	46	82	657	408	186	263	420
Rhyacophila angelita group	0	0	0	0	64	56	70
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0
Rhyacophila hyalinata group	3	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	7	0	0
Rhyacophila alberta group	7	9	0	17	36	13	0
Rhyacophila atrata complex	17	55	14	25	0	0	0
Rhyacophila coloradensis group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
Rhyacophila rotunda group	0	0	0	0	0	0	0
Rhyacophila verrula group	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	8	7	0	0
Bezzia/ Palpomyia	0	0	0	0	0	0	0
Ceratopogon	0	0	0	0	0	0	0
Mallochohelea	7	0	0	17	50	0	0
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	7	0	43	50	50	44	80
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Constempellina	0	0	0	0	0	0	0
Micropsectra	13	9	114	100	43	0	20
Paratanytarsus	0	9	0	0	0	0	0
Stempellinella	0	9	0	0	0	6	0
Tanytarsus	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19						
	RG_FOBSC2	RG_FOBSC3	RG_FOBCP1	RG_FOBCP2	RG_FOBCP3	RG_FRCP1SW1	RG_FRCP1SW2
Diamesa	3	0	71	8	14	44	90
Pagastia	13	9	43	67	50	50	40
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	0	0	0	0	7	6	30
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	3	0	29	0	7	6	0
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	0	0
Krenosmittia	0	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0	0
Lopescladius	0	0	14	0	0	0	10
Orthocladius complex	23	27	243	283	543	175	280
Parametriocnemus	33	518	371	142	79	119	310
Rheocricotopus	3	0	171	0	7	19	50
Thienemanniella	3	0	0	8	14	0	0
Tvetenia	0	0	43	8	7	0	20
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	9	43	17	14	0	20
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0
| Family: Empididae	3	0	0	0	0	0	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	0	0	14	8	0	0	0
Oreogeton	0	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	17	18	43	25	36	13	20
| Family: Simuliidae	10	45	114	83	21	0	190
Prosimulium	0	0	0	8	0	0	10
Prosimulium/Helodon	0	0	57	17	21	6	50
Simulium	13	9	243	100	43	50	160
Twinnia	0	0	0	0	0	6	40
| Family: Tipulidae	3	0	0	0	0	0	20
Antocha	0	0	0	0	0	0	0
Dicranota	7	0	0	17	7	0	0
Erioptera	0	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	0	0
Limnophila	0	0	0	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	10
Tipula	0	0	0	0	0	6	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	8	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	20	9	0	25	93	31	10
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	7	0	14	0	0	6	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	6	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	31	370
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	63	73	229	67	143	0	0
| Family: Naididae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**1098**	**2989**	**4741**	**2648**	**2305**	**1926**	**3470**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19						
	RG_FRCP1SW3	RG_FRUPO1	RG_FRUPO2	RG_FRUPO3	RG_FODPO1	RG_FODPO2	RG_FODPO3
Phylum: Arthropoda	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	0	0	4	0	10	0	11
| Family: Baetidae	20	20	12	19	0	0	22
Acentrella	80	0	0	0	0	20	11
Baetis	0	5	0	0	0	10	11
Baetis rhodani group	0	0	0	0	10	10	11
Callibaetis	0	0	0	0	0	0	0
| Family: Ephemerellidae	740	65	88	56	100	150	100
Drunella	0	0	0	0	0	0	0
Drunella grandis group	0	0	0	0	0	0	0
Drunella coloradensis	0	0	0	6	0	0	0
Drunella doddsii	0	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	10	0	11
Ephemerella excrucians complex	0	0	0	0	0	0	0
| Family: Heptageniidae	980	135	228	200	130	140	144
Cinygmula	40	5	0	0	10	20	22
Epeorus	0	0	4	6	10	0	11
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	80	15	48	0	0	10	78
| Family: Capniidae	80	200	268	194	1110	990	1011
| Family: Chloroperlidae	40	40	56	88	20	90	133
Haploperla	0	10	44	0	0	0	0
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	4	0	0	0	11
| Family: Leuctridae	0	0	0	0	10	0	0
| Family: Nemouridae	20	15	40	6	40	0	0
Malenka	0	0	0	0	60	30	0
Nemoura	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	0	5	0	0	50	30	0
Zapada oregonensis group	0	0	0	0	70	70	89
Zapada cinctipes	0	5	8	19	10	0	0
Zapada columbiana	0	5	0	6	360	150	144
Zapada frigida	0	0	0	0	0	60	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	0	11
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	20	50	20	38	80	40	67
Isoperla	0	0	0	0	30	0	0
Kogotus	0	5	0	0	60	60	167
Megarcys	0	0	4	0	0	0	0
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	0	0	0	6	0	0	0
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Ecclisomyia	0	5	0	0	160	0	78
Limnephilus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	760	205	176	244	160	60	167
Rhyacophila angelita group	120	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	0	0	10	11
Rhyacophila brunnea/vemna group	20	5	4	19	10	30	22
Rhyacophila hyalinata group	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila alberta group	40	15	28	69	0	50	44
Rhyacophila atrata complex	0	65	24	0	0	20	0
Rhyacophila coloradensis group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	10	10	11
Rhyacophila rotunda group	0	0	0	0	0	0	0
Rhyacophila verrula group	0	10	4	6	30	50	22
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	110	40	67
Heterlimnius	0	0	0	0	40	10	56
| Family: Staphylinidae	20	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	25	4	6	20	40	111
Bezzia/ Palpomyia	0	0	0	0	0	0	0
Ceratopogon	0	10	0	0	0	0	0
Mallochohelea	0	0	0	0	0	0	0
Probezzia	0	30	0	13	0	0	0
| Family: Chironomidae	180	20	12	13	0	0	0
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	10	0	0
Constempellina	0	0	0	0	0	0	0
Micropsectra	100	25	4	6	0	0	0
Paratanytarsus	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19						
	RG_FRCP1SW3	RG_FRUPO1	RG_FRUPO2	RG_FRUPO3	RG_FODPO1	RG_FODPO2	RG_FODPO3
Diamesa	80	35	12	69	0	0	0
Pagastia	20	145	24	125	110	400	400
Pseudodiamesa	0	0	0	0	10	10	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	80	0	0	0	10	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	80	0	0	0	20	0	0
Heterotrissocladius	0	0	0	6	0	0	0
Hydrobaenus	0	0	0	0	0	0	0
Krenosmittia	0	10	0	13	10	0	0
Limnophyes	0	0	0	0	0	0	0
Lopescladius	0	0	0	0	0	0	0
Orthocladius complex	620	110	68	506	170	310	256
Parametriocnemus	240	20	20	56	0	10	0
Rheocricotopus	60	0	8	0	10	0	22
Thienemanniella	20	0	0	6	0	0	0
Tvetenia	80	10	0	0	0	30	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	40	0	0	6	0	0	0
| Tribe: Procladiini	0	0	0	0	0	0	0
Procladius	0	0	0	0	0	0	0
| Family: Empididae	0	0	4	13	10	0	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	0	10	0	25	30	0	0
Oreogeton	0	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	20	5	0	0	0	10	0
| Family: Simuliidae	500	60	64	0	0	0	22
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	300	20	28	19	0	0	0
Simulium	1160	60	224	6	20	0	22
Twinnia	0	70	4	0	0	10	0
| Family: Tipulidae	0	75	4	6	0	0	0
Antocha	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	10	0
Erioptera	0	15	4	0	0	0	0
Hexatoma	0	15	0	0	0	0	0
Limnophila	0	0	0	0	0	10	0
Rhabdomastix	0	0	0	13	0	0	0
Tipula	0	0	0	0	0	10	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	0	0	20	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	40	15	16	31	60	90	122
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	0	10	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	20	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	15	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	180	0	0	150	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	5	36	0	20	0	0
| Family: Naididae	0	0	8	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	10	0	0	0	0	0
Totals:	**6880**	**1700**	**1608**	**2070**	**3220**	**3120**	**3498**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19					
	RG_FO221	RG_FO222	RG_FO223	RG_FOUEW1	RG_FOUEW2	RG_FOUEW3
Phylum: Arthropoda	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0
Ameletus	0	0	0	0	40	20
| Family: Baetidae	10	0	0	33	40	120
Acentrella	0	0	38	0	0	0
Baetis	0	0	0	83	220	380
Baetis rhodani group	10	0	0	250	640	580
Callibaetis	0	0	0	0	0	0
| Family: Ephemerellidae	70	67	200	300	460	200
Drunella	0	0	0	0	0	0
Drunella grandis group	0	0	0	0	0	0
Drunella coloradensis	0	0	0	0	60	0
Drunella doddsii	0	0	0	0	40	60
Drunella spinifera	30	0	0	17	0	0
Ephemerella excrucians complex	0	0	0	0	0	0
| Family: Heptageniidae	60	17	13	733	1560	2000
Cinygmula	10	0	0	33	60	160
Epeorus	20	0	13	200	360	240
Rhithrogena	0	0	0	17	0	0
| Order: Plecoptera	50	0	0	0	0	0
| Family: Capniidae	470	517	325	100	180	100
| Family: Chloroperlidae	60	67	0	83	120	60
Haploperla	0	0	0	0	20	0
Neaviperla	0	17	0	0	0	0
Suwallia	0	0	0	0	0	0
Sweltsa	0	0	25	17	60	40
| Family: Leuctridae	0	0	0	0	0	0
| Family: Nemouridae	80	0	0	83	140	140
Malenka	20	0	0	0	0	0
Nemoura	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0
Zapada	110	67	0	183	180	200
Zapada oregonensis group	80	50	25	350	320	400
Zapada cinctipes	20	300	75	333	160	200
Zapada columbiana	90	233	25	217	420	160
Zapada frigida	0	0	0	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0
| Family: Perlidae	20	0	0	0	0	0
Hesperoperla	0	0	0	0	20	0
| Family: Perlodidae	20	0	25	33	280	180
Isoperla	80	317	38	233	200	20
Kogotus	20	33	25	150	40	120
Megarcys	0	0	0	0	0	0
| Order: Trichoptera	20	17	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0
Pedomoecus sierra	0	0	13	0	20	20
| Family: Brachycentridae	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0
Brachycentrus occidentalis	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0
Glossosoma	0	0	0	17	0	0
| Family: Hydropsychidae	0	0	0	0	0	0
Arctopsyche	0	0	0	0	0	0
Parapsyche	0	0	0	0	0	0
Parapsyche elsis	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0
| Family: Limnephilidae	0	17	0	0	0	20
Ecclisomyia	140	33	63	0	0	0
Limnephilus	0	0	0	0	20	0
| Family: Rhyacophilidae	0	0	0	0	0	0
Rhyacophila	80	17	138	33	80	100
Rhyacophila angelita group	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	17	0	0
Rhyacophila brunnea/vemna group	10	17	13	33	0	60
Rhyacophila hyalinata group	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0
Rhyacophila alberta group	0	0	13	17	20	20
Rhyacophila atrata complex	0	0	0	17	40	80
Rhyacophila coloradensis group	0	0	0	0	0	0
Rhyacophila narvae	0	0	13	0	0	0
Rhyacophila rotunda group	0	0	0	0	0	0
Rhyacophila verrula group	10	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	20
| Order: Coleoptera	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0
| Family: Elmidae	560	533	850	233	180	180
Heterlimnius	330	233	713	67	40	0
| Family: Staphylinidae	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0
| Family: Ceratopogonidae	20	0	63	0	100	0
Bezzia/ Palpomyia	0	0	0	0	20	0
Ceratopogon	0	0	0	0	0	0
Mallochohelea	0	0	0	0	0	0
Probezzia	0	0	0	0	0	0
| Family: Chironomidae	20	17	13	83	80	0
| Subfamily: Chironominae	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0
Constempellina	0	0	0	0	0	0
Micropsectra	90	83	13	500	320	140
Paratanytarsus	0	0	0	0	0	0
Stempellinella	0	0	13	0	0	0
Tanytarsus	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Jun-19					
	RG_FO221	RG_FO222	RG_FO223	RG_FOUEW1	RG_FOUEW2	RG_FOUEW3
Diamesa	0	0	0	0	0	40
Pagastia	90	383	325	300	240	60
Pseudodiamesa	0	0	13	0	20	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0
Brillia	0	0	0	0	0	0
Corynoneura	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0
Eukiefferiella	0	0	0	17	20	60
Heterotrissocladius	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	0
Krenosmittia	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0
Lopescladius	0	0	0	0	0	0
Orthocladius complex	100	533	350	717	560	360
Parametriocnemus	40	17	75	0	20	0
Rheocricotopus	0	17	0	17	60	20
Thienemanniella	0	0	0	17	20	0
Tvetenia	20	17	0	33	20	0
| Subfamily: Tanypodinae	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0
Thienemannimyia group	10	0	0	0	0	0
| Tribe: Procladiini	0	0	0	0	0	0
Procladius	0	0	0	0	0	0
| Family: Empididae	10	0	13	0	0	0
Clinocera	10	0	0	0	0	0
Neoplasta	0	17	75	0	20	0
Oreogeton	0	0	0	0	0	0
Trichoclinocera	0	17	0	0	0	0
| Family: Oreoleptidae	0	0	0	0	0	0
Oreoleptis	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	0	0	0	0	0
| Family: Simuliidae	10	0	0	0	0	0
Prosimulium	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	17	60	20
Simulium	0	0	0	17	0	60
Twinnia	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	20	0
Antocha	10	0	0	0	20	0
Dicranota	20	0	13	0	20	0
Erioptera	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	0
Limnophila	10	17	25	0	20	0
Rhabdomastix	0	0	0	0	0	0
Tipula	0	17	0	0	0	20
Subphylum: Chelicerata	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0
| Order: Trombidiformes	0	0	13	17	0	0
| Family: Aturidae	0	0	0	0	0	0
Aturus	0	0	0	0	20	0
| Family: Feltriidae	0	0	0	0	0	0
Feltria	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0
Lebertia	30	317	163	300	380	140
| Family: Sperchontidae	0	0	0	0	0	0
Sperchon	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	13	0	0	0
Phylum: Mollusca	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0
| Family: Pisidiidae	50	1133	100	17	20	0
Pisidium	20	200	38	0	0	0
Phylum: Annelida	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0
| Family: Lumbriculidae	10	0	13	0	0	0
| Order: Tubificida	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	17	20	0
Enchytraeus	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0
Totals:	**3050**	**5337**	**3974**	**5951**	**8100**	**6800**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_HENUP1	RG_HENUP2	RG_HENUP3	RG_FO261	RG_FO262	RG_FO263	RG_FODHE1
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	20	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	30	80	40	240	60	40	500
| Family: Baetidae	0	0	0	180	40	100	0
Acentrella	0	0	0	20	0	0	0
Acentrella insignificans complex	0	0	0	0	0	0	0
Baetis	0	20	0	20	40	80	40
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	0	0	20	160	20	100	80
| Family: Ephemerellidae	70	260	280	3240	1680	3540	6380
Caudatella	0	0	0	0	0	0	20
Drunella	5	0	0	80	20	20	0
Drunella coloradensis	0	0	20	80	0	60	0
Drunella doddsii	5	0	20	760	460	800	220
Drunella spinifera	0	0	0	0	0	0	0
Ephemerella	0	0	0	0	0	0	0
Ephemerella excrucians complex	0	0	0	0	0	20	60
| Family: Heptageniidae	1165	3920	4040	9560	7340	10520	8660
Cinygmula	0	0	0	0	0	20	0
Epeorus	15	100	20	40	0	100	100
Rhithrogena	115	280	220	0	20	120	140
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	0	0	0	0	0	0	0
Utacapnia	0	0	0	0	0	0	0
| Family: Chloroperlidae	65	340	80	160	180	260	0
Neaviperla	0	0	0	0	0	0	0
Suwallia	90	220	220	0	40	100	0
Sweltsa	5	20	0	120	60	200	0
| Family: Leuctridae	5	20	120	60	80	100	0
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	0	0
Visoka cataractae	5	0	0	0	0	0	0
Zapada	0	60	20	520	180	700	960
Zapada oregonensis group	5	60	80	500	40	380	0
Zapada cinctipes	0	20	0	0	0	0	0
Zapada columbiana	5	260	0	300	100	460	80
| Family: Perlidae	0	0	0	0	0	0	80
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	0	0	0	120	0	100	180
Isoperla	0	0	0	0	0	0	0
Kogotus	0	0	0	240	120	220	700
Megarcys	15	180	80	160	20	200	60
| Family: Taeniopterygidae	55	260	540	60	120	100	180
Taenionema	0	0	0	0	0	0	0
| Order: Trichoptera	0	0	20	2420	840	340	80
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	5	0	0	280	0	0	60
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
| Family: Glossosomatidae	10	80	0	0	0	0	0
Glossosoma	15	40	20	0	0	0	0
| Family: Hydropsychidae	10	100	0	0	40	220	60
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	0	0	20	0	20	0
Parapsyche elsis	15	0	20	100	60	200	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	120	0	20	0
Dicosmoecus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	0	40	0	140	120	280	0
Rhyacophila betteni group	0	20	0	20	0	20	0
Rhyacophila brunnea/vemna group	0	0	0	0	0	20	0
Rhyacophila hyalinata group	0	60	40	120	60	20	60
Rhyacophila vofixa group	0	0	0	80	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	140	0	20	0
Mallochohelea	0	0	0	220	60	80	20
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	120	540	340	420	100	600	1200
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	5	20	60	40	80	220	180
Constempellina sp. C	0	0	0	0	0	0	0
Micropsectra	0	0	0	0	0	0	20
Stempellina	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	15	0	0	880	160	1840	220
Pagastia	0	0	20	420	220	500	180
Pseudodiamesa	0	0	0	0	0	0	40
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	20	0
Corynoneura	0	0	0	40	0	20	0
Cricotopus (Nostococladius)	0	0	0	1920	600	2260	0
Eukiefferiella	5	20	0	80	0	520	280

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Sep-19						
	RG_HENUP1	RG_HENUP2	RG_HENUP3	RG_FO261	RG_FO262	RG_FO263	RG_FODHE1
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	5	0	20	40	0	0	540
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	5	160	80	1180	340	900	3980
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	0	20	20	0	0	0	20
Rheocricotopus	35	20	80	0	0	120	80
Synorthocladius	0	0	0	20	0	0	0
Thienemanniella	0	0	0	0	0	20	0
Tvetenia	0	40	0	80	20	140	480
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	5	0	20	20	0	0	0
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	60	20	0
Oreogeton	15	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	20	0	680	200	520	280
| Family: Simuliidae	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	0	0	0	0	0	20
| Family: Tipulidae	0	0	0	0	0	0	0
Antocha	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	0	0
Gonomyodes	10	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	0	0
Limnophila	0	0	0	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	20	0	40	0
| Family: Aturidae	0	0	0	0	0	0	40
Aturus	0	0	0	0	0	60	20
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	60	20	80	140
| Family: Hydryphantidae	0	0	0	0	0	0	0
Protzia	0	0	0	20	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	40
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	5	20	20	480	40	220	60
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	20	20	0	220	180	80	80
Sperchonopsis	0	0	0	0	0	20	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	5	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	20	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	60	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**1960**	**7320**	**6560**	**26920**	**13840**	**27840**	**26620**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FODHE2	RG_FODHE3	RG_FOUCL1	RG_FOUCL2	RG_FOUCL3	RG_FOUNGD1	RG_FOUNGD2
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	960	1240	140	0	40	20	0
| Family: Baetidae	0	20	60	0	20	0	0
Acentrella	0	0	0	0	0	0	0
Acentrella insignificans complex	0	0	0	0	0	0	0
Baetis	60	40	500	840	520	200	140
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	180	120	580	340	480	180	180
| Family: Ephemerellidae	6220	10960	6520	7660	5020	10820	11960
Caudatella	0	0	0	0	0	0	0
Drunella	0	0	0	0	0	0	0
Drunella coloradensis	20	0	0	0	0	0	0
Drunella doddsii	120	300	120	260	200	260	220
Drunella spinifera	0	0	0	20	20	0	0
Ephemerella	0	0	0	0	0	0	0
Ephemerella excrucians complex	40	20	120	60	60	0	0
| Family: Heptageniidae	7140	8980	8860	8040	5020	10920	11080
Cinygmula	0	0	20	0	0	0	20
Epeorus	40	0	20	200	80	100	40
Rhithrogena	40	0	0	20	140	20	60
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	20	20	0	0	0	0	60
Utacapnia	0	0	0	0	0	0	0
| Family: Chloroperlidae	20	20	40	100	60	80	100
Neaviperla	0	0	0	20	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	80	60	100	140	60
| Family: Leuctridae	20	0	40	0	80	100	20
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	20	0	60	240	20	0	140
Visoka cataractae	0	0	0	0	0	0	0
Zapada	1540	1200	380	420	160	500	600
Zapada oregonensis group	20	0	40	240	20	0	40
Zapada cinctipes	20	60	100	80	40	200	200
Zapada columbiana	40	0	0	40	40	0	0
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	160	200	360	300	220	180	40
Isoperla	0	0	0	0	0	0	0
Kogotus	600	500	320	340	60	800	400
Megarcys	120	60	100	80	180	180	180
| Family: Taeniopterygidae	100	80	60	100	20	180	220
Taenionema	0	0	0	0	0	0	0
| Order: Trichoptera	180	200	720	1540	220	160	100
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	120	140	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	20
| Family: Glossosomatidae	0	0	20	20	0	20	20
Glossosoma	0	0	20	0	20	0	0
| Family: Hydropsychidae	0	0	60	40	20	20	40
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	0	80	20	0	40	20	20
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	120	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	80	0	360	1000	280	320	500
Rhyacophila betteni group	0	0	0	0	20	0	20
Rhyacophila brunnea/vemna group	0	0	180	180	140	280	140
Rhyacophila hyalinata group	20	0	0	0	20	0	0
Rhyacophila vofixa group	0	0	0	40	20	0	0
Rhyacophila narvae	0	0	0	60	20	100	180
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	80	20	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	120	60	180	20	60
Mallochohelea	20	60	360	100	240	100	140
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	1420	940	1000	940	700	120	40
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	820	820	0	0	80	40	40
Constempellina sp. C	20	20	0	0	0	0	0
Micropsectra	160	580	320	180	20	20	20
Stempellina	0	0	0	0	0	0	0
Stempellinella	40	0	0	20	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	120	580	500	240	460	20	0
Pagastia	220	320	220	360	100	180	80
Pseudodiamesa	80	100	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	20	0	0	20	0	40	20
Corynoneura	40	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	20	100	400	280	160	100	160

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Sep-19						
	RG_FODHE2	RG_FODHE3	RG_FOUCL1	RG_FOUCL2	RG_FOUCL3	RG_FOUNGD1	RG_FOUNGD2
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	840	660	0	0	0	0	0
Limnophyes	0	40	0	0	0	0	0
Orthocladius complex	3360	4520	5580	5100	3480	1180	460
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	20	0	0	0	0	0	0
Rheocricotopus	60	80	0	20	0	0	0
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	20
Tvetenia	480	100	80	260	40	20	100
| Subfamily: Tanypodinae	0	20	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	0	20	20	40	80	0
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	40	60	0	20	0	20	0
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	0	0	80	40	0	60	0
Oreogeton	20	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	420	460	940	820	720	900	320
| Family: Simuliidae	20	0	0	0	20	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	0	20	40	60	20	20
| Family: Tipulidae	20	40	40	0	20	0	0
Antocha	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	40	20
Gonomyodes	0	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	20	0
Limnophila	0	0	0	0	0	20	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	60	20	20	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	20	40	40	20	40	80	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	180	200	40	180	60	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0
| Family: Hygrobatidae	100	180	0	0	0	20	0
Hygrobates	0	0	60	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	120	100	120	120	80	300	20
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	200	80	120	80	180	40	0
Sperchonopsis	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	20	40	80	0	20	40	40
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	26800	34440	30060	31480	20120	29280	28360

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FOUNGD3	RG_FODNGD1	RG_FODNGD2	RG_FODNGD3	RG_MP11	RG_MP12	RG_MP13
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	0	40	0	0	0	80	0
| Family: Baetidae	0	0	360	60	20	40	0
Acentrella	0	0	0	0	0	20	20
Acentrella insignificans complex	0	20	20	20	0	0	0
Baetis	140	240	180	100	140	360	360
Baetis fuscatus gr.	0	0	0	0	0	20	0
Baetis rhodani group	180	500	140	300	180	80	340
| Family: Ephemerellidae	2740	2200	2020	2420	760	480	500
Caudatella	0	0	0	0	0	0	0
Drunella	0	0	20	0	20	20	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	80	20	20	40	0	0	0
Drunella spinifera	0	0	20	40	0	40	60
Ephemerella	0	0	0	0	0	0	0
Ephemerella excrucians complex	0	40	0	0	0	0	0
| Family: Heptageniidae	4320	2160	2500	4460	1020	920	880
Cinygmula	0	0	20	0	0	0	0
Epeorus	20	40	0	120	0	0	20
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	20	0	0
| Family: Capniidae	0	0	0	0	0	20	0
Utacapnia	0	0	0	0	0	0	0
| Family: Chloroperlidae	20	0	20	0	0	0	0
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	40	100	20	40	0	0	0
| Family: Leuctridae	0	60	0	0	0	0	0
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	20	20
Visoka cataractae	0	0	0	0	0	0	0
Zapada	120	240	200	120	120	160	200
Zapada oregonensis group	0	60	20	60	20	20	40
Zapada cinctipes	40	120	40	20	0	0	100
Zapada columbiana	20	20	160	0	0	40	40
| Family: Perlidae	0	40	20	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	60	220	80	140	60	40	60
Isoperla	0	0	0	0	0	0	0
Kogotus	280	480	420	660	120	120	140
Megarcys	60	20	0	80	20	0	20
| Family: Taeniopterygidae	0	0	20	40	60	0	0
Taenionema	0	0	0	0	0	0	0
| Order: Trichoptera	60	40	0	100	400	200	180
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	0	0	0	0	200	60	160
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	40	40	0	20	0	0	0
| Family: Glossosomatidae	0	20	60	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	20	60	0	0	20	40
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	20	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	20	0	0
Hydroptila	0	0	0	0	0	20	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	60	80	60	300	20	40	120
Rhyacophila betteni group	0	0	0	20	0	0	0
Rhyacophila brunnea/vemna group	40	220	60	60	40	100	60
Rhyacophila hyalinata group	0	20	0	60	0	0	20
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila narvae	20	40	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	100	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	20	40	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	20	0	20	20	0	0	0
Mallochohelea	0	20	0	60	0	40	20
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	140	380	240	60	580	300	1000
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	20	20	0	0	0	120	0
Constempellina sp. C	0	0	20	0	0	0	0
Micropsectra	0	20	80	0	0	0	0
Stempellina	0	20	0	0	0	0	0
Stempellinella	0	0	0	0	0	20	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	20	0	20	0	40	40	240
Pagastia	100	140	180	80	480	80	80
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	20	20	0	0	0	0	0
Corynoneura	0	0	0	0	20	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	0	100	120	40	260	120	520

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Sep-19						
	RG_FOUNGD3	RG_FODNGD1	RG_FODNGD2	RG_FODNGD3	RG_MP11	RG_MP12	RG_MP13
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	20	0	0
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	1040	440	820	620	6440	2920	8540
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0
Rheocricotopus	0	20	0	0	0	20	0
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	20	20	0
Tvetenia	20	80	40	0	40	60	140
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	20	0	40	60	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	0	40	0	0	80	0	40
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	0	0	0	0	140	20	0
Neoplasta	20	0	20	0	0	20	0
Oreogeton	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	440	1060	740	560	140	400	140
| Family: Simuliidae	0	0	20	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	0	0	0	0	0	40
| Family: Tipulidae	0	0	60	0	20	0	0
Antocha	0	20	80	20	0	0	0
Dicranota	0	0	20	0	0	0	0
Gonomyodes	0	0	0	0	0	0	0
Hexatoma	0	40	0	0	0	0	0
Limnophila	0	0	0	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	20	20	40	20	20	20	20
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	20	20	40	40	40	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	80	40	100	60	60	40
| Family: Hydryphantidae	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	40	80	120	320	80	100	40
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	40	40	20	20	20	20	40
Sperchonopsis	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	20	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	20	20	20	0	0	20	20
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	20	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**10440**	**9800**	**9360**	**11300**	**11740**	**7400**	**14300**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FOUSH1	RG_FOUSH2	RG_FOUSH3	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FOBKS1
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	20	20	20	50	8	40	29
| Family: Baetidae	0	0	0	33	33	0	14
Acentrella	0	0	20	0	0	0	0
Acentrella insignificans complex	0	0	0	0	0	0	0
Baetis	300	20	120	183	25	240	43
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	160	160	260	83	25	30	71
| Family: Ephemerellidae	660	520	400	650	183	350	129
Caudatella	0	0	0	0	0	0	0
Drunella	0	0	0	0	33	0	14
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	100	0	40	50	0	40	29
Drunella spinifera	0	0	0	17	0	20	14
Ephemerella	0	20	20	0	0	20	14
Ephemerella excrucians complex	20	0	0	0	0	0	0
| Family: Heptageniidae	1720	1820	1460	1667	858	1220	1357
Cinygmula	0	0	0	0	0	0	0
Epeorus	100	40	140	17	8	10	29
Rhithrogena	0	0	0	0	0	0	14
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	40	0	0	33	17	40	43
Utacapnia	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	0	0	8	0	0
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	20	40	0	8	0	0
| Family: Leuctridae	0	0	0	0	0	0	0
Paraleuctra	0	20	0	0	0	0	0
| Family: Nemouridae	40	0	20	17	67	10	71
Visoka cataractae	0	0	0	0	0	0	0
Zapada	200	40	220	0	17	20	143
Zapada oregonensis group	60	80	100	17	8	0	14
Zapada cinctipes	60	140	80	17	0	10	414
Zapada columbiana	100	0	0	0	0	20	14
| Family: Perlidae	80	120	20	0	25	0	100
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	140	80	160	0	25	50	243
Isoperla	0	0	0	0	0	0	0
Kogotus	20	0	40	100	75	70	143
Megarcys	140	20	100	17	8	10	14
| Family: Taeniopterygidae	80	0	20	17	0	20	86
Taenionema	0	0	0	0	0	0	0
| Order: Trichoptera	60	20	80	83	50	20	14
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	0	20	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	40	60	40	17	17	10	29
| Family: Glossosomatidae	20	40	0	17	25	0	43
Glossosoma	0	20	0	17	0	0	0
| Family: Hydropsychidae	120	60	140	0	0	10	71
Arctopsyche	0	0	0	0	0	0	14
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	0	40	80	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	60	40	100	0	25	30	43
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	0	0	0	17	0	10	0
Rhyacophila hyalinata group	60	0	0	0	0	0	14
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	20	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	40	20	0	8	0	0
Mallochohelea	20	20	20	100	92	30	71
Probezzia	0	0	0	0	25	0	0
| Family: Chironomidae	200	80	240	183	108	280	57
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	8	0	0
| Tribe: Tanytarsini	60	0	0	217	33	0	0
Constempellina sp. C	0	0	0	0	0	0	0
Micropsectra	0	20	100	117	0	70	114
Stempellina	0	0	0	17	0	0	0
Stempellinella	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	17	0	30	0
Pagastia	120	100	80	50	0	40	71
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	20	20	0	0	0	14
Corynoneura	0	20	40	0	8	10	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	100	160	60	17	0	10	0

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FOUSH1	RG_FOUSH2	RG_FOUSH3	RG_FOUKI1	RG_FOUKI2	RG_FOUKI3	RG_FOBKS1
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	20	60	0	183	0	50	0
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	2040	1760	2860	717	275	760	14
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0
Rheocricotopus	0	0	0	0	0	0	0
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	40	0	0	17	0	10	0
Tvetenia	220	60	80	83	25	40	114
| Subfamily: Tanypodinae	0	0	0	33	17	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	80	160	160	83	33	100	29
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	20	40	100	33	8	30	0
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	20	0	0	17	0	0	0
Neoplasta	0	0	20	0	0	0	14
Oreogeton	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	240	280	280	600	333	350	857
| Family: Simuliidae	0	0	20	17	75	10	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	20	0	20	0	0	0	0
| Family: Tipulidae	20	0	0	17	17	0	0
Antocha	20	20	0	0	0	20	0
Dicranota	0	0	0	0	0	0	0
Gonomyodes	0	0	0	0	0	0	0
Hexatoma	0	40	0	0	0	10	0
Limnophila	0	0	0	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	60	33	17	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	20	0	33	0	20	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	40	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Hygrobates	20	0	0	0	0	10	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	60	20	60	117	42	150	114
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	0	0	10	0
Sperchonopsis	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	57
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	100	83	75	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	60	60	0	0	0	30	0
| Family: Naididae	0	0	20	0	0	0	0
Nais	40	20	0	33	25	20	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**7880**	**6420**	**8080**	**5936**	**2772**	**4390**	**4796**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FOBKS2	RG_FOBKS3	RG_SCOUTDS1	RG_SCOUTDS2	RG_SCOUTDS3	RG_FOBSC1	RG_FOBSC2
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	11	29	17	100	20	100	20
| Family: Baetidae	0	29	0	0	0	33	0
Acentrella	0	0	0	0	0	0	0
Acentrella insignificans complex	0	0	0	0	0	0	0
Baetis	56	0	33	60	20	100	50
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	67	114	17	60	40	50	40
| Family: Ephemerellidae	167	400	333	220	840	383	160
Caudatella	0	0	0	0	0	0	0
Drunella	0	14	0	20	20	0	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	22	100	100	40	20	50	10
Drunella spinifera	11	0	33	20	0	33	20
Ephemerella	0	0	0	0	0	0	0
Ephemerella excrucians complex	11	14	0	0	0	0	10
| Family: Heptageniidae	1200	1686	1567	2160	3120	1617	1440
Cinygmula	0	0	0	0	0	0	0
Epeorus	67	71	200	20	140	117	130
Rhithrogena	44	0	33	20	20	0	20
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	0	29	50	0	20	17	0
Utacapnia	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	0	0	60	0	0
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	0	0	0	0	0
| Family: Leuctridae	0	14	0	0	0	0	0
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	133	0	0	100	10
Visoka cataractae	0	0	0	0	0	0	0
Zapada	89	186	133	40	240	0	120
Zapada oregonensis group	0	0	0	0	20	0	10
Zapada cinctipes	189	186	167	180	160	233	280
Zapada columbiana	0	0	0	20	0	0	0
| Family: Perlidae	0	14	67	20	0	17	10
Hesperoperla	44	0	0	0	0	0	0
| Family: Perlodidae	122	400	383	420	380	183	230
Isoperla	0	0	0	0	0	17	0
Kogotus	133	71	417	440	640	300	180
Megarcys	67	57	67	100	20	0	20
| Family: Taeniopterygidae	11	71	333	160	200	167	180
Taenionema	0	0	33	0	20	100	30
| Order: Trichoptera	11	86	33	20	120	66	60
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	11	0	0	0	0	33	0
Pedomoecus sierra	0	0	17	0	0	0	0
| Family: Brachycentridae	33	14	83	0	0	0	0
| Family: Glossosomatidae	44	14	0	40	40	0	0
Glossosoma	0	14	0	0	0	0	0
| Family: Hydropsychidae	0	29	50	40	0	33	20
Arctopsyche	0	0	0	0	20	0	0
Parapsyche	0	0	0	0	0	0	20
Parapsyche elsis	11	14	17	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	17	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	0	29	17	0	0	0	40
Rhyacophila betteni group	11	0	0	20	0	0	0
Rhyacophila brunnea/vemna group	67	29	17	60	40	33	0
Rhyacophila hyalinata group	22	29	17	0	20	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	20	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	11	0	0	20	0	0	0
Heterlimnius	0	29	17	0	20	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0
Mallochohelea	33	86	0	0	0	0	0
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	56	86	83	140	20	117	170
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Constempellina sp. C	0	0	33	0	40	33	0
Micropsectra	22	71	233	320	80	517	120
Stempellina	0	0	0	0	0	0	0
Stempellinella	11	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	0
Pagastia	11	0	33	60	0	17	40
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	17	0
Corynoneura	0	29	17	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	0	0	0	0	0	0	10

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FOBKS2	RG_FOBKS3	RG_SCOUTDS1	RG_SCOUTDS2	RG_SCOUTDS3	RG_FOBSC1	RG_FOBSC2
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	14	0	40	20	50	0
Limnophyes	0	0	0	20	0	0	0
Orthocladius complex	11	43	33	20	60	0	30
Parametriocnemus	0	0	0	0	20	0	10
Parorthocladius	0	0	0	0	0	0	0
Rheocricotopus	0	0	0	0	0	0	0
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0
Tvetenia	33	71	117	200	120	167	20
| Subfamily: Tanypodinae	0	0	0	0	0	17	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	11	29	83	0	80	67	10
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	11	29	50	40	20	50	30
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	0	14	0	0	0	0	0
Neoplasta	22	0	0	20	0	0	0
Oreogeton	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	14	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	667	929	650	700	860	950	470
| Family: Simuliidae	0	14	0	0	0	0	20
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	0	17	20	20	0	0
| Family: Tipulidae	11	0	34	60	40	17	0
Antocha	0	0	0	0	0	0	0
Dicranota	0	0	0	0	20	0	0
Gonomyodes	0	0	0	0	0	0	0
Hexatoma	0	0	17	0	0	0	0
Limnophila	0	0	0	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	17	10
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	67	114	33	160	140	200	70
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	11	14	0	0	0	0	0
Sperchonopsis	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	111	71	117	260	40	100	80
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	40	0	0	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**3620**	**5400**	**5934**	**6420**	**7840**	**6135**	**4200**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FOBSC3	RG_FOBCP1	RG_FOBCP2	RG_FOBCP3	RG_FOBCP4	RG_FOBCP5	RG_FRCP1SW1
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	13	0	50	14	0	70	0
| Family: Baetidae	0	0	5	14	60	20	0
Acentrella	0	0	0	14	40	20	20
Acentrella insignificans complex	0	0	0	0	0	0	0
Baetis	27	380	75	271	340	240	300
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	27	40	50	186	340	220	460
| Family: Ephemerellidae	40	120	95	157	100	60	140
Caudatella	0	0	0	0	0	0	0
Drunella	7	0	0	14	0	0	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	13	40	5	0	80	0	80
Drunella spinifera	7	0	5	14	0	20	0
Ephemerella	0	0	0	14	20	0	0
Ephemerella excrucians complex	7	0	0	14	0	0	0
| Family: Heptageniidae	673	1480	345	486	860	190	1180
Cinygmula	0	0	0	0	0	0	0
Epeorus	13	20	0	14	20	10	20
Rhithrogena	13	0	0	0	0	0	20
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	7	40	50	14	20	20	240
Utacapnia	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	0	0	0	0	20
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	20	0	0	0	0	20
| Family: Leuctridae	0	0	0	0	0	0	40
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	0	140	10	0	0	0	40
Visoka cataractae	0	0	0	0	0	0	0
Zapada	100	240	15	243	360	30	440
Zapada oregonensis group	0	0	5	0	0	0	0
Zapada cinctipes	153	40	10	100	260	10	240
Zapada columbiana	0	0	0	0	0	0	0
| Family: Perlidae	0	160	5	157	120	10	80
Hesperoperla	0	0	0	14	0	0	0
| Family: Perlodidae	207	1140	160	643	1360	300	3440
Isoperla	0	0	0	0	0	0	0
Kogotus	67	60	25	200	60	90	380
Megarcys	0	60	0	0	20	0	40
| Family: Taeniopterygidae	33	80	30	71	100	10	1040
Taenionema	0	0	0	0	0	0	180
| Order: Trichoptera	26	40	25	86	100	10	60
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	20	0	0	0	0	0	220
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	20	10	43	20	0	180
| Family: Glossosomatidae	7	0	0	0	0	0	40
Glossosoma	0	0	0	0	0	0	20
| Family: Hydropsychidae	7	20	0	0	40	0	20
Arctopsyche	0	20	0	14	0	0	0
Parapsyche	0	0	0	0	0	0	80
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	5	0	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	7	40	0	0	20	0	20
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	7	0	0	14	0	0	0
Rhyacophila hyalinata group	0	0	0	0	0	0	20
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0
Mallochohelea	13	0	15	0	20	10	20
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	100	520	50	314	680	360	220
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Polypedilum	0	0	5	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Constempellina sp. C	7	0	0	0	0	0	0
Micropsectra	120	220	30	43	140	70	120
Stempellina	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	20
Pagastia	33	20	5	57	20	60	40
Pseudodiamesa	0	0	0	0	0	10	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	0	20	0	29	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	0	40	0	129	380	30	100

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Sep-19						
	RG_FOBSC3	RG_FOBCP1	RG_FOBCP2	RG_FOBCP3	RG_FOBCP4	RG_FOBCP5	RG_FRCP1SW1
Heterotrissocladius	0	0	0	0	20	0	0
Hydrobaenus	13	0	50	0	20	70	0
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	0	40	55	543	1160	800	300
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	0	20	0	14	0	0	0
Rheocricotopus	0	0	0	14	0	0	0
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	0	5	14	0	0	0
Tvetenia	87	380	50	243	800	70	360
| Subfamily: Tanypodinae	0	0	0	0	0	10	20
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	7	0	0	0	20	0	20
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	13	0	5	57	100	40	20
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	0	0	0	0	0	0	0
Oreogeton	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	467	280	260	343	380	210	540
| Family: Simuliidae	0	80	0	14	0	0	60
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	80	10	14	60	0	180
| Family: Tipulidae	0	0	10	0	0	10	0
Antocha	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	0	20
Gonomyodes	0	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	0	0
Limnophila	0	0	0	0	0	0	0
Rhabdomastix	0	0	5	0	0	0	0
Tipula	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	5	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	15	0	0	20	40
Hygrobates	7	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	47	20	80	186	40	190	100
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	13	20	0	43	20	10	20
Sperchonopsis	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	10	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	5	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	340	70	271	240	200	120
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	20	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	7	0	0	0	0	0	40
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**2435**	**6280**	**1710**	**5139**	**8440**	**3510**	**11440**

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Sep-19						
	RG_FRCP1SW2	RG_FRCP1SW3	RG_FRUPO1	RG_FRUPO2	RG_FRUPO3	RG_FODPO1	RG_FODPO2
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	20	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	0	9	0	0	20	60	20
| Family: Baetidae	0	0	0	0	30	360	0
Acentrella	0	0	0	0	0	0	0
Acentrella insignificans complex	0	0	0	0	0	0	0
Baetis	20	0	167	160	60	480	480
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	80	55	100	180	110	680	480
| Family: Ephemerellidae	120	36	133	60	70	100	180
Caudatella	0	0	0	0	0	0	0
Drunella	0	0	0	0	20	0	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	20	27	33	0	10	0	0
Drunella spinifera	0	0	17	0	0	0	40
Ephemerella	0	0	17	40	20	0	0
Ephemerella excrucians complex	0	0	0	0	20	20	0
| Family: Heptageniidae	520	409	500	140	90	620	380
Cinygmula	0	9	0	0	0	0	0
Epeorus	0	0	0	0	0	0	0
Rhithrogena	60	9	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	140	18	67	0	0	240	260
Utacapnia	0	0	0	0	0	320	160
| Family: Chloroperlidae	0	9	0	20	20	40	40
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	0	20	10	60	60
| Family: Leuctridae	40	0	0	0	10	0	0
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	50	40	120	20	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	120	45	433	280	0	2140	1340
Zapada oregonensis group	20	0	0	20	0	100	80
Zapada cinctipes	120	100	0	140	10	180	160
Zapada columbiana	0	0	33	20	0	260	100
| Family: Perlidae	20	0	0	20	10	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	1860	582	2583	4200	1860	2500	1300
Isoperla	760	245	0	0	0	0	0
Kogotus	0	245	233	300	60	380	480
Megarcys	0	18	33	160	0	0	0
| Family: Taeniopterygidae	960	27	167	60	10	320	0
Taenionema	360	127	0	0	0	0	0
| Order: Trichoptera	140	73	150	20	0	0	140
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	0	100	233	100	90	60	380
Pedomoecus sierra	0	0	0	0	0	40	0
| Family: Brachycentridae	20	9	0	0	0	0	0
| Family: Glossosomatidae	0	9	0	20	10	20	0
Glossosoma	0	0	0	20	10	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Hydroptilidae	20	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	140	180
Dicosmoecus	0	0	33	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	20	18	17	40	40	80	0
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	0	0	0	20	10	20	20
Rhyacophila hyalinata group	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	67	20	20	160	220
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	0
Oreodytes	0	0	0	0	0	20	0
| Family: Elmidae	0	0	0	0	0	220	160
Heterlimnius	0	0	0	20	0	140	440
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	33	0	30	0	0
Mallochohelea	0	0	67	0	20	60	20
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	480	55	250	340	240	1060	560
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	20	0	0
Constempellina sp. C	0	0	0	0	0	0	0
Micropsectra	0	18	17	0	0	0	20
Stempellina	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	20	20	0	0
Pagastia	20	55	100	60	50	60	140
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	40	0	33	120	40	480	80

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FRCP1SW2	RG_FRCP1SW3	RG_FRUPO1	RG_FRUPO2	RG_FRUPO3	RG_FODPO1	RG_FODPO2
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	20	10	0	80
Limnophyes	40	0	0	0	0	20	0
Orthocladius complex	60	18	383	1160	690	1140	1000
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	20
Rheocricotopus	20	0	0	0	0	0	0
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	9	0	0	0	0	0
Tvetenia	80	27	17	80	40	580	120
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	20	9	17	20	60	80	20
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	0	0	17	0	0	0	0
Neoplasta	0	0	33	20	10	60	20
Oreogeton	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	200	318	117	100	80	120	100
| Family: Simuliidae	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	0	0	20	0	0	40
| Family: Tipulidae	20	0	0	0	0	100	40
Antocha	0	0	0	0	0	0	0
Dicranota	0	0	17	0	10	0	0
Gonomyodes	0	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	0	20
Limnophila	0	0	0	0	0	0	0
Rhabdomastix	0	0	0	20	10	0	0
Tipula	0	0	17	0	0	60	20
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	17	40	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	60	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	0	0	20	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	20	73	83	0	100	260	500
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	20	10	0	0
Sperchonopsis	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	60	0
Pisidium	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	260	191	0	0	60	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	17	0	0	40	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
| Subfamily: Tubificinae with hair chaetae	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	0
Totals:	**6700**	**2952**	**6301**	**8160**	**4240**	**14040**	**9900**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FODPO3	RG_FO221	RG_FO222	RG_FO223	RG_FO224	RG_FO225	RG_FOUEW1
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	0	0	0	0	0	0	20
| Family: Baetidae	0	0	0	40	20	20	20
Acentrella	0	0	0	0	0	0	0
Acentrella insignificans complex	0	0	0	0	0	0	0
Baetis	440	50	80	200	280	260	20
Baetis fuscatus gr.	0	0	0	0	0	0	0
Baetis rhodani group	520	100	100	180	100	200	40
| Family: Ephemerellidae	20	283	260	860	480	440	180
Caudatella	0	0	0	0	0	0	0
Drunella	20	0	20	0	20	40	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	0	67	0	0	20	40	20
Drunella spinifera	60	0	40	20	0	80	20
Ephemerella	100	0	0	20	0	0	0
Ephemerella excrucians complex	0	17	0	0	0	0	0
| Family: Heptageniidae	560	350	160	320	240	380	820
Cinygmula	0	0	0	0	0	0	20
Epeorus	0	0	0	0	0	0	0
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	40	33	40	60	180	80	100
Utacapnia	20	0	0	0	0	0	0
| Family: Chloroperlidae	40	0	0	20	40	20	20
Neaviperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	0	0	0	0	0	0	40
| Family: Leuctridae	0	17	0	0	0	0	0
Paraleuctra	0	0	0	0	0	0	0
| Family: Nemouridae	80	17	60	40	0	140	20
Visoka cataractae	0	0	0	0	0	0	0
Zapada	1820	1000	740	860	280	1220	540
Zapada oregonensis group	420	33	60	40	20	40	160
Zapada cinctipes	300	383	160	80	40	200	60
Zapada columbiana	240	17	60	0	0	40	120
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	17	0	0	0	0	0
| Family: Perlodidae	1960	533	420	700	440	1080	100
Isoperla	0	100	0	220	180	20	0
Kogotus	520	133	140	460	240	300	100
Megarcys	20	33	0	0	20	20	40
| Family: Taeniopterygidae	80	133	20	140	40	80	20
Taenionema	0	0	0	0	0	0	0
| Order: Trichoptera	180	17	80	220	0	80	20
| Family: Apataniidae	0	0	0	0	0	0	0
Apatania	0	17	0	60	0	20	0
Pedomoecus sierra	0	0	20	0	20	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	283	100	180	360	80	20
Glossosoma	20	0	0	0	0	0	0
| Family: Hydropsychidae	20	0	0	20	0	20	20
Arctopsyche	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
Hydroptila	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	150	440	1720	380	480	40
Dicosmoecus	0	0	0	0	0	0	20
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	80	150	100	20	40	0	40
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	80	0	0	80	40	20	100
Rhyacophila hyalinata group	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila narvae	100	17	20	20	20	40	40
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Dytiscidae	0	0	0	0	0	0	20
Oreodytes	0	0	0	0	0	0	0
| Family: Elmidae	80	533	1140	2080	1640	760	240
Heterlimnius	320	467	640	1400	1140	720	100
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	20	0	0
Mallochohelea	40	0	20	0	0	40	20
Probezzia	0	0	0	0	0	0	0
| Family: Chironomidae	840	33	0	120	0	0	220
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
| Tribe: Tanytarsini	20	0	0	0	0	0	0
Constempellina sp. C	0	0	0	0	0	0	0
Micropsectra	0	0	0	0	0	0	80
Stempellina	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	20
Pagastia	200	50	40	100	80	200	120
Pseudodiamesa	0	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	20
Corynoneura	20	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	600	33	0	0	0	40	60

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19						
	RG_FODPO3	RG_FO221	RG_FO222	RG_FO223	RG_FO224	RG_FO225	RG_FOUEW1
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	20	0	0	0	0	0	0
Limnophyes	20	0	0	20	0	0	0
Orthocladius complex	1540	233	160	540	220	660	620
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0
Rheocricotopus	20	0	20	0	0	0	40
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	20
Tvetenia	460	0	20	20	20	60	40
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	20	0
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	20	17	40	40	0	40	0
Chelifera/ Metachela	0	0	0	0	0	0	40
Clinocera	0	0	0	0	0	0	20
Neoplasta	200	50	0	0	20	0	40
Oreogeton	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	100	17	180	0	40	120	40
| Family: Simuliidae	60	0	0	0	0	0	0
Prosimulium/Helodon	20	0	0	0	0	0	0
Simulium	480	0	0	0	0	0	0
| Family: Tipulidae	0	0	60	0	60	40	40
Antocha	0	0	0	0	0	0	20
Dicranota	20	33	0	0	20	60	0
Gonomyodes	0	0	0	0	0	0	0
Hexatoma	0	0	0	0	0	0	0
Limnophila	0	0	0	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	33	20	60	0	20	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	20	0	20	20	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	20	0	0	0	0	40	80
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Protzia	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	160	67	200	240	160	320	380
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	40	0	20	0	0	20	0
Sperchonopsis	0	0	0	0	0	0	20
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	33	440	0	100	80	0
Pisidium	0	0	40	0	20	40	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	40	0	0	0
Enchytraeus	0	17	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	83	100	100	360	460	920
| Subfamily: Tubificinae with hair chaetae	0	17	0	0	0	20	0
| Subfamily: Tubificinae without hair chaetae	0	0	0	0	0	0	160
Totals:	**13040**	**5666**	**6280**	**11340**	**7420**	**9220**	**6160**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Sep-19	
	RG_FOUEW2	RG_FOUEW3
Phylum: Arthropoda	0	0
| Order: Collembola	0	0
Subphylum: Hexapoda	0	0
| Class: Insecta	0	0
| Order: Ephemeroptera	0	0
| Family: Ameletidae	0	0
Ameletus	60	40
| Family: Baetidae	60	0
Acentrella	0	0
Acentrella insignificans complex	0	0
Baetis	80	140
Baetis fuscatus gr.	0	0
Baetis rhodani group	40	180
| Family: Ephemerellidae	380	420
Caudatella	0	0
Drunella	0	40
Drunella coloradensis	0	0
Drunella doddsii	60	0
Drunella spinifera	20	0
Ephemerella	0	0
Ephemerella excrucians complex	0	0
| Family: Heptageniidae	1780	1720
Cinygmula	0	20
Epeorus	0	0
Rhithrogena	0	0
| Order: Plecoptera	0	0
| Family: Capniidae	20	60
Utacapnia	0	40
| Family: Chloroperlidae	20	100
Neaviperla	0	0
Suwallia	0	20
Sweltsa	0	40
| Family: Leuctridae	0	0
Paraleuctra	0	0
| Family: Nemouridae	0	20
Visoka cataractae	20	0
Zapada	580	840
Zapada oregonensis group	320	220
Zapada cinctipes	240	280
Zapada columbiana	20	0
| Family: Perlidae	40	120
Hesperoperla	20	0
| Family: Perlodidae	260	240
Isoperla	0	0
Kogotus	340	120
Megarcys	20	40
| Family: Taeniopterygidae	0	80
Taenionema	0	0
| Order: Trichoptera	20	0
| Family: Apataniidae	0	0
Apatania	0	0
Pedomoecus sierra	0	0
| Family: Brachycentridae	0	0
| Family: Glossosomatidae	20	20
Glossosoma	0	0
| Family: Hydropsychidae	20	20
Arctopsyche	0	0
Parapsyche	0	0
Parapsyche elsis	20	0
| Family: Hydroptilidae	0	0
Hydroptila	0	0
| Family: Leptoceridae	0	0
| Family: Limnephilidae	0	20
Dicosmoecus	20	0
| Family: Rhyacophilidae	0	0
Rhyacophila	140	60
Rhyacophila betteni group	0	0
Rhyacophila brunnea/vemna group	200	120
Rhyacophila hyalinata group	0	0
Rhyacophila vofixa group	0	0
Rhyacophila narvae	0	0
| Family: Thremmatidae	0	0
Oligophlebodes	0	0
| Order: Coleoptera	0	0
| Family: Dytiscidae	0	0
Oreodytes	0	0
| Family: Elmidae	840	240
Heterlimnius	580	480
| Order: Diptera	0	0
| Family: Ceratopogonidae	0	0
Mallochohelea	0	20
Probezzia	0	0
| Family: Chironomidae	280	320
| Subfamily: Chironominae	0	0
| Tribe: Chironomini	0	0
Polypedilum	0	0
| Tribe: Tanytarsini	0	0
Constempellina sp. C	0	0
Micropsectra	0	20
Stempellina	0	0
Stempellinella	0	0
| Subfamily: Diamesinae	0	0
| Tribe: Diamesini	0	0
Diamesa	0	20
Pagastia	120	60
Pseudodiamesa	0	0
| Subfamily: Orthocladiinae	0	0
Brillia	20	0
Corynoneura	20	0
Cricotopus (Nostococladius)	0	0
Eukiefferiella	140	500

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Sep-19	
	RG_FOUEW2	RG_FOUEW3
Heterotrissocladius	0	0
Hydrobaenus	40	120
Limnophyes	20	0
Orthocladius complex	500	1380
Parametriocnemus	0	0
Parorthocladius	0	40
Rheocricotopus	0	40
Synorthocladius	0	0
Thienemanniella	0	0
Tvetenia	100	60
| Subfamily: Tanypodinae	0	0
| Tribe: Pentaneurini	0	0
Thienemannimyia group	0	0
| Family: Dixidae	20	0
| Family: Empididae	60	40
Chelifera/ Metachela	0	0
Clinocera	0	40
Neoplasta	80	120
Oreogeton	0	0
| Family: Pelecorhynchidae	0	0
Glutops	0	0
| Family: Psychodidae	0	0
Pericoma/Telmatoscopus	60	40
| Family: Simuliidae	0	0
Prosimulium/Helodon	0	0
Simulium	0	20
| Family: Tipulidae	20	20
Antocha	0	20
Dicranota	0	0
Gonomyodes	0	0
Hexatoma	0	0
Limnophila	0	0
Rhabdomastix	0	0
Tipula	0	0
Subphylum: Chelicerata	0	0
| Class: Arachnida	0	0
| Order: Trombidiformes	20	20
| Family: Aturidae	0	0
Aturus	40	0
| Family: Feltriidae	0	0
Feltria	0	20
| Family: Hydryphantidae	0	0
Protzia	0	0
| Family: Hygrobatidae	0	0
Hygrobates	0	0
| Family: Lebertiidae	0	0
Lebertia	480	380
| Family: Sperchontidae	0	0
Sperchon	20	0
Sperchonopsis	0	0
| Family: Torrenticolidae	0	0
Testudacarus	0	0
Suborder: Prostigmata	0	0
| Family: Stygothrombidiidae	0	0
Stygothrombium	0	0
| Order: Sarcoptiformes	0	0
| Order: Oribatida	0	0
Phylum: Mollusca	0	0
| Class: Bivalvia	0	0
| Order: Veneroida	0	0
| Family: Pisidiidae	20	0
Pisidium	0	0
Phylum: Annelida	0	0
Subphylum: Clitellata	0	0
| Class: Oligochaeta	0	0
| Order: Lumbriculida	0	0
| Family: Lumbriculidae	0	0
| Order: Tubificida	0	0
| Family: Enchytraeidae	0	0
Enchytraeus	0	0
| Family: Naididae	0	0
Nais	600	180
| Subfamily: Tubificinae with hair chaetae	0	0
| Subfamily: Tubificinae without hair chaetae	0	0
Totals:	**8900**	**9220**

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19							
	RG_UFR11		RG_UFR12		RG_UFR13		RG_FOUKI1	
Phylum: Arthropoda	0		0		0		0	
Subphylum: Hexapoda	0		0		0		0	
| Class: Insecta	0		0		0		0	
| Order: Ephemeroptera	0		0		0		0	
| Family: Ameletidae	0		0		0		0	
Ameletus	0		0		2		1	
| Family: Baetidae	69	ND	5	ND	5	ND	16	ND
Baetis	12	ND	1	ND	1		1	ND
Baetis rhodani group	25		2		5		13	
| Family: Ephemerellidae	274		115		230		28	ND
Caudatella	1		0		0		0	
Drunella	0		0		0		0	
Drunella grandis group	0		0		0		0	
Drunella doddsii	5		6		3		1	
Drunella grandis	0		0		0		1	
Ephemerella	0		0		0		2	
| Family: Heptageniidae	230		80		99		37	
Cinygmula	52		12		15		14	
Epeorus	1		0		0		63	
Rhithrogena	0		0		0		5	
| Order: Plecoptera	0		0		0		0	
| Family: Capniidae	1		3		0		6	
| Family: Chloroperlidae	5		1		0		2	
Haploperla	0		0		0		0	
Sweltsa	11		7		1		1	
| Family: Leuctridae	8		2		2		0	
Paraleuctra	2		4		1		0	
| Family: Nemouridae	233		18		73		45	
Visoka cataractae	0		1		0		0	
Zapada	106	ND	52		69		8	ND
Zapada oregonensis group	8		7		4		2	
Zapada cinctipes	4		2		1		2	
Zapada columbiana	1		0		0		1	
| Family: Perlidae	0		0		0		0	
Hesperoperla	0		0		0		0	
| Family: Perlodidae	0		0		0		0	
Isoperla	1		0		0		0	
Kogotus	18		12		15		5	
Megarcys	0		6		3		0	
Skwala	0		0		0		0	
| Family: Taeniopterygidae	20		6		0		2	
| Order: Trichoptera	0		0		0		0	
| Family: Apataniidae	0		0		0		0	
Apatania	0		0		1		0	
Pedomoecus sierra	0		0		0		0	
| Family: Brachycentridae	0		0		0		0	
Brachycentrus	0		0		0		1	
| Family: Glossosomatidae	0		0		0		0	
Anagapetus	0		1		0		0	
Glossosoma	0		0		0		0	
| Family: Hydropsychidae	0		0		0		0	
Arctopsyche	0		0		0		0	
Parapsyche	12	ND	1	ND	0		2	
Parapsyche elsis	2		2		1		0	
| Family: Hydroptilidae	0		0		0		0	
| Family: Lepidostomatidae	0		0		0		0	
Lepidostoma	0		0		0		0	
| Family: Limnephilidae	0		2		0		0	
Ecclisomyia	0		2		3		0	
| Family: Rhyacophilidae	0		0		0		0	
Rhyacophila	15		5		1		0	
Rhyacophila betteni group	6		3		2		0	
Rhyacophila brunnea/vemna group	0		2		0		2	
Rhyacophila hyalinata group	3		0		4		1	
Rhyacophila vofixa group	1		0		1		0	
Rhyacophila atrata complex	3		5		1		0	
Rhyacophila narvae	0		1		0		0	
| Family: Thremmatidae	0		0		0		0	
Oligophlebodes	55		75		112		0	
| Order: Coleoptera	0		0		0		0	
| Family: Elmidae	0		0		0		0	
Heterlimnius	0		0		0		1	
| Order: Diptera	0		0		0		0	
| Family: Ceratopogonidae	0		0		0		0	
Bezzia/ Palpomyia	0		0		0		0	
| Family: Chironomidae	0		0		1	ND	0	
| Subfamily: Chironominae	0		0		0		0	
| Tribe: Tanytarsini	58	ND	4	ND	45		13	ND
Micropsectra	19		4		19		0	
Stempellinella	0		0		0		0	
Tanytarsus	0		0		0		16	
| Subfamily: Diamesinae	0		0		0		0	
| Tribe: Diamesini	0		0		0		0	
Diamesa	0		0		1		0	
Pagastia	24		8		13		44	
Pseudodiamesa	1		0		0		1	
| Subfamily: Orthocladiinae	0		0		0		0	
Brillia	1		1		0		0	
Cricotopus (Nostococladius)	8		3		6		0	
Eukiefferiella	29		4		3		28	
Hydrobaenus	0		0		0		5	
Limnophyes	0		0		0		0	
Orthocladius complex	20		0		5		8	
Parakiefferiella	0		0		0		0	
Rheocricotopus	0		0		1		0	
Tvetenia	80		11		7		68	
| Subfamily: Tanypodinae	0		0		0		0	
| Tribe: Pentaneurini	0		0		0		0	
Thienemannimyia group	0		0		0		8	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: **Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019**

Sample:	Dec-19							
	RG_UFR11		RG_UFR12		RG_UFR13		RG_FOUKI1	
| Family: Empididae	0		0		0		1	
Chelifera/ Metachela	8		3		9		0	
Clinocera	1		0		0		1	
Neoplasta	4		5		3		0	
Roederiodes	0		0		0		0	
| Order: Tipuloidea	0		0		0		0	
| Family: Limoniidae	0		0		0		0	
Eloeophila	0		0		0		0	
| Family: Psychodidae	0		0		0		0	
Pericoma/Telmatoscopus	7		8		6		24	
| Family: Simuliidae	0		0		0		0	
Prosimulium	0		0		0		0	
Simulium	0		1		0		0	
| Family: Tipulidae	0		0		0		0	
Antocha	2		1		0		2	
Dicranota	1		2		0		1	
Hesperoconopa	0		0		1		0	
Hexatoma	0		0		0		2	
Tipula	0		0		0		0	
Subphylum: Chelicerata	0		0		0		0	
| Class: Arachnida	0		0		0		0	
| Order: Trombidiformes	0		0		0		0	
| Family: Aturidae	0		0		0		0	
Aturus	1		0		0		3	
| Family: Feltriidae	0		0		0		0	
Feltria	6		3		4		0	
| Family: Hygrobatidae	0		0		0		0	
Hygrobates	0		0		1		0	
| Family: Lebertiidae	0		0		0		0	
Lebertia	19		2		10		15	
| Family: Sperchontidae	0		0		0		0	
Sperchon	10		7		7		2	
| Family: Torrenticolidae	0		0		0		0	
Testudacarus	0		0		0		0	
Suborder: Prostigmata	0		0		0		0	
| Family: Stygothrombidiidae	0		0		0		0	
Stygothrombium	2		0		0		0	
Phylum: Mollusca	0		0		0		0	
| Class: Bivalvia	0		0		0		0	
| Order: Veneroida	0		0		0		0	
| Family: Pisidiidae	0		0		0		0	
Phylum: Annelida	0		0		0		0	
Subphylum: Clitellata	0		0		0		0	
| Class: Oligochaeta	0		0		0		0	
| Order: Lumbriculida	0		0		0		0	
| Family: Lumbriculidae	0		0		0		0	
| Order: Tubificida	0		0		0		0	
| Family: Enchytraeidae	0		0		0		0	
Enchytraeus	0		0		0		0	
| Family: Naididae	0		0		0		0	
Nais	0		0		0		0	
Totals:	**1485**		**508**		**797**		**505**	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19							
	RG_FOUKI2		RG_FOUKI3		RG_SCOUTDS1		RG_SCOUTDS2	
Phylum: Arthropoda	0		0		0		0	
Subphylum: Hexapoda	0		0		0		0	
| Class: Insecta	0		0		0		0	
| Order: Ephemeroptera	0		0		0		0	
| Family: Ameletidae	0		0		0		0	
Ameletus	2		0		0		0	
| Family: Baetidae	8	ND	0		4	ND	9	ND
Baetis	0		0		2	ND	3	ND
Baetis rhodani group	4		8		36		43	
| Family: Ephemerellidae	9		20		11		11	
Caudatella	0		0		0		0	
Drunella	0		0		0		0	
Drunella grandis group	0		0		0		0	
Drunella doddsii	0		1		0		3	
Drunella grandis	0		0		1		0	
Ephemerella	0		2		0		0	
| Family: Heptageniidae	35		41		25		15	
Cinygmula	9		26		21		15	
Epeorus	52		92		74		33	
Rhithrogena	1		2		3		7	
| Order: Plecoptera	0		0		0		0	
| Family: Capniidae	9		4		8		18	
| Family: Chloroperlidae	0		0		1		0	
Haploperla	0		0		0		2	
Sweltsa	1		2		0		0	
| Family: Leuctridae	1		0		0		0	
Paraleuctra	0		0		0		0	
| Family: Nemouridae	39		113		476		308	
Visoka cataractae	0		0		0		0	
Zapada	2		5		5		6	
Zapada oregonensis group	0		0		0		0	
Zapada cinctipes	4		3		4		6	
Zapada columbiana	1		0		0		1	
| Family: Perlidae	0		0		1		0	
Hesperoperla	0		2		0		0	
| Family: Perlodidae	0		1		2		0	
Isoperla	1		1		14		19	
Kogotus	0		2		10		10	
Megarcys	0		7		5		0	
Skwala	0		0		0		0	
| Family: Taeniopterygidae	0		1		16		28	
| Order: Trichoptera	0		0		0		0	
| Family: Apataniidae	0		0		0		0	
Apatania	0		0		0		0	
Pedomoecus sierra	0		0		0		0	
| Family: Brachycentridae	0		0		0		0	
Brachycentrus	0		0		0		0	
| Family: Glossosomatidae	0		0		0		0	
Anagapetus	0		0		0		0	
Glossosoma	0		0		1		0	
| Family: Hydropsychidae	0		0		0		0	
Arctopsyche	0		0		0		1	
Parapsyche	0		2	ND	1		1	
Parapsyche elsis	0		1		0		0	
| Family: Hydroptilidae	0		0		0		0	
| Family: Lepidostomatidae	0		0		0		0	
Lepidostoma	2		0		0		0	
| Family: Limnephilidae	0		0		0		0	
Ecclisomyia	0		0		0		0	
| Family: Rhyacophilidae	0		0		0		0	
Rhyacophila	2		1		5		5	
Rhyacophila betteni group	0		2		1		2	
Rhyacophila brunnea/vemna group	0		0		3		7	
Rhyacophila hyalinata group	1		0		2		2	
Rhyacophila vofixa group	0		0		0		0	
Rhyacophila atrata complex	0		0		0		0	
Rhyacophila narvae	0		0		0		0	
| Family: Thremmatidae	0		0		0		0	
Oligophlebodes	0		0		1		0	
| Order: Coleoptera	0		0		0		0	
| Family: Elmidae	0		0		0		0	
Heterlimnius	0		0		0		0	
| Order: Diptera	0		0		0		0	
| Family: Ceratopogonidae	0		0		0		0	
Bezzia/ Palpomyia	0		0		0		0	
| Family: Chironomidae	0		0		1	ND	0	
| Subfamily: Chironominae	0		0		0		0	
| Tribe: Tanytarsini	80		61		1	ND	0	
Micropsectra	0		0		0		0	
Stempellinella	5		0		0		0	
Tanytarsus	29		22		3		4	
| Subfamily: Diamesinae	0		0		0		0	
| Tribe: Diamesini	0		0		0		0	
Diamesa	0		0		5		3	
Pagastia	23		46		55		20	
Pseudodiamesa	3		0		0		0	
| Subfamily: Orthocladiinae	0		0		0		0	
Brillia	0		0		0		0	
Cricotopus (Nostococladius)	0		0		0		0	
Eukiefferiella	19		35		16		21	
Hydrobaenus	7		0		0		0	
Limnophyes	0		0		0		0	
Orthocladius complex	14		11		11		1	
Parakiefferiella	0		0		0		0	
Rheocricotopus	0		0		0		1	
Tvetenia	23		40		0		4	
| Subfamily: Tanypodinae	0		0		0		0	
| Tribe: Pentaneurini	0		0		0		0	
Thienemannimyia group	4		0		1		2	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19							
	RG_FOUKI2		RG_FOUKI3		RG_SCOUTDS1		RG_SCOUTDS2	
| Family: Empididae	0		0		0		0	
Chelifera/ Metachela	0		0		0		0	
Clinocera	1		3		1		1	
Neoplasta	0		0		0		0	
Roederiodes	1		0		2		1	
| Order: Tipuloidea	0		0		0		0	
| Family: Limoniidae	0		0		0		0	
Eloeophila	0		0		0		0	
| Family: Psychodidae	0		0		0		0	
Pericoma/Telmatoscopus	6		24		28		24	
| Family: Simuliidae	0		1		0		0	
Prosimulium	0		0		0		0	
Simulium	0		0		1		2	
| Family: Tipulidae	0		0		0		0	
Antocha	1		1		0		0	
Dicranota	4		0		1		7	
Hesperoconopa	0		0		0		1	
Hexatoma	0		1		0		0	
Tipula	0		0		0		0	
Subphylum: Chelicerata	0		0		0		0	
| Class: Arachnida	0		0		0		0	
| Order: Trombidiformes	0		0		0		0	
| Family: Aturidae	0		0		0		0	
Aturus	0		0		0		0	
| Family: Feltriidae	0		0		0		0	
Feltria	1		1		0		0	
| Family: Hygrobatidae	0		0		0		0	
Hygrobates	0		0		0		0	
| Family: Lebertiidae	0		0		0		0	
Lebertia	5		8		5		4	
| Family: Sperchontidae	0		0		0		0	
Sperchon	1		0		0		2	
| Family: Torrenticolidae	0		0		0		0	
Testudacarus	0		0		0		0	
Suborder: Prostigmata	0		0		0		0	
| Family: Stygothrombidiidae	0		0		0		0	
Stygothrombium	0		0		0		0	
Phylum: Mollusca	0		0		0		0	
| Class: Bivalvia	0		0		0		0	
| Order: Veneroida	0		0		0		0	
| Family: Pisidiidae	0		0		0		0	
Phylum: Annelida	0		0		0		0	
Subphylum: Clitellata	0		0		0		0	
| Class: Oligochaeta	0		0		0		0	
| Order: Lumbriculida	0		0		0		0	
| Family: Lumbriculidae	1		0		1		0	
| Order: Tubificida	0		0		0		0	
| Family: Enchytraeidae	0		0		0		0	
Enchytraeus	0		2		0		0	
| Family: Naididae	0		0		0		0	
Nais	0		1		0		0	
Totals:	**411**		**596**		**865**		**653**	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19							
	RG_SCOUTDS3		RG_FRUPO1		RG_FRUPO2		RG_FRUPO3	
Phylum: Arthropoda	0		0		0		0	
Subphylum: Hexapoda	0		0		0		0	
| Class: Insecta	0		0		0		0	
| Order: Ephemeroptera	0		0		0		0	
| Family: Ameletidae	0		0		0		0	
Ameletus	0		0		0		0	
| Family: Baetidae	4	ND	0		0		2	ND
Baetis	1	ND	0		1	ND	2	ND
Baetis rhodani group	13		0		4		7	
| Family: Ephemerellidae	7		5		1		1	
Caudatella	0		0		0		0	
Drunella	0		0		0		0	
Drunella grandis group	0		0		0		0	
Drunella doddsii	0		2		0		0	
Drunella grandis	0		0		0		0	
Ephemerella	1		0		1		0	
| Family: Heptageniidae	14		0		0		0	
Cinygmula	11		1		1		2	
Epeorus	9		28		66		57	
Rhithrogena	3		0		0		0	
| Order: Plecoptera	0		0		0		0	
| Family: Capniidae	36		88		78		83	
| Family: Chloroperlidae	0		4		1		5	
Haploperla	0		4		1		1	
Sweltsa	0		1		2		1	
| Family: Leuctridae	0		0		0		0	
Paraleuctra	0		0		0		0	
| Family: Nemouridae	134		957		734		685	
Visoka cataractae	0		0		0		0	
Zapada	5	ND	16		16		32	
Zapada oregonensis group	1		2		0		0	
Zapada cinctipes	5		5		4		5	
Zapada columbiana	1		0		0		0	
| Family: Perlidae	0		1		0		2	
Hesperoperla	0		0		0		0	
| Family: Perlodidae	1	ND	10	ND	13		19	
Isoperla	14		216		106		153	
Kogotus	6		14		22		21	
Megarcys	0		2		10		10	
Skwala	0		0		0		0	
| Family: Taeniopterygidae	11		0		0		1	
| Order: Trichoptera	0		0		0		0	
| Family: Apataniidae	0		0		0		0	
Apatania	0		0		0		0	
Pedomoecus sierra	0		0		0		0	
| Family: Brachycentridae	0		0		0		0	
Brachycentrus	0		0		0		0	
| Family: Glossosomatidae	0		0		1		0	
Anagapetus	0		0		0		0	
Glossosoma	0		1		0		0	
| Family: Hydropsychidae	0		0		0		0	
Arctopsyche	0		0		0		0	
Parapsyche	1		1		0		0	
Parapsyche elsis	0		0		0		0	
| Family: Hydroptilidae	0		0		0		0	
| Family: Lepidostomatidae	0		0		0		0	
Lepidostoma	0		0		0		0	
| Family: Limnephilidae	0		0		0		0	
Ecclisomyia	0		0		1		1	
| Family: Rhyacophilidae	0		0		0		0	
Rhyacophila	0		5		3		3	
Rhyacophila betteni group	1		0		0		0	
Rhyacophila brunnea/vemna group	0		7		1		7	
Rhyacophila hyalinata group	1		0		0		1	
Rhyacophila vofixa group	0		0		0		0	
Rhyacophila atrata complex	1		1		1		0	
Rhyacophila narvae	0		3		0		1	
| Family: Thremmatidae	0		0		0		0	
Oligophlebodes	0		0		0		0	
| Order: Coleoptera	0		0		0		0	
| Family: Elmidae	0		0		0		0	
Heterlimnius	0		2		0		0	
| Order: Diptera	0		0		0		1	
| Family: Ceratopogonidae	0		0		0		0	
Bezzia/ Palpomyia	0		0		0		0	
| Family: Chironomidae	0		0		0		0	
| Subfamily: Chironominae	0		0		0		0	
| Tribe: Tanytarsini	1		0		5		3	
Micropsectra	0		0		0		0	
Stempellinella	0		0		0		0	
Tanytarsus	0		1		6		0	
| Subfamily: Diamesinae	0		0		0		0	
| Tribe: Diamesini	0		0		0		0	
Diamesa	7		0		0		0	
Pagastia	8		77		91		86	
Pseudodiamesa	0		0		1		0	
| Subfamily: Orthocladiinae	0		0		0		0	
Brillia	0		0		0		1	
Cricotopus (Nostococladius)	0		0		0		0	
Eukiefferiella	16		87		53		103	
Hydrobaenus	0		6		0		3	
Limnophyes	0		0		0		0	
Orthocladius complex	4		13		65		29	
Parakiefferiella	0		0		0		0	
Rheocricotopus	0		0		3		1	
Tvetenia	2		21		10		30	
| Subfamily: Tanypodinae	0		0		0		0	
| Tribe: Pentaneurini	0		0		0		0	
Thienemannimyia group	2		1		0		0	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19							
	RG_SCOUTDS3		RG_FRUPO1		RG_FRUPO2		RG_FRUPO3	
| Family: Empididae	0		2		1		0	
Chelifera/ Metachela	0		0		0		0	
Clinocera	0		1		0		0	
Neoplasta	0		0		2		5	
Roederiodes	0		0		0		0	
| Order: Tipuloidea	0		0		0		0	
| Family: Limoniidae	0		0		0		0	
Eloeophila	0		0		0		0	
| Family: Psychodidae	0		0		0		0	
Pericoma/Telmatoscopus	5		5		1		2	
| Family: Simuliidae	0		0		0		0	
Prosimulium	2		0		0		0	
Simulium	2		0		0		0	
| Family: Tipulidae	0		0		0		0	
Antocha	0		0		2		0	
Dicranota	0		2		3		3	
Hesperoconopa	0		0		0		0	
Hexatoma	0		2		0		0	
Tipula	0		0		0		0	
Subphylum: Chelicerata	0		0		0		0	
| Class: Arachnida	0		0		0		0	
| Order: Trombidiformes	0		0		0		0	
| Family: Aturidae	0		0		0		0	
Aturus	0		0		1		0	
| Family: Feltriidae	0		0		0		0	
Feltria	0		0		0		0	
| Family: Hygrobatidae	0		0		0		0	
Hygrobates	0		0		0		0	
| Family: Lebertiidae	0		0		0		0	
Lebertia	2		3		5		4	
| Family: Sperchontidae	0		0		0		0	
Sperchon	0		1		5		4	
| Family: Torrenticolidae	0		0		0		0	
Testudacarus	0		0		0		0	
Suborder: Prostigmata	0		0		0		0	
| Family: Stygothrombidiidae	0		0		0		0	
Stygothrombium	0		0		0		0	
Phylum: Mollusca	0		0		0		0	
| Class: Bivalvia	0		0		0		0	
| Order: Veneroida	0		0		0		0	
| Family: Pisidiidae	0		0		0		0	
Phylum: Annelida	0		0		0		0	
Subphylum: Clitellata	0		0		0		0	
| Class: Oligochaeta	0		0		0		0	
| Order: Lumbriculida	0		0		0		0	
| Family: Lumbriculidae	0		0		5		5	
| Order: Tubificida	0		0		0		0	
| Family: Enchytraeidae	0		0		0		0	
Enchytraeus	0		0		0		0	
| Family: Naididae	0		0		0		0	
Nais	0		0		0		0	
Totals:	**332**		**1598**		**1327**		**1382**	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19							
	RG_FODPO1		RG_FODPO2		RG_FODPO3		RG_FOUEW1	
Phylum: Arthropoda	0		0		0		0	
Subphylum: Hexapoda	0		0		0		0	
| Class: Insecta	0		0		0		0	
| Order: Ephemeroptera	0		0		0		0	
| Family: Ameletidae	0		0		0		0	
Ameletus	0		0		1		0	
| Family: Baetidae	19	ND	15	ND	5	ND	4	ND
Baetis	4	ND	4	ND	2	ND	2	ND
Baetis rhodani group	42		34		36		11	
| Family: Ephemerellidae	3		0		1		24	
Caudatella	0		0		0		0	
Drunella	0		0		0		0	
Drunella grandis group	0		0		0		0	
Drunella doddsii	0		0		1		2	
Drunella grandis	1		0		1		0	
Ephemerella	0		0		0		0	
| Family: Heptageniidae	12		4		4		21	
Cinygmula	7		2		5		67	
Epeorus	5		7		10		8	
Rhithrogena	0		0		0		0	
| Order: Plecoptera	0		0		0		0	
| Family: Capniidae	95		132		199		34	
| Family: Chloroperlidae	1		6		6		7	
Haploperla	3		1		0		1	
Sweltsa	2		1		1		6	
| Family: Leuctridae	0		0		0		0	
Paraleuctra	0		0		0		0	
| Family: Nemouridae	664		768		601		173	
Visoka cataractae	0		0		0		0	
Zapada	57		71		64		30	
Zapada oregonensis group	18		2		10		13	
Zapada cinctipes	94		74		129		37	
Zapada columbiana	0		0		0		0	
| Family: Perlidae	1		0		0		2	
Hesperoperla	0		0		0		1	
| Family: Perlodidae	24	ND	24		27		12	
Isoperla	102		75		113		17	
Kogotus	61		42		28		26	
Megarcys	7		0		1		1	
Skwala	2		0		0		0	
| Family: Taeniopterygidae	17		14		24		5	
| Order: Trichoptera	0		0		0		0	
| Family: Apataniidae	0		0		0		0	
Apatania	0		0		0		0	
Pedomoecus sierra	0		0		1		0	
| Family: Brachycentridae	0		0		0		0	
Brachycentrus	0		0		1		0	
| Family: Glossosomatidae	2	ND	0		0		0	
Anagapetus	0		0		0		0	
Glossosoma	4		0		0		2	
| Family: Hydropsychidae	0		0		0		0	
Arctopsyche	0		0		0		0	
Parapsyche	0		0		0		1	
Parapsyche elsis	0		0		0		0	
| Family: Hydroptilidae	0		0		1		0	
| Family: Lepidostomatidae	0		0		0		0	
Lepidostoma	0		0		0		0	
| Family: Limnephilidae	0		0		0		0	
Ecclisomyia	19		1		3		0	
| Family: Rhyacophilidae	0		0		0		0	
Rhyacophila	2		2		5		6	
Rhyacophila betteni group	0		0		0		1	
Rhyacophila brunnea/vemna group	4		5		6		4	
Rhyacophila hyalinata group	0		0		0		0	
Rhyacophila vofixa group	0		0		0		0	
Rhyacophila atrata complex	2		1		4		4	
Rhyacophila narvae	11		14		10		1	
| Family: Thremmatidae	0		0		0		0	
Oligophlebodes	0		0		0		1	
| Order: Coleoptera	0		0		0		0	
| Family: Elmidae	4	ND	1	ND	0		2	ND
Heterlimnius	13		10		13		34	
| Order: Diptera	0		0		0		0	
| Family: Ceratopogonidae	0		0		0		0	
Bezzia/ Palpomyia	1		0		0		0	
| Family: Chironomidae	0		0		0		0	
| Subfamily: Chironominae	0		0		0		0	
| Tribe: Tanytarsini	4		1		2	ND	2	ND
Micropsectra	0		0		0		0	
Stempellinella	0		0		0		0	
Tanytarsus	0		0		1		1	
| Subfamily: Diamesinae	0		0		0		0	
| Tribe: Diamesini	0		0		0		0	
Diamesa	0		0		0		0	
Pagastia	120		91		83		27	
Pseudodiamesa	0		0		0		0	
| Subfamily: Orthocladiinae	0		0		0		0	
Brillia	0		0		0		0	
Cricotopus (Nostococladius)	0		0		0		0	
Eukiefferiella	71		27		66		2	
Hydrobaenus	1		4		0		1	
Limnophyes	1		0		3		0	
Orthocladius complex	20		8		13		15	
Parakiefferiella	0		0		2		0	
Rheocricotopus	0		0		0		0	
Tvetenia	0		22		70		4	
| Subfamily: Tanypodinae	0		0		0		0	
| Tribe: Pentaneurini	0		0		0		0	
Thienemannimyia group	0		0		2		0	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19							
	RG_FODPO1		RG_FODPO2		RG_FODPO3		RG_FOUEW1	
| Family: Empididae	0		0		0		0	
Chelifera/ Metachela	0		0		2		0	
Clinocera	0		0		0		0	
Neoplasta	2		0		0		3	
Roederiodes	0		0		0		0	
| Order: Tipuloidea	0		0		0		0	
| Family: Limoniidae	0		0		0		0	
Eloeophila	0		0		0		0	
| Family: Psychodidae	0		0		0		0	
Pericoma/Telmatoscopus	1		5		2		2	
| Family: Simuliidae	0		0		0		0	
Prosimulium	0		0		0		0	
Simulium	2		6		0		0	
| Family: Tipulidae	0		0		0		0	
Antocha	0		0		0		7	
Dicranota	4		3		3		0	
Hesperoconopa	0		2		0		0	
Hexatoma	1		0		0		0	
Tipula	1		0		0		0	
Subphylum: Chelicerata	0		0		0		0	
| Class: Arachnida	0		0		0		0	
| Order: Trombidiformes	0		0		0		0	
| Family: Aturidae	0		0		0		0	
Aturus	1		0		0		0	
| Family: Feltriidae	0		0		0		0	
Feltria	0		0		2		0	
| Family: Hygrobatidae	0		0		0		0	
Hygrobates	0		0		0		0	
| Family: Lebertiidae	0		0		0		0	
Lebertia	8		0		0		18	
| Family: Sperchontidae	0		0		0		0	
Sperchon	2		0		5		3	
| Family: Torrenticolidae	0		0		0		0	
Testudacarus	1		0		0		0	
Suborder: Prostigmata	0		0		0		0	
| Family: Stygothrombidiidae	0		0		0		0	
Stygothrombium	0		0		0		0	
Phylum: Mollusca	0		0		0		0	
| Class: Bivalvia	0		0		0		0	
| Order: Veneroida	0		0		0		0	
| Family: Pisidiidae	1		0		1		3	
Phylum: Annelida	0		0		0		0	
Subphylum: Clitellata	0		0		0		0	
| Class: Oligochaeta	0		0		0		0	
| Order: Lumbriculida	0		0		0		0	
| Family: Lumbriculidae	0		0		1		0	
| Order: Tubificida	0		0		0		0	
| Family: Enchytraeidae	0		0		0		0	
Enchytraeus	0		0		0		0	
| Family: Naididae	0		0		0		0	
Nais	0		0		0		0	
Totals:	**1544**		**1479**		**1571**		**648**	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19			
	RG_FOUEW2		RG_FOUEW3	
Phylum: Arthropoda	0		0	
Subphylum: Hexapoda	0		0	
| Class: Insecta	0		0	
| Order: Ephemeroptera	0		0	
| Family: Ameletidae	0		0	
Ameletus	0		0	
| Family: Baetidae	5	ND	5	ND
Baetis	2	ND	1	ND
Baetis rhodani group	16		27	
| Family: Ephemerellidae	24		20	
Caudatella	0		0	
Drunella	0		0	
Drunella grandis group	0		2	ND
Drunella doddsii	0		0	
Drunella grandis	0		1	
Ephemerella	0		0	
| Family: Heptageniidae	38		30	
Cinygmula	42		35	
Epeorus	12		7	
Rhithrogena	0		0	
| Order: Plecoptera	0		0	
| Family: Capniidae	27		12	
| Family: Chloroperlidae	5		10	
Haploperla	0		1	
Sweltsa	5		2	
| Family: Leuctridae	0		1	
Paraleuctra	0		0	
| Family: Nemouridae	251		305	
Visoka cataractae	0		0	
Zapada	45	ND	50	ND
Zapada oregonensis group	16		11	
Zapada cinctipes	47		34	
Zapada columbiana	2		5	
| Family: Perlidae	2		1	
Hesperoperla	0		0	
| Family: Perlodidae	8	ND	7	ND
Isoperla	25		15	
Kogotus	25		25	
Megarcys	1		1	
Skwala	0		0	
| Family: Taeniopterygidae	7		9	
| Order: Trichoptera	0		0	
| Family: Apataniidae	0		0	
Apatania	0		0	
Pedomoecus sierra	0		0	
| Family: Brachycentridae	0		0	
Brachycentrus	0		0	
| Family: Glossosomatidae	0		1	ND
Anagapetus	0		0	
Glossosoma	0		4	
| Family: Hydropsychidae	0		0	
Arctopsyche	0		0	
Parapsyche	0		0	
Parapsyche elsis	0		1	
| Family: Hydroptilidae	0		0	
| Family: Lepidostomatidae	0		0	
Lepidostoma	0		0	
| Family: Limnephilidae	0		0	
Ecclisomyia	0		0	
| Family: Rhyacophilidae	0		0	
Rhyacophila	19		36	
Rhyacophila betteni group	1		2	
Rhyacophila brunnea/vemna group	16		14	
Rhyacophila hyalinata group	0		0	
Rhyacophila vofixa group	0		0	
Rhyacophila atrata complex	8		3	
Rhyacophila narvae	1		0	
| Family: Thremmatidae	0		0	
Oligophlebodes	1		1	
| Order: Coleoptera	0		0	
| Family: Elmidae	1		2	ND
Heterlimnius	25		7	
| Order: Diptera	0		0	
| Family: Ceratopogonidae	0		0	
Bezzia/ Palpomyia	0		0	
| Family: Chironomidae	0		1	ND
| Subfamily: Chironominae	0		0	
| Tribe: Tanytarsini	0		4	
Micropsectra	0		0	
Stempellinella	0		0	
Tanytarsus	1		0	
| Subfamily: Diamesinae	0		0	
| Tribe: Diamesini	0		0	
Diamesa	1		1	
Pagastia	40		65	
Pseudodiamesa	0		0	
| Subfamily: Orthocladiinae	0		0	
Brillia	1		0	
Cricotopus (Nostococladius)	0		0	
Eukiefferiella	21		55	
Hydrobaenus	1		0	
Limnophyes	0		1	
Orthocladius complex	21		26	
Parakiefferiella	0		0	
Rheocricotopus	0		0	
Tvetenia	22		8	
| Subfamily: Tanypodinae	0		0	
| Tribe: Pentaneurini	0		0	
Thienemannimyia group	0		0	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.22: Raw Benthic Invertebrate Community Data, FRO LAEMP, December 2018, February, June, September and December 2019

Sample:	Dec-19			
	RG_FOUEW2		RG_FOUEW3	
| Family: Empididae	1	ND	1	ND
Chelifera/ Metachela	1		5	
Clinocera	0		0	
Neoplasta	3		7	
Roederiodes	0		0	
| Order: Tipuloidea	0		0	
| Family: Limoniidae	0		0	
Eloeophila	0		1	
| Family: Psychodidae	0		0	
Pericoma/Telmatoscopus	3		4	
| Family: Simuliidae	0		0	
Prosimulium	0		0	
Simulium	4		1	
| Family: Tipulidae	0		0	
Antocha	15		21	
Dicranota	1		0	
Hesperoconopa	1		1	
Hexatoma	0		0	
Tipula	0		0	
Subphylum: Chelicerata	0		0	
| Class: Arachnida	0		0	
| Order: Trombidiformes	0		0	
| Family: Aturidae	0		0	
Aturus	0		1	
| Family: Feltriidae	0		0	
Feltria	0		0	
| Family: Hygrobatidae	0		0	
Hygrobates	0		0	
| Family: Lebertiidae	0		0	
Lebertia	8		18	
| Family: Sperchontidae	0		0	
Sperchon	2		3	
| Family: Torrenticolidae	0		0	
Testudacarus	0		0	
Suborder: Prostigmata	0		0	
| Family: Stygothrombidiidae	0		0	
Stygothrombium	0		1	
Phylum: Mollusca	0		0	
| Class: Bivalvia	0		0	
| Order: Veneroida	0		0	
| Family: Pisidiidae	0		1	
Phylum: Annelida	0		0	
Subphylum: Clitellata	0		0	
| Class: Oligochaeta	0		0	
| Order: Lumbriculida	0		0	
| Family: Lumbriculidae	0		0	
| Order: Tubificida	0		0	
| Family: Enchytraeidae	0		0	
Enchytraeus	0		0	
| Family: Naididae	0		0	
Nais	3		4	
Totals:	**827**		**918**	

Note: ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

	Date	Biological Monitoring Area	Moisture	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron
			%	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
February	14-Feb-19	RG_UFR1	71.89	390	0.02	0.29	9.1	<0.02	<5
			76.34	320	0.03	0.32	11	<0.02	<5
			75.34	370	<0.02	0.29	9	<0.02	<5
	12-Feb-19	RG_FOUNGD	77.14	570	0.03	0.49	15	0.02	3
			83.44	650	0.04	0.5	17	0.02	3
			86.73	950	0.04	0.32	18	0.04	3
	12-Feb-19	RG_FODNGD	80.38	1100	0.06	0.53	62	0.04	<5
			79.25	780	0.06	0.49	18	0.03	2
			89.71	770	<0.1	<0.5	19	0.03	<50
	13-Feb-19	RG_MP1	79.31	480	0.03	0.45	13	<0.02	<2
			78.03	1000	0.04	0.54	14	0.03	<2
			78.16	630	0.04	0.31	21	<0.02	<2
	13-Feb-19	RG_FOUSH	78.18	860	0.09	2.4	66	0.04	<5
			83.73	840	0.08	1.4	41	0.04	<2
			79.67	920	0.09	1.9	50	0.04	<2
	12-Feb-19	RG_FOUKI	79.2	790	0.05	0.35	14	0.03	2
			70.63	1700	0.07	0.55	20	0.05	3
			75.3	4300	0.07	0.63	31	0.14	8
	12-Feb-19	RG_FOBKS	83.04	430	0.1	0.38	25	<0.02	<5
	11-Feb-19	RG_FOBCP	87.28	1600	0.06	0.31	35	0.05	3
			88.6	150	<0.1	<0.5	9	<0.02	<50
			63.96	440	0.04	0.18	20	<0.02	<2
	11-Feb-19	RG_FRUPO	82.59	840	0.04	0.31	18	0.03	2
			80.78	620	0.04	0.24	19	0.02	<2
			82.63	1200	0.06	0.37	18	0.04	2
	14-Feb-19	RG_FODPO	74.63	750	0.03	0.58	11	0.02	3
			69.56	1200	0.04	0.32	15	0.04	<5
			86.77	1300	0.05	0.32	18	0.05	<5
	14-Feb-19	RG_FO22	72.4	940	<0.1	<0.5	15	0.03	<50
			78.14	2300	0.06	0.63	35	0.08	<5
			80.2	1600	0.04	0.45	22	0.06	<5
	13-Feb-19	RG_FOUEW	71.57	1500	0.03	0.45	22	0.05	3
			81.28	320	0.01	0.15	8.9	<0.01	<1
			78.02	1100	0.02	0.36	19	0.04	2
June	20-Jun-19	RG_HENUP	85.44	320	0.02	0.89	4.9	0.01	<1
			85.26	400	0.02	1.2	4.1	0.02	<1
			82.2	200	0.01	0.81	3.8	<0.01	<1
	20-Jun-19	RG_FO26	77.72	1000	0.02	0.89	17	0.04	2
			80.82	780	0.04	0.91	22	0.03	2
			76.41	500	0.03	0.76	17	0.02	1
	20-Jun-19	RG_FODHE	83.86	1000	0.04	2.7	14	0.05	3
			83.67	1600	0.04	1.8	15	0.07	5
			72.27	220	0.02	0.7	7.6	<0.01	<1
	19-Jun-19	RG_FOUNGD	80.62	1900	0.13	1.4	39	0.11	4
			72.02	4000	0.12	2.5	58	0.22	6
			77.15	1600	0.03	1.3	22	0.07	3
	19-Jun-19	RG_FODNGD	77.09	720	0.03	0.46	14	0.03	1
			84.71	1000	0.05	1.2	20	0.05	2
			79.61	780	0.04	0.68	16	0.03	2
	18-Jun-19	RG_MP1	75.12	590	0.04	0.66	12	0.02	1
			81.77	1700	0.07	1.2	23	0.06	3
			79.99	1200	0.08	1.2	19	0.06	2
	17-Jun-19	RG_FOUSH	80.64	4900	0.41	2.4	62	0.21	9
			81.87	1700	0.07	1.2	31	0.07	4
			73.34	1500	0.08	0.53	23	0.09	4
	18-Jun-19	RG_FOUKI	76.23	1100	0.05	0.83	19	0.04	2
			74.11	1400	0.04	0.49	26	0.05	3
			80.74	1100	0.05	1.1	20	0.04	2
	17-Jun-19	RG_FOBKS	60.62	11700	0.31	3.1	119	0.48	20
			85.07	9400	0.13	2.2	75	0.35	17
			69.14	5600	0.08	1.6	57	0.2	9

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

	Date	Biological Monitoring Area	Moisture	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron
			%	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
June	18-Jun-19	RG_FOBSC	86.93	2200	0.07	1.4	28	0.09	4
			84.06	2100	0.08	1.5	36	0.11	4
			83.21	1700	0.08	1.8	66	0.11	3
	18-Jun-19	RG_FOBCP	49.95	9400	0.08	3.7	177	0.72	21
			89.2	2000	0.08	1.1	47	0.09	6
			66.59	3600	0.07	1.6	61	0.19	5
	19-Jun-19	RG_FRCP1SW	72.94	7400	0.12	6.8	131	0.34	10
			75.02	960	0.03	0.54	17	0.04	<5
			75.42	4000	0.09	1.4	70	0.17	6
	19-Jun-19	RG_FRUPO	75.95	1800	0.07	1.2	32	0.1	4
			70.59	2000	0.05	0.94	28	0.08	3
			75.92	1200	0.05	0.86	23	0.05	4
	21-Jun-19	RG_FODPO	78.76	3100	0.08	1.6	39	0.1	7
			75.26	3000	0.08	1.5	39	0.1	7
			82.19	3100	0.08	1.4	36	0.1	6
	21-Jun-19	RG_FO22	84.4	7300	0.14	2.6	89	0.31	15
			87.5	5200	0.1	1.8	56	0.2	10
			82.19	3600	0.08	1.4	44	0.16	10
	20-Jun-19	RG_FOUEW	83.71	1600	0.06	0.9	22	0.05	3
			80.74	900	0.04	0.86	18	0.04	2
			84.88	1200	0.08	1.1	17	0.04	2
September	11-Sep-19	RG_HENUP	89.47	180	0.01	1	4.1	<0.01	1
			86.45	260	0.02	1.2	5	0.01	2
			83.44	270	0.02	0.9	4.6	0.01	1
	10-Sep-19	RG_FO26	85.31	1100	0.1	1.2	19	0.04	3
			85.67	1100	0.04	1.2	23	0.05	4
			82.69	760	0.05	1	15	0.03	2
	10-Sep-19	RG_FODHE	82.59	440	0.02	0.49	9.6	0.02	9
			81.37	320	0.02	0.4	7.7	0.01	6
			86.78	580	0.1	0.72	10	0.02	16
	12-Sep-19	RG_FOUCL	79.44	720	0.02	0.43	18	0.03	3
			80.24	350	0.02	0.39	13	0.01	4
			84.81	1500	0.1	0.69	26	0.07	7
	12-Sep-19	RG_FOUNGD	87.02	430	0.03	0.59	12	0.02	2
			85.42	560	0.03	0.62	14	0.03	2
			84.53	470	0.02	0.63	19	0.02	2
	12-Sep-19	RG_FODNGD	75.12	1100	0.03	0.54	20	0.04	5
			69.17	550	0.03	0.34	11	0.02	2
			65.52	1600	0.06	1.2	46	0.06	4
	05-Sep-19	RG_MP1	72.85	930	0.03	0.59	28	0.04	14
			67.97	880	0.04	0.64	21	0.04	8
			70.49	570	0.02	0.52	17	0.02	5
	09-Sep-19	RG_FOUSH	58.05	460	0.04	0.43	20	0.02	5
			56.5	740	0.05	0.56	23	0.03	3
			65.82	780	0.05	0.65	23	0.03	6
	05-Sep-19	RG_FOUKI	87.3	660	0.05	0.62	23	0.03	7
			82.52	2000	0.1	1.8	78	0.09	12
			85.16	1000	0.05	0.92	22	0.04	4
	12-Sep-19	RG_SCOUTDS	85.61	2800	0.23	2.2	42	0.12	7
			86.05	1500	0.09	1.6	27	0.06	4
			87.32	1700	0.11	1.1	23	0.07	5
	09-Sep-19	RG_FOBKS	77.79	1000	0.03	0.5	13	0.02	2
			79.53	300	0.04	0.57	8.7	0.01	1
			82.5	1100	0.06	0.89	20	0.04	4
	13-Sep-19	RG_FOBSC	88.09	1600	0.18	1.2	22	0.07	5
			86.57	1300	0.13	1.2	27	0.05	6
			86.78	1200	0.13	1.4	23	0.05	4
	06-Sep-19	RG_FOBCP	85.4	940	0.09	1.4	13	0.04	2
			86.37	770	0.07	1.1	15	0.03	2
			80.51	2200	0.06	0.78	28	0.08	5
			82.86	640	0.04	0.64	16	0.02	2
			83.82	350	0.04	0.64	8.4	0.01	1

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

	Date	Biological Monitoring Area	Moisture	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron
			%	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
September	13-Sep-19	RG_FRCP1SW	81.25	1100	0.06	0.66	16	0.04	2
			84.91	1600	0.06	0.81	24	0.06	3
			86.74	1900	0.07	1.1	26	0.07	4
	07-Sep-19	RG_FRUPO	83.1	4200	0.11	1.5	53	0.18	6
			86.33	720	0.04	0.61	13	0.02	2
			85.24	2000	0.06	0.85	24	0.07	4
	07-Sep-19	RG_FODPO	83.04	3500	0.09	1	38	0.13	6
			85.26	5400	0.11	2	55	0.18	10
			85.19	6800	0.11	2.1	61	0.19	10
	16-Sep-19	RG_FO22	84.07	2000	0.09	0.93	32	0.08	4
			85.99	3100	0.06	1.1	35	0.1	6
			85.19	2400	0.08	1	31	0.09	5
			82.53	2500	0.06	1.2	30	0.08	5
			85.34	2200	0.09	0.88	26	0.08	4
	04-Sep-19	RG_FOUEW	80.76	3800	0.07	1.5	50	0.14	8
			84.17	2300	0.08	1.6	58	0.1	6
			83	1300	0.06	1.6	47	0.06	6
December	10-Dec-19	RG_UFR1	84.46	1200	0.03	0.64	16	0.04	6
			81.76	2300	0.09	0.73	25	0.08	6
			82.7	480	0.02	0.68	13	0.02	5
	10-Dec-19	RG_FODHE	90.28	380	0.03	0.34	8.6	0.01	15
			88	430	0.03	0.57	9.6	0.02	14
			92.86	240	0.02	0.32	7.5	<0.01	6
	09-Dec-19	RG_FOUCL	82.64	880	0.04	0.56	20	0.03	4
			81.62	320	0.02	0.28	15	0.01	5
			86.66	330	0.03	0.33	12	0.01	6
	09-Dec-19	RG_FOUNGD	82.53	300	0.02	0.47	13	0.01	2
			89.72	180	0.02	0.72	8	<0.01	3
			88.22	230	0.02	0.65	8.2	<0.01	2
	09-Dec-19	RG_FODNGD	84.59	1000	0.05	0.42	18	0.03	3
			83.5	540	0.04	0.39	15	0.02	4
			83.42	190	0.02	0.25	10	<0.01	<1
	09-Dec-19	RG_MP1	80.03	1000	0.03	0.46	16	0.04	4
			81.19	550	0.03	0.4	15	0.02	6
			80.63	1100	0.03	0.52	24	0.04	4
	09-Dec-19	RG_FOUSH	76.44	520	0.07	0.76	22	0.02	2
			76.99	750	0.09	0.87	32	0.02	2
			76.18	1500	0.07	0.96	32	0.04	4
	09-Dec-19	RG_FOUKI	82.66	700	0.04	0.28	11	0.02	2
			78.71	420	0.05	0.41	17	0.02	2
			77.37	1400	0.09	0.53	25	0.04	4
	10-Dec-19	RG_SCOUTDS	78.78	1100	0.06	0.46	24	0.04	3
			83.01	2100	0.08	0.78	28	0.07	3
			75.4	2400	0.06	0.54	37	0.06	3
	10-Dec-19	RG_FOBKS	83.72	3900	0.1	1.2	47	0.13	7
			82.85	1200	0.08	0.6	29	0.04	3
			78.36	4000	0.11	0.94	110	0.1	6
	10-Dec-19	RG_FOBSC	80.97	2300	0.07	1.3	36	0.1	5
			76.01	2800	0.08	1.1	47	0.1	5
			82.32	970	0.05	0.48	18	0.04	2
	11-Dec-19	RG_FRUPO	79.14	850	0.04	0.53	16	0.03	3
			83.45	430	0.02	0.24	9.6	0.02	2
			82.11	730	0.03	0.39	15	0.02	3
	12-Dec-19	RG_FODPO	84.18	1300	0.03	0.56	20	0.05	2
			74.3	1300	0.04	0.48	16	0.05	2
			84.58	850	0.04	0.29	10	0.03	2
	11-Dec-19	RG_FO22	83.25	670	0.03	0.54	15	0.03	2
			85.53	580	0.03	0.46	15	0.02	1
			85.47	800	0.03	0.42	14	0.02	2
	11-Dec-19	RG_FOUEW	80.44	590	0.02	0.31	14	0.02	8
			74.78	420	0.02	0.25	12	0.02	1
			82.44	870	0.02	0.35	18	0.03	2

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

Month	Date	Biological Monitoring Area	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
February	14-Feb-19	RG_UFR1	2	0.7	<0.5	16	270	0.13	17
			2.5	0.7	<0.5	15	170	0.12	31
			2.7	0.7	<0.5	18	200	0.09	16
	12-Feb-19	RG_FOUNGD	1.3	1.4	0.6	14	220	0.24	33
			2	1	1.2	15	270	0.33	47
			1.3	1.4	0.57	14	380	0.27	39
	12-Feb-19	RG_FODNGD	1.3	2	2.9	14	720	0.44	88
			1	1.2	1.9	19	410	0.32	42
			1.2	<5	<5	13	570	<0.5	83
	13-Feb-19	RG_MP1	1.3	0.8	1.2	21	390	0.23	32
			0.83	1.4	0.65	19	470	0.27	29
			0.88	1	2.6	16	460	0.34	190
	13-Feb-19	RG_FOUSH	1.2	4.3	0.6	13	12600	0.4	98
			0.94	2.9	0.55	19	7300	0.33	52
			0.85	3.7	0.58	18	9600	0.39	61
	12-Feb-19	RG_FOUKI	0.72	1.1	0.42	18	720	0.22	109
			0.97	1.9	0.71	15	1000	0.39	171
			1.8	4	1.2	18	2500	1	202
	12-Feb-19	RG_FOBKS	1	1	1.9	15	390	0.2	400
	11-Feb-19	RG_FOBCP	1.2	2.1	0.72	10	730	0.41	67
			0.27	<5	<5	16	110	<0.5	31
			0.44	0.7	0.37	8.6	190	0.13	43
	11-Feb-19	RG_FRUPO	0.68	1.3	0.21	14	380	0.24	24
			0.79	0.9	0.42	14	460	0.22	86
			0.7	1.8	0.42	12	610	0.37	44
	14-Feb-19	RG_FODPO	0.54	1.1	0.32	14	640	0.26	19
			0.28	1.9	<0.5	13	530	0.36	38
			1.1	2.2	0.6	16	660	0.43	39
	14-Feb-19	RG_FO22	0.4	<5	<5	13	830	<0.5	36
			0.49	3.8	<0.5	14	2000	0.75	95
			0.76	3.2	0.6	14	1100	0.43	47
	13-Feb-19	RG_FOUEW	0.44	2.2	0.48	14	740	0.39	65
			0.52	0.46	0.22	22	220	0.1	65
			0.61	1.8	0.37	13	570	0.36	92
June	20-Jun-19	RG_HENUP	0.86	0.87	0.46	9.7	280	0.19	19
			1.3	1.1	0.58	13	350	0.22	19
			1	0.51	0.42	12	260	0.18	17
	20-Jun-19	RG_FO26	1.2	1.6	0.7	12	550	0.38	56
			1.2	1.2	0.59	11	510	0.38	76
			0.97	0.86	0.44	12	320	0.24	58
	20-Jun-19	RG_FODHE	3.5	1.8	3.4	13	690	0.39	82
			1.9	1.8	1.9	12	980	0.42	67
			0.44	0.34	0.27	13	140	0.09	38
	19-Jun-19	RG_FOUNGD	2.2	3.6	3.5	11	2300	3.1	100
			3.4	7.1	5.8	15	6200	2.5	180
			3.3	3	4.2	14	1200	0.55	41
	19-Jun-19	RG_FODNGD	1.1	1.2	2.5	18	400	0.28	38
			3.2	2	6.5	14	840	0.5	72
			1.2	1.2	5.3	17	460	0.37	47
	18-Jun-19	RG_MP1	4.2	1	13	20	370	0.3	50
			5.5	2.7	20	17	980	0.64	80
			6	2.3	21	16	820	0.5	82
	17-Jun-19	RG_FOUSH	4.1	6.2	9	14	1600	2	120
			5.6	2.9	13	19	1400	0.61	130
			0.67	2.4	1	14	860	0.53	75
	18-Jun-19	RG_FOUKI	2.5	1.8	4	21	910	0.51	129
			0.98	2.2	1.7	22	900	0.52	105
			6	1.9	7.8	14	890	0.49	150
	17-Jun-19	RG_FOBKS	2.2	16	4.7	13	9200	4.8	490
			4.6	12	5.8	13	5800	2.8	170
			2.5	8.2	3.2	14	3600	1.8	191

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

	Date	Biological Monitoring Area	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
June	18-Jun-19	RG_FOBSC	4.7	3.7	5.1	12	1600	1.2	160
			4.1	3.6	5.6	13	2300	1.4	150
			5.9	3.3	7.4	13	4500	1.6	130
	18-Jun-19	RG_FOBCP	1.3	15	3.6	11	15100	5.3	436
			4.5	3.6	5.3	12	2400	0.99	170
			1.6	5.9	2.4	11	5300	2.1	180
	19-Jun-19	RG_FRCP1SW	11	11	3.2	9.2	11200	4.1	280
			1.5	1.8	1.3	11	990	0.44	63
			1.5	5.8	1.9	12	8100	2	160
	19-Jun-19	RG_FRUPO	3	3.1	3	14	2200	1.2	140
			2.3	3	1.8	15	1700	0.94	94
			2.1	1.9	2.7	12	730	0.47	136
	21-Jun-19	RG_FODPO	3.3	4.5	5.3	16	2100	1.1	150
			2.4	4.3	3.9	14	1900	1.9	252
			1.7	4.6	3	14	1800	1.1	145
	21-Jun-19	RG_FO22	1.6	10	2.5	13	6300	2.4	260
			1.6	6.8	2.8	15	3500	1.8	162
			2	5.1	1.4	13	2700	1.4	120
	20-Jun-19	RG_FOUEW	3.1	2.4	2.5	15	1000	0.52	104
			2.3	1.4	1.7	15	600	0.32	84
			3.6	2	2.7	15	830	0.45	82
September	11-Sep-19	RG_HENUP	0.44	1.9	0.2	8.3	170	0.1	17
			0.35	1.2	0.19	8	260	0.19	19
			0.28	1.4	0.17	8.4	200	0.13	25
	10-Sep-19	RG_FO26	0.32	2.5	0.64	10	760	0.47	98
			0.4	3.2	0.65	9.6	820	0.53	106
			0.33	1.4	0.55	8.7	520	0.34	72
	10-Sep-19	RG_FODHE	1.4	0.82	0.9	9.7	370	0.23	90
			0.9	0.56	0.73	8.8	210	0.15	85
			3.2	1.3	2.7	12	420	0.25	90
	12-Sep-19	RG_FOUCL	1.1	1.4	0.85	12	580	0.29	72
			1.7	0.84	1.4	11	270	0.15	55
			1.4	3.2	1.1	12	1100	0.62	72
	12-Sep-19	RG_FOUNGD	3.1	0.8	2.6	12	260	0.15	33
			3.5	1.2	3.7	12	390	0.28	40
			2.3	1	2.2	10	370	0.22	53
	12-Sep-19	RG_FODNGD	3.2	1.8	8.1	14	600	0.39	53
			3.7	0.95	4.4	9.6	360	0.22	58
			3.3	2.9	12	14	1100	0.64	160
	05-Sep-19	RG_MP1	3.3	1.5	7	10	610	0.38	62
			3	1.7	7.4	12	620	0.4	63
			2.4	0.95	6.5	12	390	0.23	45
	09-Sep-19	RG_FOUSH	1	1	1.7	7.7	970	0.2	190
			1.2	1.4	1.9	8.9	1600	0.44	180
			1.6	1.4	2	10	1300	0.32	118
	05-Sep-19	RG_FOUKI	2.8	1.1	2.1	9.2	680	0.32	110
			6.3	2.9	5	14	2200	1.1	230
			3.2	1.8	2.6	13	1100	0.44	180
	12-Sep-19	RG_SCOUTDS	6.8	4.5	3.7	15	3600	1.1	264
			6.7	2.4	3.6	17	1200	0.58	165
			3.5	2.7	2.4	15	1500	0.66	142
	09-Sep-19	RG_FOBKS	1.8	1	2	15	2000	0.26	133
			3	0.53	2.6	16	410	0.11	106
			3.6	1.5	3	14	850	0.38	175
	13-Sep-19	RG_FOBSC	5.7	2.4	4.1	16	1200	0.58	172
			5	2	3.7	15	960	0.5	187
			6.8	2.3	5	16	900	0.48	153
	06-Sep-19	RG_FOBCP	3.7	1.6	2.7	13	880	0.38	115
			3.8	1.3	2.6	14	730	0.3	100
			1.6	3.4	1.3	11	1400	0.79	98
			1.5	0.84	1.3	12	430	0.24	118
			1.9	0.57	1.5	12	260	0.12	86

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

	Date	Biological Monitoring Area	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
September	13-Sep-19	RG_FRCP1SW	1.6	1.8	1.5	14	690	0.33	125
			2.6	2.6	1.6	14	910	0.51	90
			2	2.8	1.5	16	1300	0.68	119
	07-Sep-19	RG_FRUPO	1.7	5.8	1.6	12	10700	1.7	247
			3.8	1.2	2.2	13	500	0.25	50
			2.7	3.3	2.1	14	1400	0.67	72
	07-Sep-19	RG_FODPO	1.1	5.2	1.2	10	2200	1.3	81
			2.3	7.9	2.2	13	4200	1.9	108
			0.94	8.2	1.7	13	4500	2.1	105
	16-Sep-19	RG_FO22	1.2	3.2	1.2	13	1900	2.5	108
			1.6	4.8	1.7	13	2000	1.1	159
			1.9	3.8	1.4	12	2000	0.91	132
			1.4	4.3	1.5	11	2100	0.93	122
			2.3	4.2	1.8	13	1800	0.81	88
	04-Sep-19	RG_FOUEW	1.3	6	1.6	14	2800	1.4	195
			1.9	4	1.9	14	1700	1	197
			2.2	2.5	1.7	12	1600	0.66	154
December	10-Dec-19	RG_UFR1	1.6	1.8	0.4	10	640	0.38	38
			1.3	3	0.5	10	1500	0.58	45
			1.6	0.8	0.34	9.5	290	0.23	53
	10-Dec-19	RG_FODHE	1.1	0.72	0.53	9.9	240	0.18	50
			1.2	0.76	0.72	12	300	0.19	60
			1.1	0.45	0.58	9.1	160	0.12	78
	09-Dec-19	RG_FOUCL	0.64	1.5	0.5	9	640	0.52	70
			0.59	0.59	0.38	8.6	200	0.17	58
			0.88	0.57	0.34	7.9	180	0.14	20
	09-Dec-19	RG_FOUNGD	1.1	0.52	0.61	9	180	0.14	40
			1.3	0.32	0.41	12	110	0.08	14
			1.5	0.41	0.49	10	150	0.1	19
	09-Dec-19	RG_FODNGD	1.6	1.3	7.4	13	380	0.31	58
			1.2	0.78	3.9	12	220	0.18	62
			1.2	0.29	5.3	11	96	0.1	65
	09-Dec-19	RG_MP1	0.85	1.8	2.5	10	910	0.44	71
			0.8	0.94	2.4	11	310	0.24	73
			0.96	1.7	2.1	10	850	0.38	63
	09-Dec-19	RG_FOUSH	0.96	1.2	1.6	13	3400	0.19	289
			1.2	1.5	2.7	13	4200	0.25	700
			0.9	2.3	1.4	11	4800	0.43	282
	09-Dec-19	RG_FOUKI	0.81	0.82	0.55	15	560	0.19	90
			1.1	0.69	1.2	12	570	0.16	260
			1.1	1.8	1.8	11	1100	0.4	339
	10-Dec-19	RG_SCOUTDS	1.6	1.6	1.7	13	800	0.34	241
			1.8	2.7	1.6	12	3200	0.54	211
			1.8	1.3	1.6	10	1100	0.72	300
	10-Dec-19	RG_FOBKS	3	5.5	1.6	13	2300	0.91	210
			2.7	1.9	2.4	11	1100	0.48	400
			2.6	4.7	2	12	3100	1.2	330
	10-Dec-19	RG_FOBSC	2.8	3.7	1.5	12	1700	0.88	130
			1.9	3.6	2.4	11	2900	0.93	287
			1.1	1.4	1.1	13	690	0.33	102
	11-Dec-19	RG_FRUPO	0.92	1.3	0.52	13	730	0.32	33
			0.55	0.74	0.24	11	260	0.16	24
			0.68	1.4	0.36	13	420	0.25	27
	12-Dec-19	RG_FODPO	0.56	1.9	0.46	12	1400	0.56	41
			0.44	2	0.42	11	910	0.49	32
			0.37	1.2	0.26	10	610	0.29	28
	11-Dec-19	RG_FO22	0.41	1.2	0.28	11	1400	0.34	58
			0.59	1	0.39	11	1200	0.27	83
			0.42	1.3	0.25	12	1000	0.28	43
	11-Dec-19	RG_FOUEW	0.42	0.87	0.35	12	410	0.2	118
			0.3	0.65	0.36	15	320	0.15	101
			0.73	1.3	0.49	10	470	0.26	177

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

	Date	Biological Monitoring Area	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
February	14-Feb-19	RG_UFR1	<0.01	0.17	0.9	4.9	0.09	4.9
			<0.01	0.31	1.3	3.8	0.08	5.1
			<0.01	0.18	1.2	5.2	0.09	4.8
	12-Feb-19	RG_FOUNGD	<0.01	0.22	3.8	5.6	0.07	5.5
			<0.01	0.2	4.6	5.5	0.08	7
			<0.01	0.22	3.6	5.7	0.07	8
	12-Feb-19	RG_FODNGD	<0.01	0.32	6.5	7.2	0.08	10
			0.007	0.23	5.4	5	0.1	8.1
			<0.02	1.5	<5	8.1	0.13	6
	13-Feb-19	RG_MP1	<0.01	0.68	3.9	5	0.12	7.1
			<0.01	0.25	5	4.7	0.12	7.2
			0.01	0.33	4.7	8.4	0.09	4.9
	13-Feb-19	RG_FOUSH	0.01	0.35	6.3	9.6	0.07	9.8
			<0.01	0.33	5	6.9	0.13	9
			<0.01	0.33	6.6	6.6	0.12	9.8
	12-Feb-19	RG_FOUKI	0.009	0.25	2.9	4.5	0.15	7.8
			0.01	0.27	4.1	4.8	0.12	8.7
			0.014	0.39	5.8	4.7	0.12	7.6
	12-Feb-19	RG_FOBKS	0.01	1	11	13	0.05	5.7
	11-Feb-19	RG_FOBCP	0.01	0.34	23	9.4	0.06	32
			<0.02	<0.5	<5	10	0.09	4
			<0.01	0.55	9	8.6	0.05	19
	11-Feb-19	RG_FRUPO	0.005	0.27	1.3	5.1	0.09	6.8
			<0.01	0.38	1.9	8	0.09	10
			<0.01	0.34	2	6.2	0.07	5.9
	14-Feb-19	RG_FODPO	<0.01	0.27	1.5	3.6	0.1	9.8
			<0.01	0.16	1.4	5	0.07	7.4
			0.01	0.42	1.4	8.4	0.09	3.7
	14-Feb-19	RG_FO22	<0.02	<0.5	<5	4.9	0.1	6
			0.01	0.3	3	5.8	0.08	9.4
			<0.01	0.24	2.2	5.4	0.1	7.8
	13-Feb-19	RG_FOUEW	0.008	0.18	2.3	4.4	0.15	11
			0.008	0.2	0.78	6	0.23	5.2
			<0.01	0.17	1.8	4.4	0.13	7.8
June	20-Jun-19	RG_HENUP	0.01	0.25	2.3	4.9	0.07	16
			0.014	0.34	3	7.3	0.09	13
			0.012	0.24	2	6.2	0.1	16
	20-Jun-19	RG_FO26	0.01	0.27	1.6	3.6	0.07	12
			0.012	0.3	1.5	3.4	0.07	12
			0.012	0.24	1	3.4	0.08	12
	20-Jun-19	RG_FODHE	0.016	0.35	4.2	6.8	0.1	8.4
			0.015	0.3	3	6	0.12	7.9
			0.01	0.19	1	3.9	0.12	10
	19-Jun-19	RG_FOUNGD	0.01	0.4	12	5.1	0.08	25
			0.01	0.68	16	4.5	0.11	26
			0.006	0.27	9	5.1	0.09	12
	19-Jun-19	RG_FODNGD	0.007	0.26	3.3	4.1	0.11	13
			0.008	0.32	10	5.6	0.1	11
			0.007	0.33	6.5	4.4	0.11	12
	18-Jun-19	RG_MP1	0.006	0.26	8.6	5.2	0.11	7.7
			0.014	0.35	14	6	0.12	9.1
			0.01	0.36	16	6.1	0.1	8.4
	17-Jun-19	RG_FOUSH	0.02	0.47	15	5.9	0.27	25
			0.02	0.38	12	6.1	0.12	9.7
			0.012	0.38	6	4.7	0.1	9.9
	18-Jun-19	RG_FOUKI	0.01	0.29	8.7	4.7	0.16	9.7
			0.011	0.28	5.3	4.7	0.15	12
			<0.01	0.43	13	5	0.09	7
	17-Jun-19	RG_FOBKS	0.02	1	32	5	0.13	58
			0.01	0.75	15	3.8	0.12	26
			0.012	0.47	14	4	0.12	21

Table B.23: Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December

	Date	Biological Monitoring Area	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
June	18-Jun-19	RG_FOBSC	0.01	0.51	12	5.3	0.12	9.5
			<0.01	0.59	16	5.1	0.12	12
			0.01	0.8	15	5.7	0.08	17
	18-Jun-19	RG_FOBCP	0.022	0.74	23	2.8	0.12	95
			<0.01	0.53	10	5.3	0.08	17
			0.02	0.46	15	4.4	0.12	30
	19-Jun-19	RG_FRCP1SW	0.5	1.1	21	48	1.4	47
			0.02	0.34	4.4	5.7	0.07	5.4
			0.02	0.54	12	6.5	0.09	39
	19-Jun-19	RG_FRUPO	0.02	0.4	7.4	8.1	0.11	10
			0.012	0.36	5.7	7.6	0.12	13
			0.008	0.32	8.3	5	0.09	6.9
	21-Jun-19	RG_FODPO	0.01	0.44	10	4.7	0.1	10
			0.01	0.5	11	5	0.1	11
			0.013	0.66	10	5.7	0.11	11
	21-Jun-19	RG_FO22	0.02	0.75	14	7.5	0.11	24
			0.018	0.53	11	6.8	0.13	18
			0.02	0.61	8.2	10	0.12	11
	20-Jun-19	RG_FOUEW	0.008	0.35	9	5.6	0.12	8.2
			<0.01	0.29	7	6.4	0.16	6.5
			0.008	0.35	7.2	6.6	0.11	5.6
September	11-Sep-19	RG_HENUP	0.012	0.26	2.8	5.2	0.06	7.4
			0.009	0.25	2.9	4.6	0.06	14
			0.012	0.25	2.2	3.9	0.06	9.1
	10-Sep-19	RG_FO26	0.014	0.37	2.1	3.2	0.05	4
			0.016	0.35	2.3	3.1	0.05	6.1
			0.012	0.3	1.5	2.8	0.04	3.2
	10-Sep-19	RG_FODHE	0.015	0.22	2.3	5.1	0.07	4.5
			0.01	0.18	2.4	5.2	0.06	2.8
			0.01	0.3	4.2	7	0.07	6.2
	12-Sep-19	RG_FOUCL	0.013	0.23	2.6	7.2	0.07	4
			0.011	0.22	1.9	5.5	0.06	4.3
			0.013	0.35	3.7	5.8	0.08	12
	12-Sep-19	RG_FOUNGD	<0.01	0.26	7.6	7.5	0.08	5
			0.009	0.24	7.9	6.4	0.09	5
			0.01	0.24	7.4	6.1	0.07	3.5
	12-Sep-19	RG_FODNGD	0.01	0.31	9.9	8	0.12	5.9
			0.01	0.2	4.7	4.5	0.08	4
			0.01	0.42	20	7	0.11	7.9
	05-Sep-19	RG_MP1	0.008	0.31	7.2	5.6	0.07	16
			0.01	0.31	10	7	0.08	8.4
			0.01	0.25	5.8	7.3	0.09	7.5
	09-Sep-19	RG_FOUSH	0.009	0.29	11	5.6	0.04	5.2
			0.01	0.3	7.9	5.9	0.06	4.1
			0.01	0.26	8.6	6	0.08	8.5
	05-Sep-19	RG_FOUKI	0.01	0.29	13	6.2	0.1	13
			0.01	0.5	17	8.8	0.11	24
			<0.01	0.41	14	9.2	0.09	7.5
	12-Sep-19	RG_SCOUTDS	0.02	0.55	23	13.7	0.14	15
			0.02	0.4	16	13.7	0.12	10
			0.016	0.42	20	10.2	0.14	7.5
	09-Sep-19	RG_FOBKS	0.012	0.21	6.9	7.5	0.13	7
			0.012	0.22	7.2	7.9	0.15	4.9
			0.012	0.35	12	9.5	0.09	5.2
	13-Sep-19	RG_FOBSC	0.018	0.44	27	12.5	0.15	7.9
			0.015	0.5	28	11.9	0.12	11
			0.017	0.5	32	12.6	0.12	8.3
	06-Sep-19	RG_FOBCP	0.01	0.4	18	9.1	0.09	6.4
			<0.01	0.37	21	8.4	0.1	5.9
			0.009	0.33	24	6.3	0.07	14
			0.008	0.35	18	7.6	0.08	6.3
			0.006	0.31	17	7.3	0.07	3.7

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

	Date	Biological Monitoring Area	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
September	13-Sep-19	RG_FRCP1SW	0.01	0.49	15	7.7	0.1	5.4
			0.009	0.33	14	7.7	0.11	10
			0.012	0.44	21	7.7	0.11	8
	07-Sep-19	RG_FRUPO	0.009	0.56	20	6.1	0.09	65
			0.008	0.36	9	8.1	0.09	3.7
			0.008	0.38	14	6.8	0.09	8.3
	07-Sep-19	RG_FODPO	0.009	0.56	7.8	5.4	0.08	15
			0.022	0.66	12	7.3	0.12	20
			0.024	0.64	12	5.6	0.11	19
	16-Sep-19	RG_FO22	0.12	0.44	7.9	7.1	0.11	7.4
			0.019	0.56	9	7.8	0.11	10
			0.01	0.46	6.4	7.3	0.09	11
			0.01	0.53	7	6.7	0.08	9.2
			0.01	0.44	5.9	6.6	0.09	8.6
	04-Sep-19	RG_FOUEW	0.021	0.56	13	7.3	0.12	16
			0.014	0.53	14	6.9	0.1	22
			0.009	0.49	10	6	0.1	16
December	10-Dec-19	RG_UFR1	0.012	0.24	1.8	4.2	0.06	5.5
			0.014	0.29	2.3	4.6	0.07	5.5
			0.014	0.26	1.7	4.6	0.06	2.4
	10-Dec-19	RG_FODHE	0.01	0.15	2.2	4.4	0.08	4.6
			0.01	0.17	2.9	5.2	0.09	4.9
			0.009	0.14	2	5.2	0.07	2.8
	09-Dec-19	RG_FOUCL	0.011	0.98	2.6	4.5	0.05	5.6
			0.01	0.18	1.4	4.6	0.05	4.3
			0.006	0.13	2	3.4	0.05	5.7
	09-Dec-19	RG_FOUNGD	0.009	0.18	6.1	5.1	0.06	3.2
			0.006	0.14	6.1	4.3	0.07	4.9
			0.005	0.17	7.7	4.4	0.06	4.4
	09-Dec-19	RG_FODNGD	0.007	0.25	6.9	4.9	0.09	6.2
			0.007	0.2	6.6	5.9	0.09	4.8
			0.007	0.16	3.6	5.6	0.08	2.4
	09-Dec-19	RG_MP1	0.007	0.2	5	5.1	0.09	6.2
			0.008	0.22	4.7	6.4	0.08	4.9
			0.007	0.2	4.8	5.8	0.08	9
	09-Dec-19	RG_FOUSH	0.009	0.24	9.3	5.8	0.11	5.1
			0.011	0.32	14	7.1	0.11	4.3
			0.009	0.27	9.1	5.3	0.11	8
	09-Dec-19	RG_FOUKI	0.008	0.16	4.1	4.1	0.14	5.9
			0.009	0.18	7.4	4.4	0.11	5.5
			0.009	0.25	10	4.4	0.1	8.3
	10-Dec-19	RG_SCOUTDS	0.01	0.28	9	6.7	0.1	7.6
			0.012	0.3	8.5	6.8	0.09	8.9
			0.017	0.42	7.9	7.5	0.08	10
	10-Dec-19	RG_FOBKS	0.02	0.4	10	8.2	0.12	20
			0.01	0.32	9.7	7.5	0.08	9
			0.01	0.38	13	6.2	0.11	63
	10-Dec-19	RG_FOBSC	0.02	0.31	11	9.3	0.11	14
			0.012	0.38	16	5.9	0.08	19
			0.008	0.21	6.7	5.6	0.11	6.7
	11-Dec-19	RG_FRUPO	0.005	0.2	3.2	4.6	0.09	5.8
			<0.005	0.14	2.2	3.9	0.08	3.4
			<0.005	0.16	3	4.5	0.09	4.9
	12-Dec-19	RG_FODPO	0.005	0.21	2.6	4	0.08	7.8
			0.005	0.2	2	4	0.07	5.5
			<0.005	0.18	1.6	3.7	0.07	4.1
	11-Dec-19	RG_FO22	0.005	0.19	2.1	4.4	0.1	5.3
			0.005	0.18	2.2	5.4	0.09	4.4
			0.005	0.18	2	4.9	0.1	5
	11-Dec-19	RG_FOUEW	0.006	0.32	2	4.8	0.1	5
			0.007	0.27	1.8	4.4	0.13	4.2
			0.007	0.34	2.5	5.5	0.1	5.2

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

	Date	Biological Monitoring Area	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
February	14-Feb-19	RG_UFR1	0.01	<0.2	3.7	0.02	1.3	210
			0.01	<0.2	3.8	0.03	0.9	190
			0.01	<0.2	3.5	0.03	1.1	210
	12-Feb-19	RG_FOUNGD	0.02	<0.1	5.7	0.12	2.4	190
			0.02	<0.1	6.3	0.12	2.2	230
			0.03	<0.1	8	0.11	2.9	190
	12-Feb-19	RG_FODNGD	0.03	<0.2	14	0.11	4.4	210
			0.029	<0.05	8.1	0.07	2.5	190
			<0.1	<2	8	<0.1	3	290
	13-Feb-19	RG_MP1	0.02	<0.1	7.1	0.05	1.7	220
			0.03	<0.1	9.4	0.06	3.1	210
			0.02	<0.1	8.7	0.05	2.1	160
	13-Feb-19	RG_FOUSH	0.03	<0.2	7.8	0.11	9.3	250
			0.03	<0.1	10	0.1	6.1	220
			0.03	<0.1	8.3	0.12	7.4	180
	12-Feb-19	RG_FOUKI	0.022	<0.05	5.8	0.057	2.2	280
			0.034	<0.05	14	0.084	4.3	280
			0.07	0.07	22	0.09	8	160
	12-Feb-19	RG_FOBKS	0.02	<0.2	5.4	0.08	1.5	240
	11-Feb-19	RG_FOBCP	0.1	<0.1	20	2	4.4	120
			<0.1	<2	<5	0.3	<1	230
			0.05	<0.1	4.8	1.1	1.3	140
	11-Feb-19	RG_FRUPO	0.019	<0.05	8.8	0.11	2.7	170
			0.02	<0.1	8.3	0.09	1.6	170
			0.03	<0.1	16	0.08	3.4	130
	14-Feb-19	RG_FODPO	0.02	<0.1	4.8	0.07	2.3	230
			0.03	<0.2	8.5	0.09	4	170
			0.03	<0.2	16	0.09	4.1	200
	14-Feb-19	RG_FO22	<0.1	<2	12	<0.1	3	150
			0.05	<0.2	22	0.2	6.9	150
			0.03	<0.2	12	0.14	5.1	180
	13-Feb-19	RG_FOUEW	0.03	0.05	13	0.11	4.2	290
			0.009	<0.05	5.2	0.037	0.9	340
			0.03	<0.1	9.6	0.08	3.5	170
June	20-Jun-19	RG_HENUP	0.024	<0.05	3.7	0.076	0.9	270
			0.028	<0.05	4	0.12	1.2	320
			0.021	<0.05	2.8	0.084	0.6	330
	20-Jun-19	RG_FO26	0.031	<0.05	5.1	0.06	3.7	170
			0.029	<0.05	4.1	0.079	2.2	180
			0.022	<0.05	2.7	0.043	1.7	180
	20-Jun-19	RG_FODHE	0.04	<0.05	7.1	0.1	3.4	280
			0.035	<0.05	6.7	0.071	3.1	230
			0.012	<0.05	1.7	0.028	0.6	200
	19-Jun-19	RG_FOUNGD	0.06	<0.1	8.4	0.43	8.2	160
			0.12	<0.1	13	0.46	17	230
			0.046	4.3	7.2	0.2	6.8	240
	19-Jun-19	RG_FODNGD	0.025	<0.05	4	0.065	2.4	220
			0.045	<0.05	5.9	0.17	4.1	260
			0.03	<0.05	4.4	0.062	2.6	210
	18-Jun-19	RG_MP1	0.036	<0.05	5	0.11	2	340
			0.061	<0.05	13	0.15	5.4	370
			0.06	<0.1	11	0.14	4.6	380
	17-Jun-19	RG_FOUSH	0.11	<0.1	17	0.33	14	270
			0.06	<0.1	15	0.12	5.9	490
			0.044	<0.05	12	0.14	5.6	170
	18-Jun-19	RG_FOUKI	0.038	<0.05	7.5	0.093	3.5	400
			0.038	<0.05	6.7	0.095	4.8	350
			0.04	<0.1	6.9	0.1	3.8	320
	17-Jun-19	RG_FOBKS	0.23	0.1	40	0.93	40	170
			0.18	0.1	33	0.36	30	260
			0.12	0.08	23	0.4	20	200

Table B.23: Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December

	Date	Biological Monitoring Area	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
June	18-Jun-19	RG_FOBSC	0.07	<0.1	11	0.17	8.2	260
			0.08	<0.1	10	0.18	8.8	240
			0.08	<0.1	7.2	0.28	8.6	310
	18-Jun-19	RG_FOBCP	0.25	0.07	19	1.3	40	220
			0.07	<0.2	14	0.21	7.7	230
			0.1	<0.1	12	0.64	15	170
	19-Jun-19	RG_FRCP1SW	0.2	<0.1	18	0.78	30	330
			0.03	<0.2	4.1	0.09	3.5	140
			0.1	<0.1	25	0.35	12	160
	19-Jun-19	RG_FRUPO	0.06	<0.1	8.9	0.19	6.9	220
			0.057	<0.05	7.5	0.16	6.9	200
			0.044	<0.05	9.6	0.11	4.1	210
	21-Jun-19	RG_FODPO	0.085	0.07	18	0.18	9.1	300
			0.071	0.09	18	0.22	9	240
			0.086	0.08	20	0.17	9.4	180
	21-Jun-19	RG_FO22	0.16	0.1	33	0.38	27	190
			0.12	0.11	28	0.37	17	210
			0.09	<0.1	20	0.25	12	200
	20-Jun-19	RG_FOUEW	0.048	<0.05	11	0.16	4.5	250
			0.03	<0.1	6.9	0.19	2.9	290
			0.039	<0.05	8.4	0.18	4.2	240
September	11-Sep-19	RG_HENUP	0.024	<0.05	1.8	0.072	0.6	180
			0.026	<0.05	2.2	0.13	1	160
			0.023	<0.05	2.3	0.068	0.9	140
	10-Sep-19	RG_FO26	0.038	<0.05	6.4	0.071	3	120
			0.038	<0.05	5.5	0.086	3.3	120
			0.028	<0.05	5.1	0.052	2.1	100
	10-Sep-19	RG_FODHE	0.026	<0.05	3.6	0.042	1.4	160
			0.021	<0.05	2.8	0.037	1	120
			0.03	<0.1	5.4	0.05	1.9	250
	12-Sep-19	RG_FOUCL	0.024	0.25	3.3	0.072	2.7	150
			0.019	<0.05	2.9	0.071	1.3	160
			0.041	<0.05	6.8	0.38	6.6	150
	12-Sep-19	RG_FOUNGD	0.03	<0.1	3	0.08	1.6	220
			0.032	<0.05	3	0.12	2.3	300
			0.02	<0.1	2.7	0.09	2	180
	12-Sep-19	RG_FODNGD	0.04	<0.1	6.8	0.11	3.7	220
			0.029	<0.05	4.1	0.078	2.1	120
			0.06	<0.1	8	0.14	5.9	290
	05-Sep-19	RG_MP1	0.036	<0.05	7.6	0.12	3.5	200
			0.039	<0.05	4.9	0.13	3.6	220
			0.03	<0.05	3	0.075	2.1	230
	09-Sep-19	RG_FOUSH	0.018	<0.05	6	0.086	2	120
			0.029	<0.05	7.3	0.073	3	140
			0.027	<0.05	7.4	0.084	3.2	170
	05-Sep-19	RG_FOUKI	0.03	<0.1	4.1	0.16	2.4	170
			0.06	<0.2	8.6	0.23	6.6	330
			0.03	<0.1	5.4	0.11	5.2	250
	12-Sep-19	RG_SCOUTDS	0.097	<0.05	10	0.25	11	320
			0.059	<0.05	9.1	0.14	5.2	370
			0.049	<0.05	7.6	0.15	5.8	300
	09-Sep-19	RG_FOBKS	0.019	<0.05	2.9	0.056	2.6	420
			0.016	<0.05	2	0.04	1.1	500
			0.038	<0.05	6.5	0.085	3.2	290
	13-Sep-19	RG_FOBSC	0.051	<0.05	7.5	0.13	5.1	320
			0.044	<0.05	8	0.14	3.9	320
			0.05	<0.05	8.5	0.16	5.2	370
	06-Sep-19	RG_FOBCP	0.038	<0.05	5.4	0.13	3	200
			0.04	<0.1	4.7	0.13	2.9	220
			0.054	<0.05	11	0.32	7.1	140
			0.025	<0.05	4.1	0.13	1.9	190
			0.022	<0.05	2.3	0.098	1.4	170

Table B.23: **Composite-Taxa Benthic Invertebrate Tissue Chemistry, FRO LAEMP, February, June, September, December**

Month	Date	Biological Monitoring Area	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
			ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
September	13-Sep-19	RG_FRCP1SW	0.038	<0.05	6.8	0.11	4	180
			0.06	<0.05	10	0.18	5.2	160
			0.063	<0.05	11	0.26	5.8	180
	07-Sep-19	RG_FRUPO	0.12	0.05	11	0.45	19	140
			0.03	<0.05	6.1	0.14	2.6	160
			0.057	<0.05	9.7	0.21	7.2	160
	07-Sep-19	RG_FODPO	0.076	0.05	12	0.66	12	100
			0.13	0.1	24	0.41	19	120
			0.13	0.11	24	0.43	22	79
	16-Sep-19	RG_FO22	0.059	<0.05	12	0.3	7	120
			0.079	0.07	19	0.19	9.9	110
			0.061	<0.05	11	0.21	8.3	120
			0.061	0.05	13	0.21	8.5	120
			0.066	0.05	15	0.15	7.8	120
	04-Sep-19	RG_FOUEW	0.087	0.06	16	0.31	13	140
			0.062	<0.05	13	0.3	8	160
			0.045	<0.05	9	0.25	5.1	160
December	10-Dec-19	RG_UFR1	0.028	<0.05	6.7	0.066	3.9	140
			0.041	<0.05	10	0.087	6.4	120
			0.019	<0.05	3.4	0.065	1.6	140
	10-Dec-19	RG_FODHE	0.017	<0.05	3.5	0.041	1.3	130
			0.018	<0.05	4.1	0.045	1.5	140
			0.014	<0.05	2.2	0.035	0.8	130
	09-Dec-19	RG_FOUCL	0.023	<0.05	3.7	0.076	2.8	100
			0.011	<0.05	2.6	0.045	1.2	110
			0.011	<0.05	3.5	0.048	1.2	100
	09-Dec-19	RG_FOUNGD	0.014	<0.05	2.4	0.065	1	120
			0.01	<0.05	1.5	0.093	0.6	170
			0.013	<0.05	2.1	0.077	0.8	140
	09-Dec-19	RG_FODNGD	0.034	<0.05	10	0.12	3	170
			0.023	<0.05	6.8	0.075	1.8	150
			0.014	<0.05	2.4	0.029	0.6	170
	09-Dec-19	RG_MP1	0.029	<0.05	4.4	0.091	4.6	160
			0.019	<0.05	4	0.059	1.7	160
			0.029	<0.05	5	0.091	4.2	150
	09-Dec-19	RG_FOUSH	0.02	<0.05	2.9	0.054	2.7	200
			0.023	<0.05	3.4	0.063	3.6	200
			0.034	<0.05	5.6	0.11	5.4	130
	09-Dec-19	RG_FOUKI	0.021	<0.05	3.6	0.038	1.7	250
			0.017	<0.05	3.2	0.044	1.6	200
			0.034	<0.05	8.1	0.092	3.9	120
	10-Dec-19	RG_SCOUTDS	0.039	<0.05	6.4	0.12	3.5	180
			0.056	<0.05	9	0.13	6.1	220
			0.051	<0.05	17	0.43	3.7	210
	10-Dec-19	RG_FOBKS	0.1	<0.1	21	0.21	12	200
			0.04	<0.1	11	0.11	4.2	260
			0.07	<0.1	24	0.33	11	200
	10-Dec-19	RG_FOBSC	0.09	<0.1	10	0.22	8.7	180
			0.076	<0.05	11	0.27	8.6	200
			0.042	<0.05	6	0.1	3	180
	11-Dec-19	RG_FRUPO	0.022	<0.05	5.2	0.099	2.7	140
			0.014	<0.05	3	0.065	1.5	120
			0.02	<0.05	5.7	0.091	2.1	130
	12-Dec-19	RG_FODPO	0.026	<0.05	5.1	0.1	4	140
			0.028	<0.05	6.1	0.11	4.1	120
			0.02	<0.05	5.1	0.071	2.6	110
	11-Dec-19	RG_FO22	0.018	<0.05	3.9	0.077	2.6	120
			0.018	<0.05	3.9	0.065	2.2	120
			0.02	<0.05	6.3	0.074	2.7	120
	11-Dec-19	RG_FOUEW	0.016	<0.05	4.7	0.066	1.7	180
			0.01	<0.05	3.2	0.045	1.4	190
			0.022	<0.05	4.4	0.071	2.7	120

Table B.24: **Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019**

Year	Month	Station	Rep	Abundance	LPL Richness	% EPT	% Ephemeroptera	% Plecoptera	% Trichoptera	EPT Abundance
2012	September	RG_HENUP	1	4,600	33.0	81.4	59.6	4.04	17.7	3,743
		RG_FO26	1	10,900	42.0	76.5	42.4	10.1	24.0	8,340
		RG_FODHE	1	15,820	27.0	94.7	80.9	4.30	9.48	14,980
		RG_FOUNGD	1	13,800	33.0	78.6	60.0	5.80	12.8	10,840
		RG_MP1	1	17,400	24.0	63.8	57.5	2.59	3.74	11,100
		RG_FOUSH	1	11,960	34.0	78.9	69.6	3.34	6.02	9,440
			2	9,920	30.0	67.1	59.1	1.81	6.25	6,660
			3	15,140	27.0	71.9	63.1	3.17	5.55	10,880
		RG_FOUKI	1	11,840	26.0	84.1	74.7	3.38	6.08	9,960
		RG_FOBKS	1	3,978	22.0	78.8	69.6	3.07	6.15	3,133
		RG_FOBSC	1	6,440	25.0	63.7	49.7	6.21	7.76	4,100
		RG_FOBCP	1	7,320	27.0	84.2	73.2	1.91	9.02	6,160
		RG_FODPO	1	15,800	37.0	72.5	34.3	2.28	35.9	11,460
		RG_FO22	1	6,560	29.0	55.8	30.5	2.74	22.6	3,660
		RG_FOUEW	1	5,617	43.0	80.1	52.5	5.34	22.3	4,500
2013	September	RG_HENUP	1	3,150	27.0	91.5	77.2	2.38	11.9	2,883
		RG_FO26	1	4,400	29.0	91.2	61.9	3.98	25.3	4,012
		RG_MP1	1	4,686	26.0	47.3	35.4	2.74	9.15	2,214
		RG_FODPO	1	23,260	24.0	98.5	18.9	2.15	77.4	22,900
2015	September	RG_HENUP	1	7,500	24.0	96.0	67.7	1.33	26.9	7,200
		RG_FO26	1	9,400	32.0	85.5	67.4	2.34	15.7	8,040
		RG_FODHE	1	17,060	31.0	77.6	61.3	0.469	15.8	13,240
		RG_FOUNGD	1	7,260	28.0	92.8	74.7	2.75	15.4	6,740
		RG_FODNGD	1	7,840	28.0	93.9	76.5	5.36	12.0	7,360
		RG_MP1	1	5,467	35.0	69.8	51.2	4.57	14.0	3,817
		RG_FOUSH	1	7,320	31.0	86.1	73.0	1.91	11.2	6,300
		RG_FOUKI	1	3,490	34.0	75.1	65.0	1.72	8.31	2,620
		RG_FOBKS	1	4,150	30.0	69.0	47.3	4.52	17.2	2,862
		RG_FOBSC	1	2,927	32.0	62.4	40.1	4.97	17.4	1,827
		RG_FOBCP	1	4,250	31.0	77.6	16.2	5.59	55.9	3,300
		RG_FODPO	1	10,340	25.0	89.6	7.93	15.7	66.0	9,260
		RG_FO22	1	21,140	34.0	65.5	13.2	7.57	44.7	13,840
		RG_FOUEW	1	7,720	29.0	71.0	25.9	12.7	32.4	5,480
2016	September	RG_HENUP	1	4,830	25.0	90.9	78.3	1.66	11.0	4,390
		RG_FO26	1	17,280	37.0	78.8	55.0	6.25	17.6	13,620
		RG_FODHE	1	9,800	26.0	88.0	76.7	0.204	11.0	8,620
		RG_FOUKI	1	1,440	38.0	51.4	35.6	5.83	10.0	740
		RG_FOBKS	1	4,313	31.0	64.9	38.8	9.57	16.5	2,800
		RG_FOBSC	1	2,081	35.0	50.2	22.5	11.4	16.2	1,044
		RG_FOBCP	1	2,207	33.0	66.8	19.3	16.3	31.1	1,473
		RG_FODPO	1	11,620	35.0	76.4	14.5	20.3	41.7	8,880
		RG_FOUEW	1	6,760	33.0	60.1	16.6	13.3	30.2	4,060
2017	September	RG_HENUP	1	11,240	24.0	89.1	53.7	5.16	30.2	10,020
		RG_FO26	1	15,420	36.0	90.3	46.6	26.8	16.9	13,920
		RG_FODHE	1	12,540	33.0	93.6	82.6	1.44	9.57	11,740
		RG_FOUNGD	1	7,220	28.0	65.9	44.9	4.71	16.3	4,760
		RG_FODNGD	1	7,760	30.0	79.9	57.5	5.93	16.5	6,200
		RG_MP1	1	12,480	33.0	85.6	64.1	7.05	14.4	10,680
		RG_FOUSH	1	4,288	39.0	79.3	60.9	3.79	14.6	3,400
		RG_FOUKI	1	6,120	36.0	69.6	42.2	7.52	19.9	4,260
			2	4,009	34.0	60.8	46.7	5.22	8.84	2,436
		RG_FOBKS	1	3,347	39.0	61.6	39.4	12.4	9.76	2,060
			2	3,030	30.0	67.7	44.9	11.2	11.6	2,050
			3	4,886	34.0	59.9	34.5	10.5	14.9	2,929
		RG_FOBSC	1	3,880	41.0	57.2	28.9	14.7	13.7	2,220
		RG_FOBCP	1	5,200	37.0	62.1	12.9	12.1	37.1	3,229
		RG_FRCP1SW	1	2,300	37.0	60.9	10.9	9.35	40.7	1,400
		RG_FRUPO	1	22,540	36.0	85.1	8.25	5.68	71.2	19,180
		RG_FODPO	1	15,580	30.0	55.5	3.21	9.88	42.4	8,640
		RG_FO22	1	23,400	40.0	52.8	4.10	10.3	38.4	12,360
		RG_FOUEW	1	8,320	36.0	68.3	15.1	13.2	39.9	5,680
2018	June	RG_HENUP	1	1,839	26.0	97.9	69.2	4.53	24.2	1,800
		RG_FO26	1	2,662	35.0	71.4	35.8	18.5	17.1	1,900
		RG_FODHE	1	2,415	30.0	38.3	31.9	2.69	3.73	925
		RG_FOUNGD	1	5,983	42.0	34.0	20.3	6.96	6.69	2,033
		RG_FODNGD	1	1,665	30.0	58.0	40.2	12.3	5.41	965
		RG_MP1	1	3,720	41.0	46.0	26.1	12.6	7.26	1,710
		RG_FOUSH	1	2,529	33.0	49.7	37.9	8.76	3.11	1,257
		RG_FOUKI	1	2,225	28.0	69.9	51.9	15.1	2.92	1,555
		RG_FOBKS	1	2,631	38.0	40.1	27.2	7.89	4.97	1,054
		RG_FOBSC	1	1,207	35.0	32.5	18.3	13.3	0.888	393
		RG_FOBCP	1	1,350	36.0	54.7	40.2	10.5	3.99	738
		RG_FRCP1SW	1	706	37.0	77.1	53.3	15.6	8.22	544
		RG_FRUPO	1	1,673	40.0	75.5	31.8	12.5	31.3	1,264
		RG_FODPO	1	3,900	35.0	61.8	20.8	15.1	25.9	2,411
		RG_FO22	1	429	51.0	30.8	4.66	11.0	15.2	132
		RG_FOUEW	1	4,170	37.0	55.4	33.3	9.83	12.2	2,310
	August	RG_HENUP	1	4,643	37.0	64.0	40.9	7.08	16.0	2,971
		RG_FODHE	1	9,480	31.0	70.5	65.6	2.53	2.32	6,680
		RG_FOUNGD	1	20,360	44.0	63.5	56.3	0.982	6.19	12,920
		RG_FODNGD	1	9,340	44.0	66.2	58.9	3.21	4.07	6,180
		RG_MP1	1	7,420	35.0	57.1	52.0	2.43	2.70	4,240
		RG_FOUSH	1	4,660	45.0	76.0	68.2	2.36	5.36	3,540
		RG_FOUKI	1	6,160	29.0	77.6	74.0	1.95	1.62	4,780
		RG_FOBKS	1	9,320	38.0	61.4	56.7	2.15	2.58	5,720
		RG_FOBSC	1	8,520	35.0	49.1	43.7	0.469	4.93	4,180
		RG_FOBCP	1	23,080	44.0	31.0	22.0	0.607	8.41	7,160
		RG_FRCP1SW	1	11,880	40.0	47.8	23.7	3.20	20.9	5,680
		RG_FRUPO	1	18,820	40.0	32.7	21.5	1.49	9.78	6,160
		RG_FODPO	1	6,367	38.0	26.7	5.76	3.14	17.8	1,700
		RG_FO22	1	6,620	35.0	15.7	3.63	2.72	9.37	1,040
		RG_FOUEW	1	9,820	40.0	40.5	21.2	3.05	16.3	3,980
	September	RG_HENUP	1	5,114	29.0	83.5	69.0	2.51	12.0	4,271
			2	7,267	29.0	86.0	70.6	5.28	10.1	6,250
			3	12,860	32.0	86.2	72.8	5.29	8.09	11,080
		RG_FO26	1	24,560	45.0	78.1	58.6	8.06	11.4	19,180
			2	21,940	47.0	82.8	68.2	5.38	9.21	18,160
			3	23,600	48.0	77.8	60.8	6.44	10.6	18,360
		RG_FODHE	1	12,800	40.0	78.1	66.6	3.28	8.28	10,000
			2	17,380	35.0	76.8	64.1	1.96	10.7	13,340
			3	17,960	29.0	85.0	80.8	0.668	3.45	15,260
		RG_FOUNGD	1	22,680	41.0	68.9	52.1	3.97	12.8	15,620
			2	22,200	42.0	73.8	58.7	5.86	9.19	16,380
			3	23,800	44.0	88.8	60.7	6.97	21.2	21,140
		RG_FODNGD	1	14,280	43.0	77.7	53.1	7.14	17.5	11,100
			2	11,860	38.0	75.9	56.3	7.59	12.0	9,000
			3	14,440	44.0	76.5	56.2	11.6	8.59	11,040
		RG_MP1	1	12,900	40.0	74.9	57.8	4.96	12.1	9,660
			2	12,840	43.0	68.1	47.2	7.17	13.7	8,740
			3	10,320	36.0	69.6	52.7	4.46	12.4	7,180

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Abundance	LPL Richness	% EPT	% Ephemeroptera	% Plecoptera	% Trichoptera	EPT Abundance
2018	September	RG_FOUSH	1	8,620	39.0	70.3	48.5	3.02	18.8	6,060
			2	9,560	50.0	67.4	44.4	5.65	17.4	6,440
			3	6,680	40.0	68.4	41.9	2.99	23.5	4,570
		RG_FOUKI	1	5,500	31.0	68.8	59.4	2.73	6.67	3,783
			2	4,900	33.0	57.3	50.8	1.02	5.51	2,810
			3	5,186	35.0	53.7	44.4	2.48	6.89	2,786
		RG_FOBKS	1	7,900	33.0	61.8	49.4	3.80	8.61	4,880
			2	5,617	34.0	58.8	42.1	4.75	11.9	3,300
			3	12,580	43.0	61.5	42.4	7.15	11.9	7,740
		RG_FOBSC	1	7,020	30.0	60.4	40.7	9.69	9.97	4,240
			2	3,705	42.0	53.6	38.9	6.88	7.83	1,985
			3	3,360	32.0	53.0	36.3	5.36	11.3	1,780
		RG_FOBCP	1	6,067	36.0	78.6	48.6	5.22	24.7	4,767
			2	2,075	34.0	60.7	39.5	3.13	18.1	1,260
			3	6,300	29.0	66.0	36.8	5.40	23.8	4,160
			4	3,500	33.0	61.7	42.9	2.57	16.3	2,160
		RG_FRUPO	1	20,540	41.0	79.0	12.5	3.31	63.2	16,220
			2	4,463	38.0	66.4	15.1	2.80	48.5	2,962
			3	10,420	39.0	73.9	14.2	4.22	55.5	7,700
		RG_FODPO	1	28,120	40.0	83.7	11.1	1.14	71.5	23,540
			2	44,320	48.0	81.9	8.57	1.81	71.5	36,300
			3	66,740	50.0	77.9	7.58	1.68	68.6	51,980
		RG_FO22	1	15,120	34.0	75.5	11.2	5.16	59.1	11,420
			2	16,860	35.0	66.0	11.0	5.10	49.8	11,120
			3	14,720	36.0	58.0	12.8	3.40	41.8	8,540
			4	8,460	31.0	47.3	10.6	2.84	33.8	4,000
			5	10,980	29.0	41.2	9.47	2.55	29.1	4,520
		RG_FOUEW	1	6,360	36.0	54.4	15.1	6.92	32.4	3,460
			2	9,160	42.0	69.0	23.4	7.42	38.2	6,320
			3	6,700	36.0	64.8	24.8	7.46	32.5	4,340
	December	RG_UFR1	1	1,536	39.0	84.3	51.2	7.99	25.1	1,295
			2	3,744	37.0	85.8	45.7	9.20	30.9	3,211
			3	10,640	40.0	77.1	40.6	5.26	31.2	8,200
		RG_FOUKI	1	14,820	30.0	78.7	52.0	0.270	26.5	11,660
			2	7,120	27.0	68.3	46.9	0.562	20.8	4,860
			3	6,500	28.0	67.7	45.8	1.54	20.3	4,400
		RG_FOBSC	1	788	32.0	73.6	39.1	8.38	26.1	580
			2	397	33.0	71.8	35.5	9.57	26.7	285
			3	1,306	26.0	19.3	3.95	4.20	11.1	252
		RG_FOBCP	1	2,125	32.0	59.5	0.941	1.18	57.4	1,265
			2	2,336	23.0	42.8	0.612	1.53	40.7	1,000
			3	622	16.0	37.9	0.322	0.643	37.0	236
		RG_FRUPO	1	27,880	38.0	87.1	2.65	1.36	83.1	24,280
			2	45,040	40.0	81.4	4.66	0.888	75.9	36,680
			3	15,240	32.0	83.3	5.64	1.05	76.6	12,700
		RG_FODPO	1	31,320	40.0	88.4	3.45	1.92	83.0	27,680
			2	47,060	42.0	86.2	2.46	1.95	81.8	40,580
			3	49,880	39.0	87.4	4.61	0.962	81.8	43,600
		RG_FOUEW	1	20,420	40.0	85.6	7.74	2.45	75.4	17,480
			2	28,640	44.0	83.2	14.1	1.75	67.3	23,820
			3	30,260	43.0	79.9	10.0	2.78	67.1	24,180
2019	February	RG_FOUKI	1	10,440	32.0	57.1	30.3	0.766	26.1	5,960
			2	11,780	30.0	64.7	42.8	0.340	21.6	7,620
			3	9,320	32.0	62.2	37.8	0.429	24.0	5,800
		RG_FRUPO	1	10,200	24.0	71.8	1.37	0.392	70.0	7,320
			2	7,380	22.0	59.1	1.08	0.813	57.2	4,360
			3	7,600	23.0	67.1	2.37	0.789	63.9	5,100
		RG_FODPO	1	27,200	36.0	73.5	2.79	1.03	69.6	19,980
			2	14,700	33.0	83.0	3.13	2.04	77.8	12,200
			3	45,240	39.0	83.1	2.30	1.59	79.2	37,580
		RG_FOUEW	1	22,360	28.0	80.1	5.46	1.97	72.7	17,920
			2	9,660	30.0	69.8	10.6	2.69	56.5	6,740
			3	15,760	30.0	79.4	4.95	3.05	71.4	12,520
	June	RG_HENUP	1	2,817	32.0	85.5	66.0	2.66	16.9	2,408
			2	2,845	25.0	91.4	65.8	2.24	23.3	2,600
			3	3,875	27.0	88.1	69.0	2.26	16.8	3,412
		RG_FO26	1	9,000	40.0	70.7	43.6	12.0	15.1	6,360
			2	11,700	41.0	74.2	48.9	5.13	20.2	8,680
			3	21,020	45.0	74.1	35.4	9.61	29.1	15,580
		RG_FODHE	1	10,360	36.0	57.7	51.7	2.12	3.86	5,980
			2	6,033	34.0	63.3	55.2	3.59	4.42	3,817
			3	10,040	31.0	69.5	62.9	3.39	3.19	6,980
		RG_FOUNGD	1	3,990	37.0	60.4	44.6	9.77	6.02	2,410
			2	2,750	41.0	73.8	43.6	15.3	14.8	2,029
			3	3,867	41.0	71.0	48.0	12.1	10.9	2,744
		RG_FODNGD	1	5,450	33.0	81.7	65.7	7.34	8.56	4,450
			2	1,576	36.0	80.4	59.5	9.97	10.9	1,267
			3	3,118	36.0	74.3	58.3	8.45	7.58	2,318
		RG_MP1	1	3,045	34.0	52.8	42.7	6.57	3.58	1,609
			2	4,529	31.0	74.8	57.7	8.83	8.20	3,386
			3	3,989	33.0	74.4	53.8	12.0	8.64	2,967
		RG_FOUSH	1	4,786	28.0	82.7	69.3	8.66	4.78	3,957
			2	4,075	32.0	64.1	51.2	8.90	3.99	2,612
			3	4,144	37.0	58.7	46.9	6.70	5.09	2,433
		RG_FOUKI	1	2,392	34.0	75.2	55.0	9.97	10.3	1,800
			2	4,300	40.0	73.3	62.2	5.23	5.81	3,150
			3	3,091	33.0	72.1	58.2	9.41	4.41	2,227
		RG_FOBKS	1	2,073	41.0	69.5	58.8	5.14	5.47	1,440
			2	4,871	31.0	83.0	71.8	9.09	2.05	4,043
			3	4,200	39.0	78.6	68.2	5.36	5.06	3,300
		RG_FOBSC	1	1,615	28.0	81.7	70.9	9.91	0.929	1,320
			2	1,100	29.0	77.0	68.2	6.67	2.12	847
			3	2,991	25.0	75.1	69.0	5.47	0.608	2,245
		RG_FOBCP	1	4,743	28.0	59.9	44.6	14.2	1.20	2,843
			2	2,650	30.0	59.7	41.5	17.6	0.629	1,583
			3	2,307	33.0	45.5	31.0	12.7	1.86	1,050
		RG_FRCP1SW	1	1,925	28.0	67.5	44.2	17.2	6.17	1,300
			2	3,470	27.0	47.3	28.0	14.4	4.90	1,640
			3	6,880	30.0	44.2	27.0	13.7	3.49	3,040
		RG_FRUPO	1	1,700	35.0	52.1	13.5	17.9	20.6	885
			2	1,608	30.0	66.2	20.9	14.7	30.6	1,064
			3	2,069	31.0	47.4	13.9	16.6	16.9	981
		RG_FODPO	1	3,220	37.0	79.2	8.70	11.5	59.0	2,550
			2	3,120	35.0	67.6	11.2	7.37	49.0	2,110
			3	3,500	29.0	69.2	10.2	10.2	48.9	2,422
		RG_FO22	1	3,050	36.0	52.1	6.89	8.52	36.7	1,590
			2	5,333	27.0	33.4	1.56	1.88	30.0	1,783
			3	3,963	32.0	27.1	6.62	6.31	14.2	1,075
		RG_FOUEW	1	5,950	35.0	60.2	28.0	2.24	30.0	3,583
			2	8,100	44.0	71.6	43.0	2.22	26.4	5,800
			3	6,800	34.0	83.8	55.3	4.71	23.8	5,700

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Abundance	LPL Richness	% EPT	% Ephemeroptera	% Plecoptera	% Trichoptera	EPT Abundance
2019	September	RG_HENUP	1	1,960	29.0	87.2	71.7	2.81	12.8	1,710
			2	7,320	29.0	88.0	63.7	4.64	19.7	6,440
			3	6,560	25.0	89.9	71.0	1.52	17.4	5,900
		RG_FO26	1	26,920	42.0	74.0	53.4	12.3	8.32	19,920
			2	13,840	32.0	85.0	70.1	8.09	6.79	11,760
			3	27,840	47.0	70.0	55.7	4.09	10.1	19,480
		RG_FODHE	1	26,620	37.0	70.2	60.9	0.977	8.41	18,700
			2	26,800	48.0	66.8	55.3	1.49	10.0	17,900
			3	34,440	38.0	70.4	63.0	1.22	6.21	24,240
		RG_FOUCL	1	30,060	40.0	66.2	56.4	4.59	5.26	19,900
			2	31,480	44.0	71.6	55.4	9.78	6.42	22,540
			3	20,120	45.0	66.7	57.7	4.08	4.97	13,420
		RG_FOUNGD	1	10,440	31.0	81.0	71.6	3.26	6.13	8,460
			2	29,280	41.0	88.1	76.9	3.14	8.06	25,800
			3	28,360	38.0	94.5	83.6	3.67	7.26	26,800
		RG_FODNGD	1	9,800	44.0	72.4	53.7	4.90	13.9	7,100
			2	9,360	40.0	69.9	56.6	2.56	10.7	6,540
			3	11,300	31.0	82.1	66.9	4.96	10.3	9,280
		RG_MP1	1	11,740	29.0	27.6	18.2	5.79	3.58	3,240
			2	7,400	37.0	39.5	27.8	5.95	5.68	2,920
			3	14,300	31.0	23.6	15.2	4.06	4.34	3,380
		RG_FOUSH	1	7,880	41.0	55.8	39.1	4.57	12.2	4,400
			2	6,420	38.0	53.3	40.5	4.67	8.10	3,420
			3	8,080	36.0	46.0	30.7	5.45	9.90	3,720
		RG_FOUKI	1	5,933	36.0	52.5	46.3	2.53	3.65	3,117
			2	2,775	32.0	55.9	42.3	4.20	9.31	1,550
			3	4,390	42.0	52.4	44.9	1.82	5.69	2,300
		RG_FOBKS	1	4,800	36.0	68.2	36.6	4.76	26.8	3,271
			2	3,622	37.0	69.6	45.7	5.83	18.1	2,522
			3	5,400	37.0	69.3	45.5	4.76	19.0	3,743
		RG_SCOUTDS	1	5,933	37.0	73.6	39.3	4.21	30.1	4,367
			2	6,420	34.0	66.7	42.4	2.80	21.5	4,280
			3	7,840	34.0	79.6	54.1	3.06	22.4	6,240
		RG_FOBSC	1	6,133	31.0	62.0	40.5	2.99	18.5	3,800
			2	4,200	33.0	74.0	45.2	3.33	25.5	3,110
			3	2,433	34.0	60.8	34.5	3.01	23.3	1,480
		RG_FOBCP	1	6,280	30.0	66.9	33.1	2.23	31.5	4,200
			2	1,710	33.0	57.3	36.8	2.34	18.1	980
			3	5,143	34.0	54.7	23.6	3.06	28.1	2,814
			4	8,440	33.0	51.4	22.0	2.13	27.3	4,340
			5	3,510	32.0	37.9	24.2	0.285	13.4	1,330
		RG_FRCP1SW	1	11,440	41.0	79.4	19.4	5.77	54.2	9,080
			2	6,700	29.0	80.9	12.2	2.99	65.7	5,420
			3	2,955	28.0	73.8	18.8	7.08	48.0	2,182
		RG_FRUPO	1	6,300	30.0	80.4	15.3	7.94	57.1	5,067
			2	8,160	31.0	74.8	7.11	2.94	64.7	6,100
			3	4,240	33.0	64.6	10.6	4.25	49.8	2,740
		RG_FODPO	1	14,040	38.0	67.0	16.5	3.70	46.7	9,400
			2	9,900	33.0	65.7	16.0	9.49	40.2	6,500
			3	13,040	40.0	59.4	13.2	3.68	42.5	7,740
		RG_FO22	1	5,667	35.0	69.7	15.3	11.2	43.2	3,950
			2	6,280	30.0	49.7	10.5	12.1	27.1	3,120
			3	11,340	31.0	58.0	14.5	20.5	23.1	6,580
			4	7,420	31.0	47.2	15.6	11.6	19.9	3,500
			5	9,220	39.0	59.0	15.8	8.03	35.1	5,440
		RG_FOUEW	1	6,160	46.0	45.1	18.8	4.87	21.4	2,780
			2	8,900	42.0	54.2	27.9	4.94	21.3	4,820
			3	9,220	42.0	54.4	27.8	2.60	24.1	5,020
	December	RG_UFR1	1	29,700	45.0	79.7	45.1	6.53	28.1	23,680
			2	5,080	42.0	86.8	43.5	19.5	23.8	4,410
			3	15,940	40.0	82.2	45.2	15.8	21.2	13,100
		RG_FOUKI	1	10,100	40.0	51.9	36.0	1.19	14.7	5,240
			2	8,220	35.0	44.5	29.2	1.22	14.1	3,660
			3	11,920	34.0	56.9	32.2	1.01	23.7	6,780
		RG_SCOUTDS	1	17,300	37.0	84.7	20.5	1.62	62.7	14,660
			2	13,060	38.0	85.0	21.3	2.76	60.9	11,100
			3	6,640	31.0	84.6	19.0	1.20	64.5	5,620
		RG_FRUPO	1	31,960	34.0	86.0	2.25	1.13	82.6	27,480
			2	26,540	34.0	80.5	5.58	0.528	74.4	21,360
			3	27,640	34.0	79.7	5.14	0.941	73.7	22,040
		RG_FODPO	1	30,880	44.0	83.2	6.02	2.85	74.4	25,700
			2	29,580	30.0	87.8	4.46	1.56	81.8	25,980
			3	31,420	42.0	82.7	4.20	1.97	76.6	26,000
		RG_FOUEW	1	12,960	40.0	80.9	21.5	3.09	56.3	10,480
			2	16,540	42.0	78.7	16.8	5.56	56.3	13,020
			3	18,360	48.0	74.0	13.9	6.75	53.3	13,580

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Ephemroptera Abundance	Plecoptera Abundance	Trichoptera Abundance	Baetidae Abundance
2012	September	RG_HENUP	1	2,743	814	186	42.9
		RG_FO26	1	4,620	2,620	1,100	120
		RG_FODHE	1	12,800	1,500	680	40.0
		RG_FOUNGD	1	8,280	1,760	800	120
		RG_MP1	1	10,000	650	450	650
		RG_FOUSH	1	8,320	720	400	240
			2	5,860	620	180	280
			3	9,560	840	480	320
		RG_FOUKI	1	8,840	720	400	340
		RG_FOBKS	1	2,767	244	122	344
		RG_FOBSC	1	3,200	500	400	260
		RG_FOBCP	1	5,360	660	140	40.0
		RG_FODPO	1	5,420	5,680	360	1,060
		RG_FO22	1	2,000	1,480	180	240
		RG_FOUEW	1	2,950	1,250	300	300
2013	September	RG_HENUP	1	2,433	375	75.0	16.7
		RG_FO26	1	2,725	1,113	175	150
		RG_MP1	1	1,657	429	129	271
		RG_FODPO	1	4,400	18,000	500	960
2015	September	RG_HENUP	1	5,080	2,020	100	80.0
		RG_FO26	1	6,340	1,480	220	1,280
		RG_FODHE	1	10,460	2,700	80.0	1,340
		RG_FOUNGD	1	5,420	1,120	200	860
		RG_FODNGD	1	6,000	940	420	1,360
		RG_MP1	1	2,800	767	250	483
		RG_FOUSH	1	5,340	820	140	2,200
		RG_FOUKI	1	2,270	290	60.0	540
		RG_FOBKS	1	1,962	713	188	800
		RG_FOBSC	1	1,173	509	145	391
		RG_FOBCP	1	688	2,375	238	163
		RG_FODPO	1	820	6,820	1,620	0
		RG_FO22	1	2,800	9,440	1,600	160
		RG_FOUEW	1	2,000	2,500	980	40.0
2016	September	RG_HENUP	1	3,780	530	80.0	0
		RG_FO26	1	9,500	3,040	1,080	640
		RG_FODHE	1	7,520	1,080	20.0	580
		RG_FOUKI	1	512	144	84.0	96.0
		RG_FOBKS	1	1,675	712	413	325
		RG_FOBSC	1	469	337	237	238
		RG_FOBCP	1	427	687	360	133
		RG_FODPO	1	1,680	4,840	2,360	960
		RG_FOUEW	1	1,120	2,040	900	420
2017	September	RG_HENUP	1	6,040	3,400	580	80.0
		RG_FO26	1	7,180	2,600	4,140	860
		RG_FODHE	1	10,360	1,200	180	200
		RG_FOUNGD	1	3,240	1,180	340	700
		RG_FODNGD	1	4,460	1,280	460	1,800
		RG_MP1	1	8,000	1,800	880	980
		RG_FOUSH	1	2,613	625	163	350
		RG_FOUKI	1	2,580	1,220	460	1,040
			2	1,873	355	209	573
		RG_FOBKS	1	1,320	327	413	420
			2	1,360	350	340	630
			3	1,686	729	514	443
		RG_FOBSC	1	1,120	530	570	540
		RG_FOBCP	1	671	1,929	629	71.4
		RG_FRCP1SW	1	250	935	215	5.00
		RG_FRUPO	1	1,860	16,040	1,280	60.0
		RG_FODPO	1	500	6,600	1,540	220
		RG_FO22	1	960	8,980	2,420	300
		RG_FOUEW	1	1,260	3,320	1,100	100
2018	June	RG_HENUP	1	1,272	444	83.3	350
		RG_FO26	1	954	454	492	400
		RG_FODHE	1	770	90.0	65.0	140
		RG_FOUNGD	1	1,217	400	417	400
		RG_FODNGD	1	670	90.0	205	290
		RG_MP1	1	970	270	470	380
		RG_FOUSH	1	957	78.6	221	150
		RG_FOUKI	1	1,155	65.0	335	100
		RG_FOBKS	1	715	131	208	138
		RG_FOBSC	1	221	10.7	161	32.1
		RG_FOBCP	1	542	53.8	142	42.3
		RG_FRCP1SW	1	376	58.0	110	34.0
		RG_FRUPO	1	532	523	209	40.9
		RG_FODPO	1	811	1,011	589	22.2
		RG_FO22	1	20.0	65.0	47.0	2.00
		RG_FOUEW	1	1,390	510	410	460
	August	RG_HENUP	1	1,900	743	329	271
		RG_FODHE	1	6,220	220	240	660
		RG_FOUNGD	1	11,460	1,260	200	3,025
		RG_FODNGD	1	5,500	380	300	1,960
		RG_MP1	1	3,860	200	180	2,400
		RG_FOUSH	1	3,180	250	110	1,100
		RG_FOUKI	1	4,560	100	120	2,540
		RG_FOBKS	1	5,280	240	200	3,500
		RG_FOBSC	1	3,720	420	40.0	2,240
		RG_FOBCP	1	5,080	1,940	140	1,940
		RG_FRCP1SW	1	2,820	2,480	380	1,100
		RG_FRUPO	1	4,040	1,840	280	1,520
		RG_FODPO	1	367	1,133	200	105
		RG_FO22	1	240	620	180	60.0
		RG_FOUEW	1	2,080	1,600	300	727
	September	RG_HENUP	1	3,529	614	129	14.3
			2	5,133	733	383	16.7
			3	9,360	1,040	680	40.0
		RG_FO26	1	14,400	2,800	1,980	660
			2	14,960	2,020	1,180	460
			3	14,340	2,500	1,520	560
		RG_FODHE	1	8,520	1,060	420	440
			2	11,140	1,860	340	340
			3	14,520	620	120	520
		RG_FOUNGD	1	11,820	2,900	900	480
			2	13,040	2,040	1,300	340
			3	14,440	5,040	1,660	860
		RG_FODNGD	1	7,580	2,500	1,020	900
			2	6,680	1,420	900	720
			3	8,120	1,240	1,680	620
		RG_MP1	1	7,460	1,560	640	1,320
			2	6,060	1,760	920	1,240
			3	5,440	1,280	460	2,520

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Ephemroptera Abundance	Plecoptera Abundance	Trichoptera Abundance	Baetidae Abundance
2018	September	RG_FOUSH	1	4,180	1,620	260	720
			2	4,240	1,660	540	640
			3	2,800	1,570	200	420
		RG_FOUKI	1	3,267	367	150	433
			2	2,490	270	50.0	700
			3	2,300	357	129	443
		RG_FOBKS	1	3,900	680	300	840
			2	2,367	667	267	383
			3	5,340	1,500	900	1,200
		RG_FOBSC	1	2,860	700	680	140
			2	1,440	290	255	215
			3	1,220	380	180	140
		RG_FOBCP	1	2,950	1,500	317	16.7
			2	820	375	65.0	10.0
			3	2,320	1,500	340	0
			4	1,500	570	90.0	0
		RG_FRUPO	1	2,560	12,980	680	360
			2	675	2,163	125	100
			3	1,480	5,780	440	220
		RG_FODPO	1	3,120	20,100	320	860
			2	3,800	31,700	800	1,520
			3	5,060	45,800	1,120	2,600
		RG_FO22	1	1,700	8,940	780	360
			2	1,860	8,400	860	340
			3	1,880	6,160	500	380
			4	900	2,860	240	380
			5	1,040	3,200	280	160
		RG_FOUEW	1	960	2,060	440	40.0
			2	2,140	3,500	680	40.0
			3	1,660	2,180	500	160
	December	RG_UFR1	1	786	386	123	45.5
			2	1,711	1,156	344	55.6
			3	4,320	3,320	560	260
		RG_FOUKI	1	7,700	3,920	40.0	940
			2	3,340	1,480	40.0	500
			3	2,980	1,320	100	260
		RG_FOBSC	1	308	206	66.0	4.00
			2	141	106	38.0	2.00
			3	51.6	145	54.8	0
		RG_FOBCP	1	20.0	1,220	25.0	0
			2	14.3	950	35.7	7.14
			3	2.00	230	4.00	2.00
		RG_FRUPO	1	740	23,160	380	120
			2	2,100	34,180	400	160
			3	860	11,680	160	120
		RG_FODPO	1	1,080	26,000	600	120
			2	1,160	38,500	920	460
			3	2,300	40,820	480	440
		RG_FOUEW	1	1,580	15,400	500	240
			2	4,040	19,280	500	240
			3	3,040	20,300	840	360
2019	February	RG_FOUKI	1	3,160	2,720	80.0	340
			2	5,040	2,540	40.0	340
			3	3,520	2,240	40.0	200
		RG_FRUPO	1	140	7,140	40.0	0
			2	80.0	4,220	60.0	0
			3	180	4,860	60.0	40.0
		RG_FODPO	1	760	18,940	280	340
			2	460	11,440	300	120
			3	1,040	35,820	720	480
		RG_FOUEW	1	1,220	16,260	440	0
			2	1,020	5,460	260	20.0
			3	780	11,260	480	0
	June	RG_HENUP	1	1,858	475	75.0	542
			2	1,873	664	63.6	582
			3	2,675	650	87.5	413
		RG_FO26	1	3,920	1,360	1,080	1,140
			2	5,720	2,360	600	1,760
			3	7,440	6,120	2,020	2,720
		RG_FODHE	1	5,360	400	220	380
			2	3,333	267	217	583
			3	6,320	320	340	1,080
		RG_FOUNGD	1	1,780	240	390	250
			2	1,200	407	421	100
			3	1,856	422	467	233
		RG_FODNGD	1	3,583	467	400	450
			2	938	171	157	181
			3	1,818	236	264	182
		RG_MP1	1	1,300	109	200	191
			2	2,614	371	400	114
			3	2,144	344	478	533
		RG_FOUSH	1	3,314	229	414	443
			2	2,088	163	362	550
			3	1,944	211	278	278
		RG_FOUKI	1	1,315	246	238	23.1
			2	2,675	250	225	150
			3	1,800	136	291	72.7
		RG_FOBKS	1	1,220	113	107	33.3
			2	3,500	100	443	57.1
			3	2,863	212	225	50.0
		RG_FOBSC	1	1,145	15.0	160	40.0
			2	750	23.3	73.3	23.3
			3	2,064	18.2	164	63.6
		RG_FOBCP	1	2,114	57.1	671	57.1
			2	1,100	16.7	467	16.7
			3	714	42.9	293	50.0
		RG_FRCP1SW	1	850	119	331	12.5
			2	970	170	500	60.0
			3	1,860	240	940	100
		RG_FRUPO	1	230	350	305	25.0
			2	336	492	236	12.0
			3	288	350	344	18.8
		RG_FODPO	1	280	1,900	370	10.0
			2	350	1,530	230	40.0
			3	356	1,711	356	55.6
		RG_FO22	1	210	1,120	260	20.0
			2	83.3	1,600	100	0
			3	263	563	250	37.5
		RG_FOUEW	1	1,667	1,783	133	367
			2	3,480	2,140	180	900
			3	3,760	1,620	320	1,080

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Ephemroptera Abundance	Plecoptera Abundance	Trichoptera Abundance	Baetidae Abundance
2019	September	RG_HENUP	1	1,405	250	55.0	0
			2	4,660	1,440	340	20.0
			3	4,660	1,140	100	20.0
		RG_FO26	1	14,380	2,240	3,300	380
			2	9,700	940	1,120	100
			3	15,520	2,820	1,140	280
		RG_FODHE	1	16,200	2,240	260	120
			2	14,820	2,680	400	240
			3	21,680	2,140	420	180
		RG_FOUCL	1	16,940	1,580	1,380	1,140
			2	17,440	2,020	3,080	1,180
			3	11,600	1,000	820	1,020
		RG_FOUNGD	1	7,480	640	340	320
			2	22,520	2,360	920	380
			3	23,700	2,060	1,040	320
		RG_FODNGD	1	5,260	1,360	480	760
			2	5,300	1,000	240	700
			3	7,560	1,160	560	480
		RG_MP1	1	2,140	420	680	340
			2	2,060	420	440	520
			3	2,180	620	580	720
		RG_FOUSH	1	3,080	960	360	460
			2	2,600	520	300	180
			3	2,480	800	440	400
		RG_FOUKI	1	2,750	217	150	300
			2	1,175	258	117	83.3
			3	1,970	250	80.0	270
		RG_FOBKS	1	1,757	1,286	229	129
			2	1,656	656	211	122
			3	2,457	1,029	257	143
		RG_SCOUTDS	1	2,333	1,783	250	50.0
			2	2,720	1,380	180	120
			3	4,240	1,760	240	60.0
		RG_FOBSC	1	2,483	1,133	183	183
			2	1,900	1,070	140	90.0
			3	840	567	73.3	53.3
		RG_FOBCP	1	2,080	1,980	140	420
			2	630	310	40.0	130
			3	1,214	1,443	157	486
			4	1,860	2,300	180	780
			5	850	470	10.0	500
		RG_FRCP1SW	1	2,220	6,200	660	780
			2	820	4,400	200	100
			3	555	1,418	209	54.5
		RG_FRUPO	1	967	3,600	500	267
			2	580	5,280	240	340
			3	450	2,110	180	200
		RG_FODPO	1	2,320	6,560	520	1,520
			2	1,580	3,980	940	960
			3	1,720	5,540	480	960
		RG_FO22	1	867	2,450	633	150
			2	660	1,700	760	180
			3	1,640	2,620	2,320	420
			4	1,160	1,480	860	400
			5	1,460	3,240	740	480
		RG_FOUEW	1	1,160	1,320	300	80.0
			2	2,480	1,900	440	180
			3	2,560	2,220	240	320
	December	RG_UFR1	1	13,380	8,360	1,940	2,120
			2	2,210	1,210	990	80.0
			3	7,200	3,380	2,520	220
		RG_FOUKI	1	3,640	1,480	120	600
			2	2,400	1,160	100	240
			3	3,840	2,820	120	160
		RG_SCOUTDS	1	3,540	10,840	280	840
			2	2,780	7,960	360	1,100
			3	1,260	4,280	80.0	360
		RG_FRUPO	1	720	26,400	360	0
			2	1,480	19,740	140	100
			3	1,420	20,360	260	220
		RG_FODPO	1	1,860	22,960	880	1,300
			2	1,320	24,200	460	1,060
			3	1,320	24,060	620	860
		RG_FOUEW	1	2,780	7,300	400	340
			2	2,780	9,320	920	460
			3	2,560	9,780	1,240	660

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Heptageniidae Abundance	Ephemerellidae Abundnace	Autotrophic to Heterotrophic Index
2012	September	RG_HENUP	1	2,029	657	0.108
		RG_FO26	1	2,780	1,540	-0.182
		RG_FODHE	1	9,700	3,000	0.271
		RG_FOUNGD	1	7,440	720	0.181
		RG_MP1	1	7,250	1,950	-0.109
		RG_FOUSH	1	6,360	1,600	0.102
			2	4,820	740	-0.0338
			3	7,820	1,420	0.0641
		RG_FOUKI	1	8,220	280	0.417
		RG_FOBKS	1	2,267	156	0.144
		RG_FOBSC	1	2,180	660	-0.167
		RG_FOBCP	1	2,860	2,360	-0.0916
		RG_FODPO	1	1,660	2,700	-0.626
		RG_FO22	1	500	1,260	-0.229
		RG_FOUEW	1	1,983	667	0.0674
2013	September	RG_HENUP	1	2,300	91.7	0.410
		RG_FO26	1	1,938	400	-0.0261
		RG_MP1	1	1,343	28.6	-0.349
		RG_FODPO	1	3,120	320	-0.738
2015	September	RG_HENUP	1	4,500	460	0.125
		RG_FO26	1	3,660	1,320	0.0321
		RG_FODHE	1	5,340	3,700	-0.232
		RG_FOUNGD	1	3,900	600	0.199
		RG_FODNGD	1	4,160	480	0.170
		RG_MP1	1	2,017	250	0.0296
		RG_FOUSH	1	2,780	260	-0.127
		RG_FOUKI	1	1,480	190	-0.0351
		RG_FOBKS	1	1,038	125	-0.381
		RG_FOBSC	1	609	127	-0.406
		RG_FOBCP	1	388	138	-0.426
		RG_FODPO	1	680	140	-0.339
		RG_FO22	1	1,060	1,580	0.00493
		RG_FOUEW	1	1,380	580	0.0733
2016	September	RG_HENUP	1	2,950	820	0.112
		RG_FO26	1	5,100	3,760	-0.0832
		RG_FODHE	1	4,680	2,140	0.00191
		RG_FOUKI	1	320	88.0	-0.308
		RG_FOBKS	1	975	375	-0.370
		RG_FOBSC	1	113	119	-0.985
		RG_FOBCP	1	160	133	-0.753
		RG_FODPO	1	540	160	-0.368
		RG_FOUEW	1	580	120	-0.513
2017	September	RG_HENUP	1	4,820	940	-0.103
		RG_FO26	1	3,720	2,380	0.148
		RG_FODHE	1	7,100	2,540	0.228
		RG_FOUNGD	1	1,800	740	-0.293
		RG_FODNGD	1	1,320	1,320	-0.571
		RG_MP1	1	3,300	3,720	-0.245
		RG_FOUSH	1	1,950	263	-0.0399
		RG_FOUKI	1	1,460	60.0	-0.415
			2	1,109	72.7	-0.296
		RG_FOBKS	1	773	127	-0.320
			2	640	90.0	-0.392
			3	1,071	171	-0.369
		RG_FOBSC	1	520	50.0	-0.665
		RG_FOBCP	1	586	14.3	-0.675
		RG_FRCP1SW	1	220	15.0	-0.411
		RG_FRUPO	1	1,620	180	-0.555
		RG_FODPO	1	260	20.0	-0.932
		RG_FO22	1	380	280	-0.0715
		RG_FOUEW	1	920	240	-0.226
2018	June	RG_HENUP	1	861	50.0	-0.192
		RG_FO26	1	392	154	-0.290
		RG_FODHE	1	530	60.0	-0.723
		RG_FOUNGD	1	333	367	-0.743
		RG_FODNGD	1	245	135	-0.718
		RG_MP1	1	320	240	-1.02
		RG_FOUSH	1	700	92.9	-0.786
		RG_FOUKI	1	980	75.0	-0.939
		RG_FOBKS	1	392	177	-1.12
		RG_FOBSC	1	136	39.3	-1.17
		RG_FOBCP	1	412	84.6	-1.01
		RG_FRCP1SW	1	290	48.0	-0.794
		RG_FRUPO	1	418	68.2	-0.646
		RG_FODPO	1	611	178	-0.850
		RG_FO22	1	9.00	9.00	0.143
		RG_FOUEW	1	600	330	-0.197
	August	RG_HENUP	1	1,443	186	-0.411
		RG_FODHE	1	2,640	2,780	0.0090
		RG_FOUNGD	1	5,750	2,645	-0.283
		RG_FODNGD	1	2,180	1,360	-0.359
		RG_MP1	1	600	700	-0.568
		RG_FOUSH	1	1,730	300	-0.209
		RG_FOUKI	1	1,520	400	-0.404
		RG_FOBKS	1	960	800	-0.836
		RG_FOBSC	1	1,000	420	-0.743
		RG_FOBCP	1	2,600	520	-0.883
		RG_FRCP1SW	1	1,460	240	-0.762
		RG_FRUPO	1	1,880	620	-0.870
		RG_FODPO	1	105	157	-0.799
		RG_FO22	1	0	180	0.183
		RG_FOUEW	1	969	384	-0.432
	September	RG_HENUP	1	2,957	543	0.139
			2	4,067	1,033	0.157
			3	7,680	1,120	0.254
		RG_FO26	1	7,780	5,900	-0.152
			2	10,100	4,360	0.0595
			3	9,460	4,320	0.0073
		RG_FODHE	1	6,020	2,000	0.0691
			2	8,780	1,980	0.105
			3	9,320	4,280	0.166
		RG_FOUNGD	1	7,540	3,800	-0.165
			2	6,300	6,340	-0.251
			3	7,740	5,840	-0.194
		RG_FODNGD	1	5,040	1,580	-0.135
			2	3,940	2,020	-0.178
			3	4,620	2,860	-0.118
		RG_MP1	1	4,200	1,920	-0.172
			2	3,160	1,580	-0.331
			3	2,260	660	-0.490

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Heptageniidae Abundance	Ephemerellidae Abundnace	Autotrophic to Heterotrophic Index
2018	September	RG_FOUSH	1	2,920	460	-0.246
			2	3,100	460	-0.243
			3	1,970	390	-0.333
		RG_FOUKI	1	2,400	367	-0.0457
			2	1,500	190	-0.321
			3	1,529	286	-0.317
		RG_FOBKS	1	2,280	740	-0.325
			2	1,450	417	-0.246
			3	3,380	700	-0.315
		RG_FOBSC	1	2,520	200	-0.113
			2	1,020	185	-0.243
			3	830	220	-0.308
		RG_FOBCP	1	2,717	150	0.120
			2	705	75.0	-0.0355
			3	2,260	20.0	0.0151
			4	1,400	60.0	0.00285
		RG_FRUPO	1	1,180	1,020	-0.745
			2	388	163	-0.660
			3	700	560	-0.773
		RG_FODPO	1	1,860	400	-0.864
			2	1,820	460	-1.13
			3	2,040	420	-1.24
		RG_FO22	1	1,060	280	-0.375
			2	1,300	220	-0.104
			3	1,140	340	0.0375
			4	220	300	0.145
			5	560	300	0.317
		RG_FOUEW	1	720	200	-0.233
			2	1,600	440	-0.110
			3	1,240	220	-0.176
	December	RG_UFR1	1	223	509	-0.485
			2	789	856	-0.380
			3	1,260	2,780	-0.666
		RG_FOUKI	1	6,540	200	-0.720
			2	2,640	200	-0.784
			3	2,600	80.0	-0.704
		RG_FOBSC	1	290	14.0	-0.702
			2	136	3.00	-0.730
			3	35.5	9.68	-1.70
		RG_FOBCP	1	15.0	0	-1.97
			2	7.14	0	-1.97
			3	0	0	-
		RG_FRUPO	1	540	80.0	-1.65
			2	1,580	340	-1.33
			3	680	40.0	-1.51
		RG_FODPO	1	920	40.0	-1.39
			2	700	0	-1.71
			3	1,820	40.0	-1.29
		RG_FOUEW	1	1,040	280	-1.06
			2	3,480	320	-0.841
			3	2,220	460	-1.22
2019	February	RG_FOUKI	1	2,740	60.0	-0.432
			2	4,560	140	-0.186
			3	3,220	80.0	-0.272
		RG_FRUPO	1	140	0	-1.74
			2	80.0	0	-1.05
			3	140	0	-1.15
		RG_FODPO	1	400	20.0	-1.61
			2	300	40.0	-1.41
			3	520	40.0	-1.80
		RG_FOUEW	1	1,100	120	-1.12
			2	960	40.0	-0.687
			3	680	80.0	-1.06
	June	RG_HENUP	1	1,192	117	-0.0226
			2	1,218	45.5	-0.0757
			3	1,863	400	0.234
		RG_FO26	1	1,600	1,140	-0.137
			2	2,240	1,720	-0.218
			3	2,600	2,040	-0.341
		RG_FODHE	1	3,740	1,120	-0.177
			2	2,383	300	-0.124
			3	4,560	640	-0.0338
		RG_FOUNGD	1	990	520	-0.189
			2	779	307	0.0588
			3	1,056	500	-0.0161
		RG_FODNGD	1	2,750	383	0.0304
			2	633	124	-0.134
			3	1,400	236	0.097
		RG_MP1	1	918	155	-0.532
			2	2,071	371	0.124
			3	1,444	144	-0.182
		RG_FOUSH	1	2,571	300	-0.171
			2	1,388	138	-0.214
			3	1,533	122	-0.208
		RG_FOUKI	1	1,123	154	0.0433
			2	1,650	850	-0.292
			3	1,382	327	-0.0383
		RG_FOBKS	1	780	387	-0.294
			2	2,871	557	0.0524
			3	1,950	850	-0.269
		RG_FOBSC	1	1,015	90.0	-0.002715
			2	653	73.3	0.0314
			3	1,827	173	-0.205
		RG_FOBCP	1	1,500	543	-0.420
			2	675	408	-0.466
			3	407	250	-0.751
		RG_FRCP1SW	1	625	206	-0.198
			2	650	250	-0.525
			3	1,020	740	-0.672
		RG_FRUPO	1	140	65.0	-0.541
			2	232	88.0	-0.599
			3	206	62.5	-0.802
		RG_FODPO	1	150	110	-0.889
			2	160	150	-1.02
			3	178	111	-0.870
		RG_FO22	1	90.0	100	-0.222
			2	16.7	66.7	-0.664
			3	25.0	200	-0.0329
		RG_FOUEW	1	983	317	-0.553
			2	1,980	560	-0.374
			3	2,400	260	-0.174

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Heptageniidae Abundance	Ephemerellidae Abundnace	Autotrophic to Heterotrophic Index
2019	September	RG_HENUP	1	1,295	80.0	0.383
			2	4,300	260	0.242
			3	4,280	320	0.334
		RG_FO26	1	9,600	4,160	0.0096
			2	7,375	2,164	0.244
			3	10,760	4,440	-0.0922
		RG_FODHE	1	8,900	6,680	-0.185
			2	7,220	6,400	-0.238
			3	8,980	11,280	-0.292
		RG_FOUCL	1	8,900	6,760	-0.291
			2	8,260	8,000	-0.331
			3	5,240	5,300	-0.378
		RG_FOUNGD	1	4,340	2,820	-0.0544
			2	11,040	11,080	-0.127
			3	11,200	12,180	-0.123
		RG_FODNGD	1	2,200	2,260	-0.415
			2	2,520	2,080	-0.328
			3	4,580	2,500	-0.0173
		RG_MP1	1	1,020	780	-0.768
			2	920	540	-0.653
			3	900	560	-1.03
		RG_FOUSH	1	1,820	780	-0.434
			2	1,860	540	-0.291
			3	1,600	460	-0.570
		RG_FOUKI	1	1,683	717	-0.214
			2	867	217	-0.176
			3	1,230	430	-0.269
		RG_FOBKS	1	1,400	200	-0.212
			2	1,311	211	-0.112
			3	1,757	529	-0.126
		RG_SCOUTDS	1	1,800	467	-0.244
			2	2,200	300	-0.0401
			3	3,280	880	0.0302
		RG_FOBSC	1	1,733	467	-0.255
			2	1,590	200	-0.151
			3	700	73.3	-0.217
		RG_FOBCP	1	1,500	160	-0.323
			2	345	105	-0.308
			3	500	214	-0.791
			4	880	200	-0.770
			5	200	80.0	-0.830
		RG_FRCP1SW	1	1,220	220	-0.544
			2	580	140	-0.739
			3	427	63.6	-0.264
		RG_FRUPO	1	500	200	-0.357
			2	140	100	-0.937
			3	90.0	140	-0.818
		RG_FODPO	1	620	120	-0.847
			2	380	220	-0.488
			3	560	200	-0.888
		RG_FO22	1	350	367	-0.149
			2	160	320	-0.0630
			3	320	900	0.0485
			4	240	520	0.196
			5	380	600	-0.202
		RG_FOUEW	1	840	220	-0.192
			2	1,780	460	0.0351
			3	1,740	460	-0.244
	December	RG_UFR1	1	5,660	5,600	-0.498
			2	920	1,210	-0.201
			3	2,280	4,660	-0.351
		RG_FOUKI	1	2,380	640	-0.849
			2	1,940	180	-0.821
			3	3,220	460	-0.880
		RG_SCOUTDS	1	2,460	240	-1.20
			2	1,400	280	-1.24
			3	740	160	-1.07
		RG_FRUPO	1	580	140	-2.04
			2	1,340	40.0	-2.76
			3	1,180	20.0	-2.28
		RG_FODPO	1	480	80.0	-1.46
			2	260	0	-1.79
			3	380	60.0	-1.69
		RG_FOUEW	1	1,920	520	-0.560
			2	1,840	480	-0.749
			3	1,440	460	-0.915

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Filtering Collector Index	Predator Index	Hyporheic to Benthic Index
2012	September	RG_HENUP	1	-1.76	-0.572	-2.18
		RG_FO26	1	-1.09	-0.301	-1.61
		RG_FODHE	1	-1.86	-0.529	-1.54
		RG_FOUNGD	1	-1.90	-0.677	-0.697
		RG_MP1	1	-2.15	-0.810	-0.826
		RG_FOUSH	1	-1.85	-0.742	-0.907
			2	-1.85	-0.889	-0.458
			3	-2.37	-0.792	-0.563
		RG_FOUKI	1	-1.60	-1.16	-0.740
		RG_FOBKS	1	-1.59	-0.994	-0.563
		RG_FOBSC	1	-2.09	-0.584	-0.267
		RG_FOBCP	1	-1.38	-0.338	-0.926
		RG_FODPO	1	-1.61	-0.276	-1.32
		RG_FO22	1	-1.50	-0.415	-1.71
		RG_FOUEW	1	-0.871	-0.424	-1.88
2013	September	RG_HENUP	1	-1.41	-1.24	-1.41
		RG_FO26	1	-	-0.780	-2.02
		RG_MP1	1	-	-1.18	-0.558
		RG_FODPO	1	-1.19	-0.932	-3.00
2015	September	RG_HENUP	1	-0.978	-1.14	-
		RG_FO26	1	-1.39	-0.594	-2.27
		RG_FODHE	1	-1.81	-0.587	-2.53
		RG_FOUNGD	1	-	-0.706	-2.01
		RG_FODNGD	1	-1.65	-0.712	-1.80
		RG_MP1	1	-1.76	-0.842	-1.49
		RG_FOUSH	1	-1.28	-0.959	-1.23
		RG_FOUKI	1	-1.08	-0.980	-0.646
		RG_FOBKS	1	-1.30	-0.699	-0.363
		RG_FOBSC	1	-0.689	-0.623	-0.380
		RG_FOBCP	1	-0.863	-0.183	-1.54
		RG_FODPO	1	-1.34	-0.438	-2.71
		RG_FO22	1	-1.19	-0.194	-1.96
		RG_FOUEW	1	-1.67	-0.374	-1.96
2016	September	RG_HENUP	1	-1.27	-0.682	-2.37
		RG_FO26	1	-0.944	-0.564	-2.28
		RG_FODHE	1	-1.37	-0.494	-1.67
		RG_FOUKI	1	-1.13	-0.673	-0.872
		RG_FOBKS	1	-1.29	-0.485	-0.721
		RG_FOBSC	1	-0.960	-0.376	-0.690
		RG_FOBCP	1	-0.760	-0.318	-1.08
		RG_FODPO	1	-1.57	-0.562	-2.10
		RG_FOUEW	1	-0.881	-0.742	-1.33
2017	September	RG_HENUP	1	-0.605	-0.886	-
		RG_FO26	1	-0.788	-0.540	-2.14
		RG_FODHE	1	-1.78	-0.654	-1.75
		RG_FOUNGD	1	-1.87	-0.683	-1.00
		RG_FODNGD	1	-1.85	-0.474	-1.35
		RG_MP1	1	-1.61	-0.268	-1.14
		RG_FOUSH	1	-1.32	-0.834	-1.45
		RG_FOUKI	1	-1.13	-0.714	-0.675
			2	-1.66	-1.04	-0.425
		RG_FOBKS	1	-1.23	-0.527	-0.382
			2	-	-0.527	-0.719
			3	-1.33	-0.492	-0.343
		RG_FOBSC	1	-1.17	-0.399	-0.615
		RG_FOBCP	1	-0.782	-0.257	-1.30
		RG_FRCP1SW	1	-1.07	-0.247	-0.903
		RG_FRUPO	1	-1.04	0.242	-2.04
		RG_FODPO	1	-2.50	-0.273	-2.58
		RG_FO22	1	0.0216	-0.646	-0.898
		RG_FOUEW	1	-0.640	-0.294	-1.47
2018	June	RG_HENUP	1	-1.82	-0.663	-2.42
		RG_FO26	1	-	-0.664	-2.44
		RG_FODHE	1	-2.10	-1.25	-2.62
		RG_FOUNGD	1	-2.37	-0.675	-1.20
		RG_FODNGD	1	-0.797	-0.648	-1.82
		RG_MP1	1	-0.985	-0.503	-1.72
		RG_FOUSH	1	-1.02	-0.793	-1.90
		RG_FOUKI	1	-1.33	-0.626	-2.32
		RG_FOBKS	1	-0.619	-0.746	-1.89
		RG_FOBSC	1	-1.52	-0.539	-1.79
		RG_FOBCP	1	-1.69	-0.575	-1.60
		RG_FRCP1SW	1	-1.12	-0.362	-2.02
		RG_FRUPO	1	-1.53	-0.308	-1.57
		RG_FODPO	1	-	-0.349	-1.21
		RG_FO22	1	-0.720	-0.465	-0.991
		RG_FOUEW	1	-1.43	-0.486	-1.69
	August	RG_HENUP	1	-1.78	-0.918	-
		RG_FODHE	1	-	-0.932	-1.93
		RG_FOUNGD	1	-0.481	-0.988	-1.61
		RG_FODNGD	1	-2.41	-0.759	-1.58
		RG_MP1	1	-	-0.786	-0.879
		RG_FOUSH	1	-1.44	-1.11	-2.05
		RG_FOUKI	1	-1.05	-1.40	-1.16
		RG_FOBKS	1	-0.765	-1.07	-1.10
		RG_FOBSC	1	-1.41	-1.15	-0.976
		RG_FOBCP	1	-0.393	-1.34	-1.57
		RG_FRCP1SW	1	-0.252	-0.870	-2.01
		RG_FRUPO	1	0.0933	-1.06	-2.02
		RG_FODPO	1	-2.06	-0.870	-1.94
		RG_FO22	1	-0.943	-0.605	-1.86
		RG_FOUEW	1	-1.36	-0.644	-2.00
	September	RG_HENUP	1	-1.15	-0.834	-2.04
			2	-0.822	-0.695	-2.61
			3	-0.771	-0.848	-2.29
		RG_FO26	1	-0.792	-0.434	-1.13
			2	-0.756	-0.539	-1.22
			3	-0.802	-0.514	-1.03
		RG_FODHE	1	-1.18	-0.790	-1.05
			2	-0.100	-0.983	-1.40
			3	-	-0.648	-1.15
		RG_FOUNGD	1	-0.859	-0.468	-0.720
			2	-1.62	-0.316	-0.656
			3	-1.38	-0.336	-1.09
		RG_FODNGD	1	-1.47	-0.556	-0.747
			2	-2.17	-0.423	-0.941
			3	-1.91	-0.346	-0.700
		RG_MP1	1	-1.41	-0.505	-0.951
			2	-1.23	-0.516	-0.805
			3	-1.43	-0.771	-0.551

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Filtering Collector Index	Predator Index	Hyporheic to Benthic Index
2018	September	RG_FOUSH	1	-1.11	-0.877	-0.931
			2	-1.09	-0.716	-1.09
			3	-0.693	-0.814	-1.00
		RG_FOUKI	1	-1.10	-1.11	-0.403
			2	-1.14	-1.13	-0.167
			3	-1.37	-0.805	-0.120
		RG_FOBKS	1	-0.490	-0.706	-0.472
			2	-1.02	-0.636	-0.193
			3	-0.831	-0.658	-0.363
		RG_FOBSC	1	-1.51	-0.574	-0.218
			2	-1.23	-0.550	-0.190
			3	-1.68	-0.502	-0.140
		RG_FOBCP	1	-0.528	-0.588	-1.05
			2	-1.58	-0.453	-0.403
			3	-1.47	-0.390	-0.620
			4	-0.894	-0.745	-0.406
		RG_FRUPO	1	-0.210	-0.0349	-1.58
			2	-0.738	-0.363	-1.17
			3	-0.357	-0.133	-1.71
		RG_FODPO	1	-1.94	-1.00	-2.14
			2	-1.45	-0.844	-1.80
			3	-0.431	-0.814	-1.95
		RG_FO22	1	-0.722	-0.741	-1.96
			2	-1.13	-0.863	-1.62
			3	-1.44	-0.672	-2.23
			4	-0.564	-0.698	-1.54
			5	-1.04	-0.810	-1.81
		RG_FOUEW	1	-0.794	-0.563	-1.55
			2	-0.342	-0.554	-1.43
			3	-0.976	-0.429	-1.55
	December	RG_UFR1	1	-	-0.310	-1.33
			2	-1.66	-0.350	-1.44
			3	-1.74	-0.402	-1.23
		RG_FOUKI	1	-2.33	-1.57	-1.11
			2	-1.65	-1.38	-0.577
			3	-1.55	-1.46	-0.572
		RG_FOBSC	1	-1.67	-0.646	-0.709
			2	-1.72	-0.797	-0.584
			3	-2.48	-0.867	0.412
		RG_FOBCP	1	-2.12	-0.868	-0.520
			2	-	-0.795	-0.425
			3	-	-0.772	-0.640
		RG_FRUPO	1	-2.21	-0.777	-2.17
			2	-	-0.804	-1.95
			3	-2.09	-1.04	-1.85
		RG_FODPO	1	-2.24	-1.01	-2.58
			2	-1.58	-1.10	-2.58
			3	-2.20	-1.30	-3.39
		RG_FOUEW	1	-0.711	-0.962	-1.66
			2	-1.41	-1.00	-1.90
			3	-1.62	-1.01	-2.24
2019	February	RG_FOUKI	1	-2.08	-1.34	-0.799
			2	-2.35	-1.51	-0.894
			3	-	-1.52	-0.875
		RG_FRUPO	1	-2.14	-0.822	-2.70
			2	-	-0.939	-1.84
			3	-	-0.975	-1.95
		RG_FODPO	1	-1.77	-1.09	-2.22
			2	-1.41	-1.01	-2.01
			3	-1.79	-0.947	-2.44
		RG_FOUEW	1	-1.63	-0.987	-2.30
			2	-1.26	-0.780	-1.63
			3	-1.64	-1.00	-2.59
	June	RG_HENUP	1	-1.52	-0.835	-2.10
			2	-1.77	-0.717	-
			3	-	-0.899	-2.43
		RG_FO26	1	-1.63	-0.830	-1.79
			2	-1.36	-0.829	-1.77
			3	-1.74	-1.02	-2.27
		RG_FODHE	1	-1.38	-0.949	-1.96
			2	-1.25	-1.09	-2.49
			3	-1.12	-1.15	-2.15
		RG_FOUNGD	1	-0.763	-0.503	-1.37
			2	-0.982	-0.331	-1.59
			3	-0.642	-0.384	-1.26
		RG_FODNGD	1	-0.691	-0.599	-1.50
			2	-0.727	-0.540	-1.50
			3	-0.838	-0.518	-1.29
		RG_MP1	1	0.130	-0.767	-1.72
			2	-1.00	-0.519	-1.32
			3	-0.715	-0.515	-2.00
		RG_FOUSH	1	-1.04	-0.689	-1.62
			2	-0.731	-0.842	-1.47
			3	-0.112	-0.925	-1.67
		RG_FOUKI	1	-1.11	-0.495	-1.54
			2	-0.772	-0.521	-1.71
			3	-1.05	-0.463	-1.39
		RG_FOBKS	1	-0.700	-0.486	-1.30
			2	-1.24	-0.653	-1.91
			3	-0.931	-0.442	-1.27
		RG_FOBSC	1	-1.33	-0.736	-2.01
			2	-0.626	-0.750	-1.61
			3	-1.05	-0.972	-2.19
		RG_FOBCP	1	-0.430	-0.513	-2.00
			2	-0.489	-0.360	-1.68
			3	-0.674	-0.409	-1.31
		RG_FRCP1SW	1	-0.788	-0.419	-1.56
			2	-0.158	-0.583	-0.846
			3	0.0849	-0.502	-1.50
		RG_FRUPO	1	-0.517	-0.281	-0.891
			2	0.320	-0.396	-1.88
			3	-0.677	-0.393	-0.988
		RG_FODPO	1	-1.13	-0.634	-2.19
			2	-	-0.536	-1.62
			3	-1.28	-0.409	-1.46
		RG_FO22	1	-0.810	-0.734	-1.40
			2	0.0809	-0.697	-0.416
			3	-0.784	-0.589	-1.17
		RG_FOUEW	1	-1.54	-0.605	-2.45
			2	-1.43	-0.541	-2.12
			3	-1.43	-0.782	-2.43

Table B.24: Benthic Invertebrate Community Endpoints, Fording River, 2012 to 2019

Year	Month	Station	Rep	Filtering Collector Index	Predator Index	Hyporheic to Benthic Index
2019	September	RG_HENUP	1	-1.09	-0.762	-2.27
			2	-1.09	-0.740	-2.55
			3	-1.52	-0.898	-
		RG_FO26	1	-0.958	-0.539	-1.37
			2	-0.476	-0.559	-1.70
			3	-0.921	-0.631	-1.57
		RG_FODHE	1	-1.83	-0.512	-1.92
			2	-2.27	-0.511	-1.71
			3	-1.66	-0.430	-1.76
		RG_FOUCL	1	-1.59	-0.455	-1.27
			2	-1.91	-0.371	-1.46
			3	-1.59	-0.402	-1.18
		RG_FOUNGD	1	-1.36	-0.441	-1.29
			2	-1.46	-0.281	-1.39
			3	-1.05	-0.278	-1.70
		RG_FODNGD	1	-1.56	-0.337	-0.815
			2	-1.50	-0.445	-1.00
			3	-1.92	-0.318	-1.18
		RG_MP1	1	-	-0.847	-1.90
			2	-1.78	-0.737	-1.12
			3	-1.99	-1.05	-1.92
		RG_FOUSH	1	-1.08	-0.725	-1.36
			2	-1.06	-0.767	-1.13
			3	-0.970	-0.766	-1.18
		RG_FOUKI	1	-1.16	-0.687	-0.710
			2	-0.663	-0.629	-0.557
			3	-1.36	-0.703	-0.914
		RG_FOBKS	1	-0.944	-0.657	-0.530
			2	-0.834	-0.579	-0.500
			3	-0.936	-0.517	-0.557
		RG_SCOUTDS	1	-0.709	-0.514	-0.764
			2	-0.661	-0.543	-0.668
			3	-1.40	-0.439	-0.868
		RG_FOBSC	1	-1.16	-0.646	-0.568
			2	-0.823	-0.645	-0.772
			3	-1.39	-0.684	-0.525
		RG_FOBCP	1	-0.552	-0.447	-0.891
			2	-0.729	-0.556	-0.453
			3	-0.760	-0.397	-0.785
			4	-1.01	-0.548	-1.03
			5	-1.02	-0.586	-0.719
		RG_FRCP1SW	1	-0.558	-0.209	-1.13
			2	-0.535	-0.137	-1.12
			3	-0.447	-0.151	-0.652
		RG_FRUPO	1	-1.86	0.0457	-1.38
			2	-2.05	0.184	-1.80
			3	-1.37	0.0704	-1.27
		RG_FODPO	1	-1.70	-0.428	-1.46
			2	-1.87	-0.399	-1.61
			3	-0.916	-0.440	-1.92
		RG_FO22	1	-0.551	-0.520	-1.46
			2	-0.0147	-0.671	-0.764
			3	-0.884	-0.635	-1.82
			4	-0.200	-0.580	-1.07
			5	-0.405	-0.511	-0.980
		RG_FOUEW	1	-0.109	-0.688	-0.567
			2	-0.319	-0.558	-1.02
			3	-1.11	-0.619	-1.53
	December	RG_UFR1	1	-1.46	-0.550	-2.20
			2	-1.19	-0.401	-1.72
			3	-2.11	-0.409	-1.99
		RG_FOUKI	1	-2.04	-0.865	-1.19
			2	-2.45	-1.18	-1.61
			3	-1.72	-1.04	-1.26
		RG_SCOUTDS	1	-1.94	-1.11	-1.43
			2	-1.80	-0.907	-1.35
			3	-1.24	-0.970	-1.79
		RG_FRUPO	1	-2.37	-0.666	-2.36
			2	-1.79	-0.811	-2.33
			3	-1.81	-0.676	-2.23
		RG_FODPO	1	-2.02	-0.728	-2.56
			2	-1.56	-0.876	-2.31
			3	-2.01	-0.804	-2.58
		RG_FOUEW	1	-1.58	-0.640	-2.08
			2	-1.46	-0.676	-1.99
			3	-1.57	-0.667	-1.93

APPENDIX C
WATER

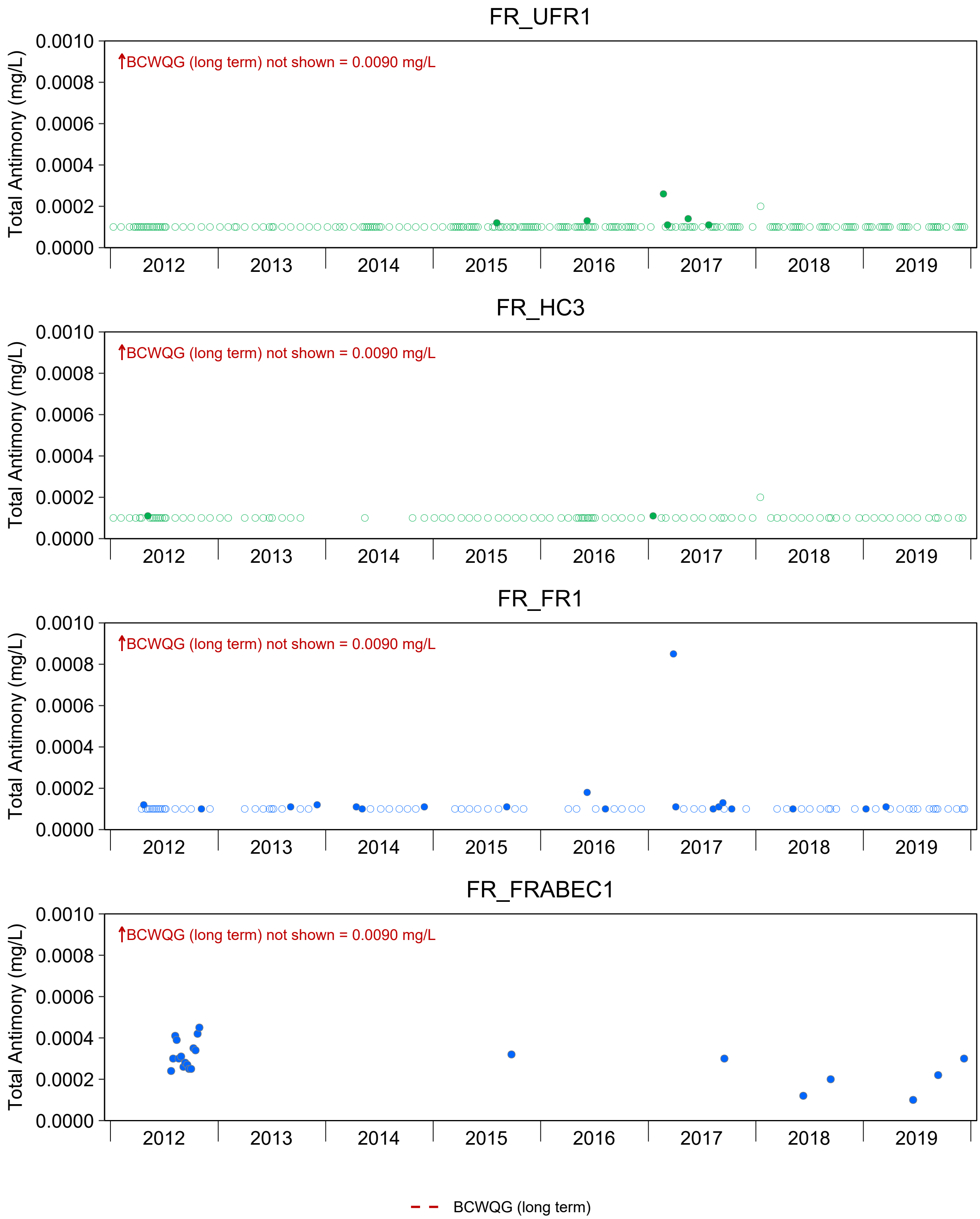

Figure C.1: Time Series Plots for Total Antimony Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Antimony was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

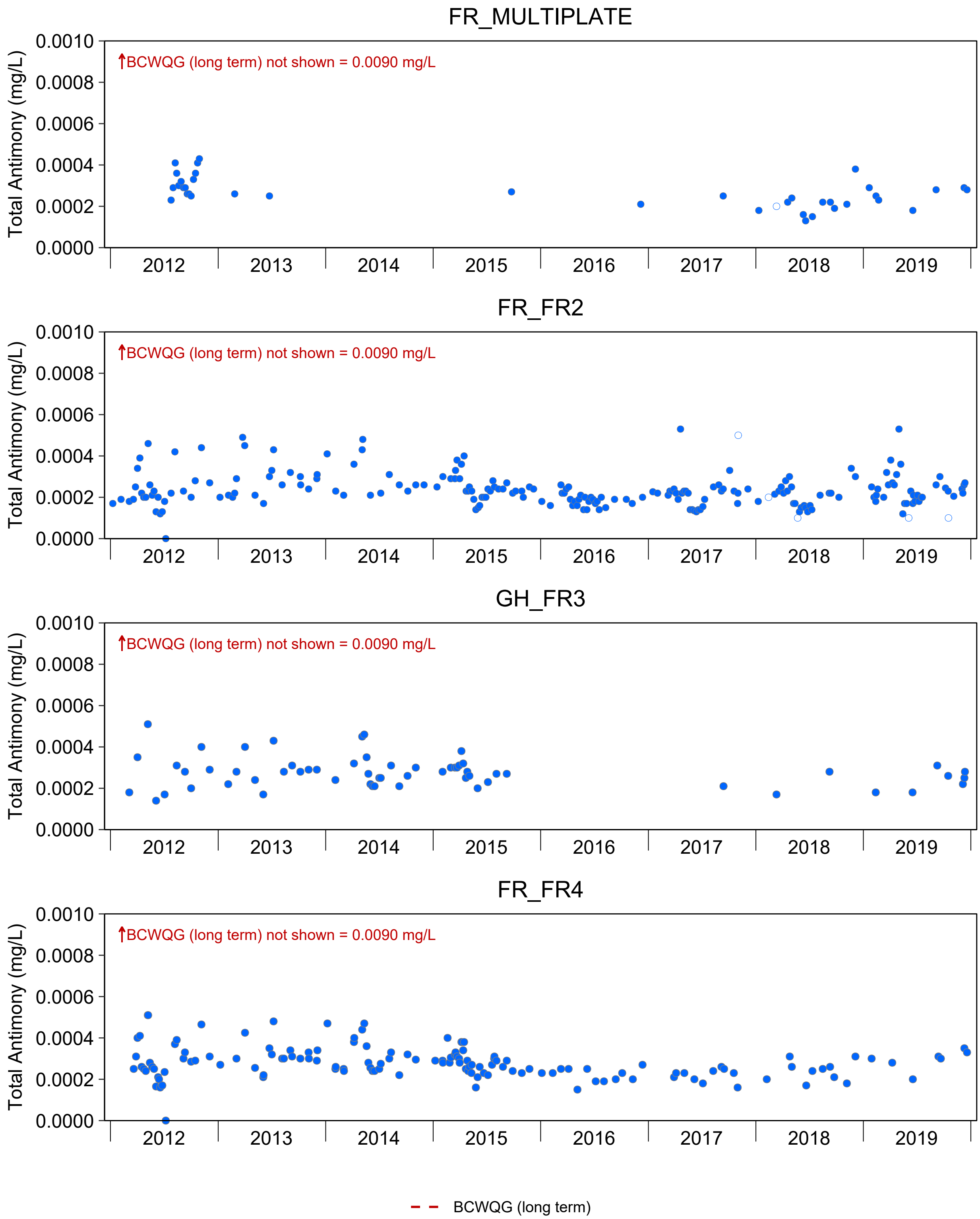

Figure C.1: Time Series Plots for Total Antimony Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Antimony was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

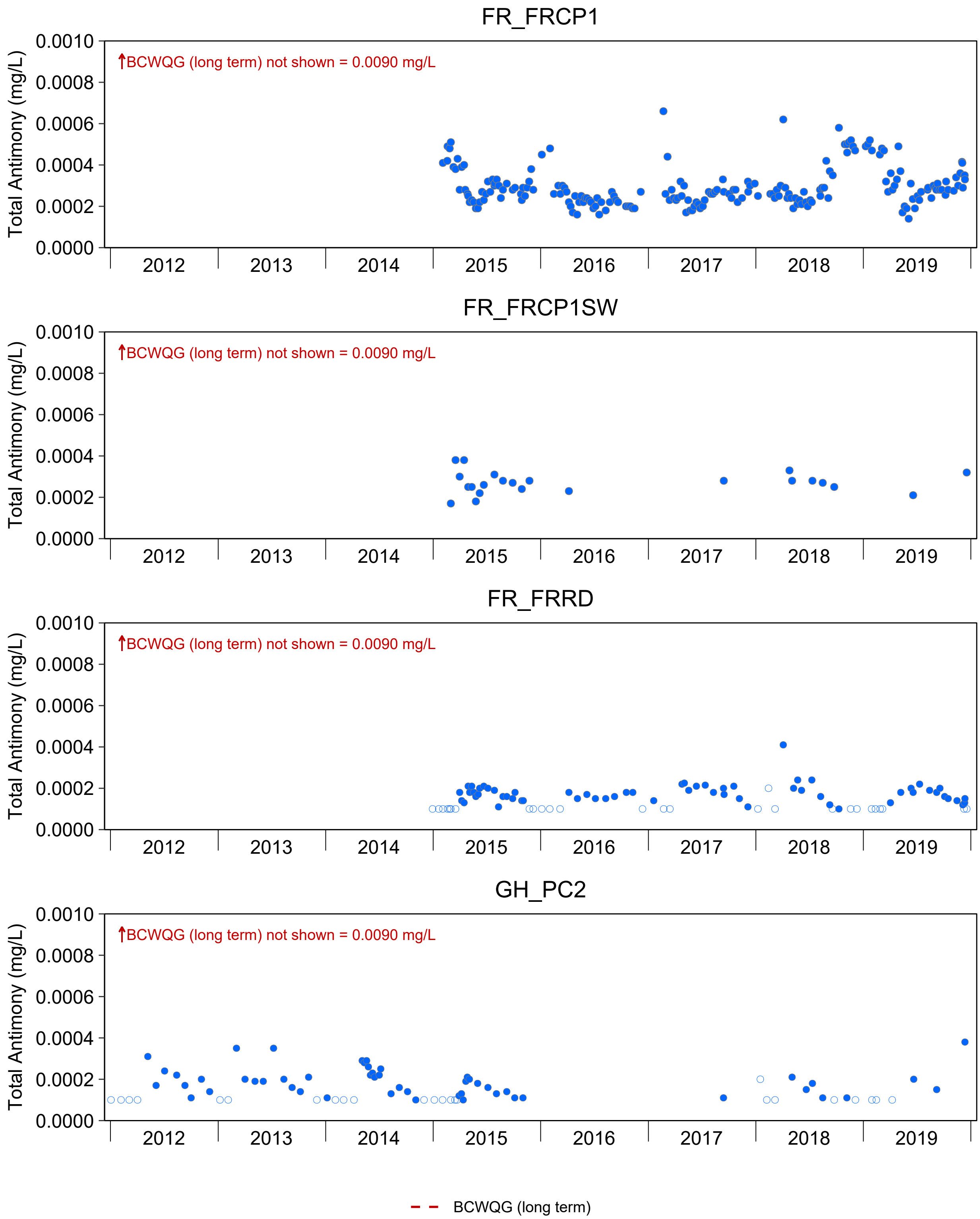

Figure C.1: Time Series Plots for Total Antimony Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Antimony was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

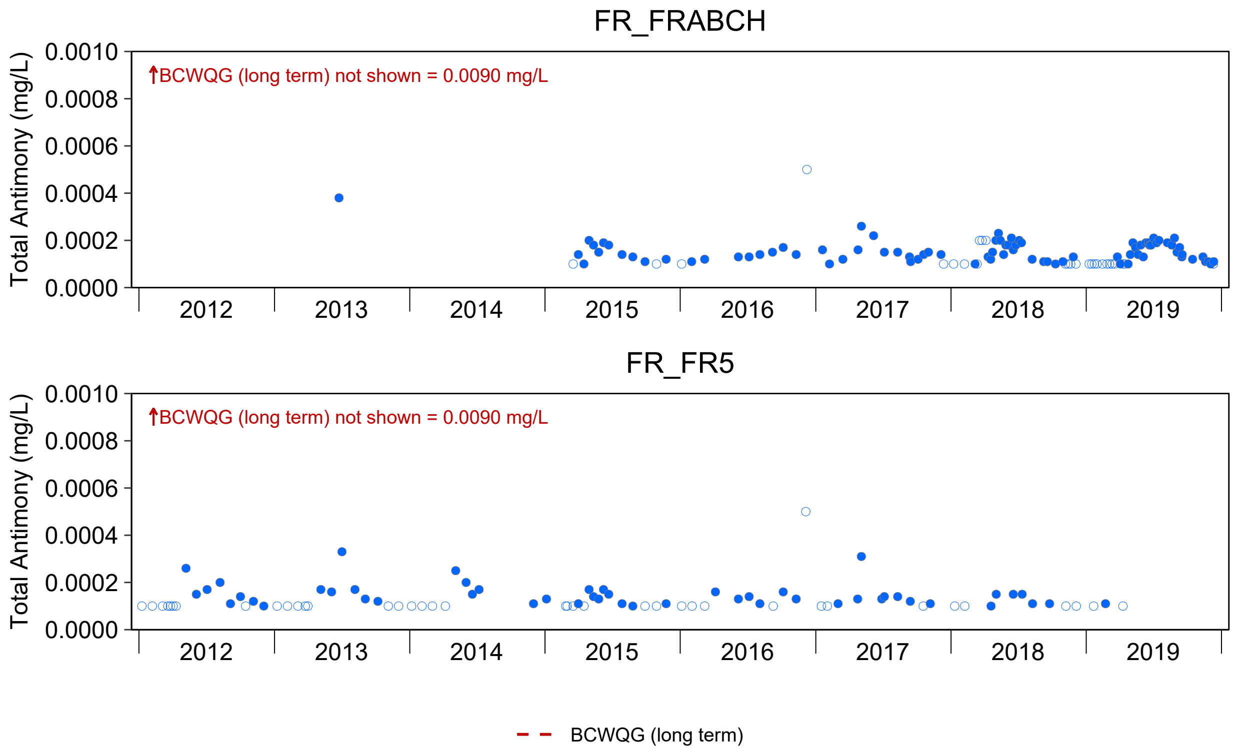

Figure C.1: Time Series Plots for Total Antimony Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Antimony was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

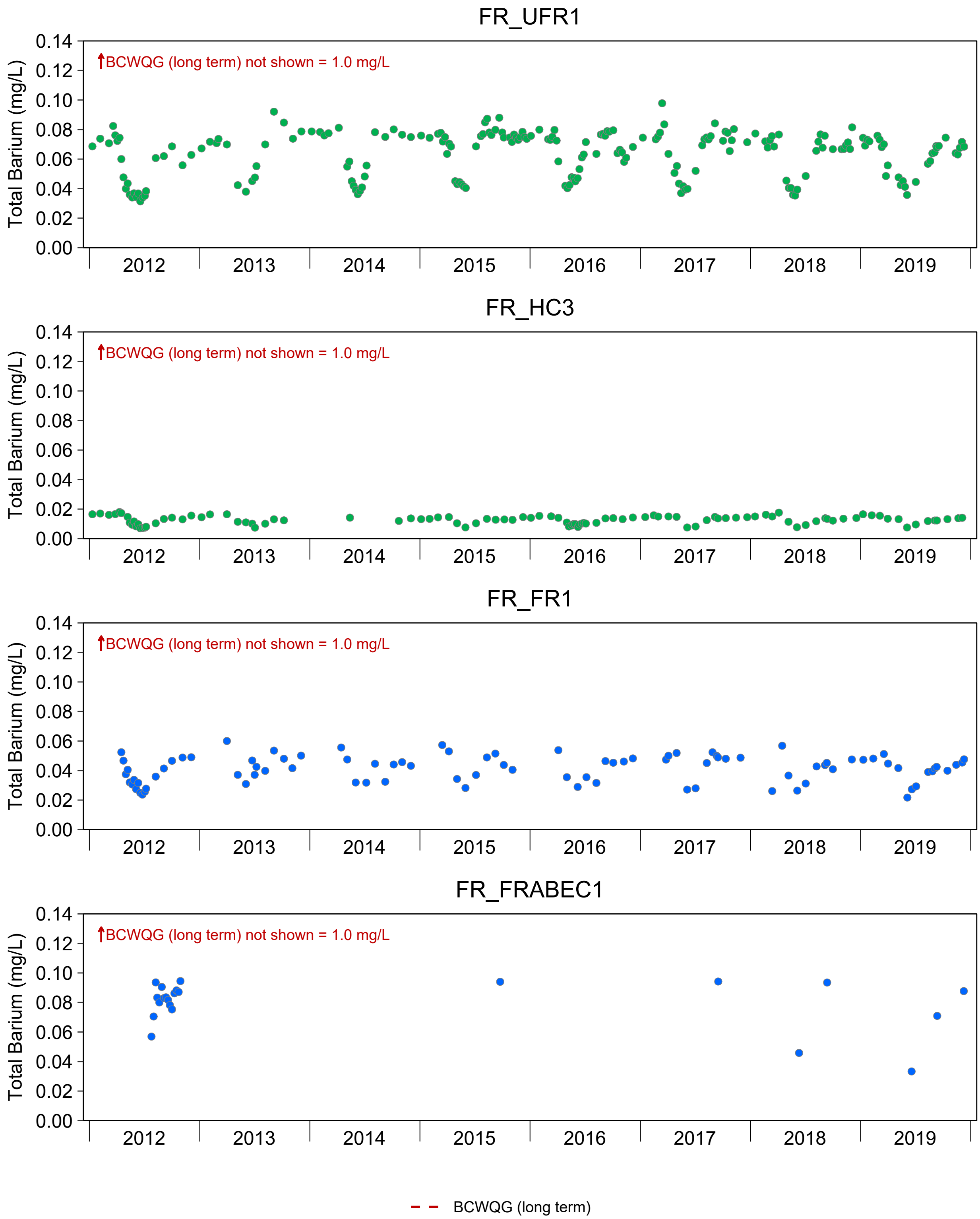

Figure C.2: **Time Series Plots for Total Barium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019**

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Barium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

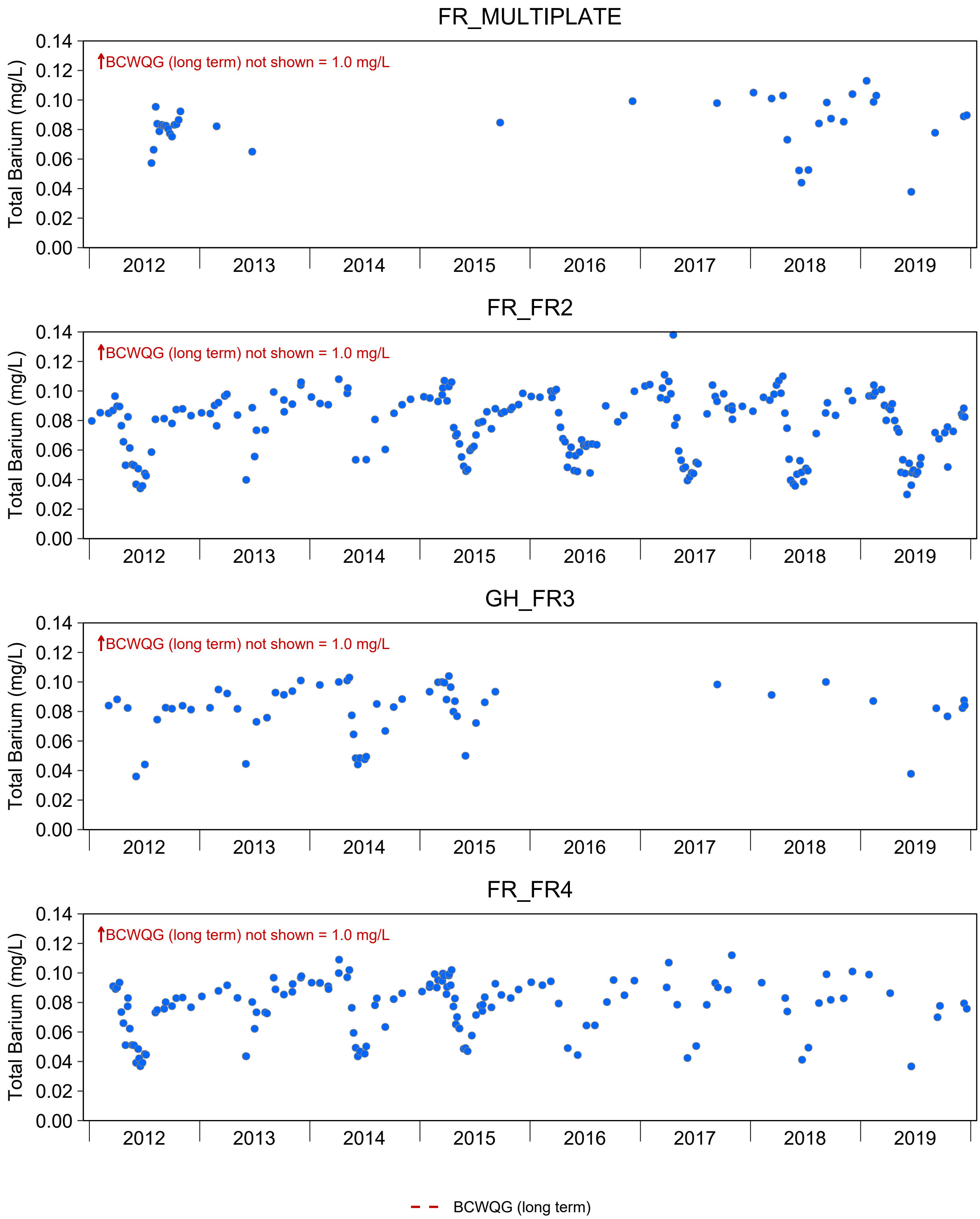

Figure C.2: Time Series Plots for Total Barium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Barium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

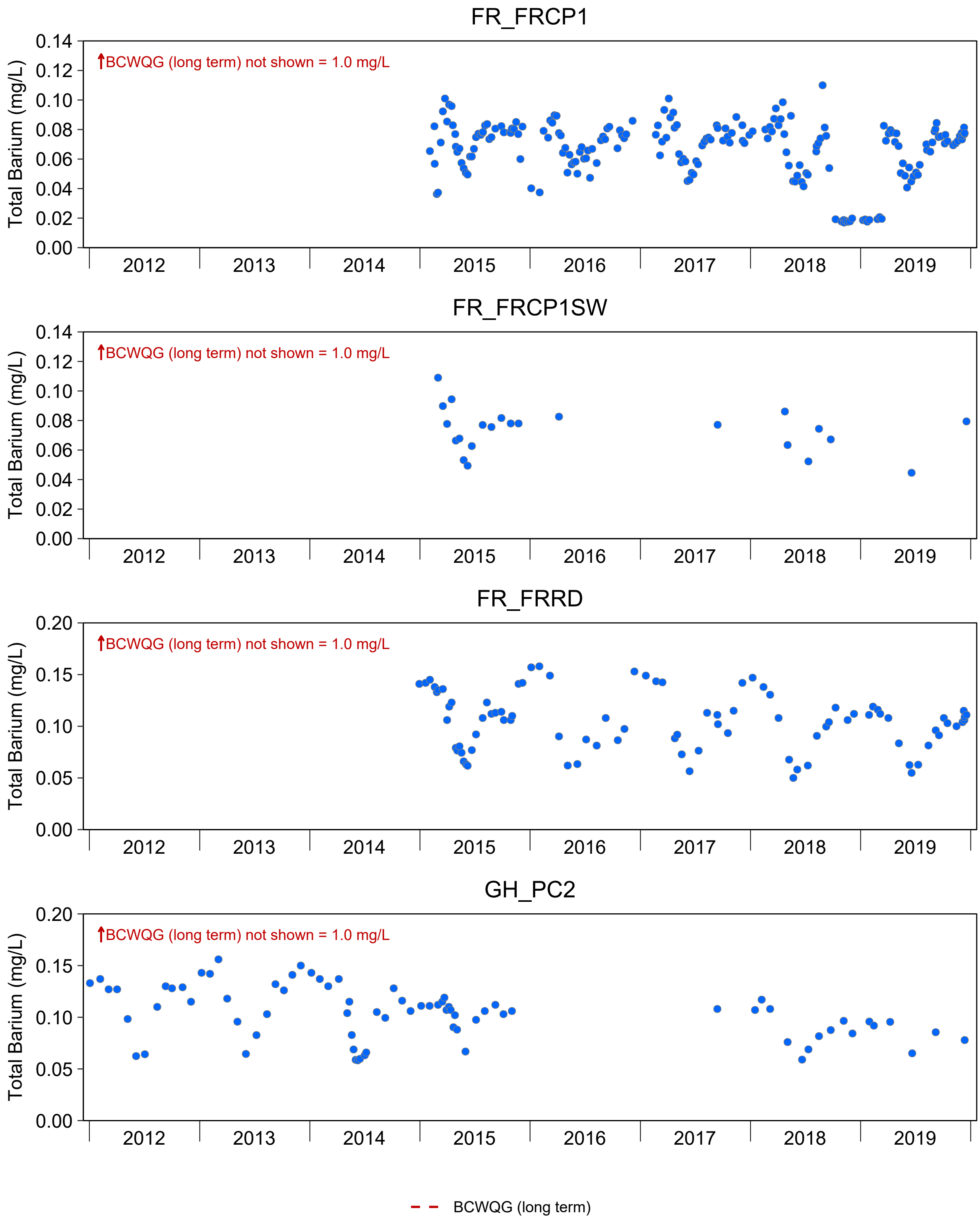

Figure C.2: Time Series Plots for Total Barium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Barium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

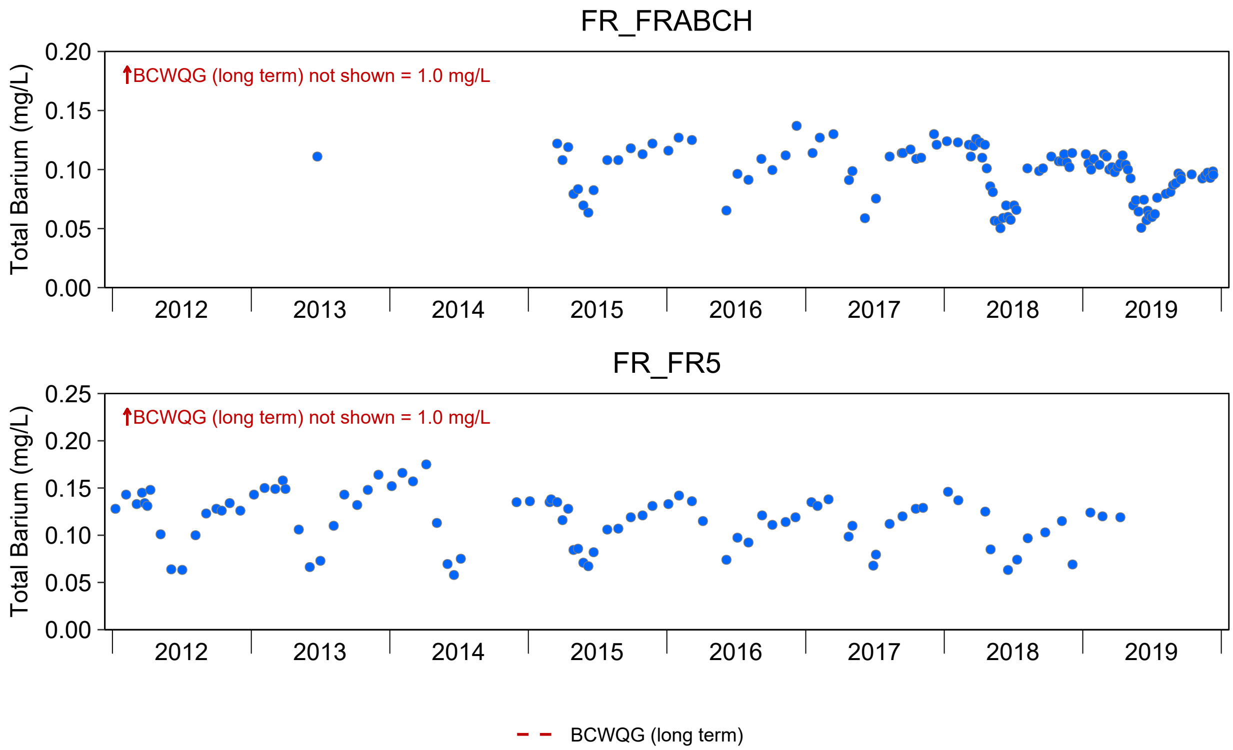

Figure C.2: Time Series Plots for Total Barium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Barium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

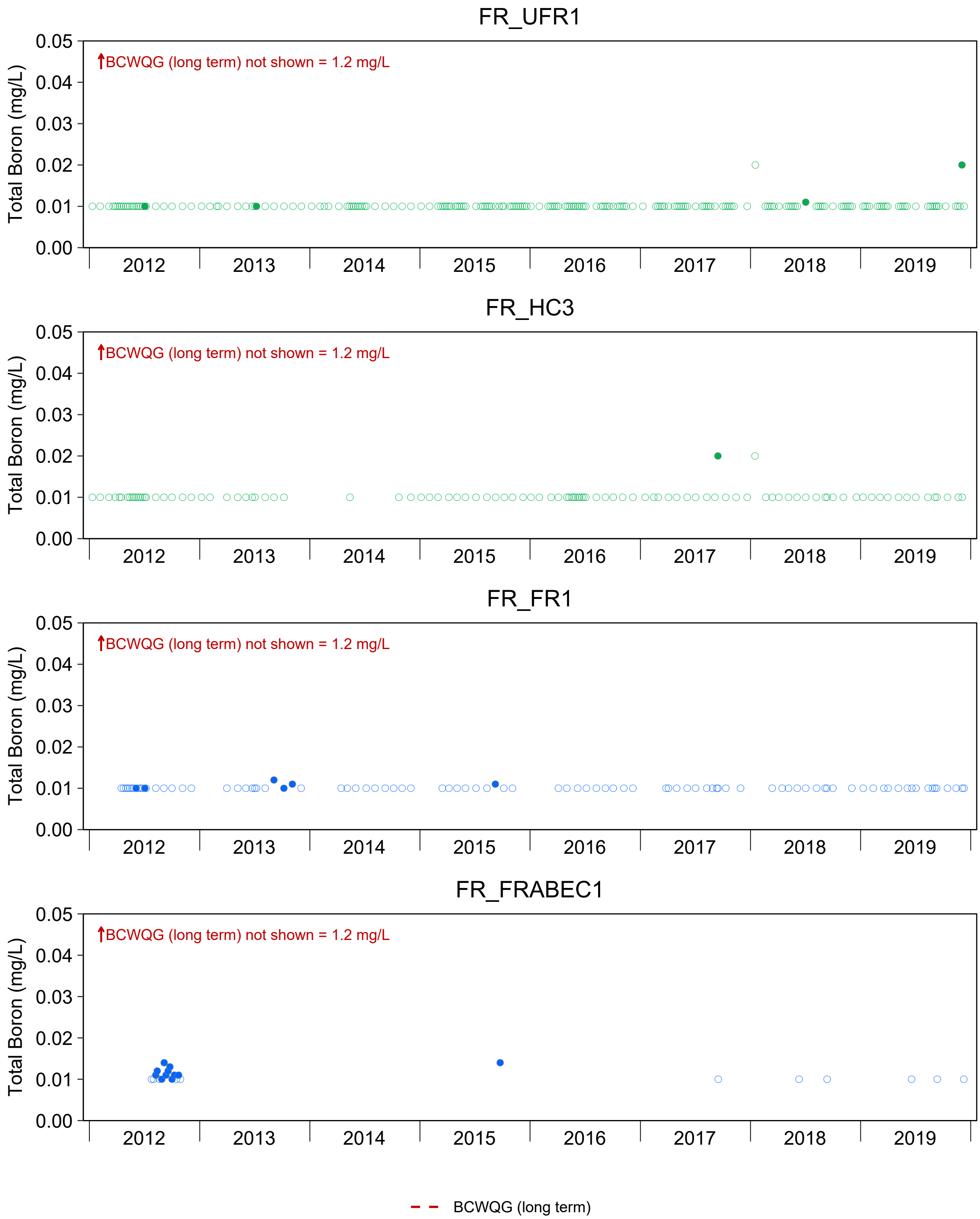

Figure C.3: Time Series Plots for Total Boron Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Boron was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

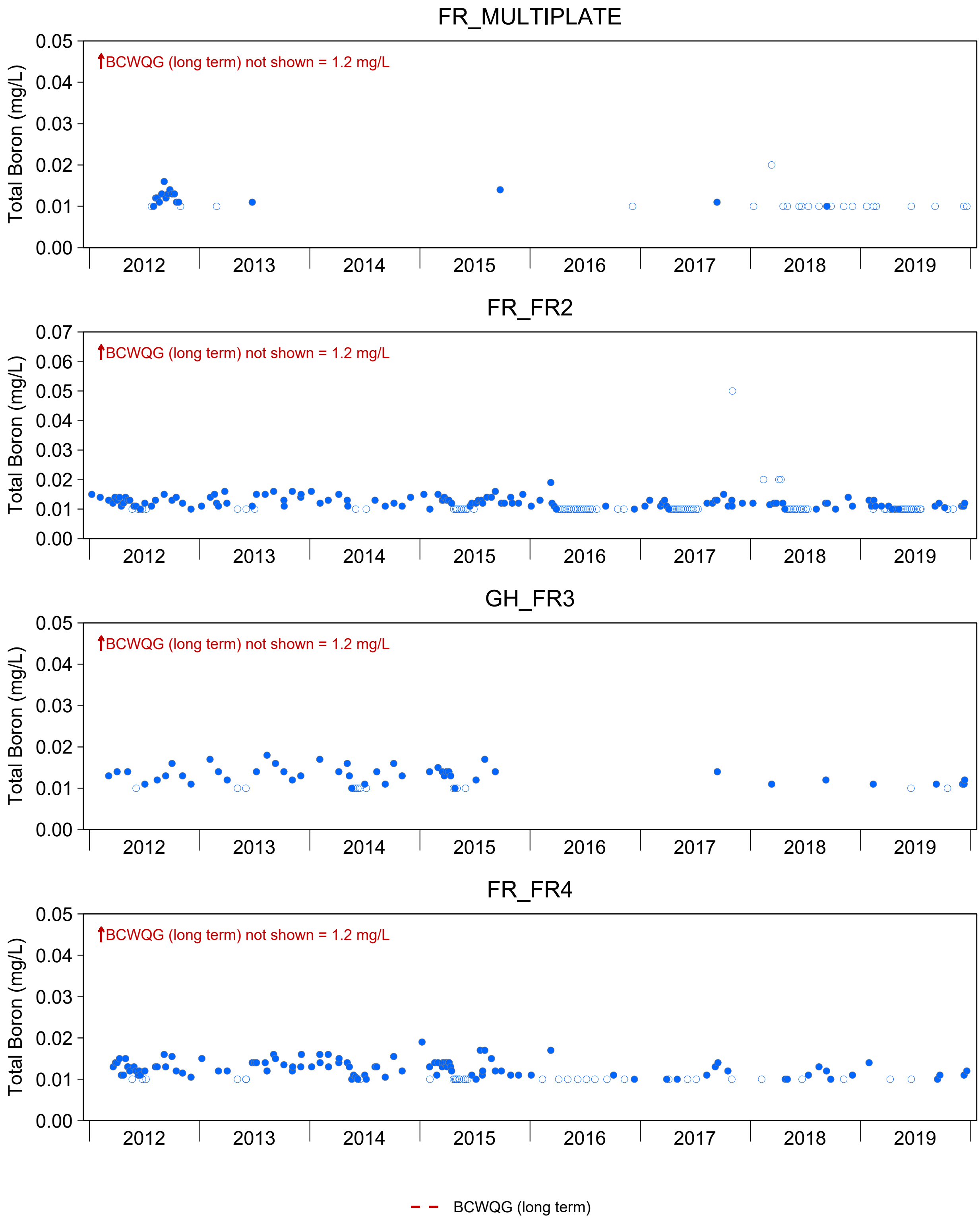

Figure C.3: Time Series Plots for Total Boron Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Boron was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

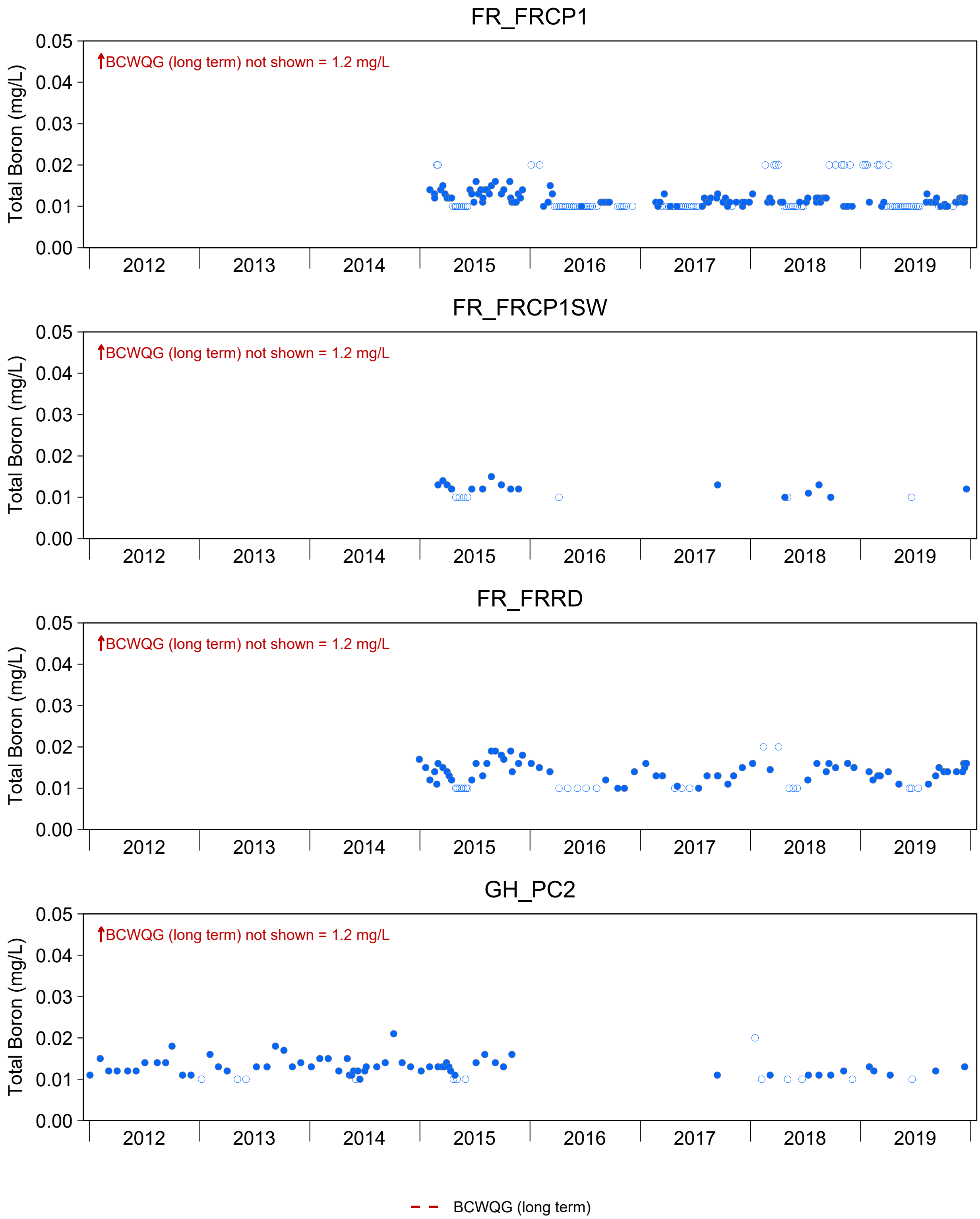

Figure C.3: Time Series Plots for Total Boron Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Boron was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

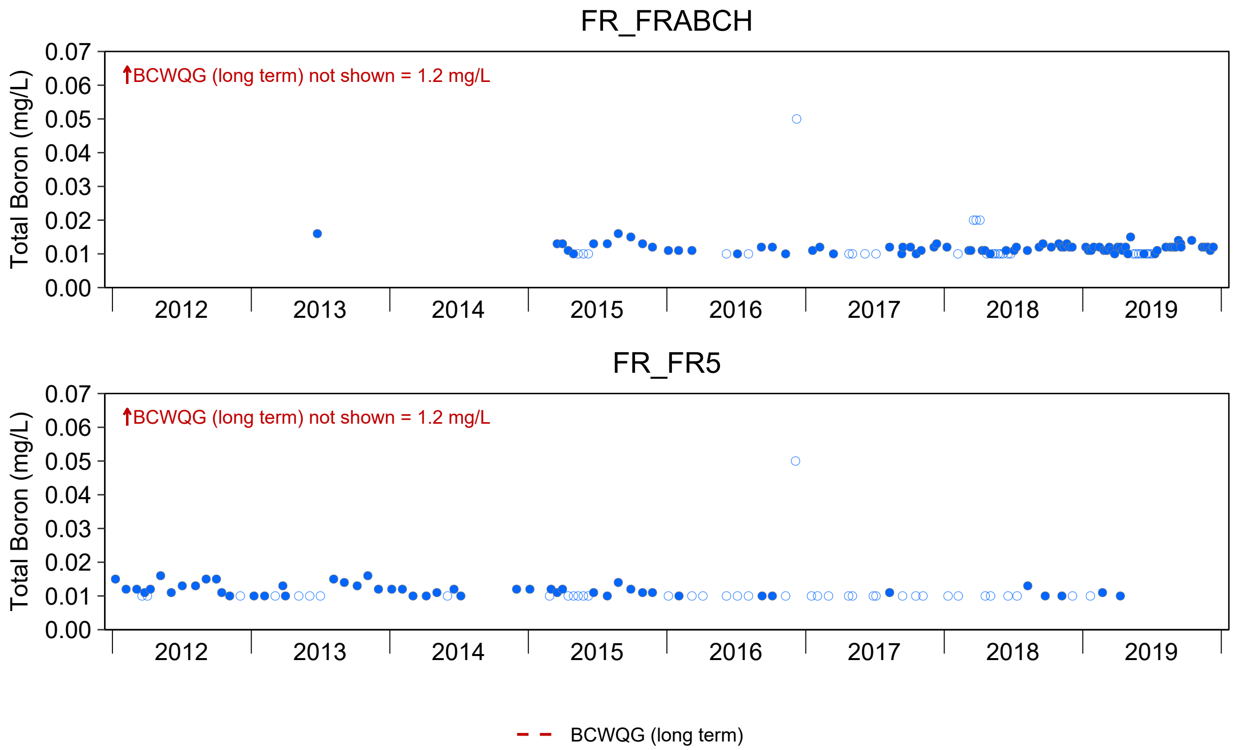

Figure C.3: Time Series Plots for Total Boron Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Boron was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

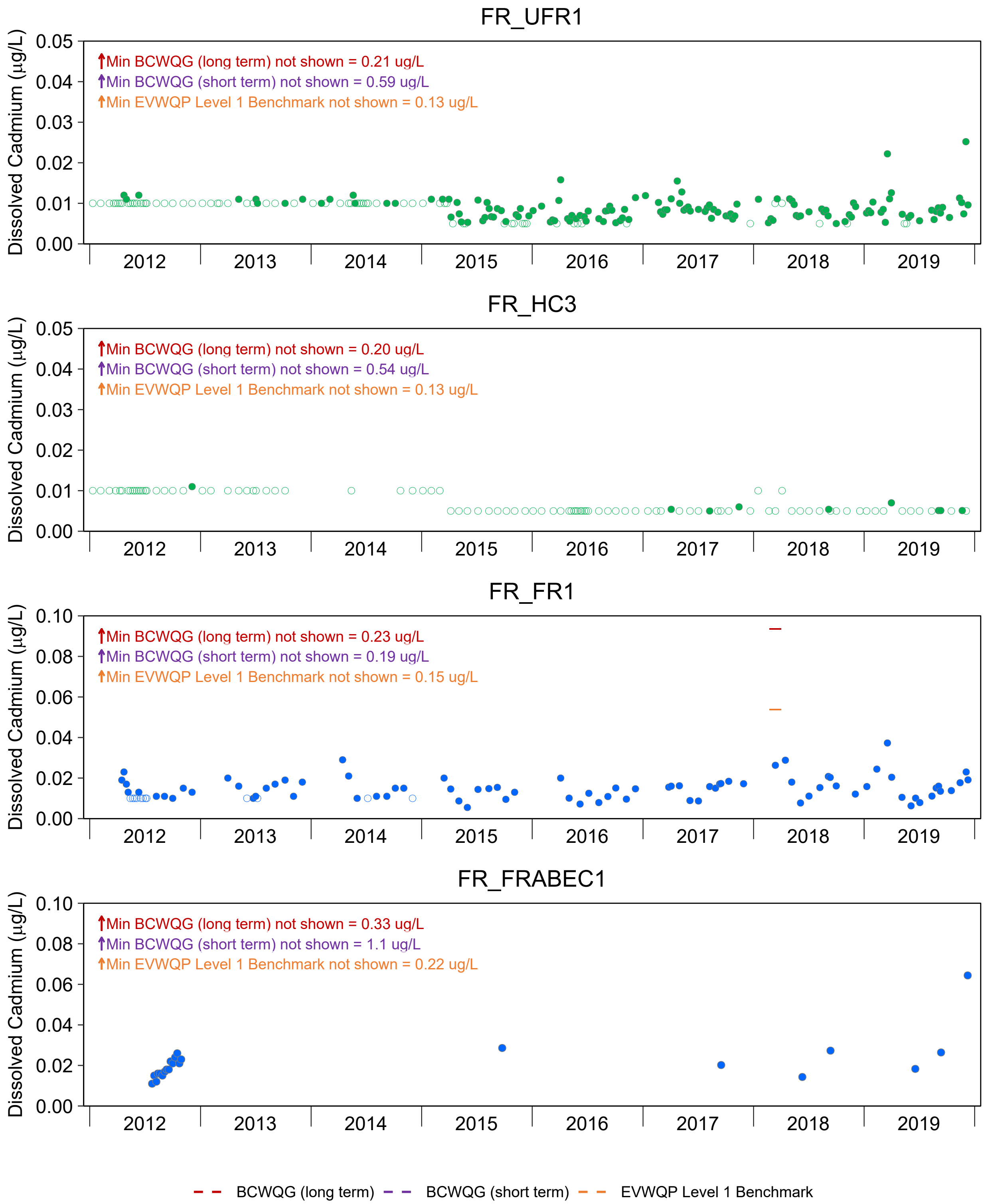

Figure C.4: Time Series Plots for Dissolved Cadmium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Dissolved Cadmium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

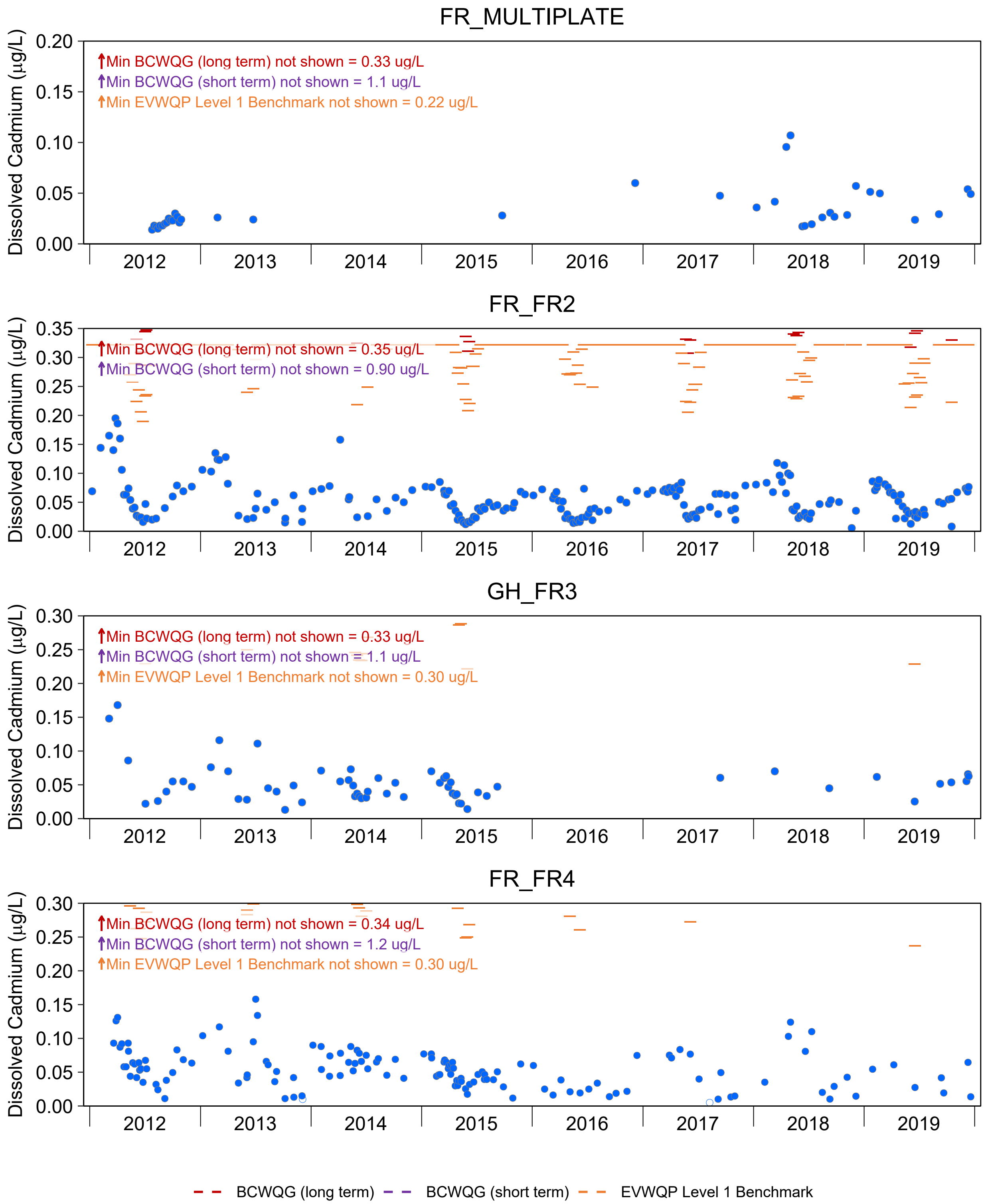

Figure C.4: Time Series Plots for Dissolved Cadmium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Dissolved Cadmium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

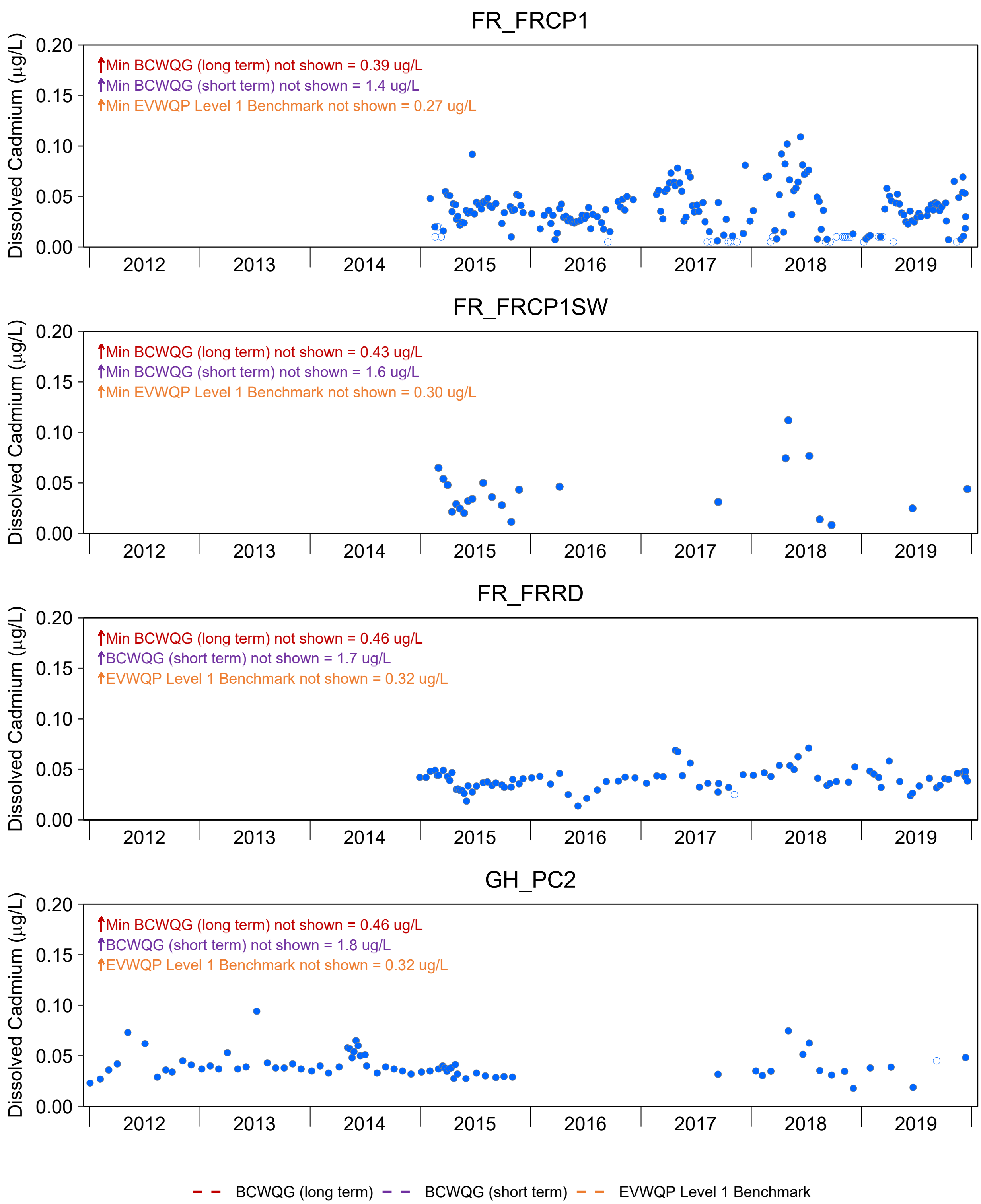

Figure C.4: Time Series Plots for Dissolved Cadmium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Dissolved Cadmium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

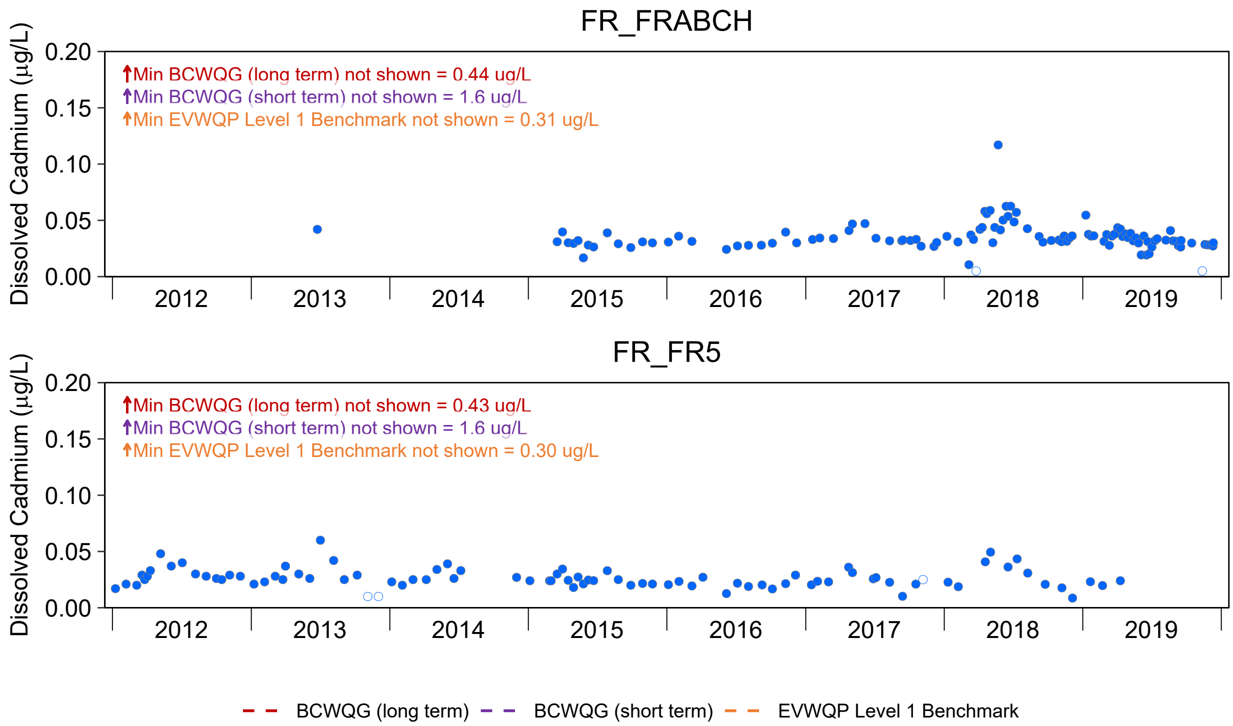

Figure C.4: Time Series Plots for Dissolved Cadmium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Dissolved Cadmium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

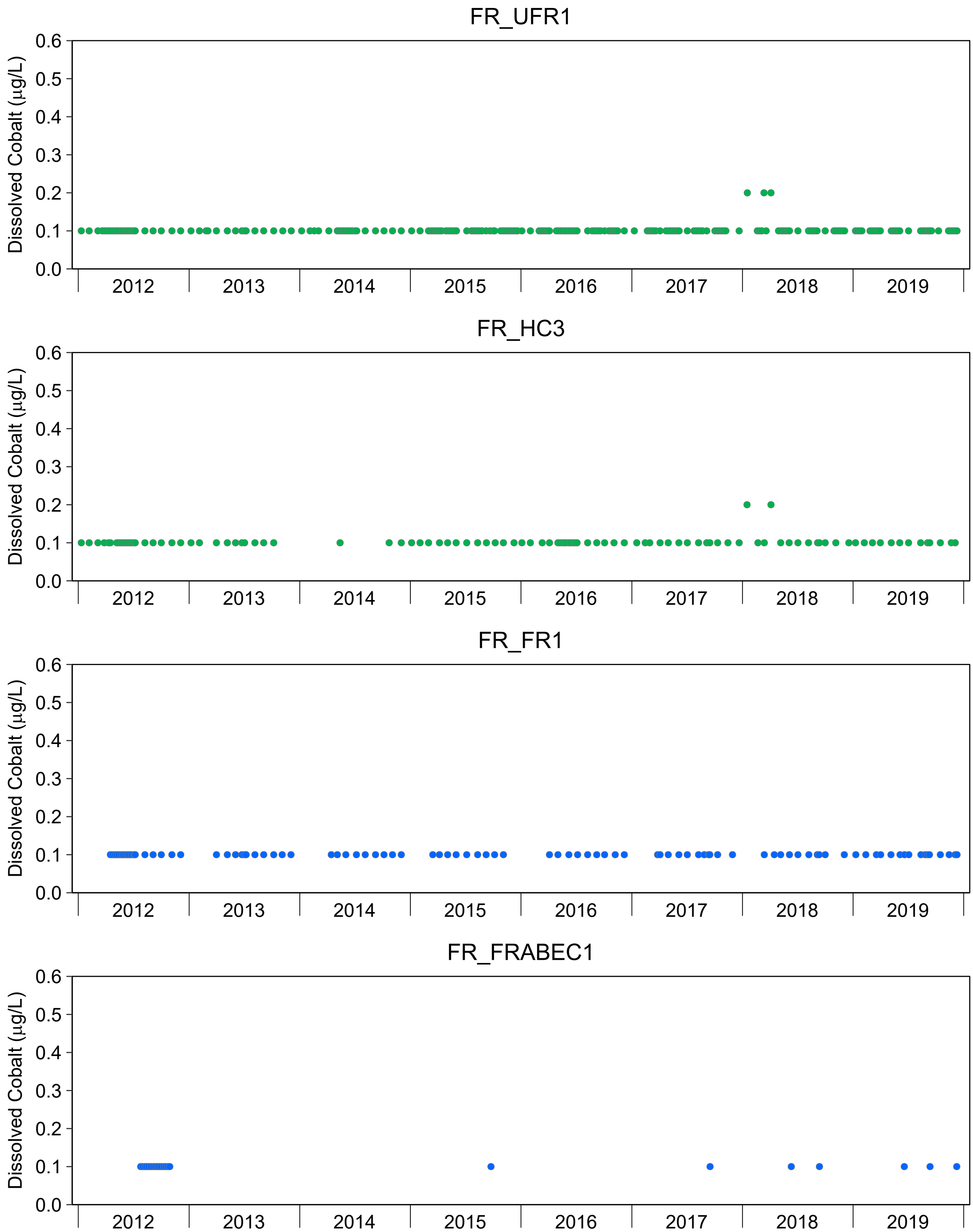

Figure C.5: Time Series Plots for Dissolved Cobalt Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Dissolved Cobalt was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Long-term average BCWQG for Total Cobalt is 4 µg/L.

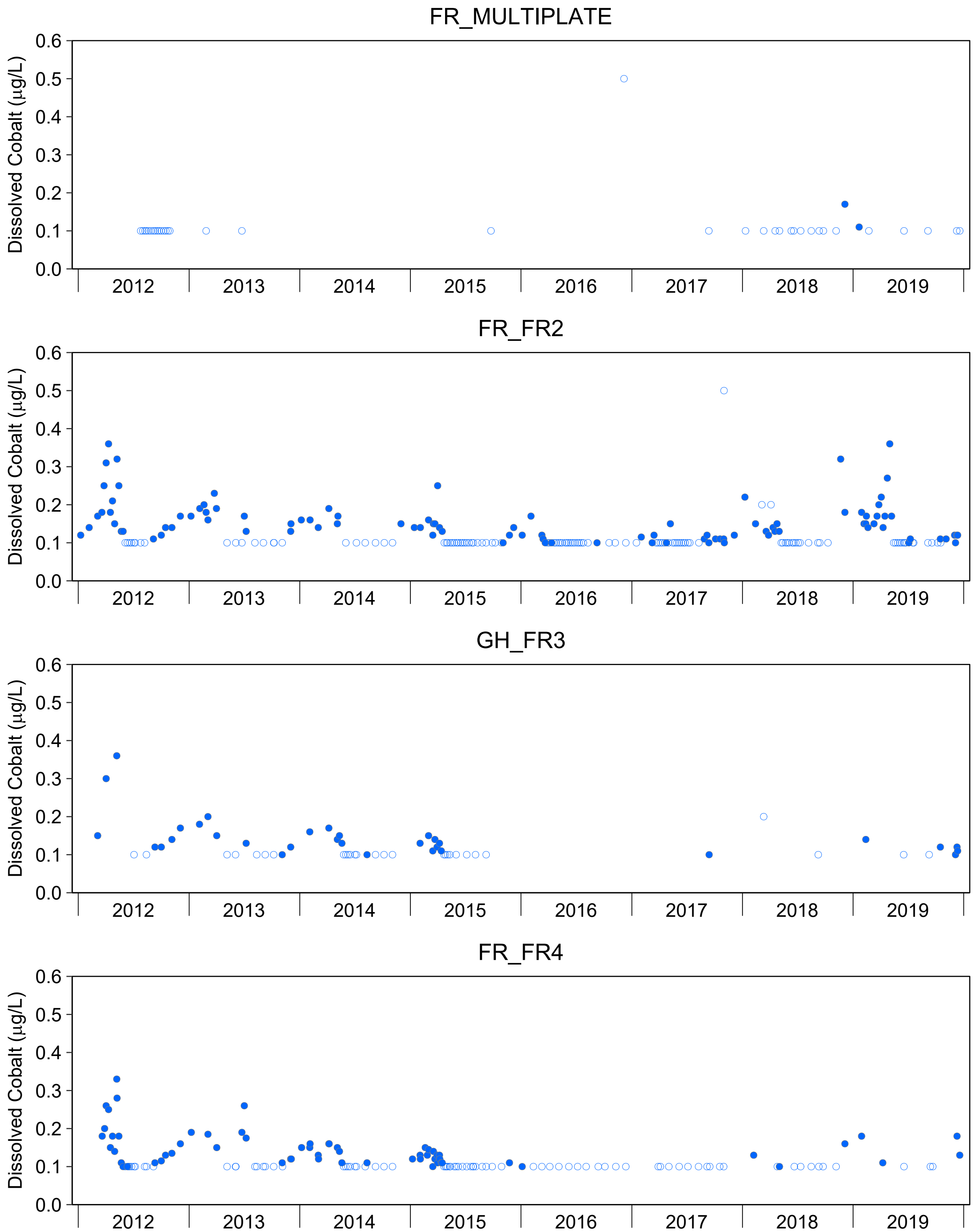

Figure C.5: Time Series Plots for Dissolved Cobalt Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Dissolved Cobalt was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Long-term average BCWQG for Total Cobalt is 4 µg/L.

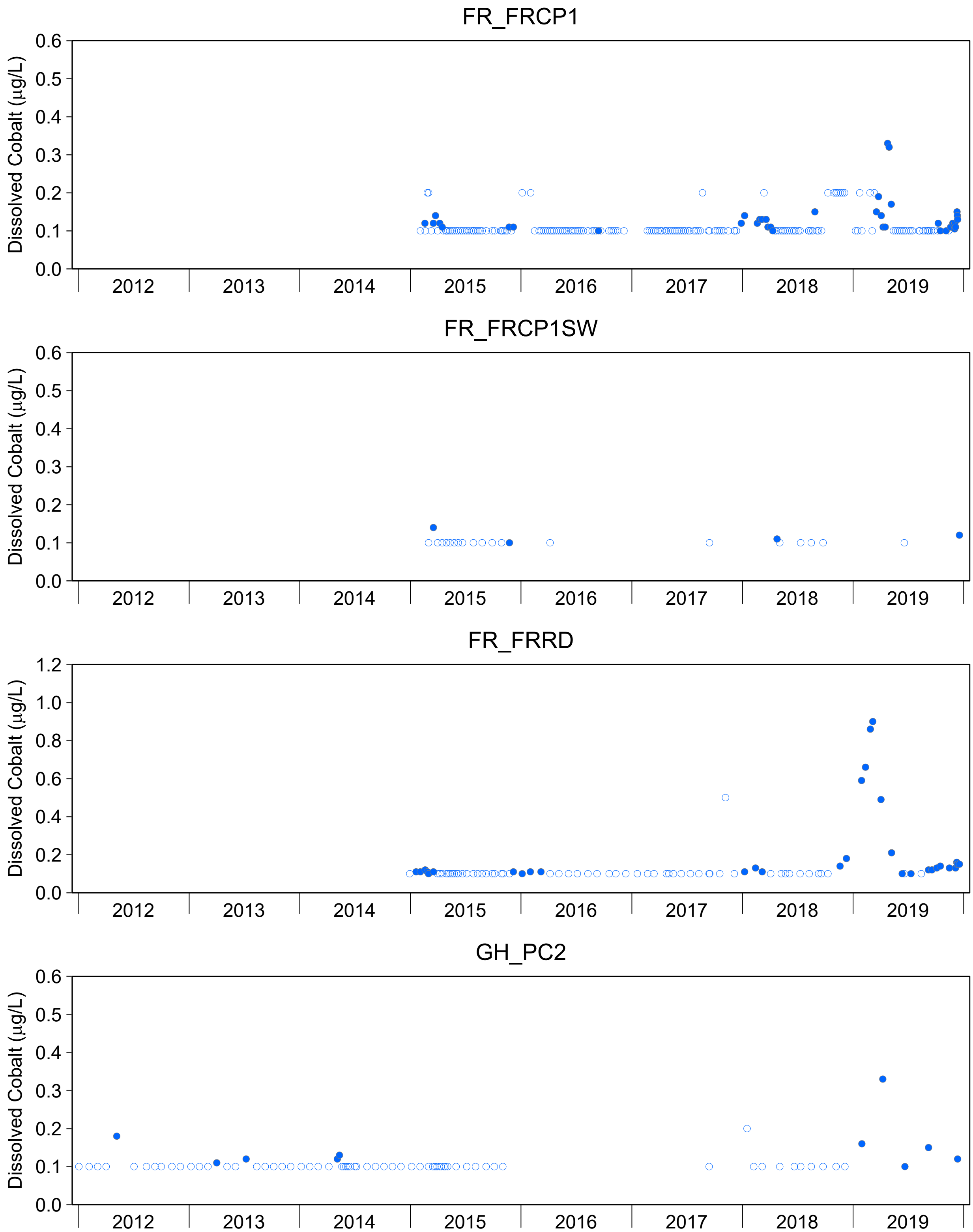

Figure C.5: Time Series Plots for Dissolved Cobalt Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Dissolved Cobalt was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Long-term average BCWQG for Total Cobalt is 4 µg/L.

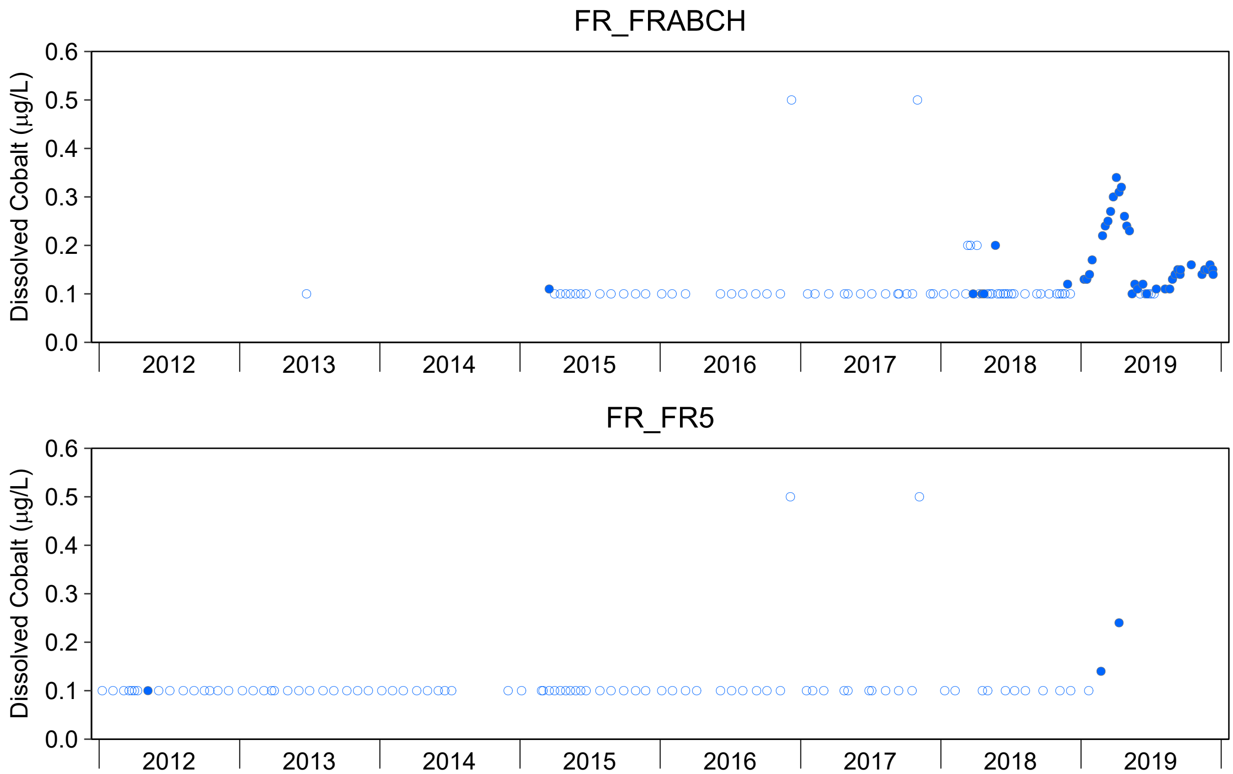

Figure C.5: Time Series Plots for Dissolved Cobalt Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Dissolved Cobalt was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Long-term average BCWQG for Total Cobalt is 4 µg/L.

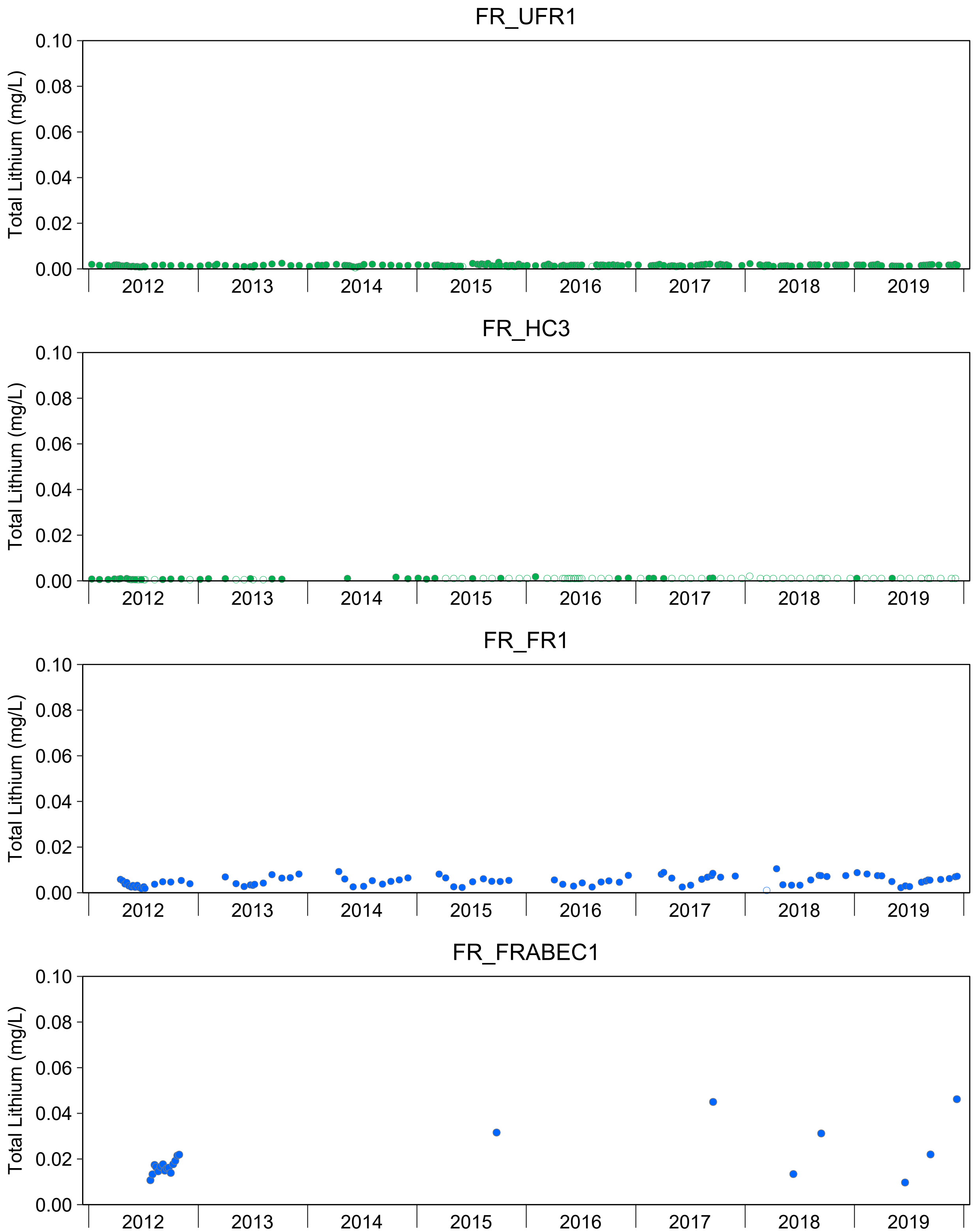

Figure C.6: Time Series Plots for Total Lithium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Lithium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

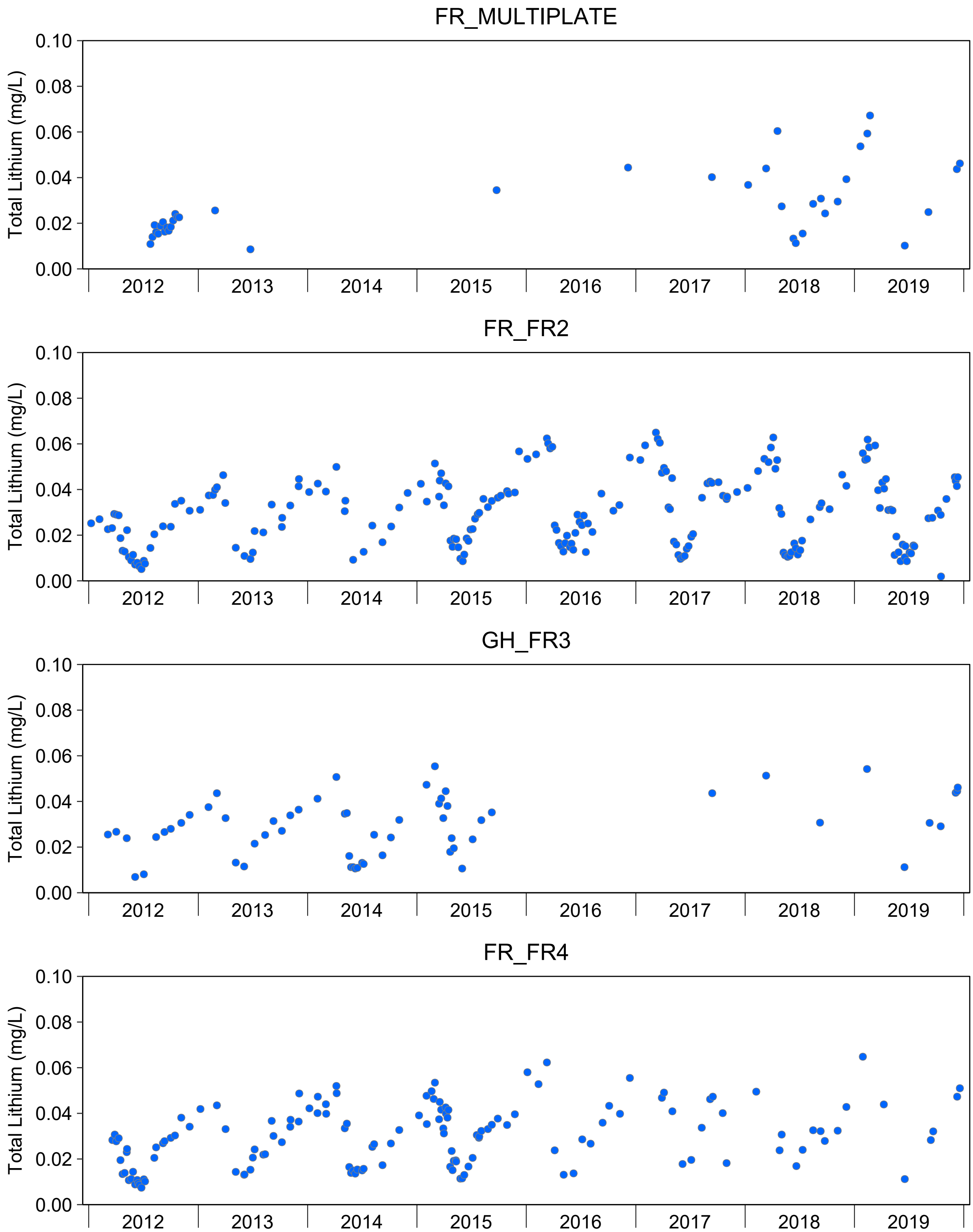

Figure C.6: Time Series Plots for Total Lithium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Lithium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

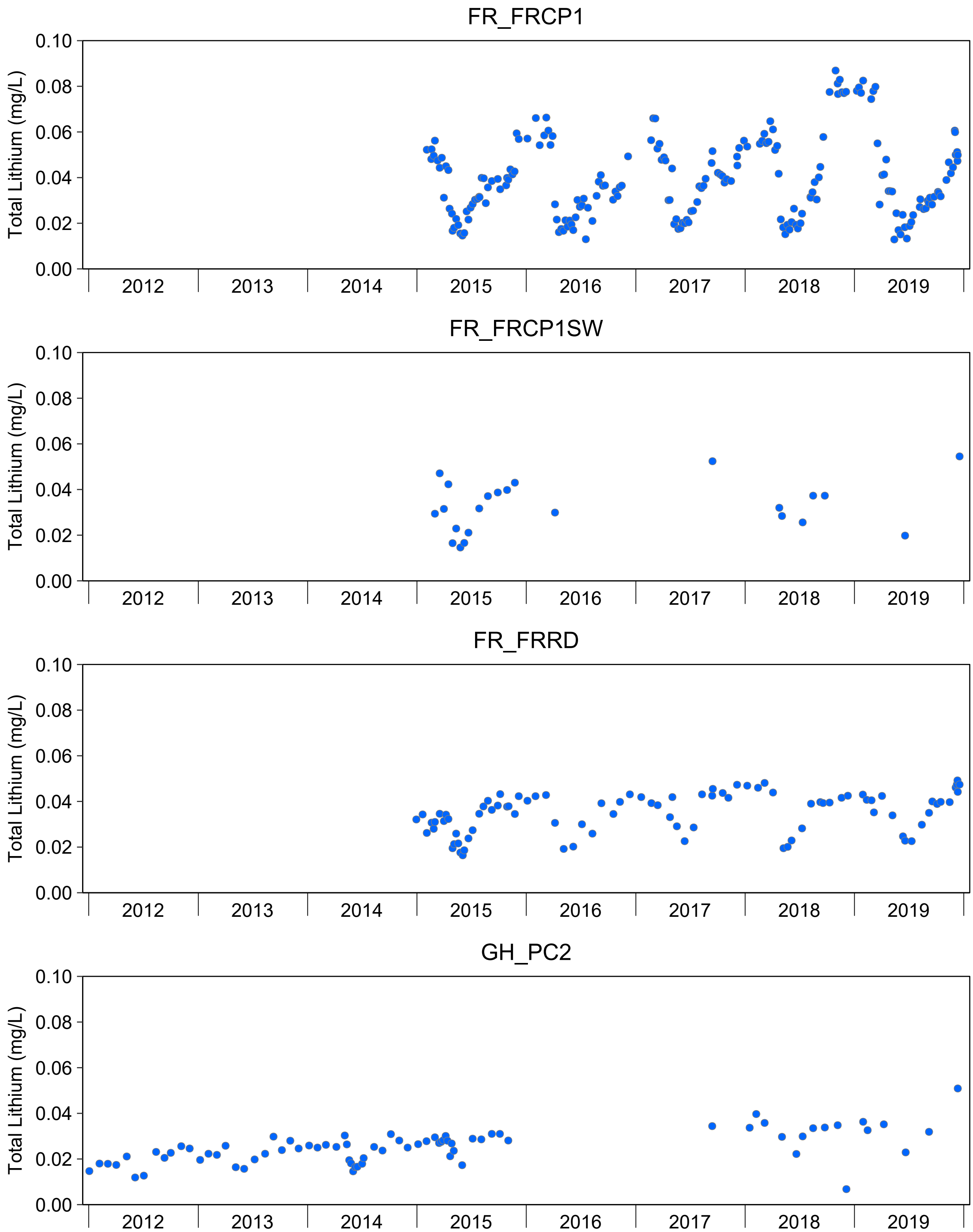

Figure C.6: Time Series Plots for Total Lithium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Lithium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

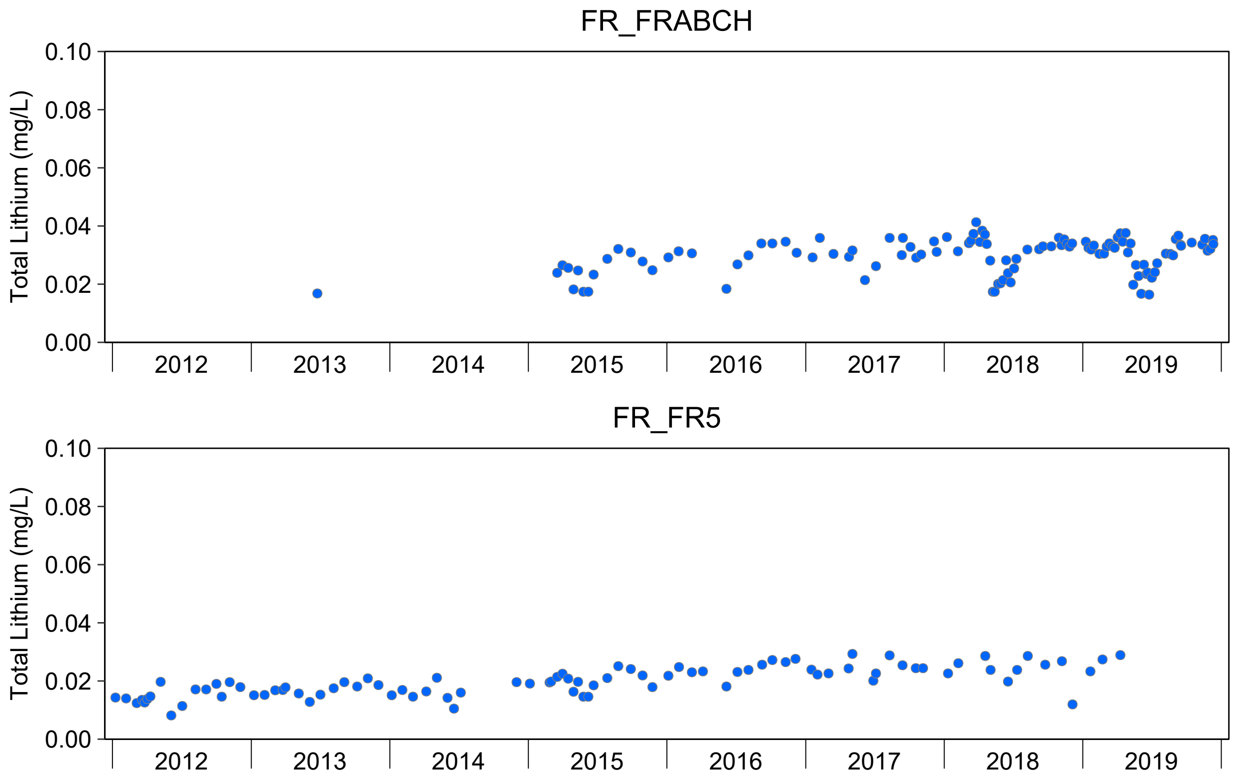

Figure C.6: Time Series Plots for Total Lithium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Lithium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

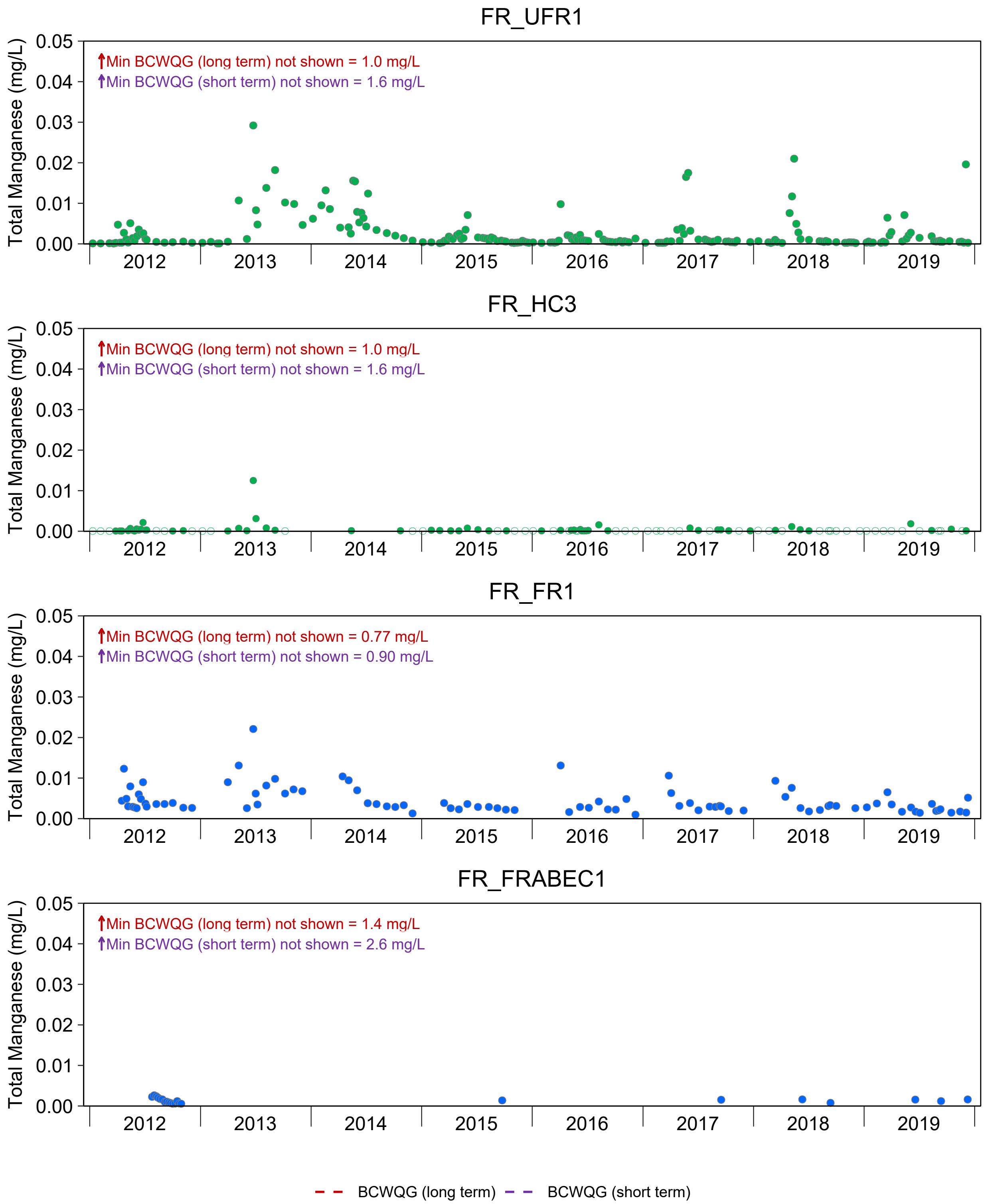

Figure C.7: Time Series Plots for Total Manganese Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Manganese was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

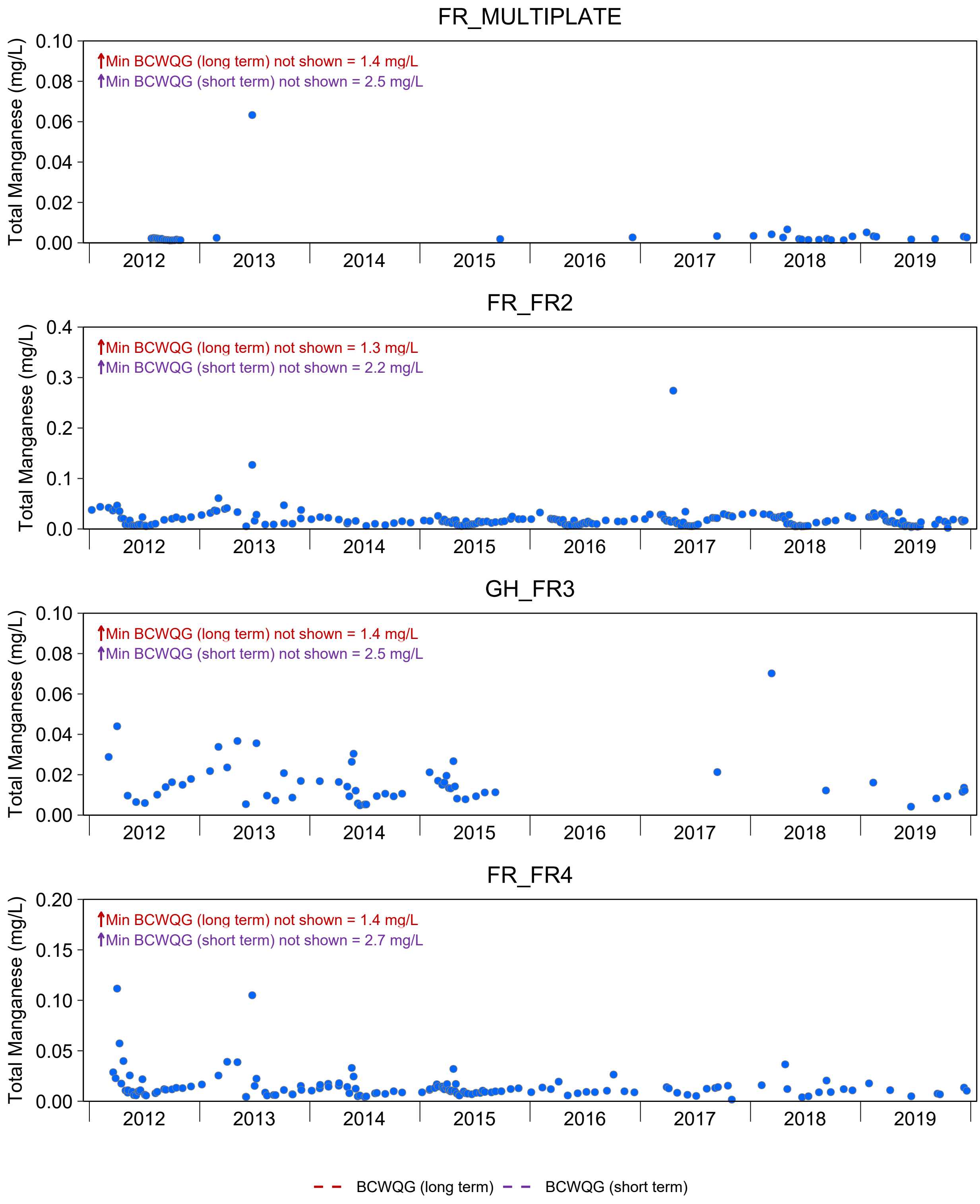

Figure C.7: Time Series Plots for Total Manganese Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Manganese was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

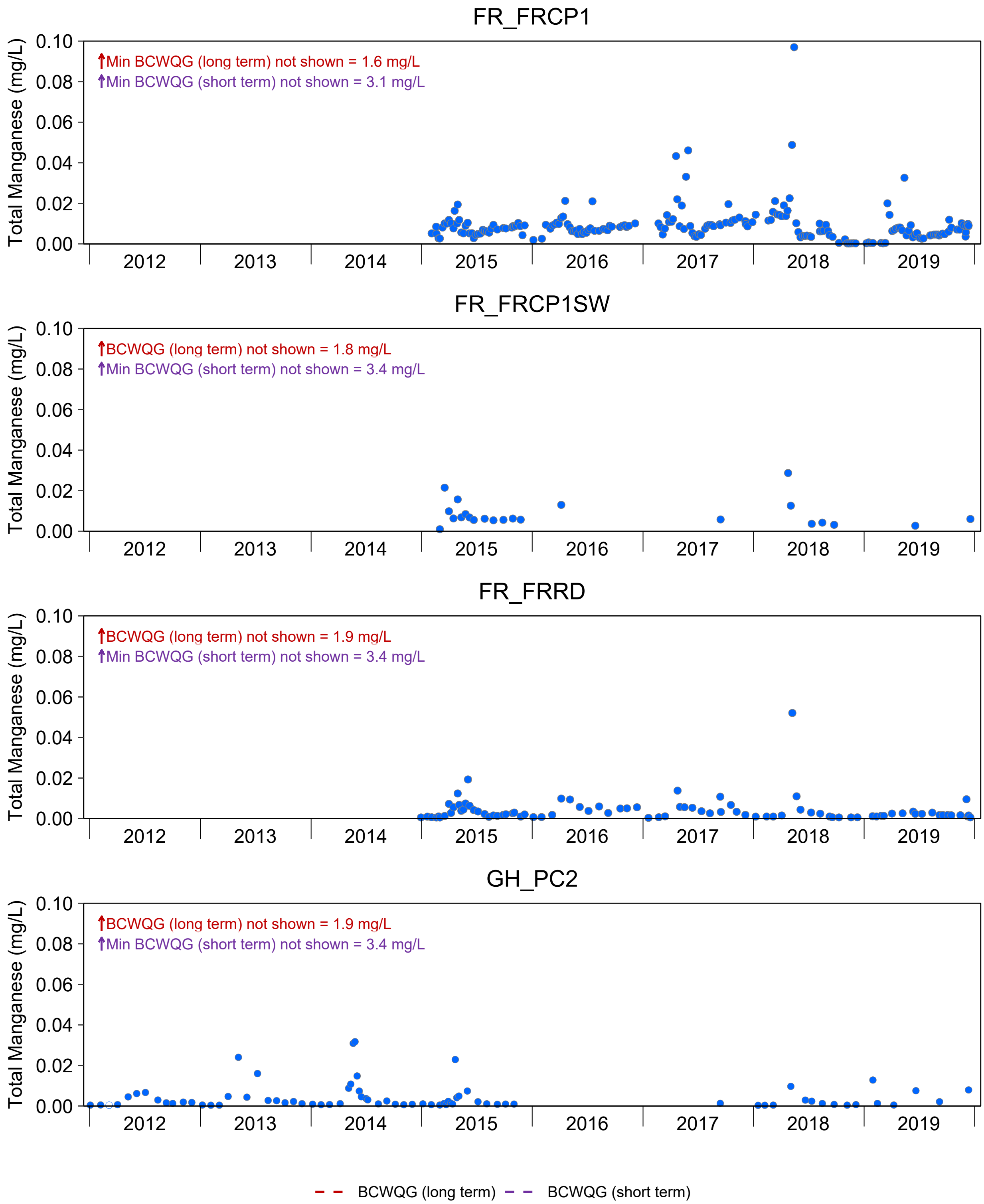

Figure C.7: Time Series Plots for Total Manganese Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Manganese was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

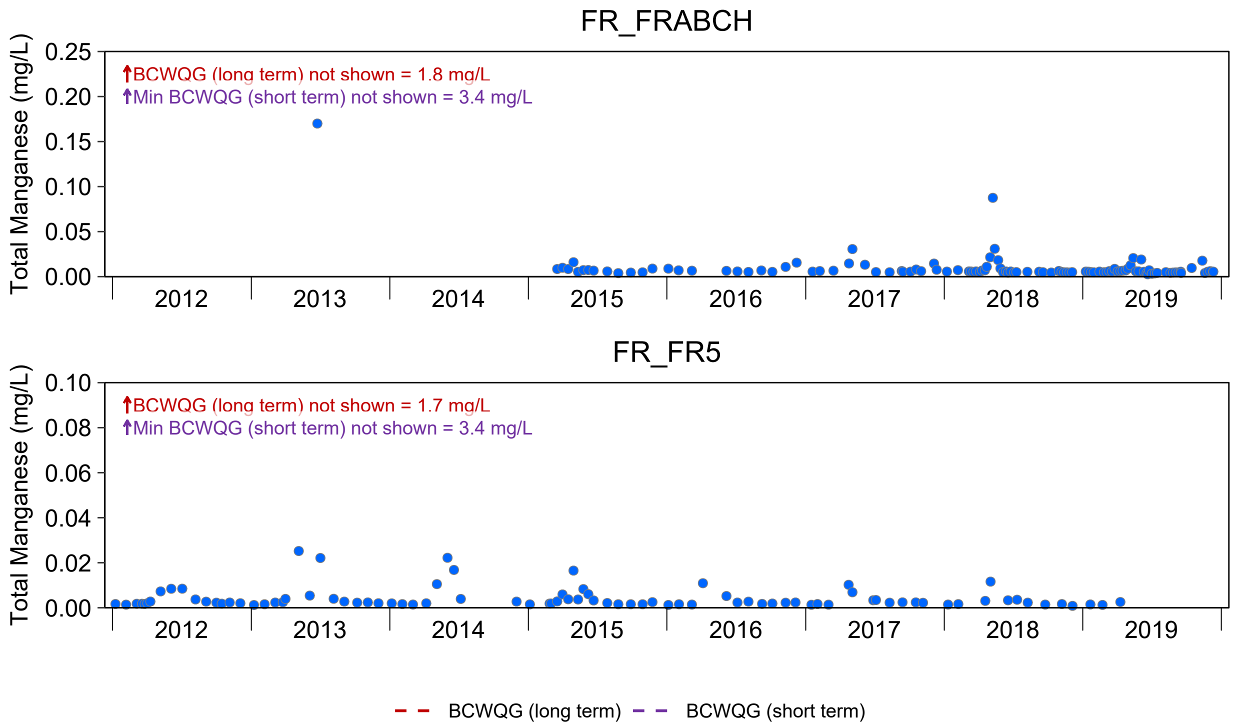

Figure C.7: Time Series Plots for Total Manganese Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Manganese was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

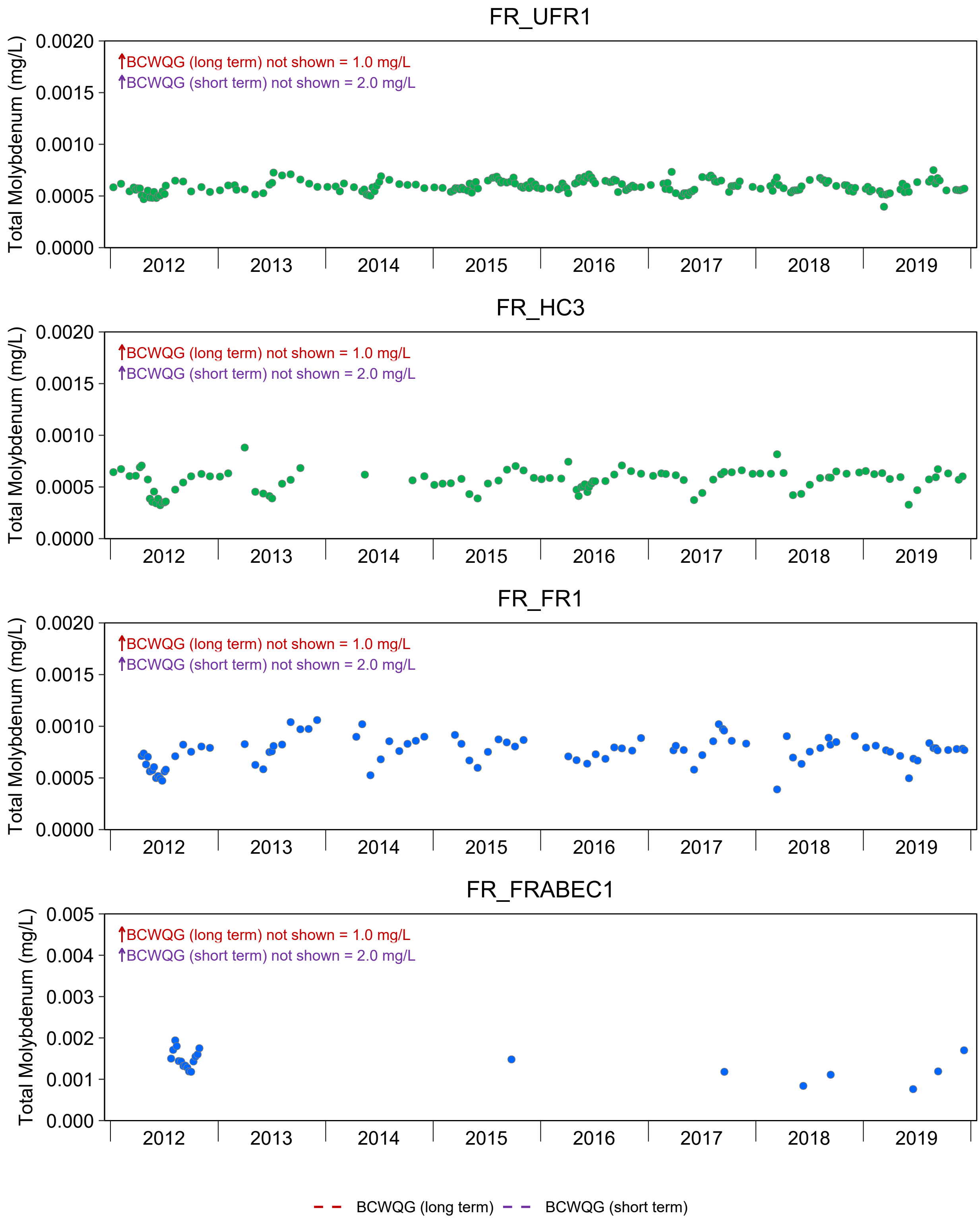

Figure C.8: Time Series Plots for Total Molybdenum Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Molybdenum was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

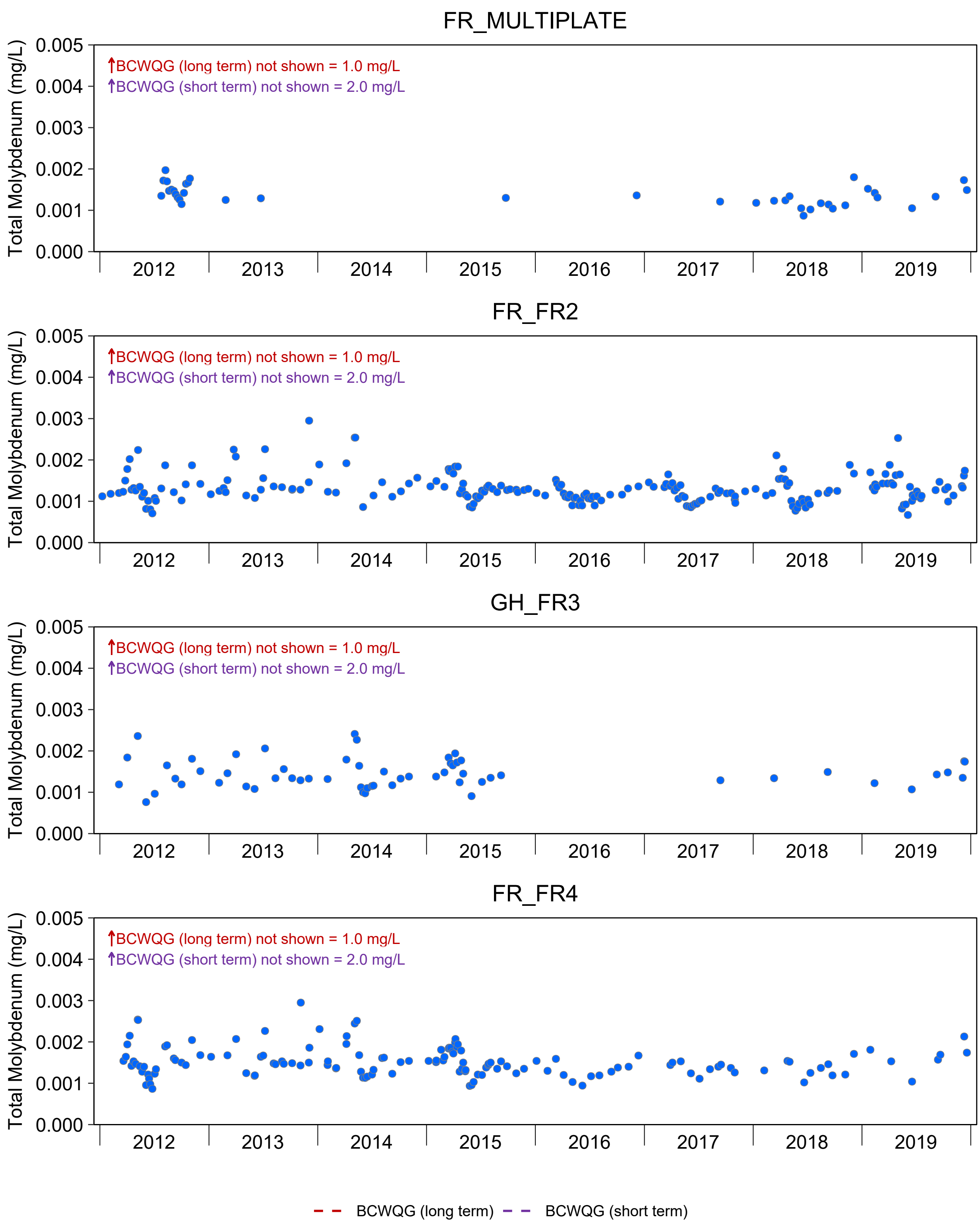

Figure C.8: Time Series Plots for Total Molybdenum Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Molybdenum was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

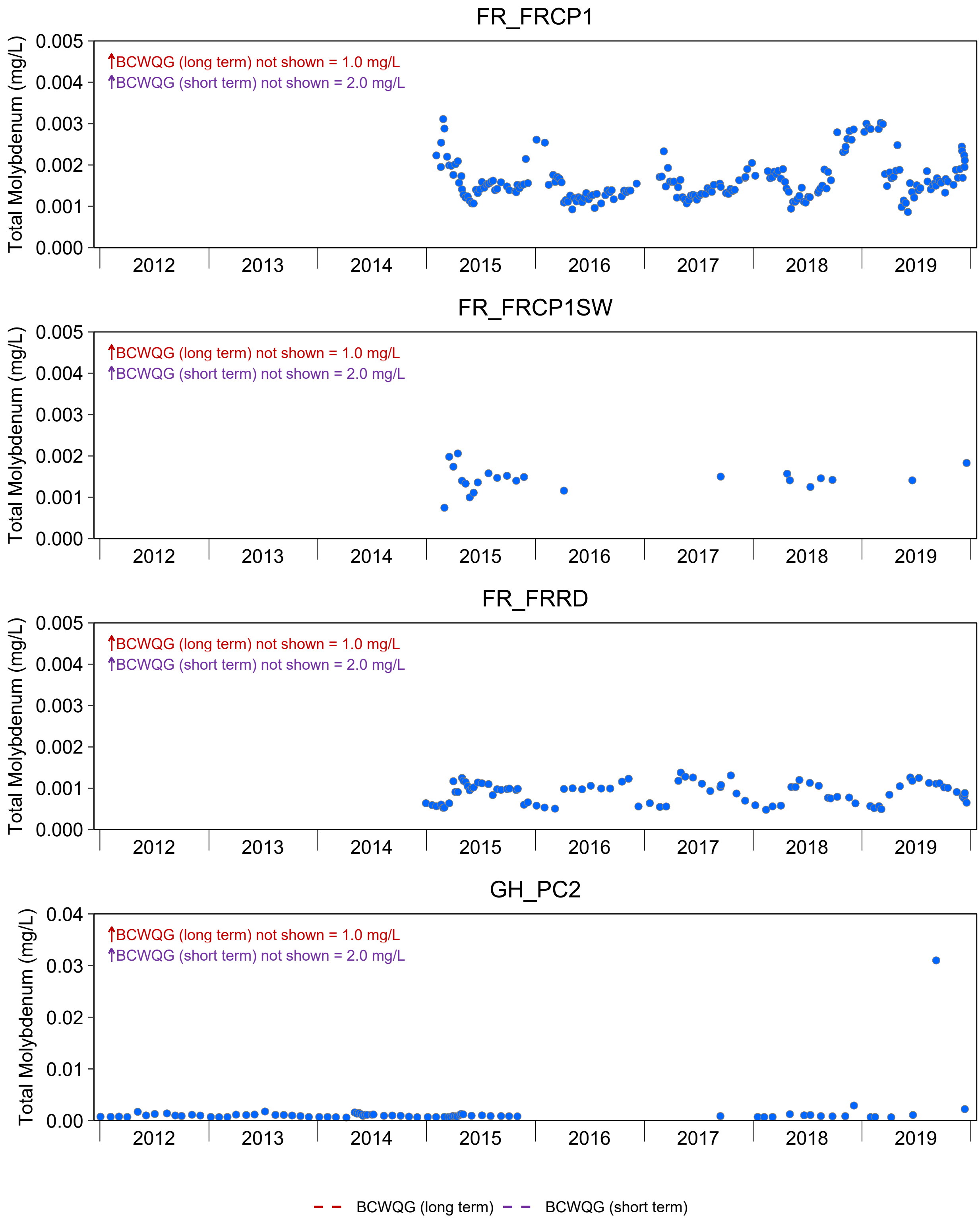

Figure C.8: Time Series Plots for Total Molybdenum Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Molybdenum was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

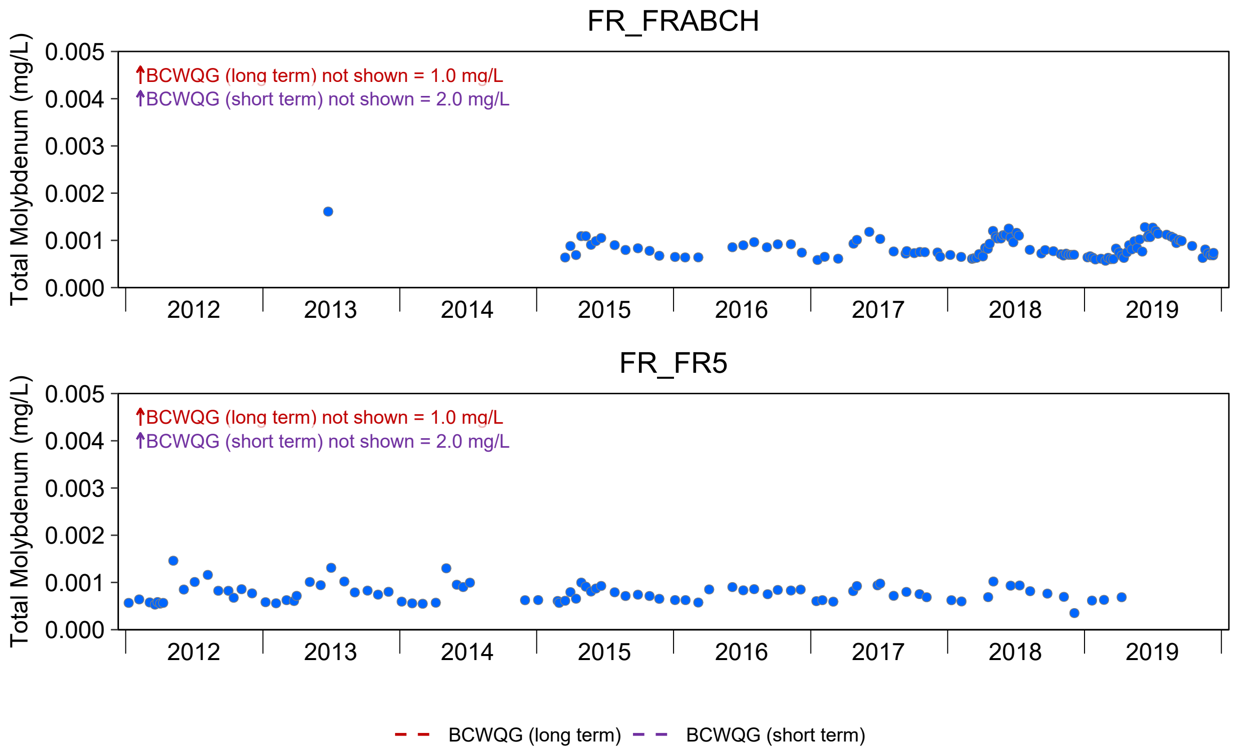

Figure C.8: Time Series Plots for Total Molybdenum Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Molybdenum was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

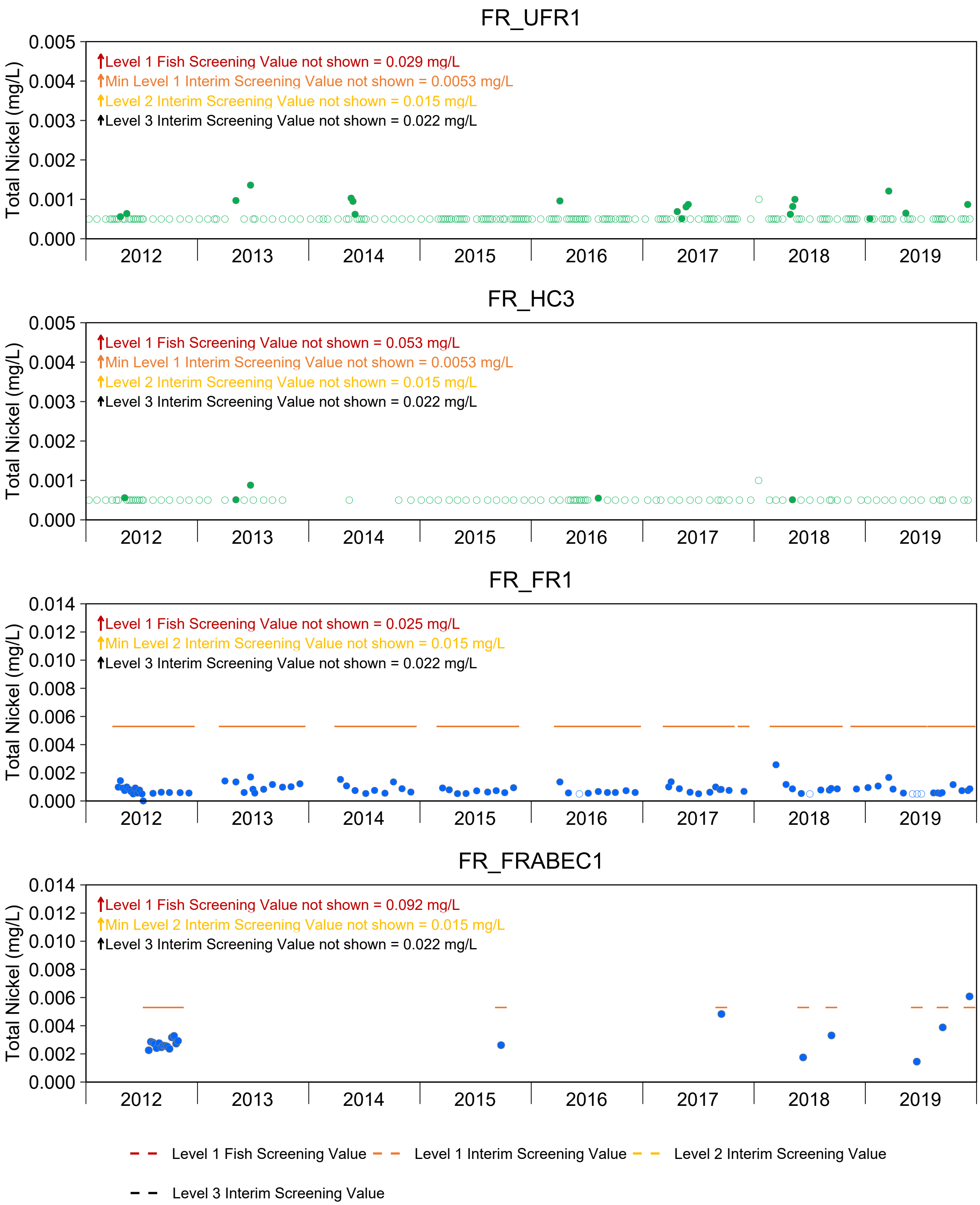

Figure C.9: Time Series Plots for Total Nickel Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Nickel was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Level 1 Fish Screening Guideline is dependent on hardness, dissolved organic carbon, and pH.

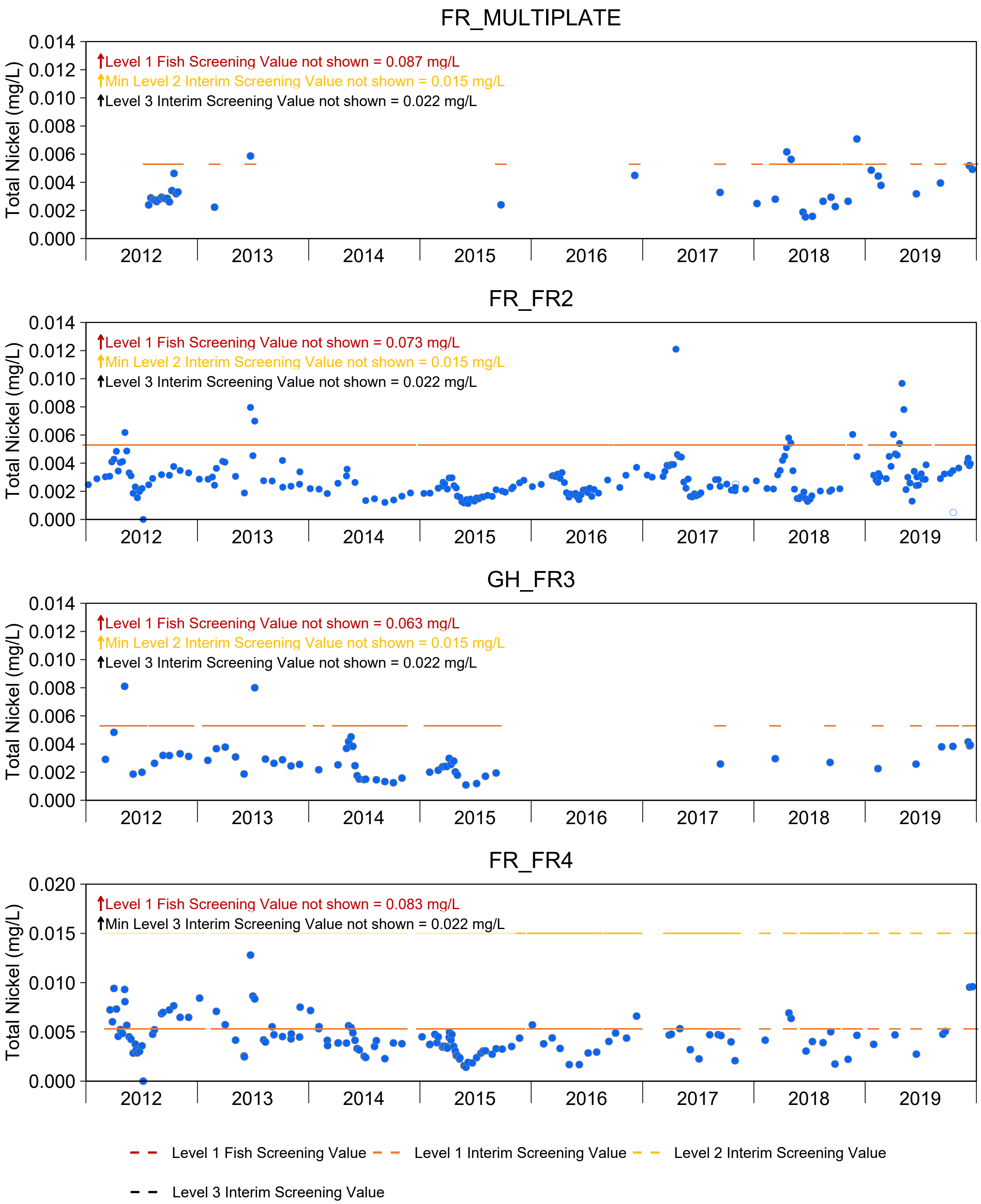

Figure C.9: Time Series Plots for Total Nickel Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Nickel was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Level 1 Fish Screening Guideline is dependent on hardness, dissolved organic carbon, and pH.

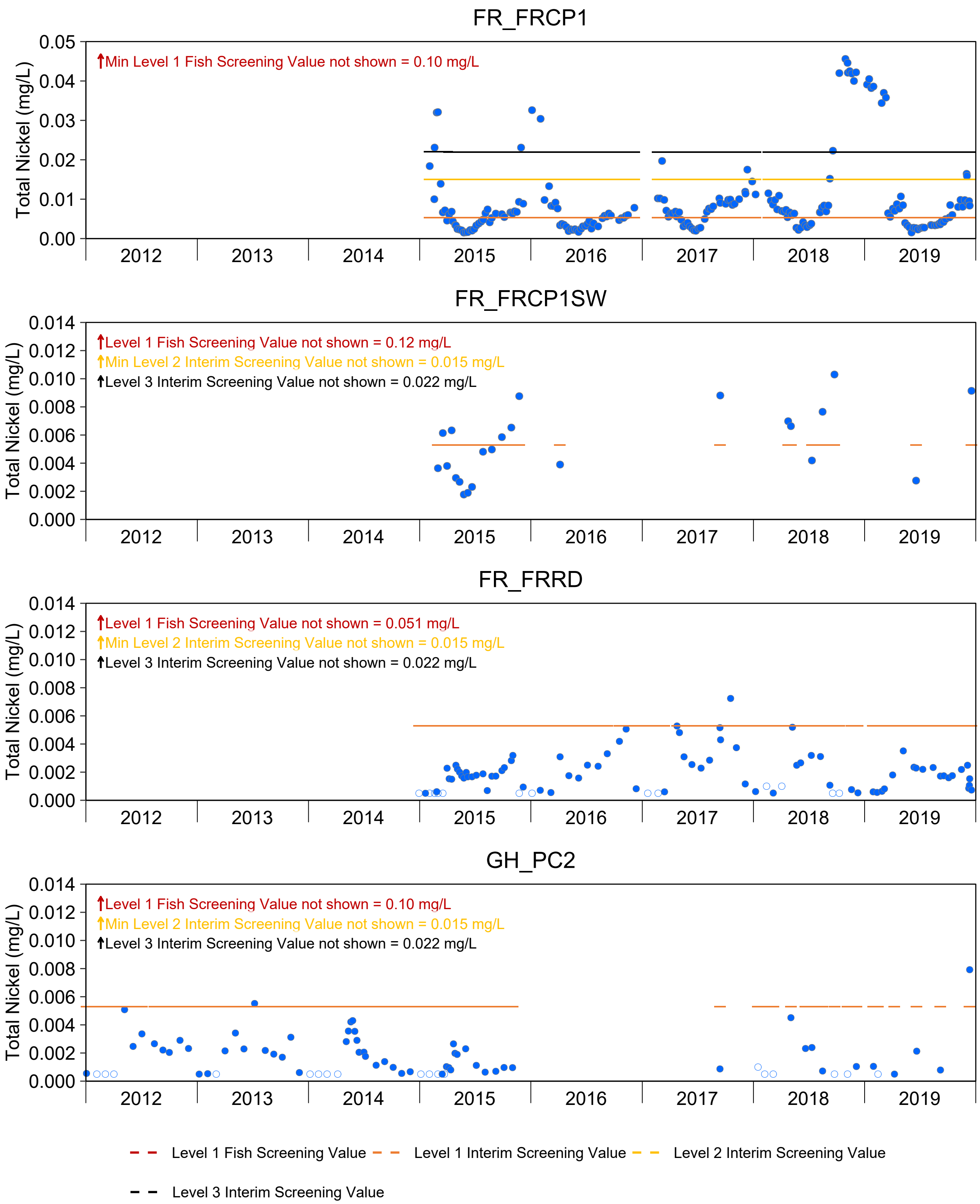

Figure C.9: Time Series Plots for Total Nickel Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Nickel was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Level 1 Fish Screening Guideline is dependent on hardness, dissolved organic carbon, and pH.

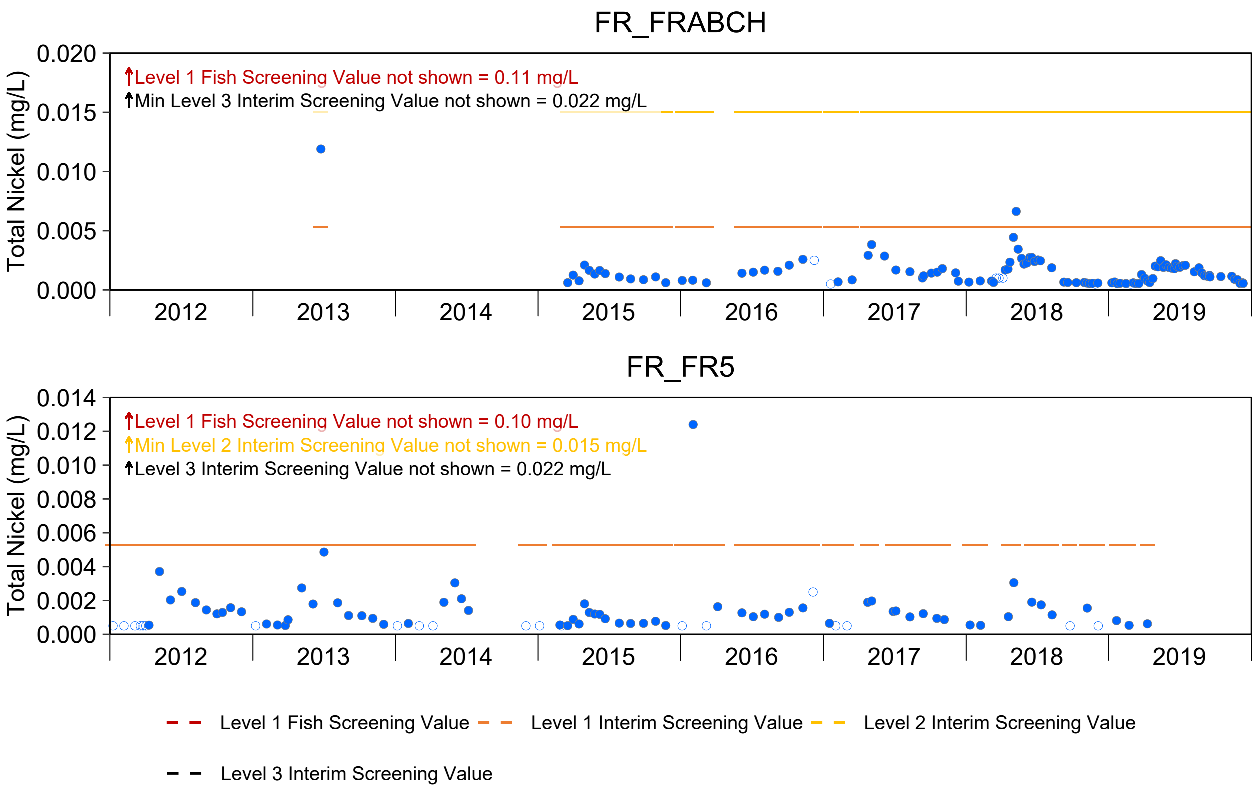

Figure C.9: Time Series Plots for Total Nickel Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Nickel was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Level 1 Fish Screening Guideline is dependent on hardness, dissolved organic carbon, and pH.

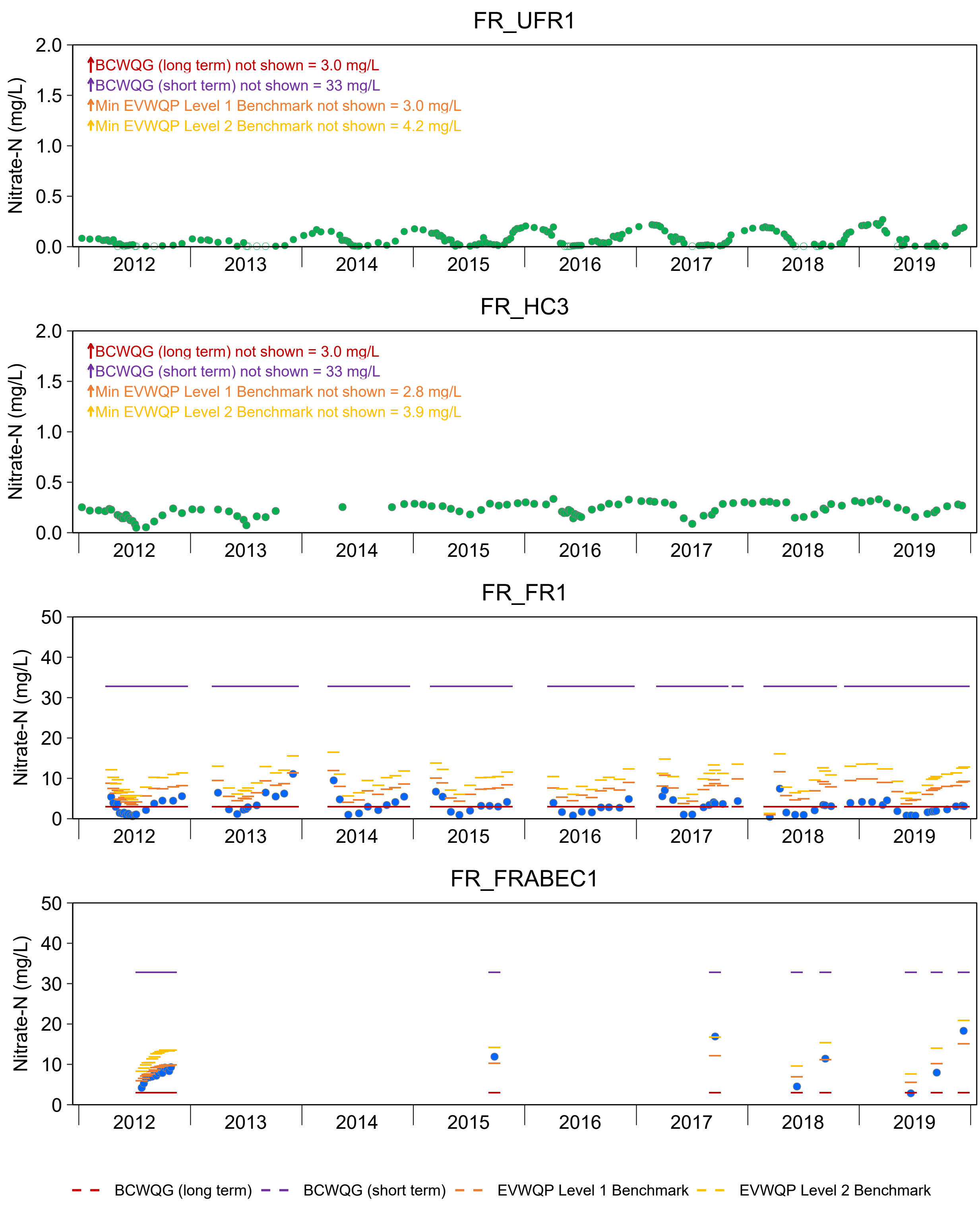

Figure C.10: Time Series Plots for Nitrate-N Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Nitrate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

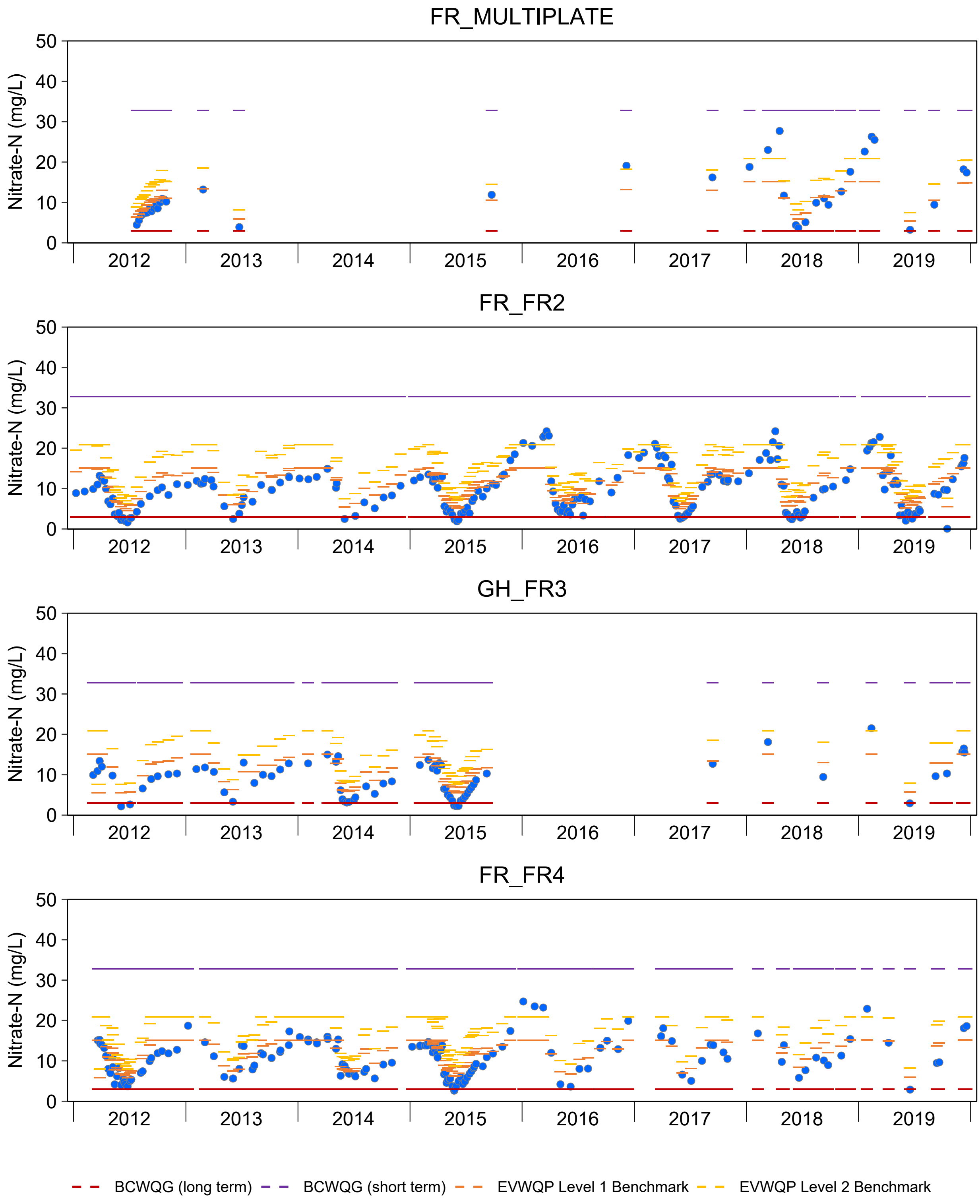

Figure C.10: Time Series Plots for Nitrate-N Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Nitrate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

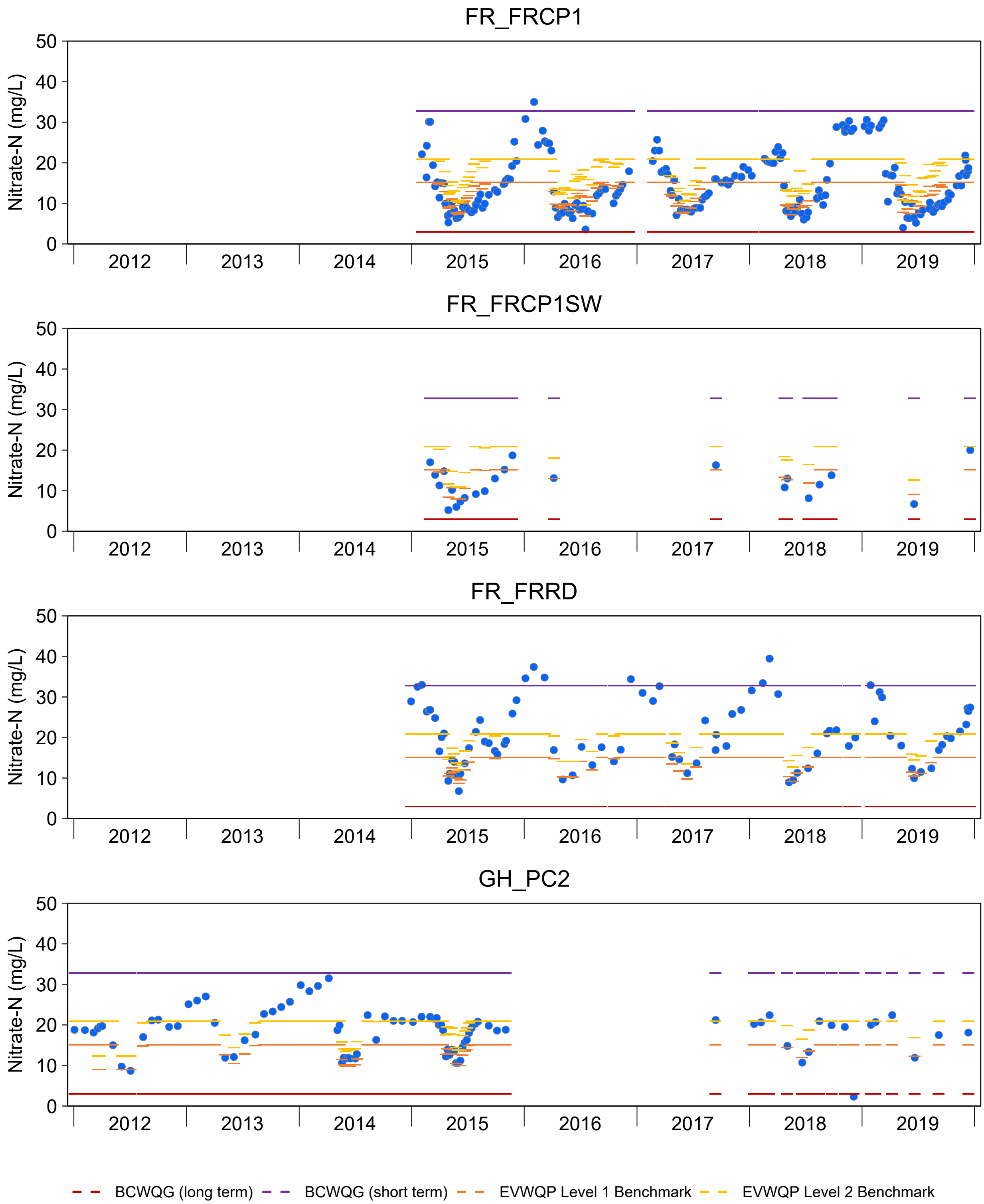

Figure C.10: Time Series Plots for Nitrate-N Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Nitrate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

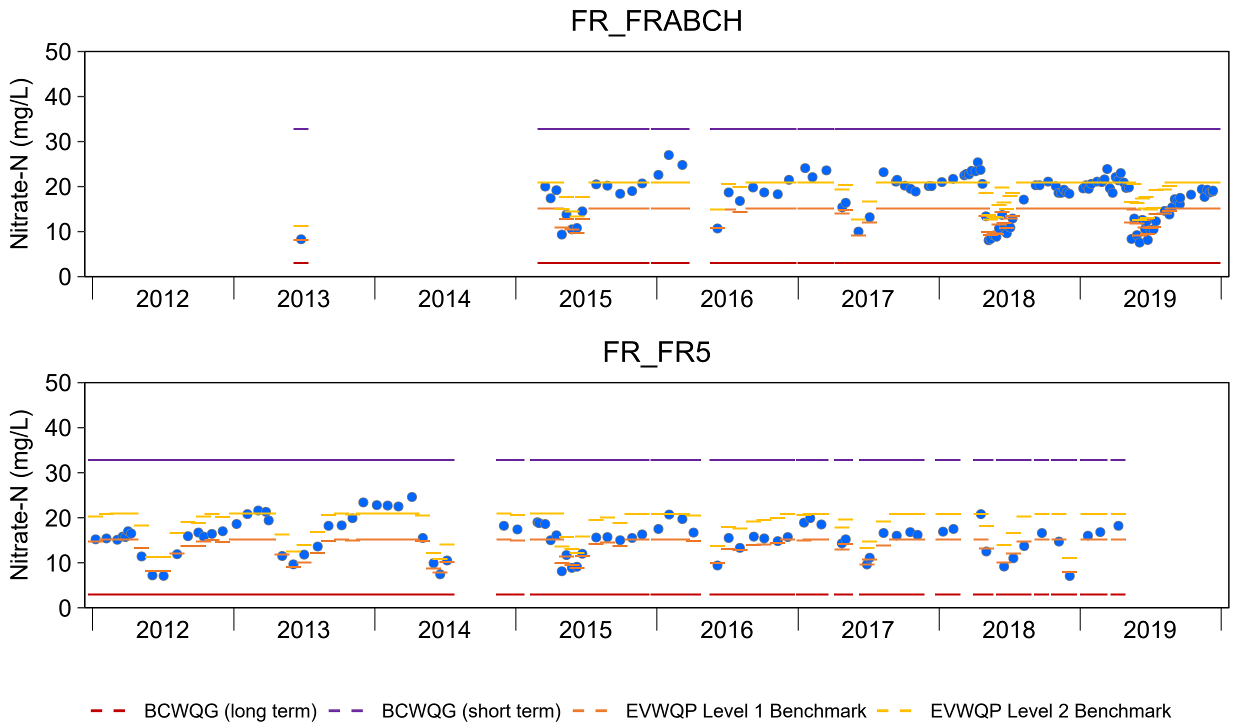

Figure C.10: Time Series Plots for Nitrate-N Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Nitrate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

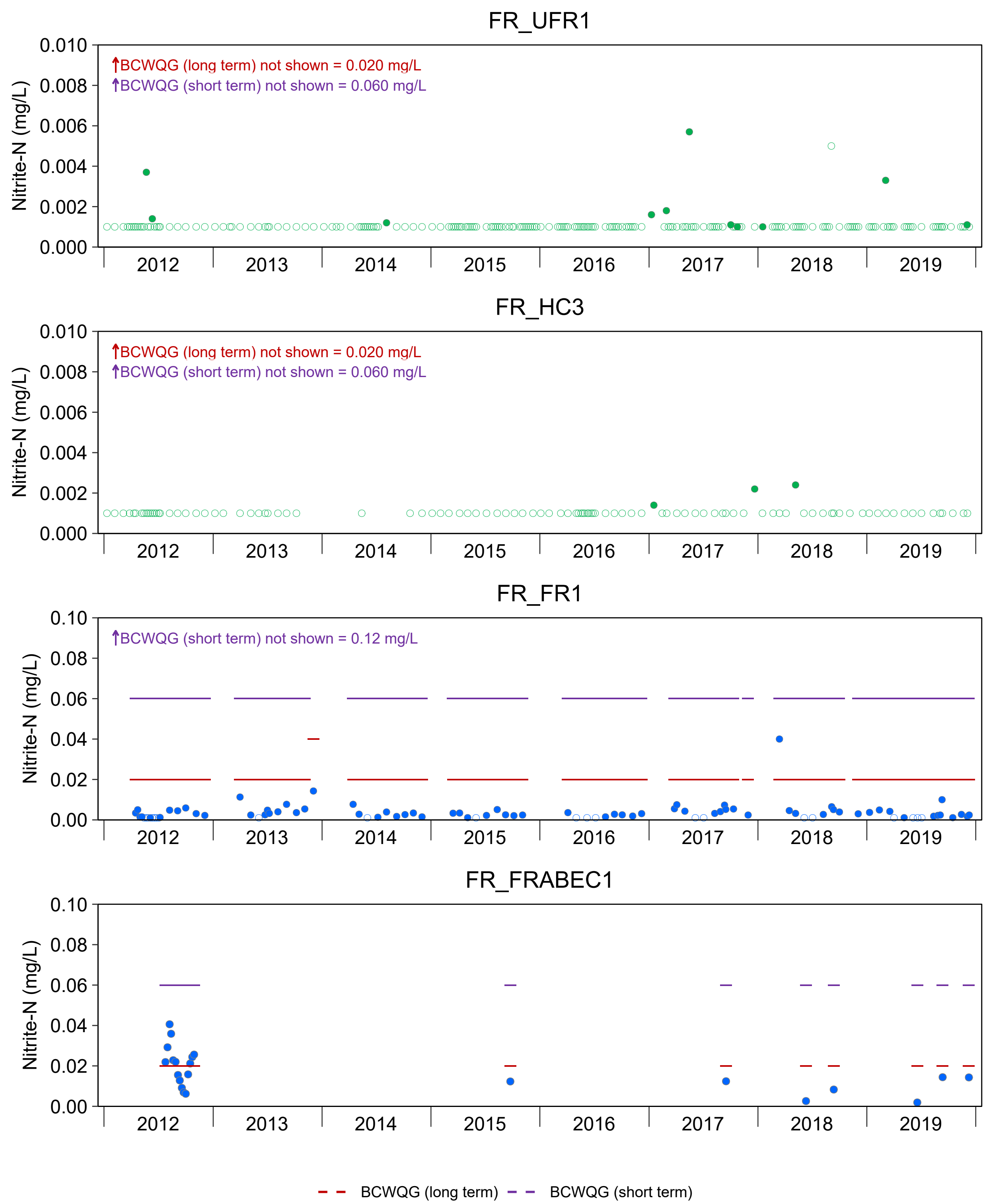

Figure C.11: Time Series Plots for Nitrite-N Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concentrations. Nitrite was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

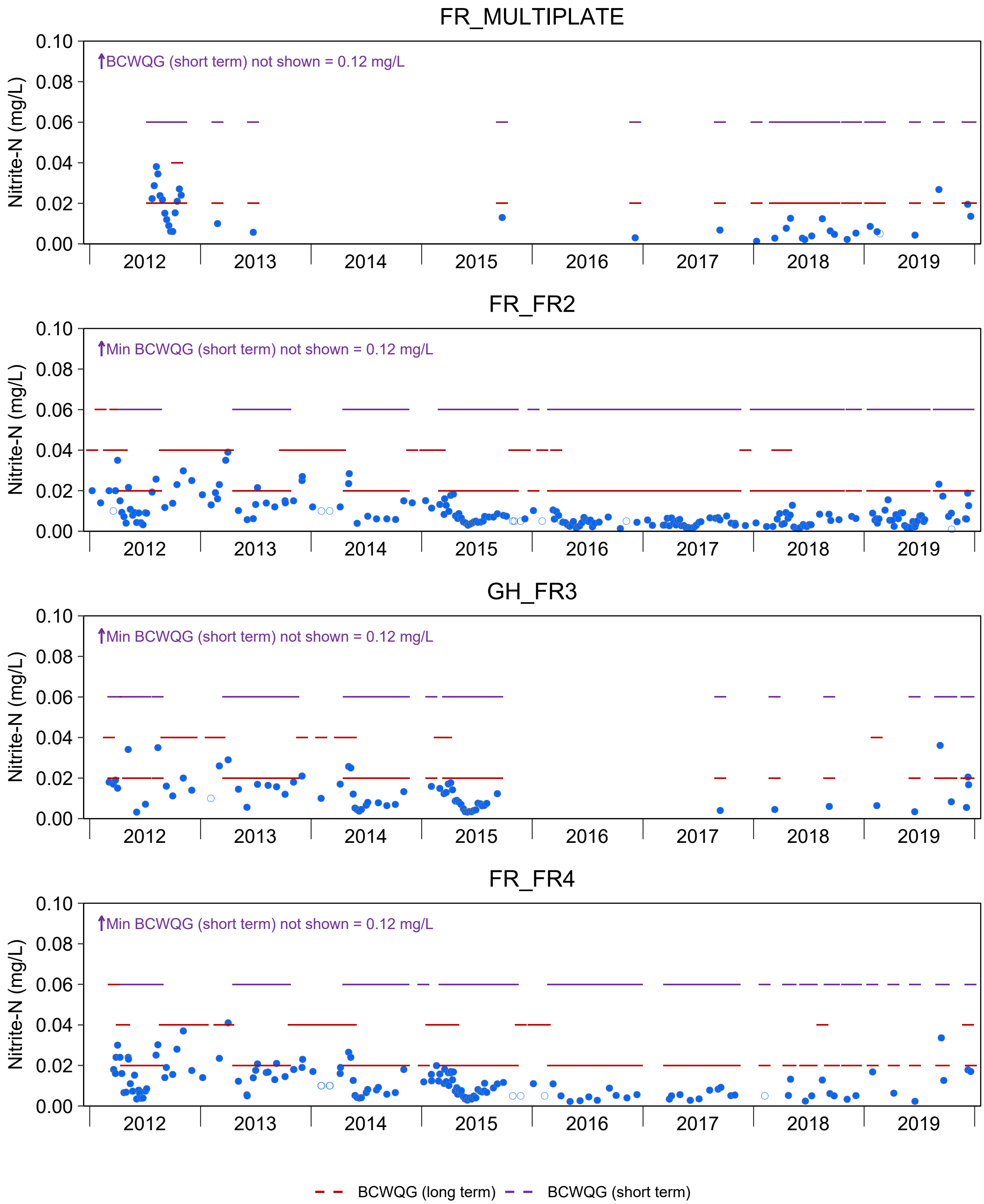

Figure C.11: Time Series Plots for Nitrite-N Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concentrations. Nitrite was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

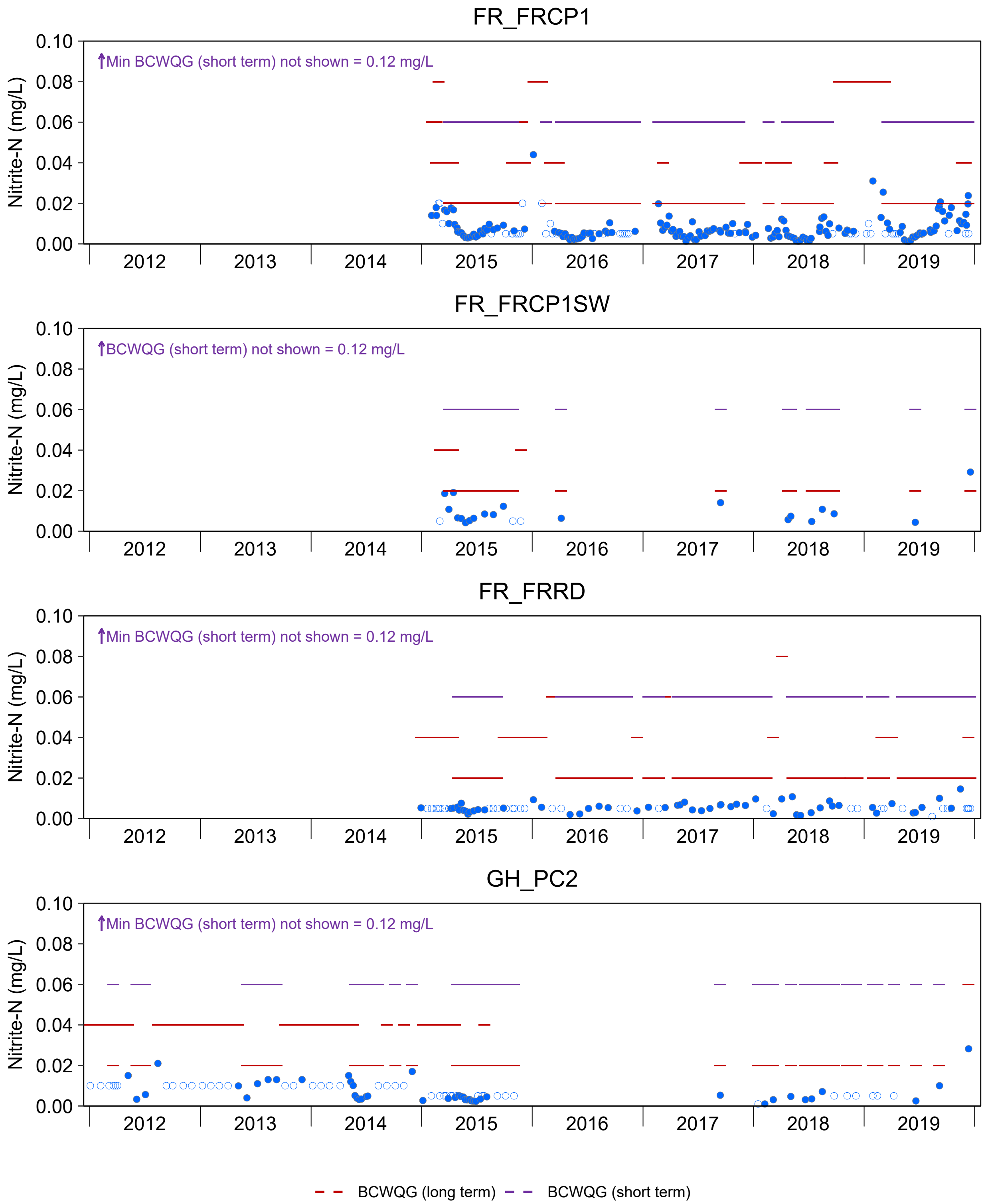

Figure C.11: Time Series Plots for Nitrite-N Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concentrations. Nitrite was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

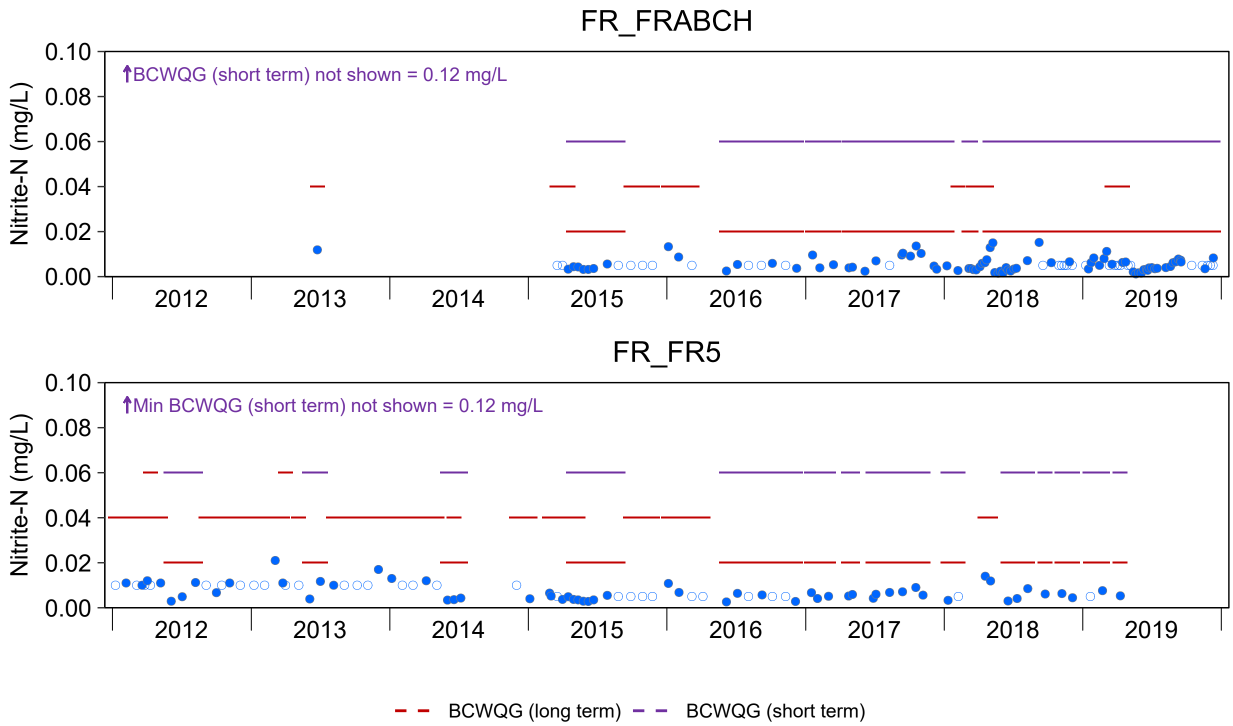

Figure C.11: Time Series Plots for Nitrite-N Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concentrations. Nitrite was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

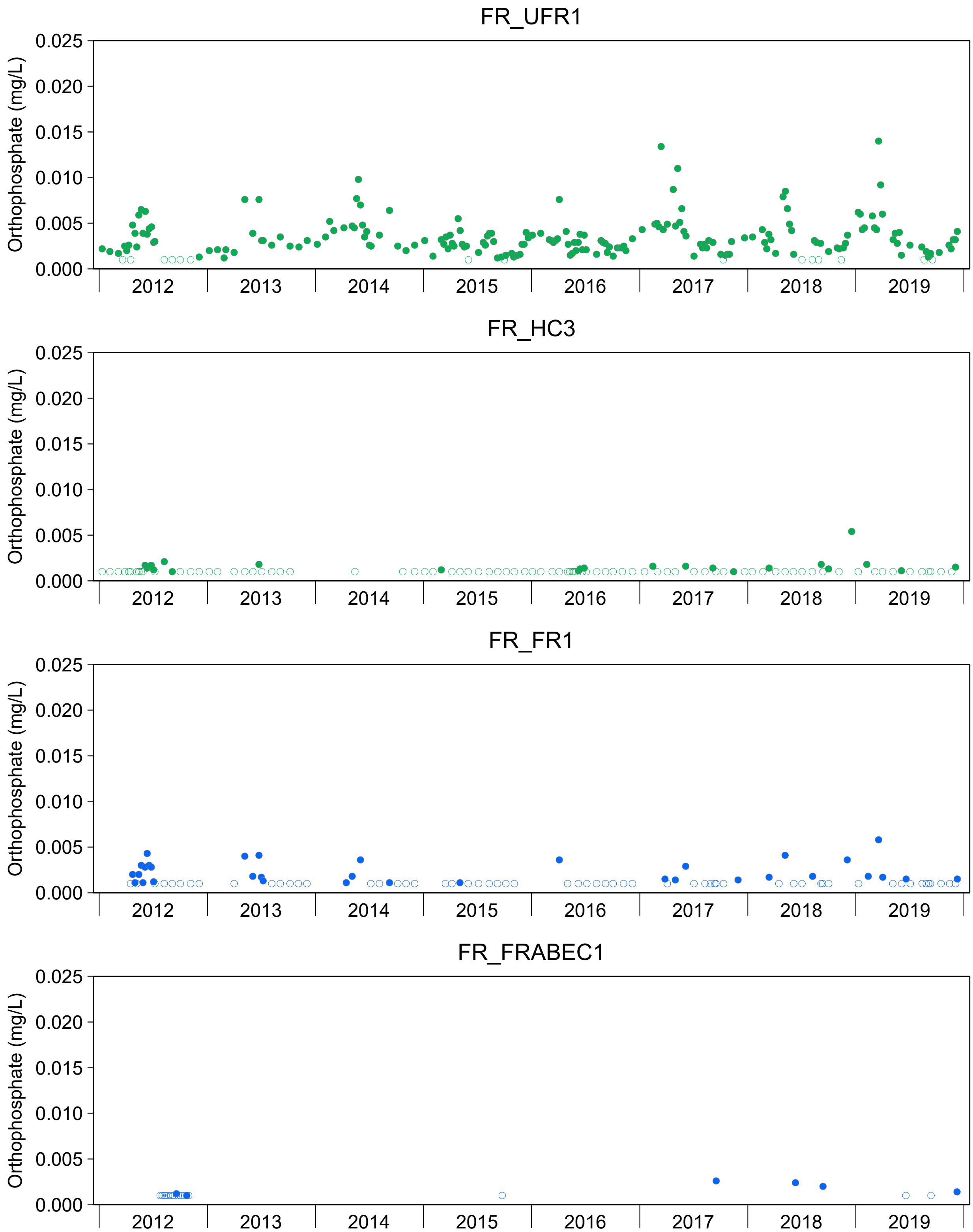

Figure C.12: Time Series Plots for Orthophosphate Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

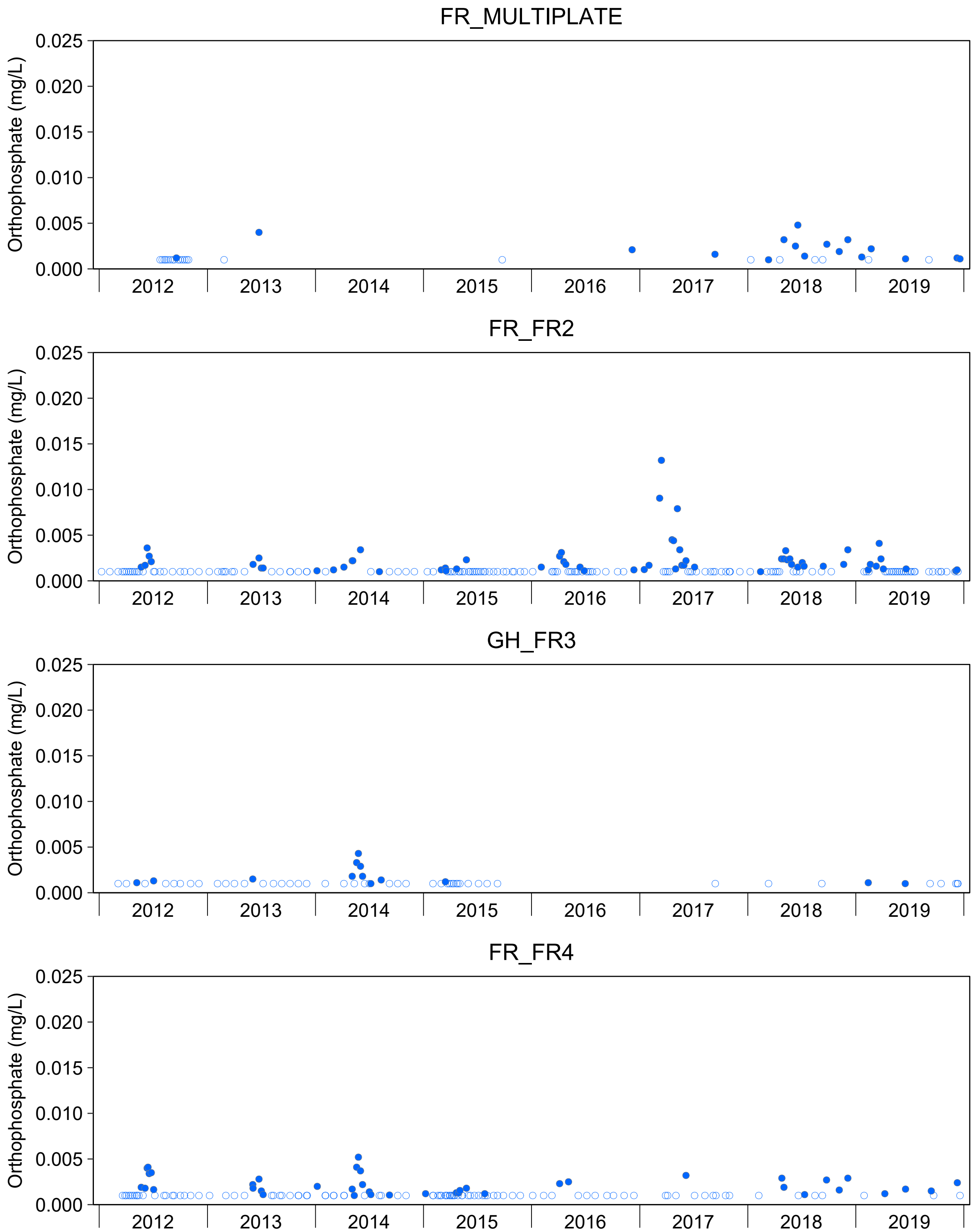

Figure C.12: Time Series Plots for Orthophosphate Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

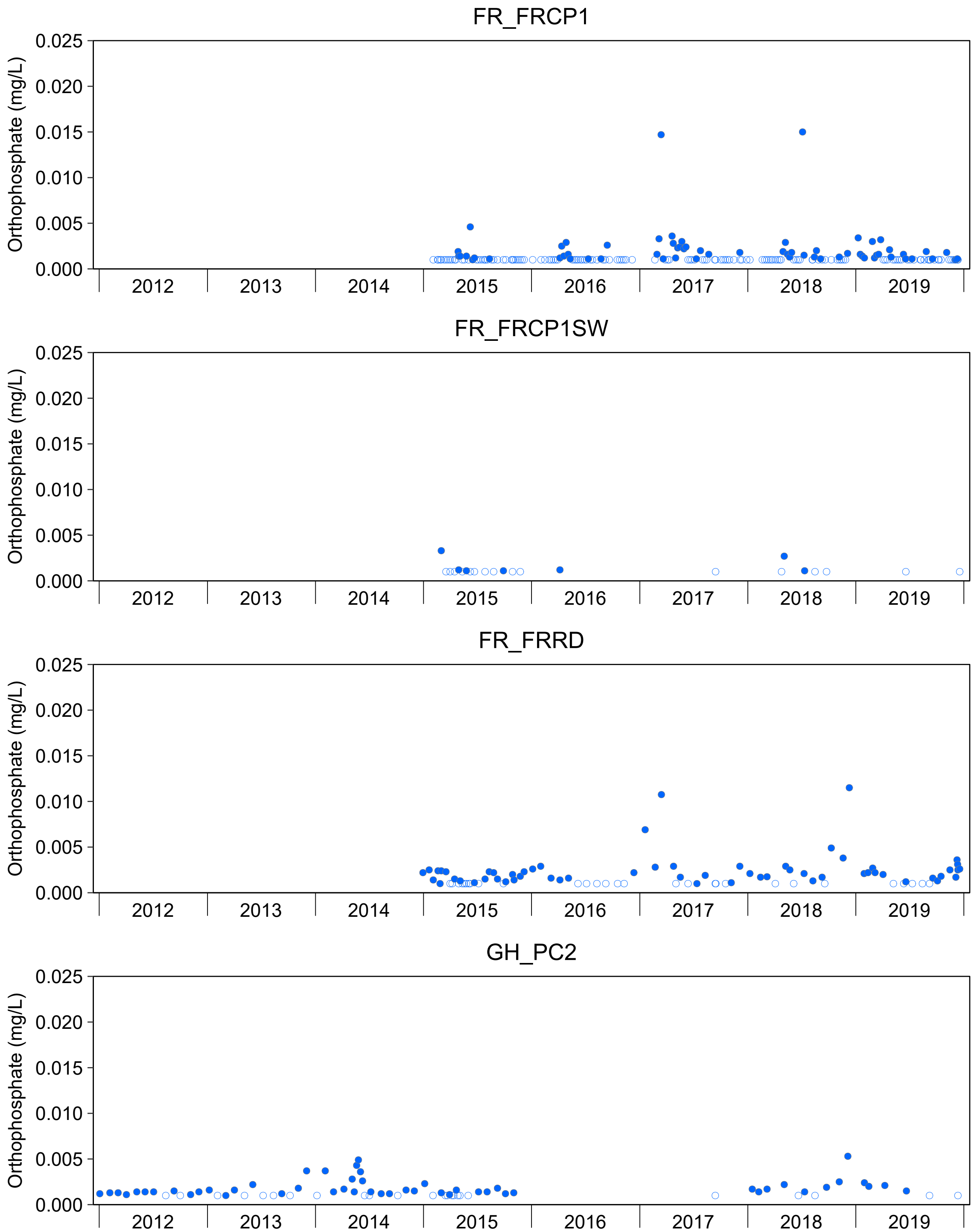

Figure C.12: Time Series Plots for Orthophosphate Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

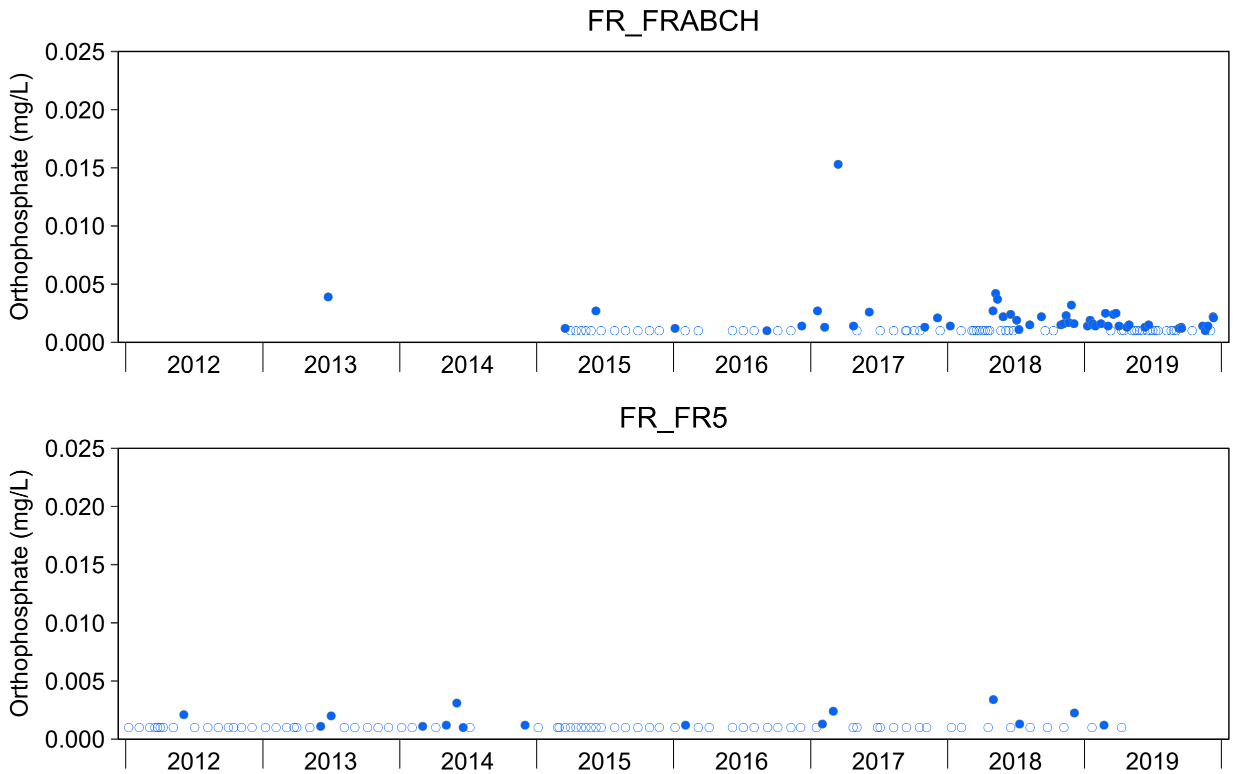

Figure C.12: Time Series Plots for Orthophosphate Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

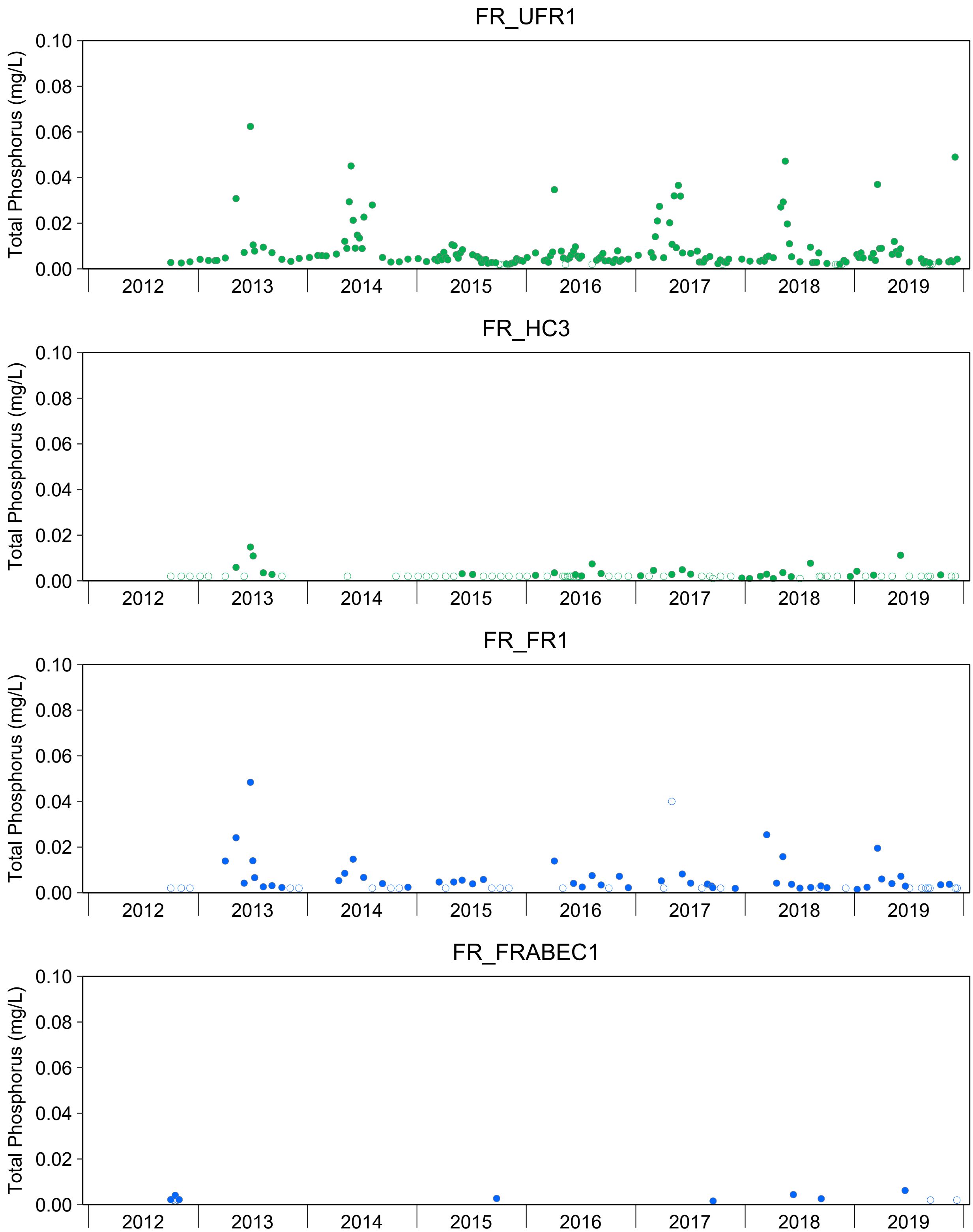

Figure C.13: Time Series Plots for Total Phosphorus Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

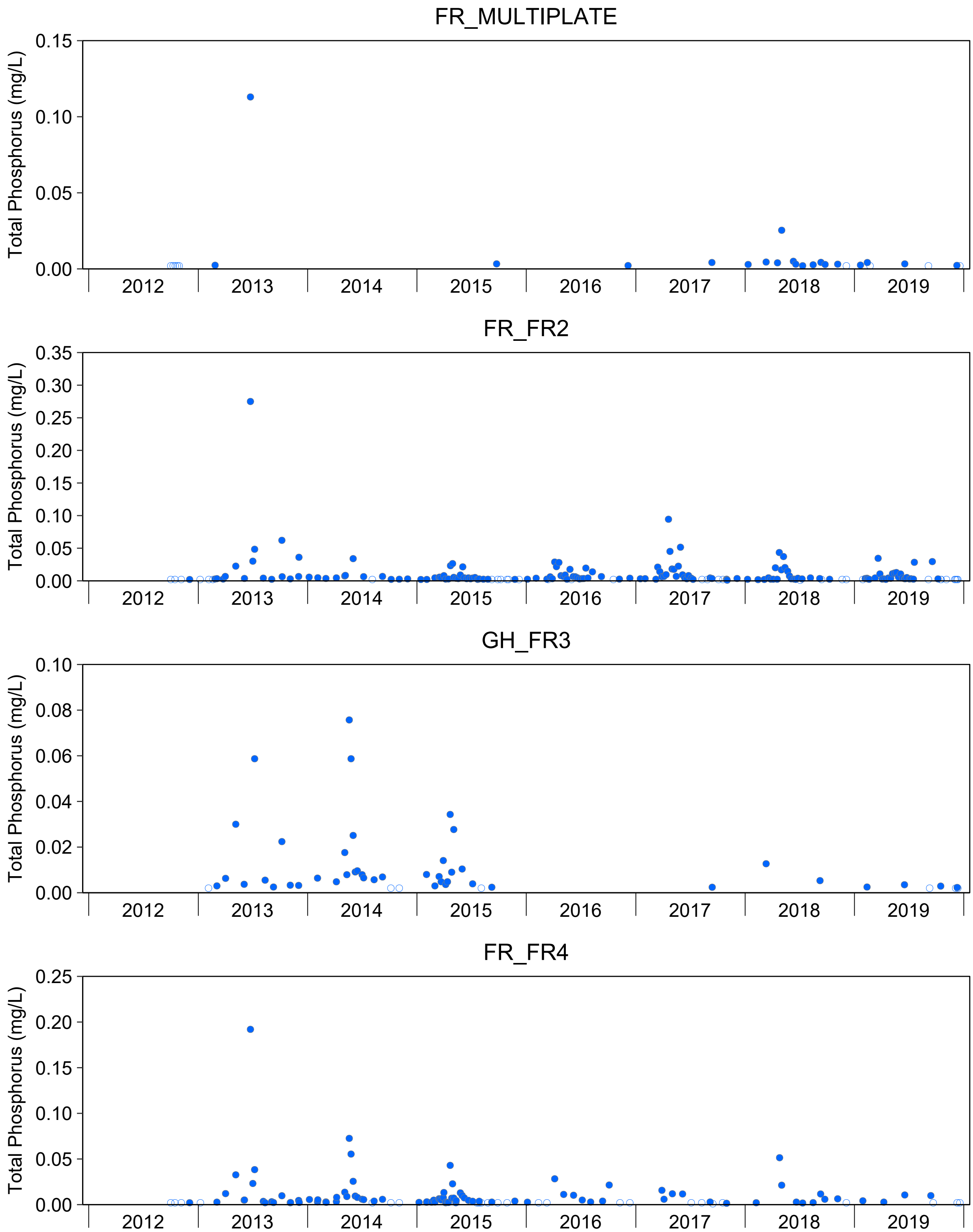

Figure C.13: Time Series Plots for Total Phosphorus Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

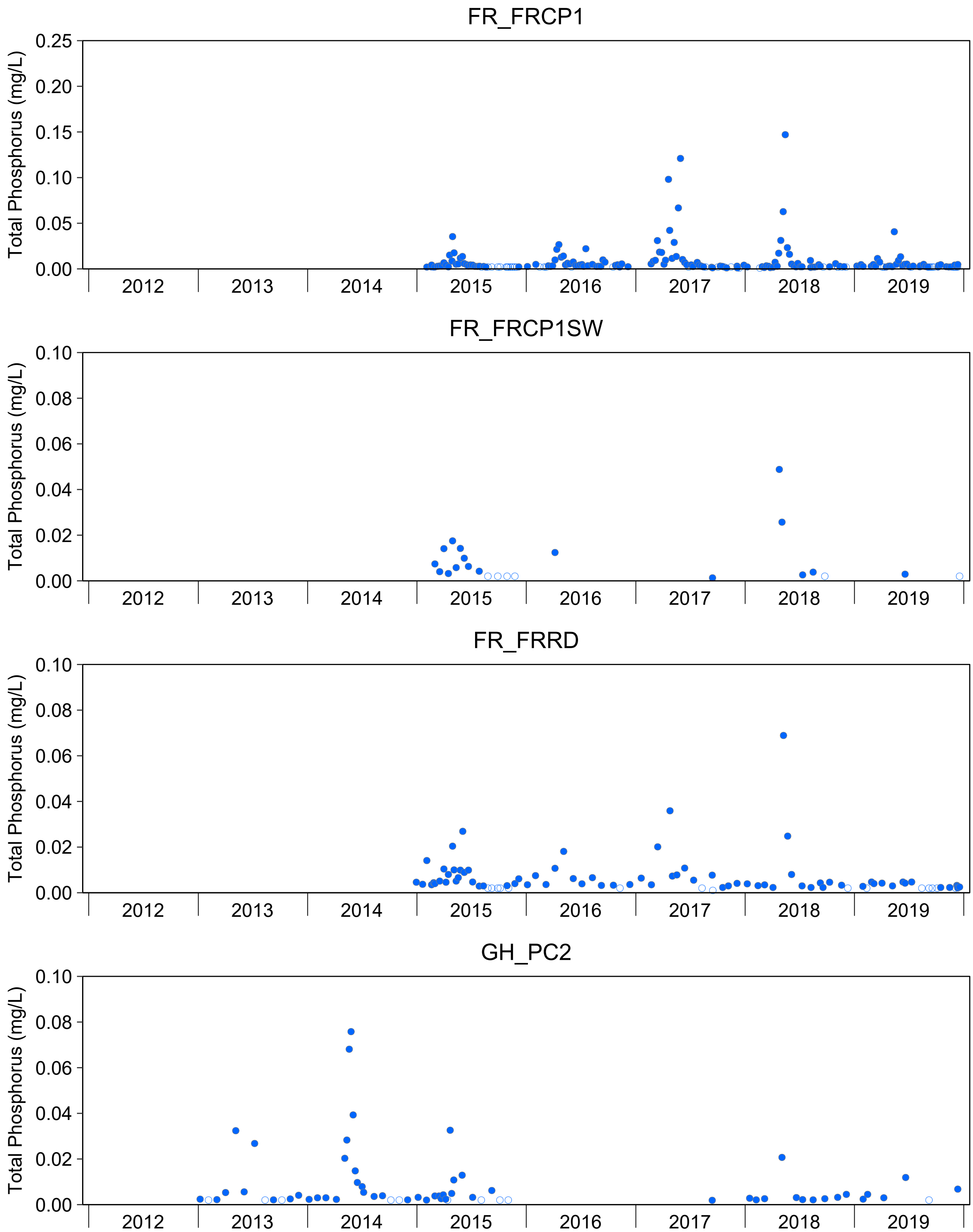

Figure C.13: Time Series Plots for Total Phosphorus Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

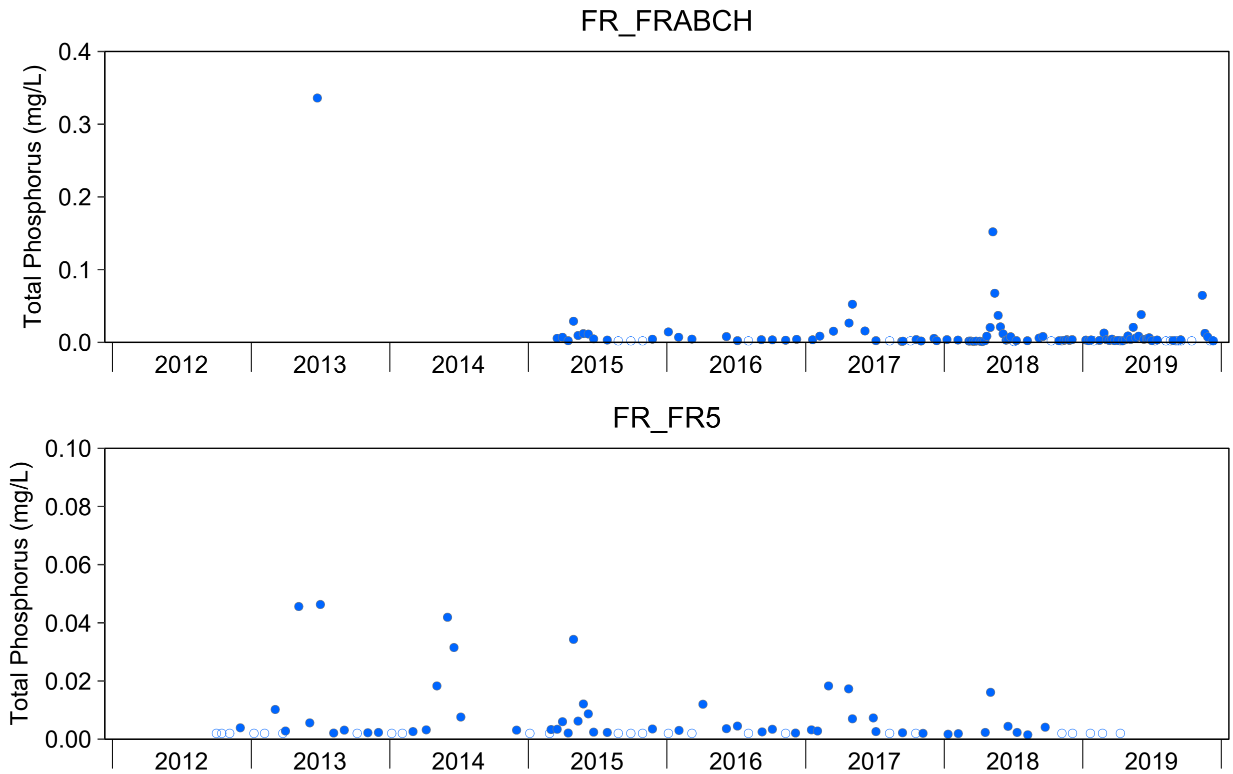

Figure C.13: Time Series Plots for Total Phosphorus Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

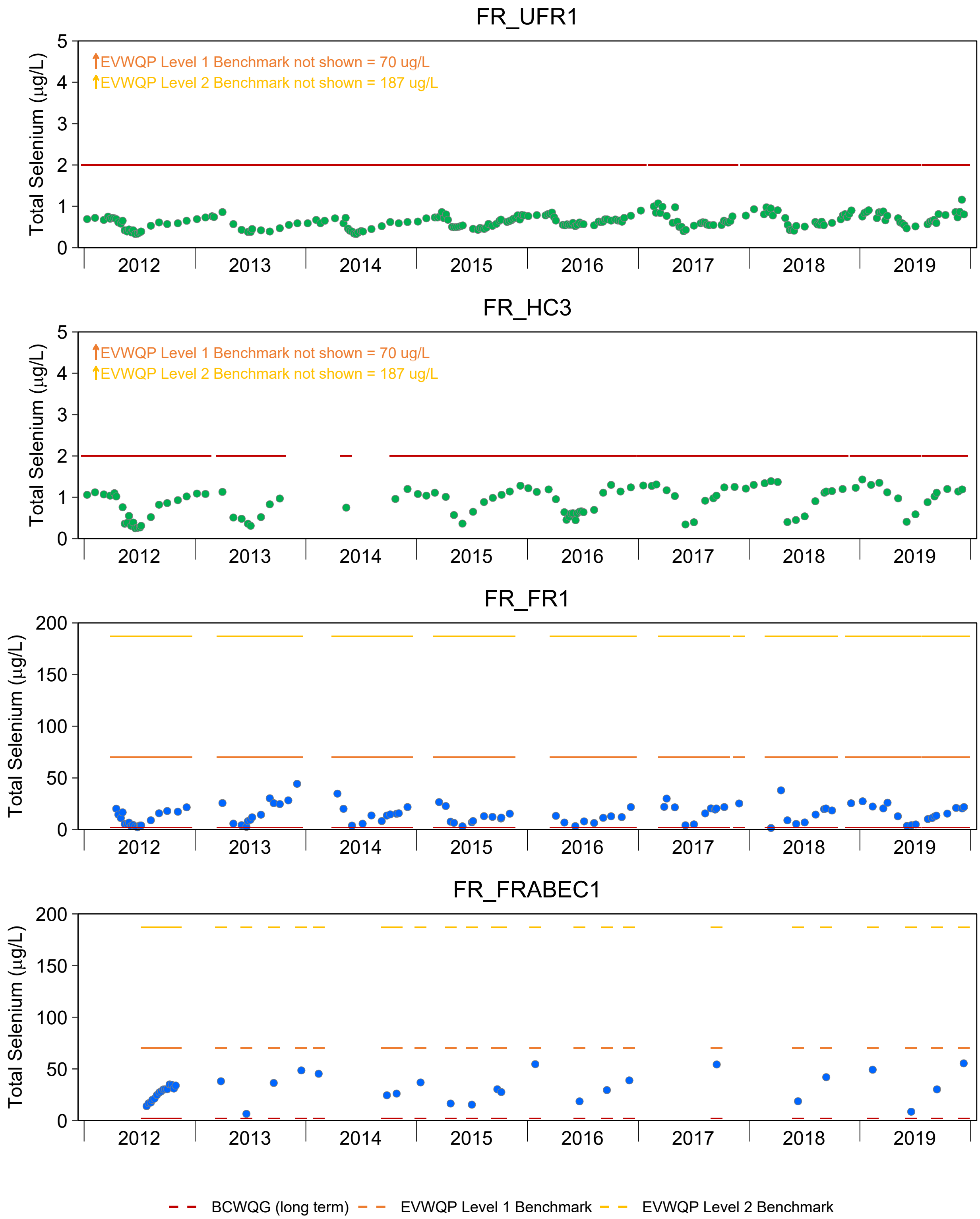

Figure C.14: Time Series Plots for Total Selenium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Selenium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

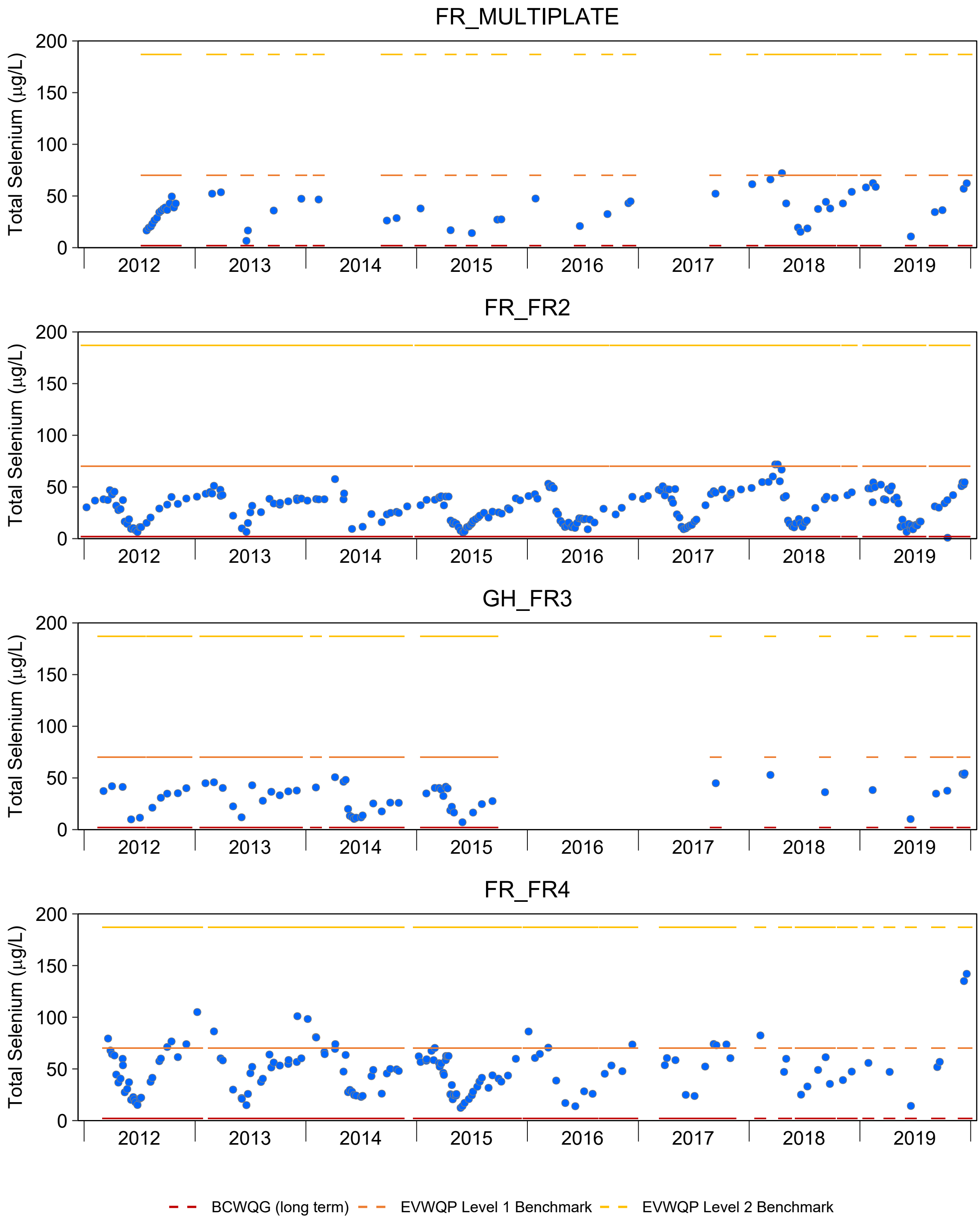

Figure C.14: Time Series Plots for Total Selenium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Selenium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

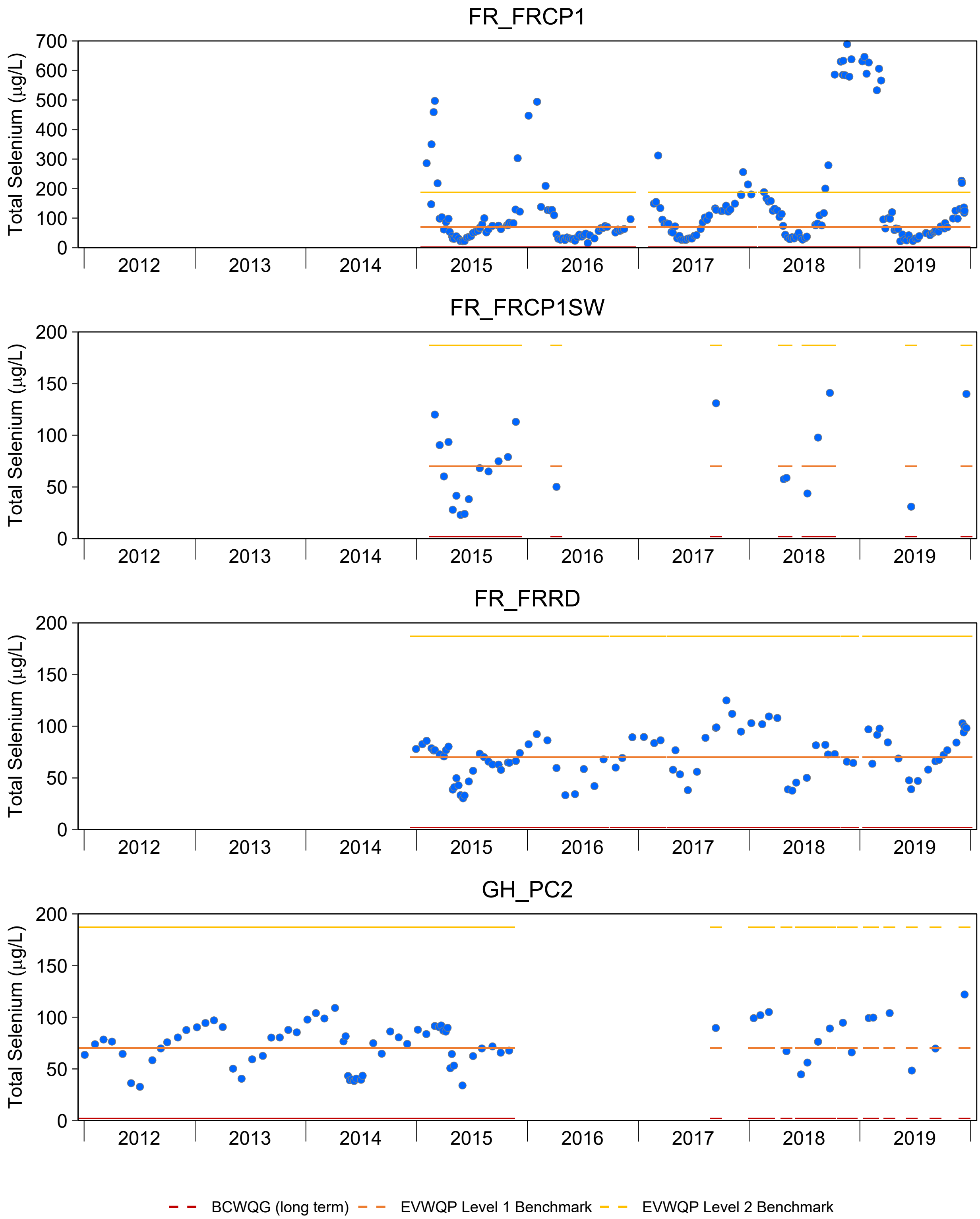

Figure C.14: Time Series Plots for Total Selenium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Selenium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

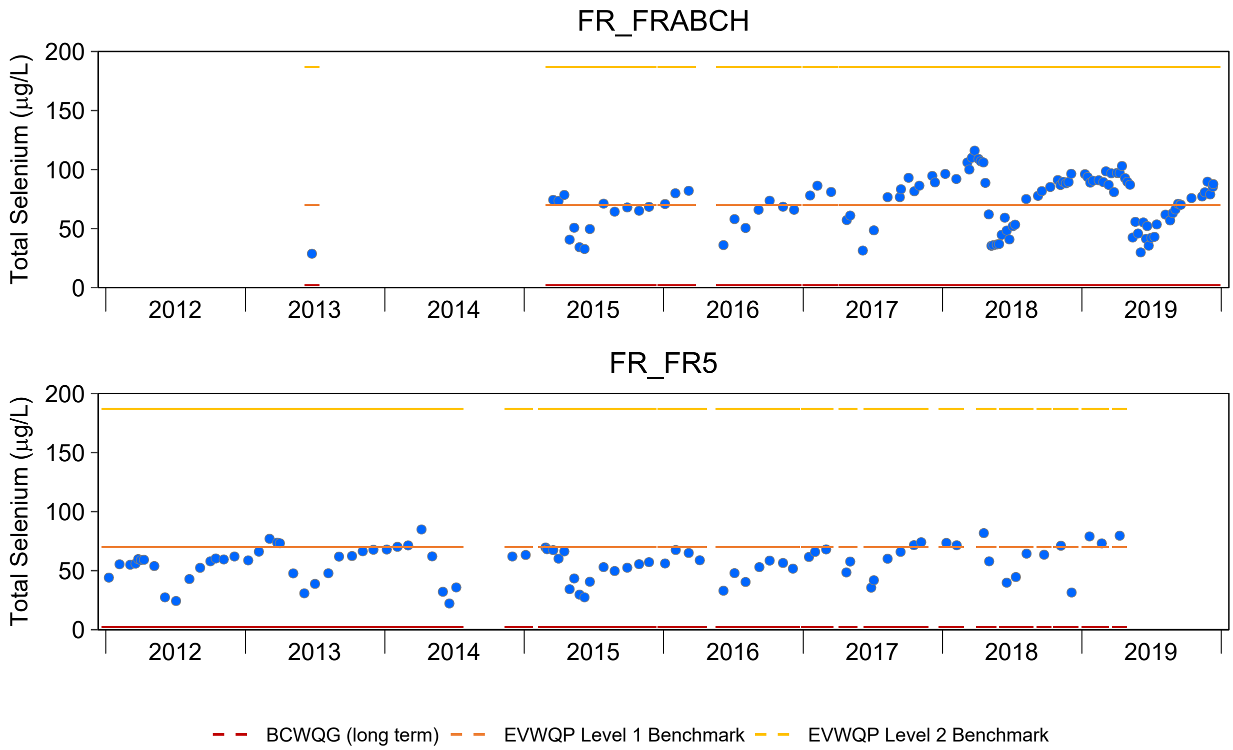

Figure C.14: Time Series Plots for Total Selenium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Selenium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

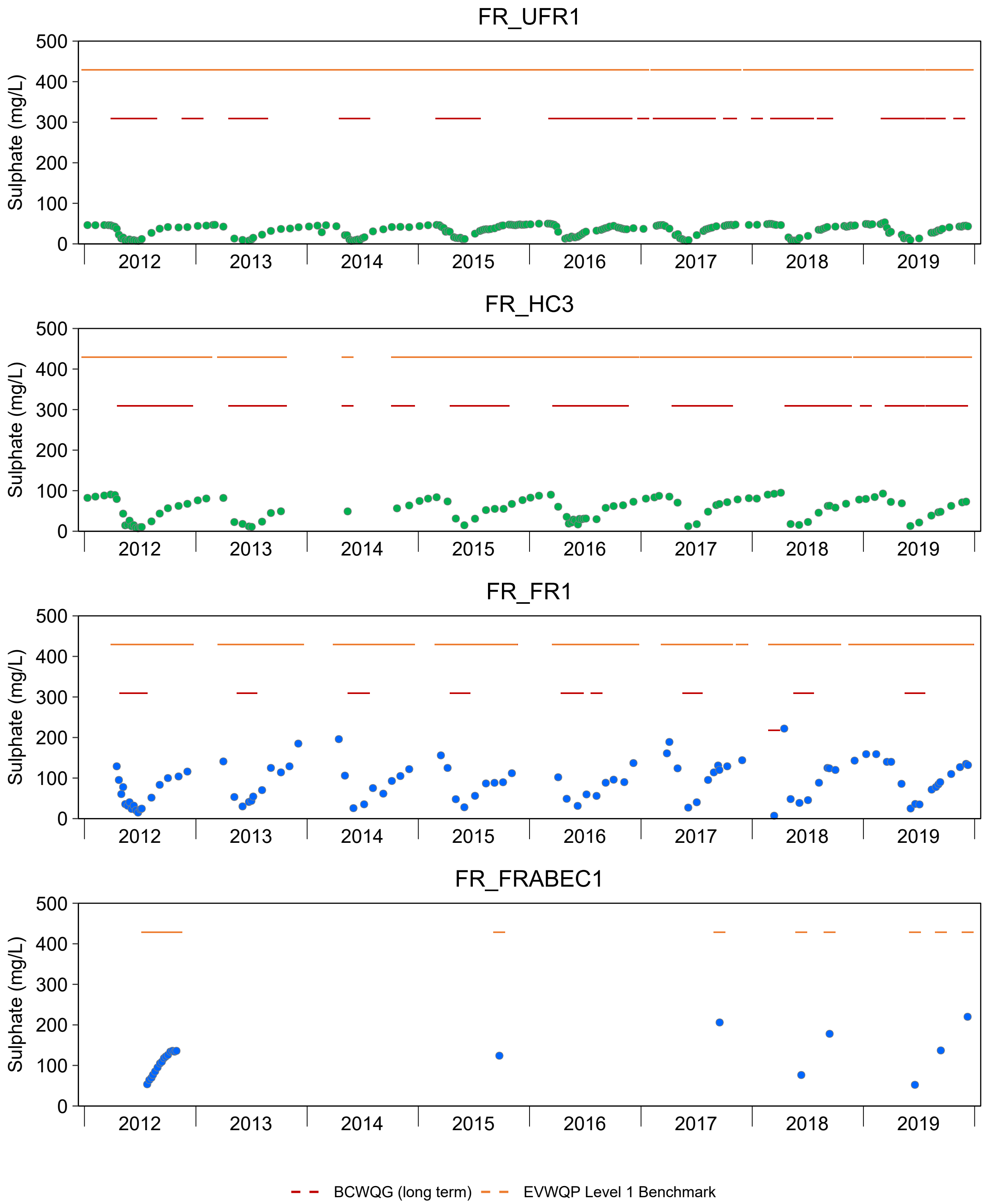

Figure C.15: Time Series Plots for Sulphate Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Sulphate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

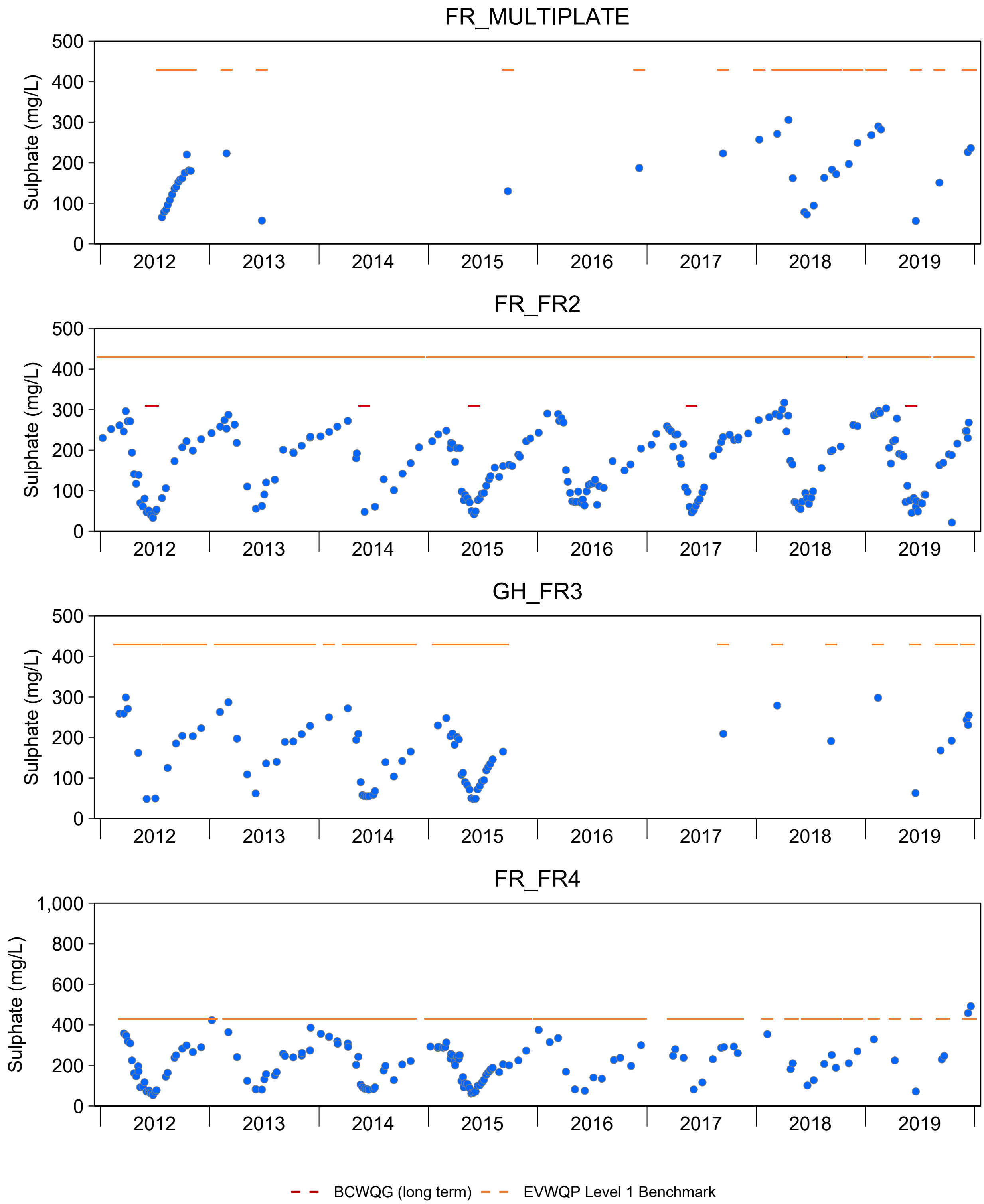

Figure C.15: Time Series Plots for Sulphate Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Sulphate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

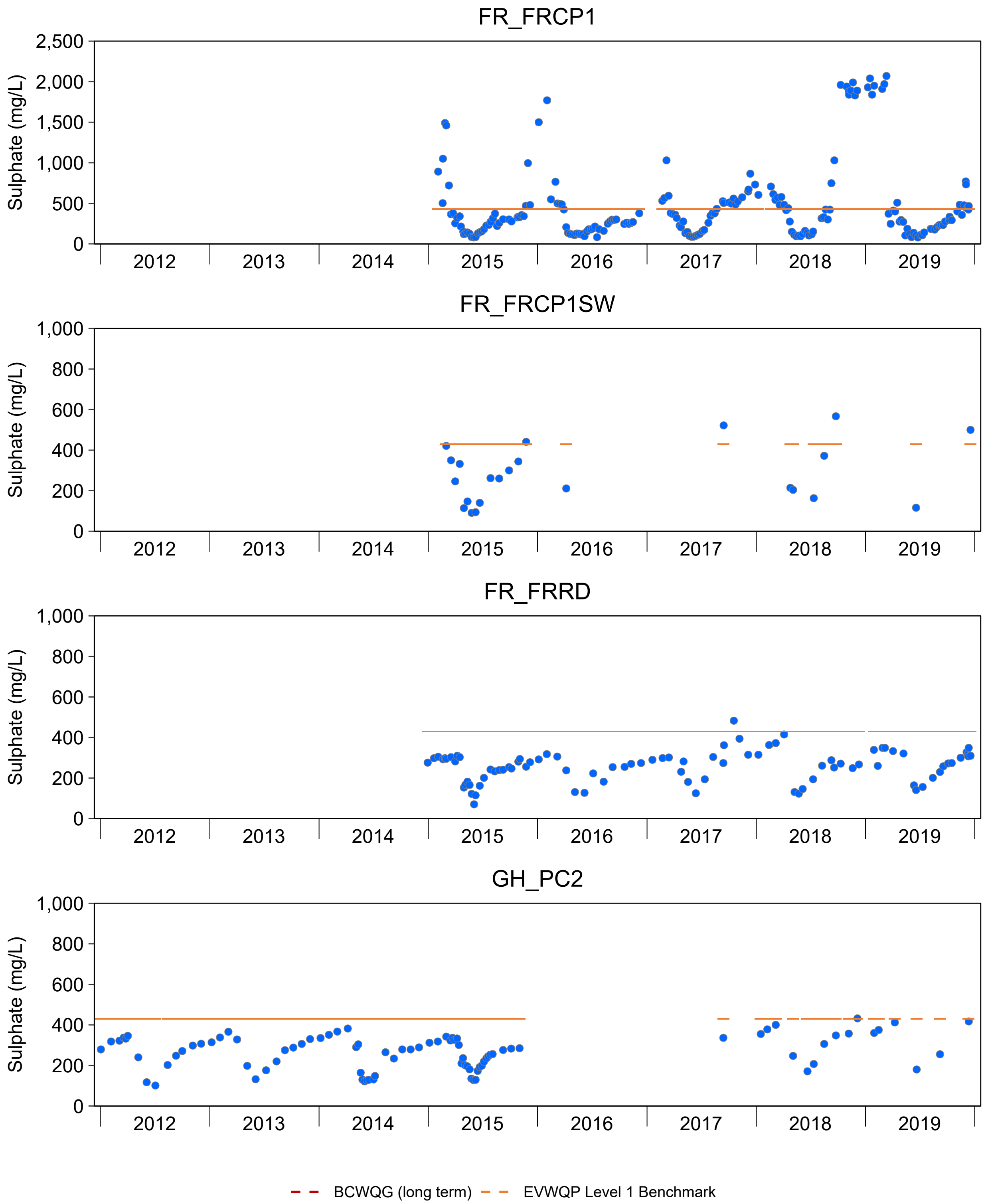

Figure C.15: Time Series Plots for Sulphate Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Sulphate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

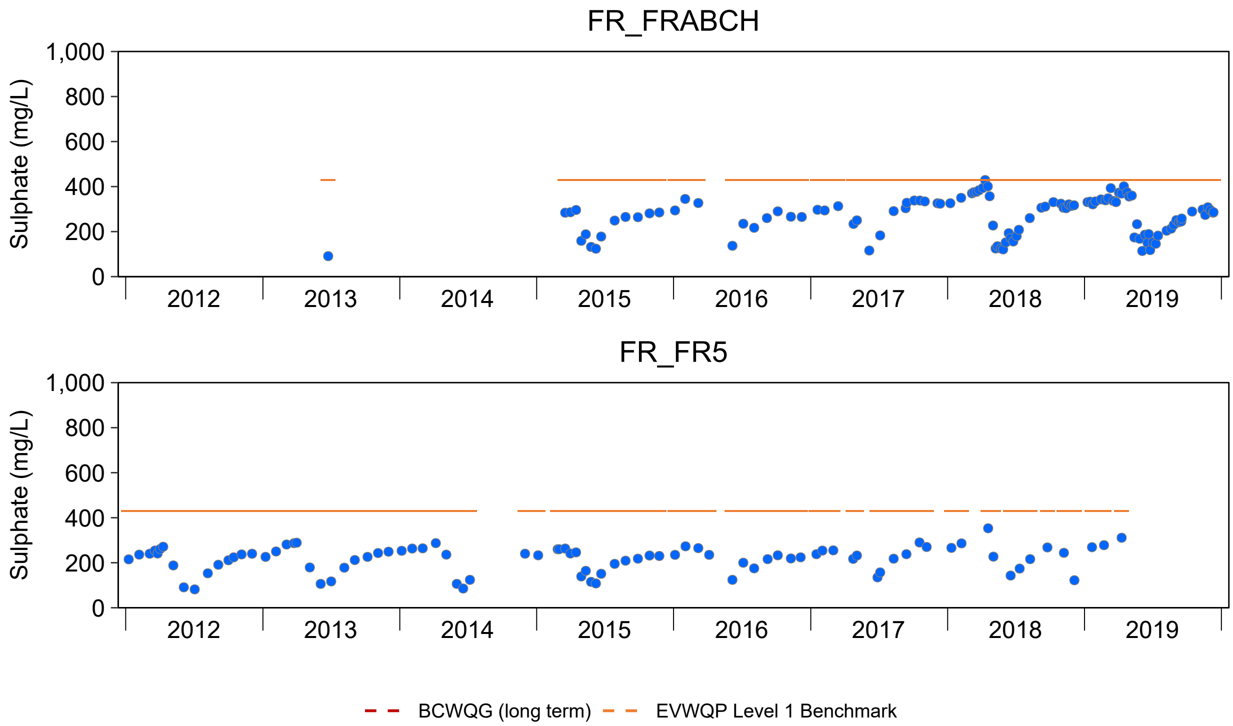

Figure C.15: Time Series Plots for Sulphate Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Sulphate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

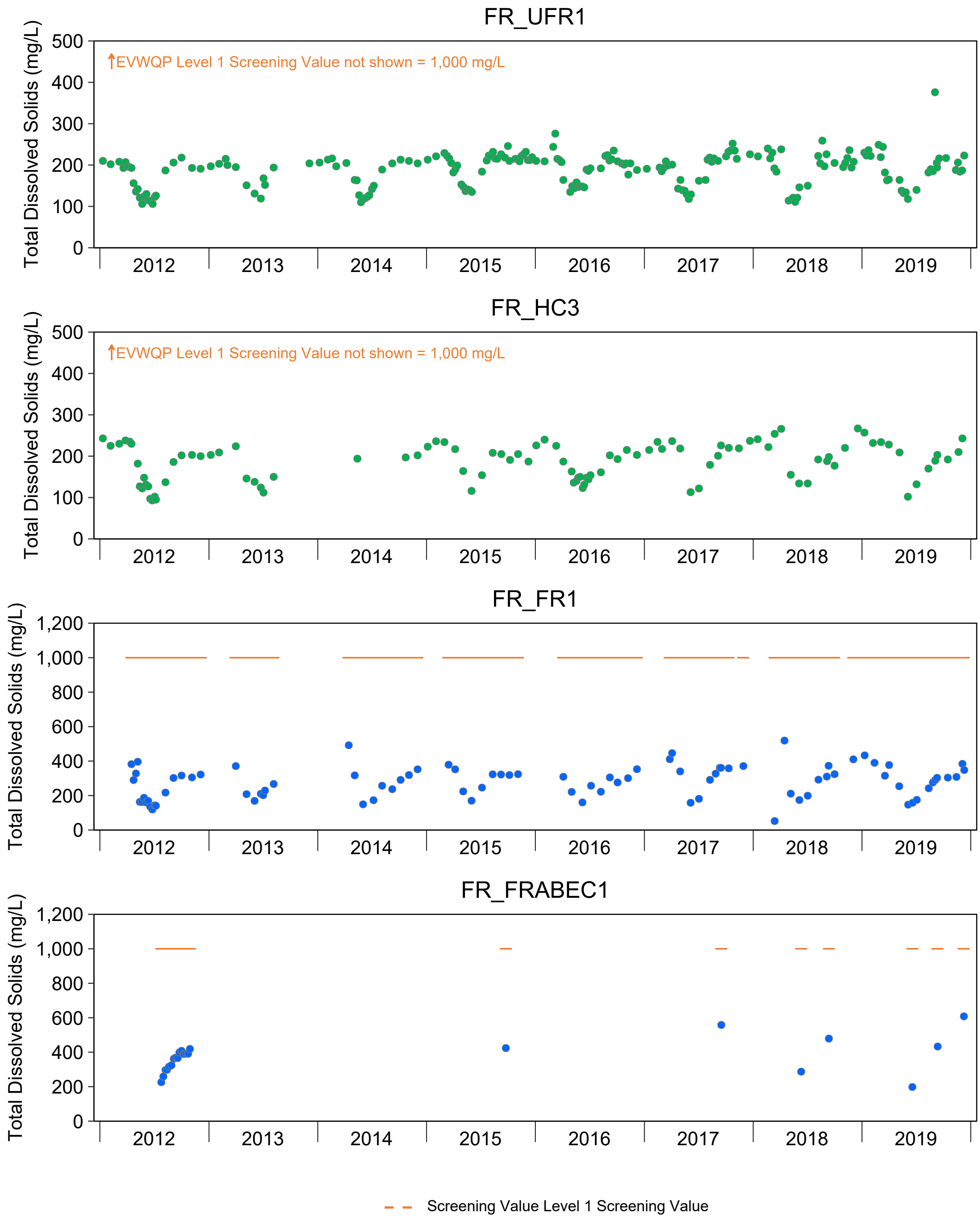

Figure C.16: Time Series Plots for Total Dissolved Solids Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Dissolved Solids was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

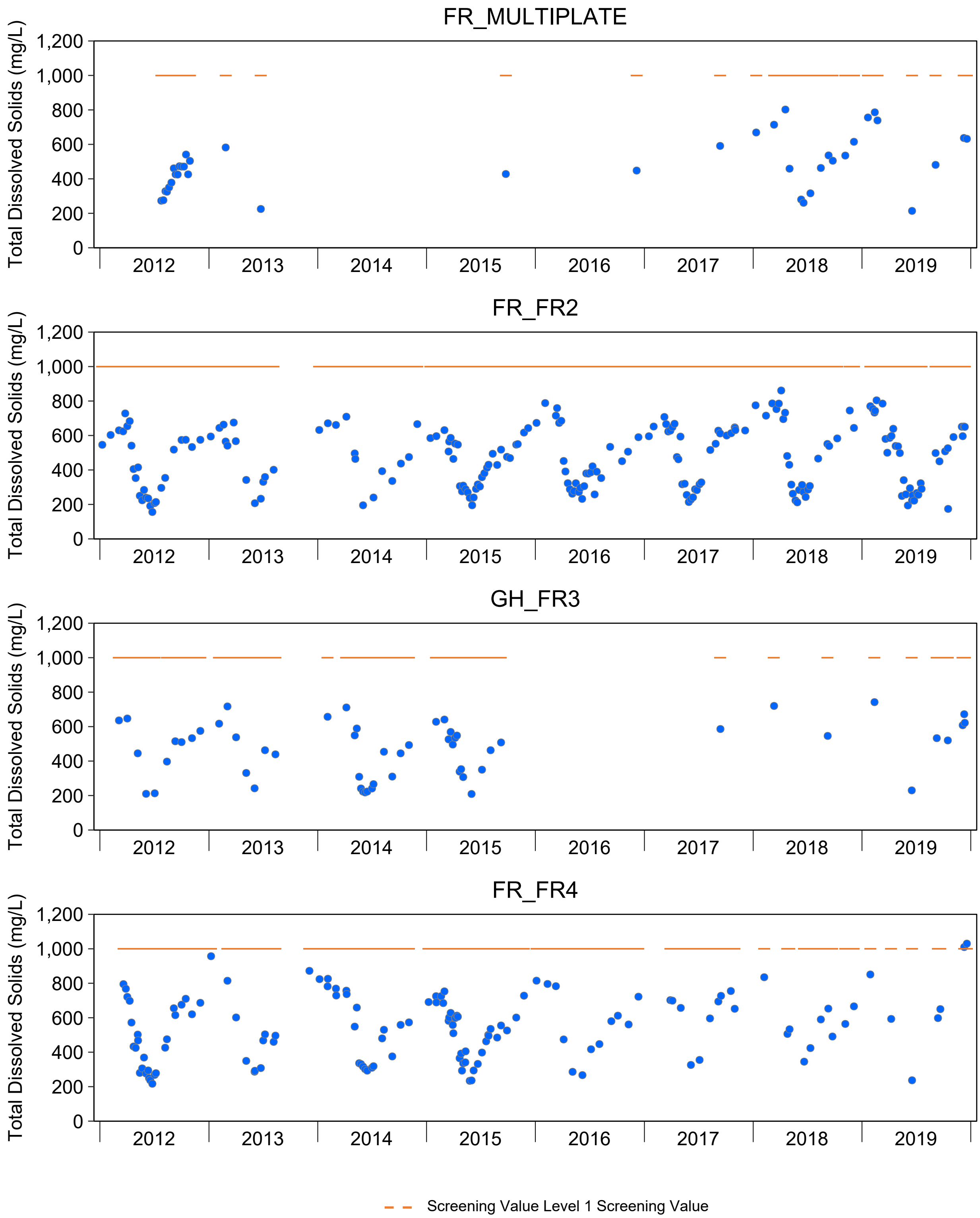

Figure C.16: Time Series Plots for Total Dissolved Solids Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Dissolved Solids was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

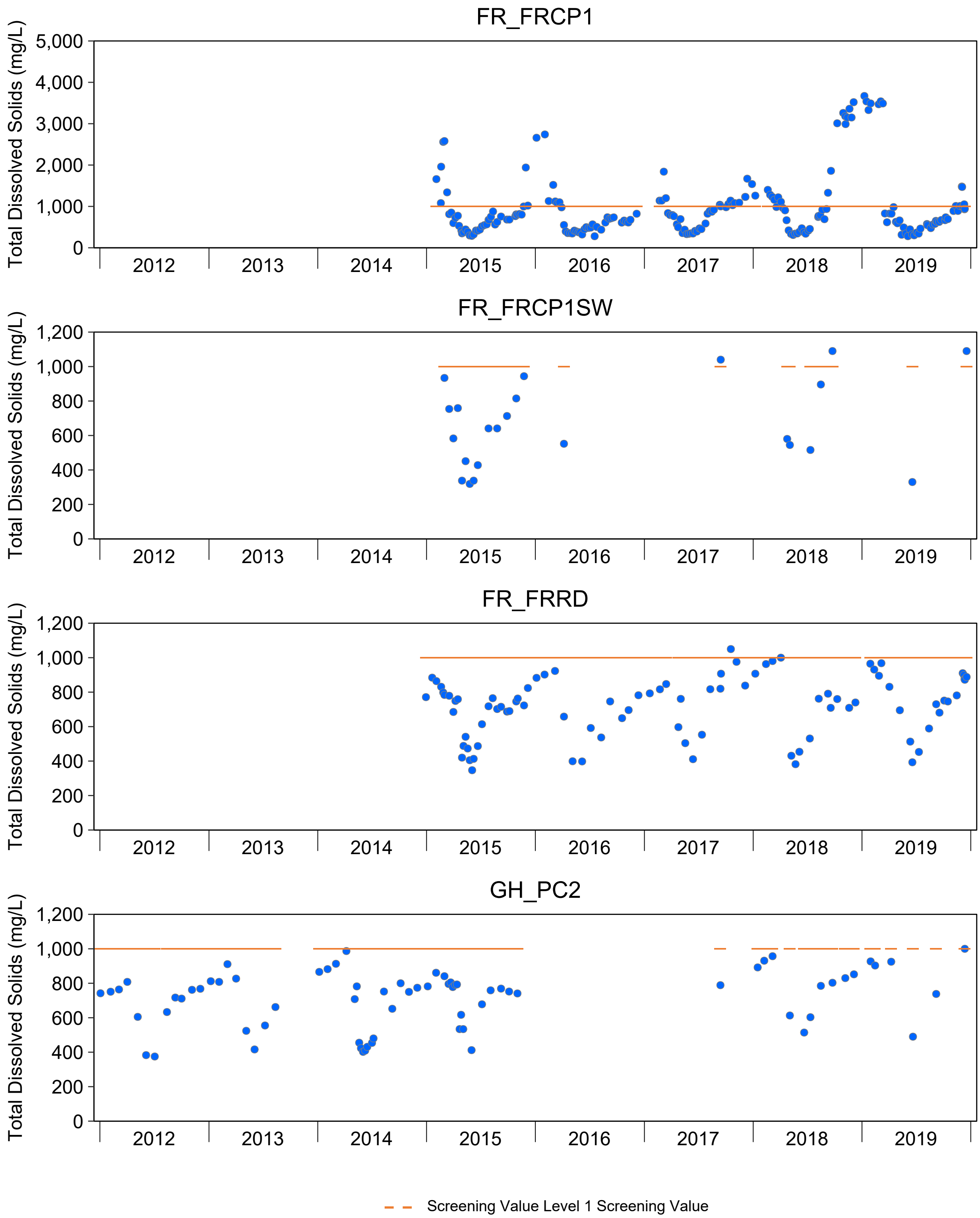

Figure C.16: Time Series Plots for Total Dissolved Solids Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Dissolved Solids was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

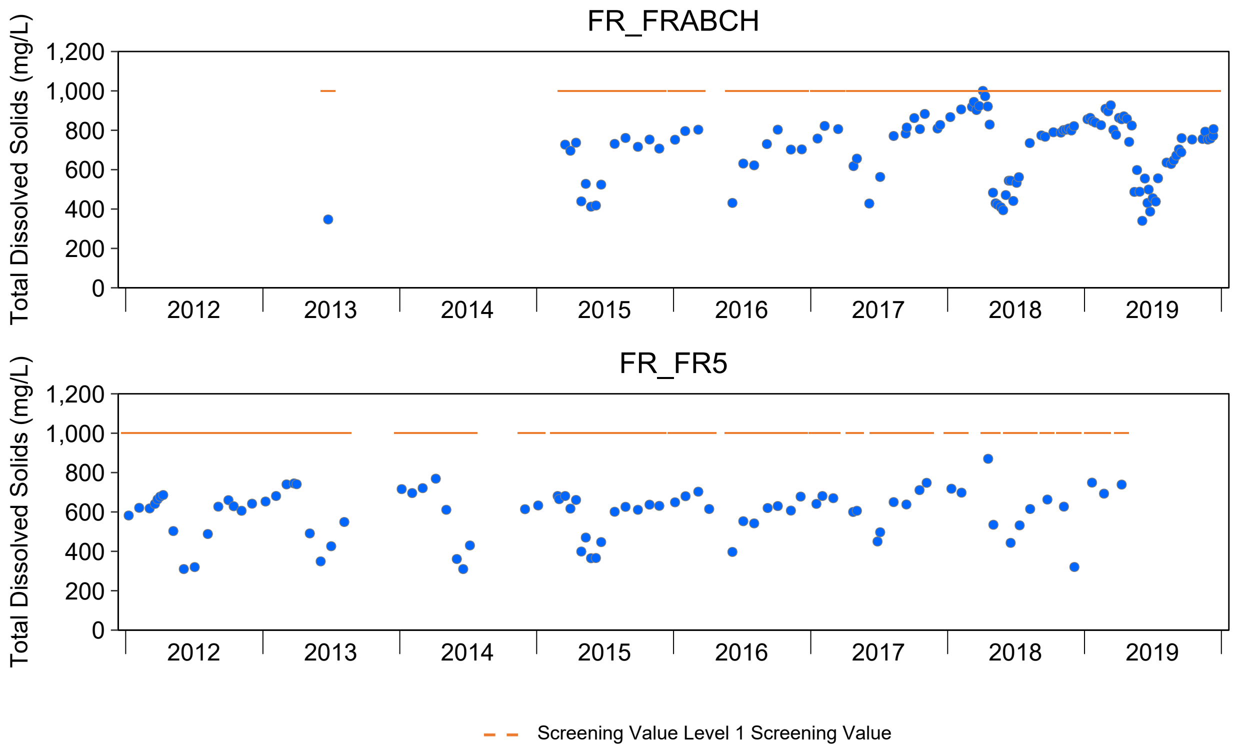

Figure C.16: Time Series Plots for Total Dissolved Solids Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Dissolved Solids was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

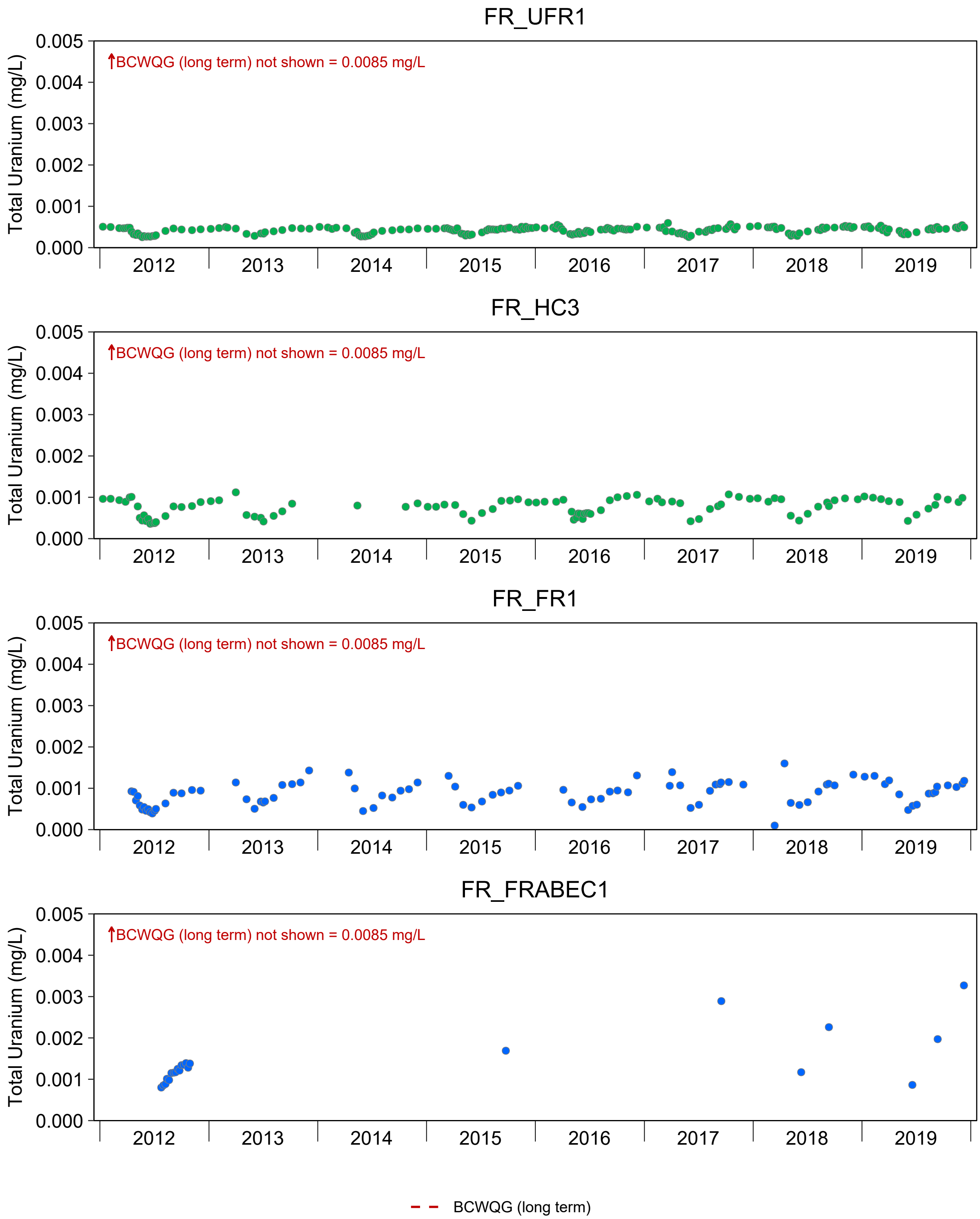

Figure C.17: Time Series Plots for Total Uranium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Uranium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

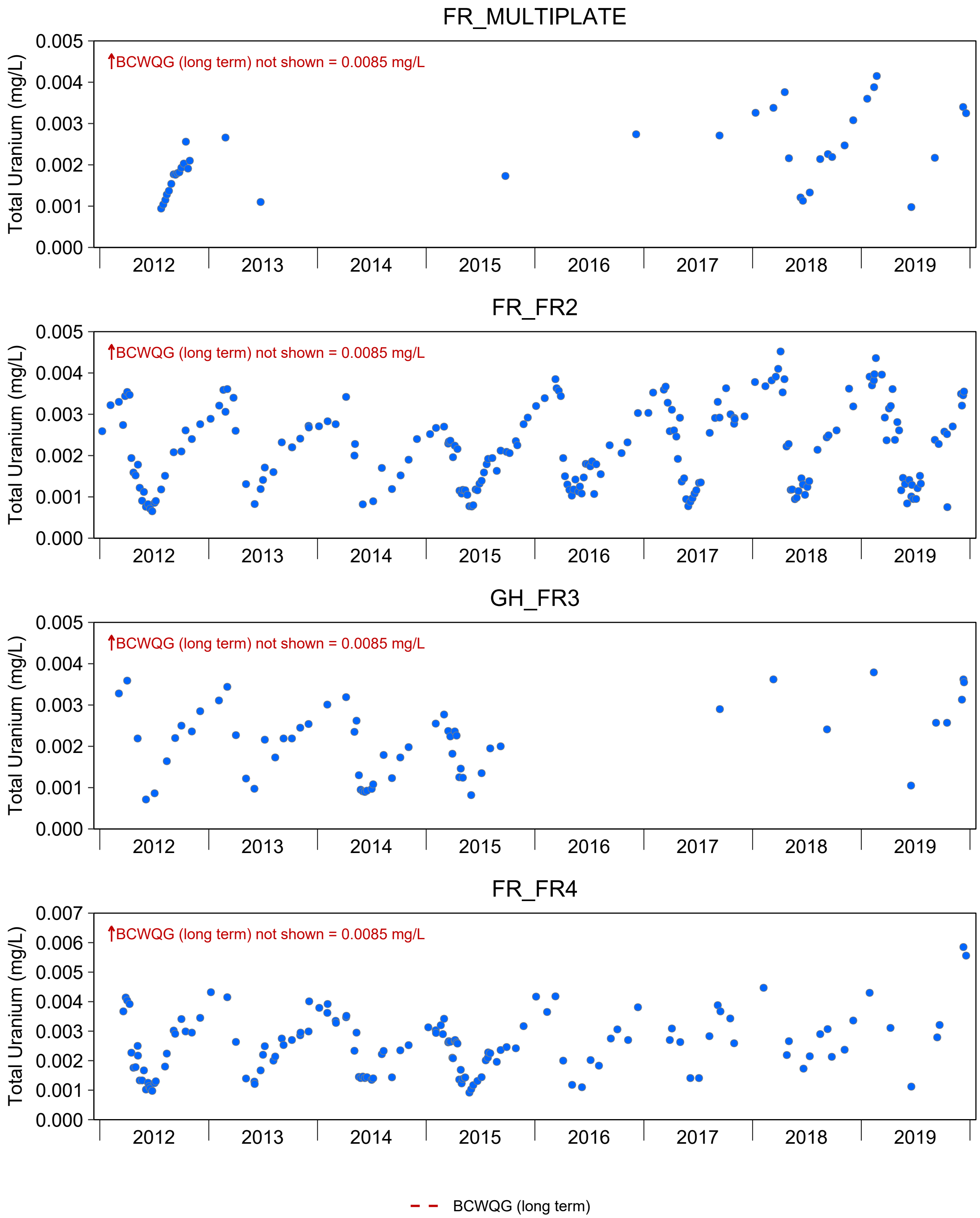

Figure C.17: Time Series Plots for Total Uranium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Uranium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

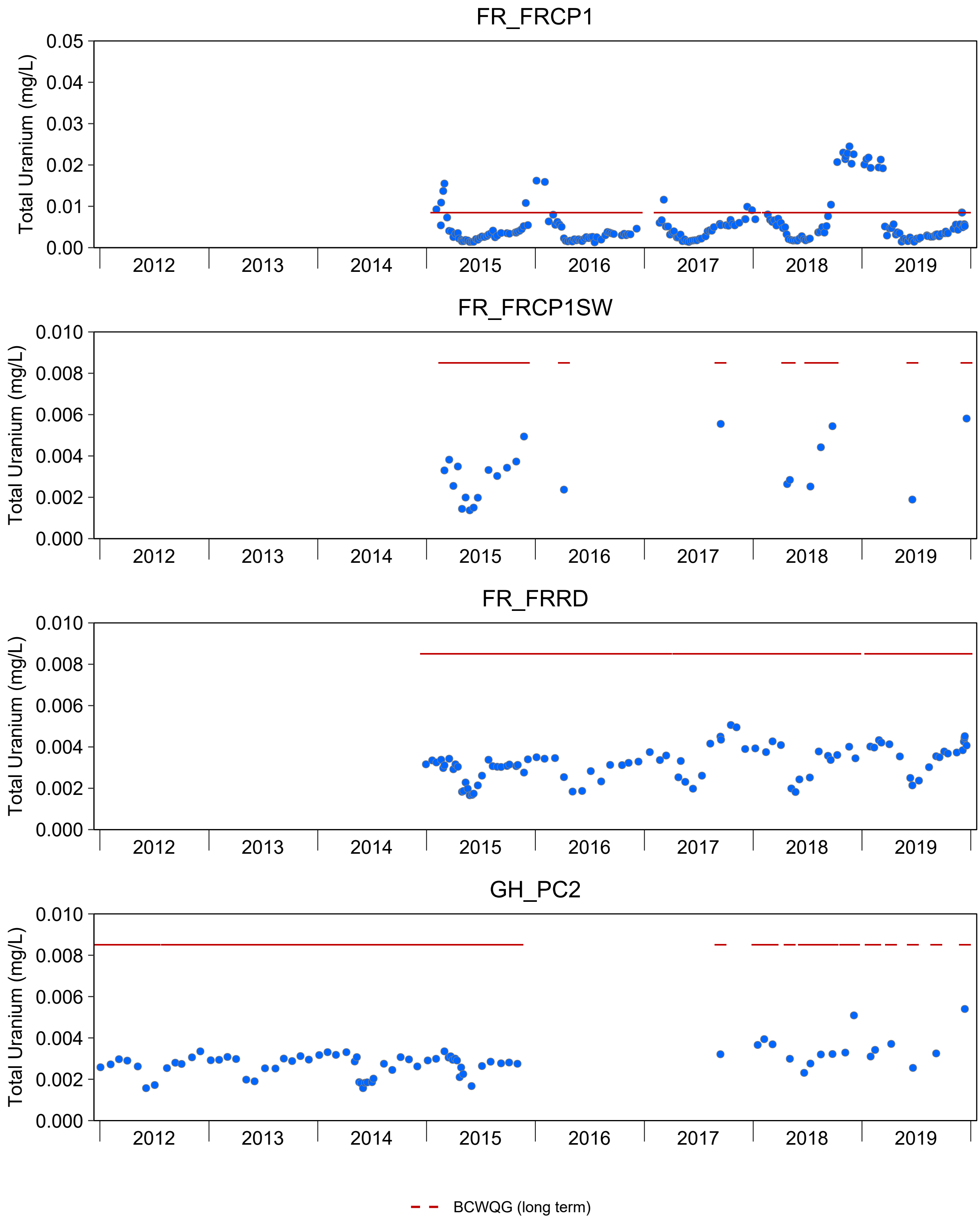

Figure C.17: Time Series Plots for Total Uranium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Uranium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

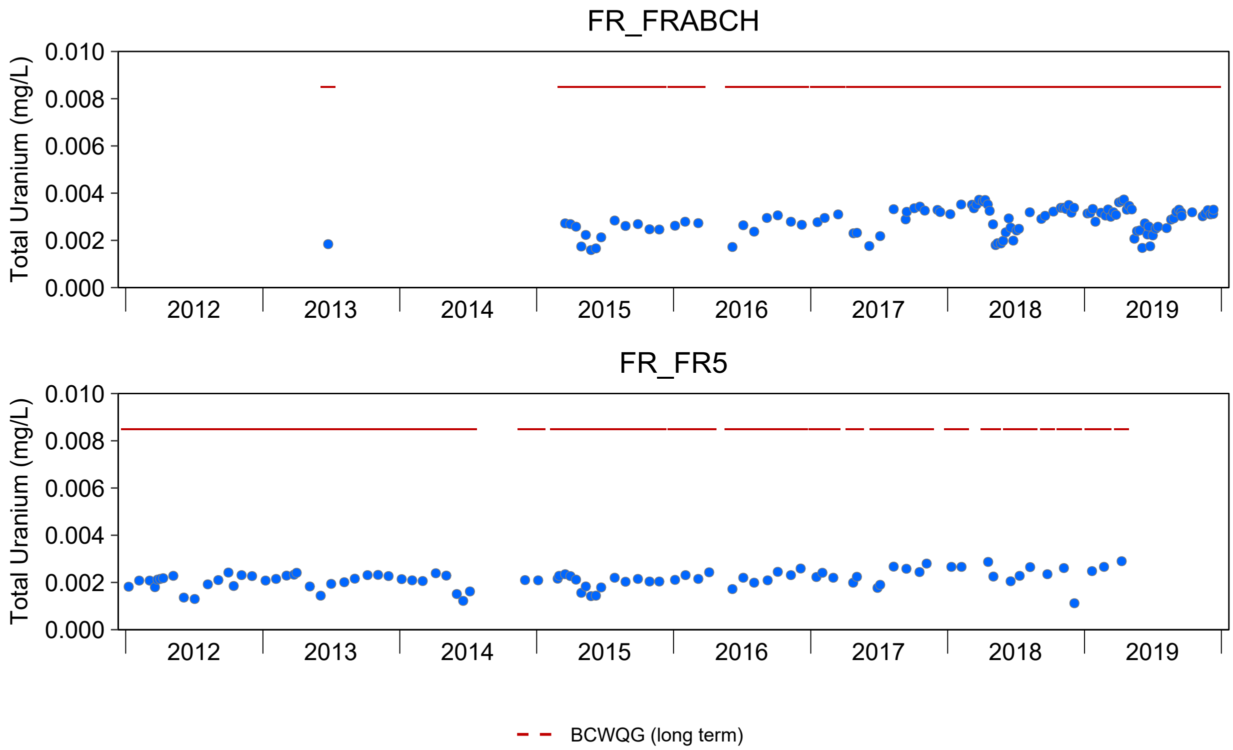

Figure C.17: Time Series Plots for Total Uranium Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Total Uranium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

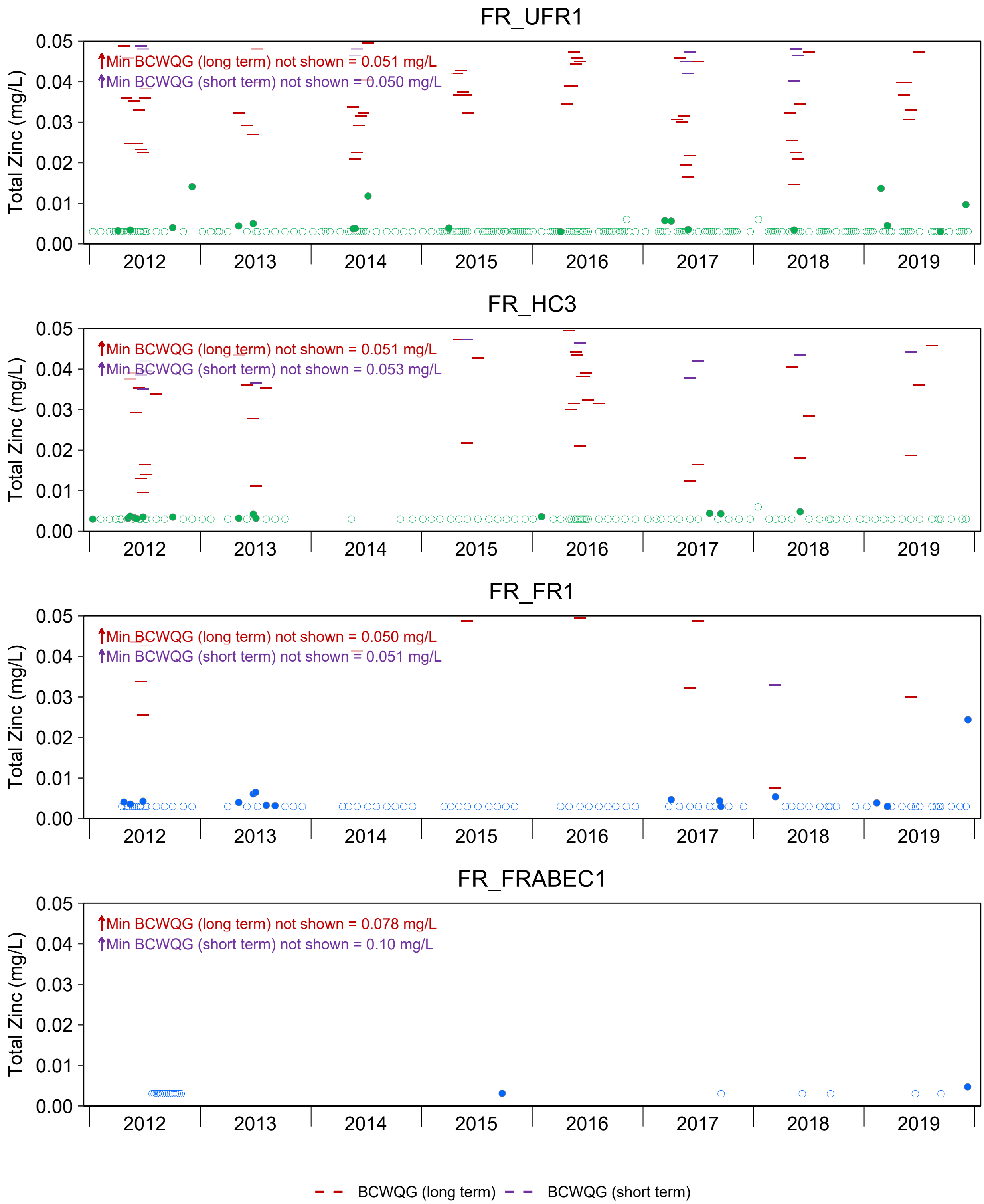

Figure C.18: Time Series Plots for Total Zinc Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Zinc was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

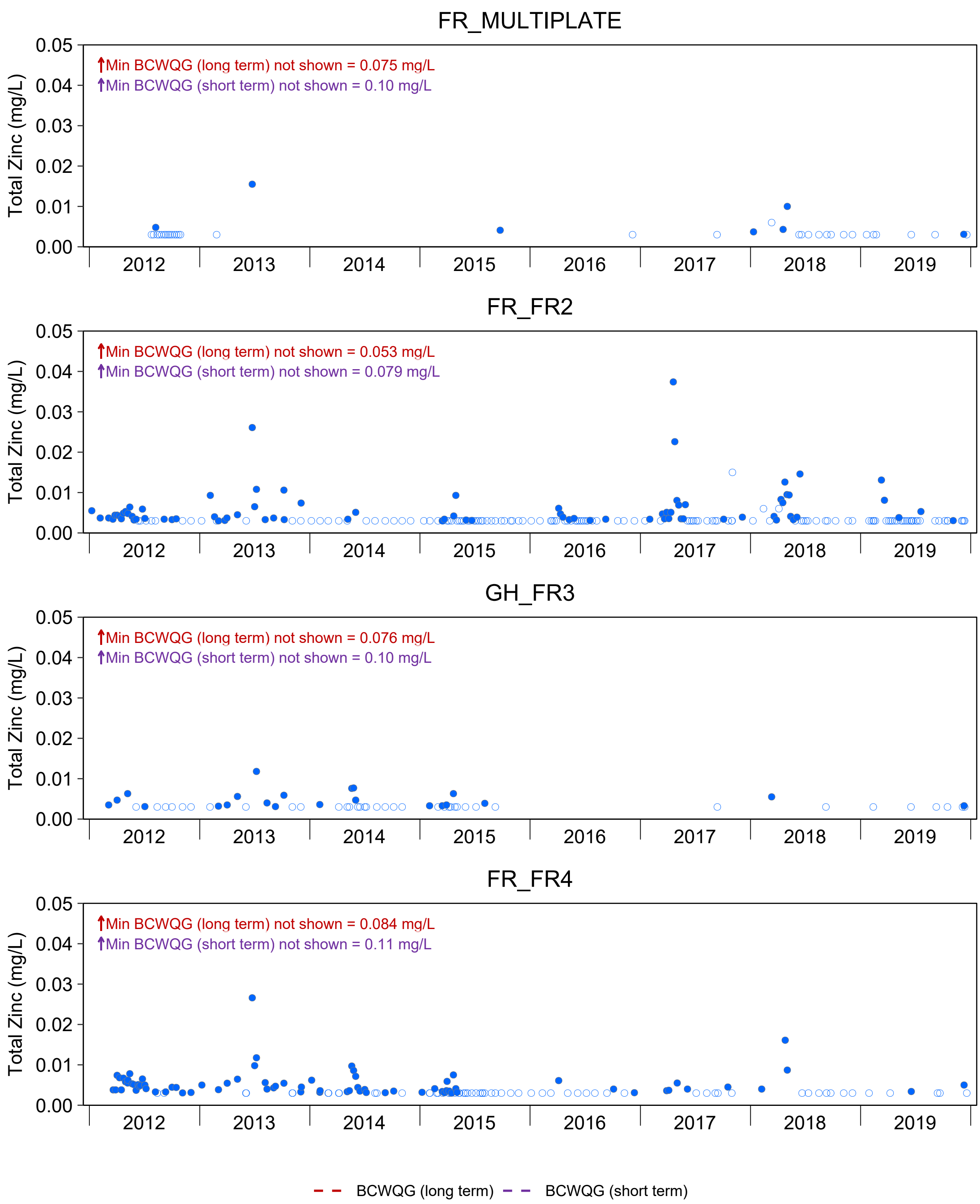

Figure C.18: Time Series Plots for Total Zinc Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Zinc was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

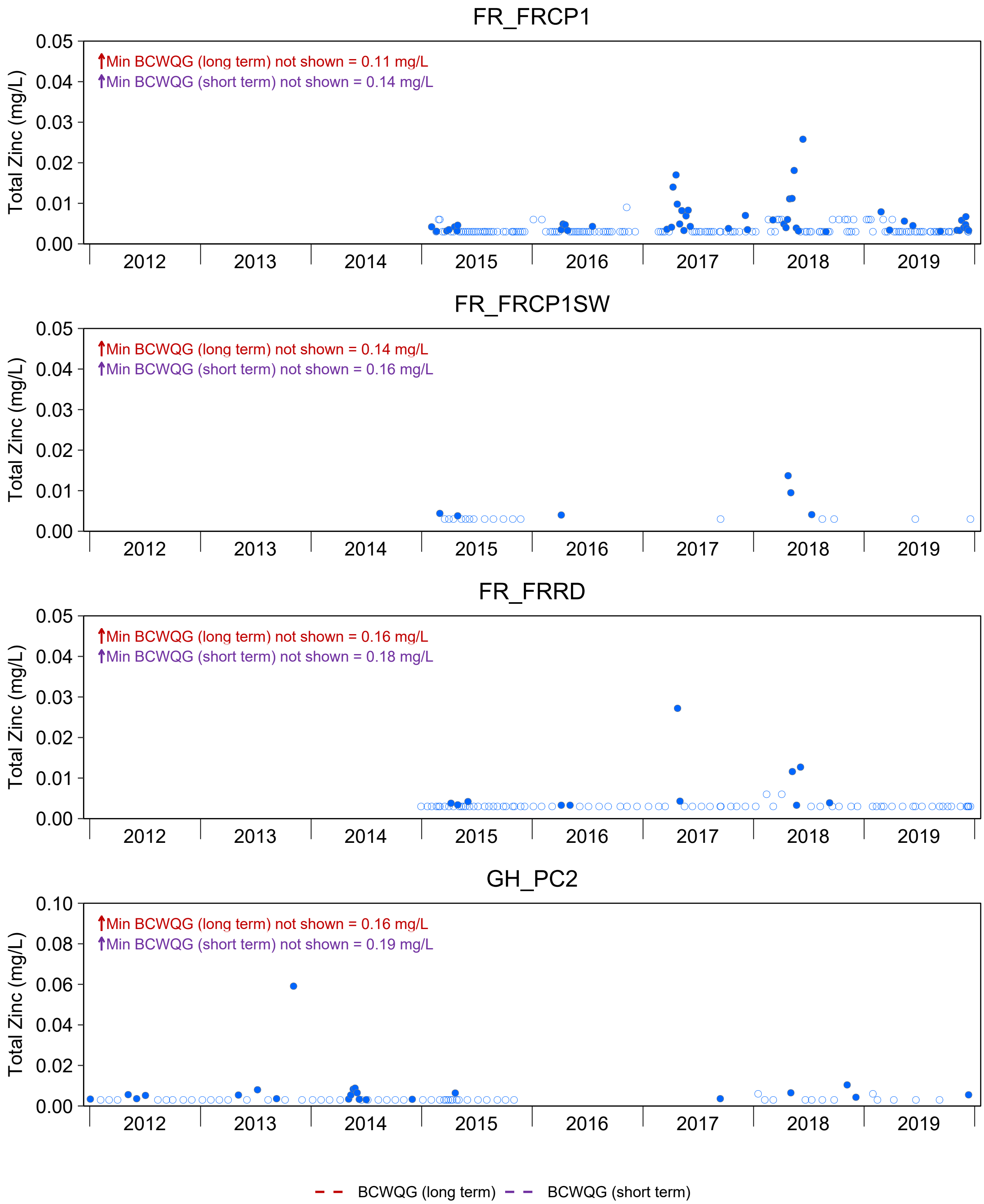

Figure C.18: Time Series Plots for Total Zinc Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Zinc was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

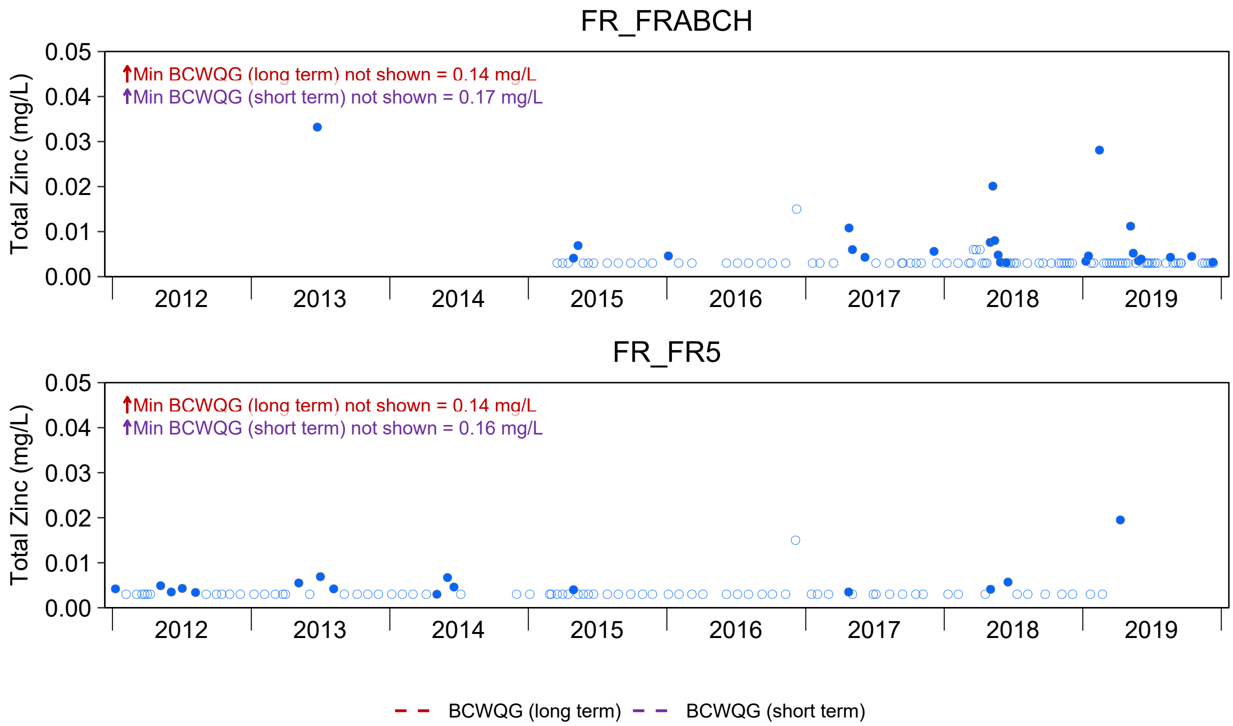

Figure C.18: Time Series Plots for Total Zinc Concentrations from the Fording River LAEMP Monitoring Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Total Zinc was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019).

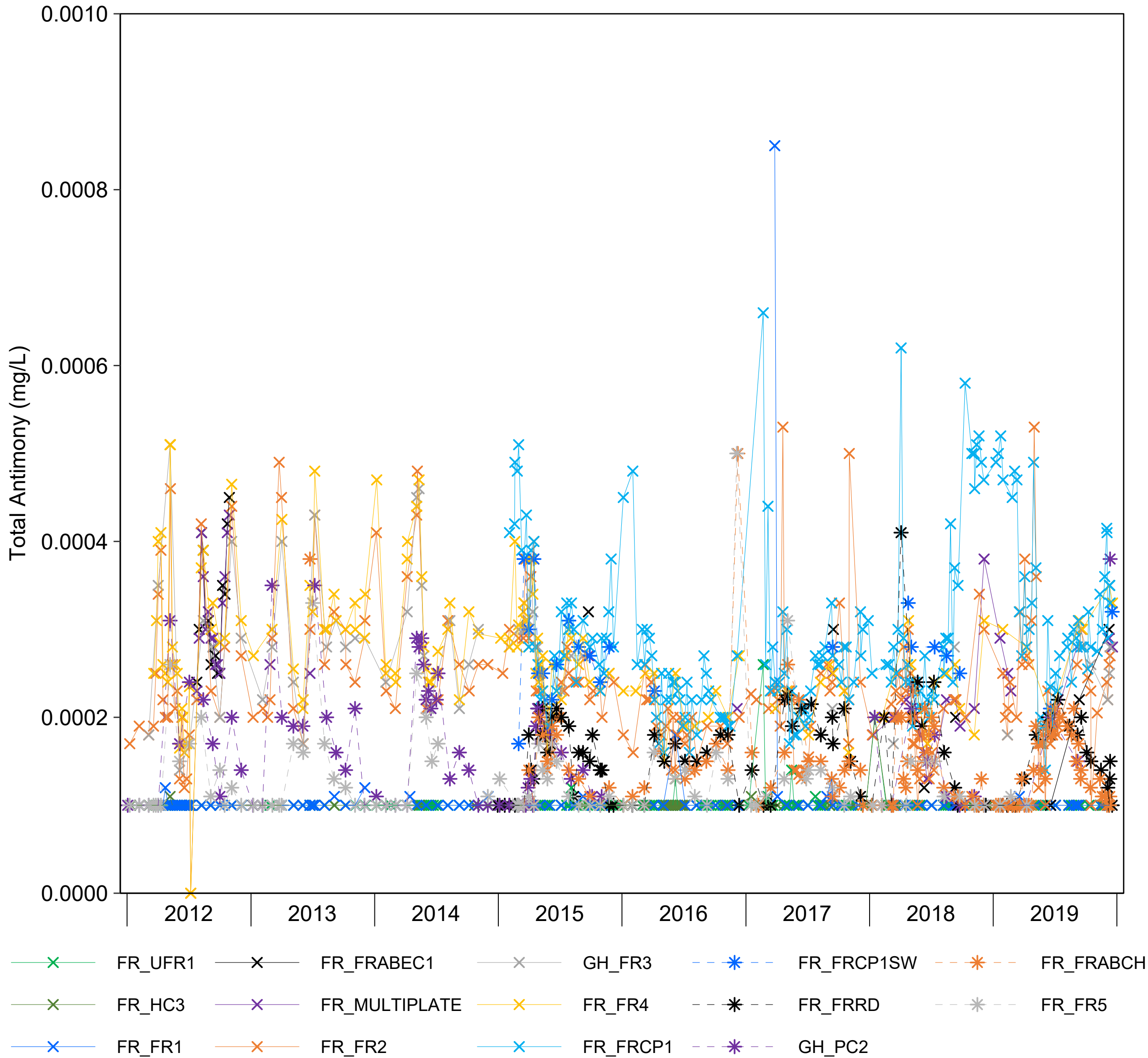

Figure C.19: Time Series Plots for Aqueous Total Antimony Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.00010 and 0.00050 mg/L). Total Antimony was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

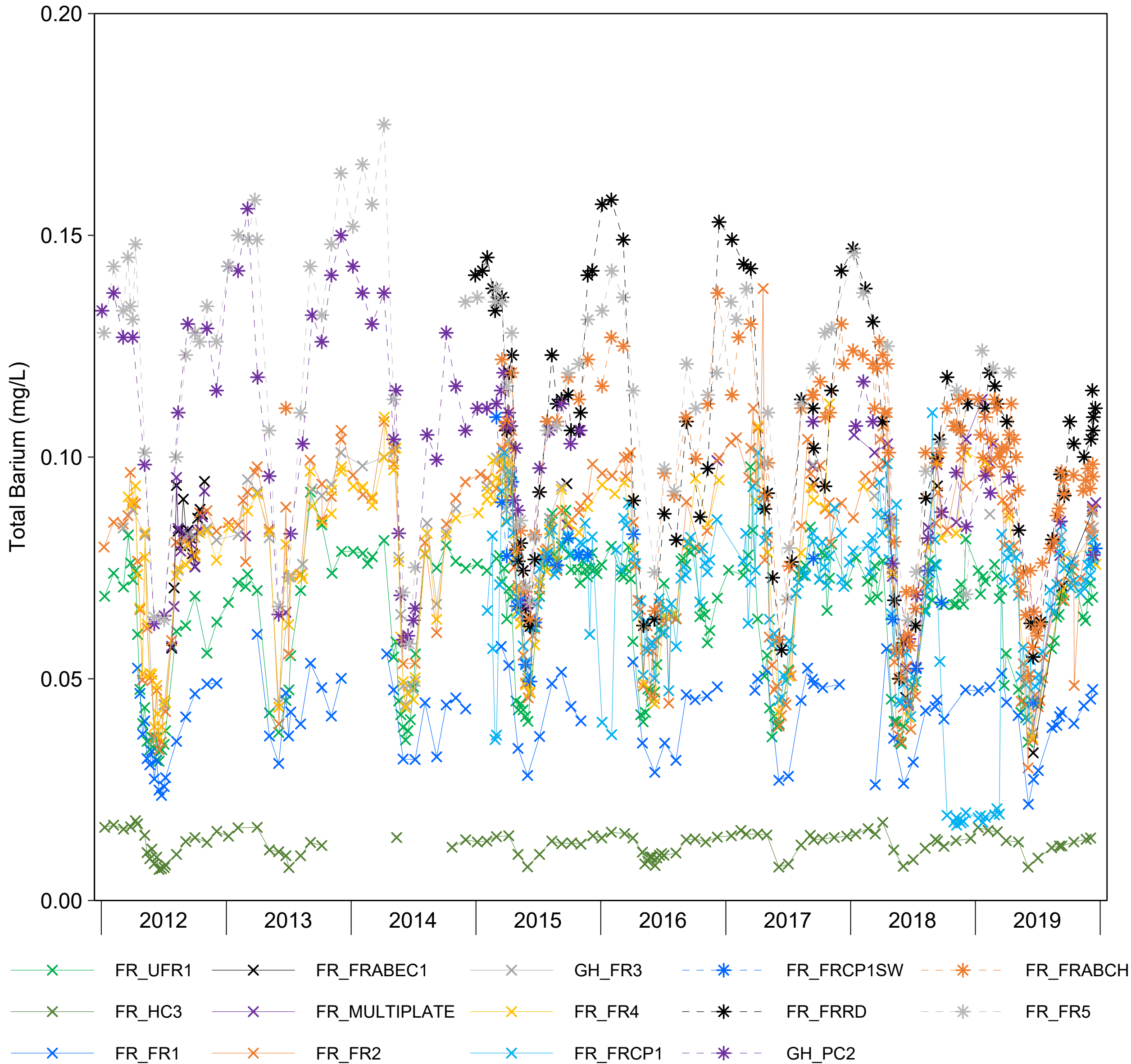

Figure C.20: Time Series Plots for Aqueous Total Barium Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: No values below the LRL. Total Barium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

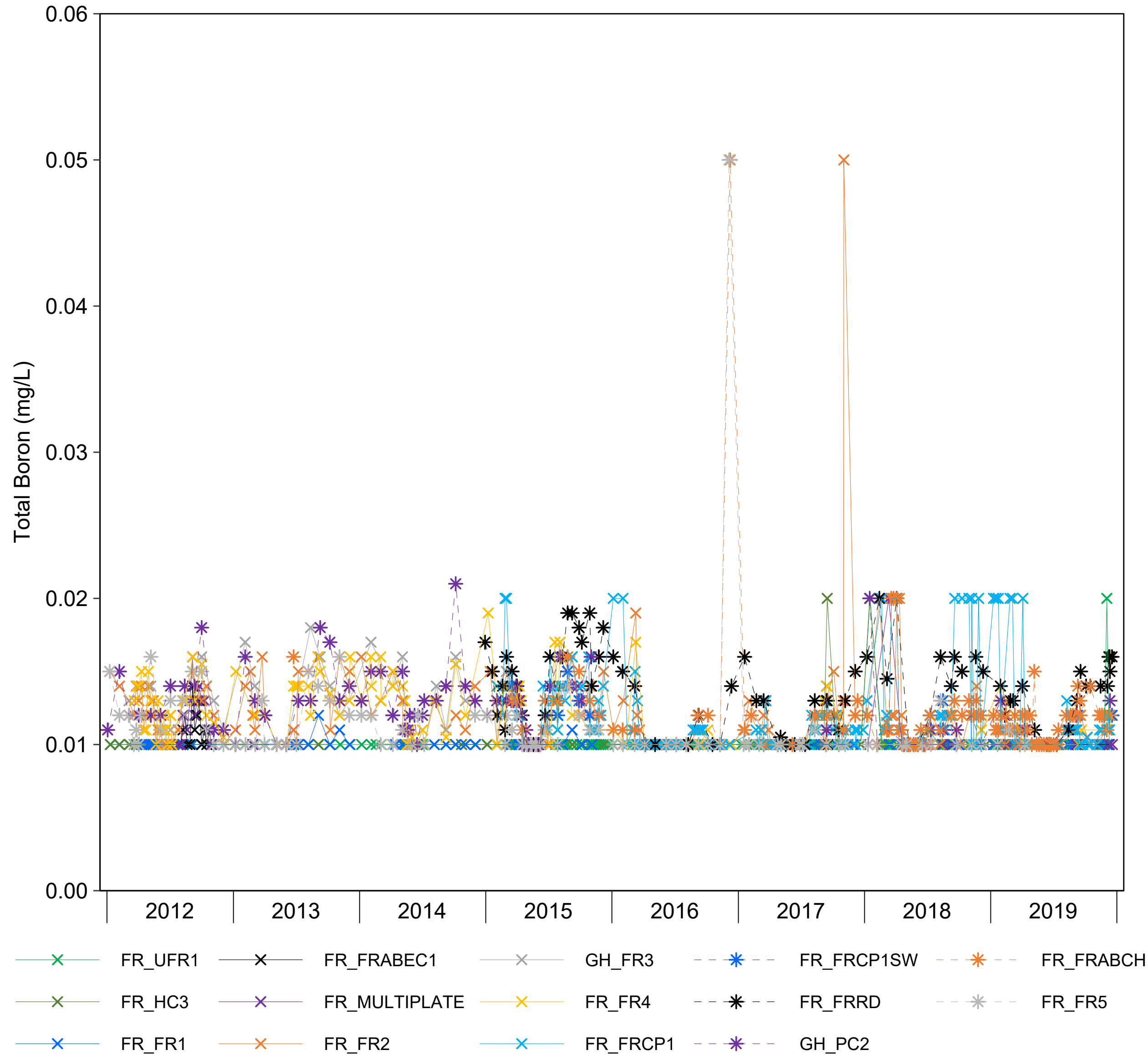

Figure C.21: Time Series Plots for Aqueous Total Boron Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.010 and 0.050 mg/L). Total Boron was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

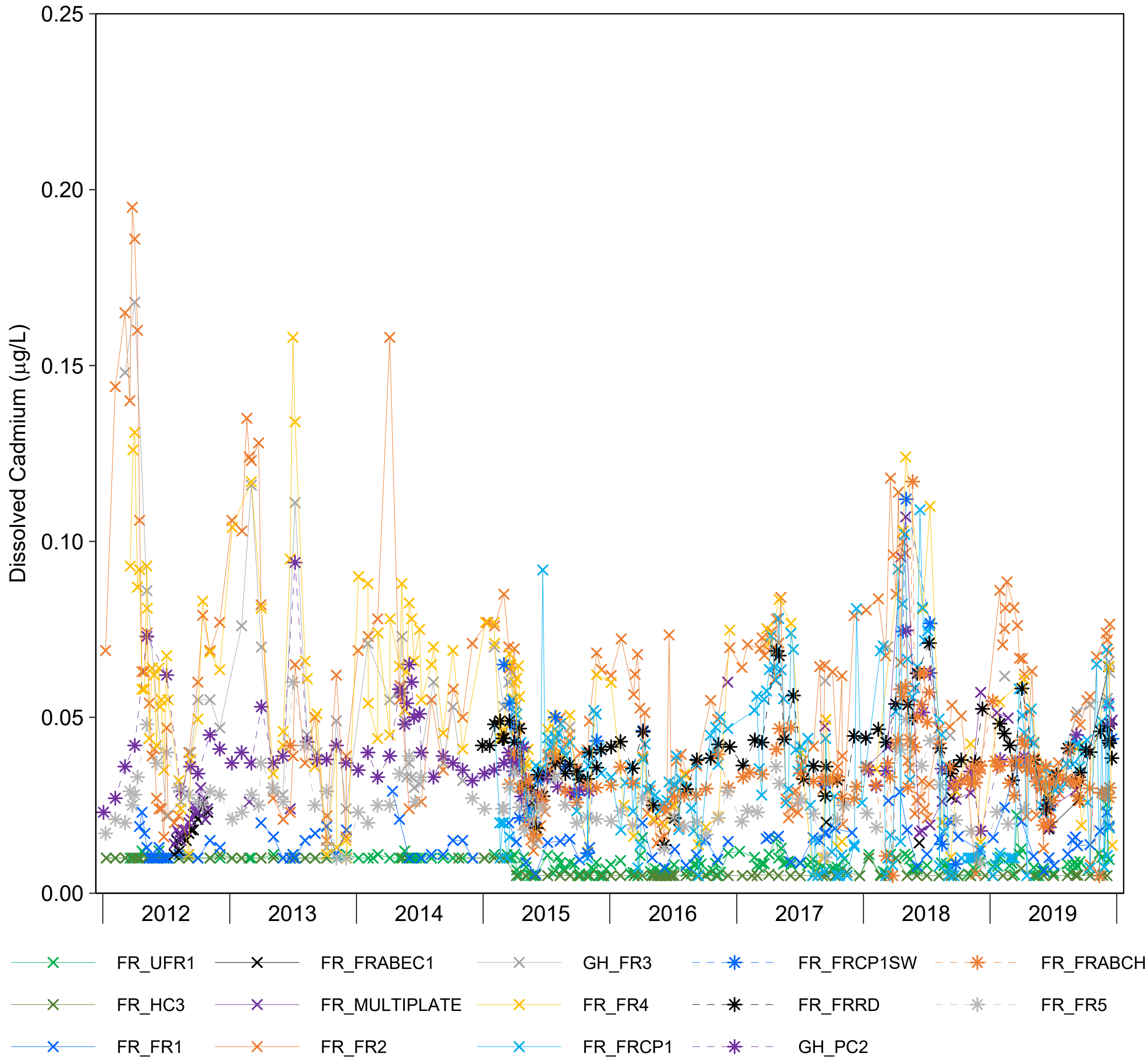

Figure C.22: Time Series Plots for Aqueous Dissolved Cadmium Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0050 and 0.045 mg/L). Dissolved Cadmium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

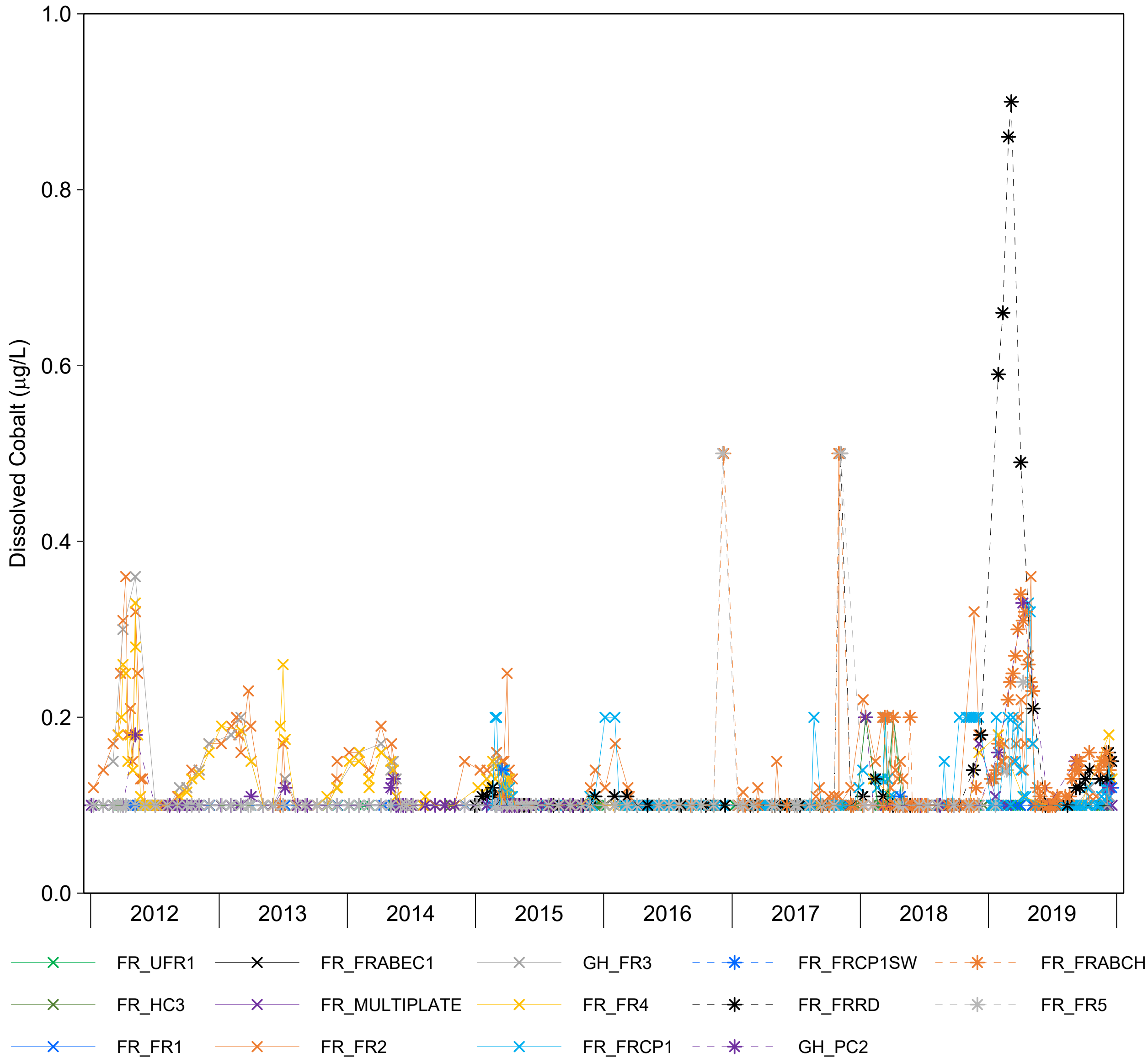

Figure C.23: Time Series Plots for Aqueous Dissolved Cobalt Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.10 and 0.50 mg/L). Dissolved Cobalt was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

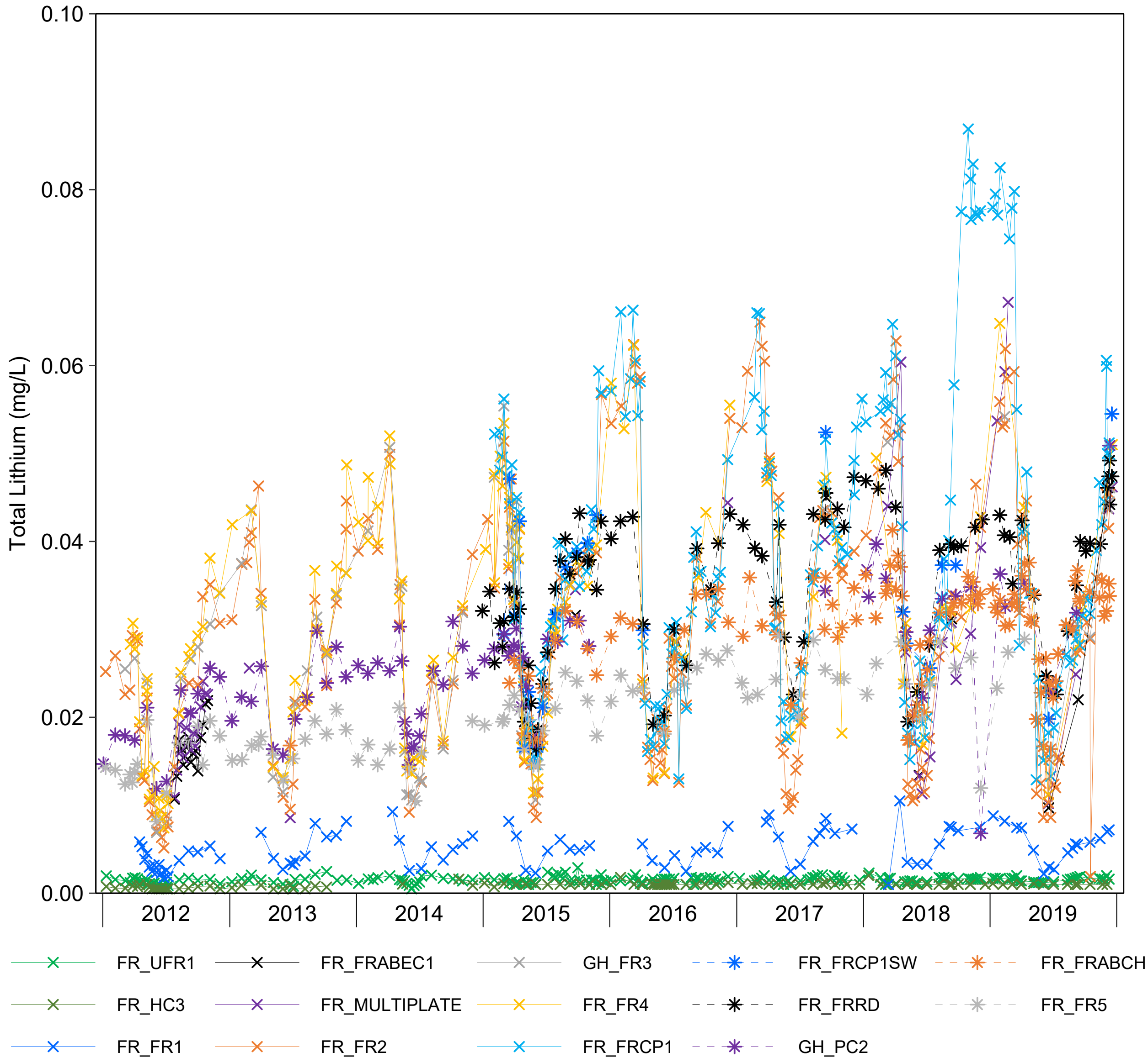

Figure C.24: Time Series Plots for Aqueous Total Lithium Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.00050 and 0.0020 mg/L). Total Lithium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

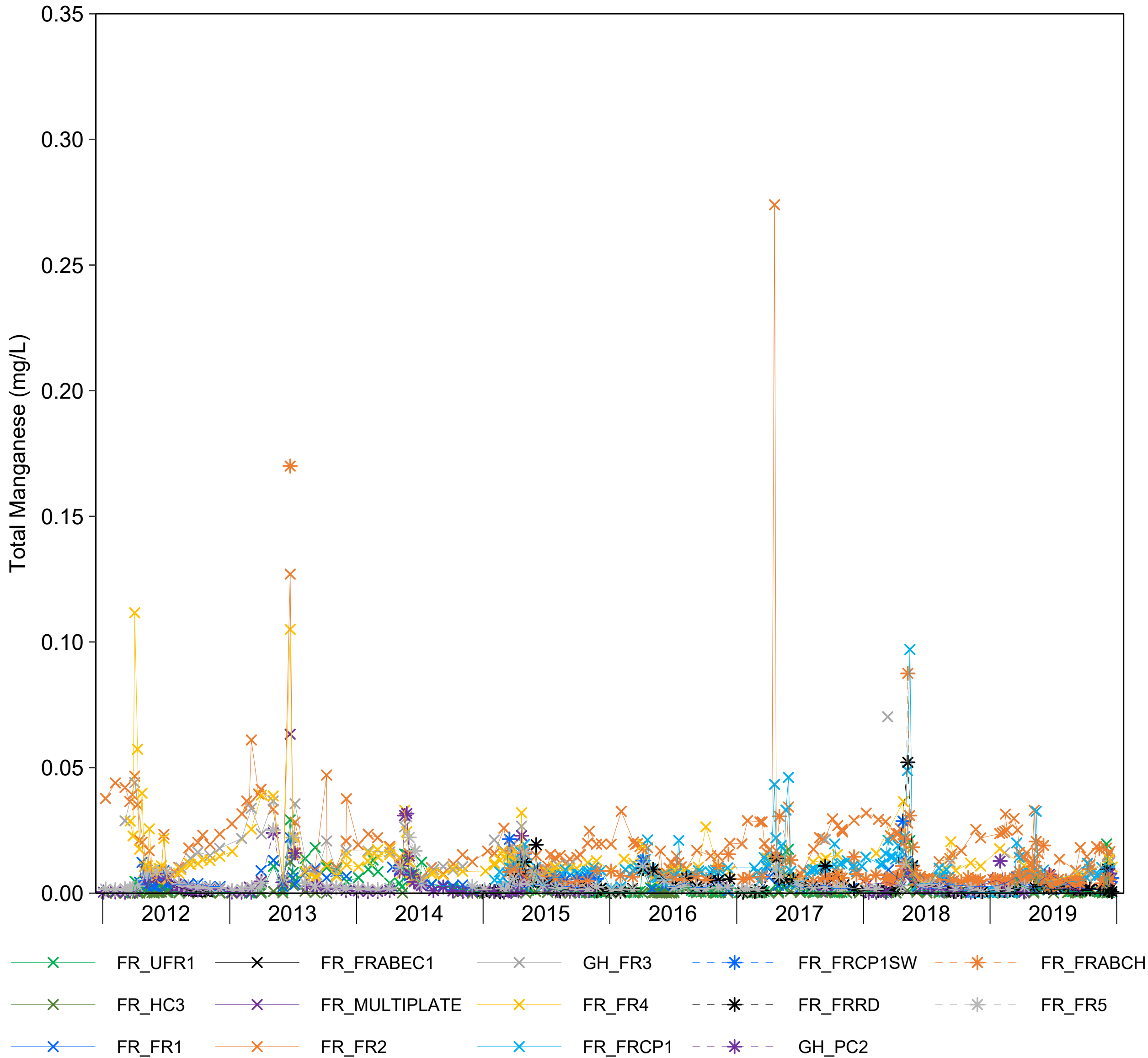

Figure C.25: Time Series Plots for Aqueous Total Manganese Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.000050 and 0.00040 mg/L). Total Manganese was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

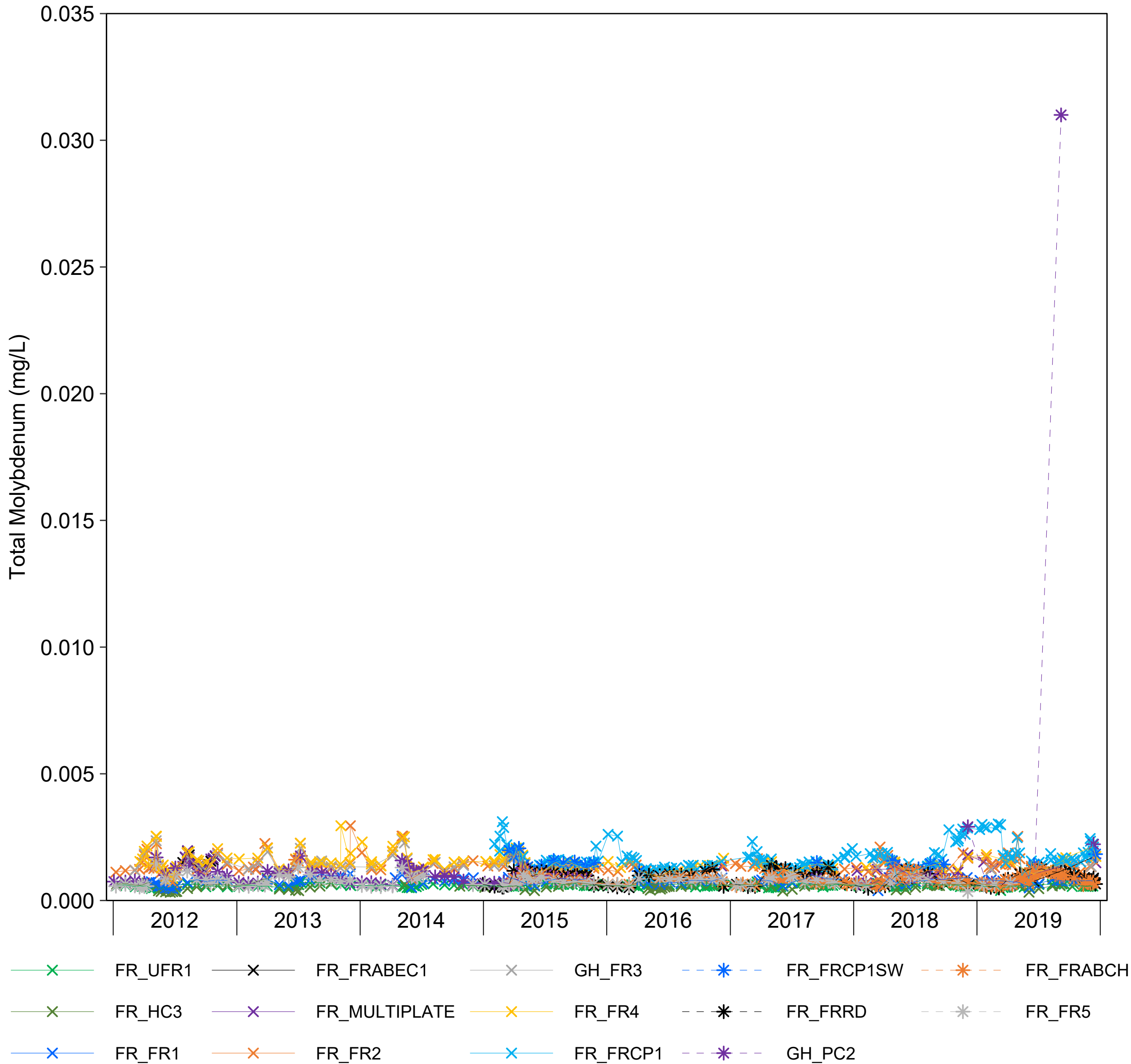

Figure C.26: Time Series Plots for Aqueous Total Molybdenum Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: No values below the LRL. Total Molybdenum was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

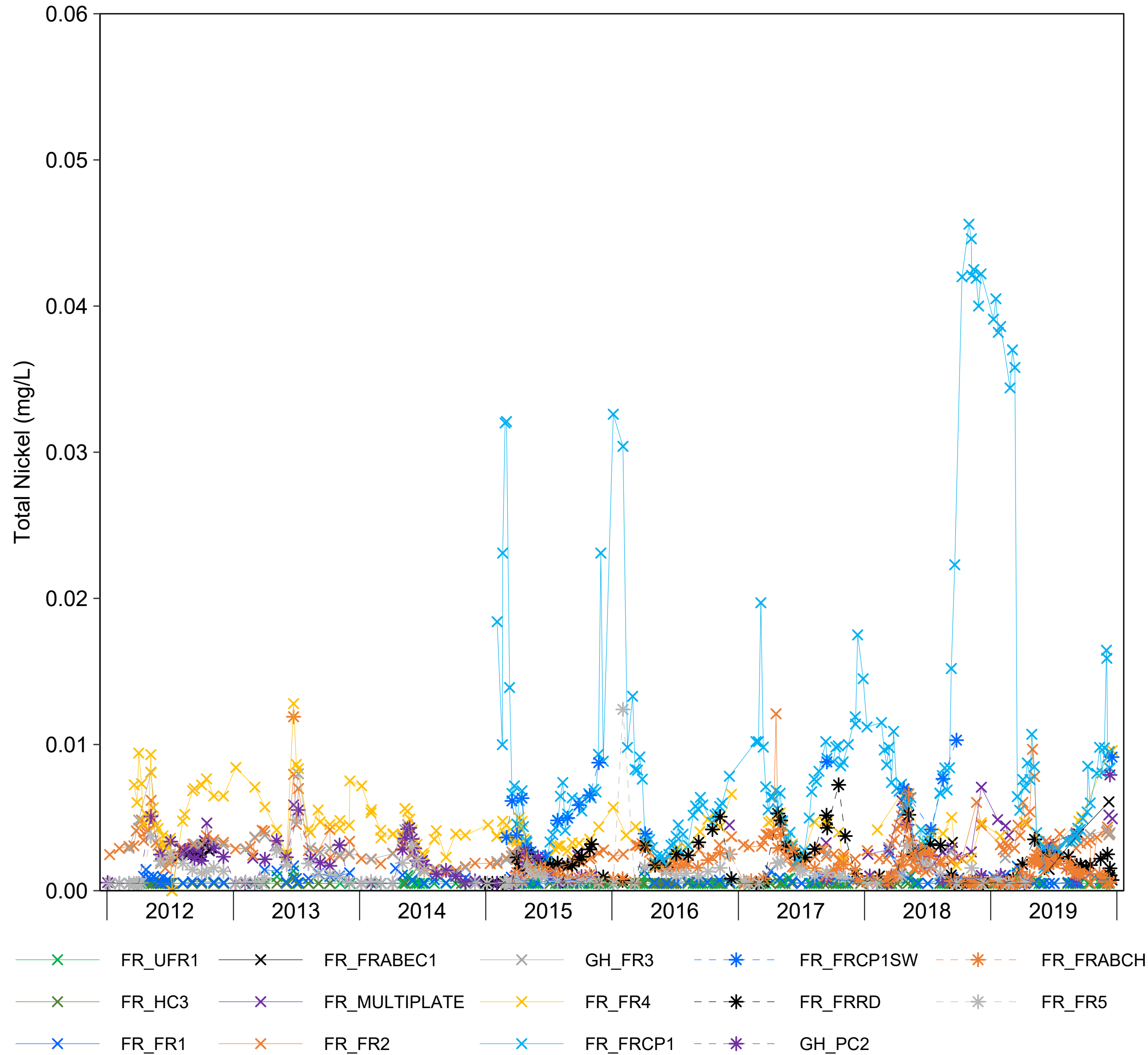

Figure C.27: Time Series Plots for Aqueous Total Nickel Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.00050 and 0.0025 mg/L). Total Nickel was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

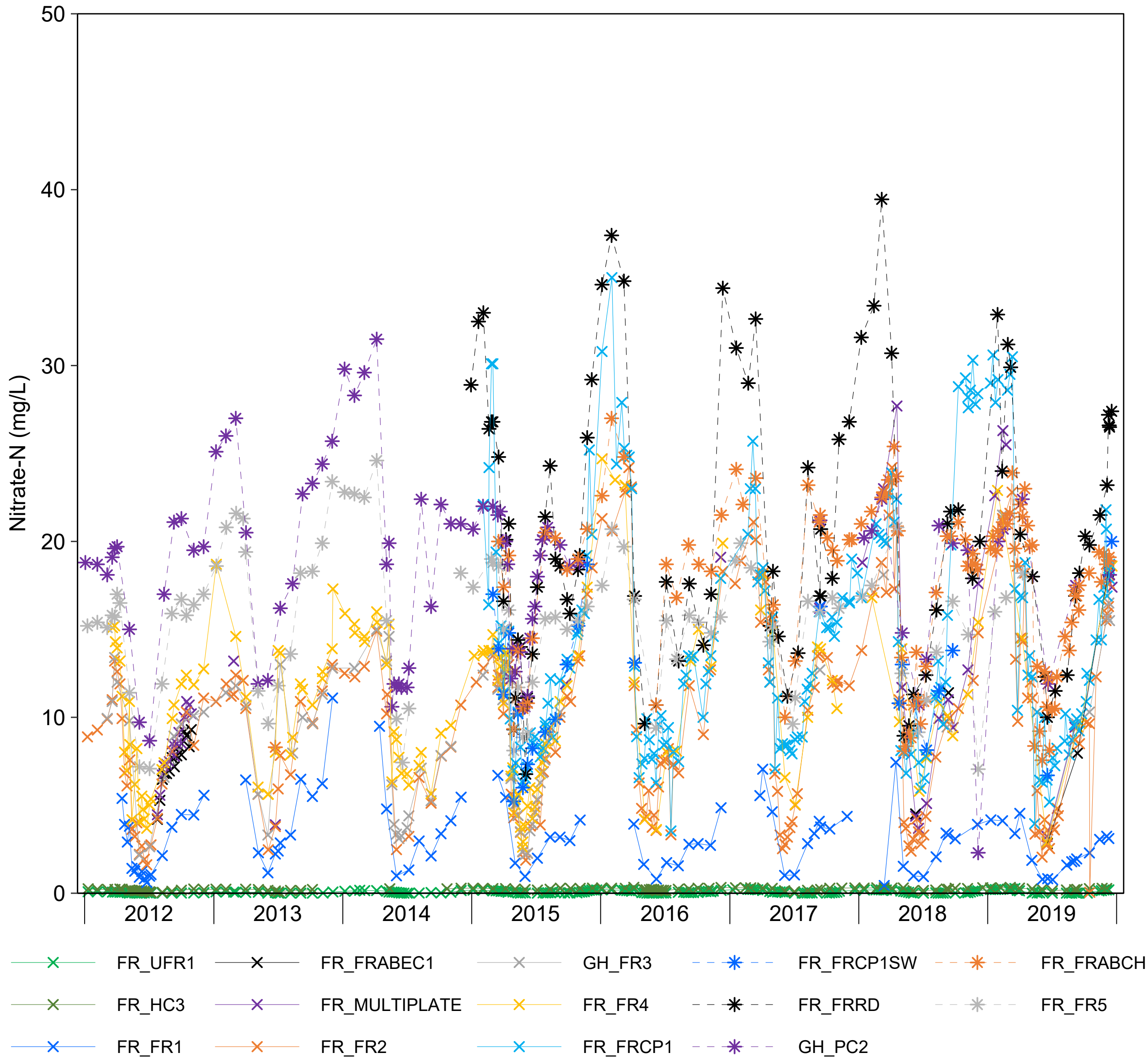

Figure C.28: Time Series Plots for Aqueous Nitrate-N Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0050 and 0.0050 mg/L). Nitrate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

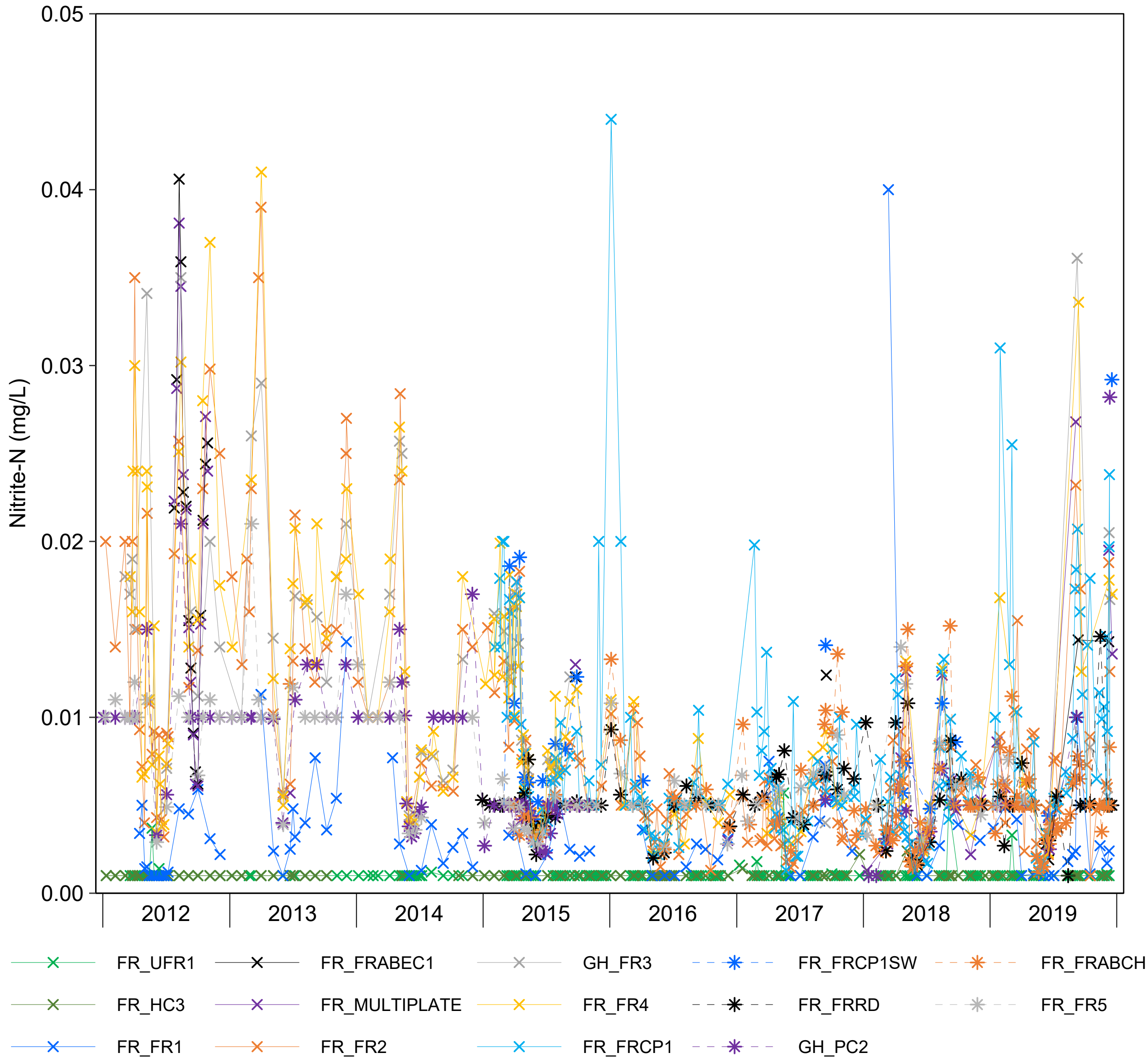

Figure C.29: Time Series Plots for Aqueous Nitrite-N Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0010 and 0.020 mg/L). Nitrite was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

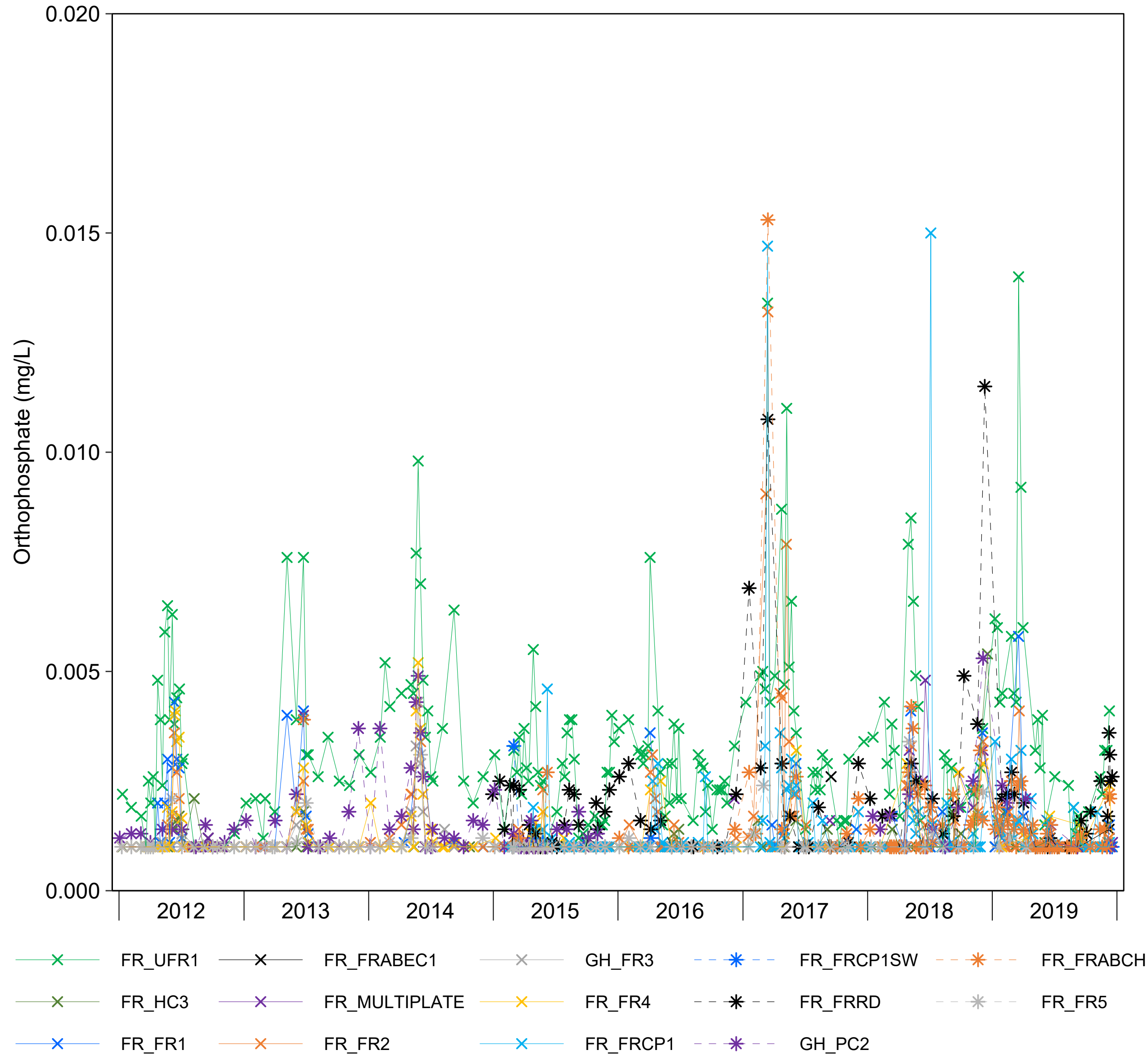

Figure C.30: Time Series Plots for Aqueous Orthophosphate Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0010 and 0.0010 mg/L). Lines included for station differentiation.

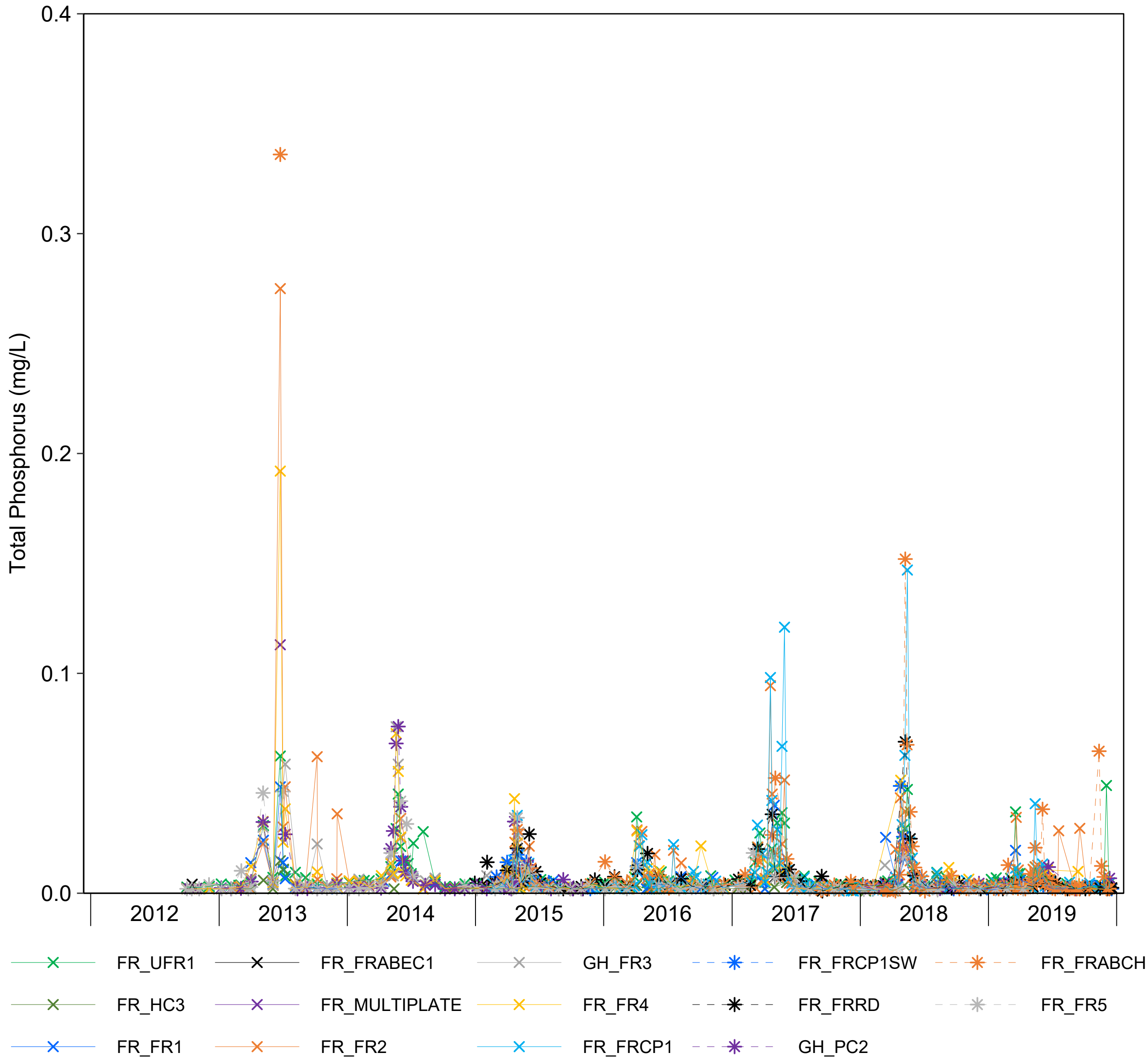

Figure C.31: Time Series Plots for Aqueous Total Phosphorus Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0010 and 0.040 mg/L). Lines included for station differentiation.

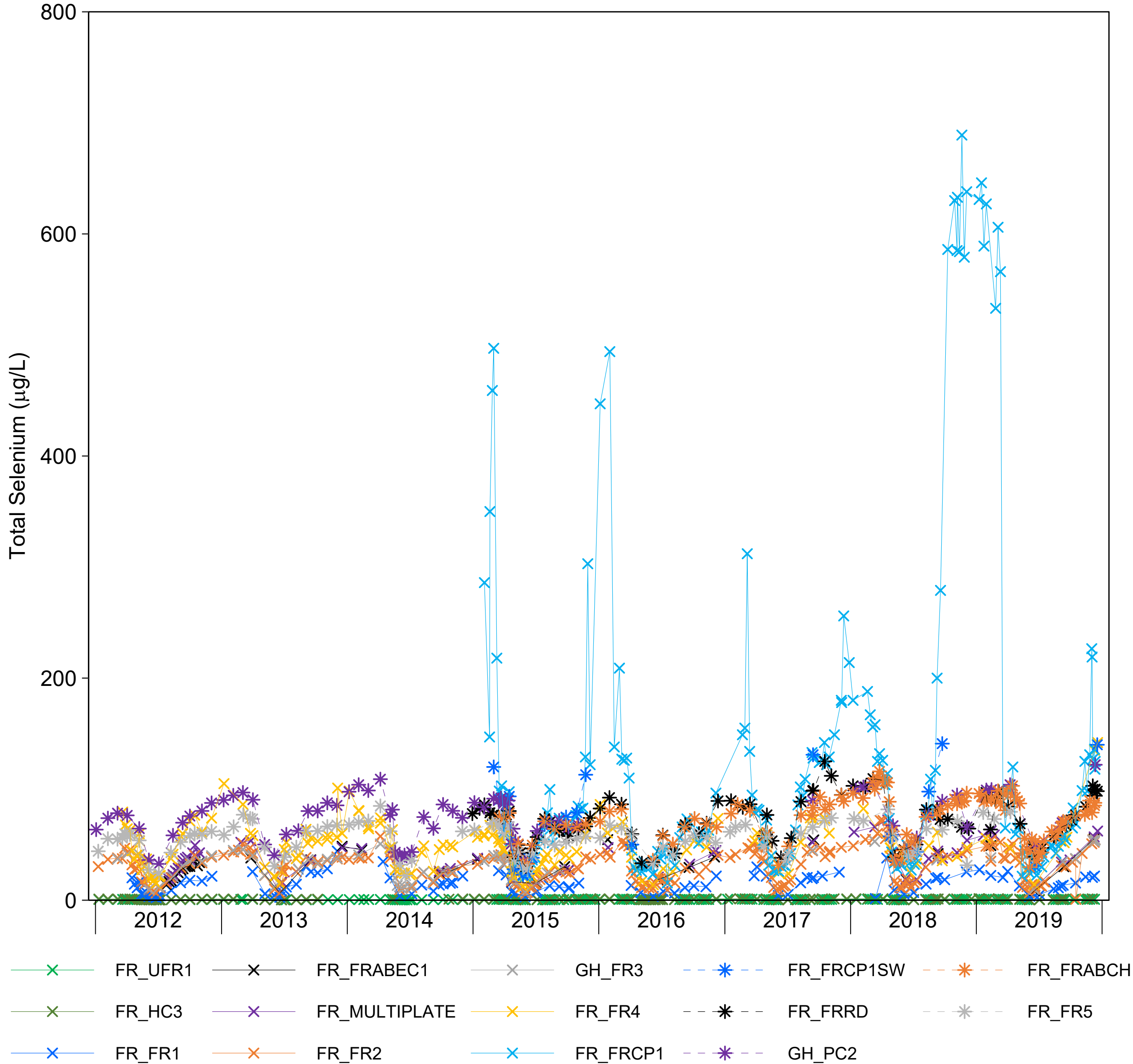

Figure C.32: Time Series Plots for Aqueous Total Selenium Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: No values below the LRL. Total Selenium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

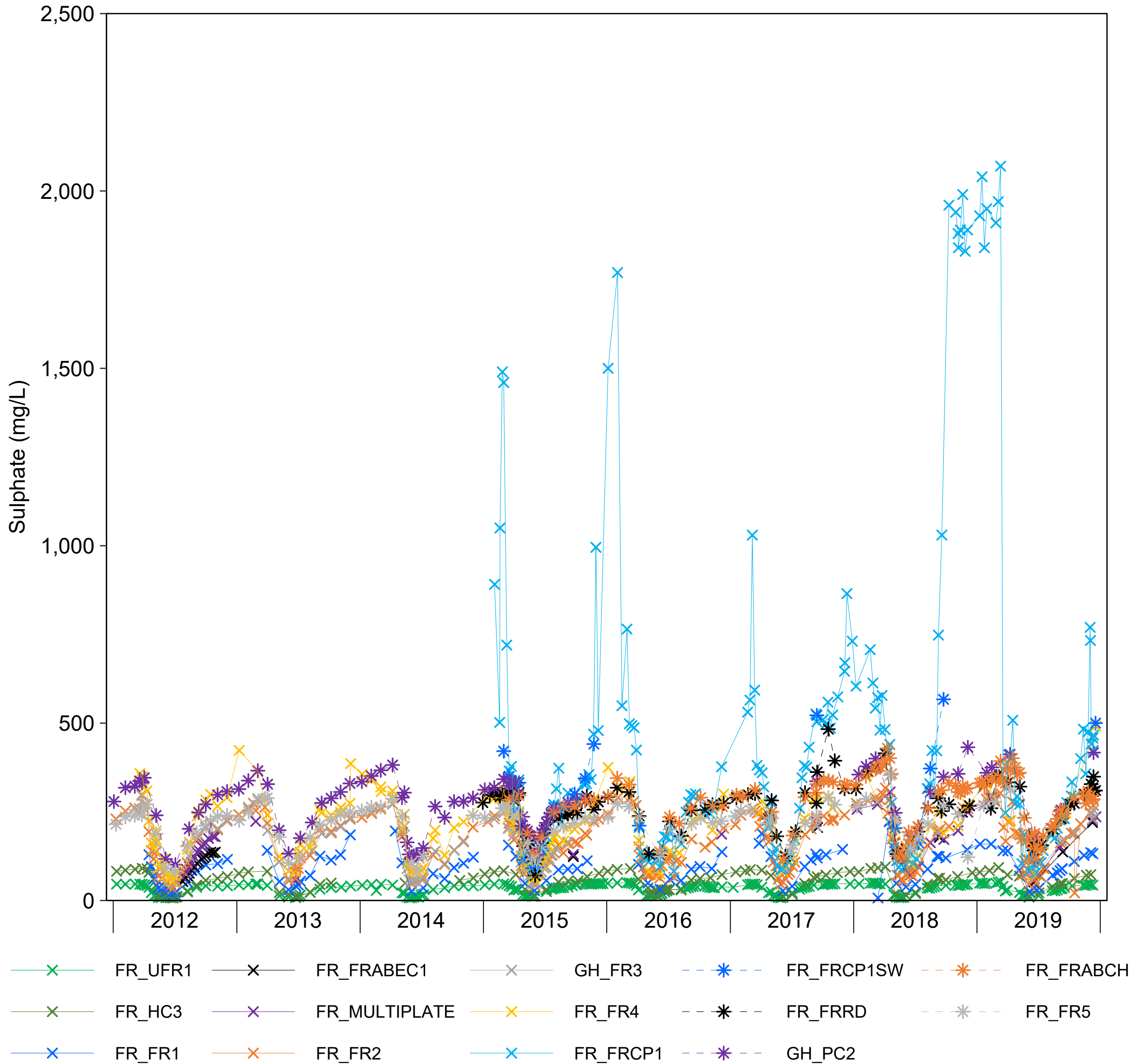

Figure C.33: Time Series Plots for Aqueous Sulphate Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: No values below the LRL. Sulphate was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

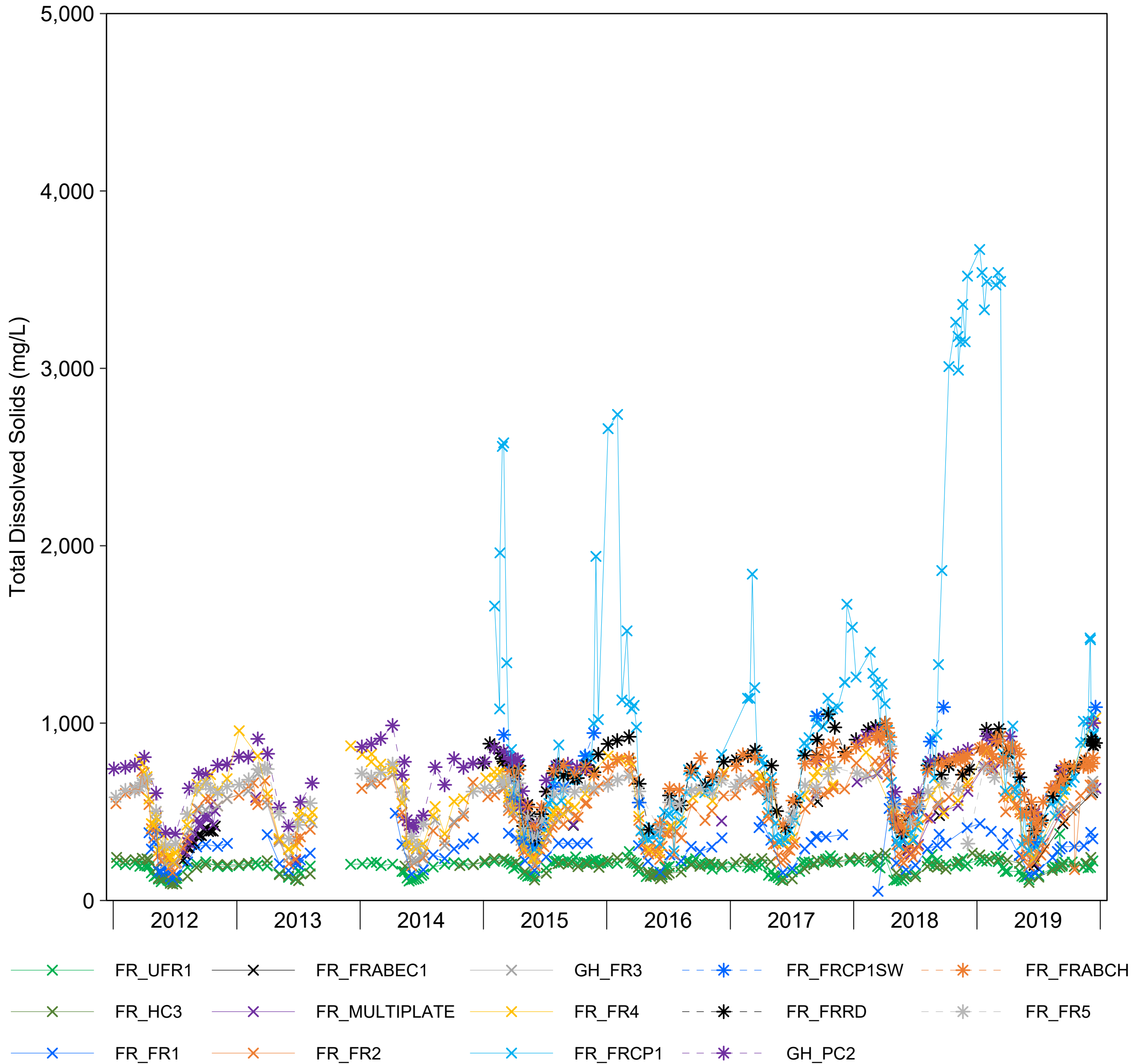

Figure C.34: Time Series Plots for Aqueous Total Dissolved Solids Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: No values below the LRL. Total Dissolved Solids was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

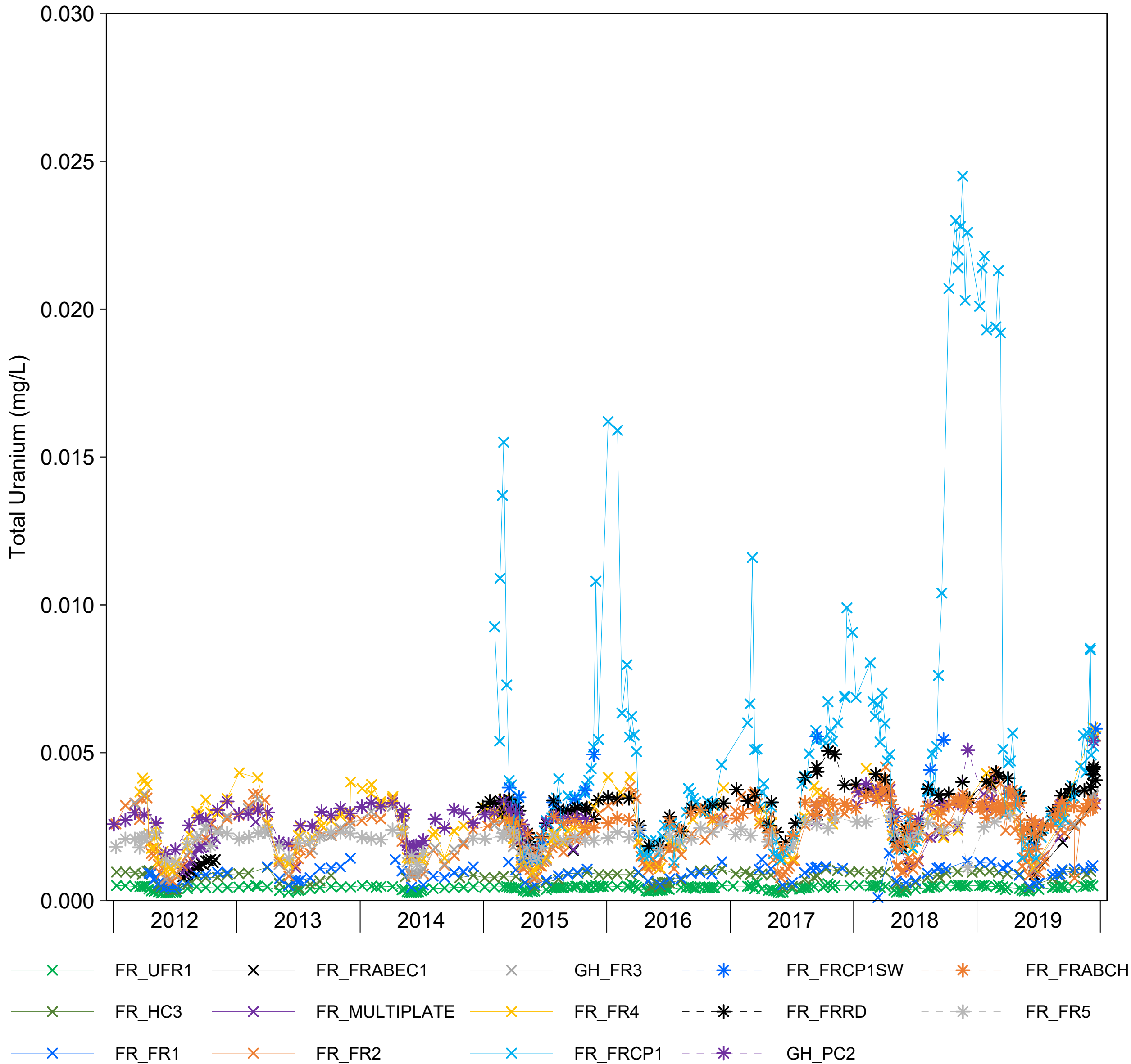

Figure C.35: Time Series Plots for Aqueous Total Uranium Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: No values below the LRL.Total Uranium was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

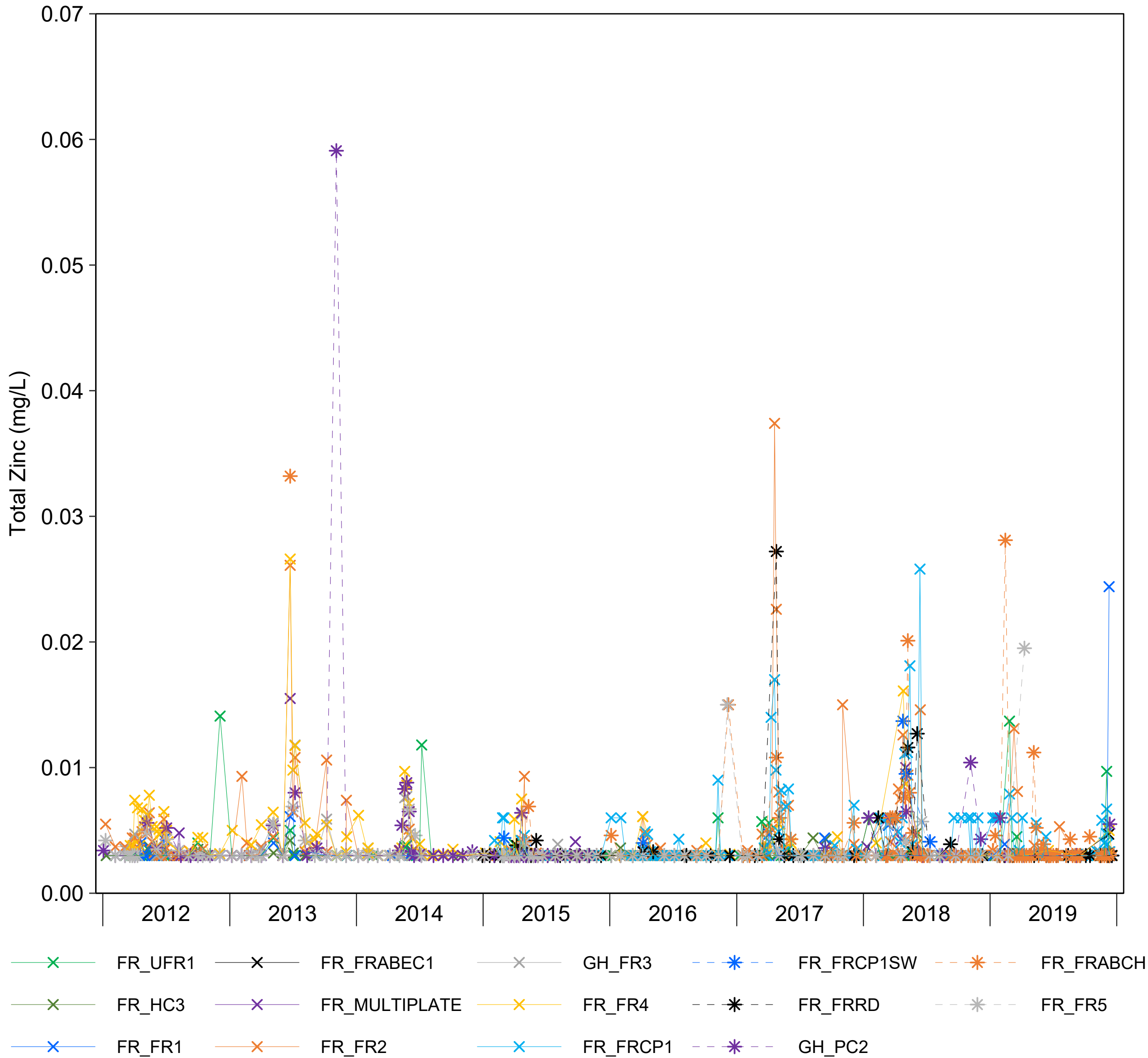

Figure C.36: Time Series Plots for Aqueous Total Zinc Concentrations from the Fording River LAEMP Sampling Stations, 2012 to 2019

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0030 and 0.015 mg/L). Total Zinc was plotted because it was identified as a mine-related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2019). Lines included for station differentiation.

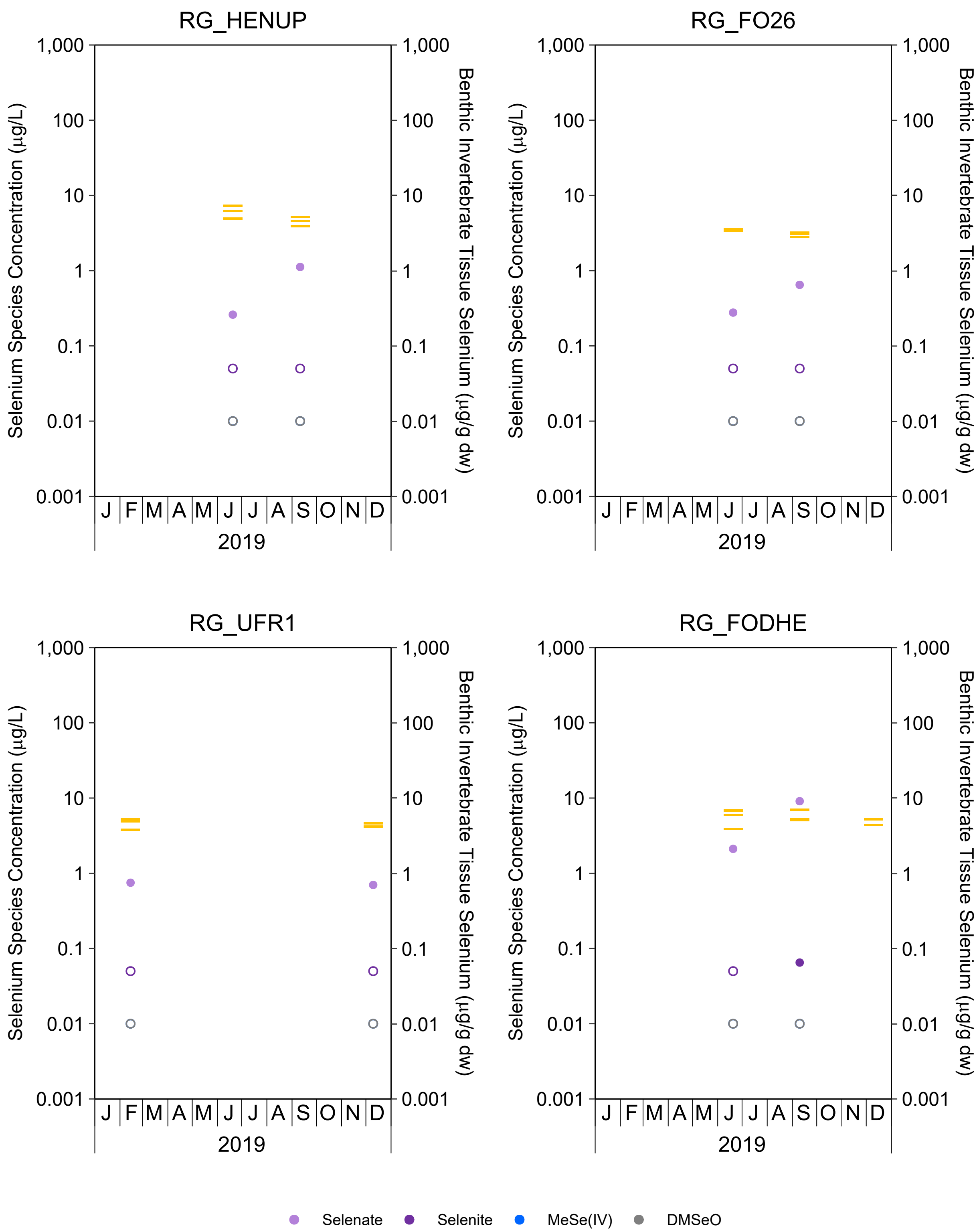

Figure C.37: Aqueous Selenium Species at Mine-exposed and Reference Stations in Fording River, January 2019 to December 2019

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open Symbol. Benthic composite tissue concentrations plotted with orange bars.

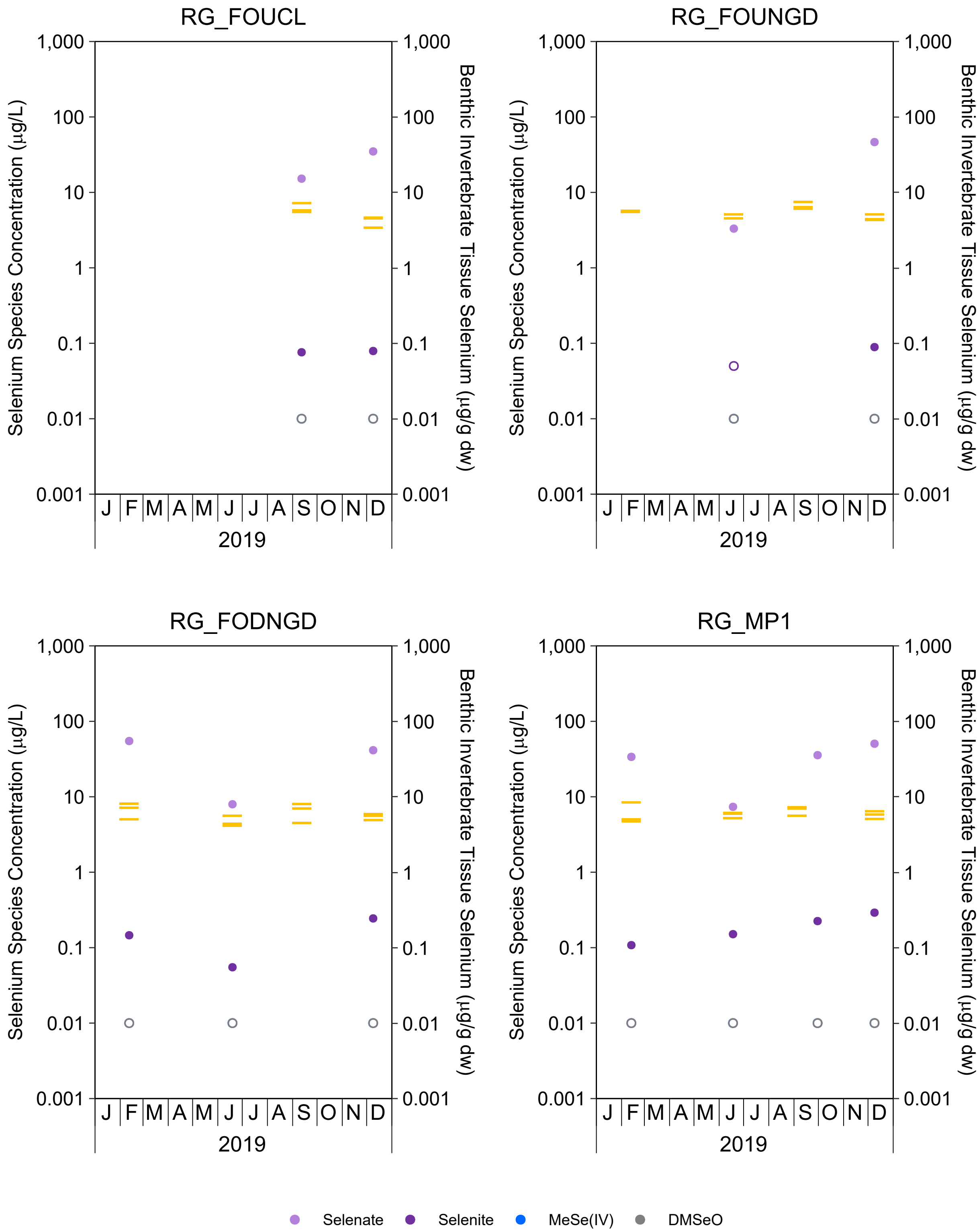

Figure C.37: Aqueous Selenium Species at Mine-exposed and Reference Stations in Fording River, January 2019 to December 2019

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open Symbol. Benthic composite tissue concentrations plotted with orange bars.

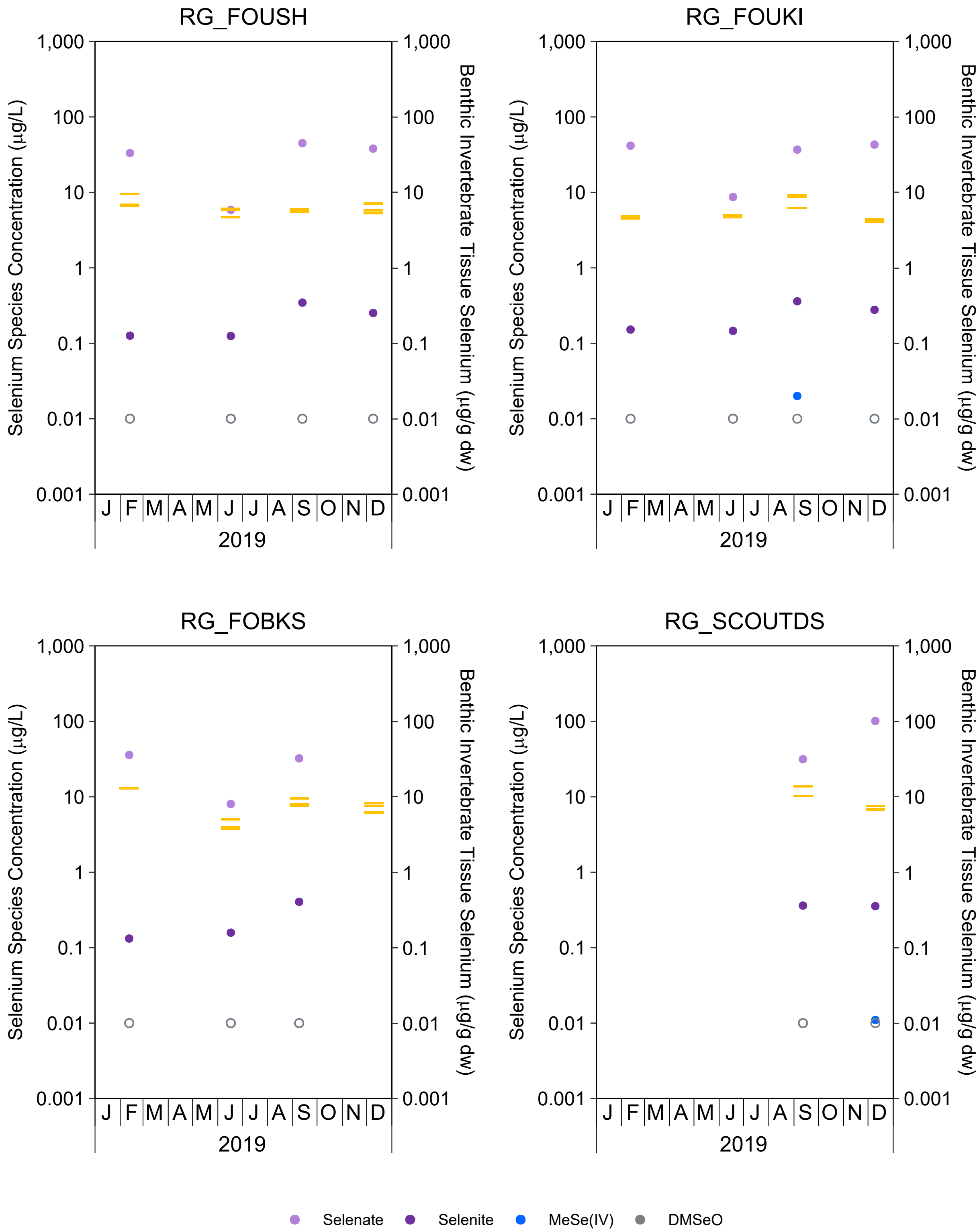

Figure C.37: Aqueous Selenium Species at Mine-exposed and Reference Stations in Fording River, January 2019 to December 2019

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open Symbol. Benthic composite tissue concentrations plotted with orange bars.

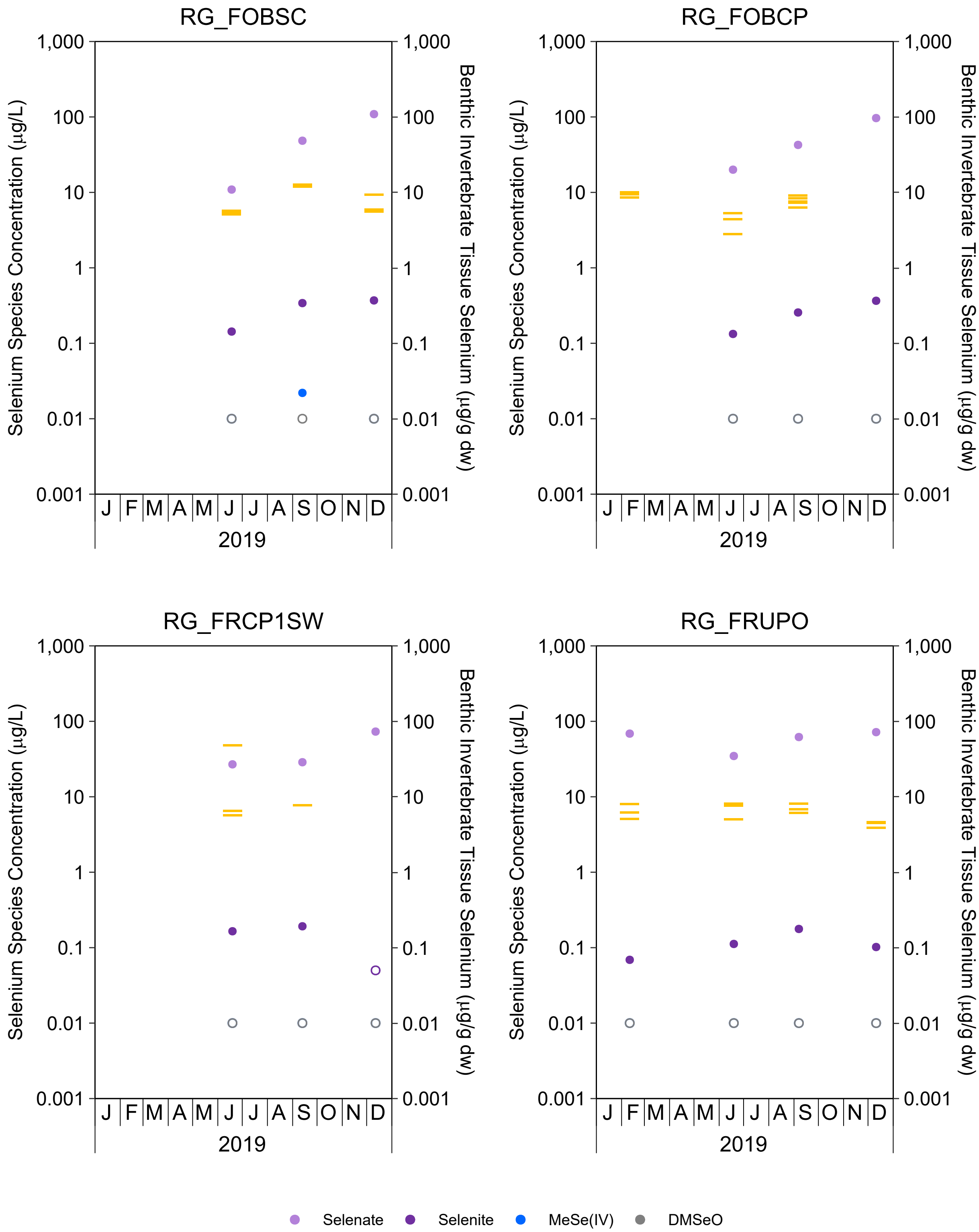

Figure C.37: Aqueous Selenium Species at Mine-exposed and Reference Stations in Fording River, January 2019 to December 2019

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open Symbol. Benthic composite tissue concentrations plotted with orange bars.

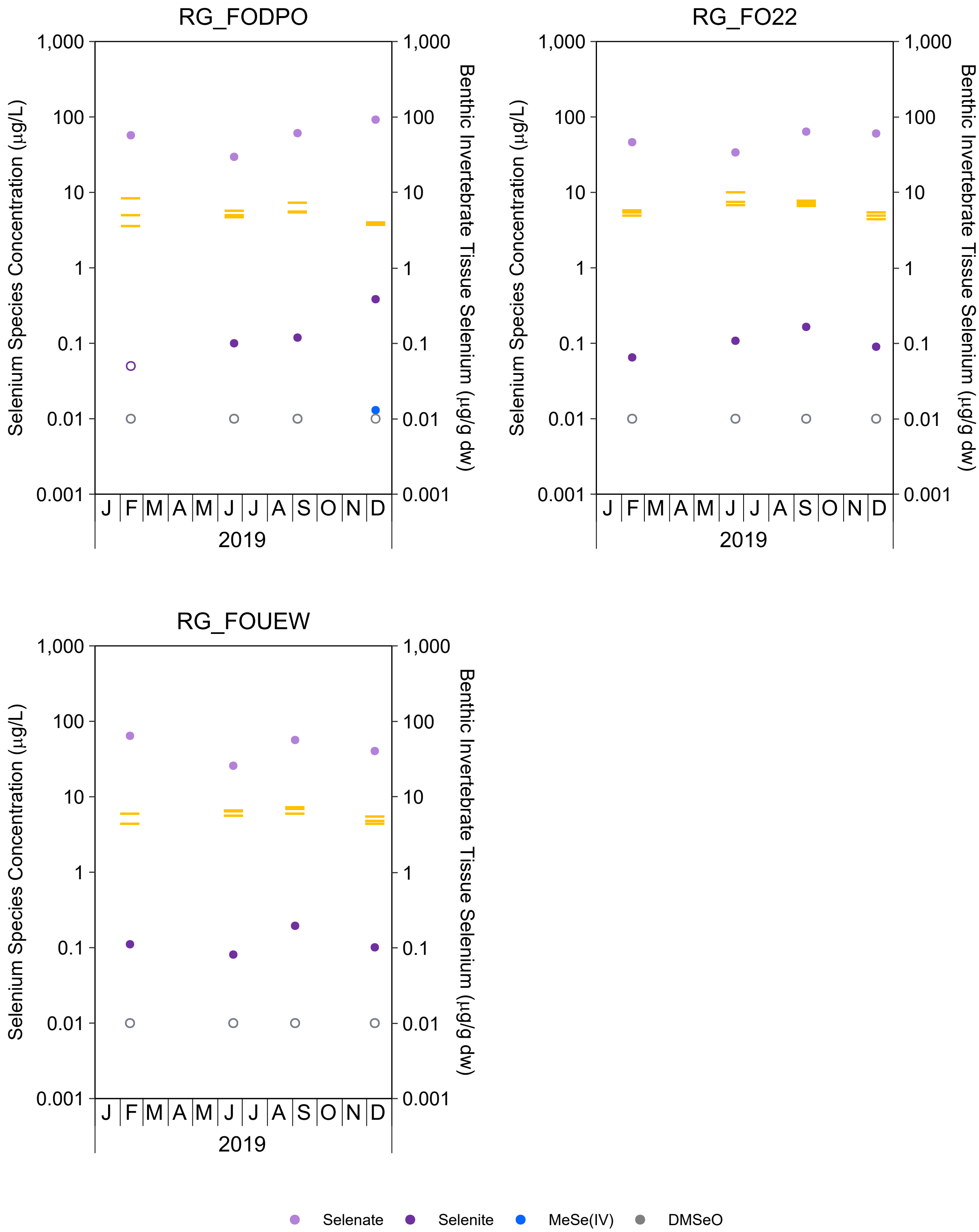

Figure C.37: Aqueous Selenium Species at Mine-exposed and Reference Stations in Fording River, January 2019 to December 2019

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open Symbol. Benthic composite tissue concentrations plotted with orange bars.

Table C.1: Summary of Water Chemistry Data for Key Parameters for the FRO LAEMP Monitoring Stations, 2019

Station	Summary Statistic	Total Dissolved Solids (mg/L)	Lab pH	Field pH	Dissolved Oxygen (mg/L)	Alkalinity (mg/L)	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ammonia (mg/L)	Sulphate (mg/L)
FR_UFR1	n	29	29	38	38	29	29	29	29	29
	Annual Minimum	118	7.42	8.00	8.31	112	<0.00500	<0.00100	<0.00500	9.57
	Annual Maximum	376	8.47	8.52	14.5	182	0.269	0.00330	0.0713	53.1
	Annual Mean	197	8.24	8.30	11.0	141	0.110	0.00108	0.0191	34.9
	Annual Median	190	8.26	8.30	11.1	145	0.134	<0.00100	0.0121	37.1
	% < LRL	0%	0%	0%	0%	0%	14%	93%	17%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	0%	-	-	0%
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	0%	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
FR_HC3	n	13	13	26	26	13	13	13	13	13
	Annual Minimum	102	7.98	7.92	6.20	88.4	0.155	<0.00100	<0.00500	12.9
	Annual Maximum	257	8.35	8.36	13.1	133	0.331	<0.00100	0.0307	92.9
	Annual Mean	200	8.15	8.19	10.6	111	0.252	<0.00100	0.00982	59.4
	Annual Median	209	8.14	8.22	11.0	111	0.262	<0.00100	<0.00500	68.9
	% < LRL	0%	0%	0%	0%	0%	0%	100%	54%	0%
	% > BCWQG[a]	-	0%	0%	4%	0%	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	4%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	0%	-	-	0%
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	0%	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
FR_FR1	n	16	16	27	27	16	16	16	16	16
	Annual Minimum	147	8.12	8.12	8.05	105	0.764	<0.00100	<0.00500	25.0
	Annual Maximum	433	8.43	8.86	13.7	180	4.54	0.0100	0.0728	159
	Annual Mean	294	8.28	8.34	10.9	140	2.46	0.00264	0.0195	100
	Annual Median	304	8.28	8.35	10.8	144	2.12	0.00200	0.0117	100
	% < LRL	0%	0%	0%	0%	0%	0.0%	25%	13%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	44%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	0%	-	-	0%
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	0%	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
FR_FRABEC1	n	3	3	3	3	3	3	3	3	3
	Annual Minimum	198	8.11	8.00	9.34	118	2.83	0.00190	0.0180	52.2
	Annual Maximum	608	8.29	8.27	13.2	175	18.3	0.0144	0.310	220
	Annual Mean	413	8.21	8.18	11.6	153	9.70	0.0102	0.126	136
	Annual Median	433	8.23	8.26	12.2	167	7.96	0.0143	0.0500	137
	% < LRL	0%	0%	0%	0%	0%	0.0%	0%	0%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	67%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	33%	-	-	0%
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	0%	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
FR_MULTIPLATE	n	7	7	6	6	7	7	7	7	7
	Annual Minimum	214	8.07	7.82	9.38	123	3.23	0.00430	<0.00500	56.3
	Annual Maximum	786	8.36	8.55	11.7	197	26.3	0.0268	0.205	290
	Annual Mean	606	8.22	8.22	10.5	179	17.5	0.0119	0.111	216
	Annual Median	637	8.25	8.26	10.5	190	18.2	0.00860	0.104	236
	% < LRL	0%	0%	0%	0%	0%	0%	14%	14%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	100%	14%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	71%	-	-	0%
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	43%	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
FR_FR2	n	36	36	30	30	36	36	36	36	36
	Annual Minimum	174	8.06	7.84	8.50	118	0.0541	<0.00100	<0.00500	21.4
	Annual Maximum	804	8.43	8.96	12.8	237	22.8	0.0232	0.0971	303
	Annual Mean	487	8.27	8.29	10.7	184	10.8	0.00716	0.0231	174
	Annual Median	517	8.28	8.30	10.5	186	10.4	0.00605	0.0130	188
	% < LRL	0%	0%	0%	0%	0%	0.0%	3%	14%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	89%	3%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	31%	-	-	0%
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	11%	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
GH_FR3	n	7	7	4	4	7	7	7	7	7
	Annual Minimum	230	8.08	8.07	8.80	134	2.93	0.00340	<0.00500	63.1
	Annual Maximum	742	8.43	8.38	14.1	218	21.5	0.0361	0.114	298
	Annual Mean	561	8.27	8.22	10.9	191	13.2	0.0138	0.0495	207
	Annual Median	608	8.28	8.22	10.3	195	15.5	0.00830	0.0336	231
	% < LRL	0%	0%	0%	0%	0%	0.0%	0%	14%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	86%	29%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	57%	-	-	0%
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	14%	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
FR_FR4	n	7	7	6	5	7	7	7	7	7
	Annual Minimum	237	8.09	6.67	8.57	134	2.88	0.00230	<0.00500	71.6
	Annual Maximum	1,030	8.32	8.51	36.3	243	22.9	0.0336	0.129	492
	Annual Mean	710	8.23	8.02	16.4	202	13.7	0.0152	0.0418	293
	Annual Median	650	8.25	8.23	12.2	197	14.5	0.0168	0.0427	247
	% < LRL	0%	0%	0%	0%	0%	0.0%	0%	14%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	86%	14%	0%	29%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	29%	-	-	-	-	43%	-	-	29%
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	14%	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
FR_FRCP1	n	47	47	43	43	47	47	47	47	47
	Annual Minimum	280	7.95	7.82	7.86	138	3.95	0.00120	<0.00500	78.8
	Annual Maximum	3,670	8.48	8.60	14.6	431	30.6	0.0310	0.147	2,070
	Annual Mean	1,110	8.24	8.22	10.5	236	14.7	0.00883	0.0296	543
	Annual Median	670	8.26	8.22	10.4	208	12.4	0.00640	0.0163	294
	% < LRL	0%	0%	0%	0%	0%	0.0%	23%	9%	0%
	% > BCWQG[a]	-	0%	0%	2%	0%	100%	4%	0%	32%
	% > BCWQG[b]	-	-	-	2%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	26%	-	-	-	-	40%	-	-	32%
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	17%	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
FR_FRCP1SW	n	2	2	0	0	2	2	2	2	2
	Annual Minimum	330	8.16	-	-	159	6.70	0.00440	<0.00500	116
	Annual Maximum	1,090	8.34	-	-	269	20.0	0.0292	0.0410	500

> 5% of samples exceed the guideline or benchmark.
> 50% of samples exceed the guideline or benchmark.
> 95% of samples exceed the guideline or benchmark.

Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline

[a] Long-term average BCQWG for the Protection of Aquatic Life. [b] Short-term maximum BCQWG for the Protection of Aquatic Life. [c] Total nickel has an Interim Screening Values instead of EVWQP Benchmarks. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

Table C.1: **Summary of Water Chemistry Data for Key Parameters for the FRO LAEMP Monitoring Stations, 2019**

Station	Summary Statistic	Total Dissolved Solids (mg/L)	Lab pH	Field pH	Dissolved Oxygen (mg/L)	Alkalinity (mg/L)	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ammonia (mg/L)	Sulphate (mg/L)
FR_FRCP1SW	Annual Mean	710	8.25	-	-	214	13.4	0.0168	0.0230	308
	Annual Median	710	8.25	-	-	214	13.4	0.0168	0.0230	308
	% < LRL	0%	0%	-	-	0%	0.0%	0%	50%	0%
	% > BCWQG[a]	-	0%	-	-	0%	100%	50%	0%	50%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	50%	-	-	-	-	50%	-	-	50%
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	0%	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
FR_FRRD	n	20	20	16	16	20	20	20	20	20
	Annual Minimum	393	7.96	6.98	9.09	161	10.0	<0.00100	0.00640	141
	Annual Maximum	968	8.57	8.56	12.6	290	32.9	0.0146	0.0798	349
	Annual Mean	768	8.20	7.98	10.5	247	21.5	0.00407	0.0225	278
	Annual Median	806	8.22	8.01	10.4	260	21.0	0.00280	0.0143	304
	% < LRL	0%	0%	0%	0%	0%	0.0%	55%	0%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	100%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	5%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	90%	-	-	0%
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	50%	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
GH_PC2	n	6	6	6	6	6	6	6	6	6
	Annual Minimum	490	8.05	7.40	8.90	174	11.9	0.00250	<0.00500	180
	Annual Maximum	1,000	8.41	8.06	11.2	243	22.4	0.0282	0.137	417
	Annual Mean	830	8.20	7.71	10.0	228	18.4	0.00803	0.0406	333
	Annual Median	914	8.17	7.68	10.0	238	19.0	0.00250	0.0210	368
	% < LRL	0%	0%	0%	0%	0%	0.0%	50%	17%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	100%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	83%	-	-	0%
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	17%	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
FR_FRABCH	n	41	41	40	40	41	41	41	41	41
	Annual Minimum	340	8.05	7.50	7.13	156	7.56	0.00120	<0.00500	114
	Annual Maximum	927	8.48	8.26	14.2	278	23.9	0.0112	0.287	401
	Annual Mean	705	8.25	8.02	9.47	223	16.8	0.00446	0.0228	272
	Annual Median	756	8.26	8.05	9.52	235	18.6	0.00390	0.0114	286
	% < LRL	0%	0%	0%	0%	0%	0.0%	29%	10%	0%
	% > BCWQG[a]	-	0%	0%	8%	0%	100%	0%	0%	0%
	% > BCWQG[b]	-	-	-	8%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	73%	-	-	0%
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	20%	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
FR_FR5	n	3	3	3	3	3	3	3	3	3
	Annual Minimum	693	8.15	8.10	9.77	222	16.0	<0.00500	<0.00500	269
	Annual Maximum	749	8.25	8.32	10.8	232	18.2	0.00760	0.243	311
	Annual Mean	727	8.20	8.19	10.2	225	17.0	0.00597	0.0939	286
	Annual Median	739	8.21	8.16	10.1	222	16.8	0.00530	0.0337	278
	% < LRL	0%	0%	0%	0%	0%	0.0%	33%	33%	0%
	% > BCWQG[a]	-	0%	0%	0%	0%	100%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-
	% > EVWQP Level 1 Benchmark[c]	0%	-	-	-	-	100%	-	-	0%
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	0%	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-

> 5% of samples exceed the guideline or benchmark.
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Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline

[a] Long-term average BCQWG for the Protection of Aquatic Life. [b] Short-term maximum BCQWG for the Protection of Aquatic Life. [c] Total nickel has Interim Screening Values instead of EVWQP Benchmarks. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

Table C.1: Summary of Water Chemistry Data for Key Parameters for the FRO LAEMP Monitoring Stations, 2019

Station	Summary Statistic	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Antimony (mg/L)	Total Arsenic (mg/L)	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Chromium (mg/L)	Total Cobalt (mg/L)
	n	29	29	29	29	29	29	29	29	29
	Annual Minimum	<0.500	0.0740	<0.000100	<0.000100	0.0357	<0.0000200	<0.0100	<0.000100	<0.000100
	Annual Maximum	<0.500	0.165	<0.000100	0.000300	0.0758	0.0000250	0.0200	0.00121	0.000190
	Annual Mean	<0.500	0.142	<0.000100	0.000126	0.0619	0.0000203	0.0103	0.000271	0.000106
	Annual Median	<0.500	0.150	<0.000100	0.000110	0.0676	<0.0000200	<0.0100	0.000170	<0.000100
FR_UFR1	% < LRL	100%	0%	100%	24%	0%	93%	97%	10%	93%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	3%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
	n	13	13	13	13	13	13	13	13	13
	Annual Minimum	<0.500	0.194	<0.000100	<0.000100	0.00754	<0.0000200	<0.0100	<0.000100	<0.000100
	Annual Maximum	<0.500	0.417	<0.000100	0.000130	0.0165	<0.0000200	<0.0100	0.000300	<0.000100
	Annual Mean	<0.500	0.341	<0.000100	0.000107	0.0130	<0.0000200	<0.0100	0.000172	<0.000100
	Annual Median	<0.500	0.372	<0.000100	0.000100	0.0132	<0.0000200	<0.0100	0.000170	<0.000100
FR_HC3	% < LRL	100%	0%	100%	46%	0%	100%	100%	8%	100%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
	n	16	16	16	16	16	16	16	16	16
	Annual Minimum	<0.500	0.148	<0.000100	<0.000100	0.0217	<0.0000200	<0.0100	<0.000100	<0.000100
	Annual Maximum	0.740	0.237	0.000110	0.000160	0.0512	<0.0000200	<0.0100	0.000560	0.000190
	Annual Mean	0.515	0.208	0.000101	0.000112	0.0407	<0.0000200	<0.0100	0.000199	0.000106
	Annual Median	<0.500	0.212	<0.000100	0.000105	0.0421	<0.0000200	<0.0100	0.000175	<0.000100
FR_FR1	% < LRL	94%	0%	88%	44%	0%	100%	100%	6%	94%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
	n	3	3	3	3	3	3	3	3	3
	Annual Minimum	<0.500	0.179	0.000100	<0.000100	0.0333	<0.0000200	<0.0100	0.000110	<0.000100
	Annual Maximum	0.570	0.219	0.000300	0.000110	0.0877	<0.0000200	<0.0100	0.000130	0.000110
	Annual Mean	0.523	0.204	0.000207	0.000103	0.0640	<0.0000200	<0.0100	0.000123	0.000103
	Annual Median	<0.500	0.213	0.000220	<0.000100	0.0709	<0.0000200	<0.0100	0.000130	<0.000100
FR_FRABEC1	% < LRL	67%	0%	0%	67%	0%	100%	100%	0%	67%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
	n	7	7	7	7	7	7	7	7	7
	Annual Minimum	<0.500	0.160	0.000180	<0.000100	0.0378	<0.0000200	<0.0100	0.000110	<0.000100
	Annual Maximum	<2.50	0.225	0.000290	0.000160	0.113	<0.0000200	<0.0100	0.000180	0.000120
	Annual Mean	0.585	0.183	0.000257	0.000119	0.0870	<0.0000200	<0.0100	0.000137	0.000104
	Annual Median	0.565	0.169	0.000280	0.000120	0.0897	<0.0000200	<0.0100	0.000130	<0.000100
FR_MULTIPLATE	% < LRL	71%	0%	0%	14%	0%	100%	100%	0%	71%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
	n	36	36	36	36	36	36	36	36	36
	Annual Minimum	<0.500	<0.100	<0.000100	<0.000100	0.0299	<0.0000200	<0.0100	<0.000100	<0.000100
	Annual Maximum	<2.50	0.236	0.000530	0.000400	0.104	0.0000310	0.0130	0.00128	0.000380
	Annual Mean	0.823	0.192	0.000234	0.000137	0.0708	0.0000204	0.0105	0.000228	0.000169
	Annual Median	0.840	0.194	0.000225	0.000117	0.0736	<0.0000200	<0.0100	0.000155	0.000140
FR_FR2	% < LRL	56%	3%	6%	19%	0%	94%	56%	19%	17%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	6%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
	n	7	7	7	7	7	7	7	7	7
	Annual Minimum	<0.500	<0.100	0.000180	<0.000100	0.0378	<0.0000200	<0.0100	<0.000100	<0.000100
	Annual Maximum	2.70	0.223	0.000310	0.000110	0.0876	<0.0000200	0.0120	0.000130	0.000130
	Annual Mean	1.19	0.185	0.000240	0.000103	0.0768	<0.0000200	0.0109	0.000111	0.000113
	Annual Median	0.940	0.191	0.000250	<0.000100	0.0823	<0.0000200	0.0110	0.000110	0.000110
GH_FR3	% < LRL	29%	14%	0%	71%	0%	100%	29%	43%	14%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
	n	7	7	7	7	7	7	7	7	7
	Annual Minimum	<0.500	<0.100	0.000200	<0.000100	0.0367	<0.0000200	<0.0100	0.000110	<0.000100
	Annual Maximum	2.80	0.240	0.000350	0.000160	0.0989	<0.0000200	0.0140	0.000150	0.000180
	Annual Mean	1.16	0.186	0.000296	0.000124	0.0750	<0.0000200	0.0111	0.000131	0.000136
	Annual Median	0.960	0.180	0.000300	0.000120	0.0777	<0.0000200	0.0110	0.000130	0.000140
FR_FR4	% < LRL	43%	14%	0%	14%	0%	100%	29%	0%	29%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-	-	-
	n	47	47	47	47	47	47	47	47	47
	Annual Minimum	<0.500	<0.100	0.000140	<0.000100	0.0176	<0.0000200	<0.0100	<0.000100	<0.000100
	Annual Maximum	7.00	0.240	0.000520	0.000310	0.0845	<0.0000400	<0.0200	0.000780	0.000370
	Annual Mean	1.76	0.178	0.000321	0.000136	0.0612	<0.0000200	0.0106	0.000191	0.000135
	Annual Median	0.830	0.190	0.000300	0.000120	0.0707	<0.0000200	0.0100	0.000150	0.000110
FR_FRCP1	% < LRL	49%	13%	0%	21%	0%	100%	51%	15%	45%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
	n	2	2	2	2	2	2	2	2	2
FR_FRCP1SW	Annual Minimum	<0.500	0.180	0.000210	0.000120	0.0446	<0.0000200	<0.0100	0.000130	<0.000100
	Annual Maximum	<2.50	0.219	0.000320	0.000130	0.0794	<0.0000200	0.0120	0.000160	0.000130

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Table C.1: Summary of Water Chemistry Data for Key Parameters for the FRO LAEMP Monitoring Stations, 2019

Station	Summary Statistic	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Antimony (mg/L)	Total Arsenic (mg/L)	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Chromium (mg/L)	Total Cobalt (mg/L)
FR_FRCP1SW	Annual Mean	<0.500	0.200	0.000265	0.000125	0.0620	<0.0000200	0.0110	0.000145	0.000115
	Annual Median	<2.50	0.200	0.000265	0.000125	0.0620	<0.0000200	0.0110	0.000145	0.000115
	% < LRL	100%	0%	0%	0%	0%	100%	50%	0%	50%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
FR_FRRD	n	20	20	20	20	20	20	20	20	20
	Annual Minimum	0.620	<0.100	<0.000100	<0.000100	0.0549	<0.0000200	<0.0100	<0.000100	<0.000100
	Annual Maximum	3.60	0.236	0.000220	0.000150	0.119	<0.0000200	0.0160	0.000410	0.000870
	Annual Mean	1.38	0.154	0.000146	0.000106	0.0977	<0.0000200	0.0132	0.000176	0.000283
	Annual Median	0.990	0.150	0.000145	<0.000100	0.105	<0.0000200	0.0140	0.000160	0.000165
	% < LRL	55%	25%	30%	55%	0%	100%	15%	5%	5%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
GH_PC2	n	6	6	6	6	6	6	6	6	6
	Annual Minimum	0.840	<0.100	<0.000100	<0.000100	0.0651	<0.0000200	<0.0100	0.000120	0.000140
	Annual Maximum	5.10	0.180	0.000380	0.000220	0.0958	<0.0000200	0.0130	0.000470	0.000320
	Annual Mean	1.55	0.142	0.000172	0.000130	0.0853	<0.0000200	0.0118	0.000215	0.000218
	Annual Median	0.840	0.150	0.000125	<0.000100	0.0887	<0.0000200	0.0120	0.000175	0.000195
	% < LRL	67%	17%	50%	67%	0%	100%	17%	0%	0%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
FR_FRABCH	n	41	41	41	41	41	41	41	41	41
	Annual Minimum	<0.500	0.0910	<0.000100	<0.000100	0.0506	<0.0000200	<0.0100	0.000100	0.000110
	Annual Maximum	2.70	0.203	0.000210	0.000280	0.113	<0.0000200	0.0150	0.000400	0.000360
	Annual Mean	1.08	0.149	0.000138	0.000122	0.0895	<0.0000200	0.0114	0.000202	0.000191
	Annual Median	0.890	0.150	0.000130	0.000110	0.0948	<0.0000200	0.0120	0.000170	0.000160
	% < LRL	54%	15%	29%	41%	0%	100%	20%	0%	0%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-
FR_FR5	n	3	3	3	3	3	3	3	3	3
	Annual Minimum	<2.50	<0.100	<0.000100	<0.000100	0.119	<0.0000200	<0.0100	0.000110	0.000100
	Annual Maximum	<2.50	0.160	0.000110	0.000130	0.124	<0.0000200	0.0110	0.000930	0.000260
	Annual Mean	<2.50	0.130	0.000103	0.000110	0.121	<0.0000200	0.0103	0.000397	0.000173
	Annual Median	<2.50	0.130	<0.000100	0.000100	0.120	<0.0000200	0.0100	0.000150	0.000160
	% < LRL	100%	33%	67%	33%	0%	100%	33%	0%	0%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	-	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-	-	-

> 5% of samples exceed the guideline or benchmark.
> 50% of samples exceed the guideline or benchmark.
> 95% of samples exceed the guideline or benchmark.

Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline
[a] Long-term average BCQWG for the Protection of Aquatic Life. [b] Short-term maximum BCQWG for the Protection of Aquatic Life. [c] Total nickel has Interim Screening Values instead of EVWQP Benchmarks. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

Table C.1: Summary of Water Chemistry Data for Key Parameters for the FRO LAEMP Monitoring Stations, 2019

Station	Summary Statistic	Total Iron (mg/L)	Total Lead (mg/L)	Total Lithium (mg/L)	Total Manganese (mg/L)	Total Mercury (mg/L)	Total Molybdenum (mg/L)	Total Nickel (mg/L)	Total Selenium (mg/L)	Total Silver (mg/L)
	n	29	29	29	29	29	29	29	29	29
	Annual Minimum	<0.0100	<0.0000500	0.00120	0.000270	<0.000000500	0.000396	<0.000500	0.000467	<0.0000100
	Annual Maximum	0.321	0.000399	0.00200	0.0196	0.00000406	0.000750	0.00121	0.00116	0.0000480
	Annual Mean	0.0429	0.0000707	0.00159	0.00196	0.000000935	0.000578	0.000543	0.000733	0.0000116
	Annual Median	<0.0100	<0.0000500	0.00160	0.000600	<0.000000500	0.000563	<0.000500	0.000733	<0.0000100
FR_UFR1	% < LRL	55%	83%	0%	0%	59%	0%	86%	0%	93%
	% > BCWQG[a]	-	0%	-	0%	17%	0%	-	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	0%	-	-
	n	13	13	13	13	13	13	13	13	13
	Annual Minimum	<0.0100	<0.0000500	<0.00100	<0.000100	<0.000000500	0.000328	<0.000500	0.000407	<0.0000100
	Annual Maximum	0.0260	<0.0000500	0.00110	0.00184	0.000000540	0.000672	<0.000500	0.00143	<0.0000100
	Annual Mean	0.0112	<0.0000500	0.00102	0.000274	0.000000503	0.000579	<0.000500	0.00105	<0.0000100
	Annual Median	<0.0100	<0.0000500	<0.00100	<0.000100	<0.000000500	0.000595	<0.000500	0.00112	<0.0000100
FR_HC3	% < LRL	85%	100%	85%	69%	92%	0%	100%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	0%	0%	-	0%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	0%	-	-
	n	16	16	16	16	16	16	16	16	16
	Annual Minimum	<0.0100	<0.0000500	0.00220	0.00143	<0.000000500	0.000497	<0.000500	0.00358	<0.0000100
	Annual Maximum	0.159	0.000153	0.00880	0.00650	0.00000213	0.000837	0.00167	0.0274	0.0000130
	Annual Mean	0.0288	0.0000627	0.00573	0.00274	0.000000674	0.000748	0.000771	0.0155	0.0000102
	Annual Median	0.0115	<0.0000500	0.00570	0.00217	<0.000000500	0.000770	0.000660	0.0145	<0.0000100
FR_FR1	% < LRL	38%	81%	0%	0%	56%	0%	19%	0%	94%
	% > BCWQG[a]	-	0%	-	0%	6%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	0%	-	-
	n	3	3	3	3	3	3	3	4	3
	Annual Minimum	<0.0100	<0.0000500	0.00970	0.00120	<0.000000500	0.000761	0.00145	0.00859	<0.0000100
	Annual Maximum	0.0140	<0.0000500	0.0462	0.00161	0.00000140	0.00170	0.00608	0.0554	<0.0000100
	Annual Mean	0.0113	<0.0000500	0.0260	0.00146	0.000000983	0.00122	0.00380	0.0358	<0.0000100
	Annual Median	<0.0100	<0.0000500	0.0220	0.00157	0.00000105	0.00119	0.00388	0.0397	<0.0000100
FR_FRABEC1	% < LRL	67%	100%	0%	0%	33%	0%	0%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	33%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	33%	0%	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	0%	-	-
	n	7	7	7	7	7	7	7	8	7
	Annual Minimum	<0.0100	<0.0000500	0.0102	0.00171	<0.000000500	0.00105	0.00318	0.0108	<0.0000100
	Annual Maximum	0.0130	<0.0000500	0.0672	0.00517	0.000000630	0.00173	0.00518	0.0625	<0.0000100
	Annual Mean	0.0107	<0.0000500	0.0436	0.00297	0.000000533	0.00141	0.00433	0.0476	<0.0000100
	Annual Median	<0.0100	<0.0000500	0.0462	0.00302	<0.000000500	0.00142	0.00444	0.0576	<0.0000100
FR_MULTIPLATE	% < LRL	57%	100%	0%	0%	71%	0%	0%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	0%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	0%	-	-
	n	36	36	36	36	36	36	36	36	36
	Annual Minimum	0.0110	<0.0000500	0.00190	0.00202	<0.000000500	0.000669	<0.000500	0.000878	<0.0000100
	Annual Maximum	0.541	0.000398	0.0619	0.0330	<0.00000500	0.00253	0.00967	0.0545	0.0000220
	Annual Mean	0.0724	0.0000744	0.0311	0.0146	0.000000707	0.00134	0.00362	0.0323	0.0000103
	Annual Median	0.0470	<0.0000500	0.0309	0.0144	<0.000000500	0.00134	0.00325	0.0362	<0.0000100
FR_FR2	% < LRL	0%	78%	0%	0%	61%	0%	3%	0%	94%
	% > BCWQG[a]	-	0%	-	0%	8%	0%	-	97%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	11%	0%	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	0%	-	-
	n	7	7	7	7	7	7	7	7	7
	Annual Minimum	0.0190	<0.0000500	0.0112	0.00417	<0.000000500	0.00107	0.00225	0.0102	<0.0000100
	Annual Maximum	0.0490	<0.0000500	0.0542	0.0161	0.000000810	0.00175	0.00415	0.0544	<0.0000100
	Annual Mean	0.0316	<0.0000500	0.0371	0.0107	0.000000544	0.00143	0.00349	0.0403	<0.0000100
	Annual Median	0.0280	<0.0000500	0.0438	0.0115	<0.000000500	0.00143	0.00383	0.0383	<0.0000100
GH_FR3	% < LRL	0%	100%	0%	0%	86%	0%	0%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	0%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	0%	-	-
	n	7	7	7	7	7	7	7	7	7
	Annual Minimum	0.0260	<0.0000500	0.0112	0.00492	<0.000000500	0.00104	0.00274	0.0142	<0.0000100
	Annual Maximum	0.0380	0.0000540	0.0648	0.0177	0.000000660	0.00213	0.00959	0.142	<0.0000100
	Annual Mean	0.0303	0.0000506	0.0398	0.0103	0.000000529	0.00164	0.00573	0.0718	<0.0000100
	Annual Median	0.0280	<0.0000500	0.0439	0.0104	<0.000000500	0.00169	0.00476	0.0558	<0.0000100
FR_FR4	% < LRL	0%	86%	0%	0%	71%	0%	0%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	0%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	29%	29%	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	0%	-	-
	n	47	47	47	47	47	47	47	47	47
	Annual Minimum	<0.0100	<0.0000500	0.0129	0.000280	<0.000000500	0.000863	0.00154	0.0216	<0.0000100
	Annual Maximum	0.418	0.000349	0.0825	0.0326	<0.00000500	0.00302	0.0405	0.646	<0.0000200
	Annual Mean	0.0375	0.0000676	0.0405	0.00639	0.000000656	0.00184	0.0109	0.155	<0.0000100
	Annual Median	0.0220	<0.0000500	0.0339	0.00529	<0.000000500	0.00168	0.00704	0.0690	<0.0000100
FR_FRCP1	% < LRL	17%	81%	0%	0%	72%	0%	0%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	9%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	60%	49%	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	19%	19%	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	15%	-	-
	n	2	2	2	2	2	2	2	2	2
FR_FRCP1SW	Annual Minimum	0.0110	<0.0000500	0.0198	0.00271	<0.000000500	0.00141	0.00276	0.0309	<0.0000100
	Annual Maximum	0.0240	0.0000570	0.0545	0.00603	0.000000690	0.00183	0.00914	0.140	<0.0000100

> 5% of samples exceed the guideline or benchmark.
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Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline

[a] Long-term average BCQWG for the Protection of Aquatic Life. [b] Short-term maximum BCQWG for the Protection of Aquatic Life. [c] Total nickel has an Interim Screening Values instead of EVWQP Benchmarks. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

Table C.1: Summary of Water Chemistry Data for Key Parameters for the FRO LAEMP Monitoring Stations, 2019

Station	Summary Statistic	Total Iron (mg/L)	Total Lead (mg/L)	Total Lithium (mg/L)	Total Manganese (mg/L)	Total Mercury (mg/L)	Total Molybdenum (mg/L)	Total Nickel (mg/L)	Total Selenium (mg/L)	Total Silver (mg/L)
FR_FRCP1SW	Annual Mean	0.0175	0.0000535	0.0372	0.00437	0.000000595	0.00162	0.00595	0.0855	<0.0000100
	Annual Median	0.0175	0.0000535	0.0372	0.00437	0.000000595	0.00162	0.00595	0.0855	<0.0000100
	% < LRL	0%	50%	0%	0%	50%	0%	0%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	0%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	50%	50%	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	0%	-	-
FR_FRRD	n	20	20	20	20	20	20	20	20	20
	Annual Minimum	<0.0100	<0.0000500	0.0226	0.000590	<0.000000500	0.000495	0.000560	0.0391	<0.0000100
	Annual Maximum	0.0980	0.0000990	0.0492	0.00953	0.000000900	0.00126	0.00351	0.103	<0.0000100
	Annual Mean	0.0188	0.0000524	0.0382	0.00219	0.000000529	0.000897	0.00164	0.0779	<0.0000100
	Annual Median	0.0105	<0.0000500	0.0399	0.00172	<0.000000500	0.000896	0.00173	0.0805	<0.0000100
	% < LRL	45%	95%	0%	0%	90%	0%	0%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	0%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	0%	60%	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	0%	-	-
GH_PC2	n	6	6	6	6	6	6	6	6	6
	Annual Minimum	<0.0100	<0.0000500	0.0229	0.000470	<0.000000500	0.000644	<0.000500	0.0484	<0.0000100
	Annual Maximum	0.278	0.000223	0.0509	0.0128	0.00000129	0.0310	0.00792	0.122	<0.0000100
	Annual Mean	0.0683	0.0000810	0.0350	0.00534	0.000000662	0.00605	0.00215	0.0905	<0.0000100
	Annual Median	0.0230	<0.0000500	0.0339	0.00481	<0.000000500	0.000884	0.000920	0.0994	<0.0000100
	% < LRL	17%	67%	0%	0%	67%	0%	17%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	17%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	17%	67%	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	0%	-	-
FR_FRABCH	n	41	41	41	41	41	41	41	41	41
	Annual Minimum	<0.0100	<0.0000500	0.0164	0.00262	<0.000000500	0.000569	<0.000500	0.0298	<0.0000100
	Annual Maximum	0.316	0.00192	0.0376	0.0206	0.00000300	0.00128	0.00247	0.103	<0.0000100
	Annual Mean	0.0483	0.000110	0.0305	0.00660	0.000000724	0.000852	0.00125	0.0734	<0.0000100
	Annual Median	0.0230	<0.0000500	0.0325	0.00544	<0.000000500	0.000809	0.00115	0.0789	<0.0000100
	% < LRL	5%	73%	0%	0%	68%	0%	2%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	10%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	0%	63%	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	0%	-	-
FR_FR5	n	3	3	3	3	3	3	3	3	3
	Annual Minimum	<0.0100	<0.0000500	0.0233	0.00126	<0.000000500	0.000616	0.000530	0.0731	<0.0000100
	Annual Maximum	0.0130	<0.0000500	0.0289	0.00254	<0.000000500	0.000687	0.000810	0.0796	<0.0000100
	Annual Mean	0.0120	<0.0000500	0.0265	0.00175	<0.000000500	0.000645	0.000653	0.0772	<0.0000100
	Annual Median	0.0130	<0.0000500	0.0274	0.00146	<0.000000500	0.000631	0.000620	0.0790	<0.0000100
	% < LRL	33%	100%	0%	0%	100%	0%	0%	0%	100%
	% > BCWQG[a]	-	0%	-	0%	0%	0%	-	100%	0%
	% > BCWQG[b]	0%	0%	-	0%	-	0%	-	-	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	-	-	0%	100%	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	0%	0%	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	0%	-	-

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Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline
[a] Long-term average BCQWG for the Protection of Aquatic Life. [b] Short-term maximum BCQWG for the Protection of Aquatic Life. [c] Total nickel has Interim Screening Values instead of EVWQP Benchmarks. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

Table C.1: Summary of Water Chemistry Data for Key Parameters for the FRO LAEMP Monitoring Stations, 2019

Station	Summary Statistic	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Aluminum (mg/L)	Dissolved Cadmium (mg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)
FR_UFR1	n	29	29	29	29	29	29	29
	Annual Minimum	<0.0000100	0.000321	<0.00300	<0.00300	<0.00000500	<0.000200	<0.0100
	Annual Maximum	0.0000200	0.000544	0.0137	0.106	0.0000252	<0.000500	0.0630
	Annual Mean	0.0000104	0.000450	0.00365	0.00908	0.00000909	0.000232	0.0125
	Annual Median	<0.0000100	0.000466	<0.00300	<0.00300	0.00000780	<0.000200	<0.0100
	% < LRL	93%	0%	86%	72%	7%	93%	93%
	% > BCWQG[a]	0%	0%	0%	3%	0%	17%	-
	% > BCWQG[b]	-	-	0%	3%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-
FR_HC3	n	13	13	13	13	13	13	13
	Annual Minimum	<0.0000100	0.000429	<0.00300	<0.00300	<0.00000500	<0.000200	<0.0100
	Annual Maximum	<0.0000100	0.00102	<0.00300	0.00300	0.00000700	0.00107	<0.0100
	Annual Mean	<0.0000100	0.000856	<0.00300	0.00300	0.00000518	0.000267	<0.0100
	Annual Median	<0.0000100	0.000906	<0.00300	<0.00300	<0.00000500	<0.000500	<0.0100
	% < LRL	100%	0%	100%	92%	69%	92%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	69%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-
FR_FR1	n	16	16	16	16	16	16	16
	Annual Minimum	<0.0000100	0.000475	<0.00300	<0.00300	0.00000630	<0.000200	<0.0100
	Annual Maximum	0.0000110	0.00130	0.0244	0.0153	0.0000373	0.00137	0.0110
	Annual Mean	0.0000101	0.000966	0.00439	0.00434	0.0000164	0.000273	0.0101
	Annual Median	<0.0000100	0.00103	<0.00300	<0.00300	0.0000155	<0.000500	<0.0100
	% < LRL	94%	0%	81%	75%	0%	94%	94%
	% > BCWQG[a]	0%	0%	0%	0%	0%	13%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-
FR_FRABEC1	n	3	3	3	3	3	3	3
	Annual Minimum	<0.0000100	0.000863	<0.00300	<0.00300	0.0000183	0.000240	<0.0100
	Annual Maximum	0.0000110	0.00327	0.00470	<0.00300	0.0000644	<0.000500	<0.0100
	Annual Mean	0.0000103	0.00203	0.00357	<0.00300	0.0000364	0.000240	<0.0100
	Annual Median	<0.0000100	0.00197	<0.00300	<0.00300	0.0000264	0.000240	<0.0100
	% < LRL	67%	0%	67%	100%	0%	67%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-
FR_MULTIPLATE	n	7	7	7	6	6	6	6
	Annual Minimum	<0.0000100	0.000977	<0.00300	<0.00300	0.0000237	<0.000200	<0.0100
	Annual Maximum	<0.0000100	0.00415	0.00310	<0.00300	0.0000539	<0.000500	<0.0100
	Annual Mean	<0.0000100	0.00306	0.00301	<0.00300	0.0000429	<0.000200	<0.0100
	Annual Median	<0.0000100	0.00340	<0.00300	<0.00300	0.0000495	<0.000500	<0.0100
	% < LRL	100%	0%	86%	100%	0%	100%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	17%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-
FR_FR2	n	36	36	36	36	36	36	36
	Annual Minimum	<0.0000100	0.000752	<0.00300	<0.00300	0.00000810	<0.000200	<0.0100
	Annual Maximum	0.0000330	0.00436	0.0131	0.00860	0.0000885	<0.000500	0.0370
	Annual Mean	0.0000109	0.00245	0.00351	0.00321	0.0000514	0.000202	0.0116
	Annual Median	<0.0000100	0.00255	<0.00300	<0.00300	0.0000532	<0.000200	<0.0100
	% < LRL	83%	0%	86%	92%	0%	94%	78%
	% > BCWQG[a]	0%	0%	0%	0%	0%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-
GH_FR3	n	7	7	7	7	7	7	7
	Annual Minimum	<0.0000100	0.00105	<0.00300	<0.00300	0.0000253	<0.000200	<0.0100
	Annual Maximum	<0.0000100	0.00379	0.00330	<0.00300	0.0000658	<0.000500	0.0150
	Annual Mean	<0.0000100	0.00290	0.00304	<0.00300	0.0000537	0.000208	0.0110
	Annual Median	<0.0000100	0.00313	<0.00300	<0.00300	0.0000554	0.000200	<0.0100
	% < LRL	100%	0%	86%	100%	0%	71%	71%
	% > BCWQG[a]	0%	0%	0%	0%	0%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-
FR_FR4	n	7	7	7	7	7	7	7
	Annual Minimum	<0.0000100	0.00112	<0.00300	<0.00300	0.0000136	<0.000200	<0.0100
	Annual Maximum	0.0000170	0.00585	0.00500	<0.00300	0.0000645	0.00100	<0.0100
	Annual Mean	0.0000113	0.00371	0.00334	<0.00300	0.0000403	0.000320	<0.0100
	Annual Median	<0.0000100	0.00321	<0.00300	<0.00300	0.0000417	<0.000200	<0.0100
	% < LRL	71%	0%	71%	100%	0%	71%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	-	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark	-	-	-	-	-	-	-
FR_FRCP1	n	47	47	47	47	47	47	47
	Annual Minimum	<0.0000100	0.00143	<0.00300	<0.00300	<0.00000500	<0.000200	<0.0100
	Annual Maximum	0.0000430	0.0218	0.00790	0.00395	0.0000693	0.000550	<0.0200
	Annual Mean	0.0000156	0.00620	0.00347	0.00306	0.0000314	0.000232	0.0103
	Annual Median	<0.0000100	0.00349	<0.00300	<0.00300	0.0000335	0.000205	<0.0100
	% < LRL	51%	0%	72%	91%	11%	83%	91%
	% > BCWQG[a]	0%	17%	0%	0%	0%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-
FR_FRCP1SW	n	2	2	2	2	2	2	2
	Annual Minimum	<0.0000100	0.00189	<0.00300	<0.00300	0.0000249	0.000220	<0.0100
	Annual Maximum	0.0000120	0.00581	<0.00300	<0.00300	0.0000439	<0.000500	0.0110

> 5% of samples exceed the guideline or benchmark.

> 50% of samples exceed the guideline or benchmark.

> 95% of samples exceed the guideline or benchmark.

Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline

[a] Long-term average BCQWG for the Protection of Aquatic Life. [b] Short-term maximum BCQWG for the Protection of Aquatic Life. [c] Total nickel has an Interim Screening Values instead of EVWQP Benchmarks. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

Table C.1: Summary of Water Chemistry Data for Key Parameters for the FRO LAEMP Monitoring Stations, 2019

Station	Summary Statistic	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Aluminum (mg/L)	Dissolved Cadmium (mg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)
FR_FRCP1SW	Annual Mean	0.0000110	0.00385	<0.00300	<0.00300	0.0000344	0.000220	0.0105
	Annual Median	0.0000110	0.00385	<0.00300	<0.00300	0.0000344	0.000220	0.0105
	% < LRL	50%	0%	100%	100%	0%	50%	50%
	% > BCWQG[a]	0%	0%	0%	0%	0%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-
FR_FRRD	n	20	20	20	20	20	20	20
	Annual Minimum	<0.0000100	0.00214	<0.00300	<0.00300	0.0000239	<0.000200	<0.0100
	Annual Maximum	<0.0000100	0.00452	<0.00300	<0.00300	0.0000582	<0.000500	<0.0100
	Annual Mean	<0.0000100	0.00368	<0.00300	<0.00300	0.0000401	0.000208	<0.0100
	Annual Median	<0.0000100	0.00381	<0.00300	<0.00300	0.0000410	<0.000200	<0.0100
	% < LRL	100%	0%	100%	100%	0%	95%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	-	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-
GH_PC2	n	6	6	6	5	5	5	5
	Annual Minimum	<0.0000100	0.00255	<0.00300	<0.00300	0.0000187	<0.000200	<0.0100
	Annual Maximum	0.0000160	0.00540	<0.00600	<0.00300	0.0000482	<0.000500	0.0110
	Annual Mean	0.0000110	0.00357	0.00350	<0.00300	0.0000351	<0.000200	0.0102
	Annual Median	<0.0000100	0.00333	<0.00300	<0.00300	0.0000380	<0.000500	<0.0100
	% < LRL	83%	0%	83%	100%	20%	100%	80%
	% > BCWQG[a]	0%	0%	0%	0%	0%	40%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-
FR_FRABCH	n	41	41	41	40	40	40	40
	Annual Minimum	<0.0000100	0.00168	<0.00300	<0.00300	<0.00000500	<0.000200	<0.0100
	Annual Maximum	0.0000110	0.00373	0.0281	0.0236	0.0000546	<0.000500	0.0570
	Annual Mean	0.0000100	0.00294	0.00402	0.00353	0.0000320	0.000266	0.0112
	Annual Median	<0.0000100	0.00310	<0.00300	<0.00300	0.0000319	<0.000200	<0.0100
	% < LRL	95%	0%	76%	95%	3%	95%	98%
	% > BCWQG[a]	0%	0%	0%	0%	0%	30%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-
FR_FR5	n	3	3	3	3	3	3	3
	Annual Minimum	<0.0000100	0.00248	<0.00300	<0.00300	0.0000197	<0.000500	<0.0100
	Annual Maximum	<0.0000100	0.00290	0.0195	<0.00300	0.0000240	<0.000500	<0.0100
	Annual Mean	<0.0000100	0.00268	0.00850	<0.00300	0.0000223	<0.000500	<0.0100
	Annual Median	<0.0000100	0.00266	<0.00300	<0.00300	0.0000231	<0.000500	<0.0100
	% < LRL	100%	0%	67%	100%	0%	100%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	33%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > EVWQP Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > EVWQP Level 2 Benchmark[c]	-	-	-	-	-	-	-
	% > EVWQP Level 3 Benchmark[c]	-	-	-	-	-	-	-

> 5% of samples exceed the guideline or benchmark.
> 50% of samples exceed the guideline or benchmark.
> 95% of samples exceed the guideline or benchmark.

Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline

[a] Long-term average BCQWG for the Protection of Aquatic Life. [b] Short-term maximum BCQWG for the Protection of Aquatic Life. [c] Total nickel has Interim Screening Values instead of EVWQP Benchmarks. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

Table C.2. Temporal Changes in Water Chemistry Analytes at Stations, FRO LAEMP, 2012 to 2019

Parameter	Status	Station	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]								Q2. Is the 2019 annual mean greater or less than all annual historical means (2012 - 2018) and the previous year (2018)?[c]									
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2019 vs. 2012-2018	2019 vs. 2018
Total Selenium	Reference	FR_UFR1	7	<0.001	b	-3.3	-4.2	7.0	**16**	**19**	**20**	**23**	C	C	C	BC	AB	AB	AB	A	No	No
		FR_HC3	6	<0.001	b	4.7	-	**22**	**30**	**33**	**32**	**38**	C	BC	-	AB	A	A	A	A	No	No
	Mine-exposed	FR_FR1	7	0.011	b	54	22	8	-12	60	9	21	AB	A	AB	AB	B	A	AB	AB	No	No
		FR_FRABEC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR2	7	<0.001	b	21	1.4	-4.4	-3.2	**29**	**35**	17	C	ABC	BC	C	C	AB	A	ABC	No	No
		GH_FR3	3	0.015	b	15	-9.0	-19	-	-	-	-	AB	A	AB	B	-	-	-	-	-	-
		FR_FR4	6	<0.001	b	3.5	-3.4	-21	-22	11	-1.8	-	AB	A	AB	B	B	A	AB	-	-	-
		FR_FRCP1	4	0.017	-	-	-	b	-21	10	50	8	-	-	-	AB	B	AB	A	AB	No	No
		FR_FRCP1SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FRRD	4	0.002	-	-	-	b	-3.4	**25**	14	14	-	-	-	B	B	A	AB	AB	No	No
		GH_PC2	5	<0.001	b	**16**	**16**	5.9	-	-	**25**	**32**	C	AB	AB	BC	-	-	A	A	No	No
		FR_FRABCH	4	<0.001	-	-	-	b	-4.7	6.7	**19**	10	-	-	-	B	B	AB	A	AB	No	No
		FR_FR5	6	0.007	b	18	**23**	10	9.1	**21**	**25**	-	B	AB	A	AB	AB	A	A	-	-	-
Nitrate-N	Reference	FR_UFR1	7	<0.001	b	3.1	**169**	**203**	**227**	**231**	**144**	**176**	B	B	A	A	A	A	A	A	No	No
		FR_HC3	6	<0.001	b	20	-	**64**	**63**	**50**	**60**	**61**	B	B	-	A	A	A	A	A	No	No
	Mine-exposed	FR_FR1	7	<0.001	b	**59**	15	15	-17	27	-27	-25	BC	A	ABC	ABC	BC	AB	C	C	No	No
		FR_FRABEC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR2	7	<0.001	b	26	14	**34**	**55**	**58**	**40**	**40**	C	ABC	BC	AB	A	A	AB	AB	No	No
		GH_FR3	3	0.383	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR4	6	0.163	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-
		FR_FRCP1	4	0.163	-	-	-	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-
		FR_FRCP1SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FRRD	4	0.868	-	-	-	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-
		GH_PC2	5	0.048	b	21	24	6	-	-	-12.1	9.5	A	A	A	A	-	-	A	A	No	No
		FR_FRABCH	4	0.097	-	-	-	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-
		FR_FR5	6	0.001	b	**25**	**32**	12	15	16	4	-	C	AB	A	ABC	ABC	ABC	BC	-	-	-
Sulphate	Reference	FR_UFR1	7	0.071	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-
		FR_HC3	6	0.006	b	-4.3	-	23	23	**32**	21	24	B	B	-	AB	AB	A	AB	AB	No	No
	Mine-exposed	FR_FR1	7	0.059	ns	ns	ns	ns	ns	**ns**	ns	ns	-	-	-	-	-	-	-	-	-	-
		FR_FRABEC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR2	7	0.030	b	14	0.78	4.0	2.2	19	23	11	A	A	A	A	A	A	A	A	No	No
		GH_FR3	3	0.277	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR4	6	0.065	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-
		FR_FRCP1	4	0.077	-	-	-	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-
		FR_FRCP1SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FRRD	4	0.040	-	-	-	b	-3.5	16	7.6	11.1	-	-	-	A	A	A	A	A	No	No
		GH_PC2	5	<0.001	b	9.2	8.0	11	-	-	**33**	**28**	C	BC	C	BC	-	-	A	AB	No	No
		FR_FRABCH	4	0.350	-	-	-	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-
		FR_FR5	6	0.042	b	10	15	11	15	20	**23**	-	B	AB	AB	AB	AB	AB	A	-	-	-
Total Nickel	Reference	FR_UFR1	7	0.121	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-
		FR_HC3	6	0.185	ns	ns	-	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	FR_FR1	7	<0.001	b	**75**	**37**	5.4	6.1	21	33	8	C	A	AB	BC	BC	BC	ABC	BC	No	No
		FR_FRABEC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_MULTIPLATE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR2	7	<0.001	b	12	**-37**	**-34**	-18	-9.2	-9	14	AB	A	C	C	BC	AB	AB	A	No	No
		GH_FR3	3	<0.001	b	-4.4	**-43**	**-48**	-	-	-	-	A	A	B	B	-	-	-	-	-	-
		FR_FR4	6	<0.001	b	2.7	-28	**-41**	**-36**	-22	-22	-	AB	A	BC	C	C	ABC	ABC	-	-	-
		FR_FRCP1	4	0.017	-	-	-	b	-11.3	14	60	16	-	-	-	AB	B	AB	A	AB	No	No
		FR_FRCP1SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FRRD	4	0.004	-	-	-	b	35	**65**	-17	26	-	-	-	B	AB	A	B	AB	No	No
		GH_PC2	5	0.003	b	4.7	-46	-41	-	-	-53	5	AB	A	AB	AB	-	-	B	AB	No	No
		FR_FRABCH	4	<0.001	-	-	-	b	**74**	**72**	34	30	-	-	-	B	A	A	AB	AB	No	No
		FR_FR5	6	0.040	b	-0.21	-38	-42	17	-18	-18	-	AB	AB	AB	B	A	AB	AB	-	-	-

(grey)	P-value < 0.05 (annual variation).
(lightest green)	> 20% Decrease in concentration.
(light green)	> 33% Decrease in concentration.
(green)	> 43% Decrease in concentration.
(dark green)	> 50% Decrease in concentration.
(lightest blue)	> 25% Increase in concentration.
(light blue)	> 50% Increase in concentration.
(blue)	> 75% Increase in concentration.
(dark blue)	> 100% Increase in concentration.
*Bold	Significant increase or decrease from base year[b].

[a] The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Montl

[b] Magnitude of Difference (MOD) was calculated as the concentrations in each year minus the concentration in the first year divided by the concentration in the fist year × 10

[c] Significance between each year determined using all pairwise comparisons with Tukey correctior

[d] "ns" = not significant; "-" insufficient data for comparison, where insufficient data is less than 6 months of recorded data

Table C.3: Pearson Correlations of Spring Water Analytes and PCA Axis scores, FRO LAEMP, 2012 to 2019

Variable	PCA1 (56%)		PCA2 (26%)	
	P-value	r_s	P-value	r_s
Temperature (C)	0.009	0.305	<0.001	0.506
Total Dissolved Solids (mg/L)	<0.001	0.758	<0.001	0.563
Alkalinity (mg/L as CaCO3)	<0.001	0.779	<0.001	0.506
Nitrate (mg/L)	<0.001	0.761	<0.001	0.546
Nitrite (mg/L)	<0.001	0.858	0.128	0.181
Ammonia (mg/L)	<0.001	0.455	0.085	-0.205
Phosphorus (mg/L)	<0.001	0.762	<0.001	-0.533
Sulphate (mg/L)	<0.001	0.732	<0.001	0.605
Dissolved Aluminum (mg/L)	0.0384	0.245	<0.001	-0.636
Total Antimony (mg/L)	<0.001	0.874	0.087	0.203
Total Arsenic (mg/L)	<0.001	0.691	<0.001	-0.690
Total Barium (mg/L)	<0.001	0.796	0.071	0.214
Dissolved Cadmium (mg/L)	<0.001	0.881	0.008	0.309
Total Chromium (mg/L)	<0.001	0.596	<0.001	-0.737
Total Cobalt (mg/L)	<0.001	0.755	<0.001	-0.591
Total Copper (mg/L)	<0.001	0.622	<0.001	-0.680
Total Iron (mg/L)	<0.001	0.789	<0.001	-0.477
Total Lead (mg/L)	<0.001	0.737	<0.001	-0.620
Total Lithium (mg/L)	<0.001	0.818	<0.001	0.558
Total Manganese (mg/L)	<0.001	0.844	0.041	-0.241
Total Molybdenum (mg/L)	<0.001	0.894	0.006	0.323
Total Nickel (mg/L)	<0.001	0.938	0.328	0.117
Total Selenium (mg/L)	<0.001	0.803	<0.001	0.544
Total Thallium (mg/L)	<0.001	0.695	<0.001	-0.650
Total Uranium (mg/L)	<0.001	0.770	<0.001	0.556
Total Zinc (mg/L)	<0.001	0.744	<0.001	-0.537

[blue] $r_s \geq 0.6$ or ≤ -0.6.

[grey] significant correlation (p-value < 0.05).

Notes: All water chemistry from May and June of the sampled year included.

Table C.4: Pearson Correlations of Summer Analytes and PCA Axis scores, FRO LAEMP, 2012 to 2019

Variable	PCA1 (47%)		PCA2 (27%)	
	P-value	r_s	P-value	r_s
Temperature (C)	<0.001	0.476	0.491	0.088
Total Dissolved Solids (mg/L)	<0.001	0.842	<0.001	0.450
Alkalinity (mg/L as CaCO3)	<0.001	0.769	<0.001	0.476
Nitrate (mg/L)	<0.001	0.819	0.006	0.342
Nitrite (mg/L)	<0.001	0.960	0.861	0.022
Ammonia (mg/L)	0.007	0.334	0.024	-0.283
Phosphorus (mg/L)	0.087	0.216	<0.001	-0.835
Sulphate (mg/L)	<0.001	0.849	<0.001	0.464
Dissolved Aluminum (mg/L)	0.980	-0.003	<0.001	-0.496
Total Antimony (mg/L)	<0.001	0.879	0.688	-0.051
Total Arsenic (mg/L)	0.014	0.305	<0.001	-0.655
Total Barium (mg/L)	<0.001	0.693	0.019	0.292
Dissolved Cadmium (mg/L)	<0.001	0.955	0.263	0.142
Total Chromium (mg/L)	0.008	0.328	<0.001	-0.878
Total Cobalt (mg/L)	<0.001	0.527	<0.001	-0.779
Total Copper (mg/L)	0.029	0.273	<0.001	-0.608
Total Iron (mg/L)	<0.001	0.466	<0.001	-0.753
Total Lead (mg/L)	<0.001	0.438	<0.001	-0.827
Total Lithium (mg/L)	<0.001	0.904	0.001	0.400
Total Manganese (mg/L)	<0.001	0.764	0.236	-0.150
Total Molybdenum (mg/L)	<0.001	0.933	0.795	0.033
Total Nickel (mg/L)	<0.001	0.908	0.832	0.027
Total Selenium (mg/L)	<0.001	0.877	0.002	0.382
Total Thallium (mg/L)	<0.001	0.514	<0.001	-0.729
Total Uranium (mg/L)	<0.001	0.850	<0.001	0.422
Total Zinc (mg/L)	<0.001	0.423	<0.001	-0.819

[blue] $r_s \geq 0.6$ or ≤ -0.6.

[grey] significant correlation (p-value < 0.05).

Notes: All water chemistry in July and August of the sampled year included.

Table C.5: Concentrations of Selenium Species Measured in Water Samples, FRO LAEMP, January to December, 2019

Water-body		Biological Monitoring Area	Sample Date	Dissolved Selenium Species (µg/L)								
				Selenate	Selenite	Dimethylselenoxide	Methylseleninic Acid	Selenocyanate	Selenomethionine	Selenosulphate	Unknown Species	Sum of Species
Fording River	Reference	RG_HENUP	20-Jun-19	0.3	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	0.3
			11-Sep-19	1.1	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	1.1
		RG_FO26	20-Jun-19	0.3	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	0.3
			10-Sep-19	0.6	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	0.6
		RG_UFR1	14-Feb-19	0.7	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	0.7
			10-Dec-19	0.7	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	0.7
		RG_FODHE	20-Jun-19	2.1	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	2.1
			10-Sep-19	9.1	0.065	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	9.1
		RG_FOUCL	12-Sep-19	15	0.076	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	15
			9-Dec-19	35	0.0790	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	35
		RG_FOUNGD	19-Jun-19	3.3	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	3.3
			9-Dec-19	46	0.089	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	46
		RG_FODNGD	12-Feb-19	55	0.15	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	55
			19-Jun-19	8.0	0.055	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	8.0
			9-Dec-19	41	0.24	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	42
		RG_MP1	13-Feb-19	34	0.11	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	34
			18-Jun-19	7.4	0.15	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	7.5
			30-Sep-19	36	0.23	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	36
			9-Dec-19	51	0.29	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	51
		RG_FOUSH	13-Feb-19	33	0.13	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	33
			17-Jun-19	5.9	0.13	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	6.0
			13-Sep-19	45	0.35	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	45
			9-Dec-19	38	0.25	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	38
		RG_FOUKI	12-Feb-19	42	0.15	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	42
			18-Jun-19	9	0.15	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	9
			5-Sep-19	37	0.36	<0.010	0.02	<0.040	<0.010	<0.060	<0.060	37
			9-Dec-19	43	0.28	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	43
		RG_FOBKS	12-Feb-19	36	0.13	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	36
			17-Jun-19	8	0.16	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	8
			9-Sep-19	32	0.41	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	33
		RG_SCOUTDS	12-Sep-19	32	0.36	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	32
			10-Dec-19	101	0.36	<0.010	0.011	<0.040	<0.010	<0.060	<0.060	101
		RG_FOBSC	18-Jun-19	11	0.14	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	11
			13-Sep-19	48	0.34	<0.010	0.022	<0.040	<0.010	<0.060	<0.060	49
			10-Dec-19	109	0.37	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	109
		RG_FOBCP	18-Jun-19	20	0.13	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	20
			6-Sep-19	43	0.26	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	43
			11-Dec-19	97	0.37	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	97
		RG_FRCP1SW	19-Jun-19	27	0.17	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	27
			13-Sep-19	29	0.19	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	29
			12-Dec-19	73	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	73
		RG_FRUPO	11-Feb-19	69	0.069	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	69
			19-Jun-19	35	0.11	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	35
			7-Sep-19	62	0.18	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	62
			11-Dec-19	72	0.10	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	72
		RG_FODPO	14-Feb-19	57	<0.050	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	57
			21-Jun-19	30	0.100	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	30
			7-Sep-19	61	0.119	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	61
			12-Dec-19	92	0.38	<0.010	0.013	<0.040	<0.010	<0.060	<0.060	92
		RG_FO22	14-Feb-19	46	0.065	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	46
			21-Jun-19	34	0.11	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	34
			16-Sep-19	64	0.17	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	64
			11-Dec-19	60	0.090	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	60
		RG_FOUEW	13-Feb-19	64	0.11	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	64
			20-Jun-19	26	0.081	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	26
			4-Sep-19	57	0.20	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	57
			11-Dec-19	40	0.10	<0.010	<0.010	<0.040	<0.010	<0.060	<0.060	41

Notes: The sum of species was calculated using zero for values reported as < LRL. Effluent from West Line Creek was diverted to the AWTF during AWTF/AOP restart (Oct 29th 2018 to present), therefore water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT. Water quality results from LC_LCUSWLC and RG_LCUT were combined during this period for data interpretation. "-" indicates no data available.

Table C.6: Results of Quarterly and Semi-Annual Toxicity Tests (Golder 2020b)

Quarter	Location	*Ceriodaphnia dubia*			*Pseudokirchneriella subcapitata*	*Hyalella azteca*		*Pimephales promelas* [a]					*Oncorhynchus mykiss*			
		% Survival	Reproduction	Broods	Cell Yield [x 10^4 cells/mL]	% Survival	Dry Weight [mg]	% Hatch	% Survival	Biomass [mg]	Length [mm]	% Normal Development	% Survival	% Viability	Length [mm]	Wet Weight [mg]
Q1	FR_UFR1	100 ± 0	89 ± 12	89 ± 12	*60.9 ± 5.1*	78 ± 30	66 ± 36	100 ± 0	86 ± 12	79 ± 15	96 ± 4	100 ± 0	-			
	FR_FRCP1	***0 ± 0***	***0 ± 0***	***0 ± 0***	***9.5 ± 1.3***	78 ± 22	77 ± 20	95 ± 9	***18 ± 12***	***40 ± 10***	128 ± 20	94 ± 13	-			
	FR_FRABCH	100 ± 0	*70 ± 24*	*67 ± 23*	71.8 ± 3.5	87 ± 16	64 ± 41	103 ± 0	78 ± 53	76 ± 51	*98 ± 2*	98 ± 4				
Q2	FR_UFR1	100 ± 0	79 ± 15	79 ± 15	*113.8 ± 7.6*	-		-					106 ± 13	107 ± 17	101 ± 1	101 ± 2
	FR_FRCP1	100 ± 0	80 ± 15	80 ± 15	*107.5 ± 9.9*	-		-					88 ± 4	87 ± 6	104 ± 0	119 ± 16
	FR_FRABCH	100 ± 0	70 ± 14	70 ± 14	120.2 ± 5.1	-		-					**73 ± 16**	**75 ± 12**	*96 ± 4*	96 ± 8
Q3	FR_UFR1	100 ± 0	94 ± 27	84 ± 18	69.5 ± 6.6	96 ± 9	78 ± 24	100 ± 0	88 ± 12	96 ± 4	101 ± 4	102 ± 0	-			
	FR_FRCP1	90 ± 32	75 ± 26	66 ± 22	***34.5 ± 6.6***	96 ± 11	75 ± 32	100 ± 0	**64 ± 17**	82 ± 8	109 ± 9	100 ± 0	-			
	FR_FRABCH	100 ± 0	84 ± 26	73 ± 17	***27.0 ± 5.5***	102 ± 5	104 ± 25	98 ± 3	72 ± 23	88 ± 8	107 ± 12	100 ± 0				
Q4	FR_UFR1	100 ± 0	90 ± 10	87 ± 9	121.6 ± 7.9	98 ± 9	143 ± 53	-					101 ± 8	98 ± 14	98 ± 4	100 ± 9
	FR_FRCP1	90 ± 32	84 ± 20	89 ± 9	***103.8 ± 10.0***	96 ± 5	***35 ± 8***	-					90 ± 4	86 ± 4	92 ± 8	96 ± 12
	FR_FRABCH	90 ± 32	81 ± 17	88 ± 13	***103.5 ± 7.2***	88 ± 26	111 ± 46	-					**84 ± 11**	81 ± 7	99 ± 3	100 ± 12

Value = result siginificantly lower than Fording River reference (FR_UFR1).

Value = result significantly lower than Elk River reference (GH_ER2).

Value = result significantly lower than Michel Creek reference (CM_MC1).

Value = result significantly lower than South Line Creek reference.

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

[a] Results for copper-amended samples are provided; reference site results are samples amended with 10 µg/L. Laboratory control results are provided for laboratory control + 10 µg/L copper (Cu) and laboratory control + 20 µg/L Cu.

Table C.7: Results of the Seasonal Kendall Test for Discharge and Water Temperature at Station FR_FRABCHF and FR_FRNTP, 2010 to 2019

Parameter	Station	Units	Years	n (Total # Months with Data)	Slope (Magnitude Change / Year)	P-value
Discharge	FR_FRABCHF	(m^3/s)	2017-2019	0	NA	NA
Temperature		(°C)	2017-2019	27	0	1.00
Discharge	FR_FRNTP	(m^3/s)	2010-2019	84	-0.0483	0.025
Temperature		(°C)	2010-2019	101	-0.124	0.001

[shaded box] P-value < 0.05.

Table C.8: **Water Quality Data, FRO LAEMP, February, June, September, and December 2019**

	Analytes	Units	RG_FRUPO 11-Feb-19 1500	RG_FOUKI 12-Feb-19 1005	RG_FOBKS 12-Feb-19 1443	RG_FOUNGD 12-Feb-19 1230	RG_FODNGD 12-Feb-19 1345	RG_FODHE 12-Feb-19 1050	RG_FOUEW 13-Feb-19 1059
Physical Tests	Conductivity (@ 25C)	uS/cm	1,270	1,040	1,050	956	995	604	1,090
	Hardness (as CaCO3)	mg/L	711	575	585	523	544	327	642
	pH	pH	8.2	8.3	8.3	8.3	8.3	8.3	8.2
	ORP	mV	467	443	390	442	473	436	380
	Total Suspended Solids	mg/L	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids	mg/L	931	733	742	663	696	390	779
	Turbidity	NTU	0.67	1.6	0.62	0.48	0.62	0.57	0.32
Ions and Nutrients	Acidity (as CaCO3)	mg/L	4.4	1.8	3.1	2.1	2.0	1.6	<1.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	275	216	218	172	183	144	230
	Alkalinity, Carbonate (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	275	216	218	172	183	144	230
	Ammonia as N	mg/L	0.080	0.041	0.034	0.029	0.038	0.045	0.043
	Bromide (Br)	mg/L	<0.050	<0.25	<0.25	<0.25	<0.25	<0.050	<0.25
	Chloride (Cl)	mg/L	1.9	<2.5	2.7	<2.5	<2.5	<0.50	<2.5
	Fluoride (F)	mg/L	0.12	0.19	0.19	0.17	0.17	0.22	0.13
	Ion Balance	%	113	98	97	99	98	101	104
	Nitrate (as N)	mg/L	24	21	22	26	27	4.1	19
	Nitrite (as N)	mg/L	0.0027	0.0062	0.0064	0.0055	0.0050	0.0049	0.0055
	Total Kjeldahl Nitrogen	mg/L	0.054	0.50	0.46	0.50	0.22	0.28	<0.050
	Orthophosphate-Dissolved (as P)	mg/L	0.0022	0.0012	0.0011	<0.0010	0.0013	0.0018	0.0013
	Phosphorus (P)-Total	mg/L	<0.0020	0.0039	0.0025	0.0021	0.0027	0.0024	0.0033
	Sulfate (SO4)	mg/L	260	294	298	260	272	159	315
	Anion Sum	meq/L	13	12	12	11	11	6.5	13
	Cation Sum	meq/L	14	12	12	11	11	6.6	13
	Cation - Anion Balance	%	6.3	-1.3	-1.3	-0.70	-1.2	0.70	1.8
Carbon	Dissolved Organic Carbon	mg/L	0.65	0.86	0.81	0.52	<0.50	<0.50	0.63
	Total Organic Carbon	mg/L	0.64	1.1	0.85	0.55	0.70	0.68	0.65
Total Metals	Aluminum (Al)-Total	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	0.0037	0.0053	<0.0030
	Antimony (Sb)-Total	mg/L	<0.00010	0.00018	0.00018	0.00018	0.00025	<0.00010	<0.00010
	Arsenic (As)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total	mg/L	0.12	0.097	0.087	0.092	0.10	0.048	0.10
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	0.012	<0.010	0.011	<0.010	<0.010	<0.010	0.011
	Cadmium (Cd)-Total	ug/L	0.041	0.082	0.066	0.062	0.059	0.024	0.029
	Calcium (Ca)-Total	mg/L	138	115	116	112	107	77	146
	Chromium (Cr)-Total	mg/L	0.00013	0.00011	<0.00010	<0.00010	<0.00010	0.00018	0.00013
	Cobalt (Co)-Total	ug/L	0.62	0.14	0.11	<0.10	<0.10	<0.10	0.20
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	<0.010	0.033	0.024	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000073	<0.000050
	Lithium (Li)-Total	mg/L	0.041	0.053	0.054	0.064	0.065	0.0082	0.028
	Magnesium (Mg)-Total	mg/L	70	57	50	46	50	29	67
	Manganese (Mn)-Total	mg/L	0.0010	0.025	0.016	0.00041	0.0015	0.0037	0.0036
	Mercury (Hg)-Total	ug/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Molybdenum (Mo)-Total	mg/L	0.00052	0.0013	0.0012	0.00099	0.0013	0.00081	0.00061
	Nickel (Ni)-Total	mg/L	0.00056	0.0026	0.0023	0.0054	0.0052	0.0011	<0.00050
	Potassium (K)-Total	mg/L	1.9	1.8	1.6	1.4	1.6	0.84	1.6
	Selenium (Se)-Total	ug/L	91	47	47	48	54	24	95
	Silicon (Si)-Total	mg/L	2.3	1.9	1.9	1.7	1.8	1.7	2.4
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	2.8	2.6	2.2	1.7	1.9	0.76	2.7
	Strontium (Sr)-Total	mg/L	0.18	0.19	0.18	0.19	0.18	0.13	0.18
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0040	0.0038	0.0038	0.0035	0.0036	0.0013	0.0029
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0030	0.016	0.0031	0.0039	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	-
	Antimony (Sb)-Dissolved	mg/L	<0.00010	0.00020	0.00020	0.00019	0.00026	<0.00010	-
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
	Barium (Ba)-Dissolved	mg/L	0.13	0.10	0.10	0.10	0.11	0.051	-
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	-
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
	Boron (B)-Dissolved	mg/L	0.013	0.011	0.012	<0.010	<0.010	<0.010	-
	Cadmium (Cd)-Dissolved	ug/L	0.045	0.075	0.062	0.065	0.055	0.024	-
	Calcium (Ca)-Dissolved	mg/L	163	130	132	125	129	80	-
	Chromium (Cr)-Dissolved	mg/L	0.00017	<0.00010	<0.00010	0.00013	<0.00010	<0.00010	-
	Cobalt (Co)-Dissolved	ug/L	0.67	0.15	0.14	<0.10	<0.10	<0.10	-
	Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-
	Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
	Lithium (Li)-Dissolved	mg/L	0.041	0.055	0.056	0.061	0.065	0.0086	-
	Magnesium (Mg)-Dissolved	mg/L	74	61	62	51	54	31	-
	Manganese (Mn)-Dissolved	mg/L	0.0011	0.025	0.018	0.00021	0.0012	0.0028	-
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
	Molybdenum (Mo)-Dissolved	mg/L	0.00057	0.0013	0.0014	0.0011	0.0015	0.00086	-
	Nickel (Ni)-Dissolved	mg/L	0.00062	0.0028	0.0028	0.0058	0.0057	0.00098	-
	Potassium (K)-Dissolved	mg/L	2.3	2.1	2.1	1.6	1.8	0.88	-
	Selenium (Se)-Dissolved	ug/L	102	57	58	59	63	26	-
	Silicon (Si)-Dissolved	mg/L	2.3	2.0	1.9	1.8	1.9	1.7	-
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
	Sodium (Na)-Dissolved	mg/L	2.9	2.6	2.6	1.8	1.9	0.79	-
	Strontium (Sr)-Dissolved	mg/L	0.20	0.20	0.21	0.19	0.20	0.13	-
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
	Uranium (U)-Dissolved	mg/L	0.0040	0.0040	0.0040	0.0036	0.0037	0.0013	-
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-
	Zinc (Zn)-Dissolved	mg/L	<0.0010	0.0016	0.0012	0.0022	0.0018	0.0016	-

Note: "-" indicates no data available.

Table C.8: Water Quality Data, FRO LAEMP, February, June, September, and December 2019

	Analytes	Units	RG_MP1	RG_FOUSH	RG_FO22	RG_FODPO	RG_UFR1	RG_FOUSH	RG_FOBKS
			13-Feb-19	13-Feb-19	14-Feb-19	14-Feb-19	14-Feb-19	17-Jun-19	17-Jun-19
			930	1230	1000	1057	1500	1058	1050
Physical Tests	Conductivity (@ 25C)	uS/cm	1,030	1,040	1,150	1,200	363	372	399
	Hardness (as CaCO3)	mg/L	583	594	684	708	196	185	189
	pH	pH	8.1	8.1	8.2	8.2	8.1	8.2	8.3
	ORP	mV	302	255	407	429	396	421	374
	Total Suspended Solids	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	3.9
	Total Dissolved Solids	mg/L	786	742	826	903	206	216	230
	Turbidity	NTU	1.4	0.66	0.83	1.5	0.95	0.53	0.49
Ions and Nutrients	Acidity (as CaCO3)	mg/L	<1.0	1.6	1.2	1.5	<1.0	<1.0	<1.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	190	207	239	241	149	124	134
	Alkalinity, Carbonate (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	190	207	239	241	149	124	134
	Ammonia as N	mg/L	0.031	0.061	0.032	0.029	0.034	0.0055	<0.0050
	Bromide (Br)	mg/L	<0.25	<0.25	<0.25	<0.25	<0.050	<0.050	<0.050
	Chloride (Cl)	mg/L	<2.5	<2.5	<2.5	<2.5	<0.50	<0.50	<0.50
	Fluoride (F)	mg/L	0.16	0.16	0.13	0.14	0.14	0.22	0.22
	Ion Balance	%	101	101	103	101	98	97	91
	Nitrate (as N)	mg/L	26	25	21	21	0.23	3.1	2.9
	Nitrite (as N)	mg/L	0.0060	0.0061	0.0050	<0.0050	<0.0010	0.0038	0.0034
	Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.18	0.14
	Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	0.0016	0.0020	0.0044	<0.0010	0.0010
	Phosphorus (P)-Total	mg/L	0.0042	0.0028	0.0026	0.0045	0.0045	0.0034	0.0035
	Sulfate (SO4)	mg/L	290	289	343	375	50	57	63
	Anion Sum	meq/L	12	12	13	14	4.0	3.9	4.2
	Cation Sum	meq/L	12	12	14	14	4.0	3.7	3.8
	Cation - Anion Balance	%	0.30	0.40	1.5	0.70	-0.80	-1.8	-4.8
Carbon	Dissolved Organic Carbon	mg/L	<0.50	0.78	0.60	<0.50	0.57	0.71	0.72
	Total Organic Carbon	mg/L	0.66	0.78	0.67	0.50	1.1	0.79	0.79
Total Metals	Aluminum (Al)-Total	mg/L	0.0030	<0.0030	0.0038	0.0085	0.0040	0.0098	0.014
	Antimony (Sb)-Total	mg/L	0.00025	0.00023	<0.00010	<0.00010	<0.00010	0.00019	0.00018
	Arsenic (As)-Total	mg/L	<0.00010	0.00010	0.00011	<0.00010	<0.00010	0.00012	0.00011
	Barium (Ba)-Total	mg/L	0.099	0.10	0.10	0.092	0.071	0.038	0.038
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	<0.010	<0.010	0.012	0.012	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total	ug/L	0.052	0.052	0.037	0.039	0.0085	0.012	0.021
	Calcium (Ca)-Total	mg/L	136	138	159	159	55	49	53
	Chromium (Cr)-Total	mg/L	0.00016	0.00014	0.00017	0.00018	0.00020	<0.00010	0.00011
	Cobalt (Co)-Total	ug/L	<0.10	<0.10	0.21	0.23	<0.10	<0.10	<0.10
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	<0.010	0.11	0.018	0.016	<0.010	0.012	0.019
	Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L	0.059	0.059	0.030	0.033	0.0016	0.0095	0.011
	Magnesium (Mg)-Total	mg/L	59	61	70	76	14	16	18
	Manganese (Mn)-Total	mg/L	0.0033	0.037	0.0056	0.0013	0.00033	0.0024	0.0042
	Mercury (Hg)-Total	ug/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00060	0.00081
	Molybdenum (Mo)-Total	mg/L	0.0014	0.0013	0.00061	0.00069	0.00053	0.0011	0.0011
	Nickel (Ni)-Total	mg/L	0.0044	0.0037	0.00054	<0.00050	<0.00050	0.0029	0.0026
	Potassium (K)-Total	mg/L	1.8	1.8	1.7	1.8	0.39	0.73	0.83
	Selenium (Se)-Total	ug/L	63	61	99	108	1.0	11	10
	Silicon (Si)-Total	mg/L	1.8	1.9	2.4	2.3	1.9	1.5	1.5
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	2.3	2.4	2.7	2.8	0.79	0.63	0.74
	Strontium (Sr)-Total	mg/L	0.19	0.19	0.18	0.18	0.096	0.084	0.086
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0039	0.0037	0.0032	0.0034	0.00050	0.00096	0.0011
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	0.0037	0.028	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	-	-	-	-	-	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	-	-	-	-	-	0.00020	0.00019
	Arsenic (As)-Dissolved	mg/L	-	-	-	-	-	<0.00010	<0.00010
	Barium (Ba)-Dissolved	mg/L	-	-	-	-	-	0.041	0.042
	Beryllium (Be)-Dissolved	ug/L	-	-	-	-	-	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	-	-	-	-	-	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	-	-	-	-	-	<0.010	<0.010
	Cadmium (Cd)-Dissolved	ug/L	-	-	-	-	-	0.020	0.025
	Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-	47	46
	Chromium (Cr)-Dissolved	mg/L	-	-	-	-	-	<0.00010	<0.00010
	Cobalt (Co)-Dissolved	ug/L	-	-	-	-	-	<0.10	<0.10
	Copper (Cu)-Dissolved	mg/L	-	-	-	-	-	<0.00050	<0.00050
	Iron (Fe)-Dissolved	mg/L	-	-	-	-	-	<0.010	<0.010
	Lead (Pb)-Dissolved	mg/L	-	-	-	-	-	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	-	-	-	-	-	0.010	0.012
	Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	-	16	18
	Manganese (Mn)-Dissolved	mg/L	-	-	-	-	-	0.0013	0.0021
	Mercury (Hg)-Dissolved	mg/L	-	-	-	-	-	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	-	-	-	-	-	0.0012	0.0011
	Nickel (Ni)-Dissolved	mg/L	-	-	-	-	-	0.0028	0.0025
	Potassium (K)-Dissolved	mg/L	-	-	-	-	-	0.75	0.85
	Selenium (Se)-Dissolved	ug/L	-	-	-	-	-	11	10
	Silicon (Si)-Dissolved	mg/L	-	-	-	-	-	1.3	1.4
	Silver (Ag)-Dissolved	mg/L	-	-	-	-	-	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	-	-	-	-	-	0.59	0.69
	Strontium (Sr)-Dissolved	mg/L	-	-	-	-	-	0.089	0.091
	Thallium (Tl)-Dissolved	mg/L	-	-	-	-	-	<0.000010	<0.000010
	Tin (Sn)-Dissolved	mg/L	-	-	-	-	-	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	-	-	-	-	-	0.0011	0.0012
	Vanadium (V)-Dissolved	mg/L	-	-	-	-	-	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	-	-	-	-	-	0.0012	<0.0010

Note: "-" indicates no data available.

Table C.8: Water Quality Data, FRO LAEMP, February, June, September, and December 2019

	Analytes	Units	RG_MP1	RG_FOUKI	RG_FOBCP	RG_FOBSC	RG_FOUNGD	RG_FODNGD	RG_FRUPO
			18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19
			1239	842	1300	900	1115	910	939
Physical Tests	Conductivity (@ 25C)	uS/cm	342	352	490	382	345	346	615
	Hardness (as CaCO3)	mg/L	180	192	283	197	182	184	346
	pH	pH	8.3	8.3	8.3	8.3	8.2	8.1	8.3
	ORP	mV	392	360	343	338	366	354	362
	Total Suspended Solids	mg/L	2.7	1.8	3.1	5.2	2.8	3.6	2.9
	Total Dissolved Solids	mg/L	214	223	327	237	197	198	393
	Turbidity	NTU	0.64	0.57	0.49	0.66	0.34	0.73	0.43
Ions and Nutrients	Acidity (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	119	127	147	134	121	118	159
	Alkalinity, Carbonate (as CaCO3)	mg/L	3.2	3.8	4.2	<1.0	<1.0	<1.0	1.6
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	123	131	151	134	121	118	161
	Ammonia as N	mg/L	<0.0050	<0.0050	<0.0050	0.0097	0.0065	0.018	0.030
	Bromide (Br)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.62
	Fluoride (F)	mg/L	0.22	0.21	0.22	0.22	0.22	0.21	0.21
	Ion Balance	%	94	96	101	92	100	102	102
	Nitrate (as N)	mg/L	3.2	2.8	6.3	2.9	2.8	2.8	10
	Nitrite (as N)	mg/L	0.0043	0.0022	0.0035	0.0023	0.0017	0.0019	0.0030
	Total Kjeldahl Nitrogen	mg/L	0.14	<0.050	0.074	0.36	<0.050	0.36	<0.050
	Orthophosphate-Dissolved (as P)	mg/L	0.0011	<0.0010	0.0012	0.0017	0.0017	<0.0010	0.0012
	Phosphorus (P)-Total	mg/L	0.0033	0.0031	0.0076	0.011	0.0039	0.0062	0.0042
	Sulfate (SO4)	mg/L	56	60	107	72	52	52	141
	Anion Sum	meq/L	3.9	4.1	5.7	4.4	3.7	3.7	6.9
	Cation Sum	meq/L	3.6	3.9	5.7	4.0	3.7	3.7	7.0
	Cation - Anion Balance	%	-3.1	-2.3	0.30	-4.4	-0.20	1.0	0.80
Carbon	Dissolved Organic Carbon	mg/L	0.66	0.64	0.57	2.4	0.93	0.94	0.56
	Total Organic Carbon	mg/L	0.76	0.73	0.55	2.1	1.1	1.6	0.94
Total Metals	Aluminum (Al)-Total	mg/L	0.018	0.011	0.030	0.029	0.018	0.012	0.010
	Antimony (Sb)-Total	mg/L	0.00018	0.00017	0.00024	0.00020	<0.00010	0.00010	0.00018
	Arsenic (As)-Total	mg/L	0.00012	0.00012	0.00012	0.00013	0.00012	0.00011	0.00011
	Barium (Ba)-Total	mg/L	0.038	0.036	0.046	0.037	0.035	0.033	0.055
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total	ug/L	0.015	0.019	0.039	0.034	0.016	0.017	0.034
	Calcium (Ca)-Total	mg/L	51	50	67	54	48	47	81
	Chromium (Cr)-Total	mg/L	0.00013	<0.00010	0.00011	0.00013	0.00016	0.00013	0.00011
	Cobalt (Co)-Total	ug/L	<0.10	<0.10	0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	0.0011	0.00054	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	0.013	0.013	0.036	0.028	0.024	0.014	0.013
	Lead (Pb)-Total	mg/L	<0.000050	<0.000050	0.000062	0.000054	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L	0.010	0.010	0.017	0.011	0.0095	0.0097	0.023
	Magnesium (Mg)-Total	mg/L	16	17	28	19	15	15	35
	Manganese (Mn)-Total	mg/L	0.0017	0.0036	0.0055	0.0049	0.0022	0.0016	0.0023
	Mercury (Hg)-Total	ug/L	0.00063	0.00057	0.00056	0.00066	0.00064	0.0023	0.00068
	Molybdenum (Mo)-Total	mg/L	0.0011	0.0010	0.0013	0.0010	0.00071	0.00076	0.0012
	Nickel (Ni)-Total	mg/L	0.0032	0.0024	0.0028	0.0027	0.0013	0.0015	0.0023
	Potassium (K)-Total	mg/L	0.74	0.77	1.2	0.90	0.58	0.61	1.3
	Selenium (Se)-Total	ug/L	11	9.7	28	14	8.9	8.6	39
	Silicon (Si)-Total	mg/L	1.5	1.5	1.6	1.6	1.4	1.3	1.6
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	0.63	0.70	1.1	0.80	0.62	0.64	1.3
	Strontium (Sr)-Total	mg/L	0.083	0.087	0.096	0.086	0.086	0.084	0.11
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.00098	0.0010	0.0018	0.0011	0.00088	0.00086	0.0021
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0030	0.0034	0.0034	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	0.00019	0.00017	0.00022	0.00021	<0.00010	<0.00010	0.00018
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Dissolved	mg/L	0.043	0.037	0.044	0.035	0.037	0.039	0.056
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved	ug/L	0.024	0.026	0.025	0.027	0.011	0.018	0.027
	Calcium (Ca)-Dissolved	mg/L	45	47	64	46	47	48	82
	Chromium (Cr)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
	Cobalt (Co)-Dissolved	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	0.0010	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.011	0.012	0.019	0.012	0.0097	0.010	0.022
	Magnesium (Mg)-Dissolved	mg/L	16	18	30	20	16	16	34
	Manganese (Mn)-Dissolved	mg/L	0.00070	0.0025	0.0014	0.00084	0.00028	<0.00010	0.00086
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	0.0011	0.00099	0.0013	0.0010	0.00074	0.00077	0.0012
	Nickel (Ni)-Dissolved	mg/L	0.0031	0.0023	0.0024	0.0028	0.0011	0.0015	0.0021
	Potassium (K)-Dissolved	mg/L	0.74	0.84	1.3	1.2	0.61	0.65	1.4
	Selenium (Se)-Dissolved	ug/L	11	9.6	28	14	9.1	8.7	40
	Silicon (Si)-Dissolved	mg/L	1.4	1.5	1.5	1.4	1.5	1.5	1.5
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	0.59	0.73	1.1	1.0	0.63	0.63	1.3
	Strontium (Sr)-Dissolved	mg/L	0.088	0.086	0.096	0.080	0.088	0.085	0.11
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	0.0011	0.0012	0.0021	0.0013	0.00091	0.00095	0.0022
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	0.0010	<0.0010	<0.0010	0.0057	<0.0010	<0.0010	<0.0010

Note: "-" indicates no data available.

Table C.8: Water Quality Data, FRO LAEMP, February, June, September, and December 2019

	Analytes	Units	RG_FRCP1SW	RG_FO26	RG_FODHE	RG_FOUEW	RG_FO22	RG_FODPO	RG_HENUP
			19-Jun-19	20-Jun-19	20-Jun-19	20-Jun-19	21-Jun-19	21-Jun-19	20-Jun-19
			1501	1201	850	1620	930	905	920
Physical Tests	Conductivity (@ 25C)	uS/cm	547	254	282	213	740	723	684
	Hardness (as CaCO3)	mg/L	301	132	152	108	424	404	367
	pH	pH	8.3	8.3	8.2	8.2	8.4	8.4	8.4
	ORP	mV	336	339	352	365	304	319	293
	Total Suspended Solids	mg/L	3.4	1.9	1.5	1.3	2.6	9.7	1.8
	Total Dissolved Solids	mg/L	330	138	158	116	499	490	443
	Turbidity	NTU	0.37	0.20	0.32	0.48	1.8	3.4	1.5
Ions and Nutrients	Acidity (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	156	119	111	90	170	167	165
	Alkalinity, Carbonate (as CaCO3)	mg/L	3.0	<1.0	<1.0	<1.0	6.8	7.6	7.8
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	159	119	111	90	177	174	172
	Ammonia as N	mg/L	<0.0050	<0.0050	0.0059	<0.0050	<0.0050	0.0056	<0.0050
	Bromide (Br)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl)	mg/L	<0.50	<0.50	<0.50	<0.50	0.81	0.84	0.77
	Fluoride (F)	mg/L	0.22	0.17	0.22	0.25	0.18	0.17	0.19
	Ion Balance	%	101	97	101	96	102	101	98
	Nitrate (as N)	mg/L	6.7	0.053	0.83	0.18	12	12	11
	Nitrite (as N)	mg/L	0.0044	<0.0010	<0.0010	<0.0010	0.0028	0.0025	0.0050
	Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	0.11	<0.050	<0.050	<0.050	<0.050
	Orthophosphate-Dissolved (as P)	mg/L	<0.0010	0.0030	0.0015	0.0025	0.0015	0.0015	0.0013
	Phosphorus (P)-Total	mg/L	0.0029	0.0054	0.0029	0.0026	0.0048	0.012	0.049
	Sulfate (SO4)	mg/L	116	17	36	22	189	180	160
	Anion Sum	meq/L	6.1	2.8	3.1	2.3	8.4	8.1	7.6
	Cation Sum	meq/L	6.1	2.7	3.1	2.2	8.6	8.2	7.4
	Cation - Anion Balance	%	0.30	-1.8	0.40	-2.3	1.2	0.40	-1.0
Carbon	Dissolved Organic Carbon	mg/L	1.1	0.89	0.86	1.1	0.91	1.1	1.2
	Total Organic Carbon	mg/L	1.1	1.1	0.94	1.4	1.1	1.4	1.1
Total Metals	Aluminum (Al)-Total	mg/L	0.027	0.0054	0.0078	0.0064	0.014	0.028	0.014
	Antimony (Sb)-Total	mg/L	0.00021	<0.00010	<0.00010	<0.00010	0.00018	0.00020	0.00017
	Arsenic (As)-Total	mg/L	0.00013	0.00013	0.00012	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total	mg/L	0.045	0.032	0.027	0.0087	0.065	0.065	0.068
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total	ug/L	0.034	0.010	0.014	<0.0050	0.035	0.044	0.028
	Calcium (Ca)-Total	mg/L	71	39	42	34	88	88	84
	Chromium (Cr)-Total	mg/L	0.00016	0.00014	0.00017	0.00017	0.00028	0.00022	0.00018
	Cobalt (Co)-Total	ug/L	<0.10	<0.10	<0.10	<0.10	0.12	0.15	0.11
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	0.011	<0.010	0.010	<0.010	0.022	0.062	0.023
	Lead (Pb)-Total	mg/L	0.000057	<0.000050	<0.000050	<0.000050	<0.000050	0.000063	<0.000050
	Lithium (Li)-Total	mg/L	0.020	0.0012	0.0030	<0.0010	0.024	0.023	0.020
	Magnesium (Mg)-Total	mg/L	30	10	12	7.1	46	42	40
	Manganese (Mn)-Total	mg/L	0.0027	0.00039	0.0017	0.00022	0.0026	0.0075	0.0035
	Mercury (Hg)-Total	ug/L	0.00069	0.00072	0.00060	<0.00050	0.00091	0.0013	<0.00050
	Molybdenum (Mo)-Total	mg/L	0.0014	0.00077	0.00069	0.00043	0.0011	0.0011	0.0011
	Nickel (Ni)-Total	mg/L	0.0028	<0.00050	<0.00050	<0.00050	0.0022	0.0021	0.0015
	Potassium (K)-Total	mg/L	1.2	0.32	0.39	0.16	1.4	1.3	1.3
	Selenium (Se)-Total	ug/L	31	0.60	4.3	0.50	52	48	43
	Silicon (Si)-Total	mg/L	1.5	1.8	1.3	0.94	1.7	1.6	1.7
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	1.1	0.61	0.47	0.23	1.6	1.5	1.6
	Strontium (Sr)-Total	mg/L	0.10	0.083	0.080	0.077	0.12	0.11	0.11
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0019	0.00042	0.00057	0.00054	0.0026	0.0026	0.0023
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	0.0040	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	0.00022	<0.00010	<0.00010	<0.00010	0.00017	0.00016	0.00015
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	0.00011
	Barium (Ba)-Dissolved	mg/L	0.049	0.033	0.029	0.0081	0.064	0.064	0.067
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved	ug/L	0.025	0.0070	0.010	0.0063	0.031	0.019	0.024
	Calcium (Ca)-Dissolved	mg/L	71	36	41	32	95	91	84
	Chromium (Cr)-Dissolved	mg/L	<0.00010	0.00015	<0.00010	<0.00012	<0.00010	0.00011	<0.00010
	Cobalt (Co)-Dissolved	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	0.11	<0.10
	Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.020	0.0012	0.0031	<0.0010	0.026	0.025	0.022
	Magnesium (Mg)-Dissolved	mg/L	30	10	12	6.7	46	43	38
	Manganese (Mn)-Dissolved	mg/L	0.0013	0.00096	0.00070	<0.00010	0.0014	0.0031	0.0022
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	0.0014	0.00064	0.00066	0.00045	0.0012	0.0011	0.0011
	Nickel (Ni)-Dissolved	mg/L	0.0027	<0.00050	<0.00050	<0.00050	0.0021	0.0019	0.0014
	Potassium (K)-Dissolved	mg/L	1.3	0.34	0.43	0.15	1.5	1.4	1.3
	Selenium (Se)-Dissolved	ug/L	32	0.45	4.4	0.60	58	57	51
	Silicon (Si)-Dissolved	mg/L	1.5	1.8	1.3	0.95	1.7	1.7	1.7
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	1.1	0.60	0.48	0.21	1.5	1.5	1.5
	Strontium (Sr)-Dissolved	mg/L	0.11	0.080	0.080	0.082	0.12	0.12	0.12
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	0.0020	0.00040	0.00060	0.00056	0.0027	0.0025	0.0023
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	<0.0010

Note: "-" indicates no data available.

Table C.8: Water Quality Data, FRO LAEMP, February, June, September, and December 2019

	Analytes	Units	RG_FOUEW	RG_MP1	RG_FOUKI	RG_FODPO	RG_FOBCP	RG_FRUPO
			04-Sep-19	05-Sep-19	05-Sep-19	07-Sep-19	06-Sep-19	07-Sep-19
			1300	930	1330	1400	1130	930
Physical Tests	Conductivity (@ 25C)	uS/cm	854	651	686	953	834	937
	Hardness (as CaCO3)	mg/L	485	350	368	540	474	541
	pH	pH	8.3	8.4	8.4	8.2	8.4	8.3
	ORP	mV	453	349	314	452	433	434
	Total Suspended Solids	mg/L	<1.0	11	<1.0	9.9	1.1	<1.0
	Total Dissolved Solids	mg/L	619	481	498	738	650	730
	Turbidity	NTU	0.37	0.30	0.23	0.50	0.33	0.21
Ions and Nutrients	Acidity (as CaCO3)	mg/L	<1.0	<1.0	<1.0	2.8	<1.0	2.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	223	172	180	231	196	237
	Alkalinity, Carbonate (as CaCO3)	mg/L	<1.0	3.8	7.0	<1.0	6.0	3.8
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	223	176	187	231	202	240
	Ammonia as N	mg/L	0.025	0.095	0.039	0.014	0.030	0.027
	Bromide (Br)	mg/L	<0.050	<0.050	<0.050	<0.25	<0.050	<0.25
	Chloride (Cl)	mg/L	1.2	<0.50	0.81	<2.5	0.99	<2.5
	Fluoride (F)	mg/L	0.16	0.23	0.22	0.18	0.19	0.18
	Ion Balance	%	98	96	96	98	100	101
	Nitrate (as N)	mg/L	14	9.4	8.7	18	9.6	17
	Nitrite (as N)	mg/L	0.012	0.027	0.023	0.010	0.018	0.010
	Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	<0.050	<0.25	<0.25	<0.25
	Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Sulfate (SO4)	mg/L	218	151	163	255	234	230
	Anion Sum	meq/L	10	7.4	7.8	11	9.6	11
	Cation Sum	meq/L	9.8	7.1	7.5	11	9.6	11
	Cation - Anion Balance	%	-1.1	-2.0	-2.2	-1.1	-0.10	0.70
Carbon	Dissolved Organic Carbon	mg/L	0.94	0.69	0.74	0.74	1.1	0.70
	Total Organic Carbon	mg/L	1.0	0.74	0.86	1.0	1.0	0.70
Total Metals	Aluminum (Al)-Total	mg/L	0.0047	<0.0030	0.0030	0.0069	0.019	0.0032
	Antimony (Sb)-Total	mg/L	0.00013	0.00028	0.00026	0.00015	0.00028	0.00018
	Arsenic (As)-Total	mg/L	<0.00010	0.00011	0.00010	<0.00010	0.00011	0.00010
	Barium (Ba)-Total	mg/L	0.090	0.078	0.072	0.086	0.080	0.096
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	0.012	<0.010	0.011	0.012	0.011	0.013
	Cadmium (Cd)-Total	ug/L	0.033	0.030	0.050	0.035	0.028	0.038
	Calcium (Ca)-Total	mg/L	114	86	89	120	104	117
	Chromium (Cr)-Total	mg/L	0.00012	0.00011	<0.00010	0.00012	0.00011	<0.00010
	Cobalt (Co)-Total	ug/L	0.14	<0.10	0.10	0.16	<0.10	0.12
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	0.013	<0.010	0.024	0.014	0.015	0.010
	Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L	0.030	0.025	0.027	0.032	0.029	0.035
	Magnesium (Mg)-Total	mg/L	53	35	38	59	51	56
	Manganese (Mn)-Total	mg/L	0.0039	0.0019	0.0092	0.0021	0.0041	0.0018
	Mercury (Hg)-Total	ug/L	<0.00050	0.00060	<0.00050	0.00068	0.00076	<0.00050
	Molybdenum (Mo)-Total	mg/L	0.00089	0.0013	0.0013	0.031	0.0015	0.0011
	Nickel (Ni)-Total	mg/L	0.0010	0.0040	0.0029	0.00079	0.0036	0.0017
	Potassium (K)-Total	mg/L	1.7	1.4	1.6	1.9	1.8	2.0
	Selenium (Se)-Total	ug/L	61	34	31	70	58	66
	Silicon (Si)-Total	mg/L	2.3	1.9	1.8	2.2	2.0	2.0
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	2.0	1.2	1.4	2.2	1.5	2.1
	Strontium (Sr)-Total	mg/L	0.14	0.13	0.14	0.15	0.15	0.14
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0030	0.0022	0.0024	0.0033	0.0032	0.0036
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	0.00013	0.00026	0.00024	0.00012	0.00027	0.00018
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	0.00010	<0.00010	0.00010	<0.00010
	Barium (Ba)-Dissolved	mg/L	0.093	0.076	0.074	0.087	0.084	0.10
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	0.011	<0.010	0.010	0.012	0.011	0.013
	Cadmium (Cd)-Dissolved	ug/L	0.030	0.029	0.051	<0.045	0.042	0.032
	Calcium (Ca)-Dissolved	mg/L	110	88	89	118	106	123
	Chromium (Cr)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved	ug/L	0.12	<0.10	<0.10	0.15	<0.10	0.12
	Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.029	0.025	0.027	0.034	0.032	0.037
	Magnesium (Mg)-Dissolved	mg/L	51	32	36	60	51	57
	Manganese (Mn)-Dissolved	mg/L	0.0024	0.00042	0.0066	0.00084	0.0023	0.00089
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	0.00090	0.0013	0.0014	0.042	0.0016	0.0011
	Nickel (Ni)-Dissolved	mg/L	0.00095	0.0038	0.0028	0.00079	0.0037	0.0017
	Potassium (K)-Dissolved	mg/L	1.7	1.4	1.7	1.9	1.9	2.2
	Selenium (Se)-Dissolved	ug/L	62	35	33	88	66	74
	Silicon (Si)-Dissolved	mg/L	2.1	1.8	1.8	2.3	2.0	2.0
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	2.0	1.1	1.4	2.4	1.6	2.2
	Strontium (Sr)-Dissolved	mg/L	0.14	0.13	0.14	0.16	0.16	0.15
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	0.0027	0.0020	0.0021	0.0031	0.0030	0.0034
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	<0.0010	0.0013	0.0034	<0.0010	0.0018	<0.0010

Note: "-" indicates no data available.

Table C.8: Water Quality Data, FRO LAEMP, February, June, September, and December 2019

	Analytes	Units	RG_FO26 10-Sep-19 1000	RG_FODHE 10-Sep-19 1600	RG_FOBKS 09-Sep-19 900	RG_FOUSH 09-Sep-19 1400	RG_FODNGD 12-Sep-19 1100	RG_FOUNGD 12-Sep-19 1430
Physical Tests	Conductivity (@ 25C)	uS/cm	333	442	737	681	609	581
	Hardness (as CaCO3)	mg/L	183	251	426	393	337	319
	pH	pH	8.5	8.4	8.4	8.4	8.3	8.3
	ORP	mV	454	461	405	475	484	355
	Total Suspended Solids	mg/L	<1.0	1.1	1.4	<1.0	<1.0	<1.0
	Total Dissolved Solids	mg/L	208	303	533	479	433	433
	Turbidity	NTU	0.20	0.32	0.35	0.39	0.31	0.37
Ions and Nutrients	Acidity (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	145	137	185	171	167	163
	Alkalinity, Carbonate (as CaCO3)	mg/L	5.6	5.2	9.8	8.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	150	142	195	179	167	163
	Ammonia as N	mg/L	<0.0050	<0.0050	0.065	0.036	0.050	0.0065
	Bromide (Br)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl)	mg/L	<0.50	<0.50	0.83	0.52	<0.50	<0.50
	Fluoride (F)	mg/L	0.17	0.23	0.21	0.20	0.22	0.20
	Ion Balance	%	98	104	106	104	101	100
	Nitrate (as N)	mg/L	0.020	2.0	9.6	9.9	8.0	6.8
	Nitrite (as N)	mg/L	<0.0010	0.010	0.036	0.027	0.014	0.0050
	Total Kjeldahl Nitrogen	mg/L	<0.050	0.54	0.18	0.072	0.11	<0.050
	Orthophosphate-Dissolved (as P)	mg/L	0.0016	<0.0010	<0.0010	0.0012	<0.0010	<0.0010
	Phosphorus (P)-Total	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Sulfate (SO4)	mg/L	38	90	168	159	137	129
	Anion Sum	meq/L	3.8	4.9	8.1	7.6	6.8	6.5
	Cation Sum	meq/L	3.7	5.1	8.6	7.9	6.8	6.5
	Cation - Anion Balance	%	-1.3	2.1	3.1	2.1	0.30	0.10
Carbon	Dissolved Organic Carbon	mg/L	0.78	0.82	0.93	1.1	0.79	0.70
	Total Organic Carbon	mg/L	0.75	0.77	0.99	1.2	0.77	0.73
Total Metals	Aluminum (Al)-Total	mg/L	0.013	0.017	0.0089	0.011	<0.0030	0.0034
	Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	0.00031	0.00030	0.00022	0.00016
	Arsenic (As)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total	mg/L	0.044	0.043	0.082	0.082	0.071	0.067
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	<0.010	<0.010	0.011	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total	ug/L	<0.0050	0.022	0.057	0.034	0.029	0.026
	Calcium (Ca)-Total	mg/L	49	61	97	92	79	77
	Chromium (Cr)-Total	mg/L	0.00010	0.00012	0.00012	0.00017	0.00011	0.00012
	Cobalt (Co)-Total	ug/L	<0.10	<0.10	0.11	<0.10	<0.10	<0.10
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	<0.010	<0.010	0.025	0.042	<0.010	<0.010
	Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L	0.0014	0.0055	0.031	0.029	0.022	0.021
	Magnesium (Mg)-Total	mg/L	13	21	37	36	31	30
	Manganese (Mn)-Total	mg/L	0.00072	0.0023	0.0083	0.0098	0.0012	0.00077
	Mercury (Hg)-Total	ug/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00053
	Molybdenum (Mo)-Total	mg/L	0.00064	0.00077	0.0014	0.0014	0.0012	0.0010
	Nickel (Ni)-Total	mg/L	<0.00050	0.00059	0.0038	0.0036	0.0039	0.0033
	Potassium (K)-Total	mg/L	0.38	0.64	1.7	1.5	1.3	1.2
	Selenium (Se)-Total	ug/L	0.61	14	35	36	30	28
	Silicon (Si)-Total	mg/L	1.9	1.7	1.9	2.0	1.8	1.8
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	0.66	0.67	1.5	1.3	1.0	0.99
	Strontium (Sr)-Total	mg/L	0.10	0.11	0.14	0.14	0.13	0.13
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.00054	0.0010	0.0026	0.0024	0.0020	0.0019
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0030	0.0043	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	<0.00010	<0.00010	0.00027	0.00027	0.00021	0.00015
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Dissolved	mg/L	0.046	0.046	0.090	0.088	0.070	0.066
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	<0.010	<0.010	0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved	ug/L	0.0090	0.014	0.052	0.030	0.026	0.020
	Calcium (Ca)-Dissolved	mg/L	49	63	98	93	82	79
	Chromium (Cr)-Dissolved	mg/L	0.00011	0.00012	0.00011	<0.00010	0.00011	0.00011
	Cobalt (Co)-Dissolved	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.0014	0.0057	0.030	0.027	0.024	0.023
	Magnesium (Mg)-Dissolved	mg/L	15	23	44	39	32	30
	Manganese (Mn)-Dissolved	mg/L	0.00026	0.00013	0.0062	0.0061	0.00053	0.00033
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	0.00063	0.00074	0.0013	0.0013	0.0012	0.0010
	Nickel (Ni)-Dissolved	mg/L	<0.00050	<0.00050	0.0039	0.0034	0.0037	0.0031
	Potassium (K)-Dissolved	mg/L	0.41	0.70	1.9	1.6	1.3	1.1
	Selenium (Se)-Dissolved	ug/L	0.60	13	36	37	35	31
	Silicon (Si)-Dissolved	mg/L	2.0	1.6	1.9	1.8	1.8	1.9
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	0.65	0.65	1.7	1.4	1.1	1.0
	Strontium (Sr)-Dissolved	mg/L	0.11	0.12	0.15	0.15	0.13	0.13
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	0.00054	0.00098	0.0025	0.0023	0.0020	0.0018
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	<0.0010	<0.0010	0.0013	0.0048	0.0013	0.0012

Note: "-" indicates no data available.

Table C.8: **Water Quality Data, FRO LAEMP, February, June, September, and December 2019**

	Analytes	Units	RG_SCOUTDS	RG_FOUCL	RG_HENUP	RG_FOBSC	RG_FRCP1SW	RG_FO22	RG_UFR1
			12-Sep-19	12-Sep-19	11-Sep-19	13-Sep-19	13-Sep-19	16-Sep-19	12-Dec-19
			1230	930	930	1400	930	1200	945
Physical Tests	Conductivity (@ 25C)	uS/cm	684	491	294	794	816	945	345
	Hardness (as CaCO3)	mg/L	387	265	160	454	463	535	193
	pH	pH	8.4	8.2	8.2	8.3	8.3	8.3	8.4
	ORP	mV	455	462	287	413	358	267	351
	Total Suspended Solids	mg/L	1.2	2.4	<1.0	2.4	24	8.4	<1.0
	Total Dissolved Solids	mg/L	501	345	203	598	623	688	199
	Turbidity	NTU	0.32	0.28	<0.10	0.66	2.8	1.4	0.13
Ions and Nutrients	Acidity (as CaCO3)	mg/L	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	2.1
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	183	158	112	192	199	227	144
	Alkalinity, Carbonate (as CaCO3)	mg/L	4.2	<1.0	<1.0	1.6	<1.0	4.2	9.2
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	187	158	112	194	199	231	153
	Ammonia as N	mg/L	0.048	<0.0050	<0.0050	0.044	0.025	0.040	0.013
	Bromide (Br)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl)	mg/L	0.76	<0.50	<0.50	0.90	0.95	1.2	<0.50
	Fluoride (F)	mg/L	0.22	0.21	0.35	0.22	0.22	0.15	0.16
	Ion Balance	%	101	98	98	98	96	99	97
	Nitrate (as N)	mg/L	9.0	3.0	0.22	9.5	9.5	16	0.20
	Nitrite (as N)	mg/L	0.029	0.0083	<0.0010	0.034	0.018	0.0073	<0.0010
	Total Kjeldahl Nitrogen	mg/L	<0.25	0.34	0.055	<0.050	0.24	<0.050	0.050
	Orthophosphate-Dissolved (as P)	mg/L	<0.0010	<0.0010	<0.0010	0.0015	0.0017	0.0013	0.0037
	Phosphorus (P)-Total	mg/L	<0.0020	<0.0020	<0.0020	0.0099	0.027	0.0035	0.0031
	Sulfate (SO4)	mg/L	161	99	48	230	241	245	45
	Anion Sum	meq/L	7.8	5.4	3.3	9.4	9.7	11	4.0
	Cation Sum	meq/L	7.9	5.3	3.2	9.2	9.3	11	3.9
	Cation - Anion Balance	%	0.50	-0.90	-0.80	-1.2	-2.0	-0.40	-1.6
Carbon	Dissolved Organic Carbon	mg/L	0.75	0.76	<0.50	0.94	1.2	0.71	5.5
	Total Organic Carbon	mg/L	0.74	0.69	<0.50	0.89	1.2	0.68	1.0
Total Metals	Aluminum (Al)-Total	mg/L	0.0033	0.0046	0.0036	0.0064	0.29	0.012	0.0050
	Antimony (Sb)-Total	mg/L	0.00030	0.00028	<0.00010	0.00031	0.00030	0.00013	<0.00010
	Arsenic (As)-Total	mg/L	0.00011	<0.00010	0.00010	0.00012	0.00032	<0.00010	<0.00010
	Barium (Ba)-Total	mg/L	0.077	0.066	0.012	0.070	0.088	0.095	0.066
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	0.032	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	<0.010	<0.010	<0.010	0.010	0.013	0.013	<0.010
	Cadmium (Cd)-Total	ug/L	0.051	0.017	0.0064	0.053	0.15	0.037	0.0088
	Calcium (Ca)-Total	mg/L	89	66	44	95	108	116	52
	Chromium (Cr)-Total	mg/L	0.00010	<0.00010	0.00012	0.00013	0.00061	0.00013	0.00014
	Cobalt (Co)-Total	ug/L	0.11	<0.10	<0.10	0.11	0.42	0.15	<0.10
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00089	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	0.025	<0.010	<0.010	0.027	0.56	0.029	<0.010
	Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.00039	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L	0.025	0.0070	<0.0010	0.028	0.030	0.034	0.0017
	Magnesium (Mg)-Total	mg/L	38	23	11	50	51	56	15
	Manganese (Mn)-Total	mg/L	0.0074	0.0010	<0.00010	0.0075	0.044	0.0054	0.00036
	Mercury (Hg)-Total	ug/L	<0.00050	<0.00050	<0.00050	<0.00050	0.0043	<0.00050	<0.00050
	Molybdenum (Mo)-Total	mg/L	0.0017	0.00074	0.00067	0.0016	0.0015	0.00098	0.00059
	Nickel (Ni)-Total	mg/L	0.0036	0.00058	<0.00050	0.0048	0.0072	0.0012	<0.00050
	Potassium (K)-Total	mg/L	1.7	0.76	0.21	1.8	1.9	1.7	0.38
	Selenium (Se)-Total	ug/L	33	17	1.1	52	54	70	0.82
	Silicon (Si)-Total	mg/L	1.9	1.8	1.2	1.9	2.4	2.4	2.1
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	1.4	0.69	0.32	1.4	1.5	2.2	0.74
	Strontium (Sr)-Total	mg/L	0.14	0.11	0.13	0.14	0.15	0.16	0.099
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000022	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0024	0.0010	0.0010	0.0028	0.0029	0.0032	0.00052
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.0015	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	0.0098	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	0.00029	0.00011	<0.00010	0.00029	0.00026	0.00013	<0.00010
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010
	Barium (Ba)-Dissolved	mg/L	0.075	0.064	0.012	0.072	0.077	0.095	0.069
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	0.010	<0.010	<0.010	<0.010	0.011	0.012	<0.010
	Cadmium (Cd)-Dissolved	ug/L	<0.060	0.014	0.0051	0.042	0.025	0.026	0.0091
	Calcium (Ca)-Dissolved	mg/L	92	68	46	102	108	123	55
	Chromium (Cr)-Dissolved	mg/L	0.00011	0.00015	0.00016	<0.00010	<0.00010	0.00010	0.00011
	Cobalt (Co)-Dissolved	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.14	<0.10
	Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020
	Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.027	0.0073	<0.0010	0.029	0.029	0.032	0.0016
	Magnesium (Mg)-Dissolved	mg/L	39	23	11	48	47	56	14
	Manganese (Mn)-Dissolved	mg/L	0.0053	0.00017	<0.00010	0.0045	<0.00010	0.0035	<0.00010
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	0.040	0.00076	0.00070	0.0016	0.0015	0.00096	0.00053
	Nickel (Ni)-Dissolved	mg/L	0.0033	0.00054	<0.00050	0.0046	0.0035	0.0011	<0.00050
	Potassium (K)-Dissolved	mg/L	1.7	0.75	0.21	1.6	1.6	1.8	0.37
	Selenium (Se)-Dissolved	ug/L	38	19	1.1	66	65	74	0.83
	Silicon (Si)-Dissolved	mg/L	2.0	1.9	1.2	1.9	1.9	2.2	1.9
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	1.6	0.73	0.36	1.4	1.4	2.1	0.70
	Strontium (Sr)-Dissolved	mg/L	0.14	0.11	0.14	0.14	0.15	0.15	0.095
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	0.0024	0.0010	0.0010	0.0028	0.0029	0.0032	0.00050
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	0.0010	<0.0010	0.0019	<0.0010	<0.0010	<0.0010	<0.0010

Note: "-" indicates no data available.

Table C.8: Water Quality Data, FRO LAEMP, February, June, September, and December 2019

	Analytes	Units	RG_FODHE	RG_FOUCL	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH
			10-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19
			1215	1030	1238	1345	1230	1030
Physical Tests	Conductivity (@ 25C)	uS/cm	540	628	852	859	878	896
	Hardness (as CaCO3)	mg/L	308	347	470	502	489	508
	pH	pH	8.4	8.4	8.4	8.2	8.3	8.3
	ORP	mV	419	381	370	428	363	324
	Total Suspended Solids	mg/L	<1.0	1.6	<1.0	7.2	6.6	<1.0
	Total Dissolved Solids	mg/L	348	422	634	608	637	660
	Turbidity	NTU	0.35	<0.10	<0.10	0.23	0.34	0.20
Ions and Nutrients	Acidity (as CaCO3)	mg/L	2.2	4.3	3.6	2.7	2.6	3.3
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	144	164	182	175	181	185
	Alkalinity, Carbonate (as CaCO3)	mg/L	9.4	12	10	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	153	175	192	175	181	185
	Ammonia as N	mg/L	0.015	0.0088	0.0070	0.31	0.19	0.15
	Bromide (Br)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl)	mg/L	0.74	<0.50	0.52	0.57	0.63	0.75
	Fluoride (F)	mg/L	0.21	0.17	0.17	0.18	0.17	0.17
	Ion Balance	%	102	98	99	108	102	105
	Nitrate (as N)	mg/L	3.1	5.6	17	18	18	18
	Nitrite (as N)	mg/L	0.0024	<0.0010	0.0017	0.014	0.020	0.020
	Total Kjeldahl Nitrogen	mg/L	0.21	0.53	<0.050	0.22	<0.050	0.17
	Orthophosphate-Dissolved (as P)	mg/L	0.0015	0.0027	0.0020	0.0014	0.0012	0.0015
	Phosphorus (P)-Total	mg/L	<0.0020	0.034	<0.0020	<0.0020	0.0023	0.0021
	Sulfate (SO4)	mg/L	132	154	218	220	226	231
	Anion Sum	meq/L	6.1	7.1	9.6	9.4	9.7	9.8
	Cation Sum	meq/L	6.2	7.0	9.5	10	9.9	10
	Cation - Anion Balance	%	1.1	-1.0	-0.60	3.9	1.2	2.3
Carbon	Dissolved Organic Carbon	mg/L	5.5	5.9	5.7	5.5	6.3	1.3
	Total Organic Carbon	mg/L	0.99	2.1	0.85	1.3	1.5	1.1
Total Metals	Aluminum (Al)-Total	mg/L	0.028	0.0059	<0.0030	0.0044	0.0062	0.0034
	Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	0.00018	0.00030	0.00029	0.00028
	Arsenic (As)-Total	mg/L	0.00011	<0.00010	<0.00010	<0.00010	0.00010	0.00010
	Barium (Ba)-Total	mg/L	0.048	0.091	0.084	0.088	0.089	0.091
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total	ug/L	0.028	0.019	0.052	0.064	0.062	0.056
	Calcium (Ca)-Total	mg/L	73	89	114	113	115	117
	Chromium (Cr)-Total	mg/L	0.00018	0.00030	0.00014	0.00013	0.00013	0.00012
	Cobalt (Co)-Total	ug/L	<0.10	<0.10	<0.10	0.11	0.11	<0.10
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	0.077	0.010	<0.010	<0.010	0.011	0.069
	Lead (Pb)-Total	mg/L	0.00013	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L	0.0072	0.0092	0.046	0.046	0.044	0.041
	Magnesium (Mg)-Total	mg/L	27	30	47	47	48	51
	Manganese (Mn)-Total	mg/L	0.0052	0.00091	0.00040	0.0016	0.0031	0.020
	Mercury (Hg)-Total	ug/L	<0.00050	<0.00050	<0.00050	0.0011	<0.00050	<0.00050
	Molybdenum (Mo)-Total	mg/L	0.00077	0.00061	0.0046	0.0017	0.0017	0.0018
	Nickel (Ni)-Total	mg/L	0.00086	0.00051	0.0051	0.0061	0.0052	0.0048
	Potassium (K)-Total	mg/L	0.78	0.85	1.5	2.2	2.1	2.1
	Selenium (Se)-Total	ug/L	22	30	54	55	57	56
	Silicon (Si)-Total	mg/L	1.8	2.0	2.0	2.0	2.0	2.1
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	2.1	0.84	1.6	1.6	1.7	1.7
	Strontium (Sr)-Total	mg/L	0.13	0.13	0.16	0.16	0.17	0.17
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	<0.000010	0.000011	<0.000010	0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0012	0.0013	0.0031	0.0033	0.0034	0.0034
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	0.024	<0.0030	0.0047	0.0047	0.0031	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	<0.00010	0.00011	0.00018	0.00030	0.00030	0.00028
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	0.00011	0.00011	<0.00010
	Barium (Ba)-Dissolved	mg/L	0.046	0.090	0.083	0.087	0.089	0.090
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved	ug/L	0.019	0.025	0.054	0.064	0.054	0.052
	Calcium (Ca)-Dissolved	mg/L	81	93	117	126	120	127
	Chromium (Cr)-Dissolved	mg/L	<0.00010	0.00012	0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Dissolved	mg/L	<0.00020	<0.00020	<0.00020	0.00024	<0.00020	<0.00020
	Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.0071	0.0089	0.048	0.053	0.047	0.047
	Magnesium (Mg)-Dissolved	mg/L	26	28	43	45	46	47
	Manganese (Mn)-Dissolved	mg/L	0.00088	0.00040	0.00026	0.0012	0.0021	0.017
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	0.00079	0.00063	0.0036	0.0017	0.0018	0.0018
	Nickel (Ni)-Dissolved	mg/L	0.00064	<0.00050	0.0050	0.0063	0.0051	0.0047
	Potassium (K)-Dissolved	mg/L	0.71	0.86	1.5	2.2	2.1	2.1
	Selenium (Se)-Dissolved	ug/L	23	32	58	60	61	60
	Silicon (Si)-Dissolved	mg/L	1.6	1.8	1.8	1.8	1.8	1.8
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	0.73	0.84	1.5	1.6	1.6	1.7
	Strontium (Sr)-Dissolved	mg/L	0.13	0.14	0.17	0.17	0.18	0.18
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	0.0012	0.0013	0.0032	0.0032	0.0033	0.0032
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	<0.0010	0.0015	0.0022	0.0034	0.0021	0.0018

Note: "-" indicates no data available.

Table C.8: Water Quality Data, FRO LAEMP, February, June, September, and December 2019

	Analytes	Units	RG_FOUKI	RG_FOBKS	RG_FOBSC	RG_SCOUTDS	RG_FOBCP	RG_FRUPO	RG_FO22
			09-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19	11-Dec-19	11-Dec-19	11-Dec-19
			1430	1530	900	1300	1230	1545	1330
Physical Tests	Conductivity (@ 25C)	uS/cm	884	876	1,250	1,240	1,220	1,150	1,030
	Hardness (as CaCO3)	mg/L	521	522	799	769	796	735	666
	pH	pH	8.2	8.1	8.1	8.1	8.1	8.0	8.1
	ORP	mV	417	465	412	477	437	5,000	471
	Total Suspended Solids	mg/L	2.4	2.8	<1.0	<1.0	<1.0	1.3	<1.0
	Total Dissolved Solids	mg/L	652	672	1,010	1,010	931	876	806
	Turbidity	NTU	0.19	0.47	0.58	0.74	0.28	<0.10	0.17
Ions and Nutrients	Acidity (as CaCO3)	mg/L	<1.0	<1.0	2.9	3.1	<1.0	1.3	<1.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	186	180	207	205	243	287	247
	Alkalinity, Carbonate (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	186	180	207	205	243	287	247
	Ammonia as N	mg/L	0.091	0.11	0.13	0.097	0.14	0.017	0.035
	Bromide (Br)	mg/L	<0.050	<0.050	<0.25	<0.25	<0.25	<0.25	<0.25
	Chloride (Cl)	mg/L	1.1	1.2	2.8	<2.5	<2.5	3.6	<2.5
	Fluoride (F)	mg/L	0.19	0.20	<0.10	<0.10	0.17	<0.10	<0.10
	Ion Balance	%	109	110	107	106	107	105	110
	Nitrate (as N)	mg/L	16	17	18	18	18	27	19
	Nitrite (as N)	mg/L	0.019	0.021	0.018	0.018	0.024	<0.0050	0.0083
	Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Orthophosphate-Dissolved (as P)	mg/L	0.0012	<0.0010	0.0024	0.0018	<0.0010	0.0031	0.0021
	Phosphorus (P)-Total	mg/L	<0.0020	0.0023	<0.0020	0.0021	<0.0020	0.0029	<0.0020
	Sulfate (SO4)	mg/L	230	231	458	442	423	307	286
	Anion Sum	meq/L	9.7	9.6	15	15	15	14	12
	Cation Sum	meq/L	11	11	16	16	16	15	14
	Cation - Anion Balance	%	4.2	4.7	3.5	3.1	3.6	2.6	4.7
Carbon	Dissolved Organic Carbon	mg/L	1.2	1.5	6.2	1.4	0.74	<0.50	<0.50
	Total Organic Carbon	mg/L	1.1	1.3	1.4	1.1	0.84	0.50	<0.50
Total Metals	Aluminum (Al)-Total	mg/L	0.0033	0.0054	0.0073	0.0051	<0.0030	<0.0030	0.0049
	Antimony (Sb)-Total	mg/L	0.00026	0.00025	0.00035	0.00031	0.00035	0.00013	0.00011
	Arsenic (As)-Total	mg/L	<0.00010	<0.00010	0.00010	0.00011	0.00011	0.00011	<0.00010
	Barium (Ba)-Total	mg/L	0.088	0.088	0.079	0.079	0.077	0.11	0.096
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	0.011	0.011	0.011	0.011	0.011	0.016	0.012
	Cadmium (Cd)-Total	ug/L	0.073	0.071	0.072	0.077	0.059	0.046	0.034
	Calcium (Ca)-Total	mg/L	119	122	169	163	156	152	136
	Chromium (Cr)-Total	mg/L	0.00010	0.00012	0.00013	0.00013	<0.00010	0.00025	0.00013
	Cobalt (Co)-Total	ug/L	0.12	0.12	0.18	0.18	0.14	0.17	0.16
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	0.060	0.049	0.035	0.035	0.024	<0.010	0.020
	Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L	0.042	0.045	0.047	0.047	0.047	0.049	0.034
	Magnesium (Mg)-Total	mg/L	52	52	93	89	92	75	66
	Manganese (Mn)-Total	mg/L	0.016	0.014	0.014	0.014	0.0087	0.0011	0.0055
	Mercury (Hg)-Total	ug/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Molybdenum (Mo)-Total	mg/L	0.0016	0.0018	0.0021	0.0021	0.0020	0.00083	0.00074
	Nickel (Ni)-Total	mg/L	0.0038	0.0039	0.0095	0.0089	0.0084	0.0011	0.00055
	Potassium (K)-Total	mg/L	2.1	2.3	2.8	2.5	2.6	2.3	1.7
	Selenium (Se)-Total	ug/L	52	53	135	129	118	100	88
	Silicon (Si)-Total	mg/L	2.1	2.1	2.2	2.2	2.2	2.6	2.5
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	2.1	2.1	2.3	2.1	2.1	3.0	2.6
	Strontium (Sr)-Total	mg/L	0.17	0.17	0.19	0.19	0.18	0.19	0.18
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	0.000017	0.000015	0.000014	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0035	0.0036	0.0059	0.0058	0.0056	0.0044	0.0033
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	0.0033	0.0050	0.0035	<0.0030	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	0.00026	0.00026	0.00032	0.00032	0.00031	<0.00010	<0.00010
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	0.00012	0.00011	0.00010	<0.00010	<0.00010
	Barium (Ba)-Dissolved	mg/L	0.087	0.087	0.081	0.079	0.080	0.12	0.10
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	0.010	0.010	0.010	<0.010	<0.010	0.013	<0.010
	Cadmium (Cd)-Dissolved	ug/L	0.068	0.066	0.065	0.066	0.019	0.043	0.030
	Calcium (Ca)-Dissolved	mg/L	128	126	173	168	176	174	156
	Chromium (Cr)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
	Cobalt (Co)-Dissolved	ug/L	0.12	0.12	0.18	0.17	0.14	0.15	0.14
	Copper (Cu)-Dissolved	mg/L	<0.00020	0.00020	0.00022	0.00022	<0.00020	<0.00020	<0.00020
	Iron (Fe)-Dissolved	mg/L	0.012	0.015	<0.010	0.011	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.047	0.046	0.052	0.052	0.050	0.049	0.033
	Magnesium (Mg)-Dissolved	mg/L	49	50	89	85	87	73	67
	Manganese (Mn)-Dissolved	mg/L	0.013	0.011	0.012	0.012	0.0073	0.00087	0.0045
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	0.0017	0.0017	0.0020	0.0020	0.0021	0.00076	0.00067
	Nickel (Ni)-Dissolved	mg/L	0.0038	0.0037	0.0097	0.0092	0.0086	0.0011	0.00056
	Potassium (K)-Dissolved	mg/L	2.2	2.3	2.7	2.6	2.8	2.5	1.8
	Selenium (Se)-Dissolved	ug/L	56	56	143	136	120	103	86
	Silicon (Si)-Dissolved	mg/L	1.9	1.8	2.0	1.9	2.0	2.4	2.4
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	2.0	2.1	2.2	2.1	2.1	2.9	2.4
	Strontium (Sr)-Dissolved	mg/L	0.18	0.18	0.18	0.18	0.19	0.18	0.18
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	0.000016	0.000014	0.000013	<0.000010	<0.000010
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	0.0034	0.0035	0.0058	0.0054	0.0049	0.0040	0.0030
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	0.0014	0.0083	0.0026	0.0023	<0.0010	0.0014	<0.0010

Note: "-" indicates no data available.

Table C.8: Water Quality Data, FRO LAEMP, February, June, September, and December 2019

	Analytes	Units	RG_FOUEW	RG_FRCP1SW	RG_FODPO
			11-Dec-19	12-Dec-19	12-Dec-19
			930	1230	945
Physical Tests	Conductivity (@ 25C)	uS/cm	948	1,040	1,220
	Hardness (as CaCO3)	mg/L	576	626	778
	pH	pH	8.1	7.9	8.1
	ORP	mV	466	458	307
	Total Suspended Solids	mg/L	<1.0	<1.0	1.2
	Total Dissolved Solids	mg/L	717	804	1,000
	Turbidity	NTU	0.21	0.15	0.24
Ions and Nutrients	Acidity (as CaCO3)	mg/L	<1.0	1.1	<1.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	238	243	242
	Alkalinity, Carbonate (as CaCO3)	mg/L	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3)	mg/L	238	243	242
	Ammonia as N	mg/L	0.0068	0.015	0.14
	Bromide (Br)	mg/L	<0.050	<0.25	<0.25
	Chloride (Cl)	mg/L	1.4	7.9	5.1
	Fluoride (F)	mg/L	0.13	<0.10	<0.10
	Ion Balance	%	106	101	105
	Nitrate (as N)	mg/L	16	18	18
	Nitrite (as N)	mg/L	0.0028	<0.0050	0.028
	Total Kjeldahl Nitrogen	mg/L	<0.050	<0.050	<0.050
	Orthophosphate-Dissolved (as P)	mg/L	<0.0010	0.0021	<0.0010
	Phosphorus (P)-Total	mg/L	<0.0020	<0.0020	0.0068
	Sulfate (SO4)	mg/L	243	299	417
	Anion Sum	meq/L	11	13	15
	Cation Sum	meq/L	12	13	16
	Cation - Anion Balance	%	2.8	0.40	2.4
Carbon	Dissolved Organic Carbon	mg/L	<0.50	<0.50	0.81
	Total Organic Carbon	mg/L	<0.50	<0.50	0.90
Total Metals	Aluminum (Al)-Total	mg/L	0.0058	0.0038	0.0060
	Antimony (Sb)-Total	mg/L	<0.00010	<0.00010	0.00038
	Arsenic (As)-Total	mg/L	0.00010	<0.00010	0.00016
	Barium (Ba)-Total	mg/L	0.097	0.077	0.078
	Beryllium (Be)-Total	ug/L	<0.020	<0.020	<0.020
	Bismuth (Bi)-Total	mg/L	<0.000050	<0.000050	<0.000050
	Boron (B)-Total	mg/L	0.011	0.012	0.013
	Cadmium (Cd)-Total	ug/L	0.030	0.036	0.054
	Calcium (Ca)-Total	mg/L	124	135	156
	Chromium (Cr)-Total	mg/L	0.00016	0.00014	0.00017
	Cobalt (Co)-Total	ug/L	0.14	0.16	0.14
	Copper (Cu)-Total	mg/L	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L	0.020	<0.010	0.030
	Lead (Pb)-Total	mg/L	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L	0.029	0.034	0.051
	Magnesium (Mg)-Total	mg/L	59	70	87
	Manganese (Mn)-Total	mg/L	0.0035	0.00075	0.0079
	Mercury (Hg)-Total	ug/L	<0.00050	<0.00050	<0.00050
	Molybdenum (Mo)-Total	mg/L	0.00066	0.00081	0.0022
	Nickel (Ni)-Total	mg/L	0.00054	<0.00050	0.0079
	Potassium (K)-Total	mg/L	1.4	1.7	2.6
	Selenium (Se)-Total	ug/L	73	92	122
	Silicon (Si)-Total	mg/L	2.4	2.5	2.1
	Silver (Ag)-Total	mg/L	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	2.6	2.4	2.3
	Strontium (Sr)-Total	mg/L	0.17	0.17	0.20
	Thallium (Tl)-Total	mg/L	<0.000010	<0.000010	0.000016
	Tin (Sn)-Total	mg/L	<0.00010	<0.00010	0.00019
	Titanium (Ti)-Total	mg/L	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0028	0.0034	0.0054
	Vanadium (V)-Total	mg/L	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total	mg/L	<0.0030	<0.0030	0.0055
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L	<0.00010	<0.00010	0.00033
	Arsenic (As)-Dissolved	mg/L	<0.00010	<0.00010	0.00011
	Barium (Ba)-Dissolved	mg/L	0.10	0.083	0.086
	Beryllium (Be)-Dissolved	ug/L	<0.020	<0.020	<0.020
	Bismuth (Bi)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved	mg/L	<0.010	<0.010	0.010
	Cadmium (Cd)-Dissolved	ug/L	0.024	0.047	0.048
	Calcium (Ca)-Dissolved	mg/L	137	147	170
	Chromium (Cr)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved	ug/L	0.12	0.14	0.12
	Copper (Cu)-Dissolved	mg/L	<0.00020	<0.00020	<0.00020
	Iron (Fe)-Dissolved	mg/L	<0.010	<0.010	0.011
	Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.027	0.033	0.049
	Magnesium (Mg)-Dissolved	mg/L	57	63	86
	Manganese (Mn)-Dissolved	mg/L	0.0026	0.00032	0.0061
	Mercury (Hg)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved	mg/L	0.00062	0.00072	0.0020
	Nickel (Ni)-Dissolved	mg/L	0.00052	<0.00050	0.0080
	Potassium (K)-Dissolved	mg/L	1.5	1.7	2.8
	Selenium (Se)-Dissolved	ug/L	72	89	119
	Silicon (Si)-Dissolved	mg/L	2.4	2.3	2.0
	Silver (Ag)-Dissolved	mg/L	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L	2.3	2.1	2.0
	Strontium (Sr)-Dissolved	mg/L	0.16	0.17	0.19
	Thallium (Tl)-Dissolved	mg/L	<0.000010	<0.000010	0.000013
	Tin (Sn)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L	0.0025	0.0032	0.0051
	Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved	mg/L	<0.0010	<0.0010	0.0033

Note: "-" indicates no data available.

APPENDIX D

SEDIMENT

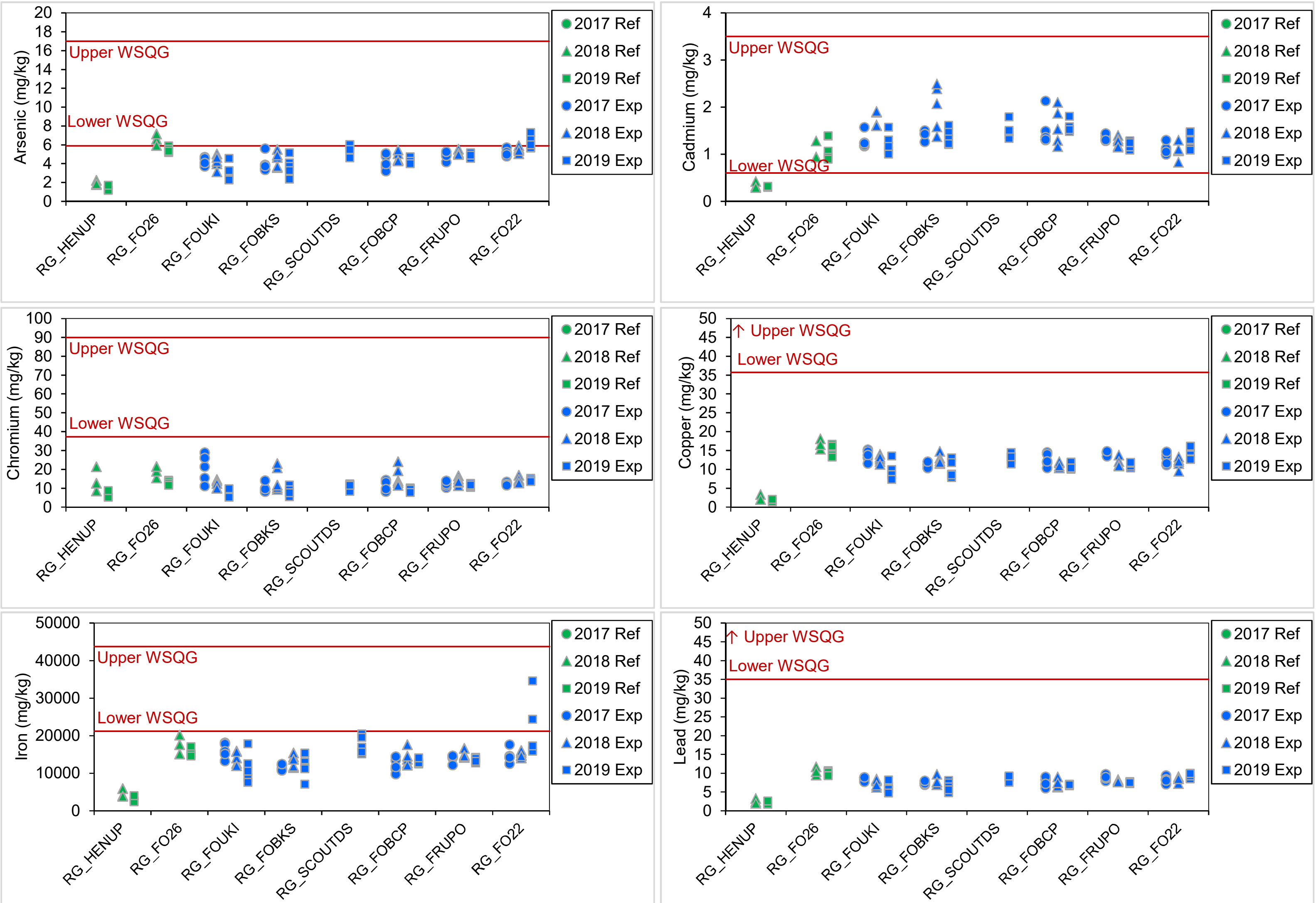

Figure D.1: Sediment Metal Concentrations Relative to BC Working Sediment Quality Guidelines (WSQG), FRO LAEMP, September 2017 to 2019

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

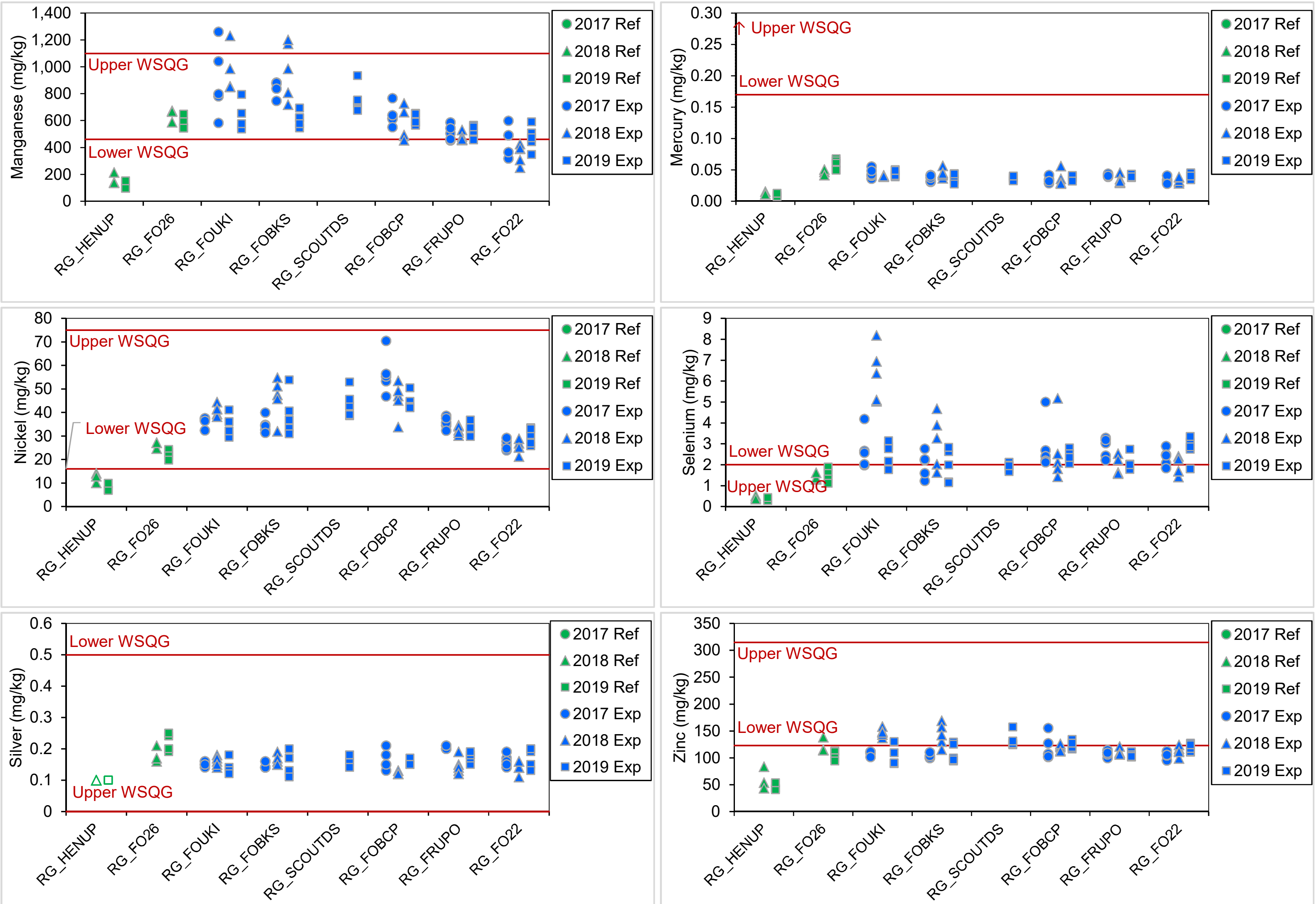

Figure D.1: Sediment Metal Concentrations Relative to BC Working Sediment Quality Guidelines (WSQG), FRO LAEMP, September 2017 to 2019

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

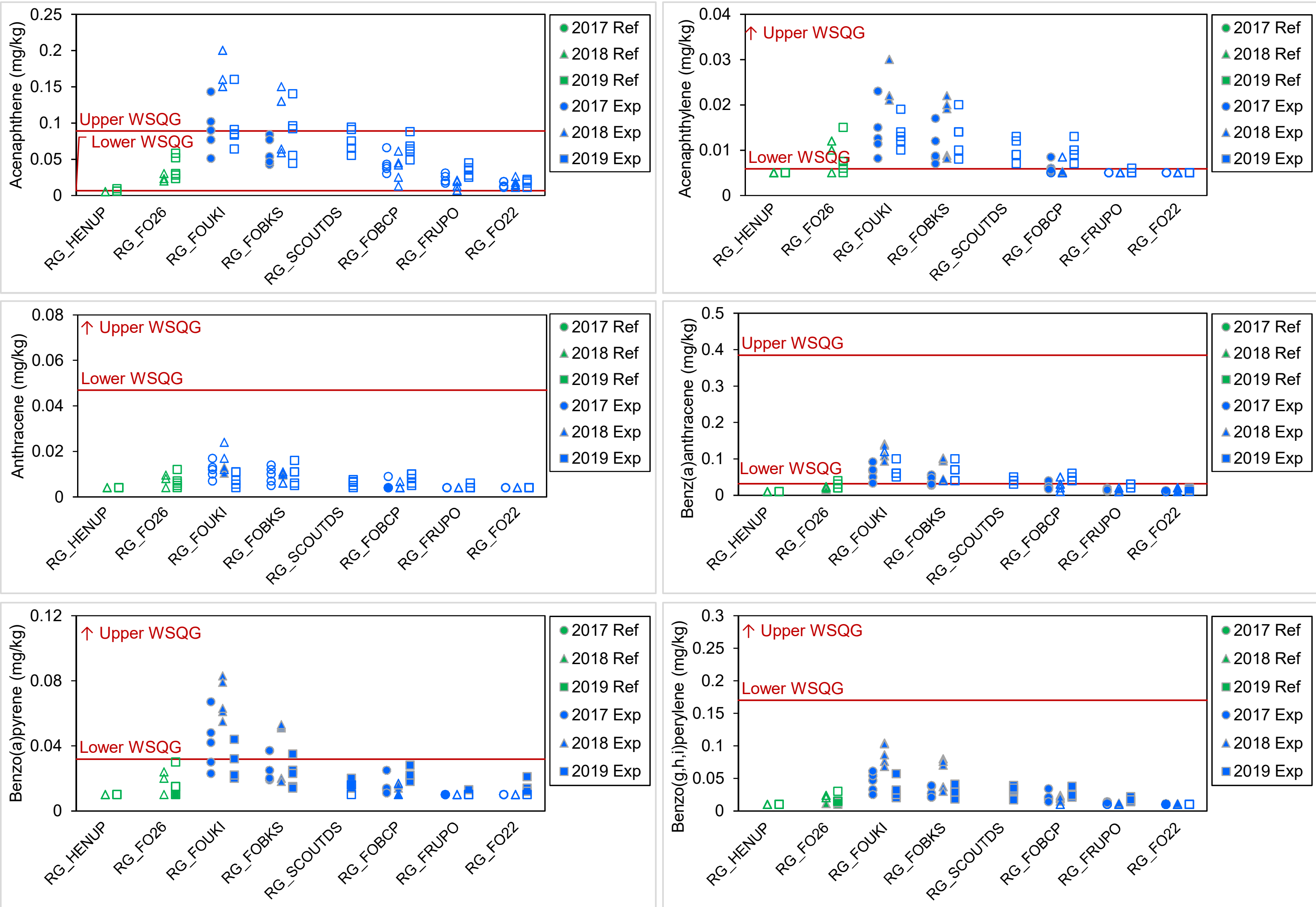

Figure D.2: Sediment Polycyclic Aromatic Hydrocarbons Concentrations Relative to BC Working Sediment Quality Guidelines (WSQG), FRO LAEMP, September 2017 to 2019

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

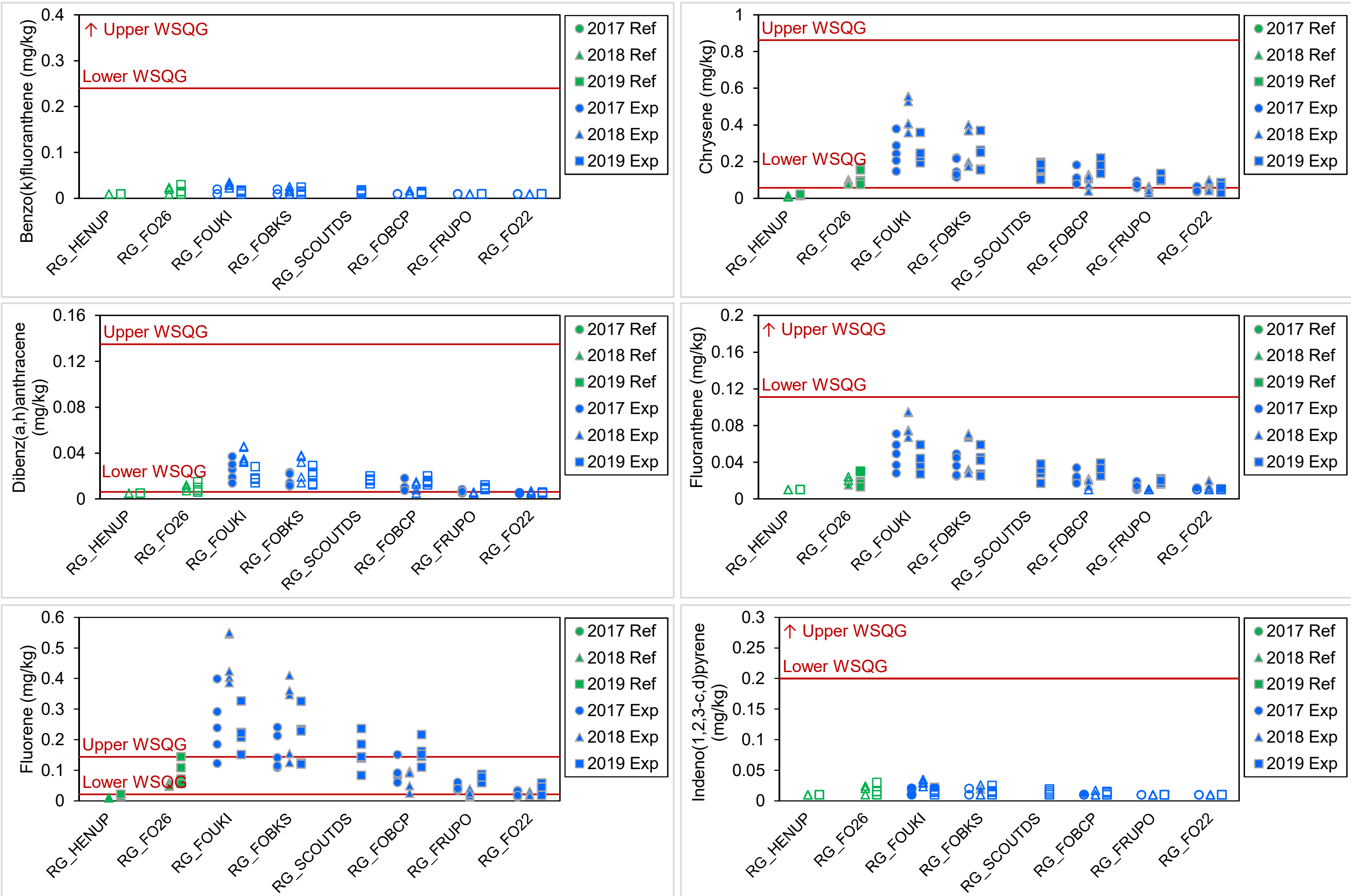

Figure D.2: Sediment Polycyclic Aromatic Hydrocarbons Concentrations Relative to BC Working Sediment Quality Guidelines (WSQG), FRO LAEMP, September 2017 to 2019

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

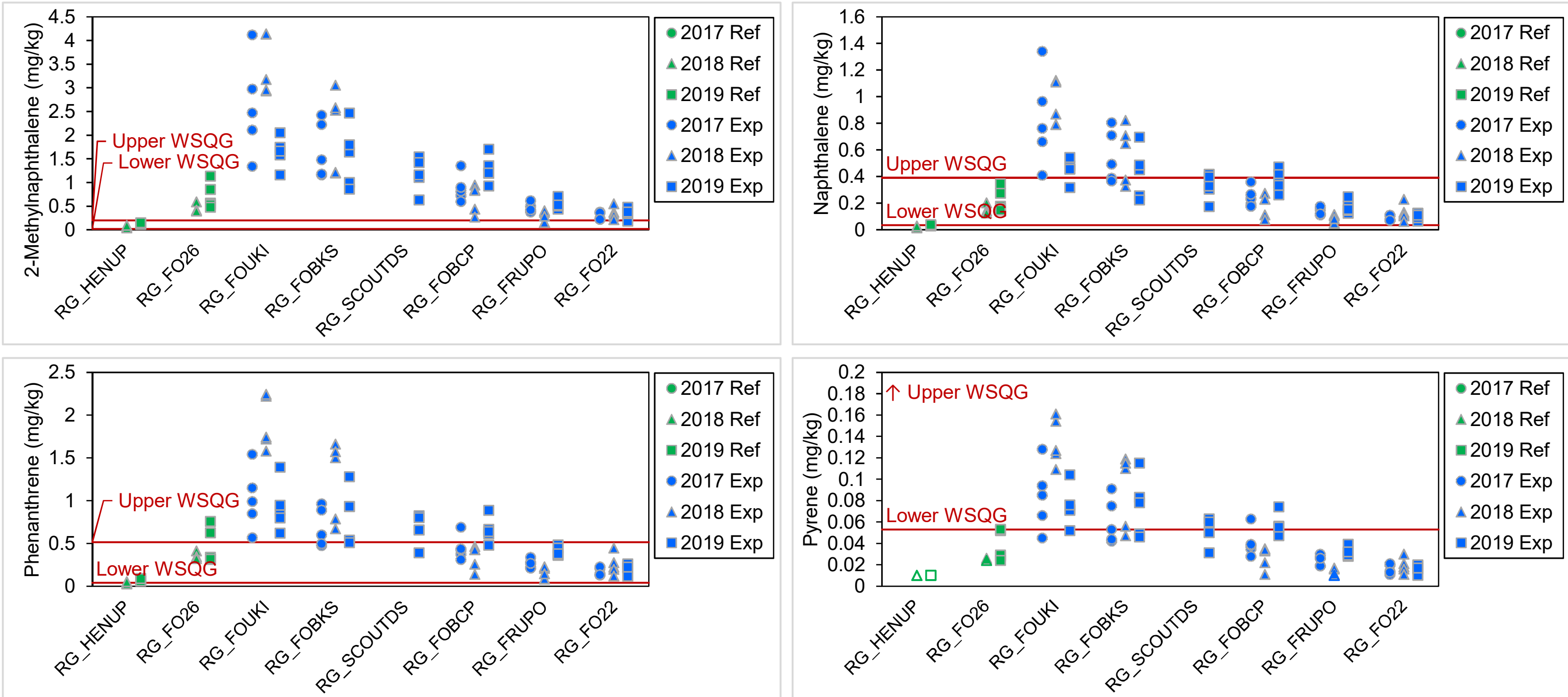

Figure D.2: Sediment Polycyclic Aromatic Hydrocarbons Concentrations Relative to BC Working Sediment Quality Guidelines (WSQG), FRO LAEMP, September 2017 to 2019

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

	Parameter	Units	Lower WSQG	Upper WSQG	RG_HENUP-Rep1	RG_HENUP-Rep2	RG_HENUP-Rep3	Min	Median	Max	Mean
					11-Sep-19	11-Sep-19	11-Sep-19				
Physical Tests	Moisture	%	-	-	42.0	41.0	38.4	38.4	41.0	42.0	40.5
	pH (1:2 soil:water)	pH units	-	-	8.32	8.23	8.32	8.23	8.32	8.32	8.29
Particle Size	% Gravel (>2mm)	%	-	-	6.2	<1.0	<1.0	<1.00	<1.00	6.20	2.73
	% Sand (2.0mm - 0.063mm)	%	-	-	-	-	-	58.4	73.8	73.8	68.7
	% Sand (2.00mm - 1.00mm)	%	-	-	2.9	2.6	<1.0	<1.00	2.60	2.90	2.17
	% Sand (1.00mm - 0.50mm)	%	-	-	9.3	9.7	<1.0	<1.00	9.30	9.70	6.67
	% Sand (0.50mm - 0.25mm)	%	-	-	25.3	25.2	6.8	6.80	25.2	25.3	19.1
	% Sand (0.25mm - 0.125mm)	%	-	-	23.9	23.7	22.8	22.8	23.7	23.9	23.5
	% Sand (0.125mm - 0.063mm)	%	-	-	12.4	12.6	26.8	12.4	12.6	26.8	17.3
	% Silt (0.063mm - 0.004mm)	%	-	-	-	-	-	17.9	23.3	39.8	27.0
	% Silt (0.063mm - 0.0312mm)	%	-	-	8.8	11.3	20.8	8.80	11.3	20.8	13.6
	% Silt (0.0312mm - 0.004mm)	%	-	-	9.1	12.0	19.0	9.10	12.0	19.0	13.4
	% Clay (<4μm)	%	-	-	2.2	2.3	2.8	2.20	2.30	2.80	2.43
	Texture	-	-	-	Loamy sand	Loamy sand	Sandy loam	-	-	-	-
Organic Carbon	Total Organic Carbon	%	-	-	5.1	5.6	6.4	5.10	5.60	6.40	5.70
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	1360	1350	2870	1,350	1,360	2,870	1,860
	Antimony (Sb)	mg/kg	-	-	<0.10	<0.10	0.12	<0.100	<0.100	0.120	0.107
	Arsenic (As)	mg/kg	5.9	17	1.21	1.15	1.69	1.15	1.21	1.69	1.35
	Barium (Ba)	mg/kg	-	-	13.0	12.7	18.8	12.7	13.0	18.8	14.8
	Beryllium (Be)	mg/kg	-	-	0.11	0.12	0.18	0.110	0.120	0.180	0.137
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.20	<0.200	<0.200	<0.200	<0.200
	Boron (B)	mg/kg	-	-	<5.0	<5.0	<5.0	<5.00	<5.00	<5.00	<5.00
	Cadmium (Cd)	mg/kg	0.6	3.5	0.289	0.296	0.315	0.289	0.296	0.315	0.300
	Calcium (Ca)	mg/kg	-	-	269,000	255,000	232,000	232,000	255,000	269,000	252,000
	Chromium (Cr)	mg/kg	37.3	90	5.24	5.15	8.69	5.15	5.24	8.69	6.36
	Cobalt (Co)	mg/kg	-	-	0.89	0.85	1.37	0.850	0.890	1.37	1.04
	Copper (Cu)	mg/kg	35.7	197	1.34	1.33	1.99	1.33	1.34	1.99	1.55
	Iron (Fe)	mg/kg	21,200	43,766	2630	2350	3940	2,350	2,630	3,940	2,970
	Lead (Pb)	mg/kg	35	91	1.70	1.72	2.55	1.70	1.72	2.55	1.99
	Lithium (Li)	mg/kg	-	-	6.2	6.7	11.9	6.20	6.70	11.9	8.27
	Magnesium (Mg)	mg/kg	-	-	43,300	42,200	59,900	42,200	43,300	59,900	48,500
	Manganese (Mn)	mg/kg	460	1100	94.5	95.4	150	94.5	95.4	150	113
	Mercury (Hg)	mg/kg	0.17	0.486	0.0094	0.0073	0.0124	0.00730	0.00940	0.0124	0.00970
	Molybdenum (Mo)	mg/kg	-	-	0.31	0.30	0.46	0.300	0.310	0.460	0.357
	Nickel (Ni)	mg/kg	16	75	6.97	6.74	9.75	6.74	6.97	9.75	7.82
	Phosphorus (P)	mg/kg	-	-	360	353	479	353	360	479	397
	Potassium (K)	mg/kg	-	-	390	400	760	390	400	760	517
	Selenium (Se)	mg/kg	2	2	0.33	0.28	0.41	0.280	0.330	0.410	0.340
	Silver (Ag)	mg/kg	0.5	-	<0.10	<0.10	<0.10	<0.100	<0.100	<0.100	<0.100
	Sodium (Na)	mg/kg	-	-	163	158	187	158	163	187	169
	Strontium (Sr)	mg/kg	-	-	128	124	100	100	124	128	117
	Sulfur (S)	mg/kg	-	-	<1000	<1000	<1000	<1,000	<1,000	<1,000	<1,000
	Thallium (Tl)	mg/kg	-	-	<0.050	<0.050	0.056	<0.0500	<0.0500	0.0560	0.0520
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.0	<2.00	<2.00	<2.00	<2.00
	Titanium (Ti)	mg/kg	-	-	14.8	15.7	32.1	14.8	15.7	32.1	20.9
	Tungsten (W)	mg/kg	-	-	<0.50	<0.50	<0.50	<0.500	<0.500	<0.500	<0.500
	Uranium (U)	mg/kg	-	-	0.411	0.389	0.491	0.389	0.411	0.491	0.430
	Vanadium (V)	mg/kg	-	-	5.02	4.74	8.53	4.74	5.02	8.53	6.10
	Zinc (Zn)	mg/kg	123	315	42.6	40.4	53.3	40.4	42.6	53.3	45.4
	Zirconium (Zr)	mg/kg	-	-	<1.0	<1.0	<1.0	<1.00	<1.00	<1.00	<1.00
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.0060	<0.0060	<0.0090	<0.00600	<0.00600	<0.00900	<0.00600
	Acenaphthylene	mg/kg	0.00587	0.128	<0.0050	<0.0050	<0.0050	<0.00500	<0.00500	<0.00500	<0.00500
	Acridine	mg/kg	-	-	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Anthracene	mg/kg	0.0469	0.245	<0.0040	<0.0040	<0.0040	<0.00400	<0.00400	<0.00400	<0.00400
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Benzo(a)pyrene	mg/kg	0.0319	0.782	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Benzo(b&j)fluoranthene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	<0.015	<0.015	<0.015	<0.0150	<0.0150	<0.0150	<0.0150
	Benzo(e)pyrene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Chrysene	mg/kg	0.0571	0.862	0.016	0.015	0.023	0.0150	0.0160	0.0230	0.0180
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.0050	<0.0050	<0.0050	<0.00500	<0.00500	<0.00500	<0.00500
	Fluoranthene	mg/kg	0.111	2.355	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Fluorene	mg/kg	0.021	0.144	0.016	0.015	0.021	0.0150	0.0160	0.0210	0.0173
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	1-Methylnaphthalene	mg/kg	-	-	0.066	0.066	0.088	0.0660	0.0660	0.0880	0.0733
	2-Methylnaphthalene	mg/kg	0.0202	0.201	0.110	0.109	0.145	0.109	0.110	0.145	0.121
	Naphthalene	mg/kg	0.0346	0.391	0.028	0.030	0.037	0.0280	0.0300	0.0370	0.0317
	Perylene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Phenanthrene	mg/kg	0.0419	0.515	0.063	0.059	0.088	0.0590	0.0630	0.0880	0.0700
	Pyrene	mg/kg	0.053	0.875	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Quinoline	mg/kg	-	-	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Acenaphthene d10	%	-	-	72.4	84.2	82.0	72.4	82.0	84.2	79.5
	Chrysene d12	%	-	-	89.3	97.8	101.4	89.3	97.8	101	96.2
	Naphthalene d8	%	-	-	62.6	72.6	70.9	62.6	70.9	72.6	68.7
	Phenanthrene d10	%	-	-	87.7	96.0	98.3	87.7	96.0	98.3	94.0
	B(a)P Total Potency Equivalent	mg/kg	-	-	<0.020	<0.020	<0.020	<0.0200	<0.0200	<0.0200	<0.0200
	IACR (CCME)	mg/kg	-	-	<0.15	<0.15	<0.15	<0.150	<0.150	<0.150	<0.150

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

	Parameter	Units	Lower WSQG	Upper WSQG	Standard Deviation	RG_FO26-Rep1 10-Sep-19	RG_FO26-Rep2 11-Sep-19	RG_FO26-Rep3 12-Sep-19	Min	Median	Max
Physical Tests	Moisture	%	-	-	1.86	66.1	67.8	83.3	47.7	66.1	83.3
	pH (1:2 soil:water)	pH units	-	-	0.0520	7.74	7.82	7.58	7.58	7.82	8.02
Particle Size	% Gravel (>2mm)	%	-	-	-	<1.0	<1.0	9.6	<1.00	<1.00	9.60
	% Sand (2.0mm - 0.063mm)	%	-	-	8.89	-	-	-	27.0	36.8	38.2
	% Sand (2.00mm - 1.00mm)	%	-	-	0.200	<1.0	<1.0	7.6	<1.00	<1.00	7.60
	% Sand (1.00mm - 0.50mm)	%	-	-	0.267	<1.0	<1.0	9.5	<1.00	2.70	9.50
	% Sand (0.50mm - 0.25mm)	%	-	-	10.7	2.0	2.2	7.6	2.00	7.60	10.6
	% Sand (0.25mm - 0.125mm)	%	-	-	0.586	9.6	10.6	6.7	6.70	10.6	15.8
	% Sand (0.125mm - 0.063mm)	%	-	-	8.26	14.3	12.2	6.5	6.50	8.10	14.3
	% Silt (0.063mm - 0.004mm)	%	-	-	11.4	-	-	-	48.4	58.0	69.4
	% Silt (0.063mm - 0.0312mm)	%	-	-	6.33	33.6	32.9	22.2	22.2	26.9	33.6
	% Silt (0.0312mm - 0.004mm)	%	-	-	5.09	35.7	36.5	26.2	26.2	31.2	36.5
	% Clay (<4µm)	%	-	-	0.321	4.3	5.0	4.2	4.00	4.30	5.00
	Texture	-	-	-	-	Silt loam	Silt loam	Silt loam	-	-	-
Organic Carbon	Total Organic Carbon	%	-	-	0.656	9.55	11.7	8.24	6.65	8.39	11.7
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	875	7480	7750	7970	6,690	7,480	7,970
	Antimony (Sb)	mg/kg	-	-	-	0.50	0.53	0.52	0.500	0.530	0.630
	Arsenic (As)	mg/kg	5.9	17	0.296	5.16	5.29	5.86	5.16	5.29	5.86
	Barium (Ba)	mg/kg	-	-	3.44	167	171	189	165	171	189
	Beryllium (Be)	mg/kg	-	-	0.0379	0.64	0.64	0.66	0.590	0.640	0.660
	Bismuth (Bi)	mg/kg	-	-	-	<0.20	<0.20	<0.20	<0.200	<0.200	<0.200
	Boron (B)	mg/kg	-	-	-	7.0	7.7	7.2	5.80	7.00	7.70
	Cadmium (Cd)	mg/kg	0.6	3.5	0.0135	1.38	1.39	1.06	0.892	1.06	1.39
	Calcium (Ca)	mg/kg	-	-	18,700	38,600	39,400	40,500	38,600	40,500	45,400
	Chromium (Cr)	mg/kg	37.3	90	2.02	13.7	14.2	13.4	11.5	13.4	14.2
	Cobalt (Co)	mg/kg	-	-	0.289	6.12	6.08	6.69	5.66	6.08	6.69
	Copper (Cu)	mg/kg	35.7	197	0.378	15.8	16.6	16.1	13.2	15.8	16.6
	Iron (Fe)	mg/kg	21,200	43,766	849	14800	14900	17000	14,500	14,900	17,000
	Lead (Pb)	mg/kg	35	91	0.485	10.6	10.3	10.2	9.28	10.2	10.6
	Lithium (Li)	mg/kg	-	-	3.16	9.1	9.0	8.7	7.80	8.70	9.10
	Magnesium (Mg)	mg/kg	-	-	9,920	10,300	10,300	8,740	8,740	10,300	10,500
	Manganese (Mn)	mg/kg	460	1100	31.8	543	551	646	541	551	646
	Mercury (Hg)	mg/kg	0.17	0.486	0.00256	0.0673	0.0642	0.0603	0.0493	0.0603	0.0673
	Molybdenum (Mo)	mg/kg	-	-	0.0896	1.50	1.52	1.59	1.50	1.59	1.70
	Nickel (Ni)	mg/kg	16	75	1.68	23.2	22.9	24.1	19.6	22.9	24.1
	Phosphorus (P)	mg/kg	-	-	70.8	1310	1270	1380	1,240	1,310	1,380
	Potassium (K)	mg/kg	-	-	211	1930	2080	2340	1,780	1,930	2,340
	Selenium (Se)	mg/kg	2	2	0.0656	1.76	1.88	1.57	1.10	1.57	1.88
	Silver (Ag)	mg/kg	0.5	-	-	0.24	0.25	0.20	0.190	0.200	0.250
	Sodium (Na)	mg/kg	-	-	15.5	70	73	82	70.0	73.0	82.0
	Strontium (Sr)	mg/kg	-	-	15.1	62.3	64.1	74.9	62.3	69.4	74.9
	Sulfur (S)	mg/kg	-	-	-	<1000	<1000	<1000	<1,000	<1,000	<1,000
	Thallium (Tl)	mg/kg	-	-	-	0.220	0.224	0.224	0.200	0.220	0.224
	Tin (Sn)	mg/kg	-	-	-	<2.0	<2.0	<2.0	<2.00	<2.00	<2.00
	Titanium (Ti)	mg/kg	-	-	9.74	17.2	18.0	11.5	11.5	18.0	24.3
	Tungsten (W)	mg/kg	-	-	-	<0.50	<0.50	<0.50	<0.500	<0.500	<0.500
	Uranium (U)	mg/kg	-	-	0.0537	1.26	1.29	1.06	0.845	1.06	1.29
	Vanadium (V)	mg/kg	-	-	2.11	24.8	26.0	26.5	24.4	25.2	26.5
	Zinc (Zn)	mg/kg	123	315	6.90	112	112	111	93.5	111	112
	Zirconium (Zr)	mg/kg	-	-	-	<1.0	<1.0	<1.0	<1.00	<1.00	1.10
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	-	<0.030	<0.028	<0.058	<0.0230	<0.0300	<0.0580
	Acenaphthylene	mg/kg	0.00587	0.128	-	<0.0075	<0.0075	<0.015	<0.00500	<0.00750	<0.0150
	Acridine	mg/kg	-	-	-	<0.015	<0.015	<0.030	<0.0100	<0.0150	<0.0300
	Anthracene	mg/kg	0.0469	0.245	-	<0.0070	<0.0060	<0.012	<0.00400	<0.00600	<0.0120
	Benz(a)anthracene	mg/kg	0.0317	0.385	-	<0.020	<0.020	<0.040	<0.0200	<0.0200	<0.0400
	Benzo(a)pyrene	mg/kg	0.0319	0.782	-	<0.015	<0.015	<0.030	<0.0100	0.0100	<0.0300
	Benzo(b&j)fluoranthene	mg/kg	-	-	-	0.035	0.034	0.063	0.0240	0.0350	0.0630
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	-	0.037	0.036	0.067	0.0270	0.0370	0.0670
	Benzo(e)pyrene	mg/kg	-	-	-	0.036	0.033	0.064	0.0230	0.0360	0.0640
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	-	<0.015	<0.015	<0.030	0.0100	0.0115	<0.0300
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	-	<0.015	<0.015	<0.030	<0.0100	<0.0150	<0.0300
	Chrysene	mg/kg	0.0571	0.862	0.00436	0.097	0.092	0.169	0.0770	0.0970	0.169
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	-	<0.0075	<0.0075	<0.015	<0.00600	<0.00750	<0.0150
	Fluoranthene	mg/kg	0.111	2.355	-	0.019	0.017	<0.030	0.0130	0.0170	0.0300
	Fluorene	mg/kg	0.021	0.144	0.00321	0.071	0.066	0.144	0.0560	0.0710	0.144
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	-	<0.015	<0.015	<0.030	<0.0100	<0.0150	<0.0300
	1-Methylnaphthalene	mg/kg	-	-	0.0127	0.323	0.304	0.652	0.275	0.323	0.652
	2-Methylnaphthalene	mg/kg	0.0202	0.201	0.0205	0.559	0.527	1.13	0.474	0.559	1.13
	Naphthalene	mg/kg	0.0346	0.391	0.00473	0.175	0.162	0.344	0.147	0.175	0.344
	Perylene	mg/kg	-	-	-	<0.015	<0.015	<0.030	<0.0100	<0.0150	<0.0300
	Phenanthrene	mg/kg	0.0419	0.515	0.0157	0.336	0.311	0.621	0.311	0.336	0.755
	Pyrene	mg/kg	0.053	0.875	-	0.028	0.029	0.052	0.0240	0.0290	0.0530
	Quinoline	mg/kg	-	-	-	<0.015	<0.015	<0.030	<0.0100	<0.0150	<0.0300
	Acenaphthene d10	%	-	-	6.27	96.6	98.3	104.8	89.0	96.6	105
	Chrysene d12	%	-	-	6.21	109.3	111.6	117.0	95.1	109	117
	Naphthalene d8	%	-	-	5.35	96.6	98.2	101.9	78.1	96.6	102
	Phenanthrene d10	%	-	-	5.58	106.0	107.6	113.8	98.0	106	114
	B(a)P Total Potency Equivalent	mg/kg	-	-	-	<0.020	<0.020	0.036	<0.0200	<0.0200	0.0360
	IACR (CCME)	mg/kg	-	-	-	0.38	0.38	0.71	0.280	0.380	0.710

Value > lower Working Sediment Quality Guideline (WSQG).
Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).
Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).
Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

Parameter		Units	Lower WSQG	Upper WSQG	Mean	Standard Deviation	RG_FOUKI-Rep1	RG_FOUKI-Rep2	RG_FOUKI-Rep3	RG_FOUKI-Rep4
							05-Sep-19	05-Sep-19	05-Sep-19	05-Sep-19
Physical Tests	Moisture	%	-	-	64.2	13.4	66.9	52.6	68.2	73.5
	pH (1:2 soil:water)	pH units	-	-	7.81	0.162	7.79	7.67	7.72	7.72
Particle Size	% Gravel (>2mm)	%	-	-	2.78	4.70	2.8	25.1	9.9	<1.0
	% Sand (2.0mm - 0.063mm)	%	-	-	33.6	5.61	-	-	-	-
	% Sand (2.00mm - 1.00mm)	%	-	-	2.50	3.22	3.3	5.7	5.7	1.6
	% Sand (1.00mm - 0.50mm)	%	-	-	3.52	3.26	2.7	5.9	7.2	5.0
	% Sand (0.50mm - 0.25mm)	%	-	-	6.42	4.09	5.7	7.5	12.4	6.8
	% Sand (0.25mm - 0.125mm)	%	-	-	11.6	3.88	13.3	7.9	17.1	7.9
	% Sand (0.125mm - 0.063mm)	%	-	-	9.52	3.55	16.3	6.5	11.5	7.7
	% Silt (0.063mm - 0.004mm)	%	-	-	60.6	8.90	-	-	-	-
	% Silt (0.063mm - 0.0312mm)	%	-	-	28.4	4.79	24.3	18.0	15.6	26.8
	% Silt (0.0312mm - 0.004mm)	%	-	-	32.1	4.15	25.9	19.6	17.4	34.5
	% Clay (<4μm)	%	-	-	4.38	0.377	5.8	3.8	3.2	9.7
	Texture	-	-	-	-	-	Silt loam	Silt loam	Sandy loam	Silt loam
Organic Carbon	Total Organic Carbon	%	-	-	8.91	1.87	9.37	9.07	7.47	13.1
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	7,390	518	3900	5780	4670	2750
	Antimony (Sb)	mg/kg	-	-	0.562	0.0630	0.34	0.40	0.42	0.31
	Arsenic (As)	mg/kg	5.9	17	5.42	0.276	2.81	3.19	3.23	2.24
	Barium (Ba)	mg/kg	-	-	173	9.50	133	164	134	127
	Beryllium (Be)	mg/kg	-	-	0.626	0.0297	0.33	0.44	0.38	0.28
	Bismuth (Bi)	mg/kg	-	-	<0.200	-	<0.20	<0.20	<0.20	<0.20
	Boron (B)	mg/kg	-	-	6.88	0.705	7.9	13.3	7.0	12.8
	Cadmium (Cd)	mg/kg	0.6	3.5	1.13	0.240	1.07	1.30	0.997	1.16
	Calcium (Ca)	mg/kg	-	-	41,200	2,690	47,500	56,400	46,600	52,500
	Chromium (Cr)	mg/kg	37.3	90	13.0	1.08	6.65	8.18	7.31	5.07
	Cobalt (Co)	mg/kg	-	-	6.11	0.372	4.86	5.88	4.63	4.77
	Copper (Cu)	mg/kg	35.7	197	15.1	1.50	8.43	9.89	8.54	7.32
	Iron (Fe)	mg/kg	21,200	43,766	15,300	996	8760	12500	10500	7490
	Lead (Pb)	mg/kg	35	91	9.95	0.588	5.71	6.50	5.77	4.64
	Lithium (Li)	mg/kg	-	-	8.58	0.536	6.1	9.9	6.5	4.7
	Magnesium (Mg)	mg/kg	-	-	9,960	709	9,270	9,010	9,100	7,220
	Manganese (Mn)	mg/kg	460	1100	574	44.8	545	652	537	576
	Mercury (Hg)	mg/kg	0.17	0.486	0.0583	0.00806	0.0434	0.0500	0.0385	0.0407
	Molybdenum (Mo)	mg/kg	-	-	1.58	0.0789	0.83	1.04	0.96	0.82
	Nickel (Ni)	mg/kg	16	75	22.2	1.77	30.2	36.0	29.3	32.0
	Phosphorus (P)	mg/kg	-	-	1,300	53.2	770	878	935	680
	Potassium (K)	mg/kg	-	-	2,000	218	930	1260	1040	730
	Selenium (Se)	mg/kg	2	2	1.52	0.322	2.16	2.88	1.75	2.75
	Silver (Ag)	mg/kg	0.5	-	0.216	0.0270	0.13	0.14	0.13	0.12
	Sodium (Na)	mg/kg	-	-	74.2	4.55	52	67	55	55
	Strontium (Sr)	mg/kg	-	-	68.2	5.04	52.2	68.6	56.7	53.9
	Sulfur (S)	mg/kg	-	-	<1,000	-	<1000	<1000	<1000	<1000
	Thallium (Tl)	mg/kg	-	-	0.218	0.0100	0.116	0.126	0.129	0.093
	Tin (Sn)	mg/kg	-	-	<2.00	-	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti)	mg/kg	-	-	18.0	4.57	11.8	14.7	10.2	7.6
	Tungsten (W)	mg/kg	-	-	<0.500	-	<0.50	<0.50	<0.50	<0.50
	Uranium (U)	mg/kg	-	-	1.07	0.199	0.614	0.712	0.646	0.579
	Vanadium (V)	mg/kg	-	-	25.4	0.861	15.4	19.2	17.8	12.1
	Zinc (Zn)	mg/kg	123	315	106	8.51	88.6	109	89.5	90.3
	Zirconium (Zr)	mg/kg	-	-	1.04	-	<1.0	<1.0	<1.0	<1.0
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.0230	-	<0.091	<0.064	<0.083	<0.085
	Acenaphthylene	mg/kg	0.00587	0.128	<0.00500	-	<0.013	<0.010	<0.014	<0.012
	Acridine	mg/kg	-	-	<0.0100	-	<0.014	<0.010	<0.015	<0.018
	Anthracene	mg/kg	0.0469	0.245	<0.00400	-	<0.0056	<0.0040	<0.011	<0.0072
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.0200	-	<0.060	<0.050	<0.060	<0.060
	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.0100	-	0.022	0.020	0.022	0.032
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.0396	0.0146	0.069	0.062	0.068	0.091
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.0424	0.0152	0.073	0.066	0.073	0.099
	Benzo(e)pyrene	mg/kg	-	-	0.0390	0.0152	0.073	0.067	0.072	0.097
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.0115	0.00335	0.026	0.020	0.025	0.032
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.0100	-	<0.014	<0.010	<0.015	<0.018
	Chrysene	mg/kg	0.0571	0.862	0.118	0.0414	0.230	0.194	0.229	0.246
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.00600	-	<0.017	<0.014	<0.018	<0.018
	Fluoranthene	mg/kg	0.111	2.355	0.0191	0.00698	0.041	0.027	0.037	0.044
	Fluorene	mg/kg	0.021	0.144	0.0890	0.0365	0.223	0.151	0.207	0.222
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.0100	-	<0.014	<0.010	<0.015	<0.018
	1-Methylnaphthalene	mg/kg	-	-	0.409	0.160	1.04	0.694	0.955	0.998
	2-Methylnaphthalene	mg/kg	0.0202	0.201	0.708	0.277	1.74	1.16	1.58	1.66
	Naphthalene	mg/kg	0.0346	0.391	0.220	0.0848	0.481	0.316	0.456	0.454
	Perylene	mg/kg	-	-	<0.0100	-	<0.014	<0.010	<0.015	<0.018
	Phenanthrene	mg/kg	0.0419	0.515	0.468	0.207	0.885	0.619	0.798	0.944
	Pyrene	mg/kg	0.053	0.875	0.0372	0.0141	0.072	0.052	0.071	0.076
	Quinoline	mg/kg	-	-	<0.0100	-	<0.014	<0.010	<0.015	<0.018
	Acenaphthene d10	%	-	-	95.6	6.64	97.9	105.5	94.1	89.7
	Chrysene d12	%	-	-	106	9.85	115.8	125.2	124.8	97.3
	Naphthalene d8	%	-	-	91.4	10.6	94.9	99.2	92.0	82.4
	Phenanthrene d10	%	-	-	105	6.61	105.0	115.1	101.7	94.9
	B(a)P Total Potency Equivalent	mg/kg	-	-	0.0240	0.00679	0.045	0.039	0.045	0.058
	IACR (CCME)	mg/kg	-	-	0.444	0.163	0.78	0.68	0.78	0.96

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

Parameter		Units	Lower WSQG	Upper WSQG	RG_FOUKI-Rep5	Min	Median	Max	Mean	Standard Deviation	RG_FOBKS-Rep1
					05-Sep-19						09-Sep-19
Physical Tests	Moisture	%	-	-	73.7	52.6	68.2	73.7	67.0	8.60	49.3
	pH (1:2 soil:water)	pH units	-	-	7.83	7.67	7.72	7.83	7.75	0.0635	8.27
Particle Size	% Gravel (>2mm)	%	-	-	16.8	<1.00	9.90	25.1	11.1	9.89	8.3
	% Sand (2.0mm - 0.063mm)	%	-	-	-	29.0	36.1	53.9	38.8	9.56	-
	% Sand (2.00mm - 1.00mm)	%	-	-	6.6	1.60	5.70	6.60	4.58	2.07	3.9
	% Sand (1.00mm - 0.50mm)	%	-	-	10.1	2.70	5.90	10.1	6.18	2.74	6.3
	% Sand (0.50mm - 0.25mm)	%	-	-	7.2	5.70	7.20	12.4	7.92	2.60	10.3
	% Sand (0.25mm - 0.125mm)	%	-	-	6.2	6.20	7.90	17.1	10.5	4.57	12.0
	% Sand (0.125mm - 0.063mm)	%	-	-	6.0	6.00	7.70	16.3	9.60	4.32	14.8
	% Silt (0.063mm - 0.004mm)	%	-	-	-	33.0	42.8	61.3	45.0	11.1	-
	% Silt (0.063mm - 0.0312mm)	%	-	-	19.5	15.6	19.5	26.8	20.8	4.60	19.1
	% Silt (0.0312mm - 0.004mm)	%	-	-	23.3	17.4	23.3	34.5	24.1	6.66	21.5
	% Clay (<4µm)	%	-	-	4.2	3.20	4.20	9.70	5.34	2.62	3.8
	Texture	-	-	-	Silt loam	-	-	-	-	-	Sandy loam
Organic Carbon	Total Organic Carbon	%	-	-	9.47	7.47	9.37	13.1	9.70	2.07	6.82
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	6150	2,750	4,670	6,150	4,650	1,390	6780
	Antimony (Sb)	mg/kg	-	-	0.67	0.310	0.400	0.670	0.428	0.142	0.57
	Arsenic (As)	mg/kg	5.9	17	4.54	2.24	3.19	4.54	3.20	0.847	5.13
	Barium (Ba)	mg/kg	-	-	214	127	134	214	154	36.3	189
	Beryllium (Be)	mg/kg	-	-	0.53	0.280	0.380	0.530	0.392	0.0973	0.59
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.200	<0.200	<0.200	<0.200	-	<0.20
	Boron (B)	mg/kg	-	-	10.6	7.00	10.6	13.3	10.3	2.83	6.7
	Cadmium (Cd)	mg/kg	0.6	3.5	1.57	0.997	1.16	1.57	1.22	0.226	1.61
	Calcium (Ca)	mg/kg	-	-	53,000	46,600	52,500	56,400	51,200	4,090	57,800
	Chromium (Cr)	mg/kg	37.3	90	9.65	5.07	7.31	9.65	7.37	1.71	11.6
	Cobalt (Co)	mg/kg	-	-	6.94	4.63	4.86	6.94	5.42	0.985	6.18
	Copper (Cu)	mg/kg	35.7	197	13.5	7.32	8.54	13.5	9.54	2.40	13.0
	Iron (Fe)	mg/kg	21,200	43,766	17800	7,490	10,500	17,800	11,400	4,040	15300
	Lead (Pb)	mg/kg	35	91	8.18	4.64	5.77	8.18	6.16	1.31	7.98
	Lithium (Li)	mg/kg	-	-	9.9	4.70	6.50	9.90	7.42	2.36	9.6
	Magnesium (Mg)	mg/kg	-	-	9,890	7,220	9,100	9,890	8,900	999	13,200
	Manganese (Mn)	mg/kg	460	1100	793	537	576	793	621	107	692
	Mercury (Hg)	mg/kg	0.17	0.486	0.0486	0.0385	0.0434	0.0500	0.0442	0.00496	0.0439
	Molybdenum (Mo)	mg/kg	-	-	1.54	0.820	0.960	1.54	1.04	0.295	1.44
	Nickel (Ni)	mg/kg	16	75	41.0	29.3	32.0	41.0	33.7	4.82	53.7
	Phosphorus (P)	mg/kg	-	-	1070	680	878	1,070	867	150	1300
	Potassium (K)	mg/kg	-	-	1270	730	1,040	1,270	1,050	229	1540
	Selenium (Se)	mg/kg	2	2	3.14	1.75	2.75	3.14	2.54	0.567	2.62
	Silver (Ag)	mg/kg	0.5	-	0.18	0.120	0.130	0.180	0.140	0.0235	0.20
	Sodium (Na)	mg/kg	-	-	70	52.0	55.0	70.0	59.8	8.11	70
	Strontium (Sr)	mg/kg	-	-	87.1	52.2	56.7	87.1	63.7	14.6	71.1
	Sulfur (S)	mg/kg	-	-	1500	<1,000	<1,000	1,500	1,100	-	<1000
	Thallium (Tl)	mg/kg	-	-	0.153	0.0930	0.126	0.153	0.123	0.0218	0.196
	Tin (Sn)	mg/kg	-	-	<2.0	<2.00	<2.00	<2.00	<2.00	-	<2.0
	Titanium (Ti)	mg/kg	-	-	18.1	7.60	11.8	18.1	12.5	4.06	17.6
	Tungsten (W)	mg/kg	-	-	<0.50	<0.500	<0.500	<0.500	<0.500	-	<0.50
	Uranium (U)	mg/kg	-	-	0.857	0.579	0.646	0.857	0.682	0.110	0.941
	Vanadium (V)	mg/kg	-	-	23.3	12.1	17.8	23.3	17.6	4.19	28.8
	Zinc (Zn)	mg/kg	123	315	130	88.6	90.3	130	101	18.1	129
	Zirconium (Zr)	mg/kg	-	-	1.1	<1.00	<1.00	1.10	1.02	-	<1.0
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.16	<0.0640	<0.0850	<0.160	<0.0640	-	<0.055
	Acenaphthylene	mg/kg	0.00587	0.128	<0.019	<0.0100	<0.0130	<0.0190	<0.0100	-	<0.010
	Acridine	mg/kg	-	-	<0.018	<0.0100	<0.0150	<0.0180	<0.0100	-	<0.010
	Anthracene	mg/kg	0.0469	0.245	<0.011	<0.00400	<0.00720	<0.0110	<0.00400	-	<0.0050
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.10	<0.0500	<0.0600	<0.100	<0.0500	-	<0.040
	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.044	0.0200	0.0220	0.0440	0.0280	0.0101	0.015
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.129	0.0620	0.0690	0.129	0.0838	0.0276	0.051
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.139	0.0660	0.0730	0.139	0.0900	0.0301	0.053
	Benzo(e)pyrene	mg/kg	-	-	0.137	0.0670	0.0730	0.137	0.0892	0.0291	0.052
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.057	0.0200	0.0260	0.0570	0.0320	0.0146	0.020
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.018	<0.0100	<0.0150	<0.0180	<0.0100	-	<0.010
	Chrysene	mg/kg	0.0571	0.862	0.360	0.194	0.230	0.360	0.252	0.0634	0.160
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.028	<0.0140	<0.0180	<0.0280	<0.0140	-	<0.013
	Fluoranthene	mg/kg	0.111	2.355	0.059	0.0270	0.0410	0.0590	0.0416	0.0117	0.027
	Fluorene	mg/kg	0.021	0.144	0.326	0.151	0.222	0.326	0.226	0.0633	0.123
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	0.022	<0.0100	<0.0150	0.0220	0.0124	-	<0.010
	1-Methylnaphthalene	mg/kg	-	-	1.22	0.694	0.998	1.22	0.981	0.190	0.598
	2-Methylnaphthalene	mg/kg	0.0202	0.201	2.05	1.16	1.66	2.05	1.64	0.321	0.998
	Naphthalene	mg/kg	0.0346	0.391	0.543	0.316	0.456	0.543	0.450	0.0831	0.255
	Perylene	mg/kg	-	-	<0.018	<0.0100	<0.0150	<0.0180	<0.0100	-	<0.010
	Phenanthrene	mg/kg	0.0419	0.515	1.39	0.619	0.885	1.39	0.927	0.286	0.538
	Pyrene	mg/kg	0.053	0.875	0.104	0.0520	0.0720	0.104	0.0750	0.0187	0.049
	Quinoline	mg/kg	-	-	<0.018	<0.0100	<0.0150	<0.0180	<0.0100	-	<0.010
	Acenaphthene d10	%	-	-	79.8	79.8	94.1	106	93.4	9.56	91.8
	Chrysene d12	%	-	-	96.8	96.8	116	125	112	14.1	112.1
	Naphthalene d8	%	-	-	62.6	62.6	92.0	99.2	86.2	14.6	77.4
	Phenanthrene d10	%	-	-	93.8	93.8	102	115	102	8.64	98.4
	B(a)P Total Potency Equivalent	mg/kg	-	-	0.083	0.0390	0.0450	0.0830	0.0540	0.0176	0.031
	IACR (CCME)	mg/kg	-	-	1.38	0.680	0.780	1.38	0.916	0.278	0.56

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

Parameter		Units	Lower WSQG	Upper WSQG	RG_FOBKS-Rep2	RG_FOBKS-Rep3	RG_FOBKS-Rep4	RG_FOBKS-Rep5	Min	Median
					09-Sep-19	09-Sep-19	09-Sep-19	09-Sep-19		
Physical Tests	Moisture	%	-	-	65.8	50.1	80.9	71.7	49.3	65.8
	pH (1:2 soil:water)	pH units	-	-	7.97	8.19	7.78	7.93	7.78	7.97
Particle Size	% Gravel (>2mm)	%	-	-	1.6	6.4	2.6	4.5	1.60	4.50
	% Sand (2.0mm - 0.063mm)	%	-	-	-	-	-	-	19.4	47.3
	% Sand (2.00mm - 1.00mm)	%	-	-	8.4	4.3	3.6	3.4	3.40	3.90
	% Sand (1.00mm - 0.50mm)	%	-	-	8.2	7.5	3.9	10.5	3.90	7.50
	% Sand (0.50mm - 0.25mm)	%	-	-	10.5	14.9	2.2	19.7	2.20	10.5
	% Sand (0.25mm - 0.125mm)	%	-	-	8.4	18.1	3.5	12.8	3.50	12.0
	% Sand (0.125mm - 0.063mm)	%	-	-	11.5	13.2	6.2	6.7	6.20	11.5
	% Silt (0.063mm - 0.004mm)	%	-	-	-	-	-	-	32.7	40.6
	% Silt (0.063mm - 0.0312mm)	%	-	-	21.8	15.9	32.8	17.8	15.9	19.1
	% Silt (0.0312mm - 0.004mm)	%	-	-	24.6	16.8	37.5	20.2	16.8	21.5
	% Clay (<4µm)	%	-	-	4.9	2.9	7.4	4.3	2.90	4.30
	Texture	-	-	-	Sandy loam	Sandy loam	Silt loam	Sandy loam	-	-
Organic Carbon	Total Organic Carbon	%	-	-	9.00	6.18	12.6	8.91	6.18	8.91
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	4920	4340	2750	4390	2,750	4,390
	Antimony (Sb)	mg/kg	-	-	0.48	0.45	0.37	0.39	0.370	0.450
	Arsenic (As)	mg/kg	5.9	17	4.06	3.70	2.32	3.24	2.32	3.70
	Barium (Ba)	mg/kg	-	-	163	137	129	163	129	163
	Beryllium (Be)	mg/kg	-	-	0.48	0.38	0.29	0.43	0.290	0.430
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.20	<0.20	<0.200	<0.200
	Boron (B)	mg/kg	-	-	6.9	5.7	13.9	9.3	5.70	6.90
	Cadmium (Cd)	mg/kg	0.6	3.5	1.46	1.20	1.32	1.22	1.20	1.32
	Calcium (Ca)	mg/kg	-	-	53,200	51,400	46,600	41,500	41,500	51,400
	Chromium (Cr)	mg/kg	37.3	90	9.07	7.42	5.42	7.56	5.42	7.56
	Cobalt (Co)	mg/kg	-	-	5.87	4.98	4.92	4.53	4.53	4.98
	Copper (Cu)	mg/kg	35.7	197	11.7	8.71	7.81	8.45	7.81	8.71
	Iron (Fe)	mg/kg	21,200	43,766	12900	11500	6990	11100	6,990	11,500
	Lead (Pb)	mg/kg	35	91	7.37	6.32	4.77	5.53	4.77	6.32
	Lithium (Li)	mg/kg	-	-	7.7	6.4	4.2	5.9	4.20	6.40
	Magnesium (Mg)	mg/kg	-	-	11,300	10,700	7,020	6,470	6,470	10,700
	Manganese (Mn)	mg/kg	460	1100	619	543	621	575	543	619
	Mercury (Hg)	mg/kg	0.17	0.486	0.0332	0.0358	0.0433	0.0270	0.0270	0.0358
	Molybdenum (Mo)	mg/kg	-	-	1.24	0.97	0.78	0.84	0.780	0.970
	Nickel (Ni)	mg/kg	16	75	40.5	33.2	36.7	30.8	30.8	36.7
	Phosphorus (P)	mg/kg	-	-	1090	1040	700	944	700	1,040
	Potassium (K)	mg/kg	-	-	1090	960	740	1100	740	1,090
	Selenium (Se)	mg/kg	2	2	2.82	1.16	1.98	1.13	1.13	1.98
	Silver (Ag)	mg/kg	0.5	-	0.17	0.12	0.13	0.11	0.110	0.130
	Sodium (Na)	mg/kg	-	-	61	61	51	50	50.0	61.0
	Strontium (Sr)	mg/kg	-	-	65.6	57.3	52.8	64.2	52.8	64.2
	Sulfur (S)	mg/kg	-	-	<1000	<1000	<1000	<1000	<1,000	<1,000
	Thallium (Tl)	mg/kg	-	-	0.140	0.135	0.101	0.116	0.101	0.135
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.00	<2.00
	Titanium (Ti)	mg/kg	-	-	15.1	11.4	12.9	10.1	10.1	12.9
	Tungsten (W)	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.500	<0.500
	Uranium (U)	mg/kg	-	-	0.952	0.726	0.631	0.674	0.631	0.726
	Vanadium (V)	mg/kg	-	-	22.4	18.5	13.3	20.5	13.3	20.5
	Zinc (Zn)	mg/kg	123	315	125	99.2	93.5	95.6	93.5	99.2
	Zirconium (Zr)	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.00	<1.00
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.092	<0.044	<0.14	<0.096	<0.0440	<0.0920
	Acenaphthylene	mg/kg	0.00587	0.128	<0.014	<0.0080	<0.020	<0.014	<0.00800	<0.0140
	Acridine	mg/kg	-	-	<0.014	<0.010	<0.025	<0.016	<0.0100	<0.0140
	Anthracene	mg/kg	0.0469	0.245	<0.011	<0.0060	<0.016	<0.011	<0.00500	<0.0110
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.070	<0.040	<0.10	<0.070	<0.0400	<0.0700
	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.025	0.014	0.035	0.023	0.0140	0.0230
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.078	0.043	0.108	0.076	0.0430	0.0760
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.081	0.046	0.113	0.082	0.0460	0.0810
	Benzo(e)pyrene	mg/kg	-	-	0.081	0.045	0.114	0.081	0.0450	0.0810
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.031	0.018	0.041	0.029	0.0180	0.0290
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.014	<0.010	<0.025	<0.016	<0.0100	<0.0140
	Chrysene	mg/kg	0.0571	0.862	0.263	0.156	0.371	0.251	0.156	0.251
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.023	<0.012	<0.029	<0.021	<0.0120	<0.0210
	Fluoranthene	mg/kg	0.111	2.355	0.045	0.025	0.059	0.042	0.0250	0.0420
	Fluorene	mg/kg	0.021	0.144	0.233	0.120	0.325	0.228	0.120	0.228
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.014	<0.010	<0.025	<0.016	<0.0100	<0.0140
	1-Methylnaphthalene	mg/kg	-	-	0.986	0.524	1.50	1.07	0.524	0.986
	2-Methylnaphthalene	mg/kg	0.0202	0.201	1.64	0.857	2.46	1.79	0.857	1.64
	Naphthalene	mg/kg	0.0346	0.391	0.449	0.223	0.695	0.485	0.223	0.449
	Perylene	mg/kg	-	-	<0.014	<0.010	<0.025	<0.016	<0.0100	<0.0140
	Phenanthrene	mg/kg	0.0419	0.515	0.929	0.509	1.28	0.931	0.509	0.929
	Pyrene	mg/kg	0.053	0.875	0.083	0.046	0.115	0.078	0.0460	0.0780
	Quinoline	mg/kg	-	-	<0.014	<0.010	<0.025	<0.016	<0.0100	<0.0140
	Acenaphthene d10	%	-	-	95.5	94.2	98.8	101.8	91.8	95.5
	Chrysene d12	%	-	-	121.2	123.2	126.1	124.4	112	123
	Naphthalene d8	%	-	-	83.4	81.0	90.6	95.4	77.4	83.4
	Phenanthrene d10	%	-	-	105.6	104.9	105.6	108.7	98.4	106
	B(a)P Total Potency Equivalent	mg/kg	-	-	0.052	0.029	0.072	0.049	0.0290	0.0490
	IACR (CCME)	mg/kg	-	-	0.89	0.50	1.25	0.87	0.500	0.870

Value > lower Working Sediment Quality Guideline (WSQG).
Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).
Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).
Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).
Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

	Parameter	Units	Lower WSQG	Upper WSQG	Max	Mean	Standard Deviation	RG_SCOUTD S-Rep1	RG_SCOUTD S-Rep2	RG_SCOUTD S-Rep3
								05-Sep-19	05-Sep-19	05-Sep-19
Physical Tests	Moisture	%	-	-	80.9	63.6	13.8	54.2	59.3	74.6
	pH (1:2 soil:water)	pH units	-	-	8.27	8.03	0.200	7.76	7.93	7.80
Particle Size	% Gravel (>2mm)	%	-	-	8.30	4.68	2.73	21.1	<1.0	<1.0
	% Sand (2.0mm - 0.063mm)	%	-	-	58.0	45.0	15.0	-	-	-
	% Sand (2.00mm - 1.00mm)	%	-	-	8.40	4.72	2.08	4.6	<1.0	<1.0
	% Sand (1.00mm - 0.50mm)	%	-	-	10.5	7.28	2.43	4.6	5.8	22.0
	% Sand (0.50mm - 0.25mm)	%	-	-	19.7	11.5	6.48	7.2	14.4	28.3
	% Sand (0.25mm - 0.125mm)	%	-	-	18.1	11.0	5.42	19.4	19.6	4.7
	% Sand (0.125mm - 0.063mm)	%	-	-	14.8	10.5	3.86	13.3	15.2	4.6
	% Silt (0.063mm - 0.004mm)	%	-	-	70.3	45.6	14.7	-	-	-
	% Silt (0.063mm - 0.0312mm)	%	-	-	32.8	21.5	6.68	12.8	19.9	15.9
	% Silt (0.0312mm - 0.004mm)	%	-	-	37.5	24.1	7.99	14.1	21.2	19.3
	% Clay (<4µm)	%	-	-	7.40	4.66	1.70	3.0	3.0	3.7
	Texture	-	-	-	-	-	-	Sandy loam	Sandy loam	Sandy loam
Organic Carbon	Total Organic Carbon	%	-	-	12.6	8.70	2.51	5.32	7.03	6.91
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	6,780	4,640	1,450	7470	7480	7110
	Antimony (Sb)	mg/kg	-	-	0.570	0.452	0.0795	0.71	0.68	0.77
	Arsenic (As)	mg/kg	5.9	17	5.13	3.69	1.04	5.95	5.54	6.00
	Barium (Ba)	mg/kg	-	-	189	156	23.9	233	204	244
	Beryllium (Be)	mg/kg	-	-	0.590	0.434	0.112	0.62	0.58	0.66
	Bismuth (Bi)	mg/kg	-	-	<0.200	<0.200	-	<0.20	<0.20	<0.20
	Boron (B)	mg/kg	-	-	13.9	8.50	3.30	8.8	8.8	13.2
	Cadmium (Cd)	mg/kg	0.6	3.5	1.61	1.36	0.173	1.40	1.33	1.79
	Calcium (Ca)	mg/kg	-	-	57,800	50,100	6,260	68,700	63,200	66,500
	Chromium (Cr)	mg/kg	37.3	90	11.6	8.21	2.29	12.1	11.5	12.2
	Cobalt (Co)	mg/kg	-	-	6.18	5.30	0.696	6.63	6.67	7.92
	Copper (Cu)	mg/kg	35.7	197	13.0	9.93	2.28	13.3	12.4	14.4
	Iron (Fe)	mg/kg	21,200	43,766	15,300	11,600	3,040	20400	16900	19500
	Lead (Pb)	mg/kg	35	91	7.98	6.39	1.31	9.03	8.69	9.05
	Lithium (Li)	mg/kg	-	-	9.60	6.76	2.02	10.4	11.9	9.6
	Magnesium (Mg)	mg/kg	-	-	13,200	9,740	2,890	14,900	13,900	10,800
	Manganese (Mn)	mg/kg	460	1100	692	610	56.2	728	675	934
	Mercury (Hg)	mg/kg	0.17	0.486	0.0439	0.0366	0.00712	0.0340	0.0382	0.0364
	Molybdenum (Mo)	mg/kg	-	-	1.44	1.05	0.279	1.57	1.52	1.72
	Nickel (Ni)	mg/kg	16	75	53.7	39.0	9.01	38.5	39.0	52.9
	Phosphorus (P)	mg/kg	-	-	1,300	1,010	219	1650	1460	1610
	Potassium (K)	mg/kg	-	-	1,540	1,090	292	1720	1640	1660
	Selenium (Se)	mg/kg	2	2	2.82	1.94	0.791	1.76	1.66	2.10
	Silver (Ag)	mg/kg	0.5	-	0.200	0.146	0.0378	0.17	0.16	0.18
	Sodium (Na)	mg/kg	-	-	70.0	58.6	8.26	84	77	77
	Strontium (Sr)	mg/kg	-	-	71.1	62.2	7.20	90.0	78.3	93.7
	Sulfur (S)	mg/kg	-	-	<1,000	<1,000	-	<1000	<1000	<1000
	Thallium (Tl)	mg/kg	-	-	0.196	0.138	0.0362	0.198	0.175	0.174
	Tin (Sn)	mg/kg	-	-	<2.00	<2.00	-	<2.0	<2.0	<2.0
	Titanium (Ti)	mg/kg	-	-	17.6	13.4	2.99	12.0	12.4	10.9
	Tungsten (W)	mg/kg	-	-	<0.500	<0.500	-	<0.50	<0.50	<0.50
	Uranium (U)	mg/kg	-	-	0.952	0.785	0.151	1.13	0.960	1.10
	Vanadium (V)	mg/kg	-	-	28.8	20.7	5.66	30.3	28.6	30.1
	Zinc (Zn)	mg/kg	123	315	129	108	17.1	127	124	157
	Zirconium (Zr)	mg/kg	-	-	<1.00	<1.00	-	<1.0	<1.0	<1.0
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.140	<0.0440	-	<0.055	<0.075	<0.091
	Acenaphthylene	mg/kg	0.00587	0.128	<0.0200	<0.00800	-	<0.0070	<0.0090	<0.013
	Acridine	mg/kg	-	-	<0.0250	<0.0100	-	<0.010	<0.010	<0.019
	Anthracene	mg/kg	0.0469	0.245	<0.0160	<0.00500	-	<0.0040	<0.0050	<0.0076
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.100	<0.0400	-	<0.030	<0.040	<0.050
	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.0350	0.0224	0.00853	<0.010	0.014	0.020
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.108	0.0712	0.0256	0.030	0.045	0.055
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.113	0.0750	0.0267	0.032	0.048	0.060
	Benzo(e)pyrene	mg/kg	-	-	0.114	0.0746	0.0275	0.032	0.047	0.058
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.0410	0.0278	0.00926	0.017	0.030	0.039
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.0250	<0.0100	-	<0.010	<0.010	<0.019
	Chrysene	mg/kg	0.0571	0.862	0.371	0.240	0.0884	0.103	0.154	0.198
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.0290	<0.0120	-	<0.013	<0.016	<0.020
	Fluoranthene	mg/kg	0.111	2.355	0.0590	0.0396	0.0140	0.017	0.028	0.035
	Fluorene	mg/kg	0.021	0.144	0.325	0.206	0.0861	0.083	0.139	0.236
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.0250	<0.0100	-	<0.010	<0.010	<0.019
	1-Methylnaphthalene	mg/kg	-	-	1.50	0.936	0.395	0.381	0.675	0.935
	2-Methylnaphthalene	mg/kg	0.0202	0.201	2.46	1.55	0.648	0.628	1.10	1.54
	Naphthalene	mg/kg	0.0346	0.391	0.695	0.421	0.192	0.173	0.305	0.417
	Perylene	mg/kg	-	-	<0.0250	<0.0100	-	<0.010	<0.010	<0.019
	Phenanthrene	mg/kg	0.0419	0.515	1.28	0.837	0.320	0.391	0.656	0.823
	Pyrene	mg/kg	0.053	0.875	0.115	0.0742	0.0282	0.031	0.050	0.063
	Quinoline	mg/kg	-	-	<0.0250	<0.0100	-	<0.010	<0.010	<0.019
	Acenaphthene d10	%	-	-	102	96.4	3.93	70.5	79.3	79.9
	Chrysene d12	%	-	-	126	121	5.50	78.9	79.6	77.2
	Naphthalene d8	%	-	-	95.4	85.6	7.32	60.8	70.4	70.4
	Phenanthrene d10	%	-	-	109	105	3.79	75.3	82.7	79.3
	B(a)P Total Potency Equivalent	mg/kg	-	-	0.0720	0.0466	0.0176	<0.020	0.031	0.042
	IACR (CCME)	mg/kg	-	-	1.25	0.814	0.301	0.36	0.52	0.68

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

Parameter		Units	Lower WSQG	Upper WSQG	RG_SCOUTD S-Rep4	RG_SCOUTD S-Rep5	Min	Median	Max	Mean	Standard Deviation
					05-Sep-19	05-Sep-19					
Physical Tests	Moisture	%	-	-	68.7	61.6	54.2	61.6	74.6	63.7	8.03
	pH (1:2 soil:water)	pH units	-	-	7.72	7.92	7.72	7.80	7.93	7.83	0.0948
Particle Size	% Gravel (>2mm)	%	-	-	3.0	<1.0	<1.00	<1.00	21.1	5.42	10.2
	% Sand (2.0mm - 0.063mm)	%	-	-	-	-	47.7	51.6	60.6	53.0	5.29
	% Sand (2.00mm - 1.00mm)	%	-	-	1.2	<1.0	<1.00	<1.00	4.60	1.76	1.92
	% Sand (1.00mm - 0.50mm)	%	-	-	5.5	<1.0	<1.00	5.50	22.0	7.78	7.81
	% Sand (0.50mm - 0.25mm)	%	-	-	20.3	4.0	4.00	14.4	28.3	14.8	9.84
	% Sand (0.25mm - 0.125mm)	%	-	-	15.3	22.1	4.70	19.4	22.1	16.2	6.89
	% Sand (0.125mm - 0.063mm)	%	-	-	9.3	19.6	4.60	13.3	19.6	12.4	5.72
	% Silt (0.063mm - 0.004mm)	%	-	-	-	-	26.9	41.1	49.0	38.9	8.30
	% Silt (0.063mm - 0.0312mm)	%	-	-	19.9	23.3	12.8	19.9	23.3	18.4	4.07
	% Silt (0.0312mm - 0.004mm)	%	-	-	22.3	25.7	14.1	21.2	25.7	20.5	4.28
	% Clay (<4μm)	%	-	-	3.3	4.4	3.00	3.30	4.40	3.48	0.589
	Texture	-	-	-	Sandy loam	Sandy loam	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	-	-	8.06	7.56	5.32	7.03	8.06	6.98	1.03
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	4970	6910	4,970	7,110	7,480	6,790	1,040
	Antimony (Sb)	mg/kg	-	-	0.54	0.70	0.540	0.700	0.770	0.680	0.0851
	Arsenic (As)	mg/kg	5.9	17	4.58	5.48	4.58	5.54	6.00	5.51	0.570
	Barium (Ba)	mg/kg	-	-	167	220	167	220	244	214	30.0
	Beryllium (Be)	mg/kg	-	-	0.48	0.58	0.480	0.580	0.660	0.584	0.0669
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.200	<0.200	<0.200	<0.200	-
	Boron (B)	mg/kg	-	-	8.8	9.5	8.80	8.80	13.2	9.82	1.91
	Cadmium (Cd)	mg/kg	0.6	3.5	1.47	1.50	1.33	1.47	1.79	1.50	0.176
	Calcium (Ca)	mg/kg	-	-	57,300	74,300	57,300	66,500	74,300	66,000	6,320
	Chromium (Cr)	mg/kg	37.3	90	8.20	11.5	8.20	11.5	12.2	11.1	1.65
	Cobalt (Co)	mg/kg	-	-	6.60	7.37	6.60	6.67	7.92	7.04	0.588
	Copper (Cu)	mg/kg	35.7	197	11.4	13.3	11.4	13.3	14.4	13.0	1.12
	Iron (Fe)	mg/kg	21,200	43,766	15100	15600	15,100	16,900	20,400	17,500	2,350
	Lead (Pb)	mg/kg	35	91	7.52	9.23	7.52	9.03	9.23	8.70	0.690
	Lithium (Li)	mg/kg	-	-	7.5	10.9	7.50	10.4	11.9	10.1	1.66
	Magnesium (Mg)	mg/kg	-	-	9,550	15,700	9,550	13,900	15,700	13,000	2,670
	Manganese (Mn)	mg/kg	460	1100	741	752	675	741	934	766	98.5
	Mercury (Hg)	mg/kg	0.17	0.486	0.0321	0.0397	0.0321	0.0364	0.0397	0.0361	0.00308
	Molybdenum (Mo)	mg/kg	-	-	1.26	1.55	1.26	1.55	1.72	1.52	0.167
	Nickel (Ni)	mg/kg	16	75	42.7	45.5	38.5	42.7	52.9	43.7	5.87
	Phosphorus (P)	mg/kg	-	-	1310	1530	1,310	1,530	1,650	1,510	135
	Potassium (K)	mg/kg	-	-	1150	1520	1,150	1,640	1,720	1,540	229
	Selenium (Se)	mg/kg	2	2	1.96	1.94	1.66	1.94	2.10	1.88	0.174
	Silver (Ag)	mg/kg	0.5	-	0.14	0.18	0.140	0.170	0.180	0.166	0.0167
	Sodium (Na)	mg/kg	-	-	60	88	60.0	77.0	88.0	77.2	10.7
	Strontium (Sr)	mg/kg	-	-	69.3	81.1	69.3	81.1	93.7	82.5	9.69
	Sulfur (S)	mg/kg	-	-	<1000	<1000	<1,000	<1,000	<1,000	<1,000	-
	Thallium (Tl)	mg/kg	-	-	0.126	0.179	0.126	0.175	0.198	0.170	0.0267
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.00	<2.00	<2.00	<2.00	-
	Titanium (Ti)	mg/kg	-	-	9.4	14.0	9.40	12.0	14.0	11.7	1.72
	Tungsten (W)	mg/kg	-	-	<0.50	<0.50	<0.500	<0.500	<0.500	<0.500	-
	Uranium (U)	mg/kg	-	-	0.894	0.998	0.894	0.998	1.13	1.02	0.0980
	Vanadium (V)	mg/kg	-	-	20.9	26.5	20.9	28.6	30.3	27.3	3.88
	Zinc (Zn)	mg/kg	123	315	126	131	124	127	157	133	13.7
	Zirconium (Zr)	mg/kg	-	-	<1.0	<1.0	<1.00	<1.00	<1.00	<1.00	-
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.065	<0.094	<0.0550	<0.0750	<0.0940	<0.0550	-
	Acenaphthylene	mg/kg	0.00587	0.128	<0.0090	<0.012	<0.00700	<0.00900	<0.0130	<0.00700	-
	Acridine	mg/kg	-	-	<0.016	<0.013	<0.0100	<0.0130	<0.0190	<0.0100	-
	Anthracene	mg/kg	0.0469	0.245	<0.0064	<0.0067	<0.00400	<0.00640	<0.00760	<0.00400	-
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.040	<0.040	<0.0300	<0.0400	<0.0500	<0.0300	-
	Benzo(a)pyrene	mg/kg	0.0319	0.782	<0.016	0.016	<0.0100	0.0140	0.0200	0.0144	0.00286
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.044	0.051	0.0300	0.0450	0.0550	0.0450	0.00951
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.049	0.054	0.0320	0.0490	0.0600	0.0486	0.0104
	Benzo(e)pyrene	mg/kg	-	-	0.048	0.055	0.0320	0.0480	0.0580	0.0480	0.0101
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.032	0.035	0.0170	0.0320	0.0390	0.0306	0.00832
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.016	<0.013	<0.0100	<0.0130	<0.0190	<0.0100	-
	Chrysene	mg/kg	0.0571	0.862	0.161	0.188	0.103	0.161	0.198	0.161	0.0371
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.016	<0.017	<0.0130	<0.0160	<0.0200	<0.0130	-
	Fluoranthene	mg/kg	0.111	2.355	0.032	0.038	0.0170	0.0320	0.0380	0.0300	0.00815
	Fluorene	mg/kg	0.021	0.144	0.144	0.185	0.0830	0.144	0.236	0.157	0.0570
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.016	<0.013	<0.0100	<0.0130	<0.0190	<0.0100	-
	1-Methylnaphthalene	mg/kg	-	-	0.709	0.865	0.381	0.709	0.935	0.713	0.215
	2-Methylnaphthalene	mg/kg	0.0202	0.201	1.16	1.42	0.628	1.16	1.54	1.17	0.353
	Naphthalene	mg/kg	0.0346	0.391	0.329	0.397	0.173	0.329	0.417	0.324	0.0964
	Perylene	mg/kg	-	-	<0.016	<0.013	<0.0100	<0.0130	<0.0190	<0.0100	-
	Phenanthrene	mg/kg	0.0419	0.515	0.656	0.799	0.391	0.656	0.823	0.665	0.172
	Pyrene	mg/kg	0.053	0.875	0.050	0.060	0.0310	0.0500	0.0630	0.0508	0.0125
	Quinoline	mg/kg	-	-	<0.016	<0.013	<0.0100	<0.0130	<0.0190	<0.0100	-
	Acenaphthene d10	%	-	-	75.4	81.5	70.5	79.3	81.5	77.3	4.42
	Chrysene d12	%	-	-	75.5	73.5	73.5	77.2	79.6	76.9	2.49
	Naphthalene d8	%	-	-	69.3	73.3	60.8	70.4	73.3	68.8	4.73
	Phenanthrene d10	%	-	-	77.5	80.3	75.3	79.3	82.7	79.0	2.80
	B(a)P Total Potency Equivalent	mg/kg	-	-	0.026	0.035	<0.0200	0.0310	0.0420	0.0308	0.00697
	IACR (CCME)	mg/kg	-	-	0.53	0.60	0.360	0.530	0.680	0.538	0.118

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

	Parameter	Units	Lower WSQG	Upper WSQG	RG_FOBCP-Rep1	RG_FOBCP-Rep2	RG_FOBCP-Rep3	RG_FOBCP-Rep4	RG_FOBCP-Rep5	Min
					06-Sep-18	06-Sep-18	06-Sep-18	06-Sep-18	06-Sep-18	
Physical Tests	Moisture	%	-	-	67.6	52.2	49.5	47.7	64.4	47.7
	pH (1:2 soil:water)	pH units	-	-	8.11	8.23	8.24	8.28	7.79	7.79
Particle Size	% Gravel (>2mm)	%	-	-	<1.0	<1.0	<1.0	1.5	<1.0	<1.00
	% Sand (2.0mm - 0.063mm)	%	-	-	-	-	-	-	-	37.3
	% Sand (2.00mm - 1.00mm)	%	-	-	<1.0	<1.0	<1.0	<1.0	1.9	<1.00
	% Sand (1.00mm - 0.50mm)	%	-	-	<1.0	<1.0	1.8	1.5	5.5	<1.00
	% Sand (0.50mm - 0.25mm)	%	-	-	3.3	5.3	14.7	9.6	17.2	3.30
	% Sand (0.25mm - 0.125mm)	%	-	-	15.9	21.5	18.2	20.5	13.2	13.2
	% Sand (0.125mm - 0.063mm)	%	-	-	16.1	20.9	14.9	19.4	12.4	12.4
	% Silt (0.063mm - 0.004mm)	%	-	-	-	-	-	-	-	43.1
	% Silt (0.063mm - 0.0312mm)	%	-	-	27.6	22.9	21.3	21.0	21.9	21.0
	% Silt (0.0312mm - 0.004mm)	%	-	-	31.0	24.3	24.0	22.1	23.8	22.1
	% Clay (<4μm)	%	-	-	5.8	4.4	4.0	3.7	4.0	3.70
	Texture	-	-	-	Silt loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	-
Organic Carbon	Total Organic Carbon	%	-	-	8.18	6.30	6.61	6.39	7.41	6.30
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	5770	5340	5820	5470	4540	4,540
	Antimony (Sb)	mg/kg	-	-	0.37	0.42	0.46	0.45	0.40	0.370
	Arsenic (As)	mg/kg	5.9	17	4.08	4.20	4.70	4.22	3.98	3.98
	Barium (Ba)	mg/kg	-	-	177	175	195	176	147	147
	Beryllium (Be)	mg/kg	-	-	0.44	0.46	0.44	0.47	0.43	0.430
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.200
	Boron (B)	mg/kg	-	-	8.1	6.9	5.8	5.9	7.1	5.80
	Cadmium (Cd)	mg/kg	0.6	3.5	1.58	1.52	1.80	1.48	1.52	1.48
	Calcium (Ca)	mg/kg	-	-	62,100	74,700	71,500	68,700	68,300	62,100
	Chromium (Cr)	mg/kg	37.3	90	9.81	9.51	10.1	9.29	7.64	7.64
	Cobalt (Co)	mg/kg	-	-	6.45	5.59	5.85	5.40	5.50	5.40
	Copper (Cu)	mg/kg	35.7	197	11.4	10.0	11.9	10.3	10.3	10.0
	Iron (Fe)	mg/kg	21,200	43,766	12400	12500	12900	12700	14000	12,400
	Lead (Pb)	mg/kg	35	91	7.01	6.94	6.62	6.86	6.90	6.62
	Lithium (Li)	mg/kg	-	-	7.6	7.9	7.4	7.9	6.4	6.40
	Magnesium (Mg)	mg/kg	-	-	14,000	13,600	12,400	13,000	10,100	10,100
	Manganese (Mn)	mg/kg	460	1100	653	585	649	564	588	564
	Mercury (Hg)	mg/kg	0.17	0.486	0.0395	0.0382	0.0366	0.0407	0.0317	0.0317
	Molybdenum (Mo)	mg/kg	-	-	1.07	1.14	1.19	1.14	1.16	1.07
	Nickel (Ni)	mg/kg	16	75	44.6	42.5	50.4	42.0	41.9	41.9
	Phosphorus (P)	mg/kg	-	-	1250	1270	1360	1330	1180	1,180
	Potassium (K)	mg/kg	-	-	1310	1270	1300	1230	970	970
	Selenium (Se)	mg/kg	2	2	2.16	2.79	2.51	2.04	2.34	2.04
	Silver (Ag)	mg/kg	0.5	-	0.17	0.15	0.15	0.15	0.15	0.150
	Sodium (Na)	mg/kg	-	-	80	74	83	72	69	69.0
	Strontium (Sr)	mg/kg	-	-	61.1	67.5	69.3	69.5	63.9	61.1
	Sulfur (S)	mg/kg	-	-	<1000	<1000	<1000	<1000	1000	<1,000
	Thallium (Tl)	mg/kg	-	-	0.128	0.166	0.167	0.161	0.123	0.123
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.00
	Titanium (Ti)	mg/kg	-	-	17.9	14.1	16.6	16.3	13.2	13.2
	Tungsten (W)	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.500
	Uranium (U)	mg/kg	-	-	0.897	1.00	0.989	0.982	1.00	0.897
	Vanadium (V)	mg/kg	-	-	22.9	22.6	24.5	22.9	21.4	21.4
	Zinc (Zn)	mg/kg	123	315	125	116	134	119	127	116
	Zirconium (Zr)	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.00
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.088	<0.068	<0.061	<0.049	<0.064	<0.0490
	Acenaphthylene	mg/kg	0.00587	0.128	<0.013	<0.010	<0.0090	<0.0070	<0.010	<0.00700
	Acridine	mg/kg	-	-	<0.015	<0.010	<0.010	<0.010	<0.013	<0.0100
	Anthracene	mg/kg	0.0469	0.245	<0.010	<0.010	<0.0050	<0.0060	<0.0080	<0.00500
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.060	<0.040	<0.040	<0.040	<0.050	<0.0400
	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.028	0.021	0.020	0.018	0.022	0.0180
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.084	0.061	0.063	0.053	0.067	0.0530
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.089	0.065	0.066	0.057	0.071	0.0570
	Benzo(e)pyrene	mg/kg	-	-	0.091	0.068	0.074	0.060	0.076	0.0600
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.038	0.024	0.024	0.021	0.024	0.0210
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.015	<0.010	<0.010	<0.010	<0.013	<0.0100
	Chrysene	mg/kg	0.0571	0.862	0.221	0.171	0.171	0.137	0.181	0.137
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.020	<0.014	<0.015	<0.012	<0.016	<0.0120
	Fluoranthene	mg/kg	0.111	2.355	0.039	0.031	0.030	0.025	0.033	0.0250
	Fluorene	mg/kg	0.021	0.144	0.216	0.162	0.145	0.110	0.152	0.110
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.015	<0.010	<0.010	<0.010	<0.013	<0.0100
	1-Methylnaphthalene	mg/kg	-	-	1.02	0.773	0.691	0.549	0.722	0.549
	2-Methylnaphthalene	mg/kg	0.0202	0.201	1.70	1.35	1.19	0.925	1.20	0.925
	Naphthalene	mg/kg	0.0346	0.391	0.470	0.413	0.349	0.262	0.333	0.262
	Perylene	mg/kg	-	-	<0.015	<0.010	<0.010	<0.010	<0.013	<0.0100
	Phenanthrene	mg/kg	0.0419	0.515	0.885	0.665	0.610	0.478	0.639	0.478
	Pyrene	mg/kg	0.053	0.875	0.074	0.055	0.056	0.047	0.055	0.0470
	Quinoline	mg/kg	-	-	<0.015	<0.010	<0.010	<0.010	<0.013	<0.0100
	Acenaphthene d10	%	-	-	100.3	97.1	95.0	94.5	107.8	94.5
	Chrysene d12	%	-	-	106.2	104.5	112.9	112.8	126.1	104
	Naphthalene d8	%	-	-	98.6	96.4	91.5	90.6	102.7	90.6
	Phenanthrene d10	%	-	-	105.8	103.3	101.7	97.1	114.7	97.1
	B(a)P Total Potency Equivalent	mg/kg	-	-	0.053	0.039	0.038	0.034	0.043	0.0340
	IACR (CCME)	mg/kg	-	-	0.89	0.65	0.65	0.57	0.72	0.570

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

Parameter		Units	Lower WSQG	Upper WSQG	Median	Max	Mean	Standard Deviation	RG_FRUPO-Rep1	RG_FRUPO-Rep2
									07-Sep-19	07-Sep-19
Physical Tests	Moisture	%	-	-	52.2	67.6	56.3	9.09	49.4	48.6
	pH (1:2 soil:water)	pH units	-	-	8.23	8.28	8.13	0.200	8.15	8.11
Particle Size	% Gravel (>2mm)	%	-	-	<1.00	1.50	1.10	-	<1.0	1.1
	% Sand (2.0mm - 0.063mm)	%	-	-	50.2	52.0	48.0	6.02	-	-
	% Sand (2.00mm - 1.00mm)	%	-	-	<1.00	1.90	1.18	-	1.0	1.0
	% Sand (1.00mm - 0.50mm)	%	-	-	1.50	5.50	2.16	1.93	1.7	2.7
	% Sand (0.50mm - 0.25mm)	%	-	-	9.60	17.2	10.0	5.94	9.7	18.0
	% Sand (0.25mm - 0.125mm)	%	-	-	18.2	21.5	17.9	3.39	20.8	24.2
	% Sand (0.125mm - 0.063mm)	%	-	-	16.1	20.9	16.7	3.43	16.3	10.7
	% Silt (0.063mm - 0.004mm)	%	-	-	45.7	58.6	48.0	6.12	-	-
	% Silt (0.063mm - 0.0312mm)	%	-	-	21.9	27.6	22.9	2.70	21.0	17.9
	% Silt (0.0312mm - 0.004mm)	%	-	-	24.0	31.0	25.0	3.44	24.1	20.4
	% Clay (<4µm)	%	-	-	4.00	5.80	4.38	0.832	4.8	4.0
	Texture	-	-	-	-	-	-	-	Sandy loam	Sandy loam
Organic Carbon	Total Organic Carbon	%	-	-	6.61	8.18	6.98	0.802	5.89	4.88
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	5,470	5,820	5,390	515	6820	5900
	Antimony (Sb)	mg/kg	-	-	0.420	0.460	0.420	0.0367	0.61	0.55
	Arsenic (As)	mg/kg	5.9	17	4.20	4.70	4.24	0.277	4.81	4.61
	Barium (Ba)	mg/kg	-	-	176	195	174	17.2	181	159
	Beryllium (Be)	mg/kg	-	-	0.440	0.470	0.448	0.0164	0.56	0.52
	Bismuth (Bi)	mg/kg	-	-	<0.200	<0.200	<0.200	-	<0.20	<0.20
	Boron (B)	mg/kg	-	-	6.90	8.10	6.76	0.948	7.1	6.3
	Cadmium (Cd)	mg/kg	0.6	3.5	1.52	1.80	1.58	0.128	1.28	1.08
	Calcium (Ca)	mg/kg	-	-	68,700	74,700	69,100	4,660	48,800	44,100
	Chromium (Cr)	mg/kg	37.3	90	9.51	10.1	9.27	0.961	12.4	10.3
	Cobalt (Co)	mg/kg	-	-	5.59	6.45	5.76	0.421	5.28	4.94
	Copper (Cu)	mg/kg	35.7	197	10.3	11.9	10.8	0.823	11.6	10.3
	Iron (Fe)	mg/kg	21,200	43,766	12,700	14,000	12,900	644	14200	13500
	Lead (Pb)	mg/kg	35	91	6.90	7.01	6.87	0.148	7.35	7.14
	Lithium (Li)	mg/kg	-	-	7.60	7.90	7.44	0.619	9.0	8.2
	Magnesium (Mg)	mg/kg	-	-	13,000	14,000	12,600	1,530	12,700	11,400
	Manganese (Mn)	mg/kg	460	1100	588	653	608	40.5	564	513
	Mercury (Hg)	mg/kg	0.17	0.486	0.0382	0.0407	0.0373	0.00350	0.0373	0.0376
	Molybdenum (Mo)	mg/kg	-	-	1.14	1.19	1.14	0.0442	1.42	1.27
	Nickel (Ni)	mg/kg	16	75	42.5	50.4	44.3	3.59	36.7	31.1
	Phosphorus (P)	mg/kg	-	-	1,270	1,360	1,280	70.5	1400	1460
	Potassium (K)	mg/kg	-	-	1,270	1,310	1,220	141	1790	1350
	Selenium (Se)	mg/kg	2	2	2.34	2.79	2.37	0.296	1.90	1.76
	Silver (Ag)	mg/kg	0.5	-	0.150	0.170	0.154	0.00894	0.18	0.15
	Sodium (Na)	mg/kg	-	-	74.0	83.0	75.6	5.77	74	70
	Strontium (Sr)	mg/kg	-	-	67.5	69.5	66.3	3.66	64.1	59.1
	Sulfur (S)	mg/kg	-	-	<1,000	1,000	1,000	-	<1000	<1000
	Thallium (Tl)	mg/kg	-	-	0.161	0.167	0.149	0.0216	0.190	0.167
	Tin (Sn)	mg/kg	-	-	<2.00	<2.00	<2.00	-	<2.0	<2.0
	Titanium (Ti)	mg/kg	-	-	16.3	17.9	15.6	1.92	20.7	23.2
	Tungsten (W)	mg/kg	-	-	<0.500	<0.500	<0.500	-	<0.50	<0.50
	Uranium (U)	mg/kg	-	-	0.989	1.00	0.974	0.0435	0.991	0.982
	Vanadium (V)	mg/kg	-	-	22.9	24.5	22.9	1.11	29.9	25.5
	Zinc (Zn)	mg/kg	123	315	125	134	124	7.05	111	101
	Zirconium (Zr)	mg/kg	-	-	<1.00	<1.00	<1.00	-	1.0	1.1
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.0640	<0.0880	<0.0490	-	<0.038	<0.025
	Acenaphthylene	mg/kg	0.00587	0.128	<0.0100	<0.0130	<0.00700	-	<0.0050	<0.0050
	Acridine	mg/kg	-	-	<0.0100	<0.0150	<0.0100	-	<0.010	<0.010
	Anthracene	mg/kg	0.0469	0.245	<0.00800	<0.0100	<0.00500	-	<0.0060	<0.0040
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.0400	<0.0600	<0.0400	-	<0.030	<0.020
	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.0210	0.0280	0.0218	0.00377	0.013	<0.010
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.0630	0.0840	0.0656	0.0115	0.049	0.033
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.0660	0.0890	0.0696	0.0119	0.053	0.036
	Benzo(e)pyrene	mg/kg	-	-	0.0740	0.0910	0.0738	0.0115	0.051	0.035
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.0240	0.0380	0.0262	0.00672	0.022	0.015
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.0100	<0.0150	<0.0100	-	<0.010	<0.010
	Chrysene	mg/kg	0.0571	0.862	0.171	0.221	0.176	0.0301	0.136	0.097
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.0150	<0.0200	<0.0120	-	<0.012	<0.0090
	Fluoranthene	mg/kg	0.111	2.355	0.0310	0.0390	0.0316	0.00508	0.022	0.016
	Fluorene	mg/kg	0.021	0.144	0.152	0.216	0.157	0.0384	0.087	0.061
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.0100	<0.0150	<0.0100	-	<0.010	<0.010
	1-Methylnaphthalene	mg/kg	-	-	0.722	1.02	0.751	0.172	0.390	0.265
	2-Methylnaphthalene	mg/kg	0.0202	0.201	1.20	1.70	1.27	0.284	0.647	0.431
	Naphthalene	mg/kg	0.0346	0.391	0.349	0.470	0.365	0.0794	0.179	0.123
	Perylene	mg/kg	-	-	<0.0100	<0.0150	<0.0100	-	<0.010	<0.010
	Phenanthrene	mg/kg	0.0419	0.515	0.639	0.885	0.655	0.147	0.481	0.360
	Pyrene	mg/kg	0.053	0.875	0.0550	0.0740	0.0574	0.00996	0.039	0.028
	Quinoline	mg/kg	-	-	<0.0100	<0.0150	<0.0100	-	<0.010	<0.010
	Acenaphthene d10	%	-	-	97.1	108	98.9	5.45	83.4	80.7
	Chrysene d12	%	-	-	113	126	112	8.50	102.6	107.9
	Naphthalene d8	%	-	-	96.4	103	96.0	5.03	68.3	68.1
	Phenanthrene d10	%	-	-	103	115	105	6.51	99.1	105.0
	B(a)P Total Potency Equivalent	mg/kg	-	-	0.0390	0.0530	0.0414	0.00723	0.028	<0.020
	IACR (CCME)	mg/kg	-	-	0.650	0.890	0.696	0.121	0.52	0.35

Value > lower Working Sediment Quality Guideline (WSQG).
Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).
Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).
Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

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Parameter		Units	Lower WSQG	Upper WSQG	RG_FRUPO-Rep3	RG_FRUPO-Rep4	RG_FRUPO-Rep5	Min	Median	Max	Mean
					07-Sep-19	07-Sep-19	07-Sep-19				
Physical Tests	Moisture	%	-	-	50.5	44.0	48.4	44.0	48.6	50.5	48.2
	pH (1:2 soil:water)	pH units	-	-	8.15	8.14	8.16	8.11	8.15	8.16	8.14
Particle Size	% Gravel (>2mm)	%	-	-	<1.0	<1.0	<1.0	<1.00	<1.00	1.10	1.02
	% Sand (2.0mm - 0.063mm)	%	-	-	-	-	-	34.2	45.7	56.6	45.7
	% Sand (2.00mm - 1.00mm)	%	-	-	<1.0	4.7	<1.0	<1.00	1.00	4.70	1.74
	% Sand (1.00mm - 0.50mm)	%	-	-	<1.0	5.2	<1.0	<1.00	1.70	5.20	2.32
	% Sand (0.50mm - 0.25mm)	%	-	-	5.7	5.2	4.5	4.50	5.70	18.0	8.62
	% Sand (0.25mm - 0.125mm)	%	-	-	21.1	12.6	16.2	12.6	20.8	24.2	19.0
	% Sand (0.125mm - 0.063mm)	%	-	-	13.7	18.0	11.5	10.7	13.7	18.0	14.0
	% Silt (0.063mm - 0.004mm)	%	-	-	-	-	-	38.3	48.9	61.7	49.5
	% Silt (0.063mm - 0.0312mm)	%	-	-	25.1	23.5	28.5	17.9	23.5	28.5	23.2
	% Silt (0.0312mm - 0.004mm)	%	-	-	28.4	25.4	33.2	20.4	25.4	33.2	26.3
	% Clay (<4µm)	%	-	-	5.5	4.5	5.0	4.00	4.80	5.50	4.76
	Texture	-	-	-	Silt loam	Sandy loam	Silt loam	-	-	-	-
Organic Carbon	Total Organic Carbon	%	-	-	5.75	5.47	5.64	4.88	5.64	5.89	5.53
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	6070	6150	6780	5,900	6,150	6,820	6,340
	Antimony (Sb)	mg/kg	-	-	0.57	0.64	0.60	0.550	0.600	0.640	0.594
	Arsenic (As)	mg/kg	5.9	17	4.54	5.12	4.88	4.54	4.81	5.12	4.79
	Barium (Ba)	mg/kg	-	-	165	169	169	159	169	181	169
	Beryllium (Be)	mg/kg	-	-	0.50	0.51	0.49	0.490	0.510	0.560	0.516
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.20	<0.200	<0.200	<0.200	<0.200
	Boron (B)	mg/kg	-	-	5.9	5.4	6.3	5.40	6.30	7.10	6.20
	Cadmium (Cd)	mg/kg	0.6	3.5	1.16	1.15	1.24	1.08	1.16	1.28	1.18
	Calcium (Ca)	mg/kg	-	-	47,100	41,500	44,000	41,500	44,100	48,800	45,100
	Chromium (Cr)	mg/kg	37.3	90	10.8	11.1	11.6	10.3	11.1	12.4	11.2
	Cobalt (Co)	mg/kg	-	-	5.17	4.96	5.27	4.94	5.17	5.28	5.12
	Copper (Cu)	mg/kg	35.7	197	10.8	11.6	11.8	10.3	11.6	11.8	11.2
	Iron (Fe)	mg/kg	21,200	43,766	12700	13900	13100	12,700	13,500	14,200	13,500
	Lead (Pb)	mg/kg	35	91	7.25	7.69	7.45	7.14	7.35	7.69	7.38
	Lithium (Li)	mg/kg	-	-	8.3	7.6	7.8	7.60	8.20	9.00	8.18
	Magnesium (Mg)	mg/kg	-	-	12,400	12,100	13,300	11,400	12,400	13,300	12,400
	Manganese (Mn)	mg/kg	460	1100	518	455	552	455	518	564	520
	Mercury (Hg)	mg/kg	0.17	0.486	0.0402	0.0427	0.0387	0.0373	0.0387	0.0427	0.0393
	Molybdenum (Mo)	mg/kg	-	-	1.41	1.26	1.41	1.26	1.41	1.42	1.35
	Nickel (Ni)	mg/kg	16	75	33.2	29.7	33.4	29.7	33.2	36.7	32.8
	Phosphorus (P)	mg/kg	-	-	1400	1390	1450	1,390	1,400	1,460	1,420
	Potassium (K)	mg/kg	-	-	1390	1350	1460	1,350	1,390	1,790	1,470
	Selenium (Se)	mg/kg	2	2	2.02	2.73	1.99	1.76	1.99	2.73	2.08
	Silver (Ag)	mg/kg	0.5	-	0.17	0.18	0.19	0.150	0.180	0.190	0.174
	Sodium (Na)	mg/kg	-	-	71	82	72	70.0	72.0	82.0	73.8
	Strontium (Sr)	mg/kg	-	-	60.4	57.9	58.8	57.9	59.1	64.1	60.1
	Sulfur (S)	mg/kg	-	-	<1000	<1000	<1000	<1,000	<1,000	<1,000	<1,000
	Thallium (Tl)	mg/kg	-	-	0.175	0.173	0.189	0.167	0.175	0.190	0.179
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.0	<2.00	<2.00	<2.00	<2.00
	Titanium (Ti)	mg/kg	-	-	15.9	22.2	21.9	15.9	21.9	23.2	20.8
	Tungsten (W)	mg/kg	-	-	<0.50	<0.50	<0.50	<0.500	<0.500	<0.500	<0.500
	Uranium (U)	mg/kg	-	-	1.02	0.962	1.02	0.962	0.991	1.02	0.995
	Vanadium (V)	mg/kg	-	-	25.8	27.0	27.4	25.5	27.0	29.9	27.1
	Zinc (Zn)	mg/kg	123	315	101	105	102	101	102	111	104
	Zirconium (Zr)	mg/kg	-	-	1.1	1.2	1.3	1.00	1.10	1.30	1.14
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.045	<0.028	<0.035	<0.0250	<0.0350	<0.0450	<0.0250
	Acenaphthylene	mg/kg	0.00587	0.128	<0.0060	<0.0050	<0.0050	<0.00500	<0.00500	<0.00600	<0.00500
	Acridine	mg/kg	-	-	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Anthracene	mg/kg	0.0469	0.245	<0.0040	<0.0040	<0.0040	<0.00400	<0.00400	<0.00600	<0.00400
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.030	<0.020	<0.030	<0.0200	<0.0300	<0.0300	<0.0200
	Benzo(a)pyrene	mg/kg	0.0319	0.782	<0.010	<0.010	<0.010	<0.0100	<0.0100	0.0130	0.0106
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.034	0.035	0.033	0.0330	0.0340	0.0490	0.0368
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.036	0.037	0.036	0.0360	0.0360	0.0530	0.0396
	Benzo(e)pyrene	mg/kg	-	-	0.035	0.036	0.035	0.0350	0.0350	0.0510	0.0384
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.015	0.014	0.017	0.0140	0.0150	0.0220	0.0166
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Chrysene	mg/kg	0.0571	0.862	0.104	0.101	0.100	0.0970	0.101	0.136	0.108
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.0090	<0.0080	<0.010	<0.00800	<0.00900	<0.0120	<0.00800
	Fluoranthene	mg/kg	0.111	2.355	0.020	0.017	0.020	0.0160	0.0200	0.0220	0.0190
	Fluorene	mg/kg	0.021	0.144	0.073	0.059	0.078	0.0590	0.0730	0.0870	0.0716
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	1-Methylnaphthalene	mg/kg	-	-	0.440	0.298	0.320	0.265	0.320	0.440	0.343
	2-Methylnaphthalene	mg/kg	0.0202	0.201	0.702	0.497	0.521	0.431	0.521	0.702	0.560
	Naphthalene	mg/kg	0.0346	0.391	0.247	0.145	0.151	0.123	0.151	0.247	0.169
	Perylene	mg/kg	-	-	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Phenanthrene	mg/kg	0.0419	0.515	0.446	0.365	0.379	0.360	0.379	0.481	0.406
	Pyrene	mg/kg	0.053	0.875	0.031	0.029	0.032	0.0280	0.0310	0.0390	0.0318
	Quinoline	mg/kg	-	-	<0.010	<0.010	<0.010	<0.0100	<0.0100	<0.0100	<0.0100
	Acenaphthene d10	%	-	-	89.5	72.5	80.6	72.5	80.7	89.5	81.3
	Chrysene d12	%	-	-	98.3	88.2	91.1	88.2	98.3	108	97.6
	Naphthalene d8	%	-	-	82.7	62.5	64.3	62.5	68.1	82.7	69.2
	Phenanthrene d10	%	-	-	95.1	85.1	94.5	85.1	95.1	105	95.8
	B(a)P Total Potency Equivalent	mg/kg	-	-	<0.020	<0.020	<0.020	<0.0200	<0.0200	0.0280	0.0216
	IACR (CCME)	mg/kg	-	-	0.37	0.36	0.37	0.350	0.370	0.520	0.394

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

	Parameter	Units	Lower WSQG	Upper WSQG	Standard Deviation	RG_FO22-Rep1	RG_FO22-Rep2	RG_FO22-Rep3	RG_FO22-Rep4	RG_FO22-Rep5
						16-Sep-18	16-Sep-18	16-Sep-18	16-Sep-18	16-Sep-18
Physical Tests	Moisture	%	-	-	2.48	49.0	37.2	48.4	57.5	48.4
	pH (1:2 soil:water)	pH units	-	-	0.0192	7.94	8.06	7.95	7.97	7.88
Particle Size	% Gravel (>2mm)	%	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm)	%	-	-	8.30	-	-	-	-	-
	% Sand (2.00mm - 1.00mm)	%	-	-	1.81	<1.0	<1.0	<1.0	<1.0	<1.0
	% Sand (1.00mm - 0.50mm)	%	-	-	1.66	2.4	<1.0	<1.0	<1.0	<1.0
	% Sand (0.50mm - 0.25mm)	%	-	-	5.62	10.6	8.3	2.1	8.2	6.2
	% Sand (0.25mm - 0.125mm)	%	-	-	4.57	23.3	36.1	20.5	23.6	26.1
	% Sand (0.125mm - 0.063mm)	%	-	-	3.10	20.1	18.9	23.4	16.1	19.1
	% Silt (0.063mm - 0.004mm)	%	-	-	8.80	-	-	-	-	-
	% Silt (0.063mm - 0.0312mm)	%	-	-	4.02	19.5	17.2	25.6	22.5	21.6
	% Silt (0.0312mm - 0.004mm)	%	-	-	4.81	20.2	16.1	25.2	25.1	22.2
	% Clay (<4µm)	%	-	-	0.559	3.4	2.8	3.0	3.8	3.6
	Texture	-	-	-	-	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam
Organic Carbon	Total Organic Carbon	%	-	-	0.392	4.68	4.78	5.87	6.23	6.43
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	426	8980	8390	7790	8130	7080
	Antimony (Sb)	mg/kg	-	-	0.0351	0.51	0.51	0.56	0.60	0.59
	Arsenic (As)	mg/kg	5.9	17	0.230	7.28	5.65	5.67	6.52	5.99
	Barium (Ba)	mg/kg	-	-	8.05	305	224	221	303	227
	Beryllium (Be)	mg/kg	-	-	0.0270	0.60	0.56	0.59	0.64	0.62
	Bismuth (Bi)	mg/kg	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)	mg/kg	-	-	0.624	7.8	6.4	5.9	6.2	5.3
	Cadmium (Cd)	mg/kg	0.6	3.5	0.0789	1.12	1.08	1.31	1.45	1.47
	Calcium (Ca)	mg/kg	-	-	2,870	42,400	38,000	47,000	51,800	49,700
	Chromium (Cr)	mg/kg	37.3	90	0.802	15.2	14.1	13.7	14.3	13.4
	Cobalt (Co)	mg/kg	-	-	0.165	4.99	6.07	6.31	6.47	6.86
	Copper (Cu)	mg/kg	35.7	197	0.642	12.7	12.6	14.8	15.8	16.1
	Iron (Fe)	mg/kg	21,200	43,766	602	34500	16100	15800	24300	17200
	Lead (Pb)	mg/kg	35	91	0.210	8.58	8.44	9.20	9.94	9.87
	Lithium (Li)	mg/kg	-	-	0.540	8.8	8.1	9.2	9.1	9.1
	Magnesium (Mg)	mg/kg	-	-	705	14,700	14,400	16,100	16,200	16,400
	Manganese (Mn)	mg/kg	460	1100	42.5	346	442	507	470	590
	Mercury (Hg)	mg/kg	0.17	0.486	0.00221	0.0403	0.0339	0.0433	0.0450	0.0401
	Molybdenum (Mo)	mg/kg	-	-	0.0814	1.39	1.33	1.46	1.67	1.49
	Nickel (Ni)	mg/kg	16	75	2.66	25.7	26.8	30.5	33.4	33.0
	Phosphorus (P)	mg/kg	-	-	32.4	1930	1980	1750	1930	1950
	Potassium (K)	mg/kg	-	-	186	1870	1700	1430	1470	1290
	Selenium (Se)	mg/kg	2	2	0.377	2.73	1.79	3.09	3.34	2.84
	Silver (Ag)	mg/kg	0.5	-	0.0152	0.15	0.13	0.19	0.20	0.20
	Sodium (Na)	mg/kg	-	-	4.82	87	83	84	88	86
	Strontium (Sr)	mg/kg	-	-	2.43	68.9	63.7	67.3	72.9	69.0
	Sulfur (S)	mg/kg	-	-	-	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl)	mg/kg	-	-	0.0102	0.201	0.187	0.206	0.215	0.204
	Tin (Sn)	mg/kg	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti)	mg/kg	-	-	2.87	12.6	11.2	13.3	11.0	11.4
	Tungsten (W)	mg/kg	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U)	mg/kg	-	-	0.0251	0.963	0.951	0.998	1.02	1.04
	Vanadium (V)	mg/kg	-	-	1.75	35.3	33.8	31.3	33.3	31.1
	Zinc (Zn)	mg/kg	123	315	4.24	110	111	117	127	124
	Zirconium (Zr)	mg/kg	-	-	0.114	<1.0	<1.0	<1.0	<1.0	<1.0
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	-	<0.020	<0.011	<0.017	<0.022	<0.020
	Acenaphthylene	mg/kg	0.00587	0.128	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Acridine	mg/kg	-	-	-	<0.030	<0.014	<0.037	<0.036	<0.032
	Anthracene	mg/kg	0.0469	0.245	-	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Benz(a)anthracene	mg/kg	0.0317	0.385	-	0.011	<0.010	0.017	0.019	0.014
	Benzo(a)pyrene	mg/kg	0.0319	0.782	-	<0.010	<0.010	0.014	0.021	0.012
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.00687	0.025	0.012	0.042	0.045	0.033
	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.00750	0.026	<0.015	0.046	0.047	0.035
	Benzo(e)pyrene	mg/kg	-	-	0.00706	0.027	0.013	0.045	0.053	0.037
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	0.00321	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	-	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene	mg/kg	0.0571	0.862	0.0161	0.052	0.030	0.084	0.087	0.069
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	-	<0.0060	<0.0050	<0.0055	<0.0050	<0.0050
	Fluoranthene	mg/kg	0.111	2.355	0.00245	<0.010	<0.010	0.011	0.011	<0.010
	Fluorene	mg/kg	0.021	0.144	0.0117	0.040	0.018	0.045	0.058	0.045
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	-	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene	mg/kg	-	-	0.0712	0.236	0.112	0.203	0.280	0.220
	2-Methylnaphthalene	mg/kg	0.0202	0.201	0.112	0.372	0.180	0.338	0.475	0.371
	Naphthalene	mg/kg	0.0346	0.391	0.0480	0.122	0.063	0.090	0.124	0.109
	Perylene	mg/kg	-	-	-	0.013	<0.010	0.043	0.027	0.023
	Phenanthrene	mg/kg	0.0419	0.515	0.0542	0.212	0.114	0.244	0.259	0.223
	Pyrene	mg/kg	0.053	0.875	0.00432	0.016	0.010	0.019	0.020	0.017
	Quinoline	mg/kg	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthene d10	%	-	-	6.12	80.8	82.1	76.4	89.7	85.6
	Chrysene d12	%	-	-	8.10	86.6	82.4	113.9	115.4	115.0
	Naphthalene d8	%	-	-	7.96	83.2	85.1	67.6	76.1	75.4
	Phenanthrene d10	%	-	-	7.28	84.4	88.4	104.9	96.9	97.7
	B(a)P Total Potency Equivalent	mg/kg	-	-	-	<0.020	<0.020	0.024	0.032	0.021
	IACR (CCME)	mg/kg	-	-	0.0709	0.27	0.16	0.44	0.48	0.36

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Value < LRL and LRL > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

Table D.1: Sediment Quality Samples and Summary Statistics for Lotic Reference and Mine-Exposed Areas, FRO LAEMP, September 2019

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Parameter		Units	Lower WSQG	Upper WSQG	Min	Median	Max	Mean	Standard Deviation
Physical Tests	Moisture	%	-	-	37.2	48.4	57.5	48.1	7.21
	pH (1:2 soil:water)	pH units	-	-	7.88	7.95	8.06	7.96	0.0652
Particle Size	% Gravel (>2mm)	%	-	-	<1.00	<1.00	<1.00	<1.00	-
	% Sand (2.0mm - 0.063mm)	%	-	-	48.0	53.4	65.3	54.8	6.88
	% Sand (2.00mm - 1.00mm)	%	-	-	<1.00	<1.00	<1.00	<1.00	-
	% Sand (1.00mm - 0.50mm)	%	-	-	<1.00	<1.00	2.40	1.28	-
	% Sand (0.50mm - 0.25mm)	%	-	-	2.10	8.20	10.6	7.08	3.19
	% Sand (0.25mm - 0.125mm)	%	-	-	20.5	23.6	36.1	25.9	6.03
	% Sand (0.125mm - 0.063mm)	%	-	-	16.1	19.1	23.4	19.5	2.63
	% Silt (0.063mm - 0.004mm)	%	-	-	33.3	43.8	50.8	43.0	6.85
	% Silt (0.063mm - 0.0312mm)	%	-	-	17.2	21.6	25.6	21.3	3.16
	% Silt (0.0312mm - 0.004mm)	%	-	-	16.1	22.2	25.2	21.8	3.80
	% Clay (<4µm)	%	-	-	2.80	3.40	3.80	3.32	0.415
	Texture	-	-	-	-	-	-	-	-
Organic Carbon	Total Organic Carbon	%	-	-	4.68	5.87	6.43	5.60	0.818
Metals (1 mm fraction)	Aluminum (Al)	mg/kg	-	-	7,080	8,130	8,980	8,070	706
	Antimony (Sb)	mg/kg	-	-	0.510	0.560	0.600	0.554	0.0428
	Arsenic (As)	mg/kg	5.9	17	5.65	5.99	7.28	6.22	0.688
	Barium (Ba)	mg/kg	-	-	221	227	305	256	43.9
	Beryllium (Be)	mg/kg	-	-	0.560	0.600	0.640	0.602	0.0303
	Bismuth (Bi)	mg/kg	-	-	<0.200	<0.200	<0.200	<0.200	-
	Boron (B)	mg/kg	-	-	5.30	6.20	7.80	6.32	0.926
	Cadmium (Cd)	mg/kg	0.6	3.5	1.08	1.31	1.47	1.29	0.181
	Calcium (Ca)	mg/kg	-	-	38,000	47,000	51,800	45,800	5,590
	Chromium (Cr)	mg/kg	37.3	90	13.4	14.1	15.2	14.1	0.688
	Cobalt (Co)	mg/kg	-	-	4.99	6.31	6.86	6.14	0.704
	Copper (Cu)	mg/kg	35.7	197	12.6	14.8	16.1	14.4	1.67
	Iron (Fe)	mg/kg	21,200	43,766	15,800	17,200	34,500	21,600	8,010
	Lead (Pb)	mg/kg	35	91	8.44	9.20	9.94	9.21	0.700
	Lithium (Li)	mg/kg	-	-	8.10	9.10	9.20	8.86	0.451
	Magnesium (Mg)	mg/kg	-	-	14,400	16,100	16,400	15,600	934
	Manganese (Mn)	mg/kg	460	1100	346	470	590	471	89.3
	Mercury (Hg)	mg/kg	0.17	0.486	0.0339	0.0403	0.0450	0.0405	0.00424
	Molybdenum (Mo)	mg/kg	-	-	1.33	1.46	1.67	1.47	0.129
	Nickel (Ni)	mg/kg	16	75	25.7	30.5	33.4	29.9	3.52
	Phosphorus (P)	mg/kg	-	-	1,750	1,930	1,980	1,910	90.7
	Potassium (K)	mg/kg	-	-	1,290	1,470	1,870	1,550	231
	Selenium (Se)	mg/kg	2	2	1.79	2.84	3.34	2.76	0.590
	Silver (Ag)	mg/kg	0.5	-	0.130	0.190	0.200	0.174	0.0321
	Sodium (Na)	mg/kg	-	-	83.0	86.0	88.0	85.6	2.07
	Strontium (Sr)	mg/kg	-	-	63.7	68.9	72.9	68.4	3.32
	Sulfur (S)	mg/kg	-	-	<1,000	<1,000	<1,000	<1,000	-
	Thallium (Tl)	mg/kg	-	-	0.187	0.204	0.215	0.203	0.0102
	Tin (Sn)	mg/kg	-	-	<2.00	<2.00	<2.00	<2.00	-
	Titanium (Ti)	mg/kg	-	-	11.0	11.4	13.3	11.9	1.00
	Tungsten (W)	mg/kg	-	-	<0.500	<0.500	<0.500	<0.500	-
	Uranium (U)	mg/kg	-	-	0.951	0.998	1.04	0.994	0.0375
	Vanadium (V)	mg/kg	-	-	31.1	33.3	35.3	33.0	1.77
	Zinc (Zn)	mg/kg	123	315	110	117	127	118	7.60
	Zirconium (Zr)	mg/kg	-	-	<1.00	<1.00	<1.00	<1.00	-
PAHs (1 mm fraction)	Acenaphthene	mg/kg	0.00671	0.0889	<0.0110	<0.0200	<0.0220	<0.0110	-
	Acenaphthylene	mg/kg	0.00587	0.128	<0.00500	<0.00500	<0.00500	<0.00500	-
	Acridine	mg/kg	-	-	<0.0140	<0.0320	<0.0370	<0.0140	-
	Anthracene	mg/kg	0.0469	0.245	<0.00400	<0.00400	<0.00400	<0.00400	-
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.0100	0.0140	0.0190	0.0142	0.00370
	Benzo(a)pyrene	mg/kg	0.0319	0.782	<0.0100	0.0120	0.0210	0.0134	0.00427
	Benzo(b&j)fluoranthene	mg/kg	-	-	0.0120	0.0330	0.0450	0.0314	0.0134
	Benzo(b+j+k)fluoranthene	mg/kg	-	-					
	Benzo(e)pyrene	mg/kg	-	-	0.0130	0.0370	0.0530	0.0350	0.0156
	Benzo(g,h,i)perylene	mg/kg	0.17	3.2	<0.0100	<0.0100	<0.0100	<0.0100	-
	Benzo(k)fluoranthene	mg/kg	0.24	13.4	<0.0100	<0.0100	<0.0100	<0.0100	-
	Chrysene	mg/kg	0.0571	0.862	0.0300	0.0690	0.0870	0.0644	0.0237
	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.00500	<0.00500	<0.00600	<0.00500	-
	Fluoranthene	mg/kg	0.111	2.355	<0.0100	<0.0100	0.0110	0.0104	-
	Fluorene	mg/kg	0.021	0.144	0.0180	0.0450	0.0580	0.0412	0.0146
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	<0.0100	<0.0100	<0.0100	<0.0100	-
	1-Methylnaphthalene	mg/kg	-	-	0.112	0.220	0.280	0.210	0.0619
	2-Methylnaphthalene	mg/kg	0.0202	0.201	0.180	0.371	0.475	0.347	0.107
	Naphthalene	mg/kg	0.0346	0.391	0.0630	0.109	0.124	0.102	0.0255
	Perylene	mg/kg	-	-	<0.0100	0.0230	0.0430	0.0232	0.0128
	Phenanthrene	mg/kg	0.0419	0.515	0.114	0.223	0.259	0.210	0.0569
	Pyrene	mg/kg	0.053	0.875	0.0100	0.0170	0.0200	0.0164	0.00391
	Quinoline	mg/kg	-	-	<0.0100	<0.0100	<0.0100	<0.0100	-
	Acenaphthene d10	%	-	-	76.4	82.1	89.7	82.9	5.02
	Chrysene d12	%	-	-	82.4	114	115	103	16.7
	Naphthalene d8	%	-	-	67.6	76.1	85.1	77.5	6.98
	Phenanthrene d10	%	-	-	84.4	96.9	105	94.5	8.11
	B(a)P Total Potency Equivalent	mg/kg	-	-	<0.0200	0.0210	0.0320	0.0234	0.00522
	IACR (CCME)	mg/kg	-	-	0.160	0.360	0.480	0.342	0.130

Value > lower Working Sediment Quality Guideline (WSQG).

Value < LRL and LRL > lower Working Sediment Quality Guideline (WSQG).

Value > upper Working Sediment Quality Guideline (WSQG, or only guideline in the case of Selenium).

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Notes: All observed data are reported to the number of significant digits reported by the laboratory and summary statistics are reported to 3 significant digits for display purposes.

APPENDIX E
INTEGRATED SUMMARY

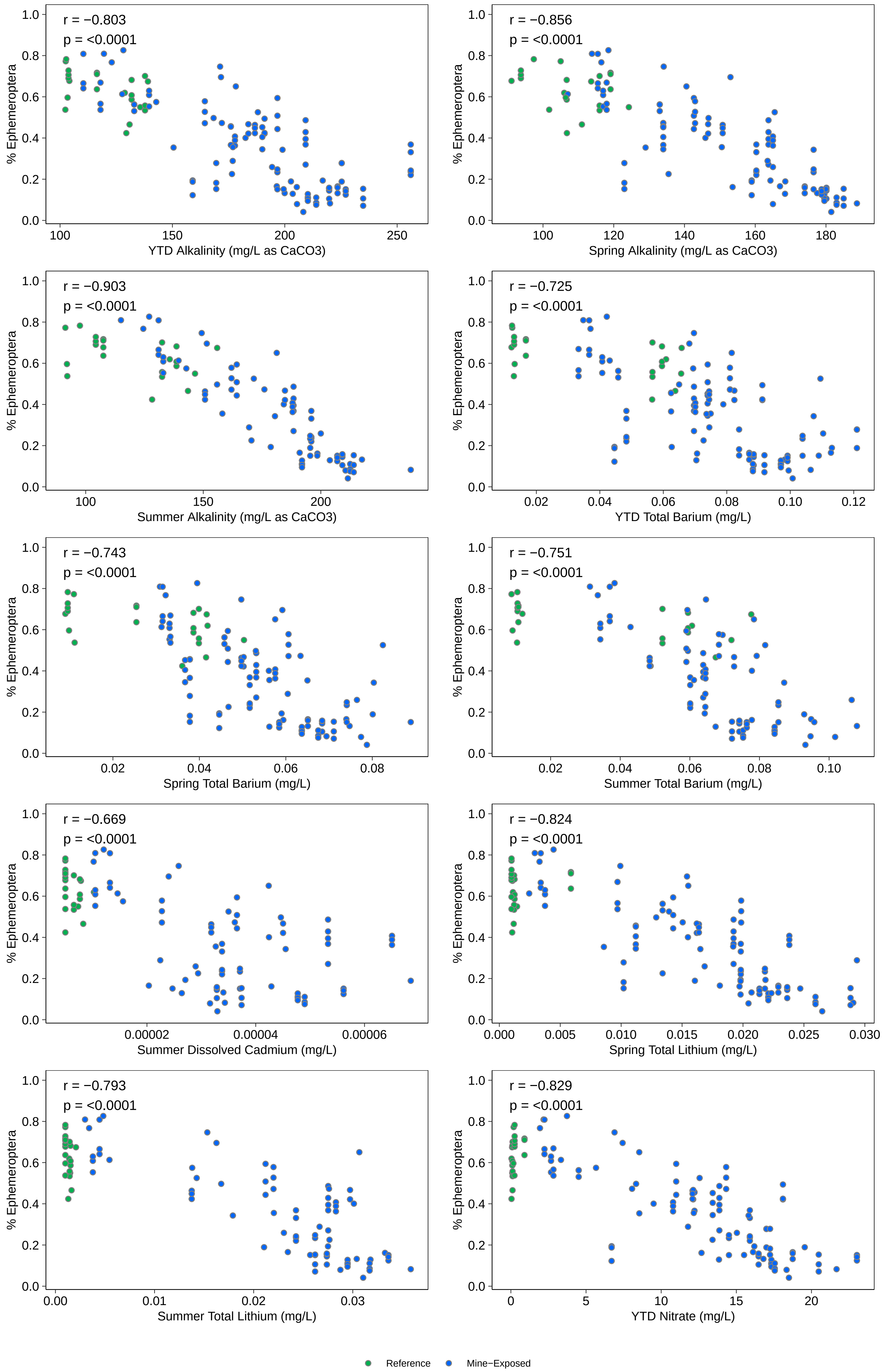
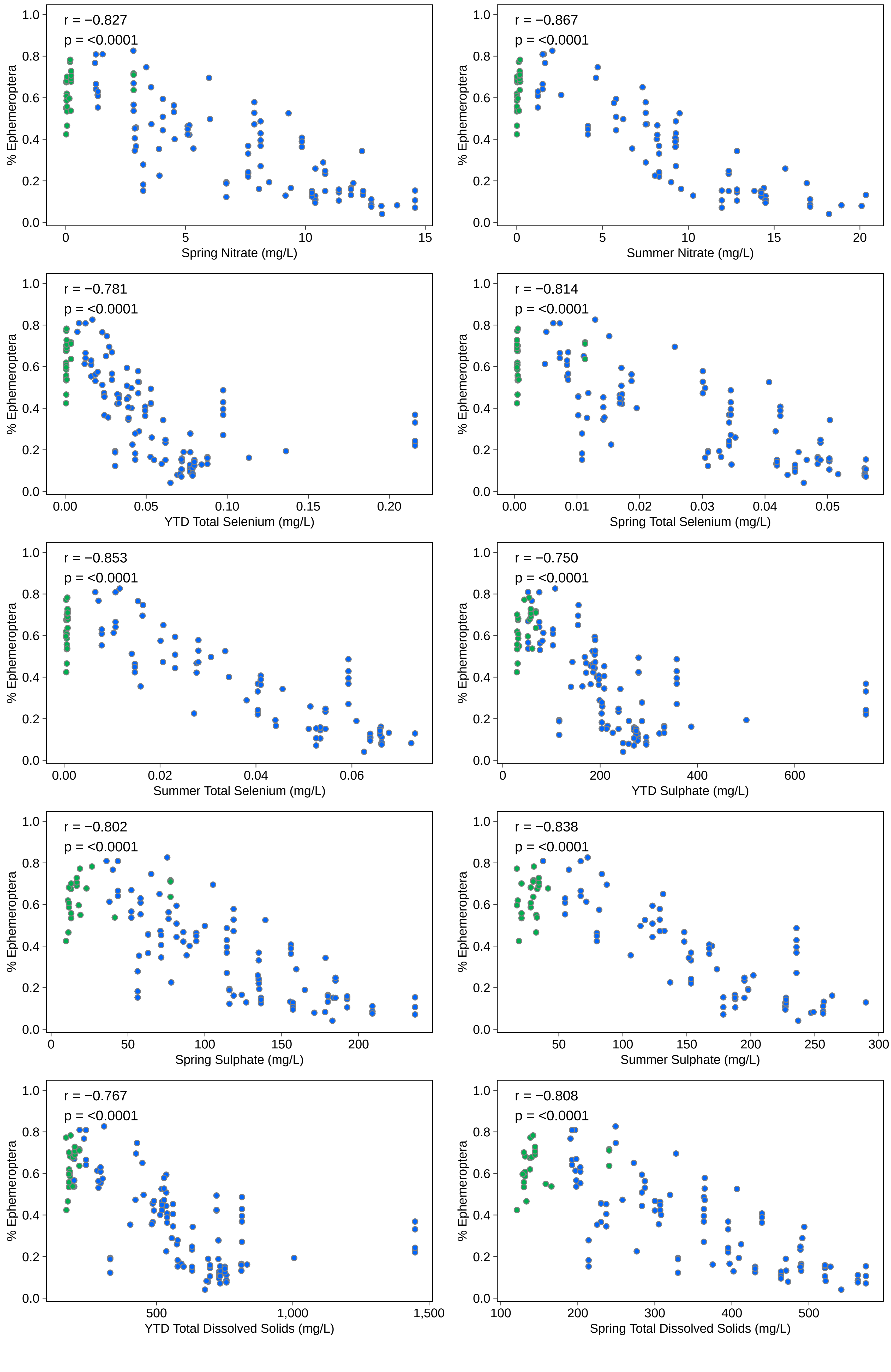


Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

Notes: YTD = Chemistry means from May and June of the sampled year included; Spring = Chemistry means from May and June of the sampled year included; Summer = Chemistry means from July and August of the sampled year included.



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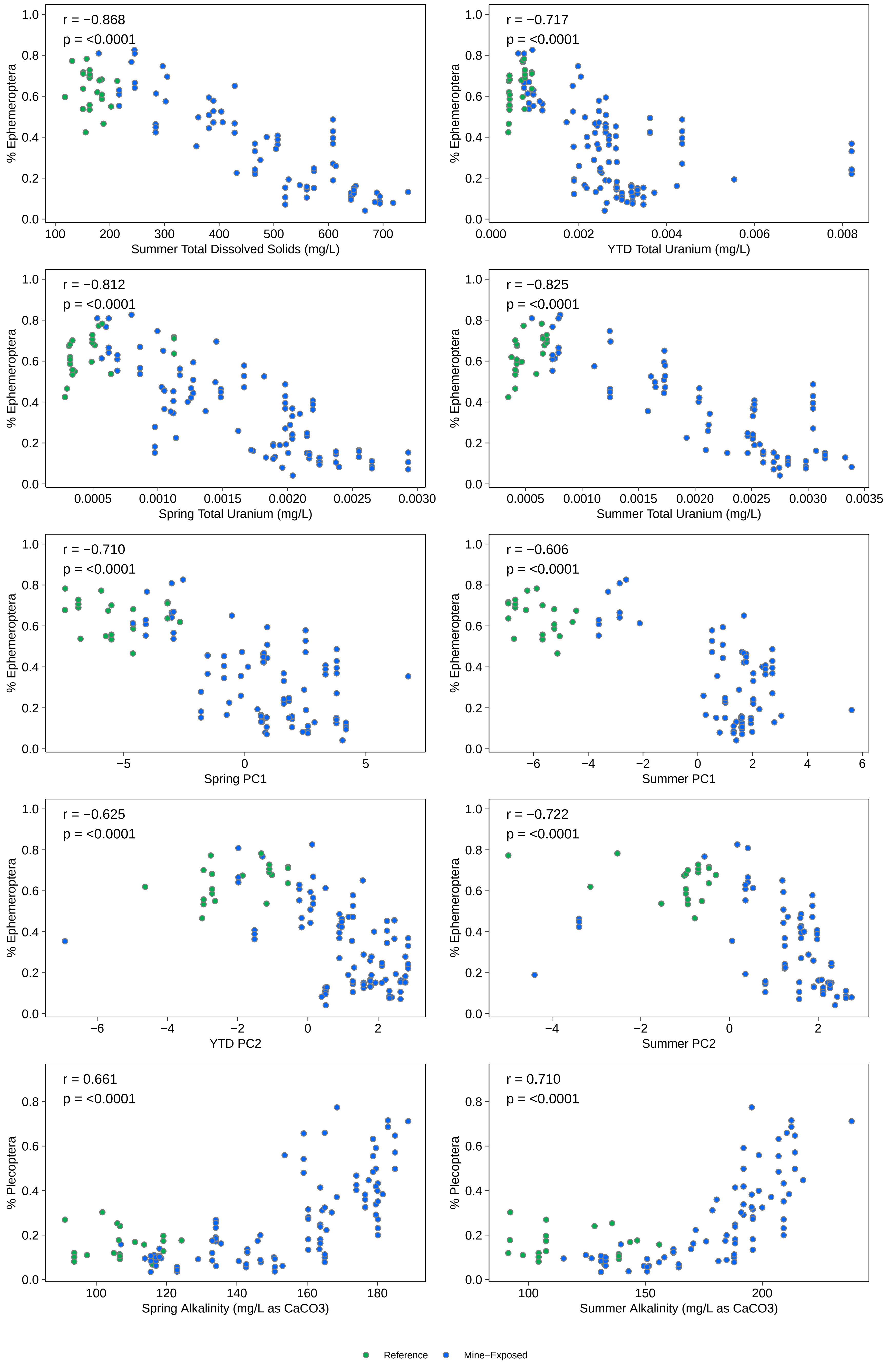

Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

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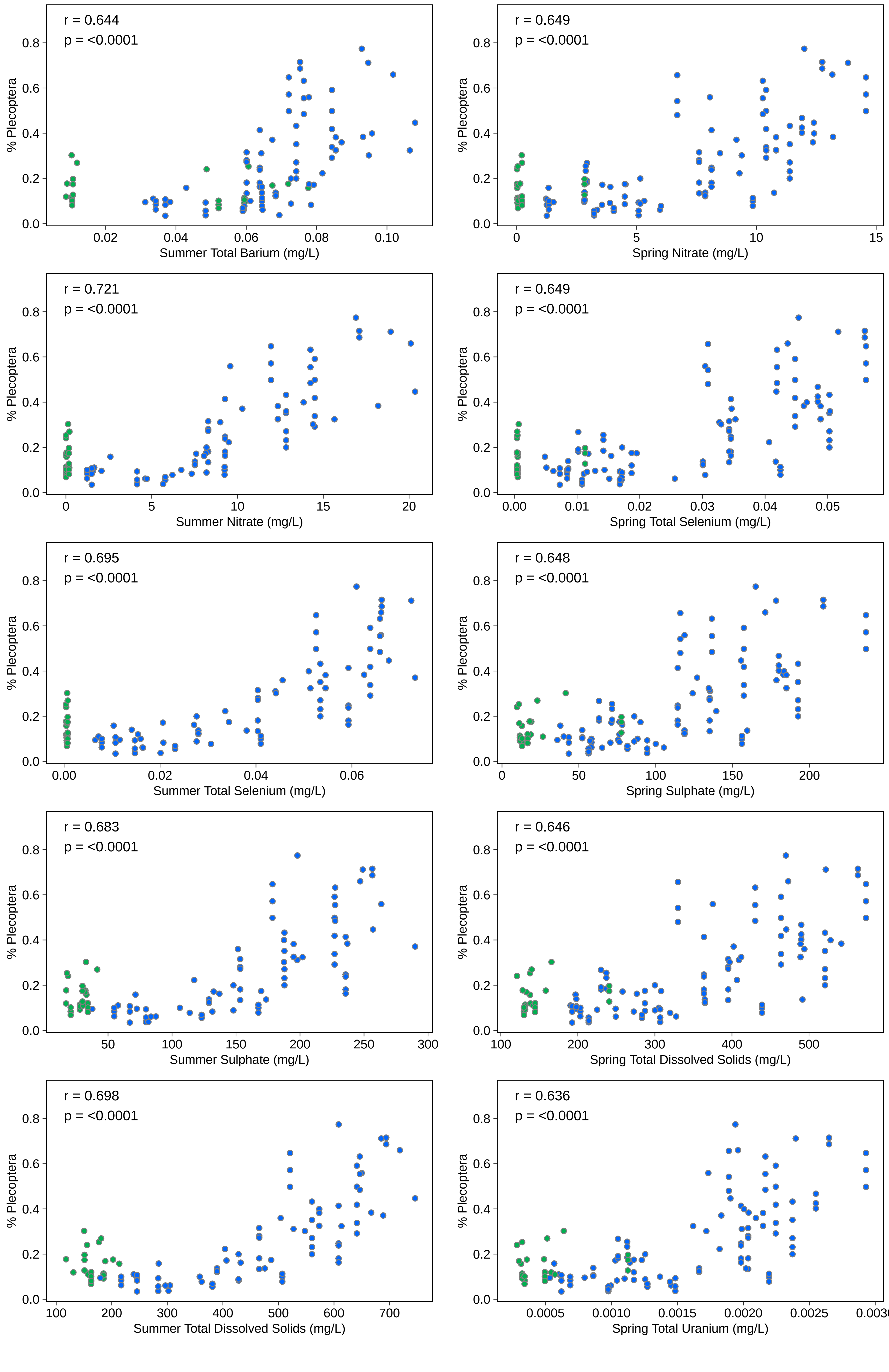

Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

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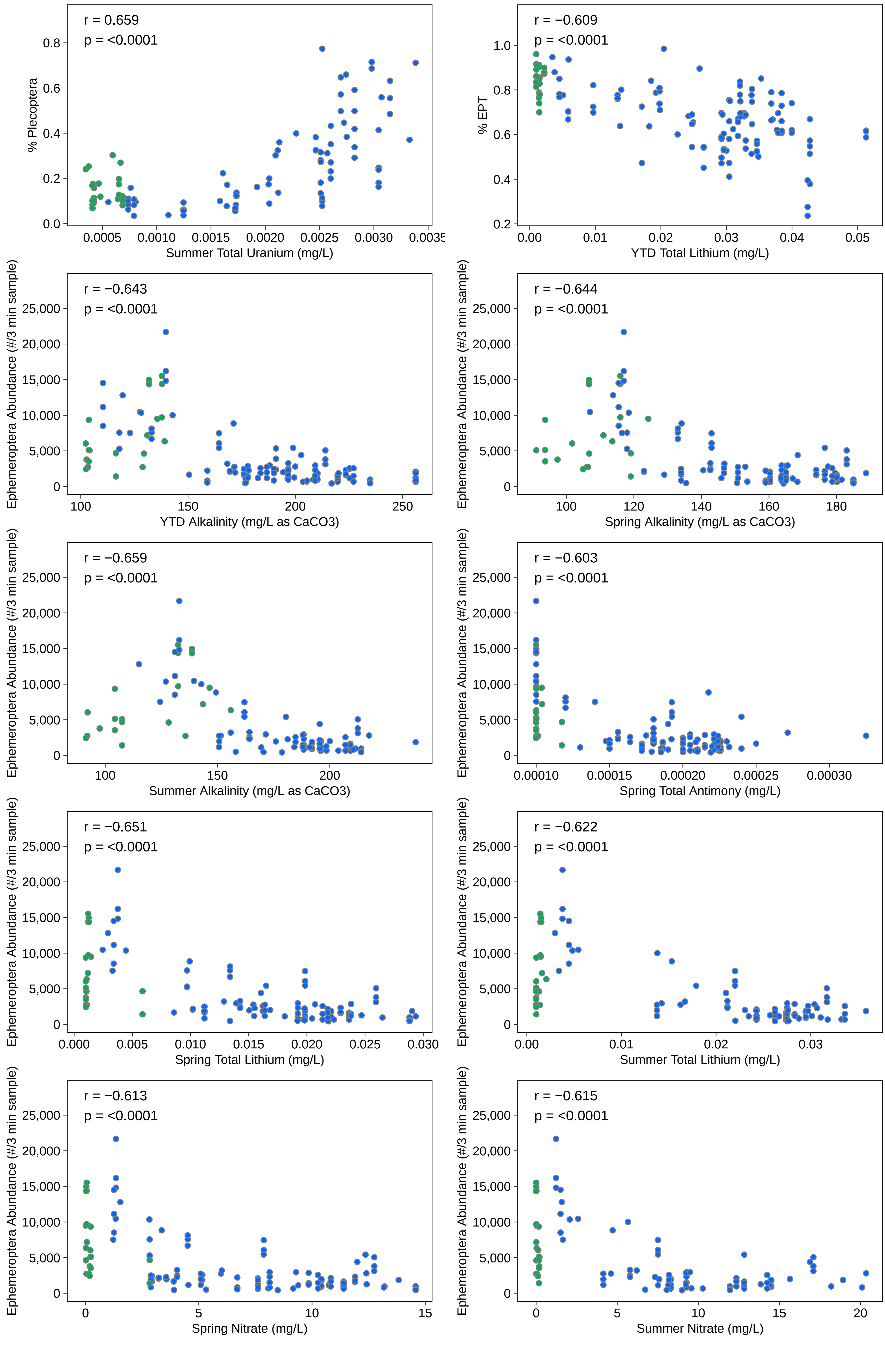

Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

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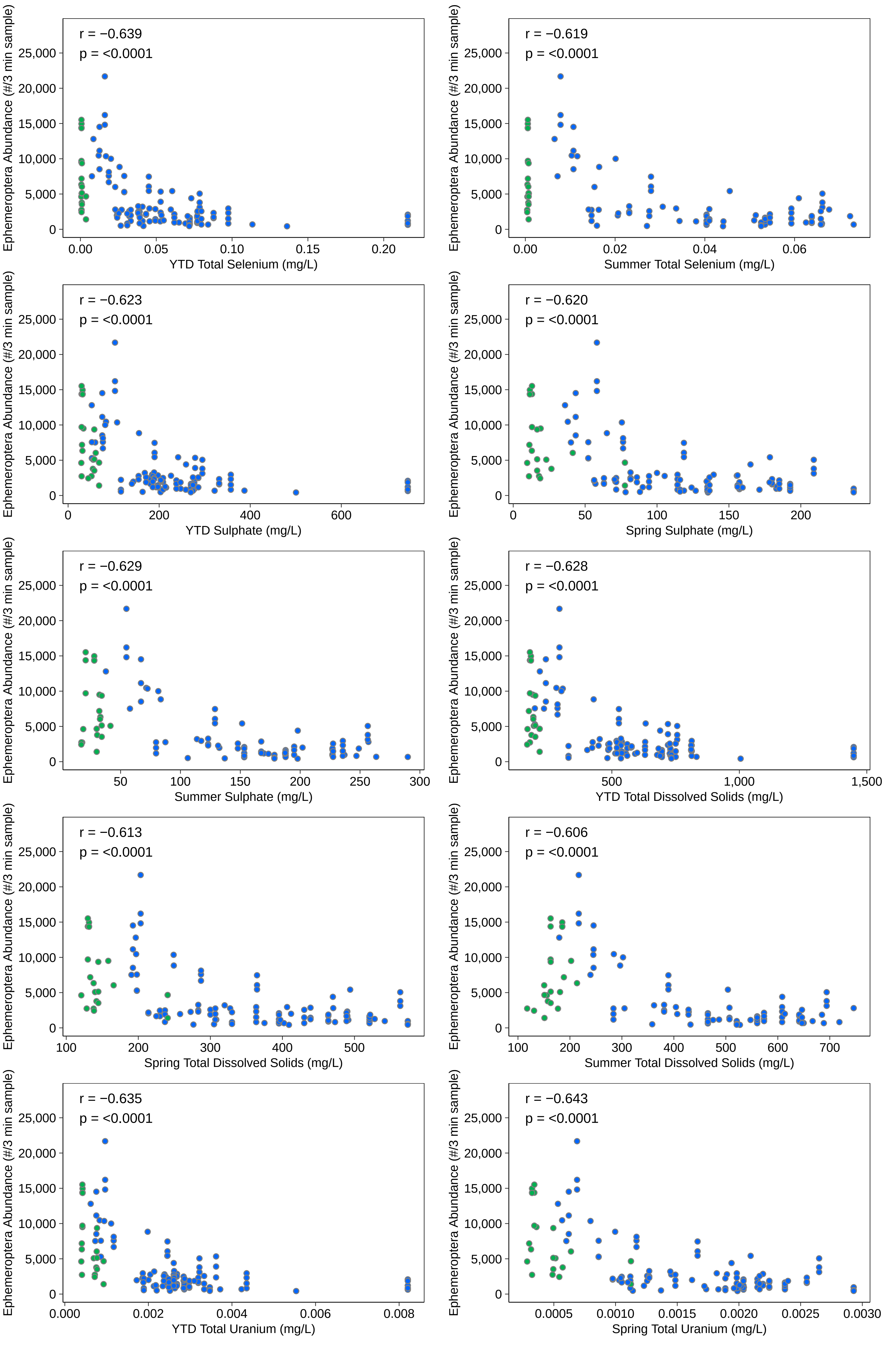

Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

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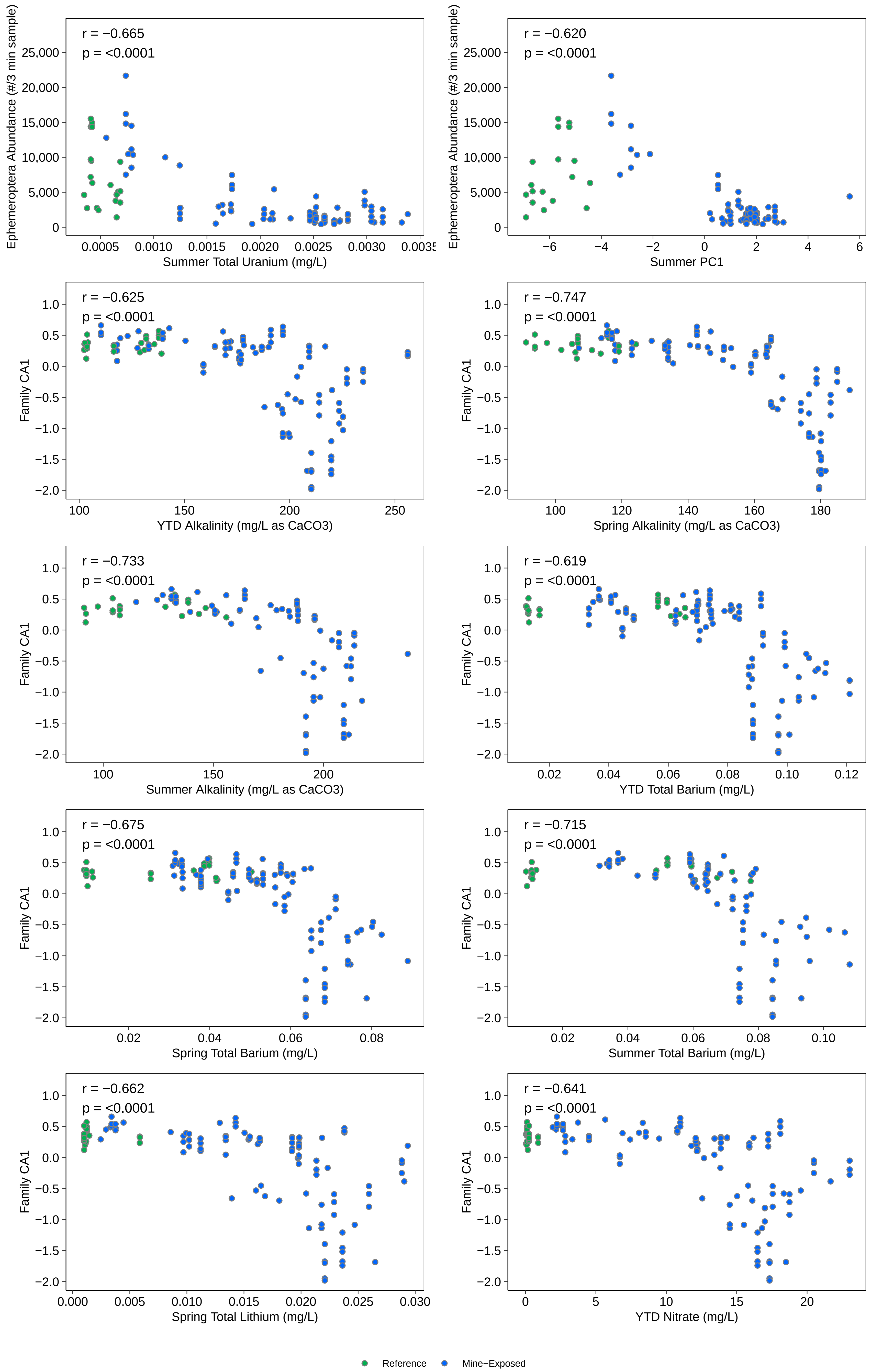

Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

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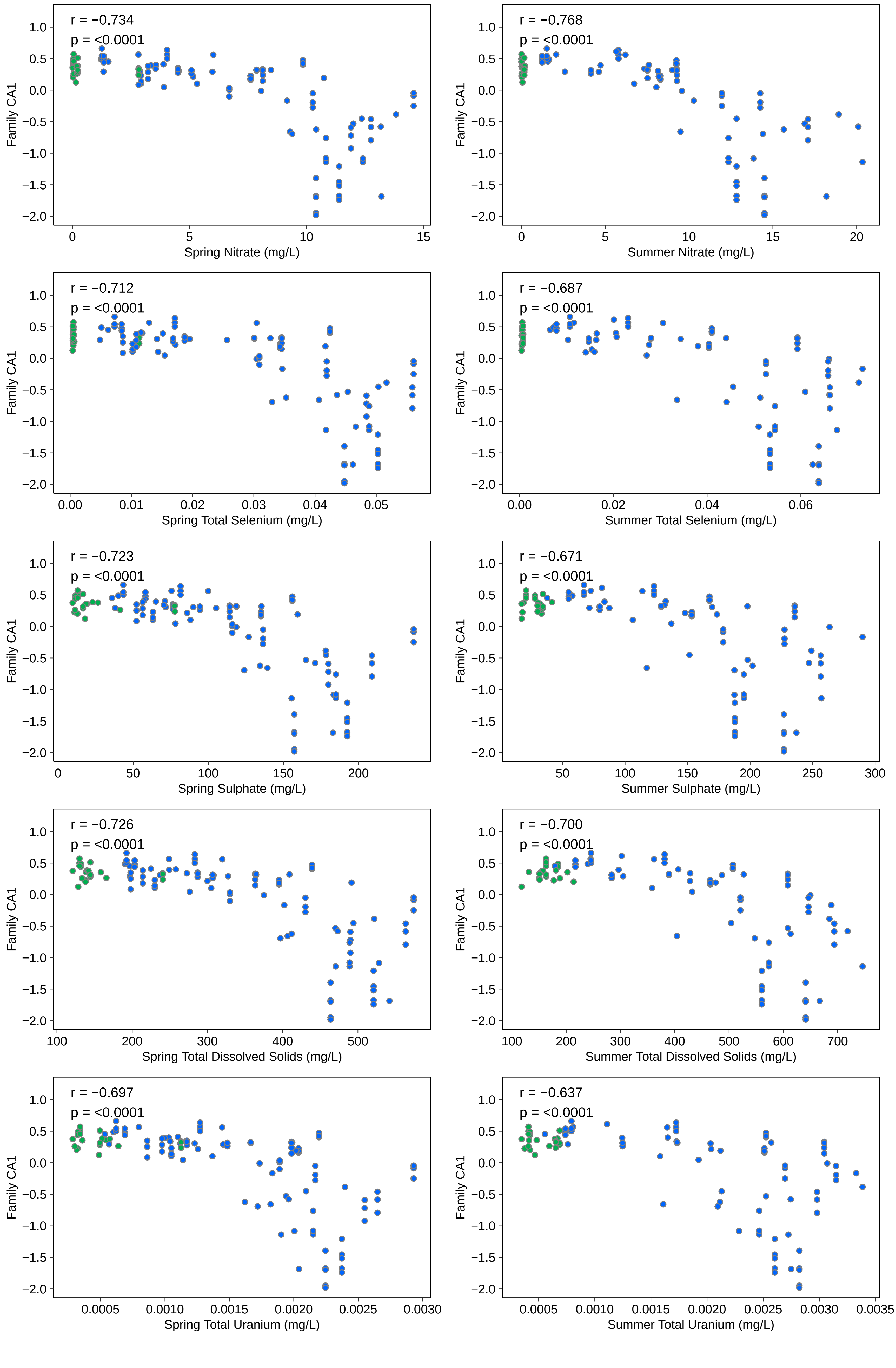

Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

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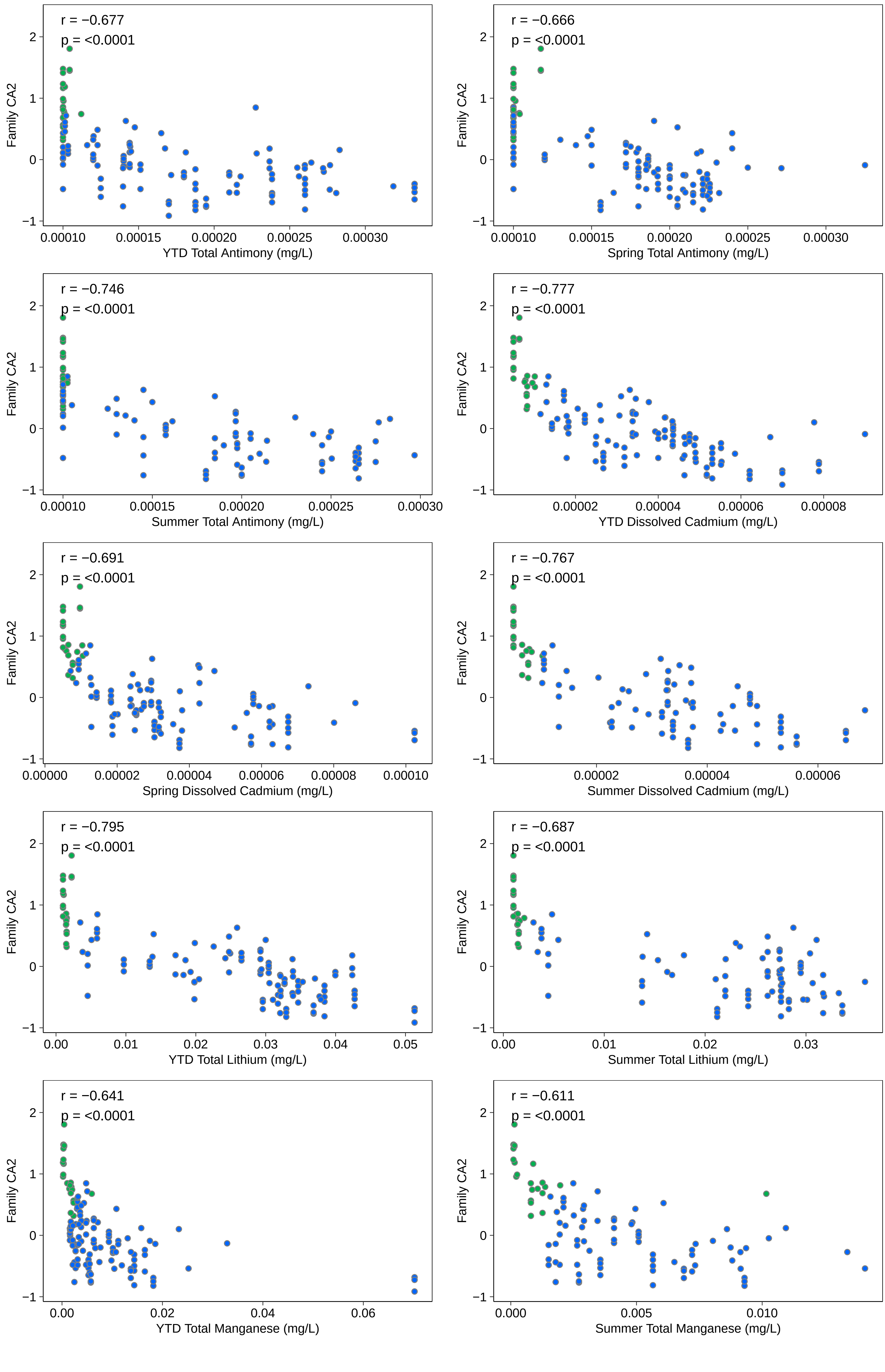

Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

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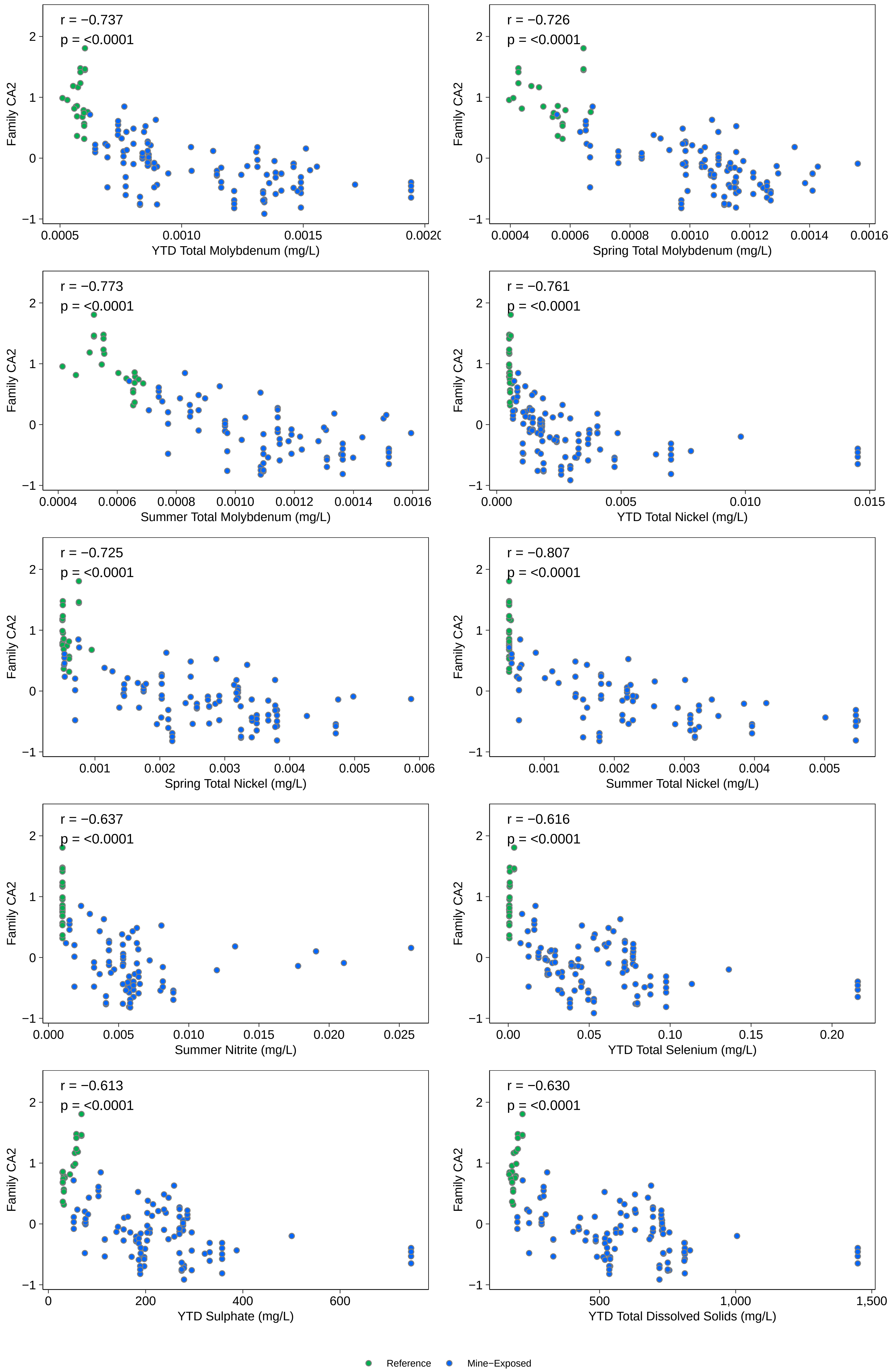

Figure E.1: **Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019**

Notes: YTD = Chemistry means from May and June of the sampled year included; Spring = Chemistry means from May and June of the sampled year included; Summer = Chemistry means from July and August of the sampled year included.

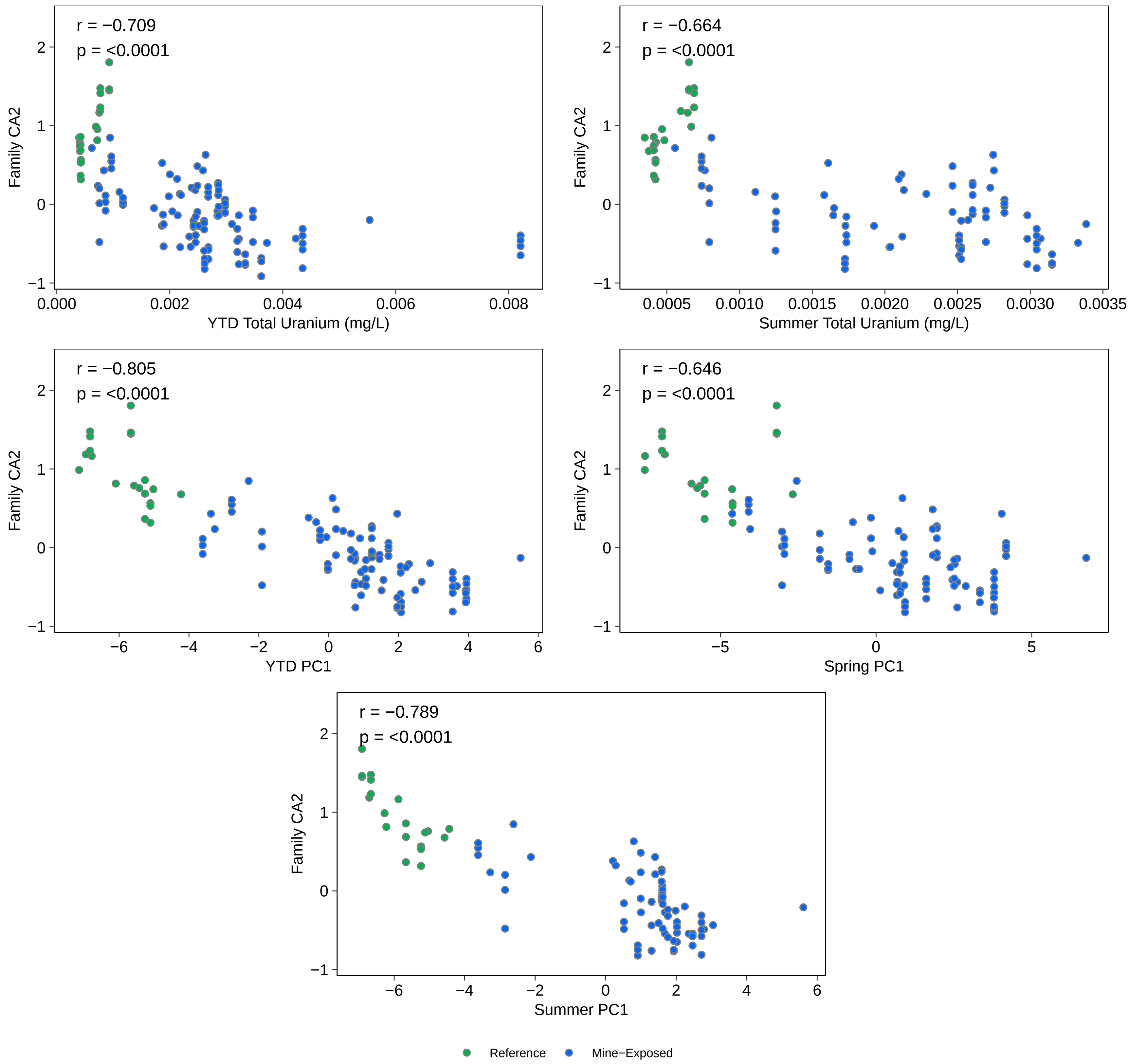

Figure E.1: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Fording River, 2012 to 2019

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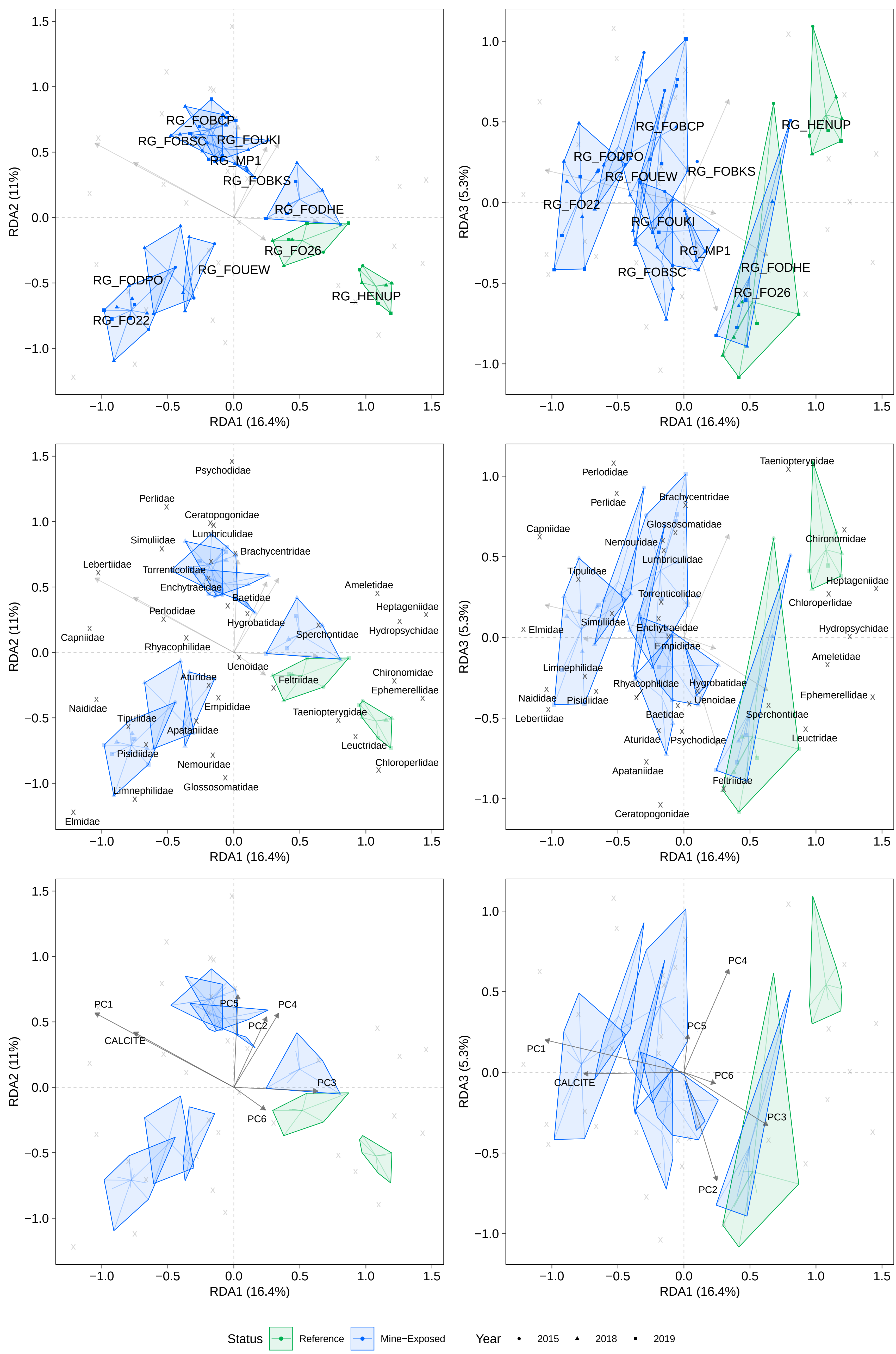

Figure E.2: **RDA Results for Benthic Invertebrate Community Data Constrained by Stressor Variables, Fording River, 2015, 2018, and 2019**

Notes: Coloured lines connect samples to their centroids. Species shown as vectors pointing to the direction of increase. PCA performed on Chi−Squared and ln(x+1) transformed taxa abundances. Grey arrows point towards increasing values of stressor variables.

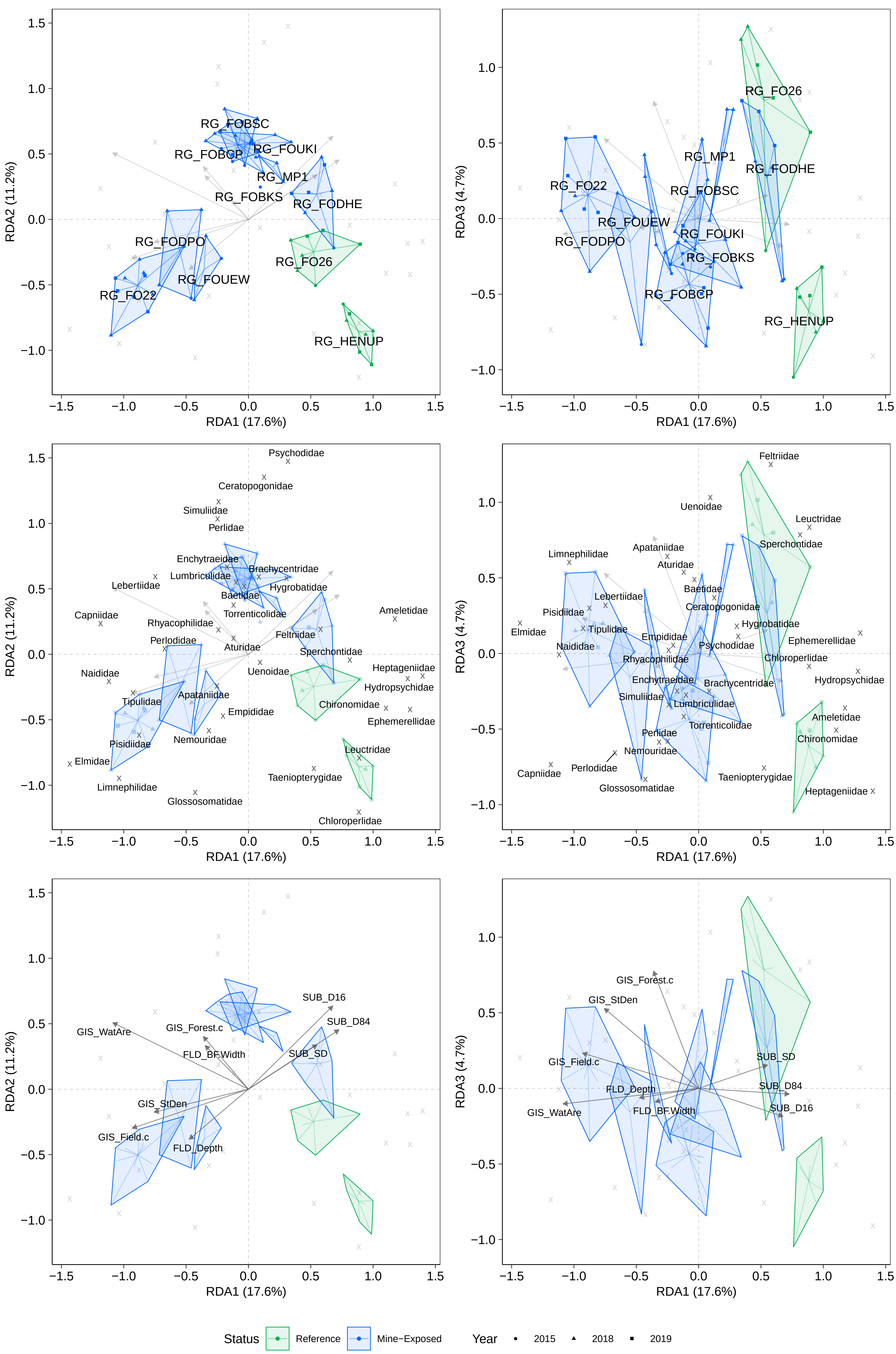

Figure E.3: RDA Results for Benthic Invertebrate Community Data Constrained by Habitat Variables, Fording River, 2015, 2018, and 2019

Notes: Coloured lines connect samples to their centroids. Species shown as vectors pointing to the direction of increase. PCA performed on Chi−Squared and ln(x+1) transformed taxa abundances. Grey arrows point towards increasing values of habitat variables.

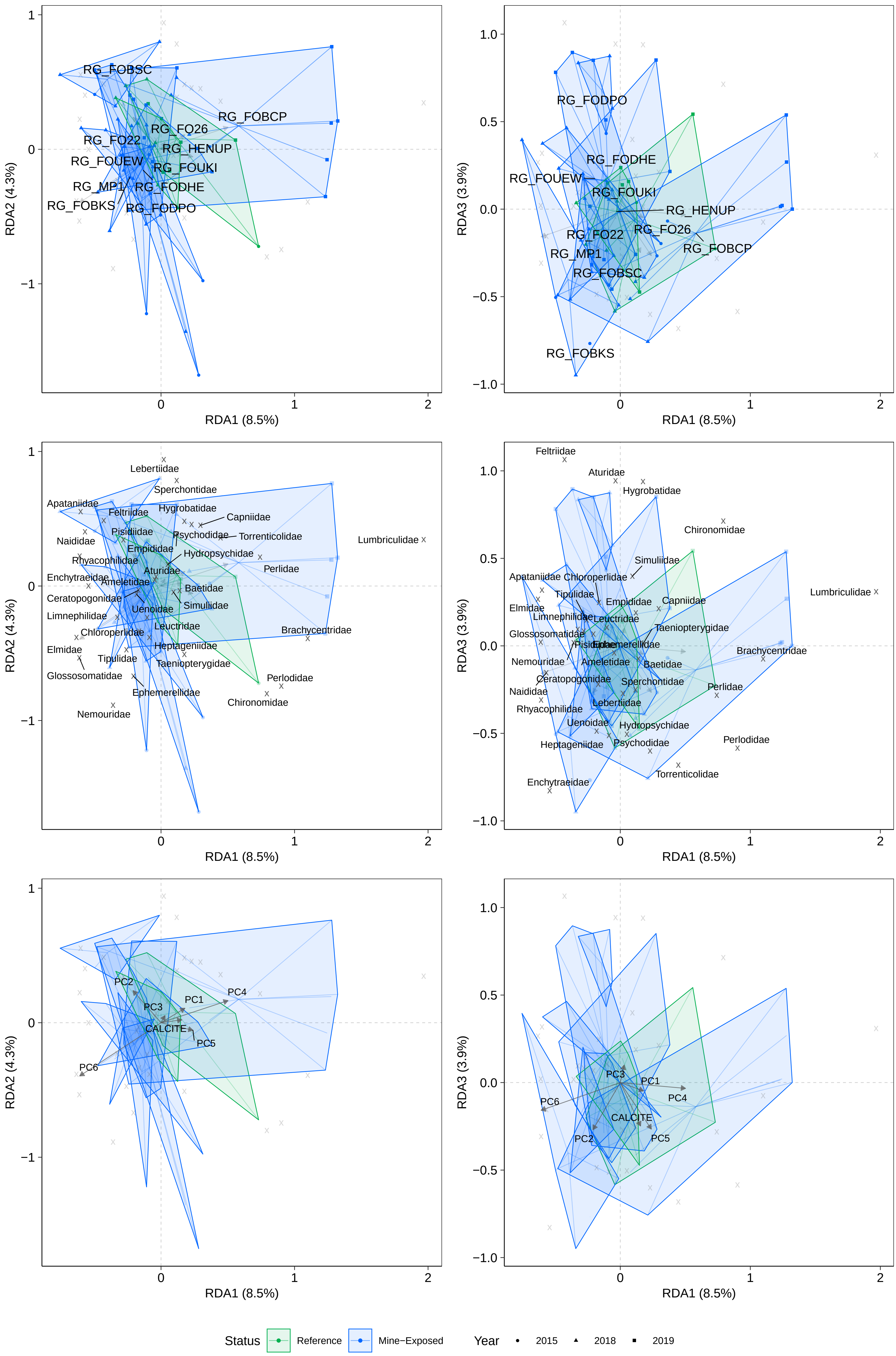

Figure E.4: RDA Results for Benthic Invertebrate Community Data Constrained by Stressor Variables After Conditioning on Habitat Variables, Fording River, 2015, 2018, and 2019

Notes: Coloured lines connect samples to their centroids. Species shown as vectors pointing to the direction of increase. PCA performed on Chi−Squared and ln(x+1) transformed taxa abundances. Grey arrows point towards increasing values of stressor variables.

Table E.1: Spearman's Correlation Relationships between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, FRO LAEMP, 2012 to 2019

Mean Type	Parameter	% Ephemeroptera		% Plecoptera		% EPT		Ephemeroptera Abundance	
		r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value
-	Calcite Index	-0.336	<0.0001	0.199	0.0158	-0.255	0.00193	-0.262	0.00140
-	Calcite (%)	-0.354	<0.0001	0.217	0.00859	-0.202	0.0145	-0.252	0.00217
-	Concreted (%)	-0.155	0.0620	0.0765	0.359	-0.252	0.00213	-0.228	0.00566
-	Embededness (%)	0.280	0.000320	-0.154	0.0509	0.260	0.000851	0.243	0.00190
-	D16	0.232	0.00308	-0.322	<0.0001	-0.0823	0.299	0.0272	0.732
-	D84	0.411	<0.0001	-0.501	<0.0001	0.00508	0.949	0.164	0.0379
-	Water Velocity (m/s)	-0.0240	0.784	0.0169	0.847	0.00690	0.937	-0.0407	0.640
-	Water Depth (cm)	-0.222	0.00985	0.0896	0.303	-0.343	<0.0001	-0.361	<0.0001
Year to Date	Temperature (C)	-0.237	0.00884	0.145	0.112	-0.0946	0.302	-0.204	0.0245
Spring	Temperature (C)	-0.228	0.0140	-0.0898	0.338	-0.449	<0.0001	-0.317	0.000537
Summer	Temperature (C)	0.0238	0.817	-0.178	0.0814	-0.251	0.0130	-0.125	0.221
Year to Date	PC1	-0.519	<0.0001	0.220	0.0204	-0.571	<0.0001	-0.574	<0.0001
	PC2	-0.625	<0.0001	0.477	<0.0001	-0.408	<0.0001	-0.568	<0.0001
Spring	PC1	-0.710	<0.0001	0.475	<0.0001	-0.483	<0.0001	-0.554	<0.0001
	PC2	-0.531	<0.0001	0.354	0.000173	-0.341	0.000310	-0.511	<0.0001
Summer	PC1	-0.606	<0.0001	0.370	0.000282	-0.534	<0.0001	-0.620	<0.0001
	PC2	-0.722	<0.0001	0.596	<0.0001	-0.334	0.00115	-0.460	<0.0001
Year to Date	Alkalinity (mg/L as CaCO3)	-0.803	<0.0001	0.580	<0.0001	-0.522	<0.0001	-0.643	<0.0001
Spring	Alkalinity (mg/L as CaCO3)	-0.856	<0.0001	0.661	<0.0001	-0.430	<0.0001	-0.644	<0.0001
Summer	Alkalinity (mg/L as CaCO3)	-0.903	<0.0001	0.710	<0.0001	-0.450	<0.0001	-0.659	<0.0001
Year to Date	Dissolved Aluminum (mg/L)	0.159	0.0721	-0.254	0.00364	0.0338	0.704	0.206	0.0193
Spring	Dissolved Aluminum (mg/L)	0.122	0.181	-0.233	0.00980	-0.0341	0.709	0.255	0.00458
Summer	Dissolved Aluminum (mg/L)	0.0438	0.664	-0.0298	0.768	0.0446	0.658	-0.0173	0.864
Year to Date	Total Antimony (mg/L)	-0.356	<0.0001	0.0609	0.493	-0.477	<0.0001	-0.529	<0.0001
Spring	Total Antimony (mg/L)	-0.517	<0.0001	0.283	0.00160	-0.483	<0.0001	-0.603	<0.0001
Summer	Total Antimony (mg/L)	-0.446	<0.0001	0.192	0.0544	-0.490	<0.0001	-0.553	<0.0001
Year to Date	Total Arsenic (mg/L)	-0.178	0.0441	-0.0253	0.776	-0.268	0.00215	-0.180	0.0417
Spring	Total Arsenic (mg/L)	-0.217	0.0164	0.0763	0.403	-0.169	0.0632	-0.0732	0.423
Summer	Total Arsenic (mg/L)	0.00797	0.937	-0.00851	0.933	0.0491	0.626	-0.0493	0.625
Year to Date	Total Barium (mg/L)	-0.725	<0.0001	0.451	<0.0001	-0.454	<0.0001	-0.457	<0.0001
Spring	Total Barium (mg/L)	-0.743	<0.0001	0.568	<0.0001	-0.369	<0.0001	-0.514	<0.0001
Summer	Total Barium (mg/L)	-0.751	<0.0001	0.644	<0.0001	-0.299	0.00239	-0.464	<0.0001
Year to Date	Dissolved Cadmium (mg/L)	-0.408	<0.0001	0.0580	0.514	-0.480	<0.0001	-0.388	<0.0001
Spring	Dissolved Cadmium (mg/L)	-0.566	<0.0001	0.317	0.000373	-0.440	<0.0001	-0.459	<0.0001
Summer	Dissolved Cadmium (mg/L)	-0.669	<0.0001	0.432	<0.0001	-0.462	<0.0001	-0.508	<0.0001
Year to Date	Total Chromium (mg/L)	-0.0110	0.902	-0.147	0.0963	-0.200	0.0234	-0.0908	0.306
Spring	Total Chromium (mg/L)	-0.216	0.0167	0.145	0.111	-0.0931	0.308	-0.0796	0.384
Summer	Total Chromium (mg/L)	0.144	0.150	-0.141	0.160	0.0807	0.423	0.00258	0.980
Year to Date	Total Cobalt (mg/L)	-0.416	<0.0001	0.0926	0.297	-0.545	<0.0001	-0.419	<0.0001
Spring	Total Cobalt (mg/L)	-0.414	<0.0001	0.259	0.00397	-0.304	0.000659	-0.358	<0.0001
Summer	Total Cobalt (mg/L)	-0.242	0.0149	0.106	0.289	-0.300	0.00232	-0.357	0.000251
Year to Date	Total Copper (mg/L)	-0.135	0.127	-0.0174	0.845	-0.200	0.0232	-0.112	0.206
Spring	Total Copper (mg/L)	-0.224	0.0130	0.177	0.0507	-0.142	0.118	-0.0997	0.274
Summer	Total Copper (mg/L)	-0.256	0.00963	0.0833	0.408	-0.272	0.00597	-0.198	0.0472
Year to Date	Total Iron (mg/L)	-0.207	0.0190	0.00390	0.965	-0.312	0.000335	-0.194	0.0284
Spring	Total Iron (mg/L)	-0.323	0.000287	0.185	0.0409	-0.301	0.000756	-0.221	0.0143
Summer	Total Iron (mg/L)	-0.115	0.262	-0.116	0.259	-0.346	0.000520	-0.340	0.000659
Year to Date	Total Lead (mg/L)	-0.288	0.000936	0.0658	0.459	-0.360	<0.0001	-0.239	0.00638
Spring	Total Lead (mg/L)	-0.378	<0.0001	0.219	0.0155	-0.326	0.000244	-0.285	0.00147
Summer	Total Lead (mg/L)	-0.00329	0.974	-0.0539	0.592	-0.166	0.0964	-0.155	0.123
Year to Date	Total Lithium (mg/L)	-0.554	<0.0001	0.201	0.0222	-0.609	<0.0001	-0.573	<0.0001
Spring	Total Lithium (mg/L)	-0.824	<0.0001	0.589	<0.0001	-0.479	<0.0001	-0.651	<0.0001
Summer	Total Lithium (mg/L)	-0.793	<0.0001	0.549	<0.0001	-0.480	<0.0001	-0.622	<0.0001
Year to Date	Total Manganese (mg/L)	-0.248	0.00465	-0.0760	0.392	-0.516	<0.0001	-0.395	<0.0001
Spring	Total Manganese (mg/L)	-0.456	<0.0001	0.219	0.0152	-0.476	<0.0001	-0.451	<0.0001
Summer	Total Manganese (mg/L)	-0.302	0.00216	-0.0235	0.815	-0.542	<0.0001	-0.488	<0.0001
Year to Date	Total Molybdenum (mg/L)	-0.360	<0.0001	0.0449	0.613	-0.495	<0.0001	-0.480	<0.0001
Spring	Total Molybdenum (mg/L)	-0.541	<0.0001	0.287	0.00135	-0.443	<0.0001	-0.542	<0.0001
Summer	Total Molybdenum (mg/L)	-0.439	<0.0001	0.131	0.191	-0.556	<0.0001	-0.513	<0.0001
Year to Date	Total Nickel (mg/L)	-0.350	<0.0001	0.00174	0.984	-0.543	<0.0001	-0.479	<0.0001
Spring	Total Nickel (mg/L)	-0.523	<0.0001	0.206	0.0232	-0.513	<0.0001	-0.478	<0.0001
Summer	Total Nickel (mg/L)	-0.513	<0.0001	0.216	0.0304	-0.559	<0.0001	-0.580	<0.0001
Year to Date	Nitrate (mg/L)	-0.829	<0.0001	0.565	<0.0001	-0.482	<0.0001	-0.580	<0.0001
Spring	Nitrate (mg/L)	-0.827	<0.0001	0.649	<0.0001	-0.388	<0.0001	-0.613	<0.0001
Summer	Nitrate (mg/L)	-0.867	<0.0001	0.721	<0.0001	-0.393	<0.0001	-0.615	<0.0001
Year to Date	Nitrite (mg/L)	-0.275	0.00161	-0.0162	0.855	-0.479	<0.0001	-0.383	<0.0001
Spring	Nitrite (mg/L)	-0.484	<0.0001	0.178	0.0495	-0.406	<0.0001	-0.405	<0.0001
Summer	Nitrite (mg/L)	-0.333	0.000655	0.0286	0.776	-0.531	<0.0001	-0.337	0.000561

P-value < 0.05/92 (0.05 Bonferroni Corrected for 92 independent comparisons).

$r_s \leq -0.6$ or $r_s \geq 0.6$.

Notes: Year to Date = Chemistry means from January to August of the sampled year included; Spring = Chemistry means from May and June of the sampled year included; Chemistry means from July and August of the sampled year included. Family CA1 and CA came from September 2012 to 2019 correspondence analysis.

Table E.1: Spearman's Correlation Relationships between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, FRO LAEMP, 2012 to 2019

Mean Type	Parameter	% Ephemeroptera		% Plecoptera		% EPT		Ephemeroptera Abundance	
		r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value
Year to Date	Ammonia (mg/L)	-0.0637	0.474	-0.221	0.0118	-0.344	<0.0001	0.0260	0.770
Spring	Ammonia (mg/L)	0.140	0.123	-0.242	0.00733	-0.133	0.144	0.110	0.226
Summer	Ammonia (mg/L)	-0.120	0.233	-0.0917	0.362	-0.290	0.00328	-0.0133	0.895
Year to Date	Total Phosphorus (mg/L)	-0.0407	0.659	-0.0846	0.358	-0.135	0.141	-0.0204	0.825
Spring	Total Phosphorus (mg/L)	-0.253	0.00658	0.229	0.0143	-0.167	0.0751	-0.155	0.100
Summer	Total Phosphorus (mg/L)	0.271	0.00889	-0.210	0.0445	0.214	0.0403	0.0624	0.555
Year to Date	Total Selenium (mg/L)	-0.781	<0.0001	0.571	<0.0001	-0.517	<0.0001	-0.639	<0.0001
Spring	Total Selenium (mg/L)	-0.814	<0.0001	0.649	<0.0001	-0.390	<0.0001	-0.594	<0.0001
Summer	Total Selenium (mg/L)	-0.853	<0.0001	0.695	<0.0001	-0.409	<0.0001	-0.619	<0.0001
Year to Date	Sulphate (mg/L)	-0.750	<0.0001	0.540	<0.0001	-0.531	<0.0001	-0.623	<0.0001
Spring	Sulphate (mg/L)	-0.802	<0.0001	0.648	<0.0001	-0.394	<0.0001	-0.620	<0.0001
Summer	Sulphate (mg/L)	-0.838	<0.0001	0.683	<0.0001	-0.410	<0.0001	-0.629	<0.0001
Year to Date	Total Thallium (mg/L)	-0.181	0.0398	-0.0185	0.836	-0.284	0.00112	-0.190	0.0314
Spring	Total Thallium (mg/L)	-0.270	0.00267	0.136	0.137	-0.231	0.0105	-0.170	0.0619
Summer	Total Thallium (mg/L)	-0.0471	0.640	0.00950	0.925	-0.105	0.295	-0.146	0.145
Year to Date	Total Dissolved Solids (mg/L)	-0.767	<0.0001	0.549	<0.0001	-0.515	<0.0001	-0.628	<0.0001
Spring	Total Dissolved Solids (mg/L)	-0.808	<0.0001	0.646	<0.0001	-0.391	<0.0001	-0.613	<0.0001
Summer	Total Dissolved Solids (mg/L)	-0.868	<0.0001	0.698	<0.0001	-0.413	<0.0001	-0.606	<0.0001
Year to Date	Total Uranium (mg/L)	-0.717	<0.0001	0.441	<0.0001	-0.549	<0.0001	-0.635	<0.0001
Spring	Total Uranium (mg/L)	-0.812	<0.0001	0.636	<0.0001	-0.434	<0.0001	-0.643	<0.0001
Summer	Total Uranium (mg/L)	-0.825	<0.0001	0.659	<0.0001	-0.433	<0.0001	-0.665	<0.0001
Year to Date	Total Zinc (mg/L)	-0.198	0.0245	-0.0453	0.610	-0.388	<0.0001	-0.162	0.0670
Spring	Total Zinc (mg/L)	-0.281	0.00172	0.134	0.140	-0.307	0.000593	-0.216	0.0169
Summer	Total Zinc (mg/L)	-0.0186	0.854	-0.0943	0.348	-0.127	0.204	-0.0849	0.399

P-value < 0.05/92 (0.05 Bonferroni Corrected for 92 independent comparisons).

$r_s \leq -0.6$ or $r_s \geq 0.6$.

Notes: Year to Date = Chemistry means from January to August of the sampled year included; Spring = Chemistry means from May and June of the sampled year included; Chemistry means from July and August of the sampled year included. Family CA1 and CA came from September 2012 to 2019 correspondence analysis.

Table E.1: **Spearman's Correlation Relationships between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, FRO LAEMP, 2012 to 2019**

Mean Type	Parameter	Plecoptera Abundance		EPT Abundance		Family CA1		Family CA2	
		r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value
-	Calcite Index	0.0997	0.231	-0.112	0.177	-0.186	0.0256	-0.284	0.000551
-	Calcite (%)	0.154	0.0639	-0.0491	0.556	-0.218	0.00859	-0.200	0.0160
-	Concreted (%)	-0.112	0.178	-0.283	0.000528	-0.0336	0.690	-0.350	<0.0001
-	Embededness (%)	-0.102	0.198	0.125	0.115	0.229	0.00369	-0.0685	0.391
-	D16	-0.458	<0.0001	-0.298	0.000122	0.370	<0.0001	-0.107	0.181
-	D84	-0.579	<0.0001	-0.283	0.000271	0.460	<0.0001	0.0349	0.662
-	Water Velocity (m/s)	0.00287	0.974	-0.0603	0.489	-0.150	0.0846	0.292	0.000653
-	Water Depth (cm)	-0.100	0.249	-0.338	<0.0001	-0.374	<0.0001	0.0153	0.861
Year to Date	Temperature (C)	-0.0167	0.856	-0.0990	0.280	-0.0329	0.723	-0.581	<0.0001
Spring	Temperature (C)	-0.353	0.000101	-0.457	<0.0001	0.0298	0.753	-0.595	<0.0001
Summer	Temperature (C)	-0.360	0.000296	-0.341	0.000637	0.191	0.0617	-0.569	<0.0001
Year to Date	PC1	-0.112	0.240	-0.474	<0.0001	-0.240	0.0121	-0.805	<0.0001
	PC2	0.129	0.177	-0.327	0.000456	-0.545	<0.0001	-0.414	<0.0001
Spring	PC1	0.220	0.0220	-0.217	0.0243	-0.527	<0.0001	-0.646	<0.0001
	PC2	0.0558	0.566	-0.296	0.00184	-0.446	<0.0001	-0.341	0.000353
Summer	PC1	-0.00594	0.955	-0.451	<0.0001	-0.383	0.000181	-0.789	<0.0001
	PC2	0.404	<0.0001	-0.0367	0.729	-0.564	<0.0001	-0.482	<0.0001
Year to Date	Alkalinity (mg/L as CaCO3)	0.319	0.000228	-0.240	0.00622	-0.625	<0.0001	-0.566	<0.0001
Spring	Alkalinity (mg/L as CaCO3)	0.420	<0.0001	-0.131	0.151	-0.747	<0.0001	-0.508	<0.0001
Summer	Alkalinity (mg/L as CaCO3)	0.457	<0.0001	-0.130	0.196	-0.733	<0.0001	-0.558	<0.0001
Year to Date	Dissolved Aluminum (mg/L)	-0.0268	0.763	0.179	0.0422	0.243	0.00589	0.0812	0.364
Spring	Dissolved Aluminum (mg/L)	0.00715	0.938	0.216	0.0167	0.241	0.00807	-0.0218	0.813
Summer	Dissolved Aluminum (mg/L)	-0.0307	0.760	-0.0415	0.681	-0.0919	0.363	0.220	0.0276
Year to Date	Total Antimony (mg/L)	-0.313	0.000302	-0.575	<0.0001	-0.0675	0.451	-0.677	<0.0001
Spring	Total Antimony (mg/L)	-0.0842	0.356	-0.474	<0.0001	-0.312	0.000515	-0.666	<0.0001
Summer	Total Antimony (mg/L)	-0.180	0.0722	-0.503	<0.0001	-0.238	0.0169	-0.746	<0.0001
Year to Date	Total Arsenic (mg/L)	-0.122	0.170	-0.162	0.0663	0.0895	0.317	-0.506	<0.0001
Spring	Total Arsenic (mg/L)	0.0813	0.373	0.0382	0.676	-0.0843	0.360	-0.329	0.000244
Summer	Total Arsenic (mg/L)	-0.0357	0.723	-0.0492	0.625	-0.0665	0.511	0.0290	0.774
Year to Date	Total Barium (mg/L)	0.341	<0.0001	-0.0813	0.360	-0.619	<0.0001	-0.318	0.000270
Spring	Total Barium (mg/L)	0.418	<0.0001	-0.0520	0.570	-0.675	<0.0001	-0.361	<0.0001
Summer	Total Barium (mg/L)	0.499	<0.0001	0.0209	0.836	-0.715	<0.0001	-0.308	0.00181
Year to Date	Dissolved Cadmium (mg/L)	-0.174	0.0485	-0.378	<0.0001	-0.136	0.127	-0.777	<0.0001
Spring	Dissolved Cadmium (mg/L)	0.0660	0.470	-0.263	0.00342	-0.390	<0.0001	-0.691	<0.0001
Summer	Dissolved Cadmium (mg/L)	0.174	0.0816	-0.249	0.0120	-0.435	<0.0001	-0.767	<0.0001
Year to Date	Total Chromium (mg/L)	-0.230	0.00883	-0.237	0.00686	0.134	0.134	-0.159	0.0742
Spring	Total Chromium (mg/L)	0.138	0.129	0.0458	0.616	-0.0892	0.333	-0.298	0.000931
Summer	Total Chromium (mg/L)	-0.237	0.0168	-0.156	0.119	0.0444	0.661	0.0261	0.796
Year to Date	Total Cobalt (mg/L)	-0.0671	0.450	-0.331	0.000131	-0.185	0.0370	-0.589	<0.0001
Spring	Total Cobalt (mg/L)	0.127	0.164	-0.153	0.0925	-0.352	<0.0001	-0.440	<0.0001
Summer	Total Cobalt (mg/L)	-0.121	0.228	-0.329	0.000786	-0.255	0.0104	-0.265	0.00780
Year to Date	Total Copper (mg/L)	-0.0671	0.450	-0.0879	0.322	0.0278	0.756	-0.359	<0.0001
Spring	Total Copper (mg/L)	0.140	0.125	0.0199	0.827	-0.106	0.251	-0.294	0.00114
Summer	Total Copper (mg/L)	0.0581	0.564	-0.0741	0.461	-0.322	0.00107	-0.0405	0.689
Year to Date	Total Iron (mg/L)	-0.0584	0.512	-0.141	0.113	-0.0143	0.874	-0.487	<0.0001
Spring	Total Iron (mg/L)	0.130	0.155	-0.0528	0.563	-0.216	0.0179	-0.380	<0.0001
Summer	Total Iron (mg/L)	-0.380	0.000123	-0.509	<0.0001	-0.00240	0.982	-0.439	<0.0001
Year to Date	Total Lead (mg/L)	0.0179	0.840	-0.122	0.169	-0.0594	0.507	-0.520	<0.0001
Spring	Total Lead (mg/L)	0.130	0.154	-0.0952	0.297	-0.257	0.00466	-0.424	<0.0001
Summer	Total Lead (mg/L)	-0.226	0.0228	-0.262	0.00825	-0.0907	0.370	-0.0415	0.682
Year to Date	Total Lithium (mg/L)	-0.137	0.123	-0.493	<0.0001	-0.252	0.00423	-0.795	<0.0001
Spring	Total Lithium (mg/L)	0.346	<0.0001	-0.178	0.0500	-0.662	<0.0001	-0.587	<0.0001
Summer	Total Lithium (mg/L)	0.278	0.00489	-0.210	0.0353	-0.576	<0.0001	-0.687	<0.0001
Year to Date	Total Manganese (mg/L)	-0.312	0.000313	-0.468	<0.0001	-0.0162	0.857	-0.641	<0.0001
Spring	Total Manganese (mg/L)	0.0260	0.776	-0.277	0.00199	-0.349	<0.0001	-0.536	<0.0001
Summer	Total Manganese (mg/L)	-0.321	0.00107	-0.549	<0.0001	-0.172	0.0879	-0.611	<0.0001
Year to Date	Total Molybdenum (mg/L)	-0.296	0.000668	-0.527	<0.0001	-0.0478	0.594	-0.737	<0.0001
Spring	Total Molybdenum (mg/L)	-0.0295	0.747	-0.387	<0.0001	-0.298	0.000935	-0.726	<0.0001
Summer	Total Molybdenum (mg/L)	-0.188	0.0599	-0.475	<0.0001	-0.190	0.0589	-0.773	<0.0001
Year to Date	Total Nickel (mg/L)	-0.330	0.000131	-0.547	<0.0001	-0.0314	0.726	-0.761	<0.0001
Spring	Total Nickel (mg/L)	-0.0694	0.447	-0.372	<0.0001	-0.292	0.00122	-0.725	<0.0001
Summer	Total Nickel (mg/L)	-0.144	0.150	-0.487	<0.0001	-0.268	0.00693	-0.807	<0.0001
Year to Date	Nitrate (mg/L)	0.351	<0.0001	-0.139	0.115	-0.641	<0.0001	-0.530	<0.0001
Spring	Nitrate (mg/L)	0.415	<0.0001	-0.108	0.238	-0.734	<0.0001	-0.484	<0.0001
Summer	Nitrate (mg/L)	0.463	<0.0001	-0.0833	0.408	-0.768	<0.0001	-0.485	<0.0001
Year to Date	Nitrite (mg/L)	-0.275	0.00161	-0.427	<0.0001	-0.0982	0.272	-0.489	<0.0001
Spring	Nitrite (mg/L)	-0.0198	0.828	-0.276	0.00209	-0.312	0.000515	-0.532	<0.0001
Summer	Nitrite (mg/L)	-0.184	0.0653	-0.364	0.000179	-0.188	0.0608	-0.637	<0.0001

P-value < 0.05/92 (0.05 Bonferroni Corrected for 92 independent comparisons).

$r_s \leq -0.6$ or $r_s \geq 0.6$.

Notes: Year to Date = Chemistry means from January to August of the sampled year included; Spring = Chemistry means from May and June of the sampled year included; Chemistry means from July and August of the sampled year included. Family CA1 and CA came from September 2012 to 2019 correspondence analysis.

Table E.1: Spearman's Correlation Relationships between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, FRO LAEMP, 2012 to 2019

Mean Type	Parameter	Plecoptera Abundance		EPT Abundance		Family CA1		Family CA2	
		r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value
Year to Date	Ammonia (mg/L)	-0.0970	0.274	-0.0330	0.711	0.0115	0.898	-0.114	0.201
Spring	Ammonia (mg/L)	-0.128	0.160	0.0190	0.835	0.191	0.0367	-0.0864	0.348
Summer	Ammonia (mg/L)	-0.00918	0.927	-0.0208	0.837	0.0651	0.520	-0.420	<0.0001
Year to Date	Total Phosphorus (mg/L)	-0.0556	0.547	-0.00638	0.945	0.148	0.110	-0.326	0.000309
Spring	Total Phosphorus (mg/L)	0.163	0.0823	-0.00576	0.951	-0.201	0.0339	-0.292	0.00177
Summer	Total Phosphorus (mg/L)	-0.268	0.00975	-0.121	0.251	0.262	0.0121	0.0651	0.540
Year to Date	Total Selenium (mg/L)	0.273	0.00160	-0.261	0.00256	-0.599	<0.0001	-0.616	<0.0001
Spring	Total Selenium (mg/L)	0.426	<0.0001	-0.0976	0.285	-0.712	<0.0001	-0.497	<0.0001
Summer	Total Selenium (mg/L)	0.425	<0.0001	-0.110	0.269	-0.687	<0.0001	-0.587	<0.0001
Year to Date	Sulphate (mg/L)	0.238	0.00672	-0.285	0.00105	-0.559	<0.0001	-0.613	<0.0001
Spring	Sulphate (mg/L)	0.399	<0.0001	-0.130	0.153	-0.723	<0.0001	-0.471	<0.0001
Summer	Sulphate (mg/L)	0.392	<0.0001	-0.146	0.144	-0.671	<0.0001	-0.598	<0.0001
Year to Date	Total Thallium (mg/L)	-0.115	0.195	-0.178	0.0442	0.0892	0.319	-0.560	<0.0001
Spring	Total Thallium (mg/L)	0.0637	0.486	-0.0657	0.472	-0.128	0.164	-0.451	<0.0001
Summer	Total Thallium (mg/L)	-0.181	0.0701	-0.235	0.0179	-0.0140	0.890	-0.262	0.00841
Year to Date	Total Dissolved Solids (mg/L)	0.256	0.00340	-0.269	0.00204	-0.557	<0.0001	-0.630	<0.0001
Spring	Total Dissolved Solids (mg/L)	0.407	<0.0001	-0.116	0.204	-0.726	<0.0001	-0.477	<0.0001
Summer	Total Dissolved Solids (mg/L)	0.452	<0.0001	-0.0892	0.375	-0.700	<0.0001	-0.585	<0.0001
Year to Date	Total Uranium (mg/L)	0.120	0.176	-0.364	<0.0001	-0.445	<0.0001	-0.709	<0.0001
Spring	Total Uranium (mg/L)	0.366	<0.0001	-0.175	0.0536	-0.697	<0.0001	-0.563	<0.0001
Summer	Total Uranium (mg/L)	0.337	0.000562	-0.209	0.0357	-0.637	<0.0001	-0.664	<0.0001
Year to Date	Total Zinc (mg/L)	-0.110	0.213	-0.174	0.0485	-0.0451	0.615	-0.391	<0.0001
Spring	Total Zinc (mg/L)	0.00297	0.974	-0.161	0.0761	-0.202	0.0269	-0.405	<0.0001
Summer	Total Zinc (mg/L)	-0.163	0.103	-0.171	0.0879	-0.103	0.307	0.0355	0.726

(grey) P-value < 0.05/92 (0.05 Bonferroni Corrected for 92 independent comparisons).

(blue) $r_s \leq -0.6$ or $r_s \geq 0.6$.

Notes: Year to Date = Chemistry means from January to August of the sampled year included; Spring = Chemistry means from May and June of the sampled year included; Chemistry means from July and August of the sampled year included. Family CA1 and CA came from September 2012 to 2019 correspondence analysis.

Table E.2: Results from Permutation based ANOVA on Redundancy Analysis of Benthic Invertebrate Community, Fording LAEMP, 2019

Parameter	Reduced Model Pseudo-F[a]	Reduced Model P-Values[a]	Conditioned Model Pseudo-F[b]	Conditioned Model P-Values[b]
Bankfull Width	2.52	0.003	1.94	0.008
Mean Depth	2.67	0.002	0.805	0.716
Substrate Size SD	1.20	0.246	1.72	0.033
D16	2.44	0.005	1.72	0.024
D84	0.439	0.965	0.431	0.988
Stream Density	3.37	<0.001	2.30	0.001
Watershed Area	9.32	<0.001	1.42	0.088
% Watershed Forest Cover	4.77	<0.001	3.09	<0.001
% Watershed Field Cover	3.34	<0.001	2.04	0.004

(shaded) P-value < 0.05.

Notes: Redundancy Analysis was performed on ln(x+1) and Chi-Squared transformed benthic invertrabete abundances at the family level.

[a] Variables selected using backwards variable elemination. Excluded variables include: Mean Velocity, Mean Substrate Size, Substrate Sorting Index, Mean Substate Embeddedness, Percent of the watershed with greater than 30% slope, Station Gradient and % Other landcover.

[b] Conditioned model results from RDA conducted on residuals of RDA on Stressor variables (table X.x [Stress var_form]).

Table E.3: Results from Permutation based ANOVA on Redundancy Analysis of Benthic Invertebrate Community, Fording LAEMP, 2019

Parameter	Full Model Pseudo-F	Full Model P-Values	Conditioned Model Pseudo-F[a]	Conditioned Model P-Values[a]
PC1 (68%)	8.79	<0.001	1.16	0.277
PC2 (12%)	6.06	<0.001	2.122	0.003
PC3 (6.1%)	3.02	0.001	1.36	0.123
PC4 (4.9%)	6.47	<0.001	2.96	<0.001
PC5 (2.7%)	3.451	<0.001	1.886	0.011
PC6 (1.6%)	2.46	0.003	2.04	0.007
Calcite	2.30	0.007	1.44	0.085

[shaded] P-value < 0.05.

Notes: Redundancy Analysis was performed on ln(x+1) and Chi-Squared transformed benthic invertrabete abundances at the family level.

[a] Conditioned model results from RDA conducted on residuals of RDA on habitat variables (table X.x [Habitat var_form]).

APPENDIX F
HABITAT

Table F.1: Habitat Information at Reference and Mine-exposed Areas, FRO LAEMP, February 2019

Station ID	Reference	Mine-exposed						
	RG_URFI	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI	RG_FOBKS	RG_FOBSC
Waterbody	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River
Date Sampled	14-Feb-19	12-Feb-19	12-Feb-19	13-Feb-19	13-Feb-19	12-Feb-19	12-Feb-19	12-Feb-19
Zone 11 UTMs - E	651379	650857	650913	651134	650859	651824	652079	652339
Zone 11 UTMs - N	5566761	5563530	5563160	5562402	5561151	555919	5558650	5558198
Elevation (m)	1,727	1,661	1,656	1,643	1,626	1,612	1,590	-
Samplers' Initials	TN, MS, AL, MG	TN, MS	TN, AL	TN, MS	TN, MS	AL, MG	AL, MG	AL, MG
Habitat Characteristics								
Site Access Description	Mine roads up to Henretta	Park in Mine Equipment area, walk in normal access snowed over	Park in Mine Storage area, walk in	Park on road	Drive along tailings pond, park on road	~1 km in from main Fording Road, can drive into site with 170 m walk in	~56 m north of bridge	500 m south of bridge
Surrounding Land Use	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining
Anthropogenic Influences	Mine	Mine	On mine property	On active mine	On active mine	Mine	Bridge, mine, road	Mine bridge 500 m upstream
Length of Reach Assessed (m)	50	50	50	50	50	30	30	~500

Table F.1: Habitat Information at Reference and Mine-exposed Areas, FRO LAEMP, February 2019

Station ID	Mine-exposed				
	RG_FOBCP	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Waterbody	Fording River	Fording River	Fording River	Fording River	Fording River
Date Sampled	11-Feb-19	11-Feb-19	14-Feb-19	14-Feb-19	13-Feb-19
Zone 11 UTMs - E	652836	653894	653896	654834	656332
Zone 11 UTMs - N	5557300	5555939	5555076	5553592	5551867
Elevation (m)	1,572	1,568	1,562	1,552	1,549
Samplers' Initials	TN, AL, MS, MG	TN, AL	TN, AL, MG	TN, MS	AL, MG
Habitat Characteristics					
Site Access Description	Walk from Teck Greenhouse	Park on spur, very close	Enter at FRUPO road. ~1.5 km hike in along river	Walk in from hydro cut line	~300 m walk in from gun range gate. Thick bush and snow. Snowshoes required.
Surrounding Land Use	Mining	Mining	Mining	Mining	Mining
Anthropogenic Influences	Mine impacted, road nearby	Downstream of mine, road nearby, construction nearby	Mine	Downstream of mine	Mine
Length of Reach Assessed (m)	30	30	50	50	50

Table F.2: Pebble Count and Calcite at Reference and Mine-exposed Areas, FRO LAEMP, February 2019

RG_UFR1					RG_FOUKI				
Rock	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Rock	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	8.4	-	1	0	1	6.0	-
2	0	1	5.9	-	2	0	1	5.0	-
3	1	1	5.8	-	3	0	0	5.0	-
4	0	1	7.1	-	4	0	0	9.0	-
5	0	0	5.5	-	5	0	1	8.0	-
6	0	0	7.4	-	6	0	1	10.0	-
7	0	0	7.3	-	7	0	1	10.0	-
8	0	0	8.3	-	8	0	1	14.0	-
9	0	0	7.7	-	9	0	1	18.0	-
10	0	0	9.2	0	10	0	0	4.0	0.5
11	0	1	6.0	-	11	0	1	6.0	-
12	0	0	4.9	-	12	0	1	7.0	-
13	0	0	7.3	-	13	0	1	6.0	-
14	0	0	3.9	-	14	0	1	12.0	-
15	0	0	11.7	-	15	0	1	11.0	-
16	0	0	8.3	-	16	0	1	7.0	-
17	0	1	22.5	-	17	0	1	6.0	-
18	0	0	6.0	-	18	0	0	4.5	-
19	0	0	6.4	-	19	0	0	5.5	-
20	0	0	5.5	0.50	20	0	0	6.8	0.25
21	0	0	12.5	-	21	0	1	6.3	-
22	0	1	9.7	-	22	0	1	9.6	-
23	0	0	5.4	-	23	0	1	9.8	-
24	0	0	10.0	-	24	0	1	9.4	-
25	0	1	7.9	-	25	0	1	7.5	-
26	0	0	9.4	-	26	0	1	7.5	-
27	0	0	13.1	-	27	0	0	5.0	-
28	0	0	7.9	-	28	0	1	6.8	-
29	0	1	8.1	-	29	0	1	3.9	-
30	0	0	13.6	0	30	0	1	4.3	0.25
31	0	0	6.6	-	31	0	1	4.9	-
32	0	0	5.4	-	32	0	1	7.8	-
33	0	0	6.2	-	33	0	1	9.3	-
34	0	0	8.1	-	34	0	1	8.1	-
35	0	0	5.9	-	35	0	1	6.3	-
36	0	1	9.2	-	36	0	0	4.8	-
37	0	1	7.7	-	37	0	0	2.8	-
38	0	1	7.5	-	38	0	0	3.4	-
39	0	0	6.8	-	39	0	1	7.5	-
40	0	0	2.8	0	40	0	1	4.8	0
41	0	0	4.8	-	41	0	1	9.6	-
42	0	0	7.0	-	42	0	1	6.4	-
43	0	0	11.4	-	43	0	1	6.9	-
44	0	1	14.5	-	44	0	1	6.8	-
45	0	0	5.8	-	45	0	1	7.4	-
46	0	0	5.5	-	46	0	1	4.3	-
47	0	1	21.5	-	47	0	1	6.4	-
48	0	0	6.3	-	48	0	1	6.8	-
49	0	1	9.0	-	49	0	1	5.9	-
50	0	0	7.1	0	50	0	1	4.9	0.5
51	0	1	3.9	-	51	0	1	4.5	-
52	0	1	8.9	-	52	0	1	3.5	-
53	0	1	8.7	-	53	0	1	5.4	-
54	0	0	7.5	-	54	0	1	5.0	-
55	0	1	6.1	-	55	0	1	7.6	-
56	0	1	8.1	-	56	0	1	4.0	-
57	0	1	13.7	-	57	0	1	6.3	-
58	0	0	5.0	-	58	0	1	4.7	-
59	0	0	7.7	-	59	0	1	9.9	-
60	0	1	7.0	0.25	60	0	1	14.5	0.25
61	0	0	12.1	-	61	0	1	66.6	-
62	0	1	7.2	-	62	0	1	7.7	-
63	0	0	12.5	-	63	0	1	5.6	-
64	0	1	8.4	-	64	0	1	3.6	-
65	0	1	14.3	-	65	0	1	6.2	-
66	0	0	12.2	-	66	0	1	4.2	-
67	0	0	7.3	-	67	0	1	7.3	-
68	0	1	5.4	-	68	0	1	9.8	-
69	0	0	8.4	-	69	0	1	3.9	-
70	0	1	7.2	0.5	70	0	1	4.4	0.25
71	0	0	5.5	-	71	0	1	4.2	-
72	0	0	5.0	-	72	0	1	8.5	-
73	0	1	11.6	-	73	0	1	20.8	-
74	0	1	9.6	-	74	0	1	6.9	-
75	0	0	8.1	-	75	0	1	8.5	-
76	0	1	8.2	-	76	0	1	10.8	-
77	0	0	4.6	-	77	0	1	9.4	-
78	0	1	6.2	-	78	0	1	10.1	-
79	0	0	12.6	-	79	0	1	13.2	-
80	0	1	5.1	0	80	0	1	9.4	0.75
81	0	0	4.6	-	81	0	1	6.1	-
82	0	0	9.7	-	82	0	1	10.3	-
83	0	0	4.7	-	83	0	1	8.5	-
84	0	1	7.0	-	84	0	1	6.4	-
85	0	0	3.0	-	85	0	1	10.2	-
86	0	0	2.7	-	86	0	1	12.9	-
87	0	0	6.6	-	87	0	1	3.5	-
88	0	0	6.7	-	88	0	0	13.0	-
89	0	0	4.1	-	89	0	1	12.5	-
90	0	0	4.5	0	90	0	1	8.4	0
91	0	0	11.7	-	91	0	1	8.0	-
92	0	0	4.5	-	92	0	1	1.9	-
93	0	0	2.5	-	93	0	1	5.2	-
94	0	0	3.8	-	94	0	0	8.6	-
95	0	1	7.3	-	95	0	1	9.0	-
96	0	1	6.5	-	96	0	1	6.0	-
97	0	0	5.6	-	97	0	1	3.7	-
98	0	0	4.3	-	98	0	0	3.3	-
99	0	0	4.5	-	99	0	0	4.5	-
100	0	1	7.2	0.25	100	0	1	4.1	0.00
Minimum	**0.0**	**0.0**	**2.5**	**0.0**	**Minimum**	**0.0**	**0.0**	**1.9**	**0.0**
Maximum	**1.0**	**1.0**	**22.5**	**0.50**	**Maximum**	**0.0**	**1.0**	**66.6**	**0.75**
Mean	**0.01**	**0.360**	**7.71**	**0.150**	**Mean**	**0.0**	**0.86**	**7.89**	**0.275**
Standard Dev.	**0.10**	**0.482**	**3.40**	**0.211**	**Standard Dev.**	**0.0**	**0.35**	**6.74**	**0.249**
Geometric mean	**-**	**-**	**7.10**	**-**	**Geometric mean**	**-**	**-**	**6.83**	**-**
Median	**0.0**	**0.0**	**7.20**	**0.00**	**Median**	**0.0**	**1.0**	**6.80**	**0.25**
Calcite Index	**0.4**		**-**	**-**	**Calcite Index**	**0.9**		**-**	**-**

Table F.2: Pebble Count and Calcite at Reference and Mine-exposed Areas, FRO LAEMP, February 2019

RG_FRUPO					RG_FODPO				
Rock	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Rock	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	6.8	-	1	0	0	4.8	-
2	0	1	5.1	-	2	0	1	4.5	-
3	0	1	7.4	-	3	0	0	2.7	-
4	0	0	6.8	-	4	0	1	5.4	-
5	0	0	5.3	-	5	0	1	5.4	-
6	0	1	7.1	-	6	0	1	5.6	-
7	0	1	9.4	-	7	0	1	6.6	-
8	0	1	5.1	-	8	0	0	4.2	-
9	0	1	6.0	-	9	0	1	8.6	-
10	0	0	7.5	0	10	0	1	3.4	0.25
11	0	1	3.6	-	11	0	0	6.1	-
12	0	1	9.1	-	12	0	0	5.2	-
13	0	0	8.0	-	13	0	1	4.0	-
14	0	1	6.2	-	14	0	0	1.2	-
15	0	0	5.2	-	15	0	1	2.9	-
16	0	1	4.9	-	16	0	1	6.9	-
17	0	1	5.7	-	17	0	1	5.3	-
18	0	1	5.8	-	18	0	1	4.9	-
19	0	1	4.6	-	19	0	0	3.4	-
20	0	1	6.9	0.25	20	0	1	4.9	0.5
21	0	1	8.1	-	21	0	1	3.8	-
22	0	0	4.6	-	22	0	1	6.7	-
23	0	0	7.2	-	23	0	1	7.8	-
24	0	1	5.2	-	24	0	1	4.6	-
25	0	1	5.3	-	25	0	1	5.4	-
26	0	1	6.3	-	26	0	1	4.7	-
27	0	1	5.6	-	27	0	0	3.4	-
28	0	0	8.9	-	28	0	0	3.1	-
29	0	0	6.4	-	29	0	1	6.3	-
30	0	1	7.9	0	30	0	0	5.0	0.5
31	0	1	5.2	-	31	0	0	3.1	-
32	0	0	6.1	-	32	0	1	3.7	-
33	0	0	7.0	-	33	0	1	5.2	-
34	0	1	4.6	-	34	0	1	6.0	-
35	0	0	5.7	-	35	0	1	4.7	-
36	0	1	6.5	-	36	0	1	5.1	-
37	0	0	5.7	-	37	0	1	5.4	-
38	0	1	6.5	-	38	0	0	2.2	-
39	0	1	6.7	-	39	0	0	2.4	-
40	0	0	3.1	0.25	40	0	1	5.8	0.25
41	0	0	7.4	-	41	0	1	7.7	-
42	0	0	8.2	-	42	0	0	4.3	-
43	0	0	11.0	-	43	0	1	6.4	-
44	0	1	4.1	-	44	0	1	3.7	-
45	0	1	5.3	-	45	0	1	7.3	-
46	0	0	10.6	-	46	0	1	3.5	-
47	0	0	4.6	-	47	0	1	5.3	-
48	0	0	3.0	-	48	0	1	5.8	-
49	0	1	2.8	-	49	0	0	2.9	-
50	0	1	5.5	0	50	0	1	6.1	0.5
51	0	0	5.6	-	51	0	1	6.8	-
52	0	1	6.7	-	52	0	1	6.5	-
53	0	1	9.8	-	53	0	1	7.4	-
54	0	1	5.4	-	54	0	1	7.3	-
55	0	0	7.6	-	55	0	1	5.8	-
56	0	0	4.1	-	56	0	1	6.6	-
57	0	1	5.0	-	57	0	1	4.9	-
58	0	1	3.3	-	58	0	1	4.9	-
59	0	0	4.7	-	59	0	1	8.3	-
60	0	0	6.6	0.75	60	0	1	5.5	0.5
61	0	1	5.9	-	61	0	1	6.7	-
62	0	0	1.6	-	62	0	1	7.4	-
63	0	1	5.3	-	63	0	1	7.0	-
64	0	1	3.7	-	64	0	1	7.8	-
65	0	1	4.8	-	65	0	1	5.4	-
66	0	0	4.1	-	66	0	1	4.4	-
67	0	1	5.9	-	67	0	1	5.5	-
68	0	0	8.2	-	68	0	1	4.3	-
69	0	1	5.0	-	69	0	1	3.9	-
70	0	1	5.8	0	70	0	1	6.6	0.25
71	0	1	4.9	-	71	0	1	4.3	-
72	0	1	4.6	-	72	0	1	4.2	-
73	0	1	7.0	-	73	0	1	5.7	-
74	0	0	7.3	-	74	0	0	2.3	-
75	0	0	6.0	-	75	0	1	4.1	-
76	0	0	3.7	-	76	0	1	4.3	-
77	0	1	5.7	-	77	0	1	5.6	-
78	0	1	5.4	-	78	0	1	6.1	-
79	0	0	4.5	-	79	0	0	4.7	-
80	0	1	7.7	0.5	80	0	0	3.6	0
81	0	1	8.9	-	81	0	1	3.9	-
82	0	1	6.6	-	82	0	1	4.4	-
83	0	0	3.6	-	83	0	1	8.2	-
84	0	0	5.9	-	84	0	1	6.7	-
85	0	1	7.3	-	85	0	1	6.9	-
86	0	1	5.1	-	86	0	1	6.1	-
87	0	0	5.3	-	87	0	1	8.7	-
88	0	0	3.0	-	88	0	1	5.7	-
89	0	0	2.7	-	89	0	1	4.2	-
90	0	1	4.8	0.75	90	0	1	6.6	0.25
91	0	1	5.6	-	91	0	0	3.3	-
92	0	1	5.6	-	92	0	1	6.1	-
93	0	1	8.1	-	93	0	1	4.7	-
94	0	0	4.9	-	94	0	1	5.6	-
95	0	1	5.5	-	95	0	1	4.5	-
96	0	0	3.7	-	96	0	1	7.4	-
97	0	1	3.1	-	97	0	0	2.9	-
98	0	0	2.6	-	98	0	0	3.2	-
99	0	1	7.2	-	99	0	1	4.6	-
100	0	1	8.5	0.25	100	0	1	6.4	0
Minimum	**0.0**	**0.0**	**1.60**	**0.0**	**Minimum**	**0.0**	**0.0**	**1.20**	**0.5**
Maximum	**0.0**	**1.0**	**11.0**	**0.75**	**Maximum**	**0.0**	**1.0**	**8.70**	**0.50**
Mean	**0.0**	**0.60**	**5.86**	**0.29**	**Mean**	**0.0**	**0.79**	**5.21**	**0.30**
Standard Dev.	**0.0**	**0.49**	**1.79**	**0.30**	**Standard Dev.**	**0.0**	**0.41**	**1.57**	**0.197**
Geometric mean	**-**	**-**	**5.57**	**-**	**Geometric mean**	**-**	**-**	**4.95**	**-**
Median	**0.0**	**0.0**	**5.65**	**0.25**	**Median**	**0.0**	**1.0**	**5.25**	**0.25**
Calcite Index	**0.6**		**-**	**-**	**Calcite Index**	**0.8**		**-**	**-**

Table F.2: Pebble Count and Calcite at Reference and Mine-exposed Areas, FRO LAEMP, February 2019

RG_FOUEW				
Rock	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	10.2	-
2	0	1	6.4	-
3	0	1	4.5	-
4	0	0	3.2	-
5	0	1	12.3	-
6	0	1	5.9	-
7	0	0	4.9	-
8	0	1	5.2	-
9	0	1	6.7	-
10	0	1	7.6	0
11	0	1	8.1	-
12	0	1	10.7	-
13	0	0	4.5	-
14	0	1	8.0	-
15	0	0	3.9	-
16	0	1	7.3	-
17	0	1	9.5	-
18	0	1	6.6	-
19	0	1	11.7	-
20	0	1	10.8	0.5
21	0	1	9.3	-
22	0	1	10.2	-
23	0	1	6.7	-
24	0	1	10.0	-
25	0	1	7.1	-
26	0	0	5.2	-
27	0	1	7.3	-
28	0	1	12.4	-
29	0	1	6.9	-
30	0	1	6.9	0.25
31	0	1	6.8	-
32	0	1	4.7	-
33	0	1	6.2	-
34	0	0	4.1	-
35	0	1	7.3	-
36	0	1	6.6	-
37	0	1	13.2	-
38	0	1	12.5	-
39	0	1	11.4	-
40	0	1	6.5	0
41	0	1	9.3	-
42	0	1	5.1	-
43	0	1	6.6	-
44	0	1	10.4	-
45	0	1	4.2	-
46	0	0	2.3	-
47	0	1	6.5	-
48	0	1	6.7	-
49	0	1	7.0	-
50	0	1	10.7	0.25
51	0	1	6.8	-
52	0	1	5.7	-
53	0	1	6.1	-
54	0	1	10.4	-
55	0	1	4.0	-
56	0	1	7.2	-
57	0	1	5.1	-
58	0	1	9.4	-
59	0	1	7.3	-
60	0	1	9.9	0
61	0	1	7.8	-
62	0	1	10.4	-
63	0	1	10.1	-
64	0	1	2.8	-
65	0	1	4.9	-
66	0	0	2.2	-
67	0	1	4.6	-
68	0	1	8.8	-
69	0	1	17.9	-
70	0	1	9.8	0.5
71	0	1	14.2	-
72	0	1	11.4	-
73	0	1	8.5	-
74	0	1	5.2	-
75	0	1	9.3	-
76	0	1	12.0	-
77	0	1	7.8	-
78	0	1	10.9	-
79	0	1	6.7	-
80	0	1	6.3	0.25
81	0	1	6.6	-
82	0	1	8.9	-
83	0	1	3.1	-
84	0	1	8.4	-
85	0	0	4.2	-
86	0	1	7.1	-
87	0	1	10.4	-
88	0	1	11.5	-
89	0	1	6.9	-
90	0	1	10.9	0.5
91	0	1	9.8	-
92	0	1	6.2	-
93	0	1	9.9	-
94	0	1	4.9	-
95	0	1	5.4	-
96	0	1	7.3	-
97	0	1	10.5	-
98	0	1	7.1	-
99	0	0	6.6	-
100	0	1	11.7	0.5
Minimum	**0.0**	**0.0**	**2.20**	**0.0**
Maximum	**0.0**	**1.0**	**17.9**	**0.50**
Mean	**0.0**	**0.90**	**7.79**	**0.275**
Standard Dev.	**0.0**	**0.30**	**2.86**	**0.219**
Geometric mean	**-**	**-**	**7.25**	**-**
Median	**0.0**	**1.0**	**7.15**	**0.25**
Calcite Index	**0.9**		**-**	**-**

Table F.3: *In Situ* Water Quality Taken at Biological Monitoring Areas, February 2019

Field Parameters		Reference		Mine-Exposed													
		RG_FO26	RG_HENUP	RG_URFI	RG_FODHE	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI	RG_FOBKS	RG_FOBSC	RG_FOBCP	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Date		-	-	14-Feb-19	-	12-Feb-19	12-Feb-19	13-Feb-19	13-Feb-19	12-Feb-19	12-Feb-19	12-Feb-19	11-Feb-19	11-Feb-19	14-Feb-19	14-Feb-19	13-Feb-19
Station 1	Temperature (°C)	-	-	0.00	-	0.30	0.00	-	-	0.20	0.00	-	0.10	1.30	2.70	8.11	0.20
	Dissolved Oxygen (mg/L)	-	-	2.10	-	12.63	12.02	-	-	12.09	11.46	-	11.20	10.91	10.52	7.13	10.08
	Dissolved Oxygen (%)	-	-	13.30	-	87.20	83.10	-	-	83.40	79.00	-	77.20	78.40	77.90	50.60	69.50
	Conductivity (µS/cm)	-	-	130.70	-	-	-	-	-	549.00	204.60	-	-	677.00	671.00	573.00	562.00
	Specific Conductivity (µS/cm)	-	-	250.90	-	938.00	900.40	-	-	1045.00	394.80	-	-	1243.00	1167.00	1099.00	1069.00
	pH	-	-	8.63	-	7.95	8.21	-	-	7.82	8.02	-	-	7.97	7.45	8.11	8.24
	ORP (mV)	-	-	139.30	-	-	119.00	-	-	86.20	107.10	-	-	85.00	113.80	-	98.90
Station 2	Temperature (°C)	-	-	0.00	-	0.30	0.00	0.00	0.00	0.10	-	-	-	1.40	2.80	-	0.10
	Dissolved Oxygen (mg/L)	-	-	1.74	-	12.43	12.03	11.45	11.65	12.04	-	-	-	10.90	10.48	-	10.05
	Dissolved Oxygen (%)	-	-	12.00	-	86.20	83.20	78.20	82.40	83.10	-	-	-	78.00	77.60	-	69.00
	Conductivity (µS/cm)	-	-	118.00	-	-	-	542.00	545.00	549.00	-	-	-	682.00	671.00	-	568.00
	Specific Conductivity (µS/cm)	-	-	227.30	-	937.60	960.00	1037.00	1042.00	1044.00	-	-	-	1242.00	1167.00	-	1083.00
	pH	-	-	8.50	-	8.06	8.37	7.82	7.99	7.84	-	-	-	7.82	7.44	-	8.27
	ORP (mV)	-	-	135.40	-	72.10	109.60	95.00	31.70	90.00	-	-	-	78.60	109.70	-	96.20
Station 3	Temperature (°C)	-	-	0.00	-	0.20	0.00	-	-	0.20	-	-	-	1.30	2.90	-	0.00
	Dissolved Oxygen (mg/L)	-	-	1.75	-	12.39	12.51	-	-	12.08	-	-	-	10.95	10.59	-	9.92
	Dissolved Oxygen (%)	-	-	11.70	-	84.80	85.00	-	-	83.80	-	-	-	78.10	78.70	-	68.20
	Conductivity (µS/cm)	-	-	95.60	-	-	-	-	-	549.00	-	-	-	681.00	67.50	-	569.00
	Specific Conductivity (µS/cm)	-	-	183.00	-	931.20	901.80	-	-	1044.00	-	-	-	1242.00	1167.00	-	1092.00
	pH	-	-	8.50	-	8.08	8.24	-	-	7.85	-	-	-	7.80	7.46	-	8.26
	ORP (mV)	-	-	131.00	-	70.80	90.30	-	-	82.90	-	-	-	82.70	104.50	-	135.70

Table F.4: **Kick and Sweep at Reference and Mine-exposed Areas, FRO LAEMP, February 2019**

		RG_FOUKI	RG_FRUPO	RG_FODPO	RG_FOUEW
Station 1	Easting	651828	653894	653905	656332
	Northing	5559818	5555939	5555078	5551867
	Date	12-Feb-19	11-Feb-19	14-Feb-19	13-Feb-19
	Samplers' Initials	MG	MS	MG	MG
	Number of Jars	1	1	1	1
	Total Kick Distance (m)	3	10	20	16
	Full Transect (Yes / No)	Yes	No	Yes	Yes
	Number of Transects	3	6	4	4
Station 2	Easting	651819	653893	653889	656285
	Northing	5559933	5555946	5555071	5551869
	Date	12-Feb-19	11-Feb-19	14-Feb-19	13-Feb-19
	Samplers' Initials	MG	MS	MG	MG
	Number of Jars	1	1	1	1
	Total Kick Distance (m)	3	10	45	10
	Full Transect (Yes / No)	Yes	No	Yes	Yes
	Number of Transects	3	7	3	2
Station 3	Easting	651811	653890	653850	656269
	Northing	5589942	5555953	5555047	5551878
	Date	12-Feb-19	11-Feb-19	14-Feb-19	13-Feb-19
	Samplers' Initials	MG	MS	MG	MG
	Number of Jars	1	1	-	1
	Total Kick Distance (m)	3	8	40	12
	Full Transect (Yes / No)	Yes	No	Yes	No
	Number of Transects	3	5	4	4

Table F.5 Habitat Information at Reference and Mine-exposed Areas, FRO LAEMP, June 2019

Station ID	Reference		Mine-exposed					
	RG_HENUP	RG_FO26	RG_FODHE	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI
Waterbody	Fording	Fording	Fording	Fording	Fording	Fording	Fording	Fording
Date Sampled	20-Jun-19	20-Jun-19	20-Jun-19	19-Jun-19	19-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19
Zone 11 UTMs - E	655825	653043	651316	650868	650967	651120	650880	651857
Zone 11 UTMs - N	5567704	5569557	5565416	5563574	5563157	5562353	5560972	5559818
Elevation (m)	1,828	1,796	1,690		1,723	1,641	1,630	1,607
Samplers' Initials	MW, JV	AL, EH	AL, EH, MW, JV	MW, JV	MW, JV	AL, EH	AL, EH	AL, EH
Habitat Characteristics								
Site Access Description	Haul road, forest road, ~300 m walk in	Mine road north past Henretta Pit, ~300 m down ravine	Mine road just south of UFRI	Off of main haul road, 10 m walk from road to sites	Off of main haul road, ~200 m walk in	To the right of main Coal Haul Road	Walk ~300 m down from road entrance	
Surrounding Land Use	Forest	Forest	Mining	Mining	Mining	Mining	Mining	Mining
Anthropogenic Influences	None, maybe logging upstream	None	Mine activity, waste rock, road building	FO operations, Mining	Mining, FO Operations, Effluent Discharge ~150 m upstream	Mining	Mining	Mining
Length of Reach Assessed (m)	>100	100	100	100	100	100	100	100
Channel Measurements								
Bankfull Width (m)	20	>50	26.0	15.7	15.0	-	17.9	-
Wetted Width (m)	9.5	4.2	22.5	10.7	12.0	-	10.8	-

Table F.5 Habitat Information at Reference and Mine-exposed Areas, FRO LAEMP, June 2019

Station ID	Mine-exposed							
	RG_FOBKS	RG_FOBSC	RG_FOBCP	FRCP1SW	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Waterbody	Fording	Fording	Fording	Fording	Fording	Fording	Fording	Fording
Date Sampled	17-Jun-19	18-Jun-19	18-Jun-19	19-Jun-19	19-Jun-19	21-Jun-19	21-Jun-19	20-Jun-19
Zone 11 UTMs - E	652048	652319	652879	653376	653856	653863	654785	656260
Zone 11 UTMs - N	5558715	5558205	5557134	5556192	5555845	5555050	5553719	5551876
Elevation (m)	1,685	1,588	1,576	1,564	1,566	1,569		
Samplers' Initials	MW, JV	MW, JV	MW, JV	AL, EH	AL, EH	AL, EH	MW, JV	MW, JV
Habitat Characteristics								
Site Access Description	Upstream of bridge, park on road before bridge, ~150 m walk in		Greenhouse Gate, stay right, 250 m walk in	Walked ~600 m through woods from FRUPO	Road access from Fording Road, then ~300 m hike in	Walked ~700 m in from road	Road access from Fording Road, then ~250 m hike in	By gun range
Surrounding Land Use	Mining	Mining	Mining	Forest	Forest	Forest	Forest	Forest / Meadow
Anthropogenic Influences	Logging, Mining (FO operations)	Mining (FO operations), Logging	Mining, Logging	Mine	Mine	Mine	Mining upstream, logging upstream	Mining Upstream, Forest, Meadow Downstream
Length of Reach Assessed (m)	100	>100	100	100	100	100	100	100
Channel Measurements								
Bankfull Width (m)	22.2	24.0	18.7	22.0	13.7	18.7	20.3	29.0
Wetted Width (m)	18.2	19.7	14.0	18.0	13.3	14.8	19.7	18.3

Table F.6: Calcite and Pebble Count at RG_HENUP, FRO LAEMP, June 2019

RG_HENUP 1			RG_HENUP 2			RG_HENUP 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	16.0	-	1	14.0	-	1	13.0	-
2	5.0	-	2	21.5	-	2	7.5	-
3	8.0	-	3	Gravel	-	3	Gravel	-
4	5.5	-	4	Sand	-	4	18.0	-
5	11.0	-	5	26.5	-	5	8.5	-
6	7.0	-	6	Sand	-	6	14.0	-
7	Sand	-	7	7.0	-	7	27.0	-
8	15.0	-	8	12.0	-	8	17.0	-
9	6.5	-	9	Gravel	-	9	33.0	-
10	16.0	0.50	10	13.0	0.50	10	17.0	0
11	11.0	-	11	15.5	-	11	Gravel	-
12	27.0	-	12	9.0	-	12	8.0	-
13	15.5	-	13	8.0	-	13	13.0	-
14	Sand	-	14	11.5	-	14	12.0	-
15	6.0	-	15	7.0	-	15	14.5	-
16	54.0	-	16	24.0	-	16	Sand	-
17	9.0	-	17	15.5	-	17	4.5	-
18	23.0	-	18	Gravel	-	18	7.5	-
19	17.0	-	19	3.5	-	19	20.0	-
20	25.0	0.50	20	15.0	0	20	21.5	0.25
21	2.0	-	21	4.0	-	21	23.0	-
22	24.5	-	22	8.0	-	22	3.0	-
23	3.0	-	23	13.0	-	23	14.0	-
24	21.0	-	24	26.7	-	24	10.5	-
25	12.5	-	25	14.0	-	25	Gravel	-
26	22.0	-	26	7.5	-	26	15.0	-
27	Gravel	-	27	12.0	-	27	3.5	-
28	5.0	-	28	20.5	-	28	9.0	-
29	3.5	-	29	9.0	-	29	7.5	-
30	Sand	-	30	16.0	0.50	30	4.5	0
31	48.0	-	31	3.0	-	31	3.0	-
32	11.0	-	32	Sand	-	32	Sand	-
33	13.5	-	33	Sand	-	33	3.5	-
34	26.5	-	34	16.0	-	34	14.0	-
35	33.0	-	35	5.5	-	35	35.0	-
36	30.0	-	36	9.0	-	36	4.5	-
37	3.0	-	37	11.5	-	37	5.0	-
38	Sand	-	38	2.0	-	38	6.0	-
39	Boulder (>100 cm)	-	39	5.5	-	39	6.5	-
40	17.0	0.25	40	18.0	0	40	6.0	0.25
41	33.5	-	41	12.0	-	41	4.0	-
42	6.5	-	42	11.0	-	42	18.0	-
43	30.5	-	43	15.0	-	43	43.0	-
44	14.0	-	44	12.0	-	44	4.5	-
45	7.0	-	45	4.5	-	45	16.0	-
46	38.0	-	46	5.0	-	46	Boulder (>100 cm)	-
47	Sand	-	47	18.0	-	47	8.0	-
48	Gravel	-	48	3.0	-	48	9.5	-
49	3.5	-	49	40.0	-	49	7.0	-
50	7.0	0	50	5.5	0.75	50	14.0	0
51	38.0	-	51	8.0	-	51	Gravel	-
52	35.5	-	52	Gravel	-	52	2.0	-
53	12.0	-	53	16.0	-	53	Sand	-
54	16.5	-	54	7.0	-	54	5.0	-
55	7.0	-	55	6.5	-	55	14.5	-
56	2.0	-	56	28.5	-	56	18.0	-
57	22.0	-	57	23.0	-	57	11.0	-
58	10.0	-	58	58.0	-	58	20.5	-
59	21.5	-	59	13.0	-	59	4.0	-
60	58.0	0	60	47.0	0.75	60	4.5	0.50
61	26.0	-	61	33.0	-	61	5.5	-
62	1.5	-	62	Gravel	-	62	18.0	-
63	36.0	-	63	2.5	-	63	9.5	-
64	Boulder (>100 cm)	-	64	31.0	-	64	26.0	-
65	39.0	-	65	15.5	-	65	17.0	-
66	25.5	-	66	9.0	-	66	15.5	-
67	14.0	-	67	22.0	-	67	55.0	-
68	8.5	-	68	30.0	-	68	26.5	-
69	Sand	-	69	15.0	-	69	12.0	-
70	35.0	0	70	7.5	0	70	19.5	0.25
71	11.5	-	71	20.0	-	71	Gravel	-
72	26.0	-	72	15.0	-	72	14.0	-
73	32.5	-	73	7.5	-	73	15.5	-
74	22.0	-	74	13.0	-	74	3.0	-
75	14.0	-	75	21.5	-	75	13.5	-
76	12.5	-	76	4.0	-	76	11.0	-
77	6.0	-	77	6.0	-	77	14.0	-
78	19.0	-	78	3.5	-	78	33.5	-
79	3.5	-	79	21.0	-	79	21.0	-
80	31.0	0.50	80	4.0	0	80	9.0	0
81	9.5	-	81	5.5	-	81	23.0	-
82	10.0	-	82	Sand	-	82	7.0	-
83	6.0	-	83	13.0	-	83	16.5	-
84	51.5	-	84	6.0	-	84	Gravel	-
85	Gravel	-	85	28.0	-	85	24.0	-
86	5.0	-	86	9.5	-	86	16.0	-
87	7.5	-	87	35.0	-	87	7.0	-
88	19.0	-	88	72.0	-	88	14.5	-
89	3.5	-	89	21.0	-	89	8.0	-
90	2.5	0	90	17.0	0.25	90	5.5	0.50
91	32.0	-	91	4.0	-	91	7.0	-
92	24.5	-	92	11.0	-	92	31.5	-
93	17.0	-	93	12.5	-	93	4.5	-
94	Gravel	-	94	26.0	-	94	Gravel	-
95	4.5	-	95	32.0	-	95	21.0	-
96	24.0	-	96	4.0	-	96	26.5	-
97	3.5	-	97	12.5	-	97	14.0	-
98	Sand	-	98	43.0	-	98	3.5	-
99	8.0	-	99	28.5	-	99	34.0	-
100	23.0	0	100	9.0	0	100	3.0	0.25
Minimum	**1.5**	**0.0**	**Minimum**	**2.0**	**0.0**	**Minimum**	**2.0**	**0.0**
Maximum	**58.0**	**0.50**	**Maximum**	**72.0**	**0.75**	**Maximum**	**55.0**	**0.50**
Mean	**17.6**	**0.19**	**Mean**	**15.6**	**0.28**	**Mean**	**13.9**	**0.20**
Standard Dev.	**13.1**	**0.24**	**Standard Dev.**	**12.3**	**0.32**	**Standard Dev.**	**9.8**	**0.20**
Geometric mean	**12.8**	**-**	**Geometric mean**	**11.9**	**-**	**Geometric mean**	**10.9**	**-**
Median	**14.0**	**0.0**	**Median**	**12.8**	**0.13**	**Median**	**13.0**	**0.25**

Table F.7: Calcite and Pebble Count at RG_FO26, FRO LAEMP, June 2019

RG_FO26 1			RG_FO26 2			RG_FO26 3		
Rock	**Intermediate Axis (cm)**	**Embeddedness**	**Rock**	**Intermediate Axis (cm)**	**Embeddedness**	**Rock**	**Intermediate Axis (cm)**	**Embeddedness**
1	5.2	-	1	6.4	-	1	9.1	-
2	7.9	-	2	5.8	-	2	2.5	-
3	6.1	-	3	5.9	-	3	10.9	-
4	6.5	-	4	7.1	-	4	6.7	-
5	2.9	-	5	8.8	-	5	3.4	-
6	3.2	-	6	12.3	-	6	3.1	-
7	2.5	-	7	5.1	-	7	8.5	-
8	1.6	-	8	6.1	-	8	10.8	-
9	8.2	-	9	1.2	-	9	3.9	-
10	7.9	0.50	10	17.6	0.75	10	2.3	0.75
11	8.8	-	11	23.2	-	11	6.9	-
12	6.9	-	12	12.1	-	12	2.8	-
13	5.1	-	13	11.7	-	13	2.4	-
14	2.8	-	14	13.2	-	14	8.1	-
15	5.3	-	15	4.2	-	15	10.4	-
16	8.9	-	16	5.1	-	16	8.7	-
17	6.0	-	17	9.1	-	17	5.2	-
18	4.2	-	18	5.5	-	18	3.1	-
19	6.0	-	19	13.9	-	19	12.6	-
20	4.1	0	20	10.8	0.50	20	8.1	0
21	4.1	-	21	4.5	-	21	11.9	-
22	6.2	-	22	6.2	-	22	10.4	-
23	6.5	-	23	4.3	-	23	6.6	-
24	5.6	-	24	3.4	-	24	4.1	-
25	8.3	-	25	9.9	-	25	2.2	-
26	4.5	-	26	6.7	-	26	1.7	-
27	8.5	-	27	8.9	-	27	5.2	-
28	3.3	-	28	5.3	-	28	10.5	-
29	5.6	-	29	5.2	-	29	3.7	-
30	4.6	0.50	30	4.2	0	30	4.8	0.50
31	4.3	-	31	2.6	-	31	3.3	-
32	7.9	-	32	7.1	-	32	2.6	-
33	6.5	-	33	6.7	-	33	9.2	-
34	8.9	-	34	5.0	-	34	12.5	-
35	2.2	-	35	4.9	-	35	8.5	-
36	5.7	-	36	2.8	-	36	6.0	-
37	3.5	-	37	16.6	-	37	6.1	-
38	5.1	-	38	3.1	-	38	6.8	-
39	7.9	-	39	2.5	-	39	4.8	-
40	4.8	0.25	40	6.4	0	40	6.3	0
41	4.5	-	41	21.2	-	41	7.6	-
42	6.0	-	42	14.4	-	42	5.4	-
43	5.1	-	43	10.5	-	43	2.8	-
44	2.1	-	44	4.5	-	44	3.2	-
45	1.8	-	45	8.5	-	45	4.1	-
46	2.7	-	46	5.5	-	46	4.1	-
47	6.4	-	47	17.4	-	47	6.9	-
48	13.5	-	48	11.8	-	48	12.2	-
49	5.5	-	49	4.5	-	49	9.1	-
50	11.2	0.50	50	29.1	0.75	50	7.9	0.25
51	7.1	-	51	8.0	-	51	4.1	-
52	7.3	-	52	21.5	-	52	3.4	-
53	4.5	-	53	4.7	-	53	8.0	-
54	7.3	-	54	4.1	-	54	5.5	-
55	6.1	-	55	9.3	-	55	3.7	-
56	7.1	-	56	6.0	-	56	18.8	-
57	5.8	-	57	3.3	-	57	13.3	-
58	10.7	-	58	12.5	-	58	12.2	-
59	4.4	-	59	2.2	-	59	4.1	-
60	6.8	0.75	60	6.9	0	60	4.5	0
61	5.9	-	61	6.7	-	61	6.2	-
62	2.8	-	62	7.2	-	62	7.6	-
63	3.2	-	63	6.1	-	63	5.3	-
64	8.5	-	64	3.6	-	64	8.4	-
65	3.4	-	65	8.2	-	65	7.2	-
66	11.2	-	66	9.3	-	66	7.6	-
67	3.2	-	67	4.5	-	67	12.6	-
68	2.8	-	68	7.1	-	68	5.1	-
69	11.8	-	69	9.3	-	69	5.6	-
70	6.1	0	70	10.1	0	70	3.4	0.25
71	7.7	-	71	35.7	-	71	6.9	-
72	3.5	-	72	4.2	-	72	6.8	-
73	4.2	-	73	5.3	-	73	9.7	-
74	4.5	-	74	4.8	-	74	9.6	-
75	5.9	-	75	5.4	-	75	5.9	-
76	8.4	-	76	5.2	-	76	1.3	-
77	4.3	-	77	3.6	-	77	1.8	-
78	2.4	-	78	6.5	-	78	7.1	-
79	6.6	-	79	2.1	-	79	4.0	-
80	3.4	0.25	80	2.7	0	80	3.1	0
81	9.3	-	81	Sand	-	81	10.5	-
82	4.0	-	82	Gravel	-	82	4.5	-
83	5.1	-	83	5.4	-	83	6.7	-
84	1.0	-	84	4.7	-	84	9.5	-
85	2.3	-	85	6.2	-	85	6.1	-
86	4.3	-	86	3.3	-	86	7.9	-
87	6.6	-	87	3.9	-	87	5.8	-
88	4.7	-	88	5.5	-	88	4.1	-
89	7.0	-	89	8.9	-	89	5.8	-
90	7.6	0	90	6.5	0.75	90	5.9	0
91	5.5	-	91	18.5	-	91	6.3	-
92	6.9	-	92	4.9	-	92	7.7	-
93	9.3	-	93	6.9	-	93	5.6	-
94	10.2	-	94	22.1	-	94	5.2	-
95	4.9	-	95	4.8	-	95	4.7	-
96	5.3	-	96	9.1	-	96	7.9	-
97	7.3	-	97	5.2	-	97	7.2	-
98	9.6	-	98	4.6	-	98	8.2	-
99	8.1	-	99	5.6	-	99	5.7	-
100	9.6	0.75	100	3.5	0.50	100	6.3	0
Minimum	**1.0**	**0.0**	**Minimum**	**1.2**	**0.0**	**Minimum**	**1.3**	**0.0**
Maximum	**13.5**	**0.75**	**Maximum**	**35.7**	**0.75**	**Maximum**	**18.8**	**0.75**
Mean	**5.9**	**0.35**	**Mean**	**8.0**	**0.33**	**Mean**	**6.5**	**0.18**
Sandard Dev.	**2.5**	**0.29**	**Standard Dev.**	**5.9**	**0.35**	**Standard Dev.**	**3.1**	**0.26**
Geometric mean	**5.3**	**-**	**Geometric mean**	**6.6**	**-**	**Geometric mean**	**5.8**	**-**
Median	**5.8**	**0.38**	**Median**	**6.1**	**0.25**	**Median**	**6.2**	**0.0**

Table F.8: Calcite and Pebble Count at RG_FODHE, FRO LAEMP, June 2019

RG_FODHE 1			RG_FODHE 2			RG_FODHE 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	13.0	-	1	22.0	-	1	5.5	-
2	8.0	-	2	12.0	-	2	7.0	-
3	8.0	-	3	17.0	-	3	7.0	-
4	6.0	-	4	10.0	-	4	3.5	-
5	10.0	-	5	6.0	-	5	10.0	-
6	11.5	-	6	9.0	-	6	14.0	-
7	3.5	-	7	2.5	-	7	12.0	-
8	5.0	-	8	29.5	-	8	10.0	-
9	6.5	-	9	8.5	-	9	9.0	-
10	5.0	0.50	10	20.5	0	10	6.0	0
11	Gravel	-	11	8.0	-	11	4.0	-
12	4.0	-	12	11.0	-	12	13.5	-
13	5.5	-	13	7.5	-	13	10.5	-
14	2.5	-	14	6.5	-	14	6.5	-
15	11.5	-	15	18.0	-	15	7.0	-
16	25.5	-	16	12.5	-	16	9.5	-
17	5.5	-	17	6.5	-	17	3.0	-
18	4.0	-	18	15.0	-	18	8.5	-
19	11.0	-	19	8.0	-	19	10.0	-
20	9.5	0.25	20	Gravel	0	20	8.0	0.25
21	12.5	-	21	9.5	-	21	3.0	-
22	8.5	-	22	7.0	-	22	11.5	-
23	8.0	-	23	8.0	-	23	6.0	-
24	7.0	-	24	7.5	-	24	14.5	-
25	Gravel	-	25	8.0	-	25	9.5	-
26	13.5	-	26	4.0	-	26	25.0	-
27	3.0	-	27	6.0	-	27	9.0	-
28	8.5	-	28	8.0	-	28	12.0	-
29	4.0	-	29	5.5	-	29	5.5	-
30	11.5	0.50	30	6.0	0.50	30	5.0	0.25
31	4.0	-	31	3.5	-	31	6.5	-
32	9.0	-	32	4.5	-	32	11.5	-
33	7.0	-	33	7.5	-	33	4.0	-
34	6.0	-	34	8.0	-	34	3.5	-
35	8.5	-	35	9.5	-	35	4.0	-
36	6.0	-	36	4.5	-	36	Gravel	-
37	6.5	-	37	5.0	-	37	4.5	-
38	12.0	-	38	9.0	-	38	11.0	-
39	14.5	-	39	6.0	-	39	9.0	-
40	6.5	0.25	40	7.0	0	40	5.0	0
41	5.5	-	41	6.5	-	41	8.5	-
42	7.0	-	42	8.0	-	42	5.5	-
43	5.5	-	43	7.0	-	43	2.5	-
44	13.0	-	44	12.5	-	44	3.5	-
45	10.5	-	45	15.0	-	45	9.0	-
46	15.5	-	46	Gravel	-	46	5.0	-
47	7.0	-	47	8.5	-	47	4.0	-
48	11.5	-	48	10.5	-	48	8.5	-
49	6.0	-	49	6.0	-	49	14.5	-
50	2.0	0	50	25.0	0.75	50	17.5	0.75
51	9.0	-	51	5.5	-	51	Sand	-
52	5.5	-	52	8.5	-	52	Sand	-
53	4.5	-	53	21.5	-	53	Sand	-
54	12.0	-	54	4.0	-	54	13.5	-
55	12.0	-	55	7.5	-	55	9.0	-
56	3.5	-	56	9.5	-	56	Sand	-
57	8.0	-	57	15.0	-	57	Sand	-
58	6.5	-	58	18.0	-	58	Gravel	-
59	6.5	-	59	17.0	-	59	Sand	-
60	9.5	0.75	60	13.5	1	60	11.5	0.50
61	Gravel	-	61	5.5	-	61	19.5	-
62	8.0	-	62	11.0	-	62	11.0	-
63	10.0	-	63	17.0	-	63	6.5	-
64	6.5	-	64	12.5	-	64	18.5	-
65	5.5	-	65	13.5	-	65	7.0	-
66	9.0	-	66	7.0	-	66	3.0	-
67	4.0	-	67	11.0	-	67	3.0	-
68	3.5	-	68	25.5	-	68	9.5	-
69	5.0	-	69	19.0	-	69	8.5	-
70	4.5	0.50	70	9.0	0.50	70	12.5	0.25
71	4.5	-	71	9.5	-	71	11.5	-
72	4.0	-	72	16.0	-	72	9.5	-
73	7.0	-	73	4.0	-	73	Sand	-
74	5.5	-	74	5.0	-	74	Sand	-
75	7.0	-	75	9.5	-	75	7.5	-
76	6.0	-	76	11.0	-	76	16.5	-
77	5.5	-	77	8.0	-	77	Sand	-
78	6.5	-	78	5.5	-	78	Gravel	-
79	3.0	-	79	6.0	-	79	9.5	-
80	11.0	0.50	80	8.5	0	80	7.0	0.50
81	4.5	-	81	9.5	-	81	6.5	-
82	3.5	-	82	9.0	-	82	11.0	-
83	9.5	-	83	6.5	-	83	8.0	-
84	2.5	-	84	7.0	-	84	13.5	-
85	5.0	-	85	8.0	-	85	13.5	-
86	5.0	-	86	9.0	-	86	6.0	-
87	7.0	-	87	10.0	-	87	8.0	-
88	8.0	-	88	5.5	-	88	7.0	-
89	5.5	-	89	8.0	-	89	10.0	-
90	9.0	0.75	90	9.5	0.75	90	13.5	0.25
91	4.5	-	91	8.0	-	91	14.5	-
92	12.0	-	92	15.0	-	92	8.0	-
93	12.0	-	93	5.0	-	93	13.0	-
94	7.5	-	94	5.5	-	94	9.5	-
95	11.0	-	95	6.0	-	95	7.0	-
96	7.0	-	96	17.5	-	96	6.0	-
97	6.0	-	97	18.0	-	97	14.0	-
98	3.0	-	98	7.0	-	98	4.5	-
99	11.5	-	99	11.0	-	99	8.0	-
100	8.0	0.25	100	9.0	0.75	100	11.0	1.0
Minimum	**2.0**	**0.0**	**Minimum**	**2.5**	**0.0**	**Minimum**	**2.5**	**0.0**
Maximum	**25.5**	**0.75**	**Maximum**	**29.5**	**1.0**	**Maximum**	**25.0**	**1.0**
Mean	**7.5**	**0.43**	**Mean**	**10.0**	**0.43**	**Mean**	**9.0**	**0.38**
Standard Dev.	**3.6**	**0.24**	**Standard Dev.**	**5.2**	**0.39**	**Standard Dev.**	**4.2**	**0.32**
Geometric mean	**6.8**	**-**	**Geometric mean**	**8.9**	**-**	**Geometric mean**	**8.0**	**-**
Median	**7.0**	**0.50**	**Median**	**8.5**	**0.50**	**Median**	**8.5**	**0.25**

Table F.9: Calcite and Pebble Count at RG_FOUNGD, FRO LAEMP, June 2019

RG_FOUNGD 1			RG_FOUNGD 2			RG_FOUNGD 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	52.0	-	1	Sand	-	1	12.0	-
2	8.0	-	2	6.0	-	2	14.5	-
3	10.0	-	3	14.0	-	3	7.0	-
4	17.0	-	4	3.0	-	4	6.5	-
5	39.0	-	5	10.0	-	5	9.5	-
6	14.5	-	6	6.0	-	6	15.5	-
7	34.0	-	7	4.5	-	7	11.0	-
8	6.0	-	8	Sand	-	8	9.5	-
9	50.0	-	9	7.0	-	9	6.5	-
10	8.5	0.25	10	12.0	0	10	4.0	0
11	4.0	-	11	12.0	-	11	16.4	-
12	Sand	-	12	9.5	-	12	4.0	-
13	Gravel	-	13	3.0	-	13	29.0	-
14	3.5	-	14	12.0	-	14	24.5	-
15	2.5	-	15	6.5	-	15	5.5	-
16	2.0	-	16	12.5	-	16	18.0	-
17	2.0	-	17	4.0	-	17	8.0	-
18	39.0	-	18	Sand	-	18	4.5	-
19	4.0	-	19	7.0	-	19	18.0	-
20	5.5	0.50	20	7.5	0.50	20	5.0	0
21	3.5	-	21	8.0	-	21	4.5	-
22	Gravel	-	22	6.0	-	22	3.5	-
23	5.0	-	23	Gravel	-	23	5.0	-
24	11.0	-	24	7.5	-	24	33.0	-
25	4.0	-	25	5.0	-	25	4.0	-
26	12.0	-	26	7.0	-	26	16.0	-
27	Sand	-	27	5.5	-	27	7.0	-
28	2.0	-	28	4.5	-	28	Gravel	-
29	6.5	-	29	Sand	-	29	4.0	-
30	Sand	-	30	6.0	0	30	Gravel	-
31	Gravel	-	31	5.5	-	31	13.0	-
32	7.0	-	32	4.0	-	32	5.0	-
33	11.5	-	33	6.5	-	33	7.5	-
34	3.0	-	34	13.0	-	34	6.0	-
35	2.5	-	35	6.0	-	35	Gravel	-
36	5.0	-	36	3.5	-	36	Gravel	-
37	6.5	-	37	7.0	-	37	15.0	-
38	7.0	-	38	3.5	-	38	10.0	-
39	13.0	-	39	5.0	-	39	11.0	-
40	11.0	0	40	4.5	0.25	40	4.0	0.5
41	2.5	-	41	8.0	-	41	7.0	-
42	4.0	-	42	16.0	-	42	4.0	-
43	8.0	-	43	5.0	-	43	3.0	-
44	5.5	-	44	4.5	-	44	8.0	-
45	2.0	-	45	8.0	-	45	5.5	-
46	3.0	-	46	7.0	-	46	7.0	-
47	4.5	-	47	16.5	-	47	Sand	-
48	6.5	-	48	6.5	-	48	5.5	-
49	6.0	-	49	9.0	-	49	11.0	-
50	Sand	-	50	15.0	0.5	50	10.0	0.25
51	8.0	-	51	7.0	-	51	36.0	-
52	Sand	-	52	29.5	-	52	4.0	-
53	3.0	-	53	6.0	-	53	7.5	-
54	2.5	-	54	15.0	-	54	2.5	-
55	Gravel	-	55	6.0	-	55	3.0	-
56	4.0	-	56	4.5	-	56	9.0	-
57	6.0	-	57	8.0	-	57	2.5	-
58	5.5	-	58	34.0	-	58	6.0	-
59	6.5	-	59	4.5	-	59	4.5	-
60	5.5	0.25	60		0	60	Gravel	-
61	Sand	-	61	5.0	-	61	4.0	-
62	55.0	-	62	5.0	-	62	5.5	-
63	4.5	-	63	8.5	-	63	6.0	-
64	63.0	-	64	10.5	-	64	3.5	-
65	3.5	-	65	13.0	-	65	13.0	-
66	4.5	-	66	2.5	-	66	4.5	-
67	72.0	-	67	Gravel	-	67	3.0	-
68	5.0	-	68	3.0	-	68	6.0	-
69	9.0	-	69	Gravel	-	69	7.5	-
70	4.0	0	70	2.5	0	70	15.0	0.25
71	3.0	-	71	4.0	-	71	Gravel	-
72	6.0	-	72	10.0	-	72	12.0	-
73	7.5	-	73	14.0	-	73	11.0	-
74	10.0	-	74	15.5	-	74	6.5	-
75	4.5	-	75	8.0	-	75	4.5	-
76	6.0	-	76	6.5	-	76	22.0	-
77	3.5	-	77	14.5	-	77	3.5	-
78	9.0	-	78	9.5	-	78	18.0	-
79	13.0	-	79	3.5	-	79	Sand	-
80	4.0	0	80	5.0	0	80	9.0	0.75
81	5.0	-	81	6.0	-	81	5.5	-
82	5.5	-	82	11.0	-	82	7.5	-
83	4.5	-	83	3.5	-	83	37.0	-
84	6.0	-	84	9.5	-	84	4.0	-
85	10.0	-	85	8.0	-	85	5.5	-
86	7.5	-	86	30.0	-	86	19.0	-
87	1.0	-	87	9.0	-	87	6.5	-
88	4.5	-	88	65.0	-	88	8.5	-
89	Gravel	-	89	11.0	-	89	3.0	-
90	5.5	0.25	90	20.0	0.25	90	10.5	0
91	3.5	-	91	11.5	-	91	5.0	-
92	6.5	-	92	7.5	-	92	4.5	-
93	11.0	-	93	8.0	-	93	10.0	-
94	4.0	-	94	6.0	-	94	14.5	-
95	2.0	-	95	4.5	-	95	2.0	-
96	3.5	-	96	Gravel	-	96	Sand	-
97	2.5	-	97	7.5	-	97	8.0	-
98	3.5	-	98	6.0	-	98	7.5	-
99	4.5	-	99	8.5	-	99	3.0	-
100	9.5	0	100	3.0	0.50	100	2.5	0
Minimum	**1.0**	**0.0**	**Minimum**	**2.5**	**0.0**	**Minimum**	**2.0**	**0.0**
Maximum	**72.0**	**0.50**	**Maximum**	**65.0**	**0.50**	**Maximum**	**37.0**	**0.75**
Mean	**9.9**	**0.16**	**Mean**	**9.1**	**0.20**	**Mean**	**9.1**	**0.22**
Standard Dev.	**13.7**	**0.19**	**Standard Dev.**	**8.1**	**0.23**	**Standard Dev.**	**7.2**	**0.28**
Geometric mean	**6.3**	**-**	**Geometric mean**	**7.4**	**-**	**Geometric mean**	**7.3**	**-**
Median	**5.5**	**0.13**	**Median**	**7.0**	**0.13**	**Median**	**7.0**	**0.13**

Table F.10: Calcite and Pebble Count at RG_FODNGD, FRO LAEMP, June 2019

RG_FODNGD 1			RG_FODNGD 2			RG_FODNGD 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	15.0	-	1	3.5	-	1	5.0	-
2	4.5	-	2	14.0	-	2	Gravel	-
3	8.0	-	3	4.5	-	3	22.0	-
4	8.0	-	4	23.0	-	4	24.5	-
5	2.5	-	5	Sand	-	5	13.5	-
6	14.0	-	6	2.0	-	6	15.5	-
7	7.0	-	7	10.0	-	7	10.5	-
8	15.0	-	8	3.0	-	8	9.0	-
9	2.0	-	9	Sand	-	9	17.0	-
10	16.0	0.25	10	10.0	1.0	10	13.0	0
11	5.0	-	11	12.0	-	11	12.0	-
12	24.5	-	12	9.0	-	12	20.0	-
13	6.0	-	13	7.5	-	13	7.0	-
14	14.0	-	14	16.0	-	14	3.5	-
15	16.0	-	15	28.0	-	15	29.0	-
16	19.0	-	16	Gravel	-	16	17.0	-
17	Gravel	-	17	Sand	-	17	13.5	-
18	15.5	-	18	10.0	-	18	21.0	-
19	20.5	-	19	9.0	-	19	4.5	-
20	7.5	0.50	20	3.5	0.75	20	13.0	1.0
21	7.5	-	21	15.0	-	21	21.0	-
22	3.0	-	22	Sand	-	22	3.0	-
23	13.5	-	23	6.0	-	23	13.0	-
24	8.0	-	24	25.0	-	24	11.0	-
25	19.0	-	25	11.0	-	25	12.0	-
26	9.0	-	26	10.0	-	26	14.5	-
27	8.5	-	27	2.5	-	27	12.5	-
28	7.0	-	28	10.0	-	28	12.5	-
29	6.5	-	29	Sand	-	29	2.5	-
30	14.0	1.0	30	3.5	0.75	30	8.0	0.50
31	9.0	-	31	18.0	-	31	15.0	-
32	15.5	-	32	15.0	-	32	8.5	-
33	14.5	-	33	3.0	-	33	21.0	-
34	7.0	-	34	4.0	-	34	4.5	-
35	7.0	-	35	2.5	-	35	9.0	-
36	16.5	-	36	4.5	-	36	20.0	-
37	5.0	-	37	14.0	-	37	13.0	-
38	13.0	-	38	3.0	-	38	19.5	-
39	12.5	-	39	12.0	-	39	7.5	-
40	3.5	0.5	40	2.0	0	40	11.0	0.50
41	38.0	-	41	2.5	-	41	12.0	-
42	24.0	-	42	Sand	-	42	11.0	-
43	26.0	-	43	Gravel	-	43	7.5	-
44	6.5	-	44	6.5	-	44	6.0	-
45	9.5	-	45	4.5	-	45	Gravel	-
46	47.0	-	46	3.5	-	46	3.0	-
47	5.0	-	47	17.5	-	47	9.0	-
48	10.5	-	48	Gravel	-	48	13.5	-
49	16.0	-	49	15.0	-	49	15.5	-
50	15.5	1.0	50	5.0	0	50	9.0	0
51	15.5	-	51	13.5	-	51	6.0	-
52	4.5	-	52	20.0	-	52	13.0	-
53	7.5	-	53	7.5	-	53	6.0	-
54	5.0	-	54	2.0	-	54	13.0	-
55	8.0	-	55	8.0	-	55	11.5	-
56	8.5	-	56	12.0	-	56	12.0	-
57	10.0	-	57	Gravel	-	57	24.0	-
58	5.0	-	58	15.0	-	58	9.0	-
59	7.5	-	59	14.5	-	59	28.5	-
60	21.0	0.75	60	13.0	1.0	60	21.0	0.25
61	5.5	-	61	11.5	-	61	21.0	-
62	16.5	-	62	13.0	-	62	14.5	-
63	8.0	-	63	Gravel	-	63	2.5	-
64	16.5	-	64	7.5	-	64	6.0	-
65	17.0	-	65	14.5	-	65	4.0	-
66	Gravel	-	66	24.5	-	66	4.0	-
67	13.0	-	67	19.0	-	67	10.0	-
68	13.0	-	68	7.5	-	68	5.0	-
69	12.5	-	69	12.0	-	69	8.5	-
70	11.0	0.75	70	15.5	0	70	31.0	0.25
71	9.0	-	71	8.0	-	71	15.5	-
72	16.0	-	72	16.0	-	72	9.5	-
73	11.0	-	73	6.5	-	73	5.5	-
74	19.5	-	74	Gravel	-	74	26.0	-
75	5.5	-	75	10.0	-	75	6.0	-
76	29.0	-	76	8.5	-	76	27.0	-
77	7.0	-	77	15.5	-	77	24.0	-
78	18.5	-	78	19.0	-	78	21.5	-
79	18.0	-	79	8.0	-	79	18.0	-
80	8.5	0	80	5.0	0.25	80	17.0	1.0
81	10.0	-	81	7.0	-	81	6.5	-
82	10.5	-	82	12.0	-	82	5.0	-
83	7.0	-	83	5.5	-	83	7.0	-
84	17.0	-	84	18.0	-	84	7.0	-
85	9.0	-	85	10.0	-	85	5.5	-
86	16.0	-	86	17.0	-	86	4.0	-
87	19.5	-	87	10.0	-	87	7.5	-
88	11.0	-	88	7.5	-	88	5.0	-
89	15.5	-	89	12.0	-	89	14.0	-
90	16.0	1.0	90	4.5	0	90	9.0	1.0
91	10.0	-	91	5.0	-	91	2.5	-
92	19.5	-	92	3.5	-	92	9.0	-
93	15.0	-	93	17.0	-	93	4.0	-
94	2.5	-	94	6.5	-	94	13.0	-
95	7.0	-	95	5.0	-	95	12.0	-
96	6.5	-	96	10.0	-	96	9.0	-
97	5.0	-	97	12.5	-	97	7.5	-
98	6.0	-	98	14.0	-	98	9.0	-
99	18.5	-	99	17.0	-	99	5.0	-
100	8.0	0	100	16.0	0.75	100	12.5	0
Minimum	**2.0**	**0.0**	**Minimum**	**2.0**	**0.0**	**Minimum**	**2.5**	**0.0**
Maximum	**47.0**	**1.0**	**Maximum**	**28.0**	**1.0**	**Maximum**	**31.0**	**1.0**
Mean	**12.2**	**0.58**	**Mean**	**10.4**	**0.45**	**Mean**	**11.9**	**0.45**
Standard Dev.	**7.2**	**0.39**	**Standard Dev.**	**5.9**	**0.44**	**Standard Dev.**	**6.8**	**0.42**
Geometric mean	**10.4**	**-**	**Geometric mean**	**8.6**	**-**	**Geometric mean**	**10.1**	**-**
Median	**10.5**	**0.63**	**Median**	**10.0**	**0.50**	**Median**	**11.0**	**0.38**

Table F.11: Calcite and Pebble Count at RG_MP1, FRO LAEMP, June 2019

RG_MP1 1			RG_MP1 2			RG_MP1 3		
Rock	**Intermediate Axis (cm)**	**Embeddedness**	**Rock**	**Intermediate Axis (cm)**	**Embeddedness**	**Rock**	**Intermediate Axis (cm)**	**Embeddedness**
1	11.9	-	1	11.7	-	1	12.3	-
2	2.5	-	2	4.8	-	2	8.1	-
3	2.6	-	3	9.3	-	3	7.2	-
4	20.5	-	4	30.5	-	4	8.5	-
5	3.1	-	5	5.9	-	5	6.3	-
6	Gravel	-	6	6.0	-	6	2.9	-
7	14.1	-	7	6.6	-	7	2.8	-
8	10.1	-	8	21.4	-	8	8.3	-
9	10.7	-	9	7.4	-	9	5.1	-
10	30.0	0.25	10	12.7	0	10	8.9	0.25
11	11.9	-	11	11.3	-	11	9.4	-
12	3.3	-	12	6.8	-	12	11.0	-
13	11.6	-	13	10.2	-	13	10.1	-
14	4.4	-	14	7.6	-	14	6.6	-
15	4.6	-	15	12.1	-	15	43.5	-
16	3.6	-	16	5.6	-	16	12.0	-
17	9.3	-	17	6.1	-	17	17.2	-
18	9.9	-	18	7.8	-	18	6.3	-
19	11.7	-	19	7.4	-	19	11.2	-
20	2.4	0	20	26.5	0.50	20	8.3	0
21	5.1	-	21	7.5	-	21	4.8	-
22	6.8	-	22	9.7	-	22	11.9	-
23	11.8	-	23	11.9	-	23	20.7	-
24	23.5	-	24	8.1	-	24	40.0	-
25	14.6	-	25	5.9	-	25	9.3	-
26	10.3	-	26	6.2	-	26	9.6	-
27	4.8	-	27	5.7	-	27	2.7	-
28	11.2	-	28	12.6	-	28	7.8	-
29	7.9	-	29	5.2	-	29	2.6	-
30	12.8	0.5	30	8.6	0	30	7.4	0.00
31	13.3	-	31	6.6	-	31	7.0	-
32	7.8	-	32	9.9	-	32	7.1	-
33	27.0	-	33	8.9	-	33	8.7	-
34	5.6	-	34	5.8	-	34	8.0	-
35	46.5	-	35	8.9	-	35	3.9	-
36	10.9	-	36	18.4	-	36	8.5	-
37	9.7	-	37	6.2	-	37	20.4	-
38	9.5	-	38	2.7	-	38	15.2	-
39	7.9	-	39	6.7	-	39	12.1	-
40	19.2	0.25	40	5.2	0	40	8.3	0.25
41	6.9	-	41	5.2	-	41	7.5	-
42	9.2	-	42	8.7	-	42	6.1	-
43	28.8	-	43	6.9	-	43	8.1	-
44	4.7	-	44	7.8	-	44	9.1	-
45	9.8	-	45	12.5	-	45	3.5	-
46	6.7	-	46	7.3	-	46	3.0	-
47	Gravel	-	47	5.1	-	47	6.7	-
48	14.3	-	48	8.2	-	48	3.8	-
49	12.0	-	49	8.9	-	49	13.2	-
50	7.9	0.25	50	5.4	0	50	14.5	0.75
51	Boulder (>100 cm)	-	51	7.6	-	51	7.5	-
52	6.6	-	52	4.7	-	52	7.9	-
53	83.0	-	53	8.2	-	53	8.1	-
54	32.5	-	54	21.5	-	54	7.1	-
55	13.6	-	55	11.2	-	55	12.8	-
56	9.3	-	56	12.4	-	56	73.5	-
57	6.2	-	57	8.6	-	57	11.2	-
58	6.1	-	58	6.2	-	58	12.8	-
59	10.1	-	59	4.9	-	59	5.2	-
60	6.1	0	60	6.5	0	60	10.0	0
61	33.0	-	61	6.3	-	61	9.3	-
62	4.4	-	62	7.9	-	62	Sand	-
63	5.4	-	63	3.3	-	63	29.9	-
64	3.4	-	64	4.4	-	64	5.8	-
65	8.5	-	65	5.9	-	65	6.7	-
66	5.1	-	66	6.4	-	66	10.9	-
67	49.0	-	67	5.5	-	67	3.5	-
68	15.1	-	68	9.7	-	68	2.4	-
69	14.1	-	69	7.6	-	69	Sand	-
70	8.8	0.00	70	36.5	0.75	70	17.5	0.5
71	24.4	-	71	11.4	-	71	8.4	-
72	Gravel	-	72	5.6	-	72	1.5	-
73	3.3	-	73	4.2	-	73	5.5	-
74	6.5	-	74	7.7	-	74	8.6	-
75	13.8	-	75	5.7	-	75	10.5	-
76	7.7	-	76	8.2	-	76	9.6	-
77	13.6	-	77	11.0	-	77	5.9	-
78	4.9	-	78	10.3	-	78	16.4	-
79	3.6	-	79	7.3	-	79	4.8	-
80	32.5	0.25	80	5.3	0	80	8.2	0.5
81	13.3	-	81	6.4	-	81	6.3	-
82	13.6	-	82	7.1	-	82	4.7	-
83	2.6	-	83	5.3	-	83	5.2	-
84	0.9	-	84	8.0	-	84	22.2	-
85	9.7	-	85	6.9	-	85	10.1	-
86	4.8	-	86	5.2	-	86	17.9	-
87	12.1	-	87	8.7	-	87	2.4	-
88	8.1	-	88	8.8	-	88	2.5	-
89	Gravel	-	89	9.4	-	89	5.3	-
90	12.8	0.00	90	8.1	0	90	4.3	0.5
91	8.2	-	91	6.3	-	91	16.5	-
92	11.4	-	92	10.2	-	92	7.2	-
93	52.0	-	93	9.4	-	93	8.3	-
94	8.4	-	94	18.4	-	94	36.4	-
95	6.8	-	95	6.9	-	95	20.1	-
96	4.9	-	96	22.6	-	96	11.5	-
97	7.6	-	97	15.3	-	97	2.4	-
98	20.6	-	98	8.9	-	98	3.9	-
99	9.4	-	99	9.1	-	99	4.4	-
100	12.9	0	100	13.2	0.75	100	5.6	0.25
Minimum	**0.9**	**0.0**	**Minimum**	**2.7**	**0.0**	**Minimum**	**1.5**	**0.0**
Maximum	**83.0**	**0.50**	**Maximum**	**36.5**	**0.75**	**Maximum**	**73.5**	**0.75**
Mean	**12.6**	**0.15**	**Mean**	**9.1**	**0.20**	**Mean**	**10.4**	**0.30**
Standard Dev.	**12.1**	**0.17**	**Standard Dev.**	**5.4**	**0.33**	**Standard Dev.**	**9.8**	**0.26**
Geometric mean	**9.4**	**-**	**Geometric mean**	**8.1**	**-**	**Geometric mean**	**8.1**	**-**
Median	**9.5**	**0.13**	**Median**	**7.7**	**0.0**	**Median**	**8.2**	**0.25**

Table F.12: Calcite and Pebble Count at RG_FOUSH, FRO LAEMP, June 2019

RG_FOUSH 1			RG_FOUSH 2			RG_FOUSH 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	5.5	-	1	4.9	-	1	5.1	-
2	7.6	-	2	14.1	-	2	6.9	-
3	3.8	-	3	20.3	-	3	10.2	-
4	3.6	-	4	7.3	-	4	5.6	-
5	17.0	-	5	8.0	-	5	5.9	-
6	9.0	-	6	12.5	-	6	3.9	-
7	9.8	-	7	16.8	-	7	6.4	-
8	7.3	-	8	13.1	-	8	9.2	-
9	4.9	-	9	10.7	-	9	6.7	-
10	7.5	0	10	9.8	0.25	10	8.9	0
11	7.2	-	11	6.1	-	11	7.3	-
12	6.6	-	12	5.5	-	12	7.5	-
13	7.4	-	13	6.6	-	13	6.8	-
14	6.6	-	14	12.6	-	14	6.6	-
15	8.9	-	15	12.9	-	15	4.6	-
16	8.4	-	16	19.4	-	16	8.5	-
17	4.3	-	17	19.2	-	17	4.4	-
18	7.5	-	18	5.2	-	18	6.5	-
19	17.4	-	19	17.3	-	19	9.4	-
20	14.0	0	20	12.6	0.25	20	9.5	0.75
21	6.5	-	21	17.4	-	21	2.1	-
22	7.6	-	22	16.2	-	22	2.9	-
23	6.4	-	23	12.0	-	23	4.7	-
24	8.2	-	24	11.0	-	24	7.3	-
25	12.8	-	25	6.2	-	25	9.5	-
26	10.1	-	26	9.6	-	26	4.2	-
27	10.5	-	27	8.9	-	27	8.1	-
28	11.0	-	28	13.6	-	28	7.2	-
29	12.1	-	29	9.4	-	29	3.9	-
30	33.8	0.25	30	22.0	0.50	30	6.4	0
31	9.6	-	31	6.7	-	31	9.5	-
32	8.9	-	32	6.4	-	32	9.3	-
33	5.1	-	33	14.5	-	33	10.2	-
34	7.1	-	34	9.7	-	34	9.1	-
35	3.4	-	35	14.0	-	35	4.8	-
36	12.4	-	36	20.0	-	36	10.0	-
37	9.0	-	37	8.1	-	37	4.4	-
38	6.8	-	38	9.1	-	38	8.3	-
39	7.2	-	39	8.0	-	39	12.7	-
40	7.6	0.25	40	7.8	0	40	> 40	0.75
41	6.2	-	41	20.4	-	41	6.2	-
42	12.7	-	42	6.5	-	42	7.9	-
43	7.3	-	43	14.5	-	43	11.2	-
44	11.1	-	44	9.3	-	44	4.7	-
45	11.3	-	45	11.1	-	45	7.8	-
46	16.9	-	46	7.7	-	46	22.2	-
47	13.3	-	47	5.9	-	47	7.3	-
48	7.2	-	48	14.6	-	48	3.1	-
49	12.0	-	49	8.6	-	49	2.7	-
50	3.1	0.5	50	11.5	0	50	4.1	0.00
51	11.2	-	51	9.0	-	51	8.3	-
52	14.1	-	52	7.1	-	52	9.5	-
53	19.8	-	53	5.9	-	53	6.9	-
54	14.6	-	54	12.1	-	54	6.1	-
55	7.1	-	55	20.6	-	55	6.2	-
56	12.3	-	56	8.1	-	56	16.2	-
57	2.4	-	57	8.7	-	57	10.1	-
58	8.0	-	58	8.1	-	58	7.5	-
59	11.9	-	59	3.4	-	59	2.5	-
60	5.1	0.5	60	7.2	0	60	20.5	0.25
61	8.5	-	61	6.6	-	61	7.4	-
62	5.3	-	62	11.2	-	62	19.2	-
63	6.6	-	63	3.7	-	63	6.1	-
64	20.8	-	64	11.2	-	64	5.2	-
65	4.1	-	65	3.6	-	65	3.5	-
66	7.3	-	66	5.1	-	66	2.4	-
67	7.3	-	67	0.8	-	67	6.9	-
68	12.4	-	68	5.0	-	68	4.3	-
69	15.9	-	69	7.1	-	69	7.7	-
70	12.5	0	70	5.6	0.25	70	6.6	0.25
71	15.2	-	71	7.6	-	71	4.7	-
72	10.8	-	72	17.9	-	72	4.5	-
73	8.4	-	73	7.2	-	73	12.3	-
74	11.2	-	74	8.6	-	74	10.1	-
75	6.0	-	75	9.4	-	75	5.1	-
76	8.5	-	76	11.4	-	76	5.0	-
77	7.4	-	77	7.6	-	77	6.1	-
78	8.3	-	78	2.7	-	78	8.4	-
79	13.2	-	79	5.9	-	79	4.5	-
80	16.8	0.75	80	8.2	0.25	80	9.9	0.25
81	8.8	-	81	7.7	-	81	4.4	-
82	7.2	-	82	14.4	-	82	4.5	-
83	7.9	-	83	3.4	-	83	8.1	-
84	9.4	-	84	16.3	-	84	8.1	-
85	10.7	-	85	16.0	-	85	9.3	-
86	6.5	-	86	2.5	-	86	10.2	-
87	7.1	-	87	17.1	-	87	9.5	-
88	13.8	-	88	10.6	-	88	35.8	-
89	8.5	-	89	8.8	-	89	12.5	-
90	11.8	0.75	90	7.8	0	90	1.7	0
91	13.5	-	91	7.4	-	91	5.1	-
92	8.7	-	92	9.1	-	92	8.9	-
93	9.6	-	93	8.2	-	93	4.1	-
94	14.0	-	94	1.9	-	94	4.9	-
95	7.2	-	95	5.9	-	95	6.7	-
96	5.5	-	96	4.9	-	96	9.2	-
97	7.3	-	97	7.7	-	97	9.8	-
98	12.7	-	98	5.6	-	98	8.1	-
99	21.1	-	99	14.5	-	99	4.5	-
100	8.5	0	100	5.6	0.50	100	9.6	0
Minimum	**2.4**	**0.0**	**Minimum**	**0.8**	**0.0**	**Minimum**	**1.7**	**0.0**
Maximum	**33.8**	**0.75**	**Maximum**	**22.0**	**0.50**	**Maximum**	**35.8**	**0.75**
Mean	**9.7**	**0.30**	**Mean**	**9.9**	**0.20**	**Mean**	**7.7**	**0.23**
Standard Dev.	**4.6**	**0.31**	**Standard Dev.**	**4.8**	**0.20**	**Standard Dev.**	**4.5**	**0.30**
Geometric mean	**8.9**	**-**	**Geometric mean**	**8.7**	**-**	**Geometric mean**	**6.8**	**-**
Median	**8.5**	**0.25**	**Median**	**8.7**	**0.25**	**Median**	**6.9**	**0.13**

Table F.13: Calcite and Pebble Count at RG_FOUKI, FRO LAEMP, June 2019

RG_FOUKI 1			RG_FOUKI 2			RG_FOUKI 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	6.1	-	1	28.3	-	1	4.3	-
2	6.8	-	2	10.7	-	2	10.7	-
3	7.1	-	3	4.3	-	3	8.5	-
4	13.5	-	4	6.2	-	4	5.2	-
5	10.9	-	5	12.8	-	5	3.3	-
6	3.3	-	6	12.6	-	6	4.9	-
7	5.9	-	7	11.4	-	7	7.6	-
8	4.5	-	8	7.9	-	8	3.8	-
9	5.6	-	9	3.8	-	9	36.7	-
10	9.5	0.25	10	7.6	0	10	16.1	0.75
11	3.6	-	11	9.3	-	11	Gravel	-
12	10.5	-	12	17.8	-	12	6.5	-
13	9.7	-	13	9.1	-	13	Gravel	-
14	4.9	-	14	4.6	-	14	31.8	-
15	5.5	-	15	5.4	-	15	9.5	-
16	30.5	-	16	10.0	-	16	3.0	-
17	7.2	-	17	8.2	-	17	9.2	-
18	16.4	-	18	5.9	-	18	6.5	-
19	10.3	-	19	5.3	-	19	5.4	-
20	5.4	0	20	6.0	0	20	6.2	0
21	8.9	-	21	13.1	-	21	11.1	-
22	3.7	-	22	2.5	-	22	9.2	-
23	4.5	-	23	13.4	-	23	11.5	-
24	5.3	-	24	18.5	-	24	9.4	-
25	7.5	-	25	9.6	-	25	5.1	-
26	4.2	-	26	8.4	-	26	5.2	-
27	9.8	-	27	10.4	-	27	9.2	-
28	6.5	-	28	7.2	-	28	4.5	-
29	5.1	-	29	6.4	-	29	16.5	-
30	6.4	0	30	19.7	0	30	4.8	0.25
31	11.4	-	31	5.1	-	31	6.8	-
32	Gravel	-	32	3.4	-	32	67.3	-
33	4.4	-	33	11.6	-	33	30.5	-
34	4.6	-	34	5.3	-	34	1.5	-
35	2.5	-	35	5.4	-	35	4.4	-
36	11.5	-	36	14.4	-	36	7.2	-
37	4.6	-	37	6.3	-	37	21.8	-
38	6.2	-	38	12.0	-	38	9.1	-
39	4.9	-	39	9.3	-	39	6.9	-
40	15.3	0.25	40	10.1	0	40	7.4	0
41	9.4	-	41	8.5	-	41	10.2	-
42	10.7	-	42	16.5	-	42	6.4	-
43	9.3	-	43	4.4	-	43	6.1	-
44	7.5	-	44	11.6	-	44	19.8	-
45	14.1	-	45	4.2	-	45	13.0	-
46	45.6	-	46	4.4	-	46	7.1	-
47	7.8	-	47	19.6	-	47	7.5	-
48	11.1	-	48	3.1	-	48	5.1	-
49	7.2	-	49	3.1	-	49	11.3	-
50	9.2	0.50	50	7.1	0.25	50	17.6	0.75
51	5.9	-	51	10.6	-	51	10.7	-
52	8.9	-	52	3.6	-	52	7.2	-
53	7.6	-	53	19.3	-	53	13.1	-
54	4.1	-	54	10.5	-	54	9.9	-
55	10.6	-	55	5.6	-	55	7.1	-
56	7.9	-	56	8.3	-	56	40.2	-
57	13.4	-	57	24.4	-	57	3.9	-
58	9.2	-	58	7.7	-	58	38.0	-
59	12.4	-	59	12.6	-	59	6.2	-
60	7.9	0.25	60	6.6	0	60	10.2	0
61	13.2	-	61	14.3	-	61	9.1	-
62	7.4	-	62	9.4	-	62	5.4	-
63	1.6	-	63	11.6	-	63	3.7	-
64	8.2	-	64	6.1	-	64	6.6	-
65	7.1	-	65	9.4	-	65	6.5	-
66	12.6	-	66	10.4	-	66	6.9	-
67	2.0	-	67	12.3	-	67	4.6	-
68	6.3	-	68	Gravel	-	68	1.9	-
69	7.5	-	69	10.2	-	69	12.7	-
70	8.0	0	70	5.4	0.75	70	7.6	0
71	10.9	-	71	7.4	-	71	7.9	-
72	5.6	-	72	7.6	-	72	6.7	-
73	5.1	-	73	5.6	-	73	6.2	-
74	5.2	-	74	4.2	-	74	2.2	-
75	6.5	-	75	14.3	-	75	4.9	-
76	11.5	-	76	8.9	-	76	4.4	-
77	5.5	-	77	26.0	-	77	7.2	-
78	5.8	-	78	14.9	-	78	2.9	-
79	5.7	-	79	9.4	-	79	4.3	-
80	6.1	0.75	80	19.5	0.25	80	4.8	0
81	4.2	-	81	12.5	-	81	4.1	-
82	8.6	-	82	9.1	-	82	54.1	-
83	9.7	-	83	7.6	-	83	Gravel	-
84	6.9	-	84	6.8	-	84	Sand	-
85	6.0	-	85	6.6	-	85	Sand	-
86	7.5	-	86	4.6	-	86	7.1	-
87	4.4	-	87	4.9	-	87	6.9	-
88	6.3	-	88	10.1	-	88	33.1	-
89	8.4	-	89	6.9	-	89	7.2	-
90	5.4	0.00	90	12.5	0	90	13.5	0.5
91	4.5	-	91	9.4	-	91	7.4	-
92	10.6	-	92	16.5	-	92	4.1	-
93	6.7	-	93	14.4	-	93	30.5	-
94	6.8	-	94	3.4	-	94	10.3	-
95	4.2	-	95	9.8	-	95	7.5	-
96	6.1	-	96	10.1	-	96	4.5	-
97	6.1	-	97	9.9	-	97	2.3	-
98	4.6	-	98	3.2	-	98	3.7	-
99	2.5	-	99	5.8	-	99	1.4	-
100	Gravel	0	100	10.0	0.25	100	8.6	0
Minimum	**1.6**	**0.0**	**Minimum**	**2.5**	**0.0**	**Minimum**	**1.4**	**0.0**
Maximum	**45.6**	**0.75**	**Maximum**	**28.3**	**0.75**	**Maximum**	**67.3**	**0.75**
Mean	**8.0**	**0.20**	**Mean**	**9.6**	**0.15**	**Mean**	**10.5**	**0.23**
Standard Dev.	**5.4**	**0.26**	**Standard Dev.**	**5.1**	**0.24**	**Standard Dev.**	**11.0**	**0.32**
Geometric mean	**7.0**	**-**	**Geometric mean**	**8.4**	**-**	**Geometric mean**	**7.7**	**-**
Median	**6.9**	**0.13**	**Median**	**9.1**	**0.0**	**Median**	**7.1**	**0.00**

Table F.14: **Calcite and Pebble Count at RG_FOBKS, FRO LAEMP, June 2019**

RG_FOBKS 1			RG_FOBKS 2			RG_FOBKS 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	4.5	-	1	13.0	-	1	6.0	-
2	11.0	-	2	5.0	-	2	8.0	-
3	8.0	-	3	4.0	-	3	Sand	-
4	3.0	-	4	3.0	-	4	2.5	-
5	4.5	-	5	4.0	-	5	Sand	-
6	23.0	-	6	9.5	-	6	0.5	-
7	10.0	-	7	6.0	-	7	2.5	-
8	12.0	-	8	3.0	-	8	2.0	-
9	14.5	-	9	Sand	-	9	Sand	-
10	15.0	0	10	7.0	0	10	6.0	0.25
11	7.0	-	11	7.0	-	11	14.0	-
12	7.5	-	12	7.0	-	12	4.0	-
13	13.5	-	13	11.0	-	13	14.5	-
14	21.0	-	14	18.0	-	14	10.5	-
15	8.5	-	15	6.0	-	15	6.0	-
16	21.0	-	16	13.5	-	16	14.0	-
17	19.5	-	17	14.0	-	17	12.0	-
18	6.0	-	18	17.5	-	18	29.0	-
19	19.5	-	19	4.0	-	19	4.5	-
20	12.0	0	20	12.0	-	20	14.0	0
21	5.0	-	21	5.0	0	21	16.0	-
22	15.0	-	22	9.5	-	22	13.5	-
23	5.5	-	23	14.0	-	23	6.0	-
24	10.5	-	24	18.5	-	24	19.5	-
25	12.5	-	25	3.5	-	25	21.0	-
26	20.0	-	26	16.5	-	26	8.0	-
27	27.5	-	27	5.0	-	27	14.0	-
28	7.0	-	28	9.0	-	28	12.0	-
29	5.5	-	29	13.0	-	29	8.5	-
30	19.0	0	30	3.0	0.25	30	Sand	-
31	23.0	-	31	7.6	-	31	6.0	-
32	2.5	-	32	3.0	-	32	Sand	-
33	4.5	-	33	4.0	-	33	Sand	-
34	4.5	-	34	12.0	-	34	2.0	-
35	10.5	-	35	12.0	-	35	5.0	-
36	5.0	-	36	6.0	-	36	12.5	-
37	7.0	-	37	7.5	-	37	3.0	-
38	6.5	-	38	15.0	-	38	17.0	-
39	4.0	-	39	3.5	-	39	13.0	-
40	6.0	0.5	40	8.0	0	40	10.0	0
41	13.0	-	41	9.5	-	41	15.0	-
42	12.0	-	42	7.0	-	42	13.5	-
43	6.0	-	43	8.0	-	43	14.0	-
44	4.0	-	44	9.0	-	44	3.0	-
45	7.5	-	45	8.0	-	45	2.0	-
46	9.5	-	46	11.0	-	46	19.5	-
47	1.0	-	47	14.0	-	47	15.0	-
48	3.0	-	48	6.0	-	48	12.5	-
49	Sand	-	49	3.5	-	49	3.0	-
50	11.0	0	50		0	50	7.0	0
51	13.0	-	51	3.0	-	51	14.0	-
52	19.5	-	52	Sand	-	52	5.0	-
53	13.0	-	53	4.0	-	53	2.5	-
54	5.0	-	54	25.0	-	54	3.0	-
55	1.5	-	55	16.0	-	55	1.0	-
56	5.0	-	56	14.0	-	56	2.0	-
57	14.0	-	57	18.0	-	57	Sand	-
58	12.0	-	58	4.5	-	58	2.5	-
59	8.0	-	59	Sand	-	59	1.0	-
60	Sand	-	60	3.0	0.25	60	7.5	0
61	16.0	-	61	13.0	-	61	8.5	-
62	3.0	-	62	10.0	-	62	10.0	-
63	0.5	-	63	8.0	-	63	10.0	-
64	4.0	-	64	22.0	-	64	12.5	-
65	8.0	-	65	7.0	-	65	8.5	-
66	7.5	-	66	9.5	-	66	14.0	-
67	3.0	-	67	27.0	-	67	13.5	-
68	Sand	-	68	11.0	-	68	17.0	-
69	1.0	-	69	14.0	-	69	13.0	-
70	24.0	0.25	70	15.0	0	70	8.5	0
71	3.0	-	71	4.0	-	71	4.5	-
72	4.5	-	72	4.5	-	72	10.0	-
73	18.0	-	73	13.0	-	73	6.0	-
74	10.0	-	74	14.0	-	74	10.0	-
75	8.0	-	75	30.0	-	75	2.0	-
76	10.5	-	76	7.5	-	76	Sand	-
77	Sand	-	77	24.5	-	77	1.0	-
78	1.0	-	78	16.0	-	78	16.0	-
79	6.0	-	79	5.5	-	79	15.0	-
80	8.5	0	80	18.0	0	80	9.0	0
81	Sand	-	81	4.5	-	81	5.5	-
82	2.0	-	82	12.0	-	82	22.0	-
83	14.0	-	83	11.0	-	83	9.5	-
84	7.0	-	84	8.0	-	84	19.0	-
85	Sand	-	85	14.5	-	85	10.0	-
86	0.5	-	86	5.5	-	86	5.5	-
87	25.0	-	87	8.0	-	87	21.0	-
88	Sand	-	88	Sand	-	88	11.0	-
89	7.0	-	89	5.0	-	89	4.3	-
90	4.5	0	90	18.5	0	90	9.5	0
91	4.0	-	91	16.0	-	91	16.0	-
92	5.0	-	92	14.0	-	92	9.0	-
93	8.5	-	93	4.5	-	93	4.0	-
94	7.0	-	94	19.0	-	94	2.0	-
95	Sand	-	95	11.0	-	95	2.0	-
96	3.5	-	96	9.5	-	96	2.5	-
97	6.0	-	97	10.0	-	97	6.0	-
98	7.5	-	98	22.0	-	98	5.0	-
99	28.0	-	99	14.0	-	99	14.0	-
100	11.5	0	100	29.5	0	100	9.5	0
Minimum	**0.5**	**0.0**	**Minimum**	**3.0**	**0.0**	**Minimum**	**0.5**	**0.0**
Maximum	**28.0**	**0.50**	**Maximum**	**30**	**0.25**	**Maximum**	**29.0**	**0.25**
Mean	**9.5**	**0.08**	**Mean**	**10.7**	**0.05**	**Mean**	**9.3**	**0.03**
Standard Dev.	**6.6**	**0.18**	**Standard Dev.**	**6.3**	**0.11**	**Standard Dev.**	**5.9**	**0.08**
Geometric mean	**7.2**	**-**	**Geometric mean**	**9.0**	**-**	**Geometric mean**	**7.1**	**-**
Median	**7.5**	**0.0**	**Median**	**9.5**	**0.0**	**Median**	**9.0**	**0.0**

Table F.15: Calcite and Pebble Count at RG_FOBSC, FRO LAEMP, June 2019

RG_FOBSC 1			RG_FOBSC 1			RG_FOBSC 2			RG_FOBSC 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	18.0	-	1	Sand	-	1	1.5	-	1	8.5	-
2	5.5	-	2	3.0	-	2	3.0	-	2	3.0	-
3	9.5	-	3	4.0	-	3	5.0	-	3	4.0	-
4	18.5	-	4	2.0	-	4	2.5	-	4	4.0	-
5	4.5	-	5	Gravel	-	5	5.0	-	5	20.0	-
6	4.0	-	6	8.0	-	6	6.5	-	6	4.5	-
7	14.0	-	7	4.0	-	7	7.0	-	7	9.0	-
8	7.0	-	8	6.5	-	8	2.5	-	8	6.0	-
9	5.5	-	9	18.5	-	9	6.5	-	9	Gravel	-
10	5.0	0.50	10	5.0	0	10	4.0	0	10	5.5	0.50
11	2.5	-	11	4.5	-	11	5.0	-	11	7.0	-
12	4.2	-	12	4.0	-	12	3.0	-	12	6.0	-
13	5.5	-	13	4.0	-	13	Sand	-	13	6.0	-
14	4.0	-	14	2.5	-	14	2.0	-	14	5.5	-
15	12.0	-	15	Gravel	-	15	Sand	-	15	14.0	-
16	17.0	-	16	3.0	-	16	Gravel	-	16	9.0	-
17	4.0	-	17	3.5	-	17	5.5	-	17	7.5	-
18	3.0	-	18	6.0	-	18	4.0	-	18	9.5	-
19	2.5	-	19	5.5	-	19	3.0	-	19	13.0	-
20	8.0	0.25	20	3.0	0	20	2.0	0	20	9.0	0.25
21	3.0	-	21	11.0	-	21	12.0	-	21	6.5	-
22	3.5	-	22	6.0	-	22	21.0	-	22	7.5	-
23	4.5	-	23	16.5	-	23	12.0	-	23	11.0	-
24	5.5	-	24	6.5	-	24	18.0	-	24	13.0	-
25	4.5	-	25	13.0	-	25	4.0	-	25	14.0	-
26	4.0	-	26	Gravel	-	26	5.5	-	26	8.5	-
27	14.5	-	27	11.5	-	27	12.0	-	27	18.0	-
28	7.0	-	28	15.0	-	28	17.5	-	28	9.0	-
29	6.5	-	29	6.0	-	29	11.0	-	29	5.0	-
30	15.8	0.75	30	Gravel	0	30	17.0	0.25	30	15.0	0.50
31	5.0	-	31	16.0	-	31	4.0	-	31	11.0	-
32	3.5	-	32	9.0	-	32	9.5	-	32	9.0	-
33	2.0	-	33	16.0	-	33	4.5	-	33	8.0	-
34	1.5	-	34	5.0	-	34	6.0	-	34	8.0	-
35	7.0	-	35	4.5	-	35	6.0	-	35	6.0	-
36	3.5	-	36	6.0	-	36	4.0	-	36	4.0	-
37	2.5	-	37	6.0	-	37	7.0	-	37	Gravel	-
38	6.0	-	38	5.5	-	38	4.0	-	38	4.0	-
39	4.5	-	39	4.0	-	39	5.0	-	39	4.0	-
40	18.5	1.0	40	9.0	0.25	40	7.0	0	40	4.5	0
41	5.5	-	41	7.0	-	41	5.0	-	41	2.0	-
42	4.0	-	42	4.0	-	42	17.0	-	42	5.0	-
43	6.0	-	43	11.0	-	43	8.5	-	43	3.0	-
44	5.0	-	44	5.0	-	44	9.0	-	44	4.5	-
45	37.5	-	45	10.0	-	45	7.0	-	45	12.0	-
46	10.0	-	46	2.0	-	46	14.5	-	46	7.0	-
47	3.0	-	47	29.0	-	47	13.0	-	47	8.5	-
48	4.5	-	48	21.0	-	48	6.0	-	48	6.0	-
49	7.0	-	49	7.0	-	49	4.0	-	49	8.0	-
50	7.0	0.75	50	5.0	0	50	7.0	0.25	50	15.0	0
51	4.5	-	51	12.0	-	51	9.0	-	51	12.0	-
52	5.5	-	52	18.0	-	52	7.5	-	52	19.0	-
53	4.5	-	53	22.0	-	53	7.5	-	53	24.0	-
54	5.5	-	54	14.0	-	54	18.0	-	54	16.0	-
55	11.5	-	55	13.5	-	55	12.0	-	55	14.5	-
56	7.5	-	56	7.0	-	56	11.0	-	56	5.5	-
57	12.0	-	57	8.0	-	57	5.0	-	57	9.0	-
58	7.0	-	58	9.0	-	58	29.0	-	58	7.5	-
59	6.5	-	59	16.0	-	59	24.0	-	59	8.0	-
60	13.0	0.50	60	19.0	0	60	27.0	0.50	60	32.5	0.75
61	5.5	-	61	18.0	-	61	32.0	-	61	13.0	-
62	4.0	-	62	16.0	-	62	25.0	-	62	19.5	-
63	2.5	-	63	8.0	-	63	12.0	-	63	28.0	-
64	4.0	-	64	Sand	-	64	19.0	-	64	14.5	-
65	3.0	-	65	Sand	-	65	4.5	-	65	5.0	-
66	5.9	-	66	18.0	-	66	Gravel	-	66	7.0	-
67	9.5	-	67	5.0	-	67	26.0	-	67	4.5	-
68	4.0	-	68	11.0	-	68	9.5	-	68	Sand	-
69	5.5	-	69	13.0	-	69	21.0	-	69	6.0	-
70	13.5	0	70	11.0	0.25	70	10.0	0	70	12.0	0
71	7.0	-	71	8.0	-	71	7.0	-	71	9.0	-
72	5.5	-	72	62.0	-	72	6.0	-	72	12.0	-
73	4.0	-	73	27.0	-	73	3.0	-	73	18.5	-
74	9.0	-	74	6.0	-	74	41.0	-	74	14.5	-
75	6.0	-	75	5.0	-	75	2.5	-	75	6.5	-
76	Sand	-	76	4.0	-	76	2.5	-	76	33.5	-
77	4.5	-	77	12.0	-	77	17.0	-	77	5.0	-
78	6.0	-	78	7.5	-	78	4.0	-	78	9.0	-
79	12.0	-	79	9.0	-	79	7.0	-	79	8.0	-
80	8.0	0	80	6.5	0	80	16.0	0	80	12.0	0.25
81	8.0	-	81	4.5	-	81	18.0	-	81	10.0	-
82	5.0	-	82	17.0	-	82	7.5	-	82	3.0	-
83	9.0	-	83	21.0	-	83	5.0	-	83	Gravel	-
84	17.5	-	84	14.0	-	84	14.0	-	84	7.0	-
85	9.5	-	85	3.5	-	85	32.0	-	85	6.5	-
86	9.5	-	86	Sand	-	86	6.5	-	86	7.0	-
87	3.5	-	87	9.0	-	87	23.0	-	87	6.5	-
88	16.5	-	88	23.0	-	88	18.0	-	88	12.5	-
89	7.5	-	89	13.0	-	89	17.0	-	89	7.0	-
90	10.0	0	90	6.0	0.50	90	35.0	0.50	90	3.5	0
91	28.0	-	91	7.5	-	91	22.0	-	91	18.0	-
92	6.5	-	92	13.0	-	92	12.0	-	92	6.0	-
93	6.0	-	93	18.5	-	93	2.0	-	93	13.5	-
94	1.5	-	94	6.0	-	94	13.0	-	94	11.5	-
95	4.5	-	95	8.0	-	95	7.0	-	95	5.5	-
96	6.5	-	96	4.5	-	96	Sand	-	96	4.0	-
97	5.0	-	97	4.0	-	97	6.5	-	97	5.0	-
98	6.5	-	98	2.5	-	98	24.0	-	98	12.0	-
99	3.5	-	99	4.0	-	99	9.0	-	99	17.0	-
100	7.0	0	100	15.0	0.75	100	18.0	0.25	100	5.5	0.25
Minimum	**1.5**	**0.0**	**Minimum**	**2.0**	**0.0**	**Minimum**	**1.5**	**0.0**	**Minimum**	**2.0**	**0.0**
Maximum	**37.5**	**1.0**	**Maximum**	**62.0**	**0.75**	**Maximum**	**41.0**	**0.50**	**Maximum**	**33.5**	**0.75**
Mean	**7.4**	**0.38**	**Mean**	**10.2**	**0.18**	**Mean**	**11.1**	**0.18**	**Mean**	**9.7**	**0.25**
Standard Dev.	**5.5**	**0.38**	**Standard Dev.**	**8.1**	**0.26**	**Standard Dev.**	**8.5**	**0.21**	**Standard Dev.**	**6.0**	**0.26**
Geometric mean	**6.1**	**-**	**Geometric mean**	**8.1**	**-**	**Geometric mean**	**8.4**	**-**	**Geometric mean**	**8.3**	**-**
Median	**5.5**	**0.38**	**Median**	**7.8**	**0.0**	**Median**	**7.5**	**0.13**	**Median**	**8.0**	**0.25**

Table F.16: Calcite and Pebble Count at RG_FOBCP, FRO LAEMP, June 2019

RG_FOBCP 1			RG_FOBCP 2			RG_FOBCP 3		
Rock	**Intermediate Axis (cm)**	**Embeddedness**	**Rock**	**Intermediate Axis (cm)**	**Embeddedness**	**Rock**	**Intermediate Axis (cm)**	**Embeddedness**
1	12.0	-	1	5.5	-	1	13.5	-
2	10.5	-	2	10.5	-	2	8.0	-
3	6.0	-	3	9.0	-	3	11.0	-
4	7.5	-	4	8.5	-	4	12.5	-
5	4.5	-	5	3.5	-	5	8.5	-
6	11.0	-	6	14.0	-	6	17.0	-
7	12.0	-	7	21.0	-	7	11.5	-
8	11.0	-	8	17.0	-	8	13.0	-
9	12.0	-	9	4.0	-	9	19.0	-
10	16.0	0.50	10	11.5	0	10	7.0	0.50
11	3.5	-	11	13.0	-	11	11.5	-
12	21.0	-	12	9.0	-	12	11.5	-
13	10.5	-	13	11.0	-	13	13.0	-
14	10.0	-	14	17.5	-	14	7.5	-
15	3.0	-	15	6.5	-	15	9.0	-
16	3.5	-	16	9.0	-	16	15.5	-
17	4.0	-	17	5.5	-	17	17.0	-
18	12.5	-	18	5.5	-	18	14.0	-
19	11.0	-	19	5.0	-	19	13.0	-
20	15.0	0	20	17.0	0.25	20	10.5	0.25
21	14.0	-	21	13.0	-	21	12.5	-
22	17.0	-	22	6.0	-	22	13.0	-
23	9.5	-	23	7.5	-	23	16.0	-
24	11.0	-	24	10.0	-	24	8.0	-
25	22.0	-	25	14.0	-	25	9.5	-
26	14.0	-	26	Gravel	-	26	4.5	-
27	11.0	-	27	8.5	-	27	12.5	-
28	6.5	-	28	6.0	-	28	5.5	-
29	13.0	-	29	3.5	-	29	4.5	-
30	4.5	0	30	Gravel	0	30	13.5	0.25
31	8.0	-	31	13.0	-	31	5.5	-
32	20.5	-	32	11.5	-	32	8.0	-
33	25.0	-	33	7.0	-	33	15.0	-
34	4.5	-	34	10.0	-	34	13.5	-
35	16.0	-	35	14.5	-	35	12.0	-
36	6.0	-	36	11.0	-	36	12.0	-
37	18.0	-	37	4.5	-	37	10.0	-
38	12.5	-	38	Gravel	-	38	13.0	-
39	11.0	-	39	14.0	-	39	Gravel	-
40		0.25	40	13.0	0	40	17.0	0.25
41	14.5	-	41	6.0	-	41	6.0	-
42	8.0	-	42	7.5	-	42	7.0	-
43	6.5	-	43	9.0	-	43	9.5	-
44	5.0	-	44	5.0	-	44	11.0	-
45	23.0	-	45	5.0	-	45	5.0	-
46	6.0	-	46	13.0	-	46	3.5	-
47	11.0	-	47	18.5	-	47	6.0	-
48	7.5	-	48	3.5	-	48	15.0	-
49	4.0	-	49	7.0	-	49	3.0	-
50	14.0	0	50	6.5	0.50	50	16.0	0
51	4.5	-	51	5.5	-	51	19.0	-
52	14.0	-	52	12.5	-	52	4.0	-
53	11.0	-	53	11.0	-	53	17.0	-
54	12.5	-	54	13.5	-	54	14.5	-
55	9.0	-	55	7.0	-	55	15.0	-
56	13.5	-	56	Gravel	-	56	10.0	-
57	26.0	-	57	2.5	-	57	11.0	-
58	32.0	-	58	4.0	-	58	14.5	-
59	3.5	-	59	10.5	-	59	13.0	-
60	5.0	0	60	11.5	0.50	60	7.0	0.50
61	17.0	-	61	13.0	-	61	34.0	-
62	11.0	-	62	14.5	-	62	6.5	-
63	15.0	-	63	16.0	-	63	7.5	-
64	17.0	-	64	15.0	-	64	9.0	-
65	3.0	-	65	12.5	-	65	8.5	-
66	17.0	-	66	13.0	-	66	Gravel	-
67	18.0	-	67	7.5	-	67	3.0	-
68	8.0	-	68	4.0	-	68	2.5	-
69	9.0	-	69	23.0	-	69	Sand	-
70	16.0	0.75	70	4.0	0	70	11.0	0
71	14.0	-	71	18.0	-	71	8.5	-
72	12.0	-	72	15.0	-	72	7.5	-
73	13.0	-	73	10.0	-	73	6.5	-
74	19.5	-	74	27.0	-	74	14.0	-
75	21.0	-	75	16.0	-	75	18.0	-
76	3.0	-	76	6.0	-	76	Sand	-
77	4.5	-	77	4.5	-	77	11.0	-
78	7.0	-	78	16.0	-	78	7.0	-
79	24.0	-	79	13.0	-	79	10.5	-
80	16.0	0.50	80	1.5	0	80	4.5	0.75
81	8.5	-	81	6.5	-	81	14.0	-
82	3.0	-	82	11.0	-	82	8.0	-
83	15.0	-	83	7.5	-	83	9.5	-
84	3.5	-	84	7.0	-	84	6.0	-
85	10.0	-	85	6.5	-	85	24.0	-
86	9.5	-	86	13.0	-	86	15.0	-
87	10.0	-	87	3.0	-	87	Gravel	-
88	4.0	-	88	5.5	-	88	17.0	-
89	23.0	-	89	10.0	-	89	2.0	-
90	25.5	0	90	15.0	0	90	10.0	0
91	8.5	-	91	3.5	-	91	4.5	-
92	10.0	-	92	12.0	-	92	9.0	-
93	26.0	-	93	4.0	-	93	14.0	-
94	Gravel	-	94	4.5	-	94	9.5	-
95	4.0	-	95	13.5	-	95	2.5	-
96	17.0	-	96	10.0	-	96	8.0	-
97	18.0	-	97	4.5	-	97	2.5	-
98	13.0	-	98	7.0	-	98	7.0	-
99	Gravel	-	99	8.5	-	99	Sand	-
100	34.0	0	100	8.0	0	100	12.0	0
Minimum	**3.0**	**0.0**	**Minimum**	**1.5**	**0.0**	**Minimum**	**2.0**	**0.0**
Maximum	**34.0**	**0.75**	**Maximum**	**27.0**	**0.50**	**Maximum**	**34.0**	**0.75**
Mean	**12.1**	**0.20**	**Mean**	**9.8**	**0.13**	**Mean**	**10.6**	**0.25**
Standard Dev.	**6.7**	**0.28**	**Standard Dev.**	**4.9**	**0.21**	**Standard Dev.**	**5.1**	**0.26**
Geometric mean	**10.3**	**-**	**Geometric mean**	**8.5**	**-**	**Geometric mean**	**9.4**	**-**
Median	**11.0**	**0.0**	**Median**	**9.0**	**0.0**	**Median**	**10.5**	**0.25**

Table F.17: Calcite and Pebble Count at RG_FRCP1SW1, FRO LAEMP, June 2019

RG_FRCP1SW 1			RG_FRCP1SW 2			RG_FRCP1SW 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	7.2	-	1	11.5	-	1	2.5	-
2	6.6	-	2	2.0	-	2	6.0	-
3	9.3	-	3	Gravel	-	3	3.0	-
4	5.4	-	4	11.0	-	4	3.0	-
5	3.9	-	5	18.0	-	5	3.0	-
6	5.6	-	6	11.0	-	6	6.5	-
7	4.3	-	7	4.0	-	7	4.0	-
8	5.2	-	8	10.5	-	8	5.0	-
9	7.5	-	9	Gravel	-	9	6.0	-
10	9.6	0	10	10.5	0.25	10	6.0	0
11	8.2	-	11	9.5	-	11	4.0	-
12	4.4	-	12	6.0	-	12	5.5	-
13	8.6	-	13	10.0	-	13	6.0	-
14	9.3	-	14	6.5	-	14	6.5	-
15	5.3	-	15	5.0	-	15	5.0	-
16	5.8	-	16	6.5	-	16	3.0	-
17	9.2	-	17	3.5	-	17	5.5	-
18	7.1	-	18	7.5	-	18	6.0	-
19	7.5	-	19	8.0	-	19	6.0	-
20	9.0	0.25	20	7.0	1.0	20	7.0	0.50
21	7.5	-	21	10.0	-	21	4.5	-
22	7.4	-	22	14.5	-	22	5.5	-
23	8.2	-	23	7.0	-	23	4.0	-
24	6.5	-	24	6.5	-	24	3.5	-
25	5.2	-	25	4.0	-	25	4.5	-
26	5.9	-	26	9.0	-	26	4.0	-
27	4.3	-	27	Gravel	-	27	5.5	-
28	6.3	-	28	3.0	-	28	6.0	-
29	4.3	-	29	4.0	-	29	4.5	-
30	12.1	0.25	30	14.0	0.25	30	6.0	0.50
31	5.8	-	31	5.5	-	31	5.5	-
32	4.2	-	32	10.0	-	32	10.0	-
33	3.3	-	33	Gravel	-	33	6.5	-
34	2.9	-	34	1.5	-	34	5.0	-
35	3.5	-	35	3.5	-	35	2.5	-
36	4.1	-	36	2.5	-	36	Gravel	-
37	6.6	-	37	14.0	-	37	7.5	-
38	5.9	-	38	7.5	-	38	Gravel	-
39	3.8	-	39	Sand	-	39	10.0	-
40	3.6	0	40	9.5	0.25	40	10.5	0
41	6.5	-	41	7.0	-	41	4.5	-
42	7.5	-	42	8.0	-	42	2.5	-
43	5.4	-	43	Sand	-	43	9.0	-
44	7.4	-	44	2.0	-	44	6.5	-
45	6.0	-	45	3.5	-	45	5.0	-
46	7.9	-	46	3.0	-	46	7.0	-
47	3.1	-	47	7.5	-	47	5.0	-
48	6.7	-	48	11.0	-	48	6.5	-
49	13.1	-	49	13.0	-	49	3.5	-
50	4.0	0.75	50	7.0	0.50	50	2.5	0.25
51	4.3	-	51	12.0	-	51	8.0	-
52	7.1	-	52	10.0	-	52	4.0	-
53	6.2	-	53	12.5	-	53	3.5	-
54	4.6	-	54	7.5	-	54	Sand	-
55	9.8	-	55	6.0	-	55	Sand	-
56	6.7	-	56	9.0	-	56	Sand	-
57	5.8	-	57	11.5	-	57	Gravel	-
58	7.5	-	58	12.0	-	58	5.5	-
59	7.9	-	59	Gravel	-	59	7.0	-
60	4.5	0.00	60	7.0	0	60	6.5	0.5
61	8.4	-	61	7.5	-	61	8.5	-
62	6.5	-	62	4.0	-	62	12.0	-
63	2.5	-	63	7.5	-	63	4.0	-
64	5.4	-	64	8.0	-	64	7.5	-
65	8.2	-	65	4.0	-	65	10.0	-
66	9.3	-	66	6.5	-	66	7.5	-
67	8.4	-	67	Gravel	-	67	12.0	-
68	8.9	-	68	14.0	-	68	2.5	-
69	8.6	-	69	11.0	-	69	4.5	-
70	6.1	0.25	70	9.5	0	70	5.0	1.0
71	10.5	-	71	5.0	-	71	4.5	-
72	9.0	-	72	Sand	-	72	4.0	-
73	5.9	-	73	15.0	-	73	5.0	-
74	4.9	-	74	6.5	-	74	4.0	-
75	8.3	-	75	5.0	-	75	3.0	-
76	4.5	-	76	2.5	-	76	4.0	-
77	3.5	-	77	7.5	-	77	4.0	-
78	6.0	-	78	5.0	-	78	3.0	-
79	7.4	-	79	5.5	-	79	3.0	-
80	6.7	0.25	80	6.5	0.25	80	3.0	0.50
81	7.7	-	81	7.0	-	81	3.0	-
82	6.9	-	82	8.0	-	82	4.0	-
83	4.3	-	83	5.5	-	83	4.0	-
84	6.1	-	84	7.0	-	84	5.5	-
85	4.2	-	85	2.0	-	85	5.5	-
86	1.5	-	86	1.5	-	86	6.0	-
87	2.7	-	87	9.0	-	87	12.5	-
88	6.2	-	88	16.0	-	88	11.0	-
89	4.5	-	89	5.0	-	89	4.5	-
90	6.2	0.0	90	Gravel	-	90	4.0	0.5
91	5.7	-	91	9.5	-	91	12.0	-
92	3.9	-	92	9.0	-	92	7.0	-
93	4.9	-	93	4.0	-	93	4.5	-
94	5.4	-	94	3.0	-	94	3.5	-
95	7.2	-	95	3.5	-	95	4.0	-
96	8.0	-	96	5.0	-	96	12.5	-
97	4.3	-	97	7.0	-	97	Gravel	-
98	8.5	-	98	6.0	-	98	6.5	-
99	6.7	-	99	10.5	-	99	4.5	-
100	8.1	0	100	8.5	0.50	100	10.5	0.25
Minimum	**1.5**	**0.0**	**Minimum**	**1.5**	**0.0**	**Minimum**	**2.5**	**0.0**
Maximum	**13.1**	**0.8**	**Maximum**	**18.0**	**1.0**	**Maximum**	**12.5**	**1**
Mean	**6.3**	**0.18**	**Mean**	**7.6**	**0.33**	**Mean**	**5.7**	**0.40**
Standard Dev.	**2.1**	**0.24**	**Standard Dev.**	**3.6**	**0.31**	**Standard Dev.**	**2.5**	**0.29**
Geometric mean	**6.0**	**-**	**Geometric mean**	**6.6**	**-**	**Geometric mean**	**5.2**	**-**
Median	**6.2**	**0.13**	**Median**	**7.0**	**0.25**	**Median**	**5.0**	**0.50**

Table F.18: Table F.23 Calcite and Pebble Count at RG_FRUPO, FRO LAEMP, June 2019

RG_FRUPO 1			RG_FRUPO 2			RG_FRUPO 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	3.4	-	1	6.2	-	1	6.9	-
2	2.1	-	2	5.1	-	2	3.7	-
3	3.4	-	3	5.5	-	3	3.8	-
4	2.5	-	4	6.2	-	4	7.3	-
5	3.8	-	5	4.3	-	5	3.9	-
6	6.1	-	6	7.4	-	6	3.7	-
7	4.6	-	7	3.9	-	7	3.8	-
8	3.1	-	8	2.6	-	8	3.6	-
9	3.2	-	9	8.4	-	9	7.7	-
10	4.5	0	10	9.9	0	10	5.6	0
11	4.1	-	11	5.3	-	11	8.8	-
12	5.6	-	12	6.0	-	12	7.1	-
13	7.8	-	13	7.5	-	13	10.5	-
14	5.6	-	14	7.4	-	14	4.6	-
15	3.4	-	15	11.1	-	15	9.8	-
16	5.2	-	16	4.6	-	16	8.2	-
17	3.3	-	17	10.3	-	17	4.5	-
18	4.5	-	18	7.5	-	18	7.9	-
19	5.1	-	19	8.2	-	19	3.5	-
20	7.1	0	20	13.4	0.75	20	5.4	0.75
21	3.4	-	21	7.7	-	21	8.9	-
22	6.5	-	22	5.2	-	22	4.2	-
23	4.9	-	23	4.1	-	23	1.5	-
24	3.9	-	24	1.4	-	24	3.9	-
25	6.2	-	25	3.5	-	25	2.7	-
26	3.3	-	26	3.1	-	26	3.1	-
27	3.3	-	27	11.5	-	27	8.1	-
28	2.8	-	28	4.2	-	28	7.4	-
29	5.2	-	29	3.5	-	29	4.9	-
30	6.1	0	30	6.5	0	30	5.2	0.50
31	10.6	-	31	16.2	-	31	5.1	-
32	8.5	-	32	9.3	-	32	3.2	-
33	4.6	-	33	11.5	-	33	6.2	-
34	5.0	-	34	10.8	-	34	6.3	-
35	6.0	-	35	8.1	-	35	5.6	-
36	6.7	-	36	7.9	-	36	5.2	-
37	3.1	-	37	6.3	-	37	5.1	-
38	4.9	-	38	7.7	-	38	7.2	-
39	2.1	-	39	7.9	-	39	7.2	-
40	1.2	0.50	40	9.9	0.50	40	5.4	0
41	7.5	-	41	4.3	-	41	5.9	-
42	4.4	-	42	4.5	-	42	3.7	-
43	4.5	-	43	6.2	-	43	10.0	-
44	6.1	-	44	5.6	-	44	7.2	-
45	4.6	-	45	4.5	-	45	6.6	-
46	2.2	-	46	8.5	-	46	6.3	-
47	2.6	-	47	6.9	-	47	11.1	-
48	5.2	-	48	8.2	-	48	8.5	-
49	3.6	-	49	11.2	-	49	7.4	-
50	6.6	0	50	11.5	0	50	6.5	0.50
51	5.8	-	51	11.7	-	51	7.5	-
52	3.4	-	52	10.5	-	52	6.8	-
53	3.6	-	53	6.3	-	53	5.2	-
54	2.4	-	54	6.4	-	54	11.9	-
55	2.9	-	55	7.1	-	55	6.8	-
56	1.5	-	56	9.6	-	56	7.1	-
57	1.9	-	57	8.8	-	57	4.4	-
58	2.2	-	58	5.9	-	58	6.4	-
59	2.6	-	59	7.3	-	59	7.4	-
60	3.7	0	60	6.9	0	60	6.9	0
61	5.3	-	61	8.2	-	61	8.5	-
62	4.2	-	62	13.9	-	62	5.3	-
63	4.5	-	63	10.3	-	63	5.2	-
64	2.2	-	64	14.5	-	64	6.5	-
65	2.3	-	65	14.2	-	65	4.2	-
66	3.5	-	66	6.3	-	66	3.7	-
67	5.2	-	67	9.3	-	67	3.5	-
68	6.2	-	68	7.5	-	68	11.1	-
69	9.1	-	69	5.3	-	69	6.3	-
70	6.8	0.50	70	9.1	0	70	9.5	0
71	3.5	-	71	5.2	-	71	5.2	-
72	6.1	-	72	5.1	-	72	2.5	-
73	7.5	-	73	6.5	-	73	5.4	-
74	4.9	-	74	5.2	-	74	8.5	-
75	6.3	-	75	4.1	-	75	10.2	-
76	6.1	-	76	7.7	-	76	3.5	-
77	7.9	-	77	6.2	-	77	3.5	-
78	12.3	-	78	8.9	-	78	3.4	-
79	5.7	-	79	5.8	-	79	5.5	-
80	2.9	0.50	80	9.9	0.50	80	3.2	0.75
81	7.2	-	81	12.7	-	81	9.6	-
82	6.7	-	82	7.5	-	82	7.9	-
83	8.5	-	83	4.8	-	83	5.6	-
84	5.6	-	84	2.5	-	84	6.7	-
85	3.2	-	85	12.7	-	85	5.8	-
86	6.1	-	86	3.8	-	86	4.5	-
87	3.9	-	87	6.5	-	87	5.5	-
88	3.6	-	88	6.6	-	88	6.1	-
89	4.1	-	89	5.1	-	89	6.3	-
90	3.8	0.25	90	9.8	0.25	90	6.4	0
91	3.3	-	91	10.7	-	91	4.5	-
92	5.3	-	92	6.3	-	92	6.6	-
93	7.5	-	93	6.4	-	93	6.9	-
94	5.7	-	94	4.8	-	94	8.4	-
95	2.6	-	95	6.5	-	95	5.8	-
96	2.0	-	96	11.3	-	96	2.5	-
97	5.5	-	97	6.4	-	97	8.9	-
98	2.8	-	98	6.6	-	98	4.6	-
99	2.5	-	99	7.5	-	99	0.4	-
100	1.8	0.50	100	9.5	0.25	100	6.1	0.75
Minimum	**1.2**	**0.0**	**Minimum**	**1.4**	**0.0**	**Minimum**	**0.40**	**0.0**
Maximum	**12.3**	**0.50**	**Maximum**	**16.2**	**0.75**	**Maximum**	**11.9**	**0.75**
Mean	**4.7**	**0.23**	**Mean**	**7.5**	**0.23**	**Mean**	**6.0**	**0.33**
Standard Dev.	**2.0**	**0.25**	**Standard Dev.**	**2.9**	**0.28**	**Standard Dev.**	**2.2**	**0.35**
Geometric mean	**4.3**	**-**	**Geometric mean**	**6.9**	**-**	**Geometric mean**	**5.6**	**-**
Median	**4.5**	**0.13**	**Median**	**7.0**	**0.13**	**Median**	**6.0**	**0.25**

Table F.19: Calcite and Pebble Count at RG_FODPO, FRO LAEMP, June 2019

RG_FODPO 1			RG_FODPO 2			RG_FODPO 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	4.3	-	1	7.2	-	1	4.4	-
2	4.4	-	2	6.7	-	2	4.5	-
3	5.7	-	3	5.4	-	3	7.6	-
4	4.8	-	4	3.4	-	4	6.6	-
5	2.9	-	5	2.0	-	5	3.6	-
6	3.8	-	6	1.8	-	6	3.5	-
7	1.5	-	7	4.0	-	7	3.9	-
8	5.9	-	8	3.1	-	8	5.5	-
9	4.7	-	9	4.5	-	9	5.8	-
10	2.6	0	10	3.5	0.50	10	3.8	0
11	3.0	-	11	5.2	-	11	5.5	-
12	1.8	-	12	3.3	-	12	3.6	-
13	2.5	-	13	3.9	-	13	4.4	-
14	2.3	-	14	5.0	-	14	4.2	-
15	6.8	-	15	4.8	-	15	5.3	-
16	1.9	-	16	2.9	-	16	1.8	-
17	4.4	-	17	4.5	-	17	3.5	-
18	3.2	-	18	3.2	-	18	5.6	-
19	3.7	-	19	5.3	-	19	4.2	-
20	7.9	0	20	4.3	0	20	5.9	0.5
21	3.1	-	21	2.7	-	21	4.2	-
22	1.5	-	22	4.3	-	22	3.8	-
23	4.0	-	23	5.6	-	23	5.7	-
24	4.5	-	24	3.5	-	24	4.1	-
25	7.7	-	25	3.8	-	25	5.9	-
26	2.3	-	26	4.5	-	26	5.1	-
27	3.2	-	27	4.1	-	27	5.7	-
28	5.1	-	28	3.4	-	28	4.2	-
29	4.3	-	29	4.3	-	29	7.5	-
30	7.5	0	30	3.2	0	30	2.4	0
31	4.1	-	31	2.3	-	31	3.5	-
32	2.8	-	32	2.1	-	32	3.6	-
33	3.0	-	33	2.5	-	33	8.6	-
34	6.1	-	34	2.3	-	34	5.8	-
35	4.7	-	35	2.8	-	35	2.3	-
36	3.2	-	36	1.8	-	36	3.2	-
37	2.9	-	37	6.1	-	37	2.1	-
38	4.2	-	38	4.3	-	38	2.9	-
39	4.4	-	39	3.0	-	39	1.2	-
40	2.3	0	40	3.1	0.25	40	7.3	0.50
41	6.3	-	41	5.1	-	41	3.3	-
42	7.1	-	42	4.2	-	42	2.5	-
43	5.2	-	43	4.9	-	43	5.2	-
44	3.5	-	44	4.4	-	44	4.8	-
45	1.8	-	45	3.7	-	45	7.3	-
46	3.9	-	46	3.8	-	46	3.6	-
47	3.1	-	47	3.9	-	47	5.2	-
48	5.0	-	48	4.2	-	48	5.9	-
49	5.4	-	49	4.1	-	49	3.2	-
50	5.8	0.25	50	4.1	0	50	2.3	0
51	3.3	-	51	4.0	-	51	4.9	-
52	3.7	-	52	5.4	-	52	5.9	-
53	2.9	-	53	4.0	-	53	5.1	-
54	1.3	-	54	8.0	-	54	4.3	-
55	1.1	-	55	4.3	-	55	1.8	-
56	7.3	-	56	7.5	-	56	3.1	-
57	4.6	-	57	4.6	-	57	4.0	-
58	6.9	-	58	4.3	-	58	5.4	-
59	3.9	-	59	3.7	-	59	4.4	-
60	4.6	0.75	60	4.1	0	60	5.5	0
61	4.3	-	61	2.4	-	61	5.8	-
62	4.9	-	62	5.5	-	62	7.5	-
63	3.5	-	63	1.6	-	63	4.6	-
64	4.8	-	64	4.2	-	64	6.8	-
65	4.3	-	65	4.0	-	65	4.5	-
66	3.6	-	66	5.1	-	66	5.5	-
67	4.3	-	67	6.3	-	67	5.2	-
68	5.2	-	68	2.4	-	68	5.1	-
69	3.0	-	69	1.8	-	69	9.1	-
70	6.8	0.50	70	5.7	0	70	4.4	0.50
71	6.2	-	71	6.2	-	71	4.6	-
72	3.3	-	72	4.2	-	72	5.3	-
73	4.0	-	73	3.4	-	73	2.9	-
74	3.7	-	74	8.1	-	74	3.4	-
75	2.0	-	75	9.8	-	75	4.5	-
76	3.0	-	76	4.1	-	76	4.3	-
77	1.8	-	77	3.2	-	77	5.6	-
78	2.7	-	78	2.3	-	78	7.9	-
79	2.8	-	79	6.3	-	79	5.8	-
80	2.8	0	80	3.4	0	80	4.2	0
81	2.1	-	81	4.8	-	81	5.1	-
82	4.5	-	82	4.4	-	82	7.0	-
83	1.8	-	83	6.7	-	83	5.4	-
84	3.1	-	84	4.7	-	84	1.1	-
85	4.9	-	85	4.6	-	85	4.0	-
86	3.9	-	86	4.5	-	86	4.4	-
87	4.5	-	87	4.0	-	87	3.8	-
88	2.3	-	88	5.2	-	88	3.1	-
89	2.9	-	89	2.2	-	89	2.5	-
90	4.0	0.50	90	8.3	0	90	3.2	0
91	7.5	-	91	7.3	-	91	8.6	-
92	3.2	-	92	5.2	-	92	4.5	-
93	5.8	-	93	4.2	-	93	3.5	-
94	5.2	-	94	4.9	-	94	5.0	-
95	5.4	-	95	5.4	-	95	4.4	-
96	4.9	-	96	4.1	-	96	4.7	-
97	2.9	-	97	2.5	-	97	5.9	-
98	3.7	-	98	3.3	-	98	4.3	-
99	1.2	-	99	5.3	-	99	5.6	-
100	2.1	0	100	3.5	0	100	5.2	0.50
Minimum	**1.1**	**0.0**	**Minimum**	**1.6**	**0.0**	**Minimum**	**1.1**	**0.0**
Maximum	**7.9**	**0.75**	**Maximum**	**9.8**	**0.50**	**Maximum**	**9.1**	**0.50**
Mean	**4.0**	**0.20**	**Mean**	**4.3**	**0.08**	**Mean**	**4.7**	**0.20**
Standard Dev.	**1.6**	**0.28**	**Standard Dev.**	**1.5**	**0.17**	**Standard Dev.**	**1.6**	**0.26**
Geometric mean	**3.7**	**-**	**Geometric mean**	**4.0**	**-**	**Geometric mean**	**4.4**	**-**
Median	**3.9**	**0.0**	**Median**	**4.2**	**0.0**	**Median**	**4.5**	**0.0**

Table F.20: **Calcite and Pebble Count at RG_FO22, FRO LAEMP, June 2019**

RG_FO22 1			RG_FO22 2			RG_FO22 3		
Rock	**Intermediate Axis (cm)**	**Embeddedness**	**Rock**	**Intermediate Axis (cm)**	**Embeddedness**	**Rock**	**Intermediate Axis (cm)**	**Embeddedness**
1	2.0	-	1	4.5	-	1	Sand	-
2	3.0	-	2	3.2	-	2	3.2	-
3	2.9	-	3	5.6	-	3	Sand	-
4	3.1	-	4	2.8	-	4	2.9	-
5	Gravel	-	5	9.4	-	5	3.0	-
6	1.9	-	6	1.8	-	6	4.0	-
7	3.9	-	7	6.4	-	7	Gravel	-
8	4.0	-	8	Gravel	-	8	3.7	-
9	6.0	-	9	2.0	-	9	4.7	-
10	Gravel	0	10	4.0	0.25	10	4.8	0
11	Sand	-	11	Sand	-	11	5.2	-
12	Gravel	-	12	Gravel	-	12	5.3	-
13	3.4	-	13	5.5	-	13	3.4	-
14	4.3	-	14	1.5	-	14	4.7	-
15	4.6	-	15	2.2	-	15	2.6	-
16	4.5	-	16	3.2	-	16	Sand	-
17	Gravel	-	17	3.4	-	17	3.2	-
18	4.5	-	18	Sand	-	18	4.9	-
19	2.5	-	19	Sand	-	19	6.4	-
20	3.4	0	20	Sand	-	20	4.4	0.25
21	2.9	-	21	4.9	-	21	4.8	-
22	6.6	-	22	4.0	-	22	1.7	-
23	Gravel	-	23	6.0	-	23	3.8	-
24	3.7	-	24	4.3	-	24	2.2	-
25	2.6	-	25	2.9	-	25	Gravel	-
26	3.9	-	26	3.2	-	26	2.1	-
27	2.6	-	27	2.3	-	27	3.9	-
28	3.3	-	28	Sand	-	28	4.9	-
29	Gravel	-	29	Sand	-	29	5.1	-
30	3.4	0	30	4.3	0	30	2.2	0
31	5.4	-	31	Sand	-	31	6.8	-
32	3.3	-	32	Sand	-	32	5.8	-
33	3.4	-	33	Sand	-	33	4.3	-
34	3.0	-	34	5.0	-	34	1.8	-
35	4.4	-	35	4.3	-	35	2.0	-
36	3.6	-	36	4.4	-	36	2.6	-
37	Gravel	-	37	5.1	-	37	3.1	-
38	5.4	-	38	4.6	-	38	4.6	-
39	6.0	-	39	6.6	-	39	4.0	-
40	3.9	0	40	2.6	0	40	5.6	0.25
41	3.7	-	41	4.2	-	41	2.5	-
42	5.6	-	42	3.2	-	42	8.0	-
43	Gravel	-	43	2.6	-	43	9.1	-
44	3.5	-	44	4.4	-	44	3.4	-
45	2.6	-	45	2.6	-	45	6.9	-
46	3.9	-	46	2.1	-	46	3.1	-
47	3.2	-	47	2.1	-	47	5.0	-
48	3.6	-	48	Gravel	-	48	Gravel	-
49	Gravel	-	49	5.0	-	49	Sand	-
50	4.5	0	50	7.0	0	50	2.5	0.50
51	5.3	-	51	2.0	-	51	2.0	-
52	Sand	-	52	5.0	-	52	3.1	-
53	Sand	-	53	Sand	-	53	5.6	-
54	Gravel	-	54	Gravel	-	54	4.3	-
55	Sand	-	55	5.4	-	55	4.1	-
56	3.2	-	56	6.3	-	56	3.6	-
57	4.0	-	57	Sand	-	57	3.4	-
58	Gravel	-	58	6.6	-	58	2.0	-
59	Gravel	-	59	Sand	-	59	1.9	-
60	2.6	0.25	60	2.1	0.50	60	1.9	0
61	3.6	-	61	6.9	-	61	2.8	-
62	4.0	-	62	Sand	-	62	3.0	-
63	5.4	-	63	Gravel	-	63	4.1	-
64	Gravel	-	64	2.1	-	64	6.7	-
65	4.0	-	65	1.1	-	65	5.5	-
66	3.4	-	66	1.4	-	66	4.3	-
67	Gravel	-	67	1.7	-	67	Gravel	-
68	Sand	-	68	8.3	-	68	5.6	-
69	Gravel	-	69	4.4	-	69	Sand	-
70	1.6	0.25	70	7.0	0.25	70	2.9	0
71	2.0	-	71	1.2	-	71	1.1	-
72	2.1	-	72	4.1	-	72	2.1	-
73	2.8	-	73	3.4	-	73	2.8	-
74	4.0	-	74	4.0	-	74	5.4	-
75	3.6	-	75	2.6	-	75	3.1	-
76	1.9	-	76	2.2	-	76	Gravel	-
77	4.0	-	77	3.9	-	77	2.0	-
78	Gravel	-	78	1.4	-	78	5.1	-
79	2.4	-	79	1.9	-	79	Gravel	-
80	2.3	0	80	2.1	0	80	1.6	0
81	4.0	-	81	2.4	-	81	3.2	-
82	4.3	-	82	3.4	-	82	4.6	-
83	Gravel	-	83	3.4	-	83	2.8	-
84	3.6	-	84	4.5	-	84	1.3	-
85	5.6	-	85	3.1	-	85	1.5	-
86	1.6	-	86	2.0	-	86	1.5	-
87	Gravel	-	87	1.9	-	87	Gravel	-
88	3.8	-	88	Gravel	-	88	Gravel	-
89	3.9	-	89	2.9	-	89	1.5	-
90	Gravel	-	90	1.8	0.25	90	3.8	0.25
91	4.0	-	91	1.1	-	91	4.0	-
92	4.7	-	92	3.0	-	92	Sand	-
93	3.7	-	93	2.5	-	93	1.8	-
94	Gravel	-	94	5.4	-	94	Sand	-
95	2.8	-	95	5.0	-	95	3.4	-
96	2.0	-	96	4.3	-	96	4.5	-
97	Gravel	-	97	2.0	-	97	1.9	-
98	3.6	-	98	3.3	-	98	2.9	-
99	3.0	-	99	Gravel	-	99	2.0	-
100	2.5	0.50	100	6.6	0.25	100	1.8	0
Minimum	**1.6**	**0.0**	**Minimum**	**1.1**	**0.0**	**Minimum**	**1.1**	**0.0**
Maximum	**6.6**	**0.50**	**Maximum**	**9.4**	**0.50**	**Maximum**	**9.1**	**0.50**
Mean	**3.6**	**0.11**	**Mean**	**3.7**	**0.17**	**Mean**	**3.7**	**0.13**
Standard Dev.	**1.1**	**0.18**	**Standard Dev.**	**1.8**	**0.18**	**Standard Dev.**	**1.6**	**0.18**
Geometric mean	**3.4**	**-**	**Geometric mean**	**3.3**	**-**	**Geometric mean**	**3.3**	**-**
Median	**3.6**	**0.0**	**Median**	**3.4**	**0.3**	**Median**	**3.4**	**0.0**

Table F.21: Calcite and Pebble Count at RG_FOUEW, FRO LAEMP, June 2019

RG_FOUEW 1			RG_FOUEW 2			RG_FOUEW 3		
Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness	Rock	Intermediate Axis (cm)	Embeddedness
1	8.5	-	1	12.4	-	1	14.0	-
2	9.4	-	2	3.4	-	2	13.5	-
3	13.5	-	3	6.6	-	3	12.0	-
4	8.4	-	4	4.4	-	4	6.0	-
5	6.9	-	5	3.2	-	5	9.5	-
6	7.3	-	6	4.1	-	6	3.5	-
7	8.5	-	7	3.1	-	7	4.0	-
8	6.2	-	8	5.6	-	8	9.0	-
9	12.8	-	9	4.2	-	9	6.0	-
10	9.6	0	10	3.1	0.25	10	18.5	0.50
11	4.3	-	11	Sand	-	11	14.0	-
12	7.8	-	12	4.1	-	12	3.5	-
13	13.0	-	13	3.6	-	13	4.0	-
14	8.6	-	14	4.2	-	14	4.5	-
15	7.4	-	15	5.4	-	15	Gravel	-
16	4.5	-	16	4.1	-	16	Sand	-
17	6.2	-	17	5.1	-	17	Gravel	-
18	14.2	-	18	6.6	-	18	3.5	-
19	8.9	-	19	5.4	-	19	4.0	-
20	8.6	0.25	20	5.4	0	20	2.0	0.50
21	6.9	-	21	3.9	-	21	11.0	-
22	7.9	-	22	4.6	-	22	5.5	-
23	6.7	-	23	3.7	-	23	8.0	-
24	10.2	-	24	2.7	-	24	5.5	-
25	7.9	-	25	Gravel	-	25	13.0	-
26	8.7	-	26	16.1	-	26	8.0	-
27	5.6	-	27	4.7	-	27	9.5	-
28	11.4	-	28	6.6	-	28	6.0	-
29	6.9	-	29	8.0	-	29	7.5	-
30	5.8	0.25	30	6.3	0	30	13.0	0.25
31	6.8	-	31	9.3	-	31	11.0	-
32	9.0	-	32	7.6	-	32	8.5	-
33	6.2	-	33	11.0	-	33	9.0	-
34	4.0	-	34	6.6	-	34	7.5	-
35	5.5	-	35	7.2	-	35	11.0	-
36	6.3	-	36	6.0	-	36	13.0	-
37	12.8	-	37	11.9	-	37	9.5	-
38	11.2	-	38	6.6	-	38	8.0	-
39	6.4	-	39	3.0	-	39	5.5	-
40	10.1	0	40	10.1	0	40	13.0	0
41	8.1	-	41	6.2	-	41	7.0	-
42	14.0	-	42	7.4	-	42	5.5	-
43	13.4	-	43	7.1	-	43	11.0	-
44	11.8	-	44	6.6	-	44	6.0	-
45	9.6	-	45	5.5	-	45	13.5	-
46	7.5	-	46	6.0	-	46	8.0	-
47	8.3	-	47	5.5	-	47	14.0	-
48	4.9	-	48	3.2	-	48	10.5	-
49	6.4	-	49	6.9	-	49	13.0	-
50	9.6	0	50	6.0	0	50	15.0	0
51	9.0	-	51	7.0	-	51	6.5	-
52	10.1	-	52	7.0	-	52	8.0	-
53	9.1	-	53	4.7	-	53	4.5	-
54	4.3	-	54	7.4	-	54	Sand	-
55	7.6	-	55	6.6	-	55	9.3	-
56	5.6	-	56	4.4	-	56	14.4	-
57	8.0	-	57	4.0	-	57	10.1	-
58	5.1	-	58	7.5	-	58	8.0	-
59	8.4	-	59	15.2	-	59	8.6	-
60	10.0	0.25	60	6.2	0.50	60	13.1	0.5
61	9.3	-	61	7.3	-	61	7.6	-
62	4.6	-	62	8.4	-	62	7.4	-
63	9.6	-	63	8.6	-	63	22.1	-
64	4.3	-	64	7.4	-	64	10.6	-
65	5.6	-	65	5.6	-	65	6.6	-
66	4.9	-	66	Gravel	-	66	8.6	-
67	7.7	-	67	Gravel	-	67	8.0	-
68	13.0	-	68	Sand	-	68	5.2	-
69	9.5	-	69	Sand	-	69	13.4	-
70	7.0	0.50	70	7.6	0.25	70	16.6	0.25
71	11.3	-	71	7.0	-	71	11.6	-
72	4.6	-	72	6.6	-	72	9.9	-
73	7.6	-	73	4.4	-	73	6.2	-
74	12.4	-	74	5.6	-	74	25.7	-
75	6.4	-	75	8.0	-	75	5.4	-
76	14.0	-	76	9.6	-	76	5.6	-
77	3.1	-	77	6.6	-	77	5.1	-
78	9.1	-	78	19.0	-	78	11.7	-
79	6.0	-	79	12.2	-	79	15.4	-
80	7.5	0	80	7.0	0.75	80	Sand	-
81	4.0	-	81	7.9	-	81	16.9	-
82	7.9	-	82	16.0	-	82	5.6	-
83	6.1	-	83	10.0	-	83	8.6	-
84	3.4	-	84	10.7	-	84	8.2	-
85	6.4	-	85	3.1	-	85	10.3	-
86	9.1	-	86	5.5	-	86	8.0	-
87	6.6	-	87	8.2	-	87	8.0	-
88	5.5	-	88	4.9	-	88	9.9	-
89	8.3	-	89	8.0	-	89	5.3	-
90	5.6	0.50	90	6.4	0.50	90	7.0	0.25
91	11.6	-	91	3.4	-	91	10.0	-
92	9.0	-	92	5.5	-	92	5.6	-
93	6.0	-	93	4.9	-	93	6.7	-
94	4.5	-	94	7.0	-	94	7.5	-
95	11.3	-	95	7.1	-	95	7.5	-
96	9.4	-	96	6.3	-	96	7.6	-
97	11.1	-	97	7.2	-	97	13.0	-
98	5.6	-	98	6.3	-	98	18.0	-
99	7.8	-	99	3.4	-	99	9.5	-
100	9.0	0.50	100	Sand	-	100	7.0	0
Minimum	**3.1**	**0.0**	**Minimum**	**2.7**	**0.0**	**Minimum**	**2.0**	**0.0**
Maximum	**14.2**	**0.50**	**Maximum**	**19.0**	**0.75**	**Maximum**	**25.7**	**0.50**
Mean	**8.1**	**0.23**	**Mean**	**6.7**	**0.25**	**Mean**	**9.3**	**0.25**
Standard Dev.	**2.7**	**0.22**	**Standard Dev.**	**3.0**	**0.28**	**Standard Dev.**	**4.2**	**0.22**
Geometric mean	**7.6**	**-**	**Geometric mean**	**6.2**	**-**	**Geometric mean**	**8.4**	**-**
Median	**7.9**	**0.25**	**Median**	**6.4**	**0.25**	**Median**	**8.2**	**0.25**

Table F.22: *In Situ* Water Quality Taken at Biological Monitoring Areas, June 2019

Field Parameters		Reference		Mine-Exposed													
		RG_FO26	RG_HENUP	RG_FODHE	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI	RG_FOBKS	RG_FOBSC	RG_FOBCP	FRCP1SW	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Date		20-Jun-19	20-Jun-19	20-Jun-19	19-Jun-19	19-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19	18-Jun-19	19-Jun-19	19-Jun-19	21-Jun-19	21-Jun-19	20-Jun-19
Station 1	Temperature (°C)	5.6	3.6	4.9	7.1	6.0	8.5	8.4	6.6	8.3	8.7	9.9	9.4	6.6	4.4	2.3	7.1
	Dissolved Oxygen (mg/L)	11	12.28	9.98	10.50	9.34	9.80	12.12	10.16	9.33	8.63	8.49	9.66	9.88	11.22	12.17	11.57
	Dissolved Oxygen (%)	110.1	116.4	96.5	109.0	92.4	102.3	125.2	100.5	96.2	89.9	90.9	102.6	98.0	105	107.8	117.1
	Conductivity (µS/cm)	168	243	186	431	415	265	264	259	500	587	720	407	473	494	809	844
	Specific Conductivity (µS/cm)	267	409	302	653	650.9	386	-	400	735	852	1,013	579	728	814	1,422	1280
	pH	8.31	7.90	8.30	8.00	7.93	8.25	8.33	8.33	8.44	8.28	8.15	8.40	8.21	8.03	7.38	8.29
	ORP (mV)	345.9	425.0	343.2	327.6	308.2	244.1	348.2	287.3	276.8	339.8	346.3	284.1	307.2	342.7	489.0	433.5
Station 2	Temperature (°C)	4.7	4.0	6.8	6.6	6.2	9.5	9.0	7.5	9.5	7.1	10.3	9.6	6.9	4.0	2.6	7.5
	Dissolved Oxygen (mg/L)	11.25	12.31	12.2	9.38	9.41	9.46	11.14	10.30	8.75	91.6	8.97	9.69	10.06	11.72	12.95	13.27
	Dissolved Oxygen (%)	109.5	117.8	124.2	94.1	93.5	100.8	117.5	104.4	92.6	9.1	97.3	103.6	100.3	108.5	115.3	139.0
	Conductivity (µS/cm)	163	245	352	423	418	274	271	268	518	505	734	410	436	484	812	877
	Specific Conductivity (µS/cm)	265	409	540	653	652	389	390	403	736	767	1,020	580	666	808	1,423	1334
	pH	8.35	8.03	8.20	7.96	7.92	8.24	8.32	8.30	8.33	8.01	8.28	8.43	8.28	8.02	7.64	8.28
	ORP (mV)	352.4	435.7	269.0	339.2	317.3	195.6	177.3	287.6	314.6	360.4	351.5	293.2	299.9	339.4	462.9	450.6
Station 3	Temperature (°C)	4.5	3.9	6.7	7.7	6.5	9.9	8.9	7.9	9.6	7.9	10.4	9.2	6.4	3.4	-	6.2
	Dissolved Oxygen (mg/L)	10.35	12.52	12.3	9.90	9.28	9.49	10.87	9.90	8.32	8.68	8.78	9.66	9.67	10.81	-	11.12
	Dissolved Oxygen (%)	100.3	120.0	128.9	102.1	93.0	102.5	113.7	101.2	88.2	88.8	95.4	102.3	96.4	98.2	-	109.3
	Conductivity (µS/cm)	162	246	351	438	460	278	271	274	526	538	729	412	432	471	-	785
	Specific Conductivity (µS/cm)	266	412	541	655	709.5	391	392	406	745	798	1,017	589	670	803.3	-	1215
	pH	8.36	7.76	8.00	8.03	8.15	8.19	8.30	8.28	8.36	8.24	8.21	8	8.20	8.0	-	7.74
	ORP (mV)	356.5	476.7	274.0	320.0	313.9	108.4	126.9	254.6	326.5	344.7	356.2	299.1	281.9	322.0	-	392.9

Table F.23: **Kick and Sweep at Reference and Mine-exposed Areas, FRO LAEMP, June 2019**

		RG_FO26	RG_HENUP	RG_FODHE	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI	RG_FOBKS	RG_FOBSC
Station 1	Easting	6553041	655825	651411	650869	650967	651119	653109	651857	652048	652315
	Northing	5569651	5567704	5565510	5563477	5563155	5562352	5561095	5559818	5558715	5558221
	Date	20-Jun-19	20-Jun-19	20-Jun-19	19-Jun-19	19-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19
	Samplers' Initials	AL	JV	JV	JV	MW	EH	AL	EH	JV	MW
	Number of Jars	1	1	1	1	1	1	1	1	1	1
	Total Kick Distance (m)	16	15	23	7	13	8	15	8	10	
	Full Transect (Yes / No)	Yes	No	Yes	No	Yes	No	No	No	Yes	No
	Number of Transects	5.0	0.5	1.0	0.25	1.0	4.0	3.0	4.0	1.0	0.75
Station 2	Easting	653050	655762	651409	650855	650889	651132	652112	651837	652057	652352
	Northing	5569604	5567709	5565491	5563521	5563180	5562413	5559879	5559917	5558669	5558164
	Date	20-Jun-19	20-Jun-19	20-Jun-19	19-Jun-19	19-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19
	Samplers' Initials	AL	JV	JV	JV	MW	AL	EH	AL	JV	MW
	Number of Jars	1	1	1	2	1	1	1	1	1	1
	Total Kick Distance (m)	16	12	22	13	13	15	12	16	19	10
	Full Transect (Yes / No)	Yes	No	Yes	Yes	No	No	No	No	Yes	No
	Number of Transects	4.0	0.5	1.0	1.0	0.5	5.0	4.0	8.0	1.0	0.5
Station 3	Easting	653043	655721	651319	650868	650869	651193	650854	651770	652073	652410
	Northing	5569557	5567663	556541	5563574	5563226	5562473	5561072	5560009	5558653	5558120
	Date	20-Jun-19	20-Jun-19	20-Jun-19	19-Jun-19	19-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19	17-Jun-19	18-Jun-19
	Samplers' Initials	EH	JV	AL	JV	MW	AL	AL	AL	JV	MW
	Number of Jars	2	1	1	1	1	1	1	1	1	1
	Total Kick Distance (m)	18	13	22	13	10	12	12	15	12	
	Full Transect (Yes / No)	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No
	Number of Transects	4.50	1.0	1	1.0	0.25	4.0	4.0	5.0	1.5	0.75

Table F.23: **Kick and Sweep at Reference and Mine-exposed Areas, FRO LAEMP, June 2019**

		RG_FOBCP	FCRP1SW	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Station 1	Easting	652884	653376	653900	653918	654785	656260
	Northing	5557136	5556192	5555956	5555092	5553710	5551876
	Date	18-Jun-19	19-Jun-19	19-Jun-19	21-Jun-19	21-Jun-19	20-Jun-19
	Samplers' Initials	JV	EH	EH	AL	JV	MW
	Number of Jars	1	1	1	2	2	2
	Total Kick Distance (m)	17	30	20	14	19	15
	Full Transect (Yes / No)	Yes	No	No	No	Yes	No
	Number of Transects	1.0	6.0	4.0	5.0	1.0	0.5
Station 2	Easting	652898	653326	653882	653898		656321
	Northing	5557118	5556203	5555884	5555077		5551868
	Date	18-Jun-19	19-Jun-19	19-Jun-19	21-Jun-19	21-Jun-19	20-Jun-19
	Samplers' Initials	JV	AL	AL	AL	JV	MW
	Number of Jars	1		1		1	1
	Total Kick Distance (m)	10	20	15		20	12
	Full Transect (Yes / No)	No	No	No	No	Yes	No
	Number of Transects	0.5	5.0	3.0	4.0	1.0	0.5
Station 3	Easting	652906	653308	653856	653862		656367
	Northing	5557100	5556216	55555845	5555052		5551884
	Date	18-Jun-19	19-Jun-19	19-Jun-19	21-Jun-19	21-Jun-19	20-Jun-19
	Samplers' Initials	JV	AL	EH	AL	JV	EH
	Number of Jars	1	1	2	1	2	2
	Total Kick Distance (m)	10	22	13	20	17	12
	Full Transect (Yes / No)	No	Yes	No	No	No	No
	Number of Transects	0.75	1.50	2.5	4.00	0.75	4.0

Table F.24: Channel Depth and Velocity at Kick and Sweep Sampling Locations in Reference and Mine-exposed Areas, FRO LAEMP, June 2019

Area	Site	Replicate	Parameter	1	2	3	4	5	Mean
Reference	**RG_HENUP**								
Reference	RG_HENUP	**1**	Depth (cm)	36	35	40	51	19	**36.2**
Reference	RG_HENUP	**1**	Velocity (m/s)	0.307	1.183	1.400	1.293	0.220	**0.881**
Reference	RG_HENUP	**2**	Depth (cm)	12	20	21	32	41	**25.2**
Reference	RG_HENUP	**2**	Velocity (m/s)	0.203	0.485	0.629	0.906	1.685	**0.782**
Reference	RG_HENUP	**3**	Depth (cm)	43	33	35	29	25	**33.0**
Reference	RG_HENUP	**3**	Velocity (m/s)	0.888	0.758	1.248	0.896	0.423	**0.843**
Reference	**RG_FO26**								
Reference	RG_FO26	**1**	Depth (cm)	15	20	20	30	10	**19.0**
Reference	RG_FO26	**1**	Velocity (m/s)	0.458	0.544	0.550	0.443	0.183	**0.436**
Reference	RG_FO26	**2**	Depth (cm)	10	20	20	20	20	**18.0**
Reference	RG_FO26	**2**	Velocity (m/s)	0.178	0.412	0.630	0.827	0.890	**0.587**
Reference	RG_FO26	**3**	Depth (cm)	20	20	40	20	20	**24.0**
Reference	RG_FO26	**3**	Velocity (m/s)	0.749	0.746	0.504	0.657	0.464	**0.624**
Mine-exposed	**RG_FODHE**								
Mine-exposed	RG_FODHE	**1**	Depth (cm)	27	28	21	12	52	**28.0**
Mine-exposed	RG_FODHE	**1**	Velocity (m/s)	0.231	0.237	0.214	0.391	1.028	**0.420**
Mine-exposed	RG_FODHE	**2**	Depth (cm)	34	21	39	35	31	**32.0**
Mine-exposed	RG_FODHE	**2**	Velocity (m/s)	0.801	0.379	1.003	0.752	1.202	**0.827**
Mine-exposed	RG_FODHE	**3**	Depth (cm)	44	34	20	33	36	**33.4**
Mine-exposed	RG_FODHE	**3**	Velocity (m/s)	0.069	0.085	0.659	0.760	0.819	**0.478**
Mine-exposed	**RG_FOUNGD**								
Mine-exposed	RG_FOUNGD	**1**	Depth (cm)	29	45	46	48	47	**43**
Mine-exposed	RG_FOUNGD	**1**	Velocity (m/s)	0.769	0.951	1.049	0.892	1.197	**0.972**
Mine-exposed	RG_FOUNGD	**2**	Depth (cm)	27	42	45	44	33	**38.2**
Mine-exposed	RG_FOUNGD	**2**	Velocity (m/s)	0.882	1.283	0.951	0.701	0.607	**0.885**
Mine-exposed	RG_FOUNGD	**3**	Depth (cm)	9	25	26	24	38	**24.4**
Mine-exposed	RG_FOUNGD	**3**	Velocity (m/s)	0.443	0.578	0.771	0.806	0.758	**0.671**
Mine-exposed	**RG_FODNGD**								
Mine-exposed	RG_FODNGD	**1**	Depth (cm)	30	33	31	38	41	**34.6**
Mine-exposed	RG_FODNGD	**1**	Velocity (m/s)	0.467	0.821	1.183	0.704	1.209	**0.8768**
Mine-exposed	RG_FODNGD	**2**	Depth (cm)	18	25	29	48	60	**36**
Mine-exposed	RG_FODNGD	**2**	Velocity (m/s)	0.491	0.647	0.851	1.128	1.755	**0.974**
Mine-exposed	RG_FODNGD	**3**	Depth (cm)	37	57	60	40	46	**48**
Mine-exposed	RG_FODNGD	**3**	Velocity (m/s)	0.657	0.727	1.240	1.106	0.823	**0.911**
Mine-exposed	**RG_MP1**								
Mine-exposed	RG_MP1	**1**	Depth (cm)	24	40	60	-	-	**41.33333**
Mine-exposed	RG_MP1	**1**	Velocity (m/s)	0.397	0.817	1.305	-	-	**0.840**
Mine-exposed	RG_MP1	**2**	Depth (cm)	10	15	30	60	50	**33**
Mine-exposed	RG_MP1	**2**	Velocity (m/s)	0.603	0.310	0.660	0.998	1.300	**0.774**
Mine-exposed	RG_MP1	**3**	Depth (cm)	10	20	40	-	-	**23.33333**
Mine-exposed	RG_MP1	**3**	Velocity (m/s)	0.301	0.710	1.107	-	-	**0.706**
Mine-exposed	**RG_FOUSH**								
Mine-exposed	RG_FOUSH	**1**	Depth (cm)	25	50	50	40	25	**38**
Mine-exposed	RG_FOUSH	**1**	Velocity (m/s)	0.502	0.659	1.081	1.173	0.745	**0.832**
Mine-exposed	RG_FOUSH	**2**	Depth (cm)	10	50	55	60	20	**39**
Mine-exposed	RG_FOUSH	**2**	Velocity (m/s)	0.341	0.787	1.077	0.835	0.902	**0.788**
Mine-exposed	RG_FOUSH	**3**	Depth (cm)	25	50	60	50	40	**45**
Mine-exposed	RG_FOUSH	**3**	Velocity (m/s)	1.025	0.876	0.953	0.703	0.812	**0.874**

Notes: Velocity measurements were taken at five randomly chosen locations throughout the kick sample area. Velocity was measured at the bottom of the water column.

Table F.24: Channel Depth and Velocity at Kick and Sweep Sampling Locations in Reference and Mine-exposed Areas, FRO LAEMP, June 2019

		Replicate	1	2	3	4	5	Mean
Mine-exposed	RG_FOUKI							
	1	Depth (cm)	30	60	-	-	-	**45.0**
		Velocity (m/s)	0.704	1.021	-	-	-	**0.863**
	2	Depth (cm)	20	30	60	-	-	**36.7**
		Velocity (m/s)	0.951	1.400	1.216	-	-	**1.189**
	3	Depth (cm)	30	50	60	-	-	**46.7**
		Velocity (m/s)	0.873	1.046	1.068	-	-	**0.996**
	RG_FOBKS							
	1	Depth (cm)	43	33	25	39	63	**40.4**
		Velocity (m/s)	1.115	0.637	0.477	0.420	0.636	**0.657**
	2	Depth (cm)	52	25	27	28	18	**30.0**
		Velocity (m/s)	0.973	0.690	0.612	0.624	0.735	**0.727**
	3	Depth (cm)	20	28	33	50	41	**34.4**
		Velocity (m/s)	0.012	0.437	1.561	1.780	0.811	**0.920**
	RG_FOBSC							
	1	Depth (cm)	18	16	27	42	45	**29.6**
		Velocity (m/s)	0.402	0.660	0.635	0.733	1.040	**0.694**
	2	Depth (cm)	42	35	43	30	33	**36.6**
		Velocity (m/s)	0.592	1.031	0.794	1.146	0.485	**0.810**
	3	Depth (cm)	20	38	34	30	26	**29.6**
		Velocity (m/s)	1.173	0.956	0.843	0.534	0.562	**0.814**
	RG_FOBCP							
	1	Depth (cm)	20	28	20	34	44	**29.2**
		Velocity (m/s)	0.550	0.870	0.845	1.218	1.849	**1.066**
	2	Depth (cm)	28	55	65	64	63	**55.0**
		Velocity (m/s)	0.789	0.899	1.144	1.012	0.908	**0.950**
	3	Depth (cm)	48	53	60	57	47	**52.9**
		Velocity (m/s)	0.681	1.192	1.230	0.678	0.680	**0.892**
	FRCP1SW							
	1	Depth (cm)	30	20	40	-	-	**30**
		Velocity (m/s)	0.996	1.333	0.149	-	-	**0.826**
	2	Depth (cm)	20	10	10	20	20	**16**
		Velocity (m/s)	0.576	0.402	0.378	0.371	0.393	**0.424**
	3	Depth (cm)	8	13	28	49	49	**29.2**
		Velocity (m/s)	0.127	0.122	0.401	0.650	1.037	**0.4674**
	RG_FRUPO							
	1	Depth (cm)	20	10	10	-	-	**13.3**
		Velocity (m/s)	0.645	0.200	0.620	-	-	**0.488**
	2	Depth (cm)	20	30	50	-	-	**33.3**
		Velocity (m/s)	0.984	0.752	0.972	-	-	**0.903**
	3	Depth (cm)	40	30	30	40	50	**38.0**
		Velocity (m/s)	0.611	1.239	1.321	1.121	1.341	**1.127**
	RG_FODPO							
	1	Depth (cm)	10	30	50	-	-	**30**
		Velocity (m/s)	0.457	0.831	0.861	-	-	**0.716**
	2	Depth (cm)	10	10	15	30	-	**16.25**
		Velocity (m/s)	0.441	0.346	0.522	1.037	-	**0.587**
	3	Depth (cm)	10	15	30	50	-	**26.25**
		Velocity (m/s)	0.390	0.446	0.762	0.830	-	**0.607**

Notes: Velocity measurements were taken at five randomly chosen locations throughout the kick sample area. Velocity was measured at the bottom of the water column.

Table F.24: Channel Depth and Velocity at Kick and Sweep Sampling Locations in Reference and Mine-exposed Areas, FRO LAEMP, June 2019

Area	Replicate		1	2	3	4	5	Mean
Mine-exposed	**RG_FO22**							
	1	Depth (cm)	20	55	45	30	20	**34.0**
		Velocity (m/s)	0.750	0.806	0.911	0.314	0.417	**0.640**
	2	Depth (cm)	31	35	31	49	90	**47.2**
		Velocity (m/s)	0.534	0.640	0.675	0.932	0.760	**0.708**
	3	Depth (cm)	15	40	60	90	95	**60.0**
		Velocity (m/s)	0.527	0.702	0.587	0.432	0.645	**0.579**
	RG_FOUEW							
	1	Depth (cm)	30	40	50	60	60	**48.0**
		Velocity (m/s)	0.347	1.008	0.957	1.007	1.250	**0.914**
	2	Depth (cm)	20	45	65	65	50	**49.0**
		Velocity (m/s)	0.386	0.714	0.578	0.999	0.765	**0.688**
	3	Depth (cm)	20	30	40	60	15	**33.0**
		Velocity (m/s)	0.657	0.738	0.537	0.867	0.340	**0.628**

Notes: Velocity measurements were taken at five randomly chosen locations throughout the kick sample area. Velocity was measured at the bottom of the water column.

Table F.25: Habitat Information Associated with Mine-exposed and Reference Areas Sampled during the Benthic Invertebrate Survey, September 2019

Station ID	Reference		Mine-exposed						
	RG_HENUP	RG_FO26	RG_FODHE	RG_FOUCL	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FODPO	RG_FO22
Waterbody	Fording	Fording	Fording	Fording	Fording	Fording	Fording	Fording	Fording
Date Sampled	11-Sep-19	10-Sep-19	10-Sep-19	12-Sep-19	12-Sep-19	12-Sep-19	5-Sep-19	7-Sep-19	16-Sep-19
Zone 11 UTMs - E	655762	653054	651409	650787	650868	650983	651142	653865	654762
Zone 11 UTMs - N	5567709	5569617	5565491	5564445	5563472	5563167	5562401	5555059	5553651
Elevation (m)	1,850	1,800	1,600	1,670	-	-	1,641	1,560	-
Samplers' Initials	MW, KD, ED	MW, KD, ED	MW, KD, ED	MW, ED, JI	PaS, AG	PaS, AG	MW, JV, AW	MW, KD, JV	MW, KD, ED
Habitat Characteristics									
Site Access Description	Logging road via RAZ	Mine road north past Henretta Pit, ~300 m down ravine	Mine road just south of UFRI	Park upstream, cross field to river	-	-	To the right of main Coal Haul Road	Walked ~700 m in from road	Road access from Fording Road, then ~250 m hike in
Surrounding Land Use	Forest	Forest	Mining	Forest and mining	Forest and mining	Forest and mining	Mining	Forest and mining	Forest
Anthropogenic Influences	Past logging	Past logging	Mining	Mining	-	-	Mining, tailings pit	Mining upstrream	Logging and mining
Length of Reach Assessed (m)	-	100	100	100	50	-	100	-	100
Channel Measurements									
Bankfull Width (m)	5.13	5.41	27.0	10.7	10.0	9.0	17.6	12.6	16.4
Wetted Width (m)	4.30	3.80	14.0	9.90	8.00	15.00	14.4	9.80	9.80
Station ID	Mine-exposed								
	RG_FOUSH	RG_FOUKI	RG_SCOUTDS	RG_FOBKS	RG_FOBSC	RG_FOBCP	FRCP1SW	RG_FRUPO	RG_FOUEW
Waterbody	Fording	Fording	Fording	Fording	Fording	Fording	Fording	Fording	Fording
Date Sampled	9-Sep-19	5-Sep-19	12-Sep-19	9-Sep-19	13-Sep-19	6-Sep-19	13-Sep-19	7-Sep-19	4-Sep-19
Zone 11 UTMs - E	650849	651855	652307	652061	652362	652885	653302	653887	656357
Zone 11 UTMs - N	5561055	5559811	5558501	5558648	5558165	5557143	5556257	5555873	5551876
Elevation (m)	1,592	1,800	1,600	1,594	-	1,576	1,603	1,575	-
Samplers' Initials	MW, KD, ED	MW, JV, AW	MW, ED, JI	MW, KD, ED	MW, KD, ED	MW, JV, AW	MW, KD, ED	MW, KD, JV	MW, JV, AW
Habitat Characteristics									
Site Access Description	Off main haul road parked with maxam, 300 m walk	-	Swift creek bridge	Swift creek gate, park at bridge	Swift gate to ponds	Greenhouse/swift gate	Log road through swift gate	Road access from Fording Road, then ~300 m hike in	Gun range to 300 m walk in
Surrounding Land Use	Mining	Mining and forest	Logging and mining	Forest, logging and mining	Forest, logging and mining	Forest and mining	Forest and logging	Forest and mining	Forest, logging and mining
Anthropogenic Influences	Mining	Mining and logging	-	Mining, logging, construction	Mining, logging	Mining	Mining, logging, construction	Mining	Gun range, highway, upstream mining
Length of Reach Assessed (m)	100	100	100	100	100	100	-	100	50
Channel Measurements									
Bankfull Width (m)	8.40	15.1	7.90	20.0	6.50	19.9	-	12.4	-
Wetted Width (m)	8.10	11.5	6.50	24.0	7.70	9.98	-	11.4	-

Table F.26: Calcite and Pebble Count at RG_HENUP, FRO LAEMP, September 2019

Rock	RG_HENUP 1				RG_HENUP 3				RG_HENUP 2			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	0	10.0		0	0	6.1		0	0	6.7	
2	0	0	7.1		0	0	5.2		0	0	9.8	
3	0	0	13.3		0	0	3.4		0	0	4.3	
4	0	0	10.0		0	0	7.5		0	0	7.7	
5	0	0	7.5		0	0	26.1		0	0	18.6	
6	0	0	8.5		0	0	6.4		0	0	14.4	
7	0	0	8.1		0	0	9.1		0	0	13.9	
8	0	0	19.1		0	0	8.4		0	0	2.1	
9	0	0	11.0		0	0	7.4		0	0	3.7	
10	0	0	29.5	0.25	0	0	11.5	0.75	0	0	14.0	0.25
11	0	0	11.1		0	0	4.2		0	0	13.3	
12	0	0	4.5		0	0	9.4		0	0	4.0	
13	0	0	6.9		0	0	4.0		0	0	7.2	
14	0	0	5.5		0	1	14.5		0	0	3.9	
15	0	0	11.4		0	0	7.3		0	0	21.3	
16	0	0	8.5		0	0	9.9		0	0	s	
17	0	0	3.2		0	0	10.3		0	0	1.1	
18	0	0	2.1		0	0	8.0		0	0	2.4	
19	0	0	5.0		0	0	s		0	0	s	
20	0	0	6.5	0	0	0	8.1	0	0	0	3.2	0
21	0	0	11.7		0	0	6.1		0	0	4.7	
22	0	0	6.2		0	0	12.2		0	0	3.4	
23	0	0	16.0		0	0	7.7		0	0	4.6	
24	0	0	11.0		0	0	4.0		0	0	13.1	
25	0	0	8.6		0	1	19.7		0	0	29.4	
26	0	0	8.0		0	0	9.1		0	0	18.9	
27	0	0	6.5		0	0	16.1		0	0	7.8	
28	0	0	11.0		0	0	10.3		0	0	4.3	
29	0	0	26.2		0	0	3.5		0	1	6.6	
30	0	0	8.9	0.50	0	0	15.1	0.75	0	0	12.1	0.25
31	0	0	8.5		0	0	8.6		0	0	3.4	
32	0	0	5.5		0	0	13.0		0	0	4.9	
33	0	0	6.9		0	0	7.5		0	0	6.6	
34	0	0	14.3		0	0	11.2		0	0	12.1	
35	0	0	13.1		0	0	13.1		0	0	11.1	
36	0	0	11.6		0	0	6.8		0	0	11.1	
37	0	0	4.9		0	0	7.2		0	0	9.5	
38	0	0	2.1		0	0	21.2		0	0	13.1	
39	0	0	1.7		0	0	11.0		0	0	21.5	
40	0	0	14.2	0	0	0	7.0	0.25	0	0	2.5	0
41	0	0	14.0		0	0	6.1		0	0	4.8	
42	0	0	4.0		0	0	8.0		0	0	7.5	
43	0	0	s		0	0	4.2		0	0	12.2	
44	0	0	14.2		0	0	17.5		0	0	1.6	
45	0	0	9.1		0	0	12.0		0	0	3.4	
46	0	0	4.6		0	0	14.3		0	0	4.0	
47	0	0	4.0		0	0	3.1		0	0	8.7	
48	0	0	3.9		0	0	4.4		0	0	s	
49	0	0	9.0		0	0	s		0	0	3.2	
50	0	0	6.5	0	0	0	9.5	0	0	0	6.7	0
51	0	0	14.5		0	0	1.1		0	0	5.0	
52	0	0	6.3		0	0	2.2		0	0	8.6	
53	0	0	8.0		0	0	7.2		0	0	7.5	
54	0	0	24.9		0	0	6.0		0	0	6.5	
55	0	0	32.0		0	0	19.1		0	0	13.4	
56	0	0	6.7		0	0	5.6		0	0	11.8	
57	0	0	41.6		0	0	7.4		0	0	17.4	
58	0	0	6.2		0	0	3.0		0	0	6.0	
59	0	0	5.5		0	0	3.2		0	0	13.2	
60	0	0	13.0	0	0	0	14.3	0.25	0	0	21.0	0.25
61	0	0	6.1		0	0	s		0	0	20.3	
62	0	0	15.0		0	0	2.0		0	0	8.6	
63	0	0	4.5		0	0	5.1		0	0	5.8	
64	0	0	7.2		0	0	4.7		0	0	9.7	
65	0	0	29.6		0	0	4.1		0	0	12.8	
66	0	0	8.2		0	0	5.5		0	0	1.6	
67	0	0	25.1		0	0	10.7		0	0	10.0	
68	0	0	9.2		0	0	6.3		0	0	s	
69	0	0	9.1		0	1	13.6		0	0	3.2	
70	0	0	6.5	0.25	0	0	9.5	0	0	0	6.2	0
71	0	0	9.0		0	0	14.1		0	0	14.0	
72	0	0	4.5		0	0	3.2		0	0	13.1	
73	0	0	3.7		0	0	7.1		0	0	6.4	
74	0	0	9.5		0	0	8.2		0	0	9.3	
75	0	0	11.0		0	0	5.6		0	0	6.0	
76	0	0	9.9		0	0	11.3		0	0	6.0	
77	0	0	19.0		0	0	11.2		0	0	13.5	
78	0	0	9.0		0	0	3.4		0	0	5.1	
79	0	0	5.7		0	0	33.2		0	0	5.8	
80	0	0	5.7	0	0	0	10.5	0	0	0	6.3	0.25
81	0	0	9.4		0	0	11.2		0	0	14.0	
82	0	0	9.2		0	0	6.9		0	0	17.1	
83	0	0	s		0	0	4.3		0	0	7.7	
84	0	0	1.2		0	0	3.1		0	0	4.5	
85	0	0	12.7		0	0	2.7		0	0	7.2	
86	0	0	4.1		0	0	2.2		0	0	13.1	
87	0	0	6.0		0	0	2.5		0	0	5.5	
88	0	0	11.1		0	0	7.1		0	0	3.1	
89	0	0	9.6		0	0	3.5		0	0	12.6	
90	0	0	10.4	0	0	0	12.2	0.25	0	0	11.2	0.25
91	0	0	9.1		0	0	5.5		0	0	4.5	
92	0	0	12.5		0	0	7.1		0	0	16.6	
93	0	0	20.5		0	0	11.0		0	0	10.0	
94	0	0	11.7		0	0	13.3		0	0	3.7	
95	0	0	5.5		0	0	6.1		0	0	7.0	
96	0	0	4.7		0	0	1.3		0	0	10.5	
97	0	0	7.5		0	0	7.0		0	0	11.7	
98	0	0	12.8		0	0	8.5		0	0	9.9	
99	0	0	s		0	0	20.8		0	0	8.9	
100	0	0	8.2	0.75	0	0	13.0	0.50	0	0	4.7	0
Minimum	**0**	**0**	**1.20**	**0**	**0**	**0**	**1.10**	**0**	**0**	**0**	**1.10**	**0**
Maximum	**0**	**0**	**41.6**	**0.750**	**0**	**1.00**	**33.2**	**0.750**	**0**	**1.00**	**29.4**	**0.250**
Mean	**0**	**0**	**10.2**	**0.175**	**0**	**0**	**8.70**	**0.275**	**0**	**0**	**8.98**	**0.125**
Standard Dev.	**0**	**0**	**6.83**	**0.265**	**0**	**0.171**	**5.42**	**0.299**	**0**	**0.100**	**5.38**	**0.132**
Geometric mean	**-**	**-**	**8.48**	**-**	**-**	**-**	**7.23**	**-**	**-**	**-**	**7.44**	**-**
Median	**0**	**0**	**8.90**	**0**	**0**	**0**	**7.40**	**0.250**	**0**	**0**	**7.60**	**0.125**
Calcite Index	**0**		**-**	**-**	**0**		**-**	**-**	**0**		**-**	**-**

Table F.27: Calcite and Pebble Count at RG_FO26, FRO LAEMP, September 2019

Rock	RG_FO26 1				RG_FO26 2				RG_FO26 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	8.4		0	1	8.1		0	1	9.0	
2	0	1	6.7		0	1	5.7		0	1	7.8	
3	0	1	6.5		0	0	3.8		0	1	2.4	
4	0	1	9.4		0	1	18.2		0	0	4.2	
5	0	0	3.2		0	1	12.7		0	1	6.2	
6	0	1	18.7		0	1	5.1		0	1	4.4	
7	0	1	4.9		0	1	6.8		0	1	10.6	
8	0	1	6.9		0	1	17.5		0	0	4.4	
9	0	1	9.5		0	1	5.1		0	1	4.9	
10	0	1	5.4	0	0	1	6.5	0	0	1	15.0	0
11	0	1	8.5		0	1	4.4		0	1	9.5	
12	0	1	3.9		0	1	3.3		0	1	9.6	
13	0	1	26.4		0	1	16.0		0	1	4.9	
14	0	1	3.3		0	1	11.3		0	1	7.6	
15	0	1	3.4		0	1	4.1		0	1	9.5	
16	0	1	5.4		0	1	18.5		0	1	14.0	
17	0	1	9.6		0	1	13.6		0	1	13.2	
18	0	1	4.2		0	1	7.8		0	1	9.2	
19	0	1	6.6		0	1	9.0		0	1	7.8	
20	0	1	4.8	0.25	0	1	21.0	0.5	0	1	6.2	0.25
21	0	1	9.4		0	1	6.2		0	1	3.0	
22	0	1	8.2		0	1	1.1		0	1	5.5	
23	0	1	4.9		0	1	4.8		0	1	6.5	
24	0	1	4.5		0	1	15.0		0	1	8.5	
25	0	1	2.7		0	1	1.4		0	1	10.2	
26	0	1	6.4		0	1	5.9		0	1	4.6	
27	0	1	3.9		0	1	19.0		0	1	7.5	
28	0	1	21.1		0	1	6.2		0	1	7.5	
29	0	1	8.2		0	1	14.0		0	1	3.9	
30	0	1	5.0	0.5	0	1	7.5	0.25	0	1	21.1	0.25
31	0	1	4.6		0	1	12.1		0	1	3.0	
32	0	1	9.0		0	1	15.0		0	1	5.5	
33	0	1	21.4		0	1	11.2		0	1	10.2	
34	0	1	18.3		0	1	14.0		0	1	8.1	
35	0	1	4.0		0	1	7.2		0	1	4.6	
36	0	1	3.4		0	1	8.6		0	1	9.6	
37	0	0	2.1		0	1	14.0		0	1	23.0	
38	0	-	s		0	1	15.4		0	1	5.4	
39	0	1	21.3		0	1	10.2		0	1	10.6	
40	0	1	6.1	0	0	1	18.5	0	0	1	12.1	0.5
41	0	1	6.9		0	1	21.0		0	1	13.0	
42	0	1	8.5		0	1	8.0		0	1	7.0	
43	0	1	9.3		0	1	10.5		0	1	11.2	
44	0	1	32.5		0	1	15.2		0	1	3.5	
45	0	1	9.2		0	1	5.7		0	1	5.6	
46	0	1	11.7		0	1	8.5		0	1	6.0	
47	0	1	6.5		0	1	6.6		0	1	10.2	
48	0	1	5.8		0	1	13.0		0	1	8.0	
49	0	-	s		0	1	22.0		0	1	12.8	
50	0	1	7.5	0.5	0	1	3.5	0.25	0	1	5.0	0
51	0	1	4.9		0	1	4.6		0	1	21.3	
52	0	1	7.7		0	1	19.0		0	1	6.5	
53	0	1	9.5		0	1	8.2		0	1	6.6	
54	0	1	11.3		0	1	7.1		0	1	3.0	
55	0	1	4.4		0	1	11.1		0	1	10.0	
56	0	1	6.2		0	1	10.7		0	1	5.9	
57	0	1	11.5		0	1	11.5		0	1	3.8	
58	0	1	4.6		0	1	11.1		0	1	9.8	
59	0	1	4.5		0	1	8.7		0	1	8.0	
60	0	1	11.1	0	0	1	5.6	0	0	1	3.6	0
61	0	1	7.1		0	1	6.6		0	1	7.3	
62	0	1	8.2		0	1	8.6		0	1	6.4	
63	0	1	5.4		0	1	20.4		0	1	12.0	
64	0	1	5.9		0	1	10.9		0	1	0.5	
65	0	1	6.7		0	1	16.0		0	1	5.0	
66	0	1	10.0		0	1	12.2		0	1	10.1	
67	0	1	4.9		0	1	16.8		0	1	1.5	
68	0	1	14.0		0	1	8.5		0	1	4.0	
69	0	1	6.4		0	1	13.2		0	1	6.1	
70	0	1	3.0	0	0	1	5.2	0	0	1	14.6	0.75
71	0	1	31.0		0	1	8.1		0	1	2.6	
72	0	1	6.8		0	1	7.4		0	1	5.5	
73	0	1	13.1		0	1	4.3		0	1	5.8	
74	0	1	4.4		0	1	6.2		0	1	3.7	
75	0	1	7.0		0	1	13.5		0	1	11.6	
76	0	0	2.5		0	1	3.4		0	1	4.2	
77	0	1	s		0	1	9.2		0	1	13.9	
78	0	1	4.0		0	1	3.2		0	1	9.7	
79	0	1	12.0		0	1	9.4		0	1	3.2	
80	0	1	7.4	0	0	1	7.8	0.25	0	1	5.0	0
81	0	1	10.5		0	1	8.4		0	1	3.0	
82	0	1	14.3		0	1	10.5		0	1	5.2	
83	0	1	11.1		0	1	19.0		0	1	3.6	
84	0	1	14.0		0	1	21.6		0	1	26.2	
85	0	1	3.6		0	1	16.3		0	1	7.6	
86	0	1	7.7		0	1	6.2		0	1	4.7	
87	0	1	8.0		0	1	11.1		0	1	3.2	
88	0	1	21.6		0	1	13.3		0	1	s	
89	0	1	9.0		0	1	11.2		0	1	2.8	
90	0	1	8.2	0.25	0	1	11.1	0	0	1	5.5	0
91	0	1	4.0		0	1	11.2		0	1	11.8	
92	0	1	13.0		0	1	10.4		0	1	4.5	
93	0	1	9.9		0	1	5.2		0	1	1.7	
94	0	1	5.5		0	1	4.7		0	1	2.7	
95	0	1	8.2		0	1	10.0		0	1	7.1	
96	0	1	6.0		0	1	11.3		0	1	6.8	
97	0	1	4.9		0	1	8.8		0	1	20.0	
98	0	1	16.2		0	1	0.5		0	1	5.6	
99	0	1	7.0		0	1	3.2		0	1	11.9	
100	0	1	5.9	0	0	1	4.1	0	0	1	11.8	
Minimum	**0**	**0**	**2.10**	**0**	**0**	**0**	**0.500**	**0**	**0**	**0**	**0.500**	**0**
Maximum	**0**	**1.00**	**32.5**	**0.500**	**0.00**	**1.00**	**22.0**	**0.500**	**0**	**1.00**	**26.2**	**0.750**
Mean	**0**	**0.969**	**8.68**	**0.150**	**0**	**0.9900**	**10.06**	**0.125**	**0**	**0.980**	**7.78**	**0.194**
Sandard Dev.	**0**	**0.173**	**5.80**	**0.211**	**0.000**	**0.100**	**5.13**	**0.177**	**0**	**0.141**	**4.74**	**0.273**
Geometric mean	**-**	**-**	**7.35**	**-**	**-**	**-**	**8.56**	**-**	**-**	**-**	**6.52**	**-**
Median	**0**	**1.00**	**7.00**	**0**	**0**	**1.00**	**9.10**	**0**	**0**	**1.00**	**6.50**	**0**
Calcite Index	**0.969**		**-**	**-**	**0.990**		**-**	**-**	**0.980**		**-**	**-**

Table F.28: Calcite and Pebble Count at RG_FODHE, FRO LAEMP, September 2019

Rock	RG_FODHE 3				RG_FODHE 2				RG_FODHE 1			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	3.1		0	0	12.2		0	0	10.0	
2	0	1	11.0		0	0	5.6		0	0	10.9	
3	0	1	s		0	0	3.5		0	0	25.1	
4	0	1	s		0	0	4.6		0	0	10.0	
5	0	1	9.2		0	0	4.1		0	0	17.5	
6	0	1	12.3		0	0	7.2		0	1	8.0	
7	0	1	7.8		0	0	7.5		0	0	7.3	
8	0	1	7.4		0	0	6.8		0	0	5.1	
9	0	1	6.2		0	0	4.3		0	0	10.3	
10	0	1	15.7	0.25	0	0	5.2	0	0	0	10.2	0
11	0	1	12.0		0	0	8.2		0	1	4.3	
12	0	1	2.2		0	0	4.7		0	1	12.0	
13	0	1	5.6		0	0	7.1		0	0	10.4	
14	0	0	5.9		0	0	5.6		0	0	3.9	
15	0	1	2.9		0	0	6.8		0	0	10.6	
16	0	0	9.4		0	0	7.1		0	0	10.2	
17	0	1	6.7		0	0	8.8		0	0	17.1	
18	0	0	5.4		0	0	8.1		0	0	12.1	
19	0	1	10.0		0	0	6.7		0	1	7.1	
20	0	0	9.2	0.25	0	0	8.2	0	0	1	10.5	0
21	0	0	5.6		0	0	7.5		0	1	19.2	
22	0	0	10.2		0	0	9.1		0	0	11.1	
23	0	0	6.2		0	0	7.7		0	0	20.7	
24	0	0	5.4		0	0	5.6		0	1	13.1	
25	0	0	4.9		0	1	9.5		0	0	9.5	
26	0	0	7.0		0	1	8.5		0	0	10.0	
27	0	0	5.8		0	0	6.7		0	0	11.2	
28	0	0	7.2		0	0	10.3		0	0	26.6	
29	0	0	7.2		0	0	10.6		0	1	9.2	
30	0	0	4.9	0	0	0	10.0	0.25	0	0	9.5	0
31	0	0	9.4		0	0	12.0		0	1	11.7	
32	0	0	6.6		0	0	13.5		0	0	14.1	
33	0	0	6.0		0	0	9.2		0	1	4.9	
34	0	0	11.8		0	0	10.0		0	0	4.2	
35	0	0	6.6		0	0	12.0		0	1	12.5	
36	0	0	5.7		0	0	14.0		0	0	12.0	
37	0	0	5.6		0	0	6.8		0	0	10.0	
38	0	0	6.8		0	0	11.9		0	0	22.1	
39	0	0	13.0		0	0	7.5		0	0	10.6	
40	0	0	-	0	0	0	10.7	0	0	0	6.0	0
41	0	0	8.4		0	0	9.0		0	0	11.6	
42	0	0	7.0		0	0	14.0		0	0	3.9	
43	0	1	5.1		0	0	8.0		0	0	20.4	
44	0	0	8.7		0	0	12.6		0	0	11.0	
45	0	0	7.0		0	0	26.0		0	0	9.0	
46	0	0	5.9		0	0	17.3		0	0	9.6	
47	0	0	4.8		0	0	10.2		0	0	8.2	
48	0	0	8.2		1	1	12.0		0	0	10.0	
49	0	0	8.2		1	1	6.3		0	0	3.1	
50	0	0	5.4	0.5	0	0	7.5	0	0	0	9.6	0
51	0	0	11.1		0	0	11.5		0	0	2.7	
52	0	0	5.6		0	0	8.2		0	0	19.1	
53	0	0	7.2		0	0	5.2		0	0	13.2	
54	0	0	5.6		0	0	15.4		0	0	9.2	
55	0	0	9.3		0	0	13.4		0	0	s	
56	0	0	8.1		0	0	12.6		0	0	6.5	
57	0	0	7.1		0	0	9.5		0	0	10.6	
58	0	1	8.4		0	0	7.3		0	0	6.0	
59	0	0	16.0		0	0	5.7		0	0	6.5	
60	0	0	5.6	0	0	0	9.5	0.25	0	0	3.1	0
61	0	0	6.4		0	0	12.8		0	0	2.1	
62	0	0	6.1		0	0	7.7		0	0	5.2	
63	0	0	6.0		0	0	11.1		0	0	20.0	
64	0	0	6.8		0	0	10.6		0	0	8.6	
65	0	0	8.2		0	0	13.2		0	0	12.6	
66	0	0	3.3		0	0	17.8		0	0	2.6	
67	0	0	2.2		0	0	6.4		0	0	4.0	
68	0	0	9.4		0	0	11.6		0	0	0.9	
69	0	0	8.0		0	0	7.7		0	0	5.1	
70	0	0	8.1	0	0	0	14.0	0	0	0	8.5	0
71	0	0	8.0		0	0	10.1		0	1	4.5	
72	0	0	9.8		0	0	5.5		0	0	13.2	
73	0	0	12.3		1	1	5.7		0	0	8.9	
74	0	0	9.2		0	0	11.1		0	0	8.5	
75	0	0	7.6		1	1	9.6		0	0	4.8	
76	0	0	4.3		0	0	12.6		0	0	5.7	
77	0	0	7.2		0	0	6.8		0	0	3.2	
78	0	0	9.8		0	0	9.5		0	0	11.3	
79	0	0	15.4		0	0	8.7		0	0	9.2	
80	0	1	7.6	0	0	0	6.5	0.25	0	0	6.5	0
81	0	0	5.6		0	0	5.7		0	0	10.2	
82	0	0	7.2		0	0	5.5		0	0	8.5	
83	0	0	13.1		0	0	6.4		0	0	18.1	
84	0	0	8.2		0	0	10.1		0	0	5.0	
85	0	0	9.4		0	0	8.7		0	0	12.0	
86	0	0	4.6		0	0	3.9		0	0	8.0	
87	0	0	6.9		0	0	5.6		0	0	9.5	
88	0	0	5.8		0	0	7.2		0	0	12.6	
89	0	1	4.6		0	0	5.7		0	0	24.0	
90	0	0	7.1	0	0	0	5.4	0	0	0	10.9	0
91	0	0	9.2		0	0	8.2		0	0	10.3	
92	0	0	5.7		0	0	15.1		0	0	9.7	
93	0	0	8.6		0	0	3.5		0	0	12.2	
94	0	0	4.2		0	0	9.5		0	0	16.5	
95	0	0	4.2		0	0	7.7		0	0	6.5	
96	0	1	19.0		0	0	7.5		0	0	15.4	
97	0	0	4.5		0	0	6.8		0	0	7.0	
98	0	1	12.2		0	0	6.5		0	0	9.5	
99	0	0	7.2		0	0	0.8		0	0	8.0	
100	0	0	7.6	0	0	0	8.3	0.25	0	0	6.4	0
Minimum	**0**	**0**	**2.20**	**0**	**0**	**0**	**0.800**	**0**	**0**	**0**	**0.900**	**0**
Maximum	**0**	**1.00**	**19.0**	**0.500**	**1.00**	**1.00**	**26.0**	**0.250**	**0**	**1.00**	**26.6**	**0**
Mean	**0**	**0.220**	**7.64**	**0.100**	**0**	**0.0600**	**8.8**	**0.100**	**0**	**0.120**	**10.10**	**0**
Standard Dev.	**0**	**0.416**	**2.99**	**0.175**	**0.197**	**0.239**	**3.60**	**0.129**	**0**	**0.327**	**5.15**	**0**
Geometric mean	**-**	**-**	**7.10**	**-**	**-**	**-**	**8.13**	**-**	**-**	**-**	**8.78**	**-**
Median	**0**	**0**	**7.20**	**0**	**0**	**0**	**8.20**	**0**	**0**	**0**	**9.70**	**0**
Calcite Index	**0.220**		**-**	**-**	**0.100**		**-**	**-**	**0.120**		**-**	**-**

Table F.29: Calcite and Pebble Count at RG_FOUCL, FRO LAEMP, September 2019

Rock	RG_FOUCL 1				RG_FOUCL 2				RG_FOUCL 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	7.6		0	1	10.5		0	1	7.8	
2	0	1	4.5		0	1	5.5		0	1	5.3	
3	0	1	12.0		0	1	7.3		0	1	5.4	
4	0	1	16.5		0	1	9.9		0	1	7.3	
5	0	1	4.6		0	1	4.6		0	1	7.7	
6	0	1	5.3		0	1	11.4		0	1	11.5	
7	0	1	7.2		0	1	8.5		0	1	4.7	
8	0	1	5.6		0	1	14.5		0	1	11.7	
9	0	1	4.4		0	1	10.3		0	1	9.3	
10	0	1	12.6	0	0	1	14.0	0.5	0	1	15.5	0.5
11	0	1	7.7		0	1	8.5		0	1	12.5	
12	0	1	9.4		0	1	8.5		0	0	3.5	
13	0	1	10.6		0	1	7.2		0	1	6.5	
14	0	1	8.1		0	1	13.1		0	1	17.0	
15	0	1	5.4		0	1	9.3		0	1	6.5	
16	0	1	3.9		0	1	7.4		0	1	8.5	
17	0	1	4.6		0	1	5.6		0	1	6.2	
18	0	1	2.6		0	1	10.0		0	1	5.8	
19	0	1	6.9		0	1	8.2		0	1	9.0	
20	0	1	2.9	0	0	1	5.5	0	0	1	7.0	0.25
21	0	1	5.2		0	1	11.2		0	1	7.7	
22	0	1	5.9		0	1	14.2		0	1	7.1	
23	0	1	3.6		0	1	11.4		0	1	6.0	
24	0	1	8.0		0	1	8.0		0	1	9.7	
25	0	1	12.5		0	1	3.5		0	1	8.4	
26	0	1	8.4		0	1	6.3		0	1	9.2	
27	0	1	15.0		0	1	11.1		0	1	3.4	
28	0	1	6.0		0	1	8.5		0	1	10.5	
29	0	1	21.2		0	1	14.3		0	1	4.5	
30	0	1	6.4	0.25	0	1	8.8	0.25	0	1	5.5	0.25
31	0	1	4.5		0	1	9.2		0	1	10.0	
32	0	1	7.4		0	1	9.2		0	1	11.5	
33	0	1	7.0		0	1	12.0		0	1	7.4	
34	0	1	5.3		0	1	14.1		0	0	3.4	
35	0	1	12.2		0	1	8.6		0	1	8.6	
36	0	1	3.6		1	1	10.2		0	1	15.5	
37	0	1	13.2		0	1	8.5		0	1	5.5	
38	0	1	7.0		0	1	8.3		0	1	13.0	
39	0	1	11.0		0	1	10.5		0	1	14.0	
40	0	1	6.4	0	0	1	5.1	0	0	1	7.4	0
41	0	1	7.3		0	1	13.3		0	1	6.0	
42	0	1	6.6		0	1	8.0		0	1	9.5	
43	0	1	11.0		1	1	12.4		0	1	6.2	
44	0	1	5.9		0	1	6.5		0	1	12.5	
45	0	1	4.6		0	1	10.1		0	1	7.8	
46	0	1	6.1		1	1	11.5		0	1	9.0	
47	0	1	6.2		0	1	5.0		0	1	6.9	
48	0	1	8.5		0	1	6.9		0	1	12.1	
49	0	1	5.2		0	1	8.1		0	1	6.4	
50	0	1	6.4	0.5	0	1	10.5	0	0	1	-	0.75
51	0	1	16.8		0	1	12.5		0	1	9.1	
52	0	1	10.5		0	1	9.8		0	1	10.0	
53	0	1	7.2		0	1	8.1		0	1	17.0	
54	0	0	6.4		1	1	14.0		0	1	6.0	
55	0	1	8.0		0	1	4.2		0	1	4.7	
56	0	1	8.4		0	1	6.7		0	1	9.5	
57	0	1	5.6		0	1	8.5		0	1	8.0	
58	0	1	7.4		0	1	6.8		0	1	4.5	
59	0	1	14.2		0	1	16.0		0	1	3.7	
60	0	1	4.8	0.25	0	1	7.2	0.5	0	1	10.5	0.25
61	0	1	3.7		0	1	5.8		0	1	8.3	
62	0	1	12.0		0	1	8.4		0	1	6.4	
63	0	1	14.5		0	1	12.2		0	1	9.9	
64	0	1	7.0		0	1	11.2		0	1	1.4	
65	0	0	8.6		0	1	9.6		0	1	6.7	
66	0	1	12.9		0	1	9.1		0	1	12.5	
67	0	0	12.2		0	1	11.7		0	1	8.0	
68	0	0	5.5		0	1	6.5		0	1	6.0	
69	0	1	24.0		0	1	6.4		0	1	9.4	
70	0	1	28.2	0.25	0	1	5.5	0.25	0	0	3.9	0.25
71	0	1	9.6		0	1	7.3		0	1	7.9	
72	0	1	5.2		0	1	11.5		0	1	9.2	
73	0	1	7.2		0	1	9.3		0	1	5.9	
74	0	1	21.8		0	1	14.2		0	1	4.6	
75	0	0	9.2		0	1	9.8		0	1	3.9	
76	0	1	14.6		0	1	8.8		0	1	11.1	
77	0	1	11.2		0	1	7.5		0	1	14.2	
78	0	1	6.4		0	1	9.6		0	1	8.1	
79	0	1	9.2		0	1	9.1		0	1	6.4	
80	0	1	13.0	0	0	1	9.2	0	0	1	11.3	0
81	0	1	5.6		0	1	3.9		0	1	9.1	
82	0	1	23.2		1	1	13.0		0	1	8.6	
83	0	1	10.4		0	1	11.0		0	1	4.3	
84	0	1	8.6		1	1	7.7		0	1	7.0	
85	0	1	17.0		1	1	7.6		0	1	10.7	
86	0	1	13.6		1	1	4.6		0	1	5.6	
87	0	1	5.5		0	1	8.5		0	1	23.2	
88	0	1	23.5		0	1	8.2		0	1	6.3	
89	0	0	5.6		0	0	5.2		0	1	7.7	
90	0	1	26.1	0.25	0	1	4.0	0.25	0	1	12.1	0.25
91	0	1	4.7		0	1	4.6		0	0	8.2	
92	0	1	3.6		0	1	6.0		0	1	8.5	
93	0	0	11.0		0	0	2.4		0	1	9.5	
94	0	1	4.9		0	1	11.1		0	1	9.6	
95	0	1	16.2		0	1	5.5		0	1	4.4	
96	0	1	8.7		0	1	9.7		0	1	16.5	
97	0	1	14.1		0	1	5.7		0	1	9.0	
98	0	1	13.0		0	1	12.8		0	1	10.6	
99	0	1	8.6		0	1	11.4		0	0	6.2	
100	0	1	6.2	0.5	0	0	4.2	0.25	0	1	5.8	0
Minimum	**0.0**	**0.0**	**2.6**	**0**	**0.0**	**0.0**	**2.4**	**0**	**0.0**	**0.0**	**1.4**	**0**
Maximum	**0.0**	**1.0**	**28.2**	**0.5**	**1.0**	**1.0**	**16.0**	**0.5**	**0.0**	**1.0**	**23.2**	**0.75**
Mean	**0.0**	**0.9**	**9.4**	**0.2**	**0.1**	**1.0**	**8.9**	**0.2**	**0.0**	**1.0**	**8.4**	**0.3**
Standard Dev.	**0.0**	**0.3**	**5.4**	**0.2**	**0.3**	**0.2**	**2.9**	**0.2**	**0.0**	**0.2**	**3.5**	**0.2**
Geometric mean	**-**	**-**	**8.2**	**-**	**-**	**-**	**8.4**	**-**	**-**	**-**	**7.7**	**-**
Median	**0.0**	**1.0**	**7.5**	**0**	**0.0**	**1.0**	**8.6**	**0**	**0.0**	**1.0**	**8.0**	**0**
Calcite Index	**0.9**		**-**	**-**	**1.1**		**-**	**-**	**1.0**		**-**	**-**

Table F.30: Calcite and Pebble Count at RG_FOUNGD, FRO LAEMP, September 2019

Rock	RG_FOUNGD 1				RG_FOUNGD 2				RG_FOUNGD 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	5.0		0	1	6.0		0	0	3.5	
2	0	0	4.5		0	0	4.0		0	0	2.0	
3	0	0	1.0		0	0	5.5		0	1	6.0	
4	0	1	2.8		0	1	4.5		0	0	2.5	
5	0	1	11.0		0	1	7.0		1	1	9.0	
6	0	0	8.5		0	1	10.0		0	0	3.0	
7	0	1	12.0		0	0	s		0	0	5.0	
8	0	0	1.0		0	1	9.0		0	0	5.0	
9	0	0	3.0		0	0	3.0		0	0	3.0	
10	0	1	7.0	0.25	0	1	8.0	0.50	0	0	s	1
11	0	0	3.0		0	0	6.0		0	0	3.5	
12	0	0	s		0	0	3.0		0	0	2.5	
13	0	1	4.5		0	1	8.5		0	0	6.0	
14	0	0	1.5		0	1	6.0		0	1	4.0	
15	0	0	s		0	0	4.0		0	1	7.0	
16	0	0	4.0		0	0	1.0		0	0	6.5	
17	0	0	1.0		0	1	8.5		0	1	3.5	
18	0	0	12.0		0	0	4.0		0	0	3.0	
19	0	0	4.5		0	0	5.0		0	0	4.0	
20	0	0	1.0	0	0	0	2.0	0.25	0	0	4.0	0.25
21	0	0	3.0		0	0	4.0		0	0	2.5	
22	0	-	12.0		0	1	5.0		0	0	5.0	
23	0	-	10.0		0	0	7.5		0	0	1.0	
24	0	1	2.0		0	0	5.0		0	1	8.0	
25	0	1	3.0		0	0	4.0		0	1	5.0	
26	0	0	5.0		0	1	7.5		0	1	6.0	
27	0	1	6.5		0	0	5.0		0	1	4.0	
28	0	1	10.0		0	0	6.0		0	1	9.0	
29	0	1	8.0		0	1	7.0		0	1	7.0	
30	0	1	6.5	0.25	0	0	7.0	0.25	0	0	3.5	0.50
31	0	-	41.0		0	0	5.5		0	0	3.0	
32	0	1	8.0		0	1	4.0		0	0	3.5	
33	0	0	s		0	0	5.5		0	0	3.0	
34	0	0	4.0		0	0	2.0		0	1	6.0	
35	0	1	8.0		0	0	s		0	0	4.0	
36	0	0	4.5		0	0	2.5		0	1	5.0	
37	0	0	3.0		0	0	5.0		0	1	5.5	
38	0	-	27.0		0	0	4.0		0	1	6.0	
39	0	1	6.0		0	0	6.5		0	1	8.0	
40	0	0	4.5	0.50	0	1	7.0	0.25	0	0	1.5	0.25
41	0	0	3.0		0	0	6.0		0	1	4.0	
42	0	0	2.0		0	1	5.0		0	1	4.5	
43	0	1	7.5		0	1	6.0		0	0	2.5	
44	0	1	4.0		0	1	6.5		0	1	5.0	
45	0	0	2.0		0	0	s		0	1	5.0	
46	0	0	9.5		0	0	3.0		0	0	4.5	
47	0	0	3.5		0	1	5.0		0	-	6.0	
48	0	0	2.5		1	1	6.0		0	0	0.5	
49	0	0	4.0		1	1	7.0		0	0	2.0	
50	0	0	2.0	0.50	0	1	3.0	0.25	0	0	4.5	0.75
51	0	1	9.0		0	1	4.5		0	0	4.0	
52	0	1	4.0		0	1	s		0	0	4.5	
53	0	0	3.5		0	1	2.5		0	1	3.0	
54	0	1	5.0		0	0	7.0		0	0	5.0	
55	0	0	3.5		0	1	8.5		0	0	7.5	
56	0	0	s		0	0	s		0	1	7.0	
57	0	0	2.5		0	0	1.5		0	0	7.5	
58	0	0	3.5		0	1	4.5		0	0	4.0	
59	0	0	s		0	1	5.0		0	0	4.5	
60	0	1	3.5	0.50	0	0	4.5	0.50	0	1	8.5	0.50
61	0	0	3.5		1	1	4.0		0	0	5.0	
62	0	1	4.5		1	1	2.5		0	1	7.0	
63	1	1	6.5		0	0	3.0		0	1	9.0	
64	-	-	14.0		0	0	5.0		0	0	3.0	
65	0	1	8.5		0	0	6.5		0	1	14.0	
66	-	-	6.0		0	0	3.0		0	1	6.0	
67	0	0	1.0		0	1	4.5		0	0	6.5	
68	0	0	3.0		0	0	3.5		0	1	7.5	
69	0	0	3.0		0	1	6.0		0	1	2.5	
70	0	0	2.5	0.25	0	0	9.0	0.25	0	1	7.0	0.25
71	0	0	4.0		0	0	5.0		0	1	8.5	
72	0	1	3.5		0	1	3.5		0	1	6.0	
73	0	1	9.0		0	1	4.0		0	0	5.0	
74	0	1	3.5		0	1	6.0		0	1	6.0	
75	1	1	2.5		0	1	16.0		0	-	14.0	
76	0	1	5.0		0	1	6.0		0	1	3.5	
77	0	1	8.0		1	1	5.0		0	0	3.0	
78	0	1	8.5		1	1	3.5		0	1	6.5	
79	0	1	8.0		0	1	5.0		0	1	5.0	
80	0	1	4.0	0.25	0	1	14.0	0.50	0	1	9.0	0.75
81	0	1	11.0		0	1	12.0		0	1	6.0	
82	-	-	25.0		1	1	4.0		0	1	3.5	
83	0	1	3.0		0	1	7.5		0	1	6.0	
84	0	1	3.5		1	1	4.0		0	1	6.0	
85	0	1	8.0		0	1	6.0		0	1	3.5	
86	0	0	5.0		0	1	5.0		0	1	1.5	
87	-	-	35.0		0	1	5.0		0	1	6.0	
88	0	0	1.0		0	0	3.0		0	1	5.5	
89	0	0	3.0		0	1	7.5		0	-	14.0	
90	-	-	18.0	0.75	0	1	8.0	0.75	0	0	4.0	0.25
91	0	1	2.5		0	1	11.0		0	1	6.0	
92	0	1	4.0		0	1	6.0		0	1	8.0	
93	0	0	3.5		0	1	5.0		0	0	3.5	
94	-	-	22.0		0	1	8.0		0	0	6.0	
95	0	0	3.0		0	1	6.0		0	0	5.5	
96	0	0	2.5		0	1	6.0		0	0	s	
97	1	1	9.0		0	1	7.5		0	0	3.0	
98	0	0	2.0		0	1	6.0		0	0	2.5	
99	-	-	19.0		0	1	5.0		0	0	1.0	
100	0	0	2.5	0.25	0	1	4.0	0.25	0	0	3.5	0.5
Minimum	**0**	**0**	**1.00**	**0**	**0**	**0**	**1.00**	**0.250**	**0**	**0**	**0.500**	**0.250**
Maximum	**1.00**	**1.00**	**41.0**	**0.750**	**1.00**	**1.00**	**16.0**	**0.750**	**1.00**	**1.00**	**14.0**	**1.00**
Mean	**0.0323**	**0.449**	**6.58**	**0.350**	**0.0800**	**0.590**	**5.60**	**0.375**	**0.0100**	**0.485**	**5.13**	**0.500**
Standard Dev.	**0.178**	**0.500**	**6.77**	**0.211**	**0.273**	**0.494**	**2.45**	**0.177**	**0.100**	**0.502**	**2.53**	**0.264**
Geometric mean	**-**	**-**	**4.71**	**-**	**-**	**-**	**5.11**	**-**	**-**	**-**	**4.51**	**-**
Median	**0**	**0**	**4.00**	**0.250**	**0**	**1.00**	**5.00**	**0.250**	**0**	**0**	**5.00**	**0.500**
Calcite Index	**0.482**		**-**	**-**	**0.670**		**-**	**-**	**0.495**		**-**	**-**

Table F.31: Calcite and Pebble Count at RG_FODNGD, FRO LAEMP, September 2019

Rock	RG_FODNGD 1				RG_FODNGD 2				RG_FODNGD 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	0	3.0		0	1	11.0		0	0	4.0	
2	0	0	5.5		0	0	7.0		0	0	3.5	
3	0	0	4.0		0	0	3.0		0	0	7.0	
4	0	0	s		0	0	4.5		0	0	3.5	
5	0	0	7.0		0	0	3.0		0	0	2.0	
6	0	0	9.5		0	1	21.0		0	0	4.5	
7	0	0	1.5		0	0	5.0		0	0	12.5	
8	0	0	6.0		0	1	12.0		0	0	6.5	
9	0	0	7.0		0	0	2.0		0	0	7.0	
10	0	0	6.5	0.50	0	1	13.0	0.75	0	1	8.5	0.25
11	0	0	8.0		0	0	s		0	0	7.0	
12	0	0	6.0		0	0	2.0		0	0	s	
13	0	0	8.5		0	0	2.5		0	0	4.0	
14	0	0	7.5		0	0	4.5		0	0	1.0	
15	0	0	7.0		0	0	5.5		0	1	7.0	
16	0	0	17.0		0	0	4.0		0	1	9.0	
17	0	0	12.0		0	0	6.0		0	0	6.0	
18	0	1	14.0		0	0	4.5		0	0	3.5	
19	0	0	8.0		0	0	2.5		0	1	3.0	
20	0	0	6.5	0.25	0	1	6.0	0.50	0	1	11.0	0.50
21	0	0	8.5		0	0	6.5		0	0	7.0	
22	0	0	3.5		0	0	5.5		0	0	5.0	
23	0	0	s		0	0	7.5		0	1	10.0	
24	0	0	1.0		0	0	4.0		0	1	10.0	
25	0	0	5.0		0	1	31.0		0	0	8.0	
26	0	0	4.5		0	0	12.0		0	1	8.0	
27	0	0	11.0		0	1	2.5		0	1	7.5	
28	0	0	9.5		0	0	s		0	1	7.0	
29	0	1	8.0		0	0	4.5		0	0	6.5	
30	0	0	7.0	0.50	0	1	10.5	0.50	0	0	6.0	0.25
31	0	1	10.0		0	0	7.0		0	1	7.0	
32	0	0	8.5		0	-	10.0		0	0	3.0	
33	0	0	6.0		0	1	10.0		0	0	9.5	
34	0	0	3.5		0	1	8.5		0	0	5.5	
35	0	0	2.0		0	1	8.5		0	0	7.0	
36	0	0	4.0		0	0	3.5		0	0	5.5	
37	0	0	8.0		0	1	5.0		0	1	8.5	
38	0	0	2.5		0	0	4.0		0	1	10.0	
39	0	1	12.0		0	0	3.0		0	0	6.0	
40	0	0	5.5	0.75	0	0	4.5	0.25	0	0	3.5	0.75
41	0	0	6.0		0	-	18.0		0	0	9.0	
42	0	0	4.5		0	1	7.5		0	1	9.5	
43	0	0	11.0		0	1	18.0		-	-	21.0	
44	0	0	9.0		0	0	7.5		0	1	8.0	
45	0	0	s		0	0	5.0		0	1	3.5	
46	0	0	6.5		0	1	9.0		0	0	7.5	
47	0	0	3.0		0	1	10.0		0	0	5.0	
48	0	1	6.5		0	0	5.0		0	1	4.0	
49	0	1	4.0		0	1	7.5		-	-	9.0	
50	0	1	5.5	0.50	0	1	6.0	0.50	0	0	8.5	0.50
51	0	1	1.0		1	1	8.5		0	1	6.0	
52	0	0	2.5		0	1	8.0		0	1	5.5	
53	0	0	10.0		0	0	s		0	1	7.0	
54	0	0	14.0		0	0	s		0	0	4.0	
55	0	1	11.5		0	0	7.5		0	1	7.5	
56	0	1	8.5		0	1	8.0		0	1	3.5	
57	0	1	9.0		0	1	8.0		0	1	6.5	
58	0	1	8.0		0	1	8.0		0	0	7.0	
59	0	1	10.0		0	0	7.0		0	1	5.0	
60	0	1	11.0	0.75	0	1	6.0	0.50	0	1	10.0	0.25
61	0	0	5.5		0	1	4.0		0	0	4.5	
62	0	1	4.5		0	0	4.5		0	1	15.0	
63	0	1	14.0		0	1	5.5		0	0	1.0	
64	0	1	6.5		0	0	2.0		0	0	3.5	
65	0	0	7.5		0	0	4.5		0	1	17.0	
66	0	0	10.0		0	0	4.0		0	0	7.5	
67	0	1	7.0		0	0	8.0		0	1	8.5	
68	0	0	3.0		0	1	9.5		0	1	4.5	
69	0	1	9.0		0	0	4.5		0	0	5.5	
70	0	0	3.5	0.25	0	0	4.0	0.75	0	1	3.5	0.50
71	0	0	4.0		0	0	3.5		0	1	7.5	
72	0	1	5.0		0	0	7.0		0	1	6.0	
73	0	1	5.0		0	1	5.5		0	1	4.5	
74	0	0	1.0		0	1	6.0		0	0	3.5	
75	0	0	4.0		0	0	s		-	-	18.0	
76	0	-	11.0		0	0	2.5		0	0	6.5	
77	0	0	4.5		0	0	s		0	1	8.0	
78	0	0	7.0		0	0	15.0		0	0	5.0	
79	0	0	9.0		0	0	s		0	1	6.5	
80	0	0	3.5	0.5	0	-	15.0	0.75	0	0	4.5	0.25
81	0	0	4.5		0	0	4.5		0	0	3.5	
82	0	-	5.0		0	0	5.5		0	0	6.0	
83	0	1	7.0		0	0	3.5		0	0	5.5	
84	0	0	6.0		0	0	2.5		0	0	3.5	
85	0	0	2.5		0	1	11.0		0	0	5.0	
86	0	1	8.5		0	0	4.0		0	0	3.5	
87	0	1	8.0		0	0	5.0		0	0	3.0	
88	0	1	13.0		0	1	7.0		0	0	5.5	
89	0	1	5.0		0	1	10.0		0	0	6.5	
90	0	1	8.0	0.75	0	1	9.5	0.75	0	0	2.5	0
91	0	1	10.0		0	1	5.0		0	0	3.5	
92	0	1	4.0		0	1	10.0		0	0	2.0	
93	0	1	12.0		0	1	4.5		0	0	12.0	
94	0	0	7.5		0	1	4.0		0	0	4.0	
95	0	1	3.0		0	1	6.0		0	1	7.5	
96	0	1	7.0		0	0	5.5		0	0	3.5	
97	0	1	11.0		0	1	7.0		0	0	2.5	
98	0	1	9.5		0	1	6.0		0	0	s	
99	0	0	13.0		0	-	20.0		0	-	12.0	
100	0	1	9.0	0.5	0	-	10.0	0.75	0	1	5.0	0.25
Minimum	**0**	**0**	**1.00**	**0.250**	**0**	**0**	**2.00**	**0.250**	**0**	**0**	**1.00**	**0**
Maximum	**0**	**1.00**	**17.0**	**0.750**	**1.00**	**1.00**	**31.0**	**0.750**	**0**	**1.00**	**21.0**	**0.750**
Mean	**0**	**0.357**	**7.05**	**0.525**	**0**	**0.421**	**7.17**	**0.600**	**0**	**0.385**	**6.48**	**0.350**
Standard Dev.	**0**	**0.482**	**3.31**	**0.184**	**0.100**	**0.496**	**4.62**	**0.175**	**0**	**0.489**	**3.41**	**0.211**
Geometric mean	**-**	**-**	**6.15**	**-**	**-**	**-**	**6.13**	**-**	**-**	**-**	**5.69**	**-**
Median	**0**	**0**	**7.00**	**0.500**	**0**	**0**	**6.00**	**0.625**	**0**	**0**	**6.00**	**0.250**
Calcite Index	**0.357**		**-**	**-**	**0.431**		**-**	**-**	**0.385**		**-**	**-**

Table F.32: Calcite and Pebble Count at RG_MP1, FRO LAEMP, September 2019

Rock	RG_MP1 1				RG_MP1 2				RG_MP1 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	10.8		0	1	13.0		0	0	19.5	
2	0	0	6.0		0	1	11.6		0	1	12.0	
3	0	0	7.2		0	1	13.9		0	0	17.0	
4	0	0	27.4		0	1	21.0		0	0	s	
5	0	0	12.5		0	1	19.8		0	1	23.4	
6	0	0	s		0	1	15.2		0	0	11.1	
7	0	0	5.0		0	1	5.3		0	1	15.5	
8	0	0	10.1		0	0	10.6		0	0	9.2	
9	0	0	s		0	1	15.5		0	1	53.0	
10	0	0	55.2	0.75	0	0	7.7	0.50	0	0	46.8	0
11	0	0	>100		0	0	7.0		0	1	49.9	
12	0	0	21.3		0	1	47.0		0	1	4.1	
13	0	0	30.1		0	1	7.1		0	0	19.1	
14	0	0	27.1		0	0	4.9		0	1	28.0	
15	0	1	8.0		0	0	13.0		0	1	8.9	
16	0	1	7.9		0	0	7.4		0	1	23.5	
17	0	1	15.0		0	0	10.8		0	1	39.8	
18	0	0	11.6		0	0	6.5		0	1	12.0	
19	0	1	18.3		0	1	42.0		0	1	20.2	
20	0	0	23.1	0	0	0	4.4	0	0	1	13.0	0
21	0	0	54.3		0	0	8.2		0	0	46.0	
22	0	1	73.0		0	1	13.1		0	1	23.1	
23	0	0	b		0	1	15.8		0	1	7.9	
24	0	0	57.5		0	0	7.6		0	0	57.8	
25	0	1	1.2		0	0	4.1		0	1	28.0	
26	0	1	28.9		0	0	7.3		0	1	77.0	
27	0	1	5.8		0	0	21.5		0	1	19.3	
28	0	1	27.2		0	1	8.4		0	1	5.4	
29	0	1	43.5		0	0	5.3		0	1	19.5	
30	0	1	7.9	0	0	1	50.0	0	0	0	19.0	0.25
31	0	0	s		0	0	49.0		0	1	8.0	
32	0	1	80.0		0	0	44.0		0	1	5.2	
33	0	0	1.3		0	0	11.0		0	1	7.4	
34	0	1	b		0	0	1.4		0	1	7.9	
35	0	0	4.4		0	1	9.6		0	1	7.2	
36	0	1	b		0	1	2.5		0	0	4.4	
37	0	1	39.8		0	1	45.5		0	1	8.0	
38	0	0	5.3		0	1	46.0		0	0	3.1	
39	0	1	b		0	1	29.5		0	1	12.1	
40	0	1	3.9	0	0	0	1.6	0	0	0	10.0	0
41	0	1	67.0		0	0	2.4		0	1	8.0	
42	0	1	9.6		0	0	1.8		0	0	7.5	
43	0	1	37.1		0	0	6.1		0	1	7.6	
44	0	1	9.5		0	1	b		0	1	46.0	
45	0	1	61.2		0	0	2.0		0	0	40.2	
46	0	0	27.1		0	1	33.0		0	1	4.2	
47	0	0	19.2		0	1	16.1		0	1	29.5	
48	0	0	7.7		0	0	2.2		0	0	12.8	
49	0	0	26.0		0	0	7.9		0	1	7.9	
50	0	1	21.1	0.25	0	0	8.4	0.25	0	1	6.0	0.25
51	0	1	15.1		0	0	4.7		0	1	b	
52	0	1	20.0		0	1	53.0		0	0	7.8	
53	0	1	13.6		0	0	2.3		0	0	4.4	
54	0	0	b		0	1	14.5		0	0	4.0	
55	0	1	20.2		0	1	11.9		0	0	55.6	
56	0	1	b		0	1	17.1		0	0	8.6	
57	0	1	64.0		0	1	14.7		0	1	8.2	
58	0	0	3.9		0	1	10.8		0	1	7.5	
59	0	0	36.9		0	1	15.9		0	1	24.0	
60	0	0	4.6	0	0	0	33.0	0	0	1	6.4	0
61	0	0	b		0	1	b		0	0	28.6	
62	0	1	24.3		0	1	45.5		0	1	25.3	
63	0	0	24.9		0	1	30.0		0	0	2.1	
64	0	0	9.9		0	1	17.5		0	1	4.0	
65	0	1	12.4		0	1	15.1		0	1	3.8	
66	0	0	7.3		0	1	51.0		0	1	23.2	
67	0	0	4.1		0	1	17.0		0	1	13.4	
68	0	0	5.6		0	1	6.4		0	1	23.2	
69	0	0	34.2		0	1	10.2		0	1	54.0	
70	0	0	6.8	0	0	1	35.0	0	0	1	8.1	0.25
71	0	0	3.0		0	1	15.2		0	1	28.1	
72	0	0	s		0	1	11.4		0	1	10.1	
73	0	0	4.5		0	1	44.0		0	0	9.1	
74	0	1	4.6		0	1	3.7		0	1	24.0	
75	0	0	2.9		0	0	3.1		0	0	4.6	
76	0	0	13.8		0	1	51.5		0	1	8.6	
77	0	1	6.5		0	1	12.5		0	1	10.1	
78	0	1	9.8		0	1	14.4		0	1	3.0	
79	0	0	26.1		0	0	13.5		0	1	8.6	
80	0	0	9.2	0	0	0	19.0	0.25	0	1	9.0	0
81	0	0	4.8		0	0	s		0	1	24.5	
82	0	1	6.2		0	0	15.9		0	0	5.4	
83	0	1	4.1		0	1	11.2		0	1	15.1	
84	0	0	9.5		0	1	10.4		0	1	8.2	
85	0	1	6.5		0	0	5.1		0	1	7.7	
86	0	0	19.0		0	0	4.2		0	1	37.3	
87	0	1	5.6		0	0	10.5		0	1	57.2	
88	0	0	4.2		0	0	7.0		0	1	29.7	
89	0	1	4.4		0	0	b		0	1	7.1	
90	0	1	5.9	0	0	1	13.4	0	0	1	26.9	0.50
91	0	0	33.2		0	1	4.5		0	1	b	
92	0	1	5.5		0	1	3.9		0	1	41.1	
93	0	1	3.9		0	1	15.6		0	1	14.0	
94	0	0	33.2		0	1	9.3		0	0	5.2	
95	0	1	5.8		0	1	4.2		0	1	12.2	
96	0	0	5.1		0	0	9.5		0	1	43.3	
97	0	1	6.7		0	0	8.3		0	0	4.8	
98	0	0	5.6		0	0	3.9		0	0	7.4	
99	0	0	19.2		0	0	19.2		0	1	28.5	
100	0	0	8.3	0.25	0	0	6.2	0	0	1	6.1	0
Minimum	**0**	**0**	**1.20**	**0**	**0**	**0**	**1.40**	**0**	**0**	**0**	**2.10**	**0**
Maximum	**0**	**1.00**	**80.0**	**0.750**	**0**	**1.00**	**53.0**	**0.500**	**0**	**1.00**	**77.0**	**0.500**
Mean	**0**	**0.450**	**18.2**	**0.125**	**0**	**0.550**	**15.6**	**0.100**	**0**	**0.710**	**18.4**	**0.125**
Standard Dev.	**0**	**0.500**	**17.9**	**0.243**	**0**	**0.500**	**13.9**	**0.175**	**0**	**0.456**	**15.8**	**0.177**
Geometric mean	**-**	**-**	**11.8**	**-**	**-**	**-**	**10.8**	**-**	**-**	**-**	**13.1**	**-**
Median	**0**	**0**	**9.85**	**0**	**0**	**1.00**	**11.1**	**0**	**0**	**1.00**	**12.0**	**0**
Calcite Index	**0.450**		**-**	**-**	**0.550**		**-**	**-**	**0.710**		**-**	**-**

Table F.33: Calcite and Pebble Count at RG_FOUSH, FRO LAEMP, September 2019

Rock	RG_FOUSH 1				RG_FOUSH 2				RG_FOUSH 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	11.1		0	1	4.1		0	1	6.8	
2	0	1	13.2		0	1	11.2		0	1	4.9	
3	0	1	12.2		0	1	11.4		0	1	19.7	
4	0	1	28.4		0	1	12.3		0	1	6.0	
5	0	1	10.9		0	1	10.5		0	1	5.9	
6	1	1	13.0		0	1	11.6		0	1	10.4	
7	0	1	11.5		0	1	22.5		0	1	20.1	
8	0	1	14.1		0	1	6.0		0	1	9.9	
9	0	1	11.2		0	1	3.8		0	1	4.0	
10	0	1	10.6	0.25	0	1	5.4	0.25	1	1	3.5	0.50
11	0	1	5.0		0	1	22.5		0	1	4.9	
12	0	1	5.7		0	1	21.0		1	1	3.6	
13	1	1	8.4		0	1	4.5		1	1	5.7	
14	0	1	13.7		0	1	13.6		0	1	17.6	
15	0	1	13.6		0	1	9.3		0	1	4.9	
16	0	1	9.2		0	1	13.2		1	1	8.0	
17	0	1	16.2		1	1	5.1		0	1	6.6	
18	0	1	6.2		0	1	2.0		0	1	7.7	
19	0	1	7.6		0	1	5.6		0	1	5.4	
20	1	1	12.0	0	0	1	9.7	0	0	1	18.0	0
21	0	1	12.6		0	1	5.8		0	1	4.5	
22	1	1	8.0		0	1	13.0		0	1	5.8	
23	0	1	10.0		0	1	17.6		0	1	24.9	
24	1	1	9.0		0	1	3.2		0	1	3.9	
25	0	0	6.2		0	1	2.4		0	1	4.0	
26	1	1	15.0		0	1	10.7		0	1	5.2	
27	0	1	3.2		0	1	10.8		0	1	6.7	
28	0	1	7.6		0	1	7.6		0	1	8.0	
29	0	1	4.1		0	1	13.5		0	1	7.1	
30	0	1	4.6	0	0	1	11.2	0.25	0	1	3.5	0
31	0	1	3.9		0	1	7.5		0	1	22.5	
32	0	1	21.8		0	1	1.9		0	1	6.0	
33	0	1	2.7		0	1	17.4		0	1	11.0	
34	1	1	8.0		0	1	10.8		0	1	16.8	
35	0	1	7.9		0	1	2.9		0	1	4.6	
36	0	1	23.5		0	1	4.5		0	1	5.0	
37	0	1	3.0		0	1	7.2		0	1	2.4	
38	0	1	12.1		0	1	16.2		0	1	17.6	
39	1	1	1.5		0	1	8.5		0	1	6.6	
40	0	1	3.5	0	0	1	9.2	0.25	0	1	35.6	0.25
41	0	1	21.0		0	1	12.6		0	1	13.2	
42	0	1	4.0		0	1	6.7		0	1	3.0	
43	0	1	24.6		0	1	5.2		0	1	4.0	
44	0	1	4.5		0	1	5.5		1	1	11.7	
45	0	1	8.0		0	1	8.7		0	1	10.5	
46	0	1	8.0		0	1	18.1		0	1	12.2	
47	0	1	1.6		-	-	s		0	1	3.1	
48	0	1	5.4		0	1	5.7		1	1	14.6	
49	0	1	14.6		0	1	8.4		0	1	3.9	
50	0	1	8.5	0	0	1	5.6	0	0	1	29.3	0
51	0	1	7.5		0	1	9.6		0	1	4.1	
52	0	1	7.0		0	1	18.0		0	1	4.2	
53	0	1	5.6		0	1	10.0		0	1	12.3	
54	0	1	5.2		0	1	7.4		0	1	5.8	
55	0	1	12.5		0	1	6.4		0	1	6.6	
56	0	1	4.6		0	1	7.5		0	1	17.2	
57	0	1	4.0		0	1	11.0		0	1	8.7	
58	0	1	8.6		0	1	16.2		0	1	3.2	
59	0	1	32.0		0	1	7.2		0	1	4.5	
60	0	1	8.9	0	0	1	18.5	0	0	1	15.0	0.25
61	1	1	9.1		0	1	13.2		0	1	4.0	
62	1	1	3.1		0	1	12.2		0	0	4.5	
63	1	1	3.0		0	1	13.1		1	1	5.4	
64	0	1	7.0		0	1	13.6		0	1	6.6	
65	0	1	17.5		0	1	7.2		0	1	5.9	
66	0	1	13.1		0	1	10.2		0	1	18.1	
67	0	1	7.5		0	1	11.3		0	1	3.2	
68	0	1	9.7		0	1	11.6		0	1	4.2	
69	0	1	9.5		0	1	3.8		0	1	5.1	
70	1	1	6.6	0	0	1	3.7	0	0	1	6.2	0
71	0	1	14.5		0	1	8.7		1	1	8.1	
72	0	1	12.1		0	1	17.2		0	1	11.4	
73	0	1	2.8		0	1	21.0		0	1	4.2	
74	0	1	9.2		0	1	9.5		0	1	16.1	
75	0	1	20.7		0	1	17.3		1	1	8.3	
76	0	1	9.0		0	1	15.0		0	1	9.9	
77	0	1	25.1		0	1	13.5		0	1	6.5	
78	0	1	9.2		0	1	4.9		0	1	8.9	
79	0	1	12.6		0	1	5.2		0	1	8.4	
80	0	1	25.2	0	0	1	8.5	0.5	0	1	7.5	0
81	0	1	42.3		0	1	11.6		0	1	5.9	
82	0	1	5.4		0	1	6.0		0	1	3.5	
83	0	1	27.1		0	1	12.3		0	1	4.7	
84	0	1	4.4		0	1	15.2		0	1	7.5	
85	0	1	9.3		0	1	9.7		0	1	7.1	
86	0	1	9.1		0	1	3.1		0	1	12.7	
87	0	1	11.6		0	1	3.2		0	1	15.7	
88	0	1	11.0		0	1	7.8		0	1	15.6	
89	0	1	6.6		0	1	4.4		0	1	11.0	
90	0	1	12.3	0.25	0	1	8.0	0	0	1	5.9	0
91	0	1	6.0		0	1	14.2		0	1	8.7	
92	0	1	8.4		0	1	7.0		0	1	8.3	
93	0	1	25.4		0	1	4.2		0	1	10.0	
94	0	1	9.1		0	1	14.3		0	1	37.5	
95	0	1	30.0		0	1	13.1		0	1	15.5	
96	0	1	9.0		0	1	6.2		0	1	6.8	
97	0	1	33.0		0	1	13.6		0	1	8.2	
98	0	1	7.5		0	1	4.9		0	1	8.0	
99	0	1	20.0		0	1	5.6		0	1	23.0	
100	0	1	8.0	0	0	1	16.2	0.5	0	1	6.5	0.5
Minimum	**0**	**0**	**1.50**	**0**	**0**	**1.00**	**1.90**	**0**	**0**	**0**	**2.40**	**0**
Maximum	**1.00**	**1.00**	**42.3**	**0.250**	**1.00**	**1.00**	**22.5**	**0.500**	**1.00**	**1.00**	**37.5**	**0.500**
Mean	**0.120**	**0.99**	**11.2**	**0.050**	**0**	**1.00**	**9.9**	**0.175**	**0.090**	**0.99**	**9.4**	**0.150**
Standard Dev.	**0.327**	**0.100**	**7.67**	**0.105**	**0.101**	**0**	**4.94**	**0.206**	**0.288**	**0.100**	**6.73**	**0.211**
Geometric mean	**-**	**-**	**9.10**	**-**	**-**	**-**	**8.57**	**-**	**-**	**-**	**7.70**	**-**
Median	**0**	**1.00**	**9.10**	**0**	**0**	**1.00**	**9.50**	**0.125**	**0**	**1.00**	**6.8**	**0**
Calcite Index	**1.11**		**-**	**-**	**1.01**		**-**	**-**	**1.08**		**-**	**-**

Table F.34: Calcite and Pebble Count at RG_FOUKI, FRO LAEMP, September 2019

Rock	RG_FOUKI 1				RG_FOUKI 2				RG_FOUKI 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	8.1		0	0	13.1		0	0	18.3	
2	0	1	7.4		0	0	8.0		0	0	12.9	
3	0	1	8.2		0	1	9.0		0	1	10.4	
4	0	0	3.5		0	1	9.5		0	0	18.3	
5	0	0	3.1		0	1	13.1		0	1	9.4	
6	0	0	6.6		0	1	4.6		0	1	3.2	
7	0	1	4.7		0	1	13.9		0	1	9.4	
8	0	1	33.0		0	0	6.6		0	1	6.8	
9	0	0	9.1		0	1	6.0		0	0	6.7	
10	0	0	6.1	0.5	0	1	12.0	0.25	0	1	12.8	0.25
11	0	1	8.4		0	1	8.1		0	1	24.4	
12	0	0	6.9		0	0	8.6		0	1	20.9	
13	0	1	21.0		0	1	9.6		0	1	11.2	
14	0	0	5.9		0	1	23.9		0	1	10.8	
15	0	0	8.1		0	0	7.1		1	1	6.7	
16	0	1	13.0		0	0	14.0		0	1	9.4	
17	0	0	6.6		0	0	6.2		0	1	34.2	
18	0	0	2.1		0	0	11.5		0	0	18.4	
19	0	0	6.1		0	0	29.2		0	1	14.0	
20	0	1	5.5	0.75	0	1	6.0	0.5	0	1	42.7	0.25
21	0	0	1.3		0	1	10.6		0	1	28.1	
22	0	1	11.5		0	0	6.8		0	1	6.9	
23	0	1	7.2		0	1	8.3		0	0	4.5	
24	0	0	1.3		0	1	10.6		0	1	5.7	
25	0	0	6.8		0	1	15.5		0	1	3.1	
26	0	0	4.5		0	1	15.2		0	1	15.6	
27	0	1	5.8		0	0	12.5		0	0	3.4	
28	0	1	5.9		0	0	9.4		0	0	14.3	
29	0	0	4.4		0	1	12.6		0	1	41.9	
30	0	1	6.2	0.25	0	1	11.7	0.25	0	0	6.8	0.50
31	0	0	6.8		0	0	10.2		0	1	34.8	
32	0	0	15.0		0	0	7.1		0	1	18.6	
33	0	0	9.0		0	0	8.0		0	0	3.9	
34	0	1	11.2		0	1	22.0		0	1	16.8	
35	0	1	6.4		0	0	12.9		0	0	1.8	
36	0	1	7.5		0	0	4.1		0	0	3.1	
37	0	0	10.4		0	1	24.5		0	0	7.9	
38	0	1	12.5		0	0	8.7		0	0	10.1	
39	0	1	13.3		0	0	11.7		0	0	6.5	
40	0	0	8.7	0	0	0	10.6	0.50	0	0	5.1	0
41	0	0	15.1		0	0	13.6		0	0	10.5	
42	0	1	19.5		0	0	1.2		0	0	5.2	
43	0	1	22.0		0	0	14.2		0	1	5.8	
44	0	1	12.1		0	0	5.5		0	1	15.3	
45	0	1	6.5		0	0	9.3		0	0	8.4	
46	0	1	8.5		0	0	15.3		0	1	36.2	
47	0	1	10.1		0	0	4.8		0	0	b	
48	0	1	19.0		0	0	10.0		0	1	3.2	
49	0	0	8.2		0	1	26.0		0	0	31.4	
50	0	1	10.2	0.25	0	1	12.2	0.75	0	0	8.0	0
51	0	0	11.7		0	1	6.2		0	0	12.0	
52	0	0	16.0		0	0	5.6		0	0	14.3	
53	0	0	5.7		0	1	17.1		0	0	7.3	
54	0	0	7.1		0	0	3.2		0	1	4.8	
55	0	1	14.0		0	1	8.6		0	0	1.2	
56	0	0	5.7		0	1	14.5		0	0	0.8	
57	0	0	14.4		0	1	4.4		0	0	1.4	
58	0	1	10.7		0	1	18.1		0	0	31.4	
59	0	1	17.5		0	0	14.4		0	1	12.2	
60	0	1	9.4	0	0	1	5.3	0.75	0	0	10.8	0
61	0	1	7.6		0	1	6.1		0	0	5.6	
62	0	1	7.9		0	1	7.2		0	0	32.1	
63	0	0	2.9		0	0	3.5		0	0	18.6	
64	0	1	4.9		0	0	22.0		0	0	31.4	
65	0	0	11.2		0	1	12.4		0	1	11.4	
66	0	1	8.2		0	1	9.2		0	0	9.1	
67	0	0	13.1		0	0	5.9		0	1	6.2	
68	0	1	14.7		0	1	11.6		0	0	14.1	
69	0	0	2.3		0	1	16.1		0	0	2.8	
70	0	0	2.5	0	0	1	5.5	0	0	1	13.2	0.25
71	0	0	6.2		0	0	5.5		0	1	6.1	
72	0	0	4.9		0	1	10.1		0	0	6.0	
73	0	0	6.6		0	1	18.6		0	0	13.1	
74	0	0	7.8		0	0	6.7		0	0	7.2	
75	0	1	15.2		0	0	10.1		0	1	29.8	
76	0	0	5.6		0	0	4.9		0	1	11.1	
77	0	0	7.4		0	0	8.8		0	0	4.0	
78	0	1	7.9		0	1	18.0		0	0	4.5	
79	0	0	10.6		0	1	18.4		0	0	13.0	
80	0	0	8.5	0	0	0	6.3	0	0	0	3.1	0
81	0	0	9.4		0	1	13.6		0	0	20.8	
82	0	1	15.2		0	0	7.0		0	1	14.3	
83	0	0	3.4		0	0	7.9		0	0	35.4	
84	0	1	18.8		0	0	7.1		1	1	8.4	
85	0	0	12.6		0	1	12.2		0	1	17.6	
86	0	1	20.5		0	1	14.4		0	0	10.1	
87	0	0	9.4		0	1	24.1		0	0	3.9	
88	0	0	10.4		0	1	16.3		0	1	7.2	
89	0	0	8.1		0	1	7.5		0	1	4.8	
90	0	1	9.6	0.25	0	0	13.5	0.50	0	0	9.6	0.50
91	0	1	10.5		0	1	9.8		0	1	23.2	
92	0	0	6.5		0	1	12.0		0	1	28.1	
93	0	1	13.8		0	1	13.6		0	1	11.0	
94	0	1	7.5		0	0	7.8		0	0	2.8	
95	0	0	s		0	1	18.1		0	1	14.4	
96	0	0	12.0		0	0	9.3		0	1	11.9	
97	0	0	13.2		0	0	3.1		0	1	9.6	
98	0	1	10.1		0	0	4.9		0	1	15.9	
99	0	0	4.3		0	0	8.8		0	1	11.2	
100	0	0	8.1	0	0	1	11.9	0.25	0	0	1.3	0
Minimum	**0**	**0**	**1.30**	**0**	**0**	**0.00**	**1.20**	**0**	**0**	**0**	**0.800**	**0**
Maximum	**0**	**1.00**	**33.0**	**0.750**	**0**	**1.00**	**29.2**	**0.750**	**1.00**	**1.00**	**42.7**	**0.500**
Mean	**0**	**0.460**	**9.41**	**0.200**	**0**	**0.510**	**10.9**	**0.375**	**0.0200**	**0.490**	**12.8**	**0.175**
Standard Dev.	**0**	**0.501**	**5.08**	**0.258**	**0**	**0.502**	**5.44**	**0.270**	**0.141**	**0.502**	**9.77**	**0.206**
Geometric mean	**-**	**-**	**8.14**	**-**	**-**	**-**	**9.63**	**-**	**-**	**-**	**9.46**	**-**
Median	**0**	**0**	**8.20**	**0.125**	**0**	**1.00**	**9.90**	**0.375**	**0**	**0**	**10.4**	**0.125**
Calcite Index	**0.460**		**-**	**-**	**0.510**		**-**	**-**	**0.510**		**-**	**-**

Table F.35: Calcite and Pebble Count at RG_FOBKS, FRO LAEMP, September 2019

Rock	RG_FOBKS 1				RG_FOBKS 2				RG_FOBKS 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	6.5		0	1	13.6		0	1	11.6	
2	0	1	3.1		0	1	14.3		0	1	8.6	
3	0	1	8.0		0	1	5.5		0	1	12.9	
4	0	0	4.0		0	1	5.1		0	1	4.9	
5	0	1	6.6		0	1	9.0		2	1	8.9	
6	0	0	6.0		1	1	3.6		0	1	9.4	
7	0	0	1.5		0	1	1.2		0	1	12.2	
8	-	-	s		0	1	5.0		2	1	7.6	
9	0	0	3.6		0	1	6.6		0	1	9.6	
10	0	0	7.0	0.25	0	1	8.1	0	0	0	4.4	0.25
11	0	1	4.0		0	1	5.5		0	1	7.0	
12	0	1	1.6		0	1	5.5		0	1	3.6	
13	0	1	10.2		0	1	17.2		0	0	4.4	
14	0	1	7.2		0	1	4.9		0	1	15.6	
15	0	1	5.5		0	1	23.1		0	1	6.2	
16	0	0	4.9		0	1	2.9		0	1	8.1	
17	0	1	6.0		0	0	1.1		0	0	2.0	
18	0	1	8.1		0	1	7.8		0	0	1.9	
19	1	1	8.3		0	1	8.9		1	1	5.6	
20	0	1	4.4	0	0	1	5.4	0.25	0	1	5.6	0.50
21	0	1	5.3		0	1	9.5		0	1	5.6	
22	0	1	7.1		0	1	6.2		0	1	10.4	
23	0	1	11.0		1	1	8.4		0	1	29.2	
24	0	1	11.4		0	1	3.9		0	1	10.6	
25	-	-	s		0	1	5.3		0	1	11.1	
26	0	1	2.2		0	1	6.7		0	1	7.2	
27	0	1	10.5		0	1	s		0	0	5.6	
28	0	1	7.8		0	1	1.5		0	1	8.6	
29	0	1	7.0		0	1	5.0		0	1	9.1	
30	0	1	8.5	0	0	1	15.0	0.75	2	1	13.0	0.75
31	0	1	7.5		0	1	6.5		0	1	8.9	
32	0	1	6.5		0	1	9.4		0	0	43.0	
33	0	1	13.0		0	0	3.2		0	1	6.7	
34	0	1	15.1		0	1	12.0		0	1	5.6	
35	0	1	11.6		0	1	14.3		0	1	8.2	
36	0	1	15.1		0	1	7.1		0	0	2.5	
37	0	1	2.6		0	1	4.0		0	0	1.9	
38	0	1	5.0		0	1	5.1		0	1	1.9	
39	0	1	18.1		0	1	3.4		0	1	6.7	
40	0	0	17.0	0.75	0	1	4.9	0	0	1	12.4	0
41	0	0	2.6		0	1	0.8		0	1	8.2	
42	0	0	4.2		0	1	5.1		0	1	8.4	
43	0	1	1.7		0	1	9.4		0	1	4.1	
44	0	1	4.5		0	1	2.6		0	0	8.2	
45	0	0	4.6		0	1	7.7		0	1	10.1	
46	0	1	5.0		0	1	4.5		0	1	22.4	
47	0	1	7.2		0	1	4.6		0	1	16.2	
48	0	1	5.1		0	1	15.0		0	1	15.3	
49	0	1	5.1		0	1	5.6		0	1	26.9	
50	0	1	7.5	0.25	0	1	7.1	0	0	1	10.2	0
51	0	0	9.2		0	1	5.5		0	1	14.1	
52	0	0	9.3		0	1	6.5		0	1	9.6	
53	0	0	11.4		0	1	9.0		0	1	15.2	
54	0	0	12.4		0	1	7.0		0	1	13.4	
55	0	0	8.3		0	1	8.5		0	1	11.0	
56	0	0	10.6		0	0	5.5		0	1	11.2	
57	0	1	13.5		0	1	5.0		0	1	10.3	
58	0	0	10.5		0	1	26.2		0	1	10.9	
59	0	1	6.5		0	1	2.7		0	1	7.5	
60	0	1	6.1	0	0	0	3.3	0	0	1	10.2	0.25
61	0	1	7.9		0	1	10.2		0	1	16.0	
62	0	0	10.1		0	1	6.4		0	0	5.5	
63	0	1	6.5		0	1	4.9		0	1	11.0	
64	0	1	10.3		0	1	4.9		0	1	4.6	
65	0	0	12.8		0	0	2.0		0	1	8.7	
66	0	0	7.2		0	1	4.3		0	1	5.0	
67	0	0	5.8		0	1	6.9		0	1	7.6	
68	0	1	9.1		0	1	13.1		0	1	9.5	
69	0	1	9.6		0	1	s		0	1	7.0	
70	0	1	3.2	0	0	1	3.7	0	0	1	8.0	0.25
71	0	1	15.3		0	1	3.5		0	1	7.2	
72	0	1	14.7		0	0	2.0		0	1	7.9	
73	0	0	7.2		0	0	4.8		0	0	7.4	
74	0	1	14.7		0	1	8.3		0	1	34.6	
75	0	1	13.3		0	1	4.2		0	0	3.6	
76	0	1	11.0		0	1	9.3		0	1	4.5	
77	0	1	6.9		0	1	1.3		0	0	6.2	
78	0	1	3.8		0	0	2.5		0	1	6.5	
79	0	1	11.8		0	0	4.7		0	0	4.5	
80	0	1	25.4	0.50	0	1	7.7	0	0	1	7.4	0
81	0	1	16.4		0	1	7.9		0	0	3.5	
82	0	1	9.1		0	1	4.1		0	1	10.0	
83	0	1	10.3		0	0	8.0		0	1	3.4	
84	0	1	7.8		0	1	9.9		0	1	7.6	
85	0	1	6.4		0	1	9.4		0	0	7.2	
86	0	1	3.2		0	1	3.0		-	-	s	
87	0	0	0.6		0	1	4.7		0	0	31.0	
88	0	1	5.7		0	0	2.2		0	0	6.5	
89	0	1	5.3		0	1	9.6		0	0	4.6	
90	0	0	5.7	0.5	0	1	12.1	0.75	0	1	11.5	0.25
91	0	1	10.3		0	1	5.7		0	1	5.2	
92	0	1	8.1		0	0	1.3		0	1	8.9	
93	0	1	3.0		0	1	12.1		0	1	11.3	
94	0	0	4.1		0	1	16.7		0	1	14.1	
95	0	1	8.8		0	1	1.7		0	1	24.0	
96	0	1	4.6		0	1	4.9		0	0	6.2	
97	0	1	10.5		0	1	3.2		0	1	1.4	
98	0	1	9.3		0	1	10.6		0	1	7.2	
99	0	1	9.5		0	0	4.9		0	1	4.5	
100	0	1	14.3	0.25	0	0	12.7	0.25	1	1	17.6	0.75
Minimum	**0**	**0**	**0.600**	**0**	**0**	**0**	**0.800**	**0**	**0**	**0**	**1.40**	**0**
Maximum	**1.00**	**1.00**	**25.4**	**0.750**	**1.00**	**1.00**	**26.2**	**0.750**	**2.00**	**1.00**	**43.0**	**0.750**
Mean	**0.0102**	**0.745**	**8.10**	**0.250**	**0.0200**	**0.860**	**6.91**	**0.200**	**0.0808**	**0.798**	**9.70**	**0.300**
Standard Dev.	**0.101**	**0.438**	**4.21**	**0.264**	**0.141**	**0.349**	**4.50**	**0.307**	**0.369**	**0.404**	**6.88**	**0.284**
Geometric mean	**-**	**-**	**6.96**	**-**	**-**	**-**	**5.63**	**-**	**-**	**-**	**8.00**	**-**
Median	**0**	**1.00**	**7.35**	**0.250**	**0**	**1.00**	**5.50**	**0**	**0**	**1.00**	**8.20**	**0.250**
Calcite Index	**0.755**		**-**	**-**	**0.880**		**-**	**-**	**0.879**		**-**	**-**

Table F.36: Calcite and Pebble Count at RG_SCOUTDS, FRO LAEMP, September 2019

Rock	RG_SCOUTDS 3				RG_SCOUTDS 1				RG_SCOUTDS 2			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	0	18.0		0	0	3.6		0	0	5.5	
2	0	0	21.5		0	0	10.7		0	0	7.2	
3	0	0	6.9		0	0	5.8		0	0	4.5	
4	0	0	3.4		0	0	6.5		0	0	7.9	
5	0	0	4.9		0	0	4.3		0	0	7.8	
6	0	0	6.8		0	0	6.6		0	0	27.4	
7	0	0	3.1		0	0	7.1		0	0	3.8	
8	0	0	19.4		0	0	5.8		0	0	7.1	
9	0	0	3.7		0	0	3.8		0	0	5.2	
10	0	0	6.9	0	0	0	8.1	0	0	0	6.5	0.50
11	0	0	7.3		0	0	2.6		0	0	5.0	
12	0	0	7.4		0	0	6.2		0	0	5.5	
13	0	0	12.2		0	0	6.0		0	0	4.9	
14	0	0	28.2		0	0	8.8		0	0	6.4	
15	0	0	6.5		0	0	10.2		0	0	3.2	
16	0	0	13.2		0	0	4.3		0	0	10.2	
17	0	0	3.5		0	0	9.6		0	0	7.2	
18	0	0	21.5		0	0	9.9		0	0	8.4	
19	0	0	12.2		0	0	6.6		0	0	7.6	
20	0	0	4.0	0	0	0	10.2	0.25	0	0	8.2	0.25
21	0	0	3.3		0	0	7.5		0	0	6.1	
22	0	0	6.7		0	0	11.5		0	0	5.8	
23	0	0	9.5		0	0	6.6		0	0	4.3	
24	0	0	3.2		0	0	11.5		0	0	9.4	
25	0	0	1.9		0	0	9.4		0	0	1.3	
26	0	0	8.6		0	0	8.5		0	0	13.4	
27	0	0	9.0		0	0	6.3		0	0	1.6	
28	0	0	4.2		0	0	11.0		0	0	1.9	
29	0	0	8.0		0	0	5.2		0	0	6.0	
30	0	0	7.0	0	0	0	6.7	0	0	0	2.2	0
31	0	0	8.3		0	0	6.6		0	0	4.7	
32	0	0	4.7		0	0	21.5		0	0	4.5	
33	0	0	3.6		0	0	5.8		0	0	6.5	
34	0	0	5.7		0	0	9.0		0	0	8.2	
35	0	0	12.0		0	0	12.8		0	0	5.3	
36	0	0	4.6		0	0	7.4		0	0	4.2	
37	0	0	5.6		0	0	3.7		0	0	1.1	
38	0	0	5.0		0	0	9.4		0	0	3.7	
39	0	0	3.0		0	0	10.2		0	0	4.5	
40	0	0	2.3	0	0	0	9.8	0	0	0	8.5	0
41	0	0	2.7		0	0	1.7		0	0	5.2	
42	0	0	4.5		0	0	2.8		0	0	2.1	
43	0	0	8.0		0	0	4.3		0	0	3.6	
44	0	0	5.5		0	0	6.4		0	0	5.0	
45	0	0	3.6		0	0	9.9		0	0	13.2	
46	0	0	3.2		0	0	7.5		0	0	9.1	
47	0	0	4.0		0	0	9.9		0	0	23.7	
48	0	0	5.5		0	0	4.5		0	0	17.4	
49	0	0	15.3		0	0	3.9		0	0	5.4	
50	0	0	17.1	0.25	0	0	9.3	0	0	0	12.6	0.25
51	0	0	7.6		0	0	7.2		0	0	6.3	
52	0	0	6.7		0	1	4.9		0	1	27.1	
53	0	0	8.0		0	0	11.4		0	0	2.2	
54	0	0	10.4		0	0	8.8		0	0	1.4	
55	0	0	6.7		0	0	3.2		0	0	1.6	
56	0	0	6.2		0	0	2.1		0	0	2.3	
57	0	0	3.5		0	0	6.0		0	0	1.7	
58	0	0	11.1		0	0	5.2		0	0	2.6	
59	0	0	5.0		0	0	10.0		0	0	2.5	
60	0	0	7.5	0.25	0	0	3.0	0	0	0	2.1	0
61	0	0	12.6		0	0	10.5		0	0	2.7	
62	0	0	5.0		0	0	4.3		0	0	2.5	
63	0	0	6.5		0	0	6.1		0	0	2.7	
64	0	0	4.5		0	0	7.0		0	0	3.4	
65	0	0	1.3		0	0	6.3		0	0	2.6	
66	0	0	2.4		0	0	9.4		0	0	7.2	
67	0	0	2.5		0	0	5.2		0	0	2.1	
68	0	0	1.9		0	0	8.2		0	0	6.5	
69	0	0	5.5		0	0	6.3		0	0	7.6	
70	0	0	3.2	0	0	0	9.2	0	0	0	8.3	0
71	0	0	3.2		0	0	12.3		0	0	11.7	
72	0	0	4.1		0	0	6.6		0	0	3.9	
73	0	0	3.4		0	0	9.8		0	0	9.2	
74	0	0	3.0		0	0	7.8		0	0	4.3	
75	0	0	2.8		0	0	8.4		0	0	3.1	
76	0	0	5.6		0	0	7.5		0	0	4.0	
77	0	0	2.9		0	0	8.0		0	0	8.0	
78	0	0	4.0		0	0	5.6		0	0	2.4	
79	0	0	2.8		0	0	11.5		0	0	2.0	
80	0	0	15.5	0.75	0	0	5.9	0.25	0	0	8.7	0
81	0	0	7.0		0	0	12.3		0	0	4.1	
82	0	0	5.5		0	0	3.8		0	0	3.6	
83	0	0	8.0		0	0	2.4		0	0	8.7	
84	0	0	3.4		0	0	8.6		0	0	3.8	
85	0	0	3.4		0	0	8.2		0	0	7.6	
86	0	0	1.1		0	0	19.0		0	0	4.5	
87	0	0	1.9		0	0	3.1		0	0	3.1	
88	0	0	8.7		0	0	6.0		0	0	4.6	
89	0	0	22.1		0	0	5.1		0	0	8.8	
90	0	0	2.7	0	0	0	6.1	0	0	0	9.4	0.50
91	0	0	6.6		0	0	10.2		0	0	2.6	
92	0	0	14.8		0	0	14.2		0	0	7.1	
93	0	0	5.3		0	0	9.1		0	0	5.2	
94	0	0	4.9		0	0	5.2		0	0	4.3	
95	0	0	8.6		0	0	4.4		0	0	8.0	
96	0	0	4.4		0	0	11.2		0	0	12.7	
97	0	0	6.4		0	0	5.2		0	0	8.6	
98	0	0	6.7		0	0	11.6		0	0	4.1	
99	0	0	5.6		0	0	4.9		0	0	5.3	
100	0	0	8.3	0	0	0	6.6	0	0	0	5.1	0
Minimum	**0**	**0**	**1.10**	**0**	**0**	**0**	**1.70**	**0**	**0**	**0**	**1.10**	**0**
Maximum	**0**	**0**	**28.2**	**0.750**	**0**	**1.00**	**21.5**	**0.250**	**0**	**1.00**	**27.4**	**0.500**
Mean	**0**	**0**	**6.97**	**0.125**	**0**	**0.0100**	**7.52**	**0.0500**	**0**	**0.0100**	**6.24**	**0.150**
Standard Dev.	**0**	**0**	**5.05**	**0.243**	**0**	**0.1000**	**3.30**	**0.105**	**0**	**0.100**	**4.67**	**0.211**
Geometric mean	**-**	**-**	**5.66**	**-**	**-**	**-**	**6.83**	**-**	**-**	**-**	**5.05**	**-**
Median	**0**	**0**	**5.55**	**0**	**0**	**0**	**6.85**	**0**	**0**	**0**	**5.20**	**0**
Calcite Index	**0**		**-**	**-**	**0.0100**		**-**	**-**	**0.0100**		**-**	**-**

Table F.37: Calcite and Pebble Count at RG_FOBSC, FRO LAEMP, September 2019

Rock	RG_FOBSC 1				RG_FOBSC 3				RG_FOBSC 2			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	0	4.8		0	1	11.0		0	0	6.0	
2	0	0	5.4		0	0	10.7		0	0	14.1	
3	0	1	4.2		0	1	7.2		0	0	S	
4	0	1	3.7		0	1	12.1		0	0	2.8	
5	0	0	6.1		0	1	13.5		0	0	13.1	
6	0	1	3.1		0	0	3.2		0	0	8.6	
7	0	0	1.3		0	1	9.6		0	0	12.5	
8	0	0	3.1		0	1	18.0		0	0	2.8	
9	-	-	s		0	1	4.6		0	0	9.0	
10	0	1	4.1	0.50	0	1	11.7	0	0	0	3.6	0
11	0	1	7.2		0	0	24.0		0	1	12.0	
12	0	0	3.5		0	1	15.4		0	1	3.6	
13	0	1	18.5		0	1	6.5		0	1	8.1	
14	0	1	8.2		0	0	12.1		0	1	5.6	
15	0	0	6.0		0	1	21.1		0	0	10.0	
16	0	0	6.5		0	1	8.0		0	0	8.5	
17	0	0	4.5		0	1	10.3		0	1	12.7	
18	0	0	4.4		0	1	10.2		0	0	10.0	
19	0	0	3.0		0	0	7.5		0	0	7.1	
20	0	0	5.0	0	0	0	10.0	0.75	0	0	15.0	0.25
21	0	0	5.2		0	0	4.3		0	1	8.5	
22	0	0	5.5		0	0	9.2		0	0	9.2	
23	0	0	7.5		0	1	6.4		0	0	6.1	
24	0	1	7.6		0	0	6.7		0	0	7.5	
25	0	0	4.2		0	0	15.5		0	0	11.2	
26	0	0	4.8		0	0	9.2		0	1	9.7	
27	0	0	5.8		0	0	9.3		0	0	10.9	
28	0	0	5.4		0	0	1.4		0	0	5.0	
29	0	0	6.0		0	0	11.1		0	0	7.4	
30	0	0	4.8	0	0	0	4.0	0.50	0	1	4.7	0
31	0	0	6.6		0	0	5.2		0	0	15.3	
32	0	0	6.0		0	0	5.1		0	1	17.0	
33	0	0	6.2		0	0	5.6		0	1	7.0	
34	0	0	4.0		0	0	4.3		0	1	8.2	
35	0	1	6.6		0	0	9.1		0	0	5.7	
36	0	1	6.2		0	0	5.6		0	0	2.5	
37	0	1	2.5		0	0	14.5		0	0	24.2	
38	0	1	2.5		0	0	6.5		0	0	11.0	
39	0	1	3.7		0	0	7.2		0	0	8.4	
40	0	1	4.8	0.25	0	0	6.4	0	0	1	26.1	0
41	0	1	3.9		0	0	11.0		0	0	8.1	
42	0	1	7.7		0	0	6.0		0	0	16.1	
43	0	1	4.4		0	0	12.6		0	0	8.6	
44	0	1	6.5		0	0	6.0		0	0	11.6	
45	0	0	2.8		0	0	9.7		0	1	5.3	
46	0	0	5.6		0	0	6.5		0	1	23.5	
47	0	0	5.8		0	0	2.1		-	-	S	
48	0	0	2.9		0	0	6.7		0	0	5.5	
49	0	0	5.2		0	0	13.0		0	0	6.5	
50	0	0	5.0	0	0	0	7.1	0	0	0	14.0	0.50
51	0	0	8.1		0	0	5.1		0	1	9.5	
52	0	0	4.7		0	0	7.0		0	0	7.3	
53	0	0	2.4		0	0	6.0		0	1	11.1	
54	0	0	11.6		0	0	10.2		0	0	6.5	
55	0	0	12.4		0	1	13.0		0	0	3.5	
56	0	0	0.9		0	0	9.5		0	0	24.0	
57	0	1	9.2		0	0	12.1		0	0	10.7	
58	0	0	3.2		0	0	3.6		0	0	10.0	
59	0	0	6.6		0	0	2.5		0	1	10.8	
60	0	0	9.2	0	0	0	4.6	0	0	1	5.6	0.50
61	0	0	3.7		0	0	6.2		0	0	5.5	
62	0	0	5.2		0	0	14.2		0	1	8.1	
63	0	0	5.3		0	0	8.0		0	0	4.0	
64	0	0	10.5		0	0	6.0		0	0	5.6	
65	0	0	6.5		0	0	3.9		0	0	10.0	
66	0	0	7.0		0	0	9.0		0	0	4.2	
67	0	0	5.0		0	0	6.0		0	0	13.0	
68	0	1	9.5		0	0	7.6		0	0	9.0	
69	0	0	10.1		0	0	9.2		0	0	5.2	
70	0	0	10.2	0.50	0	0	13.1	0	0	0	3.5	0
71	0	0	8.1		0	0	10.2		0	0	4.7	
72	0	1	4.2		0	0	10.0		0	0	7.3	
73	0	0	6.6		0	0	12.0		0	1	9.1	
74	0	0	7.7		0	0	6.0		0	0	18.2	
75	0	0	10.2		0	0	6.2		0	0	13.1	
76	0	0	4.5		0	0	13.4		0	0	9.9	
77	0	0	4.6		0	0	5.2		0	1	14.2	
78	0	0	9.8		0	0	8.5		0	0	3.1	
79	0	0	6.4		0	0	7.6		0	1	7.8	
80	0	0	3.2	0	0	0	5.5	0	0	1	17.9	0.25
81	0	0	4.1		0	0	2.9		0	0	4.2	
82	0	1	9.2		0	0	5.1		0	0	7.5	
83	0	0	12.2		0	0	8.1		0	1	9.0	
84	0	0	3.6		0	0	5.2		0	1	10.1	
85	0	0	8.5		0	0	8.2		0	1	12.3	
86	0	1	5.5		0	0	14.0		0	0	13.0	
87	0	0	10.1		0	0	10.5		0	1	8.0	
88	0	1	2.7		0	0	12.1		0	0	11.4	
89	0	0	1.5		0	0	4.1		0	1	17.6	
90	0	0	3.2	0.75	0	0	9.1	0.25	0	0	11.6	0.50
91	0	0	2.1		0	0	6.0		0	1	11.0	
92	0	1	6.1		0	0	9.0		0	0	8.7	
93	0	0	11.1		0	0	8.4		0	0	11.1	
94	0	0	4.9		0	1	12.1		0	0	9.0	
95	0	0	6.6		0	1	15.5		0	1	17.2	
96	0	0	4.3		0	1	8.0		0	0	7.0	
97	0	0	4.8		0	1	13.6		0	1	8.4	
98	0	0	5.6		0	0	3.0		0	0	6.1	
99	0	0	6.2		0	1	17.5		0	1	18.1	
100	0	0	11.6	0	0	1	4.7	0	1	1	11.1	0.25
Minimum	**0**	**0**	**0.900**	**0**	**0**	**0**	**1.40**	**0**	**0**	**0**	**2.50**	**0**
Maximum	**0**	**1.00**	**18.5**	**0.750**	**0**	**1.00**	**24.0**	**0.750**	**1.00**	**1.00**	**26.1**	**0.500**
Mean	**0**	**0.253**	**5.95**	**0.200**	**0**	**0.220**	**8.73**	**0.150**	**0.0101**	**0.333**	**9.74**	**0.225**
Standard Dev.	**0**	**0.437**	**2.84**	**0.284**	**0**	**0.416**	**4.11**	**0.269**	**0.101**	**0.474**	**4.87**	**0.219**
Geometric mean	**-**	**-**	**5.31**	**-**	**-**	**-**	**7.78**	**-**	**-**	**-**	**8.63**	**-**
Median	**0**	**0**	**5.40**	**0**	**0**	**0**	**8.05**	**0**	**0**	**0**	**9.00**	**0.250**
Calcite Index	**0.253**		**-**	**-**	**0.220**		**-**	**-**	**0.343**		**-**	**-**

Table F.38: Calcite and Pebble Count at RG_FOBCP, FRO LAEMP, September 2019

Rock	RG_FOBCP 1				RG_FOBCP 2				RG_FOBCP 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	8.6		0	0	6.5		0	1	10.1	
2	0	1	5.6		0	0	5.5		0	1	5.4	
3	0	1	13.0		0	0	11.5		1	1	8.2	
4	0	1	7.4		0	0	14.6		1	1	4.1	
5	0	0	3.4		0	0	15.2		1	1	4.5	
6	0	0	5.0		0	0	10.0		1	1	6.1	
7	1	1	8.1		0	0	6.2		0	1	9.2	
8	0	1	11.9		0	0	4.8		0	1	6.7	
9	0	1	7.6		0	0	16.9		0	1	6.6	
10	0	1	13.1	0.25	0	0	11.1	0	1	1	12.9	0.5
11	0	1	7.7		0	0	7.0		1	1	9.6	
12	0	1	12.0		0	0	12.5		1	1	9.8	
13	0	1	6.6		0	0	4.3		0	1	10.0	
14	0	1	12.4		0	1	12.1		1	1	13.4	
15	0	1	7.2		0	1	4.4		1	1	14.8	
16	0	1	9.4		0	0	S		0	0	5.5	
17	0	1	12.1		0	1	6.1		1	1	7.3	
18	0	1	10.5		0	1	13.0		0	1	11.2	
19	0	1	5.0		0	0	4.8		0	0	5.1	
20	0	1	11.0	0	0	1	8.0	0	1	1	6.7	0.50
21	0	1	14.1		0	1	11.4		1	1	12.2	
22	0	1	12.5		0	1	11.6		1	1	6.9	
23	0	1	17.0		0	0	S		1	1	8.0	
24	0	1	13.5		0	1	5.1		0	1	8.3	
25	0	1	20.0		0	0	8.3		0	1	10.4	
26	0	1	7.6		0	0	7.0		1	1	6.7	
27	0	1	13.7		0	0	S		0	0	4.8	
28	0	1	10.0		0	0	0.9		0	1	7.6	
29	0	1	5.5		0	0	4.0		1	1	10.3	
30	0	1	17.7	0	0	0	9.1	0	1	1	6.9	0.50
31	0	1	7.7		0	0	3.9		0	1	6.4	
32	0	1	3.5		0	0	4.3		0	1	3.8	
33	0	1	5.5		0	0	4.5		0	1	3.9	
34	0	1	8.9		0	0	5.5		0	1	4.9	
35	0	1	5.9		0	0	5.4		1	1	3.8	
36	0	1	7.9		0	1	6.7		1	1	8.6	
37	0	1	9.0		0	1	11.5		0	1	11.9	
38	0	0	5.6		0	1	8.4		0	1	11.2	
39	0	0	9.0		0	0	2.8		0	1	11.7	
40	0	0	6.2	0.25	0	0	7.5	0	1	1	9.5	0.25
41	0	1	15.4		0	0	7.6		0	1	6.7	
42	0	1	12.6		0	0	6.6		0	1	7.1	
43	0	1	13.0		0	1	4.1		0	1	8.2	
44	0	1	11.6		0	1	6.9		1	1	5.6	
45	0	1	11.6		0	0	11.4		0	1	12.2	
46	0	1	7.9		0	1	9.1		0	1	8.8	
47	0	1	4.0		0	1	9.0		0	1	9.5	
48	0	1	2.6		0	1	7.9		0	1	17.4	
49	0	1	5.4		0	1	10.9		0	0	3.2	
50	0	1	4.4	0	0	1	9.7	0.5	0	1	5.7	0
51	0	1	13.6		0	1	64.5		0	1	15.7	
52	0	1	9.0		0	1	11.3		0	0	2.7	
53	0	1	14.9		0	1	6.4		0	0	6.6	
54	0	0	14.9		0	1	9.5		1	1	8.7	
55	0	1	9.6		0	1	7.2		1	1	3.1	
56	0	1	4.4		0	0	4.5		1	1	8.4	
57	0	1	34.1		0	0	S		1	1	11.9	
58	0	1	10.6	.	0	0	3.6		1	1	13.2	
59	0	0	5.0		0	0	2.4		0	0	2.1	
60	0	1	17.0	0.25	0	0	3.2	0	0	0	3.6	0
61	0	1	21.6		0	0	S		1	1	10.4	
62	0	1	7.0		0	1	12.3		1	1	10.3	
63	0	1	11.0		0	0	7.4		1	1	4.9	
64	0	1	8.1		0	0	3.7		0	1	10.2	
65	0	0	4.1		1	1	7.9		0	1	9.1	
66	0	0	5.0		0	0	S		0	0	8.2	
67	0	1	4.2		1	1	6.4		0	1	7.4	
68	0	1	17.6		0	1	11.2		0	1	6.3	
69	1	1	8.1		0	1	6.6		0	0	6.9	
70	1	1	11.1	0.25	0	1	9.5	0.75	0	1	8.2	0.50
71	1	1	21.1		0	1	5.5		0	1	5.1	
72	0	1	12.3		1	1	4.1		0	0	11.2	
73	0	1	8.6		1	1	8.4		0	0	7.3	
74	0	1	17.1		0	1	13.9		0	1	9.2	
75	0	1	12.0		0	1	7.1		0	1	10.4	
76	0	0	2.6		1	1	8.0		1	1	12.9	
77	0	1	17.1		1	1	7.3		0	1	7.0	
78	0	1	8.6		0	1	6.6		0	1	8.5	
79	0	1	11.2		0	1	10.5		1	1	6.9	
80	0	1	11.9	0	1	1	13.0	0.50	0	1	10.4	0
81	0	1	12.2		0	0	5.2		1	1	9.9	
82	0	1	5.6		0	1	3.9		0	1	9.6	
83	0	0	8.6		1	1	10.3		2	1	8.2	
84	0	1	12.0		1	1	5.2		1	1	14.7	
85	0	1	6.6		0	0	3.2		1	1	9.5	
86	0	0	2.5		0	0	5.0		0	1	9.9	
87	0	1	5.6		0	1	10.2		1	1	12.2	
88	0	1	17.0		0	0	5.6		1	1	11.2	
89	1	1	12.0		1	1	10.3		0	0	2.1	
90	0	1	11.3	0.50	0	1	10.2	0.25	0	1	8.0	0.25
91	1	1	6.6		0	0	6.5		1	1	8.2	
92	0	0	8.0		0	0	9.3		0	1	6.1	
93	0	1	12.6		0	0	13.7		0	1	4.6	
94	0	0	7.2		0	0	8.4		1	1	10.1	
95	0	1	6.7		0	0	9.9		1	1	4.7	
96	0	0	24.1		0	1	14.1		1	1	6.2	
97	1	1	8.9		0	1	9.8		1	1	9.9	
98	0	1	12.5		0	1	15.6		0	0	S	
99	1	1	12.0		0	1	9.2		2	1	6.5	
100	0	1	7.5	0	1	1	7.4	0.50	0	0	11.5	0.25
Minimum	**0**	**0**	**2.50**	**0**	**0**	**0**	**0.900**	**0**	**0**	**0**	**2.10**	**0**
Maximum	**1.00**	**1.00**	**34.1**	**0.500**	**1.00**	**1.00**	**64.5**	**0.750**	**2.00**	**1.00**	**17.4**	**0.500**
Mean	**0.080**	**0.850**	**10.2**	**0.150**	**0.110**	**0.500**	**8.62**	**0.250**	**0.450**	**0.850**	**8.28**	**0.275**
Standard Dev.	**0.273**	**0.359**	**5.10**	**0.175**	**0.314**	**0.503**	**6.72**	**0.289**	**0.539**	**0.359**	**3.10**	**0.219**
Geometric mean	**-**	**-**	**9.05**	**-**	**-**	**-**	**7.42**	**-**	**-**	**-**	**7.64**	**-**
Median	**0**	**1.00**	**9.00**	**0.125**	**0**	**0.500**	**7.55**	**0.125**	**0**	**1.00**	**8.20**	**0.250**
Calcite Index	**0.930**		**-**	**-**	**0.610**		**-**	**-**	**1.30**		**-**	**-**

Table F.39: Calcite and Pebble Count at RG_FRCP1SW1, FRO LAEMP, September 2019

Rock	RG_FRCP1SW 1				RG_FRCP1SW 2				RG_FRCP1SW 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	17.5		0	0	4.6		0	0	3.2	
2	0	1	10.8		0	0	3.2		0	0	4.6	
3	0	1	8.0		0	1	3.5		0	0	2.1	
4	0	0	5.2		0	0	3.2		0	0	4.8	
5	0	0	6.2		0	1	4.5		0	1	7.5	
6	0	1	12.5		0	0	3.5		0	1	6.0	
7	0	1	8.0		0	0	3.9		0	1	5.4	
8	0	0	3.8		0	0	4.0		0	1	6.0	
9	0	1	9.0		0	0	3.2		0	1	4.8	
10	0	1	5.1	0	0	0	3.6	0.25	0	1	4.6	0.50
11	0	0	3.7		0	0	4.2		0	0	3.2	
12	0	0	8.7		0	0	6.8		0	1	4.5	
13	0	0	9.8		0	0	4.5		0	1	7.8	
14	0	1	10.5		0	0	7.0		0	1	8.9	
15	0	0	4.9		0	0	3.3		0	0	4.0	
16	0	1	7.2		0	0	3.2		0	0	7.1	
17	0	1	13.0		0	0	4.3		0	0	7.0	
18	0	0	3.7		0	0	5.6		0	1	6.0	
19	0	0	6.7		0	0	8.6		0	0	7.6	
20	0	1	7.2	0.50	0	0	3.3	0.50	0	1	7.2	0
21	0	0	3.7		0	0	3.6		0	1	7.4	
22	0	0	12.4		0	0	5.7		0	1	11.8	
23	0	0	8.0		0	0	2.6		0	0	3.2	
24	0	0	4.1		0	0	5.2		0	0	3.2	
25	0	1	7.4		0	0	4.2		0	1	7.4	
26	0	1	9.1		0	0	7.4		0	0	5.5	
27	0	0	5.8		0	0	2.6		0	0	7.2	
28	0	0	10.6		0	0	8.0		0	1	5.5	
29	0	0	7.6		0	0	s		0	1	3.0	
30	0	1	9.2	0.25	0	0	4.2	0	0	1	5.6	0
31	0	0	7.2		0	0	3.0		0	1	12.2	
32	0	0	3.6		0	0	2.4		0	1	5.9	
33	0	0	4.9		0	0	3.2		0	1	5.5	
34	0	0	3.2		0	0	3.2		0	1	11.2	
35	0	0	1.6		0	0	1.7		0	1	5.0	
36	0	0	5.6		0	0	1.6		0	1	2.2	
37	0	0	3.0		0	0	7.2		0	1	4.5	
38	0	0	6.1		0	0	3.0		0	0	3.0	
39	0	0	9.1		0	0	6.6		0	0	4.1	
40	0	1	4.0	0.75	0	0	6.0	0	0	1	9.5	0
41	0	0	9.0		0	0	2.1		0	1	8.2	
42	0	0	3.1		0	0	3.2		0	1	4.5	
43	0	0	8.2		0	0	3.2		0	1	8.1	
44	0	0	7.1		0	1	6.1		0	1	5.6	
45	0	0	6.9		0	0	4.5		0	0	1.7	
46	0	1	5.1		0	0	7.7		0	0	7.0	
47	0	1	4.5		0	0	7.0		0	1	6.5	
48	0	0	3.9		0	0	7.7		-	-	s	
49	0	0	6.0		0	0	3.6		0	1	6.8	
50	0	1	9.5	0	0	0	5.8	0	0	1	19.2	0.50
51	0	1	16.2		0	0	4.8		0	1	14.0	
52	0	1	8.2		0	0	5.7		0	1	8.0	
53	0	0	4.3		0	0	9.0		0	1	6.2	
54	0	0	10.4		0	0	3.3		0	0	3.6	
55	0	0	3.7		0	0	3.2		0	1	8.5	
56	0	1	6.4		0	0	1.0		0	0	11.5	
57	0	0	3.1		0	1	0.8		0	1	14.4	
58	0	1	7.7		0	1	6.0		0	0	1.8	
59	0	0	3.5		0	0	8.0		0	0	4.1	
60	0	0	4.5	0	0	0	10.2	0	0	1	6.2	0
61	0	1	6.0		0	0	2.8		0	1	5.4	
62	0	1	5.2		0	0	3.3		0	1	10.2	
63	0	0	3.4		0	0	2.4		0	1	6.2	
64	0	0	2.2		0	0	3.4		0	0	7.2	
65	0	0	4.1		0	0	2.6		0	1	8.8	
66	0	1	6.6		0	0	2.1		0	1	5.1	
67	0	0	4.3		0	0	5.0		0	1	6.1	
68	0	0	3.4		0	0	5.4		0	0	5.0	
69	0	1	10.2		0	0	5.6		0	0	9.0	
70	0	0	6.6	0	0	0	9.2	0.25	0	1	4.6	0.75
71	0	0	6.9		0	0	3.6		0	1	5.9	
72	0	1	13.6		0	1	7.2		0	0	6.2	
73	0	1	14.3		0	1	4.6		0	0	4.0	
74	0	1	10.6		0	0	5.1		0	1	14.1	
75	0	0	2.5		0	0	1.3		0	1	9.0	
76	0	0	3.4		0	0	5.2		0	1	8.2	
77	0	1	11.5		0	0	6.2		0	0	4.2	
78	0	0	4.6		0	0	3.2		0	1	12.4	
79	0	0	3.9		0	0	4.0		0	0	4.6	
80	0	0	7.7	0.50	0	0	3.2	0	0	1	9.2	0.25
81	0	1	7.4		0	0	3.5		0	1	8.8	
82	0	1	4.0		0	0	5.6		0	1	4.9	
83	0	0	4.1		0	0	2.0		0	0	5.0	
84	0	1	3.2		0	0	6.0		0	1	8.6	
85	0	0	2.6		0	0	9.5		0	0	4.4	
86	0	0	8.8		0	0	5.6		0	1	11.1	
87	0	1	2.6		0	0	5.4		0	1	5.2	
88	0	1	8.8		0	0	3.7		0	1	8.4	
89	0	1	10.8		0	0	4.2		0	1	6.2	
90	0	1	11.6	0.25	0	0	3.2	0	0	1	8.2	0
91	0	1	2.8		0	1	4.6		0	1	10.0	
92	0	0	10.2		0	0	2.9		0	1	7.3	
93	0	1	3.1		0	0	2.7		0	1	10.2	
94	0	1	4.6		0	0	1.2		0	1	5.2	
95	0	0	6.0		0	0	1.8		0	1	6.1	
96	0	0	4.3		0	1	9.0		0	1	7.9	
97	0	0	5.9		0	0	2.1		0	1	11.5	
98	0	0	6.3		0	0	1.2		0	1	4.2	
99	0	0	9.2		0	0	4.4		0	1	5.8	
100	0	1	3.0	0	0	0	4.6	0	0	1	4.4	0.50
Minimum	**0**	**0**	**1.60**	**0**	**0**	**0**	**0.800**	**0**	**0**	**0**	**1.70**	**0**
Maximum	**0**	**1.00**	**17.5**	**0.750**	**0**	**1.00**	**10.2**	**0.500**	**0**	**1.00**	**19.2**	**0.750**
Mean	**0**	**0.410**	**6.69**	**0.225**	**0**	**0.090**	**4.45**	**0.100**	**0**	**0.697**	**6.77**	**0.250**
Standard Dev.	**0**	**0.494**	**3.29**	**0.275**	**0**	**0.288**	**2.08**	**0.175**	**0**	**0.462**	**3.03**	**0.289**
Geometric mean	**-**	**-**	**5.94**	**-**	**-**	**-**	**3.96**	**-**	**-**	**-**	**6.14**	**-**
Median	**0**	**0**	**6.15**	**0.125**	**0**	**0**	**4.00**	**0**	**0**	**1.00**	**6.10**	**0**
Calcite Index	**0.410**		**-**	**-**	**0.090**		**-**	**-**	**0.697**		**-**	**-**

Table F.40: Calcite and Pebble Count at RG_FRUPO, FRO LAEMP, September 2019

Rock	RG_FRUPO 3				RG_FRUPO 2				RG_FRUPO 1			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	8.7		-	-	S		0	1	7.0	
2	0	1	7.5		0	1	7.6		0	1	8.7	
3	0	1	13.0		0	1	23.4		0	1	6.2	
4	1	1	11.9		0	1	11.8		0	1	8.2	
5	0	1	6.3		0	0	1.0		0	1	2.5	
6	0	1	4.9		0	1	13.4		0	1	5.1	
7	0	1	8.7		0	1	11.3		0	1	6.1	
8	0	1	9.2		0	1	6.6		0	1	3.0	
9	0	1	9.1		0	1	10.3		0	1	4.3	
10	0	1	11.9	0.50	0	0	4.7	0	0	1	7.7	0
11	0	1	8.6		0	1	4.4		0	1	5.3	
12	0	1	9.3		0	1	8.1		0	1	4.2	
13	0	1	5.0		0	1	6.4		0	1	5.0	
14	0	1	4.1		0	1	9.6		0	1	4.4	
15	0	1	5.8		0	1	14.3		0	1	10.2	
16	0	1	4.3		0	1	4.0		0	1	9.6	
17	0	1	7.6		0	0	3.4		0	1	6.7	
18	0	1	8.8		0	1	6.4		0	1	7.7	
19	0	1	5.0		0	0	4.5		0	1	3.0	
20	0	1	9.6	0.25	0	0	25.6	0.25	0	1	7.1	0
21	0	1	7.4		0	0	4.9		0	1	7.2	
22	0	1	5.4		0	0	8.4		1	1	9.6	
23	0	1	7.6		0	1	11.0		0	1	8.1	
24	0	1	8.0		0	0	3.2		0	1	10.9	
25	0	0	4.3		0	1	6.9		0	1	6.5	
26	0	1	6.0		0	1	7.3		0	1	7.3	
27	0	0	6.2		0	1	8.7		0	1	7.7	
28	1	1	16.2		0	1	13.2		1	1	7.3	
29	0	1	7.5		0	1	4.6		0	1	11.4	
30	0	1	8.6	0	0	1	7.1	0.25	0	1	8.7	0
31	0	0	6.7		0	0	S		0	1	8.5	
32	0	1	8.2		0	0	10.6		0	1	9.6	
33	0	1	4.6		0	0	4.3		1	1	11.6	
34	0	1	4.0		0	0	11.3		0	1	6.1	
35	0	0	S		0	0	3.1		0	1	6.6	
36	1	1	5.2		1	1	13.7		0	1	7.5	
37	0	1	11.1		0	0	11.8		0	1	9.8	
38	0	0	4.4		0	1	7.3		0	1	9.2	
39	0	1	9.2		0	1	9.2		0	1	8.3	
40	0	1	8.2	0.50	0	1	4.8	0	0	1	8.7	0.25
41	0	0	S		0	1	6.7		0	1	9.0	
42	0	0	9.2		1	1	13.5		0	1	5.6	
43	1	1	8.6		1	1	9.6		0	1	0.7	
44	1	1	4.3		0	1	6.3		0	1	4.9	
45	0	1	6.1		0	1	4.9		0	1	0.9	
46	0	1	7.6		0	1	3.9		0	1	1.5	
47	0	1	14.4		0	1	6.4		0	1	5.5	
48	0	1	5.4		0	1	6.5		0	1	6.0	
49	0	1	7.4		1	1	17.8		0	1	6.9	
50	0	1	6.4	0.5	0	1	9.7	0	0	1	10.3	0.25
51	0	1	4.1		0	1	12.4		0	1	7.5	
52	1	1	8.4		0	1	10.3		0	1	5.4	
53	0	1	9.2		0	0	S		0	1	7.8	
54	1	1	5.2		0	0	S		0	1	1.2	
55	0	0	4.8		0	0	3.1		1	1	4.9	
56	0	1	7.0		0	1	10.8		0	1	11.2	
57	0	1	9.9		0	1	6.9		0	1	7.0	
58	0	1	6.3		0	0	S		1	1	8.4	
59	0	1	6.0		1	1	3.6		0	1	8.0	
60	0	1	9.2	0.25	0	0	4.0	0	0	1	6.1	0
61	0	1	10.4		0	1	13.4		0	1	5.0	
62	0	1	8.4		0	1	16.1		0	1	3.4	
63	0	1	10.1		0	1	12.3		0	1	8.6	
64	0	1	5.8		0	1	4.9		0	1	7.4	
65	0	1	6.0		1	1	5.7		0	1	8.1	
66	1	1	8.6		0	1	10.1		0	1	0.5	
67	0	1	9.3		-	-	S		0	1	0.4	
68	0	1	9.1		0	0	1.8		0	1	7.4	
69	0	1	8.2		0	0	1.9		0	1	5.4	
70	0	1	9.7	0	0	0	3.4	0.25	1	1	10.8	0
71	0	1	12.4		-	-	S		0	1	9.0	
72	0	1	6.5		0	1	7.4		0	1	7.5	
73	0	1	5.0		0	0	4.0		1	1	6.2	
74	0	1	3.7		0	0	4.4		1	1	7.0	
75	0	1	7.2		0	1	7.8		0	1	5.1	
76	0	1	3.6		-	-	S		0	1	2.5	
77	0	0	3.2		0	1	9.5		0	1	5.2	
78	0	0	3.5		0	1	5.3		0	1	5.7	
79	0	1	9.0		0	1	8.2		0	1	3.4	
80	0	1	2.6	0	0	0	6.8	0.50	0	1	6.8	0
81	0	1	5.6		0	0	2.5		0	1	9.9	
82	0	1	4.3		0	1	4.1		0	1	12.8	
83	0	1	7.0		0	0	6.4		0	1	6.2	
84	1	1	9.6		0	0	5.9		0	1	4.9	
85	0	1	10.2		0	1	4.5		0	1	10.3	
86	1	1	10.5		0	1	7.8		0	1	6.4	
87	0	1	9.8		0	0	4.1		0	1	8.0	
88	0	1	4.8		0	0	3.2		0	1	3.0	
89	0	1	5.0		0	0	2.1		0	1	2.7	
90	0	1	6.9	0	0	0	2.5	0	0	1	6.2	0
91	0	1	3.8		0	0	2.6		0	1	6.9	
92	0	1	4.1		0	1	24.5		0	1	7.0	
93	0	1	6.2		0	0	16.1		0	1	6.1	
94	0	0	3.2		0	0	20.4		1	1	2.2	
95	0	1	9.0		0	1	6.3		1	1	2.2	
96	0	1	5.1		0	1	32.6		0	1	2.9	
97	0	1	11.2		0	0	3.4		0	1	6.0	
98	0	1	1.5		0	1	11.8		0	1	10.6	
99	0	1	9.3		0	1	9.1		0	1	9.5	
100	0	1	2.4	0.25	0	0	3.3	0	0	1	5.6	0.25
Minimum	**0**	**0**	**1.50**	**0**	**0**	**0**	**1.00**	**0**	**0**	**1.00**	**0.400**	**0**
Maximum	**1.00**	**1.00**	**16.2**	**0.500**	**1.00**	**1.00**	**32.6**	**0.500**	**1.00**	**1.00**	**12.8**	**0.250**
Mean	**0.100**	**0.890**	**7.24**	**0.225**	**0.0625**	**0.615**	**8.27**	**0.125**	**0.100**	**1.00**	**6.56**	**0.0750**
Standard Dev.	**0.302**	**0.314**	**2.74**	**0.219**	**0.243**	**0.489**	**5.60**	**0.177**	**0.302**	**0**	**2.72**	**0.121**
Geometric mean	**-**	**-**	**6.69**	**-**	**-**	**-**	**6.78**	**-**	**-**	**-**	**5.69**	**-**
Median	**0**	**1.00**	**7.30**	**0.250**	**0**	**1.00**	**6.85**	**0**	**0**	**1.00**	**6.85**	**0**
Calcite Index	**0.990**		**-**	**-**	**0.677**		**-**	**-**	**1.10**		**-**	**-**

Table F.41: Calcite and Pebble Count at RG_FODPO, FRO LAEMP, September 2019

Rock	RG_FODPO 1				RG_FODPO 2				RG_FODPO 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	4.6		0	0	4.3		0	1	9.1	
2	0	1	2.0		-	-	S		0	1	6.2	
3	0	0	3.7		-	-	S		0	1	6.1	
4	0	0	5.4		-	-	S		0	1	5.8	
5	0	1	4.0		0	0	2.1		0	0	6.3	
6	0	1	3.6		-	-	S		0	1	6.8	
7	0	0	4.2		0	0	1.9		0	1	7.1	
8	0	0	5.5		-	-	S		0	1	7.5	
9	0	1	7.6		-	-	S		0	1	7.7	
10	0	0	5.9	0	-	-	S	-	0	1	6.1	0.25
11	0	0	3.0		0	0	9.1		0	1	5.7	
12	0	0	3.6		0	0	3.2		0	1	6.9	
13	0	0	4.8		0	1	7.0		0	1	6.6	
14	0	0	5.5		0	0	5.1		0	1	5.4	
15	0	0	3.9		0	1	4.2		0	1	6.0	
16	0	0	4.7		0	1	6.3		0	1	5.7	
17	0	0	4.4		0	1	4.4		0	1	6.1	
18	0	0	4.0		0	1	6.9		0	1	4.4	
19	0	1	7.5		0	1	4.4		0	1	6.3	
20	0	1	8.7	0	0	0	4.6	0	0	1	7.0	0
21	0	0	4.3		0	0	4.9		0	1	10.1	
22	0	0	3.9		0	0	6.3		0	1	7.1	
23	0	1	5.0		0	0	S		0	1	9.2	
24	0	0	4.7		0	1	7.1		0	1	2.5	
25	0	0	3.6		0	0	3.1		0	1	5.4	
26	0	1	8.0		0	0	6.8		0	1	6.2	
27	0	1	6.0		0	1	9.3		0	1	4.4	
28	0	1	5.6		0	0	4.2		-	-	S	
29	0	0	4.4		0	0	4.2		0	1	5.7	
30	0	1	6.5	0	0	0	3.1	0.5	0	1	4.6	0
31	0	0	3.7		0	1	5.2		0	1	4.7	
32	0	1	4.6		0	0	6.5		0	1	6.1	
33	0	0	1.7		0	1	7.1		-	-	S	
34	0	0	2.6		0	1	3.4		0	0	5.2	
35	0	0	3.1		0	1	9.7		0	1	6.1	
36	0	1	5.1		0	1	8.7		0	0	4.2	
37	0	0	3.5		0	1	7.1		0	1	6.2	
38	0	1	5.3		0	1	3.2		0	1	S	
39	0	0	2.4		0	1	6.2		0	1	6.2	
40	0	0	3.6	0	0	1	10.5	0.25	-	-	S	1
41	0	0	2.2		0	1	7.3		0	0	4.3	
42	0	0	2.2		0	0	4.9		0	0	5.3	
43	0	0	2.2		0	0	3.9		0	1	7.1	
44	0	0	1.6		0	1	7.0		0	1	5.5	
45	0	0	1.2		0	0	2.1		0	1	6.8	
46	0	0	0.6		0	1	6.6		0	1	8.7	
47	0	0	1.9		0	0	4.9		0	1	6.2	
48	0	0	1.4		0	0	3.1		0	1	4.4	
49	0	0	1.4		0	0	6.1		0	1	4.0	
50	0	0	2.9	0	0	0	7.0	0.5	0	1	6.3	0.5
51	0	0	5.7		0	0	4.4		0	1	3.5	
52	0	0	8.3		0	0	3.0		0	1	4.7	
53	0	0	2.4		0	0	4.1		0	1	5.7	
54	0	0	3.0		0	1	2.1		0	1	6.0	
55	0	1	2.3		0	0	1.6		0	1	4.3	
56	0	1	5.1		0	0	3.1		0	1	5.1	
57	0	1	9.5		0	1	7.5		-	-	S	
58	0	1	3.2		0	1	5.1		0	1	4.5	
59	0	0	1.9		0	1	3.2		0	1	9.0	
60	1	1	3.9	0.5	1	1	4.2	0.25	0	1	2.7	0.25
61	0	0	7.2		0	1	5.9		0	1	3.4	
62	0	1	2.9		0	0	6.1		0	1	4.0	
63	0	0	7.2		0	1	4.8		0	1	6.3	
64	0	1	4.1		0	1	7.1		0	1	4.0	
65	0	1	8.1		0	1	4.3		0	1	4.7	
66	0	1	3.9		0	0	1.2		0	1	0.9	
67	0	1	5.5		0	1	2.2		0	0	4.3	
68	0	1	4.1		0	1	4.6		0	0	0.1	
69	0	0	3.1		0	1	4.6		1	1	2.8	
70	0	0	7.5	0	0	1	6.1	0	0	0	3.5	0.25
71	0	1	3.8		0	1	2.0		0	0	1.1	
72	0	1	6.2		0	1	5.2		0	1	4.9	
73	0	1	7.0		0	1	4.5		0	1	4.2	
74	0	1	7.5		0	0	1.0		0	0	6.2	
75	0	1	3.0		0	1	2.1		0	1	4.6	
76	0	1	11.5		0	1	3.2		0	1	5.6	
77	0	1	2.9		0	1	4.2		0	1	10.4	
78	0	1	7.3		0	0	1.1		0	1	7.9	
79	0	1	4.8		0	0	5.3		0	1	3.0	
80	0	1	11.2	0.25	0	0	4.1	0	1	0	4.0	0.25
81	0	0	1.1		0	1	5.1		0	1	9.0	
82	0	0	2.6		0	0	0.8		0	1	6.1	
83	0	0	2.0		0	0	1.3		1	1	7.0	
84	0	1	2.0		0	0	4.1		0	1	2.6	
85	0	0	3.9		0	1	4.7		0	1	4.9	
86	0	1	2.7		0	1	9.1		0	1	8.2	
87	0	0	F		0	0	5.7		0	0	1.8	
88	0	0	F		0	1	5.3		0	1	3.8	
89	0	0	5.0		0	1	6.1		1	1	9.0	
90	0	0	3.1	0.5	0	1	3.1	0.25	-	-	S	1
91	0	0	3.7		0	0	7.2		0	1	8.4	
92	0	1	3.1		0	0	4.8		0	1	1.6	
93	0	1	4.3		0	0	S		0	1	8.2	
94	0	1	4.8		0	0	7.3		0	1	3.4	
95	0	1	2.5		0	0	1.0		0	1	4.0	
96	0	1	4.1		0	1	9.1		0	1	7.9	
97	0	1	2.6		0	0	11.1		0	1	3.5	
98	0	1	5.6		0	0	2.5		0	1	1.4	
99	0	0	3.3		0	0	2.9		0	1	6.6	
100	0	0	3.1	0.25	0	1	10.1	0.25	0	1	2.4	0
Minimum	**0**	**0**	**0.600**	**0**	**0**	**0**	**0.800**	**0**	**0**	**0**	**0.100**	**0**
Maximum	**1.00**	**1.00**	**11.5**	**0.500**	**1.00**	**1.00**	**11.1**	**0.500**	**1.00**	**1.00**	**10.4**	**1.00**
Mean	**0.0100**	**0.450**	**4.34**	**0.150**	**0.0108**	**0.505**	**4.97**	**0.222**	**0.0421**	**0.874**	**5.45**	**0.350**
Standard Dev.	**0.100**	**0.500**	**2.15**	**0.211**	**0.104**	**0.503**	**2.35**	**0.195**	**0.202**	**0.334**	**2.09**	**0.376**
Geometric mean	**-**	**-**	**3.83**	**-**	**-**	**-**	**4.34**	**-**	**-**	**-**	**4.85**	**-**
Median	**0**	**0**	**3.90**	**0**	**0**	**1.00**	**4.70**	**0.250**	**0**	**1.00**	**5.70**	**0.250**
Calcite Index	**0.460**		**-**	**-**	**0.516**		**-**	**-**	**0.916**		**-**	**-**

Table F.42: Calcite and Pebble Count at RG_FO22, FRO LAEMP, September 2019

Rock	RG_FO22 1				RG_FO22 3				RG_FO22 2			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	3.5		0	0	6.5		0	1	4.1	
2	0	1	3.7		0	0	4.3		0	1	4.6	
3	0	1	2.5		0	0	1.2		0	1	5.2	
4	0	0	0.4		0	0	2.4		0	0	3.5	
5	0	0	1.7		0	0	2.6		0	1	3.7	
6	0	1	3.6		0	1	5.8		0	1	2.3	
7	0	1	2.7		0	1	2.4		0	1	3.4	
8	0	1	4.1		0	1	1.1		0	1	3.7	
9	0	1	4.5		0	0	2.2		0	1	3.5	
10	0	1	2.6	0	0	1	2.6	0	0	1	3.8	0
11	0	1	1.4		0	1	3.4		0	1	5.0	
12	0	1	8.2		0	1	6.6		0	1	4.5	
13	0	1	3.4		0	1	2.3		0	1	2.0	
14	0	1	4.6		0	1	2.1		0	1	5.2	
15	0	1	3.6		0	1	3.4		0	1	1.3	
16	0	0	1.2		0	1	3.4		0	1	4.8	
17	0	1	2.7		0	1	4.1		0	1	4.6	
18	0	1	3.4		0	1	4.2		0	1	4.1	
19	0	1	3.5		0	0	1.3		0	1	3.6	
20	0	1	3.1	0	0	1	3.6	0	0	1	4.0	0
21	0	1	3.5		0	0	2		0	1	2.2	
22	0	0	2.1		0	1	2.6		0	1	4.5	
23	0	1	1.8		0	0	2.4		0	1	2.0	
24	0	1	2.3		0	1	5		0	1	3.1	
25	0	1	4.2		0	1	3.4		0	1	3.2	
26	0	1	3.7		0	1	2.4		0	0	1.2	
27	0	1	5		0	1	1.4		0	1	4.6	
28	0	1	3.1		0	1	4.5		0	1	6.6	
29	0	1	2.2		0	1	3.5		0	1	3.2	
30	0	1	3.5	0	0	1	3.4	0.25	0	1	2.4	0.5
31	0	1	3.5		0	1	1.6		0	1	3.5	
32	0	1	2.7		0	1	1.6		0	1	2.1	
33	0	1	5.2		0	1	2.4		0	1	3.0	
34	0	1	3.5		0	1	1.5		0	1	2.7	
35	0	1	3.5		0	1	6.5		0	1	3.3	
36	0	1	2.4		0	1	1.2		0	1	3.0	
37	0	1	1.2		0	0	3		0	1	2.4	
38	0	0	0.6		0	1	12.8		0	1	2.1	
39	0	1	1.7		0	1	1.9		0	1	2.2	
40	0	1	3.2	0	0	1	3.2	0.25	0	1	3.4	0.25
41	0	1	4.5		0	0	1.1		0	1	5.0	
42	0	1	3.2		0	0	1.3		0	1	4.0	
43	0	1	1.1		0	1	3.2		0	1	2.2	
44	0	1	1.9		0	1	6		0	1	1.8	
45	0	1	3.6		0	1	4.5		0	1	3.2	
46	0	1	3		0	1	3.3		0	0	4.6	
47	0	1	1.1		0	1	2.2		0	1	7.0	
48	0	1	0.8		0	0	1.9		0	1	5.2	
49	0	1	1.5		0	0	3.2		0	1	2.0	
50	0	1	2.5	0	0	0	3.4	0.25	0	1	3.5	0
51	0	1	1.7		0	1	5.2		0	1	2.2	
52	0	1	3		0	1	3.4		0	1	1.7	
53	0	1	3.6		0	1	1.9		0	1	2.8	
54	0	1	6.5		0	0	2.1		0	1	2.5	
55	0	1	6.3		0	1	6.1		0	1	4.5	
56	0	1	3.4		0	1	2.4		0	1	2.4	
57	0	1	2.8		0	0	4.1		0	1	3.9	
58	0	0	1.2		0	1	3.3		0	1	3.0	
59	0	1	1.4		0	1	1.6		0	1	2.4	
60	0	1	1.2	0	0	1	1.4	0	0	1	2.5	0
61	0	1	2.7		0	1	0.9		0	1	1.4	
62	0	1	2.4		0	1	6.1		0	1	4.6	
63	0	1	2.6		0	1	3.4		0	1	2.2	
64	0	1	1.6		0	1	3.3		0	1	0.9	
65	0	1	4		0	1	2.1		0	0	2.1	
66	0	1	4		0	1	2.2		0	1	3.1	
67	0	1	5.3		0	1	0.8		0	1	3.2	
68	0	1	7.1		0	1	5.4		0	1	2.5	
69	0	0	2		0	1	3		0	1	2.0	
70	0	1	1.5	0	0	1	2.4	0	0	1	2.4	0
71	0	1	4		0	0	1.5		0	1	2.0	
72	0	1	3.2		0	0	2.8		0	1	2.6	
73	0	1	1.2		0	0	0.8		0	1	3.2	
74	0	1	0.9		0	0	2.4		0	0	1.3	
75	0	1	4.2		0	1	2.6		0	1	3.5	
76	0	1	3.1		0	1	2.6		0	1	4.1	
77	0	1	2.2		0	1	2.2		0	1	1.9	
78	0	1	4		0	1	2.6		0	1	4.4	
79	0	1	3.4		0	0	1.2		0	0	0.6	
80	0	1	3.2	0	0	1	3.2	0	0	1	2.8	0
81	0	1	5.3		0	1	3.4		0	1	2.1	
82	0	1	2.4		0	1	2		0	1	7.5	
83	0	1	2.9		0	1	1.1		0	1	2.3	
84	0	1	1.4		0	1	5.6		0	0	3.0	
85	0	1	1.8		0	1	3.2		0	1	3.5	
86	0	1	4.2		0	0	1.2		0	1	3.4	
87	0	1	1.2		0	1	6.1		0	1	4.5	
88	0	1	6		0	1	5		0	1	1.2	
89	0	0	1.4		0	1	2.1		0	1	2.1	
90	0	1	4.2	0	0	1	2.4	0.25	0	1	3.6	0
91	0	0	1		0	1	3.8		0	1	4.1	
92	0	0	2.1		0	1	1.6		0	1	3.0	
93	0	1	6.6		0	0	0.7		0	1	2.9	
94	0	1	3.2		0	1	1.7		0	0	5.0	
95	0	0	2.2		0	1	2.8		0	0	0.9	
96	0	1	1.9		0	1	3.2		0	1	2.0	
97	0	1	3.5		0	1	1.4		0	1	1.5	
98	0	1	5.6		0	1	2.8		0	1	1.8	
99	0	1	3.6		0	1	2.8		0	1	9.2	
100	0	1	2.1	0	0	1	1.1	0	0	0	1.2	0
Minimum	**0**	**0**	**0.400**	**0**	**0**	**0**	**0.700**	**0**	**0**	**0**	**0.600**	**0**
Maximum	**0**	**1.00**	**8.20**	**0**	**0**	**1.00**	**12.8**	**0.250**	**0**	**1.00**	**9.20**	**0.500**
Mean	**0**	**0.890**	**3.03**	**0**	**0**	**0.760**	**2.99**	**0.100**	**0**	**0.900**	**3.20**	**0.075**
Standard Dev.	**0**	**0.314**	**1.51**	**0**	**0**	**0.429**	**1.76**	**0.129**	**0**	**0.302**	**1.45**	**0.169**
Geometric mean	**-**	**-**	**2.64**	**-**	**-**	**-**	**2.58**	**-**	**-**	**-**	**2.88**	**-**
Median	**0**	**1.00**	**3.05**	**0**	**0**	**1.00**	**2.60**	**0**	**0**	**1.00**	**3.05**	**0**
Calcite Index	**0.890**		**-**	**-**	**0.760**		**-**	**-**	**0.900**		**-**	**-**

Table F.42: Calcite and Pebble Count at RG_FO22, FRO LAEMP, September 2019

Rock	RG_FO22 4				RG_FO22 5			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	1	2.2		0	0	1.5	
2	0	1	1.8		0	1	2.2	
3	0	0	1.9		0	0	2.8	
4	0	0	0.5		0	1	2.1	
5	0	0	2.4		0	1	2.5	
6	0	0	3.0		0	1	2.4	
7	0	1	0.8		0	1	2.8	
8	0	1	0.4		0	1	2.8	
9	0	1	2.3		0	0	2.5	
10	0	0	3.4	0	0	0	1.2	0
11	0	1	1.7		0	0	2.1	
12	0	1	5.0		0	0	4.2	
13	0	1	1.9		0	0	3.7	
14	0	1	3.7		0	0	4.1	
15	0	1	2.1		0	0	2.6	
16	-	-	S		0	0	1.2	
17	0	1	3.4		0	0	3.1	
18	0	1	6.1		0	1	3.2	
19	0	1	2.6		0	1	1.5	
20	0	1	3.1	0	0	1	2.5	0
21	0	1	3.5		0	0	3.2	
22	0	1	2.6		0	1	4.1	
23	0	1	2.6		0	0	3.6	
24	0	1	1.5		0	0	2.1	
25	0	1	1.1		0	0	2.2	
26	0	1	6.0		0	1	3.1	
27	0	0	1.1		0	0	4.6	
28	0	1	S		0	0	2.1	
29	0	1	5.7		0	1	1.5	
30	0	1	3.2	0	0	0	3.1	0
31	0	1	1.8		0	1	1.9	
32	0	1	2.2		0	1	1.8	
33	0	1	3.4		0	1	3.1	
34	0	1	4.2		0	1	4.0	
35	0	1	1.1		0	0	1.2	
36	0	0	1.3		0	0	0.9	
37	0	1	1.6		0	0	0.6	
38	0	1	1.4		0	1	4.5	
39	0	1	4.1		0	1	3.8	
40	0	1	2.1	0	0	1	3.5	0.25
41	0	1	4.1		0	1	3.2	
42	0	0	3.6		0	1	3.5	
43	0	1	3.1		0	0	4.0	
44	0	1	2.5		0	0	1.6	
45	0	1	1.8		0	0	0.7	
46	0	0	4.6		0	1	2.8	
47	0	1	3.4		0	1	2.9	
48	0	1	2.5		0	0	3.5	
49	0	1	4.2		0	1	3.5	
50	0	1	1.5	0	0	0	2.7	0
51	0	1	3.2		0	-	S	
52	0	1	1.1		0	0	1.5	
53	0	1	1.3		0	1	1.8	
54	0	1	2.6		0	1	2.8	
55	0	1	2.2		0	0	0.7	
56	0	1	1.4		0	0	0.5	
57	0	1	3.6		0	1	2.5	
58	0	1	2.6		0	1	3.6	
59	0	1	2.5		0	1	4.1	
60	0	1	2.4	0	0	1	4.5	0.25
61	0	1	1.2		0	1	5.0	
62	0	1	4.2		0	1	2.0	
63	0	1	1.4		0	0	1.9	
64	0	1	1.1		0	0	0.8	
65	0	1	4.8		0	0	3.4	
66	0	1	4.6		0	0	1.2	
67	0	1	3.9		0	1	2.4	
68	0	0	1.9		0	0	0.9	
69	0	1	3.4		0	1	2.1	
70	0	1	2.5	0	0	1	1.7	0.5
71	0	1	2.5		0	1	2.5	
72	0	1	3.3		0	1	1.8	
73	0	1	1.5		0	1	3.1	
74	0	1	4.5		0	1	4.0	
75	0	1	3.3		0	0	1.5	
76	0	1	3.5		0	0	0.7	
77	0	1	2.4		0	0	0.9	
78	0	1	1.6		0	-	S	
79	0	1	4.2		0	1	4.6	
80	0	1	4.0	0	0	0	1.3	0
81	0	1	3.6		0	1	2.5	
82	0	1	2.1		0	1	4.3	
83	0	1	2.6		0	1	3.1	
84	0	0	2.1		0	0	1.1	
85	0	0	4.0		0	0	2.2	
86	0	1	3.0		0	1	3.2	
87	0	1	3.0		0	1	4.0	
88	0	1	1.6		0	1	3.7	
89	0	1	1.7		0	1	4.2	
90	0	1	2.2	0	0	1	2.7	0
91	0	1	3.8		0	1	2.5	
92	0	1	3.6		0	0	2.6	
93	0	0	2.9		0	-	S	
94	0	1	1.1		0	0	0.5	
95	0	1	3.6		0	0	0.6	
96	0	0	3.9		0	1	2.1	
97	0	1	3.2		0	0	0.5	
98	0	1	1.9		0	1	2.0	
99	0	1	2.6		0	1	3.1	
100	0	1	1.2	0	0	1	1.9	0
Minimum	**0**	**0**	**0.400**	**0**	**0**	**0**	**0.500**	**0**
Maximum	**0**	**1.00**	**6.10**	**0**	**0**	**1.00**	**5.00**	**0.500**
Mean	**0**	**0.859**	**2.72**	**0**	**0**	**0.546**	**2.52**	**0.100**
Standard Dev.	**0**	**0.350**	**1.22**	**0**	**0**	**0.500**	**1.15**	**0.175**
Geometric mean	**-**	**-**	**2.43**	**-**	**-**	**-**	**2.20**	**-**
Median	**0**	**1.00**	**2.60**	**0**	**0**	**1.00**	**2.50**	**0**
Calcite Index	**0.859**		**-**	**-**	**0.546**		**-**	**-**

Table F.43: Calcite and Pebble Count at RG_FOUEW, FRO LAEMP, September 2019

Rock	RG_FOUEW 3				RG_FOUEW 2				RG_FOUEW 1			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	0	0	2.5		0	1	12.1		0	1	6.3	
2	0	1	9.6		0	1	9.2		0	1	8.9	
3	0	1	5.7		1	1	7.5		0	1	7.7	
4	0	0	15.2		0	1	5.5		1	1	7.2	
5	0	0	6.0		0	1	16.5		0	1	10.8	
6	0	1	8.4		0	1	4.5		0	1	10.2	
7	0	1	9.3		0	1	11.6		0	1	6.9	
8	0	0	1.8		0	1	7.5		0	1	3.4	
9	0	1	8.7		0	1	7.5		0	1	5.0	
10	0	1	10.1	0	0	1	9.1	0	0	0	5.1	0
11	0	0	6.0		0	1	11.7		0	0	4.7	
12	0	0	1.8		0	1	10.0		0	0	8.1	
13	0	0	S		0	1	7.9		0	0	1.5	
14	0	0	S		0	1	6.0		0	0	2.9	
15	0	0	34.2		0	1	8.5		0	1	4.8	
16	0	1	6.1		0	1	10.6		0	1	4.6	
17	0	1	3.8		0	1	9.5		1	1	6.3	
18	0	0	S		0	1	11.9		1	1	7.6	
19	0	0	9.4		0	1	7.5		1	1	6.2	
20	0	0	11.8	0	0	1	10.0	0	1	1	10.1	0.5
21	0	1	4.9		0	1	9.5		1	1	12.0	
22	0	1	3.2		0	1	3.0		0	1	5.9	
23	0	1	6.0		0	1	11.2		0	1	15.0	
24	0	0	S		0	1	6.0		0	1	7.9	
25	0	0	8.7		0	1	3.5		0	1	5.9	
26	0	0	6.0		0	1	6.5		0	1	8.7	
27	0	0	22.1		0	1	6.7		0	1	4.8	
28	0	0	3.0		1	1	7.1		0	1	8.0	
29	0	0	8.5		0	1	12.6		1	1	13.5	
30	0	1	16.2	0	0	1	12.3	0.5	0	1	12.2	0
31	0	1	31.5		0	1	6.5		0	1	5.8	
32	0	1	22.0		0	1	9.0		0	1	11.5	
33	1	1	7.2		0	1	12.5		0	1	6.2	
34	0	1	8.2		0	1	8.0		0	1	7.5	
35	0	1	6.1		0	1	5.0		0	0	2.7	
36	1	1	15.0		0	1	3.0		0	0	S	
37	0	1	18.2		0	1	6.1		0	1	7.1	
38	0	0	1.3		0	1	2.7		0	0	6.5	
39	1	1	34.8		0	1	11.5		0	0	6.3	
40	0	1	5.0	0	0	1	3.6	0.5	1	1	7.9	0.25
41	0	1	12.1		0	1	3.6		0	1	9.4	
42	0	1	17.3		0	1	6.5		0	0	S	
43	0	0	11.8		0	1	5.0		0	1	12.2	
44	0	0	6.0		0	1	5.6		0	0	6.1	
45	0	1	15.1		0	1	4.9		0	1	10.2	
46	0	1	17.5		0	0	S		0	1	6.0	
47	0	1	7.2		0	1	4.1		0	1	10.4	
48	0	1	10.8		0	1	5.0		0	1	4.6	
49	1	1	6.3		0	1	6.5		0	1	7.6	
50	0	1	9.2	0	0	1	9.0	0	0	1	8.0	0.25
51	0	1	23.1		0	1	4.5		0	1	8.6	
52	0	0	12.3		0	1	6.0		0	1	13.5	
53	0	0	9.3		0	1	6.5		0	1	5.9	
54	0	1	33.0		0	1	5.2		0	1	10.8	
55	0	1	9.1		0	1	8.0		0	1	5.1	
56	0	0	0.3		0	1	8.7		0	1	9.2	
57	0	0	2.3		0	1	15.2		0	1	3.2	
58	0	1	14.0		0	1	8.6		0	1	8.4	
59	0	0	2.5		0	1	5.3		0	1	6.6	
60	0	0	7.5	0.25	0	1	12.6	0	0	1	6.0	0
61	0	0	S		0	1	9.0		0	1	8.6	
62	0	0	7.0		0	1	6.0		0	1	7.1	
63	0	0	4.5		0	1	9.9		0	1	5.9	
64	0	0	S		0	1	7.5		0	1	6.0	
65	0	0	9.9		0	1	7.0		1	1	5.9	
66	0	0	4.3		0	0	S		0	1	13.3	
67	0	0	5.8		0	1	7.4		1	1	4.2	
68	0	0	10.6		0	1	4.3		0	1	6.2	
69	0	1	8.7		0	1	18.9		0	1	11.0	
70	0	0	3.5	0	0	1	4.5	0.75	0	1	8.6	0.75
71	0	1	11.0		0	1	7.9		0	1	9.2	
72	0	1	1.2		0	1	5.0		0	1	10.4	
73	0	1	1.1		0	1	7.0		0	1	9.3	
74	1	1	11.4		0	1	8.0		0	1	6.6	
75	0	1	21.3		0	1	4.3		0	1	6.0	
76	0	1	17.8		0	1	4.1		0	1	6.3	
77	0	1	15.8		0	1	6.2		1	1	8.7	
78	1	1	8.8		0	1	6.2		0	1	3.6	
79	0	0	10.0		0	1	7.2		0	1	6.0	
80	0	1	9.1	0.25	0	1	6.9	0.25	1	1	14.5	0.5
81	0	0	S		0	0	S		0	1	9.0	
82	0	0	S		0	0	4.2		1	1	8.6	
83	0	0	10.2		0	0	S		0	1	6.6	
84	0	1	21.4		0	1	8.0		0	1	3.4	
85	0	1	9.0		0	1	7.0		1	1	8.1	
86	0	0	5.0		0	1	5.9		0	1	4.9	
87	0	0	7.1		0	1	4.5		0	1	7.9	
88	0	0	11.4		0	1	6.4		0	1	12.2	
89	0	1	23.1		0	1	4.0		1	1	5.0	
90	0	1	8.1	0.25	0	1	5.0	0.5	0	1	4.4	0
91	0	1	3.2		0	1	3.0		0	1	14.2	
92	0	0	S		0	1	4.0		1	1	13.5	
93	0	0	13.3		0	1	5.5		0	1	11.1	
94	0	0	5.4		0	1	11.2		0	1	12.5	
95	0	0	S		0	1	16.1		1	1	9.3	
96	0	0	3.1		0	1	4.2		0	1	7.1	
97	0	0	8.0		0	1	8.0		0	1	6.6	
98	0	1	15.2		0	1	10.0		0	1	7.0	
99	0	1	2.4		0	1	6.5		0	1	4.6	
100	1	1	6.8	0	0	1	7.0	0.25	0	1	7.3	0.25
Minimum	**0**	**0**	**0.300**	**0**	**0**	**0**	**2.70**	**0**	**0**	**0**	**1.50**	**0**
Maximum	**1.00**	**1.00**	**34.8**	**0.250**	**1.00**	**1.00**	**18.9**	**0.750**	**1.00**	**1.00**	**15.0**	**0.750**
Mean	**0.070**	**0.510**	**10.2**	**0.075**	**0**	**0.95**	**7.49**	**0.275**	**0.170**	**0.890**	**7.72**	**0.250**
Standard Dev.	**0.256**	**0.502**	**7.42**	**0.121**	**0.141**	**0.219**	**3.19**	**0.275**	**0.378**	**0.314**	**2.91**	**0.264**
Geometric mean	**-**	**-**	**7.75**	**-**	**-**	**-**	**6.89**	**-**	**-**	**-**	**7.15**	**-**
Median	**0**	**1.00**	**8.70**	**0**	**0**	**1.00**	**7.00**	**0.250**	**0**	**1.00**	**7.15**	**0.250**
Calcite Index	**0.580**		**-**	**-**	**0.97**		**-**	**-**	**1.06**		**-**	**-**

Table F.44: *In Situ* Water Quality Taken at Biological Monitoring Areas, September 2019

Field Parameters		Reference		Mine-Exposed															
		RG_FO26	RG_HENUP	RG_FODHE	RG_FOUCL	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI	RG_SCOUTDS	RG_FOBKS	RG_FOBSC	RG_FOBCP	FRCP1SW	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Date		10-Sep-19	11-Sep-19	10-Sep-19	12-Sep-19	12-Sep-19	12-Sep-19	5-Sep-19	9-Sep-19	5-Sep-19	12-Sep-19	9-Sep-19	13-Sep-19	6-Sep-19	13-Sep-19	7-Sep-19	7-Sep-19	16-Sep-19	4-Sep-19
Station 1	Temperature (°C)	6.9	-	8.1	5.9	9.4	7.6	8.2	9.7	12.7	10.8	9.5	9.4	10.5	8.4	8.5	9.1	7.1	9.3
	Dissolved Oxygen (mg/L)	10.6	-	10.7	13.77	10.62	10.64	9.44	9.5	8.61	12.65	9.2	12.44	9.26	13.57	9.54	9.49	14.05	9.31
	Dissolved Oxygen (%)	87	-	91	110.6	92.8	89.2	96.6	85.0	97.6	114.4	80	108.2	99.5	115.8	98.0	99.1	116.3	97.5
	Conductivity (µS/cm)	213	-	296	302	401	406	48	474	568	660	496	533	656	534	705	725	605	670
	Specific Conductivity (µS/cm)	325	-	438	475	572	608	710	669	740	481	704	758	9	783	1030	1,041	920	937
	pH	8.13	-	8.25	7.57	-	-	8.21	8.10	8.51	8.30	8.13	8.31	8.50	8.24	8.10	8.07	7.56	8.40
	ORP (mV)	221.5	-	227.2	-	-	-	-	270.9	436.5	85.3	-	113.0	357.0	111.7	378.5	369.7	70.1	442.5
Station 2	Temperature (°C)	6.6	-	8.1	5.4	9.6	7.8	8.7	9.7	13.3	10.6	9.3	9.2	11.2	6.8	7.6	9.3	7.0	8.9
	Dissolved Oxygen (mg/L)	10.8	-	11	13.74	10.58	11.1	9.48	9.5	8.35	12.69	9.2	12.28	8.94	13.62	9.63	9.55	14.12	9.02
	Dissolved Oxygen (%)	88	-	93	109	93	93.7	98.5	84.0	95.0	114.0	81	107.2	98.2	112.2	97	100.1	116.5	93.7
	Conductivity (µS/cm)	195	-	438	298	403	595	488	473	576	471	494	534	667	513	686	722	603	651
	Specific Conductivity (µS/cm)	300	-	297	476	572	400	707	667	745	650	705	763	907	786	1,028	1032	920	939
	pH	8.14	-	8.25	758.00	-	-	8.33	8.10	8.49	8.47	8.11	8.14	8.53	8.08	8.19	8.06	7.43	8.36
	ORP (mV)	215.3	-	224.0	-	-	-	460.6	263.7	395.3	83.0	206.2	118.5	351.8	75.9	375.3	373.0	40.7	431.5
Station 3	Temperature (°C)	6.2	-	8.2	5.2	9.7	8.4	9.5	9.8	14.0	9.5	9.1	8.5	11.6	6.4	7.1	9.2	6.4	8.4
	Dissolved Oxygen (mg/L)	10.80	-	10.8	13.79	10.27	11.06	9.22	9.8	8.54	12.76	8.9	11.86	8.99	13.9	9.37	9.6	14.45	9.55
	Dissolved Oxygen (%)	88	-	92	108.7	90.5	84.7	97.7	87.0	99.8	111.9	77.1	101.3	99.4	113.4	92.8	100.5	117.7	97.9
	Conductivity (µS/cm)	209	-	438	296	404	405	497	473	596	468	493	523	683	507	678	727	595	649
	Specific Conductivity (µS/cm)	327	-	297	477	571	592	703	667	753	665	710	764	918	788	1,029	1041.0	924	948
	pH	7.97	-	8.25	7.53	-	-	8.34	8.09	8.49	8.02	8.02	8.20	8.51	8	8.11	8.1	7.59	8.29
	ORP (mV)	215.7	-	219.8	15.4	7.6	-	465.7	259.8	-	108.4	232.3	84.4	351.5	131.9	360.8	374.8	55.5	303.3
Station 4	Temperature (°C)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.9	-
	Dissolved Oxygen (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.52	-
	Dissolved Oxygen (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	116.9	-
	Conductivity (µS/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	587	-
	Specific Conductivity (µS/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	924	-
	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.60	-
	ORP (mV)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	62.2	-
Station 5	Temperature (°C)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3	-
	Dissolved Oxygen (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.99	-
	Dissolved Oxygen (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	111.0	-
	Conductivity (µS/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	579	-
	Specific Conductivity (µS/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	925	-
	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.33	-
	ORP (mV)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73.5	-

Note: "-" indicates no data available.

Table F.45: Kick and Sweep at Reference and Mine-exposed Areas, FRO LAEMP, September 2019

Station Parameters		Reference		Mine-Exposed															
		RG_FO26	RG_HENUP	RG_FODHE	RG_FOUCL	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI	RG_FOBKS	RG_SCOUTDS	RG_FOBSC	RG_FOBCP	RG_FCRP1SW	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Station 1	Easting	653043	655822	651411	650804	650868	650980	651135	650878	651855	652048	652291	652319	652876	653302	653891	653939	654777	656256
	Northing	556967	5567705	5565510	5564490	5563472	5563172	5562411	5560958	5559811	5558696	5558520	5558205	5557144	5556257	5555959	5555081	5553693	5551879
	Date	10-Sep-19	11-Sep-19	10-Sep-19	12-Sep-19	12-Sep-19	12-Sep-19	5-Sep-19	9-Sep-19	5-Sep-19	9-Sep-19	12-Sep-19	13-Sep-19	6-Sep-19	13-Sep-19	7-Sep-19	7-Sep-19	16-Sep-19	4-Sep-19
	Samplers' Initials	MW	MW	MW	ED	PaS	PaS, AG	JV	MW	JV	MW	ED	KD	JV	MW	JV	KD	KD	MW
	Number of Jars	1	1	2	2	1	1	1	1	1	1	1	1	-	1	1	1	2	1
	Total Kick Distance (m)	-	-	18	15	15	10	14	8	16	13	12	15	10	15	16	11	-	14
	Full Transect (Yes / No)	y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y	Y	N	Y	Y
	Number of Transects	1.0	-	1.0	1.5	2.0	1.2	1.0	1.0	1.0	1.0	1.8	-	1.0	2.0	1.0	1.0	1.3	1.0
Station 2	Easting	653051	655769	651409	650787	650854	650888	651206	650849	651836	652061	652307	652364	652894	653327	653890	653867	654769	656321
	Northing	5569595	5567710	5565491	5564445	5563518	5563175	5562467	5561055	5559848	5558666	5558501	5558168	5557118	5556190	5555874	5555063	5553635	5551862
	Date	10-Sep-19	11-Sep-19	10-Sep-19	12-Sep-19	12-Sep-19	12-Sep-19	5-Sep-19	9-Sep-19	5-Sep-19	9-Sep-19	12-Sep-19	13-Sep-19	6-Sep-19	13-Sep-19	7-Sep-19	7-Sep-19	16-Sep-19	4-Sep-19
	Samplers' Initials	MW	MW	MW	ED	PaS	PaS, AG	MW	MW	AW	KD	MW	KD	JV	ED	MW	MW	KD	MW
	Number of Jars	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1
	Total Kick Distance (m)	-	13	13	15	15	10	14	80	15	13	12	15	6	14	13	17	15	12
	Full Transect (Yes / No)	Y	Y	-	Y	Y	Y	Y	Y	Y	N	Y	-	Y	Y	Y	Y	Y	Y
	Number of Transects	1.0	2.0	-	2.0	2.0	1.0	1.0	1.0	1.0	0.7	2.5	-	1.0	2.5	-	1.0	1.0	1.0
Station 3	Easting	653038	655720	651319	650790	650865	650883	651277	650849	651834	652081	652316	652413	652915	653379	653875	6543849	654821	656357
	Northing	5569552	557666	5565423	5564419	5563560	5563218	5562502	5561113	5559905	5558647	5558446	5558112	5557094	5556204	5555858	5555044	5553602	5551876
	Date	10-Sep-19	11-Sep-19	10-Sep-19	12-Sep-19	12-Sep-19	12-Sep-19	5-Sep-19	9-Sep-19	5-Sep-19	9-Sep-19	12-Sep-19	13-Sep-19	6-Sep-19	13-Sep-19	7-Sep-19	7-Sep-19	16-Sep-19	4-Sep-19
	Samplers' Initials	MW	KD	MW	JF	PaS	PaS, AG	MW	MW	AW	MW	ED	KD	AW	KD	KD	MW	KD	JV
	Number of Jars	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Total Kick Distance (m)	5	12	12	15	15	12	20	8	12	18	10	15	10	10	11	16	15	10
	Full Transect (Yes / No)	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
	Number of Transects	2.0	2.0	1.0	2.0	2.0	-	1.0	1.0	1.0	-	1.8	-	1.0	1.0	1.0	1.0	1.5	1.0
Station 4	Easting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	654835	-
	Northing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5553386	-
	Date	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16-Sep-19	-
	Samplers' Initials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	KD	-
	Number of Jars	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	Total Kick Distance (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-
	Full Transect (Yes / No)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	-
	Number of Transects	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-
Station 5	Easting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	654835	-
	Northing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5553548	-
	Date	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16-Sep-19	-
	Samplers' Initials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	KD	-
	Number of Jars	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	Total Kick Distance (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-
	Full Transect (Yes / No)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	-
	Number of Transects	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-

Note: "-" indicates no data available.

Table F.46: **Channel Measurements Fording River September 2019**

	Replicate		1	2	3	4	5	Mean
Reference	RG_HENUP							
	1	Depth (cm)	24	29	37	36	32	**31.6**
		Velocity (m/s)	0.050	0.190	0.850	0.870	1.050	**0.602**
	2	Depth (cm)	21	26	33	41	41	**32.4**
		Velocity (m/s)	0.310	0.720	0.900	0.990	0.960	**0.776**
	3	Depth (cm)	13.5	21	32	29	21	**23.3**
		Velocity (m/s)	0.520	0.630	0.840	0.930	1.120	**0.808**
	RG_FO26							
	1	Depth (cm)	14.6	20	11	13.5	17.2	**15.3**
		Velocity (m/s)	0.060	0.450	0.450	0.410	0.530	**0.380**
	2	Depth (cm)	14.6	12.9	14.3	12.7	11.9	**13.3**
		Velocity (m/s)	0.390	0.430	0.700	0.480	0.320	**0.464**
	3	Depth (cm)	14.5	20.5	13.8	16.4	13.2	**15.7**
		Velocity (m/s)	0.370	0.630	0.570	0.460	0.260	**0.458**
Mine-exposed	RG_FODHE							
	1	Depth (cm)	19.8	14.4	20.5	13.4	13.3	**16.3**
		Velocity (m/s)	0.330	0.280	0.770	0.430	0.140	**0.390**
	2	Depth (cm)	11.8	18.9	21.4	37.9	28	**23.6**
		Velocity (m/s)	0.060	0.650	0.910	0.840	0.520	**0.596**
	3	Depth (cm)	28.4	10.5	10.4	18.2	27.0	**18.9**
		Velocity (m/s)	0.150	0.460	0.180	0.310	0.450	**0.310**
	RG_FOUCL							
	1	Depth (cm)	17.0	28.0	32.0	31.0	28.0	**27.2**
		Velocity (m/s)	0.460	0.700	0.540	0.280	0.260	**0.448**
	2	Depth (cm)	27.0	21.0	19.0	20.0	31.0	**23.6**
		Velocity (m/s)	0.250	0.440	0.360	0.580	0.520	**0.430**
	3	Depth (cm)	24.5	35.0	29.0	26.5	16.0	**26.2**
		Velocity (m/s)	0.300	0.880	0.780	0.610	0.620	**0.638**
	RG_FOUNGD							
	1	Depth (cm)	28.0	33.0	29.0	21.0	35.0	**29.2**
		Velocity (m/s)	0.090	0.350	0.820	0.380	0.260	**0.380**
	2	Depth (cm)	27.0	21.0	21.0	19.0	16.0	**20.8**
		Velocity (m/s)	0.470	0.320	0.390	0.500	0.270	**0.390**
	3	Depth (cm)	15.0	25.0	26.0	24.0	15.0	**21**
		Velocity (m/s)	0.420	0.410	0.160	0.400	0.610	**0.400**
	RG_FODNGD							
	1	Depth (cm)	8.00	12.0	17.0	27.0	36.0	**20**
		Velocity (m/s)	0.210	0.500	0.310	0.510	0.430	**0.392**
	2	Depth (cm)	8	10	25	23	22	**17.6**
		Velocity (m/s)	0.310	0.180	0.240	0.440	0.430	**0.320**
	3	Depth (cm)	15.0	22.0	30.0	31.0	29.0	**25.4**
		Velocity (m/s)	0.120	0.200	0.470	0.210	0.380	**0.276**
	RG_MP1							
	1	Depth (cm)	27.2	29.5	31.9	18.6	19.0	**25.24**
		Velocity (m/s)	0.610	0.560	0.240	1.040	0.650	**0.620**
	2	Depth (cm)	23.7	40.3	56.2	26.3	17.8	**32.86**
		Velocity (m/s)	0.940	1.170	0.590	0.150	0.200	**0.610**
	3	Depth (cm)	18.6	26.5	32	13.3	17.2	**21.52**
		Velocity (m/s)	0.180	0.720	0.470	0.180	0.580	**0.426**
	RG_FOUSH							
	1	Depth (cm)	12.7	17.5	29.0	32.4	21.0	**22.52**
		Velocity (m/s)	0.360	0.810	0.830	0.750	0.780	**0.706**
	2	Depth (cm)	19	34.5	35.7	25.3	31	**29.1**
		Velocity (m/s)	0.120	0.450	0.610	0.700	0.330	**0.442**
	3	Depth (cm)	23.7	21.8	19.5	27.2	39.7	**26.38**
		Velocity (m/s)	0.650	0.670	1.23	0.360	0.830	**0.748**
	RG_FOUKI							
	1	Depth (cm)	30.3	29.8	25.5	18.7	21.6	**25.2**
		Velocity (m/s)	0.560	0.700	0.590	0.400	0.250	**0.500**
	2	Depth (cm)	14.5	27.2	32.8	44.5	37.7	**31.3**
		Velocity (m/s)	0.210	0.490	0.680	0.960	0.280	**0.524**
	3	Depth (cm)	16.0	32.0	33.0	40.0	18.0	**27.8**
		Velocity (m/s)	0.240	0.330	0.910	0.470	0.370	**0.464**
	RG_FOBKS							
	1	Depth (cm)	46.0	39.5	26.5	29.0	29.5	**34.1**
		Velocity (m/s)	0.080	0.480	0.270	0.520	0.270	**0.324**
	2	Depth (cm)	12.0	10.1	16.0	13.0	16.2	**13.5**
		Velocity (m/s)	0.680	0.790	0.410	0.150	0.260	**0.458**
	3	Depth (cm)	26.0	15.5	17.0	17.0	7.5	**16.6**
		Velocity (m/s)	0.260	0.800	0.630	0.330	0.510	**0.506**

Notes: Velocity measurements were taken at five randomly chosen locations throughout the kick sample area. Velocity was measured at the bottom of the water column.

Table F.46: **Channel Measurements Fording River September 2019**

	Replicate		1	2	3	4	5	Mean
Mine-exposed	**RG_SCOUTDS**							
	1	Depth (cm)	14.5	19.8	37.0	35.0	20.2	**25.3**
		Velocity (m/s)	0.250	0.370	0.850	0.830	0.900	**0.640**
	2	Depth (cm)	15.5	27.0	39.0	43.0	47.0	**34.3**
		Velocity (m/s)	0.210	0.660	0.620	0.390	0.410	**0.458**
	3	Depth (cm)	41.0	34.0	39.0	59.0	48.0	**44.2**
		Velocity (m/s)	0.410	0.380	0.620	0.910	0.840	**0.632**
	RG_FOBSC							
	1	Depth (cm)	19	13.5	22	17.2	22.3	**18.8**
		Velocity (m/s)	0.440	0.460	0.610	0.580	0.840	**0.586**
	2	Depth (cm)	15	23	29	24	27	**23.6**
		Velocity (m/s)	0.530	0.820	0.590	0.320	0.850	**0.622**
	3	Depth (cm)	21	31	25	11.5	8.5	**19.4**
		Velocity (m/s)	0.480	0.380	0.350	0.140	0.420	**0.354**
	RG_FOBCP							
	1	Depth (cm)	6.8	17.9	30.4	26.5	23	**20.9**
		Velocity (m/s)	0.120	0.300	0.710	0.780	0.200	**0.422**
	2	Depth (cm)	21	33	34	31	31	**30.0**
		Velocity (m/s)	0.420	0.530	0.450	0.390	0.260	**0.410**
	3	Depth (cm)	17.4	27	31.2	15.8	11	**20.4**
		Velocity (m/s)	0.250	0.640	0.640	0.400	0.120	**0.410**
	FRCP1SW							
	1	Depth (cm)	18.4	24.3	24.5	17.7	16.2	**20.22**
		Velocity (m/s)	0.45	0.33	0.51	0.34	0.47	**0.42**
	2	Depth (cm)	33	7	18	21.5	30	**21.9**
		Velocity (m/s)	0.48	0.27	0.92	0.86	0.88	**0.682**
	3	Depth (cm)	35	18	27.5	31	38	**29.98**
		Velocity (m/s)	0.31	0.2	0.48	0.510	0.4	**0.38**
	RG_FRUPO							
	1	Depth (cm)	28.7	36.4	28.2	28.9	22.1	**28.9**
		Velocity (m/s)	0.490	0.510	0.710	0.670	0.550	**0.586**
	2	Depth (cm)	13.3	19.1	31.8	38.6	36.1	**27.8**
		Velocity (m/s)	0.130	0.300	0.430	0.170	0.350	**0.276**
	3	Depth (cm)	25.5	23	13	14	16.3	**18.4**
		Velocity (m/s)	0.760	0.840	0.290	0.340	0.440	**0.534**
	RG_FODPO							
	1	Depth (cm)	17	35.2	42.5	33.5	21.5	**29.94**
		Velocity (m/s)	0.040	0.490	0.400	0.790	0.560	**0.456**
	2	Depth (cm)	38.1	23.5	13.7	47.9	59	**36.44**
		Velocity (m/s)	0.040	0.410	0.540	0.280	0.220	**0.298**
	3	Depth (cm)	21.9	43.5	11.2	5.50	28.2	**22.06**
		Velocity (m/s)	0.490	1.440	0.030	0.110	0.200	**0.454**
	RG_FO22							
	1	Depth (cm)	17	34.5	44.5	34.5	27	**31.5**
		Velocity (m/s)	0.320	0.510	1.030	0.830	0.620	**0.662**
	2	Depth (cm)	9	18	34	59	63	**36.6**
		Velocity (m/s)	0.260	0.380	0.490	0.550	0.490	**0.434**
	3	Depth (cm)	32	29	28	52	56	**39.4**
		Velocity (m/s)	0.860	0.790	0.480	0.390	0.360	**0.576**
	4	Depth (cm)	28	42	27	25	19	**28.2**
		Velocity (m/s)	0.510	0.680	0.670	0.410	0.410	**0.536**
	5	Depth (cm)	66	61	48	24	23	**44.4**
		Velocity (m/s)	0.060	0.680	0.420	0.240	0.230	**0.326**
	RG_FOUEW							
	1	Depth (cm)	27.5	42.2	47.8	34.6	40.5	**38.5**
		Velocity (m/s)	0.310	0.710	0.750	0.680	0.430	**0.576**
	2	Depth (cm)	21	27.5	23.1	34.3	68.4	**34.9**
		Velocity (m/s)	0.330	0.560	0.750	0.650	0.570	**0.572**
	3	Depth (cm)	14.5	23.7	44	41	19	**28.4**
		Velocity (m/s)	0.260	0.310	0.700	0.720	0.250	**0.448**

Notes: Velocity measurements were taken at five randomly chosen locations throughout the kick sample area. Velocity was measured at the bottom of the water column.

Table F.47: Streamside and Instream Vegetation at Reference and Mine-exposed Areas, FRO LAEMP, September 2019

Station ID	Reference		Mine-exposed						
	RG_HENUP	RG_FO26	RG_FODHE	RG_FOUCL	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI
Canopy Coverage (%)	1-25%	1-25%	0%	1-25%	0%	1-25%	0	0%	0%
Streamside Vegetation	ferns/grass, shrubs, coniferous trees	ferns/grass, shrubs, coniferous trees	none	coniferous trees	ferns/grass, shrubs, coniferous trees	ferns/grass, shrubs, coniferous trees, deciduous trees	none	none	ferns/grass, coniferous trees
Macrophyte Coverage (%)	0%	0%	0%	0%	0%	0%	26-50%	0%	0%
Periphyton Coverage Score (1-5)	1	1	4	3	3	2	2	2	2

Station ID	Mine-exposed								
	RG_FOBKS	RG_SCOUTDS	RG_FOBSC	RG_FOBCP	RG_FRCP1SW	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Canopy Coverage (%)	1-25%	0%	0%	1-25%	0%	1-25%	-	1-25%	1-25%
Streamside Vegetation	ferns/grass, coniferous trees	none	none	ferns/grass, coniferous trees	none	none	ferns/grass	ferns/grass, coniferous trees	ferns/grass, coniferous trees
Macrophyte Coverage (%)	0%	0%	0%	0%	0%	0%	-	0%	0%
Periphyton Coverage Score (1-5)	1	1	2	2	3	2	-	-	2

Notes: "-" indicates no data recorded. Periphyton coverage scores are as follows: 1 - Rocks not slippery, no obvious colour (<0.5mm thick), 2 - Rocks slightly slippery, yellow-brown to light green in colour (0.5-1mm thick), 3 - Rocks have noticeble slippery feel, patches of thicker green to brown algae (1-5mm thick), 4 - Rocks are very slippery, numerous clumps (5-20mm thick), 5 - Rocks mostly obscurred by algae mat, may have long strands (>20mm thick).

Table F.48: Hess Sample Collection from Fording River, September 2019

Area	Replicate	Date	Time	Associated K&S Sample	Sample ID	Easting	Northing	Depth (cm)	Flow (m/s)
FO22	1	16-Sep-19	16:10	1	RG_FO22_HESS1_2019-09-16_16:10	654781	5553699	36.5	0.78
	2	16-Sep-19	15:45	1	RG_FO22_HESS2_2019-09-16_15:45	654783	5553689	31.0	0.94
	3	16-Sep-19	15:15	2	RG_FO22_HESS3_2019-09-16_15:15	654764	5553644	33.5	0.64
	4	16-Sep-19	15:00	2	RG_FO22_HESS4_2019-09-16_15:00	654761	5553637	24.5	0.65
	5	16-Sep-19	13:30	3	RG_FO22_HESS5_2019-09-16_13:30	654806	5553605	20.5	0.32
	6	16-Sep-19	13:15	3	RG_FO22_HESS6_2019-09-16_13:15	654320	5553601	24.0	0.44
	7	16-Sep-19	13:00	4	RG_FO22_HESS7_2019-09-16_13:00	654825	5553600	28.0	0.34
	8	16-Sep-19	12:45	4	RG_FO22_HESS8_2019-09-16_12:45	654846	5553581	15.0	0.41
	9	16-Sep-19	12:30	5	RG_FO22_HESS9_2019-09-16_12:30	654840	5553553	28.0	0.52
	10	16-Sep-19	12:00	5	RG_FO22_HESS10_2019-09-16_12:00	654830	5553528	26.0	0.38
FO26	1	10-Sep-19	13:30	3	RG_FO26_HESS1_2019-09-10_13:30	653042	5569643	20.0	0.45
	2	10-Sep-19	13:00	3	RG_FO26_HESS2_2019-09-10_13:00	653048	5569624	17.9	0.41
	3	10-Sep-19	12:45	3	RG_FO26_HESS3_2019-09-10_12:45	653050	5569615	15.0	0.32
	4	10-Sep-19	12:30	3	RG_FO26_HESS4_2019-09-10_12:30	653051	5569658	24.0	0.37
	5	10-Sep-19	12:15	2	RG_FO26_HESS5_2019-09-10_12:15	653051	5569600	21.0	0.44
	6	10-Sep-19	12:00	2	RG_FO26_HESS6_2019-09-10_12:00	653051	5569595	18.0	0.53
	7	10-Sep-19	11:40	2	RG_FO26_HESS7_2019-09-10_11:40	653048	5569590	15.5	0.37
	8	10-Sep-19	11:00	1	RG_FO26_HESS8_2019-09-10_11:00	653046	5569588	21.0	0.63
	9	10-Sep-19	10:40	1	RG_FO26_HESS9_2019-09-10_10:40	653039	5569576	16.9	0.46
	10	10-Sep-19	10:00	1	RG_FO26_HESS10_2019-09-10_10:00	653034	5569564	17.0	0.40
FOBCP	1	06-Sep-19	12:05	1	RG_FOBCP_HESS1_2019-09-06_12:05	652872	5557145	21.0	0.71
	2	06-Sep-19	12:20	1	RG_FOBCP_HESS2_2019-09-06_12:20	652871	5557146	24.5	0.65
	3	06-Sep-19	13:15	2	RG_FOBCP_HESS3_2019-09-06_13:15	652894	5557118	33.0	0.53
	4	06-Sep-19	13:25	2	RG_FOBCP_HESS4_2019-09-06_13:25	652896	5557119	31.0	0.39
	5	06-Sep-19	15:00	3	RG_FOBCP_HESS5_2019-09-06_15:00	652919	5557104	26.7	0.64
	6	06-Sep-19	15:30	3	RG_FOBCP_HESS6_2019-09-06_15:30	652919	5557094	15.8	0.40
	7	06-Sep-19	14:05	4	RG_FOBCP_HESS7_2019-09-06_14:05	652920	5557043	17.1	0.73
	8	06-Sep-19	14:30	4	RG_FOBCP_HESS8_2019-09-06_14:30	652920	5557047	14.8	0.93
	9	06-Sep-19	13:40	5	RG_FOBCP_HESS9_2019-09-06_13:40	652936	5556991	12.0	0.12
	10	06-Sep-19	13:50	5	RG_FOBCP_HESS10_2019-09-06_13:50	652935	5556975	22.3	0.63
FOBKS	1	09-Sep-19	13:00	1	RG_FOBKS_HESS1_2019-09-09_13:00	652039	5558723	36.0	0.52
	2	09-Sep-19	12:50	1	RG_FOBKS_HESS2_2019-09-09_12:50	652047	5558719	31.0	0.64
	3	09-Sep-19	12:30	1	RG_FOBKS_HESS3_2019-09-09_12:30	652039	5558712	27.0	0.52
	4	09-Sep-19	12:15	1	RG_FOBKS_HESS4_2019-09-09_12:15	652043	5558706	19.0	0.48
	5	09-Sep-19	12:00	2	RG_FOBKS_HESS5_2019-09-09_12:00	652050	5558700	18.0	0.79
	6	09-Sep-19	11:50	2	RG_FOBKS_HESS6_2019-09-09_11:50	652054	5558682	23.0	0.36
	7	09-Sep-19	11:30	2	RG_FOBKS_HESS7_2019-09-09_11:30	652063	5558663	21.5	0.41
	8	09-Sep-19	10:15	3	RG_FOBKS_HESS8_2019-09-09_10:15	652077	5558646	29.0	0.35
	9	09-Sep-19	9:45	3	RG_FOBKS_HESS9_2019-09-09_9:45	652081	5558647	24.5	0.63
	10	09-Sep-19	9:20	3	RG_FOBKS_HESS10_2019-09-09_9:20	652082	5558643	26.0	0.51
FOUKI	1	05-Sep-19	13:10	1	RG_FOUKI_HESS1_2019-09-05-13:00	651855	5559811	30.3	0.56
	2	05-Sep-19	13:30	1	RG_FOUKI_HESS2_2019-09-05-13:30	651854	5559804	25.5	0.59
	3	05-Sep-19	14:00	1	RG_FOUKI_HESS3_2019-09-05-14:00	651853	5559805	18.7	0.40
	4	05-Sep-19	14:30	2	RG_FOUKI_HESS4_2019-09-05-14:30	651836	5559848	15.5	0.25
	5	05-Sep-19	-	2	RG_FOUKI_HESS5_2019-09-05	651835	5559848	27.2	0.48
	6	05-Sep-19	-	2	RG_FOUKI_HESS6_2019-09-05	651835	5559847	32.8	0.68
	7	05-Sep-19	16:30	3	RG_FOUKI_HESS7_2019-09-05-16:30	651833	5559904	26.0	0.24
	8	05-Sep-19	9:00	3	RG_FOUKI_HESS8_2019-09-05-9:00	651831	5559905	36.2	0.71
	9	05-Sep-19	9:30	3	RG_FOUKI_HESS9_2019-09-05-9:30	651831	5559917	24.5	0.50
	10	05-Sep-19	10:00	3	RG_FOUKI_HESS10_2019-09-05-10:00	651826	5559917	21.0	0.65
FOBSC	1	16-Sep-19	11:15	1	RG_FOBSC_HESS1_2019-09-16_11:15	-	-	32.0	0.40
	2	16-Sep-19	11:00	1	RG_FOBSC_HESS2_2019-09-16_11:00	652291	5558250	27.0	0.50
	3	16-Sep-19	10:45	1	RG_FOBSC_HESS3_2019-09-16_10:45	652300	5558238	34.0	0.47
	4	16-Sep-19	10:30	2	RG_FOBSC_HESS4_2019-09-16_10:30	652318	5558210	27.0	0.43
	5	16-Sep-19	10:15	2	RG_FOBSC_HESS5_2019-09-16_10:15	652336	5558182	21.0	0.30
	6	16-Sep-19	10:00	2	RG_FOBSC_HESS6_2019-09-16_10:00	652331	5558191	39.0	0.84
	7	16-Sep-19	9:45	3	RG_FOBSC_HESS7_2019-09-16_9:45	652403	5558129	27.0	0.34
	8	16-Sep-19	9:30	3	RG_FOBSC_HESS8_2019-09-16_9:30	652407	5558117	21.0	0.30
	9	16-Sep-19	9:15	3	RG_FOBSC_HESS9_2019-09-16_9:15	652411	5558110	29.0	0.50
	10	16-Sep-19	9:00	3	RG_FOBSC_HESS10_2019-09-16_9:00	652417	5558106	31.0	0.53
FRCP1SW	10	07-Sep-19	9:30	3	RG_FRCP1SW_HESS1_2019_09-07-09:30	653387	5556202	35.4	0.31
	9	07-Sep-19	9:45	3	RG_FRCP1SW_HESS2_2019_09-07-09:45	653379	5556204	26.8	0.54
	8	07-Sep-19	10:00	3	RG_FRCP1SW_HESS3_2019_09-07-10:00	653331	5556190	28.0	0.39
	7	07-Sep-19	10:15	2	RG_FRCP1SW_HESS4_2019_09-07-10:15	-	-	33.0	0.48
	6	07-Sep-19	10:45	2	RG_FRCP1SW_HESS5_2019_09-07-10:45	-	-	27.0	0.71
	5	07-Sep-19	11:00	2	RG_FRCP1SW_HESS6_2019_09-07-11:00	-	-	33.0	0.81
	4	07-Sep-19	11:15	2	RG_FRCP1SW_HESS7_2019_09-07-11:15	653296	5556204	26.0	0.65
	3	07-Sep-19	11:30	1	RG_FRCP1SW_HESS8_2019_09-07-11:30	653301	5556225	27.3	0.25
	2	07-Sep-19	11:45	1	RG_FRCP1SW_HESS9_2019_09-07-11:45	653301	5556256	16.2	0.47
	1	07-Sep-19	12:00	1	RG_FRCP1SW_HESS10_2019_09-07-12:00	-	-	24.3	0.33
FRUPO	1	07-Sep-19	9:10	1	RG_FRUPO_HESS1_2019_09-07-09:10	653850	5555853	25.5	0.76
	2	07-Sep-19	9:30	1	RG_FRUPO_HESS2_2019_09-07-09:30	653865	5555855	39.5	0.54
	3	07-Sep-19	9:50	1	RG_FRUPO_HESS3_2019_09-07-09:50	653871	5555860	41.0	0.68
	4	07-Sep-19	10:00	1	RG_FRUPO_HESS4_2019_09-07-10:00	653879	5555859	23.0	0.84
	5	07-Sep-19	10:30	2	RG_FRUPO_HESS5_2019_09-07-10:30	653888	5555867	22.5	0.51
	6	07-Sep-19	11:00	2	RG_FRUPO_HESS6_2019_09-07-11:00	653895	5555878	19.8	0.37
	7	07-Sep-19	11:15	2	RG_FRUPO_HESS7_2019_09-07-11:15	653896	5555882	31.8	0.43
	8	07-Sep-19	12:10	3	RG_FRUPO_HESS8_2019_09-07-12:10	653886	5555997	32.5	0.43
	9	07-Sep-19	12:40	3	RG_FRUPO_HESS9_2019_09-07-12:40	653884	5555957	27.1	0.23
	10	07-Sep-19	13:00	3	RG_FRUPO_HESS10_2019_09-07-13:00	653886	5555965	26.0	0.85
SCOUTDS	1	12-Sep-19	15:30	1	RG_SCOUTDS_HESS1_2019-09-12-15:30	652266	5558529	28.0	0.35
	2	12-Sep-19	15:25	1	RG_SCOUTDS_HESS2_2019-09-12-15:25	652277	5558531	30.5	0.54
	3	12-Sep-19	15:00	1	RG_SCOUTDS_HESS3_2019-09-12-15:00	-	-	35.0	0.59
	4	12-Sep-19	14:55	2	RG_SCOUTDS_HESS4_2019-09-12-14:55	-	-	19.0	0.51
	5	12-Sep-19	14:45	2	RG_SCOUTDS_HESS5_2019-09-12-14:45	652303	5558511	28.0	0.48
	6	12-Sep-19	14:20	2	RG_SCOUTDS_HESS6_2019-09-12-14:30	652312	5558497	27.0	0.39
	7	12-Sep-19	14:00	3	RG_SCOUTDS_HESS7_2019-09-12-14:00	652314	5558498	35.0	0.51
	8	12-Sep-19	13:20	3	RG_SCOUTDS_HESS8_2019-09-12-13:20	652315	5558450	44.0	0.45
	9	12-Sep-19	13:00	3	RG_SCOUTDS_HESS9_2019-09-12-13:00	652320	5558440	34.0	0.38
	10	12-Sep-19	12:45	3	RG_SCOUTDS_HESS10_2019-09-12-12:45	652306	5558433	41.0	0.41
HENUP	1	11-Sep-19	14:30	1	RG_HENUP_HESS1_2019-09-11-14:30	-	-	32.0	0.71
	2	11-Sep-19	14:00	1	RG_HENUP_HESS2_2019-09-11-14:00	-	-	34.0	0.55
	3	11-Sep-19	13:30	1	RG_HENUP_HESS3_2019-09-11-13:30	-	-	19.0	0.67
	4	11-Sep-19	13:30	2	RG_HENUP_HESS4_2019-09-11-13:30	655797	5567707	24.0	0.40
	5	11-Sep-19	12:45	2	RG_HENUP_HESS5_2019-09-11-12:45	655788	5567705	24.0	0.83
	6	11-Sep-19	12:30	2	RG_HENUP_HESS6_2019-09-11-12:30	655779	5567710	18.0	0.83
	7	11-Sep-19	12:00	3	RG_HENUP_HESS7_2019-09-11-12:00	655750	5567699	42.0	0.45
	8	11-Sep-19	11:30	3	RG_HENUP_HESS8_2019-09-11-11:30	655727	5567679	29.0	0.60
	9	11-Sep-19	11:00	3	RG_HENUP_HESS9_2019-09-11-11:00	655719	5567669	31.0	0.66
	10	11-Sep-19	10:30	3	RG_HENUP_HESS10_2019-09-11-10:30	655713	5567667	27.0	0.54

Table F.49: Pebble Count at RG_UFR1, FRO LAEMP, December 2019

Rock	RG_UFR1-1				RG_UFR1-2				RG_UFR1-3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	-	-	17.0		-	-	5.0		-	-	12.5	
2	-	-	11.5		-	-	4.5		-	-	5.5	
3	-	-	15.5		-	-	7.0		-	-	6.0	
4	-	-	9.0		-	-	4.0		-	-	11.0	
5	-	-	8.5		-	-	5.0		-	-	13.0	
6	-	-	9.0		-	-	9.0		-	-	5.5	
7	-	-	5.5		-	-	5.5		-	-	4.5	
8	-	-	4.5		-	-	4.0		-	-	8.5	
9	-	-	8.5		-	-	2.0		-	-	9.0	
10	-	-	7.0	0.25	-	-	7.0	0.25	-	-	6.5	0.5
11	-	-	8.5		-	-	6.5		-	-	8.0	
12	-	-	10.5		-	-	9.0		-	-	4.5	
13	-	-	9.5		-	-	4.0		-	-	8.0	
14	-	-	11.0		-	-	4.5		-	-	6.0	
15	-	-	10.0		-	-	7.0		-	-	14.5	
16	-	-	5.0		-	-	6.0		-	-	11.0	
17	-	-	3.0		-	-	4.0		-	-	9.0	
18	-	-	5.5		-	-	5.5		-	-	12.0	
19	-	-	2.5		-	-	3.0		-	-	6.0	
20	-	-	5.5	0	-	-	6.0	0	-	-	4.5	0
21	-	-	17.5		-	-	12.5		-	-	6.0	
22	-	-	7.5		-	-	10.0		-	-	7.0	
23	-	-	7.0		-	-	3.5		-	-	16.0	
24	-	-	10.0		-	-	11.0		-	-	8.0	
25	-	-	8.5		-	-	9.0		-	-	2.0	
26	-	-	11.5		-	-	9.5		-	-	0.5	
27	-	-	5.0		-	-	5.0		-	-	9.5	
28	-	-	11.0		-	-	3.5		-	-	7.0	
29	-	-	9.0		-	-	3.0		-	-	5.5	
30	-	-	15.0	0.50	-	-	4.5	0.00	-	-	8.5	0.25
31	-	-	13.0		-	-	1.5		-	-	12.0	
32	-	-	11.0		-	-	1.0		-	-	6.0	
33	-	-	10.5		-	-	3.5		-	-	7.0	
34	-	-	4.0		-	-	7.0		-	-	11.0	
35	-	-	13.0		-	-	4.5		-	-	17.5	
36	-	-	9.0		-	-	2.0		-	-	6.0	
37	-	-	6.5		-	-	2.5		-	-	5.5	
38	-	-	4.0		-	-	18.5		-	-	1.5	
39	-	-	8.0		-	-	6.0		-	-	3.5	
40	-	-	7.0	0.25	-	-	7.5	0	-	-	4.5	0
41	-	-	12.0		-	-	11.0		-	-	1.0	
42	-	-	8.5		-	-	10.0		-	-	0.5	
43	-	-	7.5		-	-	7.5		-	-	5.5	
44	-	-	8.5		-	-	11.5		-	-	14.5	
45	-	-	9.0		-	-	6.0		-	-	13.0	
46	-	-	7.0		-	-	9.5		-	-	4.5	
47	-	-	10.0		-	-	3.5		-	-	4.0	
48	-	-	4.0		-	-	6.0		-	-	11.0	
49	-	-	6.5		-	-	7.0		-	-	5.0	
50	-	-	3.5	0	-	-	9.5	0	-	-	11.0	0.5
51	-	-	10.0		-	-	11.0		-	-	9.5	
52	-	-	13.0		-	-	1.5		-	-	15.0	
53	-	-	8.0		-	-	3.0		-	-	8.0	
54	-	-	7.0		-	-	4.5		-	-	10.5	
55	-	-	8.0		-	-	4.0		-	-	3.0	
56	-	-	6.0		-	-	7.0		-	-	7.0	
57	-	-	7.5		-	-	22.0		-	-	9.5	
58	-	-	5.5		-	-	22.0		-	-	10.0	
59	-	-	7.0		-	-	5.5		-	-	8.5	
60	-	-	6.5	0.25	-	-	5.0	0.25	-	-	7.5	0.25
61	-	-	8.0		-	-	5.0		-	-	16.5	
62	-	-	7.0		-	-	11.0		-	-	12.5	
63	-	-	7.0		-	-	2.5		-	-	12.0	
64	-	-	11.5		-	-	4.0		-	-	3.5	
65	-	-	11.5		-	-	7.5		-	-	1.5	
66	-	-	14.5		-	-	1.5		-	-	4.0	
67	-	-	2.5		-	-	1.5		-	-	2.5	
68	-	-	4.5		-	-	2.0		-	-	3.0	
69	-	-	6.0		-	-	2.0		-	-	2.0	
70	-	-	5.0	0	-	-	3.0	0	-	-	9.5	0.75
71	-	-	17.0		-	-	2.5		-	-	1.5	
72	-	-	16.5		-	-	4.0		-	-	16.0	
73	-	-	10.0		-	-	6.0		-	-	4.5	
74	-	-	6.5		-	-	5.5		-	-	5.0	
75	-	-	7.5		-	-	7.5		-	-	5.5	
76	-	-	8.5		-	-	12.0		-	-	9.0	
77	-	-	18.0		-	-	9.5		-	-	10.0	
78	-	-	12.5		-	-	4.5		-	-	17.5	
79	-	-	7.0		-	-	5.0		-	-	8.0	
80	-	-	13.0	0.25	-	-	7.5	0	-	-	6.5	0
81	-	-	13.5		-	-	5.5		-	-	8.5	
82	-	-	5.0		-	-	8.0		-	-	6.5	
83	-	-	11.5		-	-	6.5		-	-	8.0	
84	-	-	9.0		-	-	3.0		-	-	2.0	
85	-	-	13.5		-	-	6.0		-	-	6.5	
86	-	-	3.5		-	-	6.0		-	-	8.0	
87	-	-	6.0		-	-	4.5		-	-	5.0	
88	-	-	2.5		-	-	3.0		-	-	3.0	
89	-	-	3.0		-	-	2.0		-	-	3.0	
90	-	-	1.5	0	-	-	4.0	0	-	-	6.5	0
91	-	-	12.0		-	-	4.5		-	-	4.5	
92	-	-	11.5		-	-	3.0		-	-	2.5	
93	-	-	10.0		-	-	9.0		-	-	4.0	
94	-	-	9.5		-	-	2.0		-	-	4.5	
95	-	-	10.0		-	-	1.5		-	-	8.0	
96	-	-	13.5		-	-	3.5		-	-	10.0	
97	-	-	4.5		-	-	18.0		-	-	5.5	
98	-	-	12.0		-	-	3.0		-	-	7.0	
99	-	-	7.5		-	-	2.5		-	-	3.5	
100	-	-	5.5	0.25	-	-	5.5	0.25	-	-	5.5	0
Minimum	**-**	**-**	**1.50**	**0**	**-**	**-**	**1.00**	**0**	**-**	**-**	**0.50**	**0**
Maximum	**-**	**-**	**18.0**	**0.500**	**-**	**-**	**22.0**	**0.250**	**-**	**-**	**17.5**	**0.750**
Mean	**-**	**-**	**8.7**	**0.175**	**-**	**-**	**6.06**	**0.075**	**-**	**-**	**7.31**	**0.225**
Standard Dev.	**-**	**-**	**3.68**	**0.169**	**-**	**-**	**4.01**	**0.121**	**-**	**-**	**3.97**	**0.275**
Geometric mean	**-**	**-**	**7.85**	**-**	**-**	**-**	**5.02**	**-**	**-**	**-**	**6.06**	**-**
Median	**-**	**-**	**8.50**	**0**	**-**	**-**	**5.00**	**0.000**	**-**	**-**	**6.50**	**0.125**
Calcite Index	-		-	-	-		-	-	-		-	-

Table F.50: Pebble Count at RG_FOUKI, FRO LAEMP, December 2019

Rock	RG_FOUKI 1				RG_FOUKI 2				RG_FOUKI 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	-	-	5.2		-	-	9.5		-	-	9.4	
2	-	-	10.1		-	-	8.0		-	-	8.0	
3	-	-	8.6		-	-	23.1		-	-	14.1	
4	-	-	14.4		-	-	26.2		-	-	17.8	
5	-	-	13.0		-	-	9.8		-	-	9.0	
6	-	-	6.5		-	-	39.5		-	-	10.1	
7	-	-	6.2		-	-	32.0		-	-	14.3	
8	-	-	12.4		-	-	11.1		-	-	sand	
9	-	-	14.1		-	-	15.0		-	-	9.1	
10	-	-	7.0	0.5	-	-	12.0	0.5	-	-	4.2	0
11	-	-	8.6		-	-	14.4		-	-	6.5	
12	-	-	3.9		-	-	6.5		-	-	22.1	
13	-	-	6.0		-	-	5.5		-	-	11.1	
14	-	-	7.2		-	-	7.1		-	-	14.0	
15	-	-	16.0		-	-	8.5		-	-	9.2	
16	-	-	4.8		-	-	12.2		-	-	11.6	
17	-	-	13.6		-	-	3.3		-	-	12.8	
18	-	-	9.8		-	-	0.8		-	-	9.4	
19	-	-	17.4		-	-	11.6		-	-	4.6	
20	-	-	10.1	0	-	-	11.0	0.25	-	-	16.1	0
21	-	-	6.5		-	-	9.1		-	-	7.8	
22	-	-	24.2		-	-	9.0		-	-	12.0	
23	-	-	sand		-	-	8.2		-	-	17.0	
24	-	-	6.2		-	-	7.6		-	-	19.2	
25	-	-	10.5		-	-	9.5		-	-	2.2	
26	-	-	6.5		-	-	37.6		-	-	12.6	
27	-	-	9.8		-	-	6.9		-	-	15.5	
28	-	-	0.7		-	-	21.8		-	-	11.1	
29	-	-	sand		-	-	5.0		-	-	7.4	
30	-	-	17.3	0.75	-	-	13.0	0.25	-	-	sand	0.00
31	-	-	12.1		-	-	8.7		-	-	8.5	
32	-	-	14.1		-	-	8.5		-	-	12.1	
33	-	-	8.3		-	-	10.0		-	-	4.6	
34	-	-	3.5		-	-	14.2		-	-	41.4	
35	-	-	sand		-	-	7.5		-	-	6.5	
36	-	-	4.1		-	-	9.8		-	-	sand	
37	-	-	14.8		-	-	5.4		-	-	13.4	
38	-	-	3.9		-	-	12.2		-	-	10.8	
39	-	-	6.8		-	-	1.5		-	-	23.6	
40	-	-	21.5	1	-	-	15.0	0.25	-	-	16.8	0
41	-	-	sand		-	-	12.6		-	-	2.4	
42	-	-	11.0		-	-	15.0		-	-	7.3	
43	-	-	4.2		-	-	8.0		-	-	18.2	
44	-	-	8.1		-	-	21.0		-	-	13.1	
45	-	-	16.4		-	-	6.3		-	-	9.3	
46	-	-	13.1		-	-	6.6		-	-	15.2	
47	-	-	22.2		-	-	11.0		-	-	6.9	
48	-	-	22.8		-	-	7.7		-	-	14.3	
49	-	-	14.1		-	-	7.4		-	-	10.1	
50	-	-	7.5	0.75	-	-	17.1	0	-	-	10.5	0
51	-	-	12.2		-	-	15.0		-	-	6.3	
52	-	-	2.5		-	-	8.4		-	-	3.2	
53	-	-	8.9		-	-	7.8		-	-	4.4	
54	-	-	13.0		-	-	2.0		-	-	5.9	
55	-	-	7.0		-	-	9.1		-	-	13.2	
56	-	-	13.8		-	-	10.8		-	-	10.4	
57	-	-	8.0		-	-	5.4		-	-	8.6	
58	-	-	12.0		-	-	18.5		-	-	4.1	
59	-	-	2.4		-	-	28.2		-	-	5.8	
60	-	-	17.0	0	-	-	9.4	0	-	-	13.3	0
61	-	-	7.4		-	-	10.8		-	-	15.0	
62	-	-	sand		-	-	4.4		-	-	8.2	
63	-	-	14.1		-	-	10.6		-	-	9.4	
64	-	-	11.1		-	-	9.4		-	-	13.6	
65	-	-	9.6		-	-	sand		-	-	2.2	
66	-	-	sand		-	-	5.7		-	-	10.4	
67	-	-	9.2		-	-	1.3		-	-	3.4	
68	-	-	18.2		-	-	13.1		-	-	6.7	
69	-	-	4.4		-	-	14.6		-	-	8.8	
70	-	-	6.5	0	-	-	16.0	0	-	-	7.7	0
71	-	-	13.0		-	-	6.8		-	-	11.5	
72	-	-	7.1		-	-	9.4		-	-	9.9	
73	-	-	4.4		-	-	8.7		-	-	3.9	
74	-	-	23.4		-	-	2.8		-	-	6.6	
75	-	-	3.2		-	-	4.9		-	-	10.1	
76	-	-	10.1		-	-	15.1		-	-	9.5	
77	-	-	6.3		-	-	17.2		-	-	14.6	
78	-	-	5.1		-	-	11.3		-	-	6.2	
79	-	-	15.1		-	-	5.8		-	-	10.3	
80	-	-	sand	1	-	-	11.4	0	-	-	17.7	0
81	-	-	12.0		-	-	5.8		-	-	11.6	
82	-	-	6.4		-	-	17.1		-	-	9.5	
83	-	-	15.4		-	-	13.4		-	-	18.4	
84	-	-	10.0		-	-	17.1		-	-	18.1	
85	-	-	13.0		-	-	8.9		-	-	9.1	
86	-	-	12.9		-	-	9.1		-	-	8.9	
87	-	-	11.2		-	-	18.4		-	-	16.4	
88	-	-	9.2		-	-	10.1		-	-	9.0	
89	-	-	11.0		-	-	11.7		-	-	11.6	
90	-	-	12.0	0	-	-	12.0	0.00	-	-	5.8	0.00
91	-	-	28.1		-	-	3.9		-	-	8.2	
92	-	-	16.4		-	-	9.5		-	-	12.8	
93	-	-	8.7		-	-	17.0		-	-	10.9	
94	-	-	13.2		-	-	7.2		-	-	5.0	
95	-	-	12.1		-	-	9.6		-	-	6.0	
96	-	-	25.4		-	-	sand		-	-	10.5	
97	-	-	8.5		-	-	11.4		-	-	5.8	
98	-	-	7.1		-	-	11.2		-	-	11.0	
99	-	-	15.8		-	-	8.9		-	-	13.1	
100	-	-	8.9	0.5	-	-	12.4	0.25	-	-	15.0	0
Minimum	**-**	**-**	**0.70**	**0**	**-**	**-**	**0.80**	**0**	**-**	**-**	**2.200**	**0**
Maximum	**-**	**-**	**28.1**	**1.000**	**-**	**-**	**39.5**	**0.500**	**-**	**-**	**41.4**	**0.000**
Mean	**-**	**-**	**10.83**	**0.450**	**-**	**-**	**11.3**	**0.150**	**-**	**-**	**10.7**	**0.000**
Standard Dev.	**-**	**-**	**5.49**	**0.422**	**-**	**-**	**6.75**	**0.175**	**-**	**-**	**5.46**	**0.000**
Geometric mean	**-**	**-**	**9.38**	**-**	**-**	**-**	**9.54**	**-**	**-**	**-**	**9.49**	**-**
Median	**-**	**-**	**10.10**	**0.500**	**-**	**-**	**9.70**	**0.125**	**-**	**-**	**10.1**	**0.000**
Calcite Index	**-**		**-**	**-**	**-**		**-**	**-**	**-**		**-**	**-**

Table F.51: Pebble Count at RG_SCOUTDS, FRO LAEMP, December 2019

Rock	RG_SCOUTDS 3				RG_SCOUTDS 2				RG_SCOUTDS 1			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	-	-	4.3		-	-	11.2		-	-	19.8	
2	-	-	1.5		-	-	6.5		-	-	7.6	
3	-	-	5.2		-	-	6.2		-	-	8.9	
4	-	-	6.6		-	-	3.1		-	-	5.0	
5	-	-	13.2		-	-	10.5		-	-	8.4	
6	-	-	15.2		-	-	9.0		-	-	7.6	
7	-	-	4.6		-	-	8.6		-	-	8.7	
8	-	-	3.8		-	-	7.4		-	-	5.0	
9	-	-	12.9		-	-	8.2		-	-	11.5	
10	-	-	12.5	0	-	-	4.3	0	-	-	8.1	0.00
11	-	-	7.2		-	-	10.5		-	-	5.6	
12	-	-	14.3		-	-	12.1		-	-	5.5	
13	-	-	11.1		-	-	9.2		-	-	7.0	
14	-	-	15.6		-	-	14.3		-	-	9.0	
15	-	-	5.6		-	-	7.5		-	-	10.4	
16	-	-	6.9		-	-	6.6		-	-	6.4	
17	-	-	13.4		-	-	10.2		-	-	4.9	
18	-	-	11.8		-	-	7.0		-	-	8.2	
19	-	-	2.6		-	-	9.5		-	-	8.6	
20	-	-	12.1	0	-	-	7.6	0	-	-	8.3	0
21	-	-	4.9		-	-	6.1		-	-	6.1	
22	-	-	3.2		-	-	10.1		-	-	5.1	
23	-	-	4.0		-	-	5.4		-	-	7.0	
24	-	-	6.8		-	-	7.2		-	-	4.9	
25	-	-	11.2		-	-	13.0		-	-	6.0	
26	-	-	7.8		-	-	5.5		-	-	4.5	
27	-	-	5.9		-	-	6.0		-	-	5.3	
28	-	-	6.5		-	-	8.4		-	-	8.0	
29	-	-	11.0		-	-	5.4		-	-	8.6	
30	-	-	9.5	0.25	-	-	9.0	0	-	-	5.0	0.25
31	-	-	6.0		-	-	6.3		-	-	4.8	
32	-	-	7.0		-	-	7.6		-	-	5.6	
33	-	-	8.2		-	-	11.7		-	-	5.9	
34	-	-	8.6		-	-	16.5		-	-	12.2	
35	-	-	18.0		-	-	10.2		-	-	13.5	
36	-	-	6.1		-	-	6.7		-	-	10.6	
37	-	-	7.2		-	-	10.7		-	-	3.2	
38	-	-	18.3		-	-	11.8		-	-	3.4	
39	-	-	7.0		-	-	9.2		-	-	12.0	
40	-	-	8.2	0.25	-	-	5.1	0	-	-	4.8	0.25
41	-	-	14.0		-	-	6.7		-	-	2.6	
42	-	-	7.0		-	-	10.4		-	-	9.0	
43	-	-	5.5		-	-	5.9		-	-	18.0	
44	-	-	3.2		-	-	7.8		-	-	11.6	
45	-	-	6.5		-	-	6.2		-	-	12.2	
46	-	-	8.3		-	-	6.5		-	-	10.7	
47	-	-	7.0		-	-	7.4		-	-	10.0	
48	-	-	10.2		-	-	8.4		-	-	6.2	
49	-	-	9.0		-	-	7.9		-	-	13.5	
50	-	-	7.3	0.5	-	-	5.0	0	-	-	5.9	0
51	-	-	11.5		-	-	6.2		-	-	6.1	
52	-	-	11.1		-	-	4.9		-	-	7.8	
53	-	-	9.2		-	-	3.1		-	-	9.0	
54	-	-	8.9		-	-	6.7		-	-	10.5	
55	-	-	11.0		-	-	8.0		-	-	6.6	
56	-	-	7.6		-	-	7.5		-	-	7.7	
57	-	-	5.0		-	-	5.9		-	-	12.5	
58	-	-	6.1		-	-	5.5		-	-	8.6	
59	-	-	6.8		-	-	6.8		-	-	9.2	
60	-	-	5.9	0	-	-	5.3	0.25	-	-	7.1	0.25
61	-	-	8.0		-	-	2.0		-	-	14.5	
62	-	-	4.0		-	-	5.4		-	-	3.6	
63	-	-	6.1		-	-	8.4		-	-	4.0	
64	-	-	7.5		-	-	5.0		-	-	6.9	
65	-	-	6.3		-	-	14.3		-	-	8.3	
66	-	-	5.7		-	-	6.6		-	-	5.6	
67	-	-	7.5		-	-	7.1		-	-	7.8	
68	-	-	7.4		-	-	3.6		-	-	8.2	
69	-	-	6.4		-	-	8.8		-	-	15.0	
70	-	-	4.3	0	-	-	4.9	0.25	-	-	11.0	0.25
71	-	-	7.2		-	-	6.0		-	-	17.6	
72	-	-	13.1		-	-	4.5		-	-	12.0	
73	-	-	6.0		-	-	3.9		-	-	6.9	
74	-	-	9.5		-	-	7.5		-	-	9.5	
75	-	-	5.4		-	-	3.7		-	-	8.4	
76	-	-	10.6		-	-	4.5		-	-	7.5	
77	-	-	21.0		-	-	3.8		-	-	6.5	
78	-	-	8.2		-	-	8.9		-	-	4.2	
79	-	-	6.4		-	-	4.9		-	-	8.3	
80	-	-	8.7	0	-	-	8.0	0	-	-	8.5	0
81	-	-	5.1		-	-	8.6		-	-	7.6	
82	-	-	9.2		-	-	7.5		-	-	4.2	
83	-	-	4.4		-	-	5.4		-	-	4.8	
84	-	-	10.0		-	-	4.2		-	-	8.3	
85	-	-	9.2		-	-	11.7		-	-	14.0	
86	-	-	7.4		-	-	7.5		-	-	9.5	
87	-	-	8.7		-	-	8.7		-	-	12.4	
88	-	-	sand		-	-	8.3		-	-	11.2	
89	-	-	2.2		-	-	10.0		-	-	16.5	
90	-	-	3.2	0	-	-	4.3	0.75	-	-	4.8	0.00
91	-	-	11.4		-	-	8.5		-	-	8.5	
92	-	-	5.6		-	-	12.1		-	-	7.9	
93	-	-	8.6		-	-	4.3		-	-	9.4	
94	-	-	6.6		-	-	8.4		-	-	7.2	
95	-	-	5.4		-	-	5.2		-	-	7.5	
96	-	-	7.3		-	-	4.8		-	-	6.0	
97	-	-	6.6		-	-	4.8		-	-	13.8	
98	-	-	2.5		-	-	5.0		-	-	8.0	
99	-	-	8.9		-	-	6.4		-	-	7.5	
100	-	-	3.6	0.25	-	-	6.6	0.5	-	-	4.1	0
Minimum	**-**	**-**	**1.50**	**0**	**-**	**-**	**2.00**	**0**	**-**	**-**	**2.60**	**0**
Maximum	**-**	**-**	**21.0**	**0.500**	**-**	**-**	**16.5**	**0.750**	**-**	**-**	**19.8**	**0.250**
Mean	**-**	**-**	**8.00**	**0.125**	**-**	**-**	**7.38**	**0.1750**	**-**	**-**	**8.33**	**0.100**
Standard Dev.	**-**	**-**	**3.60**	**0.177**	**-**	**-**	**2.68**	**0.265**	**-**	**-**	**3.40**	**0.129**
Geometric mean	**-**	**-**	**7.23**	**-**	**-**	**-**	**6.91**	**-**	**-**	**-**	**7.70**	**-**
Median	**-**	**-**	**7.20**	**0**	**-**	**-**	**7.05**	**0**	**-**	**-**	**7.95**	**0**
Calcite Index	**-**		-	-	**-**		-	-	**-**		-	-

Table F.52: **Pebble Count at RG_FRUPO, FRO LAEMP, December 2019**

Rock	RG_FRUPO 1				RG_FRUPO 2				RG_FRUPO 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	-	-	7.0		-	-	32.0		-	-	6.0	
2	-	-	6.5		-	-	31.5		-	-	5.0	
3	-	-	10.0		-	-	14.0		-	-	6.0	
4	-	-	6.0		-	-	12.0		-	-	8.0	
5	-	-	7.0		-	-	6.0		-	-	5.5	
6	-	-	9.5		-	-	15.0		-	-	5.0	
7	-	-	6.5		-	-	4.5		-	-	8.0	
8	-	-	9.0		-	-	11.0		-	-	6.0	
9	-	-	7.0		-	-	sand		-	-	6.0	
10	-	-	7.5	0.25	-	-	8.0	0.25	-	-	5.5	0.25
11	-	-	5.5		-	-	13.0		-	-	8.0	
12	-	-	6.5		-	-	7.5		-	-	4.5	
13	-	-	8.5		-	-	12.0		-	-	3.0	
14	-	-	7.0		-	-	8.5		-	-	3.5	
15	-	-	13.0		-	-	6.5		-	-	2.0	
16	-	-	8.0		-	-	4.5		-	-	1.0	
17	-	-	9.0		-	-	10.0		-	-	3.0	
18	-	-	10.0		-	-	4.0		-	-	4.0	
19	-	-	7.5		-	-	7.5		-	-	8.0	
20	-	-	7.0	0	-	-	7.0	0	-	-	2.5	0
21	-	-	6.0		-	-	2.0		-	-	4.5	
22	-	-	7.0		-	-	9.5		-	-	8.5	
23	-	-	5.5		-	-	10.5		-	-	5.5	
24	-	-	9.0		-	-	6.5		-	-	5.5	
25	-	-	6.5		-	-	9.0		-	-	7.0	
26	-	-	5.5		-	-	7.5		-	-	8.0	
27	-	-	9.0		-	-	4.0		-	-	7.0	
28	-	-	7.5		-	-	8.0		-	-	5.5	
29	-	-	5.0		-	-	9.0		-	-	3.5	
30	-	-	10.0	0	-	-	9.5	0.25	-	-	5.0	0.25
31	-	-	6.5		-	-	11.5		-	-	2.0	
32	-	-	9.5		-	-	11.5		-	-	6.0	
33	-	-	5.5		-	-	13.0		-	-	5.0	
34	-	-	7.0		-	-	18.0		-	-	5.0	
35	-	-	8.5		-	-	24.5		-	-	sand	
36	-	-	6.5		-	-	11.0		-	-	8.5	
37	-	-	8.5		-	-	9.0		-	-	5.5	
38	-	-	8.0		-	-	15.0		-	-	6.5	
39	-	-	11.0		-	-	7.5		-	-	7.0	
40	-	-	7.5	0.25	-	-	11.0	0.5	-	-	1.5	0
41	-	-	8.0		-	-	5.0		-	-	7.0	
42	-	-	9.5		-	-	9.0		-	-	3.0	
43	-	-	7.0		-	-	16.0		-	-	5.5	
44	-	-	7.0		-	-	6.5		-	-	4.0	
45	-	-	10.0		-	-	16.0		-	-	6.0	
46	-	-	7.0		-	-	5.5		-	-	6.5	
47	-	-	6.0		-	-	18.5		-	-	3.5	
48	-	-	10.0		-	-	8.0		-	-	5.0	
49	-	-	9.5		-	-	4.5		-	-	7.5	
50	-	-	6.5	0.25	-	-	12.0	0.25	-	-	7.0	0.25
51	-	-	10.0		-	-	5.0		-	-	3.5	
52	-	-	8.0		-	-	8.5		-	-	3.0	
53	-	-	8.0		-	-	8.0		-	-	4.5	
54	-	-	10.0		-	-	11.5		-	-	5.5	
55	-	-	8.5		-	-	9.0		-	-	4.0	
56	-	-	11.5		-	-	6.0		-	-	1.0	
57	-	-	6.0		-	-	sand		-	-	5.5	
58	-	-	9.0		-	-	13.0		-	-	6.5	
59	-	-	8.0		-	-	12.0		-	-	15.0	
60	-	-	3.0	0	-	-	8.5	0	-	-	7.0	0
61	-	-	11.0		-	-	9.5		-	-	3.0	
62	-	-	18.0		-	-	16.0		-	-	4.5	
63	-	-	5.0		-	-	7.0		-	-	5.5	
64	-	-	13.5		-	-	9.5		-	-	6.0	
65	-	-	9.5		-	-	16.5		-	-	6.5	
66	-	-	8.0		-	-	10.0		-	-	10.0	
67	-	-	9.5		-	-	sand		-	-	4.5	
68	-	-	7.0		-	-	12.0		-	-	2.0	
69	-	-	10.0		-	-	10.5		-	-	5.0	
70	-	-	sand	0	-	-	6.5	0	-	-	7.0	0.25
71	-	-	6.5		-	-	6.0		-	-	7.5	
72	-	-	11.5		-	-	15.5		-	-	2.0	
73	-	-	8.5		-	-	2.0		-	-	5.5	
74	-	-	1.5		-	-	1.5		-	-	4.0	
75	-	-	5.0		-	-	13.0		-	-	3.0	
76	-	-	1.0		-	-	10.5		-	-	4.0	
77	-	-	10.0		-	-	2.0		-	-	3.5	
78	-	-	4.0		-	-	4.0		-	-	6.0	
79	-	-	3.0		-	-	10.0		-	-	6.5	
80	-	-	6.0	0	-	-	7.5	0.00	-	-	7.5	0.5
81	-	-	6.5		-	-	0.5		-	-	4.5	
82	-	-	10.0		-	-	4.0		-	-	6.0	
83	-	-	4.5		-	-	sand		-	-	6.5	
84	-	-	5.0		-	-	5.0		-	-	3.5	
85	-	-	9.0		-	-	2.0		-	-	1.0	
86	-	-	3.0		-	-	7.0		-	-	5.5	
87	-	-	5.5		-	-	2.5		-	-	6.5	
88	-	-	6.5		-	-	1.5		-	-	3.5	
89	-	-	12.0		-	-	9.0		-	-	6.0	
90	-	-	10.0	0.25	-	-	10.0	0.75	-	-	4.0	0
91	-	-	5.5		-	-	7.5		-	-	4.0	
92	-	-	9.0		-	-	16.0		-	-	5.5	
93	-	-	8.0		-	-	6.0		-	-	2.0	
94	-	-	9.0		-	-	3.0		-	-	5.5	
95	-	-	6.5		-	-	6.5		-	-	8.0	
96	-	-	7.0		-	-	9.5		-	-	5.0	
97	-	-	9.0		-	-	6.0		-	-	4.5	
98	-	-	12.0		-	-	5.0		-	-	3.0	
99	-	-	9.0		-	-	6.5		-	-	6.0	
100	-	-	9.0	0	-	-	8.0	0	-	-	3.5	0
Minimum	**-**	**-**	**1.00**	**0**	**-**	**-**	**0.50**	**0**	**-**	**-**	**1.000**	**0**
Maximum	**-**	**-**	**18.0**	**0.250**	**-**	**-**	**32.0**	**0.750**	**-**	**-**	**15.0**	**0.500**
Mean	**-**	**-**	**7.82**	**0.100**	**-**	**-**	**9.27**	**0.200**	**-**	**-**	**5.21**	**0.1500**
Standard Dev.	**-**	**-**	**2.52**	**0.129**	**-**	**-**	**5.42**	**0.258**	**-**	**-**	**2.12**	**0.175**
Geometric mean	**-**	**-**	**7.33**	**-**	**-**	**-**	**7.75**	**-**	**-**	**-**	**4.72**	**-**
Median	**-**	**-**	**8.00**	**0.000**	**-**	**-**	**8.50**	**0**	**-**	**-**	**5.50**	**0**
Calcite Index	**-**		**-**	**-**	**-**		**-**	**-**	**-**		**-**	**-**

Table F.53: Pebble Count at RG_FODPO, FRO LAEMP, December 2019

Rock	RG_FODPO 2				RG_FODPO 1				RG_FODPO 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	-	-	5.5		-	-	5.5		-	-	8.5	
2	-	-	4.5		-	-	4.5		-	-	5.5	
3	-	-	1.0		-	-	3.0		-	-	1.5	
4	-	-	4.0		-	-	7.5		-	-	2.5	
5	-	-	3.5		-	-	2.0		-	-	3.0	
6	-	-	6.0		-	-	2.0		-	-	3.5	
7	-	-	1.0		-	-	5.5		-	-	3.5	
8	-	-	2.0		-	-	3.5		-	-	3.5	
9	-	-	1.5		-	-	7.0		-	-	2.0	
10	-	-	4.0	0	-	-	4.5	0	-	-	2.0	0
11	-	-	6.0		-	-	6.5		-	-	2.5	
12	-	-	7.5		-	-	5.0		-	-	3.0	
13	-	-	6.5		-	-	4.0		-	-	1.5	
14	-	-	1.0		-	-	3.0		-	-	7.0	
15	-	-	7.0		-	-	3.5		-	-	3.5	
16	-	-	3.5		-	-	5.5		-	-	2.0	
17	-	-	2.5		-	-	5.0		-	-	2.0	
18	-	-	3.0		-	-	4.5		-	-	1.5	
19	-	-	5.0		-	-	2.0		-	-	3.0	
20	-	-	5.0	0.25	-	-	9.0	0.25	-	-	3.5	0.5
21	-	-	3.0		-	-	3.0		-	-	5.5	
22	-	-	2.5		-	-	1.5		-	-	5.0	
23	-	-	1.0		-	-	4.0		-	-	3.0	
24	-	-	1.5		-	-	2.0		-	-	3.5	
25	-	-	3.0		-	-	3.5		-	-	4.0	
26	-	-	8.0		-	-	3.5		-	-	2.0	
27	-	-	3.5		-	-	4.0		-	-	1.0	
28	-	-	4.0		-	-	1.0		-	-	1.5	
29	-	-	2.5		-	-	2.5		-	-	2.0	
30	-	-	3.0	0	-	-	5.0	0.25	-	-	1.5	0
31	-	-	3.5		-	-	5.0		-	-	1.0	
32	-	-	5.0		-	-	7.0		-	-	4.0	
33	-	-	7.5		-	-	4.0		-	-	5.5	
34	-	-	5.0		-	-	3.0		-	-	2.0	
35	-	-	1.5		-	-	3.5		-	-	2.5	
36	-	-	3.0		-	-	3.0		-	-	2.0	
37	-	-	4.0		-	-	2.0		-	-	3.0	
38	-	-	2.0		-	-	1.0		-	-	2.0	
39	-	-	3.5		-	-	4.5		-	-	4.0	
40	-	-	1.0	0	-	-	2.5	0	-	-	6.5	0.5
41	-	-	2.5		-	-	3.5		-	-	2.0	
42	-	-	6.5		-	-	6.5		-	-	3.0	
43	-	-	4.0		-	-	7.0		-	-	2.5	
44	-	-	3.5		-	-	3.5		-	-	2.5	
45	-	-	3.5		-	-	5.0		-	-	2.0	
46	-	-	3.0		-	-	7.5		-	-	0.5	
47	-	-	3.0		-	-	8.0		-	-	1.0	
48	-	-	2.5		-	-	6.5		-	-	1.5	
49	-	-	4.0		-	-	1.0		-	-	3.0	
50	-	-	1.0	0	-	-	3.5	0	-	-	4.5	0.25
51	-	-	3.5		-	-	7.0		-	-	2.5	
52	-	-	1.5		-	-	8.5		-	-	1.0	
53	-	-	1.0		-	-	3.0		-	-	2.0	
54	-	-	5.0		-	-	2.5		-	-	1.5	
55	-	-	6.0		-	-	4.0		-	-	1.5	
56	-	-	5.0		-	-	5.0		-	-	1.0	
57	-	-	2.0		-	-	2.5		-	-	2.0	
58	-	-	2.5		-	-	3.0		-	-	8.0	
59	-	-	3.0		-	-	0.5		-	-	9.5	
60	-	-	5.0	0.25	-	-	6.0	0.25	-	-	4.0	0.75
61	-	-	2.5		-	-	2.0		-	-	1.5	
62	-	-	3.0		-	-	2.5		-	-	2.5	
63	-	-	4.0		-	-	1.0		-	-	3.0	
64	-	-	3.5		-	-	2.0		-	-	1.5	
65	-	-	1.5		-	-	3.5		-	-	4.0	
66	-	-	4.5		-	-	1.5		-	-	1.5	
67	-	-	4.0		-	-	1.5		-	-	3.0	
68	-	-	3.5		-	-	0.5		-	-	6.5	
69	-	-	1.0		-	-	4.5		-	-	9.0	
70	-	-	5.0	0.5	-	-	8.0	0.5	-	-	6.5	0.25
71	-	-	6.0		-	-	6.0		-	-	6.0	
72	-	-	3.0		-	-	3.0		-	-	8.0	
73	-	-	3.0		-	-	1.0		-	-	4.5	
74	-	-	4.5		-	-	5.0		-	-	2.5	
75	-	-	2.5		-	-	4.5		-	-	4.0	
76	-	-	4.0		-	-	3.5		-	-	2.5	
77	-	-	1.5		-	-	2.0		-	-	4.0	
78	-	-	3.5		-	-	3.0		-	-	7.0	
79	-	-	5.5		-	-	1.5		-	-	2.5	
80	-	-	5.0	0.25	-	-	1.5	0	-	-	2.0	0
81	-	-	1.5		-	-	9.5		-	-	3.0	
82	-	-	2.0		-	-	3.0		-	-	2.0	
83	-	-	4.0		-	-	2.5		-	-	2.0	
84	-	-	4.5		-	-	2.0		-	-	1.5	
85	-	-	7.0		-	-	2.5		-	-	5.0	
86	-	-	5.5		-	-	1.0		-	-	7.5	
87	-	-	10.0		-	-	1.0		-	-	4.0	
88	-	-	4.5		-	-	9.5		-	-	3.0	
89	-	-	5.5		-	-	9.0		-	-	4.0	
90	-	-	4.0	0.25	-	-	7.0	0.5	-	-	4.5	0.25
91	-	-	4.5		-	-	3.5		-	-	3.5	
92	-	-	2.5		-	-	7.5		-	-	4.5	
93	-	-	3.0		-	-	5.0		-	-	1.5	
94	-	-	1.5		-	-	4.0		-	-	1.0	
95	-	-	2.0		-	-	5.5		-	-	2.0	
96	-	-	10.0		-	-	3.0		-	-	7.0	
97	-	-	6.5		-	-	7.0		-	-	6.5	
98	-	-	8.5		-	-	4.5		-	-	2.5	
99	-	-	6.0		-	-	3.0		-	-	3.5	
100	-	-	4.5	0.5	-	-	4.0	0.25	-	-	4.0	0.5
Minimum	**-**	**-**	**1.000**	**0**	**-**	**-**	**0.500**	**0**	**-**	**-**	**0.500**	**0**
Maximum	**-**	**-**	**10.0**	**0.500**	**-**	**-**	**9.5**	**0.500**	**-**	**-**	**9.5**	**0.75**
Mean	**-**	**-**	**3.85**	**0.200**	**-**	**-**	**4.05**	**0.200**	**-**	**-**	**3.37**	**0.300**
Standard Dev.	**-**	**-**	**1.97**	**0.197**	**-**	**-**	**2.21**	**0.197**	**-**	**-**	**2.01**	**0.258**
Geometric mean	**-**	**-**	**3.33**	**-**	**-**	**-**	**3.40**	**-**	**-**	**-**	**2.85**	**-**
Median	**-**	**-**	**3.50**	**0**	**-**	**-**	**3.50**	**0.250**	**-**	**-**	**3.00**	**0.250**
Calcite Index	**-**		**-**	**-**	**-**		**-**	**-**	**-**		**-**	**-**

Table F.54: Pebble Count at RG_FOUEW, FRO LAEMP, December 2019

Rock	RG_FOUEW 1				RG_FOUEW 2				RG_FOUEW 3			
	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embeddedness
1	-	-	3.0		-	-	7.5		-	-	14.0	
2	-	-	5.0		-	-	11.0		-	-	7.5	
3	-	-	2.0		-	-	8.0		-	-	8.5	
4	-	-	3.5		-	-	17.0		-	-	4.0	
5	-	-	7.5		-	-	4.5		-	-	5.0	
6	-	-	6.5		-	-	6.5		-	-	3.5	
7	-	-	3.0		-	-	5.0		-	-	5.0	
8	-	-	7.0		-	-	8.5		-	-	8.0	
9	-	-	4.0		-	-	7.5		-	-	13.5	
10	-	-	1.5	0	-	-	6.5	0.25	-	-	11.0	0.75
11	-	-	5.0		-	-	13.0		-	-	7.0	
12	-	-	5.5		-	-	8.0		-	-	14.0	
13	-	-	4.5		-	-	7.5		-	-	8.0	
14	-	-	1.5		-	-	10.0		-	-	6.5	
15	-	-	6.5		-	-	11.0		-	-	12.0	
16	-	-	9.0		-	-	9.0		-	-	3.5	
17	-	-	4.0		-	-	13.5		-	-	11.0	
18	-	-	11.0		-	-	5.5		-	-	16.5	
19	-	-	7.0		-	-	9.0		-	-	9.0	
20	-	-	8.0	0	-	-	4.0	0	-	-	15.0	0.5
21	-	-	11.0		-	-	5.5		-	-	18.0	
22	-	-	4.5		-	-	5.0		-	-	6.5	
23	-	-	11.0		-	-	12.0		-	-	11.5	
24	-	-	6.0		-	-	7.5		-	-	7.0	
25	-	-	9.5		-	-	10.0		-	-	8.0	
26	-	-	8.5		-	-	5.5		-	-	16.0	
27	-	-	7.5		-	-	6.0		-	-	11.5	
28	-	-	2.5		-	-	10.5		-	-	9.0	
29	-	-	10.0		-	-	16.0		-	-	14.0	
30	-	-	5.0	0	-	-	6.5	0	-	-	13.0	0.25
31	-	-	7.5		-	-	19.5		-	-	9.5	
32	-	-	6.5		-	-	9.0		-	-	6.0	
33	-	-	6.0		-	-	10.0		-	-	4.0	
34	-	-	3.0		-	-	7.0		-	-	9.0	
35	-	-	6.0		-	-	5.5		-	-	8.5	
36	-	-	6.5		-	-	4.0		-	-	11.0	
37	-	-	10.0		-	-	14.0		-	-	6.5	
38	-	-	4.5		-	-	11.0		-	-	19.0	
39	-	-	8.0		-	-	15.5		-	-	6.0	
40	-	-	6.5	0	-	-	6.0	0.5	-	-	13.5	0.5
41	-	-	7.0		-	-	7.5		-	-	10.0	
42	-	-	7.0		-	-	1.5		-	-	13.0	
43	-	-	8.5		-	-	4.0		-	-	3.5	
44	-	-	11.0		-	-	15.0		-	-	7.0	
45	-	-	8.0		-	-	13.5		-	-	12.0	
46	-	-	9.5		-	-	14.0		-	-	9.5	
47	-	-	11.5		-	-	13.0		-	-	6.0	
48	-	-	6.5		-	-	9.0		-	-	15.0	
49	-	-	12.0		-	-	1.5		-	-	16.5	
50	-	-	13.0	0.25	-	-	6.5	0.5	-	-	25.0	0.25
51	-	-	20.0		-	-	8.0		-	-	10.5	
52	-	-	4.5		-	-	15.5		-	-	11.0	
53	-	-	9.5		-	-	8.5		-	-	2.5	
54	-	-	10.5		-	-	14.0		-	-	11.0	
55	-	-	6.0		-	-	13.5		-	-	8.5	
56	-	-	9.5		-	-	6.0		-	-	10.5	
57	-	-	11.0		-	-	6.5		-	-	15.0	
58	-	-	9.0		-	-	7.5		-	-	9.0	
59	-	-	4.0		-	-	3.0		-	-	12.5	
60	-	-	15.5	0.25	-	-	4.0	0.25	-	-	12.0	0.25
61	-	-	4.0		-	-	3.5		-	-	13.0	
62	-	-	7.5		-	-	2.0		-	-	6.0	
63	-	-	6.5		-	-	10.0		-	-	1.5	
64	-	-	10.0		-	-	3.0		-	-	17.5	
65	-	-	9.5		-	-	4.0		-	-	4.0	
66	-	-	7.0		-	-	4.5		-	-	12.0	
67	-	-	2.0		-	-	6.0		-	-	3.5	
68	-	-	10.5		-	-	5.5		-	-	14.0	
69	-	-	1.0		-	-	2.5		-	-	12.0	
70	-	-	8.0	0.25	-	-	6.5	0.25	-	-	10.5	0.5
71	-	-	8.5		-	-	3.0		-	-	14.5	
72	-	-	5.5		-	-	4.0		-	-	7.0	
73	-	-	3.5		-	-	11.0		-	-	8.0	
74	-	-	4.5		-	-	4.5		-	-	11.5	
75	-	-	7.0		-	-	17.0		-	-	12.0	
76	-	-	6.5		-	-	9.0		-	-	23.0	
77	-	-	9.0		-	-	5.5		-	-	9.5	
78	-	-	12.0		-	-	8.5		-	-	6.5	
79	-	-	6.0		-	-	11.0		-	-	9.0	
80	-	-	4.5	0.25	-	-	16.0	0.25	-	-	11.0	0.25
81	-	-	2.5		-	-	12.0		-	-	6.5	
82	-	-	5.0		-	-	9.0		-	-	11.5	
83	-	-	6.0		-	-	11.0		-	-	4.5	
84	-	-	0.5		-	-	10.5		-	-	5.5	
85	-	-	3.0		-	-	7.5		-	-	28.0	
86	-	-	10.5		-	-	8.0		-	-	9.0	
87	-	-	8.0		-	-	4.5		-	-	7.0	
88	-	-	11.0		-	-	14.0		-	-	12.5	
89	-	-	13.0		-	-	3.0		-	-	11.0	
90	-	-	10.0	0.25	-	-	3.0	0.5	-	-	14.5	0.25
91	-	-	8.5		-	-	3.5		-	-	5.5	
92	-	-	3.5		-	-	6.5		-	-	9.5	
93	-	-	6.0		-	-	10.0		-	-	11.5	
94	-	-	9.0		-	-	15.0		-	-	16.0	
95	-	-	3.0		-	-	14.0		-	-	3.0	
96	-	-	9.5		-	-	11.5		-	-	9.0	
97	-	-	8.5		-	-	9.5		-	-	8.5	
98	-	-	7.0		-	-	9.0		-	-	16.5	
99	-	-	3.5		-	-	3.0		-	-	10.0	
100	-	-	6.0	0.5	-	-	15.5	0.75	-	-	8.0	0.25
Minimum	**-**	**-**	**0.500**	**0**	**-**	**-**	**1.50**	**0**	**-**	**-**	**1.50**	**0**
Maximum	**-**	**-**	**20.0**	**0.500**	**-**	**-**	**19.5**	**0.750**	**-**	**-**	**28.0**	**0.750**
Mean	**-**	**-**	**7.1**	**0.175**	**-**	**-**	**8.48**	**0.325**	**-**	**-**	**10.24**	**0.375**
Standard Dev.	**-**	**-**	**3.31**	**0.169**	**-**	**-**	**4.15**	**0.237**	**-**	**-**	**4.70**	**0.177**
Geometric mean	**-**	**-**	**6.15**	**-**	**-**	**-**	**7.39**	**-**	**-**	**-**	**9.14**	**-**
Median	**-**	**-**	**7.00**	**0**	**-**	**-**	**8.00**	**0.250**	**-**	**-**	**9.75**	**0.250**
Calcite Index	**-**		**-**	**-**	**-**		**-**	**-**	**-**		**-**	**-**

Table F.55: *In Situ* Water Quality Taken at Biological Monitoring Areas, December 2019

Field Parameters		Reference	Mine-Exposed															
		RG_UFR1	RG_FODHE	RG_FOUCL	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI	RG_SCOUTDS	RG_FOBKS	RG_FOBSC	RG_FOBCP	FRCP1SW	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Date		10-Dec-19	10-Dec-19	9-Dec-19	9-Dec-19	9-Dec-19	9-Dec-19	9-Dec-19	9-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19	11-Dec-19	12-Dec-19	11-Dec-19	12-Dec-19	11-Dec-19	11-Dec-19
Station 1	Temperature (°C)	0.0	0.0	1.4	1.3	1.3	0.4	-0.1	0.1	0.0	-0.1	-0.1	-0.1		4.8	4.1	2.9	1.7
	Dissolved Oxygen (mg/L)	11.24	11.38	10.85	12.92	13.19	11.72	14.14	11.5	13.66	14.13	13.58	14.01		11.26	8.76	10.26	10.7
	Dissolved Oxygen (%)	76.8	76.7	77.2	92.0	94.1	81.4	96.6	79.2	94.0	95.6	93.3	96.3		88.2	67.6	76.3	77.1
	Conductivity (µS/cm)	183.2	283.6	481.3	660	683	476.2	477.6	479	953	677	977	929		1028	640	619	572
	Specific Conductivity (µS/cm)	350.6	543.1	877.1	1207	1245	898.4	915.0	914.5	1825	1299	1876	1,785		1676	1,064	1,070	1030
	pH	8.36	8.33	7.00	8.15	8.23	8.3	7.69	8.56	8.35	8.35	8.33	8.35		7.96	7.93	8.26	8.47
	ORP (mV)			105.7	148.9	171.5				251.8	178.5	252.1	201.7		209.2			
Station 2	Temperature (°C)	0.0	-	-	-	-	-	-	0.1	0.0	-	-	-	-	4.7	4.0	-	1.6
	Dissolved Oxygen (mg/L)	11.06	-	-	-	-	-	-	11.37	13.79	-	-	-	-	12.09	8.93	-	10.29
	Dissolved Oxygen (%)	75.2	-	-	-	-	-	-	78.0	94.9	-	-	-	-	94.4	68.7	-	73.5
	Conductivity (µS/cm)	183.3	-	-	-	-	-	-	473	952	-	-	-	-	1032	638	-	568
	Specific Conductivity (µS/cm)	351.4	-	-	-	-	-	-	902.4	1822	-	-	-	-	1,685	1064	-	1030
	pH	8.35	-	-	-	-	-	-	8.57	8.37	-	-	-	-	8.03	7.92	-	8.46
	ORP (mV)		-	-	-	-	-	-	-	253.4	-	-	-	-	211.4	-	-	-
Station 3	Temperature (°C)	0.0	-	-	-	-	-	-	0.1	-0.1	-	-	-	-	4.7	4.0	-	1.6
	Dissolved Oxygen (mg/L)	10.78	-	-	-	-	-	-	11.11	13.66	-	-	-	-	12.09	9.02	-	10.7
	Dissolved Oxygen (%)	73.8	-	-	-	-	-	-	76.8	94.0	-	-	-	-	94.1	68.4	-	76.3
	Conductivity (µS/cm)	183.0	-	-	-	-	-	-	477.9	950	-	-	-	-	1022	637	-	567
	Specific Conductivity (µS/cm)	350.5	-	-	-	-	-	-	911.6	1,822	-	-	-	-	1,667	1065	-	1026
	pH	8.35	-	-	-	-	-	-	8.51	8.37	-	-	-	-	8.02	7.90	-	8.32
	ORP (mV)		-	-	-	-	-	-	-	253.2	-	-	-	-	209.9	-	-	-

Note: "-" indicates no available data.

Table F.56: **Kick and Sweep at Reference and Mine-exposed Areas, FRO LAEMP, December 2019**

Station Information		RG_UFR1	RG_FOUKI	RG_SCOUTDS	RG_FRUPO	RG_FODPO	RG_FOUEW
Station 1	Easting	651350	651866	652243	653891	653872	656312
	Northing	5566805	5559792	5558539	5555948	5555060	5551870
	Date	10-Dec-19	9-Dec-19	10-Dec-19	11-Dec-19	12-Dec-19	11-Dec-19
	Samplers' Initials	PS	MG	-	JV	MG	PS
	Number of Jars	1	1	-	1	1	1
	Total Kick Distance (m)	12	20	-	15	15	
	Full Transect (Yes / No)	y	y	-	y	y	
	Number of Transects	5.0	5.0	-	3.0	2.0	
Station 2	Easting	651371	651841	652263	653906	653913	656330
	Northing	5566764	5559848	5558536	5555889	5555088	5551868
	Date	10-Dec-19	9-Dec-19	10-Dec-19	11-Dec-19	12-Dec-19	11-Dec-19
	Samplers' Initials	MG	MG	MS	JV	MG	MG
	Number of Jars	1	1	1	1	1	1
	Total Kick Distance (m)	8	15	3.5	4.5	20	15
	Full Transect (Yes / No)	y	y	n	y	n	y
	Number of Transects	4.0	5.0	0.75	2.0	5.0	2.0
Station 3	Easting	651405	651835	652296	653866	653944	656362
	Northing	5566748	5559904	5558531	5555858	5555078	5551881
	Date	10-Dec-19	9-Dec-19	10-Dec-19	11-Dec-19	12-Dec-19	11-Dec-19
	Samplers' Initials	PS	MG	MS	JV	MG	PS
	Number of Jars	1	1	2	1	1	1
	Total Kick Distance (m)	12	15	3	8	15	15
	Full Transect (Yes / No)	y	y	y	y	y	y
	Number of Transects	5.0	5.0	2.0	2.0	3.0	3.0

Table F.57: Channel Depth and Velocity at Kick and Sweep Sampling Locations in Reference and Mine-exposed areas, Fording River December, 2019

Area	Station / Replicate	Parameter	1	2	3	4	5	Mean
Reference	RG_UFR1							
	1	Depth (cm)	11.5	12.5	19	14	20	**15.4**
		Velocity (m/s)	0.505	0.443	0.990	0.829	0.396	**0.633**
	2	Depth (cm)	35.3	23	23.5	27.3	23.5	**26.5**
		Velocity (m/s)	0.465	0.313	0.313	0.343	0.443	**0.375**
	3	Depth (cm)	29	33	34	32.5	32	**32.1**
		Velocity (m/s)	0.443	0.542	0.542	0.443	0.313	**0.457**
Mine-exposed	RG_FOUKI							
	1	Depth (cm)	13.5	18.5	16	9.4	13.2	**14.1**
		Velocity (m/s)	0.156	0.204	0.349	0.059	0.388	**0.231**
	2	Depth (cm)	11.5	22.6	18	18.5	13	**16.7**
		Velocity (m/s)	0.538	0.620	0.095	0.709	0.385	**0.469**
	3	Depth (cm)	15.0	16.4	24.2	24.0	19.8	**19.9**
		Velocity (m/s)	0.253	0.479	0.444	0.421	0.478	**0.415**
	RG_SCOUTDS							
	1	Depth (cm)	21.5	24.0	25.5	25.0	10.0	**21.2**
		Velocity (m/s)	0.313	0.375	0.581	0.506	0.371	**0.429**
	2	Depth (cm)	19.0	14.5	17.0	14.5	13.5	**15.7**
		Velocity (m/s)	0.634	0.380	0.612	0.278	0.384	**0.458**
	3	Depth (cm)	10.2	16.4	20.7	21.7	13.4	**16.5**
		Velocity (m/s)	0.195	0.365	0.327	0.490	0.282	**0.332**
	RG_FRUPO							
	1	Depth (cm)	6.5	6	8	9	3	**6.5**
		Velocity (m/s)	0.173	0.069	0.065	0.398	0.167	**0.174**
	2	Depth (cm)	7	13	17.5	12	2	**10.3**
		Velocity (m/s)	0.099	0.154	0.275	0.380	0.114	**0.204**
	3	Depth (cm)	8	19.5	8	11	21	**13.5**
		Velocity (m/s)	0.093	0.283	0.541	0.088	0.071	**0.215**
	RG_FODPO							
	1	Depth (cm)	8	13	15	9	5	**10**
		Velocity (m/s)	0.937	0.767	0.700	0.767	0.542	**0.743**
	2	Depth (cm)	7.5	13	20.5	17	7.5	**13.1**
		Velocity (m/s)	0.443	0.829	1.130	0.990	0.443	**0.767**
	3	Depth (cm)	5.5	12	24.5	32.50	11	**17.1**
		Velocity (m/s)	0.443	0.542	0.542	0.767	0.626	**0.584**
	RG_FOUEW							
	1	Depth (cm)	9.5	18	30.5	27	15.5	**20.1**
		Velocity (m/s)	0.443	0.767	0.939	0.700	0.542	**0.678**
	2	Depth (cm)	8	13	18	20.5	23	**16.5**
		Velocity (m/s)	0.396	0.542	0.886	0.700	0.829	**0.671**
	3	Depth (cm)	5.5	17	29	32	15.5	**19.8**
		Velocity (m/s)	0.313	0.542	0.939	1.085	0.313	**0.638**

Notes: Velocity measurements were taken at five randomly chosen locations throughout the kick sample area. Velocity was measured at the bottom of the water column.

Table F.58: Habitat Information at Reference and Mine-exposed Areas, FRO LAEMP, December 2018

Station ID	Reference	Mine-exposed				
	RG_UFR1	RG_FODHE	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH
Waterbody	Fording River	Fording River	Fording River	Fording River	Fording River	Fording River
Date Sampled	05-Dec-18	05-Dec-18	05-Dec-18	05-Dec-18	06-Dec-18	06-Dec-18
Zone 11 UTMs - E	651390	651337	680855	650973	651157	650862
Zone 11 UTMs - N	5566745	5565428	5563521	5563162	5562443	5580971
Elevation	1,735	1,685	1,664	1,657	-	-
Samplers' Initials	TN, MG	TN, MG	TN	TN, MG	NW, TW	NW, TW
Habitat Characteristics						
Site Access Description	reference, forest	-	park at discharge, walk in	park off haul road by discharge	-	from mine access road, 30m
Surrounding Land Use	forest, mining	mining	mining	mining	mining	mining
Anthropogenic Influences	mining downstream	-	-	-	mine activity	FRO operation surrounding on all sides
Length of Reach Assessed (m)	100	100	100	100	100	50
Bank Stability	moderate	stable, no erosion	stable, no erosion	moderate	moderate	stable, no erosion
Water Colour & Clarity	colourless, clear	colourless, clear	colourless, clear	colourless, clear	colourless, clear	colourless, clear
Substrate Coverage						
% Bedrock	-	-	-	-	-	-
% Boulder	10	-	-	5	-	-
% Cobble	70	-	10	40	-	-
% Gravel	20	-	90	55	-	-
% Sand	-	-	-	-	-	-
% Fines	-	-	-	-	-	-

Table F.58: **Habitat Information at Reference and Mine-exposed Areas, FRO LAEMP, December 2018**

Station ID	Mine-exposed				
	RG_FOUKI	**RG_FOBKS**	**RG_FOBSC**	**RG_FOBCP**	**RG_FRUPO**
Waterbody	Fording River	Fording River	Fording River	Fording River	Fording River
Date Sampled	04-Dec-18	04-Dec-18	04-Dec-18	03-Dec-18	04-Dec-18
Zone 11 UTMs - E	641858	652085	652371	652921	653892
Zone 11 UTMs - N	5559805	5558650	5558151	5556990	5555951
Elevation	-	1,595	1,590	-	-
Samplers' Initials	TN, MG	TN, MG	TN, MG	TN, NW, TW, MG	TW
Habitat Characteristics					
Site Access Description	park at base of tailing pond, need swift gate key	-	park on berm	-	fording river road
Surrounding Land Use	forest, mining	forest, mining	forest, mining	forest, mining	forest, mining
Anthropogenic Influences	mining	-	-	mining upstream	FRO upstream
Length of Reach Assessed (m)	100	100	100	100	100
Bank Stability	stable, no erosion	stable, no erosion	moderate	stable, no erosion	moderate
Water Colour & Clarity	slightly coloured, clear	colourless, clear	tea, clear	frozen, no water	colourless, clear
Substrate Coverage					
% Bedrock	-	-	-	-	-
% Boulder	5	5	5	-	-
% Cobble	5	10	15	-	-
% Gravel	80	80	80	-	-
% Sand	10	5	-	-	-
% Fines	-	-	-	-	-

Table F.58: **Habitat Information at Reference and Mine-exposed Areas, FRO LAEMP, December 2018**

Station ID	Mine-exposed		
	RG_FODPO	RG_FO22	RG_FOUEW
Waterbody	Fording River	Fording River	Fording River
Date Sampled	04-Dec-18	05-Dec-18	05-Dec-18
Zone 11 UTMs - E	653887	654828	656362
Zone 11 UTMs - N	5555078	5553606	5551885
Elevation	-	1,569	-
Samplers' Initials	NW, TW	NW, TW	NW, TW
Habitat Characteristics			
Site Access Description	-	access trail off Fording River highway	-
Surrounding Land Use	forest, mining	forest, mining	forest, mining, gun range u/s
Anthropogenic Influences	-	mining upstream	FRO upstream
Length of Reach Assessed (m)	100	50	100
Bank Stability	moderate	unstable, substantial erosion	moderate
Water Colour & Clarity	colurless, clear	colourless, clear	colurless, clear
Substrate Coverage			
% Bedrock	-	-	-
% Boulder	-	-	-
% Cobble	-	-	-
% Gravel	-	-	-
% Sand	-	-	-
% Fines	-	-	-

Table F.59: *In Situ* Water Quality Taken at Biological Monitoring Areas, FRO LAEMP, December 2018

Field Parameters		Reference	Mine-Exposed												
		RG_UFR1	RG_FODHE	RG_FOUNGD	RG_FODNGD	RG_MP1	RG_FOUSH	RG_FOUKI	RG_FOBKS	RG_FOBSC	RG_FOBCP	RG_FRUPO	RG_FODPO	RG_FO22	RG_FOUEW
Date		05-Dec-18	05-Dec-18	05-Dec-18	05-Dec-18	06-Dec-18	06-Dec-18	04-Dec-18	04-Dec-18	04-Dec-18	03-Dec-18	04-Dec-18	04-Dec-18	05-Dec-18	05-Dec-18
Station 1	Temperature (°C)	0	-0.10	1.60	1.10	-0.022	0.050	0.20	-0.025	-0.10	-0.10	4.64	3.86	2.07	0.34
	Dissolved Oxygen (mg/L)	11.89	11.66	11.39	11.99	12.17	12.08	12.24	12.53	12.41	11.94	10.21	9.88	11.44	11.78
	Dissolved Oxygen (%)	81.3	79.8	81.6	84.9	83.4	83.0	84.4	85.9	85.0	-	79.5	75.6	83.2	81.7
	Conductivity (µS/cm)	186.3	271.0	461.3	470.6	392.0	493.1	489.0	440.2	480.4	1762.0	628.0	700.0	623.0	574.0
	Specific Conductivity (µS/cm)	356.9	531.0	835.0	865.0	751.0	942.0	931.0	844.0	925.0	-	1,028.0	1,172.0	1,109.0	1,084.0
	pH	7.93	8.04	7.95	8.11	8.71	8.13	8.17	8.51	8.12	7.68	7.79	7.70	8.02	7.90
	ORP (mV)	-	-	-	-	-	-	-	-	79.20	-	-	-	-	-
Station 2	Temperature (°C)	0	-	-	-	-	-	0.10	-	-0.10	-	4.46	3.82	-	0.47
	Dissolved Oxygen (mg/L)	11.96	-	-	-	-	-	12.19	-	12.39	-	10.34	9.81	-	11.67
	Dissolved Oxygen (%)	81.8	-	-	-	-	-	83.0	-	84.9	-	80.1	74.8	-	81.3
	Conductivity (µS/cm)	186.0	-	-	-	-	-	489.6	-	506.0	-	625.0	698.0	-	561.0
	Specific Conductivity (µS/cm)	356.3	-	-	-	-	-	934.0	-	971.0	-	1,028.0	1,173.0	-	1,054.0
	pH	7.97	-	-	-	-	-	8.11	-	8.12	-	7.77	7.55	-	7.85
	ORP (mV)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Station 3	Temperature (°C)	0	-	-	-	-	-	0.10	-	0	-	4.35	3.60	-	0.49
	Dissolved Oxygen (mg/L)	12.11	-	-	-	-	-	12.17	-	12.45	-	10.47	9.95	-	11.56
	Dissolved Oxygen (%)	83.4	-	-	-	-	-	83.8	-	85.4	-	80.9	75.2	-	80.3
	Conductivity (µS/cm)	185.9	-	-	-	-	-	491.8	-	481.5	-	621.0	689.0	-	565.0
	Specific Conductivity (µS/cm)	356.2	-	-	-	-	-	937.0	-	930.0	-	1,025.0	1,167.0	-	1,065.0
	pH	7.97	-	-	-	-	-	8.09	-	8.14	-	7.82	7.67	-	7.84
	ORP (mV)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: "-" indicates no data available.

Table F.60: Kick and Sweep at Reference and Mine-exposed Areas, FRO LAEMP, December 2018

Station Information		RG_UFR1	RG_FOUKI	RG_FOBSC	RG_FRUPO	RG_FODPO	RG_FOUEW
Station 1	Easting	651390	651858	652385	653880	653848	656266
	Northing	5566745	5559805	5558151	5556001	5555044	5551878
	Date	05-Dec-18	04-Dec-18	04-Dec-18	04-Dec-18	04-Dec-18	05-Dec-18
	Samplers' Initials	TN, MG	TN, MG	TN, MG	TW, NW	TW, NW	NW, TW
	Number of Jars	1	1	1	1	1	1
	Total Kick Distance (m)	10	15	10	20	20	20
	Full Transect (Yes / No)	No	No	-	Yes	Yes	Yes
	Number of Transects	10.0	4.0	10.0	2.5	2.5	2.5
Station 2	Easting	651376	651837	652371	653893	653887	656322
	Northing	5566758	5559840	5558158	5555950	5555078	5551867
	Date	05-Dec-18	04-Dec-18	04-Dec-18	04-Dec-18	04-Dec-18	05-Dec-18
	Samplers' Initials	TN, MG	TN, MG	TN, MG	TW, NW	TW, NW	NW, TW
	Number of Jars	1	1	1	1	1	1
	Total Kick Distance (m)	10	15	10	20	20	20
	Full Transect (Yes / No)	No	Yes	No	Yes	Yes	Yes
	Number of Transects	10.0	3.0	8.0	2.5	2.5	2.5
Station 3	Easting	651350	651834	652345	653892	653942	656362
	Northing	5566774	5559908	5558184	5555880	5555079	5551885
	Date	05-Dec-18	04-Dec-18	04-Dec-18	04-Dec-18	04-Dec-18	05-Dec-18
	Samplers' Initials	TN, MG	TN, MG	TN, MG	TW, NW	TW, NW	NW, TW
	Number of Jars	1	1	1	1	1	1
	Total Kick Distance (m)	10	15	8	20	20	20
	Full Transect (Yes / No)	No	Yes	No	Yes	Yes	Yes
	Number of Transects	7.0	3.0	20.0	2.5	2.5	2.5

Table F.61: Channel Depth and Velocity at Kick and Sweep Sampling Locations in Mine-exposed Areas, FRO LAEMP, December 2018

Replicate	1	2	3	4	5	Mean
RG_FOUKI_1						
Depth (cm)	30	31	32	24	23	**28.0**
Velocity (m/s)	1.15	1.29	0.73	0.80	0.71	**0.936**
RG_FOUKI_2						
Depth (cm)	30	31	32	24	23	**28.0**
Velocity (m/s)	–	–	–	–	–	**–**
RG_FOBSC_1						
Depth (cm)	12	9	17	14	14	**13.2**
Velocity (m/s)	0.02	0.02	0.01	0.00	0.05	**0.020**
RG_FOBSC_2						
Depth (cm)	16	17	16	20	13	**16.3**
Velocity (m/s)	0.02	0.02	0.05	0.10	0.12	**0.062**
RG_FOBSC_3						
Depth (cm)	28	29	24	10	12	**20.6**
Velocity (m/s)	0.16	0.20	0.09	0.24	0.19	**0.176**

Table F.62: Summary Statistics of Pebble Size, Fording River, 2019

Area	Measure	February			June			September					December		
		R1	R2	R3	R1	R2	R3	R1	R2	R3	R4	R5	R1	R2	R3
RG_HENUP	D16	-	-	-	3.00	3.92	3.50	4.58	3.40	3.40	-	-	-	-	-
RG_HENUP	D84	-	-	-	31.2	24.3	21.1	14.0	13.4	13.0	-	-	-	-	-
RG_FO26	D16	-	-	-	3.28	3.85	3.40	4.00	5.05	3.60	-	-	-	-	-
RG_FO26	D84	-	-	-	8.32	11.8	9.52	11.7	15.5	11.8	-	-	-	-	-
RG_UFR1	D16	4.88	-	-	-	-	-	-	-	-	-	-	5.00	2.92	3.50
RG_UFR1	D84	10.2	-	-	-	-	-	-	-	-	-	-	12.1	9.50	11.0
RG_FODHE	D16	-	-	-	4.00	5.50	3.00	4.98	5.60	5.04	-	-	-	-	-
RG_FODHE	D84	-	-	-	11.5	15.0	12.6	13.2	12.0	9.80	-	-	-	-	-
RG_FOUCL	D16	-	-	-	-	-	-	5.15	5.58	5.47	-	-	-	-	-
RG_FOUCL	D84	-	-	-	-	-	-	13.7	11.7	11.5	-	-	-	-	-
RG_FOUNGD	D16	-	-	-	2.00	3.50	3.00	2.00	3.00	3.00	-	-	-	-	-
RG_FOUNGD	D84	-	-	-	11.0	12.2	14.5	9.08	7.50	7.00	-	-	-	-	-
RG_FODNGD	D16	-	-	-	5.50	2.50	5.00	3.50	3.00	3.50	-	-	-	-	-
RG_FODNGD	D84	-	-	-	17.2	15.6	20.0	10.0	10.0	9.00	-	-	-	-	-
RG_MP1	D16	-	-	-	4.40	5.58	3.90	4.48	4.37	5.40	-	-	-	-	-
RG_MP1	D84	-	-	-	15.8	11.7	13.4	45.2	33.3	37.7	-	-	-	-	-
RG_FOUSH	D16	-	-	-	6.48	5.60	4.40	4.60	4.84	4.18	-	-	-	-	-
RG_FOUSH	D84	-	-	-	13.3	14.5	9.92	16.4	14.4	15.6	-	-	-	-	-
RG_FOUKI	D16	4.30	-	-	4.50	4.85	3.88	5.40	5.98	4.42	-	-	4.37	5.78	5.80
RG_FOUKI	D84	10.0	-	-	10.7	13.5	13.0	13.8	15.3	21.3	-	-	15.1	15.2	15.0
RG_FOBKS	D16	-	-	-	2.92	4.00	2.00	4.00	2.98	4.50	-	-	-	-	-
RG_FOBKS	D84	-	-	-	15.0	16.0	14.1	11.6	9.95	13.1	-	-	-	-	-
RG_SCOUTDS	D16	-	-	-	-	-	-	4.30	2.50	3.18	-	-	5.00	4.90	4.85
RG_SCOUTDS	D84	-	-	-	-	-	-	10.2	8.70	10.5	-	-	11.7	10.1	11.2
RG_FOBSC	D16	-	-	-	3.50	3.50	3.00	3.20	5.17	5.10	-	-	-	-	-
RG_FOBSC	D84	-	-	-	11.6	16.0	18.0	8.61	13.2	12.7	-	-	-	-	-
RG_FOBCP	D16	-	-	-	4.50	4.42	4.50	5.50	4.08	4.90	-	-	-	-	-
RG_FOBCP	D84	-	-	-	18.0	14.1	15.0	13.8	11.4	11.2	-	-	-	-	-
RG_FRCP1SW	D16	-	-	-	4.28	2.50	3.00	3.48	2.60	4.18	-	-	-	-	-
RG_FRCP1SW	D84	-	-	-	8.40	11.0	7.50	10.2	6.63	9.03	-	-	-	-	-
RG_FRUPO	D16	4.10	-	-	2.60	4.77	3.70	3.40	3.10	4.30	-	-	5.50	4.00	3.00
RG_FRUPO	D84	7.52	-	-	6.52	10.5	8.23	9.25	11.9	9.60	-	-	10.0	13.0	7.00
RG_FODPO	D16	3.58	-	-	2.30	2.88	3.20	2.20	1.85	2.78	-	-	2.00	1.92	1.50
RG_FODPO	D84	6.72	-	-	5.45	5.42	5.90	6.25	7.10	7.10	-	-	6.58	5.58	5.50
RG_FO22	D16	-	-	-	2.00	1.37	1.80	1.40	2.00	1.40	1.40	1.18	-	-	-
RG_FO22	D84	-	-	-	4.30	5.02	5.02	4.20	4.52	4.33	3.92	3.72	-	-	-
RG_FOUEW	D16	4.90	-	-	5.58	3.40	5.28	4.80	4.20	2.22	-	-	3.50	4.00	6.00
RG_FOUEW	D84	10.7	-	-	11.1	8.03	13.0	10.8	10.1	15.3	-	-	10.1	13.5	14.1

Note "-" indicates no data available.

APPENDIX G
HYDROLOGY

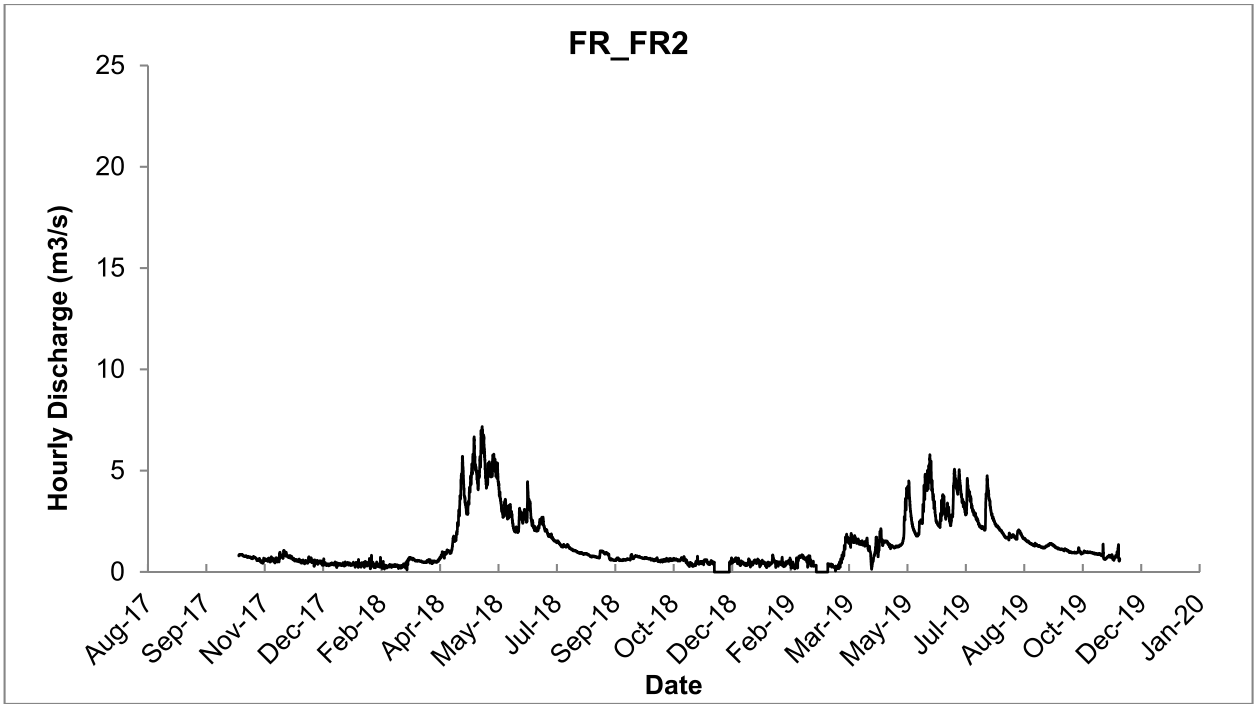

Figure G.1: Hourly Discharge Plot for FR_FR2

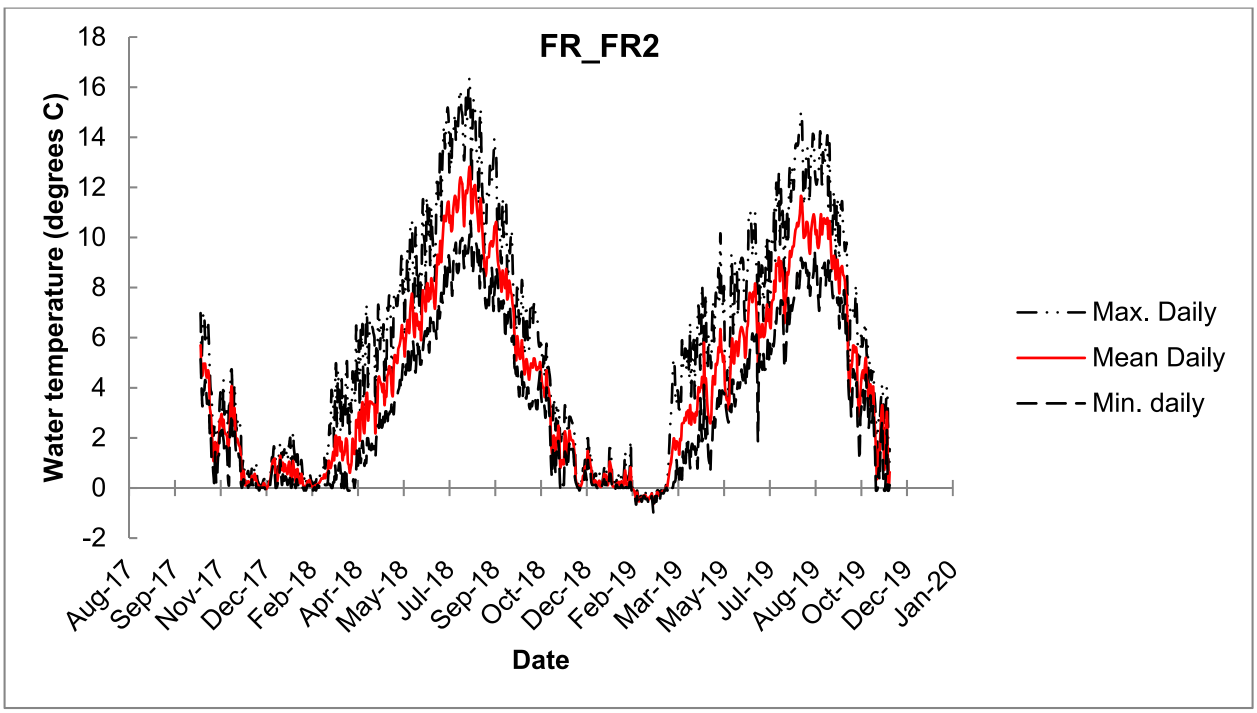

Figure G.2: Continuous Water Temperature Plot for FR_FR2

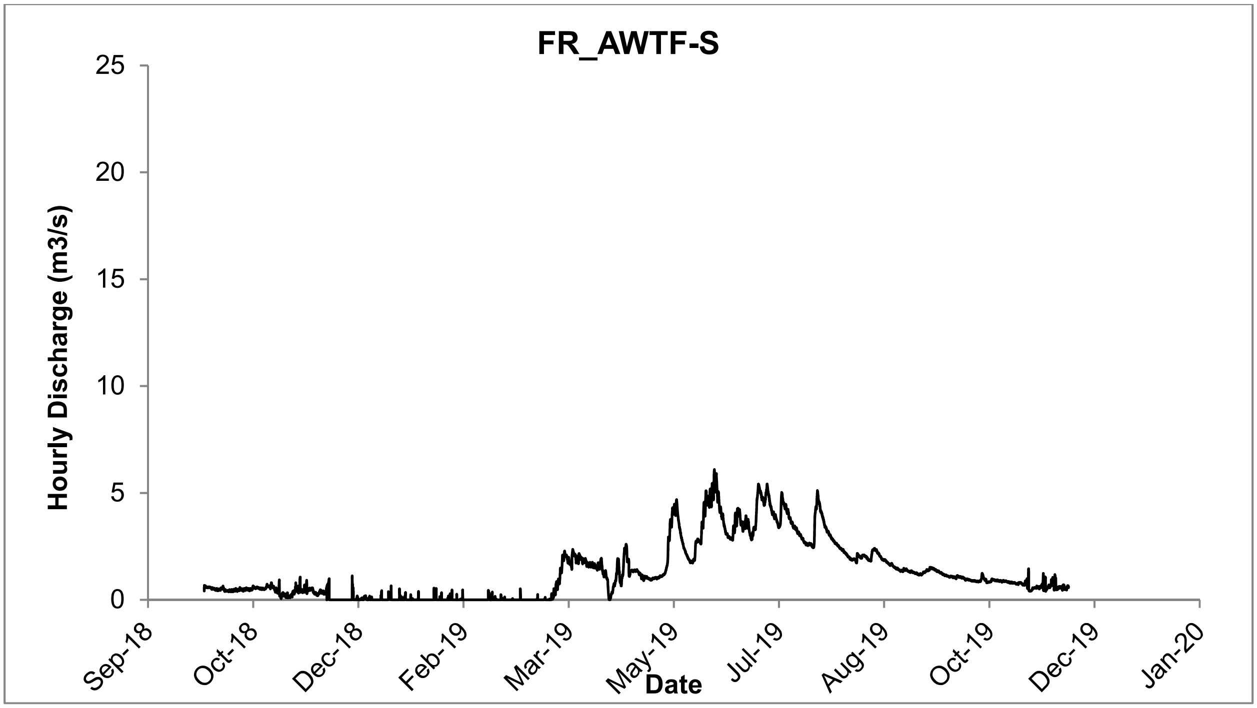

Figure G.3: **Hourly Discharge Plot for FR_AWTF-S**

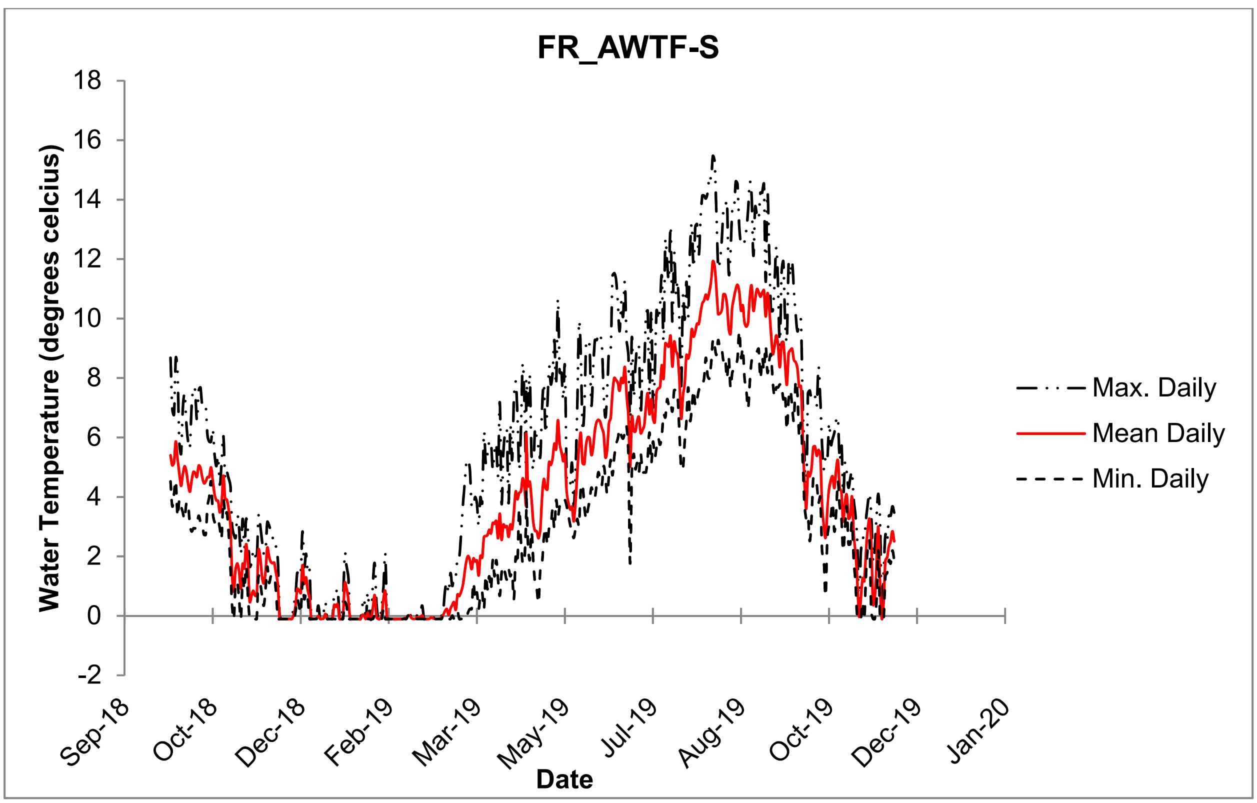

Figure G.4: **Continuous Water Temperature Plot for FR_AWTF-S**

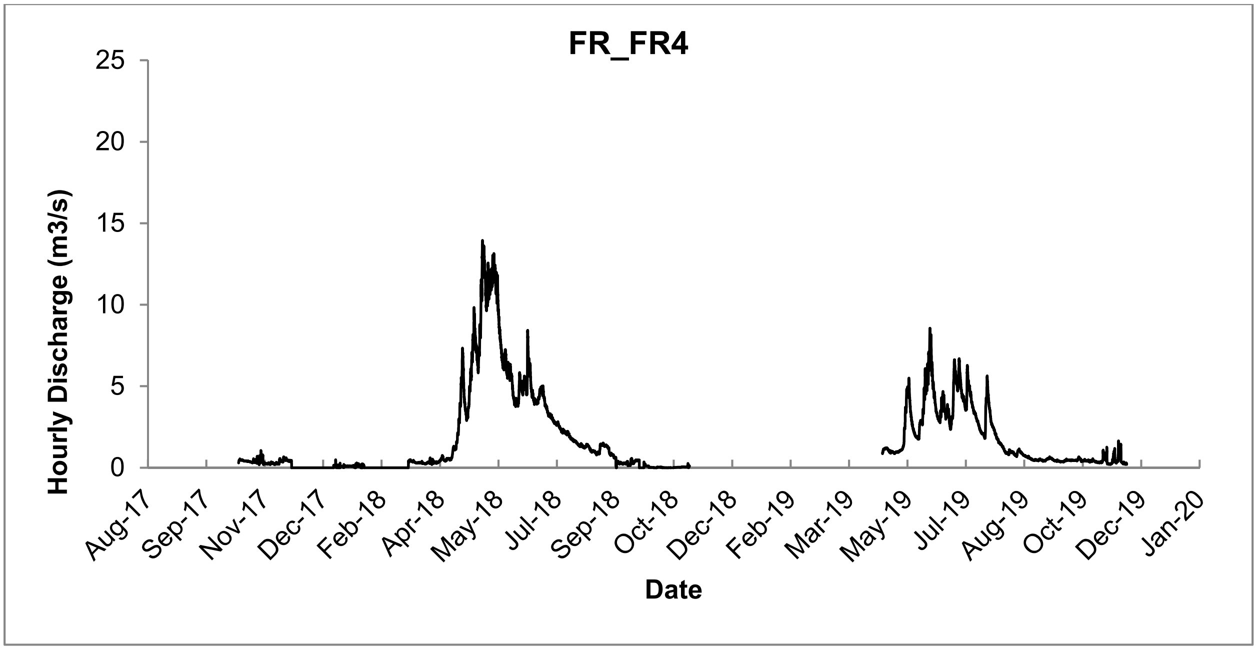

Figure G.5: Continuous Water Temperature Plot for FR_FR4

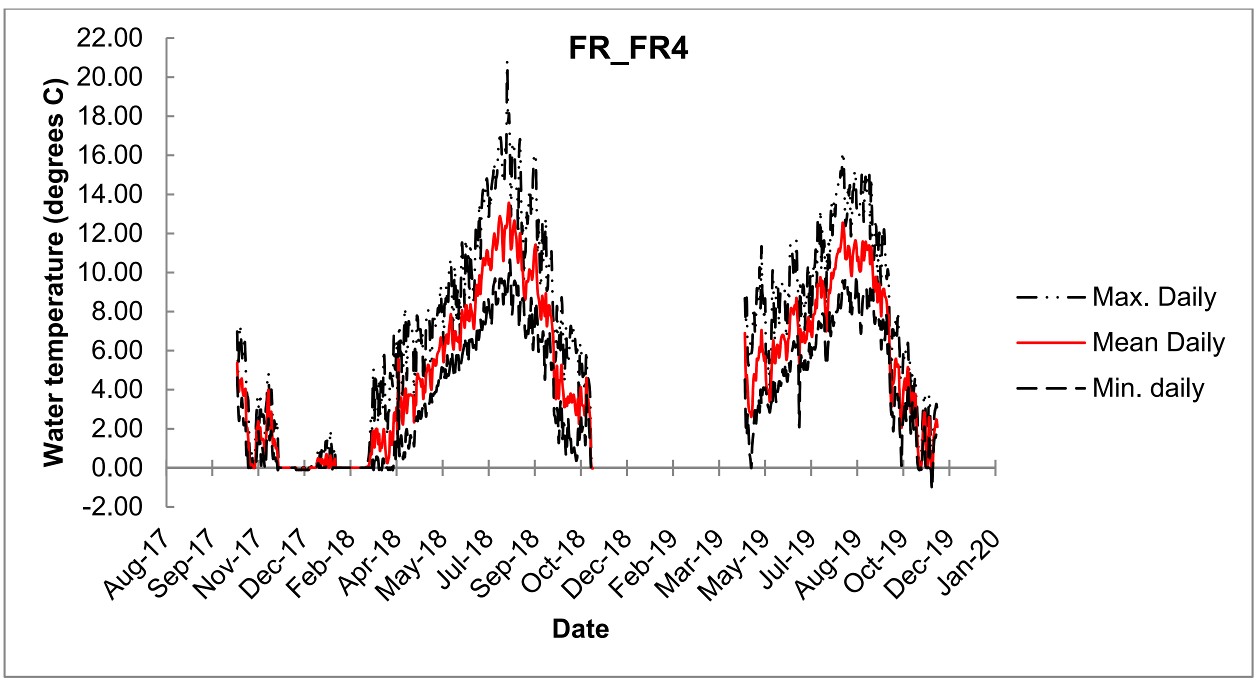

Figure G.6: Continuous Water Temperature Plot for FR_FR4

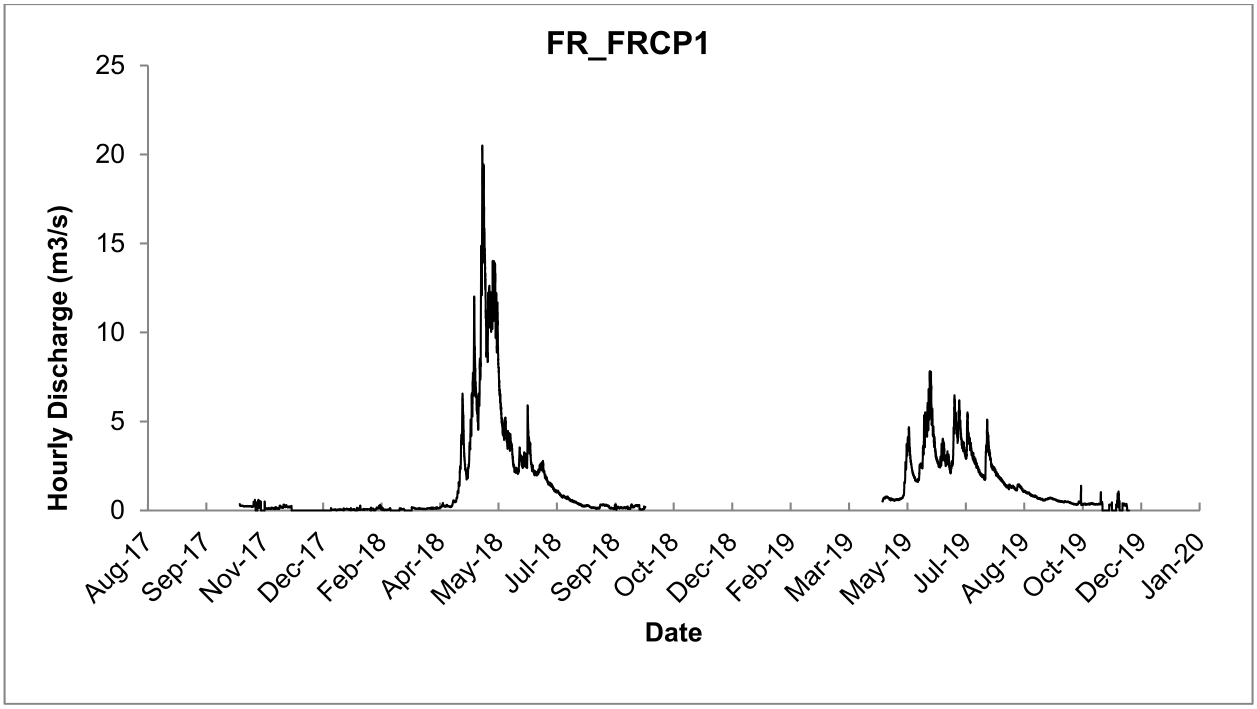

Figure G.7: Continuous Water Temperature Plot for FR_FRCP1

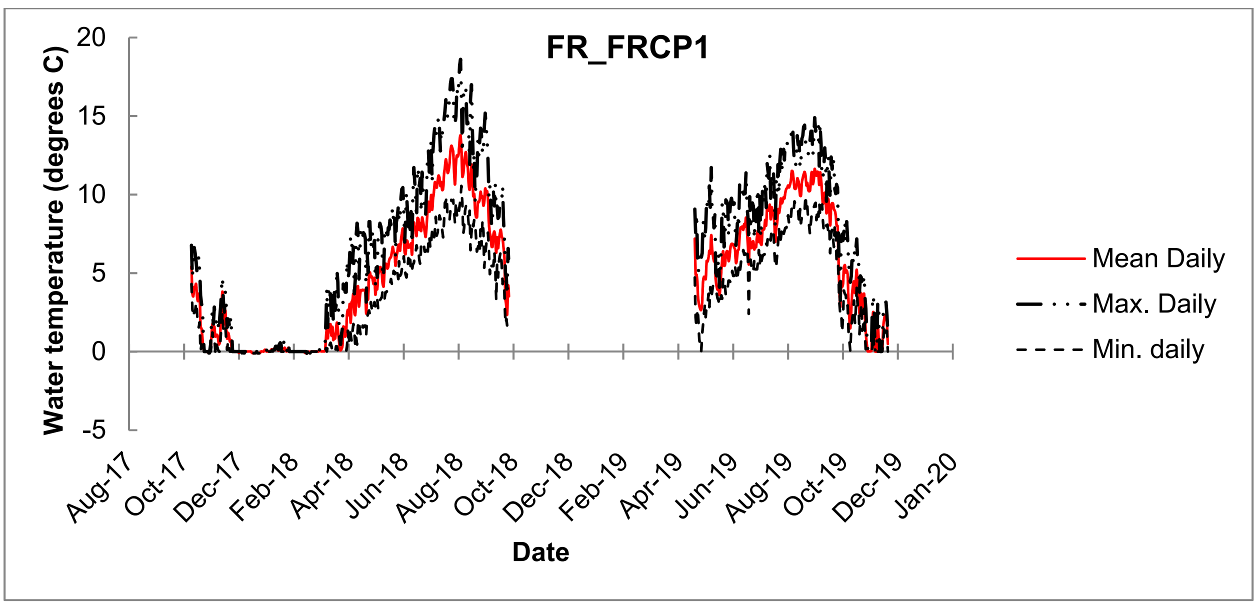

Figure G.8: Continuous Water Temperature Plot for FR_FRCP1

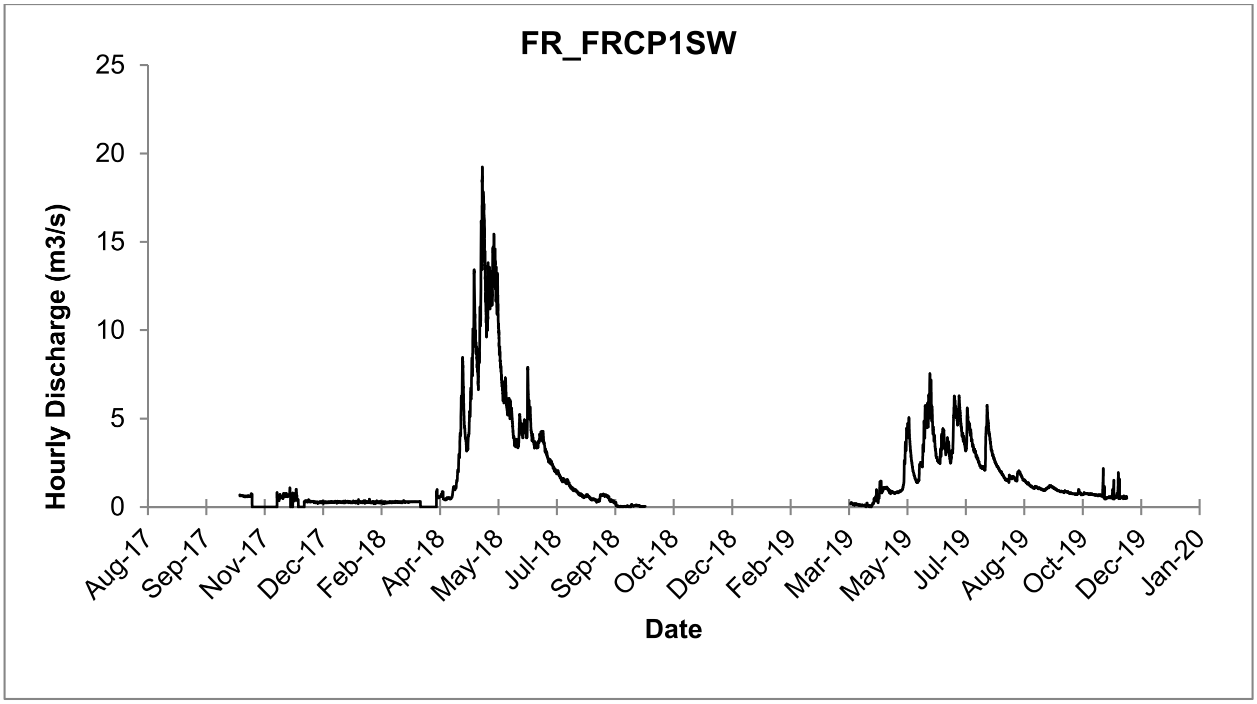

Figure G.9: **Continuous Water Temperature Plot for FR_FRCP1**

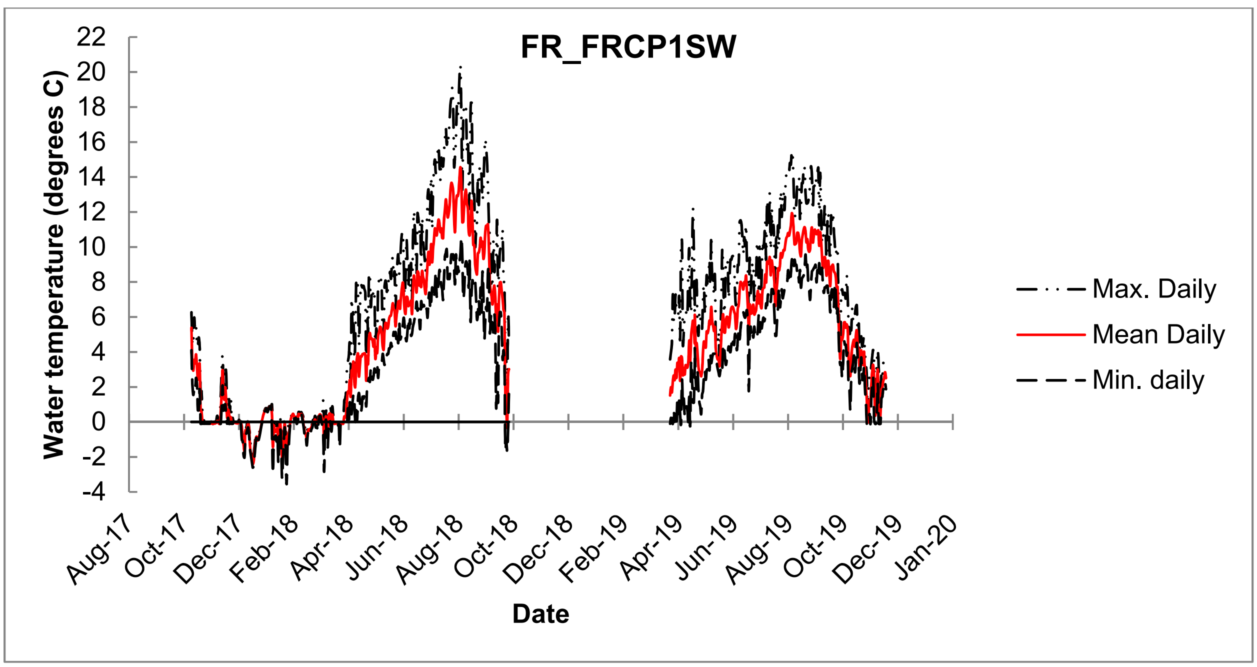

Figure G.10: **Continuous Water Temperature Plot for FR_FRCP1**

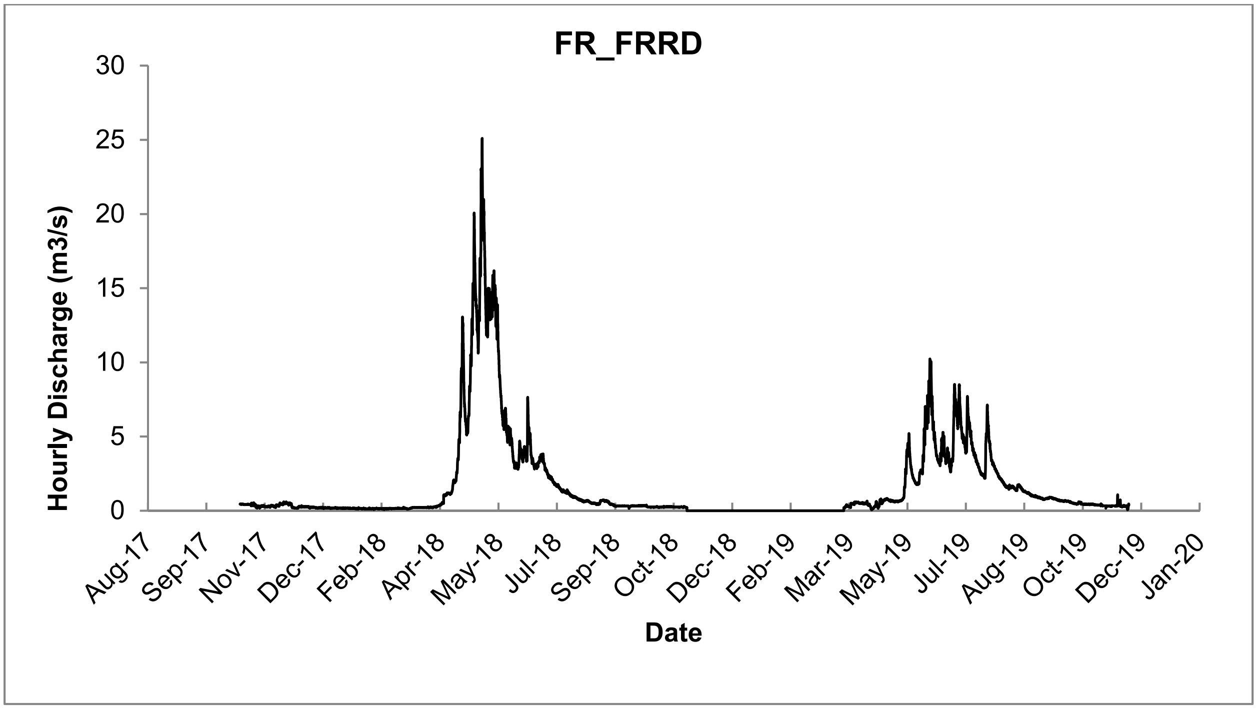

Figure G.11: Continuous Water Temperature Plot for FR_FRCP1

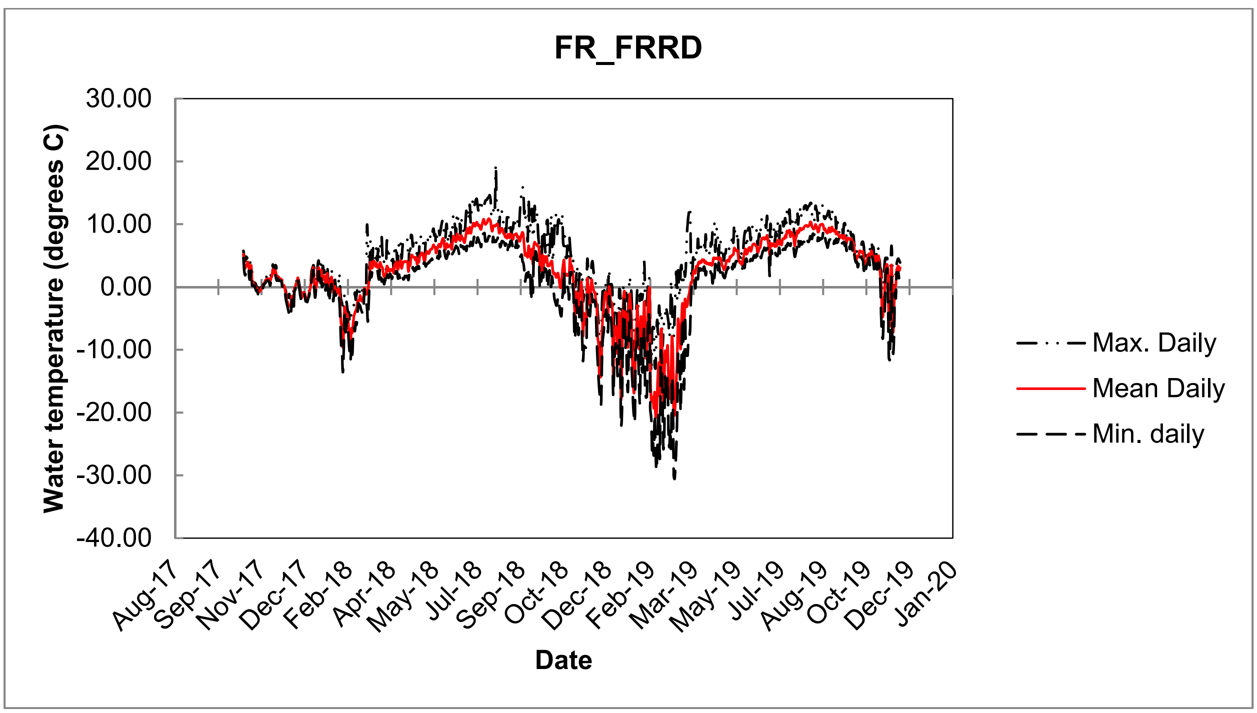

Figure G.12: Continuous Water Temperature Plot for FR_FRCP1

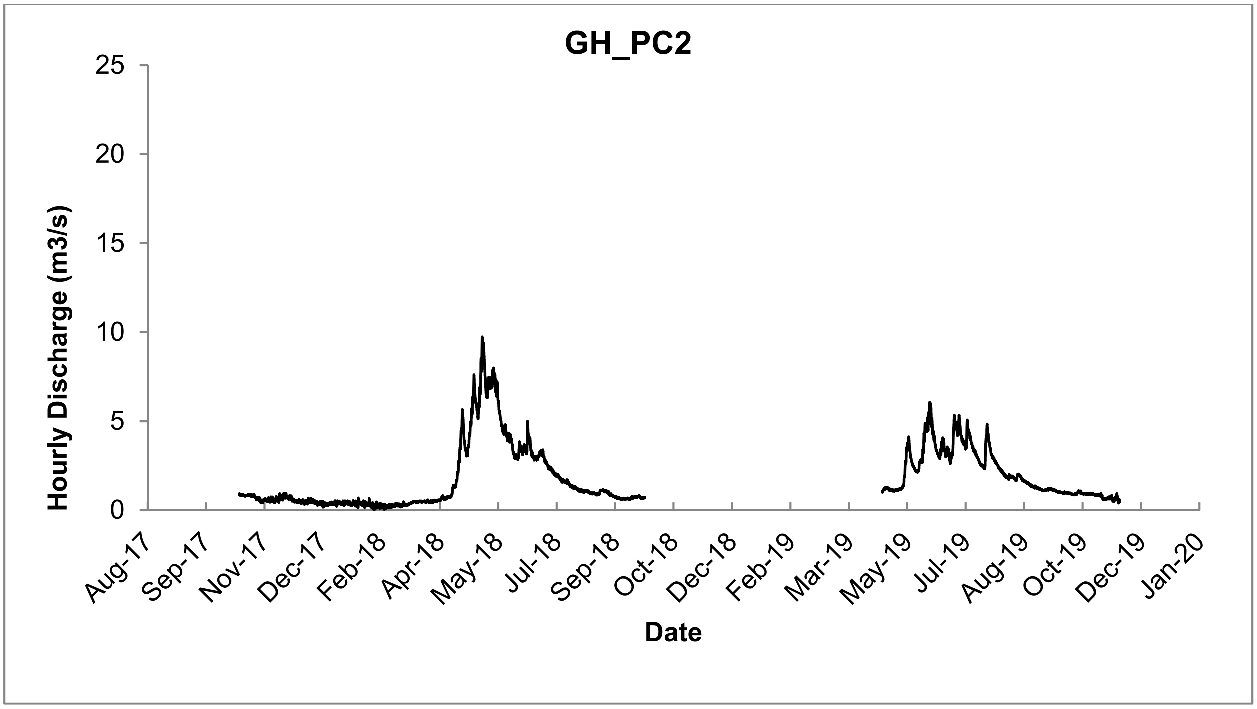

Figure G.13: Continuous Water Temperature Plot for FR_FRCP1

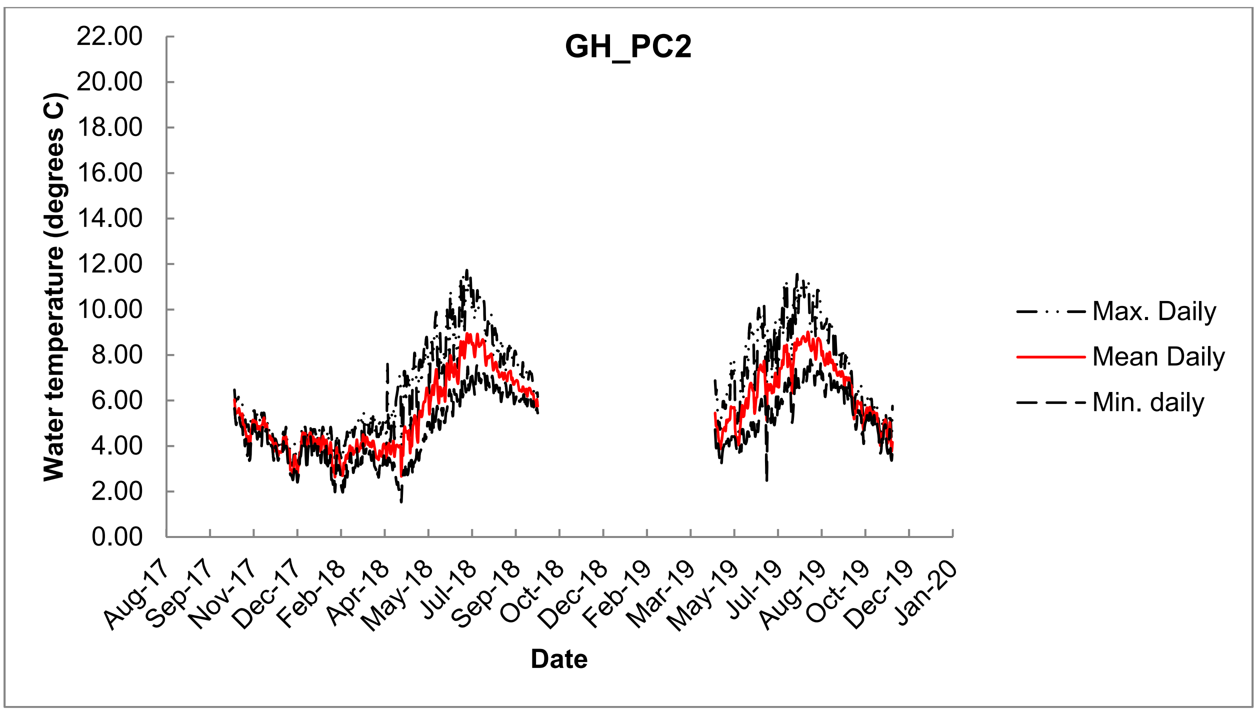

Figure G.14: Continuous Water Temperature Plot for FR_FRCP1

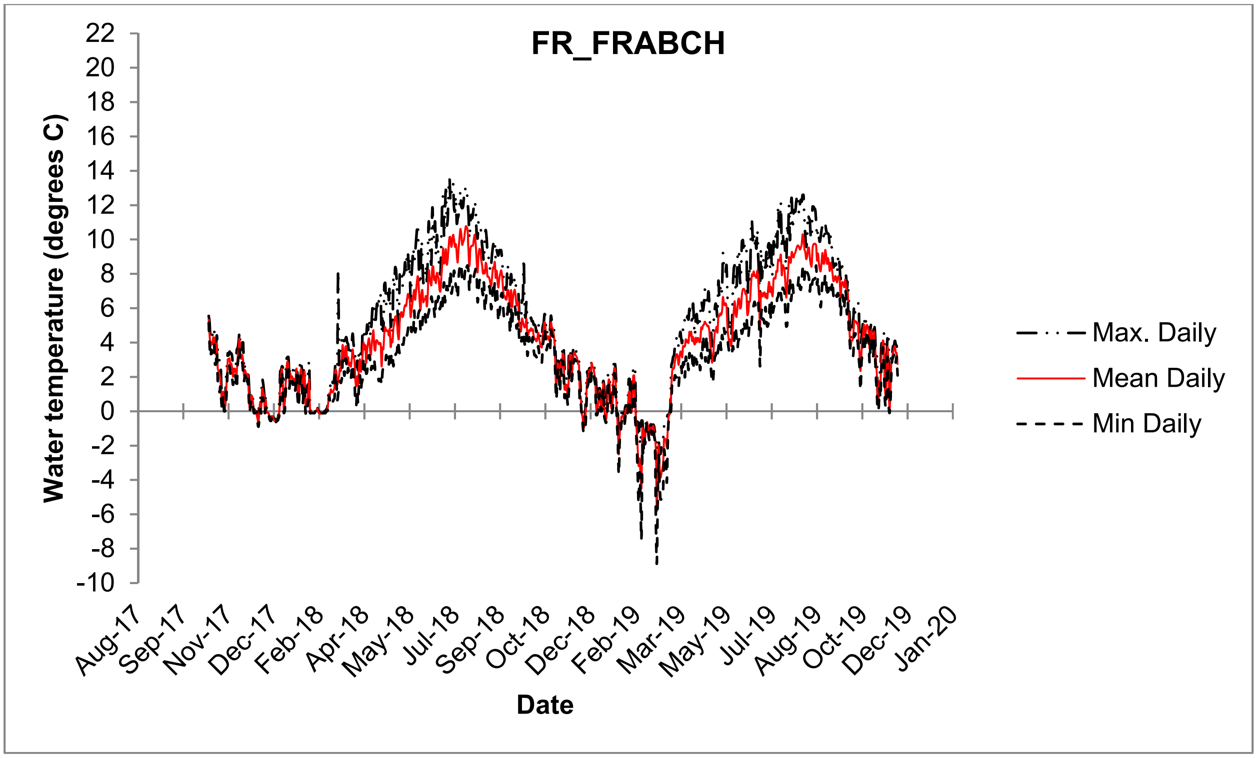

Figure G.15: Continuous Water Temperature Plot for FR_FRCP1